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# **Mona Vale Town Centre** **For Pittwater Council**

Traffic and Parking Strategy

4 May 2016



## Document Control

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# Contents

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<b>Executive Summary .....</b>	<b>1</b>
1.1 Primary Findings.....	1
1.1.1 Road Network Operation.....	1
1.1.2 Parking Strategy.....	1
1.1.3 Impact on User Groups .....	2
<b>1 Background.....</b>	<b>3</b>
1.1 Introduction .....	3
1.2 Place Planning.....	3
1.3 Aims of Study.....	3
1.4 Study Area.....	4
<b>2 Research and Data.....</b>	<b>6</b>
2.1 Types of Survey .....	6
2.1.1 Intersection Counts.....	6
2.1.2 Automatic Counters.....	7
2.1.3 Travel Time .....	8
2.1.4 Origin and Destination.....	8
2.2 On-street Parking Inventory .....	8
2.3 Parking Demand .....	9
2.4 Average Length of Stay and Turnover.....	9
2.5 Intercept Questionnaire.....	9
2.6 Online Questionnaire .....	9
2.7 Online School Questionnaire (Students and Staff) .....	9
2.8 Public Consultation.....	9
<b>3 Transport Network .....</b>	<b>10</b>
3.1 Road Network .....	10
3.2 Pedestrian Facilities.....	12
3.3 Cycling Facilities.....	12
3.4 Public Transport.....	13
3.5 Constraints and Opportunities .....	14
3.5.1 Constraints.....	15
3.5.2 Opportunities.....	16
<b>4 Improvement Options.....</b>	<b>18</b>
4.1 Intersection Reduction, Pittwater Road / Barrenjoey Road.....	18
4.2 Pittwater Road (between Barrenjoey Road and Bungan Street).....	18
4.3 Bungan Street / Pittwater Road Intersection.....	20
4.4 Bungan Street and Bungan Lane Shared Zone.....	21
4.5 Other Improvements.....	21
4.5.1 Arterial and Regional Road Signage.....	22
4.5.2 Parking Restrictions, Bungan Street.....	22
4.5.3 Split Phase Signal Operation at Pittwater Road / Darley Street .....	22
<b>5 Traffic Modelling .....</b>	<b>23</b>
5.1 Aims.....	23
5.2 Inputs.....	24
5.3 Outputs.....	24
5.4 Scenarios.....	25
5.5 Results.....	25

5.6	Findings.....	31
<b>6</b>	<b>Parking Strategy.....</b>	<b>32</b>
6.1	Framework.....	32
6.2	Strategy .....	33
6.3	User groups.....	35
6.3.1	Residents.....	35
6.3.2	Commuters and Workers in the Area.....	35
6.3.3	Visitors for Business and Social purposes.....	35
6.4	Current Peak Demand.....	35
6.5	Future unconstrained parking demand.....	37
6.6	Proposed Parking Strategies .....	39
6.7	Planning Control Parking Rates.....	41
<b>7</b>	<b>Pedestrian Strategy.....</b>	<b>44</b>
<b>8</b>	<b>Cycling Strategy .....</b>	<b>45</b>
<b>9</b>	<b>Conclusion .....</b>	<b>46</b>
9.1	Road Network Findings.....	46
9.2	Road Network Recommendations.....	46
9.3	Parking Strategy Recommendations .....	46
	<b>Attachment 1 - Intersection Traffic Survey Results.....</b>	<b>48</b>
	<b>Attachment 2 - Automated Counter Results.....</b>	<b>55</b>
	<b>Attachment 3 - On-street Parking Survey Results.....</b>	<b>56</b>
	<b>Attachment 4 - Intercept and Online Questionnaire Surveys .....</b>	<b>57</b>
	<b>Attachment 5 - Parking Demand Model.....</b>	<b>58</b>
	<b>Attachment 6 - Proposed Parking Strategies .....</b>	<b>59</b>
	<b>Attachment 7 - Traffic Modelling Presentation .....</b>	<b>64</b>

Figure 1 - Study Area.....	4
Figure 2 - Land Use Areas.....	5
Figure 3 - Intersection Survey Locations.....	6
Figure 4 - Road Hierarchy (Source: RMS Road Hierarchy Review, 2009).....	10
Figure 5 - Bus Routes Serving Mona Vale Town Centre.....	13
Figure 6 - Arterial and Regional Road Constraints.....	15
Figure 7 - Improvements to Pittwater Road and the Barrenjoey Road Intersection.....	19
Figure 8 - Conversion of Bungan Street Roundabout to Priority Intersections.....	20
Figure 9 - Bungan Street / Lane Shared Zone.....	21
Figure 10 - Screenshot of the Vissim Road Network Model.....	23
Figure 11 - Strategy Framework.....	32
Figure 12 - Change in Method of travel to work, 2001-2011 Mona Vale.....	34
Figure 13 - Employment location of Pittwater Council residents.....	34
Table 1 - Intersection Traffic Controls.....	7
Table 2 - Mona Vale Bus Service Frequency Details.....	14
Table 3 - Road Network Performance - Levels of Service.....	25
Table 4 - Modelling Results - AM Peak - Scenario 1 – 2015 Existing Situation.....	26
Table 5 - Modelling Results - PM Peak - Scenario 1 – 2015 Existing Situation.....	26
Table 6 - Modelling Results - AM Peak - Scenario 2 - Existing Arrangement with 2021 Traffic Volumes.....	27
Table 7 - Modelling Results - PM Peak - Scenario 2 - Existing Arrangement with 2021 Traffic Volumes.....	27
Table 8 - Modelling Results - AM Peak - Scenario 3 - Improvement Options with 2021 Traffic Volumes.....	28
Table 9 - Modelling Results - PM Peak - Scenario 3 - Improvement Options with 2021 Traffic Volumes.....	28
Table 10 - Peak parking demand for Council owned parking.....	35
Table 11 - Peak occupancy by land use.....	36
Table 12 - Length of stay for vehicles present at peak demand.....	37
Table 13 - Supply and Demand for the Main User Groups.....	37
Table 14 - Population Growth Factors.....	38
Table 15 - Projected Spaces Used by % Growth based on population growth.....	38
Table 16 - Projected Spaces Used by % Growth based on population growth – 5% change travel mode.....	39
Table 17 - Proposed Strategies.....	39
Table 18 - Development Parking Provision Policy Comparison.....	41

## Executive Summary

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This study has been prepared in the context of the Place Planning process being undertaken by Pittwater Council in relation to the Mona Vale Town Centre.

The aims of the study are to assess the road network capacity by way of traffic modelling and the current parking activity across the study area, providing Council with the information required to develop Place Planning improvements and a parking strategy.

The study has involved the collection of data through extensive surveys of the road network and parking usage as well as a public consultation process. This data has been modelled in relation to the future parking demands and traffic impacts across the Town Centre road network.

### 1.1 Primary Findings

#### 1.1.1 Road Network Operation

- In 2021 the traffic growth is relatively evenly distributed across the network and causes mainly even impacts at each intersection,
- The primary impact of the Place Planning Works (PPW) will be the distribution of increased traffic along Darley Street. This will require the extension of the right turn lane on the southbound Barrenjoey Road approach to Darley Street,
- The increase in traffic along Darley Street increases the delays at each end for vehicles joining Barrenjoey Road and Pittwater Road, although both intersections continue to operate within capacity,
- The Mona Vale Road / Pittwater Road intersection reaches a Level of Service C during the evening peak, which is consistent with the AECOM findings,
- The PPW constrain Pittwater Road and Park Street, so while the traffic volumes reduce, the delays remain relatively unchanged.
- The PPW result in only minor impacts on the Town Centre Road network.
- It should be noted that a traffic growth rate of 1% per year was adopted, although current records indicate zero growth over the past 5 years. The adopted rate of 1% is therefore considered to provide a robust assessment and is also inclusive of the growth associated with the Ingleside development.

The results of the traffic modelling are detailed in Section 5.

#### 1.1.2 Parking Strategy

- The parking surveys confirm that parking turnover within the Town Centre is high with a relatively short average length of stay, which is entirely appropriate within commercial centres.
- The surveys indicate a high degree of all day parking within the light industrial area surrounding Darley Street, which is indicative of commuters and workers. This type of activity prevents use by visitors and shoppers and therefore decreases the value of the parking spaces.
- The Town Centre is primarily subject to a 1 hour parking limit, while no restrictions apply to roads in close proximity to the Town Centre, which provides an opportunity for all-day parking, which in turn may encourage car usage.

- While the Place Planning may result in the loss of some on-street within the Town Centre, this could be offset through improved signage and connectivity of the Bungan Lane car park, and the addition of approximately 120 spaces within the proposed car park beneath Civic Square.
- A comparison of current planning controls with neighbouring Councils indicates that the minimum parking requirements are high in the context of a Town Centre and could be either reduced or converted to maximum limits in or to discourage car ownership and usage. This must however, be done in the context of the density of the Town Centre, access to employment and services, and public transport.
- There is high demand for drop-off and pick-up parking associated with the Mona Vale Public school, which impacts on the operation of Bungan Street and Waratah Street. This could be better managed through the provision of 5min parking controls during the School Zone times.

The Parking Strategy recommendations are detailed in Section 6.

### 1.1.3 Impact on User Groups

- **Commuters** – Will be subject to longer journey times along the Barrenjoey Road and Mona Vale Road corridors, mainly as a result of traffic growth. The implementation of restricted parking on Darley Street and increased parking restrictions within the residential area will increase the parking distance to the public transport locations on Barrenjoey Road.
- **Shoppers** – Some increased delay getting to/from the Town Centre but balanced impacts within the Town Centre, i.e. delays at some intersections, offset by lower volumes and reduced delay at others. Increased access to short-term parking if parking restrictions are applied to Darley Street and the residential area.
- **School Drop-off, Pick-up** – Some additional delay east-west along Bungan Street and accessing Pittwater Road as a result of traffic growth and the reduced speed limit within the proposed Shared Zone. Improved parking efficiency if a formal kiss and drop area is provided along the Bungan Street frontage.

# 1 Background

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## 1.1 Introduction

The Mona Vale Traffic Flow and Parking Strategy has been prepared as an outcome of the Place Planning project being undertaken by Pittwater Council for Mona Vale Town Centre. Parking and Traffic Consultants Pty Ltd (PTC) has been engaged by Council to undertake an assessment of traffic conditions and road network performance under existing and future scenarios and to develop a parking strategy to manage the existing and future parking supply.

The study has involved the collection of traffic and parking data through surveys and open forums with the public and local business community.

## 1.2 Place Planning

Between January 2014 and July 2015 Council undertook a Place Planning process, which involved public consultation and the documentation of ideas relating to the future planning of Mona Vale Town Centre. The primary goals of the process were to assist Council to:

- Create places designed for people,
- Attract the right uses to the right places,
- Provide a focal point for employment and a choice of affordable housing typology,
- Improve connectivity in and around the centre, especially for pedestrians,
- Recognise the importance of streets as community spaces and destinations.

## 1.3 Aims of Study

This study has been prepared to inform the Place Planning project being undertaken by Council as described above. Putting people rather than vehicles at the centre of Place Planning requires a change in focus towards connectivity for pedestrians, cyclists and public transport, a de-emphasis of vehicle access and the road network and a change to the management and priority of parking.

In this regard it is important to establish a balance between place making (an environment that is attractive for people to work, shop and live) and the transport network (the movement of vehicles around and through an area and the ability to accommodate parking).

The study brief detailed the following aims for this study:

- Prepare a traffic model(s) that will:
  - Assess the long-term traffic implications from the potential growth of the Mona Vale Town Centre
  - Provide a base line model to inform development assessment, traffic and transport strategy development in Mona Vale Town Centre
  - Review the performance of the existing public transport networks, especially to support the planned strategic bus corridors (BRT), and provide recommendations for improvements to cater for future growth and demands.





During the assessment of parking and connectivity it became apparent that the Study Area comprises three distinct land use categorisations, which is evidenced by the type of parking activity observed during the study. The three areas are illustrated in Figure 2 and comprise:

- Commercial Area (including schools and Council administration),
- Light Industrial Area,
- Residential Area.



Figure 2 - Land Use Areas

## 2 Research and Data

### 2.1 Types of Survey

In order to assess the current operation of the Town Centre and model future scenarios, both relating to the movement of vehicles and parking demands, a number of surveys were undertaken using various methods to best suit the type of data required. The surveys are detailed in the following.

#### 2.1.1 Intersection Counts

Intersection Counts were undertaken at the key intersections within the study area. The intersection count locations are illustrated in Figure 3 below. The surveys were undertaken using multiple cameras at each intersection and timed to coincide with the morning and afternoon peak periods, which includes the mid-afternoon school pick-up peak.

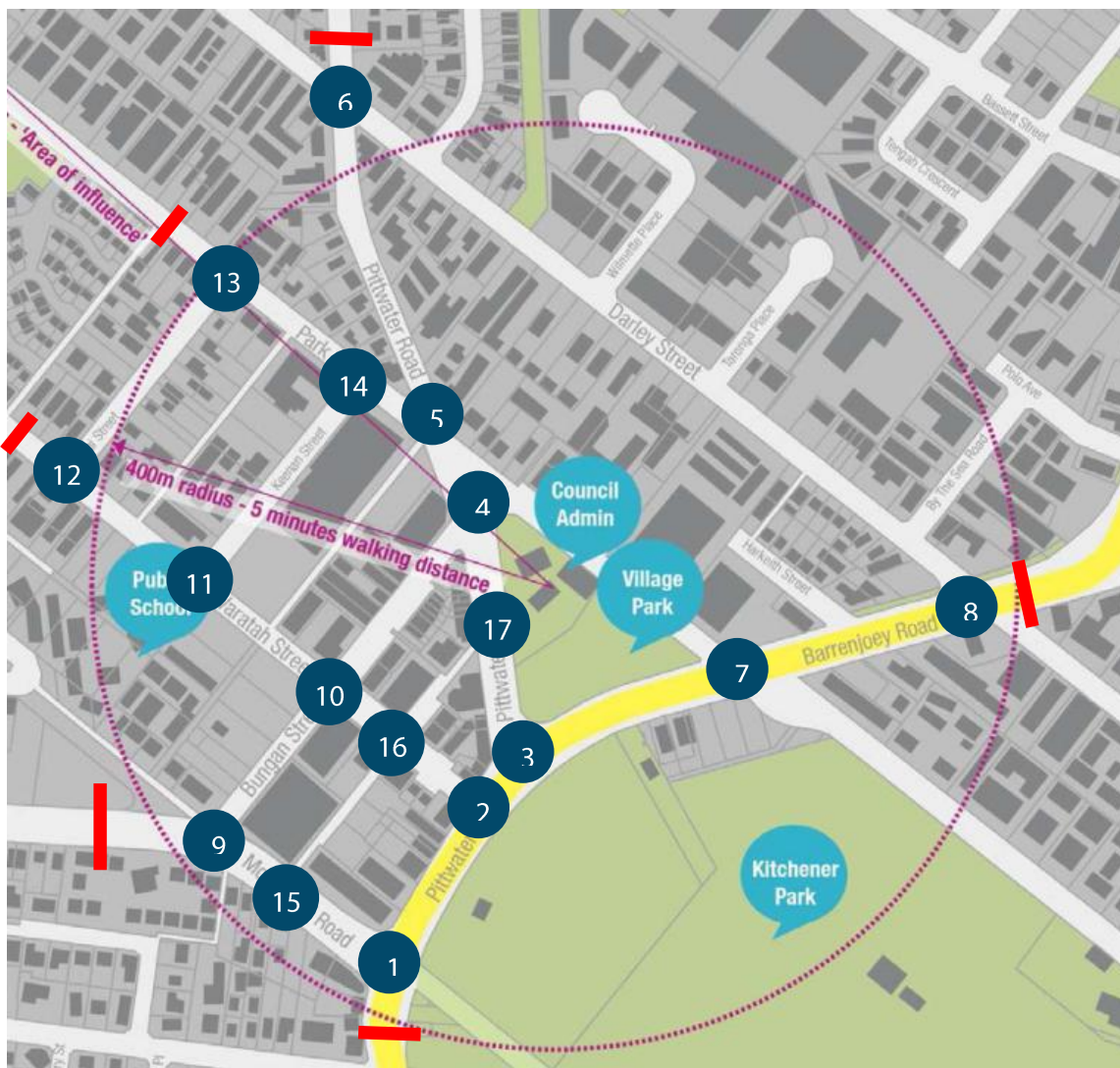


Figure 3 - Intersection Survey Locations

Table 1 - Intersection Traffic Controls

Intersection	Control Type
1. Pittwater Road / Mona Vale Road	Traffic Signals
2. Pittwater Road / Waratah Street	Give Way
3. Pittwater Road / Barrenjoey Road	Traffic Signals
4. Pittwater Road / Bungan Street	Roundabout
5. Pittwater Road / Park Street	Give Way
6. Pittwater Road / Darley Street	Traffic Signals
7. Barrenjoey Road / Park Street	Traffic Signals
8. Barrenjoey Road / Darley Street	Traffic Signals
9. Mona Vale Road / Bungan Street	Traffic Signals
10. Bungan Street / Waratah Street (includes the influence of Mona Vale Public School)	Roundabout
11. Waratah Street / Keenan Street	Give Way
12. Waratah Street / Dygal Street	Give Way
13. Park Street / Keenan Street (includes the influence of Sacred Heart School)	Give Way
14. Park Street / Dygal Street	Give Way
15. Mona Vale Road / Bungan Lane	Give Way
16. Waratah Street / Bungan Lane	Give Way
17. Pittwater Road and Bungan Lane	Give Way

The intersection surveys were undertaken at 17 intersections, which make up the basis for the road network model. The results of the surveys are presented as Attachment 1 in the format provided by Austraffic Pty Ltd.

The results indicate that the morning peak occurs between 8:30 – 9:30, while the PM peak occurs between 15:30 and 16:30, with only a few intersections subject to a slightly later peak. This indicates that pick-up activity associated with the schools in the area has a notable influence on the road network. This is not unexpected given that there are three schools within proximity of the study area and that the commuter peak would occur later and be somewhat diluted (spread through several hours) given the location of Mona Vale in relation to major employment centres.

The peak periods recorded by the surveys have been applied to all of the road network modelling scenarios, in order to assess the worst-case moments within a typical day.

### 2.1.2 Automatic Counters

Automated tube counters were used on the following roads, which lie outside of the study area (and did not form part of the model), but require comment in relation to rat-run usage, general capacity and the impact of school traffic.

- Golf Avenue
- Cabbage Tree Road
- Brinawa Street
- Vineyard Street
- Darley Street West
- Vesper Street east of Wangara Street

- Wangara Street south of Vesper Street (near Emma Street)
- Emma Street west of Wangara Street
- Oliver Way south of Emma Street.

The results of these surveys are presented in Attachment 2 in the format provided by Austraffic Pty Ltd and indicate:

- Cabbage Tree Road – The results indicate a baseline traffic volume of 300 vehicles per hour throughout the weekends and weekends, with a noticeable peak during the weekday morning and afternoon periods, which is indicative of rat-run activity. However, the additional volume above the 300vtpm baseline is 100 vehicles, which represents a 25% increase, but does not exceed the environmental capacity of the road (500 vtpm).
- Vesper Street, Wangara Street, Emma Street and Oliver Way – The survey results indicated a consistent baseline on each road of approximately 40 vtpm, however each road displays a concentrated peak during the morning period where volumes reached up to 140 vtpm. The route of this traffic was from Waratah Street to Mona Vale Road on each road, indicating that this traffic is associated with the Public School drop-off activity.

### 2.1.3 Travel Time

Travel Time Surveys were undertaken as a means of validating the base model. These are required by RMS to ensure that the travel times represented in the base model reflect the reality on the particular day of the surveys. The surveys involved multiple trips along the following routes recording the time to make each trip:

- Pittwater Road from Mona Vale Road to Darley Street,
- Pittwater Road / Barrenjoey Road from Mona Vale Road to Darley Street.

### 2.1.4 Origin and Destination

Origin and Destination surveys were undertaken which involve the recording of numberplates at specific locations coinciding with the intersection count periods. The surveys recorded light and heavy vehicle classes at the following stations:

- Pittwater Road south of Mona Vale Road
- Mona Vale Road west of Bungan Street
- Waratah Street north of Keenan Street
- Park Street north of Keenan Street
- Pittwater Road north of Darley Street
- Barrenjoey Road east of Darley Street

## 2.2 On-street Parking Inventory

Each on-street parking control and parking space was recorded in order to establish an inventory of available parking. This is required in order to compare the occupancy and turnover against the availability, having regard for the various parking controls (time restrictions etc.).

The results of the surveys were referenced in order to provide heat maps illustrating in colour coded form, the utilisation of on-street parking. The full results of the on-street parking surveys and the heat maps are presented in Attachment 3.

### **2.3 Parking Demand**

The demand for parking was recorded through manual counts of every on-street parking space within the study area during a weekday and a Saturday. The counts were undertaken every hour to provide a usage profile throughout the day.

### **2.4 Average Length of Stay and Turnover**

During the parking surveys part of the registration number of each vehicle was recorded so that each hourly count can be compared to determine the length of stay of each vehicle. This enables the calculation of the average length of stay within each surveys zone, and how many times during a typical day the spaces turnover. This is useful to determine the type of use of each space, e.g. long term usage indicates use by workers or commuters, short term use indicates use by shoppers etc. The turnover figures also provide an indication of how many cars can visit the Town Centre each day. The results of the surveys are included with the results presented in Attachment 3.

### **2.5 Intercept Questionnaire**

The traffic and parking surveys related primarily to car usage, which is vital to the preparation of the road network model and the parking strategy, however they do not address other transport modes. Intercept surveys were undertaken during the days of the parking and traffic surveys to determine the transport mode share. The questions included how visitors to the study area travelled to the Town Centre, why they made that choice, etc. The results of the Intercept Surveys are presented in Attachment 4.

### **2.6 Online Questionnaire**

In order to broaden the reach of the questionnaire surveys beyond the intercept surveys, the questionnaire was hosted online at SurveyMonkey.com. The survey was publicised by Council through a range of correspondence and public notices and was responded to by 425 people. The results of the online survey are presented in Attachment 4.

### **2.7 Online School Questionnaire (Students and Staff)**

Mona Vale Public School is located within the Town Centre and as a major land use within the study area contributes to the traffic and parking activity during peak drop-off and pick-up periods. As such it is important to understand the travel characteristics associated with students and staff at the school in isolation from the broader traffic movement and parking surveys. In this regard, online questionnaire surveys were undertaken by staff and students, which are used to establish the mode split and car usage.

### **2.8 Public Consultation**

During the preparation of the study, 2 public forums were facilitated by Council in order to record the views and opinions of the community with regard to getting to/from and around the Town Centre. The responses were varied but highlighted detailed issues relating to the road network and pedestrian facilities, particularly the lack of crossings on Pittwater Road (particularly at the Bungan Street roundabout) and the grades of the residential roads to the north of the Town Centre, which contribute towards an increased car usage rather than walking. Other local issues such as gaps in the footpaths where the grass verges still exist and poor sight lines around landscaping/planting were raised. All comments raised by the public were recorded by Council representatives and considered as part of this study.

## 3 Transport Network

### 3.1 Road Network

Primary access to the Mona Vale Town Centre is served by three (3) state roads which provide primary north-south connectivity into the area as serving as the primary gateway into the Sydney Northern Beaches. These connections are illustrated in Figure 4.

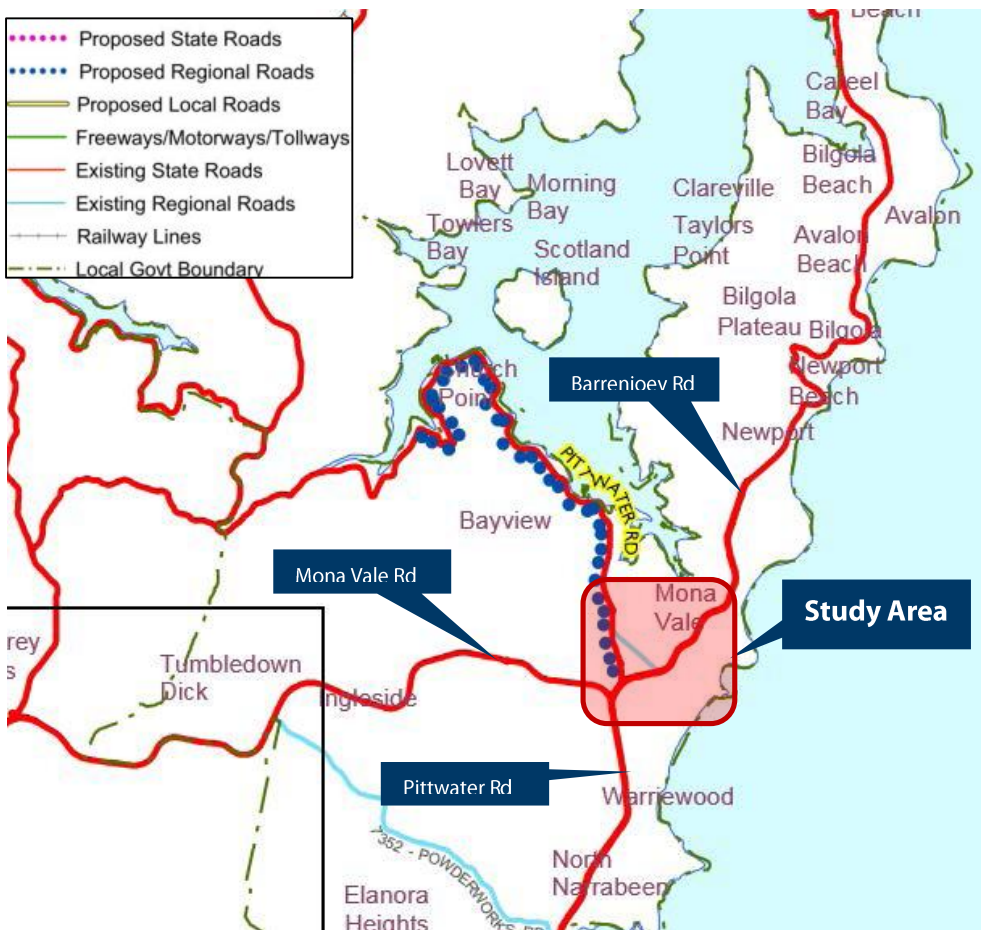


Figure 4 - Road Hierarchy (Source: RMS Road Hierarchy Review, 2009)

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy as follows:

- **State Roads** - Freeways, Motorways and Primary Arterials (RMS Managed)
- **Regional Roads** - Secondary or sub arterials (Council Managed, Part funded by the State)
- **Local Roads** - Collector and local access roads (Council Managed)

The key roads servicing the study area are described in Tables below.

### Barrenjoey Road

Road Classification	State Road - Arterial
Alignment	North-south
Number of Lanes	3 lanes in each direction, southbound lane provides a short ancillary right turn lane into Park Street. Between Park Street and Pittwater Road an additional short bus lane is provided.
Carriageway Type	Divided
Carriageway Width	28m
Speed Limit	60kph
School Zone	No
Parking Controls	No Stopping
<b>Forms Site Frontage</b>	No

### Pittwater Road (South of Barrenjoey Road)

Road Classification	State Road - Arterial
Alignment	East-West
Number of Lanes	3 lanes northbound
Carriageway Type	Divided
Carriageway Width	25m
Speed Limit	60kph
School Zone	No
Parking Controls	Within the nearside lane, between 3pm to 7pm weekdays a bus lane is in operation, 1/2hour parking is permitted between 8:30am to 3:00pm (Monday to Friday) and 8:30am to 12:30pm (Saturday). Outside of these periods unrestricted parking is permitted.
<b>Forms Site Frontage</b>	Yes

### Mona Vale Road

Road Classification	State Road - Arterial
Alignment	East-West
Number of Lanes	Typically 2 lanes in each direction west of Bungan Street. Between Bungan Street and Pittwater Road 3 lanes are provided in each direction of travel.
Carriageway Type	Divided
Carriageway Width	24m
Speed Limit	60kph
School Zone	No
Parking Controls	
<b>Forms Site Frontage</b>	Yes

### Pittwater Road (North of Barrenjoey Road)

Road Classification	Regional Road
Alignment	East-West
Number of Lanes	2 lanes each direction
Carriageway Type	Divided
Carriageway Width	20m
Speed Limit	60kph



School Zone	No
Parking Controls	Parallel 1 hour parking permitted between 8:30am to 6:00pm (Monday to Friday) and 8:30am to 12:30pm (Saturday) within northbound lane, whilst southbound lane provides 2 hour rear to kerb parking between identical time periods.
<b>Forms Site Frontage</b>	No

In addition to the key access routes illustrated above, the Mona Vale Town Centre is also served by a number of local roads which include:

- **Bungan Street** - The carriageway is generally 12m wide and carries one lane in each direction. On street parking is provided on both sides of the carriageway. Bungan Street has a posted speed limit of 40km/hr.
- **Park Street** - The carriageway is generally 10m wide and carries one lane in each direction. Within the western road verge, it provides 90degree parking whilst within the eastern road verge an on-street bus zone is provided. Park Street has a posted speed limit of 40km/hr.
- **Waratah Street** - The carriageway is generally 10m wide, carries one lane in each direction. Timed, on street parking is provided on both sides of the carriageway. Waratah Street has a posted speed limit of 40km/hr.
- **Darley Street** - The carriageway generally, carries one lane in each direction, with an on street parking provided on both sides of the carriageway. Darley Street has a posted speed limit of 40km/hr.

### 3.2 Pedestrian Facilities

Pedestrian footpaths are provided on both sides of most roads within the Town Centre with grassed verges within the residential area to the west of the Town Centre. Specific facilities relating to pedestrian access are presented in the following:

- Pedestrian crossings at most approaches to the traffic signal controlled intersections on Pittwater Road / Barrenjoey Road. While these provide protected crossing facilities, the crossings are lengthy and often involve multiple crossings on a particular route.
- Marked pedestrian crossings on all of the approaches to the Bungan Street and Waratah Street roundabout,
- Midblock zebra crossings on Bungan Street between Waratah Street and Mona Vale Road, and Waratah Street and Pittwater Road,
- Limited footpaths along the southern side of Bungan Lane north of Mona Vale Road and no footpaths between Waratah Street and Pittwater Road (the character of Bungan Lane is more of a car park than a carriageway),
- No pedestrian crossings at the roundabout intersection of Pittwater Road and Bungan Street,
- A pedestrian refuge island on Pittwater Road at the Akuna Lane intersection.

### 3.3 Cycling Facilities

Pittwater Council is presently reviewing the current Pedestrian and Cycling Infrastructure Plans which is aimed at encouraging residents of LGA to adopt cycling as a travel choice through the improvement of local

cycle connections. The current bike plan was published in 2003 and identifies three (3) primary cycle routes traversing through the Mona Vale Town Centre which include:

- Narrabeen to Bayview via Warriewood,
- Narrabeen to Mona Vale, and
- Bayview to Avalon.

### 3.4 Public Transport

The NSW Planning Guidelines for Walking and Cycling (2004) suggests a distance of 800m is a walkable catchment to Public Transport. With this in mind, the surrounding region was reviewed for proximate public transport services. The region is served by buses which primarily serve the Northern Beaches, whilst all Limited (L) and Express (E) bus services terminate at Mona Vale. The various bus routes which serve Mona Vale are illustrated in Figure 5.

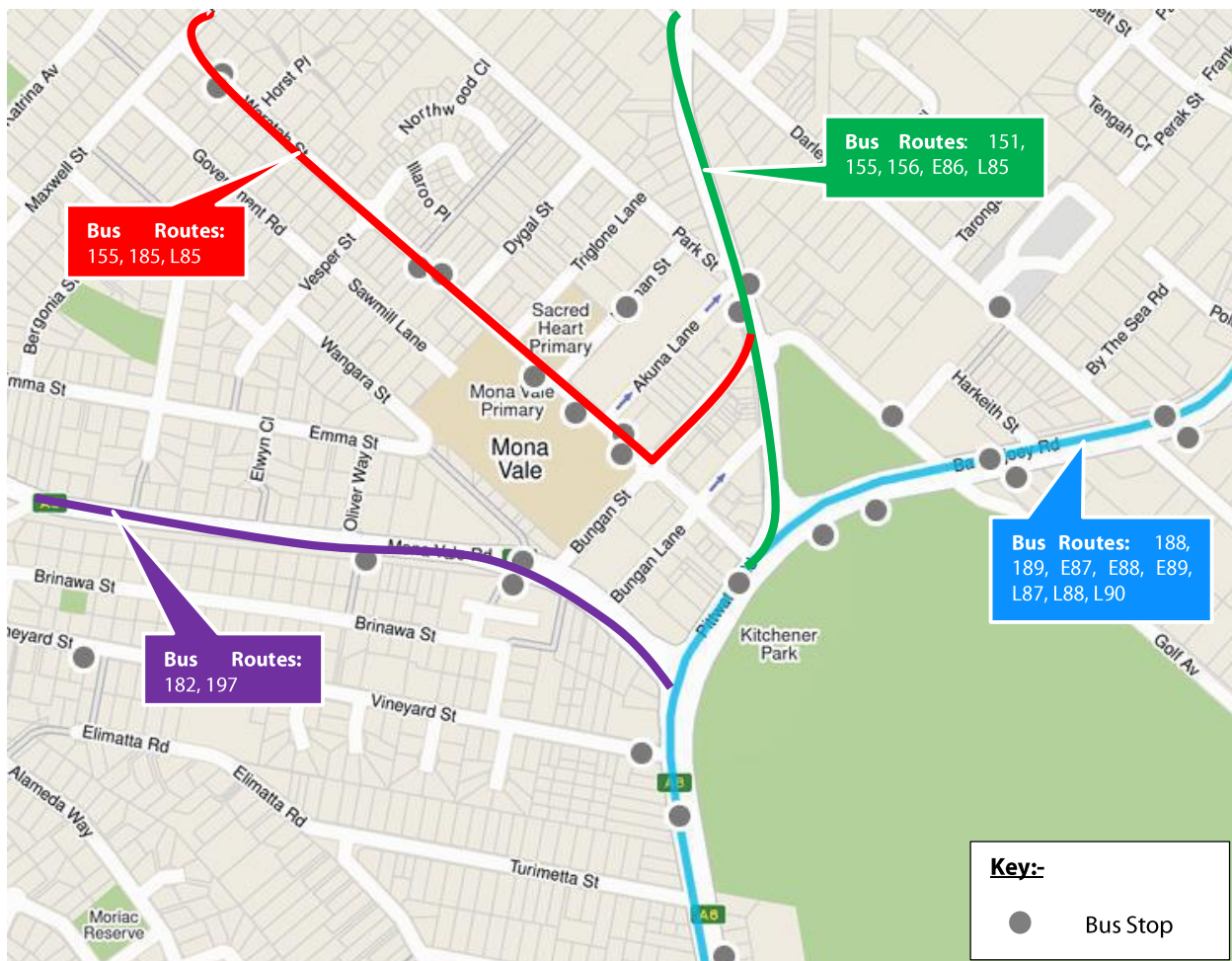


Figure 5 - Bus Routes Serving Mona Vale Town Centre

Table 2 - Mona Vale Bus Service Frequency Details

Route No.	Frequency	Coverage	Route
<b>151</b>	<u>Weekdays:</u> Every 60 minutes <u>Weekends:</u> Every 30-60 minutes Operates only between 12:00am to 4:00am	City to Mona Vale via North Sydney	Via Pittwater Road (South) onto Pittwater Road (North) terminating
<b>155</b>	<u>Weekdays:</u> Every 30-60 minutes <u>Weekends:</u> Every 30-60 minutes	Manly to Bayview Village	Via Waratah Street, Bungun Street to Pittwater Road (North)
<b>156</b>	<u>Weekdays:</u> Every 60 minutes <u>Weekends:</u> Every 60 minutes	Manly to McCarrs Creek to Manly	Via Pittwater Road (South) onto Pittwater Road (North)
<b>182</b>	<u>Weekdays:</u> 30-60 minutes <u>Weekends:</u> every 120 minutes	Narrabeen to Mona Vale via Elanora Heights	Via Mona Vale Road onto Pittwater Road (South)
<b>185</b>	<u>Weekdays:</u> 30-60 minutes <u>Weekends:</u> Every 30-60 minutes	City to Warriewood/Mona Vale	Via Waratah Street, Bungun Street to Pittwater Road (North)
<b>188/ L88/ E88</b>	<u>Weekdays:</u> 30-60 minutes <u>Weekends:</u> Every 30-60 minutes.	City to Avalon	Via Pittwater Road (South) Continuing onto Barrenjoey Road
<b>L87</b>	<u>Weekdays:</u> 30-60 minutes <u>Weekends:</u> Every 30-60 minutes	City to Newport (Limited Stops)	Via Pittwater Road (South) Continuing onto Barrenjoey Road
<b>189/ E89/ L89</b>	<u>Weekdays:</u> Every 30-60 minutes <u>Weekends:</u> Every 30-60 minutes	Dee Why to Avalon (Including Limited Stops and Express Services)	Via Pittwater Road (South) Continuing onto Barrenjoey Road
<b>192</b>	<u>Weekends:</u> Every 30-60 minutes.	Stokes Point to Avalon Loop	Via Pittwater Road (South) Continuing onto Barrenjoey Road

### 3.5 Constraints and Opportunities

The Town Centre is served by three state road and one regional road approaches, which provides efficient road connectivity to the surrounding areas, i.e. Barrenjoey Road to the north, Pittwater Road to the south and Mona Vale Road to the west. While this arrangement presents opportunities in the sense that traffic and buses are provided with suitable infrastructure to access/depart Mona Vale efficiently, the proximity to arterial roads also presents some constraints and challenges that can be counter to the desirable character of a town centre.

The particular layout of the arterial roads at Mona Vale defines a very distinct Town Centre Area in that Barrenjoey Road and Mona Vale Road define the southern and eastern edges of the town centre. This is beneficial in that the major traffic flow is directed around the town centre, unlike other linear commercial centres (Neutral Bay, Cremorne, Dee Why) where an arterial road forms the central spine of the commercial area. However, in the case of Mona Vale, the arterial roads restrain the physical growth of the town centre and present barriers to access from the east and south. In this regard, the primary retail centre has developed within the triangle formed by Mona Vale Road, Barrenjoey Road and Pittwater Road (a regional road north of Barrenjoey Road).

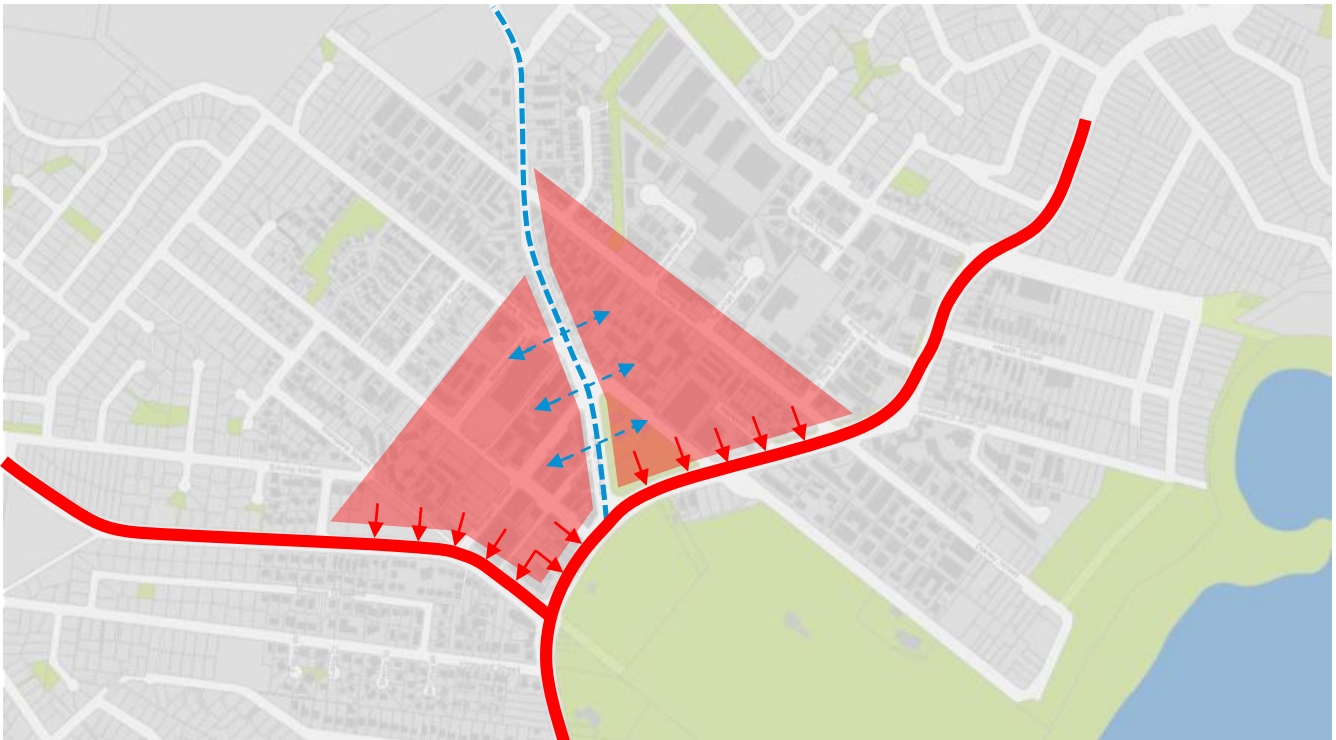


Figure 6 - Arterial and Regional Road Constraints

While the Town Centre extends on the northern side of Pittwater Road, to include Park Street and the light industrial area along Darley Street, it is clear that this regional road route divides the town centre and forms a constraint to accessibility between the east and west parts of the town centre. The diagram presented in Figure 6 highlights that without the constraint presented by Pittwater Road, the Town Centre forms a well-defined rectangular area bounded to the north-east by Darley Street. In this regard, Darley Street may present an opportunity to redirect the major traffic flow around the Town Centre enabling a reduction in the status and physical impact of Pittwater Road. Detailed constraints and opportunities are described in the following subsections.

### 3.5.1 Constraints

Considering the high level constraints, it is evident that the arterial road network and the regional road section of Pittwater Road (to the north of Barrenjoey Road) create constraints in that they bind the Town Centre to a certain area, and present barriers for connectivity, particularly by pedestrians and cyclists. Specifically:

- At its widest point, Barrenjoey Road accommodates eight traffic lanes (including a Bus Lane and turning lanes) and has a width of approximately 30 metres between the kerbs.
- The intersection of Pittwater Road and Barrenjoey Road comprises seven lanes on Barrenjoey Road and left turn slip lanes with associated islands on Pittwater Road. The layout of the intersection is very much established to prioritise the movement of vehicles with the left turn slip lanes providing very little constraint to vehicle speeds / delay when passing through the intersection. This also means that the intersection has a large footprint, which ultimately increases pedestrian walking distances and impacts on the perception of accessibility.
- A pedestrian crossing is located across Barrenjoey Road on the northern approach to the Pittwater Road intersection. This crossing has a length of 25 metres and is subject to delays associated with the operation of the traffic signals. At the standard walking rate of 1.2 metres per second, it would take the average

walker 20 seconds to walk across the carriageway. There are a further two crossings across Pittwater Road to access the Town Centre, totalling a distance of 60 metres between the Town Centre and Kitchener Park.

- The crossing distance between the western part of the Town Centre and the Village Park is 48 metres involving three separate crossings. A shorter mid-block crossing is available on Pittwater Road however this is located 130 metres to the north and does not suit the desire line along the northern side of Barrenjoey Road.
- Two crossings are located across Barrenjoey Road at the Park Street intersection, each having a length of 30 seconds and a walking time of 25 seconds for the average walker.
- There are multiple crossings located at the intersection of Pittwater Road and Mona Vale Road, which are all separately timed to suit the traffic signal operation. Crossing between the Town Centre and Kitchener Park involves the use of four crossings with a total walking distance of 71 metres. The walking time is 60 seconds, but each crossing is further delayed by the traffic signals, meaning that it takes at least 2 minutes to perform this crossing.
- The roundabout at the intersection of Pittwater Road, Bungan Street and Park Street does not include any facilities for pedestrian crossings activity. Footpaths are not provided on the eastern corners so that pedestrians are not encouraged to cross at the roundabout. The mid-block crossing on Pittwater Road provides an alternative, however is located 52 metres to the south and off the desire line between Bungan Street and Park Street.
- There are no marked or controlled pedestrian crossings across Pittwater Road to the north of the roundabout. A pedestrian refuge island is located adjacent to the Park Street intersection, however community feedback indicates that this crossing is subject to conflicting traffic movements associated with Park Street and Akuna Lane. There is also a lane merge on Pittwater Road at this location, which attracts driver's attention, rather than the pedestrian activity.
- In terms of planning changes to the road network, constraints are presented by the requirement to retain property access and existing bus routes. There may be parts of the Town Centre where the closure, or reduction in road space is desirable, however this may not be achievable due to these constraints. In relation to bus routes, the impact of bus turning paths and the specific requirements of the bus operators need to be considered. This is most likely prevalent in any proposal to amend Pittwater Road, Park Street and the intersection roundabout.
- The geography of the Town Centre, particularly the rise in level to the north presents a constraint in relation to an increase in active transport. The results of the community surveys recorded a number of comments relating to the grade, citing it as a significant reason for using a car to travel to the Town Centre.

### 3.5.2 Opportunities

Having regard for the constraints described above, there are many opportunities presented by the Mona Vale Town Centre and associated road network. The location of two arterial routes bounding the southern and western sides of the Town Centre provide a physical constraint, but enable efficient access around the Town Centre rather than through it. The regional road section of Pittwater Road does bring through-traffic through the Town Centre, however Darley Street presents an opportunity to provide an alternative route through management of signage, road space (e.g. constraining Pittwater Road) and intersection controls (e.g. improvements to traffic signal efficiency to promote the use of Darley Street). More specifically the opportunities comprise:

- The promotion of Darley Street as an alternative to Pittwater Road to reduce traffic volumes on Pittwater Road, enabling its demotion within the road hierarchy.

- Through the demotion of Pittwater Road, a reduction in the scale of the Barrenjoey Road intersection would provide the opportunity for improved pedestrian and cyclist connectivity as well as the removal of the left turn slip lanes, which would reduce the traffic speeds along Pittwater Road (along with other measures). This would facilitate the overall reduction of Pittwater Road improving the environment between the Town Centre and the Council office precinct.
- The redistribution of traffic away from Pittwater Road could enable the removal of the roundabout at Bungan Street / Park Street, further improving east-west connectivity.
- The network of lanes and private access roads in the block bounded by Waratah Street, Bungan Street and Pittwater Road provide an opportunity to raise the priority of pedestrians and cyclists over vehicles through the implementation of a Shares Zone. This could also incorporate the section of Bungan Street between Waratah Street and Pittwater Road.
- The roads extending through the residential area to the north of the Town Centre provide an opportunity to accommodate parking associated with the activity of the Town Centre, through amendments to the existing parking controls.
- The extensive unrestricted parking along Darley Street presents an opportunity to increase the quantum of short-term parking, which provides higher value parking rather than catering for commuters or workers.

## 4 Improvement Options

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Through the development of this study, a number of improvement options have been assessed and developed along with urban design concepts being prepared by Council to achieve the goals of Place Planning.

The options recognise the need to manage the road network and the volumes of traffic using the network now and in the future, while improving the environment for pedestrians and other road users. In this regard, the arterial road network, comprising Barrenjoey Road and Mona Vale Road remain largely unchanged, although improvements to the intersection of Pittwater Road and Barrenjoey Road are proposed.

Each of the improvement options has been assessed using traffic modelling to ascertain the impacts on the performance of the road network, and to assist with ascertaining mitigation options (e.g. promoting alternative routes).

The primary proposals are presented in the following sections.

### 4.1 Intersection Reduction, Pittwater Road / Barrenjoey Road

The intersection of Pittwater Road and Barrenjoey services the connection of an arterial road and a regional road and as such plays a prominent role in the road network, however this comes at a cost in terms of pedestrian connectivity and also the character of the section of road between the intersection and the Bungan Street roundabout. The provision of left turn slip lanes is suitable for the connection of higher speed roads, where it is important to minimise friction to traffic flow and where the associated roads provide sufficient capacity to facilitate free flow through the intersection. However in the subject case, it is apparent that the arrangement encourages northbound vehicles to maintain flow and speed from the northbound arterial road and into the Town Centre environment, which cannot support the continuation of higher speeds (i.e. the presence of a mid-block crossing and the Bungan Street roundabout limit the benefit of the northbound slip lane).

In this regard, it is proposed that the slips be removed which will provide the following benefits:

- Reduced vehicle speeds on Pittwater Road (north of the intersection),
- Demotion of this route for through traffic,
- Reduced crossing lengths for pedestrians,
- Ability to reduce the number of lanes on Pittwater in line with the urban design improvements prepared by Council.

### 4.2 Pittwater Road (between Barrenjoey Road and Bungan Street)

The current configuration of Pittwater Road presents a barrier between the north and south areas of the Town Centre, including Council's administration offices located on the southern corner of Pittwater Road and Park Street. The park located to the south of the Council offices forms an important facility within the Town Centre, however it is cut-off from the main retail areas. Access to this area is provided via crossings on Park Street, where connectivity is good, but only via the three crossings required to be used at the Barrenjoey Road intersection and a mid-block crossing south of the Bungan Road roundabout, which results in poor access from the south.

The adjustments to the intersection of Barrenjoey Road and Pittwater Road will facilitate a reduction in the carriageway width along the southern section of Pittwater Road. This will enable a shortening of the mid-block crossing and increased footpath width along both sides, which will be further enhanced through the provision of parallel parking spaces rather than the existing angled parking.

Pedestrian safety will also be enhanced through the provision of larger footpath areas (landings) surrounding the intersection, and the removal of the need for pedestrians to stand and wait on crossings having trafficable lanes on all sides, as per the current arrangement.



Figure 7 - Improvements to Pittwater Road and the Barrenjoey Road Intersection



### 4.3 Bungan Street / Pittwater Road Intersection

The demotion of Pittwater Road within the road network provides the opportunity to assess the appropriateness of the roundabout traffic control at the intersection of Pittwater Road, Bungan Street and Park Street, which comprises a two-lane circulation road, with no provisions for pedestrian crossings. With a reduction in traffic volumes associated with the Pittwater Road regional route (subject to the adoption of Darley Street as a viable alternative) the intersection could be remodelled to suit the future traffic volumes, and include improved pedestrian facilities.

The current arrangement being assessed by Council includes the removal of the roundabout and the provision of two separate priority controlled intersections, being Bungan Street and Park Street.



Figure 8 - Conversion of Bungan Street Roundabout to Priority Intersections

The separation of the intersections could accommodate a marked pedestrian crossing across Pittwater Road as an alternative to the existing pedestrian refuge island adjacent to Akuna Lane. The current arrangement was the subject of numerous comments by the community and is clearly a cause for concern for residents who use this route regularly.

#### 4.4 Bungan Street and Bungan Lane Shared Zone

Shared Zones are applied to roads where it is proposed that pedestrians have the right-of-way over vehicles, and are applied in areas where pedestrian activity has sufficient density and where vehicle movements can be realistically slowed. This is ideal in Town Centre situations where low speed limits are generally applied, and where traffic density and parking activity is such that vehicle speeds are naturally limited, regardless of a Shared Zone control.

The section of Bungan Street between Waratah Street and Pittwater Road, and the network of lanes to the southeast of Bungan Street provide an opportunity to establish a significant area of Shared Zone connecting numerous retail and commercial businesses along with parking located on adjoining private properties. There are some section of roadway that are within private property and consultation with these land-owners would be required with the primary aim of providing a uniform traffic and pedestrian environment.

The conversion of Bungan Lane between Mona Vale Road and Waratah Street to a shared zone will improve pedestrian access to/from the Bungan Lane car park. It is noted that the parking surveys indicate regular availability of parking within the car park, during periods when the on-street parking is at capacity. It is likely that the use of the car park can be increased (i.e. removing some demand from the on-street parking), through improved pedestrian access and improved wayfinding signage (also recommended in the Parking Strategy). The improved connectivity and increased use of the car park will contribute towards offsetting any loss of parking associated with the PPW.

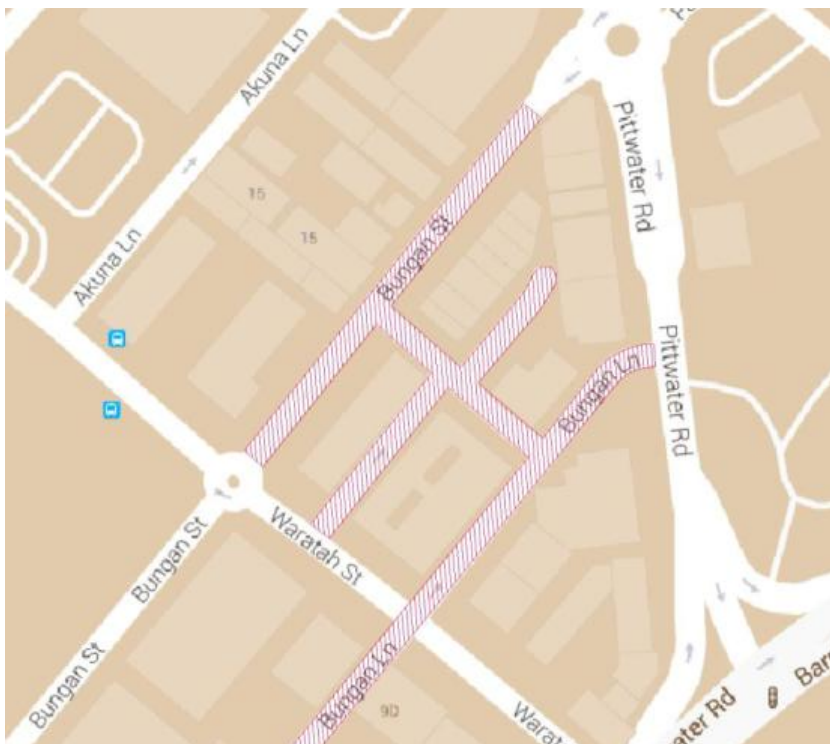


Figure 9 - Bungan Street / Lane Shared Zone

#### 4.5 Other Improvements

The items listed above represent significant works to the road network which would bring an associated level of benefit. Other measures are also available that do not require much in the way of physical works, but will contribute towards the overall strategy.

#### 4.5.1 Arterial and Regional Road Signage

The state road signage could be amended to prioritise Barrenjoey Road and Darley Street as the primary route from the south to Church Point and beyond. In conjunction with the reduction in the scale of the Barrenjoey Road / Pittwater Road intersection, this will remove Pittwater Road through the Town Centre as the primary route.

#### 4.5.2 Parking Restrictions, Bungan Street

It is apparent from discussions with the community and the traffic and parking surveys that Bungan Street experiences a short but heightened traffic peak associated with the Mona Vale Public School. This is in part due to limited short term parking along the frontages of the school. The introduction of 5P (minute) parking restriction should be considered along the northern side of Bungan Street between Mona Vale Road and Waratah Street, to align with the School Zone times. This will provide the ability for vehicles to drop-off and pick-up pupils without queuing within the carriageway, while these spaces are used by longer-term parkers.

#### 4.5.3 Split Phase Signal Operation at Pittwater Road / Darley Street

It is apparent from discussions with the community and the traffic surveys that the right turn movements from Darley Street onto Pittwater Road (whether approaching from the north or south) experience delays and are subject to restricted sight lines due to the angled alignment of the intersection.

In line with the proposal to prioritise Darley Street as an alternative to Pittwater Road, to facilitate the reduction in traffic through the Town Centre, the conversion of the intersection to a Split Phase arrangement should be pursued. A split phase arrangement would maintain priority to Pittwater Road, but would allow separate green phases for the north and south Darley Street approaches. This enables these right turn movements to be made with no opposing vehicles, improving safety. The additional phase does not necessarily mean that the performance of the intersection will improve overall (split approach is not considered the most optimal phase sequence), however the modelling results indicate that the intersection will continue to operate with an overall Level of Service of B during the morning and afternoon peak periods.

## 5 Traffic Modelling

The study involves the assessment of potential changes to the road network and in this regard, traffic modelling provides the most suitable tool to determine the effects on the road network. Modelling provides the ability to test numerous scenarios either relating to growth in traffic volumes, or physical amendments to the road network, e.g. closing roads, adding lanes, changing parking controls etc.'

The modelling undertaken in relation to this study comprises a base model of a typical weekday, which has been prepared and validated in accordance with the RMS requirements. The validation process ensures that the model reflects the existing situation. This is achieved by comparing queue lengths, the number of vehicles passing through each intersection and the journey times across the network with the data recorded in the study area, as described in Section 2.1.

The model has been prepared using the Vissim software, which presents the detailed operating results in the form of typical assessment criteria (Level of Service, Queue Lengths, Degree of Saturation etc.) and also as an animate representation of the road network with vehicles moving in real-time through the network. A screenshot of the model while running is presented as Figure 10 below.



Figure 10 - Screenshot of the Vissim Road Network Model

### 5.1 Aims

The primary aim of the traffic model is to be able to test future scenarios associated with the study and to be provided with key results and a visual interpretation of the resulting impacts. Models allow future scenarios to be tested with a high degree of certainty as to the outcomes of any proposals and are typical used to assess:

- Traffic / Transport growth scenarios (i.e. the impact of more movements across the road network),
- Physical changes to the road network, either increasing or decreasing road capacity,
- A combination of growth and physical changes.

The use of contemporary modelling software such as Linsig provides an animated output with the aim of being able to be viewed and readily understood by the viewer, which is ideally suited when presenting the results to the community.

## 5.2 Inputs

The model is prepared on the basis of many input parameters, a number of which are constant to most models within a particular area (e.g. vehicle characteristics, driver characteristics, tolerance for tolls versus longer journeys, and other parameter relating to the road network standards). In relation to the Mona Vale network model, the following project specific inputs were collected and applied to the model:

- Road geometry,
- Traffic signal arrangements (phase sequence and timing, coordination between intersections etc.), which were provided by Transport NSW,
- Traffic controls (prohibited turning movements etc.),
- Traffic and pedestrian movements collected through traffic surveys,
- Origin and destination data, and
- On-street parking activity.

During the coding of the road network and traffic volumes, observations are taken of the study area to ensure that the model is developed to reflect the existing situation and any unique local condition that affect the operation of the network (e.g. sun glare, damaged road surface, sight line constraints etc.).

## 5.3 Outputs

As described in Section 5.1, the aim of the model is to be able to test scenarios relating to traffic volumes and the road arrangements. Typically there are four performance indicators used to summarise the performance of the road network, 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 road traffic will provide an overall low average delay.
- Level of Service – This is a categorisation of average delay, intended for simple reference. RMS adopts the bands, defined in Table 3 below.
- 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.

Table 3 - Road Network Performance - Levels of Service

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

## 5.4 Scenarios

The road network study requires the development of three scenarios for the peak periods being modelled, as follows:

- Scenario 1 (Base case), 2016 existing situation,
- Scenario 2 (Do nothing), 2021 with the existing road arrangements, with traffic volume growth at 1% per annum over 5 years,
- Scenario 3 (Proposed PPW), 2021 with the potential changes to the road network and the traffic volumes adopted from Scenario 2.

## 5.5 Results

The results of the traffic modelling are presented in the following tables, while the findings are described in Section 5.6.

For ease of comparing the results, the tables are presented on the following 3 pages so that the AM and PM peak results for all three scenarios are aligned horizontally when printed.

Table 4 - Modelling Results - AM Peak - Scenario 1 – 2015 Existing Situation

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	4883	26.8	B
2. Pittwater Road / Waratah Street	1942	3.1	A
3. Pittwater Road / Barrenjoey Road	4102	13.5	A
4. Pittwater Road / Bungan Street	1472	4.9	A
5. Pittwater Road / Park Street	n/a	n/a	n/a
6. Pittwater Road / Darley Street	1537	24.6	B
7. Barrenjoey Road / Park Street	4087	29.1	C
8. Barrenjoey Road / Darley Street	4282	43.2	D
9. Mona Vale Road / Bungan Street	2223	15.5	B
10. Bungan Street / Waratah Street	1117	4.7	A
11. Waratah Street / Keenan Street	861	1.1	A
12. Waratah Street / Dygal Street	584	0.8	A
13. Park Street / Keenan Street	1005	3.3	A
14. Park Street / Dygal Street	409	0.6	A
15. Mona Vale Road / Bungan Lane	825	1.0	A
16. Waratah Street / Bungan Lane	575	0.7	A
17. Pittwater Road and Bungan Lane	357	0.6	A

Table 5 - Modelling Results - PM Peak - Scenario 1 – 2015 Existing Situation

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	4835	24.4	B
2. Pittwater Road / Waratah Street	1919	3.4	A
3. Pittwater Road / Barrenjoey Road	4118	10.8	A
4. Pittwater Road / Bungan Street	1429	5.3	A
5. Pittwater Road / Park Street	n/a	n/a	n/a
6. Pittwater Road / Darley Street	1629	23.2	B
7. Barrenjoey Road / Park Street	3959	27.6	B
8. Barrenjoey Road / Darley Street	4018	33.6	C
9. Mona Vale Road / Bungan Street	2043	20.4	B
10. Bungan Street / Waratah Street	1088	6.6	A
11. Waratah Street / Keenan Street	598	1.0	A
12. Waratah Street / Dygal Street	584	0.8	A
13. Park Street / Keenan Street	885	4.1	A
14. Park Street / Dygal Street	373	0.5	A
15. Mona Vale Road / Bungan Lane	955	1.7	A
16. Waratah Street / Bungan Lane	296	0.3	A
17. Pittwater Road and Bungan Lane	454	1.6	A

Table 6 - Modelling Results - AM Peak - Scenario 2 - Existing Arrangement with 2021 Traffic Volumes

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	5054	27.7	B
2. Pittwater Road / Waratah Street	2081	3.2	A
3. Pittwater Road / Barrenjoey Road	4243	17.2	B
4. Pittwater Road / Bungan Street	1503	13.5	A
5. Pittwater Road / Park Street	n/a	n/a	n/a
6. Pittwater Road / Darley Street	1614	26.4	B
7. Barrenjoey Road / Park Street	4165	31.1	C
8. Barrenjoey Road / Darley Street	4384	45.9	D
9. Mona Vale Road / Bungan Street	2291	15.8	B
10. Bungan Street / Waratah Street	1146	7.3	A
11. Waratah Street / Keenan Street	905	2.7	A
12. Waratah Street / Dygal Street	674	1.3	A
13. Park Street / Keenan Street	1043	15.2	B
14. Park Street / Dygal Street	466	0.8	A
15. Mona Vale Road / Bungan Lane	892	0.6	A
16. Waratah Street / Bungan Lane	613	0.7	A
17. Pittwater Road and Bungan Lane	388	0.6	A

Table 7 - Modelling Results - PM Peak - Scenario 2 - Existing Arrangement with 2021 Traffic Volumes

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	4419	24.8	B
2. Pittwater Road / Waratah Street	2641	5.1	A
3. Pittwater Road / Barrenjoey Road	3766	10.7	A
4. Pittwater Road / Bungan Street	1248	7.2	A
5. Pittwater Road / Park Street	n/a	n/a	n/a
6. Pittwater Road / Darley Street	1456	27.5	B
7. Barrenjoey Road / Park Street	3645	31.6	C
8. Barrenjoey Road / Darley Street	3701	38.5	C
9. Mona Vale Road / Bungan Street	1811	19.2	B
10. Bungan Street / Waratah Street	947	9.2	A
11. Waratah Street / Keenan Street	626	1.5	A
12. Waratah Street / Dygal Street	341	0.9	A
13. Park Street / Keenan Street	889	9.1	A
14. Park Street / Dygal Street	382	0.7	A
15. Mona Vale Road / Bungan Lane	1028	2.3	A
16. Waratah Street / Bungan Lane	345	3.2	A
17. Pittwater Road and Bungan Lane	465	1.6	A



Table 8 - Modelling Results - AM Peak - Scenario 3 - Improvement Options with 2021 Traffic Volumes

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	4729	26.6	B
2. Pittwater Road / Waratah Street	20	45.3	D
3. Pittwater Road / Barrenjoey Road	2271	9.8	B
4. Pittwater Road / Bungan Street	783	12.5	A
5. Pittwater Road / Park Street	197	38.4	C
6. Pittwater Road / Darley Street	1526	29.8	C
7. Barrenjoey Road / Park Street	4241	39.4	C
8. Barrenjoey Road / Darley Street	4061	56.0	D
9. Mona Vale Road / Bungan Street	2271	14.3	B
10. Bungan Street / Waratah Street	1289	11.7	A
11. Waratah Street / Keenan Street	733	3.2	A
12. Waratah Street / Dygal Street	652	1.1	A
13. Park Street / Keenan Street	844	2.0	A
14. Park Street / Dygal Street	501	1.2	A
15. Mona Vale Road / Bungan Lane	655	67.8	E
16. Waratah Street / Bungan Lane	778	1.0	A
17. Pittwater Road and Bungan Lane	182	1.0	A

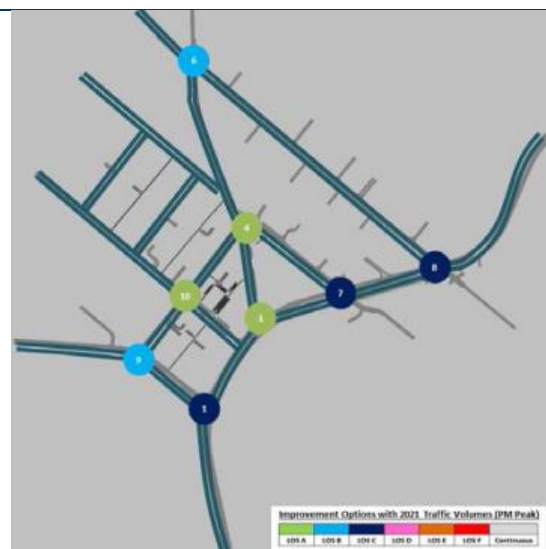
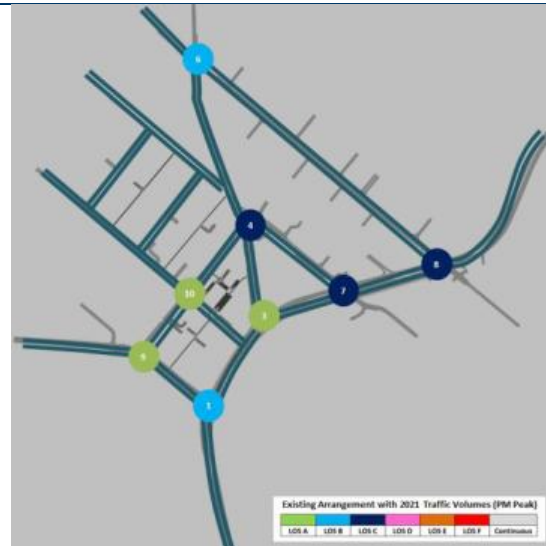
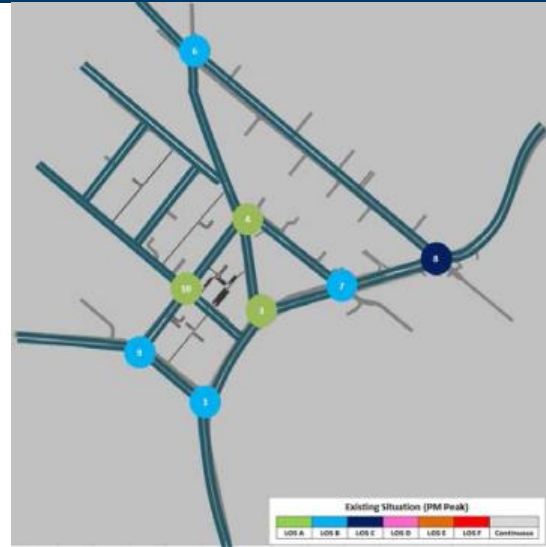
Table 9 - Modelling Results - PM Peak - Scenario 3 - Improvement Options with 2021 Traffic Volumes

Intersection	Traffic Volume	Average Delay	Level of Service
1. Pittwater Road / Mona Vale Road	4889	35.5	C
2. Pittwater Road / Waratah Street	2706	2.9	A
3. Pittwater Road / Barrenjoey Road	2088	9.8	B
4. Pittwater Road / Bungan Street	569	3.2	A
5. Pittwater Road / Park Street	687	1.9	A
6. Pittwater Road / Darley Street	1414	22.4	B
7. Barrenjoey Road / Park Street	4002	29.7	C
8. Barrenjoey Road / Darley Street	3967	42.0	C
9. Mona Vale Road / Bungan Street	2088	24.1	B
10. Bungan Street / Waratah Street	1018	7.9	A
11. Waratah Street / Keenan Street	583	0.7	A
12. Waratah Street / Dygal Street	364	0.8	A
13. Park Street / Keenan Street	852	4.0	A
14. Park Street / Dygal Street	408	0.7	A
15. Mona Vale Road / Bungan Lane	1234	20.0	B
16. Waratah Street / Bungan Lane	335	0.2	A
17. Pittwater Road and Bungan Lane	378	1.6	A

The overall intersection results are illustrated on the network in the following images (full size images are reproduced in Attachment 7 as part of the Traffic Modelling Presentation).

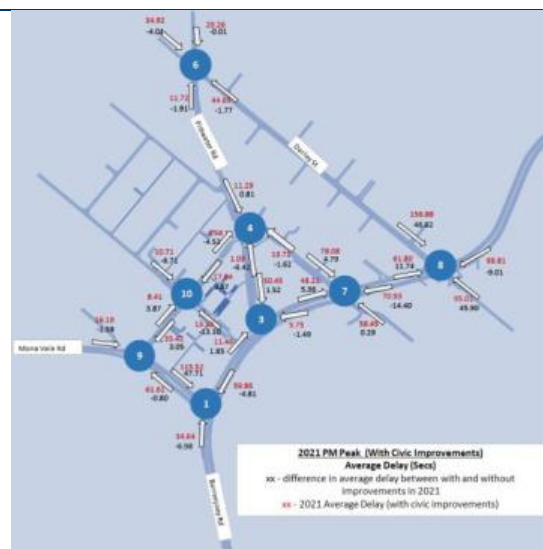
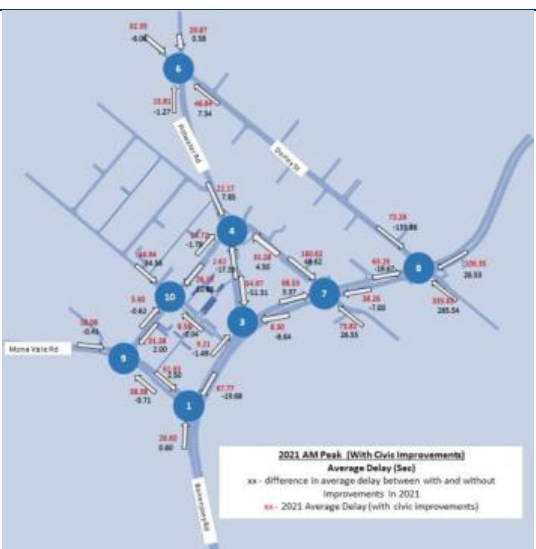
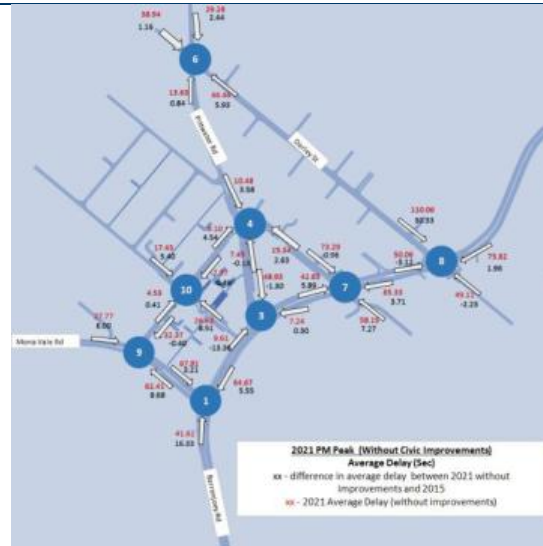
**AM Peak Results – Level of Service**

**PM Peak Results – Level of Service**



**AM Peak Results – Approach Delay (seconds)**

**PM Peak Results – Approach Delay (seconds)**



## 5.6 Findings

The traffic modelling confirms that the road network can accommodate some growth within the existing configuration, and as evident in the Level of Service Results for each intersection, there is little depreciation of LoS within the three scenarios.

The intersections where the LoS is affected include:

- Pittwater Road and Mona Vale Road - Delay is seen to increase in all scenarios, however it remains within the range of LoS B with the exception of the 2016 PM peak PPW scenario whereby the LoS drops from B to C.
- Pittwater Road and Darley Street - Delay is seen to increase in all scenarios, however it remains within the range of LoS B with the exception of the 2016 AM peak PPW scenario whereby the LoS drops from B to C. This is due to the increased traffic volumes being diverted to Darley Street, away from the existing Pittwater Road corridor, which is proposed to be reduced in width within the PPW scenario.
- Park Street and Barrenjoey Road – The LoS increases to B during the 2016 PM peak prior to the PPW, and this is due to the background traffic growth.
- Pittwater Road and Barrenjoey Road – The LoS increases to B during the 2016 AM peak due to the background traffic growth, however the performance improves following the PPW as traffic is redistributed to Darley Street.

The first run of the future scenarios found that the delays increase in relation to the right turn movements from Barrenjoey Road from the southbound carriageway. Essentially there are only four opportunities to turn right to enter the Town Centre or the area to the north, being Darley Street, Park Street, Pittwater Road and Mona Vale Road. The first run model indicated that during 2021, the queue generated by the right turn into Darley Street extends beyond the length of the right turn lane (the model does not include any optimisation or changes to the traffic signal timing). When this occurs, the model determined that it is more time/cost effective to reroute traffic to the other right turn locations, which increases demand at each intersection. It is apparent that the length of the right turn lane at Darley Street will need to be extended within the existing grassed median in response to background growth in the area, based on a growth scenario of 1% per annum.

The model has been run with the extended right turn lane, which results in less growth on the intersections to the south of Darley Street, although the demands on Darley Street increase, as a result, which is to be expected.

The PPW outlined for Pittwater Road slightly reduces the capacity of this route, therefore the model indicates a larger impact at the Mona Vale Road intersection, as more vehicles are rerouted to this intersection and through the northern part of the Town Centre. Again, the extension of the right turn lane at Darley Street and potentially amendments to the traffic signal timing will likely resolve this impact.

Generally the road network will continue to operate within capacity following the addition of background traffic growth and the PPW. Further intersection modelling may be required to assess the individual intersections where changes are proposed (e.g. the proposed split phasing arrangement at the intersection of Darley Street and Pittwater Road).

## 6 Parking Strategy

### 6.1 Framework

In implementing any strategy a robust framework is required to manage change. Council will follow the framework detailed in Figure 11 below before implementing any change.

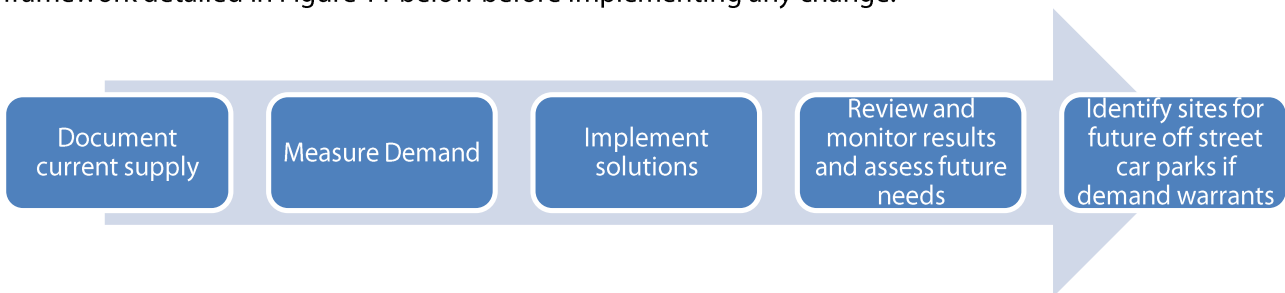


Figure 11 - Strategy Framework

- Document Supply – it is important Council has up to date records of the parking supply both on street and off street recording use (e.g. loading zone, disabled parking etc.) and time restrictions (1/2P, 1P, permit parking etc.) which provides a base position from which to manage future change.
- Measure Demand – Regular occupancy and length of stay surveys are required to measure demand at different times of the day to ensure appropriate parking controls and compliance thereof.
- Implement Solutions – As parking occupancy in a given area approaches 85%, being practical capacity, proposed solutions to be implemented in a controlled manner after community consultation. Supply records to be updated for any change accordingly.
- Review and Monitor results – it is important to monitor the outcome of any change through regular surveys to ensure appropriate parking controls are in place.
- Identify Sites for Future Off Street Car Parks – Council will incorporate potential sites for off street car parks into their overall development masterplan to ensure appropriate planning controls are in place when the need arises

All change will be referenced back to the current situation to measure success. It is also proposed that the community consultation process will continue as part of the above framework and that information about parking strategies and implementation plans will be incorporated into Council's website, the local newspaper and other communication tools, including social media as appropriate.

The collection of parking data and information on an ongoing basis is imperative to enable Council to measure the success of implemented strategies. To ensure this is undertaken in a cost effective manner Council will:

- Prepare a specification for documenting and updating parking inventory inclusive of number of spaces and type of restrictions
- Develop a program for conducting occupancy and average length of stay surveys in accordance with an agreed timetable and encompassing different times of day, days of the week and with regard to seasonal impacts, and

- Develop a reporting package incorporating graphs for use in future reporting of parking demand and the effects of implementing change.

## 6.2 Strategy

Parking is a finite resource which is expensive to supply and maintain. It also competes with other land uses within the local community (e.g. public spaces, parks, shared road space, commercial and residential developments). Contemporary literature (domestic and international) advocates for local government to reduce demand for parking by encouraging other means of transport, rather than increase supply<sup>1</sup>. It also proposes:

- Short term parking should be closest to desired locations;
- Parking spaces should be prioritised for desired users over others considering the parking needs of both private (commercial tenants and residents) and public users;
- Parking controls should be undertaken in conjunction with the promotion of alternate transport modes, which includes encouraging businesses to provide initiatives for their employees to use alternate modes;
- Parking should be easy to locate and managed by appropriate and easy to understand signage; and
- Parking management strategies should consider both the management of current supply and the needs of the future.

Free parking is subsidised by ratepayers and those that don't drive. It is expensive to provide and regulate and is socially, economically and environmentally unsustainable. Contemporary literature suggests parking users should pay market prices for the space they occupy and the revenue used to improve public amenity<sup>2</sup>.

In 2011, Mona Vale suburb had around 10,000 residents and has grown at a rate of around 70 persons per year (approx. 0.7%- 0.75% pa.) over the 10 year period from 2001 to 2011. The population growth of Mona Vale has been driven by the net gain in dwellings of almost 30 per year over the 10 year period from 2001 to 2011.<sup>3</sup> For the Pittwater LGA the estimated population growth since 2011 has been 1.3% (2012, 2013)-2.06% (2014) pa.

This growth, together with the dominance of car ownership; 57% of households in Mona Vale had access to two or more vehicles in 2011<sup>4</sup>, means that parking availability is likely to worsen contributing to:

- Increased traffic congestion
- Associated environmental effects and
- Driver frustration.

In 2011, the majority of employed persons in Mona Vale travelled to work by car, either as a driver or passenger (approximately 65.2%)<sup>5</sup>. The net change since 2001 is illustrated in Figure 12. Figure 12 also shows there has been an increase in the use of public transport (bus), walking and people working at home.

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<sup>1</sup> D Shoup (2000), *The High Cost of Free Parking*.p.229

<sup>2</sup> Christian Seibert Vol.24 No 2 Winter 2008 POLICY, *There's No Such Thing as a Free Parking Space* p 12

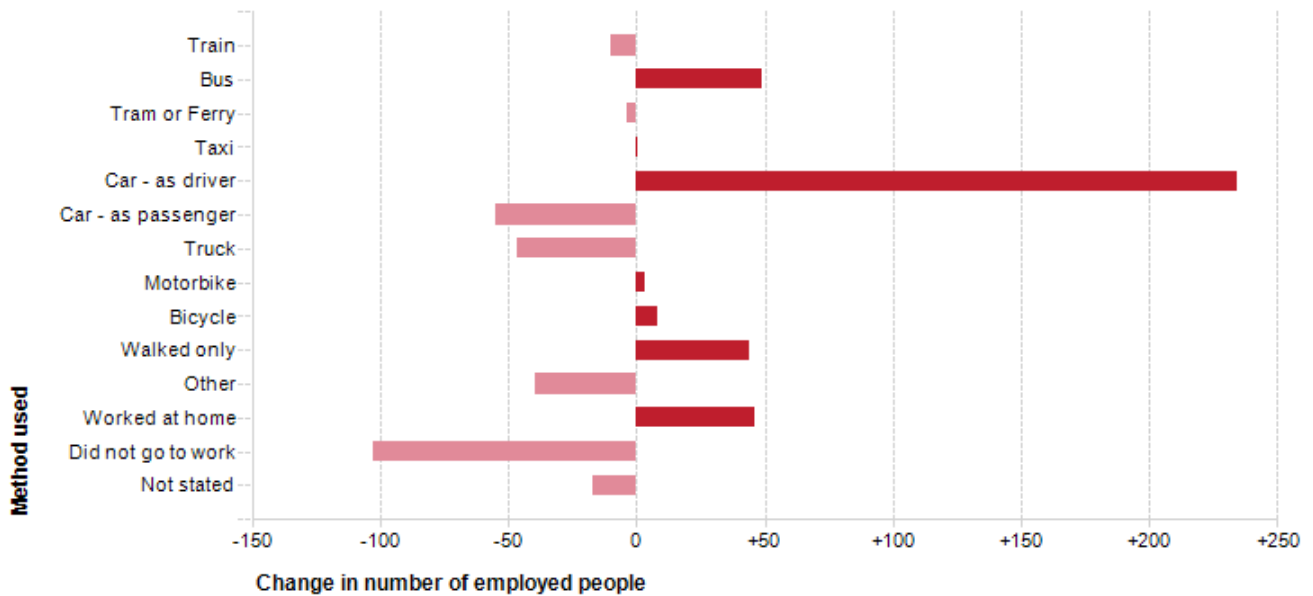
<sup>3</sup> expert.id Mona Vale Suburb Profile November 2014, page 23

<sup>4</sup> <http://profile.id.com.au/pittwater/car-ownership?WebID=150>

<sup>5</sup> <http://profile.id.com.au/pittwater/travel-to-work?EndYear=2001&WebID=150>

## Change in method of travel to work, 2001 to 2011

Mona Vale - Total employed persons

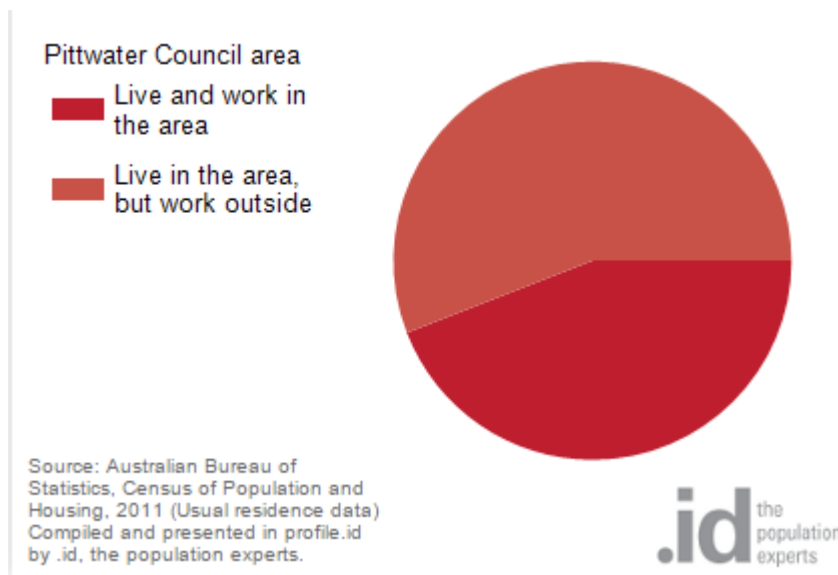


Source: Australian Bureau of Statistics, Census of Population and Housing, 2001 and 2011 (Enumerated data)  
Compiled and presented in profile.id by .id, the population experts.

**.id** the population experts

Figure 12 - Change in Method of travel to work, 2001-2011 Mona Vale

Of the resident's that travelled to work by car it is reasonable to assume a significant number work in the area based on data for Pittwater Council; in 2011 39.1% of Pittwater Council residents lived and worked in the area as illustrated in Figure 13, compared to 16.7% in the adjoining Warringah area<sup>6</sup>.



Source: Australian Bureau of Statistics, Census of Population and Housing, 2011 (Usual residence data)  
Compiled and presented in profile.id by .id, the population experts.

**.id** the population experts

Figure 13 - Employment location of Pittwater Council residents

<sup>6</sup> <http://profile.id.com.au/pittwater/residents?EndYear=2001&WebID=150>

## 6.3 User groups

Our parking survey data has identified three (3) main user groups contributing to parking demand in the area:

- Residents
- Commuters and workers in the area
- Visitors for business or social purposes

Each user group has its own distinct needs for parking in the area and compete for available parking spaces with the other groups. Any strategies pursued by the council will need to be analysed in terms of how they will affect each user group.

### 6.3.1 Residents

Residents predominantly require parking both overnight and on weekends with some vehicles remaining on-street throughout the weekday. The parking surveys provide an estimate of the demand for resident parking based on the 7am occupancy figures as it is assumed the majority of vehicles parked on street in residential areas at this time belong to residents.

### 6.3.2 Commuters and Workers in the Area

On-street unrestricted car spaces were at or close to practical occupancy (85%<sup>7</sup> occupancy) from 7.00am to 3pm on a weekday in the industrial zone. Similarly the unrestricted off-street council owned car parks (excluding Bungan Lane) were also at practical capacity from 8.00am – 4.00pm on a weekday. The peak weekday occupancy in the 8P area of the Bungan Lane car park was 67.2% at 12.00-1.00pm indicating available capacity for workers in the area. It is unlikely these spaces would be used by commuters as they would require parking for a period greater than 8 hours.

### 6.3.3 Visitors for Business and Social purposes

In many ways this is the most critical user group and any strategies should be aimed at ensuring the availability of parking spaces for the visitors for business purposes. A visitor for business activity includes people using local merchants such as doctors, grocers, pharmacies, retail and restaurants. Therefore the availability of parking, for this user group, has a direct effect on the economic prosperity and vibrancy of the town centre.

## 6.4 Current Peak Demand

Peak demand for parking on street and in Council owned off street parking was recorded at 83% at approximately 10.00- 11am on a weekday as per the following table.

Table 10 - Peak parking demand for Council owned parking

	Supply	Peak Demand	Peak Occupancy	Availability
<b>On-Street restricted spaces</b>	325	273	84%	52
<b>On-Street unrestricted spaces</b>	462	402	87%	60
<b>Off-Street restricted</b>	59	57	96.6%	2

<sup>7</sup> Concept of practical capacity ; being the level of utilization at which potential parkers perceive parking is full



<b>spaces (excl Bungan Lane)</b>				
<b>Off-Street unrestricted spaces (excl Bungan Lane)</b>	128	118	92.2%	10
<b>Bungan Lane car park 8P restricted spaces</b>	58	38	65.5%	20
<b>Bungan Lane other restricted spaces</b>	149	92	61.7%	57
<b>Total Spaces Available for Council owned public parking</b>	<b>1,181</b>	<b>980</b>	<b>83%</b>	<b>201</b>

Privately owned car parks such as Pittwater Place (437<sup>8</sup> spaces), Woolworths (376<sup>8</sup> spaces) and Aldi were outside of the scope of our surveys.

Peak occupancy was distributed by land use as follows,

Table 11 - Peak occupancy by land use

<b>Demand Drivers</b>		<b>2015</b>		
<b>WEEKDAYS</b>	<b>Supply</b>	<b>Peak Demand</b>	<b>Peak Occupancy %</b>	<b>Availability</b>
<b>Commercial</b>	687	569	83%	118
<b>Residential</b>	216	152	70%	64
<b>Industrial</b>	278	259	93%	19
<b>TOTAL</b>	<b>1,181</b>	<b>980</b>		<b>201</b>
<b>Peak Occupancy</b>		<b>83%</b>		

At peak demand there were 980 cars parked in council managed public car spaces in the study area; 422 (273+57+92) in restricted spaces (excluding 8P) and 558 (402+118+38) in 8P plus unrestricted spaces.

Of the 201 available spaces at peak 118 spaces (59%) were located in the commercial zone. Of these spaces, 77 (65%) were located in the Bungan Lane car park; 20(26%) in the 8P parking and 57 (74%) elsewhere in the car park. 32% of available spaces were located in the residential zone, predominantly in the unrestricted on street parking areas.

Table 12 below shows how long each car, that was present at the time of peak demand, stayed in the area that day.

<sup>8</sup> Mona Vale Shopping Centre Parking Report 11/09/2007 issue B Page 4

Table 12 - Length of stay for vehicles present at peak demand

	Number of cars	Restricted (excl 8P)	Unrestricted (incl 8P)
<b>Less than 2 hours</b>	303	282	21
<b>2 – 5 hours</b>	137	77	60
<b>Greater than 5 hours</b>	540	65	475
<b>Total</b>	<b>980</b>	<b>424</b>	<b>556</b>

These figures indicate that at least 440 vehicles, (calculated by the sum of all cars with a length of stay less than 5 hours 303+137), present during the peak demand period relate to short stay parkers, being visitors to the surrounding businesses and/or residences, although they are not necessarily parked in the time restricted spaces, particularly those staying for greater than 2 hours. Table 12 shows that 82% of these were parked in time restricted parking spaces (excluding 8P). The remaining 540 vehicles would be made up of workers in the area, commuters and residents leaving their vehicles on-street throughout the day. Approximately 12% were parked in restricted spaces which may indicate a need to review enforcement management as time restrictions are only effective if appropriately enforced.

Based on the above analysis, we estimated the supply and demand for each of the main user groups that require parking in the area during weekday peak periods in Table 13 below.

Table 13 - Supply and Demand for the Main User Groups

User Group	Supply	Demand	Excess
<b>Commuters, workers in the area and residents – Unrestricted + 8P spaces</b>	648	540	108
<b>Visitors for Business and Social purposes – Restricted Spaces (excl 8P)</b>	533	440	93
<b>Total</b>	<b>1,181</b>	<b>980</b>	<b>201</b>

These estimates confirm there is available parking in the study area for all user groups at peak however not necessarily easy to locate (e.g. Bungan Lane car park) or in the most convenient location (unrestricted spaces in the residential zone).

The perception that parking is not available may be due to the following:

- Drivers prefer to on-street close to their destination rather than off street and walk;
- Drivers are unaware that there is parking available;
- Drivers wish to find parking for a time period longer than that available; and
- Drivers expect to find parking close to their desired location.

## 6.5 Future unconstrained parking demand

To determine the effect of future parking demand on the parking supply we developed a model to evaluate current parking supply and forecast future levels of parking demand which is attached as Attachment 3. The model is a forecasting tool which determines the excess or shortfall in parking supply over time using existing data based on:

- council controlled public parking supply, plus
- peak occupancy data by parking restriction

The model is based on peak occupancy as determined by our surveys. Peak occupancy was used as it represents the 'worst' case scenario with regards to parking demand when estimating the likely excess or shortfall in supply.

The model uses the survey data to establish the present parking supply and demand. These figures are then extrapolated in 5 year increments (up to 20 years) to predict future demand using a growth factor.

Extrapolation of the data has been performed using a population growth factor to estimate future peak demand as follows:

Table 14 - Population Growth Factors

YEAR 5 % Growth	YEAR 10 % Growth	YEAR 15 % Growth	YEAR 20 % Growth
6.59%	6.59%	6.59%	6.59%

The population growth factor was determined by reviewing historical population growth for the Pittwater Council area for the period 2003-2014<sup>9</sup> (average 6.73% per 5 years) and the SHOROC estimated population growth for the period 2011-2031 (average 6.45% per 5 years). We note that there are a number of reasoned growth factors that can be applied to forecast future parking demand. We have selected the above after consultation with Council.

The projected future excess / (shortfall) in parking supply, assuming no changes to supply during the period, is detailed in Attachment 3 and summarised below. Once the final public domain plan is complete, the overall loss of on-street parking will need to be incorporated into the model.

Table 15 - Projected Spaces Used by % Growth based on population growth

WEEKDAYS	2015			YEAR 5			YEAR 10			YEAR 15			YEAR 20		
	# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess
<b>TOTAL</b>	1,181	980	201	1,181	1,045	136	1,181	1,113	68	1,181	1,187	-6	1,181	1,265	-84
<b>WEEKENDS</b>															
<b>TOTAL</b>	1,195	766	429	1,195	817	378	1,195	871	324	1,195	928	267	1,195	989	206

Whilst the projections show the overall parking supply exceeds the projected peak demand for the next 10 years peak occupancy levels after Year 5 will exceed 85% (practical capacity), assuming no change to travel mode, leading to congestion as cars circulate to locate a parking space.

An allowance for varying the results in future time periods is incorporated in the model, so that the effects of changes in travel behaviour in response to changes in transport options can be reflected. For the purposes of this projection we assumed a 5% change in travel mode over each 5 year period.

The projected future excess / (shortfall) in parking supply, assuming no change to supply during the period, is detailed in Attachment 3 and summarised below:

<sup>9</sup> Source: Australian Bureau of Statistics, Regional Population Growth, Australia (3218.0). Compiled and presented in profile.id by id, the population experts.

Table 16 - Projected Spaces Used by % Growth based on population growth – 5% change travel mode

WEEKDAYS	2015			YEAR 5			YEAR 10			YEAR 15			YEAR 20		
	# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Adj change in Travel Mode
TOTAL	1,181	980	201	1,181	1,045	189	1,181	1,113	123	1,181	1,187	54	1,181	1,265	-21
WEEKENDS															
TOTAL	1,195	766	429	1,195	817	419	1,195	871	368	1,195	928	313	1,195	989	255

The projections show the overall parking supply exceeds the projected peak demand for the next 15 years and peak occupancy will exceed 85% (practical capacity) after 10 years.

As proposed in Section 6.6 below Council has the option of increasing supply by reviewing the current time restrictions bearing in mind the success of this strategy is reliant on an effective enforcement system. Also Council needs to be aware of the potential impact of displaced all day parkers spilling into surrounding residential streets if unrestricted all day parking is reduced.

As mentioned above this model considers Council controlled parking only and does not include available parking privately controlled (e.g. shopping centres etc.) which were outside the scope of our surveys.

## 6.6 Proposed Parking Strategies

Potential strategies Council could consider adopting to make better use of parking supply and/or constrain future parking demand are detailed in Attachment 6 and summarised below:

Table 17 - Proposed Strategies

Strategy		Recommendation
<b>Improve Use of Existing Supply</b>	<i>The closer the parking supply is to the commercial hubs, the shorter the time restriction</i>	<ul style="list-style-type: none"> <li>Adopt a general principle that where occupancy exceeds 85% (practical capacity) on a consistent basis, consideration is given to changing time restrictions and/or implementing paid parking to manage parking demand</li> <li>Introduce time restrictions into the residential and industrial zones (Darley Street) adjoining commercial zone (e.g. 2P).</li> </ul>
	<i>Shorter time restrictions on street vs off street.</i>	<ul style="list-style-type: none"> <li>Consider converting off street car parks in the commercial zone (car parks A and B and Bungan Lane car park Levels 1 and 2) to 2P weekdays. The time restrictions will still be greater than on street (1P). Similarly 8P parking in the Bungan Lane car park could be converted to 3P parking.</li> </ul>
<b>On Street User Group Allocation</b>	<i>Council to consider the needs and priorities of the various user groups to create a safe</i>	<ul style="list-style-type: none"> <li>Work with the local schools to investigate alternative drop off /pick up zones (e.g. rear of Mona</li> </ul>

Strategy	Recommendation	
	<i>environment and improve kerbside road efficiency whilst fostering a vibrant town centre environment.</i>	Vale Primary site) and the efficient management of existing drop off/ pick up areas.
<b>Signage and Wayfinding</b>	<i>Install a town centre signage plan to direct parkers to available parking.</i>	<ul style="list-style-type: none"> <li>• Develop a town centre signage plan to direct parkers to available parking to minimise circulating traffic (e.g. the Bungan Lane car park).</li> <li>• Consider dynamic signage as part of the signage plan.</li> </ul>
<b>Encourage More Non Car Trips</b>	<i>Reduce car dependency particularly for local trips by providing incentives to use alternate modes of transport</i>	<ul style="list-style-type: none"> <li>• Consider car share schemes.</li> <li>• Incentivise employers to introduce car-pooling and/or public transport for staff</li> </ul>
	<i>Ensure a safe and accessible environment for pedestrians and cyclists</i>	<ul style="list-style-type: none"> <li>• Install Bike racks.</li> <li>• Work with local schools and businesses to promote travel smart initiatives (e.g. car-pooling, walking and cycling to school, etc.)</li> </ul>
<b>Planning</b>	<i>No new sites to be built unless there is a justifiable business case. Encourage reduced provision for sites close to public transport</i>	<ul style="list-style-type: none"> <li>• Develop overflow parking plans for peak periods. Potential sites for overflow parking on weekends include School parking.</li> <li>• Unbundle parking in new developments.</li> <li>• Reduce parking requirements for new developments, particularly those adjacent to public transport hubs – assess parking demand before creating parking.</li> </ul>

It should be noted that the parking strategies listed above recommend the better use of the existing parking supply through changes to the parking restrictions and an expansion of the restrictions. This may need to be undertaken in conjunction with the PPW, which will likely result in a reduction in the on-street parking provision. The strategy would counteract some of this loss, however the construction of a new car park beneath Civic Square would accommodate approximately 120 parking spaces, which would more than compensate for the loss of on-street parking. Changes to the parking restrictions would be best made around the time of the completion of the car park and the PPW in order to transition from the current all-day parking availability (on the fringe of the Town Centre) to the car park.

In implementing any strategy Council would need to engage with key stakeholders such as the management of the private shopping centres to understand how changes in their parking controls could impact Council

controlled parking e.g. proposed introduction of license plate recognition cameras in Pittwater Place to enforce time restrictions.

## 6.7 Planning Control Parking Rates

The planning controls for the Town Centre set the requirements for development and as such are the means by which Council can implement its policies such as building heights, FSR and parking provisions. At present, Part B of the Pittwater DCP sets minimum parking requirements for developments, which means there is effectively no limit on the number of parking spaces provided within a development (within reason). Parking within new developments is often related to the market demand for parking, balanced with the cost of construction. Generally there is a trend for more parking rather than less where the market can support the construction cost.

In recent years some Councils have implemented limits on parking supply by applying the planning controls as maximum parking rates. This is typically implemented where there is good supporting public transport and services surrounding the site. For example, the City of Sydney adopts low parking provision maximum limits in light of the need to reduce car usage within the inner city, which is viable due to the density of services and the large choice of public transport options. Other Councils are increasingly adopting maximum parking rates (typically within Town Centres) to limit parking with the ultimate aim of reducing car ownership and usage.

The following table presents the current parking provision policies for multi-unit residential, office and retail developments within Pittwater, Warringah and Manly (specifically Manly Town Centre).

Table 18 - Development Parking Provision Policy Comparison

Ref Document	Land Use Group	Land Use Activity (Primary)	Rate type	Parking Provision Requirement			
<b>Pittwater – DCP Part B – Version 21/11/15</b>							
<b>DCP Part B Ver 25/11/15</b>	Multi Dwelling Housing, Residential Flat Buildings and Shop-Top Housing	1 bedroom	minimum	1.0	space	per	dwelling
<b>DCP Part B Ver 25/11/15</b>	Multi Dwelling Housing, Residential Flat Buildings and Shop-Top Housing	2 or more bedroom dwelling	minimum	2.0	space	per	dwelling
<b>DCP Part B Ver 25/11/15</b>	Business Premises and Office Premises		Minimums	2.5	space	per	100sqm GLA
<b>DCP Part B Ver 25/11/15</b>	Retail Premises (Not including Shopping Centre Developments)		Minimums	1.0	space	per	30sqm GLA
<b>Warringah – DCP 2011 – Version 9/12/11</b>							
<b>DCP 2011 Ver 9/12/11</b>	Multi Dwelling Housing, Residential Flat Buildings, Serviced Apartments (including holiday flats), Shop-Top Housing (residential component)	1 bedroom	"Adequate Parking to be Provided"	1.0	space	per	dwelling
<b>DCP 2011 Ver 9/12/11</b>	Multi Dwelling Housing, Residential Flat Buildings, Serviced Apartments (including holiday flats), Shop-Top Housing (residential component)	2 bedroom	"Adequate Parking to be Provided"	1.2	space	per	dwelling
<b>DCP 2011</b>	Multi Dwelling Housing, Residential Flat	3 bedroom	"Adequate	1.5	space	per	dwelling

<b>Ver 9/12/11</b>	Buildings, Serviced Apartments (including holiday flats), Shop-Top Housing (residential component)		Parking to be Provided"				
<b>DCP 2011 Ver 9/12/11</b>	Multi Dwelling Housing, Residential Flat Buildings, Serviced Apartments (including holiday flats), Shop-Top Housing (residential component)		"Adequate Parking to be Provided"	1.0	visitor space	per	5 dwellings
<b>DCP 2011 Ver 9/12/11</b>	Office Premises		"Adequate Parking to be Provided"	1.0	space	per	40 sqm GFA
<b>DCP 2011 Ver 9/12/11</b>	Retail Shop (includes retail / business component of shop top housing, retail premises and neighbourhood shop)		"Adequate Parking to be Provided"	6.1	space	per	100 sqm GLFA
<b>Manly Town Centre – DCP 2013 – Version 12/12/15</b>							
<b>DCP 2013 Ver 12/12/15</b>	Residential Flat Buildings, Multi Dwelling Housing, Shop Top Housing, Attached Dwellings, Boarding Houses, Dual Occupancies, Group Homes, Hostels, Senior Housing	1 bedroom dwelling or studio	Minimum	0.6	space	per	dwelling
<b>DCP 2013 Ver 12/12/15</b>	Residential Flat Buildings, Multi Dwelling Housing, Shop Top Housing, Attached Dwellings, Boarding Houses, Dual Occupancies, Group Homes, Hostels, Senior Housing	2 bedroom dwelling	Minimum	1.0	space	per	dwelling
<b>DCP 2013 Ver 12/12/15</b>	Residential Flat Buildings, Multi Dwelling Housing, Shop Top Housing, Attached Dwellings, Boarding Houses, Dual Occupancies, Group Homes, Hostels, Senior Housing	3 or more bedroom dwelling	Minimum	2.0	space	per	dwelling
<b>DCP 2013 Ver 12/12/15</b>	Residential Flat Buildings, Multi Dwelling Housing, Shop Top Housing, Attached Dwellings, Boarding Houses, Dual Occupancies, Group Homes, Hostels, Senior Housing		Minimum	0.16	visitor space	per	dwelling

The comparison confirms that each planning control sets a minimum requirement (i.e. no limit on the provision) although the Manly DCP permits the lowest provision in light of the density of services and access by public transport. The Pittwater controls require the largest parking provision and this may in some part be due to the geographic location of the Town Centre on the northern part of the Northern Beaches Peninsular. This is also reflected in current car ownership data, courtesy of Profile.id *"Analysis of car ownership in 2011, indicates 62% of households in Pittwater Council area had access to two or more motor vehicles, compared to 44% in Greater Sydney."*

A simple comparison with the neighbouring Councils on the Peninsular indicate that a reduction in the minimum parking provisions could be implemented within the Town Centre. An alternative would be to convert the existing minimum rates to maximum rates, which limits the growth in parking provision as car ownership and provides developers with the option of providing less parking if this reflects the needs of the market. This is associated with housing affordability whereby a notable proportion of the market elect to not purchase a dwelling with a parking space. In conjunction with either reducing the minimum requires, or conversion to maximum rates, parking can be provided in an unbundled format, i.e. the dwellings and the parking spaces are purchased separately according to the wishes of the market. This is particularly relevant for 2 and 3 bedroom apartments, where under the current DCP, all purchasers are required to purchase 2 parking spaces regardless of need.

In relation to retail and commercial developments, the conversion of the DCP rates would not impact car ownership, but would encourage shoppers and workers to travel by alternative means, leaving the car at home. Those who have no viable transport alternative are reliant on the provision of on-street parking, which relates to the discussion in the sections above regarding the control of time limits on the road network.

Any reduction in private parking must be implemented in the context of the public parking surrounding the area. For example, the restriction of parking within a large residential development would place additional demand on the surrounding on-street parking supply if appropriate controls are not in place, or where the maximum parking policy is adopted in areas where there are insufficient alternative forms of transport and a reduction in car ownership cannot be supported. In the context of Mona Vale any restriction to the private parking provision will need to be determined in conjunction with an assessment of the on-street parking provision. This study has determined that the residential area in close proximity to the Town Centre is currently not subject to any parking restrictions, which potentially encourages car usage by commuters and future residents of the Town Centre (if a restricted parking policy is adopted).



## 7 Pedestrian Strategy

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As part of a package of studies being undertaken by Council in relation to the Place Planning project, Walk Mona Vale (Pedestrian Access & Mobility Plan for Mona Vale) has been prepared by Cardno for Council.

## 8 Cycling Strategy

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As part of a package of studies being undertaken by Council in relation to the Place Planning project the Pittwater Bike Plan (investigating cycling options for the Mona Vale Town Centre) has been developed by Pittwater Council.

## 9 Conclusion

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### 9.1 Road Network Findings

- The operational capacity of the road network has been assessed through modelling, based on peak hour traffic surveys, traffic signal data and a simulation of the road layout and traffic controls. The model confirms that the existing road network operates within capacity during the daily peak periods and that there is spare capacity to accommodate future growth in traffic activity.
- The model tested a future scenario whereby the existing traffic activity was increased by 1% per annum (accumulatively) to 2021. This scenario confirms that the road network can accommodate this level of growth, although there are indications that certain intersections will require adjustments to the traffic signal timing or some physical works (primarily within the state roads).
- The proposed PPW were applied to the road network model to assess the impacts on the road network. The results indicate that the works can be undertaken with some relatively minor mitigate works required. The primary impact results from redirecting traffic along Darley Street, whereby the right turn movement from Barrenjoey Road generates a queue that extends beyond the existing right turn lane, which then blocks a southbound lane. This will likely require an adjustment to the traffic signal timing and an extension to the right turn lane. It is evident that natural traffic growth will require these changes regardless of the PPW.

### 9.2 Road Network Recommendations

- Continue to develop the PPW plan on the basis that the traffic modelling confirms that the road network will still operate with a good level of service, subject to some mitigating works being undertaken;
- Develop the proposal for a Shared Zone along Bungan Street and the adjacent lanes to the south including Bungan Lane between Mona Vale Road and Pittwater Road, which will improve pedestrian access to/from the Bungan Lane car park;
- Liaise with RMS and develop concept plans in relation to changes to the arterial roads, particularly the proposal to reduce the intersection of Pittwater Road and Barrenjoey Road;
- Develop a concept plan of the intersections of Pittwater Road with Bungan Street and Park Street in the context that the modelling has confirmed that the removal of the existing roundabout can be achieved in relation to road capacity.

### 9.3 Parking Strategy Recommendations

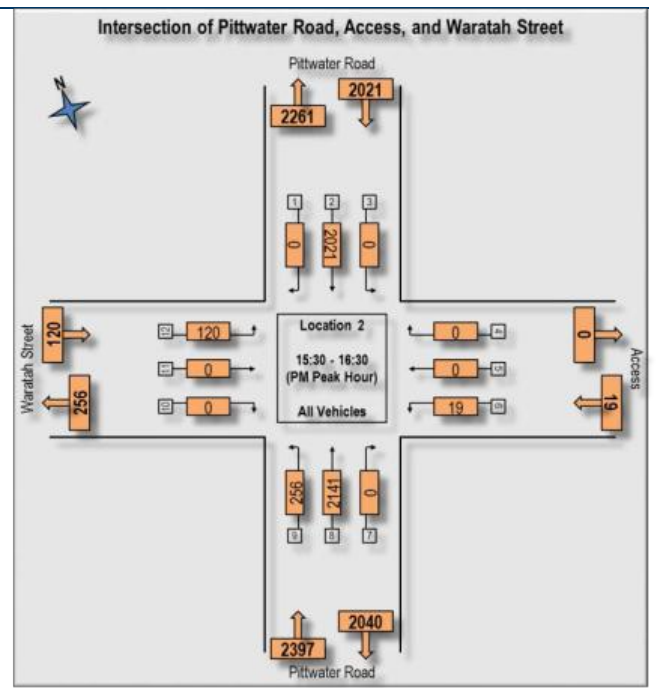
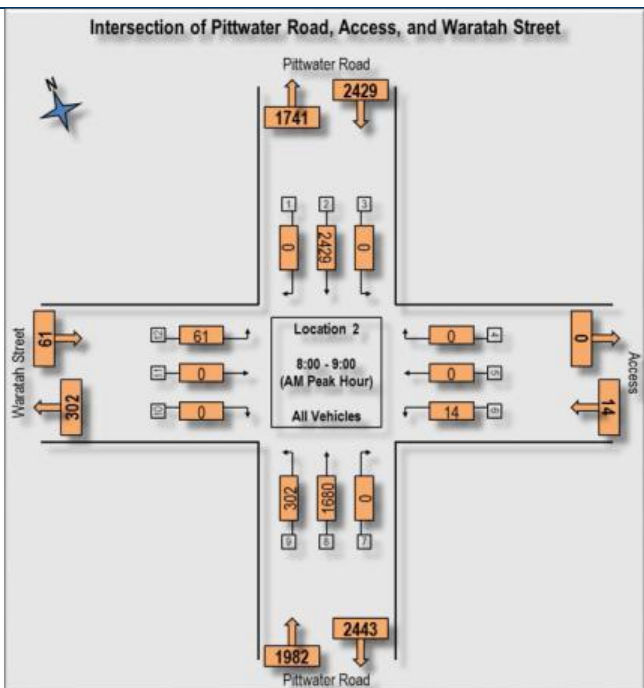
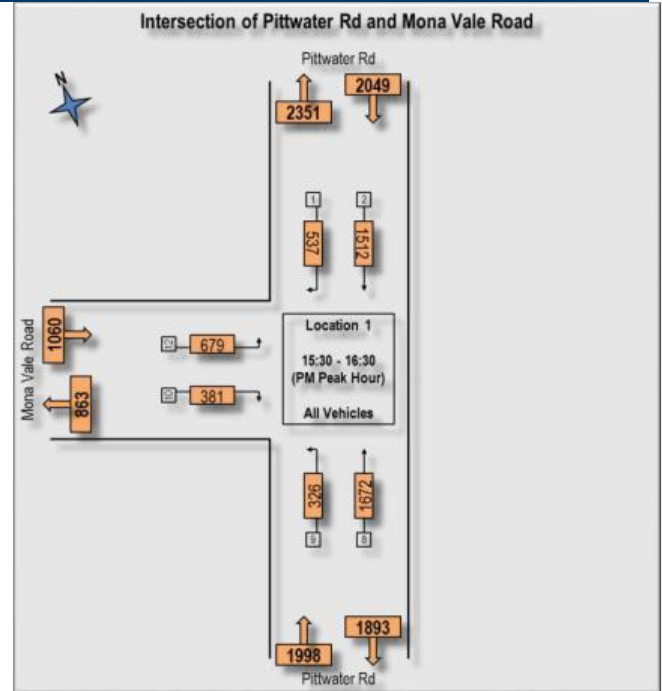
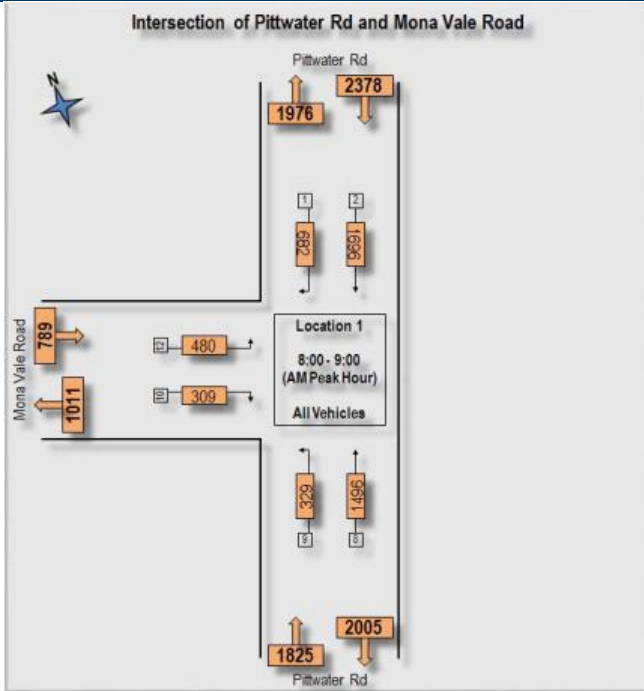
- Adopt a general principle that where occupancy exceeds 85% (practical capacity) on a consistent basis, consideration is given to changing time restrictions and/or implementing paid parking to manage parking demand;
- Introduce time restrictions into the residential and industrial zones (Darley Street) adjoining commercial zone (e.g. 2P);
- Consider converting off street car parks in the commercial zone (car parks A and B and Bungan Lane car park Levels 1 and 2) to 2P weekdays;
- The time restrictions will still be greater than on street (1P);

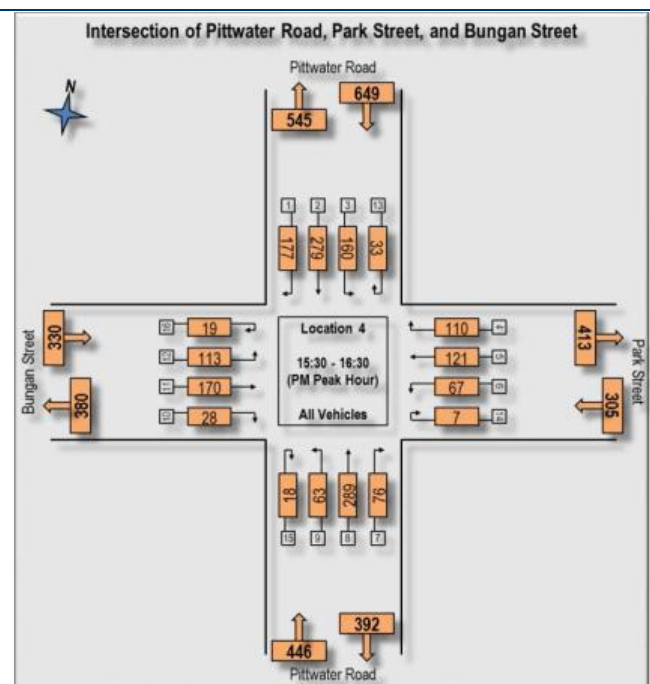
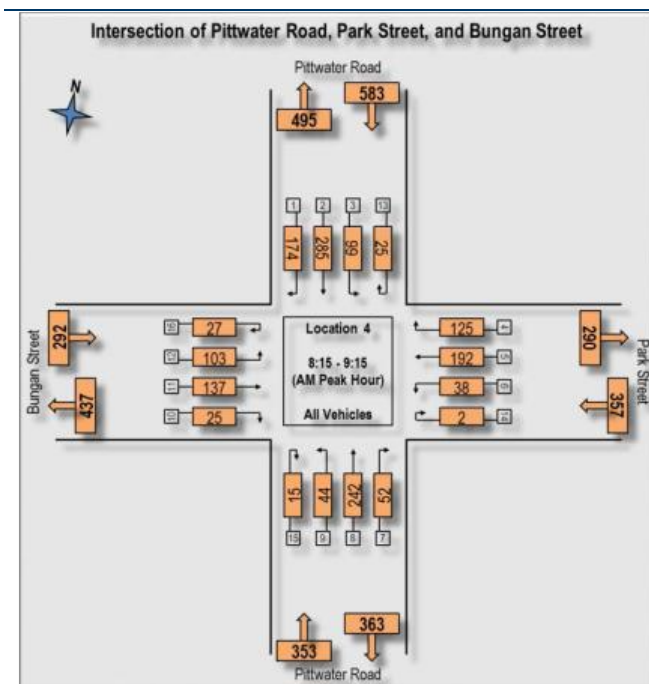
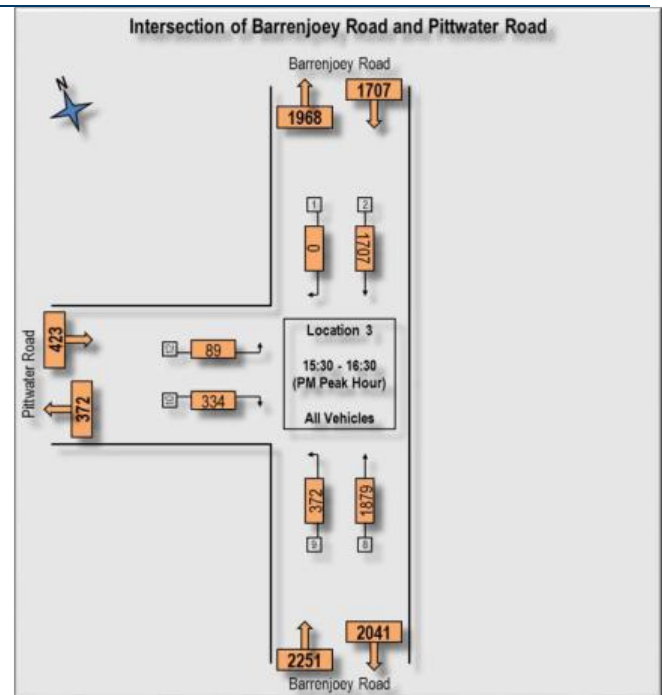
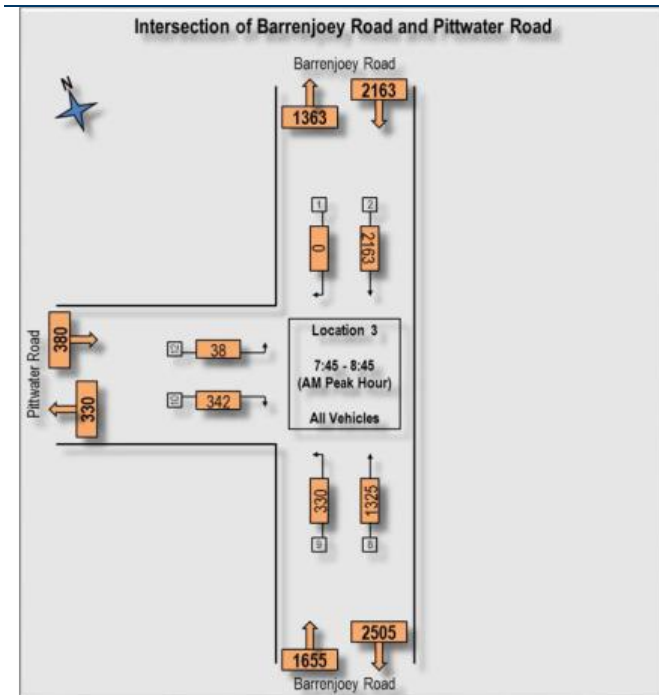
- Similarly 8P parking in the Bungan Lane car park could be converted to 3P parking;
- Consider either a reduction in the current parking requirements for developments, or the conversion of the existing rates to maximum limits, rather than minimum requirements;
- Work with the local schools to investigate alternative drop off /pick up zones (e.g. rear of Mona Vale Primary site) and the efficient management of existing drop off/ pick up areas;
- Develop a town centre signage plan to direct parkers to available parking to minimise circulating traffic (e.g. the Bungan Lane car park);
- Consider dynamic signage as part of the signage plan;
- Consider encouraging car share schemes through the provision of 'pods' in lieu of on-street parking spaces;
- Incentivise employers to introduce car-pooling and/or public transport for staff;
- Install Bike racks within strategic locations and in close proximity to major destinations (e.g. the front door of supermarkets or within the eat-street areas once established);
- Work with local schools and businesses to promote travel smart initiatives (e.g. car-pooling, walking and cycling to school, etc.);
- Develop overflow parking plans for peak periods. Potential sites for overflow parking on weekends include School parking;
- Unbundle parking in new developments;
- Reduce parking requirements for new developments, particularly those adjacent to public transport hubs – assess parking demand before creating parking.

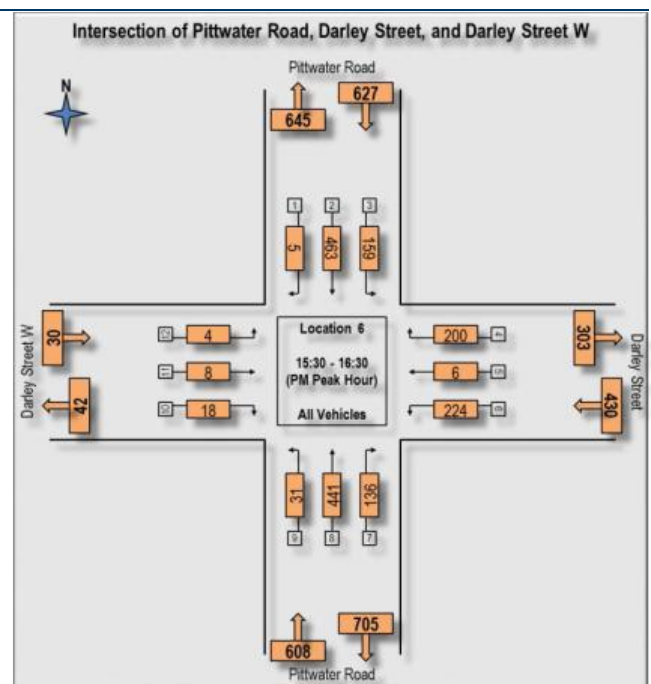
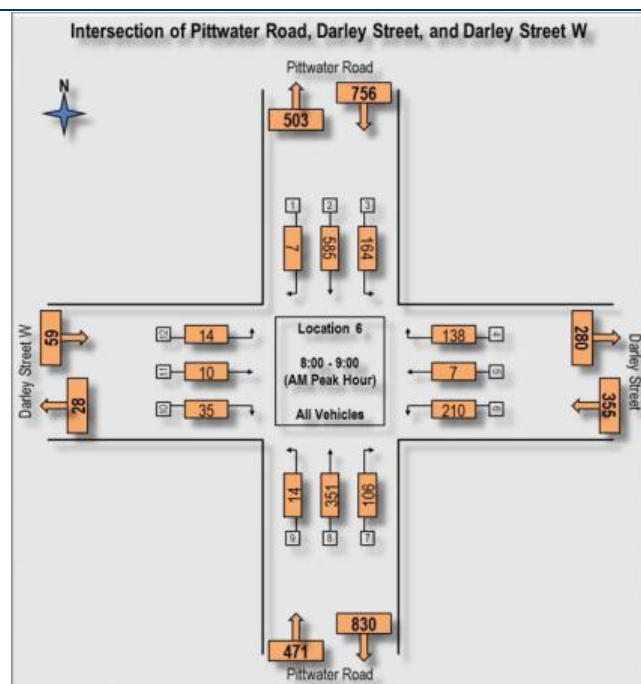
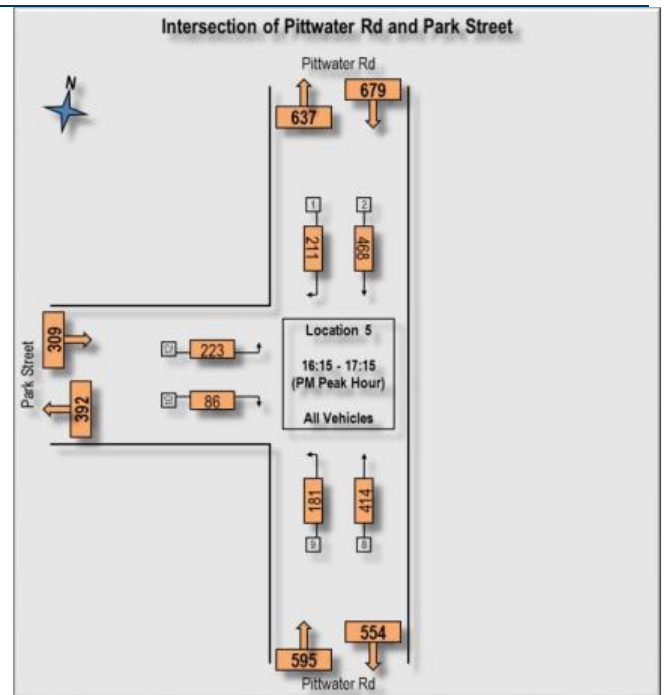
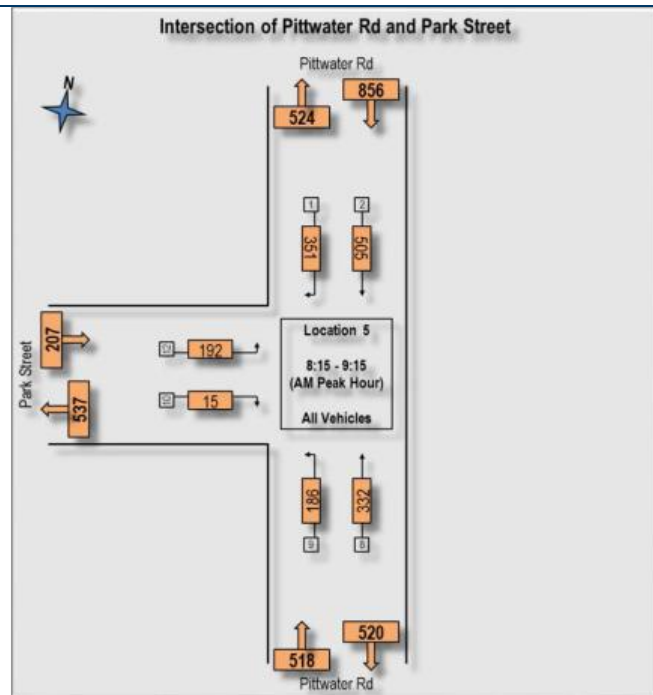
# Attachment 1 - Intersection Traffic Survey Results

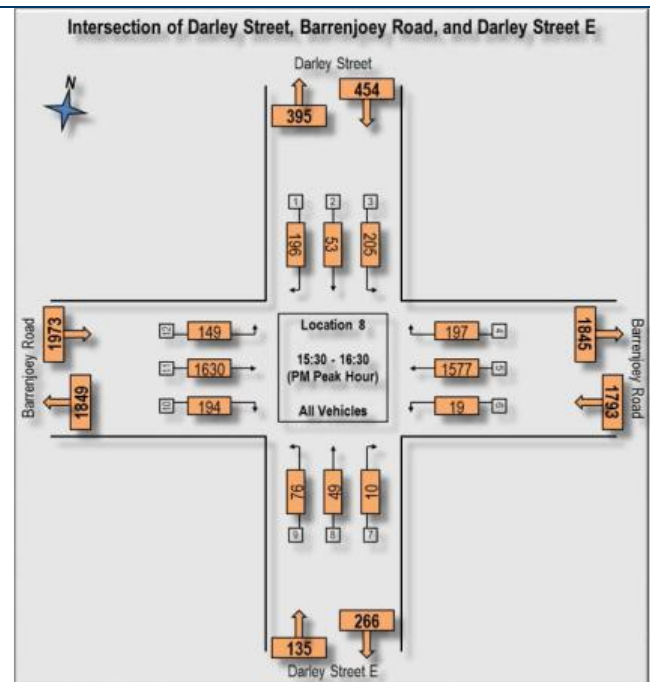
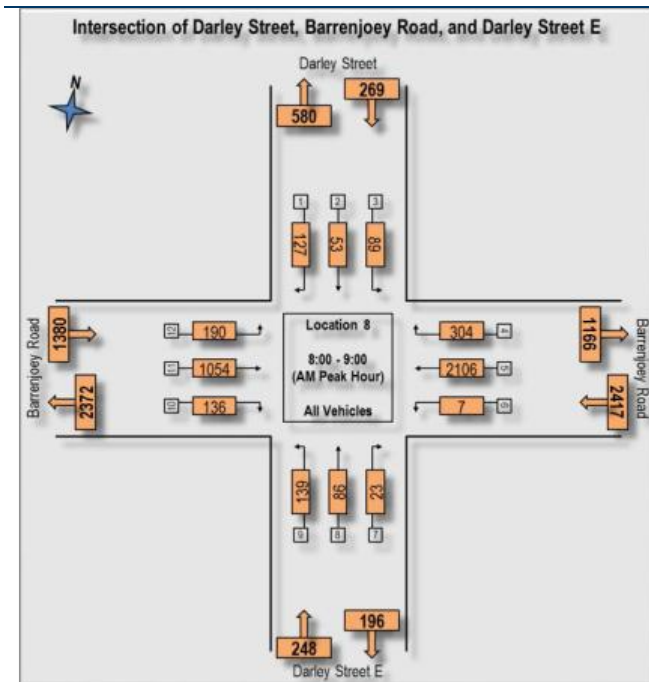
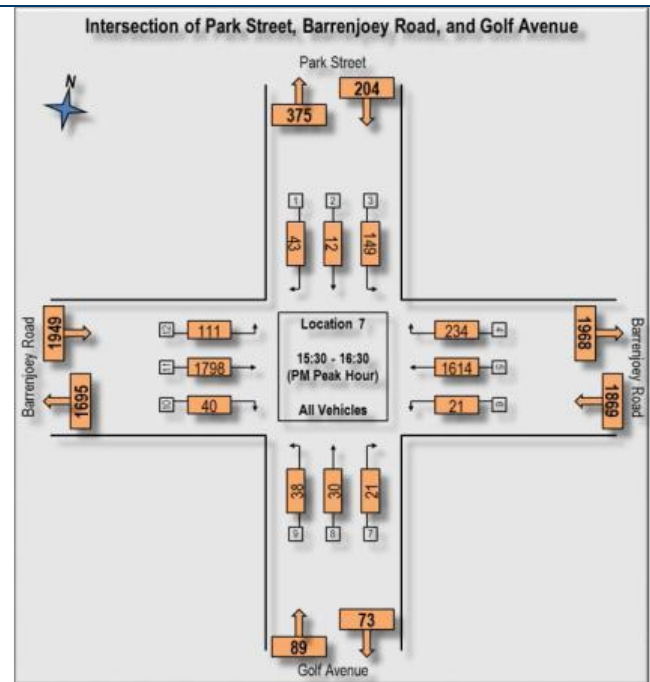
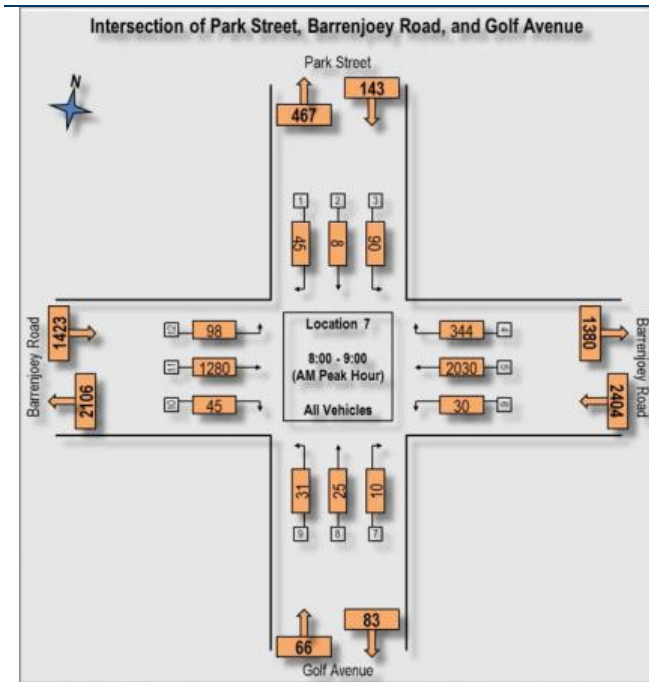
## AM Peak Results

## PM Peak Results



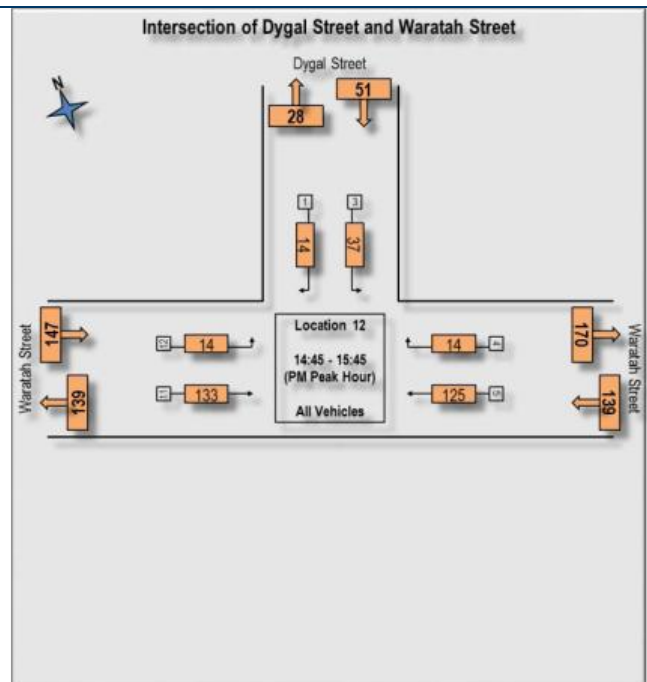
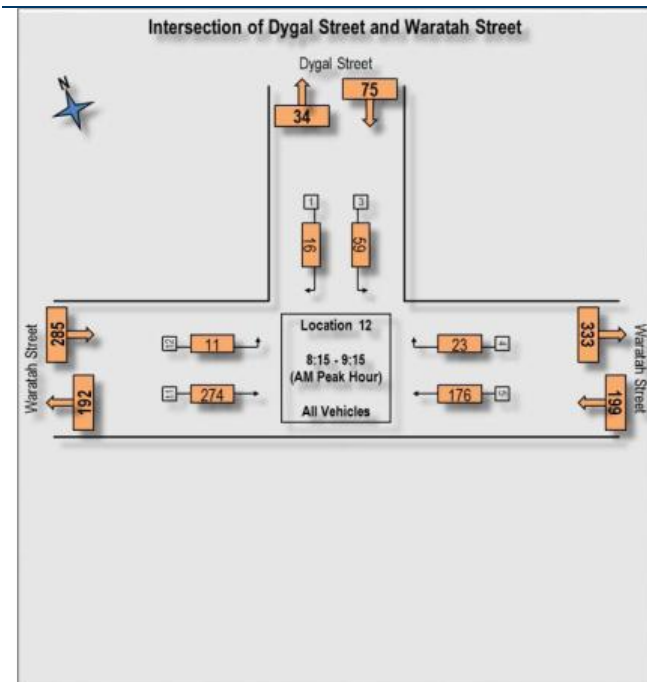
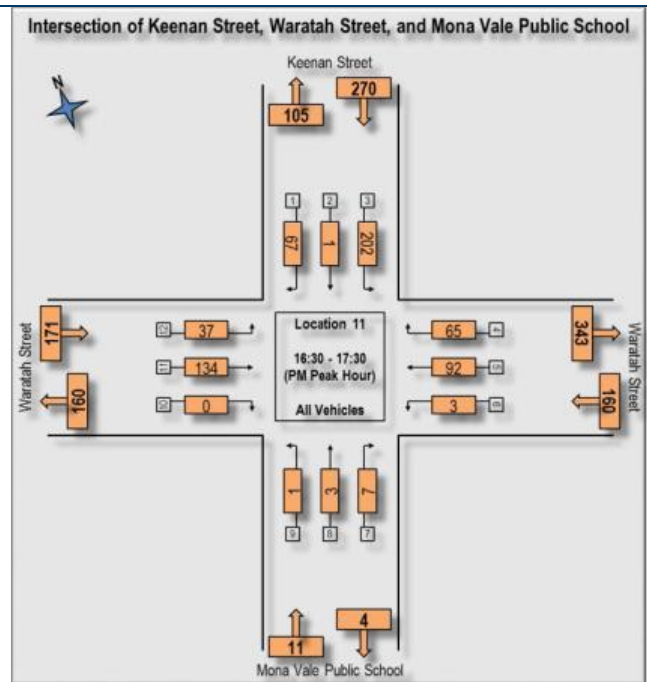
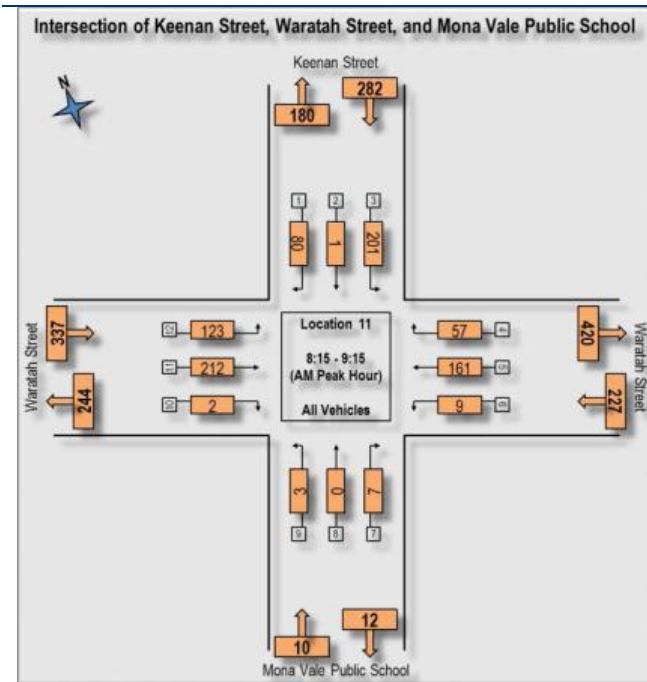


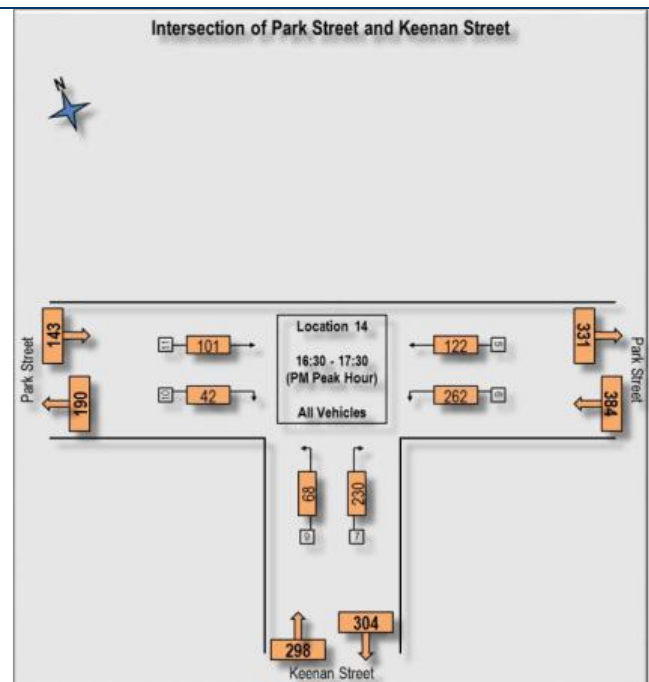
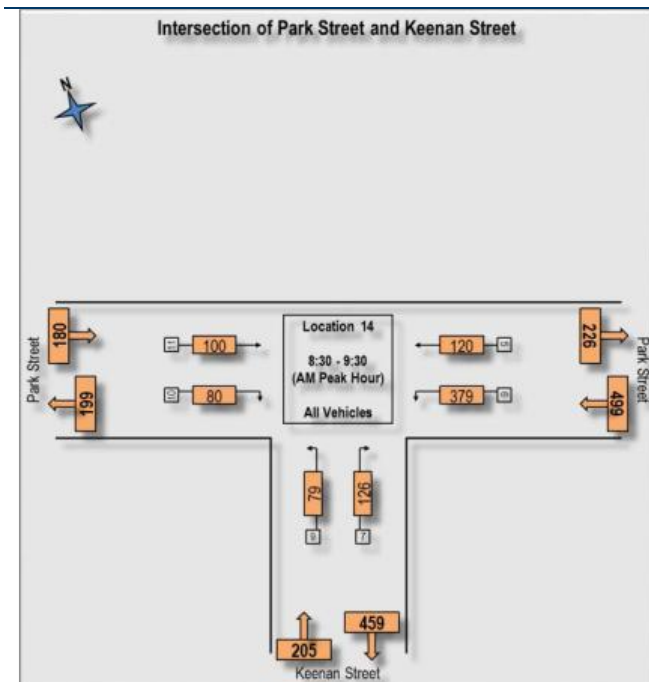
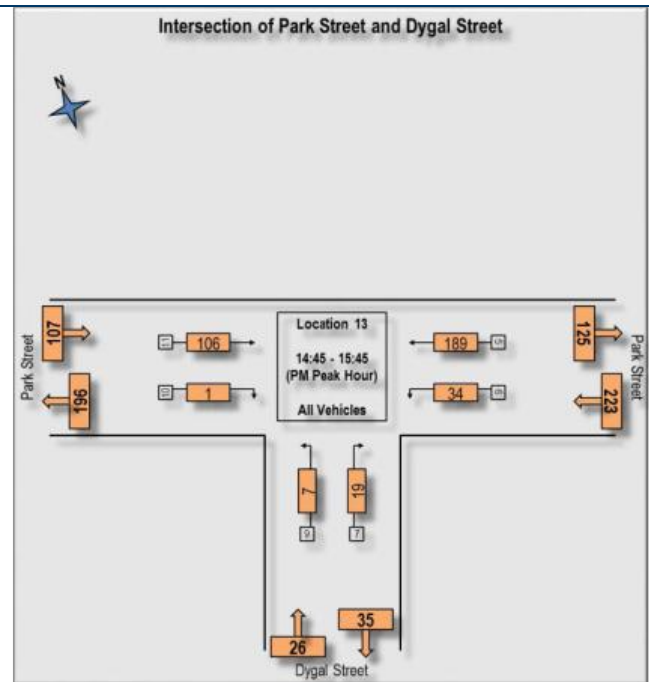
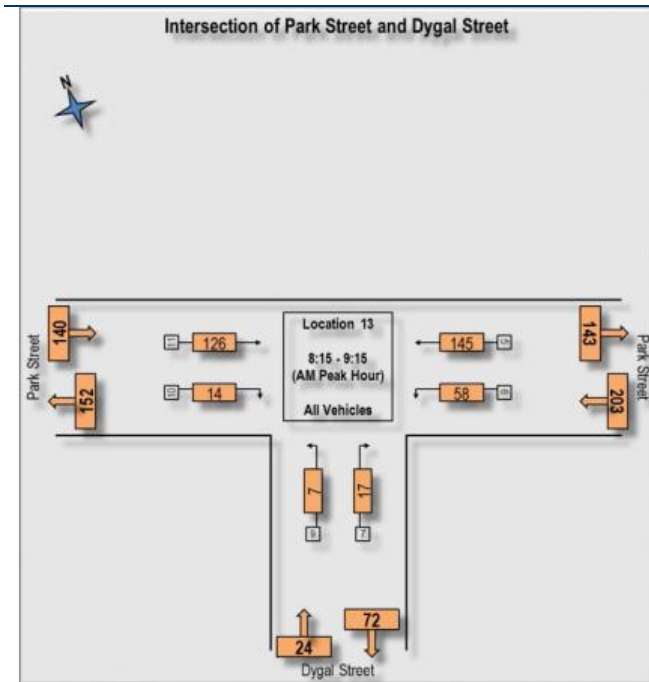












## Attachment 2 - Automated Counter Results

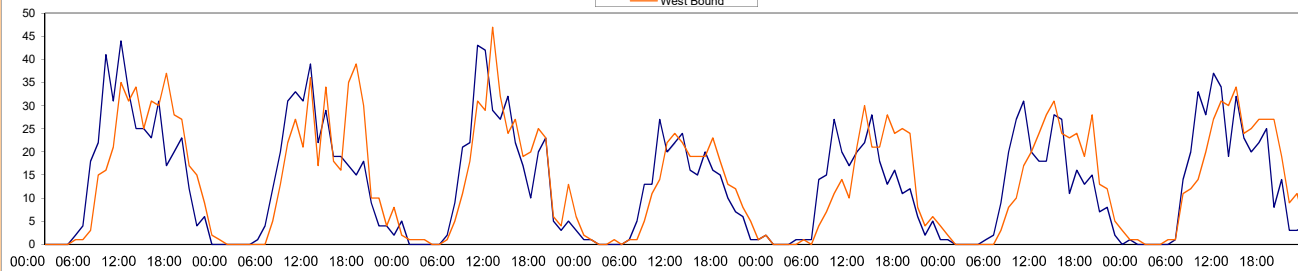
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### Darley Street W west of Pittwater Road

Suburb: Mona Vale  
 SiteId: 2  
 Speed Limit: 50  
 Job: 7061  
 Map Ref:

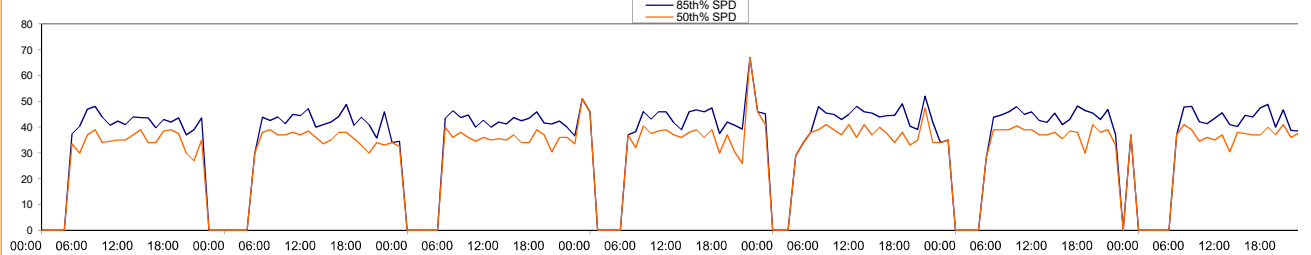
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	60 East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound
Short %	95%	98%	96%	96%	98%	97%	97%	99%	98%	97%	99%	98%	96%	97%	97%	94%	98%	96%	93%	96%	95%		
Med %	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	3%	2%	5%	2%	3%	4%	4%	4%		
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
7am-7pm Vol	335	330	665	293	308	601	308	306	614	211	209	420	219	236	455	244	256	500	301	298	599		
24Hr Vol	381	379	760	334	347	681	336	346	682	235	241	476	251	265	516	274	293	567	341	357	698		
85%ile Km	43.9	45.0	44.0	44.9	44.0	44.0	44.0	45.0	44.0	46.0	45.0	45.6	46.0	47.0	46.0	46.0	45.0	46.0	44.0	46.0	45.0		
Mean Spd	35.9	36.9	36.4	36.8	37.1	36.9	36.2	36.4	36.3	37.4	38.3	37.9	38.0	39.8	38.9	38.2	38.0	38.1	36.6	37.3	37.0		
Std Dev	9.0	9.2	9.1	9.1	8.2	8.7	7.9	9.2	8.6	8.9	8.4	8.6	9.1	8.8	9.0	8.7	8.2	8.5	9.6	9.9	9.8		
AM PK Interval Vol	44	35	79	39	36	75	43	47	76	27	24	46	27	21	41	31	24	48	37	31	65		
AM PK Factor	0.12	0.09	0.10	0.12	0.10	0.11	0.13	0.14	0.11	0.11	0.10	0.10	0.11	0.08	0.08	0.11	0.08	0.08	0.11	0.09	0.09		
AM PK 85%	42.4	42.8	43.0	47.2	41.6	44.8	40.0	40.0	40.6	46.0	45.0	45.0	44.9	41.6	45.7	45.0	44.4	44.0	43.5	42.1	44.3		
AM PK starts	10:00	10:00	10:00	11:00	11:00	11:00	09:00	11:00	11:00	09:00	11:00	11:00	08:00	11:00	11:00	09:00	11:00	09:00	10:00	11:00	11:00		
PM PK Interval Vol	31	37	61	29	39	63	32	32	59	24	23	46	28	30	52	28	31	59	32	34	66		
PM PK Factor	0.08	0.10	0.08	0.09	0.11	0.09	0.10	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.10	0.10	0.11	0.10	0.09	0.10	0.09		
PM PK 85%	39.7	44.0	41.0	41.0	41.2	43.0	41.2	44.0	44.0	39.0	45.1	42.0	45.4	48.5	48.0	45.4	43.4	44.3	40.2	44.9	43.0		
PM PK starts	15:00	16:00	15:00	13:00	17:00	13:00	13:00	12:00	12:00	12:00	16:00	12:00	13:00	12:00	12:00	13:00	13:00	13:00	13:00	13:00	13:00		

**Volume Distribution**

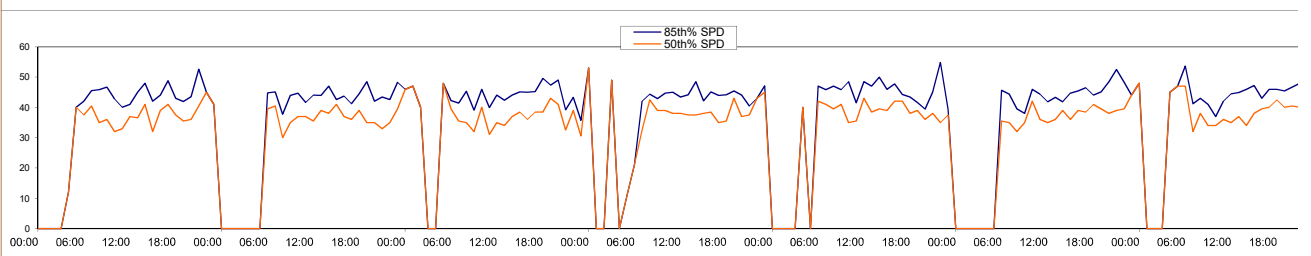


**Speed Stats**

**East Bound Speed Dist. 50th & 85th Percentiles**



**West Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	362	369	731	318	339	657	326	340	666	227	236	463	241	257	498	257	286	543	318	343	661
2: Car + Trailer	1	1	2	1	0	1	0	1	1	1	3	4	0	1	1	1	1	2	0	1	1
3: 2 axle truck	8	9	17	7	6	13	5	4	9	3	2	5	4	4	8	12	5	17	9	7	16
4: 3axle truck	0	0	0	0	2	2	0	1	1	0	0	0	0	3	3	1	0	1	2	6	8
5: 4 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6: 3 axle semi	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
7: 4 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	9	0	9	8	0	8	5	0	5	4	0	4	5	0	5	3	1	4	10	0	10
14: Motorcycle	20	9	29	13	12	25	16	11	27	9	11	20	16	13	29	15	6	21	18	2	20
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min %Vol	29.0	30.0	30.0	30.0	30.0	30.0	29.0	31.0	29.0	29.0	32.0	31.0	31.0	32.0	33.0	32.0	31.0	31.0	30.0	33.0	30.0
	71%	69%	69%	71%	75%	73%	73%	66%	68%	69%	73%	70%	71%	73%	72%	70%	72%	71%	70%	68%	68%

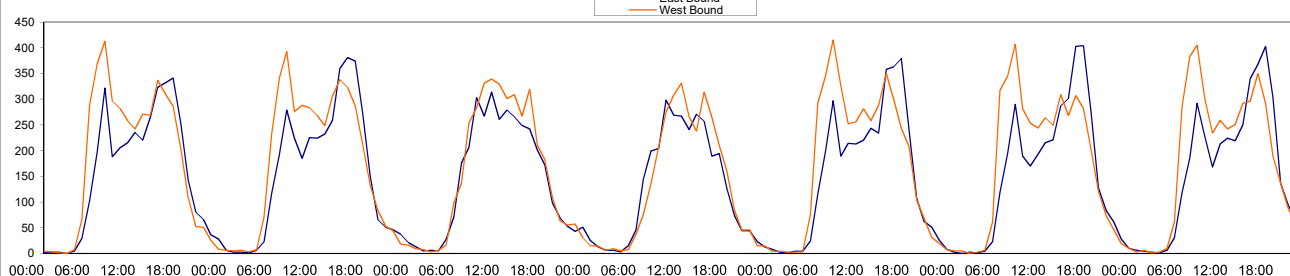
Definitions  
 85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Cabbage Tree Road west of Pittwater Road

Suburb: Mona Vale  
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 Speed Limit: 50  
 Job: 7061  
 Map Ref:

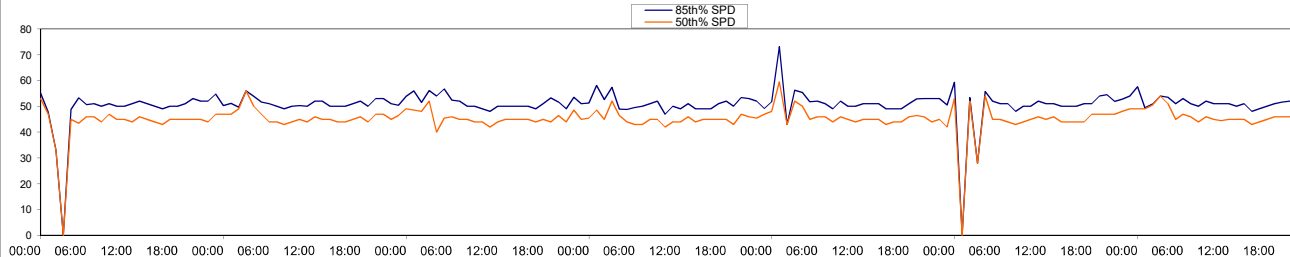
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	60 East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways	East Bound	Vest Bound	Two ways
Short %	96%	98%	97%	96%	97%	97%	96%	98%	98%	97%	99%	98%	95%	98%	97%	95%	97%	96%	95%	98%	97%
Med %	4%	2%	3%	4%	2%	3%	3%	1%	2%	3%	1%	2%	5%	2%	3%	5%	3%	4%	5%	2%	3%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	3097	3537	6634	3209	3564	6773	2936	3261	6197	2659	2786	5445	3149	3522	6671	3140	3410	6550	3193	3493	6686
24Hr Vol	3592	4151	7743	3713	4225	7938	3398	3730	7128	2968	3082	6050	3560	4134	7694	3599	4074	7673	3697	4174	7871
85%ile Km	50.2	48.0	49.0	51.0	49.0	50.0	50.0	49.0	49.0	50.0	49.0	50.0	51.0	49.0	50.0	51.0	49.0	50.0	51.0	49.0	50.0
Mean Spd	44.8	44.2	44.5	44.8	44.4	44.6	44.4	44.2	44.3	44.2	44.4	44.3	44.7	44.6	44.6	45.0	44.4	44.7	45.2	45.0	45.1
Std Dev	6.6	5.2	5.9	6.7	5.4	6.0	7.0	5.6	6.3	7.2	5.3	6.3	6.8	5.2	6.0	6.5	5.2	5.9	6.5	5.2	5.8
AM PK Interval Vol	322	413	735	279	393	672	314	339	653	298	308	577	297	415	712	290	407	697	292	405	697
AM PK Factor	0.09	0.10	0.09	0.08	0.09	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.08	0.10	0.09	0.08	0.10	0.09	0.08	0.10	0.09
AM PK 85%	50.0	48.0	48.0	49.0	48.0	48.0	48.0	48.0	48.0	47.0	49.0	49.0	49.0	48.0	49.0	48.0	47.0	47.5	50.0	48.0	49.0
AM PK starts	08:00	08:00	08:00	08:00	08:00	08:00	11:00	11:00	11:00	10:00	11:00	11:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00
PM PK Interval Vol	341	337	660	381	338	704	279	329	590	271	331	598	379	350	708	404	309	710	403	350	718
PM PK Factor	0.09	0.08	0.09	0.10	0.08	0.09	0.08	0.09	0.08	0.09	0.11	0.10	0.11	0.08	0.09	0.11	0.08	0.09	0.11	0.08	0.09
PM PK 85%	50.0	47.0	48.0	50.0	48.0	49.0	50.0	49.0	49.0	49.0	49.0	49.0	49.0	47.0	48.0	51.0	48.0	49.0	50.0	48.0	49.0
PM PK starts	17:00	15:00	15:00	16:00	15:00	16:00	13:00	12:00	12:00	14:00	12:00	12:00	17:00	15:00	15:00	17:00	14:00	16:00	17:00	16:00	16:00

**Volume Distribution**

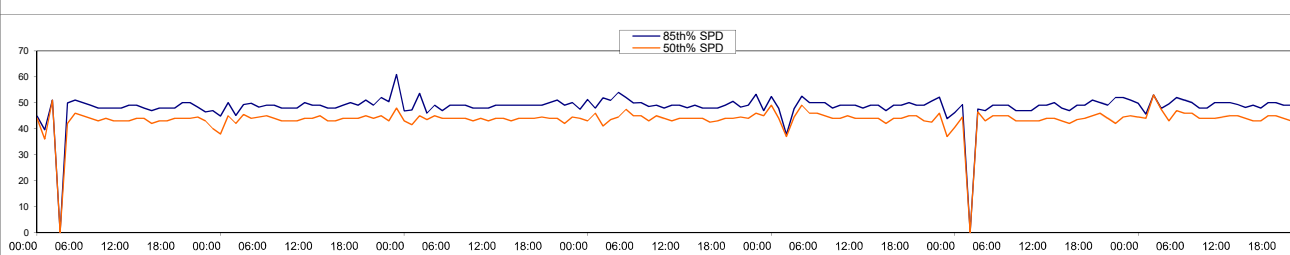


**Speed Stats**

**East Bound Speed Dist. 50th & 85th Percentiles**



**West Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	3,407	4,023	7,430	3,509	4,077	7,586	3,231	3,630	6,861	2,823	3,001	5,824	3,362	4,006	7,368	3,398	3,933	7,331	3,478	4,055	7,533
2: Car + Trailer	25	31	56	39	42	81	47	42	89	48	55	103	31	30	61	22	25	47	38	26	64
3: 2 axle truck	150	89	239	154	98	252	96	50	146	69	23	92	156	86	242	172	107	279	161	89	250
4: 3 axle truck	4	6	10	3	5	8	4	2	6	0	0	0	2	7	9	0	6	6	3	2	5
5: 4 axle truck	2	1	3	0	2	2	7	3	10	15	0	15	5	4	9	4	2	6	4	1	5
6: 3 axle semi	1	0	1	3	0	3	3	1	4	4	1	5	0	0	0	1	0	1	5	0	5
7: 4 axle semi	1	1	2	1	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
9: 6 axle semi	1	0	1	1	0	1	1	0	1	4	0	4	0	1	1	0	0	0	3	1	4
10: 7/8 axle truck	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	1	0	1	2	1	3	9	2	11	5	2	7	2	0	2	2	0	2	4	0	4
14: Motorcycle	27	58	85	36	48	84	95	67	162	112	54	166	46	43	89	29	40	69	39	47	86
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min	38.0	36.0	37.0	37.0	36.0	37.0	37.0	37.0	37.0	38.0	36.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	38.0	37.0	37.0
%Vol	81%	90%	86%	80%	89%	85%	80%	88%	84%	79%	89%	84%	81%	89%	85%	82%	90%	86%	82%	89%	86%

**Definitions**

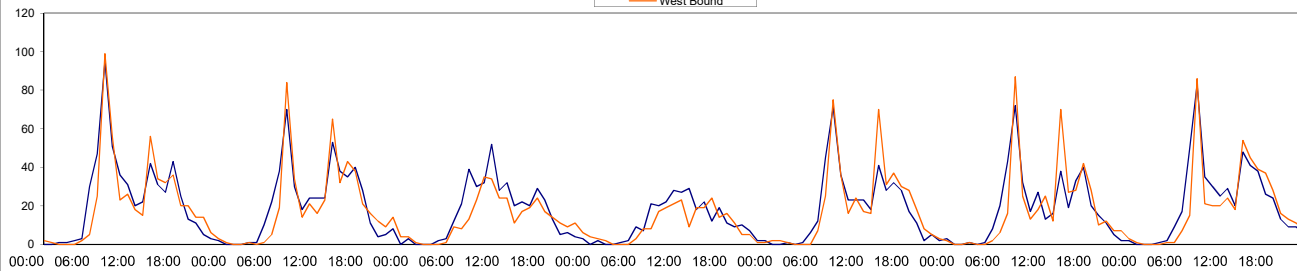
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Emma Street west of Oliver Way

Suburb: Mona Vale  
 SiteId: 5  
 Speed Limit: 50  
 Job: 7061  
 Map Ref:

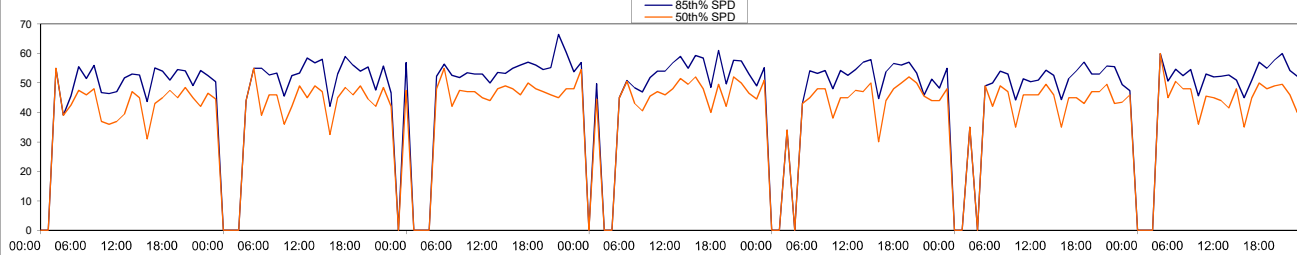
Date Record Interval (min)	Thursday 22/10/2015			Friday 23/10/2015			Saturday 24/10/2015			Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015					
	60 East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways	East	Bound	Vest Bound	Two ways
Short %	98%	98%	98%	98%	99%	98%	98%	98%	97%	98%	99%	100%	100%	98%	98%	98%	98%	98%	98%	98%	98%	96%	97%	97%
Med %	2%	2%	2%	2%	1%	1%	1%	1%	2%	2%	0%	0%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	470	440	910	422	410	832	348	249	597	236	197	433	385	405	790	370	391	761	449	407	856	449	407	856
24Hr Vol	541	507	1048	484	473	957	399	315	714	280	232	512	428	453	881	435	439	874	517	466	983	517	466	983
85%ile Km	52.0	49.0	51.0	53.4	50.0	52.0	55.0	52.0	54.0	56.0	53.0	55.0	54.0	50.0	53.0	53.0	49.0	51.0	54.0	51.0	53.0	54.0	51.0	53.0
Mean Spd	41.8	38.3	40.1	44.0	40.7	42.4	47.0	43.9	45.6	48.1	46.2	47.3	44.8	41.3	43.0	43.3	41.1	42.2	44.2	41.5	43.0	44.2	41.5	43.0
Std Dev	10.6	11.5	11.2	10.8	11.1	11.1	9.3	9.5	9.5	8.9	8.9	8.9	10.3	10.1	10.4	9.9	9.1	9.6	10.6	10.3	10.5	10.6	10.3	10.5
AM PK Interval Vol	95	99	194	70	84	154	52	35	86	28	21	49	71	75	146	72	87	159	83	86	169	83	86	169
AM PK Factor	0.18	0.20	0.19	0.14	0.18	0.16	0.13	0.11	0.12	0.10	0.09	0.10	0.17	0.17	0.17	0.17	0.20	0.18	0.16	0.18	0.17	0.16	0.18	0.17
AM PK 85%	46.8	41.2	44.9	45.5	42.4	44.0	50.0	48.0	50.0	56.8	51.9	54.7	48.0	46.5	48.0	44.2	42.0	44.0	45.7	44.0	44.0	45.7	44.0	44.0
AM PK starts	08:00	08:00	08:00	08:00	08:00	08:00	11:00	10:00	11:00	11:00	11:00	11:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00
PM PK Interval Vol	43	56	98	53	65	118	32	24	56	29	24	50	41	70	111	40	70	108	48	54	102	48	54	102
PM PK Factor	0.08	0.11	0.09	0.11	0.14	0.12	0.08	0.08	0.08	0.10	0.10	0.10	0.10	0.15	0.13	0.09	0.16	0.12	0.09	0.12	0.10	0.09	0.12	0.10
PM PK 85%	51.0	38.0	40.3	42.0	38.0	41.0	53.2	48.8	55.2	55.0	50.0	55.0	44.7	36.0	38.0	57.0	38.0	41.0	45.0	44.0	44.7	45.0	44.0	44.7
PM PK starts	17:00	14:00	14:00	14:00	14:00	14:00	13:00	12:00	13:00	13:00	16:00	12:00	14:00	14:00	14:00	17:00	14:00	14:00	14:00	14:00	14:00	14:00	14:00	14:00

**Volume Distribution**

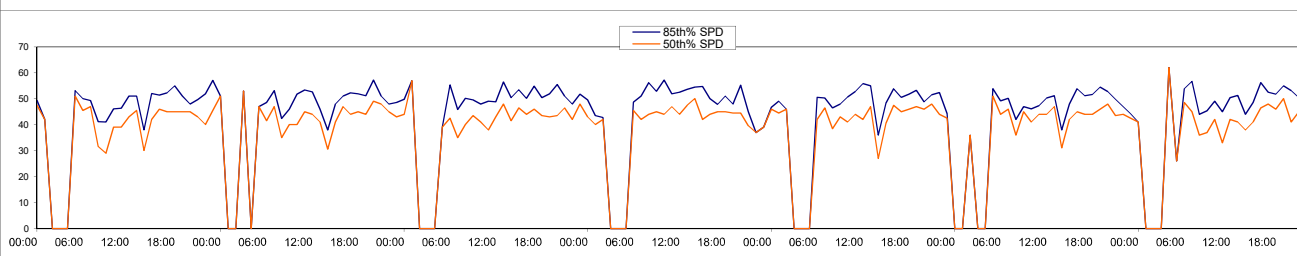


**Speed Stats**

**East Bound Speed Dist. 50th & 85th Percentiles**



**West Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	530	495	1,025	471	463	934	391	306	697	277	231	508	416	440	856	425	430	855	504	446	950	504	446	950
2: Car + Trailer	2	1	3	4	3	7	2	1	3	1	1	2	4	5	9	1	1	2	2	3	5	2	3	5
3: 2 axle truck	9	9	18	8	6	14	5	4	9	2	0	2	8	7	15	8	6	14	11	10	21	11	10	21
4: 3axle truck	0	2	2	0	0	0	0	1	1	0	0	0	0	1	1	1	1	2	0	1	1	0	1	1
5: 4 axle truck	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	3	3	0	3	3
6: 3 axle semi	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7: 4 axle semi	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	1	1	0	3	3	0	3	3
14: Motorcycle	4	9	13	7	3	10	2	4	6	2	6	8	4	1	5	7	7	14	7	10	17	7	10	17
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min %Vol	39.0	34.0	34.0	38.0	35.0	38.0	42.0	38.0	38.0	41.0	39.0	40.0	40.0	36.0	36.0	38.0	34.0	36.0	40.0	38.0	38.0	40.0	38.0	38.0
	55%	55%	54%	60%	59%	58%	67%	68%	67%	64%	72%	67%	59%	62%	59%	61%	65%	61%	56%	59%	57%	56%	59%	57%

**Definitions**

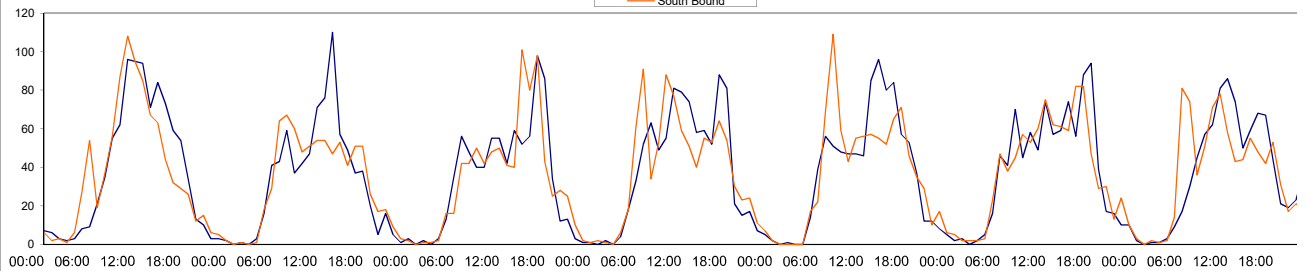
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Golf Avenue south of Barrenjoy Road

Suburb: Mona Vale  
 SiteId: 7  
 Speed Limit: 50  
 Job: 7061  
 Map Ref:

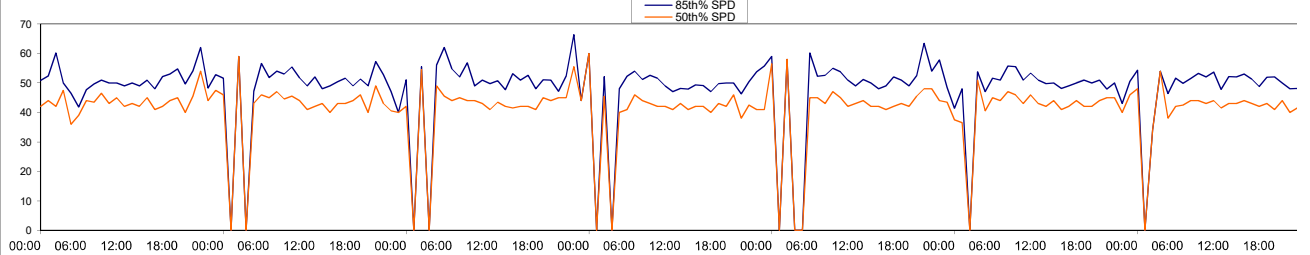
Date Record Interval (min)	Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015			Thursday 29/10/2015			Friday 30/10/2015			Saturday 31/10/2015					
	60 lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways
Short %	99%	99%	99%	96%	95%	96%	97%	96%	96%	96%	97%	96%	96%	96%	97%	96%	96%	96%	99%	99%	99%	99%	99%	99%
Med %	1%	1%	1%	4%	4%	4%	3%	3%	3%	4%	3%	3%	3%	3%	3%	3%	3%	3%	1%	1%	1%	1%	1%	1%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	799	722	1521	666	641	1307	687	677	1364	791	719	1510	750	737	1487	765	721	1486	723	653	1376	723	653	1376
24Hr Vol	900	885	1785	776	765	1541	806	805	1611	914	903	1817	880	875	1755	931	911	1842	869	854	1723	869	854	1723
85%ile Km	51.0	53.3	52.0	52.0	53.0	53.0	51.0	53.0	52.0	50.0	53.0	51.5	52.0	53.0	52.0	51.0	53.0	52.0	52.0	53.9	53.0	53.9	53.0	53.0
Mean Spd	43.4	45.8	44.6	43.2	44.5	43.8	43.4	44.5	43.9	42.2	44.0	43.1	43.3	44.7	44.0	43.5	44.4	43.9	43.2	45.3	44.2	43.2	45.3	44.2
Std Dev	8.9	9.0	9.0	9.3	9.7	9.5	9.2	10.3	9.8	9.0	9.4	9.3	9.6	9.7	9.7	8.9	9.6	9.3	9.7	9.7	9.8	9.7	9.7	9.8
AM PK Interval Vol	96	108	204	59	67	126	56	50	103	81	91	158	56	109	160	70	60	115	81	81	159	81	81	159
AM PK Factor	0.11	0.12	0.11	0.08	0.09	0.08	0.07	0.06	0.06	0.09	0.10	0.09	0.06	0.12	0.09	0.08	0.07	0.06	0.09	0.09	0.09	0.09	0.09	0.09
AM PK 85%	49.0	51.0	51.0	53.0	53.0	53.0	52.0	48.5	51.0	47.0	54.0	49.0	52.6	54.0	54.0	55.5	51.0	54.0	47.9	55.0	50.0	47.9	55.0	50.0
AM PK starts	11:00	11:00	11:00	08:00	08:00	08:00	07:00	09:00	11:00	11:00	07:00	11:00	07:00	08:00	08:00	08:00	11:00	08:00	11:00	08:00	11:00	06:00	11:00	11:00
PM PK Interval Vol	95	95	190	110	54	157	98	101	196	88	64	152	96	71	151	94	82	170	86	58	144	86	58	144
PM PK Factor	0.11	0.11	0.11	0.14	0.07	0.10	0.12	0.13	0.12	0.10	0.07	0.08	0.11	0.08	0.09	0.10	0.09	0.09	0.10	0.07	0.08	0.10	0.07	0.08
PM PK 85%	50.0	49.0	50.0	49.0	54.0	49.0	48.0	48.0	52.0	49.8	50.0	50.0	48.0	54.4	50.0	50.0	52.0	53.0	52.1	52.3	52.4	52.1	52.3	52.4
PM PK starts	12:00	12:00	12:00	14:00	12:00	14:00	17:00	15:00	17:00	17:00	17:00	17:00	14:00	17:00	14:00	18:00	16:00	17:00	12:00	12:00	12:00	12:00	12:00	12:00

**Volume Distribution**

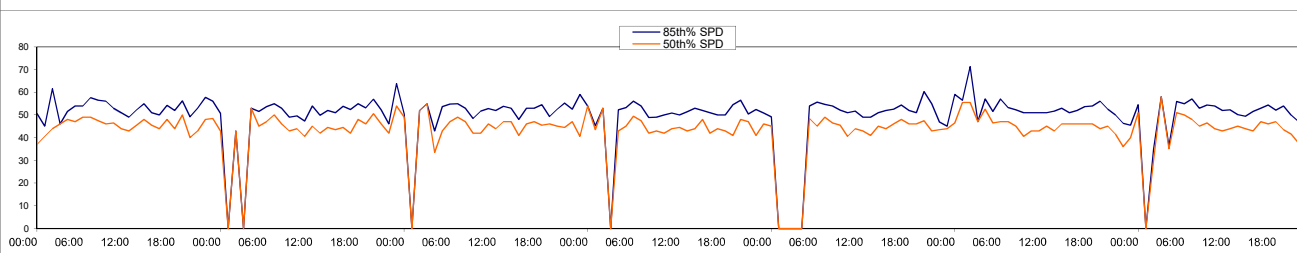


**Speed Stats**

**North Bound Speed Dist. 50th & 85th Percentiles**



**South Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	892	878	1,770	744	729	1,473	782	775	1,557	878	869	1,747	854	842	1,696	898	877	1,775	860	845	1,705	860	845	1,705
2: Car + Trailer	2	1	3	0	1	1	0	0	0	2	2	4	1	2	3	1	1	2	1	0	1	1	0	1
3: 2 axle truck	2	3	5	27	29	56	20	24	44	23	20	43	15	20	35	17	19	36	6	8	14	6	8	14
4: 3axle truck	2	1	3	4	3	7	4	2	6	8	9	17	7	8	15	13	14	27	1	1	2	1	1	2
5: 4 axle truck	1	1	2	0	0	0	0	2	2	1	2	3	1	1	2	2	0	2	1	0	1	1	0	1
6: 3 axle semi	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7: 4 axle semi	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	1	1	2	0	1	1	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
14: Motorcycle	12	13	25	3	4	7	7	6	13	1	4	5	7	13	20	6	6	12	9	8	17	9	8	17
Unpaired Axles	17	9	26	8	5	13	3	1	4	5	3	8	14	6	20	13	7	20	16	6	22	16	6	22

Pace Min %Vol	36.0	40.0	38.0	37.0	39.0	39.0	36.0	38.0	38.0	34.0	39.0	37.0	37.0	39.0	39.0	36.0	38.0	37.0	35.0	40.0	37.0	35.0	40.0	37.0
	71%	70%	69%	65%	69%	66%	69%	67%	67%	68%	68%	67%	66%	69%	66%	69%	67%	67%	68%	70%	68%	68%	70%	68%

**Definitions**

85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

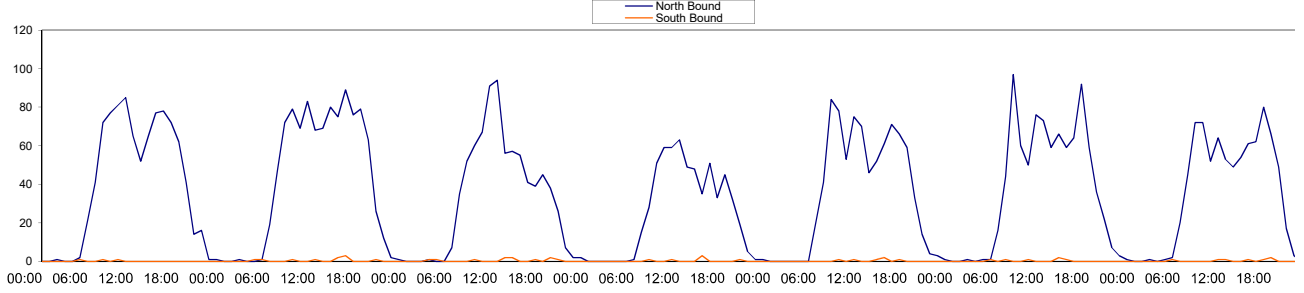


### Akuna Lane north of Waratah Street

Suburb: Mona Vale  
 SiteId: 8  
 Speed Limit: 40  
 Job: 7061  
 Map Ref:

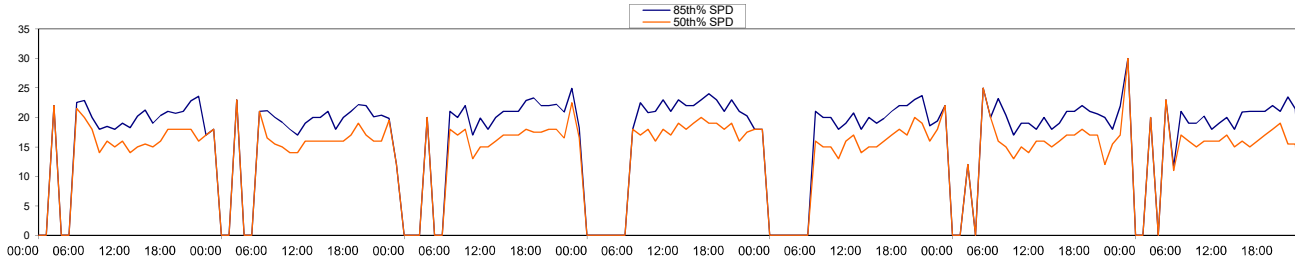
Date Record Interval (min)	Thursday 22/10/2015			Friday 23/10/2015			Saturday 24/10/2015			Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015				
	60 lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound
Short %	93%	67%	93%	95%	70%	95%	96%	91%	96%	96%	100%	96%	94%	100%	94%	95%	83%	95%	94%	94%	86%	94%	94%
Med %	6%	33%	6%	5%	30%	5%	4%	9%	4%	3%	0%	3%	6%	0%	5%	4%	17%	4%	6%	14%	6%	6%	
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	827	2	829	886	7	893	692	6	698	536	5	541	756	6	762	799	5	804	730	6	736		
24Hr Vol	924	3	927	1011	10	1021	775	11	786	595	6	601	831	6	837	887	6	893	823	7	830		
85%ile Km	20.0	11.8	20.0	20.0	15.0	20.0	21.0	21.4	21.0	22.8	18.3	22.0	21.0	14.1	21.0	20.0	19.4	20.0	21.0	20.8	21.0		
Mean Spd	16.6	10.4	16.5	16.7	11.2	16.6	17.0	16.7	17.0	18.6	16.1	18.6	16.6	8.4	16.5	16.4	16.6	16.4	16.8	17.9	16.8		
Std Dev	4.3	3.6	4.3	4.1	4.7	4.2	4.4	4.2	4.4	4.3	3.1	4.3	4.3	5.7	4.3	4.2	4.6	4.2	4.0	2.6	4.0		
AM Pk Interval Vol	85	1	85	83	1	83	91	1	91	59	1	60	84	1	84	97	1	97	72	1	72		
AM Pk Factor	0.09	0.33	0.09	0.08	0.10	0.08	0.12	0.09	0.12	0.10	0.17	0.10	0.10	0.17	0.10	0.11	0.17	0.11	0.09	0.14	0.09		
AM Pk 85%	19.0	13.0	19.0	19.0	14.0	19.0	18.0	12.0	18.0	23.0	12.0	21.0	20.0	1.0	20.0	17.0	16.0	17.0	19.0	17.0	19.0		
AM Pk starts	11:00	05:00	11:00	11:00	04:00	11:00	11:00	03:00	11:00	10:00	08:00	11:00	08:00	09:00	08:00	08:00	05:00	08:00	08:00	05:00	08:00		
PM Pk Interval Vol	78	0	78	89	3	92	94	2	94	63	3	63	71	2	71	92	2	92	80	2	81		
PM Pk Factor	0.08	0.00	0.08	0.09	0.30	0.09	0.12	0.18	0.12	0.11	0.50	0.10	0.09	0.33	0.08	0.10	0.33	0.10	0.10	0.29	0.10		
PM Pk 85%	20.3		20.3	20.0	13.8	20.0	20.0	18.3	20.0	23.0	20.0	23.0	21.0	14.9	21.0	22.0	18.6	22.0	21.0	21.0	21.0		
PM Pk starts	16:00		16:00	16:00	16:00	16:00	12:00	13:00	12:00	12:00	15:00	12:00	16:00	15:00	16:00	17:00	14:00	17:00	17:00	18:00	17:00		

**Volume Distribution**

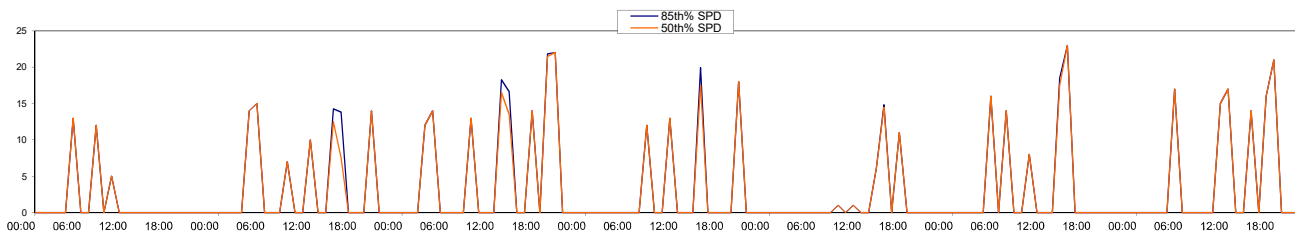


**Speed Stats**

**North Bound Speed Dist. 50th & 85th Percentiles**



**South Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	859	2	861	961	7	968	744	10	754	573	6	579	783	6	789	844	5	849	774	6	780
2: Car + Trailer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3: 2 axle truck	57	1	58	46	1	47	26	1	27	20	0	20	44	0	44	38	1	39	44	1	45
4: 3axle truck	1	0	1	2	2	4	1	0	1	0	0	0	2	0	2	0	0	0	2	0	2
5: 4 axle truck	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0
6: 3 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7: 4 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	7	0	7	2	0	2	3	0	3	2	0	2	2	0	2	4	0	4	3	0	3
14: Motorcycle	13	0	13	21	6	27	20	9	29	7	4	11	16	6	22	13	4	17	13	4	17
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min	9.0	-	9.0	8.0	-	8.0	8.0	7.0	8.0	10.0	6.0	10.0	9.0	-	9.0	8.0	8.0	8.0	9.0	6.0	9.0
%Vol	94%	100%	94%	94%	100%	94%	93%	100%	93%	94%	100%	95%	94%	100%	94%	94%	100%	94%	96%	100%	96%

**Definitions**

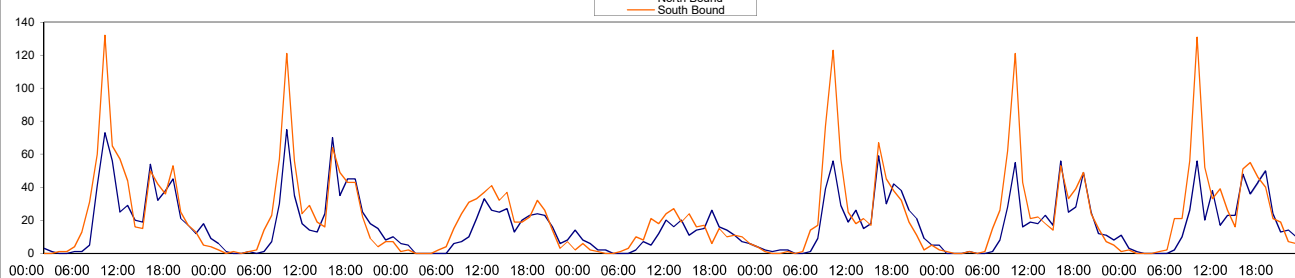
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Oliver Way south of Emma Street

Suburb: Mona Vale  
 SiteId: 6  
 Speed Limit: 50  
 Job: 7061  
 Map Ref:

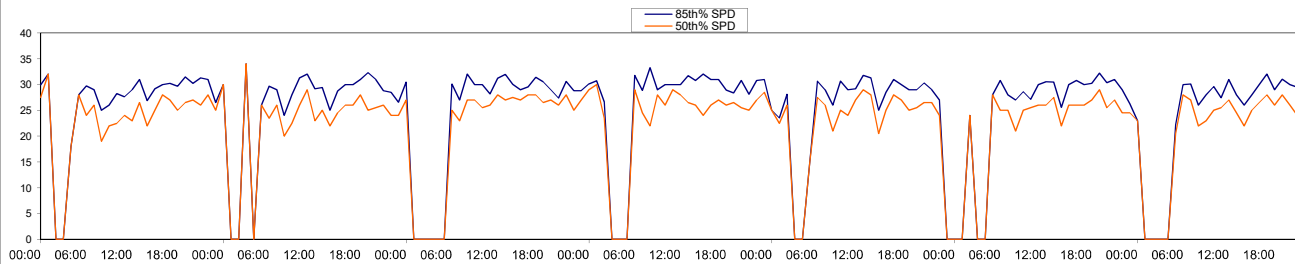
Date Record Interval (min)	Thursday 22/10/2015			Friday 23/10/2015			Saturday 24/10/2015			Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015					
	60 lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	
Short %	95%	99%	98%	97%	99%	98%	94%	99%	97%	96%	100%	98%	96%	99%	98%	96%	98%	97%	96%	99%	98%	96%	99%	98%
Med %	5%	1%	2%	3%	1%	2%	6%	1%	3%	4%	0%	2%	3%	1%	2%	4%	2%	3%	4%	1%	2%	4%	1%	2%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	453	595	1048	429	543	972	252	353	605	176	205	381	397	539	936	359	499	858	404	566	970	404	566	970
24Hr Vol	526	686	1212	496	612	1108	315	408	723	218	254	472	452	593	1045	414	572	986	464	648	1112	464	648	1112
85%ile Km	29.0	30.0	30.0	29.6	31.0	30.0	31.0	33.0	32.0	30.0	33.0	32.0	29.0	31.0	30.0	30.0	31.0	30.0	29.0	31.0	30.0	29.0	31.0	31.0
Mean Spd	24.5	25.1	24.8	24.8	25.9	25.4	27.2	29.1	28.3	27.1	29.3	28.3	25.4	26.0	25.8	25.5	26.0	25.8	25.2	26.4	25.9	25.2	26.4	25.9
Std Dev	5.2	5.6	5.5	5.1	5.2	5.2	3.9	4.4	4.3	4.0	4.3	4.3	4.8	5.1	5.0	4.6	5.2	4.9	4.9	5.0	5.0	4.9	5.0	5.0
AM PK Interval Vol	73	132	205	75	121	196	33	41	70	20	27	44	56	123	179	55	121	176	56	131	187	56	131	187
AM PK Factor	0.14	0.19	0.17	0.15	0.20	0.18	0.10	0.10	0.10	0.09	0.11	0.09	0.12	0.21	0.17	0.13	0.21	0.18	0.12	0.20	0.17	0.12	0.20	0.17
AM PK 85%	25.0	26.2	26.0	24.0	27.0	26.0	30.0	34.0	31.5	30.0	31.0	31.0	26.0	25.6	26.0	27.0	26.9	27.0	26.0	25.4	26.0	26.0	25.4	26.0
AM PK starts	08:00	08:00	08:00	08:00	08:00	08:00	10:00	11:00	10:00	10:00	11:00	10:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00
PM PK Interval Vol	54	53	104	70	64	134	27	37	64	26	24	39	59	67	126	56	53	109	50	55	99	50	55	99
PM PK Factor	0.10	0.08	0.09	0.14	0.10	0.12	0.09	0.09	0.09	0.12	0.09	0.08	0.13	0.11	0.12	0.14	0.09	0.11	0.11	0.08	0.09	0.11	0.08	0.09
PM PK 85%	26.9	30.1	27.0	25.0	25.0	25.0	32.0	32.0	32.0	31.0	35.0	33.0	25.0	26.0	25.1	25.6	25.1	25.7	32.0	29.0	27.0	32.0	29.0	27.0
PM PK starts	14:00	17:00	14:00	14:00	14:00	14:00	13:00	13:00	13:00	16:00	13:00	12:00	14:00	14:00	14:00	14:00	14:00	14:00	17:00	15:00	14:00	17:00	15:00	14:00

**Volume Distribution**

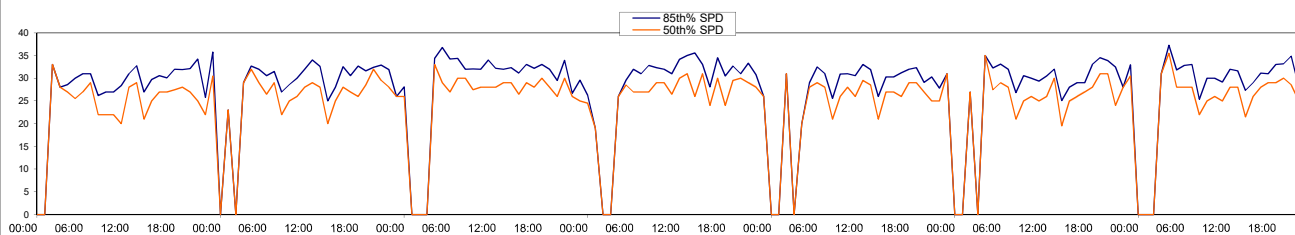


**Speed Stats**

**North Bound Speed Dist. 50th & 85th Percentiles**



**South Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	501	681	1,182	481	604	1,085	297	403	700	210	253	463	432	581	1,013	395	561	956	446	640	1,086	446	640	1,086
2: Car + Trailer	1	0	1	2	1	3	0	0	0	0	1	1	4	5	9	3	1	4	1	3	4	1	3	4
3: 2 axle truck	21	4	25	12	6	18	17	5	22	8	0	8	14	7	21	13	8	21	17	5	22	17	5	22
4: 3axle truck	1	0	1	1	1	2	1	0	1	0	0	0	1	0	1	2	1	3	0	0	0	0	0	0
5: 4 axle truck	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
6: 3 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7: 4 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0
14: Motorcycle	5	9	14	4	9	13	3	4	7	5	3	8	3	8	11	4	9	13	8	8	16	8	8	16
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min %Vol	16.0	16.0	16.0	17.0	17.0	17.0	19.0	21.0	20.0	18.0	21.0	20.0	17.0	18.0	18.0	18.0	18.0	18.0	17.0	18.0	18.0	17.0	18.0	18.0
	88%	87%	87%	89%	89%	89%	96%	94%	93%	95%	95%	93%	92%	90%	90%	93%	89%	91%	90%	90%	91%	90%	91%	90%

**Definitions**

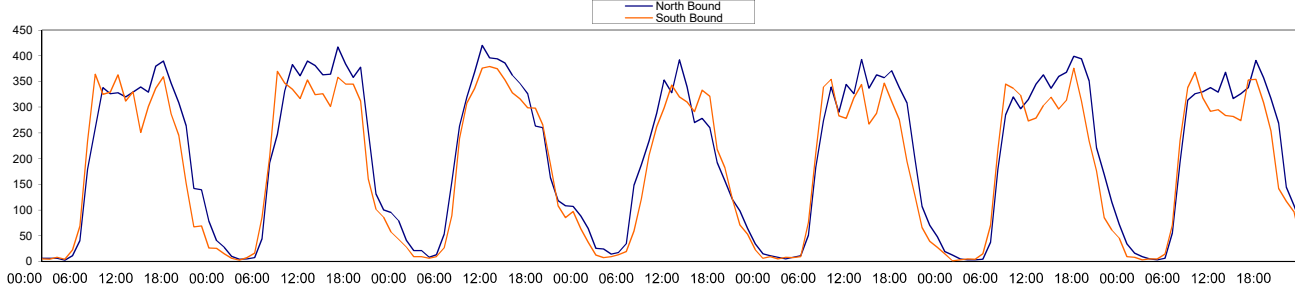
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Pittwater Road north of Bung Lane

Suburb: Mona Vale  
 SiteId: 9  
 Speed Limit: 60  
 Job: 7061  
 Map Ref:

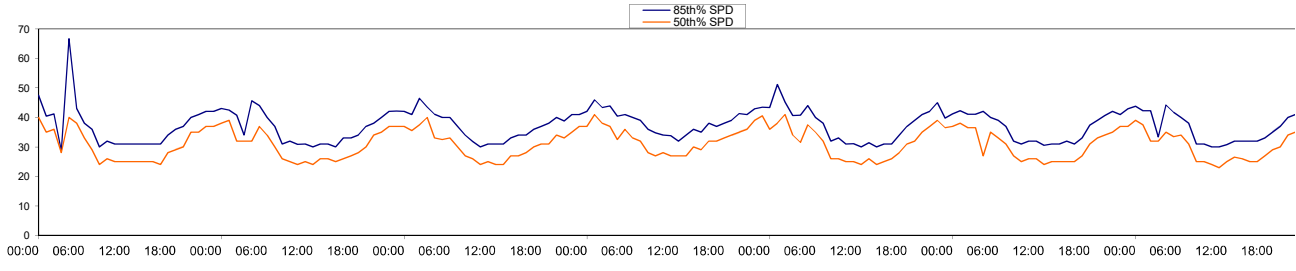
Date Record Interval (min)	Thursday 22/10/2015			Friday 23/10/2015			Saturday 24/10/2015			Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015		
	60 lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound	Two ways lorth	Bound	outh Bound
Short %	94%	95%	94%	94%	94%	94%	95%	97%	96%	96%	97%	96%	93%	94%	93%	93%	94%	93%	94%	95%	95%
Med %	6%	5%	6%	5%	5%	5%	4%	3%	4%	3%	3%	3%	7%	6%	6%	7%	6%	6%	6%	5%	5%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	3994	3803	7797	4358	4033	8391	4103	3873	7976	3279	3205	6484	4040	3599	7639	4134	3710	7844	4051	3720	7771
24Hr Vol	4907	4487	9394	5305	4816	10121	4999	4591	9590	3936	3634	7570	4764	4200	8964	4989	4402	9391	4960	4463	9423
85%ile Km	34.0	39.0	37.0	35.0	39.0	37.0	35.0	39.0	38.0	37.0	41.0	40.0	35.0	40.0	38.0	35.0	39.0	38.0	35.0	39.0	37.0
Mean Spd	27.5	30.5	28.8	27.5	30.5	28.9	28.1	31.3	29.6	30.2	33.8	31.9	28.1	31.2	29.5	28.2	31.0	29.5	27.8	30.7	29.1
Std Dev	7.9	8.5	8.4	7.7	8.6	8.3	7.8	8.5	8.3	7.5	8.1	8.0	8.3	9.3	8.9	7.5	8.8	8.2	7.8	8.9	8.5
AM PK Interval Vol	338	364	691	390	370	743	420	379	796	353	343	671	344	354	693	345	345	657	338	368	694
AM PK Factor	0.07	0.08	0.07	0.07	0.08	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.07	0.08	0.08	0.07	0.08	0.07	0.07	0.08	0.07
AM PK 85%	30.0	40.0	32.0	31.0	41.0	33.0	30.0	37.0	33.0	34.1	39.0	37.0	31.0	38.0	36.0	32.0	42.0	37.0	30.0	37.0	34.0
AM PK starts	08:00	07:00	10:00	11:00	07:00	11:00	10:00	11:00	10:00	10:00	11:00	11:00	10:00	08:00	08:00	11:00	07:00	08:00	10:00	08:00	08:00
PM PK Interval Vol	390	359	749	417	358	775	394	375	769	392	333	712	393	347	737	399	376	775	391	354	745
PM PK Factor	0.08	0.08	0.08	0.08	0.07	0.08	0.08	0.08	0.08	0.10	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.08
PM PK 85%	31.0	38.0	35.0	30.0	36.0	33.0	31.0	36.0	34.0	32.0	40.0	36.0	30.0	36.0	32.0	31.0	37.0	35.0	32.0	37.0	34.0
PM PK starts	16:00	16:00	16:00	15:00	15:00	15:00	12:00	12:00	12:00	12:00	15:00	12:00	12:00	15:00	12:00	16:00	16:00	16:00	16:00	16:00	16:00

**Volume Distribution**

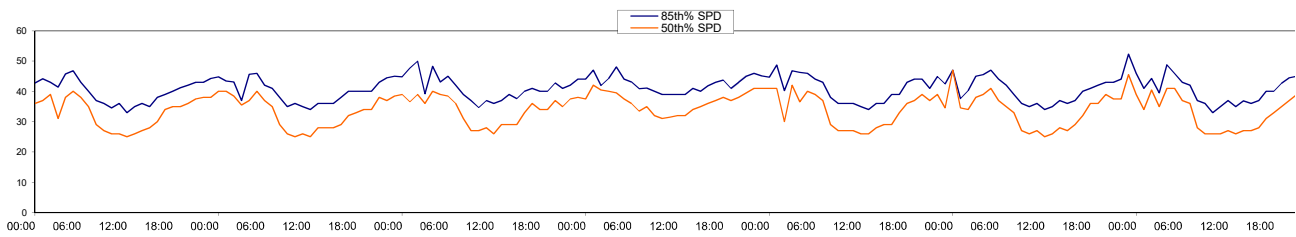


**Speed Stats**

**North Bound Speed Dist. 50th & 85th Percentiles**



**South Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	4,588	4,233	8,821	5,007	4,528	9,535	4,736	4,416	9,152	3,748	3,491	7,239	4,419	3,932	8,351	4,624	4,119	8,743	4,661	4,220	8,881
2: Car + Trailer	14	12	26	4	16	20	15	20	35	20	33	53	9	15	24	11	10	21	12	16	28
3: 2 axle truck	282	218	500	249	234	483	174	126	300	103	85	188	291	221	512	315	222	537	256	196	452
4: 3axle truck	13	12	25	16	21	37	7	5	12	1	2	3	20	21	41	19	38	57	13	14	27
5: 4 axle truck	3	2	5	11	6	17	30	11	41	29	11	40	4	4	8	7	2	9	11	6	17
6: 3 axle semi	2	4	6	8	0	8	6	1	7	7	3	10	3	0	3	1	0	1	2	2	4
7: 4 axle semi	1	1	2	1	0	1	0	1	1	0	0	0	1	1	2	1	1	2	0	0	0
8: 5 axle semi	0	0	0	1	2	3	0	0	0	0	0	0	1	0	1	1	1	2	0	1	1
9: 6 axle semi	2	1	3	1	5	6	8	7	15	7	6	13	4	2	6	3	4	7	1	4	5
10: 7/8 axle truck	0	0	0	0	0	0	2	0	2	2	1	3	0	0	0	0	0	0	1	0	1
11: Road Train	0	0	0	1	0	1	2	0	2	1	0	1	0	0	0	1	0	1	0	0	0
12: Road Train	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0
13: Unknown	2	4	6	6	4	10	18	4	22	17	2	19	12	4	16	6	5	11	3	4	7
14: Motorcycle	60	37	97	81	79	160	225	138	363	226	136	362	99	60	159	66	66	132	114	87	201
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min %Vol	19.0	24.0	21.0	20.0	23.0	22.0	21.0	24.0	23.0	22.0	27.0	24.0	20.0	24.0	21.0	20.0	24.0	22.0	19.0	22.0	20.0
	73%	62%	67%	73%	64%	68%	72%	64%	66%	74%	69%	69%	73%	61%	66%	74%	63%	67%	74%	61%	67%

**Definitions**

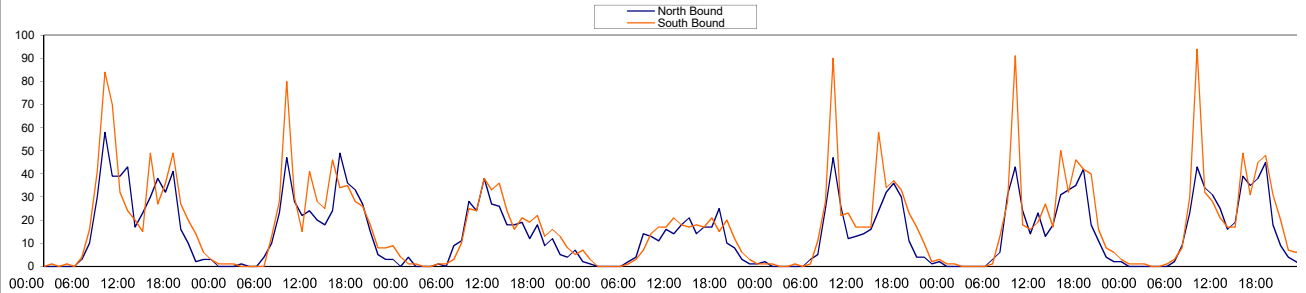
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

### Vesper Street north of Government Road

Suburb: Mona Vale  
 SiteId: 3  
 Speed Limit: 50  
 Job: 7061  
 Map Ref:

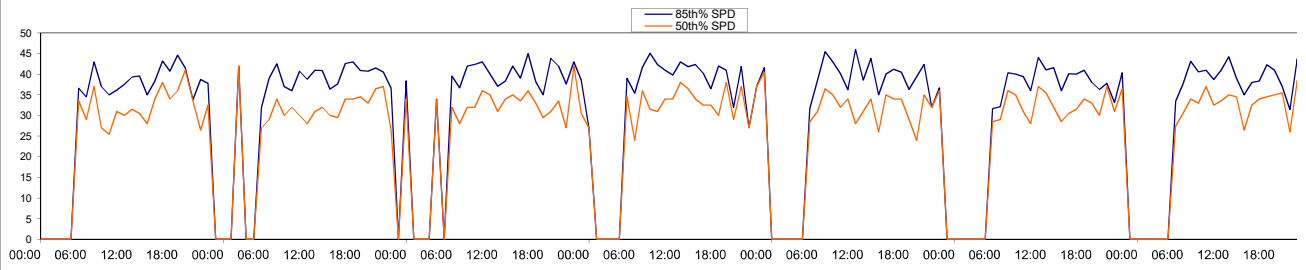
Date Record Interval (min)	Thursday 22/10/2015			Friday 23/10/2015			Saturday 24/10/2015			Sunday 25/10/2015			Monday 26/10/2015			Tuesday 27/10/2015			Wednesday 28/10/2015				
	60 lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound	Two ways	lorth	Bound	outh Bound
Short %	97%	94%	96%	96%	94%	95%	98%	97%	97%	98%	94%	96%	96%	96%	96%	96%	94%	94%	95%	97%	97%	97%	97%
Med %	3%	5%	4%	3%	6%	5%	2%	3%	3%	1%	5%	3%	3%	4%	3%	4%	6%	6%	5%	3%	3%	3%	3%
Long %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7am-7pm Vol	406	474	880	351	416	767	248	281	529	190	202	392	286	399	685	325	426	751	366	443	809	809	
24Hr Vol	437	540	977	392	478	870	292	337	629	212	232	444	305	446	751	353	475	828	392	500	892	892	
85%ile Km	40.0	38.0	39.0	40.2	39.0	39.0	42.0	40.0	41.0	42.0	40.2	41.0	41.3	39.0	40.0	40.0	39.0	40.0	41.0	40.0	40.0	40.0	
Mean Spd	31.8	31.9	31.9	32.1	32.2	32.2	34.5	34.0	34.3	34.1	34.1	34.1	33.6	32.9	33.2	33.0	33.3	33.2	33.5	33.7	33.6	33.6	
Std Dev	8.2	7.4	7.7	8.1	7.5	7.8	7.3	6.3	6.8	8.2	7.3	7.7	8.2	6.7	7.3	7.8	6.9	7.3	8.1	6.6	7.3	7.3	
AM PK Interval Vol	58	84	142	47	80	127	38	38	76	16	21	35	47	90	137	43	91	134	43	94	137	137	
AM PK Factor	0.13	0.16	0.15	0.12	0.17	0.15	0.13	0.11	0.12	0.08	0.09	0.08	0.15	0.20	0.18	0.12	0.19	0.16	0.11	0.19	0.15	0.15	
AM PK 85%	37.0	38.0	37.7	37.0	38.0	38.0	43.0	39.3	40.0	41.0	39.9	40.0	43.0	39.0	41.0	40.0	39.0	39.9	40.6	39.0	39.5	39.5	
AM PK starts	08:00	08:00	08:00	08:00	08:00	08:00	10:00	10:00	10:00	10:00	11:00	11:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	
PM PK Interval Vol	41	49	90	49	46	83	26	36	62	25	21	40	36	58	82	42	50	84	45	49	93	93	
PM PK Factor	0.09	0.09	0.09	0.13	0.10	0.10	0.09	0.11	0.10	0.12	0.09	0.09	0.12	0.13	0.11	0.12	0.11	0.10	0.11	0.10	0.10	0.10	
PM PK 85%	40.7	37.7	39.0	37.7	36.0	37.0	37.1	39.2	38.0	42.0	41.7	37.0	41.2	36.3	36.0	41.0	35.5	40.0	42.3	40.0	41.0	41.0	
PM PK starts	17:00	14:00	17:00	15:00	14:00	15:00	12:00	12:00	12:00	17:00	16:00	17:00	16:00	14:00	14:00	17:00	14:00	17:00	17:00	14:00	17:00	17:00	

**Volume Distribution**

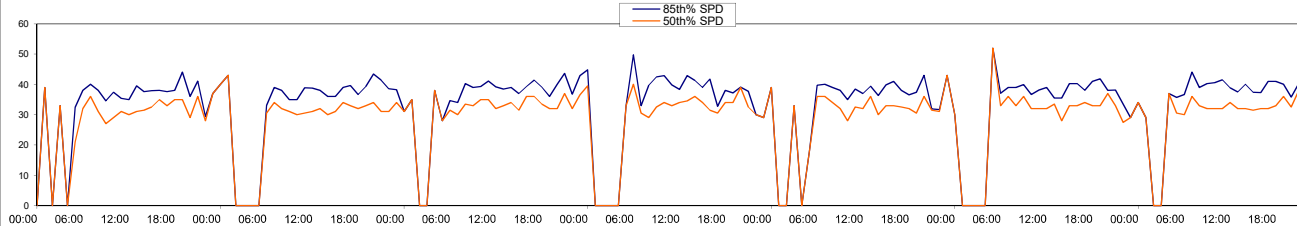


**Speed Stats**

**North Bound Speed Dist. 50th & 85th Percentiles**



**South Bound Speed Dist. 50th & 85th Percentiles**



1: Car+MotorCycle	424	510	934	377	450	827	284	325	609	205	219	424	294	428	722	339	444	783	379	481	860	860
2: Car + Trailer	0	0	0	0	0	0	1	1	2	2	0	2	0	0	0	0	1	1	0	3	3	3
3: 2 axle truck	10	27	37	10	25	35	7	11	18	3	12	15	7	16	23	11	28	39	12	16	28	28
4: 3axle truck	2	0	2	3	2	5	0	0	0	0	0	0	1	1	2	2	1	3	0	0	0	0
5: 4 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6: 3 axle semi	0	2	2	1	1	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
7: 4 axle semi	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
8: 5 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9: 6 axle semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10: 7/8 axle truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12: Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13: Unknown	1	1	2	1	0	1	0	0	0	2	0	2	3	0	3	1	1	2	1	0	1	1
14: Motorcycle	9	6	15	4	10	14	7	5	12	8	8	16	14	7	21	8	6	14	9	8	17	17
Unpaired Axles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Pace Min %Vol	24.0	25.0	24.0	26.0	25.0	25.0	27.0	25.0	27.0	28.0	25.0	25.0	27.0	25.0	25.0	27.0	25.0	25.0	26.0	27.0	26.0	26.0
	66%	75%	70%	67%	77%	72%	73%	81%	77%	69%	75%	72%	69%	79%	75%	74%	80%	77%	73%	80%	76%	76%

**Definitions**

85th Percentile Speed = The speed at or below which 85% of volume is observed to travel  
 15kph Pace Speed = The 15kph speed range within which the largest percentage of volume is observed to travel

## Attachment 3 - On-street Parking Survey Results

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## Mona Vale Town Centre Parking Study Analysis - Weekday

WEDNESDAY SUMMARY BY STREET

WEDNESDAY SUMMARY BY AREA

WEDNESDAY SUMMARY OF CAR PARK

WEDNESDAY ON STREET ANALYSIS

WEDNESDAY CAR PARKS ANALYSIS

WED CLEANED DATA

### Wednesday On-street Parking Analysis

*\* Only included Public Parking Bays*

#### Total

<b>Total Cars:</b>	<b>2806 Cars</b>	<b>Unrestricted Parking:</b>	<b>619 Cars</b>	<b>Restricted Parking:</b>	<b>2187 Cars</b>
<b>Ave. Capacity:</b>	<b>775 Bays</b>	<b>Ave. Unrestricted Bays:</b>	<b>450 Bays</b>	<b>Ave. Restricted Bays:</b>	<b>325 Bays</b>
<b>Max. Capacity:</b>	<b>796 Bays</b>	<b>Max. Unrestricted Bays:</b>	<b>462 Bays</b>	<b>Max. Restricted Bays:</b>	<b>334 Bays</b>
<b>Total Turnover:</b>	<b>3.62 Cars/Bay</b>	<b>Unrestricted Turnover:</b>	<b>1.37 Cars/Bay</b>	<b>Restricted Turnover:</b>	<b>6.73 Cars/Bay</b>
<b>Total ALOS:</b>	<b>2.51 Hrs/Car</b>	<b>Unrestricted ALOS:</b>	<b>6.78 Hrs/Car</b>	<b>Restricted ALOS:</b>	<b>1.31 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>76.3%</b>	<b>Unrestricted Ave. Occ %:</b>	<b>78.4%</b>	<b>Restricted Ave. Occ %:</b>	<b>73.4%</b>
<b>Total Peak Occ %:</b>	<b>86.5%</b>	<b>Unrestricted Peak Occ %:</b>	<b>87.8%</b>	<b>Restricted Peak Occ %:</b>	<b>84.7%</b>

#### By Areas

##### Commercial Area

<b>Total Cars:</b>	<b>2112 Cars</b>
<b>Ave. Capacity:</b>	<b>290 Bays</b>
<b>Max. Capacity:</b>	<b>300 Bays</b>
<b>Total Turnover:</b>	<b>7.29 Cars/Bay</b>
<b>Total ALOS:</b>	<b>1.32 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>80.2%</b>
<b>Total Peak Occ %:</b>	<b>92.0%</b>

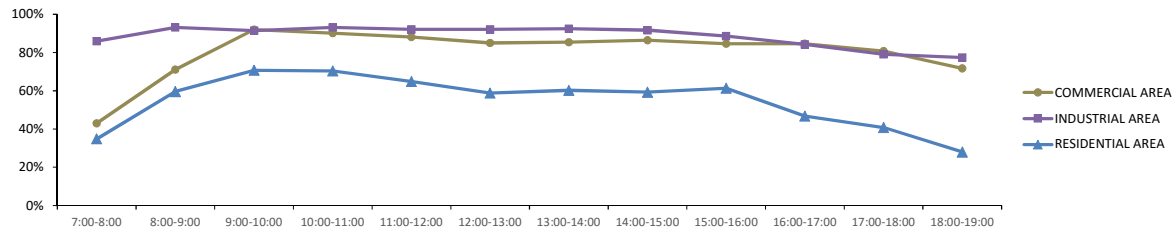
##### Industrial Area

<b>Total Cars:</b>	<b>378 Cars</b>
<b>Ave. Capacity:</b>	<b>278 Bays</b>
<b>Max. Capacity:</b>	<b>278 Bays</b>
<b>Total Turnover:</b>	<b>1.36 Cars/Bay</b>
<b>Total ALOS:</b>	<b>7.71 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>88.4%</b>
<b>Total Peak Occ %:</b>	<b>93.2%</b>

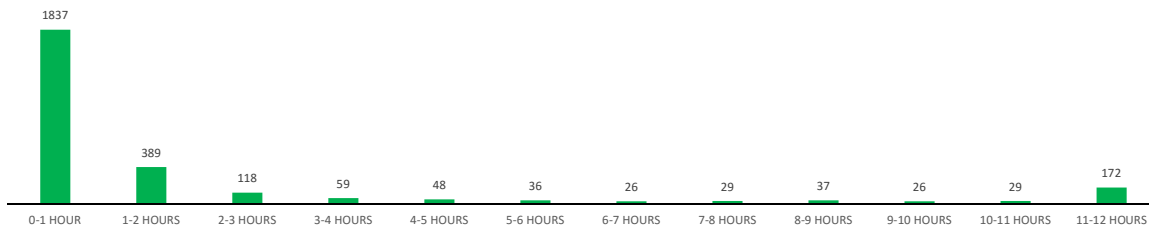
##### Residential Area

<b>Total Cars:</b>	<b>316 Cars</b>
<b>Ave. Capacity:</b>	<b>207 Bays</b>
<b>Max. Capacity:</b>	<b>218 Bays</b>
<b>Total Turnover:</b>	<b>1.52 Cars/Bay</b>
<b>Total ALOS:</b>	<b>4.27 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>54.6%</b>
<b>Total Peak Occ %:</b>	<b>70.7%</b>

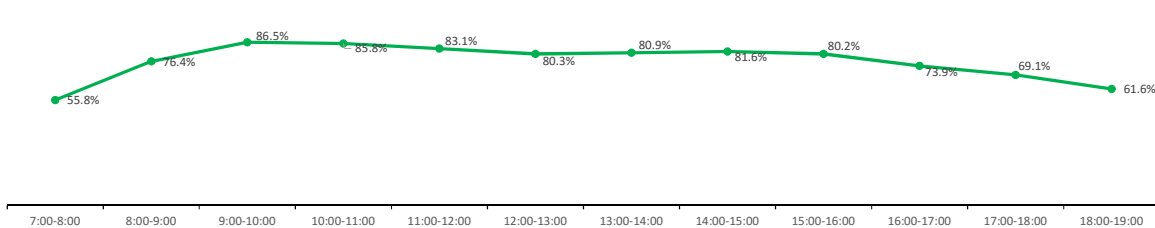
Mona Vale On-street Parking Occupancy (%) By Areas - Wednesday



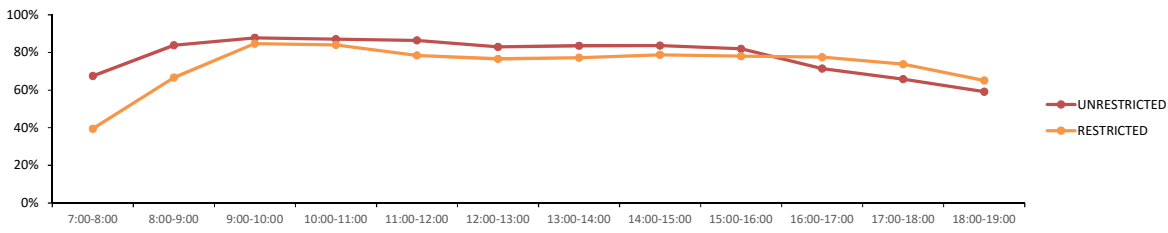
Mona Vale On-street Parking (Total) Length of Stay Distributions - Wednesday



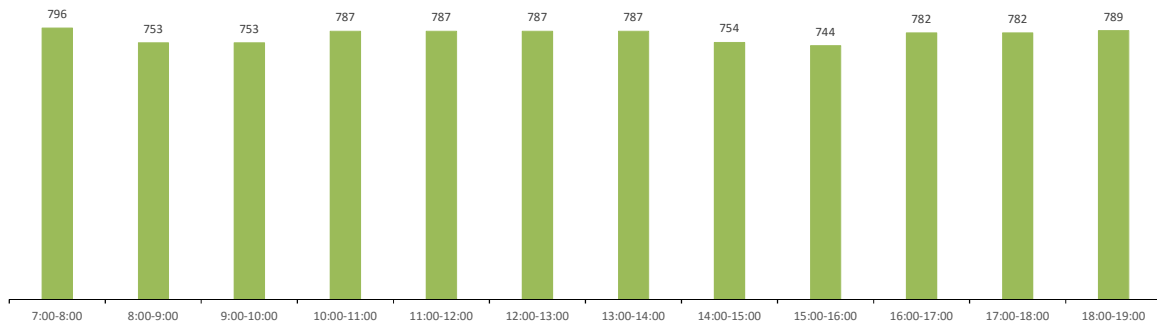
Mona Vale On-street Parking (Total) Occupancy (%) - Wednesday



Mona Vale On-street Parking (Unrestricted vs. Restricted) Occupancy (%) - Wednesday



Mona Vale On-street Parking Capacity Distributions - Wednesday



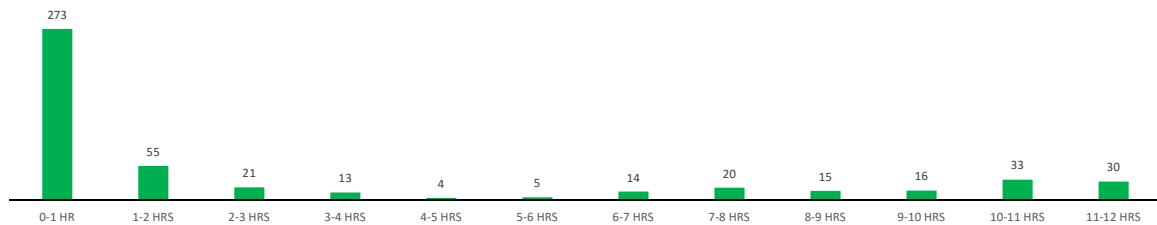
**Wednesday Off-Street Car Park Parking Analysis**

\* Only included Public Parking Bays

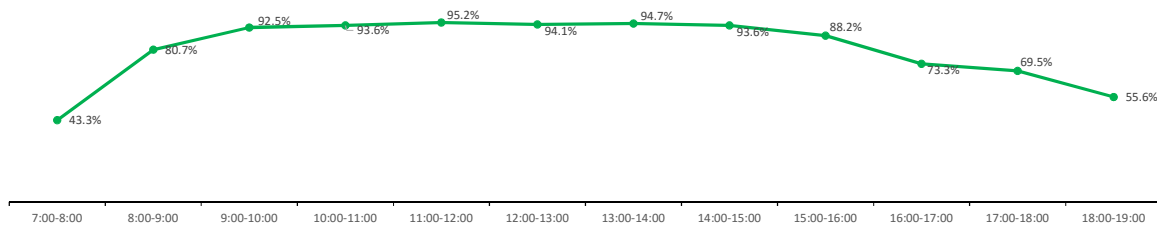
**Weekday At-grade Car Park Analysis**

<b>Total Cars:</b>	<b>499 Cars</b>	<b>Unrestricted Parking:</b>	<b>150 Cars</b>	<b>Restricted Parking:</b>	<b>349 Cars</b>
<b>Total Capacity:</b>	<b>187 Bays</b>	<b>Unrestricted Bays:</b>	<b>128 Bays</b>	<b>Restricted Bays:</b>	<b>59 Bays</b>
<b>Total Turnover:</b>	<b>2.67 Cars/Bay</b>	<b>Unrestricted Turnover:</b>	<b>1.17 Cars/Bay</b>	<b>Restricted Turnover:</b>	<b>5.92 Cars/Bay</b>
<b>Total ALOS:</b>	<b>3.66 Hrs/Car</b>	<b>Unrestricted ALOS:</b>	<b>8.25 Hrs/Car</b>	<b>Restricted ALOS:</b>	<b>1.68 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>81.2%</b>	<b>Unrestricted Ave. Occ %:</b>	<b>80.7%</b>	<b>Restricted Ave. Occ %:</b>	<b>82.3%</b>
<b>Total Peak Occ %:</b>	<b>95.2%</b>	<b>Unrestricted Peak Occ %:</b>	<b>95.3%</b>	<b>Restricted Peak Occ %:</b>	<b>98.3%</b>

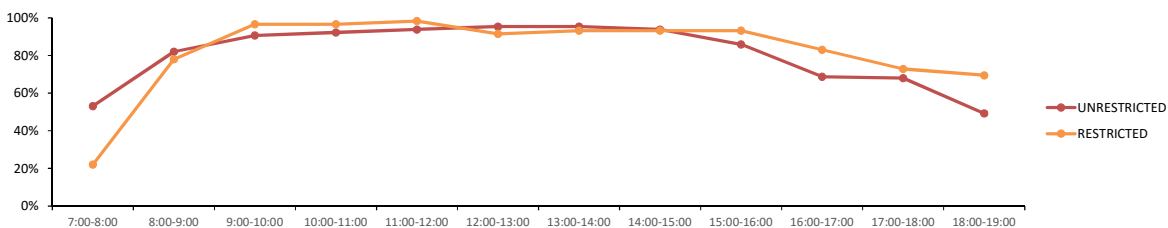
Mona Vale Off-street Parking (Total) Length of Stay Distributions - Wednesday



Mona Vale Off-street Parking (Total) Occupancy (%) - Wednesday



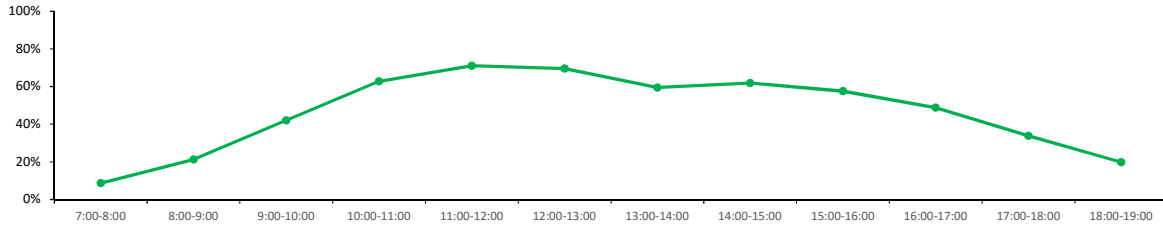
Mona Vale Off-street Parking (Unrestricted vs. Restricted) Occupancy (%) - Wednesday



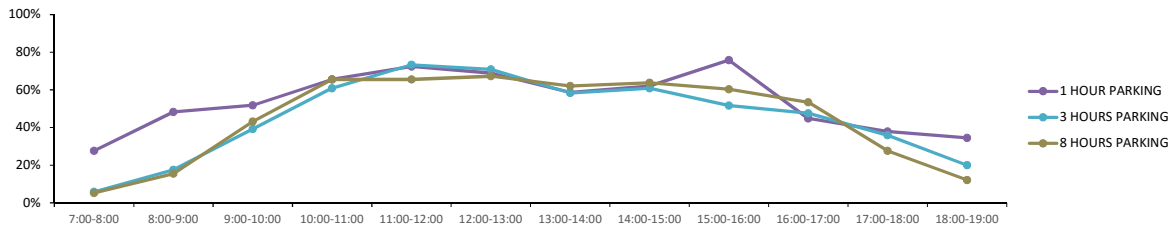
**Weekday Bungan Ln Car Park Analysis**

<b>Total Cars:</b>	<b>356 Cars</b>	<b>1P Parking:</b>	<b>120 Cars</b>	<b>3P Parking:</b>	<b>193 Cars</b>	<b>8P Parking:</b>	<b>43 Cars</b>
<b>Total Capacity:</b>	<b>207 Bays</b>	<b>1P Bays:</b>	<b>29 Bays</b>	<b>3P Bays:</b>	<b>120 Bays</b>	<b>8P Bays:</b>	<b>58 Bays</b>
<b>Total Turnover:</b>	<b>1.72 Cars/Bay</b>	<b>1P Turnover:</b>	<b>4.14 Cars/Bay</b>	<b>3P Turnover:</b>	<b>1.61 Cars/Bay</b>	<b>8P Turnover:</b>	<b>0.74 Cars/Bay</b>
<b>Total ALOS:</b>	<b>3.24 Hrs/Car</b>	<b>1P ALOS:</b>	<b>1.57 Hrs/Car</b>	<b>3P ALOS:</b>	<b>3.37 Hrs/Car</b>	<b>8P ALOS:</b>	<b>7.30 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>46.4%</b>	<b>1P Ave. Occ %:</b>	<b>54.0%</b>	<b>3P Ave. Occ %:</b>	<b>45.1%</b>	<b>8P Ave. Occ %:</b>	<b>45.1%</b>
<b>Total Peak Occ %:</b>	<b>71.0%</b>	<b>1P Peak Occ %:</b>	<b>75.9%</b>	<b>3P Peak Occ %:</b>	<b>73.3%</b>	<b>8P Peak Occ %:</b>	<b>67.2%</b>

Mona Vale Bungan Ln Car Park Occupancy (%) - Tuesday



Mona Vale Bungan Ln Car Park (1P, 3P & 8P) Occupancy (%) - Tuesday





# Mona Vale Town Centre Parking Study Analysis - Weekend

SATURDAY SUMMARY BY STREET

SATURDAY SUMMARY BY AREA

SATURDAY SUMMARY OF CAR PARK

SATURDAY ON STREET ANALYSIS

SATURDAY CAR PARKS ANALYSIS

SAT CLEANED DATA

## Saturday On-street Parking Analysis

*\* Only included Public Parking Bays*

### Total

<b>Total Cars:</b>	<b>2555 Cars</b>	<b>Unrestricted Parking:</b>	<b>569 Cars</b>	<b>Restricted Parking:</b>	<b>1986 Cars</b>
<b>Ave. Capacity:</b>	<b>792 Bays</b>	<b>Ave. Unrestricted Bays:</b>	<b>455 Bays</b>	<b>Ave. Restricted Bays:</b>	<b>337 Bays</b>
<b>Max. Capacity:</b>	<b>796 Bays</b>	<b>Max. Unrestricted Bays:</b>	<b>458 Bays</b>	<b>Max. Restricted Bays:</b>	<b>338 Bays</b>
<b>Total Turnover:</b>	<b>3.23 Cars/Bay</b>	<b>Unrestricted Turnover:</b>	<b>1.25 Cars/Bay</b>	<b>Restricted Turnover:</b>	<b>5.89 Cars/Bay</b>
<b>Total ALOS:</b>	<b>2.32 Hrs/Car</b>	<b>Unrestricted ALOS:</b>	<b>5.55 Hrs/Car</b>	<b>Restricted ALOS:</b>	<b>1.40 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>62.5%</b>	<b>Unrestricted Ave. Occ %:</b>	<b>57.8%</b>	<b>Restricted Ave. Occ %:</b>	<b>68.9%</b>
<b>Total Peak Occ %:</b>	<b>74.8%</b>	<b>Unrestricted Peak Occ %:</b>	<b>68.5%</b>	<b>Restricted Peak Occ %:</b>	<b>84.8%</b>

### By Areas

#### Commercial Area

<b>Total Cars:</b>	<b>1947 Cars</b>
<b>Ave. Capacity:</b>	<b>297 Bays</b>
<b>Max. Capacity:</b>	<b>300 Bays</b>
<b>Total Turnover:</b>	<b>6.55 Cars/Bay</b>
<b>Total ALOS:</b>	<b>1.40 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>76.7%</b>
<b>Total Peak Occ %:</b>	<b>93.9%</b>

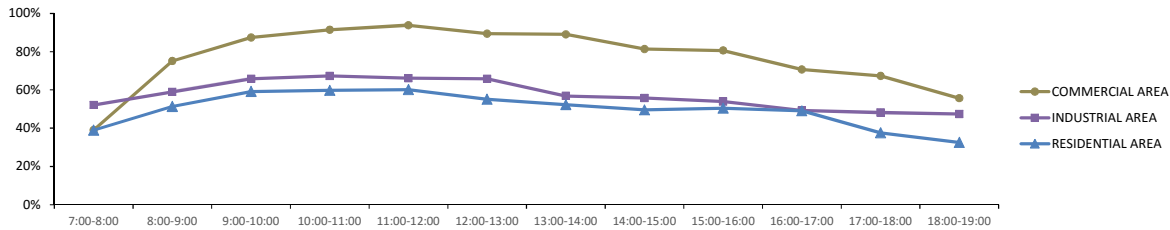
#### Industrial Area

<b>Total Cars:</b>	<b>313 Cars</b>
<b>Ave. Capacity:</b>	<b>278 Bays</b>
<b>Max. Capacity:</b>	<b>278 Bays</b>
<b>Total Turnover:</b>	<b>1.13 Cars/Bay</b>
<b>Total ALOS:</b>	<b>6.07 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>57.3%</b>
<b>Total Peak Occ %:</b>	<b>67.3%</b>

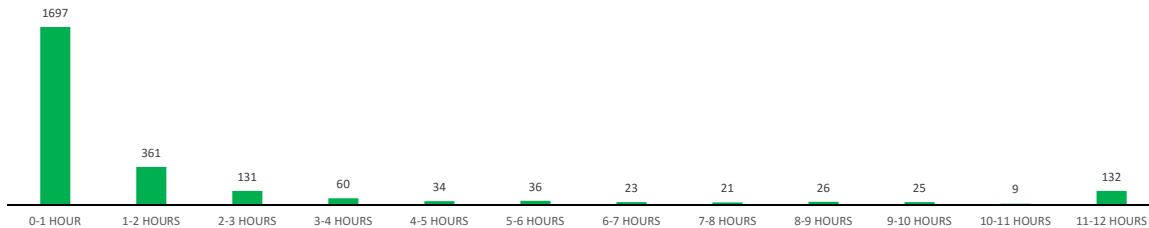
#### Residential Area

<b>Total Cars:</b>	<b>295 Cars</b>
<b>Ave. Capacity:</b>	<b>217 Bays</b>
<b>Max. Capacity:</b>	<b>218 Bays</b>
<b>Total Turnover:</b>	<b>1.36 Cars/Bay</b>
<b>Total ALOS:</b>	<b>4.40 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>49.7%</b>
<b>Total Peak Occ %:</b>	<b>60.2%</b>

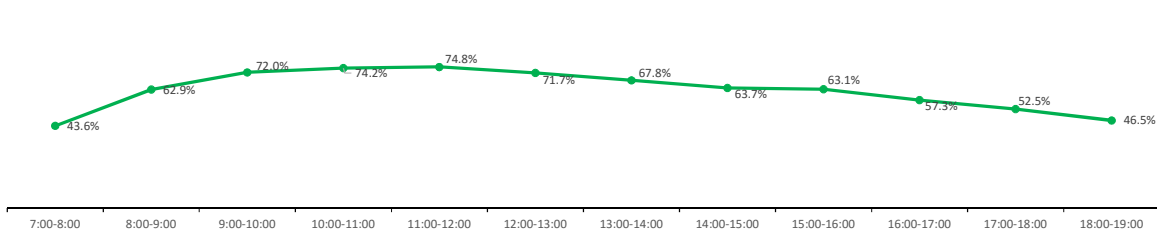
Mona Vale On-street Parking Occupancy (%) By Areas - Saturday



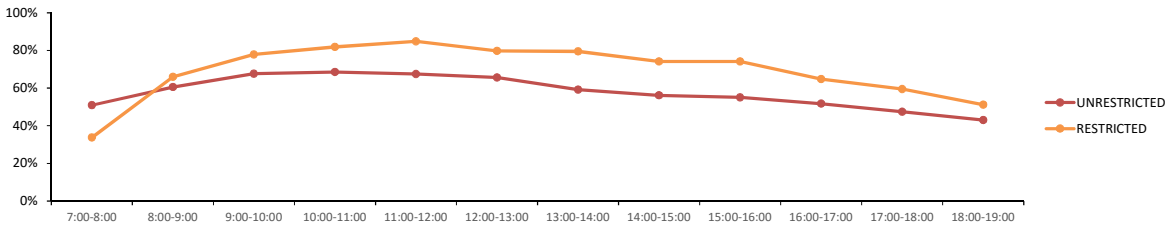
Mona Vale On-street Parking (Total) Length of Stay Distributions - Saturday



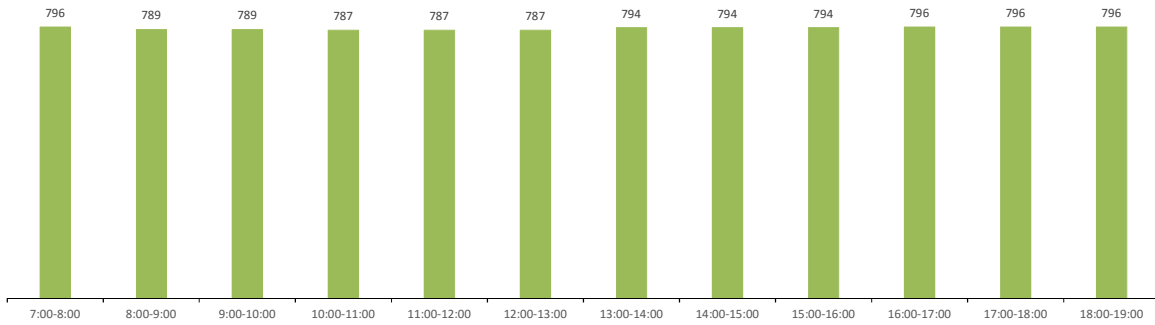
Mona Vale On-street Parking (Total) Occupancy (%) - Saturday



Mona Vale On-street Parking (Unrestricted vs. Restricted) Occupancy (%) - Saturday



Mona Vale On-street Parking Capacity Distributions - Saturday



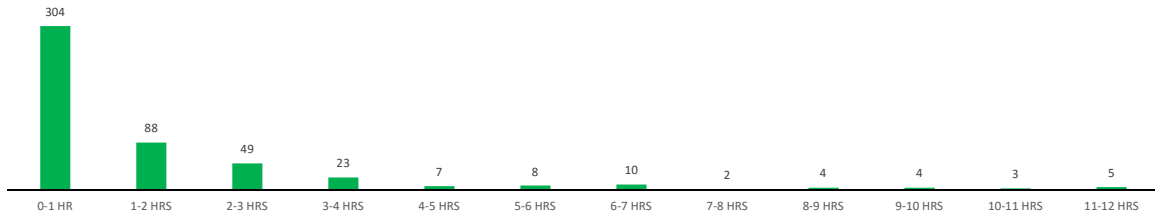
**Saturday Off-Street Car Park Parking Analysis**

\* Only included Public Parking Bays

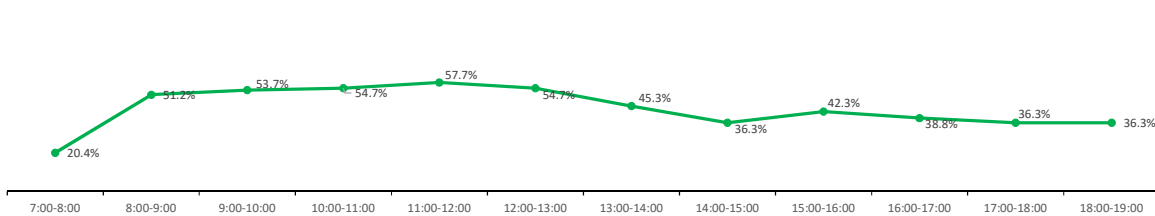
**Weekend At-grade Car Park Analysis**

<b>Total Cars:</b>	<b>507 Cars</b>	<b>Unrestricted Parking:</b>	<b>172 Cars</b>	<b>Restricted Parking:</b>	<b>335 Cars</b>
<b>Total Capacity:</b>	<b>201 Bays</b>	<b>Unrestricted Bays:</b>	<b>142 Bays</b>	<b>Restricted Bays:</b>	<b>59 Bays</b>
<b>Total Turnover:</b>	<b>2.52 Cars/Bay</b>	<b>Unrestricted Turnover:</b>	<b>1.21 Cars/Bay</b>	<b>Restricted Turnover:</b>	<b>5.68 Cars/Bay</b>
<b>Total ALOS:</b>	<b>2.08 Hrs/Car</b>	<b>Unrestricted ALOS:</b>	<b>3.12 Hrs/Car</b>	<b>Restricted ALOS:</b>	<b>1.55 Hrs/Car</b>
<b>Total Ave. Occ %:</b>	<b>44.0%</b>	<b>Unrestricted Ave. Occ %:</b>	<b>31.7%</b>	<b>Restricted Ave. Occ %:</b>	<b>73.6%</b>
<b>Total Peak Occ %:</b>	<b>57.7%</b>	<b>Unrestricted Peak Occ %:</b>	<b>45.1%</b>	<b>Restricted Peak Occ %:</b>	<b>88.1%</b>

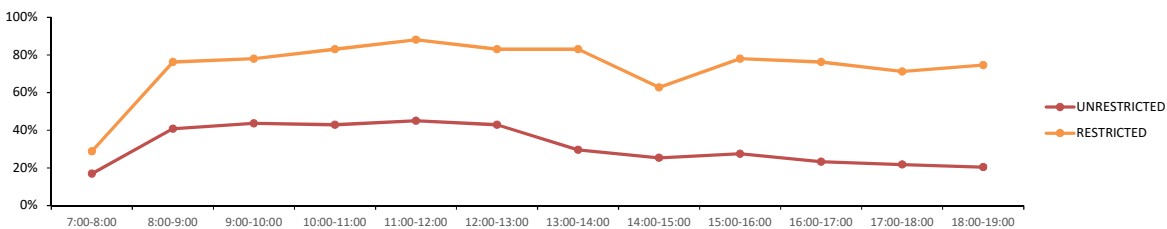
Mona Vale Off-street Parking (Total) Length of Stay Distributions - Saturday



Mona Vale Off-street Parking (Total) Occupancy (%) - Saturday



Mona Vale Off-street Parking (Unrestricted vs. Restricted) Occupancy (%) - Saturday



## Attachment 4 - Intercept and Online Questionnaire Surveys

---

# Mona Vale Town Centre Visitor Parking Survey

(untitled)

---

1. What is the purpose of your to Mona Vale today? \*

- Shopping
- Work
- Social (Gym, Lunch, Leisure etc)
- The School Run
- Other

(untitled)

---

2. What was your **principal** mode of transport today? \*

- Car
- Public Transport (Bus)
- Taxi
- Bicycle
- Walk
- Other (Please specify)

(untitled)

---

3. Were you . . . \*

- the driver
- a passenger
- dropped-off

**(untitled)**

---

4. You indicated you travelled by car, how many people were in the car (including the driver)? \*

- Driver alone
- 2 People
- 3 People
- 4 People
- 5 People

**(untitled)**

---

5. Where did you park? \*

- On-street parking
- A council car park
- On-site parking associated with the destination
- Other car park

**(untitled)**

---

6. Was it difficult to find a parking space near your preferred location (estimate of "cruising time")? \*

- 1 min or less
- 2 mins
- 5 mins
- 10 mins
- 15 mins or more

**(untitled)**

---

7. How far did you have to walk to your destination? \*

- 50 m or less
- 100 m
- 150 m
- 200 m or more

**(untitled)**

---

8. If you cycled where did you park your bike? \*

- Within a building
- At a council bike rack/rail
- At a tree, lamppost or sign etc

**(untitled)**

---

9. To get to Mona Vale, would you ... \*

	Yes	No
Use public transport	<input type="radio"/>	<input type="radio"/>
Ride a bike	<input type="radio"/>	<input type="radio"/>
Walk	<input type="radio"/>	<input type="radio"/>

(untitled)

---

10. How long is your visit to Mona Vale today? \*

- 10 mins or less
- 30 mins
- 1 hour
- 2 hours
- Half a day
- All day

(untitled)

---

11. How many times per week do you visit Mona Vale? \*

## Attachment 5 - Parking Demand Model

---



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T				
1	<b>PITTWATER COUNCIL</b>																							
2	<b>MONA VALE PARKING DEMAND MODEL</b>																							
3	ASSUMPTIONS																							
4																								
5	1	<b>INVENTORY - Weekday</b>										<b>INVENTORY - Weekend</b>												
6	<b>INVENTORY 2015</b>																							
7	<b>PARKING INVENTORY 2015</b>																							
8	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>
9	P5-1P		267	247	5	15					267	0	P5-1P		262	247	0	15					262	0
10	2P		98	77	21	0					98	0	2P		121	100	21	0					121	0
11	3P		152	143	9	0					152	0	3P		120	120	0	0					120	0
12	4P		16	16	0	0					16	0	4P		41	16	25	0					41	0
13	8P		58	58	0	0					58	0	8P		58	58	0	0					58	0
14	Unrestricted - All Day		554	140	151	263					554	0	Unrestricted - All Day		593	160	170	263					593	0
15	Unrestricted - Partial Day		36	6	30	0					36	0	Unrestricted - Partial Day		0	0	0	0					0	0
16	<b>Public Spaces*</b>		<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>					<b>1,181</b>	0	<b>Public Spaces</b>		<b>1,195</b>	<b>701</b>	<b>216</b>	<b>278</b>					<b>1,195</b>	0
17	Permit Holders		14	14	0	0					14	0	Permit Holders		0	0	0	0					0	0
18	Disabled		18	18	0	0					18	0	Disabled		18	18	0	0					18	0
19	Loading Zone		10	10	0	0					10	0	Loading Zone		10	10	0	0					10	0
20	No Parking		9	9	0	0					9	0	No Parking		9	9	0	0					9	0
21	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>					<b>1,232</b>	0	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>					<b>1,232</b>	0
22	Manual Entry																							
23	* Analysis based on public spaces only																							
24																								
25	<b>INVENTORY 5 YEARS</b>																							
26	<b>PARKING INVENTORY 5 YEARS</b>																							
27	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>
28	P5-1P		267	247	5	15					267	0	P5-1P		267	247	5	15					267	0
29	2P		98	77	21	0					98	0	2P		98	77	21	0					98	0
30	3P		152	143	9	0					152	0	3P		152	143	9	0					152	0
31	4P		16	16	0	0					16	0	4P		16	16	0	0					16	0
32	8P		58	58	0	0					58	0	8P		58	58	0	0					58	0
33	Unrestricted - All Day		554	140	151	263					554	0	Unrestricted - All Day		554	140	151	263					554	0
34	Unrestricted - Partial Day		36	6	30	0					36	0	Unrestricted - Partial Day		36	6	30	0					36	0
35	<b>Public Spaces</b>		<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>					<b>1,181</b>	0	<b>Public Spaces</b>		<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>					<b>1,181</b>	0
36	Permit Holders		14	14	0	0					14	0	Permit Holders		14	14	0	0					14	0
37	Disabled		18	18	0	0					18	0	Disabled		18	18	0	0					18	0
38	Loading Zone		10	10	0	0					10	0	Loading Zone		10	10	0	0					10	0
39	No Parking		9	9	0	0					9	0	No Parking		9	9	0	0					9	0
40	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>			<b>1,232</b>	0	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>			<b>1,232</b>	0
41	Manual Entry																							
42																								
43																								
44	<b>INVENTORY 10 YEARS</b>																							
45	<b>PARKING INVENTORY 10 YEARS</b>																							
46	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>	<b>Restriction</b>		<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>					<b>Total</b>	<b>Check</b>
47	P5-1P		267	247	5	15					267	0	P5-1P		267	247	5	15					267	0
48	2P		98	77	21	0					98	0	2P		98	77	21	0					98	0
49	3P		152	143	9	0					152	0	3P		152	143	9	0					152	0
50	4P		16	16	0	0					16	0	4P		16	16	0	0					16	0
51	8P		58	58	0	0					58	0	8P		58	58	0	0					58	0
52	Unrestricted - All Day		554	140	151	263					554	0	Unrestricted - All Day		554	140	151	263					554	0
53	Unrestricted - Partial Day		36	6	30	0					36	0	Unrestricted - Partial Day		36	6	30	0					36	0
54	<b>Public Spaces</b>		<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>					<b>1,181</b>	0	<b>Public Spaces</b>		<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>					<b>1,181</b>	0
55	Permit Holders		14	14	0	0					14	0	Permit Holders		14	14	0	0					14	0
56	Disabled		18	18	0	0					18	0	Disabled		18	18	0	0					18	0
57	Loading Zone		10	10	0	0					10	0	Loading Zone		10	10	0	0					10	0
58	No Parking		9	9	0	0					9	0	No Parking		9	9	0	0					9	0
59	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>			<b>1,232</b>	0	<b>TOTAL SUPPLY</b>		<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>			<b>1,232</b>	0
60	Manual Entry																							

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	<b>PITTWATER COUNCIL</b>																			
2	<b>MONA VALE PARKING DEMAND MODEL</b>																			
61																				
62	<b>INVENTORY 15 YEARS</b>																			
63	<b>PARKING INVENTORY 15 YEARS</b>																			
64	<b>Restriction</b>	<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>															
65	P5-1P	267	247	5	15															
66	2P	98	77	21	0															
67	3P	152	143	9	0															
68	4P	16	16	0	0															
69	8P	58	58	0	0															
70	Unrestricted - All Day	554	140	151	263															
71	Unrestricted - Partial Day	36	6	30	0															
72	<b>Public Spaces</b>	<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>															
73	Permit Holders	14	14	0	0															
74	Disabled	18	18	0	0															
75	Loading Zone	10	10	0	0															
76	No Parking	9	9	0	0															
77	<b>TOTAL SUPPLY</b>	<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>													
78	Manual Entry																			
79																				
80	<b>INVENTORY 20 YEARS</b>																			
81	<b>PARKING INVENTORY 20 YEARS</b>																			
82	<b>Restriction</b>	<b># of Spaces</b>	<b>Commercial</b>	<b>Residential</b>	<b>Industrial</b>															
83	P5-1P	267	247	5	15															
84	2P	98	77	21	0															
85	3P	152	143	9	0															
86	4P	16	16	0	0															
87	8P	58	58	0	0															
88	Unrestricted - All Day	554	140	151	263															
89	Unrestricted - Partial Day	36	6	30	0															
90	<b>Public Spaces</b>	<b>1,181</b>	<b>687</b>	<b>216</b>	<b>278</b>															
91	Permit Holders	14	14	0	0															
92	Disabled	18	18	0	0															
93	Loading Zone	10	10	0	0															
94	No Parking	9	9	0	0															
95	<b>TOTAL SUPPLY</b>	<b>1,232</b>	<b>738</b>	<b>216</b>	<b>278</b>	<b>0</b>	<b>0</b>													
96	Manual Entry																			
97																				
98	<b>2 OCCUPANCY</b>																			
99																				
100																				
101			<b>CURRENT YEAR Peak Occupancy</b>		<b>CURRENT YEAR Peak Occupancy</b>															
102		<b>W</b>		<b>W</b>																
103		<b>E</b>		<b>E</b>																
104		<b>K</b>		<b>K</b>																
105	<b>Commercial</b>	<b>D</b>	83%	<b>E</b>	65%															
106	<b>Residential</b>	<b>A</b>	70%	<b>N</b>	60%															
107	<b>Industrial</b>	<b>Y</b>	93%	<b>D</b>	66%															
108	<b>Zone Mlast</b>	<b>S</b>		<b>S</b>																
109																				
110	<b>Notes</b>																			
111	Manual Entry																			
112	* source Parking Surveys																			
113																				

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
1	<b>PITTWATER COUNCIL</b>																				
2	<b>MONA VALE PARKING DEMAND MODEL</b>																				
114																					
115	3	<b>Growth Rates</b>																			
116	3a	<b>% Growth</b>																			
117		<b>Land use</b>																			
118																					
119																					
120		<b>Land use</b>																			
121		Commercial																			
122		Residential																			
123		Industrial																			
124			0%	0%	0%	0%															
125																					
126		<b>Less Adjustment to Growth</b>																			
127		Commercial																			
128		Residential																			
129		Industrial																			
130																					
131																					
132		<b>Total</b>																			
133		Commercial	0.00%	0.00%	0.00%	0.00%															
134		Residential	0.00%	0.00%	0.00%	0.00%															
135		Industrial	0.00%	0.00%	0.00%	0.00%															
136			0.00%	0.00%	0.00%	0.00%															
137																					
138	3b	<b>% Growth</b>																			
139		<b>Population Growth</b>																			
140																					
141																					
142																					
143		<b>Population Growth</b>	6.59%	6.59%	6.59%	6.59%															
144																					
145																					
146	4	<b>Modal Shift Factor</b>																			
147																					
148																					
149		Reduction for change in travel mode	5.00%	5.00%	5.00%	5.00%															
150																					
151	5	<b>Parking Supply</b>																			
152		Only public on street and off street spaces available for parking included in our analysis																			
153	6	<b>Base Year</b>																			
			2015																		

1	PITTWATER COUNCIL																									
2	MONA VALE PARKING DEMAND MODEL																									
3	SPACES USED AT PEAK OCCUPANCY																									
4																										
5	CALCULATION SPACES USED AT PEAK OCCUPANCY BY DEMAND DRIVER WEEKDAYS AND WEEKENDS																									
6																										
7		WEEKDAY INVENTORY					2015			WEEKEND INVENTORY					2015											
8		2015	YEAR 5	YEAR 10	YEAR 15	YEAR 20	Peak Occupancy	Spaces Used		2015	YEAR 5	YEAR 10	YEAR 15	YEAR 20	Peak Occupancy	Spaces Used										
9		# Car Spaces	# Car Spaces	# Car Spaces	# Car Spaces	# Car Spaces	%	#		# Car Spaces	# Car Spaces	# Car Spaces	# Car Spaces	# Car Spaces	%	#										
10																										
11	Commercial	687	687	687	687	687	83%	569		701	701	701	701	701	65%	452										
12	Residential	216	216	216	216	216	70%	152		216	216	216	216	216	60%	130										
13	Industrial	278	278	278	278	278	93%	259		278	278	278	278	278	66%	184										
14																										
15																										
16																										
17	Zone Mlast																									
18	<b>Total</b>	1,181	1,181	1,181	1,181	1,181		980		1,195	1,195	1,195	1,195	1,195		766										
19	Overall peak occupancy							83%									65%									
20		Not Available																								
21																										
22																										
23																										
24																										
25	CALCULATION PROJECTED SPACES USED by % Growth based on Land Use																									
26																										



27	WEEKDAYS by Demand Driver									
	2015	YEAR 5		YEAR 10		YEAR 15		YEAR 20		
	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	
30	Commercial	569	0.00%	569	0.00%	569	0.00%	569	0.00%	569
31	Residential	152	0.00%	152	0.00%	152	0.00%	152	0.00%	152
32	Industrial	259	0.00%	259	0.00%	259	0.00%	259	0.00%	259
33			0.00%	0	0.00%	0	0.00%	0	0.00%	0
34	<b>TOTAL</b>	980		980		980		980		980
35										
36										
37										

38	CALCULATION PROJECTED SPACES USED by % Growth based on Population Growth									
39										
40	WEEKDAYS									
	2015	YEAR 5		YEAR 10		YEAR 15		YEAR 20		
	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	
43	<b>TOTAL</b>	980	6.59%	1,045	6.59%	1,113	6.59%	1,187	6.59%	1,265
44										
45										
46										
47										

48	CALCULATION PROJECTED SPACES USED by % Growth based on Land Use										
49											
50	WEEKENDS by Demand Driver										
	2015	YEAR 5		YEAR 10		YEAR 15		YEAR 20			
	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #		
53	Commercial	452	0.00%	452	0.00%	452	0.00%	452	0.00%	452	
54	Residential	130	0.00%	130	0.00%	130	0.00%	130	0.00%	130	
55	Industrial	184	0.00%	184	0.00%	184	0.00%	184	0.00%	184	
56			0.00%	0	0.00%	0	0.00%	0	0.00%	0	
57	<b>TOTAL</b>	766		766		766		766		766	
58		#REF!									
59											
60											
61	CALCULATION PROJECTED SPACES USED by % Growth based on Population Growth										
62											

63	WEEKENDS by Zone									
	2015	YEAR 5		YEAR 10		YEAR 15		YEAR 20		
	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	% Growth	Spaces Used #	
66	<b>TOTAL</b>	766	6.59%	817	6.59%	871	6.59%	928	6.59%	989

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	PITTWATER COUNCIL																					
2	MONA VALE PARKING DEMAND MODEL																					
3	PROJECTIONS EXCESS PARKING SUPPLY																					
4																						
5	CALCULATIONS based on % Growth Land Use																					
6																						
7	By Land Use																					
8	Demand Drivers																					
9	WEEKDAYS																					
10		2015			YEAR 5				YEAR 10				YEAR 15				YEAR 20					
11		# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode		
12	Commercial	687	569	118	687	569	118	147	687	569	118	147	687	569	118	147	687	569	118	147		
13	Residential	216	152	64	216	152	64	72	216	152	64	72	216	152	64	72	216	152	64	72		
14	Industrial	278	259	19	278	259	19	32	278	259	19	32	278	259	19	32	278	259	19	32		
15		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
16	TOTAL	1,181	980	201	1,181	980	201	250	1,181	980	201	250	1,181	980	201	250	1,181	980	201	250		
17	Peak Occupancy	83%			83%				83%				83%				83%					
18	WEEKENDS																					
19	Commercial	701	452	249	701	452	249	271	701	452	249	271	701	452	249	271	701	452	249	271		
20	Residential	216	130	86	216	130	86	92	216	130	86	92	216	130	86	92	216	130	86	92		
21	Industrial	278	184	94	278	184	94	103	278	184	94	103	278	184	94	103	278	184	94	103		
22		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
23	TOTAL	1,195	766	429	1,195	766	429	467	1,195	766	429	467	1,195	766	429	467	1,195	766	429	467		
24	Peak Occupancy	64%			64%				64%				64%				64%					


26																						
27	CALCULATIONS based on Population Growth																					
28																						
29	WEEKDAYS																					
30		2015			YEAR 5				YEAR 10				YEAR 15				YEAR 20					
31		# Car Spaces	# Spaces Used	Excess	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode	# Car Spaces	# Spaces Used	Excess	Adj change in Travel Mode		
32	TOTAL	1,181	980	201	1,181	1,045	136	189	1,181	1,113	68	123	1,181	1,187	-6	54	1,181	1,265	-84	-21		
33	WEEKENDS																					
34																						
35	TOTAL	1,195	766	429	1,195	817	378	419	1,195	871	324	368	1,195	928	267	313	1,195	989	206	255		

## Attachment 6 - Proposed Parking Strategies

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STRATEGIES	ACTION	PROS	CONS
<p><b><i>The closer the parking supply is to the commercial hubs, the shorter the time restriction</i></b></p>	<p>55% of council managed public parking supply in the Town Centre is 8P or unrestricted (71% on street, 29% off street)</p> <p>There is predominantly 1P parking in the commercial zone (excluding Bungan Lane car park), 3P or &gt; in the residential zone and unrestricted parking in the industrial zone. Unrestricted parking does not necessarily increase the commercial viability of the town centre – factors such as retail mix and the surrounding environment are more important to attracting visitors<sup>10</sup>. Free parking is socially, economically and environmentally unsustainable.</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Adopt a general principle that where occupancy exceeds 85% (practical capacity) on a consistent basis, consideration is to be given to a change to time restrictions and/or implementation of paid parking to manage parking demand (we acknowledge it is difficult to implement paid parking when free private parking is available e.g. Woolworths, Aldi, Pittwater Place).</li> </ul>	<ul style="list-style-type: none"> <li>• Increased turnover leads to increased supply.</li> <li>• Increased parking availability will attract more visitors.</li> <li>• The capital cost of introducing additional time restrictions is lower than the construction cost of building more parking.</li> </ul>	<ul style="list-style-type: none"> <li>• Displaced all day parkers will move into other unrestricted parking areas.</li> <li>• Require enforcement to be effective.</li> <li>• May require a residents/ visitors parking scheme in the residential zone. The Roads and Maritime Services (RMS) have published a guideline to Permit Parking (January 2011) (previously Permit Parking 2001) which provides mandatory procedures and guidelines for Council to follow when introducing a Resident Parking Scheme. These procedures and guidelines recommend a maximum of two permits per eligible household (house or semi-detached dwelling); one permit per unit (for multiple dwellings). Residents with no off street parking are to be prioritised.</li> <li>• There may be FBT implications for employers if paid parking is introduced where the daily rate is greater than the FBT threshold (currently \$8.26 per day).</li> </ul>


<sup>10</sup> The Means 2012

STRATEGIES	ACTION	PROS	CONS
	<ul style="list-style-type: none"> <li>• Paid parking is generally perceived by the community as revenue raising – unless benefits can be clearly articulated and excess funds reinvested into community projects which enhance street vitality and encourage alternative travel options, parking management and improvements</li> <li>• Could consider introducing time restrictions into the residential and industrial zones (Darley Street) adjoining commercial zone (e.g. 2P).</li> </ul>		
<p><b>Shorter time restrictions on street vs off street.</b></p> 	<p>This is currently in place in the commercial zone.</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Consider converting off street car parks in the commercial zone (car parks A and B and Bungan Lane car park Levels 1 and 2) to 2P weekdays.</li> </ul> <p>The time restrictions will still be greater than on street (1P). Similarly 8P parking in the Bungan Lane car park could be converted to 3P parking.</p>	<ul style="list-style-type: none"> <li>• Increase turnover and therefore supply.</li> </ul>	<ul style="list-style-type: none"> <li>• Require enforcement to be effective.</li> </ul>

<sup>11</sup> *Parking Basics, Institute for Transportation and Development India, July 2015*



STRATEGIES	ACTION	PROS	CONS
<b><i>Council to consider the needs and priorities of the various user groups to create a safe environment and improve kerbside road efficiency whilst fostering a vibrant town centre environment.</i></b>	<p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Work with the local schools to investigate alternative drop off /pick up zones (e.g. rear of Mona Vale Primary site) and the efficient management of existing drop off/ pick up areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Minimise traffic congestion at peak times</li> <li>• Improve pedestrian safety</li> </ul>	
<b><i>Install a town centre signage plan to direct parkers to available parking.</i></b>	<p>The physical layout of the town centre and current parking locations are an issue. Parking is available but patrons may not know where to find it. (Refer Section 5.2 of our Report).</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Develop a town centre signage plan to direct parkers to available parking to minimise circulating traffic (e.g. the Bungan Lane car park)</li> <li>• Could consider dynamic signage as part of the signage plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Minimise traffic congestion, driver frustration and the environmental impact of circulating traffic.</li> </ul>	<ul style="list-style-type: none"> <li>• Capital cost of implementation</li> <li>• Challenge of incorporating non council car parks into Town Centre signage plan.</li> </ul>
<b><i>Reduce car dependency particularly for local trips by providing incentives to use alternate modes of transport.</i></b>	<p><b>Recommendation :</b></p> <ul style="list-style-type: none"> <li>• Consider car share schemes</li> <li>• Incentivise employers to introduce car-pooling and/or public transport for staff</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces the reliance on the car for trips to and from the Centre.</li> </ul>	<ul style="list-style-type: none"> <li>• Forgone parking space for car share.</li> </ul>
<b><i>Ensure a safe and accessible environment for pedestrians and cyclists</i></b>	<p><b>Recommendation :</b></p> <ul style="list-style-type: none"> <li>• Install Bike racks</li> <li>• Work with local schools and businesses to promote travel smart initiatives (e.g. car-pooling, walking</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces the reliance on the car for trips to and from the Centre.</li> </ul>	

STRATEGIES	ACTION	PROS	CONS
<p><b>No new sites to be built unless there is a justifiable business case. Encourage reduced provision for sites close to public transport</b></p>  <p>12</p>	<p>and cycling to school, etc.)</p> <p>Mona Vale is a car centric community. If Council build more car parks more people will drive. <i>"If you plan for cars and traffic – you get cars and traffic, if you plan for people and places – you get people and places"</i><sup>13</sup></p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>• Develop overflow parking plans for peak periods. Potential sites for overflow parking on weekends include School parking.</li> <li>• Unbundle parking in new developments</li> <li>• Reduce parking requirements for new developments, particularly those adjacent to public transport hubs – assess parking demand before creating parking.</li> </ul>	<ul style="list-style-type: none"> <li>• Match supply with demand.</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptance by developers</li> </ul>

<sup>12</sup> Parking Basics, Institute for Transportation and Development India, July 2015

<sup>13</sup> Fred Kent Projects for Public Spaces

## Attachment 7 - Traffic Modelling Presentation

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Presented as a separate document / file

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