

APPENDIX J

WARRIEWOOD VALLEY URBAN RELEASE AREA SECTOR 9

PROPOSED REZONING FOR RESIDENTIAL DEVELOPMENT

TRAFFIC IMPACT ASSESSMENT

21 October 2008

PROJECT NO. 8041

PREPARED BY

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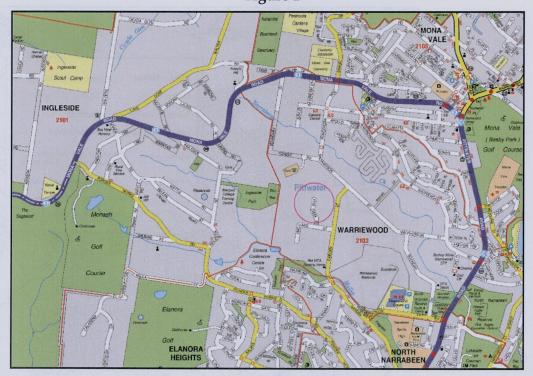
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1. Introduction And Site Location

This Traffic Impact Assessment has been prepared under instruction from Stockland Pty Ltd to accompany a rezoning application to Pittwater Council for a proposed residential subdivision within Sector 9 of the Warriewood Valley Urban Release Area (Figure 1).

Vehicle access is proposed from Orchard Street and Fern Creek Road.

DEVELOPMENT SITE LOCATION Figure 1



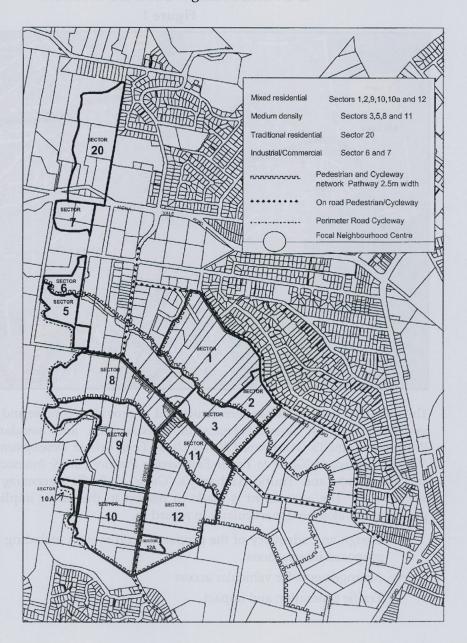
The format of this report has been structured to provide a concise and fully detailed assessment against relevant heads of consideration and standards including Pittwater Council's 'Warriewood Valley Urban Land Release Development Control Plan No. 29', Austroads 'Guide to Traffic Engineering Practice Part 5: Intersections at Grade' and the Roads and Traffic Authority's 'Guide to Traffic Generating Developments Version 2.2'. The assessment is made in respect to the traffic implications of the proposed development, particularly in regard to:

- Design and adequacy of the proposed road system including assessment of proposed intersections
- Arrangements for vehicular access
- Traffic generation and impact

2. DESCRIPTION OF DEVELOPMENT

Sector 9 is identified in the Sector map within the 'Warriewood Valley Urban Land Release Development Control Plan No. 29' and occupies a parcel of land bounded by Orchard Street in the south, Garden Street to the east and Fern Creek to the north as shown in Figure 2 below.

SECTOR MAP Figure 2



The Sector 9 Master Plan is shown in Appendix 'A'. There are currently 10 existing dwelling houses within the Sector boundaries. The proposed Master Plan will create 203 new dwelling entitlements. In accordance with the development parameters in 'DCP No. 29' for this Sector residential development will comprise a mix of medium density and traditional dwellings in the following mix:-

Medium density lots = 86

Traditional lots = 127

Total = 213

All vehicle access is proposed off Orchard Street with Fern Creek Road providing the primary internal access for the Sector.

No vehicle access is proposed from Garden Street.

3. ROAD AND TRAFFIC CONDITIONS

The Arterial road network serving the Warriewood Valley precinct and environs comprises the classified main roads Mona Vale Road (MR 162) and Pittwater Road (MR 164) which provides the major east-west and north-south routes respectively to and from the northern beaches.

An indication of traffic conditions on these roads in the vicinity of the Warriewood Valley Urban Release Area is provided in data published by The Roads and Traffic Authority of NSW. The most recent data¹ is for 2002 and is expressed in terms of Annual Average Daily Traffic (AADT) flows (two-way) as shown in Tables 3.1 and 3.2 below:

Table 3.1 MONA VALE ROAD (MR 162) TRAFFIC FLOWS

Year	AADT (West of Emma Street)
1996	17,421
1999	19,084
2002	18,556

Table 3.2
PITTWATER ROAD (MR 164) TRAFFIC FLOWS

Year	AADT (South of Vineyard Street)
1996	46,013
1999	47,841
2002	45,847

The data indicates modest decreases in average daily flows between 1999 and 2002 of some 2.8% for Mona Vale Road and 4.2% for Pittwater Road.

¹ Roads and Traffic Authority 'Traffic Volume Data 2002: Sydney Region'

Existing road characteristics and traffic facilities in the immediate area relevant to this study are:-

Orchard Street

- 9.8m wide carriageway constructed on a straight alignment with a modest down grade west to east; kerb and gutter on the southern side only
- single lane roundabout at the Garden Street/Orchard Street intersection

Fern Creek Road

- 6.6m wide carriageway between 'roll' kerbs constructed on a curving horizontal alignment with a crest approximately 80m north of Orchard Street
- "STOP" sign control in Fern Creek Road at Orchard Street

Roads directly serving Sector 9 are documented in the 'Warriewood Valley Urban Release Roads Master Plan (2006)' and have the following road hierarchy classifications and design parameters:-

Ponderosa Parade/Macpherson Street/Warriewood Road (east of Macpherson St)/**Garden Street** are 'Sub-Arterial Streets' having the following relevant design characteristics:-

Traffic Volume:

10,000 vehicles per day (approx. upper limit)

Speed Limit:

50km/h

Traffic Lanes:

2 x 3.0m wide lanes

Cycle Lane:

1.2m wide in carriageway

Parking Lane:

2.0m wide

Orchard Street/Fern Creek Road are nominated as 'Collector Streets' having the following relevant design characteristics:-

Traffic Volume:

5,000 vehicles per day (approx. upper limit)

Speed Limit:

50 km/h

Traffic Lanes:

2 x 3.7m wide lanes

Cycle Lane:

shared with traffic lane

Parking Lane:

2.0m wide

The Roads Master Plan also details road construction and traffic facilities required for the Warriewood Valley Area. The timeframe for implementing the required works is contained in the 'Warriewood Valley Section 94 Contributions Plan'2.

² 'Warriewood Valley Section 94 Contributions Plan No 15 Amendment No 16'

Works proposed in the immediate vicinity of Sector 9 and the timeframe for construction are listed in Table 3.3 below:

Table 3.3
PROPOSED ROAD WORKS/TRAFFIC FACILITES

Street	Works	Year
Orchard Street	Reconstruction	N K (Developer funded)
Orchard Street	Central median Garden Street to Fern Creek Road	2010
Orchard St/Fern Creek Rd/Grevillea Ave	Roundabout	2011
Fern Creek Road	Pedestrian refuge	2010

Peak hour traffic volume surveys were carried out at the Orchard Street/Fern Creek Road/Grevillea Avenue intersection on Tuesday 14 October 2008 to quantify existing traffic flows in the immediate area, a summary of the results are shown in Figure 3 overleaf, with the full intersection counts included in Appendix 'B'.

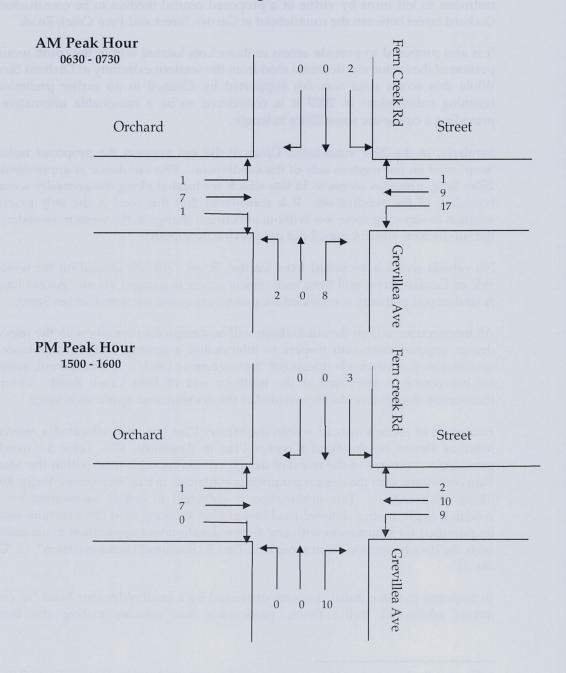
The surveys indicate that Orchard Street, between Garden Street and Fern Creek Road is carrying am and pm peak hour two way traffic flows of 44 and 41 vehicles per hour respectively or two way flows in the range 410 to 440 vehicles per day. Fern Creek Road is carrying am and pm peak hour two ways flows of 4 and 6 vehicles per hour respectively or daily two way flows in the range 40 to 60 vehicles per day.

The surveyed traffic flows for Orchard Street and Fern Creek Road reveal that these roads are presently carrying daily two way traffic flows well below the upper limit of 5,000 vehicles per day specified in the Roads Master Plan for their "Collector Street" classification.

ORCHARD STREET/FERN CREEK ROAD/GREVILLEA AVENUE, WARRIEWOOD

EXISTING PEAK HOUR TRAFFIC FLOWS (October 2008)

Figure 3



4. Access Arrangements and Road Design

As noted earlier all vehicle access to Sector 9 will be from Orchard Street with Fern Creek Road providing the primary internal access for the Sector. A new road is proposed off Orchard Street between Garden Street and Fern Creek Road with access restricted to left turns by virtue of a proposed central median to be constructed in Orchard Street between the roundabout at Garden Street and Fern Creek Road.

It is also proposed to provide access to those Lots located within the south western portion of the Sector via an access road from the western extremity of Orchard Street. While this access road was not supported by Council in an earlier preliminary rezoning submission³ in 2007 it is considered to be a reasonable alternative to providing a cul-de-sac some 280m in length.

Similarly, in the 2007 submission Council³ did not support the proposed isolated 'loop' road on the western side of the subdivision. This cul-de-sac is approximately 250m long, provides access to 16 lots which are located along the generally western boundary of the subdivision. It is considered that this road is the only practical solution to servicing these lots without effecting a change to the western boundary of the subdivision which Council did not previously support.

No vehicle access is proposed from Garden Street. All lots located on the western side of Garden Street will have rear vehicle access to garages via an "Access Lane". A landscaped pathway is provided for pedestrian access to/from Garden Street.

All intersections within the subdivision will be designed to comply with the relevant design requirements with respect to intersection geometry and sight distance as specified in the Austroads document 'Intersections at Grade'. A roundabout, suitable for bus access, is proposed at the northern end of Fern Creek Road. Detailed intersection designs would be provided at the development application stage.

Each road or section of road within the Master Plan has been allocated a reference letter as shown on the Road Concept Plan in Appendix 'C'. Table 5.1 overleaf provides a summary of the relevant design criteria for each road within the Master Plan consistent with the design parameters contained in the 'Warriewood Valley Roads Master Plan (2006)'. This information is sufficient to enable assessment for the rezoning application, a detailed road layout plan showing road cross sections would be provided for submission with any future development application in accordance with the documentation requirements in Part 5 "Required Documentation" of 'DCP No. 29'.

In response to some initial concerns expressed by a landholder that Road 'A' could attract additional traffic flows, particularly for vehicles exiting the Sector,

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³ 'Report to Environment and Planning Committee for meeting to be held on 5 November 2007 Sector 9 Preliminary Rezoning Submission – Warriewood Valley Urban Land Release'

RAY DOWSETT TRAFFIC AND TRANSPORT PLANNING PTY LTD consideration could be given at development application stage to introducing traffic management measures to discourage excessive traffic flows. 8041 Warriewood Valley - Sector 9 Rezoning.doc Page 9

ROAD DESIGN CRITERIA

TABLE 5.1

	Road	M	Access	Street	105	10
	Road	,T,	Access	Lane	104	8
	Road	, K	Access	Lane	176	8
	Road	J.	Access	Lane	52	8
	Road	T	Access	Street	26	10
	Road	,H,	Local	Street	113	16
	Road	5	Access	Street	78	10
	Road	,Ł	Local	Street	144	16
	K	, F,	Local	Street	108	16
	Road	'D'	Access	Street	95	10
	Road	,C	Local	Street	81	16
	Road	'B'	Access	Street	144	12
	Road	'A'	Local	Street	207	16
	Fern Creek	Road	Collector	Sector Entry	503	20
The state of the s	Design Criteria			Classification	Assessed daily traffic volume	Reserve width (m)

5. TRAFFIC GENERATION AND IMPACTS

The Roads and Traffic Authority's 'Guide to Traffic Generating Developments V2.2' provides data on traffic generation rates for various forms of development. In respect to residential housing the Authority advises the following applies:-

Dwelling houses:

Daily vehicle trips (dvt) = 9 per dwelling Weekday peak hour vehicle trips (pvt) = 0.85 per dwelling

Medium density residential flat building and town houses (3 or more bedrooms)

Daily vehicle trips = 5.0-6.5 per dwelling

Weekday peak hour vehicle trips – 0.5-0.65 per dwelling

An assessment based on the preceding data (using the higher figure in the range for townhouses to provide a robust assessment) for Sector 9 based on a mix of 127 traditional dwellings and 86 medium density townhouses indicates traffic generation as shown in Table 6.1 below:

Table 6.1
SECTOR 9 TRAFFIC GENERATION

Dwelling Type	Daily Traffic Generation (dvt)	Peak Hour Traffic Generation
Traditional	127 @ 9dvt/dwelling = 1,143	127 @ 0.85 pvt/dwelling = 108
Townhouse	86 @ 6.5/dwelling = 559	86 @ 0.65/dwelling = 55.9
Total	1,702 dvt	163.9 (say 164) pvt

Accordingly, the development proposal would generate approximately 1,702 daily vehicle trips or 164 peak hour vehicle trips.

Assuming an 80:20 split to the peak direction i.e. 80% departing and 20% arriving in the am peak period, with the reverse occurring in the pm peak period, the am and pm peak hour vehicle trips to and from the Sector would be generally as indicated in Table 6.2 overleaf:

Table 6.2
SECTOR 9 PEAK HOUR VEHICLE MOVEMENTS

Peak Hour	In	Out	Total
AM	33	131	164
PM	131	33	164

For assessment purposes it has been assumed that all traffic entering and exiting Sector 9 would use the Orchard Street/Fern Creek Road/Grevillea Avenue intersection whereas in reality a proportion of the traffic will depart the Sector directly onto Orchard Street (properties east of the intersection) and via a left turn from the new Road 'A' and not use the intersection. Therefore, the assessment is considered to be very robust in respect to the operation of the proposed roundabout post development.

On this basis the traffic generated has been assigned to Orchard Street/Fern Creek Road/Grevillea Avenue intersection, as shown in Figure 4 overleaf, and modelled using the 'INTANAL' intersection modelling program with the criteria for interpreting the results reproduced on the following page.

The existing and post development results are shown in Table 6.3 below:

POST DEVELOPMENT INTERSECTION PERFORMANCE COMPARISON

Table 6.3

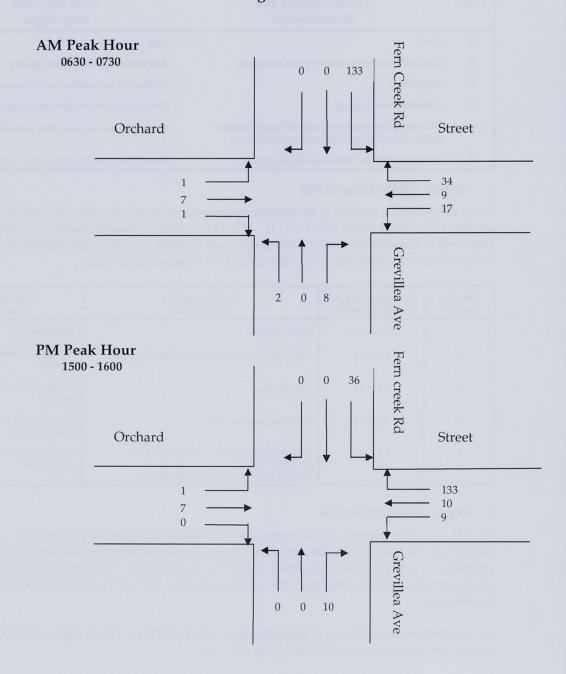
Orchard St/Fern Creek Rd/Grevillea Ave Intersection		AM Peal 0630-073			PM Peak 1500-1600	
86 @ 0.65/dwelling = 55	LOS	DS	AVD	LOS	DS	AVD
Existing conditions ('Stop' sign control)	A	0.01	2.7	A	0.01	2.8
Post development conditions (Roundabout control)	A	0.10	2.3	A	0.09	3.7

The modelling results show that, post development under roundabout control, the Orchard Street/Fern Creek Road/Grevillea Avenue intersection will continue to operate at the very satisfactory LOS 'A' in both the AM and PM peak periods with no perceptible change in Average Vehicle Delay (AVD). Similarly, daily traffic flows in Orchard Street and Fern Creek Road will remain well below the upper limit of 5,000 vehicles per day specified in the Roads Master Plan for a "Collector" Street.

ORCHARD STREET/FERN CREEK ROAD/GREVILLEA AVENUE, WARRIEWOOD

POTENTIAL PEAK HOUR TRAFFIC FLOWS

Figure 4



Criteria for Interpreting Results of 'INTANAL' Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and accident study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route).

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

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections. For intersections controlled by **traffic signals**³ both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a roundabout or GIVE WAY or STOP signs, satisfactory intersection operation is indicated by a DS of 0.8 or less.

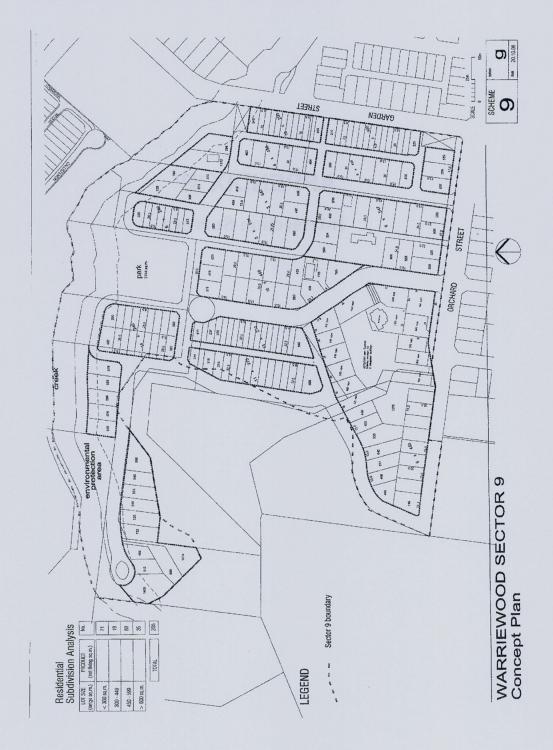
³ the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs

6. CONCLUSION

- 1. The proposed residential subdivision of Sector 9 is consistent with the planning parameters contained in 'DCP No. 29'.
- 2. The proposal will generate approximately 1,702 daily vehicle trips or 164 peak hour trips with no discernable impact on the Orchard Street/Fern Creek Road/Grevillea Avenue intersection. Post development Orchard Street and Fern Creek Road will continue to carry daily traffic flows well below the upper limit of 5,000 vehicles per day specified in the 'Warriewood Valley Roads Master Plan (2006)' for their "Collector" street classification.
- 3. The proposed access arrangements and road design comply with the relevant criteria contained in the 'Warriewood Valley Urban Land Release Development Control Plan No. 29' and 'Warriewood Valley Roads Master Plan (2006)'.
- 4. There will not be any adverse traffic or traffic related environmental implications resulting from the proposal.

APPENDIX 'A'

Warriewood Sector 9 Master Plan



APPENDIX 'B'

Intersection Surveys

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APPENDIX 'C'

Road Concept Plan

