Proposed Residential Subdivision
"Bayside Brunswick"
Bayside Way, Brunswick Heads

TRAFFIC IMPACT ASSESSMENT REPORT

November 2010

Prepared for:
Codlea Pty Ltd

TRAFFIC • PARKING • ACOUSTICS
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Reference: 33334

Project No: 33334
15 November 2010

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"Bayside Brunswick"
Bayside Way, Brunswick Heads

TRAFFIC IMPACT ASSESSMENT REPORT

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1. Introduction

TTM was engaged by Codlea Pty Ltd to prepare a Traffic Impact Assessment Report for future stages of the Bayside residential estate in Brunswick Heads. The development is located to the south of Brunswick Heads on land described as:

- Lot 73 on DP 851902

It is intended that this report will form part of an application to be lodged with the Byron Shire Council (BSC) with the concurrence of the Roads and Traffic Authority (RTA). This report has also been prepared with respect to the revised Director-General's Requirements, as issued on 14 October 2010.

This report addresses:

- Existing traffic conditions.
- Traffic generation and impact on the surrounding road network.
- Site layout, access and parking arrangements.

1.1 Site location

The proposed development, referred to as *The Site,* is situated as shown in Figure 1.

Figure 1: Site Locality

1.2 Applicable Standards & Policies

This report has been produced in accordance with the Byron Shire Council DCP 2002. In addition, the following reference documents have been used as part of this project:

- Australian / New Zealand Standard (AS / NZ 2890.1:2004).
- Austroads Guide to Traffic Engineering Practice (GTEP) Part 5 – Intersections at Grade.
- Austroads Guide to Traffic Engineering Practice (GTEP) Part 10 – Local Area Traffic Management.
- RTA Guide to Traffic Generating Developments.
- RTA Road Design Guide.
- State Environmental Planning Policy Number 11 (SEPP 11) – Traffic Generating Developments.

Abbreviations utilised in this report are described in Table 1 below

Table 1: Abbreviations

Abbreviation	Description
AM	Morning Peak Hour
ASD	Approach Sight Distance
AVD	Average Vehicle Delay (expressed in seconds)
BSC	Byron Shire Council
DCP	Development Control Plan
DOS	Degree of Saturation
km/h	Kilometres per hour
LOS	Level of Service
PM	Afternoon peak hour
RCV	Refuse Collection Vehicle
RTA	Roads and Traffic Authority
SISD	Safe Intersection Sight Distance
vpd	Vehicles Per Day
vph	Vehicles Per Hour

2. Background Information

2.1 Proposed Development

The proposed residential development is illustrated in The Site layout plan in Figure 2 and is comprised of the following:

- Single detached dwelling lots: 177
- Medium density flat lots: 1

Vehicular access to the development is to be via Stage 1 of the development. A single point of access from the Old Pacific Highway will be maintained (as required by DCP No. 6 – Bayside Brunswick Estate).

It is understood that the development is expected to be staged to meet market conditions. For the purposes of this study it has been assumed that the development would be completed in 2011.

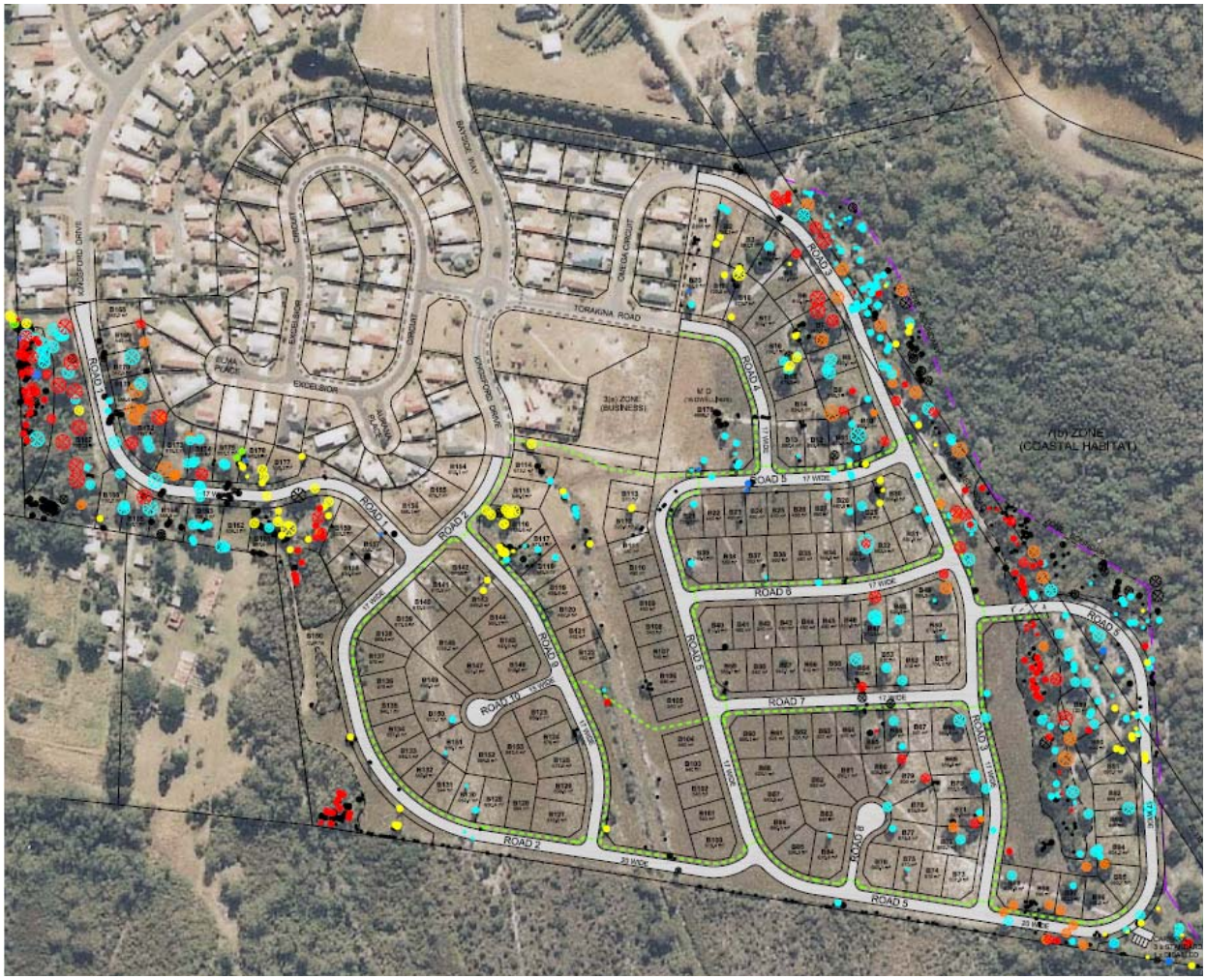

Figure 2: Site Plan

3. Existing Conditions

3.1 Site Description

The Site currently is undeveloped land.

3.2 Road Network and Transport Infrastructure

Roads in the vicinity of The Site are described as follows:

Old Pacific Highway:

- Is administered by Byron Shire Council
- Has one lane in each direction with an average pavement width of 10m
- Has a signposted speed limit of 60 km/h

Bayside Way:

- Is administered by Byron Shire Council
- Has one lane in each direction with an average pavement width of 11m
- Has a signposted speed limit of 50 km/h

Pacific Highway:

- Is administered by the Roads and Traffic Authority
- Main road freight route from Sydney to Brisbane
- Has two lanes in each direction, separated by central median
- Grade separated interchange with Gulgan Road (Old Pacific Highway) providing access to Mullumbimby and Brunswick Heads
- Has a signposted speed limit of 110km/h

Images of the surrounding roads are provided in Figure 3.

Old Pacific Highway – Facing north at Bayside Way

Old Pacific Highway – Facing south at Bayside Way

Bayside Way – Facing east at Old Pacific Highway

Torakina Road – Facing east at Omega Circuit towards future stages

Kingsford Drive – Facing south towards future stages

Kingsford Drive – Facing north towards roundabout at Excelsior Circuit (Child Care on right)

Figure 3: Images of Surrounding Road Network

3.3 Road Planning

TTM is not aware of planning for any future upgrades to the surrounding road network.

3.4 Traffic Volumes

The Bayside Brunswick development has one access point to the surrounding road network – the intersection of Old Pacific Highway and Bayside Way.

The existing turning movements at this intersection were obtained by undertaking the following traffic surveys:

- 7am - 9am Thursday 21 May 2009
- 3pm - 3.30pm Thursday 21 May 2009

The above surveys permitted the identification of turning movements during the AM and PM peak periods as shown in Figure 4 and Figure 5 respectively.

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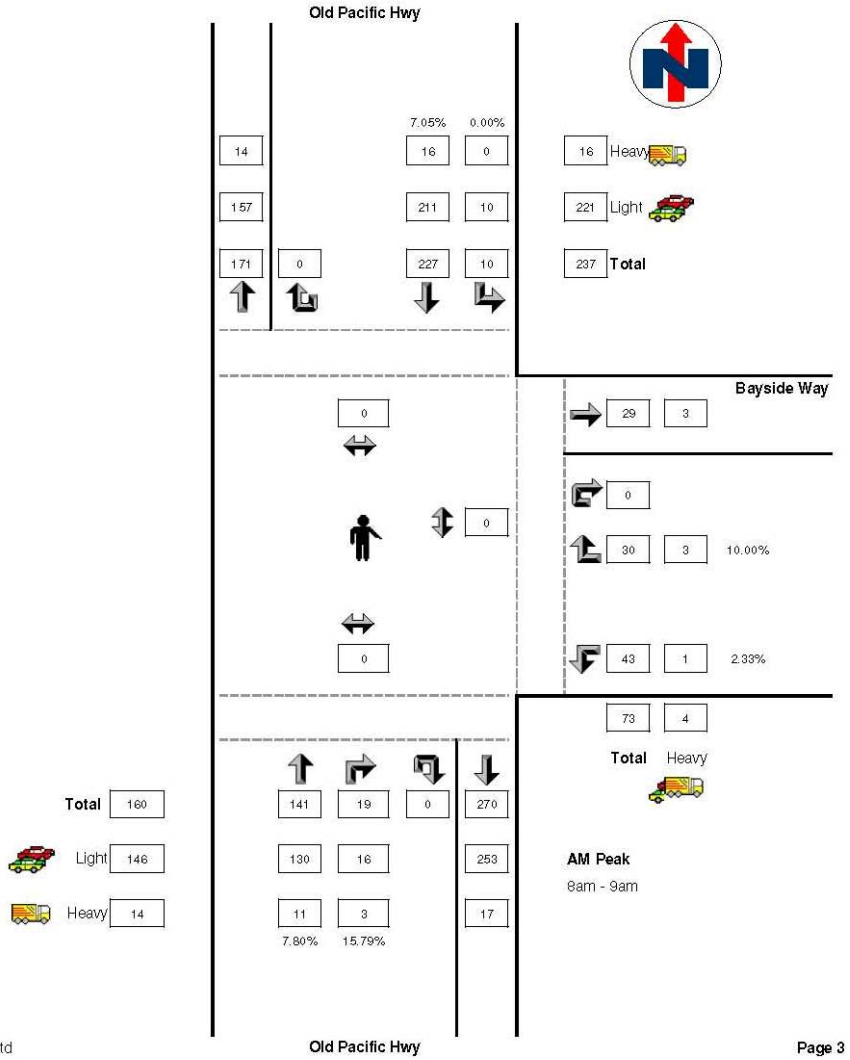

Figure 4: Existing AM Peak Traffic Volumes (2009)

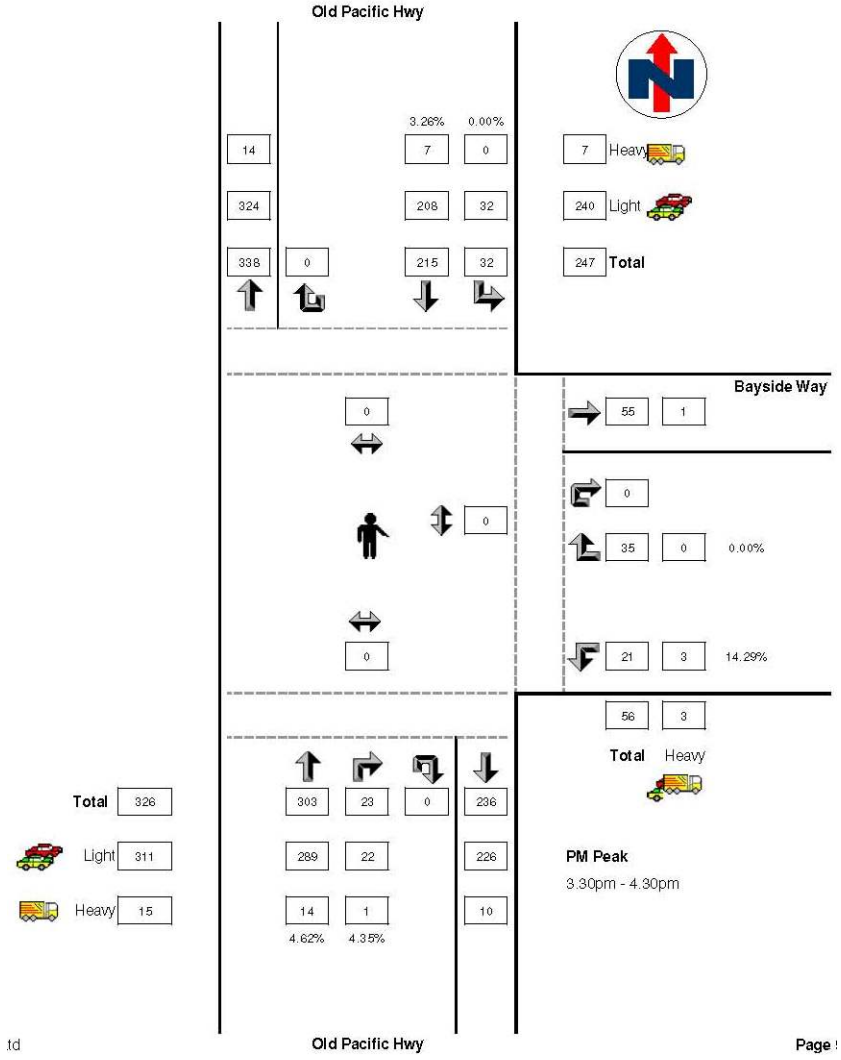

Figure 5: Existing PM Peak Traffic Volumes (2009)

4. Traffic Analysis

4.1 Traffic Generation

Traffic generation for the proposed development is shown in Table 2.

Table 2: Traffic Generation

			Daily (VPD)			Peak Hour Vehicle Trips (PHVT)		
Dwelling Type	Number of lots	Number of Dwellings	Traffic Generation Rate[1]	Unit	Traffic Generation (trips)	Traffic Generation Rate[1]	Unit	Traffic Generation (trips)
Detached Lot	177	177	9	per dwelling	1593	0.85	per dwelling	150
Medium Density Flat	1	16	6.5	per dwelling	104	0.65	per dwelling	10
TOTALS	**178**	**193**			**1697**			**161**

1 RTA Guide to Traffic Generating Developments

Assumption for Medium Density From DCP:	
Dwelling Size	**Site Area Required Per Dwelling**
Large (>85sqm)	300 sqm

Table 2 shows an estimated peak and daily two-way traffic generation of **161 vph** and **1,697 vpd** respectively.

4.2 Traffic Distribution

4.2.1 Directional Splits

Directional splits have been determined by existing traffic flows and are shown in Table 3

Table 3: Estimated Peak Hour Directional Splits

Peak Period	Direction IN	OUT
AM	30%	70%
PM	50%	50%

Peak Period	Direction IN	OUT
AM	48	113
PM	80	80

4.2.2 Distribution Patterns

Based on the existing traffic survey characteristics and the overall layout of The Site relative to the surrounding road network, TTM has estimated the distribution of the development traffic volumes to be as shown in Figure 6.

4.3 Development Traffic Volumes

The estimated development traffic volumes have been established based on the directional splits and distribution patterns described above and are depicted in Figure 6.

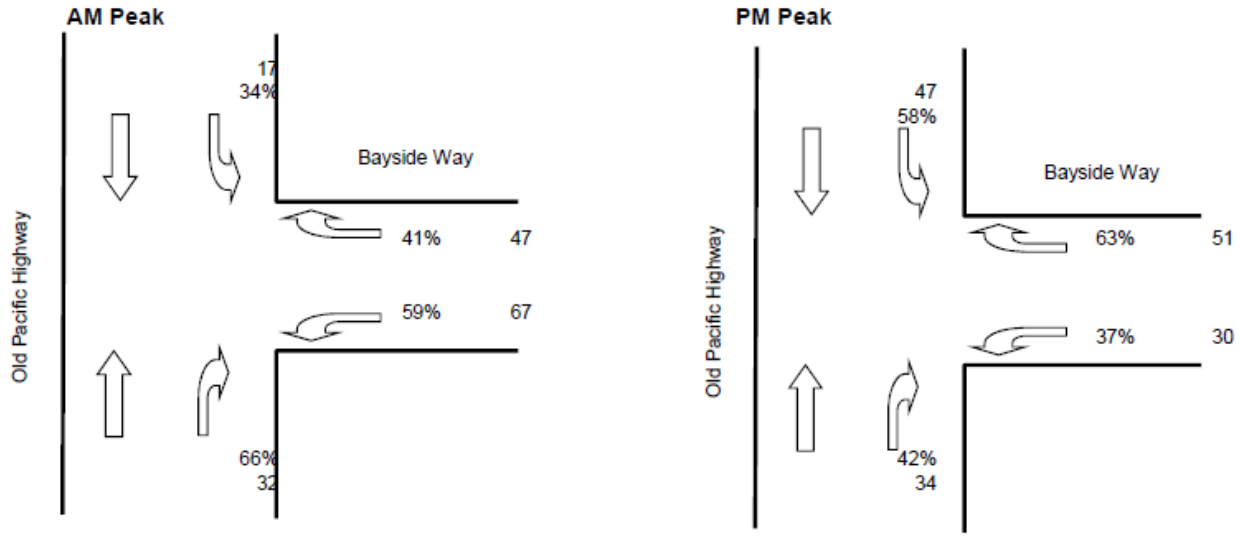

Figure 6: Traffic Distribution and Development Traffic Volumes

4.4 Forecast Base Traffic Volumes

TTM has sent email correspondence to the RTA Northern Region on 13 June 2009 requesting their input in identifying an appropriate growth rate for roads in the vicinity of the site. At the time of writing TTM had yet to receive a response.

The adoption of the following annual compound growth rates has been based on providing a conservative assessment:

- Old Pacific Highway: 3% (representing moderate growth in surrounding region)
- Bayside Way: 2% (a conservative representation of future growth in existing Bayside community)

The growth rates have been applied to the existing background traffic volumes for a period of 12 years (i.e. 10 years beyond an estimated project completion date of 2012) to determine the forecast base traffic volumes for the AM and PM peaks shown in Figure 7 and Figure 8 respectively.

The estimated forecast base with development traffic volumes for the AM and PM peaks are shown in Figure 9 and Figure 10 respectively.

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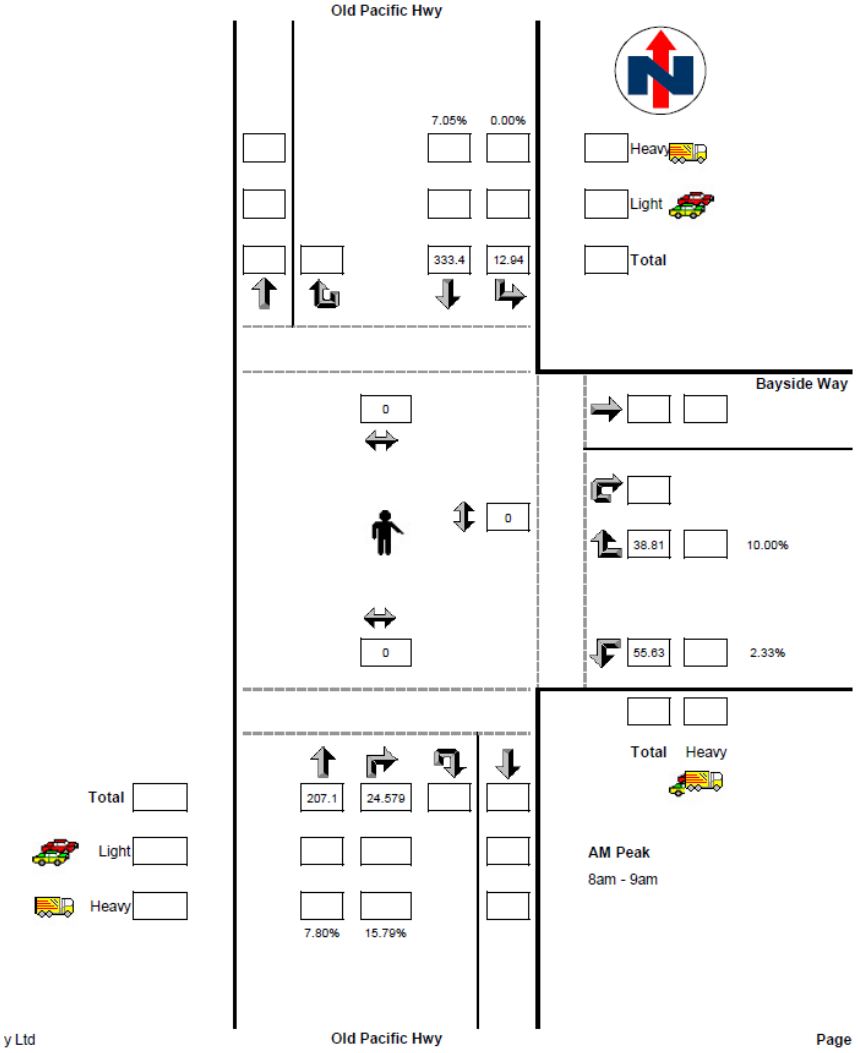

Figure 7: Forecast (2022) Traffic Volumes without development – AM Peak

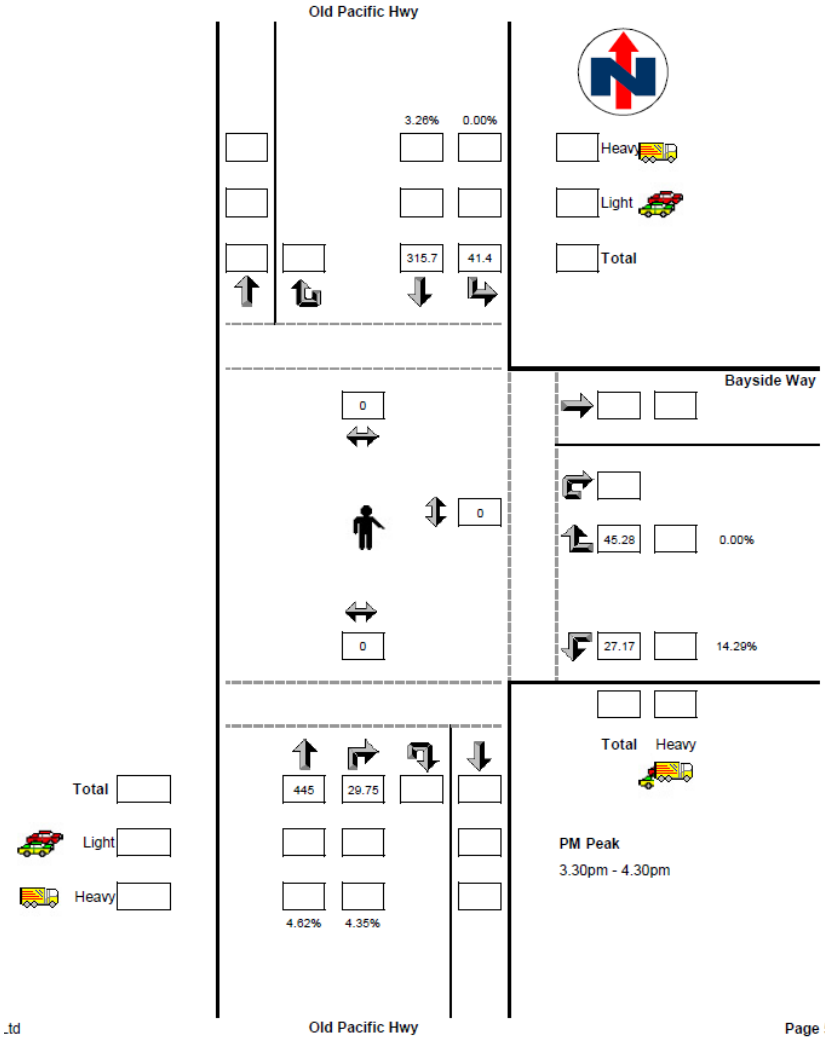

Figure 8: Forecast (2022) Traffic Volumes without development – PM Peak

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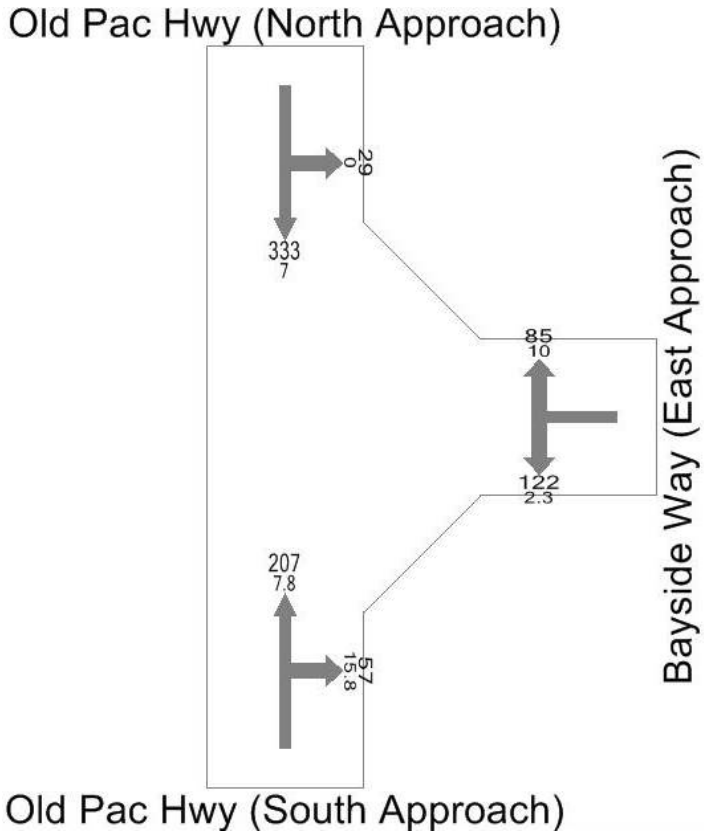

Figure 9: Forecast (2022) Traffic Volumes with development – AM Peak

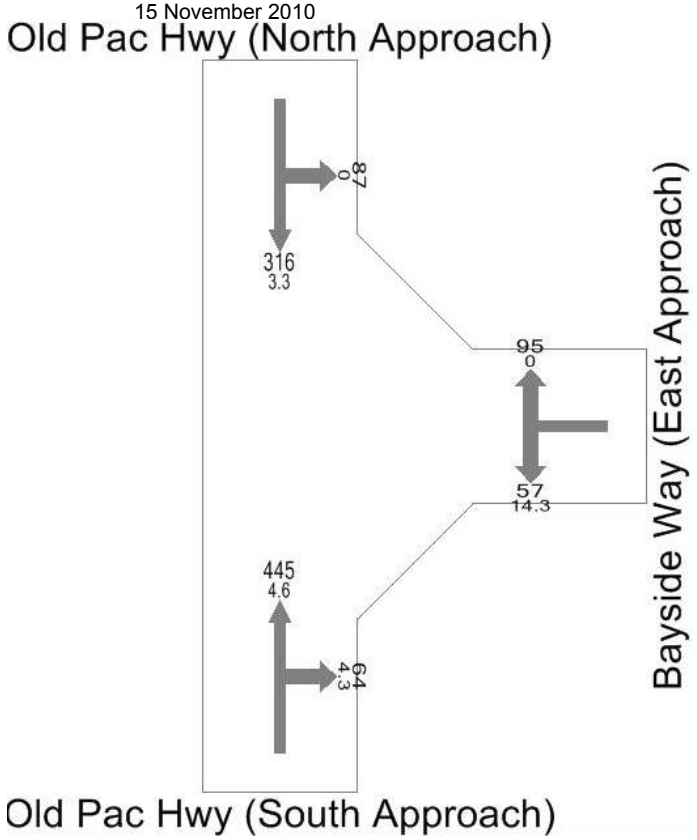

Figure 10: Forecast (2022) Traffic Volumes with development – PM Peak

5. Intersection Analysis

5.1 Intersection Performance

The performance of the road network is largely dependent on the operating performance of key intersections that are the critical capacity control points on the network. It is therefore appropriate to consider intersection operation as an essential measure of capacity within the study area. The SIDRA INTERSECTION analysis software has been used to assess the peak hour operating performance of the intersection of Bayside Way and Old Pacific Highway.

5.2 Key Findings

The existing intersection arrangement (refer to Figure 11) has been analysed for the following design scenarios:

- Scenario 1: Existing Traffic Volumes – AM and PM Peaks
- Scenario 2: Forecast (2022) Traffic Volumes without Development Case – AM and PM Peaks
- Scenario 3: Forecast (2022) Traffic Volumes with Development Case – AM and PM Peaks

The performance of the existing intersection configuration, as determined from SIDRA analysis, is presented in Table 4. SIDRA output in included in Appendix A.

Table 4: Intersection Performance

Movement		Scenario	Demand Flow (veh/hr)	Deg. of Sat.	Avg. Delay (seconds)	LoS	95% Queue (m)
AM Peak							
Old Pacific Highway (south approach)	Through	1	141	0.076	0	A	0
		2	207	0.111	0	A	0
		3	207	0.111	0	A	0
	Right	1	19	0.015	8.9	A	1
		2	25	0.028	9.9	A	1
		3	57	0.066	10.1	B	3
Bayside Way (east approach)	Left	1	43	0.058	8.3	A	1
		2	56	0.080	12.0	B	2
		3	122	0.174	12.3	B	5
	Right	1	30	0.040	9.8	A	1
		2	39	0.121	19.9	C	4
		3	85	0.290	23.1	C	12
Old Pacific Highway (north approach)	Left	1	10	0.005	7.4	A	0
		2	13	0.007	7.4	A	0
		3	29	0.016	7.4	A	0

Movement		Scenario	Demand Flow (veh/hr)	Deg. of Sat.	Avg. Delay (seconds)	LoS	95% Queue (m)
	Through	1	211	0.113	7.4	A	0
		2	333	0.178	0	A	0
		3	333	0.178	0	A	0
PM Peak							
Old Pacific Highway (south approach)	Through	1	303	0.160	0	A	0
		2	445	0.235	0	A	0
		3	445	0.235	0	A	0
	Right	1	23	0.016	8.4	A	1
		2	30	0.030	9.2	A	1
		3	64	0.067	9.5	A	3
Bayside Way (east approach)	Left	1	21	0.033	9.0	A	1
		2	27	0.045	13.0	B	1
		3	57	0.094	13.2	B	3
	Right	1	35	0.053	10.5	A	2
		2	45	0.190	24.8	C	6
		3	95	0.448	32.8	D	17
Old Pacific Highway (north approach)	Left	1	32	0.017	7.4	A	0
		2	41	0.022	7.4	A	0
		3	87	0.047	7.4	A	0
	Through	1	215	0.113	0	A	0
		2	316	0.165	0	A	0
		3	316	0.165	0	A	0

TTM's findings are as follows:

- The intersection will operate within capacity and at an acceptable LOS for all scenarios on all approaches.
- Based on the analysis carried out as part of this assessment it was found that the existing intersection layout offers the most practical and efficient use of the road reserve and should be maintained. No intersection upgrade works are required based on capacity considerations.

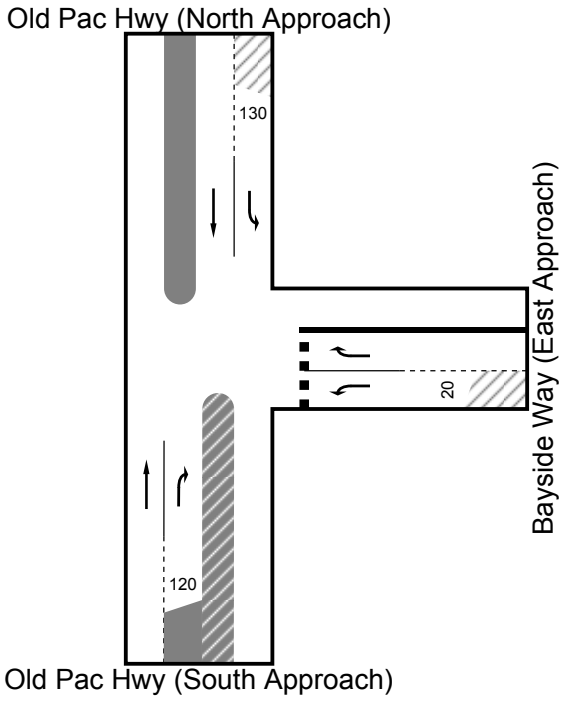

Figure 11: Existing Intersection Arrangement for Old Pacific Highway and Bayside Way

While the layout of the intersection satisfies capacity requirements for projected traffic volumes, TTM recommends the following improvements to improve safety:

- Formalisation of the left side on exit with standup kerbing.
- Construction of raised concrete median 1.2m wide.
- Installation of 'Stop' Control
- Installation of street lighting at intersection.

The above recommendations are based on site observations that sight distance to north is obscured until the hold line is reached (refer to Figure 12). TTM recommends the conversion of the intersection control from Give Way to Stop. The installation of a raised concrete median necessitates the requirement for street lighting at the intersection.

It is noted that the above recommendations have been made independent of a review of the crash history at the intersection.

Figure 12: Bayside Way – Facing north at Old Pacific Highway

6. Site Analysis

6.1 Site Access Requirements

Byron Shire Council references the Northern Rivers Local Government Development Design and Construction Manual with relevant information provided in Table 5.

Table 5: Geometric Design Requirements for Urban Roads

Road Type	Maximum Traffic Volume (vpd) [1]	Maximum Speed [2] (km/h)	Carriageway Width (m)[3][10] Min	Parking Provisions Within Road Reserve	Kerbing [4]	Footpath Requirement [15] minimum	Bicycle path Requirement	Verge Width (m) minimum (each side)	Minimum Road Reserve Width (m)
Access Street	100	40	6	Carriageway	Mountable	No	No	3	14
Local Street	2000	50	7-9	Carriageway	Mountable	Network Dependent	Network Dependent	3.5	15-17
Collector Street	3000	50	11	Carriageway	Mountable	One side [16]	Network Dependent	3.5	18
Distributor Road	3000+	60	13	Carriageway	Upright	One Side	Network Dependent	3.5	20

Austroads GTEP Part 5 requires the following:

- 113m of SISD and 63m of ASD must be provided for a 60km/h design speed.

6.2 Adequacy of Proposed Site Access

The Department of Planning issued updated Director-General's Environmental Assessment Requirements (DGRs) on 14 October 2010. This included a letter from Byron Shire Council dated 1 November 2006 that included the following statements in relation to road design:

- Road design is in accordance with the Brunswick Heads Settlement Strategy 2004, i.e. road adjacent to significant vegetation and fire hazard.
- The street layout needs to ensure that vehicles are not encouraged to excess speeds.
- From a traffic management point of view the 15m wide road adjacent to the Childcare Centre would be unnecessary and probably cause inappropriate traffic movements.

TTM has considered the above comments in undertaking a review of the internal road network, and has subsequently provided design input to the Project Team, resulting in final development plans incorporating these recommendations, as illustrated in Figure 13.

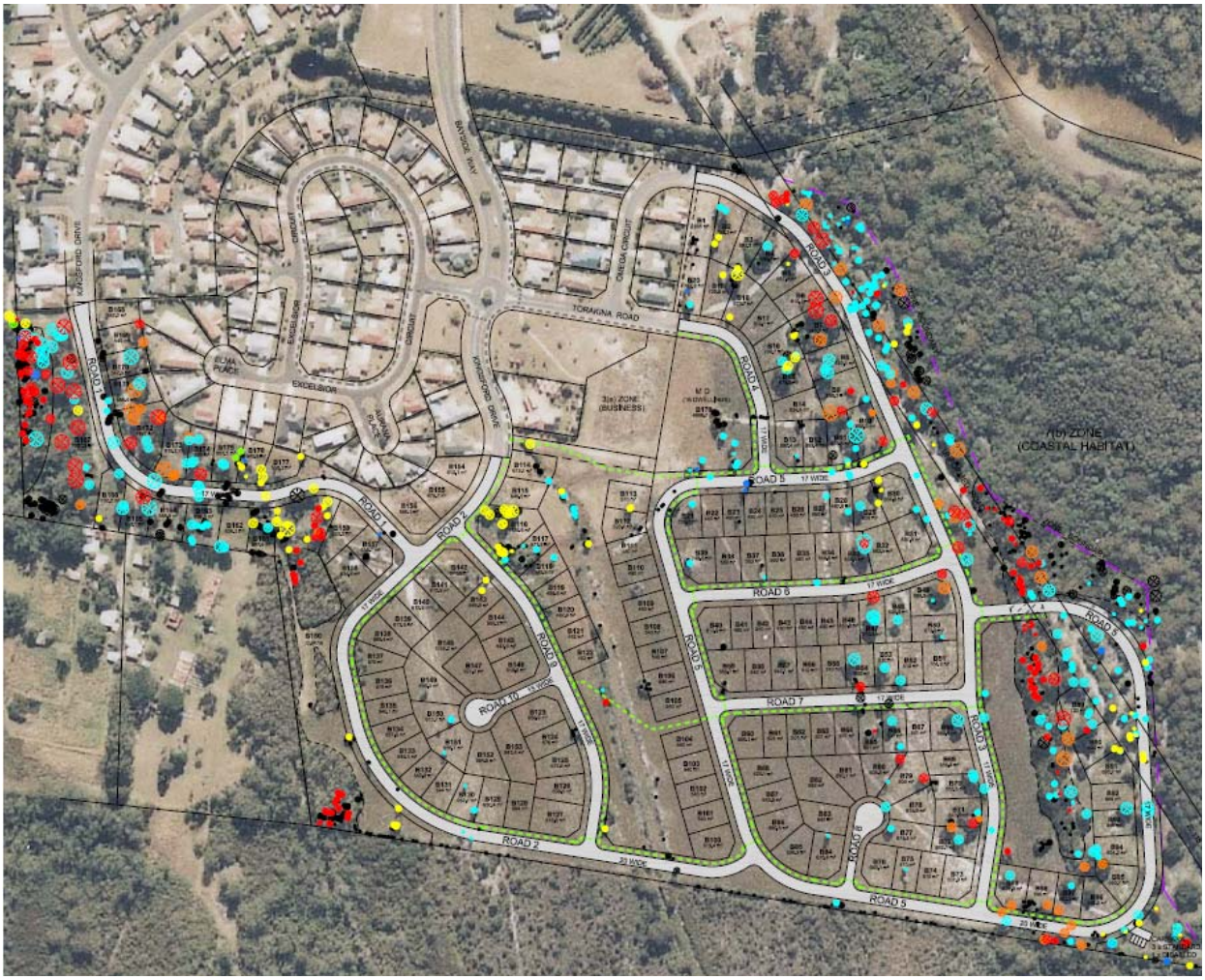

Figure 13: Final Site Layout

TTM considers that the final site plans developed through this process meet Council's requirements and satisfy the geometric considerations in the Northern Rivers Local Government Development Design and Construction Manual. By design, the likelihood of excessive speeds is reduced.

6.3 Pedestrians and Cyclists

Existing footpaths and proposed locations for off-road shared paths and footpaths are shown in Figure 14. These facilities are consistent with the requirements of the Northern Rivers Local Government Development Design and Construction Manual and link with the cycleway network as shown in Byron Shire Council (August 2008) *Byron Shire Bike Strategy and Action Plan*. An excerpt from the Bike Plan showing existing and potential cycleways in Brunswick Heads South is shown in Appendix B.

Figure 14: Existing and Proposed Cycle Routes and Footpaths

6.4 Public Transport

The Bayside Estate is serviced by two bus companies with details as follows:

- Kirklands Buslines: Route 610/611 – Mullumbimby/Brunswick Heads/Byron Bay to Lismore. One service to Lismore departing 7.30am with return service arriving at 5pm. Combined school/timetabled service. Continues to operate in school holiday periods. Pick-up/set-down at intersection of Old Pacific Highway and Bayside Way.
- Brunswick Valley Coaches: Route 645 – Ballina – Mullumbimby – Brunswick Heads – Ocean Shores – Tweed Heads.

  School Days:

  – 7am service to Brunswick Hds/Tweed Heads; 7.50am service to Ballina; 8.17am service to Byron Bay; 2.45pm service to Byron Bay; 4pm service to Brunswick Hds/New Brighton; 4.17pm service to Mullumbimby; 4.30pm service to Mullumbimby.

  School Holidays Only:

  – 3.27pm service to Brunswick Hds/New Brighton; 4.17pm service to Mullumbimby

  Every Weekday:

– 8.12am service to Mullumbimby; 8.35am service to Brunswick Heads; 10.32am service to Mullumbimby; 12.27pm service to Brunswick Hds/New Brighton, 1.02pm service to Mullumbimby; 1.37pm service to Brunswick Heads; 2.45pm to Mullumbimby; 5.12pm to Brunswick Hds/New Brighton.

Weekends:

– 9.35am service to Mullumbimby/Byron Bay; 10.42am service to Brunswick Hds/New Brighton; 3.35pm service to Mullumbimby/ByronBay; 4.37pm service to Brunswick Hds/New Brighton.

TTM confirmed pick-up/set-down arrangements directly with Brunswick Valley Coaches as follows:

- All school services travel along Bayside Way and U-Turn at roundabout at Torakina Road to service bus shelter at roundabout.
- All non-school services pick-up/set-down at intersection of Old Pacific Highway and Bayside Way.

Brunswick Valley Coaches confirmed that they will extend school bus services following completion of future stages of the Bayside Estate.

Figure 15 shows existing bus routes and stops, in addition to recommended extended bus route and stop locations. Existing published bus timetables and routes are included in Appendix C.

TTM recommends extending the route for all bus services, with the exception of the Ballina – Tweed Heads service, into the Bayside Estate as shown in Figure 15, following completion of the development.

Figure 15: Existing and Proposed Bus Routes and Stops

7. Key Findings and Conclusion

7.1 Key Findings

7.1.1 Intersection Capacity

An analysis of the operation of the intersection of Old Pacific Highway and Bayside Way indicates that its operation will remain satisfactory through to the 10-year planning horizon. Therefore no upgrades are required to increase capacity.

7.1.2 Site Access

The final site layout developed with TTM's design input is considered to meet Council's requirements and satisfy the geometric considerations in the Northern Rivers Local Government Development Design and Construction Manual.

7.1.3 Pedestrians and Cyclists

The recommended facilities shown in Section 6.3 are consistent with the requirements of the Northern Rivers Local Government Design and Construction Manual and link with the cycleway network as shown in Byron Shire Council's (August 2008) *Byron Shire Bike Strategy Plan*.

7.1.4 Public Transport

Two bus companies provide services to the Bayside Estate. Routes provide links predominantly to Mullumbimby and Brunswick Heads/New Brighton with limited services to Byron Bay, Ballina, Murwillumbah and Tweed Heads. Currently only school bus services travel into the estate. TTM recommends extending the route for all bus services, with the exception of the Ballina–Tweed Heads service, into the Bayside Estate following its completion.

7.2 Conclusion

TTM has found that the proposed development will operate satisfactorily through to a 10-year study horizon (post-opening).

Through evaluation and assessment of the proposed development and site layout plans, TTM considers this development complies with the relevant traffic and transport requirements of the Byron Shire Development Control Plan as well as the other reference documents used.

On this basis, TTM recommends that the development be granted approved on traffic engineering and transport planning grounds.

Appendix A

SIDRA OUTPUT

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AM Peak - Existing

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)
Old Pac Hwy (South Approach)										
2	T	141	7.8	0.076	0.0	LOS A	0	0.00	0.00	60.0
3	R	19	15.8	0.015	8.9	LOS A	1	0.33	0.60	47.0
Approach		**160**	**8.8**	**0.076**	**1.1**	**LOS A**	**1**	**0.04**	**0.07**	**58.2**
Bayside Way (East Approach)										
4	L	43	2.3	0.058	8.3	LOS A	1	0.32	0.63	42.7
6	R	30	10.0	0.040	9.8	LOS A	1	0.43	0.68	41.9
Approach		**73**	**5.5**	**0.058**	**8.9**	**LOS A**	**1**	**0.36**	**0.65**	**42.4**
Old Pac Hwy (North Approach)										
7	L	10	0.0	0.005	7.4	LOS A	0	0.00	0.65	48.6
8	T	211	7.1	0.113	0.0	LOS A	0	0.00	0.00	60.0
Approach		**221**	**6.8**	**0.113**	**0.3**	**LOS A**		**0.00**	**0.03**	**59.4**
All Vehicles		**454**	**7.3**	**0.113**	**2.0**	**Not Applicable**	**1**	**0.07**	**0.14**	**55.4**

PM Peak - Existing

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)
Old Pac Hwy (South Approach)										
2	T	303	4.6	0.160	0.0	LOS A	0	0.00	0.00	60.0
3	R	23	4.3	0.016	8.4	LOS A	1	0.33	0.60	47.0
Approach		**326**	**4.6**	**0.160**	**0.6**	**LOS A**	**1**	**0.02**	**0.04**	**58.9**
Bayside Way (East Approach)										
4	L	21	14.3	0.033	9.0	LOS A	1	0.34	0.63	42.6
6	R	35	0.0	0.053	10.5	LOS B	2	0.50	0.75	41.1
Approach		**56**	**5.4**	**0.053**	**9.9**	**LOS A**	**2**	**0.44**	**0.70**	**41.6**
Old Pac Hwy (North Approach)										
7	L	32	0.0	0.017	7.4	LOS A	0	0.00	0.65	48.6
8	T	215	3.3	0.113	0.0	LOS A	0	0.00	0.00	60.0
Approach		**247**	**2.8**	**0.113**	**1.0**	**LOS A**		**0.00**	**0.08**	**58.3**
All Vehicles		**629**	**4.0**	**0.160**	**1.6**	**Not Applicable**	**2**	**0.05**	**0.12**	**56.6**

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AM Peak - 2021 - No Development

Two-way stop

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)
Old Pac Hwy (South Approach)										
2	T	201	8.0	0.108	0.0	LOS A	0	0.00	0.00	60.0
3	R	24	16.7	0.027	9.8	LOS A	1	0.42	0.66	46.5
Approach		**225**	**8.9**	**0.108**	**1.1**	**LOS A**	**1**	**0.04**	**0.07**	**58.3**
Bayside Way (East Approach)										
4	L	55	1.8	0.078	12.0	LOS B	2	0.40	0.89	40.7
6	R	38	10.5	0.115	19.5	LOS C	4	0.64	1.00	36.2
Approach		**93**	**5.4**	**0.115**	**15.1**	**LOS C**	**4**	**0.50**	**0.94**	**38.7**
Old Pac Hwy (North Approach)										
7	L	13	0.0	0.007	7.4	LOS A	0	0.00	0.65	48.6
8	T	324	7.1	0.174	0.0	LOS A	0	0.00	0.00	60.0
Approach		**337**	**6.8**	**0.174**	**0.3**	**LOS A**		**0.00**	**0.02**	**59.5**
All Vehicles		**655**	**7.3**	**0.174**	**2.6**	**Not Applicable**	**4**	**0.09**	**0.17**	**54.9**

PM Peak - 2021 - No Development

Two-way stop

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)
Old Pac Hwy (South Approach)										
2	T	432	4.6	0.228	0.0	LOS A	0	0.00	0.00	60.0
3	R	29	3.4	0.028	9.1	LOS A	1	0.40	0.65	46.7
Approach		**461**	**4.6**	**0.228**	**0.6**	**LOS A**	**1**	**0.03**	**0.04**	**59.0**
Bayside Way (East Approach)										
4	L	27	14.8	0.044	12.9	LOS B	1	0.41	0.88	40.5
6	R	44	0.0	0.178	23.8	LOS C	6	0.76	1.00	33.6
Approach		**71**	**5.6**	**0.178**	**19.7**	**LOS C**	**6**	**0.63**	**0.95**	**35.9**
Old Pac Hwy (North Approach)										
7	L	41	0.0	0.022	7.4	LOS A	0	0.00	0.65	48.6
8	T	307	3.3	0.161	0.0	LOS A	0	0.00	0.00	60.0
Approach		**348**	**2.9**	**0.161**	**0.9**	**LOS A**		**0.00**	**0.08**	**58.5**
All Vehicles		**880**	**4.0**	**0.228**	**2.2**	**Not Applicable**	**6**	**0.06**	**0.13**	**55.9**

Project No: 33334
15 November 2010

AM Peak - 2021 - With Development

Two-way stop

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)
Old Pac Hwy (South Approach)										
2	T	201	8.0	0.108	0.0	LOS A	0	0.00	0.00	60.0
3	R	71	15.5	0.082	10.1	LOS B	3	0.44	0.70	46.3
Approach		**272**	**9.9**	**0.108**	**2.6**	**LOS A**	**3**	**0.12**	**0.18**	**55.8**
Bayside Way (East Approach)										
4	L	152	2.0	0.216	12.3	LOS B	6	0.44	0.92	40.5
6	R	106	10.4	0.359	24.5	LOS C	16	0.75	1.07	33.5
Approach		**258**	**5.4**	**0.360**	**17.3**	**LOS C**	**16**	**0.57**	**0.98**	**37.3**
Old Pac Hwy (North Approach)										
7	L	37	0.0	0.020	7.4	LOS A	0	0.00	0.65	48.6
8	T	324	7.1	0.174	0.0	LOS A	0	0.00	0.00	60.0
Approach		**361**	**6.4**	**0.174**	**0.8**	**LOS A**		**0.00**	**0.07**	**58.7**
All Vehicles		**891**	**7.2**	**0.359**	**6.1**	**Not Applicable**	**16**	**0.20**	**0.37**	**49.6**

PM Peak - 2021 - With Development

Two-way stop

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)
Old Pac Hwy (South Approach)										
2	T	432	4.6	0.228	0.0	LOS A	0	0.00	0.00	60.0
3	R	79	3.8	0.083	9.6	LOS A	3	0.45	0.71	46.4
Approach		**511**	**4.5**	**0.228**	**1.5**	**LOS A**	**3**	**0.07**	**0.11**	**57.5**
Bayside Way (East Approach)										
4	L	71	14.1	0.118	13.3	LOS B	4	0.45	0.92	40.2
6	R	118	0.0	0.562	36.4	LOS E	24	0.88	1.16	28.2
Approach		**189**	**5.3**	**0.561**	**27.7**	**LOS D**	**24**	**0.72**	**1.07**	**31.8**
Old Pac Hwy (North Approach)										
7	L	109	0.0	0.059	7.4	LOS A	0	0.00	0.65	48.6
8	T	307	3.3	0.161	0.0	LOS A	0	0.00	0.00	60.0
Approach		**416**	**2.4**	**0.161**	**2.0**	**LOS A**		**0.00**	**0.17**	**56.6**
All Vehicles		**1116**	**3.9**	**0.562**	**6.1**	**Not Applicable**	**24**	**0.15**	**0.29**	**50.3**

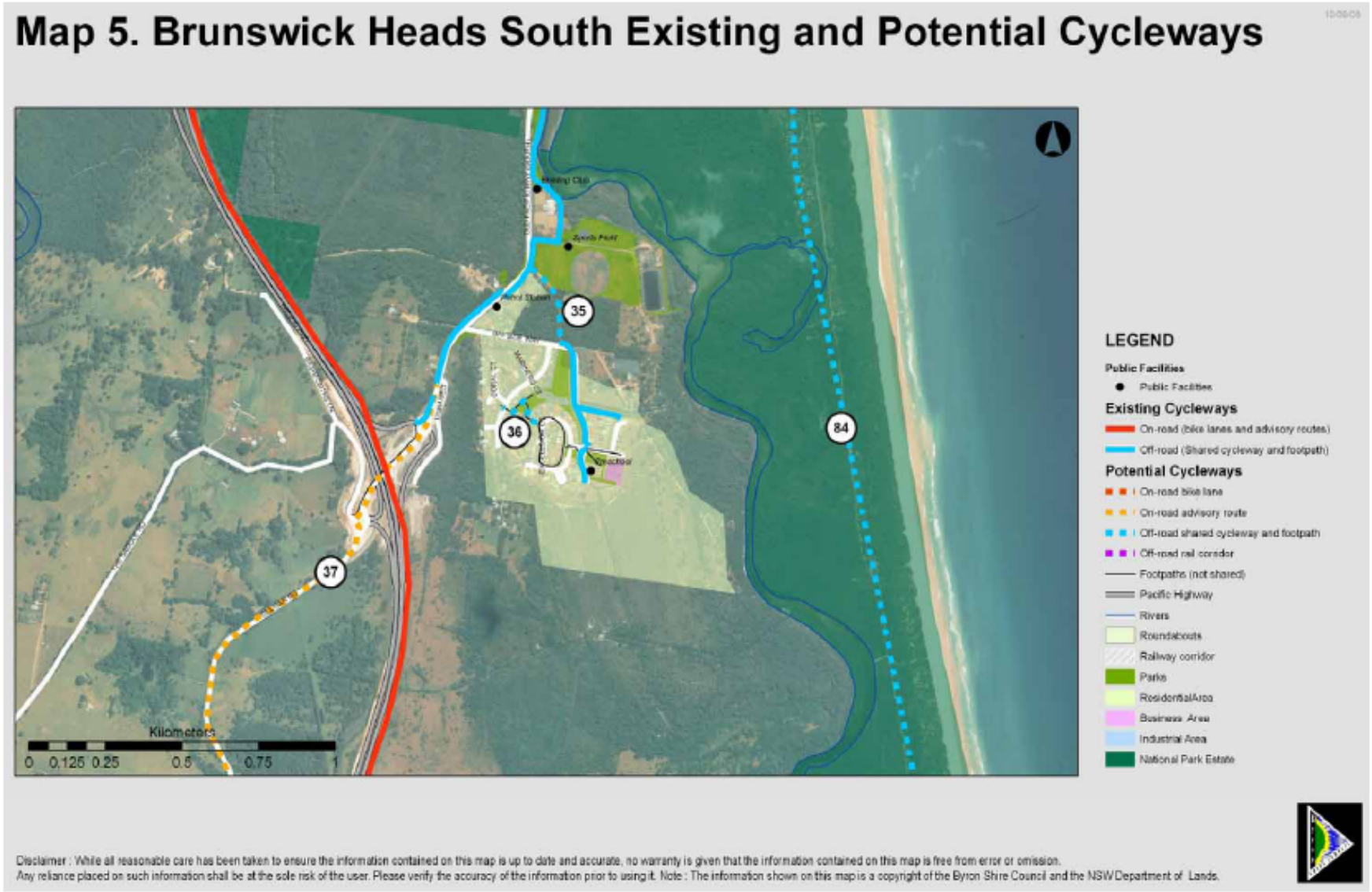
Appendix B

BYRON SHIRE BIKE STRATEGY AND ACTION PLAN

Map 5: Brunswick Heads South Existing and Potential Cycleways

Project No: 33334
15 November 2010

Map 5: Brunswick Heads South Existing and Potential Cycleways



Appendix C

EXISTING BUS TIMETABLES AND ROUTE MAP

Kirklands Buslines: Route 610/611 Timetable

Brunswick Valley Coaches: Route 645 Timetable

Brunswick Valley Coaches: Route 645 Route Map

Kirklands BUSLINES
A member of the Buslines Group
John A. Gilbert Pty Limited ABN 99 000 016 339

76 Military Road
PO Box 1135
Lismore NSW 2480
Tel: (02) 6626 1499
Fax: (02) 6621 9749
www.kirklands.com.au
info@kirklands.com.au

Mullumbimby / Brunswick Heads / Byron Bay to Lismore — Route 610 / 611

	Monday to Friday		
Route No.	610	610	610
TO LISMORE	am School Days Only	am School Holidays Only	am School Days Only
Mullumbimby Travel - Stuart Street	7:20	7:15	-
Brunswick Heads Travel Centre - Park St	7:30	7:25	-
Byron Bay Bus Zone - Johnson Street	-	7:45	7:35
Bangalow Bus Stop	8:00	8:05	8:00
Binnaburra - Opposite Buttery	8:05	-	-
Nashua - Lismore Road	8:10	-	-
Clunes - Opposite Shop	8:15	-	-
Bex Hill - Lismore Road	8:20	-	-
Lismore Spinks Park - Transit Centre	8:45	8:40	8:40

Lismore to Mullumbimby / Brunswick Heads / Byron Bay — Route 610 / 611

	Monday to Friday		
	610	610	610
FROM LISMORE	pm School Days Only	pm School Days Only	pm School Holidays Only
Lismore Spinks Park - Transit Centre	3:30	3:30	3:30
Bex Hill - Lismore Road	3:45	-	-
Clunes - Opposite Shop	3:55	-	-
Nashua - Lismore Road	4:02	-	-
Binnaburra - Opposite Buttery	4:08	-	-
Bangalow Bus Stop	4:15	4:15	4:00
Byron Bay Bus Zone - Johnson Street	-	4:40	4:25
Mullumbimby Travel - Stuart Street	4:45	-	4:50
Brunswick Heads Travel Centre - Park St	4:55	-	5:00

645 Ballina - Mullumbimby - Brunswick Heads - Ocean Shores - Tweed Heads

BVC

Weekdays (Monday To Friday) | **Weekends** (and Public Holidays)

Departing	am	am	am	am	am	am	am	pm	pm	pm	pm	pm	pm	pm	pm	am	pm
	s	s	s	s	v	s	s			s	ps	v	s	s	r	r	br
Ballina	...	...	...	...	...	...	...	...	...	...	...	...	...	s3.00	...	...	...
Lennox Head (Exavier)	...	...	...	...	...	...	...	...	...	...	...	...	...	s3.25	...	...	...
Byron Bay Information Centre	...	...	...	...	...	...	s9.05	...	...	...	...	...	s3.35	...	...	10.15	b4.05
Main Arm Corner Red Hill Rd	...	s7.30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mullumbimby Newsagent	s6.55	s7.40	...	...	8.25	...	...	12.15	1.30	...	p3.20	v3.20	...	...	5.05	10.35	4.25
Uncle Toms	s7.00	s7.45	...	...	8.30	...	...	12.20	1.35	...	*3.25	v3.25	s3.55	s4.00	5.10	...	...
Bayside pick up Pacific Hwy	...	...	...	...	8.35	...	...	12.25	1.37	...	*3.27	v3.27	...	...	5.12	...	...
Brunswick Information Centre	s7.05	...	s7.40	...	8.40	s8.40	s9.25	12.27	1.40	s2.40	*3.30	v3.30	s4.00	s4.05	5.15	10.45	4.40
Warrambool Rd	...	...	s7.43	...	...	...	...	...	1.50	...	...	...	...	...	...	...	...
O/S Shops	...	...	...	...	v8.43	s8.43	s9.30	12.30	1.55	s2.52	*s3.35	v3.32	s4.02	s4.10	5.20	10.50	4.45
Goondooloo Dr	...	...	...	...	v8.45	s8.45	...	12.32	Terminate	s2.53	*s3.35	v3.35	s4.03	...	r5.22	r10.52	r4.47
Coomburra Cres	...	...	s7.45	...	v8.47	s8.47	...	12.34		s2.54	*s3.35	v3.36	s4.04	...	r5.24	r10.54	r4.49
Yamble Dr	...	...	s7.48	...	v8.49	s8.49	...	12.36		...	*s3.35	v3.39	s4.05	...	r5.26	r10.56	r4.51
Balemo Dr	...	...	s7.50	...	v8.51	s8.51	...	12.40		...	*s3.35	v3.40	...	s4.15	r5.28	r10.58	r4.53
S.D.A Church	...	...	...	s7.55	Terminate	s8.55	...	12.45		s3.00	*s3.35	v3.45	s4.12	...	r5.30	r11.00	r4.55
Golden Beach Store	...	...	...	s7.52		...	...	12.48		...	*s3.40	v3.50	s4.08	...	r5.32	r11.02	r4.57
New Brighton Store	...	...	...	s7.50		...	...	12.50		...	*s3.42	v3.55	s4.09	...	r5.34	r11.04	r4.59
Orana Rd	...	...	...	s7.45		...	...			...	*s3.35		s4.06	...	r5.36	r11.06	r5.01
Yelgun	...	s7.50	...	...		...	...			...			...	...	...	...	...
Wooyung	...	s7.35	...	...		...	...			...			...	...	...	...	...
Crabbes Creek Shop	s7.20	s8.05	s8.05	s8.05		...	...			...			...	...	...	...	...
Murwillumbah (opposite KFC)	...	s8.30	s8.30	s8.30		...	...			...			...	...	...	...	...
Kingscliffe TAFE	s7.55	...	...	...		...	...			...			...	...	...	...	...
Tweed Heads (opp. Tweed City)	s8.45	...	...	...		...	...			...			...	...	...	...	...

Loop service

* - Does Not Pick up. Drop only.

645 Tweed Heads - Ocean Shores - Brunswick Heads - Mullumbimby - Ballina

BVC

Weekdays (Monday To Friday) | **Weekends** (and Public Holidays)

Departing	am	am	am	am	am	am	pm	pm	pm	pm	pm	pm	pm	am	pm
	s	v	s	s	s			s		s	s	v	s	r	r
Tweed Heads (opp. Tweed City)	...	...	...	...	...	...		...	...	...	...	...	s2.45	...	...
Kingscliffe TAFE	...	...	...	...	...	...		...	...	...	...	...	s3.45	...	...
Murwillumbah KFC	...	...	...	...	...	...		...	...	s3.30	s3.30	...	...	...	...
Crabbes Creek Shop	...	...	s7.40	...	...	...		...	...	...	...	...	...	...	...
Wooyung	...	...	s7.35	...	...	...		...	...	...	...	...	...	...	...
Yelgun	...	...	s7.50	...	...	...		...	...	...	...	...	...	...	...
S.D.A Church	...	v7.46	...	s8.00	s8.00	10.02		...	...	...	...	...	...	9.07	3.07
Golden Beach Store	s7.25	v7.48	...	s8.00	s8.00	10.04		...	...	...	...	...	...	9.09	3.09
New Brighton Store	s7.30	v7.50	...	s8.00	s8.00	10.06		...	...	...	...	...	...	9.11	3.11
Orana Rd	...	v7.52	...	s8.00	s8.00	10.08		...	...	...	...	...	...	9.13	3.13
Balemo Dr	s7.20	v7.56	...	s8.00	s8.00	10.10		...	...	...	s4.10	...	...	9.15	3.15
Yamble Dr	...	v8.00	...	s8.00	s8.00	10.15		...	...	...	s4.15	...	...	9.20	3.20
Coomburra Cres	...	v8.03	...	s8.05	s8.06	10.16		...	...	...	s4.16	...	...	9.21	3.21
Warrambool Rd	...	...	...	s8.05	...	...		...	...	...	s4.18	...	...	...	...
Goondooloo Dr	...	v8.05	...	s8.05	s8.07	10.20		...	...	...	...	...	...	9.25	3.25
O/S Shops	s7.40	v8.07	...	s8.05	s8.10	10.25	12.55	s2.25	2.25	...	...	v4.10	...	9.30	3.30
Brunswick Information Centre	s7.45	8.10	s8.10	8.10	s8.15	10.30	1.00	s2.40	2.40	s4.15	...	v4.15	s4.25	9.35	3.35
Bayside Pick up Pacific Hwy	...	8.12	...	8.12	s8.17	10.32	1.02	s2.45	2.45	s4.17	...	v4.17	...	...	...
Uncle Toms	s7.55	8.15	...	8.13	s8.20	10.35	1.05	...	2.50	s4.20	...	v4.20	...	...	...
Mullumbimby Newsagent	...	8.25	s8.25	8.25	...	10.40	1.10	...	3.00	s4.25	...	v4.25	s4.40	r9.50	r3.45
Main Arm Corner Red Hill Rd	...	...	...	...	...	...	...	...	...	s4.40	...	...	...	...	...
Byron Bay Information Centre	...	...	...	...	s8.45	...	...	s3.10	...	...	...	...	...	10.10	3.55
Lennox Head (Exavier)	s8.30	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ballina	s9.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Loop service

Explanations

s - Bus operates on school days only.
v - Bus operates on school holidays only.
r - Bus picks up on request.
p - On school days, bus picks up behind Mullumbimby Post Office for Tunnel Road and Pocket passengers only. All other passengers at Newsagent.
b - Travel restriction applies - see note shown right.

645 Travel Restriction

Passengers please note that Route 645 operates between Uncle Toms and Ballina/Byron. Passengers joining the bus at Uncle Toms can be set down along the route, but the bus is not permitted to pick up passengers travelling to Ballina/Byron on this section of the route. Also, passengers travelling from Ballina/Byron cannot be set down before Uncle Toms.

Public Holidays

The weekend timetable operates on Public Holidays excluding Christmas Day, Boxing Day, New Years Day and Good Friday.