



Traffic Impact Assessment

3-7 East Street and 2 Railway Street, Lidcombe NSW 2141

August 2015



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Type of Assessment: Traffic Impact Assessment

Site Location: 3-7 East Street and 2 Railway Street, Lidcombe NSW 2141

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1. Introduction

APEX Engineers were engaged by Automation Feeding Devices Pty Ltd to provide a traffic impact assessment to support the currently proposed rezoning application ('subject proposal') for the land on 3-7 East Street and 2 Railway Street in Lidcombe NSW 2141 ('subject site').

This report will address the potential traffic impacts, within the immediate surroundings of the subject site, resulting from the above-mentioned rezoning proposal.

This report has been structured into the following sections:

- **Section 2** Provides the details of the subject proposal along with a background on the previous assessments undertaken in relation to the overall rezoning scheme;
- **Section 3** Provides the details pertaining to traffic generation implications arising from the current rezoning proposal, in light of the traffic generation figures determined through previous assessments;
- **Section 4** Establishes the net additional traffic levels anticipated to be experienced by the key intersections due to the current rezoning proposal and provides the SIDRA intersection assessment results for the intersections considered;
- **Section 5** Provides the summary and conclusions of the study.

2. Project Background

The subject proposal relates to rezoning the land on 3-7 East Street and 2 Railway Street in Lidcombe, which is currently zoned as IN2 (light industrial) to B4 (mixed use).

A comprehensive traffic and transport assessment has already been undertaken by Hyder Consultants (titled 'Marsden Street Precinct – Traffic Transport and Accessibility Study', dated: 24th April 2015) for the entirety of Marsden Street precinct. However, in this assessment, the subject land (3-7 East Street and 2 Railway Street) has been assumed to be light industrial (IN2). As such, this reports presents a revised traffic assessment, which considers the proposed change of land use zoning of the subject land (updated traffic generation figures have been derived, later on in this report, based on the change in zoning from IN2 to B4 of the subject land).

This assessment will utilise information from the following documents, which have already been submitted to Council, in relation to the Marsden Street Precinct;

- 1) *Marsden Street Precinct – Traffic Transport and Accessibility Study. By Hyder Consultants (April 2015).* This document will herein be referred to as the 'Hyder report'.
- 2) *Marsden Street Precinct, Lidcombe – Yield Study. By AECOM (February 2015).* This document will herein be referred to as the 'AECOM Yield Study'.

2.1 Subject Site within the Marsden Street Precinct

The overall Marsden Street Precinct site is located in Lidcombe, adjacent to the Lidcombe town centre, railway line and Rockwood Necropolis cemetery. It has frontages of around 220 metres on all sides and is bound by the following roads:

- Railway Street (northern boundary),
- East Street (eastern boundary),

- James Street (southern boundary), and
- Mark Street (western boundary).

The Marsden Street Precinct site's current zoning includes 'R4' high-density residential, 'IN2' light industrial and 'RE1' public recreation, land uses. Properties currently occupying the Marsden Street Precinct site include single-dwelling residential houses, apartment buildings, light industrial / workshops, small offices, training facilities, community facilities and a petrol station.

The following figure illustrates the location of the subject site (3-7 East Street and 2 Railway Street) within the overall Marsden Street Precinct.



Figure 1: Location of the Subject Site within the Marsden Street Precinct

The specific location of the subject site with the surrounding road network is illustrated in **Figure 2** below.



Figure 2: Location of the Subject Site

As can be seen from the figure above, the subject site is bound by Railway Street to the north, Davey Street to the south, Raphael Street to the west and East Street to the east.

2.2 Existing Road Network Characteristics

The two key roads which bound the site, Railway Street and East Street, include the following characteristics at the site frontage;

- Railway Street – a local road which runs in the east-west alignment with a speed limit of 50 km/hr.
- East Street – a secondary arterial road which runs in the north-south alignment with a speed limit of 60 km/hr.

The internal roads which bound the site, Davey Street and Raphael Street, include the following characteristics;

- Davey Street – a local access road which runs in the east-west alignment with no signed speed limit (therefore a 50 km/hr speed limit has been assumed).
- Raphael Street – a local access road which runs in the north-south alignment with no signed speed limit (therefore a 50 km/hr speed limit has been assumed). This street is one-way (southbound) to the south of Davey Street.

2.3 Key Intersections

It is noted that the access to the subject site has been assumed to be off East Street, and accordingly, the two key intersections that are anticipated to experience the highest impact from any traffic generations pertaining to the current rezoning proposal is established to be the Railway Street/East Street intersection and the East Street/James Street intersection. It is noted that after these two intersections, the traffic is likely to be further distributed across other surrounding intersections with a much less impact (due to the overall traffic distribution across various routes).

The above two key intersections, along with likely traffic distribution routes after these intersections, are illustrated in the figure below (line thickness is indicative of the traffic volume).



Figure 3: Key Intersections and Traffic Distribution Routes

The Hyder report included turning-movement traffic counts at the two key intersections around the subject site during the following peak periods:

- Thursday 19 February 2015 – 7am to 9am
- Thursday 19 February 2015 – 4pm to 6pm



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The results from the turning movement count surveys had subsequently been analysed to identify peak one-hour periods for the AM and PM peak periods – identified as 7:45am to 8:45am and 4:45pm to 5:45pm, respectively. The following figure illustrates the traffic volumes obtained during AM and PM peak hour periods, for the two key intersection assessed in this report (extracted from the Hyder report).



Figure 4: AM and PM Peak Hour Traffic Volumes at Key Intersections

2.4 Performance of Key Intersections

The Hyder report has presented the SIDRA assessment results for the two key intersections considered in this report. The assessment results have been undertaken for the following two scenarios;

- 1) Existing (2015) baseline conditions – AM and PM peak periods.
- 2) Future (2025) conditions with development and background traffic growth – AM and PM peak periods.

The main criteria of average delay and respective levels of service (LoS) used for SIDRA intersection assessment are based on the Guide to Traffic Generating Developments (RTA, 2002). The following table illustrates the relationship between the average delay and the level of service for priority controlled intersections such as give way/stop sign controlled intersections and roundabouts.

Table 1: Performance Criteria for Priority Intersections

Level of Service (LoS)	Average Delay (sec)	Give way and Stop Intersections
A	<14	Good Operation
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory operations
D	43 to 56	Operating near capacity
E	57 to 70	Operating at capacity
F	>70	Operating over capacity, extra capacity required

The following table illustrates a summary of the baseline and future scenario performance results for the two key intersections considered (extracted from the Hyder report). The detailed SIDRA assessment results, for each case, are presented

in **Appendix A** (extracted from the Hyder report) and **Appendix B** (extracted from the Hyder report) in this report.

Table 2: Baseline and Future Scenario Performance Levels for the Key Intersections

Intersection	Existing Operations (baseline as per 2015)		Post Development Operations in 2025 (with background traffic growth)	
	Avg Delay	LoS	Avg Delay	LoS
AM Peak (7.45am – 8.45am)				
East Street/Railway Street	24.2 sec	B	35.7 sec	C
East Street/James Street	27.2 sec	B	42.8 sec	D
PM Peak (4.45pm – 5.45pm)				
East Street/Railway Street	20.2 sec	B	45.8 sec	D
East Street/James Street	11.7 sec	A	14.4 sec	A

3. Traffic Generating Potential of the Subject Site

3.1 Traffic Generation Calculation from Hyder Report

It is acknowledged that the traffic generating potential of the subject site has been determined in the Hyder report on the basis of IN2 (light industrial) land use. The following figure illustrates the land use of the subject site assumed in the Hyder report with respect to the other lots within the overall Marsden Street Precinct.



Figure 5: Land Use of the Subject Site with respect to the Overall Marsden Street Precinct

As can be seen from the above figure, the subject site is referred to as land parcel F in the Hyder report. Accordingly, the development yield for the subject site (land parcel F) has been assumed to include 2,430 square metres of gross floor area (GFA) for industrial land use (refer to *Table 3-1* in the Hyder report).

Subsequently, the traffic generation rates for the industrial land-use has been sourced from the Roads and Maritime Technical Direction note TDT 2013/04a Guide to Traffic Generating Developments – Updated traffic surveys dated August 2013.

The following table summarises the trip rates, traffic generation levels and peak hour trip distribution characteristics for the subject site as per the Hyder report.

Table 3: Trip Generation Characteristics for the Subject Site – as per Hyder Report

	AM Peak	PM Peak
Trip rates as per RMS TDT 2013/04a		
Industrial Land Use – Business parks and industrial estates	0.52 veh/100 sqm GFA	0.56 veh/100 sqm GFA
Assumptions for traffic generation in/out split ratios		
Industrial Land Use	90% in / 10% out	10% in / 90% out
Traffic generation based on the assumed development quantum		
Industrial land use with 2,430 sqm GFA	12 veh (11 trips in / 1 trip out)	13 veh (1 trip in / 12 trips out)

3.2 Traffic Generation for the Proposed Rezoning of the Subject Land

This section outlines the revised traffic generation calculation for the proposed rezoning of the subject site. Accordingly, the traffic generation figures have been derived based on the change in land zoning from IN2 to B4 of the subject land.

The land use characteristics of the proposed rezoning application is illustrated in the figure below. It is noted that the subject proposal is in line with the preferred scenario presented in the AECOM Yield Study.

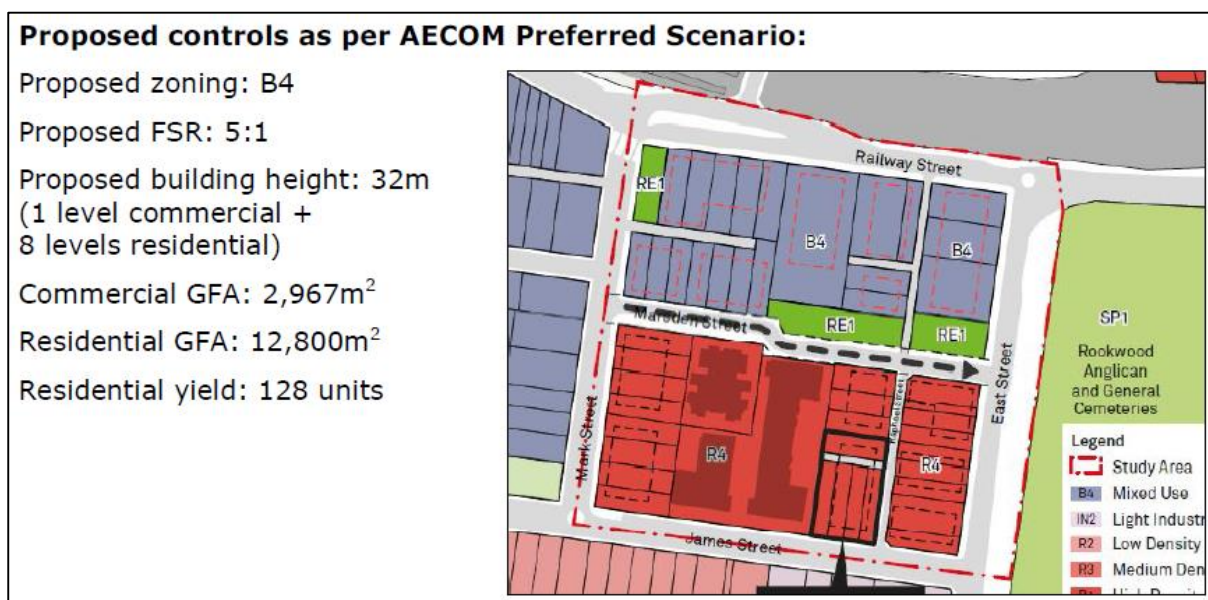


Figure 6: Proposed land use characteristics of the subject site

The following table summarises the trip rates, traffic generation levels and peak hour trip distribution characteristics for the subject site, based on the land use characteristics outlined in **Figure 6** above. The trip rates and traffic distribution assumptions presented in the table below are in line with those outlined in the Hyder report. It should be noted that, in this assessment, all the relevant assumptions have been maintained consistently with those outlined in the Hyder report (*Section 4.1.2*), in particular the following assumption is also adopted in this assessment;

- In the Hyder assessment, Commercial land-use were assumed to comprise 65% retail and 35% office. As such, this land use split has been assumed in trip generation procedure as illustrated in the table below.

Table 4: Trip Generation Characteristics for the Subject Site as per the Current Rezoning Proposal

	AM Peak	PM Peak
Trip rates as per RMS TDT 2013/04a		
Retail Land Use: Shopping centre (0-10,000 sqm GLFA)*	1.8 veh/100 sqm GLFA ¹	12.3 veh/100 sqm GLFA
Commercial Land Use – Office blocks	1.6 veh/100 sqm GFA	1.2 veh/100 sqm GFA
Residential Land Use – High-density residential flat dwellings	0.19 veh/unit	0.15 veh/unit
Assumptions for traffic generation in/out split ratios		
Retail Land Use	60% in / 40% out	50% in / 50% out
Commercial Land Use	90% in / 10% out	10% in / 90% out
Residential Land Use	10% in / 90% out	90% in / 10% out
Traffic generation based on the proposed rezoning development quantum		
Retail land use (65% of 2,967 sqm GFA = 1929 sqm GFA) = 1446 sqm GLFA ² . Also accounting for the 25% trip reduction, the effective GLFA = 1085 sqm GLFA ³	20 veh (12 trips in / 8 trips out)	133 veh (66 trips in / 67 trips out)
Commercial land use with 35% of 2,967 sqm GFA = 1038 sqm GFA	17 veh (15 trips in / 2 trips out)	12 veh (1 trips in / 11 trips out)
Residential yield of 128 units	25 veh (3 trips in / 22 trips out)	20 veh (18 trips in / 2 trips out)
Total traffic generation		
Overall rezoning proposal (mixed use comprising residential, retail and commercial uses) of the subject site	62 veh (30 trips in / 32 trips out)	165 veh (85 trips in / 80 trips out)

- 1 The AM peak hour trip rate for retail land uses was adopted in line with the figure presented in the Hyder report (determined through the surveys undertaken by Hyder)
- 2 Retail GFA was converted into GLFA at a ratio of 1:0.75 (consistent with the Hyder report).
- 3 A trip reduction factor of 25% has been applied to the retail trips in accordance with the Hyder analysis.

3.3 Comparison of Traffic Generation Levels

From the above sections, it is evident that the proposed mixed use (B4) rezoning of the subject land is likely to generate higher levels of traffic compared to when the use of the subject land is treated as light industrial (IN2).

The following table provides a comparison of the traffic generation figures established for each case.

Table 5: Comparison of Trip Generation Levels

	AM Peak	PM Peak
As per Hyder report		
Based on industrial land use (IN2) with 2,430 sqm GFA	12 veh (11 trips in / 1 trip out)	13 veh (1 trip in / 12 trips out)
As per the current rezoning proposal		
Based on mixed land use (B4) comprising residential (128 units) and commercial (35%)/retail (65%) (2,967 sqm GFA) use of the subject site	62 veh (30 trips in / 32 trips out)	165 veh (85 trips in / 80 trips out)
Net additional traffic to be accounted for		
Net additional traffic added to the key intersections	50 veh (19 trips in / 31 trips out)	152 veh (84 trips in / 68 trips out)

As can be seen from the table above, 50 and 152 additional trips must be accounted for in the revised traffic assessment when considering the current rezoning proposal of the subject land.

The following section presents the details of the revised traffic assessment. It is noted that for the purposes of this traffic assessment, the access to the subject site has been assumed to be only off East Street.

4. Revised Traffic Levels at Key Intersections

The net additional traffic levels occurring due to the current rezoning proposal has been added on to the road network for each peak hour period, based on site-wide traffic distributions outlined in the Hyder report (*Section 4.2*).

4.1 AM Peak Trip Distribution

The following figure illustrates traffic distribution assumptions adopted in the Hyder report for the AM peak hour period.

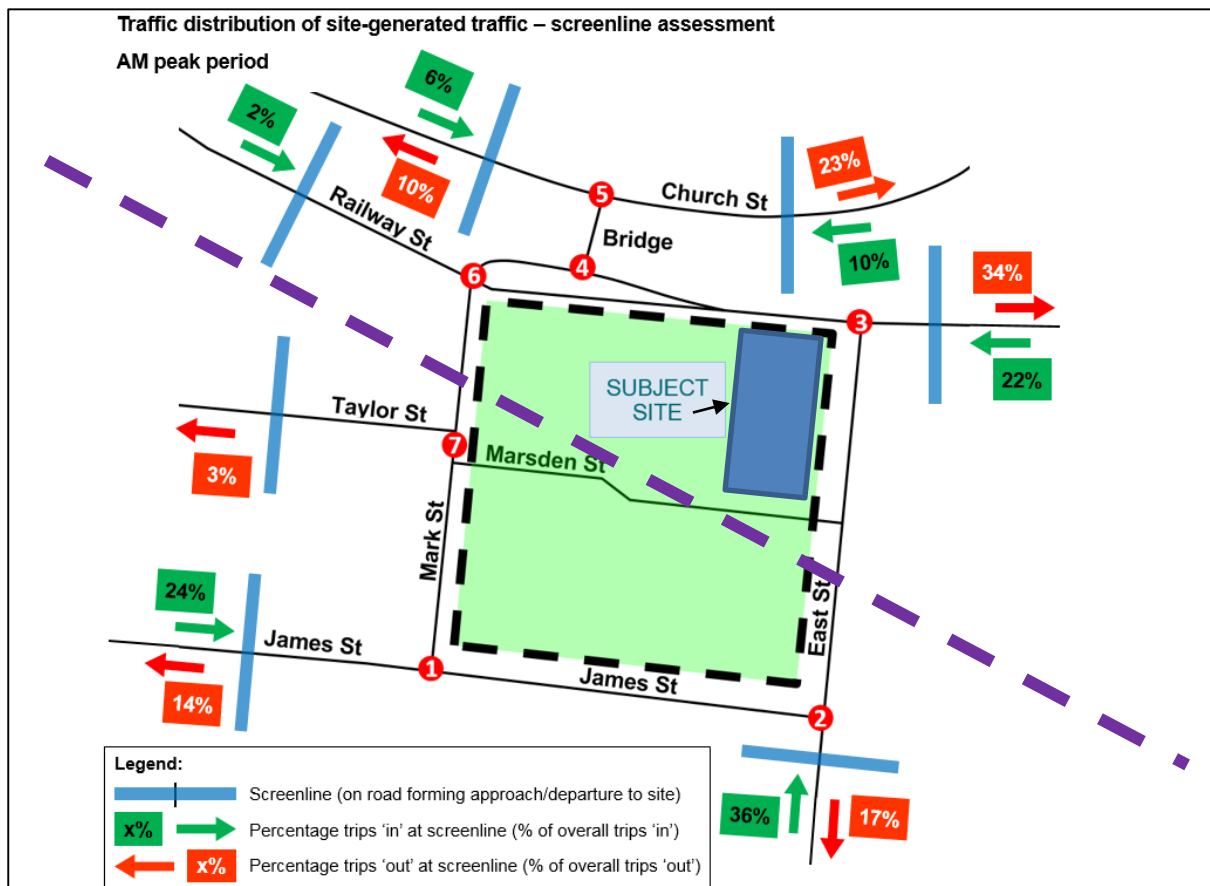


Figure 7: Traffic distribution characteristics for AM peak period

It is noted that the key intersections considered in this assessment (Railway Street/East Street intersection and the East Street/James Street intersection) are labelled as 3 and 2, respectively in the above figure.

On the shortest path basis, the following trip distribution routes has been assumed;

- 1) The traffic levels through Railway Street/East Street intersection (labelled as 3 in the above figure) include all traffic to and from the north (areas which lie above the dashed line in Purple colour in **Figure 7**)
- 2) The traffic level through East Street/James Street intersection (labelled as 2 in the above figure) include all traffic to and from the south (areas which lie below the dashed line in Purple colour in **Figure 7**)

Accordingly, the following splits of trips will be distributed across the two key intersections, during the AM peak period;

- 40% of the traffic into and 67% of the traffic out of the subject site will go through Railway Street/East Street intersection.
- 60% of the traffic into and 33% of the traffic out of the subject site will go through East Street/James Street intersection.

As per the net additional trip figures presented in **Table 4**, a total of 50 additional vehicle trips (19 trips in and 31 trips out) are likely to be generated during the AM peak period. This number of trips have subsequently been allocated to each key intersection based on the trip distribution splits established above, as illustrated in **Figure 8** below.

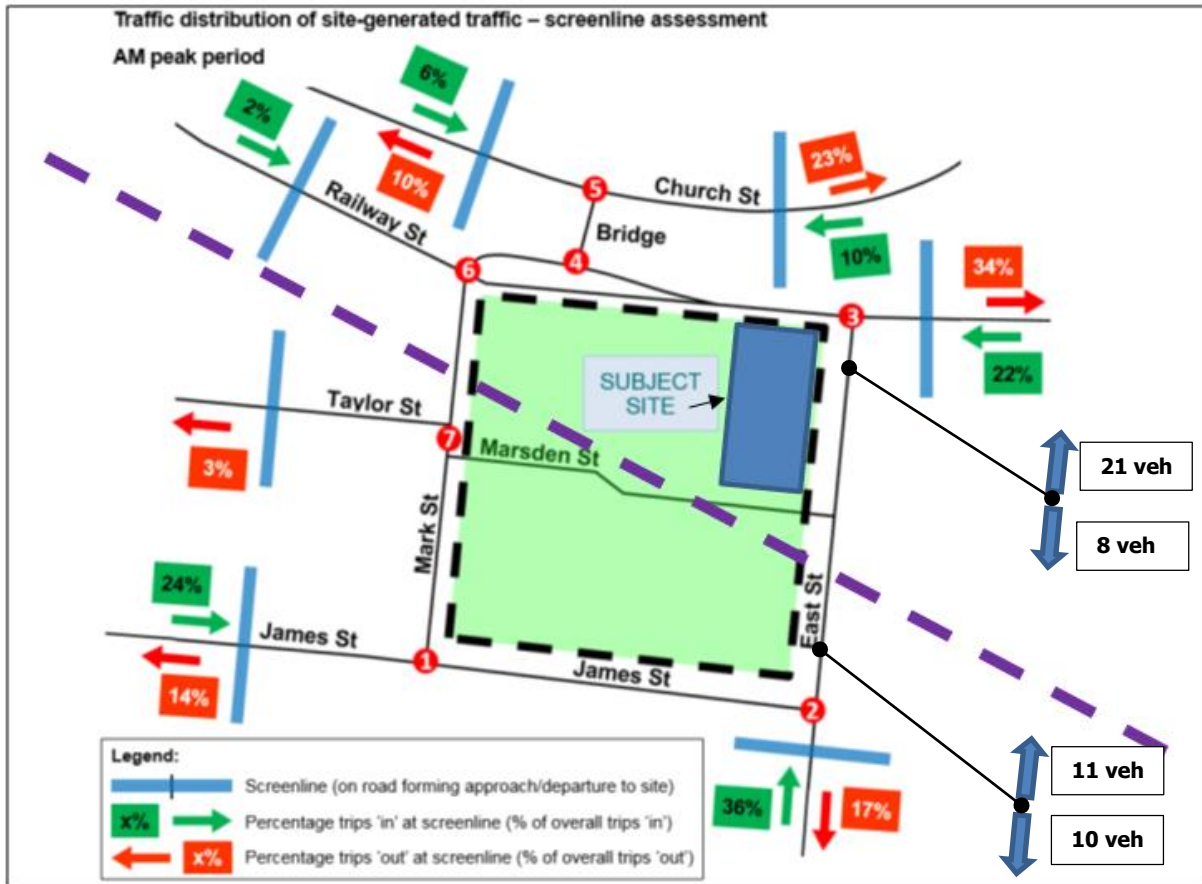


Figure 8: Traffic distribution through each key intersection during AM peak period

4.2 PM Peak Trip Distribution

The following figure illustrates traffic distribution assumptions adopted in the Hyder report for the PM peak hour period.

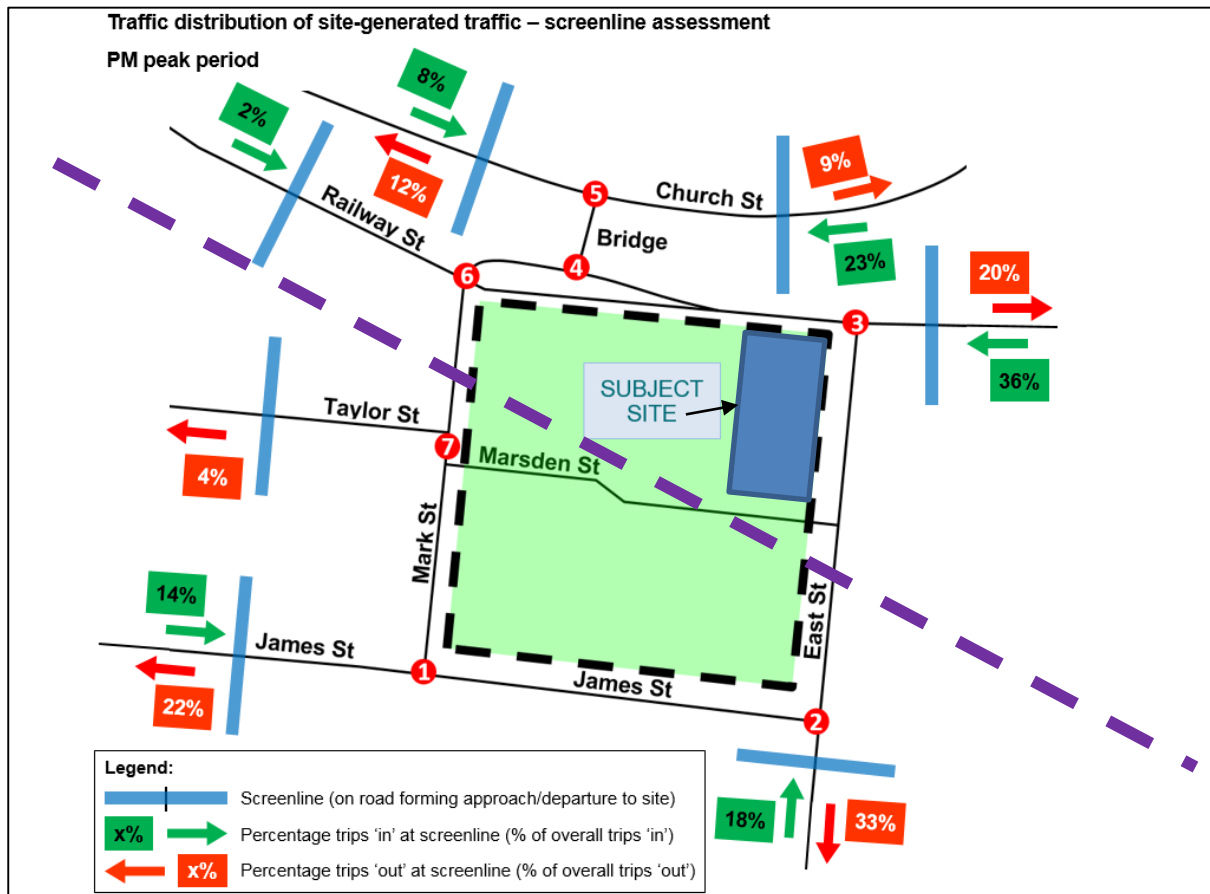


Figure 9: Traffic distribution characteristics for PM peak period

It is noted that the key intersections considered in this assessment (Railway Street/East Street intersection and the East Street/James Street intersection) are labelled as 3 and 2, respectively in the above figure.

On the shortest path basis, the following trip distribution routes has been assumed, similarly to the AM peak scenario;

- 1) The traffic levels through Railway Street/East Street intersection (labelled as 3 in the above figure) include all traffic to and from the north (areas which lie above the dashed line in Purple colour in **Figure 9**)
- 2) The traffic level through East Street/James Street intersection (labelled as 2 in the above figure) include all traffic to and from the south (areas which lie below the dashed line in Purple colour in **Figure 9**)

Accordingly, the following splits of trips will be distributed across the two key intersections, during the PM peak period;

- 68% of the traffic into and 41% of the traffic out of the subject site will go through Railway Street/East Street intersection.
- 32% of the traffic into and 59% of the traffic out of the subject site will go through East Street/James Street intersection.

As per the net additional trip figures presented in **Table 4**, a total of 43 additional vehicle trips (21 trips in and 22 trips out) are likely to be generated during the PM peak period. This number of trips have subsequently been allocated to each key intersection based on the trip distribution splits established above, as illustrated in **Figure 10** below.



Figure 10: Traffic distribution through each key intersection during PM peak period

4.3 Traffic Levels at Key Intersections

Based on the trip distribution splits and the subsequent net additional traffic loads experienced, as a result of the current rezoning proposal, at the two key intersections during each peak hour period, has been established as follows;

- 1) Obtain the post-development scenario traffic volumes (background growth + development) from the Hyder report (*Section 4.3*), for the two key intersections, for each peak hour period.
- 2) Add on the net additional traffic volumes, for AM and PM peak hour periods, as indicated in **Figure 8** and **Figure 10**, respectively.

4.3.1 Post Development Traffic Volumes for AM Peak based on the Current Rezoning Proposal

The following figure illustrates the allocation of net additional traffic (generated as a result of the current rezoning proposal) at the two key intersections during the AM peak period. It is noted that the traffic volumes indicated at each intersection, in the figure below, include the post development traffic volumes (future background growth + development) presented in the Hyder report (for the AM period) for the overall Marsden Street Precinct rezoning scenario (see *Figure 4-7* in Hyder report). In addition, the net additional traffic generated due to the current rezoning proposal has been added on to respective movements at each intersection on the basis outlined in the earlier sections.

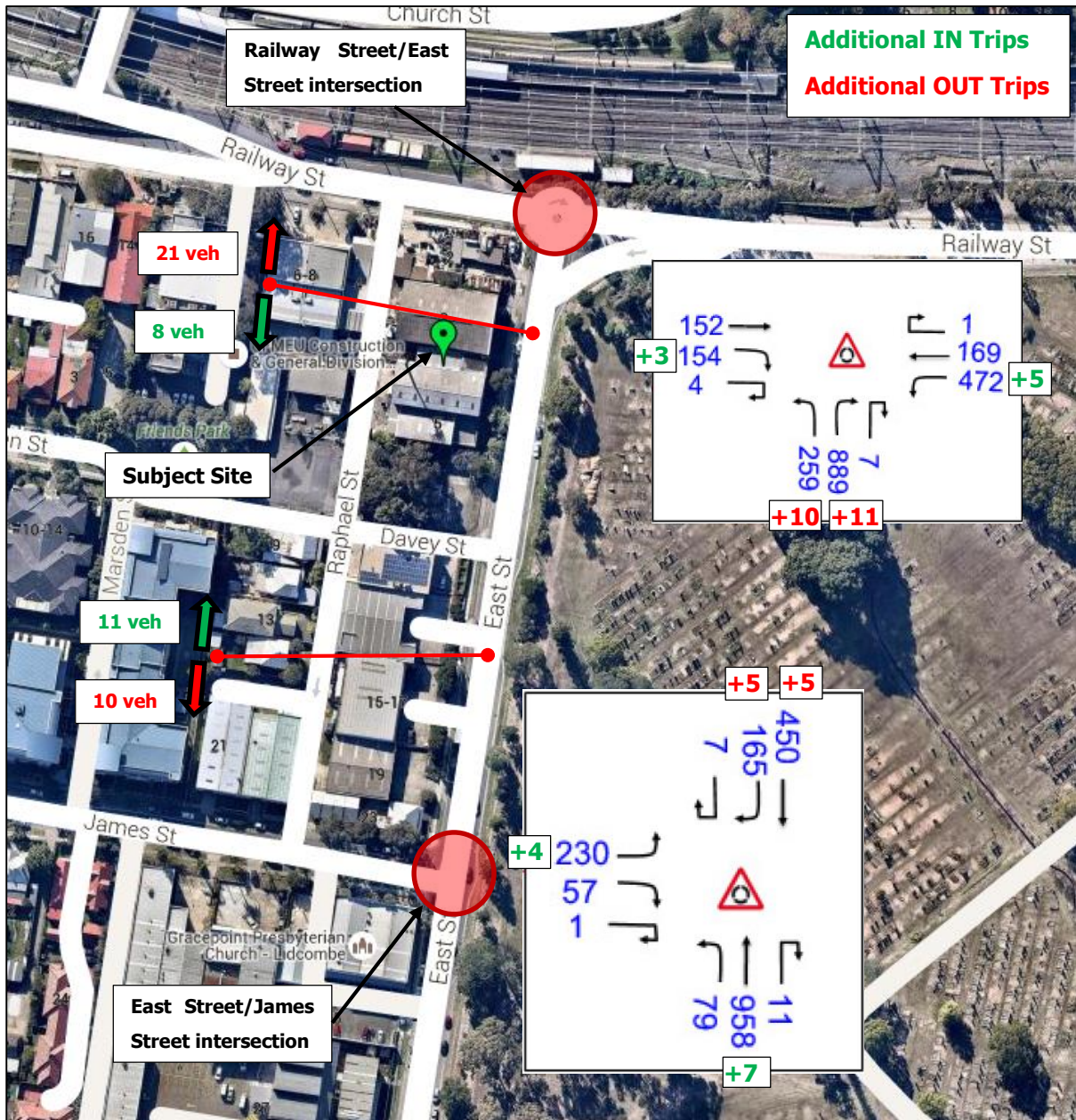


Figure 11: AM Peak Hour Traffic Volumes, based on the Current Rezoning Proposal, at Key Intersections

4.3.2 Post Development Traffic Volumes for PM Peak based on the Current Rezoning Proposal

The following figure illustrates the allocation of net additional traffic (generated as a result of the current rezoning proposal) at the two key intersections during the PM peak period. It is noted that the traffic volumes indicated at each intersection, in the figure below, include the post development traffic volumes (future background growth + development) presented in the Hyder report (for the PM period) for the overall Marsden Street Precinct rezoning scenario (see *Figure 4-8* in Hyder report). In addition, the net additional traffic generated due to the current rezoning proposal has been added on to respective movements at each intersection on the basis outlined in the earlier sections.

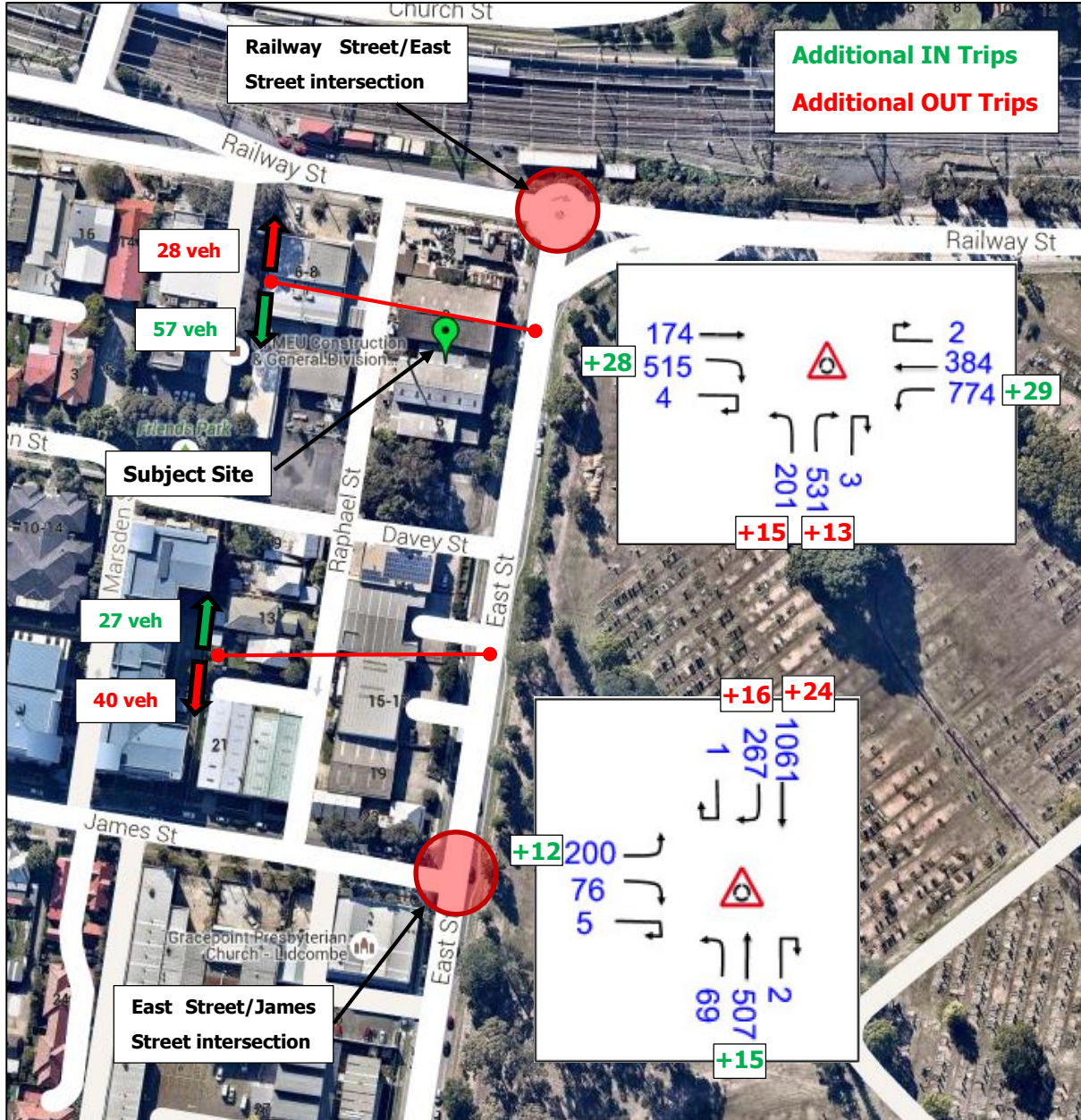


Figure 12: PM Peak Hour Traffic Volumes, based on the Current Rezoning Proposal, at Key Intersections

5. Traffic Impact Assessment

The traffic volumes derived, for each key intersection, in the above section for AM and PM peak periods have subsequently been used to model the performance of these intersections using SIDRA 5.1 software. The following figure illustrates the intersection layouts generated in SIDRA for performance assessment.

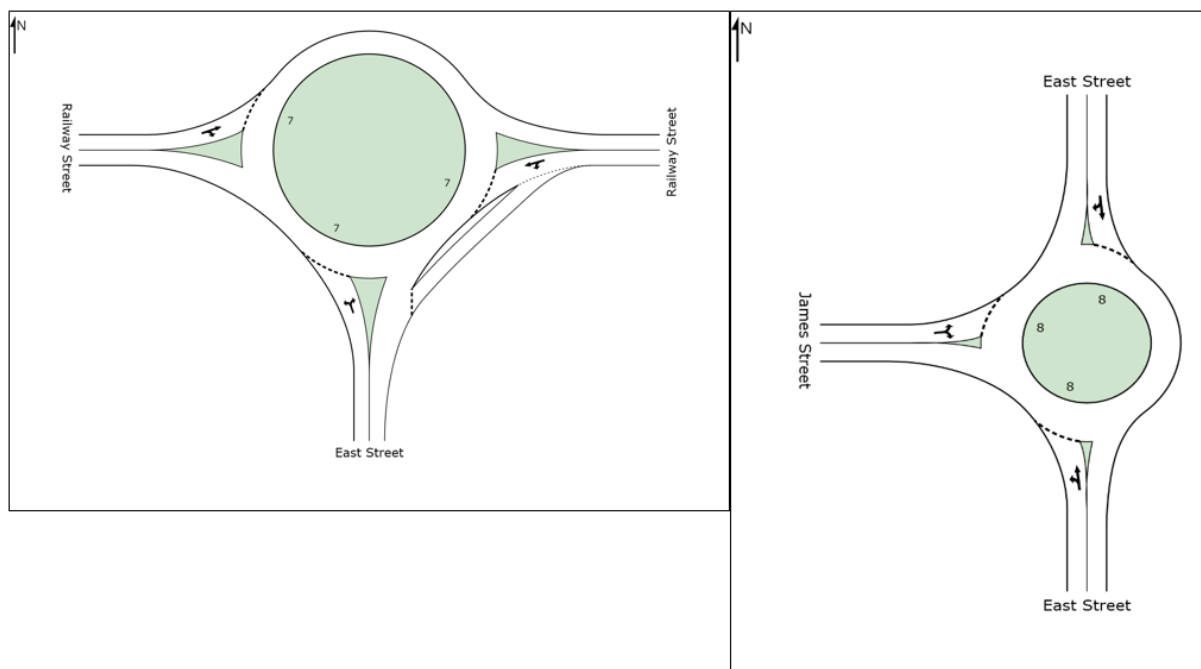


Figure 13: Layout of the Key Intersection as Developed in SIDRA Software

Subsequent to the development of appropriate intersection layouts, based on aerial photographs, the SIDRA assessment has been undertaken to investigate the performance of the two key intersections considered, with the net additional traffic generated by the current rezoning proposal. It is noted that the heavy vehicle percentages, which have been adopted by Hyder in their assessment, has been maintained in this assessment for consistency of results. The following table illustrates the intersection performance results obtained for the current rezoning proposal scenario (last two columns) in conjunction with the intersection performance metrics from other scenarios, for comparison purposes. The detailed

SIDRA intersection assessment results are presented in **Appendix C** of this document.

Table 6: Baseline and future scenario performance levels for the key intersections

Intersection	Post Development Operations in 2025 (with background traffic growth)					
	Existing Operations (baseline as per 2015)		Overall Marsden Street Precinct Proposal as per Hyder Reepert		Current Rezoning Proposal for the Subject Site	
	Avg Delay	LoS	Avg Delay	LoS	Avg Delay	LoS
AM Peak (7.45am – 8.45am)						
East Street/Railway Street	24.2 sec	B	35.7 sec	C	36.2 sec	C
East Street/James Street	27.2 sec	B	42.8 sec	D	45.1 sec	D
PM Peak (4.45pm – 5.45pm)						
East Street/Railway Street	20.2 sec	B	45.8 sec	D	51.1 sec	D
East Street/James Street	11.7 sec	A	14.4 sec	A	25.6 sec	B

As can be seen from the table above, as a result of net additional traffic generated due to the current rezoning proposal, the average delay levels at each intersection during each peak period has increased marginally, as expected (except for the East Street/James Street intersection during the PM peak period). Furthermore, the level of services for each intersection, at each peak period, has been retained at the levels determined prior to the current rezoning proposal, except for East Street/James Street intersection during the PM peak period. This intersection, with the subject rezoning proposal, will experience some 11 seconds of additional average delay



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levels and as a result the level of service has reduced from A to B. However, LoS B represents good operations with acceptable delays and spare capacity and therefore the intersection is anticipated to continue without any excessive delays or queuing.

6. Conclusions

APEX Engineers were engaged by Automation Feeding Devices Pty Ltd to provide a traffic impact assessment to support the currently proposed rezoning application for the land on 3-7 East Street and 2 Railway Street in Lidcombe NSW 2141.

The subject proposal relates to rezoning the land on 3-7 East Street and 2 Railway Street in Lidcombe, which is currently zoned as IN2 (light industrial) to B4 (mixed use). A comprehensive traffic and transport assessment has already been undertaken by Hyder Consultants for the entirety of Marsden Street precinct. However, in this assessment, the subject land (3-7 East Street and 2 Railway Street) has been assumed to be light industrial (IN2). As such, this reports presents a revised traffic assessment, which considers the proposed change of land use zoning of the subject land (updated traffic generation figures have been derived based on the change in zoning from IN2 to B4 of the subject land).

Based on the assessment presented in this report, it is evident that the proposed mixed use (B4) rezoning of the subject land is likely to generate higher levels of traffic compared to when the use of the subject land is treated as light industrial (IN2). More specifically, there is anticipated to be 50 and 152 net additional vehicle trips during future (post-development) AM and PM peak periods, respectively.

Subsequent to the traffic generation procedure, the resulting trip quantities have been allocated to each intersection considered (Railway Street/East Street intersection and the East Street/James Street intersection), based on trip distribution assumptions used in the Hyder report. The final intersection modelling results indicate that each intersection is likely to experience marginal to acceptable increases in average delays. Furthermore, the level of services for each intersection, at each peak period, has been retained at the levels determined prior to the current



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rezoning proposal, except for East Street/James Street intersection during the PM peak period. This intersection, with the subject rezoning proposal, will experience some 11 seconds of additional average delay levels and as a result the level of service has reduced from A to B. However, LoS B represents good operations with acceptable delays and spare capacity and therefore the intersection is anticipated to continue without any excessive delays or queuing.

Therefore, as illustrated in this assessment, the proposed rezoning of the subject land from IN2 (light industrial) to B4 (mixed use) is unlikely to create any adverse or unanticipated traffic impacts at the intersections in the vicinity.



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APPENDIX A – SIDRA INTERSECTION ASSESSMENT RESULTS FOR THE EXISTING (BASELINE) SCENARIO (EXTRACTED FROM THE HYDER REPORT)

Railway Street/East Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: Site 3_Railway St / East St_AM

Railway St / East St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV %	v/c	sec		Vehicles	Distance		per veh	km/h
		veh/h					veh	m			
South: East St											
1	L2	225	5.1	0.918	12.0	LOS A	23.3	167.9	1.00	0.73	44.4
3	R2	880	2.8	0.918	15.2	LOS B	23.3	167.9	1.00	0.73	47.6
3u	U	7	0.0	0.918	16.7	LOS B	23.3	167.9	1.00	0.73	48.1
Approach		1113	3.2	0.918	14.5	LOS B	23.3	167.9	1.00	0.73	46.9
East: Railway St (E)											
4	L2	466	4.1	0.362	5.5	LOS A	2.8	20.5	0.46	0.57	52.7
5	T1	148	1.4	0.120	5.3	LOS A	0.7	5.3	0.38	0.51	49.9
6u	U	1	0.0	0.120	10.1	LOS A	0.7	5.3	0.38	0.51	53.7
Approach		616	3.4	0.362	5.4	LOS A	2.8	20.5	0.44	0.55	52.0
West: Railway St (W)											
11	T1	98	3.2	0.618	19.4	LOS B	5.7	42.9	1.00	1.15	41.0
12	R2	135	13.3	0.618	22.7	LOS B	5.7	42.9	1.00	1.15	40.5
12u	U	4	25.0	0.618	24.2	LOS B	5.7	42.9	1.00	1.15	38.8
Approach		237	9.3	0.618	21.3	LOS B	5.7	42.9	1.00	1.15	40.7
All Vehicles		1965	4.0	0.918	12.5	LOS A	23.3	167.9	0.82	0.72	47.5

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.

Roundabout Capacity Model: SIDRA Standard.

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.

PM Peak

MOVEMENT SUMMARY

Site: Site 3_Railway St / East St_PM

Railway St / East St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: East St											
1	L2	153	6.2	0.703	9.7	LOS A	8.4	60.0	0.84	0.84	45.7
3	R2	524	1.0	0.703	12.8	LOS A	8.4	60.0	0.84	0.84	49.2
3u	U	3	0.0	0.703	14.4	LOS A	8.4	60.0	0.84	0.84	49.7
Approach		680	2.2	0.703	12.1	LOS A	8.4	60.0	0.84	0.84	48.4
East: Railway St (E)											
4	L2	768	3.3	0.808	13.7	LOS A	13.0	93.8	1.00	1.04	47.7
5	T1	288	2.6	0.310	7.1	LOS A	2.2	16.0	0.71	0.71	48.8
6u	U	2	0.0	0.310	11.9	LOS A	2.2	16.0	0.71	0.71	52.5
Approach		1059	3.1	0.808	11.9	LOS A	13.0	93.8	0.92	0.95	48.0
West: Railway St (W)											
11	T1	119	1.8	0.778	15.6	LOS B	10.5	75.3	1.00	1.18	42.5
12	R2	432	2.7	0.778	18.8	LOS B	10.5	75.3	1.00	1.18	42.2
12u	U	4	0.0	0.778	20.2	LOS B	10.5	75.3	1.00	1.18	40.4
Approach		555	2.5	0.778	18.1	LOS B	10.5	75.3	1.00	1.18	42.3
All Vehicles		2294	2.7	0.808	13.5	LOS A	13.0	93.8	0.92	0.97	46.6

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.

Roundabout Capacity Model: SIDRA Standard.

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.

East Street/James Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: Site 2_East St / James St_AM

East St / James St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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: East St (S)											
1	L2	75	4.2	0.857	10.2	LOS A	16.2	116.2	0.94	0.74	46.8
2	T1	920	3.1	0.857	10.1	LOS A	16.2	116.2	0.94	0.74	50.7
3u	U	11	0.0	0.857	14.9	LOS B	16.2	116.2	0.94	0.74	51.0
Approach		1005	3.1	0.857	10.2	LOS A	16.2	116.2	0.94	0.74	50.4
North: East St (N)											
8	T1	436	6.5	0.449	5.1	LOS A	4.0	29.5	0.30	0.52	53.1
9	R2	164	5.8	0.449	8.3	LOS A	4.0	29.5	0.30	0.52	49.4
9u	U	7	0.0	0.449	9.8	LOS A	4.0	29.5	0.30	0.52	53.5
Approach		607	6.2	0.449	6.0	LOS A	4.0	29.5	0.30	0.52	52.1
West: James St (W)											
10	L2	212	3.5	0.663	22.8	LOS B	6.5	46.9	1.00	1.18	39.5
12	R2	40	0.0	0.663	25.8	LOS B	6.5	46.9	1.00	1.18	39.8
12u	U	1	0.0	0.663	27.2	LOS B	6.5	46.9	1.00	1.18	38.1
Approach		253	2.9	0.663	23.3	LOS B	6.5	46.9	1.00	1.18	39.5
All Vehicles		1865	4.1	0.857	10.6	LOS A	16.2	116.2	0.74	0.73	49.1

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.

Roundabout Capacity Model: SIDRA Standard.

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.

PM Peak

MOVEMENT SUMMARY

Site: Site 2_East St / James St_PM

East St / James St
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	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: East St (S)												
1	L2	59	5.4	0.542	7.0	LOS A	4.5	32.6	0.70	0.69	48.1	
2	T1	466	2.7	0.542	6.9	LOS A	4.5	32.6	0.70	0.69	52.4	
3u	U	2	0.0	0.542	11.7	LOS A	4.5	32.6	0.70	0.69	52.6	
Approach		527	3.0	0.542	7.0	LOS A	4.5	32.6	0.70	0.69	51.9	
North: East St (N)												
8	T1	973	3.1	0.889	6.2	LOS A	21.9	157.4	0.91	0.49	51.4	
9	R2	254	2.9	0.889	9.5	LOS A	21.9	157.4	0.91	0.49	47.9	
9u	U	1	0.0	0.889	11.0	LOS A	21.9	157.4	0.91	0.49	51.7	
Approach		1227	3.1	0.889	6.9	LOS A	21.9	157.4	0.91	0.49	50.7	
West: James St (W)												
10	L2	197	0.5	0.339	7.2	LOS A	2.2	15.7	0.71	0.77	47.5	
12	R2	64	0.0	0.339	10.1	LOS A	2.2	15.7	0.71	0.77	47.9	
12u	U	5	0.0	0.339	11.6	LOS A	2.2	15.7	0.71	0.77	45.4	
Approach		266	0.4	0.339	8.0	LOS A	2.2	15.7	0.71	0.77	47.5	
All Vehicles		2021	2.7	0.889	7.1	LOS A	21.9	157.4	0.83	0.58	50.5	

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.

Roundabout Capacity Model: SIDRA Standard.

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.

APPENDIX B – SIDRA INTERSECTION ASSESSMENT RESULTS FOR THE POST DEVELOPMENT (FUTURE WITH BACKGROUND GROWTH) SCENARIO (EXTRACTED FROM THE HYDER REPORT)

Railway Street/East Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: Site 3_Railway St / East St _AM

Railway St / East St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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: East St											
1	L2	259	4.2	0.976	20.6	LOS B	36.2	259.8	1.00	0.88	40.2
3	R2	889	2.6	0.976	23.8	LOS B	36.2	259.8	1.00	0.88	42.9
3u	U	7	0.0	0.976	25.3	LOS B	36.2	259.8	1.00	0.88	43.3
Approach		1155	2.9	0.976	23.1	LOS B	36.2	259.8	1.00	0.88	42.3
East: Railway St (E)											
4	L2	472	3.8	0.374	5.6	LOS A	2.9	21.2	0.49	0.58	52.7
5	T1	169	1.2	0.139	5.4	LOS A	0.9	6.2	0.41	0.52	49.8
6u	U	1	0.0	0.139	10.2	LOS A	0.9	6.2	0.41	0.52	53.7
Approach		642	3.1	0.374	5.5	LOS A	2.9	21.2	0.47	0.56	51.9
West: Railway St (W)											
11	T1	152	2.0	0.805	30.8	LOS C	9.8	72.3	1.00	1.32	36.5
12	R2	154	11.0	0.805	34.1	LOS C	9.8	72.3	1.00	1.32	36.1
12u	U	4	25.0	0.805	35.7	LOS C	9.8	72.3	1.00	1.32	34.7
Approach		310	6.8	0.805	32.5	LOS C	9.8	72.3	1.00	1.32	36.3
All Vehicles		2107	3.6	0.976	19.1	LOS B	36.2	259.8	0.84	0.85	43.7

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.

Roundabout Capacity Model: SIDRA Standard.

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.

PM Peak

MOVEMENT SUMMARY

Site: Site 3_Railway St / East St_PM

Railway St / East St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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: East St											
1	L2	201	4.5	0.855	17.1	LOS B	15.4	109.3	1.00	1.09	41.9
3	R2	531	0.9	0.855	20.2	LOS B	15.4	109.3	1.00	1.09	44.9
3u	U	3	0.0	0.855	21.8	LOS B	15.4	109.3	1.00	1.09	45.3
Approach		735	1.9	0.855	19.3	LOS B	15.4	109.3	1.00	1.09	44.0
East: Railway St (E)											
4	L2	774	3.1	0.895	21.3	LOS B	18.7	134.1	1.00	1.27	43.3
5	T1	384	1.8	0.448	7.9	LOS A	3.6	25.3	0.83	0.80	48.5
6u	U	2	0.0	0.448	12.7	LOS A	3.6	25.3	0.83	0.80	52.1
Approach		1160	2.7	0.895	16.9	LOS B	18.7	134.1	0.94	1.12	44.9
West: Railway St (W)											
11	T1	174	1.1	0.997	41.1	LOS C	27.9	198.7	1.00	1.77	32.9
12	R2	515	2.1	0.997	44.3	LOS D	27.9	198.7	1.00	1.77	32.7
12u	U	4	0.0	0.997	45.8	LOS D	27.9	198.7	1.00	1.77	31.6
Approach		693	1.9	0.997	43.5	LOS D	27.9	198.7	1.00	1.77	32.8
All Vehicles		2588	2.2	0.997	24.7	LOS B	27.9	198.7	0.97	1.29	40.6

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.

Roundabout Capacity Model: SIDRA Standard.

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.

East Street/James Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: Site 2_East St / James St_AM

East St / James St
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	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: East St (S)											
1	L2	79	3.8	0.893	11.8	LOS A	20.0	143.6	1.00	0.79	45.8
2	T1	958	2.8	0.893	11.7	LOS A	20.0	143.6	1.00	0.79	49.7
3u	U	11	0.0	0.893	16.5	LOS B	20.0	143.6	1.00	0.79	49.9
Approach		1048	2.9	0.893	11.8	LOS A	20.0	143.6	1.00	0.79	49.3
North: East St (N)											
8	T1	450	6.0	0.476	5.2	LOS A	4.4	32.1	0.37	0.53	52.9
9	R2	165	5.5	0.476	8.4	LOS A	4.4	32.1	0.37	0.53	49.2
9u	U	7	0.0	0.476	10.0	LOS A	4.4	32.1	0.37	0.53	53.3
Approach		622	5.8	0.476	6.1	LOS A	4.4	32.1	0.37	0.53	51.9
West: James St (W)											
10	L2	230	3.0	0.831	38.4	LOS C	10.5	74.9	1.00	1.36	33.8
12	R2	57	0.0	0.831	41.4	LOS C	10.5	74.9	1.00	1.36	34.0
12u	U	1	0.0	0.831	42.8	LOS D	10.5	74.9	1.00	1.36	32.8
Approach		288	2.4	0.831	39.0	LOS C	10.5	74.9	1.00	1.36	33.8
All Vehicles		1958	3.7	0.893	14.0	LOS A	20.0	143.6	0.80	0.79	46.9

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.

Roundabout Capacity Model: SIDRA Standard.

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.

PM Peak

MOVEMENT SUMMARY

Site: Site 2_East St / James St_PM

East St / James St
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: East St (S)												
1	L2	69	4.3	0.603	7.8	LOS A	5.8	41.7	0.77	0.74	47.9	
2	T1	507	2.4	0.603	7.7	LOS A	5.8	41.7	0.77	0.74	52.1	
3u	U	2	0.0	0.603	12.5	LOS A	5.8	41.7	0.77	0.74	52.4	
Approach		578	2.6	0.603	7.7	LOS A	5.8	41.7	0.77	0.74	51.6	
North: East St (N)												
8	T1	1061	2.7	0.978	9.7	LOS A	43.1	308.4	1.00	0.54	50.7	
9	R2	267	2.6	0.978	12.9	LOS A	43.1	308.4	1.00	0.54	47.2	
9u	U	1	0.0	0.978	14.4	LOS A	43.1	308.4	1.00	0.54	50.9	
Approach		1329	2.7	0.978	10.3	LOS A	43.1	308.4	1.00	0.54	50.0	
West: James St (W)												
10	L2	200	0.5	0.377	7.6	LOS A	2.6	18.0	0.76	0.81	47.2	
12	R2	76	0.0	0.377	10.6	LOS A	2.6	18.0	0.76	0.81	47.6	
12u	U	5	0.0	0.377	12.0	LOS A	2.6	18.0	0.76	0.81	45.2	
Approach		281	0.4	0.377	8.5	LOS A	2.6	18.0	0.76	0.81	47.2	
All Vehicles		2188	2.4	0.978	9.4	LOS A	43.1	308.4	0.91	0.63	50.0	

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.

Roundabout Capacity Model: SIDRA Standard.

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.

APPENDIX C – SIDRA INTERSECTION ASSESSMENT RESULTS FOR THE POST DEVELOPMENT (FUTURE WITH BACKGROUND GROWTH) SCENARIO FOR THE CURRENT REZONING PROPOSAL

Railway Street/East Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: East St/Railway St AM

Railway Street/East Street
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV Deg. Satn %	Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
							Vehicles veh	Distance m			
South: East Street											
1	L	269	4.2	0.801	8.7	LOS A	12.7	91.2	0.87	0.62	40.3
3	R	907	2.6	0.801	11.2	LOS A	12.7	91.2	0.87	0.64	39.2
Approach		1176	3.0	0.801	10.6	LOS A	12.7	91.2	0.87	0.63	39.4
East: Railway Street											
4	L	478	3.8	0.632	7.7	LOS A	6.3	45.0	0.69	0.65	41.3
5	T	169	1.2	0.632	7.4	LOS A	6.3	45.0	0.69	0.64	41.3
Approach		647	3.1	0.632	7.6	LOS A	6.3	45.0	0.69	0.65	41.3
West: Railway Street											
11	T	152	2.0	0.781	32.4	LOS C	9.4	69.2	1.00	1.34	27.8
12	R	161	10.7	0.781	36.2	LOS C	9.4	69.2	1.00	1.33	27.2
Approach		313	6.5	0.781	34.3	LOS C	9.4	69.2	1.00	1.33	27.5
All Vehicles		2136	3.5	0.801	13.2	LOS A	12.7	91.2	0.84	0.74	37.5

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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

PM Peak

MOVEMENT SUMMARY

Site: East St/Railway St PM

Railway Street/East Street Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%			v/c	sec				Vehicles
South: East Street											
1	L	216	4.5	0.562	8.9	LOS A	6.3	44.7	0.86	0.72	40.3
3	R	547	0.9	0.562	11.4	LOS A	6.3	44.7	0.86	0.73	39.2
Approach		763	1.9	0.562	10.7	LOS A	6.3	44.7	0.86	0.73	39.5
East: Railway Street											
4	L	805	3.1	0.978	51.1	LOS D	57.3	410.5	1.00	2.13	22.4
5	T	384	1.8	0.978	50.7	LOS D	57.3	410.5	1.00	2.11	22.4
Approach		1189	2.7	0.978	51.0	LOS D	57.3	410.5	1.00	2.12	22.4
West: Railway Street											
11	T	174	1.1	0.643	11.4	LOS A	8.9	63.0	1.00	0.89	38.5
12	R	547	2.1	0.643	15.0	LOS B	8.9	63.0	1.00	0.89	37.1
Approach		721	1.8	0.643	14.1	LOS A	8.9	63.0	1.00	0.89	37.4
All Vehicles		2673	2.2	0.978	29.5	LOS C	57.3	410.5	0.96	1.39	29.2

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.
 Roundabout Capacity Model: SIDRA Standard.
 SIDRA Standard Delay Model used.

East Street/James Street Intersection

AM Peak

MOVEMENT SUMMARY

Site: East St/James St AM

James Street/East Street
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed	
						Vehicles	Distance				
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
South: East Street											
1	L	79	3.8	0.878	12.6	LOS A	18.5	132.5	0.98	0.72	39.0
2	T	976	2.8	0.878	13.4	LOS A	18.5	132.5	0.98	0.77	43.7
Approach		1055	2.8	0.878	13.3	LOS A	18.5	132.5	0.98	0.77	43.4
North: East Street											
8	T	455	6.0	0.383	7.6	LOS A	3.3	24.6	0.31	0.53	48.5
9	R	177	5.3	0.383	11.3	LOS A	3.3	24.6	0.31	0.72	45.9
Approach		632	5.8	0.383	8.6	LOS A	3.3	24.6	0.31	0.58	47.7
West: James Street											
10	L	234	3.0	0.766	44.2	LOS D	10.7	76.5	1.00	1.32	27.0
12	R	58	0.0	0.766	45.1	LOS D	10.7	76.5	1.00	1.35	24.3
Approach		292	2.4	0.766	44.3	LOS D	10.7	76.5	1.00	1.32	26.4
All Vehicles		1979	3.7	0.878	16.4	LOS B	18.5	132.5	0.77	0.79	40.7

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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

PM Peak

MOVEMENT SUMMARY

Site: East St/James St PM

James Street/East Street
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand	HV	Deg.	Satn	Average	Level of	95% Back of Queue		Prop.	Effective	Average
		Flow						Delay	Service			
		veh/h	%		v/c	sec			veh	m	per veh	km/h
South: East Street												
1	L	69	4.3	0.576		8.8	LOS A	5.3	37.7	0.75	0.58	41.4
2	T	524	2.4	0.576		9.6	LOS A	5.3	37.7	0.75	0.75	46.3
Approach		593	2.6	0.576		9.6	LOS A	5.3	37.7	0.75	0.73	45.7
North: East Street												
8	T	1085	2.7	0.998		21.8	LOS B	65.3	467.7	1.00	0.63	37.3
9	R	284	2.6	0.998		25.6	LOS B	65.3	467.7	1.00	0.63	36.1
Approach		1369	2.7	0.998		22.6	LOS B	65.3	467.7	1.00	0.63	37.0
West: James Street												
10	L	212	0.5	0.401		11.9	LOS A	2.7	19.2	0.77	0.85	45.0
12	R	81	0.0	0.401		13.0	LOS A	2.7	19.2	0.77	0.87	38.4
Approach		293	0.4	0.401		12.2	LOS A	2.7	19.2	0.77	0.85	43.0
All Vehicles		2255	2.4	0.998		17.8	LOS B	65.3	467.7	0.90	0.69	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.
 Roundabout Capacity Model: SIDRA Standard.
 SIDRA Standard Delay Model used.