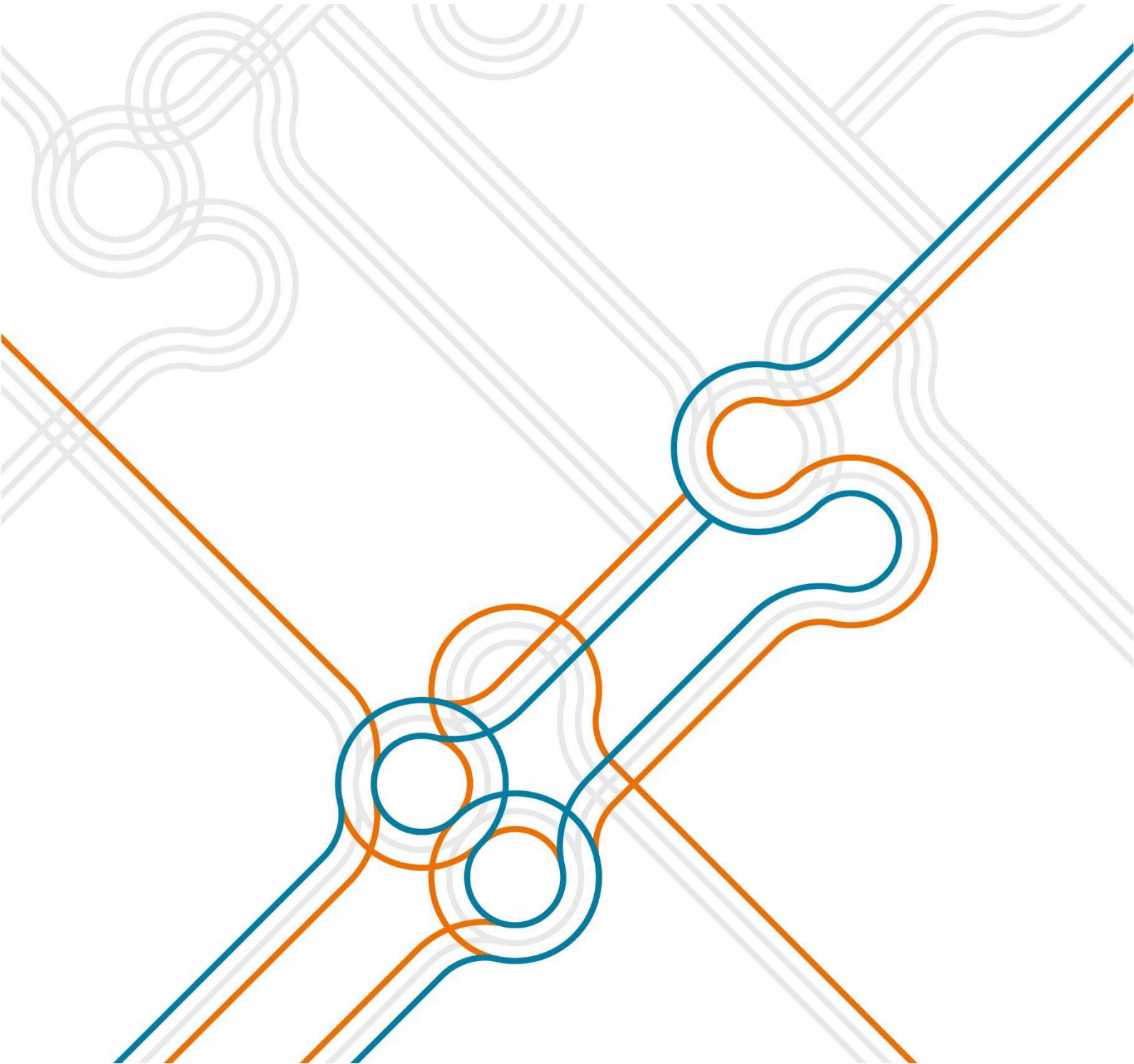

LAHC Bunnerong Road, Kingsford

Transport Impact Assessment

Prepared for: PTW

Ref: 300304525 | Date: 22 November 2023



Revision

Revision	Date	Comment	Prepared By	Approved By
A	22 November 2023	Final	P. Obmasca & S. Hong	B. Khan



Bayzid Khan

For and on behalf of

Stantec Australia Pty Ltd

Level 9, 203 Pacific Highway, St Leonards NSW 2065

Acknowledgment of Country

In the spirit of reconciliation, Stantec acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present, and extend that respect to all Aboriginal and Torres Strait Islander peoples.

Limitations

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TRANSPORT IMPACT ASSESSMENT

LAHC Bunnerong Road, Kingsford

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Appendices

Appendix A. Survey Data

Appendix B.	Existing SIDRA Results
Appendix C.	Post-development SIDRA Results

1. Introduction

1.1 Background

It is understood that a planning proposal is to be lodged with Randwick City Council (Council) for the site located at 47-55 Bunnerong Road, Kingsford. Land and Housing Corporation (LAHC) owns and manages the site and are proposing to redevelop and construct an eight storey residential building with potential to accommodate 187 units.

LAHC is a public trading enterprise that owns and manages the Government's public housing portfolio of some 130,000 properties within New South Wales.

On 30 August, Randwick City Council determined that its Comprehensive Local Environment Plan Planning Proposal (LEP PP) would not proceed with the proposed maximum building height and Development Control Plan (DCP) controls for the Site but would include it on the Key Sites Map to enable the proposal of a future site-specific DCP and PP.

LAHC intends to lodge a Planning Proposal and will require a Transport Impact Assessment (TIA) report to support the submission. This planning proposal seeks to understand the impact that a redevelopment would cause on the surrounding public domain and road network.

Stantec has been engaged by PTW to complete a Transport Impact Assessment for the proposal.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

- existing traffic and parking conditions surrounding the site
- suitability of the proposed parking in terms of supply (quantum) and layout
- service vehicle requirements
- pedestrian and bicycle requirements
- the traffic generating characteristics of the proposed development
- suitability of the proposed access arrangements for the site
- the transport impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- Randwick City Council Development Control Plan Part E7: Housing and Investigation Areas 2023 (DCP 2023)
- Randwick City Council Development Control Plan 2013 (DCP 2013)
- Randwick Local Environmental Plan (LEP) 2012
- State Environmental Planning Policy (Housing) 2021
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2018
- Australian Standard / New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- Bunnerong Road Urban Design Study for the proposal prepared by e8urban
- other documents and data as referenced in this report.



2. Strategic Context

2.1 Overview

The following strategies and plans are key locational urban planning drivers for the Site. They influence development opportunities in Kingsford and surrounding areas, with deliberate effects on future travel demand and mode splits for both workers and residents in particular.

2.2 The Kensington and Kingsford (K2K) Strategy

Council's K2K strategy had paved the way for urban regeneration of the local area. The Kensington and Kingsford town centres have been proposed with a new vision of vibrant, prosperous and attractive places. This strategy has taken effect since 2020, allowing for additional commercial use, increased height up to 51 metres and, increased floor space ratio controls along the light rail corridor.

The Site sits close to the K2K Strategy area which offers significant opportunities for new development and enhanced public domain outcomes. Analysis by e8urban as part of their design study demonstrates that the Site is one of the largest in the Corridor that is within a 500 metre walking catchment, and is significantly larger than sites along Gardeners Road that have been up-zoned within K2K.

2.3 The Kingsford South Housing Study

The strategy encompasses land between Bunnerong Road, Rainbow Street, Botany Street and Anderson Street. This strategy provides a blanket set of controls across the proposed study area with a uniform approach to urban form - this being a consistent 5-storey built form. The strategy fails to respond to lot sizes, street hierarchy, and topography. The strategy would rely on significant amalgamations of small lots to deliver a comprehensive urban renewal.

3. Existing Conditions

3.1 Site Overview

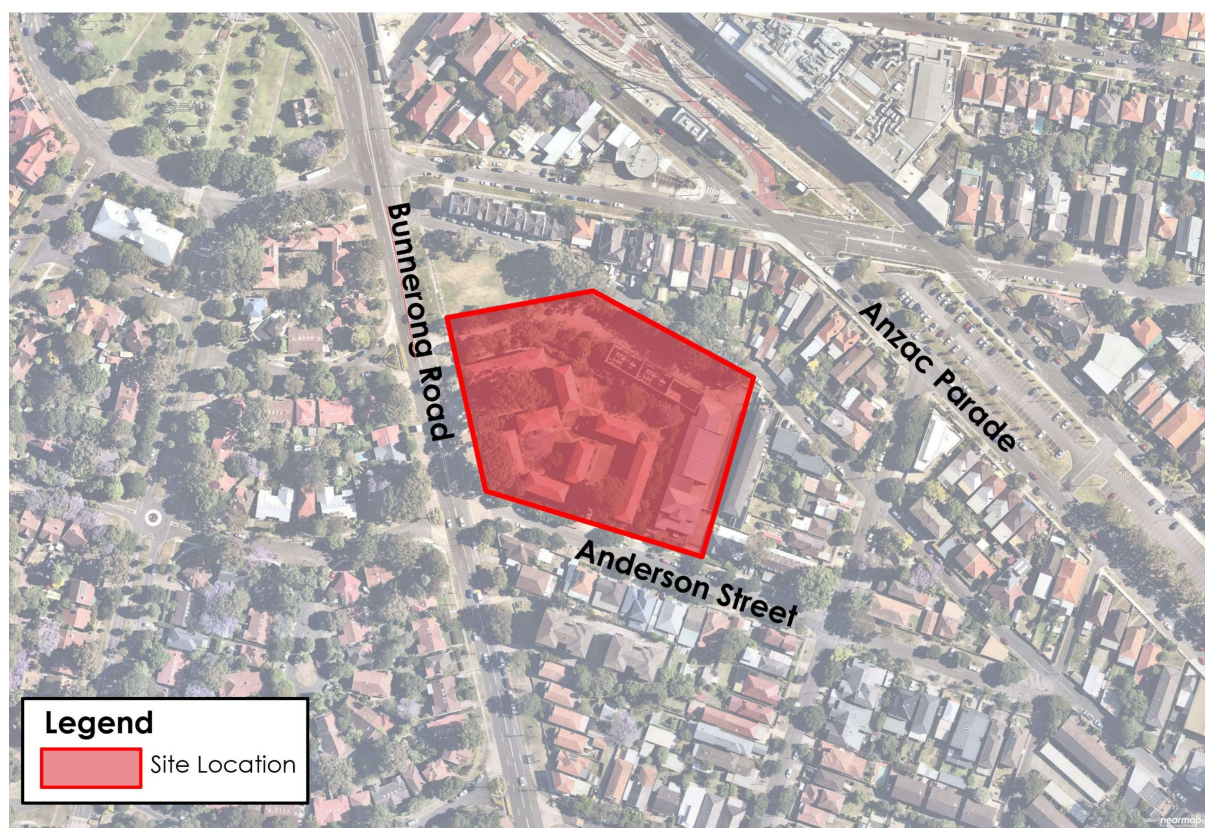
The Site is owned by LAHC and is located in Kingsford within the Randwick LGA, at 2-10 Anderson Street and 47-55 Bunnerong Road, Kingsford.

The Site consists of a single cadastral lot 6,052 sqm in size, currently occupied by eight buildings on the Site, each being three storeys in height. The buildings are arranged to form several landscape courtyards, and there are a few mature trees on the Site. The Site has a street frontage to Bunnerong Road to the west, and Anderson Street to the south. The Site is located directly east of Daceyville, a planned Garden Suburbs estate and heritage item.

The site has a land use classification as R3 Medium Density Residential. Most of the lots within the Kingsford South HIA are zoned R2 low density residential under Randwick LEP 2012. A small number of lots in the southern section of the HIA are zoned R3 Medium Density Residential, including the LAHC lands on Bunnerong Road.

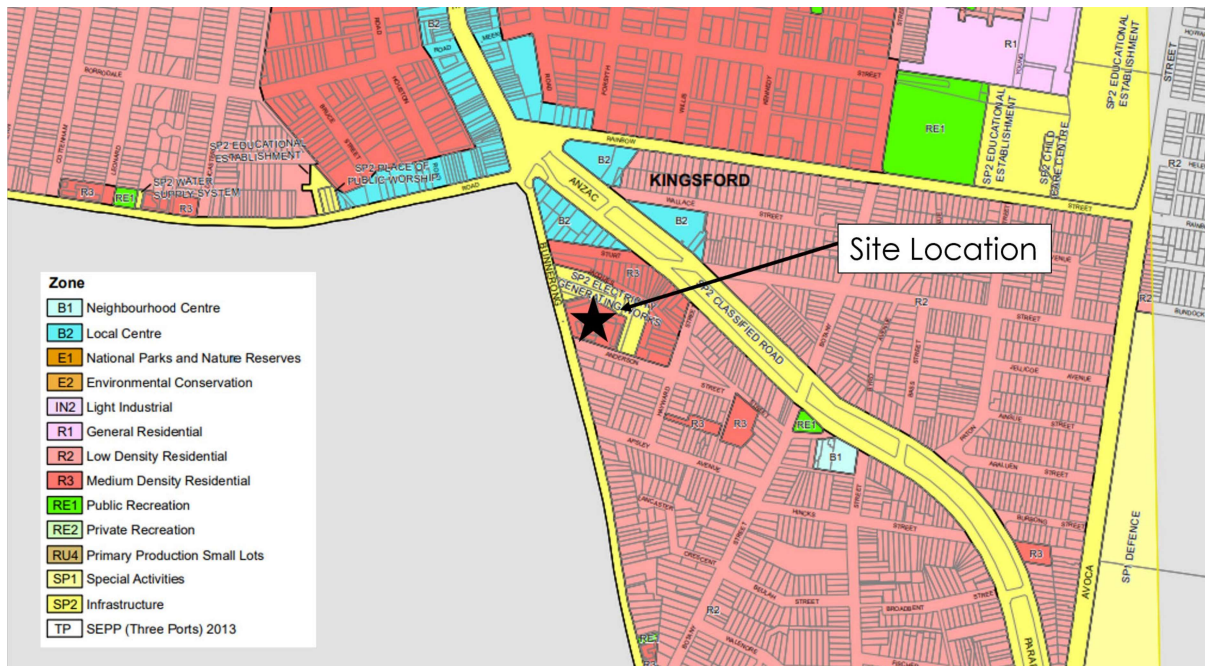
The location of the subject site and its surrounding environs is shown in Figure 1, with the LEP land use map shown in Figure 2.

Figure 1: Subject site and environs



Base image source: Nearmap

Figure 2: Land use map



Base image source: Randwick LEP 2012, Sheet LZN_002

3.2 Transport Network

3.2.1 Road Hierarchy

Roads are classified according to the functions they perform. The main purpose of defining a road's functional class is to provide a basis for establishing the policies which guide the management of the road according to their intended service or qualities.

In terms of functional road classification, State roads are strategically important as they form the primary network used for the movement of people and goods between regions, and throughout the State. Transport for NSW (TfNSW) is responsible for funding, prioritising and carrying out works on State roads. State roads generally include roads classified as freeways, state highways, and main roads under the Roads Act 1993, and the regulation to manage the road system is stated in the Australian Road Rules.

TfNSW defines four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

- Arterial Roads – Controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- Sub-Arterial Roads – Managed by either Council or TfNSW under a joint agreement. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region or provide connectivity from arterial road routes (regional links).
- Collector Roads – Provide connectivity between local sites and the sub-arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.
- Local Roads – Provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

3.2.2 Surrounding Road Network

Bunnerong Road

Bunnerong Road is a state road aligned in a north-south direction along the western boundary of the site. In the vicinity of the site, it is a two-way road configured with 2-lanes in each direction, set within an approximately 13-metre-wide



carriageway. Kerbside parking is permitted and bus zones are found sporadically along the road. The road has a posted speed limit of 60 kilometres per hour, becoming a school zone with a posted speed limit of 40 kilometres per hour, 50 metres south of the site.

Anderson Street

Anderson Street is a local road aligned in an east-west direction along the western boundary of the site. In the vicinity of the site, it is an unmarked two-way road set within an approximately 8-metre-wide carriageway. Kerbside parking is permitted subject to a 2-hour parking restriction between 8am to 6pm Monday to Friday (permit holders excepted). The road has a posted speed limit of 50 kilometres per hour.

Bunnerong Road and Anderson Street are shown in Figure 3 and Figure 4.

Figure 3: Bunnerong Road (looking north)



Figure 4: Anderson Street (looking east)



3.2.3 Existing Traffic Volumes

Stantec commissioned traffic movement counts at the intersection between Bunnerong Road, Anderson Street and Colonel Braund Crescent to understand the existing operational performance of the intersection. The survey was completed on 16 Feb 2023 during the following peak periods:

- 7:30am and 9:30am
- 4:30pm and 6:30pm.

The AM and PM peak hours were found to occur from 8:15am to 9:15am and 5:30pm to 6:30pm respectively, with traffic volumes summarised in Figure 5 and Figure 6. Full survey results are contained in Appendix A.

Figure 5: Existing AM peak hour traffic volumes

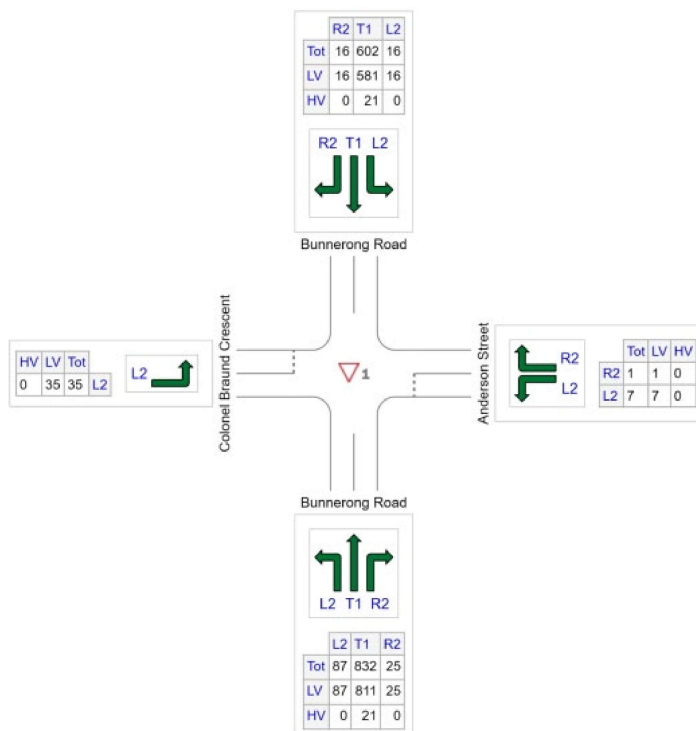
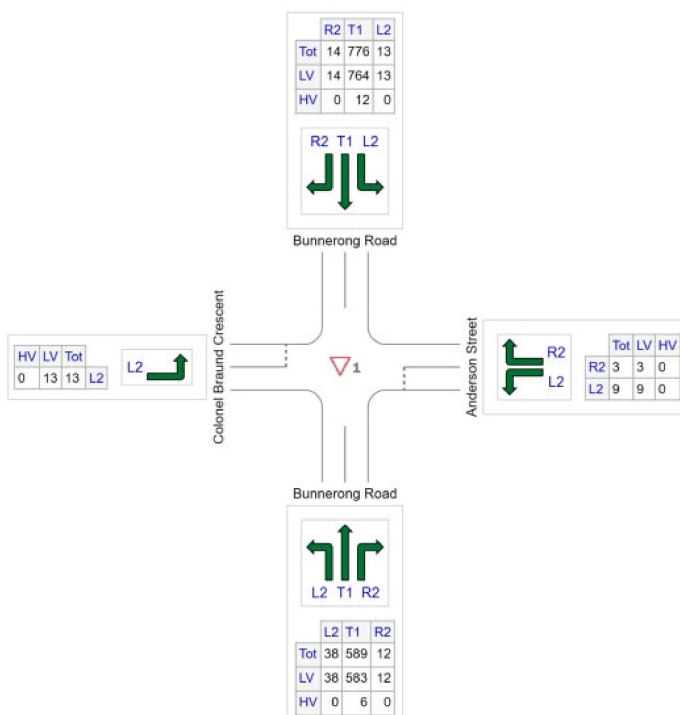


Figure 6: Existing PM peak hour traffic volumes



3.2.4 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION (SIDRA), a computer-based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the TfNSW, is vehicle delay. SIDRA determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 1 shows the criteria that SIDRA adopts in assessing the level of service.

Table 1: SIDRA INTERSECTION level of service criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 2 presents a summary of the existing operation of the intersection, with full results presented in Appendix B of this report.

Table 2: Existing intersection operating conditions

Intersection	Peak	Degree of saturation (DOS)	Average delay (sec)	95th percentile queue (m)	Level of service (LOS)
Bunnerong Road/ Anderson Street/ Colonel Braud Crescent	AM	0.015	30.9	0.4	D
	PM	0.028	24.6	0.8	C

On the basis of the above assessment, it is clear that the intersection is currently operating satisfactorily at LOS D in the weekday AM peak and LOS C in the weekday PM peak.

It is noted for the right turn movement onto Bunnerong Road, from Anderson Street, the critical gap and follow-up headway have been reduced to six seconds and three seconds respectively in accordance with the TfNSW's Traffic Modelling Guidelines (February 2013). The modelling guidelines provide a range of gap acceptance and follow up parameters for different type of movements. Based on the movement type (i.e., right turn from a minor road to a major road) and site observation, the recommended minimum gap acceptance and follow up headway for SIDRA modelling has been used.

As noted, long queues are observed along Bunnerong Road which blocks vehicles to access the Anderson Street during AM and PM peak hours. A 'keep clear' line marking at this intersection would help accessing the Anderson Street and the proposed development during the peak hour.

3.3 Public Transport

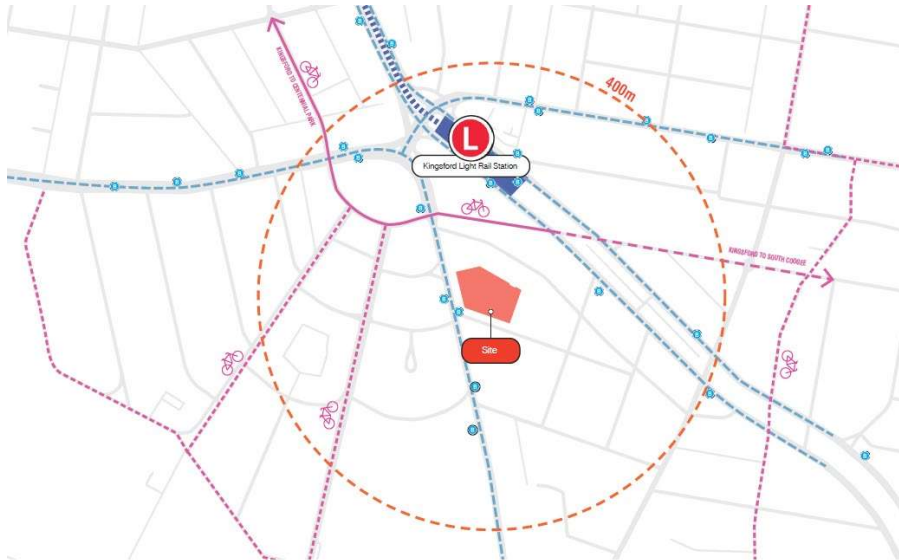
The site is relatively well serviced by public transport services, most conveniently by the Kingsford Light Rail stop, located approximately 350m north-east of the site, in addition to the two bus stops on Bunnerong Road just outside the site. The site's accessibility to public transport is portrayed in Figure 7.

The closest railway stations are Mascot and Green Square, both are located approximately 4.5 kilometres west from the site. These stations are serviced by the South T8 Line, with trains in each direction typically arriving every 3 to 5 minutes during peak hours.

There remains a moderate level of dependence on private vehicles as the primary travel mode within Kingsford for a significant number of commuters. Nevertheless, the ongoing transition of the mode shift towards public and active travel will continue given the relatively new Light rail Kingsford L3 line which opened in 2020. When combined with greater residential density through apartment living in, the opportunity for change is significant. The site presents a significant

opportunity to naturally promote the intent of the K2K Strategy by actively encouraging the use of sustainable forms of transport. This strategy aims to facilitate efficient land use and improve local connections to public transport by focusing density around light rail infrastructure so that residents, workers, students and visitors benefit from commuting advantages and access to services and jobs. The site has convenient access to regular public transport services (now and in the future), in addition to cycling and walking facilities.

Figure 7: Public transport in the vicinity of the site



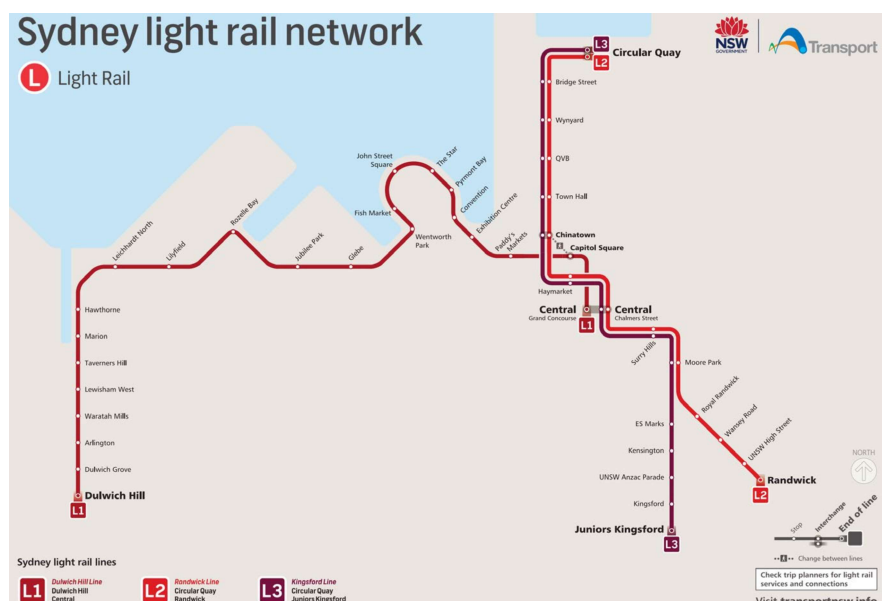
Source: Bunnerong Road Urban Design Study (e8urban, 2022)

3.3.1 Sydney Light Rail

The CBD and South East Light Rail lines have introduced a high capacity and high frequency service connecting Randwick City to Central Station and Sydney CBD, as well as the sporting facilities at Moore Park and Royal Randwick Racecourse.

The Light Rail L3 Kingsford Line forms the main spine from Sydney CBD to Kingsford Junction. The site is within an easy walk of the Kingsford light rail stop, located on Anzac Parade to the south of the intersection of Strachan Street and Middle Street in Kingsford. The stop serves a residential area and a shopping strip on Anzac Parade. The recently completed L2 Randwick and L3 Kingsford lines connect Central and Sydney CBD with Randwick and Kingsford via Surry Hills and Moore Park with current frequency of 10 minutes during the day and 15 minutes at night. The existing light rail network is shown in Figure 8.

Figure 8: Sydney light rail network



Source: <https://transportnsw.info/sydney-lightrail-network-map> accessed March 2023

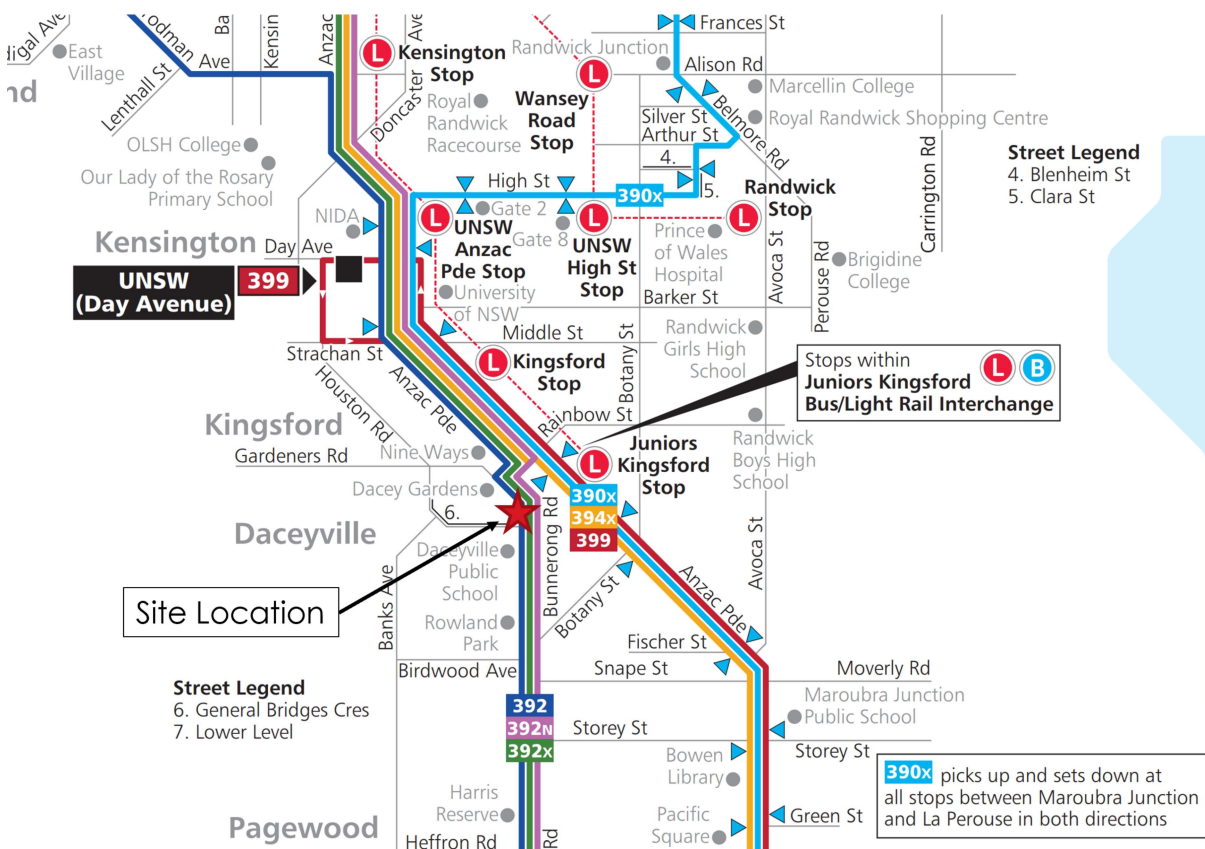
3.3.2 Bus

Bus stops are in immediate proximity to the site, located along Bunnerong Road connecting to the Sydney CBD and south-eastern suburbs.

Bus routes 392, 392N and 392X operate near the site and provide access to surrounding areas including UNSW, Daceyville Public School, and Westfield Eastgardens. The closest bus stops are located on the site frontage on Bunnerong Road and immediately across the road, on the opposite side of Bunnerong Road. The 392, Little Bay to Redfern (loop service), operates every 10 minutes on weekdays and weekends.

The surrounding public network is shown indicatively in Figure 9.

Figure 9: Surrounding bus network



Source Transport for NSW, accessed March 2023

3.4 Walking and Cycling Infrastructure

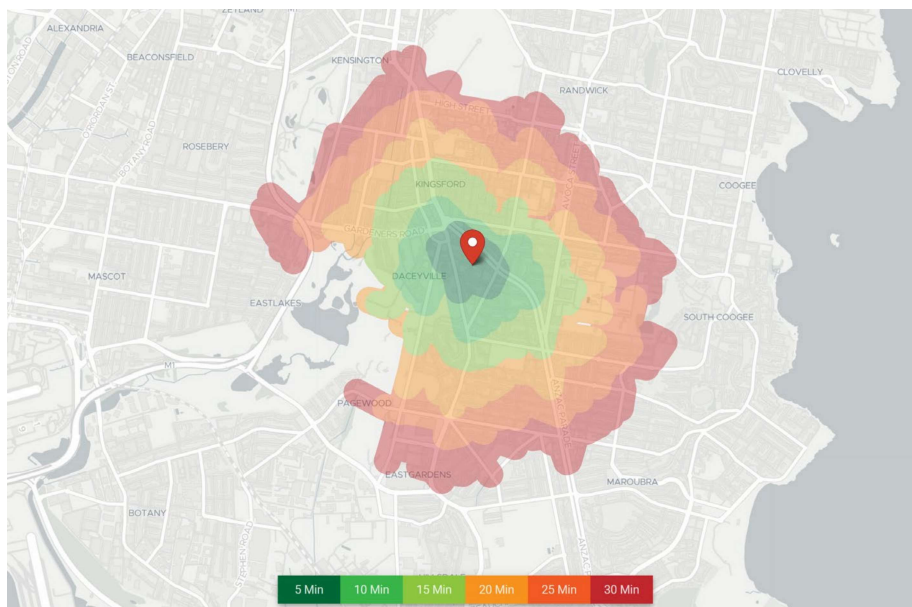
There are well established pedestrian facilities in the local precinct providing good connectivity to a variety of key destinations such as Kingsford light rail stop, Kingsford CBD, Dacey Gardens and Rowland Park.

The local area provides a moderate level of pedestrian amenity with footpaths along Bunnerong Road and Anderson Street. Safe crossing points close to the site are provided at the signalised intersection of Bunnerong Road/ Gardeners Road and at the traffic light along Bunnerong Road across Daceyville Public School. There is however a lack of pedestrian crossings in close proximity of the site, including the unsignalised intersection of Bunnerong Road/ Anderson Street. The nearest pedestrian crossing is located at Bunnerong Road/Gardeners Road intersection, approximately 250-metre north of the proposed development.

Local area pedestrian activity is low to moderate, with local bus stops along Bunnerong Road having relatively healthy demand during weekday peak periods. Pedestrians use Bunnerong Road when walking to and from the light rail. The site offers a unique opportunity to take advantage of its location by further promoting and significantly improving the connectivity within the Kingsford CBD and south-eastern suburbs.

Figure 10 illustrates the walking catchment for the site and shows a moderate level of connectivity throughout.

Figure 10: Existing walking catchment



Source: app.targomo.com/

In terms of cycling infrastructure, streets near the site include a combination of shared zones and low traffic street with/without bike lanes that are generally safe cycling route. There are select on-road cycling facilities in the local area that combine to link the site with local destinations, including Banks Avenue and Sturt Street.

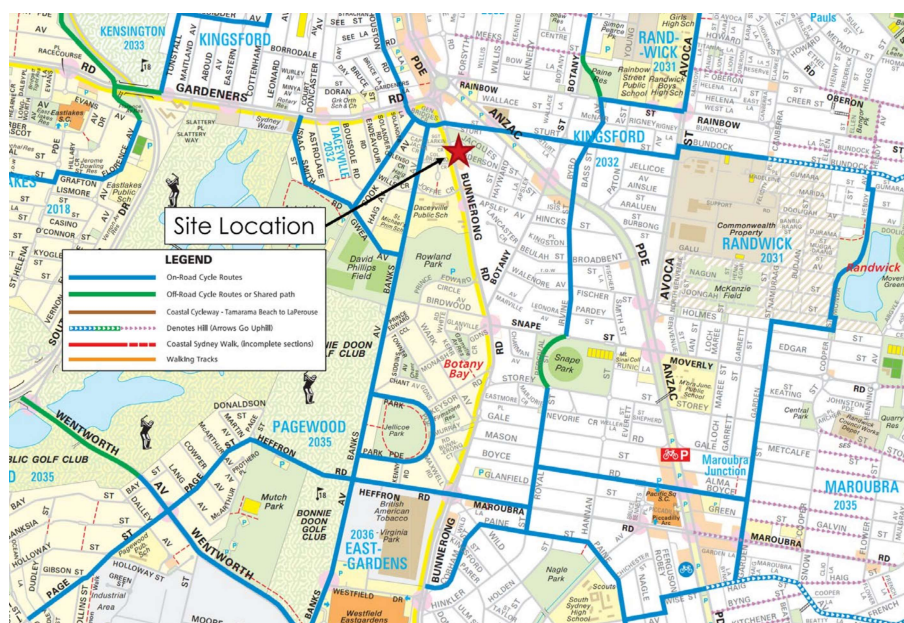
Furthermore, a recent project developed by Randwick City Council involves delivering walking and cycling improvements to provide an active transport link between Kingsford and Centennial Park. Construction started in 2022 and is expected to take up to 2 years to be completed.

It includes a 2.8km two-way cycleway and shared path improvements along Doncaster Avenue, Day Avenue, Houston Road, General Bridges Crescent and Sturt Street. This will provide the local community and commuters a safe and convenient active transport option and improve accessibility. The cycleway will connect the Kingsford Light Rail terminus to the Centennial Park cycleway at Alison Road, Randwick. It will also connect to Randwick City Council's planned cycleway between South Coogee and Kingsford.

These existing and proposed cycle routes will improve cycling accessibility around the site and the broader surrounds.

The surrounding cycling infrastructure is shown in Figure 11.

Figure 11: Surrounding cycling network



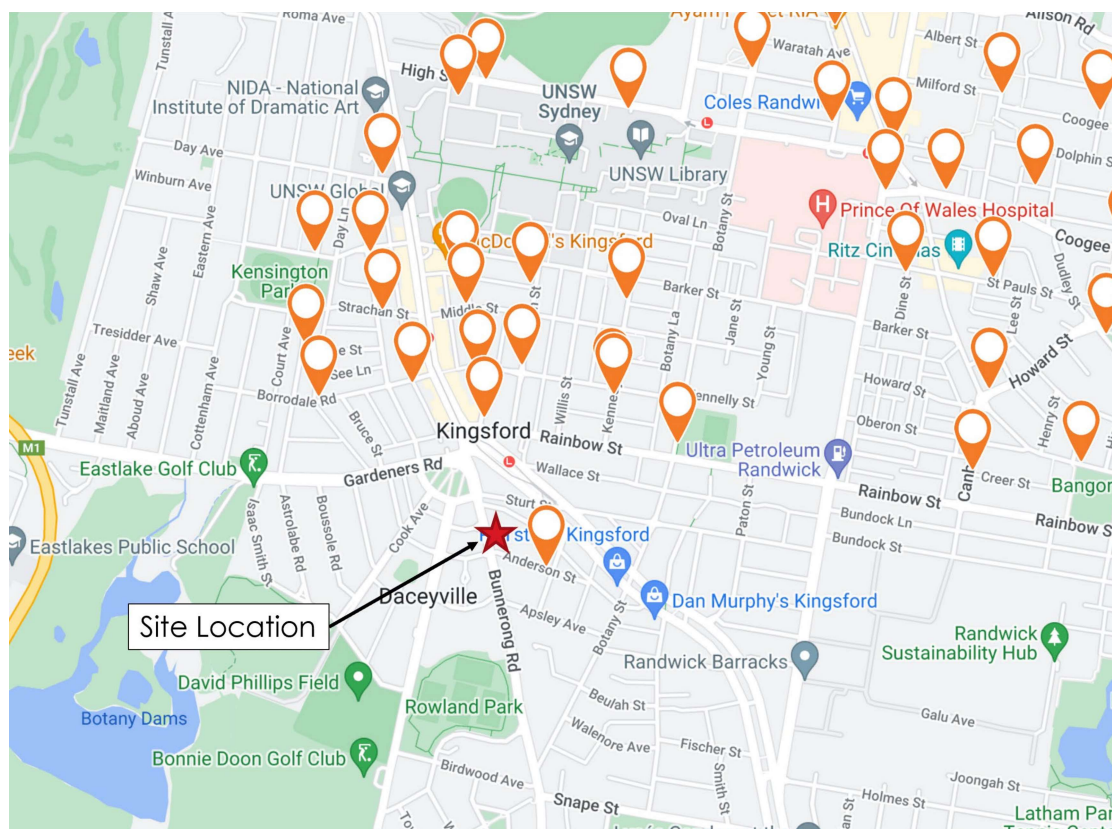
Base image source: Randwick Cycling Map, Randwick City Council, accessed March 2023

3.5 Car Share Initiatives

Car share schemes have become increasingly common throughout Sydney and are now recognised as a viable transport option for a range of trip purposes throughout Sydney, particularly shorter trips. Such facilities are likely to be of benefit to future commercial tenants at the site.

GoGet car share for example has a significant number of pods close to the site as shown Figure 12, with opportunities to provide further facilities as part of the precinct redevelopment to further limit travel by private car. Other providers like Flexicar and Car Next Door also offer services in the area.

Figure 12: GoGet Car Share Pods



Base image source: GoGet website, accessed March 2023

3.6 Existing Travel Behaviour

The 2016 Census Journey to Work (JTW) data details existing travel patterns to employment areas and the mode of travel to work. The JTW data is measured by Destination Zones, which are small geographical areas developed by the Australian Bureau of Statistics. The relevant Destination Zone for the site is Zone 115650002.

The JTW data indicates that 212 people work within the selected Destination Zone and therefore gives a comprehensive understanding of existing travel behaviour for the site. Table 3 shows the breakdown of travel mode to the zone. Data highlights that public and active transport accounts for 14 per cent of journeys to work, noting that this data does not consider the implementation of the light rail with the Kingsford line opening in 2020, which no doubt would lead to a large increase in public transport.

Table 3: Existing mode of travel to the destination zone

Mode	Percentage ¹
Train	2%
Bus	4%
Taxi	0%
Car, as driver	60%
Car, as passenger	1%

Mode	Percentage ¹
Truck	5%
Motorbike/scooter	0%
Bicycle	0%
Walked only	8%
Other Mode	0%
Worked at home	20%

[1] Does not include residents who did not go to work or who were not applicable.

3.7 Crash History

An analysis the most recent five-year period of available crash data (2017-2021) has been undertaken based on crash data provided by TfNSW for the roads surrounding the site. The locations and severity of the crash data for the five-year period is shown in Figure 13 and detailed in Table 4.

Figure 13: Crash map from 2017 to 2021

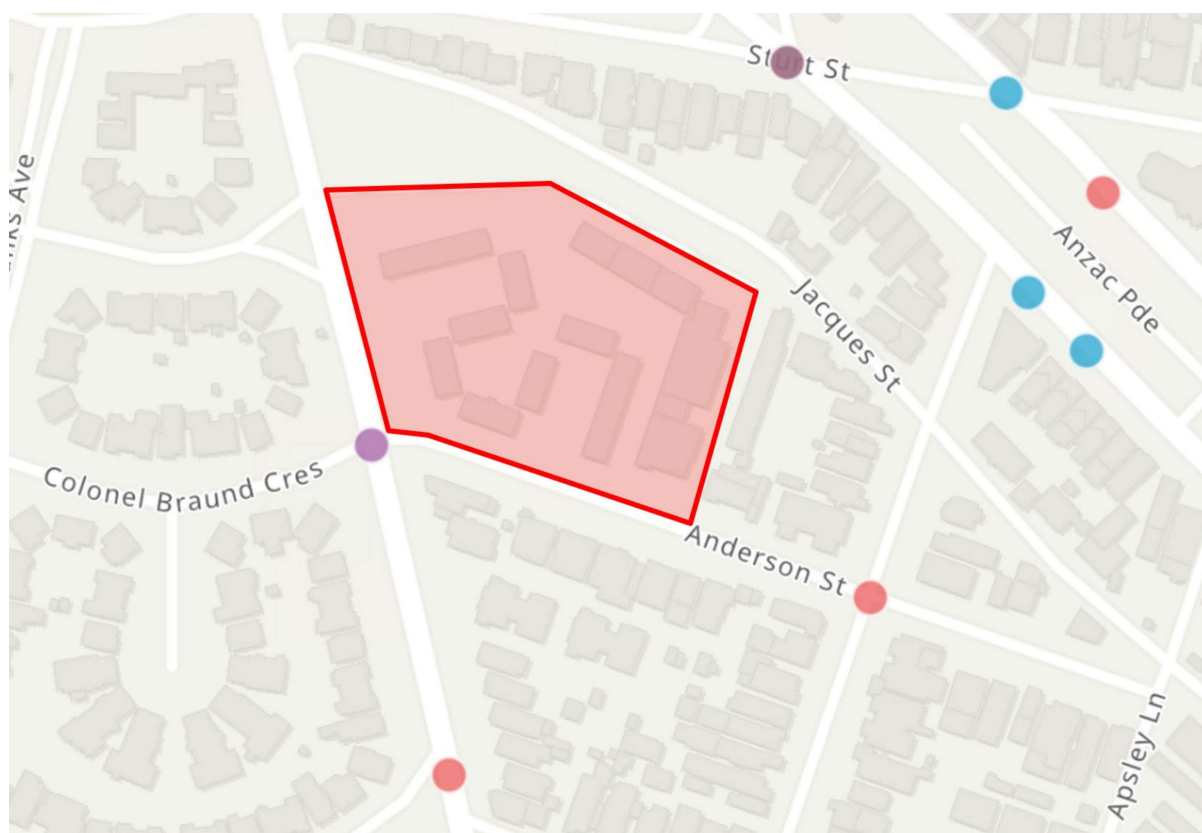


Table 4: Recorded crashes from 2017 to 2021

Road	Number of crashes	Number of injuries
Bunnerong Road	2	1
Anderson Street	1	0
Sturt Street	4	4

The following key statistics can be drawn from the crash data:

- No fatalities were recorded during the five-year period
- 5 of the crashes resulted in an injury, 3 of which were moderate/serious and located on Sturt Street. Crashes surrounding the site on Bunnerong Road or Anderson Street were either minor injuries or non-casualty (towaway)
- All of the crashes occurred during daylight hours with the exception of one crash on Sturt Street.
- Most of the crashes were the result of cross traffic or leaving parking.

Given the low occurrence of crashes within the five year period, particularly on Bunnerong Road and Anderson Street, the data does not indicate any safety concern. Moreover, the development is not anticipated to materially change the types of vehicles or significantly increase traffic volumes at key intersection surrounding the site. Therefore, the proposal would not impact road safety surrounding the site.



4. Planning Proposal

The planning proposal includes an eight-storey residential development comprising of 1-bedroom, 2-bedroom and 3-bedroom units totalling 187 units. Two basement levels are provided for carparking with the provision of loading dock facilities on the second basement level. A single two-way vehicle crossover is proposed on Anderson Street in the south-east corner of the site for use by both light vehicles accessing the basement car parks and service vehicles accessing the basement level 2 loading dock.

The area schedule is summarised in Table 5 and indicative site plan shown in Figure 14.

Table 5: Yield summary

Use	No. of bedroom	No. of units
Residential	1-bedroom	57
	2-bedroom	112
	3-bedroom	18
	Total	187

Of the 187 residential apartments, 20% of the apartments are proposed to be adaptable living units with the remaining considered to be high density residential apartments. This equates to 38 adaptable units.

Figure 14: Indicative site plan



Source: PTW

5. Parking Assessment

5.1 Car Parking Requirements

The parking requirements for the residential development have been determined based on the rates stipulated in Randwick Development Control Plan Part E7 – Housing Investigation Areas 2023 (DCP 2023).

The rates and minimum requirements are summarised in Table 6.

Table 6: Car parking requirements

Land Use	Description	No. of units	Car Parking Rate	Requirements
Residential	1-bedroom	57	0.6 spaces per dwelling	34
	2-bedroom	112	0.8 spaces per dwelling	90
	3-bedroom	18	1.1 spaces per dwelling	20
	Visitor	187	0.2 spaces per dwelling	37
Minimum total car parking requirement				181 spaces

The development proposes to provide 201 car parking spaces within the basement levels which meets the minimum total parking requirements.

In addition to the above, Australian Standard AS4299-1995 Adaptable Housing also requires one accessible space per adaptable unit. Accordingly, 38 adaptable units would require provision of 38 accessible parking spaces.

Provisions for EV charging and car share pods will also need to be considered as part of the future Development Application (DA).

5.2 Bicycle Parking

Bicycle parking rates for residential dwellings are set out in DCP 2023, with a rate of 1 space per dwelling for residents and 1 space per 10 dwellings for visitors. Considering the above, Table 7 has been prepared to outline the bicycle parking requirements for the proposed development.

Table 7: HIA DCP 2023 bicycle parking requirements

Land Use	No. of dwellings	Description	Bicycle parking rate	Bicycle parking requirement
Residential	187	Resident	1 per dwelling	187
		Visitor	1 per 10 dwellings	37
Minimum total bicycle parking requirement				224

In accordance with the HIA DCP 2023, the development will be required to provide a minimum of 187 resident and 37 visitor bicycle parking spaces.

5.3 Motorcycle Parking

Motorcycle parking requirements for residential flat buildings are provided in Randwick Development Control Plan 2013 (DCP 2013). DCP 2013 stipulates a parking rate of 5% of total car parking requirement. With a minimum total requirement of 181 spaces, this equates to a minimum motorcycle parking requirement of 9 spaces.

5.4 Electric Vehicle Charging Stations

Electric vehicle charging station provision requirements are set out in DCP 2023, for both car parking spaces and bicycle parking spaces. DCP 2023 specifies a requirement of 1 EV charging station per 5 parking spaces and 1 per 4 bicycle parking spaces. Considering the above, Table 8 has been prepared to outline the EV charging station requirements for the proposed development.



Table 8: HIA EV charging station requirements

Type	No. of spaces	EV charging station rate	Minimum EV charging station requirement
Level 1 – Car	145	1 per 5 parking spaces	29
Bicycle	224	1 per 4 bicycle spaces	56

In accordance with the HIA DCP 2023, the development will be required to provide a minimum of 29 Level 1 EV charging station for vehicles and 56 EV charging stations for bicycles.

The HIA DCP 2023 also specifies that the installation of two 'Level 2' AC fast charging EV charging points is required in the common parking areas. This will also need to be considered as part of ongoing design development.

5.5 Service Vehicle Parking

Service vehicle parking rates for residential developments are specified in DCP 2013. A provision of 1 space per 50 units up to 200 plus 1 space per 100 units thereafter is required. With a total of 187 residential units, this equates to four spaces required for service vehicle parking.

Alternatively, using the Urban Freight Forecasting Model is a reliable substitute to determining service vehicle rates. This is an interactive web model provided by TfNSW to support the forecasting of urban freight activity generated by buildings and developments. It is a best-practice guide to assist urban planners, developers and government to give greater consideration to freight and servicing demands for new buildings and precincts as part of the planning process.

Using this model with 187 residential units, the TfNSW Urban Freight Forecasting Model recommends a provision of one loading dock that can accommodate a large truck, one loading dock for SRV/small trucks and one service bay that can accommodate vans/ utes/ courier vehicles.

It is recommended that the development provides one loading dock that can accommodate larger vehicles (e.g. SRV and MRVs) and one service bay that can accommodate smaller vans and utes.

5.6 Car Parking Layout Review

The car park and loading dock layout has been reviewed against the requirements of the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS2890.6:2022) and Off Street Commercial Vehicle Facilities (AS2890.2:2018). This assessment included a review of the following:

- bay and aisle width
- adjacent structures
- circulation roads and ramps
- ramp grades
- height clearances.

The proposed layout is considered to generally be in accordance with the requirements of the relevant design standards and is expected to be able to accommodate the intended parking provision. Further design review will need to be considered as part of ongoing design development.

6. Traffic Impact Assessment

6.1 Traffic Generation

Traffic generation rates for the proposed development have been sourced from the TfNSW Guide to Traffic Generating Developments 2002 (the Guide) and Technical Direction: Updated Traffic Surveys (TDT 2013/ 04a).

TDT 2013/04a recommends the following rates for high density residential flat dwellings:

- AM peak (Sydney average): 0.19 vehicle trips per apartment
- PM peak (Sydney average): 0.15 vehicle trips per apartment

These rates are based on surveys conducted on developments that were close to public transport, greater than six storeys and almost exclusively residential in nature. The proposed site is considered to fit these criteria:

- located an approximate 500m walk from the Juniors Kingsford light rail station
- 187 apartments across an eight-level apartment building
- residential in nature.

As such, the adoption of the rates detailed in the TDT 2013/04a to estimate the traffic generation is considered appropriate. The estimated traffic generation is summarised in Table 9.

Table 9: Development traffic generation

Total apartments	AM Peak		PM Peak	
	Rate	Trips	Rate	Trips
187 units	0.19 trips/ apt	36	0.15 trips/ apt	28

Based on the above, the development is estimated to generate 36 vehicle trips in the morning peak and 28 trips in the afternoon peak. It is likely that the additional trips generated by the site will be lower as the site currently generates traffic, however, for the purposes of this assessment and additional 36 trips in the morning peak and 28 trips in the afternoon peak have been adopted.

6.2 Trip Distribution

The directional distribution and assignment of traffic generated by the proposed development will be influenced by several factors, including the:

- configuration of the arterial road network in the immediate vicinity of the site
- existing operation of intersections providing access between the local and arterial road network
- surrounding employment centres, retail centres and schools in relation to the site
- configuration of access points to the site.

Taking this into account, the following assumptions have been made regarding the trip distribution of the development:

- Outbound traffic from the development are assumed to exit towards Bunnerong Road.
- Turning movements at the Bunnerong Road/ Anderson Street/ Colonel Braund Crescent intersection have been proportionately distributed using the survey data. This equates to 85% turning left and 15% turning right during AM peak period, and 75% turning left and 25% turning right during PM peak period.

Regarding the AM and PM vehicle split of entering and exiting the site, it is assumed that residential trips yield an 80% out and 20% in during the AM peak and vice versa during the PM peak. The directional split is provided in Table 10

Table 10: Trip distribution

Type	Directional Split				Resultant Movements			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	In	Out	In	Out	In	Out	In	Out
Residential	80%	20%	20%	80%	7	29	22	6

6.3 Traffic Impact

The following scenarios have been modelled using SIDRA INTERSECTION, to assess the Planning Proposal's traffic impact on the intersection between Bunnerong Road & Anderson Street.

- Existing (refer to Section 3.2.4 and repeated below)
- Post-development

Detailed SIDRA movement summaries are included in Appendix B and Appendix C.

6.3.1 Existing

The existing operation of the Bunnerong Road/ Anderson Street/ Colonel Braud Crescent intersection is reproduced in Table 11 and illustrates that the intersection is currently operating satisfactorily at LOS D in the weekday AM peak and LOS D in the PM peak.

Table 11: Existing SIDRA results

Intersection	Peak	Degree of saturation (DOS)	Average delay (sec)	95th percentile queue (m)	Level of service (LOS)
Bunnerong Road/ Anderson Street/ Colonel Braud Crescent	AM	0.015	30.9	0.4	D
	PM	0.028	24.6	0.8	C

6.3.2 Post-development

The results for the post development scenario are summarised in Table 12.

Table 12: Post-development SIDRA results

Intersection	Peak	Degree of saturation (DOS)	Average delay (sec)	95th percentile queue (m)	Level of service (LOS)
Bunnerong Road/ Anderson Street/ Colonel Braud Crescent	AM	0.074	32.7	2.1	D
	PM	0.041	25.5	1.1	D

The results indicate that post-development, the intersection is expected to retain similar operation to existing conditions, with only a minor increase in key performance indicators.

7. Conclusions

Based on the analysis and discussions presented within this report, the following conclusions are made:

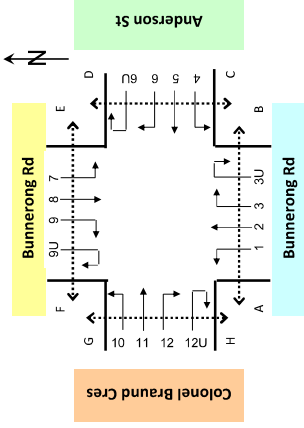
- The planning proposal includes an eight-storey residential development assorted into 1-bedroom, 2-bedroom and 3-bedroom apartments, with a total of 187 residential apartments. Two basement levels are provided for carparking with the provision of loading dock facilities on the second basement level.
- A single two-way vehicle crossover is proposed on Anderson Street in the south-east corner of the site for use by both light vehicles accessing the basement car parks and service vehicles accessing the basement level 2 loading dock.
- The planning proposal generates an on-site parking requirement of 181 car spaces for residential land use based on a preliminary assessment of indicative plans and using Randwick City Council Development Control Plan Part E7: Housing and Investigation Areas 2023, and State Environmental Planning Policy (Housing) 2021 rates.
- The proposed car parking layout and access strategy will be progressed as part of future staged development applications and to be consistent with the dimensional requirements as set out in Randwick DCP and Australian/New Zealand Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009).
- It is envisaged that all loading facilities will be provided on basement level 2. The loading areas will be developed as part future staged development applications and be designed to accommodate manoeuvring of the largest design vehicle.
- The residential apartments are expected to generate up to 36 vehicle trips in the morning peak and 28 vehicle trips in the afternoon peak.
- The SIDRA analysis indicates that the Planning Proposal will have no adverse impact on the intersection between Bunnerong Road & Anderson Street. The intersection is expected to retain similar operation to the existing conditions with only minor increases in key performance indicators.
- Overall, there is adequate capacity in the surrounding road network to accommodate the additional traffic generated by the planning proposal.

Appendix A. Survey Data



Job No. : AUNSW5532
Client : Stantec Australia Pty Ltd
Suburb : Kingsford
Location : 1. Bunnerong Rd / Anderson St / Colonel Braund Cres

Day/Date : Thu, 16 Feb 2023
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



Approach	Bunnerong Rd				Anderson St				Colonel Braund Cres				Grand Total
Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
8:15 to 9:15 AM	877	20	10	907	11	0	0	11	582	20	13	615	1,603
17:30 to 18:30 PM	603	6	5	614	17	0	0	17	751	11	12	774	1,458

Approach	Bunnerong Rd				Anderson St				Colonel Braund Cres				Grand Total
Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
7:30 to 8:30	852	23	20	895	12	0	0	12	442	18	4	464	1,417
7:45 to 8:45	886	19	15	920	14	0	0	14	504	18	8	530	1,531
8:00 to 9:00	891	17	12	920	12	0	0	12	548	18	13	579	1,584
8:15 to 9:15	877	20	10	907	11	0	0	11	582	20	13	615	1,603
8:30 to 9:30	770	24	10	804	15	0	0	15	553	26	16	595	1,471
8:45 to 9:45	550	21	7	578	8	0	0	8	393	20	12	425	1,059
9:00 to 10:00	341	15	4	360	7	0	0	7	242	16	5	263	644
AM Totals	1,622	47	30	1,699	27	0	0	27	995	44	20	1,059	2,888
16:00 to 17:00	541	15	8	564	15	0	0	15	787	23	10	820	1,444
16:15 to 17:15	548	11	8	567	18	0	0	18	779	18	9	806	1,431
16:30 to 17:30	578	11	7	596	23	0	0	23	743	11	11	765	1,423
16:45 to 17:45	583	8	7	598	24	0	0	24	741	10	12	763	1,439
17:00 to 18:00	590	5	9	604	26	0	0	26	751	8	10	769	1,454
17:15 to 18:15	599	4	6	609	19	0	0	19	731	8	11	750	1,436
17:30 to 18:30	603	6	5	614	17	0	0	17	751	11	12	774	1,458
PM Totals	1,441	24	18	1,483	50	0	0	50	1,919	35	26	1,980	3,632

Appendix B. Existing SIDRA Results



MOVEMENT SUMMARY

Site: 1 [Bunnerong Road and Anderson Street PM - Post (Site Folder: Post Development)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Bunnerong Road														
1	L2	36	0	38	0.0	0.180	5.5	LOS A	0.0	0.0	0.00	0.07	0.00	52.8
2	T1	560	6	589	1.1	0.180	0.4	LOS A	0.5	3.4	0.07	0.06	0.07	56.7
3	R2	22	0	23	0.0	0.180	10.6	LOS B	0.5	3.4	0.16	0.05	0.16	50.8
Approach		618	6	651	1.0	0.180	1.1	NA	0.5	3.4	0.07	0.06	0.07	56.3
East: Anderson Street														
4	L2	14	0	15	0.0	0.041	7.1	LOS A	0.2	1.1	0.60	0.67	0.60	33.6
6	R2	4	0	4	0.0	0.041	25.5	LOS D	0.2	1.1	0.60	0.67	0.60	34.2
Approach		18	0	19	0.0	0.041	11.2	LOS B	0.2	1.1	0.60	0.67	0.60	33.8
North: Bunnerong Road														
7	L2	23	0	24	0.0	0.217	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	54.9
8	T1	737	11	776	1.5	0.217	0.2	LOS A	0.2	1.5	0.03	0.03	0.03	58.5
9	R2	13	0	14	0.0	0.217	9.8	LOS A	0.2	1.5	0.06	0.02	0.06	52.6
Approach		773	11	814	1.4	0.217	0.5	NA	0.2	1.5	0.03	0.03	0.03	58.3
West: Colonel Braund Crescent														
10	L2	12	0	13	0.0	0.013	5.8	LOS A	0.0	0.3	0.36	0.55	0.36	38.7
Approach		12	0	13	0.0	0.013	5.8	LOS A	0.0	0.3	0.36	0.55	0.36	38.7
All Vehicles		1421	17	1496	1.2	0.217	0.9	NA	0.5	3.4	0.06	0.05	0.06	56.6

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

MOVEMENT SUMMARY

Site: 1 [Bunnerong Road and Anderson Street AM (Site Folder: Existing)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Bunnerong Road														
1	L2	83	0	87	0.0	0.256	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	51.7
2	T1	790	20	832	2.5	0.256	0.2	LOS A	0.5	3.2	0.05	0.07	0.05	57.1
3	R2	24	0	25	0.0	0.256	9.4	LOS A	0.5	3.2	0.10	0.04	0.11	52.3
Approach		897	20	944	2.2	0.256	1.0	NA	0.5	3.2	0.05	0.07	0.05	56.4
East: Anderson Street														
4	L2	7	0	7	0.0	0.015	6.5	LOS A	0.1	0.4	0.54	0.59	0.54	35.2
6	R2	1	0	1	0.0	0.015	30.9	LOS D	0.1	0.4	0.54	0.59	0.54	35.8
Approach		8	0	8	0.0	0.015	9.6	LOS A	0.1	0.4	0.54	0.59	0.54	35.3
North: Bunnerong Road														
7	L2	15	0	16	0.0	0.178	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	55.0
8	T1	572	20	602	3.5	0.178	0.5	LOS A	0.4	2.9	0.07	0.03	0.07	57.1
9	R2	15	0	16	0.0	0.178	13.2	LOS B	0.4	2.9	0.15	0.04	0.15	50.0
Approach		602	20	634	3.3	0.178	1.0	NA	0.4	2.9	0.07	0.03	0.07	56.9
West: Colonel Braund Crescent														
10	L2	33	0	35	0.0	0.039	6.4	LOS A	0.1	1.0	0.42	0.62	0.42	38.2
Approach		33	0	35	0.0	0.039	6.4	LOS A	0.1	1.0	0.42	0.62	0.42	38.2
All Vehicles		1540	40	1621	2.6	0.256	1.1	NA	0.5	3.2	0.07	0.07	0.07	55.8

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

Appendix C. Post-development SIDRA Results



MOVEMENT SUMMARY

Site: 1 [Bunnerong Road and Anderson Street PM (Site Folder: Existing)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Bunnerong Road														
1	L2	36	0	38	0.0	0.171	5.5	LOS A	0.0	0.0	0.00	0.07	0.00	52.7
2	T1	560	6	589	1.1	0.171	0.2	LOS A	0.2	1.7	0.04	0.05	0.04	57.8
3	R2	11	0	12	0.0	0.171	10.5	LOS B	0.2	1.7	0.08	0.02	0.08	52.6
Approach		607	6	639	1.0	0.171	0.7	NA	0.2	1.7	0.04	0.05	0.04	57.4
East: Anderson Street														
4	L2	9	0	9	0.0	0.028	7.1	LOS A	0.1	0.8	0.61	0.67	0.61	33.4
6	R2	3	0	3	0.0	0.028	24.6	LOS C	0.1	0.8	0.61	0.67	0.61	34.0
Approach		12	0	13	0.0	0.028	11.5	LOS B	0.1	0.8	0.61	0.67	0.61	33.5
North: Bunnerong Road														
7	L2	12	0	13	0.0	0.214	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	55.2
8	T1	737	11	776	1.5	0.214	0.2	LOS A	0.2	1.5	0.03	0.02	0.03	58.7
9	R2	13	0	14	0.0	0.214	9.7	LOS A	0.2	1.5	0.07	0.02	0.07	52.6
Approach		762	11	802	1.4	0.214	0.4	NA	0.2	1.5	0.03	0.02	0.03	58.6
West: Colonel Braund Crescent														
10	L2	12	0	13	0.0	0.013	5.7	LOS A	0.0	0.3	0.35	0.55	0.35	38.8
Approach		12	0	13	0.0	0.013	5.7	LOS A	0.0	0.3	0.35	0.55	0.35	38.8
All Vehicles		1393	17	1466	1.2	0.214	0.7	NA	0.2	1.7	0.04	0.04	0.04	57.4

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

MOVEMENT SUMMARY

Site: 1 [Bunnerong Road and Anderson Street AM - Post (Site Folder: Post Development)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Bunnerong Road														
1	L2	83	0	87	0.0	0.259	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	51.8
2	T1	790	20	832	2.5	0.259	0.3	LOS A	0.5	3.8	0.06	0.07	0.06	56.8
3	R2	28	0	29	0.0	0.259	9.5	LOS A	0.5	3.8	0.12	0.04	0.12	51.9
Approach		901	20	948	2.2	0.259	1.1	NA	0.5	3.8	0.06	0.08	0.06	56.2
East: Anderson Street														
4	L2	32	0	34	0.0	0.074	6.6	LOS A	0.3	2.1	0.55	0.64	0.55	34.6
6	R2	5	0	5	0.0	0.074	32.7	LOS D	0.3	2.1	0.55	0.64	0.55	35.2
Approach		37	0	39	0.0	0.074	10.1	LOS B	0.3	2.1	0.55	0.64	0.55	34.7
North: Bunnerong Road														
7	L2	18	0	19	0.0	0.179	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	54.9
8	T1	572	20	602	3.5	0.179	0.5	LOS A	0.4	2.9	0.07	0.03	0.07	57.0
9	R2	15	0	16	0.0	0.179	13.2	LOS B	0.4	2.9	0.15	0.04	0.15	50.0
Approach		605	20	637	3.3	0.179	1.0	NA	0.4	2.9	0.07	0.03	0.07	56.8
West: Colonel Braund Crescent														
10	L2	33	0	35	0.0	0.040	6.5	LOS A	0.1	1.0	0.43	0.62	0.43	38.2
Approach		33	0	35	0.0	0.040	6.5	LOS A	0.1	1.0	0.43	0.62	0.43	38.2
All Vehicles		1576	40	1659	2.5	0.259	1.4	NA	0.5	3.8	0.08	0.08	0.08	55.0

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



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