Traffic Signal Design Warrant Report

Brickmakers Drive and Link Road intersection, Moorebank

Prepared for Benedict Industries | 24 June 2016

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Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Traffic Signal Design Warrant Report

Final

Report J14149RPTS | Prepared for Benedict Industries Pty Ltd | 24 June 2016

Prepared by	**Dr Tim Brooker**	Approved by	**Dr Philip Towler**
Position	Senior Traffic Engineer	Position	Associate Director
Signature		Signature	
Date	24 June 2016	Date	24 June 2016

Document Control

Version	Date	Prepared by	Reviewed by
V1	24/6/16	T. Brooker	P. Towler

T +61 (0)2 9493 9500 | F +61 (0)2 9493 9599

Ground Floor | Suite 01 | 20 Chandos Street | St Leonards | New South Wales | 2065 | Australia

www.emmconsulting.com.au

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1 Introduction

A new intersection is required on Brickmakers Drive, approximately 300 metres south of Newbridge Road. This will service vehicles from a number of approved and proposed developments and, in the longer term, for vehicles from a new local road connection on the south side of Newbridge Road between Brickmakers Drive and Davy Robinson Drive.

The future local road network in the Moorebank East area is shown in the Liverpool DCP 2010 (Figure 1.1).

The future traffic volumes at the Link Road and Brickmakers Drive intersection have been analysed and compared with the RMS Warrant guidelines (provided in Appendix A) to determine whether future traffic volumes meet the RMS warrant requirement for traffic signals at the intersection.

The following existing and additional vehicular traffic movements have been considered:

- base case: 2016 traffic volumes for Brickmakers Drive;
- Scenario 1:
    - additional traffic from the approved New Brighton residential (313 dwellings) and clubhouse redevelopment traffic as identified in the GHD (2011 and 2014) traffic reports;
    - additional traffic from the proposed Moorebank Cove Residential Estate (179 dwellings);
- Scenario 2: additional traffic from the approved Moorebank Recyclers development (mainly truck traffic); and
- Scenario 3: additional traffic from the Georges Cove Marina (including potentially up to 350 residential apartments).

The existing peak hourly traffic volumes for Brickmakers Drive were surveyed by a seven day tube traffic count in March 2016 (Appendix B). Brickmakers Drive currently has sustained peak hourly traffic volumes of at least 1,039 vehicle movements two-way, over at least five hours of the day on a typical weekday. The average weekday hourly volumes are:

- morning peak hour 7–8 am = 1,039 hourly vehicle movements
- morning peak hour 8–9 am = 1,053 hourly vehicle movements
- afternoon peak hour 3–4 pm = 1,093 hourly vehicle movements
- afternoon peak hour 4–5 pm = 1,078 hourly vehicle movements
- afternoon peak hour 5–6 pm = 1,064 hourly vehicle movements

Figure 1.1 DCP map of the local road network

2 Traffic volumes on the Link Road

The peak hourly Link Road traffic volumes generated by future developments have been calculated in the traffic assessment reports for each development (Table 2.1). These calculations are for typical weekdays during the normal commuter morning and afternoon peak traffic periods.

Table 2.1 Additional peak hourly traffic from nominated developments

	Peak hourly period	Total peak hourly traffic	
		In	**Out**
Moorebank Cove residential (179 dwellings)	Morning	30	122
	Afternoon	91	61
Moorebank Recycling development[1]	Morning	23	20
	Afternoon	13	16
Georges Cove Marina commercial uses[2]	Morning	63	16
	Afternoon	62	62
Georges Cove Marina residential apartments[2]	Morning	34	135
	Afternoon	101	68
All identified developments	**Morning**	**150**	**293**
	Afternoon	**267**	**207**

Notes: 1. From Cardno (2013). This traffic is primarily truck traffic and over 90% travels to and from the north

2. From the draft traffic impact assessments for these uses by EMM (for 350 residential apartments in addition to the commercial marina uses)

The future peak hourly directional traffic volumes from the combined development traffic are:

- 293 vehicles per hour during typical weekday morning peak hour traffic periods; and
- 267 vehicles per hour during typical weekday afternoon peak hour traffic periods.

The standard RMS traffic signal warrant "traffic demand" requirement on the minor road, specified on page 2.1 of the document (see Appendix A) is at least 200 vehicles per hour over four hours of the day (ie two hours during the morning and two hours in the afternoon). The hourly traffic volumes will meet this requirement.

3 Traffic volumes on Brickmakers Drive

The future development generated peak hourly traffic volumes using Brickmakers Drive to the north and the south of the Link Road (for typical weekdays during the normal commuter morning and afternoon peak traffic periods) have been calculated in the respective traffic generation reports for each development (Table 3.1).

Table 3.1 Brickmakers Drive peak hourly traffic including traffic from new developments

	Peak hourly period	North of the Link Road intersection	South of the Link Road intersection
Existing peak hourly traffic	Morning	1,039	1,039
	Afternoon	1,064	1,064
Moorebank Cove residential (179 dwellings)	Morning	91	61
	Afternoon	92	60
New Brighton Golf Club Residential[1]	Morning	115	115
	Afternoon	115	115
New Brighton Golf Club - New Clubhouse[2]	Morning	28	28
	Afternoon	34	34
Moorebank Recycling development[3]	Morning	40	3
	Afternoon	26	3
Georges Cove Marina commercial uses[4]	Morning	48	31
	Afternoon	74	50
Georges Cove Marina residential apartments[4]	Morning	101	68
	Afternoon	102	67
All identified developments	**Morning**	**1,462**	**1,345**
	Afternoon	**1,507**	**1,393**

Notes: *1. From GHD (2011) , traffic generated by 313 dwellings, distribution 50% north, 50% south*

2. From GHD (2014) , traffic generated by additional club house uses, distribution 64% north, 36% south

3. From Cardno (2013). This traffic is primarily truck traffic and over 90% travels to and from the north

4. From the draft traffic impact assessments for these uses by EMM (for 350 residential apartments in addition to the commercial marina uses)

The future peak hourly traffic volumes for the Brickmakers Drive route will be generally higher to the north of the intersection. When all the identified future traffic growth is considered, the future peak hourly two way traffic volumes will be:

- Morning peak hour, approximately 1,462 vehicles per hour; and
- Afternoon peak hour approximately 1,507 vehicles per hour.

During both the morning and the afternoon peak hourly traffic periods, the average Brickmakers Drive traffic volumes will be:

- 731 vehicles per hour in each direction during the morning peak hour; and
- 754 vehicles per hour in each direction during the afternoon peak hour.

The standard RMS traffic signal warrant “traffic demand” requirement on the major road, is a sustained peak hourly directional traffic volumes of at least 600 vehicles per hour over four hours of the day (ie two hours during the morning and two hours in the afternoon). The hourly traffic volumes will meet this requirement.

The proposed traffic signals are also considered to be necessary for pedestrian accessibility and pedestrian safety, as the future Link Road will include a pedestrian/cycleway bridge on the northern side which will be an important connection in the future Moorebank East pedestrian and cycling access network between residential areas of Moorebank and the Georges River foreshore areas.

4 Intersection design options

Based on a SIDRA intersection analysis, the existing (February/March 2016) Brickmakers Drive traffic volumes are already at levels where an unsignalised Link Road intersection would operate with high traffic delays (level of service F) based on the proposed developments. Therefore an improved intersection is required for the development traffic flow to operate satisfactorily.

A design for the Brickmakers Drive and Link Road intersection (Figure 4.1) was agreed by all parties (including Liverpool City Council) in July 2013 as part of a NSW Land and Environment court case regarding the easement boundaries of the Link Road. This intersection provides a southbound left turning lane on Brickmakers Drive. The intersection is shown as unsignalised but there is allowance for the installation of traffic signals when warranted by increased traffic volumes.

It is noted that approval for an intersection in this location has been granted as part of the Moorebank Recyclers development approval (05-0157).

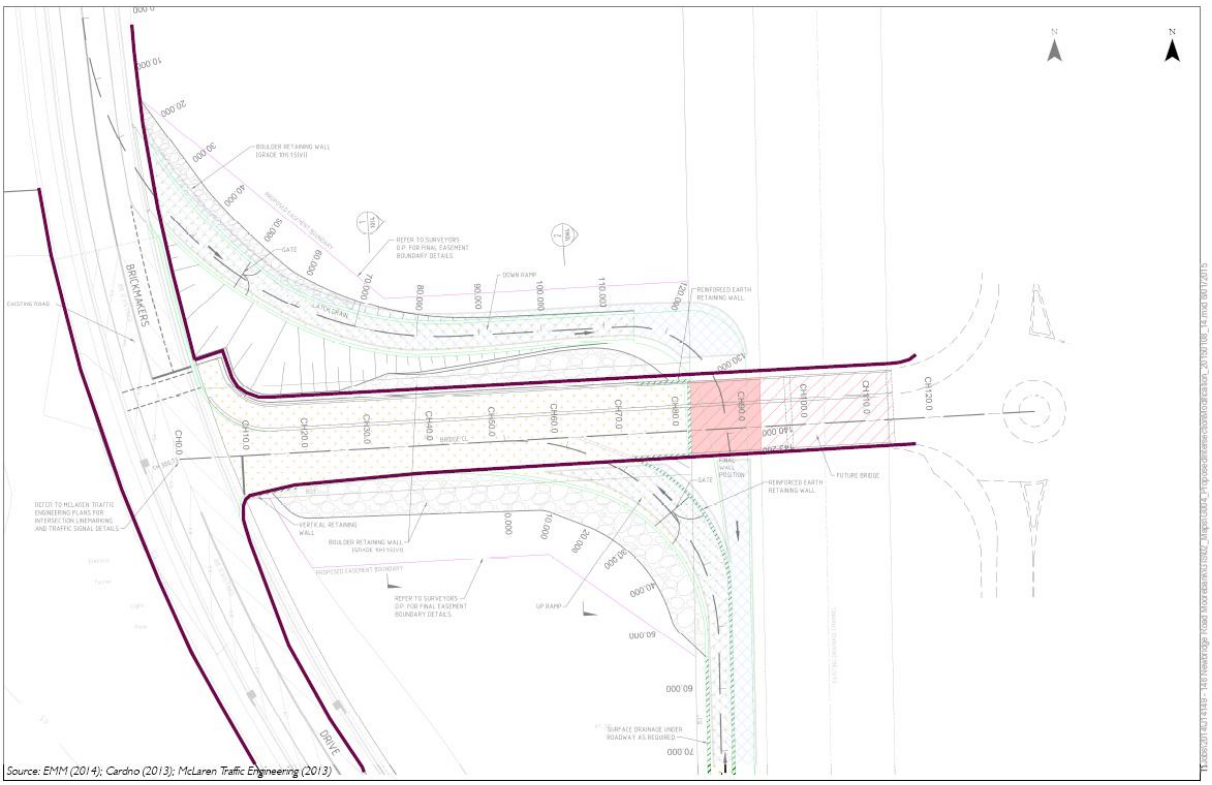

Figure 4.1 Approved intersection design from July 2013 court hearing

An alternative traffic signal controlled intersection design which provides a northbound right turning lane on Brickmakers Drive has also been considered (Figure 4.2). This alternative intersection design is the same width as the intersection shown in Figure 4.1.

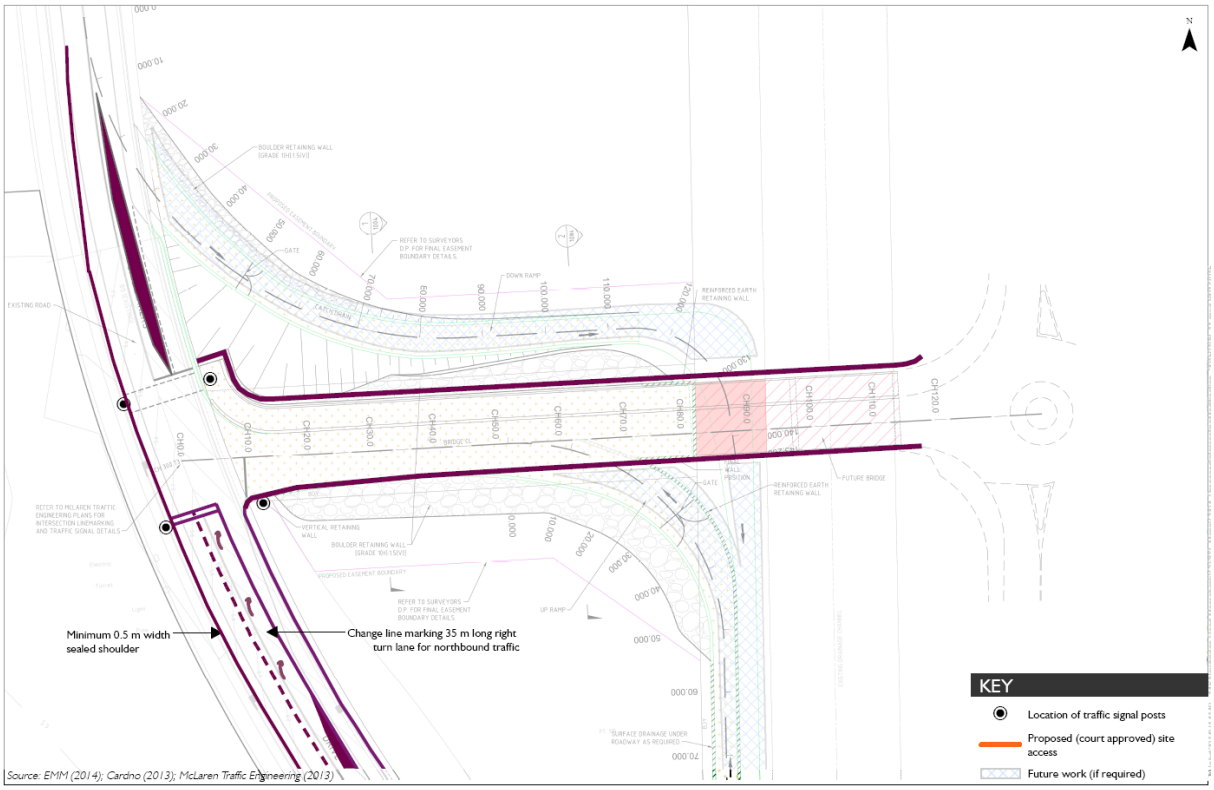

Figure 4.2 Proposed line marking for traffic signal control intersection with right turn lane

5 SIDRA analysis

A SIDRA intersection capacity analysis has been used to compare:

- the unsignalised intersection;
- the signalised intersection with one through lane in each direction and a southbound left turn lane on Brickmakers Drive (Figure 4.1); and
- the alternative traffic signal intersection design with one through lane in each direction and a northbound right turn lane on Brickmakers Drive (Figure 4.2).

The three future traffic volume scenarios in Section 1 have been considered, representing future development scenarios for the Moorebank East precinct over approximately five years.

Summaries of the intersection performance, for the three traffic scenario, are provided in Table 5.1, Table 5.2 and Table 5.3. The detailed SIDRA intersection analysis results, including the modelled intersection layouts, are provided in Appendix C.

Table 5.1 Scenario 1 intersection performance - existing traffic plus New Brighton Golf Course and Moorebank Cove residential developments

Peak hour	Operation	Unsignalised intersection	Traffic Signals with left turn lane	Traffic Signals with right turn lane
Weekday am peak hour	DOS	1.010	0.693	0.679
	LOS	F	A	A
	Average delay	162.7 s	10.2 s	9.8 s
	Maximum queue length (approach)	79 m (Link Road east)	163 m (Brickmakers Drive south)	150 m (Brickmakers Drive south)
Weekday pm peak hour	DOS	0.583	0.618	0.662
	LOS	E	A	A
	Average delay	59.1 s	8.7 s	8.1 s
	Maximum queue length (approach)	29 m (Link Road east)	162 m (Brickmakers Drive north)	176 m (Brickmakers Drive north)

Table 5.2 Scenario 2 intersection performance - Scenario 1 plus recycling development traffic

Peak hour	Operation	Unsignalised intersection	Traffic Signals with left turn lane	Traffic Signals with right turn lane
Weekday am peak hour	DOS	1.679	0.712	0.696
	LOS	F	A	A
	Average delay	709.7 s	10.9 s	10.5 s
	Maximum queue length (approach)	346 m (Link Road east)	164 m (Brickmakers Drive south)	151 m (Brickmakers Drive south)
Weekday pm peak hour	DOS	1.083	0.630	0.678
	LOS	F	A	A
	Average delay	234.8 s	9.6 s	8.9 s
	Maximum queue length (approach)	78 m (Link Road east)	162 m (Brickmakers Drive north)	176 m (Brickmakers Drive north)

Table 5.3 Scenario 3 intersection performance - Scenario 2 plus marina development traffic

Peak hour	Operation	Unsignalised intersection	Traffic Signals with left turn lane	Traffic Signals with right turn lane
Weekday am peak hour	DOS	3.358	0.827	0.809
	LOS	F	B	B
	Average delay	2,203 s	19.6 s	16.6 s
	Maximum queue length (approach)	1,083 m (Link Road east)	258 m (Brickmakers Drive south)	182 m (Brickmakers Drive south)
Weekday pm peak hour	DOS	2.536	0.773	0.823
	LOS	F	B	B
	Average delay	1,457 s	17.2 s	17.1 s
	Maximum queue length (approach)	664 m (Link Road east)	164 m (Brickmakers Drive north)	246 m (Brickmakers Drive north)

Under each of the three development scenarios considered, the traffic signals with right turn lane option provides lower traffic delays than the other options. On the basis of the SIDRA intersection capacity analysis, this is the recommended intersection treatment.

6 Summary

This traffic signal warrant analysis has considered the future traffic volumes for the Brickmakers Drive and Link Road intersection. A traffic signal controlled intersection will be required to meet the RMS warrant requirements based on the traffic demand on the minor and major roads.

The SIDRA intersection analysis comparing the future peak hour intersection capacity, traffic delays and queues lengths of two traffic signal intersection designs determined that a right turn lane on Brickmakers Drive (Figure 4.2) should be provided.

Traffic signals would also provide an important safe pedestrian crossing point on the future residential and recreational pedestrian and cycleway network for the Moorebank East area.

Appendix A

RMS Warrant Guideline

2.1 INTRODUCTION

This section describes the general warrants for the installation of traffic signals. It must be emphasised that these are only a guide. If a site satisfies the warrants, it does not necessarily mean that traffic signals are the best solution. All traffic data should be analysed and alternative treatments considered to determine the optimum solution (see Section 4 of the *Road Design Guide*). Traffic signals are sometimes installed due to public pressure or an administrative directive irrespective of the general warrants.

2.2 FACTORS INFLUENCING THE PROVISION OF TRAFFIC SIGNALS

Traffic signals are usually installed at an intersection:

- to provide traffic control at a site with a traffic capacity or road safety problem
- to control conflicting movements with high traffic flows
- to facilitate access to and from local areas in a major/minor road system, including pedestrian movements
- as part of an area wide system of traffic management

A side effect of signalisation is that the traffic flow on a major road is broken up into platoons. This assists nearby pedestrians to cross the major road and vehicles in nearby side streets to cross or enter the major road.

Factors influencing the provision of traffic signals include:

- traffic flows
- traffic conflicts
- traffic accident statistics
- pedestrian requirements
- access to major roads
- cost of installation
- availability of funds
- maintenance costs
- practicality
- feasibility
- the signposted speed limit is not more than 80km/h

General warrants are given in the following sub-sections. The figures stated should only be used as a guide and each intersection should be considered in more detail before being accepted for signal design.

2.3 SIGNALISED INTERSECTIONS

As a guide, a signalised intersection may be considered if one of the following warrants is met.

(a) Traffic demand:

For each of four one-hour periods of an average day:

(i) the major road flow exceeds 600 vehicles/hour in each direction; and

(ii) the minor road flow exceeds 200 vehicles/hour in one direction.

OR

(b) Continuous traffic:

For each of four one-hour periods of an average day:

(i) the major road flow exceeds 900 vehicles/hour in each direction; and

(ii) the minor road flow exceeds 100 vehicles/hour in one direction; and

(iii) the speed of traffic on the major road or limited sight distance from the minor road causes undue delay or hazard to the minor road vehicles; and

(iv) there is no other nearby traffic signal site easily accessible to the minor road vehicles.

OR

(c) Pedestrian safety:

For each of four one-hour periods of an average day:

(i) the pedestrian flow crossing the major road exceeds 150 persons/hour; and

(ii) the major road flow exceeds 600 vehicles/hour in each direction or, where there is a central median of at least 1.2 m wide, 1000 vehicles/hour in each direction.

OR

(d) Pedestrian safety – high speed road:

For each of four one-hour periods of an average day:

(i) the pedestrian flow crossing the major road exceeds 150 persons/hour; and

(ii) the major road flow exceeds 450 vehicles/hour in each direction or, where there is a central median of at least 1.2 m wide, 750 vehicles/hour in each direction; and

(iii) the 85th percentile speed on the major road exceeds 75 km/h.

OR

(e) Crashes:

(i) The intersection has been the site of an average of three or more reported tow-away or casualty traffic accidents per year over a three year period, where the traffic accidents could have been prevented by traffic signals; and

(ii) the traffic flows are at least 80% of the appropriate flow warrants.

2.4 SIGNALISED MARKED FOOT CROSSINGS AT INTERSECTIONS

A signalised marked foot crossing must be provided on each leg of a signalised intersection (including T Junctions), in a built-up area, except in the following circumstances:

(a) There are significant road safety implications:

(i) there is insufficient sight distance (see Section 4 of the *Road Design Guide*); or

(ii) there is adverse road geometry (see Section 4 of the *Road Design Guide*).

(b) There are significant adverse transport efficiency implications

(i) there is an unacceptable increase in delay and degree of saturation which must be substantiated by intersection modelling; or

(c) There are parallel grade separated pedestrian facilities provided; or

(d) There is an un-signalised approach (eg. slip lane) where a pedestrian crossing may be used (see Figure 2.1); or

(e) The crossing would terminate in an area that is not possible for pedestrians to access (e.g. a wall or cliff face); or

(f) The crossing is associated with a raised pavement or threshold.

The lack of adequate connecting facilities for pedestrian access (eg. no footpath or no pedestrian traffic) is not, in itself, grounds for exception.

The Manager Network Operations, Transport Management Centre, must approve all exceptions as described above.

Where an exception is granted, provision must be made in the cabling and traffic signal post locations to allow the exempted marked foot crossing to be easily provided should the exceptional conditions be removed.

Kerb ramps must be provided at each end of a signalised marked foot crossing or pedestrian crossing located at a signalised intersection (see Section 5.7 in *Geometry).*

Pedestrian clearance times are based on the 85th percentile walking speed of 1.2 m/s. If a site is frequently used by "slow walkers", such as the elderly or people with disabilities, different walking speeds may be chosen, in the range 0.8m/s to 1.2m/s, as considered appropriate for the situation.

If a two-stage (offset) crossing is included at a signalised intersection, it is to be provided in accordance with Section 14.3 in Signalised Mid-block Marked Foot Crossings.

2.4.1 Flashing yellow arrows at signalised marked foot crossings

The flashing yellow arrow may be considered to enhance pedestrian protection at signalised intersections.

The flashing yellow arrow is intended to remind drivers of their obligation to 'give way' to pedestrians while they are completing their crossing during the flashing red 'Don't Walk' clearance period of the traffic signals.

Flashing yellow arrow pedestrian protection shall only be used in conjunction with and following red arrow protection. The red arrow protection shall not be less than for the "Walk" period, but it can be greater than it. Following the red arrow protection the flashing yellow arrow shall be displayed for the remainder of clearance 1, but not less than 2 seconds.

Flashing yellow arrow pedestrian protection is not used where there is full protection of the pedestrian phase provided by a red arrow hold, i.e. throughout the "Walk" and "Don't Walk" period.

The flashing yellow arrow may be installed at sites where one or more of the following criteria is satisfied:

- 1 or more pedestrian casualty crashes involving left turn or right turn vehicles in the last 3 years;

- heavy vehicle demand on left and/or right turn through the marked foot crossing – more than 5 vehicles per phase in any one hour period on an average day;
- high speed turning traffic – greater than 30km/h;
- high proportion of children, the elderly or people with disabilities – greater than 15% during any one hour period on an average day;
- high volume of pedestrians – greater than 250 pedestrians in any 1 hour period of an average day on the crossing applicable to the flashing yellow arrow;
- there are 2 or more lanes of traffic turning left through the marked foot crossing.

Flashing yellow arrows can be used for single or dual left turns. In either case, an opposing right turn should be held by a red arrow during the flashing yellow phase.

Flashing yellow arrows can be used for right turns at a cross intersection and from the stem of a T intersection with restrictions as follows:

The flashing yellow arrow **must not** be installed where:

- there is a conflicting opposing through movement. An opposing through movement can be eliminated by adopting a split approach phasing and thus allow the installation of flashing yellow arrows for the right turn movement;
- there are 2 or more lanes of traffic turning right through the marked foot crossing. Dual right turns must have full control;
- the 85th percentile speed of traffic is higher than 75km/h.

The red arrow hold should never be reduced by substitution with the flashing yellow arrow. The flashing yellow arrow is additional to the red arrow hold, **not** a substitute (see Section 7.10.1 in *Phasing & Signal Group Display Sequence*).

2.4.2 Pedestrian crossings and signalised marked foot crossings at slip lanes

A pedestrian crossing **must** be provided at all traffic signal intersections with slip lanes as shown in Figure 2.1.

If a signalised marked foot crossing is required, the same warrants that apply to a signalised mid block marked foot crossing should also be considered to apply when converting from a pedestrian crossing to a signalised marked foot crossing.

If a dedicated bicycle path has been installed on the approach to the pedestrian crossing, and bicycle paths have been provided throughout the rest of the intersection, then regardless of other warrants, the pedestrian crossing should be converted to a signalised marked foot crossing to maintain continuity of the bicycle paths.

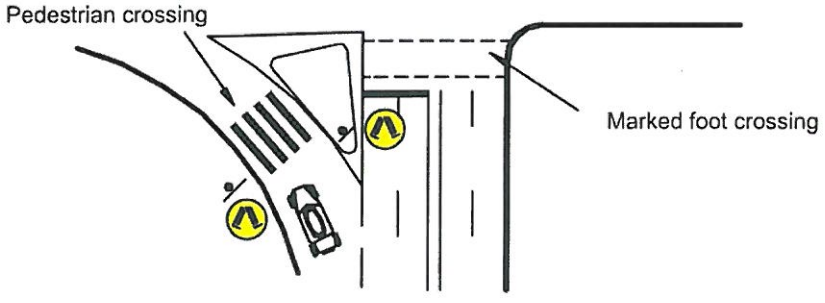

Figure 2.1 Unsignalised Approach (eg: Slip Lane etc) at the site.

Appendix B

Brickmakers Drive tube traffic count

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	**3289**	Ref : **EMM**	**UBD 270 B-12**
Street	**BRICKMAKERS ROAD, CHIPPING NORTON : Between NUWARRA ROAD & NEWBRIDGE ROAD (bidirectional) :**		
Location	About 350 Mtrs south of Newbridge Road, On Rail Fencing		*Carriageway*

TOTAL COUNT MATRIX

Start Date	04-MAR-16
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	58
Weekly 85th Percentile Speed	68
Five Day AADT	13265
Seven Day AADT	12187

	MON *7TH*	TUE *8TH*	WED *9TH*	THU *10TH*	FRI *4TH*	SAT *5TH*	SUN *6TH*	5 Dav Total	5 Dav Average	7 Dav Total	7 Dav Average
Midnight - 1am	57	48	66	68	66	126	158	**305**	**61**	**589**	**84**
1am - 2am	28	38	37	36	48	60	85	**187**	**37**	**332**	**47**
2am - 3am	29	25	30	29	32	76	67	**145**	**29**	**288**	**41**
3am - 4am	45	41	42	32	37	51	38	**197**	**39**	**286**	**41**
4am - 5am	119	121	108	105	132	68	40	**585**	**117**	**693**	**99**
5am - 6am	381	433	446	418	408	158	66	**2086**	**417**	**2310**	**330**
6am - 7am	754	818	770	778	769	269	128	**3889**	**778**	**4286**	**612**
7am - 8am	1036	957	**1098**	1051	**1052**	389	182	**5194**	**1039**	**5765**	**824**
8am - 9am	**1086**	**1029**	1061	**1071**	1017	574	325	**5264**	**1053**	**6163**	**880**
9am - 10am	586	678	701	630	650	667	504	**3245**	**649**	**4416**	**631**
10am - 11am	497	508	467	557	508	732	562	**2537**	**507**	**3831**	**547**
11am - Midday	495	486	513	514	534	**767**	**645**	**2542**	**508**	**3954**	**565**
Midday - 1pm	540	510	528	499	649	**821**	**667**	**2726**	**545**	**4214**	**602**
1pm - 2pm	623	621	640	582	692	733	607	**3158**	**632**	**4498**	**643**
2pm - 3pm	922	907	955	894	908	700	574	**4586**	**917**	**5860**	**837**
3pm - 4pm	**1123**	1034	1063	**1136**	**1110**	704	593	**5466**	**1093**	**6763**	**966**
4pm - 5pm	1065	1087	**1140**	1072	1024	699	623	**5388**	**1078**	**6710**	**959**
5pm - 6pm	942	**1149**	1089	1075	1065	645	610	**5320**	**1064**	**6575**	**939**
6pm - 7pm	849	966	944	904	934	603	531	**4597**	**919**	**5731**	**819**
7pm - 8pm	559	617	600	628	645	466	462	**3049**	**610**	**3977**	**568**
8pm - 9pm	368	444	424	473	469	365	361	**2178**	**436**	**2904**	**415**
9pm - 10pm	276	366	356	319	346	343	282	**1663**	**333**	**2288**	**327**
10pm - 11pm	191	231	221	282	348	315	196	**1273**	**255**	**1784**	**255**
11pm - Midnight	114	122	138	136	235	238	106	**745**	**149**	**1089**	**156**
Total	**12685**	**13236**	**13437**	**13289**	**13678**	**10569**	**8412**	**66325**	**13265**	**85306**	**12186**

 CFE Information Technologies

Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	**3289**	Ref : **EMM**	**UBD 270 B-12**
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TOTAL COUNT MATRIX

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Seven Day AADT	5209

	MON *7TH*	TUE *8TH*	WED *9TH*	THU *10TH*	FRI *4TH*	SAT *5TH*	SUN *6TH*	5 Dav Total	5 Dav Average	7 Dav Total	7 Dav Average
Midnight - 1am	17	10	14	11	15	37	52	**67**	**13**	**156**	**22**
1am - 2am	9	10	11	8	11	28	33	**49**	**10**	**110**	**16**
2am - 3am	17	12	10	12	16	32	22	**67**	**13**	**121**	**17**
3am - 4am	23	22	26	19	21	20	11	**111**	**22**	**142**	**20**
4am - 5am	95	98	83	81	93	33	15	**450**	**90**	**498**	**71**
5am - 6am	308	343	367	340	338	102	39	**1696**	**339**	**1837**	**262**
6am - 7am	534	572	535	556	552	162	81	**2749**	**550**	**2992**	**427**
7am - 8am	**769**	674	**784**	760	**766**	239	93	**3753**	**751**	**4085**	**584**
8am - 9am	757	**727**	751	**761**	704	**355**	199	**3700**	**740**	**4254**	**608**
9am - 10am	350	397	417	348	372	346	**303**	**1884**	**377**	**2533**	**362**
10am - 11am	248	237	207	289	246	344	285	**1227**	**245**	**1856**	**265**
11am - Midday	202	203	209	235	224	334	301	**1073**	**215**	**1708**	**244**
Midday - 1pm	221	207	208	199	220	**312**	**305**	**1055**	**211**	**1672**	**239**
1pm - 2pm	216	213	215	214	236	287	262	**1094**	**219**	**1643**	**235**
2pm - 3pm	308	281	290	271	300	272	202	**1450**	**290**	**1924**	**275**
3pm - 4pm	**319**	276	**299**	284	**310**	241	214	**1488**	**298**	**1943**	**278**
4pm - 5pm	246	276	285	**298**	262	257	226	**1367**	**273**	**1850**	**264**
5pm - 6pm	209	**282**	245	257	279	222	233	**1272**	**254**	**1727**	**247**
6pm - 7pm	200	248	259	241	258	270	203	**1206**	**241**	**1679**	**240**
7pm - 8pm	166	180	183	194	215	180	176	**938**	**188**	**1294**	**185**
8pm - 9pm	126	119	132	120	147	140	152	**644**	**129**	**936**	**134**
9pm - 10pm	84	97	97	92	118	114	93	**488**	**98**	**695**	**99**
10pm - 11pm	41	61	59	86	88	110	63	**335**	**67**	**508**	**73**
11pm - Midnight	30	32	36	24	72	74	33	**194**	**39**	**301**	**43**
Total	**5495**	**5577**	**5722**	**5700**	**5863**	**4511**	**3596**	**28357**	**5671**	**36464**	**5209**

 CFE Information Technologies

Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	**3289**	Ref : **EMM**	**UBD 270 B-12**
Street	**BRICKMAKERS ROAD, CHIPPING NORTON : From NEWBRIDGE ROAD to NUWARRA ROAD : NORTH BOUND**		
Location	About 350 Mtrs south of Newbridge Road, On Rail Fencing		*Carriageway*

TOTAL COUNT MATRIX

Start Date	04-MAR-16
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	58
Weekly 85th Percentile Speed	67
Five Day AADT	7594
Seven Day AADT	6977

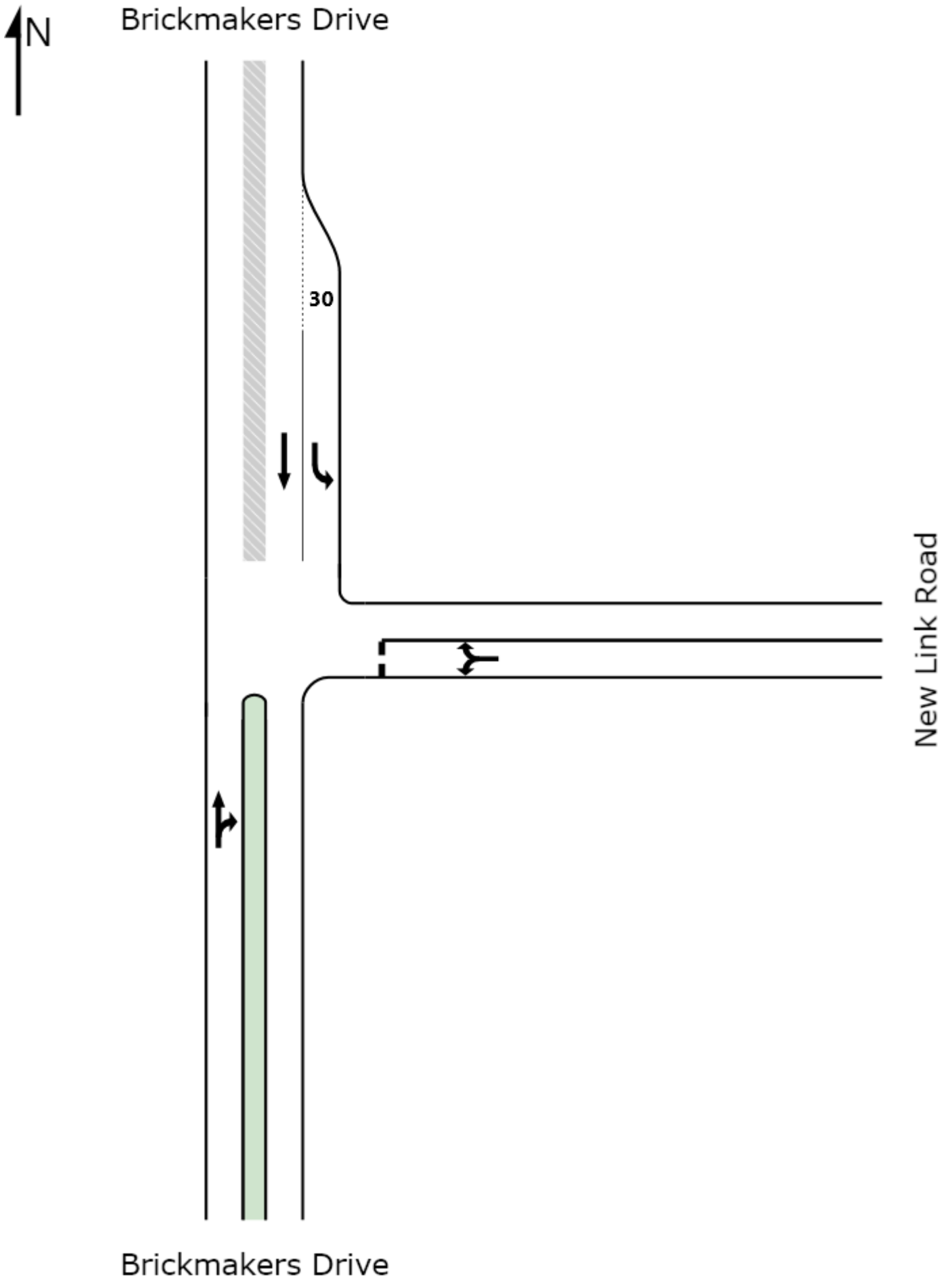
	MON *7TH*	TUE *8TH*	WED *9TH*	THU *10TH*	FRI *4TH*	SAT *5TH*	SUN *6TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	40	38	52	57	51	89	106	**238**	**48**	**433**	**62**
1am - 2am	19	28	26	28	37	32	52	**138**	**28**	**222**	**32**
2am - 3am	12	13	20	17	16	44	45	**78**	**16**	**167**	**24**
3am - 4am	22	19	16	13	16	31	27	**86**	**17**	**144**	**21**
4am - 5am	24	23	25	24	39	35	25	**135**	**27**	**195**	**28**
5am - 6am	73	90	79	78	70	56	27	**390**	**78**	**473**	**68**
6am - 7am	220	246	235	222	217	107	47	**1140**	**228**	**1294**	**185**
7am - 8am	267	283	**314**	291	286	150	89	**1441**	**288**	**1680**	**240**
8am - 9am	**329**	**302**	310	**310**	**313**	219	126	**1564**	**313**	**1909**	**273**
9am - 10am	236	281	284	282	278	321	201	**1361**	**272**	**1883**	**269**
10am - 11am	249	271	260	268	262	388	277	**1310**	**262**	**1975**	**282**
11am - Midday	293	283	304	279	310	**433**	**344**	**1469**	**294**	**2246**	**321**
Midday - 1pm	319	303	320	300	429	**509**	362	**1671**	**334**	**2542**	**363**
1pm - 2pm	407	408	425	368	456	446	345	**2064**	**413**	**2855**	**408**
2pm - 3pm	614	626	665	623	608	428	372	**3136**	**627**	**3936**	**562**
3pm - 4pm	804	758	764	**852**	**800**	463	379	**3978**	**796**	**4820**	**689**
4pm - 5pm	**819**	811	**855**	774	762	442	**397**	**4021**	**804**	**4860**	**694**
5pm - 6pm	733	**867**	844	818	786	423	377	**4048**	**810**	**4848**	**693**
6pm - 7pm	649	718	685	663	676	333	328	**3391**	**678**	**4052**	**579**
7pm - 8pm	393	437	417	434	430	286	286	**2111**	**422**	**2683**	**383**
8pm - 9pm	242	325	292	353	322	225	209	**1534**	**307**	**1968**	**281**
9pm - 10pm	192	269	259	227	228	229	189	**1175**	**235**	**1593**	**228**
10pm - 11pm	150	170	162	196	260	205	133	**938**	**188**	**1276**	**182**
11pm - Midnight	84	90	102	112	163	164	73	**551**	**110**	**788**	**113**
Total	**7190**	**7659**	**7715**	**7589**	**7815**	**6058**	**4816**	**37968**	**7593**	**48842**	**6977**

 CFE Information Technologies

Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

Appendix C

SIDRA Intersection analysis results


N
Brickmakers Drive
30
New Link Road
Brickmakers Drive

MOVEMENT SUMMARY

Site: Unsignalised Weekday AM Peak Residential Traffic

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.500	4.1	LOS A	8.9	62.8	0.77	0.00	41.7
3	R	13	0.0	0.500	10.8	LOS A	8.9	62.8	0.77	1.01	41.8
Approach		961	0.2	0.500	4.2	NA	8.9	62.8	0.77	0.01	41.7
East: New Link Road											
4	L	52	0.0	1.010	162.6	LOS F	11.3	79.3	1.00	2.39	10.2
6	R	77	0.0	1.010	162.7	LOS F	11.3	79.3	1.00	1.83	10.1
Approach		128	0.0	1.010	162.7	LOS F	11.3	79.3	1.00	2.06	10.1
North: Brickmakers Drive											
7	L	19	0.0	0.010	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	353	0.3	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		372	0.3	0.181	0.3	NA	0.0	0.0	0.00	0.03	49.6
All Vehicles		1461	0.2	1.010	17.2	NA	11.3	79.3	0.59	0.20	33.8

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 used.

MOVEMENT SUMMARY

Site: Unsignalised Weekday PM Peak Residential Traffc

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.247	10.9	LOS A	3.8	26.9	0.94	0.00	37.3
3	R	38	0.0	0.247	17.5	LOS B	3.8	26.9	0.94	1.04	37.0
Approach		345	0.0	0.247	11.6	NA	3.8	26.9	0.94	0.11	37.3
East: New Link Road											
4	L	25	0.0	0.583	58.9	LOS E	2.2	15.7	0.94	1.11	20.6
6	R	39	0.0	0.583	59.1	LOS E	2.2	15.7	0.94	1.10	20.6
Approach		64	0.0	0.583	59.0	LOS E	2.2	15.7	0.94	1.10	20.6
North: Brickmakers Drive											
7	L	58	0.0	0.031	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	973	0.0	0.499	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		1031	0.0	0.499	0.4	NA	0.0	0.0	0.00	0.03	49.6
All Vehicles		1440	0.0	0.583	5.7	NA	3.8	26.9	0.27	0.10	43.4

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 used.

MOVEMENT SUMMARY

Site: Unsignalised Weekday AM Peak Residential+Recycling Traffic

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.502	4.2	LOS A	9.0	63.4	0.77	0.00	41.6
3	R	15	0.0	0.502	10.8	LOS A	9.0	63.4	0.77	1.01	41.8
Approach		963	0.2	0.502	4.3	NA	9.0	63.4	0.77	0.02	41.6
East: New Link Road											
4	L	53	0.0	1.679	709.0	LOS F	44.6	345.8	1.00	4.98	2.8
6	R	97	19.6	1.679	709.7	LOS F	44.6	345.8	1.00	3.40	2.8
Approach		149	12.7	1.679	709.5	LOS F	44.6	345.8	1.00	3.96	2.8
North: Brickmakers Drive											
7	L	19	0.0	0.010	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	353	0.3	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		372	0.3	0.181	0.3	NA	0.0	0.0	0.00	0.03	49.6
All Vehicles		1484	1.5	1.679	74.3	NA	44.6	345.8	0.60	0.42	17.5

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 used.

MOVEMENT SUMMARY

Site: Unsignalised Weekday PM Peak Residential+Recycling Traffic

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	310	0.8	0.252	10.9	LOS A	3.9	27.6	0.94	0.00	37.2
3	R	39	0.0	0.252	17.6	LOS B	3.9	27.6	0.94	1.05	36.9
Approach		349	0.7	0.252	11.7	NA	3.9	27.6	0.94	0.12	37.2
East: New Link Road											
4	L	27	0.0	1.083	234.1	LOS F	9.9	77.6	1.00	1.95	7.5
6	R	54	21.6	1.083	234.8	LOS F	9.9	77.6	1.00	1.80	7.5
Approach		81	14.3	1.083	234.6	LOS F	9.9	77.6	1.00	1.85	7.5
North: Brickmakers Drive											
7	L	58	0.0	0.031	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	973	0.0	0.499	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		1031	0.0	0.499	0.4	NA	0.0	0.0	0.00	0.03	49.6
All Vehicles		1460	1.0	1.083	16.1	NA	9.9	77.6	0.28	0.15	35.6

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 used.

MOVEMENT SUMMARY

Site: Unsignalised Weekday AM Peak Residential+Recycling +Marina Traffic

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.547	5.8	LOS A	11.6	81.7	0.90	0.00	40.4
3	R	56	0.0	0.547	12.4	LOS A	11.6	81.7	0.90	1.11	40.7
Approach		1004	0.2	0.547	6.1	NA	11.6	81.7	0.90	0.06	40.4
East: New Link Road											
4	L	116	0.0	3.358	2202.5	LOS F	147.0	1082.9	1.00	7.65	0.9
6	R	193	9.8	3.358	2202.9	LOS F	147.0	1082.9	1.00	4.98	0.9
Approach		308	6.1	3.358	2202.7	LOS F	147.0	1082.9	1.00	5.98	0.9
North: Brickmakers Drive											
7	L	80	0.0	0.043	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	353	0.3	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		433	0.2	0.181	1.2	NA	0.0	0.0	0.00	0.11	48.6
All Vehicles		1745	1.3	3.358	393.1	NA	147.0	1082.9	0.69	1.12	4.7

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 used.

MOVEMENT SUMMARY

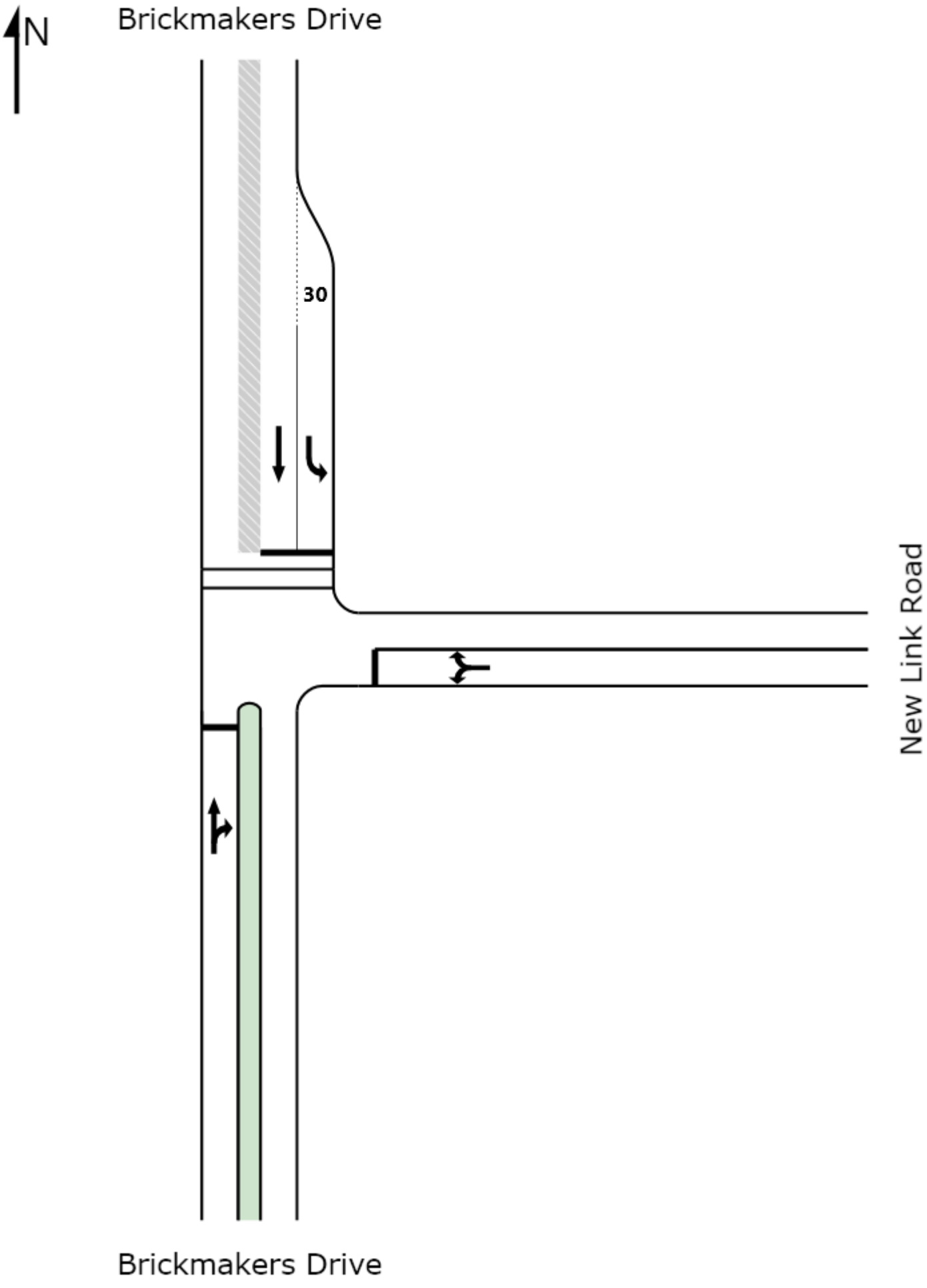
Site: Unsignalised Weekday PM Peak Residential+Recycling +Marina Traffic

New T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.456	18.1	LOS B	5.8	40.7	1.00	0.00	32.6
3	R	107	0.0	0.456	24.7	LOS B	5.8	40.7	1.00	1.15	32.5
Approach		415	0.0	0.456	19.8	NA	5.8	40.7	1.00	0.30	32.6
East: New Link Road											
4	L	82	0.0	2.536	1456.3	LOS F	90.7	663.7	1.00	4.99	1.4
6	R	136	8.5	2.536	1456.7	LOS F	90.7	663.7	1.00	4.43	1.4
Approach		218	5.3	2.536	1456.6	LOS F	90.7	663.7	1.00	4.64	1.4
North: Brickmakers Drive											
7	L	161	0.0	0.087	6.4	LOS A	0.0	0.0	0.00	0.61	43.3
8	T	973	0.0	0.499	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		1134	0.0	0.499	0.9	NA	0.0	0.0	0.00	0.09	48.9
All Vehicles		1766	0.7	2.536	184.9	NA	90.7	663.7	0.36	0.70	9.1

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 used.


N
Brickmakers Drive
30
New Link Road
Brickmakers Drive

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential Traffic

New T Intersection
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.693	7.4	LOS A	23.2	162.6	0.60	0.56	40.9
3	R	13	0.0	0.693	14.0	LOS A	23.2	162.6	0.60	0.95	38.8
Approach		961	0.2	0.693	7.5	LOS A	23.2	162.6	0.60	0.57	40.8
East: New Link Road											
4	L	52	0.0	0.479	46.0	LOS D	5.4	37.7	0.96	0.79	23.7
6	R	77	0.0	0.479	46.1	LOS D	5.4	37.7	0.96	0.79	23.7
Approach		128	0.0	0.479	46.1	LOS D	5.4	37.7	0.96	0.79	23.7
North: Brickmakers Drive											
7	L	19	0.0	0.042	10.1	LOS A	0.2	1.6	0.29	0.64	40.2
8	T	353	0.3	0.251	4.5	LOS A	5.2	36.2	0.36	0.32	44.1
Approach		372	0.3	0.251	4.8	LOS A	5.2	36.2	0.36	0.33	43.9
All Vehicles		1461	0.2	0.693	10.2	LOS A	23.2	162.6	0.57	0.53	39.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	39.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		53	39.2	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential Traffc

New T Intersection
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.326	7.2	LOS A	8.0	55.8	0.40	0.35	41.4
3	R	38	0.0	0.326	13.9	LOS A	8.0	55.8	0.40	0.92	38.3
Approach		345	0.0	0.326	8.0	LOS A	8.0	55.8	0.40	0.42	41.0
East: New Link Road											
4	L	25	0.0	0.346	67.0	LOS E	3.9	27.4	0.97	0.76	19.1
6	R	39	0.0	0.346	67.1	LOS E	3.9	27.4	0.97	0.76	19.1
Approach		64	0.0	0.346	67.1	LOS E	3.9	27.4	0.97	0.76	19.1
North: Brickmakers Drive											
7	L	58	0.0	0.129	9.0	LOS A	0.7	4.9	0.21	0.64	41.1
8	T	973	0.0	0.618	5.0	LOS A	23.1	161.6	0.42	0.39	43.4
Approach		1031	0.0	0.618	5.3	LOS A	23.1	161.6	0.41	0.41	43.3
All Vehicles		1440	0.0	0.618	8.7	LOS A	23.1	161.6	0.43	0.42	40.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	59.1	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		53	59.1	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential+Recycling Traffic

New T Intersection
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.712	7.9	LOS A	23.4	164.2	0.64	0.59	40.4
3	R	15	0.0	0.712	14.5	LOS B	23.4	164.2	0.64	0.95	38.5
Approach		963	0.2	0.712	8.0	LOS A	23.4	164.2	0.64	0.60	40.4
East: New Link Road											
4	L	53	0.0	0.574	44.1	LOS D	6.0	46.8	0.98	0.80	24.2
6	R	97	19.6	0.574	44.8	LOS D	6.0	46.8	0.98	0.80	24.2
Approach		149	12.7	0.574	44.5	LOS D	6.0	46.8	0.98	0.80	24.2
North: Brickmakers Drive											
7	L	19	0.0	0.042	10.3	LOS A	0.2	1.6	0.31	0.64	40.1
8	T	353	0.3	0.257	4.8	LOS A	5.2	36.3	0.38	0.33	43.8
Approach		372	0.3	0.257	5.0	LOS A	5.2	36.3	0.38	0.35	43.5
All Vehicles		1484	1.5	0.712	10.9	LOS A	23.4	164.2	0.61	0.56	38.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	36.7	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		53	36.7	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential+Recycling Traffic

New T Intersection
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	310	0.8	0.341	7.9	LOS A	8.1	57.1	0.43	0.38	40.7
3	R	39	0.0	0.341	14.5	LOS B	8.1	57.1	0.43	0.92	37.9
Approach		349	0.7	0.341	8.6	LOS A	8.1	57.1	0.43	0.44	40.4
East: New Link Road											
4	L	27	0.0	0.444	62.5	LOS E	4.6	36.3	0.98	0.77	19.9
6	R	54	21.6	0.444	63.3	LOS E	4.6	36.3	0.98	0.77	19.9
Approach		81	14.3	0.444	63.0	LOS E	4.6	36.3	0.98	0.77	19.9
North: Brickmakers Drive											
7	L	58	0.0	0.129	9.2	LOS A	0.7	4.9	0.23	0.65	40.9
8	T	973	0.0	0.630	5.5	LOS A	23.1	162.0	0.45	0.42	42.9
Approach		1031	0.0	0.630	5.7	LOS A	23.1	162.0	0.44	0.44	42.8
All Vehicles		1460	1.0	0.630	9.6	LOS A	23.1	162.0	0.47	0.46	39.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	54.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		53	54.2	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential+Recycling +Marina Traffic

New T Intersection
Signals - Fixed Time Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.817	13.1	LOS A	36.7	257.6	0.79	0.73	36.3
3	R	56	0.0	0.817	19.7	LOS B	36.7	257.6	0.79	0.94	35.4
Approach		1004	0.2	0.817	13.4	LOS A	36.7	257.6	0.79	0.75	36.3
East: New Link Road											
4	L	116	0.0	0.827	55.8	LOS D	16.8	123.9	1.00	0.94	21.3
6	R	193	9.8	0.827	56.2	LOS D	16.8	123.9	1.00	0.94	21.3
Approach		308	6.1	0.827	56.0	LOS D	16.8	123.9	1.00	0.94	21.3
North: Brickmakers Drive											
7	L	80	0.0	0.228	12.4	LOS A	1.4	9.5	0.36	0.67	38.5
8	T	353	0.3	0.268	7.1	LOS A	7.0	49.1	0.42	0.37	41.6
Approach		433	0.2	0.268	8.1	LOS A	7.0	49.1	0.41	0.43	41.0
All Vehicles		1745	1.3	0.827	19.6	LOS B	36.7	257.6	0.73	0.70	33.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	38.6	LOS D	0.1	0.1	0.86	0.86
All Pedestrians		53	38.6	LOS D			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential+Recycling +Marina Traffc

New T Intersection
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

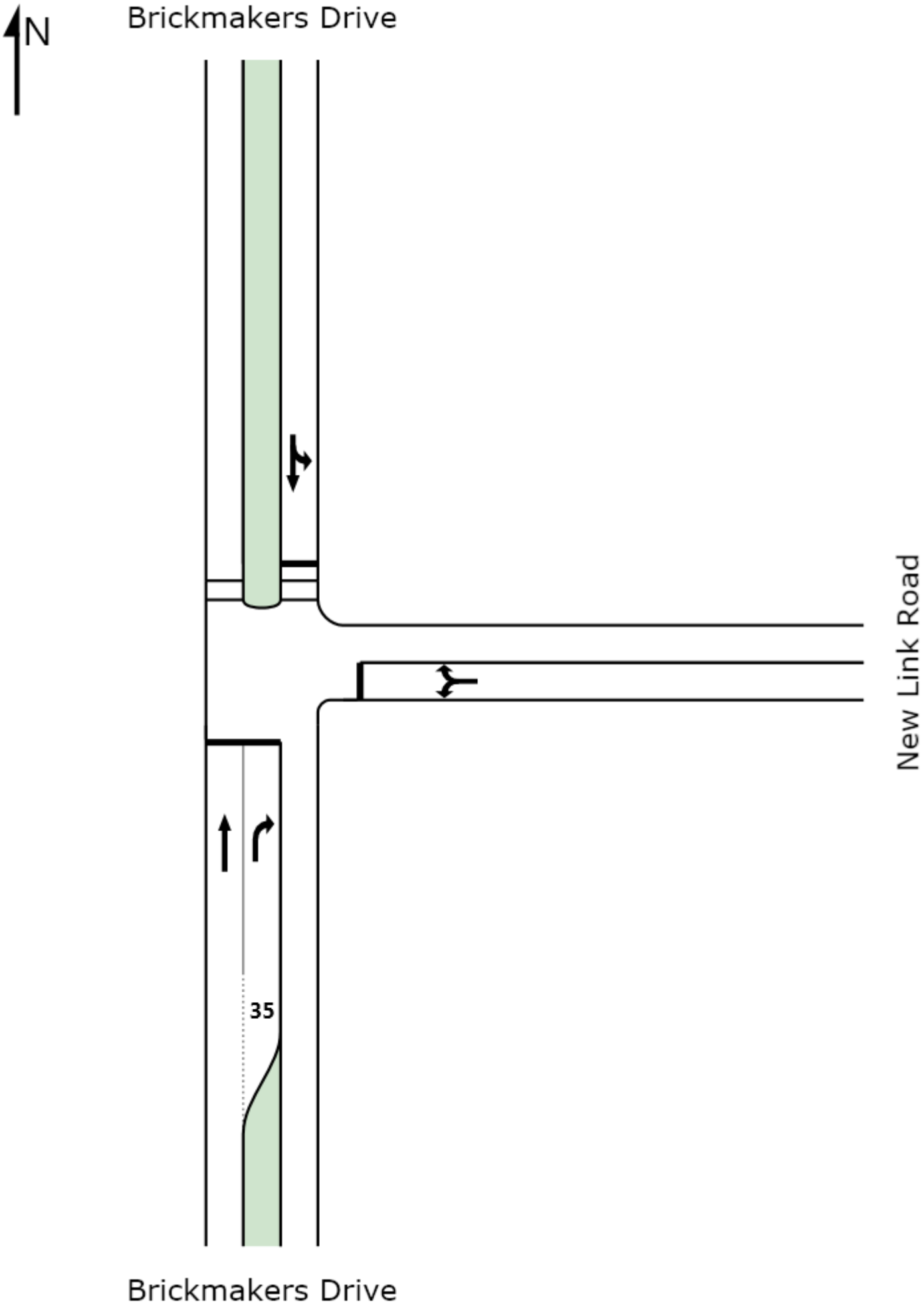
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.773	24.1	LOS B	15.4	107.7	0.90	0.88	29.9
3	R	107	0.0	0.773	30.8	LOS C	15.4	107.7	0.90	0.97	29.6
Approach		415	0.0	0.773	25.8	LOS B	15.4	107.7	0.90	0.90	29.8
East: New Link Road											
4	L	82	0.0	0.749	44.7	LOS D	8.9	65.0	1.00	0.90	24.0
6	R	136	8.5	0.749	45.1	LOS D	8.9	65.0	1.00	0.90	24.0
Approach		218	5.3	0.749	44.9	LOS D	8.9	65.0	1.00	0.90	24.0
North: Brickmakers Drive											
7	L	161	0.0	0.363	10.9	LOS A	2.1	14.8	0.36	0.68	39.6
8	T	973	0.0	0.726	8.3	LOS A	23.5	164.5	0.68	0.63	40.0
Approach		1134	0.0	0.726	8.7	LOS A	23.5	164.5	0.63	0.63	39.9
All Vehicles		1766	0.7	0.773	17.2	LOS B	23.5	164.5	0.74	0.73	34.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		53	34.2	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.


N
Brickmakers Drive
New Link Road
35
Brickmakers Drive

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential Traffic

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.679	7.0	LOS A	21.4	150.2	0.60	0.55	41.2
3	R	13	0.0	0.034	12.1	LOS A	0.2	1.3	0.36	0.68	38.7
Approach		961	0.2	0.679	7.1	LOS A	21.4	150.2	0.59	0.55	41.2
East: New Link Road											
4	L	52	0.0	0.490	44.2	LOS D	5.1	35.9	0.97	0.79	24.1
6	R	77	0.0	0.490	44.5	LOS D	5.1	35.9	0.97	0.79	24.1
Approach		128	0.0	0.490	44.4	LOS D	5.1	35.9	0.97	0.79	24.1
North: Brickmakers Drive											
7	L	19	0.0	0.267	10.9	LOS A	5.3	37.2	0.37	0.89	40.5
8	T	353	0.3	0.267	4.4	LOS A	5.3	37.2	0.37	0.33	44.0
Approach		372	0.3	0.267	4.8	LOS A	5.3	37.2	0.37	0.36	43.8
All Vehicles		1461	0.2	0.679	9.8	LOS A	21.4	150.2	0.57	0.52	39.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	36.7	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		53	36.7	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential Traffc

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.197	3.0	LOS A	4.2	29.1	0.25	0.22	45.9
3	R	38	0.0	0.215	20.1	LOS B	1.1	7.6	0.50	0.73	33.6
Approach		345	0.0	0.215	4.9	LOS A	4.2	29.1	0.28	0.28	44.1
East: New Link Road											
4	L	25	0.0	0.346	62.5	LOS E	3.6	25.4	0.97	0.76	19.9
6	R	39	0.0	0.346	62.8	LOS E	3.6	25.4	0.97	0.76	19.9
Approach		64	0.0	0.346	62.7	LOS E	3.6	25.4	0.97	0.76	19.9
North: Brickmakers Drive											
7	L	58	0.0	0.662	11.8	LOS A	25.1	175.7	0.46	0.91	40.0
8	T	973	0.0	0.662	5.4	LOS A	25.1	175.7	0.46	0.44	42.9
Approach		1031	0.0	0.662	5.7	LOS A	25.1	175.7	0.46	0.46	42.7
All Vehicles		1440	0.0	0.662	8.1	LOS A	25.1	175.7	0.44	0.43	40.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	54.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		53	54.2	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential+Recycling Traffic

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.696	7.5	LOS A	21.5	150.6	0.63	0.59	40.7
3	R	15	0.0	0.040	12.5	LOS A	0.2	1.5	0.38	0.68	38.4
Approach		963	0.2	0.696	7.6	LOS A	21.5	150.6	0.63	0.59	40.7
East: New Link Road											
4	L	53	0.0	0.585	42.4	LOS C	5.7	44.5	0.98	0.81	24.7
6	R	97	19.6	0.585	43.2	LOS D	5.7	44.5	0.98	0.81	24.6
Approach		149	12.7	0.585	42.9	LOS D	5.7	44.5	0.98	0.81	24.7
North: Brickmakers Drive											
7	L	19	0.0	0.273	11.1	LOS A	5.3	37.2	0.40	0.89	40.3
8	T	353	0.3	0.273	4.7	LOS A	5.3	37.2	0.40	0.35	43.7
Approach		372	0.3	0.273	5.1	LOS A	5.3	37.2	0.40	0.37	43.5
All Vehicles		1484	1.5	0.696	10.5	LOS A	21.5	150.6	0.61	0.56	38.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		53	34.2	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential+Recycling Traffic

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	310	0.8	0.204	3.3	LOS A	4.2	29.6	0.28	0.24	45.5
3	R	39	0.0	0.218	21.4	LOS B	1.1	7.8	0.54	0.74	32.9
Approach		349	0.7	0.218	5.3	LOS A	4.2	29.6	0.31	0.30	43.6
East: New Link Road											
4	L	27	0.0	0.441	58.0	LOS E	4.3	33.4	0.98	0.77	20.8
6	R	54	21.6	0.441	58.9	LOS E	4.3	33.4	0.98	0.77	20.8
Approach		81	14.3	0.441	58.6	LOS E	4.3	33.4	0.98	0.77	20.8
North: Brickmakers Drive											
7	L	58	0.0	0.678	12.3	LOS A	25.2	176.2	0.51	0.92	39.7
8	T	973	0.0	0.678	5.9	LOS A	25.2	176.2	0.51	0.47	42.3
Approach		1031	0.0	0.678	6.2	LOS A	25.2	176.2	0.51	0.50	42.2
All Vehicles		1460	1.0	0.678	8.9	LOS A	25.2	176.2	0.48	0.47	40.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	49.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		53	49.2	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday AM Peak Residential+Recycling +Marina Traffic

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	948	0.2	0.793	12.7	LOS A	25.9	181.5	0.81	0.78	36.6
3	R	56	0.0	0.171	16.3	LOS B	1.0	7.0	0.54	0.72	35.8
Approach		1004	0.2	0.793	12.9	LOS A	25.9	181.5	0.80	0.77	36.6
East: New Link Road											
4	L	116	0.0	0.809	40.2	LOS C	11.5	84.5	1.00	0.95	25.3
6	R	193	9.8	0.809	40.7	LOS C	11.5	84.5	1.00	0.95	25.3
Approach		308	6.1	0.809	40.5	LOS C	11.5	84.5	1.00	0.95	25.3
North: Brickmakers Drive											
7	L	80	0.0	0.365	13.6	LOS A	7.3	51.3	0.53	0.86	38.6
8	T	353	0.3	0.365	7.2	LOS A	7.3	51.3	0.53	0.47	41.0
Approach		433	0.2	0.365	8.4	LOS A	7.3	51.3	0.53	0.54	40.5
All Vehicles		1745	1.3	0.809	16.6	LOS B	25.9	181.5	0.77	0.75	34.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	26.6	LOS C	0.1	0.1	0.87	0.87
All Pedestrians		53	26.6	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Traffic Signals Weekday PM Peak Residential+Recycling +Marina Traffc

New T Intersection with Right Turn Lane
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brickmakers Drive											
2	T	307	0.0	0.222	4.7	LOS A	4.5	31.8	0.37	0.32	43.8
3	R	107	0.0	0.727	45.3	LOS D	5.1	35.6	0.94	0.94	23.8
Approach		415	0.0	0.727	15.2	LOS B	5.1	35.6	0.52	0.48	36.0
East: New Link Road											
4	L	82	0.0	0.783	50.7	LOS D	10.1	74.2	1.00	0.91	22.5
6	R	136	8.5	0.783	51.2	LOS D	10.1	74.2	1.00	0.91	22.4
Approach		218	5.3	0.783	51.0	LOS D	10.1	74.2	1.00	0.91	22.4
North: Brickmakers Drive											
7	L	161	0.0	0.823	16.8	LOS B	35.1	246.0	0.76	0.92	36.9
8	T	973	0.0	0.823	10.4	LOS A	35.1	246.0	0.76	0.72	38.0
Approach		1134	0.0	0.823	11.3	LOS A	35.1	246.0	0.76	0.75	37.8
All Vehicles		1766	0.7	0.823	17.1	LOS B	35.1	246.0	0.73	0.70	34.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	37.4	LOS D	0.1	0.1	0.91	0.91
All Pedestrians		53	37.4	LOS D			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 5, 21 Bolton Street
Newcastle, New South Wales, 2300
T 02 4927 0506 F 02 4926 1312

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866