Eastern Suburbs Cycleways - Miramar Ave Improvements Options

Wellington City Council

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Rev 0	10/6/2016	For client comment	G Ryan	A Lawson	
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Contents

Executive Summary

This issues paper has been prepared to provide background information for the Eastern Suburbs Cycleways - Miramar Ave project. It will be used for the development and assessment of options for enhancing cycle facilities along Miramar Avenue, Wellington. The paper includes a summary of the relevant Wellington City Council plans and policies, and a description of the existing layout of roads in the study area, intersection layouts, speed limits, and parking restrictions.

It also includes presentation of data which has been collected from a number of sources including surveys undertaken as a part of this study. Information has been provided on turning movements and queuing at intersections; vehicle speeds; parking utilisation; and crash statistics.

Based on this information, significant issues related to Miramar Avenue requiring further assessment and consideration by this project have been identified. These are summarised in section 11 "*Conclusions*" of this report.

Important note about your report

The sole purpose of this report is to provide an outline of the current multimodal transport issues along Miramar Avenue in Wellington.

Some existing information from the Client, Wellington City Council (WCC) has been used and presumed accurate in preparing the report, such as vehicle count data, vehicle speed data, proposed bus network changes and geometric changes, current WCC policies and plans, Danish Method assessment and outcomes, and information regarding the Shelly Bay development. Other data has been sourced from freely available online information and aerial images have been sourced form Google Earth Pro (and attributed where shown).

If there are changes to the WCC policy, plans or objectives or infrastructure changes within the study area changes for the intended cycleway, this issue report may need to be re-evaluated.

No warranty or guarantee (expressed or implied) applies to the data, observations and findings in the report to the extent permitted by law.

This report is be read in full with no excerpts taken to be representative of the findings.

This report has been prepared exclusively for Jacobs' client and no liability is accepted for any use or reliance on the report by third parties.

1. Introduction

1.1 Background

Over recent years Wellington City Council (WCC) has committed a significant amount of capital funding to cycleway development through its Long Term Plan and Annual Plan processes. The investments aim to contribute towards cycling becoming "*safer and more convenient*" (WCC Cycling Policy, November 2008) by increasing the level of service for people who use bikes.

The Urban Cycleways Programme (UCP) has provisionally allocated $9.5 million to Wellington City for investment in Cycleways up to 30 June 2018. When contributions from rates and the National Land Transport Fund are taken into account, it is likely that some $35 million will be invested in cycling up to 30 June 2018, with $6 million allocated to the Eastern Area.

The Council is currently working through the NZ Transport Agency's business case approach to develop and assess options. To date the strategic case and programme business case stages have been completed. This issues paper relates to work required to complete the indicative business case for the Eastern Area. Following completion of this indicative business case stage, a detailed business case will be developed.

The Council has established a Working Group, made up of local ward Councillors and local representative groups, to identify preferred options to recommend to Council. The Working Group has met previously to identify key and local destinations; identify priority corridors; and identify preferred routes and indicative treatment types. Community consultation commenced in March/April 2016, with a view to confirming route selection by late 2016.

While routes for providing cycleways have not been fully determined at this stage, WCC have noted that Miramar Avenue is already a popular cycling route and it may be a preferred route for a high quality cycleway, either as part of this programme or as a high priority thereafter. For this reason options are currently being assessed.

1.2 Purpose of this report

This issues report is the first report to be produced for this study of Miramar Avenue. It is intended to provide the background information which will be used to develop and assess improvement options in Miramar Avenue.

This issues paper outlines the current level of service for people on bikes and the adequacy and safety of provisions for people walking, biking, driving, parking and using buses in the study area. This will include collection and presentation of usage and crash statistics.

1.3 Study Area

The study area is limited to Cobham Drive and Miramar Avenue between Miramar Wharf in the west and Hobart Street in the east; see Figure 1.1 below.

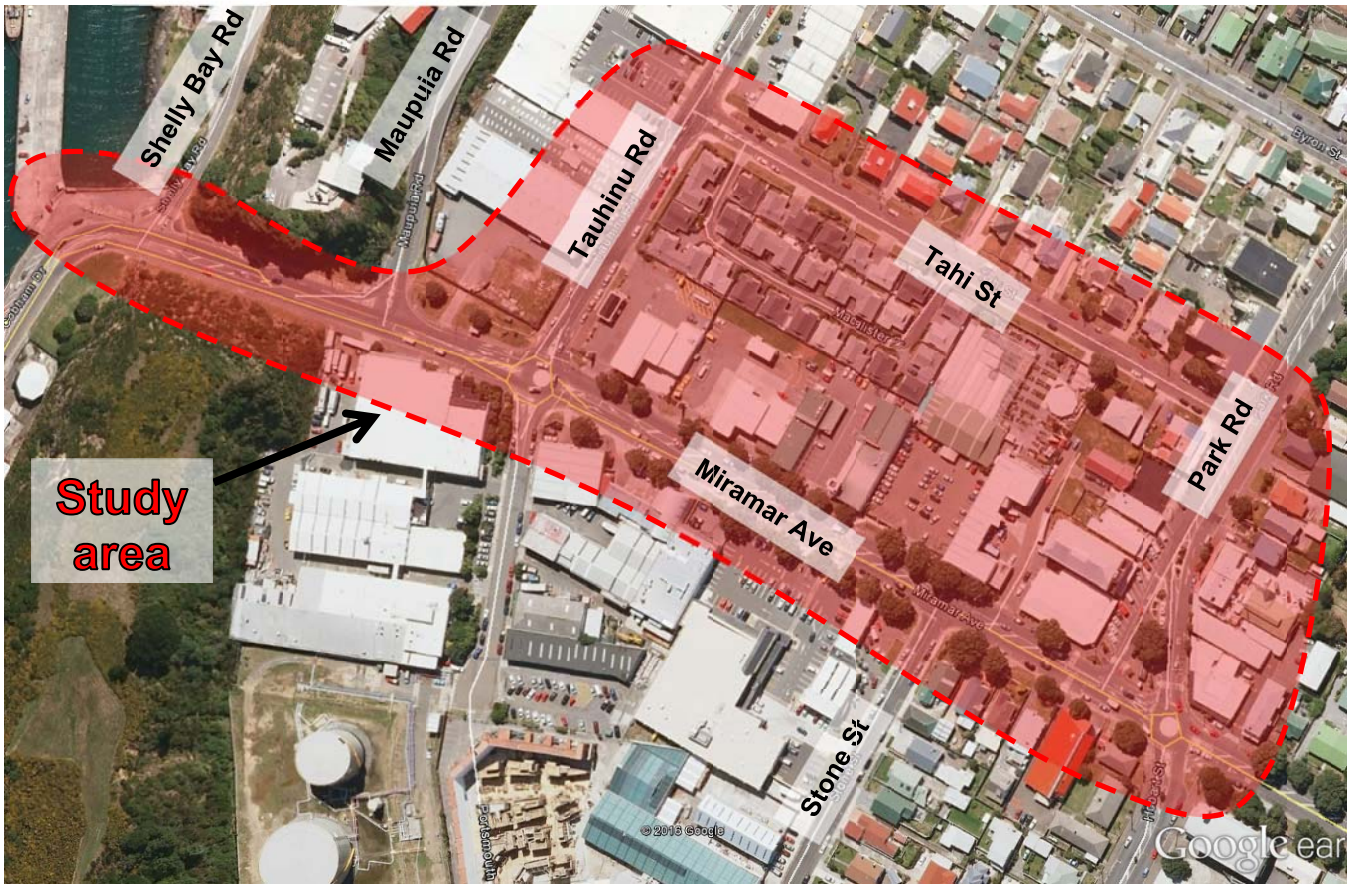


Figure 1.1: Study Area [1]

1.4 Project Objectives

The primary objective "*is to define a plan for integrated transport improvements to this section which maximises benefits for all road users, and in particular addresses the poor level of service for people travelling by cycle. The plan will be developed in conjunction with members of the Miramar Business Improvement District (BID)*".

Miramar Business Improvement District (BID) was set up in 2013 with support from local businesses and uses targeted rates in the BID area to upgrade and regenerate the town centre.

The WCC has identified the following key matters to be addressed by the study:

- Existing safety issues;
- Vehicle operating speeds;
- Appropriate provisions for people on bikes, both mid-block and at intersections;
- Appropriate provisions for buses to enable effective and efficient operation of the new core route planned from 2018;
- Appropriate provisions for pedestrians, including shoppers;
- Appropriate provisions for commercial / delivery vehicles.

Officers will recommend scheme/s and implementation plan/s for consideration by Councillors.

[1] Aerial imagery was retrieved from Google Earth Pro, Google 2016. Imagery of the site is dated 2 March 2009. Reproduced on basis of full attribution.

2. WCC Plans and Policies

2.1 Cycleways Programme Masterplan

The Cycleways Programme Masterplan[2] outlines the Council's aims for developing cycleways in Wellington and their expected benefits. It provides data on the current level of support for cycling, and describes the perceived and actual levels of lower safety relative to other modes. It indicates cycling demand by type of cyclist and identifies that 76% of people in Wellington City would consider cycling given safe and separated infrastructure, and 75% support the development of cycleways including non-cyclists.

Figure 2.1 has been extracted from the Masterplan and describes the areas where those who cycle to work live.

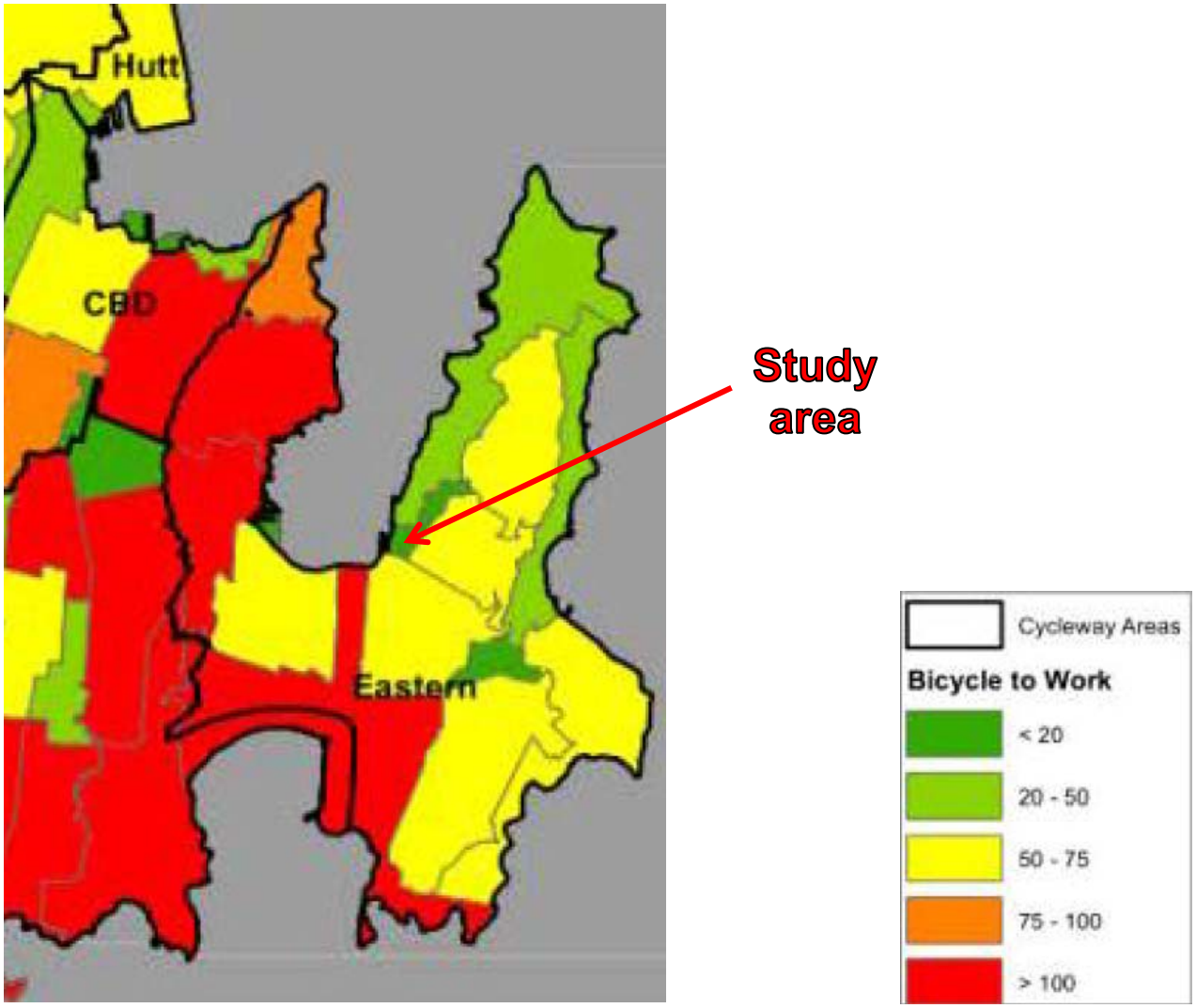


Figure 2.1:Where those who cycle to work live

The areas around Miramar Avenue show a relatively low use of cycles to travel to work, with each area typically only having 50-75 people cycling to work. Part of the reason for this may be that Miramar is a significant distance from the central city.

It also suggests further improvements in cycle facilities may result in a strong uptake.

[2] Wellington City Council, Wellington Cycleways Programme Masterplan, September 2015. Found online June 2016. http://wellington.govt.nz/~/media/services/parking-and-roads/cycling/files/cycleways-master-plan-103052.pdf

2.2 WCC Cycling Framework 2015

The WCC Cycling Framework 2015 outlines the proposed citywide cycleway network and describes the types of cycleways (quiet routes, shared zones, protected lanes, alternative paths). It also addresses some principles and frameworks, including network design principles and space allocation principles.

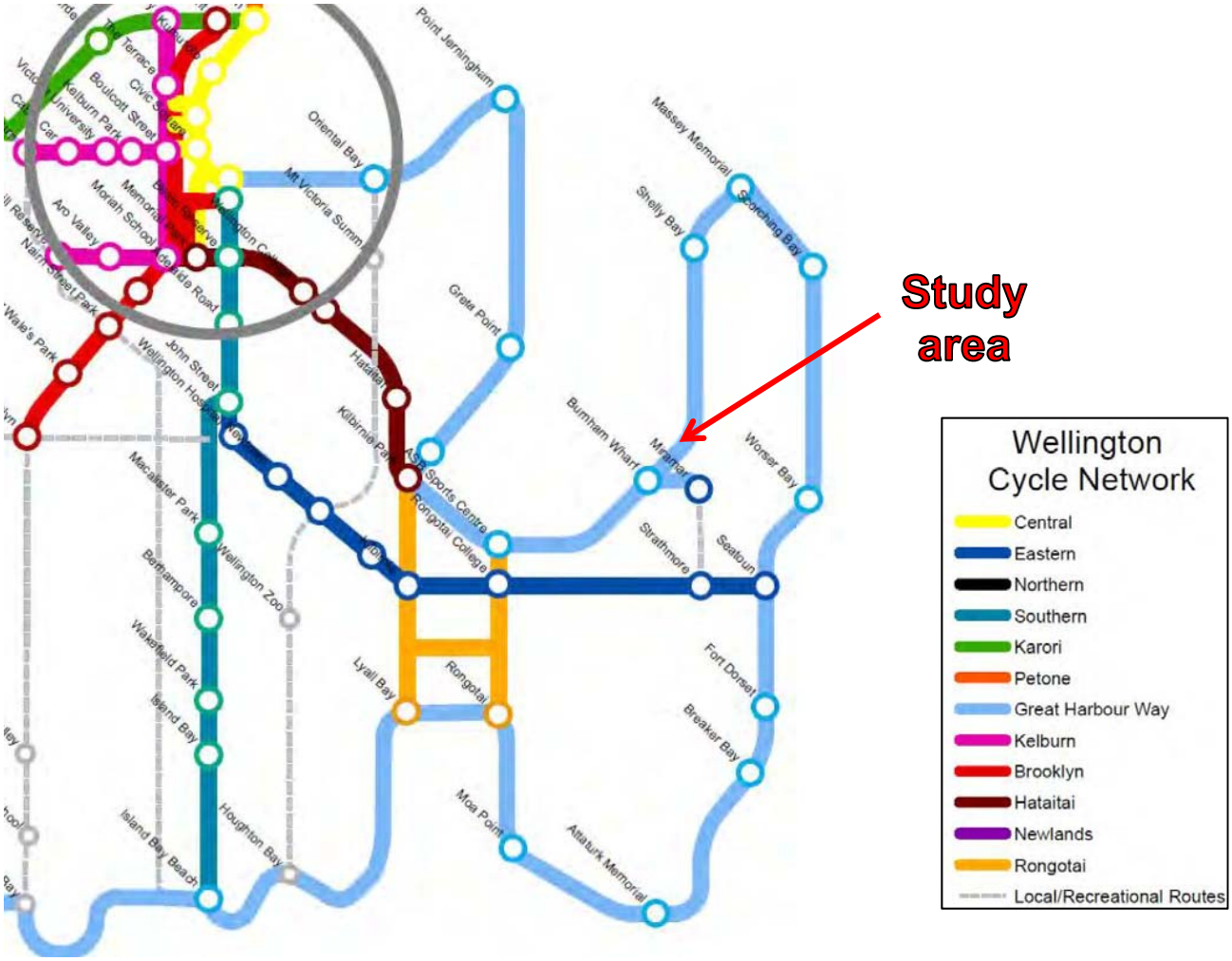


Figure 2.2:Wellington Cycleway Network Plan and the study area

2.3 Town Centre Policy

Within the WCC Centres Policy[3], Miramar is identified as one of four Town Centres, as part of the hierarchy of Central Wellington, Sub-regional Centres, Town Centres, District Centres and Neighbourhood Centres. Refer to Figure 2.3.

[3] WCC, Centres Policy, Objectives. Retrieved online May 2016. http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/plans-and-policies/a-to-z/centres/files/02objectives.pdf?la=en

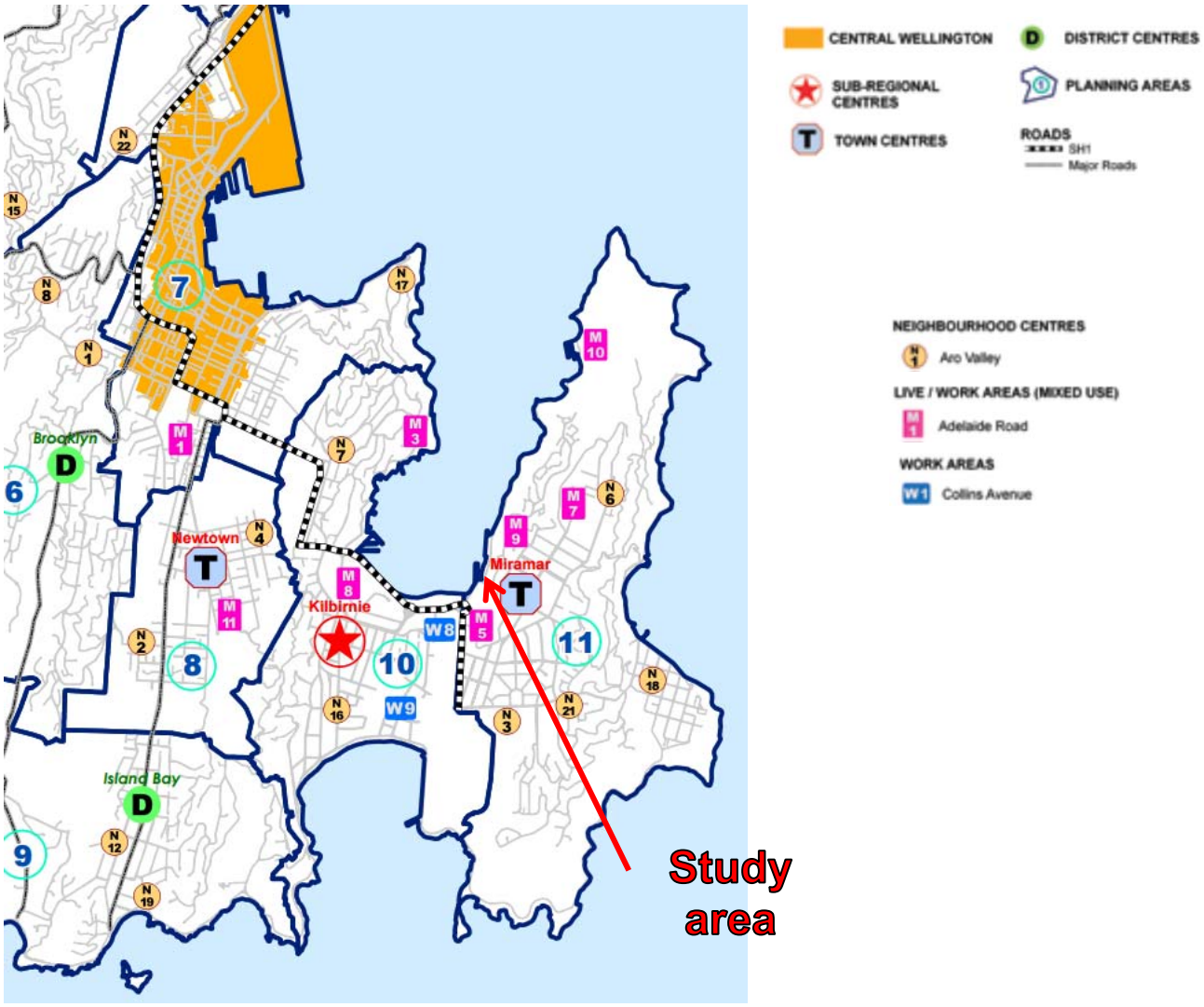


Figure 2.3: WCC Centres Policy; Hierarchy of Centres Map

Some relevant objectives of the Centres Policy are outlined in Table 2-1:

Table 2-1: WCC Centres Policy Objectives and Relevance

WCC Centres Policy Objective		Relevance
1	To identify the role and function of each centre within Wellington City and provide a spatial framework for integrated planning.	Hierarchy of streets, appropriate land use, limiting vehicle accesses on through routes
2	To maintain and strengthen the central city as the primary centre within the city and region for shopping, employment, city-living, culture and entertainment, tourism and major events, and ensure that development in other locations does not compromise this role	Links to central city; east west along Miramar
3	To strengthen the multi-functional nature of centres, including their role as social and community foci, public transport hubs, places where people live and work, and centres for entertainment, recreation and local services.	Amenity, modal interfacing and connectivity, pedestrian needs
4	To manage the location of retail activities to ensure they support Wellington's compact urban form, provide for sustainable transport options and an efficient use of resources, and support the long-term vitality and viability of existing centres	High utilisation of parking Better public transport access
5	To support centres through targeting future residential growth in and around those centres identified as suitable for change due to	Facilitate higher density Improved active mode facilities for local

WCC Centres Policy Objective		Relevance
	good transport accessibility, suitable physical characteristics and lower sensitivity to changes to character	trips
6	To ensure there is a sufficient supply of land available for industrial activities to meet the long-term needs of the city.	Provide alternate routes for pedestrians and cyclists away from industrial area to the south
7	To improve the urban design quality of all centres and build on their sense of place.	Function and streetscape, amenity

2.4 Urban Growth Plan

The WCC Urban Growth Plan 2014-2043 (UGP) also identifies that urban centres such as Miramar provide a place for local communities to shop, access services and socialise. There is a need to ensure the areas already earmarked for medium-density housing and the main streets in and around these centres are attractive and ready to support that growth.

The UGP Action Plan also includes some key transport improvements that include Miramar Avenue as part of the cycle network and a bus priority spine suburban extension. Miramar is identified as an investigation area for residential growth with medium density housing. Miramar Park, east of the Avenue, is earmarked for improvement also. One particularly relevant action is to "*Integrate cycling into the Miramar Peninsula – work with the community and interest groups to identify additional routes through the peninsula and improve the coastal recreational route.*" [4]

2.5 Road Hierarchy

The road hierarchy for Wellington City, which is defined in the District Plan, is shown in the below diagram.

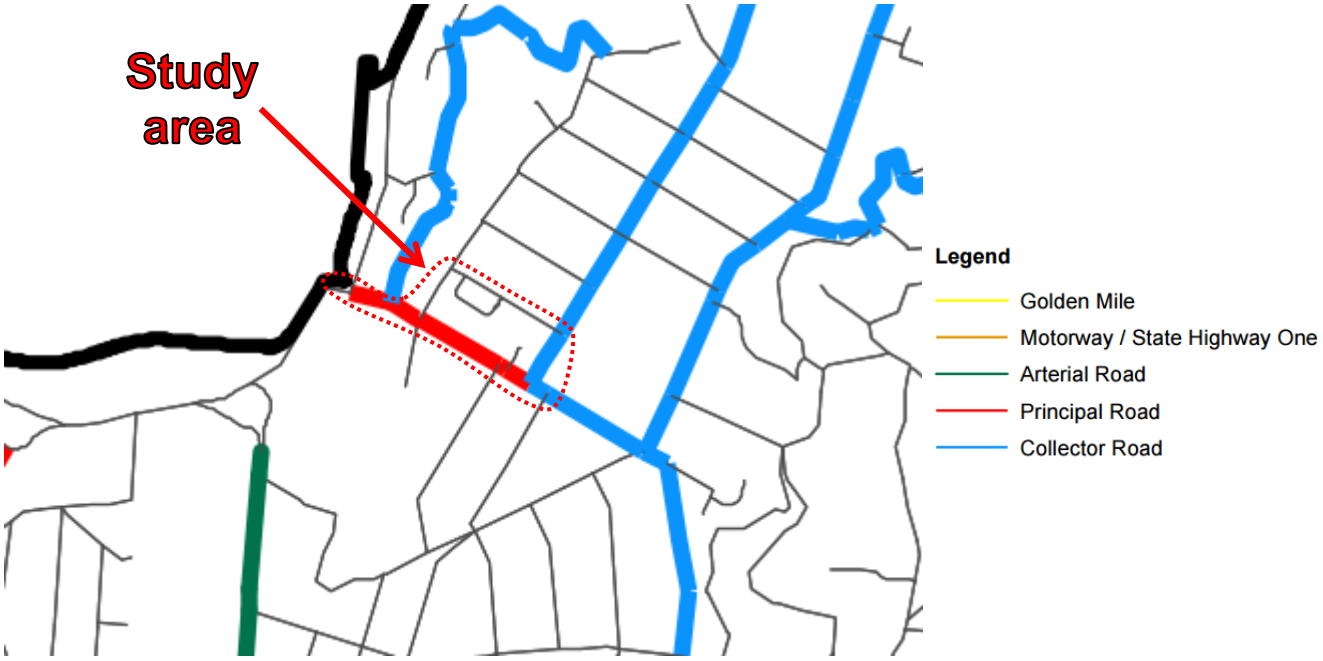


Figure 2.4: District Plan Road Hierarchy Map[5]

Miramar Avenue to the west and east of Park Road is respectively classified as a Principal Road and Collector Road, and both Maupuia Road and Park Road as Collector Roads.

[4] WCC, Urban Growth Plan, Action Plan. Retrieved online May 2016. http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/plans-and-policies/a-to-z/wgtn-urban-growth/wgtn-urban-growth-plan2015-3.pdf?la=en
[5] WCC, District Plan Volume 3, Map 33, Road Hierarchy Map. Retrieved online May 2016http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/district-plan/volume03/files/v3map33.pdf?la=en

It is noted that the diagram from the District Plan would seem to have errors. The northern end of Cobham Drive should probably be shown as being a Principal Road, and remaining sections along State highway 1 should be shown as being an Arterial Road.

2.6 District Plan Land Zoning

The District Plan identifies land zoning within the study area, as shown in Figure 2.5.

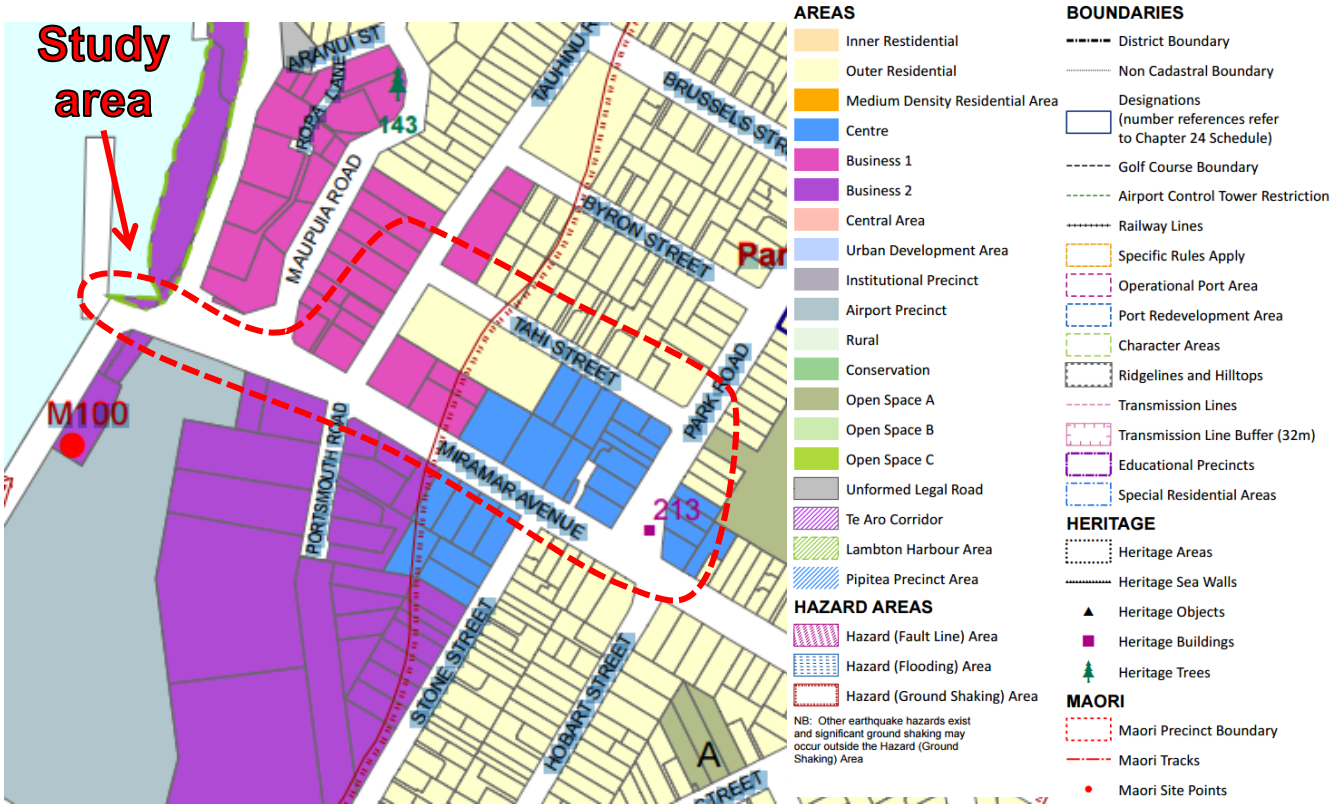


Figure 2.5: District Plan Zoning [6]

There is a mixture of land use including Centre, Business 1, Business 2, Outer residential and Airport Precinct zones along Miramar Avenue.

There is also a Heritage listed building as a bus (formerly tram) shelter (number 213) outside the Roxy Theatre. There are no heritage listed trees within the study area.

2.7 District Plan Restrictions on Access

There is a restriction on the vehicle accesses along parts of Cobham Drive (eastern side south or Miramar Avenue), Miramar Avenue (southern side between Stone and Hobart Street) and Park Street (eastern side opposite diagonal parking). Refer to Figure 2.6.

[6] WCC, District Plan, Volume 3, Map 7. Retrieved online May 2016. http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/district-plan/volume03/files/v3map07.pdf?la=en

Figure 2.6: District Plan Vehicle Access Restrictions [7]

[7] WCC, District Plan, Volume 3, Map 44 and 45. Retrieved online May 2016. http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/district-plan/volume03/files/v3map44.pdf?la=en
http://wellington.govt.nz/~/media/your-council/plans-policies-and-bylaws/district-plan/volume03/files/v3map45.pdf?la=en

3. Existing Road Structure

3.1 Road Layout

Aerial photos of Miramar Avenue and photographs taken along its length (within the study area) are provided respectively in Appendix A. The study area is relatively flat with a linear roading layout. The road environment is visually narrowed by attractive established pohutakawa trees on both sides of Miramar Avenue. The frontage buildings are typically retail, commercial, office or residential in land use and single to two storey.

Miramar Avenue typically provides a single traffic lane in each direction and a flush median (4 to 4.5m in varying width) to allow for right turning movements. Kerbside parking is provided where space permits on either side of the road. The total carriageway width is around 14m wide between Shelly Bay Road and Tauhinu Road and 16.5m wide between Tauhinu Road and Park Road. Photographs showing the typical carriageway cross sections are shown in Figure 3.1 and Figure 3.2.

Figure 3.1: Miramar Avenue carriageway between Shelly Bay Road and Tauhinu Road, note 'Miramar cutting' (facing east)

Figure 3.2: Miramar Avenue carriageway between Tauhinu Road and Park Road (facing east)

3.2 Intersection Layout

The intersections in the study area are described in the sections below for their key features. Aerial photos of the intersections are provided in Appendix A.

3.2.1 Miramar / Shelly Bay give way priority T-intersection

The layout for the Miramar / Shelly Bay priority T-intersection is shown in Appendix A, A.1. Key features include:

- A 50km/h speed limit;
- A right turn bay from Miramar Avenue;
- The Shelly Bay Road approach has small painted island (4.5m in length without pedestrian refuge space) to better control traffic movement;
- The intersection is only 40m from the right hand bend on Cobham Drive, which may impact on sight distance or judgement of opposing vehicle speeds; and
- The footpath on Shelly Bay Road is on the western side only.

The photographs in Figure 3.3 and Figure 3.4 show the intersection layout.

Figure 3.3: Miramar Avenue and Shelly Bay Road Intersection (facing southwest)

Figure 3.4: Miramar Avenue and Cobham Drive intersection, including shared path (facing west)

3.2.2 Miramar / Maupuia give way priority T-intersection

The layout for the Miramar / Maupuia priority T-intersection is shown in Appendix A, A.1. Key features include:

- A 50km/h speed limit;
- A right turn bay from Miramar Avenue;
- A left turn slip lane from Miramar Avenue;
- The double yellow no overtaking centrelines on Miramar Avenue east and west approaches;
- The Maupuia Road approach has small painted pedestrian refuge island; and
- The footpath on Maupuia Road eastern side only.

The photographs in Figure 3.5 and Figure 3.6 show the intersection layout.

Figure 3.5: Miramar Avenue and Maupuia Road intersection, including shared path (facing east)

Figure 3.6: Miramar Avenue and Maupuia Road intersection, including shared path termination (facing west)

3.2.3 Miramar / Tauhinu / Portsmouth roundabout

The layout for the Miramar / Tauhinu / Portsmouth roundabout is shown in Appendix A, A.2. Key features include:

- A single lane roundabout with a 50km/h speed limit;
- A trafficable central island to allow tracking of larger vehicles;
- Small approach islands on each leg, including pedestrian refuges on the Tauhinu and Portsmouth approaches;
- On street parking in the vicinity on the Tauhinu and Portsmouth approaches; and
- The modifications that are proposed by the Greater Wellington Regional Council to allow for tracking of higher capacity buses (refer to Appendix C).

The photograph in Figure 3.7 shows the intersection layout.

Figure 3.7: Miramar Avenue and Tauhinu Road and Portsmouth intersection (facing southeast)

3.2.4 Miramar / Stone give way priority T-intersection

The layout for the Miramar / Stone priority T-intersection is shown in Appendix A, A.3. Key features include:

- A 30km/h speed limit;
- A right turn bay from Miramar Avenue;
- On street parking in the vicinity; and
- The bus stop opposite the intersection on Miramar Avenue.

The photograph in Figure 3.8 shows the intersection layout.

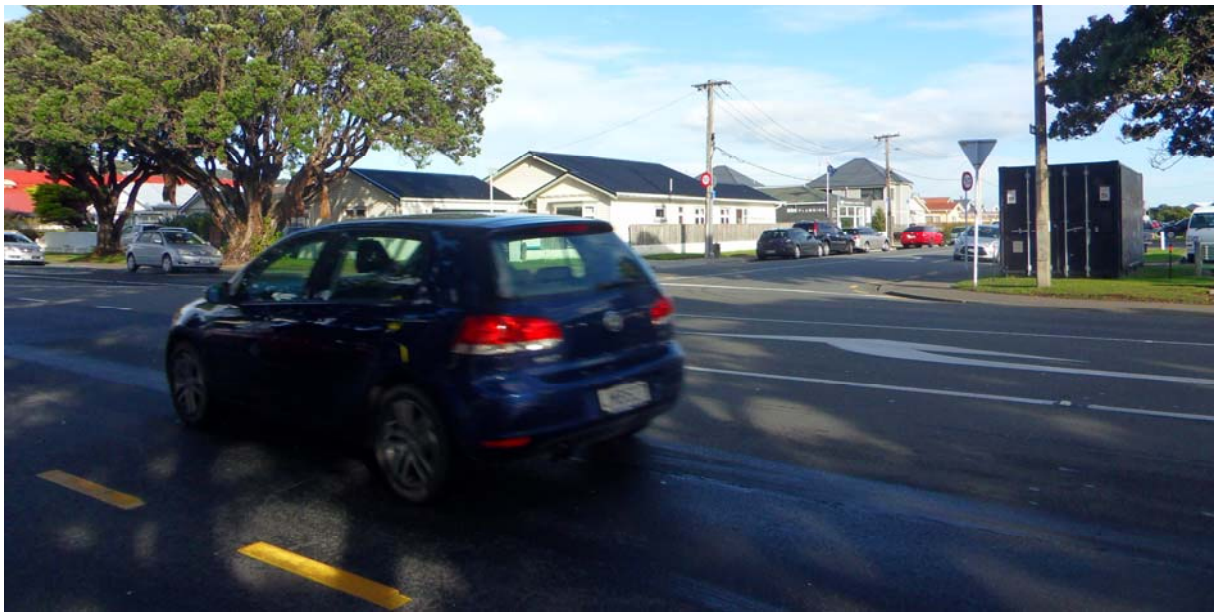


Figure 3.8: Miramar Avenue and Stone Street intersection (on Miramar Avenue facing southeast)

3.2.5 Miramar / Park / Hobart Street roundabout

The layout for the Miramar / Park / Hobart roundabout is shown in Appendix A, A.3. Key features include:

- A single lane roundabout with a 30km/h speed limit;
- The left turning lanes for the Miramar Avenue approaches;
- A trafficable central island to allow tracking of larger vehicles;
- Small approach islands on each leg except Park Road;
- The kerb build outs and pedestrian refuge islands on the Miramar (east) and Hobart approaches,
- The shared zone with parking, shops, Roxy Theatre, landscaping, seating, a heritage listed bus (formerly tram) shelter on the north-western corner;
- A busy context with many shops and facilities at the intersection approaches, including the Holy Cross Church and Miramar Veterinary Hospital;
- On street parking in the vicinity; and
- The bus stop pair on the Park Road approach and southern side of the Miramar (east) approach.

The photographs in Figure 3.9, Figure 3.10, Figure 3.11 and Figure 3.12 show the intersection layout.

Figure 3.9: Miramar Avenue and Park Road and Hobart Street intersection (on Park Road facing southeast)

Figure 3.10: Park Road and Miramar Avenue intersection, note shared zone with some parking (on park Road facing southeast)

Figure 3.11: Miramar Avenue and Park Road intersection, note shared zone (on Miramar Avenue facing east)

Figure 3.12: Park Road, note the angle parking on the western side (facing north)

3.2.6 Park /Tahi uncontrolled priority T-intersection

The layout for the Park / Tahi priority T-intersection is shown in Appendix A, A.4. Key features include:

- A 50km/h speed limit, adjacent to threshold of 30km/h zone;
- A right turn bay on Park Road;
- The mostly residential context;
- Substantial unrestricted free on street parking on both sides of Tahi Street, including a section of angle parking midway along Tahi Street;
- Uncontrolled Tahi Street approach (no limit line); and
- The angle parking on western side of Park Road, both immediately north and south of the intersection, which may introduce conflicts and sight distance constraints for vehicles turning out of Tahi Street.

The photographs in Figure 3.13 and Figure 3.14 show the intersection layout.

Figure 3.13: Tahi Street and Park Road intersection (facing south)

Figure 3.14: Tahi Street (facing west)

3.2.7 Tauhinu / Tahi give way priority T-intersection

The layout for the Tauhinu / Tahi priority T-intersection is shown in Appendix A, A.5. Key features include:

- A 50km/h speed limit;
- A right turn bay on Tauhinu Road;
- The pedestrian crossing refuge islands on north and east approaches; and
- A shopping complex opposite Tahi Street with off street parking. The entry and exit for this parking approximately aligns with Tahi Street, which may introduce conflicts between vehicles crossing Tauhinu Road and those turning in and out of Tahi Street.

The photographs in Figure 3.15 and Figure 3.16 show the intersection layout.

Figure 3.15: Tahi Street and Tauhinu Road intersection (facing northwest)

Figure 3.16: Tahi Street and Tauhinu Road intersection (facing southwest)

3.3 Extent of Speed and Parking Restrictions in the Urban Centre

Speed and parking restrictions within the urban centre of Miramar are shown in Figure 3.17.

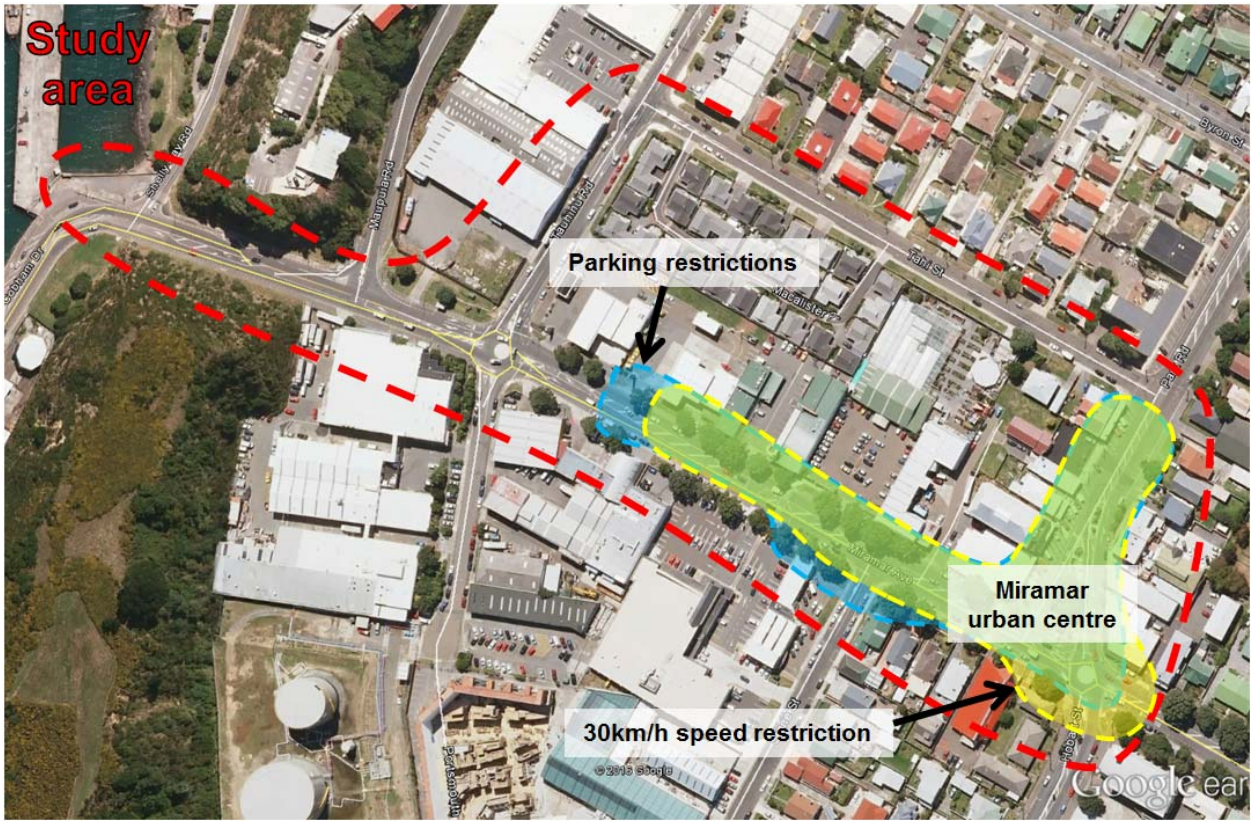


Figure 3.17: Existing Speed and Parking Restrictions

Within the urban centre of Miramar, 30km/h speed restrictions are provided to improve safety for vulnerable road users. The speed restrictions are signed as "*30 Miramar Town Centre*" and road marked on the traffic lanes with a "*30*" within red background markings to provide threshold treatments.

Time restricted parking extends over a similar area to the speed restrictions. Restrictions, which are between 5 minutes and 120 minutes, promote turnover and ensure optimal use. Utilisation was surveyed as a part of this study (refer to Section 8 of this report).

3.4 Parking Provisions

The existing on street parking supply, time restrictions, existing bus stops in the study area are shown in Figure 3.18. There are no street loading facilities identified within the study area.

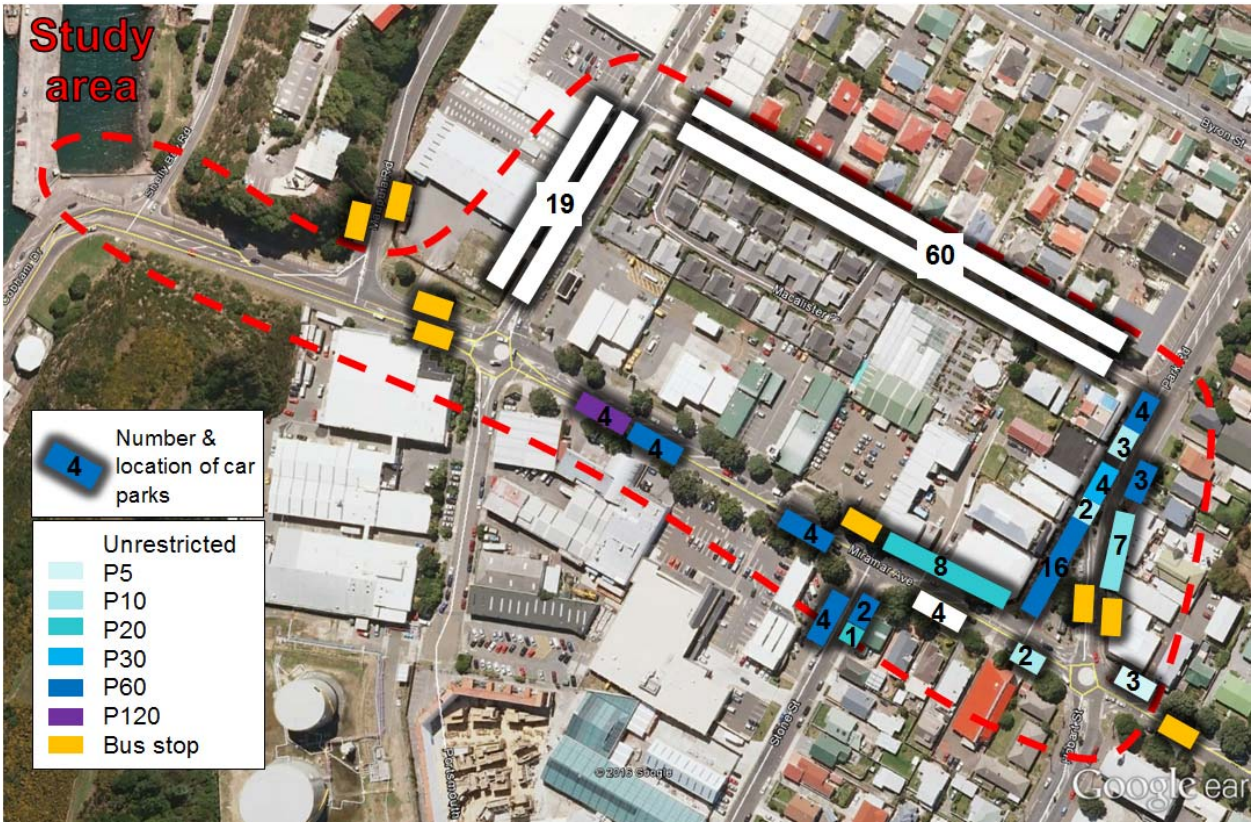


Figure 3.18: Existing Parking Provision, Restrictions and Bus Stops

In total there are around 154 on street car parks in the study area. Adjacent to residential houses they are typically unrestricted. In total around 83 car parks are unrestricted. Almost all the remaining parking restricts parking to less than 60 minutes. None of the parking is metered.

In addition to the on street parking, there are also around 50 car parks in the Palmers car park on the northern side of Miramar Avenue, 30 car parks in the retail area between Palmers and the New World service station, and a further 90 car parks in the New World supermarket car park on the southern side of Miramar Avenue.

The eastbound bus stop on Miramar Avenue adjacent to Stone Street and outside the busiest shopping and amenity area is not obviously ‘paired’ with a westbound stop, with this stop being located on Miramar Avenue around 170m to the west. This issue would potentially be addressed as a part of the changes outlined in Section 6 which are currently proposed by the Greater Wellington Regional Council.

3.5 Facilities for Pedestrians and Cyclists

The existing pedestrian and cycle facilities are shown in Figure 3.19.

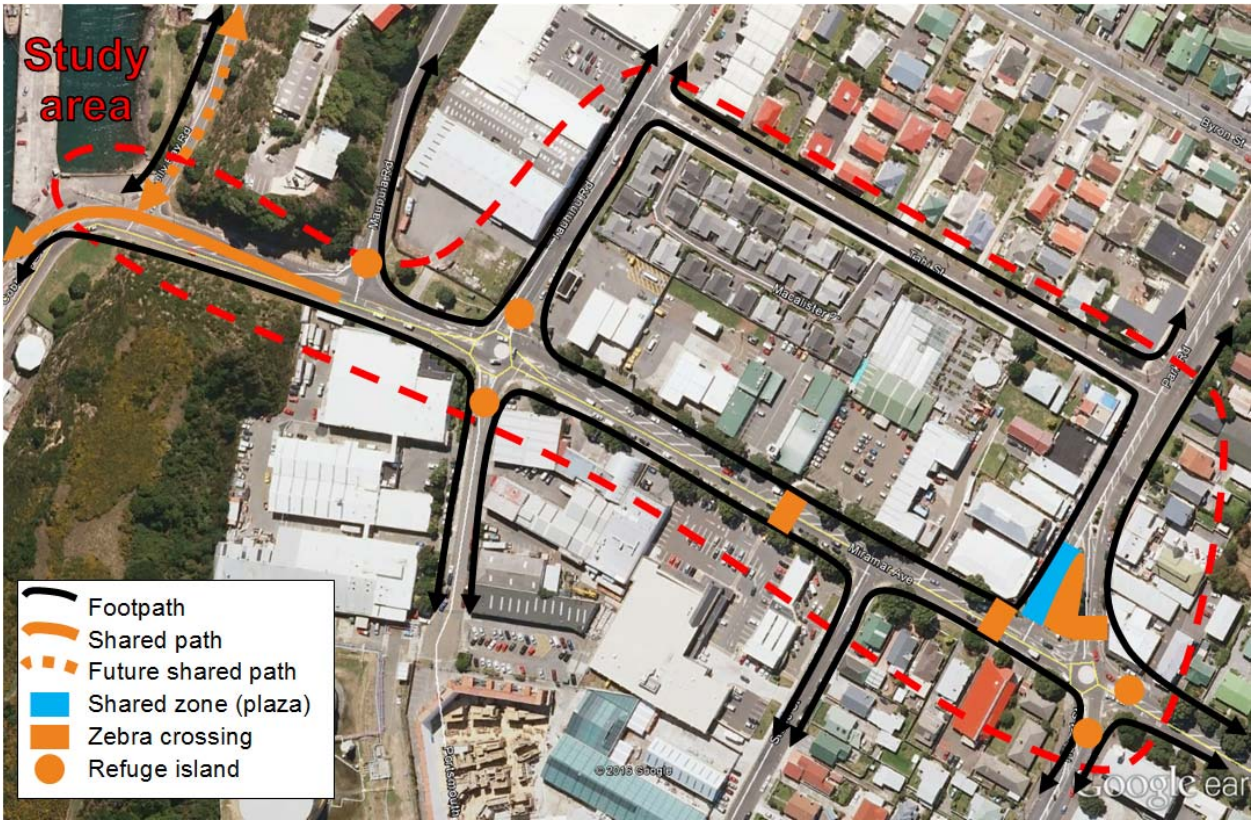


Figure 3.19: Existing Pedestrian and Cyclist Facilities

Along almost all roads within the study area there are footpaths on both sides of the carriageway. The exceptions to this are Shelly Bay Road which only has a footpath on the western side, and Maupuia Road which only has a footpath on the eastern side. They are in general at least 1.5m in sealed width and are in fair condition. However the available width varies due to various sign posts and obstructions. The grade and crossfall of the path also varies due to numerous vehicle crossings and tree roots.

Along Cobham Drive and the western section of Miramar Avenue the footpath has been converted to being a shared use path about 2.5m in width. It ends at the Maupuia Road intersection.

There is double footpath pavement on the northern side of Miramar Avenue (see Figure 3.20), due to the need to provide access to both car parks and retail shops which line the street.

Figure 3.20: Miramar Avenue midblock zebra crossing and kerb build outs between Stone Street and Tauhinu / Portsmouth (facing east)

There are various pedestrian refuge islands for side road crossings and two zebra crossings on Miramar Avenue (see Figure 3.20) and another on Park Road.

The Miramar / Park / Hobart and Miramar / Tauhinu / Portsmouth intersections are both configured as roundabouts. While roundabouts carrying low flows can provide a high level of service for cyclists, the particular roundabouts on Miramar Avenue carry high flows are considered less cycle friendly as they require cyclists to “take the lane” and subject them to significant conflicting turning movements.

Currently there are plans for a 300 lot subdivision adjacent to Shelly Bay Road. As a part of this development, a 3.0m wide shared path would be constructed along Shelly Bay Road (adjacent to two 3.0m wide traffic lanes).

4. People Walking

Pedestrian surveys were undertaken on Thursday 5th May 2016 and Saturday 7th May 2016 which recorded the people walking across Miramar Avenue within the study area. A total of nine crossing locations were surveyed. No particular events were known to be held on these survey days and the traffic patterns are considered to be presentative of typical weekdays and Saturdays.

The AM peak hour occurred 7:45am-8:45am; the interpeak hour occurred 11:45am-12:45pm; the PM peak hour occurred 4:45pm-5:45pm and the weekend peak hour occurred 12:00pm-1:00pm.

The results of the survey are shown in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 on pages 25 to 28 of this report. In the diagram, numbers on the northern side of Miramar Avenue are the number of pedestrians crossing to the northern side of the street and the numbers on southern side of the street are the number of pedestrians crossing to the southern side of the street.

A summary of the findings is below:

1) **AM peak hour**:
   - There were few walking movements (a total of 83 recorded), the main movements being some 40 people between Tauhinu Road and Stone Street heading south towards the southern side of Miramar Avenue between;
   - Of people crossing at and adjacent to the two zebra crossings across Miramar Avenue, 90% crossed midblock adjacent to a zebra crossing, just 10% crossed using a zebra crossing.
2) **Interpeak hour**:
   - There were few walking movements (a total of 105 recorded);
   - Movements were split almost evenly between the number of pedestrians crossing towards the north and those crossing towards the south;
   - Of people crossing at and adjacent to the two zebra crossings across Miramar Avenue, 67% crossed midblock adjacent to a zebra crossing, just 33% crossed using a zebra crossing; and
   - Around 36 people crossed close to the Park Road intersection.
3) **PM peak hour**:
   - Few walking movements (a total of 125 recorded);
   - Movements were split almost evenly between the number of pedestrians crossing towards the north and those crossing towards the south;
   - Of people crossing at and adjacent to the two zebra crossings across Miramar Avenue, 49% crossed midblock adjacent to a zebra crossing, 51% crossed using a zebra crossing; and
   - Around 71 people crossed close to the Park Road intersection.
4) **Weekend peak**:
   - Showed significantly higher walking movements (a total of 390 recorded), about 3.5 times that of the weekday peaks;
   - Of people crossing at and adjacent to the two zebra crossings across Miramar Avenue, 48% crossed midblock adjacent to a zebra crossing, 52% crossed using a zebra crossing;
   - Some 266 people crossed close to the Park Road intersection;
   - Some 70 pedestrians using the zebra crossing west of Stone Street.

The change in discipline in using zebra crossings is interesting, as it varied across the peak periods. Pedestrians crossing within 20m of a dedicated crossing facility can be legally expected to use it[8], so it is likely that most people recorded crossing adjacent to the two zebra crossings (not using them) were entitled to do so.

[8] New Zealand Transport Agency, Road Code, About other road users, Pedestrian crossings. Retrieved online June 2016. https://www.nzta.govt.nz/resources/roadcode/about-other-road-users/information-for-pedestrians/

Figure 4.1: Major movements by people riding bikes and walking in the AM peak hour

Figure 4.2: Major movements by people riding bikes and walking in the interpeak hour

Figure 4.3: Major movements by people riding bikes and walking in the PM peak hour

Figure 4.4: Major movements by people riding bikes and walking in the weekend peak hour

5. People Riding Bikes

5.1 Cyclist Movements

Surveys were undertaken on Thursday 5th May 2016 and Saturday 7th May 2016 recorded the people cycling along Miramar Avenue in both directions within the study area. A total of five intersections were surveyed.

The results of the survey are shown in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 shown previously on pages 25 to 28 of this report.

A summary of the findings is below:

1) **AM peak hour**:
   - Cycling movements almost entirely related to around 20 cyclists travelling west generally towards central city;
   - About half coming from Tauhinu Road (right turn at the roundabout) and half from along Miramar; Avenue from further east of the Miramar / Park / Hobart intersection (through).
2) **Interpeak hour**:
   - Negligible cycling movements were observed;
   - Suggests midday trips are unlikely to made by bike, possibly due to less mobile users (retired, parents of younger children, errands in lunch breaks), a preference to use modes to carry shopping/goods, or involving more local trips that are made on foot instead.
3) **PM peak hour**:
   - Cycle movements almost entirely related to around 20 cyclists travelling east generally away from the central city;
   - About a quarter turned into Tauhinu Road and most of the remaining flow travelled along Miramar Avenue towards the Miramar / Park / Hobart intersection (through);
   - The split between Maupuia Road and Tauhinu Road in the PM peak suggests cyclists prefer to use the Tauhinu Road as opposed to eastern sections of Miramar Avenue in the AM peak.
4) **Weekend peak**:
   - Significantly higher numbers of people on bikes with 60 cyclists travelling across both directions along Miramar Avenue and Cobham Drive, about 3 times that of the weekday peaks;
   - About 55 cycle movements at the Miramar / Shelly Bay intersection, 20 from Cobham Drive, 20 from Miramar Avenue, and 15 from Shelly Bay Road.
   - Suggests Shelly Bay is a leisure destination that is accessed by bike, which supports the future shared path along Shelly Bay Road.
   - About 10 cycle movements both east and west along Miramar Avenue.

5.2 Cyclists LOS Using the Danish Method

The WCC commissioned a study by McPhedran and Nicholls in 2014[9] which compared eight methods of assessing cycle level of service (LOS) and concluded that the 'Danish Method' produced by Jensen (Jan, 2007) was the best. This method was developed in conjunction with a pedestrian model and attempted to objectively quantify pedestrian and bicyclist satisfaction with road sections between intersections. The model's

[9] McPhedran, B. & Nicholls, A. (2014). "MEASURING THE CYCLING LEVELS OF SERVICE IN WELLINGTON – HOW BAD IS IT?". Retrieved online June 2016. http://conf.hardingconsultants.co.nz/workspace/uploads/mcphedran-brett-measuring-c-532508c5236b3.pdf

methodology is closely aligned with the NZTA Cycle network and route planning guide. The Danish cycling LOS calculation also makes some allowance for pedestrian interactions.

One drawback of the Danish Method is that it does not account for intersections or other access conflicts. In addition it was noted that Danish user expectations for a separate bike path are high and may influence the study findings and relative ranking of criteria. This method also excludes heavy vehicle and surface condition influences.

Using the Danish Method, an assessment has been made of the cycling LOS in Miramar Avenue and is shown in Figure 5.1.

Figure 5.1 : Danish LOS for cyclists (diagram produced by WCC)

It can be seen that between Cobham Drive and Hobart Street, the LOS varies between F and D. Incidentally, the areas of worst LOS compares well with the cycle crash distribution by location presented in Figure 9.6.

6. People Using Buses

6.1 Bus Routes

The current bus routes that use Miramar Avenue are shown in Figure 6.1. Details of bus routes in Wellington are provided in Appendix B.

Figure 6.1: Existing bus stops and routes in the study area

These services include route 2, 31, 18, 43, 44, and 24. The buses for the eastern suburbs currently follow two separate routes westwards to State Highway 1 in Kilbirnie. One route extends along Caledonia Street (2, 18) and other along Miramar Avenue (24, 31, 43, 44).

6.2 Proposed Changes

From 2018, the bus routes throughout Wellington City will change significantly. Details of the proposed bus routes are provided in Appendix C.

For the eastern suburbs, with the exception of Airport and Maupuia buses, all buses will pass through the section of Miramar Avenue between Park Road and Tauhinu Road. Refer to Figure 6.2 for the proposed new Wellington bus network.

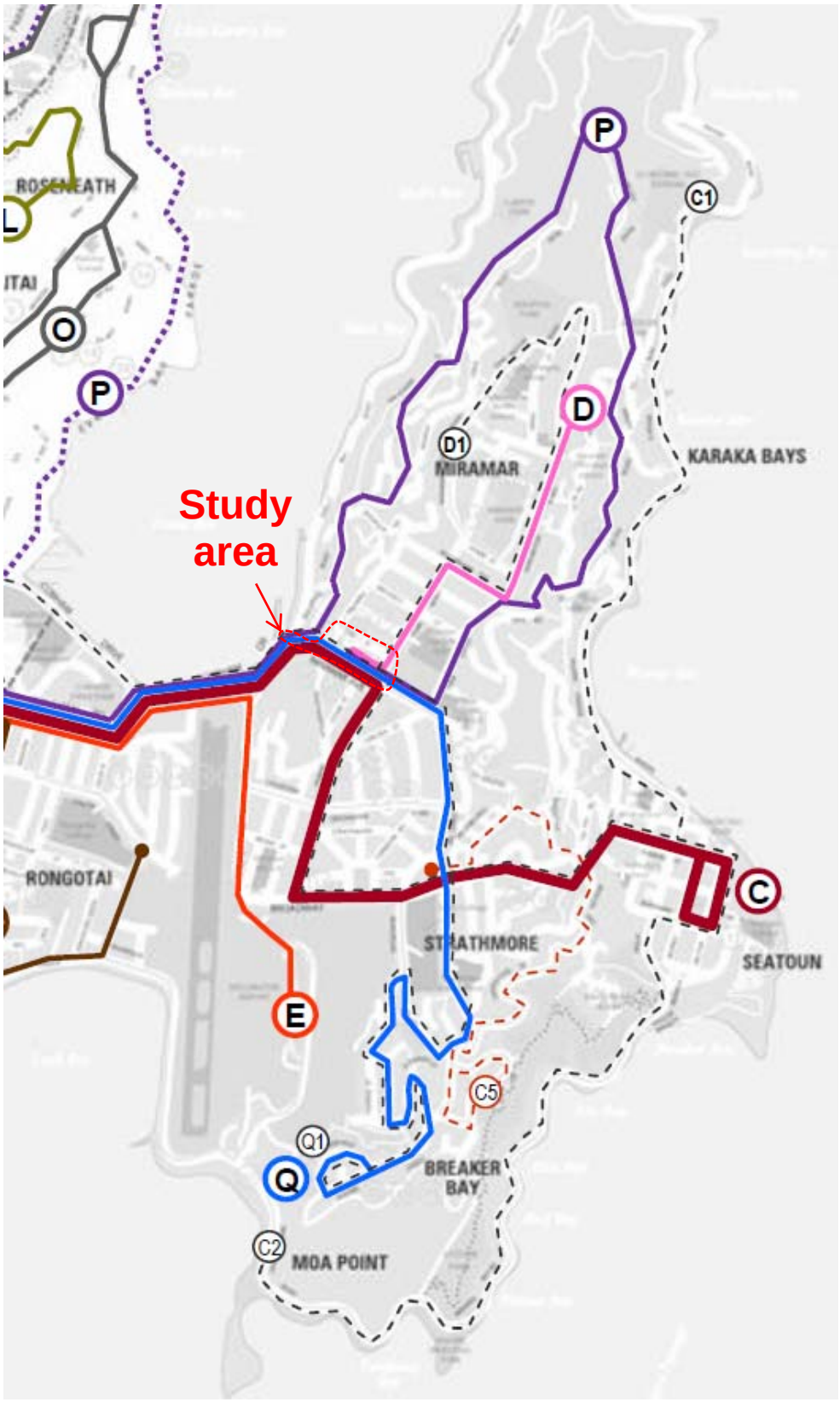


Figure 6.2: Proposed new Wellington bus network

Under the proposed changes to the bus services[10]:

- Existing routes 2 and 11 become a new high frequency (up to 10 minutes) east-west spine core route C "Karori - Wellington - Hataitai - Kilbirnie - Miramar - Seatoun", which will travel along Miramar Avenue, Hobart Street, Broadway Drive with higher capacity buses to meet demand and reduce congestion in the city.
- A new peak time targeted commuter route C1 "Scorching Bay – Seatoun – Miramar – Wellington Station (Express)".
- A new peak time targeted commuter route C2 "Moa Point – Breaker Bay Rd – Miramar – Wellington Station (Express)".
- Routes 2 and 18 become D "Miramar terminus - Miramar"
- Route 18 would also be replaced with a free connection at Courtney Place to Victoria University
- Route 31 becomes D1 "Miramar North – Miramar – Wellington Station (Express)"
- Routes 43, 44 becomes Q link route "Strathmore Park – Miramar – Kilbirnie"
- Route 25 becomes Q1 "Strathmore Park – Miramar – Kilbirnie – Hataitai – Wellington Station"
- A new route P "Miramar Heights" route as a seven day bus service that includes the north of the Miramar Peninsula and would continue through to Johnsonville to reduce bus duplication on the 'Golden Mile' in the Central City

To support this change to the bus services, double length bus stops (30m in length) will be created in this section of Miramar Avenue close to the Park Road intersection. These stops will act as a 'mini bus hub' allowing people to transfer between the bus services. The proposed location and design of these bus stops is shown in Appendix C.

In addition to the provision of double length bus stops on Miramar Avenue, the roundabout at the Tauhinu Road intersection would need to be modified to allow for the tracking of the proposed buses. The proposed roundabout layout is also shown in Appendix C, where the central island diameter would increase by 2m to 9m and the approach lanes would be set back to increase the circulating width.

[10] Grater Wellington, New Wellington City Bus Network, Miramar. Retrieved online June 2016. http://www.gw.govt.nz/miramar-2/ & http://www.gw.govt.nz/assets/Transport/Public-transport/Wellington-City-bus-review/Maps/new-wellington-bus-network-map.pdf

7. People Using Vehicles

7.1 Existing Turning Counts at the Intersections

There is significant retail development and two service stations in the section of Miramar Avenue between Tauhinu Road and Park Road. With the majority of retail parking being off street, this results in high turning flows into and out of property along this section of road. There is also retail development along the section of Park Road between Miramar Road and Tahi Street. Here the majority of retail parking is on street.

7.1.1 Surveys

Surveys were undertaken on Thursday 5th May 2016 and Saturday 7th May 2016 to record vehicle movements and queue lengths at intersections in the study area. These surveys were undertaken both manually and using video cameras. No particular events were known to be held on in or near Miramar on these survey days.

The AM peak hour occurred 7:45am-8:45am; the interpeak hour occurred 11:45am-12:45pm; the PM peak hour occurred 4:45pm-5:45pm and the weekend peak hour occurred 12:00pm-1:00pm.

The weather on Thursday 5th May included some heavy rain at times and localised flooding occurred which cleared in the evening. The weather on Saturday 7Th May was fine and sunny. Due to the flooding affecting one camera, the PM peak period counts and queue lengths at the Miramar / Tauhinu / Portsmouth intersection were surveyed on 12th May 2016 (the weather was fine but with gale force winds).

To verify that the 5th May survey data was a representative weekday with regard to travel patterns, count data both eastbound and westbound on Miramar Avenue (immediately west of the Miramar / Park / Hobart roundabout) was averaged over five weekdays within 12-19th August 2015 (for when data was available) and compared to the 5th May data. The data sets compared well across the AM peak, interpeak (IP), PM peak and weekend (WE) peak periods with the datasets within +/-10%, which is considered to be within typical day to day variation.

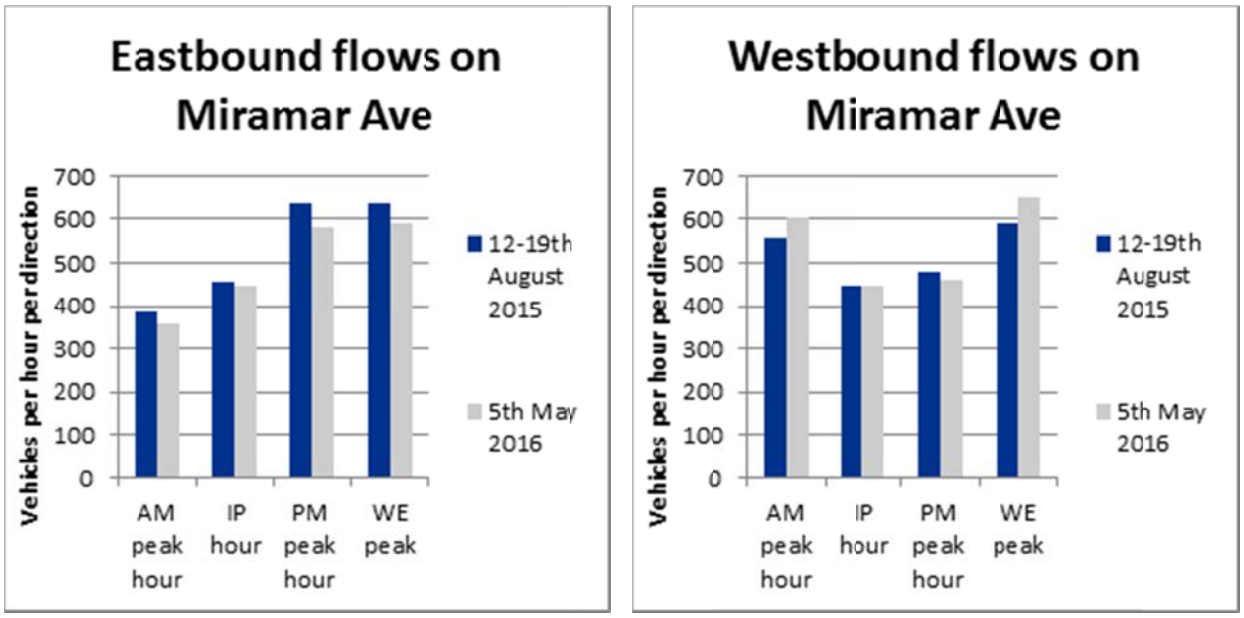


Figure 7.1: Comparison of flow data (immediately west of the Miramar / Park / Hobart roundabout); found to be within +/-10%

7.1.2 Flow Diagrams

The traffic counts at the intersections are shown in Figure 7.2, Figure 7.3, Figure 7.4 and Figure 7.5 as flow diagrams where the arrows are scaled to represent the relative flow volumes. Note that no through traffic counts

were taken at Miramar / Stone and Miramar / Maupuia intersections but these movements have been inferred for the intersection modelling.

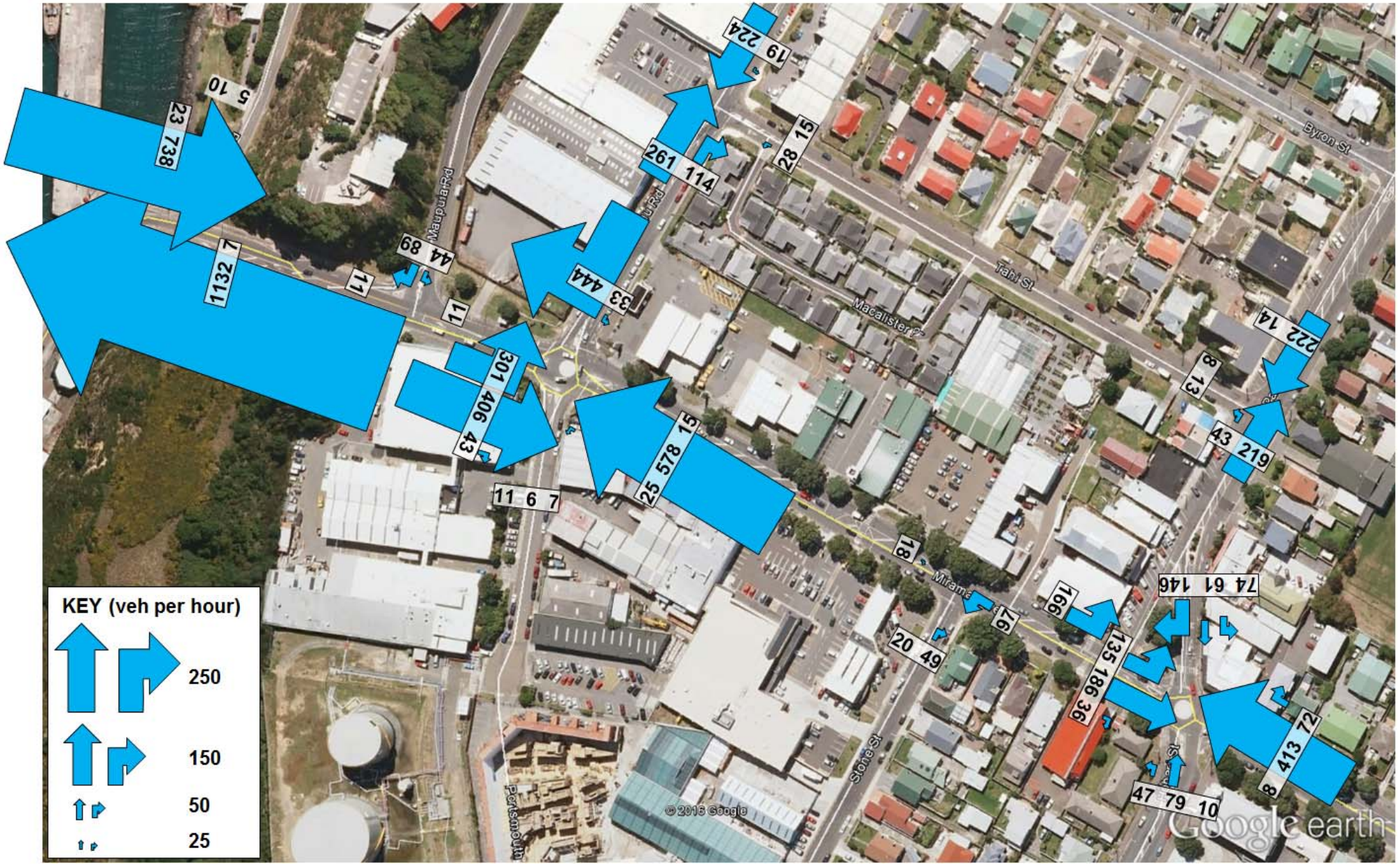


Figure 7.2: Vehicle movements in the AM peak hour

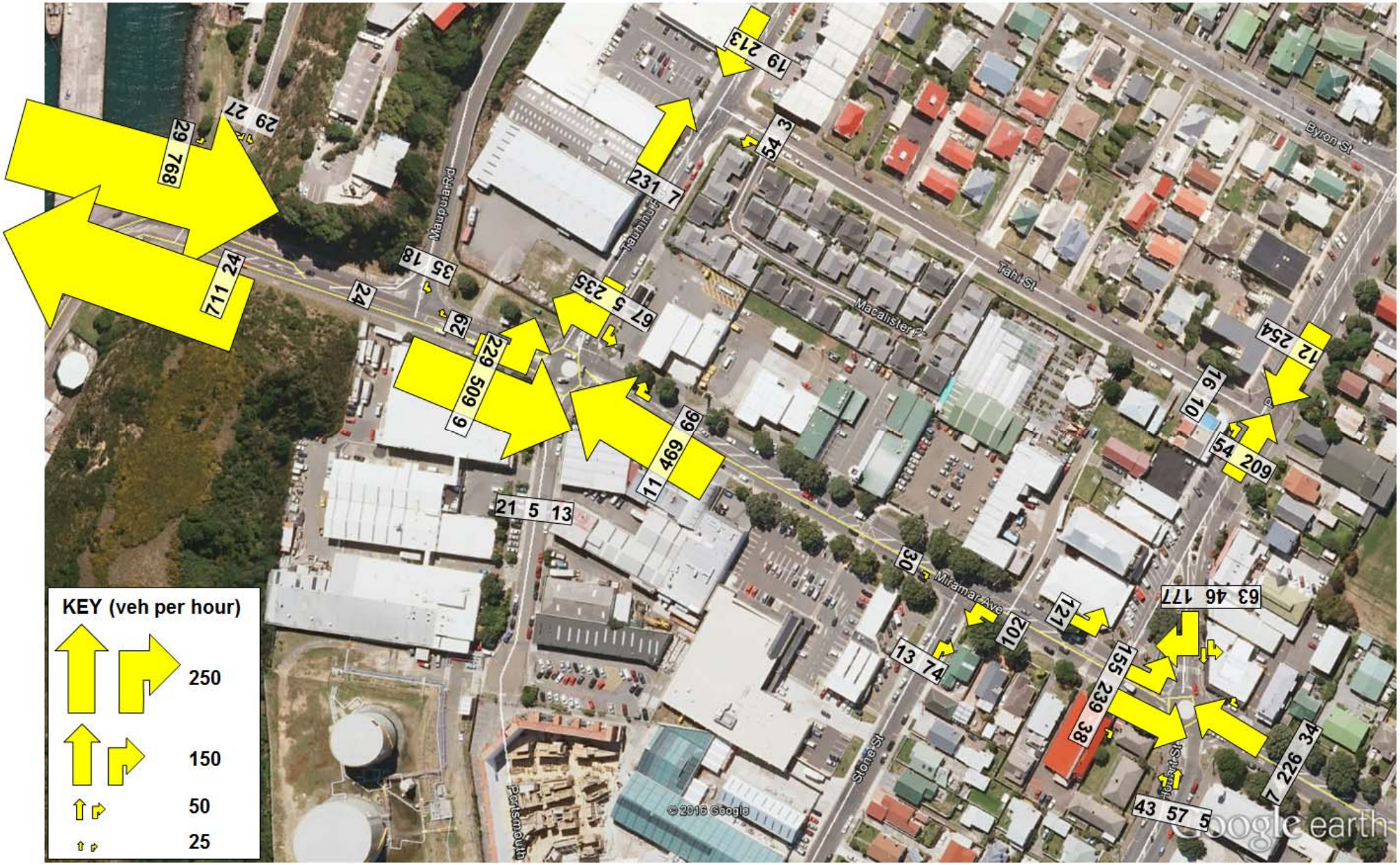


Figure 7.3: Vehicle movements in the interpeak hour

Figure 7.4: Vehicle movements in the PM peak hour

Figure 7.5: Vehicle movements in the weekend peak hour

Generally, the volume of turning traffic at the two roundabouts is high, with 40% to 44% turning traffic as a proportion of the total traffic (at Miramar / Tauhinu / Portsmouth and Miramar / Park / Hobart respectively). Flows tend to be highest towards the western side of the study area and dissipate towards the east. Heavy vehicles make up 2.8% of total traffic within the study area and people on bikes make up 1%.

A summary of the findings in the individual periods surveyed is provided below:

1) **AM peak hour**:
   - The western end of Miramar Avenue carries eastbound flows of around 1100vph and westbound flows of around 740vph;
   - At this time the westbound flows are at their highest for the week;
   - At the Miramar / Tauhinu / Portsmouth roundabout, there is a high right turn flow of 440vph for the Tauhinu approach, presumably from people rat running to gain priority at the intersection over Miramar Avenue Traffic.
2) **Interpeak hour**:
   - The western end of Miramar Avenue carries eastbound flows of around 710vph and westbound flows of around 770vph;
   - At this time flows are moderate in both directions.
3) **PM peak hour**:
   - The western end of Miramar Avenue carries eastbound flows of around 730vph and westbound flows of around 1100vph;
   - At this time eastbound flows are at their highest for the week.
4) **Weekend peak**:
   - The western end of Miramar Avenue carries eastbound flows of around 1000vph and westbound flows of around 960vph;
   - At this time throughput at intersections are at their highest levels for the week.

7.2 Future Increases in Transport Demand due to Land Development

It is expected that there will be an increase in Transport Demand along Miramar Avenue in the future due to land development occurring in the eastern suburbs. The Wellington Urban Growth Plan provides an indication of growth that can be expected[11]. Within the City, the plan expects the population to grow by around 50,000 over the next 30 years. Some of this growth will occur in the Miramar Peninsula. Miramar is noted as being a key centre for growth.

In the short term, the Wellington Council have advised that a 300 lot subdivision in Shelly Bay is likely to be developed. This development is expected to include a 3m shared path and two 3m traffic lanes along Shelly Bay Road. Traffic flows along Shelly Bay Road could increase by around 2500vpd, which could trigger the need to upgrade the Miramar / Shelly Bay intersection.

7.3 Vehicle Queuing at Intersections

Queue length data was collected at the intersections below:

- Miramar Avenue / Maupuia Road (on Thursday 5th May and Saturday 7th May);
- Miramar Avenue / Stone Street (on Thursday 5th May and Saturday 7th May);
- Miramar Avenue / Park Road / Hobart Street roundabout (on Thursday 5th May and Saturday 7th May);

[11] Wellington Urban Growth Plan 2014-2043, WCC

- Miramar Avenue / Portsmouth Road / Tauhinu Road roundabout (on Thursday 12th May for the PM peak; other peaks derived from PM peak calibration).

Miramar Avenue / Shelly Bay road intersection was omitted as the flow there are known to be relative low and so queuing would be minimal, thereby having minimal impact on the Miramar Avenue operation.

The queue lengths were sampled every three minutes and the 95th percentile queue length for the peak hours was calculated. This allows a direct comparison to the SIDRA intersection modelling outputs which also include 95th percentile queue length. For the roundabout where there are multiple lanes on some approaches, the longest queue length for each approach was taken. To convert between vehicles and length, 7m per vehicle queued was assumed.

The results are shown below.

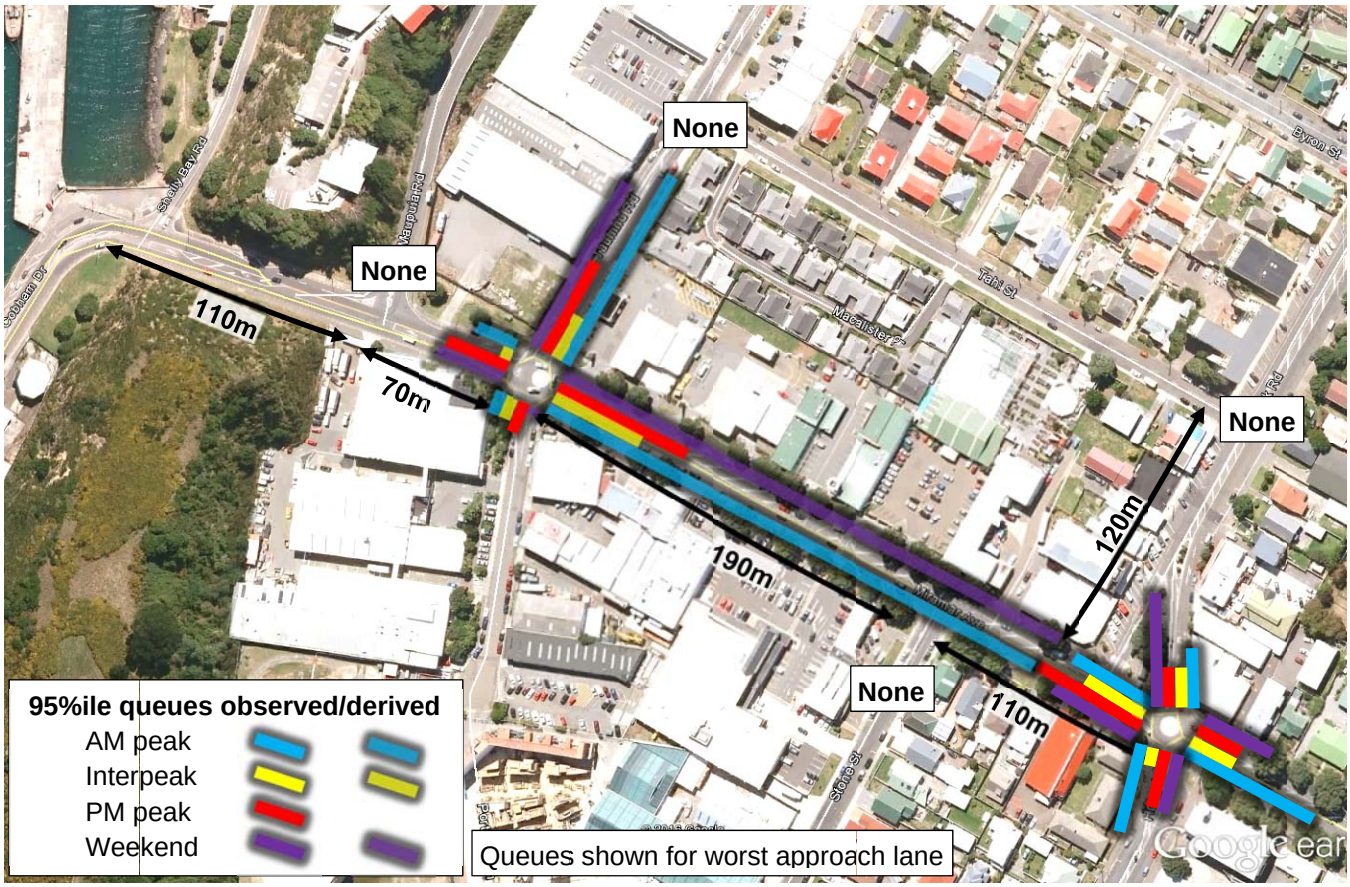


Figure 7.6: 95th percentile intersection queue lengths for AM, interpeak, PM and weekend peak hours (observed and derived)

It can be seen that there was significant queuing in the AM peak and on Saturday at the Miramar / Tauhinu / Portsmouth intersection with queues extending along most of the length of the block between Tauhinu Road and Park Road.

7.4 Results from the SIDRA Intersection Modelling of Existing Flows

The observed count data from the surveys on Thrusday 5th May, Saturday 7th May and Thursday 12 May 2016 was input into intersection models for the following five key intersections along Miramar Avenue in the study area:

- Miramar / Shelly Bay
- Miramar / Maupuia

- Miramar / Tauhinu / Portsmouth
- Miramar / Stone
- Miramar / Park / Hobart

The models were calibrated by using default parameters then modifying the exiting flow effect, critical gap acceptance and follow up headway parameters to reflect the observed 95th percentile queue lengths (see Figure 7.6; note some queue length data was derived for the Miramar / Tauhinu / Portsmouth intersection). These values were retained across all peak hours, as they would largely reflect the physical elements (such as geometry and sight distance) and be less influenced by traffic flows. The 95th percentile queue lengths in all cases were within 10m of observed (less than 2 vehicles).

Table 7-1: Summary of SIDRA model calibration (within 10m of observed 95th percentile queues)

Intersection	Approach	Exit Flow Effect (%)	Critical gap (s)	Follow up headway (s)	Comment
Default single lane unsignalised roundabout		0%	4	2	Typically 20m island diameter in 60km/h speed environment, and slightly wider entry and exit lanes
Miramar Avenue / Tauhinu Road / Portsmouth Road	Tauhinu Rd	20 *Small island diameter (difficult to see indicating)*	5.5	3.5	Fairly typical
	Miramar Ave (East)		4.5	2.75	Fairly typical
	Portsmouth Rd		8	5	Minor narrow road, heavy opposing flow
	Miramar Ave (West)		3	1.75	Lower with low opposing flows from approach immediately to right
Miramar Avenue / Park Road / Hobart Street	Park Road	50 *Busy context, skewed alignment, small island diameter (difficult to see indicating), 30km/h speed limit*	4.5	3	Fairly typical
	Miramar Ave (East)		5	3	Fairly typical
	Hobart Rd		8	5	Minor narrow road, heavy opposing flow
	Miramar Ave (West)		6.5	4.5	Higher to reflect slower entry speeds and opposing flows
Default single lane priority give way intersection		0	4.5	2.5	Typically 60km/h speed environment, similar lane configuration
Miramar Avenue / Shelly Bay Road	All	0	4.5	2.5	95%ile queues not more than 10m, no need to modify default parameters
Miramar Avenue / Maupuia Road	All	0	4.5	2.5	
Miramar Avenue / Stone Street	All	0	4.5	2.5	

The layouts modelled are shown in Figure 7.7.

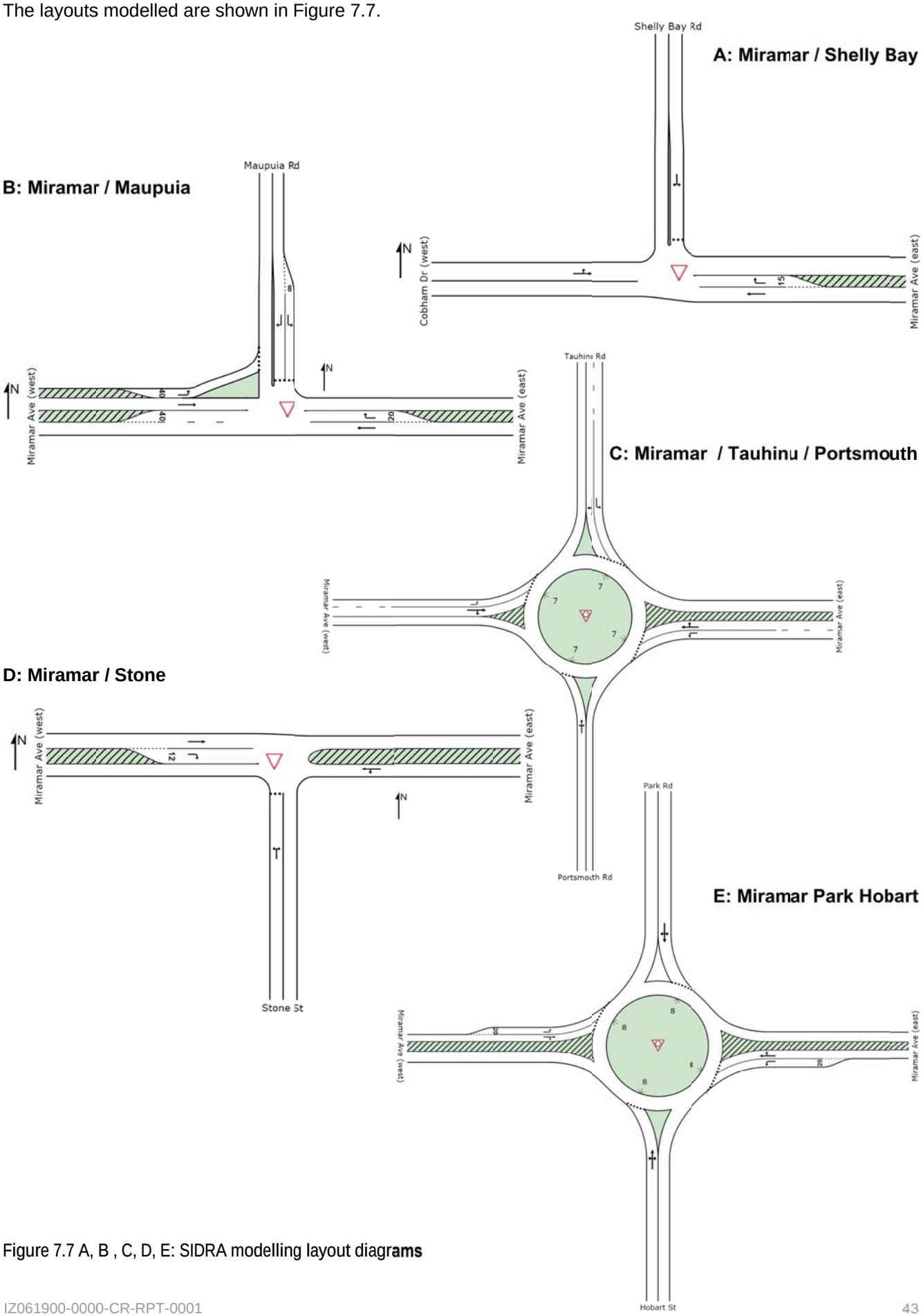


Figure 7.7 A, B , C, D, E: SIDRA modelling layout diagrams

The results of the SIDRA modelling are summarised in Table 7-2. The SIDRA Movement and Level of Service output summaries are in Appendix D.

Table 7-2: Summary of SIDRA

Miramar Avenue intersection	Approach	Movement	Delay (s) and Level of service (colour)			
			AM	IP	PM	WE
Shelly Bay	Miramar (east)	Through	0	0	0	0
		Right	9	9	16	14
	Shelly Bay	Left	8	9	13	13
		Right	16	11	16	20
	Cobham (west)	Left	6	6	6	6
		Through	0	0	0	0
Maupuia	Miramar (east)	Through	0	0	0	0
		Right	9	9	17	13
	Maupuia	Left	10	10	19	14
		Right	27	15	28	36
	Miramar (west)	Left	6	6	6	6
		Through	0	0	0	0
Tauhinu / Portsmouth	Portsmouth	Left	38	22	24	34
		Through	37	22	24	33
		Right	40	24	26	36
	Miramar (east)	Left	9	7	8	8
		Through	59	11	12	48
		Right	62	13	15	51
	Tauhinu	Left	10	12	14	14
		Through	28	14	26	52
		Right	31	18	29	49
	Miramar (west)	Left	6	6	6	6
		Through	5	5	5	5
		Right	8	8	8	8
Stone	Stone	Left	5	4	4	6
		Right	7	7	8	11
	Miramar (east)	Left	6	6	6	6
		Through	0	0	0	0
	Miramar (west)	Through	0	0	0	0
		Right	9	7	7	9
Park / Hobart	Hobart	Left	30	12	13	24
		Through	29	11	12	23
		Right	32	14	15	26
	Miramar (east)	Left	8	8	8	9
		Through	12	9	10	15
		Right	15	12	13	18
	Park	Left	8	8	10	11
		Through	8	8	10	11
		Right	10	11	13	14
	Miramar (west)	Left	12	9	9	13
		Through	15	12	21	28

Miramar Avenue intersection	Approach	Movement	Delay (s) and Level of service (colour)			
		Right	18	15	24	23

Within the table the colour coding represents the level of service provided by that movement were the colour represents the following flow conditions:

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
Free	Reasonably free	Stable	Approaching unstable	Unstable	Breakdown

LOS E is taken to represent the threshold of acceptable performance, as it represents unstable flow.

The model outputs (queue length, delay and Level of Service (LOS)) were then examined to determine the performance of intersections. The results showed:

- Miramar / Maupuia performed **worst the in weekend peak**, with LOS E for the Maupuia approach (right turns), however due to low flows queue lengths were minimal;
- Miramar / Tauhinu / Portsmouth **performed worst in the morning peak**, with LOS E for the Miramar (east) approach (right turns blocking back);
- Miramar / Stone **performed well** in all peak periods, due to low flows delays and queue lengths were minimal;
- Miramar / Park / Hobart **performed acceptably** the in AM and weekend peak, with worst LOS C for BOTH the Hobart approach in the AM and weekend peaks and Miramar (west) approach in the PM and weekend peaks.

7.5 Turning movements associated with driveways

A large volume of turning movements at driveways was observed along Miramar Avenue particularly at the New World supermarket. The turning movements into and out of vehicle accesses typically used the flush median. This provides a versatile space for safe queuing whilst waiting for a gap in traffic to undertake turning, with minimal effect on through movements. On some occasions in the weekend turning movements were observed blocking through traffic however this did not seem to result in significant delays. An example of the issues is the queues to turn into the New World car park which have been observed to block through traffic.

The flush median is also used by pedestrians as a refuge area when crossing midblock and so the large number of turning movements could reduce safety for pedestrians crossing the road.

7.6 Speed

Vehicle speed data for the study area has been obtained from WCC traffic counts undertaken from 12-19th August 2015. Additional data can be found in Appendix E. The speed data is summarised in Figure 7.8.

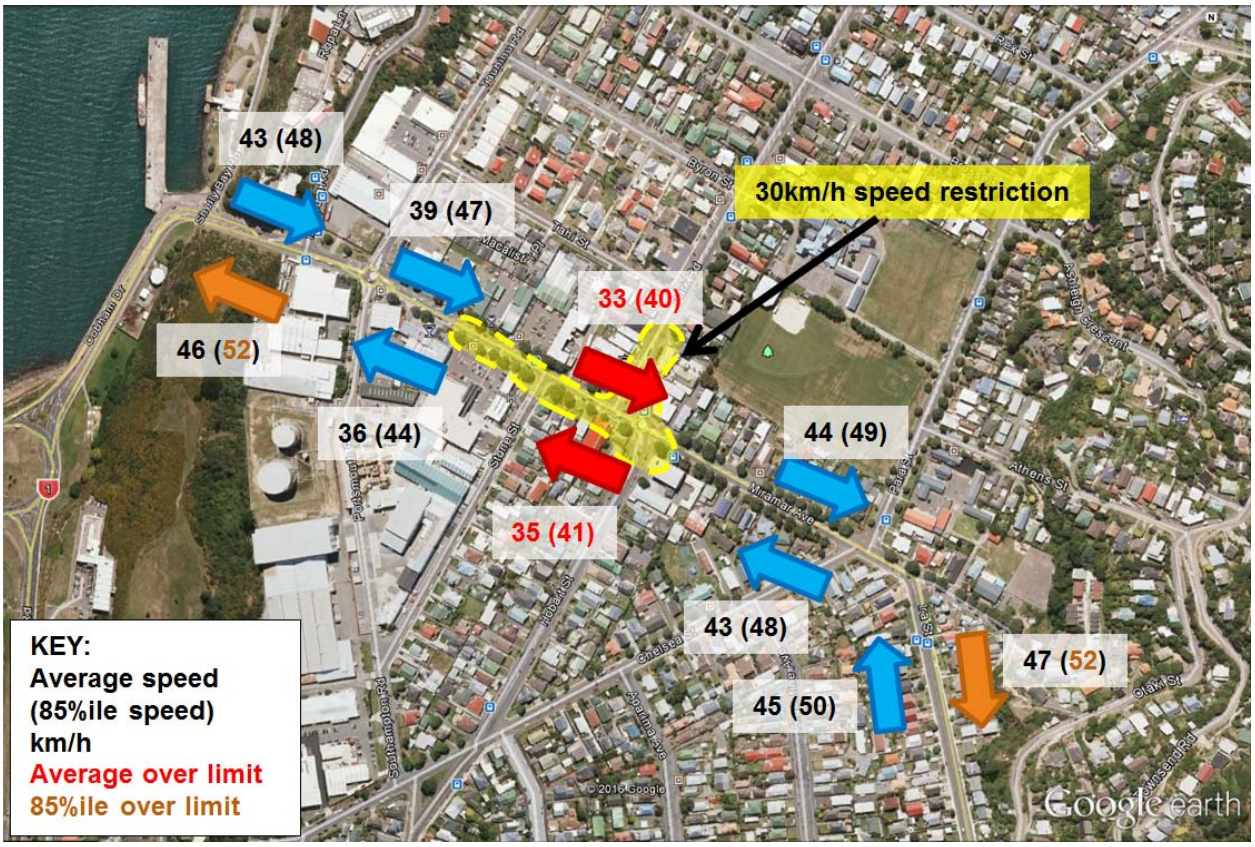


Figure 7.8 : Recorded average and 85th percentile vehicle speeds for eastbound and westbound traffic

The data shows significant speeding occurred in Miramar Avenue within the 30km/h zone, with average speeds of 35km/h and 85th percentile speeds of 41km/h recorded in the westbound direction and slightly lower speeds of 33km/h and 40km/h respectively in the eastbound direction.

Outside the 30km/h speed zone, the general 50km/h urban speed limit is observed, with only 85th percentile speeds of 52km/h recorded westbound onto Cobham Drive and southbound on Ira Street.

7.7 Rat running along Tahi Street in the AM peak period

It was suggested that there may be an issue of AM peak traffic 'rat running' (i.e. undesirably using local streets as through routes) to bypass queues and re-enter Miramar Avenue with priority over the major westbound movement at the Miramar / Tauhinu / Portsmouth roundabout.

The survey data tends to support this suggestion, as in the AM peak the right turn flow from the Tauhinu approach is unusually high compared with the westbound flow on Miramar Avenue. This issue is related to the roundabout control at the intersection. For an unsignalised roundabout it is not possible to control priority.

8. On Street Parking

Parking utilisation and turnover surveys were undertaken on Thursday 5th May 2016 and Saturday 7th May 2016 within the study area. Although some heavy rain and localised flooding occurred on 5th May, it was assumed that there were no significant changes to parking demand, on the basis that vehicle flows compared well to other data collected.

The AM, interpeak, PM and weekend peak hour parking utilisation is shown in Figure 8.1, Figure 8.2, Figure 8.3 and Figure 8.4.

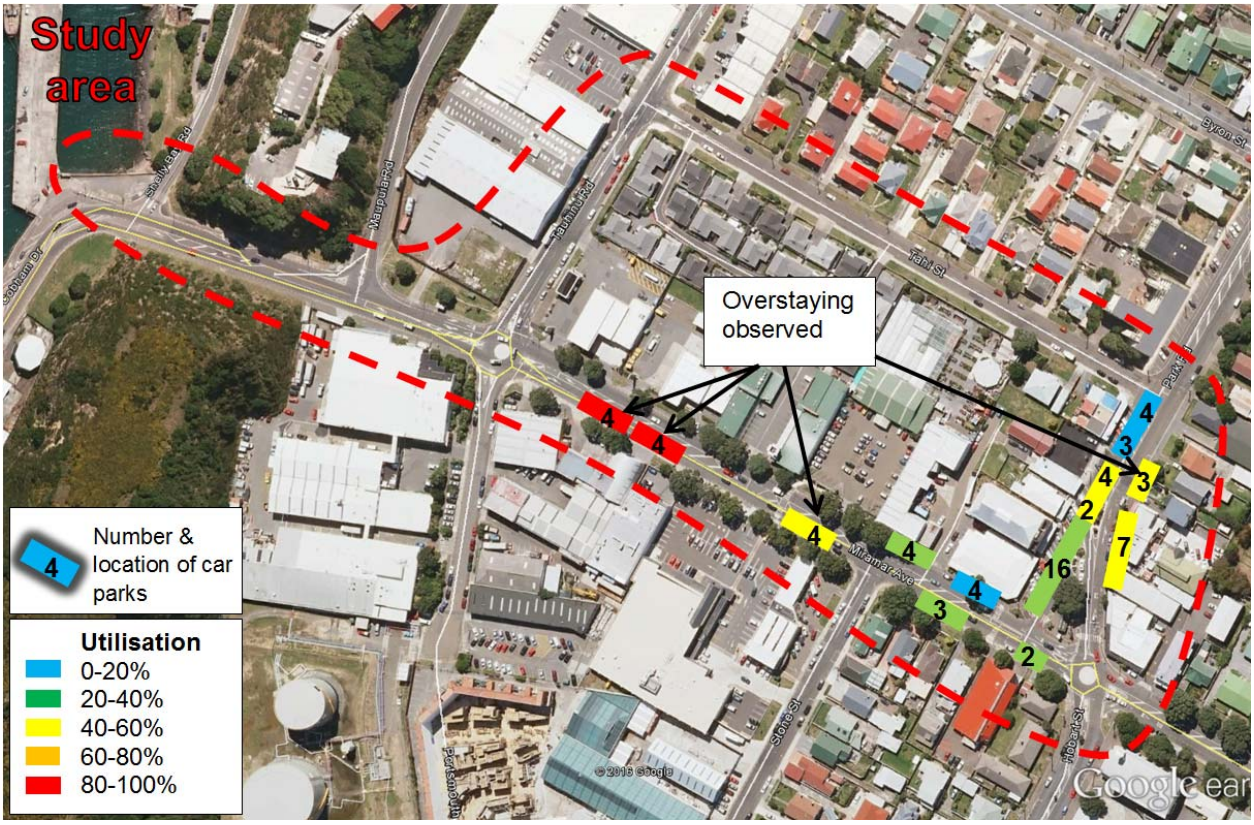


Figure 8.1: AM Peak Hour Parking Utilisation

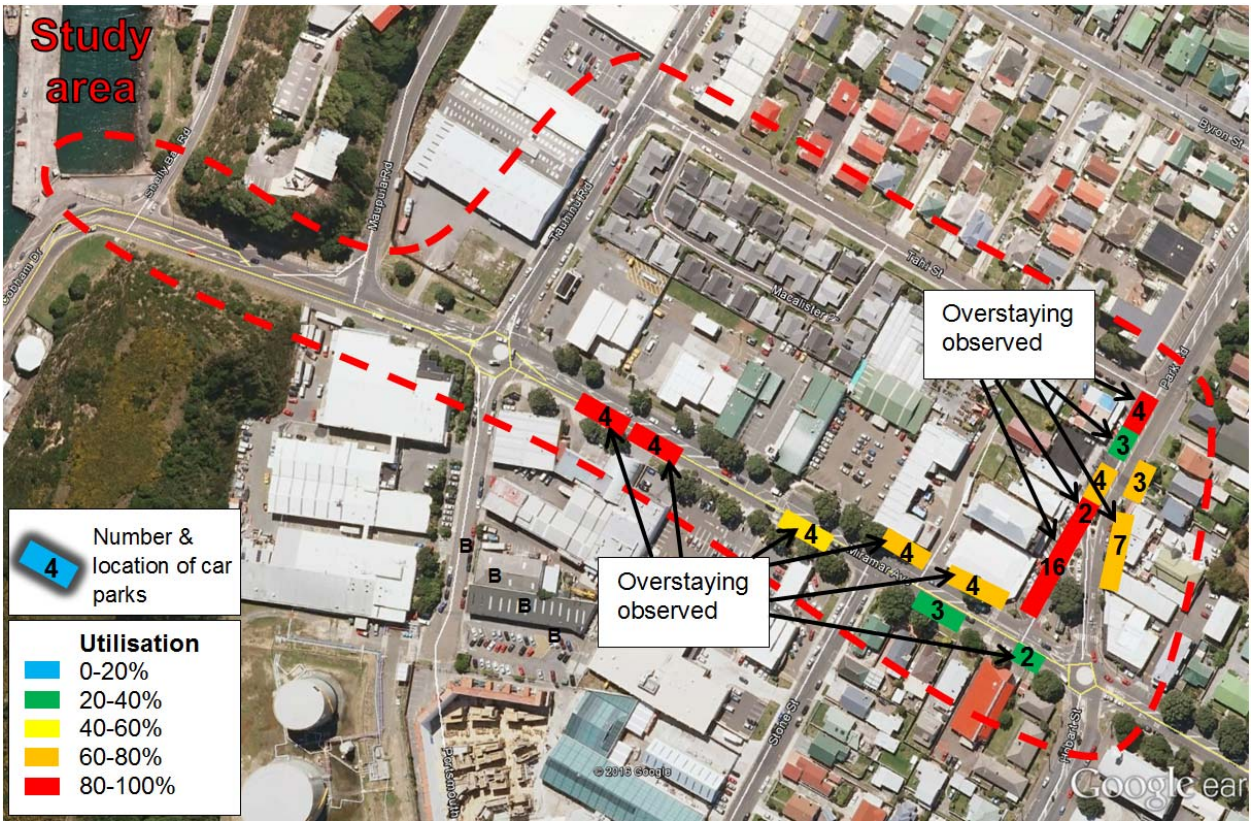


Figure 8.2: Interpeak Hour Parking Utilisation

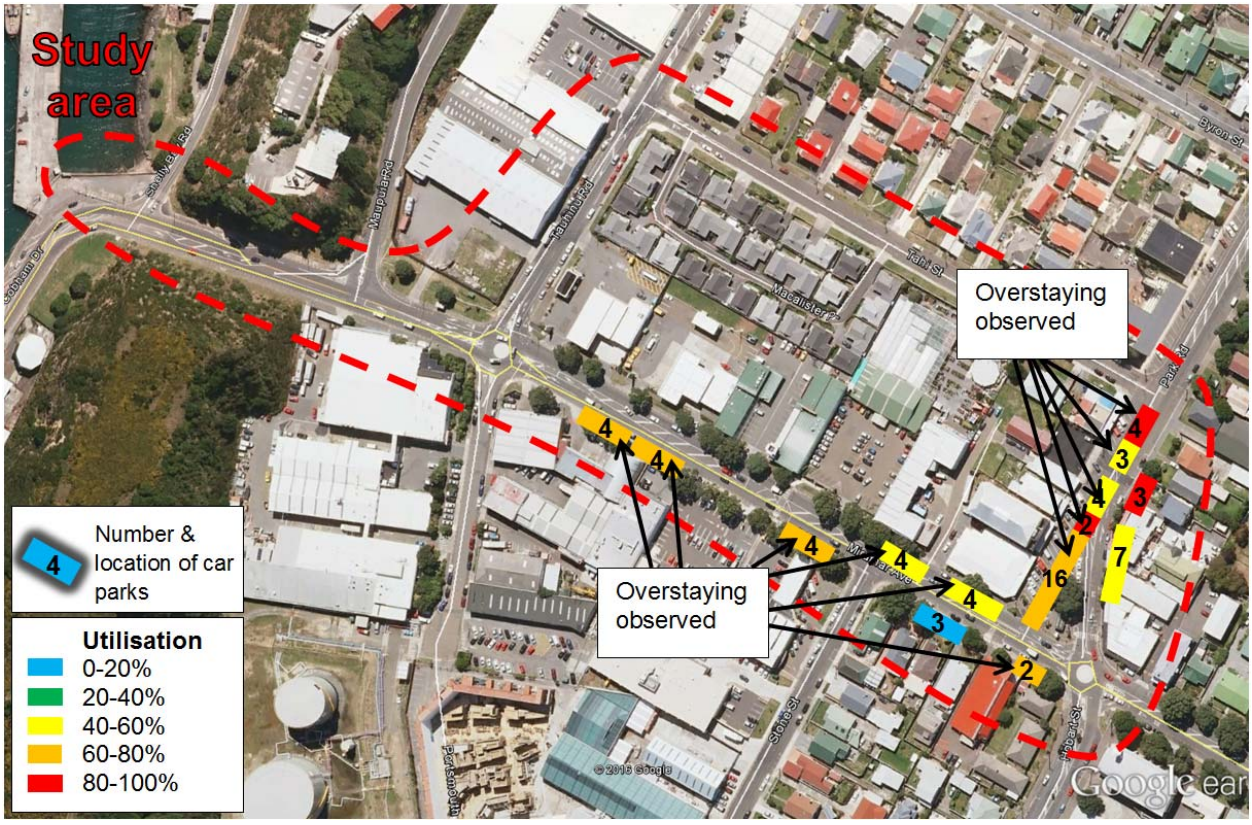


Figure 8.3: PM Peak Hour Parking Utilisation

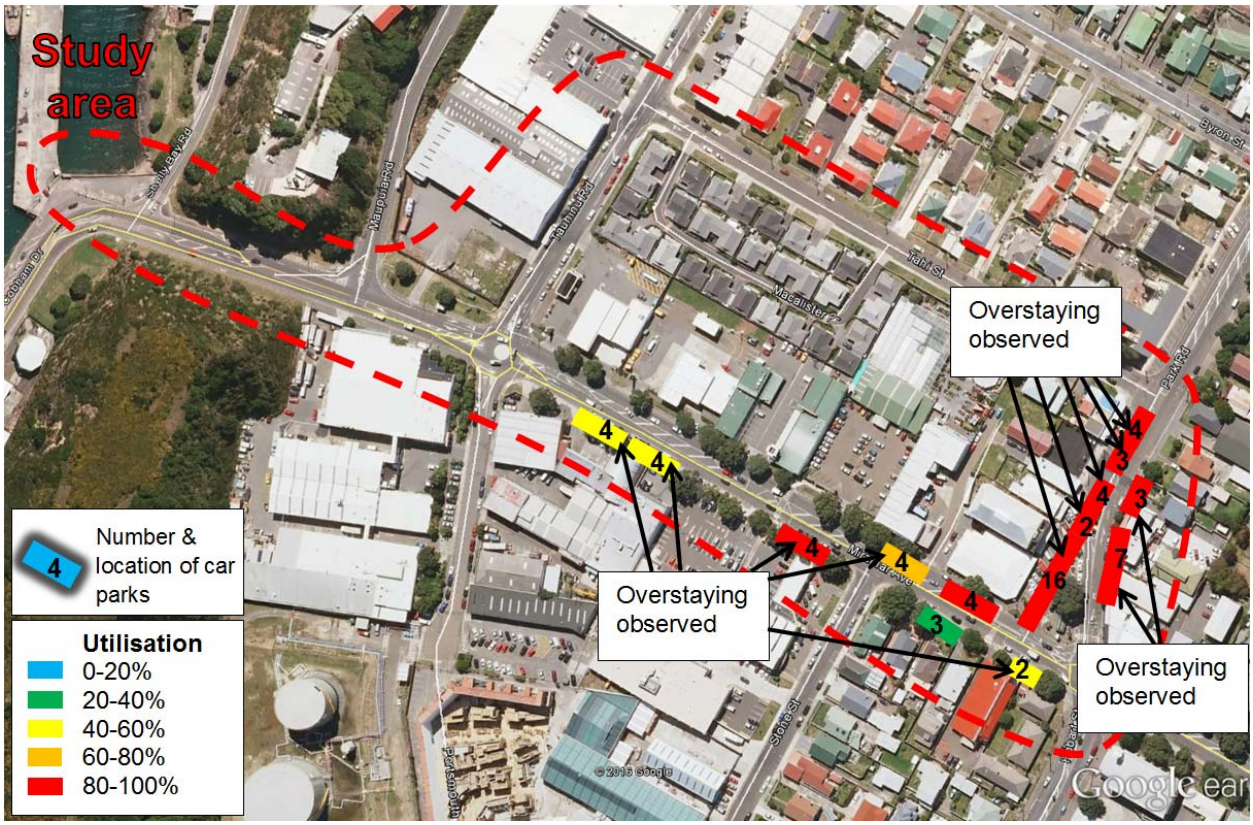


Figure 8.4: Saturday Inter-Peak Hour Parking Utilisation

The key observations were:

1) **AM peak hour**:
   - Relatively low utilisation in AM peak;
   - Significant overstaying on Miramar Ave (e.g. some cars for entire day).
2) **Interpeak peak hour and PM peak hour**:
   - Extra (illegal) parking in two 10-min parking spaces on western side of Park Road;
   - Overstaying on Miramar Avenue; low turnover;
   - Minimal pedestrian activity.
3) **Weekend peak hour**:
   - High utilisation throughout the study area with high turnover and some overstaying;
   - Extra (illegal) parking in 10-min and 30 minute parking spaces on western side of Park Road;
   - Higher turnover along Miramar Avenue, with few vehicles overstaying;
   - Some overstaying in the parking located close to the cinema on the eastern side of Park Road;
   - Heavy pedestrian traffic around the cinema / bus stop area.

9. Road Safety

The police reported crashes within the study area were extracted from the NZ Transport Agency's Crash Analysis System (CAS) database for the five year period 2011-2015. There were 40 crashes; none were fatal. The tabulated crash history summary can be found in Appendix F.

As shown in Figure 9.1, the crashes are evenly distributed over the study area in both location and conflict, and are split equally between midblock and intersection locations.

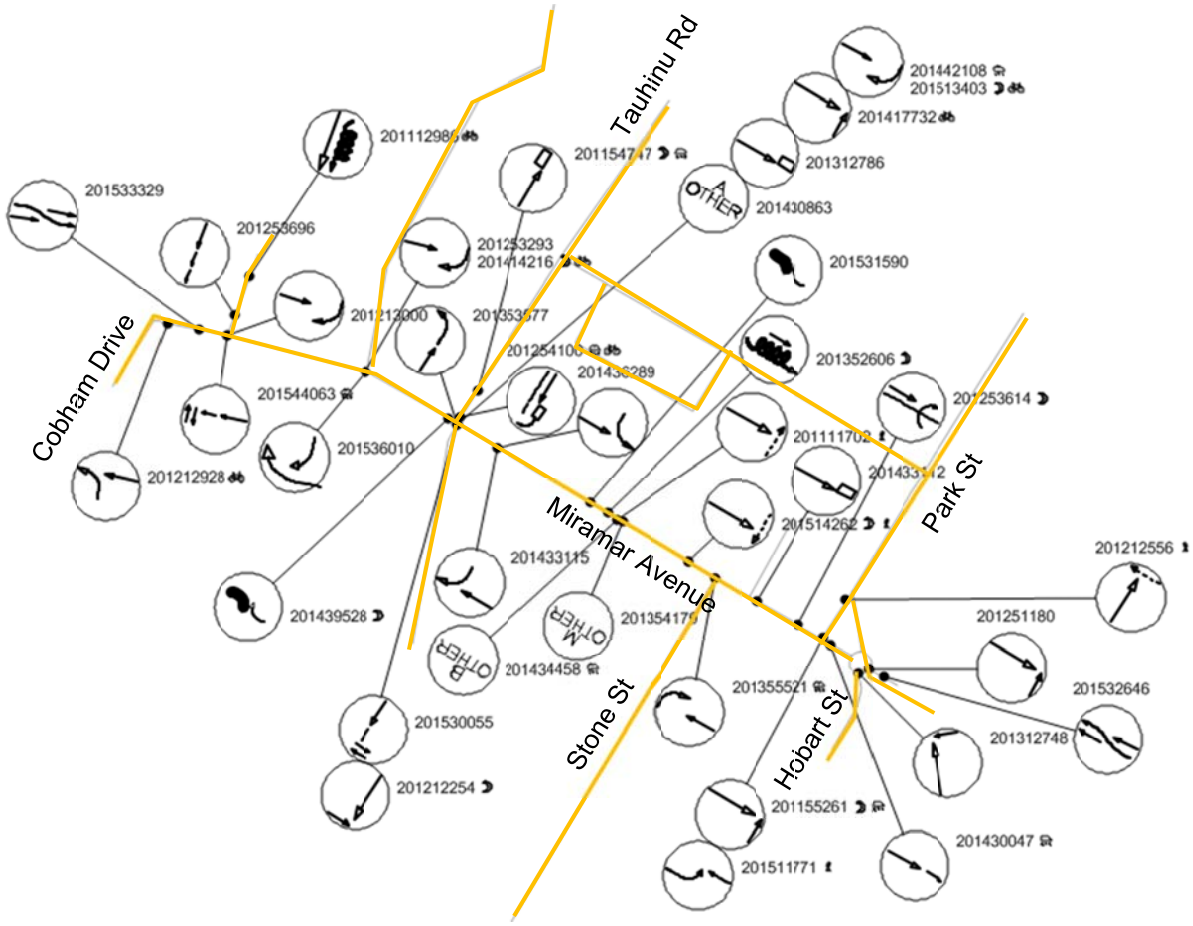


Figure 9.1: Collison diagram of crash history 2011-2015

Given the urban context with relatively closely spaced intersections and high turning flows, it is not surprising that most crashes involve crossing, turning and merging, failure to give way and rear ending. Cyclists are over represented in the crash history (1% of traffic but 15% of crashes).

Of these 40 crashes:

- 19 crashes (48%) involved a failure to give way or stop;
- 6 crashes (15%) involved people on bikes, of which 4 were attributed to a driver failing to give way;
- 4 crashes (10%) involved people walking, all of which were attributed to a driver failing to give way;
- 80% of crashes were in dry conditions;
- 75% of crashes were in daylight;

- 50% of crashes occurred midblock and 50% occurred at intersections (even split).

The crash history is summarised in Figure 9.2 by severity, in Figure 9.3 by modes involved and in Figure 9.4 by driver and vehicle factors.

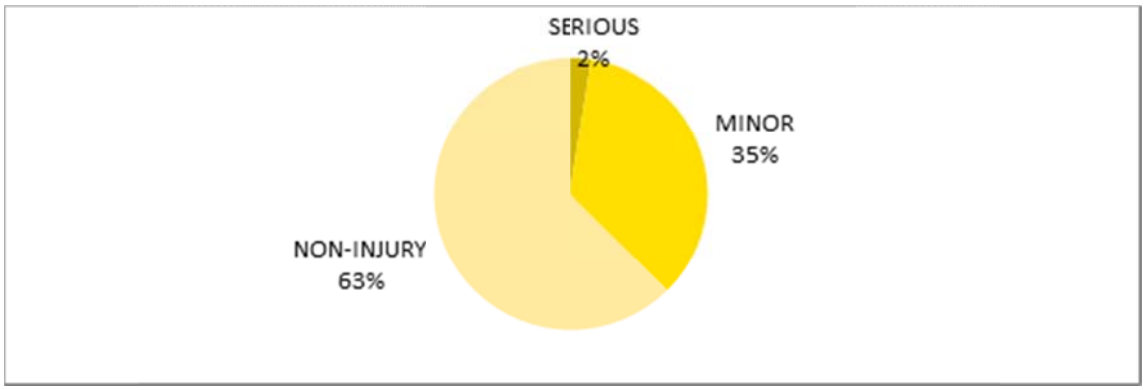


Figure 9.2: 2010-15 crash history by severity

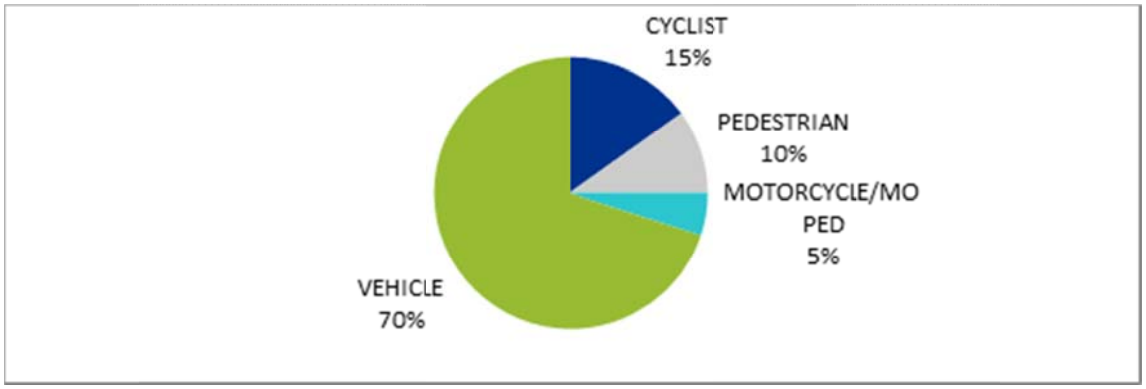


Figure 9.3: 2010-15 crash history by modes involved

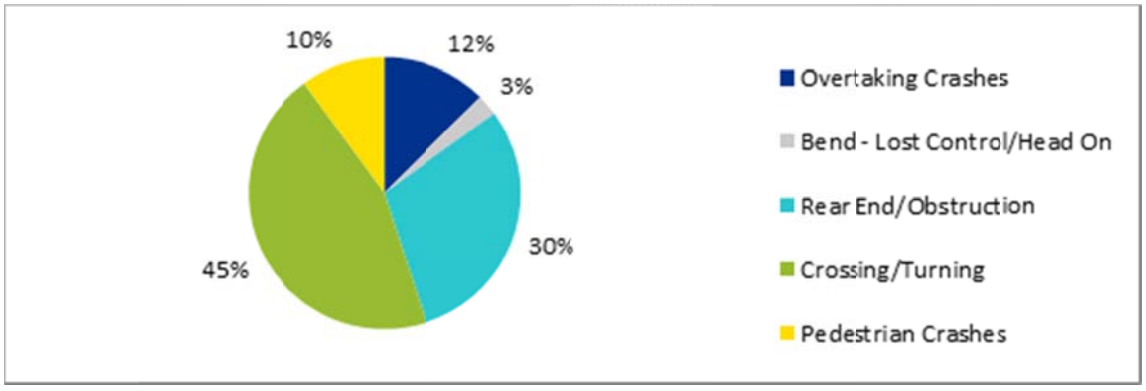


Figure 9.4: 2010-15 crash history by driver and vehicles factors

The crash distribution by location and severity is shown in Figure 9.5.

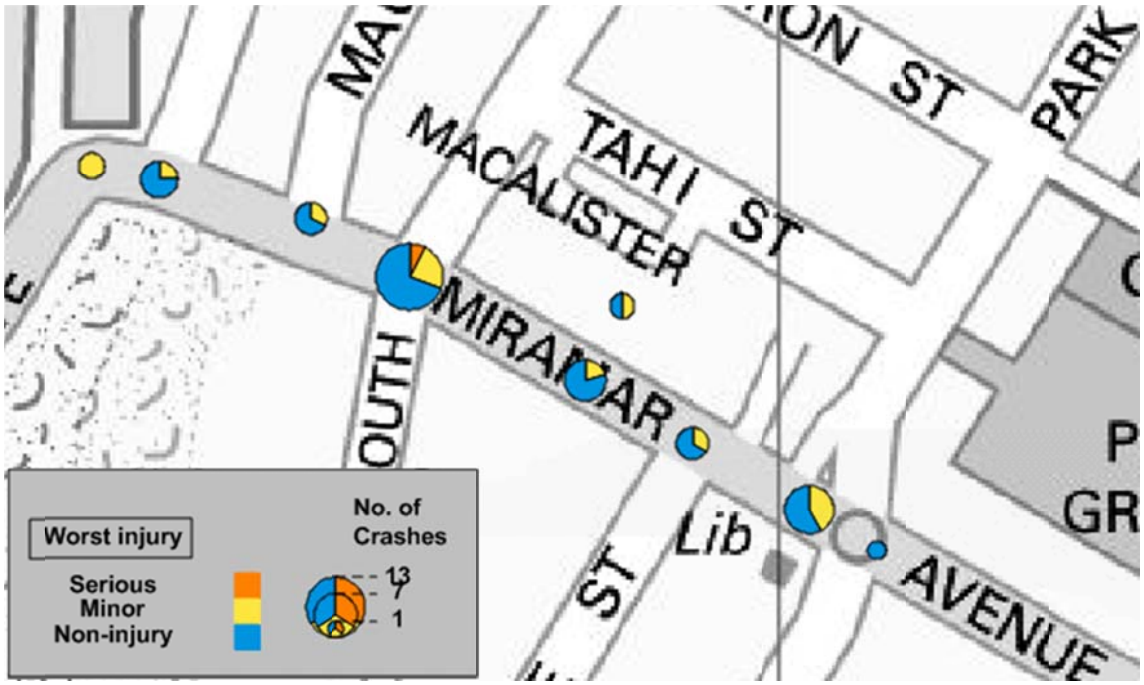


Figure 9.5: Crash distribution by location and severity

Of all locations, the highest grouping of injury crashes is at the Miramar / Tauhinu / Portsmouth roundabout. This is not surprising given the significant flows which pass through the roundabout. The next highest groupings occur at the Miramar / Park / Hobart roundabout and midblock on Miramar Avenue between Stone Street and Tauhinu Road / Portsmouth Street.

The distribution of crashes involving people on bikes is shown in Figure 9.6.

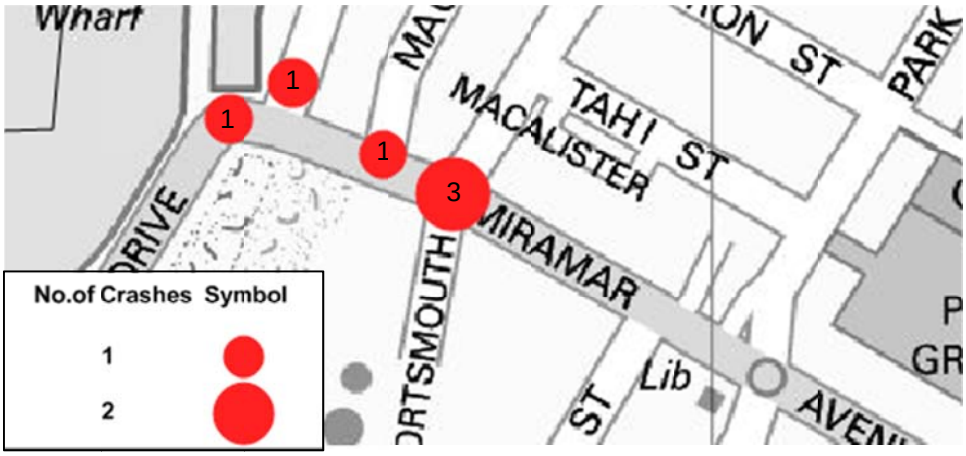


Figure 9.6: Crash distribution involving people on bikes by location

All the crashes are grouped towards the western end of the study area. This may be due to traffic speeds being higher in this location however it could also have been due to cycle traffic also being higher in these locations.

10. Subterranean Infrastructure

10.1 Drainage

Consultation was undertaken with Wellington Water to determine if there were any flooding issues within the study area. Wellington Water noted that a study is currently being undertaken by Jacobs of flooding in this area which will be completed around August 2016.

Reference was made to a previous study undertaken in 2004 by SKM for Capacity which developed flood hazard mapping of the Miramar area for a 50 year flood event, as shown in Figure 10.1.

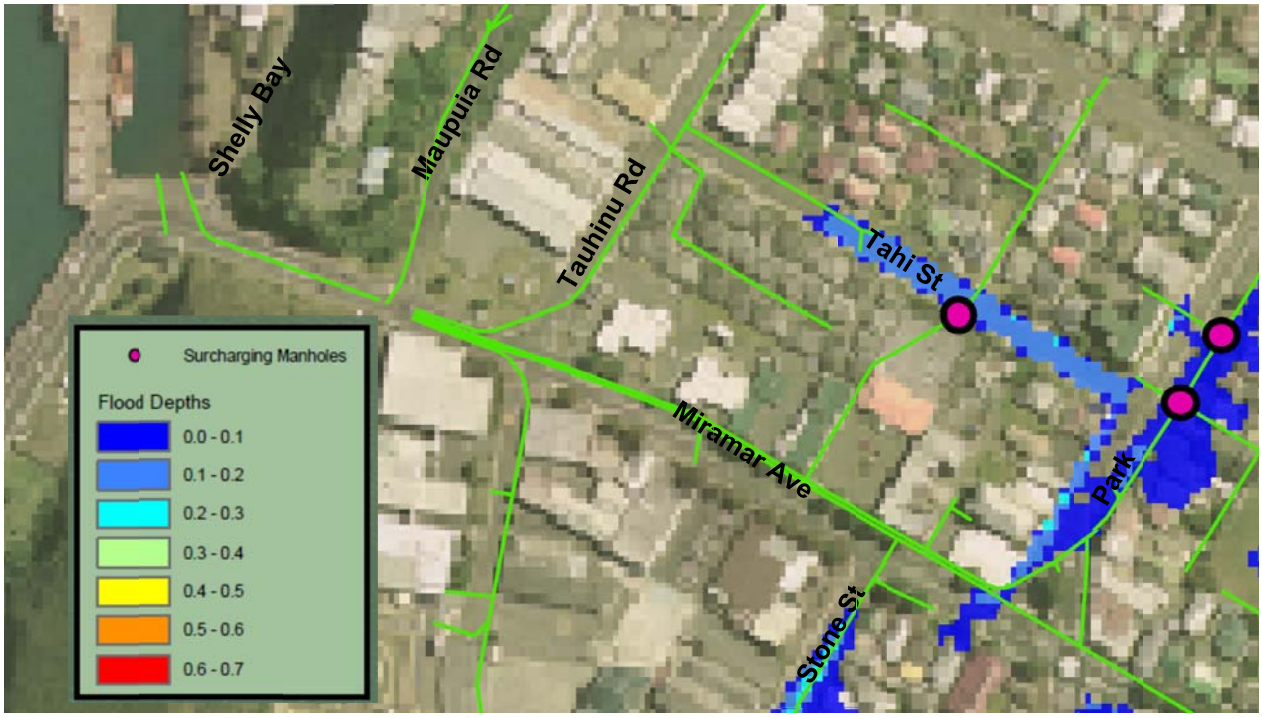


Figure 10.1: Miramar Flood Hazard Mapping (Diagram Produced by SKM in 2004)

The map identifies some areas where flooding can occur in a 50 year flood event, these include sections of Park Road, Stone Street and Tahi Street. Miramar Avenue itself is not known to flood, except around the Park Road intersection.

10.2 Wastewater

10.3 Other services

11. Conclusions

In common with most urban centres, the demand for space within the road corridor of Miramar Avenue is high due to the need to provide for access, parking and movement while also providing a streetscape that meets urban design objectives (for example creating a greater sense of place) and attracts people to Miramar. For this reason any improvements will need to balance a number of competing objectives.

The study has shown transport demands are highest in the weekend when there is more intense activity within Miramar.

There is little in the way of cycle infrastructure at present. West of the Miramar / Maupuia intersection, there is existing shared path along the northern side of the street which connects with a shared path extending along the seaward side of Cobham Drive.

Cycle flows are currently low for much of the week. The highest flows occur towards the western end of Miramar Avenue. Two groups of cyclists are evident by the patterns of flow. They are commuter cyclists on midweek days and recreational cyclists in the weekend. The highest cycle flows occur in the weekend, with up to 50 peak hour movements recorded at the Cobham / Miramar Shelly Bay intersection.

Crash data from the CAS data base shows over the 2011-15 five year period all the recorded cyclist crashes in the study area occurred on Miramar Avenue between the Tauhinu / Portsmouth intersection and Cobham Drive. This grouping may be a reflection of the higher cycle flows in this area. People on bikes are over represented in the crash history (1% of traffic but 15% of crashes).

The Miramar / Maupuia and Miramar / Tauhinu / Portsmouth intersections are currently operating at capacity at times during the week and weekend. Capacity issues occasionally result in a westbound queue extending eastward from the Miramar / Portsmouth / Tauhinu intersection almost as far as the Miramar / Hobart / Park intersection.

The Miramar / Park / Hobart and Miramar / Tauhinu / Portsmouth intersections are both configured as roundabouts. While roundabouts carrying low flows can provide a high level of service for cyclists, the particular roundabouts on Miramar Avenue carry high flows are considered less cycle friendly as they require cyclists to “take the lane” and subject them to significant conflicting turning movements.

There are large numbers of turning movements into and out of driveway accesses along Miramar Avenue during the weekend. The existing flush median is important for providing storage for these turning movements to occur. The flush median is also used by a large number of pedestrians who crossing the street. Most cross using the flush median as opposed to crossing at crossing points or pedestrian crossings.

Car parks are generally well utilised, particularly during the weekend. It is noted that there is an issue of compliance with some cars parking all day within short term parks.

Minor flooding issues are known to occur towards the eastern end of the study area, on Tahi Street, Park Road and Stone Street in a 50 year flood event.

In the future, transport demands are expected to increase with increased residential development within the peninsula. In the short term, a 300 lot subdivision is planned in Shelly Bay. This future development may result in the eventual need to upgrade the Miramar / Shelly Bay, Miramar / Maupuia and Miramar / Tauhinu / Portsmouth intersections.

The Greater Wellington Regional Council intends to provide improved bus services in Wellington from 2018. Within Miramar, this will mean a greater frequency of services using Miramar Avenue. The new Miramar Avenue ‘mini hub’ stops will be used to transfer between buses and so double bus stops will be required, located to the immediate south of the Miramar / Hobart / Park intersection. Changes will also be required at the Miramar/ Tauhinu / Portsmouth Intersection roundabout to accommodate larger buses.

All these competing issues will require consideration in developing options for upgrading Miramar Avenue to better provide for people on bikes and pedestrians.

Appendix A. Aerial Photographs of Site[12]

[12] Aerial imagery was retrieved from Google Earth Pro, Google 2016. Imagery of the site is dated 3/2/2009. Reproduced on basis of full attribution.

A.1 Aerial 1

Left to right: Cobham Drive to Miramar Avenue, Shelly Bay / Miramar Avenue Intersection, Miramar Avenue , Maupuia Road / Miramar Avenue intersection

A.2 Aerial 2

Left to right: Maupuia Road / Miramar Avenue intersection, Miramar Avenue, Portsmouth / Tauhinu / Miramar Avenue roundabout, Miramar Avenue

A.3 Aerial 3

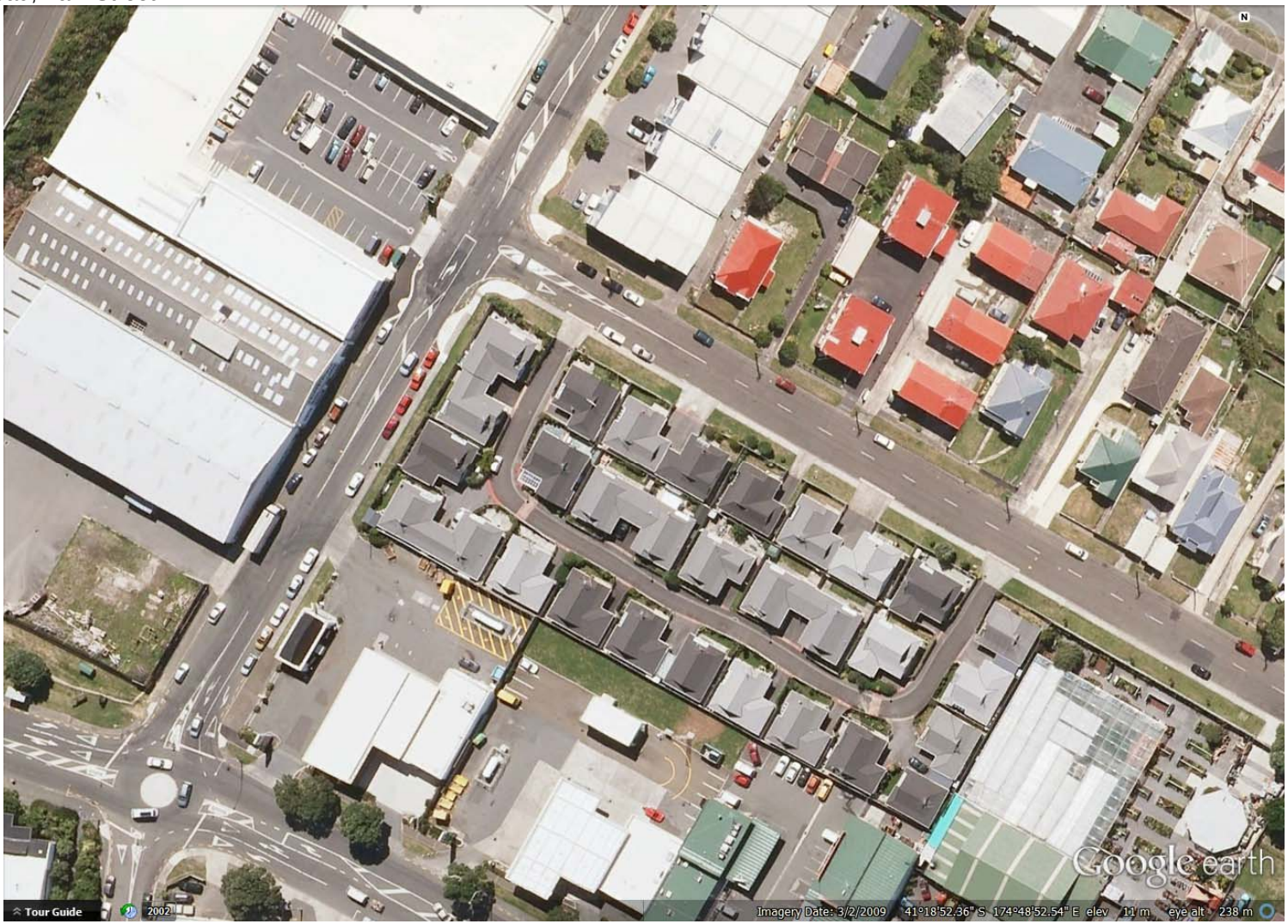
Left to right: Miramar Avenue, Miramar Avenue / Stone Street intersection, Park / Hobart / Miramar Avenue roundabout, Miramar Avenue

A.4 Aerial 4

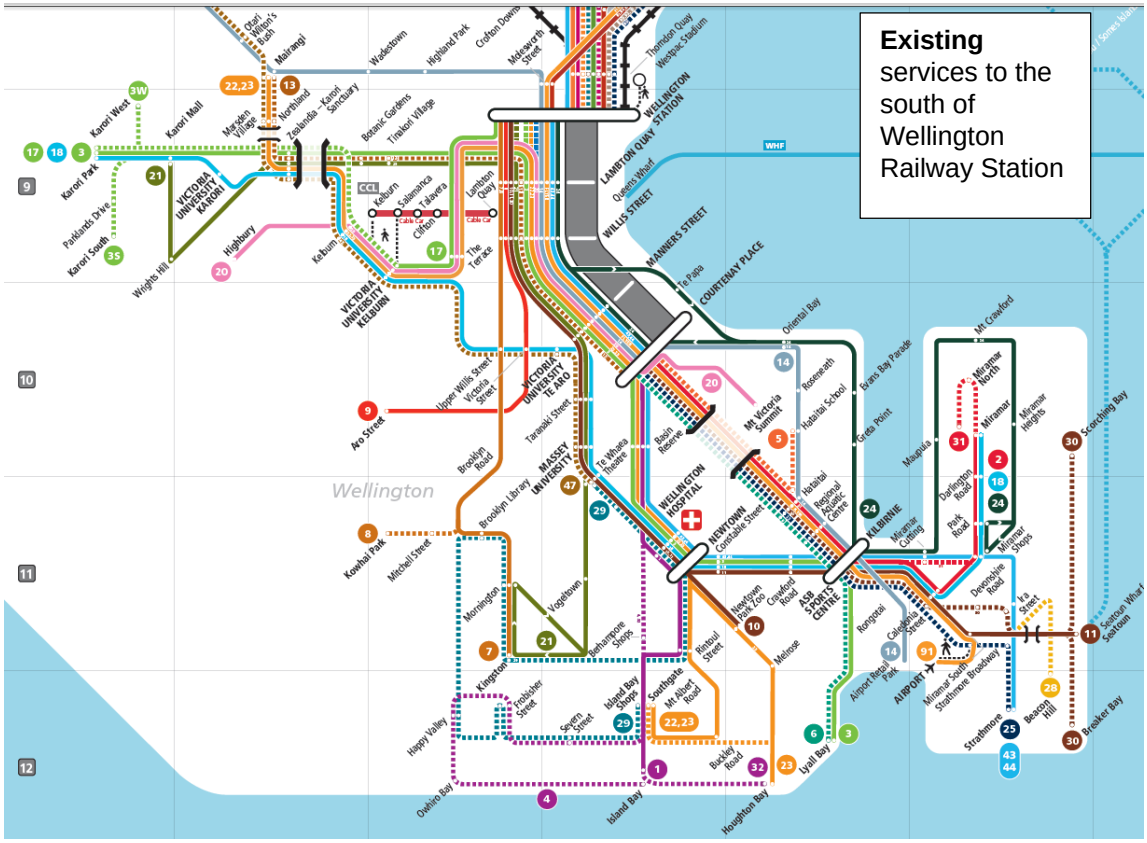
Left to right: Tahi Street, Park Road

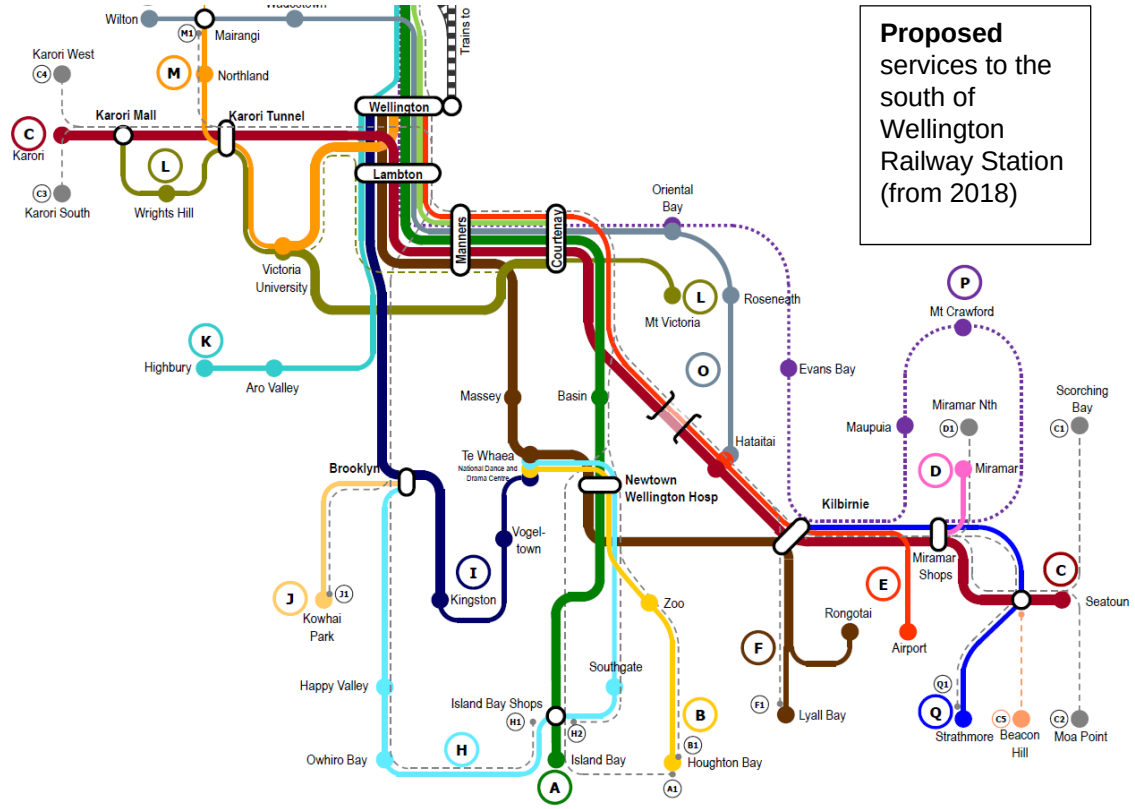
A.5 Aerial 5

Left to right: Tauhinu Road, Tahi Street



Appendix B. Existing and Proposed Bus Routes and Timetables


Existing services to the south of Wellington Railway Station
Wellington
WELLINGTON STATION
LAMBTON QUAY
WILLIS STREET
MANNERS STREET
COURTENAY PLACE
VICTORIA UNIVERSITY KELBURN
VICTORIA UNIVERSITY KARORI
VICTORIA UNIVERSITY TE ARO
MASSEY UNIVERSITY
WELLINGTON HOSPITAL
NEWTOWN
KILBIRNIE
AIRPORT
Karori West
Karori Mall
Karori Park
Karori South
Wrights Hill
Highbury
Kelburn
Mairangi
Wadestown
Northland
Oriental Bay
Roseneath
Mt Victoria
Evans Bay
Mt Crawford
Miramar North
Miramar
Scorching Bay
Seatoun
Breaker Bay
Kowhai Park
Aro Street
Brooklyn
Vogeltown
Kingston
Happy Valley
Owhiro Bay
Island Bay
Houghton Bay
Lyall Bay
Rongotai
Strathmore
Beacon Hill

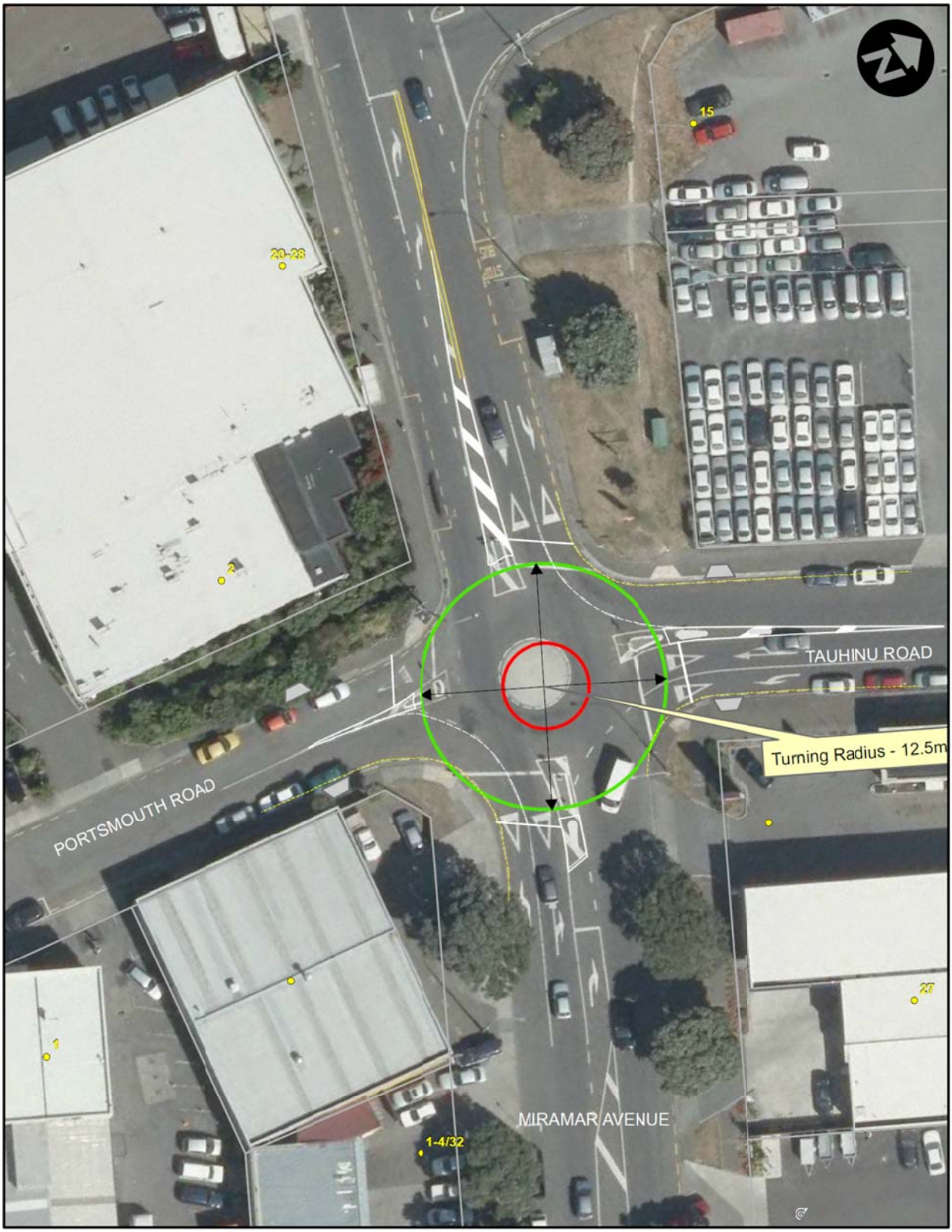

Proposed services to the south of Wellington Railway Station (from 2018)
Trains to
Wilton
Mairangi
Karori West
Northland
Karori Mall
Karori Tunnel
Wellington
Karori
Karori South
Wrights Hill
Lambton
Manners
Courtenay
Victoria University
Oriental Bay
Mt Victoria
Roseneath
Highbury
Aro Valley
Massey
Basin
Evans Bay
Mt Crawford
Maupuia
Miramar Nth
Scorching Bay
Hataitai
Miramar
Brooklyn
Te Whaea
National Dance and Drama Centre
Newtown
Wellington Hosp
Kilbirnie
Vogel-town
Miramar Shops
Seatoun
Kingston
Zoo
Rongotai
Airport
Kowhai Park
Southgate
Lyall Bay
Happy Valley
Island Bay Shops
Strathmore
Beacon Hill
Moa Point
Owhiro Bay
Island Bay
Houghton Bay

Appendix C. Bus Infrastructure Improvements

greater WELLINGTON REGIONAL COUNCIL
Te Pane Matua Taiao

PROPOSED EXTENSION TO NORTHERN INTERCHANGE STOP
PROPOSED NEW SOUTHERN INTERCHANGE STOP
MIRAMAR AVENUE (AT STONE STREET)

User Name: Agatec
Reference Scale: 1:500
Date: 18/04/2016



greater WELLINGTON REGIONAL COUNCIL

PROPOSED ROUNDABOUT MODIFICATION
MIRAMAR AVENUE (AT PORTSMOUTH / TAUHINU ROADS)

User Name: Agatec
Reference Scale: 1:500
Date: 18/04/2016

Appendix D. Results from SIDRA Analysis of Intersections

D.1 Movement Summaries

MOVEMENT SUMMARY

Site: Miramar Shelly Bay 2016 AM

Miramar Shelly Bay
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	1192	3.1	0.601	0.0	LOS A	0.0	0.0	0.00	0.00	49.8
6	R2	7	0.0	0.011	8.7	LOS A	0.0	0.3	0.62	0.70	40.6
Approach		1199	3.1	0.601	0.1	NA	0.0	0.3	0.00	0.00	49.6
North: Shelly Bay Rd											
7	L2	5	0.0	0.038	8.3	LOS A	0.1	0.9	0.79	0.87	25.7
9	R2	11	0.0	0.038	16.1	LOS C	0.1	0.9	0.79	0.87	42.3
Approach		16	0.0	0.038	13.5	LOS B	0.1	0.9	0.79	0.87	35.1
West: Cobham Dr (west)											
10	L2	24	17.4	0.387	5.7	LOS A	0.0	0.0	0.00	0.02	55.7
11	T1	777	3.1	0.387	0.0	LOS A	0.0	0.0	0.00	0.02	59.2
Approach		801	3.5	0.387	0.2	NA	0.0	0.0	0.00	0.02	58.8
All Vehicles		2016	3.2	0.601	0.2	NA	0.1	0.9	0.01	0.02	52.4

MOVEMENT SUMMARY

Site: Miramar Maupuia 2016 AM

Miramar Maupuia
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	1087	2.8	0.562	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	12	9.1	0.018	9.1	LOS A	0.1	0.5	0.63	0.73	40.0
Approach		1099	2.9	0.562	0.1	NA	0.1	0.5	0.01	0.01	49.5
North: Maupuia Rd											
7	L2	46	0.0	0.071	9.8	LOS A	0.2	1.7	0.62	0.82	29.2
9	R2	94	2.2	0.411	26.5	LOS D	1.5	10.4	0.93	1.03	34.0
Approach		140	1.5	0.411	20.9	LOS C	1.5	10.4	0.83	0.96	32.3
West: Miramar Ave (west)											
10	L2	12	0.0	0.007	5.6	LOS A	0.0	0.2	0.05	0.53	51.0
11	T1	782	3.1	0.409	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		794	3.1	0.409	0.1	LOS A	0.0	0.2	0.00	0.01	59.4
All Vehicles		2033	2.8	0.562	1.5	NA	1.5	10.4	0.06	0.07	47.5

MOVEMENT SUMMARY

Site: Miramar Portsmouth Tauhinu 2016 AM

Miramar Portsmouth Tauhinu
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portsmouth Rd											
1	L2	12	9.1	0.247	37.6	LOS D	1.1	7.7	0.89	0.95	8.6
2	T1	6	0.0	0.247	37.2	LOS D	1.1	7.7	0.89	0.95	27.1
3	R2	7	0.0	0.247	39.9	LOS D	1.1	7.7	0.89	0.95	18.8
Approach		25	4.2	0.247	38.1	LOS D	1.1	7.7	0.89	0.95	15.9
East: Miramar Ave (east)											
4	L2	26	0.0	0.041	9.1	LOS A	0.2	1.6	0.67	0.71	37.3
5	T1	608	4.2	1.000	59.2	LOS E	32.2	233.3	1.00	2.03	9.8
6	R2	16	0.0	1.000	61.6	LOS E	32.2	233.3	1.00	2.03	24.6
Approach		651	3.9	1.000	57.2	LOS E	32.2	233.3	0.99	1.98	10.5
North: Tauhinu Rd											
7	L2	35	3.0	0.066	10.1	LOS B	0.3	2.1	0.60	0.75	45.9
8	T1	4	0.0	0.877	28.1	LOS C	13.2	92.8	1.00	1.34	32.7
9	R2	467	0.9	0.877	30.9	LOS C	13.2	92.8	1.00	1.34	30.2
Approach		506	1.0	0.877	29.4	LOS C	13.2	92.8	0.97	1.30	31.1
West: Miramar Ave (west)											
10	L2	317	2.0	0.195	5.5	LOS A	1.4	9.6	0.45	0.59	48.0
11	T1	427	2.0	0.291	4.9	LOS A	2.2	15.5	0.49	0.57	41.1
12	R2	45	4.7	0.291	7.6	LOS A	2.2	15.5	0.49	0.57	36.0
Approach		789	2.1	0.291	5.3	LOS A	2.2	15.5	0.47	0.58	44.7
All Vehicles		1972	2.5	1.000	29.1	LOS C	32.2	233.3	0.78	1.23	23.1

MOVEMENT SUMMARY

Site: Miramar Stone 2016 AM

Miramar Stone
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stone St											
7	L2	21	0.0	0.113	4.9	LOS A	0.4	2.8	0.64	0.75	28.3
9	R2	52	8.2	0.113	7.3	LOS A	0.4	2.8	0.64	0.75	27.8
Approach		73	5.8	0.113	6.6	LOS A	0.4	2.8	0.64	0.75	28.0
East: Miramar Ave (east)											
10	L2	102	7.2	0.386	5.6	LOS A	0.0	0.0	0.00	0.08	55.6
11	T1	638	2.3	0.386	0.0	LOS A	0.0	0.0	0.00	0.08	57.6
Approach		740	3.0	0.386	0.8	NA	0.0	0.0	0.00	0.08	57.1
West: Miramar Ave (west)											
5	T1	469	2.0	0.235	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	19	16.7	0.029	9.2	LOS A	0.1	0.9	0.62	0.75	41.2
Approach		488	2.6	0.235	0.4	NA	0.1	0.9	0.02	0.03	49.1
All Vehicles		1301	3.0	0.386	0.9	NA	0.4	2.8	0.04	0.10	49.2

MOVEMENT SUMMARY

Site: Miramar Park Hobart 2016 AM

Miramar Park Hobart
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Hobart St											
1	L2	49	0.0	0.657	30.0	LOS C	4.3	31.3	0.88	1.18	21.6
2	T1	83	7.6	0.657	29.3	LOS C	4.3	31.3	0.88	1.18	24.4
3	R2	11	0.0	0.657	32.0	LOS C	4.3	31.3	0.88	1.18	24.5
Approach		143	4.4	0.657	29.7	LOS C	4.3	31.3	0.88	1.18	23.7
East: Miramar Ave (east)											
4	L2	8	0.0	0.011	7.5	LOS A	0.0	0.3	0.50	0.60	51.6
5	T1	435	1.9	0.673	11.7	LOS B	6.6	47.4	0.82	0.96	44.3
6	R2	76	6.9	0.673	14.9	LOS B	6.6	47.4	0.82	0.96	48.7
Approach		519	2.6	0.673	12.1	LOS B	6.6	47.4	0.81	0.95	45.3
North: Park Rd											
7	L2	78	4.1	0.383	7.8	LOS A	2.1	15.5	0.60	0.78	50.5
8	T1	64	13.1	0.383	7.8	LOS A	2.1	15.5	0.60	0.78	50.9
9	R2	154	4.1	0.383	10.4	LOS B	2.1	15.5	0.60	0.78	36.2
Approach		296	6.0	0.383	9.2	LOS A	2.1	15.5	0.60	0.78	43.7
West: Miramar Ave (west)											
10	L2	142	2.2	0.346	11.7	LOS B	1.6	11.4	0.66	0.87	43.6
11	T1	196	3.2	0.573	15.1	LOS B	3.6	26.2	0.76	0.97	41.5
12	R2	38	2.8	0.573	18.0	LOS B	3.6	26.2	0.76	0.97	41.1
Approach		376	2.8	0.573	14.1	LOS B	3.6	26.2	0.72	0.93	42.2
All Vehicles		1334	3.6	0.673	13.9	LOS B	6.6	47.4	0.75	0.93	39.5

MOVEMENT SUMMARY

Site: Miramar Shelly Bay 2016 IP

Miramar Shelly Bay
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	748	5.8	0.384	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	25	0.0	0.040	9.4	LOS A	0.1	1.0	0.66	0.80	40.1
Approach		774	5.6	0.384	0.3	NA	0.1	1.0	0.02	0.03	48.8
North: Shelly Bay Rd											
7	L2	31	3.4	0.083	8.9	LOS A	0.3	2.2	0.68	0.85	26.8
9	R2	28	3.7	0.083	11.3	LOS B	0.3	2.2	0.68	0.85	45.2
Approach		59	3.6	0.083	10.1	LOS B	0.3	2.2	0.68	0.85	33.7
West: Cobham Dr (west)											
10	L2	31	3.4	0.408	5.6	LOS A	0.0	0.0	0.00	0.02	56.7
11	T1	808	4.7	0.408	0.0	LOS A	0.0	0.0	0.00	0.02	58.8
Approach		839	4.6	0.408	0.2	NA	0.0	0.0	0.00	0.02	58.6
All Vehicles		1672	5.0	0.408	0.6	NA	0.3	2.2	0.03	0.05	50.6

MOVEMENT SUMMARY

Site: Miramar Maupuia 2016 IP

Miramar Maupuia
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	763	5.5	0.401	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	31	0.0	0.048	9.4	LOS A	0.2	1.3	0.66	0.81	40.0
Approach		794	5.3	0.401	0.4	NA	0.2	1.3	0.03	0.03	48.6
North: Maupuia Rd											
7	L2	37	0.0	0.063	10.4	LOS B	0.2	1.5	0.66	0.85	26.7
9	R2	19	0.0	0.050	14.6	LOS B	0.2	1.2	0.82	0.93	41.5
Approach		56	0.0	0.063	11.9	LOS B	0.2	1.5	0.71	0.88	30.6
West: Miramar Ave (west)											
10	L2	25	0.0	0.016	5.7	LOS A	0.1	0.4	0.09	0.52	50.8
11	T1	839	4.6	0.443	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		864	4.5	0.443	0.2	LOS A	0.1	0.4	0.00	0.02	58.9
All Vehicles		1714	4.7	0.443	0.6	NA	0.2	1.5	0.04	0.05	50.1

MOVEMENT SUMMARY

Site: Miramar Portsmouth Tauhinu 2016 IP

Miramar Portsmouth Tauhinu
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portsmouth Rd											
1	L2	22	0.0	0.227	22.0	LOS C	1.0	6.9	0.79	0.91	10.5
2	T1	5	0.0	0.227	21.6	LOS C	1.0	6.9	0.79	0.91	33.2
3	R2	14	0.0	0.227	24.4	LOS C	1.0	6.9	0.79	0.91	24.9
Approach		41	0.0	0.227	22.7	LOS C	1.0	6.9	0.79	0.91	17.3
East: Miramar Ave (east)											
4	L2	12	0.0	0.013	7.4	LOS A	0.1	0.4	0.48	0.61	39.6
5	T1	494	7.0	0.669	10.7	LOS B	6.6	48.9	0.81	0.91	18.7
6	R2	69	0.0	0.669	13.1	LOS B	6.6	48.9	0.81	0.91	46.1
Approach		575	6.0	0.669	10.9	LOS B	6.6	48.9	0.80	0.90	22.4
North: Tauhinu Rd											
7	L2	71	4.5	0.150	11.5	LOS B	0.7	5.1	0.66	0.84	44.6
8	T1	5	0.0	0.529	14.6	LOS B	3.6	25.8	0.80	1.01	40.4
9	R2	247	3.0	0.529	17.5	LOS B	3.6	25.8	0.80	1.01	37.2
Approach		323	3.3	0.529	16.2	LOS B	3.6	25.8	0.77	0.97	38.9
West: Miramar Ave (west)											
10	L2	241	3.1	0.149	5.5	LOS A	1.0	7.1	0.43	0.58	48.0
11	T1	536	4.5	0.340	5.0	LOS A	2.6	19.2	0.50	0.56	40.7
12	R2	9	22.2	0.340	7.8	LOS A	2.6	19.2	0.50	0.56	34.2
Approach		786	4.3	0.340	5.2	LOS A	2.6	19.2	0.48	0.57	43.9
All Vehicles		1725	4.6	0.669	9.5	LOS A	6.6	48.9	0.65	0.76	33.1

MOVEMENT SUMMARY

Site: Miramar Stone 2016 IP

Miramar Stone
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stone St											
7	L2	14	15.4	0.150	4.3	LOS A	0.5	3.9	0.65	0.77	28.1
9	R2	78	10.8	0.150	7.5	LOS A	0.5	3.9	0.65	0.77	27.7
Approach		92	11.5	0.150	7.1	LOS A	0.5	3.9	0.65	0.77	27.8
East: Miramar Ave (east)											
10	L2	107	7.8	0.307	5.6	LOS A	0.0	0.0	0.00	0.11	55.2
11	T1	469	5.2	0.307	0.0	LOS A	0.0	0.0	0.00	0.11	56.8
Approach		577	5.7	0.307	1.0	NA	0.0	0.0	0.00	0.11	56.3
West: Miramar Ave (west)											
5	T1	620	4.4	0.316	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	32	6.7	0.035	7.3	LOS A	0.1	1.0	0.55	0.68	42.6
Approach		652	4.5	0.316	0.4	NA	0.1	1.0	0.03	0.03	49.1
All Vehicles		1320	5.5	0.316	1.1	NA	0.5	3.9	0.06	0.12	47.3

MOVEMENT SUMMARY

Site: Miramar Park Hobart 2016 IP

Miramar Park Hobart
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Hobart St											
1	L2	45	4.7	0.342	11.9	LOS B	1.6	12.0	0.71	0.81	26.2
2	T1	60	10.5	0.342	11.1	LOS B	1.6	12.0	0.71	0.81	27.8
3	R2	5	0.0	0.342	13.8	LOS B	1.6	12.0	0.71	0.81	27.9
Approach		111	7.6	0.342	11.5	LOS B	1.6	12.0	0.71	0.81	27.3
East: Miramar Ave (east)											
4	L2	7	14.3	0.011	8.3	LOS A	0.0	0.4	0.53	0.62	50.6
5	T1	238	5.3	0.386	8.6	LOS A	2.2	16.4	0.67	0.79	47.1
6	R2	36	8.8	0.386	11.6	LOS B	2.2	16.4	0.67	0.79	50.8
Approach		281	6.0	0.386	8.9	LOS A	2.2	16.4	0.66	0.78	47.9
North: Park Rd											
7	L2	66	4.8	0.405	8.2	LOS A	2.3	16.6	0.64	0.81	50.0
8	T1	48	10.9	0.405	8.2	LOS A	2.3	16.6	0.64	0.81	50.5
9	R2	186	5.1	0.405	10.8	LOS B	2.3	16.6	0.64	0.81	35.8
Approach		301	5.9	0.405	9.8	LOS A	2.3	16.6	0.64	0.81	41.8
West: Miramar Ave (west)											
10	L2	163	6.5	0.328	9.4	LOS A	1.4	10.5	0.56	0.79	45.4
11	T1	252	5.0	0.579	12.0	LOS B	3.8	27.4	0.69	0.92	44.0
12	R2	40	2.6	0.579	14.7	LOS B	3.8	27.4	0.69	0.92	43.6
Approach		455	5.3	0.579	11.3	LOS B	3.8	27.4	0.64	0.87	44.4
All Vehicles		1147	5.9	0.579	10.4	LOS B	3.8	27.4	0.65	0.83	41.4

MOVEMENT SUMMARY

Site: Miramar Shelly Bay 2016 PM

Miramar Shelly Bay
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	773	2.3	0.388	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	13	0.0	0.043	16.3	LOS C	0.1	1.0	0.84	0.93	35.4
Approach		785	2.3	0.388	0.3	NA	0.1	1.0	0.01	0.01	49.0
North: Shelly Bay Rd											
7	L2	25	4.2	0.132	13.4	LOS B	0.4	3.1	0.84	0.93	25.4
9	R2	27	0.0	0.132	15.7	LOS C	0.4	3.1	0.84	0.93	41.6
Approach		53	2.0	0.132	14.6	LOS B	0.4	3.1	0.84	0.93	32.1
West: Cobham Dr (west)											
10	L2	29	0.0	0.564	5.5	LOS A	0.0	0.0	0.00	0.01	57.0
11	T1	1154	1.7	0.564	0.0	LOS A	0.0	0.0	0.00	0.01	59.1
Approach		1183	1.7	0.564	0.2	NA	0.0	0.0	0.00	0.01	58.9
All Vehicles		2021	1.9	0.564	0.6	NA	0.4	3.1	0.03	0.04	51.8

MOVEMENT SUMMARY

Site: Miramar Maupuia 2016 PM

Miramar Maupuia
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	815	1.8	0.418	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	39	2.7	0.137	17.3	LOS C	0.4	3.2	0.86	0.94	34.7
Approach		854	1.8	0.418	0.8	NA	0.4	3.2	0.04	0.04	47.3
North: Maupuia Rd											
7	L2	29	7.1	0.117	19.2	LOS C	0.4	2.7	0.86	0.94	25.8
9	R2	39	2.7	0.222	27.9	LOS D	0.7	4.9	0.93	0.99	33.3
Approach		68	4.6	0.222	24.2	LOS C	0.7	4.9	0.90	0.97	29.7
West: Miramar Ave (west)											
10	L2	1	0.0	0.001	5.7	LOS A	0.0	0.0	0.11	0.51	50.7
11	T1	1179	1.8	0.612	0.0	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1180	1.8	0.612	0.0	LOS A	0.0	0.0	0.00	0.00	59.7
All Vehicles		2102	1.9	0.612	1.1	NA	0.7	4.9	0.05	0.05	49.8

MOVEMENT SUMMARY

Site: Miramar Portsmouth Tauhinu 2016 PM

Miramar Portsmouth Tauhinu
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portsmouth Rd											
1	L2	35	3.0	0.270	23.9	LOS C	1.2	8.6	0.82	0.92	10.2
2	T1	9	0.0	0.270	23.5	LOS C	1.2	8.6	0.82	0.92	32.6
3	R2	1	0.0	0.270	26.2	LOS C	1.2	8.6	0.82	0.92	24.2
Approach		45	2.3	0.270	23.8	LOS C	1.2	8.6	0.82	0.92	15.1
East: Miramar Ave (east)											
4	L2	6	0.0	0.008	7.5	LOS A	0.0	0.3	0.51	0.60	39.3
5	T1	511	2.7	0.716	12.0	LOS B	8.0	57.0	0.87	0.98	18.3
6	R2	80	0.0	0.716	14.6	LOS B	8.0	57.0	0.87	0.98	45.0
Approach		597	2.3	0.716	12.3	LOS B	8.0	57.0	0.86	0.98	22.1
North: Tauhinu Rd											
7	L2	52	0.0	0.136	14.1	LOS B	0.7	4.6	0.74	0.89	43.0
8	T1	1	0.0	0.713	26.2	LOS C	6.3	44.3	0.93	1.18	33.6
9	R2	269	0.0	0.713	28.9	LOS C	6.3	44.3	0.93	1.18	31.0
Approach		322	0.0	0.713	26.5	LOS C	6.3	44.3	0.90	1.14	32.7
West: Miramar Ave (west)											
10	L2	367	0.0	0.225	5.6	LOS A	1.6	11.4	0.47	0.60	48.0
11	T1	707	2.2	0.442	5.1	LOS A	3.8	27.4	0.56	0.58	40.8
12	R2	3	0.0	0.442	7.8	LOS A	3.8	27.4	0.56	0.58	36.2
Approach		1078	1.5	0.442	5.3	LOS A	3.8	27.4	0.53	0.58	44.2
All Vehicles		2042	1.5	0.716	11.1	LOS B	8.0	57.0	0.69	0.79	32.5

MOVEMENT SUMMARY

Site: Miramar Stone 2016 PM

Miramar Stone
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stone St											
7	L2	14	15.4	0.150	4.3	LOS A	0.5	3.9	0.65	0.77	28.1
9	R2	78	10.8	0.150	7.5	LOS A	0.5	3.9	0.65	0.77	27.7
Approach		92	11.5	0.150	7.1	LOS A	0.5	3.9	0.65	0.77	27.8
East: Miramar Ave (east)											
10	L2	107	7.8	0.307	5.6	LOS A	0.0	0.0	0.00	0.11	55.2
11	T1	469	5.2	0.307	0.0	LOS A	0.0	0.0	0.00	0.11	56.8
Approach		577	5.7	0.307	1.0	NA	0.0	0.0	0.00	0.11	56.3
West: Miramar Ave (west)											
5	T1	620	4.4	0.316	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	32	6.7	0.035	7.3	LOS A	0.1	1.0	0.55	0.68	42.6
Approach		652	4.5	0.316	0.4	NA	0.1	1.0	0.03	0.03	49.1
All Vehicles		1320	5.5	0.316	1.1	NA	0.5	3.9	0.06	0.12	47.3

MOVEMENT SUMMARY

Site: Miramar Park Hobart 2016 PM

Miramar Park Hobart
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Hobart St											
1	L2	59	0.0	0.408	13.0	LOS B	2.1	15.4	0.73	0.87	25.9
2	T1	63	11.7	0.408	12.2	LOS B	2.1	15.4	0.73	0.87	27.5
3	R2	9	0.0	0.408	14.9	LOS B	2.1	15.4	0.73	0.87	27.6
Approach		132	5.6	0.408	12.7	LOS B	2.1	15.4	0.73	0.87	27.0
East: Miramar Ave (east)											
4	L2	5	0.0	0.008	8.2	LOS A	0.0	0.3	0.56	0.61	51.1
5	T1	258	3.3	0.431	9.6	LOS A	2.7	19.6	0.72	0.85	46.3
6	R2	31	6.9	0.431	12.6	LOS B	2.7	19.6	0.72	0.85	50.2
Approach		294	3.6	0.431	9.9	LOS A	2.7	19.6	0.72	0.84	47.0
North: Park Rd											
7	L2	59	3.6	0.455	10.4	LOS B	3.0	21.2	0.76	0.93	48.7
8	T1	59	8.9	0.455	10.3	LOS B	3.0	21.2	0.76	0.93	49.2
9	R2	167	1.3	0.455	12.9	LOS B	3.0	21.2	0.76	0.93	34.8
Approach		285	3.3	0.455	11.8	LOS B	3.0	21.2	0.76	0.93	41.1
West: Miramar Ave (west)											
10	L2	167	2.5	0.331	9.3	LOS A	1.4	10.4	0.56	0.79	45.7
11	T1	388	1.4	0.845	20.9	LOS C	10.4	73.5	0.93	1.19	37.6
12	R2	43	0.0	0.845	23.7	LOS C	10.4	73.5	0.93	1.19	37.3
Approach		599	1.6	0.845	17.9	LOS B	10.4	73.5	0.83	1.08	39.5
All Vehicles		1309	2.8	0.845	14.3	LOS B	10.4	73.5	0.78	0.97	39.0

MOVEMENT SUMMARY

Site: Miramar Shelly Bay 2016 WE

Miramar Shelly Bay
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	1072	1.6	0.536	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	31	0.0	0.086	14.4	LOS B	0.3	2.0	0.82	0.92	36.6
Approach		1102	1.5	0.536	0.4	NA	0.3	2.0	0.02	0.03	48.5
North: Shelly Bay Rd											
7	L2	49	0.0	0.343	12.6	LOS B	1.3	9.0	0.87	0.99	24.6
9	R2	81	0.0	0.343	20.1	LOS C	1.3	9.0	0.87	0.99	39.6
Approach		131	0.0	0.343	17.3	LOS C	1.3	9.0	0.87	0.99	32.4
West: Cobham Dr (west)											
10	L2	107	2.0	0.533	5.5	LOS A	0.0	0.0	0.00	0.06	56.3
11	T1	1006	1.8	0.533	0.0	LOS A	0.0	0.0	0.00	0.06	57.2
Approach		1114	1.8	0.533	0.6	NA	0.0	0.0	0.00	0.06	57.0
All Vehicles		2346	1.6	0.536	1.4	NA	1.3	9.0	0.06	0.09	48.4

MOVEMENT SUMMARY

Site: Miramar Maupuia 2016 WE

Miramar Maupuia
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Miramar Ave (east)											
5	T1	1028	1.3	0.526	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	38	0.0	0.092	13.0	LOS B	0.3	2.2	0.79	0.90	37.4
Approach		1066	1.3	0.526	0.5	NA	0.3	2.2	0.03	0.03	48.3
North: Maupuia Rd											
7	L2	59	0.0	0.153	14.2	LOS B	0.5	3.5	0.79	0.91	25.5
9	R2	89	0.0	0.511	36.0	LOS E	1.8	12.6	0.96	1.05	29.7
Approach		148	0.0	0.511	27.4	LOS D	1.8	12.6	0.89	1.00	28.0
West: Miramar Ave (west)											
10	L2	44	0.0	0.028	5.7	LOS A	0.1	0.8	0.11	0.52	50.7
11	T1	1056	1.7	0.547	0.0	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		1100	1.6	0.547	0.3	LOS A	0.1	0.8	0.00	0.02	58.5
All Vehicles		2315	1.4	0.547	2.1	NA	1.8	12.6	0.07	0.09	46.1

MOVEMENT SUMMARY

Site: Miramar Portsmouth Tauhinu 2016 WE

Miramar Portsmouth Tauhinu
Roundabout

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portsmouth Rd											
1	L2	5	0.0	0.104	33.6	LOS C	0.4	3.4	0.87	0.95	9.0
2	T1	1	0.0	0.104	33.3	LOS C	0.4	3.4	0.87	0.95	28.4
3	R2	4	25.0	0.104	36.2	LOS D	0.4	3.4	0.87	0.95	19.7
Approach		11	10.0	0.104	34.6	LOS C	0.4	3.4	0.87	0.95	14.7
East: Miramar Ave (east)											
4	L2	4	0.0	0.006	8.1	LOS A	0.0	0.2	0.57	0.60	38.7
5	T1	687	1.1	0.993	47.9	LOS D	33.8	238.8	1.00	1.92	11.0
6	R2	59	0.0	0.993	50.5	LOS D	33.8	238.8	1.00	1.92	27.5
Approach		751	1.0	0.993	47.9	LOS D	33.8	238.8	1.00	1.91	12.4
North: Tauhinu Rd											
7	L2	71	0.0	0.184	14.0	LOS B	0.9	6.4	0.75	0.90	43.0
8	T1	2	50.0	0.896	52.0	LOS D	12.8	91.3	1.00	1.50	25.4
9	R2	336	1.9	0.896	48.5	LOS D	12.8	91.3	1.00	1.50	24.1
Approach		408	1.8	0.896	42.6	LOS D	12.8	91.3	0.96	1.40	26.4
West: Miramar Ave (west)											
10	L2	294	2.9	0.188	5.6	LOS A	1.4	9.7	0.49	0.60	47.8
11	T1	713	1.3	0.454	5.2	LOS A	4.1	28.8	0.60	0.59	40.7
12	R2	4	0.0	0.454	7.9	LOS A	4.1	28.8	0.60	0.59	36.0
Approach		1011	1.8	0.454	5.3	LOS A	4.1	28.8	0.57	0.59	43.7
All Vehicles		2180	1.5	0.993	27.1	LOS C	33.8	238.8	0.79	1.20	23.2

MOVEMENT SUMMARY

Site: Miramar Stone 2016 WE

Miramar Stone
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stone St											
7	L2	86	6.1	0.221	5.9	LOS A	0.8	5.9	0.67	0.80	28.0
9	R2	43	0.0	0.221	10.8	LOS B	0.8	5.9	0.67	0.80	27.5
Approach		129	4.1	0.221	7.6	LOS A	0.8	5.9	0.67	0.80	27.8
East: Miramar Ave (east)											
10	L2	93	3.4	0.402	5.5	LOS A	0.0	0.0	0.00	0.07	56.1
11	T1	687	1.1	0.402	0.0	LOS A	0.0	0.0	0.00	0.07	57.8
Approach		780	1.3	0.402	0.7	NA	0.0	0.0	0.00	0.07	57.4
West: Miramar Ave (west)											
5	T1	787	1.3	0.393	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	36	0.0	0.050	8.6	LOS A	0.2	1.3	0.61	0.77	41.8
Approach		823	1.3	0.393	0.4	NA	0.2	1.3	0.03	0.03	49.0
All Vehicles		1733	1.5	0.402	1.0	NA	0.8	5.9	0.06	0.11	46.9

MOVEMENT SUMMARY

Site: Miramar Park Hobart 2016 WE

Miramar Park Hobart
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total	Demand Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Hobart St											
1	L2	62	0.0	0.515	23.5	LOS C	2.9	20.7	0.83	1.04	23.0
2	T1	44	7.1	0.515	22.8	LOS C	2.9	20.7	0.83	1.04	25.5
3	R2	7	0.0	0.515	25.5	LOS C	2.9	20.7	0.83	1.04	25.5
Approach		114	2.8	0.515	23.4	LOS C	2.9	20.7	0.83	1.04	24.4
East: Miramar Ave (east)											
4	L2	18	0.0	0.027	8.6	LOS A	0.1	0.9	0.59	0.67	50.8
5	T1	408	1.0	0.691	14.7	LOS B	7.0	49.4	0.89	1.08	42.0
6	R2	45	2.3	0.691	17.6	LOS B	7.0	49.4	0.89	1.08	47.1
Approach		472	1.1	0.691	14.7	LOS B	7.0	49.4	0.88	1.07	43.1
North: Park Rd											
7	L2	78	1.4	0.531	11.0	LOS B	3.9	27.7	0.79	0.96	48.3
8	T1	47	8.9	0.531	11.0	LOS B	3.9	27.7	0.79	0.96	48.7
9	R2	217	1.5	0.531	13.5	LOS B	3.9	27.7	0.79	0.96	34.4
Approach		342	2.5	0.531	12.6	LOS B	3.9	27.7	0.79	0.96	40.0
West: Miramar Ave (west)											
10	L2	211	2.0	0.476	12.5	LOS B	2.6	18.8	0.69	0.91	42.9
11	T1	346	1.8	0.883	28.2	LOS C	11.6	82.6	0.98	1.31	33.5
12	R2	45	0.0	0.883	31.0	LOS C	11.6	82.6	0.98	1.31	33.3
Approach		602	1.7	0.883	22.9	LOS C	11.6	82.6	0.88	1.17	36.2
All Vehicles		1529	1.8	0.883	18.1	LOS B	11.6	82.6	0.85	1.08	37.4

D.2 Level of Service Summaries

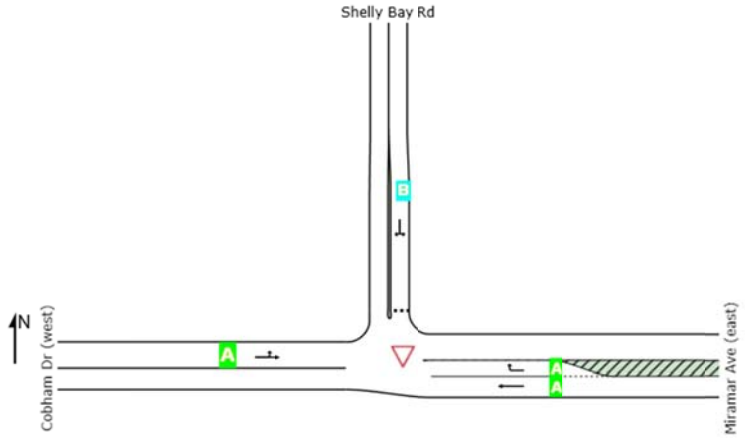
LEVEL OF SERVICE

Site: Miramar Shelly Bay 2016 AM

Miramar Shelly Bay
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	B	NA	NA



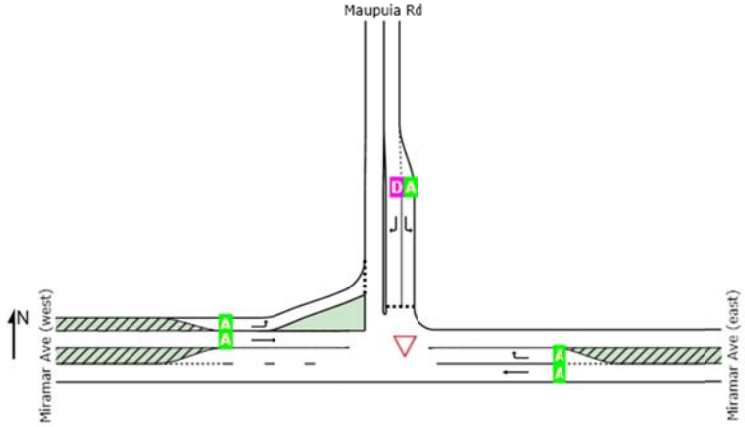
LEVEL OF SERVICE

Site: Miramar Maupuia 2016 AM

Miramar Maupuia
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	C	A	NA



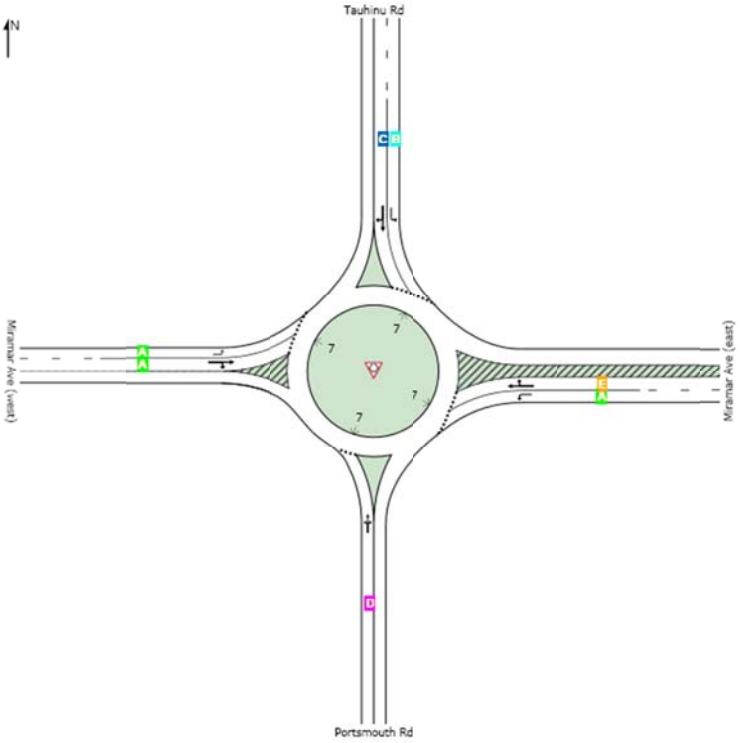
LEVEL OF SERVICE

Site: Miramar Portsmouth Tauhinu 2016 AM

Miramar Portsmouth Tauhinu
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	D	E	C	A	C



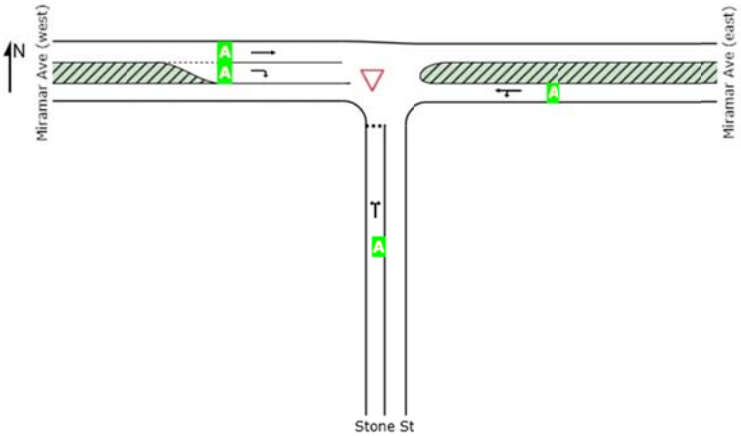
LEVEL OF SERVICE

Site: Miramar Stone 2016 AM

Miramar Stone
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



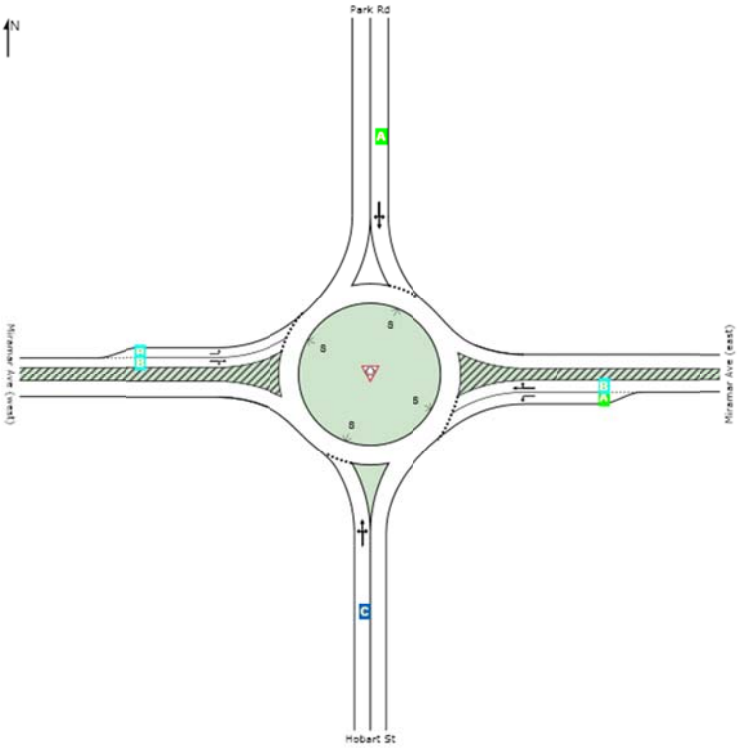
LEVEL OF SERVICE

Site: Miramar Park Hobart 2016 AM

Miramar Park Hobart
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	B	A	B	B



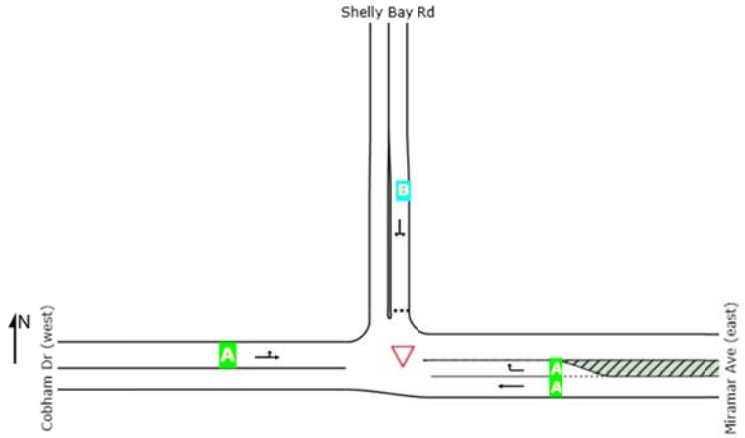
LEVEL OF SERVICE

Site: Miramar Shelly Bay 2016 IP

Miramar Shelly Bay
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	B	NA	NA



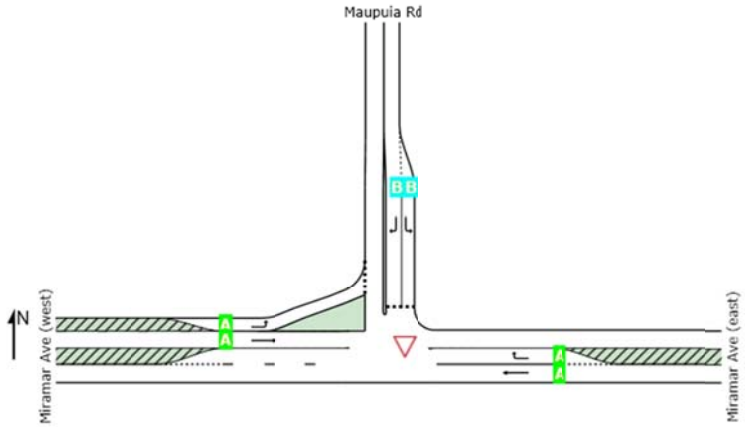
LEVEL OF SERVICE

Site: Miramar Maupuia 2016 IP

Miramar Maupuia
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	B	A	NA



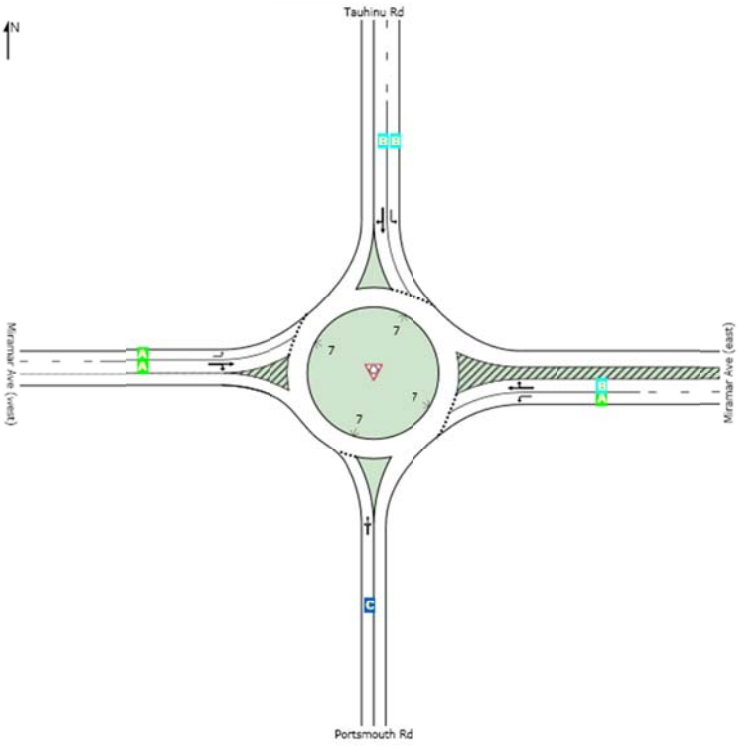
LEVEL OF SERVICE

Site: Miramar Portsmouth Tauhinu 2016 IP

Miramar Portsmouth Tauhinu
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	B	B	A	A



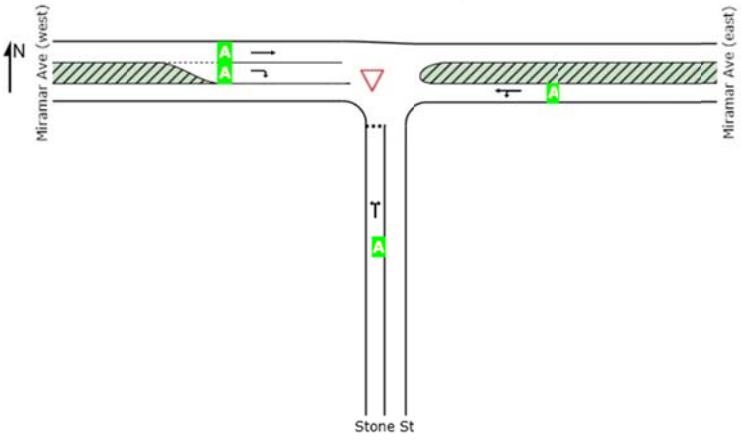
LEVEL OF SERVICE

Site: Miramar Stone 2016 IP

Miramar Stone
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



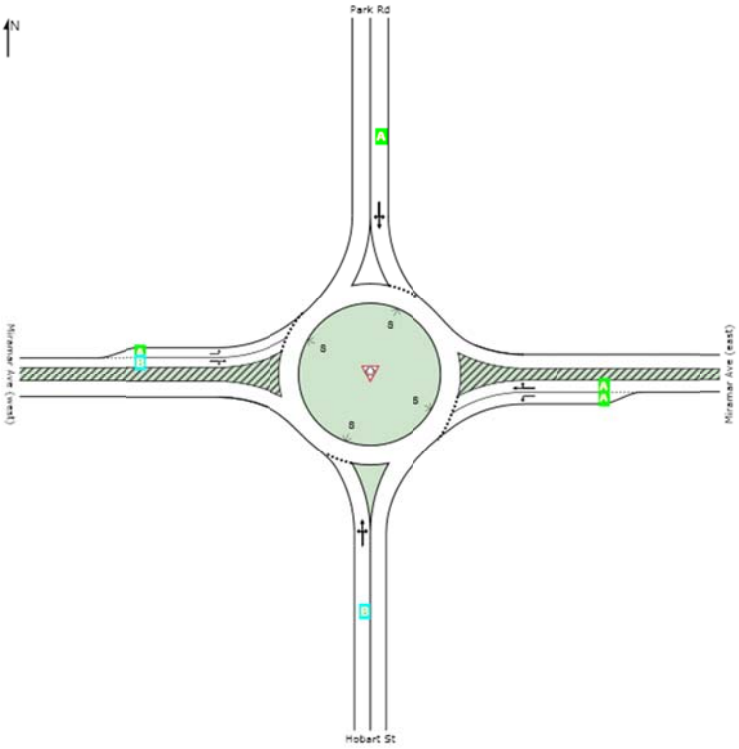
LEVEL OF SERVICE

Site: Miramar Park Hobart 2016 IP

Miramar Park Hobart
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	B	A	A	B	B



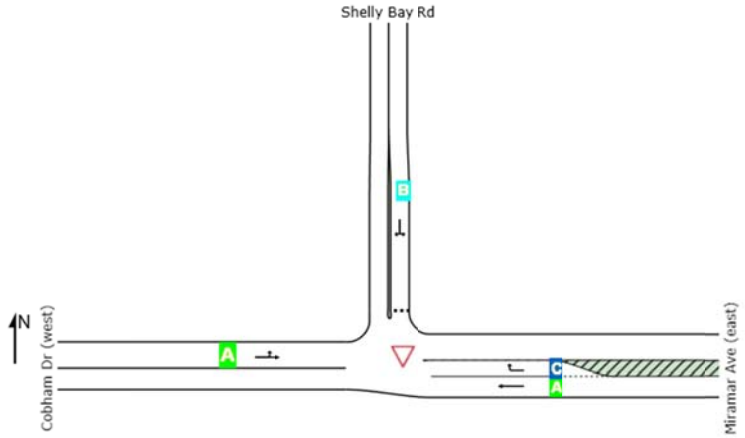
LEVEL OF SERVICE

Site: Miramar Shelly Bay 2016 PM

Miramar Shelly Bay
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	B	NA	NA



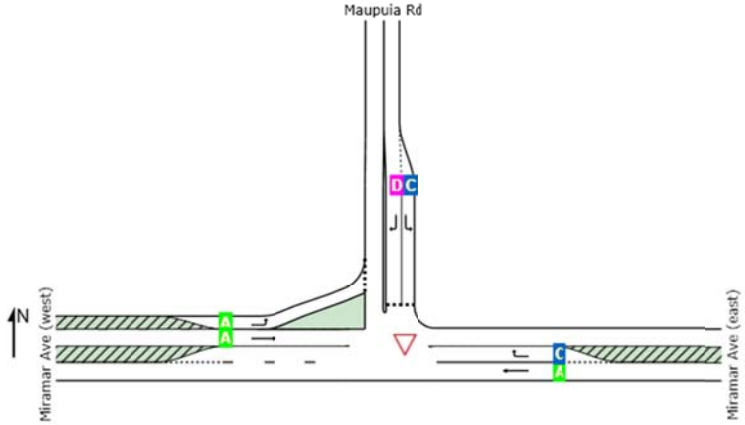
LEVEL OF SERVICE

Site: Miramar Maupuia 2016 PM

Miramar Maupuia
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	C	A	NA



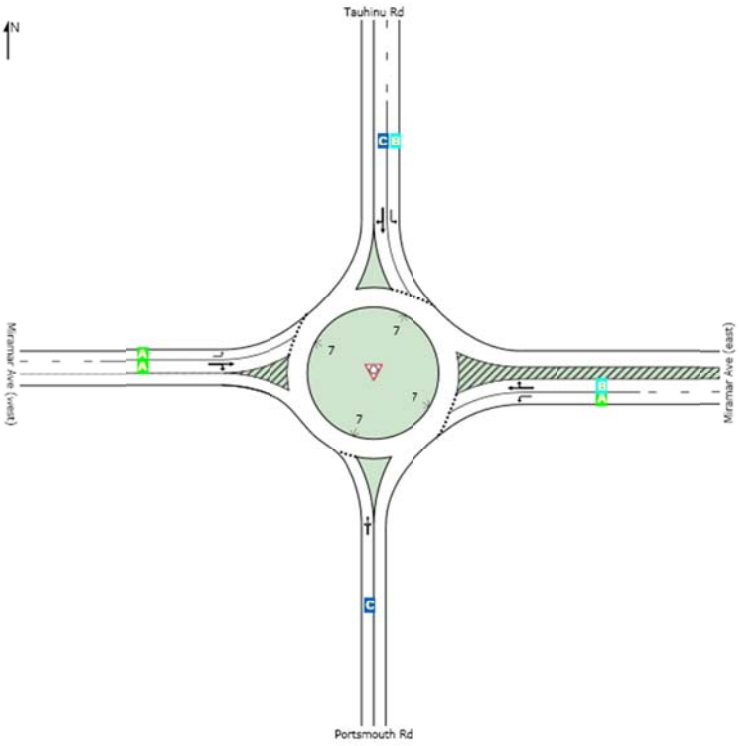
LEVEL OF SERVICE

Site: Miramar Portsmouth Tauhinu 2016 PM

Miramar Portsmouth Tauhinu
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	B	C	A	B



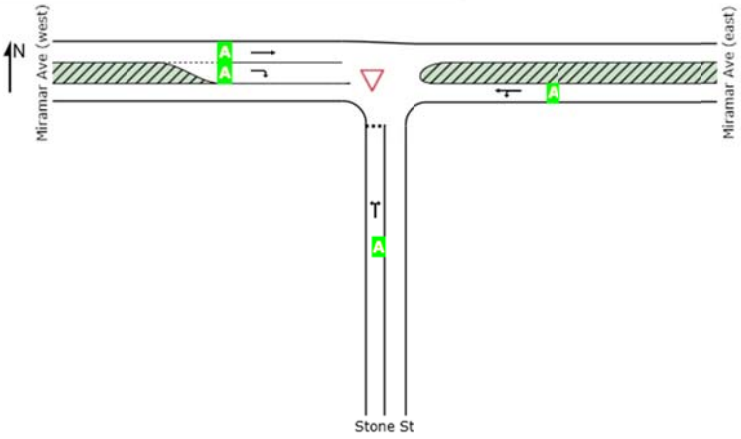
LEVEL OF SERVICE

Site: Miramar Stone 2016 PM

Miramar Stone
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



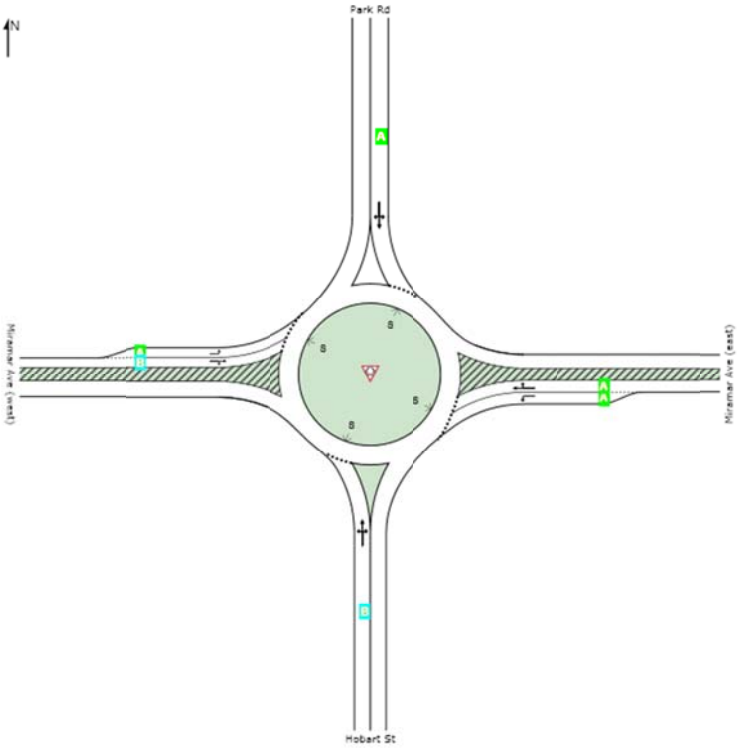
LEVEL OF SERVICE

Site: Miramar Park Hobart 2016 PM

Miramar Park Hobart
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	B	A	A	B	B



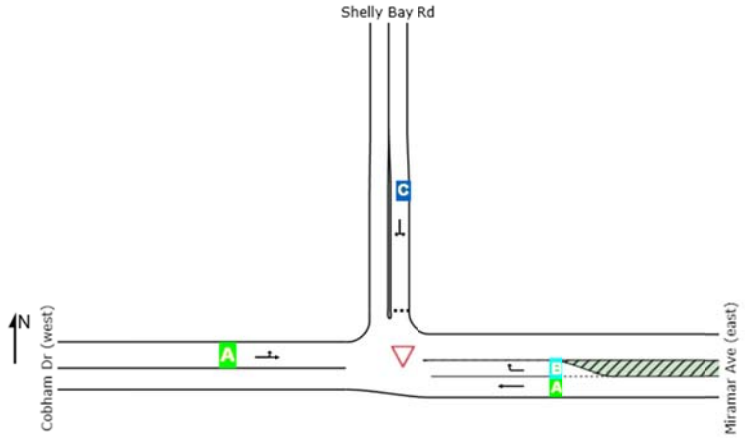
LEVEL OF SERVICE

Site: Miramar Shelly Bay 2016 WE

Miramar Shelly Bay
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	C	NA	NA



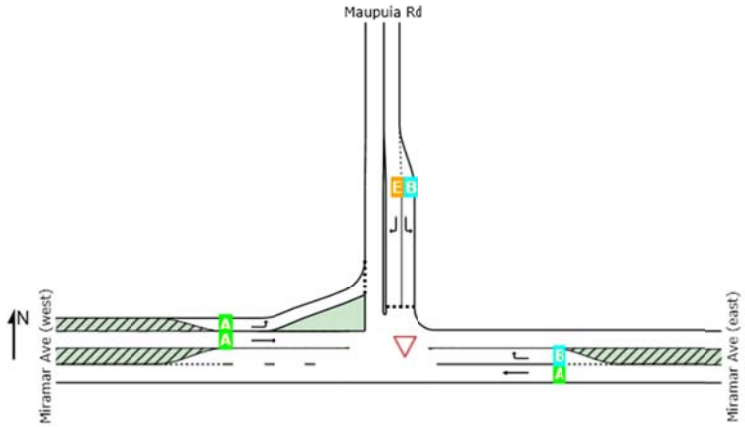
LEVEL OF SERVICE

Site: Miramar Maupuia 2016 WE

Miramar Maupuia
Giveway / Yield (Two-Way)

All Movement Classes

	East	North	West	Intersection
LOS	NA	D	A	NA



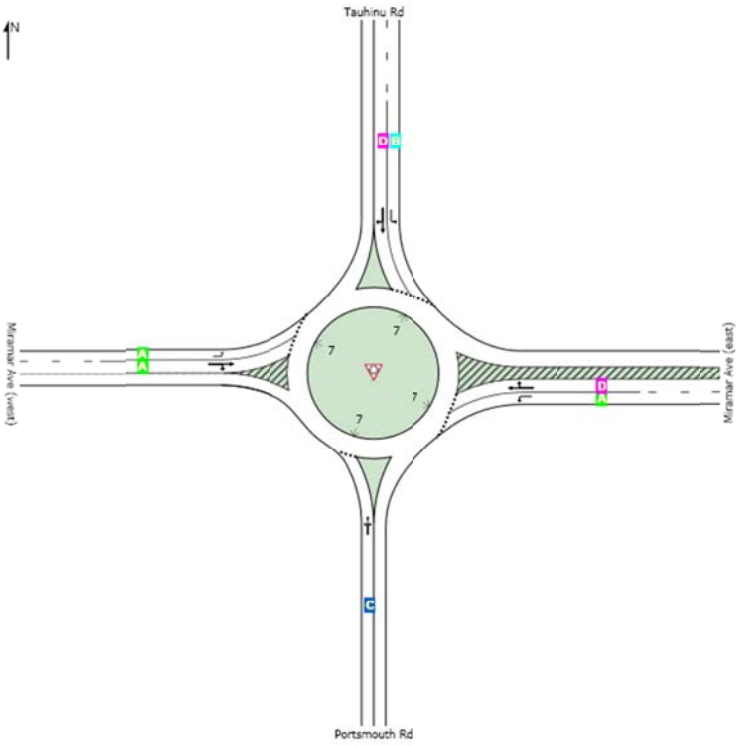
LEVEL OF SERVICE

Site: Miramar Portsmouth Tauhinu 2016 WE

Miramar Portsmouth Tauhinu
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	D	D	A	C



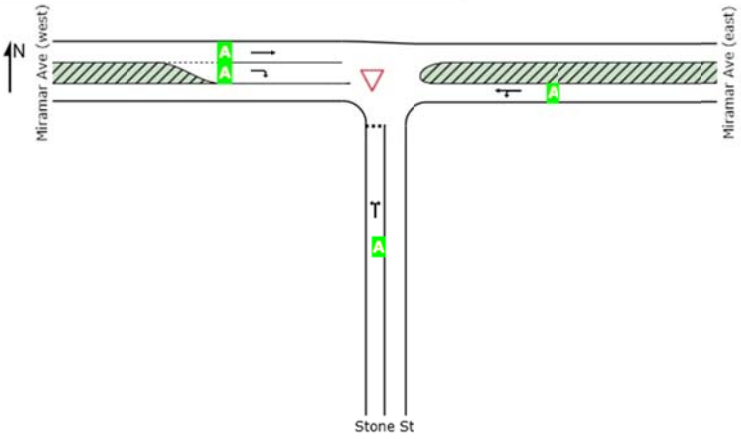
LEVEL OF SERVICE

Site: Miramar Stone 2016 WE

Miramar Stone
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	West	Intersection
LOS	A	NA	NA	NA



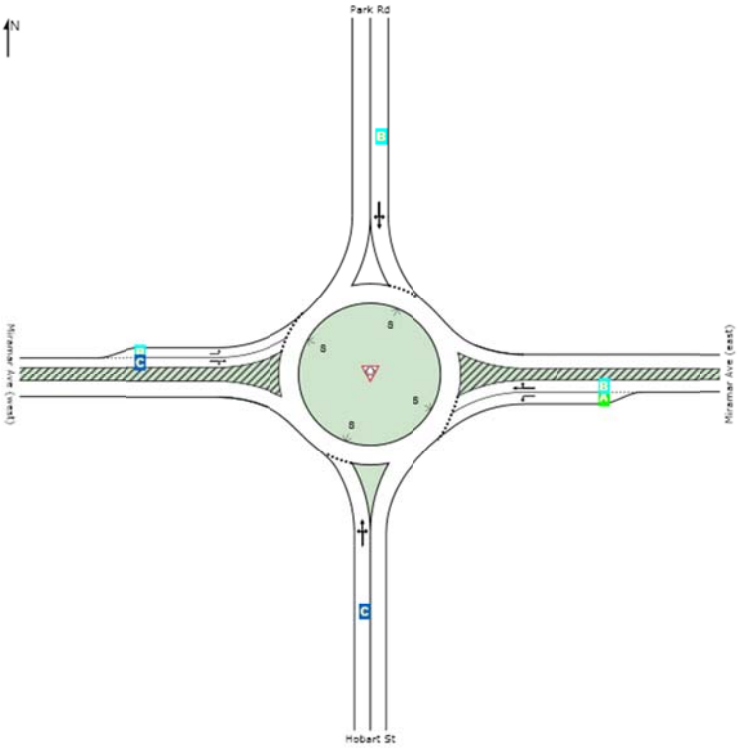
LEVEL OF SERVICE

Site: Miramar Park Hobart 2016 WE

Miramar Park Hobart
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	B	B	C	B



Appendix E. Speed Data

Street Name:	Ira St			
Site ID:	752A			
Location:	50M South of Miramar Ave, Outside #82.			
North Bound	**bound traffic, travelling towards:**			Miramar Ave
South Bound	**bound traffic, travelling towards:**			Otaki St
Start Date:	6/08/2015		End Date:	13/08/2015
Speed	**Summary**			
	Northbound	**Southbound**	**Both Directions**	
5 day 85th Percentile Speed	50	52	51	
7 day 85th Percentile Speed	50	52	51	
5 day Mean Speed	45	47	46	
7 day Mean Speed	45	47	46	
5 day 3 - 4pm 85th Percentile Speed	49	50	50	

Street Name:	Miramar Ave			
Site ID:	1015			
Location:	50M West of Chelsea St, Outside #95.			
East Bound	**bound traffic, travelling towards:**			Chelsea St
West Bound	**bound traffic, travelling towards:**			Park Rd
Start Date:	11/08/2015		End Date:	18/08/2015
Speed	**Summary**			
	Eastbound	**Westbound**	**Both Directions**	
5 day 85th Percentile Speed	49	48	48	
7 day 85th Percentile Speed	49	48	49	
5 day Mean Speed	44	43	43	
7 day Mean Speed	44	43	43	
5 day 3 - 4pm 85th Percentile Speed	47	47	47	

Street Name:	Miramar Ave			
Site ID:	1015A			
Location:	30M East of Stone St, Outside #67.			
East Bound	**bound traffic, travelling towards:**			Park Rd
West Bound	**bound traffic, travelling towards:**			Stone St
Start Date:	12/08/2015		End Date:	19/08/2015
Speed	**Summary**			
	Eastbound	**Westbound**	**Both Directions**	
5 day 85th Percentile Speed	40	41	40	
7 day 85th Percentile Speed	40	41	40	
5 day Mean Speed	33	35	34	
7 day Mean Speed	33	35	34	
5 day 3 - 4pm 85th Percentile Speed	37	37	37	

Street Name:	Miramar Ave			
Site ID:	1015B			
Location:	100M West of Stone St, Outside Kraus & Naimer.			
East Bound	**bound traffic, travelling towards:**			Stone St
West Bound	**bound traffic, travelling towards:**			Tauhinu Rd
Start Date:	14/08/2015		End Date:	21/08/2015
Speed	**Summary**			
	Eastbound	**Westbound**	**Both Directions**	
5 day 85th Percentile Speed	46	43	44	
7 day 85th Percentile Speed	47	44	45	
5 day Mean Speed	39	35	37	
7 day Mean Speed	39	36	38	
5 day 3 - 4pm 85th Percentile Speed	43	41	42	

Street Name:	Miramar Ave			
Site ID:	1015w			
Location:	40M East of Shelly Bay Rd.			
East Bound	**bound traffic, travelling towards:**			
West Bound	**bound traffic, travelling towards:**			Shelley Bay Rd
Start Date:	13/10/2015		End Date:	20/10/2015
Speed	**Summary**			
	Westbound			
5 day 85th Percentile Speed	52			
7 day 85th Percentile Speed	52			
5 day Mean Speed	46			
7 day Mean Speed	46			
5 day 3 - 4pm 85th Percentile Speed	51			

Street Name:	Miramar Ave			
Site ID:	1015e			
Location:	20M East of Shelly Bay Rd.			
East Bound	**bound traffic, travelling towards:**			Maupuia Rd
West Bound	**bound traffic, travelling towards:**			
Start Date:	13/10/2015		End Date:	20/10/2015
Speed	**Summary**			
	Eastbound			
5 day 85th Percentile Speed	48			
7 day 85th Percentile Speed	48			
5 day Mean Speed	43			
7 day Mean Speed	43			
5 day 3 - 4pm 85th Percentile Speed	48			

Appendix F. Road Safety Data

Road	Crash ID	Movement Description	Causes	Wet/dry	Light	Fatal	Serious	Minor
COBHAM DRIVE	20153329	CAR1 SBD on COBHAM DRIVE changing lanes/overtaking to right hit CAR2	CAR1 Did not check / notice another party behind	Dry	Bright Sun	0	0	0
COBHAM DRIVE	20154063	VAN1 NBD on COBHAM DRIVE hit rear end of CAR2 stop/slow for cross traffic	VAN1 following too closely, failed to notice car slowing	Wet	Overcast	0	0	0
COBHAM DRIVE	20121928	CYCLIST1 (Age 36)NBD on COBHAM DRIVE hit CAR2 merging from the left	CAR2 failed to give way at driveway, attention diverted by other traffic, visibility limited ENV: entering or leaving other non-commercial	Dry	Bright Sun	0	0	1
MAUPUIA ROAD	20153010	CAR1 SBD on MAUPUIA ROAD turning right hit VAN2 turning right into MAUPUIA ROAD	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright Sun	0	0	0
MAUPUIA ROAD	20125293	CAR1 EBD on MIRAMAR AVENUE hit CAR2 turning right onto MIRAMAR AVENUE from the left	CAR2 Did not check / notice another party, another vehicle	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20153646	CAR1 WBD on MIRAMAR AVENUE changing lanes/overtaking to right hit MOTOR CYCLE2	CAR1 attention diverted by other traffic, Did not check / notice another party behind	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20125614	TAXI1 EBD on MIRAMAR AVENUE hit CAR2 U-turning from opposite direction of travel	CAR2 Did not check / notice another party	Dry	Dark	0	0	0
MIRAMAR AVENUE	20131748	CAR1 NBD on HOBART ST hit MOPED2 crossing at right angle from right	MOPED2 Approaching a traffic control, Did not check / notice another party	Dry	Overcast	0	0	2
MIRAMAR AVENUE	20125180	CAR1 SBD on MIRAMAR AVENUE hit CAR2 crossing at right angle from right	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party, new driver / under instruction CAR2 suddenly swerved to avoid vehicle	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20141216	CYCLIST1 (Age 50)EBD on MIRAMAR AVENUE hit SUV2 turning right onto MIRAMAR AVENUE from the left	CYCLIST1 another party wearing dark clothing SUV2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Dark	0	0	1
MIRAMAR AVENUE	20143047	CAR1 EBD on MIRAMAR AVENUE hit rear end of CAR2 stopped/moving slowly	CAR1 too fast on straight, failed to notice car slowing	Wet	Overcast	0	0	0
MIRAMAR AVENUE	20115261	CAR1 EBD on MIRAMAR AVENUE hit CAR2 crossing at right angle from right	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party, inexperience	Wet	Dark	0	0	0
MIRAMAR AVENUE	20111702	CAR1 EBD on MIRAMAR AVENUE hit PEDESTRIAN crossing road from right side	CAR1 failed to give way to a pedestrian, defective vision	Dry	Bright Sun	0	0	1
MIRAMAR AVENUE	20121000	VAN1 EBD on MIRAMAR AVENUE hit MOTOR CYCLE2 turning right onto MIRAMAR AVENUE from the left	MOTOR CYCLE2 inattentive, Did not check / notice another party, new driver / under instruction	Dry	Bright Sun	0	0	1
MIRAMAR AVENUE	20143112	SUV1 EBD on MIRAMAR AVENUE hit parked veh, SUV1 hit Parked Vehicle	SUV1 emotionally upset/road rage, misjudged speed of own vehicle	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20151262	CAR1 EBD on MIRAMAR AVENUE hit PEDESTRIAN crossing road from left side	CAR1 failed to give way to a pedestrian, Did not check / notice another party	Dry	Dark	0	0	2
MIRAMAR AVENUE	20135179	CAR1 WBD on MIRAMAR AVENUE hit VEHB manoeuvring, CAR1 hit House Or Bldg	CAR1 Lost control Under Accelaration, wrong pedal / foot slipped ENV: entering or leaving shopping complex	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20135606	SUV1 EBD on MIRAMAR AVENUE lost control while overtaking	SUV1 too far left/right, overtaking	Dry	Dark	0	0	0
MIRAMAR AVENUE	20143528	CAR1 EBD on MIRAMAR AVENUE turning right hit CAR2 also turning right from opposite direction	CAR1 failed to give way at driveway CAR2 failed to give way at driveway ENV: entering or leaving other commercial	Dry	Dark	0	0	0
MIRAMAR AVENUE	20135521	CAR1 WBD on MIRAMAR AVENUE hit VAN2 turning right onto MIRAMAR AVENUE from the left	VAN2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Overcast	0	0	0
MIRAMAR AVENUE	20143115	SUV1 WBD on MIRAMAR AVENUE hit CAR2 merging from the right	CAR2 failed to give way at driveway ENV: entering or leaving service station	Dry	Overcast	0	0	0

MIRAMAR AVENUE	20143 6289	CAR1 EBD on MIRAMAR AVENUE hit TRUCK2 merging from the left	TRUCK2 failed to give way at driveway ENV: entering or leaving service station	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20153 1590	CAR1 EBD on MIRAMAR AVENUE turning right hit VAN2 also turning right from opposite direction	VAN2 failed to give way at driveway, misjudged intentions of another party ENV: entering or leaving other commercial	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20143 4458	TAXI1 WBD on MIRAMAR AVENUE hit CAR2 head on	CAR2 failed to keep left, did not see or look for other party until too late ENV: road slippery (rain), entering or leaving shopping complex	Wet	Over cast	0	0	0
MIRAMAR AVENUE	20151 3403	CYCLIST1 (Age 28)EBD on MIRAMAR AVENUE hit SUV2 turning right onto MIRAMAR AVENUE from the left	SUV2 Failed to give way At a priority traffic control, Did not check / notice another party, new driver / under instruction	Dry	Dark	0	0	1
MIRAMAR AVENUE	20141 7732	CAR1 SBD on MIRAMAR AVENUE hit CYCLIST2 (Age 67)crossing at right angle from right	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright Sun	0	0	1
MIRAMAR AVENUE	20121 2254	VAN1 SBD on TAUHINU ROAD hit CAR2 crossing at right angle from right	VAN1 Failed to give way At a priority traffic control, Did not check / notice another party CAR2 alcohol test above limit or test refused	Dry	Dark	0	1	1
MIRAMAR AVENUE	20131 2786	MOPED1 EBD on MIRAMAR AVENUE hit parked veh, MOPED1 hit Parked Vehicle	CAR2 Failed to give way At a priority traffic control	Dry	Bright Sun	0	0	1
MIRAMAR AVENUE	20143 0863	MOTOR CYCLE1 SBD on MIRAMAR AVENUE overtaking CAR2	MOTOR CYCLE1 another vehicle	Dry	Bright Sun	0	0	0
MIRAMAR AVENUE	20144 2108	SUV1 EBD on MIRAMAR AVENUE hit TRUCK2 turning right onto MIRAMAR AVENUE from the left	TRUCK2 Failed to give way At a priority traffic control	Wet	Over cast	0	0	0
PARK ROAD	20121 2556	CAR1 NBD on PARK ROAD hit PEDESTRIAN crossing road from right side	CAR1 failed to give way to a pedestrian, attention diverted while trying to find intersection	Dry	Bright Sun	0	0	1
PARK ROAD	20151 1771	CAR1 EBD on MIRAMAR AVENUE turning left hit PEDESTRIAN crossing PARK ROAD from right	CAR1 failed to give way to a pedestrian, Did not check / notice another party	Dry	Bright Sun	0	0	1
SHELLY BAY ROAD	20125 3696	CAR1 SBD on SHELLY BAY ROAD hit rear end of CAR2 stop/slow for queue	CAR1 following too closely	Dry	Bright Sun	0	0	0
SHELLY BAY ROAD	20111 2986	CYCLIST2 (Age 27)SBD on SHELLY BAY ROAD lost control while being overtaken by TRUCK1	CYCLIST2 incorrect merging/diverging manoeuvre, another vehicle	Dry	Over cast	0	0	1
TAUHINU ROAD	20125 4100	CAR1 SBD on TAUHINU ROAD hit rear of CYCLIST2 turning right from left side	CYCLIST2 Turned from incorrect position on road	Wet	Over cast	0	0	0
TAUHINU ROAD	20115 4747	CAR1 NBD on TAUHINU ROAD hit parked veh, CAR1 hit Parked Vehicle	CAR1 Inappropriate speed, too far left/right	Wet	Dark	0	0	0
TAUHINU ROAD	20153 0055	CAR1 WBD on TAUHINU ROAD hit rear end of CAR2 stop/slow for cross traffic	CAR1 Entering / On curve, following too closely CAR2 Suddenly Braked	Dry	Bright Sun	0	0	0
TAUHINU ROAD	20135 3577	CAR1 EBD on TAUHINU ROAD hit rear of left turning CAR2	CAR1 following too closely	Dry	Bright Sun	0	0	0
Z CPK NEW WORLD	20132 6297	CAR1 WBD on Z CPK NEW WORLD hit VEHB manoeuvring, CAR1 hit Cliff Bank	CAR1 driver over-reacted, wrong pedal / foot slipped	Dry	Bright Sun	0	0	1
Z FCT SHELL	20115 1993	CAR1 EBD on Z FCT SHELL hit Parked Vehicle while manoeuvring	CAR1 inattentive	Dry	Dark	0	0	0