



**TRAFFIC AND PARKING IMPACT ASSESSMENT OF
WAHROONGA SENIORS LIVING / AGED CARE DEVELOPMENT
AT 4-10 NERINGAH AVENUE SOUTH, WAHROONGA**



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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

Development Type: **Wahroonga Seniors Living / Aged Care Development**

Site Address: **4-10 Neringah Avenue South, Wahroonga**

Prepared for: **HammondCare**

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1 **INTRODUCTION**

McLaren Traffic Engineering was commissioned by HammondCare to provide a Traffic and Parking Impact Assessment of the Wahroonga Seniors Living / Aged Care Development at 4-10 Neringah Avenue South, Wahroonga as depicted in **Annexure A**.

1.1 **Description and Scale of Development**

The proposed development has the following characteristics relevant to traffic and parking, with the relevant plans reproduced in **Annexure A** for reference:

- Demolition of the existing Neringah Hospital;
- Construction of a residential Aged Care Facility and Seniors Living buildings including:
 - 18 x beds for Palliative Care;
 - 9 x beds for Residential (Aged) Care;
 - 24 staff (includes change of shift staff);
 - 12 community staff;
 - 60 x Self-contained dwellings with
 - 27 in the north building, and;
 - 33 in the south building.
- Provision of two (2) basement parking areas under the north and south proposed buildings which are interconnected. All vehicular access will be provided via a proposed one-way entry only driveway from Neringah Avenue South at the northern edge of the site and a proposed two-way driveway from Neringah Avenue South. Both proposed driveway access points are consistent with the current driveway locations for the existing building.
- The two basement car parks will accommodate approximately 90 car spaces including:
 - 27 within the north building basement area and;
 - 63 within the south building basement area.
- Provision of a service bay suitable for emergency vehicles, waste and delivery vehicles. Vehicle access to the proposed service bay is proposed via the two-way driveway from Neringah Avenue South;
- Provision of a pedestrian link through the site connecting to Archdale Walk.

1.2 **State Environmental Planning Policy (Infrastructure) 2007**

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under *Clause 104* of the *SEPP (Infrastructure) 2007*. Accordingly, formal referral to the Transport for NSW (TfNSW) is unnecessary and the application can be assessed by Ku-ring-gai Council officers accordingly.

1.3 Site Description

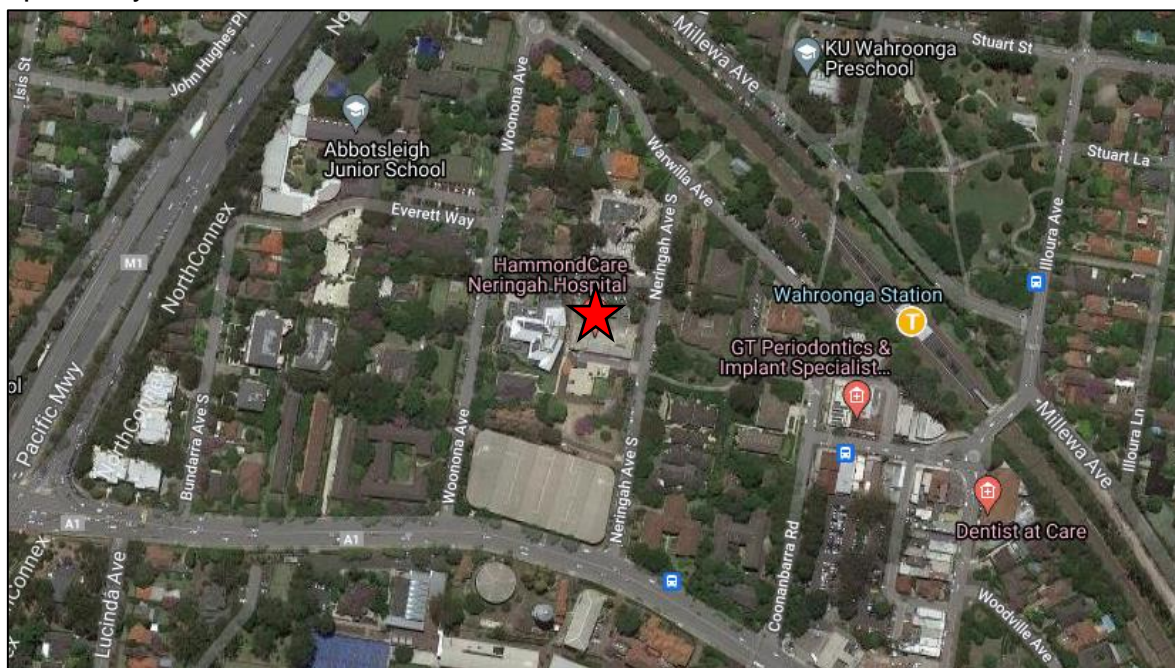
The subject site currently accommodates the existing HammondCare Wahroonga aged Care Facility consisting of 57 beds and the HammondCare Neringah Hospital. The existing HammondCare Wahroonga provides its own parking within a basement car park accessed from Woonona Avenue, whilst the HammondCare Neringah Hospital provides an at grade staff car park, accessed via a boom-gate and an separate at-grade visitor car park (including provision for emergency services) to the south of the hospital accessed from Neringah Avenue South.

The subject site is currently zoned *R2–Low Density Residential* and *R4-High Density Residential* under the *Ku-ring-gai Council Local Environmental Plan (LEP) 2015*. The site has frontages to Neringah Avenue South to the east and Woonona Avenue to the west of the site.

The site is generally surrounded by residential development and other development types with Wahroonga Train Station to the east of the site, Abbotsleigh Junior School to the west of the site, KU Wahroonga Preschool to the north of the site and Wahroonga Reservoir to the south of the site.

1.4 Site Context

The location of the site is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.



Site Location

FIGURE 1: SITE CONTEXT – AERIAL PHOTO

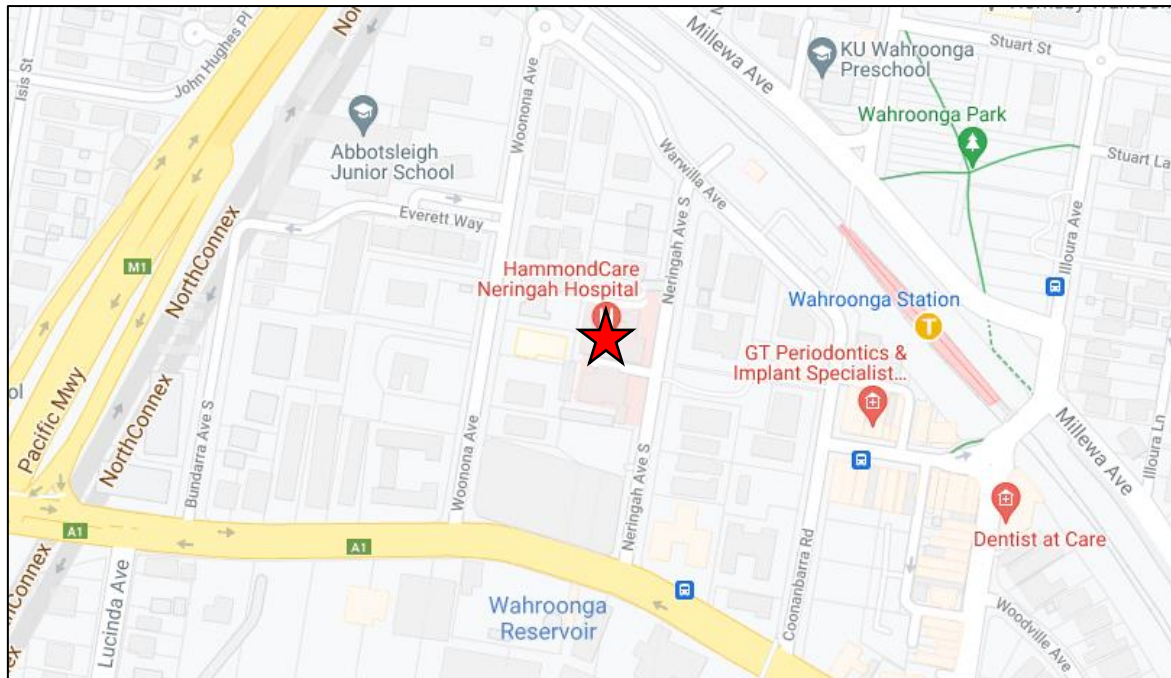


FIGURE 2: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 *Road Hierarchy*

The road network servicing the site has characteristics as described in the following sub-sections.

2.1.1 Neringah Avenue South

- Unclassified LOCAL Road;
- Approximately 10m wide two-way carriageway (one lane in each direction) and kerbside parking;
- Signposted 50km/h speed limit;
- Sections of time restricted signposted “2-P, 830am-6pm, Mon-Fri, 830am-1230pm Sat” along the eastern side of the road and time restricted “2-P 8am-5pm, Mon-Fri” on the western side of the road. Unrestricted parking is available outside of time restricted parking areas;
- “No Parking” restrictions at the entrance to the Archdale Walk and within close proximity to the existing visitor site driveway from Neringah Avenue South.

2.1.2 Pacific Highway

- RMS Classified STATE ARTERIAL Road (No. 10);
- Approximately 20m wide dual carriageway within near vicinity of the site facilitating three lanes in each direction;
- Signposted 60km/h speed limit;
- 40km/h speed limit applies during school zone hours;
- ‘No Parking’ restrictions on the southern side of the road;
- ‘Clearway’ restrictions on the northern side of the road.

2.1.3 Woonona Avenue

- Unclassified LOCAL Road;
- Approximately 9m wide two-way carriageway (one lane in each direction) and kerbside parking;
- Default 50km/h speed limit;
- 40km/h speed limit applies during school zone hours;
- Unrestricted kerbside parking permitted along both sides of the road.

2.2 *Existing Traffic Management*

- STOP SIGN controlled intersection of Neringah Avenue South / Pacific Highway that is restricted to left-in / left-out movements only;
- Priority controlled intersection of Neringah Avenue South / Warwilla Avenue;

- Provision of raised pedestrian crossings along the southern leg and eastern leg of the intersection of Warwilla Avenue and Neringah Avenue South.

2.3 Existing Traffic Volumes

Intersection traffic surveys were conducted at the intersections of Neringah Avenue South / Warwilla Avenue and Neringah Avenue South / Pacific Highway from 7:00 AM to 9:30 AM and 2:30 PM to 6:00 PM on the Tuesday 1st June 2021 representing a typical operating weekday. The full survey results are shown in **Annexure B** for reference.

2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 9.0, **Table 1** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure C**.

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 9.0)

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Neringah Avenue South / Work Site Driveway	AM	0.10	1.9 (Worst: 10.2)	NA (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.08	2 (Worst: 9.1)	NA (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.4 (Worst: 20.6)	NA (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 12)	NA (Worst: A)		LT from Neringah Avenue

NOTES:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

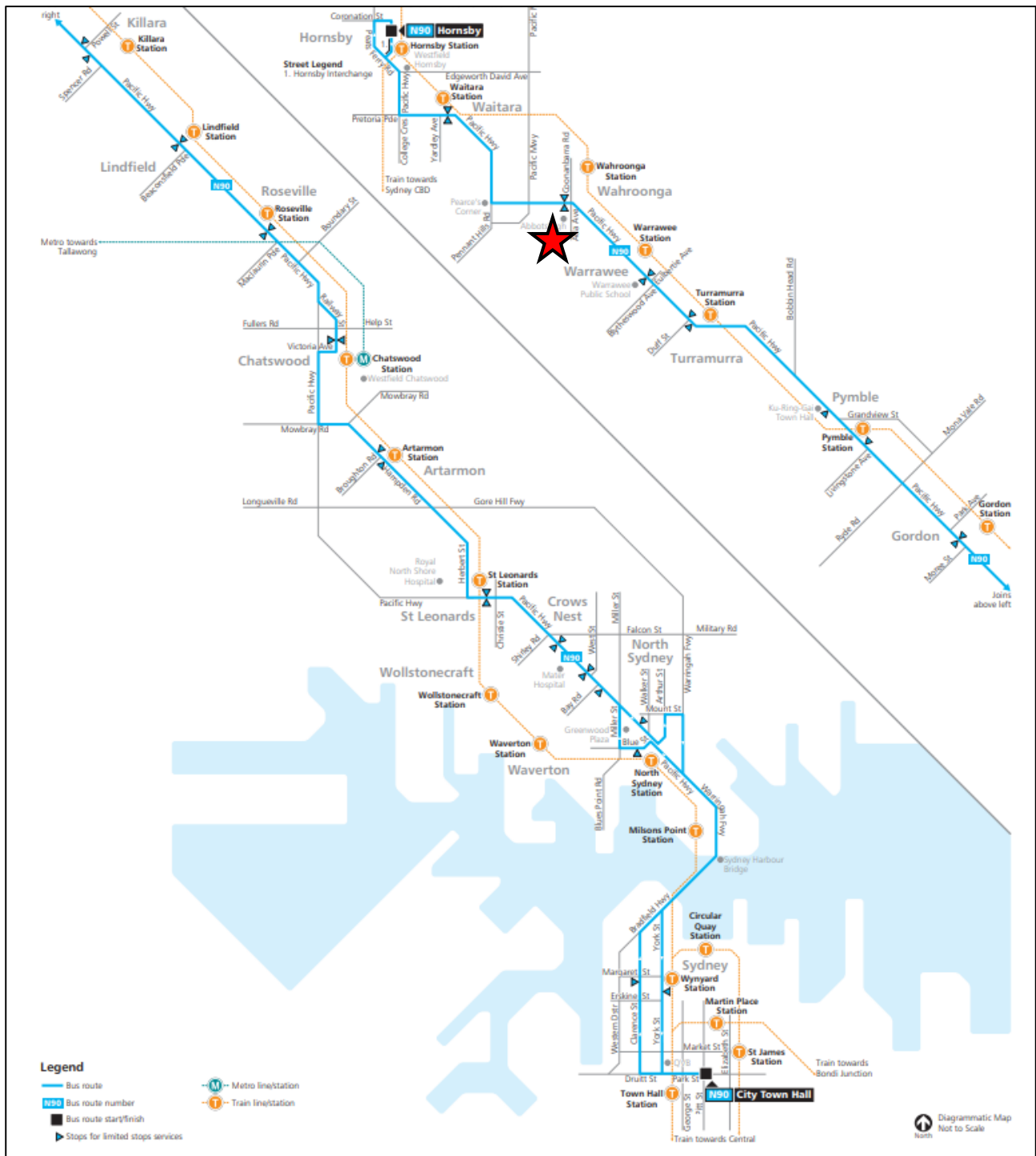
As shown above, the two relevant intersections are currently performing at a high level of efficiency, with worst movement levels of service of “A” or “B” conditions in both the AM & PM peak hour periods. The level of service “A” and “B” performance is characterised by low approach delays and spare capacity.

2.4 Public Transport

The subject site has access to existing bus stop (ID: 207625) located approximately 180m walking distance to the south of site on Pacific Highway. The bus stop services existing bus route N90 (Hornsby to City Town Hall via Chatswood (Night Service)), provided by State Transit.

Wahroonga Train Station is located (250m) walking distance to the north-east of the subject site, servicing the T1 North Shore & Western Line and T9 Northern Line. A train service is provided every 5 – 10 minutes in commuter peak periods and provides direct access between Berowra and Sydney CBD.

The location of the site subject to the surrounding public transport network is shown in **Figure 3** below.



Site Location

FIGURE 3: PUBLIC TRANSPORT NETWORK MAP

2.5 Future Road and Infrastructure Upgrades

From Ku-ring-gai Council Development Application tracker and website, it appears that there are no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

3 PARKING ASSESSMENT

3.1 Council Parking Requirement

Reference is made to Ku-ring-gai Council's *Ku-ring-gai Development Control Plan 2020, Section C, Part 22 General Access and Parking, 22R.1 Car Parking Rates* which designates the following parking rates applicable to the proposed development:

22R.1 CAR PARKING RATES

Seniors Housing

Provisions of Seniors Living Policy apply.

The following parking provision is recommended:

Resident funded development 2 spaces per 3 self contained units plus 1 visitor space for every 5 units.

Hostels, nursing and convalescent homes 1 space per 10 beds for visitors, plus 1.5 spaces per 2 employees, plus 1 space for ambulance

In the calculation of the parking spaces, overall requirement figures are to be rounded up to the nearest integer.

Whilst the provisions of the Seniors Living Policy are stated to apply, the recommended parking provision based on the above rates in Ku-ring-gai Council's DCP is summarised in **Table 2**.

TABLE 2: DCP PARKING RATES

Land Use	Type	Scale	Rate		Parking Required
			Parking Use	Rate	
Self-contained dwellings	Resident-Funded	60 self-contained dwellings	Residents	2 per 3 units	40
			Visitors	1 visitor space per 5 units	12
Aged Care	Residential and Palliative care units	27 units & 36 staff	Staff	1.5 spaces per 2 employees	27
			Visitors	1 space per 10 beds for visitors	2.7 (3)
			Ambulance	1 space for ambulance	1 ambulance space
Total	-	-	-	-	82 + 1 ambulance

As shown above, strict application of the DCP requires the provision of **82** car parking spaces plus an ambulance space. Parking provision is to be allocated as per the following as a minimum:

- 40 for residents;
- 12 for residential visitors;
- 27 for staff;
- 3 for aged care visitors.

The subject site and the proposed development is not limited by its ability to provide an adequate quantum of carparking, such that the required quantity of car parking spaces can be provided within the basement car parking area. The concept design as shown in **Annexure A**, indicates the provision of 90 car parking spaces, which will exceed the Council's DCP requirements.

The above assessment considers the car parking requirements based upon Council's DCP. The following section provides an assessment against the *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* car parking requirements.

3.2 State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004

Reference is made to *Clauses 48 and 50 of SEPP (Housing for Seniors or People with a Disability) 2004* which designates the following parking rates applicable to the proposed development:

48 Standards that cannot be used to refuse development consent for residential care facilities

(d) parking for residents and visitors: if at least the following is provided-

- (i) 1 parking space for each 10 beds in the residential care facility (or 1 parking space for each 15 beds if the facility provides care only for persons with dementia), and*
- (ii) 1 parking space for each 2 persons to be employed in connection with the development and on duty at any one time, and*
- (iii) 1 parking space suitable for an ambulance.*

50 Standards that cannot be used to refuse development consent for self-contained dwellings

(h) parking: if at least the following is provided:

- (ii) 1 car space for each 5 dwellings where the development application is made by, or is made by a person jointly with, a social housing provider*

The minimum parking provision requirements as per the above SEPP rates is summarised in **Table 3** below noting that the development is being made by a social housing provider.

TABLE 3: SEPP MINIMUM PARKING REQUIREMENTS

Type	Scale	Rate		Spaces Required
		Land Use	Rate	
Residential and Palliative Care	27 units & 36 staff	Staff	1 per 2 staff	18
		Visitors	1 per 10 beds	2.7 (3)
		Ambulance	1 ambulance	1 ambulance
Self Contained Dwellings	60 dwellings	Residential	1 per 5 dwellings	12
Subtotal	-	-	-	33 + 1 ambulance

As shown above, strict application of the SEPP requires a minimum provision of **33** car parking spaces plus one (1) ambulance. The subject site and the proposed development is not limited by its ability to provide an adequate quantum of carparking, such that the required quantity of car parking spaces can be provided.

3.3 Disabled Parking

3.3.1 Self-Contained Dwellings

Ku-ring-gai Council's DCP does not specifically outline the requirement of disabled parking for seniors living developments. Instead, reference is made to *Schedule 3 of SEPP (Housing for Seniors or people with a Disability) 2004* which states the following regarding the provision of disabled accessible parking for residents of seniors self-contained dwellings:

Schedule 3 Part 1 Standards applying to hostels and self-contained dwellings

5 Private car accommodation

If car parking (not being car parking for employees) is provided—

(a) car parking spaces must comply with the requirements for parking for persons with a disability set out in AS 2890, and

(b) 5% of the total number of car parking spaces (or at least one space if there are fewer than 20 spaces) must be designed to enable the width of the spaces to be increased to 3.8 metres, and

(c) any garage must have a power-operated door, or there must be a power point and an area for motor or control rods to enable a power-operated door to be installed at a later date.

During the Development Application stage, the provision of disabled parking is to be provided in accordance with the above and designed in accordance with parking for persons with a disability as set out in AS 2890.

3.3.2 Aged and Palliative Care disabled parking requirement

Reference is made to the *Building Code of Australia (BCA) Table D3.5* which classifies accommodation for the aged as a Class 3(b) building and requires the provision of disabled parking at the rates of:

Class 3(b) 1 space for every 100 car parking spaces or part thereof

During the Development Application stage, the provision of disabled parking for the aged care facility is to be provided in accordance with the above requirements.

3.4 Bicycle & Motorcycle Parking Requirements

The Ku-ring-gai Council DCP 2020 does not require the provision of bicycle / motorcycle parking. No bicycle / motorcycle has been provided, satisfying Council requirements.

3.5 Servicing & Loading

Reference is made to Ku-ring-gai Council's DCP which outlines the following with respect to waste collection for seniors living / aged care developments.

9 On-site internal loading facilities are to be provided for all developments with loading and unloading requirements.

10 Loading docks are to be:

- i) accessed via a rear lane or secondary streets where these are available, and accessible to heavy vehicles;*
- ii) conveniently located in such a way that minimises conflict with pedestrians and other traffic; and*
- iii) screened from the public street.*

All loading, servicing and waste collection will be undertaken from a dedicated service bay suitable for waste and delivery vehicles. Vehicle access to the proposed service bay will be undertaken via a proposed two-way driveway from Neringah Avenue South where forward entry and exit will be able to be undertaken from the site. The loading bay will also be used by Ambulance Services.

The loading area is located away from pedestrian and vehicle conflict points to minimise conflicts and is appropriately screen from the public street being located in the basement. There may be some internal delays to following vehicles while a service vehicle has to reverse entry into the service dock. Considering the low frequency of service vehicles this is acceptable.

3.6 Sight Line Assessment

During a visit to the site, it was noted that sight lines at the proposed two-way driveway location are potentially restricted due to the presence of shrubs within the Council verge adjacent to the driveway. As a result, it is likely that some of these trees will be required to be removed or relocated to ensure sufficient sight lines can be achieved from the proposed two-way driveway.

The single lane entry driveway does not require the provision of removal of shrubs within the Council verge, as the driveway is an entry only driveway, with no vehicles leaving the single lane driveway.

3.7 Car Park Design & Compliance

The car parking layout as depicted in **Annexure A** has not been assessed by MTE to achieve the relevant clauses and objectives of AS2890.1:2004, AS2890.2:2002 and AS2890.6:2009 as a part of this Traffic and Parking Impact Assessment. The detailed assessment of the car parking areas will be undertaken during the submission of the Development Application.

The subject site and the proposed development is not limited by its ability to provide an adequate quantum of carparking, such that the required quantity of car parking spaces can be provided on-site.

4 PEDESTRIAN MANAGEMENT

4.1 **Zebra Pedestrian Crossing Assessment**

As part of the assessment, consideration has been made to the provision of a pedestrian crossing across Neringah Avenue South to connect Archdale Walk on the eastern side of the road with the proposed green spine to be provided within the site.

Reference is made to the Transport for NSW (TfNSW) *Supplement to Australian Standard AS1742.10-2009, Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection Version 3.1*, which states the following warrants for the provision of zebra pedestrian crossings:

Transport practice for numerical warrants for Pedestrian (Zebra) Crossings on arterial roads are:

i) Normal Warrant:

A pedestrian (Zebra) Crossing is warranted where:

In each of three separate one hour periods in a typical day

(a) The pedestrian flow per hour (P) crossing the road is greater than or equal to 30

AND

a) The vehicular flow per hour (V) through the site is greater than or equal to 500

AND

b) The product PV is greater than or equal to 60,000

ii) Reduced Warrant for sites used predominantly by children and by aged or impaired pedestrians:...

If at least 50% of pedestrians using the crossing are aged or impaired and for each three one hour periods in a typical day

(a) $P \geq 30$

AND

(b) $V \geq 200$

AND

(c) $PV \geq 60,000$

a pedestrian (Zebra) Crossing may be installed.

As per the completed traffic intersection surveys (detailed in **Section 2.3**), the peak traffic volume surveyed to occur along Neringah Avenue South was 109 vehicles. With added consideration that the proposed development is estimated to add some 28 vehicular trips to

the road network, this peak hourly volume is expected to increase to some 137 peak hourly vehicles. Both the existing and proposed traffic volumes along Neringah Avenue South do not satisfy the warrant values of TfNSW's *Supplement to AS1742.10-2009* in any peak hourly period. Therefore, the provision of a pedestrian crossing is not warranted and is not recommended to be provided.

An alternative to a zebra pedestrian crossing is the provision of a pedestrian refuge.

4.2 Pedestrian Refuge

The relevant design guidelines for pedestrian refuges are detailed within *AS1742.10-2009, Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection Version 3.1*, the relevant *TfNSW Supplement*, and *Transport for NSW's TDT 2011/01a – Pedestrian Refuges (Supplement for narrowing or widening of roads at Pedestrian Refuges)*. Pedestrian refuges increase the ease with which pedestrians can cross a road, by providing an island area in the middle of the road, for pedestrians to wait.

One resultant impact of installing a pedestrian refuge within Neringah Avenue South near Archdale Walk is that it will reduce the quantity of available kerbside parking spaces in Neringah Avenue South. In addition to the kerbside area dedicated to the kerb ramp and/or kerb extension facilities associated with a pedestrian refuge there are also distances required to be signposted as “*No Stopping*” on either side of the kerb ramps. The typical refuge design is shown in **Annexure D** for reference.

As shown in **Annexure D**, approximately 25m of kerbside length (20m on the approach and 5m on the departure of the refuge) is required to be signposted as “*No Stopping*”. This will result in the loss of 50m of kerbside parking, approximately nine (9) car parking spaces based upon one space per 6m of kerbside length.

From a site visit undertaken, the on-street parking conditions are highly utilised and as such any removal of parking as a result of the provision of a pedestrian refuge facility is subject to the approval by Council's Local Traffic Committee.

The TfNSW Guide to Traffic Generating Developments 2002 states the following with respect to the ability for aged pedestrians to safely cross the average street.

In The Streets Where We Live, Landcom (1984), pedestrian safety and delay are further considered. This resulted in the definition of various behavioural thresholds, such as the observation that at 90 veh/hr children tend to stop playing in the street, and a 300 veh/hr limit is required for aged pedestrians to safely cross the average street.

As the forecast two-way peak hour traffic within Neringah Avenue South is 137 vehicles, it is unnecessary to provide any formal crossing facility. An acceptable alternative to a pedestrian refuge would be to replicate the “*No Stopping*” signage along the pedestrian link along the site frontage, similar to the existing design shown in front of the Archdale Walk pram ramp.

5 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

5.1 *Traffic Generation*

Traffic generation rates for the relevant land uses are provided in the *Roads and Maritime Services (RMS) Guide to Traffic Generating Developments (2002)* and recent supplements and are as follows:

RMS Guide

3.3.4 Housing for aged and disabled persons.

Evening peak hour vehicle trips = 0.1 - 0.2 per dwelling.

TDT 2013/04a

Housing for seniors

Weekday peak hour vehicle trips = 0.4 per dwelling

(Note that morning site peak hour does not generally coincide with the network peak hour)

The resulting traffic generation is summarised in **Table 4**.

TABLE 4: ESTIMATED TRAFFIC GENERATION

Use	Scale	Generation Rate	Trips	PM Peak Hour Split
Self-contained dwellings	60 units	0.4 per dwelling	24 trips	19 in 5 out ⁽¹⁾
Residential aged care	27 units	0.15 per dwelling ⁽²⁾	4 trips	1 in; 3 out ⁽³⁾
Total	-	-	28 trips	20 in; 8 out

Notes:

- (1) Assumes 80% inbound & 20% outbound during PM peak;
- (2) Average of 0.1-0.2 per dwelling TfNSW Guide rate range;
- (3) Assumes 20% inbound & 80% outbound during PM peak.

As shown, the estimated traffic generation associated with the proposed development is in the order of **28** vehicle trips (20 IN, 8 OUT) for the PM peak period. The AM peak traffic generation has been assumed to be the same for conservative analysis, with the traffic distribution split (8 IN, 20 OUT). Note that this traffic generation is considered to be conservative as it does not incorporate the traffic generation of the existing site use.

5.2 *Trip Assignment*

The road network has been assessed and the following traffic assignment has been assumed for all traffic to and from the site:

- To the site:
 - 60% from Pacific Highway;

- 40% from Warwilla Avenue (east of the site).
- From the site:
 - 60% to Warwilla Avenue (east of the site);
 - 40% to Pacific Highway.

5.3 Traffic Impact

The traffic generation outlined in **Section 5.1 & 5.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 9.0 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 5**.

TABLE 5: INTERSECTION PERFORMANCE (SIDRA INTERSECTION 9.0)

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Neringah Avenue South / Work Site Driveway	AM	0.10	1.9 (Worst: 10.2)	NA (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.08	2 (Worst: 9.1)	NA (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.4 (Worst: 20.6)	NA (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 12)	NA (Worst: A)		LT from Neringah Avenue
FUTURE PERFORMANCE						
Neringah Avenue South / Work Site Driveway	AM	0.13	2.1 (Worst: 10.3)	NA (Worst: A)	Give Way	RT from Neringah Avenue South
	PM	0.09	2.1 (Worst: 9.1)	NA (Worst: A)		RT from Neringah Avenue South
Pacific Highway / Neringah Avenue	AM	0.54	0.5 (Worst: 20.5)	NA (Worst: B)	Stop	LT from Neringah Avenue
	PM	0.41	0.3 (Worst: 11.9)	NA (Worst: A)		LT from Neringah Avenue

NOTES:

(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.

(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

(4) No overall Level of Service is provided for Give Way and Stop controlled intersections as the low delays associated with the dominant movements skew the average delay of the intersection. The Level of Service of the worst approach is an indicator of the operation of the intersection, with a worse Level of Service corresponding to long delays and reduced safety outcomes for that approach.

As shown, the intersections of Neringah Avenue South / Warwilla Avenue and Neringah Avenue South / Pacific Highway both retain the same worst movement Levels of Service under future conditions with minimal delays and additional capacity, indicating that there will be no adverse traffic impact on the road network as a result of the proposed development.

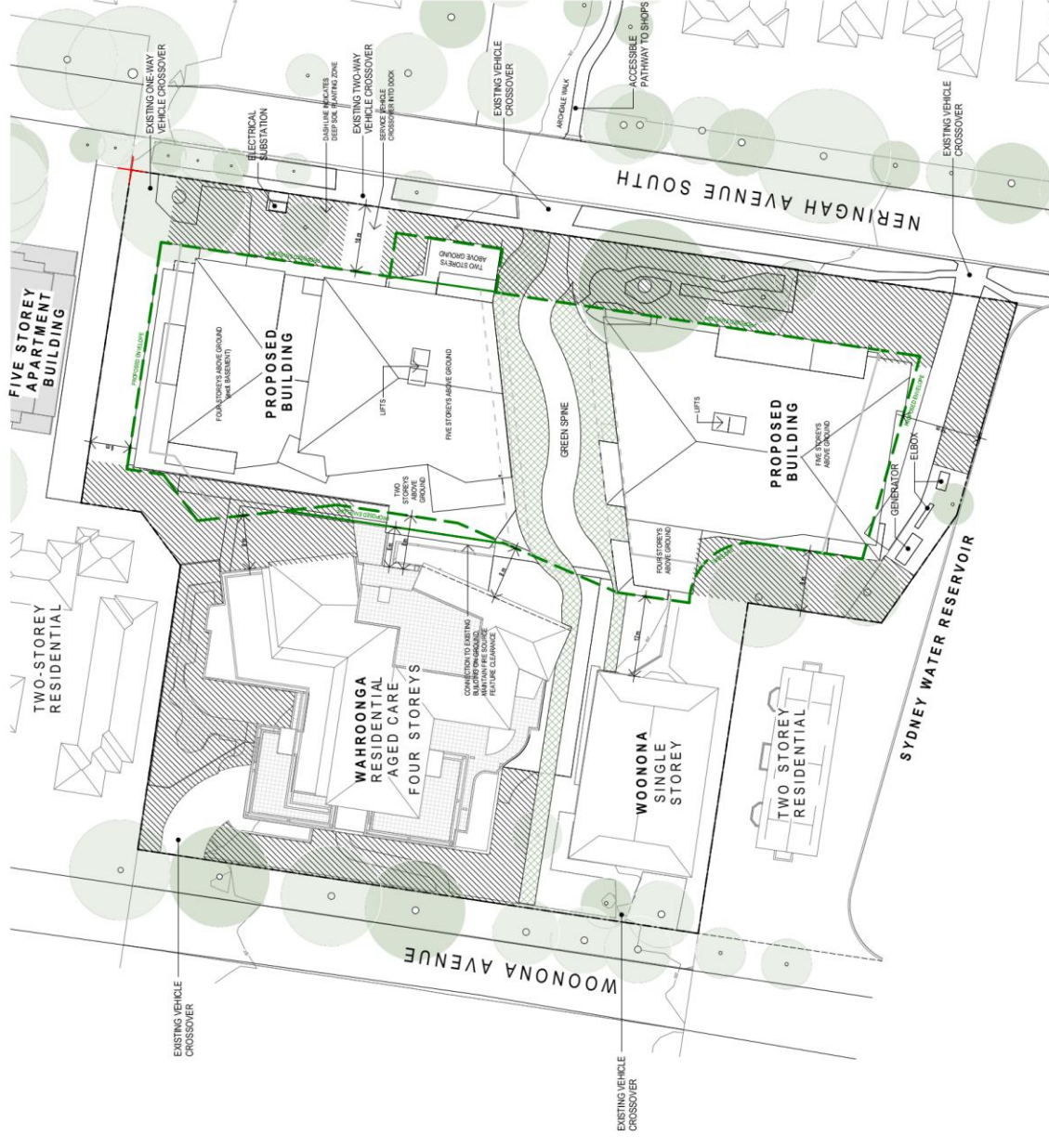
6 CONCLUSION

In view of the foregoing, the subject Wahroonga Seniors Living / Aged Care Development proposal at 4-10 Neringah Avenue South, Wahroonga (as depicted in **Annexure A**) is fully supportable in terms of its traffic and parking impacts. The following outcomes of this traffic and parking impact assessment are relevant to note:

- The proposal requires the provision of **33** to **82** car parking spaces and one (1) ambulance space, in accordance with the relevant controls applicable to the development, including Council's DCP requirements and *SEPP (Housing for Seniors or People with a Disability) 2004*.
- Council's DCP does not require the provision of bicycle and motorcycle parking facilities.
- The proposed plans have not been assessed against the relevant sections of AS2890.1, AS2890.2 and AS2890.6 as a part of this Traffic and Parking Impact Assessment. Compliance of the development is to be undertaken during the Development Application Stage.
- The subject site and the proposed development are not limited by its ability to provide an adequate quantum of carparking, such that the required quantity of car parking spaces can be provided on-site.
- During a visit to the site, it was noted that sight lines at the proposed two-way driveway location are potentially restricted due to the presence of shrubs within the Council verge adjacent to the driveway. As a result, it is likely that some of these trees will be required to be removed or relocated to ensure sufficient sight lines can be achieved from the proposed two-way driveway.
- The traffic generation of the proposed development has been estimated to be some **28** trips. The impacts of the traffic generation have been modelled using SIDRA INTERSECTION 9.0, indicating that there will be no detrimental impact to the performance of the intersections or on residential amenity surrounding the site as a result of the generated traffic.
- All waste collection, deliveries and emergency services (ambulance) will utilise the loading area in the basement.
- As part of the assessment, consideration was made to the provision of a zebra pedestrian crossing to provide connection to the Archdale Walk on the eastern side of Neringah Avenue South. The vehicular volumes along Neringah Avenue South do not satisfy the warrant values of TfNSW's *Supplement to AS1742.10-2009* for a pedestrian crossing in any peak hourly period such that the provision of a pedestrian crossing at the proposed location is not warranted.
- An alternative to a zebra pedestrian crossing is a pedestrian refuge, although is not considered mandatory and is subject to approval by Council's Local traffic Committee.



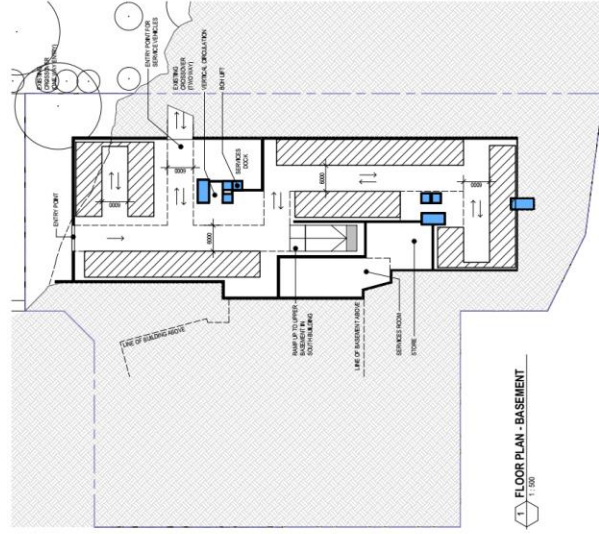
**ANNEXURE A: PROPOSED PLANS
(2 SHEETS)**



SYDNEY
STUDIOS LEVEL 10
SUITE 10.01
SUITE 10.01
SUITE 10.01

CLIENT: **Hammond Corp**
PROJECT: **Wahroonga Stage 2**
DATE: **4-12 NERINGAH AVE S**
CHECKED: **Wahroonga NSW 2076**

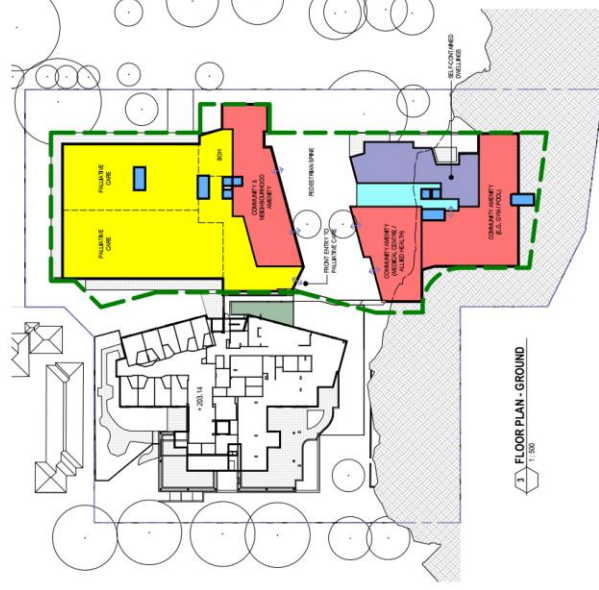
SCALE: **ART100**
DRAWN: **PS**
DATE: **22/05/2023**



1 FLOOR PLAN - BASEMENT
1:500



2 FLOOR PLAN - LOWER GROUND
1:500



3 FLOOR PLAN - GROUND
1:500



CLIENT
BIM
SYDNEY
STUDIOS LEVEL 12
SUITE 12.01
412 NERRING AVE S
WARRONGA NSW 2076
WWW.BIMARCHITECTURE.COM.AU

CLIMATE TITLE
HAMMOND CORP
CAMPOUTLINE

PROJECT 1308
WARRONGA STAGE 2
412 NERRING AVE S
WARRONGA NSW 2076

DATE - JUNE 2021
SCALE - 1:500 (B+A)

CHECKED BY REBEKAH
DRAWN BY AR200
PR

22/06/2021 2:13:30 PM
SYDNEY HAMMOND CORP (412 NERRING AVE S)



**ANNEXURE B: TRAFFIC SURVEY DATA
(2 SHEETS)**

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY trafficsurvey.com.au



Intersection of Warwilla Ave and Laneway, Wahroonga

GPS: -33.716554, 151.115211

Date: Tue 01/06/21

Weather: Fine

Suburban: Wahroonga

Customer: McLaren

North: Laneway

East: Warwilla Ave

South: Neringah Ave S

West: Warwilla Ave

Survey AM: 7:00 AM-9:30 AM

Period PM: 2:30 PM-6:00 PM

Traffic AM: 7:30 AM-8:30 AM

Peak PM: 2:45 PM-3:45 PM

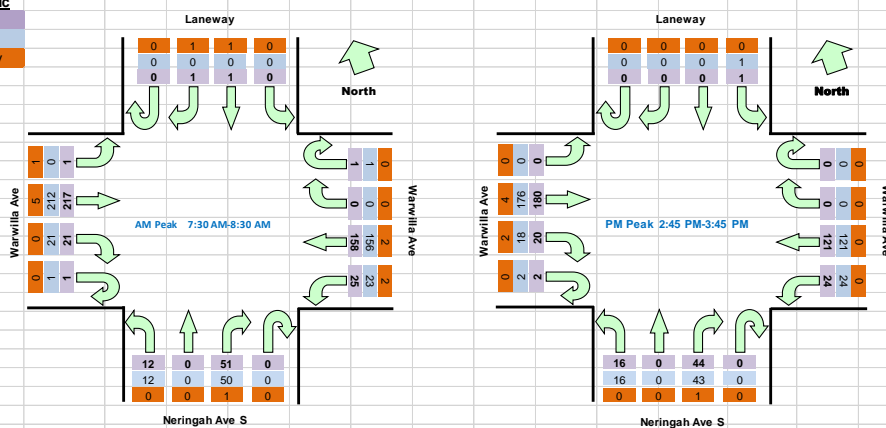
All Vehicles

Time		North Approach Laneway				East Approach Warwilla Ave				South Approach Neringah Ave S				West Approach Warwilla Ave				Hourly Total
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Peak
7:00	7:15	0	0	0	0	0	0	19	4	0	10	0	0	1	1	4	0	353
7:15	7:30	0	1	0	0	0	0	26	1	0	11	1	0	1	3	21	0	467
7:30	7:45	0	0	0	0	0	0	49	7	0	15	0	1	0	4	28	0	489
7:45	8:00	0	0	0	0	1	0	46	9	0	13	0	4	1	5	66	0	425
8:00	8:15	0	1	1	0	0	0	45	2	0	12	0	3	0	10	78	1	330
8:15	8:30	0	0	0	0	0	0	18	7	0	11	0	4	0	2	45	0	216
8:30	8:45	0	0	0	1	0	0	10	5	0	9	0	0	0	1	13	1	151
8:45	9:00	0	0	1	1	1	0	10	5	0	13	1	1	0	1	16	0	
9:00	9:15	0	0	0	0	0	0	13	4	0	15	0	0	0	1	6	0	
9:15	9:30	0	0	0	0	1	0	5	3	0	6	0	1	0	0	6	0	
14:30	14:45	0	0	0	0	0	0	29	3	0	8	0	0	1	1	12	0	384
14:45	15:00	0	0	0	1	0	0	30	7	0	10	0	5	1	1	22	0	408
15:00	15:15	0	0	0	0	0	0	43	5	0	7	0	5	0	7	40	0	384
15:15	15:30	0	0	0	0	0	0	37	5	0	15	0	3	0	5	81	0	316
15:30	15:45	0	0	0	0	0	0	11	7	0	12	0	3	1	7	37	0	225
15:45	16:00	0	0	0	0	2	1	16	8	0	9	0	1	0	2	14	0	203
16:00	16:15	0	1	0	0	0	1	6	3	0	11	0	0	0	1	16	0	225
16:15	16:30	0	1	0	0	0	0	12	4	0	16	0	0	0	1	21	0	250
16:30	16:45	0	0	0	0	1	1	17	3	0	14	0	0	0	0	20	0	242
16:45	17:00	0	0	0	0	0	0	19	6	0	17	0	1	0	0	32	0	249
17:00	17:15	0	2	0	0	1	1	12	6	0	12	0	0	0	1	29	0	225
17:15	17:30	0	0	0	0	0	2	8	3	0	12	0	1	0	0	21	0	
17:30	17:45	0	0	0	0	0	0	17	4	0	14	0	1	0	1	26	0	
17:45	18:00	0	0	0	0	1	0	17	2	0	12	0	1	0	0	18	0	

Peak Time		North Approach Laneway				East Approach Warwilla Ave				South Approach Neringah Ave S				West Approach Warwilla Ave				Peak total
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	
7:30	8:30	0	1	1	0	1	0	158	25	0	51	0	12	1	21	217	1	489
14:45	15:45	0	0	0	1	0	0	121	24	0	44	0	16	2	20	180	0	408

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic
Total
Light
Heavy



TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY trafficsurvey.com.au



Intersection of Pacific Hwy and Neringah Ave S, Wahroo

GPS -33.719037, 151.114683

Date:	Tue 01/06/21
Weather:	Fine
Suburban:	Wahroonga
Customer:	McLaren

North:	Neringah Ave S
East:	Pacific Hwy
South:	N/A
West:	Pacific Hwy

Survey	AM:	7:00 AM-9:30 AM
Period	PM:	2:30 PM-6:00 PM
Traffic	AM:	7:15 AM-8:15 AM
Peak	PM:	4:15 PM-5:15 PM

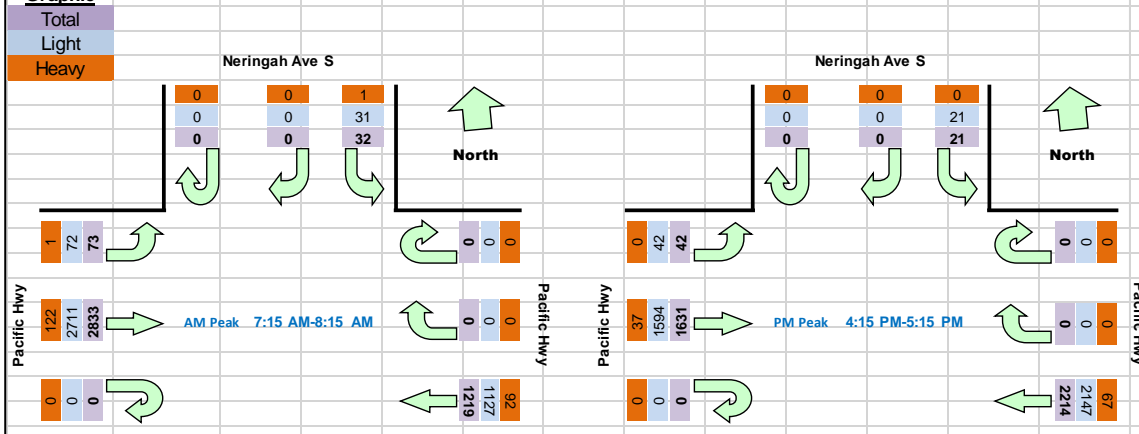
All Vehicles

Time		North Approach Neringah Ave			East Approach Pacific Hwy			West Approach Pacific Hwy			Hourly Total	
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	Hour	Peak
7:00	7:15	0	0	2	0	0	265	0	733	9	4131	
7:15	7:30	0	0	5	0	0	322	0	806	18	4157	Peak
7:30	7:45	0	0	6	0	0	290	0	697	15	4000	
7:45	8:00	0	0	8	0	0	275	0	657	23	3917	
8:00	8:15	0	0	13	0	0	332	0	673	17	3682	
8:15	8:30	0	0	10	0	0	319	0	651	14	3378	
8:30	8:45	0	0	1	0	0	313	0	603	8	3136	
8:45	9:00	0	0	5	0	0	235	0	472	16		
9:00	9:15	0	0	2	0	0	236	0	478	15		
9:15	9:30	0	0	2	0	0	265	0	480	5		
14:30	14:45	0	0	2	0	0	431	0	436	7	3458	
14:45	15:00	0	0	4	0	0	407	0	385	10	3496	
15:00	15:15	0	0	9	0	0	425	0	380	10	3586	
15:15	15:30	0	0	10	0	0	499	0	430	13	3719	
15:30	15:45	0	0	12	0	0	489	0	405	8	3783	
15:45	16:00	0	0	6	0	0	540	0	342	8	3817	
16:00	16:15	0	0	5	0	0	556	0	388	8	3894	
16:15	16:30	0	0	2	0	0	560	0	444	10	3908	Peak
16:30	16:45	0	0	6	0	0	554	0	376	12	3804	
16:45	17:00	0	0	8	0	0	557	0	397	11	3819	
17:00	17:15	0	0	5	0	0	543	0	414	9	3713	
17:15	17:30	0	0	4	0	0	474	0	422	12		
17:30	17:45	0	0	2	0	0	550	0	398	13		
17:45	18:00	0	0	2	0	0	502	0	353	10		

Peak Time		North Approach Neringah Ave			East Approach Pacific Hwy			West Approach Pacific Hwy			Peak total
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	
7:15	8:15	0	0	32	0	0	1219	0	2833	73	4157
16:15	17:15	0	0	21	0	0	2214	0	1631	42	3908

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic





**ANNEXURE C: SIDRA RESULTS
(8 SHEETS)**

MOVEMENT SUMMARY

▼ Site: 101v [EX AM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue
Existing Conditions
AM Peak Periods
Site Category: (None)
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: Neringah Avenue South (S)														
1	L2	13	0	14	0.0	0.013	5.8	LOS A	0.0	0.3	0.15	0.54	0.15	53.2
2	T1	1	0	1	0.0	0.013	8.1	LOS A	0.0	0.3	0.15	0.54	0.15	53.7
3	R2	51	1	54	2.0	0.104	10.2	LOS A	0.4	2.8	0.54	0.75	0.54	50.1
Approach		65	1	68	1.5	0.104	9.3	LOS A	0.4	2.8	0.45	0.71	0.45	50.8
East: Warwilla Avenue (E)														
4	L2	25	2	26	8.0	0.051	5.6	LOS A	0.0	0.0	0.00	0.16	0.00	56.7
5	T1	158	2	166	1.3	0.051	0.0	LOS A	0.0	0.1	0.01	0.07	0.01	59.3
6	R2	1	0	1	0.0	0.051	6.5	LOS A	0.0	0.1	0.01	0.01	0.01	58.3
Approach		184	4	194	2.2	0.051	0.8	NA	0.0	0.1	0.00	0.08	0.00	59.0
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	6.0	LOS A	0.0	0.1	0.31	0.52	0.31	52.5
8	T1	1	0	1	0.0	0.002	8.1	LOS A	0.0	0.1	0.34	0.53	0.34	52.7
9	R2	1	0	1	0.0	0.002	9.5	LOS A	0.0	0.1	0.51	0.59	0.51	50.8
Approach		3	0	3	0.0	0.002	7.9	LOS A	0.0	0.1	0.39	0.55	0.39	52.0
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.3
11	T1	217	5	228	2.3	0.069	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	21	0	22	0.0	0.069	6.3	LOS A	0.2	1.2	0.13	0.11	0.13	56.9
Approach		239	5	252	2.1	0.069	0.7	NA	0.2	1.2	0.06	0.05	0.06	59.1
All Vehicles		491	10	517	2.0	0.104	1.9	NA	0.4	2.8	0.09	0.15	0.09	57.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
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: 101v [EX PM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue
Existing Conditions
PM Peak Period
Site Category: (None)
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: Neringah Avenue South (S)														
1	L2	16	0	17	0.0	0.015	5.7	LOS A	0.1	0.4	0.12	0.54	0.12	53.3
2	T1	1	0	1	0.0	0.015	7.3	LOS A	0.1	0.4	0.12	0.54	0.12	53.7
3	R2	44	1	46	2.3	0.080	9.1	LOS A	0.3	2.2	0.49	0.69	0.49	50.9
Approach		61	1	64	1.6	0.080	8.1	LOS A	0.3	2.2	0.39	0.65	0.39	51.6
East: Warwilla Avenue (E)														
4	L2	24	0	25	0.0	0.040	5.5	LOS A	0.0	0.0	0.00	0.20	0.00	56.7
5	T1	121	0	127	0.0	0.040	0.0	LOS A	0.0	0.1	0.01	0.08	0.01	59.2
6	R2	1	0	1	0.0	0.040	6.3	LOS A	0.0	0.1	0.01	0.01	0.01	58.2
Approach		146	0	154	0.0	0.040	1.0	NA	0.0	0.1	0.01	0.10	0.01	58.8
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	5.9	LOS A	0.0	0.1	0.27	0.51	0.27	52.9
8	T1	1	0	1	0.0	0.002	7.3	LOS A	0.0	0.1	0.31	0.52	0.31	53.0
9	R2	1	0	1	0.0	0.002	8.6	LOS A	0.0	0.1	0.47	0.57	0.47	51.5
Approach		3	0	3	0.0	0.002	7.3	LOS A	0.0	0.1	0.35	0.53	0.35	52.5
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.3
11	T1	180	4	189	2.2	0.059	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	20	2	21	10.0	0.059	6.3	LOS A	0.2	1.2	0.13	0.12	0.13	56.3
Approach		201	6	212	3.0	0.059	0.7	NA	0.2	1.2	0.06	0.06	0.06	59.0
All Vehicles		411	7	433	1.7	0.080	2.0	NA	0.3	2.2	0.09	0.17	0.09	57.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
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: 101 [EX AM - Neringah Avenue South / Pacific Highway**
(Site Folder: General)]

Intersection of Neringah Avenue South and Pacific Highway
 Site Category: (None)
 Stop (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				
East: Pacific Highway (E)														
5	T1	1219	92	1283	7.5	0.230	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1219	92	1283	7.5	0.230	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Neringah Avenue (N)														
7	L2	32	1	34	3.1	0.127	20.6	LOS B	0.4	2.9	0.80	1.00	0.80	44.8
Approach		32	1	34	3.1	0.127	20.6	LOS B	0.4	2.9	0.80	1.00	0.80	44.8
West: Pacific Highway (W)														
10	L2	73	1	77	1.4	0.538	5.8	LOS A	0.0	0.0	0.00	0.04	0.00	57.5
11	T1	2833	122	2982	4.3	0.538	0.2	LOS A	0.0	0.0	0.00	0.01	0.00	59.4
Approach		2906	123	3059	4.2	0.538	0.4	NA	0.0	0.0	0.00	0.01	0.00	59.3
All Vehicles		4157	216	4376	5.2	0.538	0.4	NA	0.4	2.9	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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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Organisation: MCLAREN TRAFFIC ENGINEERING | Licence: PLUS / 1PC | Processed: Friday, 11 June 2021 3:32:29 PM

Project: \\192.168.1.107\mte storage\Jobs\2021\210429\MTE SIDRA\21 06 10.sip9

MOVEMENT SUMMARY

 **Site: 101 [EX PM - Neringah Avenue South / Pacific Highway**
(Site Folder: General)]

Intersection of Neringah Avenue South and Pacific Highway
 Existing Conditions
 PM Peak Period
 Site Category: (None)
 Stop (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				
East: Pacific Highway (E)														
5	T1	2214	67	2331	3.0	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		2214	67	2331	3.0	0.406	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
North: Neringah Avenue (N)														
7	L2	32	1	34	3.1	0.057	12.0	LOS A	0.2	1.4	0.53	0.95	0.53	49.7
Approach		32	1	34	3.1	0.057	12.0	LOS A	0.2	1.4	0.53	0.95	0.53	49.7
West: Pacific Highway (W)														
10	L2	42	0	44	0.0	0.306	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.8
11	T1	1631	37	1717	2.3	0.306	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach		1673	37	1761	2.2	0.306	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles		3919	105	4125	2.7	0.406	0.3	NA	0.2	1.4	0.00	0.01	0.00	59.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 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: 101v [FU AM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue
 Future Conditions
 AM Peak Period
 Site Category: (None)
 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: Neringah Avenue South (S)														
1	L2	13	0	14	0.0	0.013	5.8	LOS A	0.0	0.3	0.15	0.54	0.15	53.2
2	T1	1	0	1	0.0	0.013	8.1	LOS A	0.0	0.3	0.15	0.54	0.15	53.7
3	R2	63	1	66	1.6	0.129	10.3	LOS A	0.5	3.5	0.55	0.76	0.55	50.1
Approach		77	1	81	1.3	0.129	9.5	LOS A	0.5	3.5	0.47	0.72	0.47	50.6
East: Warwilla Avenue (E)														
4	L2	28	2	29	7.1	0.052	5.6	LOS A	0.0	0.0	0.00	0.18	0.00	56.6
5	T1	158	2	166	1.3	0.052	0.0	LOS A	0.0	0.1	0.01	0.08	0.01	59.3
6	R2	1	0	1	0.0	0.052	6.5	LOS A	0.0	0.1	0.01	0.01	0.01	58.3
Approach		187	4	197	2.1	0.052	0.9	NA	0.0	0.1	0.00	0.09	0.00	58.9
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	6.0	LOS A	0.0	0.1	0.31	0.52	0.31	52.5
8	T1	1	0	1	0.0	0.002	8.1	LOS A	0.0	0.1	0.34	0.53	0.34	52.7
9	R2	1	0	1	0.0	0.002	9.5	LOS A	0.0	0.1	0.51	0.59	0.51	50.8
Approach		3	0	3	0.0	0.002	7.9	LOS A	0.0	0.1	0.39	0.55	0.39	52.0
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	58.3
11	T1	217	5	228	2.3	0.069	0.1	LOS A	0.2	1.2	0.06	0.05	0.06	59.3
12	R2	21	0	22	0.0	0.069	6.3	LOS A	0.2	1.2	0.13	0.11	0.13	56.9
Approach		239	5	252	2.1	0.069	0.7	NA	0.2	1.2	0.06	0.05	0.06	59.1
All Vehicles		506	10	533	2.0	0.129	2.1	NA	0.5	3.5	0.10	0.17	0.10	57.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 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: 101v [FU PM - Neringah Avenue South / Warwilla Avenue (Site Folder: General)]

Intersection of Neringah Avenue South and Warwilla Avenue
 Future Conditions
 PM Peak Period
 Site Category: (None)
 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: Neringah Avenue South (S)														
1	L2	16	0	17	0.0	0.015	5.7	LOS A	0.1	0.4	0.11	0.54	0.11	53.3
2	T1	1	0	1	0.0	0.015	7.4	LOS A	0.1	0.4	0.11	0.54	0.11	53.8
3	R2	49	1	52	2.0	0.089	9.1	LOS A	0.3	2.4	0.49	0.70	0.49	50.9
Approach		66	1	69	1.5	0.089	8.3	LOS A	0.3	2.4	0.39	0.66	0.39	51.5
East: Warwilla Avenue (E)														
4	L2	32	0	34	0.0	0.042	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	56.3
5	T1	121	0	127	0.0	0.042	0.0	LOS A	0.0	0.1	0.01	0.10	0.01	59.1
6	R2	1	0	1	0.0	0.042	6.3	LOS A	0.0	0.1	0.01	0.01	0.01	58.2
Approach		154	0	162	0.0	0.042	1.2	NA	0.0	0.1	0.00	0.13	0.00	58.5
North: Work Site Driveway (N)														
7	L2	1	0	1	0.0	0.002	5.9	LOS A	0.0	0.1	0.27	0.52	0.27	52.8
8	T1	1	0	1	0.0	0.002	7.4	LOS A	0.0	0.1	0.31	0.53	0.31	53.0
9	R2	1	0	1	0.0	0.002	8.6	LOS A	0.0	0.1	0.47	0.57	0.47	51.5
Approach		3	0	3	0.0	0.002	7.3	LOS A	0.0	0.1	0.35	0.54	0.35	52.4
West: Warwilla Road (W)														
10	L2	1	0	1	0.0	0.059	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.3
11	T1	180	4	189	2.2	0.059	0.1	LOS A	0.2	1.2	0.05	0.05	0.05	59.3
12	R2	20	2	21	10.0	0.059	6.3	LOS A	0.2	1.2	0.13	0.12	0.13	56.3
Approach		201	6	212	3.0	0.059	0.8	NA	0.2	1.2	0.06	0.06	0.06	59.0
All Vehicles		424	7	446	1.7	0.089	2.1	NA	0.3	2.4	0.10	0.18	0.10	57.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 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: 101 [FU AM - Neringah Avenue South / Pacific Highway**
(Site Folder: General)]

Intersection of Neringah Avenue South and Pacific Highway
 Future Conditions
 AM Peak Period
 Site Category: (None)
 Stop (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				
East: Pacific Highway (E)														
5	T1	1219	92	1283	7.5	0.230	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1219	92	1283	7.5	0.230	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Neringah Avenue (N)														
7	L2	40	1	42	2.5	0.156	20.5	LOS B	0.5	3.5	0.80	1.00	0.80	44.9
Approach		40	1	42	2.5	0.156	20.5	LOS B	0.5	3.5	0.80	1.00	0.80	44.9
West: Pacific Highway (W)														
10	L2	78	1	82	1.3	0.539	5.8	LOS A	0.0	0.0	0.00	0.05	0.00	57.5
11	T1	2833	122	2982	4.3	0.539	0.2	LOS A	0.0	0.0	0.00	0.02	0.00	59.4
Approach		2911	123	3064	4.2	0.539	0.4	NA	0.0	0.0	0.00	0.02	0.00	59.3
All Vehicles		4170	216	4389	5.2	0.539	0.5	NA	0.5	3.5	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 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: 101 [FU PM - Neringah Avenue South / Pacific Highway**
(Site Folder: General)]

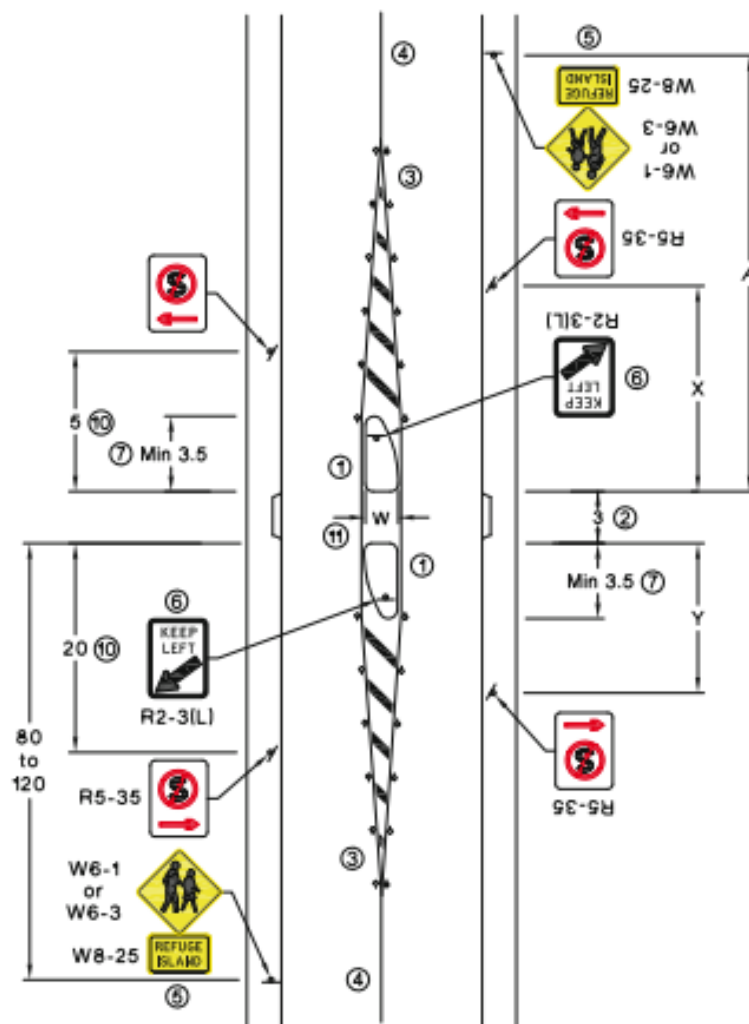
Intersection of Neringah Avenue South and Pacific Highway
 Future Conditions
 PM Peak Period
 Site Category: (None)
 Stop (Two-Way)

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				
East: Pacific Highway (E)														
5	T1	2214	67	2331	3.0	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		2214	67	2331	3.0	0.406	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
North: Neringah Avenue (N)														
7	L2	35	1	37	2.9	0.061	11.9	LOS A	0.2	1.5	0.52	0.95	0.52	49.8
Approach		35	1	37	2.9	0.061	11.9	LOS A	0.2	1.5	0.52	0.95	0.52	49.8
West: Pacific Highway (W)														
10	L2	54	0	57	0.0	0.308	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	57.7
11	T1	1631	37	1717	2.3	0.308	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		1685	37	1774	2.2	0.308	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		3934	105	4141	2.7	0.406	0.3	NA	0.2	1.5	0.00	0.02	0.00	59.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 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.



**ANNEXURE D: AS1742.10 TYPICAL PEDESTRIAN
REFUGE
(1 SHEET)**



NOTES:

- 1 Island kerbs may be painted white.
- 2 If a refuge is used in conjunction with a marked-crossing, the spacing between the islands shall be increased accordingly.
- 3 Length of splayed approach marking should be increased or other delineation devices considered if visibility to the island is reduced by vertical or horizontal alignment. Unidirectional yellow raised retroreflective pavement markers shall be provided at 6.0 m spacings.
- 4 Painted median is preceded by a single barrier line extending for 30 m minimum.
- 5 Where refuges are used on arterial or high speed roads, pedestrians or children warning signs W6-1 or W6-3 (minimum size B) as appropriate, shall be erected together with supplementary plate REFUGE ISLAND (W8-25) in advance of the refuge.
- 6 KEEP LEFT signs may be omitted if delineation of the island under all conditions is adequate.
- 7 When used near intersections, the length of the island nearest to the intersection may be reduced to accommodate turning traffic. A suggested minimum length is 1.25 m.
- 8 Road lighting in accordance with AS/NZS 1158.4 should be provided.
- 9 Frangible pedestrian assist handrails may be provided on the island at the pedestrian crossing point provided the island is at least 2 m wide.
- 10 Variations to the no-stopping distance may be required, see Clause 6.2. The no-stopping zone on the departure side may need to be extended if needed to a point where the roadway is wide enough for parking and passing traffic.
- 11 Width W to be desirably 3 m minimum if there are high pedestrian volumes or significant numbers of cyclists or people with disabilities, or 2 m minimum in other cases.

DIMENSIONS IN METRES

FIGURE 7 PEDESTRIAN REFUGE