Transport and Accessibility Impact Assessment

Australian Museum Additions and Alterations

Prepared for Australian Museum / 9 October 2018

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Taylor Thomson Whitting (NSW) Pty Ltd, Consulting Engineers | ABN 81 113 578 377
Level 3, 48 Chandos Street, St Leonards NSW 2065 | +612 9439 7288 | ttw.com.au

Structural
Civil
Traffic
Facade
Consulting
Engineers

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Revision Register

Rev	Date	Prepared By	Approved By	Remarks
0	10/07/18	GC	PY	Preliminary Draft
0.1	17/08/18	GC	PY	For review
1	18/10/09	GC	PY	For issue

Executive Summary

This report provides an assessment of the proposed Australian Museum Additions and Alterations development. The proposed works include major refurbishment of the existing Museum to provide additional exhibition and queueing space and public domain works to increase connectivity of the Museum.

This report aims to respond to the Secretary's Environmental Assessment Requirements by covering the existing conditions on site and how the proposed development impacts the site from a traffic, parking and access point of view.

During the preparation of this report, consultation with Roads and Maritime Services (RMS), City of Sydney Council and Transport for New South Wales (TfNSW) has been undertaken. A meeting was held with these authorities (minutes from this meeting are attached in Appendix F).

The following key items are identified within this report:

- The development proposes an additional pedestrian access point from William Street intended for use by groups. To support this new entry, a bus drop off is proposed on William Street that will result in the removal of four on street parking spaces.
- The development will not result in a significant increase in visitor, staff or service vehicle trips. During peak activities it is not anticipated that a significant number of vehicle trips will be generated to the Museum.
- The Museum currently experiences a low incidence of private vehicle usage across visitors and staff. A Green Travel Plan has been prepared by the Museum to encourage public and active transport use.
- No additional car parking is proposed as part of the development. This is considered acceptable due to City of Sydney's Development Control Plan (DCP) having no minimum requirement, the low incidence of private vehicle usage and the low increase in vehicular trips expected.
- Traffic movements near to the site generally operate at an acceptable Level of Service. It is not anticipated that this development will significantly impact the operation of the surrounding road network.
- No additional vehicular access points or loading facilities are proposed. Loading facilities are proposed to be improved during future works at the Museum as part of the wider master plan.

1.0 Introduction

1.1 Background

Taylor Thomson Whitting (TTW) has been engaged by the Australian Museum ('Museum') to provide advice relating to traffic, parking and access in relation to the Australian Museum Additions and Alterations redevelopment.

The Additions and Alterations redevelopment forms a part of the Museum's wider Australian Museum Master Plan Project. This Transport and Accessibility Impact Assessment has been developed in response to the Secretary's Environmental Assessment Requirements for the site, which have been detailed in Section 2.0 of this report. It is worth noting that while this report makes reference to the wider Master Plan, it largely considers the proposed development in isolation to the Museum's future development.

The proposed Additions and Alterations redevelopment involves an renewal and refurbishment of the existing Museum to provide greater exhibition space and improved pedestrian access to the Museum.

1.2 Structure

This report is divided into the following sections:

Section 1.0 gives an overview of the report.

Section 2.0 provides a detailed response to each of the project SEARs.

Section 3.0 includes the background and aim of the study.

Section 4.0 covers the existing conditions at the site.

Section 5.0 provides a summary and conclusions.

1.3 References

The following documents have been reviewed during the preparation of this report:

- City of Sydney's Development Control Plan 2012 and Local Environmental Plan 2012
- NSW Long Term Transport Master Plan 2012
- Guide to Traffic Generating Developments (Roads and Maritime Services)
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development
- Relevant Australian Standards
- NSW Planning Guidelines for Walking and Cycling
- NSW Bike Plan 2010
- NSW Long Term Transport Master Plan 2012
- Sydney's Cycling, Walking, Rail and Bus Futures 2013
- Sydney City Centre Access Strategy
- Australian Museum Annual Report 2014-15
- Australian Museum Accommodation Plan and User Requirements Brief 2016
- City of Sydney's strategic planning documents including:
    - Sustainable Sydney 2030
    - Central Sydney On Street Parking Policy

- Connecting Our City
- Sustainable Sydney 2030
- Cycle Strategy and Action Plan 2007-2017
- Walking Strategy and Action Plan 2015-2030
- Sydney's Liveable Green Network

2.0 Response to Secretary's Environmental Assessment Requirements

Under application number SSD 9452 we have been provided with Secretary's Environmental Assessment Requirements (SEARs). These requirements were issued on the 27th July 2018 following consultation with relevant stakeholders. The key issues relevant to a Transport and Accessibility Impact Assessment include those shown in Table 2.1.

Table 2.1: Response to SEARs

No	Issue	Comments and References
7	**Public domain and public access**	
7 (iii)	Identify any changes to street kerb and parking arrangements	There will be a loss of four on street metered parking spaces as a result of the development. Refer to Section 4.4.1.
7 (iv)	Provide a detailed study that tests options for the location and layout of the primary entry, equitable public access and circulation. The study should demonstrate how the proposal considers and integrates the future development and expansion of the Museum	A study of the proposed location of the bus drop off has been conducted from a traffic engineering perspective. This review has been attached in Appendix D.
8	**Transport, traffic, parking and access**	
	A transport and accessibility impact assessment prepared in accordance with the relevant guidelines identifying:	
	<u>Operation</u>	
8 (i)	Current daily and peak hour traffic generation (light and heavy vehicles), coach facilities, public transport, walking and cycling movements, existing traffic and transport facilities located within the vicinity of the proposed development	Refer to the following sections for trip generation: ▪ Section 3.9 for loading and service vehicle movements. ▪ Section 4.3 for coach pick up and drop off. ▪ Section 3.5.1, 3.6.2 and 3.7.2 for traffic, pedestrian and cyclist volumes, and Section 4.6.1, 4.6.2, 4.7 and 4.8 for trip generation of the site.
8 (ii)	Estimated daily and peak hour traffic generation (light and heavy vehicle), coach facilities, public transport, point to point transport, walking and cycling trip generation during operation	The Sections discussed in point 8 (i) also cover the anticipated trip generation during operation.

No	Issue	Comments and References
8 (iii)	An assessment of the impact of additional traffic generated by the proposed development on the existing road network and bus service operation	It is not anticipated that the project will result in a significant impact to the road network and bus service operation: ▪ The intersections near to the site are currently operating at a high Level of Service during peak periods. ▪ The Museum currently experiences a low rate of private vehicle usage (approximately 30%) and has a Green Travel Plan to maintain this low rate. ▪ The project is resulting in a relatively low increase in vehicular trips (refer to Section 4.8).
8 (iv)	An assessment of the existing and future pedestrian and cycle facilities within the vicinity of the site and identify measures to manage the likely future increase in public transport, pedestrian and cycle demands of the proposed development	The Museum is proposing to introduce a new entrance to separate group and general public entry, as well as additional queuing area for ticketing. This will ensure limited impacts to the pedestrian footpaths adjacent to the Museum. The bus drop off proposed will reduce the need for groups to traverse lengths of public footpath. Given the substantial public transport within the area, it is not anticipated that the increase in trips by the Museum will result in significant impacts. Refer to Section 4.7. The Museum experiences a low incidence of bicycle usage by visitors, and as there is only a minor increase in staff expected, there will not be significant impacts to the cycle network (Section 4.6.2).

No	Issue	Comments and References
8 (v)	An assessment of the parking, loading and servicing demand and capacity for the proposed development in accordance with appropriate parking codes and justification for the amount of car parking, loading and servicing facilities provided for the proposed development	While no improvements are proposed to the loading dock as part of this development, the Museum's masterplan includes additional loading facilities accessed from Yurong Street. The development does not propose any additional parking. This is considered acceptable due to the low incidence of private vehicle usage. Refer to Section 4.4.2.
8 (vi)	Appropriate bicycle parking provisions including end-of-trip facilities considering the availability of public transport and the requirements of the relevant parking codes and Australian Standards	A limited number of additional cyclist trips are expected to be generated by the project (Section 4.6.2). The Museum currently contains end of trip facilities (showers and change rooms) and bicycle parking for staff and visitors.
8 (vii)	Sustainable travel initiatives for staff and visitors, particularly for the provision of green travel plans and wayfinding strategies	The Museum has a Green Travel Plan with initiatives to encourage sustainable travel.
8 (viii)	Location of pedestrian and bicycle parking facilities in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance	The Museum has existing bicycle parking facilities that are not proposed to be modified as part of this development. These locations are highly used by staff.
8 (ix)	Access to, from and within the site from the road network including intersection locations, design and sight distance (i.e. turning lanes, swept paths, sight distance requirements)	Turning paths of the existing loading dock have been provided in Appendix E. No additional site access points are proposed as part of this development.
8 (x)	Service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times)	Existing and proposed service vehicle access points are detailed in Sections 3.9 and 4.9 respectively. Limited impacts are expected during day to day operations.

No	Issue	Comments and References
8 (xi)	Proposed access arrangements including vehicle access, drop-off arrangements (including coaches and point to point transport), service vehicles, emergency vehicles and loading areas for the development and measures to mitigate any associated traffic, public transport, pedestrian and bicycle networks impacts	Access points are largely unaffected by the development. A new pedestrian access for groups is proposed adjacent to a proposed bus drop off on William Street. As the development will not result in a significant increase in trips, it is not anticipated that any mitigation measures will be required.
8 (xii)	An assessment of predicted impacts on road safety	There are no additional access points proposed as part of the development. The proposed bus drop off will increase road safety as it will reduce the incidence of illegal coach parking on College Street.
	<u>Construction</u>	
8 (xiii)	An assessment of traffic and transport impacts during construction and how these impacts will be mitigated for any associated traffic, pedestrians, cyclists (particularly along William Street) and public transport services, including the preparation of a draft Construction Pedestrian Traffic Management Plan. This Plan shall include vehicle routes, truck numbers, construction program, works zone location, hours of operation, access arrangements, cumulative impacts of other development. Existing CPTMPs for developments within or around the development site should be referenced in the CPTMP to ensure that coordination of work activities are managed to minimise impacts on the transport network.	A Preliminary Construction Pedestrian Traffic Management Plan has been prepared and submitted as part of this Environmental Impact Statement. It is noted that a detailed CPTMP cannot be developed without the appointment of a builder and consideration of all final design selections. A detailed CPTMP will be prepared prior to construction of the development.
8 (xiv)	Details of construction vehicle routes, peak hour and daily truck movements, hours of operation, access arrangements at all stages of construction and traffic control measures for all works	Construction vehicle routes have been proposed within the Preliminary CPTMP. As a builder is not yet on board for the development specific details on staging of works and number of truck movements cannot be known at this stage.

No	Issue	Comments and References
8 (xv)	An assessment of construction impacts on road safety at key intersections and locations for potential pedestrian, vehicle and bicycle conflicts	Road safety has been addressed within the Preliminary CPTMP.
8 (xvi)	Details of access arrangements for workers, emergency services and the provision for safe and efficient access for loading and deliveries	This has been addressed within the Preliminary CPTMP. Further details on the site layout cannot be addressed until a builder has been appointed.

3.0 Existing Conditions

3.1 Site Location

The Australian Museum is located within the Sydney Central Business District (CBD) and is bounded by William Street to the north, College Street to the west, Yurong Street to the east and Sydney Grammar School to the south. Refer to Figure 3.1 for the site location.

The Museum has occupied the site since 1857, undergoing multiple modifications to cater to its growth. The Australian Museum Additions and Alterations project aims to redevelop part of the eastern portion of the site.

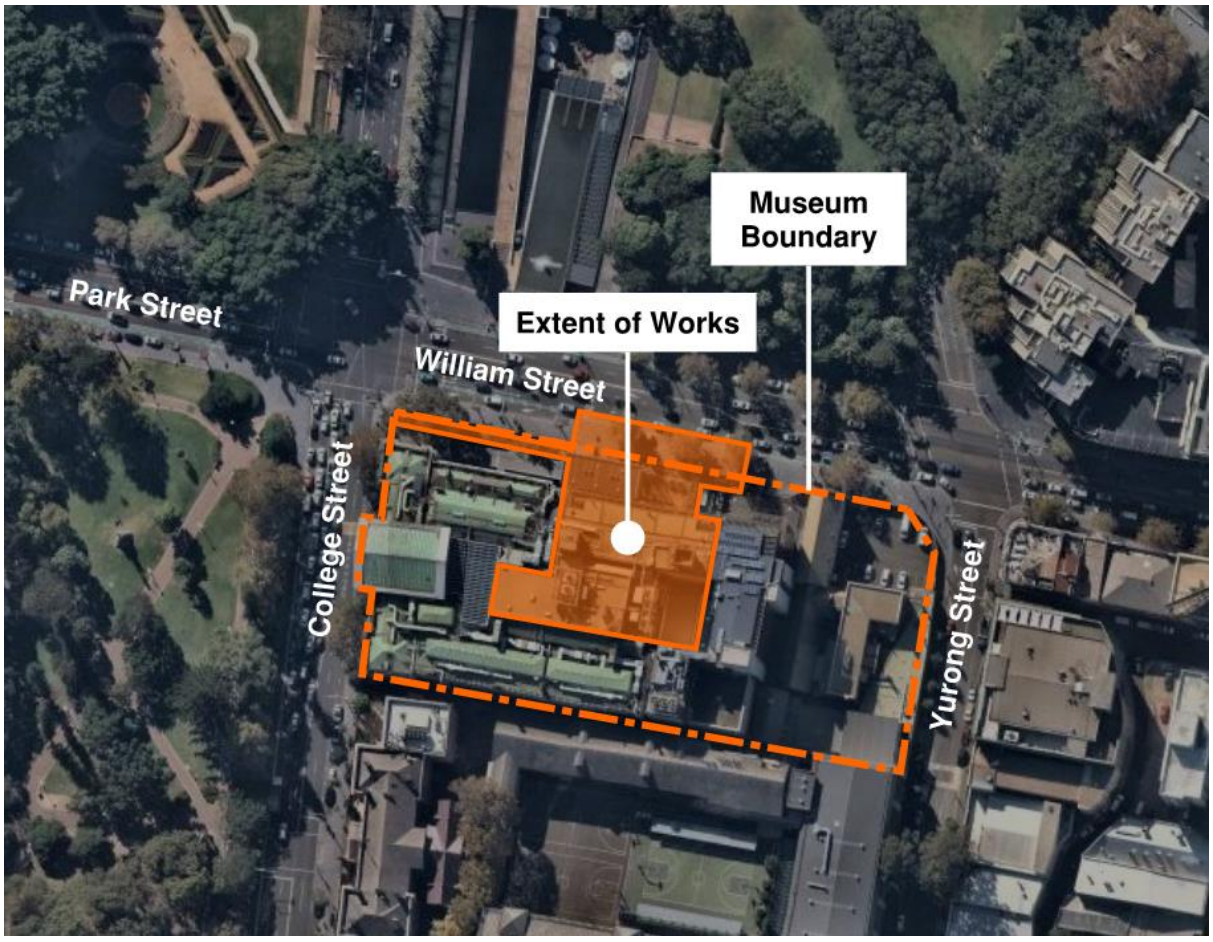

Figure 3.1: Site Location

3.2 Site Access

Vehicular entry for the Museum's fleet vehicles is accessed by Yurong Street. Entry into this car parking area is restricted by security gates and proximity cards.

Loading access currently occurs from William Street. The current arrangement allows for vehicles to enter and exit the site in a forward direction, excluding semi-trailers which are required to manoeuvre across William Street to reverse into the loading dock. Refer to Appendix E for service vehicle swept paths.

3.3 Travel Mode

3.3.1 Visitors

An intercept survey was conducted by TTW with visitors to the site on the 22nd and 23rd of July, 2016. A total of 208 responses were collected via face-to-face interview at the entrance of the Museum.

This survey was supplemented by a survey conducted by Cappre on the 22nd, 23rd, 30th and 31st of July and the 7th, 8th, 15th, 16th, 23rd and 24th of August, 2016. This survey included questions related to travel and focused on overseas and interstate visitors to the Museum. The survey captured 393 responses that had relevance to this report.

Therefore, a total of 601 visitor responses were received in relation to travel modes.

Travelling from within NSW

A total of 164 respondents travelled from within NSW. The most common transport modes to the Museum by local visitors were public transport (47%), private vehicles (33%) and walking (17%).

The average length of stay was 2 hours and 6 minutes.

Those travelling by private vehicle had an average occupancy rate of 3.2 people per car and were more likely to be travelling from the North or West of the Museum.

Interstate Visitors

There were a total of 106 interstate responders, with the majority (67%) staying within the inner city. The most common transport modes were walking (57%) and public transport (34%). Only 9% of interstate visitors travelled by private vehicle.

The average length of stay was 2 hours and 8 minutes.

The private vehicle occupancy rate was 3.5 people per car and the majority (73%) parked in off street locations.

International Visitors

There were a total of 331 international responders to the survey. The majority (68%) of these visitors were staying within the inner city. The most common transport modes to the Museum were walking (61%) and public transport (33%). Only 7% of international visitors travelled by private vehicle.

The average length of stay was 2 hours and 23 minutes.

Those travelling by private vehicle had an occupancy rate of 3.9 people per car and were more likely to park in off street spaces.

3.3.2 Staff

A staff travel mode survey was conducted via an online survey to determine staff travel patterns to the site. The survey was sent out to staff through email and was available from the 8th to the 19th of August. The survey received 154 responses.

The average length of stay of the staff at the Museum was 8 hours and 5 minutes. The staff had arrival and departure patterns as shown in Figure 3.2.

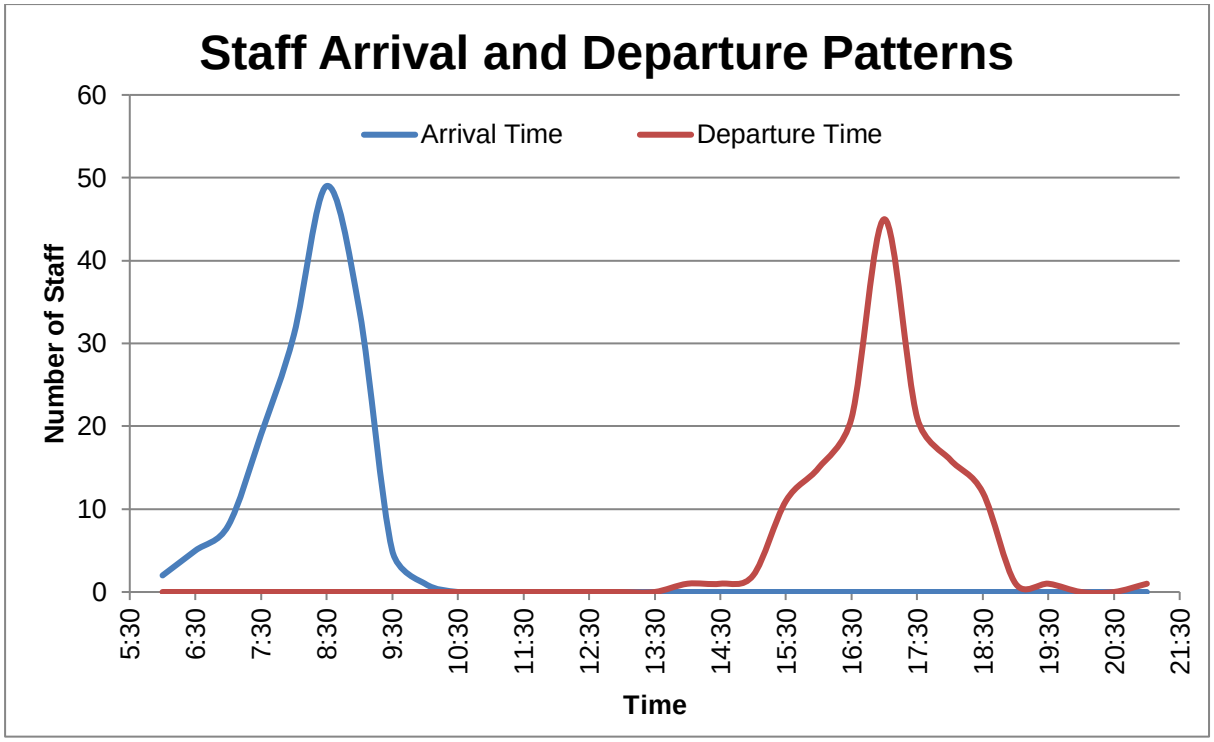

Figure 3.2: Staff Arrival and Departure Patterns

The majority of staff used public transport and active travel as their final mode of transport to the Museum, the most common modes being walking (37%) and train (36%). Refer to Figure 3.3 for a breakdown of the final travel mode.

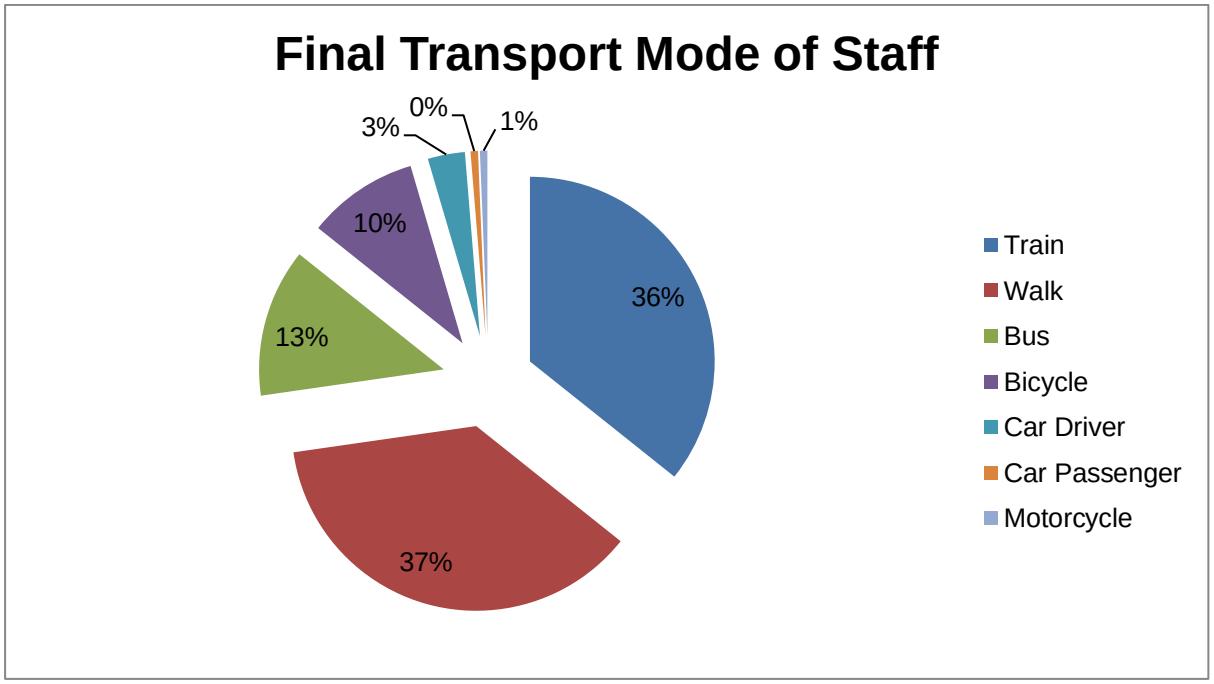

Figure 3.3: Final Travel Mode of Staff

Of the 154 respondents, 41 used a private vehicle as a driver or passenger at some point during their trip to work. However, only 6 respondents used a private vehicle as their final mode of transport, suggesting that these vehicles are largely used outside of the CBD. This represents a low rate of private vehicle usage among staff. The vehicle occupancy rate was 1.6 people per car.

The majority (86%) of those travelling by car, motorcycle or bicycle chose to park in off street parking spaces. Bicycle travellers largely used the Museum's provided bicycle staff parking.

The most common direction the Museum staff travelled from was west of the Museum (35%). Refer to Figure 3.4 for a summary of approach direction of staff.

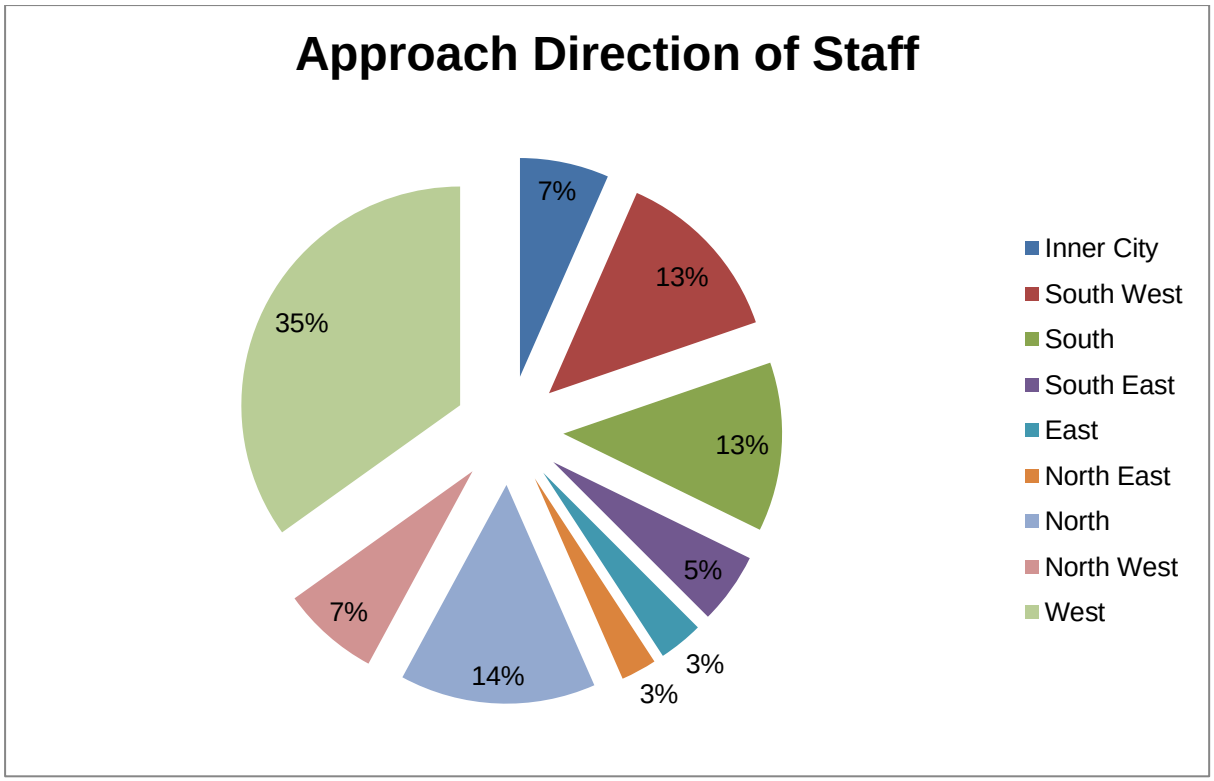

Figure 3.4: Approach Direction of Staff

3.4 Car Parking

3.4.1 On Street Parking

Most streets surrounding the Museum contain metered on street parking including along William Street, College Street and Yurong Street.

On street parking within the vicinity of the Museum ranges from $4.70 to $7.00 per hour during peak hours and $2.70 to $3.70 during off peak hours.

3.4.2 Off Street Parking

The Australian Museum does not provide off street parking on site. However, there is a provision of discounted parking located within the Hilton Sydney Hotel, Pitt Street. This parking is located approximately 10 minutes' walk to the north east of the Museum. Parking is provided at a rate of $15 for up to 3 hours and $20 for stays longer than 3 hours.

There are numerous private car parks located near to the Museum with varying rates. Refer to Figure 3.5 for the location of these car parks.

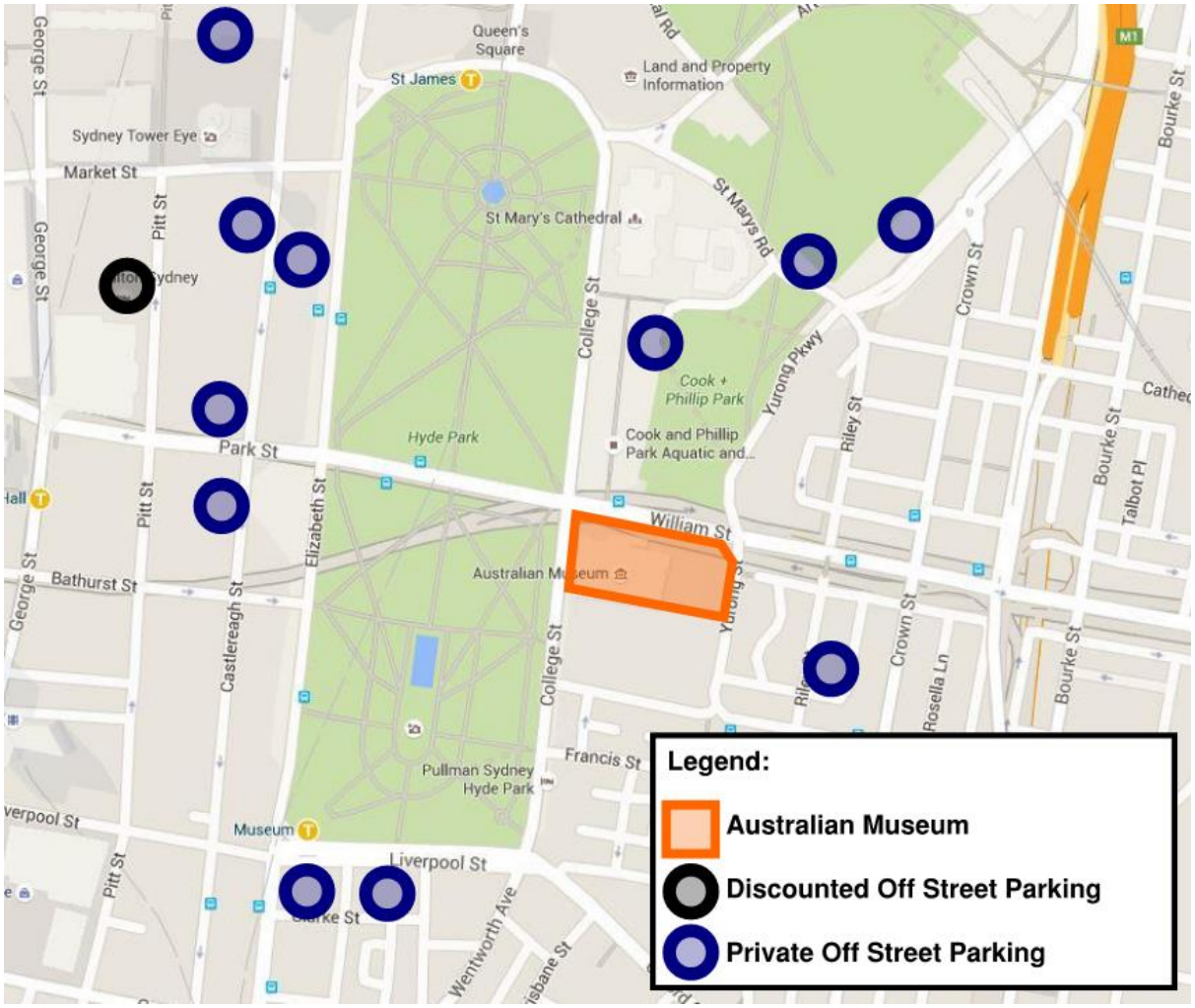

Figure 3.5: Off Street Parking Locations

3.5 Traffic Conditions

3.5.1 Traffic Volumes

Through site inspections of the surrounding road network of the Museum, it has been observed that the area currently experiences congestion due to its location in the CBD. A survey of existing traffic was completed on the 23rd and 25th of June and the 9th and 12th of July, 2016. During the 25th of June the Museum had a weekend of free admission and experienced high demand. This allowed for analysis of the intersections near to the site during school holidays, during 'normal' operation and during a major event at the Museum.

The survey identified traffic and pedestrian volumes per hour for the given intersections and identified both the AM and PM demand peaks. From these counts, traffic volumes for morning and afternoon peak hours were determined.

As the traffic count data was obtained in mid-2016, a growth factor of 2% has been applied to estimate the traffic and pedestrian conditions in 2018. This represents a conservative projection as RMS Count data indicates that traffic volumes within the CBD have remained relatively consistent for the past few years. For example, the nearby RMS traffic counter located on Crown Street has experienced a trend of decreasing traffic volumes since 2011 (see Figure 3.6).

Traffic count data from 2016 has been attached in Appendix A.

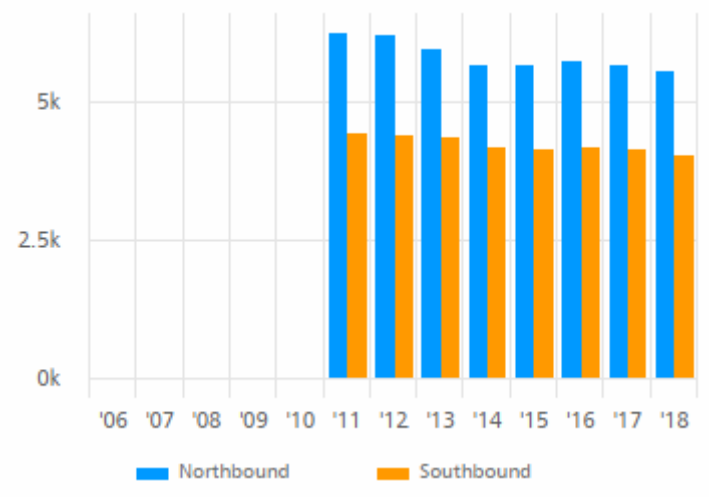

Figure 3.6: Crown Street near William Street Traffic Count Graph
Source: RMS Traffic Volume Viewer

3.5.2 Intersection Modelling

SIDRA intersection modelling has been completed for the selected intersections under projected 2018 conditions. The results are summarised in Table 3.1 and detailed results are attached in Appendix B of this report. Phasing diagrams provided by RMS were used to model the signalised intersections (see Appendix C for the phasing diagrams used).

It is noted that the majority of the nearby intersections operate at an acceptable Level of Service of 'A', 'B' or 'C'. While the intersection of College Street and Stanley Street operates at a Level of Service 'E' or 'F', it is considered acceptable for the following reasons:

- The Level of Service reported is based on the worst movement of the intersection. The worst performing movement at this intersection is a right turn out of Stanley Street onto College Street. College Street is the main vehicular route which should have preference for vehicular flows.
- All other vehicle movements are operating at Levels of Service of 'A' or 'B' in all scenarios. This includes movements along College Street.
- In all scenarios less than 10 vehicles per hour were travelling along this movement.
- It is likely that drivers will choose to turn left instead of right out of Stanley Street if they experience significant delays.

Table 3.1: Pre Development Intersection Operation

Intersection	AM Weekday Peak		PM Weekday Peak		Saturday Peak	
	LoS	Ave Delay (sec)	LoS	Ave Delay (sec)	LoS	Ave Delay (sec)
William Street, College Street and Park Street	C	35.1	C	41.3	C	33.1
William Street, Yurong Street and Boomerang Place	B	18.5	B	14.5	B	18.9
College Street and Stanley Street	F	110.2	F	143.1	E	69.0
Stanley Street and Yurong Street	A	8.1	A	7.7	A	7.3

3.6 Pedestrian Travel

3.6.1 Facilities

There are currently two main pedestrian access points into the Museum. The main entrance is from William Street, with additional access from College Street. The College Street access point is not available for public access and is largely used as an emergency exit. There is a high level of pedestrian amenity around the site, with pedestrian footpaths located as follows:

- Both kerbsides of College Street contain footpaths approximately 3.3 metres wide.
- The southern kerbside of William Street contains a footpath approximately 4.3 metres wide.
- The northern kerbside of William Street contains wide footpaths of 6 metres.
- Both kerbsides of Yurong Street contain footpaths approximately 2.3 metres wide.

There are additional access points to the Museum for staff only along William Street and Yurong Street. These locations are restricted by swipe card access.

The City of Sydney has an increasing focus on encouraging walking for trips made within the CBD, including initiatives such as a pedestrian only zone along George Street and the Liveable Green Network Plan which aims to improve pedestrian connectivity between major attractors within the CBD. This includes widening footpaths, improving lighting and increasing landscaping attractions.

3.6.2 Volumes

A pedestrian volume count was conducted simultaneously with the traffic and cyclist counts. It was found that out of the four nearby intersections that were analysed, the College Street and William Street intersection experiences the most significant pedestrian traffic. The fay with the greatest pedestrian volumes coincided with the free admission event at the Museum. The most heavily trafficked pedestrian routes are those crossing College Street, suggesting that the pedestrians are more likely to travel in an east-west direction in the area.

Table 3.2: College Street and William Street Intersection Peak Pedestrian Volumes

Day of Counts	Peak Hour	Peak Hour Pedestrian Volumes
Thursday 23rd June	8:00-9:00am	1,445
Saturday 25th June	11:30am-12:30pm	2,034
Saturday 9th July	12:00-1:00pm	1,551
Tuesday 12th July	8:30-9:30am	1,092

3.7 Cyclist Travel

3.7.1 Facilities

Cycleways leading to and around the Museum are shown in Figure 3.7. The site is well serviced by cycle facilities, with dedicated cycle lanes along William Street. There are several cycleways near to the site as shown in Figure 3.7. On road bicycle lanes are located on William Street and Park Street. Parts of Stanley Street and Yurong Street are marked on road bicycle routes.

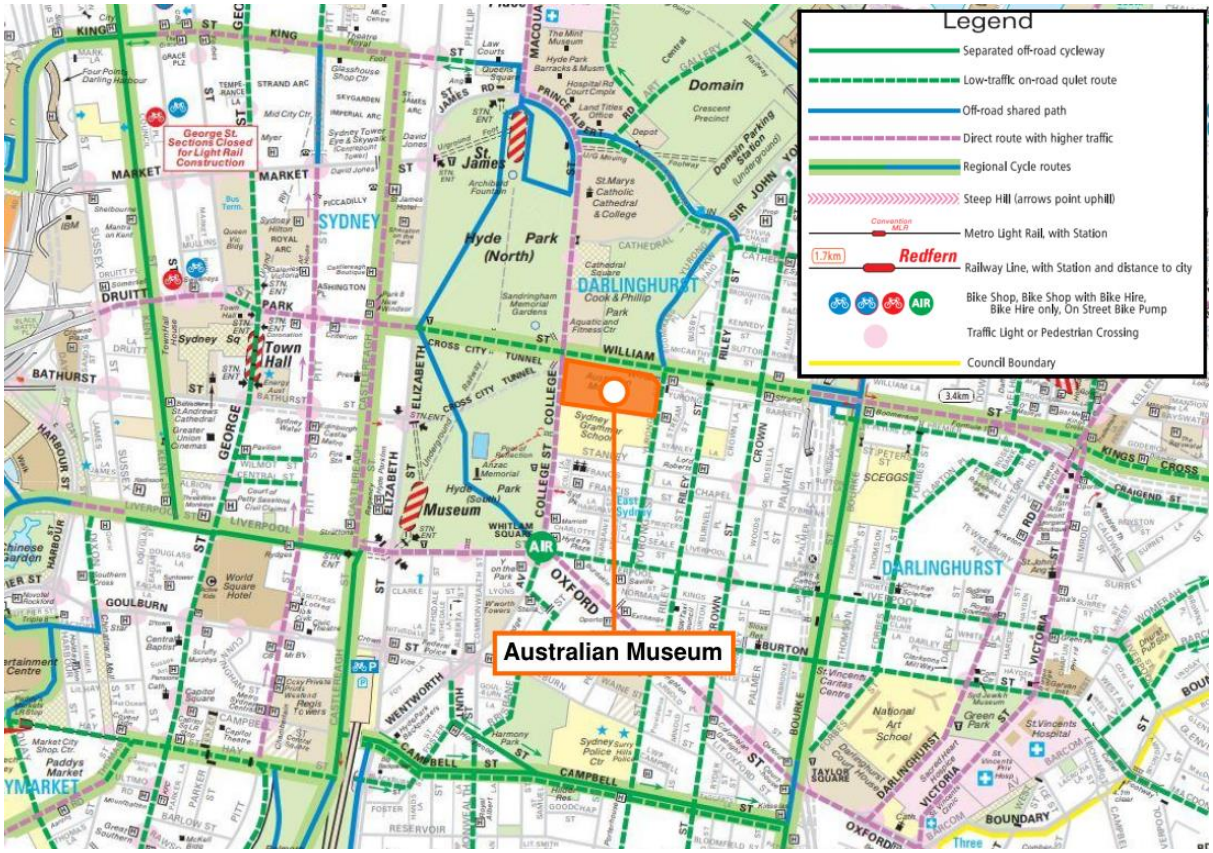

Figure 3.7: Cycleways near the Museum
Source: Sydway Bicycle Maps

The Museum contains end of trip facilities for its staff. These include 6 male and 6 female showers, 60 lockers and 17 secure bicycle parking spaces. There are lockers located on the

ground floor of the Museum. As found in the staff travel mode survey, the majority of staff that cycle to the Museum use these provided parking facilities.

Figure 3.8: Staff End of Trip Facilities

The City of Sydney aims to increase the rate of cycling trips made into and out of the city centre. The City offers weekly bike riding and maintenance courses to encourage both new and experienced riders to cycle comfortably in Sydney traffic.

3.7.2 Volumes

A count of cyclist traffic was conducted concurrently with the pedestrian and vehicle counts. It was found that out of the four major intersections near to the site, the College Street and Stanley Street intersection experienced the greatest volume of cyclists on a normal Thursday, with a peak at 7:45 to 8:45am of 266 cyclists. For the three other days of counting, the William Street and College Street intersection had the most cyclists, with volumes as shown in

Table 3.3: William Street and College Street Intersection Cyclist Volumes

Day of Counts	Peak Hour	Peak Hour Cyclist Volume
Thursday 23rd June	7:45-8:45am	218
Saturday 25th June	11:30am-12:30pm	42
Saturday 9th July	11:45am-12:45pm	51
Tuesday 12th July	8:30-9:30am	176

The most trafficked movement was north along College Street towards Martin Place. In September 2015, College Street had a separated dedicated cycleway along this direction and this is likely why the movement experiences the largest cyclist volumes. As part of the

CBD and South East Light Rail Project, this cycleway was removed to provide an extra lane for bus diversions.

3.8 Public Transport

As the Museum is located within the Sydney CBD, it is well connected by public transport services. Routes near to the site are summarised in Figure 3.9.

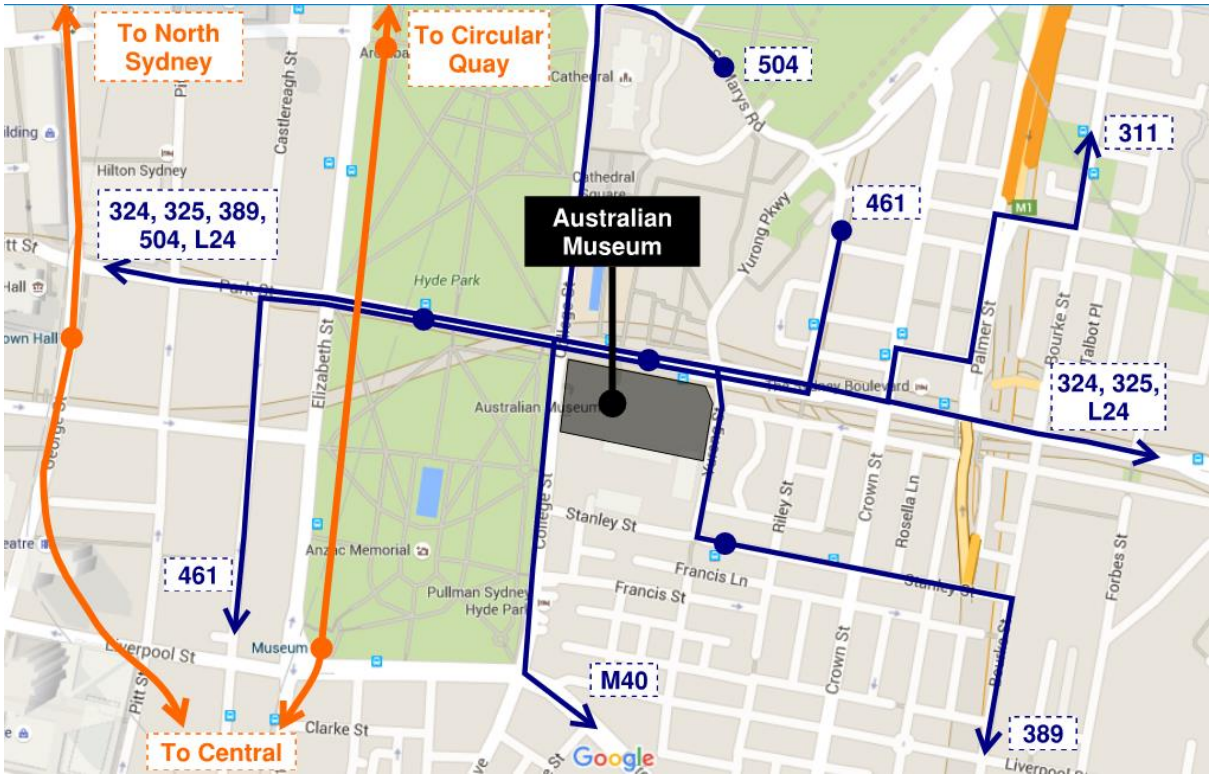

Figure 3.9: Public Transport Near to the Site

3.8.1 Bus Services

The closest bus stops to the Museum are located on William Street in front of and directly opposite the site. Other nearby bus stops are located at Hyde Park on William Street, Stanley Street near Yurong Street and Riley Street near Kennedy Street. These stops are located within 5 minutes' walk of the Museum.

The stop closest to the Museum is serviced by a number of bus routes, these are detailed in Table 3.4.

Table 3.4: Bus Services Near the Museum

Route Number	Areas of Service	Frequency
311	Millers Point, City, Kings Cross, Haymarket	Every 15 minutes during the AM and PM peak
324, 325	Watsons Bay, Vaucluse, Edgecliff	Every 15-20 minutes during the AM and PM peak
389	Bondi Beach, Bondi Junction, Darlinghurst, Pyrmont	Every 5-10 minutes during the AM and PM peak
461	Haymarket, Camperdown, Burwood	Every 10 minutes during the AM and PM peak
504, 506	Rozelle, Drummoyne, Chiswick, Ryde, Macquarie University	Every 10 minutes during the AM and PM peak
L24 (arrivals only)	Watsons Bay, Vaucluse, Edgecliff	Leaves Watsons Bay at 7:24 and 7:39 weekdays
M40	Bondi Junction, Taylor Square, City, Chatswood	Every 10 minutes during the AM and PM peak

3.8.2 Train Services

There are three train stations within a 10 minute walk of the Museum:

- Museum Station which is located a 500m walk from the site (approximately 6 minutes);
- St James Station which is located a 550m walk from the site (7 minutes); and
- Town Hall Station which is located a 700m walk from the site (10 minutes).

Museum, St James and Town Hall Stations are serviced by the following lines:

- T2 Inner West and South Line: Provides services to Leppington and Campbelltown including Burwood, Lidcombe, Granville, Liverpool and Glenfield Stations. Services run approximately 3 to 9 minutes during peak times.
- T2 Airport Lines: Follows the Inner West and South Line making additional stops at the Green Square, Mascot, International Airport, Domestic Airport and Tempe Staitons. Services run approximately every 6 minutes during peak times.
- T3 Bankstown Line: Provides services to Liverpool and Lidcombe including Sydenham, Dulwich Hill, Bankstown and Birrong Stations. Services run approximately every 15 minutes during peak times.
- Southern Highlands Line: Extends the T2 Inner West and South Line to Goulburn including Macarthur, Bowral and Moss Vale. During peak times there are approximately two services per hour.

Town Hall Station is additionally serviced by the following lines:

- T1 North Shore and Northern Line: Provides services to Hornsby, Berowra, Richmond and Emu Plains including stops at Epping, Chatswood, North Sydney, Schofields, Blacktown, Parramatta and Lidcombe. Services run approximately every 3 minutes

during peak times.

- T4 Eastern Suburbs and Illawarra Line: Provides services to Bondi Junction, Cronulla and Waterfall including stops at Sutherland, Hurstville, Wolli Creek and Kings Cross. Services run approximately every 3 to 4 minutes during peak times.
- Central Coast and Newcastle Line: Extends the North Shore and Northern Line to Newcastle including stops at Woy Woy, Gosford, Wyong and Hamilton. Services run approximately every 15 minutes during peak times.
- South Coast Line: Extends the Eastern Suburbs and Illawarra Line to Bomaderry or Kembla including stops at Kiama, Wollongong and Thirroul. Services run approximately every 10 to 20 minutes during peak times.

3.8.3 Ferry Services

The Museum is located 20 minutes' walk from Circular Quay ferry wharf. Circular Quay is serviced by all ferry services, with various destinations including Manly, Cockatoo Island, Parramatta, Pyrmont, Barangaroo, Neutral Bay, Mosman, Double Bay, Watsons Bay and Taronga Zoo.

3.8.4 Light Rail Services

The Museum is located 15 minutes' walk away from the Capitol Square Light Rail Station which is serviced by the L1 Inner West line.

3.8.5 Future Public Transport

CBD and South East Light Rail

The future light rail line will provide high frequency services between Circular Quay and Randwick/Kingsford. The closest station to the Museum will be Town Hall, which will be located on George Street approximately a 10-minute walk from the site. The line is expected to be completed in 2020.

Sydney Metro City and Southwest

The future metro line will connect from Chatswood to Sydenham as part of the wider Sydney Metro network. The closest station to the Museum will be Pitt Street station located approximately 10 minutes' walk from the site. The line is expected to be completed in 2024.

3.9 Servicing and Loading

There is an existing loading dock access from William Street at the north east corner of the site. This currently requires the use of a traffic marshal during deliveries as William Street is heavily trafficked by pedestrians. Restricted access to the loading dock is maintained by a security gate.

The Museum has advised that deliveries occur every 30 minutes to the current loading facility, with the size of delivery vehicles ranging up to semi-trailers. A turning area is provided for trucks up to and including Heavy Rigid Vehicles adjacent to the loading dock. Access to the dock by semi-trailers requires the closing of William Street for short periods to facilitate a reverse movement into the site. Access to the loading dock by semi-trailers generally occurs at night outside of peak hours and under traffic control.

The internal loading dock has capacity for 1 semi-trailer to unload or a number of smaller vehicles. The vertical height clearance available is only 4.3 metres which does not meet Australian Standards. Refer to Figure 3.10 for an image of the existing loading dock.

Figure 3.10: Existing Loading Dock

3.10 Pick Up and Drop Off

The Museum is visited by various groups including school groups, tourist groups and community groups. Currently buses use the drop off located on College Street adjacent to Sydney Grammar School (refer to Figure 3.11). Buses are expected to park within the formal coach parking provided near King Street Wharf. Mini buses generally park in on street parking locations, at the Domain Car Park or Riley Street Car Park. These private car parks have height restrictions of 1.9 and 2.1 metres respectively.

We have been advised by the Museum that the pick up and drop off zone on College Street is often occupied by users related to the Sydney Grammar School which limits the ability for buses associated with the Museum to safely access the site.

The Museum has advised that the yearly number of student visits in 2017 was 41,000. The majority of school visits occur between April and September, with 6,000 students visiting the Museum over a period of two weeks during the Science Festival in August. During this peak time, approximately 10 school buses drop off and pick up students in the morning and afternoon a day. A review of the existing bus drop off has been conducted and is attached in Appendix D.

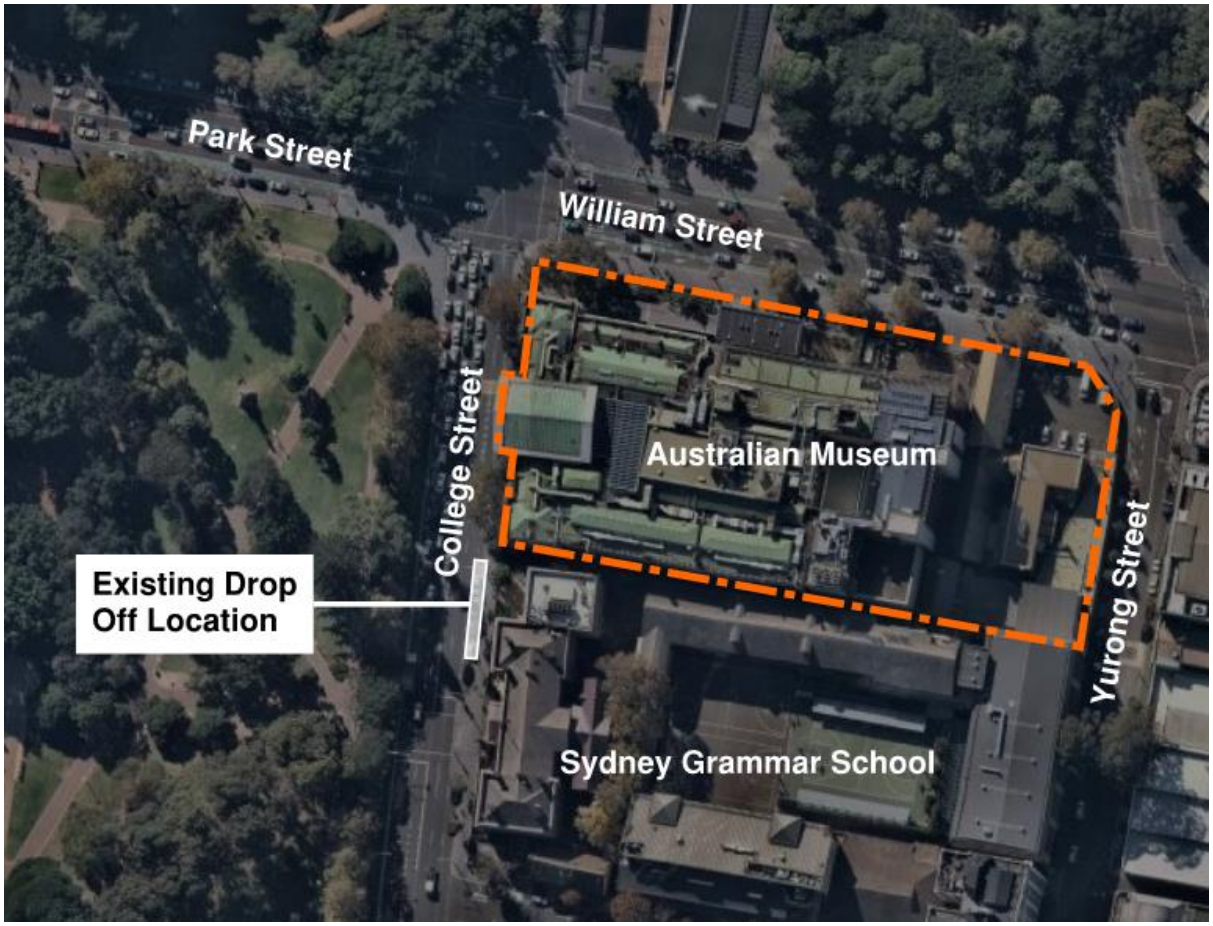

Figure 3.11: Bus Drop Off Location

3.11 Car Share Services

There are a number of car share services located within the vicinity of the site as shown in Figure 3.12. Within 200 metres of the Museum there are nine car share spaces with services by GoGet, Car Next Door and Hertz.

Hourly costs of car share services generally range between $6 and $13, with additional costs per kilometre.

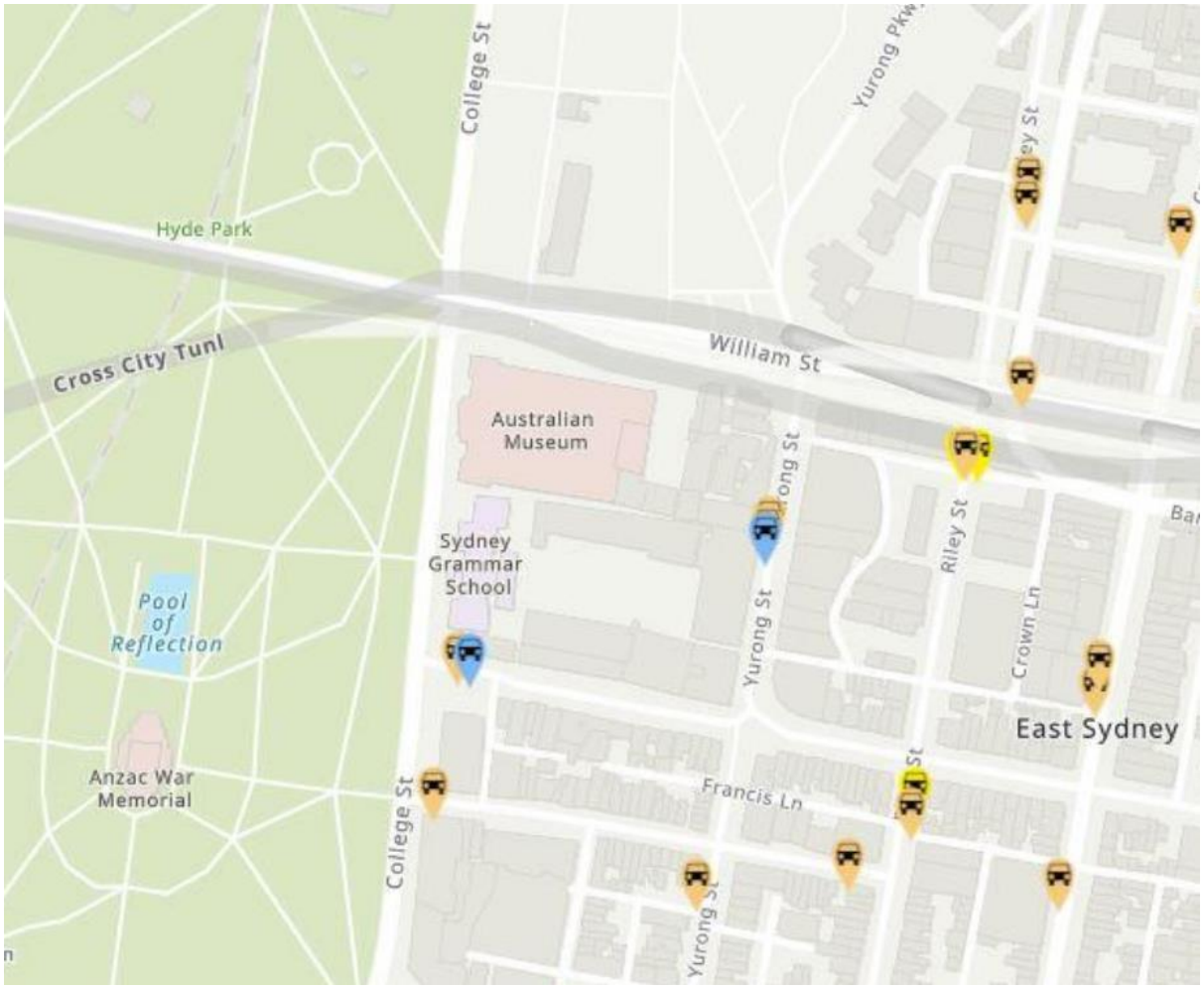

Figure 3.12: Car Share Locations near to the Museum
Source: City of Sydney Car Share Map

4.0 Proposed Development

4.1 Scope of the Development

The proposed development includes a number of alterations and additions to the Museum, largely near William Street with the aim of improving the functions of the Museum and an exhibition space that suits blockbuster exhibitions. The works proposed include:

- A new entry proposed adjacent to William Street on the ground floor suited towards the movement of groups into and out of the Museum.
- Extension of the Crystal Hall to allow for greater queuing area.
- Proposed landscaping to the ground floor adjacent to the new groups entry within the undercroft of the Crystal Hall.
- Associated kerb, footpath and roadway works with a new bus bay located on William Street adjacent to the new groups entry.

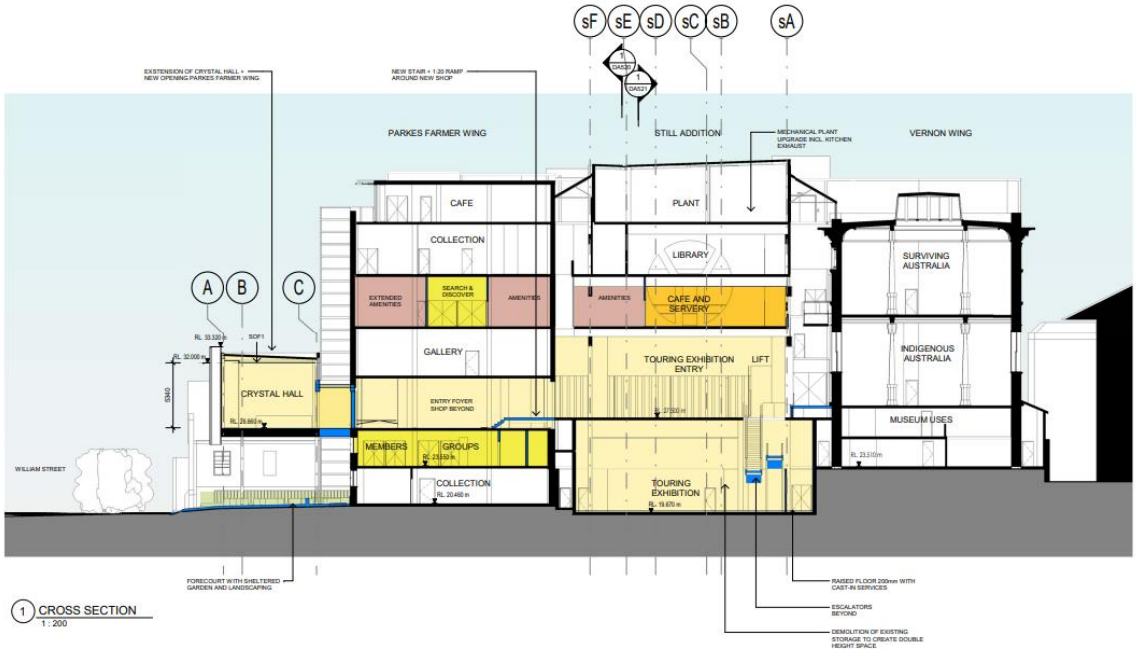

Figure 4.1: Proposed Development
Source: Architectural Drawings prepared by Hames Sharley dated 11 September 2018

4.2 Site Access

The Additions and Alterations project does not propose any change to the existing vehicular access points into the Museum, with no car parking or loading facilities proposed as part of the project.

New pedestrian access points will be available on the basement level for entry by groups into the Museum. Associated queuing space will be available in this location.

4.3 Drop Off and Pick Up Facilities

A number of options for drop off and pick up facilities were investigated during the preparation of the proposal; these are further discussed in Appendix D. Following this review, it was recommended that a bus drop off be provided located along William Street adjacent to the new group entry point. Key reasons for this recommendation include:

- Reduced queuing of groups on the public footpath and therefore increased amenity of

pedestrians around the Museum.

- Provision of a relatively accessible path of travel from the bus drop off point to the entrance to the Museum.
- Reduced distance for groups to travel to enter the Museum.
- No need to cross heavily trafficked roads or traverse narrow footpaths to enter the Museum, increasing pedestrian safety.

The proposed bus bay will impact four on street metered parking spaces and three street trees. These trees are proposed to be relocated elsewhere along the kerbside to result in no net loss of trees on William Street.

The Museum has advised that groups generally arrive in mini buses, standard buses (12.5m) or long rigid buses (14.5 metres). The proposed drop off has been designed to cater for a 14.5 metre long rigid bus in accordance with NSW Bus Guidelines. A minimum width of 3 metres for the parking lane will be provided to prevent any impact on the adjacent bicycle lane. A draw in distance of 14 metres and a draw out distance of 6.5 metres have been provided to allow for manoeuvrability of buses into and out of the area.

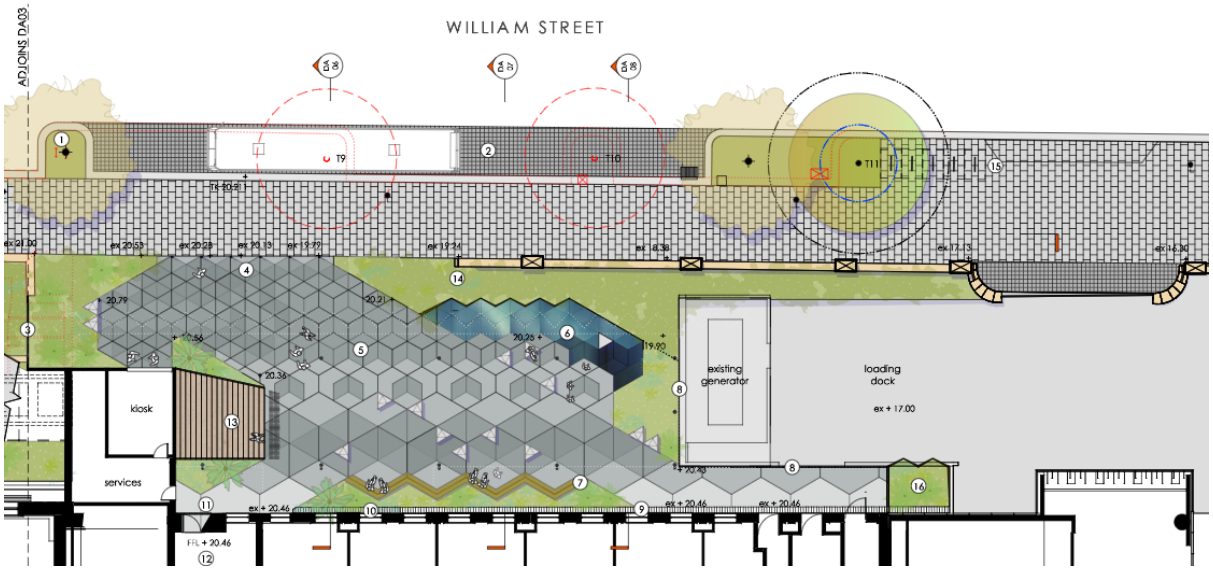

Figure 4.2: Proposed Pick Up and Drop Off Bay
Source: Landscape Architectural Drawings prepared by Sue Barnsley Design dated 13 September 2018

A Coach Management Plan has been prepared to address how pick up and drop off of groups is to be managed by the Museum during peak times. This Plan has been submitted as part of this Environmental Impact Statement. The aims of this Plan are to:

- Reduce queueing of buses during peak demand for drop off and pick up.
- Prevent impacts to traffic flow on external roads and pedestrians on footpaths adjacent to the Museum.
- Formalise bus movements during pick up and drop off of groups to result in more efficient movement of buses and groups into and out of the Museum.
- Improve the traffic conditions around the Museum during drop off and pick up times.

A Coach Management Plan was prepared following consultation with Transport for New South Wales and City of Sydney.

4.4 Car Parking

4.4.1 On Street Parking

The proposed development will result in a net loss of four on street metered parking spaces. The loss of these spaces aligns with the City of Sydney's policies to reduce vehicle trips within the CBD.

4.4.2 Off Street Parking

No off street parking is proposed as part of this development. This is considered acceptable due to the following:

- City of Sydney's Development Control Plan specifies maximum car parking rates based on the gross floor areas of different land uses. As the DCP does not specify a minimum car parking requirement, proposing no parking is in accordance with the DCP.
- The Museum experiences a low incidence of private vehicle as a travel mode (only approximately 30% of travellers to the Museum do so by car).
- There is a Green Travel Plan in place at the Museum to encourage alternative modes of transport to private vehicle trips.

4.5 Trip Generation

4.5.1 Visitors

We have been advised by Hames Sharley that the difference in gross floor area for exhibition and gallery use pre and post development are as detailed in Table 4.1.

Table 4.1: Existing and Proposed Gross Floor Areas

	Existing	Future	Difference
Exhibition and Gallery Space	5,922m^2	6,108m^2	+186m^2

TTW has been advised that the Museum currently experiences 474,000 visitors per year; on average 1,300 daily visitors. Assuming visitor numbers will increase proportionally to exhibition and gallery space, the Museum can expect to attract 488,890 visitors post development.

Averaging the annual visitors, the Museum can expect daily visitor numbers of 1,340 post development. Note that these projections do not account for peak activities such as blockbuster exhibitions or major events (these are discussed in Section 4.8.2).

According to the Museum's annual report for 2016-17, visitors comprise of:

- 63% local visitors;
- 22% international visitors; and
- 15% interstate visitors.

Following this distribution, it can be expected that daily visitor numbers for each type of visitor would be as detailed in Table 4.2.

Table 4.2: Daily Visitor Numbers per Type

Type of Visitor	Number of Daily Visitors	
	Current	Post Development
Local	819	844
International	286	295
Interstate	195	201

4.5.2 Staff

The Museum has advised that there will be a limited increase in staff as a result of the proposed development for additional security and ticketing. It is estimated this increase will total 10 to 15 staff members.

4.6 Active Transport

4.6.1 Pedestrian Trip Generation

Visitors

Following the number of visitors (summarised in Section 4.5), and the travel mode share data collected via surveys (refer to Section 3.3), the number of daily and peak hour pedestrian trips is detailed in Table 4.3.

Table 4.3: Pedestrian Visitor Trip Generation

Type	Number of Daily Pedestrian Trips	
	Current	Post Development
Local Visitor	278	287
International Visitor	349	360
Interstate Visitor	222	229
Total	**849**	**876**
Type	**Number of Peak Pedestrian Trips**	
	Current	**Post Development**
Local Visitor	35	36
International Visitor	55	56
Interstate Visitor	28	29
Total	**118**	**121**

Staff

As there is only an increase in 10 to 15 staff members as a result of the redevelopment, there would be an increase in daily pedestrian trips of 8 to 12 and peak pedestrian trips of 4 to 6.

4.6.2 Cyclist Trip Generation

Visitors

During the travel mode survey, no visitors indicated that they had travelled to the Museum by bicycle. As a result, there will be no increase in cyclist trips as a result of the development.

Staff

During the travel mode survey, 10% of staff indicated that they used a bicycle as their final mode of transport when travelling to the Museum. Therefore 1 to 2 additional peak and 2 to 4 additional daily cyclist trips are expected to be generated by the proposed development.

4.6.3 Facilities

An additional pedestrian entry will be provided for groups and additional queuing area for visitors to account for additional pedestrian volumes.

As there will be a limited increase in the number of cyclist transport trips, no further cyclist facilities are proposed. The Museum currently contains a number of bicycle racks (secured storage for staff and outdoor racks for visitors), and end of trip facilities (change rooms and shower facilities).

4.7 Public Transport

4.7.1 Visitor Trip Generation

As indicated in the travel mode survey, public transport has a significant travel mode share for visitors to the Museum (30% to 50%). Following the increase in visitors expected, the anticipated trip generation has been summarised in Table 4.4.

Table 4.4: Public Transport Visitor Trip Generation

Type	Number of Daily Public Transport Trips	
	Current	Post Development
Local Visitor	770	794
International Visitor	188	194
Interstate Visitor	1,332	136
Total	**2,290**	**1,124**
Type	**Number of Peak Public Transport Trips**	
	Current	**Post Development**
Local Visitor	96	99
International Visitor	118	121
Interstate Visitor	17	17
Total	**231**	**237**

4.7.2 Staff Trip Generation

The majority of Museum staff currently travel to work by public transport (49%). Therefore a total of 10 to 14 daily public transport and 5 to 7 peak hour public transport trips will be generated by the development.

4.7.3 Impact to Existing Facilities

Given there are numerous public transport options close to the Museum and proposed future infrastructure projects within the CBD, it is expected that the increase in trips can be accommodated without requiring additional services.

4.8 Traffic Impacts

Following the car travelling rate, length of stay (assuming an 8 hour day) and car occupancy rate for each type of visitor (as found in the travel mode survey detailed in Section 3.3), the Museum will attract a total number of peak visitor vehicle trips as detailed in Table 4.5.

Table 4.5: Visitor Trip Generation

Type of Visitor	Number of Daily Vehicle Trips	
	Current	Post Development
Local	168	174
International	10	10
Interstate	10	10
Total	**188**	**194**
Type of Visitor	**Number of Peak Vehicle Trips**	
	Current	**Post Development**
Local	21	22
International	2	2
Interstate	1	1
Total	**24**	**25**

The development will therefore result in an additional 6 daily trips and 1 peak vehicle trip.

Staff

Following the travel mode survey, only 3% of staff travel by private vehicle into the CBD. This would result in an increase of approximately 1 peak vehicle trip and 2 daily trips.

4.8.1 Future Traffic Conditions

Due to the low incidence of private vehicle usage, the Additions and Alterations project will only result in an increase of 2 peak vehicle trips. As the existing intersections adjacent to the site perform at Levels of Service of either ‘B’ or ‘C’ during peak times, it is not expected that the development will result in a significant impact to nearby intersection.

4.8.2 Peak Demand Activities

The Museum has advised that blockbuster exhibitions such as *Tutankhamun: Treasures of the Golden Pharaoh* are expected to attract a peak hourly number of 600 visitors. Major events usually held out of hours (such as fund-raising dinners, award nights and exhibition openings) are expected to attract up to 500 visitors.

It is anticipated that vehicular traffic generated by these exhibitions and major events will be able to be catered for by the surrounding road network for the following reasons:

- The majority of intersections are currently operating at Levels of Service of either ‘A’, ‘B’ or ‘C’ during peak times. This means they are currently operating at a ‘good’ or

'satisfactory' level with minimal delays according to RMS Guidelines. Therefore, they have the capacity to cater for additional traffic without resulting in 'unsatisfactory' operation.

- The Museum has a Green Travel Plan with initiatives included to encourage alternative transport and reduce vehicle volumes travelling to the Museum. The Museum currently experiences a low rate of private vehicle usage and the Green Travel Plan intends to reduce this further. With 600 peak visitors it is likely that only 62 vehicle trips would be generated (assuming event visitors are all local). Greater demand will be placed on public transport and pedestrian networks which will be sufficient given the extensive public transport options near the site and the future increase in public transport infrastructure.
- As the Museum does not provide on site parking, those travelling by private vehicle to the proposed development will park in the surrounding areas. This will reduce the effect on the roads in immediate vicinity of the Museum as vehicles will take various routes and park in separate locations.
- Current major events at the Museum already experience up to 500 visitors and we have not been advised of any traffic issues associated with these existing events.

4.9 Servicing and Loading

There is no proposal to alter the existing servicing and loading arrangements as part of the Alterations and Additions project. As the gross floor area of gallery and exhibition space is remaining largely the same, it is not anticipated that the current service vehicle movements will be significantly impacted.

Servicing and loading requirements are anticipated to increase during the installation and removal of blockbuster exhibitions. The movement of these vehicles will require consultation with the City of Sydney and other relevant authorities to ensure no adverse impact on the surrounding road network.

While the existing loading dock does not fully comply with Australian Standards, the Museum's masterplan proposes to improve loading facilities through provision of an additional facility accessed from Yurong Street with adequate manoeuvring area for semi-trailers to enter and exit in a forward direction.

4.10 Sustainable Travel

The Museum has a Green Travel Plan that promotes sustainable travel to and from the Museum. Some key actions proposed within this Plan include:

- Annual review and updating of this Plan.
- Provision of a Transport Access Guide.
- Provision of a hybrid fleet vehicle for staff to use during the day.
- Promotion of active transport.
- Provision of bicycle parking and end of trip facilities.

This development promotes sustainable travel by not proposing any additional car parking to what is currently provided and providing a bus drop off to encourage mass transport of groups to the Museum.

4.11 Construction Traffic

A Preliminary Pedestrian Construction Traffic Management Plan has been prepared and submitted as part of this Environmental Impact Statement (EIS). This Plan addresses proposed access/egress routes and methods to maintain pedestrian and cyclist safety during the construction of the project. A detailed plan would be prepared prior to construction once a builder has been appointed. This plan would provide information on the number of trucks and workers, and the staging of works.

5.0 Conclusion

This Transport and Accessibility Impact Assessment has been prepared to examine the impact of the proposed Australian Museum Additions and Alterations development. The proposal largely involves internal works, excluding an additional pedestrian access point for groups accessed from William Street and a proposed bus drop off bay on William Street.

The development will not result in a significant increase in visitor, staff or service vehicle trips. The Museum currently experiences a low incidence of private vehicle usage and encourages alternate transport modes. The Museum has a Green Travel Plan that is continually updated to ensure relevance and effectiveness.

No additional vehicular access points, loading docks or car parking are proposed as part of the development. This is considered acceptable due to limited additional vehicle trips to the Museum anticipated as a result of the development. Future works as part of the Museum's masterplan include upgrades to the loading dock to provide additional access from Yurong Street.

The majority of intersections adjacent to the Museum currently operate at a satisfactory Level of Service. The intersection of Stanley Street and College Street operates at a Level of Service 'F', however this is due to a delayed right turn out of Stanley Street and is considered acceptable as all other movements are operating at a Level of Service 'A' and less than 10 vehicles per hour experience a poor Level of Service.

A bus drop off is proposed on William Street as the existing drop off arrangements are insufficient for the Museum. A number of locations were considered for this drop off, William Street was chosen for its advantages including increased pedestrian safety, increased accessibility and more efficient pedestrian movements. This drop off will result in the loss of four on street metered parking spaces and relocation of street trees. A Coach Management Plan has been prepared to increase efficiency and safety of drop off and pick up movements.

A Preliminary Construction Pedestrian Traffic Management Plan has been prepared for the development that outlines the expected impacts during construction. A more comprehensive Plan will be prepared when a builder has been appointed and the construction methodology and staging of works is known.

Prepared by
TAYLOR THOMSON WHITTING (NSW) PTY LTD

GRACE CARPP
Traffic Engineer

Authorised By
TAYLOR THOMSON WHITTING (NSW) PTY LTD

PAUL YANNOULATOS
Technical Director

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Appendix A

Traffic Count Data

Count Data (Mid 2016)

WEEKDAY AM PEAK = AM THU 23rd June 7:45-8:45am
WEEKDAY PM PEAK = PM THU 23rd June 5:00-6:00pm
WEEKEND PEAK = Sat 9th July 12:00-1:00pm

Existing (2018)

Years	2	
Annual Growth	2.0%	Average of the last 5 years' growth rate
Total Growth	104%	according to ABS
Volume Existing	399	
Volume Future	415.1196	

College and William

AM				PM				Saturday			
William (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
214				341				643			
College (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
551				659				420			
Park (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
145				87				126			
College (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
450				443				362			

College and William

AM				PM				Saturday			
William (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
223	0	0	0	355	0	0	0	669	0	0	0
College (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
573	0	0	0	686	0	0	0	437	0	0	0
Park (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
151	0	0	0	91	0	0	0	131	0	0	0
College (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
468	0	0	0	461	0	0	0	377	0	0	0

William and Yurong

AM				PM				Saturday			
William (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
126				90				96			
Boomerang (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
527				718				416			
William (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
108				44				79			
Yurong (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
282				369				177			

William and Yurong

AM				PM				Saturday			
William (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
131	0	0	0	94	0	0	0	100	0	0	0
Boomerang (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
548	0	0	0	747	0	0	0	433	0	0	0
William (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
112	0	0	0	46	0	0	0	82	0	0	0
Yurong (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
293	0	0	0	384	0	0	0	184	0	0	0

College and Stanley

AM				PM				Saturday			
Stanley (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
317				294				300			
College (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
568				282				3			
College (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
393				346				1			

College and Stanley

AM				PM				Saturday			
Stanley (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
330	0	0	0	306	0	0	0	312	0	0	0
College (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
591	0	0	0	293	0	0	0	3	0	0	0
College (S)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
409	0	0	0	360	0	0	0	1	0	0	0

Yurong and Stanley

AM				PM				Saturday			
Stanley (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
8				11				67			
Stanley (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
148				67				42			
Yurong (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
129				154				75			

Yurong and Stanley

AM				PM				Saturday			
Stanley (E)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
8	0	0	0	11	0	0	0	70	0	0	0
Stanley (W)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
154	0	0	0	70	0	0	0	44	0	0	0
Yurong (N)											
Left	Thru	Right	U-turn	Left	Thru	Right	U-turn	Left	Thru	Right	U-turn
134	0	0	0	160	0	0	0	78	0	0	0

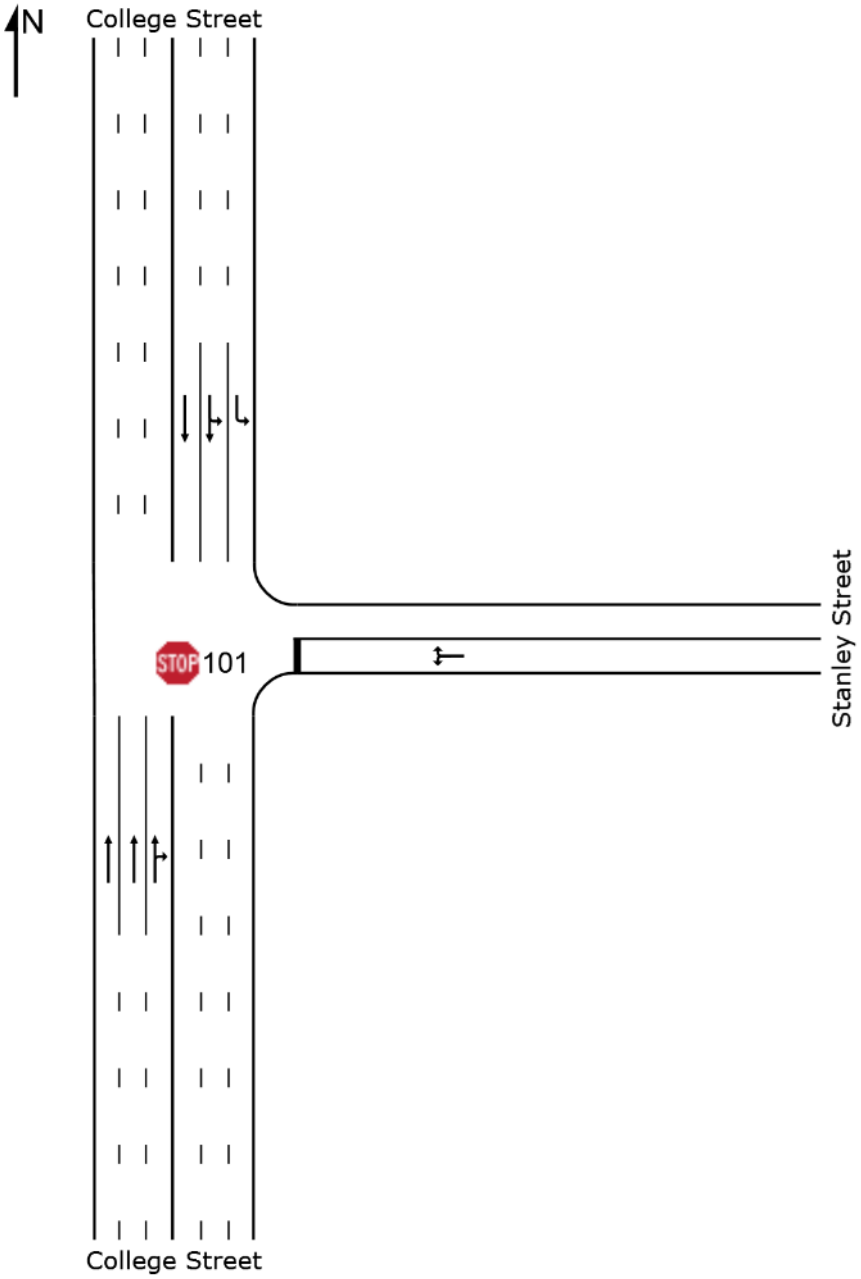
Appendix B

SIDRA Modelling Results

SITE LAYOUT

Site: 101 [SAT College + Stanley]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [SAT College + Stanley]

New Site
Stop (Two-Way)

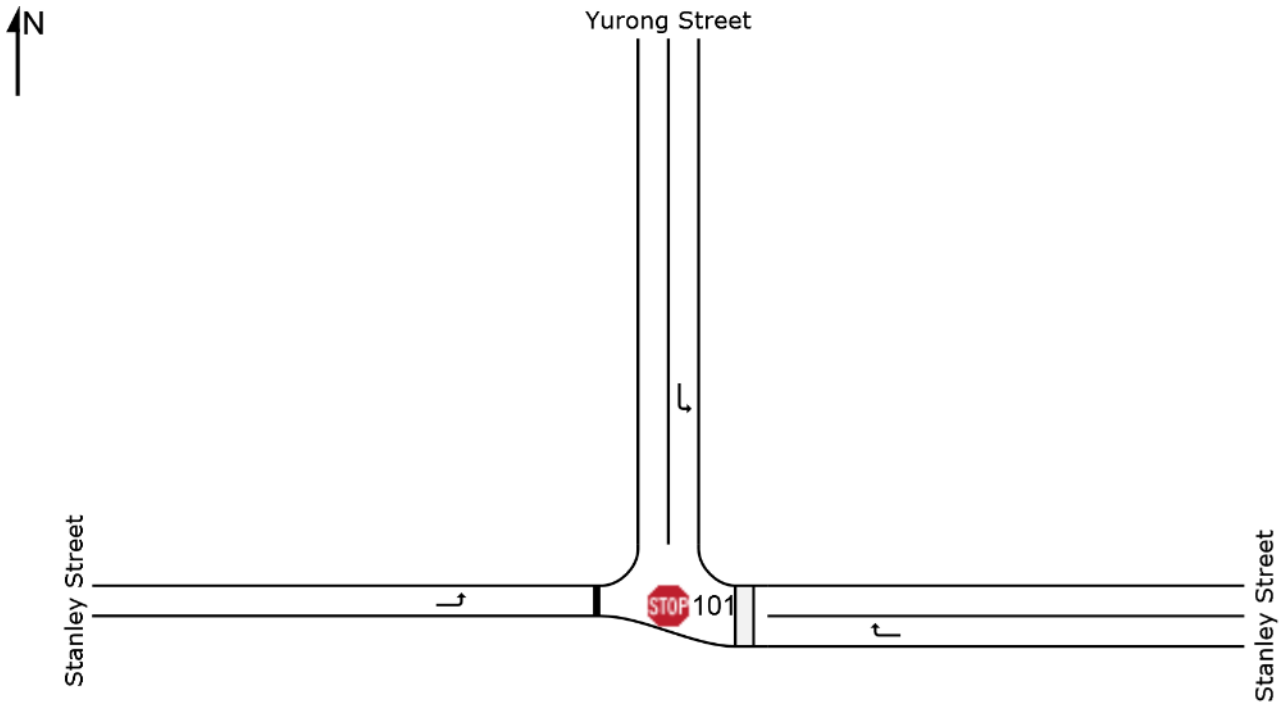
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: College Street											
2	T1	893	0.7	0.167	0.3	LOS A	0.3	2.3	0.03	0.01	39.2
3	R2	12	0.0	0.167	10.9	LOS A	0.3	2.3	0.11	0.02	37.5
Approach		904	0.7	0.167	0.4	NA	0.3	2.3	0.03	0.01	39.2
East: Stanley Street											
4	L2	13	0.0	0.035	8.9	LOS A	0.1	0.8	0.57	0.83	22.8
6	R2	1	0.0	0.035	69.0	LOS E	0.1	0.8	0.57	0.83	27.5
Approach		14	0.0	0.035	13.5	LOS A	0.1	0.8	0.57	0.83	23.2
North: College Street											
7	L2	25	0.0	0.014	3.4	LOS A	0.0	0.0	0.00	0.45	35.9
8	T1	829	1.5	0.219	0.0	LOS A	0.0	0.0	0.00	0.00	40.0
Approach		855	1.5	0.219	0.1	NA	0.0	0.0	0.00	0.01	39.8
All Vehicles		1773	1.1	0.219	0.4	NA	0.3	2.3	0.02	0.02	39.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [SAT Stanley + Yurong]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [SAT Stanley + Yurong]

New Site
Stop (Two-Way)

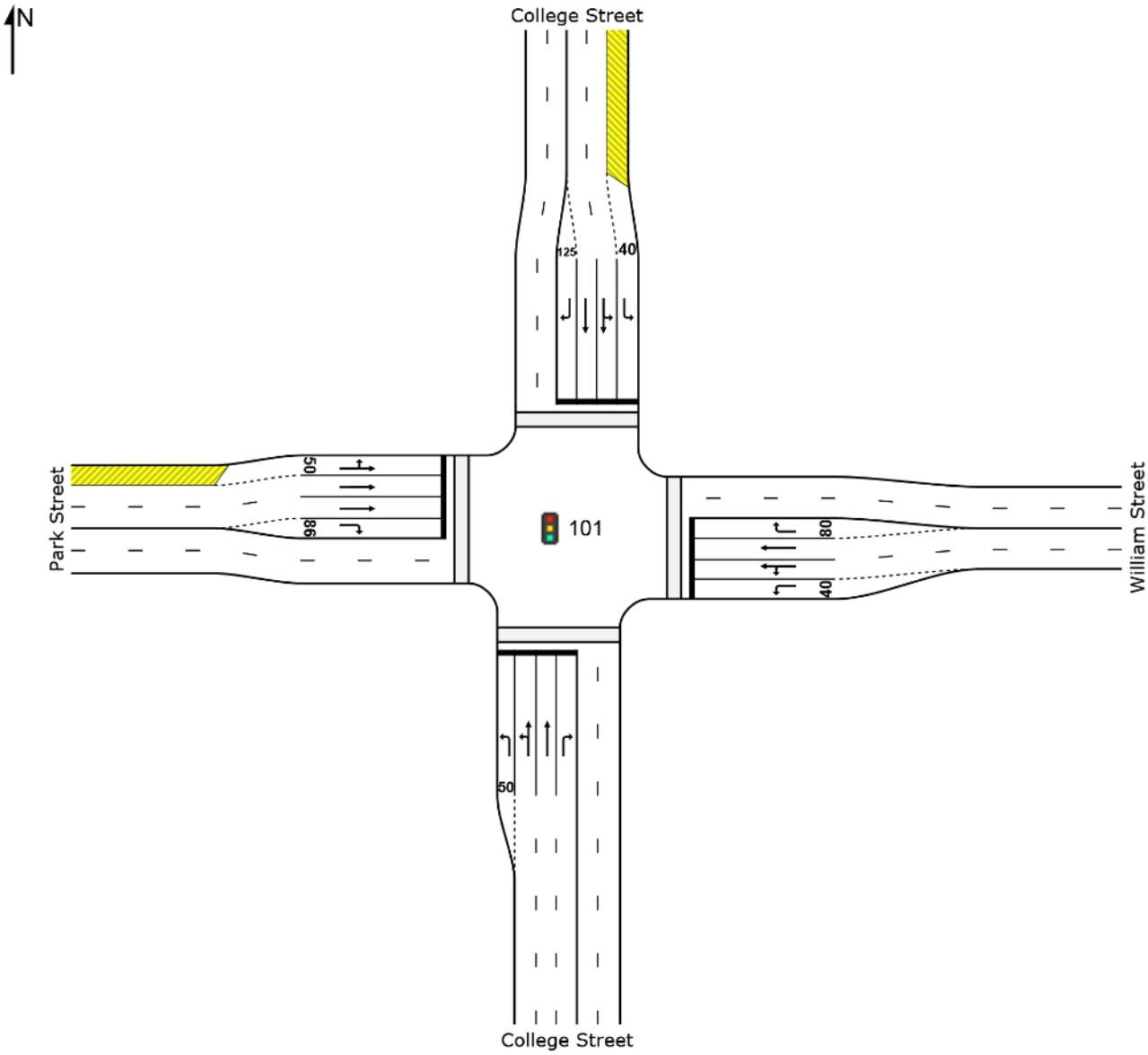
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Stanley Street											
6	R2	158	5.3	0.088	3.6	LOS A	0.0	0.0	0.00	0.50	34.9
Approach		158	5.3	0.088	3.6	NA	0.0	0.0	0.00	0.50	34.9
North: Yurong Street											
7	L2	119	8.8	0.068	3.5	LOS A	0.0	0.0	0.00	0.45	36.0
Approach		119	8.8	0.068	3.5	NA	0.0	0.0	0.00	0.45	36.0
West: Stanley Street											
10	L2	32	0.0	0.026	7.3	LOS A	0.1	0.7	0.26	0.86	32.7
Approach		32	0.0	0.026	7.3	LOS A	0.1	0.7	0.26	0.86	32.7
All Vehicles		308	6.1	0.088	3.9	NA	0.1	0.7	0.03	0.52	35.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [SAT William, College + Park]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [SAT William, College + Park]

New Site
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: College Street											
1	L2	74	4.3	0.104	18.9	LOS B	1.8	12.8	0.64	0.67	26.4
2	T1	585	0.4	0.585	28.3	LOS B	10.2	71.8	0.92	0.78	25.0
3	R2	291	0.4	0.854	45.6	LOS D	12.9	90.4	1.00	1.03	15.1
Approach		949	0.7	0.854	32.8	LOS C	12.9	90.4	0.93	0.85	22.1
East: William Street											
4	L2	327	0.3	0.330	14.0	LOS A	7.0	49.1	0.59	0.70	26.6
5	T1	805	2.6	0.850	36.4	LOS C	19.8	141.7	0.97	1.04	19.6
6	R2	263	5.2	0.692	24.2	LOS B	7.4	53.9	0.98	0.85	26.4
Approach		1396	2.6	0.850	28.9	LOS C	19.8	141.7	0.88	0.92	22.0
North: College Street											
7	L2	245	6.0	0.361	22.4	LOS B	6.9	50.6	0.76	0.75	26.9
8	T1	502	1.3	0.888	47.1	LOS D	11.6	82.4	1.00	1.15	20.0
9	R2	61	6.9	0.210	22.0	LOS B	1.6	11.7	0.85	0.71	28.8
Approach		808	3.1	0.888	37.7	LOS C	11.6	82.4	0.91	0.99	22.2
West: Park Street											
10	L2	160	2.0	0.256	23.6	LOS B	4.5	32.0	0.75	0.73	28.0
11	T1	625	5.9	0.846	40.8	LOS C	13.6	100.3	1.00	1.07	18.5
12	R2	79	6.7	0.334	23.4	LOS B	2.0	14.7	0.94	0.74	24.6
Approach		864	5.2	0.846	36.0	LOS C	13.6	100.3	0.95	0.98	20.8
All Vehicles		4018	2.8	0.888	33.1	LOS C	19.8	141.7	0.91	0.93	21.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

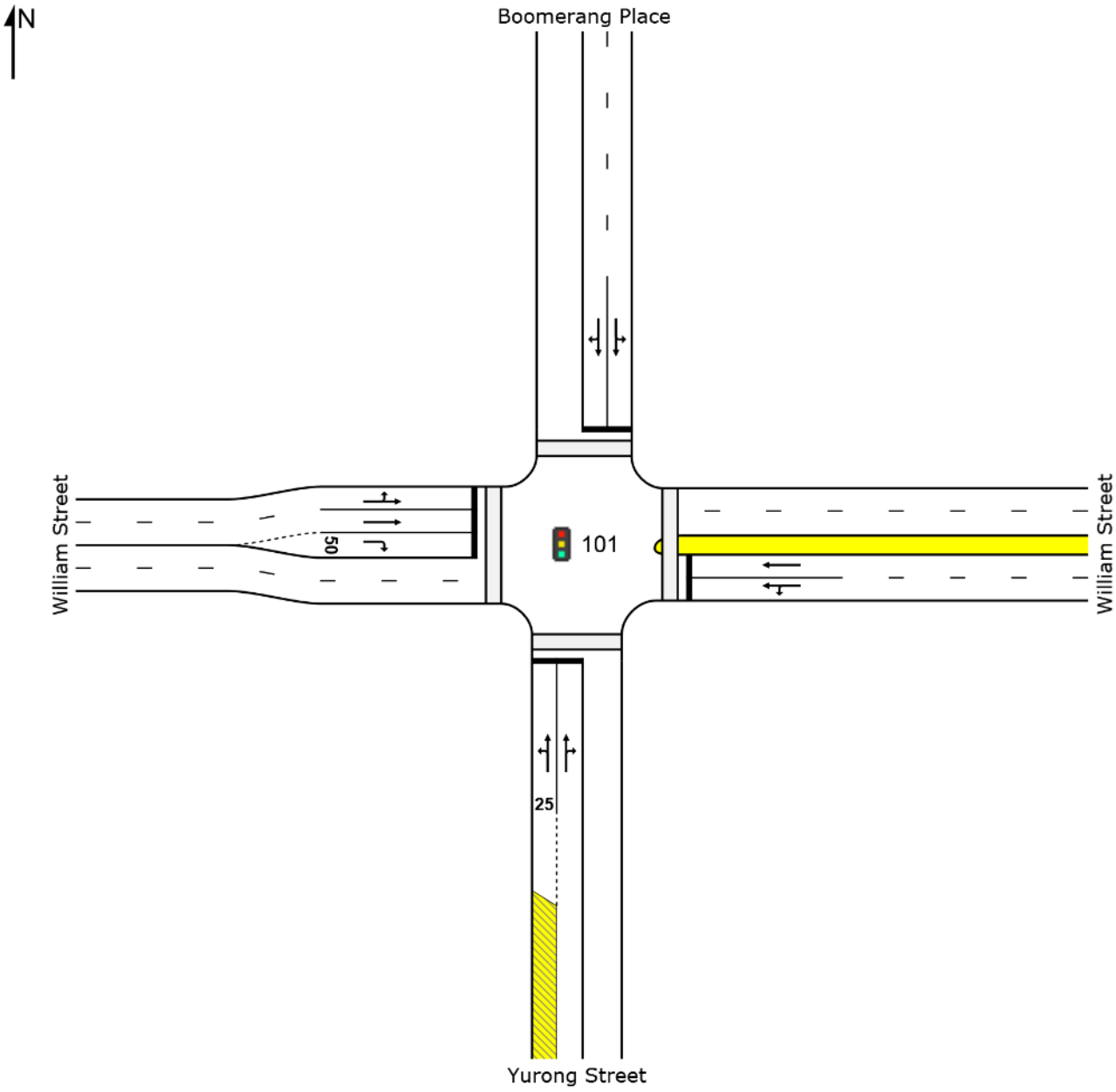
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	30.7	LOS D	0.1	0.1	0.88	0.88
P2	East Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	53	34.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	33.4	LOS D	0.1	0.1	0.91	0.91
All Pedestrians		211	33.2	LOS D			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 101 [SAT William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [SAT William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Yurong Street											
1	L2	106	5.0	0.143	15.2	LOS B	1.9	14.2	0.65	0.68	33.0
2	T1	19	5.6	0.242	21.9	LOS B	2.1	15.0	0.86	0.72	31.5
3	R2	62	5.1	0.242	25.3	LOS B	2.1	15.0	0.86	0.72	27.3
Approach		187	5.1	0.242	19.2	LOS B	2.1	15.0	0.74	0.70	31.1
East: William Street											
4	L2	36	2.9	0.869	32.3	LOS C	21.5	153.6	0.99	1.10	29.7
5	T1	1221	2.4	0.869	27.7	LOS B	21.5	153.9	0.99	1.10	24.0
Approach		1257	2.4	0.869	27.8	LOS B	21.5	153.9	0.99	1.10	24.2
North: Boomerang Place											
7	L2	8	0.0	0.021	23.6	LOS B	0.2	1.4	0.81	0.63	27.8
8	T1	3	0.0	0.023	21.2	LOS B	0.2	1.2	0.83	0.60	31.9
9	R2	4	0.0	0.023	24.5	LOS B	0.2	1.2	0.83	0.60	30.4
Approach		16	0.0	0.023	23.4	LOS B	0.2	1.4	0.82	0.62	29.6
West: William Street											
10	L2	35	0.0	0.456	12.2	LOS A	8.5	59.4	0.61	0.55	43.3
11	T1	984	0.0	0.456	7.7	LOS A	8.5	59.6	0.61	0.54	38.3
12	R2	74	0.0	0.227	16.9	LOS B	1.0	7.1	0.89	0.73	38.2
Approach		1093	0.0	0.456	8.4	LOS A	8.5	59.6	0.63	0.56	38.6
All Vehicles		2553	1.6	0.869	18.9	LOS B	21.5	153.9	0.82	0.84	29.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

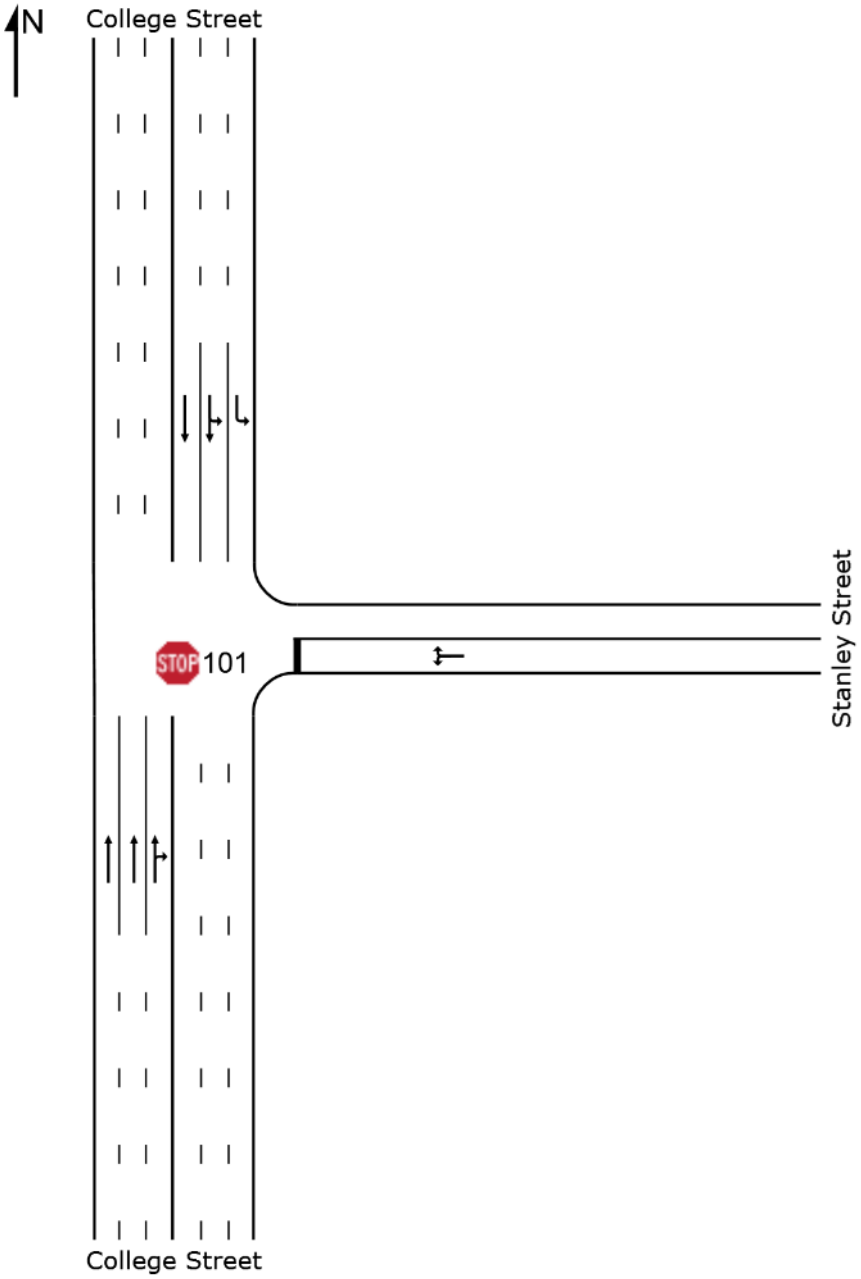
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	194	17.8	LOS B	0.3	0.3	0.77	0.77
P2	East Full Crossing	105	24.4	LOS C	0.2	0.2	0.90	0.90
P3	North Full Crossing	456	9.8	LOS A	0.4	0.4	0.58	0.58
P4	West Full Crossing	86	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		841	15.0	LOS B			0.70	0.70

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 101 [THU AM College + Stanley]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [THU AM College + Stanley]

New Site
Stop (Two-Way)

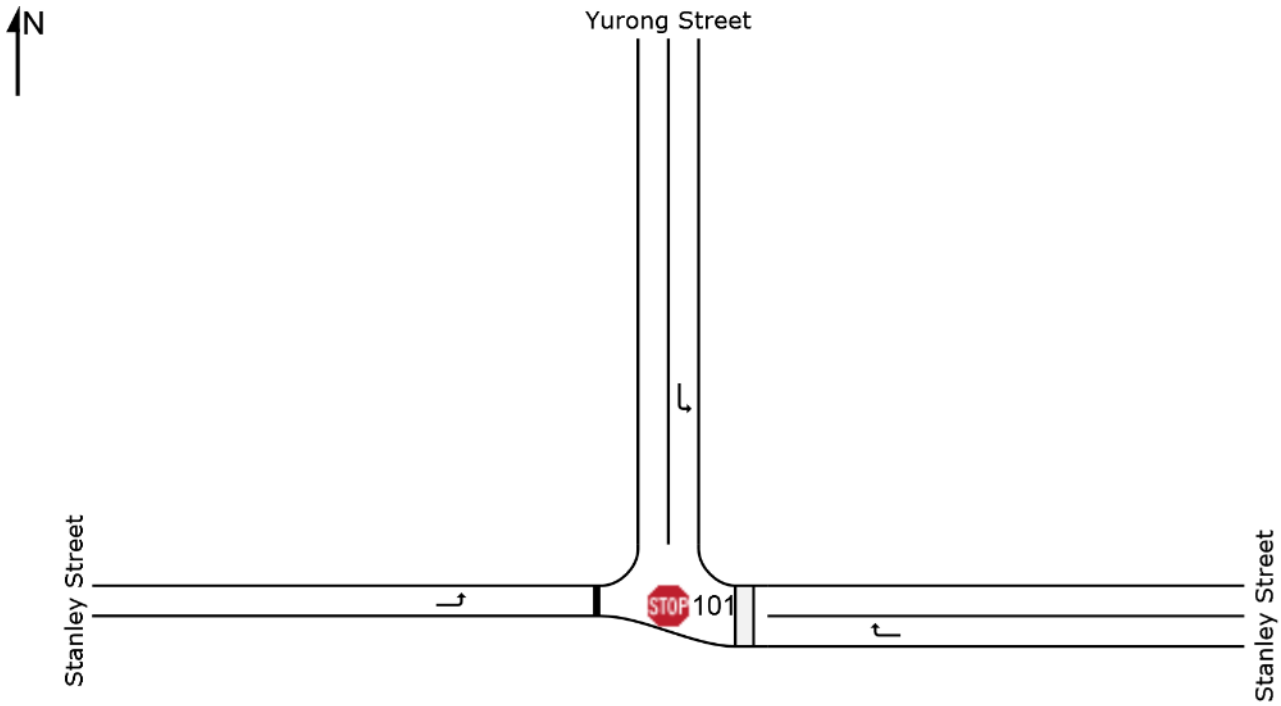
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: College Street											
2	T1	1112	1.2	0.219	0.5	LOS A	0.8	5.6	0.06	0.01	38.5
3	R2	26	0.0	0.219	11.7	LOS A	0.8	5.6	0.22	0.05	34.8
Approach		1138	1.2	0.219	0.8	NA	0.8	5.6	0.06	0.01	38.4
East: Stanley Street											
4	L2	27	0.0	0.296	13.7	LOS A	0.9	6.6	0.76	0.96	12.7
6	R2	9	0.0	0.296	110.2	LOS F	0.9	6.6	0.76	0.96	16.8
Approach		37	0.0	0.296	38.5	LOS C	0.9	6.6	0.76	0.96	13.8
North: College Street											
7	L2	102	0.0	0.217	3.4	LOS A	0.0	0.0	0.00	0.36	36.8
8	T1	792	2.1	0.217	0.0	LOS A	0.0	0.0	0.00	0.01	39.8
Approach		894	1.9	0.217	0.4	NA	0.0	0.0	0.00	0.05	39.3
All Vehicles		2068	1.5	0.296	1.3	NA	0.9	6.6	0.05	0.05	37.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [THU AM Stanley + Yurong]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [THU AM Stanley + Yurong]

New Site
Stop (Two-Way)

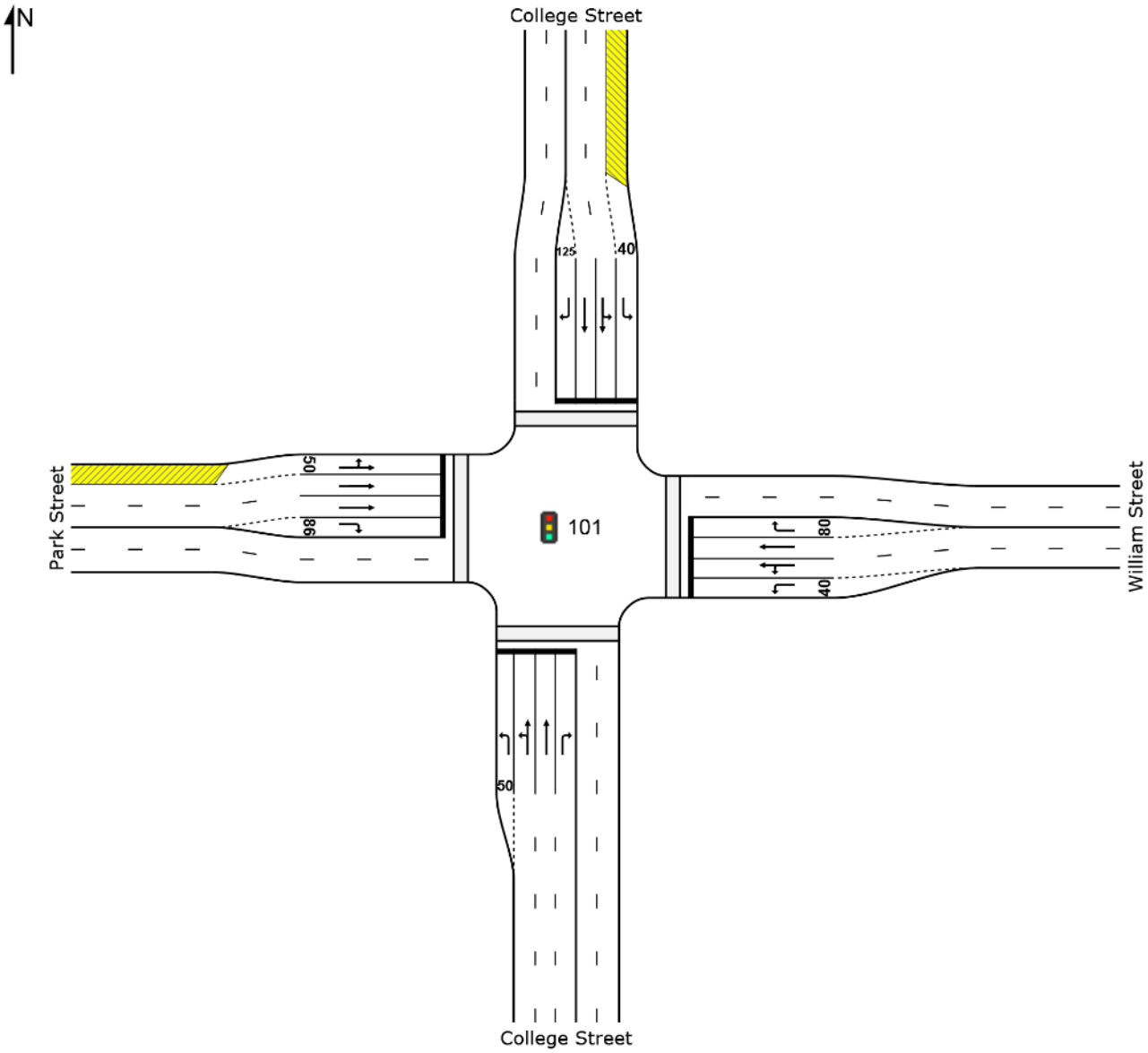
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Stanley Street											
6	R2	297	3.5	0.164	3.6	LOS A	0.0	0.0	0.00	0.50	35.0
Approach		297	3.5	0.164	3.6	NA	0.0	0.0	0.00	0.50	35.0
North: Yurong Street											
7	L2	87	7.2	0.049	3.4	LOS A	0.0	0.0	0.00	0.45	36.0
Approach		87	7.2	0.049	3.4	NA	0.0	0.0	0.00	0.45	36.0
West: Stanley Street											
10	L2	112	0.0	0.106	8.1	LOS A	0.4	2.9	0.40	0.89	32.2
Approach		112	0.0	0.106	8.1	LOS A	0.4	2.9	0.40	0.89	32.2
All Vehicles		496	3.4	0.164	4.6	NA	0.4	2.9	0.09	0.58	34.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [THU AM William, College + Park]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [THU AM William, College + Park]

New Site
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: College Street											
1	L2	69	7.6	0.106	26.1	LOS B	2.3	17.5	0.67	0.68	23.3
2	T1	743	0.6	0.715	38.6	LOS C	18.7	131.3	0.95	0.83	21.9
3	R2	248	1.3	0.798	55.6	LOS D	13.9	98.5	1.00	0.93	13.3
Approach		1061	1.2	0.798	41.8	LOS C	18.7	131.3	0.94	0.85	20.0
East: William Street											
4	L2	359	1.5	0.329	14.5	LOS B	9.3	65.7	0.52	0.68	26.2
5	T1	817	4.0	0.691	29.5	LOS C	22.2	161.0	0.86	0.75	21.8
6	R2	362	1.5	0.663	25.6	LOS B	12.6	89.1	0.93	0.82	25.8
Approach		1538	2.8	0.691	25.1	LOS B	22.2	161.0	0.80	0.75	23.6
North: College Street											
7	L2	189	2.2	0.219	20.9	LOS B	5.8	41.5	0.62	0.69	27.4
8	T1	408	0.8	0.626	46.5	LOS D	10.4	73.3	0.98	0.81	20.1
9	R2	66	31.7	0.343	31.4	LOS C	2.4	21.7	0.91	0.74	25.6
Approach		664	4.3	0.626	37.7	LOS C	10.4	73.3	0.87	0.77	22.3
West: Park Street											
10	L2	98	2.2	0.183	34.1	LOS C	3.9	27.7	0.78	0.72	24.6
11	T1	497	10.2	0.772	50.1	LOS D	13.8	105.4	1.00	0.93	16.5
12	R2	65	9.7	0.274	25.2	LOS B	2.0	15.3	0.84	0.72	23.9
Approach		660	8.9	0.772	45.2	LOS D	13.8	105.4	0.95	0.88	18.3
All Vehicles		3923	3.6	0.798	35.1	LOS C	22.2	161.0	0.88	0.80	21.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

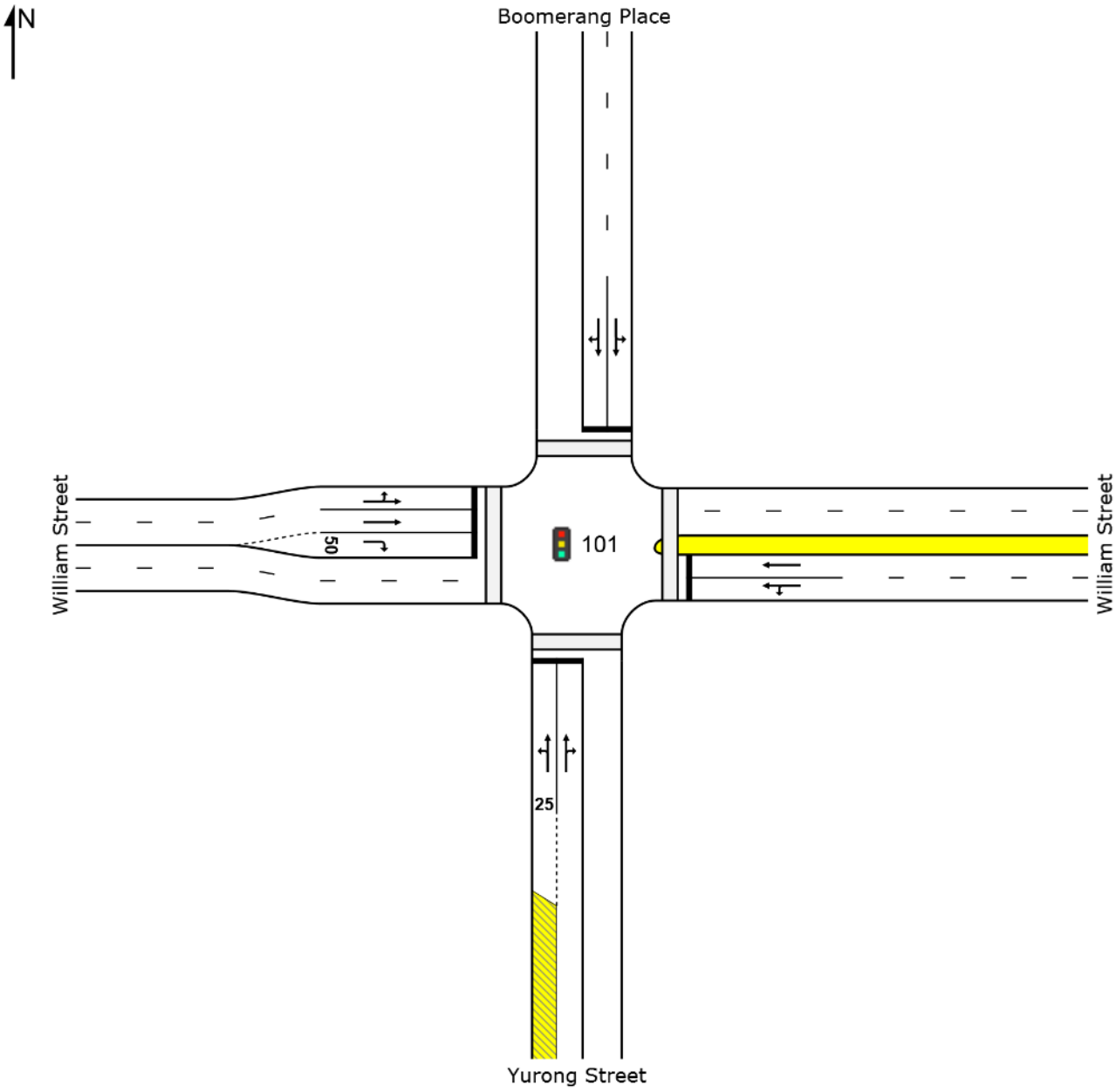
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	493	30.4	LOS D	1.2	1.2	0.75	0.75
P2	East Full Crossing	235	49.6	LOS E	0.7	0.7	0.95	0.95
P3	North Full Crossing	603	49.5	LOS E	1.8	1.8	0.96	0.96
P4	West Full Crossing	159	39.6	LOS D	0.4	0.4	0.85	0.85
All Pedestrians		1489	42.1	LOS E			0.88	0.88

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 101 [THU AM William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [THU AM William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Yurong Street											
1	L2	196	4.8	0.274	18.8	LOS B	4.5	33.1	0.71	0.72	31.7
2	T1	111	0.0	0.483	27.0	LOS B	5.5	38.5	0.92	0.77	30.6
3	R2	66	0.0	0.483	30.4	LOS C	5.5	38.5	0.92	0.77	26.1
Approach		373	2.5	0.483	23.3	LOS B	5.5	38.5	0.81	0.74	30.5
East: William Street											
4	L2	21	0.0	0.818	28.3	LOS B	22.6	161.5	0.95	0.95	31.6
5	T1	1304	2.3	0.818	23.7	LOS B	22.7	161.8	0.95	0.95	25.9
Approach		1325	2.3	0.818	23.8	LOS B	22.7	161.8	0.95	0.95	26.1
North: Boomerang Place											
7	L2	4	0.0	0.011	25.9	LOS B	0.1	0.8	0.79	0.61	27.0
8	T1	5	20.0	0.053	25.9	LOS B	0.4	2.9	0.85	0.64	30.6
9	R2	8	0.0	0.053	29.4	LOS C	0.4	2.9	0.85	0.64	28.8
Approach		18	5.9	0.053	27.6	LOS B	0.4	2.9	0.84	0.63	29.1
West: William Street											
10	L2	34	3.1	0.381	12.4	LOS A	7.4	54.7	0.56	0.51	43.2
11	T1	806	6.5	0.381	7.8	LOS A	7.4	54.9	0.56	0.50	38.1
12	R2	71	10.4	0.258	18.3	LOS B	1.1	8.5	0.87	0.74	37.4
Approach		911	6.7	0.381	8.8	LOS A	7.4	54.9	0.58	0.51	38.3
All Vehicles		2626	3.9	0.818	18.5	LOS B	22.7	161.8	0.80	0.77	30.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

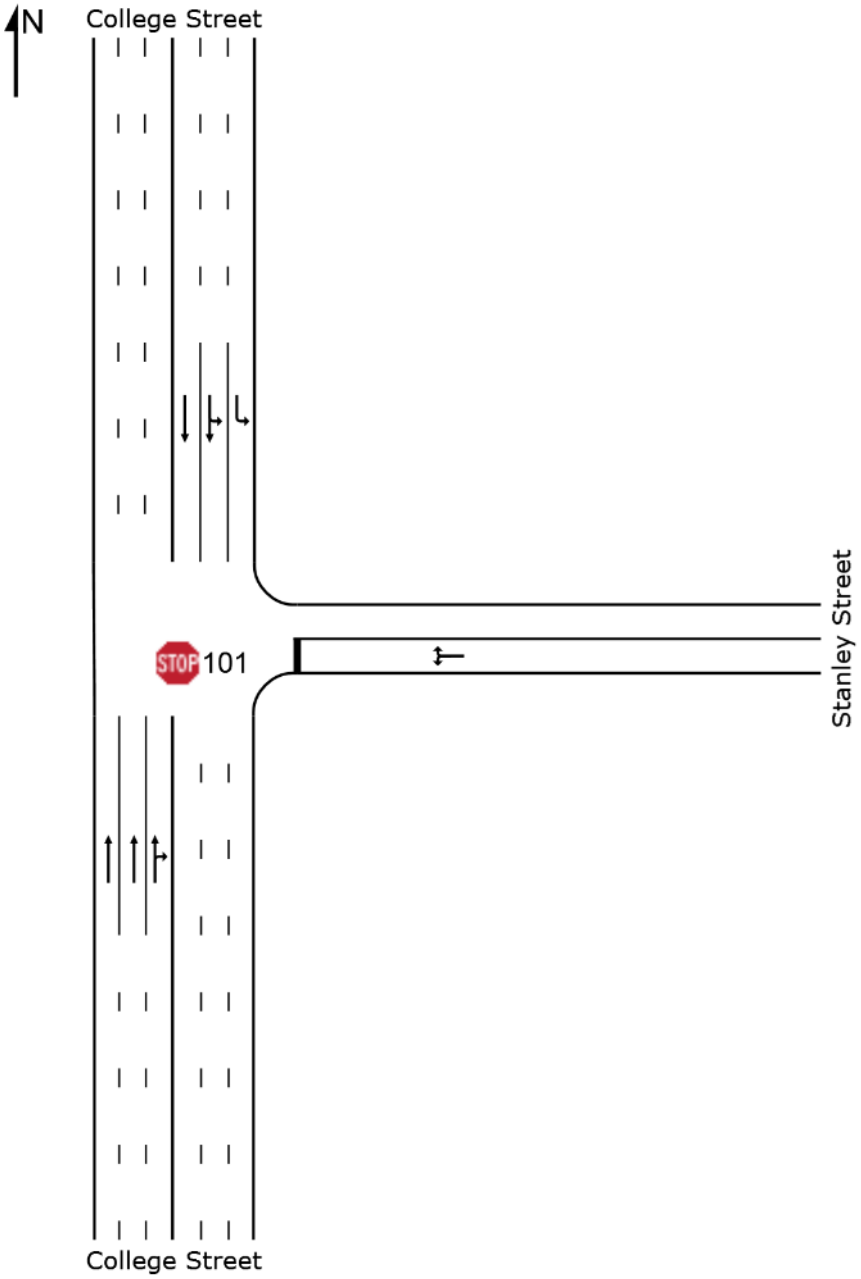
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	308	17.4	LOS B	0.4	0.4	0.71	0.71
P2	East Full Crossing	138	29.4	LOS C	0.3	0.3	0.92	0.92
P3	North Full Crossing	577	10.0	LOS B	0.6	0.6	0.54	0.54
P4	West Full Crossing	118	29.4	LOS C	0.2	0.2	0.92	0.92
All Pedestrians		1141	16.4	LOS B			0.67	0.67

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 101 [THU PM College + Stanley]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [THU PM College + Stanley]

New Site
Stop (Two-Way)

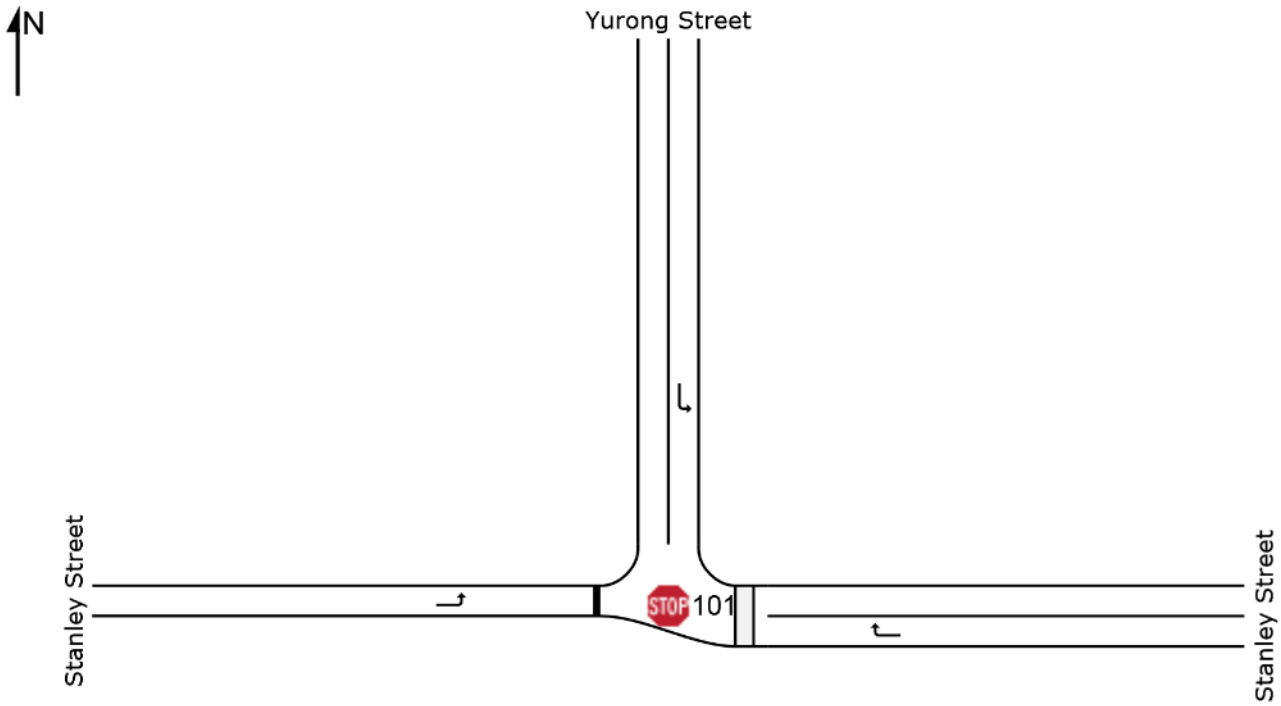
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: College Street											
2	T1	858	2.6	0.193	1.3	LOS A	1.3	9.2	0.09	0.02	36.8
3	R2	32	0.0	0.193	17.3	LOS B	1.3	9.2	0.55	0.14	25.6
Approach		889	2.5	0.193	1.9	NA	1.3	9.2	0.11	0.03	36.3
East: Stanley Street											
4	L2	13	0.0	0.148	10.4	LOS A	0.4	2.8	0.82	0.94	13.1
6	R2	3	0.0	0.148	143.1	LOS F	0.4	2.8	0.82	0.94	17.3
Approach		16	0.0	0.148	36.9	LOS C	0.4	2.8	0.82	0.94	14.0
North: College Street											
7	L2	52	2.0	0.029	3.4	LOS A	0.0	0.0	0.00	0.45	35.8
8	T1	1176	1.7	0.311	0.0	LOS A	0.0	0.0	0.00	0.00	40.0
Approach		1227	1.7	0.311	0.2	NA	0.0	0.0	0.00	0.02	39.7
All Vehicles		2133	2.0	0.311	1.2	NA	1.3	9.2	0.05	0.03	37.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [THU PM Stanley + Yurong]

New Site
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [THU PM Stanley + Yurong]

New Site
Stop (Two-Way)

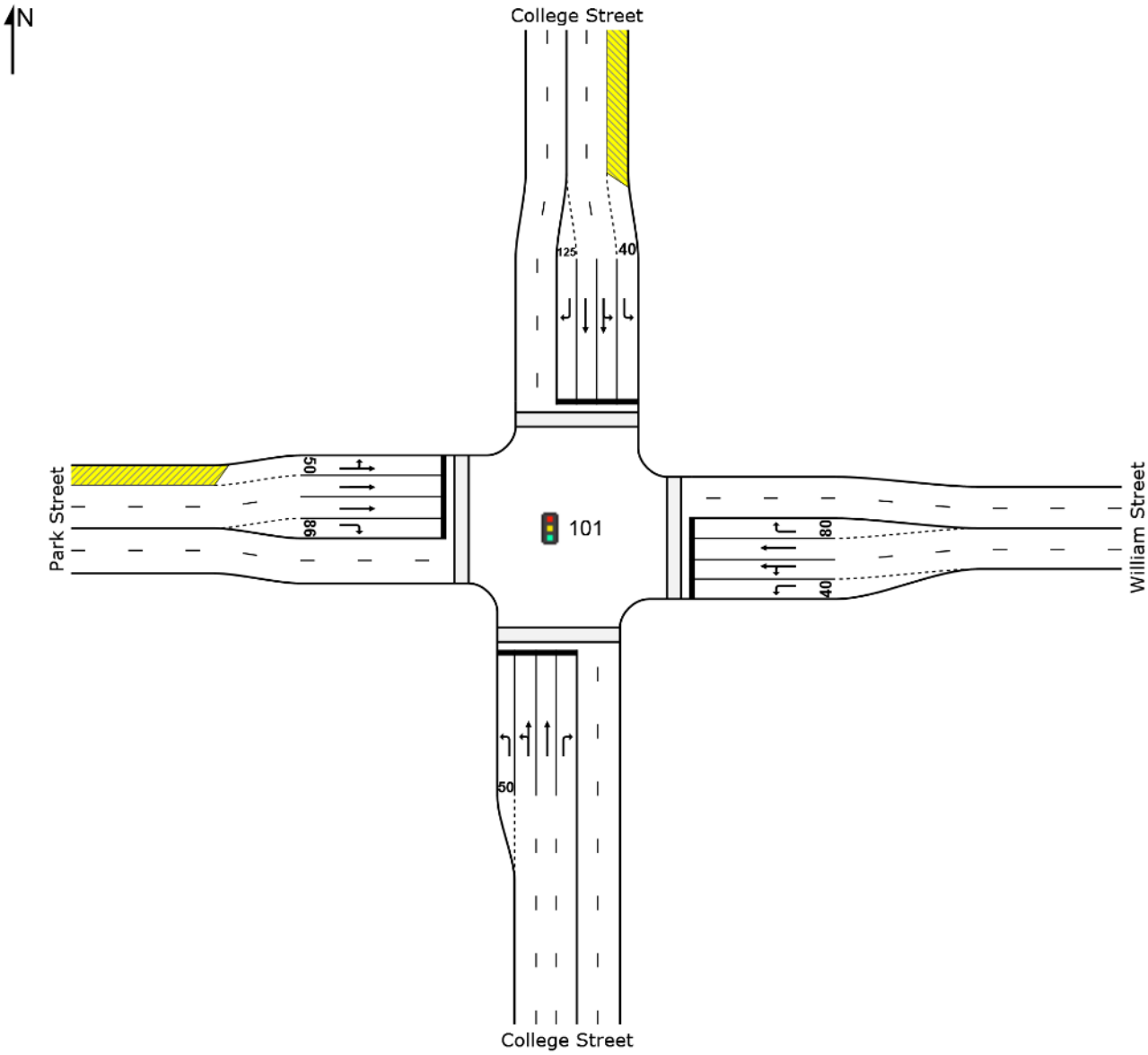
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Stanley Street											
6	R2	233	3.2	0.128	3.6	LOS A	0.0	0.0	0.00	0.50	35.0
Approach		233	3.2	0.128	3.6	NA	0.0	0.0	0.00	0.50	35.0
North: Yurong Street											
7	L2	180	7.0	0.102	3.4	LOS A	0.0	0.0	0.00	0.45	36.0
Approach		180	7.0	0.102	3.4	NA	0.0	0.0	0.00	0.45	36.0
West: Stanley Street											
10	L2	77	1.4	0.068	7.7	LOS A	0.3	1.9	0.34	0.87	32.4
Approach		77	1.4	0.068	7.7	LOS A	0.3	1.9	0.34	0.87	32.4
All Vehicles		489	4.3	0.128	4.2	NA	0.3	1.9	0.05	0.54	34.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [THU PM William, College + Park]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [THU PM William, College + Park]

New Site
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: College Street											
1	L2	52	12.2	0.077	24.6	LOS B	1.7	12.9	0.64	0.66	23.9
2	T1	543	2.7	0.551	37.8	LOS C	12.7	90.7	0.91	0.77	22.1
3	R2	279	0.0	0.888	63.5	LOS E	17.2	120.2	1.00	1.04	12.1
Approach		874	2.4	0.888	45.3	LOS D	17.2	120.2	0.93	0.85	18.8
East: William Street											
4	L2	377	1.4	0.559	23.4	LOS B	13.2	93.2	0.70	0.75	21.6
5	T1	625	3.7	0.792	44.4	LOS D	20.2	145.7	0.96	0.92	17.7
6	R2	247	2.6	0.718	33.7	LOS C	9.8	70.4	0.99	0.85	23.2
Approach		1249	2.8	0.792	35.9	LOS C	20.2	145.7	0.89	0.85	19.7
North: College Street											
7	L2	397	0.8	0.607	24.3	LOS B	14.2	100.4	0.72	0.76	26.1
8	T1	696	1.1	0.853	49.0	LOS D	24.3	171.7	0.97	1.00	19.6
9	R2	82	42.3	0.226	22.5	LOS B	2.5	23.5	0.77	0.71	28.5
Approach		1175	3.9	0.853	38.8	LOS C	24.3	171.7	0.87	0.89	21.9
West: Park Street											
10	L2	97	4.3	0.170	39.1	LOS C	5.4	39.6	0.85	0.75	23.5
11	T1	597	7.9	0.852	53.7	LOS D	17.4	129.9	0.99	1.02	15.8
12	R2	120	6.1	0.472	31.6	LOS C	4.4	32.4	0.95	0.77	21.6
Approach		814	7.2	0.852	48.7	LOS D	17.4	129.9	0.97	0.95	17.5
All Vehicles		4112	3.9	0.888	41.3	LOS C	24.3	171.7	0.91	0.88	19.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

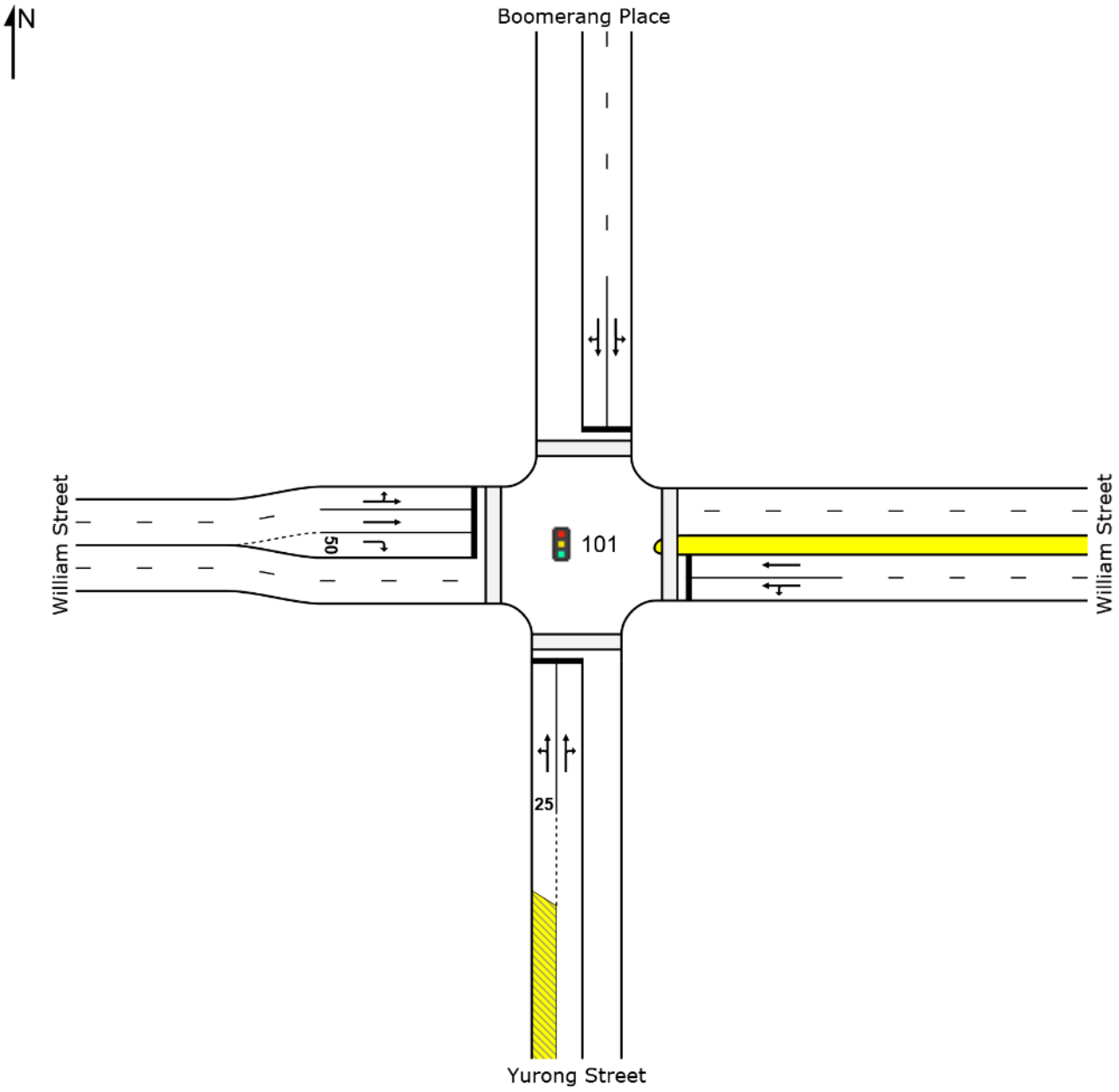
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	485	41.9	LOS E	1.3	1.3	0.88	0.88
P2	East Full Crossing	374	40.8	LOS E	1.0	1.0	0.87	0.87
P3	North Full Crossing	722	48.8	LOS E	2.2	2.2	0.96	0.96
P4	West Full Crossing	96	41.2	LOS E	0.3	0.3	0.87	0.87
All Pedestrians		1677	44.6	LOS E			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 101 [THU PM William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [THU PM William, Yurong + Boomerang]

New Site
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Yurong Street											
1	L2	168	5.0	0.236	16.5	LOS B	3.3	24.2	0.70	0.71	32.6
2	T1	37	0.0	0.305	23.2	LOS B	2.5	17.2	0.89	0.73	31.3
3	R2	57	0.0	0.305	26.6	LOS B	2.5	17.2	0.89	0.73	27.1
Approach		262	3.2	0.305	19.6	LOS B	3.3	24.2	0.77	0.72	31.3
East: William Street											
4	L2	24	0.0	0.762	23.8	LOS B	16.0	113.9	0.92	0.89	33.8
5	T1	1127	2.4	0.762	19.3	LOS B	16.0	114.1	0.92	0.89	28.5
Approach		1152	2.4	0.762	19.4	LOS B	16.0	114.1	0.92	0.89	28.6
North: Boomerang Place											
7	L2	32	0.0	0.085	25.0	LOS B	0.8	5.4	0.84	0.69	27.2
8	T1	61	1.7	0.196	22.4	LOS B	1.7	12.3	0.87	0.67	32.1
9	R2	7	0.0	0.196	25.7	LOS B	1.7	12.3	0.87	0.67	30.6
Approach		100	1.1	0.196	23.5	LOS B	1.7	12.3	0.86	0.68	30.8
West: William Street											
10	L2	20	5.3	0.500	12.1	LOS A	9.5	68.1	0.61	0.55	43.5
11	T1	1107	3.1	0.500	7.4	LOS A	9.5	68.2	0.61	0.55	38.7
12	R2	91	10.5	0.278	15.5	LOS B	1.2	9.3	0.84	0.74	38.9
Approach		1218	3.7	0.500	8.1	LOS A	9.5	68.2	0.63	0.56	38.8
All Vehicles		2732	3.0	0.762	14.5	LOS B	16.0	114.1	0.78	0.72	32.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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	South Full Crossing	404	17.2	LOS B	0.5	0.5	0.76	0.76
P2	East Full Crossing	99	24.4	LOS C	0.2	0.2	0.90	0.90
P3	North Full Crossing	786	9.4	LOS A	0.8	0.8	0.57	0.57
P4	West Full Crossing	48	24.3	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		1338	13.4	LOS B			0.66	0.66

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

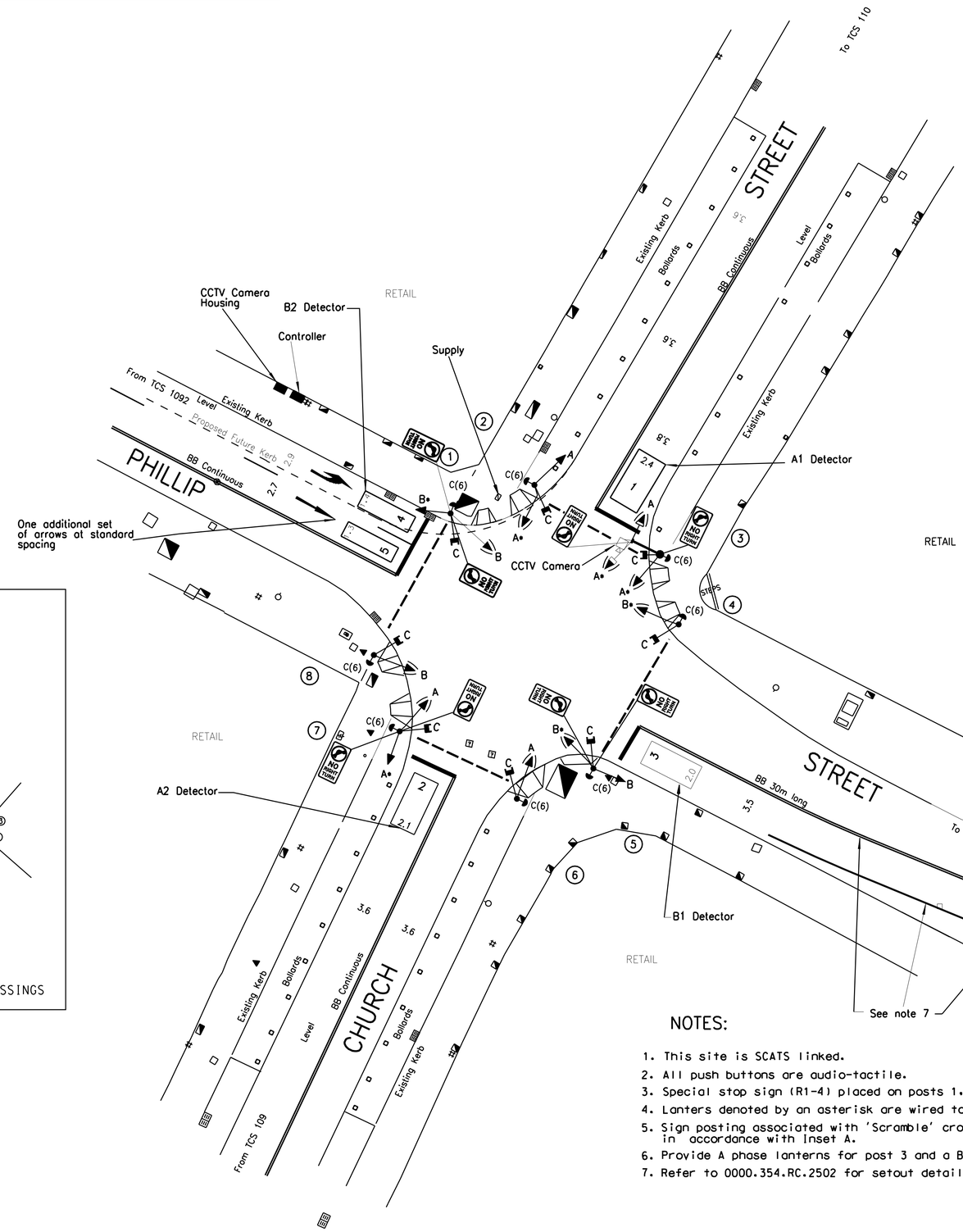
Appendix C

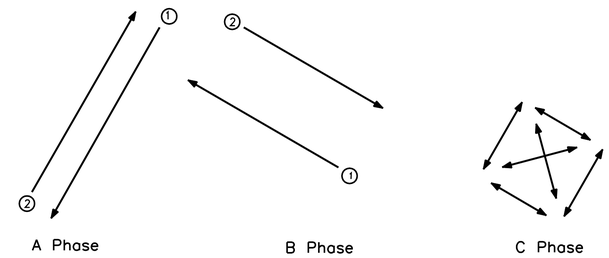
RMS Phasing Diagrams

DRAWN USING CAD
DO NOT AMEND MANUALLY

7000.354.VV.0185

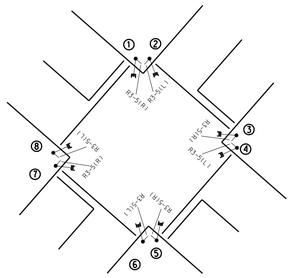
DATE IN SERVICE : 15/06/59
1st RECONSTRUCTION : 29/06/81
2nd RECONSTRUCTION : 19/02/98





MOVEMENTS

INSET A



ⓝ Represents TS post numbers

SIGN POSITIONS AT SCRAMBLE CROSSINGS

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	1	3.2	EXIST	EXIST
2	2	4.1	EXIST	EXIST
3	5S	–	EXIST	EXIST
4	2	3.2	EXIST	EXIST
5	2	4.1	EXIST	EXIST
6	2	4.1	EXIST	EXIST
7	2	4.1	EXIST	EXIST
8	2	3.2	EXIST	EXIST

NOTES:

1. This site is SCATS linked.
2. All push buttons are audio-tactile.
3. Special stop sign (R1-4) placed on posts 1.5 and 8.
4. Lanterns denoted by an asterisk are wired to a separate signal group.
5. Sign posting associated with 'Scramble' crossing to be in accordance with Inset A.
6. Provide A phase lanterns for post 3 and a B phase lantern for post 5.
7. Refer to 0000.354.RC.2502 for setout detail.

A	ORIGINAL ISSUE	
C	ISSUE WAE DETAILS ADDED. CORRIGAN ELECTRICS	27/03/98
D	Issue Network Op's instn Altered Pav't markings. Realigned ped lanterns. Added 5 SMART access stops in accordance with ARR. Inset A & Note 5. GAP	25/02/00
E	Issue JI SM 403 19.5.05 Plan amended as instructed by Mr. N Hatton - Team Leader, Network Services.	
K.I.	23.5.05	
F	Issue JI SM425 1.9.05 Amended: Phasing, post chart, detector specification, SSDDS, stop lines in Church St north and Phillip St east relocated.	
K.I.	7.9.05	
G	Issue JI SM445 6.2.06 Added "A" E.C.D. facility for southbound traffic in Church St.	
A.J.	07/02/2006	
H	Issue. Amended: Kerb line N.W. corner. Widen kerb on Eastbound approach on Phillip Street. Detectors renumbered. TAR Technologies Pty Ltd	28/04/06
I	Issue	23/08/06
J	Issue SM533 1-5-08 Add CCTV camera to post 4. Add CCTV Camera Housing. Update plan to onsite conditions for west leg of Phillip St. K. 2-5-09	
K	Issue SM573 Removed: post 3 & 6. Renumber: psi 4, 5, 6, 7, 8 and 3. Remove: C-D & D detectors. Relocate: C1 detector. Renamed: C1 & C2 detectors to B1 & B2. Drawn SK	30/06/09 09/07/09
L	Issue: WAE 'A' lantern moved from Post 3 to Post 2. AP IH	28/09/09

PUBLIC UTILITY LEGEND		REFERENCE PLANS	
HYDRANT	□	SYMBOLS/ABBS.	VD003-6
STOP VALVE	▲	STD POSIT	VD001-5
GAS VALVE	#	DET SCHED EXP	VD018-10
SEWER MANHOLE	⊛	PRES. DETECT	VC005-17
TELECOM PIT	◪	SSG DIS. SEQ.	VD018-8
ELECT LIGHT POLE	☾		
POWER POLE	○		
STAY POLE	⊘		
TELEPHONE BOX	☎	SURVEYOR: Parramatta Ccl	
TELECOM PILLAR	◕	DATE : 1997	

U.B.D. Ref. MAP 211 C2
I.S.G. CO-ORDS E: 300243 N: 1257201

DESIGNED R. N.
CHECKED R. N.
R. N. SITE CHECKED
R. N. RECOMMENDED

APPROVED
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
17-11-97 DATE

ACCEPTED
18-11-97 DATE

Roads and Traffic Authority, N.S.W

CITY OF PARRAMATTA
CHURCH STREET AND
PHILLIP STREET
PARRAMATTA

DESIGN LAYOUT TCS No 185

EXISTING ☒ PROPOSED ☐
CADD DRAWING FILE: VV0185_11L.dgn
SCALE 5 0 (1:200) 5 10
ISSUE L
FILE 354TS259
SUPERSEDES SHEET/ISSUE 11/K
REGN. 7000.354.VV.0185
SHEET 11

DRAWN BY CADD
DO NOT AMEND MANUALLY

DATE IN SERVICE : 07/11/66

RTA

7000.412.VV.0315

A Phase

B Phase

C Phase

D Phase

D1 Phase

D2 Phase

E Phase

F1 Phase

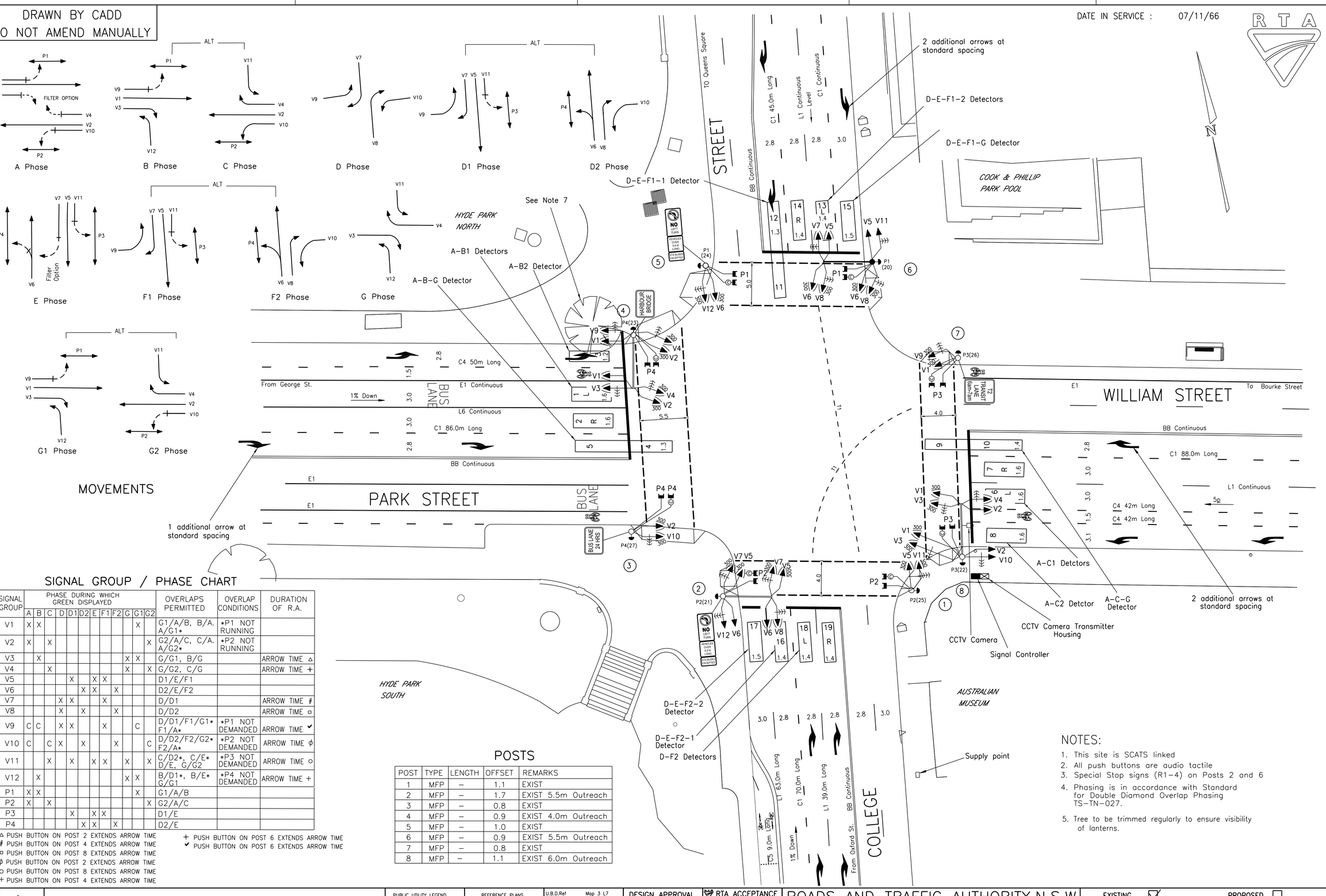
F2 Phase

G Phase

G1 Phase

G2 Phase

MOVEMENTS



SIGNAL GROUP / PHASE CHART

SIGNAL GROUP	PHASE DURING WHICH GREEN DISPLAYED												OVERLAPS PERMITTED	OVERLAP CONDITIONS	DURATION OF R.A.
	A	B	C	D	D1	D2	E	F1	F2	G	G1	G2			
V1	X	X									X		G1/A/B, B/A. A/G1*	*P1 NOT RUNNING	
V2	X		X									X	G2/A/C, C/A. A/G2*	*P2 NOT RUNNING	
V3		X								X	X		G/G1, B/G		ARROW TIME △
V4			X							X		X	G/G2, C/G		ARROW TIME +
V5					X		X	X					D1/E/F1		
V6						X	X		X				D2/E/F2		
V7				X	X			X					D/D1		ARROW TIME #
V8				X		X			X				D/D2		ARROW TIME □
V9	C	C		X	X			X			C		D/D1/F1/G1* F1/A*	*P1 NOT DEMANDED	ARROW TIME ✔
V10	C		C	X		X			X			C	D/D2/F2/G2* F2/A*	*P2 NOT DEMANDED	ARROW TIME ϕ
V11			X		X		X	X		X		X	C/D2*, C/E* D/E, G/G2	*P3 NOT DEMANDED	ARROW TIME ○
V12		X								X	X		B/D1*, B/E* G/G1	*P4 NOT DEMANDED	ARROW TIME +
P1	X	X									X		G1/A/B		
P2	X		X									X	G2/A/C		
P3					X		X	X					D1/E		
P4						X		X		X			D2/E		

△ PUSH BUTTON ON POST 2 EXTENDS ARROW TIME
PUSH BUTTON ON POST 4 EXTENDS ARROW TIME
□ PUSH BUTTON ON POST 8 EXTENDS ARROW TIME
ϕ PUSH BUTTON ON POST 2 EXTENDS ARROW TIME
○ PUSH BUTTON ON POST 8 EXTENDS ARROW TIME
+ PUSH BUTTON ON POST 6 EXTENDS ARROW TIME
✔ PUSH BUTTON ON POST 6 EXTENDS ARROW TIME

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	MFP	–	1.1	EXIST
2	MFP	–	1.7	EXIST 5.5m Outreach
3	MFP	–	0.8	EXIST
4	MFP	–	0.9	EXIST 4.0m Outreach
5	MFP	–	1.0	EXIST
6	MFP	–	0.9	EXIST 5.5m Outreach
7	MFP	–	0.8	EXIST
8	MFP	–	1.1	EXIST 6.0m Outreach

NOTES:

1. This site is SCATS linked
2. All push buttons are audio tactile
3. Special Stop signs (R1-4) on Posts 2 and 6
4. Phasing is in accordance with Standard for Double Diamond Overlap Phasing TS-TN-027.
5. Tree to be trimmed regularly to ensure visibility of lanterns.

A ORIGINAL ISSUE

'B' ISSUE -WAE
Posts 5 & 6 relocated to accommodate cycle path / crossing as per Issue A
CNJ 3/11

PUBLIC UTILITY LEGEND		REFERENCE PLANS	
HYDRANT	□	SYMBOLS/ABBS.	VD003-6
STOP VALVE	△	STD POSIT	VD001-5
GAS VALVE	#	DET SCHED EXP	VD018-10
SEWER MANHOLE	⊗	PRES DETECT	VC005-17
TELECOM PIT	◪	SSG DIS SEQ	VD018-8
ELECT LIGHT POLE	○	CABLE INSTALLATION	SHEET 19
POWER POLE	○	CABLE CHART	SHEET 20
STAY POLE	⊘		
TELEPHONE BOX	T	SURVEYOR :	
TELECOM PILLAR	◕	DATE :	

U.B.D.Ref Map 3 L7
I.S.G. CO-ORDS E: 319 483 N: 1 250 396

DESIGNED JS
CHECKED AM
R.N. SITE CHECKED
R.N. RECOMMENDED

DESIGN APPROVAL
APPROVED
ROSS NETTLE
POSITION DIRECTOR
DATE 14.4.10
DESIGN PREPARED BY
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

RTA ACCEPTANCE
RECOMMENDED
POSITION T.L.N.O
DATE 20/04/10
ACCEPTED
PAUL MCNEILL
POSITION MANAGER, ROAD NETWORK
DATE 29/04/10

ROADS AND TRAFFIC AUTHORITY, N.S.W

CITY OF SYDNEY COUNCIL AREA
TRAFFIC SIGNALS AT INTERSECTION OF PARK, WILLIAM AND COLLEGE STREETS SYDNEY

DESIGN LAYOUT TCS No 0315

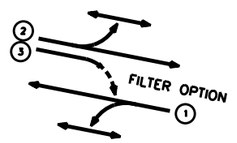
EXISTING ☑ PROPOSED ☐
CADD FILE: VV0315_21B.dgn
SCALE 5 0 (1:200) 5 10
ISSUE B
FILE 412 TS 245
SUPERSEDES SHEET/ISSUE 21A
REGN. 7000.412.VV.0315
SHEET 21

DRAWN BY CADD
DO NOT AMEND MANUALLY

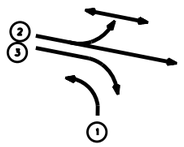
DATE IN SERVICE : 01/05/72

RTA

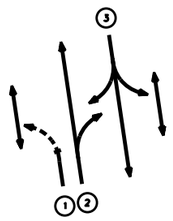
7000.412.VW.3142



A PHASE



B & D PHASE



C PHASE

MOVEMENTS

DETECTOR SPECIFICATION

Detector		Specifications				
A	FN	A(L)	A(E 1)			
	SG/PS	$\overline{A}$	A			
	DS	–	–			
A-B-D1 APP./DEP.	FN	B(PR)	D(PR)			
	SG/PS	A	A			
	DS	Z–	Z–.Z+			
A-B-D1 APP.	FN	A(L).B(L)	D(L)	B(L)	D(L)	
	SG/PS	$\overline{A/B/D}$	$\overline{A/B/D}$	$\overline{B/D}$	$\overline{B/D}$	
	DS	Z–	Z–.Z+	$\overline{Z}$–	$\overline{Z}$–.Z+	
A-B-D1 APP.	FN	A(E 3)			B(E 3)	D(E 3)
	SG/PS	A			B	D
	DS	Z–.$\overline{A}$–B–D1(PR).$\overline{B(NEXT)}$.$\overline{D(NEXT)}$			$\overline{D(NEXT)}$	$\overline{B(NEXT)}$
A-B-D2	FN	A (L)	A(E 2)		B(E2)	
	SG/PS	$\overline{A/B/D}$	A		B	
	DS	–	$\overline{B(NEXT)}$.$\overline{D(NEXT)}$		$\overline{A(NEXT)}$.$\overline{D(NEXT)}$	
A-B-D2	FN	D(E2)				
	SG/PS	D				
	DS	$\overline{A(NEXT)}$.$\overline{B(NEXT)}$				
B-C-D	FN	B(PR)	D(PR)	B(E1)		
	SG/PS	$\overline{B}$.$\overline{C}$.$\overline{D}$	$\overline{B}$.$\overline{C}$.$\overline{D}$	B		
	DS	$\overline{C}$	Z+.$\overline{C}$	$\overline{C(NEXT)}$.$\overline{D(NEXT)}$		
B-C-D	FN	C(E1)		D(E1)		
	SG/PS	C		D		
	DS	$\overline{B(NEXT)}$.$\overline{D(NEXT)}$		$\overline{B(NEXT)}$.$\overline{C(NEXT)}$		
C1	FN	C (L)	C(E2)			
	SG/PS	$\overline{C}$	C			
	DS	–	–			
C2	FN	C (L)	C(E3)			
	SG/PS	$\overline{C}$	C			
	DS	–	–			
A P.B.	FN	A(PB)	C(L)			
	SG/PS	$\overline{A(WALK)}$	A.$\overline{A(WALK)}$			
	DS	–	$\overline{B}$.$\overline{C}$.$\overline{D}$			
A-B-D P.B.	FN	A(PB)		C(L)		
	SG/PS	$\overline{A/B/D}$.A/B/D(WALK)		A/B/D.$\overline{A/B/D(WALK)}$		
	DS	$\overline{B}$.$\overline{D}$		$\overline{C}$		
C1 P.B.	FN	C(PB)	A(L)			
	SG/PS	$\overline{C1(WALK)}$	C.$\overline{C1(WALK)}$			
	DS	–	$\overline{A}$.$\overline{B}$.$\overline{D}$			
C2 P.B.	FN	C(PB)	A(L)			
	SG/PS	$\overline{C2(WALK)}$	C.$\overline{C2(WALK)}$			
	DS	–	$\overline{A}$.$\overline{B}$.$\overline{D}$			

SPECIAL SIGNAL GROUP DISPLAY SEQUENCE

SIGNAL GROUP	TABLE TYPE	REMARKS
A/B/D	3	–
B/D (RT)	40	Z– Filter option, RA protection for A Walk and Clearance. Z+ Introduces D Phase.
B/D	76	RA protection for C1 walk. P.B. on Post 3 extends R.A. subject to timer.
C RT	29	RA protection for C2 pedestrian
C• RT	83	RA protection for C1 pedestrian
A/B/D PED.		Intro concurrent with A/B/D Green Overlap permitted A ⇌B ⇌D Timer terminated except under Master link

POSTS

POST	TYPE	LENGTH	REMARKS
1	SP	–	EXIST
2	SP	–	EXIST
3	SP	–	EXIST 4.0m Outreach
4	SP	–	EXIST
5	SP	–	EXIST
6	SP	–	EXIST
7	SP	–	EXIST 6.0m Outreach
8	ELP	–	EXIST

NOTES:

1. This site is SCATS linked
2. All push buttons are audio tactile
3. Special Stop sign (R1-4) on Posts 1 and 5
4. Lanterns denoted with • are wired to separate signal group.

A ORIGINAL ISSUE
B ISSUE AMENDED TO SUIT WAE CORRIGAN 8/06

PUBLIC UTILITY LEGEND

HYDRANT	
STOP VALVE	
GAS VALVE	
SEWER MANHOLE	
TELECOM PIT	
ELECT LIGHT POLE	
POWER POLE	
STAY POLE	
TELEPHONE BOX	
TELECOM PILLAR	

REFERENCE PLANS

SYMBOLS/ABBS.	VD003-6
STD POST	VD001-5
DET SCHED EXP	VD018-10
PRES. DETECT	VD005-17
SSG DIS. SEQ.	VD018-8
SURVEYOR :	
DATE :	

U.B.D.Ref Map 3 M7
I.S.G. E: 334 746
CO-ORDS N: 6 250 198

DESIGNED ROSS NETTLE
CHECKED
R.M. SITE CHECKED
R.M. RECOMMENDED

DESIGN APPROVAL
APPROVED
ROSS NETTLE
POSITION DIRECTOR
DATE 18.11.04
DESIGN PREPARED BY
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

RTA ACCEPTANCE
RECOMMENDED
POSITION TLNO
DATE 8/3/2005
ACCEPTED
POSITION
DATE

Roads and Traffic Authority, N.S.W

CITY OF SYDNEY COUNCIL AREA
TRAFFIC SIGNALS AT INTERSECTION OF
WILLIAM STREET AND YURONG STREET
DARLINGHURST

DESIGN LAYOUT TCS No 3142

EXISTING ☑ PROPOSED ☐
CADD FILE: vw3142_188.dgn
SCALE 5 0 (1:200) 5 10
ISSUE B
FILE 412 TS 313
SUPERSEDES SHEET/ISSUE 158
REGN. 7000.412.VW.3142
SHEET 18

Appendix D

Traffic Review of Bus Drop Off

Taylor Thomson Whitting

Structural
Civil
Traffic
Facade

9 October 2018

151965 TAAB

Australian Museum
1 William Street
Sydney NSW 2000

Attention: Greg Murphy

Australian Museum Additions and Alterations
Traffic Review of Bus Drop Off

Dear Greg,

This letter intends to respond in part to an item within the Secretary's Environmental Assessment Requirements (SEARs) for the Australian Museum Additions and Alterations project (SSD 9452) dated 27th July 2018. The item relates to public domain and public access, and is written as follows:

"Provide a detailed study that test options for the location and layout of the primary entry, equitable public access and circulation. The study should demonstrate how the proposal considers and integrates the future development and expansion of the Museum"

The contents of this letter review the traffic engineering aspects to the proposal with regards to the bus drop off area and its relation to access into the Museum.

Background

The Museum experiences many visitors by coach bus. The current arrangement is such that coach buses generally use the drop off location provided on College Street that is shared with Sydney Grammar School (refer to Figure 1 for the location of this drop off). This area is approximately 30 metres long and is signposted as "No Parking" 6am to 6pm Monday to Friday.

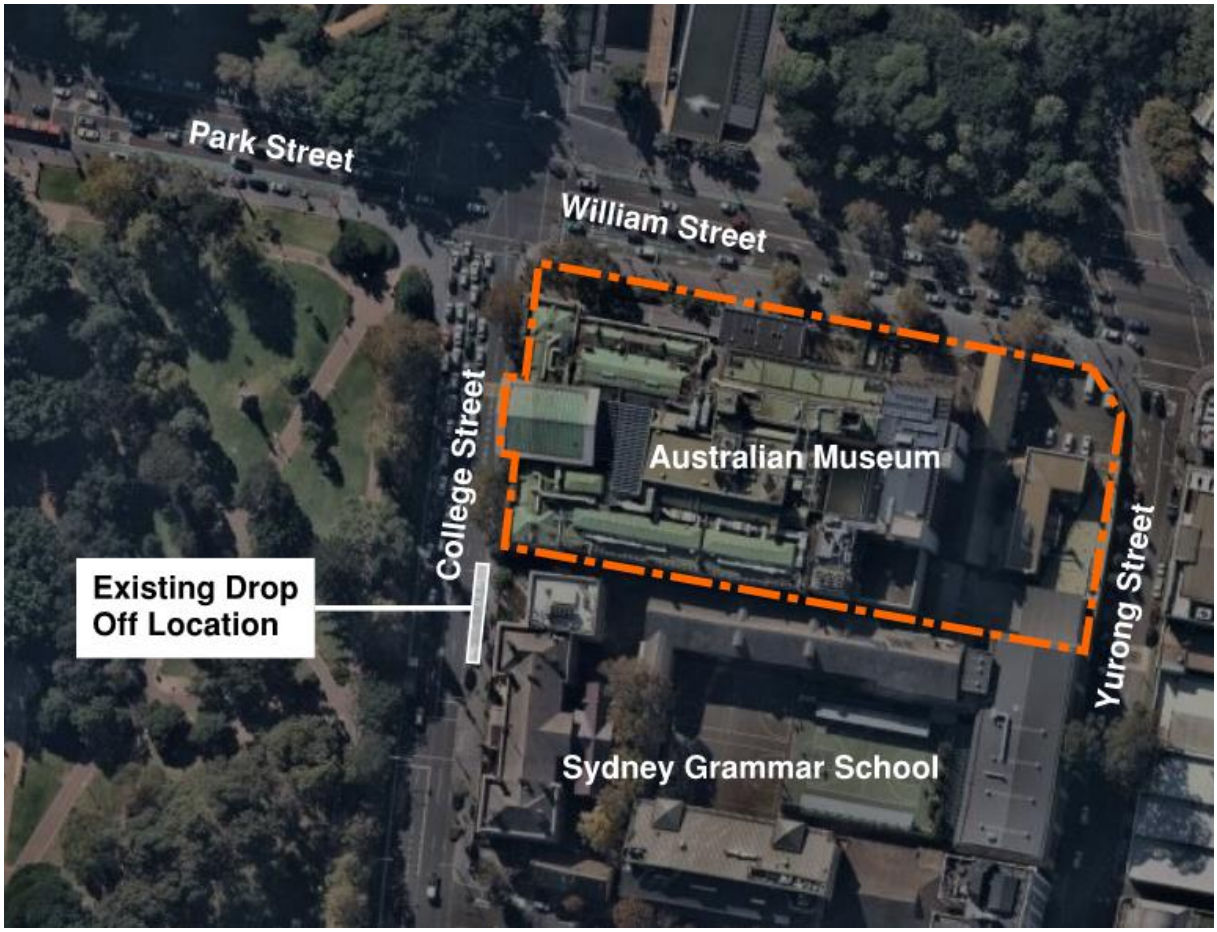


Figure 1: Drop Off Location

Once groups are dropped off in this location, they are required to walk approximately 70 metres to reach the corner of College Street and William Street where the current main entrance is to the Museum. As part of the Additions and Alterations project, a revised entry is proposed for groups located on William Street. The intent of this design is to separate group entry to reduce queuing and improve the efficiency of movements.

Existing Issues

As part of the wider traffic study of the Museum, TTW has visited the site numerous times to observe traffic movements around the site. A site visit was conducted on the 8th of August 2018 to observe the operation of bus drop off movements during a peak period (the Science Festival) and identify any significant issues with the existing arrangement. The following key issues were identified:

- The drop off area has capacity for only two coach buses to queue, there is insufficient capacity during major events (such as the Science Festival). When the current drop off zone is full, buses were observed to either queue into the trafficable lane closer to William Street or drop off in other locations such as adjacent to St Mary's Cathedral or on Park Street. Refer to Figure 2 showing an example of this queuing.
- Available footpath width is reduced significantly when groups are dropped off as they first queue adjacent to the Sydney Grammar School fence. Groups are then required to walk up the footpath into the Museum. This significantly reduces the footpath width in areas, particularly adjacent to the existing bus shelter.
- Groups are required to traverse a significant length of footpath adjacent to College Street before entering the Museum property. When the current drop off zone is full and buses drop off in other areas, groups may be required to cross at the intersection of William

Street, College Street and Park Street. It was observed that these groups can extend across the available width of the footpath resulting in unsafe behaviour by other pedestrians crossing (refer to Figure 3 showing pedestrian congestion).

Figure 2: Bus Queuing Observed During Science Festival

Figure 3: Pedestrian Congestion at Corner of William Street and College Street

Bus Drop Off Study

To alleviate the existing issues at the drop off, it is proposed to include an additional bus bay as part of the Additions and Alterations project. A number of locations were considered as part of the development, summarised below.

- Option 1: Within the Site

  Installation of a bus drop off within the Australian Museum site. Due to constraints of existing heritage buildings, this would need to be located in the eastern portion of the site.

- Option 2: Yurong Street

  Installation of a bus zone on the western kerbside of Yurong Street at the location of existing on street parking.

- Option 3: College Street near Sydney Grammar School

  Extension of the existing drop off area fronting Sydney Grammar School on the eastern kerbside of College Street towards the intersection of Park Street, College Street and William Street.

- Option 4: College Street near St Mary's Cathedral

  Direct buses to use the existing 'No Parking' zone located outside of St Mary's Cathedral.

- Option 5: Park Street

  Installation of a bus zone within the existing on street parking at Park Street.

- Option 6: William Street at Existing Bus Zone

  Utilise the existing bus zone located on William Street.

- Option 7: William Street near Proposed Group Entry

  Installation of an indented drop off bay on William Street in replacement of existing on street parking.

The advantages and disadvantages to each option has been summarised in Table 1 and a summary of the approximate location of these options is shown in Figure 4.

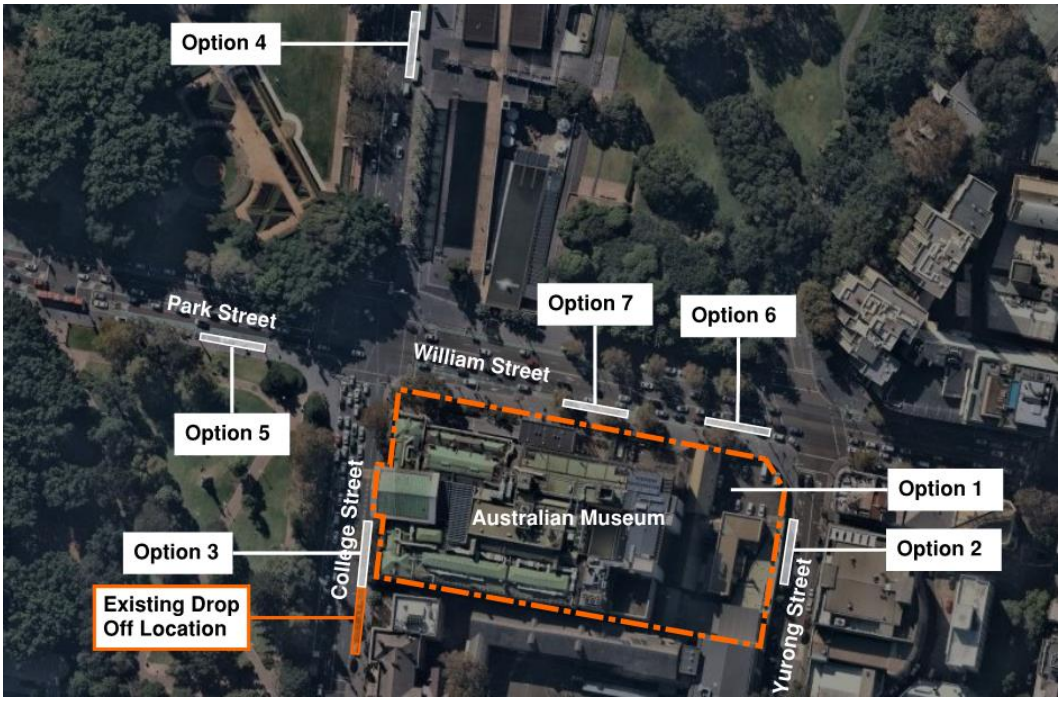


Figure 4: Location of Bus Drop Off Options

Table 1: Bus Drop Off Options

Option	Advantages	Disadvantages
1. Within the Site	Increased safety of bus and pedestrian movements. Accessible access available from drop off point. Reduced impact on external roadways.	Existing site is constrained due to heritage buildings and the size of the site, resulting in few options for an internal location. Introduction of an internal drop off would conflict with proposed master planned loading dock improvements in the eastern portion of the site. Entry and exit driveways would interfere with William Street traffic flows.
2. Yurong Street	Only impacts on street parking. Bus movements would occur on a relatively quiet street and therefore it would result in limited impacts to traffic flow.	Groups would be dropped off on Yurong Street which would be adjacent to the future loading dock entry reducing pedestrian safety. Groups would be required to traverse steep grades on William Street to reach the entrance.
3. College Street near Sydney Grammar School	No on street parking would be impacted. As it would act as an extension to the existing drop off zone, drop off behaviour would largely be maintained as existing. Relatively level access would be available to the main entry of the Museum.	Bus drop off not located near main group entry. Would require groups to traverse the College Street and William Street footpaths reducing pedestrian safety. Groups would be required to walk around the corner of College Street and William Street (an existing pinch point) which would reduce pedestrian amenity for the public. May impact traffic flow as the easternmost exiting lane on the southern College Street intersection leg would have reduced width.
4. College Street near St Mary's Cathedral	No on street parking would be impacted. Coach buses would use existing drop off area.	Groups would be required to traverse the College Street footpath for a large distance which would reduce pedestrian safety.

Option	Advantages	Disadvantages
5. Park Street	Relatively level access would be available for groups from the bus drop off location. Would result in limited impacts to traffic flow.	Would result in impacts to on street parking. May affect recently installed accessible on street parking space. Groups would be required to traverse the Park Street footpath and cross College Streets at the traffic lights. It has been observed that groups crossing at this location generally extend across the width of the crossing. This reduces pedestrian safety of the public.
6. William Street at Existing Bus Zone	No on street parking would be impacted.	Groups would be required to traverse steep grades along William Street to enter the Museum. Coach drop off and pick up would impact the existing bus services that use the bus zone. As coaches would utilise an existing travel lane along William Street, there would be a significant impact to traffic flow. Groups would be required to traverse steep grades on William Street to enter the Museum.
7. William Street near Proposed Group Entry	Groups would be dropped off and picked up adjacent to the group entrance to the Museum. This would reduce the length of time and distance that they would be required to traverse public footpaths. As a result pedestrian amenity and safety would be increased. Relatively level access would be available from the drop off point to the entrance to the Museum. Groups would be able to queue within the site instead of on the public footpath increasing pedestrian amenity of the public. There would be limited impact to traffic flow.	On street parking would be impacted. The associated kerb works would result in relocation of existing street trees.

Recommendation

Following the review of a number of options for the bus drop off, Option 7 would result in the greatest benefit for the Museum and general public. It would allow for groups visiting the Museum to enter the site as soon as possible and on a relatively accessible path. Queuing of groups would not occur on public footpaths reducing the impact to the general public and safety concerns with regards to groups queuing adjacent to heavily trafficked roads.

As the provision of one bus drop off point will be unable meet the peak demand, it is recommended that the secondary location be considered. We recommend this be a combination of the existing drop off in front of Sydney Grammar School and Option 3, as coaches currently drop off in these locations during peak times. This location will allow groups to access the Museum without needing to cross roads with significant traffic volumes, resulting in increased safety for the groups and the public.

To manage the use of these drop off locations, and reduce the impact on traffic and pedestrian flows, it is recommended that the Museum develop a Coach Management Plan detailing strategies to maintain efficient drop off movements.

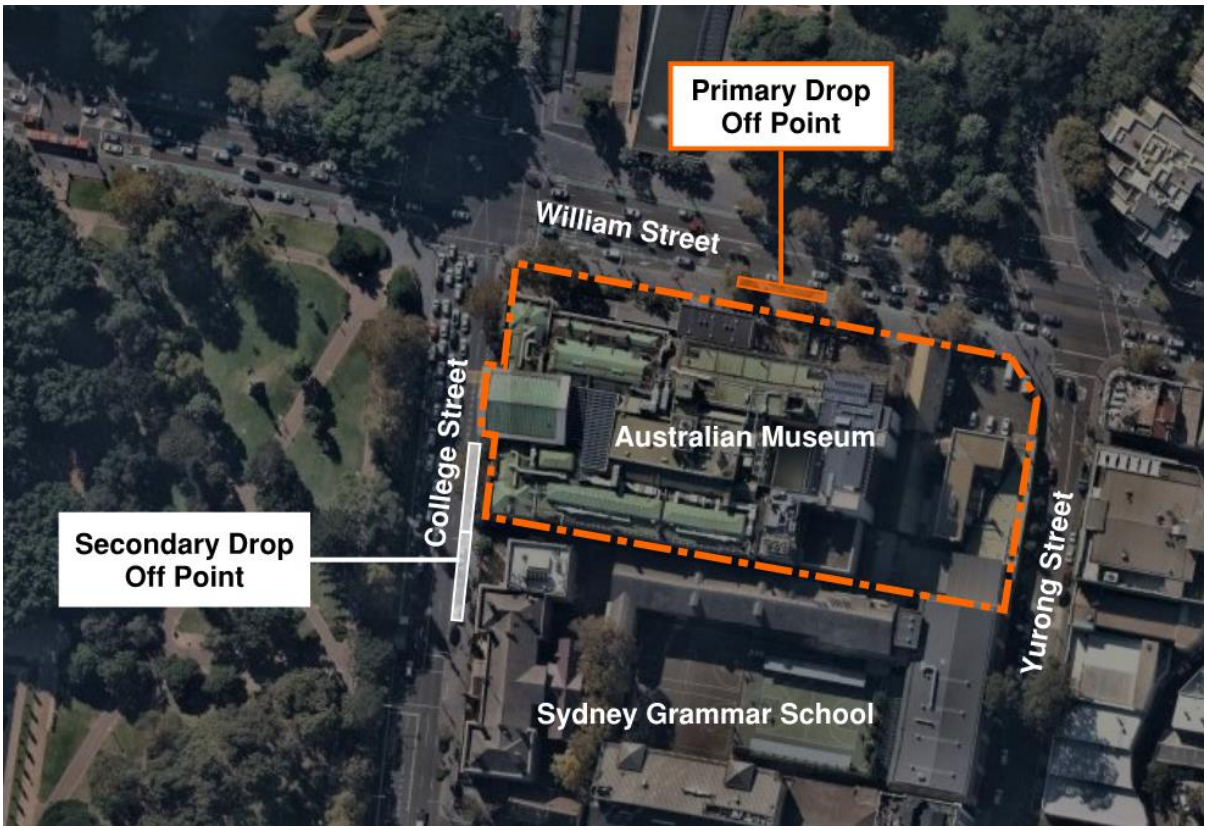


Figure 5: Recommended Drop Off Locations

Prepared by
TAYLOR THOMSON WHITTING (NSW) PTY LTD

GRACE CARPP
Traffic Engineer

Authorised By
TAYLOR THOMSON WHITTING (NSW) PTY LTD

PAUL YANNOULATOS
Technical Director

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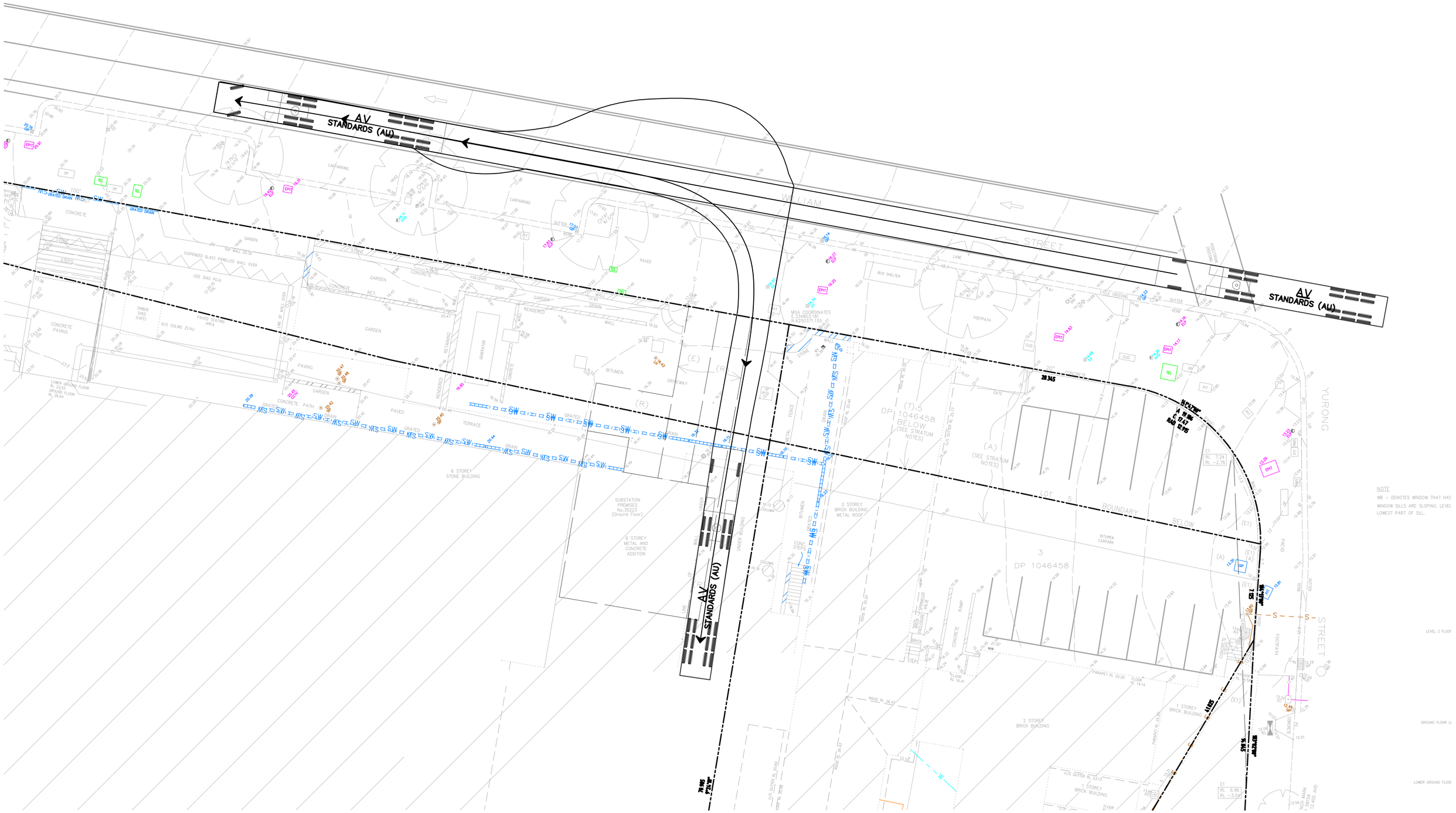
Appendix E

Vehicle Swept Path Analysis

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C01

Note: Time restrictions apply when stopping traffic on William Street.
Semi-trailers approach the Museum from Kings Cross.



PRELIMINARY

FileName: Turning-Existing_better.dwg – USER: gcocc – Plot File Created: Oct 09, 2018 – 2:41pm

A1 0 1 2 3 4 5 6 7 8 9 10

Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date
Rev	Description	Eng	Draft	Date

Architect
HAMES SHARLEY
LEVEL 7
46 MARKET STREET
SYDNEY NSW 2000

Traffic Engineer
Taylor Thomson Whitting
612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project
AUSTRALIAN MUSEUM
MASTER PLAN

Sheet Subject
LOADING DOCK TURNING PATHS

Scale : A1	Drawn	Authorised
NTS	GC	PY

Job No	Drawing No	Revision
151965	SK001	1

Plot File Created: Oct 09, 2018 - 2:41pm

Appendix F

Authorities Meeting Minutes

Record of Meeting Minutes

Project	Australian Museum Additions and Alterations	**Date & Time**	7th August 2018 2.00 – 3.00
Subject	Meeting with Transport for NSW, Roads and Maritime Services and City of Sydney	**Pages**	2
Location	Level 44, 680 George Street, Sydney	**Job No.**	151965 TAAA

Attendee(s)

Taylor Thomson Whitting – Paul Yannoulatos (TTW-PY)
Taylor Thomson Whitting – Grace Carpp (TTW-GC)
Hames Sharley – Oliver Wellings (HS-OW)
Australian Museum – Greg Murphy (AM-GM)
Transport for NSW – Katherine McCray (TfNSW-KM)
Roads and Maritime Services – Mohamed Tita (RMS-MT)
City of Sydney – Van Le (CoS-VL)

Item	Description
1	**INTRODUCTION**
1.1	**Meeting Overview**
1.1a	Project team seeking input following receival of SEARs.
1.1b	This meeting to address Traffic items only.
1.2	**Project Overview**
1.2a	TTW-PY and HS-OW outlined the site location and proposed works. It was acknowledged that the development forms part of an over-arching master plan. It was noted that the future stage is not yet funded and concept design has not commenced.
1.2b	It was noted that the project will not propose any additional car parking spaces or revised loading access as there is no available space on site.
2	**DISCUSSION**
2.1	**Bus Drop Off**
2.1a	HS-OW described the proposal of a bus drop off on William Street at the existing on street parking. TTW-PY described that the bus bay would allow for 14.5m coaches.
2.1b	AM-GM explained that the proposal intends to increase the number of school kids that visit the Museum and that a better facility for coach drop off and pick up would help formalise these movements. It was noted that busy times for this are currently in August and September (Science and Dinosaur festivals).
2.1c	TTW-GC noted that the existing arrangement for coach buses is informal and usually occurs at the drop off shared with Sydney Grammar. AM-GM explained that the Museum communicates with Sydney Grammar with regards to the pick up and drop off area.
2.1d	CoS-VL raised that the impact to street trees and metered parking will need to be addressed. It was requested that more information from the landscape architect be provided regarding removal and replacement of trees. HS-OW explained that these street trees are proposed to be replaced elsewhere along the kerb. The loss of metered parking revenue is not seen as a major obstacle as the development will generate income for CoS.

Item	Description
2.1e	TfNSW-KM raised that consideration will need to be given to the width of the bus bay given the existing cycle lane on William Street. RMS-MT agreed this would need to be considered. It was requested that an analysis of coach approach from the road network be undertaken.
2.1f	CoS-VL raised that the project team would need to justify the provision of an on street bus bay instead of an internal facility. It was noted that there was no scope of bus parking internally due to site constraints.
2.1g	TfNSW-KM requested that a Coach Management Plan be developed to address the issues with coach parking, drop off and pick up.
2.1h	TfNSW-KM raised that the development should also consider the use of other travel modes to reach the Museum, and public transport be encouraged.
2.2	**Loading**
2.2a	TTW-PY explained that as part of this stage of the master plan there would be no changes to the loading dock.
2.2b	AM-GM explained that deliveries by smaller vehicles occur frequently at the Museum.
2.3c	TTW-GC noted that smaller vehicles are able to enter and exit the Museum's loading dock in a forward direction, while semi-trailer access requires use of William Street for manoeuvring. No issues were raised with the existing arrangement.
2.3	**Construction**
2.3a	AM-GM explained that construction is expected to commence mid-2019.
2.3b	TfNSW-KM and RMS-MT discussed the need for a Construction Traffic Management Plan to consider pedestrian and vehicle impacts.
2.4	**Traffic Modelling**
2.4a	TTW-PY explained that traffic modelling has been conducted of the nearby intersections during the development of the master plan.
2.4b	TTW-GC noted that travel mode surveys had been conducted and the incidence of private vehicle usage was relatively low at approximately 30%.
2.4c	RMS-MT stated that this should be incorporated into the final traffic report.
3	**CLOSE OF MEETING**
3.1a	TTW-PY summarised the key issues raised during the meeting as follows: - CoS main concern was the impact to street trees and the drop off location. - TfNSW main concern was the bus drop off and sustainable transport measures. - RMS had no main concerns.
3.1b	No further comments or concerns were raised and the meeting was closed out at 3:00pm.

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