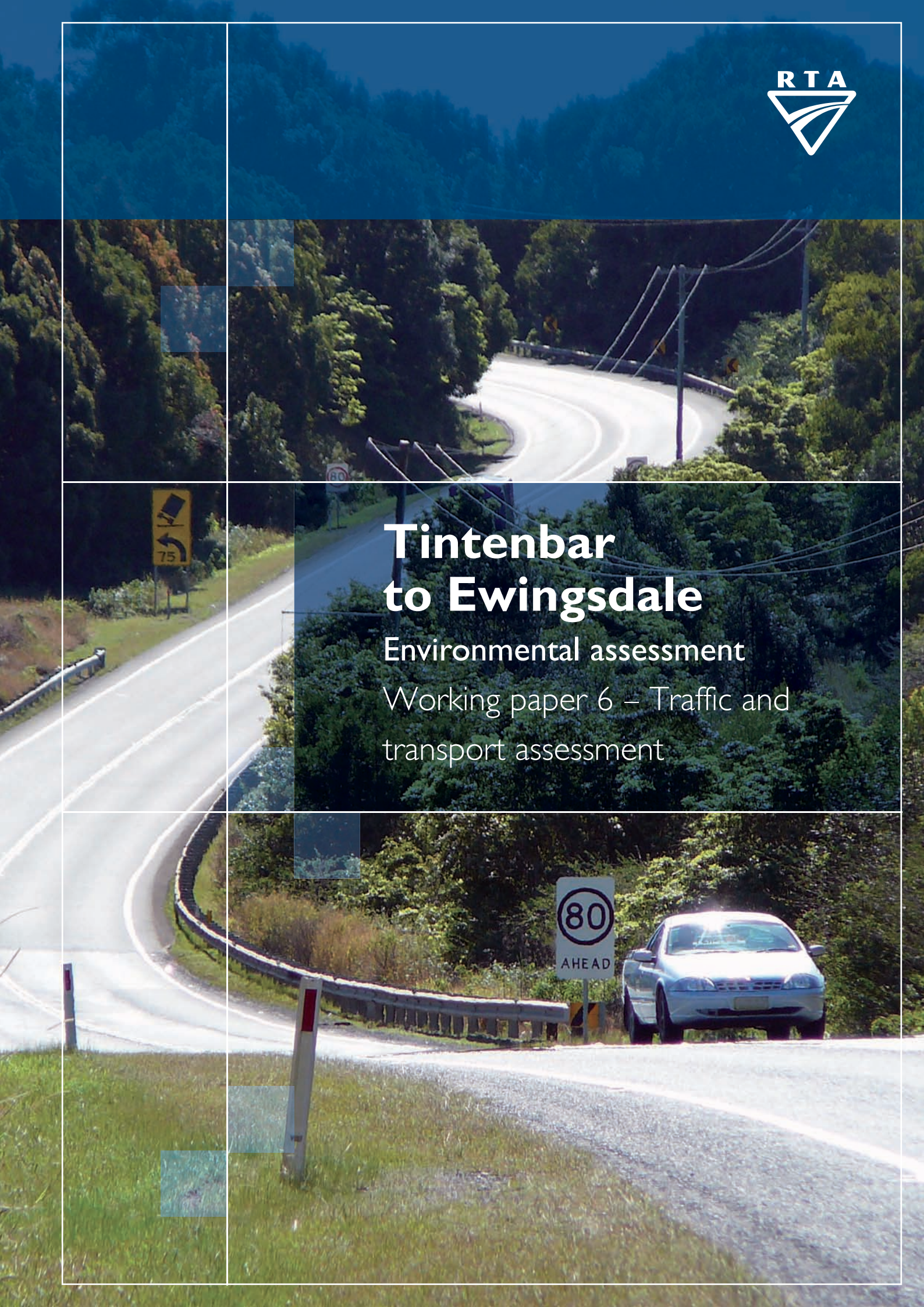

Tintenbar to Ewingsdale

Environmental assessment

Working paper 6 – Traffic and transport assessment

Roads and Traffic Authority

Tintenbar to Ewingsdale Pacific Highway Upgrade

Working Paper 06 - Traffic and Transport Assessment

June 2008

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1 Introduction

The NSW Roads and Traffic Authority (RTA) are proposing to upgrade the Pacific Highway between Tintenbar and Ewingsdale.

The existing Tintenbar to Ewingsdale section of the highway is largely a two-lane, two-way single carriageway with some overtaking lanes and one section of dual carriageway (the Bangalow bypass). In many sections, the highway alignment (both horizontal and vertical) does not meet current RTA Pacific Highway upgrade standards. The Tintenbar to Ewingsdale project is proposed as part of the NSW and Australian Governments' overall objective of fully upgrading the Pacific Highway to dual carriageway from Hexham to the Queensland border.

This report has been prepared as part of the Environmental Assessment for the proposed upgrade. The purpose of the report is to:

- assess and describe the traffic and transportation patterns for the existing Pacific Highway;
- examine historical reported accident data;
- review historical traffic growth and undertake traffic projections for the predicted opening year and up to 20 years after opening;
- present current and future levels of service for the existing Pacific Highway and proposed upgrade;
- assess the operation and impact of the proposed highway upgrade and associated interchanges;
- identify any impacts on the adjacent road network;
- assess the impacts during construction; and
- address local traffic access and integration of local and regional pedestrian and bicycle networks.

In order to assess the existing and predicted future operation of the Pacific Highway between Tintenbar and Ewingsdale, background data has been collected from a number of sources. These include:

- Historical and current traffic count data
- Heavy vehicle facilities and usage
- Reported accident history
- Previous relevant traffic studies in the area
- Existing and proposed pedestrian and bicycle facilities
- Public transport facilities and operation

1.1 Project Objectives

Objectives for the Tintenbar to Ewingsdale Pacific Highway upgrade have been developed to guide the project's development and reflect the Pacific Highway Upgrade Program Objectives.

The project objectives relevant to traffic and transport issues are as follows:

Pacific Highway Upgrading Program Objectives	**Specific Tintenbar to Ewingsdale Project Objectives**
Significantly reduce road accidents and injuries	• Develop a project that meets the following design criteria: - Four-lane divided carriage between Ross Lane and Ewingsdale joining the northern end of the proposed Ballina bypass and the existing dual carriageway roadway at Ewingsdale with potential to expand to six lanes if required with minimal disruption. - Grade separation of local roads and the proposed highway. - Limited access conditions, i.e. no private access points along the proposed highway upgrade. - Design for a 110 km/h design speed. - Design that incorporates pedal cyclists requirements. • Develop a project with a target crash rate of a maximum of 15 crashes per 100 MVK over the project length. • Develop a project that retains or replaces existing rest areas within the study area and is consistent with RTA policies on rest areas. • Where possible, improve safety of travel on the existing Pacific Highway (through the study area) until the proposed upgrade is operational.
Reduce travel times	• Develop a project that reduces travel time for Pacific Highway traffic. • Develop intersections and interchanges designed to at least a Level of Service (LoS) C, 20 years after opening for the 100th Highest Hourly Volume. • Develop a project that provides adequate flood immunity on at least one carriageway. • Develop a project that minimises disruption and delay during construction.
Reduce freight transport costs	• Develop a project that reduces overall freight transport costs. • Develop a project that meets freight transport vehicle requirements.

2 Existing Traffic and Road Network

2.1 Road Network

The Pacific Highway (**Figure 1**) between Newcastle and Brisbane forms part of the AusLink National Network. The AusLink National Network is based on national, regional and urban transport corridors, links to ports and airports, and intermodal connections between road and rail. The Pacific Highway links two state capital cities and passes through coastal regions which feature high population growth rates and increasing economic importance, particularly through the development of tourism. The Pacific Highway caters for interstate travel and transport, as well as intra-state, regional and local users. The proposed upgrade is shown in **Figure 2**.

Figure 1 The Pacific Highway, NSW

In a regional context, the highway provides direct and indirect access to Ballina, Byron Bay, Lennox Head and Lismore. Locally, the existing highway travels adjacent to the townships of Tintenbar, Newrybar, Bangalow and Ewingsdale.

With the exception of the Bangalow bypass and the Ewingsdale interchange, the Pacific Highway between Tintenbar and Ewingsdale is single carriageway roadway, generally with one lane in each direction. Overtaking lanes are provided at intermittent locations.

The existing posted speed limit on this section of the highway is 100 km/h with the exception of the following sections:

- Tintenbar Hill to just north of Ross Lane (80km/h);
- Skinners Creek to the southern end of the Bangalow bypass (80km/h); and
- St Helena Hill (60km/h).

The speed reduction is part of an ongoing review of NSW roads aimed at improving road safety. Significant lengths of this section of the highway have sub-standard geometry and many curves have advisory speed signs of 75 to 85 km/h.

While no townships have direct highway frontage, there are 28 at-grade intersections and 75 property driveways directly accessing the highway along the length of proposed upgrade from Ross Lane to Ewingsdale. The highway also provides access to businesses and facilities including:

- Macadamia Castle.
- A café and general store (in Newrybar).
- Coffee and macadamia plantations.
- A lookout at Coolamon Scenic Drive.
- A rest area and toilet facilities south of St Helena.

2.2 Regional Transport Context

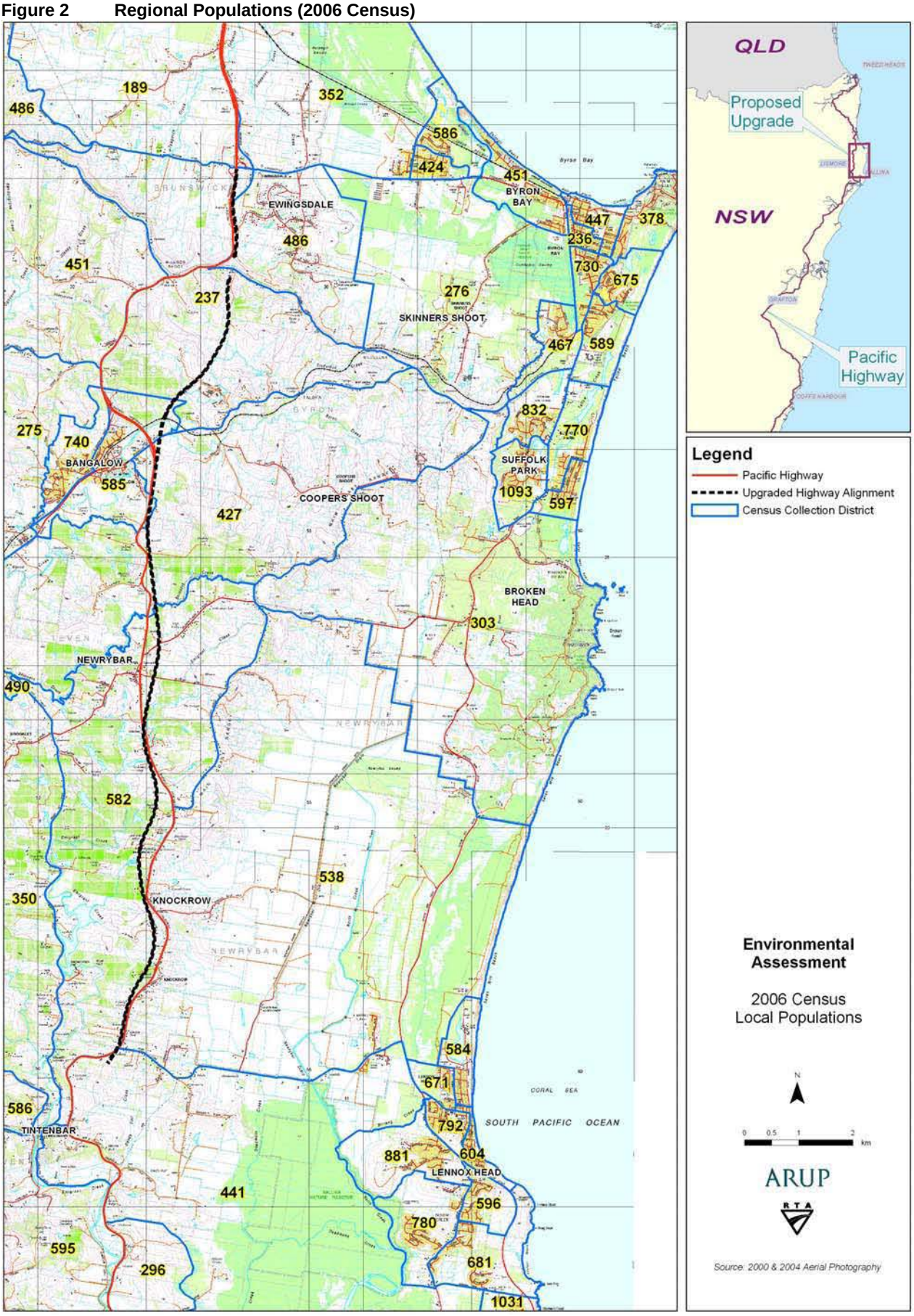
There are a number of urban centres in the local and regional area (see **Figure 2**) including (with population in brackets):

- Lennox Head / Skennars Head – (6600)
- Bangalow – (1300)
- Suffolk Park – (3300)
- Byron Bay – (5000)

There is also a considerable population living in rural and rural-residential environments (see **Figure 2**). These include:

- Tintenbar
- Knockrow
- Fernleigh (west)
- Brooklet (west)
- Nashua (west)
- Coopers Shoot
- Skinners Shoot
- Possum Creek
- Coorabell (west)
- Ewingsdale
- Tyagarah (north)

Figure 2 Regional Populations (2006 Census)



Further away, town centres including Ballina and Lismore influence traffic patterns and growth on the highway.

The Pacific Highway serves as the major north-south link within the region. The only other north-south route available is Byron Bay Road to the east which primarily performs a tourist and local traffic access role.

2.3 Highway and Regional Traffic

Data from RTA permanent and temporary count stations along the existing highway alignment and surrounding major roads have been used to provide historical traffic volume and composition data.

The most recent Annual Average Daily Traffic (AADT) figures and historical counts on the Pacific Highway and surrounding major roads are presented in **Table 1** and **Table 2**. AADT volumes refer to axle pairs rather than vehicles. These indicate that the Pacific Highway to the north of Bangalow carries higher traffic volumes than to the south, with higher volumes again to the north of the Ewingsdale interchange.

Ewingsdale Road (to the east of the Ewingsdale interchange) carries almost as much traffic as the highway south of the Ewingsdale interchange. It also experiences considerable congestion approaching the Byron Bay town centre during peak periods.

Bangalow Rd to the West of the Pacific Highway (to and from Lismore) also carries significant traffic volumes. This traffic accesses and departs the highway through the Bangalow interchange, with around 75 percent of vehicles travelling to and from the north on the highway. This accounts for the differences in traffic volumes to the north and south of the Bangalow interchange. In 2004 there was a difference of around 6000 axle pairs between the RTA count stations at Knockrow and south of the Ewingsdale interchange (see **Table 1**).

In recent years, Byron Bay Road has experienced a reduction in traffic, as indicated in **Table 2**. Byron Bay Road is the coast road and tourist route between Ballina and Byron Bay. It also provides local and regional connections for the townships of Lennox Head, Broken Head and Suffolk Park. It is likely that Pacific Highway upgrading and associated improvements in recent years have reduced the attractiveness of this route, transferring some of the Byron Bay Road traffic to the highway.

Table 1 Existing Pacific Highway Traffic Volumes

Station	Location	Year						
		1998	2001	2002	2003	2004	2005	2006
04.068	Ewingsdale – N of MR545 (Ewingsdale Rd)	-	17,535	-	-	24,288	-	-
04.066	Ewingsdale – S of MR545 (Ewingsdale Rd)	13,831	11,188	-	-	19,426	-	-
04.060	Knockrow – S of Martins Lane	8,550	9,862	11,420	12,841	13,516	13,665	12,970
04.039	E of SH16, Bruxner Hwy	19,477	20,922	-	-	23,787	-	-

Table 2 Traffic Volumes on Surrounding Roads

Station	Location	Year						
		1998	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
04.069	*Ewingsdale Road* Ewingsdale – E of SH10, Pacific Hwy	11,410	11,876	-	-	14,510	-	-
04.167	*Byron Bay Road* Byron Bay – N of Broken Head Rd	6,573	7,689	-	-	6,549	-	-
04.045	*Bangalow Road* Bangalow – 6.4km W of SH10, Pac. Hwy	5,781	6,366	6,859	7,295	7,457	7,493	7,440
04.674	*Byron Bay Road* At Ballina Shire Bdy	4,736	5,690	-	-	5,049	-	-
04.660	*Byron Bay Road* Lennox Head – 1.5km S of Tintenbar Rd	6,891	9,366	-	-	8,126	-	-

2.4 Local Traffic

An origin and destination survey was conducted on Thursday 9 December 2004 from 7:00 am to 7:00 pm to gain an understanding of the local traffic patterns in the area. This involved recording the number plates of all vehicles (separated into light and heavy vehicles) travelling onto or off the highway within the study area, through survey stations at all major side roads intersecting the highway as well as key points at the Bangalow and Ewingsdale interchanges. These number plates are subsequently matched between survey stations by computer software to observe local traffic movements using the highway. No major local road network changes have occurred between 2004 and the present time.

The survey identified a significant traffic volume using the highway as a connection between Bangalow Road to the west and Ewingsdale Road to the east, in the order of 1530 vehicles between 7am and 7pm or 35 percent of the traffic using the southern side of the Ewingsdale interchange. The majority of this traffic is assumed to be travelling between Lismore and Byron Bay. Other local trips identified were:

- A large number of vehicles travelling between Coolamon Scenic Drive and Ewingsdale (around 305 vehicles between 7am and 7pm).
- A large number of vehicles travelling between Newrybar / Broken Head Road and Bangalow (around 310 vehicles between 7am and 7pm)

These local traffic movements were identified through matching the origin and destination of vehicles within a 30 minute period. An “unconstrained” matching was also undertaken, matching the origin and destination of vehicles over the entire 12-hour survey period. Match rates were higher for this condition, particularly influenced by vehicles being matched in and out of the same point. This highlighted the local residents’ use of the highway to travelling further afield during the course of their daily business, before returning home.

Traffic volumes for the majority of the side roads intersecting the existing highway between Ross Lane and the Ewingsdale interchange have also been derived from the survey and are presented in **Table 3** and **Figure 3**. The origin and destination matrices for the cases detailed above can be found in **Appendix A.**

Table 3 Traffic Counts on Side Roads

Location of Survey – Intersection with the Pacific Highway	Survey Date	Twelve-hour (0700-1900) two-way vehicle count
Ross Lane	Thursday 9 December, 2004	3048
Martins Lane	Thursday 9 December, 2004	121
Old Byron Bay Road	Thursday 9 December, 2004	209
Watsons Lane	Thursday 9 December, 2004	109
Old Pacific Hwy, Newrybar (south)	Thursday 9 December, 2004	301
Old Pacific Hwy, Newrybar (north)	Thursday 9 December, 2004	744
Broken Head Road	Thursday 9 December, 2004	926
Bangalow Rd E (on and off-ramps)	Thursday 9 December, 2004	118
Bangalow Rd W (on and off-ramps)	Thursday 9 December, 2004	1615
Granuaille Rd (on and off-ramps)	Thursday 9 December, 2004	5838
Possum Creek Road	Thursday 9 December, 2004	360
Fowlers Lane	Thursday 9 December, 2004	211
Coolamon Scenic Drive	Thursday 9 December, 2004	1078
St Helena Road	Thursday 9 December, 2004	264
Ewingsdale Rd (on and off-ramps)	Thursday 9 December, 2004	3989

In addition to the 2004 origin and destination survey, further surveys were conducted in December 2006 and January 2007 to understand the existing traffic patterns and conditions in the vicinity of the Ewingsdale interchange. This data comprised an origin and destination survey undertaken over a 48-hour period capturing all approach and departure legs of the interchange (Friday 8 December and Saturday 9 December 2006), as well as tube counts on all approaches to the interchange for two weeks over the Christmas / New Year period commencing Monday 25 December, 2006. The movements through the Ewingsdale interchange (ordered from highest to lowest daily volume) that can be observed from the origin and destination survey data are:

- Vehicles travelling westbound from Byron Bay along Ewingsdale Road, using the interchange and northbound Pacific Highway on-ramp to head north towards Ocean Shores and Tweed Heads, and
- Vehicles travelling southbound on the Pacific Highway from Tweed Heads and Ocean Shores, using the southbound off-ramp and the interchange to head east along Ewingsdale Road towards Byron Bay.
- Vehicles travelling westbound from Byron Bay along Ewingsdale Road, using the interchange and southbound Pacific Highway on-ramp to head south towards Bangalow and Ballina.
- Vehicles travelling northbound on the Pacific Highway from Ballina and Bangalow, using the northbound off-ramp and the interchange to head east along Ewingsdale Road towards Byron Bay.

Table 4 provides a summary of the daily traffic volumes observed during the Origin and Destination survey. Further detail is provided in the *Ewingsdale Interchange Traffic Assessment* (Arup, 2007) report included in **Appendix B**.

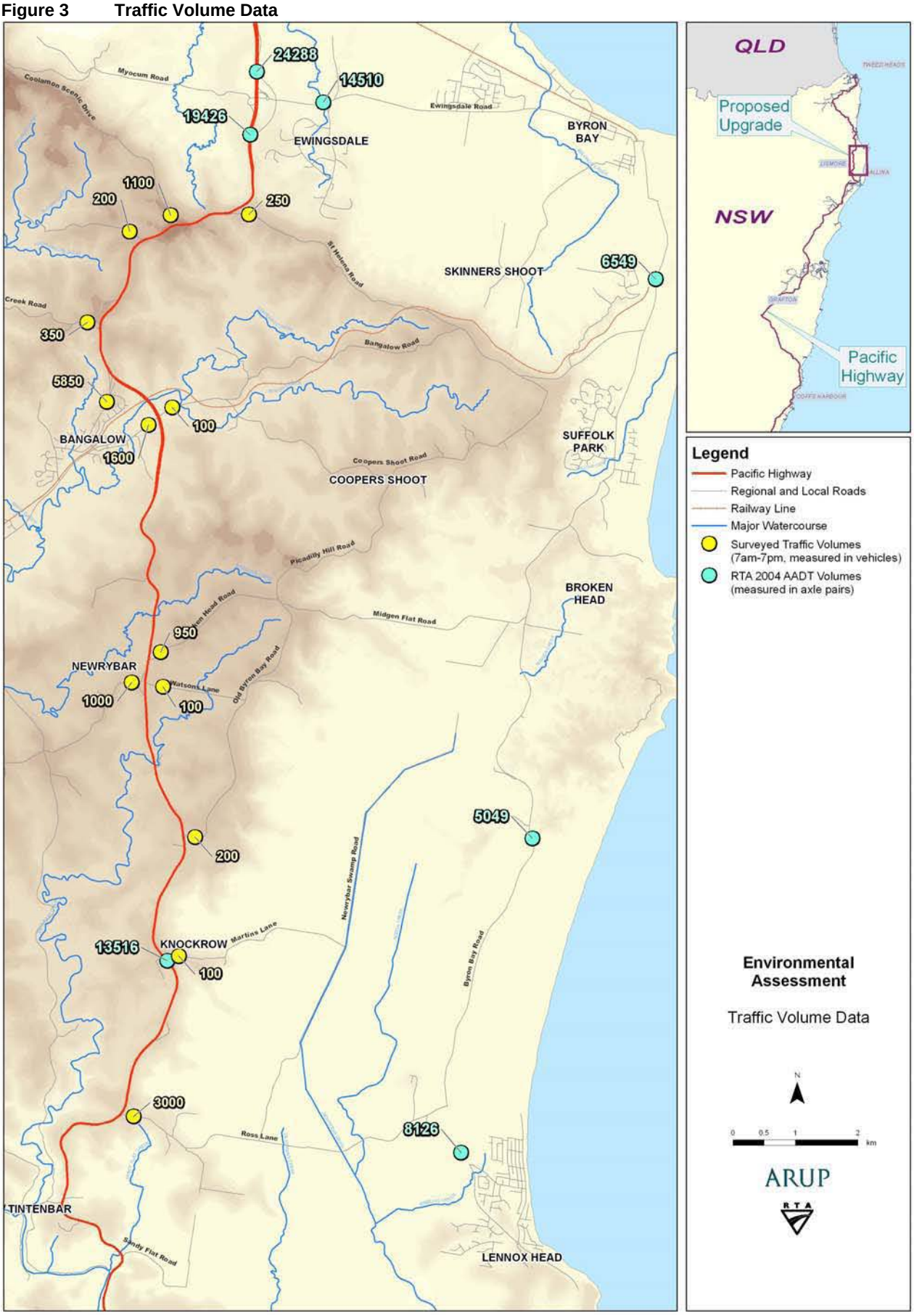
Table 4 Ewingsdale Interchange Traffic Volumes

Site		**Friday 8 December**	**Saturday 9 December**
Pacific Highway Southbound	Off ramp to Ewingsdale Road	5485	4819
	On ramp from Ewingsdale Road	2619	1875
Pacific Highway Northbound	Off ramp to Ewingsdale Road	2532	1985
	On ramp from Ewingsdale Road	4527	3840
Myocum Road West of interchange with Pacific Highway	Eastbound	1037	804
	Westbound	1258	973
Ewingsdale Road East of interchange with Pacific Highway	Eastbound	9051	7459
	Westbound	8082	6226

2.5 Travel Time Surveys

Travel time surveys were conducted during December 2004, concurrent with the origin and destination survey. These surveys comprised a number of timed runs in each direction between Ross Lane and the Ewingsdale interchange, averaging around 14.5 minutes for the 19 kilometres of existing highway. This represents an average speed of around 80 kilometres per hour. Throughout the day, traffic conditions were relatively free-flowing, although lower speeds were typically experienced while traversing St Helena Hill from the north. With the introduction of the 60km/h zone traversing St Helena Hill and the 80km/h zones at Ross Lane and south of Bangalow, it is likely that current average travel times are marginally longer.

Figure 3 Traffic Volume Data



2.6 Traffic Patterns and Variation

2.6.1 Traffic Growth Rates

In November 2003, a report entitled "*State Highway No 10, Pacific Highway at Ewingsdale - Predictions of Future Traffic Volumes*" was prepared for the RTA and is presented in **Appendix C**. This report examined historical traffic count data in the vicinity of the Ewingsdale interchange, as well as additional traffic counts undertaken by the RTA to examine the effects of the Yelgun to Chinderah upgrade (at Kankool and Nabiac).

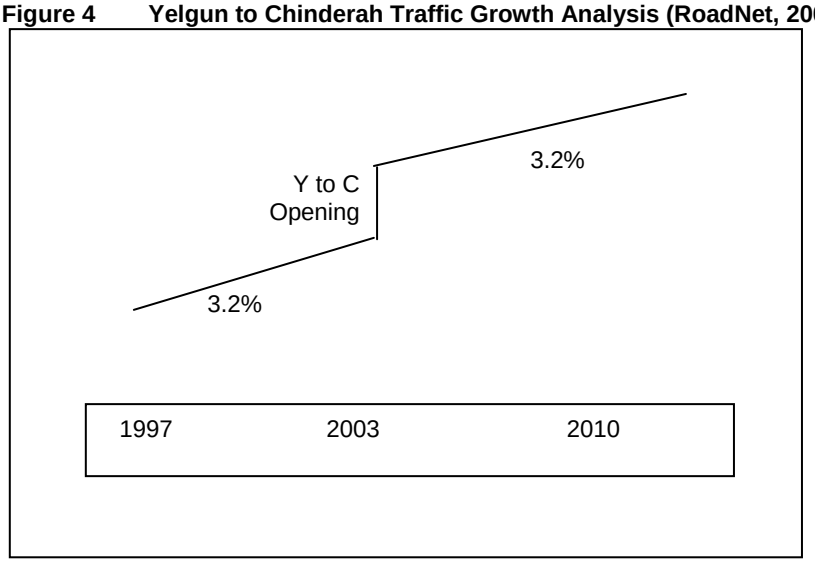
Table 5 summarises of the outcome of this analysis.

Table 5 Yelgun to Chinderah Traffic Growth Analysis (vpd) (RoadNet, 2003)

	Light Vehicles	**Heavy Vehicles**	**Total**
Pre-opening Yelgun to Chinderah (south of Ewingsdale interchange)			
17/04/1998	11208	1222	12430
25/03/2001	10283	1106	11389
Post-opening Yelgun to Chinderah (south of Ewingsdale interchange)			
25/08/2003	13823	2090	15913

The *Pacific Highway at Ewingsdale* report (RoadNet, 2003) concluded that traffic growth (both light and heavy vehicles) on the Pacific Highway, as a result of the opening of the Yelgun to Chinderah upgrade, should be treated as an instantaneous increase, as illustrated by **Figure 4**. The report recommends that future traffic growth on the highway be treated as a linear 3.2 percent growth, based on traffic volumes post Yelgun to Chinderah. 2004 AADT volumes reflect a slightly higher level of traffic growth, whereas 2005 and 2006 AADT volumes reflect lower level of traffic growth. It is recognised that annual growth will fluctuate and at this stage there is insufficient data to warrant further adjustment to the project growth rate.

Figure 4 Yelgun to Chinderah Traffic Growth Analysis (RoadNet, 2003)

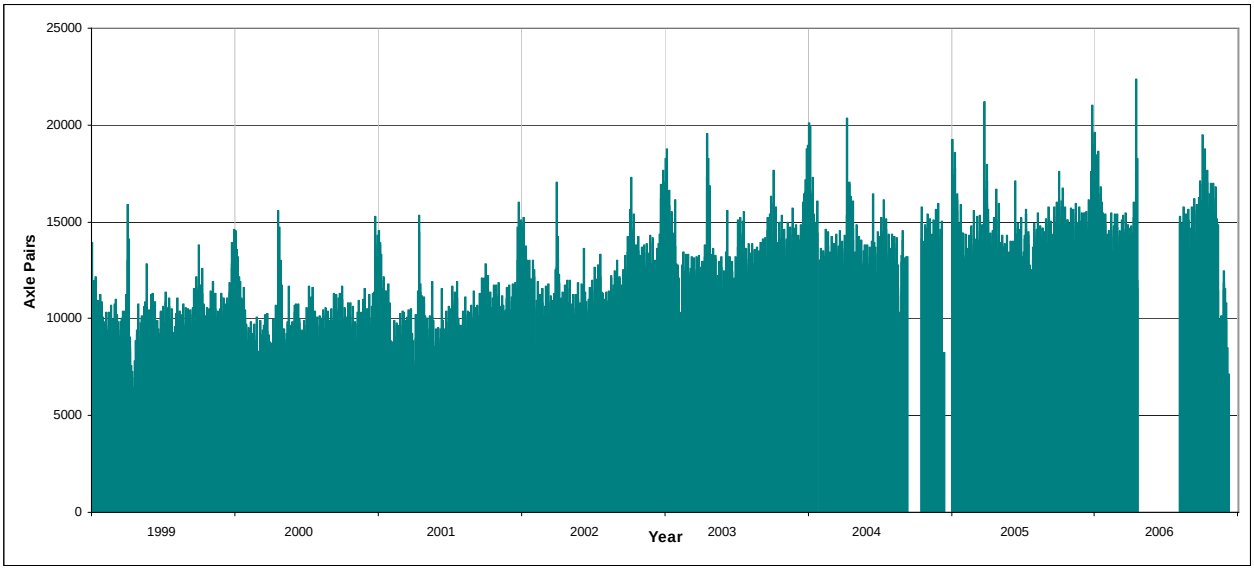


2.6.2 Traffic Variation during the Year

Traffic flows along the length of the Pacific Highway between Hexham and the Queensland border peak during the major holiday periods such as Christmas, Easter and school holiday times, with peak travel sometimes being 50 percent to 100 percent greater than the average weekday level.

Daily variation in traffic volumes on the Pacific Highway at Knockrow are shown in **Figure 5**.The highest daily volume recorded (to date) was during the 2006 Easter period, on 13 April 2006, when in total 22,401 axle pairs were recorded for the two directions. This value is around 60 percent higher than the AADT (Annual Average Daily Traffic) and is consistent with other parts of the Pacific Highway affected by holiday traffic.

Figure 5 Daily Two-Way Pacific Highway Traffic Volumes at Knockrow



Note: Zero count indicates tube failure

2.6.3 Traffic Variation during the Day

In terms of vehicles per hour, weekday volumes are relatively consistent throughout the 8am to 5pm period, with minor peaks around 8-9am and 3-4pm. Weekend traffic volumes are relatively consistent for the period 10am to 4pm. The November 2004 RTA classified counts south of Bangalow, identify an average peak hour traffic volume (measured in vehicles) of 8.6 percent of the daily total for the weekend and 7.8 percent during the week. Typical weekday and weekend traffic patterns are displayed in **Figure 6** and **Figure 7**. The data shows that, for non-holiday weekdays, traffic is relatively evenly spread throughout the day, without a major ‘commuter peak' that is evident in metropolitan regions. Traffic variation throughout the week is shown in **Figure 8** and **Figure 9**. This data has been obtained from the RTA count stations at Knockrow and south of the Ewingsdale interchange respectively.

Figure 6 Weekday Average Hourly Traffic Volumes, Newrybar

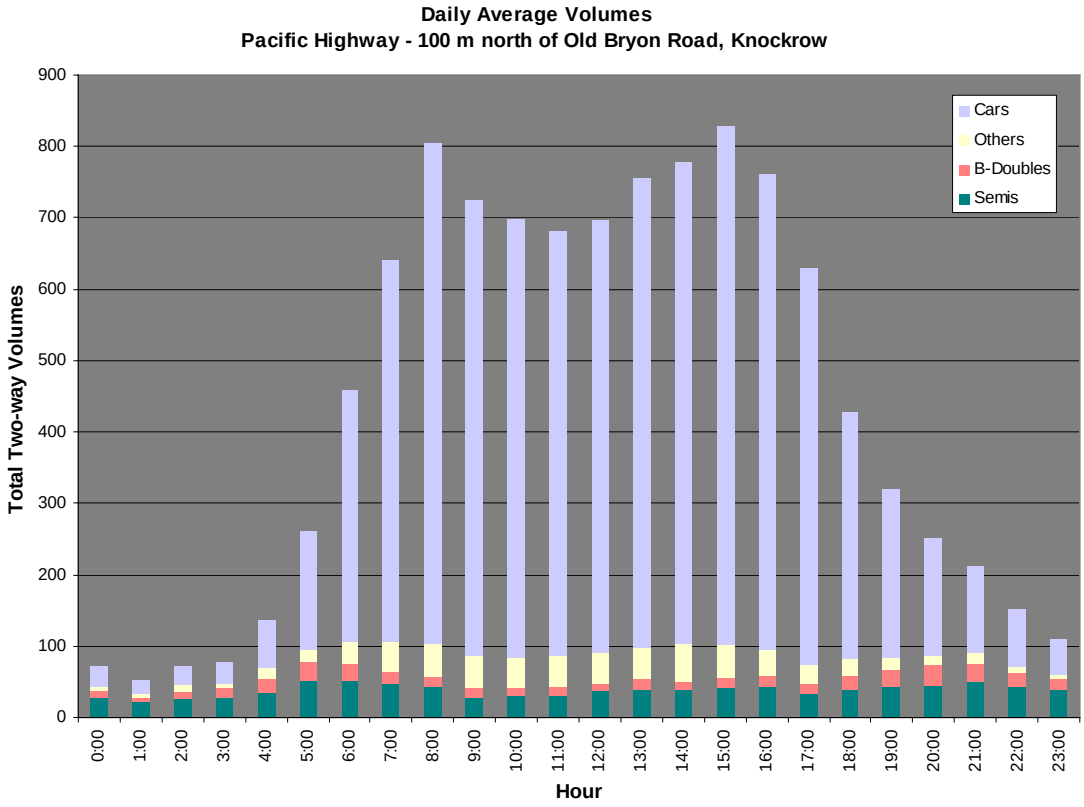


Figure 7 Weekend Average Hourly Traffic Volumes, Newrybar

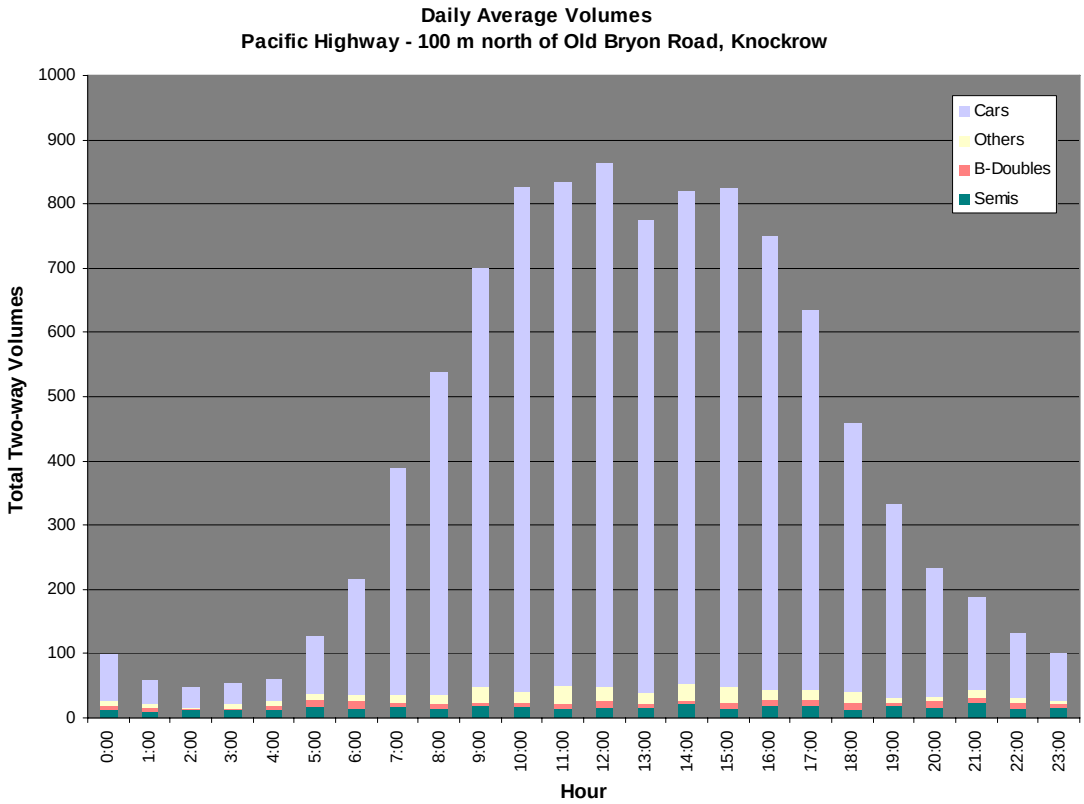


Figure 8 Weekly Profile of Light and Heavy Vehicles, Knockrow

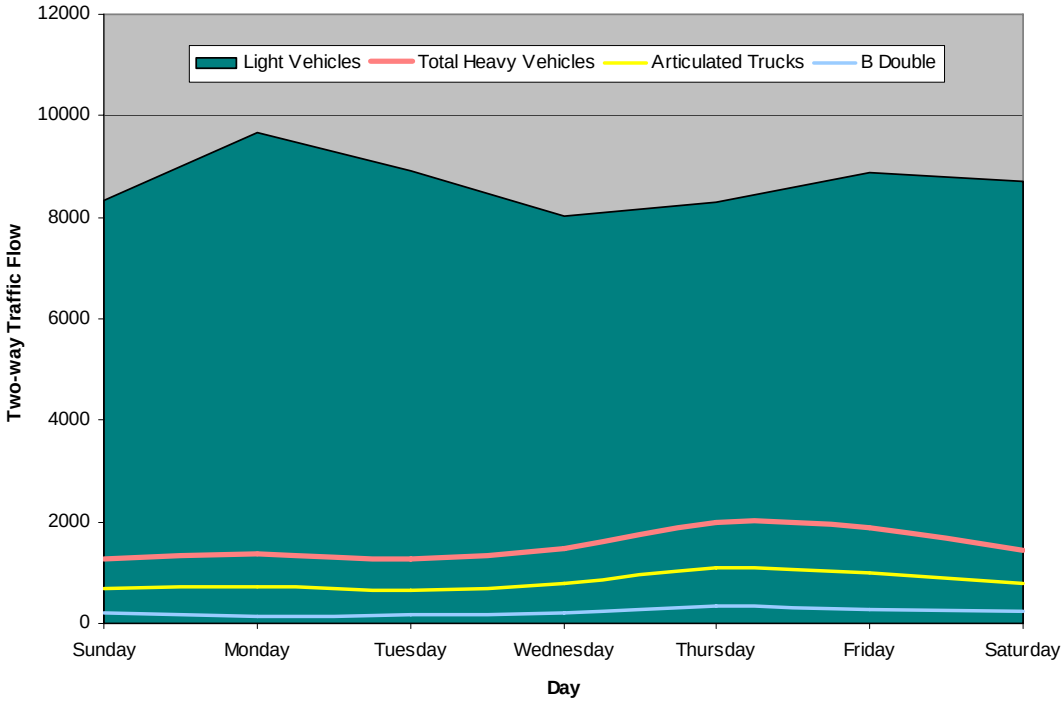
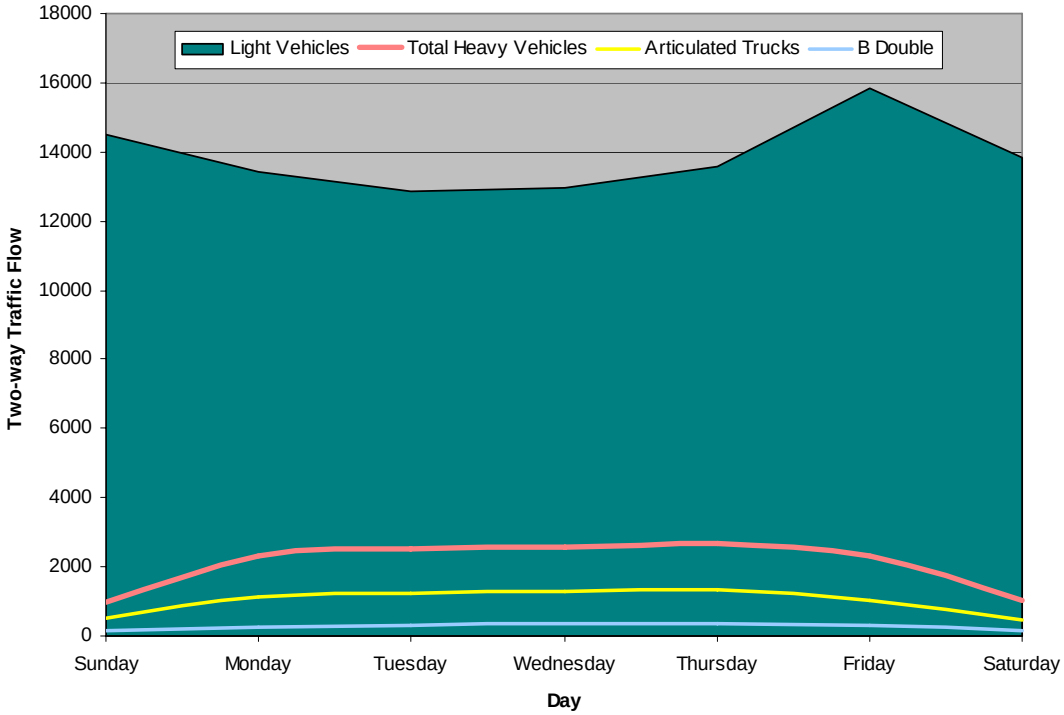


Figure 9 Weekly Profile of Light and Heavy Vehicles, South of Ewingsdale



2.7 Heavy Vehicles

In November 2004, the RTA conducted vehicle classification counts on the Pacific Highway to the north and south of the Bangalow Road interchange, in the vicinity of Old Byron Road and Sunnycrest Lane. **Table 6** and **Table 7** summarises this data, in the form of average number of heavy vehicles as a percentage of total vehicles (measured in vehicles). **Table 8** summarises the relevant heavy vehicle proportions on Bangalow Road, West of Bangalow, recorded at the RTA permanent count site during August 2004. A more detailed summary of the data at these three locations can be found in **Appendix D**.

Table 6 Heavy Vehicle Proportions: Pacific Highway at Old Byron Bay Road

Time Period	Heavy Vehicle Measure	Direction		Total
		Northbound	Southbound	
Average	Heavy vehicles as percentage of daily vehicles	16%	16%	16%
Night only 10pm – 7am	Night heavy vehicles as % of total night vehicles	49%	31%	41%
	Night heavy vehicles as percentage of total daily heavy vehicles	39%	20%	30%
Weekend	Weekend heavy vehicles as percentage of weekend total vehicles	9%	8%	9%
	Percentage of heavy vehicles during weekend peak hour (12pm)	3%	7%	6%

Notes: 1. "Average" data represents an average of both weekend and weekday traffic patterns.
2. The survey period represents a typical non-holiday period
3. Heavy vehicles are defined by Austroads in the Guide to Traffic Engineering Practice, Part 3, Traffic Studies, 2004. Heavy vehicles include trucks with two or more axles, buses, semi-trailers and B Doubles (classification categories 3-11).

Table 7 Heavy Vehicle Proportions: Pacific Highway at Sunnycrest Lane

Time Period	Heavy Vehicle Measure	Direction		Total
		Northbound	Southbound	
Average	Heavy vehicles as percentage of daily vehicles	14%	14%	14%
Night only 10pm – 7am	Night heavy vehicles as % of total night vehicles	44%	21%	33%
	Night heavy vehicles as percentage of total daily heavy vehicles	37%	19%	28%
Weekend	Weekend heavy vehicles as percentage of weekend total vehicles	9%	7%	8%
	Percentage of heavy vehicles during weekend peak hour (10am)	6%	6%	6%

Table 8 Heavy Vehicle Proportions: Bangalow Road, West of Bangalow

Time Period	Heavy Vehicle Measure	Direction		Total
		Eastbound	Westbound	
Average	Heavy vehicles as percentage of daily vehicles	8%	8%	8%
Night only 10pm – 7am	Night heavy vehicles as % of total night vehicles	22%	20%	21%
	Night heavy vehicles as percentage of total daily heavy vehicles	19%	15%	17%
Weekend	Weekend heavy vehicles as percentage of weekend total vehicles	4%	4%	4%

The above tables show that in a typical non-holiday period there is a significantly higher proportion of heavy vehicles on the Pacific Highway, compared with Bangalow Road. The classified count on the highway south of Bangalow recorded around 16 percent heavy vehicles, compared with 8 percent on Bangalow Road. When the Bangalow Road traffic to and from the north is combined with the highway through traffic at Bangalow, the heavy vehicle proportion on the highway is diluted to around 14 percent, as observed by the classified count on the highway north of Bangalow.

For the purpose of converting AADT to Annual Average Daily Vehicles (AADV), the Pacific Highway Upgrade Strategic Assessment (SKM, 2000a) uses an average of 2.4 axle pairs per heavy vehicle. Based on an annual average heavy vehicle percentage of approximately 13 percent (including holiday periods), a multiplier of 1.18 for conversion of AADT to AADV is appropriate. However, it should be noted that the proportion of heavy vehicles is significantly lower during the holiday peak periods. Classified counts at Station 04.060 during Christmas and Easter holiday periods recorded around 2-6 percent heavy vehicles. Therefore this study has adopted a heavy vehicle proportion of 5 percent during peak holiday periods. Using an average 2.4 axle pairs for heavy vehicles, this study assumes:

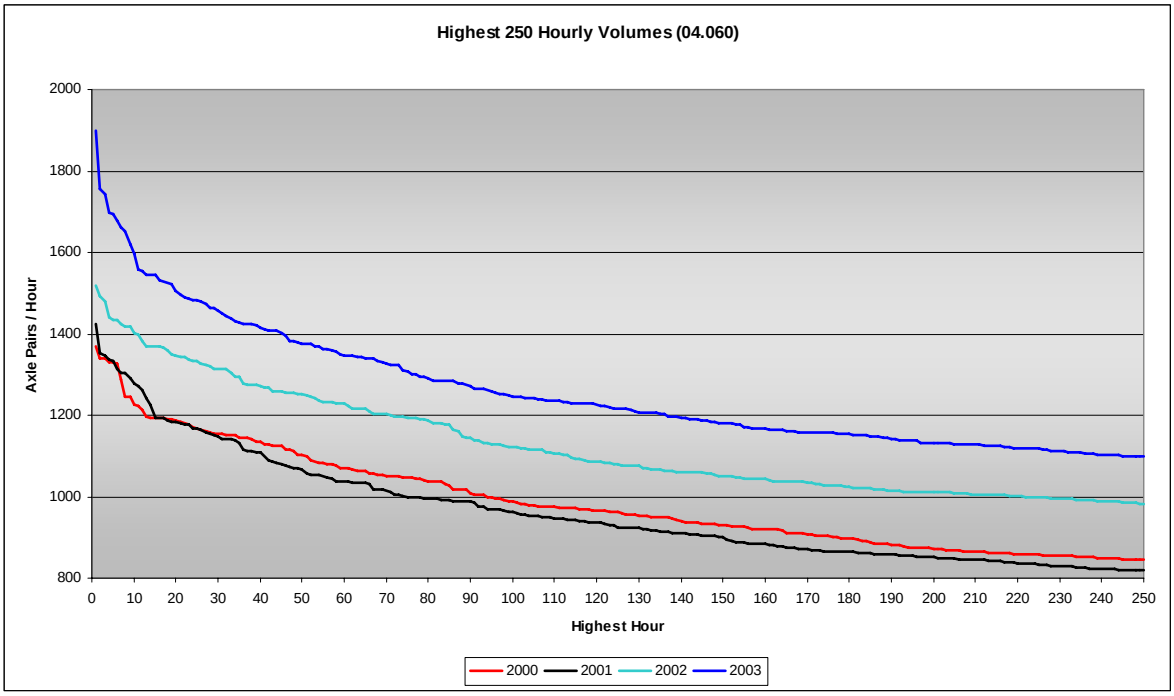
- For general period: AADV (vehicles) = AADT (axle pairs) / 1.18
- For peak holiday period: AADV (vehicles) = AADT (axle pairs) / 1.07

2.8 Design Hour Traffic Volumes

The 30th highest hourly volume (HHV) is the hourly volume that is reached or exceeded in only 30 hours of a year, while the 100th HHV is reached or exceeded in only 100 hours of a year. These two volumes are commonly used for assessing the highway and intersection capacities respectively. Recent practice has been to base Pacific Highway design on an hour between the 30th and 100th HHV, based on a graphical analysis of this range, identifying where the slope changes from steep to flat.

Hourly traffic volume data from RTA permanent count station at Knockrow, (south of Martins Lane) for 2003 (the most recent complete year available at the time of analysis) has been used to identify the HHV's (**Figure 10**). As this count station records data in axle pairs rather than vehicles, an estimate of 5 percent heavy vehicles at an average of 2.4 axles per vehicle has been used to obtain vehicle volumes.

Figure 10 Highest Hourly Volume Analysis



The graphical analysis for this data shows that there is no significant change in the graph over this range and hence the 30th HHV has been adopted as the design hour for the highway. The project objectives for intersection / interchange design identify a performance target which related to the 100th HHV

Therefore the HHV's (as two way volumes) are as follows:

- 30th HHV – 1362 vehicles (12.5 percent of AADV)
- 100th HHV – 1164 vehicles (10.7 percent of AADV)

2.9 Existing Highway Level of Service

For a given number of traffic lanes, level of service (LoS) analysis provides a means of determining the traffic-carrying performance of a road or any element of it under the prevailing roadway and traffic control conditions. This form of analysis is fundamental to the planning, design and operation of roads, and provides the basis for determining the number of traffic lanes to be provided in the road network. It takes into account the volume and composition of traffic as well as the prevailing roadway, traffic and traffic control conditions.

The design hour adopted for this analysis is the 30th HHV. The LoS for the existing Pacific Highway under this flow demand was assessed using the Highway Capacity Manual 2000.

The Highway Capacity Manual 2000 defines the level of service as "a qualitative measure describing the operational conditions within the traffic stream, based on service measures such as speed and travel time, freedom to manoeuvre, traffic interruptions comfort and convenience". In particular:

LoS A describes the highest quality of traffic service for a highway section, when motorists are able to travel at their desired speeds. The highest quality usually results in average speeds of 90 km/h or more on two-lane highways in Class I (relatively high speed roads). A maximum flow rate of 490 passenger cars per hour total in both directions may be achieved with base conditions.

LoS B characterises traffic flow with speeds of 80 km/h or slightly higher on level terrain Class I highways. Service flow rates of 780 passenger cars per hour total in both directions can be achieved under base conditions.

LoS C describes further increases in flow, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediments. The average speed still exceeds 70 km/h on

level terrain Class I highways, and a service flow rate of up to 1,190 passenger cars per hour total in both directions can be accommodated.

LoS D describes unstable flow conditions. The two opposing traffic streams operate separately at higher traffic volumes and passing becomes extremely difficult. Speeds of 60 km/h can still be maintained under base conditions for a Class I highway, with a maximum service flow rate of 1,830 passenger cars per hour total in both directions.

LoS E characterises unstable traffic flow. Even under base conditions, speeds may drop below 60 km/h. Passing is virtually impossible at LoS E and "platooning" (travelling together in a group, usually involuntarily) becomes intense. The highest volume attainable is generally 3,200 passenger cars per hour total in both directions.

LoS F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are highly variable.

LoS C has been treated as the service level objective for the highway itself, as LoS C is within the zone of stable flow, beyond which comfort and convenience is poor. This is consistent with the project objectives for intersection / interchange performance.

Table 9 indicates the forecast traffic flows along the existing Pacific Highway between Tintenbar and Ewingsdale (based on the 30th HHV in 2003 at Site 04.060 and forecast growth rates), and details the LoS in 2003, 2012, 2022 and 2032 for the existing two-lane highway.

Table 9 Levels of Service for Existing Highway

Year	AADV	Two-way peak hour volume (30^{th} HHV)	Level of Service
2003	11,000	1,450	C
2012	15,050	1,750	D
2022	18,900	2,175	E
2032	22,750	2,600	E

It has been calculated that the existing two-lane Pacific Highway currently operates at LoS C at peak times based on the 30th HHV, and will reach LoS E by the end of 2017. LoS E occurs when traffic flows are at or close to capacity. As the road approaches this level of capacity there is virtually no freedom to select desired speed or manoeuvre within the traffic stream. Even small disruptions to traffic flow would result in flow-on effects that would cause excessive queuing and delays to motorists. This would impact on all traffic movements including local business traffic and residents travelling within the local area.

During the holiday periods when the highest hourly volumes are recorded, there is usually a high proportion of through vehicles on the highway. The permanent RTA count station at Knockrow records lower AADT volumes than those measured at the temporary RTA count station, south of the Ewingsdale interchange. This is due to the higher volumes of Bangalow Road traffic entering and exiting the highway to the north of Bangalow. However, during the 30th HHV (the basis for the Level of Service calculations), it is expected that the traffic volumes north of Bangalow will not be substantially higher and hence the volumes recorded at Knockrow will provide a good basis for current and future analysis.

2.10 Overtaking Lanes

Additional overtaking lanes are provided along the existing highway between Tintenbar and Ewingsdale for both northbound and southbound carriageways. **Table 10** details the existing overtaking lanes between Ross Lane and the Ewingsdale interchange. These are also represented diagrammatically in **Figure 11.**

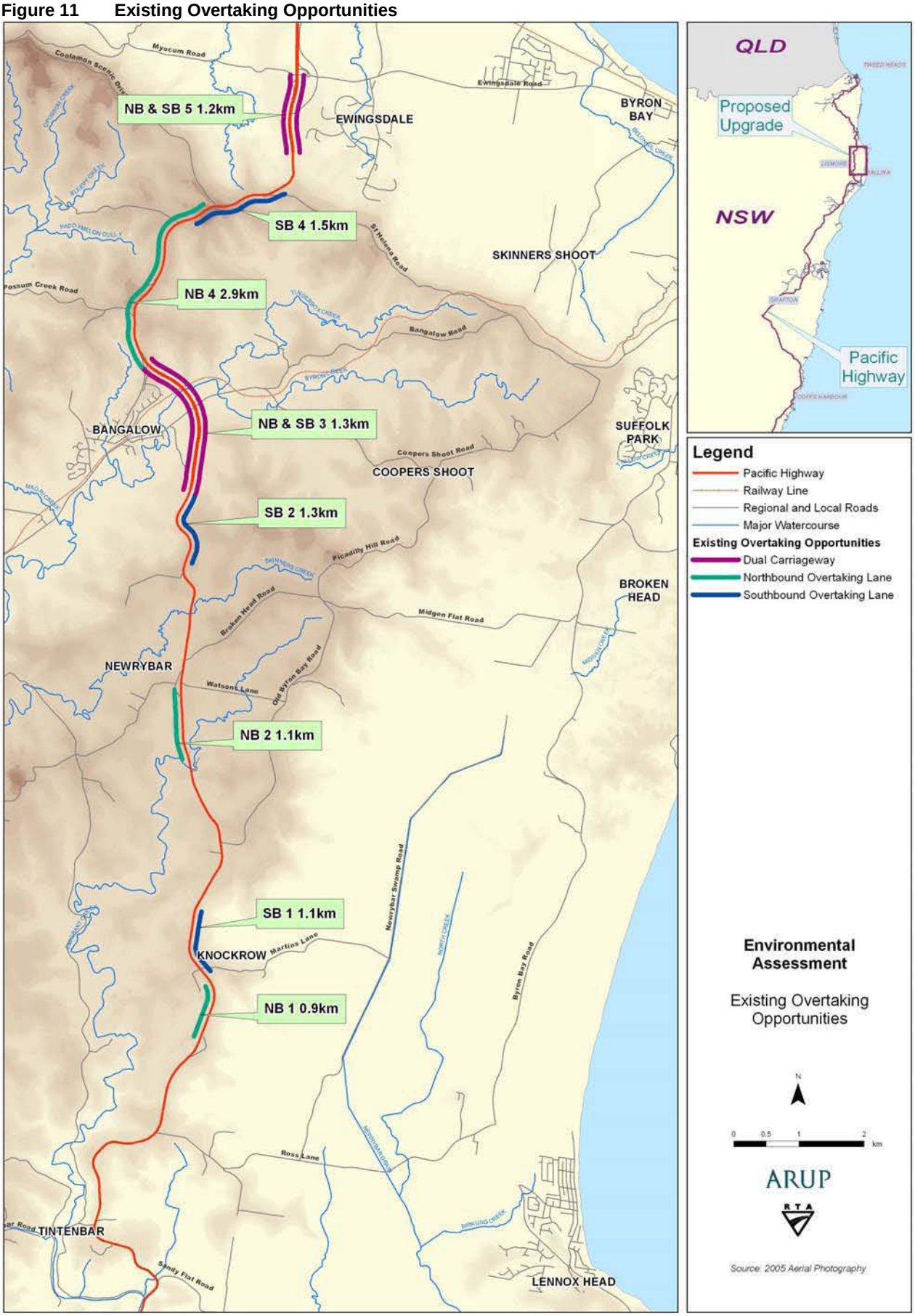
Overtaking lanes or dual carriageway are present for five sections of the northbound carriageway and total 8.3 km in length (including tapers). They are present for five sections of the southbound carriageway and total 7.3 km in length (including tapers).

The specific Level of Service for each of these sections where overtaking lanes have been provided has not been calculated as they constitute only 40 percent of the total route length, in both directions, between Ross Lane and the Ewingsdale interchange.

Table 10 Existing Overtaking Opportunities

No.	Location	Start	End	Length
NB 1	North of Ross Lane	1.6km	2.5km	0.9km
SB 1	North of Ross Lane	3.8km	2.7km	1.1km
NB 2	North of Ross Lane	6.4km	7.4km	1.0km
SB 2	North of Watson's Lane	3.1km	1.9km	1.2km
NB&SB 3	Dual Carriageway			2.3km
NB 4	North of Bangalow Interchange	1.0km	3.9km	2.9km
SB 4	North of Bangalow Interchange	5.1km	3.6km	1.5km
NB&SB 5	Dual Carriageway			1.2km
			SB	**7.3km**
			NB	**8.3km**
			Total	**15.6km**

Figure 11 Existing Overtaking Opportunities



2.11 Public Transport

Public transport operations in the area consist of long distance coach services and local bus services. There are currently no passenger rail services in the area.

Blanch's Bus Company provide two local route services within the study area. There are two main corridors for bus services between Ballina and Byron Bay, either through the inland route on the Pacific Highway, or along the coast through the townships of Lennox Head and Suffolk Park. **Table 11** outlines the local bus routes servicing the study area.

Table 11 Blanch's Local Bus Services

Route	Destination	Service Frequency (each way)
640	Ballina – Byron Bay – Ewingsdale – Mullumbimby	8 services on weekdays, 6 on Saturday and 3 on Sunday
641	Ballina – Bangalow – Byron Bay	4 services on weekdays only

Source: Transport Infoline (131500.com.au)

Blanch's Bus Company is the major operator for school bus services in the area. They provide a total of eight school runs in both the morning and afternoon (**Table 12)**. A number of smaller bus companies also operate school bus services in the area, including Aerobing, Beaumonts Coaches, Bowden Morgan and Pine, Brunswick Valley Coaches, Campbell's, Comin's, Kirkland's, Sodhi Joga Singh and Avjinder's, Summerland's and Wetzler's.

Table 12 Blanch's School Bus Services

	Destination	Number of runs
AM School Bus Routes	Sandy Flat – Tintenbar Road – Newrybar Village – Byron Bay (via Old Byron Road)	1
	Sandy Flat – Bangalow Village (and return)	2
	Ross Lane – Tintenbar Road	1
	Bangalow – Tintenbar Road	1
	Tintenbar Road – Sandy Flat (to Ballina)	1
	Sandy Flat – Ross Lane (to Ballina)	1
	Bangalow Village – Byron Bay (via Broken Head Road)	1
PM School Bus Routes	Sandy Flat – Ewingsdale (and return)	2
	Old Byron Bay Road – Newrybar Village (and return to Sandy Flat)	2
	Tintenbar Road – Knockrow Castle (and return to Ross Lane)	2
	Sandy Flat – Tintenbar Road	1
	Broken Head Road – Bangalow Village	1

Source: Blanch's Bus Company

Three bus companies, Greyhound Australia, Kirkland's Buslines and Sunstate Charters, provide long distance bus services in the area, with local travel under 40 kilometres not being permitted. The scheduled travel time between Bangalow and Brisbane is approximately three hours and 20 minutes. **Table 13** outlines the long distance bus routes servicing the area, including a Sydney to Brisbane link which stops in Ballina.

Table 13 Long Distance Bus Services

Destination	Provider	Service Frequency (each way)
Brisbane – Byron Bay – Lismore	Kirklands	1 service on weekdays
Lismore – Byron Bay – Brisbane	Kirklands	1 service on weekdays, 1 on Saturday and 2 on Sunday
Grafton – Byron Bay	Sunstate Charters	1 service on weekdays
Tweed Heads – Bangalow – Casino	Sunstate Charters	1 service on weekdays
Casino – Bangalow – Surfers Paradise	Sunstate Charters	1 service daily
Sydney – Brisbane (via Pacific Highway)	Greyhound	4 services daily

Source: Transport Infoline (131500.com.au)

The Blanch's local and school bus services operate on a 'hail-and-ride' system. Buses currently stop informally along the highway to collect passengers as long as it is safe to do so. In addition to this, there are regularly used pick-up and drop-off points at local road intersections. School buses during the morning and afternoon stop at some residential driveways. There is currently only one formal bus shelter on the existing highway between Ross Lane and Ewingsdale, adjacent to Martins Lane east at Knockrow.

2.12 Pedestrian, Bicycle and Equestrian Facilities

The Pacific Highway currently has no specific facilities for pedestrians, cyclists or equestrians within the Study area. However there are existing and proposed cycle facilities / routes (on and off-road) on Bangalow Road and Ewingsdale Road. The Pacific Highway to the north of the Ewingsdale interchange is designated as an "inter-town bikeway", connecting Byron Bay with Mullumbimby and Brunswick Heads. The NSW Coastline Cycleway route travels along The Coast Road (Byron Bay Road) between Ballina and Byron Bay.

Pedestrians currently use the highway shoulder and informal verge where available; however, pedestrian volumes are low.

2.13 Historical Accident Analysis

Accident analysis has been undertaken and is based on accident history for the 5-year period from 1 May 2002 to 30 April 2007. It comprises RTA reported accident data on the Pacific Highway between Ross Lane and the Ewingsdale interchange overpass. During this period a total of 211 accidents were recorded along this section of the existing Pacific Highway.

The accidents included:

- 7 accidents resulting in one or more fatalities.
- 75 accidents resulting in injuries.
- 129 accidents not resulting in injury, but where a vehicle was towed away.

For analysis purposes, the accident data has been separated into two sections within the study area and summarised separately as the existing highway to the north and south of Bangalow exhibits different characteristics in terms of traffic volumes and composition, as well as geometrical features. These sections and the corresponding summary table are:

- Ross Lane to Bangalow (**Table 14**); and
- Bangalow to Ewingsdale (**Table 15**).

A summary of all accidents on the Pacific Highway within the study area (the combination of the above two sections) is presented in **Table 16**. The locations of these accidents within the study area are shown in **Figure 12**.

Table 14 Accidents on the Pacific Highway between Ross Lane and Bangalow

By Severity		By Accident Description	
Severity	**Number of Accidents**	**Description**	**Number of Accidents**
Fatal accidents	2	Pedestrian	1
Injury accidents	34	Vehicles from adjacent directions	8
Tow-away/non-injury accidents	47	Vehicles from opposing directions	13
Total	**83**	Vehicles from same direction	9
		Manoeuvring	1
		Overtaking	1
		On Path (Vehicle - Object)	4
		Off Path (on straight)	10
		Off Path (on curve or turning)	35

Table 15 Accidents on the Pacific Highway between Bangalow and Ewingsdale

By Severity		By Accident Description	
Severity	**Number of Accidents**	**Description**	**Number of Accidents**
Fatal accidents	5	Pedestrian	0
Injury accidents	41	Vehicles from adjacent directions	10
Tow-away/non-injury accidents	82	Vehicles from opposing directions	13
Total	**128**	Vehicles from same direction	17
		Manoeuvring	4
		Overtaking	0
		On Path (Vehicle - Object)	6
		Off Path (on straight)	24
		Off Path (on curve or turning)	53

Table 16 Accidents on the Pacific Highway between Ross Lane and Ewingsdale

By Severity		By Accident Description	
Severity	**Number of Accidents**	**Description**	**Number of Accidents**
Fatal accidents	7	Pedestrian	1
Injury accidents	75	Vehicles from adjacent directions	18
Tow-away/non-injury accidents	129	Vehicles from opposing directions	26
Total	**211**	Vehicles from same direction	26
		Manoeuvring	5
		Overtaking	1
		On Path (Vehicle - Object)	10
		Off Path (on straight)	34
		Off Path (on curve or turning)	88

A summary of the recorded accident data is as follows:

- There were significantly more accidents at the northern end of the study area. For the 6 km section north of Bangalow 128 accidents were reported, compared with 83 accidents for the 13 km section between Ross Lane and Bangalow.
- 3 of the 7 fatal accidents were the result of a head-on collision.
- 5 of the 7 fatal accidents occurred north of Bangalow.
- Speed was a contributing factor to 2 of the 7 fatal accidents while fatigue was a contributing factor to 2 of the remaining 5 fatal accidents.
- The most common accident description was head on collisions, caused by instances other than when overtaking (25 accidents), this was followed closely by accidents as vehicles drove off the carriageway to the left on a right hand bend and colliding with an object or parked vehicle (23).

The accident rate along this section of the highway during the five years, based on 211 accidents and the traffic volumes listed for the RTA Count Stations 04.060 and 04.066 (**Table 1)**, is 36 accidents per 100 Million Vehicle Kilometres (MVK) travelled. This rate is above the state-wide accident rate for a rural 2-lane undivided road of 32.8 accidents per 100 MVK (RTA, 2004). However, the accident rate differs considerably when separating the study area into the two sections; Ross Lane to Bangalow, and Bangalow to Ewingsdale. These rates are 23 accidents per 100 MVK, and 56 accidents per 100 MVK respectively. Factors influencing this disparity include the tighter horizontal geometry north of Bangalow and St Helena Hill (steep grades and sharp curve at the base).

The seven fatal accidents are described below:

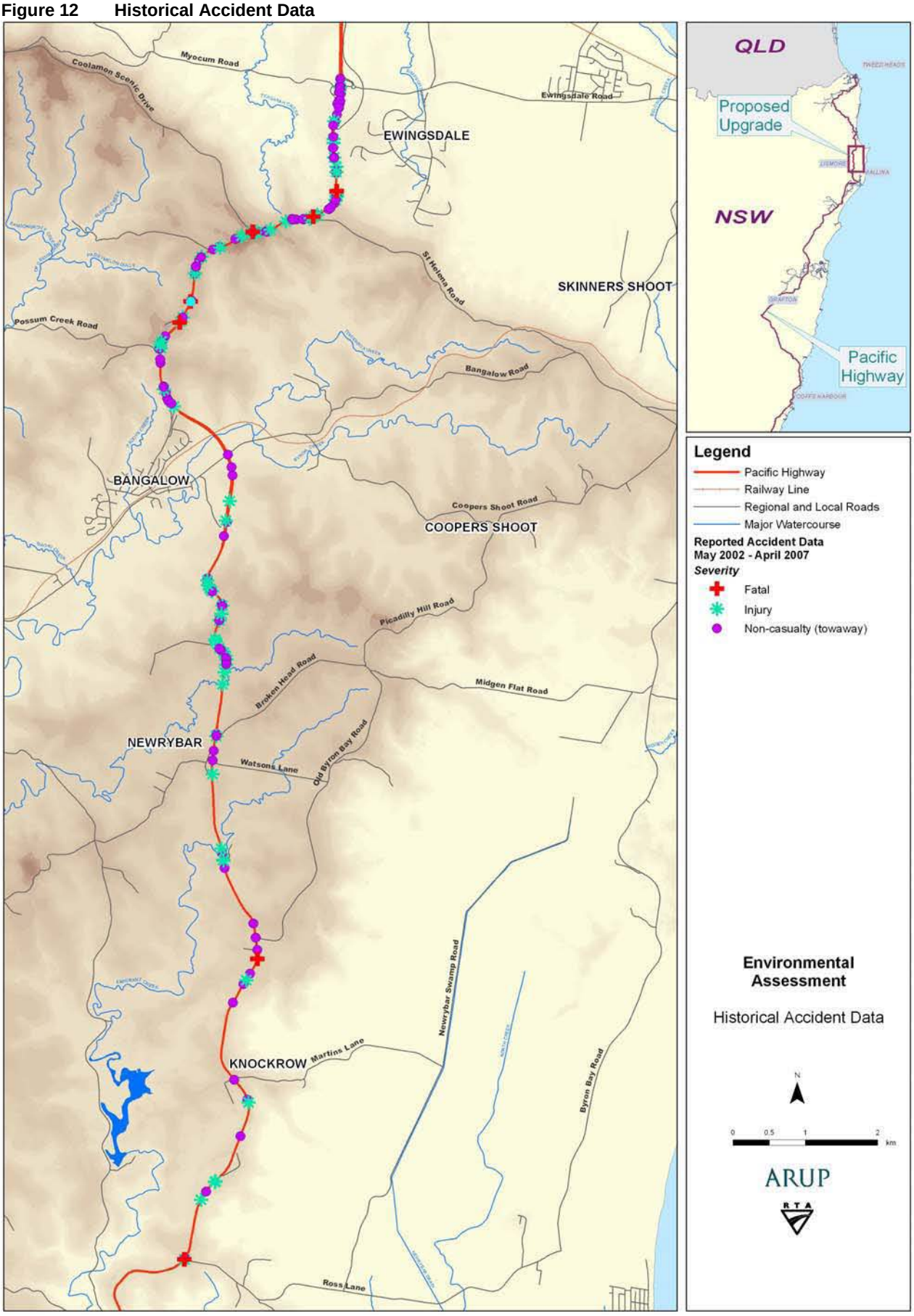
- On the night of 5 September 2002, one person was killed and another injured when a car and an articulated truck were involved in a head-on collision 800 metres south of Fowlers Lane. Fatigue was listed as a factor in the accident.
- On the night of 27 April 2003, one person was killed and another injured when two vehicles collided when a vehicle was emerging from a driveway 1 kilometre north of Granuaille Road. The accident occurred during wet weather.
- On 6 December 2003, one person was killed and six others were injured when two vehicles were involved in a head-on collision 2 kilometres south of Ewingsdale Road. The accident occurred during wet weather and speeding was listed as a factor for the accident.

- On the evening of 5 Feb 2005, a fatal accident occurred at the T-junction of the Pacific Highway with Coolamon Scenic Drive. A motorcycle making a right hand turn was hit by an oncoming vehicle.
- Mid morning on 4 May 2005, a 4WD vehicle lost control while negotiating a moderate left hand bend and crossed onto the wrong side of the road. A fatal head-on collision resulted, 1.5 kilometres south of Ewingsdale Road. The accident occurred on an overcast day, and speed was listed as being a factor.
- On the morning of 6 May 2006, a fatal accident occurred as a vehicle failed to give way, turning onto the Pacific Highway at Ross Lane. The vehicle drove through a give way sign, turning right, and collided with a utility travelling south along the Pacific Highway.
- In the middle of the day on 19 Nov 2006, a fatal accident occurred 300 metres south of Old Byron Bay Road. A 4WD vehicle negotiating a right hand bend, crossed to the other side of the road, where it then left the road and collided with an earth embankment. Only one vehicle was involved in the accident, and fatigue is listed as being a factor.

For the five-year period, approximately 3 percent of reported accidents resulted in a fatality in this section of the Pacific Highway, compared with a state-wide average of 1.0 percent (RTA 2001-2005). The number of casualty accidents per kilometre per annum over this section of the highway was 0.79. This is above the average of 0.68 for the Pacific Highway between Hexham and Tweed Heads (RTA, 1997). This overall highway data is now over ten years old and with more sections of the Pacific Highway upgrading program open to traffic; this casualty number is likely to have reduced.

Based on the costs by crash type (RTA 2005), and the accident data for 2002 – 2007 classified according to the *Definition for Coding Accidents* (Austroads, 2003), accidents on this section of the Pacific Highway are currently costing the community over $6,470,000 per year, or an average of $153,500 per accident.

Figure 12 Historical Accident Data



3 Future Traffic and Road Network

3.1 Traffic Growth

3.1.1 Selected Forecast Years

For the purposes of analysis, a planned opening year of 2012 for the proposed upgrade has been used. It should be noted however that this is a planning date and the actual year of opening will be dependent on project approval and the availability of State and Federal funding.

3.1.2 Highway Traffic Growth Rate

For the Pacific Highway, a forecast traffic growth rate of 3.2 percent has been adopted, based on the "Pacific Highway at Ewingsdale, Predictions of Future Traffic Volumes" report (RoadNet, 2003). A base year of 2004 has been adopted for analysis as this corresponds to the Northern Region RTA traffic counts conducted every three years, as well as the tube counts and origin and destination surveys conducted specifically for this project. When compared with 2003 traffic volumes, 2004 AADT traffic volumes reflect a slightly higher level of traffic growth (around 5 percent growth) than the forecast rate. It is recognised that in the coming years, as a number of the Pacific Highway upgrading projects are completed and opened to traffic (including Tintenbar to Ewingsdale), there will be some transfer of vehicles from other routes (diverted traffic), as well as some induced traffic (new vehicles). This will result in an increase over and above the historical growth rates upon which the 3.2 percent growth rate is based, which will not be sustained in the longer term. To account for this effect, an interim growth rate of 5 percent has been adopted over the 10-year period between 2004 and 2014. The estimation of this growth rate has taken into account a number of factors, including:

- The traffic growth between 2003 and 2004 at Knockrow (approximately 5 percent).
- Transfer of vehicles from Byron Bay Road (The Coast Road) and reduced growth along this route due to faster travel times and regional connectivity of the Pacific Highway as a result of the Ballina bypass and the proposed upgrade.
- Future faster travel times as well as improved road environment and consistency along the Pacific Highway.
- Future growth anticipated within the Ballina Shire, particularly Cumbalum Ridge (Ballina Shire Council, 2006).
- Future growth in South East Queensland and associated tourist traffic (Queensland Government, 2005).

This additional growth does not affect the design hour which uses the base 3.2 percent growth rate (discussed in **Section 2.6**), as it is anticipated that this growth would occur outside of the holiday peak hours.

3.1.3 Ballina Bypass

The proposed Tintenbar to Ewingsdale upgrade interfaces with the Ballina bypass Pacific Highway upgrade to the south. Consideration of the Ballina bypass is relevant to the regional travel patterns to the south as well as local traffic volumes on Ross Lane.

The "*Pacific Highway Ballina Bypass Environmental Impact Statement*" (Connell Wagner, 1998) modelled traffic volumes for major roads in the study area and along each of the bypass options using the 1994 trip table developed for the Richmond Valley Transport Study. A trip table is a matrix of all the origin and destination combinations for trips in the road network. For the "Pacific Highway at Tintenbar" the EIS reported a "base case (no bypass)" volume of 7476 vehicles per day (vpd) in 1994, reducing to 2772 vpd for the preferred option scenario (Connell Wagner, 1998). It is unlikely that given the interchanges at Cumbalum and Ross Lane, there would only be a 63 percent reduction in traffic on the existing alignment. For the purposes of the traffic and economic analysis, it is assumed that there would be around 1500 vpd on the existing highway in 2004 (base year) terms if the Ballina bypass was in place.

For “The Coast Road, south of Lennox Head” the EIS reported a “Base Case (No Bypass)” volume of 5896 vpd in 1994, reducing to 4046 vpd for the preferred option scenario (Connell Wagner, 1998). This represents a reduction and transfer to the Ballina bypass of over 30 percent. The closest RTA temporary count station to the location described above is between Lennox Head and Ross Lane. For the purposes of the traffic and economic analysis, it is anticipated that expected reduction is in the order or 10-15 percent rather than 30 percent at this location. A transfer from The Coast Road to the Ballina bypass of 1000 vpd in 2004 terms has been used; 500 of which would use Ross Lane and the balance (500) travelling to and from Ewingsdale.

3.1.4 Local Traffic Growth

The *Tintenbar to Ewingsdale Route Options Development Report* (RTA 2005c) presents some of the key demographic characteristics of the study area including population growth. Between 1991 and 2001, annual compound population growth in Ballina and Byron Shires was 2.14 percent and 2.86 percent respectively. Background traffic growth on local roads is usually related to the local population growth rates, but is more linear (as opposed to compound) in nature. On this basis a uniform linear growth rate of 2.5 percent has been adopted for local roads in the study area (excluding the existing Pacific Highway and Bangalow Road west where 3.2 percent has been used). It is anticipated that the local growth that will be generated by Ballina Shire Council’s Cumbalum Development Strategy is accounted for within this traffic growth estimate, particularly with a long lead time and likely staged development.

3.1.5 Future Highway Traffic Volumes

AADT and AADV volumes at RTA count stations south and north of Bangalow have been forecast for 2012, 2022, 2032 and 2042 (**Table 17)**. These represent traffic volumes on the existing highway with no major upgrade. These volumes indicate that current traffic volumes will have doubled by approximately 2032.

Table 17 Forecast Traffic Volumes – No Upgrade

	South of Bangalow (Knockrow)		North of Bangalow (south of Ewingsdale)	
Forecast Year	**AADT**	**AADV**	**AADT**	**AADV**
2004 (Base)	13,516*	11,450	19,426*	16,500
2012	17,800	15,050	25,200	21,350
2022	22,300	18,900	31,600	26,800
2032	26,850	22,750	38,050	32,250
2042	31,400	26,600	44,450	37,650

**AADT as recorded at RTA Count Station 04.060 & 04.066*

3.2 Proposed Upgrade Concept Design

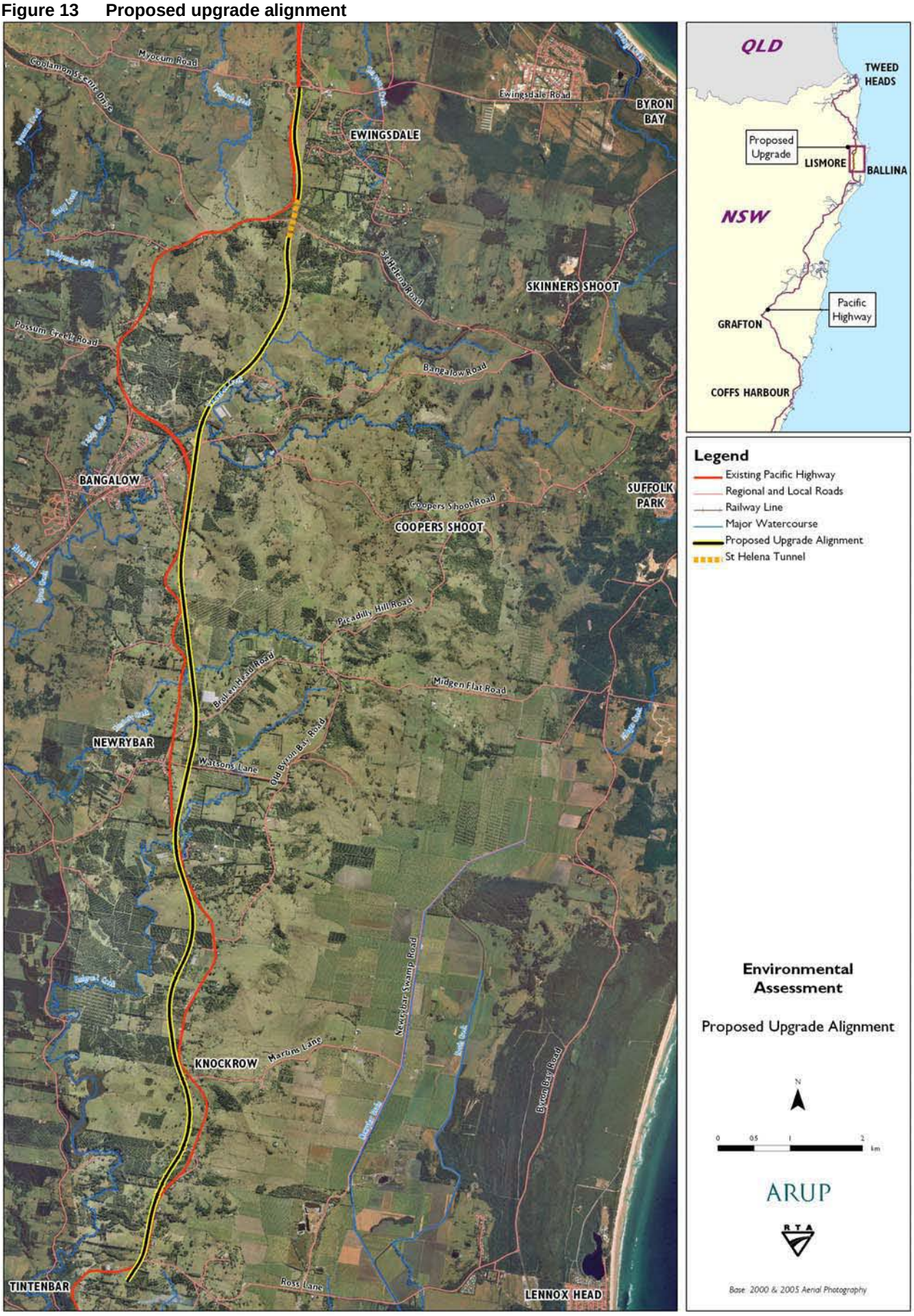
The length of the proposed upgrade would be approximately 17 km starting at Ross Lane (**Figure 13**) in Tintenbar and extending to the north to the existing Ewingsdale interchange, near the settlement of Ewingsdale. At Ross Lane, the proposed upgrade would connect to the north end of the Ballina bypass. Generally the proposed upgrade would be in close proximity to existing highway corridor from Ross Lane to the Bangalow bypass. The existing highway would be maintained for local and regional traffic.

From Bangalow, the proposed upgrade would diverge away from the Bangalow bypass to the northeast through Tinderbox valley. From there, the proposed upgrade would avoid the steep grades of St Helena Hill by way of a tunnel approximately 340 m long. North of the tunnel, the proposed upgrade alignment is located immediately to the east of the existing highway before tying into the Ewingsdale interchange.

The general features of the proposed upgrade would be:

- Four-lane divided carriageways, with a wide median allowing for the future addition of a third lane in each direction.
- Class M standard over the full length of the proposed upgrade. In accordance with the RTA's Pacific Highway Design Guidelines, 'Class M' projects are designed to 110 km/h (posted speed) freeway standard. This means a controlled access road with divided carriageways, no access for traffic between interchanges, grade separation at all intersections and alternative routes available for local traffic through the provision of service roads or local arterial road networks.
- Two bridges carrying local roads over the proposed upgrade, one for Broken Head Road and one about 500 m north of Lawlers Lane providing access to several properties east of the upgrade. Protection screens would be provided on both bridges.
- Emergency u-turn and median crossovers at about 2.5 km intervals. These facilities incorporate lay-bys where vehicles could safely pull off the upgraded highway.
- Medians and outer verges, including safety barriers where required.
- Relatively flat gradients compared to the existing highway, with the maximum grade just south of Bangalow being approximately 5.4% over 1300 metres. There would also be a 4.4% grade over almost 2 km on the north side of the tunnel. An additional southbound climbing lane would be provided in both sections so that slow moving trucks would not be a significant safety hazard to other vehicles.
- The existing highway would be retained as a continuous road for local and regional traffic. It is further anticipated that between Ross Lane and Bangalow the existing highway would be handed over to the councils. Between Bangalow and Ewingsdale the existing highway would continue to function as a regional link between Lismore / Bangalow and the north and would be retained by RTA.
- Two significant diversions of the existing highway are proposed to retain it as a continuous local road. The first is just north of Emigrant Creek where the existing highway would be diverted underneath the bridge taking the proposed upgrade over Emigrant Creek. The other diversion is where the existing highway south of the Ewingsdale interchange is being diverted to a roundabout on the western side of the interchange.

Figure 13 Proposed upgrade alignment



3.3 Proposed Upgrade Level of Service

The design hour traffic (30th HHV) is calculated based on the assumptions discussed in the previous sections including a growth rate of 3.2 percent. While lower traffic volumes would be expected on the proposed upgrade compared to the current traffic levels on the existing highway (due to future traffic being split between the existing highway and the proposed upgrade), the Design Hour Volume (DHV) has not been adjusted. This provides a conservative estimate and accounts for the higher levels of through traffic generally exhibited during holiday periods. Level of Service (LoS) of the highway is calculated based on the Highway Capacity Manual (TRB, 2000). The forecast LoS at selected years is presented in **Table 18**.

With two lanes in each direction, it is predicted that the proposed upgrade would operate at LoS B in 2012 and reach LoS C during 2033, 21 years after the nominal opening year 2012. As these traffic conditions are for the 30th HHV, it should be noted that traffic conditions throughout the year will generally be lighter than the design hour.

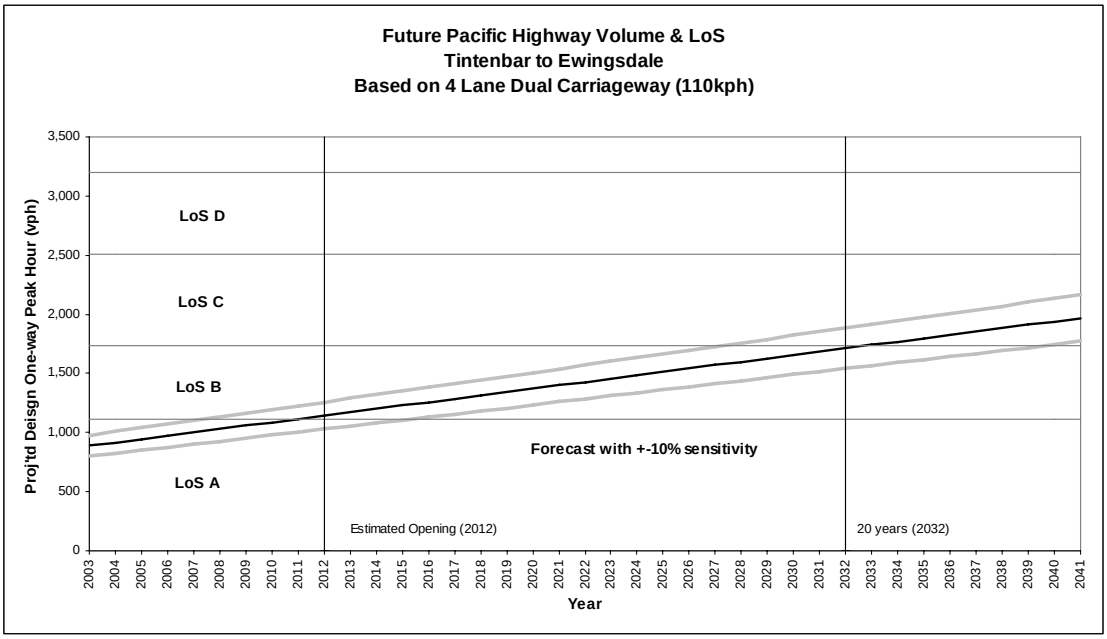
Table 18 Level of Service 2003 – 2042 for Upgraded 110km/h Highway

Year	One-way peak hr (veh)	LoS	Sensitivity Tests			
			-10 percent (2.9 percent)	LoS	+10 percent (3.5 percent)	LoS
2003 (Base)	888	-	-	-	-	-
2012	1,144	B	1,258	B	1,029	B
2022	1,428	B	1,570	B	1,285	B
2032	1,712	B	1,883	C	1,541	B
2042	1,996	C	2,195	C	1,796	C

The sensitivity analysis indicates that with a 10 percent increase in traffic (equivalent to a linear growth rate of 3.5 percent) above the projected increase, the upgraded highway would still operate at LoS C in 2042, 30 years after opening.

Figure 14 shows the increase in traffic flow and the forecast LoS during the design hour for the proposed upgrade.

Figure 14 Upgraded Highway Level of Service during the design hour



Classified hourly counts in the vicinity of Old Byron Road during a week in November 2004 were analysed to assess the distribution of heavy vehicles and total vehicles through the day. The 2012 forecast distribution of total traffic and corresponding proportion of heavy vehicles for 24 hours, based on the 2004 data is shown in **Table 19**. The forecast hourly distribution of heavy vehicles on an average day in 2012 is also shown in **Table 19** and in **Figure 15**, **Figure 16**, and **Figure 17**.

Table 19 Hourly Distribution and Heavy Vehicle Pattern

Hour	Hourly flow as a proportion of Daily Traffic flow	2012 opening year forecast								
		Ross Lane to Ivy Lane			Ivy Lane to Bangalow			Bangalow to Ewingsdale		
		% heavy vehicles	No. heavy vehicles	No. total vehicles	% heavy vehicles	No. heavy vehicles	No. total vehicles	% heavy vehicles	No. heavy vehicles	No. total vehicles
0	0.8%	50%	58	116	49%	59	121	53%	56	105
1	0.5%	60%	44	73	59%	44	76	64%	42	66
2	0.6%	60%	53	87	59%	53	91	64%	51	79
3	0.6%	65%	56	87	63%	57	91	69%	54	79
4	1.0%	54%	78	145	52%	79	151	57%	75	131
5	1.9%	40%	110	276	39%	112	287	42%	106	249
6	3.5%	24%	122	508	24%	124	529	26%	117	459
7	5.4%	15%	118	783	15%	120	815	16%	114	707
8	7.0%	12%	121	1015	12%	123	1057	13%	116	917
9	6.8%	11%	107	986	11%	109	1027	12%	103	891
10	6.9%	10%	101	1001	10%	103	1042	11%	97	904
11	6.7%	11%	103	972	10%	105	1012	11%	99	878
12	7.0%	11%	111	1015	11%	113	1057	12%	107	917
13	7.1%	11%	111	1030	11%	113	1072	11%	107	930
14	7.4%	12%	127	1073	12%	129	1117	13%	122	969
15	7.9%	11%	122	1146	10%	124	1193	11%	118	1035
16	7.6%	11%	118	1102	10%	120	1148	11%	113	996
17	6.3%	11%	98	914	10%	100	951	11%	94	825
18	4.3%	15%	95	624	15%	97	649	16%	91	563
19	3.3%	20%	95	479	19%	96	498	21%	91	432
20	2.5%	28%	100	363	27%	102	378	29%	97	328
21	2.1%	37%	111	305	36%	113	317	39%	107	275
22	1.6%	41%	94	232	40%	96	242	43%	90	210
23	1.1%	48%	77	160	47%	78	166	51%	74	144
AADV	**100%**	**16%**	**2330**	**14500**	**16%**	**2370**	**15100**	**17%**	**2240**	**13100**

3.4 Proposed upgrade Traffic Volumes

Forecast future traffic volumes for the proposed upgrade, based on the growth discussions in **Section 3.1**, are presented in **Table 20**.

Table 20 Forecast Daily Traffic Volumes (vehicles)

Forecast Year	Between Ross Lane and Ivy Lane					
	Existing Highway			Upgraded Highway		
	Light	Heavy	Total	Light	Heavy	Total
2006	1,490	110	1,600	9,590	1,910	11,500
2012	1,750	130	1,880	12,170	2,330	14,500
2022	2,190	170	2,360	15,300	2,850	18,150
2032	2,640	200	2,840	18,170	3,380	21,550
2042	3,090	230	3,320	21,000	3,900	24,900
Forecast Year	Between Ivy Lane and Bangalow					
	Existing Highway			Upgraded Highway		
	Light	Heavy	Total	Light	Heavy	Total
2006	990	70	1,060	10,100	1,950	12,050
2012	1,170	90	1,260	12,730	2,370	15,100
2022	1,470	110	1,580	16,040	2,910	18,950
2032	1,770	130	1,900	19,050	3,450	22,500
2042	2,060	160	2,220	22,030	3,970	26,000
Forecast Year	Between Bangalow and Ewingsdale					
	Existing Highway			Upgraded Highway		
	Light	Heavy	Total	Light	Heavy	Total
2006	7,460	630	8,090	8,520	1,830	10,350
2012	8,810	740	9,550	10,860	2,240	13,100
2022	11,050	930	11,980	13,710	2,740	16,450
2032	13,290	1,120	14,410	16,210	3,240	19,450
2042	15,530	1,310	16,840	18,720	3,730	22,450

Figure 15, **Figure 16** and **Figure 17** show the year 2012 expected hourly volumes on the upgraded highway between Ross Lane and Ivy Lane, Ivy Lane and Bangalow, and Bangalow and Ewingsdale respectively for both light and heavy vehicles. Due to the traffic split between the proposed upgrade and the existing highway north of Bangalow, the proportion of heavy vehicles in the traffic stream would increase to around 17 percent or 2240 vehicles in 2012. The relatively low overall volume of traffic using the existing highway south of Bangalow does not affect the percentage of heavy vehicles on the upgraded highway at around 16 percent.

3.5 Proposed Upgrade Travel Times

An assessment of the potential travel time savings for the proposed upgrade has been undertaken by comparing theoretical travel times under free-flow conditions on the existing highway and proposed upgrade. For light vehicles, this is the distance travelled divided by the relevant speed limit (a combination of 60km/h, 80km/h and 100km/h for the existing highway, and 110km/h for the proposed upgrade). For heavy vehicles, the travel times have been adjusted for the terrain based on the acceleration and deceleration curves given in the *Pacific Highway Design Guidelines* (RTA, 2005b).

Typical travel time savings for this section of the highway would be at least 2.5 minutes for trucks and 2 minutes for cars when compared with travel on the existing highway. As these savings are based on free-flow traffic calculations, they represent a minimum expected travel time saving as travel times on single-lane sections of the existing highway are influenced by the percentage time spent following another vehicle. The time saving would also be expected to be greater in peak holiday times and would increase through time as traffic volumes increase, as the performance of the existing highway reduces markedly when experiencing higher traffic volumes.

3.6 Existing Highway Operation

Following construction of the upgraded highway, the existing Pacific Highway would become part of the regional road network. To the north of Bangalow, the existing highway would still carry significant traffic volumes. Traffic travelling between areas north of Bangalow and Lismore via Bangalow Road would use the existing highway and travel through the Ewingsdale interchange for access to the Pacific Highway further north. Based on current travel patterns, just under 45 percent of the existing volume will still use the existing Pacific Highway north of Bangalow. **Table 21** shows the forecast Level of Service on the existing Pacific Highway, after the proposed upgrade. With the upgraded highway in place, the existing highway south of Bangalow is forecast to operate at Level of Service A until 2032, 20 years after the nominal opening year. In 2032, the existing highway north of Bangalow is forecast to operate at Level of Service C which is considered acceptable. With the proposed upgrade, the forecast future levels of service during peak times on the existing highway represent a significant improvement over the levels of service shown in **Table 9**. If no upgrade was to occur, the existing highway is forecast to operate at Level of Service E (at or close to capacity) during peak times.

Table 21 Existing Highway Level of Service Post-Upgrade

Forecast Year	Ross Lane and Ivy Lane		Ivy Lane to Bangalow		Bangalow to Ewingsdale	
	Two-way peak hour (vehicles)	Level of Service	Two-way peak hour (vehicles)	Level of Service	Two-way peak hour (vehicles)	Level of Service
2006	190	-	130	-	970	-
2012	230	A	150	A	1150	B/C
2022	280	A	190	A	1440	C
2032	340	A/B	230	A	1730	C
2042	400	B	270	A	2020	D

North of Bangalow, heavy vehicle traffic usage of the existing highway would be significantly reduced. At present the approved B-double route for vehicles up to 26 metres is via the existing Pacific Highway. The B-double route would transfer to the upgraded highway and other regional through truck traffic would also choose to use the upgraded highway. The reduction of heavy vehicle traffic on the existing highway would be particularly noticeable at night-time when noise can be a major concern.

Figure 18, **Figure 19** and **Figure 20** show the year 2012 forecast hourly volumes on the existing highway between Ross Lane and Ivy Lane, Ivy Lane and Bangalow, and Bangalow and Ewingsdale,

for both light and heavy vehicles. Currently just under 30 percent of daily heavy vehicles or approximately 640 heavy vehicles per day (2006) travel on the existing highway during the night-time hours of 10pm to 7am. This would drop to less than 20 percent or 125 heavy vehicles per day (2012) travelling at night on the existing highway.

Heavy vehicle proportions on the existing highway north of Bangalow would be similar to Bangalow Road west (around 8 percent of daily traffic) as traffic on the existing highway would comprise traffic connecting to and from Bangalow Road, as well as tourist and local traffic. Approximately 60 percent of all heavy vehicles (or just under 5 percent of total vehicles) would be rigid trucks of 3 axles or less. Heavy vehicle proportions south of Bangalow, where the forecast traffic volumes are lower, would be around 7 percent of daily traffic.

Figure 15 Hourly Distribution, Upgraded Highway (2012) between Ross Lane and Ivy Lane

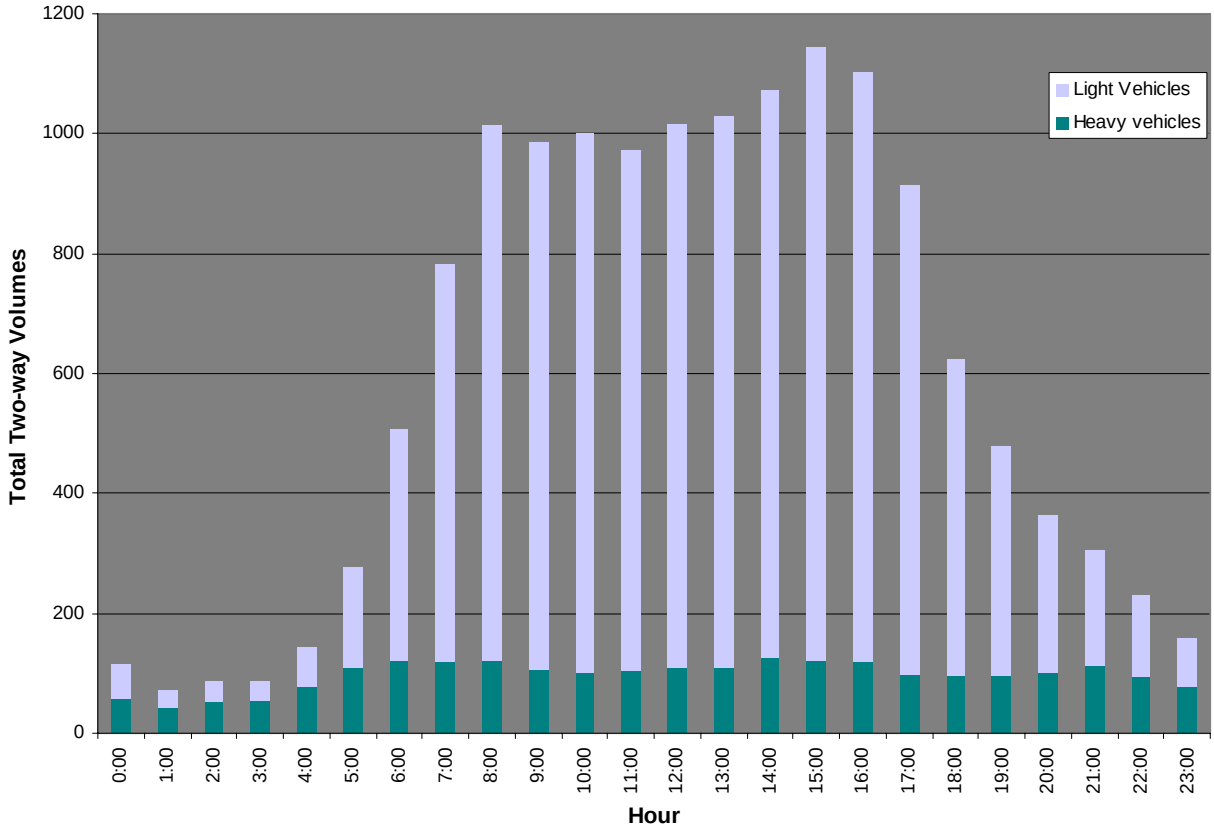


Figure 16 Hourly Distribution, Upgraded Highway (2012) between Ivy Lane and Bangalow

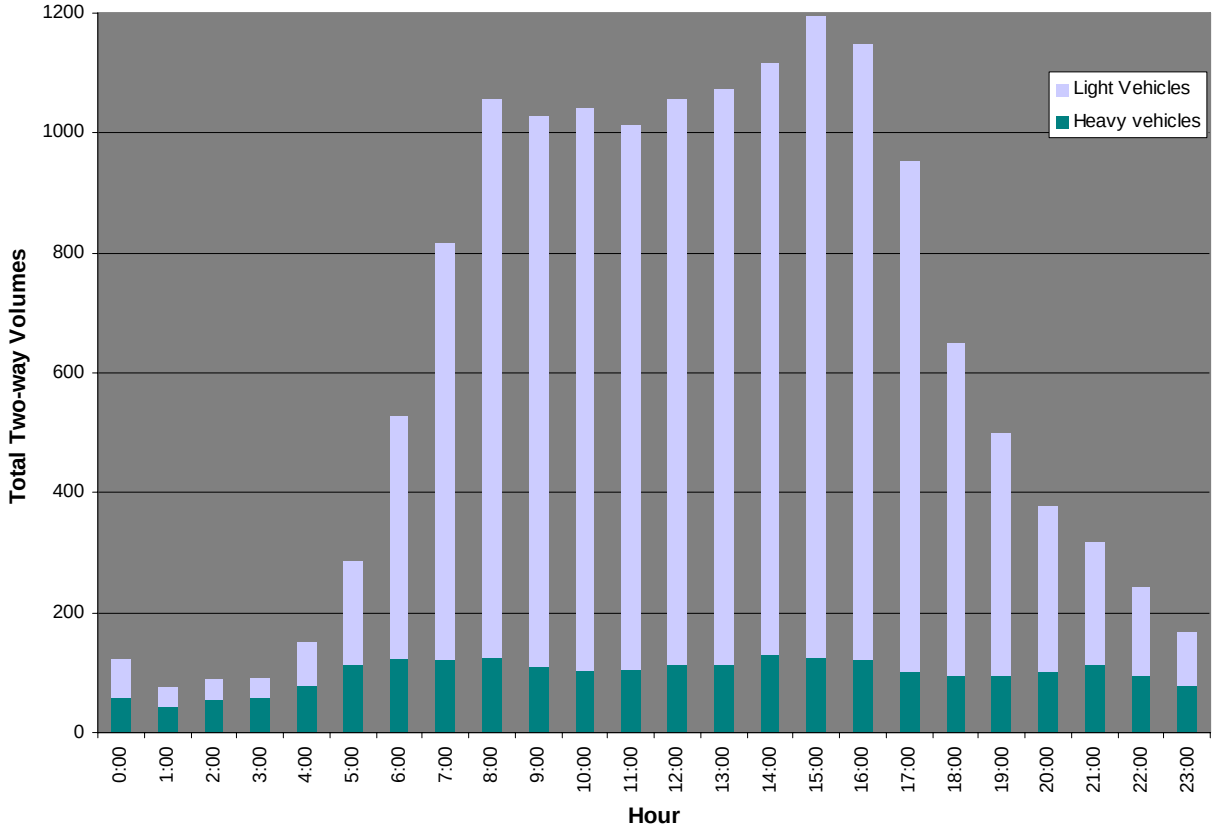


Figure 17 Hourly Distribution, Upgraded Highway (2012) between Bangalow and Ewingsdale

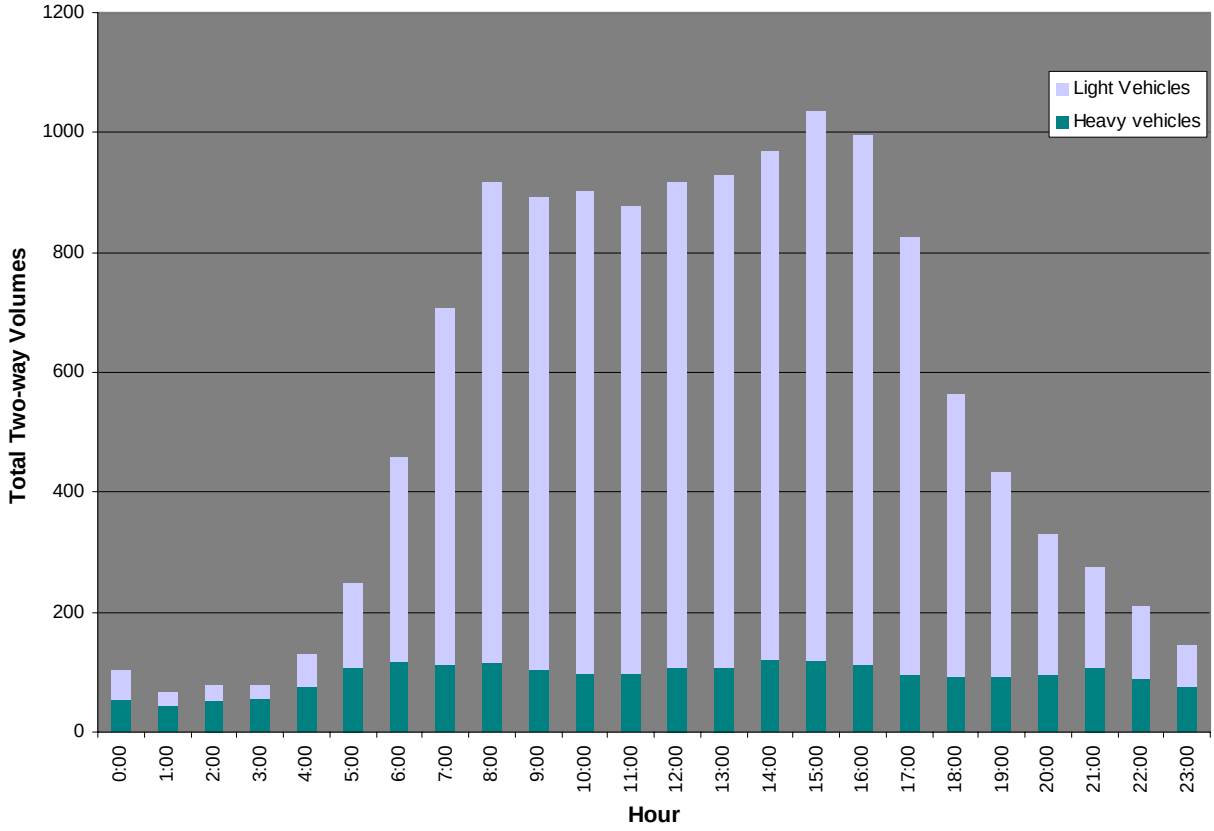


Figure 18 Hourly Distribution, Existing Highway (2012) between Ross Lane and Ivy Lane

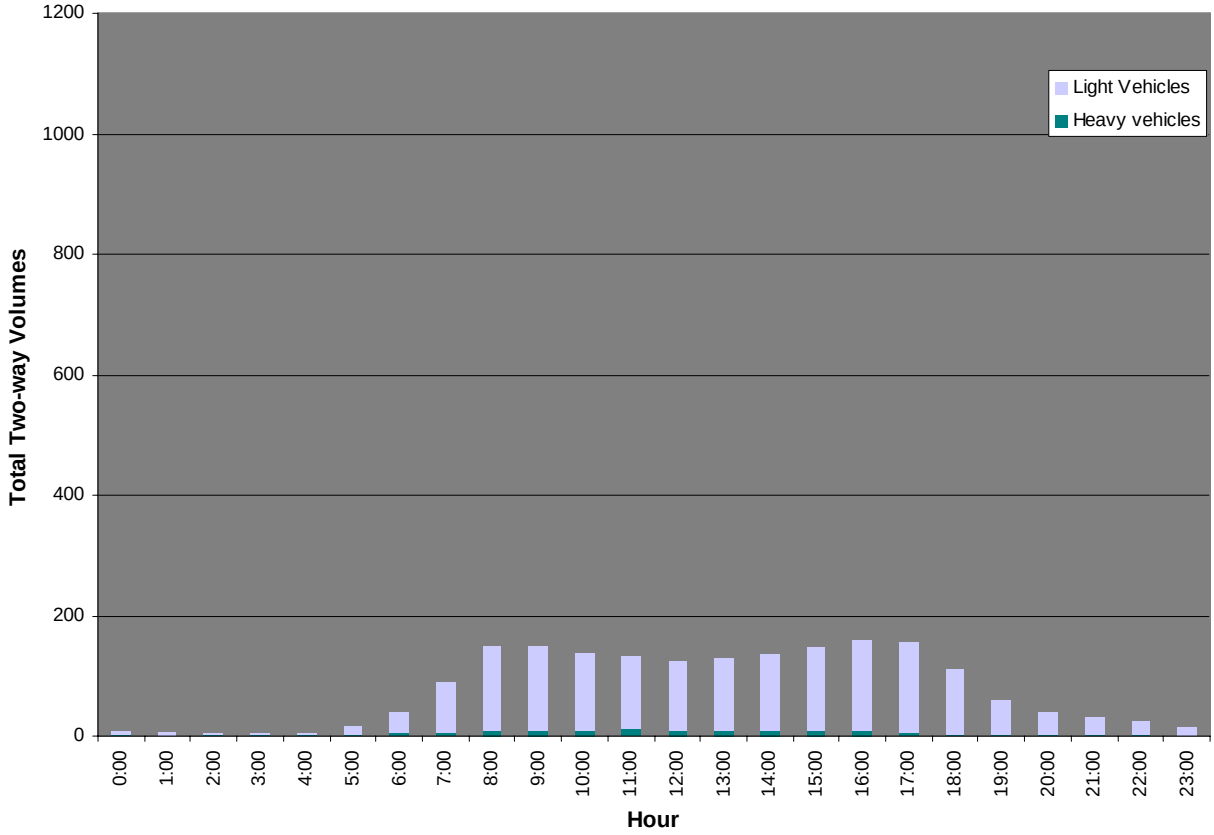


Figure 19 Hourly Distribution, Existing Highway (2012) between Ivy Lane and Bangalow

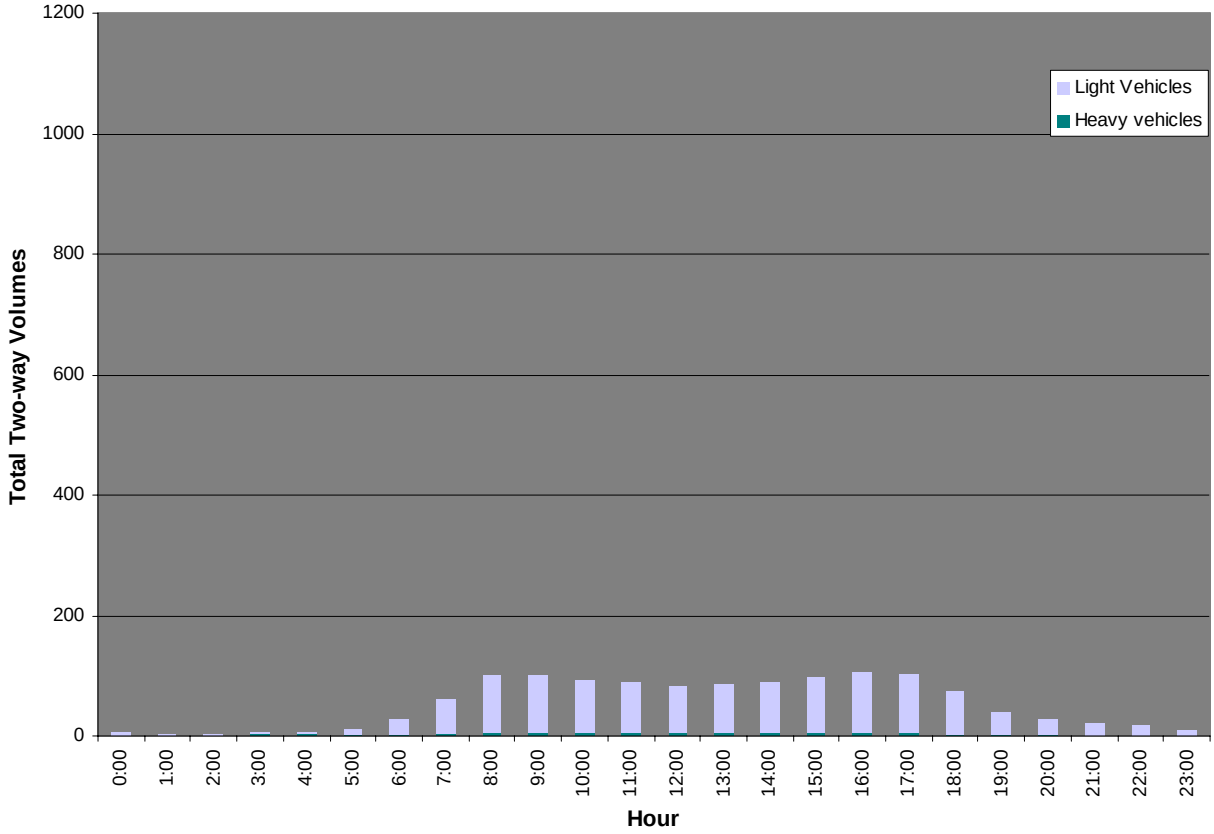
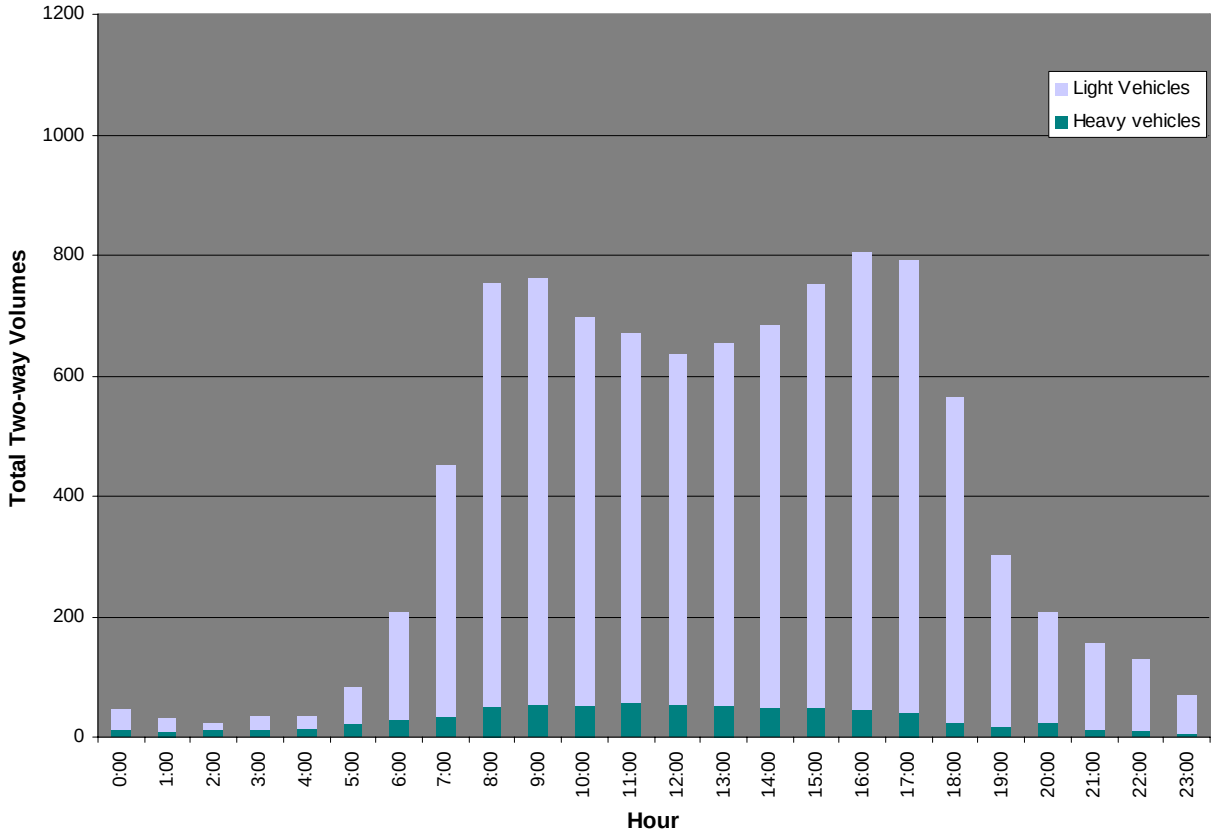


Figure 20 Hourly Distribution, Existing Highway (2012) between Bangalow and Ewingsdale



3.7 Interchanges and Intersections

The design standards being applied to this section of the highway do not permit traffic access to the highway other than via grade separated intersections. Four interchanges are proposed along the length of the preferred route. These are:

- Ross Lane (diamond interchange in conjunction with the Ballina bypass)
- Ivy Lane (half-diamond interchange)
- Bangalow Road (half-diamond interchange)
- Ewingsdale Road and Myocum Road (modification of existing Ewingsdale interchange)

3.7.1 Ross Lane Interchange

At the southern end of the project, a full diamond interchange would be provided at Ross Lane. The interchange is a diamond layout type with a roundabout located on each side at the ramp terminations. The bulk of the interchange would be constructed as part of the adjacent Ballina bypass project to the south with the associated tie-in works to the existing highway. The construction of the proposed upgrade would involve the addition of north-facing ramps as shown in **Figure 21**.

The roundabout on the west side would connect to the existing highway, providing local access to the south. The roundabout on the east side would connect to Ross Lane and to the existing highway providing local access to the north. The two roundabouts are connected by a bridge above the upgraded highway that would be constructed as part of the Ballina bypass. To allow the upgraded highway to be constructed as close as possible to the west side of the existing highway the southbound off-ramp would connect to the existing highway about 1 km north of Ross Lane, with local traffic able to follow the existing highway to access Ross Lane and Tintenbar.

The existing highway would be integrated with the interchange to allow direct access for vehicles entering or leaving the upgraded highway. As such, through vehicles on the existing highway would be required to travel through the interchange to continue north or south.

3.7.2 Ivy Lane Interchange

At Ivy Lane a half-diamond interchange with north-facing ramps would be provided (**Figure 22)**. This half interchange would provide access between the local road network and the proposed upgrade to the north. There would be an underpass with roundabouts on both sides of the interchange connecting to the north facing ramps. The underpass would also provide access across the proposed upgrade to replace the severed Ivy Lane. The roundabout on the east side would be connected to the existing highway at the existing Ivy Lane intersection, which would be upgraded to cater for the increased traffic volumes.

The key role of this interchange is to provide local access to the Knockrow area, including the local tourist attraction of Macadamia Castle. The expected daily traffic volume would be comparatively low. Forecast 2032 volumes are approximately 430 vehicles per day on each of the two ramps. The proposed roundabouts would provide a good level of service this traffic.

3.7.3 Bangalow Interchange

At Bangalow a half-diamond interchange with south-facing ramps would be provided as shown in **Figure 23**. This half interchange would provide access between the local road network, including Bangalow and Lismore, and the upgraded highway to the south. The upgrade would pass above Bangalow Road on twin bridges. Ramps to and from the upgraded highway would connect to Bangalow Road. A roundabout on the west side of the Upgrade would allow continued access to the Bangalow bypass to the north.

The existing Bangalow bypass ramps to Bangalow Road would be removed and their function replaced by:

- a connection from the above roundabout to Bangalow Road, servicing traffic travelling to and from the south on the existing highway, as well as new northbound off-ramp; and
- a new southbound on-ramp to the west of the upgraded highway

The key traffic movements at the interchange will be the northbound off-ramp traffic turning right at the interchange roundabout then left onto Bangalow Road, as well as Bangalow Road traffic turning right onto the southbound on-ramp. As traffic volumes on Bangalow Road to the west of the interchange are low, turning movements associated with the interchange occur generally unopposed, resulting in a good level of service. The interchange roundabout has been modelled using the SIDRA intersection analysis software (version 3.1) for 2032, and operates at LoS A with a maximum average delay of 11.8 seconds for southbound existing highway through movement.

3.7.4 Ewingsdale Interchange

The existing Ewingsdale interchange would be improved as part of the proposed upgrade. The proposed layout is shown in **Figure 24**. As the proposed upgrade merges onto the existing highway, the existing highway traffic would be diverted to the west onto a new connection road that would connect to a new roundabout on the west side of the existing interchange. A new northbound off-ramp would be provided. A new direct southbound on-ramp is proposed to replace the existing loop for improved safety and readability of the interchange.

As discussed in **Section 2.4**, surveys were conducted in December 2006 and January 2007 to understand the existing traffic patterns and conditions in the vicinity of the Ewingsdale interchange. This data comprised an origin and destination survey undertaken over a 48-hour period capturing all approach and departure legs of the interchange (Friday 8 December and Saturday 9 December 2006), as well as tube counts on all approaches to the interchange for two weeks over the Christmas / New Year period commencing Monday 25 December, 2006.

A supplementary study entitled the *Ewingsdale Interchange Traffic Assessment* (Arup, 2008) was undertaken to evaluate a series of options and the future layout requirements of the interchange to

achieve a LoS C in 2032. This report is included in **Appendix B**. The interchange layout proposed as part of the upgraded highway achieves an overall LoS A for the eastern roundabout and LoS B for the western roundabout (**Table 22**), which is considered acceptable.

Table 22 Ewingsdale Interchange Analysis Results

Location	LoS	Degree of Saturation	Average Delay	Max. Delay	Max. Delay Movement	Max. 95 Percent Queue	Max 95 Percent Queue Movement
Eastern Intersection	A	0.713	9.5 sec	13.5 sec	SB off ramp, RT	72m	Ewingsdale E, Thru
Western Intersection	B	0.893	15.8 sec	22.2 sec	Ewingsdale, LT	140m	Ewingsdale E, LT

3.7.5 Assessment of Additional Interchange Locations

The current connections to the existing highway carrying significant traffic volumes (derived from 2004 origin and destination surveys) include:

- Bangalow north (approximately 7000 vehicles per day (vpd))
- Bangalow south (approximately 2000 vpd)
- Coolamon Scenic Drive (approximately 1150 vpd)
- Broken Head Road (1000 vpd)

Opportunities for north-facing ramps at the Bangalow interchange have been investigated, however, this would result in additional traffic passing through the main street of Bangalow (in excess of 7000 vpd) rather than travelling on Granuaille Road. It is considered that this would negatively impact the Bangalow town centre. In addition to this, drivers may be more inclined to use Bangalow Road to travel to Byron Bay, particularly if Ewingsdale Road is busy when travelling from the north, or as a seemingly more direct route when travelling from the south. Bangalow Road is not suitable for carrying additional traffic between the existing interchange and St Helena Road.

Traffic volumes on all other roads within the study area can be adequately serviced by the existing highway and do not justify the consideration of additional interchanges or access points within the study area. It is anticipated that the existing highway (with suitable minor treatment) would provide a suitable standard and level of service for local road users.

Figure 21 Ross Lane Interchange

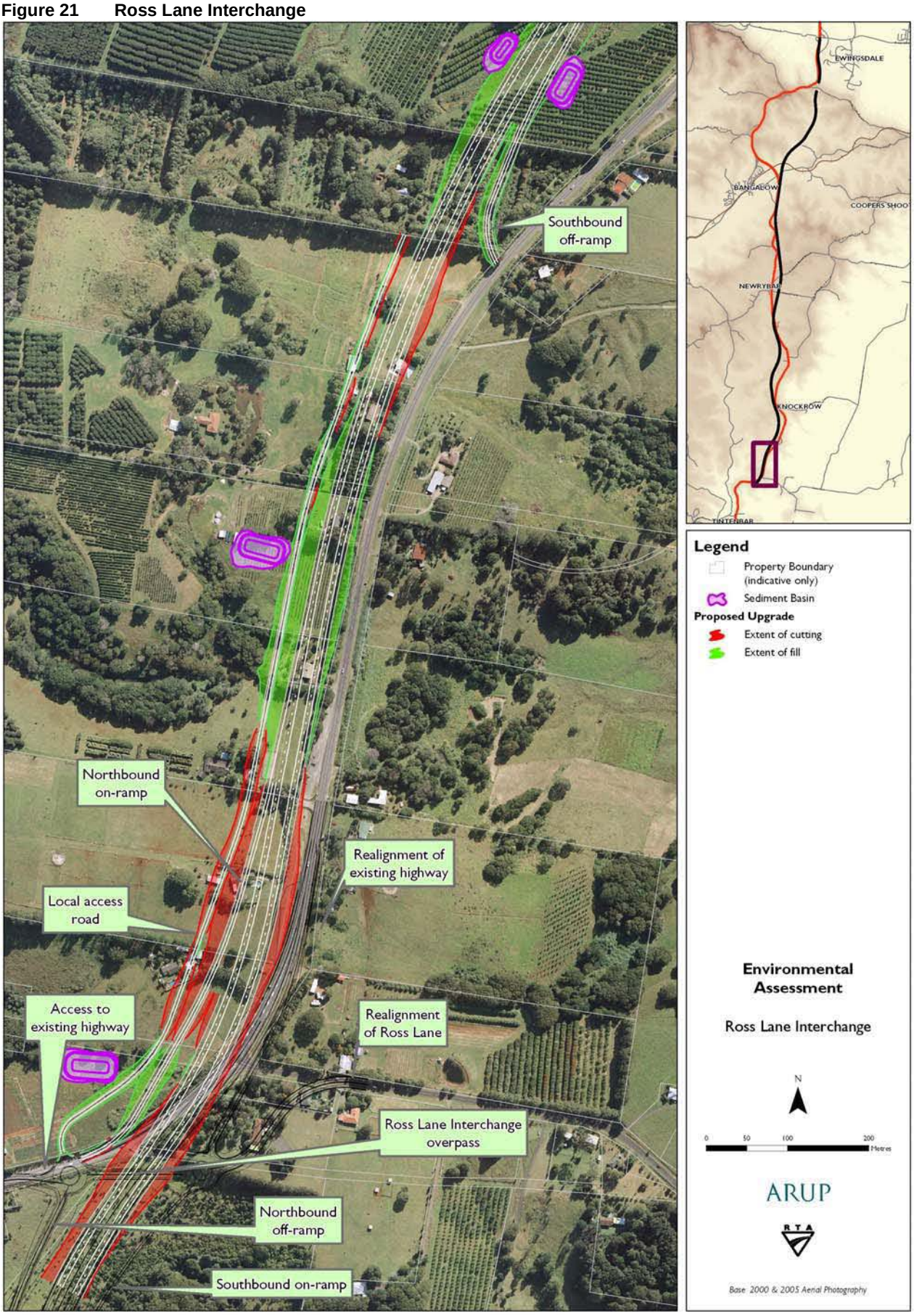


Figure 22 Ivy Lane Interchange

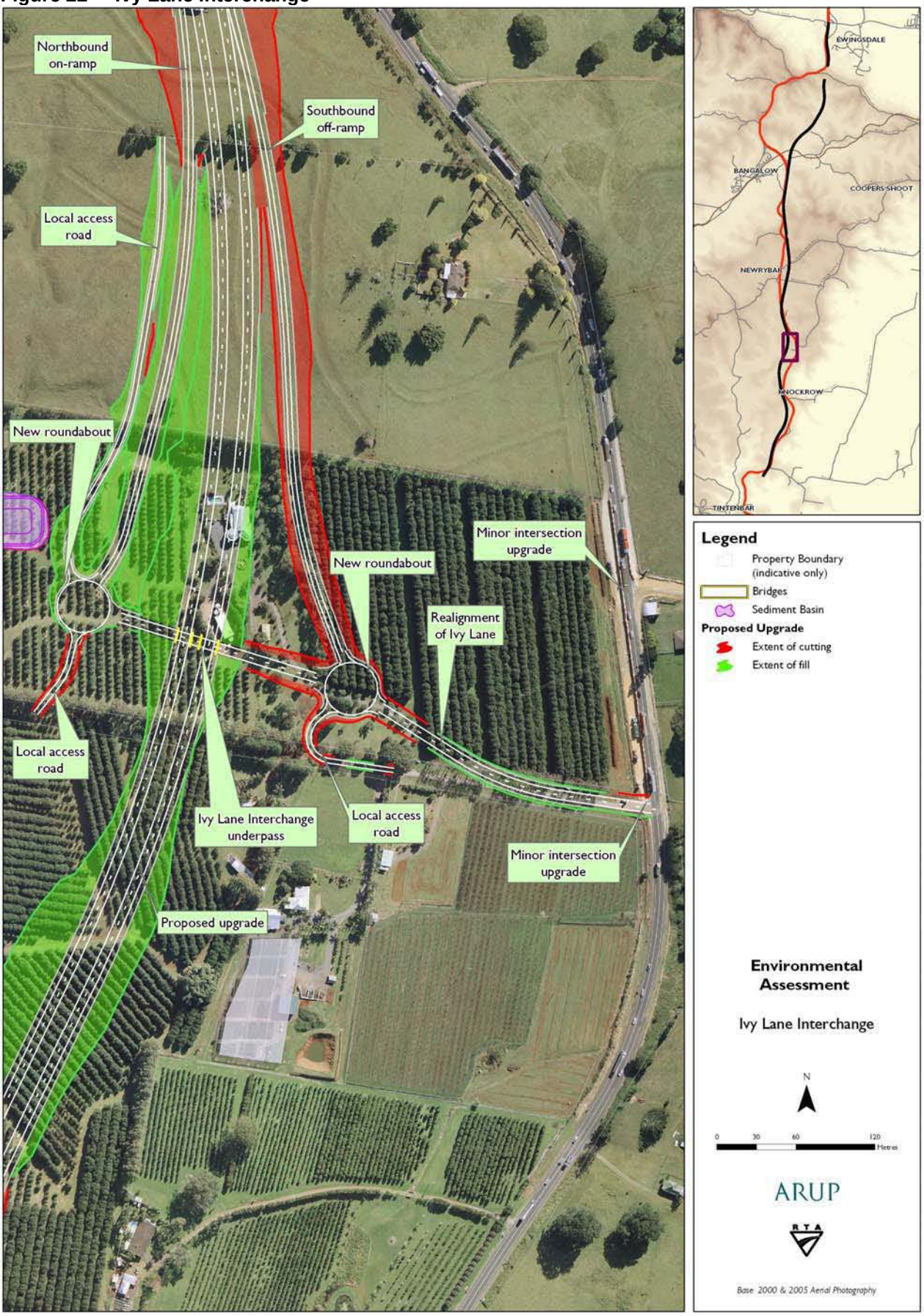


Figure 23 Bangalow Interchange

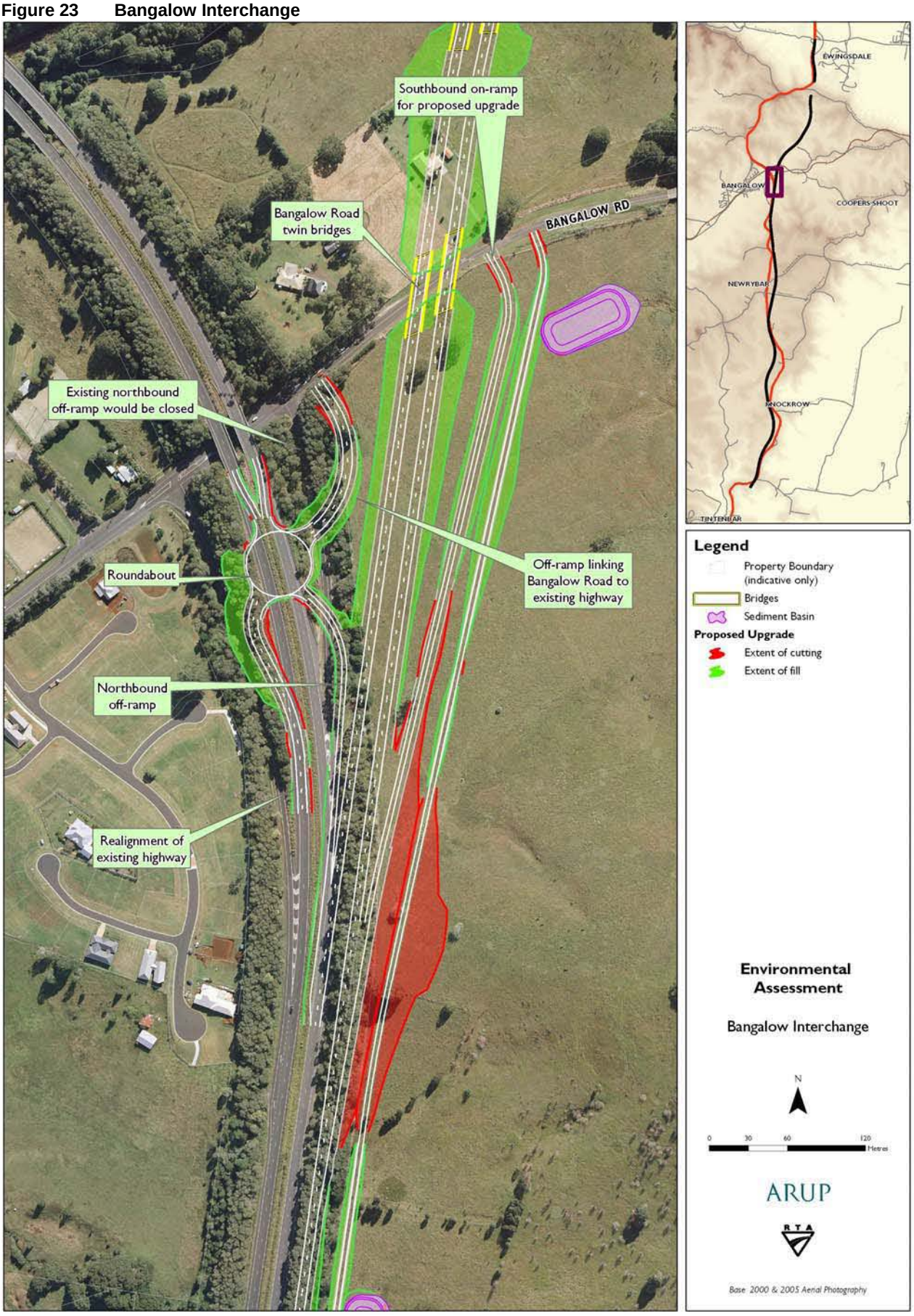
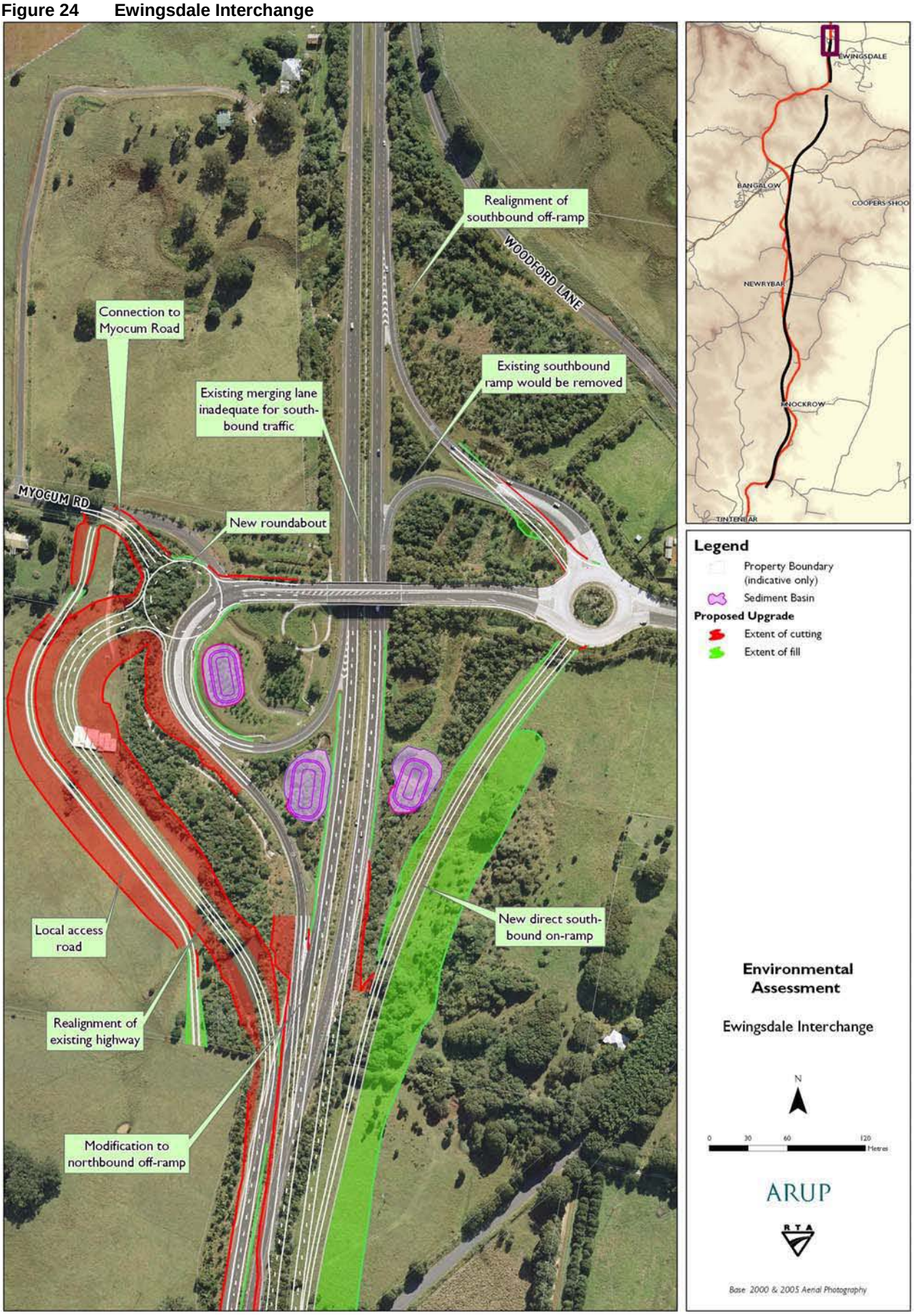


Figure 24 Ewingsdale Interchange



3.8 Local Access and Travel Patterns

3.8.1 Local Access Concept

As discussed in **Section 3.7**, the proposed upgrade would intersect a number of local roads where access to the upgraded highway would not be provided. In accordance with the *Pacific Highway Design Guidelines* (RTA, 2005b) these local roads have been treated by either providing grade separation in the form of an overpass or underpass, or terminating the local road and providing an access road linking to another nearby local road with grade separation. This treatment would ensure that impacts on local access routes and connectivity are minimal.

In addition to connectivity of the local road network, where the upgraded highway severs existing property access to the existing highway or local roads, service roads have been provided to connect intersecting roads and property accesses, as well as providing local north / south connections. The details of individual access for affected properties has been developed in consultation with the relevant property owner(s).

The resulting concept design of the local road network for the upgraded highway is displayed in **Figure 25**. The proposed access arrangements for the local roads intersected by the upgraded highway is summarised in **Table 23**.

Table 23 Local Road Treatments

Local Road	**Treatment**
Ross Lane	Full diamond interchange.
Martins Lane East	Access road with underpass connection to existing highway approximately 550m south of Martins Lane.
Ivy Lane	Half-diamond interchange (north-facing ramps) with access maintained to western properties through the interchange to the existing highway.
Existing highway at Emigrant Creek	Localised realignment of existing highway and provision of an underpass of the upgraded highway.
Watsons Lane	Remaining open with an underpass.
Broken Head Road	Overpass of the upgraded highway.
Bangalow Road	Half-diamond interchange (north-facing ramps) and underpass of the ungraded highway.
Tinderbox Road	Localised diversion south-west to an underpass location.
St Helena Road	Existing road maintained – passes above tunnel.
Ewingsdale Road	Modification of existing interchange.

3.8.2 Future Local Traffic Volumes

Forecast traffic volumes for local roads have been calculated in current terms (2006 traffic volumes) and are presented in **Table 24**. These include an allowance for additional traffic on Ross Lane due to the construction of the approved Ballina bypass, as discussed in **Section 3.1.3**. This allows the full effect of both upgrade proposals (Ballina bypass and Tintenbar to Ewingsdale) to be evaluated. This does however mean that the existing traffic volumes on Ross Lane are not equal to the “Base Case” figures quoted.

Table 24 Forecast Daily Local Traffic Volumes (2006- vehicles)

Local Road	Base Case *(no upgrade)*	Upgraded Highway
Ross Lane	3680	4520
Martins Lane	140	140
Old Byron Bay Road	240	240
Watsons Lane	130	130
Old Pacific Hwy, Newrybar	1170	1010
Broken Head Road	1050	740
Bangalow Rd (east of interchange)	140	140
Bangalow Rd (west of interchange)	2100	2100
Granuaille Rd (on and off-ramps)	7450	7450
Possum Creek Road	410	370
Fowlers Lane	240	240
Coolamon Scenic Drive	1210	890
St Helena Road	290	290
Ewingsdale Rd (on and off-ramps)	5110	2660

A number of the local roads have low existing volumes and are not likely to be affected by the proposed upgrade. These roads include:

- Martins Lane;
- Old Byron Bay Road;
- Watsons Lane;
- Bangalow Road east;
- Fowlers Lane; and
- St Helena Road

Ross Lane, in conjunction with Tintenbar Road, provides an important east-west regional route. It provides local access to Lennox Head, Broken Head, Suffolk Park and the south of Byron Bay via Byron Bay Road (The Coast Road). As a result of the upgrade, additional traffic is expected on Ross Lane due to the Ross Lane interchange and its function in providing local access for regional traffic movements.

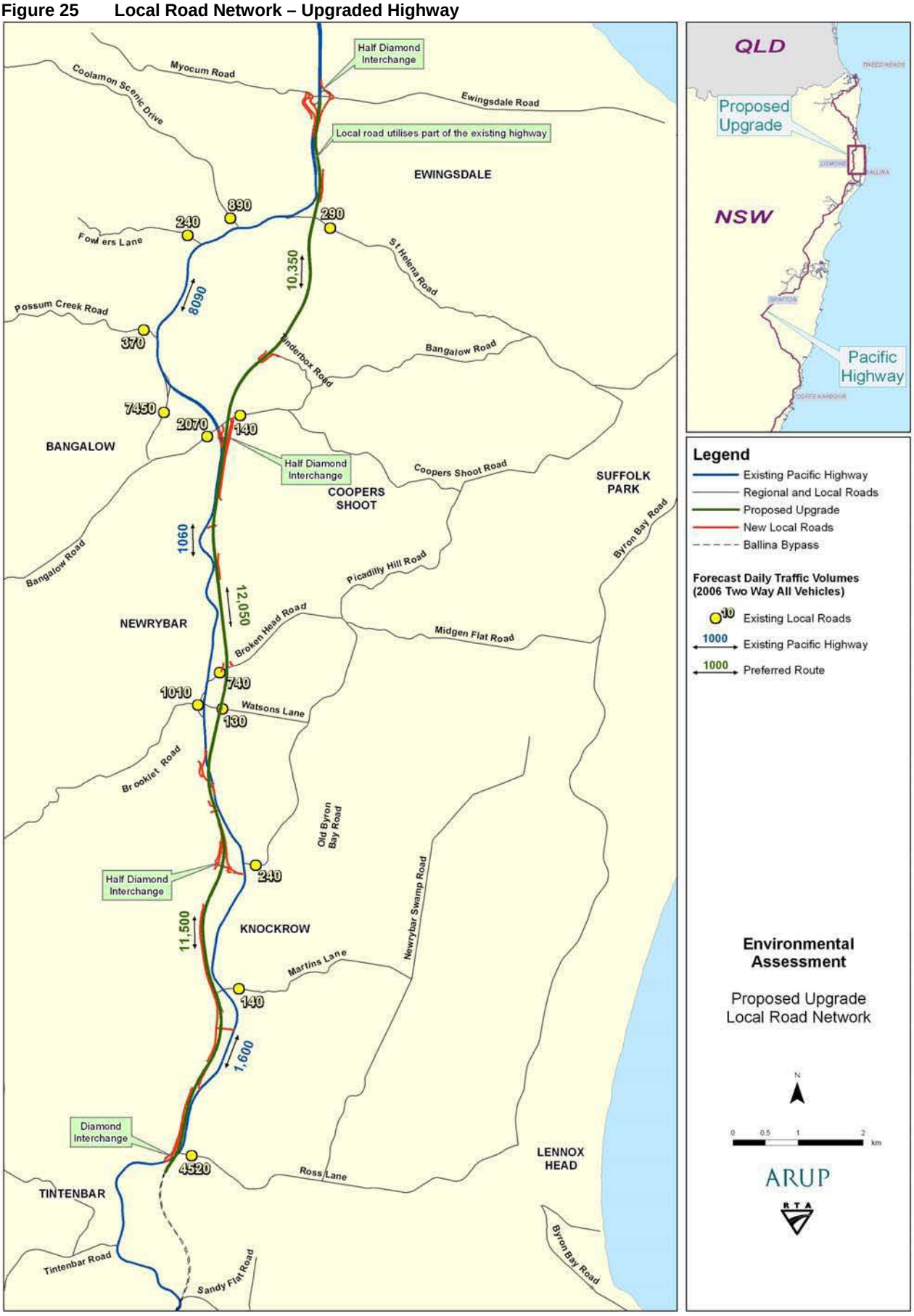
The Old Pacific Highway at Newrybar provides access to local businesses, the local residential village as well as an east-west connection to Friday Hut Road through Brooklet Road. The substantially reduced traffic volume on the existing highway is likely to reduce the passing trade and stopping traffic through Newrybar. The provision of interchanges at Ross Lane, Ivy Lane, Bangalow and Ewingsdale may reduce the attractiveness of Brooklet Road for trip origins and destinations outside of the project study area, causing some road users to adjust their travel patterns. As a result, slightly decreased traffic volumes are forecast with the provision of the upgraded highway.

Possum Creek Road and Coolamon Scenic Drive provide east-west connections between the existing Highway and Friday Hut Road. The traffic volumes recorded on these roads indicate through traffic use of these connections. The provision of interchanges at Ross Lane, Ivy Lane, Bangalow and

Ewingsdale may reduce the attractiveness of these routes for trip origins and destinations outside of the project study area, causing some road users to adjust their travel patterns. As a result, decreased traffic volumes are forecast with the provision of the upgraded highway.

Currently, a significant proportion of the traffic using the south-facing Ewingsdale interchange ramps travels through Bangalow (approximately 35 percent between 7am and 7pm). The upgraded highway concept design includes the provision of a replacement local service road to connect the existing highway to the Ewingsdale interchange. This results in a reduced number of vehicles using the south-facing Ewingsdale interchange ramps to and from the upgraded highway, This is explained in more detail in the *Ewingsdale Interchange Traffic Assessment* (Arup, 2008) report included in **Appendix B**.

Figure 25 Local Road Network – Upgraded Highway



3.9 Accident Risk

During the five-year period from 1 May 2002 to 30 April 2007, the 19 km section of the Pacific Highway between Ross Lane and the Ewingsdale interchange had an accident rate of 36 accidents per 100 MVK travelled.

With the improved highway standard and the bypassing of the circuitous / hazardous section of the highway north of Bangalow, it is forecast that the overall accident rate on the proposed upgrade can be reduced to meet the project target (see **Section 1.1**) of 15 accidents per 100 MVK travelled. Current accident rates on sections of the Pacific Highway that have already been upgraded indicate that this target is achievable. The proposed upgrade addresses the existing Pacific Highway crash history, particularly those with high severity, through:

- Separating opposing traffic flows, reducing read-on accidents;
- Providing a higher standard of alignment, reducing “run off road” accidents;
- Restricting highway access to grade-separated interchanges only, reducing intersection accidents;
- Providing better ‘clear zones’ adjacent to the carriageways, reducing the severity in loss of control accidents and increasing the opportunity for errant vehicles to regain control.

Despite significant traffic volumes still using the existing highway north of Bangalow, there will be a substantial reduction in the percentage and size of heavy vehicles along the route. Heavy vehicle proportions would be similar to that shown in **Table 8** for Bangalow Road west as traffic on the existing highway would comprise Bangalow Road, tourist and local traffic.

The number of accidents and the accident rate on the existing highway is forecast to decrease, after the proposed upgrade, due to:

- A significant reduction in traffic volumes
- Greater consistency in driver behaviour with the separation of high speed through highway traffic and lower speed local traffic,
- A reduction in the percentage and size of heavy vehicles.
- Greater consistency in the road environment and traffic conditions between Bangalow to Ewingsdale and Bangalow to Lismore.

The proposed upgrade offers a substantial annual reduction in the number of accidents between Tintenbar and Ewingsdale. The combined accident forecast for the preferred route and the existing highway is shown in **Table 25.** This combined forecast is conservative as it assumes the historical accident rates for the existing Pacific highway. As noted above, these rates are expected to improve; thus the number of accidents post-upgrade is likely to be less than those shown in **Table 25**.

Table 25 Forecasts of Accident Rates

Forecast Year	Accidents per year on existing highway (no upgrade)	Accidents per year on the preferred route and existing highway (post-upgrade combined)
2006	36	18
2012	43	22
2022	53	27
2032	65	33
2042	75	38

3.10 Cyclists and Pedestrians

Pedestrians would generally be encouraged not to walk within the road reserve along the proposed upgrade. Provision for pedestrian movements across the highway will be incorporated with the provision for local vehicle access. This has been addressed by local access and frontage roads, grade separation and interchange design.

Cyclists would not be permitted to use the proposed upgrade. Cyclists would have an alternative route along the existing Pacific Highway (or its replacement roadway). The existing highway is generally suitable for cyclists although there is not a continuous sealed shoulder. The forecast traffic volumes on this route after the opening of the proposed upgrade would be in excess of 3000 vpd north of Bangalow, which is the maximum volume identified by Austroads' recommendations for safe, on-road cycling conditions (Austroads, 1988). Treatment options for the existing highway may need to be investigated to ensure safe cycling conditions in the future.

3.11 Public Transport

The proposed upgrade will improve the travel time and passenger comfort for long distance coach services using the Pacific Highway, through bypassing the circuitous sections and steep grades on the existing highway. Local bus services, including those identified in **Table 11**, will have the option of travelling on the existing highway where these services currently pick-up and set down at intermediate locations along the highway. Alternatively, these services will be able to use the upgraded highway (in part or in full) and access local centres as required through the interchanges provided.

3.12 Regional Road Network

3.12.1 Regional travel patterns and traffic volumes

There are a number of key regional roads intersecting with the existing highway between Ross Lane and Ewingsdale that provide east-west access both locally and regionally. These are:

- Ross Lane (regional road 7735) east to Lennox Head and The Coast Road
- Bangalow Road (main road 65) west to Lismore
- Ewingsdale Road (main road 545) east to Byron Bay

Following the construction of the upgraded highway, the existing Pacific Highway would fulfil a regional road function, providing a continuous alternative route for local and regional traffic accessing the surrounding local road network. Significant traffic volumes will still use the existing highway north of Bangalow to travel between Bangalow Road and Ewingsdale Road, as well as to and from the north on the Pacific Highway, although there will be a substantial reduction in the percentage and size of heavy vehicles along the route.

The proposed upgrade offers the following characteristics in terms of regional travel patterns:

- Existing access to and from the regional road network at Ross Lane, Bangalow and Ewingsdale is replicated or retained.
- The existing highway remains to service existing travel patterns between Bangalow and Ewingsdale / the Pacific Highway north of Ewingsdale.
- The proposed upgrade is located close to the existing highway.
- The design of the upgraded highway maintains the existing local road connectivity through the provision of local road underpasses or overpasses as well as service roads for properties affected by the upgrade. As such, there is no need for drivers to adjust their wider travel patterns to and from the area.
- The improved quality and standard of the upgraded highway, in conjunction with the Ballina bypass project, may divert some traffic from Byron Bay Road (The Coast Road), relieving some of the increasing congestion on this route.

The combination of the above characteristics is should result in only relatively minor changes to local and regional travel patterns and traffic volumes. Wider influences from the cumulative effects of the Pacific Highway Upgrading Program such as overall improvements to the road environment and travel times, resulting in the increased accessibility of regional areas are outside the scope of this assessment.

3.12.2 Indirect impacts from increased accessibility to Byron and Ballina Shires

The increased accessibility through improved travel times and travel conditions on the Pacific Highway are likely to result in increased visitations to the Byron and Ballina Shires from both the north and south. The corresponding likely increase in traffic volumes as a result of this increased accessibility is accommodated within the forecast Pacific Highway, regional road and local road traffic growth as discussed in **Section 3.1**. This increased accessibility to the north coast region has been an incremental and ongoing result of the overall Pacific Highway Upgrading Program, which the proposed upgrade forms a small part.

3.13 Construction

Much of the proposed upgrade will be able to be constructed with minimal disruption to existing highway traffic (e.g. the Bangalow bypass to South of Tunnel section). However, there are a number of locations where one carriageway would not be clearly separate from the existing highway and construction activities would be required in close proximity to existing highway traffic. For example, construction of the integration with the existing Bangalow bypass section involves duplication alongside and in close vicinity to the existing highway. Once the new carriageway is complete the existing southbound carriageway will be upgraded and some traffic disruption will occur.

Locations where work will be carried out in close proximity to the existing highway are:

- At the tie-ins at the southern limit of the project to the north of the Ross Lane interchange
- At the Emigrant Creek Bridge and the overpass of the existing highway.
- At the Bangalow Road overpass
- Along the duplicated section of the existing Bangalow bypass.
- At the tie-in at the northern limit of the project at the Ewingsdale interchange.

Note that the Broken Head Road overpass can be completed without impacting traffic on the existing highway, but the overpass will have impacts to local road users.

In addition to speed restrictions and traffic controls, night work could be required for short periods at the above locations where the proposed new carriageway conflicts with the existing highway. Night work may be necessary to allow smooth transitions to be constructed and traffic diversions to be installed while minimising traffic impacts. Detailed arrangements for works in these areas would be developed during detail design.

There are no appropriate alternative temporary routes to the existing highway that could be used during construction. Provision for highway traffic therefore needs to be considered in the construction staging and construction methodology for all sections of the proposed upgrade.

Management strategies in construction may include provision for traffic use of temporary carriageways, temporary reductions in speed limits through worksites, use of traffic controllers and temporary signage. Control measures to manage traffic would be consistent with the RTA's *Traffic Control at Work Sites* (RTA 2003) manual.

Haulage may have an impact on local roads. It would include the transfer of fill material between sections as well as the delivery of construction materials such as pavement materials, asphalt, and concrete. Where significant volumes of fill material need to be transferred between sections, this transfer should not coincide with peaks in delivery of construction materials. Haulage should also take

into account peak travel hours and times, particularly during school and public holiday periods, to minimise the potential for delays on the highway to the travelling public.

A detailed construction traffic management plan would be prepared in order to minimise disruption to existing highway and local road traffic for the duration of construction.

4 Conclusions

The proposed upgrade meets the traffic and transport objectives of the Pacific Highway Upgrading Program through:

- Providing the opportunity for a significant reduction in road accidents and injuries through transferring a significant proportion of the existing highway traffic to the upgraded alignment which offers a lower accident rate as a result of improved geometry (both horizontal and vertical), dual carriageway (separating opposing directions), safer and continuous overtaking opportunities, reduced speed differential between vehicle types, and providing capacity for future traffic growth. In addition, is anticipated that there will be a significant reduction in the number of accidents on the existing highway after the upgrade is completed by a significant reduction in traffic volumes, greater consistency in driver behaviour with the separation of high speed through highway traffic and lower speed local traffic, a reduction in the percentage and size of heavy vehicles, and greater consistency in the road environment between Bangalow to Ewingsdale and Bangalow to Lismore.
- Reducing travel times through a reduction in highway length, bypassing steep grades and circuitous sections of the existing highway.
- Reduce freight transport costs through the improved road conditions and travel times discussed above, reduced vehicle wear and tear, and greater highway consistency and continuity.

It is anticipated that the operational traffic and transport impacts of the proposed upgrade on the local and regional road network will be minimal through the following design considerations and outcomes:

- Existing access to and from the regional road network at Ross Lane, Bangalow and Ewingsdale is replicated or retained.
- The existing highway remains to service existing travel patterns between Bangalow and Ewingsdale / the Pacific Highway north of Ewingsdale.
- The proposed upgrade is located close to the existing highway.
- The design of the upgraded highway maintains the existing local road connectivity through the provision of local road underpasses or overpasses as well as service roads for properties affected by the upgrade. As such, there is no need for drivers to adjust their wider travel patterns to and from the area.
- The improved quality and standard of the upgraded highway, in conjunction with the Ballina bypass project, may divert some traffic from Byron Bay Road (The Coast Road), relieving some of the increasing congestion on this route.

Direct construction traffic impacts on the existing highway will be minimal the upgraded highway is constructed away from the existing highway. Where highway construction interfaces with the existing highway or local roads, appropriate worksite speed limits and construction traffic management would be implemented in accordance with the RTA's *Traffic Control at Worksites* (RTA, 2003) manual. A minimum of two lanes (one in each direction) would be open to traffic at all times on the existing highway, while a single lane of traffic (under appropriate traffic control or temporary signals) would be maintained on local roads. Spoil truck traffic will used the upgraded highway corridor where possible, but are likely to generate some additional traffic on Bangalow Road and the existing highway to access potential spoil sites at Ewingsdale and Bangalow. Where this construction traffic is entering and exiting the existing road network, access arrangements would be in accordance with the RTA's *Traffic Control at Worksites* (RTA, 2003) manual and would involve signage and traffic controllers as appropriate.

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Appendix A

Origin and Destination Survey Results

Table A1 Origin and Destination Survey Matrix – 30 Minute Match

IN/OUT	Ross Lane	Martins Lane	Old Byron Bay Road	Watsons Lane	Newybar South	Newybar North	Broken Head Road	Bangalow NB Off Ramp (To Bangalow)	Bangalow NB Off Ramp (To Byron Bay	Bangalow SB Off Ramp	Possum Creek Road	Fullers Lane	Scenic Drive	St Helena Drive	Ewingsdale Off Ramp	MATCH	OBSRV	THRU%
Ross Lane	3	2	1	0	11	0	5	28	2	1	0	0	5	0	17	75	427	16.9
Martins Lane	3	0	2	0	3	1	2	5	0	0	0	0	0	0	5	21	64	32.8
Old Byron Bay Road	7	3	4	0	3	0	0	6	0	1	0	0	0	0	2	26	112	19.6
Watsons Lane	0	0	1	4	0	2	6	15	0	0	0	0	0	0	2	30	51	51
Newybar South	12	1	3	1	2	1	4	8	0	1	0	0	1	0	3	37	151	23.2
Newybar North	4	1	0	5	5	5	51	83	3	2	0	2	1	0	30	192	400	46.8
Broken Head Road	5	0	2	3	0	8	18	83	4	2	0	1	8	0	14	148	468	27.8
Bangalow SB On Ramp (From Bangalow)	42	2	13	15	1	82	65	13	1	1	0	0	1	0	5	241	820	27.8
Bangalow SB On Ramp (From Byron Bay)	2	1	0	0	0	1	3	1	0	0	0	0	0	0	3	11	64	17.2
Bangalow NB On Ramp	0	0	1	1	0	1	0	7	0	42	8	21	94	5	694	874	2955	28.2
Possum Creek Road	0	0	0	0	0	0	0	2	0	6	11	0	2	1	4	26	159	9.4
Fullers Lane	0	0	0	0	0	0	2	0	0	14	0	3	3	2	20	44	106	38.7
Scenic Drive	3	0	0	0	0	5	7	1	0	57	0	2	10	2	175	262	560	45
St Helena Drive	0	0	0	0	0	0	0	0	0	4	0	0	0	5	7	16	120	9.2
Ewingsdale On Ramp	27	1	1	5	0	36	11	3	0	642	14	21	130	10	22	923	1982	45.5
MATCH	108	11	28	34	25	142	174	255	10	774	33	50	255	25	1005	2929	8604	32.4
OBSRV	491	55	100	55	149	343	448	795	54	2883	195	107	507	140	1985	8307		
THRU%	21.4	20	24	54.5	15.4	39.9	34.8	30.4	18.5	25.4	11.3	43.9	48.3	14.3	49.5	33.6		

Table A2 Origin and Destination Survey Matrix – Unconstrained Match

IN/OUT	Ross Lane	Martins Lane	Old Byron Bay Road	Watsons Lane	Newybar South	Newybar North	Broken Head Road	Bangalow NB Off Ramp (To Bangalow)	Bangalow NB Off Ramp (To Byron Bay)	Bangalow SB Off Ramp	Possum Creek Road	Fullers Lane	Scenic Drive	St Helena Drive	Ewingsdale Off Ramp	MATCH	OBSRV	THRU%
Ross Lane	43	2	2	0	11	4	6	35	2	18	1	0	5	1	21	151	427	25.3
Martins Lane	3	23	2	0	3	1	3	5	0	2	1	0	0	0	6	49	64	40.6
Old Byron Bay Road	9	4	27	0	4	7	4	9	0	4	0	0	1	0	3	72	112	40.2
Watsons Lane	1	0	4	6	0	3	8	16	1	0	1	0	1	0	2	43	51	72.5
Newybar South	14	2	4	1	39	15	7	13	0	4	0	0	1	0	6	106	151	44.4
Newybar North	6	2	3	6	20	47	54	90	5	18	0	3	1	0	39	294	400	61.8
Broken Head Road	8	0	7	3	6	41	71	100	4	20	0	1	8	3	28	300	468	48.9
Bangalow SB On Ramp (From Bangalow)	51	2	16	17	9	93	75	222	13	41	0	0	9	3	36	587	820	44.5
Bangalow SB On Ramp (From Byron Bay)	2	1	0	0	2	2	7	8	7	3	0	0	0	0	6	38	64	48.4
Bangalow NB On Ramp	16	1	5	1	8	14	14	54	3	672	47	28	114	17	756	1750	2955	36.5
Possum Creek Road	0	0	0	0	0	0	1	4	0	31	38	1	3	1	23	102	159	40.3
Fullers Lane	1	0	0	0	0	0	3	0	1	22	0	23	5	3	20	78	106	51.9
Scenic Drive	6	1	0	1	3	5	9	8	0	84	3	2	77	5	192	396	560	57
St Helena Drive	0	0	0	0	0	0	0	2	1	12	1	1	5	19	24	65	120	38.3
Ewingsdale On Ramp	34	2	3	5	3	42	25	30	2	723	29	24	146	22	261	1351	1982	55
MATCH	194	40	73	40	108	274	287	596	39	1655	121	83	376	74	1425	5385	8604	44.3
OBSRV	491	55	100	55	149	343	448	795	54	2883	195	107	507	140	1985	8307		
THRU%	30.8	30.9	46	61.8	46.3	66.2	48.2	47	59.3	34.1	42.6	56.1	59	39.3	58.6	45.9		

Appendix B

Ewingsdale Interchange Assessment

Roads and Traffic Authority

Tintenbar to Ewingsdale Pacific Highway Upgrade

Ewingsdale Interchange Traffic Assessment

ARUP

Roads and Traffic Authority

Tintenbar to Ewingsdale Pacific Highway Upgrade

Ewingsdale Interchange Traffic Assessment

June 2008

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SIDRA Modelling Traffic Input Volumes

Appendix B

Detailed SIDRA Modelling Output

Appendix C

Origin and Destination Survey Data

Appendix D

Interchange Tube Count Survey Data

1 Introduction

The NSW Roads and Traffic Authority have engaged Arup to provide project development services for the Pacific Highway upgrade between Tintenbar and Ewingsdale. In order to progress the preliminary engineering design for the proposed upgrade, traffic assessment and modelling for the Ewingsdale interchange has been undertaken to establish the future requirements for the interchange and evaluate options for upgrading the existing layout. The interchange currently consists of two intersections and an overpass which link the Pacific Highway to Ewingsdale Road and Myocum Road.

This report presents the current (2006) and future (2032) traffic conditions associated with the Ewingsdale interchange and details the interchange configuration scenarios that have been evaluated, along with the relevant modelling results and recommendations.

The scenarios considered are in line with intersection / interchange requirements as set out in the Pacific Highway Design Guidelines (RTA, 2005).

1.1 Background

The existing Ewingsdale interchange experiences high volumes of traffic both in terms of average daily flows throughout the year as well as peak hourly flows during holiday periods, as Ewingsdale Road serves as the primary road access to Byron Bay. The proposed Pacific Highway upgrade from Tintenbar to Ewingsdale requires modifications to the existing layout of the Ewingsdale interchange in order to accommodate the proposed upgrade alignment as well as an existing highway connection on the western side.

These required modifications have presented the opportunity to review the layout, operation and performance of the overall interchange. The existing interchange was constructed in 1995. Since this time, changes to the Pacific Highway Design Guidelines mean that the interchange no longer complies with current design standards. In addition to this, community comments regarding the legibility of the interchange and difficulties during peak periods have been received by Arup and the RTA.

On this basis, a number of interchange scenarios have been developed and modelled to assess the differences between the options and recommend a preferred layout or staged layout.

1.2 Objectives

The project objective relevant to this study is to “develop intersections and interchanges designed to at least a Level of Service (LoS) C, 20 years after opening for the 100th Highest Hourly Volume”. For planning purposes, the year of opening has been taken as 2012. This objective was identified as part of a broader plan to reduce travel times.

Level of Service can be explained as “an index of the operational performance of traffic on a given traffic lane, carriageway, road or intersection, based on service measures such as delay, degree of saturation, density and speed during a given flow period”.

The Level of Service of the intersection is calculated according to the RTA NSW method, which uses the average delay per vehicle, in seconds, to determine the Level of Service. As shown in **Table 1**, to maintain a LoS C or better, the average delay per vehicle must be less than 42.5 seconds. Note that LoS calculated according to this method is different to LoS calculated using Austroads or US Highway Capacity Manual definitions (SIDRA User Guide, Akcelik & Associates, September 2004).

Table 1 - RTA Intersection Level of Service Criteria

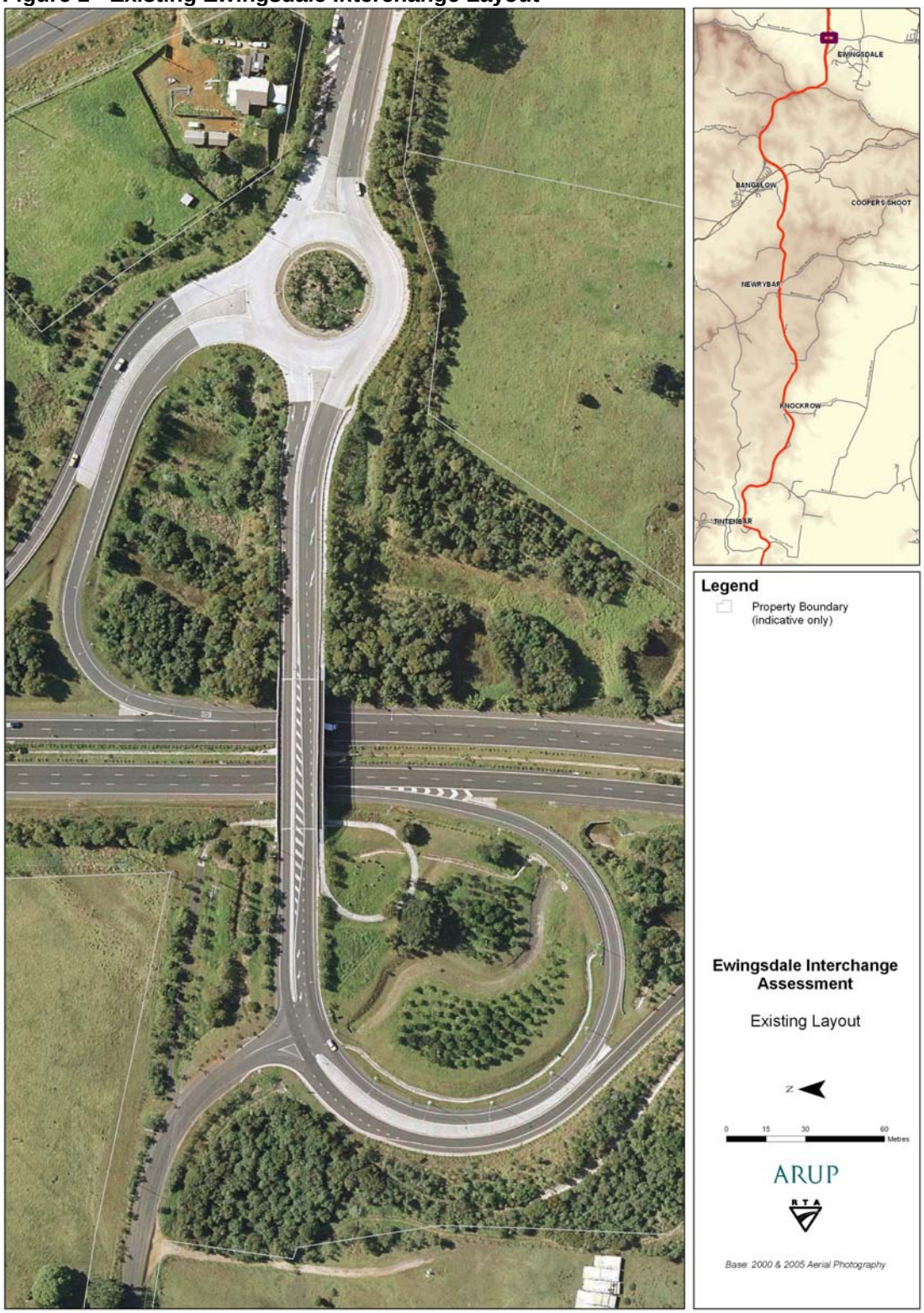
Level of Service	Average Delay per Vehicle (seconds)
A	d ≤14.5
B	14.5 ≤ 28.5
C	28.5 ≤ 42.5
D	42.5 ≤ 56.5
E	56.5 ≤ 70.5
F	70.5 < d

2 Existing Interchange Layout and Traffic Conditions

2.1 Existing Layout

The existing layout of the Ewingsdale interchange is shown in **Figure 1**. Both the northbound and southbound highway on-ramps are loop roads, and the western intersection is currently a give-way 'T' intersection.

Figure 1 - Existing Ewingsdale Interchange Layout



2.2 Existing Traffic Conditions

In order to understand the existing traffic patterns and conditions in the vicinity of the interchange, data has been collected in the form of origin and destination surveys as well as tube counts on all approaches to the interchange.

2.2.1 Origin-Destination Survey

An origin and destination survey was undertaken over a 48-hour period (Friday and Saturday) from 0:00 on Friday 8 December 2006 to 0:00 on Sunday 10 December 2006. The survey captured all vehicles (rather than using a sampling methodology) using the number plate survey technique. Video technology was used to record vehicles at the following six locations:

- Pacific Highway SB off ramp to Ewingsdale Road (Site 1)
- Pacific Highway SB on ramp from Ewingsdale Road (Site 2)
- Pacific Highway NB off ramp to Ewingsdale Road (Site 3)
- Pacific Highway NB on ramp from Ewingsdale Road (Site 4)
- Ewingsdale Road west of interchange with Pacific Highway, EB (Site 5E)
- Ewingsdale Road west of interchange with Pacific Highway, WB (Site 5W)
- Ewingsdale Road east of interchange with Pacific Highway, EB (Site 6E)
- Ewingsdale Road east of interchange with Pacific Highway, WB (Site 6W)

Vehicle number plates were later manually transcribed. Number plate matching software was then used to determine the travel patterns of vehicles using the interchange, resulting in an origin and destination matrix.

The results of this survey have been used to represent a typical non-holiday period.

Figure 2, **Figure 3** and **Figure 4** indicate the results for the OD survey during the daylight hours of 7am to 7pm. **Figure 2** and **Figure 3** show the hourly inbound volumes, entering the interchange from each approach, for the Friday and Saturday respectively. Hourly traffic volumes were generally higher on the Friday than the Saturday; however, the very early morning period between midnight and 5am was similar for the two days. The hourly profile also varied significantly between these two days, with relatively pronounced peaks at 8am and 4pm on the Friday, whereas traffic built gradually to a peak at midday on the Saturday before slowly tapering off. There was a minor peak in traffic volumes between 5-6pm. After 8pm on Saturday night, traffic volumes dropped off more quickly than on the Friday night.

The percentage of vehicles travelling in the daytime hours between 7am and 7pm on both days was approximately 80% of the total daily traffic flows.

Figure 4 has been included to develop an understanding of the ramp utilisation at the interchange, showing hourly ramp volumes on each of the four ramps. Whilst the proportions vary throughout the day, it can be seen that the highest volumes are generally to and from the north (northbound on-ramp and southbound off-ramp).

Figure 2 and **Figure 4** indicate that the highest hourly flow was observed between 16:00-17:00 (4-5pm) on Friday the 8th, with a total inbound volume of 1340 vehicles and the number of vehicles using the interchange ramps being recorded as 1197. This hour has been identified as the typical non-holiday peak hour for analysis purposes.

The second highest hourly flow was recorded during the am peak time of 8-9am, with values of 1275 and 1135 for the inbound and ramp volumes, respectively.

Figure 2 - OD Survey Results for Friday 8 December

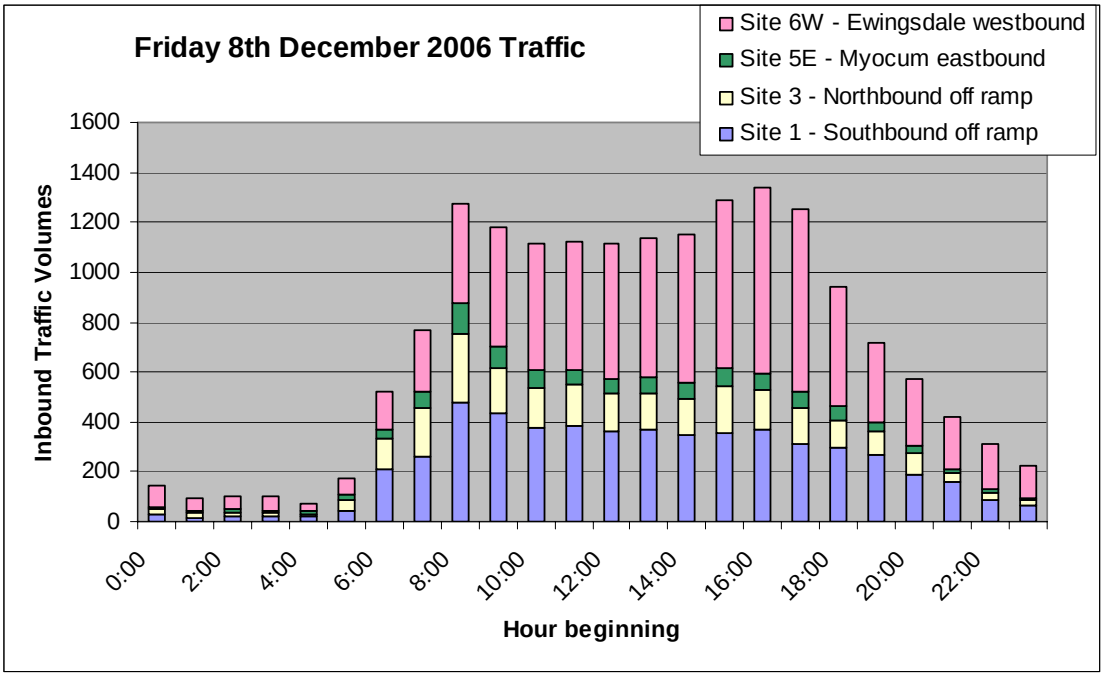


Figure 3 - OD Survey Results for Saturday 9 December

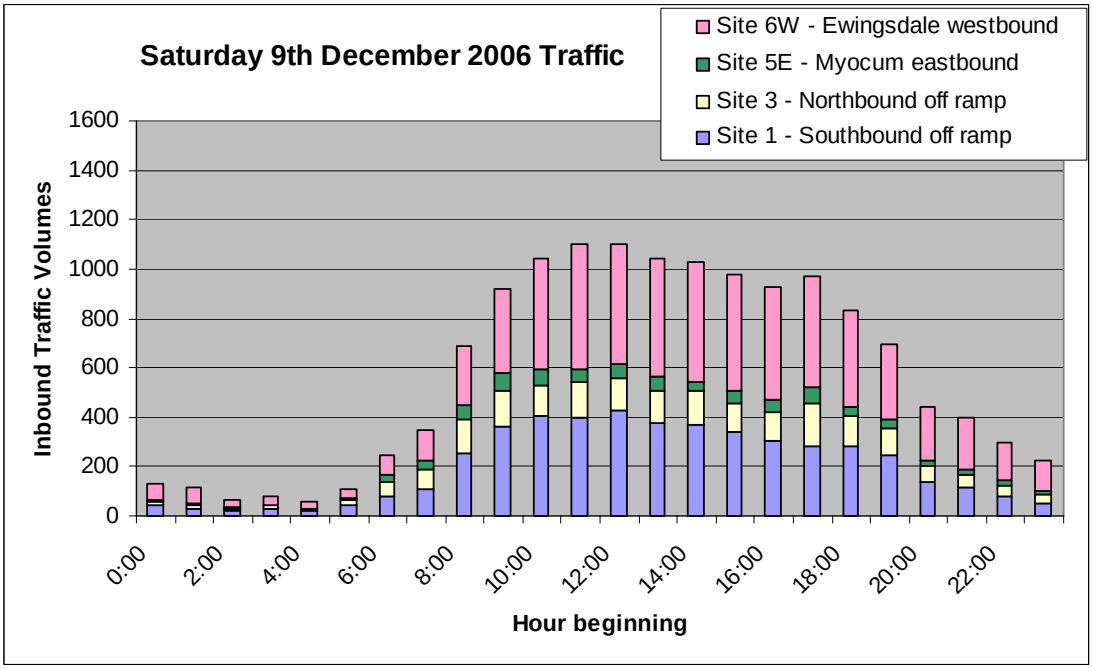
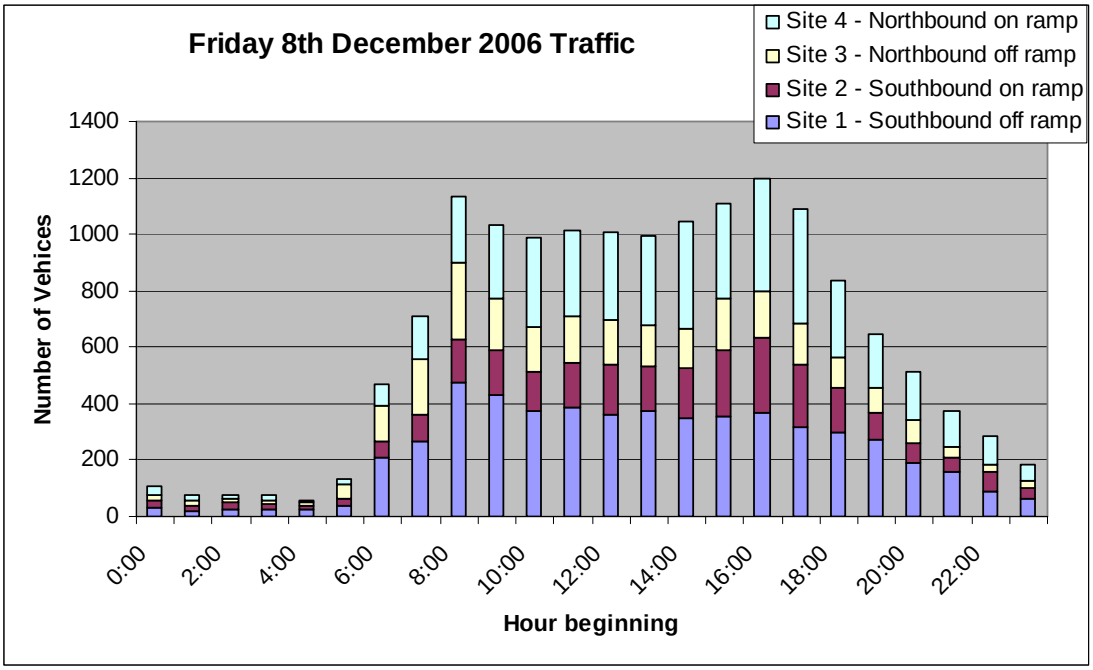


Figure 4 - OD Survey Results for On/Off Ramps, Friday 8 December



The hourly heavy vehicle volume was fairly consistent over the survey period, with a slight rise in numbers on the Friday between 6am and 5pm. Hourly heavy vehicle volumes were between 3 and 174 vehicles per hour, with an average of 57. Outside of the 'peak' time identified (6am to 5pm), this average reduced to 28 vehicles per hour.

There was a significant difference between the heavy vehicle traffic recorded on the Friday and Saturday of the survey period. The inbound heavy vehicle volume on Friday 8th December, as shown in **Figure 5**, ranged between 10 vehicles at 1am and 93 vehicles at 2:00pm. The inbound volumes for Saturday 9th December, shown in **Figure 6**, are significantly smaller, ranging from 2 vehicles at 11pm to 30 vehicles at 10:00am.

The volumes for the two days surveyed were relatively similar in their distribution throughout the day, having a low number of vehicles reported during the early morning and late night hours, with higher volumes measured between 6:00am and 5:00pm.

Figure 5 - Heavy Vehicle Volumes for Friday 8 December

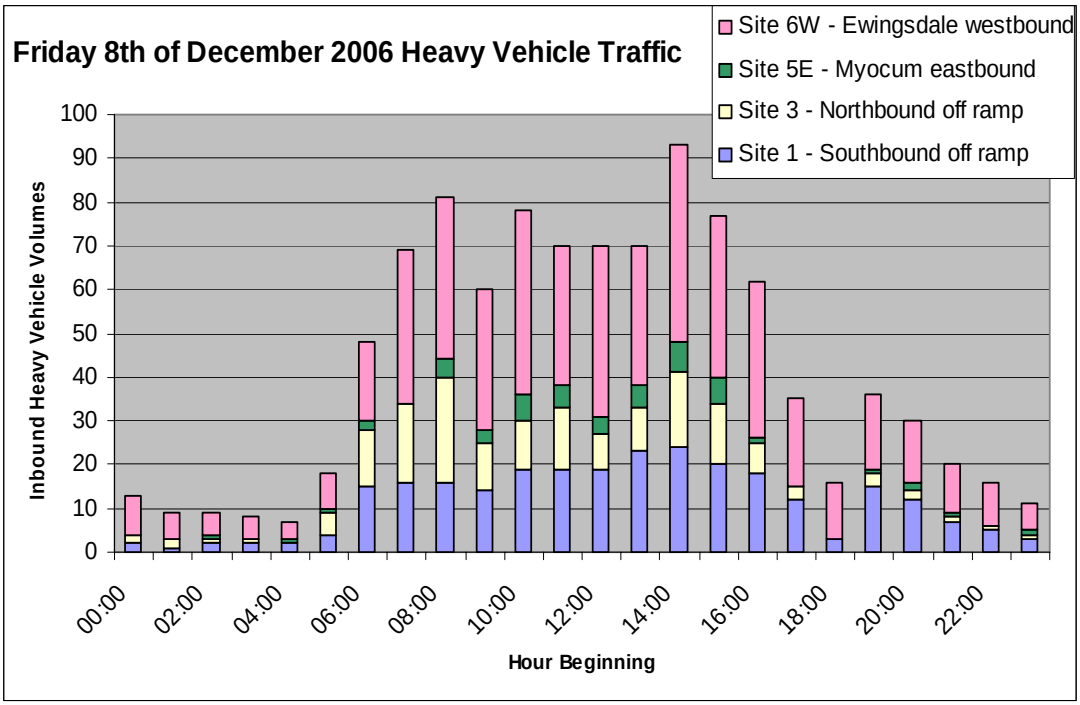
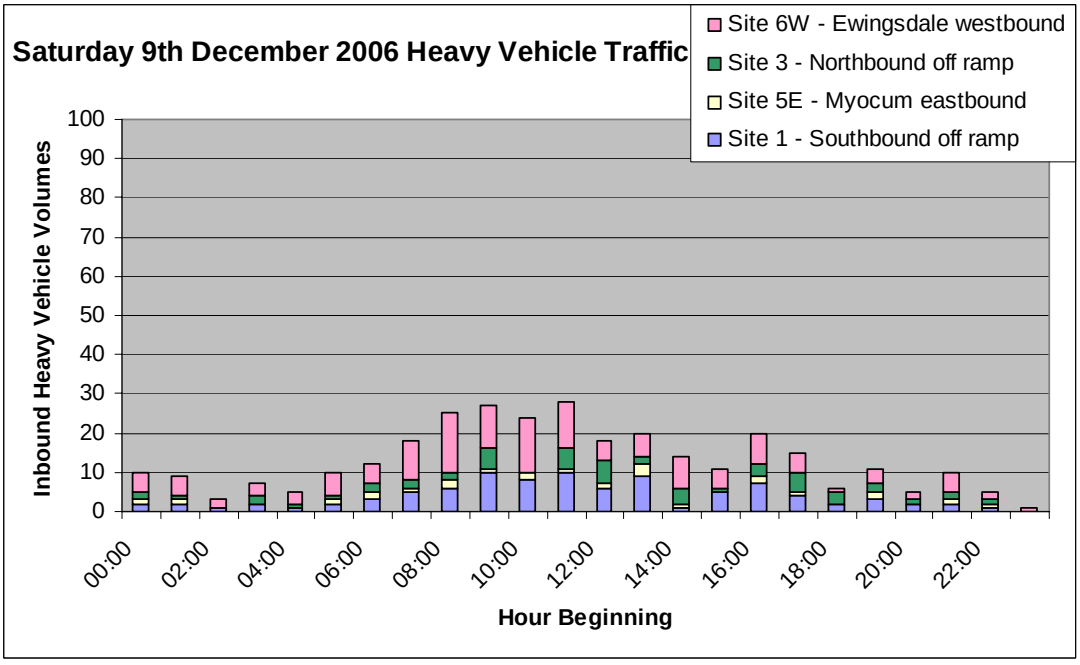


Figure 6 - Heavy Vehicle Volumes for Saturday 9 December



The origin and destination survey data has been analysed to derive a matrix showing the number of trips from each origin to each destination (such as the number of vehicles approaching the interchange westbound on Ewingsdale Road, then heading south on the Pacific Highway). A series of different matrices were derived from the results, showing light vehicles, heavy vehicles and total vehicles, as well as the heavy vehicle percentage of total. The origin and destination matrices derived from the survey are included with the survey data in **Appendix C**.

Total daily volumes for each of the survey locations are shown in **Table 2**. The key movements through the Ewingsdale interchange (ordered from highest to lowest daily volume) that can be observed from the OD survey data are:

- Vehicles travelling westbound from Byron Bay along Ewingsdale Road, using the interchange and northbound Pacific Highway on-ramp to head north towards Ocean Shores and Tweed Heads, and
- Vehicles travelling southbound on the Pacific Highway from Tweed Heads and Ocean Shores, using the southbound off-ramp and the interchange to head east along Ewingsdale Road towards Byron Bay.
- Vehicles travelling westbound from Byron Bay along Ewingsdale Road, using the interchange and southbound Pacific Highway on-ramp to head south towards Bangalow and Ballina.
- Vehicles travelling northbound on the Pacific Highway from Ballina and Bangalow, using the northbound off-ramp and the interchange to head east along Ewingsdale Road towards Byron Bay.

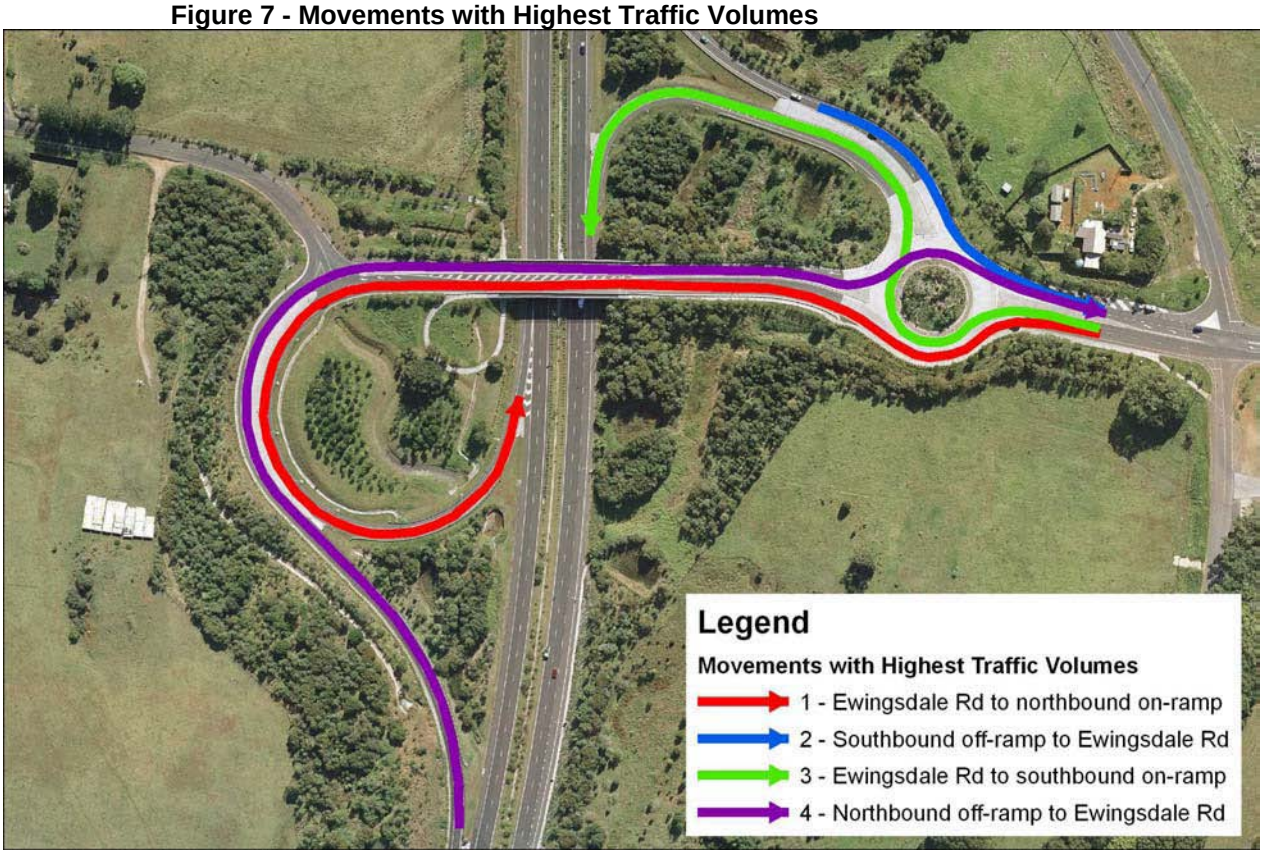
These four movements associated with Ewingsdale Road recorded significantly higher traffic volumes than other movements available at the interchange. As such, traffic volumes associated with Myocum Road were comparatively low. There was also no significant use of the interchange as a u-turn facility for vehicles to head back in their direction of origin either on the Pacific Highway or Ewingsdale Road.

Table 2 - Surveyed Total Daily Volumes

Site		Friday 8 December	Saturday 9 December
Pacific Highway Southbound	1. Off ramp to Ewingsdale Road	5485	4819
	2. On ramp from Ewingsdale Road	2619	1875
Pacific Highway Northbound	3. Off ramp to Ewingsdale Road	2532	1985
	4. On ramp from Ewingsdale Road	4527	3840
Ewingsdale Road West of interchange with Pacific Highway	5E. Eastbound	1037	804
	5W. Westbound	1258	973
Ewingsdale Road East of interchange with Pacific Highway	6E. Eastbound	9051	7459
	6W. Westbound	8082	6226

Figure 7 shows the four key movements through Ewingsdale interchange, as described above.

Figure 7 - Movements with Highest Traffic Volumes



2.2.2 Tube Count Data

To permit calibration of the origin and destination data captured for peak holiday traffic, tube counts were conducted for two weeks over the Christmas and New Year period commencing 0:00 on Monday 25th of December, 2006. These counts were undertaken at the same six survey locations used for the origin and destination survey (see **Section 2.2.1**).

The hourly inbound traffic volumes during the two-week Christmas / New Year period surveyed can be seen in **Figure 8**, while **Figure 9** extracts the highest 12 hours (combined volumes) from this two week period. Similarly, the hourly utilisation of the interchange ramps can be seen in **Figure 10** (entire period) and **Figure 11** (highest 12). The highest 12 hours have been calculated on the basis of total hourly approach or ramp volumes and hence may not necessarily reflect the highest 12 hours for an individual ramp or approach. Generally the highest ranked hours occurred around midday, although a few results indicate similar volumes as late as 4:00pm.

It should be noted when examining these results that Site 2 (Southbound on-ramp) experienced some difficulties during the survey. Shortly after installation, the Site 2 tubes were severed and were not replaced until a mid-survey check was undertaken. As a result, no data was available from Site 2 for the initial part of the survey. Site 2 data was only recorded from 1pm on Friday 29th of December, which was the 5th day of the survey. This resulted in lower than actual combined ramp volumes until that time, as shown in **Figure 10**.

When examining **Figure 8, Figure 9, Figure 10** and **Figure 11,** the holiday peak hour during the two week survey period can be identified as 12 noon on Thursday 4 January 2007. The same peak hour can be identified from both peak inbound (or approach) volumes as well as peak ramp usage.

Figure 8 - Holiday Inbound Traffic

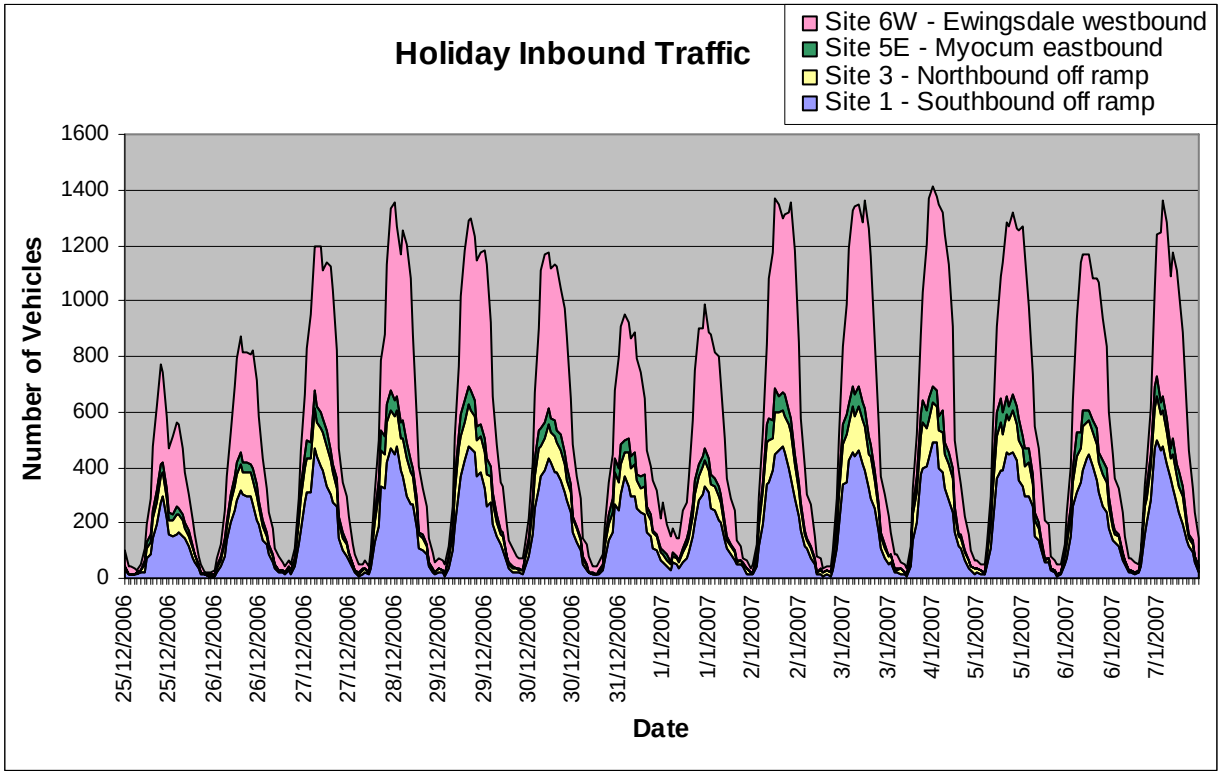


Figure 9 - Peak Holiday Inbound Traffic

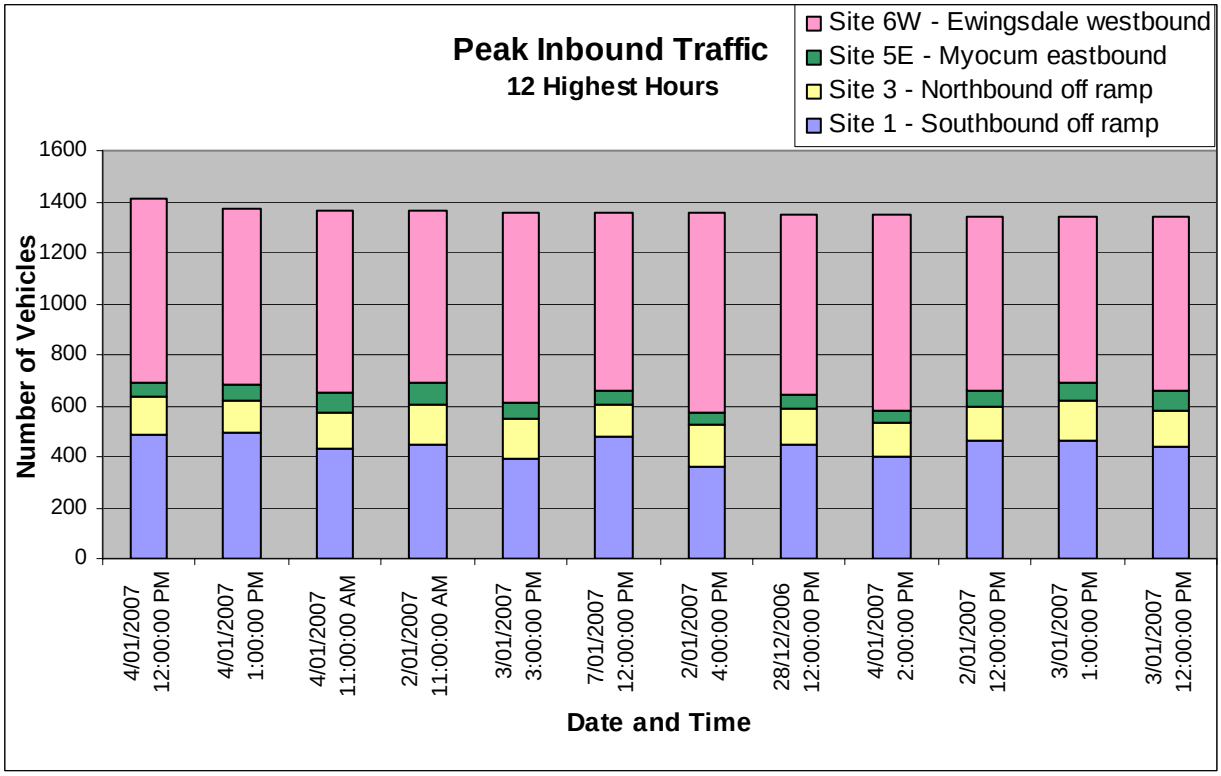


Figure 10 - Holiday Ramp Usage

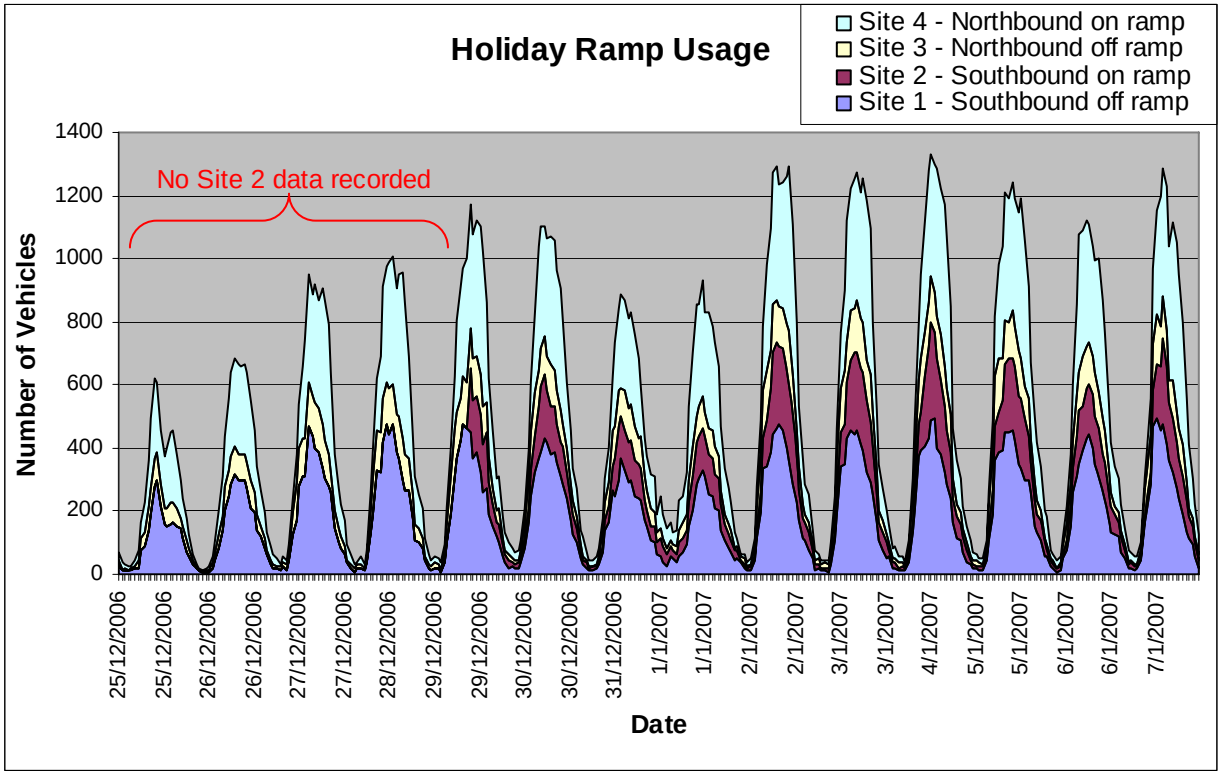
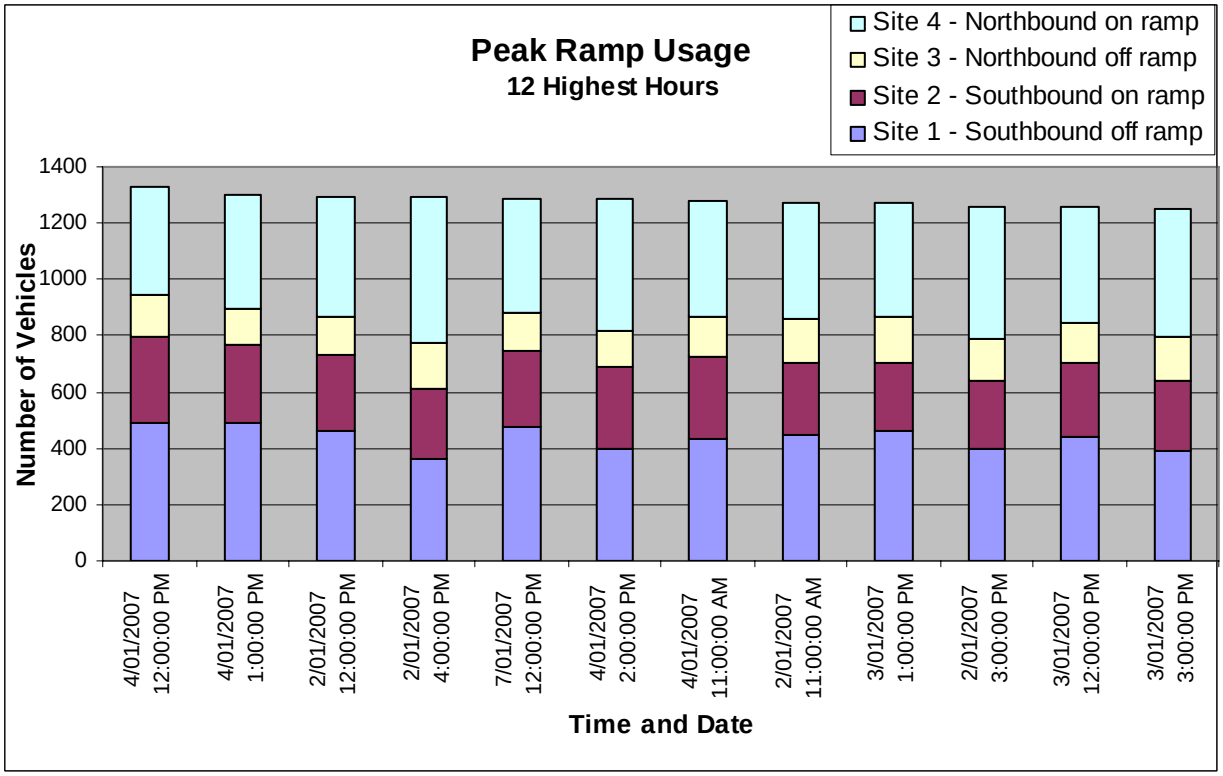


Figure 11 - Peak Holiday Ramp Usage



2.2.3 RTA Permanent Count Station Data

The RTA has a number of permanent count stations to continuously measure hourly traffic data throughout the year. The data is recorded using induction loops. Several loops of wire are embedded into the pavement, with an alternating current passing through them. A mass of metal such as a car or truck passing through the electromagnetic field changes the inductance of the loop. The change in inductance depends on the size and metallic content of the vehicle, and hence can be used to determine the class of vehicle travelling along the road.

In the vicinity of the project there are two permanent count stations, located at Knockrow, south of Martins Lane (station number 04.060) and at Nashua, on Bangalow Road (station number 04.045).

The data available from these count stations were Annual Average Daily Traffic (AADT) volumes up until 2005 and hourly count data for 2005 / 06. The data is recorded in axle pairs, and then converted to number of vehicles using an approximation of 5% heavy vehicles (for peak hours) with an average of 2.4 axle pairs, and 95% light vehicles having 1 axle pair.

The above count stations have been used to estimate future peak hourly volumes on the existing highway once the proposed upgrade is opened to traffic, as well as examining the hourly volumes observed during the interchange surveys in relation to traffic volumes throughout the year.

3 Interchange Scenarios and Future Traffic Conditions

3.1 Interchange Scenarios

Arup has examined the following interchange scenarios:

- Scenario 1: Base case (no highway upgrade) on both the eastern and western intersections.
- Scenario 2: Upgraded highway with the existing highway connection added to the western intersection (requiring a roundabout). The existing northbound on and off ramps remain on the western side. The existing eastern intersection layout remains, with additional traffic travelling from the southbound off-ramp to the existing Pacific Highway (south).
- Scenario 2B: Upgraded highway with the existing highway connection added to the western intersection (requiring a roundabout). The upgraded highway and additional NB on ramp are added to the western intersection. The existing eastern intersection layout remains, with additional traffic travelling from the southbound off-ramp to the existing Pacific Highway (south).
- Scenario 3: Upgraded highway with a new western half diamond ramp layout. The existing highway connection is added to the western intersection. The existing eastern intersection layout remains, with additional traffic travelling from the southbound off-ramp to the existing Pacific Highway (south).
- Scenario 4: Upgraded highway with the existing highway connection added to the western intersection (requiring a roundabout). The existing northbound on and off ramps remain on the western side. A new eastern half diamond ramp layout.
- Scenario 4B: Upgraded highway with the existing highway connection added to the western intersection (requiring a roundabout). The existing northbound on and off ramps remain on the western side. There is a new eastern half diamond ramp layout with the incorporation of Woodford Lane into the eastern intersection.
- Scenario 5: Upgraded highway with a new full diamond interchange ramp layout. The existing highway connection is added to the western intersection.
- Scenario 5B: Upgraded highway with a new full diamond interchange ramp layout. The existing highway connection is added to the western intersection. Incorporation of Woodford Lane into the eastern intersection.

The modelled intersection configurations are outlined in the figures below. Some future scenarios require a dual-lane western roundabout for satisfactory operation. On this basis, all future scenarios have been modelled with dual-lane roundabouts for effective comparison. The modelled layouts for each scenario are shown in **Figure 12** – **Figure 19**.

Figure 12 - Base Case, No Highway Upgrade (1)

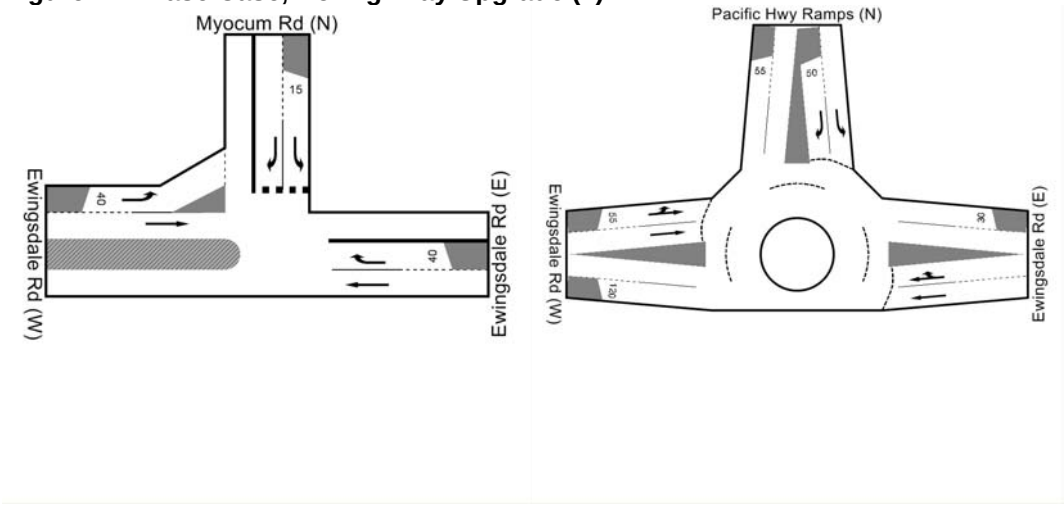
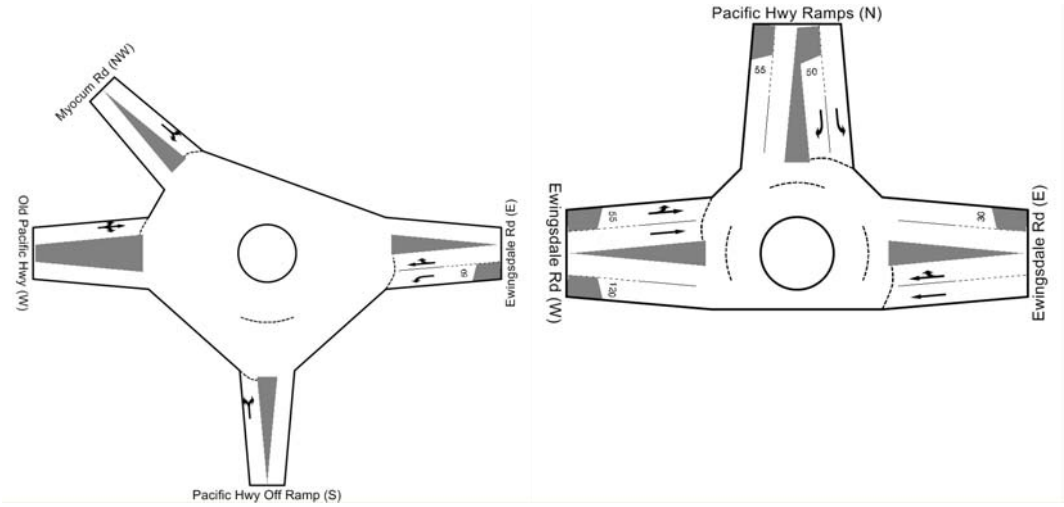


Figure 13 - Upgraded highway + new western roundabout and existing ramps (2)
Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

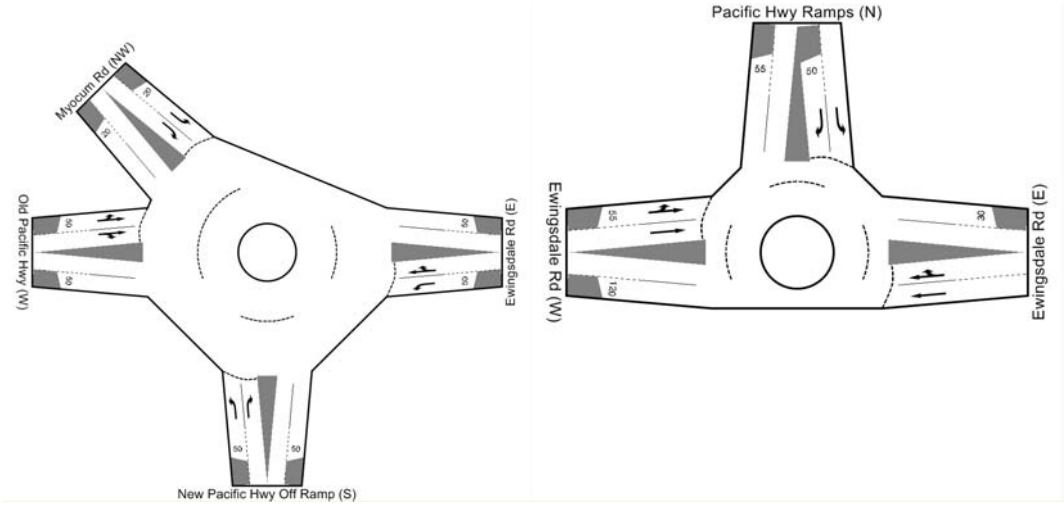
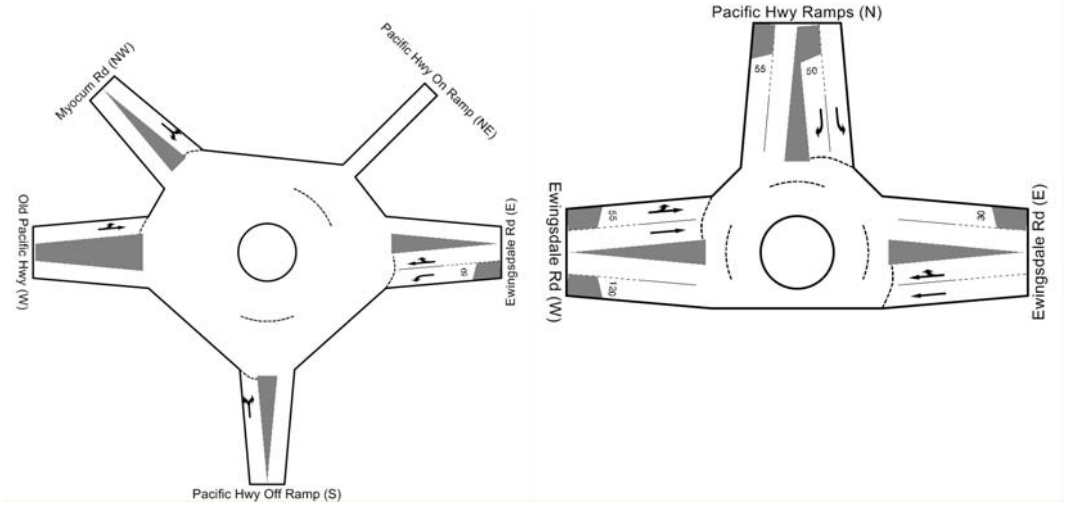


Figure 14 - Upgraded highway + new western roundabout + additional NB on-ramp (2B)

Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

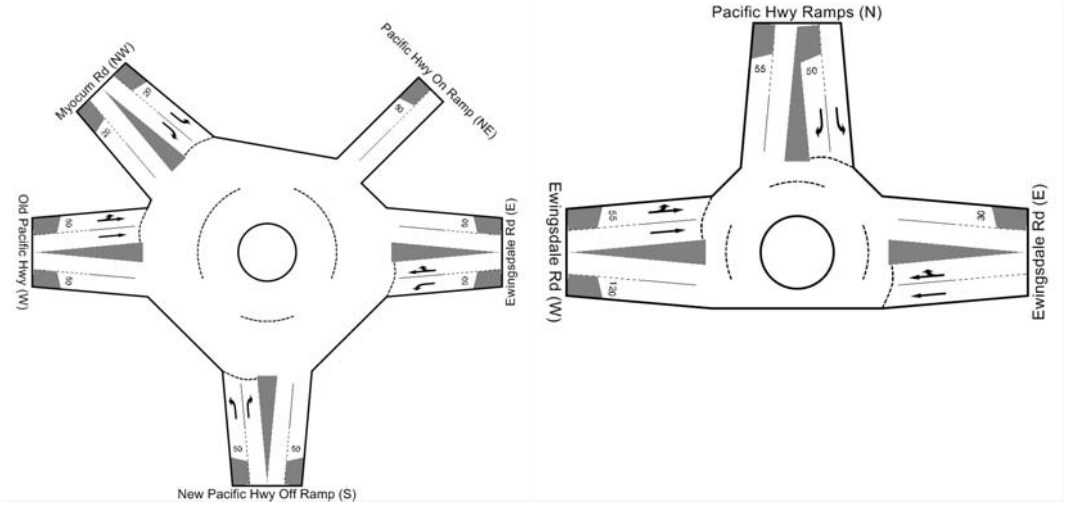
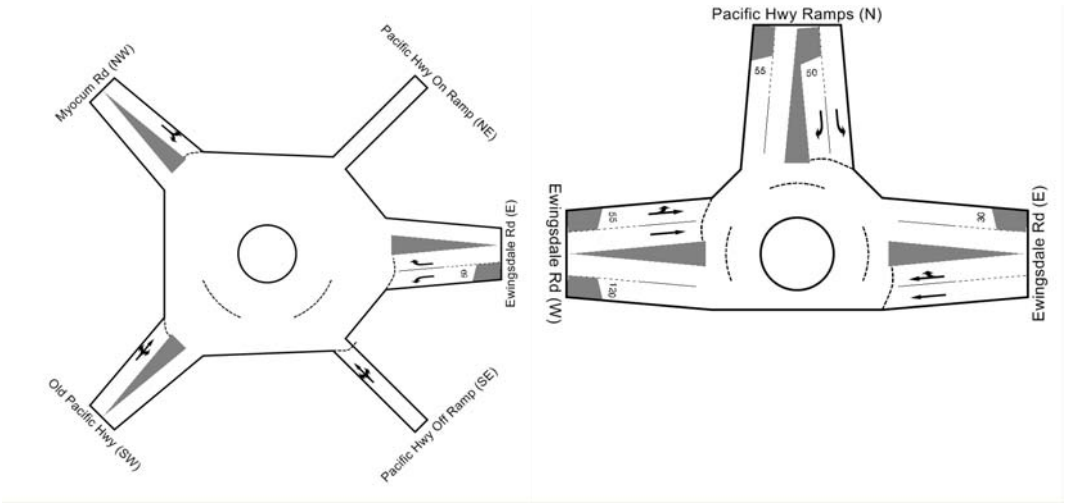


Figure 15 - Upgraded highway + western half-diamond (3)

Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

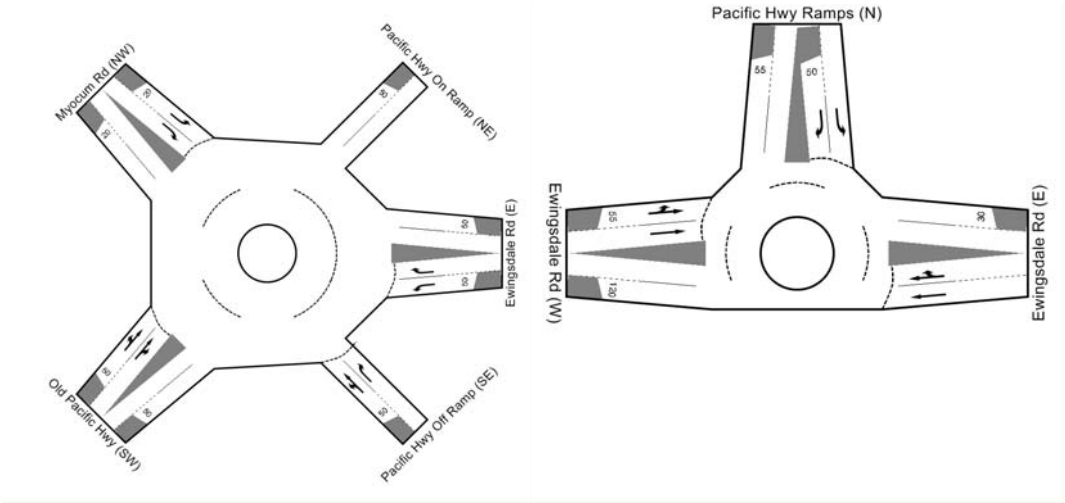
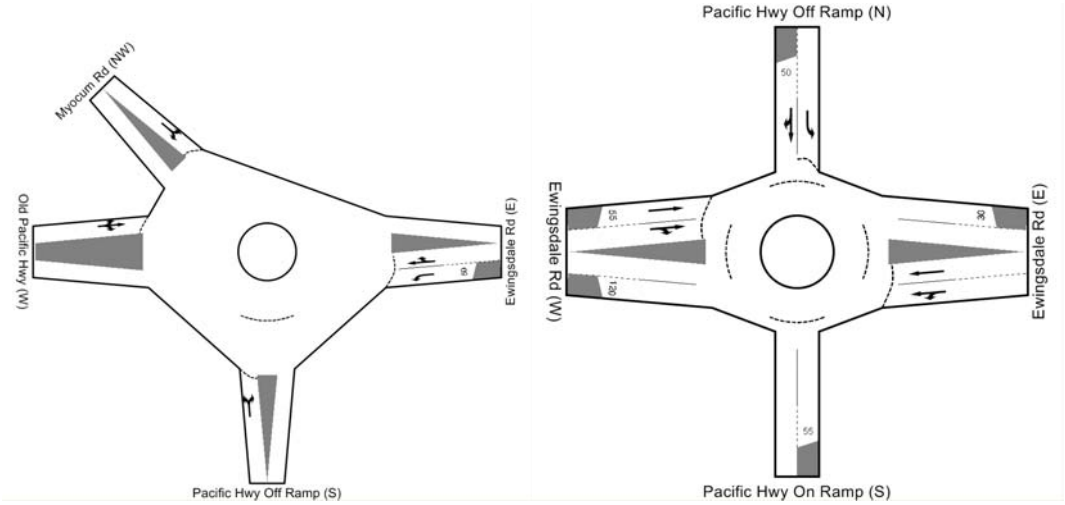


Figure 16 - Upgraded highway+ new western roundabout + eastern half-diamond (4)
Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

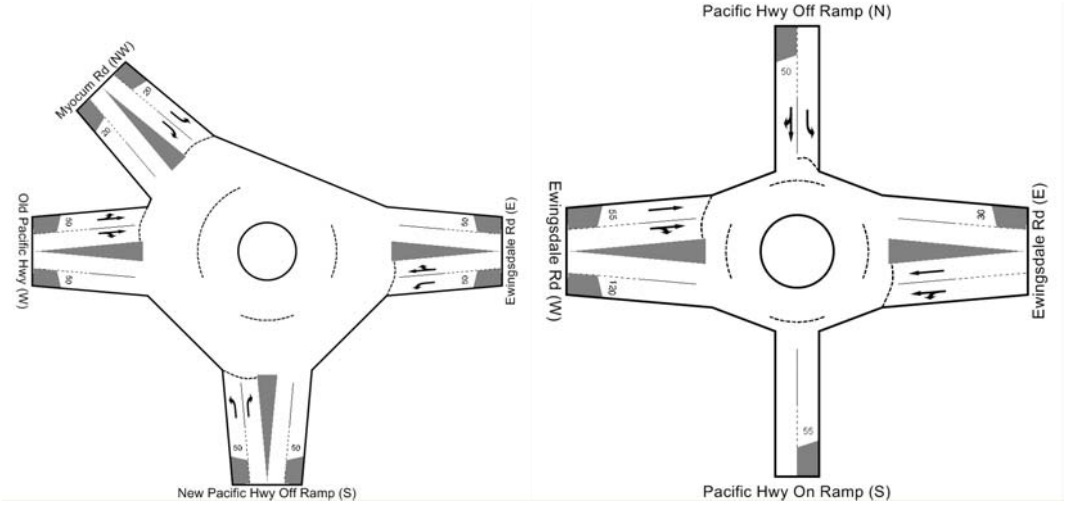
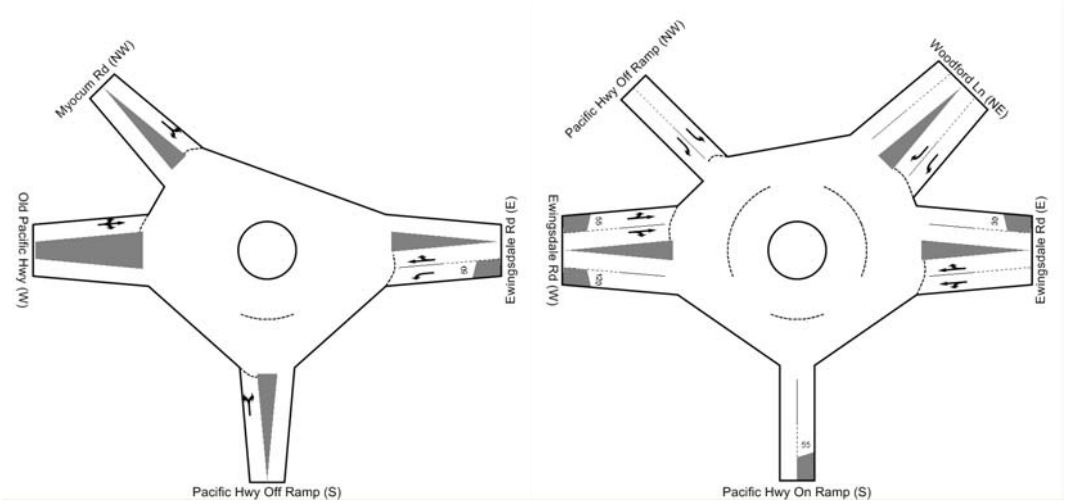


Figure 17 - Upgraded highway+ new western roundabout + eastern half-diamond + Woodford Lane (4B)

Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

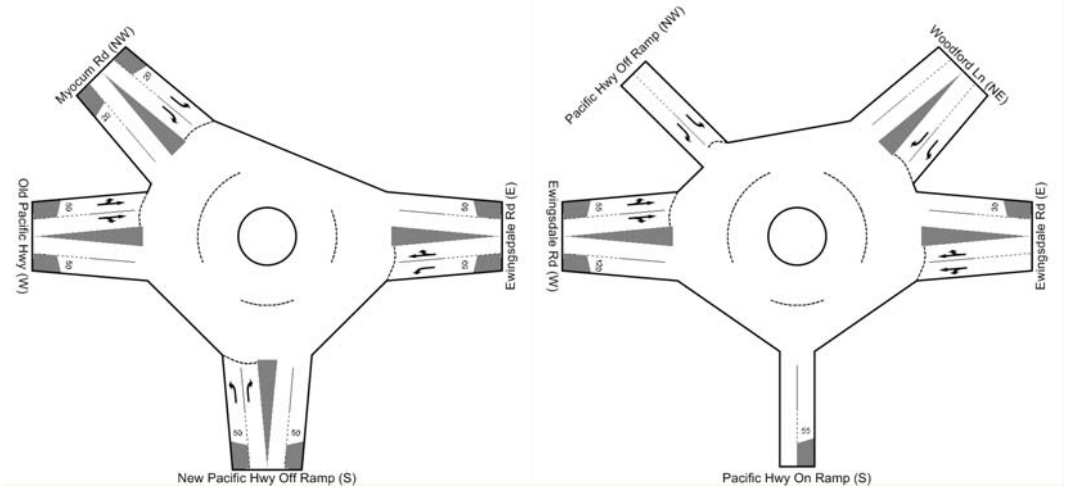
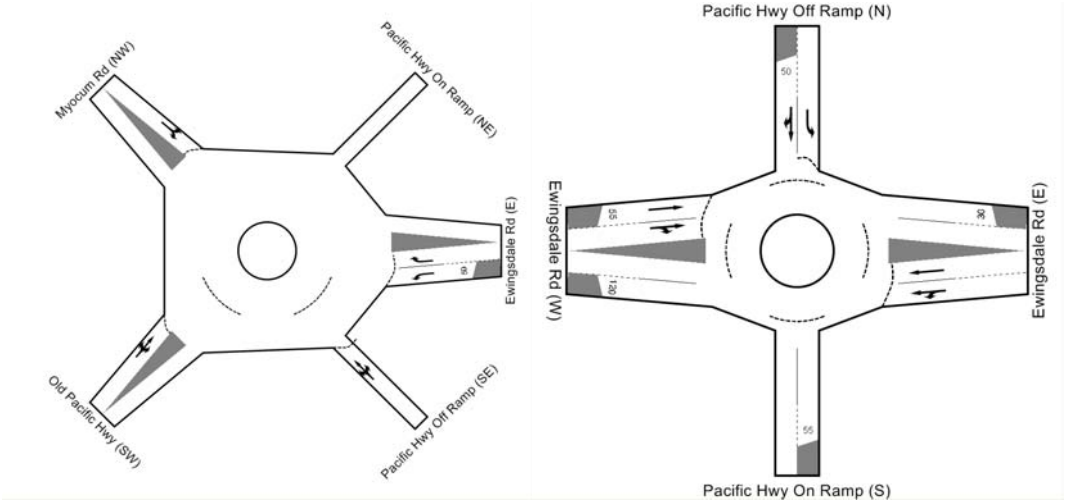


Figure 18 - Upgraded highway + full diamond interchange (5)

Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes

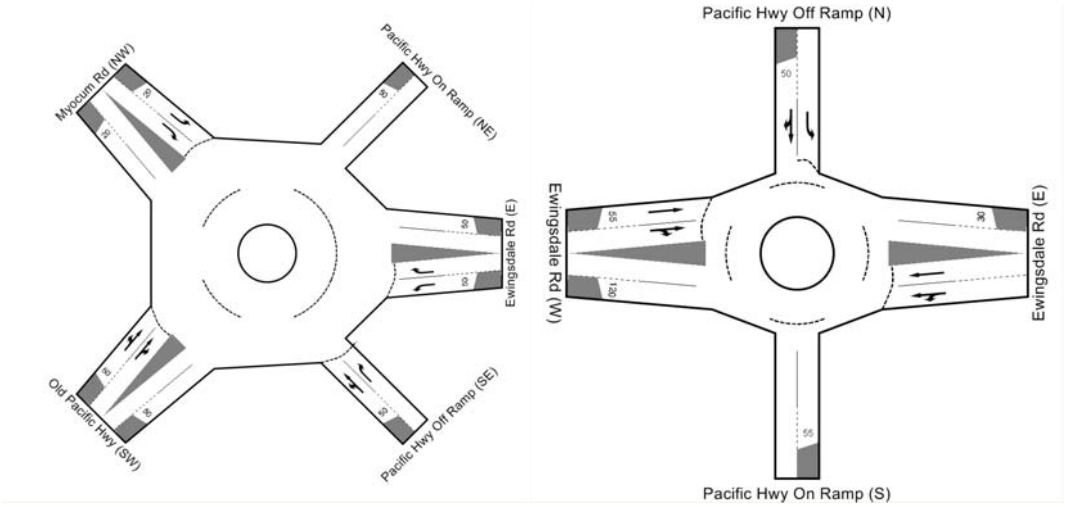
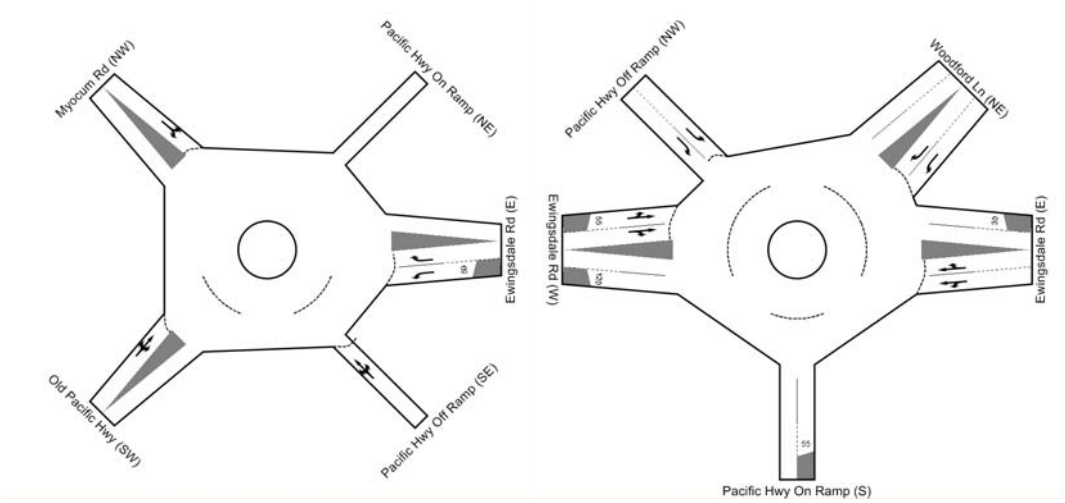
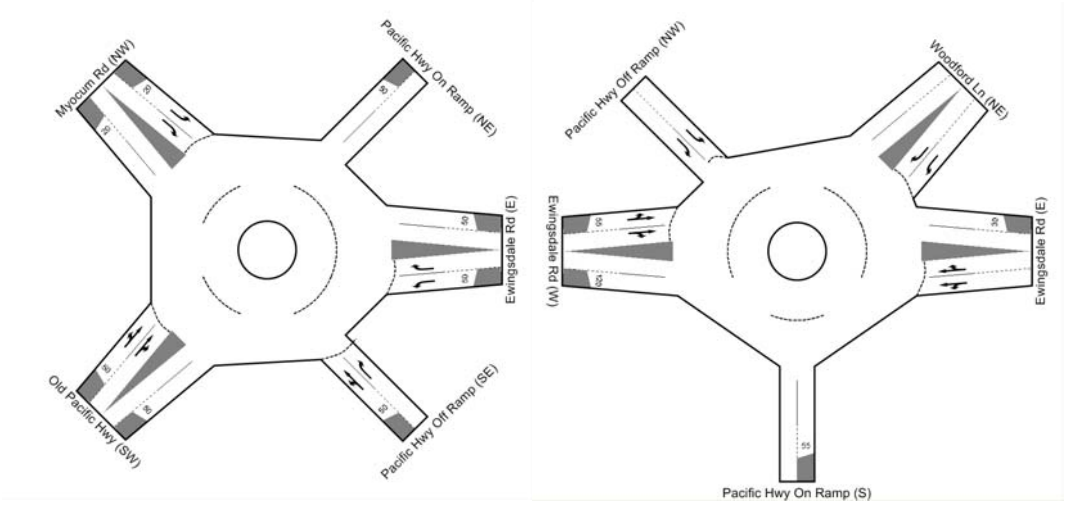


Figure 19 - Upgraded highway + full diamond interchange + Woodford Lane (5B)
Layout for current (2006) traffic volumes



Layout for future (2032) traffic volumes



3.2 Future Traffic

Each interchange scenario has been modelled for a 2006 base year as well as for forecast 2032 volumes, 20 years after the nominal opening year (for planning purposes only) of 2012. Future traffic volumes at the interchange have been forecast using the Tintenbar to Ewingsdale Pacific Highway growth rate of 3.2% linear growth (RTA, 2006). For traffic assessment (RTA, 2006), a linear growth rate for local roads of 2.5% has been adopted. It is envisaged that the adoption of 3.2% for Ewingsdale Road accounts for the future hospital traffic, assuming full operation by 2032.

The Level of Service calculations carried out for the proposed upgrade were based on this 3.2% linear growth from a base year of 2003. To ensure a consistent methodology is applied when considering the surveyed 2006 interchange volumes, a factor of 1.76 has been used to convert 2006 forecast or actual volumes to future (2032) volumes This assumes the base year of 2003.

Future volumes using the interchange are derived from the current volumes multiplied by this growth rate (1.76) plus the forecast additional interchange traffic as a result of the proposed upgrade. In the existing scenario, any traffic travelling north / south along the highway does not need to use the interchange. With the construction of the proposed upgrade, all vehicles that are still using the existing highway alignment will travel through the interchange, increasing traffic volumes to and from the north.

4 Modelling

4.1 Methodology

For each of the interchange scenarios, Arup has modelled the following hourly traffic scenarios:

- Peak non-holiday traffic. This is based on the peak hour observed during the OD surveys in December and corresponds to 4pm on a Friday.
- Peak Christmas holiday traffic. This is based on the peak hour observed during the tube counts undertaken over the Christmas / New Year period and corresponds to midday on 4 January 2007. This hour also represents an approximate 100th Highest Hourly Volume (HHV) on the Pacific Highway at Knockrow, when compared with hourly flows throughout the year.

The intersection analysis software, SIDRA Intersection (Version 3.1), was used to analyse both intersections at the Ewingsdale interchange for each layout scenario. They were analysed for the peak holiday and non-holiday hours above, using the corresponding traffic volumes calculated from the tube count and OD survey data. The volumes were multiplied by the growth factor of 1.76 to determine future (2032) traffic volumes, as detailed in **Section 3.2**.

The input traffic volumes used in the SIDRA modelling are summarised in **Appendix A**.

4.2 Assumptions

Assumptions that were made regarding modelled traffic volumes and intersection layouts are detailed below.

With the construction of the Tintenbar to Ewingsdale proposed upgrade, traffic that is currently using the south facing ramps at Ewingsdale (i.e. northbound off-ramp and southbound on-ramp) will be split between the upgraded highway and existing highway. The origin and destination survey undertaken as part of the traffic assessment (RTA, 2006) matched vehicles travelling between Bangalow and the Ewingsdale interchange. These vehicles were assumed to be local or regional traffic travelling between Bangalow / Lismore and Ewingsdale/Byron Bay, and would therefore continue to use the existing highway. This traffic was approximately 35% of the total Ewingsdale interchange south-facing ramp traffic volumes counted on the survey day.

In addition to this, 2006 hourly count station data at Nashua (Bangalow Road) and Knockrow (Pacific Highway), as well as projected 2032 Annual Average Daily Traffic (AADT) data for the proposed upgrade was analysed. Traffic currently using the Pacific Highway between Bangalow and Ewingsdale comprises traffic travelling to and from Lismore, Bangalow and towns in between that then use the highway to travel to and from the north, as well as traffic travelling to and from the south (including Ballina) along the Pacific Highway. As there is no wider origin and destination information to give an indication of holiday peak regional traffic patterns, as well as no permanent count station data to the south of the Ewingsdale interchange, holiday peak traffic volumes at Nashua (6.3km west of the Pacific Highway) and Knockrow (south of Bangalow) have been used. This assists in estimating the likely future peak traffic volumes on the existing highway, following construction of the proposed upgrade. As part of the traffic assessment, projected 2032 traffic volumes were estimated for the proposed upgrade north of Bangalow, as well as the existing highway. These have also been used as a reference in estimating the likely future peak traffic volumes on the existing highway, following construction of the proposed upgrade, although it is recognised that holiday peak traffic volumes on the Pacific Highway

may be a greater percentage of annual average daily traffic volumes than on Bangalow Road.

The sum of the peak hourly data at Nashua and Knockrow was found to have an approximate 30% / 70% split between the two locations respectively, and the projected 2032 data along the proposed upgrade was found to have a 43% / 57% split between the existing highway and the proposed upgrade. When comparing these figures with the origin and destination survey data discussed above, a 35% / 65% split between the existing highway and the proposed upgrade traffic using the Ewingsdale interchange was considered as appropriate.

In addition to the traffic using the interchange through current travel patterns, the construction of the proposed upgrade will result in additional traffic using the interchange. This traffic will primarily be made up of vehicles travelling to and from the north from Bangalow Road. These vehicles currently use Granuaille Road and the Pacific Highway, and in the future will continue to use the existing highway rather than the proposed upgrade as no north-facing interchange ramps are proposed at Bangalow. This traffic currently does not use the existing interchange, however as the existing highway will connect into the Ewingsdale interchange through a new roundabout, these vehicles will be required to pass through the interchange in the future, using the north-facing ramps to travel to and from the north on the Pacific Highway.

To determine the likely peak hourly traffic volume using the existing highway, 2006 permanent count station data at Nashua (Bangalow Road) was again examined. Hourly volumes of 539 and 602 axle pairs were recorded at midday on 4 and 5 January 2006 respectively. The latter would approximately correspond to midday on the 4 January 2007, which is the hour identified as the holiday peak hour. The AADT volume measured at this site in 2005, which is the most recent data available, was 7493 axle pairs. Hourly volumes of 539 and 602 represent 7.2% and 8.0% of the AADT value, respectively. With the proposed upgrade constructed including north-facing ramps at Ivy Lane and south-facing ramps at Bangalow Road, AADT volumes on the existing highway north of Bangalow are expected to reduce to around 8100 vehicles in current terms (2006). Conservatively applying 8% to this value gives an hourly volume of 650 vehicles. This value represents the total two-way traffic that would continue to use the existing highway after the upgrade has been completed, during a typical holiday peak hour.

To calculate the corresponding non-holiday peak hourly volume, the holiday peak hour of 650 vehicles was reduced to a nominal two-way hourly volume of 600 vehicles. The 35% of existing Ewingsdale interchange ramp traffic that would use the existing highway (as discussed above) is assumed to be included in these values. The heavy vehicle component of the existing highway traffic that is not currently using the interchange has been assumed as 5% heavy vehicles, which is consistent with estimates for the proposed upgrade.

For the purpose of analysis, intersection movements within the Ewingsdale interchange which had no values recorded during the 2006 origin and destination survey were assigned nominal volumes of less than 10 vehicles. These values have a negligible impact on the intersection capacity.

U-Turn movements at the existing eastern interchange roundabout were recorded during the 2006 origin and destination surveys, but found to be negligible values. Therefore, for the purpose of this analysis, they were assumed to be zero.

4.3 Results

Intersection performance indicators including the Level of Service, degree of saturation, average delay, maximum delay and 95th percentile queue length for the modelled scenarios are listed in **Table 3**, **Table 4**, **Table 5** and **Table 6**. A more detailed summary for each approach can be found in **Appendix B**.

Key observations from the modelling are:

- The existing interchange layout with no upgrade performs adequately in both 2006 and 2032. This is primarily due to the low volumes on Myocum Road and the unopposed northbound on-ramp traffic movement at the western intersection.
- The difference in traffic terms between the existing eastern intersection (roundabout) and the provision of eastern half diamond interchange ramps (i.e. new southbound on-ramp) is negligible, although there is a benefit in not having the southbound on-ramp traffic conflicting with other movements.
- The roundabout on the western side of the interchange introduced by the upgrade is required to have two circulating lanes to provide an adequate Level of Service for interchange Scenarios 2 and 3.
- With current traffic volumes, the roundabout on the western side of the interchange introduced by the upgrade operates slightly more efficiently with the existing ramp configuration (Scenario 2) than with the provision of a western half diamond (Scenario 3). This is primarily due to the unopposed turn for vehicles turning left onto the northbound on-ramp from Ewingsdale Road (one of the heaviest movements). However, a significant volume of traffic is turning right onto the northbound on-ramp from the old highway connection. This situation is reversed in other future traffic conditions where the provision of a western half diamond operates slightly more efficiently than the existing ramp layout.

4.3.1 Existing (2006) Peak Holiday Traffic Results

Eastern intersection

For the eastern intersection, the degree of saturation is similar (between 0.35 and 0.37) across all scenarios based on the existing ramp configuration, as well those that introduce a half-diamond layout. Similar average delays between five and seven seconds also resulted from all scenarios. The maximum delays are experienced on right turning movements with very similar delays on the right turns from the southbound off-ramp approach and the Ewingsdale Road westbound approach.

Western intersection

For the western intersection, the degree of saturation reported across the scenarios modelled was between 0.35 and 0.38 with the existing ramp configuration and around 0.5 with the half-diamond layout. All scenarios were modelled with a single lane roundabout. The maximum delays on the Western intersection with the existing ramp configuration are generally on Myocum Road, primarily due to the low volumes on this leg. Once a half diamond ramp configuration is introduced, the maximum delays are experienced on right turning movements, with very similar delays on the right turns from the northbound off-ramp approach and the Ewingsdale Road westbound approach.

4.3.2 Existing (2006) Peak Non Holiday Traffic Results

The 2006 non-holiday peak traffic exhibited similar but generally slightly better results when compared with the 2006 holiday peak traffic. There was a slightly greater variability in the degree of saturation between scenarios.

4.3.3 Future (2032) Peak Holiday Traffic Results

Eastern intersection

For the eastern intersection, all scenarios modelled offered acceptable performance, operating at LoS A. The degrees of saturation reported across the scenarios modelled were between 0.68 and 0.75. When comparing the results for the existing roundabout configuration and a half-diamond layout, there is a marginal increase in the degree of saturation with the half-diamond layout, but slightly reduced average delays, maximum delays and 95th percentile queue length. The incorporation of an additional intersection leg for Woodford Lane and the associated possible traffic volume increases results in relatively minor increases across all of the result indicators used. Average delays of between 6 and 10 seconds were recorded. Maximum 95th percentile queues are around 60-80m long, or 10-14 vehicles on the Ewingsdale Road westbound approach across the scenarios modelled.

Western intersection

When examining the western intersection analysis results, it can be seen that, as with the eastern intersection, all scenarios offer acceptable performance with a degree of saturation generally between 0.74 and 0.9 and delays generally between 14 and 16 seconds. While these delays are similar, the results border on the upper limit of LoS A (14.5 seconds), hence some scenarios report LoS A while others report LoS B. Scenario 1 (existing intersection layout) reported a significantly lower degree of saturation and average delay, as the major movements through this intersection operate unopposed. As expected under this situation, the right-turn movement out of Myocum Road reported the highest maximum delay (41 seconds) across the scenarios modelled, however the traffic volumes undertaking this movement are relatively low.

There was a significant reduction in the degree of saturation, delays and queues recorded for the western intersection in Scenario 2B, which is due to the provision of the additional northbound highway on-ramp in this layout (two separate northbound on-ramps in total). The maximum queue lengths in particular are significantly lower in this scenario, measuring 36m, whereas the other scenarios reported queues of between 80-140m. This carries through for the peak, non peak, existing and future options modelled, but is more noticeable in this case due to the higher volumes recorded.

4.3.4 Future (2032) Peak Non Holiday Traffic Results

As with the existing traffic results, the future (2032) results for peak holiday and non holiday periods were proportional in terms of degree of saturation, queue lengths and average delay.

The eastern intersection reported LoS A for all layout scenarios, with the average delay ranging from 6 to 10 seconds. The degree of saturation ranged from 0.524 (existing intersection) to 0.795 (scenario including the realignment of Woodford Lane). The western intersection displayed a wider range of between 2 and 15 seconds average delay, with the maximum delay recorded as 46 seconds (right turn out of Myocum Road under the existing intersection layout).

Table 3 - Existing (2006) Peak Holiday Traffic Results

Scenario	Eastern Intersection							Western Intersection						
	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement
1	A	0.352	5.5	13.1	SB off ramp, RT	17	SB off ramp, LT	N/A	0.225	1.9	17.9	Myocum, RT	3	Ewingsdale E, RT
2	A	0.351	6.7	12.3	Ewingsdale E, RT	17	SB off ramp, LT	A	0.379	8.5	13.7	Myocum, RT	23	Ewingsdale E, LT
2B	A	0.351	6.7	12.3	Ewingsdale E, RT	17	SB off ramp, LT	A	0.353	6	13.7	Myocum, RT	17	Old hwy all, Ewingsdale LT
3	A	0.351	6.7	12.3	Ewingsdale E, RT	17	SB off ramp, LT	A	0.5	9.6	17.2	Myocum, RT	27	Old hwy, all
4	A	0.365	6.8	12.3	SB off ramp, RT	17	Ewingsdale E, Thru	A	0.379	8.5	13.7	Myocum, RT	23	Ewingsdale E, LT
4B	A	0.361	6.9	13.8	Ewingsdale E, RT	18	Ewingsdale E, LT	A	0.359	8.5	13.1	Ewingsdale, RT	22	Ewingsdale E, LT
5	A	0.365	6.8	12.3	SB off ramp, RT	17	Ewingsdale E, Thru	A	0.5	9.6	15.2	NB off ramp, RT	27	Old hwy, all
5B	A	0.361	6.9	13.8	Ewingsdale E, RT	18	Ewingsdale E, LT	A	0.5	9.4	15.1	Ewingsdale, RT	26	Old hwy, all

Table 4 - Existing (2006) Peak Non Holiday Traffic Results

Scenario	Eastern Intersection							Western Intersection						
	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement
1	A	0.27	5.7	12.1	SB off ramp, RT	13	Ewingsdale E, all and SB off ramp, LT	N/A	0.234	2	18.6	Myocum, RT	3	Ewingsdale E, RT
2	A	0.342	6.6	12.2	Ewingsdale E, RT	18	Ewingsdale E, all	A	0.364	8.3	14.4	Myocum, RT	22	Ewingsdale E, Thru and RT
2B	A	0.342	6.6	12.2	Ewingsdale E, RT	18	Ewingsdale E, all	A	0.308	6.1	13	NB off ramp, RT	17	Ewingsdale E, Thru and RT
3	A	0.342	6.6	12.2	Ewingsdale E, RT	18	Ewingsdale E, all	A	0.438	9.7	15.3	NB off ramp, RT	24	Old hwy, all
4	A	0.368	6.6	12.2	SB off ramp, RT	19	Ewingsdale E, Thru	A	0.364	8.3	14.4	Myocum, RT	22	Ewingsdale E, Thru and RT
4B	A	0.383	6.7	13.7	Ewingsdale E, RT	20	Ewingsdale E, Thru & RT	A	0.378	8.3	14.4	Myocum, RT	22	Ewingsdale E, LT
5	A	0.368	6.6	12.2	SB off ramp, RT	19	Ewingsdale E, Thru	A	0.438	9.7	15.3	NB off ramp, RT	24	Old hwy, all
5B	A	0.383	6.7	13.7	Ewingsdale E, RT	20	Ewingsdale E, Thru & RT	A	0.438	9.6	15.2	NB off ramp, RT	24	Old hwy, all

Table 5 - Future (2032) Peak Holiday Traffic Results

Scenario	Eastern Intersection							Western Intersection						
	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement
1	A	0.676	6.2	14.1	SB off ramp, RT	54	SB off ramp, LT	N/A	0.395	2.2	41.4	Myocum, RT	6	Ewingsdale E, RT
2	A	0.675	8.7	15.7	Ewingsdale E, Thru	60	Ewingsdale E, all	B	0.893	15.8	22.2	Ewingsdale, LT	140	Ewingsdale E, LT
2B	A	0.675	8.7	15.7	Ewingsdale E, Thru	60	Ewingsdale E, all	A	0.614	6.4	15.6	Myocum, RT	36	Ewingsdale E, LT
3	A	0.675	8.7	15.7	Ewingsdale E, Thru	60	Ewingsdale E, all	A	0.742	14.3	32.4	Old hwy, RT	92	Old hwy, Thru and RT
4	A	0.713	9.5	13.5	SB off ramp, RT	72	Ewingsdale E, Thru	B	0.893	15.8	22.2	Ewingsdale, LT	140	Ewingsdale E, LT
4B	A	0.751	10.1	19.4	Ewingsdale E, RT	82	Ewingsdale E, Thru & RT	B	0.849	14.8	19.6	Ewingsdale, RT	116	Ewingsdale E, LT
5	A	0.713	9.5	13.5	SB off ramp, RT	72	Ewingsdale E, Thru	A	0.742	14.3	32.4	Old hwy, RT	92	Old hwy, Thru and RT
5B	A	0.751	10.1	19.4	Ewingsdale E, RT	82	Ewingsdale E, Thru & RT	A	0.717	13.4	28.6	Old hwy, RT	83	Old hwy, Thru and RT

Table 6 - Future (2032) Peak Non Holiday Traffic Results

Scenario	Eastern Intersection							Western Intersection						
	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement	LoS	Degree of Saturation	Average Delay	Max Delay	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement
1	A	0.524	6.1	12.7	SB off ramp, RT	32	SB off ramp, LT	N/A	0.412	2.2	45.6	Myocum, RT	6	Ewingsdale E, RT
2	A	0.700	8.5	15.4	Ewingsdale E, RT	68	Ewingsdale E, all	A	0.822	12.9	20	Ewingsdale E, RT	103	Ewingsdale E, Thru and RT
2B	A	0.700	8.5	15.4	Ewingsdale E, RT	68	Ewingsdale E, all	A	0.552	6.4	16.1	Myocum, R	34	Ewingsdale E, Thru and RT
3	A	0.700	8.5	15.4	Ewingsdale E, RT	68	Ewingsdale E, all	B	0.724	14.7	33.9	Old hwy, RT	88	Old hwy, Thru and RT
4	A	0.761	9.2	13.2	SB off ramp, RT	84	Ewingsdale E, Thru	A	0.822	12.9	20	Ewingsdale E, RT	103	Ewingsdale E, Thru and RT
4B	A	0.795	9.7	19.5	Ewingsdale E, RT	94	Ewingsdale E, Thru & RT	A	0.82	12.7	16.2	Ewingsdale E, RT	103	Ewingsdale E, LT
5	A	0.761	9.2	13.2	SB off ramp, RT	84	Ewingsdale E, Thru	B	0.724	14.7	33.9	Old hwy, RT	88	Old hwy, Thru and RT
5B	A	0.795	9.7	19.5	Ewingsdale E, RT	94	Ewingsdale E, Thru & RT	A	0.706	13.9	22.4	Old hwy, Thru	81	Old hwy, Thru and RT

5 Interchange Ramp Operation and Capacity

The ramp operation and capacity for each of the five layout scenarios was assessed using the methodology outlined in the US Highway Capacity Manual (Transportation Research Board, 2000). Highway on and off ramps were assessed for merge and diverge capacities respectively.

5.1 Input Values and Adjustment Factors

The assessment requires input values of through traffic and ramp traffic, acceleration / deceleration lane lengths, as well as a number of different factors such as PHF (peak hour factor), f_{hv} (heavy vehicle factor), and f_p (adjustment for driver population).

The PHF values range from 0.80 for rural freeways / off peak conditions to 0.95 for urban / suburban peak hour conditions. An average value of 0.88 was taken as the highway is in a rural location, but close to major towns and a popular travel route for local and holiday traffic. This value is consistent with Level of Service calculations undertaken for the existing highway as part of the Tintenbar to Ewingsdale Traffic and Transport Working Paper (RTA, 2006).

The factor for heavy vehicles, f_{hv}, was calculated using an equation that takes into account the passenger car equivalents of heavy vehicles and the proportion of heavy vehicles in the stream. Assuming a rolling terrain, the input values were taken as 2.5 passenger car units (pcu) per heavy vehicle and 5% heavy vehicles in the general traffic stream, giving an f_{hv} value of 0.93.

The adjustment for driver population ranges from a factor of 0.85 if assuming recreational drivers to 1.00 which assumes commuters are familiar with the road. 0.85 was conservatively used, which assumes that most users are travelling longer distances on the highway, so are therefore unfamiliar with the interchange.

Acceleration / deceleration lane lengths were calculated using a combination of existing (measured) and typical design values. The existing lane lengths were measured and compared to required lengths for stopping sight distance, and acceleration / deceleration requirements. For all scenarios except for northbound in Scenario 2B, acceleration lanes were taken as 450m, and deceleration lanes 180m. Scenario 2B northbound also used a deceleration length of 180m, however values of 50m and 400m were input for the slow and high speed merge lanes respectively.

5.2 Results

Using the 2032 peak holiday traffic volumes, the Level of Service of the merge / diverge was calculated according to the methods described in the *Highway Capacity Manual* (HCM, 2000) for each scenario. The density of vehicles in the merge / diverge influence areas were calculated; measured in passenger cars per kilometre per lane (pc/km/ln). These were then converted to LoS according to **Table 7** (HCM, 2000).

Table 7 - LoS Criteria for Merge and Diverge Areas

Level of Service	Density (pc/km/ln)
A	≤ 6
B	>6 - 12
C	>12 - 17
D	>17 - 22
E	> 22
F	Demand exceeds capacity

For each scenario the LoS for each on / off ramp was calculated; the results of which are shown in **Table 8**. The results for the northbound ramps in Scenario 2B are excluded from this table as a different approach was used to calculate the merge / diverge.

Table 8 - Ramp LoS Results based on Predicted 2032 Traffic Volumes

Scenario	SB On Ramp	NB On Ramp	SB Off Ramp	NB Off Ramp
1	A	B	B	B
2	A	C	B	B
2B	A	-*	B	-*
3	A	C	B	B
4	A	C	B	B
4B	A	C	B	B
5	A	C	B	B
5B	A	C	B	B

*See discussion below

Scenario 2B includes two northbound on-ramps from the western intersection, which are in close proximity to each other, and therefore had to be modelled differently to the other scenarios. It was instead modelled as a slow speed merge of the half diamond on-ramp with the existing (loop) on-ramp, followed by a high speed merge of the combined ramp traffic onto the highway. **Table 9** shows the LoS for this merge / diverge option.

Table 9 - Scenario 2B NB Ramp LoS Results based on Predicted 2032 Traffic Volumes

	Diverge	Merge 1	Merge 2
Scenario 2B	B	B	C

The results indicate that for the forecast 2032 traffic volumes, the southbound on-ramp operates at LoS A across all layout scenarios, while both the northbound and southbound off-ramps operate at LoS B. The northbound off-ramp generally operates at LoS C with the exception of Scenario 1, which reported LoS B. Scenario 1 is the 'base case' (existing layout), hence the proposed upgrade (and associated additional traffic volumes through the interchange) is not included.

The northbound and southbound on-ramps reported a differing LoS because of the higher traffic volumes travelling to the north from the proposed upgrade than traffic travelling south along the 'old' highway route.

The northbound ramp volumes for scenario 2B are shown in **Table 9**, indicating LoS B for the off ramp diverge and slow speed merge (merge 1, where the two on-ramps merge together), and LoS C for the high speed merge (merge 2, where the on-ramp merges with the upgraded highway traffic). The LoS reported for merge 2 is consistent with the northbound on-ramp results for other scenarios, as summarised in **Table 8**.

The acceleration and deceleration lane lengths used to determine the merge / diverge lane LoS were taken as 180m for off ramps and 450m for on ramps for all layout scenarios except 2B. Scenario 2B involved a double merge due to this option layout involving two on ramps, to the north and south-west of the intersection. The existing spiralling northbound on-ramp was modelled with a slow speed merge facility onto a new northbound (diamond-style) on-ramp, followed by a standard high-speed merge with the northbound upgraded highway traffic. The northbound off-ramp deceleration lane length was taken as 180m, as in the other layout options, and the merge lane lengths were 50m and 400m for the slow and high speed merges respectively.

The lengths were calculated using a combination of the existing lane lengths, as well as the *Highway Capacity Manual* (HCM, 2000) and the *RTA Design Guidelines* (RTA, 2005). The existing measured lane lengths were approximately 170m for both off ramps (northbound and southbound), and 300m for the on ramps. Therefore, to maintain the levels of service as outlined in the above tables, these lane lengths would need to be increased to 180m and 450m for deceleration and acceleration respectively.

6 Recommendations

6.1 Preferred Interchange Layout

6.1.1 Eastern Intersection

The analysis undertaken indicates that the existing roundabout currently operates satisfactorily during a typical holiday peak period and would continue to do so in 2032 with the proposed upgrade, 20 years after the nominal opening year of 2012. However, in conjunction with the proposed upgrade, the opportunity has been taken to incorporate other changes which address issues with confusion / readability of the current layout and also to address some existing ramp design deficiencies.

The proposed changes to the eastern side of the existing interchange are shown in **Figure 20** and summarised below:

- A new direct southbound on-ramp would be provided. The existing loop ramp exits on the north side of the roundabout for vehicles wishing to travel south, which can be confusing to some users. In addition, the length of the acceleration lane onto the highway is insufficient because of the low speed (40km/h) of the 40 m radius curve at the entry under the bridge. Removal of this on-ramp and replacement with a new direct ramp connected to the south side of the roundabout is therefore proposed.
- The existing southbound off-ramp would be retained but slightly re-aligned at the location of the connection to the eastern roundabout.

The proposed layout allows for the future realignment of Woodford Lane, connecting into the roundabout. The advantage would be the elimination of the existing at-grade intersection between Woodford Lane and Ewingsdale Road and its replacement with the safer roundabout layout. This is a future provision only and is not part of the proposed upgrade works.

6.1.2 Western Intersection

The analysis undertaken indicates that the existing T-intersection currently operates satisfactorily during a typical holiday peak period and would continue to do so in 2032 without the proposed upgrade. However, modification to this intersection is required to incorporate a fourth leg which is brought about through the connection of the existing highway (and the associated Bangalow / Lismore traffic) into the interchange, in addition to the upgraded highway northbound on and off ramps.

The proposed changes to the western side of the existing interchange are shown in **Figure 20** and summarised below:

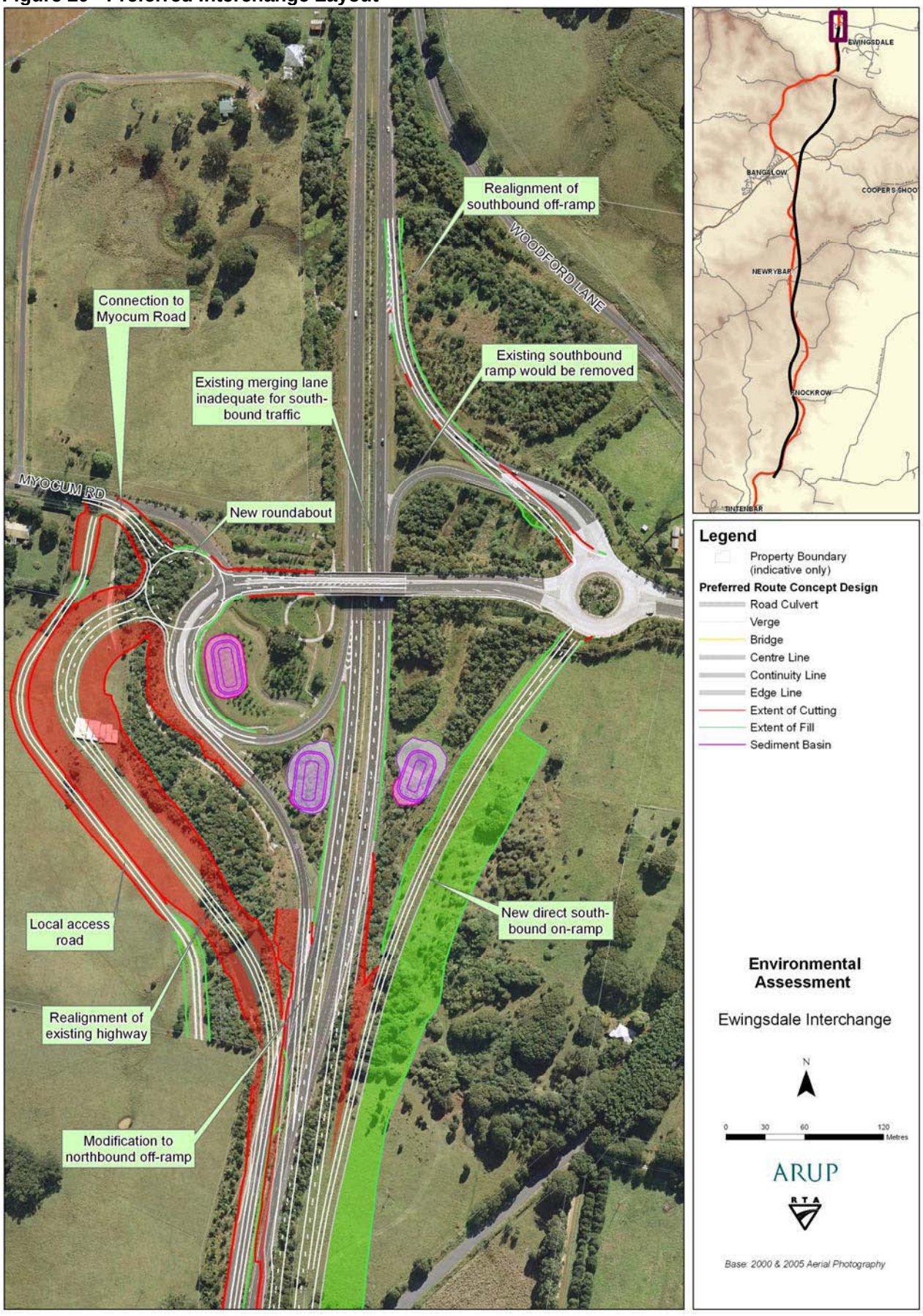
- A new roundabout to replace the existing T-intersection.
- Relocation of the existing highway further to the west so that it can continue to provide a connection to Bangalow and Lismore. The relocated road would connect to the new roundabout.
- The existing northbound off-ramp would be modified slightly so that it diverges from the proposed upgrade rather than from the existing highway. The end of this ramp would also be modified so that it connects to the new roundabout.
- The existing looped northbound on-ramp would be retained, but modified slightly so that it exits from the new roundabout on the western side.
- Myocum Road would also be connected to the new roundabout

When considering the two key ramp layout options (the existing layout [Scenario 2] and a diamond configuration [Scenario 3]), the analysis indicates that there is no significant short to medium term traffic benefit in upgrading the western intersection to the diamond

configuration, although it would provide some additional future capacity. The existing ramp layout also generally operates satisfactorily in terms of readability and driver understanding (unlike the eastern intersection). Both ramp layout options will operate satisfactorily in 2032 with the proposed upgrade, based on the forecast traffic volumes, although the existing layout is likely to be slightly higher than its practical maximum degree of saturation during the holiday peak hours.

In order to accommodate future traffic growth, the roundabout on the western side would include provisions for the addition of a new direct northbound on-ramp from the roundabout (heading north-east), thereby creating two northbound on-ramps. This is a future provision only and is not part of the proposed upgrade works.

Figure 20 - Preferred Interchange Layout



6.2 Sensitivity Testing

Input traffic volume sensitivity testing was carried out using the SIDRA software package. The volumes analysed were future predicted volumes for 2032, in the peak holiday season. Volumes of 80-150% of the forecast volumes were examined, with the practical maximum values indicating 110-120% flow scale at the eastern intersection, and between 90-110% for the western intersection. **Table 10** indicates the LoS, degree of saturation, average and maximum delays, maximum 95% queue and the associated maximum movement results of the sensitivity testing.

Table 10 - Sensitivity Testing – Practical Maximum Volumes

Scenario	Flow Scale	LoS	Degree of Saturation	Average Delay (sec)	Max Delay (sec)	Max Delay Movement	Max 95% Queue	Max 95% Queue Movement
Eastern Intersection								
2 and 3	117%	A	0.852	12.2	22.7	Ewingsdale E, RT	126m	Ewingsdale E, all
4 and 5	112%	A	0.852	12.1	14.8	Ewingsdale E, RT	123m	Ewingsdale E, Thru
Western Intersection								
2 and 4	97%	B	0.851	14.2	18.7	Ewingsdale E, LT	117m	Ewingsdale E, LT
3 and 5	106%	B	0.855	19.1	50.1	Highway SW, LT	147m	Highway SW, Thru & RT

The volume versus queue length relationship was fairly steady up until the optimum flow scale, after which a small change in volume had a large effect on the queue lengths of the intersection. This in turn affects the average delay in a similar way, with the delay increasing steadily until the optimum flow, after which it increases quickly. Flow scales over 130% for the eastern intersection and 110-120% for the western intersection had a degree of saturation greater than 1. These results are shown in **Table 11**.

Table 11 - Variation of SIDRA Outputs with Flow Scale

Scenario	Flow Scale (%)	Intersection Degree of Saturation	Longest Queue (veh)	Average Delay (sec)	Level of Service
Eastern Intersection					
Scenario 2 and 3	80	0.518	4.2	7.3	A
	90	0.596	5.8	7.8	A
	100	0.675	8.4	8.7	A
	110	0.767	12.4	10.3	A
	120	0.891	21.0	13.6	A
	130	1.033	55.2	29	C
	140	1.201	133.5	81.5	F
	150	1.404	225.7	171.9	F
Scenario 4 and 5	80	0.536	4.6	7.5	A
	90	0.613	6.8	8.3	A
	100	0.713	9.9	9.5	A
	110	0.829	15.5	11.5	A
	120	0.962	32.1	17.9	B
	130	1.118	90.9	47.5	D
	140	1.302	176.1	112.6	F
	150	1.528	268.3	211.6	F
Western Intersection					
Scenario 2 and 4	80	0.628	7	10	A
	90	0.751	10.9	11.8	A
	100	0.893	19.3	15.8	B
	110	1.012	45.1	28.1	B
	120	1.379	225.9	122.5	F
	130	1.807	425.9	240.7	F
	140	2.326	628.6	381.8	F
	150	2.89	810.4	538.8	F
Scenario 3 and 5	80	0.475	4.6	10.2	A
	90	0.594	7.4	11.5	A
	100	0.742	12.7	14.3	A
	110	0.938	30.7	26.3	B
	120	1.213	94.8	65.5	E
	130	1.64	189.6	146.3	F
	140	2.563	325.8	343.2	F
	150	4.928	503.2	890.8	F

References

[1] Guide to Traffic Engineering Practice: Part 2, Roadway Capacity (1988), AUSTROADS, Ambassador Press, Granville, NSW.

[2] RTA (2005), Upgrading Program beyond 2006: Design Guidelines (draft issue 1.2).

[3] RTA (2006), Tintenbar to Ewingsdale: Upgrading the Pacific Highway – Traffic and Transport Working Paper.

[4] Transportation Research Board (2000), Highway Capacity Manual, National Academy of Sciences, USA.

Appendix A

SIDRA Modelling Traffic Input Volumes

A1 Existing Peak Non-Holiday

Scenario	Movement	East								West							
		Ewingsdale Rd W		Pacific Hwy		Woodford Ln		Ewingsdale Rd E		Pacific Hwy		Old Pacific Hwy		Myocum Rd		Ewingsdale Rd	
		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
1	Left	19	0	347	18							10	1	62	1		
	Thru	188	7					503	21			146	6			416	17
	Right			3	0			252	12					1	0	91	4
2	Left	19	0	347	18					0	0	6	1	62	1	416	17
	Thru	188	7					591	25	4	0	51	2	0	0	307	11
	Right			222	11			164	8	95	4	270	11	1	0	91	4
2B	Left	19	0	347	18					0	0	6	1	0	0	416	17
	Thru Left	188	7					591	25	4	0	270	11	62	1	307	11
	Thru Right									0	0	51	2	0	0	91	4
	Right			222	11			164	8	95	0			1	0	0	0
3	Left	19	0	347	18					5	0	6	1	0	0	307	11
	Thru	188	7					591	25	4	0	270	11	62	1	91	4
	Right			222	11			164	8	95	4	51	2	1	0	416	17
4	Left			347	18			164	8	0	0	6	1	62	1	416	17
	Thru	188	7	1	0			591	25	4	0	51	2	0	0	307	11
	Right	19	0	222	11					95	4	270	11	1	0	91	4
4B	Left	5	0	5	0	17	1	164	8	5	0	6	1	0	0	307	11
	Thru Left	188	7	370	17	5	0	591	25	4	0	270	11	62	1	91	4
	Thru Right			1	0												
	Right	19	0	222	11	4	0	21	1	95	4	51	2	1	0	416	17
5	Left			347	18			164	8	5	0	6	1	0	0	307	11
	Thru	188	7	1	0			591	25	4	0	270	11	62	1	91	4
	Right	19	0	222	11					95	4	51	2	1	0	416	17
5B	Left	5	0	5	0	17	1	164	8	5	0	6	1	0	0	311	11
	Thru Left	188	7	370	17	5	0	591	25	4	0	270	11	62	1		
	Thru Right			1	0					0	0					91	4
	Right	19	0	222	11	4	0	21	1	95	4	56	2	1	0	399	16

A2 Existing Peak Holiday

Scenario	Movement	East								West							
		Ewingsdale Rd W		Pacific Hwy		Woodford Ln		Ewingsdale Rd E		Pacific Hwy		Old Pacific Hwy		Myocum Rd		Ewingsdale Rd	
		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
1	Left	6	2	469	14							2	0	50	4		
	Thru	183	8					476	19			141	6			400	16
	Right			3	1			193	6					5	0	81	4
2	Left	6	2	469	14					0	0	1	0	50	4	400	16
	Thru	183	8					544	21	1	0	49	2	2	0	325	13
	Right			260	14			125	4	92	4	306	13	3	0	81	4
2B	Left	6	2	469	14					0	0	1	0	0	0	400	16
	Thru Left	183	8					544	21	1	0	306	13	50	4	325	13
	Thru Right									0	0	49	2	2	0	81	4
	Right			260	14			125	4	92	4			3	0	0	0
3	Left	6	2	469	14					5	0	1	0	2	0	325	13
	Thru Left	183	8					544	21	1	0	306	13	50	4		
	Thru Right									0	0					81	4
	Right			260	14			125	4	92	4	49	2	3	0	400	16
4	Left			469	14			125	4	0	0	1	0	50	4	400	16
	Thru	183	8	1	0			544	21	1	0	49	2	2	0	325	13
	Right	6	2	260	14					92	4	306	13	3	0	81	4
4B	Left	5	0	5	0	20	1	125	4	0	0	1	0	50	4	377	15
	Thru Left	183	8	446	13	5	0	544	21	1	0	52	4			331	13
	Thru Right			1	0									2	0		
	Right	6	2	260	14	6	0	23	1	92	4	306	13	3	0	81	4
5	Left			469	14			125	4	5	0	1	0	2	0	325	13
	Thru Left	183	8	1	0			544	21	1	0	306	13	50	4		
	Thru Right									0	0					81	4
	Right	6	2	260	14					92	4	49	2	3	0	400	16
5B	Left	5	0	5	0	20	1	125	4	5	0	1	0	2	0	331	13
	Thru Left	183	8	446	13	5	0	544	21	1	0	306	13	50	4		
	Thru Right			1	0					0	0					81	4
	Right	6	2	260	14	6	0	23	1	92	4	54	2	3	0	377	15

A3 Future Peak Non-Holiday

Scenario	Movement	East								West							
		Ewingsdale Rd W		Pacific Hwy		Woodford Ln		Ewingsdale Rd E		Pacific Hwy		Old Pacific Hwy		Myocum Rd		Ewingsdale Rd	
		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
1	Left	33	0	611	32							18	2	109	2		
	Thru	331	12					885	37			257	11			732	30
	Right			5	0			444	21					2	0	160	7
2	Left	33	0	611	32					0	0	11	2	109	2	732	30
	Thru	332	12					1040	44	7	0	90	4	0	0	540	19
	Right			391	19			289	14	167	7	475	19	2	0	160	7
2B	Left	33	0	611	32					0	0	11	2	0	0	732	30
	Thru Left	331	12					1040	44	7	0	475	19	109	2	540	19
	Thru Right									0	0	90	4	0	0	160	7
	Right			391	19			289	14	167	7			2	0	0	0
3	Left	33	0	611	32					5	0	11	2	0	0	540	19
	Thru Left	332	12					1040	44	7	0	475	19	109	2		
	Thru Right									0	0					160	7
	Right			391	19			289	14	167	7	90	4	2	0	732	30
4	Left			611	32			289	14	0	0	11	2	109	2	732	30
	Thru	331	12	1	0			1040	44	7	0	90	4	0	0	540	19
	Right	33	0	391	19					167	7	475	19	2	0	160	7
4B	Left	9	0	5	0	37	2	289	14	0	0	11	2	109	2	701	28
	Thru Left	331	12	580	30	5	0	1040	44	7	0	98	5			549	20
	Thru Right			1	0									0	0		
	Right	33	0	391	19	8	0	31	2	167	7	475	19	2	0	160	7
5	Left			611	32			289	14	5	0	11	2	0	0	540	19
	Thru Left	331	12	1	0			1040	44	7	0	475	19	109	2		
	Thru Right									0	0					160	7
	Right	33	0	391	19					167	7	90	4	2	0	732	30
5B	Left	9	0	5	0	37	2	289	14	5	0	11	2	0	0	549	20
	Thru Left	331	12	580	30	5	0	1040	44	7	0	475	19	109	2		
	Thru Right			1	0					0	0					160	7
	Right	33	0	391	19	8	0	31	2	167	7	98	5	2	0	701	28

A4 Future Peak Holiday

Scenario	Movement	East								West							
		Ewingsdale Rd W		Pacific Hwy		Woodford Ln		Ewingsdale Rd E		Pacific Hwy		Old Pacific Hwy		Myocum Rd		Ewingsdale Rd	
		Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
1	Left	11	4	825	25							4	0	88	7		
	Thru	322	14					838	33			248	11			704	28
	Right			5	2			340	11					9	0	143	7
2	Left	11	4	825	25					0	0	2	0	88	7	704	28
	Thru	322	14					957	37	2	0	86	4	4	0	572	23
	Right			458	25			220	7	162	7	539	23	5	0	143	7
2B	Left	11	4	825	25					0	0	2	0	0	0	704	28
	Thru Left	322	14					957	37	2	0	539	23	88	7	572	23
	Thru Right									0	0	86	4	4	0	143	7
	Right			458	25			220	7	162	7			5	0	0	0
3	Left	11	4	825	25					5	0	2	0	4	0	572	23
	Thru Left	322	14					957	37	2	0	539	23	88	7		
	Thru Right									0	0					143	7
	Right			458	25			220	7	162	7	86	4	5	0	704	28
4	Left			825	25			220	7	0	0	2	0	88	7	704	28
	Thru	322	14	1	0			957	37	2	0	86	4	4	0	572	23
	Right	11	4	458	25					162	7	539	23	5	0	143	7
4B	Left	9	0	5	0	35	1	220	7	0	0	2	0	88	7	663	27
	Thru Left	322	14	784	24	5	0	957	37	2	0	95	4			576	23
	Thru Right			1	0									4	0		
	Right	11	4	458	25	10	0	41	1	162	7	539	23	5	0	143	7
5	Left			825	25			220	7	5	0	2	0	4	0	572	23
	Thru Left	322	14	1	0			957	37	2	0	539	23	88	7		
	Thru Right									0	0					143	7
	Right	11	4	458	25					162	7	86	4	5	0	704	28
5B	Left	9	0	5	0	35	1	220	7	5	0	2	0	4	0	576	23
	Thru Left	322	14	784	24	5	0	957	37	2	0	539	23	88	7		
	Thru Right			1	0					0	0					143	7
	Right	11	4	458	25	10	0	41	1	162	7	95	4	5	0	663	27

Appendix B

Detailed SIDRA Modelling Output

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario E1

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	521	3.8	0.233	3.5	LOS A	11	0.04	0.32	54.5
6	R	209	2.9	0.233	11.3	LOS A	11	0.04	0.66	46.8
Approach		**730**	**3.6**	**0.233**	**5.7**	**LOS A**	**11**	**0.04**	**0.41**	**51.9**
Pacific Hwy Ramps (N)										
7	L	508	2.9	0.352	5.6	LOS A	17	0.36	0.49	50.2
9	R	4	25.0	0.005	13.1	LOS A	0	0.34	0.61	45.4
Approach		**513**	**3.1**	**0.352**	**5.6**	**LOS A**	**17**	**0.36**	**0.49**	**50.2**
Ewingsdale Rd (W)										
10	L	8	25.0	0.048	6.5	LOS A	2	0.32	0.49	50.5
11	T	201	4.0	0.116	4.1	LOS A	5	0.29	0.38	52.2
Approach		**209**	**4.8**	**0.116**	**4.2**	**LOS A**	**5**	**0.30**	**0.39**	**52.1**
All Vehicles		**1452**	**3.6**	**0.352**	**5.5**	**LOS A**	**17**	**0.19**	**0.44**	**51.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E1 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 1
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SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario E2 E2B and E3

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	595	3.7	0.313	4.6	LOS A	16	0.44	0.43	51.0
6	R	136	2.9	0.313	12.3	LOS A	16	0.44	0.68	45.0
Approach		**731**	**3.6**	**0.313**	**6.0**	**LOS A**	**16**	**0.44**	**0.48**	**49.6**
Pacific Hwy Ramps (N)										
7	L	508	2.9	0.351	5.6	LOS A	17	0.36	0.49	50.3
9	R	288	5.2	0.263	12.2	LOS A	11	0.35	0.67	45.4
Approach		**798**	**3.8**	**0.351**	**7.9**	**LOS A**	**17**	**0.36**	**0.56**	**48.3**
Ewingsdale Rd (W)										
10	L	8	25.0	0.048	6.2	LOS A	2	0.28	0.46	50.8
11	T	201	4.0	0.115	3.9	LOS A	5	0.26	0.36	52.5
Approach		**209**	**4.8**	**0.115**	**4.0**	**LOS A**	**5**	**0.26**	**0.37**	**52.5**
All Vehicles		**1738**	**3.8**	**0.351**	**6.7**	**LOS A**	**17**	**0.38**	**0.50**	**49.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E2,2B&3 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 2&3
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SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario E4 and E5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	136	2.9	0.283	7.1	LOS A	14	0.46	0.60	48.9
5	T	595	3.7	0.334	5.2	LOS A	17	0.46	0.48	50.4
Approach		**731**	**3.6**	**0.334**	**5.5**	**LOS A**	**17**	**0.46**	**0.50**	**50.1**
Pacific Hwy Off Ramp (N)										
7	L	508	2.9	0.365	6.4	LOS A	16	0.34	0.54	49.7
8	T	1	0.0	0.250	5.3	LOS A	10	0.34	0.48	50.9
9	R	288	5.2	0.268	12.3	LOS A	10	0.34	0.68	45.3
Approach		**799**	**3.8**	**0.365**	**8.5**	**LOS A**	**16**	**0.34**	**0.59**	**47.9**
Ewingsdale Rd (W)										
11	T	201	4.0	0.091	4.4	LOS A	0	0.00	0.40	53.6
12	R	8	25.0	0.091	11.9	LOS A	0	0.00	0.68	46.7
Approach		**209**	**4.8**	**0.091**	**4.7**	**LOS A**		**0.00**	**0.41**	**53.3**
All Vehicles		**1739**	**3.8**	**0.365**	**6.8**	**LOS A**	**17**	**0.35**	**0.53**	**49.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E4&5 - Ewingsdale Rd / Pacific Hwy Ramps - 4(2&3)
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SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario E4B and E5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	136	2.9	0.295	7.1	LOS A	14	0.47	0.61	48.9
5	T	595	3.7	0.349	5.3	LOS A	18	0.48	0.48	50.3
6	R	25	4.0	0.347	13.8	LOS A	18	0.48	0.72	44.0
Approach		**756**	**3.6**	**0.349**	**5.9**	**LOS A**	**18**	**0.47**	**0.51**	**49.7**
Woodford Ln (NE)										
24	L	27	3.7	0.028	8.2	LOS A	1	0.58	0.66	48.0
26	R	6	0.0	0.010	13.6	LOS A	0	0.59	0.73	44.4
Approach		**33**	**3.0**	**0.028**	**9.2**	**LOS A**	**1**	**0.58**	**0.67**	**47.2**
Pacific Hwy Off Ramp (NW)										
27	L	488	2.9	0.361	5.2	LOS A	17	0.38	0.47	50.6
29	R	289	5.2	0.262	13.6	LOS A	11	0.37	0.71	44.4
Approach		**779**	**3.7**	**0.361**	**8.4**	**LOS A**	**17**	**0.38**	**0.56**	**47.9**
Ewingsdale Rd (W)										
10	L	5	0.0	0.042	4.4	LOS A	1	0.11	0.38	52.8
11	T	201	4.0	0.112	4.5	LOS A	5	0.10	0.38	52.8
12	R	8	25.0	0.113	11.9	LOS A	5	0.10	0.64	46.3
Approach		**214**	**4.7**	**0.112**	**4.8**	**LOS A**	**5**	**0.10**	**0.39**	**52.5**
All Vehicles		**1782**	**3.8**	**0.361**	**6.9**	**LOS A**	**18**	**0.39**	**0.52**	**49.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W1

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	438	3.9	0.230	0.0	LOS A	0	0.00	0.00	60.0
6	R	89	4.5	0.082	9.1	LOS A	3	0.27	0.64	47.7
Approach		**527**	**4.0**	**0.230**	**1.5**	**LOS A**	**3**	**0.04**	**0.11**	**57.5**
Myocum Rd (N)										
7	L	57	7.0	0.088	9.2	LOS A	2	0.27	0.63	47.8
9	R	5	0.0	0.017	17.9	LOS B	1	0.67	0.82	40.1
Approach		**62**	**6.5**	**0.088**	**9.9**	**LOS A**	**2**	**0.30**	**0.65**	**47.1**
Ewingsdale Rd (W)										
10	L	2	0.0	0.001	7.6	LOS A	0	0.00	0.60	49.8
11	T	155	3.9	0.081	0.0	LOS A	0	0.00	0.00	60.0
Approach		**156**	**3.8**	**0.081**	**0.1**	**LOS A**		**0.00**	**0.01**	**59.8**
All Vehicles		**745**	**4.2**	**0.230**	**1.9**	**Not Applicable**	**3**	**0.06**	**0.13**	**56.9**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: W1 - Ewingsdale Rd / Myocum Rd - 1
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SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W2 and W4

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	1	0.0	0.100	5.2	LOS A	5	0.51	0.49	50.3
3	R	101	4.0	0.101	13.0	LOS A	5	0.51	0.71	44.6
Approach		**102**	**3.9**	**0.101**	**12.9**	**LOS A**	**5**	**0.51**	**0.70**	**44.7**
Ewingsdale Rd (E)										
4	L	438	3.9	0.379	7.6	LOS A	23	0.59	0.64	48.1
5	T	356	3.9	0.312	4.9	LOS A	19	0.53	0.46	50.1
6	R	89	4.5	0.312	11.4	LOS A	19	0.53	0.68	45.3
Approach		**883**	**4.0**	**0.379**	**6.9**	**LOS A**	**23**	**0.56**	**0.57**	**48.6**
Myocum Rd (NW)										
27	L	57	7.0	0.061	6.6	LOS A	3	0.56	0.56	49.3
29	R	5	0.0	0.062	13.7	LOS A	3	0.56	0.69	44.2
Approach		**62**	**6.5**	**0.061**	**7.2**	**LOS A**	**3**	**0.56**	**0.57**	**48.8**
Old Pacific Hwy (W)										
10	L	1	0.0	0.333	7.0	LOS A	17	0.41	0.56	48.8
11	T	54	3.7	0.297	5.4	LOS A	17	0.41	0.48	50.3
12	R	336	4.2	0.296	12.3	LOS A	17	0.41	0.65	45.0
Approach		**391**	**4.1**	**0.296**	**11.3**	**LOS A**	**17**	**0.41**	**0.63**	**45.6**
All Vehicles		**1438**	**4.1**	**0.379**	**8.5**	**LOS A**	**23**	**0.52**	**0.60**	**47.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W2B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	1	0.0	0.100	5.2	LOS A	4	0.45	0.49	50.8
3	R	101	4.0	0.096	13.0	LOS A	4	0.45	0.70	44.8
Approach		**102**	**3.9**	**0.096**	**12.9**	**LOS A**	**4**	**0.45**	**0.70**	**44.9**
Ewingsdale Rd (E)										
4	L	438	3.9	0.353	6.0	LOS A	17	0.69	0.26	47.5
5	T	356	3.9	0.235	3.6	LOS A	14	0.05	0.32	54.3
6	R	89	4.5	0.234	10.1	LOS A	14	0.05	0.63	47.6
Approach		**883**	**4.0**	**0.353**	**5.4**	**LOS A**	**17**	**0.37**	**0.32**	**50.0**
Myocum Rd (NW)										
27	L	57	7.0	0.061	6.6	LOS A	3	0.56	0.56	49.3
29	R	5	0.0	0.062	13.7	LOS A	3	0.56	0.69	44.2
Approach		**62**	**6.5**	**0.061**	**7.2**	**LOS A**	**3**	**0.56**	**0.57**	**48.8**
Old Pacific Hwy (W)										
10	L	337	4.2	0.296	5.3	LOS A	17	0.41	0.48	50.4
11	T	54	3.7	0.295	5.4	LOS A	17	0.41	0.48	50.4
Approach		**391**	**4.1**	**0.296**	**5.3**	**LOS A**	**17**	**0.41**	**0.48**	**50.4**
All Vehicles		**1438**	**4.1**	**0.353**	**6.0**	**LOS A**	**17**	**0.39**	**0.40**	**49.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W3 and W5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.135	8.0	LOS A	5	0.58	0.71	48.4
22	T	1	0.0	0.143	7.0	LOS A	5	0.58	0.64	49.1
23	R	101	4.0	0.133	15.2	LOS B	5	0.58	0.80	43.6
Approach		**107**	**3.7**	**0.134**	**14.8**	**LOS B**	**5**	**0.58**	**0.79**	**43.8**
Ewingsdale Rd (E)										
4	L	356	3.9	0.291	3.7	LOS A	14	0.70	0.18	48.9
6	R	527	4.0	0.267	12.1	LOS A	18	0.04	0.68	46.1
Approach		**883**	**4.0**	**0.291**	**8.7**	**LOS A**	**18**	**0.30**	**0.48**	**47.1**
Myocum Rd (NW)										
27	L	59	6.8	0.090	10.4	LOS A	6	0.80	0.73	46.8
29	R	3	0.0	0.091	17.2	LOS B	6	0.80	0.79	42.0
Approach		**62**	**6.5**	**0.090**	**10.8**	**LOS A**	**6**	**0.80**	**0.74**	**46.6**
Old Pacific Hwy (SW)										
30	L	1	0.0	0.500	9.8	LOS A	27	0.70	0.82	47.3
31	T	336	4.2	0.456	9.0	LOS A	27	0.70	0.80	48.2
32	R	54	3.7	0.458	14.6	LOS B	27	0.70	0.83	43.6
Approach		**391**	**4.1**	**0.456**	**9.7**	**LOS A**	**27**	**0.70**	**0.80**	**47.5**
All Vehicles		**1443**	**4.1**	**0.500**	**9.6**	**LOS A**	**27**	**0.45**	**0.60**	**46.9**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W4B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	1	0.0	0.100	5.2	LOS A	5	0.52	0.49	50.3
3	R	101	4.0	0.102	13.1	LOS A	5	0.52	0.71	44.6
Approach		**102**	**3.9**	**0.102**	**13.0**	**LOS A**	**5**	**0.52**	**0.71**	**44.6**
Ewingsdale Rd (E)										
4	L	413	3.9	0.359	7.5	LOS A	22	0.58	0.64	48.2
5	T	362	3.9	0.316	4.9	LOS A	20	0.54	0.46	50.1
6	R	89	4.5	0.317	11.4	LOS A	20	0.54	0.68	45.3
Approach		**864**	**3.9**	**0.359**	**6.8**	**LOS A**	**22**	**0.56**	**0.57**	**48.6**
Myocum Rd (NW)										
27	L	57	7.0	0.062	6.6	LOS A	3	0.56	0.56	49.2
29	R	5	0.0	0.062	13.8	LOS A	3	0.56	0.69	44.2
Approach		**62**	**6.5**	**0.062**	**7.2**	**LOS A**	**3**	**0.56**	**0.57**	**48.7**
Old Pacific Hwy (W)										
10	L	1	0.0	0.333	7.0	LOS A	17	0.41	0.56	48.8
11	T	59	3.4	0.299	5.4	LOS A	17	0.41	0.48	50.3
12	R	336	4.2	0.300	12.3	LOS A	17	0.41	0.65	45.0
Approach		**396**	**4.0**	**0.300**	**11.2**	**LOS A**	**17**	**0.41**	**0.63**	**45.6**
All Vehicles		**1424**	**4.1**	**0.359**	**8.5**	**LOS A**	**22**	**0.51**	**0.59**	**47.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Holiday

Scenario W5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.132	7.9	LOS A	5	0.57	0.70	48.4
22	T	1	0.0	0.125	6.9	LOS A	5	0.57	0.63	49.1
23	R	101	4.0	0.133	15.1	LOS B	5	0.57	0.79	43.6
Approach		**107**	**3.7**	**0.133**	**14.7**	**LOS B**	**5**	**0.57**	**0.79**	**43.8**
Ewingsdale Rd (E)										
4	L	362	3.9	0.295	3.7	LOS A	14	0.71	0.18	48.8
6	R	502	4.0	0.254	12.1	LOS A	17	0.04	0.68	46.1
Approach		**864**	**3.9**	**0.295**	**8.6**	**LOS A**	**17**	**0.32**	**0.47**	**47.1**
Myocum Rd (NW)										
27	L	59	6.8	0.088	10.2	LOS A	5	0.79	0.73	47.1
29	R	3	0.0	0.088	16.9	LOS B	5	0.79	0.78	42.2
Approach		**62**	**6.5**	**0.088**	**10.5**	**LOS A**	**5**	**0.79**	**0.73**	**46.8**
Old Pacific Hwy (SW)										
30	L	1	0.0	0.500	9.5	LOS A	26	0.69	0.81	47.5
31	T	336	4.2	0.454	8.7	LOS A	26	0.69	0.78	48.3
32	R	59	3.4	0.454	14.3	LOS A	26	0.69	0.82	43.8
Approach		**396**	**4.0**	**0.454**	**9.5**	**LOS A**	**26**	**0.69**	**0.79**	**47.6**
All Vehicles		**1429**	**4.1**	**0.500**	**9.4**	**LOS A**	**26**	**0.46**	**0.59**	**47.0**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario E1

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	552	4.0	0.262	3.5	LOS A	13	0.03	0.32	54.6
6	R	278	4.7	0.262	11.3	LOS A	13	0.03	0.66	46.9
Approach		**829**	**4.2**	**0.262**	**6.1**	**LOS A**	**13**	**0.03**	**0.43**	**51.6**
Pacific Hwy Ramps (N)										
7	L	384	4.9	0.270	5.6	LOS A	13	0.35	0.49	50.3
9	R	3	0.0	0.003	12.1	LOS A	0	0.32	0.61	45.5
Approach		**387**	**4.9**	**0.270**	**5.6**	**LOS A**	**13**	**0.35**	**0.49**	**50.3**
Ewingsdale Rd (W)										
10	L	20	0.0	0.053	6.1	LOS A	2	0.36	0.51	50.2
11	T	205	3.4	0.127	4.3	LOS A	5	0.34	0.41	51.8
Approach		**225**	**3.1**	**0.128**	**4.5**	**LOS A**	**5**	**0.34**	**0.42**	**51.6**
All Vehicles		**1441**	**4.2**	**0.270**	**5.7**	**LOS A**	**13**	**0.16**	**0.45**	**51.2**

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Following Degree of Saturation
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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E1 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 1
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SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario E2 E2B and E3

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	648	4.0	0.342	4.5	LOS A	18	0.42	0.42	51.2
6	R	181	4.4	0.342	12.2	LOS A	18	0.41	0.67	45.1
Approach		**829**	**4.1**	**0.342**	**6.2**	**LOS A**	**18**	**0.42**	**0.47**	**49.6**
Pacific Hwy Ramps (N)										
7	L	384	4.9	0.270	5.6	LOS A	13	0.34	0.49	50.4
9	R	245	4.9	0.221	12.1	LOS A	9	0.35	0.66	45.4
Approach		**630**	**4.9**	**0.270**	**8.1**	**LOS A**	**13**	**0.34**	**0.56**	**48.2**
Ewingsdale Rd (W)										
10	L	20	0.0	0.052	5.7	LOS A	2	0.32	0.47	50.6
11	T	205	3.4	0.124	4.0	LOS A	5	0.30	0.38	52.1
Approach		**225**	**3.1**	**0.124**	**4.2**	**LOS A**	**5**	**0.30**	**0.38**	**52.0**
All Vehicles		**1684**	**4.3**	**0.342**	**6.6**	**LOS A**	**18**	**0.37**	**0.49**	**49.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E2,2B&3 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 2&3
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SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario E4 and E5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	181	4.4	0.312	7.0	LOS A	15	0.44	0.59	49.1
5	T	648	4.0	0.368	5.1	LOS A	19	0.44	0.47	50.5
Approach		**829**	**4.1**	**0.368**	**5.5**	**LOS A**	**19**	**0.44**	**0.49**	**50.2**
Pacific Hwy Off Ramp (N)										
7	L	384	4.9	0.282	6.5	LOS A	12	0.33	0.54	49.8
8	T	1	0.0	0.250	5.3	LOS A	8	0.33	0.48	50.9
9	R	245	4.9	0.223	12.2	LOS A	8	0.33	0.68	45.3
Approach		**631**	**4.9**	**0.282**	**8.7**	**LOS A**	**12**	**0.33**	**0.60**	**47.8**
Ewingsdale Rd (W)										
11	T	205	3.4	0.098	4.4	LOS A	0	0.00	0.40	53.6
12	R	20	0.0	0.098	11.2	LOS A	0	0.00	0.70	46.7
Approach		**225**	**3.1**	**0.098**	**5.0**	**LOS A**		**0.00**	**0.42**	**52.9**
All Vehicles		**1685**	**4.3**	**0.368**	**6.6**	**LOS A**	**19**	**0.34**	**0.52**	**49.6**

Symbols which may appear in this table:

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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E4&5 - Ewingsdale Rd / Pacific Hwy Ramps - 4(2&3)
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SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario E4B and E5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	181	4.4	0.323	7.0	LOS A	16	0.45	0.60	49.0
5	T	648	4.0	0.381	5.1	LOS A	20	0.46	0.47	50.4
6	R	23	4.3	0.383	13.7	LOS A	20	0.46	0.71	44.1
Approach		**852**	**4.1**	**0.381**	**5.8**	**LOS A**	**20**	**0.46**	**0.50**	**49.9**
Woodford Ln (NE)										
24	L	24	4.2	0.023	7.8	LOS A	1	0.52	0.63	48.3
26	R	4	0.0	0.006	13.2	LOS A	0	0.55	0.69	44.8
Approach		**28**	**3.6**	**0.023**	**8.6**	**LOS A**	**1**	**0.53**	**0.64**	**47.8**
Pacific Hwy Off Ramp (NW)										
27	L	371	4.9	0.280	5.3	LOS A	12	0.36	0.47	50.7
29	R	246	4.9	0.219	13.6	LOS A	9	0.36	0.70	44.5
Approach		**618**	**4.9**	**0.280**	**8.6**	**LOS A**	**12**	**0.36**	**0.56**	**47.9**
Ewingsdale Rd (W)										
10	L	5	0.0	0.044	4.4	LOS A	1	0.11	0.38	52.8
11	T	205	3.4	0.119	4.5	LOS A	5	0.10	0.38	52.8
12	R	20	0.0	0.118	11.3	LOS A	5	0.09	0.65	46.3
Approach		**230**	**3.0**	**0.119**	**5.1**	**LOS A**	**5**	**0.10**	**0.41**	**52.2**
All Vehicles		**1728**	**4.2**	**0.383**	**6.7**	**LOS A**	**20**	**0.38**	**0.51**	**49.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W1

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	456	3.9	0.240	0.0	LOS A	0	0.00	0.00	60.0
6	R	100	4.0	0.092	9.1	LOS A	3	0.28	0.64	47.6
Approach		**556**	**4.0**	**0.240**	**1.6**	**LOS A**	**3**	**0.05**	**0.12**	**57.3**
Myocum Rd (N)										
7	L	66	1.5	0.098	9.0	LOS A	2	0.27	0.64	47.7
9	R	1	0.0	0.004	18.6	LOS B	0	0.69	0.74	39.6
Approach		**67**	**1.5**	**0.098**	**9.2**	**LOS A**	**2**	**0.28**	**0.64**	**47.6**
Ewingsdale Rd (W)										
10	L	12	8.3	0.007	7.8	LOS A	0	0.00	0.60	49.8
11	T	160	3.8	0.084	0.0	LOS A	0	0.00	0.00	60.0
Approach		**172**	**4.1**	**0.084**	**0.5**	**LOS A**		**0.00**	**0.04**	**59.1**
All Vehicles		**795**	**3.8**	**0.240**	**2.0**	**Not Applicable**	**3**	**0.06**	**0.14**	**56.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: W1 - Ewingsdale Rd / Myocum Rd - 1
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SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W2 and W4

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Pacific Hwy Off Ramp (S)										
1	L	4	0.0	0.105	5.1	LOS A	5	0.51	0.49	50.3
3	R	104	3.8	0.106	13.0	LOS A	5	0.51	0.71	44.6
Approach		**108**	**3.7**	**0.106**	**12.7**	**LOS A**	**5**	**0.51**	**0.70**	**44.8**
Ewingsdale Rd (E)										
4	L	456	3.9	0.335	6.8	LOS A	19	0.50	0.58	48.7
5	T	335	3.6	0.364	5.2	LOS A	22	0.55	0.48	50.0
6	R	100	4.0	0.364	11.7	LOS A	22	0.55	0.69	45.2
Approach		**891**	**3.8**	**0.364**	**6.8**	**LOS A**	**22**	**0.52**	**0.55**	**48.7**
Myocum Rd (NW)										
27	L	66	1.5	0.063	6.2	LOS A	3	0.54	0.55	49.4
29	R	1	0.0	0.062	14.4	LOS A	3	0.54	0.69	43.8
Approach		**67**	**1.5**	**0.063**	**6.4**	**LOS A**	**3**	**0.54**	**0.55**	**49.3**
Old Pacific Hwy (W)										
10	L	7	14.3	0.280	7.6	LOS A	15	0.42	0.58	48.8
11	T	56	3.6	0.277	5.5	LOS A	15	0.42	0.49	50.3
12	R	296	4.1	0.278	12.3	LOS A	15	0.42	0.65	44.9
Approach		**359**	**4.2**	**0.278**	**11.2**	**LOS A**	**15**	**0.42**	**0.63**	**45.7**
All Vehicles		**1425**	**3.8**	**0.364**	**8.3**	**LOS A**	**22**	**0.50**	**0.58**	**47.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W2B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Pacific Hwy Off Ramp (S)										
1	L	4	0.0	0.100	5.1	LOS A	4	0.44	0.49	50.9
3	R	104	3.8	0.100	13.0	LOS A	4	0.44	0.70	44.9
Approach		**108**	**3.7**	**0.100**	**12.7**	**LOS A**	**4**	**0.44**	**0.69**	**45.1**
Ewingsdale Rd (E)										
4	L	456	3.9	0.308	5.9	LOS A	15	1.00	0.07	45.7
5	T	335	3.6	0.271	3.5	LOS A	17	0.02	0.32	54.6
6	R	100	4.0	0.272	10.1	LOS A	17	0.02	0.65	47.7
Approach		**891**	**3.8**	**0.308**	**5.5**	**LOS A**	**17**	**0.52**	**0.23**	**48.9**
Myocum Rd (NW)										
27	L	66	1.5	0.063	6.2	LOS A	3	0.54	0.55	49.4
29	R	1	0.0	0.062	14.4	LOS A	3	0.54	0.69	43.8
Approach		**67**	**1.5**	**0.063**	**6.4**	**LOS A**	**3**	**0.54**	**0.55**	**49.3**
Old Pacific Hwy (W)										
10	L	303	4.3	0.278	5.4	LOS A	15	0.42	0.49	50.3
11	T	56	3.6	0.277	5.5	LOS A	15	0.42	0.49	50.3
Approach		**360**	**4.2**	**0.278**	**5.4**	**LOS A**	**15**	**0.42**	**0.49**	**50.3**
All Vehicles		**1426**	**3.8**	**0.308**	**6.1**	**LOS A**	**17**	**0.49**	**0.35**	**48.9**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W3 and W5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.143	8.1	LOS A	6	0.60	0.71	48.2
22	T	4	0.0	0.143	7.1	LOS A	6	0.60	0.65	48.9
23	R	104	3.8	0.145	15.3	LOS B	6	0.60	0.80	43.5
Approach		**113**	**3.5**	**0.145**	**14.7**	**LOS B**	**6**	**0.60**	**0.79**	**43.8**
Ewingsdale Rd (E)										
4	L	335	3.6	0.274	3.7	LOS A	13	1.00	0.08	46.7
6	R	556	4.0	0.281	12.1	LOS A	19	0.02	0.69	46.2
Approach		**891**	**3.8**	**0.281**	**8.9**	**LOS A**	**19**	**0.39**	**0.46**	**46.4**
Myocum Rd (NW)										
27	L	66	1.5	0.092	9.9	LOS A	5	0.79	0.72	47.2
29	R	1	0.0	0.091	16.9	LOS B	5	0.79	0.79	42.2
Approach		**67**	**1.5**	**0.092**	**10.1**	**LOS A**	**5**	**0.79**	**0.72**	**47.1**
Old Pacific Hwy (SW)										
30	L	7	14.3	0.438	10.3	LOS A	24	0.70	0.84	47.2
31	T	296	4.1	0.431	9.0	LOS A	24	0.70	0.80	48.2
32	R	56	3.6	0.431	14.7	LOS B	24	0.70	0.83	43.5
Approach		**359**	**4.2**	**0.431**	**9.9**	**LOS A**	**24**	**0.70**	**0.80**	**47.4**
All Vehicles		**1430**	**3.8**	**0.438**	**9.7**	**LOS A**	**24**	**0.50**	**0.58**	**46.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W4B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Pacific Hwy Off Ramp (S)										
1	L	4	0.0	0.105	5.1	LOS A	5	0.50	0.49	50.4
3	R	104	3.8	0.106	13.0	LOS A	5	0.50	0.71	44.7
Approach		**108**	**3.7**	**0.106**	**12.7**	**LOS A**	**5**	**0.50**	**0.70**	**44.8**
Ewingsdale Rd (E)										
4	L	437	3.9	0.378	7.3	LOS A	22	0.55	0.61	48.4
5	T	339	3.5	0.300	4.7	LOS A	18	0.50	0.44	50.4
6	R	100	4.0	0.299	11.2	LOS A	18	0.50	0.66	45.5
Approach		**876**	**3.8**	**0.379**	**6.7**	**LOS A**	**22**	**0.52**	**0.55**	**48.8**
Myocum Rd (NW)										
27	L	66	1.5	0.063	6.3	LOS A	3	0.54	0.55	49.4
29	R	1	0.0	0.062	14.4	LOS A	3	0.54	0.69	43.8
Approach		**67**	**1.5**	**0.063**	**6.4**	**LOS A**	**3**	**0.54**	**0.55**	**49.3**
Old Pacific Hwy (W)										
10	L	7	14.3	0.280	7.6	LOS A	16	0.42	0.58	48.8
11	T	61	3.3	0.281	5.5	LOS A	16	0.42	0.49	50.3
12	R	296	4.1	0.281	12.3	LOS A	16	0.42	0.65	44.9
Approach		**364**	**4.1**	**0.281**	**11.1**	**LOS A**	**16**	**0.42**	**0.63**	**45.7**
All Vehicles		**1415**	**3.7**	**0.378**	**8.3**	**LOS A**	**22**	**0.50**	**0.58**	**47.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Existing Peak Non Holiday

Scenario W5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.143	8.0	LOS A	6	0.59	0.71	48.3
22	T	4	0.0	0.143	7.0	LOS A	6	0.59	0.64	49.0
23	R	104	3.8	0.144	15.2	LOS B	6	0.59	0.80	43.5
Approach		**113**	**3.5**	**0.144**	**14.6**	**LOS B**	**6**	**0.59**	**0.79**	**43.8**
Ewingsdale Rd (E)										
4	L	339	3.5	0.277	3.7	LOS A	13	1.00	0.08	46.6
6	R	537	3.9	0.271	12.1	LOS A	19	0.02	0.69	46.2
Approach		**876**	**3.8**	**0.277**	**8.8**	**LOS A**	**19**	**0.40**	**0.45**	**46.4**
Myocum Rd (NW)										
27	L	66	1.5	0.091	9.8	LOS A	5	0.78	0.72	47.4
29	R	1	0.0	0.091	16.7	LOS B	5	0.78	0.78	42.3
Approach		**67**	**1.5**	**0.091**	**9.9**	**LOS A**	**5**	**0.78**	**0.72**	**47.3**
Old Pacific Hwy (SW)										
30	L	7	14.3	0.438	10.1	LOS A	24	0.69	0.83	47.4
31	T	296	4.1	0.431	8.8	LOS A	24	0.69	0.79	48.3
32	R	61	3.3	0.430	14.5	LOS B	24	0.69	0.82	43.7
Approach		**364**	**4.1**	**0.431**	**9.8**	**LOS A**	**24**	**0.69**	**0.80**	**47.4**
All Vehicles		**1420**	**3.7**	**0.438**	**9.6**	**LOS A**	**24**	**0.51**	**0.58**	**46.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario E1

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	917	3.8	0.412	3.5	LOS A	25	0.07	0.31	54.2
6	R	369	3.2	0.412	11.3	LOS B	25	0.07	0.64	46.7
Approach		**1287**	**3.7**	**0.412**	**5.7**	**LOS A**	**25**	**0.07**	**0.41**	**51.7**
Pacific Hwy Ramps (N)										
7	L	895	2.9	0.676	7.3	LOS A	54	0.67	0.68	48.1
9	R	7	28.6	0.011	14.1	LOS B	0	0.45	0.66	45.0
Approach		**901**	**3.1**	**0.676**	**7.3**	**LOS A**	**54**	**0.67**	**0.68**	**48.1**
Ewingsdale Rd (W)										
10	L	16	25.0	0.094	7.6	LOS A	4	0.44	0.59	49.7
11	T	354	4.2	0.225	4.9	LOS A	10	0.43	0.45	51.0
Approach		**370**	**5.1**	**0.225**	**5.0**	**LOS A**	**10**	**0.43**	**0.46**	**51.0**
All Vehicles		**2558**	**3.7**	**0.676**	**6.2**	**LOS A**	**54**	**0.33**	**0.51**	**50.3**

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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E1 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 1
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SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario E2 E2B and E3

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	1046	3.7	0.660	7.8	LOS A	60	0.79	0.79	48.2
6	R	239	2.9	0.660	15.7	LOS B	60	0.82	0.90	43.3
Approach		**1285**	**3.6**	**0.660**	**9.2**	**LOS A**	**60**	**0.80**	**0.81**	**47.1**
Pacific Hwy Ramps (N)										
7	L	895	2.9	0.675	7.3	LOS A	53	0.66	0.68	48.1
9	R	508	5.1	0.484	13.1	LOS B	26	0.57	0.76	44.4
Approach		**1402**	**3.7**	**0.675**	**9.4**	**LOS A**	**53**	**0.63**	**0.71**	**46.6**
Ewingsdale Rd (W)										
10	L	16	25.0	0.091	6.8	LOS A	4	0.41	0.54	49.9
11	T	354	4.2	0.218	4.3	LOS A	12	0.41	0.40	51.2
Approach		**370**	**5.1**	**0.218**	**4.4**	**LOS A**	**12**	**0.41**	**0.41**	**51.1**
All Vehicles		**3057**	**3.8**	**0.675**	**8.7**	**LOS A**	**60**	**0.67**	**0.72**	**47.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E2,2B&3 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 2&3
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Movement Summary

Future Peak Holiday

Scenario E4 and E5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	239	2.9	0.602	10.7	LOS B	47	0.79	0.90	46.5
5	T	1046	3.7	0.713	9.6	LOS A	72	0.84	0.91	47.5
Approach		**1285**	**3.6**	**0.713**	**9.8**	**LOS A**	**72**	**0.83**	**0.91**	**47.3**
Pacific Hwy Off Ramp (N)										
7	L	895	2.9	0.691	8.6	LOS A	53	0.63	0.75	47.9
8	T	1	0.0	0.500	6.5	LOS A	25	0.54	0.61	49.4
9	R	508	5.1	0.494	13.5	LOS B	25	0.54	0.79	44.5
Approach		**1403**	**3.7**	**0.691**	**10.4**	**LOS B**	**53**	**0.60**	**0.76**	**46.5**
Ewingsdale Rd (W)										
11	T	354	4.2	0.162	4.4	LOS A	0	0.00	0.40	53.6
12	R	16	25.0	0.162	11.9	LOS B	0	0.00	0.68	46.7
Approach		**370**	**5.1**	**0.162**	**4.8**	**LOS A**		**0.00**	**0.41**	**53.3**
All Vehicles		**3058**	**3.8**	**0.713**	**9.5**	**LOS A**	**72**	**0.62**	**0.78**	**47.6**

Symbols which may appear in this table:

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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E4&5 - Ewingsdale Rd / Pacific Hwy Ramps - 4(2&3)
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SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario E4B and E5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	239	2.9	0.634	11.3	LOS B	52	0.82	0.94	45.8
5	T	1046	3.7	0.751	10.5	LOS B	82	0.88	0.97	46.8
6	R	44	2.3	0.746	19.4	LOS B	82	0.91	1.03	40.7
Approach		**1329**	**3.5**	**0.751**	**10.9**	**LOS B**	**82**	**0.87**	**0.97**	**46.4**
Woodford Ln (NE)										
24	L	43	2.3	0.074	11.8	LOS B	4	0.83	0.84	45.3
26	R	11	0.0	0.027	17.3	LOS B	1	0.80	0.84	41.5
Approach		**54**	**1.9**	**0.074**	**13.0**	**LOS B**	**4**	**0.83**	**0.84**	**44.5**
Pacific Hwy Off Ramp (NW)										
27	L	856	2.9	0.695	7.9	LOS A	56	0.69	0.78	48.3
29	R	509	5.1	0.515	15.3	LOS B	29	0.60	0.84	43.5
Approach		**1365**	**3.7**	**0.695**	**10.6**	**LOS B**	**56**	**0.66**	**0.80**	**46.3**
Ewingsdale Rd (W)										
10	L	9	0.0	0.076	4.5	LOS A	3	0.18	0.39	52.2
11	T	354	4.2	0.203	4.6	LOS A	11	0.17	0.39	52.2
12	R	16	25.0	0.203	12.0	LOS B	11	0.17	0.63	46.0
Approach		**379**	**5.0**	**0.203**	**4.9**	**LOS A**	**11**	**0.17**	**0.40**	**51.9**
All Vehicles		**3127**	**3.8**	**0.751**	**10.1**	**LOS B**	**82**	**0.69**	**0.82**	**46.9**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W1

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	771	3.8	0.405	0.0	LOS A	0	0.00	0.00	60.0
6	R	158	4.4	0.144	9.7	LOS A	6	0.38	0.69	47.2
Approach		**928**	**3.9**	**0.405**	**1.7**	**LOS A**	**6**	**0.07**	**0.12**	**57.4**
Myocum Rd (N)										
7	L	100	7.0	0.163	10.0	LOS B	4	0.38	0.69	47.3
9	R	9	0.0	0.085	41.4	LOS E	2	0.89	0.97	28.0
Approach		**109**	**6.4**	**0.163**	**12.6**	**LOS B**	**4**	**0.42**	**0.71**	**44.7**
Ewingsdale Rd (W)										
10	L	4	0.0	0.002	7.6	LOS A	0	0.00	0.60	49.8
11	T	273	4.4	0.144	0.0	LOS A	0	0.00	0.00	60.0
Approach		**277**	**4.3**	**0.144**	**0.1**	**LOS A**		**0.00**	**0.01**	**59.8**
All Vehicles		**1314**	**4.2**	**0.405**	**2.2**	**Not Applicable**	**6**	**0.08**	**0.14**	**56.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: W1 - Ewingsdale Rd / Myocum Rd - 1
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SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W2 and W4

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	2	0.0	0.004	7.5	LOS A	0	0.77	0.55	48.3
3	R	178	3.9	0.221	14.7	LOS B	16	0.86	0.81	43.2
Approach		**180**	**3.9**	**0.221**	**14.6**	**LOS B**	**16**	**0.86**	**0.81**	**43.2**
Ewingsdale Rd (E)										
4	L	771	3.8	0.893	22.2	LOS C	140	1.00	1.36	37.3
5	T	626	3.8	0.795	12.9	LOS B	98	0.97	1.11	44.5
6	R	158	4.4	0.794	19.4	LOS B	98	0.97	1.12	40.2
Approach		**1554**	**3.9**	**0.893**	**18.2**	**LOS B**	**140**	**0.98**	**1.23**	**40.2**
Myocum Rd (NW)										
27	L	100	7.0	0.141	7.3	LOS A	6	0.65	0.66	48.6
29	R	9	0.0	0.016	15.6	LOS B	1	0.63	0.74	43.2
Approach		**109**	**6.4**	**0.141**	**8.0**	**LOS A**	**6**	**0.65**	**0.67**	**48.1**
Old Pacific Hwy (W)										
10	L	2	0.0	0.125	8.3	LOS A	5	0.47	0.65	48.3
11	T	95	4.2	0.127	6.5	LOS A	5	0.47	0.57	49.9
12	R	592	4.1	0.480	12.9	LOS B	29	0.57	0.73	44.3
Approach		**688**	**4.1**	**0.480**	**12.0**	**LOS B**	**29**	**0.56**	**0.71**	**45.0**
All Vehicles		**2531**	**4.0**	**0.893**	**15.8**	**LOS B**	**140**	**0.84**	**1.04**	**42.0**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W2B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	2	0.0	0.003	7.4	LOS A	0	0.61	0.49	49.5
3	R	178	3.9	0.167	14.7	LOS B	9	0.66	0.77	43.9
Approach		**180**	**3.9**	**0.167**	**14.6**	**LOS B**	**9**	**0.66**	**0.77**	**44.0**
Ewingsdale Rd (E)										
4	L	771	3.8	0.614	6.3	LOS A	36	1.00	0.21	45.7
5	T	626	3.8	0.445	3.6	LOS A	30	0.08	0.32	54.0
6	R	158	4.4	0.445	10.1	LOS B	30	0.08	0.62	47.4
Approach		**1554**	**3.9**	**0.613**	**5.6**	**LOS A**	**36**	**0.54**	**0.29**	**48.9**
Myocum Rd (NW)										
27	L	100	7.0	0.141	7.3	LOS A	6	0.65	0.66	48.6
29	R	9	0.0	0.016	15.6	LOS B	1	0.63	0.74	43.2
Approach		**109**	**6.4**	**0.141**	**8.0**	**LOS A**	**6**	**0.65**	**0.67**	**48.1**
Old Pacific Hwy (W)										
10	L	594	4.0	0.477	5.9	LOS A	28	0.55	0.54	49.3
11	T	95	4.2	0.123	6.5	LOS A	5	0.46	0.57	50.0
Approach		**688**	**4.1**	**0.477**	**6.0**	**LOS A**	**28**	**0.54**	**0.54**	**49.4**
All Vehicles		**2531**	**4.0**	**0.614**	**6.4**	**LOS A**	**36**	**0.55**	**0.41**	**48.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W3 and W5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.014	10.8	LOS B	1	0.72	0.74	46.3
22	T	2	0.0	0.014	9.5	LOS A	1	0.72	0.71	47.6
23	R	178	3.9	0.245	16.7	LOS B	12	0.78	0.94	42.5
Approach		**185**	**3.8**	**0.245**	**16.5**	**LOS B**	**12**	**0.78**	**0.93**	**42.7**
Ewingsdale Rd (E)										
4	L	626	3.8	0.514	3.9	LOS A	28	1.00	0.16	46.6
6	R	928	4.0	0.503	12.1	LOS B	40	0.07	0.66	46.0
Approach		**1555**	**3.9**	**0.514**	**8.8**	**LOS A**	**40**	**0.44**	**0.46**	**46.2**
Myocum Rd (NW)										
27	L	104	6.7	0.360	23.5	LOS C	21	1.00	1.02	36.6
29	R	5	0.0	0.020	30.6	LOS C	1	0.93	0.81	34.0
Approach		**109**	**6.4**	**0.360**	**23.8**	**LOS C**	**21**	**1.00**	**1.01**	**36.5**
Old Pacific Hwy (SW)										
30	L	2	0.0	0.333	16.4	LOS B	19	0.85	0.93	41.4
31	T	592	4.1	0.740	23.5	LOS C	92	0.96	1.24	36.6
32	R	95	4.2	0.742	32.4	LOS C	92	1.00	1.37	32.7
Approach		**688**	**4.1**	**0.740**	**24.7**	**LOS C**	**92**	**0.96**	**1.26**	**36.0**
All Vehicles		**2537**	**4.1**	**0.742**	**14.3**	**LOS B**	**92**	**0.63**	**0.74**	**42.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W4B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	2	0.0	0.004	7.5	LOS A	0	0.77	0.55	48.3
3	R	178	3.9	0.222	14.8	LOS B	16	0.86	0.82	43.2
Approach		**180**	**3.9**	**0.222**	**14.7**	**LOS B**	**16**	**0.86**	**0.81**	**43.2**
Ewingsdale Rd (E)										
4	L	726	3.9	0.849	19.1	LOS B	116	1.00	1.27	39.4
5	T	631	3.8	0.799	13.1	LOS B	100	0.97	1.12	44.3
6	R	158	4.4	0.798	19.6	LOS B	100	0.97	1.13	40.1
Approach		**1514**	**3.9**	**0.849**	**16.6**	**LOS B**	**116**	**0.99**	**1.19**	**41.4**
Myocum Rd (NW)										
27	L	100	7.0	0.141	7.3	LOS A	6	0.65	0.66	48.6
29	R	9	0.0	0.016	15.6	LOS B	1	0.64	0.74	43.2
Approach		**109**	**6.4**	**0.141**	**8.0**	**LOS A**	**6**	**0.65**	**0.67**	**48.0**
Old Pacific Hwy (W)										
10	L	2	0.0	0.143	8.3	LOS A	6	0.47	0.65	48.3
11	T	104	3.8	0.138	6.5	LOS A	6	0.47	0.58	49.8
12	R	592	4.1	0.480	12.9	LOS B	29	0.57	0.73	44.3
Approach		**697**	**4.0**	**0.480**	**11.9**	**LOS B**	**29**	**0.55**	**0.71**	**45.0**
All Vehicles		**2500**	**4.0**	**0.849**	**14.8**	**LOS B**	**116**	**0.84**	**1.01**	**42.8**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Holiday

Scenario W5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.014	10.5	LOS B	1	0.71	0.74	46.6
22	T	2	0.0	0.014	9.3	LOS A	1	0.71	0.71	47.9
23	R	178	3.9	0.239	16.4	LOS B	11	0.77	0.93	42.8
Approach		**185**	**3.8**	**0.239**	**16.2**	**LOS B**	**11**	**0.77**	**0.93**	**42.9**
Ewingsdale Rd (E)										
4	L	631	3.8	0.514	3.9	LOS A	28	1.00	0.16	46.6
6	R	884	4.1	0.479	12.1	LOS B	37	0.06	0.66	46.0
Approach		**1514**	**4.0**	**0.514**	**8.7**	**LOS A**	**37**	**0.45**	**0.46**	**46.3**
Myocum Rd (NW)										
27	L	104	6.7	0.332	20.2	LOS C	19	1.00	0.99	38.8
29	R	5	0.0	0.018	28.4	LOS C	1	0.92	0.80	35.1
Approach		**109**	**6.4**	**0.332**	**20.5**	**LOS C**	**19**	**1.00**	**0.98**	**38.6**
Old Pacific Hwy (SW)										
30	L	2	0.0	0.333	15.1	LOS B	17	0.83	0.91	42.4
31	T	592	4.1	0.715	20.4	LOS C	83	0.95	1.19	38.6
32	R	104	3.8	0.717	28.6	LOS C	83	1.00	1.31	34.5
Approach		**697**	**4.0**	**0.715**	**21.6**	**LOS C**	**83**	**0.95**	**1.21**	**37.9**
All Vehicles		**2505**	**4.1**	**0.717**	**13.4**	**LOS B**	**83**	**0.64**	**0.72**	**43.1**

Symbols which may appear in this table:

Following Degree of Saturation
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* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario E1

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	971	4.0	0.462	3.5	LOS A	30	0.05	0.31	54.4
6	R	489	4.5	0.462	11.3	LOS A	30	0.05	0.65	46.8
Approach		**1460**	**4.2**	**0.462**	**6.1**	**LOS A**	**30**	**0.05**	**0.43**	**51.4**
Pacific Hwy Ramps (N)										
7	L	677	5.0	0.524	6.4	LOS A	32	0.58	0.56	48.7
9	R	5	0.0	0.006	12.7	LOS A	0	0.43	0.63	45.0
Approach		**682**	**5.0**	**0.524**	**6.4**	**LOS A**	**32**	**0.58**	**0.56**	**48.6**
Ewingsdale Rd (W)										
10	L	35	0.0	0.105	7.3	LOS A	4	0.50	0.61	49.3
11	T	361	3.6	0.252	5.4	LOS A	12	0.51	0.51	50.4
Approach		**396**	**3.3**	**0.252**	**5.6**	**LOS A**	**12**	**0.51**	**0.52**	**50.3**
All Vehicles		**2538**	**4.3**	**0.524**	**6.1**	**LOS A**	**32**	**0.27**	**0.48**	**50.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E1 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 1
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SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario E2 E2B and E3

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	1141	4.0	0.700	7.4	LOS A	68	0.77	0.75	48.4
6	R	319	4.7	0.700	15.4	LOS B	68	0.80	0.87	43.5
Approach		**1460**	**4.2**	**0.700**	**9.1**	**LOS A**	**68**	**0.77**	**0.78**	**47.1**
Pacific Hwy Ramps (N)										
7	L	677	5.0	0.523	6.4	LOS A	32	0.58	0.56	48.7
9	R	432	4.6	0.408	13.0	LOS A	21	0.54	0.75	44.6
Approach		**1109**	**4.9**	**0.523**	**8.9**	**LOS A**	**32**	**0.57**	**0.64**	**46.9**
Ewingsdale Rd (W)										
10	L	35	0.0	0.101	6.4	LOS A	4	0.47	0.56	49.5
11	T	361	3.6	0.243	4.6	LOS A	13	0.49	0.43	50.6
Approach		**396**	**3.3**	**0.243**	**4.8**	**LOS A**	**13**	**0.48**	**0.44**	**50.5**
All Vehicles		**2965**	**4.3**	**0.700**	**8.5**	**LOS A**	**68**	**0.66**	**0.68**	**47.4**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E2,2B&3 - Ewingsdale Rd / Pacific Hwy Ramps (N) - 2&3
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SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario E4 and E5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	319	4.7	0.643	10.6	LOS A	53	0.78	0.88	46.6
5	T	1141	4.0	0.761	9.7	LOS A	84	0.85	0.91	47.5
Approach		**1460**	**4.2**	**0.761**	**9.9**	**LOS A**	**84**	**0.83**	**0.90**	**47.3**
Pacific Hwy Off Ramp (N)										
7	L	677	5.0	0.537	7.6	LOS A	30	0.54	0.66	48.4
8	T	1	0.0	0.500	6.2	LOS A	19	0.51	0.57	49.6
9	R	432	4.6	0.415	13.2	LOS A	19	0.51	0.77	44.6
Approach		**1110**	**4.9**	**0.537**	**9.8**	**LOS A**	**30**	**0.52**	**0.71**	**46.8**
Ewingsdale Rd (W)										
11	T	361	3.6	0.172	4.4	LOS A	0	0.00	0.40	53.6
12	R	35	0.0	0.172	11.2	LOS A	0	0.00	0.70	46.7
Approach		**396**	**3.3**	**0.172**	**5.0**	**LOS A**		**0.00**	**0.42**	**52.9**
All Vehicles		**2966**	**4.3**	**0.761**	**9.2**	**LOS A**	**84**	**0.61**	**0.76**	**47.8**

Symbols which may appear in this table:

Following Degree of Saturation
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Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: E4&5 - Ewingsdale Rd / Pacific Hwy Ramps - 4(2&3)
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SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario E4B and E5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
4	L	319	4.7	0.669	11.1	LOS A	58	0.81	0.92	46.1
5	T	1141	4.0	0.790	10.5	LOS A	94	0.88	0.96	46.7
6	R	35	5.7	0.795	19.5	LOS B	94	0.90	1.02	40.7
Approach		**1495**	**4.2**	**0.790**	**10.8**	**LOS A**	**94**	**0.87**	**0.95**	**46.4**
Woodford Ln (NE)										
24	L	46	4.3	0.063	10.2	LOS A	3	0.74	0.79	46.9
26	R	8	0.0	0.016	15.5	LOS B	1	0.72	0.79	42.9
Approach		**54**	**3.7**	**0.063**	**11.0**	**LOS A**	**3**	**0.74**	**0.79**	**46.2**
Pacific Hwy Off Ramp (NW)										
27	L	647	4.9	0.536	6.6	LOS A	31	0.59	0.61	49.1
29	R	433	4.6	0.429	14.7	LOS B	21	0.55	0.80	43.7
Approach		**1081**	**4.8**	**0.536**	**9.8**	**LOS A**	**31**	**0.57**	**0.69**	**46.6**
Ewingsdale Rd (W)										
10	L	9	0.0	0.078	4.5	LOS A	3	0.15	0.38	52.4
11	T	361	3.6	0.211	4.5	LOS A	11	0.15	0.38	52.4
12	R	35	0.0	0.211	11.3	LOS A	11	0.15	0.64	46.1
Approach		**405**	**3.2**	**0.211**	**5.1**	**LOS A**	**11**	**0.15**	**0.41**	**51.7**
All Vehicles		**3035**	**4.3**	**0.795**	**9.7**	**LOS A**	**94**	**0.66**	**0.78**	**47.1**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W1

Give-way

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Ewingsdale Rd (E)										
5	T	802	4.0	0.422	0.0	LOS A	0	0.00	0.00	60.0
6	R	176	4.0	0.164	9.9	LOS A	6	0.41	0.70	47.1
Approach		**978**	**4.0**	**0.422**	**1.8**	**LOS A**	**6**	**0.07**	**0.13**	**57.2**
Myocum Rd (N)										
7	L	117	1.7	0.184	9.9	LOS A	5	0.39	0.70	47.2
9	R	2	0.0	0.022	45.6	LOS D	1	0.90	0.97	26.5
Approach		**119**	**1.7**	**0.184**	**10.5**	**LOS A**	**5**	**0.40**	**0.70**	**46.6**
Ewingsdale Rd (W)										
10	L	21	9.5	0.012	7.9	LOS A	0	0.00	0.60	49.8
11	T	282	4.2	0.149	0.0	LOS A	0	0.00	0.00	60.0
Approach		**304**	**4.6**	**0.149**	**0.5**	**LOS A**		**0.00**	**0.04**	**59.2**
All Vehicles		**1401**	**3.9**	**0.422**	**2.2**	**Not Applicable**	**6**	**0.09**	**0.16**	**56.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

Site: W1 - Ewingsdale Rd / Myocum Rd - 1
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SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W2 and W4

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Pacific Hwy Off Ramp (S)										
1	L	7	0.0	0.012	7.3	LOS A	1	0.76	0.60	48.4
3	R	183	3.8	0.220	14.5	LOS B	16	0.85	0.81	43.3
Approach		**190**	**3.7**	**0.220**	**14.3**	**LOS A**	**16**	**0.84**	**0.80**	**43.4**
Ewingsdale Rd (E)										
4	L	802	4.0	0.759	12.5	LOS A	85	0.90	0.99	44.8
5	T	588	3.4	0.821	13.5	LOS A	103	0.97	1.13	44.0
6	R	176	4.0	0.822	20.0	LOS B	103	0.97	1.14	39.8
Approach		**1566**	**3.8**	**0.821**	**13.7**	**LOS A**	**103**	**0.94**	**1.06**	**43.8**
Myocum Rd (NW)										
27	L	117	1.7	0.152	6.8	LOS A	6	0.62	0.62	48.8
29	R	2	0.0	0.003	16.1	LOS B	0	0.61	0.68	43.1
Approach		**119**	**1.7**	**0.152**	**7.0**	**LOS A**	**6**	**0.62**	**0.63**	**48.7**
Old Pacific Hwy (W)										
10	L	14	14.3	0.152	9.1	LOS A	6	0.50	0.68	48.2
11	T	99	4.0	0.153	6.7	LOS A	6	0.50	0.60	49.7
12	R	520	3.8	0.432	12.9	LOS A	25	0.56	0.74	44.3
Approach		**633**	**4.1**	**0.432**	**11.8**	**LOS A**	**25**	**0.55**	**0.72**	**45.1**
All Vehicles		**2508**	**3.7**	**0.822**	**12.9**	**LOS A**	**103**	**0.82**	**0.93**	**44.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W2B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	7	0.0	0.009	7.3	LOS A	0	0.59	0.53	49.7
3	R	183	3.8	0.167	14.5	LOS B	9	0.63	0.76	44.1
Approach		**190**	**3.7**	**0.167**	**14.3**	**LOS A**	**9**	**0.63**	**0.75**	**44.3**
Ewingsdale Rd (E)										
4	L	802	4.0	0.552	6.1	LOS A	30	1.00	0.11	45.7
5	T	588	3.4	0.490	3.6	LOS A	34	0.04	0.32	54.4
6	R	176	4.0	0.490	10.1	LOS A	34	0.04	0.64	47.6
Approach		**1566**	**3.8**	**0.551**	**5.6**	**LOS A**	**34**	**0.53**	**0.25**	**48.9**
Myocum Rd (NW)										
27	L	117	1.7	0.152	6.8	LOS A	6	0.62	0.63	48.8
29	R	2	0.0	0.003	16.1	LOS B	0	0.61	0.68	43.1
Approach		**119**	**1.7**	**0.152**	**7.0**	**LOS A**	**6**	**0.62**	**0.63**	**48.7**
Old Pacific Hwy (W)										
10	L	534	4.1	0.438	6.0	LOS A	24	0.55	0.54	49.3
11	T	99	4.0	0.130	6.6	LOS A	5	0.47	0.58	49.8
Approach		**633**	**4.1**	**0.438**	**6.1**	**LOS A**	**24**	**0.53**	**0.55**	**49.4**
All Vehicles		**2508**	**3.7**	**0.552**	**6.4**	**LOS A**	**34**	**0.54**	**0.38**	**48.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA SOLUTIONS

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W3 and W5

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.025	11.1	LOS A	1	0.72	0.77	45.9
22	T	7	0.0	0.025	9.9	LOS A	1	0.72	0.75	47.2
23	R	183	3.8	0.252	17.0	LOS B	12	0.79	0.94	42.3
Approach		**195**	**3.6**	**0.252**	**16.6**	**LOS B**	**12**	**0.78**	**0.93**	**42.5**
Ewingsdale Rd (E)										
4	L	588	3.4	0.485	3.9	LOS A	26	1.00	0.11	46.6
6	R	978	4.0	0.526	12.1	LOS A	44	0.04	0.68	46.1
Approach		**1566**	**3.8**	**0.526**	**9.0**	**LOS A**	**44**	**0.40**	**0.46**	**46.3**
Myocum Rd (NW)										
27	L	117	1.7	0.381	24.3	LOS B	22	1.00	1.03	36.1
29	R	2	0.0	0.008	30.4	LOS C	0	0.93	0.74	34.1
Approach		**119**	**1.7**	**0.381**	**24.4**	**LOS B**	**22**	**1.00**	**1.03**	**36.1**
Old Pacific Hwy (SW)										
30	L	14	14.3	0.333	18.0	LOS B	18	0.86	0.94	40.5
31	T	520	3.8	0.724	25.1	LOS B	88	0.96	1.25	35.7
32	R	99	4.0	0.723	33.9	LOS C	88	1.00	1.37	32.0
Approach		**633**	**4.1**	**0.724**	**26.3**	**LOS B**	**88**	**0.97**	**1.26**	**35.1**
All Vehicles		**2513**	**3.7**	**0.724**	**14.7**	**LOS B**	**88**	**0.60**	**0.73**	**42.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W4B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (S)										
1	L	7	0.0	0.012	7.4	LOS A	1	0.75	0.60	48.5
3	R	183	3.8	0.217	14.6	LOS B	15	0.83	0.81	43.3
Approach		**190**	**3.7**	**0.217**	**14.4**	**LOS A**	**15**	**0.83**	**0.80**	**43.5**
Ewingsdale Rd (E)										
4	L	767	3.8	0.820	15.5	LOS B	103	0.97	1.13	42.2
5	T	599	3.5	0.731	9.7	LOS A	76	0.88	0.94	47.5
6	R	176	4.0	0.732	16.2	LOS B	76	0.88	0.98	42.5
Approach		**1541**	**3.7**	**0.821**	**13.3**	**LOS A**	**103**	**0.92**	**1.04**	**44.1**
Myocum Rd (NW)										
27	L	117	1.7	0.152	6.8	LOS A	6	0.63	0.62	48.8
29	R	2	0.0	0.003	16.1	LOS B	0	0.61	0.68	43.1
Approach		**119**	**1.7**	**0.152**	**7.0**	**LOS A**	**6**	**0.63**	**0.63**	**48.7**
Old Pacific Hwy (W)										
10	L	14	14.3	0.165	9.1	LOS A	7	0.50	0.69	48.2
11	T	108	4.6	0.164	6.7	LOS A	7	0.50	0.60	49.7
12	R	520	3.8	0.431	12.9	LOS A	24	0.56	0.74	44.4
Approach		**642**	**4.2**	**0.431**	**11.8**	**LOS A**	**24**	**0.54**	**0.71**	**45.2**
All Vehicles		**2492**	**3.7**	**0.820**	**12.7**	**LOS A**	**103**	**0.80**	**0.92**	**44.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

SIDRA INTERSECTION

Movement Summary

Future Peak Non Holiday

Scenario W5B

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Pacific Hwy Off Ramp (SE)										
21	L	5	0.0	0.024	10.9	LOS A	1	0.72	0.77	46.2
22	T	7	0.0	0.024	9.7	LOS A	1	0.72	0.74	47.5
23	R	183	3.8	0.248	16.8	LOS B	12	0.78	0.94	42.5
Approach		**195**	**3.6**	**0.248**	**16.4**	**LOS B**	**12**	**0.77**	**0.93**	**42.7**
Ewingsdale Rd (E)										
4	L	599	3.5	0.491	3.9	LOS A	26	1.00	0.11	46.6
6	R	943	3.9	0.507	12.1	LOS A	41	0.04	0.68	46.2
Approach		**1542**	**3.8**	**0.507**	**8.9**	**LOS A**	**41**	**0.41**	**0.46**	**46.3**
Myocum Rd (NW)										
27	L	117	1.7	0.358	21.1	LOS B	20	1.00	1.00	38.1
29	R	2	0.0	0.007	28.6	LOS C	0	0.92	0.74	35.0
Approach		**119**	**1.7**	**0.358**	**21.2**	**LOS B**	**20**	**1.00**	**1.00**	**38.0**
Old Pacific Hwy (SW)										
30	L	14	14.3	0.326	16.9	LOS B	18	0.84	0.92	41.4
31	T	520	3.8	0.706	22.4	LOS B	81	0.96	1.21	37.3
32	R	108	4.6	0.706	30.7	LOS C	81	1.00	1.32	33.5
Approach		**642**	**4.2**	**0.705**	**23.7**	**LOS B**	**81**	**0.96**	**1.22**	**36.7**
All Vehicles		**2498**	**3.8**	**0.706**	**13.9**	**LOS A**	**81**	**0.61**	**0.72**	**42.8**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue
- Density for continuous movement

Appendix C

Origin and Destination Survey Data

AUSTRALASIAN TRAFFIC SURVEYS

EFFECTIVE DATA SOLUTIONS

N.S.W. | VIC. | QLD. | S.A. | W.A. | N.T. | A.C.T. | TAS.

2796 - Ewingsdale Origin Destination Survey

Dec-06

JOB NUMBER	2796
JOB NAME	EWINGSDALE
CLIENT	ARUP
SURVEY LOCATION	1. Pacific Highway Southbound off Ramp to Ewingsdale Road
	2. Pacific Highway Southbound on Ramp From Ewingsdale Road
	3. Pacific Highway Northbound off ramp to Ewingsdale Road
	4. Pacific Highway Northbound on ramp from Ewingsdale Road
	5E. Ewingsdale Road West of interchange with Pacific Highway, Eastbound
	5W. Ewingsdale Road West of interchange with Pacific Highway, Westbound
	6E. Ewingsdale Road East of interchange with Pacific Highway, Eastbound
	6W. Ewingsdale Road East of interchange with Pacific Highway, Westbound
SURVEY TYPE	ORIGIN DESTINATION
SURVEY DATE	Friday, 8 December 2006

EWINGSDALE ORIGIN DESTINATION SURVEY Friday 8th and Saturday 9th, December, 2006

AUSTRALASIAN TRAFFIC SURVEYS

Class 1 = Light Vehicles
Class 2 = Heavy Vehicles
Note: Sites may not sum to 100% due to certain hours not having any vehicles, therefore marked as 0% arriving

Summary - Average %	% of 1 that goes to 2			% of 3 that goes to 2			% of 5E that goes to 2			% of 6W that goes to 2		
	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total
Day 1	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	10.6%	7.3%	10.8%	30.7%	43.9%	31.7%
Day 2	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	7.2%	2.1%	6.9%	29.6%	27.4%	29.2%
Combined	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	8.9%	4.7%	8.9%	30.1%	35.6%	30.4%

Summary - Average %	% of 1 that goes to 4			% of 3 that goes to 4			% of 5E that goes to 4			% of 6W that goes to 4		
	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total
Day 1	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	2.8%	1.7%	2.8%	48.8%	40.6%	48.2%
Day 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.8%	4.2%	5.7%	52.8%	58.3%	53.3%
Combined	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	4.3%	3.0%	4.2%	50.8%	49.4%	50.7%

Summary - Average %	% of 1 that goes to 5W			% of 3 that goes to 5W			% of 5E that goes to 5W			% of 6W that goes to 5W		
	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total
Day 1	0.6%	0.8%	0.6%	2.8%	2.9%	2.8%	0.7%	0.0%	0.6%	15.9%	12.7%	15.6%
Day 2	0.8%	2.5%	0.9%	3.6%	1.0%	3.5%	2.8%	0.0%	2.6%	13.9%	10.9%	13.9%
Combined	0.7%	1.7%	0.7%	3.2%	2.0%	3.2%	1.8%	0.0%	1.6%	14.9%	11.8%	14.7%

Summary - Average %	% of 1 that goes to 6E			% of 3 that goes to 6E			% of 5E that goes to 6E			% of 6W that goes to 6E		
	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total	% of 1	% of 2	% of Total
Day 1	99.2%	99.0%	99.2%	97.0%	88.8%	97.0%	85.9%	61.6%	85.8%	0.2%	0.0%	0.2%
Day 2	99.1%	93.3%	99.1%	96.2%	86.5%	96.3%	84.2%	56.3%	84.4%	0.2%	0.0%	0.2%
Combined	99.2%	96.1%	99.1%	96.6%	87.6%	96.6%	85.0%	58.9%	85.1%	0.2%	0.0%	0.2%

EWINGSDALE ORIGIN DESTINATION SURVEY

AUSTRALASIAN TRAFFIC SURVEYS

Class 1 = Light Vehicles
Class 2 = Heavy Vehicles

48 Hour	1 to 2						3 to 2						5E to 2						6W to 2					
	Class			% of 1 that goes to 2			Class			% of 3 that goes to 2			Class			% of 5E that goes to 2			Class			% of 6W that goes to 2		
Time	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
00:00 - 01:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	24	3	**27**	31.6%	33.3%	31.8%
01:00 - 02:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	17	3	**20**	36.2%	50.0%	37.7%
02:00 - 03:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	21	4	**25**	43.8%	80.0%	47.2%
03:00 - 04:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	17	3	**20**	36.2%	60.0%	38.5%
04:00 - 05:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	15	3	**18**	48.4%	75.0%	51.4%
05:00 - 06:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	20	4	**24**	34.5%	50.0%	36.4%
06:00 - 07:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	49	8	**57**	36.0%	44.4%	37.0%
07:00 - 08:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	8	0	**8**	12.9%	0.0%	12.9%	63	14	**77**	29.9%	40.0%	31.3%
08:00 - 09:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	12	1	**13**	10.4%	25.0%	10.9%	111	17	**128**	30.8%	45.9%	32.2%
09:00 - 10:00	1	0	**1**	0.2%	0.0%	0.2%	1	0	**1**	0.6%	0.0%	0.6%	5	0	**5**	6.4%	0.0%	6.2%	127	8	**135**	28.5%	25.0%	28.2%
10:00 - 11:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	0.7%	0.0%	0.6%	6	0	**6**	10.0%	0.0%	9.1%	104	14	**118**	22.2%	33.3%	23.1%
11:00 - 12:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	0.7%	0.0%	0.7%	5	3	**8**	9.3%	60.0%	13.6%	136	11	**147**	28.4%	34.4%	28.8%
12:00 - 13:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	9	0	**9**	17.3%	0.0%	16.1%	144	15	**159**	28.6%	38.5%	29.3%
13:00 - 14:00	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	2.4%	0.0%	2.2%	6	2	**8**	12.0%	40.0%	14.5%	124	15	**139**	23.4%	46.9%	24.7%
14:00 - 15:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	15	0	**15**	25.4%	0.0%	23.8%	138	16	**154**	25.2%	35.6%	26.0%
15:00 - 16:00	1	0	**1**	0.3%	0.0%	0.3%	0	0	**0**	0.0%	0.0%	0.0%	3	3	**6**	4.8%	50.0%	8.7%	203	16	**219**	32.0%	43.2%	32.6%
16:00 - 17:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	0.7%	0.0%	0.7%	17	0	**17**	27.9%	0.0%	27.4%	227	15	**242**	32.0%	41.7%	32.5%
17:00 - 18:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	10	0	**10**	18.2%	0.0%	18.2%	191	11	**202**	26.9%	55.0%	27.6%
18:00 - 19:00	1	0	**1**	0.4%	0.0%	0.4%	0	0	**0**	0.0%	0.0%	0.0%	8	0	**8**	15.4%	0.0%	15.4%	129	9	**138**	27.7%	69.2%	28.9%
19:00 - 20:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	4	0	**4**	11.4%	0.0%	11.1%	88	4	**92**	28.8%	23.5%	28.5%
20:00 - 21:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	11.1%	0.0%	10.3%	58	4	**62**	22.7%	28.6%	23.0%
21:00 - 22:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	12.5%	0.0%	11.8%	43	4	**47**	21.6%	36.4%	22.4%
22:00 - 23:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	50.0%	0.0%	50.0%	56	3	**59**	32.0%	30.0%	31.9%
23:00 - 00:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	36	2	**38**	28.8%	33.3%	29.0%
00:00 - 01:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	26	2	**28**	43.3%	40.0%	43.1%
01:00 - 02:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	33.3%	0.0%	28.6%	21	1	**22**	38.2%	20.0%	36.7%
02:00 - 03:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	12	1	**13**	41.4%	50.0%	41.9%
03:00 - 04:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	11	1	**12**	29.7%	33.3%	30.0%
04:00 - 05:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	9	0	**9**	36.0%	0.0%	32.1%
05:00 - 06:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	9	1	**10**	31.0%	16.7%	28.6%
06:00 - 07:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	14.3%	0.0%	13.0%	19	1	**20**	24.4%	20.0%	24.1%
07:00 - 08:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	1.3%	0.0%	1.3%	3	0	**3**	9.4%	0.0%	9.1%	41	2	**43**	36.3%	20.0%	35.0%
08:00 - 09:00	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	1.5%	0.0%	1.5%	4	0	**4**	6.7%	0.0%	6.5%	81	3	**84**	37.2%	20.0%	36.1%
09:00 - 10:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	0.7%	0.0%	0.7%	6	0	**6**	8.8%	0.0%	8.7%	92	2	**94**	27.7%	18.2%	27.4%
10:00 - 11:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	4	0	**4**	6.2%	0.0%	6.0%	102	5	**107**	23.2%	35.7%	23.6%
11:00 - 12:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	9.6%	0.0%	9.4%	117	4	**121**	23.9%	33.3%	24.1%
12:00 - 13:00	1	0	**1**	0.2%	0.0%	0.2%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	5.5%	0.0%	5.4%	123	1	**124**	25.6%	20.0%	25.5%
13:00 - 14:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	6.3%	0.0%	5.9%	113	3	**116**	23.9%	50.0%	24.2%
14:00 - 15:00	2	0	**2**	0.6%	0.0%	0.6%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	13.9%	0.0%	13.5%	125	1	**126**	26.4%	12.5%	26.2%
15:00 - 16:00	1	0	**1**	0.3%	0.0%	0.3%	1	0	**1**	0.8%	0.0%	0.8%	12	0	**12**	25.0%	0.0%	25.0%	121	2	**123**	25.9%	40.0%	26.0%
16:00 - 17:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	7.7%	0.0%	7.3%	114	3	**117**	25.1%	37.5%	25.3%
17:00 - 18:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	10	0	**10**	17.2%	0.0%	16.9%	108	2	**110**	24.3%	40.0%	24.5%
18:00 - 19:00	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	0.9%	0.0%	0.8%	3	0	**3**	8.6%	0.0%	8.6%	119	1	**120**	30.4%	100.0%	30.6%
19:00 - 20:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	1	**1**	0.0%	50.0%	2.6%	80	0	**80**	26.9%	0.0%	26.6%
20:00 - 21:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	56	0	**56**	25.6%	0.0%	25.3%
21:00 - 22:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	43	0	**43**	21.3%	0.0%	20.8%
22:00 - 23:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	49	1	**50**	31.8%	50.0%	32.1%
23:00 - 00:00	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	37	0	**37**	30.3%	0.0%	30.1%

1 to 4						3 to 4						5E to 4						6W to 4					
Class			% of 1 that goes to 4			Class			% of 3 that goes to 4			Class			% of 5E that goes to 4			Class			% of 6W that goes to 4		
1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	28	3	**31**	36.8%	33.3%	36.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	17	2	**19**	36.2%	33.3%	35.8%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	14	1	**15**	29.2%	20.0%	28.3%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	17	1	**18**	36.2%	20.0%	34.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	7	0	**7**	22.6%	0.0%	20.0%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	20	3	**23**	34.5%	37.5%	34.8%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	69	10	**79**	50.7%	55.6%	51.3%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	4.8%	0.0%	4.8%	112	15	**127**	53.1%	42.9%	51.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	1	**4**	2.6%	25.0%	3.4%	206	16	**222**	57.2%	43.2%	55.9%
1	0	**1**	0.2%	0.0%	0.2%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	3.8%	0.0%	3.7%	219	16	**235**	49.1%	50.0%	49.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	4	1	**5**	6.7%	16.7%	7.6%	276	21	**297**	59.0%	50.0%	58.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	9.3%	0.0%	8.5%	264	17	**281**	55.1%	53.1%	55.0%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	3.8%	0.0%	3.6%	278	14	**292**	55.3%	35.9%	53.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	2.0%	0.0%	1.8%	294	13	**307**	55.4%	40.6%	54.5%
5	1	**6**	1.7%	5.6%	1.9%	0	0	**0**	0.0%	0.0%	0.0%	8	0	**8**	13.6%	0.0%	12.7%	326	18	**344**	59.6%	40.0%	58.1%
3	0	**3**	1.0%	0.0%	0.9%	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	1.6%	0.0%	1.4%	304	16	**320**	47.9%	43.2%	47.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	1.6%	0.0%	1.6%	359	17	**376**	50.6%	47.2%	50.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	5.5%	0.0%	5.5%	381	7	**388**	53.6%	35.0%	53.1%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	9.6%	0.0%	9.6%	251	4	**255**	54.0%	30.8%	53.3%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	1	0	**1**	2.9%	0.0%	2.8%	178	10	**188**	58.2%	58.8%	58.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	160	8	**168**	62.5%	57.1%	62.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	117	4	**121**	58.8%	36.4%	57.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	90	6	**96**	51.4%	60.0%	51.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	55	3	**58**	44.0%	50.0%	44.3%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	26	3	**29**	43.3%	60.0%	44.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	21	2	**23**	38.2%	40.0%	38.3%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	12	1	**13**	41.4%	50.0%	41.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	17	2	**19**	45.9%	66.7%	47.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	12	3	**15**	48.0%	100.0%	53.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	13	4	**17**	44.8%	66.7%	48.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	48	2	**50**	61.5%	40.0%	60.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	66	6	**72**	58.4%	60.0%	58.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	6	0	**6**	10.0%	0.0%	9.7%	118	8	**126**	54.1%	53.3%	54.1%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	7.4%	0.0%	7.2%	198	8	**206**	59.6%	72.7%	60.1%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	4	0	**4**	6.2%	0.0%	6.0%	284	5	**289**	64.7%	35.7%	63.8%
1	0	**1**	0.3%	0.0%	0.3%	0	0	**0**	0.0%	0.0%	0.0%	6	0	**6**	11.5%	0.0%	11.3%	320	9	**329**	65.3%	75.0%	65.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	1	**3**	3.6%	100.0%	5.4%	299	2	**301**	62.2%	40.0%	61.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	8	0	**8**	16.7%	0.0%	15.7%	286	1	**287**	60.5%	16.7%	59.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	271	6	**277**	57.3%	75.0%	57.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	6.3%	0.0%	6.3%	292	2	**294**	62.4%	40.0%	62.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	7.7%	0.0%	7.3%	238	5	**243**	52.4%	62.5%	52.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	3.4%	0.0%	3.4%	258	2	**260**	58.1%	40.0%	57.9%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	5	0	**5**	14.3%	0.0%	14.3%	190	0	**190**	48.6%	0.0%	48.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	3	0	**3**	8.3%	0.0%	7.9%	167	3	**170**	56.2%	75.0%	56.5%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	2	0	**2**	9.1%	0.0%	9.1%	119	2	**121**	54.3%	100.0%	54.8%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	109	4	**113**	54.0%	80.0%	54.6%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	7	0	**7**	35.0%	0.0%	33.3%	57	1	**58**	37.0%	50.0%	37.2%
0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	0	0	**0**	0.0%	0.0%	0.0%	46	1	**47**	37.7%	100.0%	38.2%

1 to 5W						3 to 5W						5E to 5W						6W to 5W					
Class			% of 1 that goes to 5W			Class			% of 3 that goes to 5W			Class			% of 5E that goes to 5W			Class			% of 6W that goes to 5W		
1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	22	3	25	28.9%	33.3%	29.4%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	10	1	11	21.3%	16.7%	20.8%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	10	0	10	20.8%	0.0%	18.9%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	12	1	13	25.5%	20.0%	25.0%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	6	1	7	19.4%	25.0%	20.0%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	17	1	18	29.3%	12.5%	27.3%
4	2	6	2.1%	13.3%	2.9%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	19	0	19	14.0%	0.0%	12.3%
1	0	1	0.4%	0.0%	0.4%	0	0	0	0.0%	0.0%	0.0%	1	0	1	1.6%	0.0%	1.6%	28	5	33	13.3%	14.3%	13.4%
1	0	1	0.2%	0.0%	0.2%	0	0	0	0.0%	0.0%	0.0%	2	0	2	1.7%	0.0%	1.7%	29	4	33	8.1%	10.8%	8.3%
2	0	2	0.5%	0.0%	0.5%	5	1	6	3.2%	10.0%	3.6%	0	0	0	0.0%	0.0%	0.0%	86	7	93	19.3%	21.9%	19.5%
1	0	1	0.3%	0.0%	0.3%	6	0	6	4.1%	0.0%	3.8%	0	0	0	0.0%	0.0%	0.0%	58	4	62	12.4%	9.5%	12.2%
2	1	3	0.6%	5.6%	0.8%	2	1	3	1.4%	7.7%	2.0%	2	0	2	3.7%	0.0%	3.4%	51	2	53	10.6%	6.3%	10.4%
6	0	6	1.8%	0.0%	1.7%	7	0	7	4.8%	0.0%	4.5%	0	0	0	0.0%	0.0%	0.0%	62	7	69	12.3%	17.9%	12.7%
4	0	4	1.3%	0.0%	1.2%	8	2	10	6.4%	22.2%	7.5%	1	0	1	2.0%	0.0%	1.8%	60	3	63	11.3%	9.4%	11.2%
0	0	0	0.0%	0.0%	0.0%	21	0	21	17.8%	0.0%	16.2%	2	0	2	3.4%	0.0%	3.2%	54	8	62	9.9%	17.8%	10.5%
7	0	7	2.2%	0.0%	2.1%	4	2	6	2.5%	15.4%	3.4%	1	0	1	1.6%	0.0%	1.4%	62	2	64	9.8%	5.4%	9.5%
3	0	3	0.9%	0.0%	0.9%	9	1	10	6.3%	14.3%	6.7%	1	0	1	1.6%	0.0%	1.6%	82	3	85	11.6%	8.3%	11.4%
6	0	6	2.1%	0.0%	2.0%	14	0	14	10.9%	0.0%	10.7%	0	0	0	0.0%	0.0%	0.0%	86	1	87	12.1%	5.0%	11.9%
0	0	0	0.0%	0.0%	0.0%	10	0	10	9.4%	0.0%	9.4%	0	0	0	0.0%	0.0%	0.0%	63	0	63	13.5%	0.0%	13.2%
5	0	5	2.0%	0.0%	1.9%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	39	3	42	12.7%	17.6%	13.0%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	28	1	29	10.9%	7.1%	10.7%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	37	2	39	18.6%	18.2%	18.6%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	28	1	29	16.0%	10.0%	15.7%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	24	1	25	19.2%	16.7%	19.1%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	2	0	2	33.3%	0.0%	28.6%	7	0	7	11.7%	0.0%	10.8%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	9	2	11	16.4%	40.0%	18.3%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	4	0	4	13.8%	0.0%	12.9%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	8	0	8	21.6%	0.0%	20.0%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	3	0	3	12.0%	0.0%	10.7%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	6	1	7	20.7%	16.7%	20.0%
0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	2	0	2	9.5%	0.0%	8.7%	10	2	12	12.8%	40.0%	14.5%
0	0	0	0.0%	0.0%	0.0%	4	0	4	5.2%	0.0%	5.1%	0	0	0	0.0%	0.0%	0.0%	5	2	7	4.4%	20.0%	5.7%
1	1	2	0.4%	16.7%	0.8%	4	0	4	3.1%	0.0%	3.0%	0	0	0	0.0%	0.0%	0.0%	10	2	12	4.6%	13.3%	5.2%
1	0	1	0.3%	0.0%	0.3%	6	0	6	4.2%	0.0%	4.1%	1	0	1	1.5%	0.0%	1.4%	32	1	33	9.6%	9.1%	9.6%
3	0	3	0.8%	0.0%	0.7%	7	0	7	5.8%	0.0%	5.8%	6	0	6	9.2%	0.0%	9.0%	42	3	45	9.6%	21.4%	9.9%
4	1	5	1.0%	11.1%	1.3%	7	1	8	5.2%	25.0%	5.8%	3	0	3	5.8%	0.0%	5.7%	42	0	42	8.6%	0.0%	8.4%
4	0	4	1.0%	0.0%	0.9%	12	0	12	9.7%	0.0%	9.3%	0	0	0	0.0%	0.0%	0.0%	48	1	49	10.0%	20.0%	10.1%
3	0	3	0.8%	0.0%	0.8%	7	0	7	5.6%	0.0%	5.6%	0	0	0	0.0%	0.0%	0.0%	45	1	46	9.5%	16.7%	9.6%
6	0	6	1.7%	0.0%	1.7%	1	0	1	0.8%	0.0%	0.8%	2	0	2	5.6%	0.0%	5.4%	46	0	46	9.7%	0.0%	9.6%
4	0	4	1.2%	0.0%	1.2%	7	0	7	5.9%	0.0%	5.8%	0	0	0	0.0%	0.0%	0.0%	51	1	52	10.9%	20.0%	11.0%
6	0	6	2.2%	0.0%	2.1%	6	0	6	5.9%	0.0%	5.7%	0	0	0	0.0%	0.0%	0.0%	45	0	45	9.9%	0.0%	9.7%
6	1	7	2.2%	33.3%	2.5%	11	0	11	6.8%	0.0%	6.6%	2	0	2	3.4%	0.0%	3.4%	51	0	51	11.5%	0.0%	11.4%
5	0	5	1.8%	0.0%	1.8%	8	0	8	6.9%	0.0%	6.7%	0	0	0	0.0%	0.0%	0.0%	68	0	68	17.4%	0.0%	17.3%
8	0	8	3.3%	0.0%	3.3%	0	0	0	0.0%	0.0%	0.0%	0	0	0	0.0%	0.0%	0.0%	46	1	47	15.5%	25.0%	15.6%
0	0	0	0.0%	0.0%	0.0%	3	0	3	5.3%	0.0%	5.2%	0	0	0	0.0%	0.0%	0.0%	41	0	41	18.7%	0.0%	18.6%
1	0	1	0.9%	0.0%	0.9%	2	0	2	4.3%	0.0%	4.1%	0	0	0	0.0%	0.0%	0.0%	47	1	48	23.3%	20.0%	23.2%
2	0	2	2.7%	0.0%	2.6%	2	0	2	4.8%	0.0%	4.7%	0	0	0	0.0%	0.0%	0.0%	41	0	41	26.6%	0.0%	26.3%
0	0	0	0.0%	0.0%	0.0%	2	0	2	6.1%	0.0%	6.1%	0	0	0	0.0%	0.0%	0.0%	30	0	30	24.6%	0.0%	24.4%

1 to 6E						3 to 6E						5E to 6E						6W to 6E					
Class			% of 1 that goes to 6E			Class			% of 3 that goes to 6E			Class			% of 5E that goes to 6E			Class			% of 6W that goes to 6E		
1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
29	2	**31**	100.0%	100.0%	100.0%	17	2	**19**	100.0%	100.0%	100.0%	9	0	**9**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
14	1	**15**	100.0%	100.0%	100.0%	15	2	**17**	100.0%	100.0%	100.0%	8	0	**8**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
21	2	**23**	100.0%	100.0%	100.0%	12	1	**13**	100.0%	100.0%	100.0%	9	1	**10**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
22	2	**24**	100.0%	100.0%	100.0%	9	1	**10**	100.0%	100.0%	100.0%	10	0	**10**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
19	2	**21**	100.0%	100.0%	100.0%	9	0	**9**	100.0%	0.0%	100.0%	8	1	**9**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
37	4	**41**	100.0%	100.0%	100.0%	38	5	**43**	100.0%	100.0%	100.0%	16	1	**17**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
185	13	**198**	97.9%	86.7%	97.1%	107	13	**120**	100.0%	100.0%	100.0%	34	2	**36**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
233	16	**249**	99.6%	100.0%	99.6%	165	17	**182**	100.0%	100.0%	100.0%	50	0	**50**	80.6%	0.0%	80.6%	0	0	**0**	0.0%	0.0%	0.0%
416	15	**431**	99.8%	100.0%	99.8%	240	23	**263**	100.0%	100.0%	100.0%	98	1	**99**	85.2%	25.0%	83.2%	0	0	**0**	0.0%	0.0%	0.0%
407	13	**420**	99.0%	100.0%	99.1%	152	9	**161**	96.2%	90.0%	95.8%	70	3	**73**	89.7%	100.0%	90.1%	0	0	**0**	0.0%	0.0%	0.0%
338	19	**357**	99.7%	100.0%	99.7%	141	10	**151**	95.3%	100.0%	95.6%	50	5	**55**	83.3%	83.3%	83.3%	3	0	**3**	0.6%	0.0%	0.6%
347	17	**364**	99.4%	94.4%	99.2%	136	12	**148**	97.8%	92.3%	97.4%	42	3	**45**	77.8%	60.0%	76.3%	4	0	**4**	0.8%	0.0%	0.8%
327	18	**345**	98.2%	100.0%	98.3%	139	8	**147**	95.2%	100.0%	95.5%	41	4	**45**	78.8%	100.0%	80.4%	0	0	**0**	0.0%	0.0%	0.0%
312	21	**333**	98.7%	100.0%	98.8%	114	7	**121**	91.2%	77.8%	90.3%	42	3	**45**	84.0%	60.0%	81.8%	1	0	**1**	0.2%	0.0%	0.2%
294	17	**311**	98.3%	94.4%	98.1%	97	12	**109**	82.2%	100.0%	83.8%	34	4	**38**	57.6%	100.0%	60.3%	5	0	**5**	0.9%	0.0%	0.8%
303	18	**321**	96.5%	100.0%	96.7%	157	11	**168**	97.5%	84.6%	96.6%	58	3	**61**	92.1%	50.0%	88.4%	4	0	**4**	0.6%	0.0%	0.6%
319	17	**336**	99.1%	100.0%	99.1%	132	6	**138**	93.0%	85.7%	92.6%	42	1	**43**	68.9%	100.0%	69.4%	2	0	**2**	0.3%	0.0%	0.3%
283	11	**294**	97.9%	100.0%	98.0%	114	3	**117**	89.1%	100.0%	89.3%	42	0	**42**	76.4%	0.0%	76.4%	5	0	**5**	0.7%	0.0%	0.7%
277	3	**280**	99.6%	100.0%	99.6%	96	0	**96**	90.6%	0.0%	90.6%	39	0	**39**	75.0%	0.0%	75.0%	0	0	**0**	0.0%	0.0%	0.0%
248	14	**262**	98.0%	100.0%	98.1%	87	3	**90**	100.0%	100.0%	100.0%	30	1	**31**	85.7%	100.0%	86.1%	0	0	**0**	0.0%	0.0%	0.0%
172	12	**184**	100.0%	100.0%	100.0%	77	2	**79**	100.0%	100.0%	100.0%	24	2	**26**	88.9%	100.0%	89.7%	0	0	**0**	0.0%	0.0%	0.0%
147	7	**154**	100.0%	100.0%	100.0%	38	1	**39**	100.0%	100.0%	100.0%	14	1	**15**	87.5%	100.0%	88.2%	0	0	**0**	0.0%	0.0%	0.0%
83	5	**88**	100.0%	100.0%	100.0%	26	1	**27**	100.0%	100.0%	100.0%	5	0	**5**	50.0%	0.0%	50.0%	0	0	**0**	0.0%	0.0%	0.0%
58	3	**61**	100.0%	100.0%	100.0%	19	1	**20**	100.0%	100.0%	100.0%	5	1	**6**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
37	2	**39**	100.0%	100.0%	100.0%	15	2	**17**	100.0%	100.0%	100.0%	4	1	**5**	66.7%	100.0%	71.4%	0	0	**0**	0.0%	0.0%	0.0%
28	2	**30**	100.0%	100.0%	100.0%	12	1	**13**	100.0%	100.0%	100.0%	4	1	**5**	66.7%	100.0%	71.4%	0	0	**0**	0.0%	0.0%	0.0%
20	1	**21**	100.0%	100.0%	100.0%	8	0	**8**	100.0%	0.0%	100.0%	3	0	**3**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
24	2	**26**	100.0%	100.0%	100.0%	12	2	**14**	100.0%	100.0%	100.0%	1	0	**1**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
18	1	**19**	100.0%	100.0%	100.0%	7	1	**8**	100.0%	100.0%	100.0%	2	0	**2**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
36	2	**38**	100.0%	100.0%	100.0%	20	1	**21**	100.0%	100.0%	100.0%	7	1	**8**	100.0%	100.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%
77	3	**80**	100.0%	100.0%	100.0%	56	2	**58**	100.0%	100.0%	100.0%	16	2	**18**	76.2%	100.0%	78.3%	0	0	**0**	0.0%	0.0%	0.0%
105	5	**110**	100.0%	100.0%	100.0%	72	2	**74**	93.5%	100.0%	93.7%	29	1	**30**	90.6%	100.0%	90.9%	1	0	**1**	0.9%	0.0%	0.8%
247	5	**252**	99.6%	83.3%	99.2%	124	2	**126**	95.4%	100.0%	95.5%	50	2	**52**	83.3%	100.0%	83.9%	1	0	**1**	0.5%	0.0%	0.4%
345	9	**354**	99.7%	100.0%	99.7%	135	5	**140**	95.1%	100.0%	95.2%	56	1	**57**	82.4%	100.0%	82.6%	1	0	**1**	0.3%	0.0%	0.3%
390	8	**398**	99.2%	100.0%	99.3%	113	0	**113**	94.2%	0.0%	94.2%	51	2	**53**	78.5%	100.0%	79.1%	0	0	**0**	0.0%	0.0%	0.0%
382	8	**390**	98.7%	88.9%	98.5%	127	3	**130**	94.8%	75.0%	94.2%	38	1	**39**	73.1%	100.0%	73.6%	1	0	**1**	0.2%	0.0%	0.2%
412	5	**417**	98.8%	100.0%	98.8%	112	5	**117**	90.3%	100.0%	90.7%	50	0	**50**	90.9%	0.0%	89.3%	0	0	**0**	0.0%	0.0%	0.0%
356	7	**363**	99.2%	100.0%	99.2%	117	2	**119**	94.4%	100.0%	94.4%	37	3	**40**	77.1%	100.0%	78.4%	2	0	**2**	0.4%	0.0%	0.4%
352	1	**353**	97.8%	100.0%	97.8%	125	3	**128**	99.2%	100.0%	99.2%	29	1	**30**	80.6%	100.0%	81.1%	4	0	**4**	0.8%	0.0%	0.8%
323	4	**327**	98.5%	100.0%	98.5%	111	1	**112**	93.3%	100.0%	93.3%	33	0	**33**	68.8%	0.0%	68.8%	0	0	**0**	0.0%	0.0%	0.0%
267	7	**274**	97.8%	100.0%	97.9%	96	3	**99**	94.1%	100.0%	94.3%	33	0	**33**	84.6%	0.0%	80.5%	0	0	**0**	0.0%	0.0%	0.0%
266	2	**268**	97.8%	66.7%	97.5%	151	4	**155**	93.2%	100.0%	93.4%	44	1	**45**	75.9%	100.0%	76.3%	4	0	**4**	0.9%	0.0%	0.9%
273	2	**275**	98.2%	100.0%	98.2%	107	3	**110**	92.2%	100.0%	92.4%	27	0	**27**	77.1%	0.0%	77.1%	0	0	**0**	0.0%	0.0%	0.0%
234	3	**237**	96.7%	100.0%	96.7%	101	2	**103**	100.0%	100.0%	100.0%	33	1	**34**	91.7%	50.0%	89.5%	0	0	**0**	0.0%	0.0%	0.0%
136	2	**138**	100.0%	100.0%	100.0%	54	1	**55**	94.7%	100.0%	94.8%	20	0	**20**	90.9%	0.0%	90.9%	0	0	**0**	0.0%	0.0%	0.0%
111	2	**113**	99.1%	100.0%	99.1%	45	2	**47**	95.7%	100.0%	95.9%	19	0	**19**	100.0%	0.0%	95.0%	0	0	**0**	0.0%	0.0%	0.0%
73	1	**74**	97.3%	100.0%	97.4%	40	1	**41**	95.2%	100.0%	95.3%	13	1	**14**	65.0%	100.0%	66.7%	0	0	**0**	0.0%	0.0%	0.0%
52	0	**52**	100.0%	0.0%	100.0%	31	0	**31**	93.9%	0.0%	93.9%	12	0	**12**	100.0%	0.0%	100.0%	0	0	**0**	0.0%	0.0%	0.0%

48 Hour Matches	Total Matches Leaving Site 1						Total Matches Arriving at Site 2						Total Matches Leaving Site 3						Total Matches Arriving at Site 4					
	Class			Percentage Matched			Class			Percentage Matched			Class			Percentage Matched			Class			Percentage Matched		
Time	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
00:00 - 01:00	29	2	**31**	100%	100%	100%	24	3	**27**	100%	100%	100%	17	2	**19**	94%	100%	95%	28	3	**31**	100%	100%	100%
01:00 - 02:00	14	1	**15**	88%	100%	88%	17	3	**20**	100%	100%	100%	15	2	**17**	100%	100%	100%	17	2	**19**	100%	100%	100%
02:00 - 03:00	21	2	**23**	95%	100%	96%	21	4	**25**	100%	100%	100%	12	1	**13**	92%	100%	93%	14	1	**15**	100%	100%	100%
03:00 - 04:00	22	2	**24**	96%	100%	96%	17	3	**20**	100%	100%	100%	9	1	**10**	100%	100%	100%	17	1	**18**	100%	100%	100%
04:00 - 05:00	19	2	**21**	90%	100%	91%	15	3	**18**	100%	100%	100%	9	0	**9**	100%	100%	100%	7	0	**7**	100%	100%	100%
05:00 - 06:00	37	4	**41**	100%	100%	100%	20	4	**24**	95%	100%	96%	38	5	**43**	93%	100%	93%	20	3	**23**	100%	100%	100%
06:00 - 07:00	189	15	**204**	98%	100%	99%	49	8	**57**	98%	100%	98%	107	13	**120**	96%	100%	96%	69	10	**79**	99%	91%	98%
07:00 - 08:00	234	16	**250**	95%	100%	95%	71	14	**85**	86%	78%	84%	165	17	**182**	94%	94%	94%	115	15	**130**	87%	75%	86%
08:00 - 09:00	417	15	**432**	91%	94%	91%	123	18	**141**	96%	86%	95%	240	23	**263**	94%	96%	95%	209	17	**226**	98%	85%	97%
09:00 - 10:00	411	13	**424**	98%	93%	98%	134	8	**142**	93%	80%	92%	158	10	**168**	90%	91%	90%	223	16	**239**	94%	73%	93%
10:00 - 11:00	339	19	**358**	95%	100%	96%	111	14	**125**	94%	78%	92%	148	10	**158**	97%	91%	97%	280	22	**302**	98%	79%	96%
11:00 - 12:00	349	18	**367**	95%	95%	95%	142	14	**156**	98%	88%	97%	139	13	**152**	94%	93%	94%	269	17	**286**	95%	77%	93%
12:00 - 13:00	333	18	**351**	98%	95%	98%	153	15	**168**	94%	83%	93%	146	8	**154**	98%	100%	98%	280	14	**294**	95%	88%	95%
13:00 - 14:00	316	21	**337**	91%	91%	91%	133	17	**150**	94%	85%	93%	125	9	**134**	92%	90%	92%	295	13	**308**	98%	87%	97%
14:00 - 15:00	299	18	**317**	93%	75%	91%	153	16	**169**	96%	94%	96%	118	12	**130**	93%	71%	90%	339	19	**358**	95%	95%	95%
15:00 - 16:00	314	18	**332**	93%	90%	93%	207	19	**226**	98%	83%	96%	161	13	**174**	94%	93%	94%	308	16	**324**	97%	84%	97%
16:00 - 17:00	322	17	**339**	92%	94%	92%	245	15	**260**	99%	88%	98%	142	7	**149**	91%	100%	91%	360	17	**377**	94%	94%	94%
17:00 - 18:00	289	11	**300**	96%	92%	96%	201	11	**212**	97%	73%	95%	128	3	**131**	90%	100%	90%	384	7	**391**	96%	78%	96%
18:00 - 19:00	278	3	**281**	94%	100%	94%	138	9	**147**	92%	100%	92%	106	0	**106**	99%	100%	99%	256	4	**260**	96%	100%	96%
19:00 - 20:00	253	14	**267**	99%	93%	99%	92	4	**96**	99%	100%	99%	87	3	**90**	100%	100%	100%	179	10	**189**	99%	100%	99%
20:00 - 21:00	172	12	**184**	97%	100%	97%	61	4	**65**	94%	80%	93%	77	2	**79**	95%	100%	95%	160	8	**168**	98%	100%	98%
21:00 - 22:00	147	7	**154**	98%	100%	98%	45	4	**49**	96%	100%	96%	38	1	**39**	100%	100%	100%	117	4	**121**	94%	100%	95%
22:00 - 23:00	83	5	**88**	99%	100%	99%	61	3	**64**	95%	100%	96%	26	1	**27**	96%	100%	96%	90	6	**96**	96%	100%	96%
23:00 - 00:00	58	3	**61**	94%	100%	94%	36	2	**38**	97%	100%	97%	19	1	**20**	95%	100%	95%	55	3	**58**	98%	100%	98%
00:00 - 01:00	37	2	**39**	97%	100%	98%	26	2	**28**	96%	100%	97%	15	2	**17**	94%	100%	94%	26	3	**29**	96%	100%	97%
01:00 - 02:00	28	2	**30**	93%	100%	94%	23	1	**24**	92%	100%	92%	12	1	**13**	92%	100%	93%	21	2	**23**	100%	100%	100%
02:00 - 03:00	20	1	**21**	95%	100%	95%	12	1	**13**	92%	100%	93%	8	0	**8**	100%	100%	100%	12	1	**13**	100%	100%	100%
03:00 - 04:00	24	2	**26**	96%	100%	96%	11	1	**12**	92%	100%	92%	12	2	**14**	100%	100%	100%	17	2	**19**	94%	100%	95%
04:00 - 05:00	18	1	**19**	100%	100%	100%	9	0	**9**	100%	100%	100%	7	1	**8**	100%	100%	100%	12	3	**15**	100%	100%	100%
05:00 - 06:00	36	2	**38**	92%	100%	93%	9	1	**10**	90%	100%	91%	20	1	**21**	95%	100%	95%	13	4	**17**	93%	100%	94%
06:00 - 07:00	77	3	**80**	99%	100%	99%	22	1	**23**	100%	100%	100%	56	2	**58**	98%	100%	98%	48	2	**50**	98%	67%	96%
07:00 - 08:00	105	5	**110**	98%	100%	98%	45	2	**47**	80%	100%	81%	77	2	**79**	100%	100%	100%	66	6	**72**	86%	100%	87%
08:00 - 09:00	248	6	**254**	99%	100%	99%	87	3	**90**	92%	100%	92%	130	2	**132**	98%	100%	99%	124	8	**132**	91%	89%	90%
09:00 - 10:00	346	9	**355**	99%	90%	99%	99	2	**101**	88%	100%	89%	142	5	**147**	99%	100%	99%	203	8	**211**	87%	100%	88%
10:00 - 11:00	393	8	**401**	99%	100%	99%	106	5	**111**	90%	83%	90%	120	0	**120**	100%	100%	100%	288	5	**293**	87%	100%	87%
11:00 - 12:00	387	9	**396**	99%	90%	99%	122	4	**126**	92%	100%	93%	134	4	**138**	100%	80%	99%	327	9	**336**	96%	100%	96%
12:00 - 13:00	417	5	**422**	98%	83%	98%	127	1	**128**	98%	100%	98%	124	5	**129**	100%	83%	99%	301	3	**304**	98%	100%	98%
13:00 - 14:00	359	7	**366**	97%	78%	97%	116	3	**119**	97%	100%	97%	124	2	**126**	96%	100%	96%	294	1	**295**	99%	100%	99%
14:00 - 15:00	360	1	**361**	97%	100%	97%	132	1	**133**	99%	100%	99%	126	3	**129**	97%	75%	96%	271	6	**277**	97%	100%	98%
15:00 - 16:00	328	4	**332**	99%	80%	99%	135	2	**137**	87%	67%	86%	119	1	**120**	98%	100%	98%	295	2	**297**	87%	100%	87%
16:00 - 17:00	273	7	**280**	91%	100%	91%	117	3	**120**	98%	100%	98%	102	3	**105**	92%	100%	92%	241	5	**246**	98%	100%	98%
17:00 - 18:00	272	3	**275**	97%	75%	96%	118	2	**120**	100%	100%	100%	162	4	**166**	96%	80%	96%	260	2	**262**	92%	100%	92%
18:00 - 19:00	278	2	**280**	100%	100%	100%	123	1	**124**	96%	100%	96%	116	3	**119**	95%	100%	95%	195	0	**195**	92%	100%	92%
19:00 - 20:00	242	3	**245**	99%	100%	99%	80	1	**81**	98%	17%	92%	101	2	**103**	96%	100%	96%	170	3	**173**	99%	100%	99%
20:00 - 21:00	136	2	**138**	99%	100%	99%	56	0	**56**	98%	0%	95%	57	1	**58**	97%	100%	97%	121	2	**123**	98%	100%	98%
21:00 - 22:00	112	2	**114**	97%	100%	97%	43	0	**43**	100%	0%	98%	47	2	**49**	100%	100%	100%	109	4	**113**	100%	80%	99%
22:00 - 23:00	75	1	**76**	99%	100%	99%	49	1	**50**	96%	100%	96%	42	1	**43**	98%	100%	98%	64	1	**65**	98%	100%	98%
23:00 - 00:00	52	0	**52**	100%	100%	100%	37	0	**37**	95%	0%	93%	33	0	**33**	100%	100%	100%	46	1	**47**	96%	100%	96%

Total Matches Leaving Site 5E						Total Matches Arriving at Site 5W						Total Matches Arriving at Site 6E						Total Matches Leaving Site 6W					
Class			Percentage Matched			Class			Percentage Matched			Class			Percentage Matched			Class			Percentage Matched		
1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total	1	2	Total	% of 1	% of 2	% of Total
9	0	**9**	100%	100%	100%	22	3	**25**	100%	100%	100%	55	4	**59**	100%	100%	100%	74	9	**83**	97%	100%	98%
8	0	**8**	100%	100%	100%	10	1	**11**	100%	100%	100%	37	3	**40**	100%	100%	100%	44	6	**50**	94%	100%	94%
9	1	**10**	100%	100%	100%	10	0	**10**	100%	100%	100%	42	4	**46**	100%	100%	100%	45	5	**50**	94%	100%	94%
10	0	**10**	91%	100%	91%	12	1	**13**	100%	100%	100%	41	3	**44**	100%	100%	100%	46	5	**51**	98%	100%	98%
8	1	**9**	100%	100%	100%	6	1	**7**	100%	100%	100%	36	3	**39**	100%	100%	100%	28	4	**32**	90%	100%	91%
16	1	**17**	94%	100%	94%	17	1	**18**	94%	100%	95%	91	10	**101**	100%	91%	99%	57	8	**65**	98%	100%	98%
34	2	**36**	97%	100%	97%	23	2	**25**	96%	100%	96%	326	28	**354**	96%	97%	96%	137	18	**155**	101%	100%	101%
62	0	**62**	98%	100%	98%	30	5	**35**	81%	83%	81%	448	33	**481**	89%	79%	88%	203	34	**237**	96%	97%	96%
115	4	**119**	95%	100%	95%	32	4	**36**	94%	100%	95%	754	40	**794**	91%	87%	91%	346	37	**383**	96%	100%	96%
78	3	**81**	98%	100%	98%	93	8	**101**	92%	73%	90%	629	25	**654**	90%	78%	90%	432	31	**463**	97%	97%	97%
60	6	**66**	97%	100%	97%	65	4	**69**	97%	80%	96%	532	34	**566**	90%	85%	90%	441	39	**480**	94%	93%	94%
54	5	**59**	96%	100%	97%	57	4	**61**	97%	80%	95%	529	31	**560**	92%	79%	91%	455	30	**485**	95%	94%	95%
52	4	**56**	100%	100%	100%	75	7	**82**	96%	100%	96%	507	30	**537**	90%	79%	90%	484	36	**520**	96%	92%	96%
50	5	**55**	91%	100%	92%	73	5	**78**	96%	83%	95%	469	31	**500**	90%	82%	90%	479	31	**510**	90%	97%	91%
59	4	**63**	97%	57%	93%	77	8	**85**	91%	89%	90%	430	33	**463**	89%	94%	89%	523	42	**565**	96%	93%	95%
63	6	**69**	91%	100%	92%	74	4	**78**	91%	80%	91%	522	32	**554**	90%	86%	90%	573	34	**607**	90%	92%	90%
61	1	**62**	97%	100%	97%	95	4	**99**	100%	80%	99%	495	24	**519**	91%	83%	90%	670	35	**705**	94%	97%	95%
55	0	**55**	92%	100%	92%	106	1	**107**	91%	100%	91%	444	14	**458**	92%	78%	91%	663	19	**682**	93%	95%	93%
52	0	**52**	98%	100%	98%	73	0	**73**	94%	0%	92%	412	3	**415**	92%	75%	91%	443	13	**456**	95%	100%	95%
35	1	**36**	97%	100%	97%	44	3	**47**	98%	100%	98%	365	18	**383**	94%	95%	94%	305	17	**322**	100%	100%	100%
27	2	**29**	100%	100%	100%	28	1	**29**	97%	100%	97%	273	16	**289**	99%	100%	99%	246	13	**259**	96%	93%	96%
16	1	**17**	100%	100%	100%	37	2	**39**	97%	100%	98%	199	9	**208**	95%	100%	95%	197	10	**207**	99%	91%	99%
10	0	**10**	100%	100%	100%	28	1	**29**	93%	100%	94%	114	6	**120**	93%	100%	93%	174	10	**184**	99%	100%	99%
5	1	**6**	100%	100%	100%	24	1	**25**	100%	100%	100%	82	5	**87**	99%	100%	99%	115	6	**121**	92%	100%	92%
6	1	**7**	100%	100%	100%	9	0	**9**	100%	100%	100%	56	5	**61**	100%	100%	100%	59	5	**64**	98%	100%	98%
6	1	**7**	100%	100%	100%	9	2	**11**	100%	100%	100%	44	4	**48**	98%	100%	98%	51	5	**56**	93%	100%	93%
3	0	**3**	100%	100%	100%	4	0	**4**	100%	100%	100%	31	1	**32**	97%	100%	97%	28	2	**30**	97%	100%	97%
1	0	**1**	100%	100%	100%	8	0	**8**	89%	100%	89%	37	4	**41**	100%	100%	100%	36	3	**39**	97%	100%	98%
2	0	**2**	100%	100%	100%	3	0	**3**	100%	100%	100%	27	2	**29**	100%	100%	100%	24	3	**27**	96%	100%	96%
7	1	**8**	100%	100%	100%	6	1	**7**	100%	100%	100%	63	4	**67**	98%	80%	97%	28	6	**34**	97%	100%	97%
21	2	**23**	100%	100%	100%	12	2	**14**	92%	100%	93%	149	7	**156**	98%	100%	98%	77	5	**82**	99%	100%	99%
32	1	**33**	91%	100%	92%	9	2	**11**	82%	100%	85%	207	8	**215**	81%	114%	82%	113	10	**123**	100%	100%	100%
60	2	**62**	100%	100%	100%	15	3	**18**	88%	100%	90%	422	9	**431**	92%	90%	92%	210	13	**223**	96%	87%	96%
68	1	**69**	99%	100%	99%	40	1	**41**	89%	100%	89%	537	15	**552**	90%	100%	90%	323	11	**334**	97%	100%	97%
65	2	**67**	98%	100%	99%	58	3	**61**	89%	75%	88%	554	10	**564**	93%	83%	93%	428	13	**441**	97%	93%	97%
52	1	**53**	96%	100%	96%	56	2	**58**	90%	100%	91%	548	12	**560**	97%	86%	97%	480	13	**493**	98%	108%	98%
55	1	**56**	100%	100%	100%	64	1	**65**	98%	100%	98%	574	10	**584**	98%	100%	98%	470	4	**474**	98%	80%	98%
48	3	**51**	94%	100%	94%	55	1	**56**	100%	100%	100%	512	12	**524**	99%	92%	99%	446	5	**451**	94%	83%	94%
36	1	**37**	95%	100%	95%	55	0	**55**	98%	100%	98%	510	5	**515**	98%	100%	98%	446	7	**453**	94%	88%	94%
48	0	**48**	100%	100%	100%	62	1	**63**	87%	100%	88%	467	5	**472**	92%	71%	92%	464	5	**469**	99%	100%	99%
39	2	**41**	89%	100%	89%	57	0	**57**	97%	100%	97%	396	12	**408**	97%	80%	96%	397	8	**405**	87%	100%	88%
58	1	**59**	89%	100%	89%	70	1	**71**	92%	100%	92%	465	7	**472**	98%	100%	98%	421	4	**425**	95%	80%	95%
35	0	**35**	97%	100%	97%	81	0	**81**	94%	100%	94%	407	5	**412**	100%	63%	99%	377	1	**378**	96%	100%	96%
36	2	**38**	97%	100%	97%	54	1	**55**	98%	100%	98%	368	6	**374**	99%	100%	99%	293	4	**297**	99%	100%	99%
22	0	**22**	100%	100%	100%	44	0	**44**	98%	100%	98%	210	3	**213**	100%	100%	100%	216	2	**218**	99%	100%	99%
19	1	**20**	95%	100%	95%	50	1	**51**	100%	100%	100%	175	5	**180**	99%	100%	99%	199	5	**204**	99%	100%	99%
20	1	**21**	95%	100%	95%	45	0	**45**	98%	100%	98%	126	3	**129**	97%	100%	97%	147	2	**149**	95%	100%	96%
12	0	**12**	92%	100%	92%	32	0	**32**	97%	100%	97%	95	0	**95**	97%	100%	97%	113	1	**114**	93%	100%	93%

Friday 8th and Saturday 9th, December, 2006

48 Hour Plates	Site 1			Site 2			Site 3			Site 4			Site 5E			Site 5W			Site 6E			Site 6W		
	Plates Recorded			Plates Recorded			Plates Recorded			Plates Recorded			Plates Recorded			Plates Recorded			Plates Recorded			Plates Recorded		
Time	1	2	Total	1	2	Total	1	2	Total	1	2	Total	1	2	Total	1	2	Total	1	2	Total	1	2	Total
00:00 - 01:00	29	2	**31**	24	3	**27**	18	2	**20**	28	3	**31**	9	0	**9**	22	3	**25**	55	4	**59**	76	9	**85**
01:00 - 02:00	16	1	**17**	17	3	**20**	15	2	**17**	17	2	**19**	8	0	**8**	10	1	**11**	37	3	**40**	47	6	**53**
02:00 - 03:00	22	2	**24**	21	4	**25**	13	1	**14**	14	1	**15**	9	1	**10**	10	0	**10**	42	4	**46**	48	5	**53**
03:00 - 04:00	23	2	**25**	17	3	**20**	9	1	**10**	17	1	**18**	11	0	**11**	12	1	**13**	41	3	**44**	47	5	**52**
04:00 - 05:00	21	2	**23**	15	3	**18**	9	0	**9**	7	0	**7**	8	1	**9**	6	1	**7**	36	3	**39**	31	4	**35**
05:00 - 06:00	37	4	**41**	21	4	**25**	41	5	**46**	20	3	**23**	17	1	**18**	18	1	**19**	91	11	**102**	58	8	**66**
06:00 - 07:00	192	15	**207**	50	8	**58**	112	13	**125**	70	11	**81**	35	2	**37**	24	2	**26**	338	29	**367**	136	18	**154**
07:00 - 08:00	247	16	**263**	83	18	**101**	176	18	**194**	132	20	**152**	63	0	**63**	37	6	**43**	505	42	**547**	211	35	**246**
08:00 - 09:00	459	16	**475**	128	21	**149**	254	24	**278**	213	20	**233**	121	4	**125**	34	4	**38**	831	46	**877**	360	37	**397**
09:00 - 10:00	419	14	**433**	144	10	**154**	175	11	**186**	236	22	**258**	80	3	**83**	101	11	**112**	697	32	**729**	446	32	**478**
10:00 - 11:00	355	19	**374**	118	18	**136**	152	11	**163**	286	28	**314**	62	6	**68**	67	5	**72**	589	40	**629**	468	42	**510**
11:00 - 12:00	366	19	**385**	145	16	**161**	148	14	**162**	284	22	**306**	56	5	**61**	59	5	**64**	575	39	**614**	479	32	**511**
12:00 - 13:00	341	19	**360**	163	18	**181**	149	8	**157**	295	16	**311**	52	4	**56**	78	7	**85**	561	38	**599**	503	39	**542**
13:00 - 14:00	348	23	**371**	142	20	**162**	136	10	**146**	301	15	**316**	55	5	**60**	76	6	**82**	520	38	**558**	531	32	**563**
14:00 - 15:00	323	24	**347**	159	17	**176**	127	17	**144**	358	20	**378**	61	7	**68**	85	9	**94**	485	35	**520**	547	45	**592**
15:00 - 16:00	336	20	**356**	212	23	**235**	171	14	**185**	316	19	**335**	69	6	**75**	81	5	**86**	578	37	**615**	635	37	**672**
16:00 - 17:00	350	18	**368**	248	17	**265**	156	7	**163**	383	18	**401**	63	1	**64**	95	5	**100**	545	29	**574**	709	36	**745**
17:00 - 18:00	302	12	**314**	208	15	**223**	142	3	**145**	398	9	**407**	60	0	**60**	117	1	**118**	483	18	**501**	711	20	**731**
18:00 - 19:00	297	3	**300**	150	9	**159**	107	0	**107**	268	4	**272**	53	0	**53**	78	1	**79**	450	4	**454**	465	13	**478**
19:00 - 20:00	255	15	**270**	93	4	**97**	87	3	**90**	181	10	**191**	36	1	**37**	45	3	**48**	389	19	**408**	306	17	**323**
20:00 - 21:00	178	12	**190**	65	5	**70**	81	2	**83**	164	8	**172**	27	2	**29**	29	1	**30**	277	16	**293**	256	14	**270**
21:00 - 22:00	150	7	**157**	47	4	**51**	38	1	**39**	124	4	**128**	16	1	**17**	38	2	**40**	210	9	**219**	199	11	**210**
22:00 - 23:00	84	5	**89**	64	3	**67**	27	1	**28**	94	6	**100**	10	0	**10**	30	1	**31**	123	6	**129**	175	10	**185**
23:00 - 00:00	62	3	**65**	37	2	**39**	20	1	**21**	56	3	**59**	5	1	**6**	24	1	**25**	83	5	**88**	125	6	**131**
00:00 - 01:00	38	2	**40**	27	2	**29**	16	2	**18**	27	3	**30**	6	1	**7**	9	0	**9**	56	5	**61**	60	5	**65**
01:00 - 02:00	30	2	**32**	25	1	**26**	13	1	**14**	21	2	**23**	6	1	**7**	9	2	**11**	45	4	**49**	55	5	**60**
02:00 - 03:00	21	1	**22**	13	1	**14**	8	0	**8**	12	1	**13**	3	0	**3**	4	0	**4**	32	1	**33**	29	2	**31**
03:00 - 04:00	25	2	**27**	12	1	**13**	12	2	**14**	18	2	**20**	1	0	**1**	9	0	**9**	37	4	**41**	37	3	**40**
04:00 - 05:00	18	1	**19**	9	0	**9**	7	1	**8**	12	3	**15**	2	0	**2**	3	0	**3**	27	2	**29**	25	3	**28**
05:00 - 06:00	39	2	**41**	10	1	**11**	21	1	**22**	14	4	**18**	7	1	**8**	6	1	**7**	64	5	**69**	29	6	**35**
06:00 - 07:00	78	3	**81**	22	1	**23**	57	2	**59**	49	3	**52**	21	2	**23**	13	2	**15**	152	7	**159**	78	5	**83**
07:00 - 08:00	107	5	**112**	56	2	**58**	77	2	**79**	77	6	**83**	35	1	**36**	11	2	**13**	254	7	**261**	113	10	**123**
08:00 - 09:00	250	6	**256**	95	3	**98**	132	2	**134**	137	9	**146**	60	2	**62**	17	3	**20**	458	10	**468**	218	15	**233**
09:00 - 10:00	349	10	**359**	112	2	**114**	143	5	**148**	233	8	**241**	69	1	**70**	45	1	**46**	595	15	**610**	332	11	**343**
10:00 - 11:00	397	8	**405**	118	6	**124**	120	0	**120**	332	5	**337**	66	2	**68**	65	4	**69**	596	12	**608**	439	14	**453**
11:00 - 12:00	391	10	**401**	132	4	**136**	134	5	**139**	340	9	**349**	54	1	**55**	62	2	**64**	564	14	**578**	490	12	**502**
12:00 - 13:00	424	6	**430**	130	1	**131**	124	6	**130**	308	3	**311**	55	1	**56**	65	1	**66**	587	10	**597**	481	5	**486**
13:00 - 14:00	369	9	**378**	120	3	**123**	129	2	**131**	297	1	**298**	51	3	**54**	55	1	**56**	515	13	**528**	473	6	**479**
14:00 - 15:00	371	1	**372**	134	1	**135**	130	4	**134**	278	6	**284**	38	1	**39**	56	0	**56**	523	5	**528**	473	8	**481**
15:00 - 16:00	332	5	**337**	156	3	**159**	121	1	**122**	341	2	**343**	48	0	**48**	71	1	**72**	507	7	**514**	468	5	**473**
16:00 - 17:00	300	7	**307**	119	3	**122**	111	3	**114**	245	5	**250**	44	2	**46**	59	0	**59**	410	15	**425**	454	8	**462**
17:00 - 18:00	281	4	**285**	118	2	**120**	168	5	**173**	283	2	**285**	65	1	**66**	76	1	**77**	475	7	**482**	444	5	**449**
18:00 - 19:00	279	2	**281**	128	1	**129**	122	3	**125**	212	0	**212**	36	0	**36**	86	0	**86**	408	8	**416**	391	1	**392**
19:00 - 20:00	244	3	**247**	82	6	**88**	105	2	**107**	172	3	**175**	37	2	**39**	55	1	**56**	371	6	**377**	297	4	**301**
20:00 - 21:00	138	2	**140**	57	2	**59**	59	1	**60**	124	2	**126**	22	0	**22**	45	0	**45**	210	3	**213**	219	2	**221**
21:00 - 22:00	116	2	**118**	43	1	**44**	47	2	**49**	109	5	**114**	20	1	**21**	50	1	**51**	177	5	**182**	202	5	**207**
22:00 - 23:00	76	1	**77**	51	1	**52**	43	1	**44**	65	1	**66**	21	1	**22**	46	0	**46**	130	3	**133**	154	2	**156**
23:00 - 00:00	52	0	**52**	39	1	**40**	33	0	**33**	48	1	**49**	13	0	**13**	33	0	**33**	98	0	**98**	122	1	**123**

Appendix D

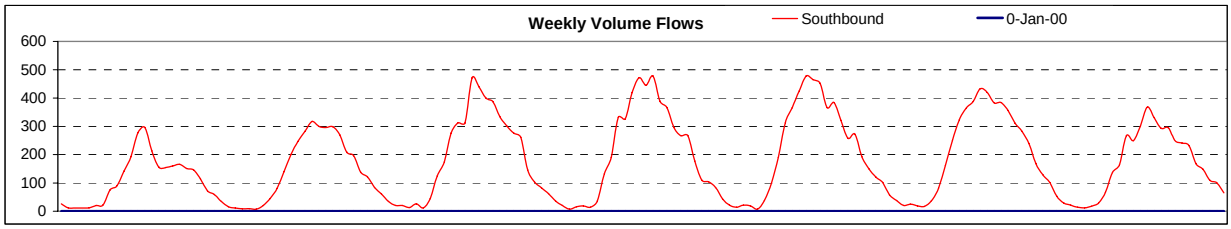
Interchange Tube Count Survey Data

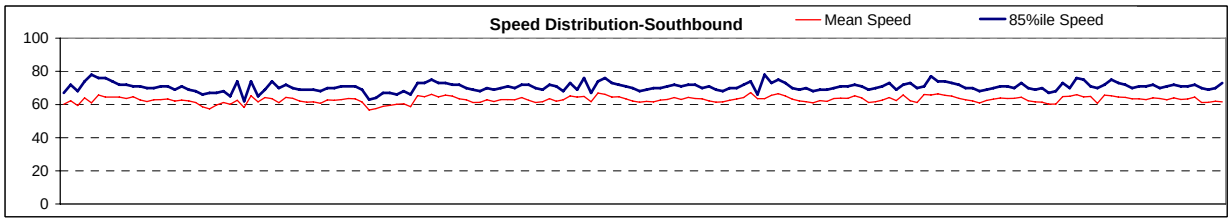
AUSTRALASIAN TRAFFIC SURVEYS

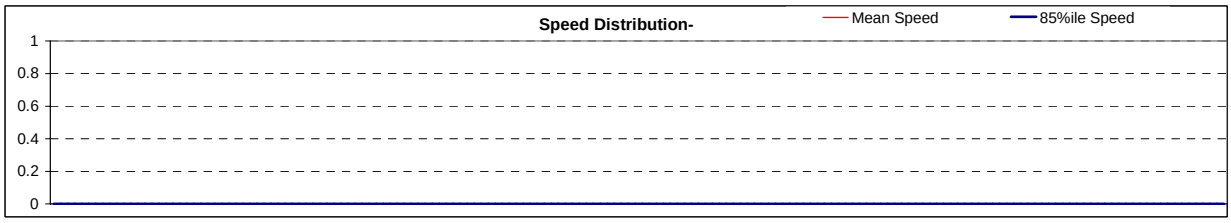
Automated vehicle Study Summary Report
Pacific Highway, Southbound off Ramp to Ewingsdale Rd

From: Monday, 25 Dec 06
Untill: Sunday, 31 Dec 06

Data Record Inerval = 1Hr	Monday, 25 Dec 06			Tuesday, 26 Dec 06			Wednesday, 27 Dec 06			Thursday, 28 Dec 06			Friday, 29 Dec 06			Saturday, 30 Dec 06			Sunday, 31 Dec 06		
	outhboun	######	2 way	outhboun	######	2 way	outhboun	######	2 way	outhboun	######	2 way	outhboun	######	2 way	outhbour	######	2 way	outhboun	######	2 way
Short Veh %	2557	0	2557	3287	0	3287	4425	0	4425	4824	0	4824	4937	0	4937	4858	0	4858	3799	0	3799
Medium Veh %	52	0	52	94	0	94	174	0	174	154	0	154	164	0	164	113	0	113	92	0	92
Long Veh %	2	0	2	11	0	11	35	0	35	32	0	32	30	0	30	14	0	14	15	0	15
7am-7pm Vol	2144	0	2144	2895	0	2895	3917	0	3917	4235	0	4235	4294	0	4294	4135	0	4135	3157	0	3157
24Hr Vol	**2612**	**0**	**2612**	**3392**	**0**	**3392**	**4635**	**0**	**4635**	**5010**	**0**	**5010**	**5132**	**0**	**5132**	**4985**	**0**	**4985**	**3907**	**0**	**3907**
85%ile Speed	**70**		**70**	**69**		**69**	**70**		**70**	**71**		**71**	**70**		**70**	**70**		**70**	**71**		**71**
Mean Speed	**62.42**		**62.42**	**62.00**		**62.00**	**62.83**		**62.83**	**62.96**		**62.96**	**63.06**		**63.06**	**63.06**		**63.06**	**63.47**		**63.47**
AM Pk Hr Vol	277	0	277	282	0	282	471	0	471	472	0	472	478	0	478	388	0	388	300	0	300
AM Hr Factor	0.11	#####	0.11	0.08	#####	0.08	0.10	#####	0.10	0.09	#####	0.09	0.09	#####	0.09	0.08	#####	0.08	0.08	#####	0.08
AM Peak 85%	78	0	78	74	0	74	75	0	75	76	0	76	78	0	78	77	0	77	76	0	76
AM Peak Time	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00
PM Pk Hr Vol	296	0	296	317	0	317	440	0	440	478	0	478	465	0	465	433	0	433	368	0	368
PM Hr Factor	0.11	#####	0.11	0.09	#####	0.09	0.09	#####	0.09	0.10	#####	0.10	0.09	#####	0.09	0.09	#####	0.09	0.09	#####	0.09
PM Peak 85%	71	0	71	71	0	71	72	0	72	72	0	72	73	0	73	73	0	73	73	0	73
PM Peak Time	12:00	18:00	12:00	12:00	18:00	12:00	12:00	18:00	12:00	13:00	18:00	13:00	12:00	18:00	12:00	12:00	18:00	12:00	12:00	18:00	12:00







Classification Satistics 24Hr Vol	25-Dec-06			26-Dec-06			27-Dec-06			28-Dec-06			29-Dec-06			30-Dec-06			31-Dec-06		
	outhboun	######	2 way	outhboun	######	2 way	outhboun	######	2 way	outhboun	######	2 way	outhboun	0	2 way	outhbour	0	2 way	outhboun	0	2 way
1 Car	2535	0	2535	3230	0	3230	4349	0	4349	4756	0	4756	4879	0	4879	4788	0	4788	3761	0	3761
2 Car+Trailer	22	0	22	57	0	57	76	0	76	68	0	68	58	0	58	70	0	70	38	0	38
3 2 axle Truck	43	0	43	76	0	76	145	0	145	129	0	129	131	0	131	92	0	92	78	0	78
4 3 axle Truck	9	0	9	16	0	16	28	0	28	24	0	24	30	0	30	20	0	20	12	0	12
5 4 axle Truck	0	0	0	2	0	2	1	0	1	1	0	1	3	0	3	1	0	1	2	0	2
6 3 axle Semi	2	0	2	3	0	3	3	0	3	4	0	4	6	0	6	3	0	3	6	0	6
7 4 axle Semi	0	0	0	3	0	3	4	0	4	3	0	3	2	0	2	3	0	3	4	0	4
8 5 axle Semi	0	0	0	0	0	0	1	0	1	3	0	3	2	0	2	0	0	0	2	0	2
9 6 axle Semi	0	0	0	5	0	5	27	0	27	21	0	21	18	0	18	8	0	8	3	0	3
10 7/9axle Truck	0	0	0	0	0	0	0	0	0	1	0	1	2	0	2	0	0	0	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

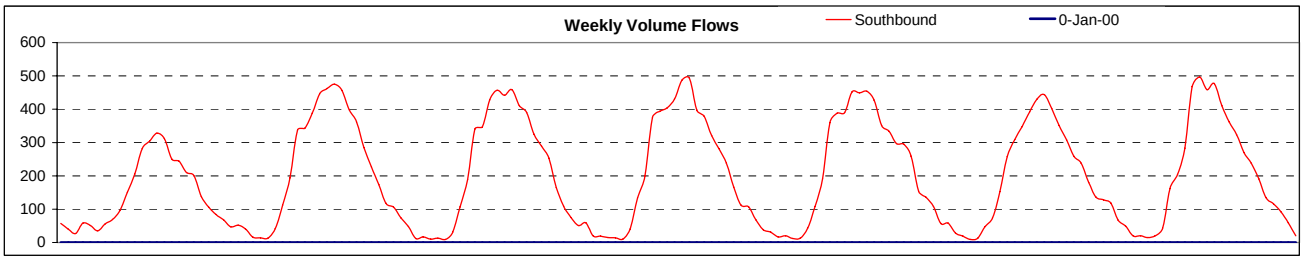
AUSTRALASIAN TRAFFIC SURVEYS

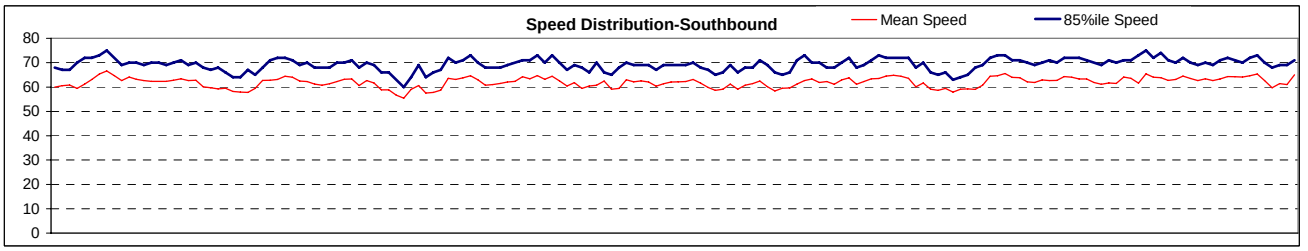
Automated vehicle Study Summary Report

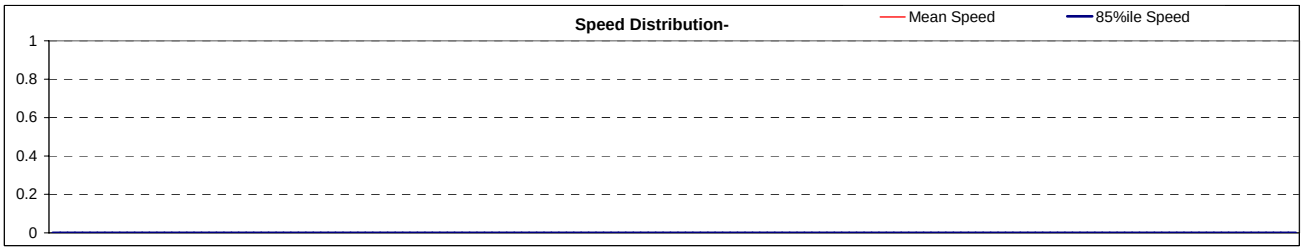
Pacific Highway, Southbound off Ramp to Ewingsdale Rd

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way
Short Veh %	3325	0	3325	4939	0	4939	4762	0	4762	4927	0	4927	5132	0	5132	4616	0	4616	4816	0	4816
Medium Veh %	83	0	83	205	0	205	193	0	193	177	0	177	180	0	180	131	0	131	102	0	102
Long Veh %	12	0	12	38	0	38	33	0	33	42	0	42	33	0	33	22	0	22	16	0	16
7am-7pm Vol	2722	0	2722	4354	0	4354	4306	0	4306	4368	0	4368	4456	0	4456	3919	0	3919	4114	0	4114
24Hr Vol	**3420**	**0**	**3420**	**5182**	**0**	**5182**	**4988**	**0**	**4988**	**5146**	**0**	**5146**	**5346**	**0**	**5346**	**4770**	**0**	**4770**	**4934**	**0**	**4934**
85%ile Speed	**70**		**70**	**69**		**69**	**70**		**70**	**68**		**68**	**70**		**70**	**71**		**71**	**70**		**70**
Mean Speed	**62.51**		**62.51**	**61.82**		**61.82**	**62.60**		**62.60**	**61.33**		**61.33**	**62.66**		**62.66**	**62.99**		**62.99**	**63.40**		**63.40**
AM Pk Hr Vol	282	0	282	446	0	446	457	0	457	431	0	431	452	0	452	392	0	392	497	0	497
AM Hr Factor	0.08	#####	0.08	0.09	#####	0.09	0.09	#####	0.09	0.08	#####	0.08	0.08	#####	0.08	0.08	#DIV/0!	0.08	0.10	#DIV/0!	0.10
AM Peak 85%	75	0	75	72	0	72	73	0	73	70	0	70	73	0	73	73	0	73	75	0	75
AM Peak Time	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	10:00	18:00	10:00
PM Pk Hr Vol	328	0	328	475	0	475	459	0	459	493	0	493	454	0	454	444	0	444	477	0	477
PM Hr Factor	0.10	#####	0.10	0.09	#####	0.09	0.09	#####	0.09	0.10	#####	0.10	0.08	#####	0.08	0.09	#DIV/0!	0.09	0.10	#DIV/0!	0.10
PM Peak 85%	71	0	71	71	0	71	73	0	73	71	0	71	73	0	73	72	0	72	73	0	73
PM Peak Time	13:00	18:00	13:00	13:00	18:00	13:00	13:00	18:00	13:00	13:00	18:00	13:00	13:00	18:00	13:00	13:00	18:00	13:00	12:00	18:00	12:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	0	2 way	outbour	0	2 way	outbour	0	2 way
1 Car	3283	0	3283	4854	0	4854	4700	0	4700	4866	0	4866	5055	0	5055	4539	0	4539	4727	0	4727
2 Car+Trailer	42	0	42	85	0	85	62	0	62	61	0	61	77	0	77	77	0	77	89	0	89
3 2 axle Truck	61	0	61	165	0	165	158	0	158	148	0	148	137	0	137	110	0	110	83	0	83
4 3 axle Truck	18	0	18	37	0	37	31	0	31	26	0	26	37	0	37	20	0	20	14	0	14
5 4 axle Truck	4	0	4	3	0	3	4	0	4	3	0	3	6	0	6	1	0	1	5	0	5
6 3 axle Semi	4	0	4	5	0	5	10	0	10	10	0	10	9	0	9	11	0	11	6	0	6
7 4 axle Semi	0	0	0	4	0	4	4	0	4	7	0	7	3	0	3	2	0	2	5	0	5
8 5 axle Semi	1	0	1	2	0	2	1	0	1	1	0	1	2	0	2	0	0	0	0	0	0
9 6 axle Semi	7	0	7	26	0	26	18	0	18	23	0	23	19	0	19	7	0	7	5	0	5
10 7/9axle Truck	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	2	0	2	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

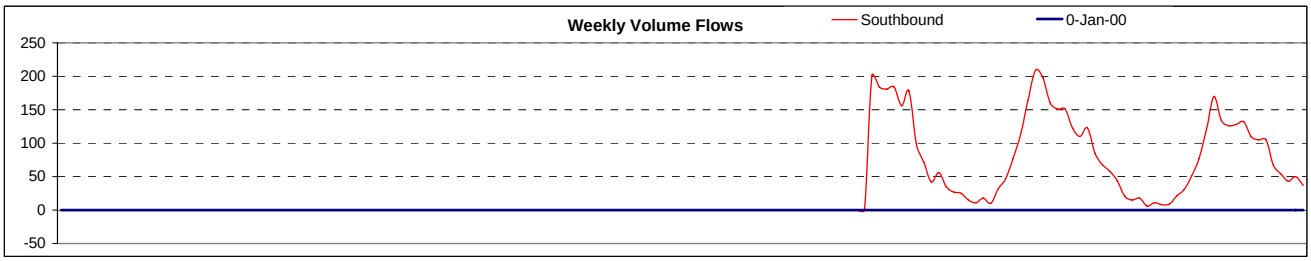
AUSTRALASIAN TRAFFIC SURVEYS

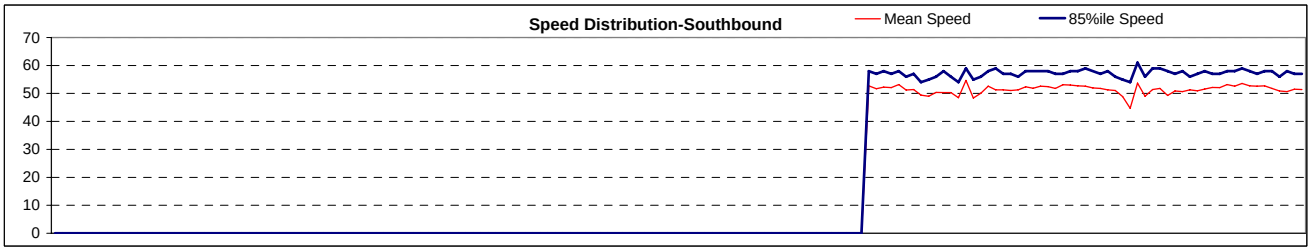
Automated vehicle Study Summary Report

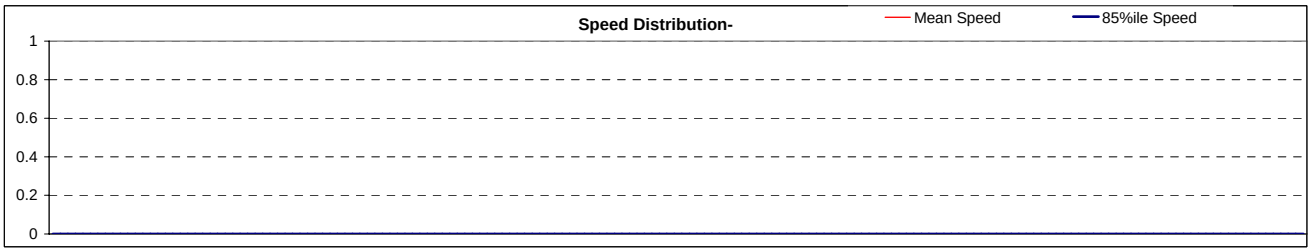
Pacific Highway, Southbound on ramp from Ewingsdale Rd

From: Monday, 25 Dec 06
Untill: Sunday, 31 Dec 06

Data Record Inerval = 1Hr	Monday, 25 Dec 06			Tuesday, 26 Dec 06			Wednesday, 27 Dec 06			Thursday, 28 Dec 06			Friday, 29 Dec 06			Saturday, 30 Dec 06			Sunday, 31 Dec 06		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way
Short Veh %	0	0	0	0	0	0	0	0	0	0	0	0	1332	0	1332	1982	0	1982	1573	0	1573
Medium Veh %	0	0	0	0	0	0	0	0	0	0	0	0	41	0	41	49	0	49	52	0	52
Long Veh %	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14	8	0	8	4	0	4
7am-7pm Vol	0	0	0	0	0	0	0	0	0	0	0	0	1183	0	1183	1663	0	1663	1326	0	1326
24Hr Vol	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1387**	**0**	**1387**	**2039**	**0**	**2039**	**1629**	**0**	**1629**
85%ile Speed													**57**		**57**	**58**		**58**	**58**		**58**
Mean Speed													**51.77**		**51.77**	**52.06**		**52.06**	**52.10**		**52.10**
AM Pk Hr Vol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	209	0	209	170	0	170
AM Hr Factor	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	0.00	#####	0.00	0.10	#DIV/0!	0.10	0.10	#DIV/0!	0.10
AM Peak 85%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0	59	61	0	61
AM Peak Time	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	11:00	18:00	11:00	11:00	18:00	11:00
PM Pk Hr Vol	0	0	0	0	0	0	0	0	0	0	0	0	201	0	201	198	0	198	134	0	134
PM Hr Factor	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	0.14	#####	0.14	0.10	#DIV/0!	0.10	0.08	#DIV/0!	0.08
PM Peak 85%	0	0	0	0	0	0	0	0	0	0	0	0	58	0	58	59	0	59	59	0	59
PM Peak Time	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	18:00	13:00	18:00	13:00	12:00	18:00	12:00	12:00	18:00	12:00







Classification Satistics 24Hr Vol	25-Dec-06			26-Dec-06			27-Dec-06			28-Dec-06			29-Dec-06			30-Dec-06			31-Dec-06		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	0	2 way	outbour	0	2 way	outbour	0	2 way
1 Car	0	0	0	0	0	0	0	0	0	0	0	0	1310	0	1310	1956	0	1956	1555	0	1555
2 Car+Trailer	0	0	0	0	0	0	0	0	0	0	0	0	22	0	22	26	0	26	18	0	18
3 2 axle Truck	0	0	0	0	0	0	0	0	0	0	0	0	34	0	34	39	0	39	47	0	47
4 3 axle Truck	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	9	0	9	4	0	4
5 4 axle Truck	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	0	1	1	0	1
6 3 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	3	0	3
7 4 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0
8 5 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1
9 6 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	12	0	12	5	0	5	0	0	0
10 7/9axle Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

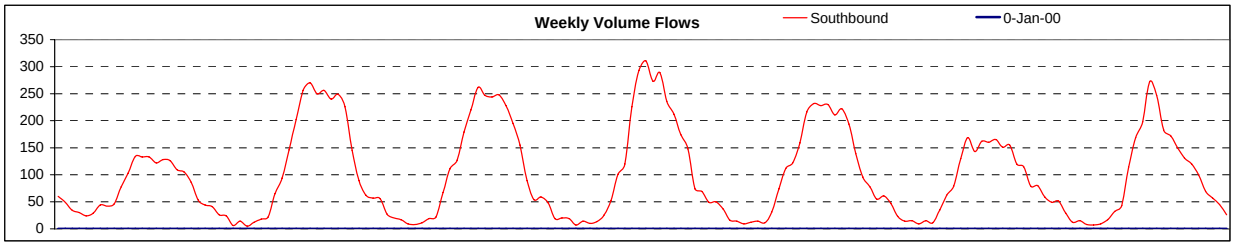
AUSTRALASIAN TRAFFIC SURVEYS

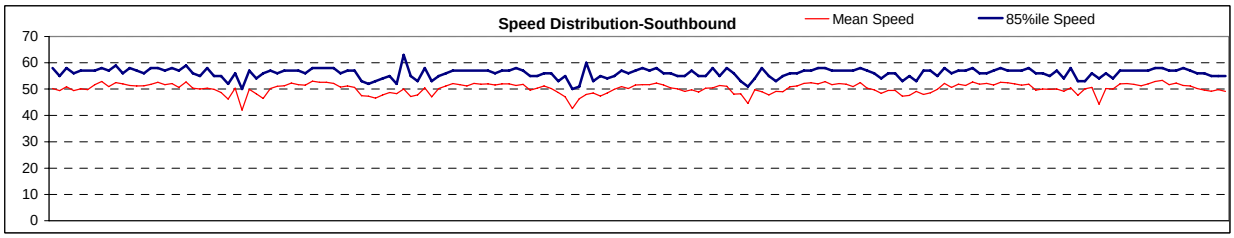
Automated vehicle Study Summary Report

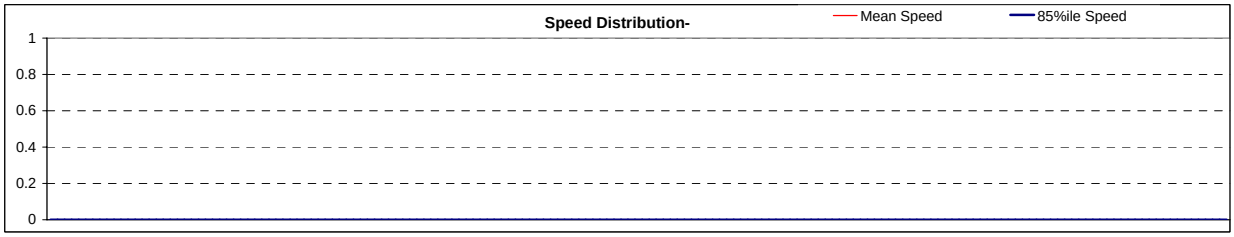
Pacific Highway, Southbound on ramp from Ewingsdale Rd

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way
Short Veh %	1710	0	1710	2658	0	2658	2519	0	2519	2685	0	2685	2438	0	2438	1999	0	1999	2161	0	2161
Medium Veh %	60	0	60	102	0	102	111	0	111	111	0	111	126	0	126	46	0	46	52	0	52
Long Veh %	9	0	9	31	0	31	28	0	28	26	0	26	18	0	18	6	0	6	11	0	11
7am-7pm Vol	1303	0	1303	2423	0	2423	2305	0	2305	2457	0	2457	2161	0	2161	1628	0	1628	1899	0	1899
24Hr Vol	**1779**	**0**	**1779**	**2791**	**0**	**2791**	**2658**	**0**	**2658**	**2822**	**0**	**2822**	**2583**	**0**	**2583**	**2051**	**0**	**2051**	**2225**	**0**	**2225**
85%ile Speed	**57**		**57**	**57**		**57**	**57**		**57**	**56**		**56**	**57**		**57**	**57**		**57**	**57**		**57**
Mean Speed	**51.40**		**51.40**	**51.38**		**51.38**	**51.52**		**51.52**	**50.81**		**50.81**	**51.37**		**51.37**	**51.53**		**51.53**	**51.59**		**51.59**
AM Pk Hr Vol	134	0	134	256	0	256	220	0	220	293	0	293	216	0	216	169	0	169	198	0	198
AM Hr Factor	0.08	#####	0.08	0.09	#####	0.09	0.08	#####	0.08	0.10	#####	0.10	0.08	#####	0.08	0.08	#DIV/0!	0.08	0.09	#DIV/0!	0.09
AM Peak 85%	59	0	59	57	0	57	63	0	63	60	0	60	58	0	58	58	0	58	58	0	58
AM Peak Time	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	10:00	18:00	10:00	11:00	18:00	11:00
PM Pk Hr Vol	133	0	133	270	0	270	262	0	262	311	0	311	232	0	232	165	0	165	272	0	272
PM Hr Factor	0.07	#####	0.07	0.10	#####	0.10	0.10	#####	0.10	0.11	#####	0.11	0.09	#####	0.09	0.08	#DIV/0!	0.08	0.12	#DIV/0!	0.12
PM Peak 85%	59	0	59	58	0	58	58	0	58	58	0	58	58	0	58	58	0	58	58	0	58
PM Peak Time	1:00	18:00	1:00	12:00	18:00	12:00	12:00	18:00	12:00	12:00	18:00	12:00	12:00	18:00	12:00	14:00	18:00	14:00	12:00	18:00	12:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	######	2 way	outbour	0	2 way	outbour	0	2 way	outbour	0	2 way
1 Car	1691	0	1691	2606	0	2606	2487	0	2487	2655	0	2655	2413	0	2413	1978	0	1978	2132	0	2132
2 Car+Trailer	19	0	19	52	0	52	32	0	32	30	0	30	25	0	25	21	0	21	29	0	29
3 2 axle Truck	55	0	55	92	0	92	91	0	91	100	0	100	104	0	104	43	0	43	46	0	46
4 3 axle Truck	3	0	3	9	0	9	17	0	17	11	0	11	22	0	22	3	0	3	4	0	4
5 4 axle Truck	2	0	2	1	0	1	3	0	3	0	0	0	0	0	0	0	0	0	2	0	2
6 3 axle Semi	2	0	2	1	0	1	4	0	4	0	0	0	2	0	2	2	0	2	2	0	2
7 4 axle Semi	0	0	0	2	0	2	4	0	4	3	0	3	1	0	1	1	0	1	1	0	1
8 5 axle Semi	1	0	1	3	0	3	4	0	4	2	0	2	0	0	0	0	0	0	1	0	1
9 6 axle Semi	6	0	6	24	0	24	15	0	15	21	0	21	14	0	14	2	0	2	7	0	7
10 7/9axle Truck	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	1	0	1	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

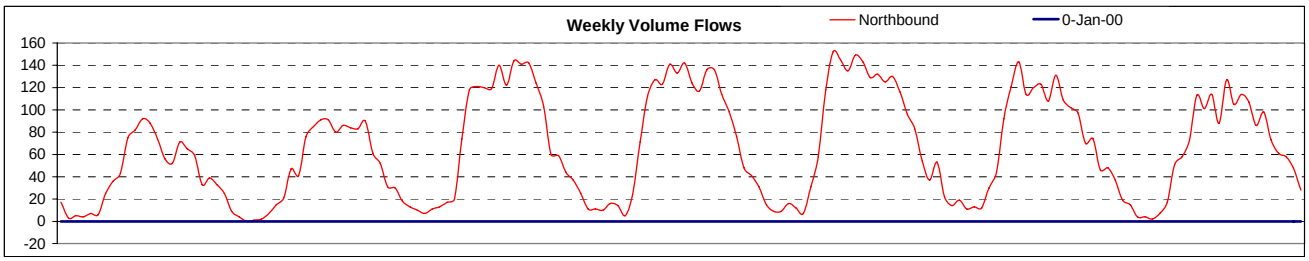
AUSTRALASIAN TRAFFIC SURVEYS

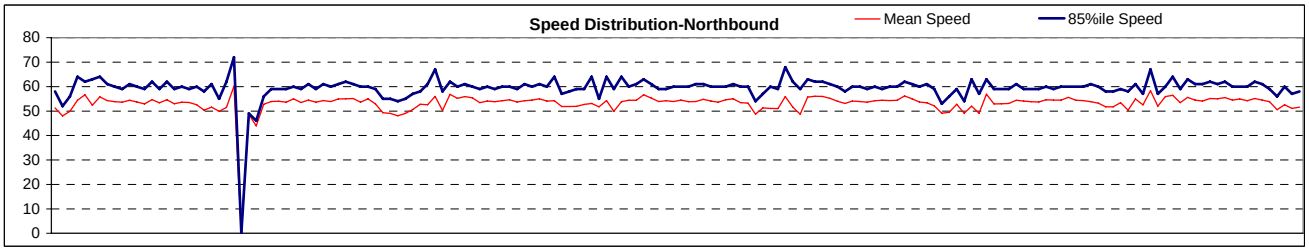
Automated vehicle Study Summary Report

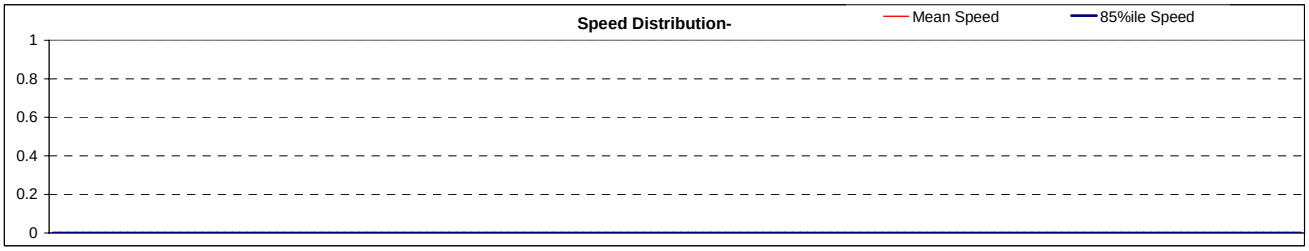
Pacific Highway, Pacific Hwy Northbound off Ramp to Ewingsdale Rd

From: Monday, 25 Dec 06
Untill: Sunday, 31 Dec 06

Data Record Inerval = 1Hr	Monday, 25 Dec 06			Tuesday, 26 Dec 06			Wednesday, 27 Dec 06			Thursday, 28 Dec 06			Friday, 29 Dec 06			Saturday, 30 Dec 06			Sunday, 31 Dec 06		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	lorthbour	########	2 way	lorthbour	########	2 way
Short Veh %	968	0	968	1067	0	1067	1682	0	1682	1759	0	1759	1844	0	1844	1633	0	1633	1497	0	1497
Medium Veh %	29	0	29	38	0	38	83	0	83	86	0	86	93	0	93	49	0	49	51	0	51
Long Veh %	2	0	2	4	0	4	17	0	17	20	0	20	23	0	23	15	0	15	4	0	4
7am-7pm Vol	790	0	790	920	0	920	1395	0	1395	1467	0	1467	1535	0	1535	1312	0	1312	1199	0	1199
24Hr Vol	**999**	**0**	**999**	**1109**	**0**	**1109**	**1782**	**0**	**1782**	**1865**	**0**	**1865**	**1961**	**0**	**1961**	**1697**	**0**	**1697**	**1552**	**0**	**1552**
85%ile Speed	**60**		**60**	**60**		**60**	**60**		**60**	**60**		**60**	**60**		**60**	**60**		**60**	**61**		**61**
Mean Speed	**53.37**		**53.37**	**53.78**		**53.78**	**54.22**		**54.22**	**54.21**		**54.21**	**54.27**		**54.27**	**53.86**		**53.86**	**54.29**		**54.29**
AM Pk Hr Vol	92	0	92	91	0	91	140	0	140	141	0	141	152	0	152	143	0	143	114	0	114
AM Hr Factor	0.09	#####	0.09	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.08	#DIV/0!	0.08	0.07	#DIV/0!	0.07
AM Peak 85%	64	0	64	72	0	72	67	0	67	64	0	64	68	0	68	63	0	63	67	0	67
AM Peak Time	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	10:00	18:00	10:00	8:00	18:00	8:00	9:00	18:00	9:00	11:00	18:00	11:00
PM Pk Hr Vol	88	0	88	91	0	91	144	0	144	142	0	142	143	0	143	131	0	131	127	0	127
PM Hr Factor	0.09	#####	0.09	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.07	#####	0.07	0.08	#DIV/0!	0.08	0.08	#DIV/0!	0.08
PM Peak 85%	62	0	62	62	0	62	64	0	64	61	0	61	62	0	62	61	0	61	62	0	62
PM Peak Time	12:00	18:00	12:00	12:00	18:00	12:00	13:00	18:00	13:00	12:00	18:00	12:00	12:00	18:00	12:00	14:00	18:00	14:00	13:00	18:00	13:00







Classification Satistics 24Hr Vol	25-Dec-06			26-Dec-06			27-Dec-06			28-Dec-06			29-Dec-06			30-Dec-06			31-Dec-06		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	0	2 way	lorthbour	0	2 way	lorthbour	0	2 way
1 Car	965	0	965	1057	0	1057	1654	0	1654	1732	0	1732	1816	0	1816	1611	0	1611	1481	0	1481
2 Car+Trailer	3	0	3	10	0	10	28	0	28	27	0	27	28	0	28	22	0	22	16	0	16
3 2 axle Truck	24	0	24	31	0	31	71	0	71	77	0	77	81	0	81	40	0	40	42	0	42
4 3 axle Truck	4	0	4	6	0	6	11	0	11	8	0	8	11	0	11	8	0	8	7	0	7
5 4 axle Truck	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	2	0	2
6 3 axle Semi	1	0	1	1	0	1	2	0	2	4	0	4	3	0	3	5	0	5	2	0	2
7 4 axle Semi	0	0	0	0	0	0	1	0	1	3	0	3	1	0	1	0	0	0	1	0	1
8 5 axle Semi	0	0	0	0	0	0	1	0	1	2	0	2	1	0	1	1	0	1	0	0	0
9 6 axle Semi	1	0	1	3	0	3	12	0	12	10	0	10	18	0	18	8	0	8	1	0	1
10 7/9axle Truck	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

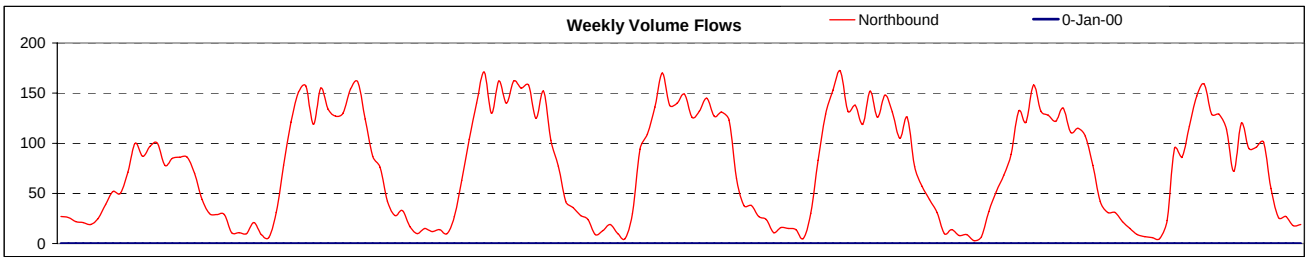
AUSTRALASIAN TRAFFIC SURVEYS

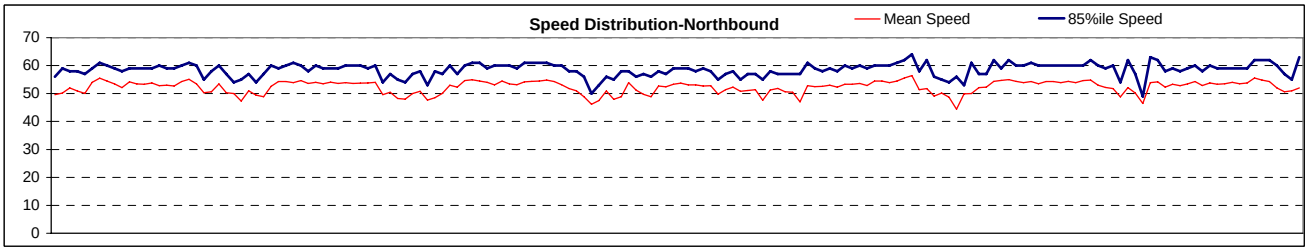
Automated vehicle Study Summary Report

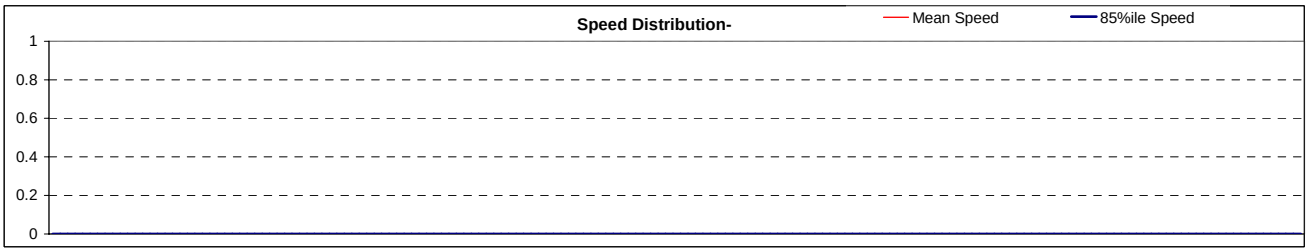
Pacific Highway, Northbound off Ramp to Ewingsdale Rd

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way
Short Veh %	1218	0	1218	1863	0	1863	1917	0	1917	1880	0	1880	1876	0	1876	1682	0	1682	1610	0	1610
Medium Veh %	57	0	57	98	0	98	117	0	117	96	0	96	123	0	123	59	0	59	52	0	52
Long Veh %	9	0	9	21	0	21	26	0	26	22	0	22	25	0	25	6	0	6	8	0	8
7am-7pm Vol	954	0	954	1575	0	1575	1675	0	1675	1582	0	1582	1579	0	1579	1428	0	1428	1334	0	1334
24Hr Vol	**1284**	**0**	**1284**	**1982**	**0**	**1982**	**2060**	**0**	**2060**	**1998**	**0**	**1998**	**2024**	**0**	**2024**	**1747**	**0**	**1747**	**1670**	**0**	**1670**
85%ile Speed	**59**		**59**	**59**		**59**	**60**		**60**	**57**		**57**	**60**		**60**	**60**		**60**	**59**		**59**
Mean Speed	**53.16**		**53.16**	**53.49**		**53.49**	**53.76**		**53.76**	**51.84**		**51.84**	**53.38**		**53.38**	**53.92**		**53.92**	**53.54**		**53.54**
AM Pk Hr Vol	100	0	100	157	0	157	171	0	171	170	0	170	172	0	172	158	0	158	159	0	159
AM Hr Factor	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.09	#####	0.09	0.08	#####	0.08	0.09	#DIV/0!	0.09	0.10	#DIV/0!	0.10
AM Peak 85%	61	0	61	61	0	61	61	0	61	59	0	59	61	0	61	62	0	62	63	0	63
AM Peak Time	10:00	18:00	10:00	9:00	18:00	9:00	9:00	18:00	9:00	9:00	18:00	9:00	9:00	18:00	9:00	11:00	18:00	11:00	10:00	18:00	10:00
PM Pk Hr Vol	100	0	100	161	0	161	162	0	162	149	0	149	152	0	152	135	0	135	129	0	129
PM Hr Factor	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.07	#####	0.07	0.08	#####	0.08	0.08	#DIV/0!	0.08	0.08	#DIV/0!	0.08
PM Peak 85%	61	0	61	60	0	60	61	0	61	59	0	59	64	0	64	62	0	62	63	0	63
PM Peak Time	13:00	18:00	13:00	16:00	18:00	16:00	13:00	18:00	13:00	12:00	18:00	12:00	13:00	18:00	13:00	15:00	18:00	15:00	12:00	18:00	12:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	0	2 way	orthbour	0	2 way	orthbour	0	2 way
1 Car	1206	0	1206	1828	0	1828	1895	0	1895	1850	0	1850	1853	0	1853	1667	0	1667	1583	0	1583
2 Car+Trailer	12	0	12	35	0	35	22	0	22	30	0	30	23	0	23	15	0	15	27	0	27
3 2 axle Truck	50	0	50	84	0	84	100	0	100	85	0	85	112	0	112	54	0	54	44	0	44
4 3 axle Truck	5	0	5	12	0	12	16	0	16	10	0	10	10	0	10	4	0	4	7	0	7
5 4 axle Truck	2	0	2	2	0	2	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1
6 3 axle Semi	5	0	5	2	0	2	2	0	2	3	0	3	1	0	1	3	0	3	0	0	0
7 4 axle Semi	0	0	0	2	0	2	4	0	4	1	0	1	1	0	1	0	0	0	1	0	1
8 5 axle Semi	0	0	0	2	0	2	2	0	2	2	0	2	3	0	3	0	0	0	2	0	2
9 6 axle Semi	4	0	4	14	0	14	17	0	17	16	0	16	18	0	18	3	0	3	5	0	5
10 7/9axle Truck	0	0	0	1	0	1	1	0	1	0	0	0	2	0	2	0	0	0	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

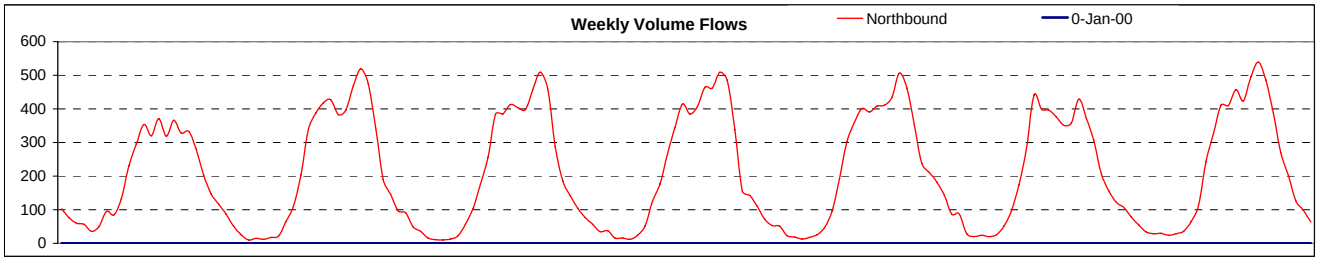
AUSTRALASIAN TRAFFIC SURVEYS

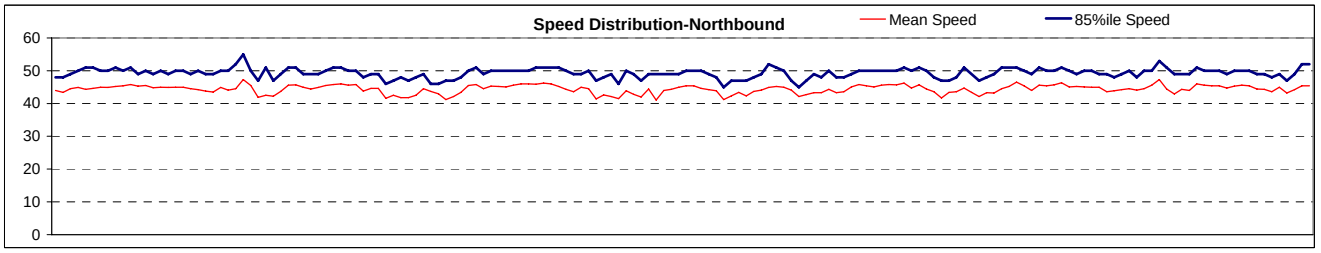
Automated vehicle Study Summary Report

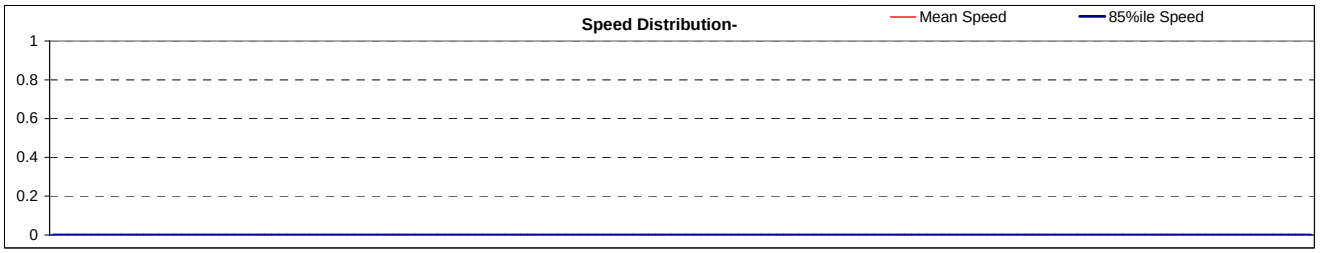
Pacific Highway, Northbound on ramp from Ewingsdale Rd

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way
Short Veh %	4383	0	4383	5010	0	5010	4753	0	4753	4880	0	4880	5179	0	5179	4757	0	4757	5216	0	5216
Medium Veh %	98	0	98	172	0	172	183	0	183	187	0	187	164	0	164	137	0	137	125	0	125
Long Veh %	14	0	14	29	0	29	30	0	30	36	0	36	33	0	33	19	0	19	16	0	16
7am-7pm Vol	3533	0	3533	4550	0	4550	4315	0	4315	4407	0	4407	4459	0	4459	4092	0	4092	4564	0	4564
24Hr Vol	**4497**	**0**	**4497**	**5211**	**0**	**5211**	**4966**	**0**	**4966**	**5103**	**0**	**5103**	**5376**	**0**	**5376**	**4914**	**0**	**4914**	**5358**	**0**	**5358**
85%ile Speed	**50**		**50**	**49**		**49**	**50**		**50**	**48**		**48**	**50**		**50**	**50**		**50**	**49**		**49**
Mean Speed	**44.89**		**44.89**	**44.88**		**44.88**	**45.43**		**45.43**	**43.78**		**43.78**	**45.02**		**45.02**	**45.08**		**45.08**	**44.86**		**44.86**
AM Pk Hr Vol	354	0	354	418	0	418	385	0	385	414	0	414	401	0	401	441	0	441	411	0	411
AM Hr Factor	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.08	#####	0.08	0.07	#####	0.07	0.09	#DIV/0!	0.09	0.08	#DIV/0!	0.08
AM Peak 85%	51	0	51	55	0	55	51	0	51	50	0	50	51	0	51	51	0	51	53	0	53
AM Peak Time	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	11:00	18:00	11:00	10:00	18:00	10:00	11:00	18:00	11:00
PM Pk Hr Vol	371	0	371	519	0	519	509	0	509	509	0	509	506	0	506	429	0	429	539	0	539
PM Hr Factor	0.08	#####	0.08	0.10	#####	0.10	0.10	#####	0.10	0.10	#####	0.10	0.09	#####	0.09	0.09	#DIV/0!	0.09	0.10	#DIV/0!	0.10
PM Peak 85%	50	0	50	51	0	51	51	0	51	52	0	52	51	0	51	51	0	51	52	0	52
PM Peak Time	13:00	18:00	13:00	16:00	18:00	16:00	16:00	18:00	16:00	16:00	18:00	16:00	16:00	18:00	16:00	16:00	18:00	16:00	16:00	18:00	16:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	######	2 way	orthbour	0	2 way	orthbour	0	2 way	orthbour	0	2 way
1 Car	4322	0	4322	4928	0	4928	4700	0	4700	4815	0	4815	5095	0	5095	4632	0	4632	5130	0	5130
2 Car+Trailer	61	0	61	82	0	82	53	0	53	65	0	65	84	0	84	125	0	125	86	0	86
3 2 axle Truck	76	0	76	142	0	142	149	0	149	150	0	150	130	0	130	110	0	110	102	0	102
4 3 axle Truck	19	0	19	26	0	26	30	0	30	32	0	32	29	0	29	24	0	24	13	0	13
5 4 axle Truck	3	0	3	4	0	4	4	0	4	5	0	5	5	0	5	3	0	3	10	0	10
6 3 axle Semi	4	0	4	7	0	7	8	0	8	9	0	9	10	0	10	9	0	9	6	0	6
7 4 axle Semi	1	0	1	2	0	2	4	0	4	8	0	8	3	0	3	2	0	2	4	0	4
8 5 axle Semi	2	0	2	2	0	2	2	0	2	2	0	2	3	0	3	0	0	0	2	0	2
9 6 axle Semi	6	0	6	17	0	17	16	0	16	16	0	16	17	0	17	8	0	8	4	0	4
10 7/9axle Truck	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

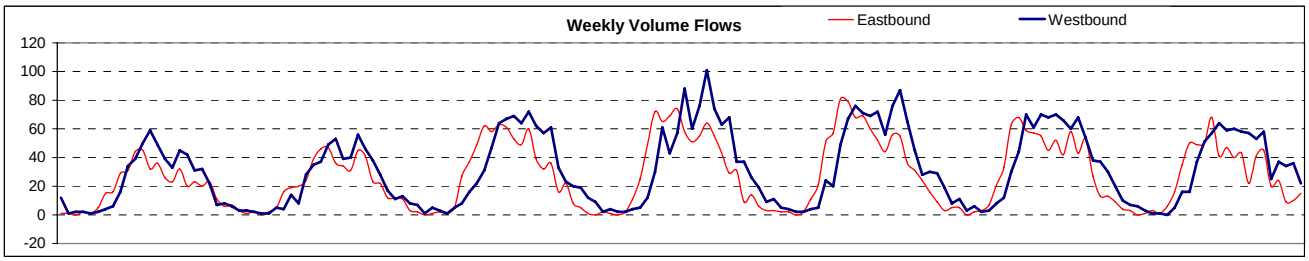
AUSTRALASIAN TRAFFIC SURVEYS

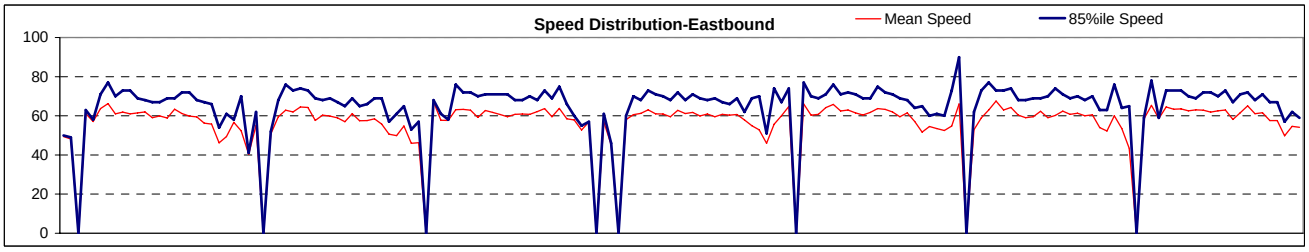
Automated vehicle Study Summary Report

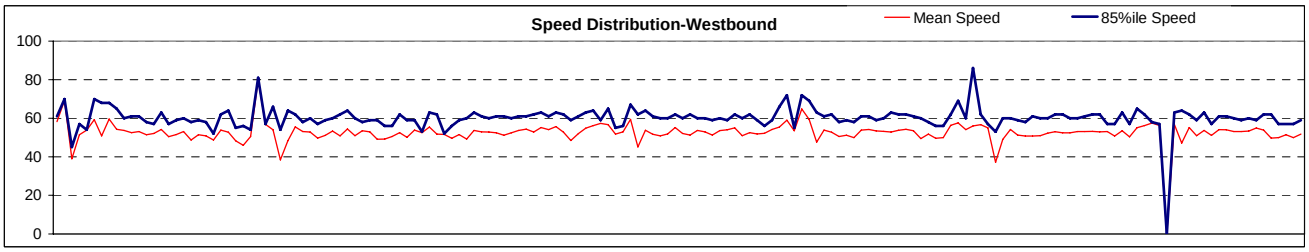
Ewingsdale Road, West of interchange with Pacific Highway

From: Monday, 25 Dec 06
Untill: Sunday, 31 Dec 06

Data Record Inerval = 1Hr	Monday, 25 Dec 06			Tuesday, 26 Dec 06			Wednesday, 27 Dec 06			Thursday, 28 Dec 06			Friday, 29 Dec 06			Saturday, 30 Dec 06			Sunday, 31 Dec 06		
	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way
Short Veh %	446	538	984	488	535	1023	669	756	1425	774	872	1646	817	899	1716	726	839	1565	632	757	1389
Medium Veh %	3	3	6	5	4	9	19	11	30	14	13	27	13	15	28	10	9	19	7	4	11
Long Veh %	0	1	1	1	0	1	1	2	3	0	2	2	2	2	4	1	1	2	0	1	1
7am-7pm Vol	361	469	830	408	457	865	578	649	1227	666	758	1424	688	753	1441	622	699	1321	516	595	1111
24Hr Vol	**449**	**542**	**991**	**494**	**539**	**1033**	**689**	**769**	**1458**	**788**	**889**	**1677**	**832**	**916**	**1748**	**737**	**849**	**1586**	**639**	**763**	**1402**
85%ile Speed	**69**	**60**	**64**	**68**	**60**	**64**	**70**	**61**	**65**	**69**	**60**	**65**	**70**	**60**	**65**	**70**	**61**	**65**	**70**	**60**	**64**
Mean Speed	**59.95**	**52.32**	**55.78**	**58.67**	**51.77**	**55.07**	**61.05**	**53.08**	**56.85**	**60.70**	**52.72**	**56.47**	**61.52**	**52.65**	**56.87**	**60.80**	**52.20**	**56.20**	**61.34**	**52.67**	**56.62**
AM Pk Hr Vol	45	50	95	46	37	83	63	64	127	74	61	131	81	76	146	68	70	129	68	57	125
AM Hr Factor	0.10	0.09	0.10	0.09	0.07	0.08	0.09	0.08	0.09	0.09	0.07	0.08	0.10	0.08	0.08	0.09	0.08	0.08	0.11	0.07	0.09
AM Peak 85%	77	70	75	76	81	81	76	63	69	73	67	71	77	72	75	90	86	80	78	65	73
AM Peak Time	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	9:00	11:00	9:00	11:00	10:00	9:00	10:00	10:00	11:00	11:00	11:00
PM Pk Hr Vol	36	59	91	47	56	101	61	72	132	64	101	165	69	87	142	58	70	125	47	64	106
PM Hr Factor	0.08	0.11	0.09	0.10	0.10	0.10	0.09	0.09	0.09	0.08	0.11	0.10	0.08	0.09	0.08	0.08	0.08	0.08	0.07	0.08	0.08
PM Peak 85%	72	64	65	69	64	66	75	63	67	71	62	66	75	63	66	76	63	67	73	62	66
PM Peak Time	13:00	12:00	12:00	12:00	16:00	16:00	12:00	15:00	15:00	15:00	15:00	15:00	12:00	17:00	17:00	16:00	2:00	12:00	13:00	12:00	13:00







Classification Satistics 24Hr Vol	25-Dec-06			26-Dec-06			27-Dec-06			28-Dec-06			29-Dec-06			30-Dec-06			31-Dec-06		
	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way	Eastbound	Westbound	2 way
1 Car	445	537	982	484	527	1011	652	730	1382	755	845	1600	789	866	1655	711	822	1533	621	741	1362
2 Car+Trailer	1	1	2	4	8	12	17	26	43	19	27	46	28	33	61	15	17	32	11	16	27
3 2 axle Truck	3	3	6	4	4	8	19	11	30	13	11	24	13	15	28	7	6	13	6	4	10
4 3 axle Truck	0	0	0	1	0	1	0	0	0	1	1	2	0	0	0	3	3	6	1	0	1
5 4 axle Truck	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
6 3 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0
7 4 axle Semi	0	0	0	1	0	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0
8 5 axle Semi	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
9 6 axle Semi	0	1	1	0	0	0	0	1	1	0	0	0	1	2	3	0	0	0	0	1	1
10 7/9axle Truck	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	1	1

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

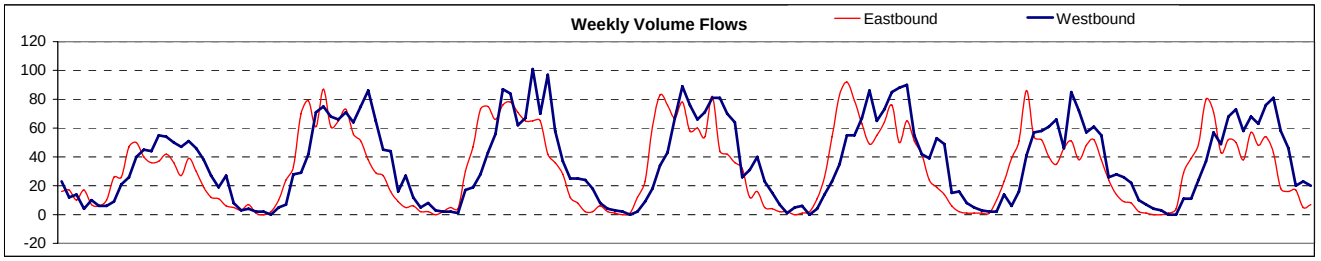
AUSTRALASIAN TRAFFIC SURVEYS

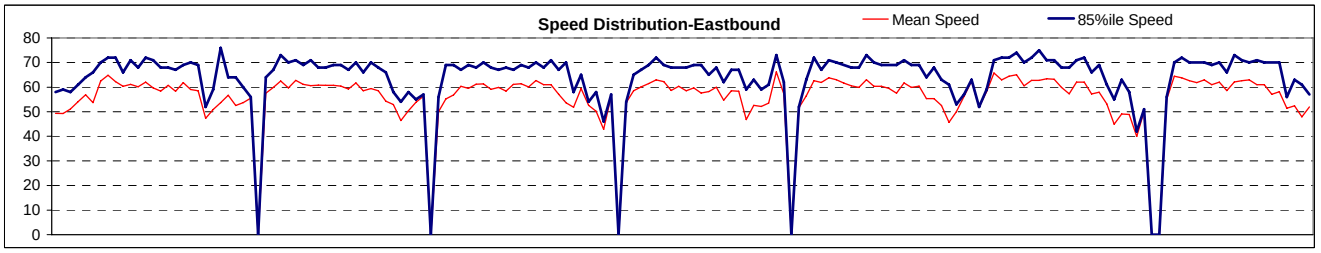
Automated vehicle Study Summary Report

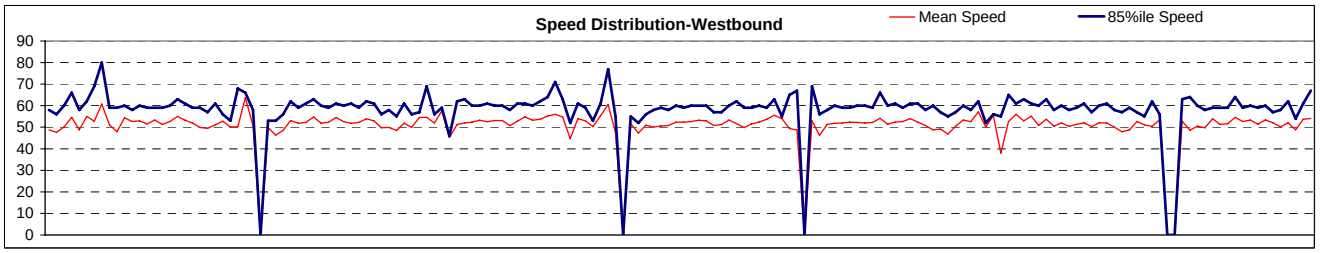
Ewingsdale Road, West of interchange with Pacific Highway

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
Short Veh %	564	670	1234	787	879	1666	832	913	1745	831	901	1732	903	981	1884	715	825	1540	719	860	1579
Medium Veh %	8	12	20	25	26	51	23	25	48	24	19	43	24	27	51	7	6	13	4	6	10
Long Veh %	0	0	0	1	2	3	1	1	2	0	2	2	3	4	7	2	2	4	1	1	2
7am-7pm Vol	429	517	946	697	757	1454	740	790	1530	712	768	1480	769	796	1565	591	675	1266	603	712	1315
24Hr Vol	**572**	**682**	**1254**	**813**	**907**	**1720**	**856**	**939**	**1795**	**855**	**923**	**1778**	**930**	**1012**	**1942**	**724**	**833**	**1557**	**724**	**867**	**1591**
85%ile Speed	**68**	**60**	**63**	**69**	**60**	**64**	**68**	**61**	**64**	**67**	**59**	**63**	**69**	**60**	**64**	**70**	**60**	**64**	**69**	**60**	**64**
Mean Speed	**58.88**	**52.13**	**55.21**	**60.15**	**52.29**	**56.01**	**60.11**	**53.15**	**56.47**	**59.14**	**51.88**	**55.37**	**60.49**	**51.85**	**55.98**	**60.48**	**51.42**	**55.63**	**60.70**	**52.24**	**56.09**
AM Pk Hr Vol	50	45	90	87	75	162	76	87	163	83	89	167	92	67	147	86	58	127	80	57	128
AM Hr Factor	0.09	0.07	0.07	0.11	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.09	0.10	0.07	0.08	0.12	0.07	0.08	0.11	0.07	0.08
AM Peak 85%	72	80	74	73	68	68	70	69	69	72	77	72	73	69	71	75	65	71	72	64	70
AM Peak Time	10:00	11:00	10:00	11:00	11:00	11:00	11:00	11:00	11:00	8:00	11:00	11:00	9:00	11:00	9:00	9:00	11:00	9:00	9:00	10:00	10:00
PM Pk Hr Vol	42	55	96	73	86	144	78	101	166	82	81	163	76	90	161	52	85	136	57	81	130
PM Hr Factor	0.07	0.08	0.08	0.09	0.09	0.08	0.09	0.11	0.09	0.10	0.09	0.09	0.08	0.09	0.08	0.07	0.10	0.09	0.08	0.09	0.08
PM Peak 85%	76	63	66	70	62	65	71	71	69	69	62	65	73	66	67	72	63	66	73	67	68
PM Peak Time	14:00	13:00	14:00	14:00	17:00	14:00	12:00	15:00	15:00	15:00	7:00	15:00	15:00	17:00	15:00	18:00	15:00	15:00	15:00	18:00	17:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
1 Car	555	662	1217	772	854	1626	808	890	1698	819	882	1701	888	961	1849	702	812	1514	708	843	1551
2 Car+Trailer	9	8	17	15	25	40	24	23	47	12	19	31	15	20	35	13	13	26	11	17	28
3 2 axle Truck	8	12	20	21	22	43	17	19	36	20	17	37	23	26	49	6	6	12	4	5	9
4 3 axle Truck	0	0	0	3	3	6	6	6	12	4	2	6	1	1	2	1	0	1	0	0	0
5 4 axle Truck	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
6 3 axle Semi	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	1	1	2
7 4 axle Semi	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2	1	0	1	0	0	0
8 5 axle Semi	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
9 6 axle Semi	0	0	0	0	1	1	0	0	0	0	1	1	1	0	1	0	1	1	0	0	0
10 7/9axle Truck	0	0	0	1	1	2	0	0	0	0	0	0	1	1	2	1	1	2	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

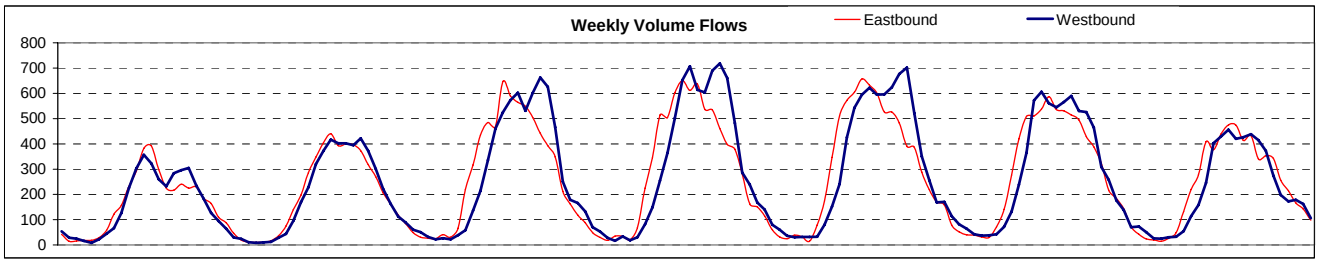
AUSTRALASIAN TRAFFIC SURVEYS

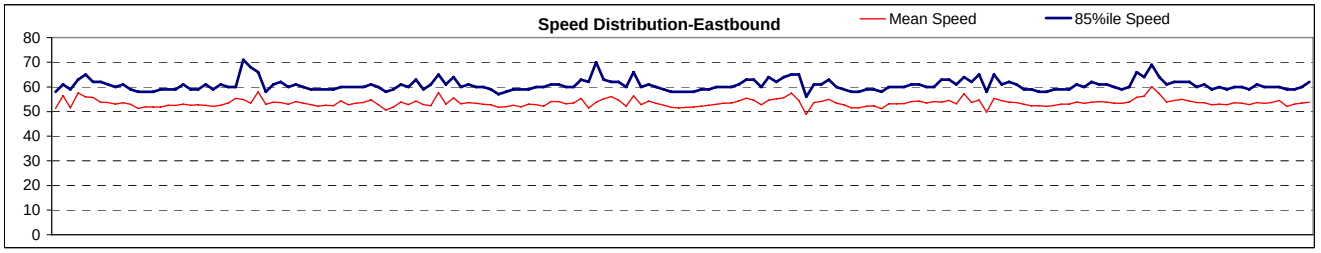
Automated vehicle Study Summary Report

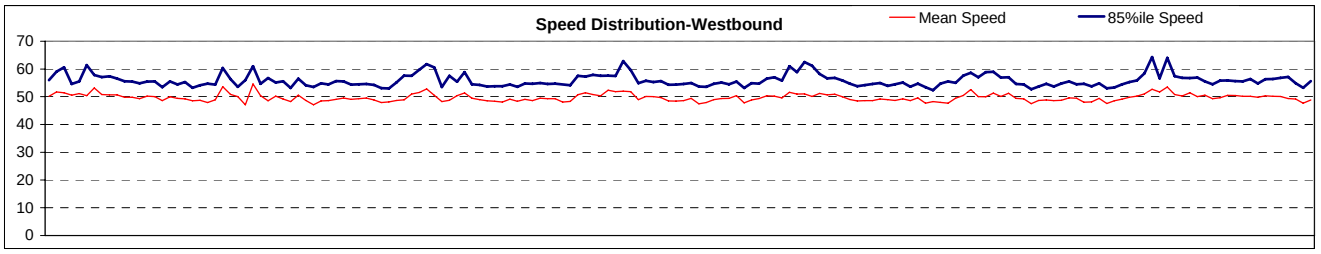
Ewingsdale Road, East of interchange with Pacific Highway

From: Monday, 25 Dec 06
Untill: Sunday, 31 Dec 06

Data Record Inerval = 1Hr	Monday, 25 Dec 06			Tuesday, 26 Dec 06			Wednesday, 27 Dec 06			Thursday, 28 Dec 06			Friday, 29 Dec 06			Saturday, 30 Dec 06			Sunday, 31 Dec 06		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
Short Veh %	3720	3641	7361	4627	4537	9164	6533	6472	13005	7100	7286	14386	7276	7347	14623	6897	6839	13736	5594	5136	10730
Medium Veh %	80	71	151	127	133	260	231	263	494	227	254	481	224	268	492	156	167	323	131	123	254
Long Veh %	3	3	6	14	11	25	50	41	91	50	32	82	50	37	87	29	18	47	18	8	26
7am-7pm Vol	3076	3131	6207	4033	4024	8057	5639	5850	11489	6111	6539	12650	6180	6494	12674	5783	5873	11656	4593	4240	8833
24Hr Vol	**3804**	**3715**	**7519**	**4769**	**4684**	**9453**	**6815**	**6787**	**13602**	**7379**	**7580**	**14959**	**7551**	**7660**	**15211**	**7082**	**7027**	**14109**	**5745**	**5268**	**11013**
85%ile Speed	**59**	**55**	**57**	**60**	**55**	**57**	**60**	**55**	**57**	**59**	**55**	**57**	**60**	**55**	**57**	**60**	**54**	**57**	**60**	**56**	**58**
Mean Speed	**52.52**	**49.72**	**51.14**	**53.09**	**48.87**	**51.00**	**52.80**	**48.98**	**50.90**	**52.74**	**48.93**	**50.81**	**52.86**	**49.02**	**50.93**	**53.15**	**48.86**	**51.01**	**53.44**	**50.02**	**51.80**
AM Pk Hr Vol	383	357	740	404	373	777	647	525	1172	650	653	1303	657	595	1252	538	606	1144	439	429	868
AM Hr Factor	0.10	0.10	0.10	0.08	0.08	0.08	0.09	0.08	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.08
AM Peak 85%	65	61.45	62	71	61	64	65	61.73	63	70	62.84	64	65	62.56	63	65	59.023	63	69	64.308	66
AM Peak Time	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00
PM Pk Hr Vol	392	323	715	440	422	857	590	663	1168	637	719	1319	632	702	1254	587	590	1148	475	456	931
PM Hr Factor	0.10	0.09	0.10	0.09	0.09	0.09	0.09	0.10	0.09	0.09	0.09	0.09	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.08
PM Peak 85%	61	60.37	60	61	57.6	59	63	57.55	60	64	56.55	60	63	55.53	59	62	55.576	58	62	57.116	59
PM Peak Time	12:00	12:00	12:00	12:00	16:00	12:00	12:00	16:00	13:00	13:00	16:00	12:00	12:00	17:00	12:00	12:00	15:00	12:00	12:00	12:00	12:00







Classification Satistics 24Hr Vol	25-Dec-06			26-Dec-06			27-Dec-06			28-Dec-06			29-Dec-06			30-Dec-06			31-Dec-06		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
1 Car	3693	3605	7298	4558	4489	9047	6420	6360	12780	6989	7183	14172	7174	7241	14415	6795	6735	13530	5534	5072	10606
2 Car+Trailer	27	36	63	69	48	117	113	112	225	111	103	214	102	106	208	102	104	206	60	64	124
3 2 axle Truck	63	59	122	103	113	216	183	222	405	184	213	397	181	223	404	122	137	259	109	102	211
4 3 axle Truck	15	11	26	20	20	40	43	40	83	39	40	79	36	43	79	31	28	59	16	18	34
5 4 axle Truck	2	1	3	4	0	4	5	1	6	4	1	5	7	2	9	3	2	5	6	3	9
6 3 axle Semi	2	1	3	5	6	11	5	6	11	10	6	16	7	9	16	8	6	14	10	6	16
7 4 axle Semi	0	1	1	2	0	2	4	6	10	3	5	8	2	1	3	2	2	4	3	0	3
8 5 axle Semi	0	1	1	0	1	1	2	1	3	4	4	8	4	3	7	1	1	2	2	1	3
9 6 axle Semi	1	0	1	7	4	11	38	26	64	32	16	48	35	24	59	17	9	26	3	1	4
10 7/9axle Truck	0	0	0	0	0	0	1	2	3	1	1	2	1	0	1	1	0	1	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	1	0	1	1	3	4	1	11	12	2	8	10	1	8	9	0	3	3	2	1	3

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

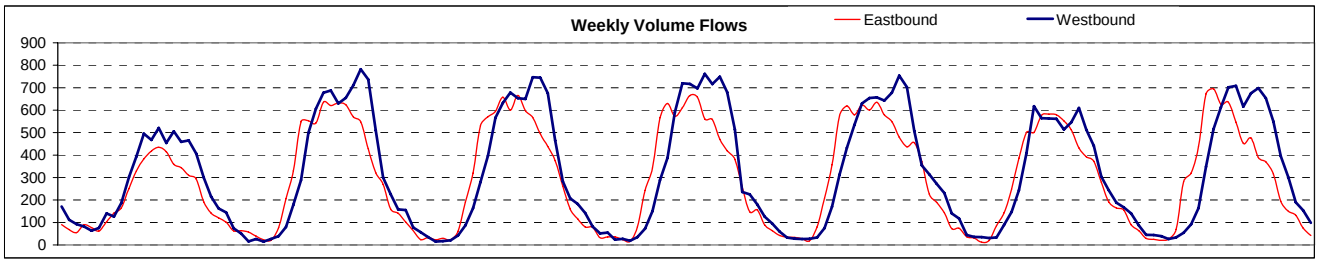
AUSTRALASIAN TRAFFIC SURVEYS

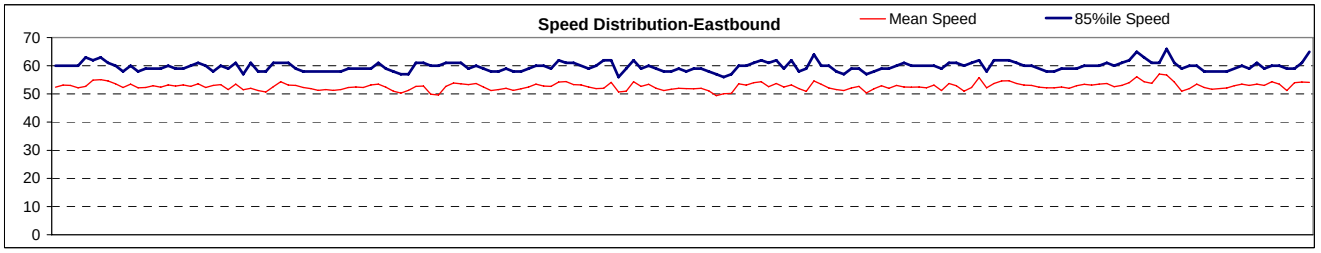
Automated vehicle Study Summary Report

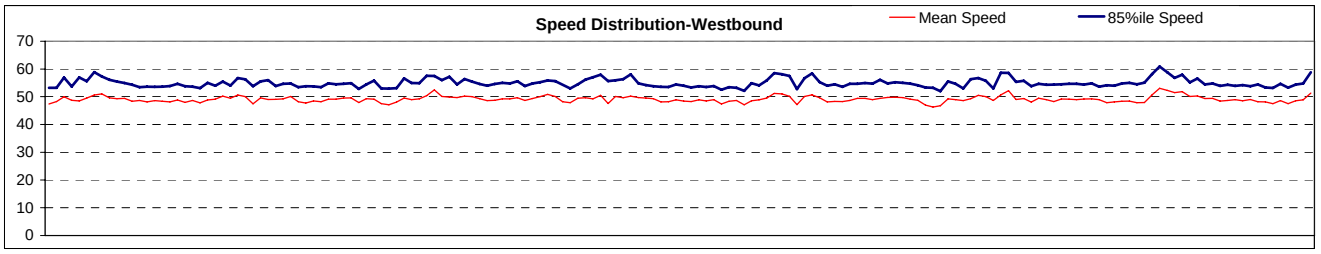
Ewingsdale Road, East of interchange with Pacific Highway

From: Monday, 01 Jan 07
Untill: Sunday, 07 Jan 07

Data Record Inerval = 1Hr	Monday, 01 Jan 07			Tuesday, 02 Jan 07			Wednesday, 03 Jan 07			Thursday, 04 Jan 07			Friday, 05 Jan 07			Saturday, 06 Jan 07			Sunday, 07 Jan 07		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
Short Veh %	4860	6242	11102	7241	7772	15013	7163	7475	14638	7304	7781	15085	7609	7925	15534	6728	6955	13683	6881	7604	14485
Medium Veh %	130	157	287	279	313	592	276	302	578	252	289	541	272	298	570	167	183	350	145	177	322
Long Veh %	20	19	39	57	44	101	56	47	103	60	48	108	58	40	98	25	21	46	21	19	40
7am-7pm Vol	3896	4958	8854	6294	7085	13379	6356	6774	13130	6350	7059	13409	6505	6862	13367	5668	5889	11557	5813	6641	12454
24Hr Vol	**5011**	**6419**	**11430**	**7578**	**8134**	**15712**	**7495**	**7826**	**15321**	**7618**	**8122**	**15740**	**7941**	**8271**	**16212**	**6921**	**7162**	**14083**	**7047**	**7804**	**14851**
85%ile Speed	**60**	**54**	**57**	**59**	**54**	**56**	**59**	**55**	**57**	**59**	**54**	**56**	**59**	**55**	**57**	**60**	**55**	**57**	**59**	**54**	**57**
Mean Speed	**52.91**	**48.69**	**50.54**	**52.16**	**48.77**	**50.41**	**52.47**	**49.37**	**50.89**	**51.73**	**48.52**	**50.07**	**52.15**	**49.00**	**50.54**	**52.90**	**48.96**	**50.90**	**52.73**	**48.71**	**50.62**
AM Pk Hr Vol	383	495	878	635	678	1313	658	632	1290	630	720	1331	623	630	1253	577	618	1142	695	613	1239
AM Hr Factor	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.08	0.10	0.08	0.08
AM Peak 85%	63	58.9	61	61	56.75	59	61	57.53	59	62	58.03	61	64	58.53	62	62	58.618	61	66	60.923	62
AM Peak Time	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	11:00	9:00	11:00	11:00	11:00	11:00	11:00	11:00	10:00	11:00	10:00	11:00	11:00
PM Pk Hr Vol	435	521	956	632	782	1330	666	747	1319	665	762	1382	635	754	1292	582	610	1145	635	709	1337
PM Hr Factor	0.09	0.08	0.08	0.08	0.10	0.08	0.09	0.10	0.09	0.09	0.09	0.09	0.08	0.09	0.08	0.08	0.09	0.08	0.09	0.09	0.09
PM Peak 85%	61	55.49	57	61	56.64	58	62	56.13	59	62	55.88	58	61	56.08	57	62	55	58	65	58.837	61
PM Peak Time	13:00	13:00	13:00	13:00	16:00	16:00	13:00	15:00	13:00	12:00	14:00	12:00	13:00	16:00	13:00	12:00	16:00	12:00	12:00	13:00	12:00







Classification Satistics 24Hr Vol	1-Jan-07			2-Jan-07			3-Jan-07			4-Jan-07			5-Jan-07			6-Jan-07			7-Jan-07		
	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way	Eastboun	Vestboun	2 way
1 Car	4808	6164	10972	7119	7643	14762	7066	7387	14453	7209	7677	14886	7501	7811	15312	6622	6807	13429	6757	7478	14235
2 Car+Trailer	52	78	130	122	129	251	97	88	185	95	104	199	108	114	222	106	148	254	124	126	250
3 2 axle Truck	98	129	227	224	265	489	222	252	474	205	250	455	217	242	459	141	157	298	117	150	267
4 3 axle Truck	24	24	48	54	46	100	50	45	95	45	37	82	46	52	98	24	25	49	23	26	49
5 4 axle Truck	8	4	12	1	2	3	4	5	9	2	2	4	9	4	13	2	1	3	5	1	6
6 3 axle Semi	8	6	14	7	8	15	12	8	20	13	9	22	10	14	24	14	12	26	6	5	11
7 4 axle Semi	0	2	2	6	4	10	6	10	16	6	9	15	5	6	11	0	2	2	5	4	9
8 5 axle Semi	1	3	4	4	3	7	3	4	7	2	2	4	3	2	5	1	0	1	1	2	3
9 6 axle Semi	11	7	18	38	27	65	34	24	58	38	28	66	37	17	54	9	6	15	9	8	17
10 7/9axle Truck	0	1	1	2	2	4	1	1	2	1	0	1	3	1	4	1	1	2	0	0	0
11 B-Double	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Road Train	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Class 13 Unknown	1	1	2	1	5	6	0	2	2	2	4	6	2	8	10	1	3	4	0	4	4

Definitions:
85th Percentile Speed = The speed at or below which 85% of volume is observed to travel
Short = 1-2, Medium = 3-5, Long = 6-12

Appendix C

Predictions of Future Traffic Volumes (RoadNet 2003)

State Highway No 10
Pacific Highway
at
Ewingsdale

Predictions of
Future Traffic Volumes

Prepared for

RTA Pacific Highway Office

Grafton

Roads and Traffic Authority

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Prepared by

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November 2003

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Appendix A Hourly distribution of heavy vehicles

Appendix B Average Daily Flow by Vehicle Type

Appendix C Diagram showing Vehicle Types

Glossary of Terms

AADT	Average Annual Daily Traffic (measurement of axle pairs which includes correction for multi axle vehicles)
AVPD	Average Vehicles Per Day (number of vehicles)
Classifier count	A traffic count that distinguishes between the types of vehicles. Commonly the counters are two parallel tubes across the roadway connected to a computer.
Vehicle Class	Vehicles are categorised into 12 classes according to their axle configuration. Appendix C contains a diagram showing the classes.
Light vehicle	(Class 1 & 2).
Commercial Vehicle	(Class 3 to 12).
B-Double	Class 10
Growth Rate	The growth rates expressed in this report are linear, ie the percentage increase calculated for the first year is added each year. For example, if the first year volume is 1000 vehicles, a linear growth rate of 5% would see an increase by 50 vehicles each year. Over 10 years this would give an overall increase of 500 and result in a total volume of 1500.

1. Project History

The Roads and Traffic Authority (RTA) opened the Ewingsdale Interchange to traffic in September 2000. The interchange is located at the junction of SH 10 – Pacific Highway and MR 545, which provides access to Byron Bay.

The Yelgun to Chinderah Freeway was opened on 6 August 2002, which provides a significant shortening of that section of the Pacific Highway.

These improvement works together with the overall upgrading of the Pacific Highway have created more attractive travel conditions than was previously available.

Changes in vehicle regulation in recent years have allowed freight to be transported in B-Doubles on the full length of the Pacific Highway from Hexham to Queensland. The approval to the B-Double route was granted with the opening of the Chinderah to Yelgun Freeway in August 2003. This approval made the Highway available for use by all B-Double vehicles. Over the period 2000 to the opening, the Highway was available for use by small B-Doubles (19 metre long, the same length as a semi trailer), subject to gross weight not exceeding 50 tonnes.

Local residents in the Ewingsdale area have expressed significant concerns in relation to traffic noise levels so the RTA has commissioned a noise assessment for that section of the Pacific Highway. This report has been commissioned primarily to provide traffic figures for that noise assessment.

Roadnet Pty Ltd has been engaged by the RTA to examine existing traffic data and make a prediction as to the number of vehicles using the Highway in 2010. In the process of this prediction an assessment is made of the number of vehicles using the Highway in 1997 and 2003.

The assessment and prediction will include the number of vehicles by general type as defined by the Austroads 1994 classification. These vehicle groups (12 categories in all) will be grouped on the basis of:

Light vehicles (Class 1 & 2) and

Commercial Vehicles (Class 3 to 12).

2. General methodology

The Pacific Highway has undergone significant changes over the last few years, and it is expected that these changes will continue to occur at least until 2010. The changes have generally involved increased capacity and improved safety by the provision of dual, divided carriageways. These improvements have also had the general effect of improved travel times. In addition, a number of improvements have also involved significant shortening of the route. The Yelgun to Chinderah Freeway is notable in this respect – it has reduced the overall travel length along the Highway by 14km. This change in length has made the Pacific Highway much more attractive for use by through commercial vehicles.

The approval to the full length of the Pacific Highway from Hexham to the Queensland border for use by B-Double vehicles has had the effect of changing the traffic mix using the Highway, particularly for through trips.

It can reasonably be assumed that the overall transportation task between Sydney/Newcastle and Queensland will not change dramatically as a result of the improvements to the Pacific Highway. However, it is also clear that road shortening has the potential to transfer commercial vehicle trips to the Pacific Highway from the other major north-south routes. In addition, the approval to B-Double use of the Pacific Highway gives rise to the expectation of the transfer of some part of the transportation task from semi-trailer to B-Double vehicles. The report takes this in account.

Factors to be considered in arriving at predicted vehicle flows on the Pacific Highway at Ewingsdale include:

- The roles of the major north-south road links in the transportation task, and the degree of transfer between routes (if any) of that task.
- Historic traffic flows on the appropriate north-south routes.
- The timing and nature of recent and expected improvements to the Pacific Highway and impact on travel length and time.
- Any detectable trends in traffic flows and routes associated with the Pacific Highway upgrade program.
- A detailed assessment of recent traffic flows on the Pacific Highway in the vicinity of the Ewingsdale Interchange.

The impact of these factors has been taken into account in analysis of the data and the conclusions reached by this report. The various factors are discussed in more detail below.

3. Discussion

a. North south links.

The major north-south road transport routes north of Sydney consist of the Pacific, New England and Newell Highways. The New England and Newell Highways are National Highways. Both Highways have been approved as B-Double routes for many years.

The Pacific Highway is a State Highway. Over recent years the Federal Government has assisted the State improve the Highway to standard whereby it is now able to safely carry all vehicle types up to B-Double configuration.

The Newell Highway provides a link between Brisbane and Melbourne and between Brisbane and Adelaide. There are no east west connections between the Newell and New England Highways that are sufficiently attractive to cause a transfer of through traffic to the New England Highway. There is no reason to expect any change in the behaviour of local traffic on the Newell Highway. The Pacific Highway is not any more attractive now for local traffic on the Newell Highway or for Melbourne – Brisbane traffic. If any changes in passenger car or freight movement do occur in the future they would only be minor. As a result, no further analysis has been made of traffic flows on the Newell Highway.

The New England Highway joins the Pacific Highway at Hexham. Through traffic from the south can then follow either route to Queensland. It is clear from the data available that there has been a change in travel patterns following the improvement to the Pacific Highway and the associated approval as a B-Double route. There has been a significant transfer of freight from the New England Highway to the Pacific Highway. Details are provided in the section “Traffic flows at Kankool and Nabiac” below.

The east-west connections between the New England and Pacific Highways cater for east west movement and are not attractive to north-south traffic. As a result, there is no reason to expect any change in the behaviour of local traffic (including commercial traffic) on the New England Highway with further improvement to the Pacific Highway.

b. Historic traffic flows.

Substantial data has been made available for the purposes of this study. In addition to a copy of the publication "Traffic Volume Data for Northern Region 2001", detailed information has been provided on traffic flows at a number of relevant locations. Counts have generally been taken before and after the opening of the Yelgun to Chinderah Freeway. The data includes:

Pacific Highway

At Nabiac – ten months of classifier count in 2002, covering before and after the opening of the Yelgun to Chinderah Freeway.

At Ewingsdale (Junction with MR 545 – Byron Bay Road)

Classifier counts south of the Interchange in 1998 (34 days) and 2001 (16 days).

Classifier counts north of the Interchange in 2001 (13 days).

For both north and south of the Interchange – 3 weeks of classifier counts from 5th August to 25th August 2003.

At Bangalow (S of MR 306 – Mullumbimby Road).

Classifier counts in 1998 (8 days) and 2001 (6 days).

New England Highway

At Kankool – eight months of classifier count in 2001, three months of classifier counts in 2002, covering before and after the opening of the Yelgun to Chinderah Freeway and 4 weeks of classifier counts in May/June 2003.

This information is adequate to predict the rate of growth of traffic flow and to identify any significant trends in the transfer of traffic from the New England Highway to the Pacific Highway. The information also permits an assessment of the change in traffic characteristics following the opening to traffic of the Yelgun to Chinderah Freeway.

c. Improvements to the Pacific Highway.

The RTA has provided details of recently opened projects and further projects planned for opening on the Pacific Highway by 2010. Tables 1 and 2 below set out details of these works.

Table 1 – Opening date and details of existing projects

Project	When opened	Old length (km)	New Length (km)	Dist saved (km)	Time saved (min)
Bulahdelah to Coolongolook	Oct-99	22.8	23	-0.2	11
Raymond Terrace to Karuah	Dec-00	18	18	0	1.1
Coolongolook to Wang Wauk	Jul-01	12	12	0	0.4
Taree Bypass (final stage)	May-00	1.5	1	0.5	0.3
Lyons Road to Englands Road	May-01	5.3	5.3	0	1
Bray Street to Arthur Street	Aug-00	0.8	0.8	0	0.3
Tandys Lane	Dec-01	6.7	5.5	1.2	1.3
Ewingsdale Interchange	Sep-00	1.7	1.2	0.5	0.75
Yelgun to Chinderah	Aug-02	42	28	14	22

Table 2 – Opening date and details of upcoming projects

Project	When to be opened*	Old length (km)	New Length (km)	Dist saved (km)	Time saved (min)**
Halfway Creek Deviation	Nov-03	3.4	3.1	0.3	0.3
Karuah Bypass	Jul-04	9.4	9.8	-0.4	2.5
Karuah to Tea-Gardens Rd	Jun-05	12	12	0	1.3
Tea-Gardens Road to Bulahdelah	Dec-09	26	26	0	2.5
Bulahdelah Bypass	Dec-09	8	8	0	2
Taree to Coopernook	Jun-05	10.6	10.2	0.4	0.6
Coopernook Bypass	Jun-06	4.7	4.2	0.5	1
Bonville Deviation	Dec-08	10.1	9.6	0.5	1.5
Brunswick Heads to Yelgun	Dec-06	7	6.7	0.3	1.5
Macksville Bypass	Jun-10	7.3	6	1.3	3

* Indicative and subject to funding

** Estimated time savings

The major point of interest arising from Table 1 – Existing Projects is the small amount of improvement in travel distance achieved from 1999 to 2002 prior to the opening of the Yelgun to Chinderah Freeway. Eight major projects have achieved a savings in length of 2.0km. The eight projects have also achieved travel time savings of 16 minutes. The Yelgun to Chinderah achieves a travel distance saving of 14km and travel time saving of 22 minutes.

On the basis of the traffic data provided, it is evident that there was no significant transfer of commercial traffic from the New England Highway to the Pacific Highway until the opening of the Yelgun to Chinderah Freeway in August 2002. This is not at all unexpected. Historically, the prime determinant of route for commercial traffic is trip length, with a much lower priority being given to travel time. The figures above indicate that there was no substantial reason for heavy transport operators to change routes from the New England to Pacific Highways prior to the Yelgun to Chinderah Freeway opening. This significant reduction in travel distance and lower operating cost plus the approval of the Pacific Highway from Hexham to the Queensland border as a B-Double route has resulted in a significant shift of heavy vehicle traffic from the New England Highway to the Pacific Highway. This transfer is quantifiable in terms of heavy commercial vehicles.

In the case of light vehicles (motor cars and car trailer combinations) there will have been a continuing leakage of through trips from the New England to the Pacific Highway with the continuing improvement in travel condition and travel time. The data available has not permitted the quantification of this leakage.

Upcoming projects between now and 2010 are expected to further reduce travel distance by 2.4km and travel time by 16 minutes. The savings (particularly in travel distance) will not be sufficient to cause a further, significant transfer of commercial traffic from the New England to the Pacific Highway between now and 2010. It is considered that any significant transfer has already occurred and is incorporated in the most recent traffic counts for the Pacific Highway at the Ewingsdale Interchange.

d. Trends in traffic flows.

Normal traffic growth associated with the New England Highway and the Pacific Highway at Ewingsdale has been estimated on the basis of the historic Annual Average Daily Traffic (AADT) data contained in the RTA's publication "Traffic Volume Data – Northern Region 2001. This provides a reliable guide to overall traffic volumes in the past and is the accepted source for the predicting future overall traffic flows. The graphs below show the line of best fit for traffic growth at each of the sites of interest. Of these the most reliable model is the site immediately to the north of the Ewingsdale Interchange - 3.2% (linear) growth. This growth rate is supported by examination of the long term trend on the Pacific Highway and has been used in this study to extrapolate to the traffic flows on the Pacific Highway expected in 2010. The 3.2% growth factor in Figure 2 relates to a base year of 2001. Due to the abrupt change in the traffic volumes since August 2002 it is appropriate to restart the projections from year 2003. This has been done by applying a 3.2% linear growth to year 2003 volumes, even though they are approximately 3000 vpd higher than the year 2001 volumes. This approach is conservative in that it has the effect of increasing the projected traffic volumes by approximately 100 vehicles per day per year over a projection using 2001 as the base year. Use of a higher growth rate, such as 3.6% calculated for the site located further to the north at the Mullumbimby turnoff is not appropriate because of the distance from Ewingsdale interchange and the potential for local traffic influences.

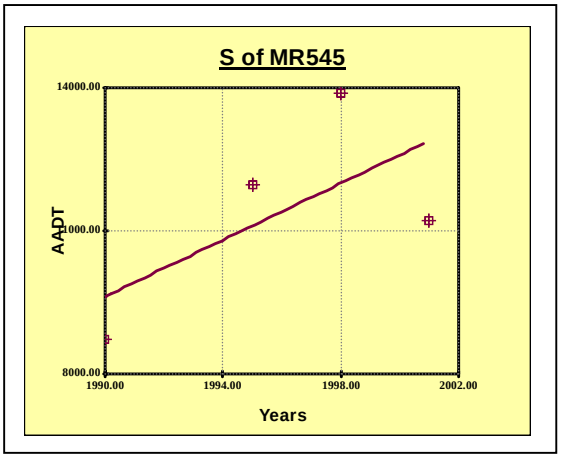


Figure 1- Pacific Highway immediately south of Ewingsdale Interchange.

The line of best fit provides a poor representation of the traffic growth (2.2%).

Limited confidence can be gained from this line due to the scatter in the data.

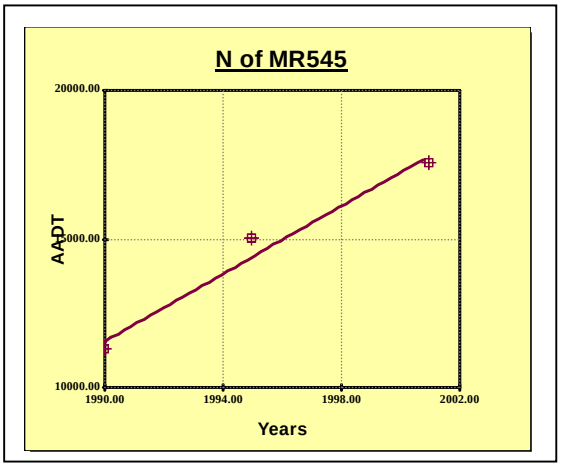
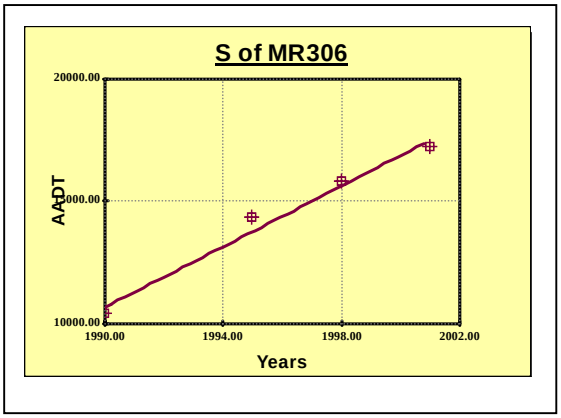


Figure 2- Pacific Highway immediately north of Ewingsdale Interchange.

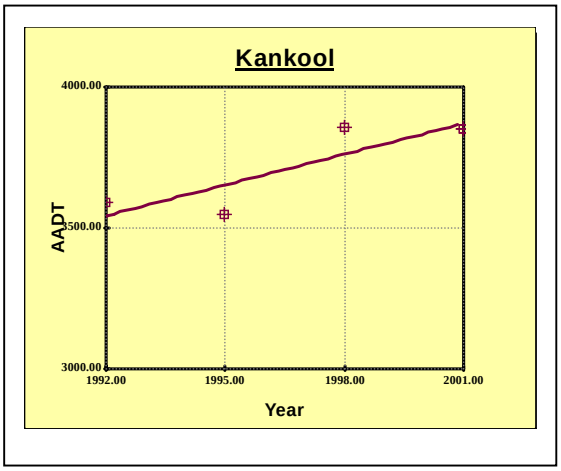
The line of best fit indicates a good fit with a growth rate of 3.2%.

Figure 3- Pacific Highway south of MR 306 – Mullumbimby Road.



The line of best fit here shows a high correlation with the data, indicating a good fit and has a growth rate of 3.6%.

Figure 4- New England Highway at Kankool.



The rate of overall traffic growth at Kankool on the New England Highway has been assessed at 0.9% annually.

This growth rate has been applied to traffic identified as having transferred to the Pacific Highway following the opening to traffic of the Yelgun to Chinderah Freeway.

e. Traffic flows at Kankool and Nabiac.

The historic classifier counts at Kankool on the New England Highway and Nabiac on the Pacific Highway have been analysed. The raw data has been adjusted to take account of the time of year on the basis of the Daily Distribution of Traffic Volumes contained in the RTA's publication "2001 Traffic Volume Data for Northern Region". Volumes were adjusted in accordance with the percentage of annual flow at the nearest available permanent traffic count site for the comparable week of the year. Traffic flows were then grouped into successive 50 day lots to provide a reliable measure of change to traffic over time.

Tables 3 and 4 below contain summaries of the analysis of traffic at Kankool and Nabiac.

Table 3 – Traffic break up at Kankool, New England Highway

Pre-opening Yelgun to Chinderah	Cl 1-2	Cl 3-12	Total Vehicles	Large Trucks Cl 6-12
8/06/2001	2722	1083	3805	833
28/07/2001	2714	1053	3767	809
16/09/2001	2782	1060	3842	818
5/11/2001	3334	1118	4452	860
25/12/2001	2717	902	3619	715
Average	2854	1043	3897	805
Post-opening Yelgun to Chinderah				
15/09/2002	3057	990	4047	752
4/11/2002	3269	982	4251	743
4/06/2003	2730	964	3694	705
Average	3019	978	3997	733

Table 4 – Traffic break up at Nabiac, Pacific Highway

Pre-opening Yelgun to Chinderah	Cl 1-2	Cl 3-12	Total Vehicles	Large Trucks Cl 6-12
27/02/2002	8662	1581	10243	1089
18/04/2002	10521	1747	12268	1192
7/06/2002	8459	1691	10150	1158
27/07/2002	9565	1544	11109	1051
Average	9302	1641	10943	1123
Post-opening Yelgun to Chinderah				
15/09/2002	8824	1727	10551	1249
4/11/2002	9129	1809	10938	1340
Average	8977	1768	10745	1294

In overall terms, the combined through traffic on the New England and Pacific Highway should remain essentially the same, except for the natural growth rate identified above. Any increase in usage of one route (outside of natural growth) should be reflected by a decrease in usage of the other.

The column for “Large Trucks Cl 6-12” shows an estimate of the overall amount of heavy truck movements on the two Highways. Refer to diagram showing vehicle types

in
Appendix C.

Analysis of the data contained in the tables leads to the conclusion that there is no obvious trend indicating a transfer of light vehicles from the New England Highway.

There has been a clear reduction over the analysis period in the freight movement on the New England Highway between pre and post opening of the Yelgun to Chinderah Freeway. This is mirrored by a significant increase in freight movement on the Pacific Highway, which is more than twice the decrease for the New England Highway.

As a result, it is reasonable to accept that there has been a transfer of heavy transport to the Pacific Highway and there has been an increase in B-Double usage at the Ewingsdale Interchange from low base figures of less than 20 per day. This results from a combination of transfer of B-Doubles from the New England Highway and the transfer of freight from ordinary heavy vehicles to B-Double vehicles.

In view of the results at Nabiac, one explanation could be that much of the growth in heavy transport movements is locally generated, rather than being through traffic. In particular, it is plausible that there has been a significant change to B-Double use on the new section of Highway because:

- the increase in heavy vehicle traffic on the Pacific Highway is double the reduction on the New England;
- the road transport task is unlikely to have increased so rapidly; and
- there is no other major transport route from which traffic would have transferred to the Pacific Highway on opening of theYelgun to Chinderah section.

f. Traffic flows at Ewingsdale Interchange.

Classifier counts at sites immediately south and north of the Ewingsdale Interchange on the Pacific Highway have been analysed. The data has been grouped into classes on the same basis as classifier data for Kankool on the New England Highway and Nabiac on the Pacific Highway as set out in "Section e – Traffic flows at Kankool and Nabiac" above. Average values for each class have been calculated. Traffic volumes were adjusted in accordance with the percentage of annual flow at the nearest available permanent traffic count site for the comparable week of the year in 2001. This has the effect of taking into account the variation in flow over the course of the year.

Tables 5 and 6 below summarise the outcome of this analysis.

Table 5 – South of Ewingsdale Interchange

Pre-opening Yelgun to Chinderah	Cl 1-2	Cl 3-12	Total
17/04/1998	11208	1222	12430
25/03/2001	10283	1106	11389
Post-opening Yelgun to Chinderah			
25/08/2003	13823	2090	15913

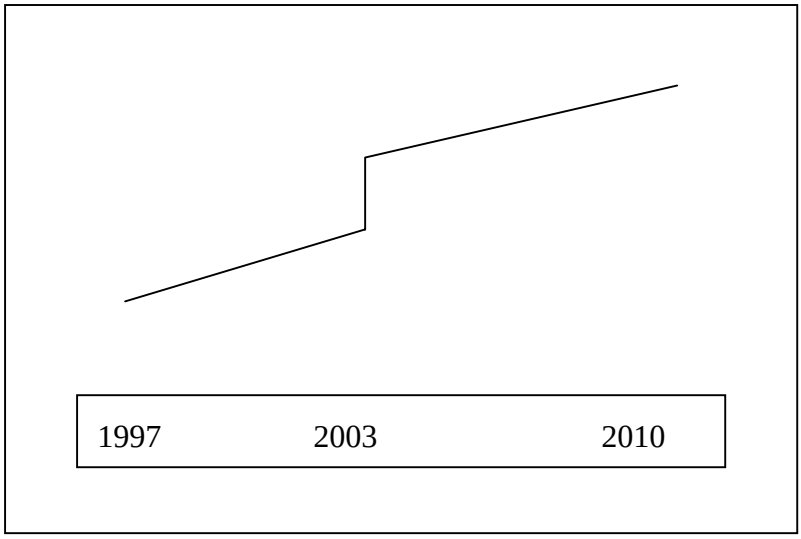
Table 6 – North of Ewingsdale Interchange

Pre-opening Yelgun to Chinderah	Cl 1-2	Cl 3-12	Total
8/04/2001	14550	1720	16270
Post-opening Yelgun to Chinderah			
25/08/2003	17387	2167	19554

The traffic flows included in the tables demonstrate the extent of increase in traffic using the Pacific Highway following the opening to traffic of the Yelgun to Chinderah Freeway.

The increase in traffic following the opening to traffic of the Yelgun to Chinderah has been taken into account in the estimation of traffic volumes in 2010. This has been done by shifting the trend line for growth in traffic by the amount of the increase and projecting the post opening volume at 3.2% linear growth. The following figure shows the nature of the method used.

Figure 5- Traffic Projection Method



The traffic projections are based on linear growth, which is considered a reasonable conclusion given the historical trends.

A non-linear growth rate is considered improbable for the following reasons. The recent shift in freight movement to the Pacific Highway has resulted from the cumulative effect of many improvements on the Pacific Highway together with a change in B-Double approval. There are no improvements or vehicle regulation changes proposed that may cause another significant shift in freight or passenger car traffic to the Pacific Highway prior to 2010. Linear growth is expected into the future because the long term trend indicated by historical data contained in the RTA's traffic counting publication is essentially linear.

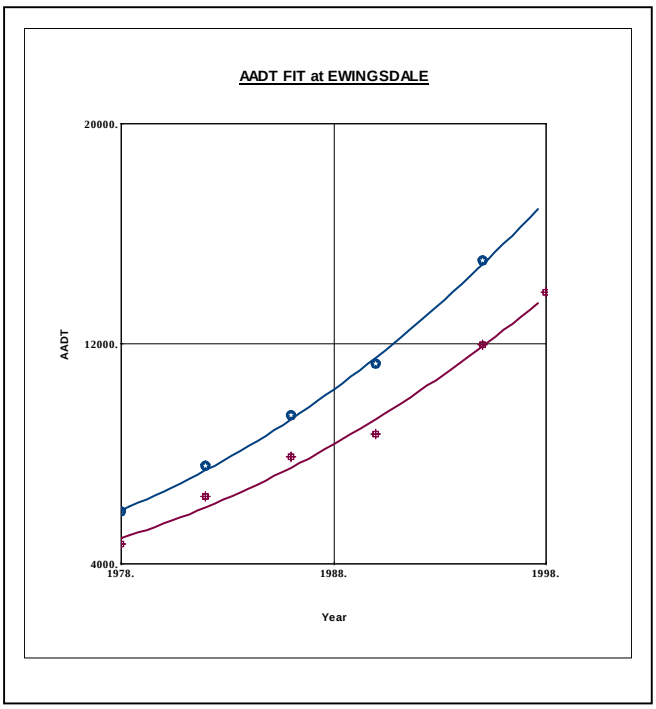
The data compiled for 1997, 2003 and 2010 on traffic flows have been consolidated into the format required for noise analysis. Details are provided in Appendix A.

Details of the hourly distribution of vehicles by type in 2003 have been included in Appendix B.

g. 1997 Traffic flows at Ewingsdale Interchange.

The historic data available has been analysed to establish the Average Vehicles Per Day (AVPD) for north and south of Ewingsdale on the Pacific Highway in 1997. The AADT data was analysed to arrive at the growth rate in the period 1997-1998, and the ratio between traffic volumes south and north of the Interchange in 1997. A power regression was used in this case to arrive at an interpolated value for AADTs south and north of the Interchange. As is apparent from the graph over page, a very good fit has been achieved, which gives confidence in the quality of prediction of overall traffic flows in 1997. Classifier count data is available for traffic south of Ewingsdale in 1998. In the absence of classifier counts north of Ewingsdale, the distribution of vehicles by class and hour south of the interchange in 1998 has been applied to traffic north of the Interchange. Classifier data from 1995 has not been used as this was on the basis of the NAASRA classification system, which is not compatible with the Austroads94 classification now in use.

Figure 6- Trend lines 1978 to 1998



AVPDs of 12,033 (south) and 15,080 (north) have been calculated for 1997 at Ewingsdale Interchange.

The distribution of traffic by hour and class recorded in 1998 south of Ewingsdale Interchange has been applied to the overall estimated flows for 1997 south and north of the Interchange.

h. 2003 Traffic flows at Ewingsdale Interchange.

The traffic flows shown for August 2003 represent the best data available on traffic flows immediately north and south of the Ewingsdale Interchange in 2003. This data, which covers three weeks in August, has been used in arriving at an estimate of the average traffic flows across the whole of 2003. Traffic flow varies from week to week over the course of a year. Average weekly flows on the Pacific Highway for the same period in 2001 are available in 'Traffic Volume Data for Northern Region 2001". The traffic flows for the corresponding three weeks in August in 2001 needed to be increased by 4% to bring them into line with the annual average traffic flows. The observed traffic flows for August 2003 have been increased by 4% to arrive at the estimated annual average flows for 2003.

As a result, Average Vehicles Per Day (AVPD) has been set at 15,912 south of the interchange and 19,554 north of the interchange for year 2003. These traffic flows have not been adjusted for AADT (axle pairs) because actual numbers of vehicles have been provided for the noise study. The hourly distribution of traffic has been calculated on the basis of the average distribution over the period of the classifier counts south and north of the Ewingsdale Interchange in August 2003, and the percentages applied to the adopted AVPDs.

i. Predicted 2010 Traffic flows at Ewingsdale Interchange.

AVPDs for 2010 south and north of the interchange have been calculated by the application of the linear annual growth factor of 3.2% identified under "Section d – Trends in traffic flows" above.

Average Vehicles Per Day (AVPD) has been predicted at 19,462 south of the interchange and 23,934 north of the interchange for year 2010. The hourly distribution of traffic has been calculated on the basis of the average distribution over the period of the classifier counts south and north of the Ewingsdale Interchange in August 2003, and the percentages applied to the predicted AVPDs.

4. Conclusions

An investigation has been made of traffic flows on the Pacific Highway at the Ewingsdale Interchange. This investigation covers a period from prior to the opening of the Ewingsdale Interchange to after the opening of the Yelgun to Chinderah Freeway.

The investigation has taken into account the factors contributing to growth of traffic on the Pacific Highway, including changes to travel time and travel distance with upgrading of the Highway and approval to use of the full length of the Highway by B-Double vehicles.

An assessment has been made of the transfer of traffic from the New England Highway to the Pacific Highway following the opening of the Yelgun to Chinderah Freeway.

As a result of this investigation, information has been generated which is suitable for use in an assessment of noise impact arising from past, present and future traffic on the Pacific Highway at Ewingsdale Interchange. This data is included in Appendix A.

Daily traffic flows grouped by class for south and north of the Interchange have been included as Appendix B.

A summary figure showing the Austroads94 vehicle classification system has been included as Appendix C.

Appendix A Hourly distribution of heavy vehicles

South of Ewingsdale – 2003 and 2010

State Highway 10 - Pacific Highway

Existing and predicted traffic flows
SOUTH of EWINGSDALE Interchange

Table 1 - Vehicles per day

Year	VPD
2003	15912
2010	19462

Table 2 - Hourly distribution of heavy vehicles
(Vehicle Class 3 - 12)
For years 2003 & 2010

Hour start	% of VPD in hour	% Heavy Vehicles (CL 3-12)
0	0.69	42.45
1	0.54	47.56
2	0.48	58.90
3	0.72	59.09
4	0.96	53.06
5	1.48	38.50
6	3.10	22.57
7	5.16	13.67
8	7.22	10.05
9	7.61	8.68
10	7.20	9.17
11	7.21	9.43
12	6.93	9.53
13	6.88	9.60
14	7.25	10.01
15	7.81	9.62
16	7.80	8.30
17	6.95	8.00
18	4.65	10.11
19	2.87	16.40
20	2.23	23.17
21	1.88	25.69
22	1.42	27.52
23	0.97	34.46

South of Ewingsdale – 1997

State Highway 10 - Pacific Highway

Historic traffic flows
SOUTH of EWINGSDALE Interchange

Table 1 - Vehicles per day

Year	VPD
1997	12033

Table 2 - Hourly distribution of heavy vehicles
(Vehicle Class 3 - 12)

(Based on 1998 classifier counts S of Ewingsdale)

For year 1997

Hour start	% of VPD in hour	% Heavy Vehicles (CL 3-12)
0	0.72	30.26
1	0.58	35.54
2	0.54	40.13
3	0.63	44.52
4	0.98	33.40
5	1.99	22.14
6	3.56	15.16
7	5.43	10.27
8	6.94	7.68
9	7.14	6.95
10	7.33	7.23
11	7.30	7.28
12	6.93	7.75
13	7.01	7.61
14	7.47	8.09
15	7.62	7.53
16	7.47	6.62
17	6.33	6.31
18	4.34	8.16
19	2.98	12.06
20	2.35	15.96
21	1.91	18.03
22	1.44	20.30
23	1.00	22.82

North of Ewingsdale – 2003 and 2010

State Highway 10 - Pacific Highway

Existing and predicted traffic flows
NORTH of EWINGSDALE Interchange

Table 1 - Vehicles per day

Year	VPD
2003	19554
2010	23934

Table 2 - Hourly distribution of heavy vehicles
(Vehicle Class 3 - 12)
For years 2003 & 2010

Hour start	% of VPD in hour	% Heavy Vehicles (CL 3-12)
0	0.62	34.19
1	0.45	38.10
2	0.40	49.33
3	0.54	53.47
4	0.76	49.65
5	1.30	33.06
6	2.93	19.82
7	4.77	12.82
8	6.97	8.85
9	7.64	7.59
10	7.57	7.87
11	7.51	8.00
12	7.25	8.50
13	7.19	8.95
14	7.62	9.01
15	8.11	8.14
16	7.92	7.25
17	6.90	6.71
18	4.57	8.73
19	2.79	14.89
20	2.15	19.80
21	1.82	21.64
22	1.33	22.40
23	0.89	27.98

North of Ewingsdale – 1997

State Highway 10 - Pacific Highway

Historic traffic flows
NORTH of EWINGSDALE Interchange

Table 1 - Vehicles per day

Year	VPD
1997	15080

(Based on AADT counts N & S of Ewingsdale)

Table 2 - Hourly distribution of heavy vehicles
(Vehicle Class 3 - 12)

(Based on 1998 classifier counts S of Ewingsdale)

For year 1997

Hour start	% of VPD in hour	% Heavy Vehicles (CL 3-12)
0	0.72	30.26
1	0.58	35.54
2	0.54	40.13
3	0.63	44.52
4	0.98	33.40
5	1.99	22.14
6	3.56	15.16
7	5.43	10.27
8	6.94	7.68
9	7.14	6.95
10	7.33	7.23
11	7.30	7.28
12	6.93	7.75
13	7.01	7.61
14	7.47	8.09
15	7.62	7.53
16	7.47	6.62
17	6.33	6.31
18	4.34	8.16
19	2.98	12.06
20	2.35	15.96
21	1.91	18.03
22	1.44	20.30
23	1.00	22.82

Appendix B Average Daily Flow by Vehicle Type

Class 1 to 2	Light vehicles.
Class 3 to 5	Light commercial vehicles.
Class 6 to 12	Heavy commercial vehicles including semi trailers and B-Doubles.

South of Ewingsdale Interchange. Traffic Distribution 2003

Hour start	% flow in hour	% HV (CL 3-12)	% Car CL 1-2	% LC CL 3-5	% HC CL 6-12
0	0.69	42.45	57.55	6.60	35.85
1	0.54	47.56	52.44	7.32	40.25
2	0.48	58.90	41.10	9.59	49.32
3	0.72	59.09	40.91	10.00	49.09
4	0.96	53.06	46.94	11.56	41.49
5	1.48	38.50	61.50	9.29	29.2
6	3.10	22.57	77.43	7.38	15.19
7	5.16	13.67	86.33	5.82	7.85
8	7.22	10.05	89.95	4.80	5.25
9	7.61	8.68	91.32	4.47	4.21
10	7.20	9.17	90.83	4.90	4.27
11	7.21	9.43	90.57	4.81	4.63
12	6.93	9.53	90.47	4.62	4.9
13	6.88	9.60	90.40	4.47	5.13
14	7.25	10.01	89.99	4.69	5.32
15	7.81	9.62	90.38	4.60	5.02
16	7.80	8.30	91.70	3.69	4.61
17	6.95	8.00	92.00	3.10	4.89
18	4.65	10.11	89.89	2.95	7.17
19	2.87	16.40	83.60	3.64	12.75
20	2.23	23.17	76.83	4.40	18.77
21	1.88	25.69	74.31	4.86	20.83
22	1.42	27.52	72.48	5.50	22.02
23	0.97	34.46	65.54	4.73	29.73

North of Ewingsdale Interchange. Traffic Distribution 2003

	% flow	% HV	% Car	% LC	% HC
Hour start	in hour	(CL 3-12)	CL 1-2	CL 3-5	CL 6-12
0	0.62	34.19	65.81	5.13	29.06
1	0.45	38.10	61.90	4.76	33.33
2	0.40	49.33	50.67	6.67	42.67
3	0.54	53.47	46.53	9.90	43.56
4	0.76	49.65	50.35	10.49	39.16
5	1.30	33.06	66.94	8.98	24.08
6	2.93	19.82	80.18	7.27	12.54
7	4.77	12.82	87.18	6.13	6.69
8	6.97	8.85	91.15	4.65	4.2
9	7.64	7.59	92.41	4.18	3.41
10	7.57	7.87	92.13	4.42	3.44
11	7.51	8.00	92.00	4.39	3.62
12	7.25	8.50	91.50	4.47	4.04
13	7.19	8.95	91.05	4.44	4.52
14	7.62	9.01	90.99	4.54	4.47
15	8.11	8.14	91.86	4.07	4.07
16	7.92	7.25	92.75	3.29	3.96
17	6.90	6.71	93.29	2.47	4.24
18	4.57	8.73	91.27	2.56	6.17
19	2.79	14.89	85.11	3.24	11.64
20	2.15	19.80	80.20	4.21	15.59
21	1.82	21.64	78.36	3.80	17.83
22	1.33	22.40	77.60	4.00	18.4
23	0.89	27.98	72.02	4.17	23.81

Appendix C Diagram showing Vehicle Types

Austroads94

Austroads94 replaced NAASRA in Australia in 1994. It is an improved system using information from the spacings of the first three axles, the total number of axles and the number of axle groups. There are 13 classes.

Level 1	Level 2		Level 3	Austroads Classification			
Length	Axles and Groups		Vehicle Type				
Type	Axles	Groups	Description	Class		Parameters	Dominant Vehicle
Short up to 5.5m	**Light Vehicles**						
	2	1 or 2	Short Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc.	SV	1	d(1) <= 3.2m and axles = 2	
Medium 5.5m to 14.5m	3, 4 or 5	3	Short - Towing Trailer, Caravan, Boat, etc.	SVT	2	groups = 3, d(1) >= 2.1m, d(1) <= 3.2m, d(2) >= 2.1m and axles = 3,4,5	
	Heavy Vehicles						
	2	2	Two Axle Truck or Bus	TB2	3	d(1) > 3.2m and axles = 2	
	3	2	Three Axle Truck or Bus	TB3	4	axles = 3 and groups = 2	
	> 3	2	Four Axle Truck	T4	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	Three Axle Articulated Three axle articulated vehicle or Rigid vehicle and trailer	ART3	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	Four Axle Articulated Four axle articulated vehicle or Rigid vehicle and trailer	ART4	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	Five Axle Articulated Five axle articulated vehicle or Rigid vehicle and trailer	ART5	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	>= 6	> 2	Six Axle Articulated Six (or more) axle articulated vehicle or Rigid vehicle and trailer	ART6	9	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	B Double B Double or Heavy truck and trailer	BD	10	groups = 4 and axles > 6	
	> 6	5 or 6	Double Road Train Double road train or Heavy truck and two trailers	DRT	11	groups = 5 or 6 and axles > 6	
Long Combination Over 33.0m	> 6	> 6	Triple Road Train Triple road train or Heavy truck with three trailers	TRT	12	groups > 6 and axles > 6	
	Ungrouped Classes						
			Unclassifiable Vehicle		13		
			Unclassifiable Axle Event		0		

Group: Axle group, where adjacent axles are less than 2.1m apart

Groups: Number of axle groups

Axles: Number of axles (maximum axle spacing of 10.0m)

d(1): Distance between first and second axle

d(2): Distance between second and third axle

Appendix D

Classified Count Data

D1 Pacific Highway, South of Bangalow

D1.1 Daily Average Total

LOCATION: SH10 Pacific Highway - 100m North of Old Byron Rd, Knockrow **DURATION:** 16th November to 26th November 2004

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	36	2	3	1	0	0	1	1	26	9	0	0	80	38	42	48	52
1:00	22	1	3	0	0	0	0	1	19	7	0	0	55	23	32	42	58
2:00	24	1	4	0	0	0	0	1	23	9	0	0	63	25	38	40	60
3:00	25	1	4	1	0	0	1	0	24	10	0	0	67	26	41	39	61
4:00	45	2	8	2	1	0	1	1	28	16	0	0	103	47	56	45	55
5:00	121	5	8	3	0	0	1	2	42	22	0	0	206	126	80	61	39
6:00	275	11	17	4	0	1	1	2	44	20	0	0	375	286	89	76	24
7:00	470	14	21	8	1	1	2	2	39	14	0	0	570	484	86	85	15
8:00	630	22	27	8	0	1	2	2	36	11	0	0	739	652	87	88	12
9:00	621	24	27	7	0	1	2	3	26	10	1	0	723	645	78	89	11
10:00	631	29	24	7	0	1	2	3	26	9	0	0	733	660	73	90	10
11:00	611	26	26	7	0	1	3	3	25	10	0	0	712	637	75	89	11
12:00	633	27	23	7	0	1	3	3	32	11	0	0	740	660	80	89	11
13:00	640	31	24	5	1	1	3	3	31	12	0	0	751	671	80	89	11
14:00	664	28	32	6	1	2	2	3	34	11	0	0	784	692	92	88	12
15:00	725	23	25	7	0	1	3	3	36	13	0	0	837	748	89	89	11
16:00	700	18	22	5	0	1	3	3	36	15	0	0	803	718	85	89	11
17:00	585	16	17	4	1	1	2	3	31	13	0	0	672	601	71	89	11
18:00	378	12	13	3	0	1	2	2	31	16	0	0	459	390	69	85	15
19:00	268	11	9	2	0	1	2	2	35	18	0	0	348	279	69	80	20
20:00	181	6	7	2	0	0	1	1	39	21	0	0	260	187	73	72	28
21:00	140	5	8	2	0	1	1	2	43	23	0	0	226	145	81	64	36
22:00	93	3	4	2	0	0	1	2	39	20	0	0	164	96	68	58	42
23:00	60	3	4	1	0	0	1	1	34	15	0	0	119	63	56	53	47
24HRS	8580	321	361	94	7	16	41	51	778	336	1	1	10587	8899	1688	84	16
DAY Total	7879	291	305	80	6	14	33	39	500	207	1	1	9357	8169	1188	87	13
NIGHT Total	701	30	56	14	1	2	8	12	278	129	0	0	1230	730	500	59	41
DAY %	92	91	84	85	86	0	80	76	64	62	0	0	88	92	70	-	-
NIGHT %	8	9	16	15	14	0	20	24	36	38	0	0	12	8	30	-	-

D1.2 Weekday Average Total

LOCATION: SH10 Pacific Highway - 100m North of Old Byron Rd, Knockrow **DURATION:** 16th November to 26th November 2004

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	26	2	3	0	0	0	1	1	29	9	0	0	71	28	43	39	61
1:00	18	1	4	0	0	0	0	1	21	7	0	0	52	19	33	36	64
2:00	25	1	5	1	0	0	1	1	26	12	0	0	71	26	45	37	63
3:00	28	1	4	1	0	1	1	0	28	13	0	0	77	29	48	38	62
4:00	62	3	10	3	1	0	1	1	34	20	0	0	135	65	70	48	52
5:00	161	6	8	4	0	0	2	3	51	26	0	0	262	167	95	64	36
6:00	342	12	20	5	0	0	1	3	53	23	0	0	459	354	105	77	23
7:00	521	14	25	10	1	1	3	3	47	17	0	0	641	535	106	83	17
8:00	680	20	33	10	0	0	2	3	43	13	0	0	805	700	105	87	13
9:00	612	26	30	9	0	1	2	3	28	13	0	0	725	638	87	88	12
10:00	587	28	27	7	0	1	3	4	30	11	0	0	699	615	84	88	12
11:00	572	24	28	6	0	1	3	4	30	13	0	0	682	596	86	87	13
12:00	584	22	25	9	0	0	4	3	36	12	0	0	696	606	90	87	13
13:00	629	29	27	6	1	2	4	4	38	16	0	0	756	658	98	87	13
14:00	651	26	35	8	1	3	2	4	38	12	0	0	780	677	103	87	13
15:00	706	21	28	8	0	2	3	4	42	14	0	0	829	727	102	88	12
16:00	652	15	22	7	0	1	3	5	42	15	0	0	762	667	95	88	12
17:00	543	13	15	4	1	1	2	2	33	14	0	0	630	556	74	88	12
18:00	336	12	13	4	0	0	2	2	39	20	0	0	429	348	81	81	19
19:00	228	8	12	2	0	1	2	2	44	22	0	0	321	236	85	74	26
20:00	161	4	8	2	0	0	1	2	45	29	0	0	252	165	87	66	34
21:00	119	3	9	2	0	1	1	2	49	26	0	0	212	122	90	57	43
22:00	77	3	5	1	0	0	1	2	42	20	0	0	152	80	72	52	48
23:00	46	4	3	1	0	0	2	1	38	16	0	0	111	50	61	45	55
24HRS	8367	298	399	111	7	17	48	61	906	394	1	1	10610	8664	1946	82	18
DAY Total	7582	265	338	94	6	14	38	46	584	248	1	1	9218	7846	1372	85	15
NIGHT Total	785	33	61	17	1	3	10	15	322	146	0	0	1392	818	574	59	41
DAY %	91	89	85	85	86	0	79	75	64	63	0	0	87	91	71	-	-
NIGHT %	9	11	15	15	14	0	21	25	36	37	0	0	13	9	29	-	-

D1.3 Weekend Average Total

LOCATION: SH10 Pacific Highway - 100m North of Old Byron Rd, Knockrow **DURATION: 16th November to 26th November 2004**

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	70	3	4	1	1	0	1	0	13	7	0	0	98	73	25	74	26
1:00	34	2	2	0	0	1	1	1	11	6	0	0	57	36	21	64	36
2:00	31	2	2	1	0	0	0	0	12	3	0	0	49	33	16	67	33
3:00	30	2	5	1	0	0	1	1	12	4	0	0	53	32	21	60	40
4:00	33	2	4	1	1	1	1	0	13	6	0	0	60	35	25	59	41
5:00	85	5	9	1	0	0	0	1	18	10	0	0	128	90	38	70	30
6:00	167	13	8	2	0	0	0	1	15	12	1	0	217	180	37	83	17
7:00	339	16	8	4	0	0	1	1	18	6	0	0	390	355	35	91	9
8:00	479	23	10	3	0	1	2	1	16	6	0	0	539	502	37	93	7
9:00	630	23	13	5	0	1	3	2	20	4	1	0	700	653	47	93	7
10:00	753	32	12	4	0	1	2	1	17	6	0	0	827	785	42	95	5
11:00	746	39	18	5	0	2	2	4	15	7	0	0	835	785	50	94	6
12:00	780	35	15	2	0	4	2	1	18	8	0	0	863	815	48	94	6
13:00	701	34	12	2	1	0	1	1	18	5	0	0	773	735	38	95	5
14:00	734	34	19	3	0	2	1	2	22	6	0	0	820	768	52	94	6
15:00	751	27	14	5	0	0	4	1	14	11	0	0	825	778	47	94	6
16:00	687	21	11	1	0	1	1	1	19	11	0	1	751	708	43	94	6
17:00	573	18	10	2	0	1	1	2	19	10	0	0	635	591	44	93	7
18:00	407	11	12	2	0	1	1	2	12	13	0	0	459	418	41	91	9
19:00	287	14	4	0	0	0	1	2	20	6	0	0	332	301	31	91	9
20:00	194	6	5	2	0	0	2	0	18	9	0	0	234	200	34	85	15
21:00	140	4	5	2	0	1	1	3	23	9	0	0	187	144	43	77	23
22:00	101	2	5	1	0	0	0	1	15	10	0	0	133	103	30	77	23
23:00	73	2	5	1	0	0	0	1	18	4	0	0	102	75	27	74	26
24HRS	8819	367	208	44	2	12	25	24	390	172	2	1	10063	9195	868	91	9
DAY Total	8198	335	165	38	1	11	22	20	265	113	1	1	9167	8538	629	93	7
NIGHT Total	621	32	43	6	1	1	3	4	125	59	1	0	896	657	239	73	27
DAY %	93	91	79	86	50	0	88	83	68	66	0	0	91	93	72	-	-
NIGHT %	7	9	21	14	50	0	12	17	32	34	0	0	9	7	28	-	-

D2 Pacific Highway, North of Bangalow

D2.1 Daily Average Total

LOCATION: SH10 Pacific Highway - 600m North of Sunnycrest Lane, Bangalow **DURATION: 16th November to 26th November 2004**

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	43	2	4	0	0	0	1	1	25	9	0	0	85	45	40	53	47
1:00	27	1	4	0	0	0	0	1	17	6	0	0	58	28	29	49	51
2:00	30	1	5	1	0	0	1	1	25	9	0	0	72	32	41	44	56
3:00	40	2	6	1	0	0	1	1	25	10	0	0	85	42	44	49	51
4:00	88	6	11	3	1	0	1	1	29	15	0	0	156	95	61	61	39
5:00	190	7	11	4	0	0	2	3	41	19	0	0	277	197	80	71	29
6:00	389	17	21	5	0	0	2	2	44	20	1	0	501	405	95	81	19
7:00	591	22	26	9	1	1	3	3	37	14	1	1	708	612	95	87	13
8:00	762	30	30	8	0	1	3	2	37	11	1	0	884	791	93	89	11
9:00	735	31	31	9	0	2	3	3	27	10	2	0	851	766	85	90	10
10:00	733	33	29	7	0	1	3	4	29	9	1	0	849	766	83	90	10
11:00	699	31	29	8	0	1	3	4	27	11	0	0	812	730	83	90	10
12:00	714	30	27	7	1	1	3	3	34	10	0	0	830	744	86	90	10
13:00	729	33	28	6	1	1	4	3	33	13	1	0	851	762	89	89	11
14:00	799	35	33	7	1	3	3	4	34	11	0	0	931	834	96	90	10
15:00	838	28	33	10	0	2	4	3	35	13	0	0	967	866	100	90	10
16:00	801	24	23	8	0	1	4	4	36	13	0	0	916	825	91	90	10
17:00	671	23	15	5	1	1	3	4	30	12	0	0	765	694	71	91	9
18:00	434	14	14	5	0	1	3	3	32	18	0	0	523	448	75	86	14
19:00	302	10	12	2	0	1	2	2	38	17	0	0	387	313	75	81	19
20:00	212	7	10	3	0	0	1	1	35	22	0	0	293	219	74	75	25
21:00	153	4	9	2	0	0	2	2	42	21	0	0	234	157	77	67	33
22:00	112	4	5	1	0	0	1	2	36	17	0	0	178	116	62	65	35
23:00	69	3	3	2	0	0	1	1	31	12	0	0	123	72	51	59	41.327
24HRS	10161	399	416	114	8	21	52	58	778	320	7	4	12338	10560	1778	86	14
DAY Total	9173	354	347	97	6	18	43	45	506	204	6	3	10802	9527	1275	88	12
NIGHT Total	988	45	69	17	2	3	9	13	272	116	1	1	1536	1033	503	67	33
DAY %	90	89	83	85	75	0	83	78	65	64	0	0	88	90	72	-	-
NIGHT %	10	11	17	15	25	0	17	22	35	36	0	0	12	10	28	-	-

D2.2 Weekday Average Total

LOCATION: SH10 Pacific Highway - 600m North of Sunnycrest Lane, Bangalow **DURATION: 16th November to 26th November 2004**

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	32	2	3	0	0	0	1	2	30	10	0	0	81	34	47	42	58
1:00	22	1	4	0	0	0	0	1	21	7	0	0	56	23	33	41	59
2:00	28	1	6	1	0	0	1	1	29	11	0	0	78	29	49	37	63
3:00	33	1	6	1	0	1	1	1	29	12	0	0	85	34	51	40	60
4:00	73	3	11	3	1	0	1	2	35	18	0	0	149	76	73	51	49
5:00	173	6	10	5	0	0	2	3	49	24	0	0	274	179	95	65	35
6:00	386	13	24	6	0	1	2	3	56	24	1	0	515	399	116	77	23
7:00	591	19	29	12	1	2	3	3	44	16	1	2	721	610	111	85	15
8:00	768	27	37	11	0	1	4	3	42	13	1	1	906	795	111	88	12
9:00	737	32	37	11	0	2	3	3	28	13	2	0	868	769	99	89	11
10:00	682	32	33	9	0	1	3	5	32	10	1	0	808	714	94	88	12
11:00	645	29	33	9	1	1	3	5	31	12	1	0	770	674	96	88	12
12:00	660	29	32	10	1	0	4	3	39	11	0	0	790	689	101	87	13
13:00	703	34	33	7	1	1	5	4	40	16	1	0	846	737	109	87	13
14:00	778	35	38	9	1	4	4	5	40	12	1	0	927	813	114	88	12
15:00	843	30	40	11	1	2	5	4	43	14	0	0	994	873	121	88	12
16:00	817	26	27	11	0	2	6	6	43	15	0	0	954	843	111	88	12
17:00	708	23	18	6	1	2	3	4	35	13	0	0	814	731	83	90	10
18:00	448	16	15	6	0	1	4	3	39	20	0	0	552	464	88	84	16
19:00	299	10	15	3	0	1	2	3	45	21	0	0	400	309	91	77	23
20:00	214	8	12	4	0	0	1	2	44	28	0	0	314	222	92	71	29
21:00	158	4	10	2	0	0	2	2	49	25	0	0	252	162	90	64	36
22:00	112	5	6	1	0	0	1	2	43	20	0	0	190	117	73	62	38
23:00	67	3	3	2	0	1	1	1	37	15	0	0	131	70	61	53	47
24HRS	9978	391	481	140	10	23	61	70	924	381	10	6	12475	10366	2109	83	17
DAY Total	9052	355	408	120	8	21	51	54	595	239	8	4	10916	9405	1511	86	14
NIGHT Total	926	36	73	20	2	2	10	16	329	142	2	2	1559	961	598	62	38
DAY %	91	91	85	86	80	0	84	77	64	63	0	0	88	91	72	-	-
NIGHT %	9	9	15	14	20	0	16	23	36	37	0	0	12	9	28	-	-

D2.3 Weekend Average Total

LOCATION: SH10 Pacific Highway - 600m North of Sunnycrest Lane, Bangalow **DURATION: 16th November to 26th November 2004**

Class	1	2	3	4	5	6	7	8	9	10	11	12	Total	Light Total	Heavy Total	Light %	Heavy %
0:00	70	3	5	1	0	0	1	0	12	5	0	0	96	73	23	76	24
1:00	39	3	5	0	0	0	1	2	7	5	0	0	61	42	19	69	31
2:00	38	2	3	0	0	1	1	1	15	2	0	0	60	39	21	66	34
3:00	58	4	5	1	0	0	1	1	15	5	0	0	87	61	26	70	30
4:00	126	14	9	2	1	1	1	0	15	6	0	0	173	140	33	81	19
5:00	231	11	12	3	1	1	2	1	19	9	0	0	287	241	46	84	16
6:00	396	26	13	3	0	0	1	1	15	12	0	0	464	421	43	91	9
7:00	590	27	18	4	0	1	3	3	22	8	0	0	674	617	57	92	8
8:00	745	37	13	3	1	1	1	0	23	7	0	0	829	782	47	94	6
9:00	732	27	15	5	0	1	2	3	22	4	1	0	810	758	52	94	6
10:00	862	33	20	4	0	1	2	3	21	8	0	0	952	895	58	94	6
11:00	833	35	18	6	0	2	2	2	16	7	0	0	918	868	50	95	5
12:00	850	33	13	1	0	3	2	1	23	6	0	0	930	882	48	95	5
13:00	794	30	15	2	1	1	2	2	16	5	0	0	865	823	42	95	5
14:00	852	35	20	3	0	2	1	1	20	7	0	0	940	887	53	94	6
15:00	826	25	15	7	0	1	2	0	14	11	0	0	899	850	49	95	5
16:00	760	20	12	1	0	1	1	1	19	9	0	1	822	780	43	95	5
17:00	579	23	9	1	0	1	1	3	19	11	0	0	644	601	43	93	7
18:00	398	9	13	2	0	1	2	1	13	14	0	0	451	407	44	90	10
19:00	310	11	5	1	0	1	1	2	21	7	0	0	356	321	35	90	10
20:00	207	6	6	2	0	0	1	0	13	7	0	0	241	213	29	88	12
21:00	141	5	7	2	0	0	1	3	24	9	0	0	189	145	44	77	23
22:00	114	3	5	1	0	0	0	1	17	9	0	0	149	117	33	78	22
23:00	74	2	4	1	0	0	1	1	18	3	0	0	102	76	26	75	25
24HRS	10619	417	255	50	3	15	27	27	414	169	1	1	11994	11035	959	92	8
DAY Total	9475	352	196	40	1	13	21	22	282	115	1	1	10517	9827	691	93	7
NIGHT Total	1144	65	59	10	2	2	6	5	132	54	0	0	1477	1208	268	82	18
DAY %	89	84	77	80	33	0	78	81	68	68	0	0	88	89	72	-	-
NIGHT %	11	16	23	20	67	0	22	19	32	32	0	0	12	11	28	-	-