Harwood Marine

Traffic Assessment Report
Harwood Slipway Marine Project

October 2012

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1. Introduction

1.1 The Concept

Harwood Marine plans to create a marine industry precinct on the Clarence River. The precinct would allow large areas of land that can be easily accessed from the existing slipway and the river to be dedicated to marine industry. In particular the site would target boat builders requiring both good access to the Clarence River and Pacific Ocean to get boats in and out as well as the Pacific Highway to get materials and staff in and out.

This report forms part of a planning proposal submitted from Harwood Marine for land adjacent to its existing marine industry on Harwood Island.

1.2 Purpose of this report

The purpose of this traffic impact assessment report is to assess the traffic and access aspects of the Harwood Marine precinct concept.

This report has been prepared with reference to the Roads and Maritime Services (RMS) document “Guide to Traffic generating Developments” (October 2002).

1.3 Scope and limitations

The assessment considers road traffic access to the site from the Pacific Highway via the existing local road network. The assessment is based on information provided by the client and observations of existing conditions at the time of the site inspection.

1.4 Report Structure

The report follows the following structure:

Section 2 describes the existing road network and traffic conditions in the study area.

Section 3 presents the ‘no development’ and ‘with development’ cases including estimated future traffic volumes on the local road network. The results of peak period traffic analysis at the main access road intersection with the Pacific Highway are presented to indicate the performance of the intersection operating as an at-grade junction to year 2020.

Section 4 presents the conclusions and recommendations from the study.

2. Existing Conditions

2.1 Site Location

Access to the site is via Pacific Highway and Watts Lane. Watts lane is located approximately one kilometre to the north of Harwood bridge. The site is located on River Road approximately 250 metres east of Beckmans Lane, Harwood.

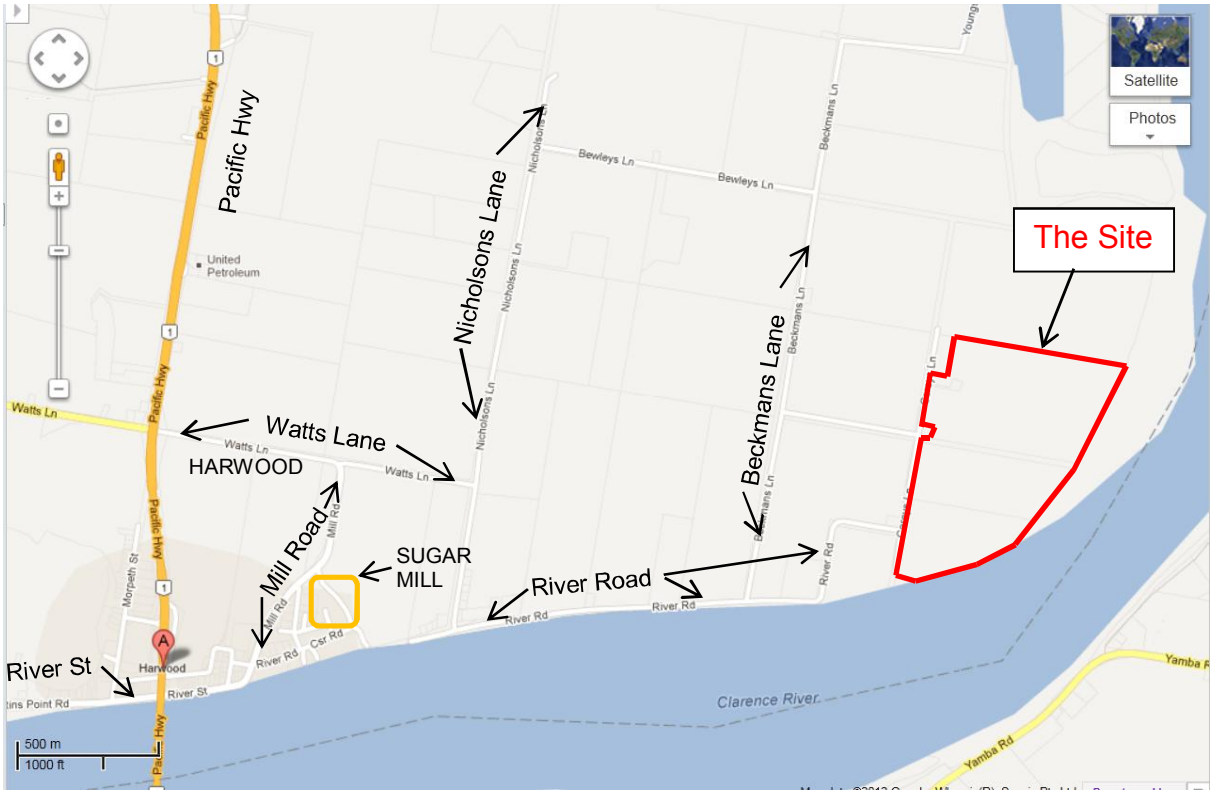

Figure 1 Site Location

Source: Google maps

2.2 Road Network

Watts Lane is the only formed and sealed road for vehicle access between the Pacific Highway and the site.

Watts Lane intersects with the Pacific Highway as a four way junction with stop signs controlling traffic on the Watts Lane approaches. Sight lines for traffic turning at the highway are generally unobstructed and the terrain is level. Separate turn lanes are provided for vehicles turning from the highway.

Access to and from Harwood village is via River Street which passes beneath the highway. As there is no direct vehicular connection between River Street and River Road, vehicles that wish to access the site from Harwood would travel via Mill Road, Watts Lane, Nicholsons Lane and River Road.

There are a number of unsealed roads and road reserves that could be linked to provide a future alternative road access between the site and the Pacific Highway. One such route is Watts Lane (sealed road), Nicholsons Lane (gravel road), a road reserve connecting Nicholsons Lane and Careys Lane (no formed road), Careys Lane and River Road to the site.

2.3 Access to Site

Watts Lane between Pacific Highway and Mill Road has a sealed width of approximately six metres and grassed shoulders approximately one metre wide. The centreline is marked with a single broken line and there are no edge lines.

Watts Lane between Mill Road and Nicholsons Lane has a sealed pavement approximately six metres wide; there is no line marking.

The intersection of Watts Lane and Mill Road gives priority to the more heavily trafficked movement between Watts Lane (west) and Mill Road.

Nicholsons Lane between Watts Lane and River Road has a six metre wide bitumen seal in generally good condition and has wide grassed shoulders. Traffic has a sign posted speed limit of 100 km/hr. At its southern end Nicholsons Lane becomes River Road which runs in an approximately east west direction parallel to the river.

Nicholsons Lane

River Road runs parallel to the Clarence River providing vehicle access to approximately 12 properties and connecting to Beckmans Lane and Careys Lane. It also provides access to the Harwood Sailing Club. River Road has a 3.9 metre wide bitumen sealed pavement with grassed shoulders for most of its length.

River Road

All the road network is susceptible to flooding. Access to the site is not possible by road during major flooding. It is estimated that River Road carries up to 150 vehicles per day.

2.4 Traffic volumes

2.4.1 Pacific Highway Traffic

Traffic volume data was available from the Roads and Maritime Services (RMS) website for the Pacific Highway from the 'Wells Crossing to Iluka Road Upgrading the Pacific Highway Concept Design Report'. This data indicated an AADT in 2004 of approximately 7,500 vehicles (including 20% heavy vehicles) on the Pacific Highway south of Maclean. The RMS report identified an annual growth rate of 2.6%. By applying this growth rate to the AADT at the Harwood Bridge count station (04.001) over the 8 year period from 2004-2012, it is estimated that the current (2012) AADT on the highway is approximately 12,000. It is also assumed that the percentage of heavy vehicles has remained at approximately 20%.

Traffic volume data was available from Clarence Valley Council for only the western leg of Watts Lane intersection with the highway. The count data was provided for the period between 19th May to 2nd June 2010. An average two way daily volume of 774 was identified.

To assist in understanding the traffic flows at the intersection of Pacific Highway and Watts Lane during peak periods, intersection traffic turning movements were undertaken between 16:30 and 16:50 on Monday 3rd September and between 07:45 and 08:00 on Tuesday 4th September 2012.

2.4.2 Traffic generated by Harwood Mill and Refinery

The number of vehicles generated by the Harwood Mill and Refinery site was provided by the NSW Sugar Milling Co-operative Limited and is included in Appendix B. There are over 104,700 vehicle movements per year. Cane, raw sugar, molasses and mill mud are transported during the crushing season from June to December and generate a total of 89,900 truck movements over the six month period. Refined sugar, and boiler fuel is transported throughout the year and generates a total of 17,600 truck movements.

From this data, it is clear that the traffic generated by the Sugar Mill accounts for most of the traffic using Watts Lane. It is estimated that during the seasonal peak between June and December, there are approximately 120 truck movements per day, assuming equal distribution of traffic throughout the day and night.

In addition to the haulage of these materials, the Sugar Mill generates approximately 350 employee trips per day as well as deliveries of miscellaneous supplies.

2.4.3 Traffic generated by current Harwood Marine Operations

The current operations at Harwood Marine employ approximately 40 to 90 persons depending on the number of contractors working at the site. Working hours are between 06:30 and 17:00. The maximum number of work trips generated by the existing development is approximately 90 arrivals during the morning peak and 90 departures during the evening peak period.

In addition to employee traffic, two semi-trailers access the site each week to deliver materials.

2.5 Pacific Highway/ Watts Lane Intersection Analysis

The intersection counts on 3rd and 4th of September were used to estimate the AM and PM peak hour turning volumes for the turning movements at the intersection of Watts Lane with Pacific Highway. Estimates of peak period through traffic movements on the highway were derived from the average daily profile data provided in the 'Wells Crossing to Iluka Road Upgrading the Pacific Highway Concept Design Report'. A 50% directional split on the Highway during peak periods was assumed.

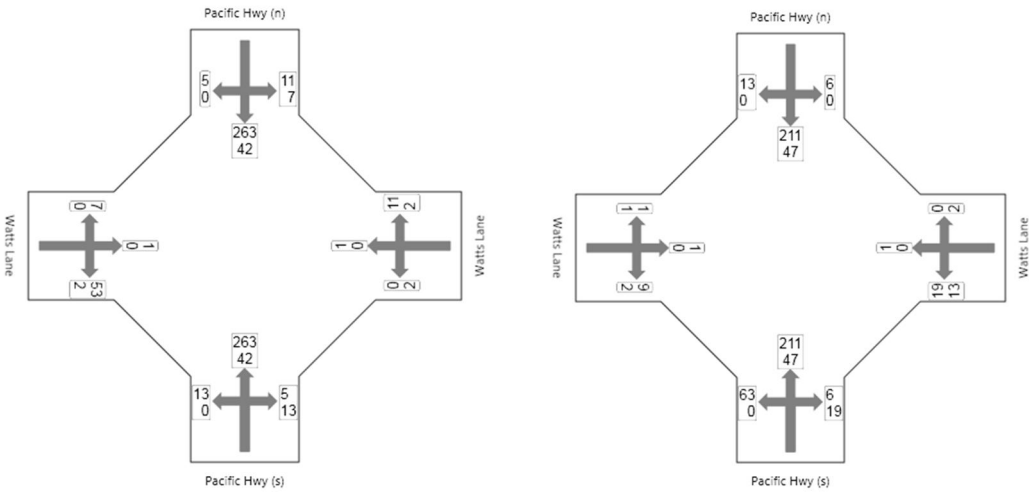

Figure 2 2012 AM and PM Peak Hour Traffic Volumes

The intersection traffic flows shown in Figure 2 were analysed using SIDRA Intersection Version 5.1 and the performance of the intersection operating under stop sign control is measured in terms of Average Delay, Level of service and Degree of Saturation for each movement. The description of each Level of Service (LoS) referred to in the SIDRA results tables are given in

Table 1. The results of the SIDRA intersection capacity analysis of existing traffic flows are given in Tables 2 and 3 with the SIDRA Movement Summaries provided in Appendix B.

Table 1 Description of Level of Service

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

Source: Guide to Traffic Generating Developments (RMS, 2002)

Table 2 Existing AM and PM Peak SIDRA Results - Pacific Highway/Watts Lane Intersection

Approach	Movement	Level of Service (AM Peak)	Level of Service (PM Peak)
Pacific Hwy (north)	Left	A	A
	Through	A	A
	Right	A	A
Watts Lane (east)	Left[1]	X	X
	Through	B	D
	Right	B	E
Pacific Hwy (south)	Left	A	A
	Through	A	A
	Right	A	A
Watts Lane (west)	Left	B	B
	Through	B	B
	Right	B	B

Notes:

1. The left turn from Watts Lane (east) is a continuous movement and LoS is not reported

From the SIDRA results in Table 2 the traffic turning between Watts Lane (east) and Pacific Highway (south) experience a good Level of Service. Traffic using the left turn lane from Watts Lane (east) does not conflict with highway traffic.

2.6 Crash Data

Crash data for the intersection of Pacific Highway and Watts Lane was provided by RMS for the five year period from 2007 to 2011. The incidents that were recorded during this period are summarised in Table 3.

Table 3 Pacific Highway/Watts Lane Intersection Crash Details

Date	Ambient conditions	Severity	Road User Movement Code	Description
19/04/07	Dry/Daylight	Property Only	30	Southbound car/ stationary southbound vehicle
18/08/07	Dry/Evening	Fatality	21	Northbound car turning right/ southbound semi-trailer through
16/02/11	Dry/Daylight	Property Only	10	Westbound utility through/southbound car through
11/05/11	Dry/Daylight	Property Only	21	Southbound truck right turn/northbound car through

There are a relatively low number of crashes reported at the site. There was one fatal crash, no injury crashes and three property damage crashes reported.

The data indicates that the fatality occurred in overcast conditions in the evening when ambient lighting would have been poor. The crash involved a passenger vehicle turning right into Watts Lane colliding with a semi-trailer travelling south of the highway. The crash resulted in one fatality and two persons injured.

Only four incidents were reported over the five year period which is less than one crash per year.

It can be concluded from the crash data that the crash rate at the intersection is relatively low considering the high volume of traffic on the highway. It is also concluded that the casualty crash that occurred may have been due to the poor visibility conditions rather than an inherent safety issue at the intersection.

2.7 Public transport, pedestrians and cyclists

A school bus service runs along Watts Lane and Nicholsons Lane and River Road. There were no formal bus stops.

There are no formed pedestrian paths along Watts Lane, Nicholsons Lane, River Road or Careys Lane. The only pedestrians observed during the site inspection were school children moving and to and from the bus stops.

There are no cycle paths in the study area. There were no cyclists observed on the roads during the site inspection.

2.8 Car parking

A large level gravelled area is currently available for employee and visitor car parking. Although there are no current plans available for future car parking, there is ample room to develop car parking facilities within the site.

3. Future Conditions

3.1 Introduction

The ultimate development of the precinct concept is likely to occur in a time frame well beyond the upgrade of the Pacific Highway and the provision of a grade-separated junction between the Pacific Highway and Watts Lane.

For the purposes of this assessment it is assumed that the highway would be upgraded by 2020. Prior to 2020, the intersection of Pacific Highway and Watts lane would continue to operate as an at-grade junction.

This section investigates the capacity of the highway intersection to accommodate the future traffic volumes for the 'no development' case and the 'with development' case.

3.2 Background traffic growth

An estimate of the growth in background traffic on the Pacific Highway was made by projecting a growth rate of 2.5% per annum to the 2004 traffic counts to the horizon year 2020. The resultant daily traffic volume on the Pacific Highway at Watts Lane is given in Table 4.

Table 4 2020 AADT on Pacific Highway

Year	AADT
2004	7,500[1]
2012	12,000[2]
2020	14,400

Notes:

1. *From RMS Count Station 04.400*
2. *Projection based on 2.5% pa growth applied to RMS Count Station 04.001*

Peak period intersection turning volumes were estimated by applying a 2.5% pa growth to highway traffic. The resulting 2020 AM and PM peak hour traffic volumes are shown in Figure 3

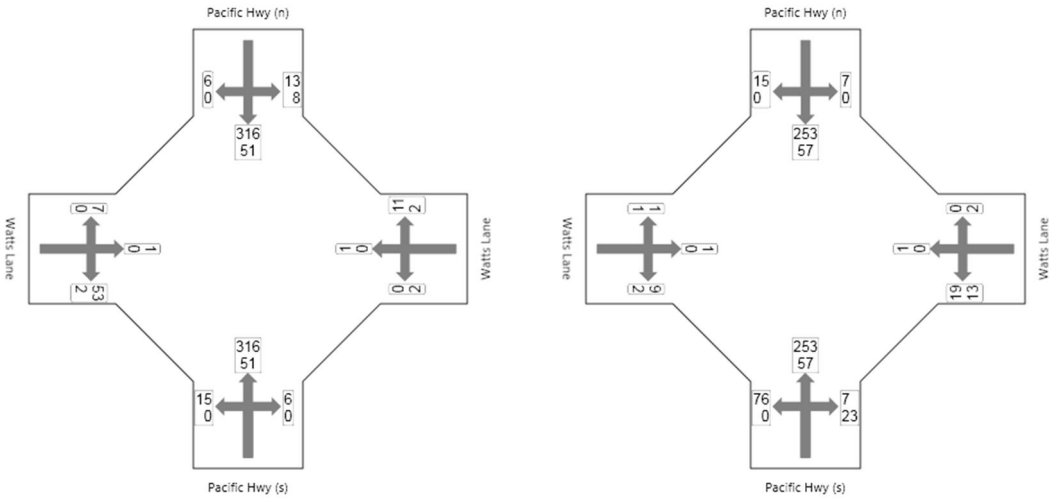

Figure 3 2020 Without Development - AM and PM Peak Hour Traffic Volumes

3.3 Traffic Impact Assessment - 'No Development' Case

It is assumed in the future case analysis that the Pacific Highway upgrade would not have been completed by 2020. The performance of the intersection of the Highway with Watts Lane in year 2020 without the proposed development was assessed by analysing the projected intersection turning volumes using SIDRA. The results of the analysis are given in Table 5.

Table 5 2020 Without Development AM and PM Peak SIDRA Results - Pacific Highway/Watts Lane Intersection

Approach	Movement	Level of Service (AM Peak)	Level of Service (PM Peak)
Pacific Hwy (north)	Left	A	A
	Through	A	A
	Right	A	A
Watts Lane (east)	Left[1]	X	X
	Through	C	F
	Right	C	F
Pacific Hwy (south)	Left	A	A
	Through	A	A
	Right	A	B
Watts Lane (west)	Left	B	C
	Through	B	B
	Right	B	B

Notes:

1. The left turn from Watts Lane (east) is a continuous movement and LoS is not reported.

The results indicate that the increased volume of traffic on the highway by 2020 would cause the through and right turn movements on the Watts Lane eastern approach to operate at LoS F. Although only a very small number of vehicles are involved in these movements, they would experience very long delays.

The left turn from Watts Lane to the Pacific Highway is a free left turn and the analysis results indicate a low level of delay (9.5 seconds). The right turn from the Pacific Highway to Watts Lane would operate at LoS B described as 'Acceptable delays and spare capacity'.

Figure 4 on the next page shows the layout of the Pacific Highway intersection with Watts Lane.

Figure 4 Pacific Highway/Watts Lane intersection

Source *Google Maps*

3.4 Traffic Impact Assessment - 'With Development' Case

3.4.1 Traffic Generation

The time frame under consideration is the 8 year period to 2020 at which time it is assumed that the intersection of Watts Lane with the Pacific Highway would be upgraded to a grade-separated interchange. The interchange would provide adequate traffic capacity for the ultimate development of the site.

At ultimate development it is understood that around 300 people will be employed at the site. Within the eight year time frame, employment at the development site is expected to increase from the existing maximum of 90 persons to approximately 150 persons.

The traffic generated by the proposed development in 2020 is therefore approximately 150 vehicle trips to the site on weekdays and Saturdays. It is therefore assumed that there will be 150 arrivals and 150 departures in the morning and evening peak hours respectively.

During the 8 year period to 2020, the two semi-trailers per week that currently serve the site to deliver materials are expected to be sufficient to meet the projected delivery needs of the development.

3.4.2 Traffic Distribution

The additional 60 employees that will access the proposed expanded development by 2020 are likely to travel to and from the south via the Pacific Highway. A small proportion may live in Harwood. It is therefore assumed that the majority of traffic would turn right from the Pacific Highway onto Watts Lane when travelling to the site in the morning, and turn left onto the highway when leaving the site in the evening. An alternative to attempting to turn right from Watts Lane would be to pass through Harwood village, beneath the Pacific Highway via River Street before joining the highway from Morpeth Street.

3.4.3 Pacific Highway/Watts Lane Intersection Capacity Assessment

The performance of the intersection of the Highway with Watts Lane in year 2020 with the additional traffic generated by the proposed development was assessed by analysing the projected intersection turning volumes using SIDRA. Shown in Figure 5.

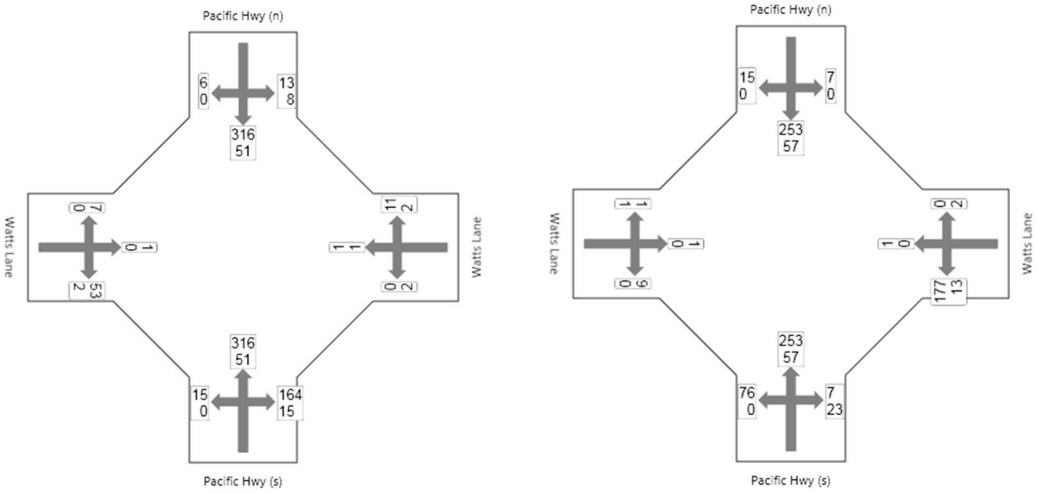

Figure 5 2020 With Development - AM and PM Peak Hour Traffic Volumes

The results of the SIDRA capacity analysis are given in Table 6. Movement Summary reports are included in Appendix A

Table 6 2020 With Development AM and PM Peak SIDRA Results - Pacific Highway/Watts Lane Intersection

Approach	Movement	Level of Service (AM Peak)	Level of Service (PM Peak)
Pacific Hwy (north)	Left	A	A
	Through	A	A
	Right	A	A
Watts Lane (east)	Left[1]	n/a	n/a
	Through	D	F
	Right	D	F
Pacific Hwy (south)	Left	A	A
	Through	A	A
	Right	A	B
Watts Lane (west)	Left	D	B
	Through	D	B
	Right	D	B

Notes:

1. *The left turn from Watts Lane (east) is a continuous movement and LoS is not reported in SIDRA*

A comparison of the results of the traffic analysis with and without the proposed development (refer to Table 5 and Table 6) shows that the right turn from the Pacific Highway is not significantly affected by the increase in employee traffic travelling to the development site in the morning peak which is expected to operate with a LoS A.

Similarly, the free left turn from Watts Lane to the Pacific Highway is not significantly affected in the PM peak as this is a free flow and unrestricted movement at the intersection.

3.4.4 Assessment of Local Roads

The local road network between the Pacific Highway and River Road via Watts Lane and Nicholsons Lane generally provides roads of sufficient width to carry the additional traffic to be generated by the proposed development expansion.

River Road is separated from the Clarence River by a narrow grassed verge that varies in width between three to five metres. There is no guard fence along the river bank. The existing road seal is approximately 3.9 metres wide so that two vehicles cannot pass without one leaving the sealed pavement. A drainage outlet opposite Beckmans Lane presents a serious hazard for errant vehicles.

Rural roads with a daily traffic volume of greater than 150 vehicles per day require a minimum pavement width of 6.2 metres (2 x 3.1 m lanes) and a formed shoulder width of 1.5 metres on each side (Austroads Guide to Road Design Part 3). As the proposed development expansion will result in a daily traffic volume in excess of 150 vehicles per day, the road will need to be widened to provide the required cross section. The existing verge adjacent to the river is narrow and widening along the northern edge is recommended for safety reasons.

4. Conclusions and Recommendation

The following conclusions are made:

1. The crash rate is low at the Pacific Highway/ Watts Lane intersection.
2. The major generator of traffic on Watts Lane is the Sugar Cane Mill in Mill Road
3. Background traffic growth alone on the Pacific Highway to 2020 is the major factor affecting the performance of the intersection at Watts Lane.
4. Traffic generated by the proposed development to 2020 does not significantly affect the level of service of traffic movements to and from the Pacific Highway (south) and Watts Lane (east).
5. Beyond about 2020 it is assumed that a grade separated interchange will be constructed as part of the Pacific Highway upgrade to remove the conflict between traffic flows on the Pacific Highway and Watts Lane.
6. The additional employee traffic from the proposed development could be satisfactorily accommodated on the local road network, subject to safety improvements on River Road.
7. There are alternative routes that could be developed between the development site and the Pacific Highway if required.

It is recommended that River Road be upgraded in accordance with the minimum standards required by Austroads to accommodate the increased traffic volume due to the proposed development. No upgrade of the Watts Lane / Pacific Highway intersection is warranted due to the additional traffic to be generated by the proposed Harwood Marine development.

Appendices

Appendix A – SIDRA Results

MOVEMENT SUMMARY

Site: Watts Hwy AM Existing

Pacific Hwy/ Watts Lane Intersection
Existing operation AM Peak
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	13	0.0	0.007	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	305	13.8	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	18	70.6	0.037	14.6	LOS B	0.1	1.5	0.51	0.73	44.5
Approach		336	16.3	0.171	1.1	NA	0.1	1.5	0.03	0.06	58.4
East: Watts Lane											
4	L	2	100.0	0.002	9.5	X	X	X	X	0.56	49.0
5	T	1	0.0	0.061	25.4	LOS B	0.2	1.6	0.74	0.99	36.3
6	R	13	16.7	0.061	25.8	LOS B	0.2	1.6	0.74	1.00	36.5
Approach		16	26.7	0.061	23.6	LOS B	0.2	1.6	0.64	0.94	37.9
North: Pacific Hwy (n)											
7	L	18	41.2	0.021	8.5	LOS A	0.1	0.7	0.12	0.55	49.1
8	T	305	13.8	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	5	0.0	0.005	9.8	LOS A	0.0	0.1	0.39	0.64	47.1
Approach		328	15.1	0.171	0.6	NA	0.1	0.7	0.01	0.04	59.0
West: Watts Lane											
10	L	7	0.0	0.202	21.2	LOS B	0.7	5.3	0.69	0.88	38.9
11	T	1	0.0	0.202	21.7	LOS B	0.7	5.3	0.69	1.01	38.6
12	R	55	3.8	0.202	21.4	LOS B	0.7	5.3	0.69	1.00	38.9
Approach		63	3.3	0.202	21.4	LOS B	0.7	5.3	0.69	0.99	38.9
All Vehicles		743	14.9	0.202	3.1	NA	0.7	5.3	0.09	0.15	55.7

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Pacific Hwy/ Watts Lane Intersection
Existing operation PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	63	0.0	0.034	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	258	18.4	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	25	75.0	0.050	14.3	LOS A	0.2	2.2	0.49	0.72	44.9
Approach		346	19.1	0.148	2.5	NA	0.2	2.2	0.04	0.17	56.3
East: Watts Lane											
4	L	32	40.0	0.022	8.3	X	X	X	X	0.58	49.8
5	T	1	0.0	0.040	54.1	LOS D	0.1	1.3	0.86	0.95	24.7
6	R	2	100.0	0.040	58.7	LOS E	0.1	1.3	0.86	1.00	25.7
Approach		35	42.4	0.040	12.8	LOS A	0.1	1.3	0.08	0.62	45.5
North: Pacific Hwy (n)											
7	L	6	0.0	0.005	7.7	LOS A	0.0	0.1	0.12	0.56	49.1
8	T	258	18.4	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	13	0.0	0.012	9.8	LOS A	0.0	0.3	0.40	0.66	47.1
Approach		277	17.1	0.148	0.6	NA	0.0	0.3	0.02	0.04	59.0
West: Watts Lane											
10	L	2	50.0	0.056	24.9	LOS B	0.2	1.6	0.67	0.87	38.1
11	T	1	0.0	0.056	22.8	LOS B	0.2	1.6	0.67	0.97	37.8
12	R	12	18.2	0.056	23.3	LOS B	0.2	1.6	0.67	1.00	38.1
Approach		15	21.4	0.056	23.5	LOS B	0.2	1.6	0.67	0.98	38.0
All Vehicles		673	19.6	0.148	2.7	NA	0.2	2.2	0.05	0.16	56.1

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Watts Hwy AM 2020 no dev

Pacific Hwy/ Watts Lane Intersection
2020 AM Peak with no development
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	15	0.0	0.008	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	366	13.8	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	6	0.0	0.007	9.9	LOS A	0.0	0.2	0.43	0.64	47.1
Approach		387	13.0	0.205	0.5	NA	0.0	0.2	0.01	0.04	59.2
East: Watts Lane											
4	L	2	100.0	0.002	9.5	X	X	X	X	0.56	49.0
5	T	1	0.0	0.077	30.2	LOS C	0.3	2.0	0.80	1.00	33.7
6	R	13	16.7	0.077	30.6	LOS C	0.3	2.0	0.80	1.00	33.8
Approach		16	26.7	0.077	27.7	LOS B	0.3	2.0	0.69	0.94	35.5
North: Pacific Hwy (n)											
7	L	21	40.0	0.024	8.4	LOS A	0.1	0.7	0.05	0.56	49.5
8	T	366	13.8	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	6	0.0	0.007	10.1	LOS A	0.0	0.2	0.43	0.65	46.8
Approach		394	15.0	0.205	0.6	NA	0.1	0.7	0.01	0.04	59.1
West: Watts Lane											
10	L	7	0.0	0.247	25.2	LOS B	0.9	6.7	0.76	0.96	36.3
11	T	1	0.0	0.247	25.7	LOS B	0.9	6.7	0.76	1.03	36.1
12	R	55	3.8	0.247	25.4	LOS B	0.9	6.7	0.76	1.02	36.3
Approach		63	3.3	0.247	25.4	LOS B	0.9	6.7	0.76	1.01	36.3
All Vehicles		860	13.5	0.247	2.9	NA	0.9	6.7	0.08	0.13	55.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Watts Hwy AM 2020 with 150 emp

Pacific Hwy/ Watts Lane Intersection
2020 AM Peak WITH development
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	15	0.0	0.008	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	366	13.8	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	179	8.2	0.199	10.7	LOS A	0.8	6.2	0.49	0.76	46.5
Approach		560	11.7	0.205	3.6	NA	0.8	6.2	0.16	0.26	54.6
East: Watts Lane											
4	L	2	100.0	0.002	9.5	X	X	X	X	0.56	49.0
5	T	2	50.0	0.143	48.4	LOS D	0.4	3.7	0.89	1.00	27.2
6	R	13	16.7	0.143	46.4	LOS D	0.4	3.7	0.89	1.00	27.2
Approach		17	31.3	0.143	42.0	LOS C	0.4	3.7	0.77	0.95	29.1
North: Pacific Hwy (n)											
7	L	21	40.0	0.025	9.6	LOS A	0.1	0.9	0.34	0.58	48.0
8	T	366	13.8	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	6	0.0	0.007	10.1	LOS A	0.0	0.2	0.43	0.65	46.8
Approach		394	15.0	0.205	0.7	NA	0.1	0.9	0.02	0.04	58.9
West: Watts Lane											
10	L	7	0.0	0.349	34.9	LOS C	1.3	9.6	0.85	1.02	31.4
11	T	1	0.0	0.349	35.4	LOS C	1.3	9.6	0.85	1.05	31.2
12	R	55	3.8	0.349	35.1	LOS C	1.3	9.6	0.85	1.05	31.4
Approach		63	3.3	0.349	35.1	LOS C	1.3	9.6	0.85	1.05	31.4
All Vehicles		1034	12.7	0.349	5.1	NA	1.3	9.6	0.16	0.24	52.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
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NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Watts Hwy PM 2020 no dev

Pacific Hwy/ Watts Lane Intersection
2020 PM Peak with no development
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	76	0.0	0.041	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	309	18.4	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	31	75.9	0.069	15.7	LOS B	0.3	3.0	0.54	0.77	43.7
Approach		416	19.2	0.178	2.6	NA	0.3	3.0	0.04	0.18	56.2
East: Watts Lane											
4	L	32	40.0	0.022	8.3	X	X	X	X	0.58	49.8
5	T	1	0.0	0.064	81.0	LOS F	0.2	2.0	0.91	1.00	19.0
6	R	2	100.0	0.064	85.6	LOS F	0.2	2.0	0.91	1.00	20.2
Approach		35	42.4	0.064	15.2	LOS B	0.2	2.0	0.08	0.62	43.3
North: Pacific Hwy (n)											
7	L	7	0.0	0.006	7.7	LOS A	0.0	0.1	0.13	0.56	49.0
8	T	309	18.4	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	15	0.0	0.016	10.2	LOS A	0.1	0.4	0.44	0.68	46.7
Approach		332	17.1	0.178	0.6	NA	0.1	0.4	0.02	0.04	59.0
West: Watts Lane											
10	L	2	50.0	0.074	29.8	LOS C	0.2	2.0	0.75	0.91	35.2
11	T	1	0.0	0.074	27.7	LOS B	0.2	2.0	0.75	1.00	35.0
12	R	12	18.2	0.074	28.1	LOS B	0.2	2.0	0.75	1.00	35.2
Approach		15	21.4	0.074	28.3	LOS B	0.2	2.0	0.75	0.99	35.2
All Vehicles		797	19.4	0.178	2.8	NA	0.3	3.0	0.05	0.16	55.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Watts Hwy PM 2020 with 150 emp

Pacific Hwy/ Watts Lane Intersection
2020 AM Peak WITH development
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Hwy (s)											
1	L	76	0.0	0.041	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	309	18.4	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	31	75.9	0.069	15.7	LOS B	0.3	3.0	0.54	0.77	43.7
Approach		416	19.2	0.178	2.6	NA	0.3	3.0	0.04	0.18	56.2
East: Watts Lane											
4	L	189	6.7	0.107	7.7	X	X	X	X	0.60	49.8
5	T	1	0.0	0.064	81.0	LOS F	0.2	2.0	0.91	1.00	19.0
6	R	2	100.0	0.064	85.6	LOS F	0.2	2.0	0.91	1.00	20.2
Approach		193	7.7	0.107	9.0	LOS A	0.2	2.0	0.01	0.61	48.5
North: Pacific Hwy (n)											
7	L	7	0.0	0.006	7.7	LOS A	0.0	0.1	0.13	0.56	49.0
8	T	309	18.4	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	15	0.0	0.016	10.2	LOS A	0.1	0.4	0.44	0.68	46.7
Approach		332	17.1	0.178	0.6	NA	0.1	0.4	0.02	0.04	59.0
West: Watts Lane											
10	L	2	50.0	0.048	24.9	LOS B	0.2	1.2	0.70	0.89	38.1
11	T	1	0.0	0.048	22.9	LOS B	0.2	1.2	0.70	1.00	37.8
12	R	9	0.0	0.048	22.4	LOS B	0.2	1.2	0.70	1.00	38.1
Approach		13	8.3	0.048	22.9	LOS B	0.2	1.2	0.70	0.98	38.0
All Vehicles		953	16.0	0.178	3.5	NA	0.3	3.0	0.04	0.23	54.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
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SIDRA Standard Delay Model used.

Appendix B – Harwood Sugar Mill Traffic Data

NSW Sugar Milling Co-operative Ltd.

Estimate of traffic movements to & from Harwood Mill & Refinery site. (along Watts Lane)

1. Cane Haulage

Basis – 750,000 tonnes of cane PA
Crushing Season June - December
Net tonnes cane per load – 21.5 tonnes

Total Number of Loads to Mill – 34,900
Total number of empty Bins from Mill – 34,900

Breakdown as follows

West along Yamba road to Harwood Bridge	- 5,780
East from Maclean to Harwood Bridge	- 430
From South side of Bridge along Highway	- 16,200
Along Watts lane from the west side of Highway	- 4,070
Along the Highway from the North to Watts lane	- 6,420
Direct to Mill from farms east of mill	- 1,070
Total	**34,900**

Note: Movements doubles to account for empty bins leaving the Mill

Total 69,800

2. Raw Sugar transport

Basis - Raw sugar transported from Broadwater & Condong Mill to Harwood storage shed
Tonnes – 150,000
Crushing Season - June – December
Net Per load – 30 tonnes

Total Number of Loads to Mill (from the North) –	5,000
Total number of empty Trucks from Mill	5,000
Total	**10,000**

3. Refined Sugar transport

Basis - Refined Sugar transported from Harwood
Tonnes – 250,000 PA
Period - All year
Assume all B doubles @ 42 tonnes
125,000 t to Grafton as Bulk
125,000t as packaged product 90% to the south 10% north
Bulk Sugar to Grafton

Total Number of Loads	– 2,900
Total number of empty Trucks	- 2,900
Total	**5,800**

Packaged Refined Sugar - South

Total Number of Loads	- 2,600
Total number of empty Trucks	- 2,600

(Note Most Empty Trucks would come from the North)

Total	**5,200**

Packaged Refined Sugar - North

Total Number of Loads	- 300
Total number of empty Trucks	- 300
Total	**600**

Total for Refined Sugar = 11,600

4. Molasses transport

Basis - Molasses transported from Harwood to Various locations
Tonnes – 30,000
Period Crushing Season - June – December
Net Per load – 30 tonnes

Total Number of Loads	1,000
Total number of empty Trucks to Mill	1,000
Total	2,000

Note: some molasses sales are in 200litre drums. This increases the traffic by an estimated 500 trip per year. (Total movements 1000)

Total	**3,000**

5. Mill Mud Transport

Basis - Mud transported from Harwood to farms within the Mill area
Tonnes – 35,000t
Crushing Season - June – December
Net Per load – 10 tonnes
Assume even Distribution North and south

Total Number of Loads to Mill (from the North) –	3.500
Total number of empty Trucks from Mill	3,500
Total	**7,000**

6. Boiler fuel Transport

Wood waste is transported to the site throughout the year. It is expected that the requirements will be 50,000 t PA

Net Per load – 20 tonnes
Period – All year

Total Number of Loads to Mill (from the south) –	2,500
Total number of empty Trucks from Mill	2,500
Total	5,000
Total	**6,000**

Grand Total = 104,700 Movements per year

Miscellaneous Traffic

1. Employee traffic**.** Harwood site employees about 175 people who access the site.
2. Deliveries to and from the Mill/Refinery site. (eg overnight transport companies, bulk process chemical deliveries).

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