RoadNet

Traffic Study
(Final)

Residential Subdivision,
45 Hearns Lake Rd, Woolgoolga

for

BBK Development Corporation Pty Ltd

24 December 2007

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1.0 Executive Summary

Roadnet Pty Ltd has been engaged by BBK Development Corporation P/L of Coffs Harbour to carry out a traffic study for a proposed 41 residential lot subdivision and 2 reserve lots at Hearns Lake, Woolgoolga.

This report is a revision of the Traffic Study undertaken in 2003, which recommended 200 lots, could be catered for in the study area. The current subdivision proposal lies within the northern precinct as set out in the 2005 Hearns Lake Sandy Beach DCP, with the proposed capacity of the precinct set at 180 lots (Refer to for Hearns Lake/Sandy Beach DCP) This represents a reduction of 20 lots from RoadNet's previous 2003 traffic study recommended allowable lots (See map 5 of the Hearns Lake/Sandy Beach DCP)

The site is located on the eastern side of the Pacific Highway to the south of Woolgoolga. Access is proposed off Hearns Lake Road, which joins the Pacific Highway as a 'T' junction.

Information supplied by the RTA indicates that the proposed Pacific Highway bypass may commence in the next 5 to 7 years. It is understood from information provided by Council and the RTA that an interchange may be provided in the vicinity of (but not at) Hearns Lake Road as part of the Highway Upgrading works. (See figure 2)

A traffic count was performed in November 2007 and revealed the following;

Peak Hour AM traffic movements in 2007 were 3% less than in 2003.

Peak Hour PM traffic movements in 2007 were 5% less than in 2003

The current traffic count information revealed peak traffic volumes have not changed since 2003, (peak traffic volumes have decreased slightly) and hence the conclusions from the 2003 report are deemed to be still relevant.

The following salient conclusions from the 2003 report are

The Hearns Lake Road junction currently operates at a level of service 'B' in normal traffic conditions with an average delay to the right turn movement of 20 seconds in the peak hour.

The Hearns Lake Road junction would operate at a level of service 'C' in average traffic conditions in 5 years time (year 2008) with an average delay to the right turn movement of 31 seconds in the peak hour. This assumes completion of 41 lots of the subdivision and the current Highway traffic flow would increase by an annual rate of 600 vehicles per day.

In 10 years time under average traffic conditions the junction would operate at a level of service 'C' with an average delay to the right turn movement of 38 seconds. This assumes completion of 180 lots. The amount of traffic that would turn right onto the Highway from Hearns Lake Road when the subdivision is fully developed is 75 vehicles per hour (just more than one car per minute), which is not a high volume.

The main reason for the increasing delays at the junctions is the decreasing availability of gaps in the Highway traffic flow in which to enter the traffic stream.

The intersection traffic counts and modelling results for nearby sites contained in the Traffic Study for the Sapphire to Woolgoolga Upgrade of the Pacific Highway are considerably lower than that contained in this traffic impact report. (It is assumed that volumes on the Highway have increased significantly since the previous surveys were conducted in 2001).

School buses in the morning used the turning facility in Hearns Lake Road. In the afternoon they stopped outside the caravan park on the widened shoulder south of the junction.

Sight distance for pedestrians crossing from West to East is limited due to the curve in the Highway. **The recent reduction in speed limit from 100 to 80 kph has assisted this movement.**

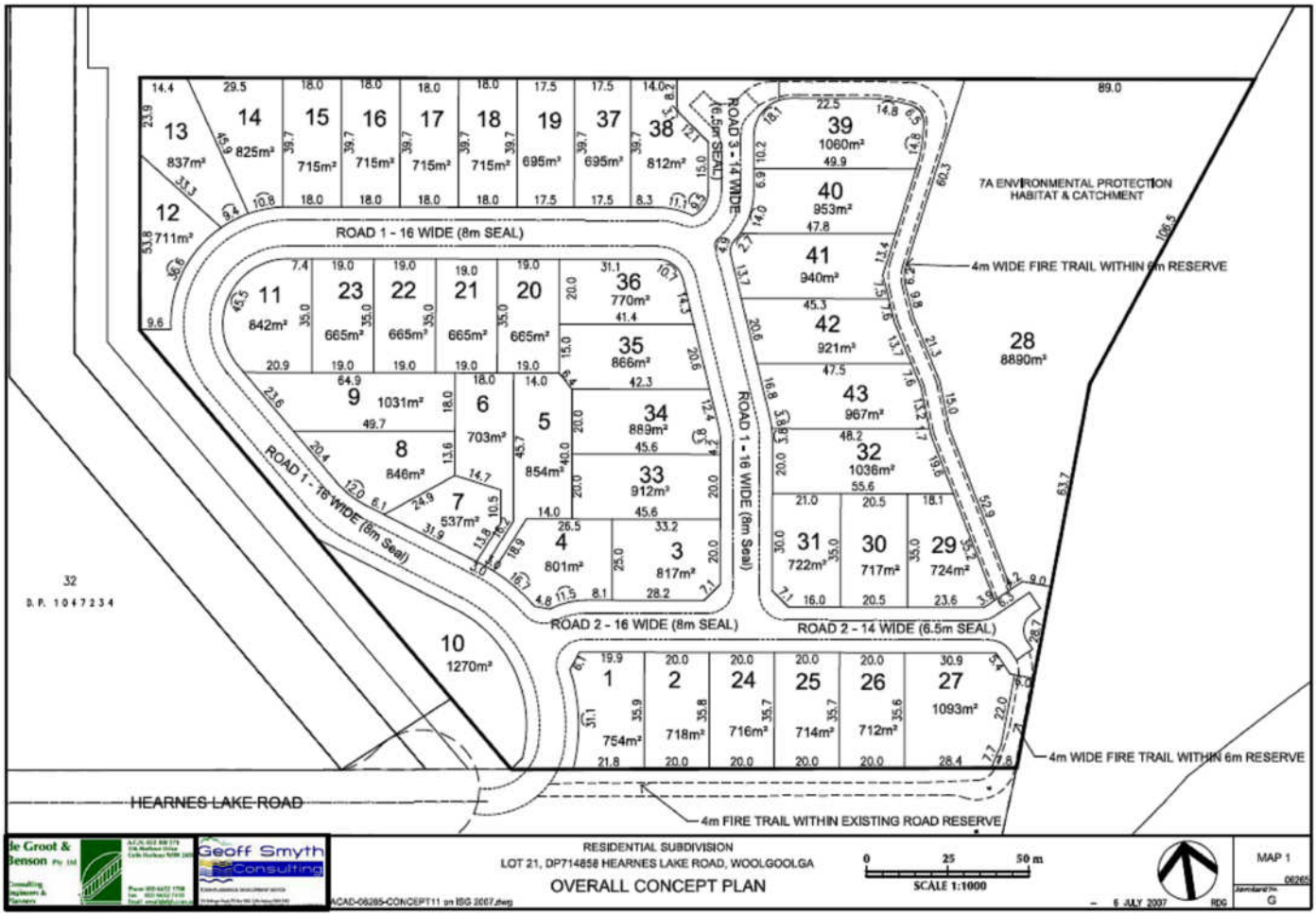


Figure 1 Overall Concept Plan

Access to the proposed subdivision will be via the intersection of Hearns Lake Road and Pacific Highway

Discussions with the RTA have indicated that they would allow access to the subdivision via Hearns Lake Road whilst there were less than 80 new lots on Hearns Lake Road.

An extract from Coffs Harbour Councils Development Contribution plan for Hearns Lake states the following:

> **That development north of Hearns Lake Road will be required to pay a local contribution towards the construction of a new intersection on the Pacific Highway at Bosworth Road (The new Pacific Highway intersection will be subject to the approval of the RTA and dependant on timing of new development with timing of the Pacific Highway upgrade)**

The Development contributions plan continues with the following extract

> **That development north of Hearns Lake Road is limited to 80 lots after which access and egress to the northern precinct is to be via the Bosworth road intersection. The cost of the collector road from the northern boundary of Lot 4 DP 612977 Bosworth Road, and required intersection upgrade work is to proceed beyond the 80 lot limit,**

be forward funded by the developer who wishes to proceed beyond the 80 lot limit, with costs being reimbursed as contributions are received.

Future planning for Pacific Highway bypass, to the west, will provide for a roundabout access onto the current Pacific Highway after the bypass is constructed (See fig 2)

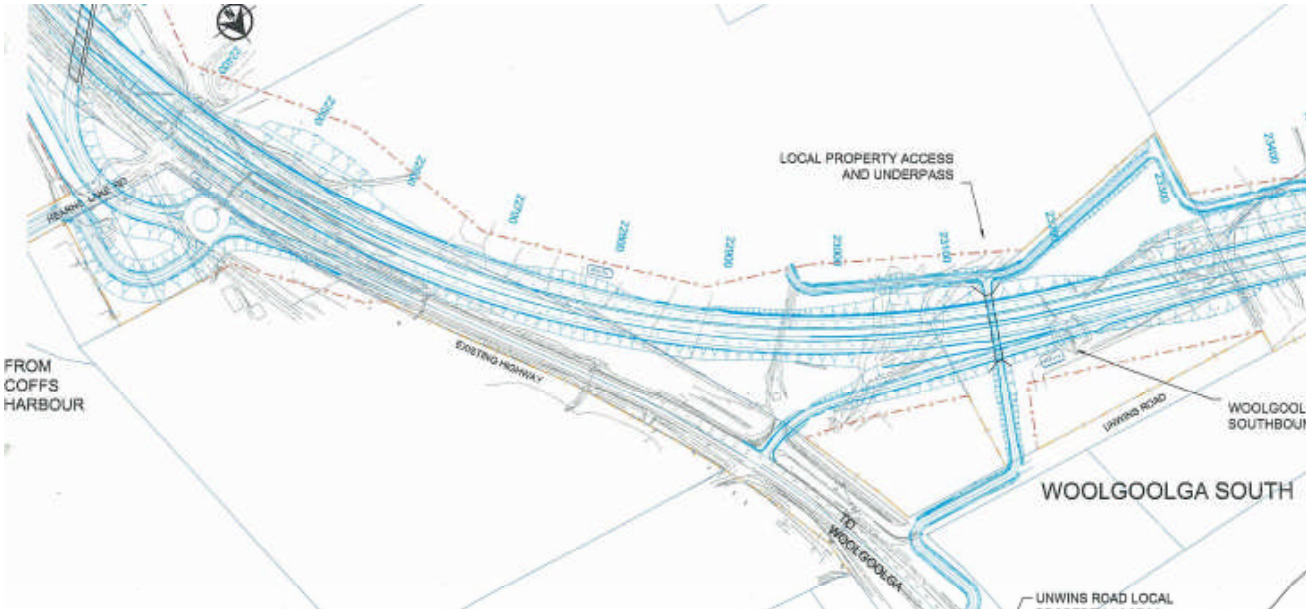


Figure 2 Proposed Hearns Lake Rd intersection details

2.0 Traffic Volumes

Intersection traffic counts were conducted on 1 November 2007 at:

- Pacific Highway / Hearns Lake Road

2007 traffic count data for the Highway interpolated from recent the Coffs Harbour Highway Planning Sapphire-Woolgoolga Section Supplementary report Feb 2004.is shown in the table below.

Road	Location	Direction	AM Peak Hour	PM Peak Hour	Estimated Two way daily flow
Pacific Highway 2007	Near Hearns Lake Road	Northbound Southbound	588 708	682 757	16 358

Using this information an AADT of 17089 for 2008 vehicles per day was calculated for the Pacific Highway. A growth rate of 3.4%% was used to determine future traffic volumes on the Pacific Highway. This figure was adopted from the Coffs Harbour Highway Planning - Sapphire to Woolgoolga Section: Supplementary Options Report, Feb 2004. Table 1 below shows the predicted AADT's to the year 2027.

Year	AADT
2007	16358
2008	17089
2009	17829
2010	18559
2011	19290
2012	20020
2013	20751
2014	21481
2015	22211
2016	22941
2017	23672

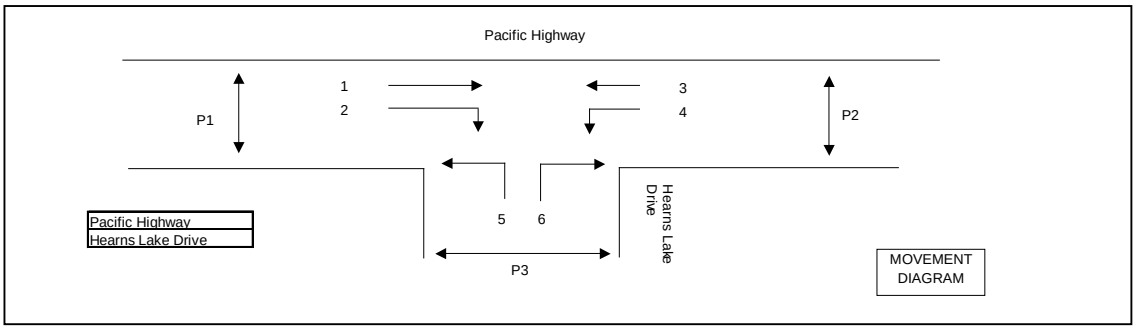
Table 1 – Predicted Future AADT's for the Pacific Highway

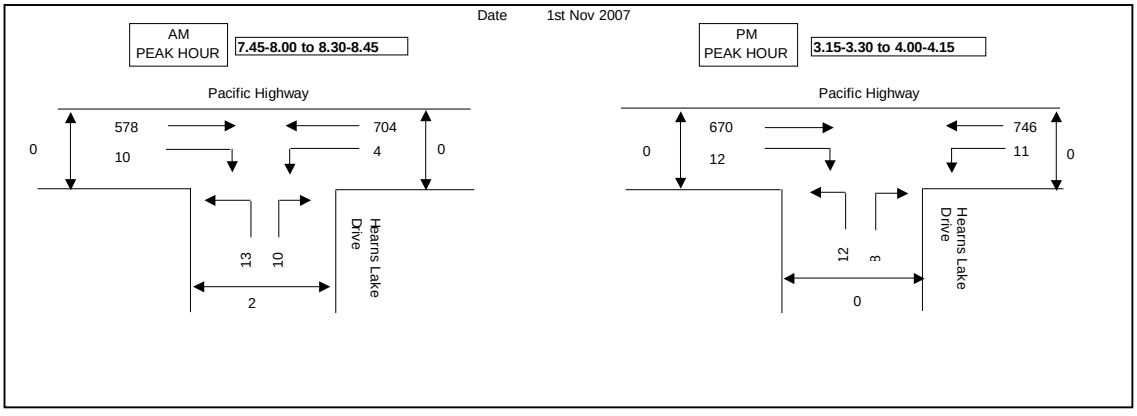
Table 2 - Existing Peak Hour Traffic Volumes (November 2007)
Hearns Lake Road

Location Pacific Highway Street 2 Hearns Lake Drive Town Woolgoolga
Date 1st Nov 2007 Day Thursday

Time	1	H	2	H	3	H	4	H	5	H	6	H	1/4h totals	Hrly Total	P1	P2	P3	1/4h totals
7.30-7.45	98	11	2	0	148	8	1	0	2	0	2	0	272	Incl. Hvy	0	0	1	1
7.45-8.00	92	10	4	0	154	9	1	0	2	0	4	0	276		0	0	1	1
8.00-8.15	102	7	1	0	174	16	0	0	4	0	1	0	305		0	0	0	0
8.15-8.30	164	13	1	0	169	13	2	0	4	0	1	0	367	1220	0	0	1	1
8.30-8.45	172	18	4	0	162	7	1	0	3	0	4	0	371	1319	0	0	0	0
8.45-9.00	96	10	2	0	129	9	0	0	1	0	2	0	249	1292	0	0	0	0
9.00-9.15	134	11	1	0	147	9	9	0	2	0	1	0	314	1301	0	0	0	0
9.15-9.30	142	10	1	0	154	11	2	0	1	0	1	0	322	1256	0	0	0	0
9.30-9.45	0	0	0	0	0	0	0	0	0	0	0	0	0	885	0	0	0	0
9.45-10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	636	0	0	0	0
10.00-10.15	0	0	0	0	0	0	0	0	0	0	0	0	0	322	0	0	0	0
10.15-10.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1000	90	16	0	1237	82	16	0	19	0	16	0	Max Hr	1319	0	0	3	3
	Overall peak hour:						**7.45-8.00 to 8.30-8.45**							**2**				
Peak total	530	48	10	0	659	45	4	0	13	0	10	0	1319		0	0	2	2
Light+HV	578		10		704		4		13		10							

Time	1	H	2	H	3	H	4	H	5	H	6	H	1/4h totals	Hrly Total	P1	P2	P3	1/4h totals
3.00-3.15	108	7	3	0	126	6	4	0	0	0	0	0	254	Incl. Hvy	0	0	1	1
3.15-3.30	150	5	5	0	191	16	2	0	0	0	2	0	371		0	0	0	0
3.30-3.45	173	12	2	0	166	11	4	0	5	0	2	0	375		0	0	0	0
3.45-4.00	145	11	4	0	162	18	1	0	1	0	1	0	343	1343	0	0	0	0
4.00-4.15	160	14	1	0	170	12	4	0	6	0	3	0	370	1459	0	0	0	0
4.15-4.30	140	7	5	0	125	14	3	0	2	0	3	0	299	1387	0	0	0	0
4.30-4.45	145	7	6	0	121	14	6	0	1	0	3	0	303	1315	0	0	0	0
4.45-5.00	158	7	0	0	133	17	2	0	1	0	3	0	321	1293	0	0	0	0
5.00-5.15	0	0	0	0	0	0	0	0	0	0	0	0	0	923	0	0	0	0
5.15-5.30	0	0	0	0	0	0	0	0	0	0	0	0	0	624	0	0	0	0
5.30-5.45	0	0	0	0	0	0	0	0	0	0	0	0	0	321	0	0	0	0
5.45-6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1179	70	26	0	1194	108	26	0	16	0	17	0	Max Hr	1459	0	0	1	1
	Overall peak hour:						**3.15-3.30 to 4.00-4.15**							**2**				
Peak total	628	42	12	0	689	57	11	0	12	0	8	0	1459		0	0	0	0
Light+HV	670		12		746		11		12		8							





2.1 Traffic Growth and Composition

The estimated AADT for year 2007 at Hearns Lake Road is 16358

A review of traffic volume data over a 3 year period between year and 2001 and 2004 shows that traffic growth on the Highway of approximately 3.4%.

From the intersection counts the percentage of heavy vehicles on the Highway varies between 8 and 12% depending upon the direction of travel and time of day. These variations have been incorporated into the traffic model.

2.2 Intersections

Hearns Lake Road meets the Pacific Highway at a T-junction constructed to an Austroads Type CH (C) standard. It has right turn and left turn storage bays along with painted centreline markings and traffic islands. The turning lane widths are relatively narrow due to site constraints.

Sight distance in both directions exceeds safe intersection sight distance requirements for the 80 kph speed limit.

For pedestrians crossing from the western side of the Highway sight distance is restricted due to the curve in the Highway.

Hearns Lake Road Junction – looking south on the Highway

2.3 Pedestrians

Traffic counts showed few pedestrians crossing the Highway, three in the morning and one in the afternoon at Hearns Lake Road.

Two pedestrians crossed Hearns Lake Road during the five-hour counting period.

2.4 Traffic Generation from Hearns Lake Road

The proposed subdivision will have up to 41 residential lots.

Traffic generation rates contained in the RTA's Guide to Traffic Generating Developments are 9 trips per day for free standing residential tenements and 6 trips per day for medium density tenements.

It is assumed for the purposes of this study that all allotments will be free standing residential tenements.

The total external traffic generation from the subdivision would be 41 x 9 = 369 trips per day.

Peak hour trips are estimated at 41 trips assuming that each residence generates one trip in peak hour.

2.5 Traffic Generation from Existing Development

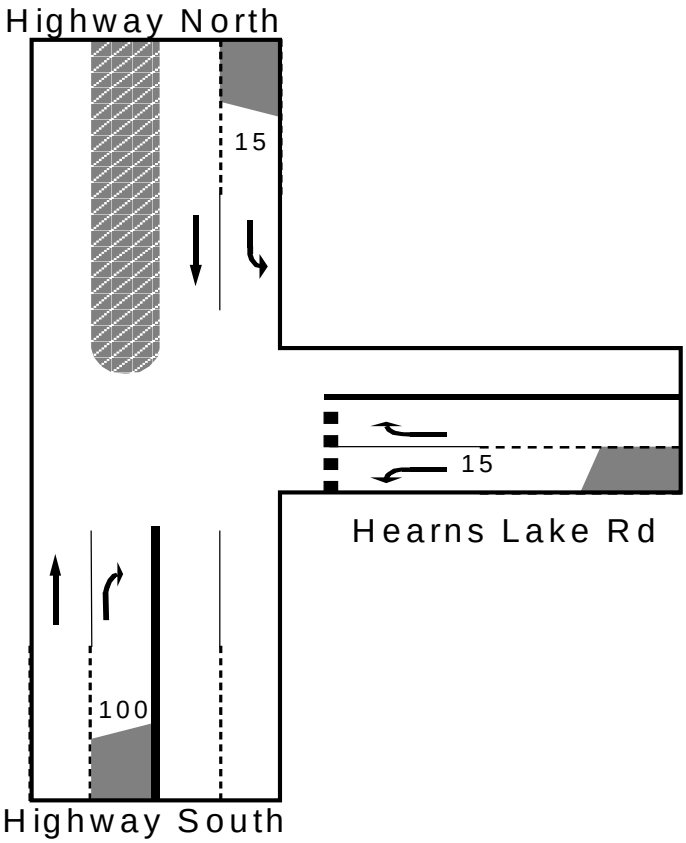
On the day of the traffic count a maximum of 43 trips were generated by existing development and the beach. The Pines Caravan Park caters for mostly permanent accommodation with only 19 units available for holiday letting. There will be a small increase in traffic generation during the summer months with increased patronage of the Caravan Park and increased visitors to the beach. For the purposes of analysis it is estimated that the existing daily volume would double.

2.6 Traffic Assignment

It would be normal practice to assign new traffic to the Pacific Highway intersection in the same proportions as shown in the existing intersection counts. However, there is an inconsistency in directional splits between the two sites counted, Hearns Lake Drive and Bosworth Road. Accordingly, traffic has been assigned on the basis of 50% to the north and to the south. The low volumes involved would not make a significant difference in the modelling results.

2.7 Traffic Modelling

Traffic modelling has been carried out using Sidra to quantify the impact of the development on intersections and road capacity.



Inputs

Heavy vehicles –percentages as per intersection counts.

5 second gap acceptance for right turn out with follow up headway of 3 seconds.
These parameters best fit the delays at the existing intersection measured during the intersection counts.

Growth rate 4.3% linear.

Holiday periods have not been modeled. If traffic conditions are heavy (Christmas Hols) to the extent that the right turn out is difficult the traffic could turn left and proceed to Graham Drive turn right and U turn before travelling north.

Movement Summary

Pacific Hwy/Hearns Lake Rd

2007 am Existing development

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)
Highway South										
2	T	608	8.0	0.329	0.0	LOS A	0	0.00	0.00	80.0
3	R	11	0.0	0.017	12.3	LOS B	1	0.57	0.75	44.8
Approach		**620**	**7.9**	**0.329**	**0.2**	**LOS A**	**1**	**0.01**	**0.01**	**79.0**
Hearns Lake Rd										
4	L	14	0.0	0.029	13.5	LOS B	1	0.60	0.81	43.7
6	R	11	0.0	0.053	24.4	LOS C	1	0.84	0.95	35.8
Approach		**25**	**0.0**	**0.054**	**18.3**	**LOS C**	**1**	**0.70**	**0.87**	**39.8**
Highway North										
7	L	4	0.0	0.002	8.2	LOS A	0	0.00	0.67	49.0
8	T	741	5.9	0.395	0.0	LOS A	0	0.00	0.00	80.0
Approach		**745**	**5.9**	**0.395**	**0.0**	**LOS A**		**0.00**	**0.00**	**79.8**
All Vehicles		**1390**	**6.7**	**0.395**	**0.4**	**Not Applicable**	**1**	**0.02**	**0.02**	**78.2**

Assumptions:

Total lots to be developed are 41

1 peak hour trip per lot – 41 new trips at final development (additional turning traffic).

Highway growth - 600 new daily trips per year (Equates to 60 per hour in peak hour).

Peak Christmas holiday traffic will not increase to a higher level than the current year because the road is now at capacity at that time with predicted one direction volumes exceeding 1700 vehicles per hour.

Holiday traffic using Hearns Lake Road will be double existing counted volumes due to the beach and higher caravan park occupancy.

The default gap acceptance in the model has been increased by 10% to account for site conditions.

These factors have been incorporated into the modelling to demonstrate the various traffic conditions that would be expected over the next 5 and 10 years at the Hearns Lake Road junction

2.8 Interpretation of Modelling Results

The results indicate that delays will be experienced at the junction irrespective of additional side road traffic that would be generated by the initial stages of the subdivision. The main reason for the increasing delays at the junction is traffic growth on the Highway. The availability of adequate gaps in the Highway traffic flow in which to enter the traffic stream is decreasing.

Safety issues need to be considered in conjunction with capacity issues. In this regard it is the authors opinion that when average delays on a side road exceed approximately 40 seconds in rural environments drivers are sometimes tempted to accept smaller gaps in the traffic stream. This behaviour can lead to accidents. A 42 second delay is the trigger point for a change in level of service from C to D.

This assumption relates to normal traffic conditions. Motorists can usually tolerate longer delays during peak holiday traffic and exercise patience at those times. On this basis it is considered reasonable that 41 lots could be permitted. With more than 135 lots the time average delays during non-Christmas holiday traffic conditions would approximate 40 seconds and alternative access arrangements would be desirable.

For future stages of the development above 135 lots a road connection to Bosworth Road should be provided. The Bosworth Road junction could be upgraded to accommodate the additional traffic. Alternatively future residents of the subdivision could access the town of Woolgoolga via the local road network and not use the Pacific Highway. once the new highway is complete.

The Bosworth Road junction with the Highway carries slightly higher side road traffic than Hearns Lake Road. Modelling results indicate similar performance to those shown for Hearns Lake Road. The need for improvements at this site would correspond with the timing suggested for the Hearns Lake precinct connection road (This applies to northern precinct of CHCC's DCP) to Bosworth Road – year 2011. The need for the improvements would be largely driven by increased traffic on the Highway not necessarily due to the additional traffic resulting from the 80-lot subdivision. (The 80-lot maximum allowable subdivision limit is a requirement of CHCC as per their DCP for the northern precinct)

3.0 Assessment of Traffic Impacts

The traffic impact of the proposal has been assessed against a number of criteria that make up the efficiency, safety and amenity of an urban area.

3.1 Pacific Highway

Daily traffic volumes on the Pacific Highway are expected to increase at an annual rate of 600 vehicles per day, which equates to 3.4% pa linear growth on year 2003 volumes.

The impact of adding 369 trips to the Highway as a result of the subdivision proposal summarised below.

A detailed analysis was carried out for the Highway using the Florida Department of Transportation's software package for the calculation of Level of Service and flows. This software makes provision for more detailed input of the various operational parameters. These include AADT, terrain, % overtaking opportunity, % HV, presence of medians, sheltered turning bays, posted speed zoning, directional flow and design hour flow as a % of AADT.

The table below gives details of the output from the FDOT software and indicates the level of service for existing conditions and when the Hearns Lake subdivision is fully complete in say 10 years time.

Level of Service – AADT (FDOT software)

Rural conditions	A	B	C	D	E
Pacific Highway 2 lanes undivided. 80 kph speed limit.	1,300	5,200	12,500	18,000	24,600

The estimated existing AADT is 16358, which provides a Level of Service (LOS) 'C'.

The addition of the subdivision traffic (369 vpd) now would retain LOS 'C'.

In 10 years time without the subdivision (22,358 vpd) the LOS would be 'D'.

In 10 years time with the subdivision (22,727 vpd) the LOS would be 'D'.

The timing of construction and location of any Highway bypass (or major upgrade) of the locality is beyond the scope of this report. However, it is expected that such a proposal would be ultimately undertaken and would provide relief for local traffic.

The impacts on the Highway intersections are detailed in the following section.

3.1.1 Intersection of the Pacific Highway and Hearns Lake Road

The junction of Pacific Highway and Hearns Lake Road is constructed as a Type C junction with painted median islands. Sight distance is good and exceeds the Safe Intersection Sight Distance for 80kph contained in Austroads Guidelines.

Intersection modelling shows that the site will operate satisfactorily in the short to medium term with acceptable delays. As traffic in the locality grows, the junction may need additional work to ensure traffic efficiency is maintained at a reasonable level of service and that an unacceptable accident history does not develop. Alternatively, traffic flows might be split by way of a connection road being completed between Graham Drive and Hearns Lake Road.

Traffic from Hearns Lake subdivision (The northern precinct as per the CHCC's DCP for this area) plus other possible development in Woolgoolga area has been added to existing traffic volumes at the junction. A growth rate of 3.3% pa (linear) has been applied to existing volumes on the Pacific Highway to reflect growth in the Region. Using these figures the intersection has been modelled for existing and future peak hour flow traffic conditions. In addition, highway traffic volumes have been increased to reflect peak holiday traffic conditions.

These modelling results indicate that the existing intersection will continue to function satisfactorily under average traffic volumes with the full development of the proposed subdivision. However, holiday traffic volumes on the Pacific Hwy will make it difficult to gain entry for the right turn out of Hearns Lake Road.

It is recommended that the Do Nothing option be accepted for this intersection and a connection road be constructed to Bosworth Road after the development of135 lots.

Pedestrian activity at the Highway junction is very low and as a result it would be difficult to justify the provision of any specific traffic management measures other than those already implemented. The connection road does provide the opportunity for buses to use the local roads and avoid pedestrians needing to cross the Highway.

3.2 Traffic Efficiency and Amenity on Hearns Lake Road

The operational performance of roads can be summarised using Level of Service criteria. This is measured between levels 'A' and 'F', with 'A' being good and 'F' being poor. Local urban two lane roads can carry up to 1400 vehicles per hour in one direction before entering the LOS 'F' category. LOS details are shown in the table below extracted from Table 4.4 in the RTA Traffic Generating Guidelines.

Hearns Lake Road will carry far less than this volume (2000 vpd and 30 vph) when the subdivision is fully developed and will operate at level of service 'A'.

Peak hour flows per direction - Urban Road

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Notwithstanding the carrying capacity of urban streets there is the issue of environmental capacity, which relates to retaining the amenity of an area.

Table 4.6 in the RTA Traffic Generating Guidelines relates to "Environmental capacity performance standards on residential streets".

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour two way volume veh/hr)
Local	Access way	25	100
Local	Street	40	200 environmental goal 300 maximum
Collector	Street	50	300 environmental goal 500 maximum

Environmental goals have been developed from research and relate to safety and amenity. These goals have been incorporated into Council's Subdivision Code. The environmental goal for a collector road is a maximum flow of up to 3000 vpd, that is, services up to 300 dwellings at 10 trips per day per lot.

3.3 Pedestrians

The issue of pedestrian safety is critical and is linked to the issue of safety and accessibility for buses. It is understood from discussions with various stakeholders that northbound route buses sometimes stop on the road shoulder in a gravel driveway opposite the junction to pick up and set down residents of the Caravan Park in Hearns Lake Road. This did not occur during the traffic counts. A bus turning area has been provided in Hearns Lake Road but this is only used by school services and not by route buses using the Highway. The diversion would add to the trip time for the occasional passenger using the stop.

Pedestrians crossing the Highway are not desirable even though the speed limit has been reduced from 100 to 80kph.

4.0 CONCLUSIONS

Based on the analysis in this report the Hearns Lake Road junction with the Highway will operate at level 'C' (acceptable delays) with 41 lots under average traffic conditions. Under peak holiday conditions turning onto the Highway will become increasingly difficult due mainly to growth in Highway traffic volumes.

It is concluded that the proposed urban development at Hearns Lake (Northern Precinct as per CHCC's DCP only) can be accommodated if a traffic management strategy is implemented that progressively upgrades access to the Highway as the need arises.

The measures contained in the strategy include staging of the subdivision, augmenting the local road network and ultimately upgrading the Bosworth Road junction as the prime access to the north. The existing Hearns Lake Road junction would be retained in its current configuration combined with an access from the upgraded highway

A key issue is the timing of when access improvements might be needed.

On the basis of the analysis contained in this study the staging proposed would allow the development of 135 lots without the need for the Bosworth Road intersection upgrading.

This timing should be considered in light of the Traffic Study for the Sapphire to Woolgoolga Upgrade of the Pacific Highway, which predicts lower volumes on the Highway and lower intersection delays than contained in this report.

It appears that volumes on the Highway have increased significantly since the previous surveys were conducted in 2001. Whether that trend will continue is unknown. Accordingly, the analysis contained in this traffic study may be conservative and overstate future delays.

Approval to the 41-lot subdivision as proposed should be given and traffic conditions reviewed as future development applications are submitted for further stages of the northern precinct. The proposal will not adversely impact on Highway traffic flow or safety if the traffic management strategy is adopted and implemented.

5.0 RECOMMENDATIONS

1. Approval be given to the development of the 41 residential lot subdivision.
2. A road connection be constructed from Hearns Lake Road to Bosworth Estate when more than 135 lots are developed.
3. A contribution be provided towards the upgrading of the Bosworth Road junction with the Highway consistent with the level of traffic generation by the subdivision to that site and as per the Hearns Lake s94 contribution plan requirements.