

# Transport Impact Assessment;

Planning Proposal  
159-167 Darley Street West,  
Mona Vale

For Intrec  
1 July 2021

parking;  
traffic;  
civil design;  
wayfinding;  
**ptc.**

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## Document Control

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# 1 Introduction

## 1.1 Project summary

**ptc.** has been engaged by Intrec to prepare a Traffic Impact Assessment (TIA) to in support of a Planning Proposal (PP) to Northern Beaches Council (Council) for a residential development at 159-167 Darley Street West, Mona Vale. The Site is located within the Northern Beaches Council Local Government Area (LGA) and under Council's Local Environmental Plan (LEP), the site is zoned R2 Low Density Residential. The proposal seeks to amend these controls and rezone the site as R3 Medium Density Residential.

The location of the proposed development is shown in Figure 1.

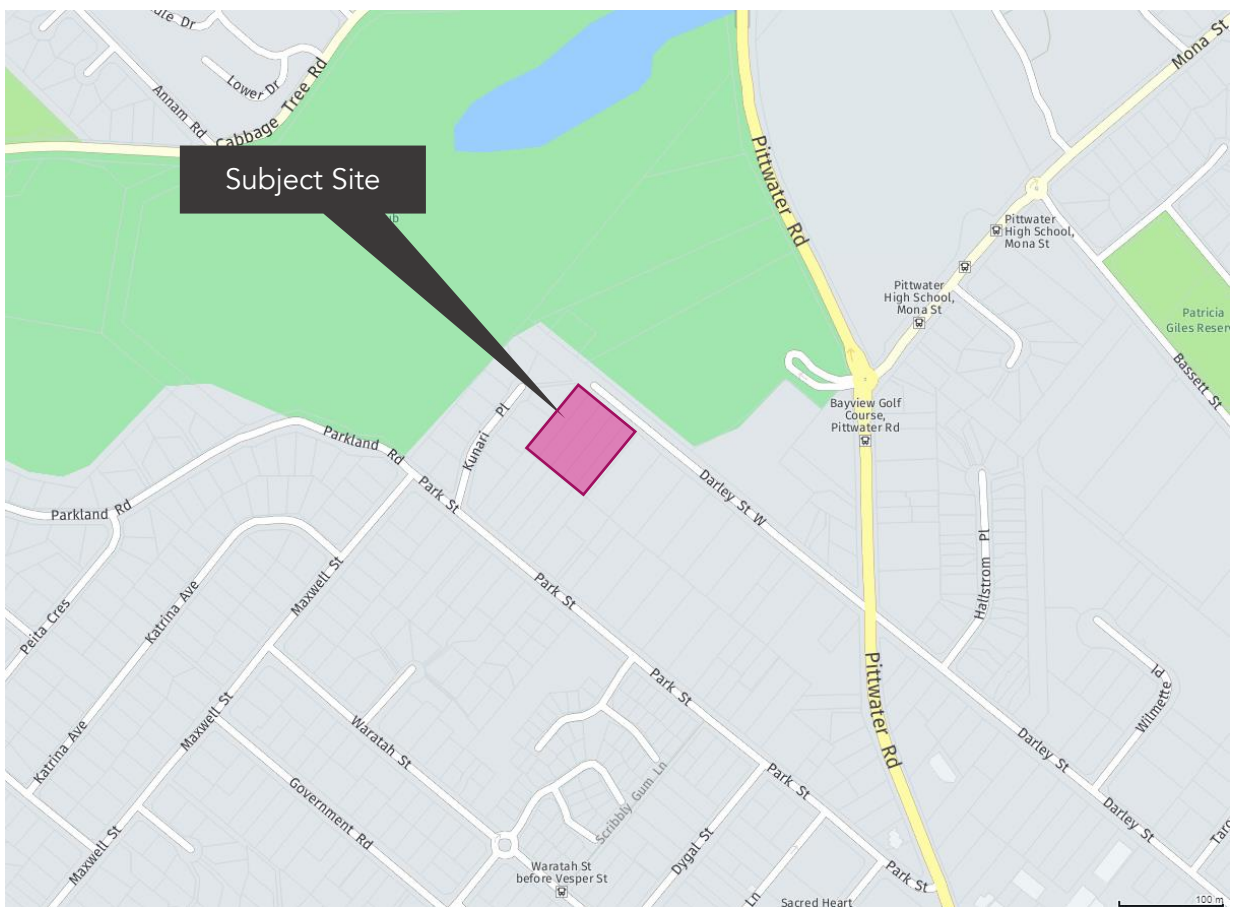


Figure 1: Site location (Source: HERE WeGo Maps)

## 1.2 Ministerial Directions

Section 9.1(2) of the Environmental Planning and Assessment Act 1979 requires that planning proposals follow specific Ministerial Directions. This traffic report addresses the following Ministerial Direction:

### 3.4 Integrating Land Use and Transport

*The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives:*

- a) improving access to housing, jobs and services by walking, cycling and public transport, and*
- b) increasing the choice of available transport and reducing dependence on cars, and*
- c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and*
- d) supporting the efficient and viable operation of public transport services, and*
- e) providing for the efficient movement of freight.*

The proposal at 159-167 Darley Street West, Mona Vale, will not be changing the function of the existing land use as a residential zone. Additionally, the development will have a negligible impact the surrounding transport network while also improving access to housing.

## 2 Background information

### 2.1 Site context

The site of the proposal lies within a Low Density Residential (R2) zone. The local land use surrounding the subject site is shown in Figure 2.

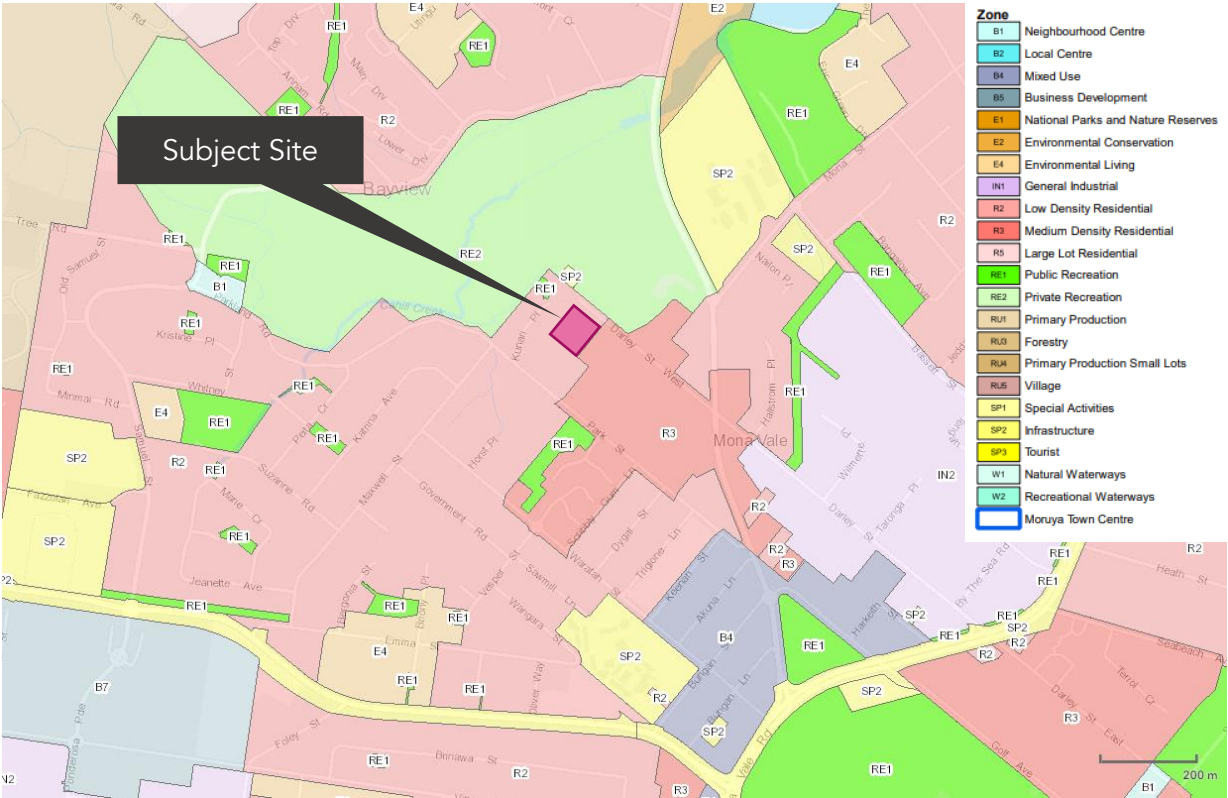


Figure 2: Local land use map (Source: ePlanning Spatial Viewer)

## 2.2 Development Site

The development site comprises of the following lots, as shown in :

- DP11108, LOT 1-5



Figure 3: Property information

## 2.3 Development proposal

A detailed description of the proposal is provided in the planning proposal request and architectural plans. The key aspects of the concept scheme from a traffic perspective are summarised below:

- 3 x 2-storey townhouses
- 2 x 2-storey residential flat buildings
  - Building A – 20 Dwellings
  - Building B – 18 Dwellings
- The three townhouses will have individual garages while the residential flat buildings will have basement car parks below each building.

The layout of the potential development is shown in Figure 4.





Figure 4: Proposed development layout (Source: Urban Design Study – Giles Tribe)

### 3 Existing transport infrastructure

#### 3.1 Road hierarchy

The NSW administrative road hierarchy comprises the following road classifications:

- State Roads – Under the care and maintenance of Roads and Maritime Services
- Regional Roads – Under the care and maintenance of Council partially funded by the State
- Local Roads – Under the care and maintenance of Council



Figure 5: Road hierarchy (Source: RMS Road Hierarchy Review)

### 3.1.1 Existing road network

Table 1: Existing road network – Darley Street West

Darley Street West	
Road Classification	Local Road
Alignment	East - West
Number of Lanes	1 lane in each direction
Carriageway Type	Undivided
Carriageway Width	8 metres
Speed Limit	50 kph
School Zone	No
Parking Controls	No restrictions (60-degree parking northern side)
Forms Site Frontage	Yes



Figure 6: Existing road network – Darley Street West (Eastbound)

Table 2: Existing Road Network – Pittwater Road (Regional Road)

Pittwater Road	
Road Classification	Regional Road
Alignment	North - South
Number of Lanes	2 lanes in each direction
Carriageway Type	Undivided
Carriageway Width	14 metres
Speed Limit	60 kph
School Zone	No
Parking Controls	No restrictions
Forms Site Frontage	No



Figure 7: Existing road network – Pittwater Road (Southbound)



Table 3: Existing road network – Pittwater Road (State Road)

Pittwater Road	
Road Classification	State Road
Alignment	North - South
Number of Lanes	3 lanes in each direction and 1 bus lane in each direction
Carriageway Type	Divided
Carriageway Width	21 metres
Speed Limit	60 kph
School Zone	No
Parking Controls	¼P 8:30am-3pm (Mon-Fri), 8am-2:30pm (Sat)
Forms Site Frontage	No



Figure 8: Existing road network – Pittwater Road (Southbound)

Table 4: Existing road network – Mona Vale Road

Mona Vale Road	
Road Classification	State Road
Alignment	East - West
Number of Lanes	2 lanes in each direction
Carriageway Type	Undivided
Carriageway Width	14 metres
Speed Limit	60 kph
School Zone	No
Parking Controls	Unrestricted
Forms Site Frontage	No



Figure 9: Existing road network – Mona Vale Road (Eastbound)



Table 5: Existing road network – Barrenjoey Road

Barrenjoey Road	
Road Classification	State Road
Alignment	North - South
Number of Lanes	3 lanes in each direction
Carriageway Type	Divided
Carriageway Width	21 metres
Speed Limit	60 kph
School Zone	No
Parking Controls	No Stopping
Forms Site Frontage	No



Figure 10: Existing road network – Mona Vale Road (Eastbound)

### 3.2 Public transport

The locality has been assessed in the context of available forms of public transport that may be utilised by prospective residents and visitors. When defining accessibility, reference is made to the NSW Planning Guidelines for Walking and Cycling (2004) where a distance of 400-800m is recommended as a comfortable walkable catchment to access public transport and local amenities. [Further, Integrating Land Use and Transport, Improving Transport Choice — Guidelines for planning and development \(2001\) requires that households be located within a 400 metre walk of a bus route, accessing a metropolitan railway station.](#)

Figure 11 [illustrates shows](#) the public transport services in relation to the subject site [and demonstrates compliance with the requirements.](#)

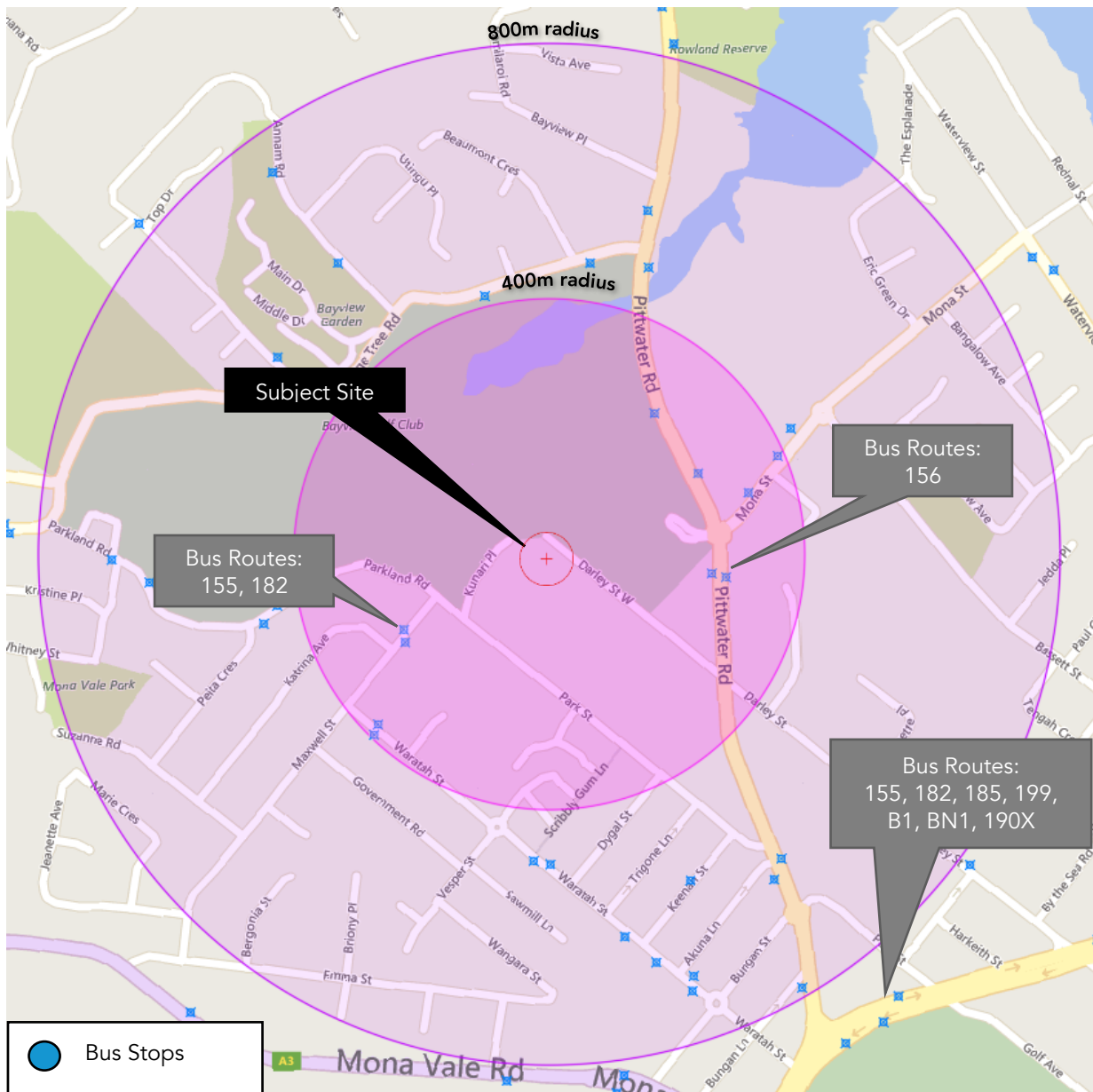


Figure 11: Local public transport services

### 3.2.1 Bus services

There is an abundance of bus stops within 800m of the site as shown in Figure 11 with great service coverage. Additionally, on Barrenjoey Road which is just outside of the 800m radius are additional bus services along with the B1 (B-Line) bus which provides a direct route to the city. The bus service information and the routes are shown in Table 6 and Figure 1.

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Table 6: Bus services summary

Route	Coverage	Frequency (approx.)
Standard Bus Services		
155	Bayview Garden Village to Northern Beaches Hospital <a href="#">(direct, non-school service)</a>	Mon-Sun: Every hour
156	McCarrs Creek to Mona Vale <a href="#">(direct, non-school service)</a>	Mon-Sun: Every 30 minutes
182	Mona Vale to Narrabeen	Mon-Sun: Every hour
199	Palm Beach to Manly via Mona Vale & Dee Why	Mon-Sun: Every 10-20 minutes
190X	Avalon Beach to City Wynyard (Express Service)	Mon-Fri: Every 10-20 minutes
B-Line Bus Services		
B1	B-Line Mona Vale to City Wynyard	Mon-Fri: Every 2-10 minutes during peak hours, 10 minutes during off-peak hours Sat & Sun: Every 10 to 15 minutes
BN1	B-Line City QVB to Mona Vale (Night Service)	Mon-Sun: Every 10 to 30 minutes
School Buse Services		
131	Galstaun School to Sacred Heart PS via Pittwater HS (School Bus)	Mon-Fri: One morning service
162	Myoora Rd before Booralie Rd to Sacred Heart PS via North Narrabeen (School Bus)	Mon-Fri: One morning service
632N	Manly Wharf to St. Lukes Dee Why (School Bus)	Mon-Fri: One afternoon service
633N	Pittwater High to Mater Maria Warriewood (School Bus)	Mon-Fri: One afternoon service
635N	Cromer Heights to Sacred Heart PS (School Bus)	Mon-Fri: One afternoon service
638N	Pittwater High to Newport (School Bus)	Mon-Fri: One afternoon service
639N	Pittwater High to Barrenjoey High (School Bus)	Mon-Fri: One afternoon service
649N	Pittwater High to Beacon Hill (School Bus)	Mon-Fri: One afternoon service
679N	Pittwater High to Plateau & Barrenjoey Rds (School Bus)	Mon-Fri: One afternoon service
789N	Balgowlah Boys HS to Avalon (School Bus)	Mon-Fri: One afternoon service

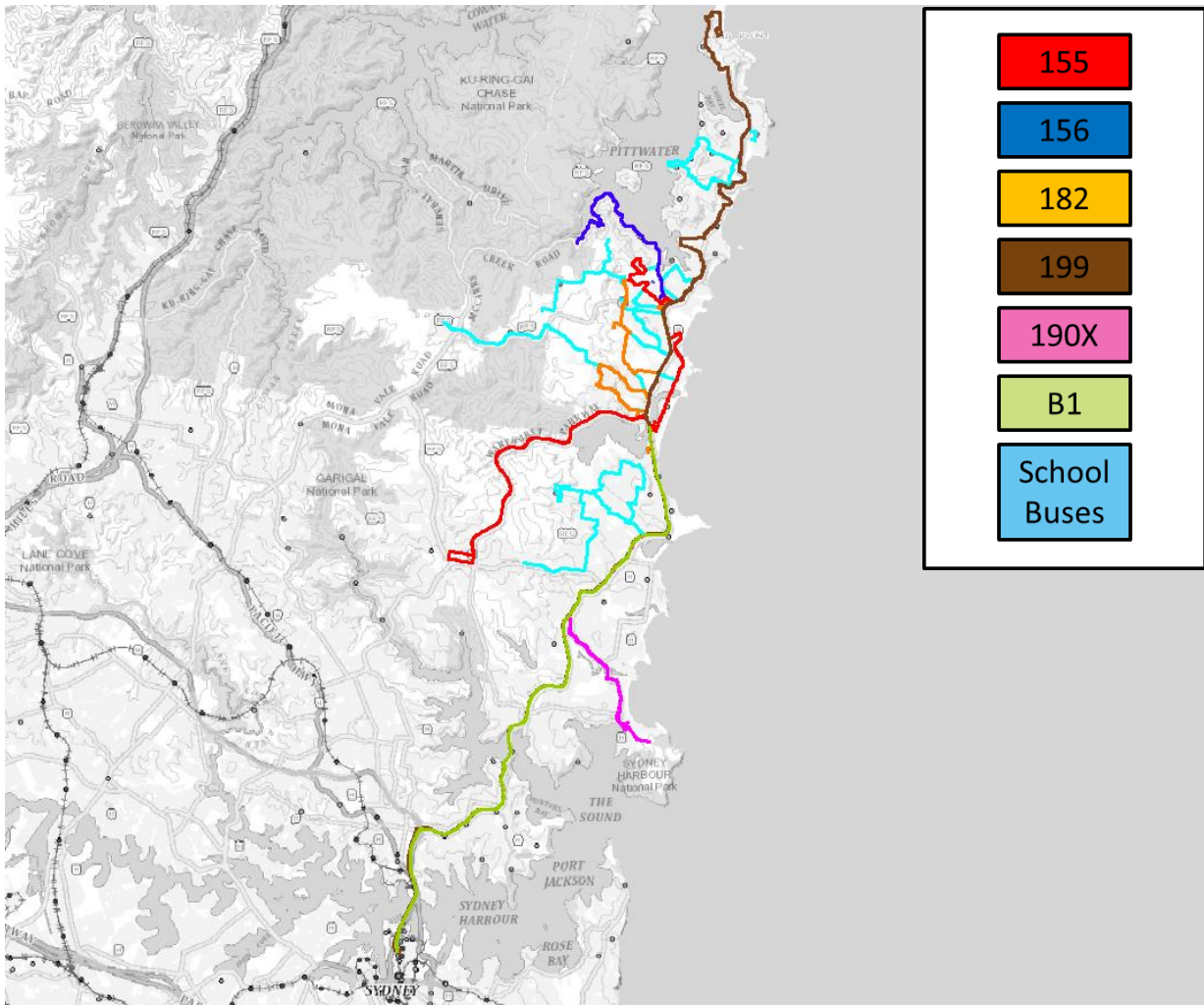


Figure 12: Map of bus routes

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### 3.3 Active transport

#### 3.3.1 Walking

As mentioned above, the NSW Planning Guidelines for Walking and Cycling (2004) recommends a distance of 400-800m as a comfortable walkable catchment to access public transport and local amenities. Figure 11 shows the 400m and 800m walking catchments for the site.

A Walk Score assessment has been undertaken, using [www.walkscore.com](http://www.walkscore.com) and this analysis indicates that the existing site has a Walk Score of 73. Based on this classification the site is deemed 'very walkable' as most errands can be accomplished by foot. Figure 13 summarises the factors which determine the walk score.



## Scores for 159 Darley Street West



Walk Score  
**73**



Figure 13: Walk score (Source: Walk Score)

### 3.3.2 Cycling

Figure 14 shows the extent of cycle infrastructure within the surrounding area of the subject site. There is a range of low-moderate difficulty on-road bike paths along with an abundance of off-road bike paths servicing the Mona Vale and neighbouring suburbs. However, there are no direct routes to the proposed development site.

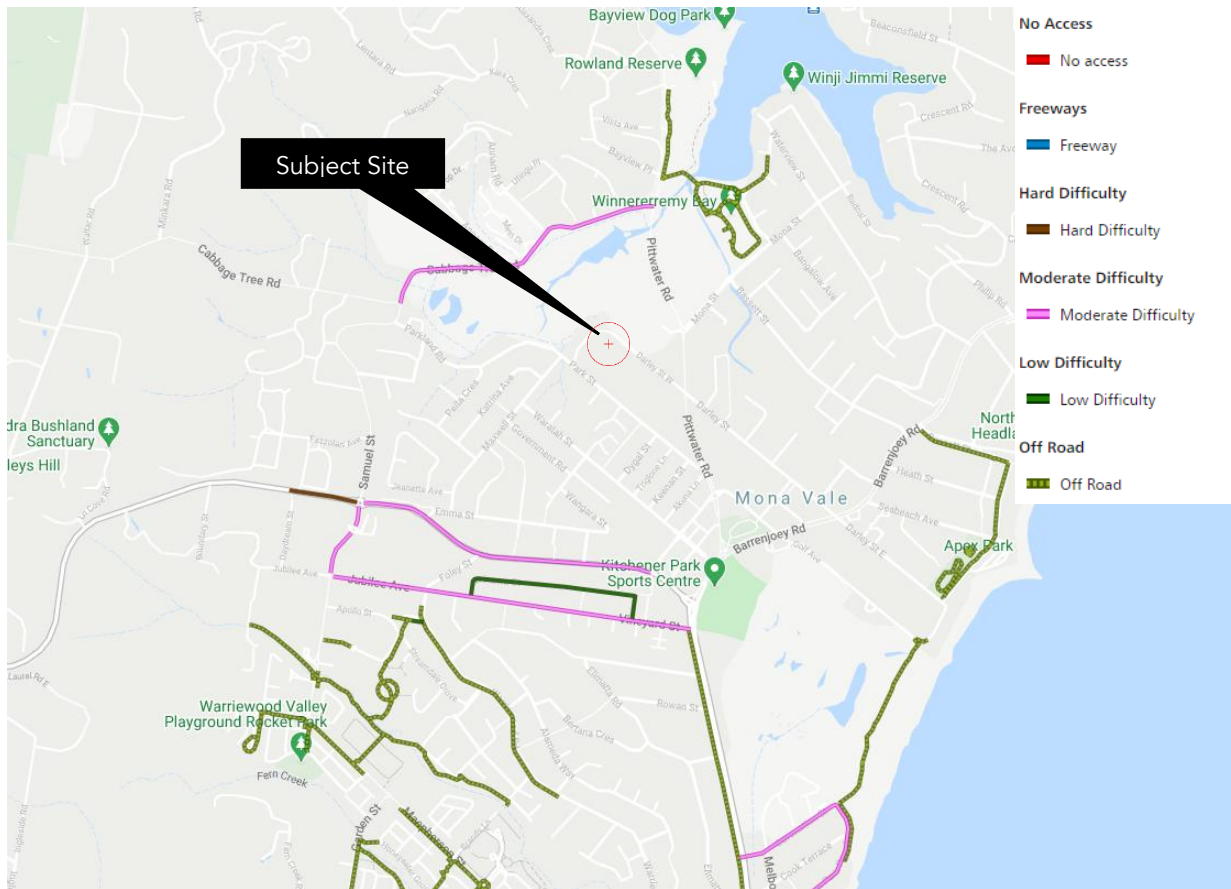


Figure 14: Cycling routes (Source: RMS Cycleways Finder)

## 4 Parking provision

### 4.1 Planning policy

The proposed development is subject to the parking provision rates specified in the following planning documents:

- Northern Beaches Council Pittwater 21 Development Control Plans (DCP) 2004
- State Environmental Planning Policy (SEPP) 65: Design Quality of Residential Apartment Development 2002
- NSW Department of Planning and Environment (DPE): Apartment Design Guideline (ADG) 2015

### 4.2 Proposed parking requirements

The proposal includes three townhouse developments and two residential flat buildings. The two residential type developments require separate car park provision assessment due to the nature of their land use.

#### 4.2.1 Townhouse (dwelling house)

The townhouse developments can be categorised as a 'dwelling house'. The DCP specifies that a dwelling house requires the following minimum parking rates be applied:

- 1-bedroom dwelling requires 1 space
- 2 or more-bedroom dwelling requires 2 spaces

All three townhouses will have three bedrooms each; therefore, each will require **2 car parking spaces** bringing the total to **6 spaces**.

#### 4.2.2 Residential flat building

The DCP states that for residential flat buildings the following minimum rates are adopted:

- 1-bedroom dwelling requires 1 space
- 2 or more-bedroom dwelling requires 2 spaces
- 1 space per 3 dwellings for visitor spaces

Table 7 summarises the parking requirements for the residential flat buildings.

Table 7: Residential flat buildings parking provision

Building	No. Bedrooms/Visitor	Parking Rate	Parking Requirement	Parking Proposed
A	1	1 space per dwelling	6	
	2+	2 spaces per dwelling	28	
	Visitor	1 space per 3 dwellings	7	
	<b>Total</b>		<b>41</b>	<b>43</b>
B	1	1 space per dwelling	6	
	2	2 spaces per dwelling	24	
	Visitor	1 space per 3 dwellings	6	
	<b>Total</b>		<b>36</b>	<b>37</b>

### 4.2.3 Accessible/adaptable parking spaces

The DCP states that the residential flat building component of the proposal requires accessible and adaptive spaces to be included in the car parking provision.

Residential flat buildings are required to have 10% adaptable housing, with one (1) adaptable space ~~is required~~ per adaptable dwelling.

It is also specified in the DCP that 3% of the required parking spaces are to be accessible spaces.

Table 8 summarises the calculations to determine the total number of accessible and adaptable spaces required to be included as part of the total parking provision.-

Table 8: Accessible/Adaptable parking provision

Component	Number of dwellings/spaces	Parking Rate	Parking Requirement (min)	Proposed Provision
Adaptable	38	10% of dwellings	4	
Accessible	77	3% of total spaces	3	
<b>Total</b>			<b>6</b>	<b>6</b>

It should be noted that ~~although~~ the ~~provision for inclusion of~~ accessible and adaptable parking spaces will be further detailed to meet the requirements of the DCP during the Development Application stage.

## 4.3 Bicycle parking requirements

The DCP stipulates that for residential flat developments, secure bicycle storage facilities must be provided within the building at the rate of 1 bicycle rack per 3 dwellings.

Table 9 summarises the parking provision for bicycle storage facilities.

Table 9: Bicycle parking provision

Number of dwellings	Parking Rate	Parking Requirement (min)	Proposed Provision
38	1 bicycle space per 3 dwellings	13	13

The development will provide adequate storage cage facilities for bicycle storage which will be further detailed in the next design stage.

## 4.4 Motorcycle parking requirements

The DCP does not specify any requirements for motorcycle parking facilities for the development land use.

## 4.5 Carwash bay requirements

The DCP stipulates and development with greater than 10 dwellings must provide car wash bay facilities. The development proposes to include a car wash bay in each of the two basement car parks.



## 5 Traffic impact assessment

Generally, the traffic activity associated with a particular type of land use can be determined through a number of approaches. For the purposes of this assessment, the traffic generation related to each land use for the existing and post-development traffic generation is determined with reference to the following document:

- RMS Guide to Traffic Generating Developments 2002 (RMS Guide); and

### 5.1 Existing traffic generation

The site is currently occupied by 4 single house dwellings. The RMS Guide provides the following rates for a single dwelling house to estimate the generated traffic:

- Weekday peak hour vehicle trips = 0.85 per dwelling

Table 10 summarises the trips generated by the existing developments.

Table 10: Summary of existing traffic generation

Peak Hour	Number of Dwellings	Trip Generation Rate	Generated Trips
AM	4	0.85 trips per dwelling	4
PM		0.85 trips per dwelling	4

### 5.2 Proposed traffic generation

The development application proposes that the existing dwellings will be replaced by 3 townhouses and 24 38 residential flat apartments. The three townhouses can be treated as single house dwellings and acquires the same rates used for the existing traffic generation. The residential flat apartments adopt a different rate from the RMS guide. The following rate is provided for the residential flat building with three or more bedrooms:

- Weekday peak hour vehicle trips = 0.5-0.65 per dwelling

Due to the lack of heavy rail and nearby bus services, it can be assumed that the 0.65 peak hour vehicles trips per dwelling rate can be adopted.

Table 11 summarises the trips generated by the proposed development

Table 11: Summary of proposed traffic generation

Peak Hour	Type of Dwelling	Number of Dwellings	Trip Generation Rate	Generated Trips
AM	Townhouse	3	0.85 trips per dwelling	3
PM			0.85 trips per dwelling	3
AM	Residential Flat	38	0.65 trips per dwelling	25
PM			0.65 trips per dwelling	25

The net trip generation created by the development can be calculated by adding the existing traffic generation and the proposed. Table 12 outlines the total amount of traffic generation.

Table 12: Net traffic generation

	AM Peak	PM Peak
Existing Peak Hour Trips	4	4
Development Peak Hour Trips	28	28
<b>Peak Hour Trips</b>	<b>24</b>	<b>24</b>

### 5.3 Existing traffic volumes

Due to the COVID-19 restrictions currently in place, it has not been possible to undertake traffic surveys of the existing intersections, as vehicle volumes through the intersection would not be representative of the typical traffic volumes. Alternatively, the traffic volumes in the vicinity of the subject site were determined using historic intersection survey data which were then interpolated based on nearby annual traffic counters from TfNSW Traffic Volume Viewer.

The surveys were conducted on Thursday, 22<sup>nd</sup> October 2016 between 7:30-9:30am and 2:30-6:30pm at the following intersection:

- Pittwater Road / Darley Street West

The location of the intersection surveyed is shown in Figure 15.



Figure 15: Pittwater Road / Darley Street West intersection (Source: Nearmaps)

According to the TfNSW Traffic Volume Viewer the nearest traffic count was taken on Barrenjoey Road, 7km south of the intersection adjacent to the Barrenjoey Road / Pittwater Road intersection. The counter shows traffic volume data from 2008-2019 for both eastbound and westbound traffic.

Figure 16 shows graphs for the traffic volume data during the AM and PM peaks.

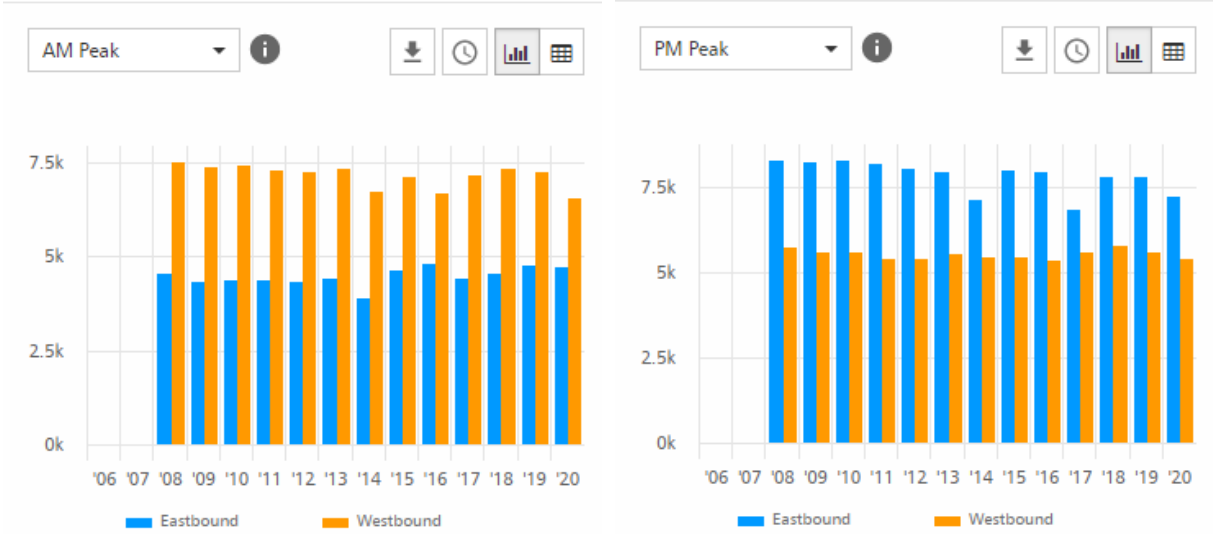


Figure 16: Traffic volume data for Barrenjoey Road (Source: TfNSW Traffic Volume Viewer)

During both the morning and afternoon peak hours in Figure 16, the eastbound and westbound traffic has shown little to no growth between the 2008 and 2019 period. Therefore, it can be assumed that the growth has been negligible between 2015 and the existing traffic volume.

**5.3.1 Existing peak hour traffic volumes**

The peak hour for the intersection was calculated based on the total number of vehicles passing through each leg at 15-minute intervals. The AM and PM peak hours are as follows:

- Morning Peak Period: 8:00am-9:00am
- Afternoon Peak Period: 3:30pm-4:30pm

The existing traffic volumes collected during the peak hours are shown in Figure 17 and Figure 18.



Figure 17: Existing AM peak traffic volumes



Figure 18: Existing PM peak traffic volumes

## 5.4 Development traffic distribution

The following assumptions were made to determine the assignment of the additional trips generated by the proposed development:

- The inbound and outbound traffic split was assumed to be 80% outbound and 20% inbound during the morning peak and vice versa for the PM peak. This assumes that most residents will leave in the morning for work while some may return from night shifts or dropping other members within the residence off to work or school.
- The directional distribution of vehicles has been adopted from the existing surveys by using the directional ratio of vehicles entering and exiting Darley Street West. The directional split with the inbound and outbound split incorporated is illustrated in Figure 19 and Figure 20 for the morning and afternoon peak respectively.



Figure 19: Directional split during the AM peak hour





Figure 20: Directional split during the PM peak hour

## 5.5 SIDRA analysis

In order to confirm the current operation of the intersection, an assessment has been undertaken using the SIDRA Intersection modelling software, which presents a range of performance indicators (Level of Service, Average Delay, etc.).

Typically, there are four performance indicators used to summarise the performance of an intersection, being:

- Degree of Saturation – The total usage of the intersection expressed as a factor of 1 with 1 representing 100% use/saturation. (e.g. 0.8=80% saturation)
- Average Delay – The average delay encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay.
- 95% Queue lengths (Q95) – is defined to be the queue length in metres that has only a 5-percent probability of being exceeded during the analysis time period. It transforms the average delay into measurable distance units.
- Level of Service (LoS) – This is a categorization of average delay, intended for simple reference. The RMS adopts the following bands:

The LoS criteria is shown in Table 13.

Table 13: Level of Service Criteria

Level of Service	Average Delay (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Extra capacity required	Extreme delay, major treatment required

The following intersection was analysed using SIDRA based on survey data collected on Thursday, 22<sup>nd</sup> October 2015:

- Pittwater Road / Darley Street West

A summary of the modelling results for the existing and proposed post development traffic conditions are presented in Table 14. The full movement summary of the outputs from SIDRA along with the intersection layouts used are provided in Attachment 1.

Table 14: SIDRA modelling results for pre and post-development

Intersection	Time	Period	Level of Service	Highest Average Delay (s)	Highest Degree of Saturation (%)	Longest 95% Queue Length (m)
Pittwater Road / Darley Street West	AM Peak	Existing	LOS B	19.5	0.732	91.3
		Development	LOS B	20.3	0.643	100.8
	PM Peak	Existing	LOS B	20.4	0.659	90.6
		Development	LOS B	20.8	0.697	92.7

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### 5.5.1 Intersection summary

The SIDRA analysis of the Pittwater Road and Darley Street West intersection indicates that it currently performing at a good LOS B in both the AM and PM peaks. When the development is introduced, the LOS remains at a good LOS B with spare capacity in both the AM and PM peaks and with a negligible increase in average delay.

## 6 Access and car park assessment

The following section presents an assessment of the proposed development with reference to the requirements of AS2890.1:2004 Off-street car parking, AS2890.3:2015 Bicycle parking and AS2890.6-2009 Off-street parking for people with disabilities, as well as industry best practice. The proposed car park is to be used as a residential car park; therefore, it has been designed as a Class 1A parking facility.

### 6.1 Car park arrangement

#### 6.1.1 Residential

The car park access and parking arrangements are to be assessed against the requirements of AS2890.1:2004, with reference to Class 1A (residential/employee) facilities. The development is to provide the following dimensions for the parking spaces (90° angle parking):

- Car Spaces: 2.4m x 5.4m
- Aisle Width: 5.8m (minimum)

All parking spaces provided are to meet the minimum requirements stated in the Australian standards.

#### 6.1.2 Accessible parking

All accessible parking spaces are to be individually assessed against the requirements of AS2890.6. Accessible parking spaces are to be designed based on the following dimensions:

- Accessible Space: 2.4m x 5.4m
- Adjacent Shared Bay: 2.4m x 5.4m (with a bollard)

All shared bays and accessible spaces will be in accordance with AS2890.6, including the installation of bollards and relevant pavement marking. A minimum height clearance of 2.5m is to be maintained above all accessible and shared bays.

#### 6.1.3 Bicycle parking

Approved bicycle parking devices (BPD's) shall be installed as per the following requirements of AS2890.3:2015:

- Horizontal Parking: 1800mm x 500mm
- Access Aisle: 1500mm

Any bicycle spaces which are provided by the development will adhere to the above requirements.

#### 6.1.4 Motorcycle parking

All motorcycle parking spaces are to be individually assessed against the requirements of AS2890.3:2015. Motorcycle parking spaces are to be designed based on the following dimensions:

- Horizontal Parking: 2400mm x 1200mm

The proposed development motorcycle spaces will adhere to the above requirements.

## 7 Conclusion

**ptc.** has been engaged by Intrec to prepare a Traffic Impact Assessment (TIA) to accompany a Planning Proposal (PP) to Northern Beaches Council for the development of a residential development at 159-167 Darley Street West, Mona Vale. The key findings of this Traffic Impact Assessment are:

- The Site is located within the Northern Beaches Council Local Government Area (LGA) and under Council's Local Environmental Plan (LEP), the site is zoned R2 Low Density Residential. The proposal seeks to amend these controls and rezone the site as R3 Medium Density Residential.
- The development is proposed to include 3 x 2-storey townhouses and 2 x 2-storey residential flat buildings (38 dwellings). The 3 townhouses will have individual garages while the residential flat buildings will have basement car parks below each building.
- The site is accessible to public transport via 10 bus stops within a 400-800m walkable radius. There are no heavy rail services within proximity to the site. Mona Vale town centre is located 600m from the development site which allows the future residents of the development to walk to the shops and restaurants nearby.
- The development is proposing a total of 6 spaces for the townhouses and 44 spaces for Building A and 29 Spaces for Building B of the residential flat development. 4 of the residential flat building parking spaces are required to be adaptable and 3 spaces accessible. Car park access for both the townhouses and the residential flat building will be via Darley Street West.
- A SIDRA analysis of the Pittwater Road and Darley Street West intersection was conducted and the modelling indicates that the intersection is currently performing at a good Level of Service (LOS) B in both the AM and PM peaks. When the development is introduced, the LOS remains at a good LOS B with spare capacity in both the AM and PM peaks and with a negligible increase in average delay.
- The access and basement design would generally be designed having regard for the relevant Australian Standards (AS2890 series). Detailed assessment of the design ensuring compliance with AS2890 and relevant Council controls would be undertaken as part of the DA documentation.

In summary, the Planning Proposal is supportable on traffic planning grounds and will not result in any adverse impacts on the surrounding road network or the availability of on-street parking.



## Attachment 1      SIDRA Movement Summaries

# MOVEMENT SUMMARY

**Site: TCS3148 [03 - Pittwater Road / Darley Street W (AM Development) (Site Folder: Development)]**

AM Peak: 8:00-9:00AM

PM Peak: 3:30-4:30PM

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

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: Pittwater Road (S)														
1	L2	16	0	17	0.0	0.136	11.1	LOS A	2.9	21.0	0.36	0.34	0.36	53.2
2	T1	351	16	369	4.6	0.547	10.7	LOS A	9.5	68.5	0.52	0.51	0.52	50.3
3	R2	106	2	112	1.9	0.547	19.6	LOS B	9.5	68.5	0.65	0.64	0.65	46.4
Approach		473	18	498	3.8	0.547	12.7	LOS A	9.5	68.5	0.55	0.54	0.55	49.5
East: Darley Street (E)														
4	L2	210	5	221	2.4	0.643	48.7	LOS D	10.2	73.1	0.97	0.83	0.98	33.3
5	T1	8	0	8	0.0	0.502	40.2	LOS C	6.9	49.2	0.94	0.80	0.94	34.4
6	R2	138	3	145	2.2	0.502	45.8	LOS D	6.9	49.2	0.94	0.80	0.94	33.8
Approach		356	8	375	2.2	0.643	47.4	LOS D	10.2	73.1	0.96	0.82	0.97	33.5
North: Pittwater Road (N)														
7	L2	164	7	173	4.3	0.139	11.4	LOS A	2.8	20.5	0.36	0.67	0.36	49.4
8	T1	585	7	616	1.2	0.555	8.1	LOS A	14.3	100.8	0.51	0.47	0.51	52.9
9	R2	8	0	8	0.0	*0.555	13.6	LOS A	14.3	100.8	0.51	0.47	0.51	51.4
Approach		757	14	797	1.8	0.555	8.8	LOS A	14.3	100.8	0.48	0.51	0.48	52.1
West: Darley Street West (W)														
10	L2	19	0	20	0.0	0.550	55.5	LOS D	4.1	29.2	1.00	0.78	1.01	31.4
11	T1	13	1	14	7.7	0.550	49.4	LOS D	4.1	29.2	1.00	0.78	1.01	31.8
12	R2	47	0	49	0.0	*0.550	54.7	LOS D	4.1	29.2	1.00	0.78	1.01	31.3
Approach		79	1	83	1.3	0.550	54.0	LOS D	4.1	29.2	1.00	0.78	1.01	31.4
All Vehicles		1665	41	1753	2.5	0.643	20.3	LOS B	14.3	100.8	0.63	0.60	0.63	44.7

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

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[ Ped ped	Dist ] m					
South: Pittwater Road (S)												
P1	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
East: Darley Street (E)												
P2	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03

North: Pittwater Road (N)												
P3	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
West: Darley Street West (W)												
P4	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	204.7	208.6	1.02
All	Pedestrians	200	211	44.3	LOS E	0.1	0.1	0.94	0.94	208.5	213.6	1.02

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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# MOVEMENT SUMMARY

**Site: TCS3148 [04 - Pittwater Road / Darley Street W (PM Development) (Site Folder: Development)]**

AM Peak: 8:00-9:00AM

PM Peak: 3:30-4:30PM

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

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: Pittwater Road (S)														
1	L2	45	0	47	0.0	0.167	11.6	LOS A	3.8	26.5	0.38	0.41	0.38	52.3
2	T1	441	5	464	1.1	0.671	11.0	LOS A	13.1	92.7	0.56	0.56	0.56	50.0
3	R2	136	3	143	2.2	* 0.671	18.8	LOS B	13.1	92.7	0.66	0.66	0.66	47.0
Approach		622	8	655	1.3	0.671	12.7	LOS A	13.1	92.7	0.57	0.57	0.57	49.5
East: Darley Street (E)														
4	L2	224	5	236	2.2	* 0.697	48.3	LOS D	11.0	78.8	0.97	0.85	1.03	33.3
5	T1	9	0	9	0.0	0.660	41.2	LOS C	10.3	73.3	0.97	0.84	1.00	34.0
6	R2	200	5	211	2.5	0.660	46.8	LOS D	10.3	73.3	0.97	0.84	1.00	33.4
Approach		433	10	456	2.3	0.697	47.4	LOS D	11.0	78.8	0.97	0.84	1.01	33.4
North: Pittwater Road (N)														
7	L2	159	5	167	3.1	0.136	11.8	LOS A	2.8	20.3	0.37	0.67	0.37	49.2
8	T1	463	9	487	1.9	0.438	7.8	LOS A	10.6	75.5	0.48	0.43	0.48	53.1
9	R2	7	0	7	0.0	0.438	13.3	LOS A	10.6	75.5	0.48	0.43	0.48	51.6
Approach		629	14	662	2.2	0.438	8.9	LOS A	10.6	75.5	0.45	0.49	0.45	52.1
West: Darley Street West (W)														
10	L2	5	0	5	0.0	0.232	52.7	LOS D	1.7	12.1	0.95	0.73	0.95	32.4
11	T1	9	0	9	0.0	0.232	46.3	LOS D	1.7	12.1	0.95	0.73	0.95	32.9
12	R2	21	0	22	0.0	0.232	51.5	LOS D	1.7	12.1	0.95	0.73	0.95	32.3
Approach		35	0	37	0.0	0.232	50.3	LOS D	1.7	12.1	0.95	0.73	0.95	32.5
All Vehicles		1719	32	1809	1.9	0.697	20.8	LOS B	13.1	92.7	0.64	0.61	0.65	44.4

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.

Intersection and Approach LOS values are based on average delay for all vehicle 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.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[ Ped ped	Dist ] m					
South: Pittwater Road (S)												
P1	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
East: Darley Street (E)												
P2	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03



North: Pittwater Road (N)												
P3	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
West: Darley Street West (W)												
P4	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	204.7	208.6	1.02
All	Pedestrians	200	211	44.3	LOS E	0.1	0.1	0.94	0.94	208.5	213.6	1.02

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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# MOVEMENT SUMMARY

**Site: TCS3148 [01 - Pittwater Road / Darley Street W (AM Existing) (Site Folder: Existing)]**

AM Peak: 8:00-9:00AM

PM Peak: 3:30-4:30PM

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

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: Pittwater Road (S)														
1	L2	14	0	15	0.0	0.125	10.4	LOS A	2.5	18.4	0.34	0.32	0.34	53.8
2	T1	351	16	369	4.6	0.502	8.8	LOS A	8.7	62.6	0.48	0.48	0.48	51.7
3	R2	106	2	112	1.9	0.502	16.6	LOS B	8.7	62.6	0.58	0.60	0.58	48.3
Approach		471	18	496	3.8	0.502	10.6	LOS A	8.7	62.6	0.50	0.50	0.50	50.9
East: Darley Street (E)														
4	L2	210	5	221	2.4	0.732	52.6	LOS D	10.8	77.5	1.00	0.87	1.10	32.2
5	T1	7	0	7	0.0	0.537	42.2	LOS C	7.0	50.1	0.96	0.80	0.96	33.7
6	R2	138	3	145	2.2	0.537	47.7	LOS D	7.0	50.1	0.96	0.80	0.96	33.2
Approach		355	8	374	2.3	0.732	50.5	LOS D	10.8	77.5	0.98	0.84	1.04	32.6
North: Pittwater Road (N)														
7	L2	164	7	173	4.3	0.135	10.7	LOS A	2.6	19.2	0.34	0.67	0.34	49.9
8	T1	585	7	616	1.2	0.526	6.6	LOS A	12.9	91.3	0.47	0.43	0.47	54.1
9	R2	7	0	7	0.0	*0.526	12.1	LOS A	12.9	91.3	0.47	0.43	0.47	52.5
Approach		756	14	796	1.9	0.526	7.6	LOS A	12.9	91.3	0.44	0.48	0.44	53.1
West: Darley Street West (W)														
10	L2	14	0	15	0.0	0.509	57.4	LOS E	3.1	22.2	1.00	0.76	1.00	30.9
11	T1	10	1	11	10.0	0.509	51.3	LOS D	3.1	22.2	1.00	0.76	1.00	31.3
12	R2	35	0	37	0.0	*0.509	56.6	LOS E	3.1	22.2	1.00	0.76	1.00	30.8
Approach		59	1	62	1.7	0.509	55.9	LOS D	3.1	22.2	1.00	0.76	1.00	30.9
All Vehicles		1641	41	1727	2.5	0.732	19.5	LOS B	12.9	91.3	0.59	0.57	0.61	45.2

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

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[ Ped ped	Dist ] m					
South: Pittwater Road (S)												
P1	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
East: Darley Street (E)												
P2	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03

North: Pittwater Road (N)												
P3	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
West: Darley Street West (W)												
P4	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	204.7	208.6	1.02
All	Pedestrians	200	211	44.3	LOS E	0.1	0.1	0.94	0.94	208.5	213.6	1.02

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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# MOVEMENT SUMMARY

**Site: TCS3148 [02 - Pittwater Road / Darley Street W (PM Existing) (Site Folder: Existing)]**

AM Peak: 8:00-9:00AM

PM Peak: 3:30-4:30PM

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

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: Pittwater Road (S)														
1	L2	31	0	33	0.0	0.164	12.0	LOS A	3.7	26.4	0.39	0.39	0.39	52.3
2	T1	441	5	464	1.1	0.659	11.0	LOS A	12.8	90.6	0.56	0.55	0.56	50.1
3	R2	136	3	143	2.2	* 0.659	18.7	LOS B	12.8	90.6	0.66	0.65	0.66	47.0
Approach		608	8	640	1.3	0.659	12.8	LOS A	12.8	90.6	0.57	0.57	0.57	49.5
East: Darley Street (E)														
4	L2	224	5	236	2.2	* 0.655	46.4	LOS D	10.7	76.5	0.96	0.83	0.97	33.9
5	T1	6	0	6	0.0	0.618	39.6	LOS C	9.9	70.4	0.96	0.82	0.96	34.5
6	R2	200	5	211	2.5	0.618	45.2	LOS D	9.9	70.4	0.96	0.82	0.96	33.9
Approach		430	10	453	2.3	0.655	45.7	LOS D	10.7	76.5	0.96	0.83	0.97	33.9
North: Pittwater Road (N)														
7	L2	159	5	167	3.1	0.138	12.2	LOS A	2.9	20.9	0.39	0.68	0.39	49.0
8	T1	463	9	487	1.9	0.437	7.8	LOS A	10.6	75.2	0.48	0.43	0.48	53.1
9	R2	5	0	5	0.0	0.437	13.3	LOS A	10.6	75.2	0.48	0.43	0.48	51.6
Approach		627	14	660	2.2	0.437	9.0	LOS A	10.6	75.2	0.46	0.49	0.46	52.0
West: Darley Street West (W)														
10	L2	4	0	4	0.0	0.182	51.1	LOS D	1.4	10.1	0.93	0.72	0.93	32.9
11	T1	8	0	8	0.0	0.182	44.8	LOS D	1.4	10.1	0.93	0.72	0.93	33.4
12	R2	18	0	19	0.0	0.182	50.0	LOS D	1.4	10.1	0.93	0.72	0.93	32.8
Approach		30	0	32	0.0	0.182	48.8	LOS D	1.4	10.1	0.93	0.72	0.93	32.9
All Vehicles		1695	32	1784	1.9	0.659	20.4	LOS B	12.8	90.6	0.63	0.61	0.64	44.7

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

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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.

\* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[ Ped ped	Dist ] m					
South: Pittwater Road (S)												
P1	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
East: Darley Street (E)												
P2	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03



North: Pittwater Road (N)												
P3	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	209.8	215.2	1.03
West: Darley Street West (W)												
P4	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	204.7	208.6	1.02
All	Pedestrians	200	211	44.3	LOS E	0.1	0.1	0.94	0.94	208.5	213.6	1.02

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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