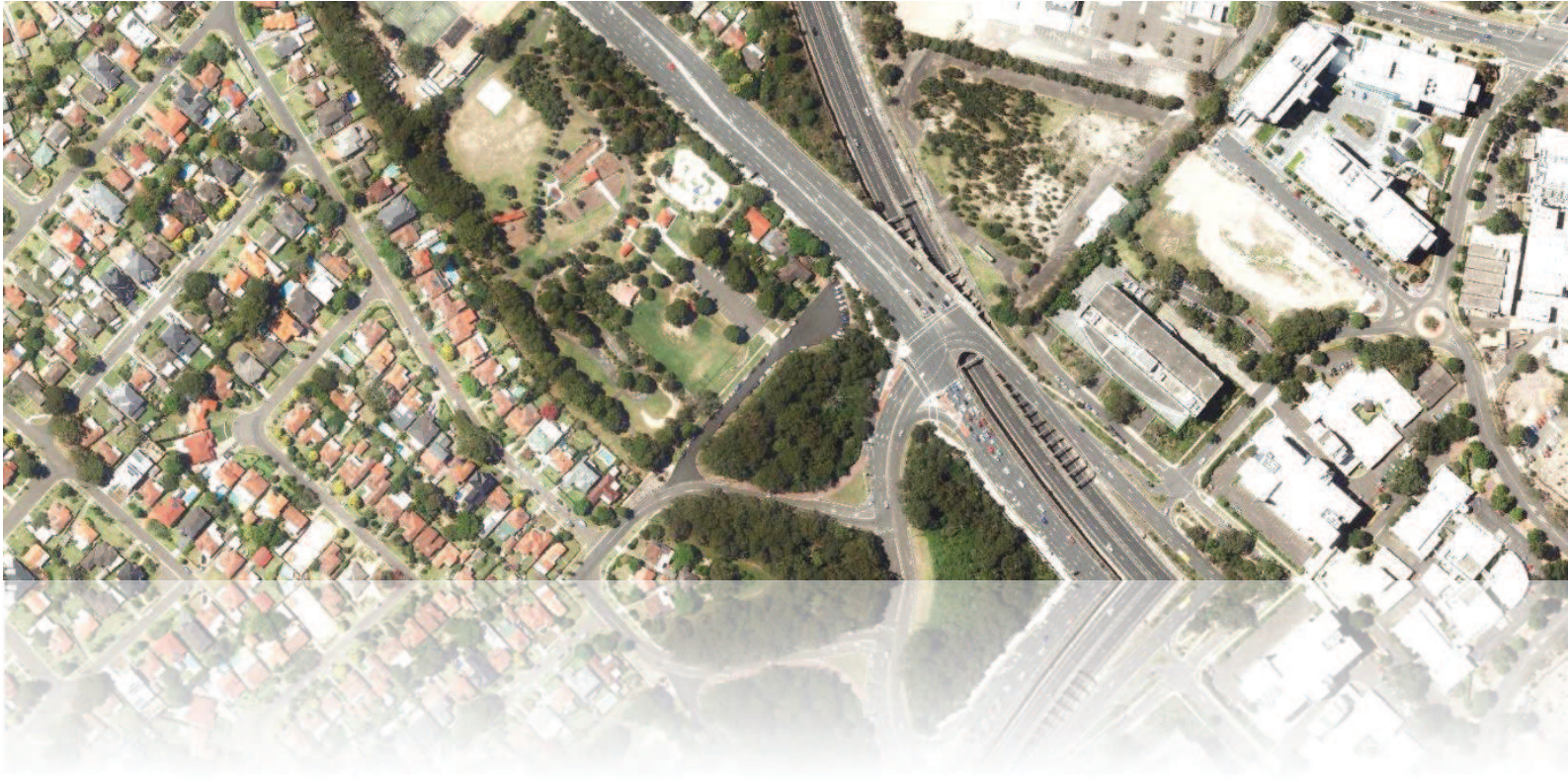

PLANNING PROPOSAL FOR A MIXED USE DEVELOPMENT

TRAFFIC & PARKING IMPACT ASSESSMENT

86 Blenheim Road & 12A-14 Epping Road, North Ryde

FINAL Issue A: 16th June 2015

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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

2015/286

PLANNING PROPOSAL – MIXED USE DEVELOPMENT

86 BLENHEIM ROAD & 12A-14 EPPING ROAD, NORTH RYDE

NSW 2113

Prepared for: Think Planners
Job reference: 2015/286
FINAL issue A: 16th June 2015

Status	Issue	Prepared By	Checked By	Date
Draft	A	RT	CM	15th June 2015
Final	A	RT	CM	16th June 2015

TABLE OF CONTENTS

1 INTRODUCTION

M^CLaren Traffic Engineering was commissioned by *Think Planners* to provide a traffic and parking impact assessment of a mixed use planning proposal on the site of 86 Blenheim Road & 12A-14 Epping Road, North Ryde NSW. This is a broad scope analysis and a refined scale of development would be required prior to submission of a Development Application (DA) for the development.

1.1 Development Summary

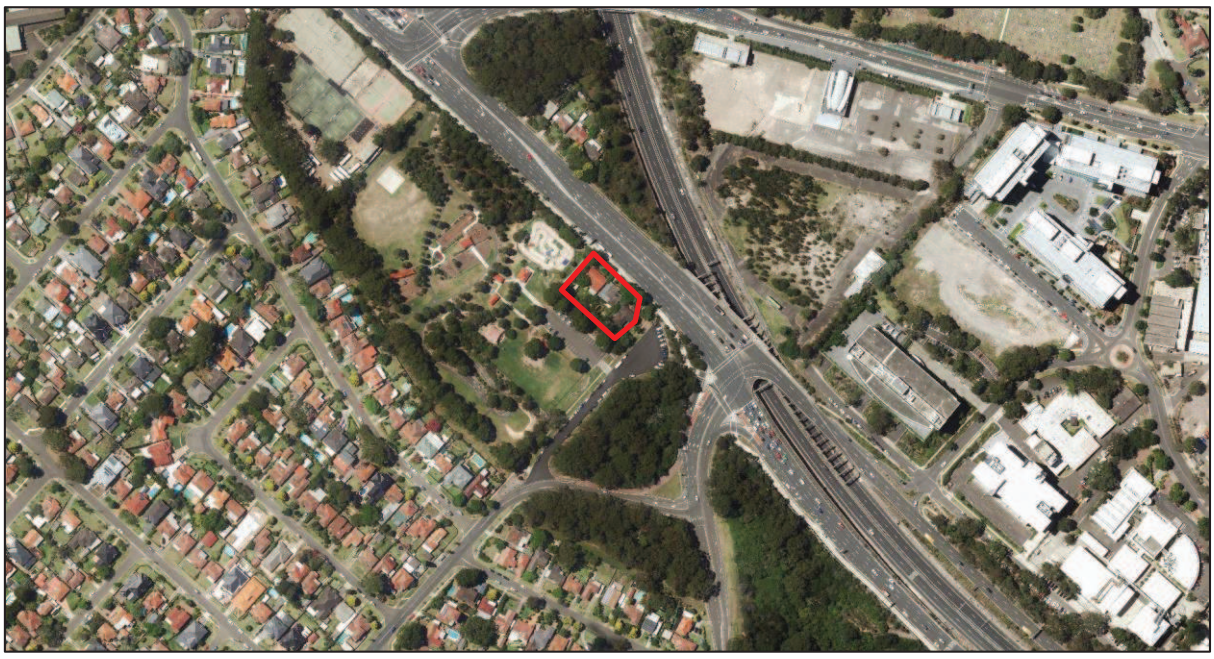
As part of the proposal, a total of three (3) existing residential lots will be amalgamated to accommodate a mixed use residential flat building. The site is proposed to accommodate a total of 95 x 2-bedroom residential apartments and 250m^2 GFA of commercial space. Adequate on-site parking is to be provided to accommodate the parking demand of the proposed development.

1.2 Site Location and Context

The site is located within a LOCAL cul-de-sac road, at the northern end of Blenheim Road, North Ryde. It has a frontage of approximately 48m to Epping Road and borders Blenheim Park on its western and south boundaries, as shown in **Figures 1 & 2**.

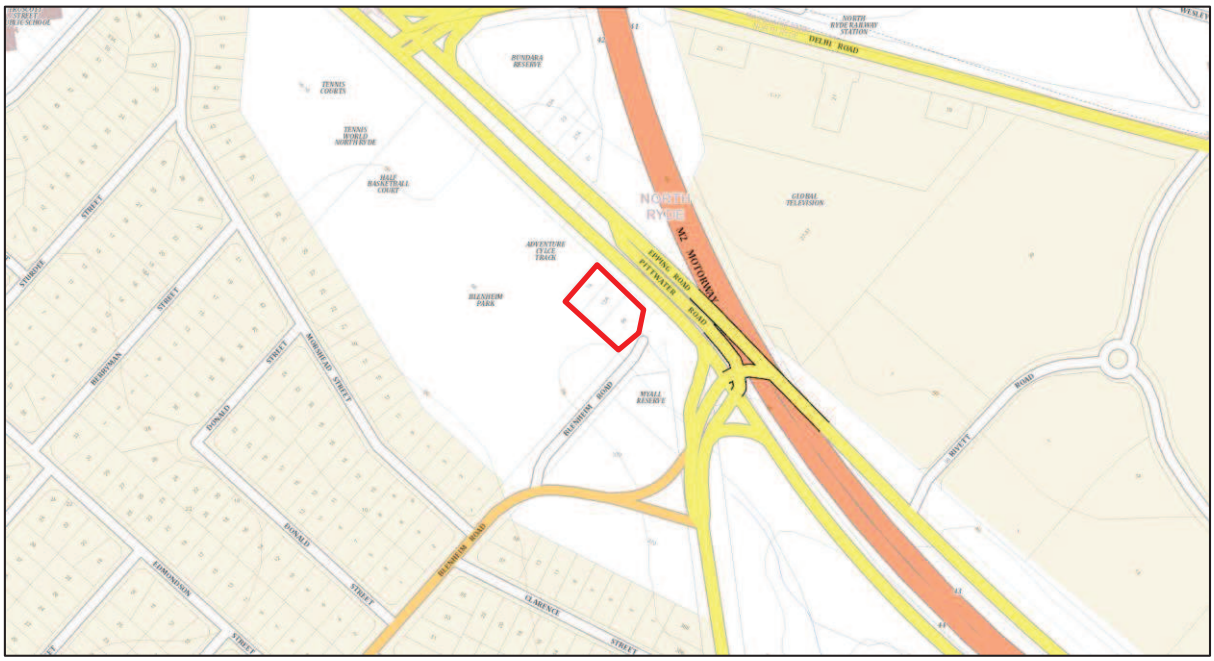
The three (3) existing residential lots on the site are legally identified as follows:

- Lot C DP410408
- Lot D DP410408
- Lot E DP410408



SITE LOCATION

FIGURE 1: AERIAL LOCATION



SITE LOCATION

FIGURE 2: MAP LOCATION

1.3 State Environmental Planning Policy (Infrastructure) 2007

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under Clause 104 of the SEPP (Infrastructure) 2007. Accordingly, formal referral to the Roads and Maritime Services (RMS) is not necessary and City of Ryde Council officers can determine this proposal accordingly.

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 Road Hierarchy

Epping Road has the following characteristics within close proximity to the site:

- RMS Classified STATE Road
- Approximately 30m wide two-way carriageway with four westbound lanes and five eastbound lanes
- Signposted 70km/h speed limit
- *"No Stopping"* and Clearway restrictions apply along both sides of the road

Blenheim Road has the following characteristics within close proximity to the site:

- Unclassified LOCAL Road
- Approximately 8m wide two-way carriageway with a cul-de-sac arrangement at the end of the street
- No signposted speed limit, 50km/h applies
- Generally unrestricted kerbside parking along both sides of the road

2.2 Traffic & Pedestrian Management

The surrounding traffic and pedestrian management controls include the following:

- Give Way T-junction at the intersection of Blenheim Road / cul-de-sac
- Give Way T-junction at the intersection of Blenheim Road / Pittwater Road
- Cul-de-sac arrangement at end of Blenheim Road (No Through Road)

2.3 Existing Intersection Performance

Intersection surveys were carried out between 7-9am and 4-6pm on Tuesday the 18th October 2011 at the intersections of Blenheim Road / cul-de-sac and Blenheim Road / Pittwater Road. Survey data is reproduced in **Annexure B** for reference and a summary of results is presented below. The intersection performance has been assessed using *SIDRA INTERSECTION 6.1* with **Table 1** below summarising the performance output.

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 6.1)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/vehicle)	Level of Service[3]	Control Type	Worst Movement
EXISTING PERFORMANCE						
Blenheim Rd / Pittwater Rd	AM	1.00	10.9 (>70)	**A** (Worst: F)	Give Way	Right turn from Pittwater Road North
	PM	>1.00	69.5 (>70)	**F** (Worst: F)		Right turn from Pittwater Road North
Blenheim Rd / Cul-de-sac	AM	0.17	0.8 (6.9)	**A** (Worst: A)	Give Way	Right turn from the cul-de-sac
	PM	0.30	0.5 (8.9)	**A** (Worst: A)		Right turn from the cul-de-sac

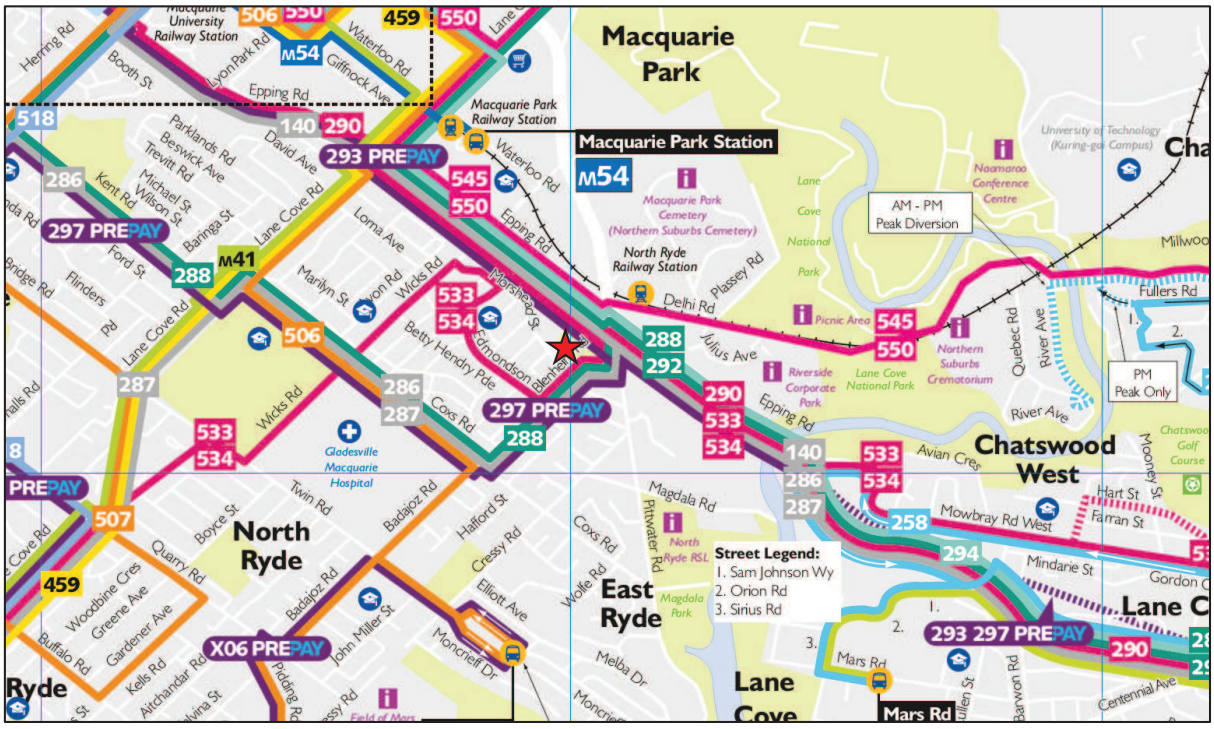
NOTES:

(1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
(2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
(3) Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

As shown in **Table 1**, the intersections of Blenheim Road with the cul-de-sac currently experience good levels of service throughout the day (A/A for AM/PM). The intersection of Blenheim Road with Pittwater Road currently has levels of service A/F for AM/PM. Although the right turn movement from Pittwater Road (North) has been assessed as LoS F, operationally this would not be apparent given that there are traffic lights at the nearby intersection of Epping Road / Pittwater Road, and that “KEEP CLEAR” is clearly marked to allow vehicles to turn right from Pittwater Road.

2.4 Public Transport Accessibility

The subject site is located approximately 550m walking distance from North Ryde Railway Station which provides regular and frequent services along the T1 line, including Chatswood, Sydney CBD, Epping and Hornsby at a minimum frequency of one service every 15 minutes throughout the day, and additional services during the peak hour. In addition, there are numerous bus routes surrounding the site that provide regular servicing throughout the day to nearby urban centres and areas less accessible by train such as Ryde and Lane Cove. Therefore, it can be concluded that the site is well accessed via public transport and the residents, commuters and visitors associated with the proposed development will not be disadvantaged in terms of public transport.



★ **Site Location**

2.5 Future Infrastructure & Development

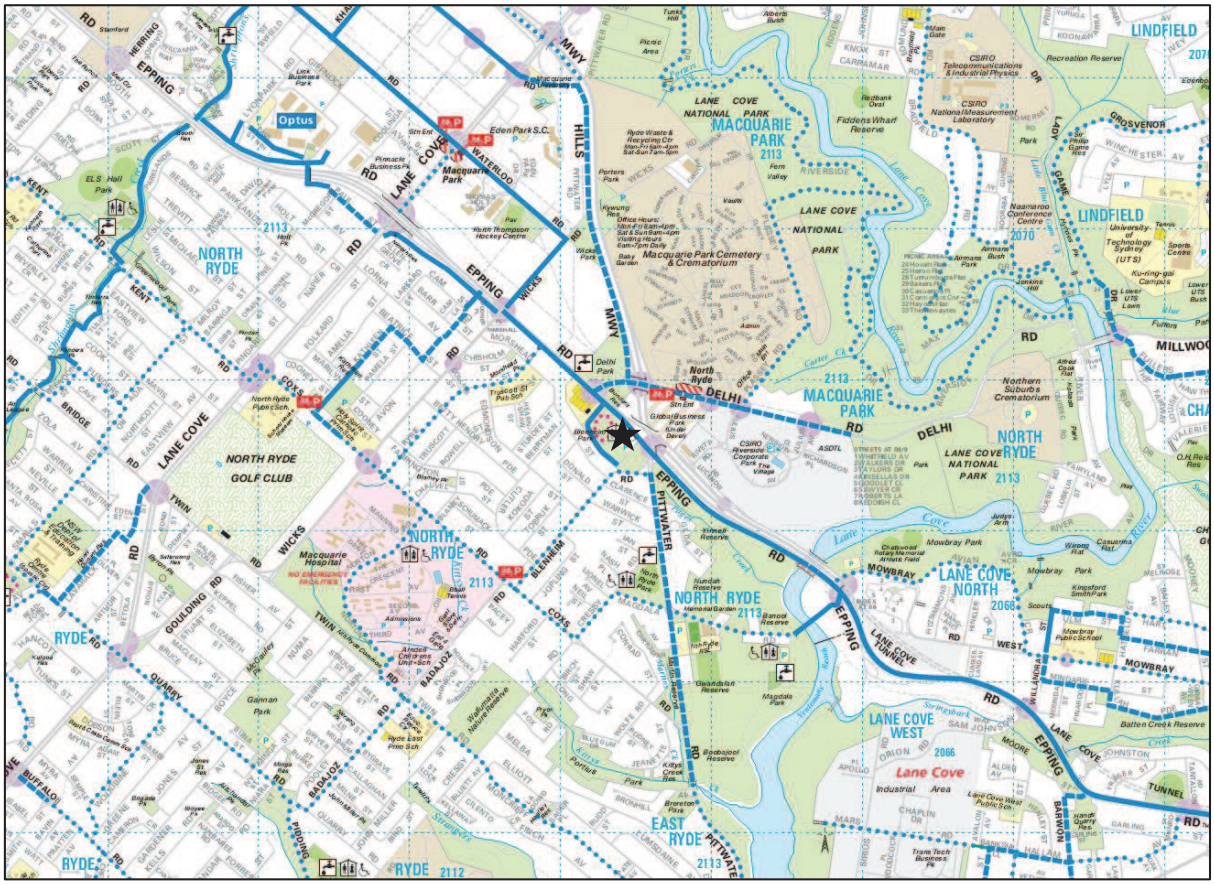
From City of Ryde Council's Development Application tracker and website, it appears that there is no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

2.6 Bicycle Infrastructure

The subject site is also located within good bicycle infrastructure, with a shared off-road bike path located along the site frontage on Epping Road. The bike path along Epping Road connects to numerous other bike paths and nearby urban centres, such as:

- Macquarie University (approximately 3km)
- Ryde (approximately 4km)
- Chatswood (approximately 6km)
- Artarmon (approximately 6km)
- Sydney CBD (approximately 13km)

Figure 3 below shows designated bicycle paths and walking trails close to the site.



★ **SITE LOCATION**

FIGURE 3: EXISTING BICYCLE PATHS

3 PROPOSED DEVELOPMENT

3.1 Zoning

The existing site is located within the R2 – Low Density Residential zone with an existing maximum FSR of 0.5:1 and maximum building height of 9.5m under the *Ryde Local Environmental* Plan (LEP) 2014. As part of the proposal, the applicant seeks to increase the FSR to 4.3:1 as well as the maximum building height.

3.2 Development Scale

The proposed mixed use development, represented by the conceptual plans in **Annexure A**, will include the construction of a mixed use residential / commercial building. Details of the proposal are as follows:

- 95 x 2 bedroom residential apartments
- 250m^2 Commercial GFA
- Basement level car parking

The vehicular access to the site will be via Blenheim Road only, and therefore two driveways along Epping Road will be closed. This will greatly improve the safety and traffic flow of vehicles, cyclists and pedestrians along Epping Road.

This is a broad scope analysis and a refined scale of development would be required prior to submission of a Development Application (DA) for the development. Conceptual plans of the proposal are reproduced in **Annexure A.**

4 PARKING ASSESSMENT

4.1 Council Parking Requirement

Reference is made to City of Ryde Council's *Development Control Plan (DCP) 2014 – Part 9.3: Parking Controls* which designate the following parking requirements applicable to the subject development:

Residential Development
0.9 to 1.2 spaces / two bedroom dwelling
1 visitor space / 5 dwellings

Office and Business Premises
1 space / 40m^2 of GFA

Table 2 below summarises Council's above car parking requirement

TABLE 2: COUNCIL DCP CAR PARKING REQUIREMENTS

Land Use	Type	Scale	Rate	Spaces Required	
				Min	Max
Residential	2 bedroom	95	0.9 to 1.2 spaces per unit	85.5	114
	Visitor	95	1 space per 5 dwellings or part thereof	19	
Non-Residential	Commercial	250m^2	1 space per 40m^2 GFA	6.3	
Total				**111**	**139**

As shown above, strict application of the DCP requires a total of **111-139** car parking spaces for the current development proposal. These parking requirements outlined in Council's DCP shall be met by the development within the DA and Construction Certificate stages. It is expected that this parking will be accommodated on-site in the form of underground basement parking, subject to detailed design.

4.2 Disabled Parking

The required disabled parking should comply with those requirements set out in Council's DCP and the Building Code of Australia (BCA).

4.3 Bicycle & Motorcycle Parking Requirements

Council's DCP specifies that *in every new building, where the floor space exceeds 600m2 GFA provide bicycle parking equivalent to 10% of the required car spaces or part thereof*. Therefore, given that the current development proposal requires 111-139 car parking spaces, 11-14 bicycle spaces are required. These are to be designed in accordance with AS 2890.3:1993

4.4 Servicing & Loading

Council's DCP does not specify any loading facility requirements for residential flat buildings with access from the local road network. As such, it is understood that waste collection and loading will be conducted on-street.

4.5 Parking Design Compliance

Compliance assessments of vehicular access arrangements and internal parking layouts are subject to detailed design assessments at DA stages. The submitted concept plans appear to generally comply with AS2890.1, AS2890.6 and AS4299 where applicable. Further there is opportunity to comply with these standards and it is assumed that a compliant parking layout will be achieved at the DA stage.

5 TRAFFIC ASSESSMENT

The impacts of the expected traffic generation levels associated with the subject proposal are discussed in the following sub-sections.

The assessment of traffic volumes generated by the development option has been conducted in accordance with the RMS *Guide to Traffic Generating Developments* (October 2002) and more recent supplements. The assessment takes the view that the overall Level of Service (LoS) of nearby critical intersections should be maintained whilst some increase in delay for individual movements could be tolerated, particularly for non-critical movements.

Additionally, along with the performance of the nearby critical intersections of Blenheim Road with Pittwater Road and the cul-de-sac, due consideration is to be given to the local area's road safety, traffic flow efficiency and local amenity.

5.1 Traffic Generation

As outlined above, the traffic generation rates have been based upon those specified in the RMS *Guide to Traffic Generating Developments* (October 2002). Updated data from the RMS (RMS Technical Direction TDT 2013/04) outlines reduced trip rates for high density residential developments compared to those found in 2002. Further sensitivity is included by not discounting the existing traffic generation of the residential dwellings on the site. **Table 3** hence outlines reasonable worst case traffic generation for the proposed development scale.

TABLE 3: ESTIMATED TRAFFIC GENERATION

Use	Scale	Peak Hour Rate	Peak Hour Generation	Peak Hour Split	
				AM	PM
PROPOSED FUTURE TRAFFIC					
Residential	95 units	0.19 per unit(1)	18	4 in 14 out	14 in 4 out
Office	250m^2 GFA	2 per 100m^2(2)	5	4 in 1 out	1 in 4 out
Total	**-**	**-**	**23**	**8 in 15 out**	**15 in 8 out**

Notes: (1) Assumes 20% inbound & 80% outbound during AM peak: Vice versa for PM.
(2) Assumes 80% inbound & 20% outbound during AM peak: Vice versa for PM.

As shown above, the maximum traffic generation associated with the proposed development is in the order of 23 vehicle trips (AM – 8 inbound and 15 outbound; PM – 15 inbound and 8 outbound) for the site above the existing traffic generation. This equates to approximately 1 vehicle every 2.5 minutes, which is a relatively low level of traffic generation when considering the existing traffic volumes on both Pittwater Road and Epping Road.

In addition, no concession has been made for the traffic generation of the existing sites.

5.2 Traffic Assignment

Given the location of the site, all traffic generation of the site is assumed to travel to and from Epping Road via Pittwater Road.

5.3 Traffic Impact

The traffic generation outlined in **Section 5.1 & 5.2** above has been added to the existing traffic volumes recorded. SIDRA INTERSECTION 6.1 was used to assess the intersections performance. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 4** below:

TABLE 4: FUTURE INTERSECTION PERFORMANCES (SIDRA INTERSECTION 6.1)

Intersection	Peak Hour	Degree of Saturation(1)	Average Delay(2) (sec/vehicle)	Level of Service(3)	Control Type	Worst Movement
EXISTING PERFORMANCE						
Blenheim Rd / Pittwater Rd	AM	1.00	10.9 (>70)	**A** (Worst: F)	Give Way	Right turn from Pittwater Road North
	PM	>1.00	69.5 (>70)	**F** (Worst: F)		Right turn from Pittwater Road North
Blenheim Rd / Cul-de-sac	AM	0.17	0.8 (6.9)	**A** (Worst: A)	Give Way	Right turn from the cul-de-sac
	PM	0.30	0.5 (8.9)	**A** (Worst: A)		Right turn from the cul-de-sac
FUTURE PERFORMANCE (after development)						
Blenheim Rd / Pittwater Rd	AM	1.00	10.8 (>70)	**A** (Worst: F)	Give Way	Right turn from Pittwater Road North
	PM	>1.00	>70 (>70)	**F** (Worst: F)		Right turn from Pittwater Road North
Blenheim Rd / Cul-de-sac	AM	0.17	1.0 (6.9)	**A** (Worst: A)	Give Way	Right turn from the cul-de-sac
	PM	0.31	0.6 (9.1)	**A** (Worst: A)		Right turn from the cul-de-sac

NOTES:

(1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.

(2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
(3) Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

As shown in **Table 4** above, the intersections of Blenheim Road with Pittwater Road and the cul-de-sac maintain their overall Levels of Service (LoS) when compared to the existing intersection performances. The additional delays due to the proposed development are minimal and therefore will have little to no impact on the surrounding traffic environment. Furthermore, the traffic generation of the proposed development has been analysed as a worst case scenario, such as by not discounting existing uses on the site and additional traffic is hence likely to be lower than what was analysed. Residential amenity is not strictly applicable given the close proximity to Epping Road, an RMS classified STATE road, though in any case is unlikely to be affected by the proposed development.

6 CONCLUSION

In summary, the planning proposal at 86 Blenheim Road & 12A-14 Epping Road, North Ryde for 95 residential units and 250m^2 GFA of commercial space has been assessed on its traffic and parking impacts.

The result of the parking assessment has shown that the development proposal should provide 111-139 car parking spaces in a basement car park in order for strict compliance with Council's DCP. Bicycle parking in the order of 11-14 parking spaces and service/loading bay provision can be determined during Development Application.

The traffic generation associated with the planning proposal is low with respect to the existing traffic volumes on surrounding streets, namely Pittwater Road and Epping Road. Although the analysis shows additional delays, these are considered minimal and will not have an adverse impact on the surrounding traffic environment.

In view of the foregoing, the planning proposal at 86 Blenheim Road & 12A-14 Epping Road, North Ryde for 95 residential units and 250m^2 GFA of commercial space is supportable on traffic and parking grounds.

ANNEXURE A: TRAFFIC SURVEYS (Sheet 1 of 2)

Curtis Traffic Surveys	Turning movement count				Peak Hour Volumes		223	287							
Job:	111004mcl					335									
Day, date	18/10/11					0									
Location:	Pittwater Rd & Blenheim Rd						0	1280							
Weather:	Fine														
Client:	McLaren Traffic Engineering														
	From Pittwater Rd north				From Blenheim Rd				From Pittwater Rd south						
	Through		Right		Left		Right		Left		Through				
Time Period	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses			
07:00 to 07:15	85	0	23	0	92	4	1	0	3	0	156	0	364		
07:15 to 07:30	76	0	38	2	97	4	0	0	2	0	212	0	431		
07:30 to 07:45	91	0	52	4	78	7	0	0	0	0	404	0	636	peak	
07:45 to 08:00	54	0	27	3	46	6	1	0	1	0	284	0	422		
08:00 to 08:15	65	2	47	3	78	4	0	0	0	0	352	0	551		
08:15 to 08:30	52	1	44	5	69	6	0	0	0	0	253	1	431		
08:30 to 08:45	91	1	57	4	82	5	0	0	0	0	391	1	632		
08:45 to 09:00	74	1	58	4	87	4	0	0	0	0	281	1	510		
Total	588	5	346	25	629	40	2	0	6	0	2333	3			
Hourly summary															
07:00 to 08:00	306	0	140	9	313	21	2	0	6	0	1056	0	1853		
07:15 to 08:15	286	2	164	12	299	21	1	0	3	0	1252	0	2040		
07:30 to 08:30	262	3	170	15	271	23	1	0	1	0	1293	1	2040		
07:45 to 08:45	262	4	175	15	275	21	1	0	1	0	1280	2	2036		
08:00 to 09:00	282	5	206	16	316	19	0	0	0	0	1277	3	2124	peak hour	

Curtis Traffic Surveys	Turning movement count				Peak Hour Volumes		141	21							
Job:	111004mcl					24			22						
Day, date	18/10/11					314			200						
Location:	Blenheim Rd & dead end														
Weather:	Fine														
Client:	McLaren Traffic Engineering														
	From Blenheim Rd east				From dead end				From Blenheim Rd west						
	Through		Right		Left		Right		Left		Through				
Time Period	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses			
07:00 to 07:15	26	0	0	0	0	0	0	0	0	0	93	4	123		
07:15 to 07:30	40	2	0	0	0	0	1	0	4	1	97	4	149		
07:30 to 07:45	50	4	2	0	1	0	0	2	6	2	77	7	151		
07:45 to 08:00	26	3	2	0	2	0	2	0	6	0	45	6	92		
08:00 to 08:15	41	1	6	2	6	1	3	0	4	1	72	3	140		
08:15 to 08:30	40	5	4	0	4	1	2	0	3	1	65	5	130		
08:30 to 08:45	54	3	3	1	3	1	5	0	6	0	79	4	159		
08:45 to 09:00	53	3	5	1	4	1	3	1	8	1	83	3	166	peak	
Total	330	21	22	4	20	4	16	3	37	6	611	36			
Hourly summary															
07:00 to 08:00	142	9	4	0	3	0	3	2	16	3	312	21	515		
07:15 to 08:15	157	10	10	2	9	1	6	2	20	4	291	20	532		
07:30 to 08:30	157	13	14	2	13	2	7	2	19	4	259	21	513		
07:45 to 08:45	161	12	15	3	15	3	12	0	19	2	261	18	521		
08:00 to 09:00	188	12	18	4	17	4	13	1	21	3	299	15	595	peak hour	

ANNEXURE A: TRAFFIC SURVEYS (Sheet 2 of 2)

Curtis Traffic Surveys	Turning movement count				Peak Hour Volumes		568	902							
Job:	111004mcl					207									
Day, date	18/10/11					6									
Location:	Pittwater Rd & Blenheim Rd						8	458							
Weather:	Fine														
Client:	McLaren Traffic Engineering														
	From Pittwater Rd north				From Blenheim Rd				From Pittwater Rd south						
	Through		Right		Left		Right		Left		Through				
Time Period	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses			
16:00 to 16:15	106	0	62	3	23	2	0	0	1	0	61	0	258		
16:15 to 16:30	262	0	134	3	63	5	0	0	3	0	105	0	575	peak	
16:30 to 16:45	188	0	97	3	50	2	0	0	1	0	99	0	440		
16:45 to 17:00	206	0	127	3	58	2	0	0	2	0	105	0	503		
17:00 to 17:15	249	0	132	5	40	5	0	0	2	0	124	0	557		
17:15 to 17:30	219	0	157	1	50	3	4	0	2	0	116	3	555		
17:30 to 17:45	228	0	140	4	46	3	2	0	2	0	110	0	535		
17:45 to 18:00	225	0	133	5	54	1	0	0	2	0	69	0	489		
Total	1683	0	982	27	384	23	6	0	15	0	789	3			
Hourly summary															
16:00 to 17:00	762	0	420	12	194	11	0	0	7	0	370	0	1776		
16:15 to 17:15	905	0	490	14	211	14	0	0	8	0	433	0	2075		
16:30 to 17:30	862	0	513	12	198	12	4	0	7	0	444	3	2055		
16:45 to 17:45	902	0	556	13	194	13	6	0	8	0	455	3	2150	peak hour	
17:00 to 18:00	921	0	562	15	190	12	6	0	8	0	419	3	2136		

Curtis Traffic Surveys	Turning movement count				Peak Hour Volumes		26	8							
Job:	111004mcl					13			10						
Day, date	18/10/11					200			575						
Location:	Blenheim Rd & dead end														
Weather:	Fine														
Client:	McLaren Traffic Engineering														
	From Blenheim Rd east				From dead end				From Blenheim Rd west						
	Through		Right		Left		Right		Left		Through				
Time Period	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses	Other vehicles	Buses			
16:00 to 16:15	61	3	2	0	3	0	0	0	2	0	20	2	93		
16:15 to 16:30	135	3	2	0	4	0	2	0	6	0	59	5	216		
16:30 to 16:45	96	3	2	0	0	0	5	0	2	0	50	2	160		
16:45 to 17:00	127	3	2	0	0	0	3	0	2	0	58	2	197		
17:00 to 17:15	133	5	1	0	2	0	8	0	8	0	38	5	200		
17:15 to 17:30	156	1	3	0	2	0	6	0	2	0	52	3	225	peak	
17:30 to 17:45	140	4	2	0	2	0	6	0	1	0	46	3	204		
17:45 to 18:00	131	5	4	0	2	0	6	0	2	0	52	1	203		
Total	979	27	18	0	15	0	36	0	25	0	375	23			
Hourly summary															
16:00 to 17:00	419	12	8	0	7	0	10	0	12	0	187	11	666		
16:15 to 17:15	491	14	7	0	6	0	18	0	18	0	205	14	773		
16:30 to 17:30	512	12	8	0	4	0	22	0	14	0	198	12	782		
16:45 to 17:45	556	13	8	0	6	0	23	0	13	0	194	13	826		
17:00 to 18:00	560	15	10	0	8	0	26	0	13	0	188	12	832	peak hour	

ANNEXURE B: SIDRA ANALYSIS (Sheet 1 of 4)

MOVEMENT SUMMARY

▽ Site: EXISTING AM - Blenheim Rd / Pittwater Rd

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pittwater Rd S											
2	T1	1280	0.0	0.219	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1280	0.0	0.219	0.0	NA	0.0	0.0	0.00	0.00	60.0
North: Pittwater Rd N											
8	T1	287	0.0	0.235	3.4	LOS A	1.8	12.4	0.50	0.00	56.8
9	R2	222	0.0	1.000	81.9	LOS F	11.5	80.7	1.00	2.08	24.5
Approach		509	0.0	1.000	37.6	NA	11.5	80.7	0.72	0.91	36.1
West: Blenheim Rd											
10	L2	335	0.0	0.344	11.7	LOS A	1.7	11.6	0.63	0.86	45.4
Approach		335	0.0	0.344	11.7	LOS A	1.7	11.6	0.63	0.86	45.4
All Vehicles		2124	0.0	1.000	10.9	NA	11.5	80.7	0.27	0.35	49.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: EXISTING AM - Blenheim Rd / Cul-de-sac

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Blenheim Rd E											
5	T1	200	0.0	0.120	0.2	LOS A	0.2	1.3	0.11	0.06	49.4
6	R2	22	0.0	0.120	5.9	LOS A	0.2	1.3	0.11	0.06	48.7
Approach		222	0.0	0.120	0.8	NA	0.2	1.3	0.11	0.06	49.3
North: Cul-de-sac											
7	L2	21	0.0	0.017	5.6	LOS A	0.1	0.5	0.36	0.54	45.8
9	R2	14	0.0	0.018	6.9	LOS A	0.1	0.4	0.45	0.65	44.9
Approach		35	0.0	0.018	6.1	LOS A	0.1	0.5	0.40	0.59	45.4
West: Blenheim Rd W											
10	L2	24	0.0	0.174	4.6	LOS A	0.0	0.0	0.00	0.04	49.3
11	T1	314	0.0	0.174	0.0	LOS A	0.0	0.0	0.00	0.04	49.8
Approach		338	0.0	0.174	0.3	NA	0.0	0.0	0.00	0.04	49.7
All Vehicles		595	0.0	0.174	0.8	NA	0.2	1.3	0.06	0.08	49.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: EXISTING PM - Blenheim Rd / Pittwater Rd

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pittwater Rd S											
1	L2	8	0.0	0.080	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
2	T1	458	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
Approach		466	0.0	0.080	0.1	NA	0.0	0.0	0.00	0.01	59.9
North: Pittwater Rd N											
8	T1	902	0.0	0.470	3.0	LOS A	7.0	49.3	0.68	0.00	57.0
9	R2	569	0.0	1.127	254.2	LOS F	94.4	661.0	1.00	5.58	11.4
Approach		1471	0.0	1.127	100.2	NA	94.4	661.0	0.81	2.16	22.3
West: Blenheim Rd											
10	L2	207	0.0	0.194	5.5	LOS A	0.8	5.5	0.31	0.56	47.8
12	R2	6	0.0	0.194	127.5	LOS F	0.6	4.2	0.91	0.92	27.6
Approach		213	0.0	0.194	9.0	LOS A	0.8	5.5	0.33	0.57	46.8
All Vehicles		2150	0.0	1.127	69.5	NA	94.4	661.0	0.58	1.53	27.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: EXISTING PM - Blenheim Rd / Cul-de-sac

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Blenheim Rd E											
5	T1	575	0.0	0.302	0.0	LOS A	0.1	0.7	0.02	0.01	49.9
6	R2	10	0.0	0.302	5.5	LOS A	0.1	0.7	0.02	0.01	49.2
Approach		585	0.0	0.302	0.1	NA	0.1	0.7	0.02	0.01	49.9
North: Cul-de-sac											
7	L2	8	0.0	0.006	5.1	LOS A	0.0	0.2	0.28	0.50	46.0
9	R2	26	0.0	0.047	8.9	LOS A	0.1	1.0	0.58	0.79	43.7
Approach		34	0.0	0.047	8.0	LOS A	0.1	1.0	0.51	0.73	44.3
West: Blenheim Rd W											
10	L2	13	0.0	0.110	4.6	LOS A	0.0	0.0	0.00	0.03	49.3
11	T1	200	0.0	0.110	0.0	LOS A	0.0	0.0	0.00	0.03	49.8
Approach		213	0.0	0.110	0.3	NA	0.0	0.0	0.00	0.03	49.8
All Vehicles		832	0.0	0.302	0.5	NA	0.1	1.0	0.03	0.04	49.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: FUTURE AM - Blenheim Rd / Pittwater Rd

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pittwater Rd S											
2	T1	1280	0.0	0.219	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1280	0.0	0.219	0.0	NA	0.0	0.0	0.00	0.00	60.0
North: Pittwater Rd N											
8	T1	287	0.0	0.233	3.3	LOS A	1.7	12.2	0.51	0.00	56.9
9	R2	227	0.0	1.000	79.8	LOS F	11.6	81.0	1.00	2.09	24.9
Approach		514	0.0	1.000	37.1	NA	11.6	81.0	0.72	0.92	36.2
West: Blenheim Rd											
10	L2	350	0.0	0.359	11.8	LOS A	1.8	12.4	0.63	0.87	45.3
Approach		350	0.0	0.359	11.8	LOS A	1.8	12.4	0.63	0.87	45.3
All Vehicles		2144	0.0	1.000	10.8	NA	11.6	81.0	0.28	0.36	49.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: FUTURE AM - Blenheim Rd / Cul-de-sac

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Blenheim Rd E											
5	T1	200	0.0	0.124	0.2	LOS A	0.2	1.6	0.13	0.07	49.3
6	R2	27	0.0	0.124	5.9	LOS A	0.2	1.6	0.13	0.07	48.6
Approach		227	0.0	0.124	0.9	NA	0.2	1.6	0.13	0.07	49.2
North: Cul-de-sac											
7	L2	36	0.0	0.029	5.6	LOS A	0.1	0.8	0.36	0.56	45.8
9	R2	14	0.0	0.018	6.9	LOS A	0.1	0.4	0.45	0.65	44.9
Approach		50	0.0	0.029	5.9	LOS A	0.1	0.8	0.39	0.58	45.5
West: Blenheim Rd W											
10	L2	24	0.0	0.174	4.6	LOS A	0.0	0.0	0.00	0.04	49.3
11	T1	314	0.0	0.174	0.0	LOS A	0.0	0.0	0.00	0.04	49.8
Approach		338	0.0	0.174	0.3	NA	0.0	0.0	0.00	0.04	49.7
All Vehicles		615	0.0	0.174	1.0	NA	0.2	1.6	0.08	0.09	49.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: FUTURE PM - Blenheim Rd / Pittwater Rd

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pittwater Rd S											
1	L2	8	0.0	0.080	5.5	LOS A	0.0	0.0	0.00	0.03	58.1
2	T1	458	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
Approach		466	0.0	0.080	0.1	NA	0.0	0.0	0.00	0.01	59.9
North: Pittwater Rd N											
8	T1	902	0.0	0.471	3.1	LOS A	7.0	49.3	0.68	0.00	57.0
9	R2	584	0.0	1.157	306.0	LOS F	112.1	785.0	1.00	6.31	9.8
Approach		1486	0.0	1.157	122.1	NA	112.1	785.0	0.81	2.48	19.7
West: Blenheim Rd											
10	L2	212	0.0	0.199	5.5	LOS A	0.8	5.7	0.31	0.56	47.8
12	R2	6	0.0	0.199	131.4	LOS F	0.6	4.3	0.91	0.92	27.2
Approach		218	0.0	0.199	9.0	LOS A	0.8	5.7	0.33	0.57	46.8
All Vehicles		2170	0.0	1.157	84.5	NA	112.1	785.0	0.59	1.76	24.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: FUTURE PM - Blenheim Rd / Cul-de-sac

Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Blenheim Rd E											
5	T1	575	0.0	0.312	0.1	LOS A	0.2	1.6	0.04	0.02	49.7
6	R2	25	0.0	0.312	5.5	LOS A	0.2	1.6	0.04	0.02	49.0
Approach		600	0.0	0.312	0.3	NA	0.2	1.6	0.04	0.02	49.7
North: Cul-de-sac											
7	L2	13	0.0	0.009	5.1	LOS A	0.0	0.3	0.28	0.51	46.0
9	R2	26	0.0	0.048	9.1	LOS A	0.1	1.0	0.59	0.80	43.7
Approach		39	0.0	0.048	7.8	LOS A	0.1	1.0	0.49	0.70	44.4
West: Blenheim Rd W											
10	L2	13	0.0	0.110	4.6	LOS A	0.0	0.0	0.00	0.03	49.3
11	T1	200	0.0	0.110	0.0	LOS A	0.0	0.0	0.00	0.03	49.8
Approach		213	0.0	0.110	0.3	NA	0.0	0.0	0.00	0.03	49.8
All Vehicles		852	0.0	0.312	0.6	NA	0.2	1.6	0.05	0.06	49.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.