Appendix A

Traffic Impact Assessment (Revision A)

University of Technology, Sydney

Dr Chau Chak Wing Building Development

Transport Impact Assessment

220911-30

Rev A | August 2011

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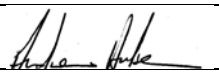
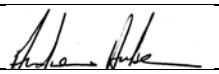
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Executive Summary

The proposed Dr Chau Chak Wing Building, located at 14 – 28 Ultimo Road, Ultimo, will accommodate the UTS Business School and related teaching and research faculty of the school. The building will provide for 454 academic/ support staff and research students and 7905 undergraduate and post graduate students. The development is designed to accommodate a maximum of 1256 students at any one time. Many of these students and staff positions are already located on the UTS campus in other buildings.

Pedestrian facilities are generally good in the locality as all of the signalised intersections have pedestrian crossing facilities. There is a pedestrian link from Central Station to the Ultimo Pedestrian Network (UPN) and there is a wide footpath on both sides of Ultimo Road providing access to the building. An on – road bicycle route is provided along Ultimo Road which forms part of the Pyrmont – Moore Park (R8) cycleway network, connecting to other routes for travel in all directions.

The Broadway precinct is well served by public transport. Central station is located within 5 to 10 minutes walk from the site and bus frequencies are reasonably high. A light rail station is located within close proximity to the site. The additional students/ staff generated by the site are unlikely to have any significant impact on the existing cyclist, pedestrians and public transport facilities.

The main RTA controlled State Roads in the area are Broadway and Harris Street. The Average Annual Daily Traffic (AADT) on Broadway has reduced by almost 20% since 1996. The traffic volume on Harris Street has also reduced since 1999 but to a lesser extent. The main intersections in the vicinity of the site are Harris Street/Ultimo Road and Ultimo Road/Darling Drive. These two intersections have been surveyed in the am and pm peak periods with analysis undertaken to determine the existing operating conditions and determine any change in operation.

In total 21 parking spaces are proposed. The proposed low level of parking is to comply with the aims of the NSW Government and City of Sydney plan to reduce the demand for travel to the CBD by private car. No parking will be allocated for student use. The only vehicular access will be left-in/left-out on Ultimo Road, approximately 25m west of Ultimo Road/ Darling Drive intersection. The left in/ left out provision will be enforced by regulatory sign control.

The site currently accommodates 114 on – grade parking spaces. It is estimated that the site currently generates 57 vehicular trips during the peak traffic period. The forecast traffic generation from the site is estimated to be less than 20 vehicles per hour. This represents a peak hour reduction of traffic to/from the site about 37 vehicles/hour. Sidra intersection modelling shows that due to the forecast traffic generation of the site and distribution onto the road network, there would be negligible impact on the Harris Street/Ultimo Road and the Ultimo Road/Darling Drive intersection during both the am and pm peaks.

A Construction Traffic Management Plan will need to be prepared by the construction contractor prior to obtaining the Construction Certificate for the development.

1 Introduction

Arup has been commissioned by University of Technology, Sydney (UTS) to undertake a transport impact assessment for the proposed Dr Chau Chak Wing Building located at 14 – 28 Ultimo Road, Ultimo, Sydney. This report has been prepared as a component of Environmental Assessment (EA) of the development which will be lodged to Department of Planning.

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

The report addresses the traffic and transport issues raised by the Director General's Requirements issued by the Department of Planning including input from the City of Sydney and RTA.

1.1 Scope of the Report

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

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

1.2 Background Review

The following documents have been reviewed:

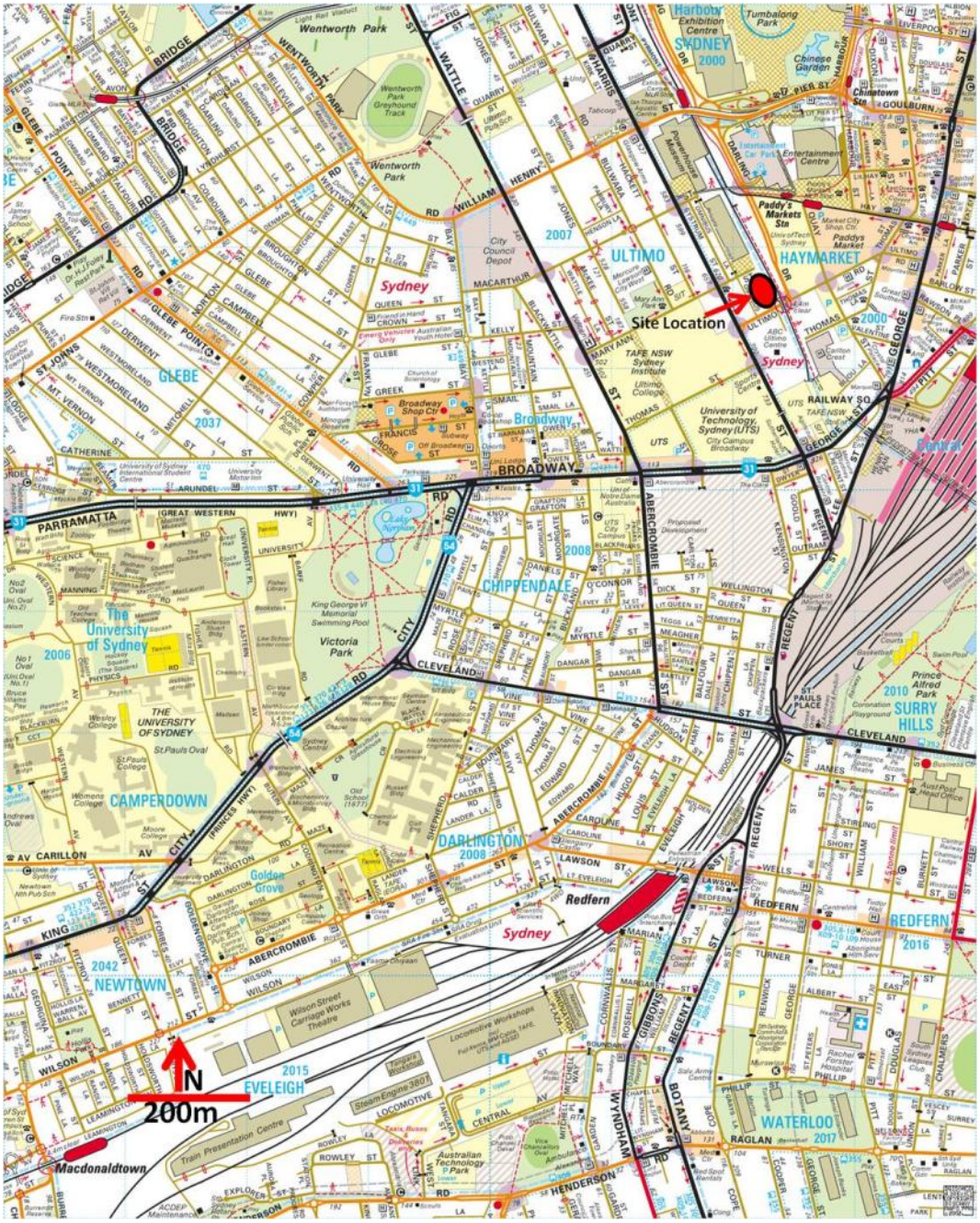
- Concept Plan – UTS Transport Management and Accessibility Plan (TMAP) report prepared by Halcrow MWT dated 8 May 2009;
- UTS Masterplan projects; and
- UTS City Campus Masterplan – Economic Impact Assessment prepared by Urbis.

2 Existing Conditions

2.1 Site Area and Land Uses

The site (approximately 0.28 hectares of land) is located on the northern side of Ultimo Road and is generally bounded by Ultimo Road (south), the Ultimo Pedestrian Network (UPN) adjacent to Darling Drive (east), Mary Ann Street (north) and Omnibus Lane (west) (refer to Figure 1). The site, formerly a Dairy Farmers Cooperative building, currently accommodates an on – grade commercial car park.

Figure 1: Site Location



The locality land uses are predominantly educational and business facilities. Specific land uses include:

- UTS library – opposite side of Darling Drive;
- Ultimo College – opposite side of Harris Street;
- ABC Ultimo centre – south side of Ultimo Road;
- The Broadway precinct of the UTS city campus – bounded by Harris Street, Thomas Street, Jones Street and Broadway – approximately 200m south west of the site; and
- Paddy's Market – approximately 300m north of the site.

2.2 Road Hierarchy and Traffic Data

The main RTA controlled State Roads which function as arterial roads in the area are Broadway which runs along the southern boundary of the precinct and Harris Street which runs to the west of the site. Broadway provides east – west connection to the CBD from Parramatta Road. This heavily trafficked road forms a pedestrian barrier in the locality. However, most of the intersections linking Broadway are controlled by traffic signals with pedestrian crossing facilities on most of the approaches. There are kerbside bus lanes on both sides of Broadway.

Harris Street provides north – south connection between Ultimo and Pyrmont. The speed limit is restricted to 50km/h in Harris Street. Between Broadway and Thomas Street, Harris Street is restricted to one – way southbound.

Ultimo Road, which runs along the southern boundary of the site, provides east – west connection between Harris Street (west) and Thomas Street (east). It is a two lane two – way road with additional kerbside bicycle lane in some sections of the road.

Darling Drive is located to the east of the site. It provides north - south connection between Ultimo Road and Pyrmont Bridge Road. It is generally a two lane two way road with additional turning lanes at some intersections. Darling Drive provides access to several car parks in the Darling Harbour area.

Mary Ann Street, a local road, runs along the northern boundary of the site and it provides the existing access to the site. It runs east – west from Wattle Street (west) crossing Harris Street to terminate at the UPN corridor. Therefore, east of Harris Street, Mary Ann Street is a no through road.

Omnibus Lane forms the western boundary to the site and connects between Ultimo Road and Mary Ann Street providing local two way vehicle access to adjacent properties. Two way vehicular accesses will be retained on Omnibus Lane following the site development.

Average Annual Daily Traffic (AADT) data for Broadway, Harris Street and Ultimo Road is outlined Table 1.

Table 1: Historical AADT Traffic Volume

Street	Location	AADT			
		1996	1999	2002	2005
Broadway	W/ Wattle St	68869	71810	64266	55557
Harris Street	At Ultimo Rd	25678	36366	33363	31568
Harris Street	N/ Marry Ann St	28336	31263	27103	27812
Ultimo Rd	W/ Quay St	12304	15188	12589	14802

Source: RTA

The data in the above table shows that since 1996 the traffic volume on Broadway has reduced by almost 20%, possibly due to opening of City West Link Road and Cross City Tunnel and introduction of kerbside Bus Lane on Broadway/ Parramatta Road.

Since 1999, the traffic volume on Harris Street has also reduced but to a lesser extent. The traffic volume of Ultimo Road is just below 15,000 vehicles per day. As per RTA Functional Classification of Road, traffic volume on a collector road varies between 2,000 – 10, 000 vehicles per day. Therefore, historically Ultimo Road is providing an important role for traffic circulation in the precinct providing access to the arterial road system.

2.3 Intersections in the Vicinity of the Site

The major intersections in the vicinity of the site are Harris Street/ Ultimo Road, Ultimo Road/ Darling Drive and Harris Street/ Mary Ann Street intersections. Harris Street/ Ultimo Road T - intersection is controlled by traffic signals with pedestrian crossing facilities on all approaches. It should be noted that on the south approach to the intersection, half of the pedestrian crossing line is currently missing (refer to Photograph 1). It is important that line marking is replaced appropriately after road works to ensure a safe environment is maintained for all road users. The right turn movement is prohibited from Harris Street to Ultimo Road.

Ultimo Road/ Darling Drive intersection is also controlled by traffic signals with pedestrian crossing facilities on north, east and south approaches. There is an existing driveway access on the south approach of the intersection (refer to Photograph 2). The right turn into the driveway is prohibited from Ultimo Road.

Harris Street/ Mary Ann Street intersection currently carries the existing site vehicles. This intersection is also controlled by traffic signals with pedestrian crossing facilities on all four approaches. On the west approach of the intersection, Mary Ann Street is restricted to one – way westbound.

The traffic and pedestrian volumes of Harris Street/ Ultimo Road and Ultimo Road/ Darling Drive have been surveyed by Arup appointed private contractor R.O.A.R. DATA on Wednesday, 17 November 2010 in the following two peak traffic periods:

- AM – 7am – 9am
- PM – 4pm – 6pm

The peak hour traffic has been determined between 8am – 9am and 5pm – 6pm in both the intersections. The results of the intersection count data is attached in **Appendix A**.

Photograph 1: Missing pedestrian line marking on the south approach of Harris Street and Ultimo Road intersection



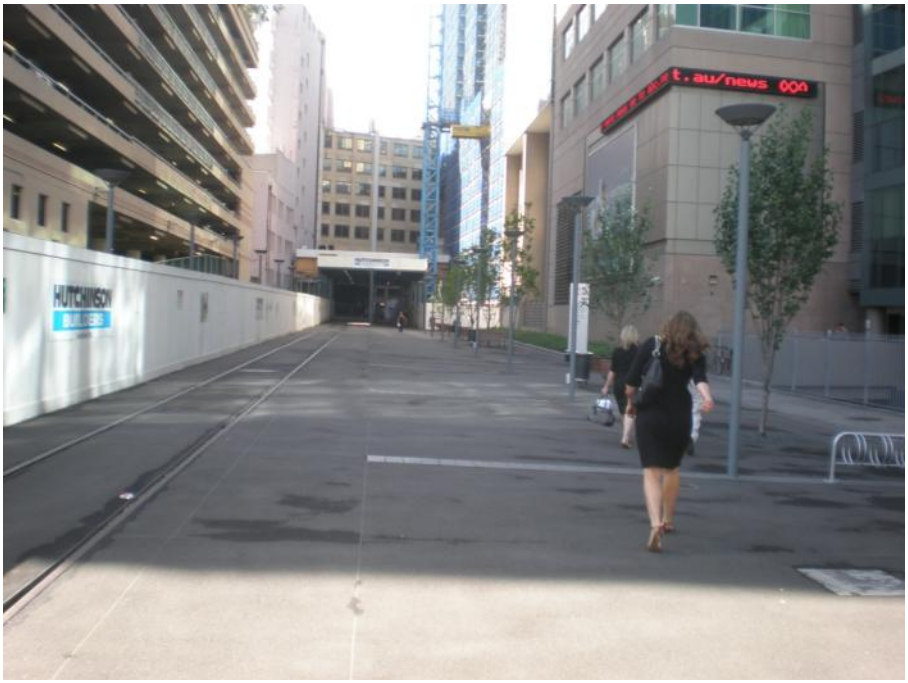
Photograph 2: Existing driveway on the south approach of Ultimo Road/ Darling Drive intersection



2.4 Pedestrian Facilities

Pedestrian facilities are generally good in the locality as all of the signalised intersections have pedestrian crossing facilities. From Central Station a pedestrian link is provided to the site via the Broadway pedestrian tunnel which connects to the UPN, a wide walkway along the disused rail track (at the rear of the ABC site) – pedestrian stairs/ ramps at Ultimo Road – pedestrian crossing facilities on the south, east and north approaches of Ultimo Road/ Darling Drive intersection (refer to Photograph 3).

Photograph 3: Pedestrian Path along the disused rail track (looking south)



A wide footpath is provided on both sides of Ultimo Road (refer to Photograph 4). There is good pedestrian connection between the proposed site and the Building 1 (Tower Building). The UTS library is located on Ultimo Road to the east of Darling Drive and therefore very convenient for future student/ staff to access the library.

There is no pedestrian footpath on Omnibus Lane. Pedestrians were observed to walk along the lane which carries very light traffic flows (refer to Photograph 5).

Photograph 4: Footpath on Ultimo Road in front of the site



Photograph 5: Pedestrian walking along Omnibus Lane



2.5 Parking Provision

2.5.1 On – Street

In front of the site on Ultimo Road, parking is prohibited due to the existing cycleway. Restricted ticket parking is available on Ultimo Road between Darling Drive and Quay Street(2P Ticket; Mon – Fri, 8am – 6pm; 4P Ticket, 6pm – 10pm Mon – Fri, 8am – 10pm, Sat – Sun & Public Holidays). Angle parking is available on Quay Street (same restrictions as Ultimo Road).

Ticket parking is also available on Mary Ann Street (1P Ticket, 10am – 9pm; Authorised Residents Vehicle Excepted, Area 14).

Parking is prohibited in Harris Street at the vicinity of the site. No stopping and peak hour clearway restrictions are in place on both sides of Harris Street.

2.5.2 Off – Street

The site currently provides discounted parking to students, staff and contractors. As stated earlier, on – grade commercial parking (Wilson Parking) is available on the south – west corner of Ultimo Road/ Quay Street intersection. Parking fee varies in different periods of the day but maximum parking fee is $29/ day. During the site visit at around 9am, the Wilson car park was about 25% occupied. This site will be developed in future for mixed use which is understood to include some public parking.

In addition to above, there are other numerous basement car parking spaces in the vicinity for the UTS staff and public (e.g. UTS Building 1, 6 & 10 basement car parks).

2.6 Public Transport Facilities

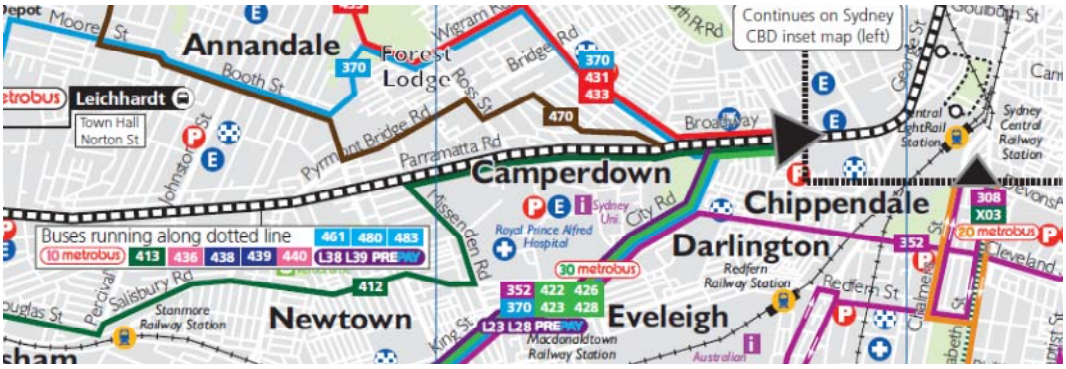
2.6.1 Bus

Bus stops are located on both sides of Broadway (just west of Lee Street). Buses also stop in front of the Building 1 (Tower Building). Bus frequency in the Broadway area is one of the highest amongst any Sydney area. On average, inbound and outbound frequency on Broadway in the am peak is about one bus in every 30 seconds and one minute respectively. Generally buses run from the west and southern region (Region 7 and 6) travel along Broadway/ Harris Street. However, buses to the other regions are also located within walking distance such as:

- Lee Street bus interchange – direct buses to the Northern Beaches, North West sector and some Eastern services.
- Eddy Avenue – express bus services to UNSW and eastern suburb services

On 6 December 2010, pm route E87 (route to Newport) has been extended to commence from Wynyard to Central station (Railway Square).

Figure 2: Routes along Broadway (Region 6)



Source: NSW TransportInfo website

2.6.2 Train

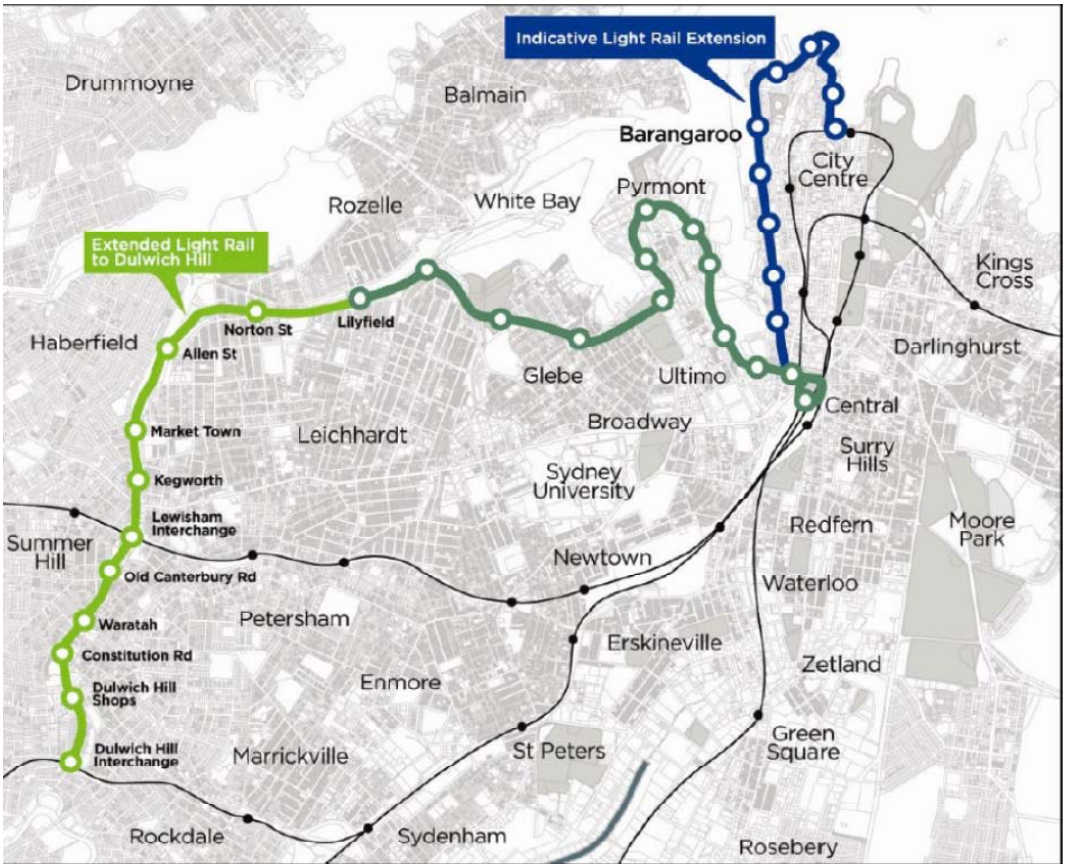
Central Station is located within a 10 minute walking distance from the site. All train services pass through Central station, both suburban and inter – city services. Central station provides the most comprehensive access to Sydney's extensive CityRail network. Wheel chair access to the station is available via the Eddy Avenue entrance.

2.6.3 Light Rail

Light rail services operate between Central station to Lilyfield via Rozelle, Glebe and Pyrmont. Public consultation is currently being undertaken for the extension of the light rail services from Lilyfield to Dulwich Hill (Stage 1). According to the NSWTransportInfo website, the 5.6km Stage 1 route extension will operate from 2012. A transport study is currently being undertaken for the Stage 2 extension of the light rail services (Central to Circular Quay – refer to Figure 3).

The Paddy's Market station is located within walking distance of the site. Currently The Light Rail services operate every 10 - 15 minutes on Sunday to Thursday (6am to 11pm) and Friday & Saturday (6am to midnight).

Figure 3: Existing and proposed light rail route



Source: GHD Sydney Light rail Inner West Extension Study; July 2010

2.6.4 Taxi

A taxi rank is currently provided at Central station. Taxi circulation in this area is good.

2.7 Bicycle Routes and Facilities

An on – road bicycle route is provided along Ultimo Road (refer to Photograph 6). The City of Sydney (CoS) 'Cycle Strategy and Action Plan 2007 – 2017' provides the proposed regional cycling routes in Sydney connecting to the adjacent LGAs of Botany, Leichhardt, Marrickville, North Sydney, Randwick, Waverly and Woollahra (refer to Figure 4).

During the site visit in the am peak hour, a high number of cyclists were visible using Harris Street – Ultimo Road – Darling Drive. The CoS aims to increase the mode share by cycling. In the Cycle Strategy and Action Plan 2007 - 2017 CoS's specific target includes:

- Increase the number of bicycle trips made in the CoS, as a percentage of total trips, from less than 2% in 2006 to 5% by 2011, and to 10% by 2016;
- Increase the number of bicycle trips between 2 and 20 km made in the CoS, as a percentage of total trips to 20% by 2016;

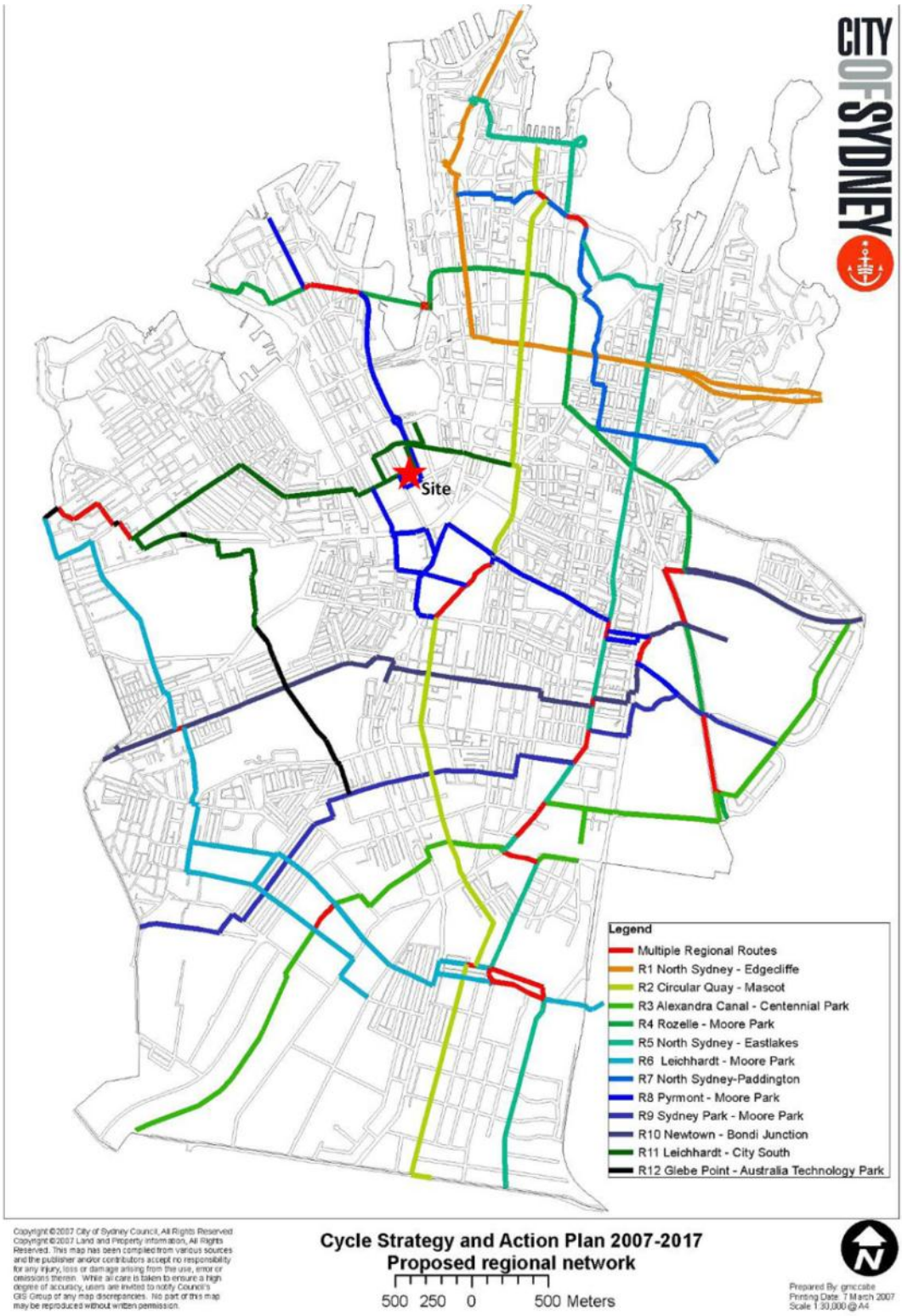
- Achieve a minimum 80% good level of confidence and comfort for cyclists that ride in the CoS by 2016; and
- Measure and monitor the number of collisions and injuries involving bicycles and achieve a reduction in the number of incidents.

The Figure 4 shows that the Pyrmont – Moore Park (R8) cycleway network runs adjacent to the site frontage, Ultimo Road. The future cycleway network will be available in all directions to/ from the site.

Photograph 6 Ultimo Road Bicycle Lanes



Figure 4: City of Sydney proposed Regional Bicycle Network



2.8 Existing Student Travel Mode Share

As per Halcrow MWT report, the Broadway Precinct currently has teaching facilities for 12,200 equivalent full time students (excluding Haymarket Precinct). The university provided postcode information for all students to identify their place of residence and travel mode. The statistics showed that students living within CoS LGA (approximately 17%) either walk or cycles as they don't use the public transport facilities.

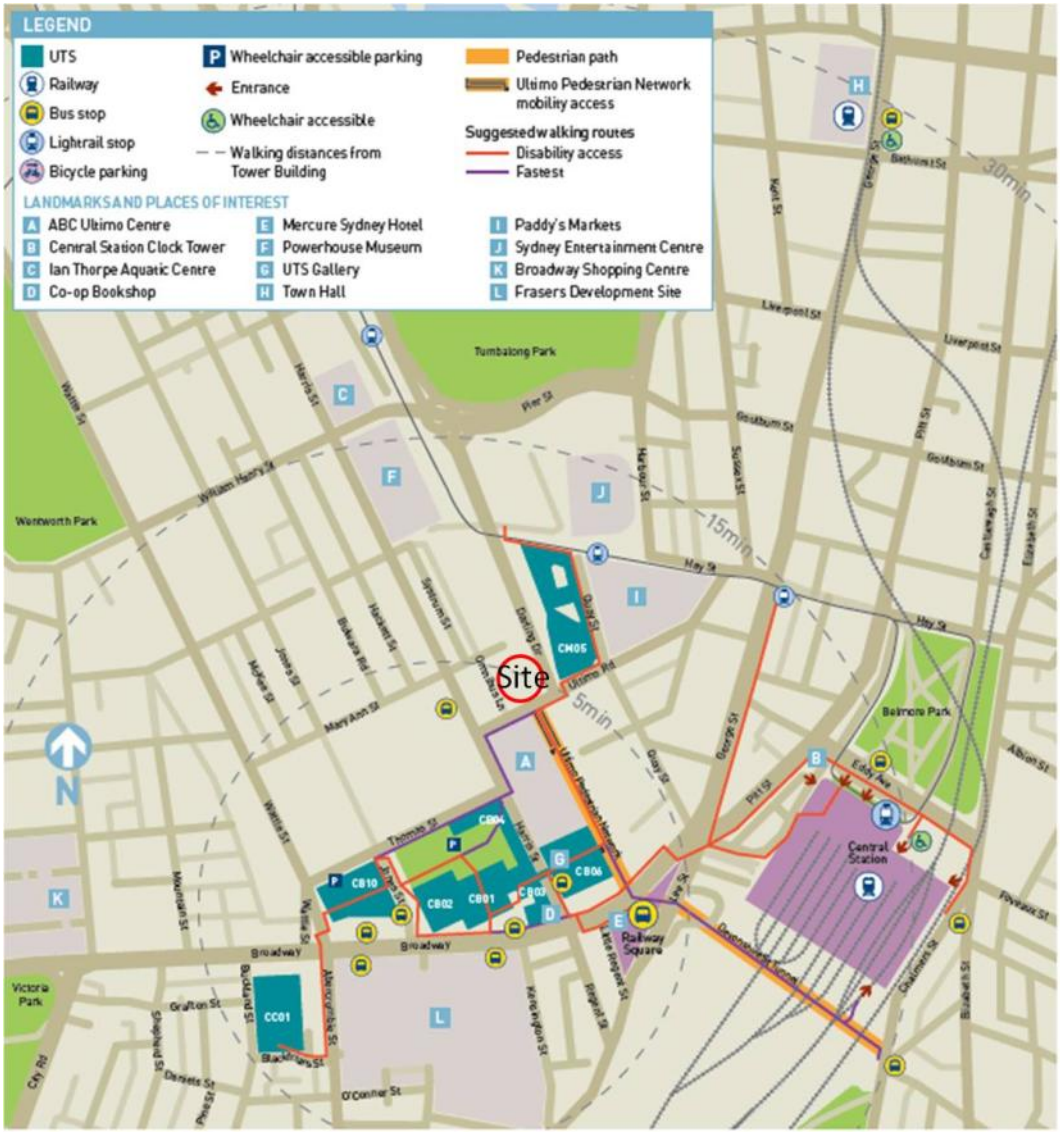
The preferred mode of student travel was based on the availability of bus and/ or rail services (e.g. none of the student travelled by train from Botany Bay area and similarly none of the student travelled by bus from Rockdale). Where both bus and rail services were generally equally accessible, the students were proportioned to each mode. Due to the close proximity to Central station and frequency, reliability and capacity of rail services, the highest proportion of the existing student travel by train.

2.9 UTS Travel Information

UTS has comprehensive travel information for the existing and future students/ staff. It states that the UTS city campus is located at the centre of Sydney's public transport network. Parking is very limited in the area and walking/ cycling and/ or public transport usage is encouraged. Most of the buildings have bicycle locker and male and female shower rooms.

Public transport facilities and associated pedestrian paths to/ from the campus are shown graphically on Figure 5. The figure shows that all public transport facilities are within 5 minute walking distance of the university.

Figure 5: UTS Travel Info



2.10 Accident Data Review

The "five-year" (January 2004 to December 2009) recorded accident history in the Ultimo area has been examined to identify any potential road safety deficiencies, particularly pedestrian related accidents. These accidents are presented graphically in terms of pedestrians and vehicles (refer to Figure 6 and Figure 7). The key observations are:

- There are a significant number of pedestrian casualties along Harris Street. Broadway and Harris Street intersection, where pedestrian storage area is very limited, is a significant concern;
- There are no recorded pedestrian related accidents at the Harris Street/ Ultimo Road or Ultimo Road/ Darling Drive intersections;
- There are no recorded pedestrian accidents adjacent to the site frontage where significant number of pedestrians was observed to cross Ultimo Road;

- The number of vehicular crashes (related to injury) along Broadway and Harris Street are also significant; and
- There were no fatality related vehicular accidents in the locality.

Figure 6: Pedestrian accident in the area (year 2005 -2009)

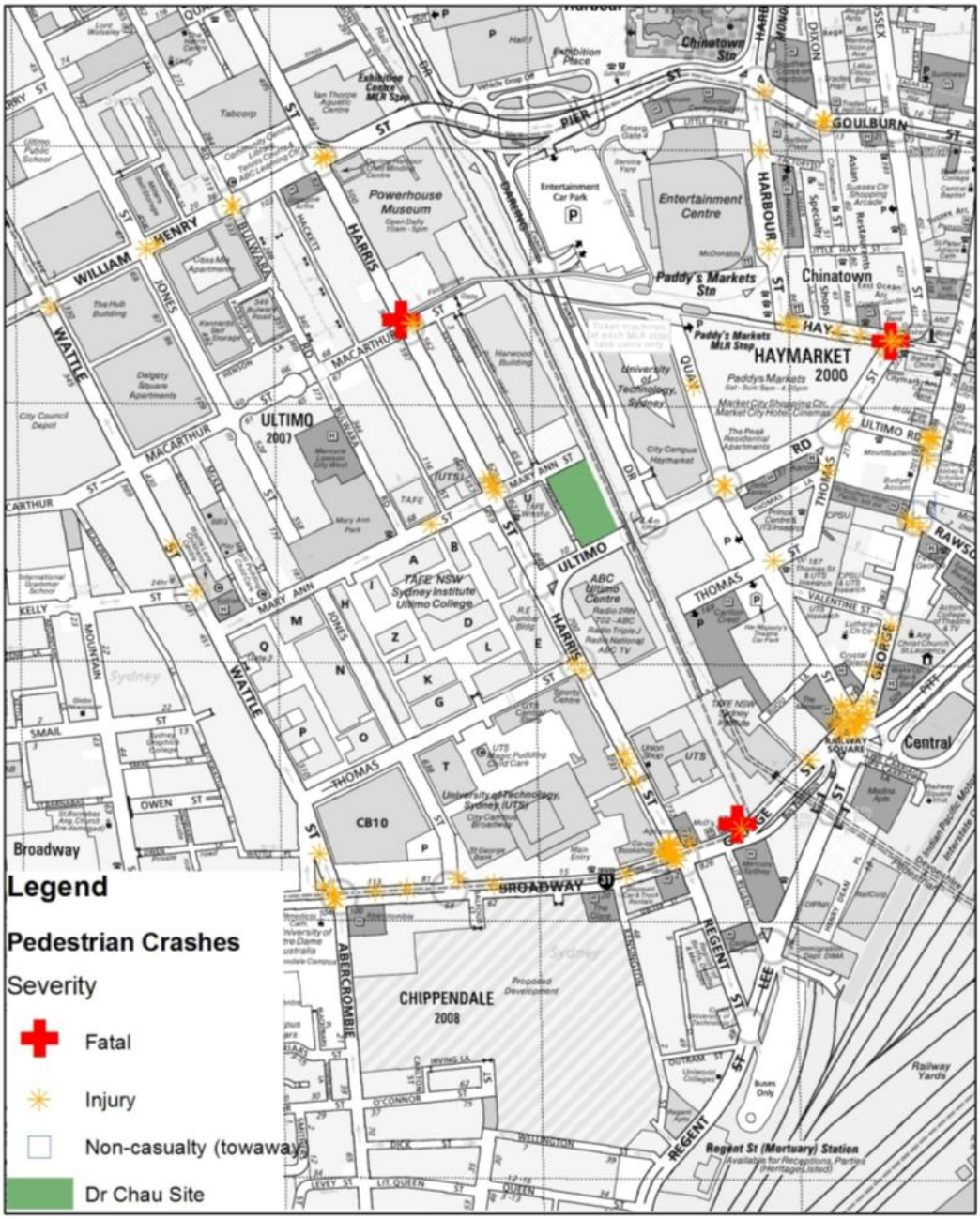
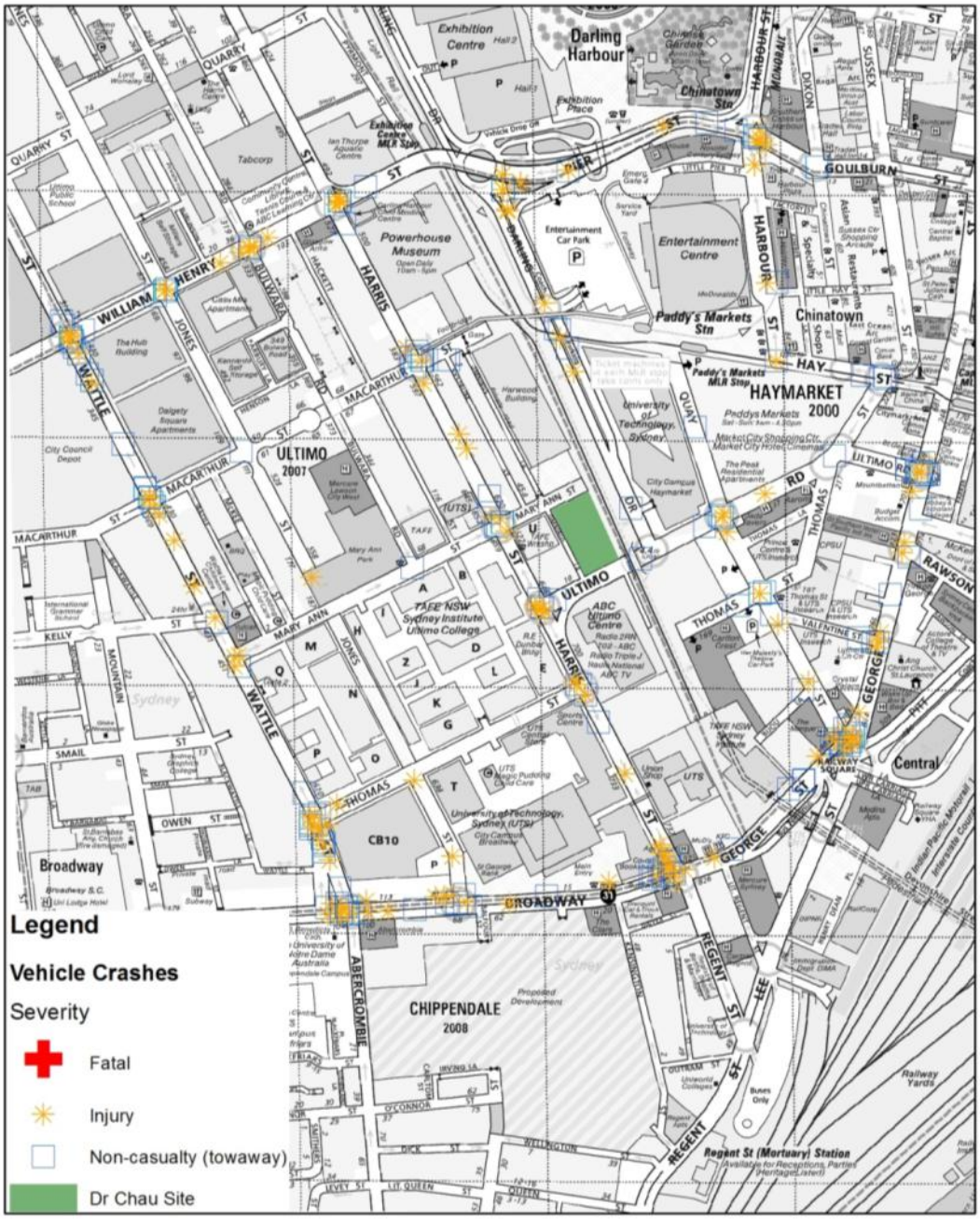


Figure 7: Vehicular accident in the area (year 2005 -2009)



3 Proposed Development

3.1 Description of Development

The 11 storey Dr Chau Chak Wing Building will accommodate the UTS Business School and related teaching and research faculty of the school. The proposed gross floor area of the building is 15,488 m^2. The building will accommodate 454 academic/ support staff and research students and 7905 undergraduate and post graduate students. The development is designed to accommodate a maximum of 1256 students at any one time. Many of these students and staff positions are already located on the UTS campus in other buildings.

The construction of the project is expected to commence in early 2012. The building is anticipated to be completed and occupied in 2014.

3.2 Planning Controls

The car and bicycle parking for the development will be provided based on Draft Sydney Local Environmental Plan 2011 and Draft Sydney Development Control Plan (DCP) 2010.

3.2.1 Chinatown Public Domain Plan

The Chinatown Public Domain Plan was adopted by CoS on 16 August 2010. A number of public domain proposals will be implemented which will result improved pedestrian, cyclist and public transport accessibility in the locality. Some specific proposals that have been/ will be implemented in Ultimo Road are:

- Remove parking along the northern side of Ultimo Road, west of Thomas Street, to provide for a separated cycleway;
- Widen footpath on southern side of Ultimo Road, between Quay Street and Darling Drive;
- Widen footpaths at Thomas Street intersection in conjunction with Thomas Street upgrades.

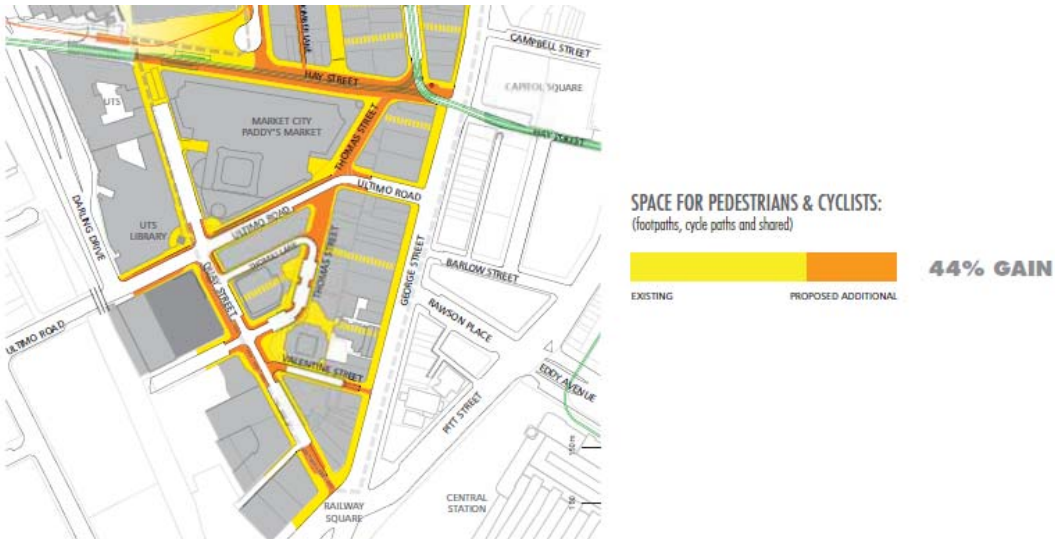
After the implementation of the above proposals, the pedestrian and bicycle accessibility in the area will improve significantly (refer to Figure 8 and Figure 9).

Figure 8: Cycleway Strategy



Source: Chinatown Public Domain Plan, CoS

Figure 9: Gain of Pedestrian space



Source: Chinatown Public Domain Plan, CoS

3.2.2 Bicycle Parking

As per Draft Sydney DCP 2010, the bicycle parking rate for tertiary educational establishments is 1 space per 10 staff and 1 space per 10 students. Based on this rate, the development require minimum 170 bicycle parking space (assuming all 454 staff present in the campus).

The development will provide 170 bicycle parking spaces (minimum 130 on site, including 101 spaces for the students) and therefore will comply with the Council requirements. One personal Class 2 locker will be provided for each internal bike space. In addition, CCTV cameras will be installed at the bike storage areas.

In addition to indoor bicycle parking, 22 outdoor bicycle parking racks are also proposed near the pedestrian entrances from Ultimo Road and Mary Ann Street at ground floor level. Each of these would comprise six racks that would accommodate 12 bicycles. Also, although not part of the proposed development, it is intended that there would be six racks for 12 bicycles on the potential future link with the Ultimo Pedestrian Network (UPN).

The layout, design and security of the on and off – street bicycle facilities will comply with the minimum requirements of Australian Standard AS 2890.3 – 1993 Parking Facilities Part 3: Bicycle Parking Facilities.

3.2.3 Car Parking

As per Draft Sydney LEP 2011, the maximum number of car parking spaces for education facilities on any land is 1 car parking space for every 200 m^2 GFA. For a proposed floor area of 15,488m^2, 77 car spaces are permissible.

The development will provide 21 designated parking spaces at basement level, which will be generally allocated for senior staff. Due to the location within the core CBD fringe and availability of public transport, 21 parking spaces are considered appropriate for the development. Out of the 21 parking spaces, 12 spaces will be allocated for small car spaces to achieve the ‘Green Star’ rating for the development (minim 10 spaces will need to be small car spaces for the ‘Green Star’ rating).

The parking within the development will be controlled by boom gate. The car park layout will be designed in accordance with Australian Standard 2890.1:2004 and relevant Council codes. The design car (B99) swept path for entry and exit is attached in **Appendix C** of this report.

3.2.4 Service vehicle provision

Schedule 9 of the Draft DCP 2010 states the service vehicle provision for new developments. According to the DCP, for commercial developments, 1 service vehicle provision is required per 3,300 m^2 GFA for the first 50,000 m^2 GFA.

For a proposed floor area of 15,488m^2, 4 service vehicle spaces are required; 2 for trucks and 2 for vans.

The proposed design includes a basement level loading dock which can accommodate an 8.8m Medium Rigid Vehicle (MRV) which is sufficient to service the refuse collection and delivery requirements of the development. Room

for one MRV or two SRV trucks and 3 separate courier vans is proposed. The loading dock has been designed to accommodate a MRV with swept paths in accordance with AS 2890.2 – 2002 – Part 2: Off-street commercial vehicle facilities. The delivery vehicle will able to enter and exit the site in a forward direction. The loading vehicle swept path is attached in **Appendix C** of this report.

It is anticipated that there will be between 10 and 20 deliveries per day by a range of vehicle types from Vans up to SRV. Garbage and recycling will be collected 3 to 4 times per week usually at night. The delivery vehicles (MRV, SRV or courier vans) are expected to access the site predominantly during the off – peak hours, thus there will be negligible impact on peak hour traffic.

3.2.5 Disabled vehicle provision

Schedule 9 of Draft DCP 2010 states one accessible car parking space for every 20 car parking spaces or part thereof is to be allocated as accessible visitor parking.

As per the DCP condition, the development will provide one disabled parking space.

3.3 Pedestrian and Vehicular Access

Pedestrian and vehicular access to the proposed development will be separated. A number of pedestrian access doorways will be provided via the Ultimo Road, Omnibus Lane and Mary Ann Street frontages.

The only vehicular access will be left-in/left-out on Ultimo Road, approximately 25m west of Ultimo Road/ Darling Drive intersection (refer to Figure 10). The left in/ left out provision will be enforced by regulatory sign control. Internal two-way traffic will be controlled by boom gates at basement level leaving clear access at the Ultimo Road entrance. Appropriate signposting will be provided on Ultimo Road driveway entrance to prohibit unauthorised access into the driveway. The driveway will serve the basement car park and loading dock level.

Mary Ann Street will provide on-street drop-off/ pick-up areas near to the development.

Figure 10: Location of the proposed driveway



Figure 11: Details of the proposed driveway including signage

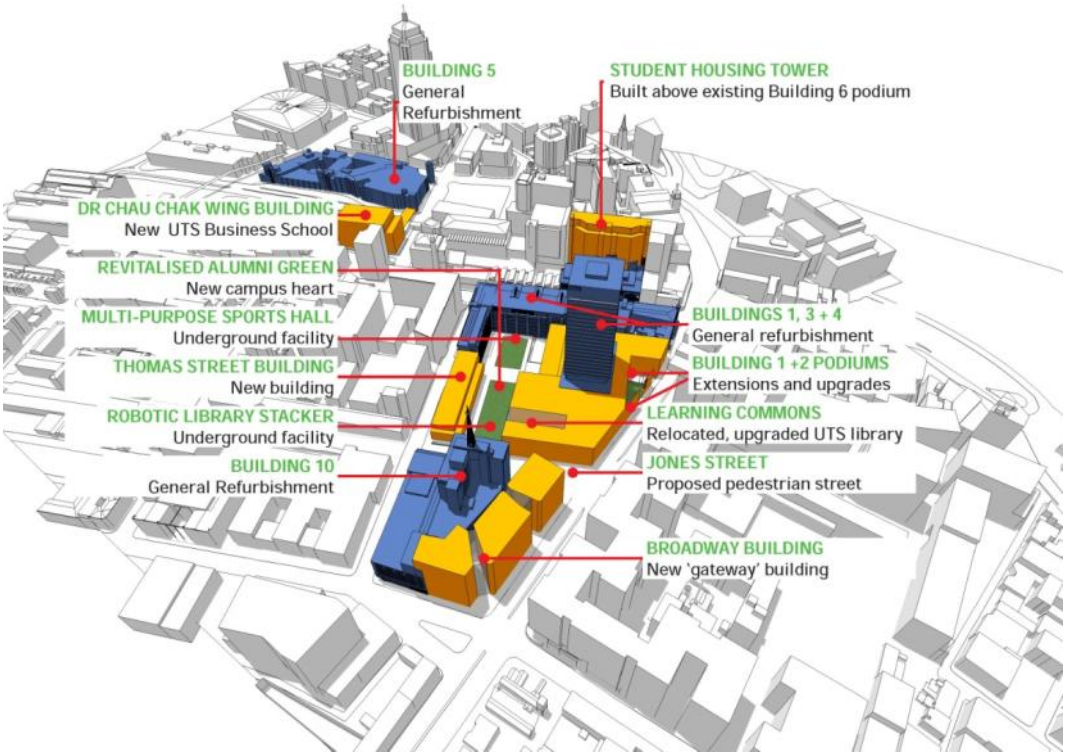
3.4 Other Major UTS Developments

According to the UTS website, the UTS City Campus Master Plan comprises a number of distinct projects, which will be delivered on a staged basis over the next 10 years. These projects are a mixture of new buildings, significant refurbishments and internal upgrades (refer to Figure 12 and Table 2). There are a number of major redevelopments which are currently being constructed in the vicinity:

- Frasers Broadway – redevelopment for mixed uses and public open space;
- Metro Plaza at 61 – 79 Quay Street – two 16 – storey towers, four levels of retail and basement parking; and
- Other new buildings and refurbishments those are included in the UTS Broadway Concept Plan.

All master planning undertaken for the campus has included the traffic and transport implications of the Dr Chau Chak Wing Building.

Figure 12: UTS Masterplan Projects



Source: UTS website

Table 2: UTS Major Projects

Project	Description	Status	Timeframes*
Multi-Purpose Sports Hall	Underground facility	Under construction, due to complete end of March 2011	2009 to 2011
Great Hall Upgrade	Complete reinvention of UTS's principal ceremonial venue	In design. Construction to start in early 2011	2010-2011
Broadway building	New 'gateway' building, also known as Information Technology and Engineering Building	Demolition complete, excavation due to start early 2011	2010 to 2013
Student Housing Tower	A 720-bed tower, rising above an extended Building 6 podium	Under construction, tower concrete structure complete	2009 to 2011
Dr Chau Chak Wing Building	New building for the UTS Business School	In schematic design	2010 to 2012
Buildings 1 and 2 podium extension	Extensions and upgrades	Lacoste Stevenson with Daryl Jackson Robin Dyke announced as winners of design competition.	under review
Robotic library stacker	Underground facility	Pending completion of Multi-Purpose Sports Hall (MPSH)	2011 to 2014
Building 7	New building, also known as Thomas Street Building	Design competition forthcoming	2011 to 2013
Learning commons	Relocated, upgraded UTS library	To be advised	2013 to 2016
Revitalised Alumni Green	New campus heart	Pending completion of MPSH and library stacker	2014
Buildings 1, 3 and 4	General refurbishment	To be advised	tba
Building 5	General refurbishment	Pending completion of Building 14	2016 to 2018
Building 10	General refurbishment	Pending completion of Broadway building	2010 to 2014

*NOTE: All project timeframes are indicative only and may vary as Master Plan projects progress.

4 Transport Impact Assessment

4.1 Traffic Generation

4.1.1 Existing

The site currently accommodates 114 on – grade parking spaces. During the semester period the car park operates at capacity due to a reasonably low parking rate for UTS students and staff. Assuming 50% of the car park access occurs during the peak traffic period during the semester, the car park would currently generate 57 vehicular trips (all inbound in the am peak and outbound in the pm peak) on the road network.

4.1.2 Forecast

The proposed facility will provide 21 staff car parking spaces in the basement level. Assuming 70% of the car arriving/ departing the site in the peak period, the peak hour traffic generation will be less than 20 vehicles/ hour. Therefore, the peak hour net reduction of traffic to/ from the proposed site will be about 37 vehicles/ hour.

4.1.3 Integrated Traffic Impact

There are two significant developments that are currently planned for construction near the subject development (refer to section 3.4). The traffic significance of the three proposed development is compared in Table 3.

Table 3: Comparison of the large scale developments at Broadway

Frasers Broadway	**Metro Plaza Quay Street**	**Dr Chau Chak Wing Building**
Parking provision in accordance with Central Sydney planning controls and approximate traffic generation in the peak hours on the road network of 473 veh/h.	Parking provision of approximately 240 spaces for residential and retail mix.	Parking provision – 28 and traffic generation in the peak hours 20 veh/h

Based on the comparison in the above table, it is evident that the other two developments in the vicinity are significantly larger compared to the subject development. The proposed Dr Chau Chak Wing Building will generate negligible traffic in comparison to these nearby developments.

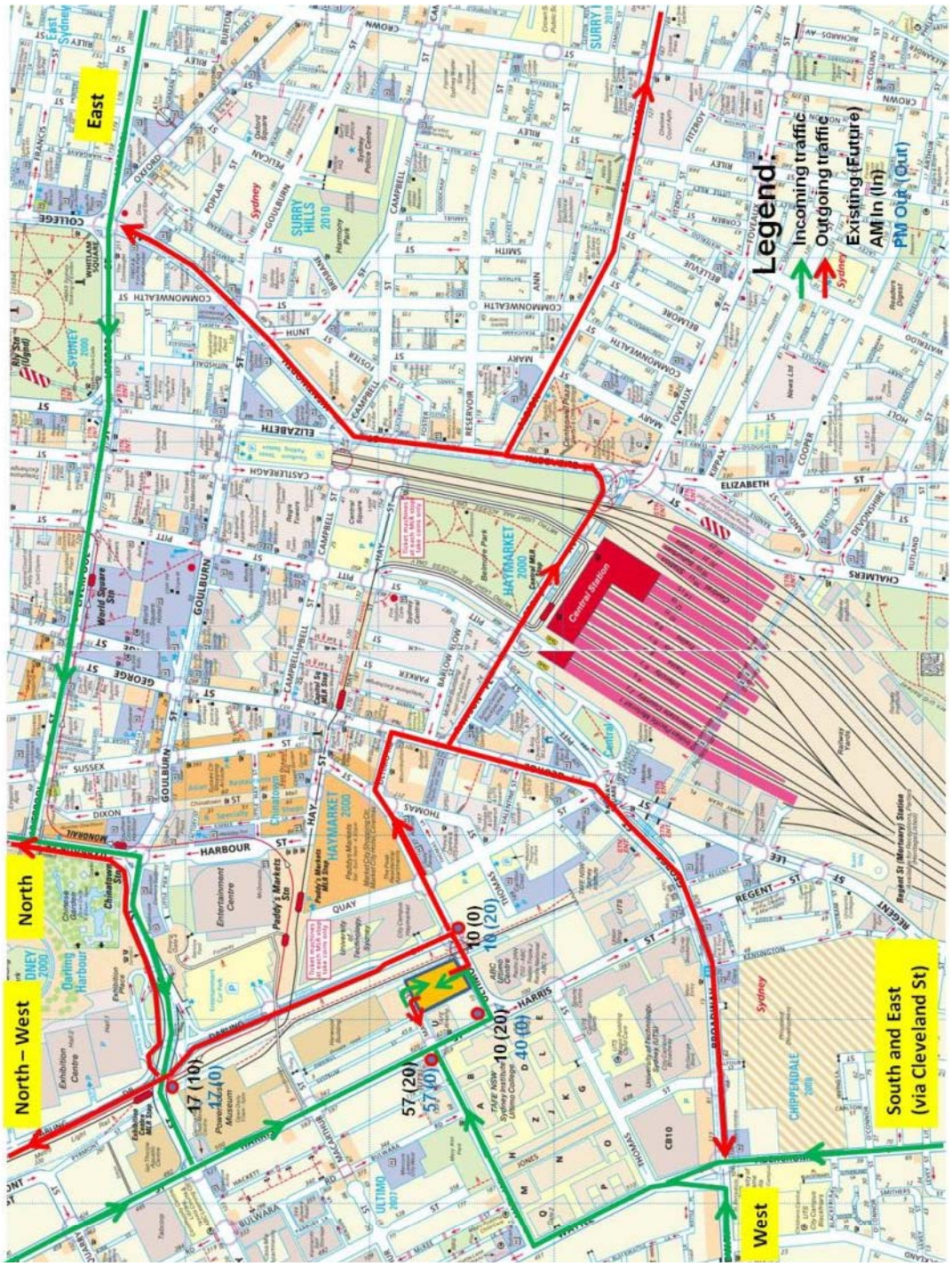
4.2 Traffic Distribution

The existing site has vehicular access via Mary Ann Street. The future proposed site access is a left – in/ left – out driveway at Ultimo Road. Therefore, the existing and future peak hour traffic distribution will be slightly different such as:

- All future traffic will access the site via Ultimo Road using approach routes along Mary Ann Street from the west and Harris Street from the north.
- All future traffic will depart the site via Ultimo Road turning left into Darling Drive or proceeding through to George Street and Eddy Avenue as shown in Figure 13.

It can be seen in Figure 13 that the site generated future traffic volume in Harris Street/ William Henry Street, Harris Street/ Ultimo Road (pm peak) and Ultimo Road/ Darling Drive (am peak) will be lower.

Figure 13: Future assumed trip distribution to/ from the site and existing and future site traffic at the nearby intersections



4.3 Road System Operations

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

Table 4: Level of Service Definitions

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

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

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

Sidra intersection modelling program (version 5) has been used to assess the three major intersections discussed in the previous section. The existing intersection performance is assessed in this report in terms of the following four factors for each intersection:

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

When reviewing Sidra results, the traffic queues from adjacent intersections need to be considered.

Harris Street/ Ultimo Road and Ultimo Road/ Darling Drive traffic signals have been analysed by Sidra. Harris Street/ Mary Ann Street intersection has not been analysed. As the alteration of the future site access from Mary Ann Street to Ultimo Road, this intersection will carry 37 and 57 less vehicles in the am and pm peak hour respectively (refer to Figure 13). Therefore, the performance of this intersection is likely to improve in the future.

The results of the intersection analysis are presented in Table 5 and **Appendix B**.

Table 5: Existing and Future Intersection performance

Intersection	Scenario	AM Peak				PM Peak			
		LOS	DOS	AVD (sec)	Max Queue (m)	LOS	DOS	AVD (sec)	Max Queue (m)
Harris St/ Ultimo Rd	Existing	A	0.545	11.4	91.2	B	0.768	22.5	206
	Future	A	0.548	11.4	91.2	B	0.757	22.7	205.4
Ultimo Rd/ Darling Dr	Existing	A	0.344	10.8	29.0	A	0.451	12.1	53.0
	Future	A	0.340	10.8	29.0	A	0.451	12.1	53.0

4.3.1 Harris Street/ Ultimo Road Intersection

Sidra results shows that in the am peak period, the intersection is currently operating at LOS A with about 45% spare capacity. The maximum queue on the east approach (Ultimo Road) is just over 90m.

However, during the site inspection this intersection was found to be affected by heavy traffic queue on Broadway/ Harris Street intersection. On occasions the southbound traffic queue on Harris Street extends well beyond the Mary Ann Street intersection. There are three southbound lanes on Harris Street and the kerbside lane remains significantly underutilized.

The left turning traffic from Ultimo Road onto Harris Street is also significant. On occasions the traffic queue reaches back to the Darling Drive intersection (refer to Photograph 7). Ultimo Road and Harris Street carry significant peak hour traffic volumes providing access through this precinct. This is similar to many intersections close to the Sydney CBD where the road network is heavily congested due to heavy inbound traffic flows in the am peak and outbound traffic flows in the pm peak period. It can be seen in Table 5 however that there is virtually no impact on this intersection due to the site traffic in the am peak period.

In the pm peak period, the intersection is currently operating at LOS B with increased capacity compared to am peak. The maximum queue exceeds over 200m on the north approach of the intersection. Similar to am peak, the site traffic will have negligible impact on this intersection.

Photograph 7: Traffic Queue on Harris Street and Ultimo Road Intersection

	
Traffic Queue on Harris St (looking north)	Traffic Queue on Harris St (looking south)
	
Traffic Queue on Ultimo Rd (looking east)	Traffic Queue on Ultimo Rd (looking west)

4.3.2 Ultimo Road/ Darling Drive Intersection

This intersection has been modelled as a three way T – intersection as there was no vehicular activities on the driveway (south approach) during the peak hour. During the site inspection in the am peak period no vehicles accessed the driveway (refer to intersection count data in **Appendix A**). The intersection was observed to be operating with free flowing traffic. There were some occasional queues on Darling Drive but all vehicles were able to clear the stop line in the designated green time.

Sidra results show that the intersection is currently operating at LOS A in both the am and pm peak period. The site traffic will have negligible impact on this intersection and will not be noticeable.

4.4 Pedestrian Access

The proposed development will provide good pedestrian facilities both internal and external to the site. Footpaths are reasonably wide and most of the signal controlled intersections have pedestrian crossing facilities in the locality. Existing street footpaths and road crossings between the proposed site and the surrounding areas are generally in good condition and will be retained.

The proposed site driveway in Ultimo Road has been designed to reduce impact on the safety of pedestrians on the northern footpath of Ultimo Road. All vehicles will be able to enter and leave the site in a forwards direction. In addition, the vehicular and pedestrian access to the site will be separated, and vehicles using the proposed driveway crossover will be required to give way to the pedestrians on the footpath and traffic in the street.

There is no pedestrian related accident on Ultimo Road at the site frontage (refer to Figure 6). There are direct and wide pedestrian paths between the site and the public transport network/ other UTS campuses/ library such as Central Station is accessible via the UPN and the Broadway pedestrian tunnel. Buses stopping at Broadway in front of the UTS Building 1 (Tower Building) can be accessed via wide footpaths along Ultimo Road and Harris Street.

Ultimo Road/ Harris Street intersection has pedestrian crossing facilities on all the three approaches. Maintenance of all line marking after road works needs to be ensured (refer to Photograph 1).

The new building ground floor will provide an improved relationship to Omnibus Lane for pedestrians. The need for pedestrians to cross Ultimo Road nearby to the site will be reduced significantly when the UPN project is extended to establish a direct link to the site. Existing pedestrian crossing facilities at the traffic lights will provide suitable crossing facilities in the interim. There has been no recorded pedestrian casualty at this location between years 2005 – 2009.

In summary, the existing pedestrian facilities are sufficient to accommodate the future staff/ students generated by the development.

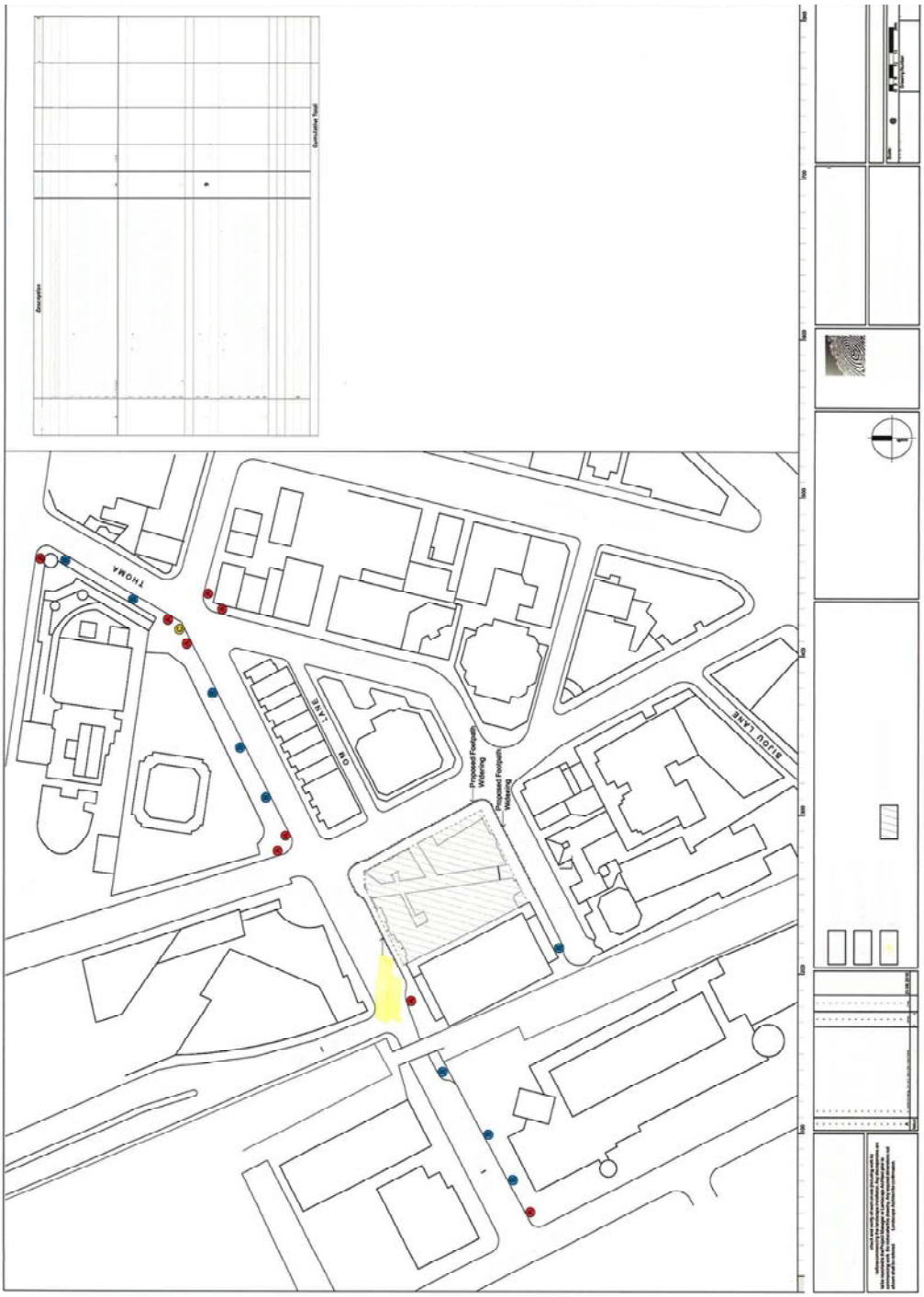
4.4.1 Footpath Widening

The CoS has proposed a planning agreement relating the development at 61 – 79 Quay Street, Haymarket (DA No: D/2010/950). As per CoS letter dated 26 November 2010, the nature of the draft planning agreement is to secure the following:

- Footpath widening to Quay Street, Thomas Street and Ultimo Road, including but not limited to kerb alignment, kerb and gutter work, footpath and road widening, pavement finish, drainage pits, pit lid adjustments, light and traffic pole relocation, road milling and resheeting as required (refer to Figure 14)
- Traffic signal upgrade at Thomas Street/ Ultimo Road intersection

It is anticipated that the project will improve the pedestrian safety and accessibility in the locality.

Figure 14: Public Domain VPA Works Schedule (61-79 Quay Street, Haymarket)



Source: CoS

4.5 Parking Impact

The NSW Government and CoS seek to reduce the demand for travel by private car to the Sydney CBD (refer to NSW Government's Metropolitan Transport Plan 2010: http://www.nsw.gov.au/metropolitantransportplan and CoS 2030 Sustainable Sydney http://www.cityofsydney.nsw.gov.au/2030/thedirections/IntegratedTransport.asp). The relatively low parking provision for the development is in keeping with this philosophy. The site is well-served by public transport and therefore suitable alternatives to private car travel are readily available. According to the UTS City Campus Masterplan the additional students will be mainly the international students who typically utilise public transport rather than drive personal vehicles.

Although there will be a loss of off – street parking due to the development of the site, the lower parking provision will certainly discourage future students/ staff not to drive to the campus. For those who still need to drive to the campus parking will be available near the site. The kerb and gutter will be reinstated along the site boundary on Mary Ann Street which will generate a number of on-street parking spaces at that location.

There is short term ticket parking available on Mary Ann Street and Ultimo Road (between Darling Drive and Quay Street). Visitors/ students travelling by vehicle may also park in nearby parking stations.

4.6 Public Transport, Pedestrian and Cyclist Impact

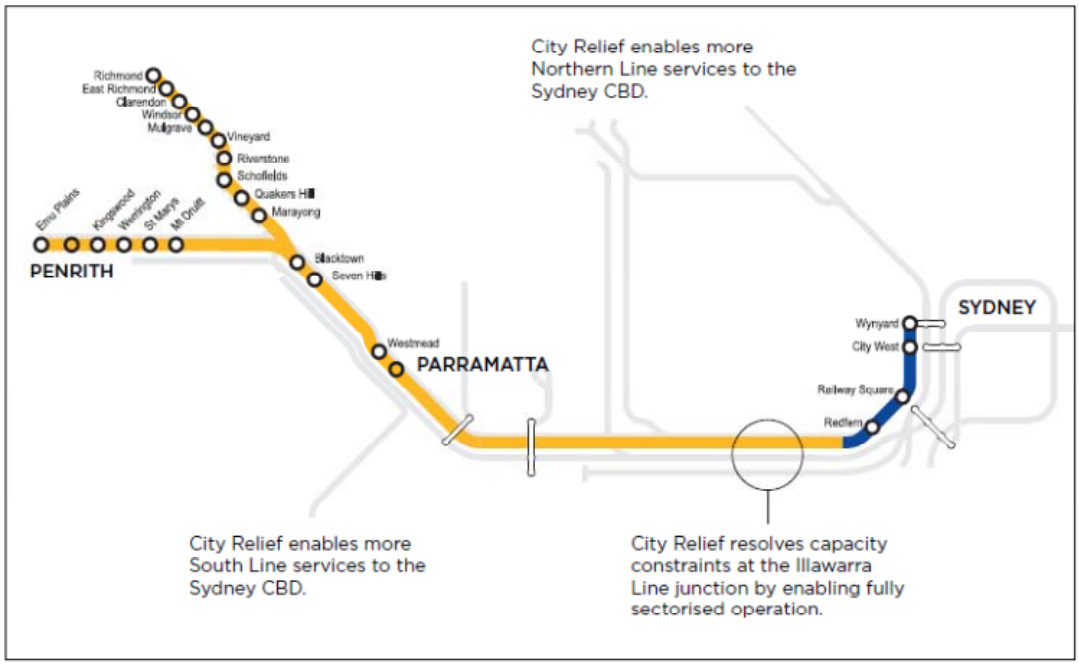
The majority of employees and visitors to the site are expected to use public transport or walk. Most of the 454 staff and 7905 students for Dr Chau building are current occupants of the university and are using the existing transport facilities. Due to its prime location, the existing public transport has sufficient capacity to accommodate existing students/ staff in the area. It is expected that as the level of activities within the Ultimo area increases in the future, the level of public transport service would improve (e.g. increase of bus and train frequencies).

The pedestrian volume generated by the development will have no significant impact on pedestrian traffic in surrounding streets, particularly with the excellent connections offered by the UPN. The development is unlikely to result in any significant impact on cyclist facilities.

4.7 Western Sydney Fast Train Services

In the NSW Government's released Metropolitan Transport Plan, a major capacity improvement is proposed for the Main Western Railway line express services (refer to Figure 15). At the Sydney CBD end, a two track extension of the main western line beyond Central to Wynyard via new rail tunnels will reduce passenger transfer delays with trains terminating at Central in the morning peak. It will improve the peak hour rail access to the Western CBD Corridor of Sydney including Barangaroo and permit an extra six trains per hour, increasing the peak hour frequency from 12 to 18 trains per hour city bound. This will result an extra 5,000 passenger seats to operate from Western Sydney to and from the Sydney CBD.

Figure 15 : Western Sydney Fast Train Service Proposal (Western CBD Rail Corridor)



Source: Metropolitan Transport Plan 2010, www.nsw.gov.au

4.8 Sustainable Transport Initiatives

The UTS City Campus ESD Masterplan 2020 outlines a number of initiatives relating to transport. The key principles for transport were summarised as:

"Transportation is more than providing a means for faculty, staff, and students to arrive on campus every day. UTS already has the advantage of a location near Sydney's Central Station, with major bus and train routes on the campus's doorstep. However, the campus's connection to established transportation routes can be strengthened, with improved facilities and circulation corridors and expanded way-finding schemes. In addition, more bicycle storage facilities, locker rooms, and parking for electric vehicles and other alternative transportation incentives should be included in campus development."

Many of these initiatives are included in the proposed development and the broader UTS campus policies will apply.

5 Authorities Issues

5.1 Department of Planning Director-General's Requirements

Section 5 of the NSW Department of Planning Director – General's Requirements (Application No: MP 09_0153) dated 27 August 2009 has raised some specific transport and accessibility issues for the development which need to be addressed for both construction and operation stages. Table 6 below provides the issues and Arup responses:

Table 6: DGR's issues and Arup Responses

Issue	Arup Response
The EA shall provide a Traffic Impact Study prepared in accordance with the RTA's Guide to Traffic Generating Developments, considering traffic generation, any required road/ intersection upgrades, access, loading dock (s), car parking arrangements, measures to promote public transport usage and pedestrian and bicycle linkages (and potential impacts for pedestrians and cyclists during the construction phase of the project).	This traffic impact assessment report has been prepared in accordance with RTA's Guide to Traffic Generating Developments; Version 2.2; October 2002. All relevant existing and future traffic and transport issues have been considered in this report. The site is located in close proximity of existing public transport facilities. Pedestrian facilities in the locality are adequate and the CoS Pyrmont – Moore Park bicycle route runs along the site frontage. Due to these readily available sustainable transport facilities, car parking provision for the development is considered as low as possible. In addition, the development will provide sufficient bicycle parking, locker and shower facilities for its occupants. UTS always encourages its existing and future students/ staff to use the existing public transport, cycling and walking (refer to section 2.9). The potential impacts for the pedestrians and cyclists during the construction phase are discussed in section 6 of this report.
The EA must demonstrate the provision of sufficient on – site car parking for the proposal having regard to local planning controls and RTA guidelines (Note: The Department supports reduced car parking rates in areas well – served by public transport).	Due to the close proximity of public transport availability, parking provision for the development is minimised as practicable as possible so that it minimizes the traffic and parking impact in the locality.

5.2 RTA

RTA letter dated 18 September 2009 has requested that a number of issues be included in the transport and traffic impact assessment. The issues are outlined in Table 7.

Table 7: RTA issues and Arup Responses

Issue No.	Issue	Arup Response
1	It is noted that the Metropolitan Strategy has designated the development site to be located with Global Sydney and a major focal point for regional transport connections and jobs growth. It is important that the development of an educational establishment takes into consideration, and contributes to the achievement of, transport objectives contained in this and other high – level NSW Government strategies. The strategies include the NSW State Plan, Urban Transport Statement and the Sydney City Subregional Strategy. These policies share the aims of increasing the use of walking, cycling and public transport; appropriately co – locating new urban development with existing and improved transport services; and improving the efficiency of the road network. By addressing both the supply of transport services and measures to manage demand for car use, the EA report should demonstrate how users of the educational establishment, will be able to make travel choices that support the achievement of relevant State Plan targets.	There are existing paved footpaths in the vicinity of the site joining all the public transport facilities and other UTS campuses/ library. The footpaths on both sides of Ultimo Road are in good conditions and will be retained (refer to section 4.4 and Photograph 4). In addition, once the UPN is implemented, the pedestrian safety and accessibility in the area will be improved. As discussed in section 2.7, as the site sits on the future regional bicycle route, it will be very convenient for cyclists to access the site. The site will provide adequate bicycle parking, separate male/ female shower and locker facilities. All NSW Government policies target and focus on sustainable mode of transport e.g. reduction of car and increase of walking, cycling, public transport usage. UTS will continue to strive on focusing its polices by encouraging public and active transport for its current staff/ students (refer to section 2.9)
2	Daily and peak traffic movements likely to be generated by the proposed development including the impact on nearby intersections and the need/ associated funding for upgrading or road improvement works (if required). The key intersections to be examined/ modelled include: • Ultimo Road and Harris Street • Harris Street and Mary Ann Street, and • Darling Drive and Ultimo Road	Peak hour traffic movement has been estimated in this report and Harris Street/ Ultimo Road and Ultimo Road/ Darling Drive intersections have been analysed. As there will be no future access via Mary Ann Street to the site, Harris Street/ Mary Ann Street intersection has not been analysed (confirmed in RTA email dated 11 November 2010).
3	Details of the proposed access and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standard (i.e. turn paths, sight distance requirements, aisle widths, etc.)	The proposed driveway will not result in any loss of parking in Ultimo Road. The car space dimensions, vehicular manoeuvre path, aisle width, ramp width, sight distance and gradient will be designed in accordance with AS 2890.1 and 2890.2. A vehicular control point (swipe card operated boom gates) will be located inside the property boundary at basement level to minimising the potential for

Issue No.	Issue	Arup Response
		queuing back to Ultimo Road.
4	Proposed number of car parking spaces and compliance with the appropriate parking codes.	As stated above, as per NSW State Government and CoS sustainability policies, the car parking provision of the development is proposed to be 50% of that permissible which supports sustainable outcomes.
5	Details of service vehicle movements (including vehicles type and likely arrival and departure times)	Service vehicle will able to enter and exit the site in a forward direction. Details of the swept path of a MRV attached in the **Appendix C** of this report.
6	The RTA requires the EA report to assess the implications of the proposed development for non – car travel modes (including public transport use, walking and cycling); the potential for implementing a location – specific sustainable travel plan (e.g. 'Travelsmart' or other travel behaviour change initiative); and the provision of facilities to increase the non – car mode share for travel to and from the site. This will entail an assessment of the accessibility of the development site by public transport.	A location specific Travel Access Guide (TAG)/ Green Travel Plan could be produced in due course for the development. The UTS has established sustainable transport initiatives that apply across the campus.
7	The RTA will require in due course the provision of a traffic management plan for all demolition/ construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures.	A full Construction Traffic Management Plan would need to be prepared by the construction contractor. An indicative guideline has been outlined in Section 6 of this report.

The proposed development has been discussed in Sydney Regional Development Advisory Committee (SRDAC) meeting held on 16 June 2011. In the meeting various traffic and transport issues were discussed with Arup. RTA letter dated 29 June 2011 has addressed most of the issues discussed in the meeting. The issues are outlined in Table 8.

Table 8: RTA issues and Arup Responses

Issue No.	Issue	Arup Response
1	Vehicular access to and from the proposed building is to be left in/left out only. Note: As Ultimo Road is too narrow to allow the construction of a physical barrier to enforce this requirement, signage and a parking management plan is to be provided.	The proposed left – in/ left – out driveway will be enforced by regulatory sign control (refer to Figure 11)
2	A Parking Management Plan is to be proposed prior to occupancy.	Only 21 parking spaces are proposed at the basement level. It is likely that most of the traffic will travel one direction into the car park (inbound flow in the am peak and outbound flow in the pm peak). RTA at its email dated 17 August 2011 advised that "*The Parking Management Plan will be a short document reminding users of the carpark of the need to turn left only, watch*

Issue No.	Issue	Arup Response
		out for pedestrians and cyclists,who to contact if the signs are damaged and any other requirements the University may want. *The RTA does not need to see a document, but it is to be provided to all users of the carpark.*" Appropriate signs will be installed at the entrance of the car park to guide the motorist to watch out the pedestrians and cyclist while exiting the site.
3	The Parking Management Plan is to be provided to all staff and students using the parking area and is to include but not be limited to: • a requirement that all vehicles enter and leave the site in a left in/left out direction • drivers to give way to pedestrians and cyclists when entering and exiting the carpark. • the location and maintenance of NO RIGHT TURN or ALL TRAFFIC LEFT signage within the property.	As per Australian Road Rules all vehicles entering and exiting the site will have to give way the pedestrians on the northern footpath on Ultimo Road. Regulatory signposting 'No Right Turn' and 'Only' sign will be installed at the access driveway at Ultimo Road (refer to Figure 11).
4	Existing Transport Accessibility Guides and information located within the university campuses shall be updated and maintained to guide students and staff to the various transport accessibility modes and facilities within the campuses.	The University travel information guide will be updated incorporating the existing and proposed new UTS developments.
5	The layout of the proposed car parking areas associated with the subject development (including, driveways, grades, turn paths, sight distance requirements, aisle widths, aisle lengths, and parking bay dimensions) and end of trip bike facilities should be in accordance to Council requirements and AS 2890.2- 2002 and AS 2890.6-2009. The internal aisle ways are to be marked with pavement arrows to direct vehicular and bicycle movements in I out of the site and guide traffic circulation through the car park. Additionally, clear sight lines shall be provided at the property boundary line to ensure adequate visibility between vehicles leaving the car park along the frontage road footpath in accordance with Figure 3.3 of AS 2890.1 - 2004 for light vehicles and AS 2890.2 – 2002 for heavy vehicles.	The car park will be designed in accordance with AS 2890.1, 2890.2 and 2890.6. Pavement arrows will be installed to assist the vehicular and bicycle movement, thus improving safety and accessibility inside the car park.
6	Concerns are raised with regard to the adequacy and operation of loading provision. Details of servicing/delivery requirement for the proposed development have not been provided. Details including truck sizes and number of movements shall be provided by	RTA email to Planning and Infrastructure, dated 15 July 2011 confirms that "*For this instance, additional information for service/loading vehicles is not required by the proponent.*"

Issue No.	Issue	Arup Response
	the developer and endorsed by both Council and the RT A prior to the determination of the development application.	
7	A Demolition and Construction Traffic Management Plan detailing construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be submitted to Council, for approval, prior to the issue of a construction certificate.	A Construction Traffic Management Plan will be prepared by the Construction Contractor. RTA and CoS will need to be consulted in this process.
8	All costs associated with the proposed development shall be at not cost to the RT A.	Comments noted.

6 Traffic and Pedestrian Management during Construction Period

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

6.1 Traffic Impact

The construction traffic should generally be restricted outside the peak traffic hours to minimize the traffic impact in the locality. On-site car parking should not be provided for the construction workers to minimize the traffic impact. The majority of the workforce should be encouraged to travel by train and bus outside the morning and afternoon commuter peak periods.

6.2 Parking Impact

Construction workers should not be parking in the residential streets. The kerb side parking on Mary Ann Street should not be affected during the construction period. If any parking is required on Mary Ann Street, application for 'Works Zone' should be lodged to CoS.

6.3 Pedestrian Activity at/ near the Site

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

The pedestrian activity adjacent to construction access driveway on Mary Ann Street should be managed and controlled by site personnel. Pedestrian affects on Ultimo Road should be minimised and a safe and convenient pedestrian environment should be maintained at all times.

6.4 Impact to cycleway

There should not be any adverse impact to the cyclists on Ultimo Road.

6.5 Impact to Adjacent Businesses/ Properties

There is no other business activity at the vicinity of the site. Properties opposite side of Mary Ann Street and Omnibus Lane should not be affected due to the construction activity.

6.6 Truck Movements

The construction site loading bays and on-site construction platforms (if required) should be accessed via separated entry and exit driveways onto Mary Ann Street so that all vehicles should able to enter and exit the worksite areas in a forward

direction. Mary Ann Street provides good access to Harris Street via the existing traffic signals for travel in all directions.

All queuing and storage of trucks should be accommodated on-site, within the designated construction zones or in designated marshalling areas. Trucks should not be permitted to park on – street in Mary Ann Street or other surrounding streets. Truck drivers will be advised of presence of the traffic controllers/ spotters and they must observe his/ her directions.

6.7 Construction Traffic Management

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

6.8 Hours of Construction

Work associated with the construction of the development must be carried out in accordance with the local Council and / or Department of Planning Requirements. Generally construction hours are restricted to:

- Monday to Friday: 7am – 6pm
- Saturday: 7am – 5pm
- Sunday/ Public Holiday: No work

The construction contractor will consult with CoS officers about the appropriate construction hours for the development.

6.9 Stakeholders Consultation

Stakeholders need to be consulted and all necessary approvals must be obtained from the relevant government authorities. The main stakeholders, such as CoS and RTA, must be consulted should any modifications to the operational and/ or infrastructure traffic management arrangements occurs during the construction stage (refer to issue 7 in Table 7).

7 Conclusions and Recommendations

This report describes the existing situation, development proposal, forecast traffic generation, transport impact assessment and compliance with government policy for the proposed Dr Chau Chak Wing Building development located at 14 – 28 Ultimo Road, Ultimo, Sydney. The conclusions of this study can be summarised as follows:

- Traffic generated by the proposed development can be accommodated on the existing road network with minimal/ negligible impact. The site is expected to generate less traffic activity than currently occurs as a result of the at-grade temporary car park;
- In accordance with State government and CoS sustainability policies, the development includes a relatively low 21 car parking spaces which is less than 30% of that permissible under the DCP. The majority of students, staff and visitors to the development will travel by public transport or by walking/ cycling;
- A left - in/ left – out driveway arrangement is proposed on Ultimo Road to be enforced by regulatory sign control. The proposed driveway will not incur any loss of parking on Ultimo Road;
- The site is well-served by pedestrian facilities allowing for convenient connections to other parts of Ultimo area. Further improvement to pedestrian safety and accessibility will occur with the implementation of the UPN project between Central Station and Darling Harbour area;
- The development will provide adequate secure bike parking, shower facilities and locker facilities for the students and staff;
- UTS currently have comprehensive travel information for its existing and future students/ staff. A location specific Travel Access Guide (TAG)/ Green Travel Plan could be produced in due course; and
- All traffic and transport issues raised by Department of Planning DGRs and RTA have been considered in this report.

Appendix A

Intersection Count Results

R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : ARUP

Job No/Name : 3372 ULTIMO Traffic Counts

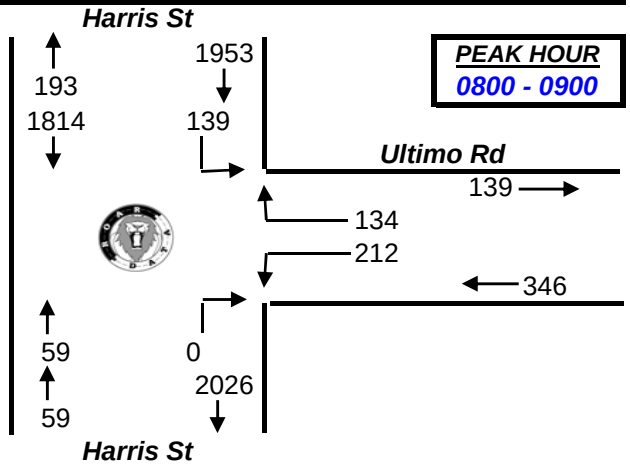
Day/Date : Wednesday 17th November 2010

All Vehicles

	NORTH		EAST		SOUTH		
	Harris St		*Ultimo Rd*		*Harris St*		
Time Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
0700 - 0715	394	22	14	37	0	6	**473**
0715 - 0730	444	17	15	29	0	7	**512**
0730 - 0745	429	23	15	35	0	2	**504**
0745 - 0800	483	27	14	36	0	18	**578**
0800 - 0815	460	36	24	46	0	9	**575**
0815 - 0830	446	28	41	47	0	13	**575**
0830 - 0845	450	34	34	47	0	11	**576**
0845 - 0900	458	41	35	72	0	26	**632**
Period End	**3564**	**228**	**192**	**349**	**0**	**92**	**4425**

	NORTH		EAST		SOUTH		
	Harris St		*Ultimo Rd*		*Harris St*		
Peak Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
0700 - 0800	1750	89	58	137	0	33	**2067**
0715 - 0815	1816	103	68	146	0	36	**2169**
0730 - 0830	1818	114	94	164	0	42	**2232**
0745 - 0845	1839	125	113	176	0	51	**2304**
0800 - 0900	1814	139	134	212	0	59	**2358**

PEAK HR	**1814**	**139**	**134**	**212**	**0**	**59**	**2358**





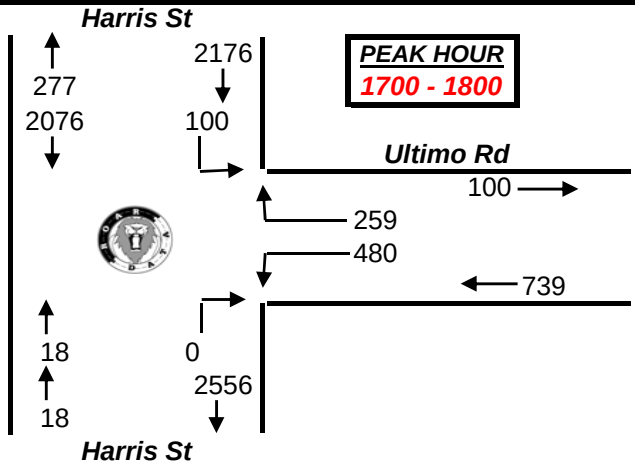
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All Vehicles

	NORTH		EAST		SOUTH		
	Harris St		*Ultimo Rd*		*Harris St*		
Time Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
1600 - 1615	353	23	33	114	0	13	**536**
1615 - 1630	421	25	59	90	0	6	**601**
1630 - 1645	442	14	49	118	0	4	**627**
1645 - 1700	463	32	45	121	0	4	**665**
1700 - 1715	497	24	49	119	0	3	**692**
1715 - 1730	532	23	57	126	0	2	**740**
1730 - 1745	492	27	68	138	0	6	**731**
1745 - 1800	555	26	85	97	0	7	**770**
Period End	**3755**	**194**	**445**	**923**	**0**	**45**	**5362**

	NORTH		EAST		SOUTH		
	Harris St		*Ultimo Rd*		*Harris St*		
Peak Per	**T**	**L**	**R**	**L**	**R**	**T**	**TOTAL**
1600 - 1700	1679	94	186	443	0	27	**2429**
1615 - 1715	1823	95	202	448	0	17	**2585**
1630 - 1730	1934	93	200	484	0	13	**2724**
1645 - 1745	1984	106	219	504	0	15	**2828**
1700 - 1800	2076	100	259	480	0	18	**2933**

PEAK HR	**2076**	**100**	**259**	**480**	**0**	**18**	**2933**



R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : ARUP

Job No/Name : 3372 ULTIMO Traffic Counts

Day/Date : Wednesday 17th November 2010

Peds	NORTH	EAST	SOUTH	
	Harris St	*Ultimo Rd*	*Harris St*	
Time Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOTAL
0700 - 0715	2	10	5	**17**
0715 - 0730	8	9	8	**25**
0730 - 0745	6	27	11	**44**
0745 - 0800	13	40	24	**77**
0800 - 0815	22	42	22	**86**
0815 - 0830	34	40	35	**109**
0830 - 0845	24	52	38	**114**
0845 - 0900	23	54	46	**123**
Period End	**132**	**274**	**189**	**595**

PEAK HOUR
0800 - 0900

Peds	NORTH	EAST	SOUTH	
	Harris St	*Ultimo Rd*	*Harris St*	
Peak Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0800	29	86	48	**163**
0715 - 0815	49	118	65	**232**
0730 - 0830	75	149	92	**316**
0745 - 0845	93	174	119	**386**
0800 - 0900	103	188	141	**432**

PEAK HR	**103**	**188**	**141**	**432**

Peds	NORTH	EAST	SOUTH	
	Harris St	*Ultimo Rd*	*Harris St*	
Time Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOTAL
1600 - 1615	54	78	52	**184**
1615 - 1630	25	52	27	**104**
1630 - 1645	12	45	25	**82**
1645 - 1700	31	54	30	**115**
1700 - 1715	34	42	29	**105**
1715 - 1730	35	76	41	**152**
1730 - 1745	34	67	41	**142**
1745 - 1800	44	58	20	**122**
Period End	**269**	**472**	**265**	**1006**

PEAK HOUR
1700 - 1800

Peds	NORTH	EAST	SOUTH	
	Harris St	*Ultimo Rd*	*Harris St*	
Peak Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1600 - 1700	122	229	134	**485**
1615 - 1715	102	193	111	**406**
1630 - 1730	112	217	125	**454**
1645 - 1745	134	239	141	**514**
1700 - 1800	147	243	131	**521**

PEAK HR	**147**	**243**	**131**	**521**

R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : ARUP

Job No/Name : 3372 ULTIMO Traffic Counts

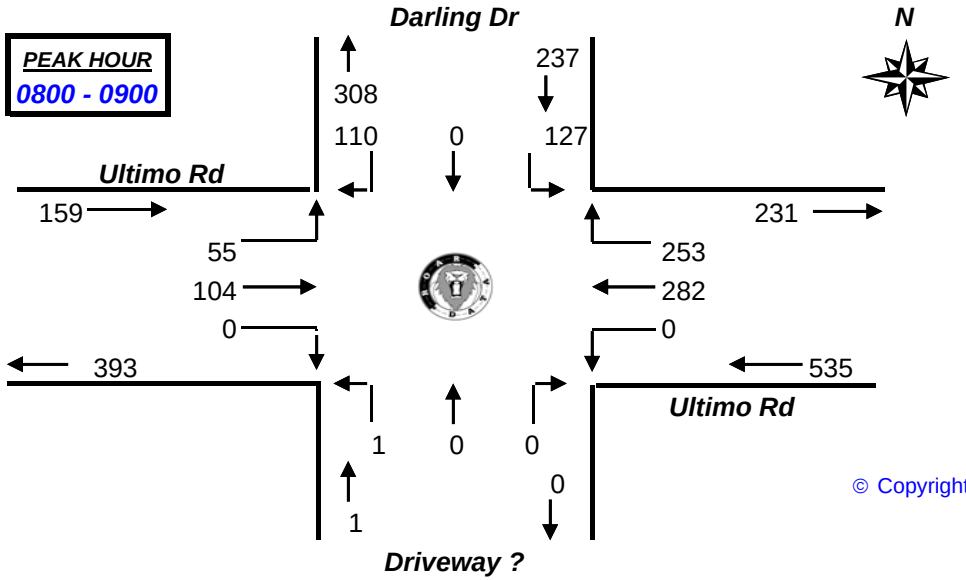
Day/Date : Wednesday 17th November 2010

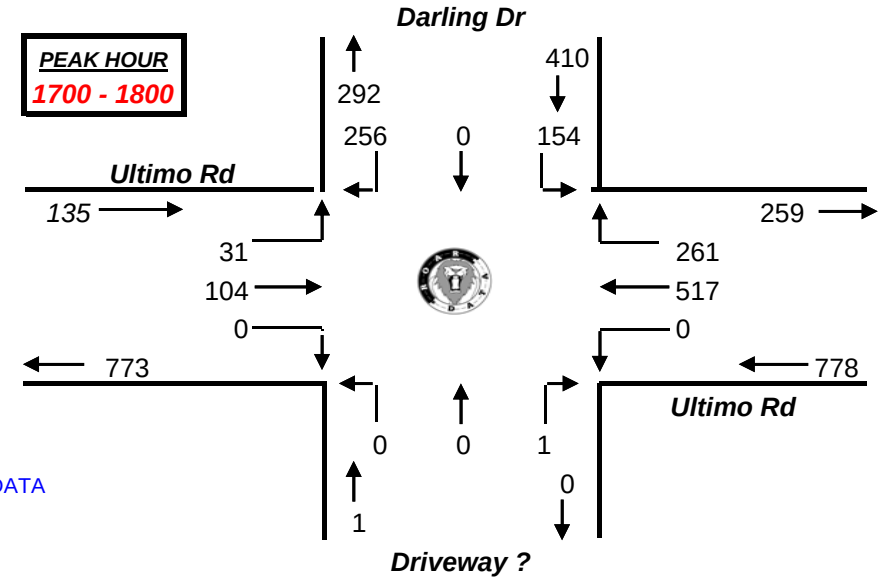
All Vehicles	NORTH Darling Dr			WEST Ultimo Rd			SOUTH Driveway ?			EAST Ultimo Rd			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0715	20	1	26	4	12	1	0	0	0	3	38	27	**132**
0715 - 0730	12	1	14	5	12	1	0	0	0	1	37	36	**119**
0730 - 0745	34	1	19	4	21	0	0	0	0	0	45	41	**165**
0745 - 0800	33	1	23	9	18	0	0	0	0	0	49	49	**182**
0800 - 0815	19	0	30	7	17	0	0	0	0	0	64	51	**188**
0815 - 0830	43	0	25	16	24	0	0	0	0	0	71	62	**241**
0830 - 0845	29	0	20	12	30	0	1	0	0	0	67	67	**226**
0845 - 0900	36	0	35	20	33	0	0	0	0	0	80	73	**277**
Period End	**226**	**4**	**192**	**77**	**167**	**2**	**1**	**0**	**0**	**4**	**451**	**406**	**1530**

All Vehicles	NORTH Darling Dr			WEST Ultimo Rd			SOUTH Driveway ?			EAST Ultimo Rd			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1600 - 1615	22	0	32	11	19	0	1	0	0	0	125	46	**256**
1615 - 1630	29	0	36	8	25	0	0	0	0	0	118	47	**263**
1630 - 1645	26	0	40	5	19	0	1	3	0	0	112	75	**281**
1645 - 1700	25	0	55	9	29	0	1	0	0	0	127	60	**306**
1700 - 1715	32	0	38	10	23	0	0	0	0	0	127	69	**299**
1715 - 1730	37	0	75	8	29	0	0	0	0	0	140	59	**348**
1730 - 1745	36	0	60	7	28	0	0	0	1	0	132	71	**335**
1745 - 1800	49	0	83	6	24	0	0	0	0	0	118	62	**342**
Period End	**256**	**0**	**419**	**64**	**196**	**0**	**3**	**3**	**1**	**0**	**999**	**489**	**2430**

	NORTH Darling Dr			WEST Ultimo Rd			SOUTH Driveway ?			EAST Ultimo Rd			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
0700 - 0800	99	4	82	22	63	2	0	0	0	4	169	153	**598**
0715 - 0815	98	3	86	25	68	1	0	0	0	1	195	177	**654**
0730 - 0830	129	2	97	36	80	0	0	0	0	0	229	203	**776**
0745 - 0845	124	1	98	44	89	0	1	0	0	0	251	229	**837**
0800 - 0900	127	0	110	55	104	0	1	0	0	0	282	253	**932**
PEAK HOUR	**127**	**0**	**110**	**55**	**104**	**0**	**1**	**0**	**0**	**0**	**282**	**253**	**932**

	NORTH Darling Dr			WEST Ultimo Rd			SOUTH Driveway ?			EAST Ultimo Rd			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1600 - 1700	102	0	163	33	92	0	3	3	0	0	482	228	**1106**
1615 - 1715	112	0	169	32	96	0	2	3	0	0	484	251	**1149**
1630 - 1730	120	0	208	32	100	0	2	3	0	0	506	263	**1234**
1645 - 1745	130	0	228	34	109	0	1	0	1	0	526	259	**1288**
1700 - 1800	154	0	256	31	104	0	0	0	1	0	517	261	**1324**
PEAK HOUR	**154**	**0**	**256**	**31**	**104**	**0**	**0**	**0**	**1**	**0**	**517**	**261**	**1324**





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R.O.A.R. DATA

Reliable, Original & Authentic Results

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

Client : ARUP

Job No/Name : 3372 ULTIMO Traffic Counts

Day/Date : Wednesday 17th November 2010

Peds	NORTH	WEST	SOUTH	EAST	
	Darling Dr	*Ultimo Rd*	*Driveway ?*	*Ultimo Rd*	
Time Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOTAL
0700 - 0715	10	0	8	3	**21**
0715 - 0730	16	0	10	1	**27**
0730 - 0745	11	0	19	5	**35**
0745 - 0800	16	1	36	11	**64**
0800 - 0815	34	2	32	16	**84**
0815 - 0830	58	0	42	21	**121**
0830 - 0845	49	3	65	21	**138**
0845 - 0900	59	1	64	25	**149**
Period End	**253**	**7**	**276**	**103**	**639**

Peds	NORTH	WEST	SOUTH	EAST	
	Darling Dr	*Ultimo Rd*	*Driveway ?*	*Ultimo Rd*	
Time Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOTAL
1600 - 1615	107	4	90	19	**220**
1615 - 1630	118	6	69	21	**214**
1630 - 1645	153	2	119	34	**308**
1645 - 1700	111	4	77	21	**213**
1700 - 1715	74	2	120	55	**251**
1715 - 1730	96	2	137	75	**310**
1730 - 1745	93	1	123	52	**269**
1745 - 1800	70	2	107	57	**236**
Period End	**822**	**23**	**842**	**334**	**2021**

PEAK HOUR
0800 - 0900

PEAK HOUR
1700 - 1800

Peds	NORTH	WEST	SOUTH	EAST	
	Darling Dr	*Ultimo Rd*	*Driveway ?*	*Ultimo Rd*	
Peak Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
0700 - 0800	53	1	73	20	**147**
0715 - 0815	77	3	97	33	**210**
0730 - 0830	119	3	129	53	**304**
0745 - 0845	157	6	175	69	**407**
0800 - 0900	200	6	203	83	**492**
PEAK HR	**200**	**6**	**203**	**83**	**492**

Peds	NORTH	WEST	SOUTH	EAST	
	Darling Dr	*Ultimo Rd*	*Driveway ?*	*Ultimo Rd*	
Peak Period	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	TOT
1600 - 1700	489	16	355	95	**955**
1615 - 1715	456	14	385	131	**986**
1630 - 1730	434	10	453	185	**1082**
1645 - 1745	374	9	457	203	**1043**
1700 - 1800	333	7	487	239	**1066**
PEAK HR	**333**	**7**	**487**	**239**	**1066**

Appendix B

Sidra Intersection Results

MOVEMENT SUMMARY

Site: ExistingAMPeak

Harris St & Ultimo Rd Traffic Signal
Existing AM Peak (8am - 9am)
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harris St (south)											
2	T	62	2.0	0.048	2.8	LOS A	0.6	4.6	0.12	0.10	55.2
Approach		62	2.0	0.048	2.8	LOS A	0.6	4.6	0.12	0.10	55.2
East: Ultimo Rd (east)											
4	L	223	5.0	0.533	51.5	LOS D	12.5	91.2	0.88	0.81	25.1
6	R	141	5.0	0.169	47.9	LOS D	4.2	30.9	0.76	0.75	25.9
Approach		364	5.0	0.533	50.1	LOS D	12.5	91.2	0.83	0.79	25.4
North: Harris St (north)											
7	L	146	2.0	0.546	12.5	LOS A	10.2	73.8	0.23	0.95	45.4
8	T	1909	5.0	0.545	4.2	LOS A	10.2	74.6	0.23	0.21	52.6
Approach		2056	4.8	0.545	4.8	LOS A	10.2	74.6	0.23	0.27	52.0
All Vehicles		2482	4.7	0.545	11.4	LOS A	12.5	91.2	0.32	0.34	45.1

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	148	43.4	LOS E	0.4	0.4	0.85	0.85
P3	Across E approach	198	9.2	LOS A	0.3	0.3	0.39	0.39
P5	Across N approach	108	45.9	LOS E	0.3	0.3	0.88	0.88
All Pedestrians		454	29.1				0.66	0.66

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

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MOVEMENT SUMMARY

Site: ExistingPMPeak

Harris St & Ultimo Rd Traffic Signal
Existing PM Peak (5pm - 6pm)
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harris St (south)											
2	T	19	2.0	0.018	9.8	LOS A	0.5	3.5	0.30	0.22	46.2
Approach		19	2.0	0.018	9.8	LOS A	0.5	3.5	0.30	0.22	46.2
East: Ultimo Rd (east)											
4	L	505	5.0	0.769	41.9	LOS C	25.2	183.6	0.88	0.86	28.1
6	R	273	5.0	0.207	34.1	LOS C	6.0	43.9	0.60	0.76	31.0
Approach		778	5.0	0.768	39.1	LOS C	25.2	183.6	0.78	0.82	29.1
North: Harris St (north)											
7	L	105	2.0	0.759	24.9	LOS B	28.1	204.5	0.68	0.94	37.2
8	T	2185	5.0	0.759	16.6	LOS B	28.2	206.0	0.68	0.62	39.3
Approach		2291	4.9	0.759	17.0	LOS B	28.2	206.0	0.68	0.64	39.2
All Vehicles		3087	4.9	0.768	22.5	LOS B	28.2	206.0	0.70	0.68	36.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	138	30.8	LOS D	0.3	0.3	0.72	0.72
P3	Across E approach	256	16.5	LOS B	0.5	0.5	0.53	0.53
P5	Across N approach	155	33.0	LOS D	0.4	0.4	0.74	0.74
All Pedestrians		549	24.8				0.63	0.63

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

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MOVEMENT SUMMARY

Site: FutureAMPeak

Harris St & Ultimo Rd Traffic Signal
Future AM Peak
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harris St (south)											
2	T	62	2.0	0.048	2.8	LOS A	0.6	4.6	0.12	0.10	55.2
Approach		62	2.0	0.048	2.8	LOS A	0.6	4.6	0.12	0.10	55.2
East: Ultimo Rd (east)											
4	L	223	5.0	0.533	51.5	LOS D	12.5	91.2	0.88	0.81	25.1
6	R	141	5.0	0.169	47.9	LOS D	4.2	30.9	0.76	0.75	25.9
Approach		364	5.0	0.533	50.1	LOS D	12.5	91.2	0.83	0.79	25.4
North: Harris St (north)											
7	L	157	2.0	0.548	12.5	LOS A	10.2	74.4	0.24	0.94	45.4
8	T	1909	5.0	0.548	4.3	LOS A	10.3	75.2	0.24	0.21	52.5
Approach		2066	4.8	0.548	4.9	LOS A	10.3	75.2	0.24	0.27	51.9
All Vehicles		2493	4.7	0.548	11.4	LOS A	12.5	91.2	0.32	0.34	45.1

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	148	43.4	LOS E	0.4	0.4	0.85	0.85
P3	Across E approach	198	9.2	LOS A	0.3	0.3	0.39	0.39
P5	Across N approach	108	45.9	LOS E	0.3	0.3	0.88	0.88
All Pedestrians		454	29.1				0.66	0.66

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

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MOVEMENT SUMMARY

Site: FuturePMPeak

Harris St & Ultimo Rd Traffic Signal
Future PM Peak
Signals - Fixed Time Cycle Time = 120 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Harris St (south)											
2	T	19	2.0	0.019	10.4	LOS A	0.5	3.7	0.32	0.23	45.6
Approach		19	2.0	0.019	10.4	LOS A	0.5	3.7	0.32	0.23	45.6
East: Ultimo Rd (east)											
4	L	505	5.0	0.751	40.1	LOS C	24.4	178.0	0.86	0.85	28.8
6	R	273	5.0	0.203	33.2	LOS C	5.9	43.0	0.59	0.76	31.4
Approach		778	5.0	0.751	37.7	LOS C	24.4	178.0	0.77	0.82	29.6
North: Harris St (north)											
7	L	63	2.0	0.757	25.6	LOS B	28.1	204.5	0.69	0.95	36.8
8	T	2185	5.0	0.757	17.4	LOS B	28.1	205.4	0.69	0.63	38.8
Approach		2248	4.9	0.757	17.6	LOS B	28.1	205.4	0.69	0.64	38.7
All Vehicles		3045	4.9	0.757	22.7	LOS B	28.1	205.4	0.71	0.68	35.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	138	30.1	LOS D	0.3	0.3	0.71	0.71
P3	Across E approach	256	17.1	LOS B	0.5	0.5	0.53	0.53
P5	Across N approach	155	32.3	LOS D	0.4	0.4	0.73	0.73
All Pedestrians		549	24.6				0.63	0.63

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

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MOVEMENT SUMMARY

Site: ExistingAMPeak

Ultimo Rd/ Darling Dr Traffic Signal
Existing AM Peak (8am-9am)
The intersection is designed as a three way T - intersection as there is no activity on the driveway (south approach) during the peak hour
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ultimo Rd (east)											
5	T	297	2.0	0.243	2.5	LOS A	2.5	18.0	0.21	0.18	46.5
6	R	266	2.0	0.344	9.2	LOS A	2.6	18.4	0.23	0.67	40.9
Approach		563	2.0	0.344	5.7	LOS A	2.6	18.4	0.22	0.41	43.7
North: Darling Dr (north)											
7	L	134	2.0	0.274	25.7	LOS B	4.1	29.0	0.75	0.75	30.9
9	R	116	5.0	0.242	25.6	LOS B	3.5	25.8	0.74	0.75	31.0
Approach		249	3.4	0.274	25.7	LOS B	4.1	29.0	0.75	0.75	30.9
West: Ultimo Rd (west)											
10	L	58	5.0	0.077	11.7	LOS A	1.0	7.4	0.32	0.70	39.2
11	T	109	2.0	0.077	2.6	LOS A	1.0	7.4	0.20	0.16	46.3
Approach		167	3.0	0.077	5.8	LOS A	1.0	7.4	0.24	0.34	43.5
All Vehicles		980	2.5	0.344	10.8	LOS A	4.1	29.0	0.36	0.49	39.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	87	24.3	LOS C	0.1	0.1	0.90	0.90
P5	Across N approach	211	8.5	LOS A	0.2	0.2	0.53	0.53
All Pedestrians		298	13.1				0.64	0.64

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

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MOVEMENT SUMMARY

Site: ExistingPMPeak

Ultimo Rd/ Darling Dr Traffic Signal
Existing PM Peak (5pm-6pm)
The intersection is designed as a three way T - intersection as there is no activity on the driveway (south approach) during the peak hour
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ultimo Rd (east)											
5	T	544	2.0	0.446	5.3	LOS A	6.9	49.0	0.39	0.35	43.1
6	R	275	2.0	0.446	11.8	LOS A	5.0	35.9	0.39	0.74	39.1
Approach		819	2.0	0.446	7.5	LOS A	6.9	49.0	0.39	0.48	41.7
North: Darling Dr (north)											
7	L	162	2.0	0.266	21.9	LOS B	4.3	30.6	0.66	0.75	32.8
9	R	269	5.0	0.451	23.1	LOS B	7.3	53.0	0.74	0.78	32.1
Approach		432	3.9	0.451	22.7	LOS B	7.3	53.0	0.71	0.77	32.4
West: Ultimo Rd (west)											
10	L	33	5.0	0.072	13.6	LOS A	1.1	7.8	0.39	0.75	38.2
11	T	109	2.0	0.072	4.9	LOS A	1.1	7.8	0.31	0.24	43.6
Approach		142	2.7	0.072	6.9	LOS A	1.1	7.8	0.32	0.36	42.2
All Vehicles		1393	2.7	0.451	12.1	LOS A	7.3	53.0	0.49	0.56	38.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	252	20.8	LOS C	0.4	0.4	0.83	0.83
P5	Across N approach	351	10.8	LOS B	0.4	0.4	0.60	0.60
All Pedestrians		603	15.0				0.70	0.70

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

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MOVEMENT SUMMARY

Site: FutureAMPeak

Ultimo Rd/ Darling Dr Traffic Signal
Future AM Peak
The intersection is designed as a three way T - intersection as there is no activity on the driveway (south approach) during the peak hour
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ultimo Rd (east)											
5	T	297	2.0	0.243	2.5	LOS A	2.5	18.0	0.21	0.18	46.5
6	R	266	2.0	0.340	9.2	LOS A	2.6	18.3	0.23	0.67	40.9
Approach		563	2.0	0.340	5.7	LOS A	2.6	18.3	0.22	0.41	43.7
North: Darling Dr (north)											
7	L	134	2.0	0.274	25.7	LOS B	4.1	29.0	0.75	0.75	30.9
9	R	116	5.0	0.242	25.6	LOS B	3.5	25.8	0.74	0.75	31.0
Approach		249	3.4	0.274	25.7	LOS B	4.1	29.0	0.75	0.75	30.9
West: Ultimo Rd (west)											
10	L	53	5.0	0.072	11.7	LOS A	1.0	6.9	0.32	0.70	39.2
11	T	104	2.0	0.072	2.7	LOS A	1.0	6.9	0.20	0.16	46.2
Approach		157	3.0	0.072	5.7	LOS A	1.0	6.9	0.24	0.34	43.6
All Vehicles		969	2.5	0.340	10.8	LOS A	4.1	29.0	0.36	0.49	39.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	87	24.3	LOS C	0.1	0.1	0.90	0.90
P5	Across N approach	211	8.5	LOS A	0.2	0.2	0.53	0.53
All Pedestrians		298	13.1				0.64	0.64

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

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MOVEMENT SUMMARY

Site: FuturePMPeak

Ultimo Rd/ Darling Dr Traffic Signal
Future PM Peak
The intersection is designed as a three way T - intersection as there is no activity on the driveway (south approach) during the peak hour
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ultimo Rd (east)											
5	T	544	2.0	0.448	5.3	LOS A	6.9	49.4	0.40	0.35	43.1
6	R	275	2.0	0.449	11.9	LOS A	5.0	35.8	0.40	0.74	39.1
Approach		819	2.0	0.448	7.5	LOS A	6.9	49.4	0.40	0.48	41.7
North: Darling Dr (north)											
7	L	162	2.0	0.266	21.9	LOS B	4.3	30.6	0.66	0.75	32.8
9	R	269	5.0	0.451	23.1	LOS B	7.3	53.0	0.74	0.78	32.1
Approach		432	3.9	0.451	22.7	LOS B	7.3	53.0	0.71	0.77	32.4
West: Ultimo Rd (west)											
10	L	38	5.0	0.078	13.6	LOS A	1.2	8.3	0.39	0.74	38.1
11	T	115	2.0	0.078	4.9	LOS A	1.2	8.3	0.30	0.24	43.7
Approach		153	2.7	0.078	7.0	LOS A	1.2	8.3	0.33	0.36	42.1
All Vehicles		1403	2.7	0.451	12.1	LOS A	7.3	53.0	0.48	0.55	38.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	252	20.8	LOS C	0.4	0.4	0.83	0.83
P5	Across N approach	351	10.8	LOS B	0.4	0.4	0.60	0.60
All Pedestrians		603	15.0				0.70	0.70

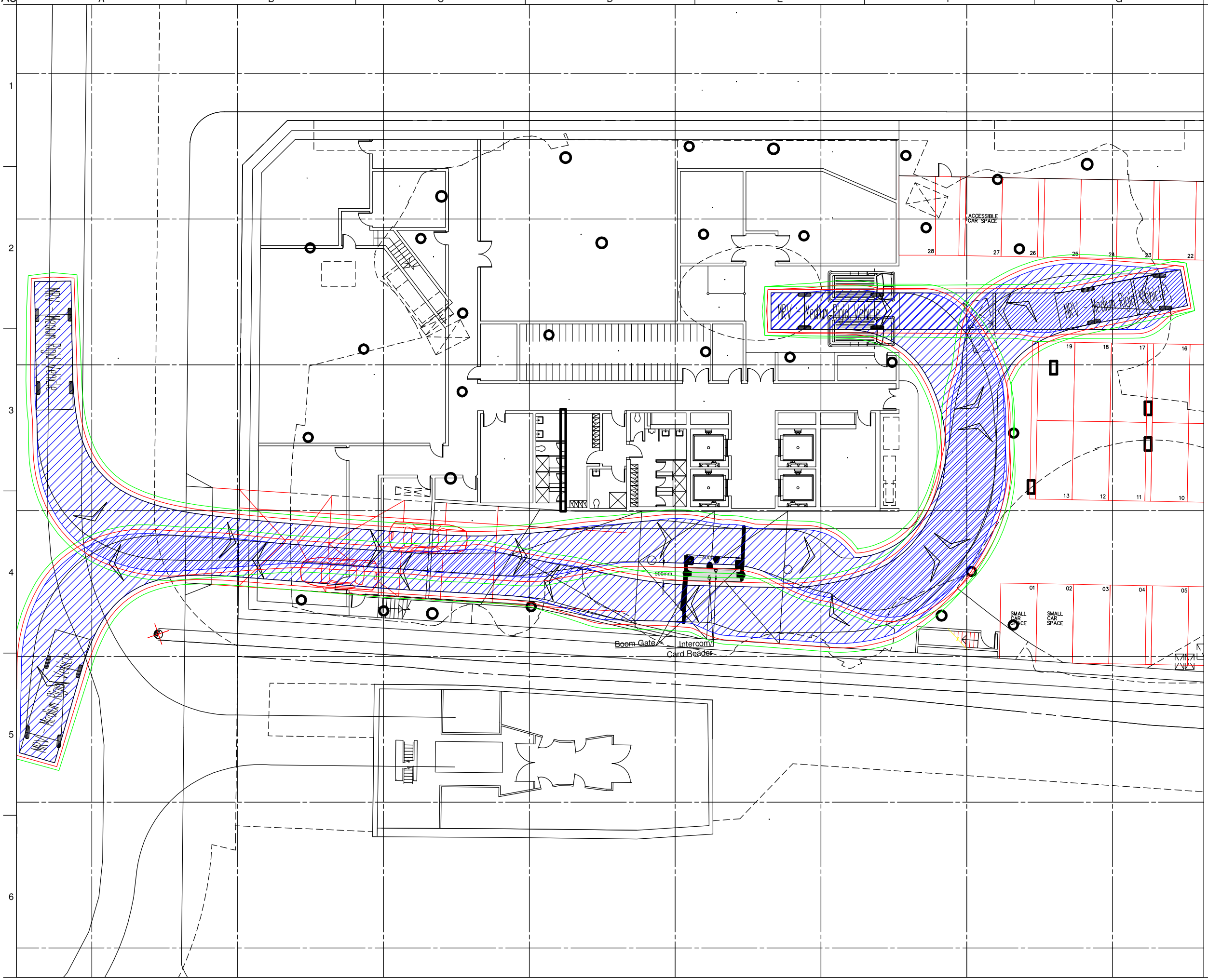
Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual pedestrian movements: Delay (HCM).

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Appendix C

Swept Path Diagram for Service Vehicle

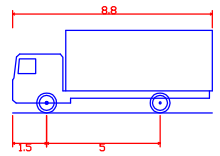
A3



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

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
University of Technology Sydney

Job Title
Dr Chau Chak
Wing Building

Drawing Title
Turning Paths
8.8m Service Vehicle
Boom gate and intercom location
Option 2

Scale at A3 1:400

Discipline Planning

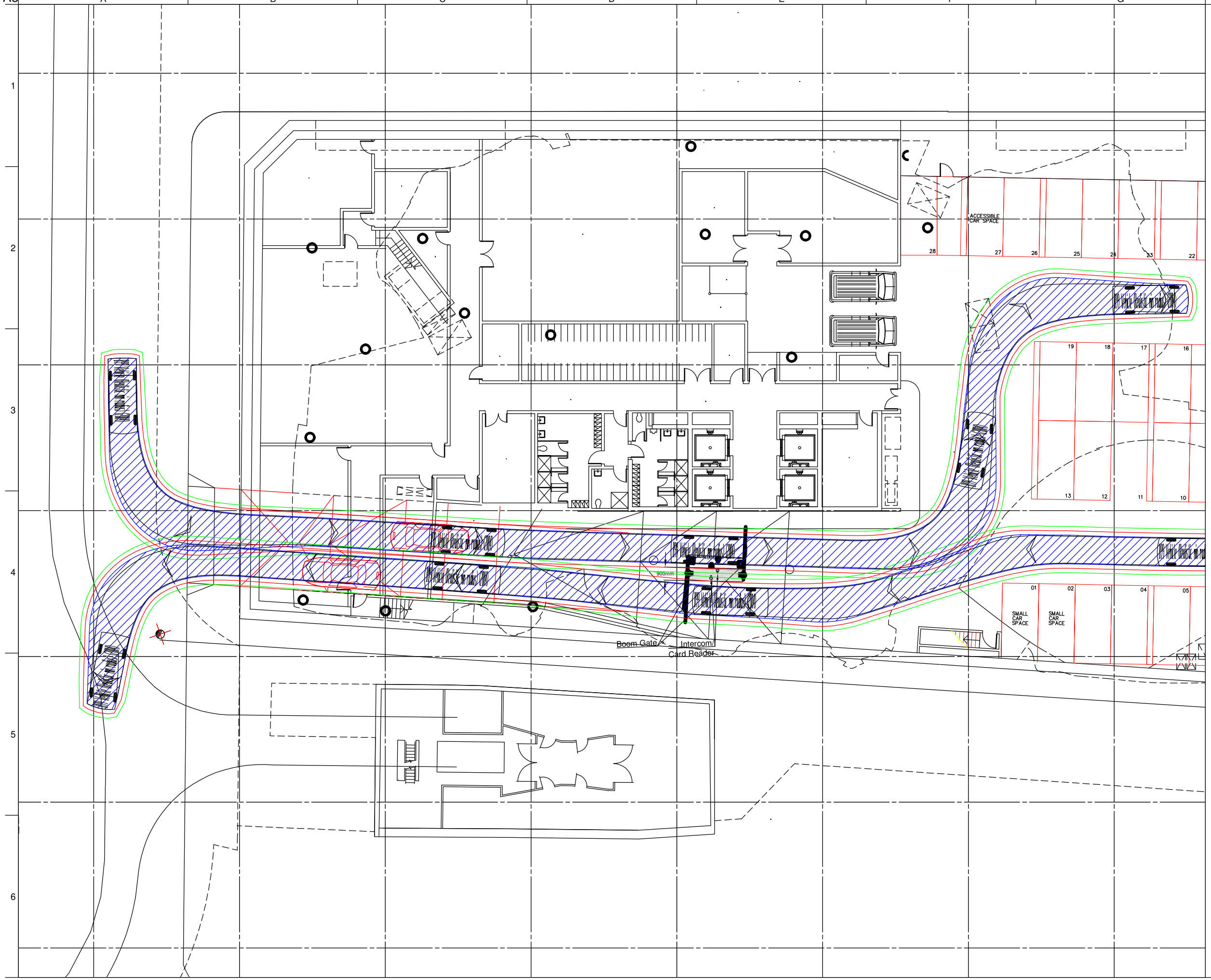
Drawing Status
Draft

Job No	Drawing No	Issue
220911	**SKT006**	**B**

Do not scale

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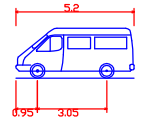
A3



Legend

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

Design Vehicle(s)



B99 Vehicle (Realistic min radius) (2004)

Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.250m

Issue	Date	By	Chkd	Appd

ARUP

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Sydney, NSW, 2000
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www.arup.com.au

Client

University of Technology Sydney

Job Title

Dr Chau Chak
Wing Building

Drawing Title

Turning Paths
5.2m B99 Car
Boom gate and intercom location
Option 2

Scale at A3 1:400

Discipline Planning

Drawing Status

Draft

Job No	Drawing No	Issue
220911	**SKT003**	**B**

Do not scale

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Appendix B

Addendum to the Dr Chau Chak Wing Building Noise Assessment

MARSHALL DAY Acoustics

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Chippendale
NSW 2008
T: +612 9282 9422 Fax: +612 9281 3611
A.C.N. 006 675 403
www.marshallday.com

27 July 2011

University of Technology, Sydney
Program Management Office
City Campus
Bldg 10 Lvl 6 Rm 132
235 Jones Street
Ultimo NSW 2007

Attention: Sally-Anne Vaughton

Dear Sally-Anne,

ADDENDUM TO RP002 R02 2010377SY
DR CHAU CHAK WING BUILDING NOISE IMPACT ASSESSMENT

Marshall Day Acoustics have reviewed the response to the Part 3A submission from the City of Sydney Council dated 30 June 2011 (ref: 2011/162591). As requested in Section 5: Health, Infrastructure and Contamination - Noise, provided below are additional details relating to community consultation and complaints handling procedures. Reference has been made to the *Interim Construction Noise Guideline* Table 5: Options for work practices - consultation and notification.

Community notification and consultation

- Provide, reasonably ahead of time, information such as total building time, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur. For works outside standard hours, inform affected residents and other sensitive land use occupants between five and 14 days before commencement.

- Provide information to neighbours before and during construction through media such as letterbox drops, community meetings or individual contact.

- Use a site information board at the front of the site with the name of the organisation responsible for the site and their contact details, hours of operation and regular information updates. This signage should be clearly visible from the outside and include after hours emergency contact details.

- Appoint a community liaison officer.

- A regular newsletter with site news, significant project events and timing of different activities could be provided to affected residences.

- Provide a toll-free contact phone number for enquiries during the works.
- Facilitate contact with people to ensure that everyone can see that the site manager understands potential issues, that a planned approach is in place and that there is an ongoing commitment to minimise noise.

Complaints handling

Initially, complaints should be directed to an appointed community liaison officer who shall make a preliminary investigation and record of the complaint including the following:

- Details of the complaint including date, time and description of noise
- The activities being carried out on site at the time of the complaint
- Identification of noise source or activity based on previous noise reports if appropriate
- Complainant's name, contact number, and address
- Time of verbal response and timeframe for written response where appropriate.

The community liaison officer and the contractor will decide whether immediate action is required by the contractor or whether the matter may be addressed at the next formal site meeting.

For on-going complaints, the contractor or community liaison office may request measurements by an acoustic consultant should be made of the specific noise source. Investigation of the noise complaint should include:

- Determination of noise sources and measuring or estimating noise levels at the time of complaint
- Recommendations to achieve guidelines
- Report of findings, recommendations, actions and time taken to close out complaint.

We trust this information is satisfactory. If you have any further questions please do not hesitate to contact us.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD



Sandy Marshall

Consultant

Appendix C

Reflectivity Report (Draft of Issue 2)

University of Technology Sydney

UTS Dr Chau Chak Wing Building

Reflectivity Study

220911-80/040204/R001

Issue 2 | September 2011

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10
201 Kent Street
Sydney
NSW 2000
Australia
www.arup.com

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 220911-80

ARUP

Document Verification

ARUP

Job title		UTS Dr Chau Chak Wing Building			**Job number** 220911-80
Document title		Reflectivity Study			**File reference**
Document ref		220911-80/040204/R001			
Revision	**Date**	**Filename**	220911-80 Reflectivity Study Report - Draft 1 20110111.docx		
Draft 1	14/01/11	**Description**	First draft		
			Prepared by	Checked by	Approved by
		Name	Jorg Kramer	Jon Morgan	Peter Hartigan
		Signature			
Draft 2	18/01/11	**Filename**	220911-80 Reflectivity Study Report - Draft 2 20110118.docx		
		Description	Updated references to adjacent buildings		
			Prepared by	Checked by	Approved by
		Name	Jorg Kramer	Jon Morgan	Peter Hartigan
		Signature			
Final Draft	03/02/11	**Filename**	220911-80 Reflectivity Study Report - Final Draft 20110203.docx		
		Description	Updated for Part 3A design		
			Prepared by	Checked by	Approved by
		Name	Jorg Kramer	Phillip Greenup	Peter Hartigan
		Signature			
Issue	07/02/11	**Filename**	220911-80 Reflectivity Study Report - Issue 20110207.docx		
		Description	Issued for inclusion in Planning Application EA Report		
			Prepared by	Checked by	Approved by
		Name	Jorg Kramer	Peter Hartigan	Peter Hartigan
		Signature			
				Issue Document Verification with Document	✓

Document Verification

Job title		UTS Dr Chau Chak Wing Building			**Job number** 220911-80
Document title		Reflectivity Study			**File reference**
Document ref		220911-80/040204/R001			
Revision	**Date**	**Filename**	220911-80 Reflectivity Study Report - Issue 2 20110905.docx		
Issue 2	05/09/11	**Description**	Updates to analysis reflecting revised facade geometry		
			Prepared by	Checked by	Approved by
		Name	Jorg Kramer	Peter Hartigan	Peter Hartigan
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

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Appendix A

Annual Reflections Overview

Executive Summary

The proposed building analysed in this report is the University of Technology Sydney Dr Chau Chak Wing Building, an 11 storey plus plant level and basement faculty building designed by Gehry Partners LLP to house the Faculty of Business of the University of Technology Sydney (UTS). This Reflectivity Report assesses the impact of solar reflections off the proposed development on traffic and occupants of nearby buildings in the surrounding area of the proposed site, in terms of reduced visibility of visual tasks. This is to address the qualitative requirements of Section 7.2 *Environmental Issues: Reflectivity Impact* of the Urban Development Plan Ultimo-Pyrmont. This assessment is performed following the methodology of David N.H. Hassall of the University of New South Wales.

Preliminary analysis carried out on an earlier design iteration had identified some glazing that produced reflections potentially causing glare to traffic in Mary Ann St and Ultimo Rd. Subsequently the design was altered in response with the identified glazing areas slightly rotated in plan to mitigate reflections. The analysis has been updated with the current design, which represents a further development of the architecture retaining changes to mitigating reflections.

With the proposed design it is found that the building performs well in terms of solar reflectivity, and glare affecting motorists on surroundings streets will not exceed the limits of acceptability according to the Hassall methodology.

- Traffic:
  Glare risks have been eliminated from any façade aspects that could potentially cause reflections affecting traffic for either or several of the following reasons:
  - Reflections are below the threshold of 500Cd/m² stipulated by Hassall
  - Surrounding buildings will be blocking reflections
  - Other parts of the building itself will be blocking reflections
  - Vegetation considered a permanent feature due to redundancy of several trees behind each other and presence of leaves during times of expected reflections, will be blocking reflections
- Pedestrians:
  Pedestrians are easily able to adjust their view in any location where unwanted reflections may be received, reducing the impact of the reflections. They move at a rate significantly slower than that of a vehicle. For this reason it is acceptable to assume that it will be safe for pedestrians to divert their vision in order to avoid glare.
- Adjacent buildings:
  Adjacent building facades exposed to reflections are also exposed to direct sun at other times, such that glare from reflections does not appear significant. Any potential glare reflections that may occasionally be produced towards these buildings will be reduced / offset by the following:
  - The glass reflectance limited to 20% reduces intensity of reflections significantly
  - Overshading of neighbouring buildings by the proposed development will serve to reduce direct solar glare potential to these buildings and thus offset reflections

The study has found that every façade aspect can have a maximum external reflectance of 20% in accordance with council regulations without causing unacceptable glare.

1 Introduction

This report supports the Project Application for the proposed University of Technology Sydney Dr Chau Chak Wing Building submitted to the Minister for Planning pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). It has been produced in response to the Director General's requirements. It addresses the controls laid out in Section 7.2 *Environmental Issues: Reflectivity Impact* of the Urban Development Plan Ultimo-Pyrmont [1] referenced in the Director General's requirements.

This Reflectivity Report assesses the likelihood of rogue solar reflections off the proposed development on traffic in the surrounding area and on occupants of nearby buildings. This assessment is performed following the methodology of David N.H. Hassall of the University of New South Wales [2].

The reflectivity study presented in this report was performed with three-dimensional building and site models received from Gehry Partners LLP on 29th October 2010, 3rd November 2010 and 1st July 2011.

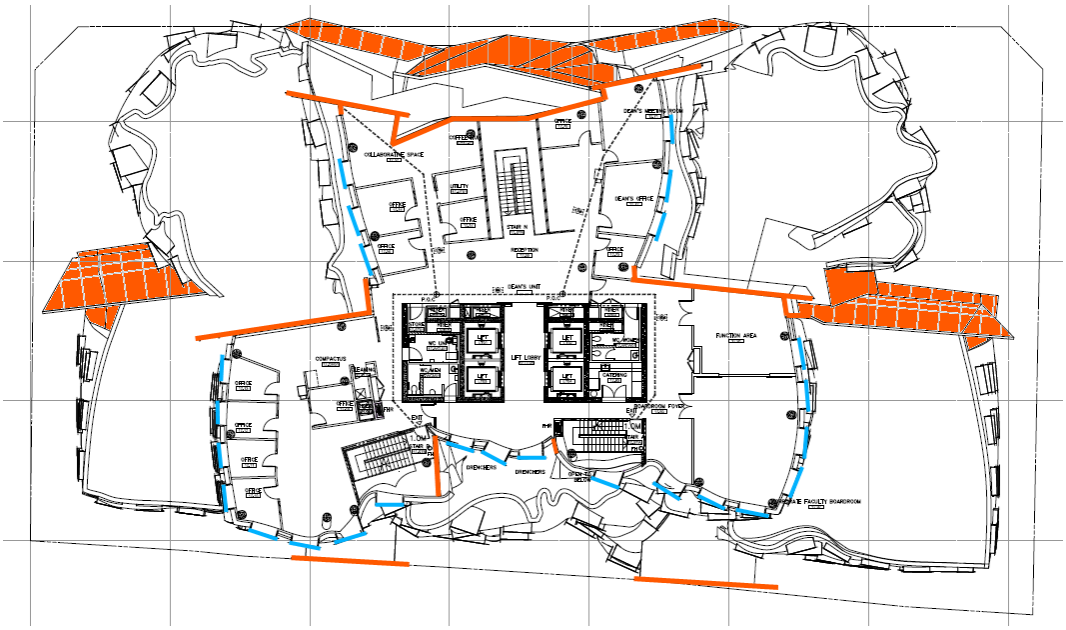
2 Project Description

2.1 General

The proposed Dr Chau Chak Wing Building development is an approximately 15,488m² faculty building designed by Gehry Partners LLP to house the Faculty of Business of the University of Technology Sydney (UTS).

The development will contain teaching, research and office spaces as well as support facilities in a single building volume rising to 12 storeys in height. The building is articulated into several sub-volumes that are arranged stacked and rotated against each other.

2.2 Facades



Upper level plan. Blue - punched windows; red - inclined full height glazing

The facade of the building is divided into areas with two main characters. The east, south and north facing are clad in brick with large glazed punched windows. The west facing facade and some infill areas are full height glazed.



Model east elevation

The brick chosen for the solid facade areas has a rough texture. It is considered not to produce any specular reflections, and was therefore not included in the reflection analysis in this report.

The punched windows in the brick facade are of roughly 2.2m high × 2m to 2.8m high × 2m size. The proposed glass has an external reflectivity of 20% in line with the allowable maximum under the UDP [1]. The glazing in punched windows is vertical, but plan orientation follows the undulating facade such that most windows have an individual orientation.



Model west elevation

The full height glazed areas are flush glazed and do not incorporate any external elements. This glazing is divided into several 2-6 storey high planes at different angles of inclination and plan orientation, and an area central to the west elevation where the glazing is faceted. The selected glass is the same as for the punched windows with an external reflectivity of 20%.

2.3 Site relations

The proposed building is located on the site 14-28 Ultimo Road, Ultimo. UTS's buildings are organised as an urban campus with buildings integrated into Sydney's Ultimo neighbourhood. The Dr Chau Chak Wing Building is surrounded by buildings that are not a part of the University: the Australian Broadcasting Corporation (ABC) headquarters to the south, an apartment building and a Sydney TAFE building to the west, and the Powerhouse Museum to the north.

The development is taller than the surrounding buildings, hence its facades can be seen from locations further away in the neighbouring streets.

3 Assessment of Facade Reflections

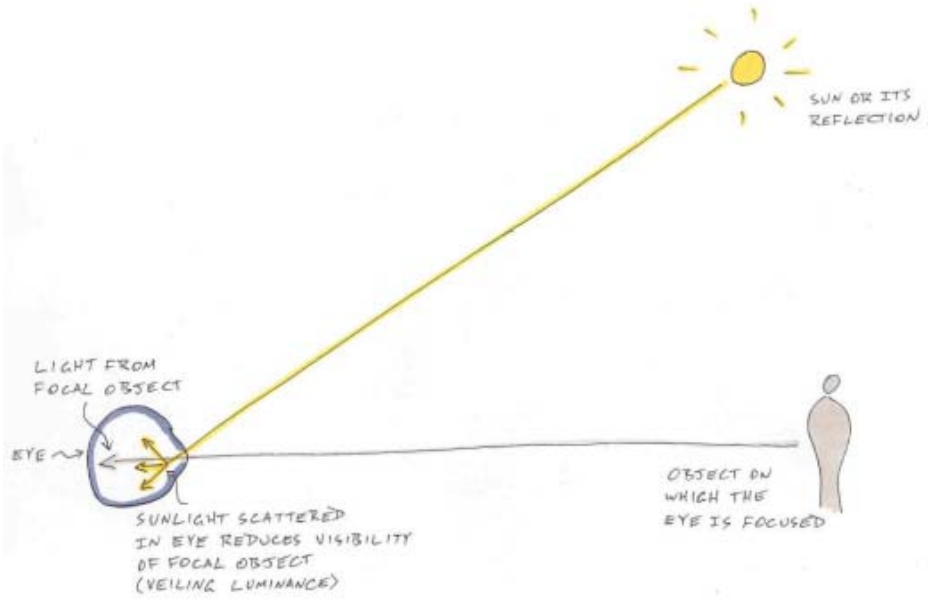
3.1 Criteria for Assessment

This report assesses the likelihood of undesirable solar reflections that affect nearby roadways and traffic. The assessment follows the methodology of David N. H. Hassall of the University of New South Wales. This methodology is detailed in Section 3.2 of this report.

Any glazed building has the potential to cause solar reflections in many directions at any time at which the sun is visible. The study will assess the importance of these reflections in terms of 'disability glare' and 'discomfort glare'. These are defined in the Hassall methodology as follows:

- Disability glare – glare from reflections which impact the observer in a way that they are unable to perform a visual task, such as reading or driving, without taking evasive action (such as turning away or raising a hand to shield the eyes). It is critical that a driver's view is unaffected by disability glare as this has the potential to cause road accidents. Note that the term 'Disability' indicates temporary impact on the ability to perform visual tasks and does not imply that the glare effect leads to long-term disability in any form.
- Discomfort glare – glare from reflections causing the observer psychological annoyance.

Calculations following this method centre on equivalent veiling luminance in the eyes of observers due to solar reflections. The terms 'veiling luminance' and 'veiling glare' refer to the effect of multiple reflection and scattering within the eye of direct light from a bright source. This produces a perception similar to a thin veil being overlaid on the visual scene, and reduces the contrast in the scene, potentially impairing visual tasks.



The equivalent veiling luminance is a measure of this effect, and hence considered a measure of the visual impact of glare. Luminance is measured in Cd/m² (candela per metre squared) and is a representation of how bright a surface will appear to the human eye. Where the equivalent veiling glare figure exceeds the level of 500Cd/m², the solar reflection is considered excessive (potentially causing disability glare) in accordance with the Hassall methodology.

3.2 Methodology

The assessment of undesirable solar reflections is based on the methodology described by David N. H. Hassall [2]. This involves several steps, as outlined below.

1. The size, orientation and extent of reflective objects on each facade are determined by examination of drawings provided by the architect, the site and surrounds, and expected glazing materials.
2. Several observer locations are chosen for critical facades, representing locations from which traffic participants may observe the facades.
3. Times at which the sun is reflected off the facade are determined, as well as the directions in which it is reflected.
4. For each observer, the equivalent veiling luminance in the eye of the observer is calculated. This involves calculations of the strength of solar illumination, the position of the sun in front of the facade, the apparent position of the sun reflected in the facade, and the reflected solar illumination received by the observer.
5. The calculated equivalent veiling luminance is compared with the maximum allowed level of 500Cd/m². Veiling luminance in excess of this limit is considered to potentially cause glare impairing visual tasks (disability glare) and thus pose a risk to traffic if it cannot be effectively blocked.
6. For situations where the maximum level is exceeded, the case is further investigated to assess whether the offending section of facade is not shaded by external elements, and whether it presents a sufficiently large solid angle to the observer. If the offending facade section is shaded or too small to reflect a portion of the sun disk large enough to cause disability glare to the observer, the case is disregarded.
7. In some situations, high veiling luminance may be caused by grazing reflections, when the sun itself is close to its reflection in the observer's field of view. In this case the impact of the reflection is considered minimal when compared to that of the actual sun. Consequently, grazing reflections, where the angle between the observer direction and the real sun is less than 20°, are not included in the results. Reflections where the angle is greater than 20° are included and are considered on an individual basis.
8. With knowledge of the impact of solar reflections on numerous observers for each facade, the investigation is generalised for all similar observers within sight of each facade.

To allow calculations to proceed, a number of assumptions were made:

- A nominal glazing reflectance of 20% has been considered, as this is the reflectance of the proposed glass reference product as well as the allowable limit under the

provisions of the Ultimo-Pyrmont UDP. Where the results show that no disabling reflections are produced by this glass, no disabling reflections will be produced by glass of a lesser reflectivity.

- Each facade is assumed to be 100% glazed as a worst case assumption. Glazing joints and framing elements theoretically reduce the reflectivity of the facades, but due to the choice of flush glazing to the larger curtain wall areas and large glass panes in windows this effect is very small.
- It is assumed that to carry out the visual tasks required for traffic participation, drivers and pedestrians face parallel to the ground, and parallel to their direction of travel.

Each of the above assumptions is considered appropriate in this case, and the Hassall methodology is considered best practice for such analysis.

3.3 Model / Analysis Approach



Plan view showing extent of surroundings modelled and roads leading towards site

In order to allow assessment of the complex geometry of the building with numerous glazing plane orientations, the analysis was undertaken using 3d models and the daylight simulation and rendering software Radiance [3]. The rendering analysis converts real illuminance into equivalent veiling luminance after Hassall's definition, depending on reflectivity of the facade and observer direction. A glass with nominal external reflectivity of 20% was modelled for all glazed facades.

Models provided by Gehry Partners included the proposed building with all reflective facade surfaces as well as mass modelling of the surrounding topology and structures.

The software used allows rendering of sunlight reflections in the following principal ways:

1. Observing distribution of reflected light on ground and other surfaces for a specific time. This allows assessing towards which observer locations reflections are cast off the facades. The equivalent veiling luminance is calculated for a specific observer direction
2. Highlighting all areas on the reflecting surface that produce excessive reflections towards a specific observer location, but covering the entire year. This allows assessing in detail if and from which precise areas excessive reflections originate from the facade

Using the first method, reflections off the facades were first simulated at numerous different times representative of the variation in sunlight over the hours of the day and over the course of a year.

From the results, areas in which potentially adverse reflections off the building occur were identified. These were then assessed in detail with perspective images generated using the second method.

All images used in this report use the following colour coding:

- Any sun reflections or areas on the facades producing sun reflections towards the observer, whether excessive or deemed tolerable, are highlighted in **blue and yellow**
- All areas where the equivalent veiling luminance exceeds the 500Cd/m² threshold are highlighted in **yellow**

4 Results

4.1 Global analysis

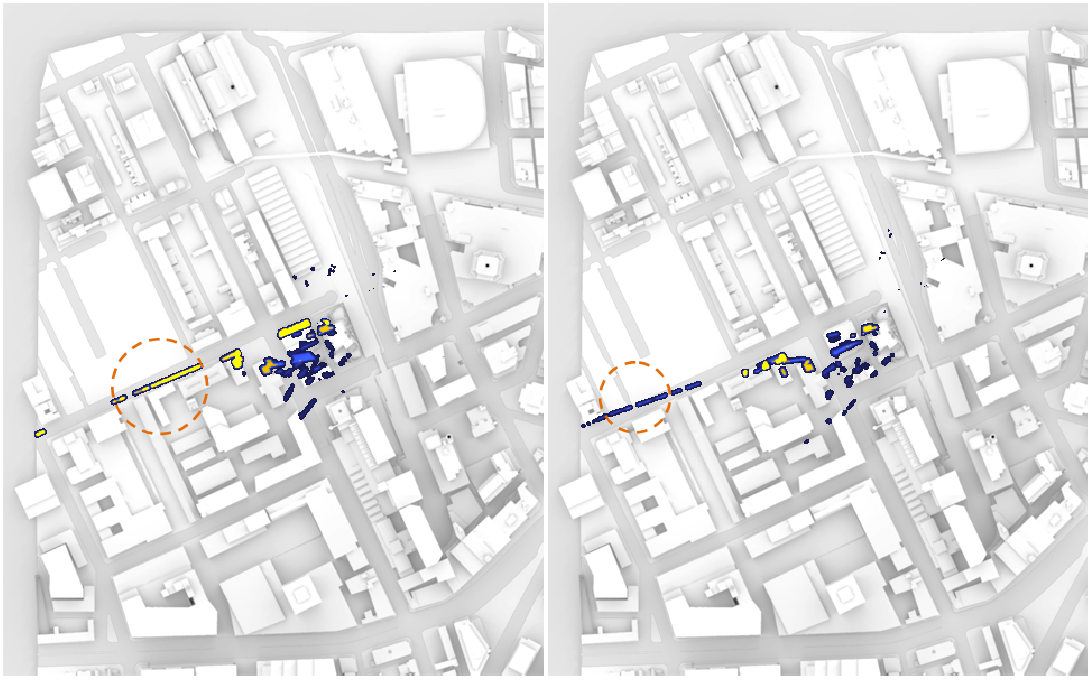
Renderings of the 3d model were made in plan view of the area surrounding the site to approximately 400m distance.

Reflections off the facades were firstly simulated at 15-min intervals over an entire day for each month of the year (See Appendix A for an overview. Plan renderings in sections below are excerpted from this series).

From inspection of the generated results, it was apparent that some reflections fall onto roads and may be visible to traffic participants. As the plan renderings returned only a limited resolution result, and observer directions could not be finely tuned to accurately represent veiling luminance in all locations following the roads, perspective studies from driver locations were undertaken in any areas where the renderings highlighted reflections exceeding the 500Cd/m² threshold and in locations where smaller scattered reflections appeared to be thrown in the direction of the observer (where high peak intensities may not be visible from the resolution of the generated plan images). These areas included Mary Ann St, Darling Drive, and Ultimo Rd, and analysis findings are presented below.

Reflections in Harris St, Thomas St, on Broadway, and in other surrounding streets were found to be either entirely blocked by other buildings or not falling close to traffic participants' expected view directions, thus not reaching a concerning level of equivalent veiling luminance. Reflections in other locations are discussed below.

4.2 Mary Ann St



December 21, 17:45 December 21, 18:00

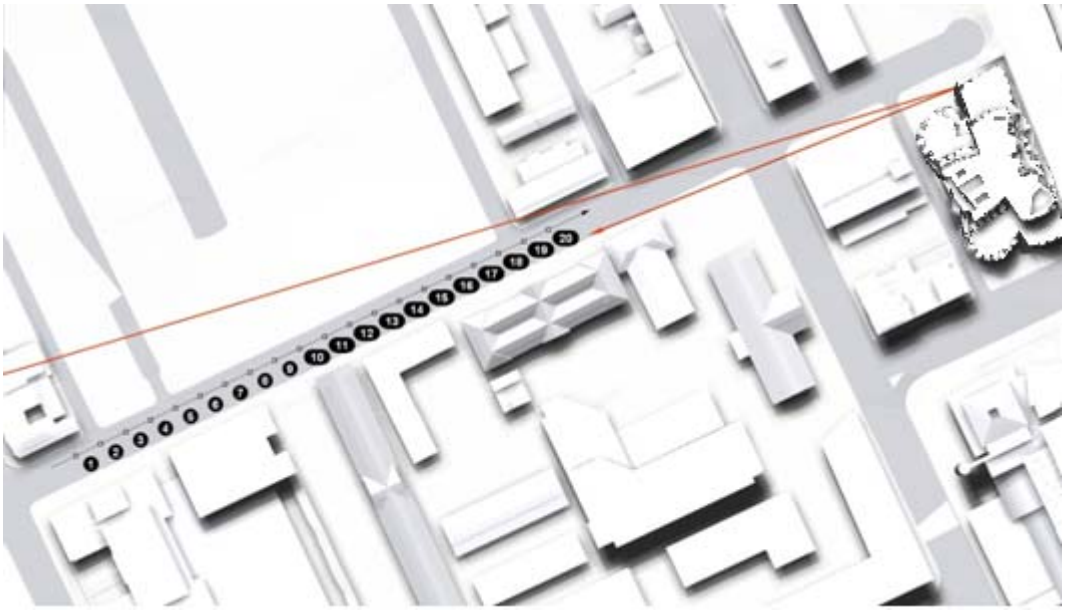
Reflections reaching Mary Ann St (at approx. times of highest intensities)

Reflections off the northern areas of the western facade of the building hit the north side of Mary Ann St in the late afternoon during summer. Traffic in Mary Ann St is one way only, but leading in the direction of the site, so that drivers may be able to see the top of the building when driving more to the northern side of the street. Reflections 'wander' across the road for a short period during the day only at the following times:

- November – January: periods varying between 0 and approximately 30 minutes, shifting between 5pm and 7pm

Reflections take the form of long 'shards' of projected light. This means that they do not cover large areas of the street, and traffic participants will travel through the zone of exposure to reflections in a short period of time. However, the 'shards' stretch roughly in the direction of the road, and the length of these zones when passing through in travel direction may be in the order of 60m. The calculations not taking vegetation into account indicate that the equivalent veiling luminance of some reflections would exceed the threshold of 500Cd/m² for these periods.

Worst case reflections were thus assessed from observer locations spaced at 10m intervals for the length of the stretch of Mary Ann St where any reflections could be observed.



Viewpoints / driver locations analysed in Mary Ann St. Red arrow qualitatively indicates path of reflections cast in direction of observers

Preliminary analysis from observer locations carried out on an earlier design iteration had identified glazing planes that produced reflections above the threshold of 500Cd/m² from areas which were potentially visible through or above trees. Subsequently the design was altered in response with this plane slightly rotated in plan towards the south to mitigate reflections, and further analysis was carried out with the current design.



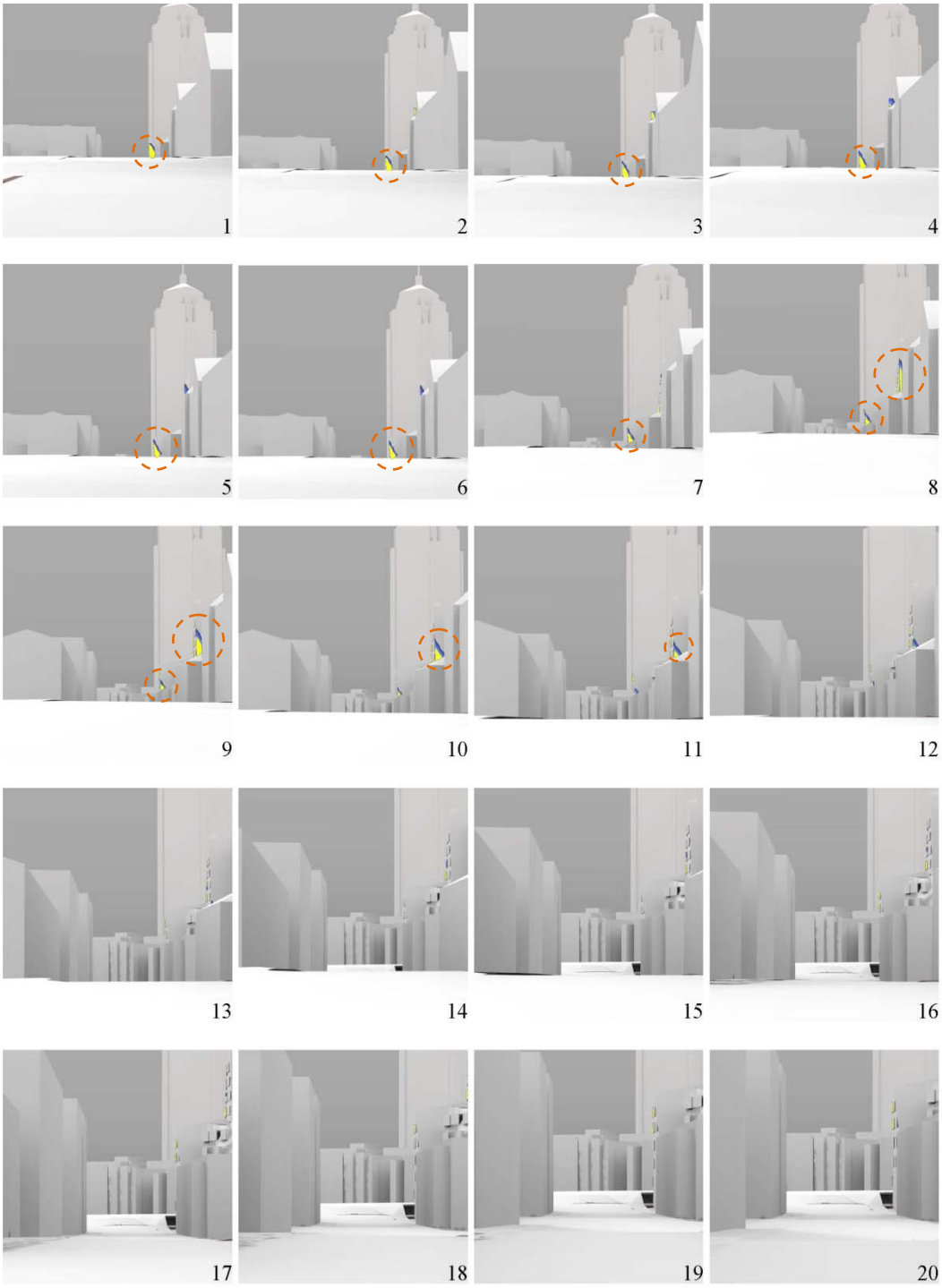
Earlier design



Reflections after change of glazing orientation (below vegetation)

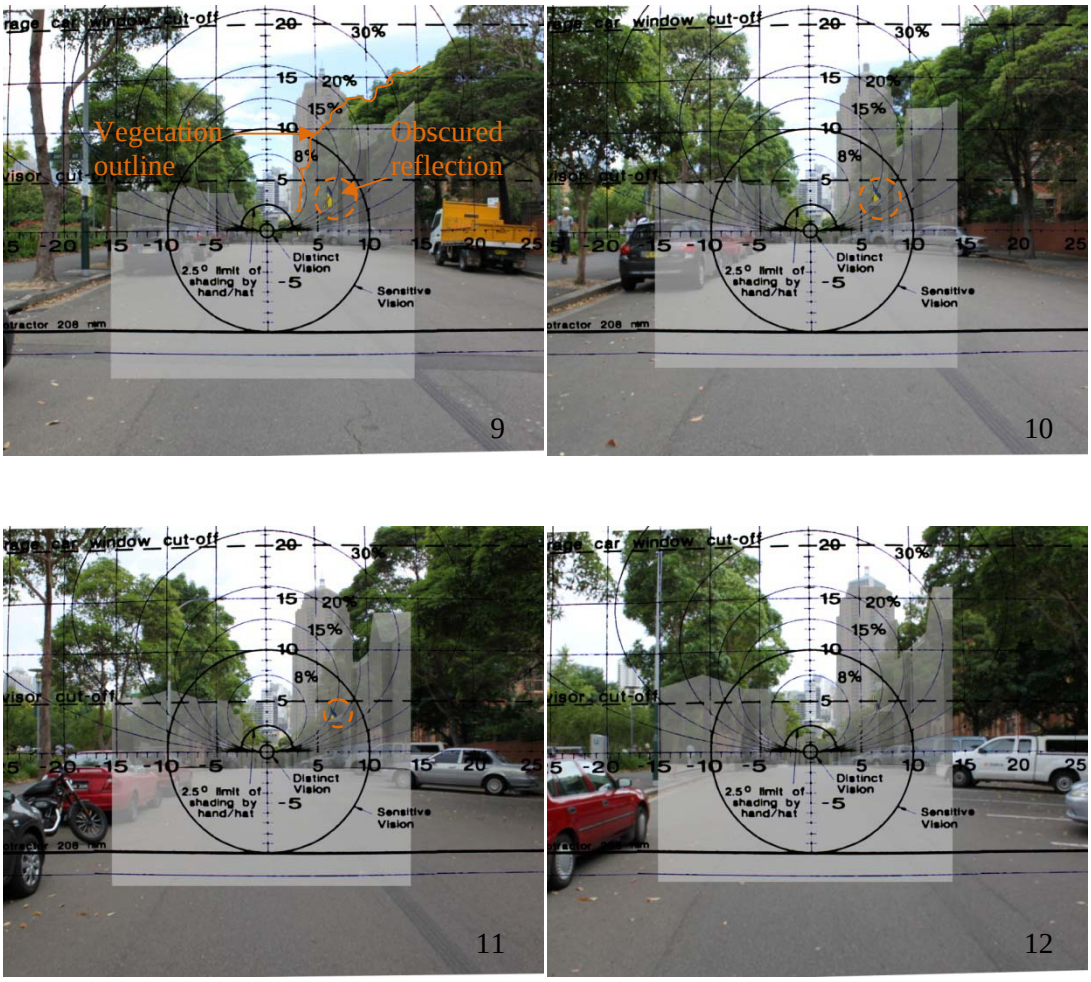
Comparison in reflection intensity earlier and current design (disregarding vegetation)

All images shown and analysis described in the following are based on the current revised design.



Reflections off the building facade shown in perspective from Mary Ann St viewpoints at 10m intervals approaching the Dr Chau Chak Wing Bldg. Note these images show cumulative worst case intensities of the entire year

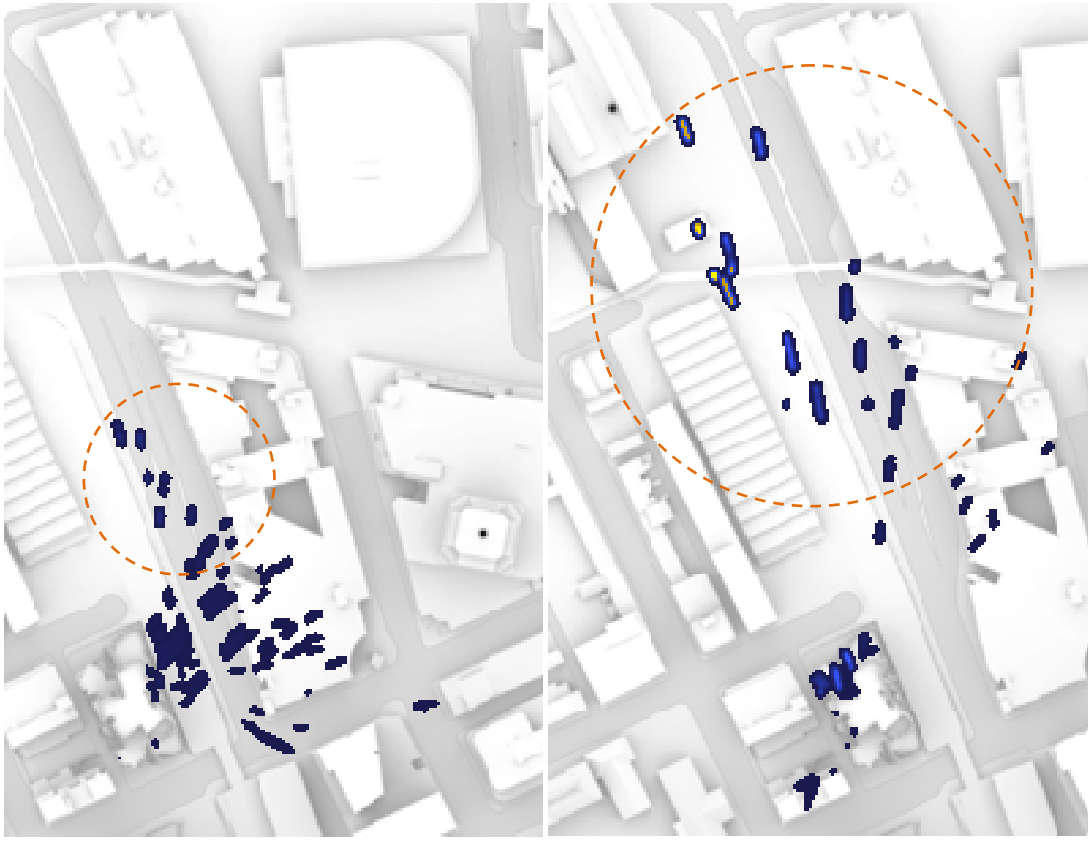
As shown in the series of images, reflections are visible above the modeled building geometry. Mary Ann St is however flanked by vegetation not included in the model. The rendered images were thus overlayed with photos taken in the same locations on site to assess the effect of vegetation on the visibility of reflections.



Overlay of observer perspectives with site photos showing vegetation

With the current design any reflections that exceeded the 500Cd/m² threshold were found, as shown in the image sequence excerpt, to occur only where view of the building would in reality be obscured by a row of trees. As reflections only occur during summer when these trees are carrying leaves, and as in any instance several trees behind each other block the line of sight towards the facade such that removal of single trees will not affect the obscuration, the trees can be regarded as permanent features obscuring reflections. **Excessive reflections causing glare in Mary Ann St were therefore discounted**.

4.3 Darling Drive



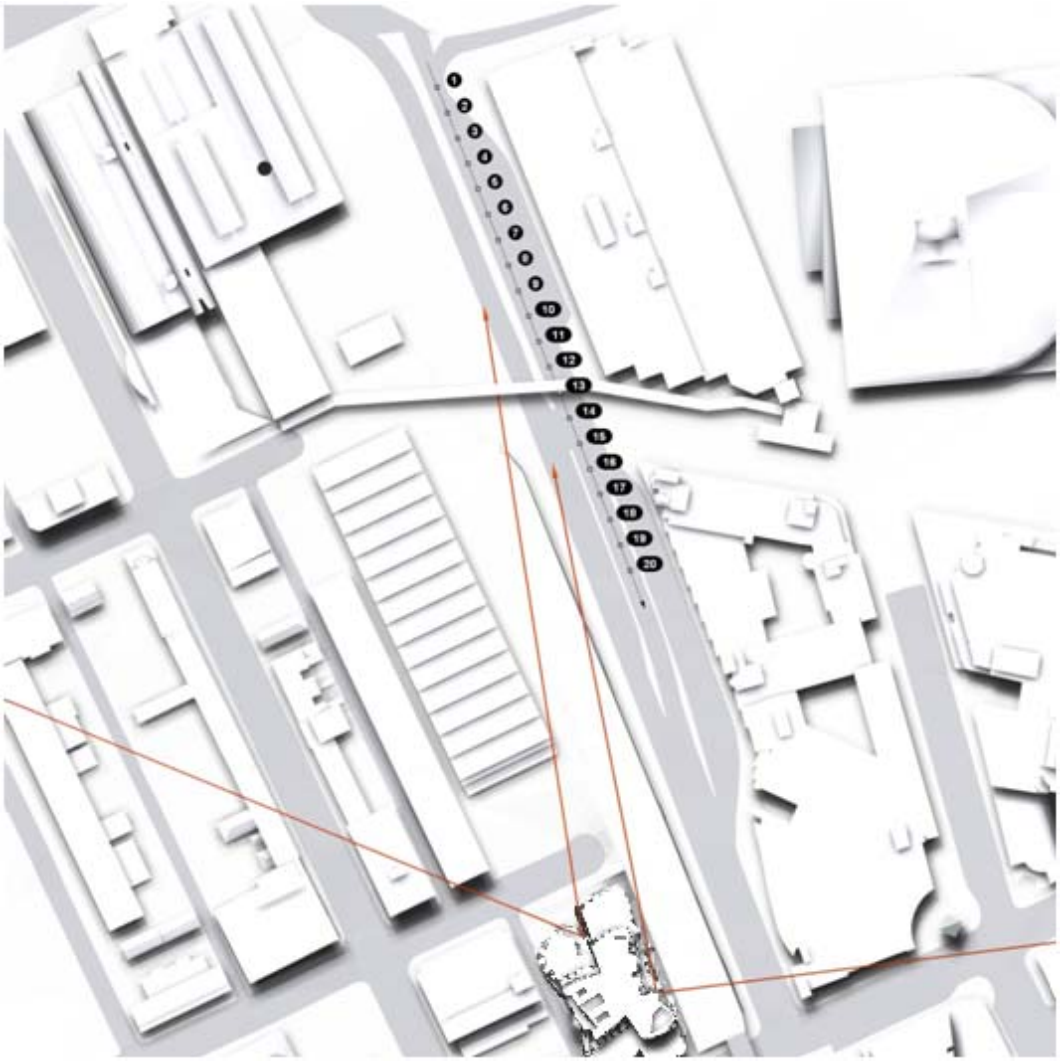
February 21 7:00 June 21 16:00

Examples of reflections cast on Darling Drive (disregarding vegetation)

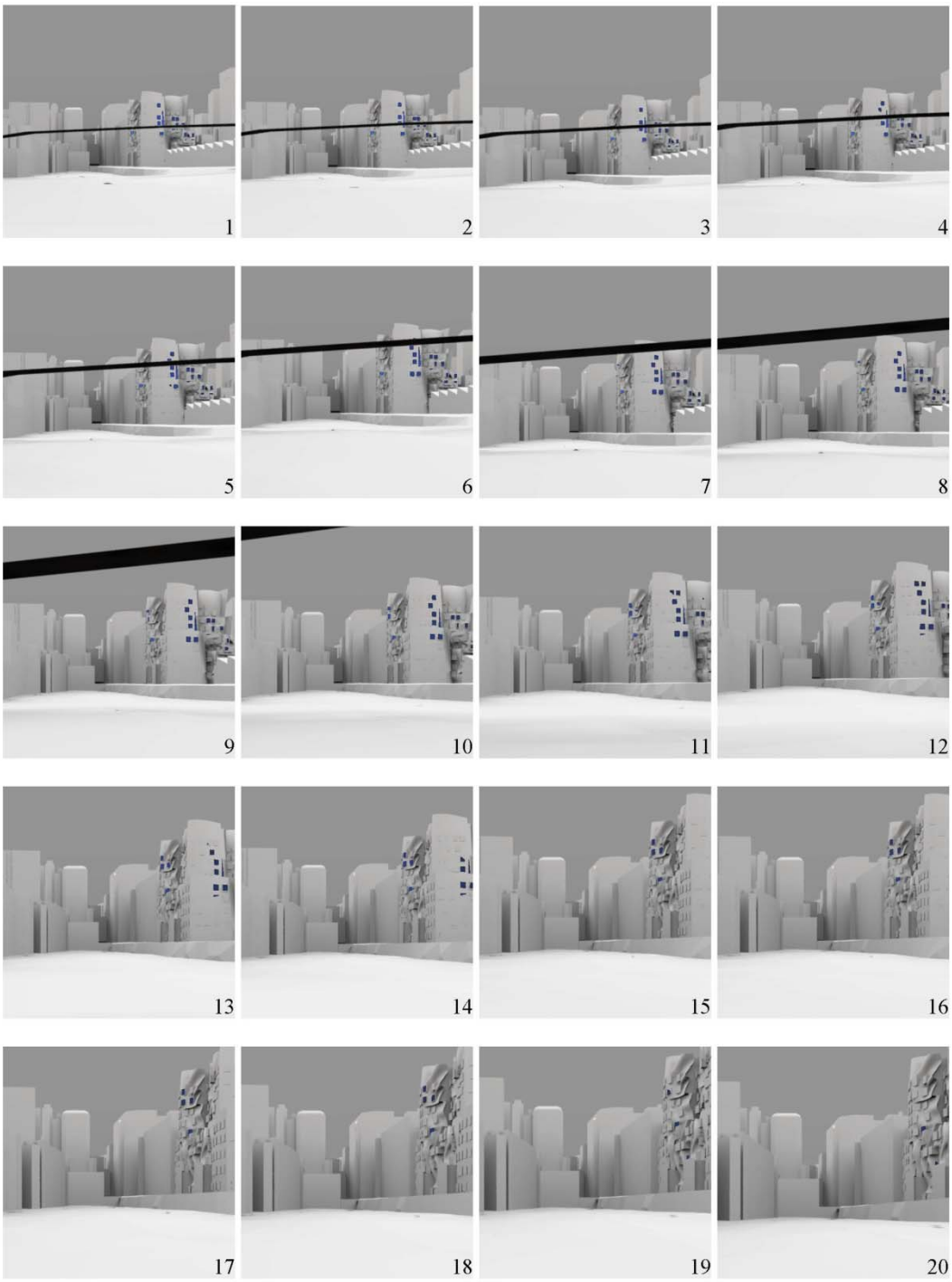
From the plan studies some reflections off punched windows on the building's north and north-east could be observed to be thrown towards Darling Drive, potentially close within the viewing direction of traffic travelling south. These occur throughout the year for minutes at a time due to the small window areas reflected, approximately around the following times:

- Jan 6.00-6.30
- Feb - Apr 6.30-8.00 and 16.00-17.30
- May-Jun 8.00-8.30 and 15.00-16.00
- Jul-Aug 8.30-9.00 and 15.30-17.00
- Sep 7.00-8.00 and 15.30-17.30
- Oct-Dec 6.00-6.30 and 17.00-18.30

Worst case reflections were thus assessed from observer locations spaced at 10m intervals for the length of the stretch of Darling Drive where reflections close to driver direction of vision could be observed.



Viewpoints / driver locations analysed on Darling Drive



Reflections off the building facade shown in perspective from Darling Drive viewpoints at 10m intervals approaching the Dr Chau Chak Wing Bldg. Note these images show cumulative worst case intensities of the entire year

All worst case reflections off the punched windows were found to cause veiling luminance below the threshold of 500Cd/m² and are thus not regarded as problematic in accordance with the Hassall methodology.



Trees between Darling Dr and the Dr Chau Chak Wing Building site

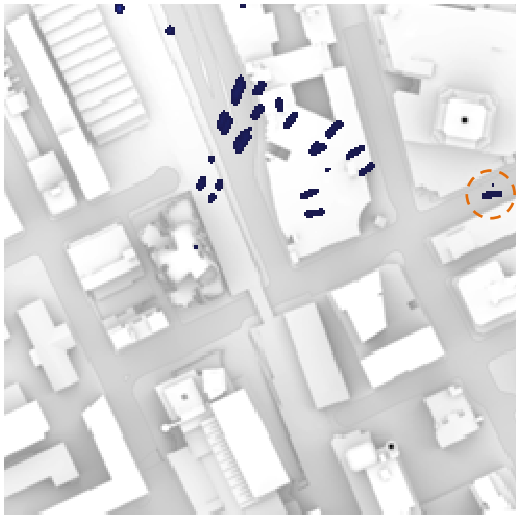
The model used for the study does not reflect vegetation. Along the entire section of Darling Dr analysed, dense and tall tree planting is likely to significantly obscure view of the site. Trees are approximately 20-25m in height and evergreen.

Any reflections at lower levels would thus be additionally masked by these trees. As these trees are evergreen, and as in any instance several trees behind each other block the line of sight towards the facade such that removal of single trees will not affect the obscuration, the trees can be regarded as permanent features obscuring reflections. **Excessive reflections causing glare to drivers on Darling Drive were discounted**.

4.4 Ultimo Rd



April 21 7:30



January 21 6:15

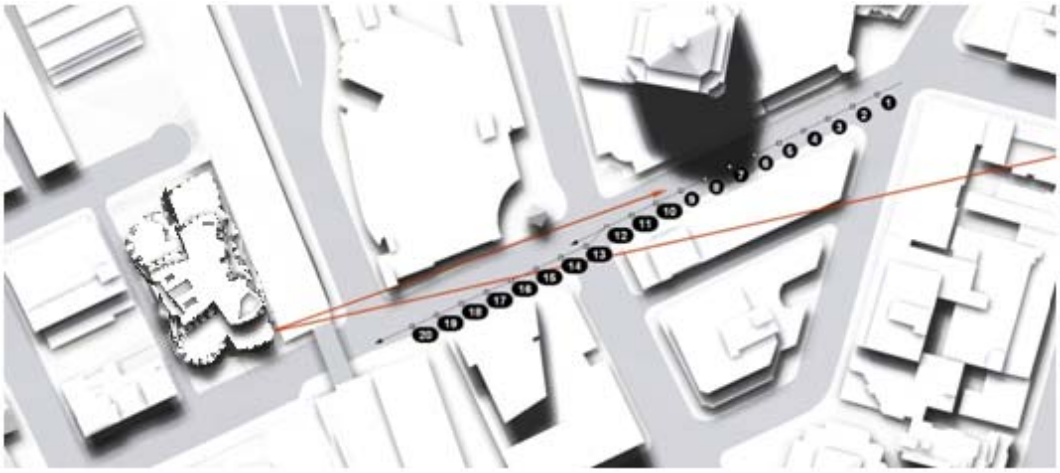
Examples of reflections cast on Ultimo Rd during morning hours

On Ultimo Rd, small flashes of reflections are cast from window box glazing in the south-eastern segment of the building. These can be seen by drivers travelling west on the stretch east of the UPN bridge. Reflections in this area occur during the following times:

April to October: periods varying between 0 and approximately 10 minutes, shifting between 7.30am and 10am

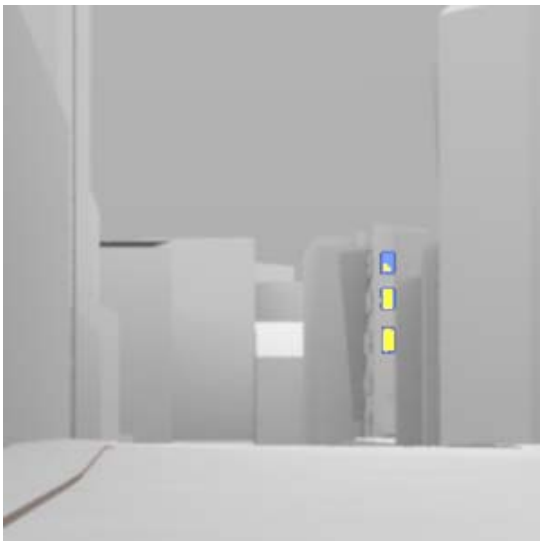
November to March: periods varying between 0 and approximately 10 minutes, shifting between 6am and 8am

They cover relatively small areas and thus would only be perceived for brief periods of time, but since even brief flashes of glare may affect driver vision, worst case reflections were assessed in more detail from observer locations spaced at 10m intervals for the length of the stretch of Ultimo Rd where any reflections could be observed.

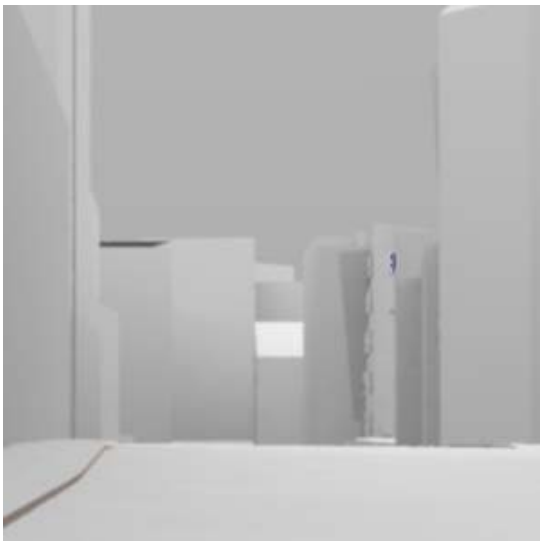


Viewpoints / driver locations analysed on Ultimo Rd

Preliminary analysis from observer locations carried out on an earlier design iteration had identified three windows that produced reflections slightly above the threshold of 500Cd/m². Subsequently the design was altered in response with these windows slightly rotated in plan towards the south to mitigate reflections, and further analysis was carried out with the current design.



Earlier design



Reflections after change of window orientation

Comparison in reflection intensity earlier and current design (disregarding vegetation)

All images shown and analysis described in the following are based on the revised design.



Reflections off the building facade shown in perspective from Ultimo Rd viewpoints at 10m intervals approaching the Dr Chau Chak Wing Bldg. Note these images show cumulative worst case intensities of the entire year.

No reflections reaching viewpoints of drivers travelling along Ultimo Rd were found above the threshold of 500Cd/m² in this analysis. **Excessive reflections causing glare in Ultimo Rd were therefore discounted**.

Note that any reflections below the threshold (and therefore considered acceptable; shown blue in images) still produced would likely be significantly further reduced by the trees planted along the north side Ultimo Rd in front of the UTS Building 5. The mitigating effect of trees was not considered in image generation.

4.5 Impact on Pedestrians

From the perspective of pedestrians moving along roadways, the incidence of reflections from the building is generally similar to the examined road traffic locations. Glare from reflections close to the viewing direction is therefore not expected in these locations.

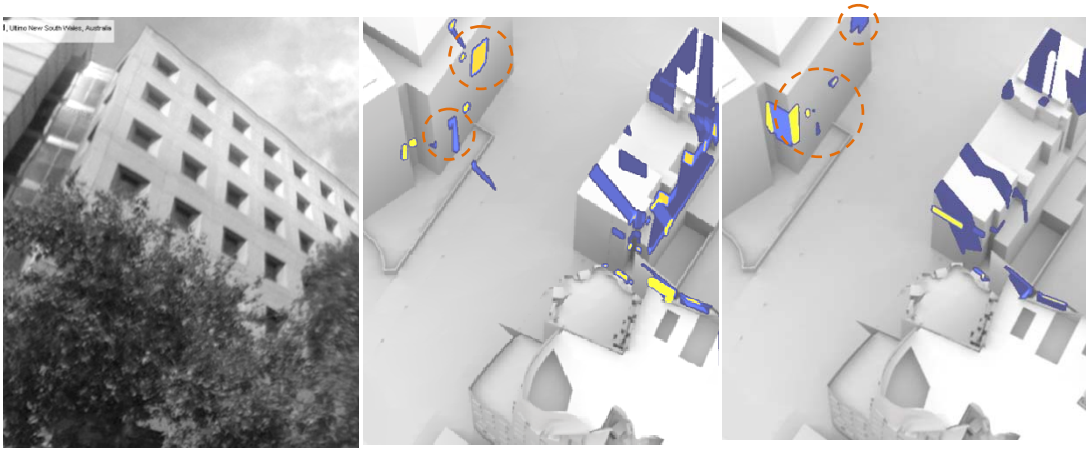
In other locations accessible to pedestrians where any glare from reflections may occur, the observer is easily able to adjust their view and thus reduce the glare impact of reflections. Pedestrians move at a rate significantly slower than that of a vehicle. For this reason it is acceptable to assume that it will be safe for pedestrians to divert their vision in order to avoid glare.

4.6 Impact on Surrounding Buildings

The initial studies show that some reflections are cast onto the facades of surrounding buildings and could enter these through window areas. The nature of these is described in the sections below.

In general, building occupants do not perform visual tasks as demanding as those required of drivers, so that they are capable of altering their direction of view during these brief periods. Reflections would be visible only from limited locations within any affected buildings.

4.6.1 ABC Building



August 21, 16:45 August 21, 17:15

Examples of reflections cast onto the ABC Building facade

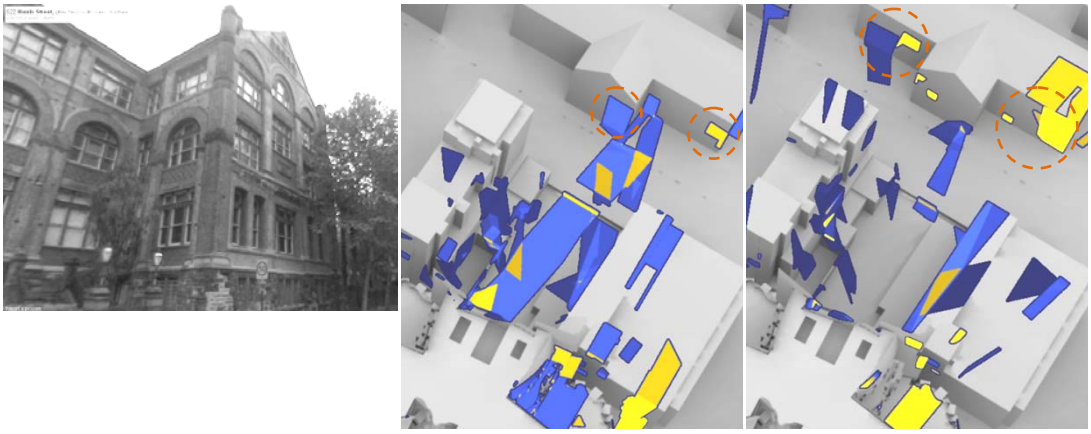
Some reflections were found to reach the Ultimo Rd facade of the ABC building at 700 Harris St. Reflections are scattered across the facade for varying durations in the afternoon throughout the year, intermittently approximately during the following intervals:

- Dec- Feb 15.30-17.30
- Mar - Apr 15.00-17.30
- May 16.00-16.45, Jun - Jul 16.30-17.00
- Aug 16.15-17.15
- Sep 15.00 and 16.45-17.15
- Oct - Nov 15.00-17.30

Individual patches of reflected sunlight do not appear to fall into individual windows for longer than 15-30min maximally.

As this facade is north facing, it is expected that direct sun enters this building for significant durations on sunny days. Given the short duration of reflections, the fact that the reflective surfaces of the proposed building are limited to 20% in reflectivity, and the further mitigating effect of the visual light transmission of the ABC building glazing it is **unlikely that reflections off its facades will cause significant additional discomfort to occupants of the ABC Building**.

4.6.2 TAFE Building (The Muse)



December 21, 16:45 December 21, 18:00

Examples of reflections cast onto TAFE Building facades across Harris St

Some reflections were found to reach the facade of the TAFE Building (also referred to as The Muse) opposite 634-642 Harris St. Reflections reaching this facade are cast across the lot 634-642 Harris St. Reflections are scattered across the facade for varying durations during summer afternoons, intermittently for up to 60 minutes approximately during the following intervals:

- Dec-Jan 15.45-19.00
- Feb 15.45-18.00,
- Mar 16.30-17.30
- Sep 16.00-17.00
- Oct 15.30-18.00
- Nov 15.15-18.30

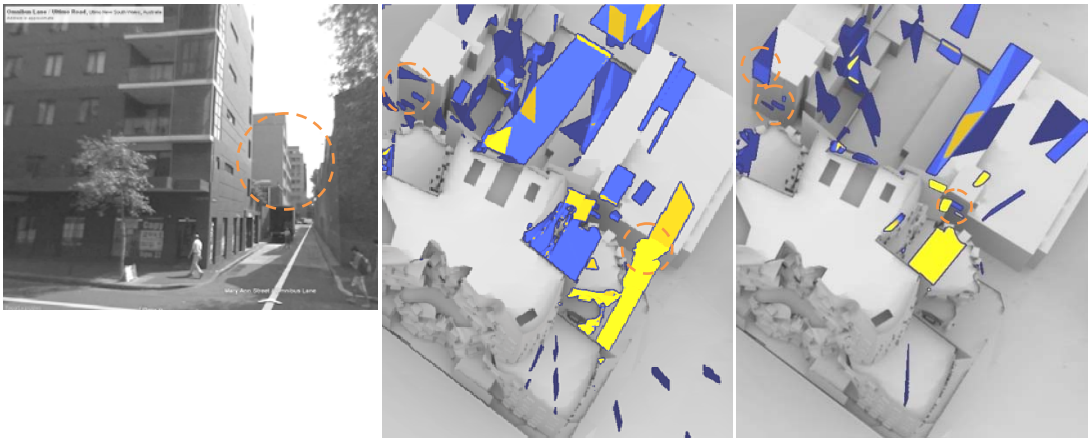
While it is possible that these reflections can cause subjective nuisance to occupants, the intensity of reflected sunlight is significantly reduced by the 20% limit on glazing reflectivity. This limit is in accordance with the standard reflectivity controls laid out in the UDP Section 7.2 [1], and this is **assumed to be adequate to limit the likelihood of any discomfort to occupants**. In addition the following factors are considered to reduce the impact of reflections:

- The circulation space in the centre of the section reached by any reflections is transitory in nature so that it is unlikely that occupants are affected for any longer periods of time. We note that adjacent spaces also receiving reflections are used for other purposes including offices and meeting rooms
- The affected facade is East facing and currently exposed to direct sunlight during morning hours from the direction of the Dr Chau Chak Wing Building site. This direct sunlight is significantly more intense than any reflections off the proposed building would be due to the 20% limit on glazing reflectivity, hence the development is not likely to increase the maximal glare impact to this building
- Reflections reaching the TAFE building occur at low sun angles and mainly during summer months, such that the trees present on either side of Harris St in between the

northern half of the building and the reflecting facade may obscure some reflections. These trees are of similar height as the TAFE building. It is noted that the trees do not provide full coverage of the facade, and that they are deciduous and there may be times of the year when reflections are cast and the trees do not have foliage; however they are likely to contribute to reducing the exposure to reflections

- Glass absorbtance and reflectance of the TAFE Building glazing reduce the intensity of reflections, depending on glass build-up.

4.6.3 Apartment Building / former National Cash Register



December 21, 16:45 December 21, 18:00

Examples of reflections cast onto building rear facades in Omnibus Lane

Some reflections were also found to reach the rear facade of the apartment building 6-10 Ultimo Rd and the former National Cash Register Building (now part of TAFE) 622-632 Harris St, facing Omnibus Lane. Reflections are scattered across the facade for varying durations, intermittently approximately during the following intervals:

- Jan 14.15-18.30
- Feb 14.00-18.00
- Mar 13.30-17.30
- Apr 13.30-16.30
- May 13.00-16.00
- Jun 12.00-15.00
- Jul 12.30-15.30
- Aug 13.00-16.00
- Sep 13.30-16.30
- Oct 13.30-17.30
- Nov 14.00-18.00
- Dec 14.00-18.15

Patches of reflected sunlight are from both punched windows and larger areas of curtain wall glazing on the north of the planned Dr Chau Chak Wing building.

These patches can fall onto individual locations on the rear facade for up to approximately 90 minutes during summer afternoons.

While it is possible that these reflections can cause subjective nuisance to occupants, the intensity of reflected sunlight is significantly reduced by the 20% limit on glazing reflectivity. This limit is in accordance with the standard reflectivity controls laid out in the UDP Section 7.2 [1], and is **assumed to be adequate to limit the likelihood of any discomfort to occupants**. In addition the following factors are considered to reduce the impact of reflections:

- Windows in the apartment building facing east are largely high-level small area windows presumably opening into bathrooms or kitchens, so that impact from reflections is mainly limited to spaces where less permanent occupancy is expected, as well as in size of sun patches reaching the inside.
- Currently, the affected East facing facade is exposed to direct sunlight from the direction of the Dr Chau Chak Wing Building site throughout the morning. On inspection on site, most windows appeared to have blinds lowered. This direct sunlight is significantly more intense than any reflections off the proposed building would be due to the 20% limit on glazing reflectivity, hence the development is unlikely to increase the maximal glare impact to this building. It is not assumed that overall blind use (and with it use of electrical lighting) is increased due to the impact of reflections, as morning direct sunlight with higher glare potential currently reaching the building is shielded by the development
- Glass absorbtance and reflectance of the apartment building and former NCR building glazing reduce the intensity of reflections, depending on glass build-up.

5 Conclusions

The proposed building performs well in terms of solar reflectivity, and glare affecting motorists on surroundings streets will not exceed the limits of acceptability according to the Hassall methodology.

Glare risks have been eliminated from façade aspects that could potentially cause reflections affecting traffic, either because surrounding buildings or other parts of the building itself, or vegetation considered a permanent feature due to redundancy of several trees behind each other and presence of leaves during times of expected reflections, will be blocking reflections that could cause glare to drivers.

The study has found that every façade aspect can have a maximum external reflectance of 20% in accordance with council regulations without causing unacceptable glare. This result was obtained making worst case assumptions about the reflectivity of the facade, not taking into account any reduction of facade reflectivity through joints and framing elements.

Pedestrians are easily able to adjust their view in any location where unwanted reflections may be received, reducing the impact of the reflections. They move at a rate significantly slower than that of a vehicle. For this reason it is acceptable to assume that it will be safe for pedestrians to divert their vision in order to avoid glare.

Adjacent building facades exposed to reflections are also exposed to direct sun at other times, such that glare from reflections does not appear significant. The glass reflectance limited to 20% as well as the overshading of neighbouring buildings by the proposed development will serve to reduce and offset potential glare reflections that may occasionally be produced towards these buildings.

References

[1] Urban Development Plan for Ultimo-Pyrmont Precinct (1999 Update). Prepared in accordance with Sydney Regional Environmental Plan No. 26 – City West, adopted by the Minister for Urban Affairs and Planning on 10 June 1999. Issued by the Department of Urban Affairs and Planning. In particular see Section 7.2 *Environmental Issues: Reflectivity Impact*

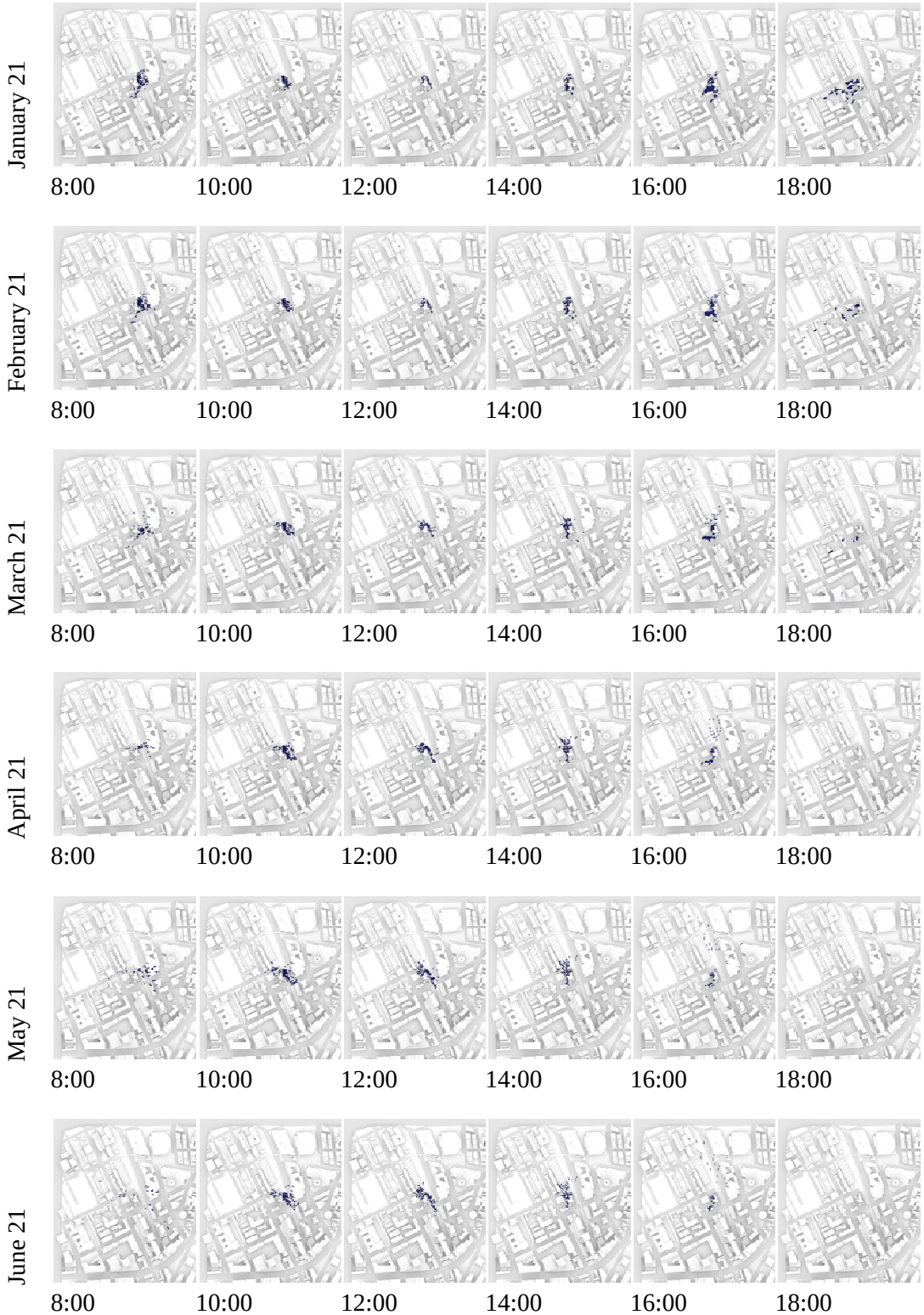
[2] Hassall, D. N. H. (1991): Reflectivity. Dealing with Rogue Solar Reflections, Faculty of Architecture, University of New South Wales, ISBN 0 646 07086 X

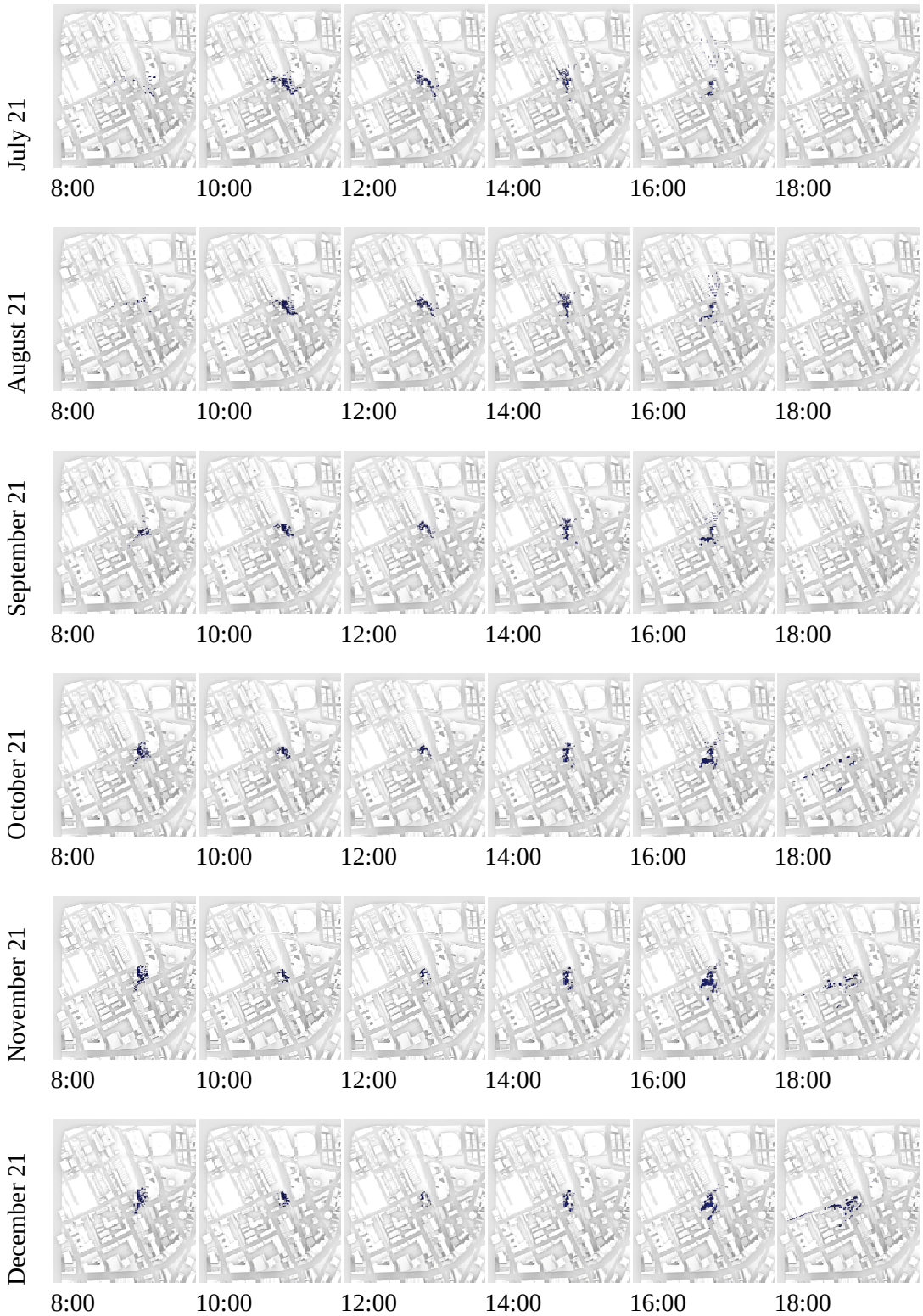
[3] Radiance (software). Homepage: http://radsite.lbl.gov/radiance/HOME.html

Appendix A

Annual Reflections Overview

A1 Annual Reflections Image Sequence





The images above show an overview of the image sequences generated to initially assess locations of reflections cast off the facade. Note this is an excerpt, actual calculations were done at 15min intervals.

Appendix D

Access Report



UNIVERSITY TECHNOLOGY SYDNEY (UTS)

DR CHAU CHAK WING

ACCESS REVIEW

Morris-Goding Accessibility Consulting

FINAL v5

16th August 2011

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1. EXECUTIVE SUMMARY

The Access Review Report is a key element in design development of the Dr Chau Chak Wing Building, UTS and an appropriate response to the AS1428 series, Building Code of Australia (BCA), City of Sydney Access DCP, and ultimately the Commonwealth Disability Discrimination Act (DDA).

Morris-Goding Accessibility Consulting has prepared the Access Report to provide advice and strategies to maximise reasonable provisions of access for people with disabilities.

The development has been reviewed to ensure that ingress and egress, paths of travel; circulation areas and toilets comply with relevant statutory guidelines.

In general, the development has accessible paths of travel that are continuous throughout. In line with the reports recommendations, the proposed development has demonstrated an appropriate degree of accessibility. The Development Application drawings indicate that compliance with statutory requirements, pertaining to site access, common area access, accessible parking and accessible sanitary facilities, can be readily achieved.

The recommendations in this report are associated with detailed design. These recommendations should be addressed prior to construction certificate.

2. INTRODUCTION

2.1. General

UTS have engaged Morris-Goding Accessibility Consulting, to provide a design review of the proposed development located at 14-28 Ultimo Road, Ultimo, Sydney.

From the information provided, the development consists of 12 levels with 1 basement level of common car parking below.

The requirements of the investigation are to:

- Review supplied drawings of the proposed development (Design Development Issue – 1 July 2011),
- Provide a report that will analyse the provisions of disability design of the development, and
- Recommend solutions that will ensure the design complies with the Disability Discrimination Act (DDA), Building Code of Australia (BCA) and AS 1428 series.

2.2. Objectives

The report considers user groups such as residents and residential visitors. The Report attempts to deliver equality, independence and functionality to people with disabilities inclusive of:

- People with sensory impairment (hearing and vision)
- People with mobility impairments (ambulant and wheelchair)
- People with dexterity impairments

The Report seeks to provide compliance with the DDA. In doing so, the Report attempts to eliminate, as far as possible, discrimination against persons on the ground of disability.

2.3. Statutory Requirements

The following standards are to be used to implement the Report:

- AS 1428.1 – 2009 (General requirements for Access)
- AS 1428.2 - (Enhanced Access)
- AS 1735.12 - (Lifts, Escalators, & Moving Walks)
- BCA 2011 - Building Code of Australia
- DDA - Disability Discrimination Act (DDA Premises Standards)
- UTS Design Guidelines Access Policy
- City of Sydney Access DCP 2004

3. INGRESS & EGRESS

3.1. Approach

The site is bound by Ultimo Road, Omnibus Lane and Mary Ann Street located in Haymarket, Sydney.

There is a continuous path of travel from transport links, with the main Central Railway Station and bus stops within 5 mins walk from the site with appropriate paths of travel suitable for a person in a wheelchair compliant with the UTS Access Guidelines and the City of Sydney Access DCP.

Pedestrian footpaths along the continuous path of travel to the site appear to have appropriate hardstand paths with gradients and clearances suitable for persons in a wheelchair compliant with AS1428.1:2009, clause 6.

Approach to the site is via a continuous accessible path of travel from the boundary streets which has appropriate gradients for persons in a wheelchair in accordance with AS1428.1:2009, clause 6.1 and the DDA Premises Standards.

Any proposed works to the forecourt area needs to have gradients not steeper than 1:20.

3.2. Main Entrance

Entry into the Dr. Chau Chak Wing Building is via the pedestrian footpath near Ultimo Road. There is a continuous accessible path from the pedestrian footpath to the main entry doors compliant with AS1428.1:2009 and the DDA Premises Standards. The path of travel currently appears to have a gradient of 1:33.5 compliant with AS1428.1:2009 and the City of Sydney Access DCP.

There are appropriate automatic sliding doors at the building entry with appropriate circulation and clearances in accordance with AS1428.1:2009 and the UTS Access Policy.

From the doors, there is a continuous path of travel to the passenger lifts compliant with AS1428.1:2009. The circulation areas in front of the passenger lifts are appropriate for a person in a wheelchair in accordance with AS1428.1:2009 and the DDA Premises Standards. The passenger lifts provide an accessible path of travel throughout all levels of the development.

3.3. Secondary Entrance

There is a secondary entrance accessible via the pedestrian footpath near Mary Anne Street. There are appropriate hardstand pathways from the pedestrian footpath to the main entry door in accordance with AS1428.1:2009 and the City of Sydney Access DCP.

Entry is via the automatic sliding doors with suitable circulation and clearances in accordance with AS1428.1:2009 and the UTS Access Policy.

From the entry door, there is an accessible path of travel to the passenger lifts compliant with AS1428.1:2009. The circulation areas in front of the passenger lifts are appropriate for a person in a wheelchair in accordance with AS1428.1:2009 and the DDA Premises Standards. The passenger lifts provide an accessible path of travel throughout all levels of the development.

3.4. Emergency Egress

There are 2 emergency egress stair wells leading from the upper levels down to street level and others leading out from the lower basement car park levels.

All emergency egress stair doors have a clear width of 920mm (1000mm door leaf) compliant with AS1428.2.

The main accessible egress points are via the two separate entry doors located on the ground floor compliant with the City of Sydney Access DCP.

The architect has acknowledged the following issues, which will be implemented in future drawings:

(i) At least 1 lift should be operational in the event of an emergency (best practice).

(ii) Consider creating fire safety refuges in fire stair landings on all office floors (best practice) for people in wheelchairs.

(iii) Should the provision of any emergency systems be installed within the building, the systems should include audible and visual warnings indicators in assisting people with sensory disabilities (best practice).

4. PATHS OF TRAVEL

4.1. General

The paths of travel within the ground floor foyer area have appropriate circulation areas for wheelchair manoeuvrability compliant with AS1428.1:2009 and the DDA Premises Standards.

In general, arterial circulation areas are greater than 1800mm with main corridors with 1500mm wide clearance clearances compliant with the UTS Access Policy. The lift lobbies on all levels of the development have ample circulation space to allow two wheelchair users to pass each other compliant with AS1428.1:2009 and the DDA Premises Standards.

In general, the main paths of travel throughout the development are level and have appropriate clearances that are generally wide enough (at least 1800mm) to allow two wheelchair users to pass each other in accordance with AS1428.1:2009 and the DDA Premises Standards.

The ends of the corridors on all floors have suitable width (at least 1550mm) to allow 2 wheelchairs users to perform 180° turns. There are appropriate passing bays suitable for wheelchair users to pass one another compliant with the City of Sydney Access DCP.

The architect has acknowledged the following issue, which will be implemented in future drawings:

(i) The corridors on 6th, 7th, 11th floors require 1240mm clear depth in front of certain doorways to ensure access for wheelchair users, compliant with AS1428.1:

4.2. Doors

Lift lobby doors have suitable automatic sliding doors with appropriate clearances and circulation compliant with AS1428.1:2009, clause 13.3 and the UTS Access Policy.

All doors leading into common areas and offices have a minimum 850mm clear width compliant with AS1428.1:2009 and the DDA Premises Standards.

In general, most doors have appropriate clearances and circulation at doorways compliant with the UTS Access Policy and the City of Sydney Access DCP. Modifications are required to ensure appropriate circulation at doors.

The architect has acknowledged the following issue, which will be implemented in future drawings:

(i) Certain doors throughout will require greater clear width to ensure 850mm min. active leaf (generally 920mm door leaf) and 510/530mm latch side clearance to comply with AS1428.1:2009.

4.3. Lifts

There are 4 passenger lifts within the building with suitable wheelchair access to all floors of the development. The lifts provide an appropriate continuous accessible path of travel to and from the ground floor lift lobby to the levels above compliant with the City of Sydney Access DCP.

The passenger lifts appears to have an internal dimension of 1600mm by 2000mm which is appropriate according to the DDA Premises Standards.

The architect has acknowledged the following issues, which will be implemented in future drawings:

(i) Lift car components (grabrail, control buttons, lighting) to comply with AS1735.12.

4.4. Lift for Persons with Limited Mobility

There is an AS1735.15 compliant lift within the ground level GSB Seminar/Lecture Space (LT05).

The lift provides an appropriate continuous accessible path of travel to and from the front of the tiered lecture space to the ground floor. The passenger lift appears to have an internal dimension of 1300mm by 1400mm which is appropriate according to the DDA Premises Standards.

There is an additional lift located within the AV room of the ground floor GSB Seminar/Lecture Space (LT06). The low-rise vertical platform lift has internal dimensions of 940mm x 1500mm compliant with AS1735.14 and BCA 2011, Table D3.6b.

4.5. Ramps

There are ramps within the smaller of the tiered GSB Seminar/Lecture Spaces (ground and first floor) as well as the first floor GSB Seminar/Lecture Space. There is also an external ramp on the eastern boundary of the building.

The architect has acknowledged the following issues, which will be implemented in future drawings:

(i) Ensure 1:14 ramps adjacent to the Seminar Lecture Space (03.05) have handrails around the column compliant with AS1428.1

4.6. Internal Stairs

There is a stair located at the main entrance which provides access up to first floor. There are additional stairs throughout the development.

All stairs have closed risers compliant with AS1428.1:2009 and the UTS Access Policy

The architect has acknowledged the following issue, which will be implemented in future drawings:

(i) Ensure all stair handrails are designed in accordance with AS1428.1.

4.7. Roof Decks

There are 3 Roof Decks located on the eighth floor of the building which has level access from the building. These areas are accessed via dual-hinged doors with 850mm clear widths and appropriate circulation on either side of the doors compliant with AS1428.1:2009 and the City of Sydney Access DCP.

5. AMENITIES AND FACILITIES

5.1. Reception Desk

There is a reception desk located on the ground level. There is an accessible apth of travel from the entry door to the reception desk in accordance with AS1428.1:2009, clause 6.1.

To enter behind the reception desk, there is a clearance of 700mm which will need to be widened to ensure an appropriate path of travel by a person in a wheelchair in accordance with AS1428.1:2009, clause 6.3.

The architect has acknowledged the following issue which will be implemented in future drawings:

(i) Ensure minimum 1000mm clear width at Ground level Reception suitable for wheelchair access in accordance with AS1428.1:2009, clause 6.3.

5.2. Auditoriums

There are 4 auditoriums within the Dr Chau Chak Wing building – 2 on the ground floor and 2 on the first floor.

There are 6 wheelchair seating spaces within the larger GSB Seminar/Lecture Space on the ground floor and 3 wheelchair seating spaces in the GSB Seminar/Lecture Space on the first floor compliant with the DDA Premises Standards. Each of the smaller GSB Seminar/Lecture Spaces has 3 wheelchair seating spaces compliant with the DDA Premises Standards.

On the ground level, the accessible path of travel to the GSB Seminar Lecture space front row accessible wheelchair spaces is via the lift (refer to Section 4.4). From the lift, there is a hinged door with 850mm clear width. On the first floor, the continuous accessible path of travel is via 1:14 ramps. It is noted that the doors are auto doors, which negates the need for latch side clearance in accordance with AS1428.1-2009.

There is an accessible path of travel from main entry doors to the wheelchair seating spaces within the smaller GSB Seminar/Lecture Spaces. From the information provided, the architect has designed the accessible seating with 2450mm depth by min. 800mm wide in accordance with AS1428.1:2009.

5.3. Computer Laboratories

There are 3 Postgraduate Computer Labs located on the second, third and fourth floors. There is an appropriate continuous path of travel to each of the rooms via the passenger lifts from the ground floor lift lobby in accordance with As1428.1:2009 and the UTS Access Policy. There is suitable circulation at computer desks to allow use by a person in a wheelchair in accordance with the UTS Access Policy.

5.4. Kitchenettes/Utility Areas

There are kitchenettes and utility areas from 3rd-10th levels which serve the staff and students within the building.

The utility areas are located along the secondary paths of travel within the building. In general, there are appropriate clearances at benches suitable for a person in a wheelchair in accordance to the UTS Access Policy and the DDA Premises Standards.

The coffee bar areas are located adjacent to the passenger lifts appropriate for persons in a wheelchair. There is, in general, appropriate circulation at the coffee bar suitable for a person in a wheelchair.

Kitchenette areas have appropriate clearances at doorways which allow a continuous path of travel to the facilities. Modifications are required to ensure appropriate clearance between kitchen benches.

The architect has acknowledged the following issue, which will be implemented in future drawings:

(i) Provide 1550mm diameter in front of utility (3rd, 4th, 5th and 8th floor), coffee bar benches (4th, 5th, 7th and 8th floor) as well as the work room kitchenette (3rd floor).

5.5. Café

There is a café located on the ground floor of the development. There is a continuous accessible path of travel from the pedestrian footpath near Omnibus Lane and Mary Ann Street to the café compliant with the DDA Premises Standards and the City of Sydney Access DCP. Entry into the café area is via a dual-hinged entry door with an 850mm clear width, suitable in accordance with AS1428.1:2009 and the UTS Access Policy.

There are appropriate circulation areas suitable for a person in a wheelchair to turn 180° and for two wheelchair users to pass one another in accordance with the DDA Premises Standards and the UTS Access Policy.

There is an appropriate path of travel and clearance in front of the kitchen servery area suitable for a person in a wheelchair in accordance with AS1428.1:2009.

6. SANITARY FACILITIES

6.1. Accessible Toilets

There are 10 accessible toilets within the Dr Chau Chak Wing building located adjacent to the lift lobby area. There are appropriate paths of travel to the accessible toilets compliant with AS1428.1:2009 and the City of Sydney Access DCP.

All accessible toilet doors are automatic entry doors suitable in accordance with AS1428.1:2009 and the UTS Access Policy. There are baby change tables within all accessible toilets. Baby change tables are recessed into the wall to provide appropriate wheelchair circulation in accordance with AS1428.1:2009.

First floor
There is a unisex accessible WC/Shower located on the basement level of the development. The accessible sanitary facility is located adjacent to the men's and women's amenities. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. There is suitable circulation around the pan, basin and shower compliant with AS1428.1:2009.

Second floor
The accessible toilet is located adjacent to the Seminar/Green Room which has a continuous path of travel from the passenger lifts. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The accessible toilet has dimensions of 2130mm x 3130mm which is suitable in accordance with AS1428.1:2009. There is suitable circulation around the pan and basin.

Third floor
The unisex accessible toilet is located adjacent to the Storage. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The accessible toilet has internal dimensions of 1900mm x 2690mm suitable in accordance with AS1428.1:2009 and the City of Sydney Access DCP.

Fourth floor
The accessible toilet is located adjacent to the Express Terminals which has a continuous path of travel from all areas on this level. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. There are appropriate clearances around the door suitable to AS1428.1:2009. The internal dimensions of 1900mm x 2690mm allow for an AS1428.1:2009 compliance accessible toilet and the City of Sydney Access DCP.

Fifth floor
The accessible toilet is located adjacent to the women's sanitary facilities which have a continuous path of travel from all areas on this level. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The internal dimensions of 2020mm x 2890mm allow for an AS1428.1:2009 compliance accessible toilet and the City of Sydney Access DCP.

Sixth floor
There is a continuous accessible path of travel from all areas on this level to the accessible toilet located next to the men's sanitary facilities. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The accessible toilet has internal dimensions of 2020mm x 2890mm suitable in accordance with AS1428.1:2009 and the City of Sydney Access DCP.

Seventh floor
From the passenger lift lobby area, there is an accessible path of travel to the accessible WC located adjacent the offices (grid ref. X40, Y70). Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3.

The accessible WC has internal dimensions to ensure appropriate circulation under AS1428.1-2009 and DDA Premises Standards.

Eighth floor
The accessible toilet is located adjacent to the storage near the women's sanitary facility and is accessible from all areas on this level. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The internal dimensions of 1950mm x 2750mm allow for an AS1428.1:2009 compliant accessible toilet and the City of Sydney Access DCP.

Ninth floor
The accessible toilet is located adjacent to the offices and has an appropriate path of travel to from passenger lifts and all areas on this level. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The internal dimensions of 1980mm x 2900mm are suitable for an AS1428.1:2009 compliant accessible toilet and the City of Sydney Access DCP.

Tenth floor
There is a unisex accessible toilet located adjacent to the passenger lifts which is accessible by wheelchair from all areas of this level. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The accessible toilet has appropriate internal dimensions of 2060mm x 3400mm suitable in accordance with AS1428.1:2009 and the City of Sydney Access DCP.

Eleventh floor
The accessible unisex toilet is located adjacent the men's sanitary facility. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. There is a unisex accessible toilet has appropriate internal dimensions of 1980mm x 3410mm suitable in accordance with AS1428.1:2009 and the City of Sydney Access DCP.

Twelfth floor
The accessible toilet has an appropriate path of travel from the lift lobby area. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3. The internal dimensions of 1980mm x 3410mm allow for an AS1428.1:2009 compliant accessible toilet and the City of Sydney Access DCP.

6.2. Accessible Showers

There are male and female toilet and shower facilities located in the basement level of the Dr Chau Chak Wing building.

From the lift lobby area, there is an accessible path of travel to the accessible shower facility. Entry is via an automated door with an appropriate clear width in accordance with AS1428.1:2009, clause 13.3.

The accessible shower has an appropriate internal dimension of 2500mm x 2700mm compliant with the circulation requirements of AS1428.1:2009.

7. MISCELLANEOUS

7.1. Car Parking

There is a basement car parking level with 21 parking spaces. An accessible car bay with 2.4 metre width adjacent a 2.4 metre shared zone has been provided in accordance with AS2890.6 and the UTS Access Policy.

The accessible car bay is located adjacent to the passenger lift lobby located in the basement level of the development which forms part of the continuous path of travel to all levels within the building compliant with the City of Sydney Access DCP. There is an accessible path of travel to the dual-hinged entry doors to the lift lobby area. The larger door leaf has a clear width of 900mm compliant with the DDA Premises Standards.

There is a continuous accessible path of travel from the doorway entry to the passenger lift compliant with AS1428.1:2009 and the UTS Access Policy.

7.2. Lighting

In accordance with the UTS Access Policy, lighting levels are to comply with AS1428.2 and will be analysed during the design development stage.

In general the maintenance illumination levels should be 150 lux for paths of travel, corridors and stairs. Ensure all lighting levels comply with AS1680.

7.3. Signage

Way finding and identification Signage to comply with AS1428.1 requirements compliant with the UTS Access Policy and the DDA Premises Standards and will be analysed during the design development stage.

7.4. Hearing Systems

Hearing systems are to be provided where an inbuilt amplification system is installed to assist hearing-impaired people are to comply with AS14281 compliant with the UTS Access Policy. These areas are to be signed in accordance with AS1428.1. All floor, wall and ceiling finishes are to be selected to minimise reverberation.

Hearing systems will be analysed during the design development stage.

7.5. Furniture and Fitments

All furniture and fitments are to comply with AS1428.2 and the UTS Access Policy to ensure equitable access to facilities. Where drinking fountains, vending machines, ATMs and telephones are provided, compliance with AS1428.2 is required and will be analysed during the design development stage.

7.6. Controls

All controls are to comply with AS1428.1 and UTS Access Policy.

These issues will be analysed during the design development stage.

Appendix E

Floor Space Schedule

UNIVERSITY OF TECHNOLOGY, SYDNEY - DR CHAU CHAK WING BUILDING
PART 3A RESPONSE TO SUBMISSIONS
FLOOR SPACE SCHEDULE
GEHRY PARTNERS, LLP

2009-022 UTS
6 September 2011

LEVEL		CITY OF SYDNEY GROSS FLOOR AREA	UNITS
Basement 01		**813**	**M2**
Ground 02		**1863**	**M2**
Level 03		**1705**	**M2**
Level 04		**1662**	**M2**
Level 05		**1795**	**M2**
Level 06		**1795**	**M2**
Level 07		**1772**	**M2**
Level 08		**897**	**M2**
Level 09		**857**	**M2**
Level 10		**764**	**M2**
Level 11		**764**	**M2**
Level 12		**740**	**M2**
Level 13		**44**	**M2**
	TOTAL GROSS FLOOR AREA	**15470**	**M2**
	SITE AREA	**2816**	**M2**
	DEVELOPED FLOOR SPACE RATIO	**5**	
	MAXIMUM PERMISSABLE FLOOR SPACE @ 5.5 : 1	**15488**	**M2**

Appendix F

Flood Risk Assessment

University Technology Sydney

UTS Dr Chau Chak Wing Building

UTS Dr Chau Chak Wing Building Flood Risk Assessment

REP/220911/H001

Issue | 17 October 2011

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10
201 Kent Street
Sydney
NSW 2000
Australia
www.arup.com

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 220911/00

ARUP

Document Verification

ARUP

Job title		UTS Dr Chau Chak Wing Building			**Job number** 220911/00
Document title		UTS Dr Chau Chak Wing Building Flood Risk Assessment			**File reference**
Document ref		REP/220911/H001			
Revision	**Date**	**Filename**	Flood Risk Assessment_UTS_Draft.docx		
Draft 1	14/09/11	**Description**	First draft		
			Prepared by	Checked by	Approved by
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Executive Summary

This report provides an assessment of flooding on the proposed Dr Chau Chak Building to be located at 14-28 Ultimo Road, Ultimo. The assessment includes a review of the external catchment and hydraulic capacity of the existing stormwater network, estimation of surface water runoff and the preparation of a hydraulic model to simulate overland flow adjacent to the site.

The findings of the analysis completed, indicate that the development site, and particularly the proposed basement car park, are at risk from overland flooding due to surcharging of the existing stormwater network compounded by the local topography in the vicinity of the site. Mitigation measures are therefore required to ensure that adequate flood protection is achieved.

Flood protection to the building floor levels can be achieved by setting development floor levels above the 100 year ARI flood level.

However, flood protection to the basement car park through the provision of elevated ground levels cannot practically be achieved without significantly impacting on the form and function of the proposed building to the extent that the viability of the project is questioned. A previous report prepared by Arup, investigated the various options for providing flood protection and recommended that a hydraulically operated floodgate be installed. For the reasons noted above the recommendation from this previous report is reinforced through the completion of this assessment.

1 Introduction

This report has been prepared to determine the extent and levels of flooding predicted at the site of the proposed Dr Chau Chak Wing Building. The site is expected to experience flooding from overland flow in major storm events and this report aims to define the level of flooding anticipated on the roads adjacent to the site, to enable Flood Planning Level's (FPL) which satisfy the requirements of the City of Sydney to be set.

To determine the flood levels in the roads adjacent to the site, a hydraulic model has been created which simulates the overland flow along the existing roads. The development of the hydraulic model has taken a number of factors into consideration. These factors include the approximate catchment size and corresponding runoff in a 100 year Average Recurrence Interval (ARI) event, the capacity of the existing stormwater network in the vicinity of the site and the site topography. The 100 year ARI event indicates the average or expected period between exceedance of a specific discharge from a catchment for a given rainfall intensity and storm duration. This storm event is also commonly referred to as the 1% AEP (Annual Exceedance Probability) indicating that there is a 1% chance of the discharge being exceeded in any given year.

1.1 Site Location

The development site (hence forth referred to as the site) is located at 14-28 Ultimo Road, Ultimo within a densely developed urban area of Sydney. It is positioned to the north of Central Station, north and west of George Street and east of Harris Street, refer Figure 1.

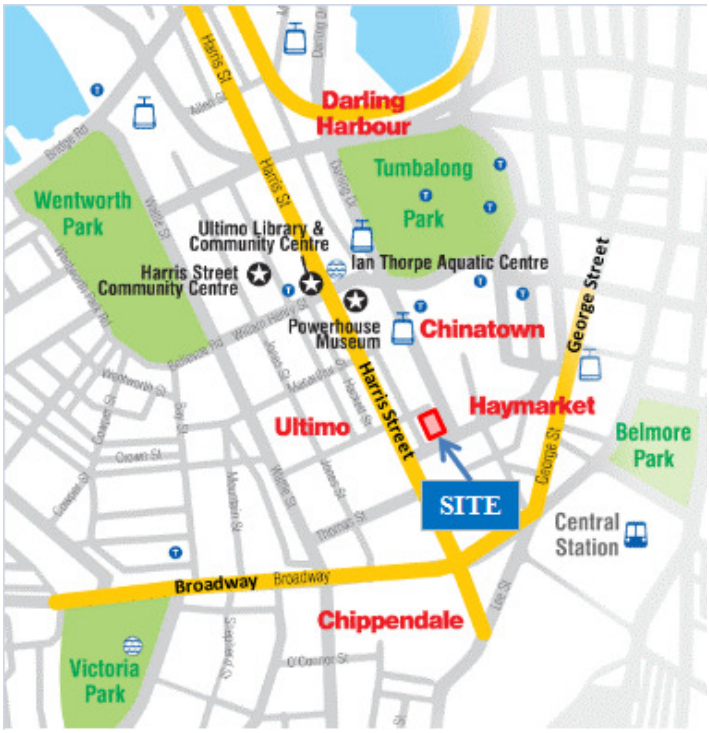


Figure 1 Locality Plan

The site was previously occupied by the 'Dairy Farmers' Brick warehouse building which has been demolished and the site is now currently utilised as an on grade car park. The site is bounded by Ultimo Road to the south, Mary Ann Street to the north, Omnibus Lane to the west and former railway tracks to the east, refer Figure 2.



Figure 2 Site Plan

1.2 Previous Studies

City of Sydney Flood Risk Management Plans

The City of Sydney Council are currently in the process of developing floodplain risk management studies and floodplain risk management plans for all its catchment areas. The process is part of the NSW Government's Flood Prone Land Policy, which aims to reduce the possible effects of flooding and flood liability on owners and occupiers. However, the plan for the catchment area that the proposed development site is located within has not yet been completed and therefore cannot be utilised as background to this report.

Arup Flood Report

Arup previously undertook a flood study for the site, which was submitted with the Part 3a Project Application in February 2011 entitled "*UTS Dr Chau Chak Wing Building – Flood Risk Assessment*". The study was a high level assessment of the potential impacts of flooding at the site and included a review of the external catchments, corresponding estimation of expected runoff, hydraulic capacity of the existing stormwater network in the vicinity of the site, anticipated flooding regime and provided recommendations to mitigate the impact from flooding.

Sydney Water Study

Sydney Water Corporation (SWC) completed a study on the capacity of their trunk drainage network in July 1996. The report titled *"Utilities Planning Services City Area SWC 30 – Capacity Assessment"* (referred to in this document as the SWC Capacity Assessment) determined 5 year Average Recurrence Interval (ARI) runoffs from the various sub-catchments and the capacity of pipe network to assess the level of serviceability of the existing pipe network. The methodology and results documented in the SWC Capacity Assessment have been used as the basis for this report.

1.3 Key Design Criteria

The City of Sydney Draft Flood Planning Level Requirements specifies the minimum level of protection for building floors and basement car park entrances. These levels are given in Table 1.

Table 1 City of Sydney Flood Planning Levels

Location	Flood Planning Level
Building Floor Level	- Merits based approach with minimum of 1% AEP (Annual Exceedance Probability)
Underground Car Park	- 1% AEP + 0.5m; or - Level based on review of Probable Maximum Flood (PMF).

1.4 References

Relevant guidelines and standards that have been considered in this assessment include:

- City of Sydney Council (August 2009) – "*Draft Stormwater Drainage Design Code*";
- City of Sydney Council – "*Draft Flood Planning Level Requirements*";
- Sydney Water Corporation – *"Utilities Planning Services City Area SWC 30 Capacity Assessment"*
- Bureau of Meteorology's (June 2003) "*The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration*"
- Institution of Engineers Australia (1997) – "*Australia Rainfall and Runoff*"

2 Existing Hydrology

2.1 Introduction

This report utilises data from the SWC Capacity Assessment to enable an estimation of 100 year ARI flood flows to be developed. A summary of the relevant information obtained from the SWC Capacity Assessment is provided in Appendix A.

2.2 Catchment Description

The SWC Capacity Assessment indicates that the site is located within the Darling Harbour Amplification Stormwater Drain Catchment 30A2. The overall catchment for this trunk network is 40.7 ha which can be separated into 3 sub-catchments (A, B and C) as shown in Figure 3.

Catchments A and B comprise the areas to the north-west of Central Station and George Street having a combined total area of approximately 19.7 ha (14.7 ha and 5.0 ha, for catchments A & B respectively). Any overland flow from these catchments is expected to drain directly to the site.

Catchment C is the area to the south-east of Central Station. A review of orthophoto maps and walk over of the catchment showed that surface water runoff from this catchment would be intercepted by George Street, Central Station and the embankment of the railway line and directed away from the site.

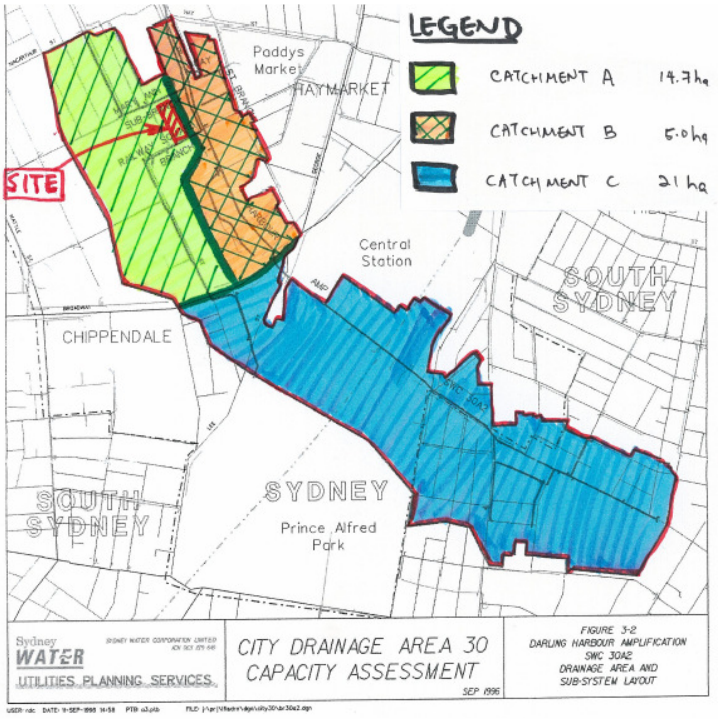


Figure 3 Map of external catchment

2.3 Existing Trunk Drainage System

The SWC Capacity Assessment identified trunk drainage networks adjacent to the proposed site. They are described as follows and are shown schematically in Figure 4:

- System 1 - collects runoff from catchment A and runs east along Ultimo Road before heading north along Darling Drive;
- System 2 - collects runoff from catchment B and C and runs north from beneath the existing properties and then along Darling Drive; and
- System 3 - collects runoff from catchment A and runs east along Mary Ann Street before connecting to System 1 in Darling Drive.

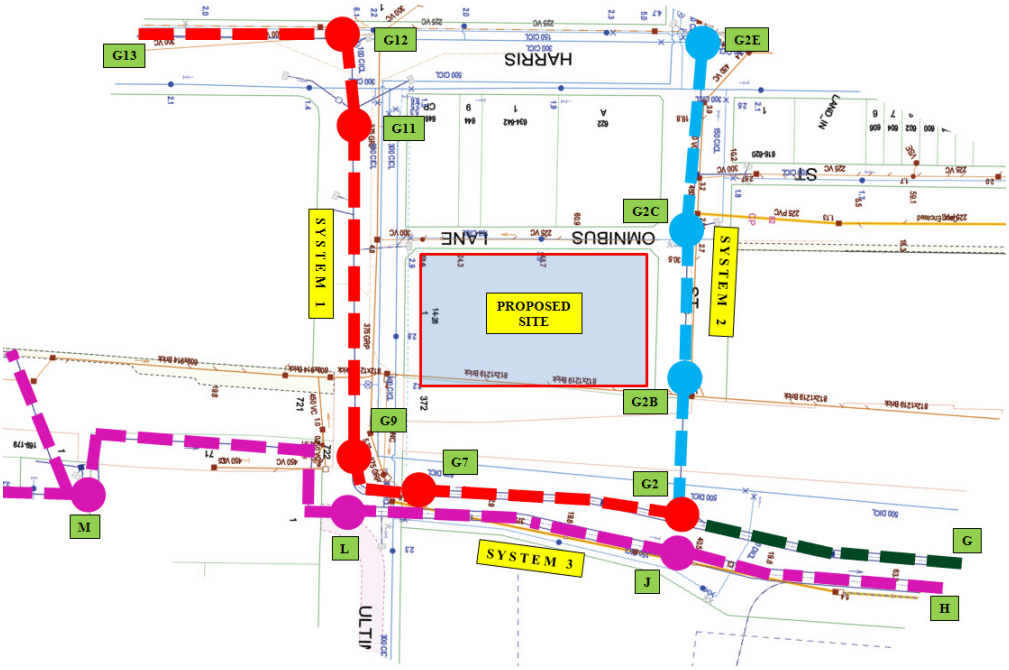


Figure 4 Schematic of existing major pipe networks

The SWC Capacity Assessment provides the catchment areas contributing to each section of the trunk network shown above. The report also determined the capacity of the pipe systems and related this capacity to a defined storm event. This enabled the level of serviceability achieved by the existing network to be determined. These catchment areas, pipe capacity and approximate storm event capacities are shown in Table 2.

Table 2 Summary of existing pipe capacity and storm event capacity

Pipe Section	Catchment Area (ha)	Pipe Size (mm)	Pipe Capacity (m^3/s)	Approx. Storm Event Capacity ARI (years)
System 1 - Ultimo Road				
G12-G13	5.8	Ø750	1.43	2-3
G11-G12	7.7	Ø750	1.53	2-3
G9-G11	10.0	Ø900	2.00	2-3
G7-G9	10.0	1800 x 1500	4.99	50-100
G2-G7	10.0	1800 x 1800	6.29	100

System 2 - Darling Drive				
L-M	23.6 (5.0*)	Ø1350	9.05 (1.92*)	25
J-L	24.4 (5.0*)	2600 x 1600	6.42 (1.32*)	25
System 3 - Mary Ann Street				
G2C-G2E	2.4	Ø750	1.18	25-50
G2B-G2C	3	Ø750	1.33	15-20
G2-G2B	3.6	Ø750	2.31	50-100

*The catchment areas for System 2 shown in brackets are based on the improved understanding of the actual catchment draining to the site as described in section 2.2. Pipe capacities are based on the direct proportion of actual catchment area determined to be contributing.

As can be seen from the table above, the trunk drainage system in the vicinity of the site is in general undersized to accommodate the 100 year ARI event. In particular for the section along Ultimo Road, the system is expected not to be able to convey runoff from storms greater than 2-3 year ARI event within the pipe network.

2.4 Source of Flooding and Local Topography

The site is not located in the immediate vicinity of any watercourse, therefore major stream flooding is not considered a risk to the site. The site is however expected to be subject to overland flow resulting from surcharging of the trunk drainage system.

Overland flow from catchments A & B would be conveyed along Ultimo Road to the sag point located beneath the railway bridge. This will result in ponding in this area until depth of water reaches a level whereby the crest in Darling Drive is overtopped and relief along Darling Drive to the north is experienced.

A portion of the runoff from Catchment A will be intercepted by Mary Ann Street and flow to the sag point located at the head of the cul-de-sac. In major storm events where the trunk drainage network is under capacity surface water will pond within the road up to the relief point at the corner of Omnibus Lane, before flowing south towards Ultimo Road.

Topographic survey of the site and surrounding areas was undertaken by Rygate & Company Pty Ltd. A review of this survey and an inspection on site has identified key features in the local area which will influence flooding experienced at the site and require inclusion in the hydraulic model. These are:

- Development fronting the road reserve;
- A sag point in Ultimo Road under the existing railway bridge;
- High point along Darling Drive approximately 10m from the intersection with Ultimo Road;
- Sag point at the end of Mary Ann Street cul-de-sac;
- Relief point from ponding experienced within Mary Ann Street at the corner of Mary Ann Street and Omnibus Lane;
- Crest in the driveway to the ABC building car park south of the site;
- Crest in the driveway to the Transgrid building east of the site; and
- Existing levels within the development site.

Figure 5 shows these key levels around the site and indicates the general direction of overland flow.

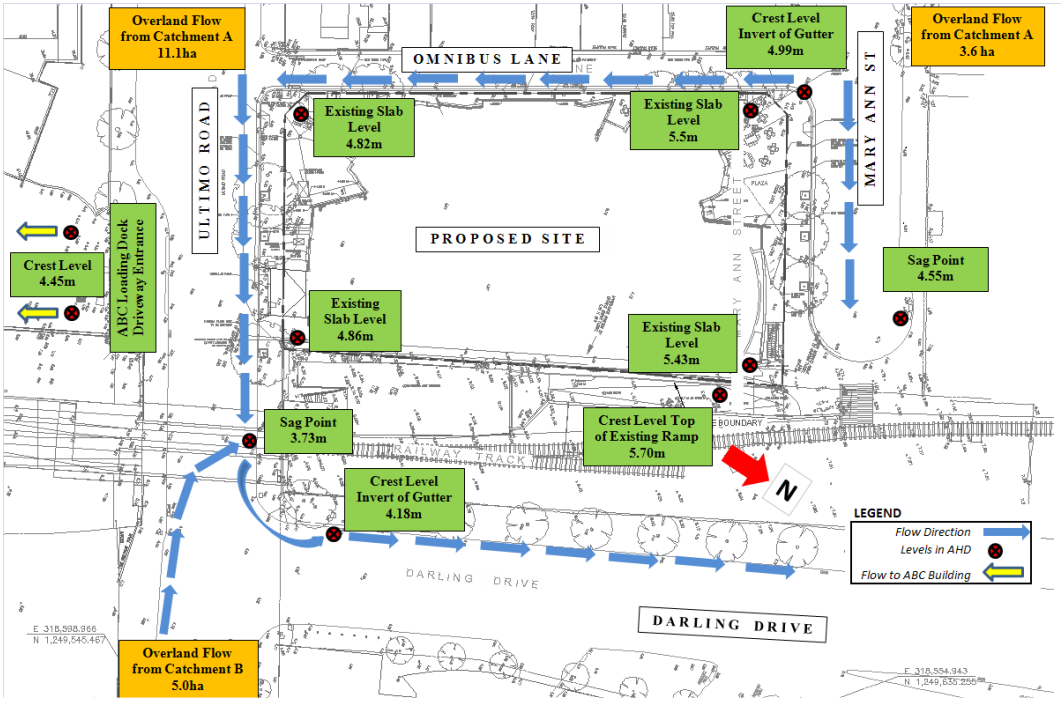


Figure 5 Key levels and overland flow route

2.5 Calculation of 100 year ARI Flow Rates

To provide a consistent methodology with that used in the preparation of the SWC Capacity Assessment (and hence enable the data from this report to be utilised), the coefficient which is derived from the relationship between rainfall intensity and runoff coefficient for the 5 year and 100 year events were used.

Table 3 shows a summary of the rainfall intensities, intensity ratio, runoff coefficient ratio and corresponding multipliers for the 100 year ARI storm event. Appendix A provides extracts from the SWC Capacity Assessment showing data for the development of these multipliers.

Table 3 Intensity ratios, runoff coefficients and multipliers

ARI years	Rainfall Intensity (mm/hr)	Factors/Coefficient for % Impervious = 73%		
		Average T_C = 15min		
(y)	$^{y}I_{15m}$	$F_{15} = I_y/I_5$	Runoff Coeff ($CoR_{y)}$	$N_y = F_y*CoR_y/CoR_5$
5	108.69	1.000	0.771	1.000
100	183.33	1.687	0.985	2.167

The 5 year ARI flow rates were increased by the factor Ny (as shown in the Table 3) to determine 100 year ARI flow rates. In accordance with the City of Sydney Stormwater Drainage Design Code, to determine resultant overland flow, 100 year

ARI runoff minus 50% of the piped capacity flow has been used, shown in Table 4.

Table 4 Summary of resultant 100 year ARI overland flow rate

Pipe Section	5yr ARI Runoff (m^3/s)	100yr ARI Runoff (m^3/s)	Pipe Capacity (m^3/s)	Overland Flow Rate (m^3/s)
System 1 - Ultimo Road				
G12-G13	1.48	3.21	1.43	2.49
G11-G12	2.01	4.36	1.53	3.59
G9-G11	2.60	5.63	2.00	4.63
G7-G9	2.59	5.61	4.99	3.12
G2-G7	2.52	5.46	6.29	2.32
System 2 - Darling Drive				
L-M	2.51	5.43	1.92*	4.47
J-L	2.51	5.43	1.32*	4.77
System 3 - Mary Ann Street				
G2C-G2E	0.75	1.63	1.18	1.04
G2B-G2C	0.94	2.04	1.33	1.37
G2-G2B	1.11	2.41	2.31	1.25

* The pipe capacitates for System 2 are based on the improved understanding of the actual catchment draining to the site as described in section 2.2 and are calculated based on the direct proportion of the catchment determined to be contributing.

2.6 Calculation of Probable Maximum Flood

The Probable Maximum Flood (PMF) is a theoretical event defined as the flood generated by the most severe precipitation possible at a site, at a particular time of year and is considered to be representative of an extremely rare flood event.

To determine the PMF, Probable Maximum Precipitation (PMP) and the corresponding rainfall intensities need to be determined. The procedure for determining the PMP is defined in the Bureau of Meteorology's (BOM) publication "*The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration, June 2003*".

The critical duration for assessment of the PMP is assumed to be equal to the time of concentration for the catchments draining to the site and has been determined in the SWC Capacity Assessment as 15 minutes. The contributing catchment area is less than $1000km^2$. Therefore, the generalised short duration method as defined in the BOM publication is applicable.

As critical storm duration is less than 1hr, terrain category is not required to be classified. Similarly, as the catchment elevation is less than 1500m, the Elevation Adjustment Factor (EAF) is taken as being equal to one. The moisture adjustment factor obtained from the BOM publication applicable to the Sydney region is 0.70.

Using the parameters described above, the 15 minute PMP depth calculated for the catchment is 170mm which corresponds to a rainfall intensity of 680mm/hr.

This rainfall intensity has been related to an approximate ARI by creating a logarithmic graph of the mulitpliers determined in the SWC Capacity Assessment

and determining the equation for the slope of this line. This equation was then used with the PMP rainfall intensity determined for the site to calculate an approximate ARI. This process determined the ARI for the PMP to be approximately 1 in 30,000,000,000 years. Obviously, the extreme nature of the theoretical ARI determined for this event is considered inappropriate to use for setting Flood Planning Levels and has therefore been excluded from further investigation.

3 Estimation of Flood Levels

3.1 Introduction

The purpose of this analysis is to obtain flood levels in Ultimo Road and Mary Ann Street/Omnibus Lane. City of Sydney Council has requested that hydraulic calculations are undertaken to determine the characteristics of the overland flow in these roads. Flow along Ultimo Road is complicated and influenced by a number of factors which warrant the use of a hydraulic model to simulate the flow. Flow along Omnibus Lane can be represented in a simple channel section and will be uniform, therefore a simplified approach is considered suitable for this section.

3.2 Ultimo Road Flooding

3.2.1 Model Selection

As both sides of Ultimo Road and Darling Drive are confined by buildings, changes in the flow path (width, height, shape) will generally occur in one direction only (i.e. in the direction of flow). Therefore, it is considered sufficient to undertake a 1-D hydraulic analysis for the purpose of determining flood depths in these roads.

The software developed by the US Army Corp Engineers - HEC RAS, was used to produce the hydraulic model. The locations of cross sections used in developing this model are shown in Appendix C.

3.2.2 Flow Regime

The methodology used for determining hydrological inputs produces peak runoffs. As such, a steady flow analysis has been undertaken which will provide a conservative estimate of flooding depths, and hence is considered suitable for the purposes of setting flood levels.

3.2.3 Boundary Conditions

The hydraulic model was run using mixed mode simulation, which requires both upstream and downstream boundary conditions to be applied. Normal depth was used at both the upstream and downstream ends of the model as no other controls were noted during an inspection of the site. The existing road longitudinal grades of Ultimo Road and Darling Drive were used to establish normal depths and are shown in Table 6.

Table 5 Boundary Conditions

HEC RAS Chainage	Boundary Condition	Value (m/m)
150 - (Upstream)	Normal Depth	0.045
0 - (Downstream)	Normal Depth	0.011

3.2.4 Roughness

Manning's values for input to the hydraulic model were obtained from the "*Draft Stormwater Drainage Design Code*" by City of Sydney Council, 2009. The values adopted are:

Table 6 Manning's n values

Manning's n	Ground Condition	Location
0.018	Asphalt pavement	Main channel and overbanks for footpaths
0.033	Grassed areas	Left overbank on Darling Drive

3.2.5 Lateral Weir

A key feature of the hydraulic model is the expected loss of flow from the system from discharge to the ABC building car park when overtopping of the driveway crest occurs. This feature has been incorporated into the model through the inclusion of a lateral weir structure from Ch85.42m – Ch102.42 set at a level of 4.45m (Refer to Appendix C1). This weir models water that will flow into the ABC basement and therefore results in a more accurate understanding of flood levels.

3.2.6 Flow Rates

The development of flow rates for input into the hydraulic model has been discussed in the Section 2.5. The magnitude of flows applied at specific cross sections in the model, along with the contributing catchments and corresponding pipe network references are shown in Table 5.

Table 7 Summary of the flow input in HEC RAS

Chainage	Contributing Catchment	Network Reference	Resultant 100 year ARI Overland Flow (m^3/s)
150	A	G11-G12	3.59
106.56	A	(G11-G12) – lateral weir flow	1.53
70	A	(G9-G11) – lateral weir flow	2.57
50	A + B	(G2-G7) + (J-L) – lateral weir flow	5.03

3.2.7 Modelling Results

The hydraulic modelling has shown that flood levels at the site are significantly influenced by the presence of the sag beneath the railway bridge. As flow velocities through the area of ponding are low, the kinetic energy component of the energy equation through this section is correspondingly low. As such, to provide the required energy to convey the flow through this area the potential energy (i.e. water surface elevation) increases. The backwater effects experienced from this situation impact from Ch 40 to Ch 130 beyond which free uniform flow occurs.

Long and cross section plots and tabulated results from the HEC-RAS model showing water surface elevations, depths and velocities are included within Appendix D.

A summary of the water surface elevations at the key locations for determining the required Flood Planning Levels are given in Table 8.

Table 8 Summary of the 100 year ARI flood levels at Ultimo Road and Darling Drive

Location	Chainage (m)	Flood Level (m)
Western Building Line	120	4.67
Basement Car park Entrance	97.82	4.68

3.3 Mary Ann Street Flooding

3.3.1 Introduction

A second flooding mechanism exists at the site on the Mary Ann Street side of the development to the north. The SWC Capacity Assessment indicates that a trunk stormwater network runs beneath Mary Ann Street and to the east under the railway embankment.

In major storm events the capacity of this network is exceeded and begins to flood. This overland flow within Mary Ann Street will result in ponding within the roadway extending into the surrounding properties. The railway embankment to the east and properties to the north and south prevent flow from escaping and water ponds until the water is sufficiently high to escape along Omnibus Lane.

3.3.2 Local Topography

An inspection of the site and review of the topographical survey shows that the entrance to the Transgrid building directly to the east of the site has been constructed with a ramp which rises from street level before falling to the entrance of the building which is below the general level of the surrounding ground. The crest of this ramp is approximately 5.70m.

The existing site levels along the northern boundary are between approximately 5.40-5.50m and the level at the invert of kerb in Omnibus Lane at the intersection with Mary Ann Street is 4.99m

3.3.3 Existing Flooding

To determine the level of existing flooding on Mary Ann Street the depth of flow experienced at the relief point in Omnibus Lane was calculated. To calculate the flooding depth, the 100 year ARI flow rate of 1.25m3/s as calculated in Section 2.5 above was used along with the Manning's formula. The Omnibus Lane road cross section was used to determine the boundary surface profile with flow restricted to being contained entirely within the road, hence assuming a vertical barrier at the kerb line. It is noted that this assumption will produce a slightly more conservative flow depth but this approach is considered appropriate.

The calculated depth of flow was 0.250m which provides a water surface elevation of 5.249m.

4 Impacts of Flooding

4.1 Ultimo Road

4.1.1 Determination of Flood Planning Levels

The hydraulic modelling shows that there is impact on the development from overland flow during major storm events.

The flooding experienced is largely influenced by the location of the site at the downstream end of the wider catchment and existing local topographical features, specifically the sag point on Ultimo Road and crest on Darling Drive.

Flood Planning Levels which provide the required level of immunity in accordance with the City of Sydney's "*Draft Flood Planning Level Requirements"* are summarised in Table 9.

Table 9 Summary of required Flood Planning Levels at Ultimo Road

Location	Item	HEC RAS Chainage	100 year ARI Flood Level (m)	Req. Flood Planning Level (m)
Ultimo Road	Building Floor	120	4.670	4.670
Ultimo Road	Car park Entrance	97.82	4.680	5.180

4.1.2 Mitigation

The proposed development floor level of 5.00m adequately achieves the required level of flood immunity to meet the requirements of the City of Sydney.

However, the proposed top of the ramp for the entrance to the basement car park is at a level of 4.230m and will therefore not meet the City of Sydney requirements without additional mitigation. A previous report prepared by Arup, investigated a number of options for mitigating possible flooding of the basement car park including the provision of elevated ground levels, increasing the capacity of the trunk network and the provision of a hydraulically operated flood gate.

The report recommended the installation of a hydraulically operated flood gate to provide flood protection. This option was recommended due to the impracticality of providing permanent flood defence through elevated ramp levels and the significant potential impact on the form and function of the building.

4.2 Mary Ann Street

4.2.1 Determination of Flood Planning Levels

The proposed development will need to be protected against flooding from the overland flow within Mary Ann Street. Two options for providing this protection were investigated.

- Setting building levels at an appropriate level to provide the Flood Planning Level assuming relief occurs along Omnibus Lane; and
- Providing a formalised overland flow path along the eastern edge of the building.

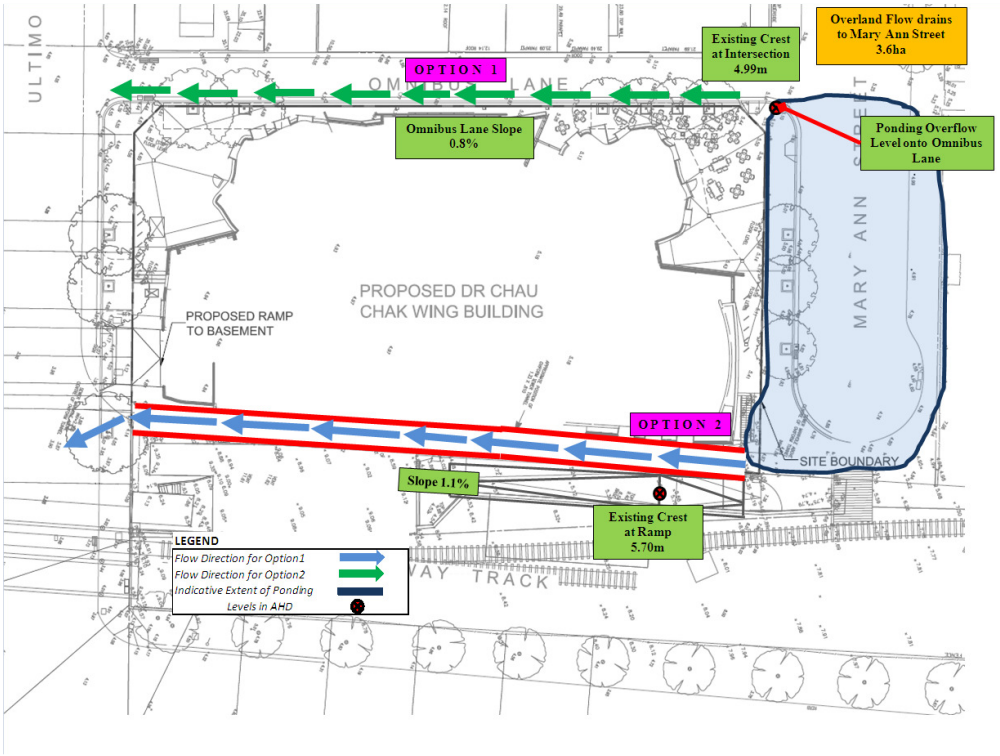


Figure 6 Flood mitigation options Mary Ann Street

4.2.2 Mitigation

Detailed investigation, (refer to Appendix D) of both options shown in Figure 6 was undertaken and concluded that there wasn't sufficient space available to provide a dedicated overland flow path along Mary Ann Street. It is therefore recommended that the flood mitigation measure that should be adopted is to set the buildings levels at or above the 100 year ARI level.

The depth of flow experienced in the 100 year ARI event in Omnibus Lane will be the controlling flood level for this location. As such, the depth of flow determined for the existing flooding situation will be appropriate to use in determining flow depths in the proposed case.

This calculated depth of flow is 0.250m which corresponds to a water surface elevation of 5.249m.

Refer to Appendix D for calculations of flow depths in Omnibus Lane.

5 Summary

This report has assessed the potential flooding experienced on the proposed Dr Chau Chak Building located at 14-28 Ultimo Road, Ultimo. The hydraulic modelling and calculations show that there is impact on the development on both the Ultimo Road and Mary Ann Street sides of the development from overland flow during major storm events.

The flooding experienced is a consequence of the inability of the existing trunk network to convey the runoff during 100 year ARI storm events, location of the site at the downstream end of the wider catchment and existing local topographical features, specifically the sag point on Ultimo Road and barrier to flow created by the existing railway embankment.

Flood Planning Levels in accordance with the City of Sydney's "*Draft Flood Planning Level Requirements"* have been determined and are summarised in Table 10.

Table 10 Summary of the 100 year ARI flood levels at Ultimo Road and Darling Drive

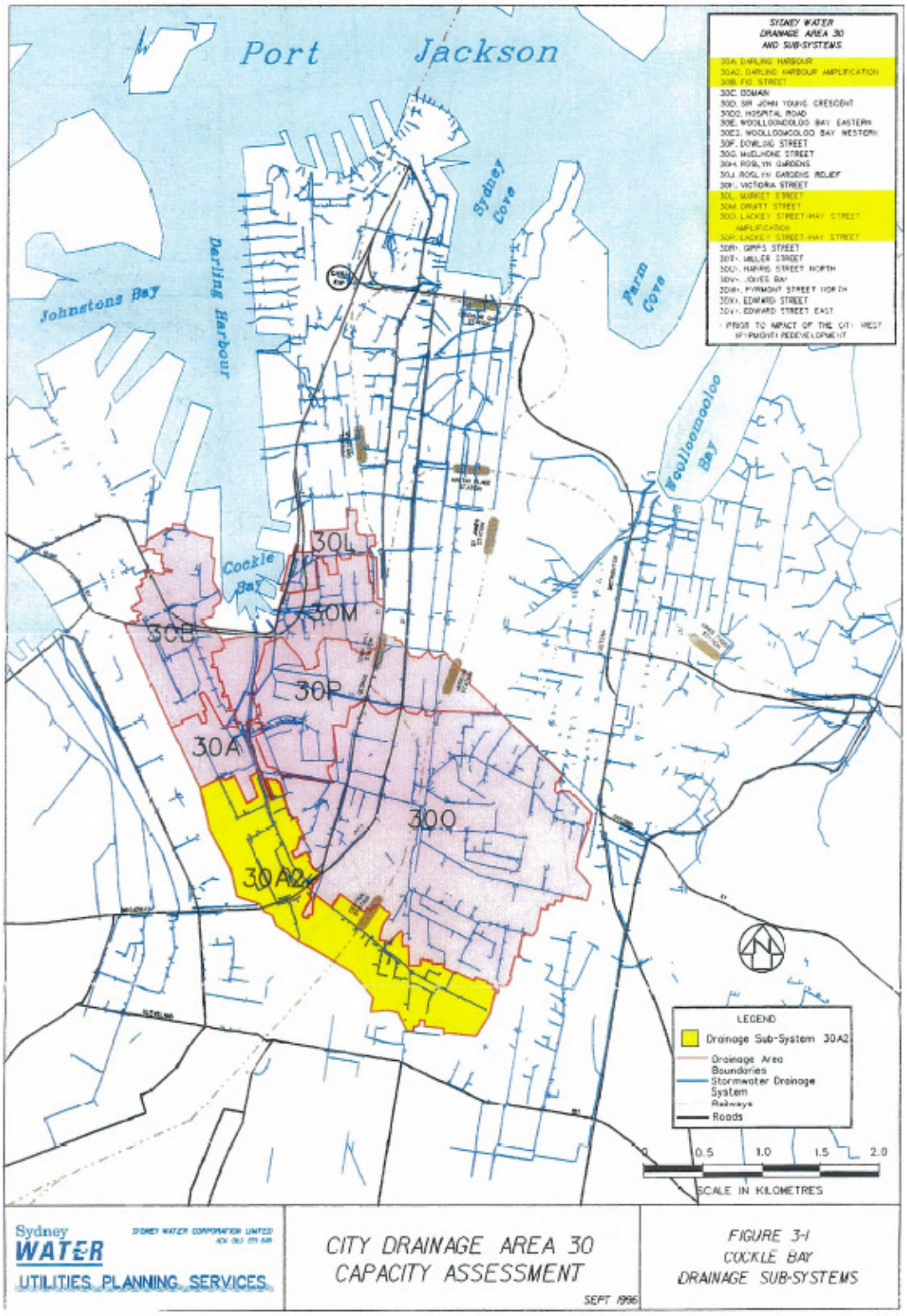
Source of flooding	Item	1% AEP Flood Level (m)	Flood Planning Level (m)
Ultimo Road	Building Floor	4.670	4.670
Mary Ann Street	Building Floor	5.250	5.250
Ultimo Road	Car park Entrance	4.680	5.180

The floor levels of the building will need to be set at or above the Flood Planning Levels provided in Table 10. Additionally, the provision of a hydraulically operated floodgate to provide flood protection to the basement car park is required.

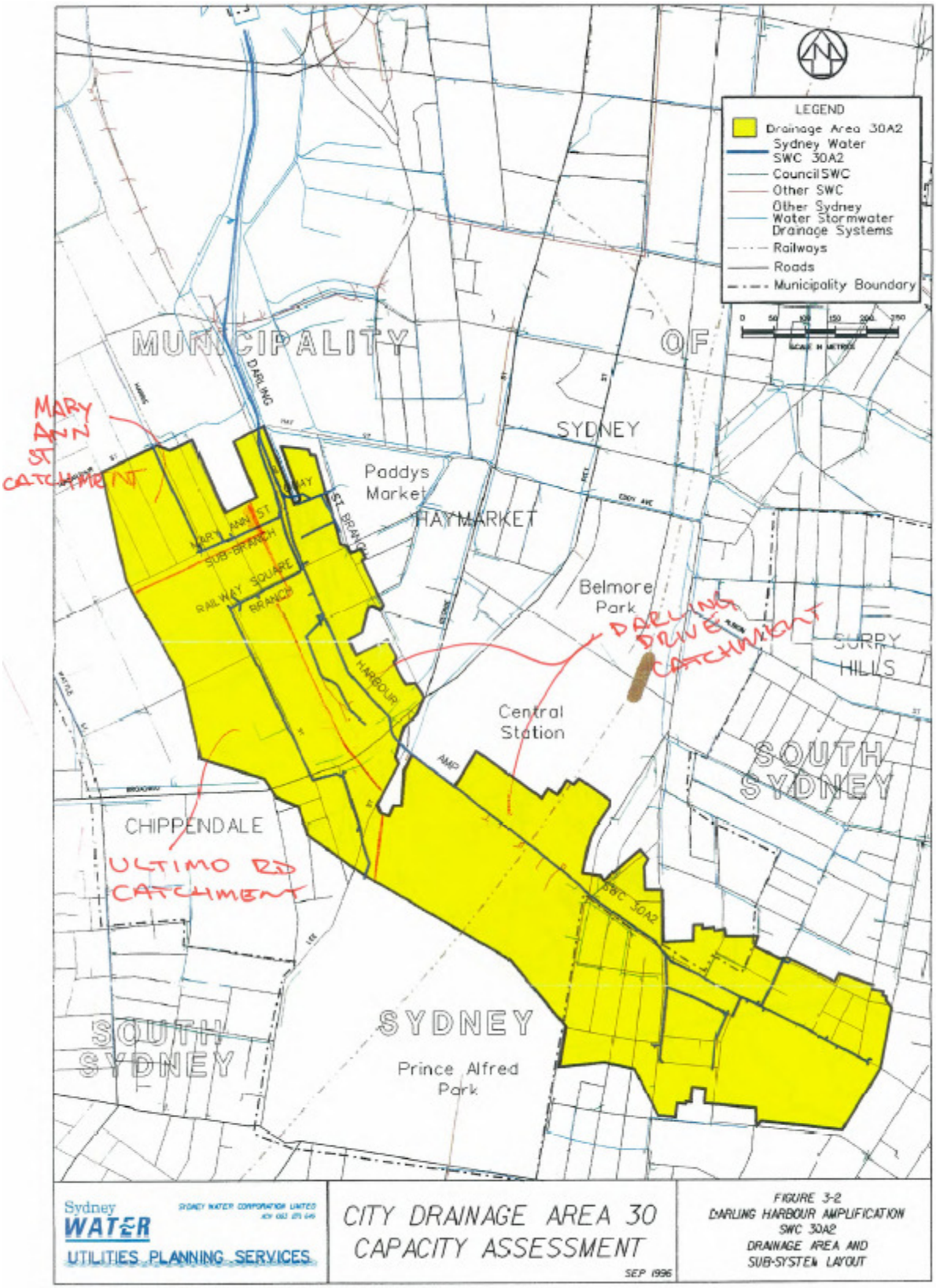
Appendix A

Extracts from Section 3 Darling Harbour Amplification SWC 30A2

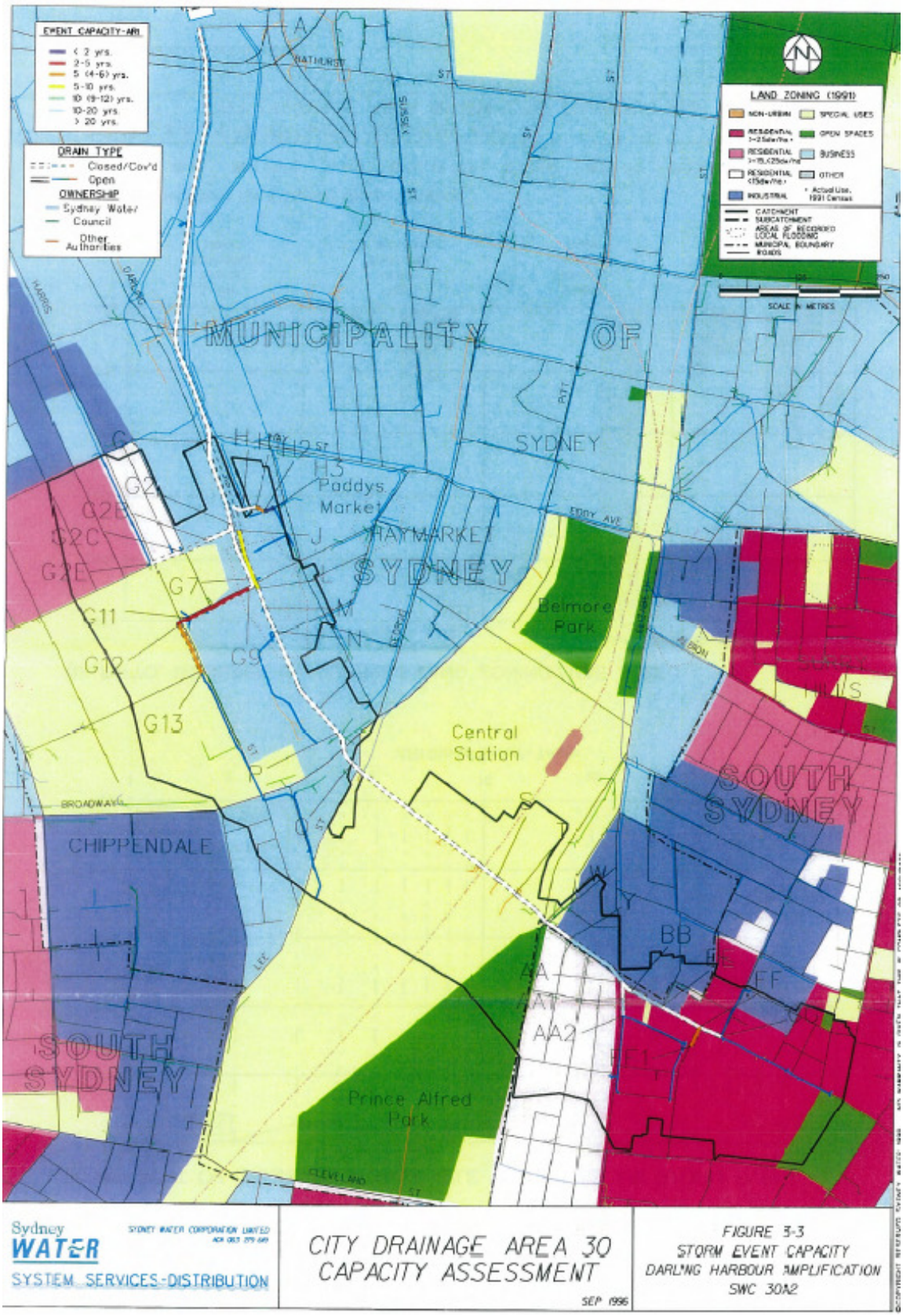
A1 Location Plan



A2 Catchment Plan 30A2



A3 Pipe Network 30A2



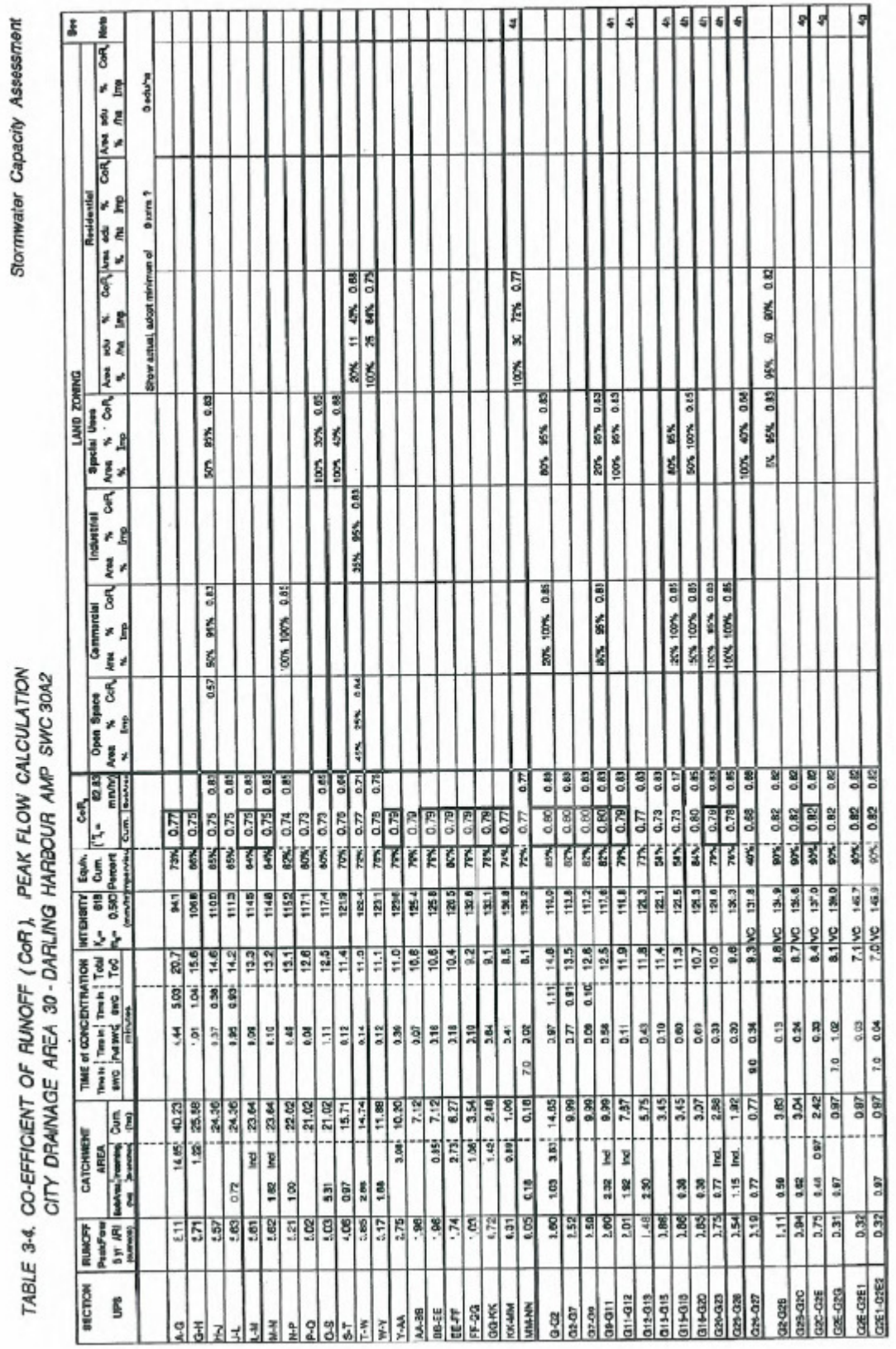
A4 Pipe Capacity and 5 year Runoff

Stormwater Capacity Assessment

TABLE 3-2. SUMMARY DETAILS FOR CITY DRAINAGE AREA 30 - DARLING HARBOUR AMP SWC 30A2

MAIN DRAIN or BRANCH		INCOMING BRANCH, SUB-BRANCH or SIDELINE	Land Feature	Owner / not Sydney	NODES according to HSD Region 1993	UPS & DS Region	SECTION for REACH LENGTH Section (m)	System (m)	Raised (m)	Conduit (m)	Manning Duct (N)	No. off	CROSS-SECTION Width B (mm)	Height H (mm)	Dia. D (mm)	Type	HYDRAULIC CAPACITY "n" Manning	Capacity (cumecs)	CATCHMENT AREA (ha)	RUNOFF 5 yr ARI Peak Flow (cumecs)	RATIO Capacity 5yr Peak	Ratio x F_1 x (F_2 x F_3 ...)	ARI Storm Event Capacity (years)	Landuse Design ARI (years)	See Note
No.	Name																								
						TOTALS	4,321.4	4,135.3	2,934.2	4,321.4															
30A2	MAIN CHANNEL	30A2A			A-G	A-G	648.41	648.41	648.41	648.41		1	3000	2400		B	C	0.0140	16.60	40.2	8.11	2.047	1061	50-100	20	
30A2	MAIN CHANNEL	30A2C			G-G1	G-H	109.30	109.30	105.30	105.30	648	1	3650	1000		D	C	0.0140	7.90	25.6	5.71	1.385	760	15-20	100	2a
30A2	MAIN CHANNEL	Marina Blvd			G1-G2	H-J	97.98	97.98	97.98	97.98	754	1	3650	1600		B	C	0.0140	7.90	24.4	5.57	1.418	779	15-20	100	
30A2	MAIN CHANNEL	Marina Blvd			G2-G4	J-L	93.34	93.34	93.34	93.34	792	1	2400	1600		B	C	0.0140	6.42	24.4	5.65	1.140	845	8-9	100	
30A2	MAIN CHANNEL	SL			G4-G5	L-M	33.38	33.38	33.38	33.38	885	1	1350			P	C	0.0130	9.05	23.6	5.61	1.614	866	25-50	100	
30A2	MAIN CHANNEL	30A2D, SL			G5-G8	M-N	38.89	38.89	38.89	38.89	918	1	1350			P	C	0.0130	9.05	23.6	5.62	1.609	860	25-50	100	
30A2	MAIN CHANNEL				G8-G8	N-P	186.12	186.12	186.12	186.12	957	1	1350			P	C	0.0130	9.05	22.0	5.21	1.737	935	25-50	100	
30A2	MAIN CHANNEL	George St			G8-G9	P-Q	53.85	53.85	53.85	53.85	1,143	1	1350			P	C	0.0130	16.50	21.0	5.02	3.287	1680	100 &>	100	
30A2	MAIN CHANNEL	Central Station			G9-G11	Q-S	280.60	280.60	280.60	280.60	1,197	1	1500			P	C	0.0130	7.54	21.0	5.03	1.499	814	20-25	20	
30A2	MAIN CHANNEL	Central Station			G11-G12	S-T	39.15	39.15	39.15	39.15	1,478	1	1200			P	C	0.0130	6.20	15.7	4.06	1.529	832	20-25	20	
30A2	MAIN CHANNEL	Central Station			G12-G14	T-W	62.16	62.16	62.16	62.16	1,517	1	1050			P	C	0.0130	6.39	14.7	3.85	1.650	896	25-50	20	
30A2	MAIN CHANNEL	Devonshire St			G14-G16	W-Y	45.83	45.83	45.83	45.83	1,579	1	1050			P	C	0.0130	5.69	11.9	3.17	1.795	946	25-50	20	
30A2	MAIN CHANNEL	30A27			G16-G17	Y-AA	104.84	104.84	104.84	104.84	1,625	1	1050			P	C	0.0130	3.86	10.2	2.75	1.402	773	15-20	10	
30A2	MAIN CHANNEL	Devonshire St			G17-G18	AA-BB	20.00	20.00	20.00	20.00	1,730	1	750			P	C	0.0130	2.59	7.1	1.96	1.974	1041	50-100	10	
30A2	MAIN CHANNEL	SL @ D0			G18-G21	BB-EE	54.65	54.65	54.65	54.65	1,750	1	750			P	C	0.0130	2.59	7.1	1.96	1.921	736	12-15	10	2c
30A2	MAIN CHANNEL	30A27			G21-G22	EE-FF	65.93	65.93	65.93	65.93	1,804	1	750			P	C	0.0130	2.59	6.3	1.74	1.549	654	25-50	10	
30A2	MAIN CHANNEL	30A27, SL@ FFA/B			G22-G23	FF-GG	35.33	35.33	35.33	35.33	1,870	1	600			P	C	0.0130	1.79	3.5	1.03	1.743	648	25-50	10	2d
30A2	MAIN CHANNEL	SL a @ GGA, KK			G23-G26	GG-KK	115.94	115.94		115.94	1,905	1	450			P	C	0.0130		2.5	0.72				10	2e
30A2	MAIN CHANNEL	3La @ LL, MM			G26-G28	KK-MM	73.06	73.06		73.06	2,021	1	375			P	C	0.0130		1.1	0.31				5	3d
30A2	MAIN CHANNEL (tab)		Devonshire St		G28-G29	MM-NN	4.21	4.21		4.21	2,044	1	300			P	C	0.0130		0.2	0.05				5	
30A2A	RAILWAY SQUARE BR	30A2E			G-H	G-G2	125.80	125.80	125.80	125.80	648	1	2100	1800		B	C	0.0140	2.81	14.7	3.69	2.167	1100	100 &>	100	2b
30A2A	RAILWAY SQUARE BR	Marlon Blvd-Ultimo St			H-H	G2-G7	90.80	90.80	93.60	93.60	724	1	1800	1800		B	C	0.0140	6.29	10.0	2.53	2.499	1281	100 &>	100	
30A2A	RAILWAY SQUARE BR	Ultimo St			M-N	G7-G8	16.73	16.73	16.73	16.73	868	1	1800	1500		B	C	0.0140	4.99	10.0	2.59	1.925	1011	50-100	100	
30A2A	RAILWAY SQUARE BR	SLa @ G10, G11 (2 off)			N-P	G8-G11	104.25	104.25	104.25	104.25	879	1	900			P	C	0.0130	2.00	10.0	2.60	0.769	478	2-3	100	3b
30A2A	RAILWAY SQUARE BR	SL	Harris St		P-Q	G11-G12	22.69	22.69	22.69	22.69	983	1	750			P	C	0.0130	1.53	7.7	2.01	0.762	474	2-3	100	
30A2A	RAILWAY SQUARE BR		Harris St		Q-R	G12-G13	83.16	83.16	83.16	83.16	1005	1	750			P	C	0.0130	1.45	5.8	1.44	0.955	569	4-5	100	
30A2A	RAILWAY SQUARE BR		Harris St		R-T	G13-G15	17.95	17.95		17.95	1089	1	525			P	C	0.0130		3.5	0.86				100	
30A2A	RAILWAY SQUARE BR		Harris St		T-U	G15-G18	108.65	108.65		108.65	1,107	1	450			P	C	0.0130		3.5	0.86				100	
30A2A	RAILWAY SQUARE BR		George St		U-Y	G16-G20	124.72	124.72		124.72	1,215	1	525			P	C	0.0130		3.1	0.85				100	
30A2A	RAILWAY SQUARE BR	SL @ G21			Y-Z4	G20-G23	60.00	60.00		60.00	1340	1	375			P	C	0.0130		2.7	0.75				20	3c
30A2A	RAILWAY SQUARE BR	SL @ G25			Z4-Z7	G23-G26	53.40	53.40		53.40	1,400	1	300			P	C	0.0130		1.9	0.54				20	3d
30A2A	RAILWAY SQUARE BRANCH				Z7-Z8	G26-G27	60.74	60.74		60.74	1,453	1	225			P	C	0.0130		0.8	0.19				20	
30A2B	MARY ANN STREET SUB-BRANCH				H-H2	G3-G28	40.39	40.39	40.39	40.39	774	1	750			P	C	0.0130	2.81	3.6	1.11	2.075	1999	50-100	100	
30A2B	MARY ANN STREET SB	Mary Ann St			H2-H3	G28-G25	42.73	42.73	42.73	42.73	815	1	750			P	C	0.0130	1.33	3.0	0.94	1.419	784	15-20	100	
30A2B	MARY ANN STREET SB	SL			H3-H5	G25-G3E	52.70	52.70	52.70	52.70	857	1	750			P	C	0.0130	1.18	2.4	0.75	1.665	849	15-20	10	
30A2B	MARY ANN STREET SB		Harris St		H5-H7	G3E-G23	183.00	183.00		183.00	910	1	300			P	C	0.0130		1.0	0.31				10	
30A2B	SIDELINE		Mary Ann St		H5-H8	G2E-G2E1	6.65	6.65		6.65	910	1	525			P	C	0.0130		1.0	0.32				10	
30A2B	SIDELINE		Mary Ann St		H8-H9	G2E1-G1E2	7.50	7.50		7.50	916	1	225			P	C	0.0130		1.0	0.32				10	

A5 Runoff Coefficients



Stormwater Capacity Assessment

TABLE 3-4. CO-EFFICIENT OF RUNOFF (CoR), PEAK FLOW CALCULATION
CITY DRAINAGE AREA 30 - DARLING HARBOUR AMP SWC 30A2

| SECTION | RUNOFF | CATCHMENT AREA | | | TIME of CONCENTRATION | | | INTENSITY | Equiv. | CoR | LAND ZONING | | |

A6 Frequency Factors and Storm Multipliers

Stormwater Capacity Assessment

TABLE 3-5. RAINFALL INTENSITY and STORM EVENT CAPACITY LOOKUP
CITY DRAINAGE AREA 30 - DARLING HARBOUR AMP SWC 30A2

(a) RAINFALL INTENSITY and VARIOUS FACTORS

ARI years (y)	IFD Rainfall Intensity AR&R 1987 (Rainman©) UBD (28th Ed) Map 67J7 $^{y}I_{15m}$	$^{y}I_{60m}$	Rainfall Intensity $I_y = K_y / (ToC + 5)^{m}y$ Equation Constants K_y	m_y	Factors/Coef. with %Imperv.= and Duration=Avg of ToC,15 min= 73% 18 I_y / I_1 F_y	Runoff Coeff. CoR_y	$F_y.CoR_y/CoR_1$ N_y
0.5	47.26	23.29	285	0.600	0.434	0.607	0.341
1	64.74	31.91	391	0.600	0.594	0.657	0.506
2	84.80	41.51	517	0.604	0.776	0.706	0.710
3			561	0.593	0.871	0.735	0.830
4			593	0.586	0.943	0.755	0.923
5	108.69	54.87	618	0.580	1.000	0.771	1.000
6			632	0.577	1.033	0.784	1.051
7			643	0.574	1.062	0.795	1.095
8			654	0.571	1.087	0.805	1.135
9			663	0.569	1.110	0.813	1.170
10	122.62	62.83	671	0.567	1.130	0.821	1.203
12			691	0.565	1.174	0.834	1.269
15			716	0.561	1.229	0.850	1.354
20	141.03	73.15	748	0.557	1.302	0.870	1.468
25			772	0.554	1.355	0.886	1.557
50	165.07	86.82	845	0.545	1.526	0.936	1.851
100	183.33	97.31	917	0.537	1.697	0.985	2.167

(b) STORM EVENT CAPACITY (SEC) LOOKUP TABLE

ARI years (y)	Lookup Factor For Cap/q_1= N_y based on average ToC N_y	With the ToC applicable to each section $K_y . F_y$	Storm Event Capacity Rating is (Alternative Display Options) Stand. Rating	At least	Colour	GIS Database	Group Rating
<0.5			Below.5	Below.5	Purple	0.25	< 0.5
0.5	0.341	211	0.5-1	0.5	Purple	0.50	1-2
1	0.506	313	1-2	1	Purple	1.00	1-2
2	0.710	445	2-3	2	Red	2.00	2-5
3	0.830	503	3-4	3	Red	3.00	2-5
4	0.923	546	4-5	4	Orange	4.00	5
5	1.000	580	5-6	5	Orange	5.00	5
6	1.051	604	6-7	6	Yellow	6.00	5-10
7	1.095	624	7-8	7	Yellow	7.00	5-10
8	1.135	641	8-9	8	Yellow	8.00	5-10
9	1.170	657	9-10	9	Light green	9.00	10
10	1.203	671	10-12	10	Light green	10.00	10
12	1.269	702	12-15	12	Light blue	12.00	10-20
15	1.354	741	15-20	15	Light blue	15.00	10-20
20	1.468	793	20-25	20	Grey	20.00	20-50
25	1.557	833	25-50	25	Grey	25.00	20-50
50	1.851	963	50-100	50	Grey	50.00	50-100
100	2.167	1100	100 &>	100	Grey	100.00	> 100

UPS a:\SEC30A2.XLS, Print Date 3/04/96, Analysis March,1996

A7 Intensity Frequency Duration Details

RAINFALL INTENSITIES IN MM/HOUR

TITLE: City Area Drainage Area 30 [Darling Harbour Por.] DATE: 04/10/94
UBD Map ref: 67 J 7

Site data : 2I1= 41.5 2I12= 8.21 2I72= 2.54 50I1= 86.8 50I12= 16.7
50I72= 5.12 REGSKEW=0.000 F2=4.291 F50=15.86 C10=0.80

Duration	Average Storm Recurrence Interval (years)						
	1	2	5	10	20	50	100
2min	135.44	172.45	215.32	239.33	271.89	313.87	345.38
3	120.53	153.73	192.84	214.85	244.57	282.96	311.83
4	110.14	140.66	177.07	197.65	225.33	261.15	288.13
5	102.20	130.66	164.97	184.43	210.53	244.35	269.85
6	95.88	122.70	155.31	173.86	198.68	230.87	255.17
7	90.55	115.98	147.13	164.90	188.62	219.42	242.70
8	85.99	110.22	140.11	157.19	179.96	209.56	231.95
9	82.01	105.20	133.98	150.46	172.40	200.93	222.53
10	78.57	100.84	128.65	144.61	165.81	193.41	214.32
11	75.52	96.98	123.92	139.40	159.95	186.72	207.01
12	72.67	93.37	119.49	134.52	154.45	180.44	200.14
13	70.15	90.19	115.57	130.21	149.59	174.88	194.06
14	67.87	87.31	112.02	126.30	145.18	169.82	188.53
15	65.74	84.60	108.69	122.62	141.03	165.07	183.33
16	63.82	82.16	105.68	119.30	137.28	160.77	178.62
17	62.02	79.88	102.86	116.18	133.76	156.73	174.20
18	60.40	77.83	100.32	113.38	130.59	153.10	170.21
20	57.36	73.96	95.54	108.08	124.60	146.22	162.67
25	51.33	66.29	86.01	97.52	112.64	132.46	147.58
30	46.69	60.39	78.64	89.35	103.36	121.78	135.84
35	43.04	55.74	72.82	82.87	96.00	113.28	126.48
40	40.03	51.89	67.98	77.48	89.87	106.19	118.69
45	37.51	48.68	63.93	72.97	84.72	100.24	112.13
50	35.39	45.96	60.50	69.14	80.35	95.18	106.54
60	31.91	41.51	54.87	62.83	73.15	86.82	97.31
90	24.68	32.08	42.32	48.41	56.32	66.78	74.81
2hrs	20.49	26.62	35.07	40.09	46.62	55.24	61.85
3	15.72	20.41	26.83	30.64	35.60	42.14	47.16
4	13.01	16.88	22.17	25.30	29.37	34.74	38.86
4.5	12.04	15.62	20.50	23.38	27.14	32.10	35.89
6	9.96	12.92	16.93	19.30	22.39	26.46	29.58
9	7.64	9.90	12.95	14.75	17.10	20.19	22.55
12	6.34	8.21	10.72	12.20	14.13	16.67	18.62
14	5.76	7.46	9.74	11.09	12.84	15.15	16.92
16	5.31	6.87	8.97	10.21	11.82	13.95	15.57
18	4.94	6.39	8.34	9.49	10.99	12.96	14.47
20	4.63	5.99	7.82	8.89	10.30	12.15	13.56
22	4.36	5.64	7.36	8.38	9.70	11.44	12.77
24	4.13	5.35	6.98	7.93	9.19	10.83	12.09
30	3.57	4.63	6.04	6.86	7.95	9.37	10.46
36	3.18	4.12	5.37	6.11	7.07	8.34	9.30
48	2.63	3.40	4.43	5.03	5.83	6.87	7.66
60	2.24	2.90	3.78	4.30	4.97	5.86	6.54
72	1.96	2.54	3.30	3.75	4.34	5.12	5.71

Note: The above rainfall intensities were derived using the procedures described in Chapter 2 of the Institution of Engineers Australia, publication, 'Australian Rainfall & Runoff', 1987 ed.

Appendix B

PMF Calculations

B1 - Probable Maximum Precipitation Calculations - BOM GSDM 2003

Catchment Charateristics

Catchment Area (km^2)	0.197	Represents contributing catchments A & B (see Arup report Section 2.2)
Percent Rough (%)	0	Section 4.2 from GSDM - elevation change within catchment < 50m
Elevation of Catchment (m)	8	Section 4.3 from GSDM
Elevation Adjustment Factor (EAF)	1	Section 4.2 from GSDM
Moisture Adjustment Factor (MAF)	70	Figure 3 from GSDM (see below)
Storm duration (hrs)	0.25	Time of Concentration from SWC report

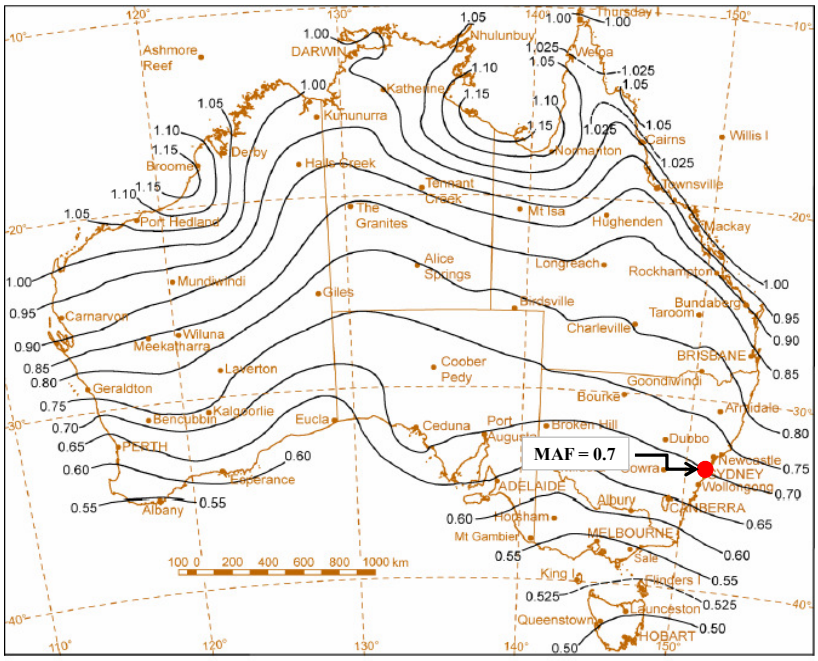


Figure 3: Moisture Adjustment Factor

(Figure extracted from GSDM)

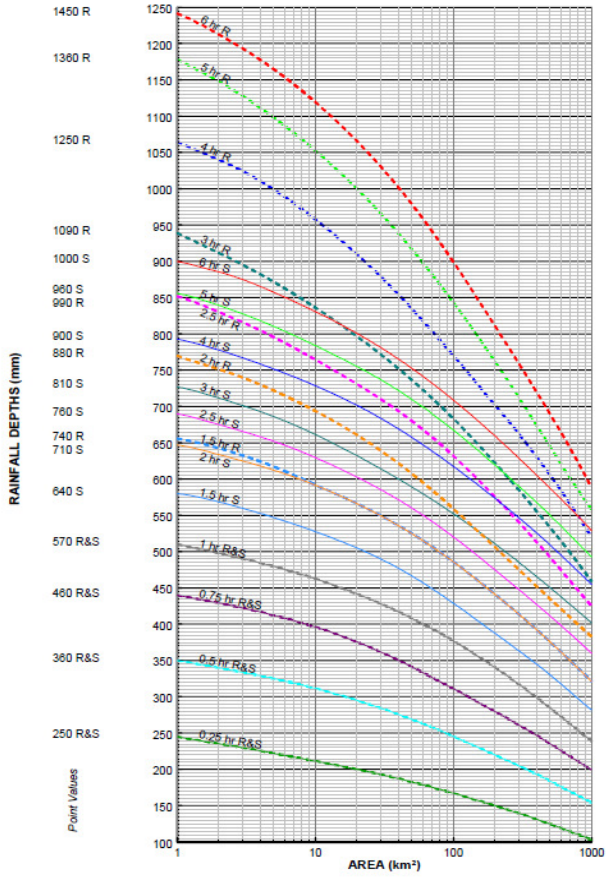


Figure 4: Depth-Duration-Area Curves of Short Duration Rainfall

(Figure extracted from GSDM)

Therefore, depths of rainfall from Figure 4

Point Value	1 km^2 Value	Interpolated depth for 0.197 km^2
(mm)	(mm)	(mm)
250	245	248

PMP Value = $D_{R\&S}$ x MAF x EAF	
Duration	PMP Value
(h)	(mm)
0.25	170

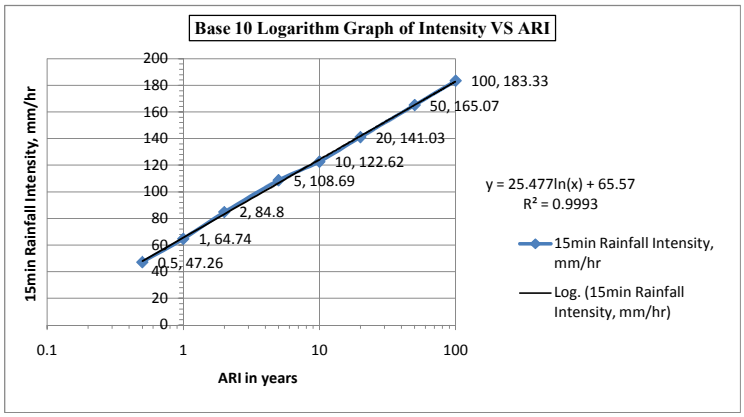
Note: Probable Maximum Precipitation (PMP) was estimated base on formula outlined in Section 4.5 of GSD, value rounded to nearest 10mm

Rainfall Intensity

Duration	Average Intensity
(h)	(mm/hr)
0.25	680

Relationship between rainfall intensity and ARI

ARI, years	15min Rainfall Intensity from SWC report (mm/hr)
0.5	47.26
1	64.74
2	84.8
5	108.69
10	122.62
20	141.03
50	165.07
100	183.33



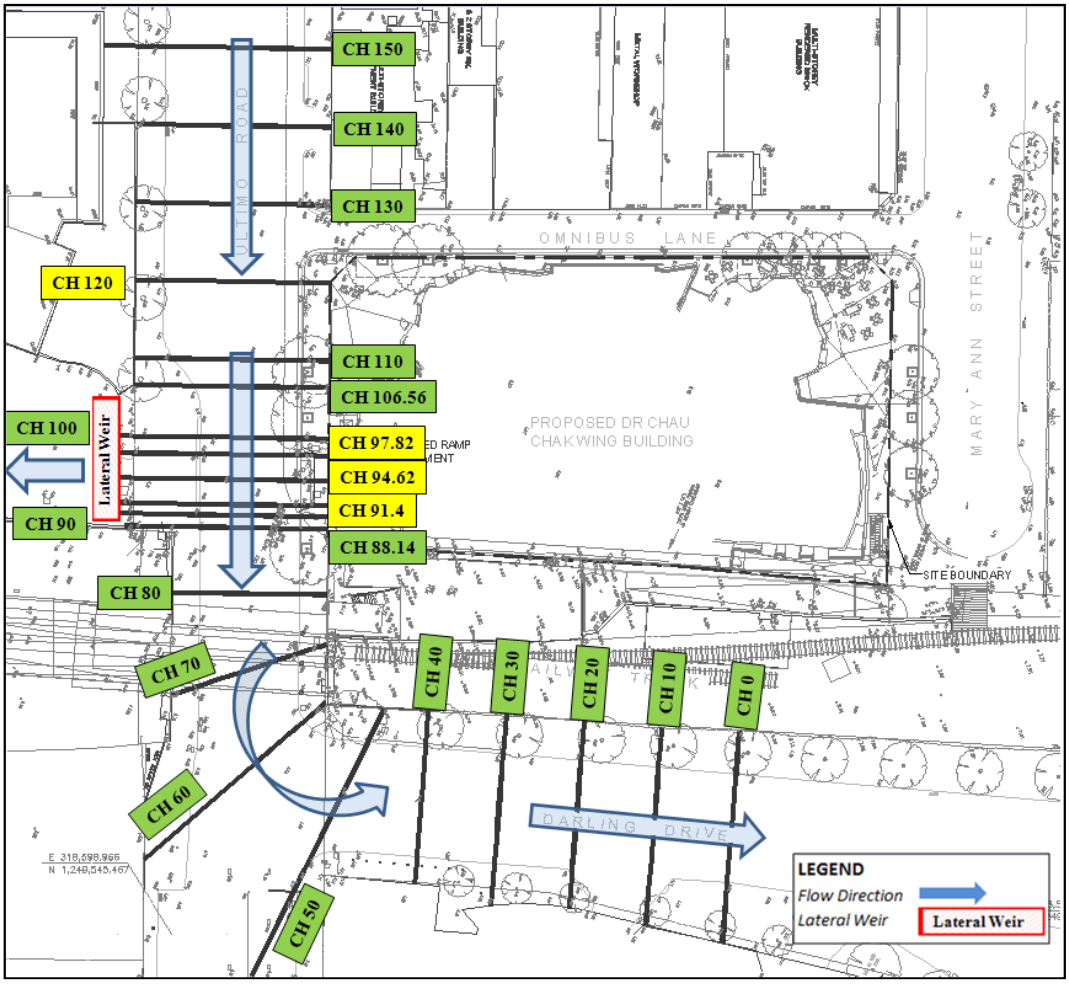
Shown above is a base 10 logarithmic graph of rainfall intensity versus ARI. A best fit equation for the slope of this plot has been determined to enable extrapolation of the data beyond the 100 year ARI. The ARI for the PMP event calculated above is determined using the equation shown.

Intensity (y) = 25.477ln(x) + 65.57
x = exp((y - 65.57)/25.477)
= 29,778,328,908

Appendix C

HEC RAS Modelling

C1 HEC RAS Section Location

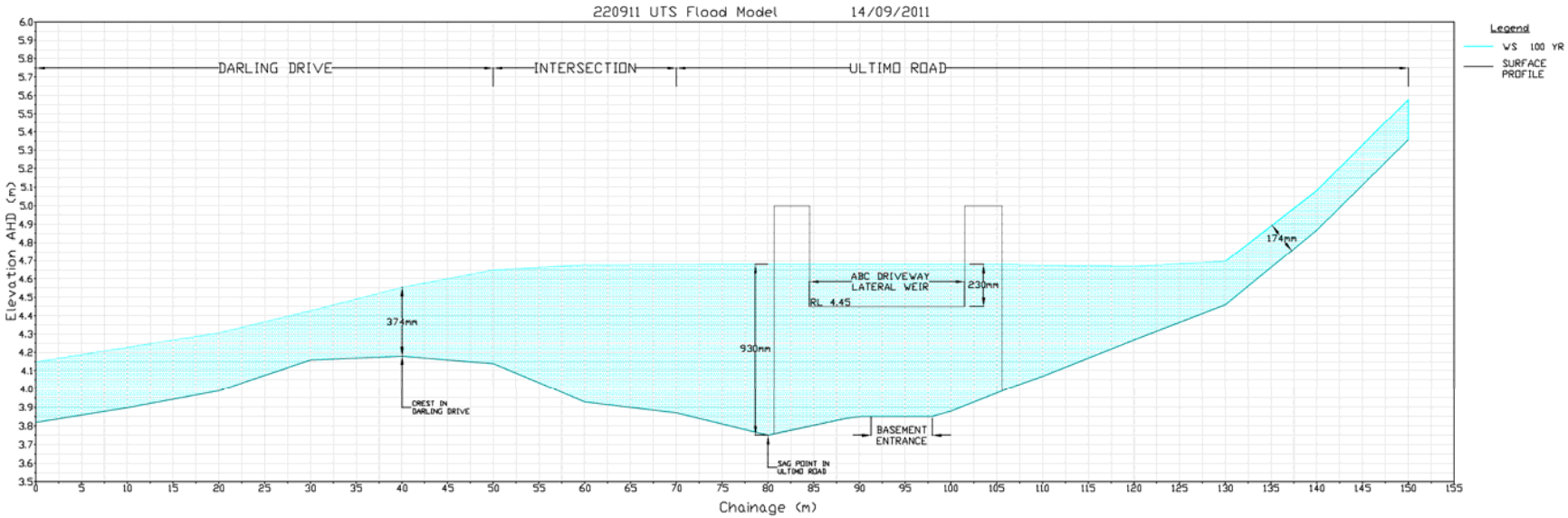


C2 Manning's Values

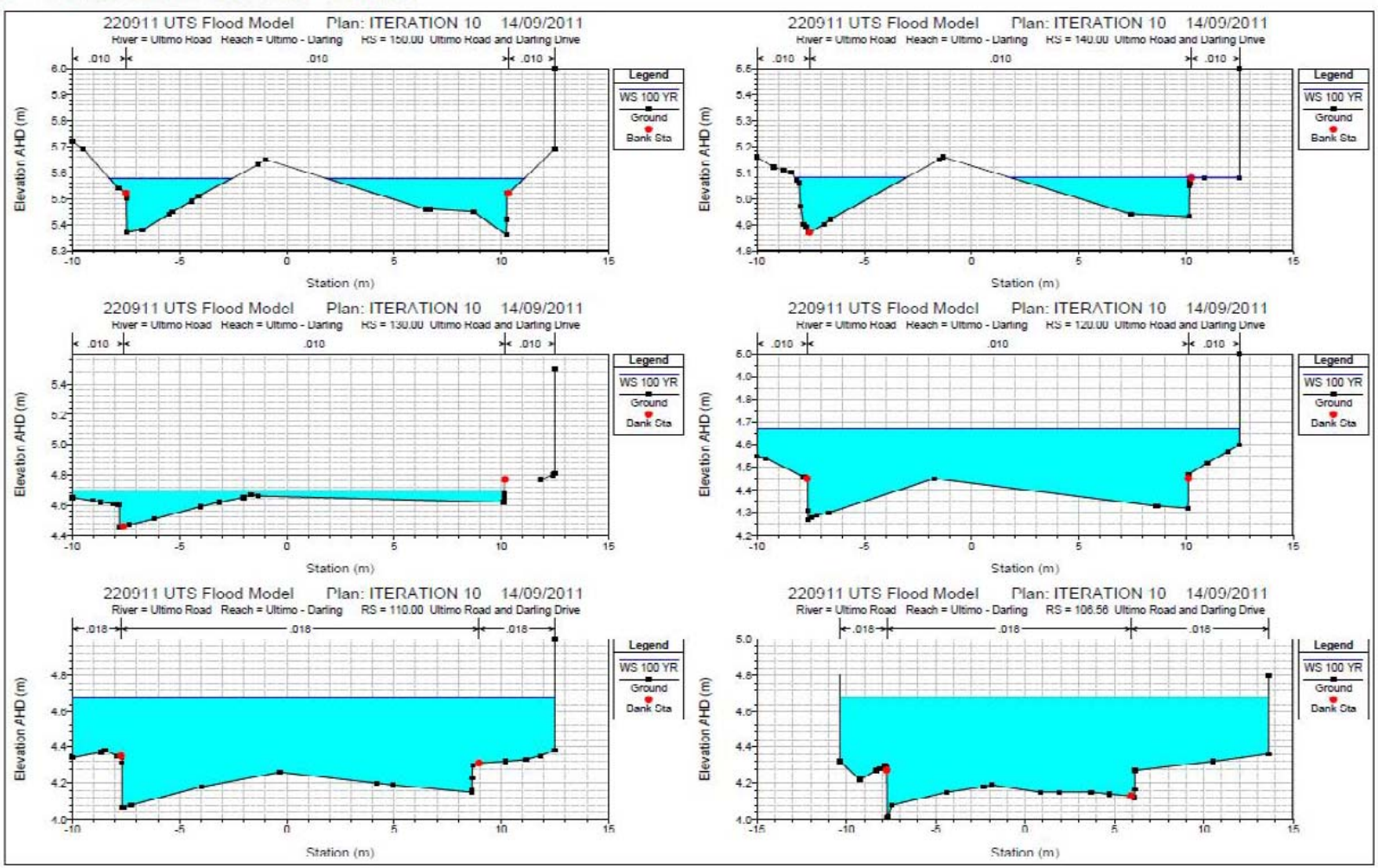
Chainage/ Station m	Manning's Value, n		
	Left Bank	Main Channel	Right Bank
150	0.018	0.018	0.018
140	0.018	0.018	0.018
130	0.018	0.018	0.018
120	0.018	0.018	0.018
110	0.018	0.018	0.018
106.56	0.018	0.018	0.018
100	0.018	0.018	0.018
97.82	0.018	0.018	0.018
94.62	0.018	0.018	0.018
91.4	0.018	0.018	0.018
90	0.018	0.018	0.018
88.44	0.018	0.018	0.018
80	0.018	0.018	0.018
70	0.018	0.018	0.018
60	0.018	0.018	0.018

Chainage/ Station m	Manning's Value, n		
	Left Bank	Main Channel	Right Bank
50	0.033	0.018	0.018
40	0.033	0.018	0.018
30	0.033	0.018	0.018
20	0.033	0.018	0.018
10	0.033	0.018	0.018
0	0.033	0.018	0.018

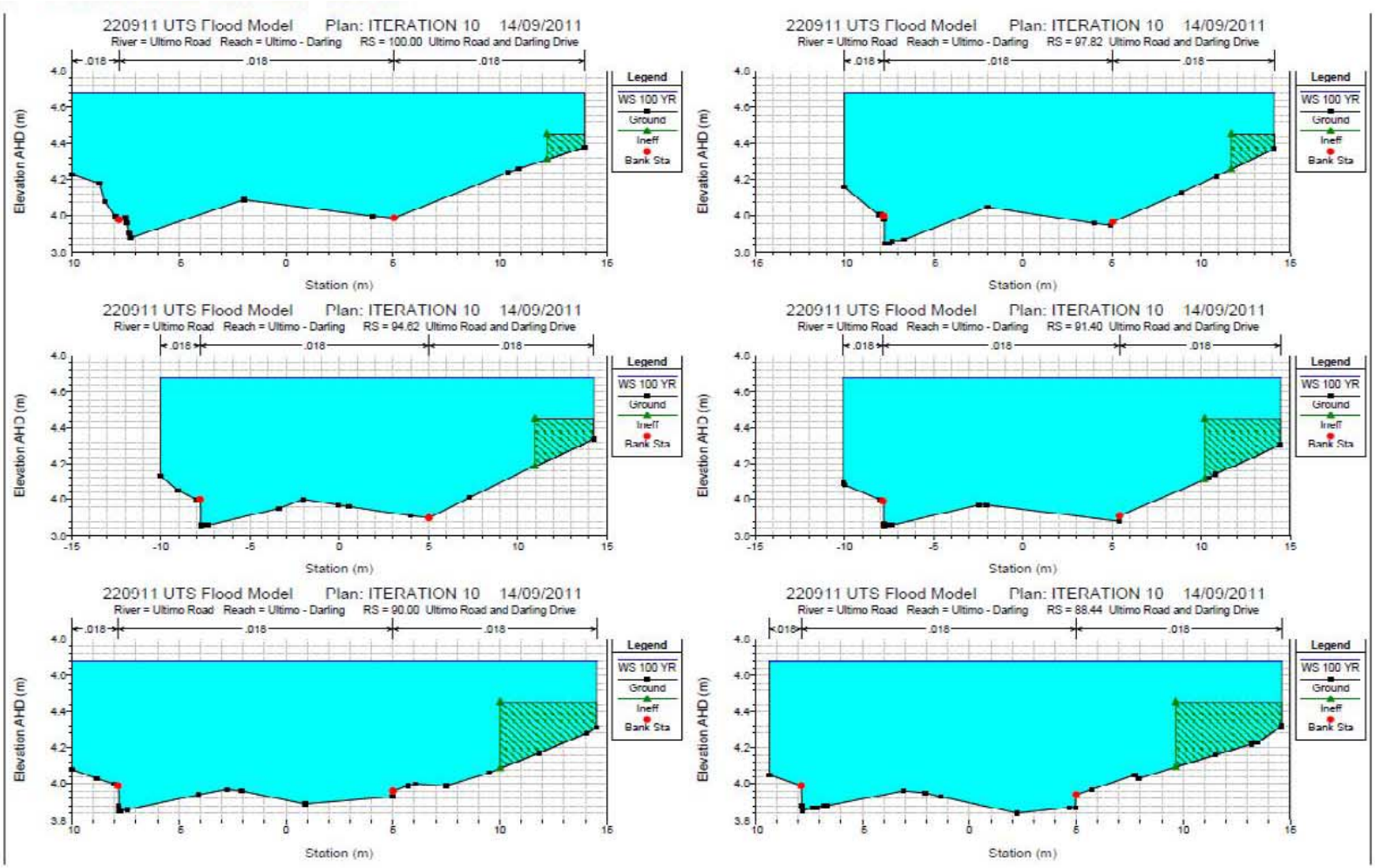
C3 Longitudinal Profile



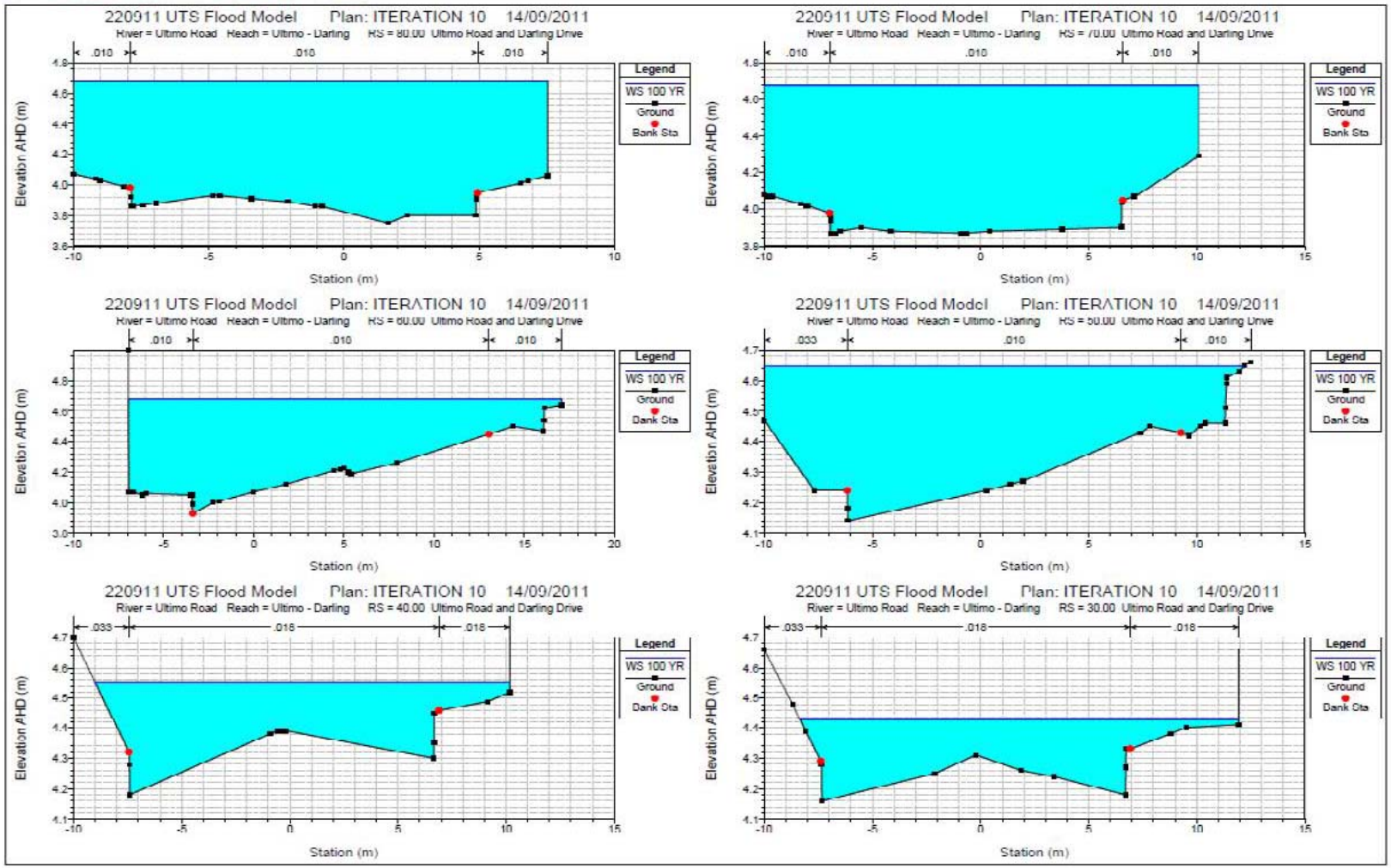
C4 Cross Sections CH150m – 106.56m



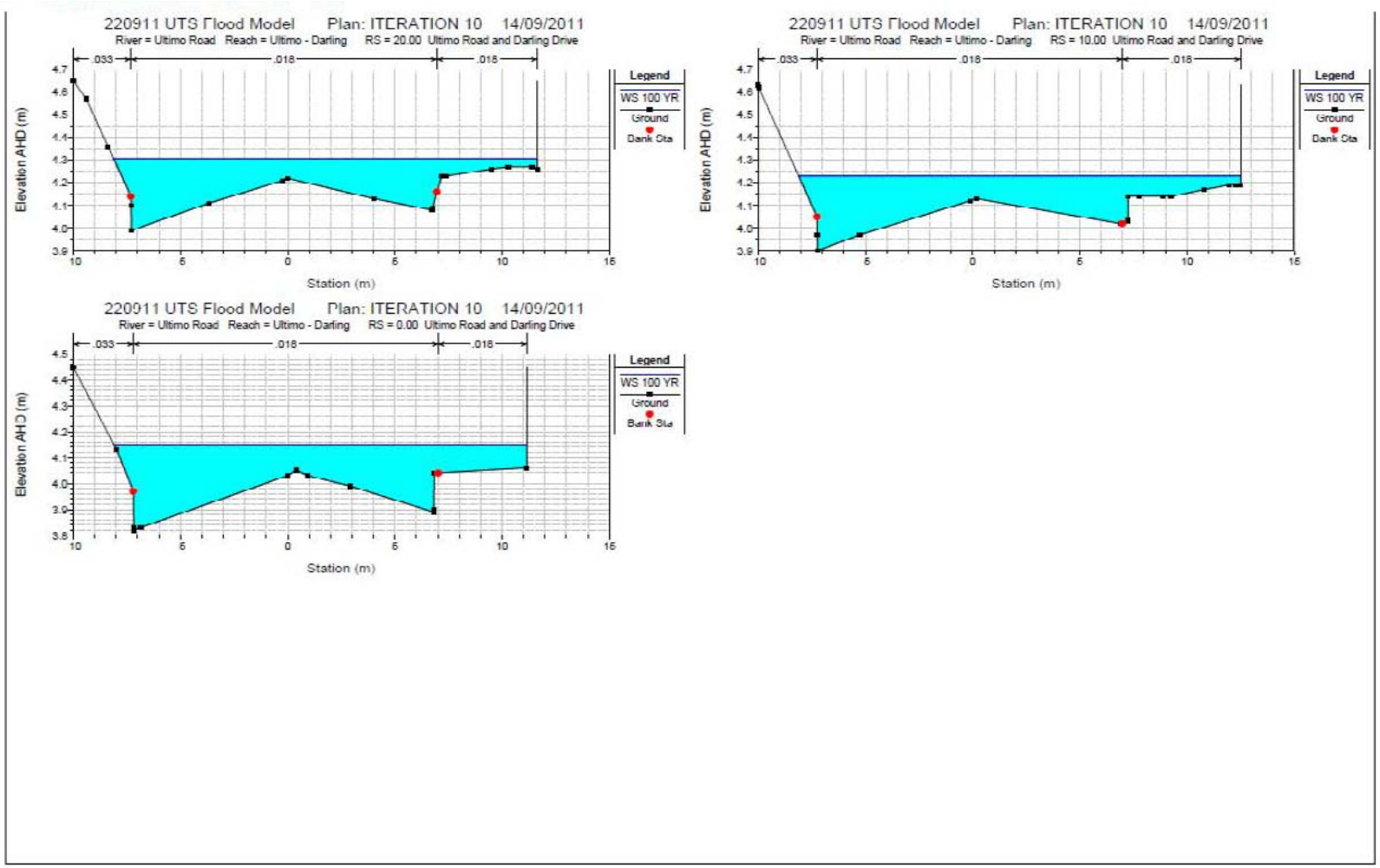
C5 Cross Sections CH100m – 88.44m



C6 Cross Sections CH80m - 30m



C7 Cross Sections CH20m - 0m



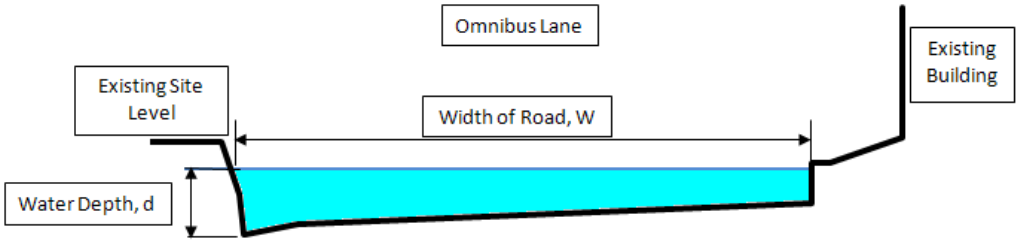
C8 Summary of Results

100 Year ARI Results								
Chainage/ Station m	**Flow Q m^3/s**	**Flood Level 100 YR W.S. m**	**Minimum Ground Level m**	**Maximum Flood Depth, d m**	**Flow Velocity V m/s**	**Velocity Depth Product V x d m^2/s**	**Lateral Weir Crest Level m**	**Description**
0	5.03	4.15	3.82	0.33	1.61	0.53		Darling Drive
10	5.03	4.23	3.90	0.33	1.74	0.57		
20	5.03	4.31	3.99	0.32	1.85	0.59		
30	5.03	4.43	4.16	0.27	1.76	0.48		
40	5.03	4.55	4.18	0.37	1.42	0.53		Crest at Darling Drive
50	5.03	4.65	4.14	0.51	0.77	0.39		Darling Drive
60	2.57	4.68	3.93	0.75	0.24	0.18		Intersection
70	2.57	4.68	3.87	0.81	0.19	0.15		Ultimo Road - Sag Point
80	1.53	4.68	3.75	0.93	0.12	0.11		Ultimo Road
88.44	1.53	4.68	3.84	0.84	0.11	0.09		
90	1.53	4.68	3.85	0.83	0.11	0.09		
91.4	1.53	4.68	3.85	0.83	0.11	0.09	4.45	Ultimo Road - Entrance to Proposed Basement
94.62	1.53	4.68	3.85	0.83	0.11	0.09		
97.82	1.53	4.68	3.85	0.83	0.11	0.09		
100	1.53	4.68	3.88	0.80	0.12	0.10		Ultimo Road - Entrance to ABC Loading Dock
101	Lateral Structure (ABC Building Loading Dock Driveway)							
106.56	1.53	4.68	4.01	0.67	0.15	0.10		
110	3.59	4.68	4.07	0.61	0.38	0.23		Ultimo Road
120	3.59	4.67	4.27	0.40	0.63	0.25		
130	3.59	4.70	4.46	0.25	2.18	0.55		
140	3.59	5.08	4.87	0.21	2.61	0.55		
150	3.59	5.58	5.36	0.22	2.55	0.56		

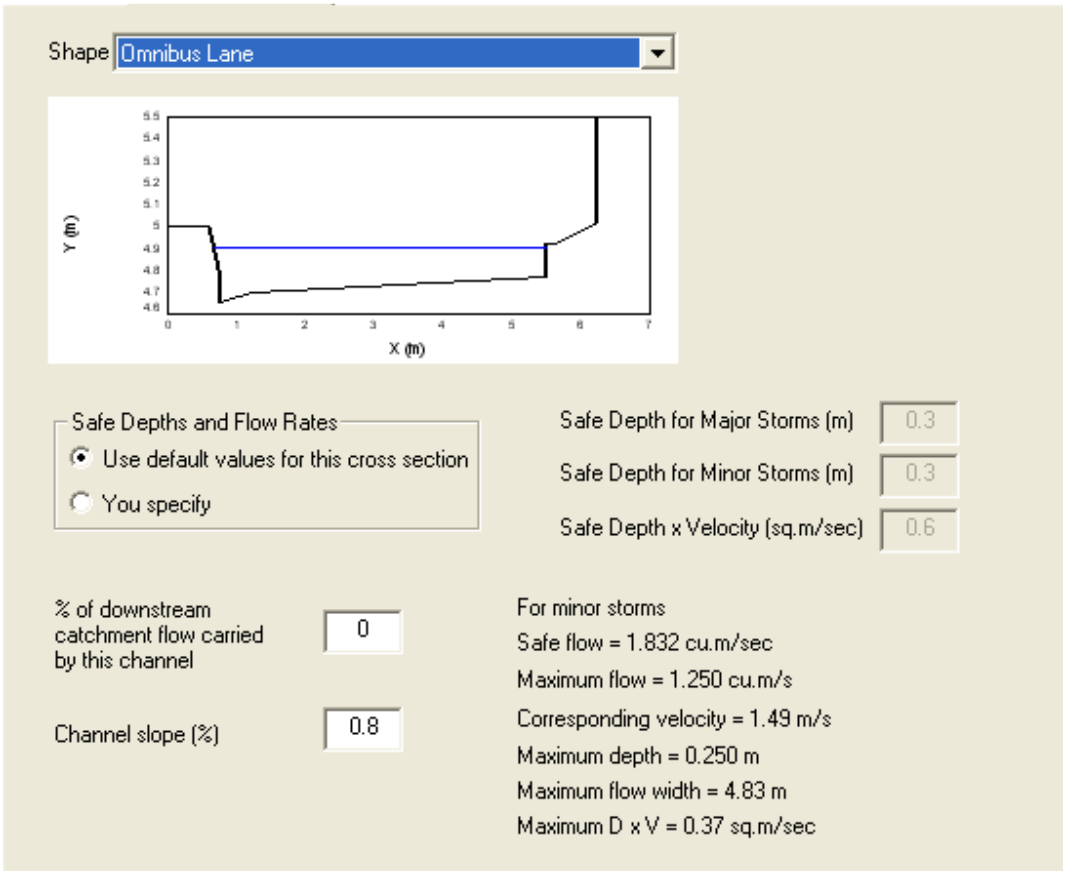
Appendix D

Mary Ann Street Hydraulic Calculation Summary

D1 Option 1: Onmibus Lane Overland Flow Path Results



Open Channel Manning's Results – DRAINS output



D2 Option 2: Mary Ann Street Overland Flow Path Results

Channel Option	Depth, d (mm)	Width, W (mm)	Velocity (m/s)	V x d (m^2/s)
A	100	10090	1.24	0.12
B	150	5260	1.58	0.24
C	200	3380	1.85	0.37
D	250	2450	2.04	0.51
E	300	1915	2.18	0.65
F	350	1580	2.26	0.79

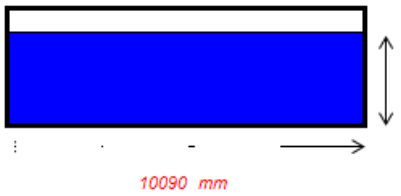
ARUP

STORMWATER DRAINAGE
Channel Flow

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option A

Cross Sectional Area	1.009	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	10.290	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.098		Velocity	1.24	m/s
			FLOW	**1.250**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

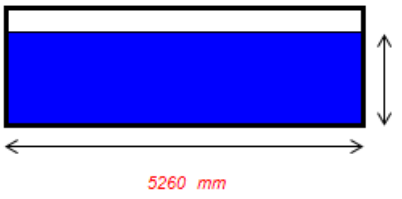
ARUP

STORMWATER DRAINAGE
Channel Flow

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option B

Cross Sectional Area	0.789	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	5.560	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.142		Velocity	1.59	m/s
			FLOW	**1.251**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

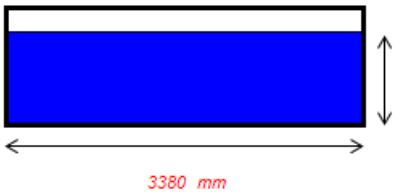
ARUP

STORMWATER DRAINAGE
Channel Flow

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option C

Cross Sectional Area	0.676	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	3.780	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.179		Velocity	1.85	m/s
			FLOW	**1.250**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

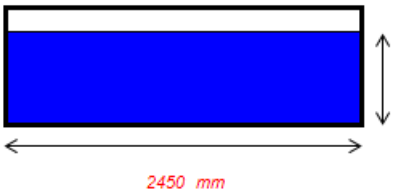
ARUP

STORMWATER DRAINAGE
Channel Flow

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option D

Cross Sectional Area	0.613	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	2.950	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.208		Velocity	2.04	m/s
			FLOW	**1.251**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

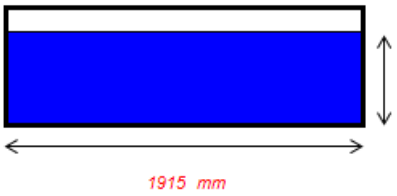
STORMWATER DRAINAGE
Channel Flow

ARUP

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option E

Cross Sectional Area	0.575	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	2.515	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.228		Velocity	2.18	m/s
			FLOW	**1.251**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

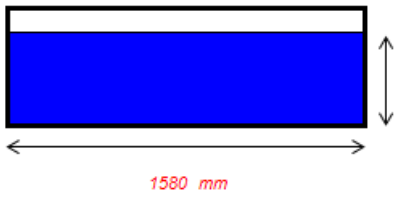
STORMWATER DRAINAGE
Channel Flow

ARUP

File No.: UTS Dr Chau Chak Wing Building
Project No. 220911

Engineer: Thomas Chew
Date: 13-Sep-11

Checked b GJE
Revision: A



Option F

Cross Sectional Area	0.553	m^2	Hydraulic Grade	*1.10%*	
Wetted Perimeter	2.280	m	Mannings Roughness	*0.018*	
Hydraulic Radius	0.243		Velocity	2.27	m/s
			FLOW	**1.253**	**m3/s**

Notes:
1). Above calculation is based on Mannings equation.
1). Figures shown thus "*abc*" (red & italics) are to be entered into sheet.
3). Section is flowing Partially Full

Appendix G

Revised Quantity Surveyor Certificate of Cost

RLB | Rider Levett Bucknall

J:12858.reports.6.1.civ.jpv.db

19 October 2011

University of Technology Sydney
Project Management Office
Level 19, Building 1
PO Box 123
ULTIMO, NSW 2007

Attention: Mrs Sally Vaughton

Dear Sally,

UTS – DR CHAU CHAK WING BUILDING
REVISED QUANTITY SURVEYOR CERTIFICATE OF COST

As requested we have prepared this revised Quantity Surveyor's Certificate of Cost to verify the Capital Investment Value of the project in accordance with the definition contained in the State Environment Planning Policy (Major Development) 2005. As requested, we have revised our previous certificate dated 22 December 2010 to exclude the early works package.

Under this policy the Capital Investment Value has the same meaning as in the Environmental Planning Assessment Regulation 2000 which was amended on 7 May 2010 to the following;

> *Capital Investment Value of a development or project includes all costs necessary to establish and operate the project, including the design and construction of buildings, structures, associated infrastructure and fixed or mobile plant and equipment, other than the following costs:*
>
> *(a) amounts payable, or the cost of land dedicated or any other benefit provided, under a condition imposed under Division 6 or 6A of Part 4 of the Environmental Planning and Assessment Act or a planning agreement under that division*
>
> *(b) costs relating to any part of the development or project that is the subject of a separate development consent or project approval*
>
> *(c) land costs (including any costs of marketing and selling land)*
>
> *(d) GST (within the meaning of A New Tax System (Goods and Services Tax) Act 1999 of the Commonwealth).*

)01
756

19 October 2011

UTS – DR CHAU CHAK WING BUILDING
REVISED QUANTITY SURVEYOR CERTIFICATE OF COST

Based on the this definition, we advise that our revised estimate of Capital Investment Value for this project is $125,655,000 excluding GST as summarised below;

Building works	$88,011,000
External works incl. augmentation of services	$2,075,000
Consultant and project management fees	$35,569,000
Contingency	incl.
Long Service Leave Levy	incl.
TOTAL	$125,655,000

We note our estimate excludes allowances for the following items based on advice provided by the NSW Department of Planning;

- Development Application and Construction Certificate fees
- Authority fees
- Escalation for potential cost increases beyond October 2011
- Loose furniture, fittings and equipment
- Finance costs

We trust the above is self explanatory however, if you have any queries please do not hesitate to contact us.

Yours faithfully,



Jeremy Vitler
Associate
Rider Levett Bucknall

jeremy.vitler@au.rlb.com

Appendix H

Section 94 Advice

RPS

Sydney Office
Level 12, 92 Pitt Street, GPO Box 4401, Sydney NSW Australia 2001
T +61 2 8270 8300 F +61 2 8270 8399 E sydney@rpsgroup.com.au W rpsgroup.com.au

Our Ref: PR105711
Date: 17 October 2011

Attn: Kate MacDonald
Department of Planning and Infrastructure
23-33 Bridge Street
SYDNEY NSW 2000

Dear Kate

RE: UTS Dr Chau Chak Wing Building Project – Section 94 Contributions

We refer to the Project Application MP09_0153 for the Dr Chau Chak Wing Building project and specifically the submission from the City of Sydney dated 30 June 2011 as it relates to section 94 contributions. The following discussion and justification is provided to make the case as to the reasons why a condition requiring a section 94 contribution must not be included with this development.

In determining an application under Part 3A of the Environmental Planning and Assessment Act 1979, the Minister is required to have regard to any section 94 contributions plan which applies to the land. However the Minister has discretion whether to impose conditions, including in relation to development contributions.

On the basis of policy and practice as set out below, it is considered that the Minister, or a delegate acting on behalf of the Minister, should exercise this discretion and exempt UTS, a Crown entity, from the imposition of a condition requiring the payment of a section 94 contribution. To do so would not be inconsistent with the approach taken by the City of Sydney on other UTS projects as outlined below, nor with the views expressed by the City in relation to the Dr Chau Chak Wing submission.

The City of Sydney's Submission

The City provided a response which did not support an exemption from section 94 contributions, based on the review of information provided in the submitted application to the DP&I. Whilst it presents a brief justification for this stance, their submission does not press any demands that section 94 contributions should be levied for this development. Instead, the City leaves the discretion to the DP&I to decide the way in which to proceed.

The City has not recommended a condition of approval requiring UTS to pay section 94 contributions in accordance with the Ultimo Pyrmont Plan. Rather it notes that *"in the event that the applications are approved and the proposed exemption from S.94 contributions is not supported by the Department, please contact the City to determine the relevant S.94 payment before determination*."

Status of UTS as a registered charity or not-for-profit institution

The phrase 'registered charity' is not a legal term. In the context of Section 94 contribution plans, the phrase is likely to have come from the *Draft Local Development Contributions Guidelines – Preparation and Administration of Development Contributions Plans 2009* of the then Department of Planning. It is presumed that it is intended to mean institutions or organisations that carry out

charitable or public interest activity on a not-for-profit basis that are recognised as 'deducible gift recipient' for tax purposes. UTS is endorsed as a deductible gift recipient by the Australian Taxation Office under Item 1 of section 30-15 (Subdivision 30-BA) of the Income Tax Assessment Act 1997. UTS is also endorsed as an income tax exempt charitable entity under Subdivision 50-B of the Income Tax Assessment Act 1997 as Item 1.1 – charitable institution.

It is reasonable that a registered charity should not have to make Section 94 contributions. The Ultimo-Pyrmont Plan does not state that not-for-profit organisations are exempt from the payment of contributions however, City of Sydney has left discretion of their application in this case to the DP&I. With UTS's status both as a charitable entity and the nature of the Dr Chau Chak Wing Project as a development which provides a distinct community benefit the enforcement of development enforcing Section 94 contributions on the development would be unreasonable.

Status of UTS as an entity of the Crown

UTS is deemed to be the Crown for the purposes of determining development applications under Part 4 of the EPA Act. Under Part 4, Division 4 EPA Act a reference to the Crown includes a reference to a person prescribed to be the Crown for the purposes of the Division (section 88(2)(a) EPA Act). Under clause 226(1) (c) of the EPA Regulations, an Australian university within the meaning of the *Higher Education Act 2001* is a prescribed person. UTS is an Australian University under that Act (Schedule 1).

The status of UTS as an entity of the Crown under the EPA Act does not provide the basis for an automatic exemption from development contributions. However, the continuing effect of the 1993 Circular D6 "*Crown Development Applications and Conditions of Consent*" means that the imposition of a condition requiring development contributions for a Crown entity is not supported and is discouraged.

Limiting development contributions for Crown developments that provide a public service

Circular D6 "*Crown Development Applications and Conditions of Consent*" was introduced in 1993 by the former Department of Urban Affairs and Planning (DUAP) and updated in 1995. The Circular provides policy direction regarding appropriate conditions of consent, in particular, the limitations on imposition of levies on Crown developments by councils where an application proposes a 'public service' including educational establishments, as opposed to a commercial development. The Circular remains in force.

The Circular clarifies that it is confirmed government policy that limitations on the imposition of development contributions on Crown developments which provide a public service including educational establishments, are strongly supported and encouraged.

Whilst the Circular relates to Development Applications that are processed under Part 4 of the Act, it was created prior to the introduction of Part 3A. It is therefore reasonable to assume that the intent of the circular would also encompass development applications which, until recently, fell under Part 3A of the Act. It is further noted that under the recent (1 October 2011) amendments to the EP&A Act including the repeal of Part 3A, the Dr Chau Chak Wing Project would fall under Part 4 and be a Development Application. For these reasons, Circular D6 is considered to be applicable.

The approach of limiting imposition of development contributions to educational establishments has been applied to UTS educational facilities in recent years. To our knowledge there have been no applications determined since 2009, including Part 3A and Part 4 applications, for UTS educational facilities, that include a condition of approval requiring UTS to pay development contributions. Indeed, in all of these applications the City has not previously raised the payment of contributions.

The perceived inconsistency between Ultimo Pyrmont Section 94 Contributions Plan 1994, which does not explicitly exempt educational establishments, and the active Circular D6 may be

explained by the fact that the Contributions Plan was adopted in 1994, prior to the release of the Circular (1995).

The Circular describes the desired treatment of development contributions for educational facilities across the State, with the intent that is is applied to respective contribution plans. The Ultimo Pyrmont Section 94 Contributions Plan has not been updated since 1994. It is curious that the Plan does not address the treatment of educational facilities and as such they exist within the "other uses" category by default.

Public benefits provided by the Dr Chau Chak Wing Project and other projects that form part of the UTS Campus Masterplan

The Ultimo Pedestrian Network

Subject to the resolution of property access issues associated with the Transgrid parcel of land that separates the subject site from the UPN, works are proposed to link the Dr Chau Chak Wing building directly with the UPN and to undertake related public domain works in the UPN.

When complete the UPN will be significant public pedestrian infrastructure linking Central Station and Surry Hills beyond to Haymarket and Darling Harbour. UTS also recognise that the UPN has the potential to act as an important movement corridor and linkage between many of the buildings that comprise the university campus. This activity and regularity of use by students has flow-on effects to the quality, safety and vibrancy of the UPN as a linear piece of public space.

The planned and designed integration of the Dr Chau Chak Wing building with the UPN are likely to be the significant push required to finally achieving the planned and long awaited vision for the UPN.

For more than 10 years UTS have been a significant contributor to the UPN through direct expenditure on works and through ongoing participation in the Cultural and Educational Precinct (UCEP) of City of Sydney and the Ultimo Pedestrian Network (UPN) Regeneration Project Control Group (PCTG) of the Sydney Harbours and Foreshore Authority (SHFA) Committee. In 2001 UTS contributed $800,000 to the construction of the bridge and escalators linking the UPN with level 4 of the Peter Johnson Building (Building 6). This contribution was made pursuant to an Agreement between UTS, SHFA and the NSW Department of Education and Training. It was in connection with the development of the Devonshire Street Tunnel extension under the TAFE Marcus Clarke Building and the development of the bridge and escalators, the paving and landscaping of the UPN between UTS Building 6 and the TAFE Marcus Clarke Building. UTS has maintained the escalators since they were constructed in 2001. In addition, UTS funded structural studies of the Ultimo Road Rail Underbridge (a heritage item) to ascertain work that would be necessary to make safe for pedestrian traffic. The bridge is a vital component of the UPN linking the north and south sections. It is understood that the transfer of ownership from RailCorp to SHFA is imminent.

UTS Masterplan

UTS has developed a City Campus Masterplan 2020 that will deliver new spaces and facilities for educational and public use. It involves an estimated $1 billion worth of new construction and refurbishment works. The economic benefits to the local and wider economies will be substantial, with particular contribution arising from the subject development.

The Economic Impact Assessment (EIA) submitted with the EA outlines these benefits. The EIA expects the Dr Chau Chak Wing building to generate significant economic value with high profile status of the architect and world class standard facilities.

A key element of the Masterplan is providing 30,000sqm of open space areas, retail spaces and public thoroughfare. Landscaping will be incorporated throughout with out door areas for public enjoyment including Alumni Green, Jones Street and the UPN, as well as several new laneways

and arcades. Public networks and thoroughfares will be strengthened within and around the campus, improving circulation in the area. This is being achieved in the subject development.

The enhancement of public areas, together with new and refurbished buildings, will significantly improve the aesthetic quality of the precinct. It involves 600m of new frontages to public streets and will contribute to the vibrancy of the area.

Further facilities are being provided for direct community use in order to achieve a key Masterplan objective, to strengthen and reinforce social cohesion and a sense of community. This includes encouraging community use of arts, cultural and entertainment and sporting facilities.

Immediate Public Benefits associated with the proposal.

There will be multiple public benefits that will arise from the proposed development. These have been described above and in detail in both the EA and Response to Submissions. Further immediate public benefits are listed below.

- Provision of an internationally renowned design contribution and landmark for City of Sydney's nominated cultural and educational ribbon.
- Public domain improvements to Ultimo Road, Omnibus Lane and Mary Anne Street. The building will provide important additional accessible path of travel to and from the UPN and Ultimo Road via the public spaces with the proposed building.
- The building will be accessible to the general public.
- Safety to the surrounding areas will be improved with improved lighting, passive and active surveillance, cameras and security personnel.
- Facilities within the building will be available to host public events, exhibitions and lectures.
- The provision of generous public forecourt areas at the building entrances which will serve as significant extensions and enhancements to the footways.

Conclusion

It is acknowledged that the Minister is required to have regard to any section 94 contributions plan which applies to the land. However the Minister has discretion whether to impose conditions, including those in relation to development contributions.

In our submission it would be inappropriate and unnecessary to impose a condition requiring a developer contribution for this project due to:

- an established precedence for not requiring such levies on other recent UTS redevelopments;
- confirmed and ongoing State government policy discourages it for development of this type;
- the magnitude of public benefit contributions made by the subject proposal; and
- the planned long term investment in social, public and educational infrastructure in the precinct as part of the UTS campus Masterplan.

Please don't hesitate to contact the undersigned if you require further clarification in relation to any of the above.

Yours sincerely
RPS



Tim Moore
General Manager

Appendix I

Email correspondence MP09_0153 Dr Chau Chak Wing, Ultimo

From: HUSEYIN Sevda [Sevda_HUSEYIN@rta.nsw.gov.au]
Sent: Friday, 15 July 2011 9:21 AM
To: Kate MacDonald
Subject: RE: MP 09_0153 Dr Chau Chak Wing, Ultimo
Hi Kate,

Thankyou for pointing that out. For this instance, additional information for service/loading vehicles is not required by the proponent.

Kind Regards,

Sevda Huseyin
Assistant Transport Planner
Land Use Planning and Assesment | Sydney Region
Roads & Traffic Authority | Transport NSW
☎ 8849 2914 | 🖷 fax 8849 2918 | ✉ sevda_huseyin@rta.nsw.gov.au

---

From: Kate MacDonald [mailto:Kate.MacDonald@planning.nsw.gov.au]
Sent: Wednesday, 13 July 2011 4:46 PM
To: HUSEYIN Sevda
Subject: MP 09_0153 Dr Chau Chak Wing, Ultimo

Hi Sevda,

I have just reviewed the SRDAC's response to the Dr Chau Chak building at UTS and would like to clarify what additional information the Proponent should provide to demonstrate what the servicing/delivery requirements of the building are. For ease of reference, I note that pg. 21 of the Transport Impact Assessment states that there will be 10 - 20 deliveries per day by a range of vehicles (up to a maximum size of 8.8m in length) and these deliveries should occur in non-peak periods. In addition, I also note that garbage collection would occur 3 - 4 times per week after the PM peak period.

If you would like to discuss this matter please feel free to contact me on 9228 6435.

Kind regards,

Kate

Kate MacDonald
Senior Planner, Metropolitan and Regional Projects North
NSW Department of Planning & Infrastructure | GPO Box 39 | Sydney NSW 2001
T 02 9228 6435 E kate.macdonald@planning.nsw.gov.au

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Appendix J

Proposal to remove small Platanus street tree on the corner of Omnibus Lane and Ultimo Road

JACKSON ARCHITECTURE

DARYL JACKSON ROBIN DYKE PTY LTD

64 Rose Street Chippendale NSW 2008
Robin Dyke NSW Registration No. 3739
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www.djrd.com.au
office@djrd.com.au
ABN 48 942 921 969

SYDNEY
Melbourne
Canberra
Brisbane
Shenyang
Shanghai
Hanoi
London

10 October 2011

Campus Development Program Management Office
Level 19, Building 1
Broadway ULTIMO 2007

Attention: Nigel Oliver

Dear Nigel,

UTS CHAU CHAK WING BUILDING LANDSCAPE
Proposal to remove small Platanus street tree on the corner of Omnibus Lane & Ultimo Road

This letter is in response to the City of Sydney's comments regarding this matter as contained in their letter dated 30 June 2011as well subsequent meetings and discussions with them. Set out below are our arguments to support the removal of the small street tree in question, referenced as Tree 1 in the City of Sydney letter.

1.0 Background:

The small street tree in question is a *Platanus orientalis,* (refer to Fig 1 plan and Fig 2 photograph below) and is located near the corner of Omnibus Lane and Ultimo Road. It is proposed that the tree be removed to facilitate the development of the proposed UTS Chau Chak Wing School of Business.

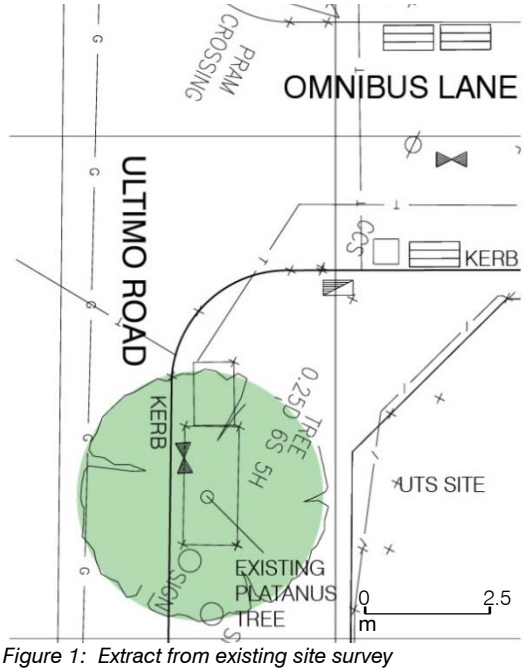


Figure 1: Extract from existing site survey

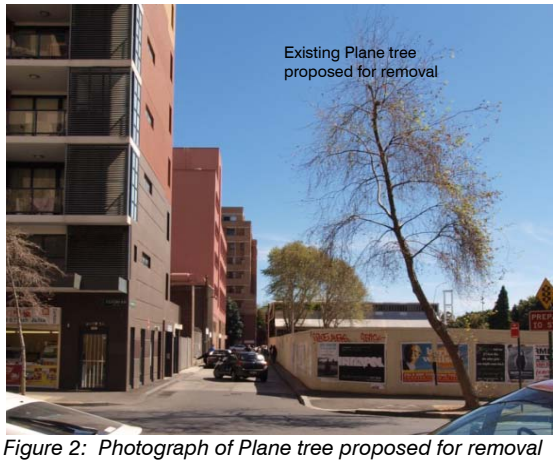


Figure 2: Photograph of Plane tree proposed for removal

PRINCIPAL DIRECTORS
Daryl Jackson
Robin Dyke

PRINCIPALS
Andrew Hipwell
Daniel Beekwilder
Glenn Holmes

SENIOR ASSOCIATES
Geoffrey Rex
Jim Russell
Vino Mudaly

ASSOCIATES
Anna Harris
Peter Lean
Donna Paredes

2.0 Justification for Tree Removal:

1. As part of the City of Sydney's pavement requirements, pavement cross-overs are planned at the corner of Ultimo Road and Omnibus Lane. The standard City of Sydney detail is to be incorporated for these cross-overs and in so doing the tree in question is located within the proposed cross over area (refer Figure 3 below)
2. The tree is located 5m from the Omnibus Lane kerb which will prove, as the tree matures, to be a sight line hazard for traffic entering into Ultimo Road from Omnibus lane as well as causing sight restrictions to street signage.
3. The tree is not listed on the City of Sydney tree register as having significant importance in terms of size, specie and/or history.
4. The removed street tree will be replaced with new Plane trees in Omnibus Lane and further down Ultimo Road to the City of Sydney specifications.

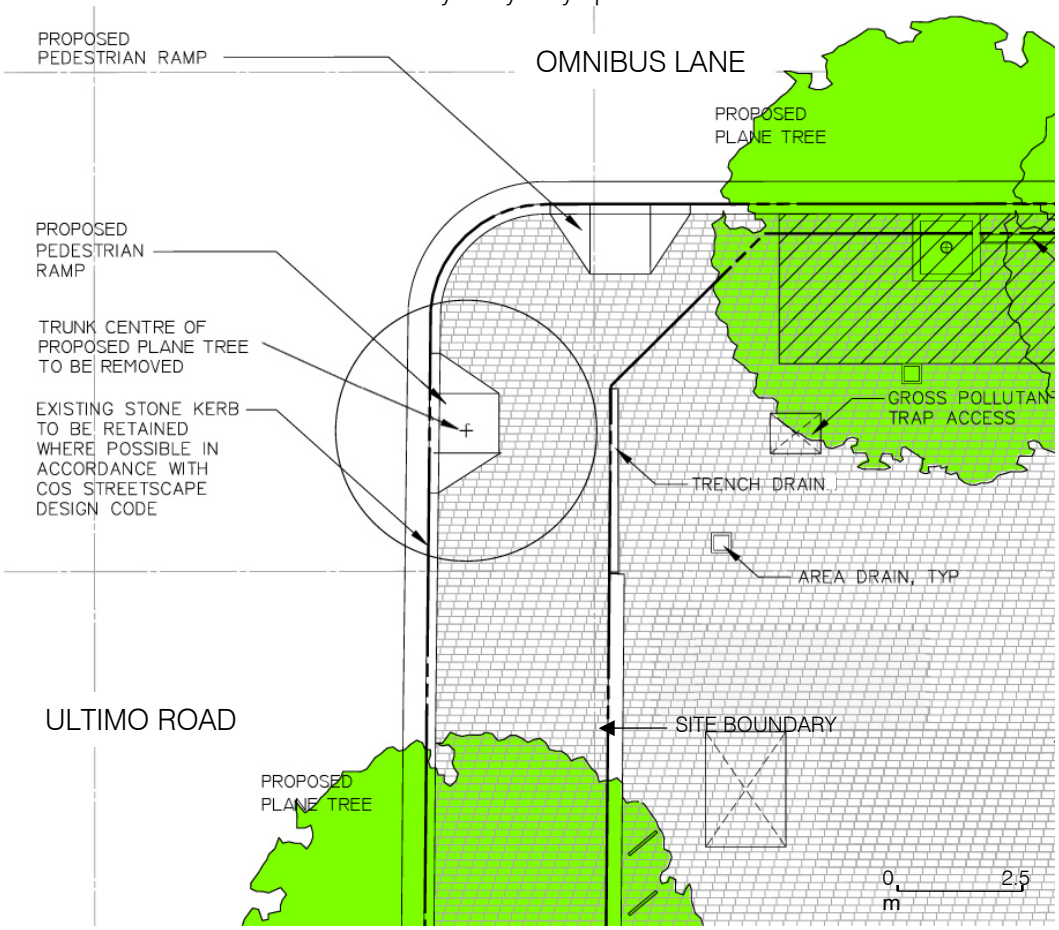


Figure 3: Pavement Crossing Proposal

Yours faithfully,
Daryl Jackson Robin Dyke Architects

Geoffrey Rex
Senior Associate

Appendix K

Notice of Determination – Approval – D/2011/882

City of Sydney

ABN 22 636 550 790
GPO Box 1591 Sydney NSW 2001 Australia
Town Hall House 456 Kent Street Sydney NSW 2000 Australia
Phone +61 2 9265 9333 Fax +61 2 9265 9222
council@cityofsydney.nsw.gov.au www.cityofsydney.nsw.gov.au

NOTICE OF DETERMINATION - APPROVAL

Issued under Section 80(1)(a) of the Environmental Planning and Assessment Act 1979

Development Application No.	D/2011/882
Applicant	UNIVERSITY of TECHNOLOGY L 19 B2 15 Broadway BROADWAY NSW 2007
Land to be developed	14-28 ULTIMO ROAD , ULTIMO NSW 2007 Lot 1 DP 76938
Approved development	Demolition of existing carpark and the excavation, remediation, shoring and piling of the basement levelsof the proposed Dr Chau Chak Wing Building (subject of a separate Part 3a Project Application) for an educational establishment. The proposal is Integrated Development with the NSW Office of Water and is a Crown development
Cost of development	$6,916,000.00
Determination	The application was determined under delegation of Council and was granted consent **subject to the conditions** in Schedules 1 and 2 and the **Terms of Approval** in Schedule 3.
Consent is to operate from	12 October 2011
Consent will lapse on	12 October 2016

Reasons for conditions

Unrestricted consent may affect the environmental amenity of the area and would not be in the public interest.

Right of appeal

If you are dissatisfied with this decision, Section 97 of the Environmental Planning and Assessment Act 1979 (the Act) gives you the right to appeal to the Land and Environment Court within 6 months after the date on which you received this notice.

Alternatively, you may request a review of the decision by the City's Small Permits Appeals Panel, under Section 82A of the Environmental Planning and Assessment Act 1979, within 6 months of the date of this notice (N.B. Section 82A is not applicable to integrated or designated development). This applies if the matter was determined by a Council officer under delegation of Council. An application form is available at Council's One Stop Shop. A fee is payable.

city of villages

For further information please contact **Kate Bartlett on ph. 9265 9200.**

GRAHAM JAHN
Director - City Planning & Regulatory Services

NOTICE OF DETERMINATION – APPROVAL D/2011/882

CONDITIONS OF CONSENT

SCHEDULE 1A

APPROVED DEVELOPMENT/DESIGN MODIFICATIONS/COVENANTS AND CONTRIBUTIONS/USE AND OPERATION

Note: Some conditions in Schedule 1A are to be satisfied prior to issue of a Construction Certificate and some are to be satisfied prior to issue of Occupation Certificate, where indicated.

(1) APPROVED DEVELOPMENT

(a) Development must be in accordance with Development Application No. D/2011/882 dated 10 June 2011 and the following drawings:

Drawing Number	Architect	Date
A1-1.01	Darryl Jackson Robin Dyke Architects	06/03/2011
A1-0.01	Darryl Jackson Robin Dyke Architects	06/03/2011
A1-0.02	Darryl Jackson Robin Dyke Architects	06/03/2011
A1-0.03	Darryl Jackson Robin Dyke Architects	06/03/2011
A1-0.04	Darryl Jackson Robin Dyke Architects	13/05/2011
S2-2.01	Darryl Jackson Robin Dyke Architects	11/03/2011
S2-1.02	Darryl Jackson Robin Dyke Architects	04/06/2011

and as amended by the conditions of this consent.

(b) In the event of any inconsistency between the approved plans and supplementary documentation, the plans will prevail.

(2) ASSOCIATED ROADWAY COSTS

All costs associated with the construction of any new road works including kerb and gutter, road pavement, drainage system and footway shall be borne by the developer. The new road works must be designed and constructed in accordance with the City's "Development Specification for Civil Works Design and Construction".

(3) COST OF SIGNPOSTING

All costs associated with signposting for any kerbside parking restrictions and traffic management measures associated with the development shall be borne by the developer.

(4) TRAFFIC WORKS

Any proposals for alterations to the public road, involving traffic and parking arrangements, must be designed in accordance with RTA Technical Directives

and must be referred to and agreed to by the Sydney Traffic Committee prior to any work commencing on site.

(5) VEHICLE ACCESS

The site must be configured to allow a vehicle to be driven onto and off the site in a forward direction.

(6) VEHICLE FOOTWAY CROSSING

A separate application is to be made to, and approved by, Council for the construction of any proposed vehicle footway crossing or for the removal of any existing crossing and replacement of the footpath formation where any such crossings are no longer required.

All disused or redundant vehicle crossings and laybacks must be removed and footway and kerb reinstated in accordance with Council's standards, to suit the adjacent finished footway and edge treatment materials, levels and details, or as otherwise directed by Council officers. All construction and replacement works are to be completed in accordance with the approved plans prior to the issue of an Occupation Certificate.

Note: In all cases the construction materials should reinforce the priority of pedestrian movement over that of the crossing vehicle.

SCHEDULE 1B

PRIOR TO COMMENCEMENT OF WORK/HEALTH AND BUILDING

Note: An Approval under S140(1) of the Heritage Act must be obtained from the NSW Heritage Council prior to any excavation works commencing on site. This is to ensure that the archaeology identified as being present on site is appropriately managed and recorded prior to bulk excavation.

(7) COMPLIANCE WITH BUILDING CODE OF AUSTRALIA

The proposed work must comply with the Building Code of Australia (BCA).

(8) CERTIFICATION OF GEOTECHNICAL INSPECTION

Prior to commencement of work, a Geotechnical inspection report/certificate confirming that the development site is suitable for the proposed development must be provided to Council. The certificate must be in accordance with Clause A2.2(a)(iii) of the Building Code of Australia and be prepared by an appropriately qualified person.

(9) DEMOLITION

The demolition must be carried out in accordance with AS 2601-2001, *The demolition of Structures*

(10) DEMOLITION/SITE RECTIFICATION (if cost is under $50m)

If following the commencement of the demolition, and/or remediation, there is a suspension in activity for 24 months, UTS will rectify the site.

If there is an indefinite halt to the overall project for the construction of the building, UTS will rectify the entire site by filling the excavated hole with clean fill and landscaping to an appropriate standard. This would include turfing the site and planting a range of small trees, in line with a Landscape Plan to be submitted to Council for approval. Landscaping is to be maintained regularly by a contractor appointed by UTS.

(11) ASBESTOS REMOVAL

All demolition works involving the removal and disposal of asbestos cement must only be undertaken by contractors who hold a current WorkCover Asbestos or "Demolition Licence" and a current WorkCover "Class 2 (Restricted) Asbestos Licence and removal must be carried out in accordance with National Occupational Health and Safety Commission (NOHSC): "Code of Practice for the Safe Removal of Asbestos" and the City of Sydney Asbestos Policy.

(12) ASBESTOS REMOVAL SIGNAGE

Standard commercially manufactured signs containing the words "DANGER ASBESTOS REMOVAL IN PROGRESS" measuring not less than 400mm x 300mm are to be erected in prominent visible positions on the site.

(13) CLASSIFICATION OF WASTE

Prior to the exportation of waste (including fill or soil) from the site, the waste materials must be classified in accordance with the provisions of the Protection

of the 'Environment Operations Act 1997 and the NSW DECC Waste Classification Guidelines, Part1: Classifying Waste (April 2008)'. The classification of the material is essential to determine where the waste may be legally taken. The Protection of the Environment Operations Act 1997 provides for the commission of an offence for both the waste owner and the transporters if the waste is taken to a place that cannot lawfully be used as a waste facility for the particular class of waste. For the transport and disposal of industrial, hazardous or Group A liquid waste advice should be sought from the EPA.

(14) DISPOSAL OF ASBESTOS

Asbestos to be disposed of must only be transported to waste facilities licensed to accept asbestos. The names and location of these facilities are listed in Part 6 of the City of Sydney's Asbestos Policy.

(15) NOTIFICATION OF ASBESTOS REMOVAL

All adjoining properties and those opposite the development must be notified in writing of the dates and times when asbestos removal is to be conducted. The notification is to identify the licensed asbestos removal contractor and include a contact person for the site together with telephone and facsimile numbers and email address.

(16) PROHIBITION OF ASBESTOS RE-USE

No asbestos products are to be reused on the site (i.e. packing pieces, spacers, formwork or fill etc).

(17) SIGNAGE LOCATION AND DETAILS

(a) A site notice board must be located at the main entrance to the site in a prominent position and must have minimum dimensions of 841mm x 594mm (A1) with any text on the notice to be a minimum of 30 point type size.

(b) The site notice board must include the following:

(i) contact person for the site;

(ii) telephone and facsimile numbers and email address; and

(c) site activities and time frames.

(18) SKIPS AND BINS

No asbestos laden skips or bins are to be left in any public place without the approval of Council.

(19) PHOTOGRAPHIC RECORD / DILAPIDATION REPORT - PUBLIC DOMAIN

Prior to commencement of works, a photographic recording of the public domain site frontages is to be prepared and submitted to Council's satisfaction.

The recording must include clear images of the footpath, nature strip, kerb and gutter, driveway crossovers and laybacks, kerb ramps, road carriageway, street trees and plantings, parking restriction and traffic signs, and all other existing infrastructure along the street.

The form of the recording is to be as follows:-

(a) A PDF format report containing all images at a scale that clearly demonstrates the existing site conditions;

(b) Each image is to be labelled to identify the elements depicted, the direction that the image is viewed towards, and include the name of the relevant street frontage;

(c) Each image is to be numbered and cross referenced to a site location plan;

(d) A summary report, prepared by a suitable qualified professional, must be submitted in conjunction with the images detailing the project description, identifying any apparent existing defects, detailing the date and authorship of the photographic record, the method of documentation and limitations of the photographic record;

(e) Include written confirmation, issued with the authority of both the applicant and the photographer that the City of Sydney is granted a perpetual non-exclusive license to make use of the copyright in all images supplied, including the right to make copies available to third parties as though they were Council images. The signatures of both the applicant and the photographer must be included.

(20) FOOTPATH DAMAGE BANK GUARANTEE

A Footpath Damage Bank Guarantee must be lodged with Council in accordance with the City of Sydney's adopted Schedule of Fees and Charges. The Footpath Damage Bank Guarantee must be submitted as an unconditional bank guarantee in favour of Council as security for repairing any damage to the public domain in the vicinity of the site.

The guarantee must be lodged with Council prior to commencement of works.

(21) TEMPORARY GROUND ANCHORS, TEMPORARY SHORING AND PERMANENT BASEMENT/RETAINING WALLS AFFECTING THE ROAD RESERVE

For temporary shoring including ground anchors affecting the road reserve, a separate application under Section 138 of the Roads Act 1993 must be lodged with Council.

For new permanent basement wall/s or other ground retaining elements (not being anchors projecting under the road reserve):-

(a) Prior to commencement of works, the following documents must be submitted to Council:

(i) Dilapidation Report of adjoining buildings/structures.

(ii) Evidence that public utility services have been investigated.

(b) If adjoining a Public Way:

(i) Evidence of a $10 million dollar public liability insurance policy specifically indemnifying the City of Sydney, valid for at least the

duration of the project. The original document must be submitted to Council.

(ii) Bank guarantee in accordance with the Council's fees and charges. The original document must be submitted to Council.

(c) Prior to commencement of work of the kind to referred to in this Condition:

(i) The location of utility services must be fully surveyed and the requirements of the relevant public utility authority complied with; and

(ii) The following documents must be submitted to and approved Council:

a. Structural drawings and certification as prescribed elsewhere in this consent.

b. Geotechnical report and certification as prescribed elsewhere in this consent.

(d) Prior to occupation of the site, Council must receive written and photographic confirmation that the restoration of the public way has been complete in accordance with the following:

(i) All ground anchors must be de-stressed and isolated from the building prior to completion of the project.

(ii) The temporary structure, including foundation blocks, anchors and piers must be removed above and below the public way, prior to completion of project, down to a depth of 2m.

(iii) All timber must be removed.

(iv) All voids must be backfilled with stabilised sand (14 parts sand to 1 part cement).

(v) All costs for any reinstatement of the public way made necessary because of an unstable, damaged or uneven surface to the public way must be borne by the owner of the land approved for works under this consent.

(e) The Bank Guarantee may be released after the developer submits certification to Council that all the works described in (d) above have been completed and that there is no remaining instability, damage or unevenness to the public domain as a result of the development. This certification is to include relevant photographs and must be to the satisfaction of the Council's Director City Planning.

(22) CONSTRUCTION TRAFFIC MANAGEMENT PLAN

(a) The Construction Traffic Management Plan accompanying this Development Application has not been approved by this consent.

(b) A Construction Traffic Management Plan must be submitted to and approved by Council prior to commencement of works.

(23) STREET TREE PROTECTION

Street trees must be protected during construction works as follows:

(a) Tree trunk and major limb protection must be undertaken prior to or during the installation of any hoarding or scaffoldings. The protection must be installed by a qualified Arborist (AFQ 2 or 3) and must include:

(i) An adequate clearance, minimum 250mm, must be provided between the structure and tree branches, limbs and truck at all times;

(ii) Tree trunk/s and/or major branches, located within 500mm of any hoarding or scaffolding structure, must be protected by wrapped hessian or similar material to limit damage, and

(iii) Timber planks (50mm x 100mm or similar) must be placed around tree trunk/s. The timber planks must be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping. The hessian and timber planks must not be fixed to the tree in any instance, or in any fashion,

(iv) Tree trunk and major branch protection is to remain in place for the duration of construction and development works, and must be removed at the completion of the project.

(b) All hoarding support columns are to be placed a minimum of 300mm from the edge of the existing tree pits/setts, so that no sinking or damage occurs to the existing tree setts. Supporting columns must not be placed on any tree roots that are exposed.

(c) Materials or goods, including site sheds, must not be stored or placed:

(i) around or under the tree canopy; or

(ii) within two (2) metres of tree trunks or branches of any street trees.

(d) Protective fencing (1.8 metre chain wire mesh fencing) must be erected on top of the hoarding to protect branches during the construction works.

(e) Any damage sustained to street tree/s as a result of the erection of hoardings, scaffolding, or due to the loading/unloading of vehicles adjacent the site, must be immediately reported to the Council's Street Tree Contract Coordinator on 9265 9333, in order to determine the appropriate action for maintaining the health and structural integrity of any damaged street tree.

(24) APPLICATION FOR HOARDINGS AND SCAFFOLDING ON A PUBLIC PLACE

(a) A separate application under Section 138 of the Roads Act 1993 is to be made to Council to erect a hoarding and/or scaffolding in a public place and such application is to include:-

(i) Architectural, construction and structural details of the design in accordance with the *Policy for the Design and Construction of Hoarding* (September 1997) and the *Guidelines for Temporary Protective Structures* (April 2001).

(ii) Structural certification prepared and signed by an appropriately qualified practising structural engineer.

Evidence of the issue of a Structural Works Inspection Certificate and structural certification will be required prior to the commencement of demolition or construction works on site.

Assessment of the impacts of construction and final design upon the City of Sydney's street furniture such as bus shelters, phone booths, bollards and litter bins and JCDecaux street furniture including kiosks, bus shelters, phones, poster bollards, bench seats and littler bins. The applicant is responsible for the cost of removal, storage and reinstallation of any of the above as a result of the erection of the hoarding. In addition, the applicant is responsible for meeting any revenue loss experienced by Council as a result of the removal of street furniture. Costing details will be provided by Council. The applicant must also seek permission from the telecommunications carrier (e.g. Telstra) for the removal of any public telephone.

(b) Should the hoarding obstruct the operation of Council's CCTV Cameras, the applicant must relocate or replace the CCTV camera within the hoarding or to an alternative position as determined by Council's Contracts and Asset Management Unit for the duration of the construction of the development. The cost of relocating or replacing the CCTV camera is to be borne by the applicant. Further information and a map of the CCTV cameras is available by contacting Council's CCTV Unit on 9265 9232.

(c) The hoarding must comply with the Councils policies for hoardings and temporary structures on the public way. Graffiti must be removed from the hoarding within one working day.

(25) UTILITY SERVICES

To ensure that utility authorities are advised of the development:

(a) Prior to commencement of works a survey is to be carried out of all utility services within and adjacent to the site including relevant information from utility authorities and excavation if necessary, to determine the position and level of services.

(b) Prior to the commencement of work the applicant is to obtain written approval from the utility authorities (e.g. Energy Australia, Sydney Water, and Telecommunications Carriers) in connection with the relocation and/or adjustment of the services affected by the construction of the underground structure. Any costs in the relocation, adjustment or support of services are to be the responsibility of the developer.

(26) BARRICADE PERMIT

Where construction/building works require the use of a public place including a road or footpath, approval under Section 138 of the Roads Act 1993 for a Barricade Permit is to be obtained from Council prior to the commencement of work. Details of the barricade construction, area of enclosure and period of work are required to be submitted to the satisfaction of Council.

(27) WASTE AND RECYCLING MANAGEMENT - MINOR

The proposal must comply with the relevant provisions of Council's *Policy for* Waste *Minimisation in New Developments 2005* which requires facilities to minimise and manage waste and recycling generated by the proposal.

SCHEDULE 1C

DURING CONSTRUCTION/PRIOR TO OCCUPATION/COMPLETION

(28) LAND CONTAMINATION

The site is to be remediated and validated in accordance with the report prepared by EIS E24387KB-RAP-ver2.6 dated August 2011 and the "Interim Advice" letter from NSW EPA accredited site auditor Andrew Lau JBS41546-17800 dated 4 August 2011. Prior to occupation of the site (O.C.) a Site Audit Statement is to be submitted to Council clearly indicating that the site is suitable for the proposed use. Conditions on the Site Audit Statement shall form part of the consent.

Where the Site Audit Statement is subject to conditions that require ongoing review by the Auditor or Council these should be discussed with Council before the SAS is issued.

Prior to the exportation of waste (including fill or soil) from the site the material should be classified in accordance with the provisions of the Protection of the Environment Operations Act 1997 and the NSW DECC Waste Classification Guidelines, Part 1 Classifying Waste (April 2008). The classification of the material is essential to determine where the waste may be legally taken. The Protection of the Environment Operations Act 1997 provides for the commission of an offence for both the waste owner and the transporter if the waste is taken to a place that cannot lawfully be used as a waste facility for the particular class of waste. For the transport and disposal of Industrial, hazardous or Group A liquid waste advice should be sought from the EPA.

(29) COMPLIANCE WITH ACID SULFATE SOILS MANAGEMENT PLAN (ASSMP)

All recommendations contained within the Acid Sulfate Soils Management Plan submitted by EIS within the Remedial Action Plan reference E24387KB-RAP Ver 2.3-Environmental Investigation Services dated February 2011, must be implemented prior to above ground works commencing.

A statement from a suitably qualified and accredited environmental consultant must be submitted to Council prior to occupation of the building stating that the Acid Sulphate Soils Management Plan by EIS by EIS within the Remedial Action Plan reference E24387KB-RAP Ver 2.3-Environmental Investigation Services dated February 2011 has been implemented in accordance with the 'Acid Sulfate Soils Assessment Guidelines' (ASSMAC August 1998).

(30) USE OF HIGHLY INTRUSIVE APPLIANCES - TIME RESTRICTION.

The operation of high noise intrusive plant and machinery such as pile – drivers, rock breakers and hydraulic hammers and those which are not listed in Groups B, C, D, E or F of Schedule 1 of the City of Sydney Code of Practice for Construction Hours/Noise 1992 and Australian Standard 2436-2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites is restricted to the hours of 09.00am to 1.00pm - 2.00pm to 3.00pm.

All reasonable and feasible steps must be undertaken to ensure that the work, including demolition, excavation and building complies with the *City of Sydney Code of Practice for Construction Hours/Noise 1992* and Australian Standard 2436 - 2010 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'.

(31) HOURS OF WORK AND NOISE – OUTSIDE CBD

The hours of construction and work on the development must be as follows:

(a) All work, including building/demolition and excavation work, and activities in the vicinity of the site generating noise associated with preparation for the commencement of work (eg. loading and unloading of goods, transferring of tools etc) in connection with the proposed development must only be carried out between the hours of 7.30am and 5.30pm on Mondays to Fridays, inclusive, and 7.30am and 3.30pm on Saturdays, with safety inspections being permitted at 7.00am on work days, and no work must be carried out on Sundays or public holidays.

(b) All work, including demolition, excavation and building work must comply with the *City of Sydney Building Sites Noise Code* and Australian Standard 2436 - 1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites".

(32) DEMOLITION, EXCAVATION AND CONSTRUCTION MANAGEMENT

(a) Details of the proposed community consultation strategy to include but not be limited to demonstrating how the public will be notified about the construction phases, intensity and hours, Site Manager contact details, complaints handling strategy, proposed meetings with stakeholders and content of the proposed meetings in order to minimise complaints shall be submitted to Council for review and approval. The approved community consultation strategy shall be implemented throughout the works.

(b) Copies of the complaint logs must be made available to council officers on request.

(c) Before any works are commenced on site the telephone number of an appropriate and readily contactable site worker must be provided to the occupiers of all noise / vibration sensitive receivers in the locality of the site likely to be most affected by intrusive noise/vibration and be on public display.

(d) All machinery and plant being operated on site must be effectively fitted and maintained with acoustic silencing devices or mufflers where possible in order to keep resultant site noise levels to a minimum.

(e) Council has the right to request that further ameliorative measures be taken should it receive sustained complaints concerning excessive noise. This may include the installation of a noise logger, requesting spot noise measurements or other such action as may be considered necessary in order to respond and resolve those complaints.

(33) HAZARDOUS AND INDUSTRIAL WASTE

Hazardous and/or industrial waste arising from the demolition/operational activities must be removed and/or transported in accordance with the requirements of the Department of Environment and Conservation (DEC) and the NSW Work Cover Authority pursuant to the provisions of the following:

(a) *Protection of the Environment Operations Act 1997.*

(b) *Protection of the Environment Operations (Waste) Regulation 1996.*

(c) *Waste Avoidance and Recovery Act 2001.*

(d) *New South Wales Occupational Health & Safety Act 2000.*

(e) *New South Wales Construction Safety Act 1912 (Regulation 84A-J Construction Work Involving Asbestos or Asbestos Cement 1983).*

(f) *The Occupational Health & Safety Regulation 2001.*

(g) *The Occupational Health & Safety (Asbestos Removal Work) Regulation 1996.*

(34) ACCESS DRIVEWAYS TO BE CONSTRUCTED

Approved driveways are to be constructed for all vehicular access to the construction site in accordance with the requirements of Council's "Driveway Specifications" to the satisfaction of Council.

(35) LOADING AND UNLOADING DURING CONSTRUCTION

The following requirements apply:

(a) All loading and unloading associated with construction activity must be accommodated on site.

(b) If, during excavation, it is not feasible for loading and unloading to take place on site, a Works Zone on the street may be considered by Council.

(c) A Works Zone may be required if loading and unloading is not possible on site. If a Works Zone is warranted an application must be made to Council at least 8 weeks prior to commencement of work on the site. An approval for a Works Zone may be given for a specific period and certain hours of the days to meet the particular need for the site for such facilities at various stages of construction. The approval will be reviewed periodically for any adjustment necessitated by the progress of the construction activities.

(d) In addition to any approved construction zone, provision must be made for loading and unloading to be accommodated on site once the development has reached ground level.

(e) The structural design of the building must allow the basement and/or the ground floor to be used as a loading and unloading area for the construction of the remainder of the development.

(36) NO OBSTRUCTION OF PUBLIC WAY

The public way must not be obstructed by any materials, vehicles, refuse, skips or the like, under any circumstances. Non-compliance with this requirement will result in the issue of a notice by Council to stop all work on site.

(37) USE OF MOBILE CRANES

The following requirements apply:

(a) Mobile cranes operating from the road must not be used as a method of demolishing or constructing a building.

(b) For special operations including the delivery of materials, hoisting of plant and equipment and erection and dismantling of on site tower cranes which warrant the on-street use of mobile cranes, permits must be obtained from Council for the use of a mobile crane. The permits must be obtained 48 hours beforehand for partial road closures which, in the opinion of Council will create minimal traffic disruptions and 4 weeks beforehand in the case of full road closures and partial road closures which, in the opinion of Council, will create significant traffic disruptions.

(c) Special operations and the use of mobile cranes must comply with the approved hours of construction. Mobile cranes must not be delivered to the site prior to 7.30am without the prior approval of Council.

(38) COVERING OF LOADS

All vehicles involved in the excavation and/or demolition process and departing the property with demolition materials, spoil or loose matter must have their loads fully covered before entering the public roadway.

(39) VEHICLE CLEANSING

Prior to the commencement of work, suitable measures are to be implemented to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving the site. It is an offence to allow, permit or cause materials to pollute or be placed in a position from which they may pollute waters.

SCHEDULE 2
PRESCRIBED CONDITIONS

The prescribed conditions in accordance with Division 8A of the *Environmental Planning and Assessment Regulation 2000* apply:

Clause 98	Compliance with *Building Code of Australia* and insurance requirements under the *Home Building Act 1989*
Clause 98A	Erection of signs
Clause 98B	Notification of *Home Building Act 1989* requirements
Clause 98C	Conditions relating to entertainment venues
Clause 98D	Conditions relating to maximum capacity signage
Clause 98E	Conditions relating to shoring and adequacy of adjoining property

Refer to the NSW State legislation for full text of the clauses under Division 8A of the *Environmental Planning and Assessment Regulation 2000*. This can be accessed at: http://www.legislation.nsw.gov.au

SCHEDULE 3

TERMS OF APPROVAL

The Terms of Approval for Integrated Development as advised by NSW Office of Water are as follows:

1. **General and Administrative Issues.**

   (a) Groundwater shall not be pumped or extracted for any purpose other than temporary construction dewatering.

   (b) Pumped water (tailwater) shall not be allowed to discharge off-site (eg adjoining roads, stormwater system, sewerage system, etc) without the controlling authorities approval and/or owners consent.

   (c) The licensee shall allow (subject to Occupational Health and Safety Provisions) the NSW Office of Water or any person authorised by it, full and free access to the works (excavation or bore/borefield), either during or after construction, for the purpose of carrying out inspection or test of the works and its fittings and shall carry out any work or alterations deemed necessary by the NSW Office of Water for the protection and proper maintenance of the works, or the control of the water extracted to prevent wastage and for the protection of the quality and prevention from pollution or contamination of the groundwater.

   (d) If a work is abandoned at any time the licensee shall notify the NSW Office of Water that the work has been abandoned and seal off the aquifer by such methods as agreed to or directed by the NSW Office of Water.

   (e) Suitable documents are to be supplied to the NSW Office of Water of the following:
   - A report of prediction of the impacts of pumping on any licensed groundwater users or groundwater dependent ecosystems in the vicinity of the site. Any adverse impacts will not be allowed and the project will need to be modified.
   - A report of assessment of the potential for salt water intrusion to occur as a result of the dewatering. This report is only required for sites within 250m of any marine or estuarine foreshore area. The generation of conditions leading to salt water intrusion will not be allowed, and the proposal will need to be modified.
   - Descriptions of the methods used and actual volume of groundwater to be pumped (kilolitres/megalitres) from the dewatering works, the works locations, the discharge rate (litres per second), duration of pumping (number of days/weeks), the amount of lowering of the water table and the anticipated quality of the pumped water.
   - Descriptions of the actual volume of pumped water (tailwater) to be reinjected (kilolitres/megalitres), the reinjection locations, the disposal rate (litres per second), duration of operation (number of days/weeks) and anticipated quality of treated water to be reinjected.
   - Monitoring of groundwater levels (minimum of 3 weekly measurements of depth to water at a minimum of 3 locations broadly distributed across the site) beneath the proposed development site prior to construction. This requirement is only for sites where the proposed structure shall extend greater than one floor level into the existing ground level.

2) Specific Conditions.

(a) The design and construction of the structure must preclude the need for permanent dewatering.

(b) The design and construction of the structure that may be impacted by any watertable must include a water proof retention system (i.e. a fully tanked structure) with adequate provision for future fluctuations of water table levels. (It is recommended that a minimum allowance for a water table variation of at least +/-1.0 metre beyond any expected fluctuation be provided). The actual water table fluctuation and fluctuation safety margin must be determined by a suitably qualified professional.

(c) Construction methods and material used in and for construction are not to cause pollution of the groundwater.

(d) Monitoring of groundwater levels is to be continued at least weekly during the construction stage and at least weekly over a period of at least 2 months following cessation of dewatering, with all records being provided to the NSW Office of Water on expiration of the licence. This requirement is only for sites where the proposed structure shall extend greater than one floor level into the existing ground level.

(e) Groundwater quality testing must be conducted (and report supplied to the NSW Office of Water). Samples must be taken prior to the commencement of dewatering, (and ongoing to the satisfaction of the NSW Office of Water for any extraction and reinjection activities). Collection and testing and interpretation of results must be done by suitably qualified persons and NATA certified laboratory identifying the presence of any contaminants and comparison of the data against accepted water quality objectives or criteria.

(f) Discharge of any contaminated pumped water (tailwater) that is not to be reinjected, must comply with the provisions of the *Protection of the Environment Operations Act 1997* and any requirements of the relevant controlling authority. The method of disposal of pumped water (i.e. street drainage to the stormwater system or discharge to sewer) and written permission from the relevant controlling authority must be presented to the NSW Office of Water in support of the licence application.

(g) Discharge of any contaminated pumped water (tailwater) that is to be reinjected, must comply with the provisions of the *Protection of the Environment Operations Act 1997*. The quality of any pumped water (tailwater) that is to be reinjected must be compatible with, or improve the intrinsic or ambient groundwater in the vicinity of the reinjection site. Contaminated groundwater is not to be reinjected into any aquifer. The following must be demonstrated in writing:

- The treatment to be applied to the pumped water (tailwater) to remove any contamination.
- The measures to be adopted to prevent redistribution of any contamination in the groundwater system. Any reinjection proposal that is likely to further spread contamination within the groundwater system will not be allowed and the project will need to be modified.
- The means to avoid degrading impacts on the identified beneficial use of the groundwater. Any reinjection proposal that is likely to lower the identified beneficial use of a groundwater system will not be allowed and the project will need to be modified.

(h) Written advice be provided from the Certifying Authority to the NSW Office of Water to certify that the following ground settlement issues have been addressed in reports submitted by the proponent:

- Assessment by a suitably qualified geotechnical professional that the proposed dewatering activity does not pose an unacceptable risk of off-site impacts such as damage to surrounding buildings or infrastructure as a result of differential sediment compaction and surface settlement during and following pumping of groundwater.
- Settlement monitoring activities to be undertaken prior to, during and for the required period of time following the dewatering pumping to confirm the impact predictions.
- Locations of settlement monitoring points, and schedules of measurement.

3) Formal Application Issues.

(a) An application must be completed on the prescribed form for the specific purpose of temporary construction dewatering and a licence obtained from the NSW Office of Water prior to the installation of the groundwater extraction works. A plan drawn to scale will be required with the application clearly identifying the location of the dewatering installations.

(b) Upon receipt of a Development Consent from Council of the City of Sydney, a fully completed licence application form, unambiguous documentation of the means by which the below-ground areas of the development will be designed and constructed to prevent any groundwater seepage inflows (and therefore preclude any need for permanent or semi-permanent pumping), together with all other required supporting information, the NSW Office of Water will issue a Water Licence under Part 5 of the *Water Act, 1912*.

(c) A licence application under Part 5 of the *Water Act 1912* must be accompanied by a $151.00 fee and must specify the proposed volume of groundwater to be pumped in total (megalitres). The licence is also subject to administrative charges as determined from time to time by the Independent Pricing and Regulatory Tribunal (IPART).

NOTICE OF DETERMINATION – APPROVAL D/2011/882

The Terms of Approval as advised by RailCorp are as follows:

1. All works are to be implemented, carried out and monitored in accordance with submitted and approved documentation.

2. There is to be no penetration or excessive loads placed on Mary Ann Street without prior services searches being carried out and should any RailCorp service be identified within a zone of influence of at least two metres from the proposed works, then those works are not to proceed without prior receipt of RailCorp written approval.

3. Should any works in Omnibus Lane have potential to involve exposure of redundant RailCorp cables then RailCorp is to be notified at least five (5) working days in advance and those works are not to commence until advised by RailCorp. RailCorp contant for this notification is Mr Victor Cornelio on telephone number (02) 9752 8201.

IMPORTANT ADDITIONAL INFORMATION

A Review of this determination by the *Small Permits Appeal Panel* must be made in writing. An application form is available at the One Stop Shop.

The Environmental Planning and Assessment Act 1979 requires you to:

1. Obtain a ***Construction Certificate*** prior to the commencement of any works. An application may be lodged with Council, or you may apply to a private accredited certifier for a Construction Certificate. An accredited certifier **must obtain Council's approval** to certain conditions of this development consent, where indicated before issuing the Construction Certificate.

2. Nominate a ***Principal Certifying Authority*** (PCA) which may be either Council or an accredited certifier and notify Council of that appointment. You **cannot lawfully** commence works without complying with this requirement.

3. Give Council at least two days notice of your intention to commence the erection of a building **before** commencing construction works. You cannot lawfully commence works without complying with this requirement.

4. Obtain an ***Occupation Certificate*** before commencing occupation or commencing to use the building or on the completion of other works including the erection of a sign. You cannot lawfully commence occupation or the use of a building without complying with this requirement.

You may also need to:

5. Lodge an ***Application for Approval*** under Section 68 of the *Local Government Act 1993* for an activity under that Act, including the **erection of a hoarding.**

6. Lodge an ***Application for Subdivision*** to obtain a ***Subdivision Certificate*** if a land (including stratum) subdivision is proposed and an Application for Subdivision to obtain ***Strata Title Subdivision*** under the relevant Strata Titles Act, if strata title of the development is proposed.

7. Comply with the Food Act 2003, the Australia New Zealand Food Standards Code, Australian Standard 4674 – 2004, and register the business with Council if the premises is used for the manufacture, preparation, packing, storing, conveying or delivering of food or beverage for sale.

8. Contact Sydney Water, Rockdale (Urban Development Section) regarding the water and sewerage services to this development.

9. Carry out critical stage inspections in accordance with Section 109E of the EP&A Act 1979 and clauses 162A, 162B and 163 of the EP&A Regulation 2000.

Applications and submissions referred to in this consent may be lodged at:
CBD Level 2, Town Hall House, 456 Kent St, Sydney.
KINGS CROSS 50-52 Darlinghurst Rd, Kings Cross.
GLEBE Customer Service Centre, 186 Glebe Point Rd, Glebe.
If you have any enquiries on any aspect of this consent, contact Kate Bartlett ph. 9265 9200, email kbartlett@cityofsydney.nsw.gov.au.