



# BOYD'S BAY GARDEN WORLD REZONING

## MICRO-SIMULATION ASSESSMENT OF ULTIMATE TRAFFIC IMPACTS

FOR

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PTY.LTD**



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# CONTENTS

	Page
<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1 BACKGROUND	1
1.2 SCOPE	1
1.3 STUDY AREA	1
<b>2. 2031 BASE MODEL .....</b>	<b>3</b>
2.1 BACKGROUND	3
2.2 MODEL DEVELOPMENT	3
2.2.1 2031 Cross Border Traffic Master Plan	3
2.2.2 Model Extent	4
2.2.3 Model Periods	4
2.2.4 2031 Base Traffic Volumes	5
2.3 MODEL VALIDATION	7
2.3.1 Traffic Volume Validation	7
2.3.2 Number of Vehicles Variation	7
2.4 2031 BASE ROAD NETWORK PERFORMANCE	8
2.5 SUMMARY OF BASE ROAD NETWORK UPGRADES	11
<b>3. PROPOSED DEVELOPMENT .....</b>	<b>12</b>
3.1 DEVELOPMENT TRAFFIC GENERATION AND DISTRIBUTION	12
3.1.1 Traffic Generation Rates	12
3.1.2 Traffic Generation	13
3.1.3 Traffic Distribution	13
<b>4. ROAD NETWORK PERFORMANCE WITH PROPOSED DEVELOPMENT .....</b>	<b>15</b>
4.1 WOLLEMI PLACE INTERSECTION	15
4.2 PARKES DRIVE INTERSECTION	16
4.2.1 Pedestrian Provision at Parkes Drive	16
4.3 TUGUN BYPASS / PACIFIC HIGHWAY INTERSECTIONS	17
4.4 KENNEDY DRIVE INTERSECTIONS	18
4.5 SUMMARY OF DEVELOPMENT-REQUIRED UPGRADES	20
<b>5. MAXIMUM DEVELOPMENT TRAFFIC .....</b>	<b>21</b>
<b>6. IMPACT OF TRINGA DEVELOPMENT USING PARKES DRIVE.....</b>	<b>23</b>
6.1 TRINGA DEVELOPMENT	23
6.2 ROAD NETWORK PERFORMANCE	24
6.3 MAXIMUM TRAFFIC VOLUMES AT PARKES DRIVE	25
<b>7. SENSITIVITY ANALYSIS – REVISED BULKY GOOD TRIP GENERATION RATE ASSESSMENT.....</b>	<b>28</b>
<b>8. SUMMARY AND CONCLUSIONS .....</b>	<b>29</b>

## Tables

Table 2.1:	Cross Border Study Road Network Inclusions for 2021 and 2031
Table 2.2:	Cordon / Paramics Equivalence Table
Table 3.1:	Proposed Development Components
Table 3.2:	Bulky Goods Subcategories Peak Trip Generation Comparison
Table 3.3:	Peak Hour Development Traffic Generation
Table 3.4:	Proposed Development Options In/Out Peak Hour Volumes
Table 4.1:	Kennedy Drive Intersection Performance Comparison – AM Peak
Table 4.2 :	Kennedy Drive Intersection Performance Comparison – PM Peak
Table 5.1 :	Maximum Development Traffic Volumes and Screenshots
Table 5.2 :	Maximum Development Traffic Volumes / Hour

Table 6.1:	Tringa Development Trip Generation
Table 6.2:	Tringa Development Trips
Table 6.3:	Maximum Peak Hour Traffic Volumes
Table 6.4:	Performance with Recommended Maximum Traffic Volumes
Table 7.1:	Revised Site Traffic Generation

## Figures

Figure 1.1:	Micro-Simulation Study Area
Figure 2.1:	Base 2031 Paramics Model Extent and Road Network Inclusions
Figure 2.2:	2031 AM Peak Link Volumes (7:00am-9:00am)
Figure 2.3:	2031 PM Peak Link Volumes (4:00pm-6:00pm)
Figure 2.4:	Cross Border Cordon Links
Figure 2.5:	Number of Vehicles Comparison – AM Peak
Table 2.6:	Number of Vehicles Comparison – PM Peak
Figure 2.7:	Northern Intersection Failure Patterns and Upgrade Requirements
Figure 2.8:	Southern Intersection Upgrade Requirements
Figure 2.9:	Planned Through Traffic Overpass for Kennedy Drive
Figure 2.10:	Kennedy Drive Roundabout Intersection Performance
Figure 2.11:	Proposed Signalised Configuration for Kennedy Drive / Pacific Highway Interchange
Figure 3.1:	Proposed Development Peak Traffic Distribution
Figure 4.1:	Wollemi Place Intersection configuration and 2031 Peak Traffic Volumes
Figure 4.2:	Priority Controlled Intersection Failure with Development Traffic – AM Peak
Figure 4.3:	Parkes Drive Signalised Intersection Configuration
Figure 4.4:	Southbound Queuing at Tugun Bypass off-ramp
Figure 4.5:	Proposed Southbound Right Turn Lane
Figure 6.1:	Tringa Development
Figure 6.2:	Signalised Parkes Drive Intersection Performance with Tringa Development
Figure 6.3:	Parkes Drive Intersection Required Upgrades for Tringa Development
Figure 6.4:	Tringa Development Upgrade Requirements - Peak Period Queues Lengths
Figure 6.5:	Maximum Right Turn Queues – 120% Development Traffic (PM Peak)

## Appendices

Appendix A:	2031 Cross Border Cordon Outputs
Appendix B:	2031 Base Case Validation Results



## 1. INTRODUCTION

### 1.1 BACKGROUND

Bitzios Consulting had previously been engaged by Maro Developments/Leisure Brothers to undertake a transport assessment for the proposed rezoning of Lot 10 on DP 1084319 (referred to as Boyd's Bay Garden World) with the inclusion of Zone 5(b) land uses to reflect the intent of Tweed Shire Council's (TSC)'s Tweed Urban and Employment Lands Strategy 2009 (TUELS 2009).

Following the review of the previous transport assessment by TSC and the NSW Roads and Maritime Services (RMS, previously RTA), a meeting was held between the proponent, TSC and the RMS on the 24<sup>th</sup> November to discuss the limitations of the site as a result of the uncertainty into the potential traffic impacts from the proposed land use composition.

The meeting resolved that the proponent was to undertake further assessment into the ultimate traffic impacts to determine what amount of traffic generated by the site could be catered for without adversely impacting on the surrounding state and local road network. It was agreed at the meeting that the most suitable approach was to develop a Paramics micro-simulation model for the study area for the ultimate design year of 2031 and based on the recently completed 2031 Cross Border Transport Master Plan.

### 1.2 SCOPE

Based on outcomes of the meeting held between the proponent, TSC and RMS, this report includes the following:

- development of the micro-simulation model for 2031 based on the study area cordon outputs from the 2031 Cross Border Strategic Transport Model;
- review of planned road network upgrades within the study area and identification of upgrade requirements not yet assessed;
- assessment of the proposed development's traffic generation on the road network and confirmation of ultimate road network upgrades as a result of the proposed development;
- assessment of the maximum traffic generation feasible in and out of Parkes Drive to ensure that it does not result in adverse traffic performance within the study area; and
- assessment to determine the impacts and subsequent requirements as a result of the previously approved 'Tringa Industrial Development' should it access Parkes Drive.

It should be noted that this report elaborates on the potential impacts and requirements of the development as previously determined within the initial report titled "*P0777.004R Boyds Bay Business Park Transport Assessment Report*".

### 1.3 STUDY AREA

Consistent with the previous transport assessment, the study area for the micro-simulation model is shown in Figure 1.1 and includes the following primary intersections:

- Parkes Drive/ Pacific Highway northbound CD Road;
- Wollemi Place / Pacific Highway northbound CD Road;
- Tugun Bypass / Pacific Highway Interchange - eastern signalised intersection;
- Tugun Bypass / Pacific Highway Interchange – western signalised intersection;
- Kennedy Drive/ Pacific Highway Interchange – eastern roundabout intersection; and
- Kennedy Drive/ Pacific Highway Interchange – western roundabout intersection.



**Figure 1.1: Micro-Simulation Study Area**

## 2. 2031 BASE MODEL

### 2.1 BACKGROUND

Previous assessments using Sidra intersection models of the base year (2011), 10 year design horizon (2021) and 20 year ultimate design horizon (2031) have been presented and accepted by both TSC and RMS. This report expands on the previous 2031 assessments by focusing on the interaction between intersections within the study area using micro-simulation modelling.

Typically, micro-simulation models are created using existing traffic networks and traffic data to ensure the model is valid to current conditions. However, as this assessment is based only on validated 2031 strategic transport model data and includes significant future planned road network upgrades, it was agreed by TSC, RMS and the proponent that the base model development process is irrelevant and not required as part of this study.

It should be noted that due to these specific requirements for modelling only future years, full compliance with the RMS Paramics Manual is not relevant and as such not been included within this report.

### 2.2 MODEL DEVELOPMENT

#### 2.2.1 2031 Cross Border Traffic Master Plan

To determine the impacts from traffic growth associated with various planned and approved developments over the next 20 years, TSC in conjunction with Gold Coast City Council (GCCC), RMS and the Queensland Department of Transport and Main Roads (DTMR) commissioned the development of a Cross Border Traffic Master Plan. The stated objectives of the Master Plan development included:

- identifying and assessing options for optimising the interaction of the Pacific Highway (including the Tugun Bypass) with the adjacent urban arterial road network with the aim of promoting local function trips on the local network and minimising reliance on the Pacific Highway/Pacific Motorway;
- optimising highway interchanges to provide the most appropriate levels of service and outline implementation arrangements to provide connectivity between the growth areas and local and regional facilities such as the Gold Coast Airport and John Flynn Hospital; and
- improving pedestrian and public transport connectivity including integration with the proposed future extension of the Gold Coast Rail Line to the Gold Coast Airport.

Table 2.1 provides a list of the road network inclusions for 2031 Cross Border Master Plan as agreed by the study stakeholders. Data from the Cross Border strategic modelling forms the basis for the determination of potential traffic volumes within proximity to the subject site.

**Table 2.1: Cross Border Study Road Network Inclusions for 2031**

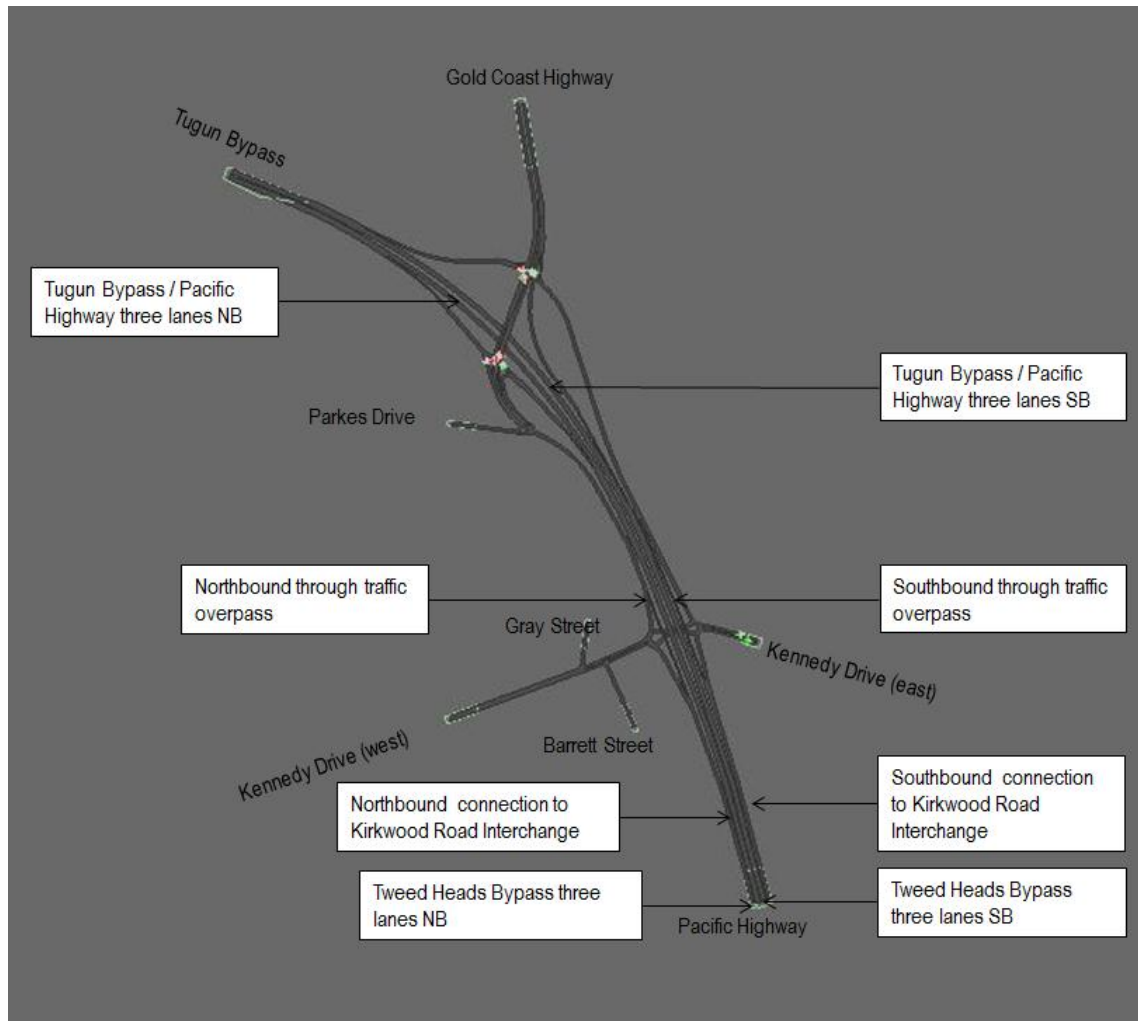
Road Network Upgrades	2031 Configuration
Additional (southern) access to Gold Coast Airport	included
Kirkwood Road interchange	included
Scenic Drive Diversion	included
McAlisters Road extension	included
Cobaki Parkway (from Kennedy Drive to Boyd Street)	four lanes
Boyd Street (from Cobaki Parkway to the Gold Coast Highway)	four lanes
Pacific Highway (from Kirkwood Road to Kennedy Drive)	six lane road + 2 service roads (one-way, two lanes /direction)
Pacific Highway Banora Point upgrade	included
GCCC Priority Infrastructure Plan projects	included
TSC Road Contribution Plan projects	included

Road Network Upgrades	2031 Configuration
Pacific Motorway between Stewart Road and Mudgeeraba Interchange (i.e. Robina Town Centre Drive)	eight lanes
Pacific Motorway between Mudgeeraba Interchange and Nerang South (i.e. Nielsens Road)	eight lanes

Source: Cross Border Traffic Study (2011)

### 2.2.2 Model Extent

Figure 2.1 demonstrates the model extents and road network inclusions by 2031.



**Figure 2.1: Base 2031 Paramics Model Extent and Road Network Inclusions**

### 2.2.3 Model Periods

Models were developed for the following 2 hour AM and PM peak periods which are consistent with the strategic transport model cordons extracts from the Cross Border model:

- AM Peak - 7:00am to 9:00am; and
- PM Peak – 4:00pm to 6:00pm.

Each model also included a 15 minute warm-up period and cool-down period on either side of the assessed peak period to ensure network performance was realistic during the assessed peak period.



## 2.2.4 2031 Base Traffic Volumes

Figure 2.2 and 2.3 demonstrates the AM and PM peak traffic volumes from the Cross Border Strategic Model for each link within the study area.

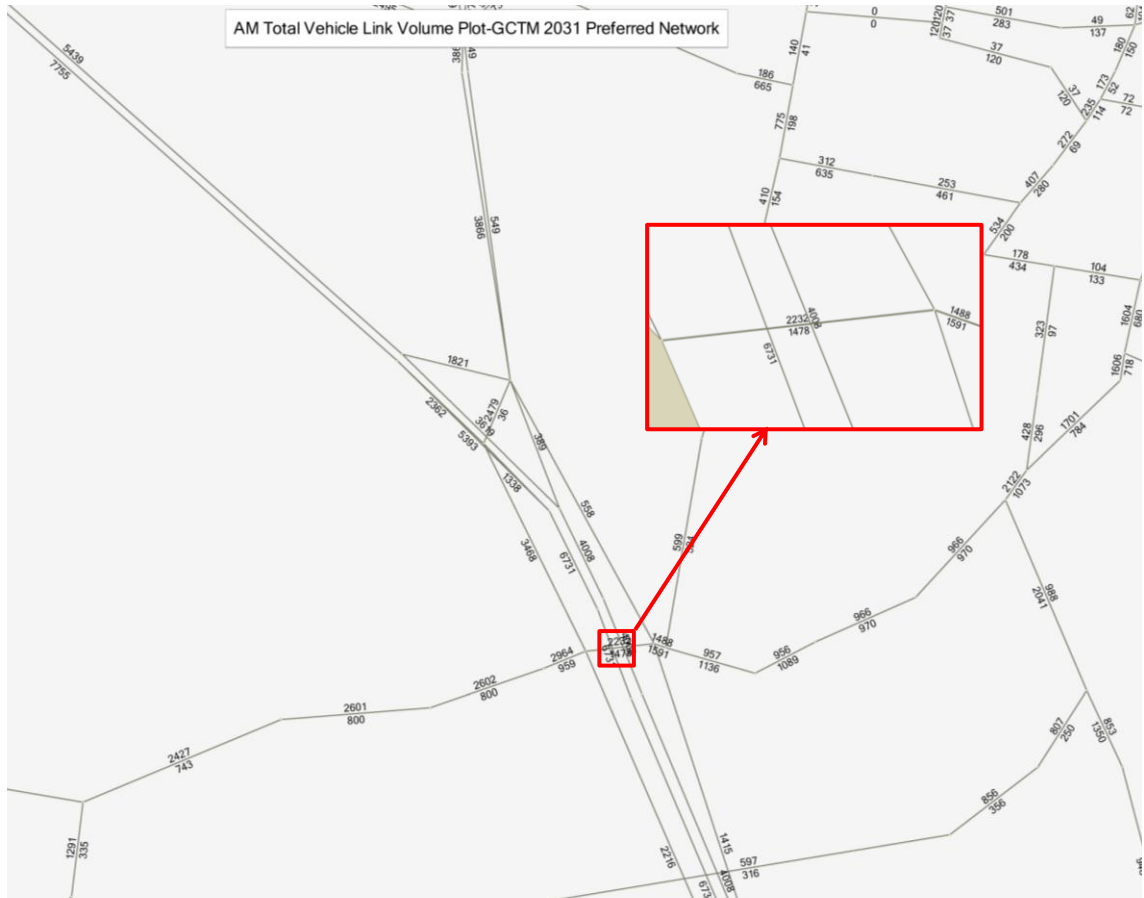


Figure 2.2: 2031 AM Peak Link Volumes (7:00am-9:00am)

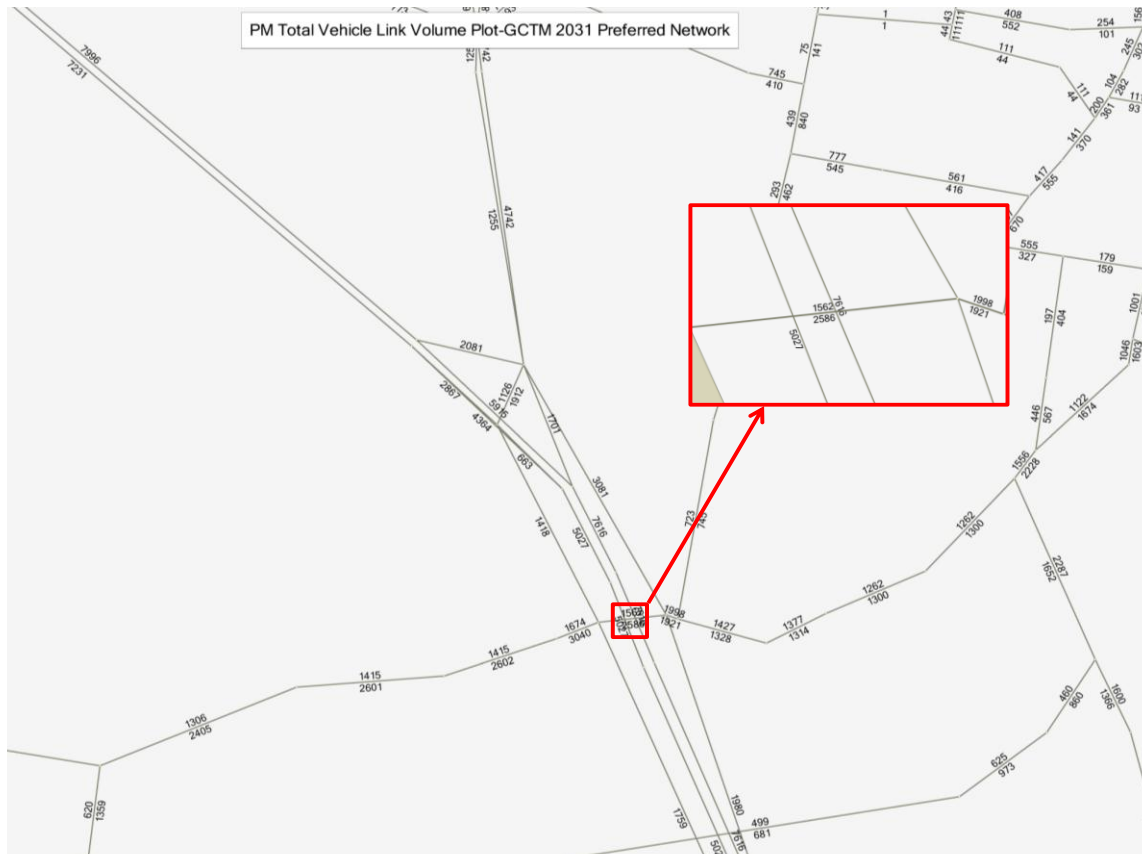
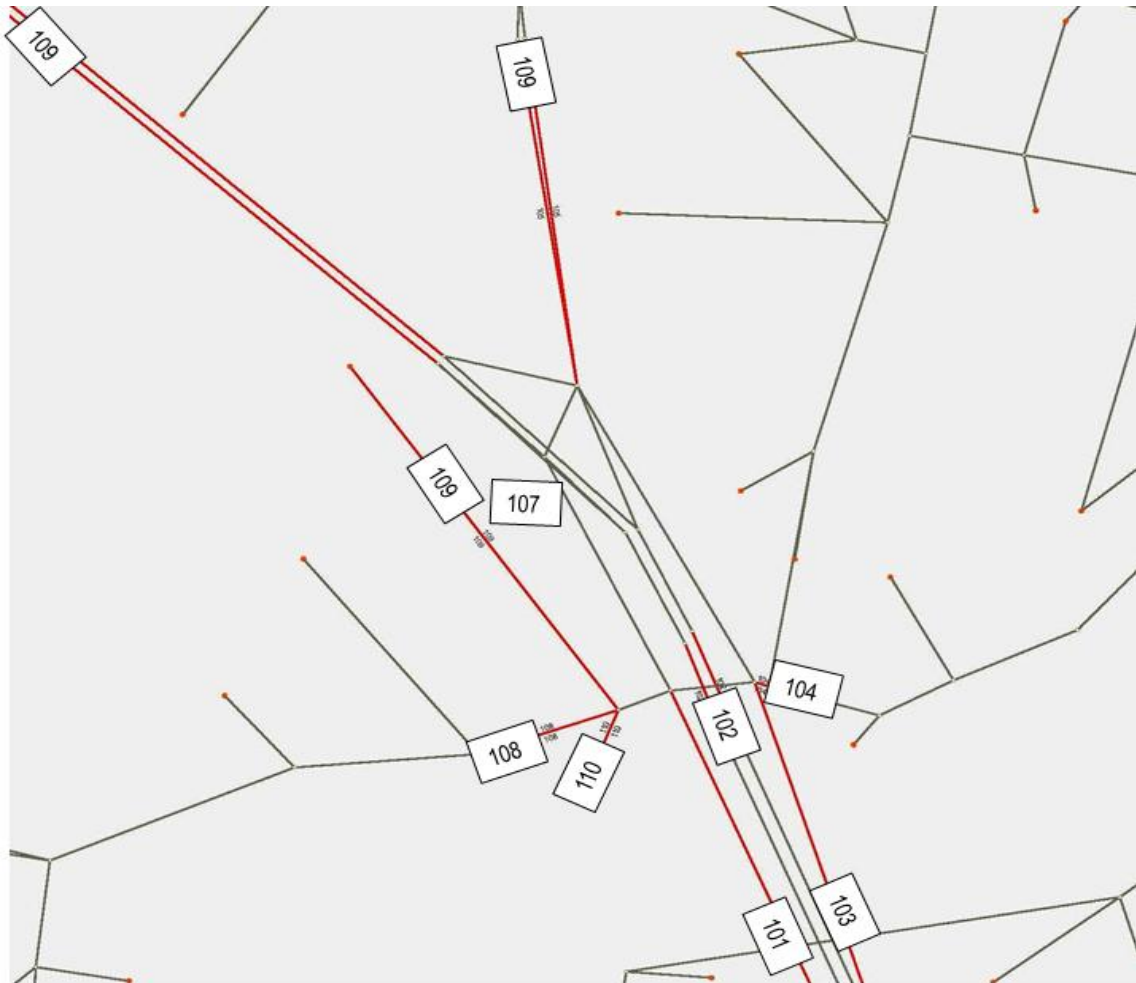


Figure 2.3: 2031 PM Peak Link Volumes (4:00pm-6:00pm)

Peak period traffic volumes for both standard vehicles (PV) and commercial vehicles (CV) were extracted using defined model cordons for the study area from the 2031 Cross Border Model. Figure 2.4 demonstrates the cordon extraction extent with Appendix A providing the cordon matrices for each peak period. Table 2.2 provides the respective Cordon and Paramics Zone location.



**Figure 2.4: Cross Border Cordon Links**

**Table 2.2: Cordon / Paramics Equivalence Table**

Cordon No.	Paramics Zone	Location
101	1	NB CD Road at Tweed River Bridge
102	2	Pacific Highway at Tweed River
103	3	SB CD Road at Tweed River Bridge
104	4	Kennedy Drive east before Ducat St
105	5	Gold Coast Highway north of Tugun Bypass interchange
106	6	Tugun Bypass
107	7	Parkes Drive (not in Cross Border Model)
108	8	Kennedy Drive west before Gray Street
109	9	Rose St
110	10	Barrett St
-	11	Wollemi Place (not in cross Border Model)
-	12	Tringa Development link (not with model)

## 2.3 MODEL VALIDATION

To ensure that modelled intersection volumes and route choice through the model is accurate, the base case Paramics model has been validated against link and turn data outputs at the major intersections and links within the 2031 Cross Border model.

As strategic models do not accurately take into consideration node and intersection configurations, constraints and delays, the base case validation has been undertaken for the improved base case model. This allows traffic demands to pass through the network consistent with the strategic model outputs.

### 2.3.1 Traffic Volume Validation

The comparison between the modelled and strategic traffic count data was undertaken using the commonly used GEH statistic, which measures the degree of divergence of the modelled value from the observed value whilst accounting for the relative scale of each movement-volume (i.e. the higher volume movements are more important to match to than the lower volume movements). GEH results less than 5 indicated acceptable comparisons between observed and modelled counts.

GEH validation checks have been undertaken across all five RMS recommended seed values (i.e 28,560,2849,7771 and 86524) with results demonstrated within Appendix B. The validation assessment confirmed that the average GEH for AM and PM models was 0.87 and 0.69 respectively. Therefore, both the AM and PM modelled volumes are deemed to be valid against 2031 data within the study area.

### 2.3.2 Number of Vehicles Variation

To ensure robustness of the model, the number of vehicles within the model was assessed across all five (5) seed values as demonstrated within Figures 2.5 and 2.6 for AM and PM peak models respectively.

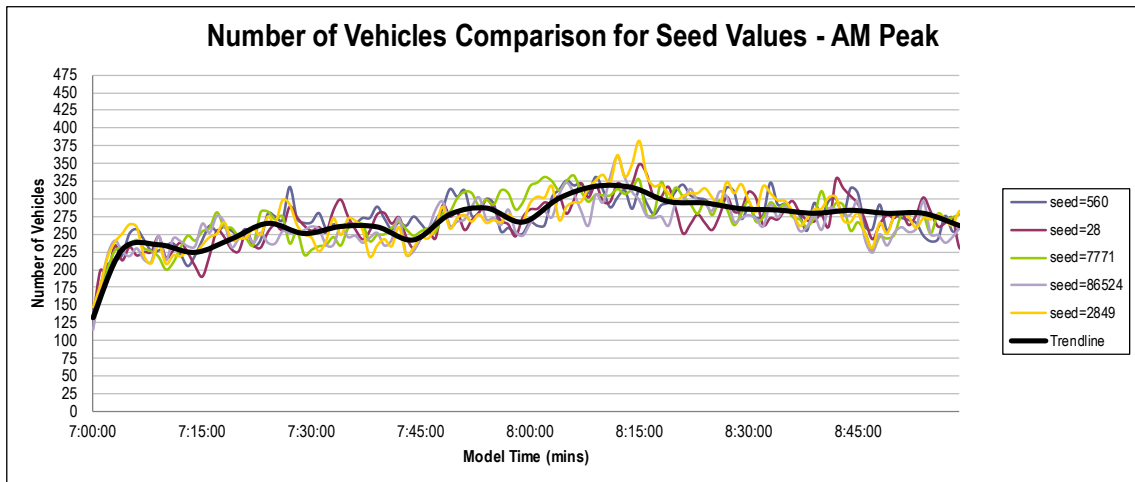


Figure 2.5: Number of Vehicles Comparison – AM Peak

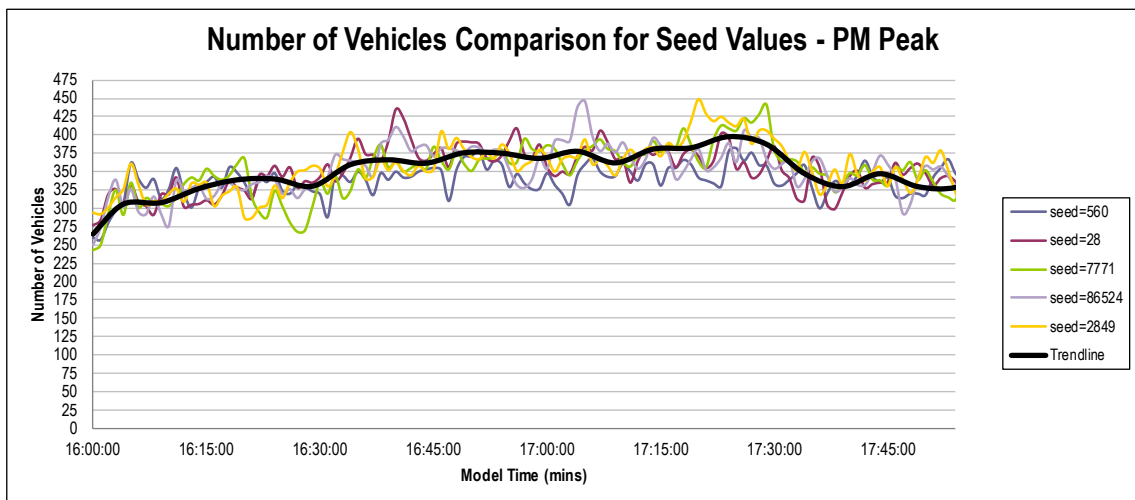


Table 2.6: Number of Vehicles Comparison – PM Peak

Both AM and PM models demonstrate an adequate level of robustness across the seed values. The base case models are therefore valid to confirmed input data from the 2031 Cross Border Model and considered fit for the purpose.

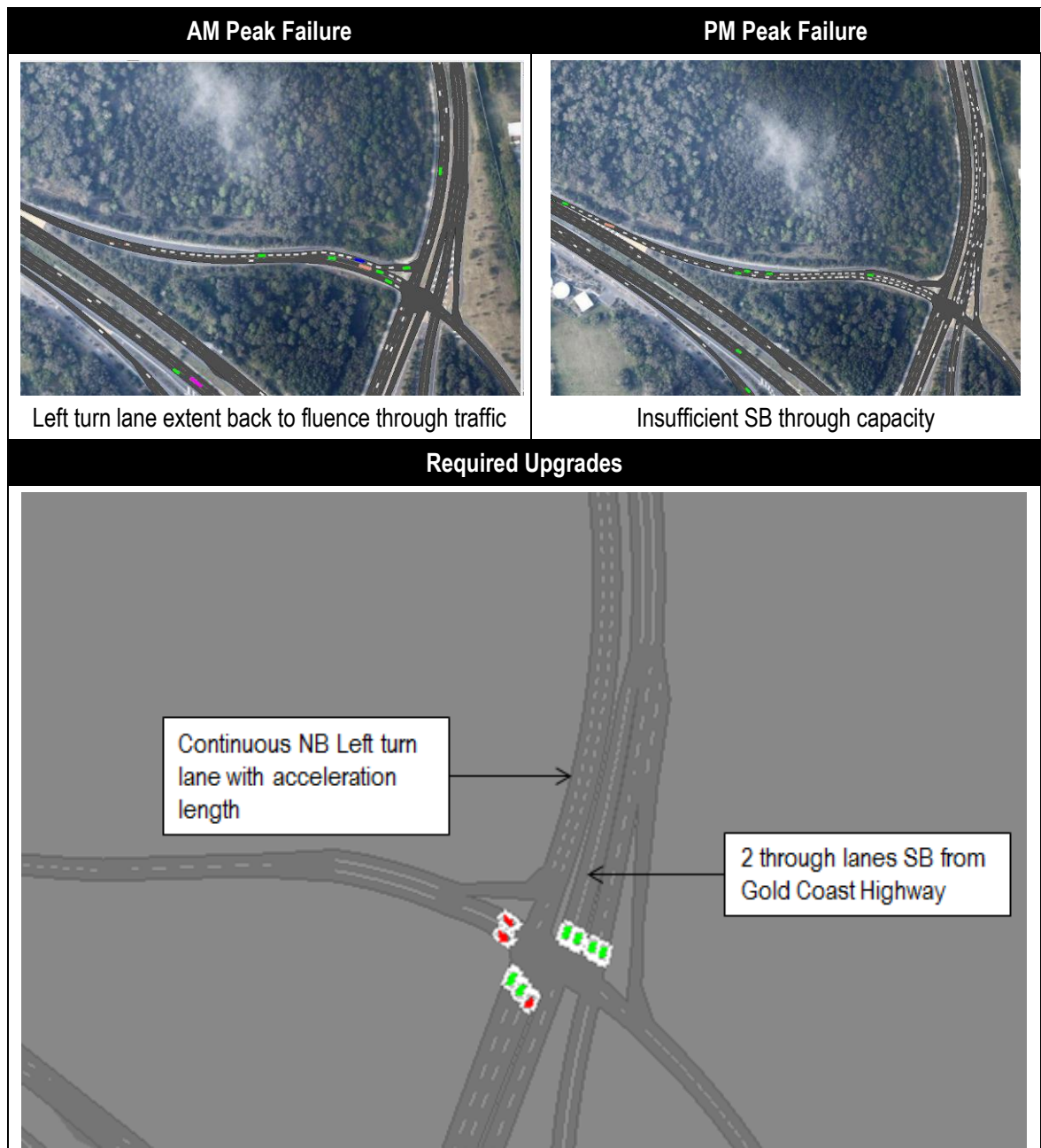
## 2.4 2031 BASE ROAD NETWORK PERFORMANCE

The 2031 base road network requires specific upgrades at intersections to cater for the background traffic. These intersections include:

- Tugun Bypass /Pacific Highway Interchange intersections; and
- Kennedy Drive Roundabout intersections.

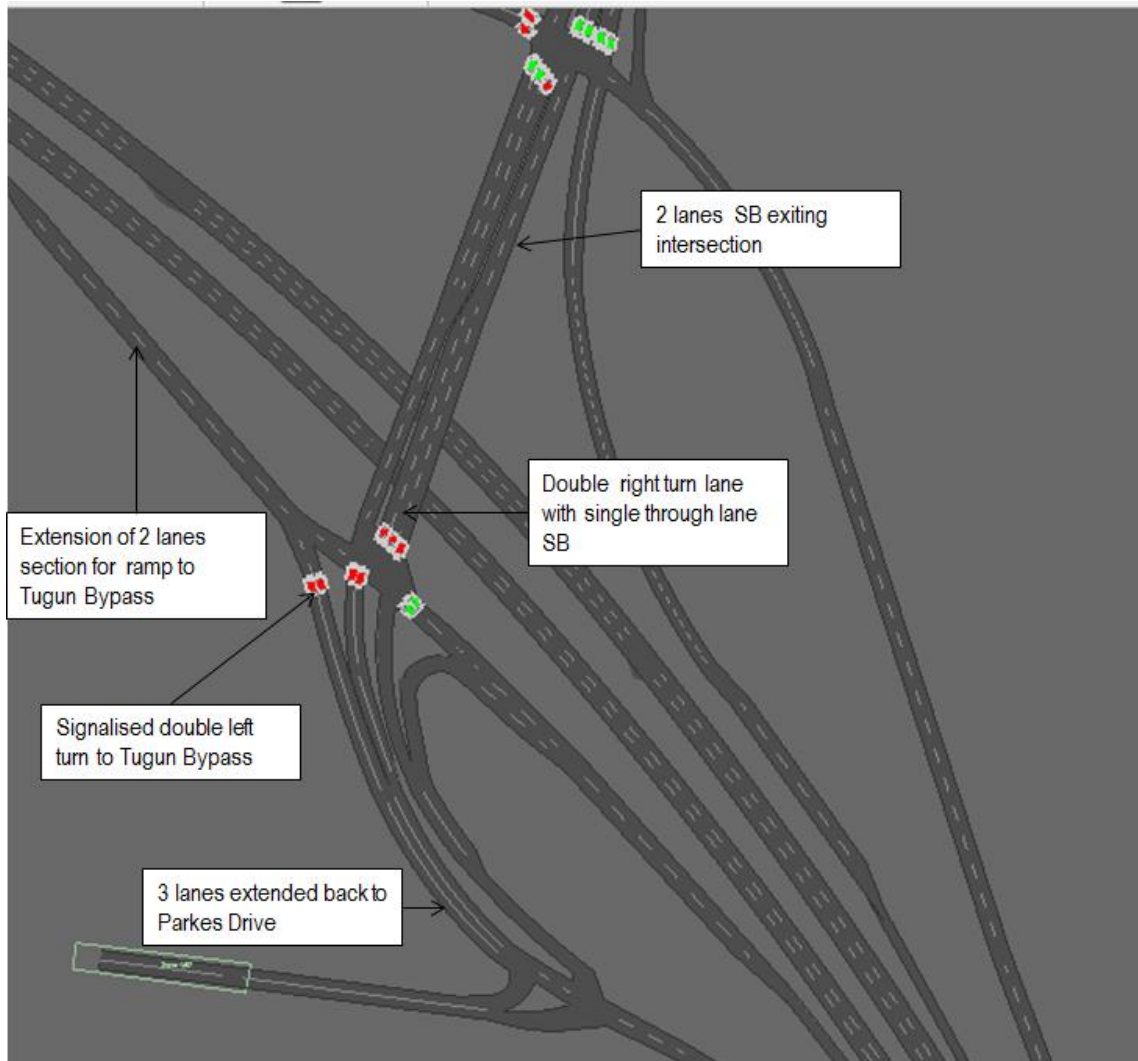
### ***Tugun Bypass / Pacific Highway Interchange***

The existing configuration of the Tugun Bypass / Pacific Highway interchange intersections are currently designed as 'interim only', with road reserve built into the design to cater for future upgrades. The northern interchange intersection requires upgrades in both the AM peak and PM peak as shown in Figure 2.7. Following the inclusion of these upgrades, the southern intersection shall require subsequent upgrades as shown in Figure 2.8.



**Figure 2.7: Northern Intersection Failure Patterns and Upgrade Requirements**





**Figure 2.8: Southern Intersection Upgrade Requirements**

### ***Kennedy Drive Roundabout Intersections***

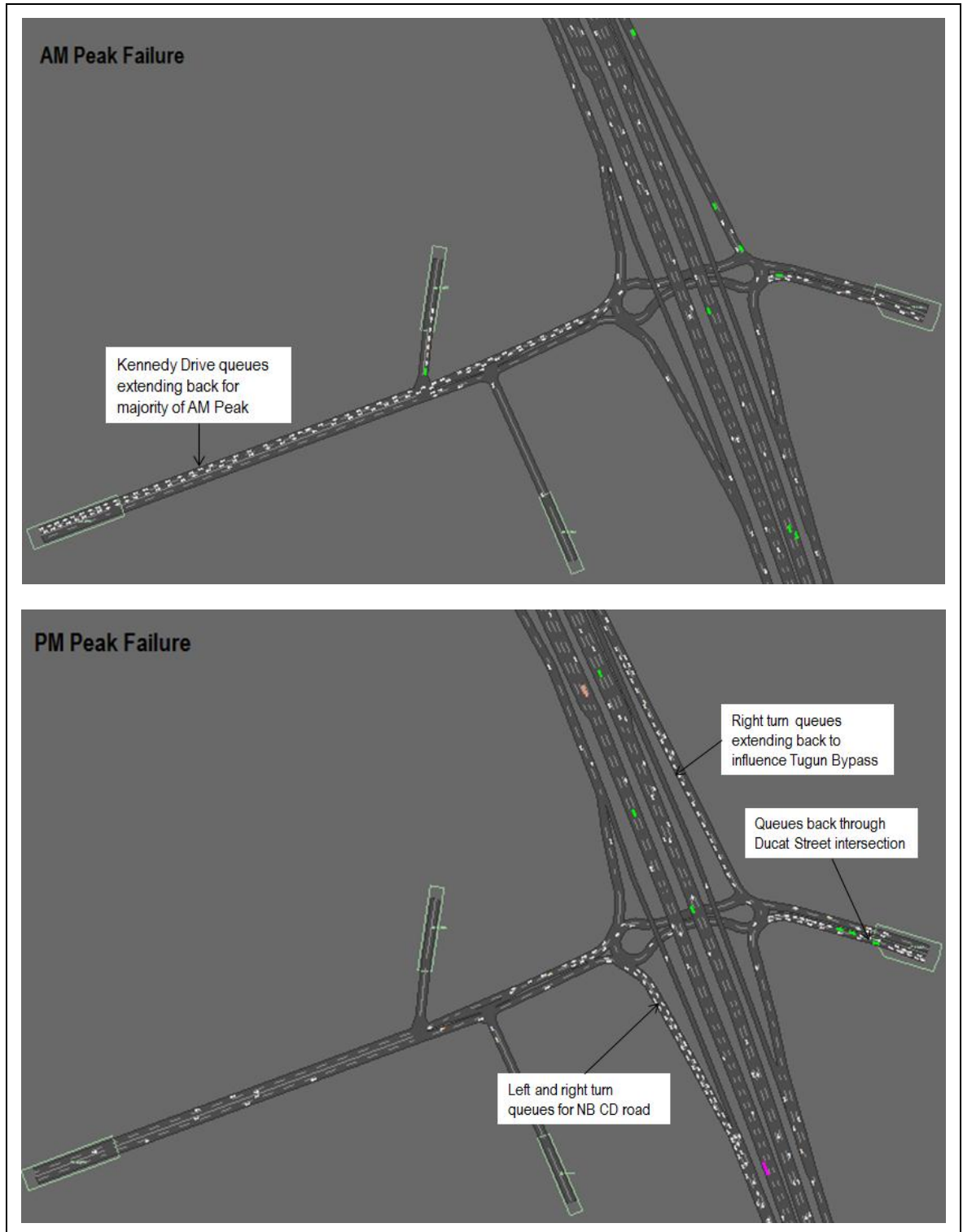
By 2031, the planned upgrades for the Kennedy Drive interchange intersection are to include northbound and southbound through traffic overpasses whilst still retaining the existing roundabout intersection as depicted in Figure 2.9 below.



**Figure 2.9: Planned Through Traffic Overpass for Kennedy Drive**

Previous assessment of these intersections' future requirements undertaken by Parsons Brinkerhoff using Sidra recommended to retain the roundabout intersection instead of upgrading to signals. However, a

review of this assessment noted discrepancies of the input data for the Sidra assessment and also did not take into consideration the interaction between surrounding intersections. The resultant network performance under base traffic conditions in 2031 while retaining the roundabout is long queues extending back along Kennedy Drive beyond the study area during the AM as well as long queues and associated delays extending back along the northbound and southbound CD roads in the PM peak as shown in Figure 2.10.



**Figure 2.10: Kennedy Drive Roundabout Intersection Performance**

Consistent with the existing situation along Kennedy Drive, long residual queues for the eastbound approach of Kennedy Drive occur due to two conflicting right turn movements with priority at the roundabout intersection (northbound and eastbound approaches). Therefore, the high traffic volumes eastbound result in long queues early in the peak period and remain present even when opposing turn movements are not comparatively high.

This constraint within the future road network does not allow background traffic growth through to each assessed intersection and as a result limits the potential traffic passing the proposed development site. As such, the roundabout intersections have been assessed as signals in order to both test the effectiveness of signals at this location but also to “un-constrain” the model to allow traffic to pass through the network and properly assess the impacts and/or limitations on development access intersections. Figure 2.11 shows the required configuration at the Kennedy Drive roundabouts should they be upgraded to signals.



**Figure 2.11: Proposed Signalised Configuration for Kennedy Drive / Pacific Highway Interchange**

The inclusion of signals on Kennedy Drive greatly improves the performance of Kennedy Drive by providing dedicated green time for each movement. This configuration also allows the coordination of signals between the new signals and the existing signals at Ducat Street.

## 2.5 SUMMARY OF BASE ROAD NETWORK UPGRADES

Following a review of the 2031 base models, the following road network upgrades are required to cater for background traffic during peak periods:

- Construct a continuous left turn lane from the Tugun Bypass SB off-ramp to Gold Coast Highway NB;
- Construct a second SB through lane for Gold Coast Highway SB to the Pacific Highway / Tugun Bypass overpass;
- Construct a second right turn lane from overpass to the Tugun Bypass NB on-ramp;
- Construct a signalised double left turn for the northbound CD road approach to the Tugun Bypass NB on-ramp; and
- Convert the existing roundabout intersections at Kennedy Drive to signals.

It should be noted that the above-mentioned required upgrades derived from the micro-simulation assessment are consistent with the findings within the initial Sidra assessment undertaken for this study.



### 3. PROPOSED DEVELOPMENT

In maintaining consistency with the previous assessment provided to TSC and the RMS, traffic generation for the proposed development composition remains unchanged. The development is generally proposed to include a range of Bulky Goods Retail and Business Park land uses. It is noted that the RMS had previously had concerns regarding the inclusion of Bulky Goods within the site. However, this assessment has included the initial level of bulky goods to confirm its acceptability as a viable land use for the site. For the purpose of assessing the potential traffic generated by the proposed development, Table 3.1 provides a breakdown of the proposed development components.

**Table 3.1: Proposed Development Components**

Proposed Development Land Use	No. Buildings	Site Area/Per Floor (m <sup>2</sup> )	Floors	Gross Floor Area (GFA) m <sup>2</sup>
Business Park	4	2,225	3	26,700
Bulky Goods Retail	1	13,480	1	13,480
<b>Total Gross Floor Area (m<sup>2</sup>)</b>				<b>40,180</b>

TSC and RMS are advised that the floor areas used within this assessment are deemed conservative, as the practical site composition after considering the sites parking requirements, landscaping, setbacks and internal roadways would be less than initially estimated.

Primary access to the site shall be via the existing site access from Parkes Drive to the north. In addition, the existing access to the south east via Wollemi Place is proposed to be used as exit only.

### 3.1 DEVELOPMENT TRAFFIC GENERATION AND DISTRIBUTION

#### 3.1.1 Traffic Generation Rates

As this application is for rezoning only, the precise land use components are not fully determined. Traffic generation for Bulky Goods land uses varies considerably depending on the specific type of retail component. The RTA's Guideline for Traffic Generating Developments states that peak traffic generated by Bulky Goods (retail) is approximately 2.5 trips per 100m<sup>2</sup>. However, this rate does not specify the applicable types of Bulky Goods and as such RTA have requested further assessment into the applicable traffic generation rates for the proposed development.

Bitzios Consulting recently undertook a review of various traffic generation rates for Bulky Goods in South East Queensland that were undertaken by the Queensland Department of Transport and Main Roads as detailed in Table 3.2 below.

**Table 3.2: Bulky Goods Subcategories Peak Trip Generation Comparison**

Bulky Goods Land Use Type Subcategories	Thursday PM Rate (trips/100m <sup>2</sup> GFA)	No. Surveys	Saturday Morning Rate (trips/100m <sup>2</sup> GFA)	No. Surveys
Electrical	6.95	2	-	0
Furniture	2.10	5	2.86	2
Hardware	2.98	5	9.17	4
Recreational Retail	4.48	2	-	0
Office Supplies	2.94	1	8.97	2
Boating Camping and Fishing Retail	4.53	1	3.33	1
Auto Parts Retail	-	0	12.23	2

Bulky Goods Land Use Type Subcategories	Thursday PM Rate (trips/100m <sup>2</sup> GFA)	No. Surveys	Saturday Morning Rate (trips/100m <sup>2</sup> GFA)	No. Surveys
Miscellaneous	-	0	8.73	2
<b>Average</b>	<b>3.48</b>		<b>8.12</b>	

The average trip generation for Hardware (e.g. Bunnings) is 2.98 trips per 100m<sup>2</sup> during the PM peak and 9.17 trips per Saturday morning peak. Whilst the highest peak traffic generation for these types of land uses occurs during the Saturday morning period, the most critical time for the subject site is the weekday PM peak period which coincides with background commuter peak.

The above weekday peak for Hardware / Home Improvements is greater than the RTA rate. However, it is considered a that reduced traffic generation rate is applicable for the subject site due to the following considerations:

- the only existing competing Bunnings is located at South Tweed Heads with a catchment that extends as far north as Tugun and south to Ocean Shores. Therefore, the majority of trips that would historically travel to the competing site would subsequently be included within background traffic; and
- there is expected to be a level of diverted trips due to passing trade, particularly on the northbound CD road.

No reductions have been made to the background traffic levels to cater for these potential traffic pattern variations. Based on the above, it is considered appropriate to use the RTA's rate of 2.5 trips/100m<sup>2</sup> for the purpose of this assessing the AM and PM weekday peak periods. In addition it is considered conservative to assess AM peak periods using the above rates as this is typically for PM peaks only.

### 3.1.2 Traffic Generation

Table 3.3 demonstrates the potential traffic generated by the proposed development using rates as per RTA's Guideline for Traffic Generating Developments as determined above.

**Table 3.3: Peak Hour Development Traffic Generation**

Proposed Development Land Use	Gross Leasable Area (m <sup>2</sup> )	RTA Trip Generation Rate/100m <sup>2</sup> (two-way)	Peak Hour Trips (two-way)	Directionality	
				In/Out (%)	
				AM Peak	PM Peak
Business Park	26,700	1.1	293.7	70/30	30/70
Bulky Goods (retail)	13,480	2.5	337	60/40	40/60
<b>Total</b>	<b>40,180</b>		<b>631</b>		

Table 3.4 demonstrates the resultant peak hour trips in and out of the development for AM and PM peak periods

**Table 3.4: Proposed Development Options In/Out Peak Hour Volumes**

Proposed Development Land Use	AM Peak		PM Peak	
	In	Out	In	Out
Business Park	206	88	88	206
Bulky Goods (retail)	202	135	135	202
<b>Total Trips</b>	<b>408</b>	<b>223</b>	<b>223</b>	<b>408</b>

### 3.1.3 Traffic Distribution

Traffic distribution to and from the development is consistent with the previous Sidra assessment and is shown in Figure 3.1.

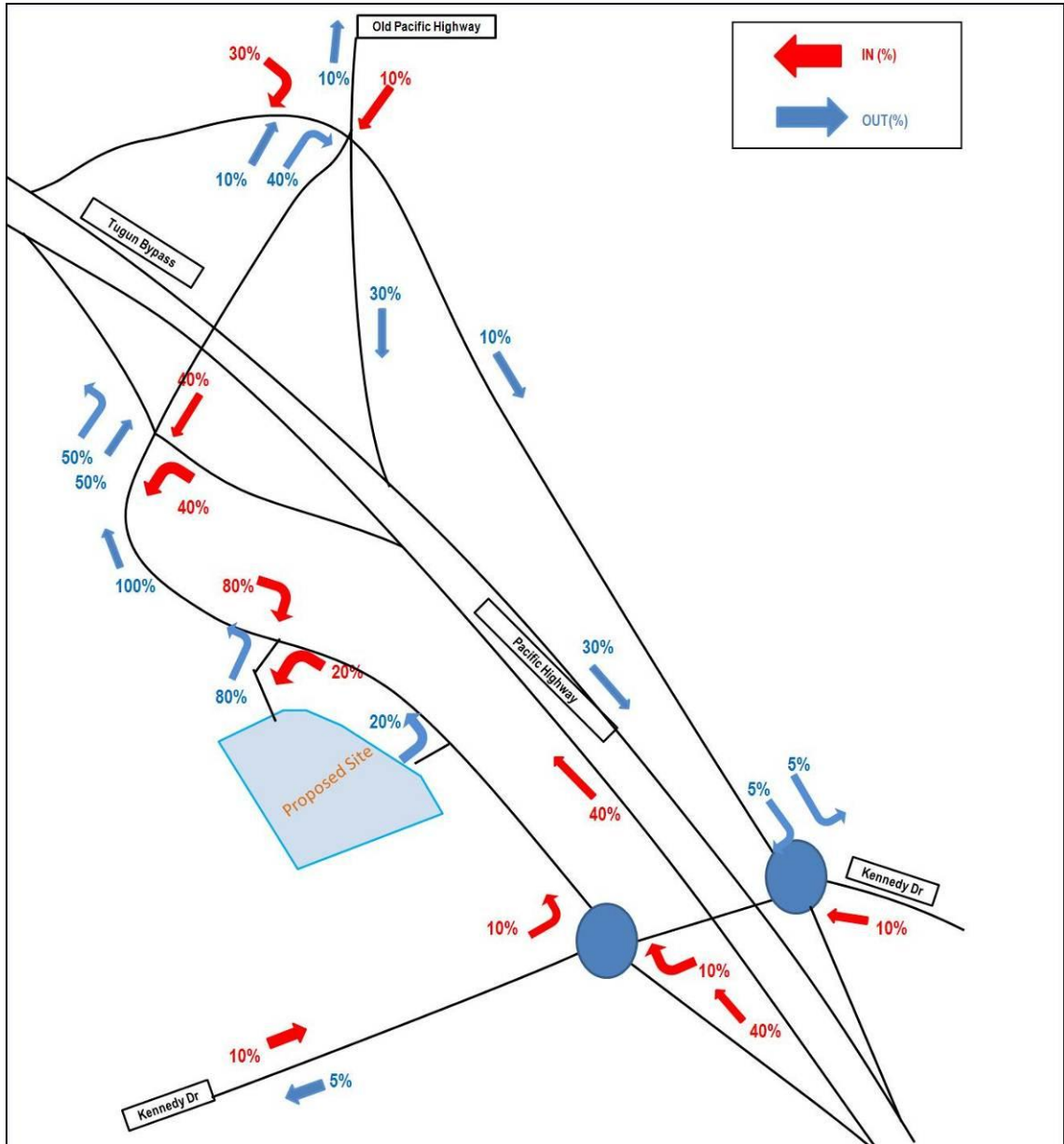


Figure 3.1: Proposed Development Peak Traffic Distribution

## 4. ROAD NETWORK PERFORMANCE WITH PROPOSED DEVELOPMENT

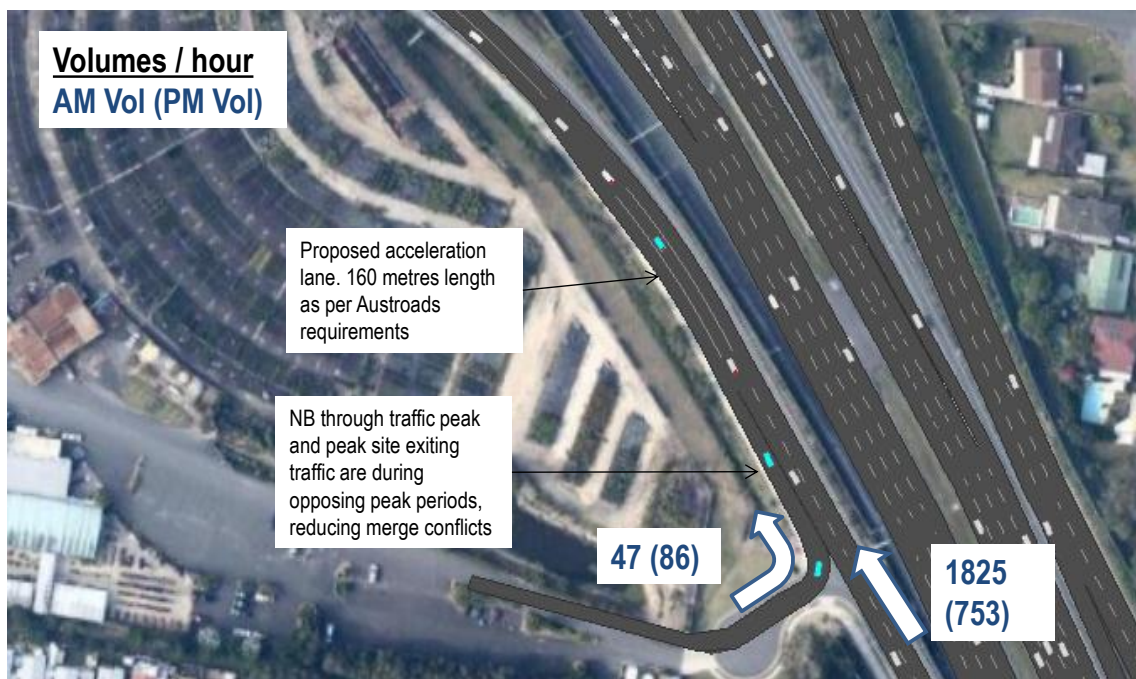
The base 2031 road network was modelled in Paramics with the inclusion of the proposed development traffic. This section details the impacts and required upgrades within the network to cater for the proposed development.

### 4.1 WOLLEMI PLACE INTERSECTION

The Wollemi Place intersection is proposed to be an 'exit only' and designed to allow egress of the site for staff and service vehicles. Assessment of the existing configuration demonstrated that whilst the traffic volumes are expected to be low out of the site in both the AM and PM peaks, potential conflicts and safety concerns would be present between vehicles exiting the site and the northbound traffic past the site. As a result it is proposed to provide an acceleration lane with merge length from Wollemi Place to negate these safety concerns. As vehicles using this exit from the site are primarily outside peak periods, this configuration is considered appropriate to provide safe and equitable access to the site and will not adversely impact the northbound CD road past the site.

Figure 4.1 shows the peak period traffic volumes and the proposed inclusion of an acceleration lane. As traffic volumes are low exiting the site and northbound traffic past the site is expected to be metered as a result of Kennedy Drive intersection, the potential for weave and kerbside lane dependence is not considered to be an adverse issue. The model demonstrates that vehicles can continue to safely merge from the slip lane as well as access Parkes Drive. It is noted that maximum traffic volumes for opposing movements is during alternate peak periods, which reduces any potential issues associated with this configuration.

A weave assessment using the Highway Capacity Manual Software (HCS) has been undertaken for 2031 AM and PM traffic volumes in, out and passing the site for the proposed separation of intersections. This assessment derived a volume/capacity ratio of 0.602 and 0.297 respectively, demonstrating that the potential conflicting traffic movements will not exceed acceptable limits.



**Figure 4.1: Wollemi Place Intersection configuration and 2031 Peak Traffic Volumes**

The level of development traffic able to use this access is expected to be designed into the internal road layout and allow egress from staff and loading areas only. As such, it is expected that the precise configuration of this access point will be determined and more thoroughly examined during the further detailed development assessment. At this stage of assessment, it is suggested that RMS restrict entry to the site via Wollemi Place but continue to allow site egress.



## 4.2 PARKES DRIVE INTERSECTION

The existing priority controlled intersection with inclusion of development traffic in 2031 results in 140 metre queues and lengthy delays when entering Parkes Drive in the AM peak as shown in Figure 4.3. Therefore, Parkes Drive will require signalisation to cater for 2031 peak period traffic volumes.



**Figure 4.2: Priority Controlled Intersection Failure with Development Traffic – AM Peak**

The inclusion of signals at Parkes Drive intersection as shown in Figure 4.3 provides dedicated green time for turning movements. The configuration would require a left turn slip lane for NB traffic entering Parkes Drive. Signal phasing requires only two phases as turning traffic in and out of Parkes Drive will run concurrently. Also, the turning approaches do not require any additional stand-up lanes. Further assessment into the ultimate capacity of this intersection is detailed within Section 5.0.



**Figure 4.3: Parkes Drive Signalised Intersection Configuration**

### 4.2.1 Pedestrian Provision at Parkes Drive

RMS highlighted concerns for pedestrians and off-road cyclists at the Parkes Drive intersection with the inclusion of signals. This concern has arisen due to the planned Southern Cross University expansion at Gold Coast Airport and potential for increase in pedestrian and cycle trips between the University and West Tweed Heads/ Kennedy Drive. A review of the surrounding residential areas and demographics suggests that tertiary students would be more inclined to reside at surrounding coastal suburbs such as Kirra, Bilinga and Coolangatta as opposed to West Tweed Heads / Kennedy Drive. Therefore, pedestrian volumes past



the Parkes Drive intersection are not expected to warrant major design considerations when signalling the intersection.

Irrespective of the volumes of expected pedestrians at the intersection, the proposed configuration allows pedestrians to continue along the CD road during the A Phase and shall only be stopped during B Phase when vehicles are turning in and out of Parkes Drive. The left turn slip lane shall be provided with a zebra crossing facility with clear sight lines for both approaching vehicles and pedestrians.

### 4.3 TUGUN BYPASS / PACIFIC HIGHWAY INTERSECTIONS

During the AM peak, both signalised intersections continue to perform acceptably and do not require any further upgrades. However, during the PM peak period, turning traffic into the site from the Tugun Bypass off-ramp reduces the southbound through capacity and queues extend back along the off-ramp as shown in Figure 4.4.



**Figure 4.4: Southbound Queuing at Tugun Bypass off-ramp**

Whilst development traffic volumes turning right are not considerably high (approximately 65 vehicles per hour), the provision of a dedicated right turning lane would significantly increase the potential capacity for turning traffic as well as remove the impacts on background through traffic. Figure 4.5 shows the benefits of the inclusion of the proposed 50 metre long right turn lane at the northern interchange intersection.



**Figure 4.5: Proposed Southbound Right Turn Lane**



### 4.4 KENNEDY DRIVE INTERSECTIONS

Kennedy Drive interchange intersections have been previously determined to require upgrading from roundabouts to signals to cater for background traffic conditions in 2031. Comparisons between base and development traffic are shown in Table 4.1 below.

**Table 4.1 Kennedy Drive Intersection Performance Comparison – AM Peak**

	AM Peak	
	Base	With Development
Traffic Flow (Veh/hour)		
Maximum Queue Lengths		
Delay (sec)		

Model  
 Screenshot



**Table 4.2 Kennedy Drive Intersection Performance Comparison – PM Peak**

	PM Peak	
	Base	With Development
Traffic flow (Veh/hour)		
Maximum Queue Lengths		



<p>Delay</p>		
<p>Model Screenshot</p>		

The inclusion of development traffic at Kennedy Drive intersection is negligible and does not exacerbate the base conditions to warrant any further upgrades. TSC is recommended to revisit the inclusion of signals at Kennedy Drive as part of any future planning.

#### 4.5 SUMMARY OF DEVELOPMENT-REQUIRED UPGRADES

To cater for the initially assumed development traffic generation, the following road network upgrades are required:

- Wollemi Place – Modified to “Exit Only” and provide a continuous left turn lane with 160 metres acceleration length;
- Parkes Drive / NB CD Road intersection – Upgrade to signals and provide left turn lane into Parkes Drive from the southern approach;
- Tugun Bypass southbound off-ramp approach to northern intersection – Provide 50 metre right turn lane.

It should be noted that these upgrades are consistent with the previous Sidra assessment for 2031 and the inclusion of the above upgrades are not limited to catering for the initially assumed traffic generation for the site. Section 5.0 details the maximum development traffic that can be catered for without adversely impacting the surrounding road network.

## 5. MAXIMUM DEVELOPMENT TRAFFIC

Following the assessment of the required upgrades for the proposed development composition, TSC and RMS required further assessment of the revised road network to determine the maximum amount of development traffic could be added to the system without resulting in adverse queues and delays within the network.

Therefore, the proposed development traffic generation was incrementally increased to determine the maximum traffic that could be generated by the site. This assessment showed that development traffic could be increased by an additional 30%. Traffic volumes beyond an additional 30% caused capacity issues at the Parkes Drive intersection in the PM peak, where development traffic queues exiting Parkes Drive extended back to the development access and do not clear within each signal cycle. During the AM peak at beyond 30% development traffic, queues also increase along the SB entry approach to Parkes Drive although these queues do clear each cycle and do not extend back to influence adjacent intersections. Maximum peak hour traffic volumes and typical queue “screen shots” are shown in Table 5.1 below.

**Table 5.1 Maximum Development Traffic Volumes and Screenshots**

Peak Period	AM Peak	
	Traffic Volumes (vol/hr)	Queue Screen Shot
AM Peak		
PM Peak		

The assessment determined that the maximum traffic generated by the development that can be adequately catered by the proposed configuration at Parkes Drive is approximately 500 vehicles per hour exiting the site at Parkes Drive as shown in Table 5.2. All other surrounding intersections continue to perform within acceptable limits with the inclusion of 30% additional development traffic.

**Table 5.2 Maximum Development Traffic Volumes / Hour**

Peak Period	Into Site		Out of Site		Total / hr
	Right turn at Parkes Drive	Left Turn at Parkes Drive	Left Turn at Parkes Drive	Left Turn at Wollemi Place	
AM Peak	359	134	267	60	830
PM Peak	211	60	481	115	867

Any further traffic increases of development traffic would require the implementation of additional stand-up approach lanes entering and exiting Parkes Drive. These however could be easily constructed and are assessed in further detail within Section 6.0 and 7.0.



## 6. IMPACT OF TRINGA DEVELOPMENT USING PARKES DRIVE

TSC has advised that approval has been given for an industrial park located at Tringa Street (referred to as Tringa Development) located to the west of the site and accessed via Kennedy Drive. Approval of this development does not include access onto Parkes Drive, however the proponent for the Tringa Development has approach TSC and RMS to obtain access. This section investigates the potential impacts, limitation and subsequent requirements to cater for the Tringa Development at Parkes Drive.

### 6.1 TRINGA DEVELOPMENT

The Tringa Development (See Figure 6.1) is proposed to include approximately 80,000m<sup>2</sup> of industrial land use, which is expected to generate approximately 300 trips per hour as detailed within Table 6.1. Traffic generation rates were derived from the RTA Guide to Traffic Generating Developments and based on the average trip rates for Industrial Warehouse and Factory land uses.

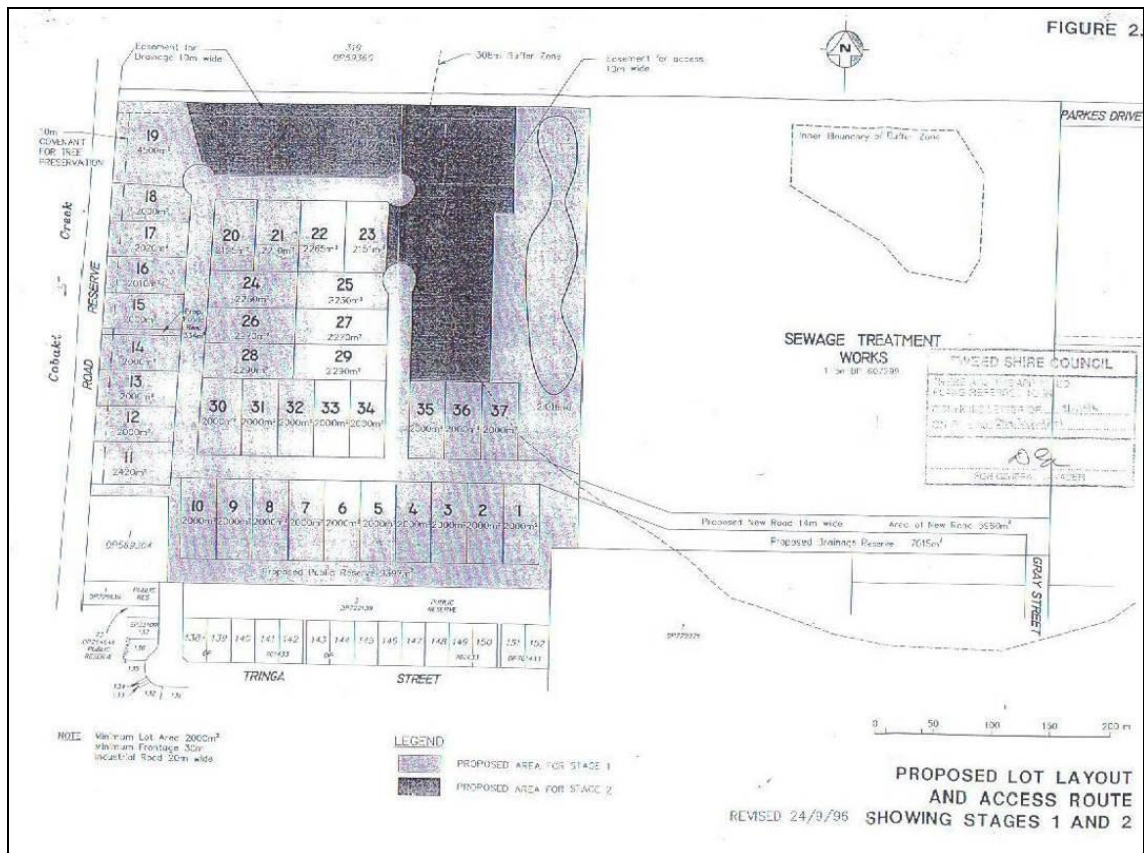


Figure 6.1: Tringa Development

Table 6.1: Tringa Development Trip Generation

Component	Rate	Trips
Site Area	79,330m <sup>2</sup>	
Applicable GFA	39,650m <sup>2</sup>	
Daily Traffic Generation Rate	4.5trips/100m <sup>2</sup> GFA/day	1,785/day
Peak Hour Trip Generation Rate	0.75 trips/100m <sup>2</sup> GFA/ hour	298/hour

Table 6.2 demonstrates the resultant trips in and out of the Parkes Drive for the Tringa Development.

**Table 6.2: Tringa Development Trips**

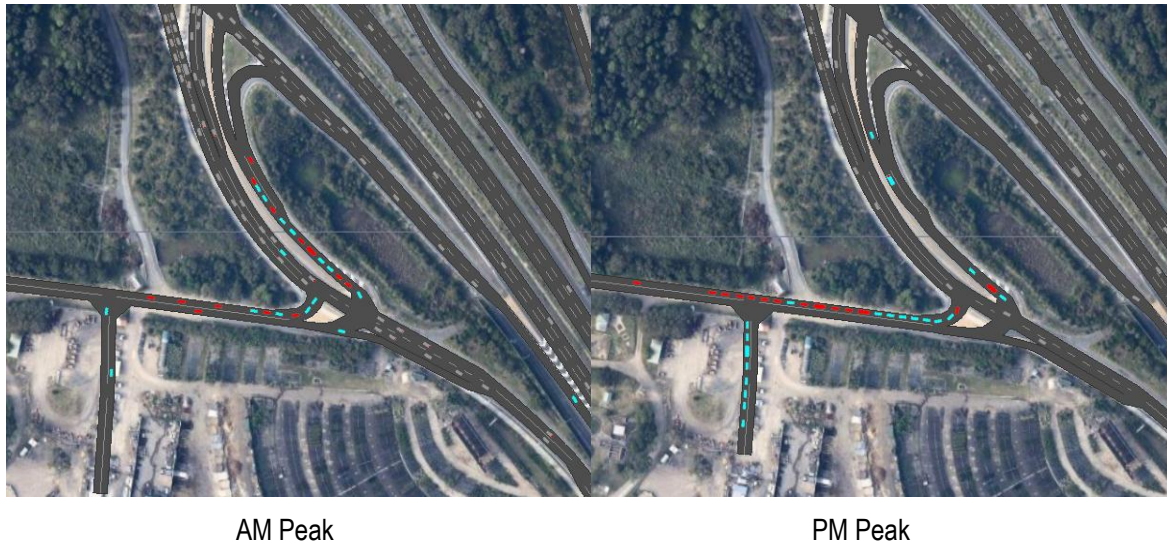
Component	Percentage (%)		Trips /hr	
	IN	OUT	IN	OUT
AM Peak	60	40	148	119
PM Peak	40	60	119	178

For the purpose of assessing the traffic distributions for the Tringa Development, traffic distributions throughout the network have been assumed to be as per the proposed development at Boyd's Bay Garden World. To determine the difference between development traffic and Tringa traffic, existing development traffic is highlighted as blue with Tringa traffic highlighted as red and background traffic as grey.

To remain conservative, no reduction in traffic from Kennedy Drive (west) has been made from the background traffic data out of the Cross Border Strategic Modelling outputs.

## 6.2 ROAD NETWORK PERFORMANCE

The initial single lane configuration at Parkes Drive will not be able to cater for the inclusion of Tringa Development as shown in Figure 6.2. As a result, Parkes Drive requires the inclusion of additional approach lanes both entering and exiting Parkes Drive as shown in Figure 6.3.



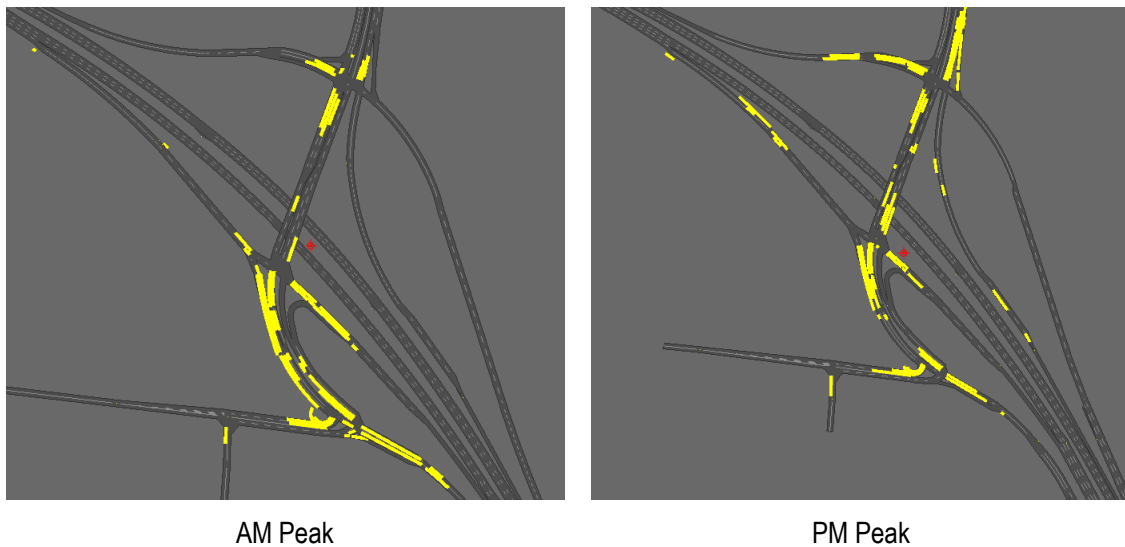
**Figure 6.2: Signalised Parkes Drive Intersection Performance with Tringa Development**



**Figure 6.3: Parkes Drive Intersection Required Upgrades for Tringa Development**



The inclusion of additional approach lanes at Parkes Drive greatly improves the intersection capacity with acceptable maximum queues during AM and PM peak periods as shown in Figure 6.4. Parkes Drive intersection could therefore cater for higher traffic volumes as detailed in Section 6.3.



**Figure 6.4 Tringa Development Upgrade Requirements - Peak Period Queues Lengths**

**6.3 MAXIMUM TRAFFIC VOLUMES AT PARKES DRIVE**

The Boyd's Bay Development and Tringa Development traffic volumes have been incrementally increased to determine the maximum traffic volumes achievable in and out of Parkes Drive without adversely impacting on the surrounding road network.

Assessment of the maximum development traffic volumes that can be accommodated shows that a 20% increase in both developments is the limit of maximum development under this configuration. Beyond the 20% increase, development traffic queuing over the overpass queues out of the provided turn lane and does not clear during each cycle (as shown in Figure 6.5). However, these queues only occurred for a small proportion of the PM peak period and did not cause major delays or affect surrounding intersections. Other intersections within the study area such as at Kennedy Drive are not adversely affected by the increased development traffic volumes.



**Figure 6.5 Maximum Right Turn Queues – 120% Development Traffic (PM Peak)**

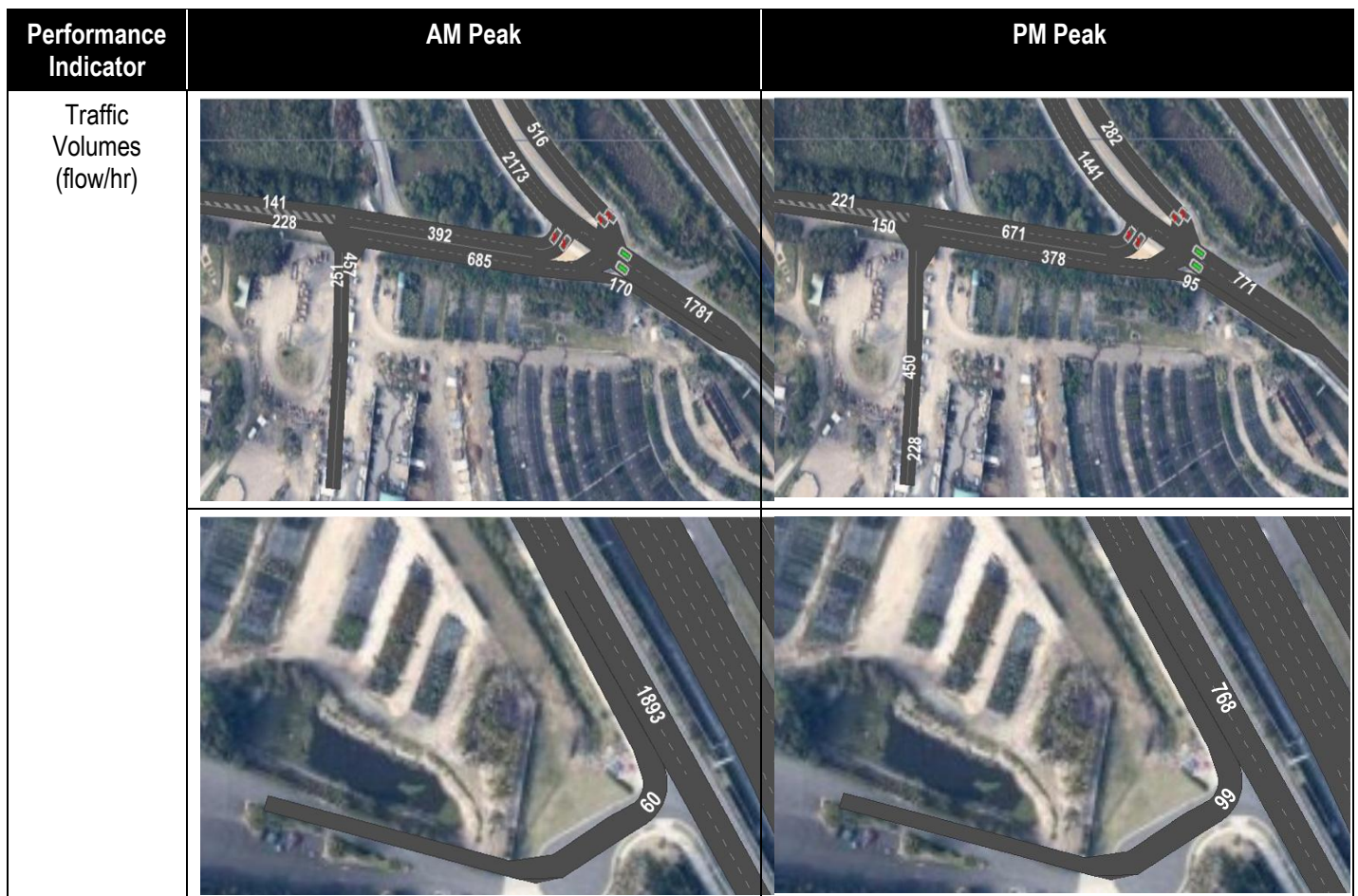
In order to ensure that development traffic does not exceed a level that would cause adverse traffic impacts for the surrounding road network, it is recommended that total traffic volumes in and out of the sites do not exceed 120% of what was previously assessed. Table 6.3 shows the combined maximum peak hour traffic generation for each peak period that can be accommodated without adversely impacting on the performance of the road network.

**Table 6.3: Maximum Peak Hour Traffic Volumes**


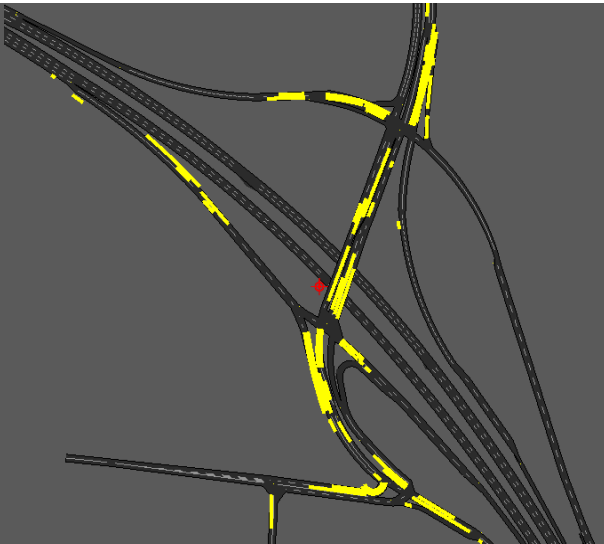


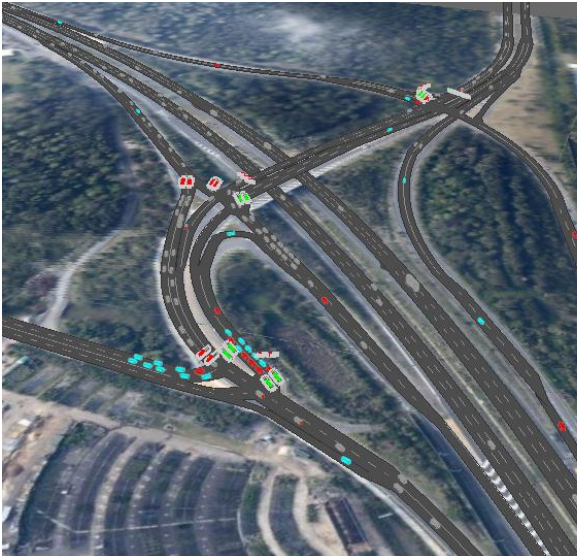

Peak Period	Boyd's Bay Development		Tringa Development		Total		2way
	IN	OUT	IN	OUT	IN	OUT	
AM Peak	457	311	223	151	680	462	1,142
PM Peak	228	550	143	230	371	780	1,151

Table 6.4 demonstrates the performance indicators for the AM and PM peak periods with the inclusion of the recommended maximum development traffic.

**Table 6.4: Performance with Recommended Maximum Traffic Volumes**





Performance Indicator	AM Peak	PM Peak
Maximum Queues		
Delay (sec)		
Model Screenshot		

The combined developments can generate a total of approximately 680 trips into the sites in the AM peak and 780 trips out of the sites in the PM peak. Based on the assumed peak period trip distribution and in/out splits, the total peak period trip generation is estimated at 1,150 trips per hour during the peak periods. Based on the total potential traffic generation, should Tringa Development not be granted access off Parkes Drive and Boyd's Bay Development construct the full intersection requirements at Parkes Drive, the road network would be able to cater for up to 180% of the Boyd's Bay Development traffic generation.

## 7. SENSITIVITY ANALYSIS – REVISED BULKY GOOD TRIP GENERATION RATE ASSESSMENT

RMS have requested the review of the potential bulky goods trip generation rate and what impacts a higher rate will have on the infrastructure upgrades or limits to the development area.

As previously identified within Table 3.2, the average PM peak trip generation rate for bulky goods is shown as 3.48 trips/100m<sup>2</sup>. When applying this trip generation rate to the proposed development the total revised trips (per hour) from the site are as shown in Table 7.1.

**Table 7.1: Revised Site Traffic Generation**

Proposed Development Land Use	Gross Leasable Area (m <sup>2</sup> )	RTA Trip Generation Rate/100m <sup>2</sup> (two-way)	Peak Hour Trips (two-way)	Directionality	
				In/Out (%)	
				AM Peak	PM Peak
Business Park	26,700	1.1	293.7	70/30	30/70
Bulky Goods (retail)	13,480	<b>3.48</b>	469	60/40	40/60
<b>Total</b>	<b>40,180</b>		<b>763</b>		

The revised trip generation rate for bulky goods land use results in a total peak hour trip generation of 763 vehicles per hour. The report has demonstrated that the site access intersection and surrounding 'influenced' intersections can accommodate a maximum trip generation of up to 850 vehicles per hour generated by the site. Beyond this, intersection upgrades to Parkes Drive intersection can be undertaken to allow the ultimate development traffic generation of 1,150 vehicles per hour. Therefore, the increase in trip generation for bulky goods can easily be catered for within the proposed upgrades and will not result in any additional upgrades or limitations to development yield on the subject site.

## 8. SUMMARY AND CONCLUSIONS

Micro-simulation models have been developed and assessed to provide further information into the potential impacts, limitation and subsequent requirements for the proposed re-zoning of Boyd's Bay Garden World. This assessment was undertaken using Paramics on the 2031 ultimate road network configuration surrounding the site as per the 2031 Cross Border Transport Study undertaken in 2011 for TSC, RMS and others.

By 2031, the following road network upgrades are required to cater for background traffic volumes during peak periods:

- construct a continuous left turn lane from the Tugun Bypass SB off-ramp to Gold Coast Highway NB;
- construct a second SB through lane for Gold Coast Highway SB to the Pacific Highway / Tugun Bypass overpass;
- construct a second right turn lane from the overpass to the Tugun Bypass NB on-ramp; and
- construct a signalised double left turn for the northbound CD road approach to the Tugun Bypass NB on-ramp;

In addition to the upgrades, the modelling of signals at the Kennedy Drive roundabouts demonstrate a significant improvement compared to the initial plans of retaining the roundabouts (which are shown to be over capacity). As a result, TSC is recommended to revisit the proposal for signalling these intersections as part of any future upgrades.

As the application is for a rezoning proposal, assessment to date on the internal layout of the site has not been undertaken. Therefore, the assessed GFA's and resultant traffic generation is considered conservative considering the site area and subsequent requirements for parking, set-back and internal circulation.

The inclusion of development traffic as per the previous assessment traffic generation levels confirms the following upgrades to be required:

- Wollemi Place – Upgrade to 'Limited Exit Only' and provide an continuous left turn lane with 160 metres acceleration length;
- Parkes Drive / NB CD Road intersection – Upgrade to signals and provide a left turn lane into Parkes Drive from the southern approach and associated pedestrian provisions; and
- Tugun Bypass southbound off-ramp approach to northern intersection – Provide a 50 metre right turn lane.

The performance comparisons of the Kennedy Drive intersections with and without development traffic are negligible with only small number of development vehicles using the intersection at any given time. The above 'development required' upgrades include some "spare capacity" and can withstand up to 30% more site traffic generation, which equates to approximately 850 vehicles per hour. Beyond this level of traffic, a second approach lane entering and exiting the site is required.

The inclusion of the Tringa Development traffic introduces a requirement for two approach lanes entering and exiting Parkes Drive to cater for the additional developmental traffic volumes. It is recommended that should Tringa Development be given access to Parkes Drive, the Tringa Development would be responsible for the construction of these additional approach lanes.

With the inclusion of these upgrades, the surrounding road network can withstand up to 20% more of the combined Boyd's Bay Development and Tringa Development traffic generation without adversely impacting the surrounding road network performance. This equates to approximately 1,150 vehicles per hour during the peak period based on the assessed traffic in/out splits.

Should Tringa Development not be granted access off Parkes Drive and Boyd's Bay Development construct the full intersection requirements at Parkes Drive, the road network would be able to cater for up to 1.8 times the proposed development's traffic generation.

The surrounding road network's spare capacity with the inclusion of the proposed development's traffic generation in 2031 provides a level of resilience for the sites potential land uses. Considering the network

performance and the conservative site land use areas within the assessment, the existing and future road network (including base and development required upgrades) could cater for higher trip ends than previously assessed (i.e. high trip generation rates for proposed land uses). A review of a high traffic generation rate for Bulky Good land use (i.e. 3.48 trips/100m<sup>2</sup>) remains within acceptable traffic capacity limits of the surrounding network and does not result in any additional road network requirements or limitations on development yield.

In our opinion, the site could adequately cater for the inclusion of Bulky Goods land uses and it is recommended that RMS and TSC reconsider the restriction of not allowing Bulky Goods retail on the site.

## **APPENDIX A**

### **2031 CROSS BORDER CORDON OUTPUTS**

**MORNING PEAK - 2HRS ( 7:00AM – 9:00AM)**

AMPV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	236	501	855	0	388	72	27
102	0	0	0	0	1315	4781	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	264	0	159	801	0	247	30	20
105	0	360	18	35	0	37	0	55	5	4
106	0	2919	57	210	1220	0	0	43	17	10
107	0	0	0	0	0	0	0	0	0	0
108	0	0	924	846	398	351	0	0	38	16
109	0	0	61	45	31	74	0	20	0	2
110	0	0	53	43	30	73	0	16	3	0

**DAY TIME PEAK - 7HRS ( 9:00AM – 4:00PM)**

DTPV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	1077	560	819	0	2287	246	170
102	0	0	0	0	3289	10012	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	1119	0	396	1715	0	2130	188	159
105	0	3300	585	457	0	2623	0	919	76	65
106	0	10735	876	1741	1518	0	0	581	168	131
107	0	0	0	0	0	0	0	0	0	0
108	0	0	2223	2008	901	653	0	0	130	94
109	0	0	257	188	78	142	0	138	0	13
110	0	0	172	157	67	110	0	93	12	0

**AFTERNOON PEAK 7HRS ( 4:00PM – 6:00PM)**

PMPV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	313	140	144	0	966	85	68
102	0	0	0	0	640	3797	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	310	0	85	533	0	809	68	60
105	0	1652	400	210	0	1890	0	460	39	36
106	0	5413	534	857	119	0	0	285	75	68
107	0	0	0	0	0	0	0	0	0	0
108	0	0	546	470	196	112	0	0	38	30
109	0	0	74	52	17	45	0	38	0	4
110	0	0	48	44	14	26	0	30	4	0

**NIGHT TIME PEAK 13HRS ( 6:00PM – 7:00AM)**

NTPV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	383	137	384	0	926	88	60
102	0	0	0	0	1742	6177	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	420	0	158	978	0	726	64	53
105	0	1722	113	214	0	1621	0	601	35	32
106	0	6150	278	883	0	0	0	307	84	69
107	0	0	0	0	0	0	0	0	0	0
108	0	0	1009	746	423	870	0	0	40	29
109	0	0	94	65	32	86	0	42	0	4
110	0	0	64	53	29	70	0	30	4	0

AMCV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	4	13	106	0	12	1	0
102	0	0	0	0	31	601	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	5	0	1	51	0	5	1	0
105	0	38	2	1	0	5	0	4	1	0
106	0	685	17	54	89	0	0	9	4	1
107	0	0	0	0	0	0	0	0	0	0
108	0	0	9	5	2	8	0	0	0	0
109	0	0	1	1	1	4	0	0	0	0
110	0	0	0	0	0	1	0	0	0	0

DTCV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	14	28	237	0	39	4	1
102	0	0	0	0	108	2027	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	14	0	3	218	0	16	2	1
105	0	114	20	4	0	287	0	11	2	1
106	0	2034	201	172	118	0	0	28	13	4
107	0	0	0	0	0	0	0	0	0	0
108	0	0	38	16	11	44	0	0	1	0
109	0	0	4	2	2	13	0	1	0	0
110	0	0	1	1	1	4	0	0	0	0

PMCV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	3	7	22	0	8	1	0
102	0	0	0	0	23	565	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	3	0	1	54	0	3	0	0
105	0	23	5	1	0	78	0	2	0	0
106	0	520	56	42	5	0	0	5	3	1
107	0	0	0	0	0	0	0	0	0	0
108	0	0	9	4	3	6	0	0	0	0
109	0	0	1	0	0	3	0	0	0	0
110	0	0	0	0	0	1	0	0	0	0

NTCV	101	102	103	104	105	106	107	108	109	110
101	0	0	0	10	12	140	0	26	2	1
102	0	0	0	0	78	1350	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0
104	0	0	11	0	2	147	0	10	1	1
105	0	86	4	3	0	247	0	8	1	0
106	0	1436	37	114	0	0	0	19	9	3
107	0	0	0	0	0	0	0	0	0	0
108	0	0	26	10	7	61	0	0	0	0
109	0	0	2	1	1	9	0	0	0	0
110	0	0	1	1	0	3	0	0	0	0

Date: 13/01/2012

Figure Title: 2031 Cross Border Cordon Outputs

Project No.: P077.001

Project Name: Boyd's Bay Garden World Site Re-Zoning Micro-simulation Traffic Assessment



## **APPENDIX B**

### **2031 BASE CASE VALIDATION RESULTS**

Location	Movement	Seed = 6 modelled vol			Seed = 28 modelled vol			Seed = 560 modelled vol			Seed = 2849 modelled vol			Seed = 7771 modelled vol			Seed = 86524 modelled vol			Average	
		count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	GEH	GEH
Intersection 1-Tugun Bypass/Pac Mwy West	Service Road N/B Right	560	561	0.06	560	564	0.19	560	537	0.98	560	560	0.02	560	582	0.94	560	553	0.28	0.41	0.41
	Service Road N/B Left	1077	1160	2.48	1077	1170	2.79	1077	1151	2.22	1077	1132	1.67	1077	1157	2.41	1077	1138	1.83	2.23	2.23
	Pac Hway S/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
	Pac Hway S/B Right (towards N/B on-Ramp)	19	14	1.25	19	24	1.09	19	17	0.36	19	21	0.56	19	22	0.78	19	24	1.09	0.85	0.85
	Pac M'way N/B off Ramp Right (towards Pac Hway)	658	656	0.08	658	700	1.63	658	675	0.68	658	711	2.03	658	676	0.70	658	667	0.37	0.91	0.91
Intersection 2-Tugun Bypass/Pac Mwy East	Pac Hway S/B Bear Left (towards Service Road)	59	65	0.77	59	60	0.13	59	75	2.02	59	59	0.07	59	59	0.00	59	63	0.58	0.59	0.59
	Pac Hway S/B T through	19	14	1.25	19	24	1.09	19	17	0.36	19	24	1.09	19	22	0.78	19	24	1.09	0.94	0.94
	Pac Hway S/B Left (towards Pac Mway S/B on-Ramp)	180	195	1.10	180	198	1.27	180	194	1.02	180	191	0.81	180	212	2.25	180	196	1.13	1.26	1.26
	Pacific Hway N/B T through	1217	1212	0.14	1217	1258	1.17	1217	1204	0.37	1217	1264	1.32	1217	1253	1.02	1217	1215	0.07	0.68	0.68
	Tugun Bypass S/B off Ramp Left	610	638	1.12	610	659	1.95	610	691	3.16	610	660	1.98	610	655	1.79	610	636	1.04	1.84	1.84
	Tugun Bypass S/B off Ramp Through (towards S/B Service Road)	170	199	2.17	170	192	1.64	170	219	3.55	170	205	2.56	170	219	3.55	170	197	2.03	2.58	2.58
	Tugun Bypass S/B off Ramp Right	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
Intersection 3-Kennedy Dr West	Kennedy Dr E/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
	Kennedy Dr E/B through	986	1007	0.67	986	964	0.72	986	1006	0.63	986	999	0.41	986	963	0.75	986	992	0.19	0.56	0.56
	Kennedy Dr E/B Left	478	487	0.39	478	474	0.18	478	443	1.63	478	471	0.34	478	503	1.13	478	492	0.64	0.72	0.72
	Kennedy Dr W/B through	217	226	0.61	217	208	0.62	217	232	1.04	217	223	0.40	217	224	0.47	217	207	0.69	0.64	0.64
	Kennedy Dr W/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
	Kennedy Dr W/B Right	480	504	1.06	480	503	1.04	480	535	2.44	480	499	0.84	480	503	1.04	480	483	0.14	1.09	1.09
	Pac Mwy N/B Off-Ramp Left	244	234	0.61	244	261	1.10	244	242	0.13	244	262	1.13	244	255	0.70	244	250	0.38	0.68	0.68
	Pac Mwy N/B Off-Ramp Right	118	123	0.46	118	130	1.08	118	131	1.17	118	133	1.34	118	121	0.27	118	110	0.80	0.85	0.85
	Pac Mwy N/B Off-Ramp Through	678	732	2.02	678	761	3.08	678	714	1.36	678	729	1.92	678	743	2.42	678	724	1.72	2.09	2.09
Intersection 4-Kennedy Dr East	Kennedy Dr W/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
	Kennedy Dr W/B through	629	653	0.95	629	665	1.40	629	688	2.30	629	651	0.85	629	657	1.08	629	615	0.58	1.19	1.19
	Kennedy Dr W/B Left	132	123	0.80	132	138	0.47	132	134	0.17	132	126	0.57	132	120	1.11	132	131	0.09	0.54	0.54
	Kennedy Dr E/B through	585	588	0.12	585	577	0.35	585	608	0.92	585	582	0.14	585	575	0.44	585	583	0.08	0.34	0.34
	Kennedy Dr E/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	0.00
	Kennedy Dr E/B right	519	542	0.98	519	515	0.20	519	526	0.31	519	506	0.60	519	507	0.55	519	521	0.07	0.45	0.45
	Pac Mwy S/B Off-Ramp Left	123	150	2.31	123	148	2.11	123	164	3.42	123	146	1.98	123	156	2.79	123	139	1.40	2.34	2.34
	Pac Mwy S/B Off-Ramp Right	68	79	1.34	68	68	0.06	68	84	1.84	68	72	0.48	68	78	1.23	68	79	1.29	1.04	1.04
	Pac Mwy S/B Off-Ramp Through	38	29	1.47	38	39	0.16	38	45	1.17	38	48	1.53	38	46	1.32	38	45	1.09	1.12	1.12
Link			0.81			0.85			1.11			0.82			0.98			0.62	0.87	0.87	
West Tugun Bypass	SBD	2720	2824	1.98	2720	2613	2.06	2720	2715	0.09	2720	2681	0.74	2720	2668	0.99	2720	2632	1.70	1.26	1.26
	NBD	3878	3621	4.20	3878	3859	0.31	3878	3817	0.98	3878	3831	0.76	3878	3857	0.34	3878	3815	1.01	1.26	1.26
Service Road	NE (SBD)	285	308	1.34	285	254	1.86	285	295	0.59	285	267	1.08	285	280	0.27	285	264	1.27	1.07	1.07
	NW (NBD)	1734	1826	2.17	1734	1737	0.07	1734	1688	1.12	1734	1694	0.97	1734	1747	0.31	1734	1695	0.95	0.93	0.93
	SE (SBD)	708	733	0.93	708	691	0.64	708	704	0.13	708	723	0.58	708	672	1.37	708	696	0.43	0.68	0.68
	SW (NBD)	1108	1167	1.73	1108	1152	1.29	1108	1087	0.65	1108	1124	0.48	1108	1122	0.40	1108	1081	0.82	0.90	0.90
			2.06			0.00			0.00			0.00			0.00			0.00	0.34	0.34	
	Link Average		1.43		Link Average	0.70		Link Average	0.58		Link Average	0.64		Link Average	0.45		Link Average	0.75	0.76	0.76	
	Average		1.04		Average	0.86		Average	0.99		Average	0.79		Average	0.90		Average	0.67	0.87	0.87	

Date:  
09 March 2012

Figure Title:  
**AM Validation Results**

Project No.:  
P0777.001

Project Name:  
**Boyd's Bay Garden Centre Rezoning**

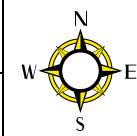


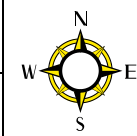
Figure No.:  
B.1

Location	Movement	Seed = 6 modelled vol			Seed = 28 modelled vol			Seed = 560 modelled vol			Seed = 2849 modelled vol			Seed = 7771 modelled vol			Seed = 86524 modelled vol			Average	
		count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr	GEH	count/hr	/hr
Intersection 1-Tugun Bypass/Pac Mwy West	Service Road N/B Right	226	212	0.95	226	253	1.74	226	230	0.26	226	234	0.53	226	241	0.95	226	223	0.23	0.78	
	Service Road N/B Left	430	468	1.79	430	485	2.57	430	441	0.53	430	484	2.53	430	480	2.34	430	489	2.75	2.09	
	Pac Hway S/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
	Pac Hway S/B Right (towards N/B on-Ramp)	945	973	0.89	945	992	1.49	945	973	0.89	945	968	0.74	945	969	0.76	945	960	0.49	0.88	
	Pac M'way N/B off Ramp Right (towards Pac Hway)	320	325	0.28	320	339	1.02	320	338	0.99	320	322	0.08	320	321	0.03	320	354	1.85	0.71	
Intersection 2-Tugun Bypass/Pac Mwy East	Pac Hway S/B Bear Left (towards Service Road)	573	548	1.04	573	564	0.38	573	562	0.46	573	568	0.19	573	574	0.04	573	569	0.17	0.38	
	Pac Hway S/B T through	945	878	2.22	945	998	1.68	945	832	3.79	945	973	0.89	945	973	0.90	945	968	0.73	1.70	
	Pac Hway S/B Left (towards Pac Mway S/B on-Ramp)	826	878	1.78	826	866	1.38	826	832	0.19	826	837	0.38	826	833	0.23	826	835	0.29	0.71	
	Pacific Hway N/B T through	547	536	0.45	547	588	1.74	547	566	0.81	547	553	0.28	547	558	0.47	547	575	1.20	0.82	
	Tugun Bypass S/B off Ramp Left	60	70	1.25	60	56	0.53	60	58	0.20	60	69	1.13	60	60	0.00	60	60	0.00	0.52	
	Tugun Bypass S/B off Ramp T through (towards S/B Service Road)	910	971	1.99	910	946	1.18	910	944	1.12	910	968	1.91	910	993	2.71	910	940	1.00	1.65	
	Tugun Bypass S/B off Ramp Right	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
Intersection 3-Kennedy Dr West	Kennedy Dr E/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
	Kennedy Dr E/B through	617	633	0.62	617	615	0.10	617	630	0.50	617	638	0.82	617	617	0.00	617	609	0.32	0.39	
	Kennedy Dr E/B Left	205	203	0.14	205	235	1.99	205	208	0.17	205	212	0.48	205	214	0.62	205	220	1.03	0.74	
	Kennedy Dr W/B through	950	968	0.60	950	954	0.15	950	946	0.11	950	959	0.29	950	928	0.72	950	940	0.31	0.36	
	Kennedy Dr W/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
	Kennedy Dr W/B Right	309	329	1.15	309	331	1.23	309	316	0.40	309	344	1.94	309	347	2.10	309	343	1.88	1.45	
	Pac Mwy N/B Off-Ramp Left	560	558	0.08	560	561	0.06	560	551	0.38	560	558	0.08	560	573	0.55	560	576	0.67	0.31	
	Pac Mwy N/B Off-Ramp Right	157	151	0.48	157	171	1.09	157	165	0.63	157	152	0.36	157	153	0.32	157	174	1.32	0.70	
	Pac Mwy N/B Off-Ramp T through	142	144	0.13	142	167	1.97	142	138	0.34	142	159	1.39	142	161	1.54	142	150	0.62	1.00	
Intersection 4-Kennedy Dr East	Kennedy Dr W/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
	Kennedy Dr W/B through	777	806	1.03	777	814	1.29	777	782	0.18	777	661	4.35	777	775	0.09	777	816	1.36	1.38	
	Kennedy Dr W/B Left	155	163	0.60	155	156	0.08	155	168	1.02	155	146	0.78	155	158	0.20	155	133	1.88	0.76	
	Kennedy Dr E/B through	440	421	0.92	440	459	0.92	440	457	0.80	440	433	0.31	440	444	0.19	440	451	0.52	0.61	
	Kennedy Dr E/B U-turn	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00	
	Kennedy Dr E/B right	334	359	1.32	334	325	0.52	334	333	0.05	334	357	1.21	334	330	0.22	334	329	0.27	0.60	
	Pac Mwy S/B Off-Ramp Left	534	540	0.26	534	525	0.37	534	536	0.09	534	554	0.88	534	556	0.94	534	551	0.73	0.54	
	Pac Mwy S/B Off-Ramp Right	481	493	0.54	481	473	0.37	481	483	0.09	481	493	0.54	481	503	0.99	481	467	0.64	0.53	
	Pac Mwy S/B Off-Ramp T through	467	487	0.92	467	515	2.14	467	483	0.73	467	495	1.25	467	498	1.39	467	488	0.96	1.23	
Link	Turn Average		0.71	Turn Average		0.87	Turn Average		0.49	Turn Average		0.78	Turn Average		0.61	Turn Average		0.71	0.69		
West Tugun Bypass	SBD	3998	4018	0.32			0.00	3998	3861	2.19	3998	4059	0.95	3998	4002	0.06	3998	3939	0.94	0.74	
	NBD	3616	3819	3.33			0.00	3616	3621	0.09	3616	3595	0.34	3616	3631	0.25	3616	3618	0.03	0.67	
Service Road	NE (SBD)	1541	1604	1.60			0.00	1541	1505	0.92	1541	1542	0.04	1541	1560	0.48	1541	1507	0.86	0.65	
	NW (NBD)	709	838	4.62			0.00	709	662	1.81	709	715	0.21	709	722	0.49	709	711	0.08	1.20	
	SE (SBD)	990	1020	0.95			0.00	990	984	0.21	990	995	0.14	990	982	0.25	990	949	1.32	0.48	
	SW (NBD)	880	884	0.13			0.00	880	853	0.90	880	867	0.42	880	886	0.20	880	901	0.72	0.40	
Link Average	1.82		1.82	Link Average		0.00	Link Average		1.02	Link Average		0.35	Link Average		0.29	Link Average		0.66	0.69		
Average	1.27		1.27	Average		0.43	Average		0.76	Average		0.56	Average		0.45	Average		0.68	0.69		

Date:  
09 March 2012

Figure Title:

PM Validation Results



Project No.:  
P0777.001

Project Name:

Boyd's Bay Garden Centre Rezoning

Figure No.:  
B.2



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**Our Reference:** P0777.001L  
**Your Reference:** -

3 April 2012

Planit Consulting  
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 Kingscliff, NSW

Attention: **Adam Smith**  
 Sent via email: AdamS@planitconsulting.com.au

Dear Adam

**RE: BOYDS BAY GARDEN CENTRE REZONING – REVISED LAND USE TRAFFIC GENERATION COMPARISON**

Bitzios Consulting has previously undertaken a micro-simulation assessment of the potential external traffic impacts as a result of rezoning of the Boyd's Bay Garden Centre site located at West Tweed Heads. The report provided to Tweed Shire Council (TSC) and the NSW Roads and Maritime Service (RMS) dated the 12<sup>th</sup> March 2012, outlined a potential land use composition for the site for the purpose of determining the maximum traffic generation and subsequent road network requirements as a result of the proposed development.

Following consultation with TSC and refinement of the site layout, the proposed land use composition has been revised and as a result the traffic generation for the site has been reviewed to ensure the previous traffic assessment remains valid for the purpose of the rezoning application.

Table 1 demonstrates a comparison between site traffic generation for the initially assumed land use composition and the revised land use composition, which is consistent with the rezoning application.

**Table 1: Land Use Traffic Generation Comparison**

Land Use	Gross Floor Area (GFA) m <sup>2</sup>	Agreed Traffic Generation Rate /100m <sup>2</sup> GFA	Traffic Generation (trips /hr)	Total Trips (trips/hr)
<b>Initial Land Use Composition</b>				
Business Park	26,700	1.1	293.7	<b>763 trips/hr</b>
Bulk Goods	13,480	3.48	469	
<b>Revised Land Use Composition</b>				
Business Park	6,584	1.1	72.4	<b>748 trips/hr</b>
Bulk Goods	19,416	3.48	675.7	

The revised land use composition shall generate approximately 748 trips per hour during the AM and PM peak periods, which is slightly less than previously assessed within the micro-simulation report for the initially proposed land use composition. Therefore, the traffic impacts and subsequent road network upgrades as detailed within Bitzios Consulting's report (12<sup>th</sup> March, 2012) are appropriate for the purpose of assessing the external impacts of the revised land use composition within the rezoning application.

Do not hesitate to contact me if you require any additional information.

Yours faithfully



**Andrew Eke**

*Senior Traffic Engineer / Transport Planner*  
**BITZIOS CONSULTING**



# BOYDS BAY BUSINESS PARK TRANSPORT ASSESSMENT REPORT

FOR

**MARO DEVELOPMENTS &  
LEISURE BROTHERS**



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## DOCUMENT CONTROL SHEET

### Issue History

Report File Name	Prepared by	Reviewed by	Issued by	Date	Issued to
P0777.001R Boyd's Bay Business Park Transport Assessment Report	P. Kumar/S. Brooke	A. Eke/S. Brooke	S. Brooke	05/04/2011	Adam Leech Leisure Brothers
P0777.002R Boyd's Bay Business Park Transport Assessment Report	P. Kumar/S. Brooke	A. Eke/S. Brooke	A.Eke	18/05/2011	Adam Leech - Leisure Brothers Bede Emmett – Planit Consulting
P0777.003R Boyd's Bay Business Park Transport Assessment Report	A.Eke	A. Eke/S. Brooke	A.Eke	29/08/2011	Adam Smith – Planit Consulting



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# CONTENTS

	Page
<b>1. INTRODUCTION .....</b>	<b>1</b>
1.1 SCOPE	1
<b>2. PROPOSED DEVELOPMENT .....</b>	<b>2</b>
<b>3. EXISTING CONDITIONS .....</b>	<b>3</b>
3.1 SURROUNDING ROAD NETWORK	3
3.1.1 Pacific Highway	3
3.1.2 Tugun Bypass	3
3.1.3 Kennedy Drive Interchange	3
3.1.4 Parkes Drive3	3
3.1.5 Wollemi Place	3
3.2 TRAFFIC VOLUMES	3
3.3 2013 (YEAR OF OPENING) TRAFFIC VOLUMES	4
<b>4. FUTURE TRAFFIC CONDITIONS .....</b>	<b>6</b>
4.1 PREVIOUS STUDIES	6
4.1.1 Lower Tweed and Pacific Highway Road Network Masterplan (2006)	6
4.1.2 Cross Border Traffic Master Plan (2011)	7
4.1.3 Pacific Motorway Service Road Interchanges (Kirkwood Road to Kennedy Drive) (2010)	7
4.2 FUTURE ROAD NETWORK UPGRADES	9
4.2.1 20 Year Design Assessment	9
4.2.2 Interim 10 Year Design Assessment	9
4.3 FUTURE YEAR TRAFFIC VOLUMES	9
4.3.1 10 Years Design Horizon - 2023 Traffic Volumes	9
4.3.2 20 Year Design Horizon – 2033 Traffic Volumes	11
<b>5. TRAFFIC ASSESSMENT .....</b>	<b>12</b>
5.1 DEVELOPMENT TRAFFIC GENERATION AND DISTRIBUTION	12
5.1.1 Traffic Generation Rates	12
5.1.2 Traffic Generation	13
5.1.3 Traffic Distribution	13
5.1.4 Development Traffic Volumes	14
5.1.5 Development Influenced Intersections	14
5.2 2013 (YEAR OF OPENING) INTERSECTION ASSESSMENT	15
5.3 2023 (10 YEAR DESIGN HORIZON) INTERSECTION ASSESSMENT	16
5.3.1 Base (Without Development) Intersection Performance	16
5.3.2 With Development Intersection Performance	18
5.4 2023 (10 YEAR DESIGN HORIZON) INTERSECTION ASSESSMENT	22
5.4.1 2023 Background Traffic Assessment	22
5.4.2 2023 'With Development' Assessment	23
5.5 KEY INTERSECTION ASSESSMENT FINDINGS	25
<b>6. SITE ACCESS .....</b>	<b>26</b>
6.1 WOLLEMI PLACE SITE ACCESS	26
6.2 PARKES DRIVE SITE ACCESS	28
<b>7. ALTERNATE TRAVEL MODES .....</b>	<b>29</b>
7.1 PEDESTRIANS AND CYCLISTS	29
7.2 PUBLIC TRANSPORT	30
<b>8. CONCLUSIONS.....</b>	<b>32</b>

## Tables

Table 2.1:	Proposed Development Components
Table 4.1:	Cross Border Study Road Network Inclusions for 2021 and 2031
Table 5.1:	Bulky Goods Subcategories Peak Trip Generation Comparison
Table 5.2:	Peak Hour Development Traffic Generation
Table 5.3:	Proposed Development Options In/Out Peak Hour Volumes
Table 5.4:	2013 Intersection Performance
Table 5.5:	2033 Base Intersection Configuration Performance (without development)
Table 5.6:	2033 Upgraded Intersection Configuration Performance (without development)
Table 5.7:	Site 1 - 2033 Intersection Performance (with development)
Table 5.8:	Wollemi Place Intersection with Upgrade - 2033 Intersection Performance (with development)
Table 5.9:	Parkes Drive Intersection with Improvement - 2033 Intersection Performance (with development)
Table 5.10:	Site 2 - 2033 Upgraded Intersection Performance (with development)
Table 5.11:	Pacific Highway/Tugun Bypass Western Intersection - 2033 Intersection Performance (with development)
Table 5.12:	Pacific Highway/Tugun Bypass Eastern Intersection - 2033 Intersection Performance (with development)
Table 5.13:	Pacific Highway/Tugun Bypass Eastern Intersection - 2033 Intersection Performance (with development)
Table 5.14:	Kennedy Drive / Pacific Highway - 2033 Intersection Performance (with Development)
Table 5.15:	2033 Base Intersection Configuration Performance (without development)
Table 5.16:	Site 1 - 2033 Intersection Performance (with development)
Table 5.17:	Site 2 - 2033 Intersection Performance (with development)
Table 5.18:	Site 3 and 4 - 2033 Base Upgraded Intersection Performance (with development)
Table 5.19:	Kennedy Drive / Pacific Highway Interchange - 2033 Intersection Performance (with Development)

## Figures

Figure 1.1:	Site Location
Figure 3.1:	2013 AM Peak Hour Traffic Volumes
Figure 3.2:	2013 PM Peak Hour Traffic Volumes
Figure 4.1:	Lower Tweed and Pacific Highway Road Network Masterplan Timeline
Figure 4.2:	Council's Proposed 2030 Kennedy Drive Interchange Configuration
Figure 4.3:	Council's Proposed 2015 Interim Service Road Configuration
Figure 4.4:	2023 AM Peak Hour Traffic Volumes
Figure 4.5:	2023 PM Peak Hour Traffic Volumes
Figure 4.6:	2033 AM Peak Hour Traffic Volumes
Figure 4.7:	2033 PM Peak Hour Traffic Volumes
Figure 5.1:	Proposed Development Peak Traffic Distribution
Figure 5.2:	Required Base Upgrade for Pacific Highway / Tugun Bypass Intersections
Figure 5.3:	Required Upgrade for Wollemi Place Intersection
Figure 5.4:	Required Upgrade for Parkes Drive Intersection
Figure 5.5:	Required Upgrade for Pacific Highway/Tugun Bypass Eastern Intersection
Figure 5.6:	Site 4 Intersection with Development Required Right Turn Lane
Figure 6.1:	Wollemi Place Existing Site Access
Figure 6.2:	Upgrade for the Wollemi Place/Pacific Highway CD Road Intersection
Figure 6.3:	Austrroads Guide to Engineering Practice: Intersections at Grade – Figure 6.48
Figure 6.4:	Austrroads Guide to Engineering Practice: Intersections at Grade – Table 6.17
Figure 6.5:	2033 Wollemi Place Left Turn Lane Requirements
Figure 6.6:	Permitted Site Access Location
Figure 7.1:	Existing Pedestrian and Cycle Network
Figure 7.2:	Future Cycleway for Kennedy Drive
Figure 7.3:	Existing Bus Routes and Stops

## Appendices

Appendix A:	Council and RTA Terms of Reference Correspondence
Appendix B:	Traffic Surveys
Appendix C:	Kirkwood Road and Kennedy Drive Interchange Report Extracts
Appendix D:	Development Traffic Volumes
Appendix E:	SIDRA Outputs

## 1. INTRODUCTION

Bitzios Consulting has been engaged by Maro Developments to undertake a transport assessment for the proposed rezoning of Lot 10 on DP 1084319 to include Zone 5(b) land uses to reflect the intent of Council's Tweed Urban and Employment Lands Strategy 2009 (TUELS 2009). The site is approximately five hectares in area and is located at 1 Wollemi Place, West Tweed Heads directly off the northbound connector to the Tugun Bypass as shown in Figure 1.1.

The subject site presently accommodates the existing Boyd's Bay Garden World, which includes a retail nursery as well as the sale of building materials and bulk landscape supplies.



**Figure 1.1: Site Location**

The adjacent site to the west consists of the Council owned Sewage Treatment Plant (STP) being Lot 1 on DP 607299, with residential properties to the south accessed via Kennedy Drive.

### 1.1 SCOPE

The traffic assessment report has been developed generally in accordance with the Terms of Reference outlined by Council and the RTA as detailed below and in Appendix A.

- assess the proposed development against relevant provisions within the RTA's Guide to Traffic Generating Developments;
- ensure the development does not adversely impact the surrounding road network out to a 20 year design horizon;
- assess the requirements for site access configurations;
- identify facilities for pedestrian and cyclist both internally and externally to the site; and
- Identify public transport facilities within proximity to the development.

As the proposed development is currently only applying for a re-zoning of the subject site, no detailed assessment into the internal layout and parking provisions has yet to be undertaken.

## 2. PROPOSED DEVELOPMENT

Maro Developments are applying to Council to re-zone Lot 10 in DP1084319 from 1(a) Rural to allow such uses consistent with 5(b) land uses and to reflect the intent of Council's Tweed Urban and Employment Lands Strategy 2009 (TUELS 2009).

The development is generally proposed to include a range of Bulky Goods Retail and Business Park land uses. However, the precise land use inclusion within the site is not yet known and will be predominately market determined at the detailed investigation stage following rezoning approval. Therefore, precise internal layouts are conceptual only for this purpose of assessment.

Following discussions with RTA and Council it is considered inappropriate to undertake detailed internal layout assessments for parking, circulating roadways, pedestrians and service vehicles at this stage. Therefore this report primarily deals with the potential external impacts of a proposed land use rezoning.

For the purpose of assessing the potential traffic generated by the proposed development, Table 2.1 provides a breakdown of the proposed development components.

**Table 2.1: Proposed Development Components**

Proposed Development Land Use	No. Buildings	Site Area/Per Floor (m <sup>2</sup> )	Floors	Gross Floor Area (GFA) m <sup>2</sup>
Business Park	4	2,225	3	26,700
Bulky Goods Retail	1	13,480	1	13,480
<b>Total Gross Floor Area (m<sup>2</sup>)</b>				<b>40,180</b>

Primary access to the site shall be via the existing site access from Parkes Drive to the north. In addition, the existing access to the south east via Wollemi Place is proposed to be used as exit only.

Development of the site is not envisaged to be completed for approximately two years, therefore assessment of the traffic impacts associated with the development have been undertaken based on year of opening at 2013.



### 3. EXISTING CONDITIONS

#### 3.1 SURROUNDING ROAD NETWORK

##### 3.1.1 Pacific Highway

The Pacific Highway in proximity to the site is a NSW RTA state-controlled road with a posted speed of 100km/hr. Prior to the construction of the Tugun Bypass to the north, the subject site gained access via Rose Street off Kennedy Drive. In 2008 with the opening of the Tugun Bypass, a new interchange was constructed north of Kennedy Drive. This interchange connects to Kennedy Drive via north and south collector-distributor (CD) roads on either side of the Pacific Highway. The CD roads have a posted speed of 60km/hr, with the northbound CD road providing a new access point for the subject site via Wollemi Place and Parks Drive.

As a result of the Tugun Bypass's construction, the section of Pacific Highway between the Tugun Bypass and the Gold Coast Highway to the north was renamed the Old Pacific Highway and downgraded to 80km/hr northbound and 60km/hr southbound. This section of road is still controlled by the RTA up to the QLD/NSW border.

##### 3.1.2 Tugun Bypass

The opening of the Tugun Bypass in 2008 provided a four lane highway bypass approximately 7km long that takes traffic to the west of the Gold Coast Airport and connects to the QLD state-controlled M1 Pacific Motorway at Stewart Road, Currumbin. The Tugun Bypass is maintained by the Queensland Department of Transport and Main Roads (DTMR).

##### 3.1.3 Kennedy Drive Interchange

Kennedy Drive is a four lane arterial road with a posted speed of 60km/hr. It provides the primary arterial road function for western Tweed Heads suburbs such as West Tweed Heads, Panorama, Piggabeen, Bilambil Heights and Cobaki. The Kennedy Drive interchange with the Pacific Highway is a dual lane combined roundabout with a 'dog-bone' configuration.

Kennedy Drive currently carries approximately 22,000 vehicles per day and experiences significant traffic congestion during peak periods at the Pacific Highway interchange intersection. These adverse traffic conditions can be attributed to conflicting movements at the roundabouts combined with adverse queues at Kennedy Drive/Ducat Street signalised intersection which extend back to the interchange.

##### 3.1.4 Parkes Drive

Parkes Drive fronts the subject site to the north and provides access for traffic to/from the north via the Tugun Bypass. Parkes Drive also provide access to adjacent sites including Council's Sewage Treatment Plant and other properties currently zoned for rural and open space land use. Traffic volumes on Parkes Drive generally do not exceed 100 vehicles a day.

##### 3.1.5 Wollemi Place

Wollemi Place is an access place which provide direct access to the subject site onto the Pacific Highway service road. Currently the existing occupier of the site (Boys Bay Garden World) are the sole site which gain access via Wollemi Place and carries approximately 300 vehicles per day.

#### 3.2 TRAFFIC VOLUMES

Intersection surveys were undertaken on Kennedy Drive interchange and Tugun Bypass/Old Pacific Highway intersection in 2010 for the Cross Border Transport Master Plan. Further surveys of Parkes Drive and Wollami Place intersection were undertaken in 2011. Appendix B demonstrates the relevant survey data at key locations surrounding the site.

### 3.3 2013 (YEAR OF OPENING) TRAFFIC VOLUMES

It is envisaged that the proposed development will not be construction and operational until 2013, therefore traffic survey data has been increased to reflect expected traffic volumes in 2013. Based on traffic growth within the Gold Coast Strategic Transport Model (GCSTM) for the major links within proximity to the site a, 3.5% compounding traffic growth rate has been adopted and applied to relevant survey data. It should be noted that this growth rate is relatively conservative for Kennedy Drive turn volumes, as these roundabout intersections have had relatively zero growth during peak periods in recent years due to peak period capacity restraints at these intersections. Figure 3.1 and Figure 3.2 show the resultant 2013 peak hour traffic volumes at key intersections within proximity to the development for AM and PM peak hours respectively.

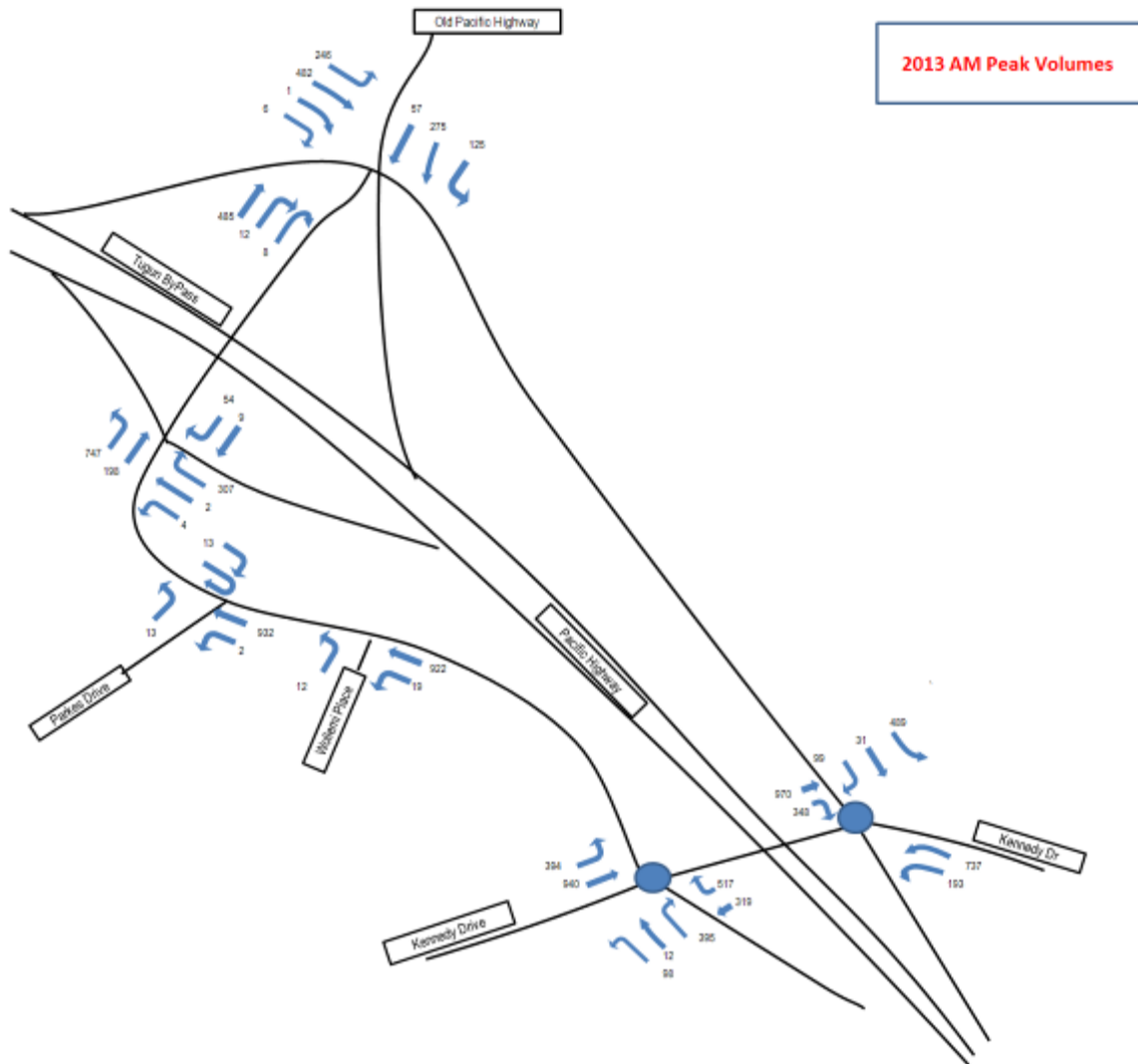


Figure 3.1: 2013 AM Peak Hour Traffic Volumes

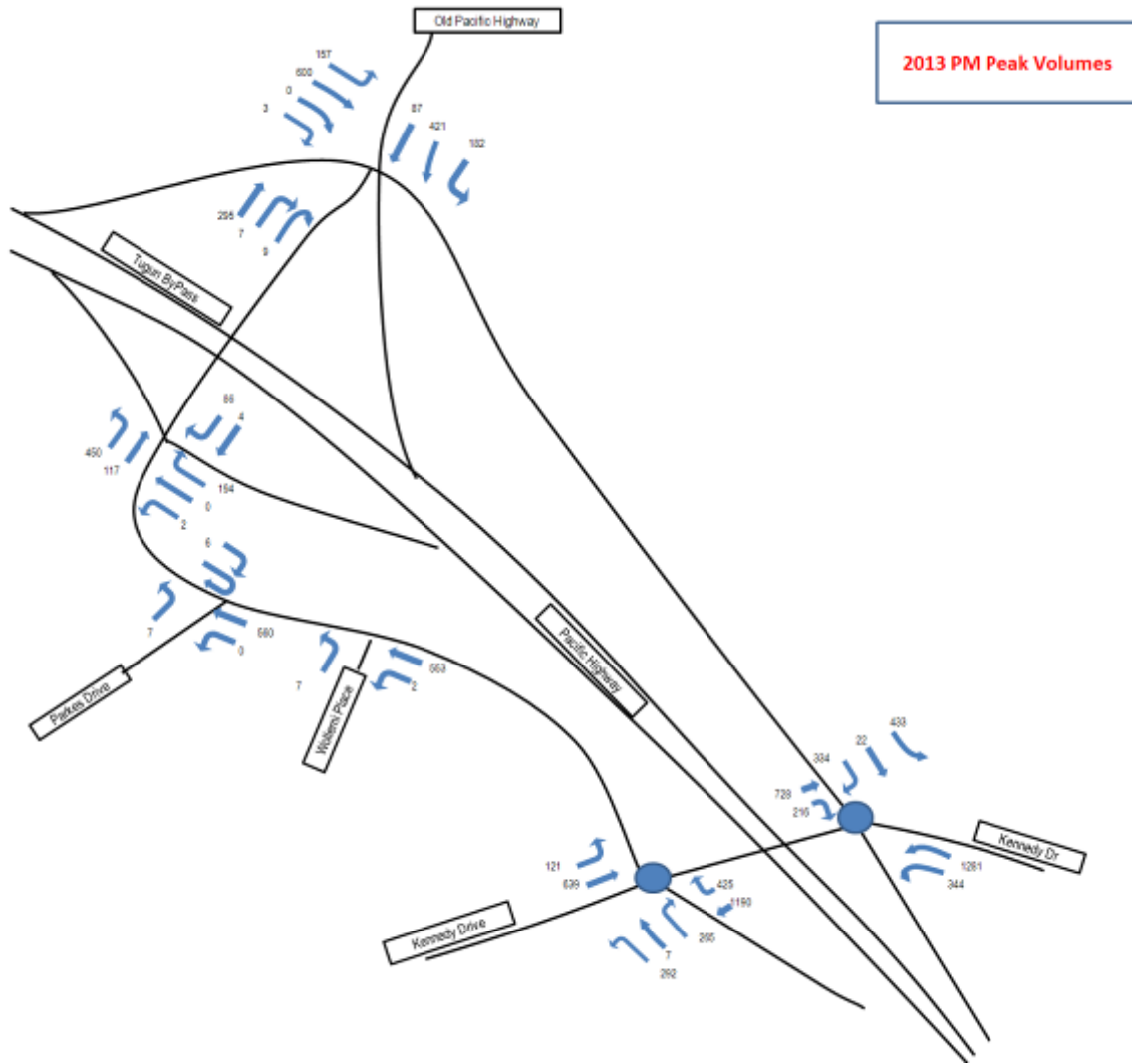


Figure 3.2: 2013 PM Peak Hour Traffic Volumes

## 4. FUTURE TRAFFIC CONDITIONS

As per Council's requirements for assessing the future traffic impacts of the proposed development to a 20 year design horizon from the year of opening, a design year assessment of 2033 has been undertaken.

In order to determine an accurate representation of the future expected road network within proximity to the site by 2033, a number of confirmed and proposed road network improvements are detailed below based on a number of previous studies and Council's projected construction timelines.

### 4.1 PREVIOUS STUDIES

As a result of the existing deficiencies with the current road network as well as the requirements for expected traffic growth in future years, Tweed Shire Council have commissioned a number of studies to identify the road network requirements and determine strategies to cater for the expected traffic increase over the next 20 years. These studies included the following:

- Lower Tweed and Pacific Highway Road Network Master Plan, which was undertaken by Parson Brinkerhoff in 2006;
- Tweed Cross Border Study, which undertaken is currently being undertaken in association with Gold Coast City Council, NSW's RTA, and DTMR and was prepared by Bitzios Consulting; and
- Pacific Highway Service Road Interchanges for Kirkwood Road to Kennedy Drive, which was undertaken by Parson Brinkerhoff in 2010.

#### 4.1.1 Lower Tweed and Pacific Highway Road Network Masterplan (2006)

Parsons Brinkerhoff were commissioned in 2006 to develop the Lower Tweed and Pacific Highway Masterplan, which identified a number a major road network inclusions and provided recommendations for implementation timelines. This Masterplan has since been adopted by Tweed Shire Council and the NSW RTA, which have announced meeting the anticipated construction timelines as shown in Figure 4.1.

#### Major elements included in the 2006 Master Plan:

Master Planning Element	Funding Responsibility	Anticipated Construction Time Table
Banora Point Upgrade	RTA	2010-2015
Kirkwood Road Extension (including modifications to Fraser Driver)	TSC	2015-2020
Terranora Creek Western Service Road	Joint RTA/TSC	2015-2020
Kirkwood Road South Facing Ramps	Joint RTA/TSC	2015-2020
Terranora Eastern Service Road	Joint RTA/TSC	2025-2030
Kennedy Drive to Tugun Bypass Service Roads	QDMR/Federal Government	Completed
Tweed Heads Bypass widening to six lanes	RTA	2025 to 2030

Source: Tweed Shire Council

**Figure 4.1: Lower Tweed and Pacific Highway Road Network Masterplan Timeline**



#### 4.1.2 Cross Border Traffic Master Plan (2011)

To determine the impacts from traffic growth associated with the planned and approved development, Tweed Shire Council (TSC) in conjunction with Gold Coast City Council (GCCC), NSW Roads and Traffic Authority (RTA) and DTMR commissioned the development of a Cross Border Traffic Master Plan. The stated objectives of the Master Plan development included:

- identifying and assessing options for optimising the interaction of the Pacific Highway (including the Tugun Bypass) with the adjacent urban arterial road network with the aim of promoting local function trips on the local network and minimising reliance on the Pacific Highway/Pacific Motorway;
- optimising highway interchanges to provide the most appropriate levels of service and outline implementation arrangements to provide connectivity between the growth areas and local and regional facilities such as the Gold Coast Airport and John Flynn Hospital; and
- improving pedestrian and public transport connectivity including integration with the proposed future extension of the Gold Coast Rail Line to the Gold Coast Airport.

Table 4.1 provides a list of the road network inclusions for 2021 and 2031 Cross Border Study as agreed by the study stakeholders. Data from the Cross Border strategic modelling is integral to the determination of potential traffic volumes within proximity to the subject site.

**Table 4.1: Cross Border Study Road Network Inclusions for 2021 and 2031**

Key Links	2021 Configuration	2031 Configuration
Additional (southern) access to Gold Coast Airport	included	included
Kirkwood Road interchange	included	included
Scenic Drive Diversion	not included	included
McAlisters Road extension	not included	included
Cobaki Parkway (from Kennedy Drive to Boyd Street)	two lanes	four lanes
Boyd Street (from Cobaki Parkway to the Gold Coast Highway)	two lanes	four lanes
Pacific Highway (from Kirkwood Road to Kennedy Drive)	four lane road + eastern service road (two-way, one lane/direction road)	six lane road + 2 service roads (one-way, two lanes /direction)
Pacific Highway Banora Point upgrade	included	included
GCCC Priority Infrastructure Plan projects	included	included
TSC Road Contribution Plan projects	included	included
Pacific Motorway between Stewart Road and Mudgeeraba Interchange (i.e. Robina Town Centre Drive)	four lanes	eight lanes
Pacific Motorway between Mudgeeraba Interchange and Nerang South (i.e. Nielsens Road)	six lanes	eight lanes

Source: Cross Border Traffic Study (2011)

#### 4.1.3 Pacific Motorway Service Road Interchanges (Kirkwood Road to Kennedy Drive) (2010)

Tweed Shire Council commissioned Parsons Brinkerhoff to undertake a study of various options for Kirkwood Road and Kennedy Drive interchanges for 2015 interim and 2030 ultimate configurations.

The report recommendation, which was reiterated by Councils representative John Zawadski has identified the preferred option for 2030 upgrade to improvements as shown in Figure 4.2 and includes the following ultimate configuration components:

- removal of ramps at Kennedy Drive construction of through movement bridges over Kennedy Drive;
- retaining the existing roundabout intersections at Kennedy Drive;
- southbound service road connecting the eastern interchanges at Kirkwood Road and Kennedy Drive; and

- northbound service road connecting the western interchanges at Kirkwood Road and Kennedy Drive.



Source: Tweed Shire Council

**Figure 4.2: Council’s Proposed 2030 Kennedy Drive Interchange Configuration**

Whilst accurate timelines for the above-mentioned upgrades are yet to be confirmed, it is envisaged that the service road upgrades to Kennedy Drive/Kirkwood Road will accompany the planned six laning of the Tweed Bypass section of the Pacific Highway in 2030.

Similarly for the 10 year assessment and consistent with Cross Border Study recommendations for 2021, Figure 4.3 demonstrates the interim Eastern Service Road connection between Kirkwood Road and Kennedy Drive.



Source: Tweed Shire Council

**Figure 4.3: Council’s Proposed 2015 Interim Service Road Configuration**

## 4.2 FUTURE ROAD NETWORK UPGRADES

### 4.2.1 20 Year Design Assessment

As a result of the abovementioned studies, together with Tweed Shire Council's Road Infrastructure Planning, the following significant road network upgrades are highly anticipated to be implemented by the 20 year design horizon for the proposed development (i.e 2033).

- Pacific Highway / Kirkwood Road interchange;
- Tweed Bypass six laning;
- Kennedy Drive to Kirkwood Road Service Roads;
- Cobaki Parkway connection between Boyd Street and Piggabeen Road; and
- Scenic Drive Deviation between Scenic Drive and Piggabeen Road.

The inclusion of the above-mentioned road network inclusions by 2033 is expected to significantly alter the traffic patterns within proximity to the proposed development. As a result, traffic volumes for assessing the impacts of the proposed development in the 20 year design horizon are derived from strategic transport model data within Councils studies, namely the 2030 Kirkwood Road and Kennedy Drive interchange study as well as the 2031 Cross Border Study.

### 4.2.2 Interim 10 Year Design Assessment

Feedback from the RTA highlighted that given the capacity restrictions of the current network and the uncertain timeframe for future network modifications by 2033, it is suggested that the network impacts for an intervening period (10 years) should also be examined to determine any works necessary to mitigate the traffic generation potential of the site.

As a result, an assessment has been undertaken based on the 2021 interim year assessment from the Cross Border Strategic Transport Model, which includes agreed assumed upgrades by 2021.

The following 2021 network inclusions have been agreed by the RTA, Tweed Shire Council, Gold Coast City Council and the Qld Department of Transport and Main Road:

- Additional southern access to Gold Coast Airport / Southern Cross University;
- Kirkwood Road Interchange;
- Cobaki Parkway connection between Boyd Street and Piggabeen Road (two lanes); and
- Pacific Highway (from Kirkwood Road to Kennedy Drive) to include four lanes + eastern service road (two-way, one lane/direction).

## 4.3 FUTURE YEAR TRAFFIC VOLUMES

Future traffic volumes have been based on AM and PM peak strategic outputs from the 2021 and 2031 Cross Border. The data has then been further increased to determine 10 year (2023) and 20 year (2033) traffic volumes using an annual growth rate of 2.4%, which is based on average growth between 2015 and 2030 of through traffic on the Pacific Highway and Kennedy Drive from Parson Brinkerhoff's Service Road Interchanges Study.

### 4.3.1 10 Years Design Horizon - 2023 Traffic Volumes

Figure 4.4 and Figure 4.5 demonstrate the 2023 peak hour traffic volumes for the AM and PM peak respectively.



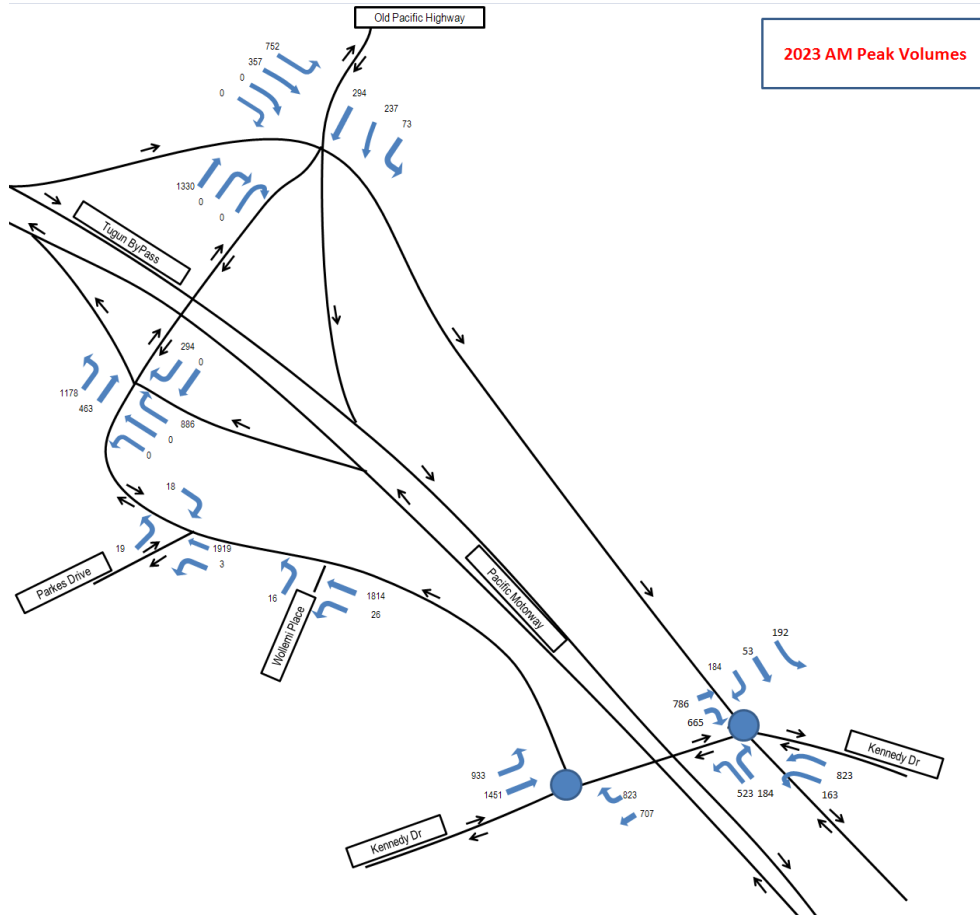


Figure 4.4: 2023 AM Peak Hour Traffic Volumes

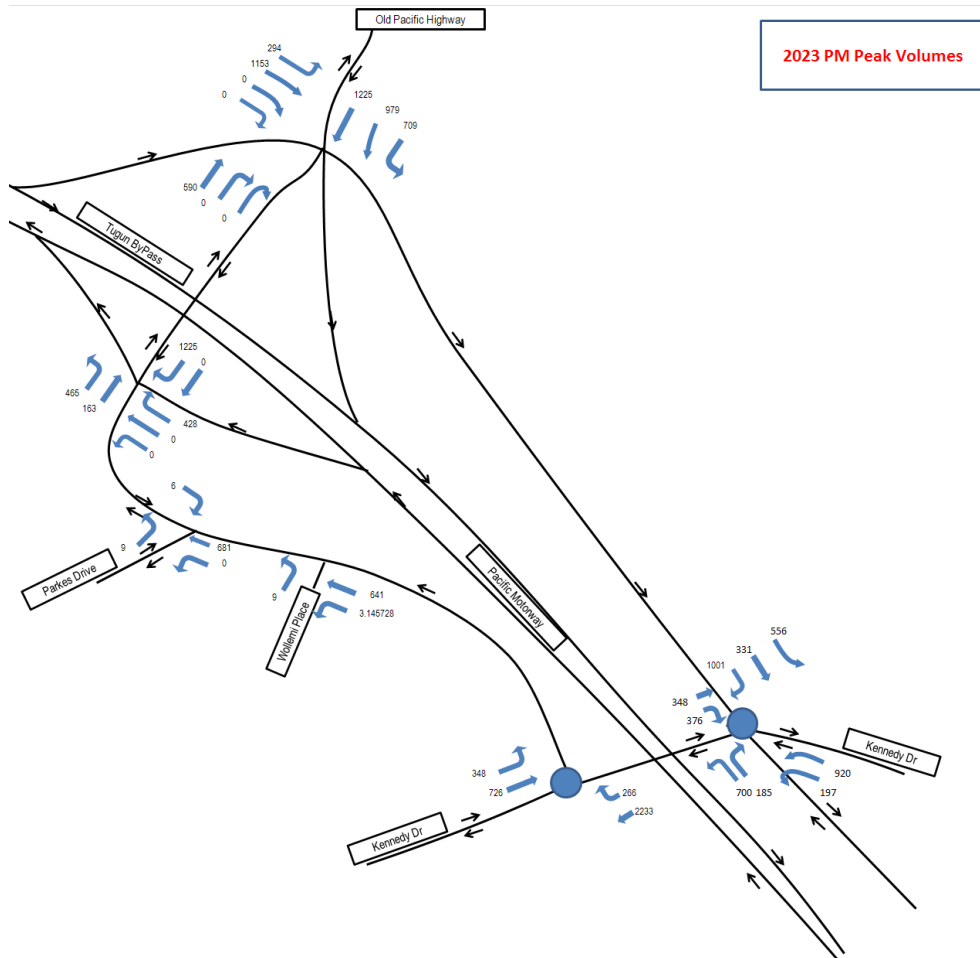


Figure 4.5: 2023 PM Peak Hour Traffic Volumes



### 4.3.2 20 Year Design Horizon – 2033 Traffic Volumes

Figure 4.6 and Figure 4.7 demonstrate the 2033 peak hour traffic volumes for the AM and PM peak respectively.

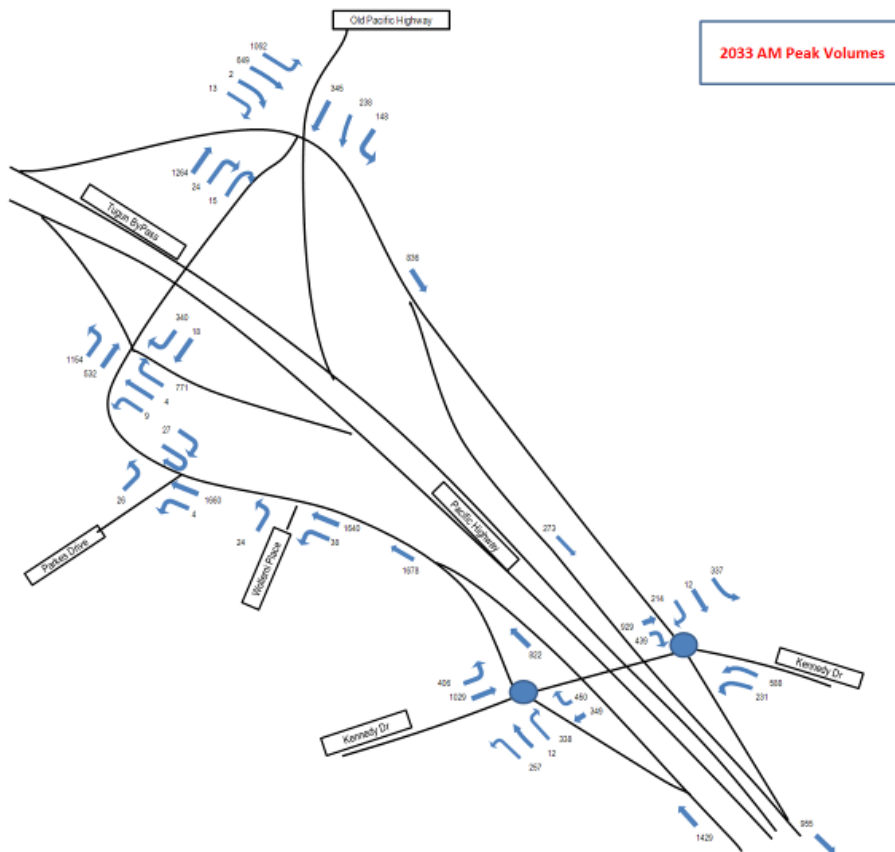


Figure 4.6: 2033 AM Peak Hour Traffic Volumes

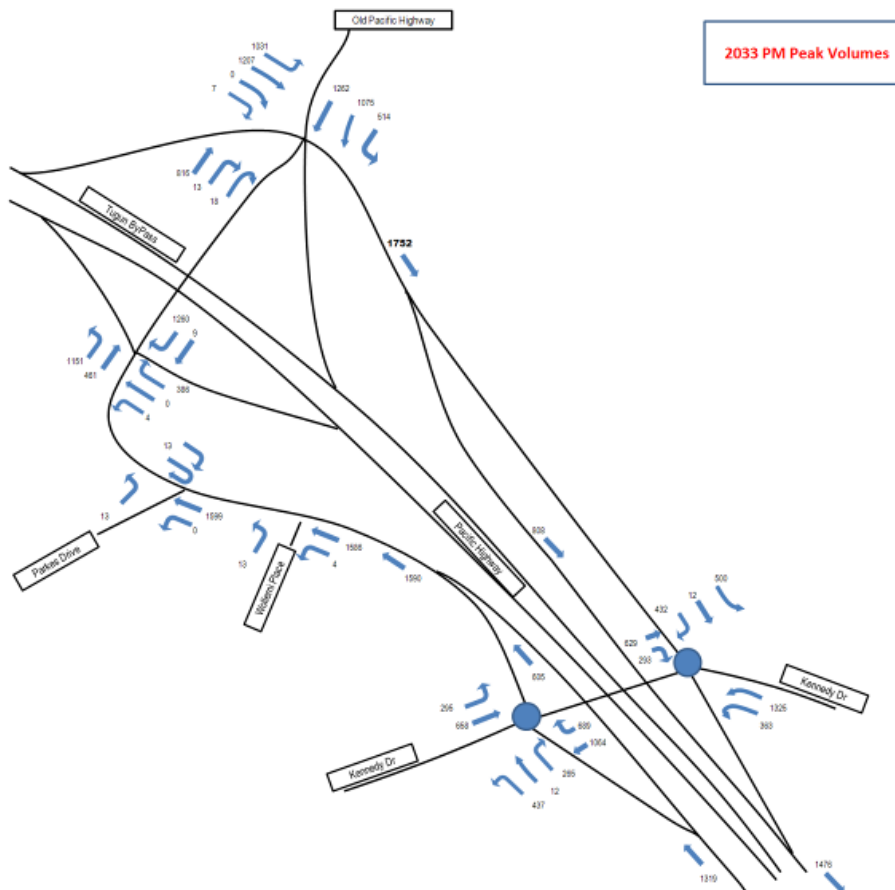


Figure 4.7: 2033 PM Peak Hour Traffic Volumes

## 5. TRAFFIC ASSESSMENT

This section investigates the influence that traffic generated by the proposed development will have on the surrounding road network and identifies any require mitigation measures to negate the impacts of the proposed development.

The operating performance of the surrounding intersections has been assessed using aaSIDRA modelling package and focusing on the degree of saturation (DoS), average delay (seconds) and 95th%ile queue length (vehicles).

### 5.1 DEVELOPMENT TRAFFIC GENERATION AND DISTRIBUTION

#### 5.1.1 Traffic Generation Rates

As this application is for rezoning only, the precise land use components are not fully determined. However, the size of the bulky goods component indicates the potential for a Hardware/Home Improvements such as a Bunnings, Masters or similar.

Traffic generation for Bulky Goods land uses varies considerably depending on the specific type of retail. The RTA's Guideline for Traffic Generating Developments states that peak traffic generated by Bulky Goods (retail) is approximately 2.5 trips per 100m<sup>2</sup>. However, this rate does not specify the applicable types of Bulky Goods and as such RTA have requested further assessment into the applicable traffic generation rates for the proposed development.

Bitzios Consulting recently undertook a review of various traffic generation rates for Bulky Goods in South East Queensland that were undertaken by the Queensland Department of Transport and Main Roads as details in Table 5.1 below.

**Table 5.1: Bulky Goods Subcategories Peak Trip Generation Comparison**

Bulky Goods Land Use Type Subcategories	Thursday PM Rate (trips/100m <sup>2</sup> GFA)	No. Surveys	Saturday Morning Rate (trips/100m <sup>2</sup> GFA)	No. Surveys
Electrical	6.95	2	-	0
Furniture	2.10	5	2.86	2
Hardware	2.98	5	9.17	4
Recreational Retail	4.48	2	-	0
Office Supplies	2.94	1	8.97	2
Boating Camping and Fishing Retail	4.53	1	3.33	1
Auto Parts Retail	-	0	12.23	2
Miscellaneous	-	0	8.73	2
<b>Average</b>	<b>3.48</b>		<b>8.12</b>	

The average trip generation for Hardware (e.g. Bunnings) is 2.98 trips per 100m<sup>2</sup> during the PM peak and 9.17 trips per Saturday morning peak. Whilst the highest peak traffic generation for these types of land uses occurs during the Saturday morning period, the most critical time for the subject site is the weekday PM peak period which coincides with background commuter peak.

The above weekday peak for Hardware / Home Improvements is greater than the RTA rate. However, it is considered a reduced traffic generation rate is applicable for the subject site due to the following considerations:

- The only existing competing Bunnings is located at South Tweed Heads with a catchment that extends as far north as Tugun and south to Ocean Shores. Therefore, the majority of trips that would historically travel to the competing site would subsequently be included within background traffic; and
- There is expected to be a level of diverted trips due to passing trade, particularly on the northbound CD road.

Based on the above, it is considered appropriate to use the RTA's rate of 2.5 trips/100m<sup>2</sup> for the purpose of this assessing the AM and PM weekday peak periods. In addition it is considered conservative to assess AM peak periods using the above rates as this is typically for PM peaks only.

### 5.1.2 Traffic Generation

Table 5.2 demonstrates the potential traffic generated by the proposed development using rates as per RTA's Guideline for Traffic Generating Developments as determined above.

**Table 5.2: Peak Hour Development Traffic Generation**

Proposed Development Land Use	Gross Leasable Area (m <sup>2</sup> )	RTA Trip Generation Rate/100m <sup>2</sup> (two-way)	Peak Hour Trips (two-way)	Directionality	
				In/Out (%)	
				AM Peak	PM Peak
Business Park	26,700	1.1	293.7	70/30	30/70
Bulky Goods (retail)	13,480	2.5	337	60/40	40/60
<b>Total</b>	<b>40,180</b>		<b>631</b>		

Table 5.3 demonstrates the resultant peak hour trips in and out of the development for AM and PM peak periods

**Table 5.3: Proposed Development Options In/Out Peak Hour Volumes**

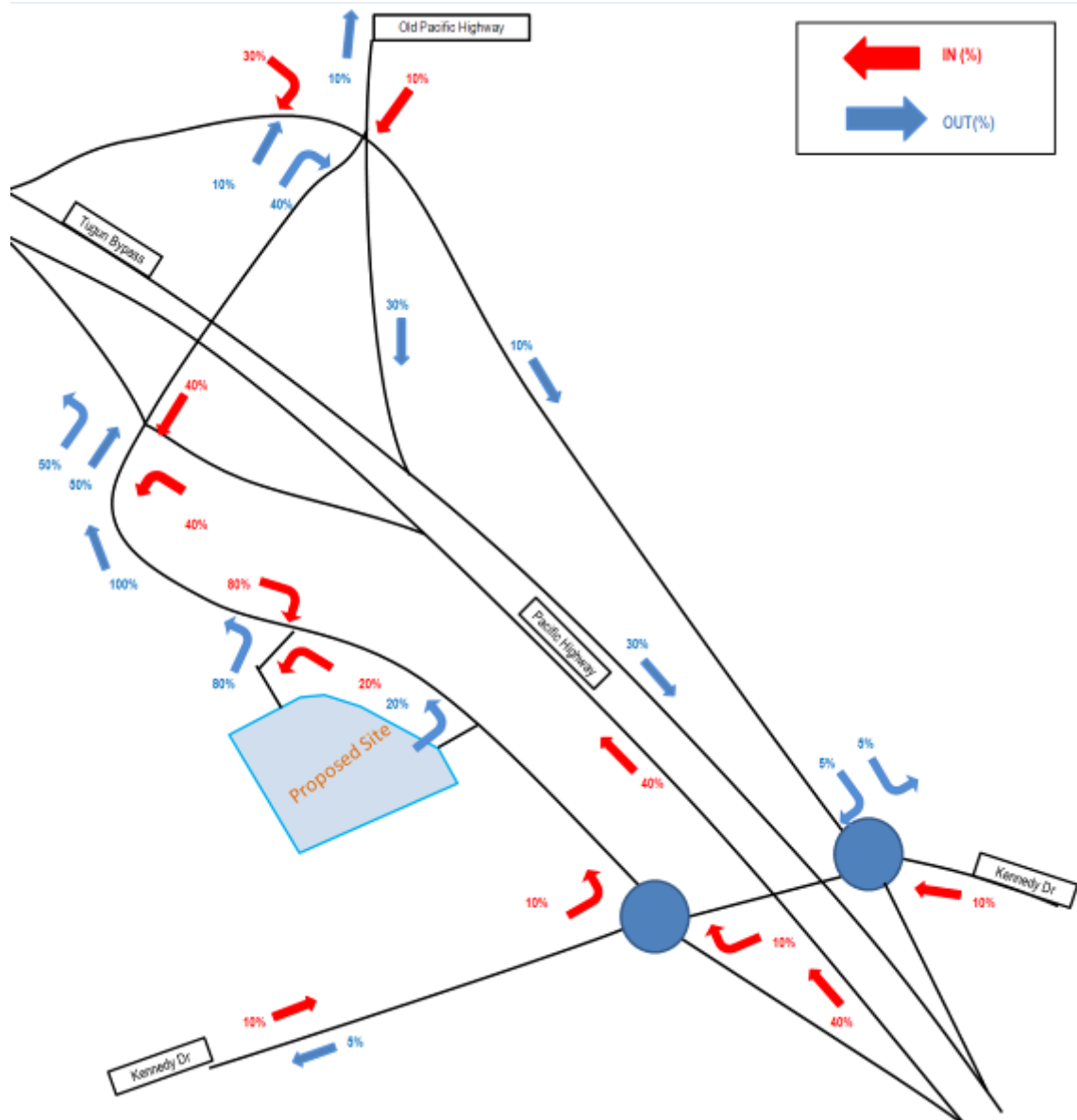
Proposed Development Land Use	AM Peak		PM Peak	
	In	Out	In	Out
Business Park	206	88	88	206
Bulky Goods (retail)	202	135	135	202
<b>Total Trips</b>	<b>408</b>	<b>223</b>	<b>223</b>	<b>408</b>

### 5.1.3 Traffic Distribution

Traffic distribution to and from the development has been assessed based on the existing travel patterns surrounding the subject site as well as the following considerations:

- Due to the sites convenient location adjacent to the Tugun Bypass and Pacific Highway, trips from the north and south are expected to make up the majority (70%) of trips to /from the site.
- The ability for vehicles to access the site directly via the motorway is expected to divert trips a large proportion of trips from the south (e.g Kingscliff, Bogangar, Cudgen, Casuarina) that would historically use the existing Bunnings / bulky goods retail at Greenway Drive South Tweed Heads to continue north to conveniently access the subject site;
- Traffic from the west is primarily residential based (Bilambil, Piggabeen, West Tweed Heads) and will use Kennedy Drive to access the site. These trips include a high percentage of car based trips and extend considerable length reaching out towards rural parcels and as a result these trips typically have a large proportion of linked trips into Tweed Heads / Coolangatta. Therefore, trips from the west are expected to make up only 10% of total trips to the proposed development; and
- Traffic to/from Coolangatta and Tweed Heads have the choice of using the Old Pacific Highway or Kennedy Drive to access the site and are expected to make up approximately 20% of trips to the site.

Figure 5.1 demonstrates the expected traffic distribution to/from the external road network.



**Figure 5.1: Proposed Development Peak Traffic Distribution**

#### 5.1.4 Development Traffic Volumes

Appendix D shows the development traffic volumes for each of the intersections based on the resultant distribution details in Figure 5.1 and in/out traffic generation in Table 5.2.

#### 5.1.5 Development Influenced Intersections

It is generally considered necessary to assess intersection that will see an increase of beyond 5% background traffic levels as a result of development traffic. Based on the above-mentioned traffic distribution of the proposed developments traffic generation, the following intersections have been assessed to determine the impacts of traffic generated by the proposed development for year of opening (2013) and 20 year design horizon (2033):

- Site 1 - Wollemi Place/Pacific Highway northbound CD road;
- Site 2 - Parkes Drive/Pacific Highway northbound CD road;
- Site 3 - Tugun Bypass Pacific Highway Interchange (Western Signalised Intersection);
- Site 4 - Tugun Bypass/Pacific Highway Interchange (Eastern Signalised Intersection);
- Site 5 - Kennedy Drive/Pacific Highway Interchange (Eastern Roundabout Intersection); and
- Site 6 - Kennedy Drive/Pacific Highway Interchange (Western Roundabout Intersection).



Whilst traffic from the site is expected to pass through the Kennedy Drive roundabouts (Sites 5 and 6), volumes are below 5% of background traffic volumes, the existing local importance of the functionality of these intersections warrant the need to investigate the proposed developments potential impacts.

## 5.2 2013 (YEAR OF OPENING) INTERSECTION ASSESSMENT

Table 5.4 provides a summary of the 2013 performance of each assessed intersection with and without the development. Detailed Sidra outputs are demonstrated within Appendix E.

**Table 5.4: 2013 Intersection Performance**

Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
<b>Site 1 – Wollemi Place/Pacific Highway Northbound CD Road</b>						
2013 Base (no development)	0.249	0.147	0.4	0.2	1.0	0.3
2013 With Development	0.266	0.158	0.8	1.5	4.2	4.5
<b>Site 2 – Parkes Drive/Pacific Highway Northbound CD Road</b>						
2013 Base (no development)	0.249	0.149	0.5	0.3	1.1	0.3
2013 With Development	0.765	0.597	9.0	7.1	50.2	34.5
<b>Site 3 – Tugun Bypass/Pacific Highway Interchange (western signalised intersection)</b>						
2013 Base (no development)	0.417	0.251	17.9	19.9	40.2	28.9
2013 With Development	0.479	0.365	20.1	20.0	51.9	43.9
<b>Site 4 – Tugun Bypass/Pacific Highway Interchange (eastern signalised intersection)</b>						
2013 Base (no development)	0.305	0.359	18.0	20.0	58.3	68.7
2013 With Development	0.376	0.492	21.4	24.2	71.7	87.1
<b>Site 5 – Kennedy Drive/Pacific Highway Interchange (eastern roundabout intersection)</b>						
2013 Base (no development)	0.573	0.860	8.7	13.2	31.9	117.7
2013 With Development	0.586	0.887	8.9	14.4	33.2	134.5
<b>Site 6 – Kennedy Drive/Pacific Highway Interchange (western roundabout intersection)</b>						
2013 Base (no development)	0.938	0.469	26.7	9.3	193.8	26.6
2013 With Development	0.977	0.481	33.9	9.5	249.58	29.1

Table 5.4 shows that all base intersections perform within capacity with the inclusion of development generated traffic, with the exception of Kennedy Drive roundabout intersections. Both intersections exceed the operational capacity and include considerable queues and subsequent time delays during the peak periods irrespective of the proposed development.

The implication of adverse eastbound queuing from Kennedy Drive/Ducat Street signalised intersection that results in queues extending back to influence both the roundabout intersection to the west. As a result, practical queues both on Kennedy Drive as well as the Pacific Highways southbound CD road are considerably long.

The site access intersections (i.e Wollemi Place and Parkes Drive) will continue to perform well within the acceptable operation capacity for the proposed development and do not require any mitigation measures in 2013.

Tugun Bypass/Pacific Highway interchange intersection also continues to perform well with the acceptable capacity limits and do not require any mitigation measures in 2013 as a result of development generated traffic.

### 5.3 2033 (20 YEAR DESIGN HORIZON) INTERSECTION ASSESSMENT

#### 5.3.1 Base (Without Development) Intersection Performance

As previously mentioned within Section 4, future base traffic volumes at intersections within proximity to the development will depend greatly on the implementation of future road network upgrades scheduled. As such, traffic volumes have been generated using Council's previous study data primarily comprising of strategic model data. Table 5.5 demonstrates the Base (without development) intersection performance without the proposed development generated traffic for each of the assessed intersections.

**Table 5.5: 2033 Base Intersection Configuration Performance (without development)**

Site No.	Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
		AM	PM	AM	PM	AM	PM
1	Wollemi Place / Pacific Highway northbound CD road	0.445	0.421	1.0	0.4	7.8	3.4
2	Parkes Drive/Pacific Highway northbound CD road	0.441	0.424	1.5	0.6	8.5	3.5
3	Tugun Bypass/Pacific Highway Interchange (Western Signalised Intersection)	0.772	1.000	26.2	29.7	113.5	143.2
4	Tugun Bypass/Pacific Highway Interchange (Eastern Signalised Intersection)	1.000	1.207	33.0	135.2	259.7	731.7
5	Kennedy Drive/Pacific Highway Interchange (Eastern Roundabout Intersection)	0.429	1.030	9.3	38.2	27.5	363.0
6	Kennedy Drive/Pacific Highway Interchange (Western Roundabout Intersection)	0.897	0.698	19.4	13.2	151.3	70.1

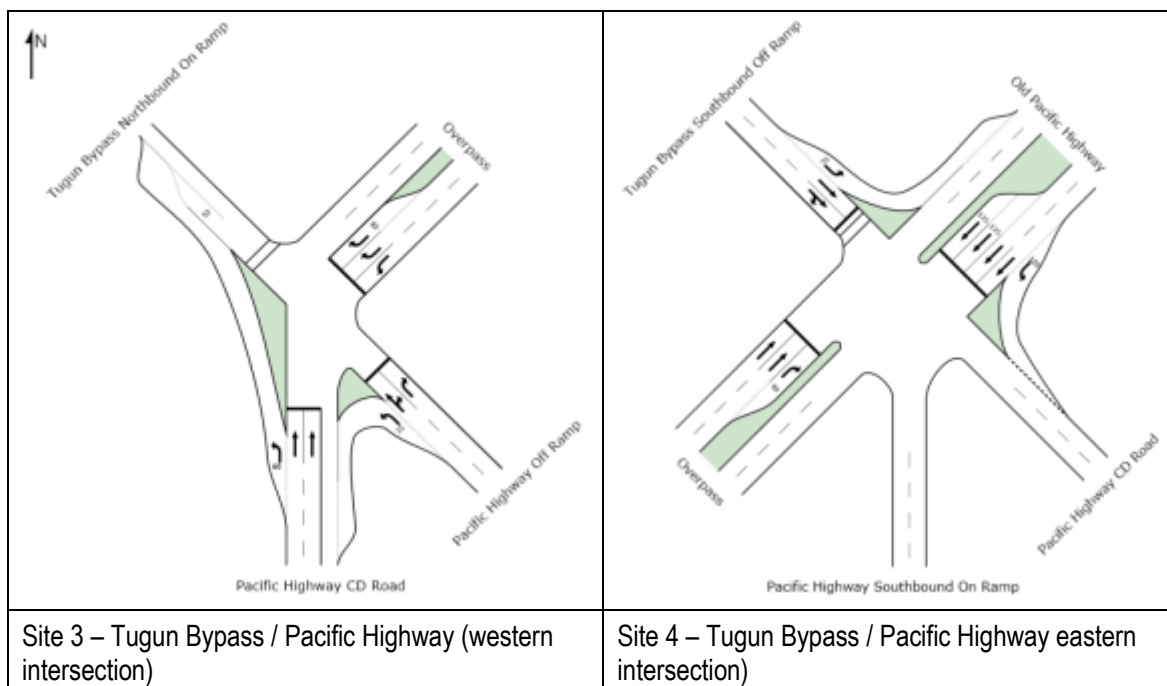
#### **Site Access Intersections (Sites 1 & 2)**

Table 5.5 shows that in 2033 the base configuration of both site access intersections (Wollemi Place and Parkes Drive) will continue to perform within acceptable limits in 2033 base traffic volumes.

#### **Tugun Bypass/Pacific Highway Interchange Intersections (Sites 3 & 4)**

The existing configurations for both Site 3 and Site 4 (Pacific Highway/Tugun Bypass Interchange intersections) will exceed their operation capacity in 2033 as a result of background traffic. Whilst these intersections were constructed in 2008, the existing linemarking and lane utilisation limits the full potential utilisation of the full intersection footprint. As such, a number of improvements are recommended to be implemented prior to 2033 irrespective of the proposed development. These include the following improvements, which are demonstrated in Figure 5.2:

- Site 3 (western intersection)
  - double right turn from the northern approach (overpass) to Tugun Bypass on-ramp, with a short exit lane;
- Site 4 (eastern intersection)
  - two southbound through lanes from Old Pacific Highway;
  - left turn from Tugun Bypass off-ramp to Old Pacific Highway northbound to be upgrade to include a continuous lane with 70 metre acceleration lane.



**Figure 5.2: Required Base Upgrade for Pacific Highway / Tugun Bypass Intersections**

Table 5.6 demonstrates the performance of the Pacific Highway/Tugun Bypass Interchange intersections with the above-mentioned intersection improvements.

**Table 5.6: 2033 Upgraded Intersection Configuration Performance (without development)**

Site No.	Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
		AM	PM	AM	PM	AM	PM
3	Tugun Bypass/Pacific Highway Interchange (Western Signalised Intersection)	0.644	0.842	24.0	31.8	101.8	266.2
4	Tugun Bypass/Pacific Highway Interchange (Eastern Signalised Intersection)	0.592	0.853	17.3	29.4	150.7	228.2

The above-mentioned base intersection improvements are required due to a combination of future planned road upgrades at Kennedy Drive and Kirkwood Road as well as traffic increases on the Gold Coast Highway. Both of which will significantly increase the level of traffic utilising the Tugun Bypass / Pacific Highway interchange by 2033. Council and the RTA are recommended to further investigate ‘flow-on’ impacts and network upgrades as a result of the future network improvements and future demands on the Tugun Bypass / Pacific Highway interchange.

**Kennedy Drive/Pacific Highway Intersections (Sites 5 and 6)**

In 2033 the base configuration of both roundabout intersections at Kennedy Drive will exceed the operational capacity, even with the inclusion of additional overpass ramps for through traffic to/from Kirkwood Road interchange irrespective of the development. As currently occurs, the close proximity to Ducat Street signalised intersection acts as a metre for westbound traffic approaching the intersection and is expected to continue out to 2033.

No additional mitigation measures have been assessed for the Kennedy Drive intersection. However, Council have indicated that additional improvements such as left turn slip lanes may be included although no timelines of configurations have been confirmed.

### 5.3.2 With Development Intersection Performance

#### Site 1 - Wollemi Place/Pacific Highway northbound CD road.

Table 5.7 provides a summary of the performance of Site 1, with the inclusion of development generated traffic in 2033.

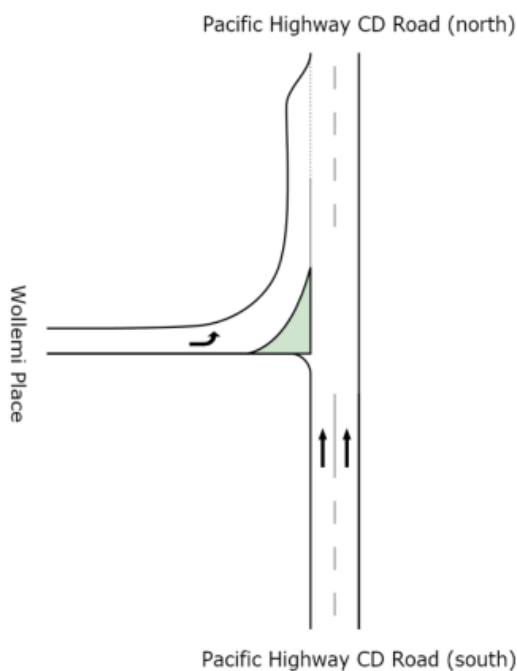
**Table 5.7: Site 1 - 2033 Intersection Performance (with development)**

Site 1 – Wollemi Place/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
Base (no development)	0.445	0.421	1.0	0.4	7.8	3.4
With Development	0.715	0.937	2.8	6.5	21.6	44.8

In 2033, the proposed development traffic exceeds the operational capacity of the intersection for the Wollemi Place approach turning left on the northbound CD road.

This can be attributed to the inclusion of the northbound overpass at Kennedy Drive and connection to Kirkwood Road, which significantly increase the volumes of northbound through traffic and subsequently reducing the level of acceptable gaps for traffic exiting Wollemi Place.

Therefore it is recommended to include a left slip lane out of Wollemi Place to allow traffic to exit and merge into the northbound through lane as shown in Figure 5.3.



**Figure 5.3: Required Upgrade for Wollemi Place Intersection**

Table 5.8 demonstrates the performance of the proposed intersection improvement with proposed development traffic.

**Table 5.8: Wollemi Place Intersection with Upgrade - 2033 Intersection Performance (with development)**

Site 1 – Wollemi Place/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
With Development (no upgrade)	0.715	0.937	2.8	6.5	21.6	44.8
With Development (with upgrade)	0.466	0.433	0.2	0.4	0.0	0.0



The recommended upgrade to Wollemi Place improves the intersection performance within acceptable limits by allowing exiting vehicles to merge with northbound traffic.

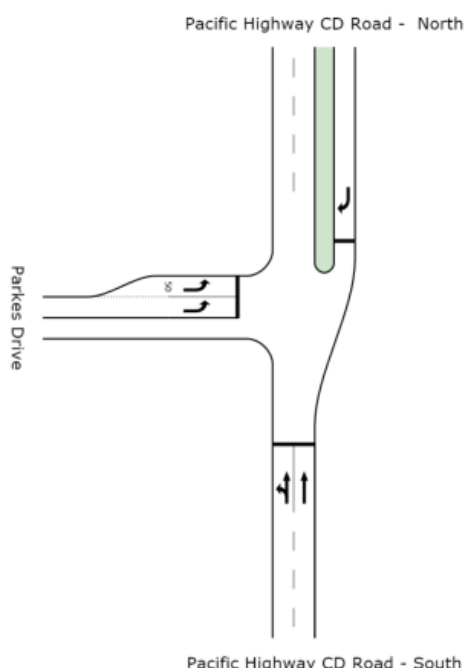
**Site 2 – Parkes Drive/Pacific Highway northbound CD Road**

Table 5.9 provides a summary of the performance of Site 2, with the inclusion of development generated traffic in 2033.

**Table 5.9: Parkes Drive Intersection with Improvement - 2033 Intersection Performance (with development)**

Site 2 – Parkes Drive/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
Base (no development)	0.441	0.424	1.5	0.6	8.5	3.5
With Development	3.929	4.512	587.9	548.6	1,287.5	1,295.7

In 2033 with the proposed development traffic, the intersection performance exceeds the operational capacity as a result of insufficient gaps for turning traffic. Similar to Site 1, the addition of the northbound overpass at Kennedy Drive significantly increase through traffic passing Parkes Drive. As such, the intersection requires the upgrading to signalisation in order to provide designated green time for turning traffic in and out of the development as shown in Figure 5.4.



**Figure 5.4: Required Upgrade for Parkes Drive Intersection**

The inclusion of an additional short left turn lane is proposed to limit the queues on Parkes Drive that may influence potential site access locations of the subject site. Table 5.10 demonstrates the performance of the proposed intersection improvement with proposed development traffic.

**Table 5.10: Site 2 - 2033 Upgraded Intersection Performance (with development)**

Site 2 – Parkes Drive/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
With Development (no upgrade)	3.929	4.512	587.9	548.6	1,287.5	1,295.7
With Development (with upgrade)	0.798	0.662	21.1	16.3	210.7	146.4

The signalisation at Parkes Drive intersection improves the intersection performance within acceptable limits.

An interim assessment (10 years) has therefore been undertaken in section 5.4 to determine if signalisation is required prior to the construction of the northbound overpass is constructed at Kennedy Drive.

**Site 3 – Tugun Bypass/Pacific Highway Interchange Western Intersection**

Table 5.11 provides a summary of the performance of Site 3, with the inclusion of required upgrades for background traffic and development generated traffic in 2033.

**Table 5.11: Pacific Highway/Tugun Bypass Western Intersection - 2033 Intersection Performance (with development)**

Site 3 – Tugun Bypass/Pacific Highway Interchange (western signalised intersection)	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
Base (no development) (no upgrade)	0.772	1.000	26.2	29.7	113.5	143.2
Base (no development) (with upgrade)	0.644	0.842	23.8	31.5	100.1	266.2
With Development (with upgrade)	0.705	0.900	24.3	32.7	113.0	286.3

In 2033 with the proposed development traffic, the upgraded base configuration continues to perform within the acceptable operation limits, with only a negligible increase in performance indicators compared to the base traffic volumes. Therefore no mitigation measures are required as a result of the development generated traffic.

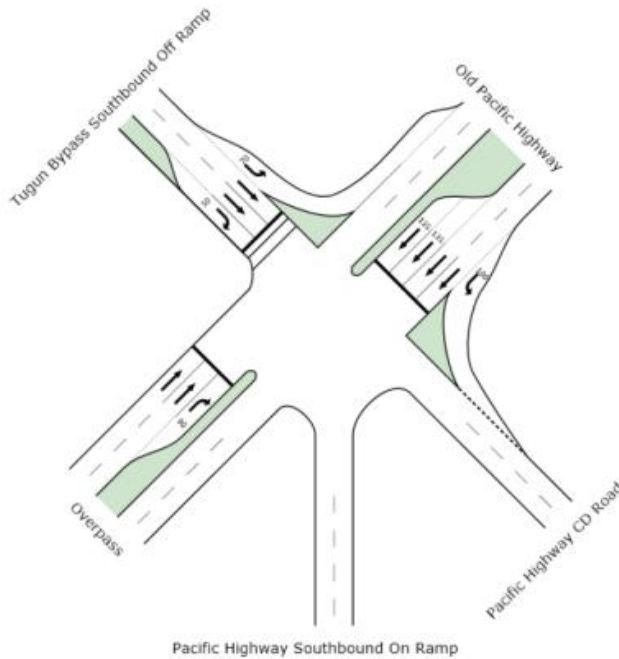
**Site 4 – Tugun Bypass/Pacific Highway Interchange Eastern Intersection**

Table 5.12 provides a summary of the performance of Site 4, with the inclusion of required upgrades for background traffic and development generated traffic in 2033.

**Table 5.12: Pacific Highway/Tugun Bypass Eastern Intersection - 2033 Intersection Performance (with development)**

Site 4 – Tugun Bypass/Pacific Highway Interchange (eastern signalised intersection)	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
Base (no development) (no upgrade)	1.000	1.207	33.0	135.2	259.7	731.7
Base (no development) (with upgrade)	0.592	0.853	17.3	29.4	150.7	228.2
With Development (with upgrade)	0.636	0.924	20.4	37.1	164.8	276.8

Development traffic causes the signalised intersection to exceed the operational capacity limit of 0.9. As such, the intersection requires a dedicated right turn lane for the Tugun Bypass off-ramp to cater for development traffic as shown in Figure 5.5.



**Figure 5.5: Required Upgrade for Pacific Highway/Tugun Bypass Eastern Intersection**

Table 5.13 shows the resultant intersection performance with the required upgrades to cater for the development traffic.

**Table 5.13: Pacific Highway/Tugun Bypass Eastern Intersection - 2033 Intersection Performance (with development)**

Site 4 – Tugun Bypass/Pacific Highway Interchange (eastern signalised intersection)	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
With Development (with upgrade)	0.636	0.924	20.4	37.1	164.8	276.8
With Development (with additional upgrade)	0.592	0.902	19.4	34.1	151.3	240.6

The proposed development is therefore responsible for a dedicated right turn lane to be included at southbound off-ramp approach to the Tugun Bypass/Pacific Highway interchange intersection by 2033.

The interim year assessment (10 years) has therefore been undertaken to determine if this intersection improvement is required prior to 2033.

**Site 5 and 6 – Kennedy Drive/Pacific Highway Roundabout Intersections**

Table 5.14 provides a summary of the performance of Site 5 and 6, with the inclusion of development generated traffic in 2033 and comparing to the base (without development) performance.

**Table 5.14: Kennedy Drive / Pacific Highway - 2033 Intersection Performance (with Development)**

Location	Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
		AM	PM	AM	PM	AM	PM
Kennedy Drive/Pacific Highway Interchange (Eastern Roundabout Intersection)	Without Development	0.429	1.030	9.3	38.2	27.5	363.0
	With Development	0.487	1.064	9.5	49.3	30.8	456.9
Kennedy Drive/Pacific Highway Interchange (Western Roundabout Intersection)	Without Development	0.897	0.698	19.4	13.2	151.3	70.1
	With Development	0.956	0.731	26.7	14.0	217.6	79.1

The traffic generated by the proposed development provides only a minor increase in traffic volumes and subsequent minor impact on performance criteria by 2033. As the configuration continues to operate at capacity without development traffic even with the proposed overpasses to remove through traffic, no mitigation measures are required as a result of the development generated traffic at both Kennedy Drive intersections.

Council's S.94 Road Contributions Plan –Works Schedule includes a number of improvements for *Zone 1 Tweed Heads – Kennedy Drive* between Ducat Street and Cobaki Creek Bridge. As such, the proposed development's S.94 contributions will go towards improving the existing operational deficiencies along Kennedy Drive.

## 5.4 2023 (10 YEAR DESIGN HORIZON) INTERSECTION ASSESSMENT

Based on the level of expected traffic increases over a 20 year design horizon and subsequent upgrades as a result of background traffic, the RTA have requested an assessment of the interim 10 year design horizon. This assessment will confirm the timelines for development generated upgrades as previously identified.

### 5.4.1 2023 Background Traffic Assessment

Table 5.15 demonstrates the Base (without development) intersection performance without the proposed development generated traffic for each of the assessed intersections.

**Table 5.15: 2033 Base Intersection Configuration Performance (without development)**

Site No.	Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
		AM	PM	AM	PM	AM	PM
1	Wollemi Place / Pacific Highway northbound CD road	0.487	0.171	0.8	0.2	6.2	0.4
2	Parkes Drive/Pacific Highway northbound CD road	0.509	0.181	1.3	0.3	9.7	0.4
3	Tugun Bypass/Pacific Highway Interchange (Western Signalised Intersection)	0.700	1.000	24.9	28.3	108.4	130.6
4	Tugun Bypass/Pacific Highway Interchange (Eastern Signalised Intersection)	1.000	1.006	28.1	50.4	215.3	363.9
5	Kennedy Drive/Pacific Highway Interchange (Eastern Roundabout Intersection)	0.737	1.441	13.3	198.4	55.6	139.3
6	Kennedy Drive/Pacific Highway Interchange (Western Roundabout Intersection)	1.407	0.722	259.8	6.5	2129.8	23.5

Table 5.15 shows that in 2023 site access intersection of Wollemi Place and Parkes Drive will continue to perform within acceptable limits under base traffic volumes. However, even with planned improvements in place the Kennedy Drive roundabout intersections (sites 5 and 6) will operate over the operation capacity and continue to cause significant delays and queues. The planned upgrades as detailed in Council's Kennedy Drive and Kirkwood Interchange planned are therefore required prior to 2023 based on forecast traffic volumes.

The Tugun Bypass / Pacific Highway interchange intersections (sites 3 and 4) exceed capacity during the AM and PM peaks. This reduction in operational capacity compared to current conditions can be attributed



to the increased usage of the Tugun Bypass over the next 10 years, particularly at the subject intersections for traffic to/from Coolangatta due to the following reasons:

- increased congestion on the Gold Coast Highway around Tugun as a result of Cobaki Lakes will make the competing parallel route less desirable for local trips;
- TMR's proposed upgrades to Coolangatta Road /Gold Coast Highway interchange will divert new trips to/from Coolangatta; and
- increased development in and around the Gold Coast Airport Precinct.

## 5.4.2 2023 'With Development' Assessment

### **Site 1 - Wollemi Place/Pacific Highway northbound CD road.**

Table 5.16 provides a summary of the performance of Site 1, with the inclusion of development generated traffic in 2023.

**Table 5.16: Site 1 - 2023 Intersection Performance (with development)**

Site 1 – Wollemi Place/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
With Development – no upgrades	1.017	0.171	234.3	13	53.2	5.3
With Development – with upgrades	0.487	0.171	-	-	-	-

The sidra assessment shows that Wollemi Place will require a left turn acceleration lane in 2023 as previously detailed within the 2033 assessment. However, the strategic peak hour volumes are unconstrained and the sidra assessment does not take into consideration the performance of the Kennedy Drive roundabout to the south which limits and meters northbound traffic passing Wollemi Place. It is still considered relevant for Wollemi Place to be upgraded to include a left turn lane as a result of traffic generated by full development of the subject site prior to 2023.

### **Site 2 – Parkes Drive/Pacific Highway northbound CD Road**

Table 5.17 demonstrates that Parkes Drive / Pacific Highway northbound CD road requires signalisation by 2023.

**Table 5.17: Site 2 - 2023 Intersection Performance (with development)**

Site 2 – Parkes Drive/Pacific Highway Northbound CD Road	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
With Development – no upgrades	5.750	0.649	762.6	7.5	1412.6	39.3
With Development – with upgrades	0.821	0.644	23.0	14.6	281.9	49.1

The interim year (2023) assessment demonstrates that the proposed development requires upgrading Parkes Drive / Pacific Highway northbound CD road intersection to signals with an additional left turn lane from Parkes Drive.

It is therefore recommended that Parkes Drive/ Pacific Highway northbound CD road be upgraded to signals to cater for full development of the proposed land use by 2023.

### **Sites 3 and 4 – Tugun Bypass / Pacific Highway Interchange Intersections**

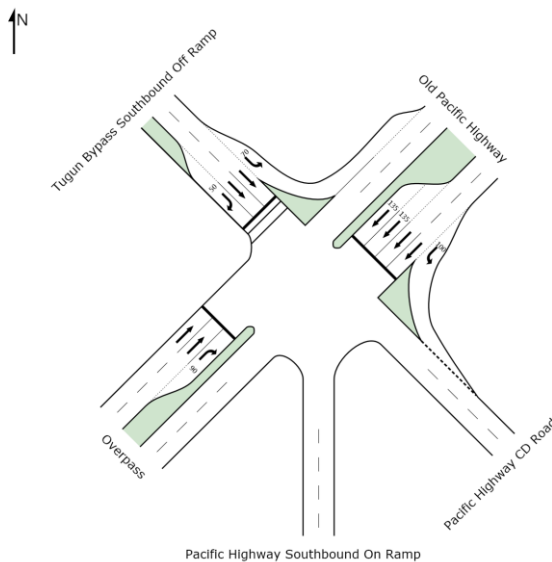
The 2023 interim assessment shows that both intersections will require upgrades irrespective of proposed development consistent with the 2033 assessment. Table 5.18 shows the performance of the upgraded intersection due to background traffic requirement and with the inclusion of development traffic.

**Table 5.18: Site 3 and 4 - 2023 Base Upgraded Intersection Performance (with development)**

Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
	AM	PM	AM	PM	AM	PM
Site 3 Background Required Upgrades – with Development	0.719	0.893	22.5	31.5	111.6	226.5
Site 4 Background Required Upgrades - with Development	0.559	0.927	19.1	37.5	140.7	272.4

Site 3 will continue to operate within acceptable limits with the inclusion of development traffic in 2023. Therefore, no additional upgrades are required.

For Site 4 however will require additional upgrades to cater for development traffic. Specifically, the requirement for a 50 metre right turn lane for the Tugun Bypass off-ramp approach to the intersection (as determined in 2033 assessment and shown in Figure 5.6 below) is therefore required prior to 2023 under full development traffic conditions.



**Table 5.6: Site 4 Intersection with Development Required Right Turn Lane**

**Sites 5 and 6 – Pacific Highway / Kennedy Drive Interchange Intersections**

Table 5.19 provides a summary of the performance of Site 5 and 6, with the inclusion of development generated traffic in 2023 and comparing to the base (without development) performance.

**Table 5.19: Kennedy Drive / Pacific Highway Interchange - 2023 Intersection Performance (with Development)**

Location	Scenario	Degree of Saturation (DoS)		Average Delay (s)		95% Back of Queue (m)	
		AM	PM	AM	PM	AM	PM
Kennedy Drive/Pacific Highway Interchange (Eastern Roundabout Intersection)	Without Development	0.737	1.441	13.3	198.4	55.6	1013.9
	With Development	0.786	1.468	14.4	223.4	76.6	1074.5
Kennedy Drive/Pacific Highway Interchange (Western Roundabout Intersection)	Without Development	1.407	0.722	259.8	6.5	2129.8	23.5
	With Development	1.508	0.732	317.5	6.6	2477.4	31.0

The inclusion of development traffic provide only a minor increase in performance indicators in comparison to the already over capacity performance of the Kennedy Drive roundabout intersections. As previously detailed, these intersections are planned for additional upgrades after 2023 as part fo the Kirkwood Road – Kennedy Drive interchnage planning.

## 5.5 KEY INTERSECTION ASSESSMENT FINDINGS

Below details the key findings for the assessment of development influenced intersections:

- In 2013, all intersections continue to operate at acceptable levels of performance with the inclusions of development generated traffic. Kennedy Drive roundabout intersections are a known concern to both Council and the RTA and exhibit considerable queues during peak periods irrespective of development traffic. With the inclusion of traffic generated by the proposed development, exacerbation of these issues is minor in comparison and does not warrant the need for additional upgrades as a result of the development.
- With the inclusion of development generated traffic, the site access intersection at Wollemi Place requires a left turn continuous slip lane by 2023.
- With the inclusion of development generated traffic, the site access intersection at Parkes Drive requires signalisation by 2023. This shall include an additional left turn lane from Parkes Drive northbound to reduce traffic queues along Parkes Drive back to influence possible site access locations.
- In both 2023 and 2033 with the inclusion of agreed road network upgrades, the base configuration at both signalised intersections at Tugun Bypass / Pacific Highway interchange are required to be upgraded, irrespective of the development of the subject site. Development of the subject site will require a 50 metre right turn lane to be added to the Tugun Bypass southbound off-ramp approach to the eastern intersection.
- Kennedy Drive / Pacific Highway roundabout intersections will continue to experience significant queues and delays irrespective of development at the subject site. The inclusion of development generated traffic at Kennedy Drive roundabout intersection results in a negligible reduction in the operational performance as both intersections continue to perform at capacity under base traffic volumes. The proposed developments S.94 contributions will go towards funding Council's identified mitigation measures as detailed within the Road Contributions Plan-Schedule 5 for *Zone 1-Kennedy Drive*. No additional improvement measures at the Kennedy Drive roundabout intersections are therefore required as a result of the proposed development.

## 6. SITE ACCESS

### 6.1 WOLLEMI PLACE SITE ACCESS

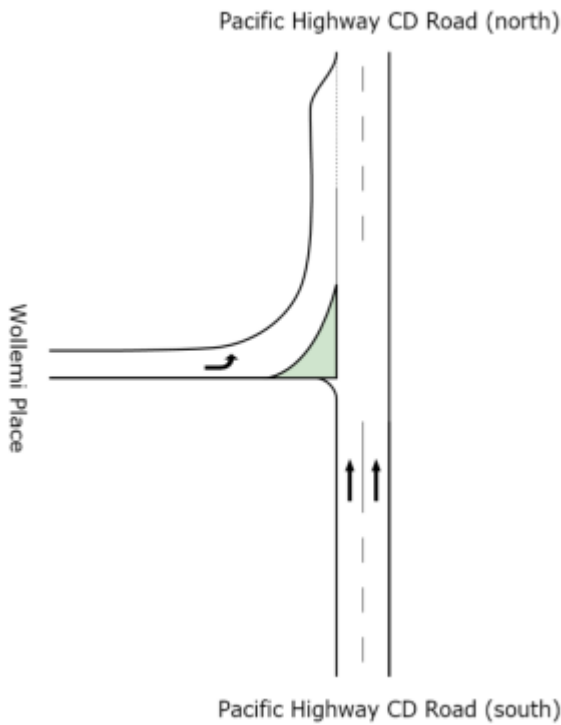
The existing site access at Wollemi Place is a left in/left out configuration off the one way Pacific Highway CD Road northbound as shown in Figure 6.1 below.



**Figure 6.1: Wollemi Place Existing Site Access**

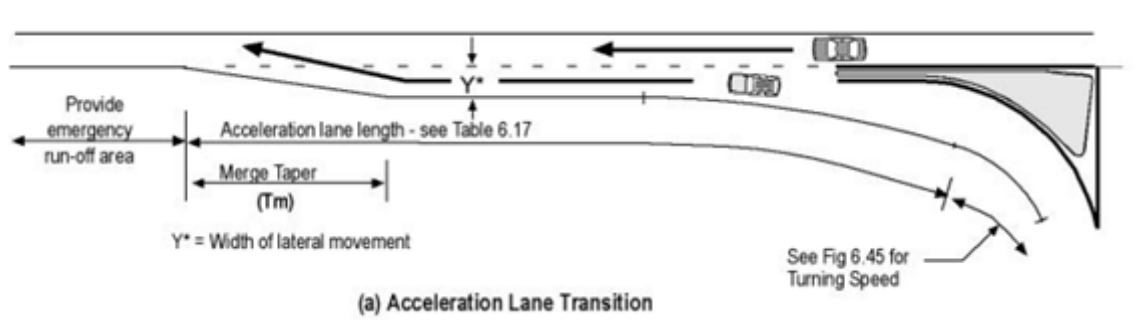
With the inclusion of the proposed development, it is proposed the existing site access via Wollemi Place will change from an entry/exit from the Pacific Highway CD Road to an exit only. The layout for the intersection will implement a continuous slip lane to merge on to the Pacific Highway CD Road to minimise development impacts to through traffic. The layout for the Wollemi Place/Pacific Highway CD Road is shown in Figure 6.2 below.





**Figure 6.2: Upgrade for the Wollemi Place/Pacific Highway CD Road Intersection**

The acceleration/merge lane length requirement is to comply with Austroads Guide to Engineering Practice: Intersections at Grade, see Figure 6.3 and Figure 6.4.



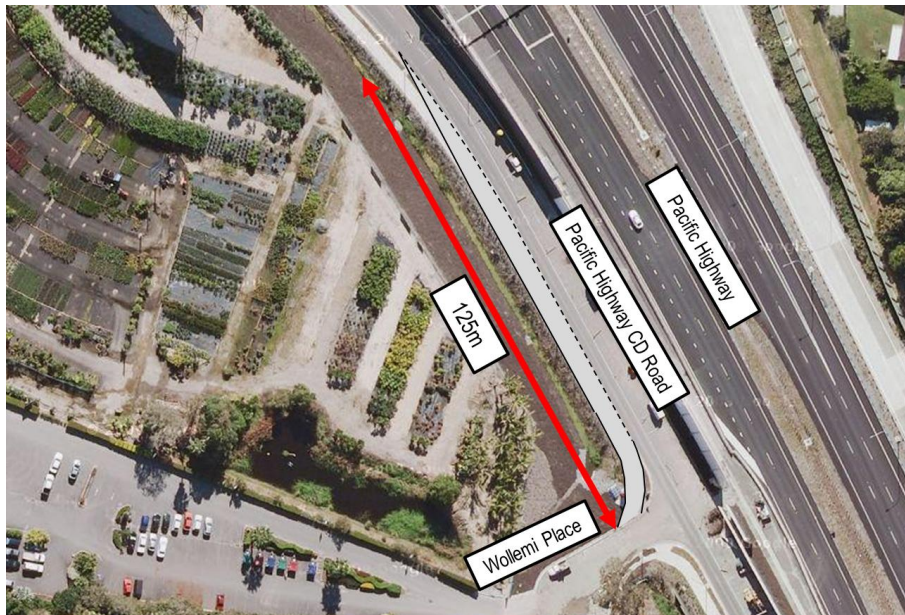
**Figure 6.3: Austroads Guide to Engineering Practice: Intersections at Grade – Figure 6.48**

Design speed of road entered (km / h)	Length of acceleration lane A (m) (including length of merge taper) where design speed of entry curve (km / h) is								4 sec travel (m)	Merge Tm (m)	Min desir. length 4 sec
	0**	20	30	40	50	60	70	80			
50	105	105	105	105	-	-	-	-	55	50	105
60	125	125	125	125	125	-	-	-	65	60	125
70	165	150	150	150	150	150	-	-	80	70	150
80	235	220	210	195	170	170	170	-	90	80	170
90	330	315	305	290	260	220	190	190	100	90	190
100	450	435	425	410	380	340	290	220	110	100	210
110	610	595	585	570	540	500	450	320	120	110	230

\*\* Adopt minimum desirable length = 4 sec travel + Tm  
Length required where a vehicle accelerates from zero speed

**Figure 6.4: Austroads Guide to Engineering Practice: Intersections at Grade – Table 6.17**

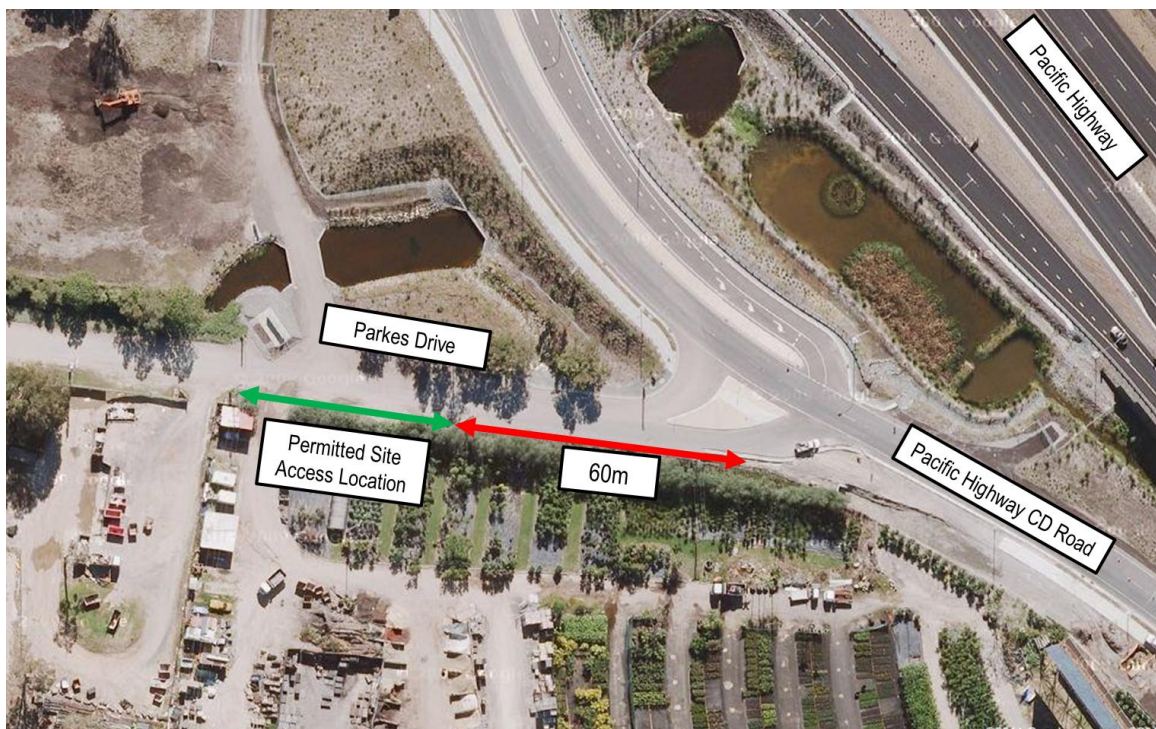
In accordance with Austroads –Intersections at Grad, a 125 metre long acceleration lane is required from Wollemi Place to the Pacific Highway CD Road. This distance is shown on an aerial image in Figure 6.5 below.



**Figure 6.5: 2033 Wollemi Place Left Turn Lane Requirements**

## 6.2 PARKES DRIVE SITE ACCESS

The site access on Parkes Drive via the Pacific Highway CD Road requires sufficient distance between the site access crossover and the Pacific Highway CD Road intersection. The aaSIDRA assessment determined that the maximum queues on Parkes Drive in 2033 with the proposed signalised configuration is 58 metre. As a result, a site access exit crossover shall not be located within 60 metre of the Parkes Drive/Pacific Highway CD road intersection as shown in Figure 6.6.



**Figure 6.6: Permitted Site Access Location**

As Parkes Drive provides only minor traffic volumes (less than 100 vehicles per day), Austroads Intersections at Grade requirements of the proposed site access is a Type BAR - Basic Right Turn and Type BAL - Basic Left Turn treatments. In addition, all access driveways shall comply with AS2890 and Council's requirements in regards to form, widths and verge profile.



## 7. ALTERNATE TRAVEL MODES

This section investigates the proposed developments provisions for alternate transport modes other than car such as bus, walk and cycle.

### 7.1 PEDESTRIANS AND CYCLISTS

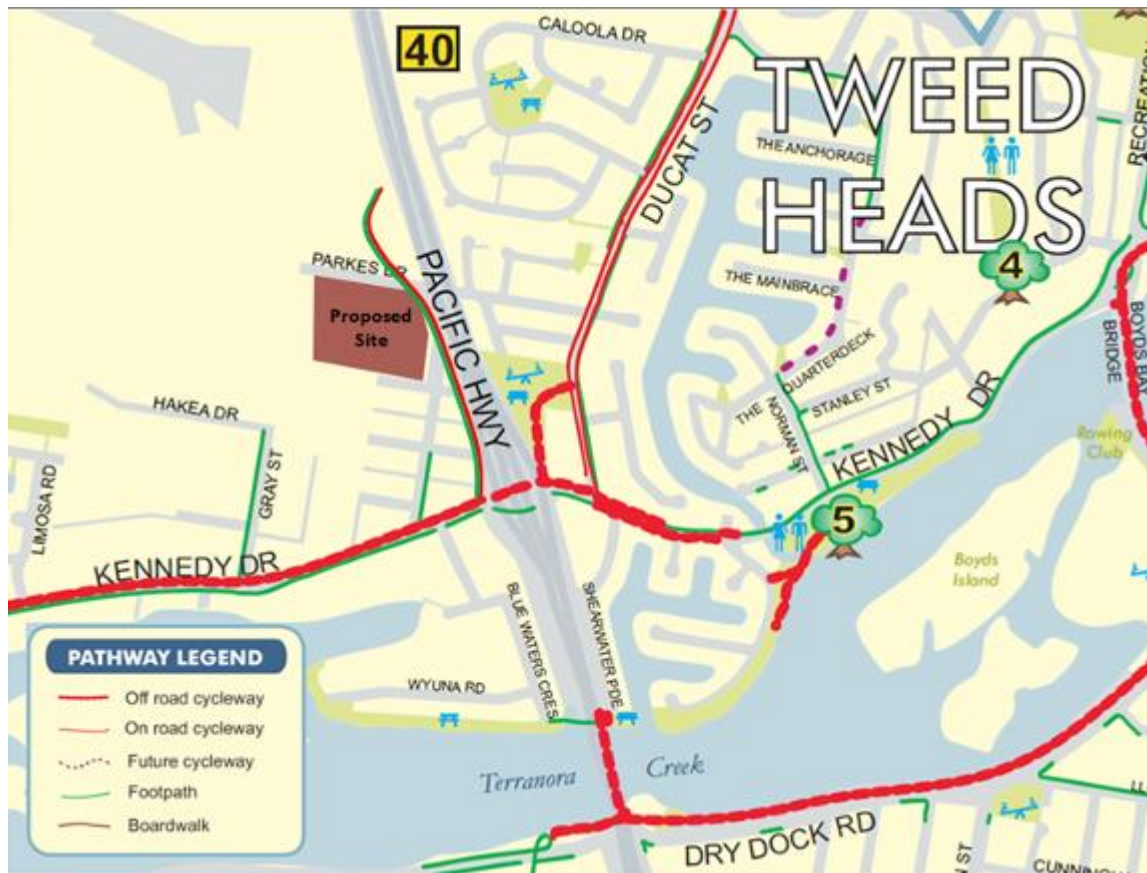
Figure 7.1 shows the surrounding pedestrian and cycle network connecting to the site. The northbound CD road between Kennedy Drive and the Tugun Bypass currently includes a shared cycle and pedestrian footpath. This connects to pedestrian footpaths and crossing facilities east-west along Kennedy Drive. In addition, a footpath currently exits along the eastern side of Rose Street between Kennedy Drive and Honeysuckle Street.

The Pacific Highway/Tugun Bypass interchange includes pedestrian/cyclist crossing facilities on the north-western side of the interchange. Existing pedestrian and cyclist activity is low as a result of limited trip generators and pedestrian/cyclist connections along the Old Pacific Highway.



Figure 7.1: Existing Pedestrian and Cycle Network

Council's planning for future cyclist provisions includes a cycleway to be constructed along Kennedy Drive as shown in Figure 7.2. Timing for this cycleway is not yet determine and is likely to coincide with road network improvements such as the opening of Cobaki Parkway and Kennedy Drive Interchange improvements scheduled for 2015-2018.



Source: Tweed Shire Council

**Figure 7.2: Future Cycleway for Kennedy Drive**

Connection to the existing pedestrian and cycle facilities shall be provided along the frontage of Parkes Drive, in accordance with Council and the RTA's requirements. Further details into pedestrian and cycle facilities along the frontage of the proposed development will be provided as part the any detailed development applications for the subject site following rezoning approval.

It is noted that as part Council's Road Contributions Plan – Works Schedule for *Zone 1 Tweed Heads – Kennedy Drive*, improvements to lighting and pedestrian facilities along Kennedy Drive are proposed. As such, the purposed developments S.94 contributions to Council will go to improving pedestrian and cycle amenities along Kennedy Drive within proximity to the proposed development.

## 7.2 PUBLIC TRANSPORT

The development is located in relative proximity to several bus services operated by Surfside Buslines as shown in Figure 7.3. The existing bus routes (601 and 608) travel east-west along Kennedy Drive with existing stops located 470 metres from the site access, with convenient access via Rose Street of the recently constructed pedestrian/cycle pathway along the Pacific Highway's northbound CD road. The average weekday frequency for the each of the bus routes shown in Figure 7.3 is one hour.





Source: Tweed Shire Council

**Figure 7.3: Existing Bus Routes and Stops**

As the site is within close proximity to existing bus facilities, the proposed development itself does not warrant the need for dedicated bus routes or stops within or adjacent to the development. However, future bus services may be included along the Old Pacific Highway following the expected future growth of Southern Cross University Campus adjacent to Gold Coast Airport and any proposed commercial development of the existing Greyhound track site to the north. Any potential future bus routes as a result of additional developments in the area could subsequently better serve the proposed development.

## 8. CONCLUSIONS

The proposed rezoning the subject has been assessed with the following land use components:

- Business Park – 27,400m<sup>2</sup>; and
- Bulky Goods (Retail) – 13,480m<sup>2</sup>.

The development is expected to generate 631 vehicle trips during AM and PM peak periods. Assessment of the traffic impacts of the proposed development has been undertaken on the site access intersections at Parkes Drive and Wollemi Place, the Tugun Bypass/Pacific Highway signalised intersection and the Kennedy Drive/Pacific Highway roundabout intersections.

In 2013 (expected year of opening), the development generated traffic does not result in any intersection upgrade requirements at the assessed intersections, with the site access intersections and Tugun Bypass/Pacific Highway interchange intersections continuing to perform within acceptable limits. Whilst Kennedy Drive roundabout intersections exhibit considerable queues during peak periods, traffic generated by the proposed development at these intersections is minor in comparison to base traffic volumes and does not warrant the need for additional upgrades as a result of the development.

Future road network improvements planned within proximity to the subject site by 2023 and 2033 will result in the redistribution and subsequent increase in traffic volumes using Pacific Highway/Tugun Bypass interchange compared to existing conditions. As a result, base intersection configurations at Pacific Highway/Tugun Bypass require a range road network upgrades by 2023 irrespective of the proposed development. In addition, the inclusion of the through traffic overpasses at Kennedy Drive (estimated at 2025) significantly increase through traffic passing the site and accessing the Tugun Bypass interchange.

By 2023, traffic generated by the proposed development requires the need for an additional 50 metre long dedicated right turn bay for the Tugun Bypass southbound off-ramp. This requirement is reliant on background traffic volumes utilising the spare capacity at the intersection. Therefore, relevant conditioning of such works should be imposed based on agreed development yields, intersection performance or traffic volume thresholds.

Parkes Drive intersection will require upgrading to signals and with an additional short left turn lane from Parkes Drive as a result of full development of the subject site by 2023. As this upgrade is not required at year of opening and no staging is yet determined as part of the rezoning application, Council and the RTA are recommended to impose relevant conditions of approval for the timing of the required signalisation to coincide with an agreed development yields or staging.

Wollemi Place 'exit only' intersection will require the inclusion of an acceleration lane for left turning traffic as a result of the proposed development by 2023. As this upgrade is not required at year of opening and no staging is yet determined as part of the rezoning application, Council and the RTA are recommended to impose relevant conditions of approval for the timing of the required signalisation to coincide with an agreed development yields or staging.

The inclusion of development generated traffic at Kennedy Drive roundabout intersections results in a negligible exacerbation of adverse traffic conditions as both intersections continue to exceed capacity under base traffic volumes across all model years. It is noted that the proposed developments S.94 contributions will go towards funding Council's identified mitigation measures as details within the Road Contributions Plan-Schedule 5 for *Zone 1-Kennedy Drive*. No additional improvement measures at the Kennedy Drive roundabout intersections are required as a result of the proposed development.

Site access will be via the existing access at Parkes Drive, with the Wollemi Place access proposed to be limited to left out exit only configuration. The access driveway onto Parkes Drive shall be limited to being located 60 metres west of the Parkes Drive/northbound CD road intersection, in order to provide sufficient separation of vehicle movements in/out of the site. The internal road network shall be designed in accordance with AS2890 and Council's requirements in regards to parking bays, circulating roadways and service vehicle facilities.

The subject site has good connectivity to existing pedestrian and cycle facilities within the surrounding road network. Existing bus route and facilities along Kennedy Drive together with pedestrian connections provides sufficient public transport to the proposed development. Future planning for potential larger scale developments to the north may introduce additional public transport services to the area.

## **APPENDIX A**

### **COUNCIL AND RTA TERMS OF REFERENCE CORRESPONDENCE**



### **1.1.1 Traffic Impact Study**

#### Terms of Reference

- As per this MOU.
- As per letter from the Roads and Traffic Authority dated 16 June 2010, seen in Attachment 2.

#### Scope

- An assessment of the traffic impacts of the development on the surrounding road network.

#### Methodology:

The following methodology is to be included in the study/assessment:

- The traffic study should address the relevant provisions in Table 2.1 of the RTA's "Guide to Traffic Generating Developments";
- Ensure the development does not adversely affect the neighbouring road network; and
- The study requires the concurrence of the RTA regarding any proposed access to the Pacific Highway service road.

#### Report outcomes

The following outcomes are to be included in the impact study/assessment:

- Consider both the Tweed Shire Council's Tweed LEP 2000 and proposed Tweed LEP 2010, and the Tweed Road Development Strategy;
- Site access including type of intersection control, construction feasibility and vehicle speeds/environment;
- Internal traffic movements;
- Traffic generation and impacts;
- The road system capacity;
- Current and proposed roadworks;
- Facilities for pedestrians, cyclists (internal and external connections); and
- Public transport.

#### General comments

- The concurrence of the RTA is required for any proposed access to the Pacific Highway service road, with matters to be addressed to be in accord with RTA requirements in their letter of 16 June 2010 (Attached) and any other matters that they may wish to raise during preparation of the study.

File No. 438.5314 NTH09/01691 10/1084  
Reference. GT1/LEP/2000  
Michael Baldwin



TRAFFIC - GENERAL  
LOCAL ENVIRONMENTAL PLAN 2000

The General Manager  
Tweed Shire Council  
PO Box 816  
Murwillumbah NSW 2484

TWEED SHIRE COUNCIL	
FILE No:	PP 10/000/PT.1
DOC. No:	18297189
REC'D:	24 JUN 2010
ASSIGNED TO:	RUSSELL, S
HARD COPY	<input checked="" type="checkbox"/>
IMAGE	<input type="checkbox"/>

Re: Doc: 16962181

#### Planning Proposal Boyd's bay Garden World Initial Consultation and Assessment Justification

Dear Sir

I refer to your letter dated 25 May 2010, your reference GT1/LEP/2000, regarding the above proposal.

A traffic study will be necessary to determine the impact of the additional volume of traffic generated by this proposal on the surrounding road network particularly the arterial road network. It is important that this proposal is not considered in isolation. The combined effects of this and other projects in the vicinity need to be considered in the traffic study assessing potential impacts.

The road network in the vicinity of the Boyd's Bay Garden World is sensitive to increases in traffic generation. The current intersection of Parkes Drive with the on ramp to the Pacific Highway is currently designed for very low traffic volumes. Any study will need to be expanded beyond the immediate access to the road network. The Traffic study will need to consider at a minimum, the performance of Kennedy Drive including the Pacific Highway access ramps, the Tugun Bypass interchange and the Gold Coast Highway.

The Roads and Traffic Authority (RTA) will require a comprehensive assessment of the road safety and traffic impacts of the proposal. The RTA Road Design Guide requires intersection designs to accommodate traffic figures twenty (20) years into the future. Future analysis of intersection performance will need to be undertaken. Given the change in nature of the traffic patterns this proposal will create, some assessment of likely travel attractors and travel patterns should be undertaken to accurately determine traffic distributions.

The traffic study detail should take into account the key issues relevant to the scale of this proposal as set out in Section 2.3 of the RTA's "Guide to Traffic Generating Developments" (copy attached). This should at least include information relating to:-

- The total traffic impact on the road network including other activities in the area.
- Intersection sight distances
- Existing and proposed access conditions
- Detail of servicing and parking arrangements for commercial development
- Public transport routes and infrastructure e.g. Buses and cycleways
- A Section 94 Contributions Plan for improvements to the road network

Roads and Traffic Authority

31 Victoria Street Grafton NSW 2460  
Post Office Box 576 Grafton NSW 2460 DX7610  
www.rta.nsw.gov.au | 02 66401300

Current RTA Road Design Standards should be adopted when designing any necessary upgrading of the surrounding road infrastructure. Detailed plans of any roadworks should be submitted with the Development Application for consideration.

If you have any further enquiries please contact Michael Baldwin on 6686 1832 or email [land\\_use\\_northern@rta.nsw.gov.au](mailto:land_use_northern@rta.nsw.gov.au).

Yours faithfully



16 JUN 2010

Chris Harrison  
Acting Regional Manager, Northern Region

## **APPENDIX B**

### **TRAFFIC SURVEYS**



Site: 6  
 Location: Tugun Bypass, Tweed Bypass West - Tweed  
 Date: 21/04/2010



Time Interval 7:00am - 9:00am		Tweed Heads Bypass Southbound			Pacific Mwy Westbound			Tweed Heads Bypass Northbound			Hourly Totals
		Thru	Right	U-Turn	Left	Thru	Right	Left	Thru	U-Turn	
7:00	7:15	1	13	0	1	1	45	133	24	0	
7:15	7:30	1	11	0	0	0	66	135	28	0	
7:30	7:45	3	13	0	2	1	75	156	41	0	
7:45	8:00	2	8	0	0	1	67	187	51	0	1066
8:00	8:15	2	12	1	0	0	59	139	41	0	1102
8:15	8:30	1	16	0	2	0	76	170	40	0	1166
8:30	8:45	0	11	0	1	0	57	142	40	0	1126
8:45	9:00	3	10	0	0	0	85	109	54	0	1071
Hourly Peak 7:30am - 8:30am		8	49	1	4	2	277	652	173	0	

Time Interval 4:00pm - 6:00pm		Tweed Heads Bypass Southbound			Pacific Mwy Westbound			Tweed Heads Bypass Northbound			Hourly Totals
		Thru	Right	U-Turn	Left	Thru	Right	Left	Thru	U-Turn	
4:00	4:15	1	16	0	2	0	52	112	40	0	
4:15	4:30	0	7	0	0	0	60	110	30	0	
4:30	4:45	0	18	0	0	0	31	121	30	0	
4:45	5:00	0	19	0	0	0	48	103	26	0	826
5:00	5:15	3	21	0	0	0	47	117	35	0	826
5:15	5:30	1	20	0	0	0	49	120	29	0	838
5:30	5:45	1	20	0	5	0	46	113	16	0	839
5:45	6:00	2	11	0	0	0	41	93	20	0	810
Hourly Peak 4:45pm - 5:45pm		5	80	0	5	0	190	453	106	0	

Site: 7  
 Location: Tugun Bypass, Tweed Bypass East - Tweed  
 Date: 21/04/2010



Time Interval 7:00am - 9:00am		Tweed Heads Bypass Southbound				Tweed Heads Bypass Northbound				Pacific Mwy Off Ramp Eastbound				Hourly Totals
		Left	Bear Left	Thru	U-Turn	Thru	Right	Hard Right	U-Turn	Left	Thru	Bear Right	Right	
7:00	7:15	10	44	17	0	68	1	0	0	33	58	0	1	
7:15	7:30	13	52	10	0	90	1	1	0	46	98	0	1	
7:30	7:45	22	65	13	0	98	5	5	0	64	102	1	2	
7:45	8:00	27	56	11	0	105	3	1	0	56	117	0	2	959
8:00	8:15	33	62	18	0	98	1	1	0	51	97	0	1	1047
8:15	8:30	31	65	16	0	109	2	0	0	52	119	0	1	1093
8:30	8:45	27	67	13	0	92	1	3	0	55	106	0	0	1073
8:45	9:00	27	76	12	0	123	4	0	0	54	124	0	3	1097
Hourly Peak 8:00am - 9:00am		118	270	59	0	422	8	4	0	212	446	0	5	

Time Interval 4:00pm - 6:00pm		Tweed Heads Bypass Southbound				Tweed Heads Bypass Northbound				Pacific Mwy Off Ramp Eastbound				Hourly Totals
		Left	Bear Left	Thru	U-Turn	Thru	Right	Hard Right	U-Turn	Left	Thru	Bear Right	Right	
4:00	4:15	42	100	12	0	79	7	1	0	48	141	0	1	
4:15	4:30	48	93	5	0	86	2	3	0	37	137	0	0	
4:30	4:45	41	110	14	0	54	1	0	0	38	146	0	0	
4:45	5:00	43	87	20	0	74	1	2	0	28	125	0	0	1011
5:00	5:15	42	86	22	0	71	4	4	0	36	132	0	3	984
5:15	5:30	38	97	20	0	74	0	2	0	40	138	0	0	973
5:30	5:45	41	89	20	0	59	3	0	0	26	140	0	1	963
5:45	6:00	36	76	11	0	60	1	0	0	30	123	0	2	949
Hourly Peak 4:00pm - 5:00pm		157	348	73	0	264	8	6	0	132	533	0	6	

Site: 8  
 Location: Kennedy Dr, West Roundabout - Tweed  
 Date: 10/06/2010



Time Interval 7:00am - 9:00am		Kennedy Dr Westbound			Pacific Mwy Off Ramp Northbound			Kennedy Dr Eastbound		Hourly Totals
		Thru	Right	U-Turn	Left	Thru	Right	Left	Thru	
7:00	7:15	51	73	1	19	0	41	65	86	
7:15	7:30	52	75	2	21	0	37	90	118	
7:30	7:45	59	93	2	17	2	55	82	176	
7:45	8:00	72	110	1	22	3	97	76	193	1791
8:00	8:15	77	89	1	21	0	93	80	220	2036
8:15	8:30	80	107	0	28	4	111	66	259	2296
8:30	8:45	99	99	1	25	1	87	82	260	2464
8:45	9:00	119	81	1	33	1	119	69	238	2551
Hourly Peak 8:00am - 9:00am		375	376	3	107	6	410	297	977	

Time Interval 4:00pm - 6:00pm		Kennedy Dr Westbound			Pacific Mwy Off Ramp Northbound			Kennedy Dr Eastbound		Hourly Totals
		Thru	Right	U-Turn	Left	Thru	Right	Left	Thru	
4:00	4:15	265	87	0	58	0	63	38	156	
4:15	4:30	266	112	0	64	3	68	37	134	
4:30	4:45	271	95	1	53	2	60	33	156	
4:45	5:00	275	120	0	61	2	62	36	158	2736
5:00	5:15	251	122	2	76	2	57	37	132	2748
5:15	5:30	276	129	3	73	0	60	27	130	2762
5:30	5:45	238	95	0	59	1	69	41	154	2748
5:45	6:00	211	70	1	43	0	46	39	123	2567
Hourly Peak 4:30pm - 5:30pm		1073	466	6	263	6	239	133	576	



Site: 9  
 Location: Kennedy Dr, East Roundabout - Tweed  
 Date: 21/04/2010



Time Interval 7:00am - 9:00am		Pacific Mwy Off Ramp Southbound			Kennedy Dr Westbound		Kennedy Dr Eastbound			Hourly Totals
		Left	Thru	Right	Left	Thru	Thru	Right	U-Turn	
7:00	7:15	51	3	22	34	94	94	39	0	
7:15	7:30	85	3	24	36	96	107	49	0	
7:30	7:45	100	11	20	34	121	142	78	0	
7:45	8:00	112	8	26	32	154	206	67	0	1848
8:00	8:15	126	5	31	62	150	244	80	0	2209
8:15	8:30	116	5	15	46	165	283	89	0	2528
8:30	8:45	107	1	18	62	177	284	66	0	2737
8:45	9:00	83	6	31	44	177	292	58	1	2824
Hourly Peak 8:00am - 9:00am		432	17	95	214	669	1103	293	1	

Time Interval 4:00pm - 6:00pm		Pacific Mwy Off Ramp Southbound			Kennedy Dr Westbound		Kennedy Dr Eastbound			Hourly Totals
		Left	Thru	Right	Left	Thru	Thru	Right	U-Turn	
4:00	4:15	108	6	84	80	275	159	57	0	
4:15	4:30	118	6	87	64	296	167	65	0	
4:30	4:45	130	10	84	88	288	186	52	0	
4:45	5:00	96	5	81	72	308	186	44	1	3203
5:00	5:15	117	5	91	75	283	142	47	0	3194
5:15	5:30	114	3	97	75	317	143	52	0	3192
5:30	5:45	106	1	95	63	238	178	52	0	3087
5:45	6:00	104	2	71	60	214	136	37	2	2920
Hourly Peak 4:15pm - 5:15pm		461	26	343	299	1175	681	208	1	





Traffic Data & Control  
 Traffic Data & Control  
 Suite 26, Level 2  
 58 Riverwalk Ave  
 Robina, Australia 4226  
 (07) 55758041 fred@traffidc.com.au

Count Name: Tweed Bypass & Parkes Drive  
 Site Code:  
 Start Date: 02/16/2011  
 Page No: 1

### Turning Movement Data

Start Time	Tweed Bypass Westbound			Tweed Bypass Northbound			Parkes Drive Eastbound		Int. Total
	Thru	Right	App. Total	Left	Thru	App. Total	Left	App. Total	
7:00 AM	0	0	0	1	188	189	3	3	192
7:15 AM	3	0	3	3	182	185	4	4	192
7:30 AM	2	0	2	1	216	217	1	1	220
7:45 AM	2	0	2	0	196	196	4	4	202
Hourly Total	7	0	7	5	782	787	12	12	806
8:00 AM	5	1	6	1	234	235	5	5	246
8:15 AM	3	1	4	0	198	198	2	2	204
8:30 AM	2	0	2	0	181	181	1	1	184
8:45 AM	2	0	2	1	171	172	3	3	177
Hourly Total	12	2	14	2	784	786	11	11	811
*** BREAK ***	-	-	-	-	-	-	-	-	-
3:00 PM	1	0	1	1	155	156	3	3	160
3:15 PM	3	0	3	1	150	151	0	0	154
3:30 PM	2	0	2	0	146	146	0	0	148
3:45 PM	4	1	5	0	143	143	2	2	150
Hourly Total	10	1	11	2	594	596	5	5	612
4:00 PM	2	1	3	1	172	173	1	1	177
4:15 PM	3	0	3	0	173	173	4	4	180
4:30 PM	2	2	4	0	143	143	1	1	148
4:45 PM	0	0	0	0	127	127	1	1	128
Hourly Total	7	3	10	1	615	616	7	7	633
5:00 PM	1	1	2	0	136	136	2	2	140
5:15 PM	1	0	1	0	102	102	2	2	105
5:30 PM	0	0	0	0	80	80	1	1	81
5:45 PM	1	0	1	1	98	99	1	1	101
Hourly Total	3	1	4	1	416	417	6	6	427
Grand Total	39	7	46	11	3191	3202	41	41	3289
Approach %	84.8	15.2	-	0.3	99.7	-	100.0	-	-
Total %	1.2	0.2	1.4	0.3	97.0	97.4	1.2	1.2	-
Car	34	7	41	11	3090	3101	34	34	3176
% Car	87.2	100.0	89.1	100.0	96.8	96.8	82.9	82.9	96.6
Truck	5	0	5	0	101	101	7	7	113
% Truck	12.8	0.0	10.9	0.0	3.2	3.2	17.1	17.1	3.4



Traffic Data & Control  
 Traffic Data & Control  
 Suite 26, Level 2  
 58 Riverwalk Ave  
 Robina, Australia 4226  
 (07) 55758041 fred@trafficdc.com.au

Count Name: Tweed Bypass & Rose Cres  
 Site Code:  
 Start Date: 02/16/2011  
 Page No: 1

### Turning Movement Data

Start Time	Tweed Bypass Northbound			Rose Street Eastbound			Int. Total
	Left	Thru	App. Total	Left	U-Turn	App. Total	
7:00 AM	1	182	183	6	0	6	189
7:15 AM	12	190	202	1	0	1	203
7:30 AM	3	213	216	2	0	2	218
7:45 AM	3	191	194	3	0	3	197
Hourly Total	19	776	795	12	0	12	807
8:00 AM	4	225	229	4	0	4	233
8:15 AM	7	199	206	2	0	2	208
8:30 AM	5	179	184	4	0	4	188
8:45 AM	2	158	160	7	0	7	167
Hourly Total	18	761	779	17	0	17	796
*** BREAK ***	-	-	-	-	-	-	-
3:00 PM	3	151	154	5	0	5	159
3:15 PM	4	141	145	4	0	4	149
3:30 PM	2	145	147	8	0	8	155
3:45 PM	1	138	139	4	0	4	143
Hourly Total	10	575	585	21	0	21	606
4:00 PM	1	167	168	11	0	11	179
4:15 PM	0	158	158	5	0	5	163
4:30 PM	2	142	144	5	0	5	149
4:45 PM	0	121	121	0	0	0	121
Hourly Total	3	588	591	21	0	21	612
5:00 PM	0	139	139	1	0	1	140
5:15 PM	0	93	93	0	0	0	93
5:30 PM	1	85	86	1	0	1	87
5:45 PM	0	97	97	0	0	0	97
Hourly Total	1	414	415	2	0	2	417
Grand Total	51	3114	3165	73	0	73	3238
Approach %	1.6	98.4	-	100.0	0.0	-	-
Total %	1.6	96.2	97.7	2.3	0.0	2.3	-
Car	46	3012	3058	69	0	69	3127
% Car	90.2	96.7	96.6	94.5	-	94.5	96.6
Truck	5	102	107	4	0	4	111
% Truck	9.8	3.3	3.4	5.5	-	5.5	3.4

## **APPENDIX C**

### **KIRKWOOD ROAD AND KENNEDY DRIVE INTERCHANGE REPORT EXTRACTS**

## Executive summary

Parsons Brinckerhoff (PB) has been commissioned by Tweed Shire Council (TSC) to undertake intersection analysis for the interim (Year 2015) and ultimate (Year 2030) scenarios based on concept designs prepared by TSC for the Kirkwood Road and Kennedy Drive interchanges.

The study scope included:

- assessment of TSC interim (Year 2015) and ultimate (Year 2030) concept designs for the Kirkwood Road and Kennedy Drive interchanges
- comparison of results to TSC Level of Service criterion
- refinement of the interim (Year 2015) and ultimate (Year 2030) concept design for the Kennedy Drive interchange to achieve revised TSC Level of Service criteria.

### Assessment of TSC concept designs

Strategic modelling was undertaken using the EMME model developed as part of the “Lower Tweed and Pacific Highway Traffic Master Plan”. The strategic model was updated to reflect the interim and ultimate road network for 2015 and 2030 respectively. Traffic volumes were extracted from the strategic model for the eastern and western intersections for the Kennedy Drive and Kirkwood Road interchanges and also for the Kennedy Drive / Ducat Street intersection. These volumes were extracted for the AM and PM peak periods for 2015 and 2030.

Detailed traffic analysis (SIDRA analysis) was undertaken for 2015 and 2030 AM and PM peak periods based on the interim and ultimate concept designs supplied by TSC. These concepts included roundabout and traffic signal control for the Kennedy Drive and Kirkwood Road interchanges. The provision of a northbound and southbound overpass for the eastern and western intersections of the Kennedy Drive interchange was also considered as part of the ultimate concept design (2030).

### Comparison of results to TSC Level of Service criterion

TSC has indicated that the maximum intersection performance criterion is set at Level of Service C.

The analysis of the TSC concept designs indicate:

- Roundabouts may be the most suitable intersection control for the Kirkwood Road interchange, as the eastern intersection with traffic signal control in 2030 PM peak hour is expected to operate at LoS D.
- It appears that there is no preferred intersection control for the Kennedy Drive interchange as neither a roundabout nor traffic signals are expected to operate at LoS C for both intersections in the 2030 PM peak hour. However, the eastern intersection with roundabout control (and overpass) is expected to operate at LoS D in the 2030 PM peak hour.
- The Kennedy Drive / Ducat Street intersection is expected to operate at LoS D in the 2030 PM peak hour.



Due to the Stage 1 (Year 2015) analysis indicating LoS F results for the Kennedy Drive interchange, additional refinement of the concept design was required. As the Stage 1 design for the Kennedy Drive interchange is expected to be operational until 2030, a LoS F at the year of opening was a significant concern.

The revised roundabout and signalised intersection layouts for the Kennedy Drive interchange were developed and analysed to determine an optimal layout that satisfied the revised TSC intersection performance criteria, which are as follows:

- Year 2015 Stage 1 Analysis: Maximum LOS D when 2015 volumes are applied to Stage 1 Layout
- Year 2030 Stage 1 Analysis: Maximum LOS E when 2030 volumes are applied to Stage 1 Layout
- Year 2030 Stage 2 Analysis: Maximum LOS C when 2030 volumes are applied to Stage 2 Layout.

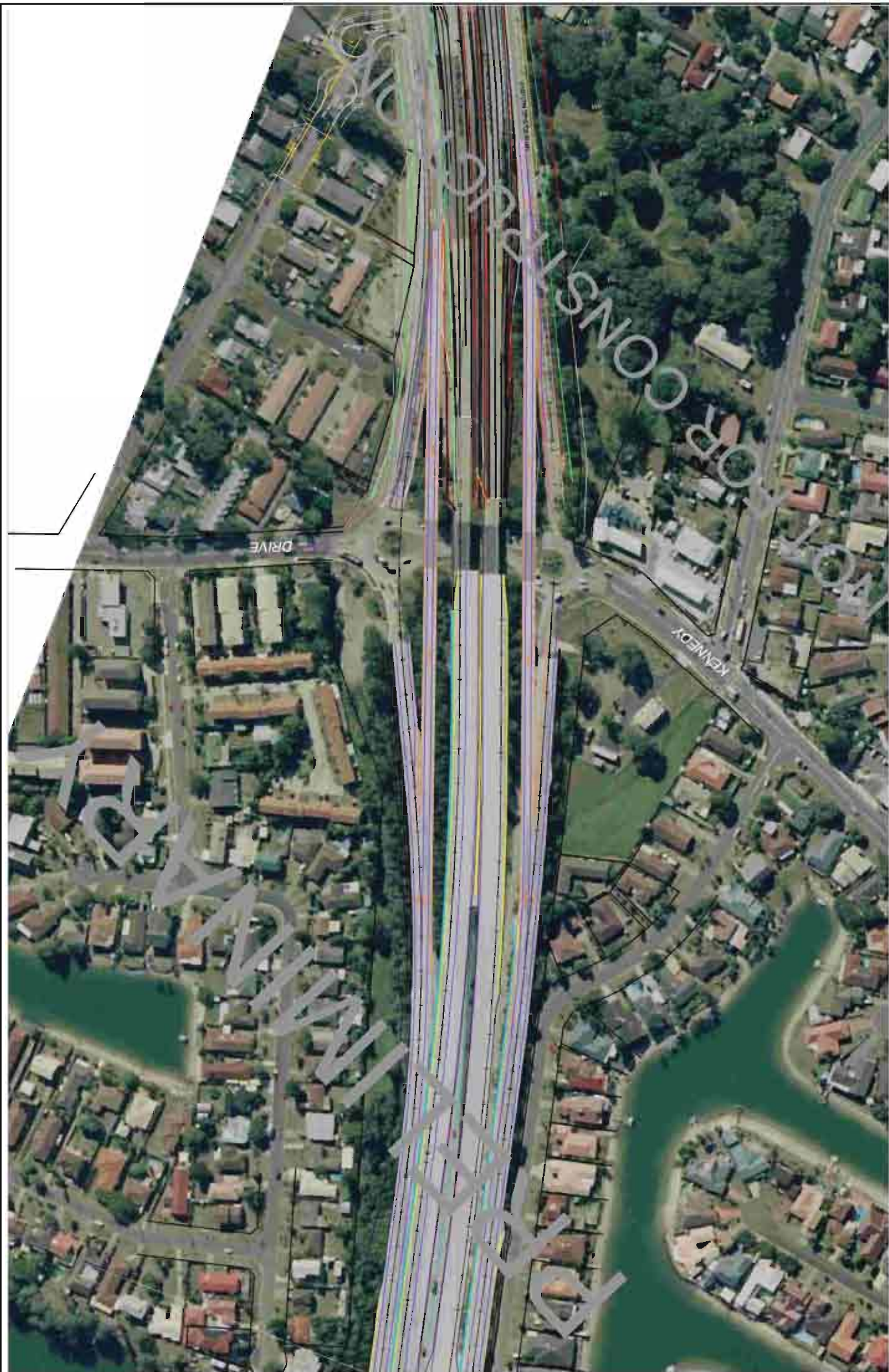
### **Refinement of Kennedy Drive Interchange concept design**

Additional strategic modelling was undertaken to apply 2030 volumes to the Stage 1 layout, with traffic volumes extracted for the eastern and western intersections of the Kennedy Drive interchange.

PB reviewed the specific movements that are significantly impacting on the operation of the Kennedy Drive interchange and considered measures to improve the operation of those movements. Detailed traffic analysis (SIDRA analysis) of the eastern and western intersections of the Kennedy Drive interchange were undertaken. Localised improvements to the roundabout and signalised intersection layouts were considered to determine the minimum intersection layout footprints required to achieve the revised TSC Level of Service criteria.

The analysis indicates that the roundabout layouts generally operate better in relation to queues and delays. By 2030, signalisation of the northern approach (southbound service road) of the eastern roundabout intersection is required in the PM peak period (based on the Year 2030 Stage 1 analysis) to reduce queues and delays on the eastern approach of Kennedy Drive.

It is advisable that Tweed Shire Council look at all factors (intersection operation, safe pedestrian crossing arrangements, ability to incorporate bicycle lanes if required etc) in determining the most suitable intersection configuration.



<p><b>DESIGN UNIT</b>          CONSULTING ENGINEERS          4000 SHEPPARD AVENUE EAST, SUITE 1000          SCARBOROUGH, ONTARIO M1S 1T5          TEL: 416-491-7272 FAX: 416-491-7273          WWW.DELTA-ENGINEERS.COM</p>	<p><b>DESIGN ENGINEER</b>          CHECKED BY: [ ] DATE: [ ]          DESIGNED BY: [ ] DATE: [ ]          DRAWING NO. [ ] SHEET NO. [ ]          PROJECT NO. [ ] SHEET TITLE: [ ]          DATE: [ ]</p>	<p><b>PROJECT:</b> KENNEDY DRIVE INTERCHANGE WITH ROUNDABOUT FOR 2030.</p> <p><b>PLAN TITLE:</b> FIGURE 10</p>	<p><b>DRAWING NUMBER</b></p> <p>SHEET 1 OF 1 SHEETS</p> <p>FIGURE A</p>
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**DESIGN UNIT**  
 CHARTERED PROFESSIONAL ENGINEERS  
 10000 KIRKWOOD ROAD, SUITE 100  
 KIRKWOOD, QLD 4012  
 PHONE: (07) 5560 3300  
 FAX: (07) 5560 3333  
 WEBSITE: www.tweedshire.qld.gov.au

**TWEED SHIRE COUNCIL**

PROJECT: **KIRKWOOD ROAD INTERCHANGE WITH ROUNDABOUTS FOR 2030.**

DESIGN ENGINEER: [Name] DATE: [Date]  
 CHECKED: [Name] DATE: [Date]  
 APPROVED: [Name] DATE: [Date]

DRAWING NUMBER: [Number]  
 SHEET 1 OF 1 SHEETS  
 ISSUE A

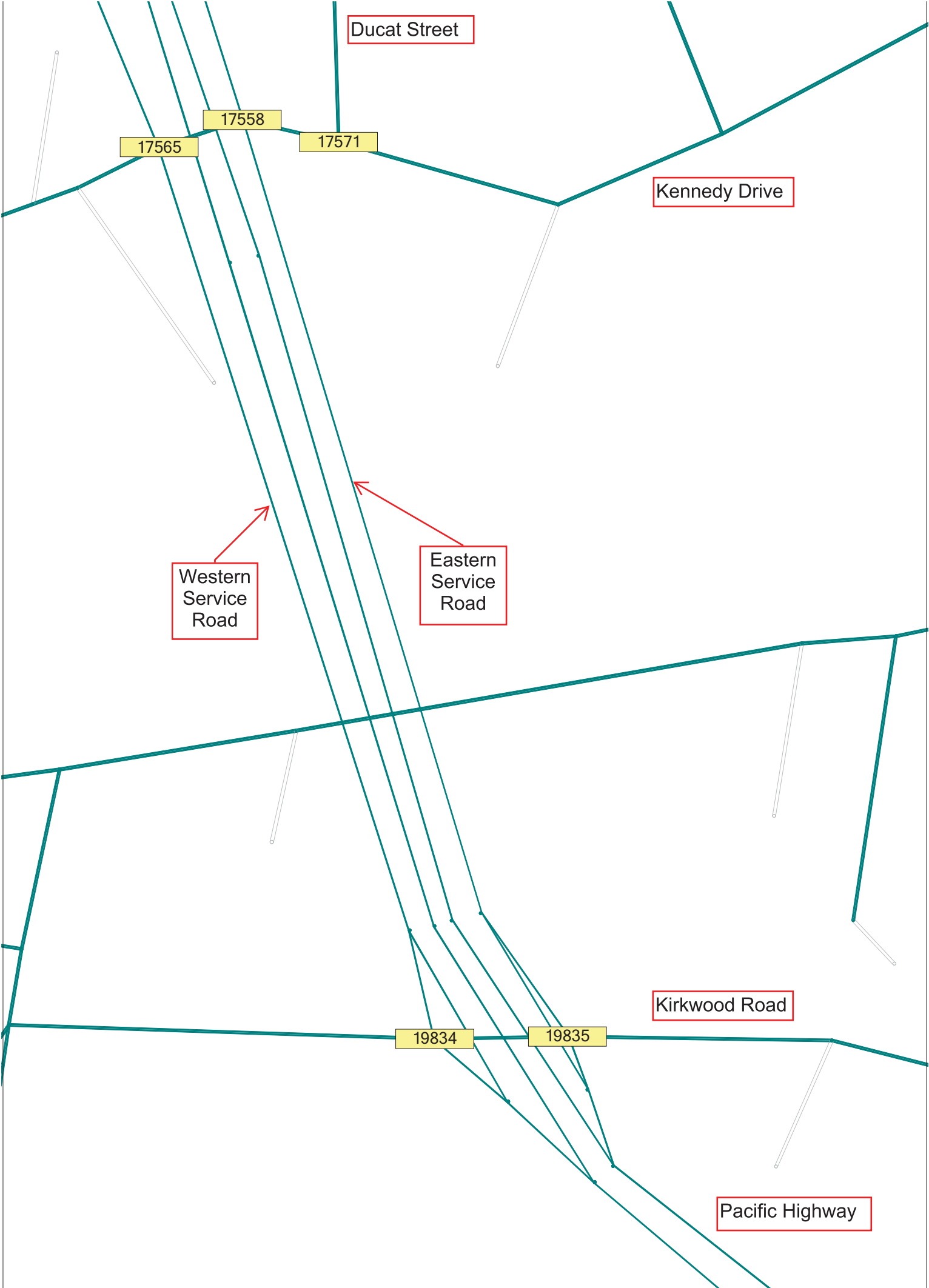
PLAN TITLE: **FIGURE 6**

SCALE: 1:1000  
 DATE: 20/11/2020  
 DRAWN BY: [Name]  
 CHECKED BY: [Name]  
 APPROVED BY: [Name]

Tweed Shire City Council  
 10000 Kirkwood Road, Suite 100, Kirkwood QLD 4012  
 Phone: (07) 5560 3300, Fax: (07) 5560 3333  
 Website: www.tweedshire.qld.gov.au



# YEAR 2030 ROAD NETWORK



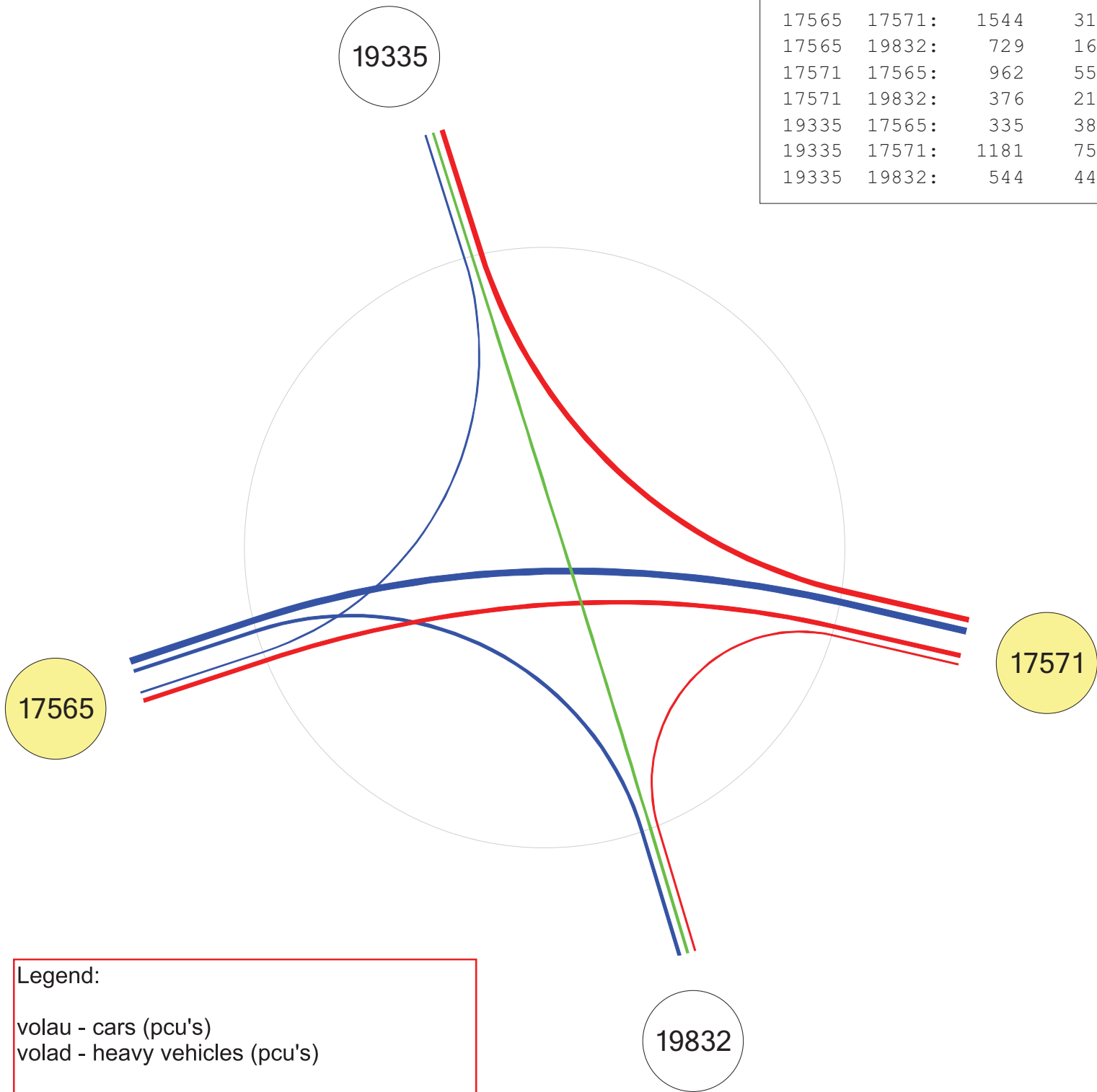


# Year 2030 AM Peak Period Turning Volumes (2 hours)

## Kennedy Drive Interchange - Eastern Intersection

Intersection node 17558:

from:	to:	volau	volad
17565	17571:	1544	31
17565	19832:	729	16
17571	17565:	962	55
17571	19832:	376	21
19335	17565:	335	38
19335	17571:	1181	75
19335	19832:	544	44



**Legend:**  
volau - cars (pcu's)  
volad - heavy vehicles (pcu's)

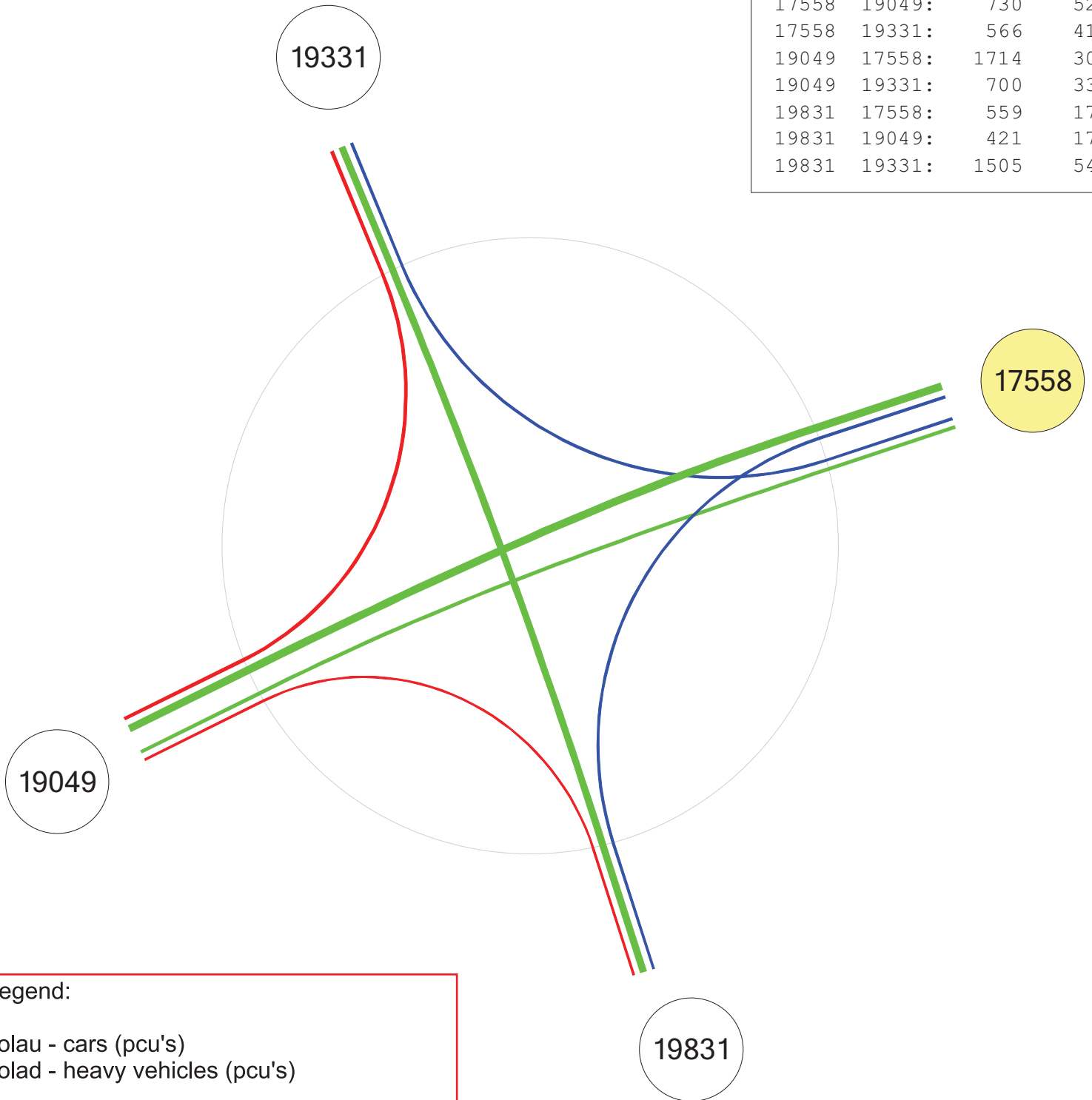
**Note:**  
pcu - passenger car unit

# Year 2030 AM Peak Period Turning Volumes (2 hours)

## Kennedy Drive Interchange - Western Intersection

Intersection node 17565:

from:	to:	volau	volad
17558	19049:	730	52
17558	19331:	566	41
19049	17558:	1714	30
19049	19331:	700	33
19831	17558:	559	17
19831	19049:	421	17
19831	19331:	1505	54



### Legend:

volau - cars (pcu's)  
volad - heavy vehicles (pcu's)

### Note:

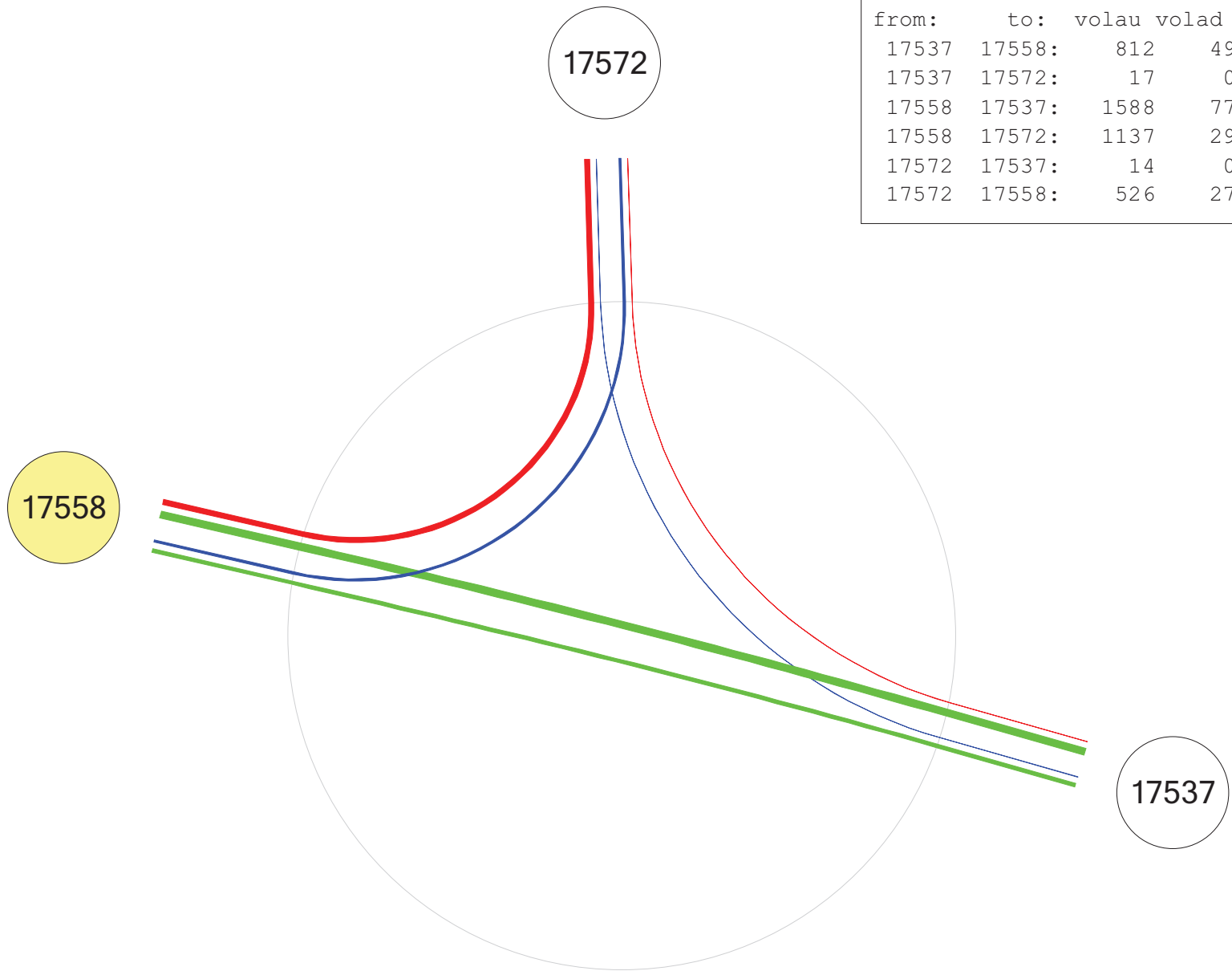
pcu - passenger car unit

# Year 2030 AM Peak Period Turning Volumes (2 hours)

## Kennedy Drive / Ducat Street Intersection

Intersection node 17571:

from:	to:	volau	volad
17537	17558:	812	49
17537	17572:	17	0
17558	17537:	1588	77
17558	17572:	1137	29
17572	17537:	14	0
17572	17558:	526	27



### Legend:

volau - cars (pcu's)  
volad - heavy vehicles (pcu's)

### Note:

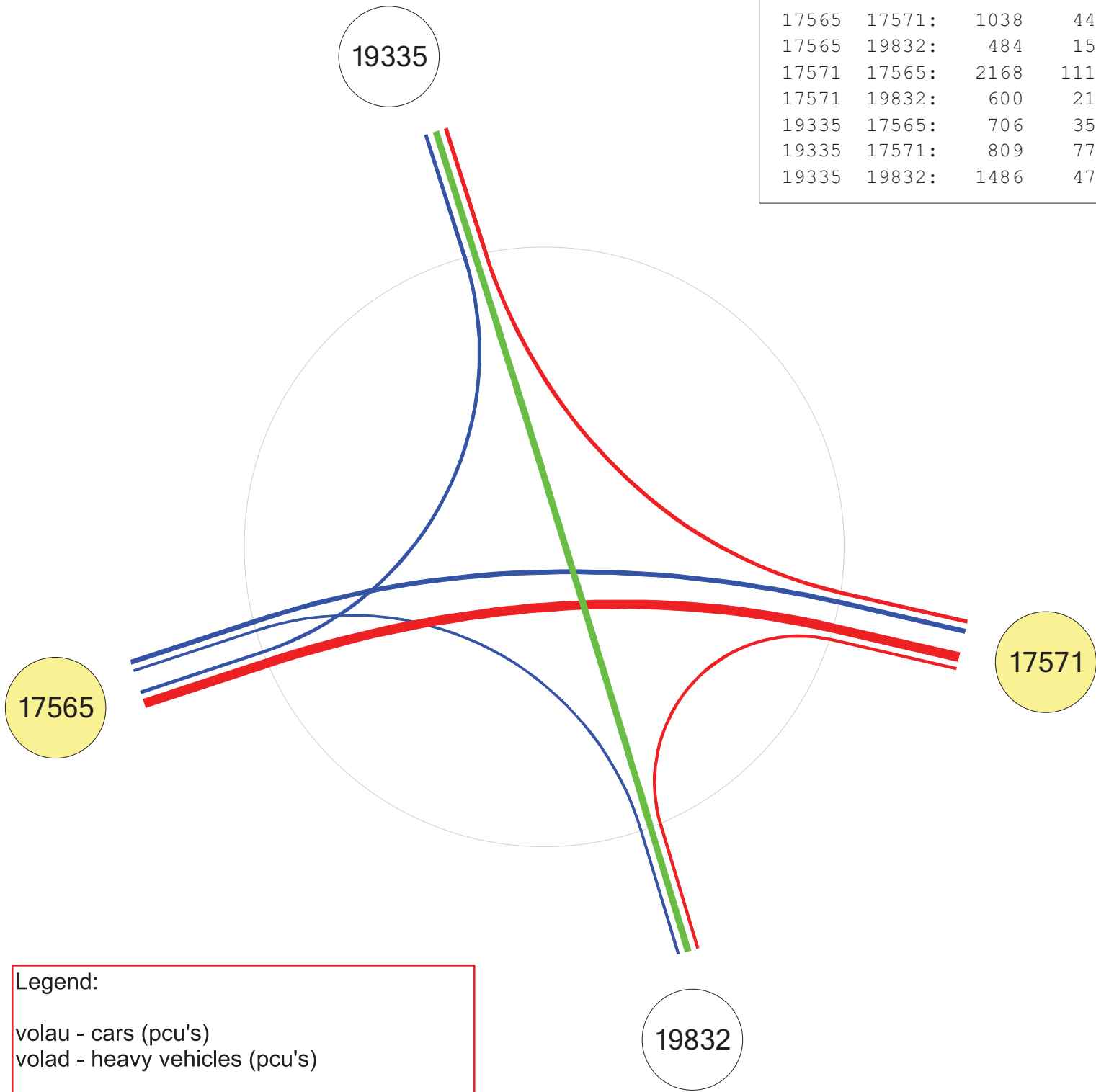
pcu - passenger car unit

# Year 2030 PM Peak Period Turning Volumes (2 hours)

## Kennedy Drive Interchange - Eastern Intersection

Intersection node 17558:

from:	to:	volau	volad
17565	17571:	1038	44
17565	19832:	484	15
17571	17565:	2168	111
17571	19832:	600	21
19335	17565:	706	35
19335	17571:	809	77
19335	19832:	1486	47



### Legend:

volau - cars (pcu's)  
 volad - heavy vehicles (pcu's)

### Note:

pcu - passenger car unit

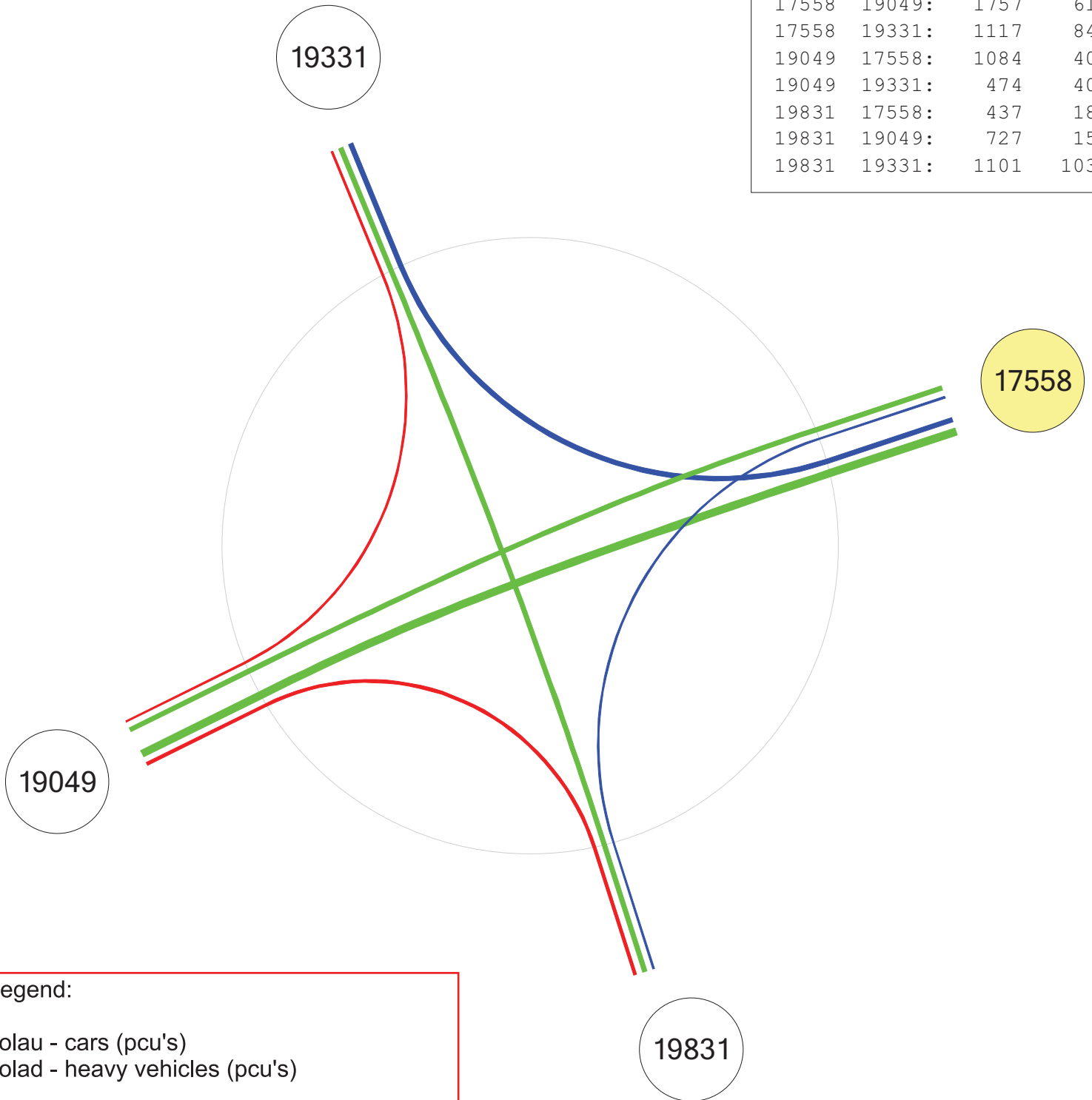


# Year 2030 PM Peak Period Turning Volumes (2 hours)

## Kennedy Drive Interchange - Western Intersection

Intersection node 17565:

from:	to:	volau	volad
17558	19049:	1757	61
17558	19331:	1117	84
19049	17558:	1084	40
19049	19331:	474	40
19831	17558:	437	18
19831	19049:	727	15
19831	19331:	1101	103



### Legend:

volau - cars (pcu's)  
volad - heavy vehicles (pcu's)

### Note:

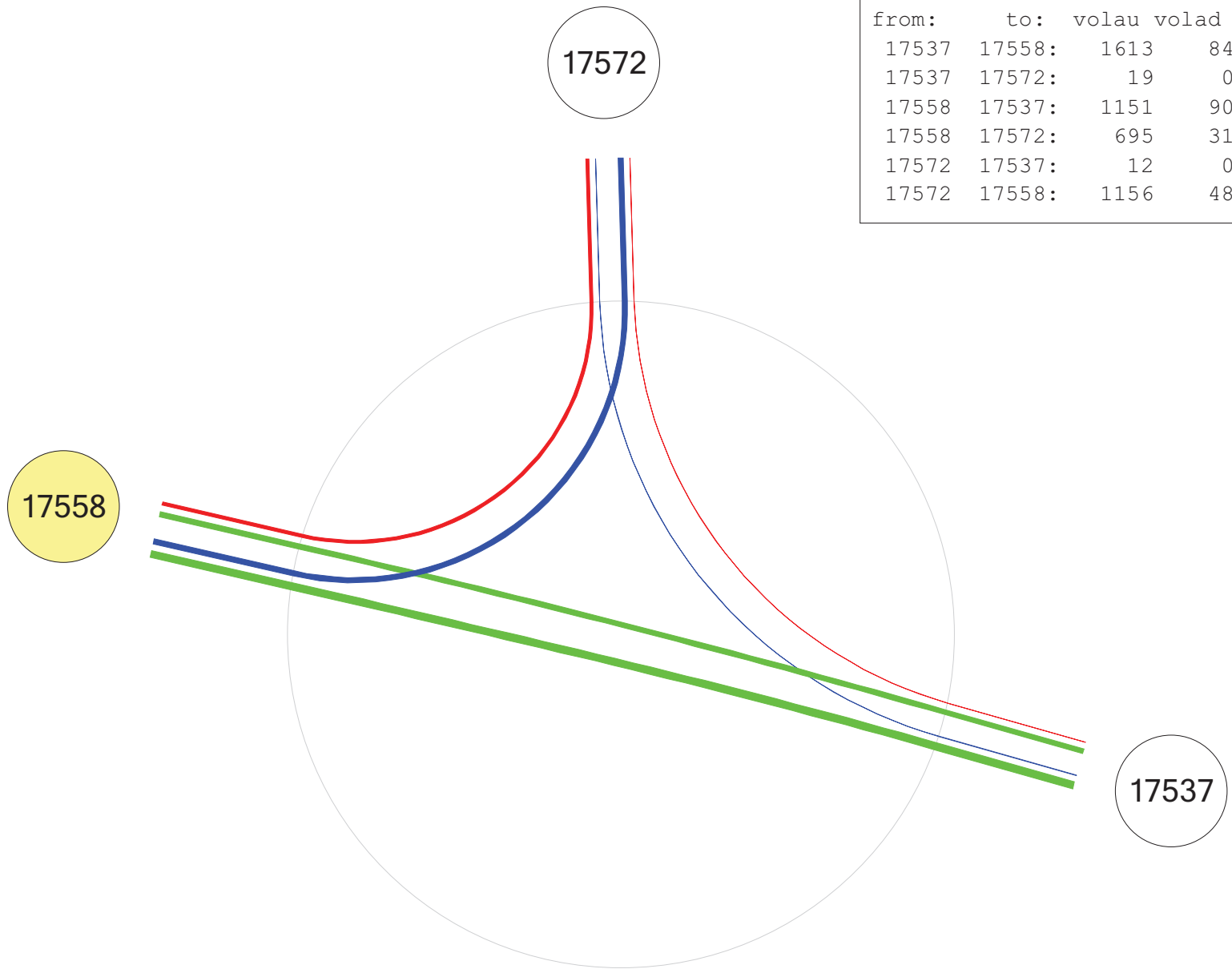
pcu - passenger car unit

# Year 2030 PM Peak Period Turning Volumes (2 hours)

## Kennedy Drive / Ducat Street Intersection

Intersection node 17571:

from:	to:	volau	volad
17537	17558:	1613	84
17537	17572:	19	0
17558	17537:	1151	90
17558	17572:	695	31
17572	17537:	12	0
17572	17558:	1156	48



### Legend:

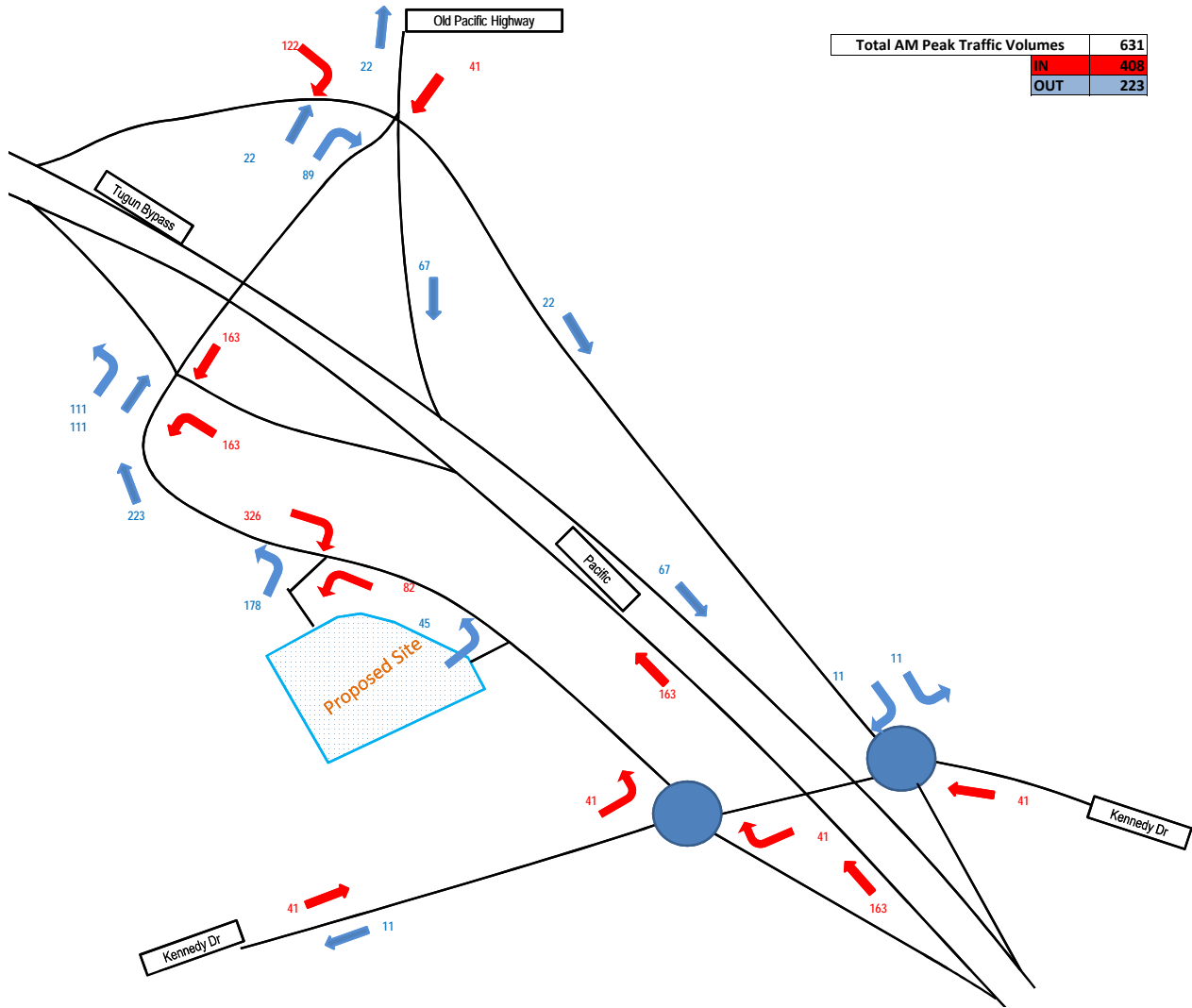
volau - cars (pcu's)  
volad - heavy vehicles (pcu's)

### Note:

pcu - passenger car unit

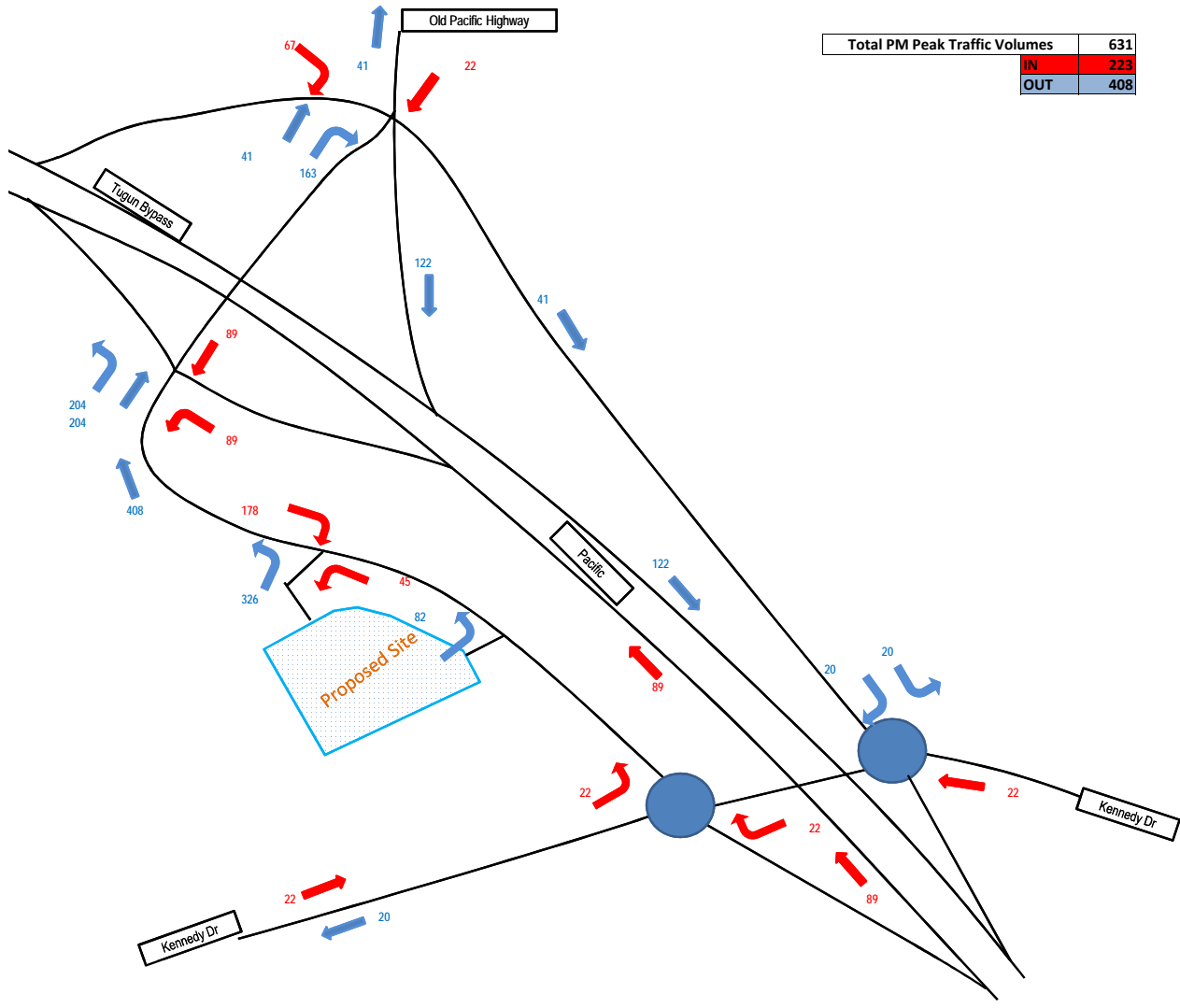
## **APPENDIX D**

### **DEVELOPMENT TRAFFIC VOLUMES**



Total AM Peak Traffic Volumes		631
IN	408	
OUT	223	





Total PM Peak Traffic Volumes		631
IN	223	
OUT	408	

## **APPENDIX E**

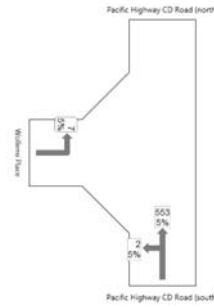
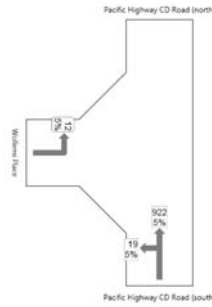
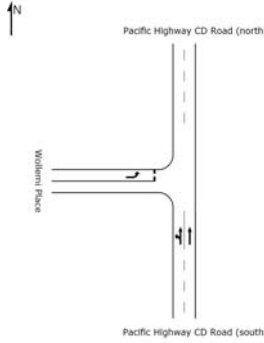
### **SIDRA OUTPUTS**

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road (south)										
1	L	19	5.0	0.250	8.3	LOS A	0.0	0.0	1.07	48.0
2	T	922	5.0	0.249	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
941		5.0	0.249	0.2	LOS A	0.0	0.0	0.00	0.02	59.7
West: Wollemi Place										
10	L	12	5.0	0.033	16.4	LOS C	0.1	1.0	0.70	41.4
Approach										
12		5.0	0.033	16.4	LOS C	0.1	1.0	0.70	0.89	41.4
All Vehicles										
953		5.0	0.249	0.4	NA	0.1	1.0	0.01	0.03	59.4

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road (south)										
1	L	2	5.0	0.143	8.3	LOS A	0.0	0.0	0.00	49.0
2	T	553	5.0	0.147	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
555		5.0	0.147	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Wollemi Place										
10	L	7	5.0	0.011	11.6	LOS B	0.0	0.3	0.50	45.6
Approach										
7		5.0	0.011	11.6	LOS B	0.0	0.3	0.50	0.70	45.6
All Vehicles										
562		5.0	0.147	0.2	NA	0.0	0.3	0.01	0.01	59.7

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2013 No Development

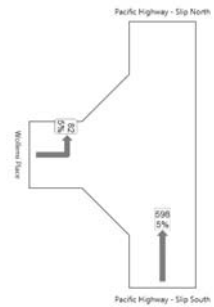
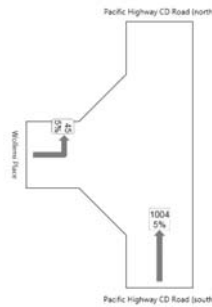
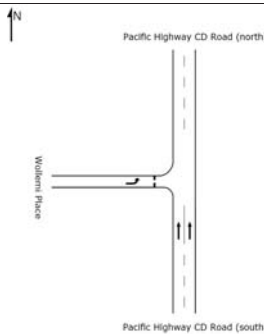


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road (south)										
2	T	1004	5.0	0.266	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
1004		5.0	0.266	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Wollemi Place										
10	L	45	5.0	0.139	18.4	LOS C	0.6	4.2	0.76	39.9
Approach										
45		5.0	0.139	18.4	LOS C	0.6	4.2	0.76	0.92	39.9
All Vehicles										
1049		5.0	0.266	0.8	NA	0.6	4.2	0.03	0.04	58.7

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway - Slip South										
2	T	598	5.0	0.158	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
598		5.0	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Wollemi Place										
10	L	82	5.0	0.137	12.5	LOS B	0.6	4.5	0.55	44.8
Approach										
82		5.0	0.137	12.5	LOS B	0.6	4.5	0.55	0.84	44.8
All Vehicles										
680		5.0	0.158	1.5	NA	0.6	4.5	0.07	0.10	57.6

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2013 with Development

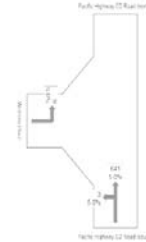
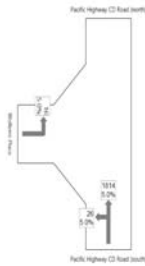
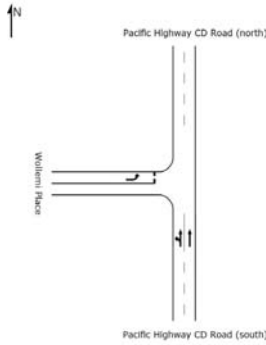


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
							veh	m			
South: Pacific Highway CD Road (south)											
1	L	26	5.0	0.487	8.3	LOS A	0.0	0.0	0.00	1.08	49.0
2	T	1814	5.0	0.487	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1840	5.0	0.487	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
West: Wollemi Place											
10	L	16	5.0	0.306	84.9	LOS F	0.8	6.2	0.97	1.01	18.0
Approach		16	5.0	0.306	84.9	LOS F	0.8	6.2	0.97	1.01	18.0
All Vehicles		1856	5.0	0.487	0.8	NA	0.8	6.2	0.01	0.02	58.6

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
							veh	m			
South: Pacific Highway CD Road (south)											
1	L	3	5.0	0.171	8.3	LOS A	0.0	0.0	0.00	1.10	49.0
2	T	641	5.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		644	5.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
West: Wollemi Place											
10	L	9	5.0	0.016	12.5	LOS B	0.1	0.4	0.54	0.74	44.8
Approach		9	5.0	0.016	12.5	LOS B	0.1	0.4	0.54	0.74	44.8
All Vehicles		653	5.0	0.171	0.2	NA	0.1	0.4	0.01	0.02	59.7

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2023 No Development

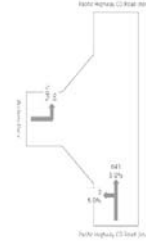
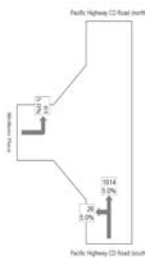
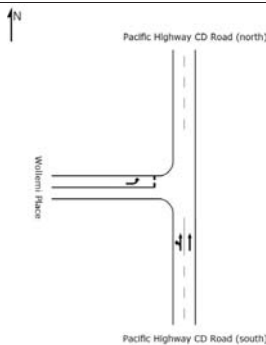


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
							veh	m			
South: Pacific Highway CD Road (south)											
1	L	26	5.0	0.491	8.3	LOS A	0.0	0.0	0.00	1.08	49.0
2	T	1814	5.0	0.488	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1840	5.0	0.487	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
West: Wollemi Place											
10	L	61	5.0	1.017	234.3	LOS F	7.3	53.2	1.00	1.43	8.0
Approach		61	5.0	1.017	234.3	LOS F	7.3	53.2	1.00	1.43	8.0
All Vehicles		1901	5.0	1.017	7.6	NA	7.3	53.2	0.03	0.06	49.6

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
							veh	m			
South: Pacific Highway CD Road (south)											
1	L	3	5.0	0.167	8.3	LOS A	0.0	0.0	0.00	1.10	49.0
2	T	641	5.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		644	5.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
West: Wollemi Place											
10	L	91	5.0	0.162	13.0	LOS B	0.7	5.3	0.57	0.86	44.3
Approach		91	5.0	0.162	13.0	LOS B	0.7	5.3	0.57	0.86	44.3
All Vehicles		735	5.0	0.171	1.6	NA	0.7	5.3	0.07	0.11	57.4

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2023 with Development



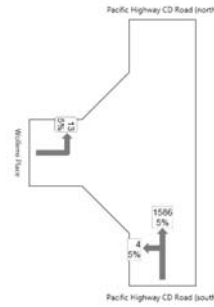
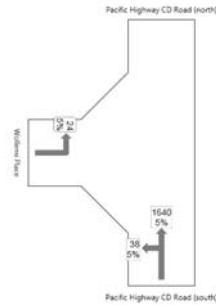
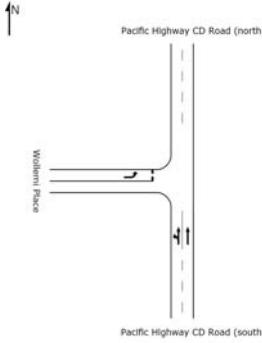


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
							veh	m		
South: Pacific Highway CD Road (south)										
1	L	38	5.0	0.447	8.3	LOS A	0.0	0.0	0.00	1.07
2	T	1640	5.0	0.445	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1678	5.0	0.445	0.2	LOS A	0.0	0.0	0.00	59.7
West: Wollemi Place										
10	L	24	5.0	0.293	57.0	LOS F	1.1	7.8	0.95	1.01
Approach										
		24	5.0	0.292	57.0	LOS F	1.1	7.8	0.95	1.01
All Vehicles										
		1702	5.0	0.445	1.0	NA	1.1	7.8	0.01	0.04

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
							veh	m		
South: Pacific Highway CD Road (south)										
1	L	4	5.0	0.400	8.3	LOS A	0.0	0.0	0.00	1.10
2	T	1586	5.0	0.421	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1590	5.0	0.421	0.0	LOS A	0.0	0.0	0.00	60.0
West: Wollemi Place										
10	L	13	5.0	0.133	43.1	LOS E	0.5	3.4	0.93	0.98
Approach										
		13	5.0	0.133	43.1	LOS E	0.5	3.4	0.93	0.98
All Vehicles										
		1603	5.0	0.421	0.4	NA	0.5	3.4	0.01	0.01

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2033 No Development

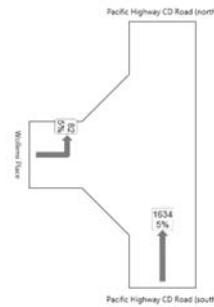
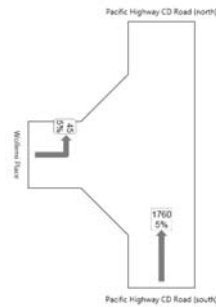
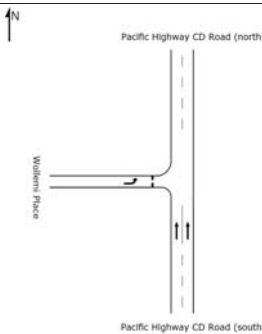


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
							veh	m		
South: Pacific Highway CD Road (south)										
2	T	1760	5.0	0.466	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1760	5.0	0.466	0.0	LOS A	0.0	0.0	0.00	60.0
West: Wollemi Place										
10	L	45	5.0	0.714	112.2	LOS F	3.0	21.6	0.98	1.10
Approach										
		45	5.0	0.715	112.2	LOS F	3.0	21.6	0.98	1.10
All Vehicles										
		1805	5.0	0.715	2.8	NA	3.0	21.6	0.02	0.03

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
							veh	m		
South: Pacific Highway CD Road (south)										
2	T	1634	5.0	0.433	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1634	5.0	0.433	0.0	LOS A	0.0	0.0	0.00	60.0
West: Wollemi Place										
10	L	82	5.0	0.943	136.6	LOS F	6.1	44.8	1.00	1.36
Approach										
		82	5.0	0.937	136.6	LOS F	6.1	44.8	1.00	1.36
All Vehicles										
		1716	5.0	0.937	6.5	NA	6.1	44.8	0.05	0.06

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2033 with Development

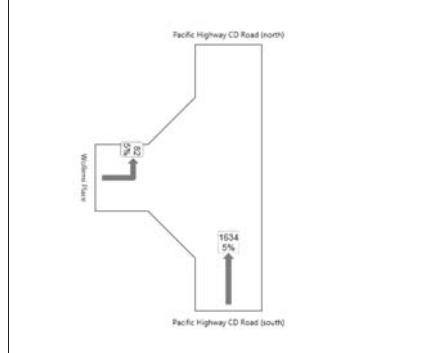
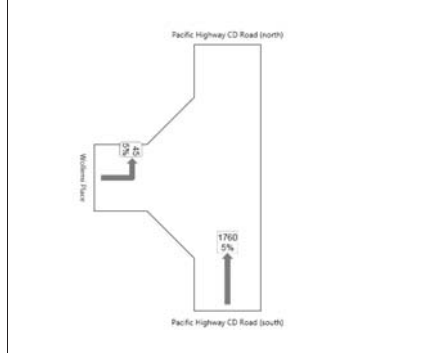
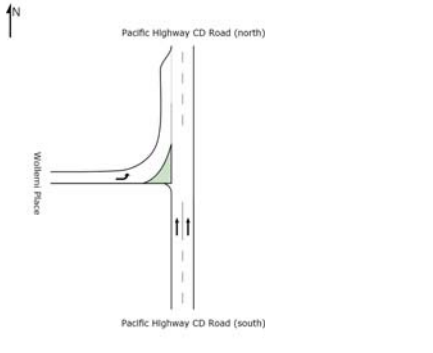


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road (south)										
2	T	1760	5.0	0.466	0.0	LOS A	0.0	0.0	0.00	60.0
Approach		1760	5.0	0.466	0.0	LOS A	0.0	0.0	0.00	60.0
West: Wollemi Place										
10	L	45	5.0	0.025	7.7	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.60	49.8
Approach		45	5.0	0.025	7.7	NA	0.0	0.0	0.00	49.8
All Vehicles		1805	5.0	0.466	0.2	NA	0.0	0.0	0.01	59.7

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road (south)										
2	T	1634	5.0	0.433	0.0	LOS A	0.0	0.0	0.00	60.0
Approach		1634	5.0	0.433	0.0	LOS A	0.0	0.0	0.00	60.0
West: Wollemi Place										
10	L	82	5.0	0.046	7.7	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.60	49.8
Approach		82	5.0	0.046	7.7	NA	0.0	0.0	0.00	49.8
All Vehicles		1716	5.0	0.433	0.4	NA	0.0	0.0	0.03	59.4

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Wollemi Place / Pacific Highway CD Road Intersection - 2033 with Development with Upgrades

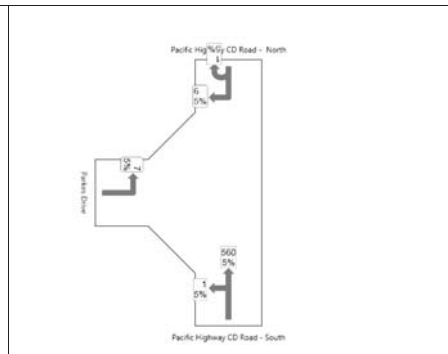
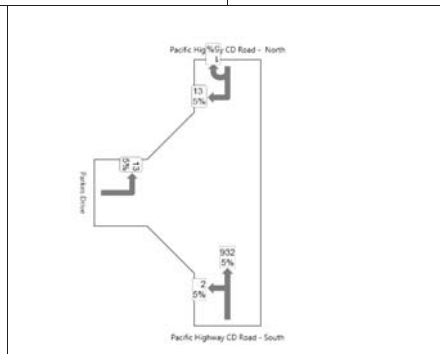
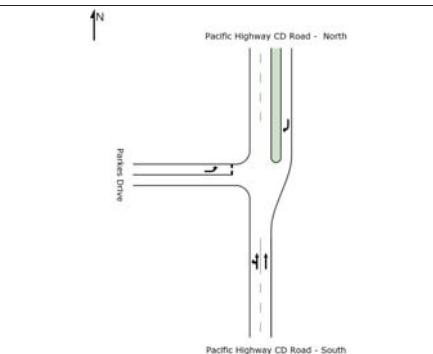


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	2	5.0	0.250	8.3	LOS A	0.0	0.0	1.10	49.0
2	T	932	5.0	0.247	0.0	LOS A	0.0	0.0	0.00	60.0
Approach		934	5.0	0.247	0.0	LOS A	0.0	0.0	0.00	60.0
North: Pacific Highway CD Road - North										
9	R	14	5.0	0.029	14.5	LOS B	0.1	0.9	0.67	43.0
Approach		14	5.0	0.029	14.5	LOS B	0.1	0.9	0.67	43.0
West: Parkes Drive										
10	L	13	5.0	0.036	16.4	LOS C	0.1	1.1	0.70	41.4
Approach		13	5.0	0.036	16.4	LOS C	0.1	1.1	0.70	41.4
All Vehicles		961	5.0	0.247	0.5	NA	0.1	1.1	0.02	59.3

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	1	5.0	0.143	8.2	LOS A	0.0	0.0	0.00	1.09
2	T	560	5.0	0.149	0.0	LOS A	0.0	0.0	0.00	60.0
Approach		561	5.0	0.149	0.0	LOS A	0.0	0.0	0.00	60.0
North: Pacific Highway CD Road - North										
9	R	7	5.0	0.009	11.1	LOS B	0.0	0.3	0.50	0.68
Approach		7	5.0	0.009	11.1	LOS B	0.0	0.3	0.50	0.68
West: Parkes Drive										
10	L	7	5.0	0.011	11.7	LOS B	0.0	0.3	0.51	0.71
Approach		7	5.0	0.011	11.7	LOS B	0.0	0.3	0.51	0.71
All Vehicles		575	5.0	0.149	0.3	NA	0.0	0.3	0.01	0.02

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2013 No Development

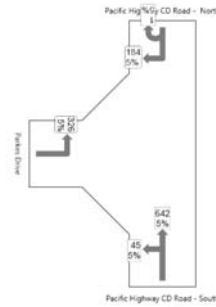
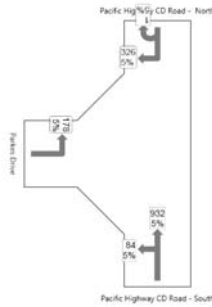
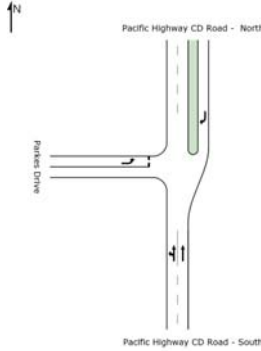


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	84	5.0	0.270	8.3	LOS A	0.0	0.0	0.99	48.0
2	T	932	5.0	0.270	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1016	5.0	0.270	0.7	LOS A	0.0	0.0	0.00	58.9
North: Pacific Highway CD Road - North										
9	R	327	5.0	0.766	27.3	LOS D	6.9	50.2	0.91	1.32
Approach										
		327	5.0	0.766	27.3	LOS D	6.9	50.2	0.91	1.32
West: Parkes Drive										
10	L	178	5.0	0.524	23.0	LOS C	3.0	22.2	0.84	1.07
Approach										
		178	5.0	0.524	23.0	LOS C	3.0	22.2	0.84	1.07
All Vehicles										
		1521	5.0	0.765	9.0	NA	6.9	50.2	0.29	0.46

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	45	5.0	0.182	8.3	LOS A	0.0	0.0	0.00	1.01
2	T	642	5.0	0.182	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		687	5.0	0.183	0.5	LOS A	0.0	0.0	0.00	59.1
North: Pacific Highway CD Road - North										
9	R	185	5.0	0.272	13.0	LOS B	1.5	10.8	0.62	0.89
Approach										
		185	5.0	0.272	13.0	LOS B	1.5	10.8	0.62	0.89
West: Parkes Drive										
10	L	326	5.0	0.597	17.7	LOS C	4.7	34.5	0.75	1.09
Approach										
		326	5.0	0.597	17.7	LOS C	4.7	34.5	0.75	1.09
All Vehicles										
		1198	5.0	0.597	7.1	NA	4.7	34.5	0.30	0.47

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2013 with Development

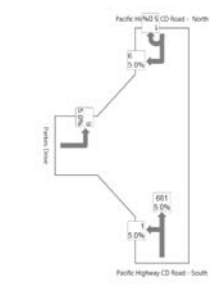
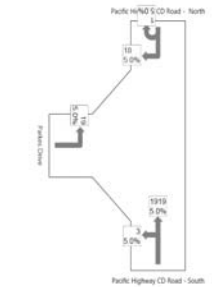
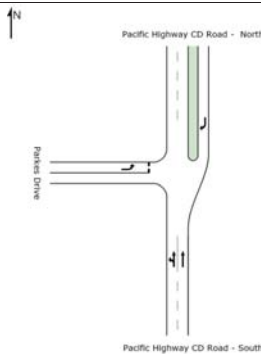


Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	3	5.0	0.509	8.3	LOS A	0.0	0.0	1.10	49.0
2	T	1919	5.0	0.509	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		1922	5.0	0.509	0.0	LOS A	0.0	0.0	0.00	60.0
North: Pacific Highway CD Road - North										
9	R	19	5.0	0.286	69.9	LOS F	0.8	6.0	0.97	1.01
Approach										
		19	5.0	0.286	69.9	LOS F	0.8	6.0	0.97	1.01
West: Parkes Drive										
10	L	19	5.0	0.479	127.8	LOS F	1.3	9.7	0.98	1.03
Approach										
		19	5.0	0.479	127.8	LOS F	1.3	9.7	0.98	1.03
All Vehicles										
		1960	5.0	0.509	1.9	NA	1.3	9.7	0.02	0.02

Movement Performance - Vehicles										
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h
South: Pacific Highway CD Road - South										
1	L	1	5.0	0.181	8.2	LOS A	0.0	0.0	0.00	1.09
2	T	691	5.0	0.181	0.0	LOS A	0.0	0.0	0.00	60.0
Approach										
		692	5.0	0.181	0.0	LOS A	0.0	0.0	0.00	60.0
North: Pacific Highway CD Road - North										
9	R	7	5.0	0.010	12.0	LOS B	0.0	0.3	0.55	0.71
Approach										
		7	5.0	0.010	12.0	LOS B	0.0	0.3	0.55	0.71
West: Parkes Drive										
10	L	9	5.0	0.017	12.9	LOS B	0.1	0.4	0.56	0.76
Approach										
		9	5.0	0.017	12.9	LOS B	0.1	0.4	0.56	0.76
All Vehicles										
		698	5.0	0.181	0.3	NA	0.1	0.4	0.01	0.02

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2023 No Development

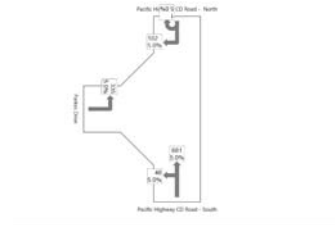
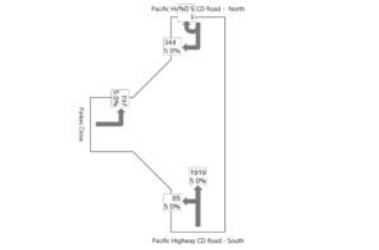
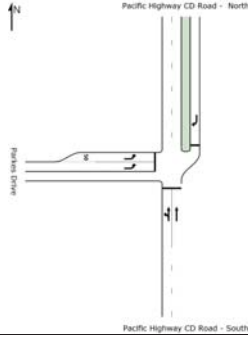


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed		
		veh/h	%	v/c	sec	Vehicles	Distance	per veh	km/h		
South: Pacific Highway CD Road - South											
1	L	85	5.0	0.821	23.4	LOS C	38.3	279.9	0.82	0.95	38.7
2	T	1919	5.0	0.821	15.1	LOS B	38.5	280.8	0.82	0.76	40.0
Approach											
2004		5.0	0.821	15.4	LOS B	38.5	280.8	0.82	0.77	40.0	
North: Pacific Highway CD Road - North											
9	R	345	5.0	0.808	54.0	LOS D	18.2	132.9	1.00	0.92	24.2
Approach											
345		5.0	0.808	54.0	LOS D	18.2	132.9	1.00	0.92	24.2	
West: Parkes Drive											
10	L	197	5.0	0.293	43.5	LOS D	5.3	38.7	0.85	0.78	27.3
Approach											
197		5.0	0.293	43.5	LOS D	5.3	38.7	0.85	0.78	27.3	
All Vehicles											
2546		5.0	0.821	22.8	LOS C	38.5	280.8	0.85	0.79	35.6	

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed		
		veh/h	%	v/c	sec	Vehicles	Distance	per veh	km/h		
South: Pacific Highway CD Road - South											
1	L	46	5.0	0.483	15.9	LOS B	4.2	30.4	0.79	0.88	44.3
2	T	681	5.0	0.483	7.6	LOS A	4.2	30.6	0.79	0.67	46.4
Approach											
727		5.0	0.483	8.1	LOS A	4.2	30.6	0.79	0.68	46.3	
North: Pacific Highway CD Road - North											
9	R	183	5.0	0.510	20.9	LOS C	2.6	19.2	0.94	0.80	38.2
Approach											
183		5.0	0.510	20.9	LOS C	2.6	19.2	0.94	0.80	38.2	
West: Parkes Drive											
10	L	335	5.0	0.467	20.8	LOS C	2.4	17.4	0.93	0.79	38.2
Approach											
335		5.0	0.467	20.8	LOS C	2.4	17.4	0.93	0.79	38.2	
All Vehicles											
1245		5.0	0.510	13.4	LOS B	4.2	30.6	0.85	0.73	42.5	

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2023 with Development

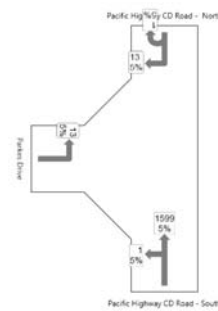
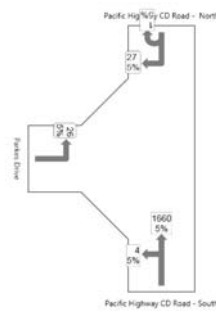
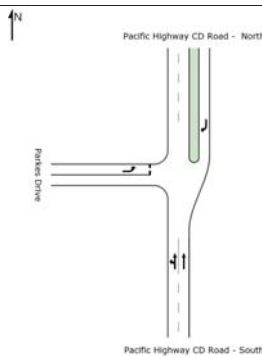


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed		
		veh/h	%	v/c	sec	Vehicles	Distance	per veh	km/h		
South: Pacific Highway CD Road - South											
1	L	4	5.0	0.444	8.3	LOS A	0.0	0.0	1.10	49.0	
2	T	1660	5.0	0.441	0.0	LOS A	0.0	0.0	0.00	60.0	
Approach											
1664		5.0	0.441	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
North: Pacific Highway CD Road - North											
9	R	28	5.0	0.222	39.2	LOS E	0.9	6.2	0.93	0.99	28.9
Approach											
28		5.0	0.222	39.2	LOS E	0.9	6.2	0.93	0.99	28.9	
West: Parkes Drive											
10	L	26	5.0	0.321	58.6	LOS F	1.2	8.5	0.95	1.01	23.0
Approach											
26		5.0	0.319	58.6	LOS F	1.2	8.5	0.95	1.01	23.0	
All Vehicles											
1718		5.0	0.441	1.5	NA	1.2	8.5	0.03	0.03	57.6	

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed		
		veh/h	%	v/c	sec	Vehicles	Distance	per veh	km/h		
South: Pacific Highway CD Road - South											
1	L	1	5.0	0.500	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
2	T	1599	5.0	0.424	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach											
1600		5.0	0.424	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
North: Pacific Highway CD Road - North											
9	R	14	5.0	0.096	32.6	LOS D	0.4	2.6	0.91	0.97	31.7
Approach											
14		5.0	0.096	32.6	LOS D	0.4	2.6	0.91	0.97	31.7	
West: Parkes Drive											
10	L	13	5.0	0.137	44.1	LOS E	0.5	3.5	0.93	0.98	27.1
Approach											
13		5.0	0.136	44.1	LOS E	0.5	3.5	0.93	0.98	27.1	
All Vehicles											
1627		5.0	0.424	0.6	NA	0.5	3.5	0.02	0.02	59.0	

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2033 No Development

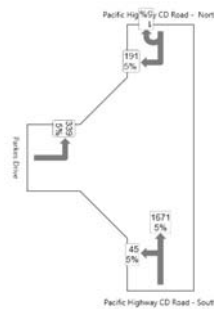
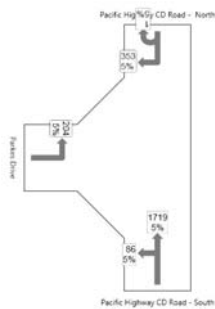
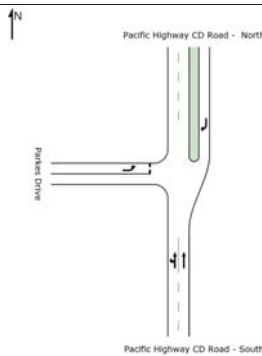


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pacific Highway CD Road - South											
1	L	86	5.0	0.478	8.3	LOS A	0.0	0.0	0.00	1.03	49.0
2	T	1719	5.0	0.479	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach											
1805		5.0	0.479	0.4	LOS A	0.0	0.0	0.00	0.05	0.05	59.4
North: Pacific Highway CD Road - North											
9	R	354	5.0	3.933	2700.4	LOS F	176.4	1287.5	1.00	4.91	0.8
Approach											
354		5.0	3.929	2700.4	LOS F	176.4	1287.5	1.00	4.91	0.8	0.8
West: Parkes Drive											
10	L	204	5.0	3.238	2120.5	LOS F	97.8	713.9	1.00	3.64	1.0
Approach											
204		5.0	3.259	2120.5	LOS F	97.8	713.9	1.00	3.64	1.0	1.0
All Vehicles											
2363		5.0	3.929	587.9	NA	176.4	1287.5	0.24	1.09	3.5	3.5

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pacific Highway CD Road - South											
1	L	45	5.0	0.455	8.3	LOS A	0.0	0.0	0.00	1.06	49.0
2	T	1671	5.0	0.455	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach											
1716		5.0	0.455	0.2	LOS A	0.0	0.0	0.00	0.03	0.03	59.6
North: Pacific Highway CD Road - North											
9	R	192	5.0	1.714	712.1	LOS F	57.3	418.1	1.00	3.73	2.9
Approach											
192		5.0	1.716	712.1	LOS F	57.3	418.1	1.00	3.73	2.9	2.9
West: Parkes Drive											
10	L	339	5.0	4.520	3231.7	LOS F	177.5	1295.7	1.00	4.48	0.7
Approach											
339		5.0	4.512	3231.7	LOS F	177.5	1295.7	1.00	4.48	0.7	0.7
All Vehicles											
2247		5.0	4.512	548.6	NA	177.5	1295.7	0.24	1.02	1.02	3.7

AM Movement Summary

PM Movement Summary

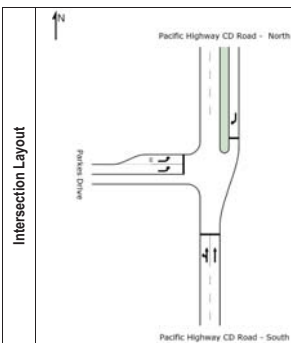


Intersection Layout

AM Volume Summary

PM Volume Summary

Parkes Drive / Pacific Highway CD Road Intersection - 2033 with Development



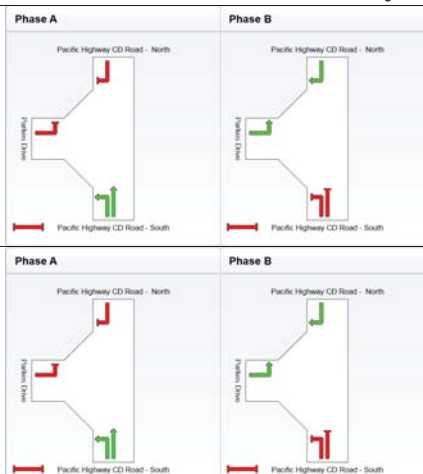
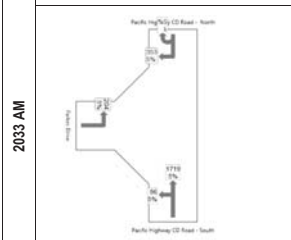
Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pacific Highway CD Road - South											
1	L	86	5.0	0.796	23.2	LOS C	28.8	209.9	0.83	0.96	38.8
2	T	1719	5.0	0.798	14.9	LOS B	28.9	210.7	0.83	0.79	40.1
Approach											
1805		5.0	0.798	15.3	LOS B	28.9	210.7	0.83	0.80	0.80	40.1
North: Pacific Highway CD Road - North											
9	R	354	5.0	0.790	42.8	LOS D	15.6	114.2	0.99	0.92	27.6
Approach											
354		5.0	0.790	42.8	LOS D	15.6	114.2	0.99	0.92	0.92	27.6
West: Parkes Drive											
10	L	204	5.0	0.269	34.5	LOS C	5.3	38.4	0.84	0.77	30.8
Approach											
204		5.0	0.269	34.5	LOS C	5.3	38.4	0.84	0.77	0.77	30.8
All Vehicles											
2363		5.0	0.798	21.1	LOS C	28.9	210.7	0.86	0.81	0.81	36.6

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pacific Highway CD Road - South											
1	L	45	5.0	0.661	16.0	LOS B	20.0	146.0	0.62	0.97	43.9
2	T	1671	5.0	0.662	7.7	LOS A	20.1	146.4	0.62	0.57	47.1
Approach											
1716		5.0	0.662	7.9	LOS A	20.1	146.4	0.62	0.58	0.58	47.0
North: Pacific Highway CD Road - North											
9	R	192	5.0	0.659	44.3	LOS D	9.2	67.0	0.99	0.84	27.1
Approach											
192		5.0	0.659	44.3	LOS D	9.2	67.0	0.99	0.84	0.84	27.1
West: Parkes Drive											
10	L	339	5.0	0.582	43.2	LOS D	8.1	58.9	0.97	0.81	27.4
Approach											
339		5.0	0.582	43.2	LOS D	8.1	58.9	0.97	0.81	0.81	27.4
All Vehicles											
2247		5.0	0.662	16.3	LOS B	20.1	146.4	0.71	0.64	0.64	40.2

AM Movement Summary

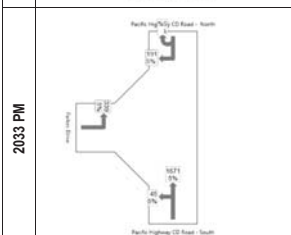
PM Movement Summary

Phasing



Phase Timing Results		
Phase	A	B
Green Time (sec)	48	20
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	54	26
Phase Split	68 %	33 %

80 second



Phase Timing Results		
Phase	A	B
Green Time (sec)	55	13
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	61	19
Phase Split	76 %	24 %

80 second

Parkes Drive / Pacific Highway CD Road Intersection - 2033 with Development with Additional Upgrades





Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles												
	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	HV Flow	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		veh/h	%	v/c	sec		veh	m		per veh	km/h			
	South: Pacific Highway CD Road											South: Pacific Highway CD Road												
	1	L	747	5.0	0.417	8.5	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.69	48.7	1	L	450	5.0	0.251	8.5	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.69	48.8
	3	R	196	5.0	0.219	32.9	LOS C	4.3	31.7	0.83	0.75	31.5	3	R	117	5.0	0.174	37.0	LOS D	2.9	21.1	0.88	0.74	29.8
	Approach											Approach												
	943		5.0	0.417	13.6	LOS B	4.3	31.7	0.17	0.71	43.7	567		5.0	0.251	14.3	LOS B	2.9	21.1	0.18	0.70	43.1		
	South East: Pacific Highway Off Ramp											South East: Pacific Highway Off Ramp												
	21	L	4	5.0	0.002	8.9	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.63	48.7	21	L	2	5.0	0.001	8.9	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.63	48.7
	22	T	2	5.0	0.224	17.7	LOS B	5.5	40.2	0.71	0.58	36.4	22	T	1	5.0	0.178	21.7	LOS C	4.0	28.9	0.76	0.61	33.9
	23	R	307	5.0	0.222	26.3	LOS C	5.5	40.2	0.71	0.78	34.8	23	R	194	5.0	0.174	30.2	LOS C	4.0	28.9	0.76	0.77	32.7
	Approach											Approach												
	313		5.0	0.222	26.0	LOS C	5.5	40.2	0.70	0.78	35.0	197		5.0	0.174	30.0	LOS C	4.0	28.9	0.76	0.77	32.8		
	North East: Overpass											North East: Overpass												
	24	L	9	5.0	0.037	39.6	LOS D	0.5	3.6	0.89	0.66	28.7	24	L	4	5.0	0.008	29.1	LOS C	0.2	1.3	0.75	0.63	33.3
	26	R	54	5.0	0.219	42.9	LOS D	2.9	20.9	0.93	0.75	27.5	26	R	86	5.0	0.174	32.6	LOS C	3.7	27.0	0.80	0.77	31.6
	Approach											Approach												
63		5.0	0.219	42.4	LOS D	2.9	20.9	0.92	0.74	27.6	90		5.0	0.174	32.4	LOS C	3.7	27.0	0.80	0.76	31.7			
All Vehicles		1319	5.0	0.417	17.9	LOS B	5.5	40.2	0.33	0.73	40.2	All Vehicles		654	5.0	0.251	19.9	LOS B	4.0	28.9	0.38	0.72	38.8	

AM Movement Summary

PM Movement Summary

Phasing

2013 AM		Phase A			Phase B			Phase C			<table border="1"> <thead> <tr> <th colspan="4">Phase Timing Results</th> </tr> <tr> <th>Phase</th><th>A</th><th>B</th><th>C</th> </tr> </thead> <tbody> <tr> <td>Green Time (sec)</td><td>20</td><td>31</td><td>11</td> </tr> <tr> <td>Yellow Time (sec)</td><td>4</td><td>4</td><td>4</td> </tr> <tr> <td>All-Red Time (sec)</td><td>2</td><td>2</td><td>2</td> </tr> <tr> <td>Phase Time (sec)</td><td>28</td><td>37</td><td>17</td> </tr> <tr> <td>Phase Split</td><td>33%</td><td>46%</td><td>21%</td> </tr> </tbody> </table>	Phase Timing Results				Phase	A	B	C	Green Time (sec)	20	31	11	Yellow Time (sec)	4	4	4	All-Red Time (sec)	2	2	2	Phase Time (sec)	28	37	17	Phase Split	33%	46%	21%	80 second
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2013 No Development



Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles												
	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	HV Flow	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		veh/h	%	v/c	sec		veh	m		per veh	km/h			
	South: Pacific Highway CD Road											South: Pacific Highway CD Road												
	1	L	858	5.0	0.479	8.5	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.69	48.7	1	L	654	5.0	0.365	8.5	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.69	48.7
	3	R	309	5.0	0.345	33.9	LOS C	6.6	48.5	0.86	0.78	31.1	3	R	321	5.0	0.256	26.9	LOS C	6.0	43.9	0.75	0.76	34.5
	Approach											Approach												
	1167		5.0	0.479	15.2	LOS B	6.6	48.5	0.23	0.72	42.3	975		5.0	0.365	14.6	LOS B	6.0	43.9	0.25	0.71	42.9		
	South East: Pacific Highway Off Ramp											South East: Pacific Highway Off Ramp												
	21	L	167	5.0	0.093	8.9	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.63	48.7	21	L	93	5.0	0.052	8.9	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	0.63	48.7
	22	T	2	5.0	0.348	27.1	LOS C	6.6	48.5	0.86	0.70	30.9	22	T	1	5.0	0.247	27.9	LOS C	4.5	32.6	0.86	0.68	30.6
	23	R	307	5.0	0.345	35.6	LOS D	6.6	48.5	0.86	0.80	30.3	23	R	194	5.0	0.242	36.5	LOS D	4.5	32.6	0.86	0.78	29.9
	Approach											Approach												
	476		5.0	0.345	26.2	LOS C	6.6	48.5	0.56	0.74	35.1	288		5.0	0.242	27.6	LOS C	4.5	32.6	0.58	0.73	34.3		
	North East: Overpass											North East: Overpass												
	24	L	172	5.0	0.349	32.1	LOS C	7.1	51.9	0.85	0.78	31.9	24	L	93	5.0	0.259	36.5	LOS D	4.4	32.2	0.88	0.76	30.0
	26	R	54	5.0	0.110	32.1	LOS C	2.4	17.3	0.78	0.75	31.8	26	R	86	5.0	0.240	38.2	LOS D	4.1	29.9	0.88	0.77	29.2
	Approach											Approach												
226		5.0	0.349	32.1	LOS C	7.1	51.9	0.83	0.77	31.9	179		5.0	0.259	37.3	LOS D	4.4	32.2	0.88	0.76	29.6			
All Vehicles		1869	5.0	0.479	20.1	LOS C	7.1	51.9	0.39	0.73	38.7	All Vehicles		1442	5.0	0.365	20.0	LOS B	6.0	43.9	0.39	0.72	38.8	

AM Movement Summary

PM Movement Summary

Phasing

2013 AM		Phase A			Phase B			Phase C			<table border="1"> <thead> <tr> <th colspan="4">Phase Timing Results</th> </tr> <tr> <th>Phase</th><th>A</th><th>B</th><th>C</th> </tr> </thead> <tbody> <tr> <td>Green Time (sec)</td><td>20</td><td>20</td><td>22</td> </tr> <tr> <td>Yellow Time (sec)</td><td>4</td><td>4</td><td>4</td> </tr> <tr> <td>All-Red Time (sec)</td><td>2</td><td>2</td><td>2</td> </tr> <tr> <td>Phase Time (sec)</td><td>28</td><td>28</td><td>28</td> </tr> <tr> <td>Phase Split</td><td>33%</td><td>33%</td><td>35%</td> </tr> </tbody> </table>	Phase Timing Results				Phase	A	B	C	Green Time (sec)	20	20	22	Yellow Time (sec)	4	4	4	All-Red Time (sec)	2	2	2	Phase Time (sec)	28	28	28	Phase Split	33%	33%	35%	80 second
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2013 with Development



Intersection Layout	Movement Performance - Vehicles													Movement Performance - Vehicles												
	Mov ID	Turn	Demand	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	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	veh/h	%	v/c	sec	veh	m	per veh	km/h										
	South: Pacific Highway CD Road													South: Pacific Highway CD Road												
	1	L	1178	5.0	0.657	8.6	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.69	48.6	1	L	485	5.0	0.270	8.5	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.69	48.8		
	2	T	463	5.0	0.700	42.7	LOS D	9.1	66.2	0.99	0.87	27.6	2	T	163	5.0	0.345	42.9	LOS D	3.0	22.2	0.95	0.76	27.5		
	Approach 1641 5.0 0.700 18.2 LOS B 9.1 66.2 0.28 0.74 40.0													Approach 648 5.0 0.345 17.1 LOS B 3.0 22.2 0.24 0.71 40.8												
	South East: Pacific Highway Off Ramp													South East: Pacific Highway Off Ramp												
	21	L	1	5.0	0.001	8.8	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.64	48.7	21	L	1	5.0	0.001	8.8	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.64	48.7		
	22	T	1	5.0	0.681	23.6	LOS C	14.8	108.4	0.91	0.79	32.4	22	T	1	5.0	0.957	61.2	LOS E	11.4	83.5	1.00	1.11	20.6		
	23	R	885	5.0	0.682	32.1	LOS C	14.8	108.4	0.91	0.86	31.8	23	R	428	5.0	0.857	69.7	LOS E	11.4	83.5	1.00	1.11	20.5		
	Approach 887 5.0 0.682 32.1 LOS C 14.8 108.4 0.90 0.86 31.8													Approach 430 5.0 0.957 69.6 LOS E 11.4 83.5 1.00 1.11 20.5												
	North East: Overpass													North East: Overpass												
	24	L	5	5.0	0.006	17.7	LOS B	0.1	0.7	0.53	0.62	40.4	24	L	604	5.0	0.464	11.5	LOS B	9.7	70.7	0.45	0.68	45.0		
	26	R	294	5.0	0.690	40.2	LOS D	11.0	80.3	0.97	0.86	28.4	26	R	826	5.0	1.000 <sup>3</sup>	27.5	LOS C	17.9	130.6	1.00	0.89	34.1		
	Approach 299 5.0 0.690 39.8 LOS D 11.0 80.3 0.96 0.85 28.6													Approach 1230 5.0 1.000 19.7 LOS B 17.9 130.6 0.73 0.79 38.7												
	All Vehicles 2827 5.0 0.700 24.9 LOS C 14.8 108.4 0.55 0.79 35.6													All Vehicles 2308 5.0 1.000 28.3 LOS C 17.9 130.6 0.64 0.82 33.6												
	AM Movement Summary													PM Movement Summary												

2023 AM	Phasing			Phase Timing Results	80 second																								
	Phase A	Phase B	Phase C																										
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	Phase	A	B	C																									
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2023 No Development



Intersection Layout	Movement Performance - Vehicles													Movement Performance - Vehicles												
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	veh/h	%	v/c	sec	veh	m	per veh	km/h	veh/h	%	v/c	sec	veh	m	per veh	km/h										
	South: Pacific Highway CD Road													South: Pacific Highway CD Road												
	1	L	1289	5.0	0.719	8.2	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.66	49.0	1	L	689	5.0	0.384	8.1	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.66	49.2		
	2	T	574	5.0	0.640	37.1	LOS D	12.0	87.5	0.95	0.83	29.7	2	T	452	5.0	0.690	40.4	LOS D	10.0	73.1	0.99	0.87	28.4		
	Approach 1863 5.0 0.719 17.1 LOS B 12.0 87.5 0.29 0.71 40.8													Approach 1141 5.0 0.690 20.9 LOS C 10.0 73.1 0.39 0.74 38.1												
	South East: Pacific Highway Off Ramp													South East: Pacific Highway Off Ramp												
	21	L	164	5.0	0.091	8.9	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.63	48.7	21	L	90	5.0	0.050	8.9	NA <sup>9</sup>	NA <sup>9</sup>	NA <sup>9</sup>	0.00	0.63	48.7		
	22	T	1	5.0	0.625	20.8	LOS C	15.3	111.6	0.85	0.75	34.1	22	T	1	5.0	0.852	39.6	LOS D	10.4	75.9	1.00	0.94	28.0		
	23	R	885	5.0	0.618	29.2	LOS C	15.3	111.6	0.85	0.84	33.3	23	R	428	5.0	0.816	48.0	LOS D	10.4	75.9	1.00	0.94	25.9		
	Approach 1050 5.0 0.618 26.0 LOS C 15.3 111.6 0.72 0.81 35.1													Approach 519 5.0 0.816 41.2 LOS D 10.4 75.9 0.83 0.89 28.2												
	North East: Overpass													North East: Overpass												
	24	L	168	5.0	0.208	21.0	LOS C	5.4	39.5	0.64	0.73	38.1	24	L	94	5.0	0.076	10.6	LOS B	1.7	12.2	0.34	0.64	46.6		
	26	R	294	5.0	0.596	45.5	LOS D	7.3	53.6	0.99	0.81	26.6	26	R	1225	5.0	0.893	38.8	LOS D	31.0	226.5	0.93	0.96	29.0		
	Approach 462 5.0 0.596 36.6 LOS D 7.3 53.6 0.86 0.78 29.9													Approach 1319 5.0 0.893 36.8 LOS D 31.0 226.5 0.89 0.94 29.8												
	All Vehicles 3375 5.0 0.719 22.5 LOS C 15.3 111.6 0.50 0.75 37.1													All Vehicles 2979 5.0 0.893 31.5 LOS C 31.0 226.5 0.69 0.86 32.2												
	AM Movement Summary													PM Movement Summary												

2023 AM	Phasing			Phase Timing Results	75 second																								
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2023 with Development



Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles												
	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	HV Flow	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	veh/h	%	v/c	sec			veh	m		per veh	km/h		
	<b>South: Pacific Highway CD Road</b> 1 L 1154 5.0 0.644 8.6 NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> 0.69 48.6 2 T 532 5.0 0.704 41.1 LOS D 11.9 86.8 0.99 0.87 28.2 Approach 1686 5.0 0.704 18.9 LOS B 11.9 86.8 0.31 0.75 39.5 <b>South East: Pacific Highway Off Ramp</b> 21 L 9 5.0 0.005 8.9 NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> 0.63 48.7 22 T 4 5.0 0.702 28.6 LOS C 15.6 113.5 0.95 0.84 29.9 23 R 771 5.0 0.720 37.2 LOS D 15.6 113.5 0.95 0.87 29.6 Approach 784 5.0 0.720 36.8 LOS D 15.6 113.5 0.94 0.87 29.8 <b>North East: Overpass</b> 24 L 18 5.0 0.018 15.3 LOS B 0.5 3.6 0.47 0.64 42.3 26 R 340 5.0 0.690 37.8 LOS D 13.9 101.2 0.95 0.86 29.4 Approach 358 5.0 0.690 36.7 LOS D 13.9 101.2 0.93 0.85 29.8 All Vehicles 2828 5.0 0.720 26.1 LOS C 15.6 113.5 0.56 0.79 34.9											<b>South: Pacific Highway CD Road</b> 1 L 1151 5.0 0.642 8.6 NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> 0.69 48.6 2 T 461 5.0 0.976 74.1 LOS E 14.4 105.1 1.00 1.23 19.7 Approach 1612 5.0 0.976 27.3 LOS C 14.4 105.1 0.29 0.85 34.2 <b>South East: Pacific Highway Off Ramp</b> 21 L 4 5.0 0.002 8.9 NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> NA <sup>3</sup> 0.63 48.7 22 T 1 5.0 0.988 61.9 LOS E 11.9 87.2 1.00 1.12 20.5 23 R 386 5.0 0.959 70.4 LOS E 11.9 87.2 1.00 1.12 20.4 Approach 391 5.0 0.959 69.6 LOS E 11.9 87.2 0.99 1.11 20.5 <b>North East: Overpass</b> 24 L 632 5.0 0.478 11.2 LOS B 11.5 84.3 0.44 0.67 45.4 26 R 637 5.0 1.000 <sup>1</sup> 27.0 LOS C 18.9 138.2 1.00 0.89 34.4 Approach 1269 5.0 1.000 19.2 LOS B 18.9 138.2 0.72 0.78 39.1 All Vehicles 3272 5.0 1.000 29.2 LOS C 18.9 138.2 0.54 0.85 33.2												
	AM Movement Summary											PM Movement Summary												

2033 AM	Phasing											Phase Timing Results	80 second	
	Phase A			Phase B			Phase C			Phase Timing Results				
	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	A	B			C
												Green Time (sec) 16 24 22 Yellow Time (sec) 4 4 4 All-Red Time (sec) 2 2 2 Phase Time (sec) 22 30 28 Phase Split 28% 38% 35%	80 second	
												Green Time (sec) 10 9 43 Yellow Time (sec) 4 4 4 All-Red Time (sec) 2 2 2 Phase Time (sec) 16 15 49 Phase Split 20% 19% 61%		80 second

Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2033 No Development



Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles												
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2033 AM	Phasing											Phase Timing Results	80 second	
	Phase A			Phase B			Phase C			Phase Timing Results				
	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	Green Time (sec)	Yellow Time (sec)	All-Red Time (sec)	A	B			C
												Green Time (sec) 19 30 13 Yellow Time (sec) 4 4 4 All-Red Time (sec) 2 2 2 Phase Time (sec) 25 36 19 Phase Split 31% 45% 24%	80 second	
												Green Time (sec) 15 14 53 Yellow Time (sec) 4 4 4 All-Red Time (sec) 2 2 2 Phase Time (sec) 21 20 59 Phase Split 21% 20% 59%		100 second

Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2033 No Development with Upgrades



Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles																																																
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (west) - 2033 with Development with Upgrades



Intersection Layout	Movement Performance - Vehicles											Movement Performance - Vehicles																																																
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (east) - 2013 No Development





Intersection Layout	Movement Performance - Vehicles												Movement Performance - Vehicles													
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32	R	90	5.0	0.196	33.8	LOS C	4.3	31.7	0.74	0.76	31.1																																																																																																																																																																																																																																																																																																																																																																																						
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Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h																																																																																																																																																																																																																																																																																																																																																																																						
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24	L	709	5.0	0.922	32.0	LOS C	23.1	168.6	0.90	1.01	32.2																																																																																																																																																																																																																																																																																																																																																																																						
25	T	2196	5.0	0.817	37.8	LOS D	27.7	202.0	0.95	0.92	29.0																																																																																																																																																																																																																																																																																																																																																																																						
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27	L	294	5.0	0.164	7.7	NA <sup>1</sup>	NA <sup>1</sup>	NA <sup>1</sup>	0.00	0.60	49.8																																																																																																																																																																																																																																																																																																																																																																																						
28	T	1153	5.0	0.927	53.2	LOS D	37.3	272.4	1.00	1.14	23.4																																																																																																																																																																																																																																																																																																																																																																																						
29	R	69	4.9	0.928	61.5	LOS E	37.1	271.1	1.00	1.14	23.2																																																																																																																																																																																																																																																																																																																																																																																						
Approach 1516 5.0 0.927 44.8 LOS D 37.3 272.4 0.81 1.04 26.1																																																																																																																																																																																																																																																																																																																																																																																																	
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31	T	631	5.0	0.315	14.1	LOS B	10.3	75.0	0.60	0.52	41.5																																																																																																																																																																																																																																																																																																																																																																																						
32	R	165	5.0	0.920	72.6	LOS E	11.4	83.5	1.00	1.03	20.0																																																																																																																																																																																																																																																																																																																																																																																						
Approach 796 5.0 0.920 26.2 LOS C 11.4 83.5 0.69 0.63 34.0																																																																																																																																																																																																																																																																																																																																																																																																	
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	Phase Timing Results																																
	Phase	A	B		C																												
Green Time (sec)	25	24	33																														
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	Phase Timing Results																																
	Phase	A	B		C																												
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (east) - 2023 with Development



	<b>Movement Performance - Vehicles</b> <table border="1"> <thead> <tr> <th>Mov ID</th> <th>Turn</th> <th>Demand</th> <th>HV Flow</th> <th>Deg. Satn</th> <th>Average Delay</th> <th>Level of Service</th> <th>95% Back of Queue Vehicles</th> <th>95% Back of Queue Distance</th> <th>Prop. Queued</th> <th>Effective Stop Rate per veh</th> <th>Average Speed km/h</th> </tr> <tr> <th>veh/h</th> <th>%</th> <th>v/c</th> <th>sec</th> <th></th> <th>veh</th> <th>m</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td colspan="12"><b>North East: Old Pacific Highway</b></td> </tr> <tr> <td>24</td> <td>L</td> <td>148</td> <td>5.0</td> <td>0.167</td> <td>11.4</td> <td>LOS B</td> <td>2.6</td> <td>19.1</td> <td>0.41</td> <td>0.69</td> <td>45.8</td> </tr> <tr> <td>25</td> <td>T</td> <td>583</td> <td>5.0</td> <td>0.514</td> <td>34.8</td> <td>LOS C</td> <td>8.7</td> <td>63.3</td> <td>0.94</td> <td>0.79</td> <td>30.1</td> </tr> <tr> <td colspan="12">Approach 731 5.0 0.514 30.1 LOS C 8.7 63.3 0.83 0.77 32.4</td> </tr> <tr> <td colspan="12"><b>North West: Tugun Bypass Southbound Off Ramp</b></td> </tr> <tr> <td>27</td> <td>L</td> <td>708</td> <td>5.0</td> <td>1.000<sup>2</sup></td> <td>21.5</td> <td>LOS C</td> <td>16.9</td> <td>123.4</td> <td>0.78</td> <td>0.91</td> <td>38.0</td> </tr> <tr> <td>28</td> <td>T</td> <td>1003</td> <td>5.0</td> <td>0.550</td> <td>14.9</td> <td>LOS B</td> <td>15.3</td> <td>111.8</td> <td>0.74</td> <td>0.65</td> <td>39.8</td> </tr> <tr> <td>29</td> <td>R</td> <td>15</td> <td>5.0</td> <td>0.545</td> <td>22.8</td> <td>LOS C</td> <td>15.3</td> <td>111.8</td> <td>0.74</td> <td>0.91</td> <td>38.9</td> </tr> <tr> <td colspan="12">Approach 1726 5.0 1.000 17.6 LOS B 16.9 123.4 0.75 0.76 39.0</td> </tr> <tr> <td colspan="12"><b>South West: Overpass</b></td> </tr> <tr> <td>31</td> <td>T</td> <td>1264</td> <td>5.0</td> <td>0.956</td> <td>55.2</td> <td>LOS E</td> <td>35.6</td> <td>259.7</td> <td>1.00</td> <td>1.27</td> <td>22.9</td> </tr> <tr> <td>32</td> <td>R</td> <td>39</td> <td>5.0</td> <td>0.290</td> <td>49.4</td> <td>LOS D</td> <td>2.3</td> <td>16.9</td> <td>0.98</td> <td>0.73</td> <td>25.4</td> </tr> <tr> <td colspan="12">Approach 1303 5.0 0.956 55.0 LOS E 35.6 259.7 1.00 1.25 23.0</td> </tr> <tr> <td colspan="12">All Vehicles 3760 5.0 1.000 33.0 LOS C 35.6 259.7 0.85 0.93 30.5</td> </tr> </tbody> </table>	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	veh/h	%	v/c	sec		veh	m					<b>North East: Old Pacific Highway</b>												24	L	148	5.0	0.167	11.4	LOS B	2.6	19.1	0.41	0.69	45.8	25	T	583	5.0	0.514	34.8	LOS C	8.7	63.3	0.94	0.79	30.1	Approach 731 5.0 0.514 30.1 LOS C 8.7 63.3 0.83 0.77 32.4												<b>North West: Tugun Bypass Southbound Off Ramp</b>												27	L	708	5.0	1.000 <sup>2</sup>	21.5	LOS C	16.9	123.4	0.78	0.91	38.0	28	T	1003	5.0	0.550	14.9	LOS B	15.3	111.8	0.74	0.65	39.8	29	R	15	5.0	0.545	22.8	LOS C	15.3	111.8	0.74	0.91	38.9	Approach 1726 5.0 1.000 17.6 LOS B 16.9 123.4 0.75 0.76 39.0												<b>South West: Overpass</b>												31	T	1264	5.0	0.956	55.2	LOS E	35.6	259.7	1.00	1.27	22.9	32	R	39	5.0	0.290	49.4	LOS D	2.3	16.9	0.98	0.73	25.4	Approach 1303 5.0 0.956 55.0 LOS E 35.6 259.7 1.00 1.25 23.0												All Vehicles 3760 5.0 1.000 33.0 LOS C 35.6 259.7 0.85 0.93 30.5												<b>Movement Performance - Vehicles</b> <table border="1"> <thead> <tr> <th>Mov ID</th> <th>Turn</th> <th>Demand</th> <th>HV Flow</th> <th>Deg. 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Queued</th> <th>Effective Stop Rate per veh</th> <th>Average Speed km/h</th> </tr> <tr> <th>veh/h</th> <th>%</th> <th>v/c</th> <th>sec</th> <th></th> <th>veh</th> <th>m</th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td colspan="12"><b>North East: Old Pacific Highway</b></td> </tr> <tr> <td>24</td> <td>L</td> <td>514</td> <td>5.0</td> <td>0.655</td> <td>23.1</td> <td>LOS C</td> <td>13.9</td> <td>101.3</td> <td>0.80</td> <td>0.91</td> <td>37.0</td> </tr> <tr> <td>25</td> <td>T</td> <td>2337</td> <td>5.0</td> <td>1.207</td> <td>180.8</td> <td>LOS F</td> <td>100.2</td> <td>731.7</td> <td>1.00</td> <td>1.95</td> <td>10.0</td> </tr> <tr> <td colspan="12">Approach 2851 5.0 1.207 152.3 LOS F 100.2 731.7 0.96 1.76 11.6</td> </tr> <tr> <td colspan="12"><b>North West: Tugun Bypass Southbound Off Ramp</b></td> </tr> <tr> <td>27</td> <td>L</td> <td>734</td> <td>5.0</td> <td>1.000<sup>2</sup></td> <td>16.4</td> <td>LOS B</td> <td>18.9</td> <td>137.7</td> <td>0.84</td> <td>0.91</td> <td>41.6</td> </tr> <tr> <td>28</td> <td>T</td> <td>1504</td> <td>5.0</td> <td>1.198</td> <td>228.4</td> <td>LOS F</td> <td>90.5</td> <td>660.5</td> <td>1.00</td> <td>2.42</td> <td>8.1</td> </tr> <tr> <td>29</td> <td>R</td> <td>7</td> <td>5.0</td> <td>1.220</td> <td>236.6</td> <td>LOS F</td> <td>90.5</td> <td>660.5</td> <td>1.00</td> <td>2.45</td> <td>8.1</td> </tr> <tr> <td colspan="12">Approach 2245 5.0 1.198 159.1 LOS F 90.5 660.5 0.95 1.93 11.1</td> </tr> <tr> <td colspan="12"><b>South West: Overpass</b></td> </tr> <tr> <td>31</td> <td>T</td> <td>816</td> <td>5.0</td> <td>0.422</td> <td>13.0</td> <td>LOS B</td> <td>11.5</td> <td>84.2</td> <td>0.67</td> <td>0.58</td> <td>42.2</td> </tr> <tr> <td>32</td> <td>R</td> <td>31</td> <td>5.0</td> <td>0.231</td> <td>49.3</td> <td>LOS D</td> <td>1.9</td> <td>13.5</td> <td>0.97</td> <td>0.72</td> <td>25.4</td> </tr> <tr> <td colspan="12">Approach 847 5.0 0.422 14.3 LOS B 11.5 84.2 0.68 0.59 41.2</td> </tr> <tr> <td colspan="12">All Vehicles 5943 5.0 1.207 135.2 LOS F 100.2 731.7 0.92 1.66 12.6</td> </tr> </tbody> </table>	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	veh/h	%	v/c	sec		veh	m						<b>North East: Old Pacific Highway</b>												24	L	514	5.0	0.655	23.1	LOS C	13.9	101.3	0.80	0.91	37.0	25	T	2337	5.0	1.207	180.8	LOS F	100.2	731.7	1.00	1.95	10.0	Approach 2851 5.0 1.207 152.3 LOS F 100.2 731.7 0.96 1.76 11.6												<b>North West: Tugun Bypass Southbound Off Ramp</b>												27	L	734	5.0	1.000 <sup>2</sup>	16.4	LOS B	18.9	137.7	0.84	0.91	41.6	28	T	1504	5.0	1.198	228.4	LOS F	90.5	660.5	1.00	2.42	8.1	29	R	7	5.0	1.220	236.6	LOS F	90.5	660.5	1.00	2.45	8.1	Approach 2245 5.0 1.198 159.1 LOS F 90.5 660.5 0.95 1.93 11.1												<b>South West: Overpass</b>												31	T	816	5.0	0.422	13.0	LOS B	11.5	84.2	0.67	0.58	42.2	32	R	31	5.0	0.231	49.3	LOS D	1.9	13.5	0.97	0.72	25.4	Approach 847 5.0 0.422 14.3 LOS B 11.5 84.2 0.68 0.59 41.2												All Vehicles 5943 5.0 1.207 135.2 LOS F 100.2 731.7 0.92 1.66 12.6											
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25	T	2337	5.0	1.207	180.8	LOS F	100.2	731.7	1.00	1.95	10.0																																																																																																																																																																																																																																																																																																																																																																																						
Approach 2851 5.0 1.207 152.3 LOS F 100.2 731.7 0.96 1.76 11.6																																																																																																																																																																																																																																																																																																																																																																																																	
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27	L	734	5.0	1.000 <sup>2</sup>	16.4	LOS B	18.9	137.7	0.84	0.91	41.6																																																																																																																																																																																																																																																																																																																																																																																						
28	T	1504	5.0	1.198	228.4	LOS F	90.5	660.5	1.00	2.42	8.1																																																																																																																																																																																																																																																																																																																																																																																						
29	R	7	5.0	1.220	236.6	LOS F	90.5	660.5	1.00	2.45	8.1																																																																																																																																																																																																																																																																																																																																																																																						
Approach 2245 5.0 1.198 159.1 LOS F 90.5 660.5 0.95 1.93 11.1																																																																																																																																																																																																																																																																																																																																																																																																	
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31	T	816	5.0	0.422	13.0	LOS B	11.5	84.2	0.67	0.58	42.2																																																																																																																																																																																																																																																																																																																																																																																						
32	R	31	5.0	0.231	49.3	LOS D	1.9	13.5	0.97	0.72	25.4																																																																																																																																																																																																																																																																																																																																																																																						
Approach 847 5.0 0.422 14.3 LOS B 11.5 84.2 0.68 0.59 41.2																																																																																																																																																																																																																																																																																																																																																																																																	
All Vehicles 5943 5.0 1.207 135.2 LOS F 100.2 731.7 0.92 1.66 12.6																																																																																																																																																																																																																																																																																																																																																																																																	
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (east) - 2033 No Development



Intersection Layout	Movement Performance - Vehicles														Movement Performance - Vehicles													
	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed				
	v/h/h	%	v/c	sec			veh	m		per veh	km/h	v/h/h	%	v/c	sec			veh	m		per veh	km/h						
	North East: Old Pacific Highway														North East: Old Pacific Highway													
	24	L	148	5.0	0.159	10.9	LOS B	2.7	19.7	0.33	0.68	46.3	24	L	514	5.0	0.626	20.5	LOS C	16.1	117.6	0.71	0.83	39.6				
	25	T	583	5.0	0.201	23.3	LOS C	6.4	46.7	0.68	0.64	36.0	25	T	2337	5.0	0.853	40.9	LOS D	31.3	228.2	0.97	0.96	27.8				
	Approach														Approach													
	731 5.0 0.201 20.8 LOS C 6.4 46.7 0.61 0.64 37.7														2851 5.0 0.853 37.3 LOS D 31.3 228.2 0.92 0.94 29.3													
	North West: Tugun Bypass Southbound Off Ramp														North West: Tugun Bypass Southbound Off Ramp													
	27	L	1062	5.0	0.592	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.6	27	L	1031	5.0	0.575	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.7				
	28	T	649	5.0	0.568	31.3	LOS C	15.1	110.0	0.89	0.76	30.8	28	T	1207	5.0	0.846	36.8	LOS D	30.6	223.3	0.98	0.97	28.5				
	29	R	15	5.0	0.569	39.2	LOS D	15.0	109.7	0.89	0.87	30.3	29	R	7	5.0	0.837	45.0	LOS D	30.6	223.2	0.96	0.99	28.3				
	Approach														Approach													
	1726 5.0 0.592 16.9 LOS B 15.1 110.0 0.34 0.66 40.2														2245 5.0 0.846 23.5 LOS C 30.6 223.3 0.53 0.80 35.5													
	South West: Overpass														South West: Overpass													
	31	T	1264	5.0	0.587	14.8	LOS B	20.6	150.7	0.70	0.63	40.7	31	T	816	5.0	0.432	17.0	LOS B	14.1	102.7	0.68	0.60	39.1				
	32	R	39	5.0	0.218	55.2	LOS E	2.7	19.7	0.96	0.74	23.8	32	R	31	5.0	0.288	60.8	LOS E	2.3	16.9	0.99	0.72	22.4				
Approach														Approach														
1303 5.0 0.587 16.0 LOS B 20.6 150.7 0.71 0.63 39.8														847 5.0 0.432 18.6 LOS B 14.1 102.7 0.69 0.60 38.1														
All Vehicles														All Vehicles														
3760 5.0 0.592 17.3 LOS B 20.6 150.7 0.52 0.65 39.6														5943 5.0 0.853 29.4 LOS C 31.3 228.2 0.74 0.84 32.5														

AM Movement Summary

PM Movement Summary

Phasing

Intersection Layout	Phase A			Phase B			Phase C			Phase Timing Results	100 seconds																								
	Green	Yellow	All-Red	Green	Yellow	All-Red	Green	Yellow	All-Red																										
2033 AM										<table border="1"> <tr><th>Phase</th><th>A</th><th>B</th><th>C</th></tr> <tr><td>Green Time (sec)</td><td>41</td><td>31</td><td>10</td></tr> <tr><td>Yellow Time (sec)</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>All-Red Time (sec)</td><td>2</td><td>2</td><td>2</td></tr> <tr><td>Phase Time (sec)</td><td>47</td><td>37</td><td>16</td></tr> <tr><td>Phase Split</td><td>47%</td><td>37%</td><td>16%</td></tr> </table>	Phase	A	B	C	Green Time (sec)	41	31	10	Yellow Time (sec)	4	4	4	All-Red Time (sec)	2	2	2	Phase Time (sec)	47	37	16	Phase Split	47%	37%	16%	100 seconds
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Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (east) - 2033 No Development with Upgrades



Intersection Layout	Movement Performance - Vehicles														Movement Performance - Vehicles													
	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand	HV Flow	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed				
	v/h/h	%	v/c	sec			veh	m		per veh	km/h	v/h/h	%	v/c	sec			veh	m		per veh	km/h						
	North East: Old Pacific Highway														North East: Old Pacific Highway													
	24	L	144	5.0	0.184	13.1	LOS B	3.4	24.6	0.41	0.69	44.3	24	L	502	5.0	0.682	27.2	LOS C	16.9	123.1	0.80	0.90	34.6				
	25	T	624	5.0	0.266	30.9	LOS C	7.4	53.8	0.79	0.70	31.9	25	T	2359	5.0	0.918	49.3	LOS D	35.2	256.7	1.00	1.02	25.2				
	Approach														Approach													
	768 5.0 0.266 27.6 LOS C 7.4 53.8 0.72 0.70 33.7														2861 5.0 0.918 45.4 LOS D 35.2 256.7 0.96 1.00 26.4													
	North West: Tugun Bypass Southbound Off Ramp														North West: Tugun Bypass Southbound Off Ramp													
	27	L	1062	5.0	0.592	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.6	27	L	1031	5.0	0.575	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.7				
	28	T	649	5.0	0.636	30.8	LOS C	17.7	129.0	0.91	0.79	30.8	28	T	1179	5.0	0.924	51.9	LOS D	37.9	276.8	1.00	1.13	23.7				
	29	R	137	5.0	0.637	39.0	LOS D	17.4	127.0	0.91	0.87	29.9	29	R	74	5.0	0.926	60.2	LOS E	37.7	275.4	1.00	1.13	23.5				
	Approach														Approach													
	1848 5.0 0.636 18.2 LOS B 17.7 129.0 0.39 0.68 39.3														2284 5.0 0.924 32.2 LOS C 37.9 276.8 0.55 0.89 31.1													
	South West: Overpass														South West: Overpass													
	31	T	1309	5.0	0.630	16.5	LOS B	22.6	164.8	0.74	0.67	39.3	31	T	898	5.0	0.457	16.1	LOS B	15.1	109.9	0.68	0.60	39.8				
	32	R	128	5.0	0.397	48.9	LOS D	7.3	53.2	0.93	0.80	25.6	32	R	194	5.0	0.902	69.5	LOS E	12.8	93.3	1.00	0.99	20.6				
Approach														Approach														
1437 5.0 0.630 19.4 LOS B 22.6 164.8 0.76 0.68 37.5														1092 5.0 0.902 25.6 LOS C 15.1 109.9 0.73 0.67 34.1														
All Vehicles														All Vehicles														
4053 5.0 0.636 20.4 LOS C 22.6 164.8 0.58 0.69 37.5														6237 5.0 0.924 37.1 LOS D 37.9 276.8 0.77 0.90 29.2														

AM Movement Summary

PM Movement Summary

Phasing

Intersection Layout	Phase A			Phase B			Phase C			Phase Timing Results	100 seconds																								
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Intersection Layout	Movement Performance - Vehicles												Movement Performance - Vehicles											
	Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand Flow	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	veh/h	%	v/c	sec			veh	m		per veh	km/h		
	North East: Old Pacific Highway												North East: Old Pacific Highway											
	24	L	144	5.0	0.178	12.0	LOS B	3.0	22.2	0.38	0.69	45.2	24	L	502	5.0	0.668	25.7	LOS C	16.6	121.2	0.78	0.89	35.4
	25	T	624	5.0	0.250	29.2	LOS C	7.2	52.4	0.77	0.69	32.7	25	T	2359	5.0	0.892	46.0	LOS D	33.0	240.6	1.00	1.00	26.1
	Approach	768	5.0	0.250	26.0	LOS C	7.2	52.4	0.70	0.69	34.5	Approach	2861	5.0	0.892	42.5	LOS D	33.0	240.6	0.96	0.98	27.4		
	North West: Tugun Bypass Southbound Off Ramp												North West: Tugun Bypass Southbound Off Ramp											
	27	L	1062	5.0	0.592	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.6	27	L	1031	5.0	0.575	7.8	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	NA <sup>3</sup>	0.60	49.7
	28	T	649	5.0	0.593	33.1	LOS C	15.1	110.1	0.91	0.78	30.0	28	T	1179	5.0	0.892	45.3	LOS D	32.9	240.3	1.00	1.07	25.6
	29	R	137	5.0	0.503	37.7	LOS D	6.8	49.3	0.81	0.78	29.5	29	R	74	5.0	0.250	31.8	LOS C	3.5	25.6	0.71	0.74	32.0
	Approach	1848	5.0	0.592	18.9	LOS B	15.1	110.1	0.38	0.68	38.9	Approach	2284	5.0	0.892	27.9	LOS C	32.9	240.3	0.54	0.85	33.1		
	South West: Overpass												South West: Overpass											
	31	T	1309	5.0	0.587	13.7	LOS B	20.7	151.3	0.68	0.61	41.6	31	T	898	5.0	0.449	15.4	LOS B	14.8	108.0	0.66	0.58	40.3
	32	R	128	5.0	0.357	46.8	LOS D	7.1	51.9	0.91	0.79	26.2	32	R	194	5.0	0.902	69.5	LOS E	12.8	93.3	1.00	0.99	20.6
	Approach	1437	5.0	0.587	16.6	LOS B	20.7	151.3	0.70	0.63	39.5	Approach	1092	5.0	0.902	25.0	LOS C	14.8	108.0	0.72	0.66	34.5		
	All Vehicles	4053	5.0	0.592	19.4	LOS B	20.7	151.3	0.55	0.66	38.2	All Vehicles	6237	5.0	0.902	34.1	LOS C	33.0	240.6	0.76	0.87	30.4		

AM Movement Summary

PM Movement Summary

Phasing

2033 AM	Phase A	Phase B	Phase C	Phase Timing Results	100 second																								
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Phase	A	B	C																										
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Phase Time (sec)	39	35	28																										
Phase Split	39 %	35 %	26 %																										
				<table border="1"> <thead> <tr> <th>Phase</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Green Time (sec)</td> <td>35</td> <td>35</td> <td>12</td> </tr> <tr> <td>Yellow Time (sec)</td> <td>4</td> <td>4</td> <td>4</td> </tr> <tr> <td>All-Red Time (sec)</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Phase Time (sec)</td> <td>41</td> <td>41</td> <td>18</td> </tr> <tr> <td>Phase Split</td> <td>41 %</td> <td>41 %</td> <td>18 %</td> </tr> </tbody> </table>	Phase	A	B	C	Green Time (sec)	35	35	12	Yellow Time (sec)	4	4	4	All-Red Time (sec)	2	2	2	Phase Time (sec)	41	41	18	Phase Split	41 %	41 %	18 %	100 second
Phase	A	B	C																										
Green Time (sec)	35	35	12																										
Yellow Time (sec)	4	4	4																										
All-Red Time (sec)	2	2	2																										
Phase Time (sec)	41	41	18																										
Phase Split	41 %	41 %	18 %																										

Tugun Bypass – Pacific Highway - Old Pacific Highway Interchange (east) - 2033 with Development with Additional Upgrades



Movement Performance - Vehicles												Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed	Mov ID	Turn	Demand Flow	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	veh/h	%	v/c	sec			veh	m		per veh	km/h		
East: Kennedy Drive (east)												East: Kennedy Drive (east)											
4	L	193	5.0	0.452	8.9	LOS A	3.3	24.0	0.60	0.75	47.9	4	L	344	5.0	0.860	17.6	LOS B	16.1	117.7	0.97	1.22	41.0
5	T	737	5.0	0.452	8.0	LOS A	3.3	24.0	0.61	0.70	48.0	5	T	1281	5.0	0.860	17.3	LOS B	16.1	117.7	0.97	1.24	40.7
Approach	930	5.0	0.452	8.2	LOS A	3.3	24.0	0.61	0.71	48.0	Approach	1625	5.0	0.860	17.3	LOS B	16.1	117.7	0.97	1.24	40.8		
North: Southbound Pacific Highway CD Road Off-ramp												North: Southbound Pacific Highway CD Road Off-ramp											
7	L	489	5.0	0.573	12.4	LOS B	4.4	31.9	0.73	0.98	44.9	7	L	433	5.0	0.458	10.1	LOS B	2.9	21.1	0.63	0.87	47.2
8	T	31	5.0	0.574	11.3	LOS B	4.4	31.9	0.73	0.94	45.2	8	T	22	5.0	0.458	8.9	LOS A	2.9	21.1	0.63	0.80	47.3
9	R	99	5.0	0.182	16.8	LOS B	0.8	6.0	0.63	0.89	41.8	9	R	334	5.0	0.410	15.3	LOS B	2.4	17.2	0.63	0.92	43.1
Approach	619	5.0	0.573	13.1	LOS B	4.4	31.9	0.71	0.96	44.3	Approach	789	5.0	0.458	12.2	LOS B	2.9	21.1	0.63	0.89	45.3		
West: Kennedy Drive (west)												West: Kennedy Drive (west)											
11	T	970	5.0	0.400	5.5	LOS A	0.0	0.0	0.00	0.46	52.3	11	T	728	5.0	0.286	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	348	5.0	0.400	11.2	LOS B	0.0	0.0	0.00	0.81	46.5	12	R	216	5.0	0.286	11.2	LOS B	0.0	0.0	0.00	0.82	46.5
Approach	1318	5.0	0.400	7.0	LOS B	0.0	0.0	0.00	0.55	50.6	Approach	944	5.0	0.286	6.8	LOS B	0.0	0.0	0.00	0.54	50.8		
All Vehicles	2867	5.0	0.573	8.7	LOS A	4.4	31.9	0.35	0.69	48.3	All Vehicles	3358	5.0	0.860	13.2	LOS B	16.1	117.7	0.62	0.96	44.3		

AM Movement Summary

PM Movement Summary

Intersection Layout	AM Volume Summary	PM Volume Summary

Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2013 No Development

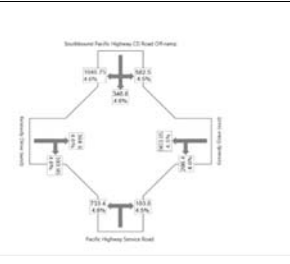
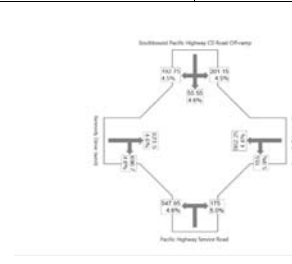
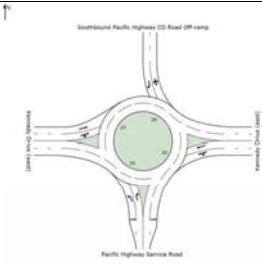


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h	
<b>South: Pacific Highway Service Road</b>												
1	L	548	4.6	0.687	13.3	LOS B	6.1	44.3	0.90	1.08	44.0	
3	R	175	5.0	0.329	16.1	LOS B	1.6	12.0	0.75	0.94	42.4	
Approach		723	4.7	0.687	14.0	LOS B	6.1	44.3	0.86	1.04	43.6	
<b>East: Kennedy Drive (east)</b>												
4	L	155	5.0	0.737	18.3	LOS B	7.6	55.6	0.83	1.11	40.5	
5	T	862	4.6	0.737	17.9	LOS B	7.6	55.6	0.84	1.09	40.2	
Approach		1017	4.6	0.737	18.0	LOS B	7.6	55.6	0.83	1.09	40.3	
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>												
7	L	201	4.5	0.417	12.8	LOS B	2.2	15.9	0.79	0.95	44.6	
8	T	56	4.6	0.417	11.7	LOS B	2.2	15.9	0.79	0.92	44.9	
9	R	193	4.5	0.417	19.5	LOS B	2.2	15.9	0.81	0.99	39.9	
Approach		449	4.6	0.417	15.6	LOS B	2.2	15.9	0.80	0.96	42.4	
<b>West: Kennedy Drive (west)</b>												
11	T	824	4.6	0.589	6.5	LOS A	5.0	36.2	0.52	0.56	48.6	
12	R	697	4.6	0.589	12.4	LOS B	4.9	35.4	0.54	0.68	44.5	
Approach		1520	4.6	0.589	9.2	LOS B	5.0	36.2	0.53	0.61	46.6	
All Vehicles		3710	4.6	0.737	13.3	LOS B	7.6	55.6	0.71	0.87	43.6	

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h	
<b>South: Pacific Highway Service Road</b>												
1	L	601	4.6	1.033	84.3	LOS F	34.1	248.1	1.00	2.53	18.1	
3	R	326	4.5	0.870	58.8	LOS E	11.5	83.3	1.00	1.53	23.9	
Approach		927	4.6	1.033	75.3	LOS F	34.1	248.1	1.00	2.18	19.8	
<b>East: Kennedy Drive (east)</b>												
4	L	206	4.6	1.441	422.0	LOS F	139.3	1013.3	1.00	5.87	4.8	
5	T	964	4.5	1.441	422.6	LOS F	139.3	1013.3	1.00	5.42	4.8	
Approach		1170	4.6	1.441	422.5	LOS F	139.3	1013.3	1.00	5.50	4.8	
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>												
7	L	583	4.5	1.195	192.9	LOS F	123.9	901.4	1.00	5.79	9.5	
8	T	347	4.6	1.195	191.8	LOS F	123.9	901.4	1.00	5.79	9.6	
9	R	1049	4.6	1.195	199.3	LOS F	123.9	901.4	1.00	5.33	9.7	
Approach		1978	4.6	1.195	196.1	LOS F	123.9	901.4	1.00	5.54	9.6	
<b>West: Kennedy Drive (west)</b>												
11	T	365	4.6	0.310	6.3	LOS A	2.0	14.3	0.43	0.54	49.2	
12	R	394	4.6	0.310	12.0	LOS B	2.0	14.3	0.43	0.67	44.8	
Approach		759	4.6	0.310	9.3	LOS B	2.0	14.3	0.43	0.61	46.8	
All Vehicles		4834	4.6	1.441	198.4	LOS F	139.3	1013.3	0.91	4.11	9.5	

**AM Movement Summary**

**PM Movement Summary**



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2023 No Development

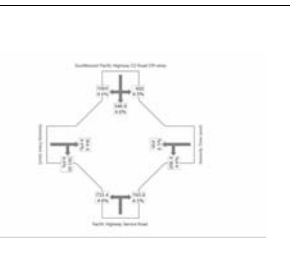
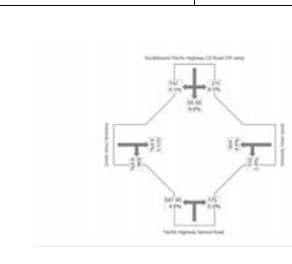
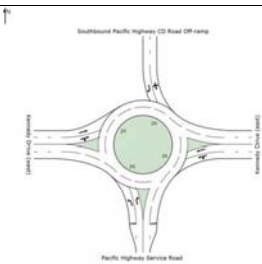


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h	
<b>South: Pacific Highway Service Road</b>												
1	L	548	4.6	0.753	15.6	LOS B	8.8	63.9	0.95	1.14	42.1	
3	R	175	5.0	0.364	16.9	LOS B	2.4	17.2	0.78	0.96	41.8	
Approach		723	4.7	0.753	15.9	LOS B	8.8	63.9	0.91	1.10	42.0	
<b>East: Kennedy Drive (east)</b>												
4	L	155	5.0	0.787	20.4	LOS C	10.5	76.6	0.86	1.17	39.0	
5	T	904	4.6	0.785	20.1	LOS C	10.5	76.6	0.86	1.15	38.7	
Approach		1059	4.6	0.786	20.2	LOS C	10.5	76.6	0.86	1.15	38.7	
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>												
7	L	211	4.5	0.444	13.3	LOS B	2.9	21.1	0.80	0.96	44.2	
8	T	56	4.6	0.444	12.2	LOS B	2.9	21.1	0.80	0.93	44.5	
9	R	192	4.5	0.433	19.8	LOS B	2.5	18.3	0.82	1.00	39.7	
Approach		459	4.5	0.444	15.9	LOS B	2.9	21.1	0.81	0.97	42.1	
<b>West: Kennedy Drive (west)</b>												
11	T	824	4.6	0.596	6.5	LOS A	6.2	44.9	0.54	0.56	48.5	
12	R	696	4.6	0.596	12.4	LOS B	6.0	44.0	0.55	0.69	44.4	
Approach		1520	4.6	0.596	9.2	LOS B	6.2	44.9	0.54	0.62	46.5	
All Vehicles		3760	4.6	0.786	14.4	LOS B	10.5	76.6	0.74	0.90	42.7	

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h	
<b>South: Pacific Highway Service Road</b>												
1	L	591	4.6	1.035	85.8	LOS F	36.1	262.3	1.00	2.54	17.9	
3	R	336	4.5	0.878	59.8	LOS E	13.9	100.8	1.00	1.55	23.6	
Approach		927	4.6	1.035	76.3	LOS F	36.1	262.3	1.00	2.18	19.7	
<b>East: Kennedy Drive (east)</b>												
4	L	206	4.6	1.464	445.4	LOS F	145.7	1059.8	1.00	6.04	4.5	
5	T	984	4.5	1.466	445.9	LOS F	145.7	1059.8	1.00	5.60	4.6	
Approach		1190	4.6	1.468	445.8	LOS F	145.7	1059.8	1.00	5.67	4.6	
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>												
7	L	602	4.5	1.246	237.2	LOS F	147.7	1074.5	1.00	6.59	8.0	
8	T	347	4.6	1.247	236.1	LOS F	147.7	1074.5	1.00	6.59	8.0	
9	R	1068	4.6	1.245	243.4	LOS F	147.7	1074.5	1.00	6.08	8.2	
Approach		2017	4.6	1.245	240.3	LOS F	147.7	1074.5	1.00	6.32	8.1	
<b>West: Kennedy Drive (west)</b>												
11	T	365	4.6	0.313	6.4	LOS A	2.4	17.5	0.44	0.54	49.2	
12	R	394	4.6	0.314	12.0	LOS B	2.5	18.0	0.43	0.67	44.8	
Approach		759	4.6	0.315	9.3	LOS B	2.5	18.0	0.43	0.61	46.8	
All Vehicles		4893	4.6	1.468	223.4	LOS F	147.7	1074.5	0.91	4.49	8.6	

**AM Movement Summary**

**PM Movement Summary**



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2023 with Development

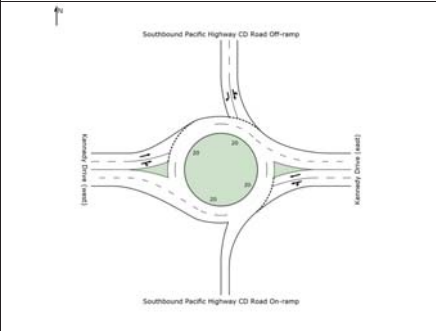


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
<b>East: Kennedy Drive (east)</b>											
4	L	193	5.0	0.477	9.2	LOS A	3.7	26.7	0.62	0.77	47.8
5	T	778	5.0	0.476	8.3	LOS A	3.7	26.7	0.63	0.73	47.9
Approach 971 5.0 0.476 8.5 LOS A 3.7 26.7 0.63 0.74 47.9											
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	500	5.0	0.585	12.6	LOS B	4.5	33.2	0.74	0.99	44.7
8	T	31	5.0	0.585	11.4	LOS B	4.5	33.2	0.74	0.95	45.1
9	R	110	5.0	0.202	16.9	LOS B	0.9	6.7	0.64	0.89	41.8
Approach 641 5.0 0.586 13.2 LOS B 4.5 33.2 0.72 0.97 44.2											
<b>West: Kennedy Drive (west)</b>											
11	T	970	5.0	0.400	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	348	5.0	0.400	11.2	LOS B	0.0	0.0	0.00	0.81	46.5
Approach 1318 5.0 0.400 7.0 LOS B 0.0 0.0 0.00 0.55 50.6											
All Vehicles 2930 5.0 0.586 8.9 LOS A 4.5 33.2 0.37 0.70 48.2											

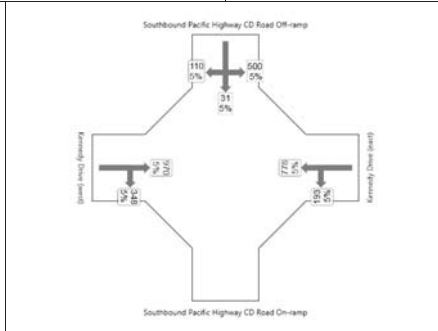
**AM Movement Summary**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
<b>East: Kennedy Drive (east)</b>											
4	L	344	5.0	0.887	19.9	LOS B	18.4	134.5	1.00	1.31	39.3
5	T	1303	5.0	0.887	19.7	LOS B	18.4	134.5	1.00	1.34	39.0
Approach 1647 5.0 0.887 19.7 LOS B 18.4 134.5 1.00 1.33 39.0											
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	453	5.0	0.478	10.2	LOS B	3.1	22.7	0.63	0.88	47.0
8	T	22	5.0	0.478	9.1	LOS A	3.1	22.7	0.63	0.81	47.2
9	R	354	5.0	0.434	15.4	LOS B	2.6	18.8	0.64	0.93	42.9
Approach 829 5.0 0.478 12.4 LOS B 3.1 22.7 0.64 0.90 45.1											
<b>West: Kennedy Drive (west)</b>											
11	T	728	5.0	0.286	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	216	5.0	0.286	11.2	LOS B	0.0	0.0	0.00	0.82	46.5
Approach 944 5.0 0.286 6.8 LOS B 0.0 0.0 0.00 0.54 50.8											
All Vehicles 3420 5.0 0.887 14.4 LOS B 18.4 134.5 0.64 1.01 43.2											

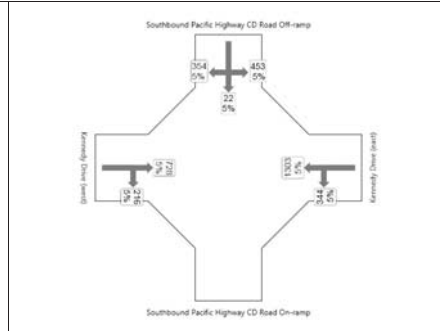
**PM Movement Summary**



**Intersection Layout**



**AM Volume Summary**



**PM Volume Summary**

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2013 with Development

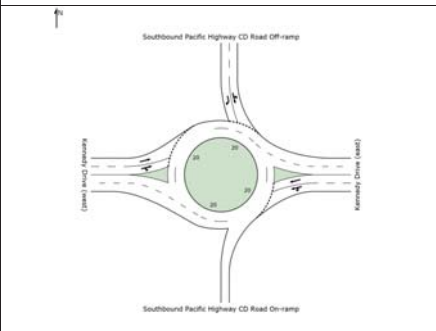


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
<b>East: Kennedy Drive (east)</b>											
4	L	231	5.0	0.459	10.5	LOS B	3.8	27.5	0.71	0.85	47.0
5	T	588	5.0	0.459	9.8	LOS A	3.8	27.5	0.72	0.83	47.1
Approach 819 5.0 0.459 10.0 LOS B 3.8 27.5 0.72 0.84 47.1											
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	337	5.0	0.390	10.9	LOS B	2.3	17.0	0.67	0.89	46.3
8	T	12	5.0	0.387	9.8	LOS A	2.3	17.0	0.67	0.84	46.7
9	R	214	5.0	0.318	16.4	LOS B	1.6	12.0	0.86	0.92	42.2
Approach 563 5.0 0.390 13.0 LOS B 2.3 17.0 0.67 0.90 44.6											
<b>West: Kennedy Drive (west)</b>											
11	T	929	5.0	0.415	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	439	5.0	0.415	11.2	LOS B	0.0	0.0	0.00	0.78	46.5
Approach 1368 5.0 0.415 7.3 LOS B 0.0 0.0 0.00 0.56 50.2											
All Vehicles 2750 5.0 0.459 9.3 LOS A 3.8 27.5 0.35 0.71 48.0											

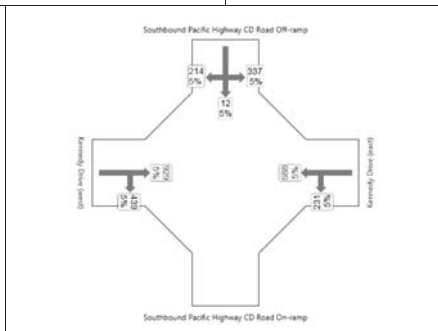
**AM Movement Summary**

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec		Vehicles	Distance	per veh	km/h	
<b>East: Kennedy Drive (east)</b>											
4	L	363	5.0	1.028	68.9	LOS E	49.7	363.0	1.00	2.59	20.8
5	T	1325	5.0	1.030	69.3	LOS E	49.7	363.0	1.00	2.55	20.7
Approach 1688 5.0 1.030 69.2 LOS E 49.7 363.0 1.00 2.56 20.8											
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	500	5.0	0.512	10.4	LOS B	3.5	25.6	0.65	0.90	46.8
8	T	12	5.0	0.522	9.3	LOS A	3.5	25.6	0.65	0.84	47.1
9	R	432	5.0	0.514	15.9	LOS B	3.4	25.1	0.66	0.96	42.5
Approach 944 5.0 0.514 12.9 LOS B 3.5 25.6 0.65 0.92 44.7											
<b>West: Kennedy Drive (west)</b>											
11	T	629	5.0	0.280	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	293	5.0	0.280	11.2	LOS B	0.0	0.0	0.00	0.78	46.5
Approach 922 5.0 0.280 7.3 LOS B 0.0 0.0 0.00 0.56 50.3											
All Vehicles 3554 5.0 1.030 38.2 LOS D 49.7 363.0 0.65 1.61 29.5											

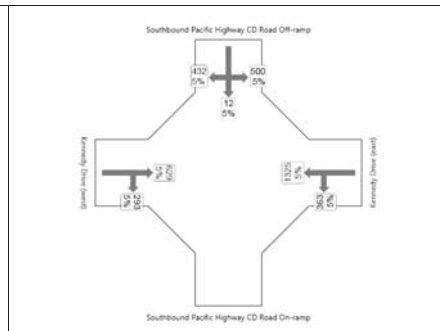
**PM Movement Summary**



**Intersection Layout**



**AM Volume Summary**



**PM Volume Summary**

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2033 No Development



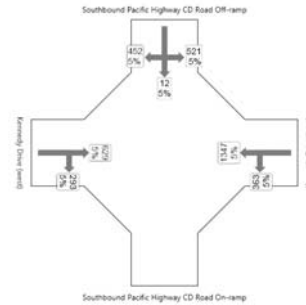
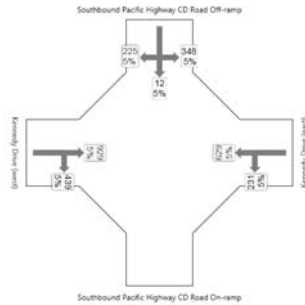
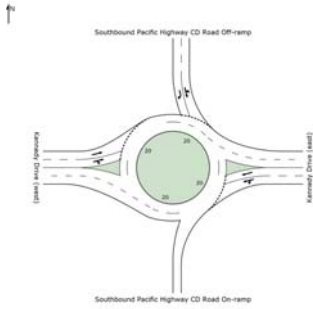


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
4	L	231	5.0	0.487	10.9	LOS B	4.2	30.8	0.73	0.87	46.6
5	T	629	5.0	0.487	10.2	LOS B	4.2	30.8	0.74	0.86	46.8
Approach											
860		5.0	0.487	10.4	LOS B		4.2	30.8	0.74	0.87	46.8
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	348	5.0	0.402	11.0	LOS B	2.4	17.8	0.68	0.89	46.2
8	T	12	5.0	0.400	9.9	LOS A	2.4	17.8	0.68	0.85	46.6
9	R	225	5.0	0.333	16.5	LOS B	1.8	12.8	0.67	0.92	42.1
Approach											
585		5.0	0.402	13.1	LOS B		2.4	17.8	0.67	0.90	44.5
<b>West: Kennedy Drive (west)</b>											
11	T	929	5.0	0.415	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	439	5.0	0.415	11.2	LOS B	0.0	0.0	0.00	0.78	46.5
Approach											
1368		5.0	0.415	7.3	LOS B		0.0	0.0	0.00	0.56	50.2
<b>All Vehicles</b>											
2813		5.0	0.487	9.5	LOS A		4.2	30.8	0.36	0.73	47.9

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
4	L	363	5.0	1.065	92.6	LOS F	62.6	456.9	1.00	3.11	17.0
5	T	1347	5.0	1.064	93.0	LOS F	62.6	456.9	1.00	3.03	17.0
Approach											
1710		5.0	1.064	92.9	LOS F		62.6	456.9	1.00	3.05	17.0
<b>North: Southbound Pacific Highway CD Road Off-ramp</b>											
7	L	521	5.0	0.533	10.6	LOS B	3.8	27.5	0.66	0.91	46.6
8	T	12	5.0	0.522	9.5	LOS A	3.8	27.5	0.66	0.86	47.0
9	R	452	5.0	0.537	16.1	LOS B	3.7	27.1	0.67	0.97	42.4
Approach											
965		5.0	0.537	13.1	LOS B		3.8	27.5	0.66	0.94	44.5
<b>West: Kennedy Drive (west)</b>											
11	T	629	5.0	0.280	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
12	R	293	5.0	0.280	11.2	LOS B	0.0	0.0	0.00	0.78	46.5
Approach											
922		5.0	0.280	7.3	LOS B		0.0	0.0	0.00	0.56	50.3
<b>All Vehicles</b>											
3617		5.0	1.064	49.3	LOS D		62.6	456.9	0.65	1.84	25.7

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (east) - 2033 with Development

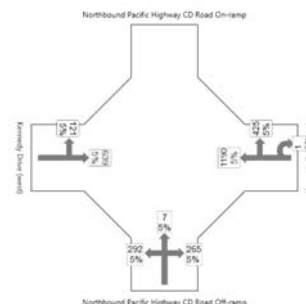
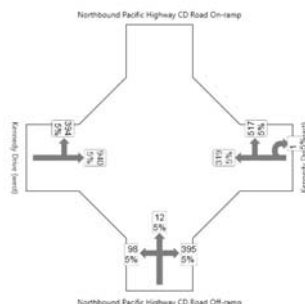
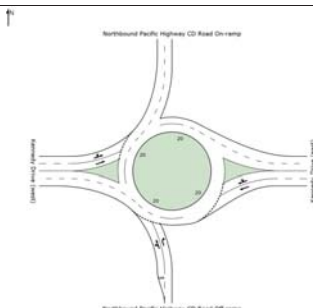


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	98	5.0	0.177	10.7	LOS B	0.8	5.9	0.57	0.81	46.6
2	T	12	5.0	0.176	8.4	LOS A	0.8	5.9	0.57	0.72	46.6
3	R	395	5.0	0.391	14.1	LOS B	2.3	16.7	0.59	0.89	44.0
Approach											
505		5.0	0.391	13.3	LOS B		2.3	16.7	0.59	0.87	44.5
<b>East: Kennedy Drive (east)</b>											
5	T	319	5.0	0.207	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	518	5.0	0.277	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach											
837		5.0	0.276	9.1	LOS B		0.0	0.0	0.00	0.62	48.5
<b>West: Kennedy Drive (west)</b>											
10	L	394	5.0	0.938	42.3	LOS D	26.5	193.8	1.00	1.83	27.9
11	T	940	5.0	0.938	43.0	LOS D	26.5	193.8	1.00	1.81	27.6
Approach											
1334		5.0	0.938	42.8	LOS D		26.5	193.8	1.00	1.82	27.7
<b>All Vehicles</b>											
2676		5.0	0.938	26.7	LOS C		26.5	193.8	0.61	1.26	35.0

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	292	5.0	0.360	11.7	LOS B	2.2	15.9	0.71	0.90	45.5
2	T	7	5.0	0.368	9.4	LOS A	2.2	15.9	0.71	0.84	45.2
3	R	265	5.0	0.422	18.7	LOS B	2.6	18.7	0.73	0.98	40.5
Approach											
564		5.0	0.422	15.0	LOS B		2.6	18.7	0.72	0.94	42.9
<b>East: Kennedy Drive (east)</b>											
5	T	1190	5.0	0.469	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
6	R	426	5.0	0.469	11.3	LOS B	0.0	0.0	0.00	0.80	46.5
Approach											
1616		5.0	0.469	7.0	LOS B		0.0	0.0	0.00	0.55	50.6
<b>West: Kennedy Drive (west)</b>											
10	L	121	5.0	0.443	10.7	LOS B	3.6	26.6	0.73	0.86	47.0
11	T	639	5.0	0.444	10.0	LOS A	3.6	26.6	0.74	0.84	47.0
Approach											
760		5.0	0.444	10.1	LOS B		3.6	26.6	0.74	0.84	47.0
<b>All Vehicles</b>											
2940		5.0	0.469	9.3	LOS A		3.6	26.6	0.33	0.70	48.0

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2013 No Development

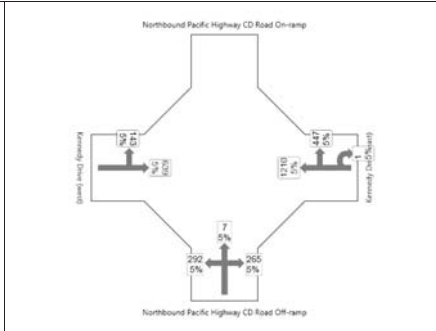
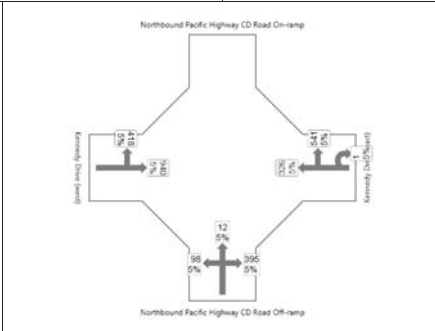
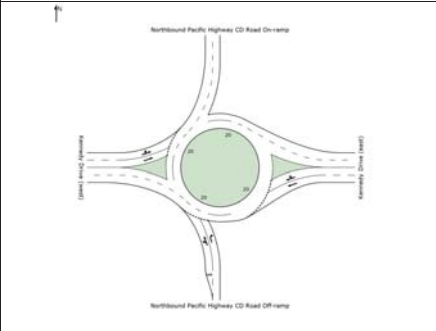


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	98	5.0	0.179	10.8	LOS B	0.8	6.0	0.58	0.81	46.4
2	T	12	5.0	0.179	8.5	LOS A	0.8	6.0	0.58	0.73	46.5
3	R	395	5.0	0.395	14.3	LOS B	2.3	17.1	0.60	0.90	43.9
Approach		505	5.0	0.395	13.5	LOS B	2.3	17.1	0.60	0.88	44.4
<b>East: Kennedy Drive (east)</b>											
5	T	326	5.0	0.212	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	542	5.0	0.289	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach		868	5.0	0.289	9.1	LOS B	0.0	0.0	0.00	0.62	48.5
<b>West: Kennedy Drive (west)</b>											
10	L	418	5.0	0.977	56.7	LOS E	34.2	249.5	1.00	2.15	23.6
11	T	940	5.0	0.977	57.6	LOS E	34.2	249.5	1.00	2.11	23.3
Approach		1358	5.0	0.977	57.3	LOS E	34.2	249.5	1.00	2.12	23.4
All Vehicles		2731	5.0	0.977	33.9	LOS C	34.2	249.5	0.61	1.42	31.4

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	292	5.0	0.365	12.0	LOS B	2.2	16.3	0.72	0.91	45.3
2	T	7	5.0	0.368	9.6	LOS A	2.2	16.3	0.72	0.85	45.0
3	R	265	5.0	0.432	19.1	LOS B	2.7	19.4	0.74	0.99	40.2
Approach		564	5.0	0.431	15.3	LOS B	2.7	19.4	0.73	0.95	42.7
<b>East: Kennedy Drive (east)</b>											
5	T	1210	5.0	0.481	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
6	R	448	5.0	0.481	11.3	LOS B	0.0	0.0	0.00	0.80	46.5
Approach		1658	5.0	0.481	7.1	LOS B	0.0	0.0	0.00	0.55	50.6
<b>West: Kennedy Drive (west)</b>											
10	L	143	5.0	0.484	11.2	LOS B	4.0	29.1	0.75	0.88	46.5
11	T	639	5.0	0.465	10.5	LOS B	4.0	29.1	0.75	0.87	46.7
Approach		782	5.0	0.465	10.6	LOS B	4.0	29.1	0.75	0.87	46.6
All Vehicles		3004	5.0	0.481	9.5	LOS A	4.0	29.1	0.33	0.71	47.8

**AM Movement Summary**

**PM Movement Summary**



**Intersection Layout**

**AM Volume Summary**

**PM Volume Summary**

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2013 with Development

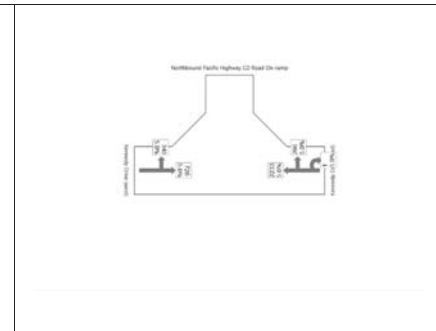
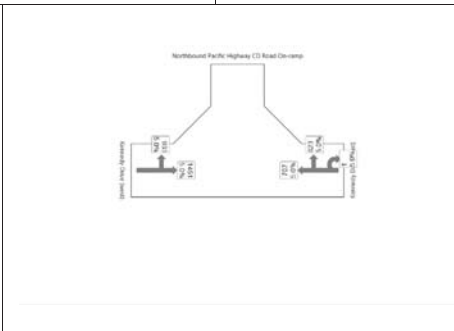
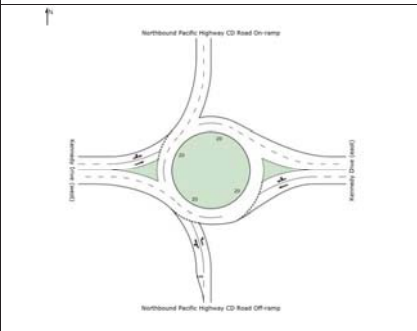


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
5	T	707	5.0	0.442	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	824	5.0	0.442	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach		1531	5.0	0.442	8.6	LOS B	0.0	0.0	0.00	0.60	49.0
<b>West: Kennedy Drive (west)</b>											
10	L	933	5.0	1.407	420.8	LOS F	291.8	2129.8	1.00	5.89	4.8
11	T	1451	5.0	1.407	421.2	LOS F	291.8	2129.8	1.00	5.68	4.8
Approach		2384	5.0	1.407	421.1	LOS F	291.8	2129.8	1.00	5.76	4.8
All Vehicles		3915	5.0	1.407	259.8	LOS F	291.8	2129.8	0.61	3.74	7.5

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
5	T	2233	5.0	0.722	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
6	R	267	5.0	0.722	11.3	LOS B	0.0	0.0	0.00	0.89	46.5
Approach		2500	5.0	0.722	6.1	LOS B	0.0	0.0	0.00	0.51	51.6
<b>West: Kennedy Drive (west)</b>											
10	L	348	5.0	0.433	8.2	LOS A	3.2	23.5	0.48	0.60	48.3
11	T	726	5.0	0.433	7.1	LOS A	3.2	23.5	0.49	0.55	48.8
Approach		1074	5.0	0.433	7.5	LOS A	3.2	23.5	0.49	0.57	48.6
All Vehicles		3574	5.0	0.722	6.5	LOS A	3.2	23.5	0.15	0.53	50.7

**AM Movement Summary**

**PM Movement Summary**



**Intersection Layout**

**AM Volume Summary**

**PM Volume Summary**

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2023 No Development

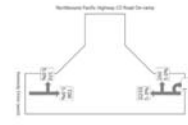
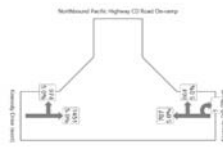


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
5	T	707	5.0	0.450	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	865	5.0	0.462	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach 1572 5.0 0.462 8.7 LOS B 0.0 0.0 0.00 0.60 48.9											
<b>West: Kennedy Drive (west)</b>											
10	L	974	5.0	1.508	517.5	LOS F	339.4	2477.4	1.00	6.10	3.9
11	T	1451	5.0	1.508	517.8	LOS F	339.4	2477.4	1.00	5.97	4.0
Approach 2425 5.0 1.508 517.7 LOS F 339.4 2477.4 1.00 6.02 3.9											
All Vehicles 3997 5.0 1.508 317.5 LOS F 339.4 2477.4 0.61 3.89 6.3											

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>East: Kennedy Drive (east)</b>											
5	T	2233	5.0	0.732	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
6	R	289	5.0	0.732	11.3	LOS B	0.0	0.0	0.00	0.88	46.5
Approach 2522 5.0 0.732 6.2 LOS B 0.0 0.0 0.00 0.51 51.5											
<b>West: Kennedy Drive (west)</b>											
10	L	370	5.0	0.455	8.4	LOS A	4.2	31.0	0.52	0.61	48.1
11	T	726	5.0	0.455	7.4	LOS A	4.2	31.0	0.52	0.57	48.6
Approach 1096 5.0 0.455 7.7 LOS A 4.2 31.0 0.52 0.58 48.4											
All Vehicles 3618 5.0 0.732 6.6 LOS A 4.2 31.0 0.16 0.53 50.6											

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2023 with Development

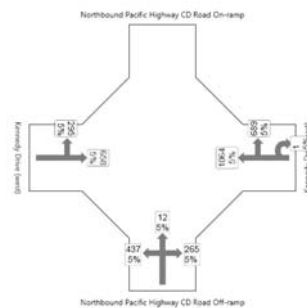
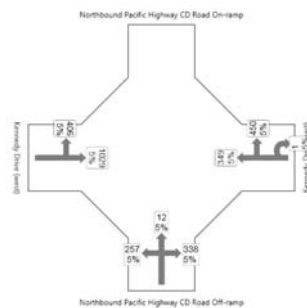
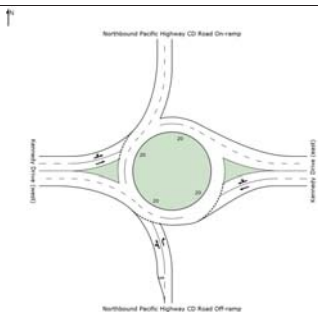


Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	257	5.0	0.309	9.5	LOS A	1.6	11.4	0.57	0.80	47.7
2	T	12	5.0	0.308	7.2	LOS A	1.6	11.4	0.57	0.67	47.3
3	R	338	5.0	0.329	13.7	LOS B	1.7	12.7	0.55	0.86	44.3
Approach 607 5.0 0.329 11.8 LOS B 1.7 12.7 0.56 0.83 45.7											
<b>East: Kennedy Drive (east)</b>											
5	T	349	5.0	0.223	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	451	5.0	0.241	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach 800 5.0 0.241 8.8 LOS B 0.0 0.0 0.00 0.61 48.8											
<b>West: Kennedy Drive (west)</b>											
10	L	406	5.0	0.898	28.5	LOS C	20.7	151.3	1.00	1.54	34.0
11	T	1029	5.0	0.897	28.7	LOS C	20.7	151.3	1.00	1.53	33.6
Approach 1435 5.0 0.897 28.6 LOS C 20.7 151.3 1.00 1.54 33.7											
All Vehicles 2842 5.0 0.897 19.4 LOS B 20.7 151.3 0.62 1.12 39.4											

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		Vehicles	m		per veh	km/h
<b>South: Northbound Pacific Highway CD Road Off-ramp</b>											
1	L	437	5.0	0.568	15.0	LOS B	4.6	33.4	0.80	1.04	42.6
2	T	12	5.0	0.571	12.7	LOS B	4.6	33.4	0.80	1.00	42.0
3	R	265	5.0	0.467	20.6	LOS C	3.0	21.8	0.77	1.02	39.2
Approach 714 5.0 0.568 17.1 LOS C 4.6 33.4 0.79 1.03 41.2											
<b>East: Kennedy Drive (east)</b>											
5	T	1064	5.0	0.509	5.5	LOS A	0.0	0.0	0.00	0.46	52.3
6	R	690	5.0	0.509	11.3	LOS B	0.0	0.0	0.00	0.74	46.5
Approach 1754 5.0 0.509 7.8 LOS B 0.0 0.0 0.00 0.57 49.8											
<b>West: Kennedy Drive (west)</b>											
10	L	295	5.0	0.697	20.5	LOS C	9.6	70.1	0.95	1.21	38.8
11	T	658	5.0	0.698	20.4	LOS C	9.6	70.1	0.94	1.20	38.5
Approach 953 5.0 0.698 20.4 LOS C 9.6 70.1 0.95 1.20 38.6											
All Vehicles 3421 5.0 0.698 13.2 LOS B 9.6 70.1 0.43 0.84 44.3											

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2023 No Development

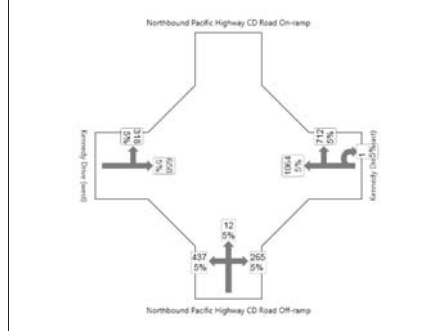
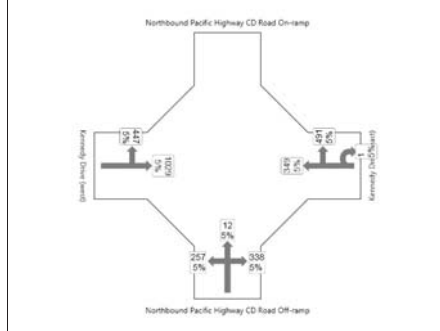
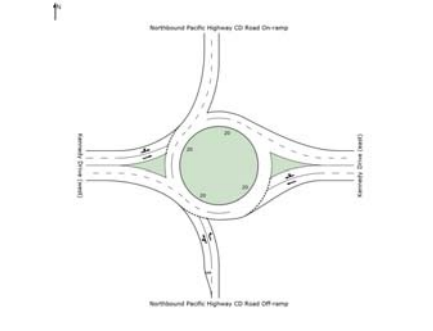


Movement Performance - Vehicles											
Mov ID	Turn	Demand	HV	Dag	Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		Flow	%	v/c	sec			Vehicles	Distance	per veh	km/h
		veh/h						veh	m		
South: Northbound Pacific Highway CD Road Off-ramp											
1	L	257	5.0	0.315	9.7	LOS A	1.6	11.8	0.58	0.81	47.6
2	T	12	5.0	0.316	7.3	LOS A	1.6	11.8	0.58	0.69	47.1
3	R	338	5.0	0.334	13.8	LOS B	1.8	13.0	0.57	0.87	44.3
Approach		607	5.0	0.334	11.9	LOS B	1.8	13.0	0.57	0.84	45.6
East: Kennedy Drive (east)											
5	T	349	5.0	0.224	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	492	5.0	0.263	11.3	LOS B	0.0	0.0	0.00	0.71	46.5
Approach		841	5.0	0.263	8.9	LOS B	0.0	0.0	0.00	0.61	48.7
West: Kennedy Drive (west)											
10	L	447	5.0	0.955	42.5	LOS D	29.8	217.6	1.00	1.90	27.8
11	T	1029	5.0	0.956	43.1	LOS D	29.8	217.6	1.00	1.88	27.5
Approach		1476	5.0	0.956	43.0	LOS D	29.8	217.6	1.00	1.89	27.6
All Vehicles		2924	5.0	0.956	26.7	LOS C	29.8	217.6	0.62	1.30	34.9

Movement Performance - Vehicles											
Mov ID	Turn	Demand	HV	Dag	Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed
		Flow	%	v/c	sec			Vehicles	Distance	per veh	km/h
		veh/h						veh	m		
South: Northbound Pacific Highway CD Road Off-ramp											
1	L	437	5.0	0.573	15.3	LOS B	4.7	34.1	0.80	1.05	42.4
2	T	12	5.0	0.571	12.9	LOS B	4.7	34.1	0.80	1.01	41.8
3	R	265	5.0	0.472	20.9	LOS C	3.0	22.2	0.78	1.02	39.0
Approach		714	5.0	0.573	17.3	LOS C	4.7	34.1	0.79	1.04	41.0
East: Kennedy Drive (east)											
5	T	1064	5.0	0.516	5.5	LOS A	0.0	0.0	0.00	0.47	52.3
6	R	713	5.0	0.516	11.3	LOS B	0.0	0.0	0.00	0.74	46.5
Approach		1777	5.0	0.516	7.8	LOS B	0.0	0.0	0.00	0.57	49.8
West: Kennedy Drive (west)											
10	L	318	5.0	0.731	22.7	LOS C	10.8	79.1	0.97	1.27	37.3
11	T	658	5.0	0.731	22.8	LOS C	10.8	79.1	0.96	1.25	36.9
Approach		976	5.0	0.731	22.8	LOS C	10.8	79.1	0.97	1.26	37.0
All Vehicles		3467	5.0	0.731	14.0	LOS B	10.8	79.1	0.44	0.86	43.7

AM Movement Summary

PM Movement Summary



Intersection Layout

AM Volume Summary

PM Volume Summary

Kennedy Drive / Pacific Highway CD Road Intersection (west) - 2033 with Development

