

## Memorandum

To: Anthony Wetherdin

From: Fred Gennaoui

Date: 29 May 2018

Job N°: 14989.002

**Subject: Mundamia Residential Subdivision Traffic Review**

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### Background

TDG in association with Gennaoui Consulting was commissioned to review the *Proposed Subdivisions at Mundamia Traffic and Transport Review*, (Gennaoui 2013), to determine

- Review the *Proposed Subdivisions at Mundamia Traffic and Transport Review*, (Gennaoui 2013), to determine whether the proposed Jemalong subdivision generates in isolation the need to provide a roundabout at the intersection of Road One and George Evans Drive. This analysis should also take into consideration the roundabout required at the intersection of Road 1 and Road 9 under Council's section 94 Plan (i.e. does the roundabout required under the 94 Plan remove the need to provide a roundabout at the intersection of George Evans Road and Road 1);
- If a second roundabout is required at the intersection of George Evans Road and Road 1, what proportion of the traffic would the Jemalong subdivision generate;
- If a roundabout isn't required at this intersection, does the Jemalong subdivision, in isolation, generate the need to provide traffic calming measures at the intersection of George Evans Road and Road 1;
- Indicate whether there will be a need for the second roundabout at the junction of George Evans Road with Road One if the adjoining subdivision proceeds and advise what percentage of traffic the proposed Jemalong development would generate within the Mundamia Urban Renewal Area;
- Establish whether the Jemalong subdivision, in isolation, generate the need to construct the roundabout identified in Council's section 94 plan at the intersection of Road 1 and Road 9. If no, are any traffic calming devices required at this intersection as an interim measure until the development in the residual portion of the URA is complete.



The assessment indicated that

- Roundabouts were not required at the intersections of George Evans Road with Road One, and Road One with Road Nine on capacity grounds.
- The provision of a roundabout may be considered at the junction of Road One with Road Nine when the latter is extended into the subdivision adjacent to Jemalong. A roundabout at this location, would on safety ground, ensure minimum conflicts and provide a landmark of the main access to both subdivisions.

Council reviewed the Traffic Report and raised the following concerns:

- Environmental capacity of Road 1 and George Evans Road north of University;
- Need or otherwise of traffic calming devices within the Jemalong subdivision taking into account traffic generated by the Thompsons Point Reserve;
- Formulation of Draft Conditions of Consent.

Council's concerns were addressed in an addendum report issued on 16 November 2017. This addendum which included the impact of traffic generated by the Thompson Point Reserve concluded that

*The four one lane roundabouts suggested along Road One are not required on capacity ground. The roundabouts at the intersections of Road One with George Evans Road (to be constructed when the realignment of George Evans Road is completed), with Road Nine and with Road 14 may be considered to reduce speed along Road One. An entry threshold is preferred at Road Sixteen.*

### Scope of Addendum

Council's raised further concerns in relation to 16 November Addendum report. As a result, TDG in association with Gennaoui Consulting was appointed to assess the following matters:

- Identify whether an environmental capacity threshold of 500 vpd, or a desirable environmental capacity threshold of 300 vpd, should be used for the purpose of designing traffic calming devices and the apportionment of development contributions within the Mundamia URA.
- Council's requirement to construct four new roundabouts along Road 1 in lieu of the 8 LATM devices to reduce vehicle speeds along Road 1, and advise whether this would provide a suitable traffic management outcome in accordance with the Austroad Guidelines.
- if roundabouts are the preferred traffic management option, provide advice on the proportion of traffic the proposed subdivision would generate for each roundabout relative to the total traffic generated by the residual development in the Mundamia URA.

The need for this assessment was also prompted by Council's for the Department to assess the traffic impacts of the proposal based on the level of development currently planned for the Mundamia Urban Release Area (i.e. development of the subject site plus the residual development within the release area).



## Issues Raised By Council

In response to the November 2017 Addendum report Council raised a number of matters presented in **Table 1**; consultants' comments are also provided in **Table 1**.

	Council's Concerns	Comments
1	The Traffic Report Addendum (TDG report dated 16 November 2017) refers to Environmental Capacity threshold as being "500" vehicles per hour (vph). In accordance with RMS guidelines and in numerous traffic texts this is known as "absolute maximum" environmental capacity, where as "desirable environmental capacity" is much lower ("300" vph), and accordingly "300" vph should be the appropriate threshold being for a Greenfields development with no constraints preventing a design within the "desirable capacity threshold".	<i>Addressed in this Addendum</i>
2	Shoalhaven City Council receives complaints and safety concerns regarding through traffic and speeds on collector roads in residential sub-divisions when volumes are less than 300vph. It is unacceptable in Council Traffic Unit's view to adopt the "maximum" capacity threshold when there is an opportunity with this Greenfields development (and there being no constraints) to appropriately design within the "desirable" capacity threshold identified in RMS guidelines.	<i>Addressed in this Addendum</i>
3	Table 2 of the Traffic Report Addendum (TDG report dated 16 November 2017) clearly indicates that the RMS' "desirable" environmental capacity threshold is clearly breached <b>as consequence of the Jemalong sub-division alone</b>	<i>The volumes in Table 2 exceeds the 300 vph desirable capacity by 7 cars only including the Thompson Point Reserve traffic. Without the latter the trip generated by the Jemalong subdivision would be less than the "desirable" capacity</i>
4	Accordingly, it is inappropriate in Council Traffic Unit's view that a VPA be conditioned for a "contribution" only to the traffic calming treatments, when the Jemalong sub-division alone will breach the RMS guidelines for "desirable" environmental threshold, and this is evidenced in Table 2 of the Traffic Report Addendum (TDG report dated 16 November 2017).	<i>As per above..</i>
5	Accordingly, draft Condition A11 (provision of VPA) should be deleted and replaced with an appropriate condition (within conditions B17-B20 or similar section within the conditions) requiring the Jemalong development to provide the required traffic calming treatments (including all three roundabouts and the northern threshold) which are required as consequence of the Jemalong development alone. This will also protect Council's interests and ensure satisfactory local road conditions through the sub-division in the event that the adjacent Council sub-division never goes ahead.	<i>Addressed in this Addendum.</i>



	Council's Concerns	Comments
6	Upon deletion of draft Condition A11 (provision of VPA) this should be replaced with an appropriate condition in section B requiring the Jemalong development to provide the required traffic calming treatments (including all three of the roundabouts and the northern threshold).	<i>Addressed in this Addendum</i>
7	Draft Condition B19 shall be reworded as follows: <i>The Applicant shall design and construct a traffic calming device (e.g. entry threshold) in Road One just north of Road Sixteen, in the form of a "flat top road hump". The flat top road hump threshold shall have a 4m length flat top and all other design parameters, as well as signs and lines, are to be designed in accordance with AS1742.13 for a "flat top hump". The applicant shall also design and construct all three roundabouts at the intersections of Road One with George Evans Road, Road Nine and Road Fourteen. The roundabouts shall be designed generally in accordance with AUSTROADS guidelines with select design parameters suitable for the proposed locations, to Council satisfaction. Details must be shown on the Construction Certificate Drawings.</i>	<i>Addressed in this Addendum.</i>
8	Reword the "Note" under B19 as follows: <b>Note:</b> <i>Concept designs for all traffic facilities and all traffic calming treatments including all roundabouts, the northern threshold, the shared path (cycleway) and all line marking and signage throughout the development will require referral to the Shoalhaven Traffic Committee for approval. A minimum of six to eight weeks should be allowed for this. Any amendments to the designs following these approvals must be shown on the Construction Certificate Drawings.</i>	<i>Agreed. All required treatments should be referred to the Shoalhaven Traffic Committee for approval.</i>
9	Amend Condition B24 to require the 'design' and construction of all paths including cycleways to be provided as part of each Stage, this to ensure they are appropriately designed and built and extended with each stage as the demands arise. This will also ensure the vision of a completed path network throughout the sub-division is addressed as each Stage is appropriately designed and built, and the applicant doesn't get to Stages 7 & 8 and realise a cycleway won't fit due to earlier designs not making allowance for the cycleway in their designs.	<i>The design and construction of footpaths and cycleways is outside the scope of this review. This matter will be reviewed and considered by the Department separately.</i>

**Table 1: Matters Raised by Council re November Report**

### Consultation with Council and Proponent

A Draft Addendum dated 24 April 2018, prepared to address the above matters, was circulated to Council and the proponent. The more relevant points raised by Council and the Proponent are addressed in **Table 2a** and **2b** respectively and incorporated where appropriate in this report.



Council's Comments	Response
<p>1. The report suggests that the Jemalong sub-division alone does not breach environmental capacity, but it is the small proportion of traffic from Thompson Point Reserve that is an issue. The report refers to the structure of Tables 3 &amp; 4 of the report to make that conclusion.</p>	<p><i>Do not agreed as traffic to and from the Thompson Point reserve currently use the unmade section along George Evans Rd and Jonsson Rd. This traffic would then divert to Road 1 because it will provide a better route, and therefore will benefit patrons of Thompson Point reserve;</i></p>
<p>2. The Unit disagrees that Council (ie Shoalhaven City rate payers) must provide a financial contribution towards the proposed traffic calming works to mitigate the impacts of the Jemalong sub-division. It is for this reason that the Jemalong sub-division must contribute for the roundabouts on Road 1 at George Evans Road, Road 09 and Road 14 as well as the northern entry threshold immediately north of Road 16.</p>	<p><i>For the above reason, the applicant should not be solely responsible for the funding of the traffic measures. The proportion of contribution by the applicants are stipulated in Table 5 of this report.</i></p>
<p>3. Roundabouts are the preferred and more effective method of speed control, Council is only suggesting the 4 treatments to address the full length through the sub-division.</p>	<p><i>Council has indicated it agrees with an entry threshold before entering the Road 1.</i></p>
<p>4. There also appears to be a typographical error in Table 5 (In both of the lines relating to "Roundabout at George Evans" it would appear that data for "Thompsons" and "Adjacent" have been incorrectly switched) and this should be amended.</p>	<p><i>Noted and adjusted</i></p>
<p>5. An issue which doesn't appear to have been raised to date is that the TDG report and associated plans indicate a median is proposed on Road One (between George Evans Road and Road 09), which contrary to the DCP. If this is supported, this adds further nexus for the Jemalong sub-division to construct the George Evans Road roundabout at their own cost (due to the need to provide a turnaround at the end of the proposed median).</p>	<p><i>If the median is constructed between Road 9 and George Evans Road, the roundabout at the junction of Road 1 with Road 9 should be constructed at the time of providing the median.</i></p> <p><i>The proposed median along Road One, between Road 9 and George Evans Road, should not extend past Road 7 as not to prevent any RFS and other Emergency vehicles accessing Road 7.</i></p> <p><i>In this instance, the construction of the roundabout at George Evans may be deferred until the Council/NLALC subdivision is in place.</i></p>

**Table 2a: Matters Raised by Council re April Draft Addendum Report**

Proponent's Comments	Response
Residential dwellings in the Jemalong subdivision have been assumed to generate 0.9 vehicle movements in a peak hour whereas residential dwellings in the Council/NLALC subdivision have been assumed to generate 0.85 vehicle movements in a peak hour.	<i>Council/NLALC subdivision has now been assumed to generate 0.9 vehicle movements in a peak hour (refer Table 2).</i>
The figures used in Table 4 for the Jemalong subdivision are incorrect as they do not allow for the 15% reduction on vehicles movements external to the subdivision – the 297 should be reduced to 240 which is only 80% of the desirable environmental capacity.	<i>The 15% would only apply when the Council subdivision is in place; at that time traffic volumes along Road 1, between Road 9 and George Evans Rd would be very near the maximum environmental capacity of 500 vph.</i>
There are errors in Table 5 with respect to the share of Thompsons Point Traffic and the SCC/NLALC	<i>Table 5 has been amended.</i>

**Table 2b: Matters Raised by Proponent re April Draft Addendum Report**

## The Proposed Subdivisions

### Proposed Jemalong Subdivision

The Jemalong subdivision is proposed to be developed in 11 stages, would include 307 residential allotments and one small commercial lot. The proposed road layout of the Jemalong subdivision is illustrated in **Figure 1**; the boundaries of the adjacent subdivision are also shown in **Figure1**.

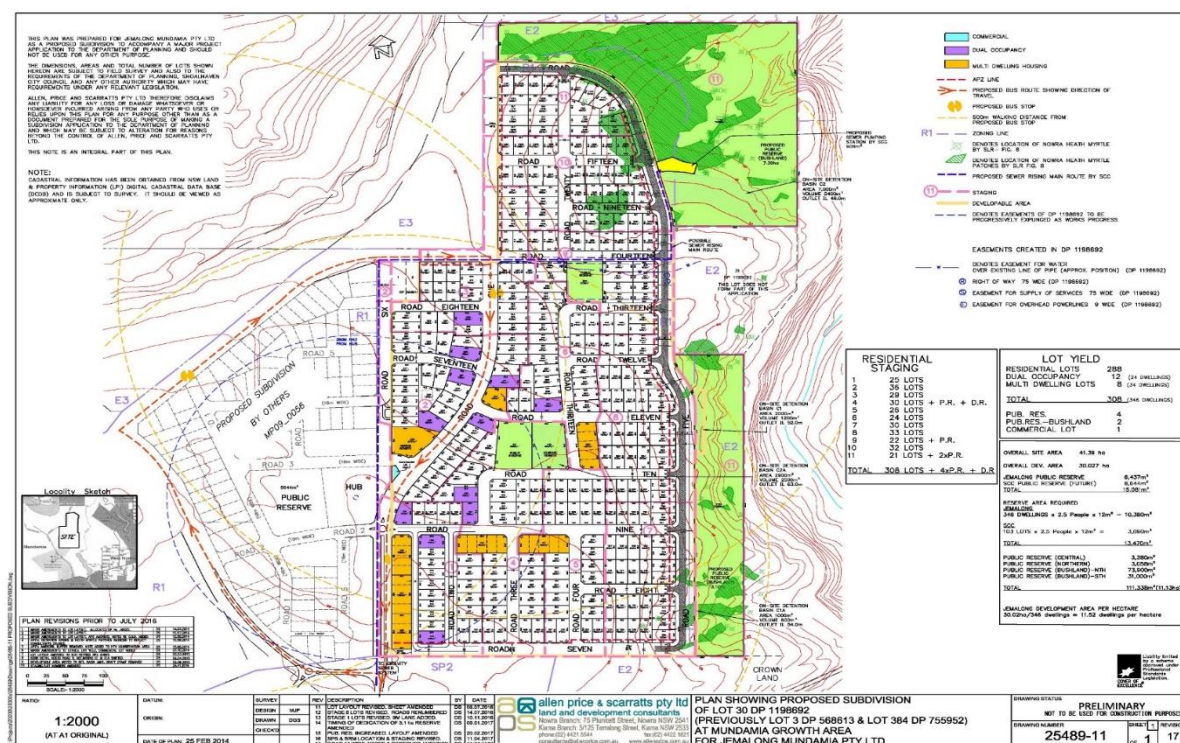
The proposed Jemalong development would generate about 300 vehicles per hour two-way during the morning and afternoon peak periods as noted in **Table 3**, It has been assumed that on weekends peak hourly traffic volumes would be about 80 percent of the weekday peak.

	Lots	Dwellings	Trip Rates	Trips Weekdays	Weekend Trips
Low Density	287	287	0.9 / dwelling	258	207
Medium Density	8	35	0.4-0.65 / dwelling	14 - 23	11-18
Dual Occupancy	12	24	0.5-0.65/ dwelling	12 - 16	10-13
<b>Total</b>	<b>307</b>	<b>346</b>		<b>284-297</b>	<b>228-238</b>

Source: TDG (2017)

**Table 3: Trip Generation of Jemalong Subdivision**





**Figure 1: Proposed Jemalong Residential Subdivision**

## Adjoining Subdivision

This subdivision was assumed to consist of 109 lots including 105 residential lots, neighbourhood shops and a community facility as identified in MP 09-0056 are shown in **Figure 2**. The proposed land uses for this subdivision were obtained from the Bitzios report (2012) and summarised in **Table 4**. It is noted MP09-0056 has been withdrawn, however the subdivision yield is generally consistent with the development contemplated under Council Section 94 contribution Plan.



**Figure 2: Council and NLALC Subdivision Layout (Source SET Consultants, 2013)**

Adopting the trip generation rates included in **Table 4**, the proposed subdivision would generate about 470 and 490 vehicles two-way during the morning and afternoon peak hour respectively



		TRIP RATE	TOTAL TRIPS		EXTERNAL TRIPS	
			AM	PM	AM	PM
<b>Residential Land Use</b>						
Single Dwellings	158	0.9 / dwelling	142	142	121	121
Medium Density	69	0.65 / dwelling	45	45	38	38
<b>Total Residential</b>	<b>167</b>		<b>187</b>	<b>187</b>	<b>159</b>	<b>159</b>
<b>Neighbourhood Centre</b>						
Commercial / Retail (m <sup>2</sup> GLFA)	1,994	AM 8.61 /100m <sup>2</sup> GLFA PM 12.3 /100 m <sup>2</sup> GLFA	172	245	146	208
Child Care Centre (children)	55	AM 2 trips per child and PM 1 trip per child	110	55	94	47
<b>Sub-Total</b>			<b>282</b>	<b>300</b>	<b>240</b>	<b>255</b>
<b>TOTAL</b>			<b>469</b>	<b>487</b>	<b>399</b>	<b>414</b>

Source: Bitzios (2012) and Gennaoui (2013)

**Table 4: Trip Generation of Adjacent Subdivision**

Bitzios had adopted a trip generation rate of 0.85 per dwelling. In order to be consistent with the adopted rate for the Jemalong subdivision, a trip generation rate of 0.9 per dwelling has been adopted.

The provision within the subdivision of a neighbourhood centre and a child care centre would attract trips from all residential developments within the Mundamia URA. It has therefore been assumed that about 15 percent of all residential and commercial trips would remain within the two subdivisions; the remaining trips, also included in **Table 4**, would travel externally along George Evans Road.

It has been assumed that on weekends peak hourly residential traffic volumes will be about 80 percent of weekday peak with no Child Care Centre in operation.

### Traffic Volumes along George Evans Road and Road N°1

The likely traffic volumes along George Evans Road and the proposed Road One for the weekday conditions (AM & PM peak hours) and weekend peak hour were previously estimated in the TDG October 2017 report for the following two scenarios:

- Scenario 1: includes traffic generated by Jemalong Subdivision;
- Scenario 2: includes all the Mundamia Urban Release Area (Jemalong + adjacent subdivision).

The Thompson Point Reserve is situated about 1 km north of the proposed Jemalong Subdivision; its recreational use is generally associated with rock climbing. The following assessment of both scenarios includes the traffic estimated to be generated by the Thompson Point Reserve.

#### Scenario 1 - Jemalong Subdivision and Thompsons Point Reserve

The total two-way peak hourly volumes during the morning and afternoon peak hours and weekend peak hour, along Road One and George Evans Road for both scenarios are summarised in **Table 5**.





## Scenario 2 – Whole Mundamia Urban Release Area & Thompsons Point Reserve

The total two-way peak hourly volumes during the morning and afternoon peak hours and weekend peak hour, along Road One and George Evans Road, at the completion of the Mundamia Urban Release Area and including the estimated peak traffic volumes of the Thompsons Point Reserve, are summarised in **Table 5**. The volumes generated by Council's subdivision includes the slight increase due to the revised trip rate adopted in **Table 4** for the residential dwellings.

		Scenario 1			Scenario 2 +Mundamia URA	
Road	Section	Jemalong Subdivision	Thompson Point Reserve	Sub- Total	Adjacent Subdivision	Total
WEEKDAY AM PEAK						
Road One	North of Road Nine	170	10	180		180
Road One	Road Nine to George Evans	297	10	307	226	533
George Evans	Road 1 to Uni Roundabout	297	10	307	398	705
WEEKDAY PM PEAK						
Road One	North of Road Nine	170	10	180		180
Road One	Road Nine to George Evans	297	10	307	238	545
George Evans	Road 1 to Uni Roundabout	297	10	307	414	721
WEEKEND PEAK HOUR						
Road One	North of Road Nine	136	40	176		176
Road One	Road Nine to George Evans	238	40	278	186	463
George Evans	Road 1 to Uni Roundabout	238	40	278	325	602

**Table 5: Future Traffic Volumes**

## Scenario 2 – Whole Mundamia Urban Release Area & Thompsons Point Reserve

The total two-way peak hourly volumes during the morning and afternoon peak hours and weekend peak hour, along Road One and George Evans Road, at the completion of the Mundamia Urban Release Area and including the estimated peak traffic volumes of the Thompsons Point Reserve, are summarised in **Table 5**.

## Assessment of Environmental Capacity

### Environmental Capacity

RTA Guide to Traffic Generating Developments (section 4.3.5) defines environmental capacity as *the consideration of a range of differing perceptions and attitudes to traffic impacts in a particular area. The environmental expectations of residents often varies significantly, even within the same district. It is accepted that the performance standard usually occurs at the top end of a range. Engineering standards are often based on concepts of good practice, with a concerted focus on safety factors. For example, a road with a wide central-median, and with separate carriageways of approximately 5 metres width would have less impact on pedestrian safety than an undivided road of width 7 metres, and hence could accommodate a higher traffic flow for the same degree of safety.*



It should be noted that the Environmental Capacity of a street can be increased through a reduction in speed. For example, on an existing residential street where traffic volumes reach the maximum Environmental Capacity (of 500 vph) and a proposed development could cope with the volume over the standard), traffic speed may be reduced by the introduction of traffic calming methods.

Table 4.6 of the RTA Guide (2002) takes into account both amenity and safety considerations and sets out the recommended Environmental Capacity performance standards for streets with *direct access to residential properties*. The RTA Guide suggests an Environmental Goal of 300 vph/hr for collector roads with maximum of 500 veh/hr with a speed limit of 50 kmh. The maximum speeds given are design speeds for new residential areas.

#### Assessment of Road No1 and George Evans Road Without Adjacent Subdivision

The speed limit along all roads within the Jemalong Subdivision is anticipated to be 50 km/h.

Road One between George Evans Road and Road Sixteen, illustrated in **Figure 1**, will function as a collector road and will have the following characteristics:

- The section between George Evans Road and Road Nine will be a boulevard with a divided carriageway with one lane in each direction and parking permitted on both sides. It is understood that no vehicular access to and from the adjacent land use will be permitted on that section of road. If parking is permitted adjacent to residences, then the roundabout at the junction of Road Nine with Road One would facilitate access to the eastern side of the roadway.
- The section between Road Nine and Road Sixteen will have a two-lane undivided carriageway with parking permitted on both sides; residences along the road will have direct access to it.

The ratio of the estimated future two-way traffic volumes to the Desirable Environmental capacity along Road One and George Evans Road at completion of the Jemalong subdivision are included in **Table 4** without and with Thompson point Reserve traffic.

An assessment of the Environmental Capacity of the roadway without the Council/NLALC subdivision indicates:

- At the completion of the Jemalong Subdivision the total estimated two-way peak hourly volumes along Road One and George Evans Road, without the Thompson Point Reserve would be slightly below the Desirable Environmental Capacity of 300 vph as noted in **Tables 5** and **6**.
- The completion of Road One within the subdivision will provide a more direct access to and from the Thompson Point Reserve from George Evans Road. Traffic to and from the Reserve would therefore redirect, from the currently unmade route along George Evans Road and Jonsson Road, to Road One. This would have the following impacts on Road One:
  - North of Road Nine, Road One would continue to operate below the Desirable Environmental Capacity at all time;
  - South of Road Nine, Road One would operate marginally above the 300 vph Desirable Environmental Goal during the morning and afternoon peak hour on weekdays; and
  - Traffic volumes along Road One would not exceed the Desirable Environmental Goal on weekend.



## Assessment of Road One and George Evans Road with Whole Mundamia URA

The ratio of the estimated future two-way traffic volumes to the Desirable Environmental Capacity along Road One and George Evans Road at completion of the whole Mundamia URA are also included in **Table 4** with the Thompson Point Reserve traffic.

		Jemalong Subdivision only		With Thompson Point		With Council/ URA		
Road	Section	Volumes vph	% EC 300 vph	Volumes Vph	% EC 300 vph	Volumes vph	% EC 300 vph	% EC 500 vph
WEEKDAY AM PEAK								
Road One	North of Road Nine	170	57%	180	60%	180	60%	36%
Road One	Road 9 to George Evans	297	99%	307	102%	533	176%	107%
George Evans	Uni Roundabout to Road 1	297	99%	307	102%	705	233%	141%
WEEKDAY PM PEAK								
Road One	North of Road Nine	170	57%	180	60%	180	60%	36%
Road One	Road 9 to George Evans	297	99%	307	102%	545	180%	109%
George Evans	Uni Roundabout to Road 1	297	99%	307	102%	721	238%	144%
WEEKEND PEAK HOUR								
Road One	North of Road Nine	136	45%	176	59%	176	59%	35%
Road One	Road 9 to George Evans	238	79%	278	93%	463	153%	93%
George Evans	Uni Roundabout to Road 1	238	79%	278	93%	602	199%	120%

**Table 6: Traffic Volumes & Environmental Capacity- Mundamia Urban Release Area & Thompsons Point Reserve**

An assessment of the Environmental Capacity of the roadway at full completion of the Mundamia URA indicates the total estimated two-way peak hourly volumes along Road One would

- not exceed the desirable Environmental Goal of 300 vph north of Road Nine at all time;
- between Georges Evans Road and Road Nine
  - exceed the 500 vph maximum Environmental Capacity during the morning and afternoon peak hours; and
  - not exceed the maximum Environmental capacity on weekend.

An assessment of the Environmental Capacity of the roadway at full completion of the Mundamia URA indicates the total estimated two-way peak hourly volumes along George Evans Road would considerably exceed the 500 vph maximum Environmental Capacity during the weekdays morning and afternoon peak hours and on weekend.

However, it should be noted that the concept of Environmental Capacity does not apply to this section of road as it is abutted by vegetations.



## Need for Traffic Calming Devices

The TDG report (October 2017) indicated that

- roundabouts are not required on capacity grounds at the junction of Road One with George Evans Road and with Road Nine.
- the provision of a roundabout at the intersection of Road One with Road Nine included in the 2010 Contribution Plan could be considered in conjunction with the adjacent subdivision, on safety ground to ensure minimum conflicts and to provide a landmark of the main access to both subdivisions.

Traffic measures to necessarily reduce through traffic and speed along Road One north of Road Nine, are not required as traffic volumes are expected to be in the same order as the Desirable Environmental Goal of 300 vph.

The traffic volumes along Road One, between George Evans Road and Road Nine, would exceed the Desirable Environmental Capacity of the roadway when the whole of the Mundamia URA is in place. It should be noted however that if a median was provided along the section of Road One between Road 7 (but not including) and Road Nine, there would be no direct vehicular access from adjacent properties.

Nevertheless, Council's main concern appears to be related to the anticipated high speed along Road One by through traffic to the Thompson Point Reserve and traffic generated by the subdivision. Traffic generated by the subdivision is less likely to speed than traffic to and from Thompsons Point Reserve.

Council's Traffic Unit had initially asked for four roundabouts to be provided at the intersections of Road One with George Evans Rd, with Road Nine, with Road Fourteen and Road Sixteen. These roundabouts were preferred by Council to the provision of road humps. The disadvantages of road humps include:

- traffic noise level may increase just before and after the device due to braking, acceleration and the vertical displacement of vehicles (Bendtsen & Larson 2001)
- they may divert traffic to nearby streets without LATM measures
- they are uncomfortable for vehicle passengers and cyclists
- they may adversely affect access for buses, commercial vehicles and emergency vehicles
- they can impact on passenger comfort when used on bus routes.

The roundabout at Road Sixteen is not supported. Council has indicated that the provision of an entry threshold just to the north of Road Sixteen is considered a more appropriate traffic calming device, to inform traffic from the Thompsons Road Reserve they are entering a residential area.

In this context, and based on the above assessment, the provisions of roundabouts at the intersections of Road One with George Evans Road, with Road Nine and with Road 14/Jonsson Road are supported to reduce speed and manage conflicting movements at the intersections. They will become most effective when the adjacent subdivision is in place. Roundabouts have the advantages to:

- reduce vehicle conflict points and road crashes at intersections
- reduce vehicle speeds on the approach to, and through, the intersection
- control of traffic movement and provision of orderly and largely uninterrupted flow of traffic
- an increase in the visibility of the intersection
- clarify the priority of traffic movements
- enhance the appearance of the street when landscaped.



Nevertheless, it should be noted that the provisions of these improvements are not solely related to traffic generated by the Jemalong subdivision but also the traffic generated by the Thompsons Point Reserve and the adjoining subdivision which has been estimated to generate about 60 percent of all the Mundamia URA trips.

### Contribution Allocation

The contribution towards the cost of constructing the roundabout at the intersection of Road One with Road Nine is included in Council's adopted Section 94 Contribution Plan and does not form part of this assessment.

The peak hour volumes generated by the Mundamia URA and the Thompsons Point Reserve were factored to estimate the average weekly daily traffic volumes using each of the remaining three proposed devices along Road One. This information is included in **Table 7**.

Device	Jemalong	Thompsons	Adjacent	Total Volumes
<b>Average Weekly Daily Volumes</b>				
Entry Thresholds		111		<b>111</b>
Roundabout at Road 14	1603	111		<b>1714</b>
Roundabout at George Evans with Road 1	2,800	111	3770	<b>6,638</b>
<b>Percentage Contribution by Device</b>				
Entry Thresholds	0%	100%	0%	<b>100%</b>
Roundabout at Road 14	82%	18%	0%	<b>100%</b>
Roundabout at George Evans with Road 1	42%	1%	57%	<b>100%</b>

**Table 7: Proportion of Overall Subdivision Traffic**

A contribution in lieu for each device should be raised in accordance to the percentage of traffic the proposed Jemalong development would generate within the Mundamia Urban Release Area as summarised in **Table 7**. Traffic associated with the Thompsons Point Reserve have been included as they would account for most of through traffic along Road One north of Road Nine. Council should be responsible for this small portion of costs.



## Proposed Conditions of Consent

In order to ensure that speeds are maintained at acceptable safe levels, the following conditions of consent are proposed:

- The applicant shall contribute towards the cost of the roundabout at the intersections of Road One with Road Nine in accordance with Council's Contribution Plan;
- The applicant shall provide the following proportional contributions towards the cost of the roundabouts at the following intersections:
  - Road One with George Evans Road -42%, and
  - Road One with Road Fourteen -82%.
- The design of all roundabouts should satisfy Council's Traffic Unit and subject to the formal legal approval process through the Shoalhaven Traffic Committee and Council.
- If the Applicant pursue the provision of a median along Road 1, between Road 9 and Road 7, then
  - The proposed median should not extend south along Road 1 beyond Road 7 so as not to prevent any RFS and other Emergency vehicles accessing Road 7; and
  - The roundabout at Road 1 and Road 9 should be constructed concurrent to the median to allow vehicles to access the lots on the eastern side of Road 1.
- The design of the intersection for Road 1 and Road 7 to be undertaken concurrent to the design of the median in Road 1 and the Roundabout at Road 1 and George Evans Road to ensure the site access arrangements are suitable prior to the issue of any Construction Certificate.