15-21 Cottonwood Crescent, Macquarie Park

Transport Impact Assessment

Prepared for:

Cottonwood Development Pty Ltd

6 February 2026

PROJECT INFORMATION

Project Name:	15-21 Cottonwood Crescent, Macquarie Park
Client:	Cottonwood Development Pty Ltd
Project Number:	2354
Prepared By:	JMT Consulting

DOCUMENT HISTORY

Document Title	Revision	Date issued	Author
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1 Introduction

1.1 Background

This transport impact assessment report has been prepared in support of a State Significant Development Application (SSDA) and concurrent Rezoning Proposal – SSD-94006708 – at 15-21 Cottonwood Crescent, Macquarie Park (AKA. 88 Waterloo Road).

The proposed SSDA seeks development consent for demolition of existing buildings and construction of a residential development comprising two residential flat buildings above a common basement car park / sleaved podium incorporating residential, car parking, and a retail component within the Waterloo Road frontage. Other key parameters include:

- Provision of 10% affordable housing per the uplift sought.
- 1 x 60-storey tower (205.5 m); and, 1 x 52-storey tower (179.4m)
- Floor Space Ratio (**FSR**) of 14.5:1

1.2 Site description

The site is located at 15-21 Cottonwood Crescent, Macquarie Park (SP8144, SP7630, SP7892, SP7984) within the Ryde Local Government Area (**LGA**).

The site is accessible from Cottonwood Crescent, and it has secondary pedestrian access from Waterloo Road. To the west, Waterloo Road provides access to Herring Road, linking the site with Macquarie Centre, Macquarie University and the Macquarie University Metro station. The Metro station portal is located approximately 150m from the site.

To the east, Waterloo Road connects with Lane Cove Road (A3) and the Hills Motorway (M2), facilitating regional access to Sydney's northern, western and southern suburbs.

Significant intra-regional bus services run down both Waterloo and Herring Road, with a major bus-interchange located within the western forecourt of the Macquarie Shopping Centre approximately 400m from the site.

An active transport route extends through the Shrimptons Creek open space corridor which can be accessed directly from the site via connections at Waterloo Road less than 100m from the site

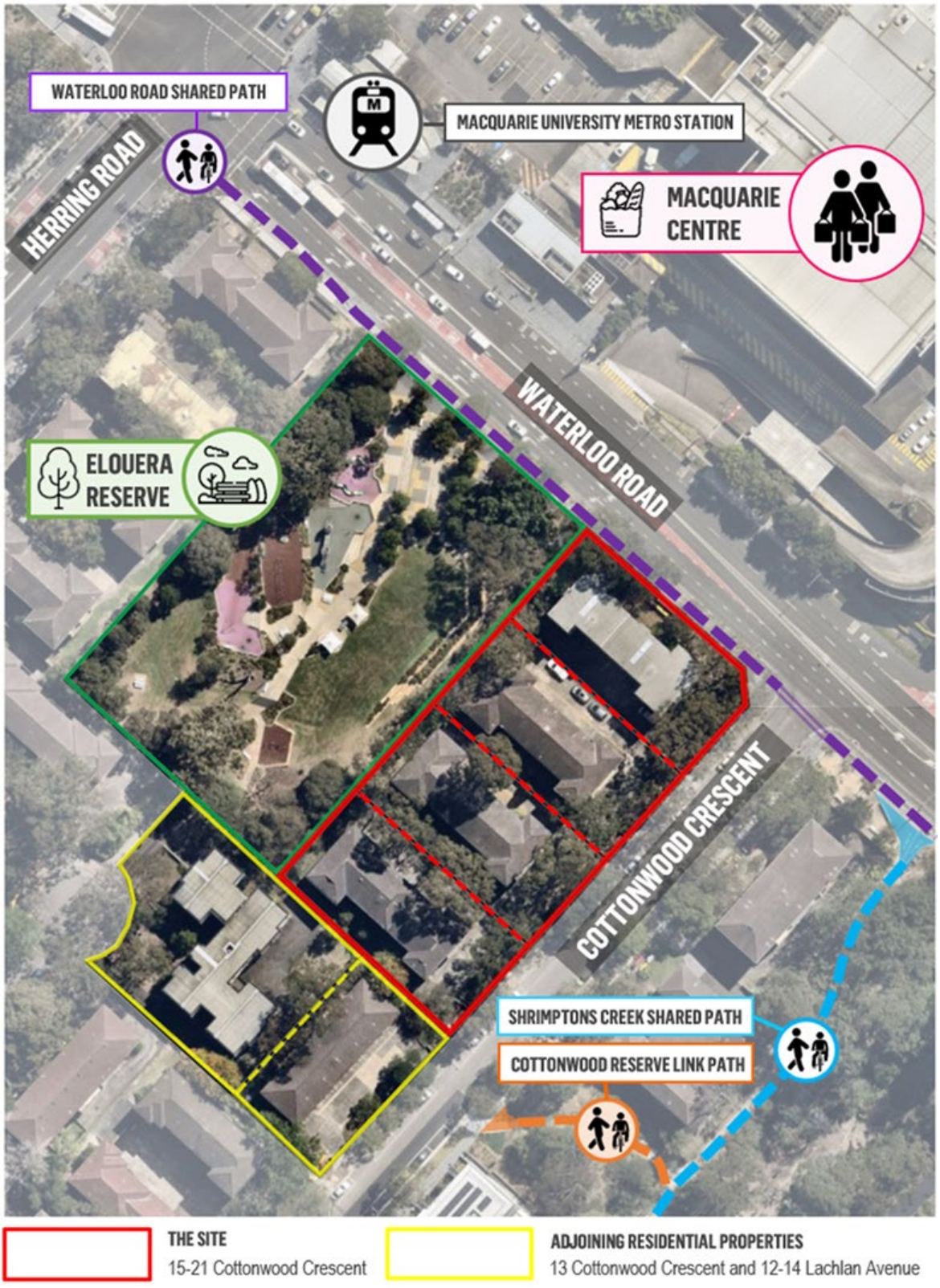


Figure 1 Site context

Source: Urbis

1.3 Report purpose

The report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-94006708) on 8 October 2025 relevant to traffic and transport as summarised in Table 1 below.

Table 1 SEARs requirements

Item	Description of Requirement - SSD-94006708	Relevant Section of Report
9. Transport	*Provide a Transport Impact Assessment (TIA) in accordance with the processes and methodology recommended in the Guide to Transport Impact Assessment (GITA) published by TfNSW.*	The report has also been prepared with consideration of the relevant items contained within the TfNSW Guide to Transport Impact Assessment (GTIA) – Appendix E scoping checklist. It should be noted however that the GTIA provides for a generic set of guidelines across all types of development, with many of the items in the scoping checklist not relevant to a sub-division proposal. Section 1.1.3 of the GTIA specifically notes the following "*recommendations in this Guide may not be appropriate in all development situations. Discretion and professional judgement should always be exercised and clearly documented*"
	If the construction of the development would cause interruptions to regular pedestrian and transport routes (including public transport, active transport or general traffic), a preliminary Construction Traffic (or Transport) Management Plan (CTMP) should be prepared as part of the TIA to mitigate any such impacts.	A preliminary CTMP has been prepared and provided as Section 6 of this document.

1.4 Consideration of agency feedback

The transport impact assessment report has also been prepared with consideration of the advice provided by Transport for NSW (TfNSW) and City of Ryde Council ('Council') in their respective submissions to the project SEARs. Responses are provided in the following tables.

Table 2 Responses to Council submission to SEARs

Council Pre-Lodgement Feedback	Response
Assess the existing traffic conditions within the surrounding road network affected by the proposed development. This assessment needs to be based on weekday morning and afternoon peak hour traffic surveys in recent time between 7:00am – 9:00am and 4:00pm – 6:00pm at the following intersections: - Waterloo Road and Cottonwood Crescent - Waterloo Road and Herring Road - Herring Road and Windsor Drive	Assessment of the surrounding road network has been undertaken consistent with Council's advice and documented in Section 5 of this report.
Provide a SIDRA traffic modelling assessment of the following scenarios: - Existing Conditions - Existing + Post-Development Conditions - 10-year projected traffic conditions (with and without the development traffic), which incorporates background traffic growth for Macquarie Park established within Transport for NSW's Strategic Traffic Forecasting Model (STFM).	SIDRA modelling for the scenarios advised by Council has been undertaken and documented in Section 5 of this report.
Recommend appropriate ameliorative measures to minimise the impact of the proposed development on traffic safety and efficiency within the surrounding public road network that are to be delivered by the applicant. These measures can comprise of active transport improvements to encourage greater walk and cycle trips as a means to reduce traffic generated by the proposed development.	Various ameliorative measures have been recommended as part of this assessment including the provision of bicycle parking, car share, electric vehicle charging infrastructure, high quality connections to nearby active transport and the preparation of a detailed Green Travel Plan prior to the occupancy of the development.
Ensure the vehicular access, off-street parking and heavy vehicle servicing arrangements are designed to comply with the following: - The Australian Standard for Parking Facilities Part 1: Off-Street Parking (AS 2890.1) - The Australian Standard for Parking Facilities Part 2: Off-Street Commercial Vehicle Facilities (AS2890.2) - The Australian Standard for Parking Facilities Part 3: Bicycle Parking Facilities (AS2890.3) - The Australian Standard for Parking Facilities Part 6: Off-Street Parking for People with Disabilities (AS2890.6) - Ryde City Council's Development Control Plan	The design makes provision for compliance with these relevant guidelines as detailed in Section 4 of this document.

Council Pre-Lodgement Feedback	Response
Provide a swept path assessment which shall be undertaken to demonstrate that the largest/longest vehicle to be serviced on site is capable of accessing and vacating the site via the proposed access driveway in a forward direction without any encroachment on adjoining public and private infrastructure. Additional swept path plans are to be provided to demonstrate that largest/longest vehicle can turn at the critical nearby intersections without encroaching on the opposing lanes	Swept path analysis has been undertaken and is provided in Appendix A of this document.
Details of the proposed traffic generation and impacts on the surrounding road network (modelling to include approved and under construction developments in the area)	Forecast traffic generation and intersection modelling has been carried out and is detailed in Section 5 of this document.
Number of parking spaces (including car, visitor, motorbike, bicycle and car share); a low provision of car parking is strongly recommended to minimise traffic generation and given the proximity of the site to Macquarie Park metro station and bus interchange	The number of parking spaces (including car, visitor, motorbike, bicycle and car share) is compliant with the maximum rates outlined in the Ryde DCP for the Macquarie Park corridor, refer to Section 4 for further details.
Proposed loading arrangements (turntable(s) should be avoided).	On-site loading arrangements are detailed in Section 4. Given the site geometry and need to accommodate a large 12.5m waste vehicle a turntable is proposed, consistent with the approved DA for the subject site.
A draft Green Travel Plan should also be provided demonstrating how the proposal will discourage private vehicle travel and promote sustainable travel options to/from the site	A draft GTP has been prepared and is provided in Section 4 of this document.
Justification for the proposed podium (rather than underground) parking	Parking is proposed both at the podium and basement levels to ensure a suitable level of parking (including car share and visitor) is provided for all users of the subject site and minimise impacts to surrounding residential streets.
Details on any pedestrian / cyclist connections to/from the site including to the adjacent Elouera Reserve.	Details of various active transport measures proposed as part of the proposal are outlined in Section 4 of this document.

Table 3 Responses to TfNSW submission to SEARs

Council Pre-Lodgement Feedback	Response
A TIA shall be prepared in accordance with the Guide to Transport Impact Assessment (GTIA). The GTIA replaces the Guide to Traffic Generating Developments. The TIA will enable TfNSW to understand the impacts the development may have on the state classified road network that it manages as well as the impacts from local/regional road connections with the state classified road network as a consequence of increased vehicular, bus and active transport movements.	This transport impact assessment has been developed in accordance with the GTIA and assesses the impacts of the proposal on the surrounding road network.

2 Existing Conditions

2.1 Site location and vehicle access

The site is bounded by Cottonwood Crescent and Waterloo Road within the suburb of Macquarie Park as presented in Figure 2 below. The site currently comprises of a number of medium density residential dwellings with frontages to Cottonwood Crescent. Four individual driveway crossovers are provided to each of these existing residential buildings. The Macquarie University metro station is located less than 200m walk away from the site, along with the Macquarie University bus interchange.

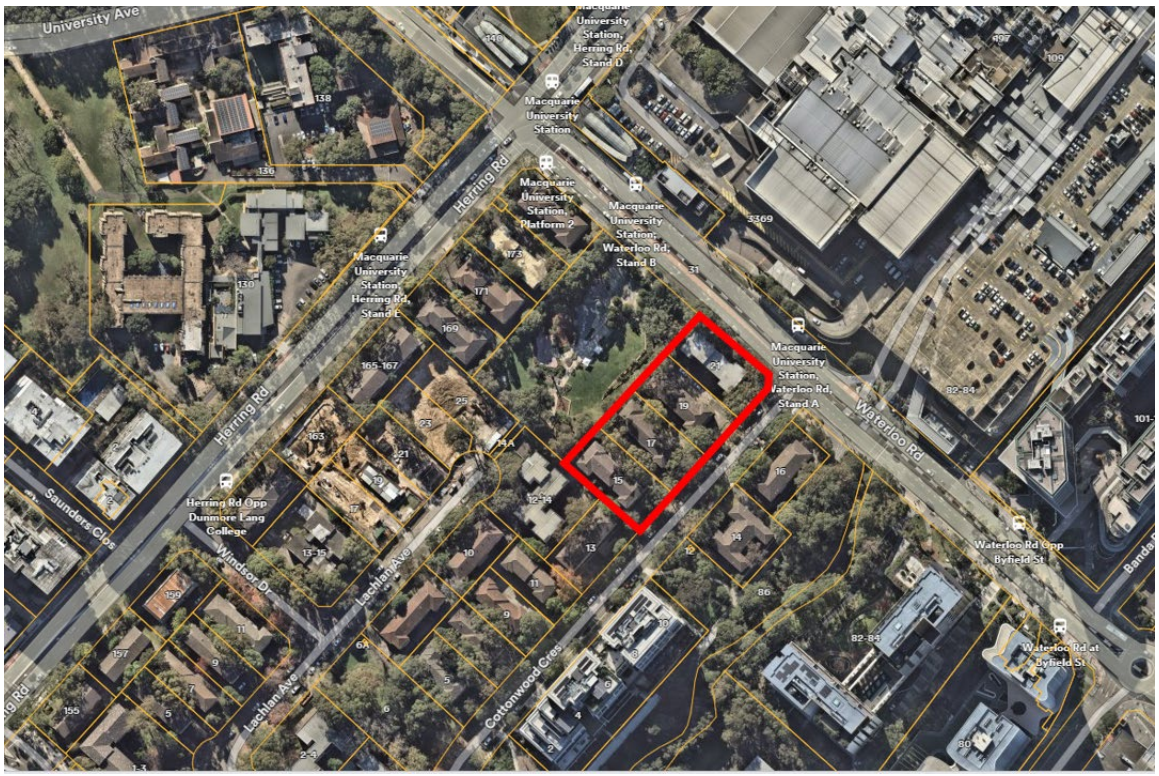


Figure 2 Site location

2.2 Car parking

There is currently on-site car parking for the existing residential dwellings, with vehicular access to these car spaces provided via Cottonwood Crescent.

2.3 Surrounding road network

To manage the extensive network of roads for which councils are responsible under the Roads Act 1993, Transport for NSW (TfNSW) in partnership with local government established an administrative framework of *State, Regional,* and *Local Road* categories. State Roads are managed and financed by TfNSW and Regional and Local Roads are managed and financed by councils. Key State and Regional roads which provide access to the site are illustrated in Figure 3.

Epping Road and the M2 Motorway are State Classified Roads in close proximity of the site which cater for regional east-west traffic travelling through the City of Ryde. Epping Road extends from the Pacific Highway and Lane Cove in the east to Epping in the west. It provides an important link between Sydney's Northern and North West suburbs and the North Shore and CBD. The M2 Hills Motorway is an arterial road approximately 1 kilometre north-east of the site that connects with the Lane Cove Tunnel in North Ryde and provides regional connectivity through to Macquarie Park.

Cottonwood Crescent and Waterloo Road fronting the site are local roads which provide connectivity to the State and Regional road network. Being local roads there is no restriction in terms of vehicle access under the Transport & Infrastructure SEPP 2021.

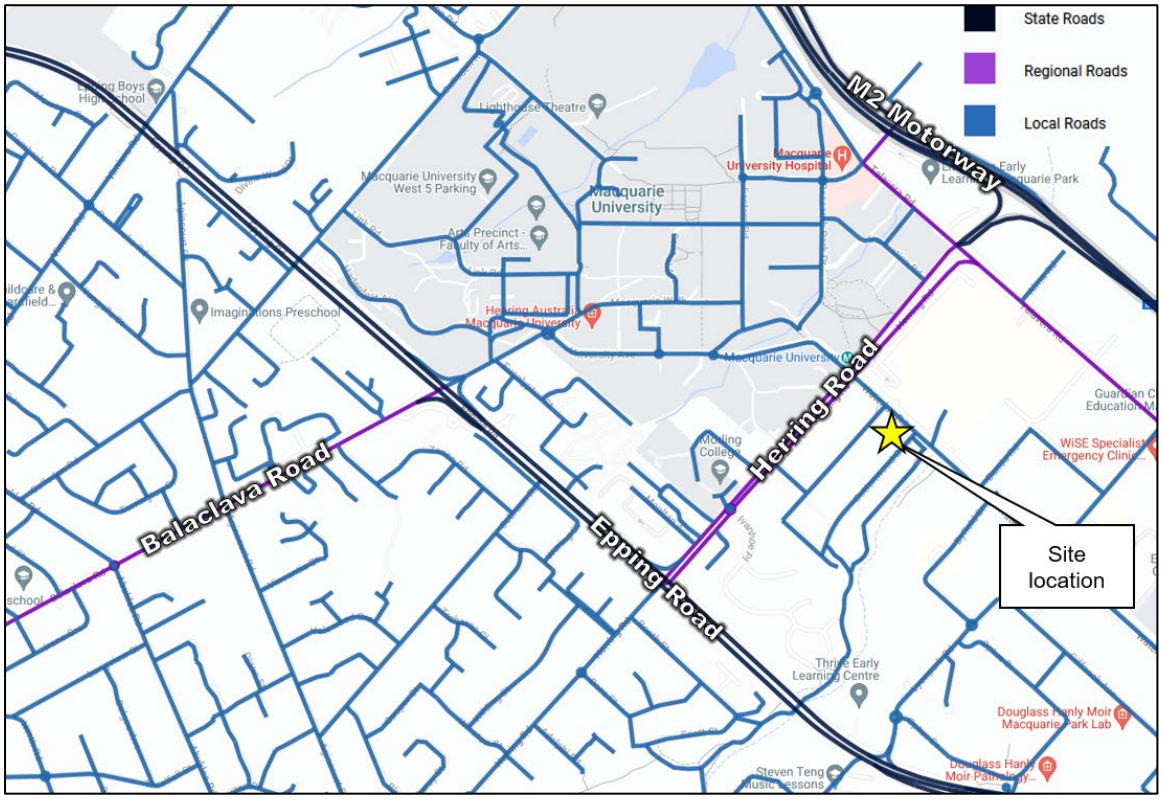


Figure 3 Existing road network

2.4 Existing traffic volumes

Traffic counts were undertaken at the key intersections immediately surrounding the site during the morning and afternoon peak hour periods on Tuesday 1 April 2025– with this existing traffic data indicated in the figures below. The traffic data was collected at the following locations:

- Waterloo Road / Cottonwood Crescent
- Herring Road / Windsor Drive
- Herring Road / Waterloo Road

This traffic data at nearby intersections has formed the basis for the road network analysis undertaken and summarised in Section 5 of this document.

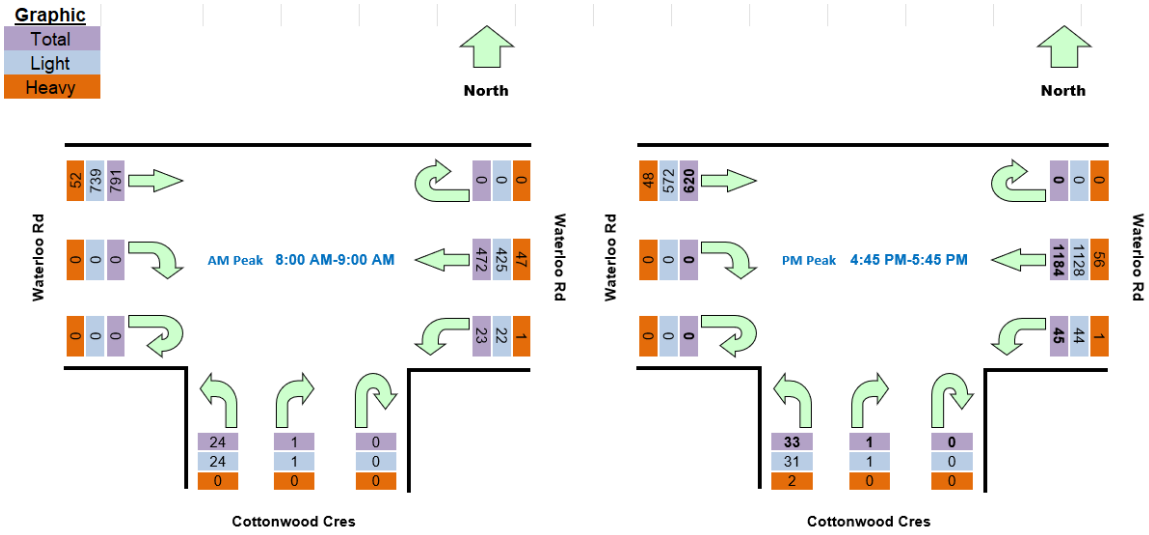


Figure 4 Traffic counts – Waterloo Road / Cottonwood Crescent intersection

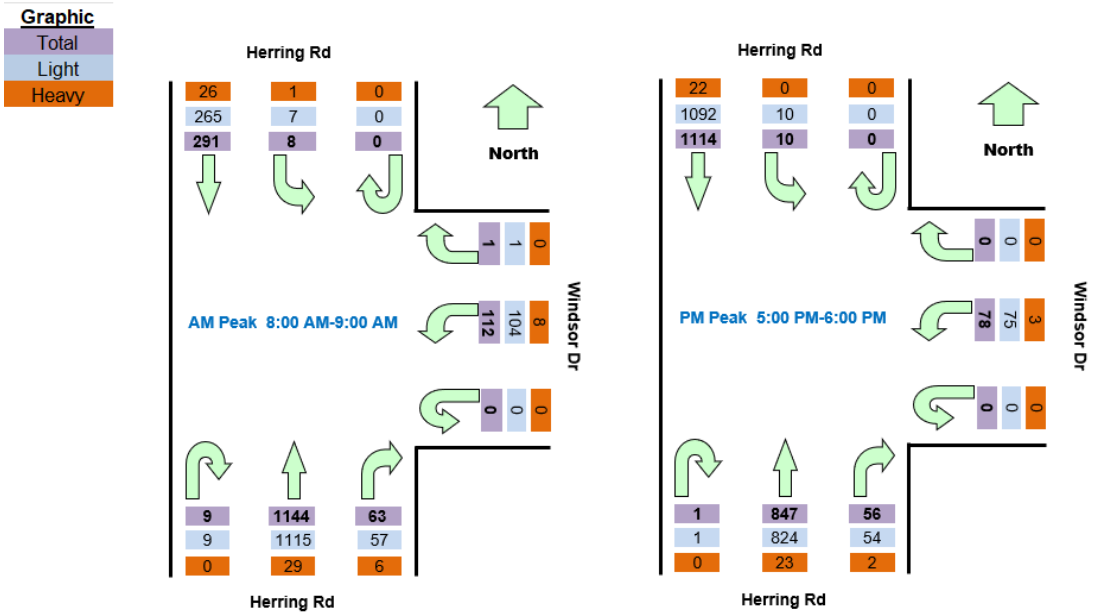


Figure 5 Traffic counts – Herring Road / Windsor Drive intersection

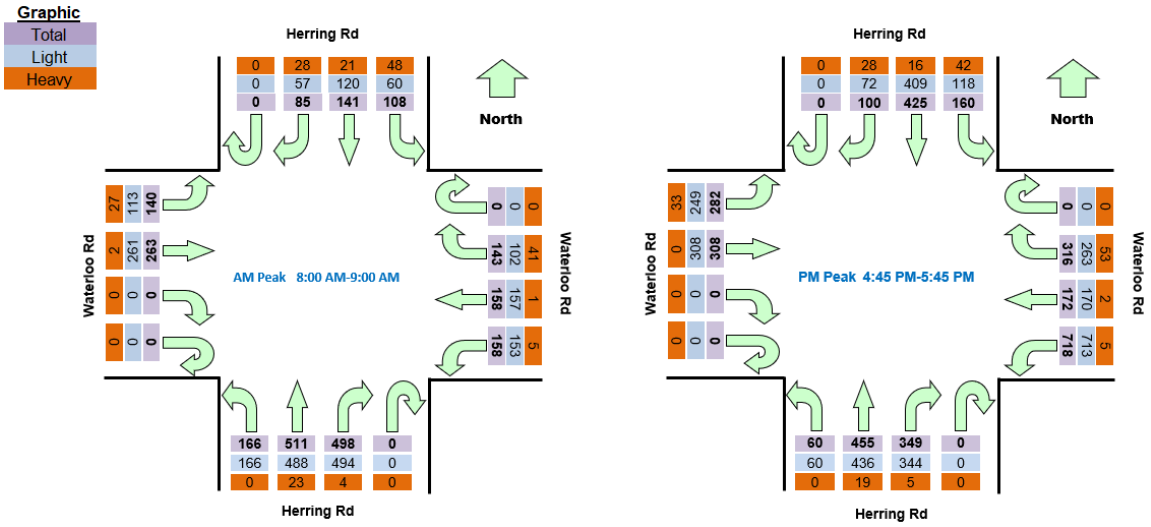


Figure 6 Herring Road / Waterloo Road intersection

2.5 Public transport services

The site benefits from a range of public transport services within close walking distance as indicated in Figure 7 below – making it highly suitable for future development. These public transport services include:

- Macquarie University metro station located approximately 200m or 2-3 minute away from the site. Metro services arrive every four minutes during peak hour and provide for direct, high capacity connections between Tallawong and Chatswood. Following the opening of Sydney Metro (City and Southwest) the line will be extended through to North Sydney and the Sydney CBD – offering an improved level of public transport accessibility to the site.
- Bus stops along Waterloo Road, Herring Road and University Avenue all within 400m of the site – including the Macquarie Centre bus interchange. These bus routes service a range of key centres including Parramatta, Epping, North Sydney, St Leonards and the Sydney CBD. Services run frequently throughout the day and evening.

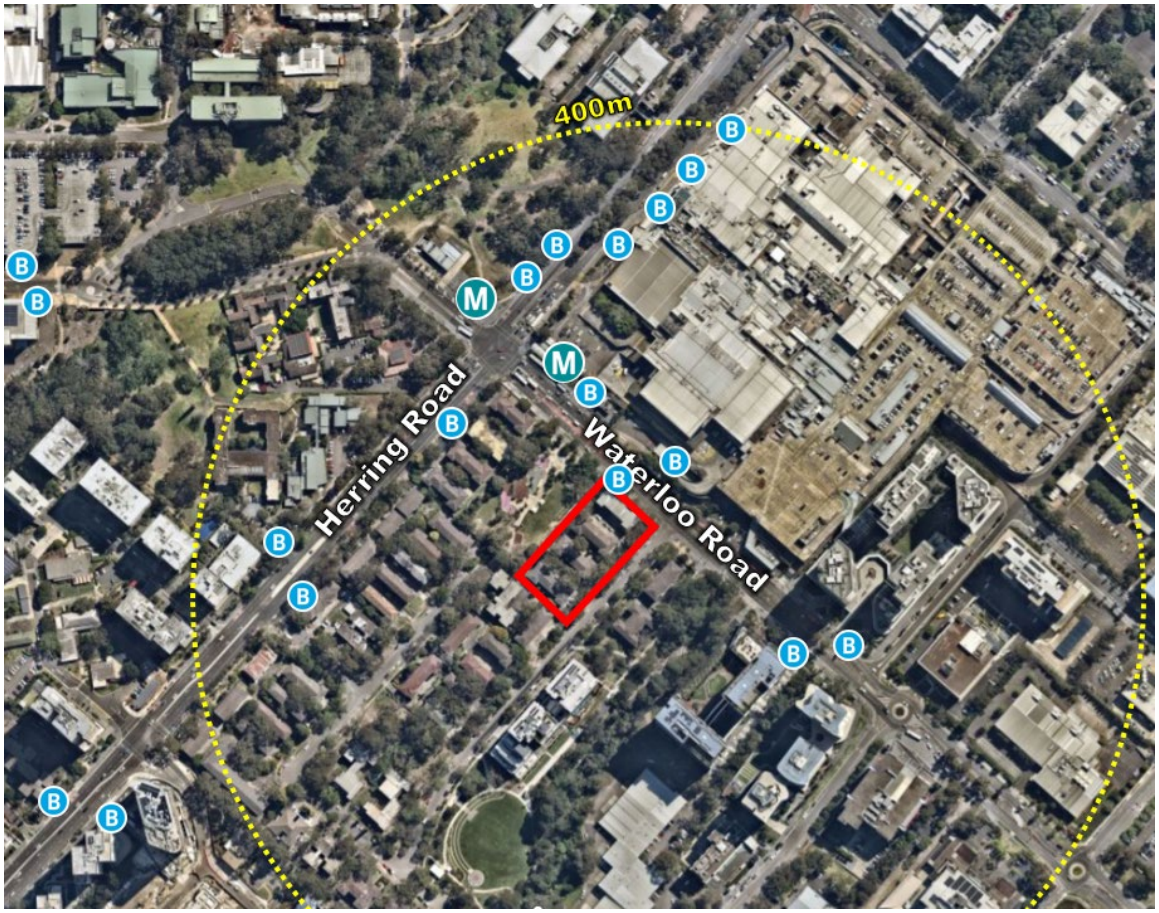


Figure 7 Public transport services

2.6 Public transport catchment

An indicator of the level of public transport accessibility a site contains is the number of locations accessible within a 30 minute public transport catchment. A key objective of the Greater Sydney Commission's Greater Sydney Region Plan is to deliver a 30-minute city where jobs, services and quality public transport spaces are in easy reach of residences.

As illustrated in Figure 8 a number of key employment centres across Sydney can be reached within 30 minutes public transport travel time of the site, including Chatswood, St Leonards, Ryde and Hornsby. The advent of future public transport services, particularly Sydney Metro City and Southwest, will improve this public transport catchment and reduce the impacts of vehicle based travel.

Figure 8 30 minute public transport catchment

Source: https://www.mapnificent.net/sydney

2.7 Active transport

The existing Macquarie Park cycle network is illustrated below in Figure 9. There are sections of well- developed, shared, off-road paths linking to the site from all directions other than to the south and west There are a number of off-road shared cycle ways along the major roads, including Waterloo Road (directly adjacent to the site) and Lane Cove Road. The site benefits from being located adjacent to the Shrimptons Creek active transport corridor which provides for walking and cycling opportunities. The City of Ryde Bicycle Strategy 2022 – 2030 seeks to improve cycling connectivity in the area through the provision of a future cycleway network.

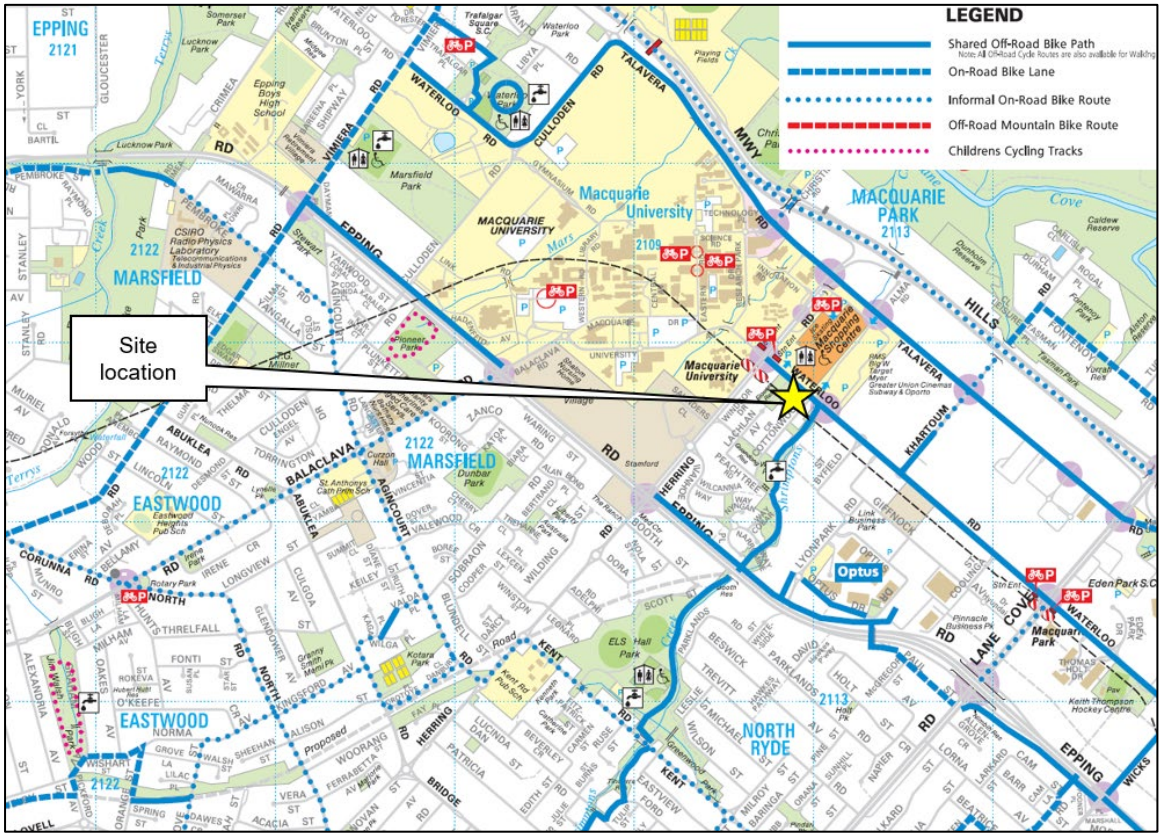


Figure 9 Macquarie Park cycling network

Source: City of Ryde Council

2.8 Crash history

A review of crash data published by Transport for NSW for the most recent five year period has been review and is shown in Figure 10. This indicates no recorded crash history adjacent to the site, particularly at the planned driveway entrance on Cottonwood Crescent.

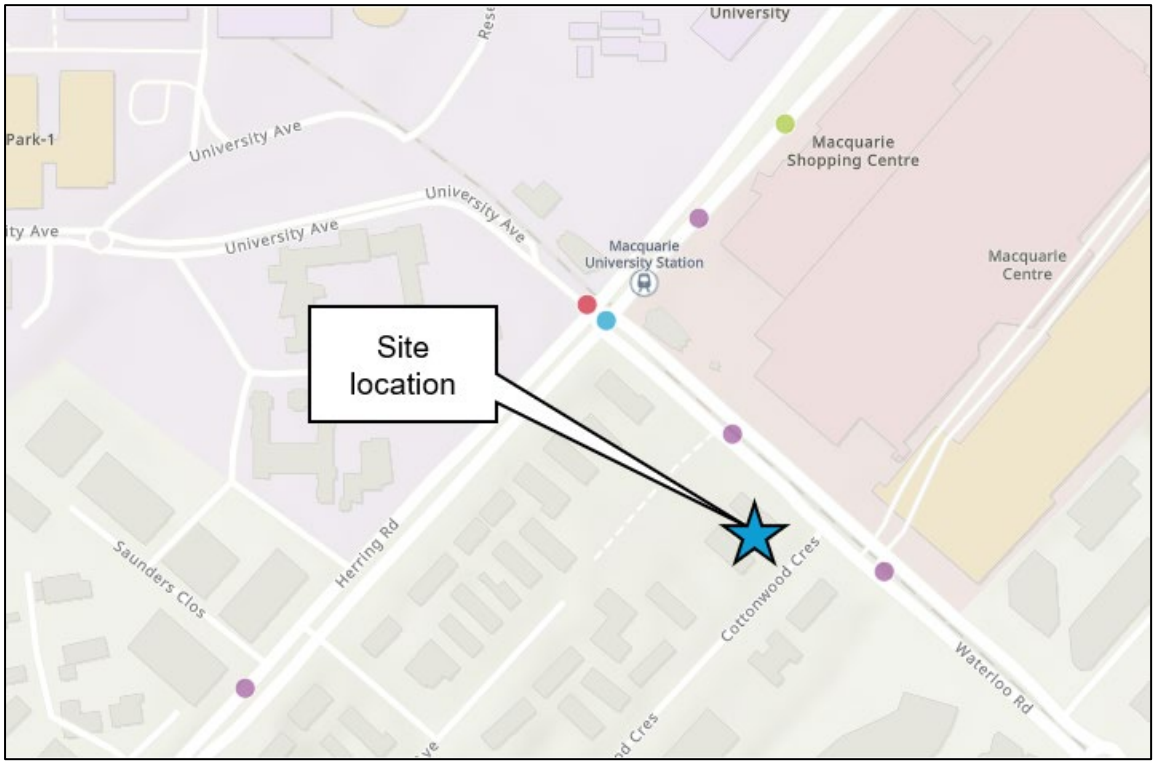


Figure 10 Crash data

Source: NSW Centre for Road Safety

3 Future Transport Context

This section describes the various transport initiatives that are planned in the Macquarie Park area which will directly benefit future users of the site. These measures will support the objective of promoting travel by public transport and active transport and reducing the private vehicle related impacts of the development.

3.1 Macquarie Park Precinct and Bus Interchange

Transport for NSW is proposing a precinct and bus interchange that creates a place for people to enjoy, meet and connect. The proposal would connect people to Macquarie University, Macquarie Centre, Macquarie Business Park and residential and commercial areas. The interchange upgrade – on Herring Road between Waterloo Road and Talavera Road – would improve travel efficiency and connectivity, making it easier for people to move safely into and around Macquarie Park.

Key features of the proposal include widening of footpaths, expansion of the existing bus stand capacity and improved pedestrian crossing opportunities along Herring Road.

The bus interchange is located within a 5 minute walk of the site and will therefore support access to and from the site via public transport.

Figure 11 Macquarie Park Precinct and Bus Interchange

Source: Transport for NSW

3.2 Herring Road upgrades

Transport for NSW recently carried out a number of improvements to Herring Road as indicated in Figure 12. This includes a new northbound bus lane, new traffic lights at Ivanhoe Place as well as more capacity at the Epping Road / Herring Road intersection. These upgrades will support travel within the Macquarie Park area and facilitate future access to the site via Herring Road.

Figure 12 Herring Road improvements

Source: Transport for NSW

3.3 Sydney Metro

Sydney Metro is a major public transport infrastructure project currently in the construction phase within proximity of the subject site. The Sydney Metro City and Southwest metro line opened in August 2024 and connects to the Sydney Metro Northwest line at Chatswood station and provide significantly improved connectivity from the southwest and Sydney CBD to Chatswood and the northwest including Macquarie Park. The expansion of the Sydney Metro network has further enhanced public transport accessibility to the site which is within a 2-3 minute walk of the Macquarie University metro station. Future residents and users of the site will benefit from direct connections beyond Chatswood through to key employment areas such as North Sydney, Barangaroo and Central Station.

3.4 Macquarie Park Stage 1 & Stage 2 rezoning

The Macquarie Park Innovation Precinct – Stage 1 and Stage 2 rezoning proposal was developed by the Department of Planning, Housing and Infrastructure (DPHI) and placed on public exhibition in late 2023 (Stage 1) and July 2024 (Stage 2) . Supporting the Stage rezoning proposal was a detailed precinct wide transport study which identified a number of further improvements in public and active

transport services which will support future development and reduce traffic related impacts. These future improvements include:

- An upgraded Macquarie University bus interchange
- Higher frequency bus services along Waterloo Road
- Implementation of a fine grain street network to support improved pedestrian accessibility
- Completion of missing links in Macquarie Park's local/regional cycling network
- New strategic bus corridors servicing Macquarie Park
- Future mass transit connections to Randwick and Epping

Detailed traffic modelling was undertaken which covered all roads within Macquarie Park, including those fronting the subject site. The traffic modelling confirmed that the future level of development envisaged, which also considered planned developments such as the subject site, could be accommodated subject to implementation of a range of transport initiatives.

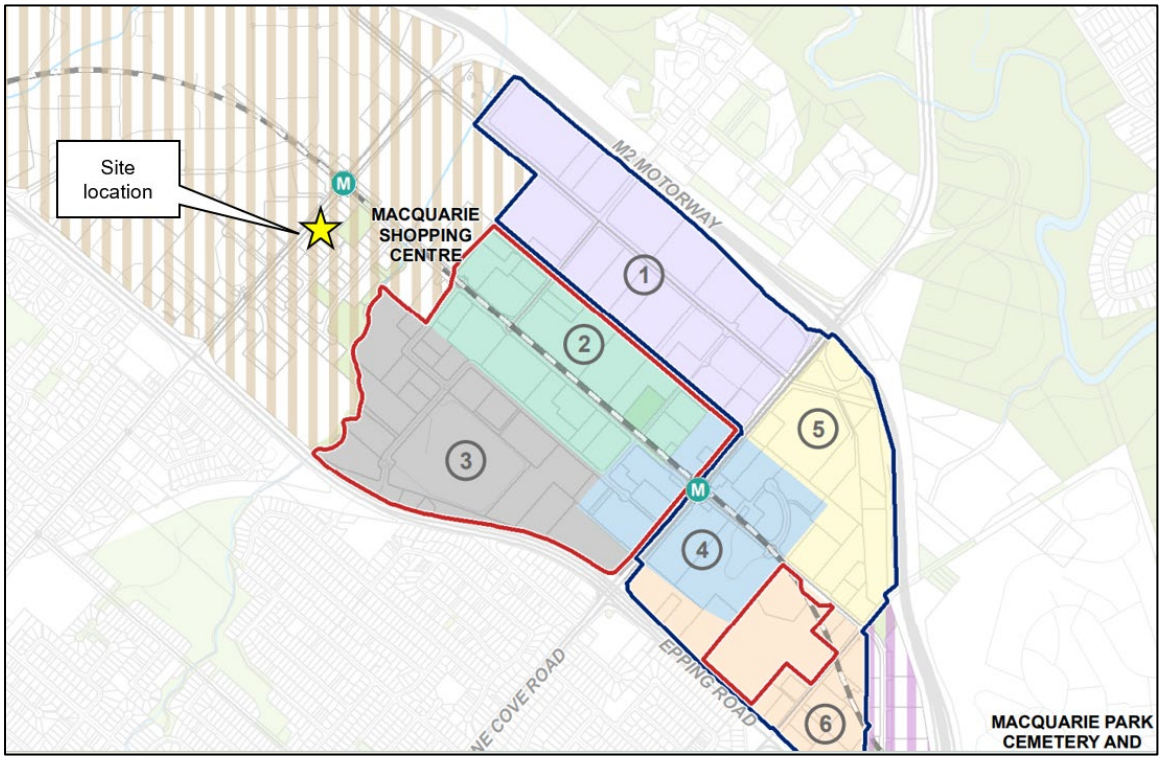


Figure 13 Macquarie Park rezoning area

Source: Department of Planning, Housing and Infrastructure

4 Site Access, Servicing & Parking

4.1 Proposed vehicle access

The proposed vehicle site access strategy is illustrated in Figure 14 below. All vehicle access would be retained via Cottonwood Crescent through of three driveways, those being as follows:

- One driveway providing access to ground level and basement parking; and
- One driveway providing access to the above ground parking levels; and
- The southernmost driveway providing dedicated access to an on-site loading area.

This access strategy appropriately separates service vehicles and trucks travelling to/from the site with residents and visitors – providing for a strong safety outcome as well as addresses preliminary feedback provided by Council during consultation held with Council representatives. Given the scale of the development two separate driveways for residential access is considered suitable and removes points of conflict between vehicles travelling from street level to the basement and upper parking levels.

The vehicle access point has been designed in accordance with the design requirements set out in the relevant Australian Standard, namely AS2890.1:2004 and AS2890.2:2018. 6.4m wide driveways for cars are provided which exceeds the minimum requirement outlined in the Australian Standards. Vehicle swept paths indicating the entry and exit of vehicles from the site is provided in Appendix A of this document.

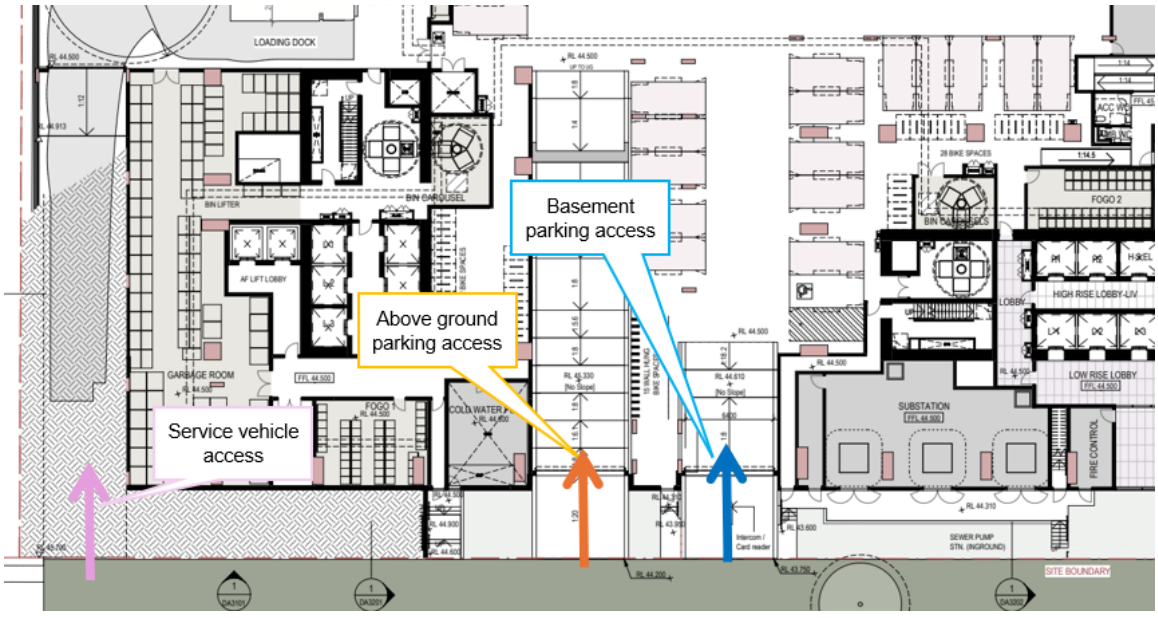


Figure 14 Proposed vehicle site access strategy

The location of the site access driveways has been selected in order to:

- Ensure sufficient queueing distance from the northernmost site access driveway to the Waterloo Road / Cottonwood Crescent intersection (over 50m storage provided); and
- Avoid clashes as far as practicable with nearby driveways serving adjacent developments on Cottonwood Crescent. This is illustrated in Figure 15 and demonstrates that the proposed driveway locations are located away from existing and future driveways for major developments on Cottonwood Crescent, providing a strong outcome in terms of road user safety.

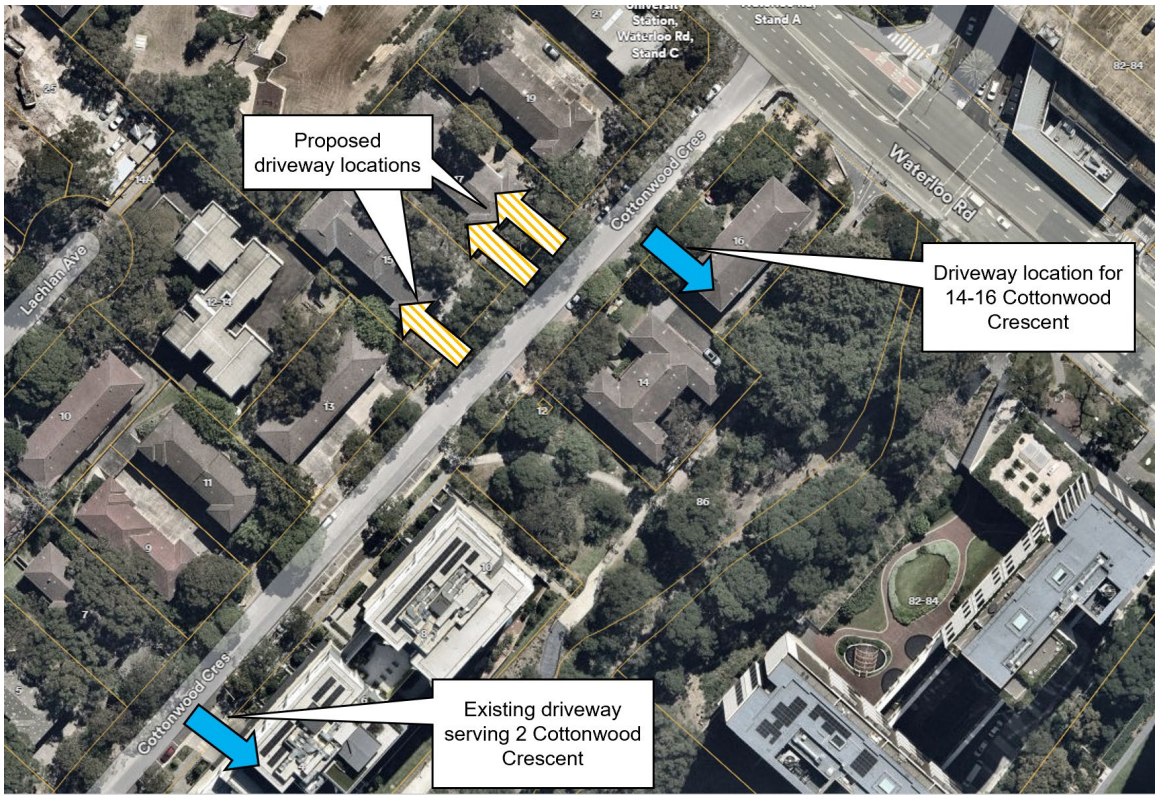


Figure 15 Driveway locations on Cottonwood Crescent

4.2 Driveway design

The proposed driveway design and location complies with the relevant requirements of AS/NZS 2890.1, specifically:

- Table 3.2 – Access driveway widths. The driveways are over 6m wide which is sufficient to accommodate a B85 car and a B99 car travelling in opposite directions.
- Clause 3.3 - driveway gradients including a minimum 5% gradient for the first 6m from the property boundary.
- Clause 3.2.4 - As indicated in Figure 16 the site access driveways on Cottonwood Crescent has been designed to provide drivers with adequate sight

distances to view oncoming pedestrians on Cottonwood Crescent, with no obstructions of greater than 1m in height provided within the 'sight triangles' as required under AS2890.1

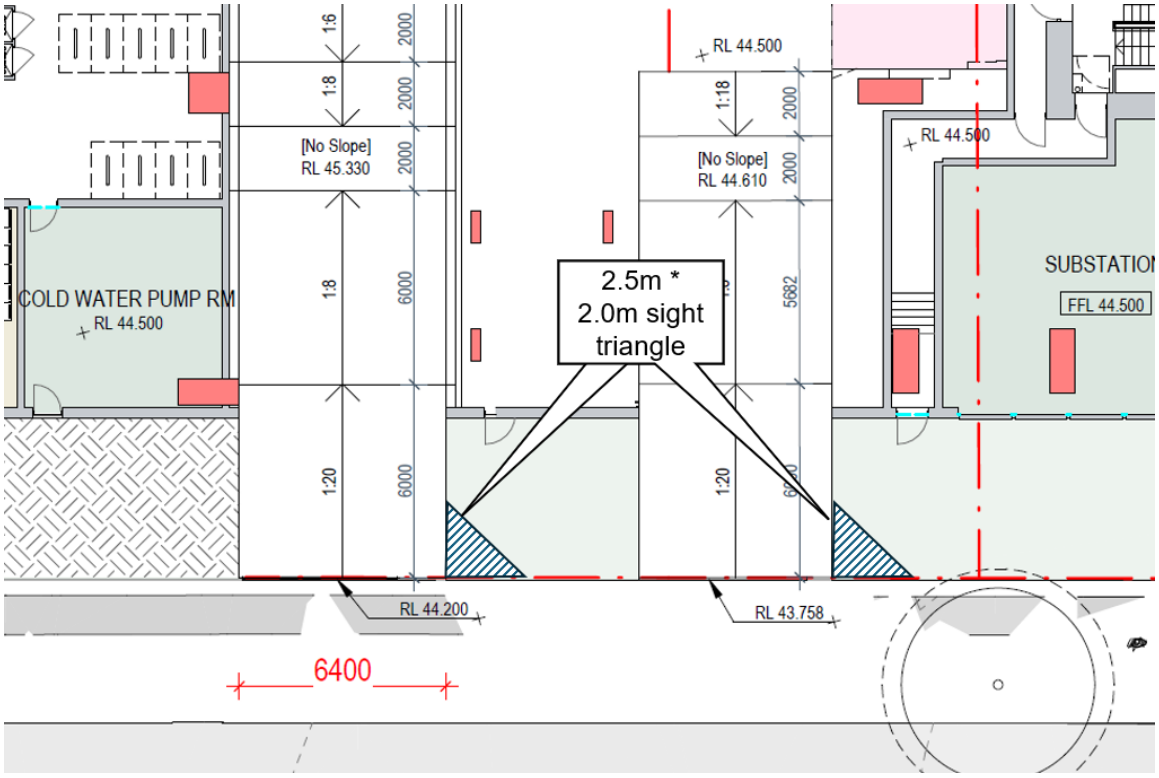


Figure 16 Sight distances from access driveway

4.3 On-street car parking

As previously noted in Section 2.1 of this document the site currently contains four vehicular points of access across Cottonwood Crescent – impacting the pedestrian and on-street parking environment. The proposal reduces the number of driveways fronting the site from four down to three– providing for an improved environment for pedestrians and potentially facilitating the introduction of additional on-street car parking spaces.

4.4 Car parking layout

On-site car parking at both basement and upper levels has been designed to facilitate the future development. The car park and associated elements such as car parking space dimensions, circulation aisles and ramp would be designed in accordance with the relevant Australian Standard for car parking facilities, namely AS2890.1 and AS2890.6.

Car parking spaces have been designed to comply with a Class 1A car park facility for residents and commercial staff as specified in the Australian Standard

(generally low turnover long term parking) with 2.4m wide spaces and aisle widths of 5.8m.

A minimum 1m offset is provided from the edge of the parking space to the adjacent wall. Internally within the site suitable provisions have been made to accommodate vehicle circulation with appropriate traffic management devices such as signage, line-marking and mirrors where required.

The design makes suitable provision for B85 and B99 vehicles to pass in opposing directions at all times when circulating between parking levels, with an example presented in Figure 17.

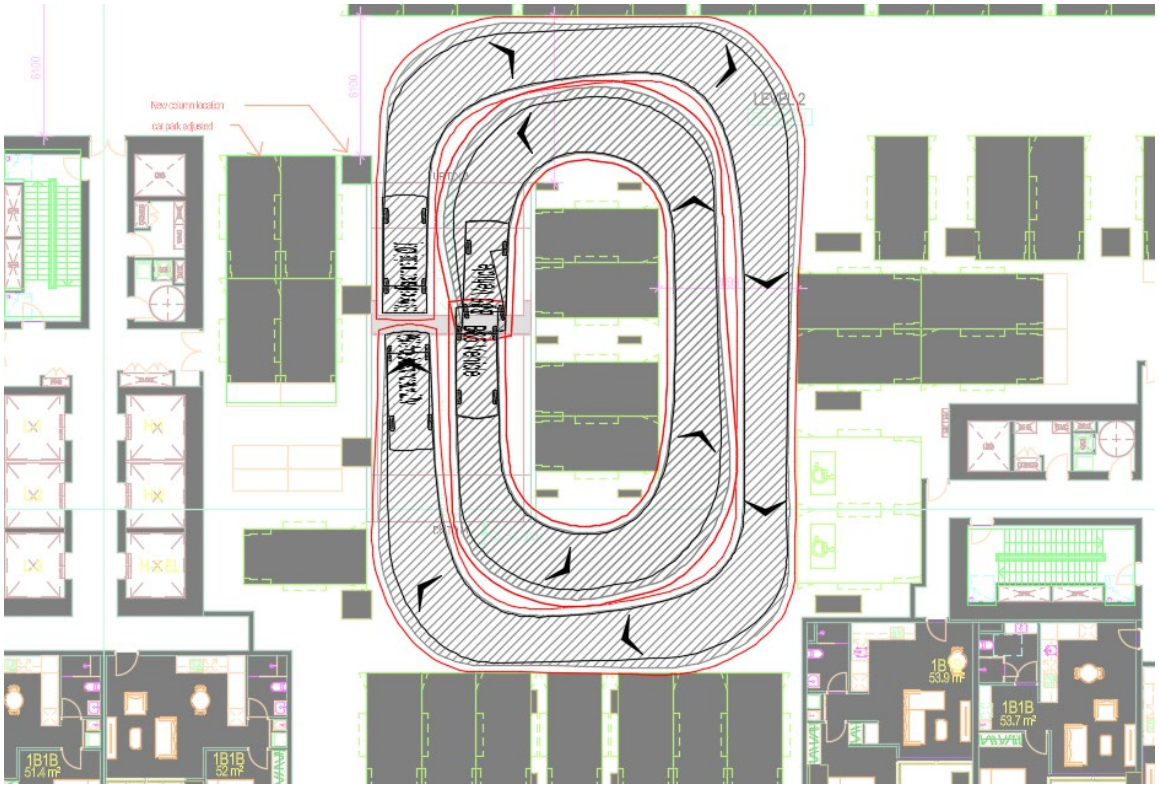


Figure 17 Swept paths – internal vehicle circulation

4.5 On-site loading

The proposal includes an on-site loading dock which can accommodate three vehicles at any one time, those being:

- One * 12.5m Heavy Rigid Vehicle (HRV) equivalent to a Ryde Council waste collection vehicle
- One * 8.8m Medium Rigid Vehicle (MRV)
- One * 6.4m Small Rigid Vehicle (SRV)

This loading provision is considered suitable to accommodate the needs of the site based on the yields achievable under the development proposal. The loading area will have a height clearance of 4.5m which is consistent with the recommended clearances nominated in AS2890.2.

All vehicles will enter and exit the site from Cottonwood Crescent in a forwards direction with the aid of a turntable. The use of a turntable is consistent with the approach adopted and approved for the recent DA for the subject site.

As per the requirements of AS2890.2 all loading/unloading activity will be separated with the advent of a standalone loading area and turntable. Linemarking and signage will be in place to direct service vehicles exiting the loading dock to give way to pedestrians and vehicles on Cottonwood Crescent when exiting the site.

Vehicle swept paths have been developed to confirm the suitability of the design to accommodate the movement of MRVs and waste trucks within the site, with these swept paths provided in Appendix A of this document.

The building management team will be required to engage and maintain a Loading Dock Manager to organise and supervise delivery and removal activities. The Building Manager will need to be present on the site during all normal servicing hours and contactable by mobile phone at other times to oversee the operation of the loading dock areas.

Retail tenants would be allocated one of the delivery windows for their deliveries to occur. Residents would need to book-in times with building management if they require the loading dock for activities (such as moving/receiving furniture). A delivery schedule will be organised by management to stagger and control arrival of deliveries.

4.6 Car parking provision

4.6.1 Residential parking provision

The car parking requirements for the proposed development has been assessed against Council's Development Control Plan (DCP) 2014. Specifically, the DCP stipulates maximum car parking rates for the Macquarie Park Corridor which the site is located within. The car parking requirements are summarised in Table 4 – demonstrating that the proposed parking provision of 700 spaces is below the maximum of 703 spaces permissible under Council's controls. The proposed level of car parking is therefore considered appropriate.

Table 4 On-site car parking

User	Maximum Car Parking Rate	Proposed Quantum (GFA / units / spaces)	Max. Number of Spaces Permitted	Proposed Number of Spaces
Residents	0.6 spaces per studio or 1 bed unit	321	193	
	0.9 spaces per 2 bed unit	305	275	
	1.4 spaces per 3 bed unit	232	235	
	Sub-total	***858***	***703***	***700***

The reduced level of parking when compared to the maximum allowable number reflects the strategic location of the site adjacent to public transport and other services. Notwithstanding this a suitable level of on-site parking for residents is required to support travel to destinations not well served by public transport or outside of established centres. The majority of residents will use their cars on a discretionary basis and undertake trips outside of busy road network periods – therefore having a limited impact on the surrounding street network.

The development will implement a number of measures to reduce traffic impacts such as:

- Provision of high quality bicycle parking for residents and visitors;
- Offer good quality pedestrian connections to the surrounding street network;
- Provide spaces for car share vehicles within the site;
- Provide electric vehicle charging infrastructure in line with NCC requirements;
- Implement a Green Travel Plan to support public transport and active transport use.

4.6.2 Residential visitors

For residential visitors the car parking requirements have been assessed against Council's Development Control Plan (DCP) 2014. Specifically, the DCP stipulates **maximum** car parking rates of 1 space per 10 units for residential developments within the Macquarie Park Corridor, with no minimum requirements.

On this basis between 0 and 86 visitor spaces could be provided under the DCP. The proposal complies with the DCP requirements by providing for 33 visitor parking spaces.

Reference is made to SSD- 74319712 which was approved by DPHI in October 2025 for the nearby site at 161 Herring Road & 13-15 Lachlan Avenue, Macquarie Park. This approved development provides for 181 residential apartments and 8 visitor parking spaces (inclusive of potential future car share spaces). This parking ratio of 1 visitor space per approximately 23 apartments is equivalent to that proposed as part of this application.

4.6.3 Retail parking

A small amount of retail floor space is proposed as part of the development which is intended to be ancillary to the primary residential use. The small format retail would primarily be for the purposes of building residents and nearby passing foot traffic in Macquarie Park rather than destination retail that requires car parking. In this context it is considered appropriate to not provide for any car parking for this retail use, which is consistent with the maximum parking controls in place for the Macquarie Park corridor.

The relatively small number of retail staff travelling to the site would utilise the excellent public transport services available as previously described in Section 2.5 of this document.

4.7 Bicycle parking

The Council DCP stipulates that "In *every new building, where the floor space exceeds 600m² GFA (except for dwelling houses and multi-unit housing) provide bicycle parking equivalent to 10% of the required car spaces or part thereof.*"

Based on the above, a minimum of 75 bicycle spaces are required. It is proposed to provide 75 bicycle parking spaces on the lower ground floor for the use of residents and visitors. In addition all two and three bedroom residential apartments will be provided with individual storage areas large enough to store bicycles – consistent with the requirements of Class 1 bicycle parking facilities as per AS2890.3. Therefore parking for 585 bicycles are to be available as part of the development, significantly exceeding Council's minimum requirements under their DCP.

The bicycle parking locations provided at the lower ground level of the building are indicated in Figure 18.

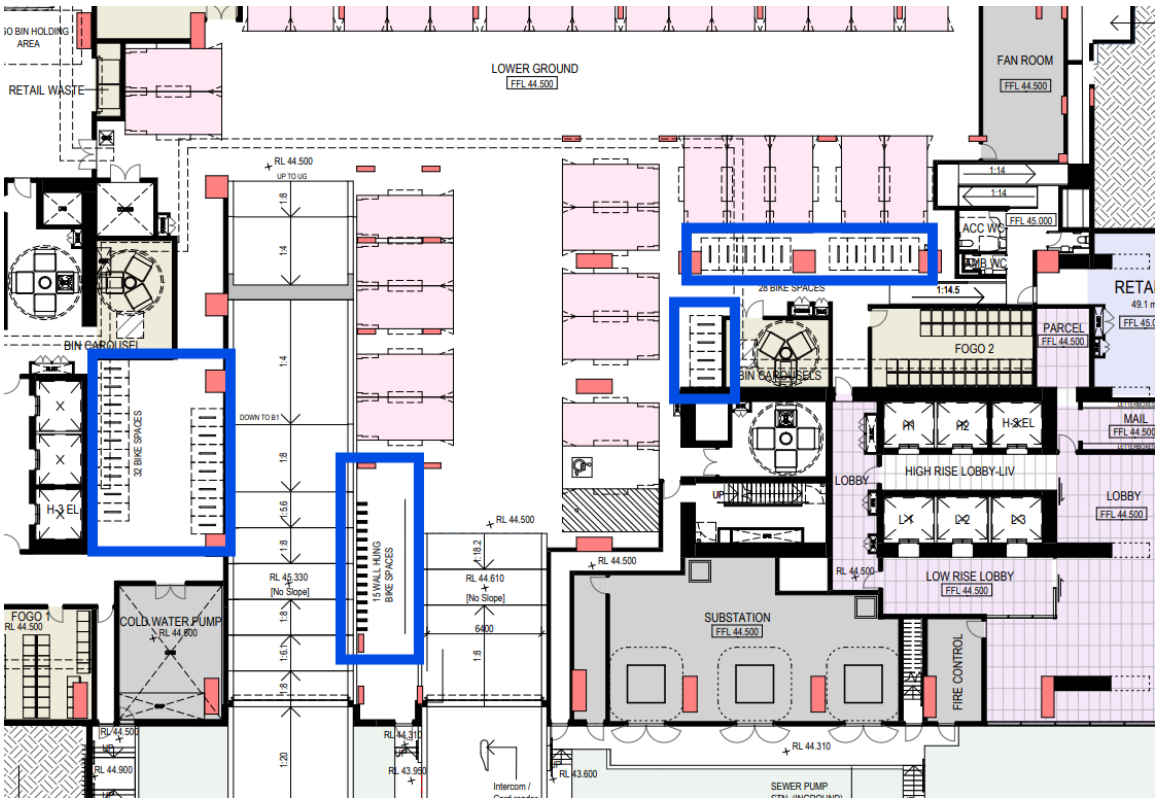


Figure 18 Lower ground bicycle parking area

4.8 Car share

The design makes provision for five car share spaces to be provided within the visitor parking level of the development. These car share spaces could be made available for either residents of the building or the surrounding local community. The number and location of these car share spaces will be confirmed prior to occupancy following discussions with potential car share operators to understand whether an operator would have interest in providing car share vehicles in the subject development.

4.9 Active transport considerations

The development proposal incorporates active transport measures to support travel by this form of transport and reduce reliance on private vehicles. The measures take advantage of the site's location adjacent to Elouera Reserve and Shrimptons Creek, with connections to be provided to existing walking and cycling infrastructure. From the site pedestrians and cyclists have a range of options including high quality connections along Waterloo Road to bus stops and the Macquarie University metro station which is less than a 5 minute away.

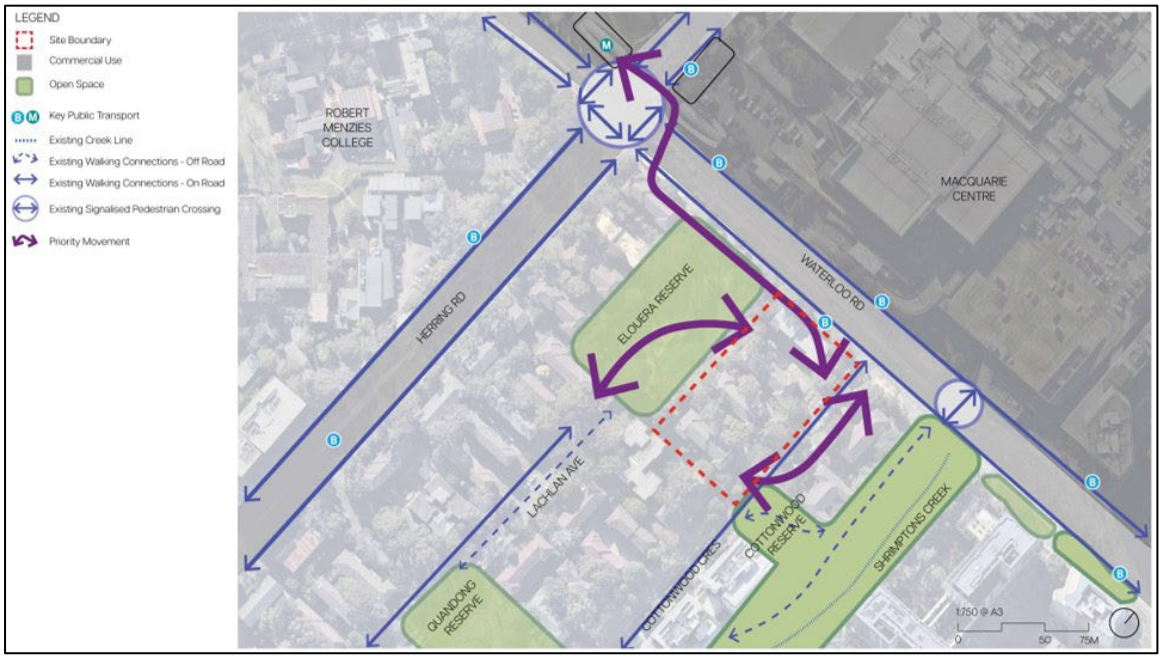


Figure 19 Active transport considerations

Source: Place Design Group

5 Traffic Impact Assessment

5.1 Forecast traffic generation

To understand the potential level of traffic generation from the subject site JMT Consulting undertook multiple surveys in March 2025 at recently completed high density residential developments located in Macquarie Park in the vicinity of the subject site. The surveyed sites were as follows:

- 2-10 Cottonwood Crescent, Macquarie Park (207 apartments)
- 16 Byfield Street, Macquarie Park (412 apartments)
- 102 Waterloo Road, Macquarie Park (680 apartments)
- 82 Waterloo Road, Macquarie Park (334 apartments)

The above sites were all completed in the past 5-10 years and are all within close walking distance of the Macquarie University metro station and bus interchange – therefore they are considered representative of the likely travel behaviours of future residents of the subject site. This approach is consistent with the 'benchmarking' methodology as recommended in the TfNSW Guide to Transport Impact Assessment document.

The outcomes of the detailed traffic generation surveys are presented in Table 5.

Table 5 Traffic generation of similar residential developments in Macquarie Park

Site	No. of apartments	Peak Hour Traffic Movements		Traffic Generation Rate	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
2-10 Cottonwood Crescent	207	22	25	0.11	0.12
16 Byfield Street	412	39	42	0.09	0.10
102 Waterloo Road	680	95	95	0.14	0.14
82 Waterloo Road	334	40	48	0.12	0.14
Total	***1,633***	***196***	***210***	***0.12***	***0.13***

Based on the outcomes of the surveys and the residential yields proposed the forecast level of traffic generation associated with the proposed development would be as follows:

- AM peak hour: 103 vehicle trips
- PM peak hour: 111 vehicle trips

5.2 Forecast traffic distribution

The forecast direction of travel to the site utilised in the traffic modelling is shown in Figure 20 (arrival routes) and Figure 21 (departure routes). The number of different arrival and departure routes available to residents contributes to spreading the traffic load and minimising the impact on the surrounding road network.

Figure 20 Forecast traffic distribution (arrival routes)

Figure 21 Forecast traffic distribution (departure routes)

5.3 Road network impacts

The traffic modelling undertaken to support the proposal has been conducted using the TfNSW approved 'SIDRA' modelling package. The traffic modelling metric used to analyse the performance of the intersections is intersection Level of Service (LOS). Level of Service is a measure that uses the average delay experienced by vehicles to categorically assign each approach and movement with a qualitative ordinal grade (A through F, with A being the best and F being the worst). RMS Traffic Modelling Guidelines indicate the average delay relating to each grade, this is outlined in Table 6. In typical urban environments it is typical for intersections to operate at Level of Service D or E and still remain within acceptable performance levels.

Table 6 Level of service grades / description

Level of service grade	Average delay (seconds)	Description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode
F	Greater than 71	Unsatisfactory with excessive queuing

The following scenarios have been considered in the traffic modelling:

- Scenario 1: Existing conditions
- Scenario 2: Existing conditions + 10 years growth
- Scenario 3: Existing conditions + 10 years growth + development proposal

Traffic modelling undertaken for the Stage 1 and Stage 2 rezoning of the Macquarie Park precinct, utilising TfNSW's strategic traffic model (STFM), indicates the following levels of background traffic growth in the area – taking into consideration future development within the Macquarie Park area.

- 0.41% per annum in the AM peak hour
- 0.92% per annum in the PM peak hour

These growth rates have been applied over a 10 year period to existing traffic counts.

The modelling results indicate that the proposal is not anticipated to significantly impact the surrounding road network. The modelling outputs are summarised in Table 7 (AM peak hour) and Table 8 (PM peak hour), with detailed modelling outputs provided as Appendix B of this document. The traffic modelling indicates all intersections would retain their level of service under a 'future base' scenario which takes into consideration background traffic growth from other developments in Macquarie Park.

It is noted that the intersection of Herring Road / Waterloo Road is forecast to operate at Level of Service E with the proposal in place. This intersection performance is largely the result of background traffic growth over a 10 year period – separate to the development proposal. The potential development of the subject site has a relatively minor impact on intersection performance, with this Level of Service E maintained with or without the Planning Proposal in place. As previously noted it is common in urban environments for intersections to operate at Level of Service D or E during peak hours and still retain an acceptable level of performance – particularly when considering the effects of background traffic growth. In this context the traffic impacts at the Herring Road / Waterloo Road intersection arising from the proposal are considered acceptable.

Table 7 Road network performance – AM Peak Hour (8am – 9am)

Intersection	Existing Conditions		Existing Conditions + 10 Years Traffic Growth		Existing Conditions + 10 Years Growth + Proposal	
	Delay (s)	Level of Service	Delay (s)	Level of Service	Delay (s)	Level of Service
Waterloo Road / Cottonwood Crescent	7	A	7	A	7	A
Waterloo Road / Herring Road	51	D	61	E	67	E
Windsor Drive / Herring Road	8	A	8	A	8	A

Table 8 Intersection performance – PM Peak Hour (5pm – 6pm)

Intersection	Existing Conditions		Existing Conditions + 10 Years Traffic Growth		Existing Conditions + 10 Years Growth + Proposal	
	Delay (s)	Level of Service	Delay (s)	Level of Service	Delay (s)	Level of Service
Waterloo Road / Cottonwood Crescent	9	A	9	A	9	A
Waterloo Road / Herring Road	47	D	59	E	62	E
Windsor Drive / Herring Road	22	B	28	B	35	C

6 Preliminary Green Travel Plan

6.1 Overview

A Green Travel Plan (GTP) is a package of measures put in place by the development occupants to try and encourage more sustainable travel. It is a means for a development to demonstrate a commitment and take a pro-active step towards improving the environmental sustainability of its activities.

More generally, the principles of a GTP are applied to all people travelling to and from a site. Government authorities are placing increasing emphasis on the need to reduce the number and lengths of motorised journeys and in doing so encourage greater use of alternative means of travel with less negative environmental impacts than the car.

It is envisaged that any approval of the proposed development would include a condition of consent requiring a final GTP to be prepared to promote sustainable travel. On this basis, a framework for the implementation of such travel plan is provided in the following sections.

6.2 Objectives

The main objectives of the GTP are to reduce the need to travel and promotion of sustainable means of transport. The more specific objectives include:

- High mode share for public transport, cycling and walking journeys;
- Ensuring adequate facilities are provided at the site to enable the tenants and visitors of the development to commute by sustainable transport modes;
- Reduce the number of car journeys associated with general travel;
- Facilitate the sustainable and safe travel of occupants; and
- Raise awareness of sustainable transport amongst residents of the development.

6.3 Potential measures

A suite of potential measures is described below which may be considered for future implementation as part of the final GTP to be prepared prior to initial occupancy of the site.

Table 9 List of potential GTP measures

Action	Responsibility
Cycling	
Provide sufficient cycle parking to meet needs, which is easily accessible and secure	Developer
Provide adequate cycle parking facilities for residents and visitors	Developer
Ensure cycle parking is clearly visible or provide signage to direct people to cycle bays	Building manager
Produce a map showing cycle routes and bike stands in the area	Building manager
Walking	
Produce a Transport Access Guide (TAG) showing safe walking routes to and from the site with times, distances to local facilities, such as shops and bus stops	Developer
Public Transport	
Develop a map showing public transport routes in the area	Building manager
Put up a noticeboard with leaflets and maps showing the main public transport routes to and from the site	Building manager
Carshare / Carpooling	
Put a poster on the noticeboard where residents would register their interest in carpooling by indicating their work location	Building manager
Develop a map showing car-share spots in the area	Building manager
General actions	
Promotion including: • An events calendar. Best in conjunction with statewide events such as National Bike Week and Bike2Work Day, National Walk to Work Day. • Display boards in prominent locations to show public transport maps and timetables.	Building manager

6.4 Monitoring and review

In order for the GTP to be effective, it must be reviewed on a regular basis. It is important to ensure that the GTP is meeting its objectives and having the intended impact on car use and transport choices. The GTP should be reviewed periodically by undertaking resident and other users of the building travel surveys. It is recommended that the mode shares are first reviewed at least 18 months after occupation, to allow activity levels to settle at the site.

7 Preliminary Construction Traffic Management Plan

7.1 Overview

For the purposes of the SSDA a preliminary Construction Pedestrian Traffic Management Plan (CTPMP) has been prepared. This preliminary CPTMP outlines the key principles for how construction may be carried out on the site, subject to further planning to be undertaken during subsequent stages of the project. As the project is early in the design phase details around construction timeframes, methodology and processes are not yet confirmed.

Prior to the commencement of construction for the site, a detailed CPTMP will be prepared. This will be reinforced through an appropriately worded condition of consent, with the purpose of the CTPMP to assess the proposed access and operation of construction traffic associated with the proposed development with respect to safety and capacity. The Contractor will be responsible for preparing the CTPMP, ensuring the following are addressed:

- Proposed construction vehicle routes;
- Indicative construction programme;
- Expected construction vehicle types and volumes;
- Car parking arrangements and site access during construction;
- Safety measures to minimise impacts to pedestrians and cyclists; and

The Contractor will also be responsible for monitoring and coordinating all vehicles entering and exiting the site.

7.2 Working hours

Working hours will be confirmed at the time of the development of the detailed CPTMP however are envisaged to take place during the following hours:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sunday / public holiday: No work

The appointed contractor will be responsible for instructing and controlling all subcontractors regarding the hours of work. Any work outside the approved construction hours would be subject to specific prior approval.

7.3 Construction traffic routes

The construction vehicles routes to be utilised for the construction of the subject site would be selected in order to:

- Maximise vehicle use to the State and Regional road network and limit the extent of travel on residential streets;
- Avoid impacting concurrent construction projects in the vicinity of the site; and
- Minimise impacts to the public transport network

The potential construction vehicle routes are illustrated in Figure 22 and include Epping Road, Lane Cove Road, Talavera Road, the M2 Motorway and Waterloo Road. All access into and out of the construction site would be via Cottonwood Crescent.

These construction routes will be confirmed during the preparation of the detailed CPTMP developed prior to the commencement of construction.

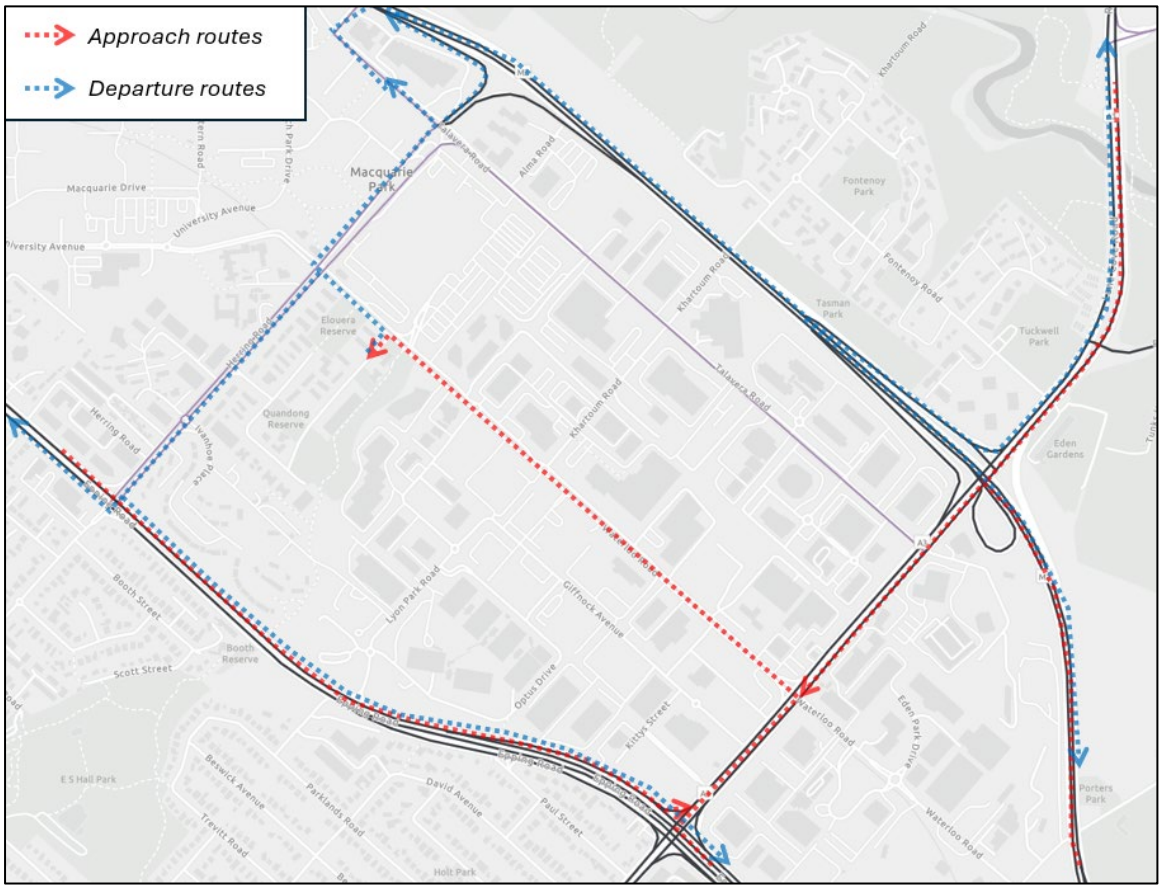


Figure 22 Potential construction vehicle routes

7.4 Construction vehicle volumes

The number of construction vehicles accessing the site on a typical day may be in the order of 40-50 vehicles. This figure will be confirmed following the appointment of a contractor and will form part of the detailed CPTMP to be prepared prior to the commencement of construction. It should be noted however that the level of construction vehicle traffic will be less than that generated during the operational phase of the project.

7.5 Works zones

To facilitate the construction project, a work zone may potentially be established on Cottonwood Crescent adjacent to the site. The work zone would require the temporary removal of approximately 4 existing on-street parking spaces. The work zone would be approximately 25m in length and allow for large items to be lifted by cranes positioned within the site.

Should a works zone be installed on Cottonwood Crescent, a B-Class hoarding will be installed adjacent to the work zone to provide protection to pedestrians.

The requirement for this works zone will be confirmed following the appointment of a contractor at the time of the preparation of the detailed CPTMP.

7.6 Road closures and road occupancy

It is not anticipated that the works will necessitate the need for any road closures or occupation of roadways during the project. Should this need arise the appointed contractor would liaise closely with Council and TfNSW and schedule these works well in advance to minimise impacts to road users.

7.7 Size and type of vehicles

The site will have various types of construction vehicles accessing the site, including:

- 12.5m Heavy Rigid Vehicles (HRVs)
- 8.8m Medium Rigid Vehicles (MRVs)
- 6.5m Small Rigid Vehicles (SRVs);
- Utes/vans

7.8 Impacts to pedestrians

Temporary fencing and hoardings will be installed along the site frontages on Cottonwood Crescent and Waterloo Road to maintain pedestrian movements and ensure the safety of pedestrians walking adjacent to the construction site. Footpaths will remain open at all times to pedestrians and therefore minimal impacts are anticipated.

Traffic controllers will be positioned at vehicle site access points to manage interactions between vehicles and pedestrians on the adjoining footpath. Traffic control plans for the site access points will be developed during the preparation of the detailed CPTMP (prior to the commencement of construction) which will further detail management arrangements to be in place to ensure the safety of pedestrians in the area.

7.9 Construction worker parking

Given the location of the site in close proximity to Macquarie University metro station and bus interchange, workers will be encouraged to use public transport as a means of access. Initially, there would be very little on-site parking, however, once the basement and parking levels are completed, contractors may be able use these facilities subject to availability. All other parking will be the responsibility of the individual construction worker. It is intended that the majority of contractors will be utilising the excellent public transport services to travel to and from the site.

The potential car parking arrangements will be outlined within the detailed Construction Traffic Management Plan (CTMP) to be prepared prior to the commencement of works on the site. This CTMP would outline how workers will travel to the site and measures to be in place to minimise impacts to the surrounding street network. These measures may include (but are not limited to):

- During site induction staff will be informed of the existing public transport network servicing the site
- Identification of suitable off-site parking areas from where workers can either walk or use public transport to access the site; and
- To support construction workers in utilising public transport, appropriate arrangements will be made for any equipment/ tool storage and drop-off requirements

7.10 Cumulative construction impacts

There may be other construction projects occurring at the same as the proposed works at the site. Ongoing review of cumulative heavy vehicle traffic generation and coordination of heavy vehicle routes used by these projects will be undertaken on a regular basis between the appointed contractor, Council and TfNSW to minimise

impacts on the road network. As other CTPMPs become available for adjacent projects, these will be reviewed by the contractor and discussions held with relevant stakeholders.

It is noted that the works at the site are anticipated to generate a relatively low level of construction vehicle activity of at most 5-10 vehicles per hour. This volume of vehicles would not impact the operation of the surrounding road network.

7.11 Emergency vehicle access

Emergency vehicle access will be maintained at all times, or if necessary site personnel will grant access to emergency vehicles entering the site itself.

The contractor will liaise with the NSW Police, Fire Brigade and emergency services agencies throughout construction and a 24-hour contact would be made available for 'out of hours' emergencies and access. The emergency services will be briefed

7.12 Mitigation measures – construction phase

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

- Trucks to minimise the use of local streets for access to the construction site;
- Trucks to enter and exit the site in a forward direction;
- Pedestrians near the ingress/egress points will not be held unnecessarily.
- At construction vehicle access/egress points, priority is to be given to trucks accessing the site over trucks egressing the site so as to have no impact to traffic flow on surrounding roads (unless exceptional circumstances do not permit)
- Trucks to not circulate on the road network to wait to enter the site (unless exceptional circumstances do not permit)
- Restrict construction vehicle activity to designated routes which do not utilise any local roads;
- Truck drivers will be advised of the designated truck routes to/ from the site;
- Construction access from the external road network to mainly occur at signalised intersection;
- Pedestrian movements adjacent the construction site will be managed and controlled by site personnel where required;
- Pedestrian warning signs and construction safety signs/devices to be utilised in the vicinity of the site and to be provided in accordance with WorkCover requirements;

- Construction activity to be carried out in accordance with approved hours of work;
- Truck loads would be covered during transportation off-site;
- Establishment and enforcement of appropriate on-site vehicle speed limits which would be reviewed depending on weather conditions or safety requirements;
- Activities related to the construction works would not impede traffic flow along adjacent roads;
- Materials would be delivered and spoil removed during standard construction hours;
- Construction vehicles not to queue on adjacent streets;
- During site induction, workers will be informed of the existing bus, train and metro network servicing the site;
- To support construction workers in utilising public transport, appropriate arrangements will be made for any equipment/ tool storage and drop-off requirements; and
- Development and enforcement of driver charter.

The appointed contractor will include the following in all subcontract procurement packages as part of a driver code of conduct:

- a copy of the approved truck routes as previously detailed in this document.
- the approved maximum truck size
- any other entry restrictions, or site access restrictions as agreed to by the authorities.

All staff employed on the head contractor (including sub-contractors) would be required to undergo a site induction. The induction would include permitted access routes to and from the construction site for site staff and delivery vehicles, parking arrangements, as well as standard environmental, workplace health and safety, driver protocols and emergency procedures. The approved work hours must be included as part of this induction.

8 Summary

This transport assessment report has been undertaken by JMT Consulting to support a State Significant Development Application for the site at 15-21 Cottonwood Crescent, Macquarie Park. Key findings of the transport assessment are as follows:

- The site has strong access to nearby public transport, with Macquarie University metro station approximately 200m or 2 to 3 minute walk of the site. Bus stops are located on Herring Road and Waterloo Road in close proximity to the site.
- Vehicle access to the site would be via one of three driveways along Cottonwood Crescent which will accommodate both cars and service vehicles. No vehicle driveways would be provided along Waterloo Road.
- Service vehicle access to an on-site loading dock is to be provided via Cottonwood Crescent, with all trucks entering and exiting the site in a forwards direction via the use of a turntable. The design makes provision for a large 12.5m long truck equivalent to a Council waste collection vehicle.
- Car parking for all uses will be delivered in accordance with the parking rates outlined in the City of Ryde DCP for the Macquarie Park corridor.
- Parking for bicycles is to be provided within the site to meet Council's relevant requirements.
- Traffic modelling undertaken indicates that the proposal is not anticipated to result in unacceptable traffic impacts on the surrounding road network – with all intersections retaining their level of service compared to a 'future base' scenario.
- The proposal can implement a number of measures to further reduce traffic impacts such as:
    - provision of bicycle parking for residents and visitors
    - good quality walking connections to nearby public transport
    - car share available to the general public
    - electric vehicle charging stations
    - implementation of a Green Travel Plan

In the above context, the traffic and transport impacts arising from the proposal are considered acceptable.

Appendix A: Vehicle Swept Paths

SITE BOUNDARY

SITE BOUNDARY

2000mm

HRV - Heavy Rigid Vehicle HRV

SRV - Small Rigid Vehicle

MRV - Medium Rigid Vehicle MRV

SRV - Small Rigid Vehicle

FFL 44.500

FOGO BIN HOLDING AREA

BULKY WASTE
44 m²

RETAIL WASTE

RL 44.500

RL 44.500

UP

LRS

COMMS

COMMS

MHR

SPR

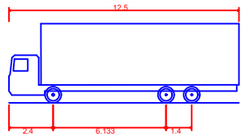
GPO

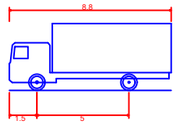
GPO

Exhaust

Job Title	88 Waterloo Road
Client	Billbergia
	JMT Consulting ABN: 32 6358 30054 www.jmtconsulting.com.au PO Box 199, Kingsford NSW 2032
Drawing Title	Turning Paths
Drawing No	2354_01
Date	02.02.25
Legend	Body Envelope 300mm Envelope Wheel Envelope
Job No	2354
Scale at A3	1:100

Vehicle type(s)





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

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

FFL 44.500
FOGO BIN HOLDING AREA
MRV Medium Rigid Vehicle
RETAIL WASTE
LOWER GROUND
FAN ROOM
FFL 44.500
TO SUR
REF
SRV Small Rigid Vehicle
UP TO UG
1:14
1:14
ACC WC
AMB WC
FFL 45.000
28 BIKE SPACES
1:14.5
RETAIL 1
49.1 m²
FFL 45.000
PARCEL
FFL 44.500
FOGO 2
BIN CAROUSELS
BIN CAROUSEL
AF LIFT LOBBY
L-1
L-2
L-3
H-3 EL
32 BIKE SPACES
H1
H2
H-3 EL
LETTERBOXES
MAIL
FFL 44.500
LETTERBOXES
HIGH RISE LOBBY-LIV
LOBBY
LOBBY
FFL 44.500
L-1
L-2
L-3
GARBAGE ROOM
RL 44.500
FFL 44.500
FOGO 1
RL 44.500
COLD WATER PUMP
RL 44.500
15 WALL HUNG BIKE SPACES
RL 44.500
RL 44.500
LOW RISE LOBBY
FFL 44.500
SUBSTATION
FFL 44.500
FIRE CONTROL
RL 44.900
RL 44.600
RL 44.310
RL 43.95
RL 44.310
RL 43.600
Intercom / Card reader
SEWER PUMP STN. (INGROUND)
BOOSTER 4X0.7
SITE BOUNDARY

Job Title
88 Waterloo Road

Drawing Title
Turning Paths

Client
Billbergia

Drawing No
2354_02

Job No
2354

Date
02.02.25

Scale at A3
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Legend
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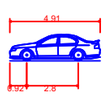
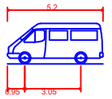
- 300mm Envelope
- Wheel Envelope

Vehicle type(s)





B85 Vehicle (Realistic min radius) (2004)	
Overall Length	4.910m
Overall Width	1.870m
Overall Body Height	1.421m
Min Body Ground Clearance	0.120m
Track Width	1.770m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	5.750m

B99 Vehicle (8m min radius) (2004)	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	8.000m

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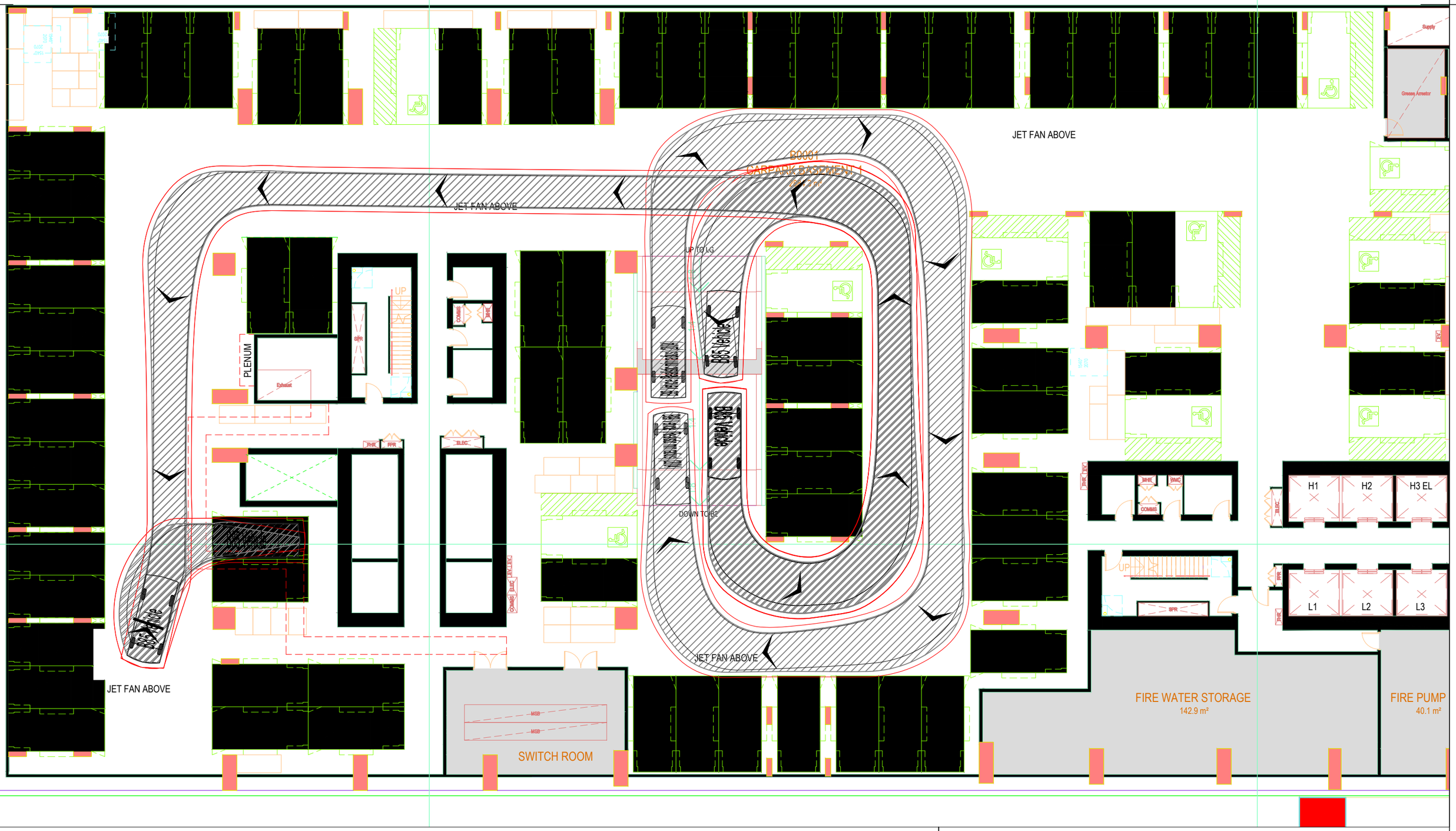

Job Title
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Drawing Title
Turning Paths

Drawing No
2354_03

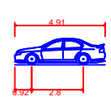
Date
02.02.25

Legend
Body Envelope
300mm Envelope
Wheel Envelope

Job No
2354

Scale at A3
1:200

Vehicle type(s)



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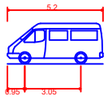

B99 Vehicle (8m min radius) (2004)

Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	8.000m

Appendix B: Traffic Modelling Outputs

MOVEMENT SUMMARY

Site: [1a] AM Existing (Waterloo & Cottonwood)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Cottonwood Crescent															
1	L2	All MCs	19	0.0	19	0.0	0.019	6.6	LOS A	0.1	0.5	0.34	0.58	0.34	51.9
Approach			19	0.0	19	0.0	0.019	6.6	LOS A	0.1	0.5	0.34	0.58	0.34	51.9
East: Waterloo Road (E)															
4	L2	All MCs	24	0.0	24	0.0	0.158	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.0
5	T1	All MCs	546	12.1	546	12.1	0.158	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach			571	11.6	571	11.6	0.158	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
West: Waterloo Road (W)															
11	T1	All MCs	680	10.4	680	10.4	0.186	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			680	10.4	680	10.4	0.186	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles			1269	10.8	1269	10.8	0.186	0.3	NA	0.1	0.5	0.01	0.02	0.01	59.6

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [1b] AM Existing + Growth (Waterloo & Cottonwood)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Cottonwood Crescent															
1	L2	All MCs	20	0.0	20	0.0	0.020	6.7	LOS A	0.1	0.5	0.35	0.58	0.35	51.8
Approach			20	0.0	20	0.0	0.020	6.7	LOS A	0.1	0.5	0.35	0.58	0.35	51.8
East: Waterloo Road (E)															
4	L2	All MCs	25	0.0	25	0.0	0.164	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	56.9
5	T1	All MCs	569	12.1	569	12.1	0.164	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach			594	11.6	594	11.6	0.164	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
West: Waterloo Road (W)															
11	T1	All MCs	708	10.4	708	10.4	0.194	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			708	10.4	708	10.4	0.194	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles			1322	10.8	1322	10.8	0.194	0.3	NA	0.1	0.5	0.01	0.02	0.01	59.6

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [1e] PM Existing + Growth (Waterloo & Cottonwood)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Cottonwood Crescent															
1	L2	All MCs	39	0.0	39	0.0	0.061	9.2	LOS A	0.2	1.4	0.54	0.76	0.54	50.2
Approach			39	0.0	39	0.0	0.061	9.2	LOS A	0.2	1.4	0.54	0.76	0.54	50.2
East: Waterloo Road (E)															
4	L2	All MCs	49	0.0	49	0.0	0.354	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	56.9
5	T1	All MCs	1286	5.2	1286	5.2	0.354	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.6
Approach			1336	5.0	1336	5.0	0.354	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.5
West: Waterloo Road (W)															
11	T1	All MCs	671	10.1	671	10.1	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			671	10.1	671	10.1	0.183	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles			2046	6.6	2046	6.6	0.354	0.4	NA	0.2	1.4	0.01	0.03	0.01	59.4

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [1f] PM Existing + Growth + Development (Waterloo & Cottonwood)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Cottonwood Crescent															
1	L2	All MCs	79	0.0	79	0.0	0.118	9.1	LOS A	0.4	2.9	0.54	0.79	0.54	50.3
Approach			79	0.0	79	0.0	0.118	9.1	LOS A	0.4	2.9	0.54	0.79	0.54	50.3
East: Waterloo Road (E)															
4	L2	All MCs	106	0.0	106	0.0	0.369	5.6	LOS A	0.0	0.0	0.00	0.09	0.00	56.5
5	T1	All MCs	1286	5.2	1286	5.2	0.369	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	59.4
Approach			1392	4.8	1392	4.8	0.369	0.5	NA	0.0	0.0	0.00	0.05	0.00	59.1
West: Waterloo Road (W)															
11	T1	All MCs	671	10.1	671	10.1	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			671	10.1	671	10.1	0.183	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles			2143	6.3	2143	6.3	0.369	0.7	NA	0.4	2.9	0.02	0.06	0.02	59.0

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2a] AM Existing (Herring & Windsor)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1378	2.7	1378	2.7	0.240	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	73	2.9	73	2.9	0.106	7.9	LOS A	0.4	2.6	0.42	0.67	0.42	51.1
Approach			1451	2.7	1451	2.7	0.240	0.5	NA	0.4	2.6	0.02	0.03	0.02	59.4
East: Windsor Drive (E)															
4	L2	All MCs	93	2.3	93	2.3	0.078	6.0	LOS A	0.3	2.0	0.20	0.55	0.20	52.2
Approach			93	2.3	93	2.3	0.078	6.0	LOS A	0.3	2.0	0.20	0.55	0.20	52.2
North: Herring Road (N)															
7	L2	All MCs	6	0.0	6	0.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.2
8	T1	All MCs	320	7.6	320	7.6	0.059	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach			326	7.4	326	7.4	0.059	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles			1869	3.5	1869	3.5	0.240	0.7	NA	0.4	2.6	0.03	0.06	0.03	59.0

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2b] AM Existing + Growth (Herring & Windsor)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1436	2.7	1436	2.7	0.250	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	76	2.9	76	2.9	0.112	8.1	LOS A	0.4	2.8	0.43	0.68	0.43	51.0
Approach			1511	2.7	1511	2.7	0.250	0.5	NA	0.4	2.8	0.02	0.03	0.02	59.3
East: Windsor Drive (E)															
4	L2	All MCs	97	2.3	97	2.3	0.081	6.0	LOS A	0.3	2.1	0.21	0.55	0.21	52.2
Approach			97	2.3	97	2.3	0.081	6.0	LOS A	0.3	2.1	0.21	0.55	0.21	52.2
North: Herring Road (N)															
7	L2	All MCs	7	0.0	7	0.0	0.061	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.2
8	T1	All MCs	333	7.6	333	7.6	0.061	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach			340	7.4	340	7.4	0.061	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles			1948	3.5	1948	3.5	0.250	0.7	NA	0.4	2.8	0.03	0.06	0.03	59.0

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2c] AM Existing + Growth + Development (Herring & Windsor)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1436	2.7	1436	2.7	0.250	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	90	2.4	90	2.4	0.135	8.2	LOS A	0.5	3.4	0.44	0.69	0.44	50.9
Approach			1526	2.7	1526	2.7	0.250	0.5	NA	0.5	3.4	0.03	0.04	0.03	59.2
East: Windsor Drive (E)															
4	L2	All MCs	155	1.4	155	1.4	0.128	6.0	LOS A	0.5	3.5	0.21	0.56	0.21	52.2
Approach			155	1.4	155	1.4	0.128	6.0	LOS A	0.5	3.5	0.21	0.56	0.21	52.2
North: Herring Road (N)															
7	L2	All MCs	19	0.0	19	0.0	0.063	5.6	LOS A	0.0	0.0	0.00	0.09	0.00	56.6
8	T1	All MCs	333	7.6	333	7.6	0.063	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach			352	7.2	352	7.2	0.063	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
All Vehicles			2032	3.3	2032	3.3	0.250	0.9	NA	0.5	3.5	0.04	0.08	0.04	58.7

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2d] PM Existing (Herring & Windsor)
Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1185	1.8	1185	1.8	0.205	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	68	1.5	68	1.5	0.303	22.6	LOS B	1.0	7.4	0.83	0.97	0.98	42.4
Approach			1254	1.8	1254	1.8	0.303	1.3	NA	1.0	7.4	0.05	0.05	0.05	58.6
East: Windsor Drive (E)															
4	L2	All MCs	81	0.0	81	0.0	0.088	7.2	LOS A	0.3	2.2	0.41	0.65	0.41	51.6
Approach			81	0.0	81	0.0	0.088	7.2	LOS A	0.3	2.2	0.41	0.65	0.41	51.6
North: Herring Road (N)															
7	L2	All MCs	13	0.0	13	0.0	0.193	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
8	T1	All MCs	1103	1.5	1103	1.5	0.193	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach			1116	1.5	1116	1.5	0.193	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles			2451	1.6	2451	1.6	0.303	0.9	NA	1.0	7.4	0.04	0.05	0.04	58.9

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2e] PM Existing + Growth (Herring & Windsor)
Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1294	1.8	1294	1.8	0.224	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	75	1.5	75	1.5	0.394	28.0	LOS B	1.4	9.8	0.88	1.01	1.11	39.9
Approach			1369	1.8	1369	1.8	0.394	1.6	NA	1.4	9.8	0.05	0.05	0.06	58.3
East: Windsor Drive (E)															
4	L2	All MCs	89	0.0	89	0.0	0.100	7.5	LOS A	0.4	2.5	0.43	0.67	0.43	51.5
Approach			89	0.0	89	0.0	0.100	7.5	LOS A	0.4	2.5	0.43	0.67	0.43	51.5
North: Herring Road (N)															
7	L2	All MCs	14	0.0	14	0.0	0.210	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
8	T1	All MCs	1205	1.5	1205	1.5	0.210	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach			1218	1.5	1218	1.5	0.210	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles			2676	1.6	2676	1.6	0.394	1.1	NA	1.4	9.8	0.04	0.05	0.05	58.7

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2f] PM Existing + Growth + Development (Herring & Windsor)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (S)															
2	T1	All MCs	1294	1.8	1294	1.8	0.224	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	113	1.0	113	1.0	0.619	35.6	LOS C	2.6	18.0	0.92	1.10	1.47	36.9
Approach			1407	1.7	1407	1.7	0.619	2.9	NA	2.6	18.0	0.07	0.09	0.12	57.0
East: Windsor Drive (E)															
4	L2	All MCs	111	0.0	111	0.0	0.122	7.4	LOS A	0.4	3.1	0.43	0.67	0.43	51.5
Approach			111	0.0	111	0.0	0.122	7.4	LOS A	0.4	3.1	0.43	0.67	0.43	51.5
North: Herring Road (N)															
7	L2	All MCs	45	0.0	45	0.0	0.216	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	56.9
8	T1	All MCs	1205	1.5	1205	1.5	0.216	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach			1249	1.5	1249	1.5	0.216	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles			2768	1.5	2768	1.5	0.619	1.9	NA	2.6	18.0	0.05	0.08	0.08	57.9

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [3a] AM Existing (Herring & Waterloo)
Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130.0 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	106	2.0	106	2.0	0.159	35.0	LOS C	4.5	31.9	0.71	0.74	0.71	32.4
2	T1	All MCs	637	3.6	637	3.6	* 0.889	50.8	LOS D	41.7	297.3	0.99	1.00	1.12	31.0
3	R2	All MCs	539	4.3	539	4.3	* 0.889	74.8	LOS F	19.1	138.9	1.00	1.00	1.26	19.2
Approach			1282	3.8	1282	3.8	0.889	59.6	LOS E	41.7	297.3	0.97	0.98	1.14	25.8
East: Waterloo Road (205m)															
4	L2	All MCs	256	11.5	256	11.5	0.275	22.6	LOS B	8.6	66.0	0.58	0.74	0.58	35.0
5	T1	All MCs	189	3.3	189	3.3	0.303	34.8	LOS C	8.9	64.1	0.79	0.66	0.79	29.9
6	R2	All MCs	203	11.9	203	11.9	* 0.889	77.8	LOS F	13.6	99.4	0.99	0.98	1.29	21.1
Approach			648	9.3	648	9.3	0.889	43.5	LOS D	13.6	99.4	0.77	0.79	0.86	27.3
North: Herring Road (135m)															
7	L2	All MCs	109	9.6	109	9.6	0.119	21.7	LOS B	3.4	25.7	0.53	0.70	0.53	38.4
8	T1	All MCs	134	7.1	134	7.1	0.098	28.7	LOS C	2.7	20.3	0.69	0.54	0.69	39.3
9	R2	All MCs	79	18.7	79	18.7	0.286	57.4	LOS E	4.4	36.1	0.92	0.77	0.92	27.7
Approach			322	10.8	322	10.8	0.286	33.3	LOS C	4.4	36.1	0.69	0.65	0.69	35.3
West: University Avenue (340m)															
10	L2	All MCs	135	4.7	135	4.7	0.199	34.6	LOS C	5.7	41.4	0.71	0.75	0.71	34.7
11	T1	All MCs	235	4.5	235	4.5	* 0.766	59.6	LOS E	15.0	109.0	1.00	0.90	1.09	22.0
Approach			369	4.6	369	4.6	0.766	50.5	LOS D	15.0	109.0	0.90	0.85	0.95	26.5
All Vehicles			2622	6.1	2622	6.1	0.889	51.1	LOS D	41.7	297.3	0.88	0.87	0.99	27.3

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Qued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Herring Road (380m)												

P1	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
East: Waterloo Road (205m)												
P2	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
North: Herring Road (135m)												
P3	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
West: University Avenue (340m)												
P4	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
All Pedestrians		200	211	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94

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.

MOVEMENT SUMMARY

Site: [3b] AM Existing + Growth (Herring & Waterloo)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	118	2.7	118	2.7	0.171	36.1	LOS C	5.3	37.7	0.70	0.74	0.70	31.9
2	T1	All MCs	698	3.9	698	3.9	*0.945	65.7	LOS E	54.8	391.8	0.99	1.10	1.20	27.2
3	R2	All MCs	589	4.5	589	4.5	*0.945	90.5	LOS F	24.3	176.8	1.00	1.06	1.36	16.9
Approach			1405	4.0	1405	4.0	0.945	73.7	LOS F	54.8	391.8	0.97	1.05	1.22	22.8
East: Waterloo Road (205m)															
4	L2	All MCs	278	12.1	278	12.1	0.304	24.7	LOS B	10.3	79.8	0.59	0.75	0.59	33.8
5	T1	All MCs	207	4.1	207	4.1	0.342	38.8	LOS C	10.7	77.7	0.81	0.68	0.81	28.3
6	R2	All MCs	221	11.9	221	11.9	*0.945	92.3	LOS F	17.1	125.9	0.99	1.03	1.38	18.9
Approach			706	9.7	706	9.7	0.945	50.0	LOS D	17.1	125.9	0.78	0.82	0.90	25.3
North: Herring Road (135m)															
7	L2	All MCs	119	11.5	119	11.5	0.127	22.0	LOS B	3.9	29.8	0.52	0.70	0.52	38.1
8	T1	All MCs	145	7.2	145	7.2	0.103	29.6	LOS C	3.1	23.4	0.68	0.54	0.68	38.8
9	R2	All MCs	85	17.3	85	17.3	0.298	60.7	LOS E	5.1	41.3	0.91	0.77	0.91	26.9
Approach			349	11.1	349	11.1	0.298	34.6	LOS C	5.1	41.3	0.68	0.65	0.68	34.8
West: University Avenue (340m)															
10	L2	All MCs	147	5.7	147	5.7	0.224	37.8	LOS C	6.8	50.1	0.73	0.76	0.73	33.5
11	T1	All MCs	249	5.1	249	5.1	*0.863	71.4	LOS F	18.4	134.3	1.00	1.00	1.20	19.6
Approach			397	5.3	397	5.3	0.863	58.9	LOS E	18.4	134.3	0.90	0.91	1.03	24.3
All Vehicles			2858	6.5	2858	6.5	0.945	61.0	LOS E	54.8	391.8	0.88	0.93	1.05	24.7

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Qued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec

South: Herring Road (380m)												
P1	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
East: Waterloo Road (205m)												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
North: Herring Road (135m)												
P3	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
West: University Avenue (340m)												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
All Pedestrians		200	211	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92

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.

MOVEMENT SUMMARY

Site: [3c] AM Existing + Growth + Development (Herring & Waterloo)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Queued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	118	2.7	118	2.7	0.168	37.7	LOS C	5.6	39.9	0.70	0.74	0.70	31.3
2	T1	All MCs	712	3.8	712	3.8	* 0.950	69.5	LOS E	59.6	425.7	0.99	1.10	1.19	26.3
3	R2	All MCs	644	4.1	644	4.1	* 0.950	95.4	LOS F	28.4	205.9	1.00	1.06	1.33	16.3
Approach			1474	3.9	1474	3.9	0.950	78.3	LOS F	59.6	425.7	0.97	1.05	1.21	21.9
East: Waterloo Road (205m)															
4	L2	All MCs	278	12.1	278	12.1	0.303	26.0	LOS B	11.0	85.3	0.59	0.75	0.59	33.1
5	T1	All MCs	219	3.8	219	3.8	0.374	43.3	LOS D	12.4	89.7	0.83	0.70	0.83	26.7
6	R2	All MCs	221	11.9	221	11.9	* 0.950	98.6	LOS F	18.3	134.7	1.00	1.03	1.37	18.1
Approach			718	9.5	718	9.5	0.950	53.6	LOS D	18.3	134.7	0.79	0.82	0.90	24.3
North: Herring Road (135m)															
7	L2	All MCs	119	11.5	119	11.5	0.127	23.0	LOS B	4.1	31.8	0.52	0.70	0.52	37.6
8	T1	All MCs	145	7.2	145	7.2	0.101	31.1	LOS C	3.3	24.8	0.67	0.53	0.67	38.2
9	R2	All MCs	85	17.3	85	17.3	0.274	62.2	LOS E	5.4	43.2	0.90	0.77	0.90	26.6
Approach			349	11.1	349	11.1	0.274	36.0	LOS C	5.4	43.2	0.67	0.65	0.67	34.2
West: University Avenue (340m)															
10	L2	All MCs	147	5.7	147	5.7	0.221	39.6	LOS C	7.3	53.3	0.72	0.76	0.72	32.8
11	T1	All MCs	249	5.1	249	5.1	* 0.911	83.1	LOS F	20.6	150.7	1.00	1.05	1.28	17.6
Approach			397	5.3	397	5.3	0.911	67.0	LOS E	20.6	150.7	0.90	0.94	1.07	22.5
All Vehicles			2938	6.3	2938	6.3	0.950	65.7	LOS E	59.6	425.7	0.88	0.93	1.05	23.6

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Queued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec

South: Herring Road (380m)												
P1	Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	223.1	200.0	0.90
East: Waterloo Road (205m)												
P2	Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	223.1	200.0	0.90
North: Herring Road (135m)												
P3	Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	223.1	200.0	0.90
West: University Avenue (340m)												
P4	Full	50	53	69.3	LOS F	0.2	0.2	0.96	0.96	223.1	200.0	0.90
All Pedestrians		200	211	69.3	LOS F	0.2	0.2	0.96	0.96	223.1	200.0	0.90

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.

MOVEMENT SUMMARY

Site: [3d] PM Existing (Herring & Waterloo)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130.0 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	60	5.3	60	5.3	0.106	39.0	LOS C	2.7	19.4	0.74	0.73	0.74	30.8
2	T1	All MCs	539	3.7	539	3.7	* 0.869	52.4	LOS D	34.8	247.8	0.99	0.98	1.11	30.6
3	R2	All MCs	557	4.5	557	4.5	* 0.869	71.5	LOS F	19.3	140.2	1.00	0.97	1.21	19.8
Approach			1156	4.2	1156	4.2	0.869	60.9	LOS E	34.8	247.8	0.98	0.97	1.14	25.2
East: Waterloo Road (205m)															
4	L2	All MCs	738	5.7	738	5.7	0.514	23.0	LOS B	19.8	145.6	0.68	0.78	0.68	33.5
5	T1	All MCs	167	3.8	167	3.8	0.514	47.7	LOS D	17.5	127.6	0.82	0.77	0.82	29.3
6	R2	All MCs	260	8.1	260	8.1	* 0.869	72.5	LOS F	17.4	125.9	1.00	0.96	1.22	22.1
Approach			1165	6.0	1165	6.0	0.869	37.6	LOS C	19.8	145.6	0.77	0.82	0.82	29.1
North: Herring Road (135m)															
7	L2	All MCs	173	8.5	173	8.5	0.189	23.0	LOS B	5.7	42.8	0.56	0.72	0.56	37.6
8	T1	All MCs	502	2.7	502	2.7	0.414	37.4	LOS C	12.5	89.2	0.84	0.71	0.84	35.6
9	R2	All MCs	108	11.7	108	11.7	0.355	56.9	LOS E	6.1	47.1	0.92	0.78	0.92	27.9
Approach			783	5.2	783	5.2	0.414	36.9	LOS C	12.5	89.2	0.79	0.72	0.79	34.6
West: University Avenue (340m)															
10	L2	All MCs	199	2.6	199	2.6	0.283	34.8	LOS C	8.6	61.5	0.73	0.77	0.73	34.6
11	T1	All MCs	247	6.8	247	6.8	* 0.819	62.5	LOS E	16.4	121.3	1.00	0.95	1.15	21.4
Approach			446	5.0	446	5.0	0.819	50.2	LOS D	16.4	121.3	0.88	0.87	0.96	27.0
All Vehicles			3551	5.1	3551	5.1	0.869	46.6	LOS D	34.8	247.8	0.86	0.85	0.94	28.5

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Qued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Herring Road (380m)												

P1	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
East: Waterloo Road (205m)												
P2	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
North: Herring Road (135m)												
P3	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
West: University Avenue (340m)												
P4	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
All Pedestrians		200	211	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94

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.

MOVEMENT SUMMARY

Site: [3e] PM Existing + Growth (Herring & Waterloo)
Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	68	4.6	68	4.6	0.122	39.6	LOS C	3.1	22.3	0.75	0.73	0.75	30.6
2	T1	All MCs	602	3.8	602	3.8	* 0.983	83.1	LOS F	49.8	354.7	1.00	1.24	1.37	23.7
3	R2	All MCs	613	4.6	613	4.6	* 0.983	99.8	LOS F	25.8	188.0	1.00	1.13	1.49	15.8
Approach			1283	4.3	1283	4.3	0.983	88.8	LOS F	49.8	354.7	0.98	1.16	1.40	20.1
East: Waterloo Road (205m)															
4	L2	All MCs	811	6.4	811	6.4	0.564	23.4	LOS B	22.6	167.2	0.71	0.79	0.71	33.3
5	T1	All MCs	191	4.4	191	4.4	0.564	47.4	LOS D	19.9	145.6	0.84	0.78	0.84	29.3
6	R2	All MCs	305	8.6	305	8.6	* 0.983	98.7	LOS F	24.8	181.9	1.00	1.11	1.48	18.1
Approach			1306	6.6	1306	6.6	0.983	44.5	LOS D	24.8	181.9	0.79	0.87	0.91	26.7
North: Herring Road (135m)															
7	L2	All MCs	195	8.1	195	8.1	0.211	22.9	LOS B	6.5	48.3	0.57	0.73	0.57	37.6
8	T1	All MCs	568	3.3	568	3.3	0.476	38.6	LOS C	14.5	104.3	0.86	0.73	0.86	35.1
9	R2	All MCs	128	12.3	128	12.3	0.434	58.3	LOS E	7.4	57.3	0.94	0.79	0.94	27.5
Approach			892	5.7	892	5.7	0.476	38.0	LOS C	14.5	104.3	0.81	0.74	0.81	34.2
West: University Avenue (340m)															
10	L2	All MCs	221	2.9	221	2.9	0.319	35.7	LOS C	9.8	70.1	0.75	0.78	0.75	34.3
11	T1	All MCs	281	6.7	281	6.7	* 0.930	76.6	LOS F	21.1	156.4	1.00	1.11	1.35	18.7
Approach			502	5.0	502	5.0	0.930	58.6	LOS E	21.1	156.4	0.89	0.96	1.08	24.7
All Vehicles			3983	5.4	3983	5.4	0.983	59.1	LOS E	49.8	354.7	0.87	0.95	1.06	25.1

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Qued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec

South: Herring Road (380m)												
P1	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
East: Waterloo Road (205m)												
P2	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
North: Herring Road (135m)												
P3	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
West: University Avenue (340m)												
P4	Full	50	53	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94
All Pedestrians		200	211	59.3	LOS E	0.2	0.2	0.96	0.96	213.1	200.0	0.94

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.

MOVEMENT SUMMARY

Site: [3f] PM Existing + Growth + Development (Herring & Waterloo)

Output produced by SIDRA INTERSECTION Version: 10.0.8.241

Herring Road x Waterloo Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Queued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Herring Road (380m)															
1	L2	All MCs	68	4.6	68	4.6	0.119	41.2	LOS C	3.3	23.7	0.74	0.73	0.74	30.0
2	T1	All MCs	607	3.8	607	3.8	* 0.967	79.0	LOS F	50.9	362.5	0.99	1.17	1.29	24.5
3	R2	All MCs	634	4.5	634	4.5	* 0.967	97.4	LOS F	27.4	198.8	1.00	1.09	1.41	16.1
Approach			1309	4.2	1309	4.2	0.967	85.9	LOS F	50.9	362.5	0.98	1.11	1.32	20.5
East: Waterloo Road (205m)															
4	L2	All MCs	811	6.4	811	6.4	0.586	24.9	LOS B	25.8	190.7	0.72	0.80	0.72	32.4
5	T1	All MCs	219	3.8	219	3.8	0.586	50.6	LOS D	22.2	161.9	0.85	0.79	0.85	27.9
6	R2	All MCs	305	8.6	305	8.6	* 0.967	96.9	LOS F	25.4	186.3	1.00	1.08	1.40	18.3
Approach			1335	6.5	1335	6.5	0.967	45.6	LOS D	25.8	190.7	0.80	0.86	0.90	26.4
North: Herring Road (135m)															
7	L2	All MCs	195	8.1	195	8.1	0.208	24.1	LOS B	6.8	51.1	0.56	0.73	0.56	37.2
8	T1	All MCs	568	3.3	568	3.3	0.473	41.9	LOS C	15.5	111.5	0.85	0.73	0.85	34.3
9	R2	All MCs	128	12.3	128	12.3	0.413	62.8	LOS E	7.8	60.7	0.93	0.79	0.93	26.9
Approach			892	5.7	892	5.7	0.473	41.0	LOS C	15.5	111.5	0.80	0.74	0.80	33.1
West: University Avenue (340m)															
10	L2	All MCs	221	2.9	221	2.9	0.319	38.1	LOS C	10.5	75.4	0.75	0.78	0.75	33.4
11	T1	All MCs	281	6.7	281	6.7	* 0.967	92.8	LOS F	24.1	178.6	1.00	1.17	1.42	16.3
Approach			502	5.0	502	5.0	0.967	68.7	LOS E	24.1	178.6	0.89	1.00	1.13	22.5
All Vehicles			4038	5.4	4038	5.4	0.967	60.5	LOS E	50.9	362.5	0.87	0.93	1.04	24.8

Site Level of Service (LOS) Method: Delay (NSW). Site LOS Method is specified in the Parameter Settings dialog (Options 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.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Queued	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec

South: Herring Road (380m)												
P1	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
East: Waterloo Road (205m)												
P2	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
North: Herring Road (135m)												
P3	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
West: University Avenue (340m)												
P4	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92
All Pedestrians		200	211	64.3	LOS F	0.2	0.2	0.96	0.96	218.1	200.0	0.92

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.