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Midal Cables International Pty Ltd

Report for Proposed Aluminium Rod and Conductor Manufacturing Traffic Impact Assessment

December 2011



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- A Intersection Counts
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1. Introduction

1.1 Background

GHD Pty Ltd has been engaged by Midal Cables International Pty Limited (Midal) to prepare a traffic impact assessment for the proposed aluminium rod and conductor manufacturing facility located in Tomago, NSW. This report examines the transportation impacts of the proposal as input into an Environmental Assessment (EA) being prepared by GHD Pty Ltd for the proponents Midal. The proposed site is located adjacent to the existing Tomago Aluminium Smelter at Tomago in Port Stephens, New South Wales. A location plan of the proposed development site is given in Figure 1.

1.2 Purpose of Report

The purpose of this report is to assess traffic impacts associated with the proposed development, and to that end, the report provides the following information:

- ▶ A review of the existing road environment in the vicinity of the site and the road network conditions;
- ▶ Examines future traffic conditions without the proposed development and the performance of existing transport infrastructure;
- ▶ Examines the proposed traffic operations during the construction period and transport routes for the delivery of materials to/from the site;
- ▶ Examines the traffic implications of the proposal with respect to its impacts on the external road network, in terms of network performance, residential amenity, accessibility and road safety; and
- ▶ Provides a summary of the findings from the assessment.

Information used in this report has been based on site observations, data provided by the client and the RTA, as well as detailed traffic surveys carried out to understand current traffic conditions.

1.3 The Proposal

Midal proposes to construct an aluminium rod and conductor manufacturing facility on a 2.8ha parcel of land adjacent to the Tomago Aluminium Smelter at Tomago in Port Stephens (Refer to Figure 1). This facility will process molten aluminium purchased and transported from the Tomago Aluminium Smelter, effectively value adding to the smelter's existing output.

Midal have entered into a long term supply contract with Tomago to supply molten metal to the proposed facility. It is a relatively moderate operation involving the production of 25,000 tonnes of cable in the first year operation, and increasing to 50,000 tonnes per annum in the fifth year of operation.

Construction/Preparation of the site is expected to take 10 months and will employ some 35 construction personnel during this phase.

The proposal consists of:

- ▶ Construction of an approximately 150m long dedicated haul road from the Tomago Aluminium Smelter to the proposed facility;
- ▶ Two large buildings to accommodate the rod and conductor manufacturing processes and storage of finished products;



- ▶ Several smaller buildings providing workshop facilities and storage;
- ▶ Provisions for car parking; and
- ▶ Provisions for efficient drainage, water reuse and sewage treatment.

1.4 Report Structure

The report has been structured as follows:

1. An overview of the existing site and access arrangements (Section 2);
2. A review of existing traffic conditions in the vicinity of the site and along the surrounding road network (Section 3) that will service the site;
3. Examines traffic conditions in the future without the inclusion of the proposed development.
4. Assess the traffic implications from the development and operation of the proposed development on the surrounding road network;
5. Review of future cumulative impacts, which is based on the proposed Midal development, other known approved development applications, and background traffic growth along Tomago Road; and
6. A summary of the findings of the assessment (Section 5).



2. Site Description and Access Arrangements

This section provides an overview of the site location proposed for the aluminium rod and conductor manufacturing facility, existing land uses and the current access provisions to the site.

2.1 Site Location

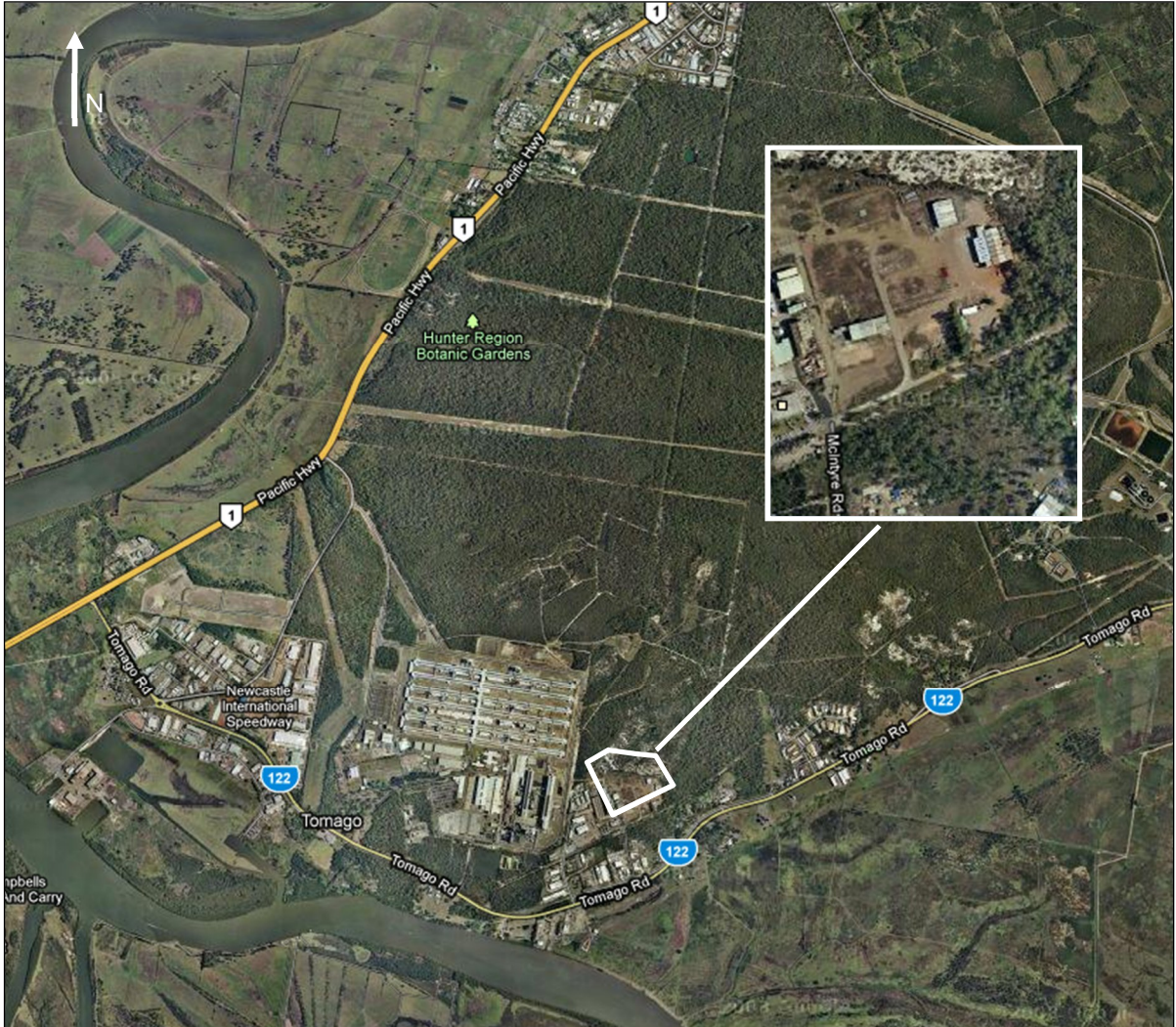
The proposed site location is situated in Tomago and is situated within a semi-rural/industrial area of Port Stephens Council in the NSW Hunter Region. The site is situated 24 km north-west of the Newcastle CBD and approximately 3.4 km east of the Pacific Highway.

Directly west of the site lies the Tomago Aluminium Smelter and numerous other commercial and industrial developments. The site itself is bound by School Drive to the south and McIntyre Road to the south-west. Access to the facility is via McIntyre Road and School Drive. At present, the site is undeveloped and surrounded by numerous commercial and industrial developments. (Refer to Figure 1).

2.2 Surrounding Land Uses

Figure 1 illustrates the location of the site with respect to the local commercial and industrial developments, as well as the local road infrastructure in Tomago. Some of the key traffic generators in the precinct include the Tomago Aluminium Smelter together with a cluster of other industrial complexes. To a lesser extent, the surrounding area includes some semi-rural residential dwellings located directly south-east of the site.

Figure 1 Site Location



Source: Google Maps Imagery 2011

2.3 Site Access

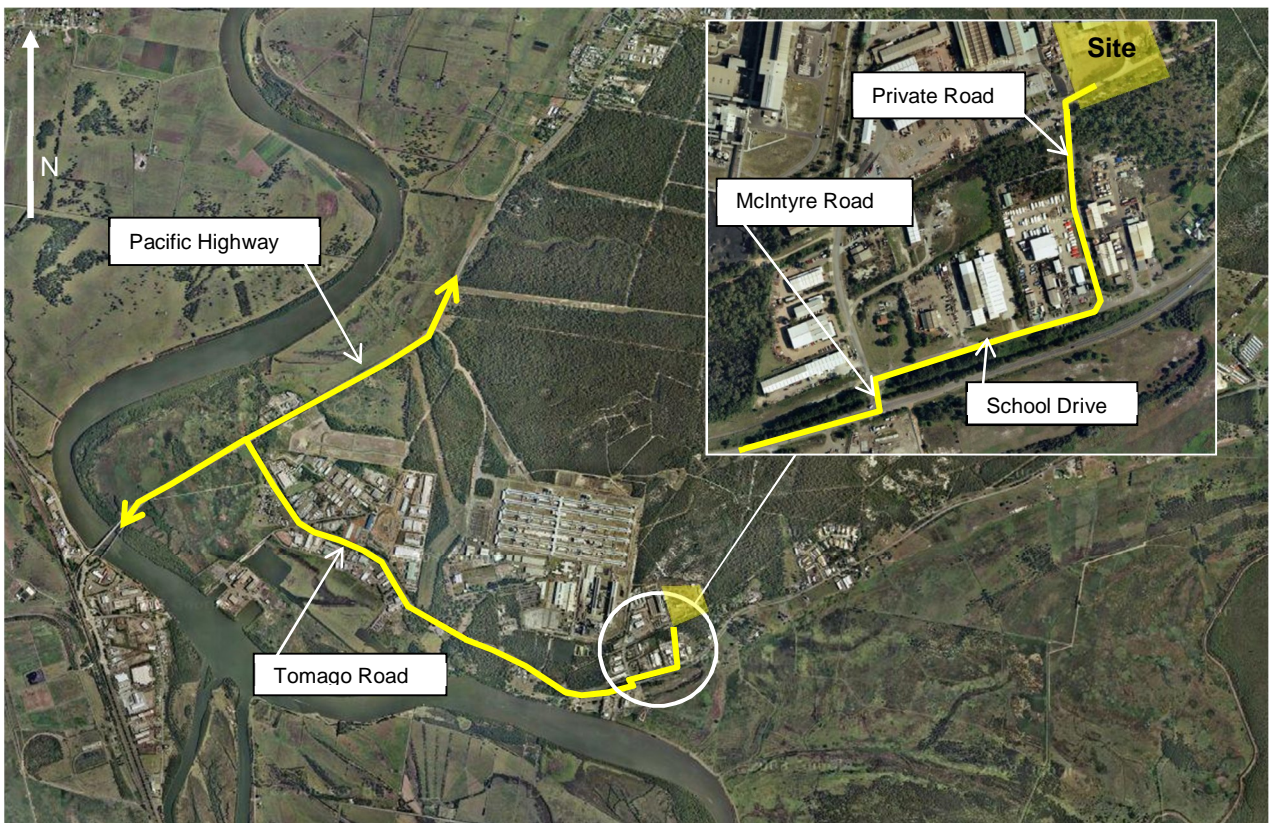
The site is proposed to be accessed via a Private Road (refer to Figure 3) situated off School Drive. The driveway is 12m wide and unsealed with a gravel surface (Refer to Figure 2 and is proposed to accommodate two-way movement from the facility.

Figure 2 Site access, located off Private Road



Access to the site is provided by a Private Road, and via School Drive, McIntyre Road and to a lesser extent Tomago Road (Refer to Figure 3).

Figure 3 Access Route



Source: Google Maps Imagery 2011



3. Existing Traffic Conditions

This section reviews the existing road and transport conditions that will influence the proposed development and its operations. For the purpose of this assessment, it is essential to understand the operation of the existing road and transport network serving the project site within the context of the study.

3.1 Surrounding Roads and Traffic Volumes

The classification of roads on the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The NSW Roads and Traffic Authority (RTA) has developed a set of road hierarchy classifications detailed in Table 1 indicating typical nominal volumes in terms of average annual daily traffic (AADT) serviced by various classes of road.

Table 1 Functional Classification of Roads

Type of Road	Traffic Volume (AADT)	Peak Hour Volume (vph)
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 - 20,000	500 – 2,000
Collector Road	2,000 - 10,000	200 – 1,000
Local Road	<2,000	0 - 200

The existing road network surrounding the location consists of Tomago Road, McIntyre Road and School Drive. Existing industrial businesses located within close proximity to the site require using McIntyre road as the main access route to the facility from the sub-regional and regional road networks.

3.1.1 Tomago Road

Tomago Road is the main east-west road serving the Tomago Industrial Precinct and links directly to the Pacific Highway at its western end and Nelson Bay Road at its eastern end. Tomago Road carries local industrial traffic as well as traffic from the Port Stephens and Williamtown Airport area. Tomago Road is a sealed two lane divided road (one lane per direction) characterised by wide shoulders on both sides with a sign posted speed limit of 80 km/h.

From the intersection counts undertaken in March 2011 Tomago Road was carrying approximately 900 vehicles (both directions) for the AM peak and 1,000 vehicles (both directions) for the PM Peak. Based on Table 1, Tomago Road can be classified as an Arterial Road.

Figure 4 Tomago Road (looking west towards approach to McIntyre Road)



3.1.2 McIntyre Road (west)

McIntyre Road has a sealed two lane carriageway in good condition (Refer to Figure 5). It provides access to Tomago Smelter and other industrial developments. It carries approximately 250 vehicles per hour (two-way) with some 20, or 8% are heavy vehicles.

Figure 5 McIntyre Road (looking towards Tomago Road)



3.1.3 School Drive

School Drive runs parallel to Tomago Road and is located immediately north of Tomago Road. It forms a T-intersection with McIntyre Road at its western end and has a sign posted speed limit of 50km/h. School Drive has a sealed two lane carriageway in a fair condition with wide grass shoulders. It carries approximately 140 vehicles for the AM peak and 160 vehicles for the PM Peak.

Figure 6 School Drive, view looking east towards turnoff to Tomago Road



3.1.4 Private Road (also referred to as McIntyre Road East)

Private Road is the main road providing access to the proposed site and other various industrial developments situated north of Tomago Road.

Private Road has a sealed two lane carriageway in good condition with wide grass shoulders. The speed environment in that area is estimated to be 50-60 km/h however it is not sign posted.

Figure 7 Private Road looking north from School Drive



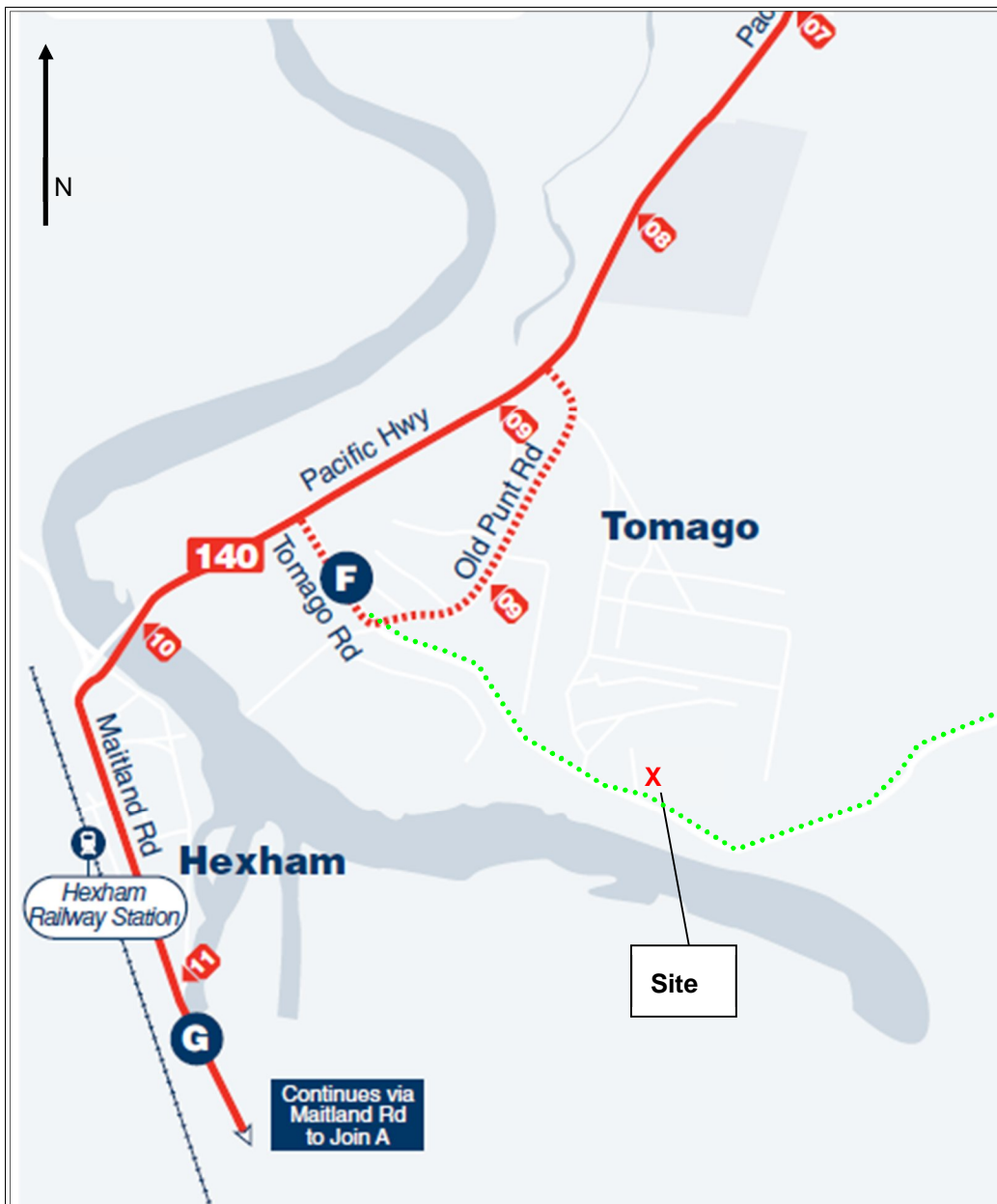
3.2 Existing Public Transport

The proposed site is situated in a semi-regional district and as a result there are no direct bus routes that service the immediate vicinity. However, there is a bus stop facility provided by Hunter Valley Buses near the Tomago Road and Pacific Highway intersection in the vicinity of the Tomago Village Caravan Park

located along Tomago Road some 3.2km west of the proposed site location (noted in Figure 8 as stop 'F').

Hunter Valley Buses operates Bus Route 140 which is a peak period bus service from Raymond Terrace to Newcastle Station Terminus. (Refer to Figure 8). Table 2 outlines the bus service availability for the Tomago Village Caravan Park bus stop.

Figure 8 Hunter Valley Buses Route 140 Map



Source: <http://www.cdcbus.com.au/Hunter-Valley-Buses.html>

During the AM peak, bus route 140 bound for Raymond Terrace stops at the Tomago Village Caravan bus stop.



Table 2 Route 140 Bus Service

Route No.	Operator	Route	Closest Bus Stop to proposed location	Weekday operation hours	Weekday AM peak service frequency	Weekend service availability
140	Hunter Valley Buses	Lakeside Shops - Newcastle Station Terminus	Tomago Village Caravan Park	6:37am – 6:20pm	2	n/a

3.3 Existing Road Safety Environment

The crash history of the existing road network has been reviewed to assess the existing conditions and safety of roads near the vicinity of the proposed development. RTA crash data for the period between 2005- 2009 has been analysed for the road section along Tomago Road (between Old Punt Road and Masonite Road).

The assessment of the crash data revealed:

- ▶ 22 crashes occurred within the 5 year period;
 - 1 fatal crash;
 - 13 crashes resulting in injuries;
 - 8 crashes without injuries;
- ▶ 45.5% of all crashes occurred in the vicinity of intersections;
- ▶ 77.3% of crashes involved multiple vehicles and a similar percentage occurred during daytime;

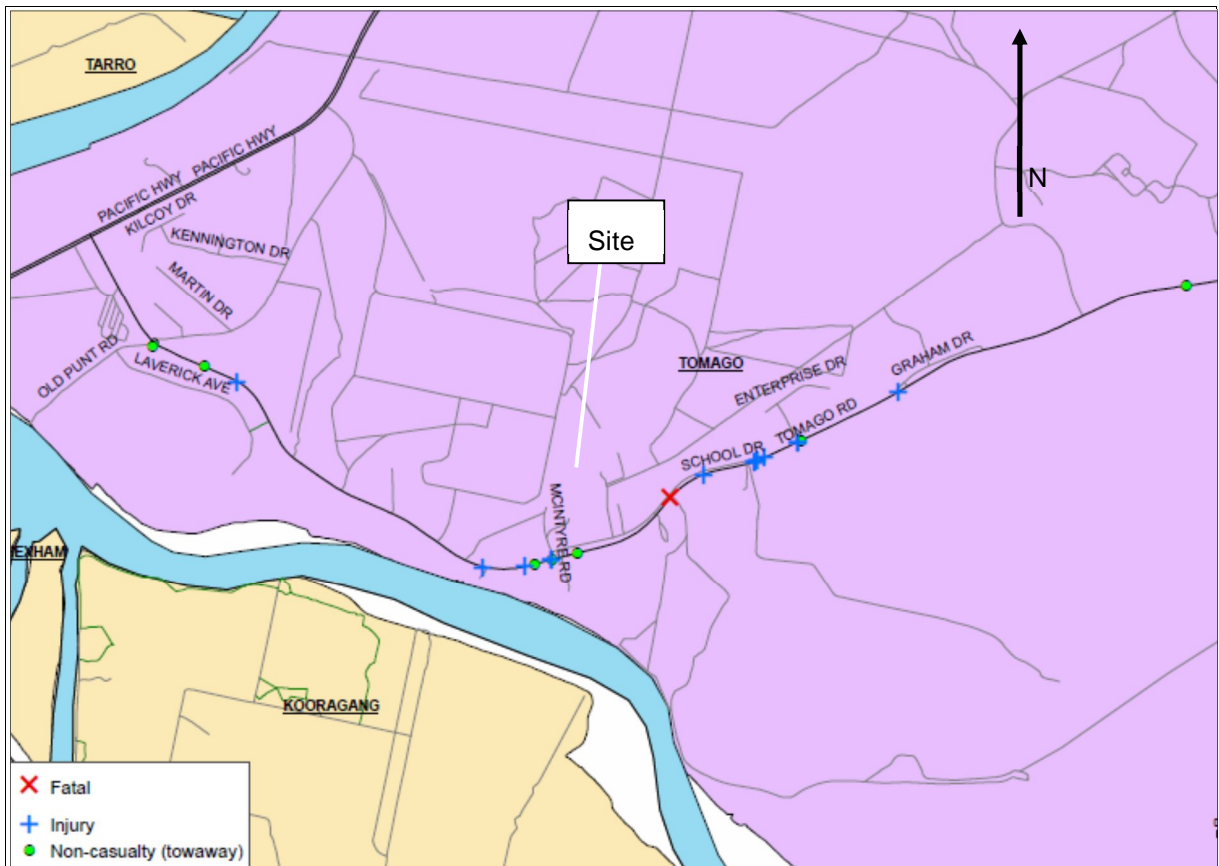
The type and characteristics of recorded crashes are summarised in Table 3.

Table 3 Crash Summary (Road User movements)

2005-2009	Tomago Road, between Old Punt Road and Masonite Road	
Types of Crashes	Number of Crashes	Percentage
Intersection, adjacent approaches	4	18.2%
Head on (not overtaking)	1	4.5%
Opposing vehicles; turning	2	9.1%
Rear end	6	27.3%
vehicles leaving driveway	1	4.5%
Overtaking; same direction	1	4.5%
Hit animal	1	4.5%
Off road, on straight	2	9.1%

Although rear end and intersection collisions represent a high percentage of recorded crashes, it is noted that the existing intersection with McIntyre Road is not identified to have any recorded crash trends.

Figure 9 Crash Locations



Source: Roads and Traffic Authority – Summary Crash Report, Tomago Road, Tomago (2005 –2009)

3.4 Existing Traffic Management Controls

The existing road network near the vicinity of the proposed development comprises the following traffic management features:

Give way control

- ▶ School Drive and McIntyre Road West intersection.
- ▶ Tomago Road and McIntyre Road intersection.

Roundabout

- ▶ Tomago Road approximately 2.5km west of the proposed site location.



Signalised Traffic Lights

- ▶ Tomago Road and Pacific Highway intersection.

Sign-posted speed limits

- ▶ 60km/h, 80 km/h along Tomago Road.
- ▶ 50km/h along McIntyre Road and School Drive.

3.5 Existing Traffic Volumes (Peak hour Volumes)

Peak hour traffic counts were conducted at three key intersections near the vicinity of the proposed site. This information has been used to compare the level of traffic activity on the existing road network and to examine existing intersection performance. The turning movement counts were conducted at the following intersections:

- ▶ Tomago Road and McIntyre intersection.
- ▶ McIntyre Road and School Drive intersection.
- ▶ School Drive and Private Access Road intersection.

The counts were undertaken between 6:15 am to 9:00 am and 2:45 pm to 5:30 pm on 01 March 2011 and are reproduced in Appendix A. A summary of the peak hour traffic counts showing the light and heavy vehicle volumes is presented in Table 4.

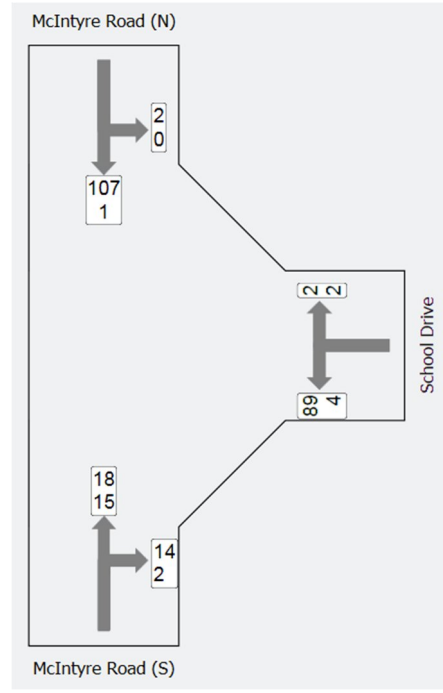
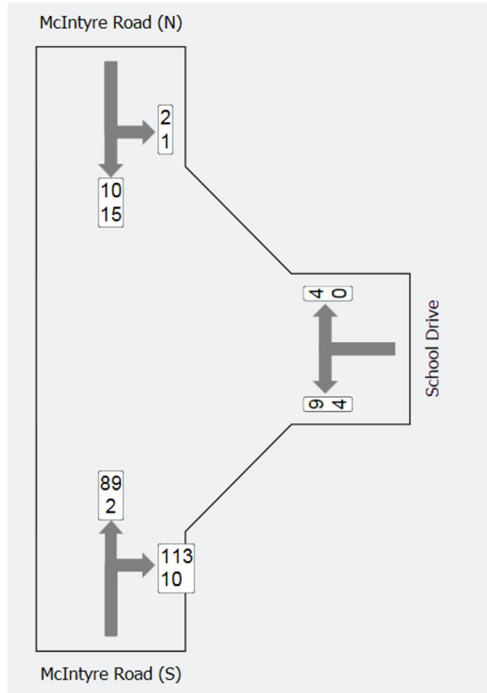
Table 4 Existing Peak hour Intersection volumes (2011)

Tomago Road and McIntyre Road Intersection	
AM Peak (6:30 – 7:30 a.m.)	PM Peak (15:45 – 16:45 p.m.)
<p>The diagram shows McIntyre Road at the top with a T-junction onto Tomago Road. On McIntyre Road, traffic flows from left to right with 14 vehicles turning left and 18 vehicles turning right. On Tomago Road, traffic flows from west to east. At the intersection, 165 vehicles turn left, 15 vehicles turn right, and 380 vehicles go straight through. On the east side of Tomago Road, 270 vehicles turn left, 0 vehicles turn right, and 91 vehicles go straight through.</p>	<p>The diagram shows McIntyre Road at the top with a T-junction onto Tomago Road. On McIntyre Road, traffic flows from left to right with 160 vehicles turning left and 31 vehicles turning right. On Tomago Road, traffic flows from west to east. At the intersection, 30 vehicles turn left, 12 vehicles turn right, and 363 vehicles go straight through. On the east side of Tomago Road, 375 vehicles turn left, 33 vehicles turn right, and 6 vehicles go straight through.</p>

McIntyre Road and School Drive Intersection

AM Peak (6:15 – 7:15 a.m.)

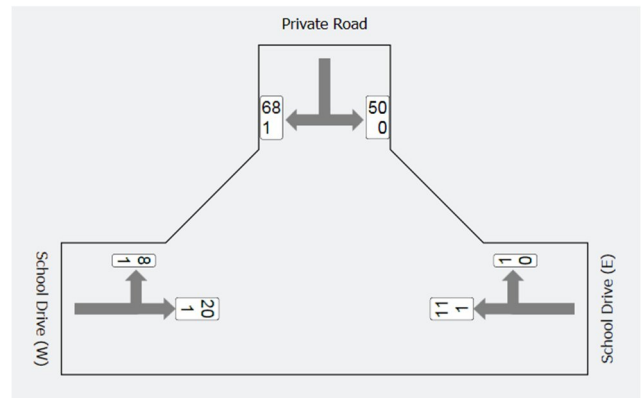
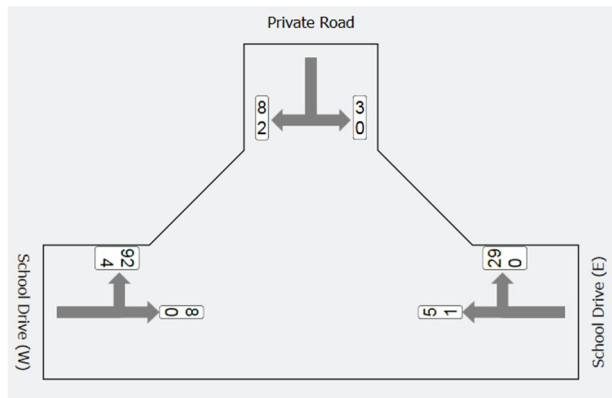
PM Peak (15:45 – 16:45 p.m.)



School Drive and Private Access Road Intersection

AM Peak (6:30 – 7:30 a.m.)

PM Peak (15:45 – 16:45 p.m.)



3.6 Existing Intersection Performance

The performance of the existing road network is largely dependent on the operating performance of the key intersections which are critical capacity control points on the road network. The SIDRA traffic model has been used to assess the existing peak hour operating performance of the following intersections:

- ▶ Tomago Road and McIntyre Road;
- ▶ McIntyre Road and School Drive; and



► School Drive and Private Access Road.

The criteria for evaluating the operational performance of intersections is provided by the *RTA Guidelines to Traffic Generating Developments, 2002* and reproduced in Table 5. The criterion is based on a qualitative measure (i.e. Level of Service), which is applied to each average delay band.

The 'Level of Service' is the standard used to measure the performance of the intersection operation. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

Table 5 Performance Criteria for Intersections – Pacific Highway, Barcoongere Way and Site Access

Level of Service	Average Delay Per Vehicle (secs/vehicle)	Traffic Signals, Roundabout	Give-Way and Stop Signs
A	Less than 14	Good Operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and other accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity and requires other control mode
F	Greater than 70	Roundabouts require other control mode	

The results of the SIDRA analysis for the above mentioned intersections under existing traffic volumes during the morning and evening peak periods are presented in Table 6. The movement summary reports are attached in Appendix B.

Table 6 Intersection Performance – Existing Peak Conditions (2011)

Intersection Location	AM peak			PM peak		
	LoS	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)
Tomago Road / McIntyre Road	C	0.325	35	B	0.396	17.8
McIntyre Road / School Drive	A	0.147	7.9	A	0.096	8.7
School Drive / Private Access Road	A	0.057	8.2	A	0.125	7.1



- a) The level of service for priority controlled intersections and roundabouts are based on the highest average delay per vehicle for the most critical movement.
- b) The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.
- c) The average delay for priority controlled intersections and roundabouts are selected from the movement on the approach with the highest average delay.

The above intersections are currently operating with acceptable Levels of Service in both the AM and PM peak periods. Field observations during the peak periods indicated that these intersections operate satisfactorily under existing traffic demands, which is consistent with the results of the modelling.



4. Future Traffic Conditions

This section provides an understanding of future traffic conditions with known approved developments along Tomago Road and expected background daily traffic growth without the proposed development of the Midal site.

4.1 Background Traffic Growth

This section estimates growth in background traffic for Tomago Road, which has been obtained by reviewing historical traffic growth trends. The findings from this section will be used to predict future background traffic growth along the external road network and in the assessment of future traffic conditions.

Table 7 provides an understanding of historical daily traffic volumes along Tomago Road.

Table 7 Average Annual Daily Traffic (AADT) Volumes on Tomago Road, Vehicles

Station	Location	1995	1998	2001	2004
05.590	Hexham – East of SH10 Pacific Highway	7360	8147	8323	9343

Source: Roads and Traffic Authority, Traffic Volumes Data for Hunter and Northern Regions (2004)

The above information has been extracted from a RTA permanent counting station located along Tomago Road, some 800m east of the intersection of Tomago Road with the Pacific Highway. Recorded traffic volumes during the period from 1995 to 2004 indicate that the annual average growth in traffic was 2.7% per annum. Applying this annual traffic growth rate to current traffic levels along Tomago Road over a 10 year future horizon period indicates that daily traffic will increase to 14,700 vehicles per day by 2021.

4.2 Assessment of Approved Staged Redlake Developments

Discussion with the relevant authorities has indicated that there is an additional proposed development planned to be constructed in the vicinity of the Project Site. This proposed development has been approved for development and is located on the southern side of Tomago Road some 1 km east of the Project Site.

4.2.1 Approved Development Proposal

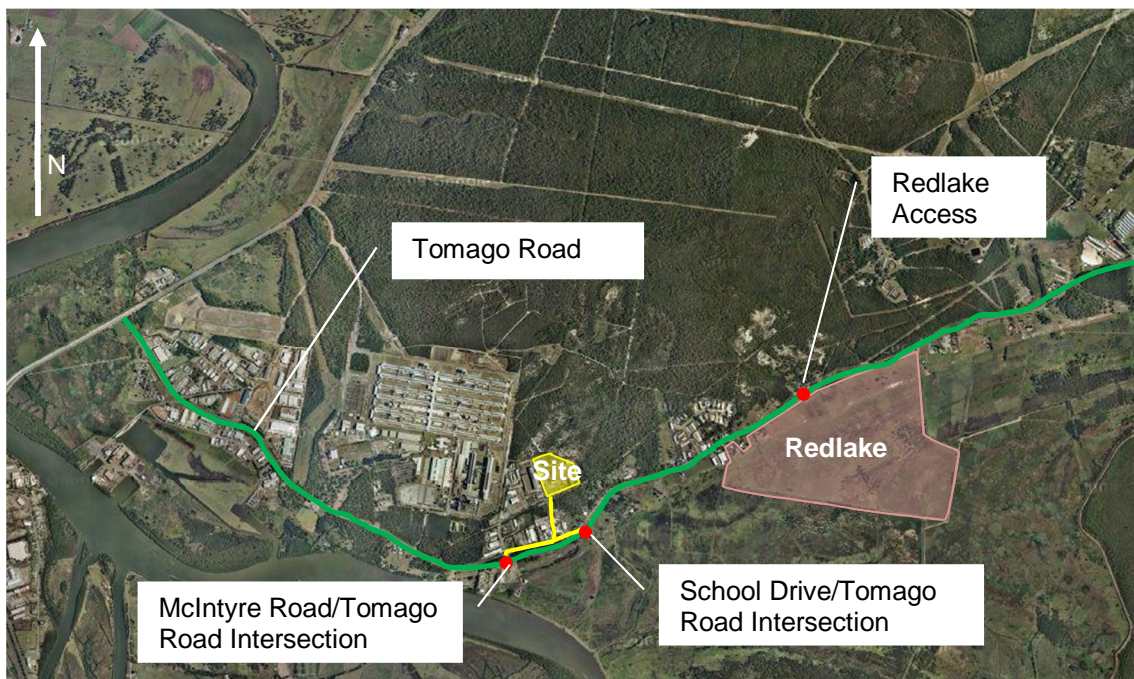
This site is owned by Redlake Enterprises (RLE) and the proposal is to develop 135 hectares of industrial land for the purpose of an integrated WesTrac facility, a CAT Training Institute and subdivision of land for sale to related and unrelated uses over a number of stages. The proposal covers 3 stages and consists of the following:

- ▶ **Stage 1** will consist of approximately 23 hectares to be developed mainly for the WesTrac facility and the CAT Training Institute. The WesTrac Facility will employ some 400 staff and will operate 24 hours a day.

- ▶ **Stage 2** would involve the subdivision of land for industrial uses and will cover approximately 36 hectares.
- ▶ **Stage 3** would involve the subdivision of land for industrial uses and will cover approximately 48 hectares.

The proposed Redlake development site has direct frontage to Tomago Road and access is proposed via a spine road within the development which is planned to form a new signalised intersection with Tomago Road. The development is expected to increase traffic along Tomago with majority of the traffic (85%) travelling to and from the Pacific Highway and thereby passing via McIntyre Road and proposed Midal site (Refer to Figure 10).

Figure 10 Location of Proposed Redlake Development



4.2.2 Traffic Generation by Approved Development

The traffic generation for the Redlake development was reported in a Traffic Impact Statement Report, prepared by Better Transport Futures for Redlake Enterprises, and dated September 2007. The traffic generation rates used in the assessment were obtained from the *RTA Guide for Traffic Generating Development*. This document was later supplemented by an Addendum Report dated September 11th, 2008. The addendum revised the traffic generation calculations on the basis of new surveyed traffic generation rates for a similar site. The source data was obtained from the “*Assessment of Hunter Valley Business Park Trip Rates*” prepared by Maunsell Australia Pty Ltd.

The aforementioned reports indicate that the full development of the Redlake site is expected to generate a total of 1,702 vehicle trips in the AM peak and 1,967 vehicle trips in the PM peak. These traffic volume predictions will increase traffic on Tomago Road to three times its current levels during peak periods and as a result likely to require network upgrades. The traffic generated by the staged development of the site is summarised in Table 8.



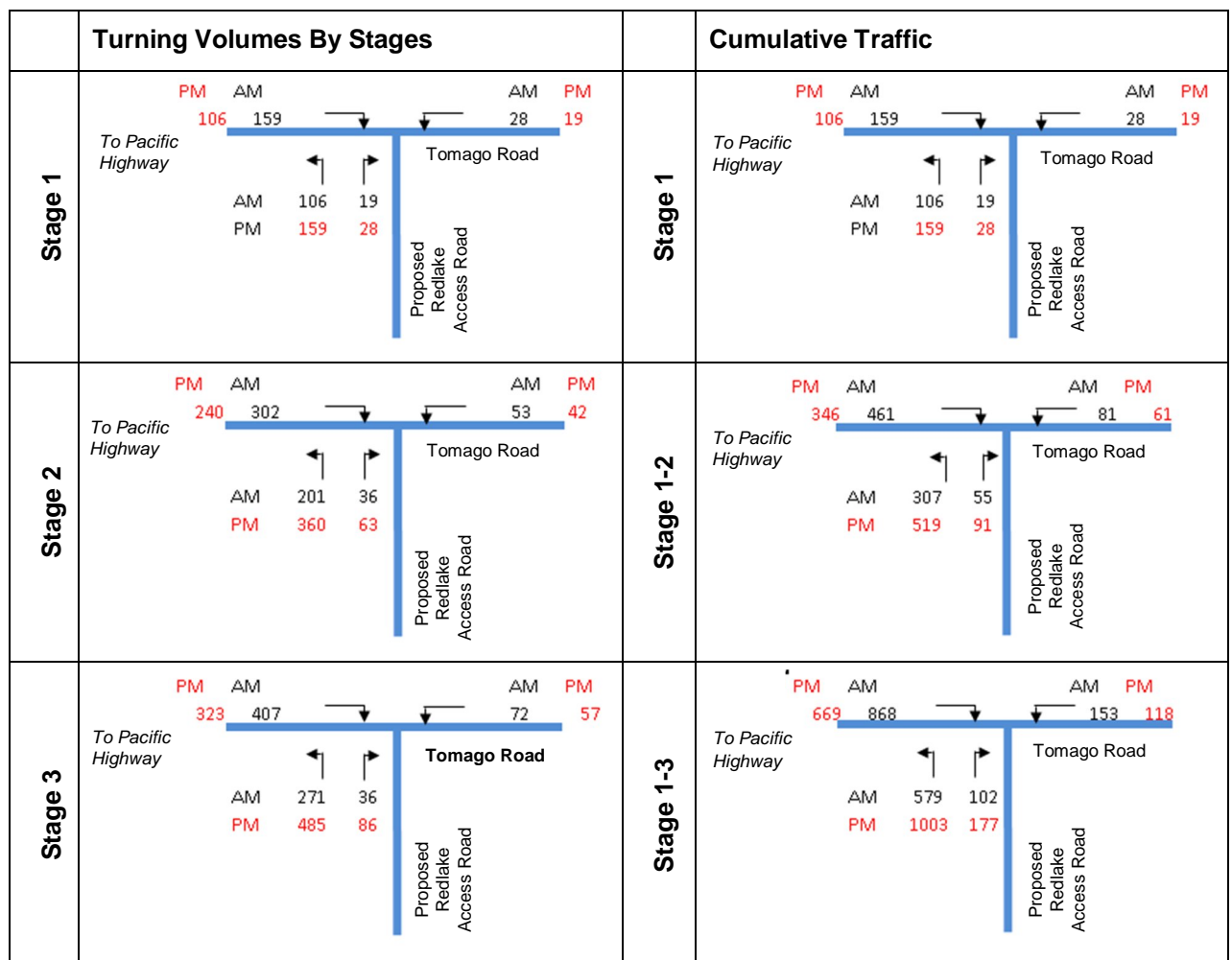
Table 8 Redlake Traffic Generation

	AM Peak			PM Peak		
	IN	OUT	Total	IN	OUT	Total
Stage 1	187	125	312	125	187	312
Stage 2	355	237	592	282	423	705
Stage 3	479	319	798	380	570	950
Total	1021	681	1702	787	1180	1967

Source: WesTrac Industrial Subdivision, Addendum Report, Better Transport Futures, 11 September 2008.

The staged and cumulative directional traffic flows at the proposed access intersection with the Redlake development is shown in Figure 11.

Figure 11 Staged Redlake Traffic Forecasts





4.2.3 Development Impact on Road Network

The increase in traffic along Tomago Road associated with the Redlake development is likely to impact on the operational performance of all intersections along Tomago Road. As a result intersections west of the Redlake site would experience a significant increase in through traffic in the order of 868 vehicles in the eastbound direction and 570 vehicles in the westbound direction. Table 9 provides an understanding of existing traffic levels along Tomago Road.

Table 9 Existing traffic levels along Tomago Road (2011)

	Eastbound	Westbound
AM Peak Existing Volumes	412	310
PM Peak Existing Volumes	388	408

Table 10 and Table 11 provide an understanding of the traffic impact on Tomago Road from forecast traffic generated by the Redlake Development in the AM and PM peak, respectively.

Table 10 Tomago Road with forecast Redlake Development in the AM Peak (2011)

Redlake Development	Redlake Traffic	With Tomago Road Traffic	Increase	Redlake Traffic	With Tomago Road Traffic	Increase
	Eastbound			Westbound		
► Stage 1	+ 159	571	(39%)	+ 106	416	(34%)
► Stage 2	+ 461	873	(111%)	+ 307	617	(199%)
► Stage 3	+ 868	1280	(211%)	+ 579	889	(287%)

Table 11 Tomago Road with forecast Redlake Development in the PM Peak (2011)

Redlake Development	Redlake Traffic	With Tomago Road Traffic	Increase	Redlake Traffic	With Tomago Road Traffic	Increase
	Eastbound			Westbound		
► Stage 1	+ 106	494	(27%)	+ 159	567	(39%)
► Stage 2	+ 346	734	(89%)	+ 519	927	(127%)
► Stage 3	+ 669	1057	(172%)	+ 1003	1411	(246%)



It should be noted that the Redlake development Stages 2 and 3 will significantly increase traffic volumes along Tomago Road and as a result this will impact on the performance of intersections situated between the site and the Pacific Highway.

4.2.4 Intersection Performance with Approved Development

The intersections of McIntyre Road/Tomago Road and School Drive/Tomago Road have been appraised with the additional traffic associated with the proposed Redlake development. The results of the SIDRA Intersection analysis under existing conditions with the staged Redlake development are presented in Table 12 and Table 13 respectively.

Table 12 Tomago Road / McIntyre Road Intersection Performance

Intersection Location	AM peak			PM peak		
	LoS	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)
Tomago Road / McIntyre Road						
► Stage 1	F	0.455	77.8	C	0.626	30.0
► Stage 2	F	1.0	>200	F	2.431	>200
► Stage 3	F	1.0	>200	F	2.733	>200

Table 13 Tomago Road / School Drive Intersection Performance

Intersection Location	AM peak			PM peak		
	LoS	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)
► Stage 1	B	0.314	15.1	A	0.327	13.7
► Stage 2	C	0.476	29.8	B	0.525	24.5
► Stage 3	F	0.695	>200	F	1.167	>200

- The level of service for priority controlled intersections and roundabouts are based on the highest average delay per vehicle for the most critical movement.
- The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.
- The average delay for priority controlled intersections and roundabouts are selected from the movement on the approach with the highest average delay.

It is evident from findings presented in Table 12 and Table 13 that the operational performance of the intersections will deteriorate and result in an unsatisfactory level of service, and potential safety and operational implications with the inclusion of additional traffic generated by the Redlake development. In summary, the results highlight that:

- Under a Stage 1 Redlake development scenario (2011) with no changes to the intersection configuration or controls, the intersection of McIntyre Road and Tomago Road experience significant



delays and unacceptable traffic conditions during the AM peak and the operating performance of School Drive and Tomago Road deteriorate to a LoS B.

- ▶ The McIntyre Road and Tomago Road intersection performs unsatisfactory in both AM and PM peaks with the inclusion of Stage 2 and Stage 3 traffic from the proposed Redlake development.
- ▶ The Tomago Road and School Drive intersection performs unsatisfactory with the inclusion of proposed Stage 3 Redlake development traffic.

The majority of intersections along Tomago Road are currently under give way signpost control with Tomago Road as the priority movement. In order to cater for additional traffic generated by developments located east of the Midal site, improvements to the priority controlled intersections situated along Tomago Road will be required. Those improvements are directly associated with expected increases in through traffic along Tomago Road.

It is noted that the above analysis does not allow for future background traffic growth along Tomago Road which is expected to have further impacts on intersection operations. This growth in background traffic is expected to be related to ongoing work at the airport and the development of the Tomago industrial lands.

4.2.5 Appraisal of Tomago Road with McIntyre Road Intersection

Options for the Tomago Road/McIntyre Road intersection revealed that with the anticipated increase of traffic along Tomago Road, the intersection's operational performance will improve by converting priority controlled intersection to either a CHR or seagull intersection treatment or under roundabout or traffic signal control. SIDRA analysis was undertaken to test four possible intersection upgrade options and is shown in Table 14 to Table 22.

Table 14 Stage 1 CHR Intersection McIntyre Road/Tomago Road (Option 1)

Tomago Road / McIntyre Road Intersection Stage 1 – CHR Intersection		
	AM Peak	
	Intersection Level of Service	E
	Average Delay (sec)	57.2
	Degree of Saturation	0.410
	PM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	24.7
	Degree of Saturation	0.537

Table 15 Stage 1 Seagull Intersection McIntyre Road/Tomago Road (Option 2)

Tomago Road / McIntyre Road Intersection Stage 1 – Seagull intersection		
	AM Peak	
	Intersection Level of Service	C
	Average Delay (sec)	42.2
	Degree of Saturation	0.410
	PM Peak	
	Intersection Level of Service	B
Average Delay (sec)	20.2	
Degree of Saturation	0.316	

Table 16 Stage 1 Intersection Appraised McIntyre Road 2011 (Option 3)

Tomago Road / McIntyre Road Intersection Stage 1 Option 1 Roundabout		
	AM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	19.8
	Degree of Saturation	0.467
	PM Peak	
	Intersection Level of Service	A
Average Delay (sec)	13.9	
Degree of Saturation	0.490	

Table 17 Stage 1 Intersection Appraised McIntyre Road 2011 (Option 4)

Tomago Road / McIntyre Road Intersection Stage 1 Option 2 Signal Controlled		
	AM Peak	
	Intersection Level of Service	A
	Average Delay (sec)	13.1
	Degree of Saturation	0.760
	PM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	14.6
	Degree of Saturation	0.782

Table 18 Stage 2 Intersection Appraised McIntyre Road 2011 (Option 3)

Tomago Road / McIntyre Road Intersection Stage 2 Option 1 Roundabout		
	AM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	24.4
	Degree of Saturation	0.648
	PM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	16.4
	Degree of Saturation	0.775

Table 19 Stage 2 Intersection Appraised McIntyre Road 2011 (Option 4)

Tomago Road / McIntyre Road Intersection Stage 2 Option 2 Signal Controlled		
	AM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	15.3
	Degree of Saturation	0.853
	PM Peak	
	Intersection Level of Service	B
Average Delay (sec)	17.9	
Degree of Saturation	0.879	

Table 20 Stage 3 Intersection Appraised McIntyre Road 2011 (Option 3)

Tomago Road / McIntyre Road Intersection Stage 3 Option 1 Roundabout		
	AM Peak	
	Intersection Level of Service	C
	Average Delay (sec)	42.3
	Degree of Saturation	0.890
	PM Peak	
	Intersection Level of Service	F
Average Delay (sec)	295.7	
Degree of Saturation	1.154	

Table 21 Stage 3 Intersection Appraised McIntyre Road 2011 (Option 4)

Tomago Road / McIntyre Road Intersection Stage 3 Option 2 Signal Controlled		
	AM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	24.5
	Degree of Saturation	0.948
	PM Peak	
	Intersection Level of Service	F
	Average Delay (sec)	94.2
	Degree of Saturation	1.048

Table 22 Stage 3 Intersection Appraised McIntyre Road 2011 (Option 5)

Tomago Road / McIntyre Road Intersection Stage 3 Option 3 Signal Controlled		
	AM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	16.3
	Degree of Saturation	0.745
	PM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	16.9
	Degree of Saturation	0.732

The results revealed the following:

- ▶ A CHR intersection treatment (Option 1) performs unsatisfactorily with proposed Stage 1 Redlake development traffic under 2011 traffic conditions.
- ▶ A seagull intersection treatment (Option 2) performs satisfactorily with proposed Stage 1 Redlake development traffic under 2011 traffic conditions.
- ▶ A roundabout configuration (Option 3) will only cater for increases in traffic along Tomago Road up to Stage 2 of the Redlake development under 2011 traffic conditions.

- ▶ An increase in traffic along Tomago Road associated with traffic generated by the delivery of Redlake Stage 3 requires the intersection to be widened and upgraded to traffic signals (Option 5).
- ▶ The Tomago Road/McIntyre Road intersection is required to be upgraded to a seagull intersection treatment (Option 2) with the delivery and opening of the Redlake Stage 1 development.
- ▶ The RTA have highlighted in discussions that the preferred traffic control treatment for intersections along Tomago Road is traffic signals.
- ▶ The appraisal of the intersection with Redlake Stages 2 and 3 development traffic indicates that a roundabout (Option 3) is initially required for Stage 2 which is upgraded to traffic signals with additional traffic lanes (Option 5) in both directions along Tomago Road for the proposed Redlake Stage 3 development.

4.2.6 Appraisal of Tomago Road with School Drive Intersection

Based on the results shown in Section 4.2.4 the intersection of Tomago Road with School Drive has been appraised under current peak traffic conditions with the proposed Redlake Stage 3 development.

Table 23 Stage 3 Intersection Appraisal of School Drive (Option 3)

Tomago Road / School Drive Intersection Stage 3 Option 1 Roundabout		
	AM Peak	
	Intersection Level of Service	C
	Average Delay (sec)	34.7
	Degree of Saturation	0.815
	PM Peak	
	Intersection Level of Service	B
	Average Delay (sec)	18.1
	Degree of Saturation	0.867



Table 24 Stage 3 Intersection Appraisal of School Drive 2011 (Option 5)

Tomago Road / School Drive Intersection Stage 3 Option 2 Signal Controlled		
	AM Peak	
	Intersection Level of Service	A
	Average Delay (sec)	13.4
	Degree of Saturation	0.894
	PM Peak	
	Intersection Level of Service	A
Average Delay (sec)	11.0	
Degree of Saturation	0.830	

Options for the Tomago Road/School Drive intersection revealed that with the anticipated increase of traffic along Tomago Road associated with traffic generated by the delivery of Redlake Stage 3, the intersection's operational performance will improve by converting priority controlled to a roundabout or traffic signals.



5. Impact of the Proposed Works

This section summarises the traffic generation expected from the proposed development and examines the traffic implications.

5.1 Construction Traffic

During construction of the new facility it is expected that additional traffic will be generated and is associated with staff movements to/from the site. Staff would comprise of project management, various trades, and general construction staff. Over the full construction period, the peak construction workforce is estimated to be some 35 employees over a 10 month period. Allowing for some car sharing, counter balanced by moderate turnover of traffic throughout the day, some 70 daily trips will be generated by car and van (refer to Table 25). Some 25% of these are anticipated to occur during within the morning and evening peak hours.

The workforce traffic movements are likely to be distributed based on a 100/0 split between arrivals and departures during the morning peak period, and the reverse during the afternoon peak period.

Table 25 Midal Construction Period Traffic Generation

Vehicle Type	Movements Per Day	
	Initial 2 months of Construction	Remaining 8 months of Construction
Light Vehicles	70	70
Heavy Vehicles	30	16

Heavy vehicle traffic would mainly be generated by activities associated with the proposed development over a 10 month period. It is estimated that 15 heavy vehicles a day would be used over the first 2 months of construction. The remaining 8 months of the construction period will use 8 heavy vehicles daily. Assuming a worst case scenario, this would translate to 30 heavy vehicle movements (or 60 in passenger car equivalent) distributed over an 8 hour day. For the purpose of this assessment, it is assumed that 25% of the heavy vehicle movements occur during the peak hour.

5.2 Normal Operations

5.2.1 Workforce Traffic Generation

It is proposed that the facility will operate 24 hours a day, seven days a week (excluding public holidays). At its maximum capacity, the development will operate with two shifts comprising of 42 employees per shift (2 shifts a day over a 24 hour period equating to 12 hours/shift). It is also expected that during a normal time shift the development would attract 35 administration staff and 5 contractors. Based on the proposed employee occupancy levels the site would attract a total daytime employment population of approximately 82 persons.



It is estimated that some 164 daily trips, by light vehicles will be generated by the site. Under a worst case scenario assessment some 42 of these are anticipated to occur during the morning and evening peak hours.

It is assumed the majority of the workforce would arrive during the morning period and depart generally during the afternoon period. The workforce arrival and departure periods represent the worst case peak period traffic generation.

5.2.2 Delivery and Service Vehicles

It is estimated that the proposed facility would have the following staged production capacity:

- ▶ 25,000 tonnes of cable produced in the first year
- ▶ 50,000 tonnes of cable produced per year after 5 years.

At peak operations, the total truck movements each year generated from the transporting of products is estimated to be approximately 2,000 trucks. This is based on 50,000 tonnes produced after the fifth year of operation with each truck transporting 25 tonnes of material. Assuming outgoing movements will occur 355 days per year this equates to approximately 12 truck movements per day on the average (refer to Table 26).

In addition, the site also requires delivery of material which has been estimated to be 1,065 truckloads per year, which equates to an additional 6 movements per day based on a 355 day working year.

Table 26 Midal Operational Period Traffic Generation

Vehicle Type	Trucks Per Year	Working Days Per Year	Movements Per Day	
			Operational Period (Transportation of Cables)	Operational Period (Delivery of Materials/Supplies)
Light Vehicles	n/a	n/a	82	82
Heavy Vehicles	3,065	355	12	6

5.2.3 Summary of total traffic generation from Midal

The proposed development traffic generation potential is summarised in Table 25.



Table 27 Summary of Estimated Traffic Generated

Vehicle Movements	Daily movements (car equivalent)	Estimated Peak Hour Volumes			
		Inbound		Outbound	
Construction Period		AM Peak	PM Peak	AM Peak	PM Peak
Light Vehicle movements	70	35 ²			35 ²
Heavy Vehicles movements	60 ¹	4 ³	4 ³	4 ³	4 ³
Total	130	43	4	4	39
Operational Period					
Light Vehicles movements	164	82 ²			82 ²
Heavy Vehicles movements	36 ¹	3 ³	2 ³	2 ³	3 ³
Total	200	85	2	2	85

¹ In car- equivalent (i.e. 1 heavy vehicle = 2 passenger cars)

² It is assumed that the workforce would arrive during the morning period and generally depart during the afternoon peak period. It is also assumed that there will be a hand over period, and as a result arrivals and departures will not occur at the same time.

³ It is assumed that 25% of the movements occur during the peak hour.

5.3 Network Appraisal

Post development and construction traffic has been superimposed on the existing road network to determine operating capacity of key intersections along the surrounding road network. These traffic volumes have then been used as part of SIDRA analysis of key intersections during the peak periods. The results from the SIDRA appraisals have been used to determine the operational performance of the following intersections:

- ▶ Tomago Road and McIntyre Road intersection;
- ▶ McIntyre Road and School Drive intersection; and
- ▶ School Drive and Private Access Road intersection.

5.3.1 Key Assumptions

As part of this assessment, we have made the following assumptions to examine both the construction and operational traffic activity generated from the site.

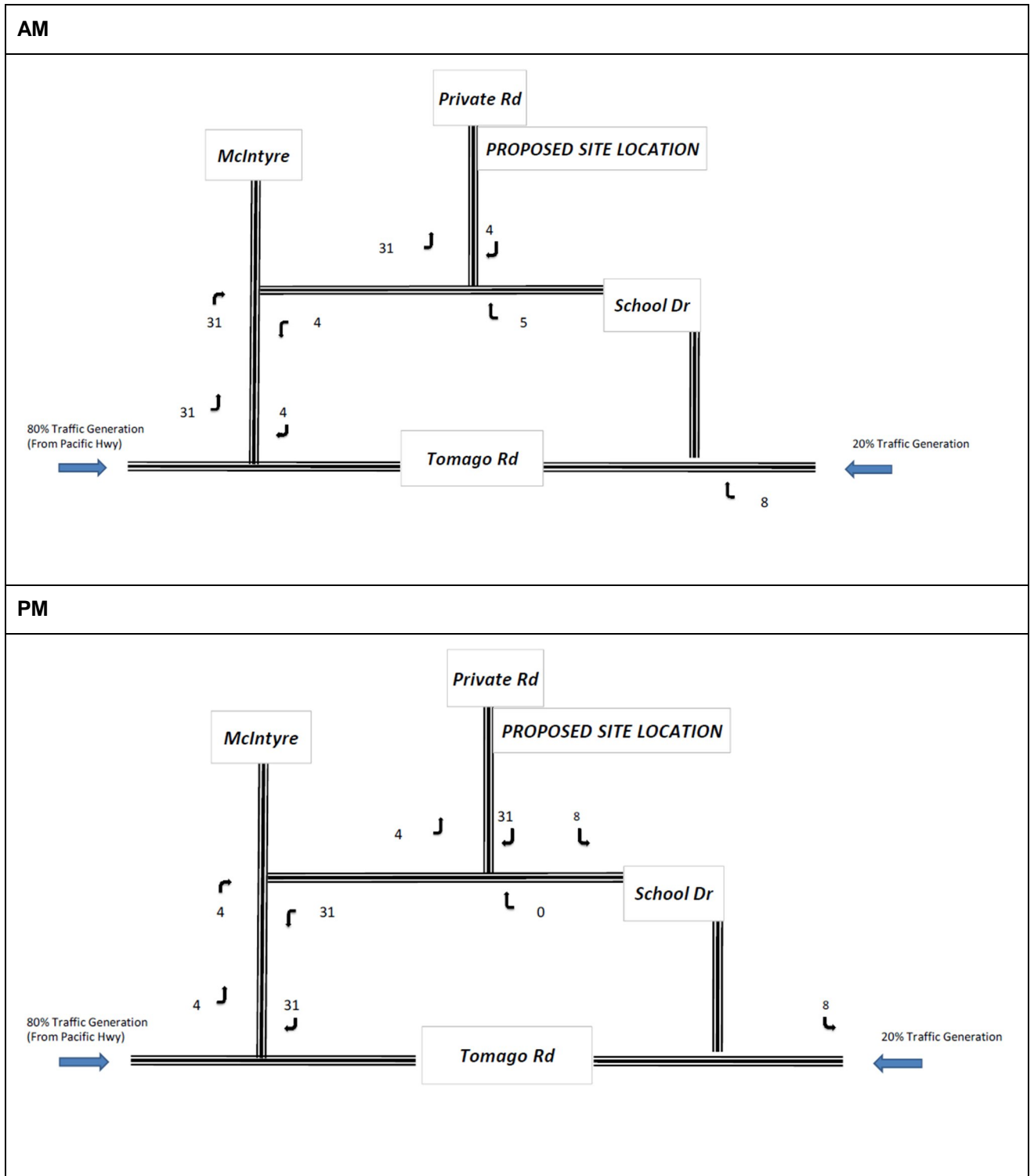
- ▶ All heavy vehicles would enter and exit via the Tomago Road and McIntyre intersection; and
- ▶ The total light vehicles would be distributed 80/20 on entry with 80% of the light vehicles from the west entering via Tomago Road and McIntyre Road intersection, with the other 20% from the east entering via School Drive/McIntyre Road (east) intersection. This would be reverse from the PM peak, with light vehicles leaving the site.



5.3.2 Forecast Peak Hour Construction Traffic (2011)

Traffic distribution during the construction stage is shown schematically in Figure 12.

Figure 12 Midal Construction Traffic Distribution 2011 – AM and PM Peak

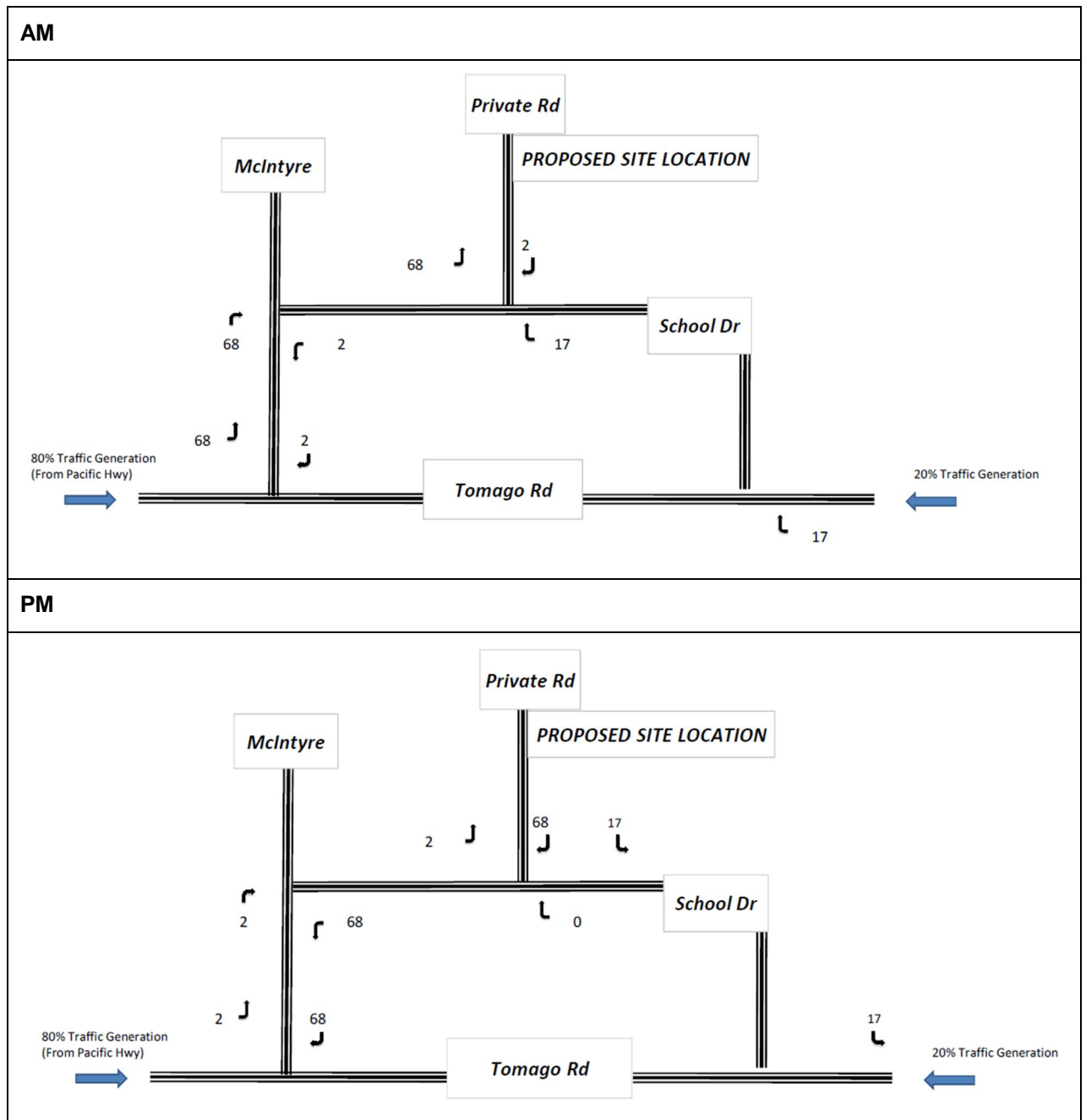




5.3.3 Forecast Peak Hour Operational Traffic (2011)

Traffic distribution after the full opening of the development is shown schematically in Figure 13.

Figure 13 Midal Operational Traffic Distribution 2011 – AM and PM Peak



5.3.4 Intersection Performance

A summary of the results of the intersection analysis for projected traffic volumes at the subject intersections for the construction and normal operational phase is presented in Table 28 and Table 29.



Table 28 Intersection Performance (2011) with Construction Traffic

Intersection location	AM peak			PM peak		
	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Tomago Road / McIntyre Road	0.343	40.9	C	0.475	19	B
McIntyre Road / School Drive	0.175	8.2	A	0.127	8.7	A
School Drive / Private Access	0.076	9.7	A	0.145	7.2	A

Table 29 Intersection Performance (2011) with Proposed Midal Development

Intersection location	AM peak			PM Peak		
	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Tomago Road / McIntyre Road	0.363	40.4	C	0.562	20.3	B
McIntyre Road / School Drive	0.202	8.3	A	0.097	8.7	A
School Drive / Private Access	0.096	9.6	A	0.167	7.2	A

- a) The level of service for priority controlled intersections and roundabouts are based on the highest average delay per vehicle for the most critical movement.
- b) The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.
- c) The average delay for priority controlled intersections and roundabouts are selected from the movement on the approach with the highest average delay.

Based on the intersection analysis, the subject intersections will operate at a satisfactory level of service (LoS) and have the capacity to accommodate post development and construction traffic generated by the proposed Midal development.

The existing intersection operation will not be appreciably effected as a result of the proposed development.

5.4 Cumulative Impacts

Section 4.2 details the impact from the approved 3 staged Redlake development on the intersections of Tomago Road/McIntyre Road and Tomago Road/School Drive. The analysis revealed that both intersections are required to be upgraded as a result of increases in traffic associated with the proposed Redlake development.



Table 28 in Section 5.3.4 summarises the results of the intersection analysis under existing 2011 intersection configurations, 2011 background traffic and with additional traffic generated by the Midal development site. The results show that without both future background traffic growth and traffic associated with the development of Redlake site, the existing intersections have the capacity to accommodate the proposed Midal development traffic.

These intersections have been appraised with both Redlake Stage 1 development traffic and the proposed Midal development traffic, Refer to Table 30 for details of this assessment.

Table 30 Stage 1 (plus Midal Development) Seagull intersection McIntyre Road/Tomago Road

Tomago Road / McIntyre Road Intersection Stage 1 (Both Stage and Midal Development) – Seagull intersection							
	AM Peak						
	<table border="1"> <tr> <td>Intersection Level of Service</td> <td style="text-align: center;">D</td> </tr> <tr> <td>Average Delay (sec)</td> <td style="text-align: center;">46.4</td> </tr> <tr> <td>Degree of Saturation</td> <td style="text-align: center;">0.449</td> </tr> </table>	Intersection Level of Service	D	Average Delay (sec)	46.4	Degree of Saturation	0.449
	Intersection Level of Service	D					
	Average Delay (sec)	46.4					
	Degree of Saturation	0.449					
	PM Peak						
<table border="1"> <tr> <td>Intersection Level of Service</td> <td style="text-align: center;">B</td> </tr> <tr> <td>Average Delay (sec)</td> <td style="text-align: center;">21.9</td> </tr> <tr> <td>Degree of Saturation</td> <td style="text-align: center;">0.448</td> </tr> </table>	Intersection Level of Service	B	Average Delay (sec)	21.9	Degree of Saturation	0.448	
Intersection Level of Service	B						
Average Delay (sec)	21.9						
Degree of Saturation	0.448						

The results indicate that the intersection performs satisfactorily with the inclusion of both development and an intersection upgrade to a seagull intersection treatment (Option 2) under 2011 traffic conditions.

These intersections have been reappraised with the inclusion of traffic generated by the Redlake development with the inclusion of 2021 background traffic growth along Tomago Road. The purpose of the assessments is to identify if this results in a need to upgrade any infrastructure beyond what is shown under the with Redlake development scenario in Section 4.2.5, to cater for the anticipated future traffic growth along Tomago Road and traffic generated by the proposed Midal Site.

The results of the modelling are shown in Table 31 and Table 32.



Table 31 2021 Tomago Road/McIntyre Road Intersection Performance - With All Developments

	Stage	AM peak			PM peak		
		Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Option 2 Seagull	Stage 1	0.548	83.7	F	0.684	30.5	C
	Stage 1	0.625	21.2	B	0.696	15.8	B
Option 3 Roundabout	Stage 2	0.807	28.9	C	1.033	101.8	F
	Stage 3	1.052	109.9	F	1.475	872.9	F
Option 4 : Signal Controlled (no major change to intersection layout)	Stage 1	0.897	25.9	B	0.875	22.7	B
	Stage 2	0.948	33.8	C	0.917	44.5	D
	Stage 3	1.213	337.7	F	1.540	623.2	F
Option 5 : Signal Controlled (major change to intersection layout)	Stage 3	0.744	13.2	A	0.814	20.0	B

Table 32 2021 Tomago Road/School Drive Intersection Performance - With All Developments

	Stage	AM peak			PM peak		
		Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Existing Conditions	Stage 1	0.387	17.8	B	0.398	21.3	B
Option 3 : Roundabout	Stage 3	0.935	41.6	C	0.991	23.6	B
Option 5 : Signal Controlled (with major change to intersection layout)	Stage 3	0.814	11.2	A	0.782	10.2	A



The analysis indicates that no further capacity enhancements are required to the intersection of Tomago Road/School Drive beyond what is shown in Sections 4.2.5 and 4.2.6 to accommodate the proposed staged development of the Redlake Site. The intersection of Tomago Road/McIntyre Road is required to be upgraded to either a roundabout or traffic signals from what is shown in Sections 4.2.5 and 4.2.6 as a result of background traffic growth along Tomago Road.

5.5 Parking Provision

Guidelines for minimum parking requirements for the proposed development are provided on Port Stephens Council's DCP 2007 (Section B3). The RTA's *Guide to Traffic Generating Developments* also provides recommended minimum standards. The guidelines are as follows:

Table 33 Guidelines for Minimum Parking Requirements

Land Use	RTA Guidelines	Port Stephens Council DCP
Factories	1.3 spaces per 100 m ² GFA	1 space per 100 m ² GFA + 1 space per 30 spaces for disabled parking
Warehouses	1 space per 300 m ² GFA	1 space per 200 m ² GFA + 1 space

Gross floor area estimate for the development is in the order of 9,600 m². However, a large proportion of the gross area would be allocated for storage. Assuming a 50% manufacturing space and 50% storage or warehousing split in the gross area and applying the above guidelines, the required parking provision would be:

- ▶ 78 spaces as per the RTA Guidelines; and
- ▶ 75 spaces as per Port Stephens Council DCP.

5.5.1 Staff Parking

Parking requirements for staff is also calculated based on shift schedules as the employment staff for the development will be working in shifts. At its maximum capacity this operation will involve two, 12 hour shifts comprising 42 employees each per shift with 35 administration staff for a total employment of approximately 119 persons. However, it is anticipated that a maximum of 70 employees are expected to be on site at any one time.

The peak demand for staff parking will occur in between shift changes, i.e. at 7:00 a.m. and 7:00 p.m. Using the conservative assumption of one car per employee, this peak demand for parking will be at around 7:00 pm when 70 staff will still be finishing their shift, and another 42 staff workers plus administration staff will have arrived to start their shift. On this basis, car parking provision requirement is estimated to be a minimum of 70 spaces. The proposed site layout currently provides 82 spaces which would be sufficient to cater to staff parking.

5.5.2 Visitor Parking

There would be provision for visitor parking in the order of 4 spaces.



5.5.3 Provisions for Disabled Parking

Based on the Port Stephens Council's DCP 2007, a total of two spaces shall be allocated for disabled parking.



6. Summary and Conclusions

6.1 Overview

- ▶ The proposed development is expected to result in a marginal increase in traffic flow along Tomago Road, McIntyre Road and School Drive during the weekday peak periods.
- ▶ The current intersection arrangements at the intersection of McIntyre Road with Tomago Road operates satisfactory under 2011 peak period conditions and has available capacity to accommodate both construction traffic and operational traffic generated from the proposed Midal development.
- ▶ The findings from section 4.2.3 indicated that all 3 stages of the Redlake development directly impacts on Tomago Road operations during peak periods, and would increase by between 27%-39% (Stage 1) and 172%-287% (Stage 3).
- ▶ The intersection of McIntyre Road with Tomago Road is directly impacted by increases in traffic associated with all 3 stages of the Redlake development and results in the intersection performing unsatisfactorily and requires upgrading to a seagull intersection treatment (Option 2) in Stage 1 and eventually traffic signals under Stage 3.
- ▶ Stage 3 of the proposed Redlake development impacts on both the performance of the intersection at Tomago Road with School Drive and Tomago Road at McIntyre Road and requires upgrading of the intersection with School Drive to traffic signals and second through traffic lane in each direction on Tomago Road approaches to McIntyre Road (Option 5).
- ▶ Background traffic over the next 10 years has been estimated to increase by 2.7% per annum and is understood to be directly associated with the development of employment lands situated in close proximity to the airport and other Tomago Road industrial sites.
- ▶ The assessment of the intersection of McIntyre Road and Tomago Road under 2021 traffic conditions with the delivery of Stage 1 Redlake development and the Midal development indicates that the intersection is required to be upgraded to either a roundabout or traffic signals.
- ▶ The assessment of cumulative impacts in 2021 indicated that the above proposed upgrades are directly associated with traffic generation from the 3 Stage Redlake development and 2021 background traffic growth, and as a result can accommodate traffic generated by the proposed Midal development without any additional upgrades.

6.2 Key Findings Associated with the Development Proposal

The key findings from the traffic assessment of the Proposed Development are:

6.2.1 Proposed Development - Construction Traffic Generation

The proposed aluminium rod and conductor manufacturing facility is expected to attract some 70 car trips per day by employees and 60 truck trips per day by heavy vehicles during the construction period. The construction period is planned to occur over a ten month period only.

6.2.2 Proposed Development – Peak Operational Traffic Generation

During peak operations, the facility will attract some 164 car trips and 36 truck trips per day.



6.2.3 Traffic Impact

The expected increase in traffic on Tomago Road, McIntyre Road, and School Drive from the proposed development is minor and has no direct impact on road capacity or intersection operations.

6.2.4 Road Impact

The current road network has been identified to be suitable for proposed trucking operations without the need for major improvements to pavement condition, carriageway alignment and road width.

6.2.5 Site Access

The proposed access arrangement to the site is adequate to accommodate anticipated construction and operational traffic. It is expected that the private road will be upgraded to accommodate traffic generated by the proposed development.

6.2.6 Parking

The proposed site layout can accommodate up to 82 parked vehicles and is deemed to be adequate based on the requirements set by RTA Guidelines and Port Stephens Council DCP.

6.2.7 Mitigation Measures

It is recommended that in the development of the design for the seagull intersection treatment at the intersection of McIntyre Road and Tomago Road for short term 2011 arrangements, that a road safety audit of the design is undertaken and that this includes further investigation of current crash trends. It is also recommended that further consideration is given for the medium to long term corridor needs as a result of planned growth from development in the region as highlighted under the 2021 assessments presented in Section 5.4.

Based on the type of vehicles that would require access to the site during the construction period, it is recommended that a Construction Traffic Management Plan (CTMP) is developed and implemented. Some of the initiatives that are likely to form part of the CTMP include:

- ▶ Requirement to consult and seek approval from the RTA.
- ▶ General signposting of the access roads with appropriate heavy vehicle and construction warning signs.
- ▶ Installation of specific warning signs at the access entrance to the construction site to warn existing road users of entering and exiting construction traffic.
- ▶ Installation of appropriate traffic control and warning signs for areas identified to have potential safety risks.
- ▶ The promotion of car-pooling for construction staff and other shared transport initiatives during the construction phase.



Appendix A
Intersection Counts

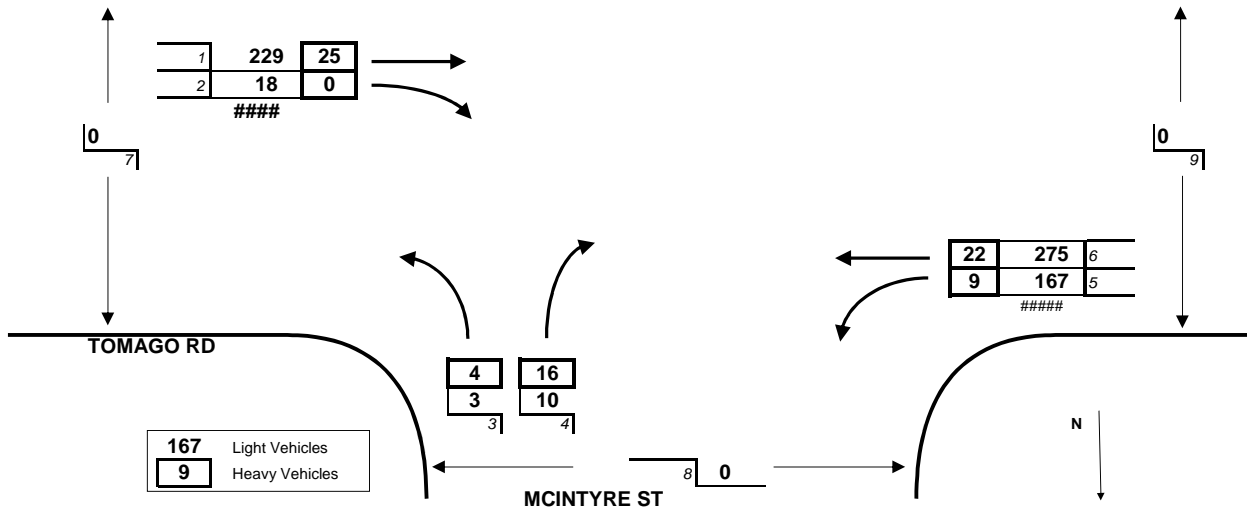
1/3/2011 - TOMAGO RD / MCINTYRE ST, TOMAGO

7:00 <<< HOUR ENDING

Tuesday

Summary:

TOMAGO RD / MCINTYRE ST	
702	Total Light Vehicles
76	Total Heavy Vehicles
0	Total Pedestrians



1/3/2011 - TOMAGO RD / MCINTYRE ST, TOMAGO

Hour	Light Vehicles						Total Vehicles 15 MIN HOUR	Pedestrians		
	1	2	3	4	5	6		7	8	9
06:15	48	5	0	1	39	49	142	0	0	0
06:30	52	8	1	2	72	59	194	0	0	0
06:45	64	2	0	3	33	74	176	0	0	0
07:00	65	3 <	2	4	23 <	93	190	702 <	0	0
07:15	36	2	0	2	20	78	138	698	0	0
07:30	53	1	2	3	17	76 <	152	656	0	0
07:45	61	3	2 <	8	14	44	132	612	0	0
08:00	57	5	1	2	15	41	121	543	0	0
08:15	60 <	1	0	4	13	45	123	528	0	0
08:30	50	1	2	9	14	35	111	487	0	0
08:45	33	2	1	7	11	45	99	454	0	0
09:00	39	4	0	4 <	18	43	108	441	0	0

Hour	Heavy Vehicles						Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6		
06:15	4	0	3	3	1	4	15	
06:30	7	0	0	4	3	4	18	
06:45	6	0	1	8	1	3	19	
07:00	8	0	0 <	1 <	4	11	24	76
07:15	8	0	0	3 <	3	7	21	82
07:30	11	0	0	2	4	7	24	88
07:45	7	2 <	2	2	2	7 <	22	91
08:00	11 <	0 <	0	4	3	7	25	92 <
08:15	4	0 <	0	4	5 <	7	20	91
08:30	8	0 <	0	0	3	6	17	84
08:45	8	0	1	3	1	4	17	79
09:00	7	0	1	3	2	12	25	79

Hour	All Vehicles						Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6		
06:15	52	5	3	4	40	53	157	
06:30	59	8	1	6	75	63	212	
06:45	70	2	1	11	34	77	195	
07:00	73	3 <	2	5	27 <	104	214	778
07:15	44	2	0	5	23	85	159	780 <
07:30	64	1	2	5	21	83 <	176	744
07:45	68	5	4 <	10	16	51	154	703
08:00	68	5	1	6	18	48	146	635
08:15	64 <	1	0	8	18	52	143	619
08:30	58	1	2	9	17	41	128	571
08:45	41	2	2	10	12	49	116	533
09:00	46	4	1	7 <	20	55	133	520

Note: Arrows "<" indicate the end time for the peak hour for each turning movement.

1/3/2011 - TOMAGO RD / MCINTYRE ST, TOMAGO

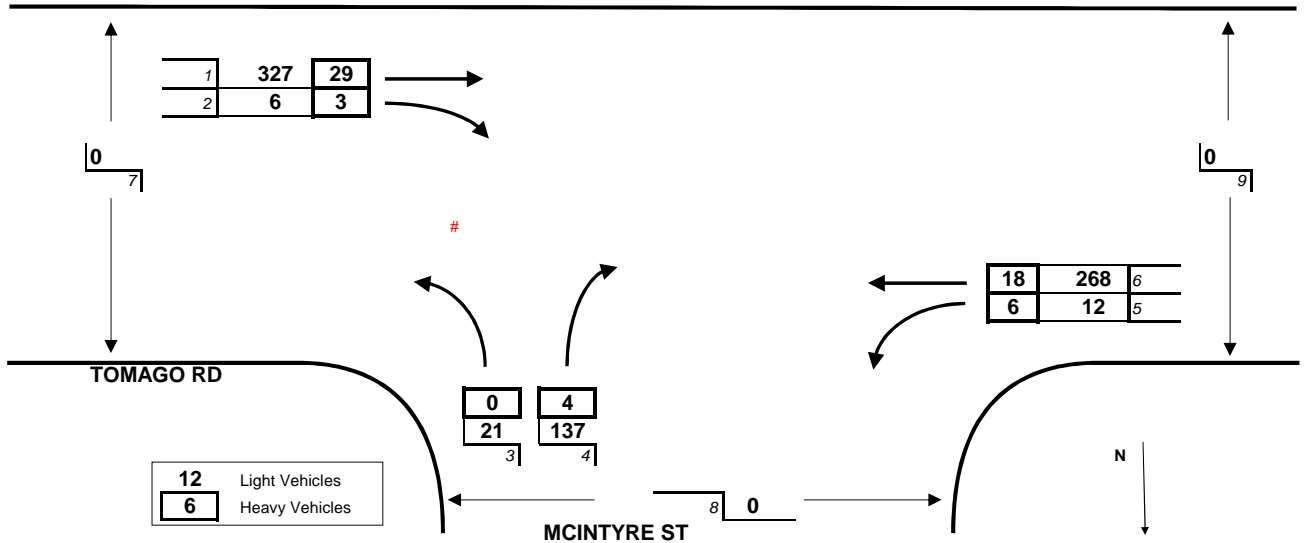
17:00 <<< HOUR ENDING

Tuesday

Summary:

TOMAGO RD / MCINTYRE ST

771 Total Light Vehicles
60 Total Heavy Vehicles
0 Total Pedestrians



1/3/2011 - TOMAGO RD / MCINTYRE ST, TOMAGO

	Light Vehicles						Total Vehicles 15 MIN HOUR	Pedestrians			
	1	2	3	4	5	6		7	8	9	
14:45	51	1	3	12	3	52	122	0	0	0	
15:00	42	1	0	7	5	42	97	0	0	0	
15:15	58	1	0	18	5	54	136	0	0	0	
15:30	55	2	4	28	18	63	170	525	0	0	0
15:45	74	3	10	30	9	90	216	619	0	0	0
16:00	55	1	1	12	10 <	64	143	665	0	0	0
16:15	65	0	10 <	44	4	70	193	722	0	0	0
16:30	83	4 <	2	15	4	68 <	176	728	0	0	0
16:45	98	1	8	59	3	71	240	752	0	0	0
17:00	81	1	1	19 <	1	59	162	771 <	0	0	0
17:15	90 <	0	2	13	5	52	162	740	0	0	0
17:30	69	0	1	8	2	55	135	699	0	0	0

	Heavy Vehicles						Total Vehicles 15 MIN HOUR			
	1	2	3	4	5	6				
14:45	8	0	0	1	0	8	17			
15:00	6	0	1	2	2	8	19			
15:15	7	0	0	1	2	8	18			
15:30	10 <	0	0 <	2 <	3	7 <	22	76		
15:45	8 <	1	0 <	0	7 <	4	20	79 <		
16:00	5	1	0	1	1	5	13	73		
16:15	5	0	0	0	3 <	4	12	67		
16:30	8	2 <	0	0	0	8	18	63		
16:45	7	1 <	0	3	1	4	16	59		
17:00	9	0	0	1	2	2	14	60		
17:15	5	0	0	1	0	0	6	54		
17:30	3	0	0	0	0	2	5	41		

	All Vehicles						Total Vehicles 15 MIN HOUR			
	1	2	3	4	5	6				
14:45	59	1	3	13	3	60	139			
15:00	48	1	1	9	7	50	116			
15:15	65	1	0	19	7	62	154			
15:30	65	2	4	30	21	70	192	601		
15:45	82	4	10	30	16	94	236	698		
16:00	60	2	1	13	11 <	69	156	738		
16:15	70	0	10 <	44	7 <	74	205	789		
16:30	91	6 <	2	15	4	76 <	194	791		
16:45	105	2	8	62	4	75	256	811		
17:00	90	1	1	20 <	3	61	176	831 <		
17:15	95 <	0	2	14	5	52	168	794		
17:30	72	0	1	8	2	57	140	740		

Note: Arrows "<" indicate the end time for the peak hour for each turning movement.

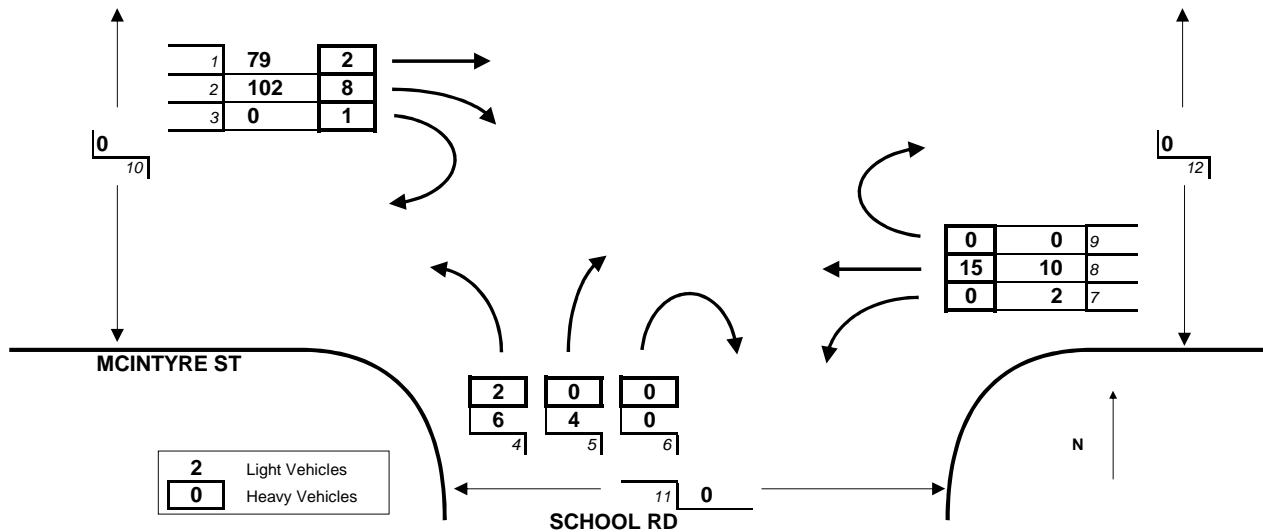
1/3/2011 - MCINTYRE ST / SCHOOL RD, TOMAGO

7:00 <<< HOUR ENDING

Tuesday

Summary:

MCINTYRE ST / SCHOOL RD	
203	Total Light Vehicles
28	Total Heavy Vehicles
0	Total Pedestrians



1/3/2011 - MCINTYRE ST / SCHOOL RD, TOMAGO

	Light Vehicles									Total Vehicles 15 MIN HOUR	Pedestrians			
	1	2	3	4	5	6	7	8	9		10	11	12	
06:15	17	32	0	1	2	0	1	2	0	55	0	0	0	
06:30	31	46	0	1	0	0	0	1	0	79	0	0	0	
06:45	21	9	0	0	1	0	1	5	0	37	0	0	0	
07:00	10 <	15 <	0	4	1 <	0	0 <	2	0	32	203 <	0	0	0
07:15	10	11	0	3	0	0	0	0	0	24	172	0	0	0
07:30	5	15	0	4	1	0	0	4 <	0	29	122	0	0	0
07:45	8	10	0	6	0	0	0	0	0	24	109	0	0	0
08:00	7	11	0	1	0	0	0	3	0	22	99	0	0	0
08:15	4	9	0	7	0	0	0	0	0	20	95	0	0	0
08:30	4	11	0	6 <	1	0	0	4	0	26	92	0	0	0
08:45	6	7	0	3	0	0	0	4 <	0	20	88	0	0	0
09:00	11	11	0	2	1	0	0	3 <	0	28	94	0	0	0

	Heavy Vehicles									Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6	7	8	9		
06:15	0	1	1	0	0	0	0	3	0	5	
06:30	0	2	0	1	0	0	0	4	0	7	
06:45	0	1	0	1	0	0	0	7	0	9	
07:00	2	4	0 <	0	0	0	0	1 <	0	7	28
07:15	0	2 <	0	2	0	0	1	0	0	5	28
07:30	2	1	0	3	0	0	0	1	0	7	28
07:45	0	2 <	1 <	1	0	0	0	4	0	8	27
08:00	1	4 <	0 <	2 <	0	0	1	1	0	9	29
08:15	4 <	2 <	0 <	2 <	0	0	1	1	0	10	34 <
08:30	1	1 <	0 <	0	0	0	1 <	0	0	3	30
08:45	0	1	0	3	1 <	0	0 <	2	0	7	29
09:00	1	1	0	2	0 <	0	0	2	0	6	26

	All Vehicles									Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6	7	8	9		
06:15	17	33	1	1	2	0	1	5	0	60	
06:30	31	48	0	2	0	0	0	5	0	86	
06:45	21	10	0	1	1	0	1	12	0	46	
07:00	12 <	19 <	0 <	4	1 <	0	0	3 <	0	39	231 <
07:15	10	13	0	5	0	0	1	0	0	29	200
07:30	7	16	0	7	1	0	0	5	0	36	150
07:45	8	12	1 <	7	0	0	0	4	0	32	136
08:00	8	15	0 <	3	0	0	1	4	0	31	128
08:15	8	11	0 <	9 <	0	0	1	1	0	30	129
08:30	5	12	0 <	6	1	0	1 <	4	0	29	122
08:45	6	8	0	6	1	0	0 <	6	0	27	117
09:00	12	12	0	4	1	0	0	5	0	34	120

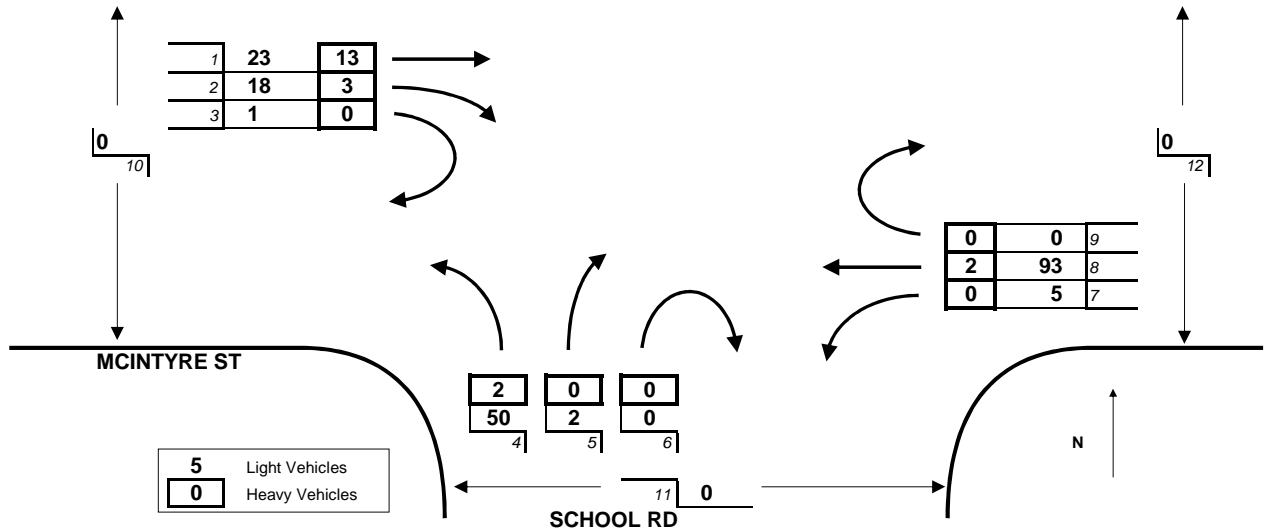
Note: Arrows "<" indicate the end time for the peak hour for each turning movement.

1/3/2011 - MCINTYRE ST / SCHOOL RD, TOMAGO

16:15 <<< HOUR ENDING

Tuesday

Summary:	
MCINTYRE ST / SCHOOL RD	
192	Total Light Vehicles
20	Total Heavy Vehicles
0	Total Pedestrians



1/3/2011 - MCINTYRE ST / SCHOOL RD, TOMAGO

	Light Vehicles									Total Vehicles 15 MIN HOUR	Pedestrians			
	1	2	3	4	5	6	7	8	9		10	11	12	
14:45	3	1	0	8	0	0	1	10	0	23	0	0	0	
15:00	3	4	0	7	0	1	0	2	0	17	0	0	0	
15:15	2	4	0	15	0	0	1	2	0	24	0	0	0	
15:30	11	8	0	10	1	0 <	3	26	0	59	123	0	0	0
15:45	6	2	1 <	17	1 <	0 <	2 <	20	0	49	149	0	0	0
16:00	6 <	6 <	0 <	6	0 <	0	0 <	5	0	23	155	0	0	0
16:15	0	2	0 <	17	0 <	0	0	42 <	0	61	192 <	0	0	0
16:30	4	3	0 <	6	0	0	0	13	0	26	159	0	0	0
16:45	2	1	0	43	1	0	0	27	0	74	184	0	0	0
17:00	1	3	0	10 <	0	0	0	8	0	22	183	0	0	0
17:15	3	1	0	7	0	0	0	7	0	18	140	0	0	0
17:30	0	1	0	3	0	0	0	9	0	13	127	0	0	0

	Heavy Vehicles									Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6	7	8	9		
14:45	0	1	0	2	0	0	0	0	0	3	
15:00	1	2	0	0	0	0	0	2	0	5	
15:15	1	1	0	0	1	0	0	1	0	4	
15:30	2	1 <	0	1	0 <	0	0	1 <	0	5	17
15:45	6	1 <	0	0	0 <	0	0	0 <	0	7	21 <
16:00	1	1	0	1	0 <	0	0	1	0	4	20
16:15	4 <	0	0	0	0	0	0	0	0	4	20
16:30	2 <	0	0	0	0	0	0	0	0	2	17
16:45	2	0	0	3 <	0	0	0	0	0	5	15
17:00	1	1	0	0	0	0	0	2	0	4	15
17:15	0	0	0	0	0	0	0	1	0	1	12
17:30	0	0	0	0	0	0	0	0	0	0	10

	All Vehicles									Total Vehicles 15 MIN HOUR	
	1	2	3	4	5	6	7	8	9		
14:45	3	2	0	10	0	0	1	10	0	26	
15:00	4	6	0	7	0	1	0	4	0	22	
15:15	3	5	0	15	1	0	1	3	0	28	
15:30	13	9	0	11	1	0 <	3	27	0	64	140
15:45	12	3	1 <	17	1 <	0 <	2 <	20	0	56	170
16:00	7	7 <	0 <	7	0 <	0	0 <	6	0	27	175
16:15	4 <	2	0 <	17	0	0	0	42 <	0	65	212 <
16:30	6	3	0 <	6	0	0	0	13	0	28	176
16:45	4	1	0	46	1	0	0	27	0	79	199
17:00	2	4	0	10 <	0	0	0	10	0	26	198
17:15	3	1	0	7	0	0	0	8	0	19	152
17:30	0	1	0	3	0	0	0	9	0	13	137

Note: Arrows "<" indicate the end time for the peak hour for each turning movement.

1/3/2011 - SCHOOL RD / PRIVATE RD, TOMAGO

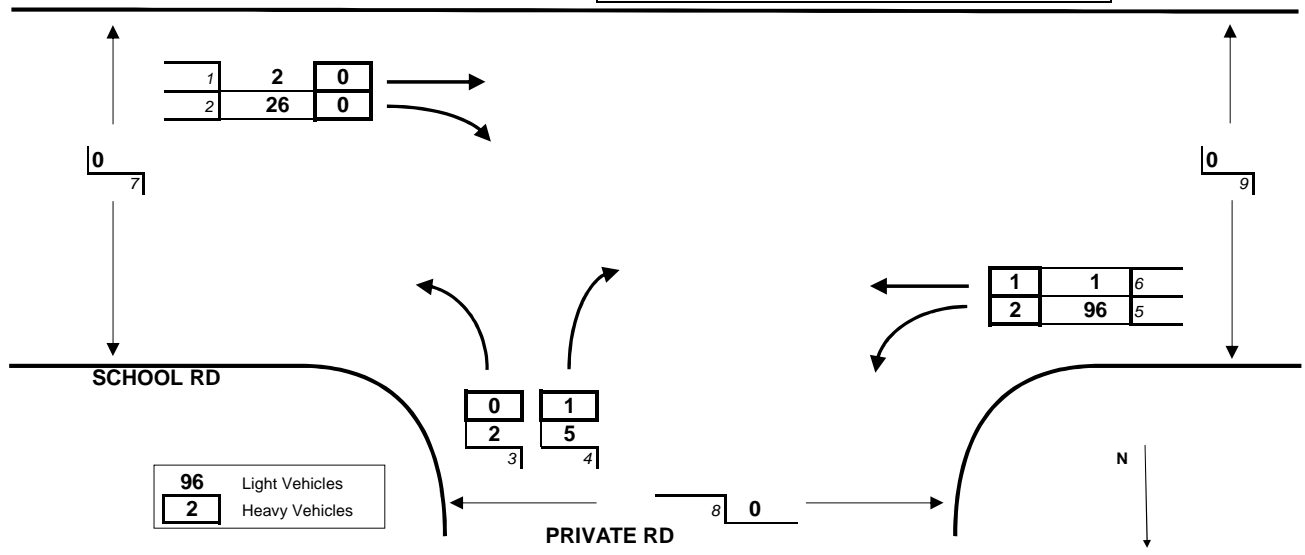
7:00 <<< HOUR ENDING

Tuesday

Summary:

SCHOOL RD / PRIVATE RD

132 Total Light Vehicles
4 Total Heavy Vehicles
0 Total Pedestrians



1/3/2011 - SCHOOL RD / PRIVATE RD, TOMAGO

	Light Vehicles						Total Vehicles		Pedestrians		
	1	2	3	4	5	6	15 MIN HOUR		7	8	9
06:15	0	1	0	0	14	0	15		0	0	0
06:30	1	14	0	2	46	0	63		0	0	0
06:45	0	9	2	0	25	1	37		0	0	0
07:00	1	2 <	0	3	11 <	0	17	132 <	0	0	0
07:15	0	1 <	1 <	2	7	2	13	130	0	0	0
07:30	3	3	0 <	1	3	5	15	82	0	0	0
07:45	3	2	0	2	10	3	20	65	0	0	0
08:00	1	3	0	2	5	1 <	12	60	0	0	0
08:15	1 <	4	0	1	5	1	12	59	0	0	0
08:30	1	2	0	6 <	6	0	15	59	0	0	0
08:45	1	1	0	0	5	2	9	48	0	0	0
09:00	3	1	0	2	2	1	9	45	0	0	0

	Heavy Vehicles						Total Vehicles		Pedestrians		
	1	2	3	4	5	6	15 MIN HOUR		7	8	9
06:15	0	0	0	0	0	0	0				
06:30	0	0	0	0	0	1	1				
06:45	0	0	0	1	1	0	2				
07:00	0	0	0	0	1	0	1	4			
07:15	0	0	0	0	1	1	2	6			
07:30	1	0	0	1	1 <	0	3	8			
07:45	0	0	1	1	1 <	0	3	9			
08:00	0	0	0	0	0	3	3	11			
08:15	2 <	1	0	2 <	0	0	5	14			
08:30	0	1	1	0	0	3	5	16			
08:45	0	0	2 <	0	0	2 <	4	17 <			
09:00	1 <	1 <	0 <	1	0	0	3	17 <			

	All Vehicles						Total Vehicles		Pedestrians		
	1	2	3	4	5	6	15 MIN HOUR		7	8	9
06:15	0	1	0	0	14	0	15				
06:30	1	14	0	2	46	1	64				
06:45	0	9	2	1	26	1	39				
07:00	1	2 <	0	3	12 <	0	18	136 <			
07:15	0	1 <	1 <	2	8	3	15	136 <			
07:30	4	3	0 <	2	4	5	18	90			
07:45	3	2	1	3	11	3	23	74			
08:00	1	3	0	2	5	4 <	15	71			
08:15	3 <	5	0	3	5	1	17	73			
08:30	1	3	1	6 <	6	3	20	75			
08:45	1	1	2 <	0	5	4	13	65			
09:00	4	2	0 <	3	2	1	12	62			

Note: Arrows "<" indicate the end time for the peak hour for each turning movement.

1/3/2011 - SCHOOL RD / PRIVATE RD, TOMAGO

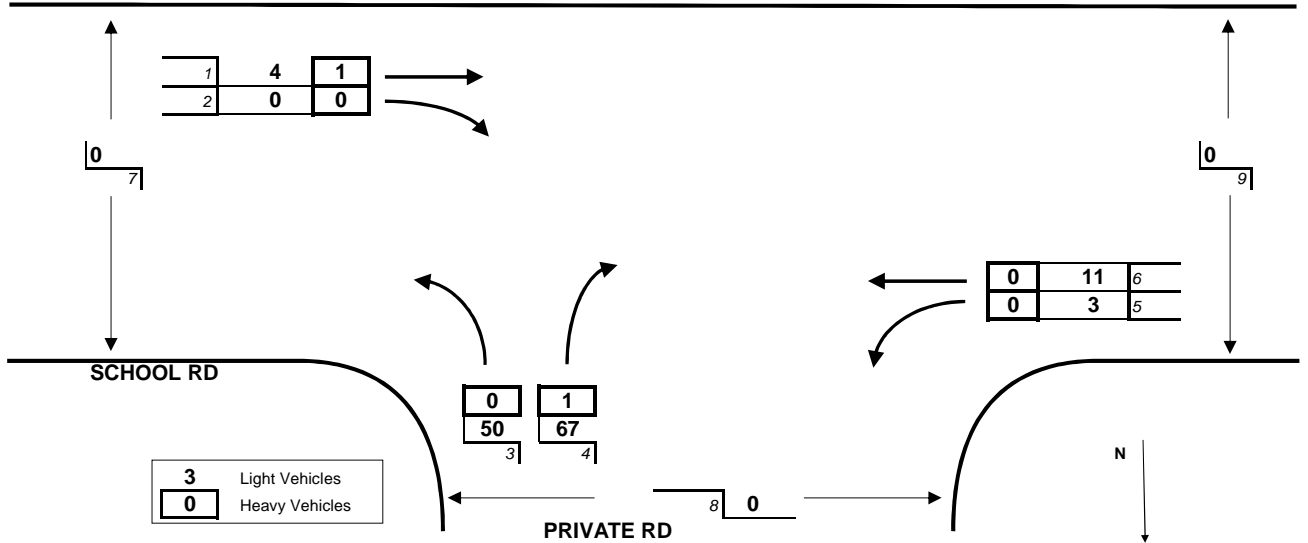
17:00 <<< HOUR ENDING

Tuesday

Summary:

SCHOOL RD / PRIVATE RD

135 Total Light Vehicles
2 Total Heavy Vehicles
0 Total Pedestrians



1/3/2011 - SCHOOL RD / PRIVATE RD, TOMAGO

	Light Vehicles						Total Vehicles 15 MIN HOUR	Pedestrians		
	1	2	3	4	5	6		7	8	9
14:45	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0	0
15:15	2	0	1	11	1	4	19	0	0	0
15:30	0	0	3	4	2	4	13	32	0	0
15:45	3	1 <	2	13	2	8	29	61	0	0
16:00	4	0 <	2	4	3	3 <	16	77	0	0
16:15	2	0 <	0	11	2 <	1	16	74	0	0
16:30	1 <	0 <	1	3	0	2	7	68	0	0
16:45	1	0	45	37	1	6	90	129	0	0
17:00	0	0	4	16 <	0	2	22	135 <	0	0
17:15	1	0	2 <	5	3	1	12	131	0	0
17:30	1	0	1 <	4	0	2	8	132	0	0

	Heavy Vehicles						Total Vehicles 15 MIN HOUR	Pedestrians		
	1	2	3	4	5	6		7	8	9
14:45	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	1	0	1	0	0	0
15:15	0	1	0	2	1	0	4	0	0	0
15:30	0	0 <	0	0 <	0	1	1	6	0	0
15:45	0	0 <	0	0 <	1 <	0	1	7 <	0	0
16:00	0	0 <	0	0 <	0	1 <	1	7 <	0	0
16:15	0	0	0	0	0	0 <	0	3	0	0
16:30	0	0	0	0	0	0	0	2	0	0
16:45	1 <	0	0	1	0	0	2	3	0	0
17:00	0 <	0	0	0	0	0	0	2	0	0
17:15	0 <	0	0	0	1	0	1	3	0	0
17:30	0 <	0	0	0	0	0	0	3	0	0

	All Vehicles						Total Vehicles 15 MIN HOUR	Pedestrians		
	1	2	3	4	5	6		7	8	9
14:45	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	1	0	1	0	0	0
15:15	2	1	1	13	2	4	23	0	0	0
15:30	0	0	3	4	2	5	14	38	0	0
15:45	3	1 <	2	13	3	8	30	68	0	0
16:00	4	0 <	2	4	3 <	4 <	17	84	0	0
16:15	2	0	0	11	2 <	1	16	77	0	0
16:30	1 <	0	1	3	0	2	7	70	0	0
16:45	2	0	45	38	1	6	92	132	0	0
17:00	0	0	4	16 <	0	2	22	137 <	0	0
17:15	1	0	2 <	5	4	1	13	134	0	0
17:30	1	0	1 <	4	0	2	8	135	0	0

Note: Arrows "<" indicate the end time for the peak hour for each turning movement.



Appendix B
SIDRA Results

LANE SUMMARY

Site: AM McIntyre - School

McIntyre Road - School Drive Intersection
 (AM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: McIntyre Road (S)																
Lane 1	0	91	123	214	5.6	1455	0.147	100	4.2	LOS A	0.7	5.2	500	-	0.0	0.0
Approach	0	91	123	214	5.6		0.147		4.2	NA	0.7	5.2				
East: School Drive																
Lane 1	13	0	4	17	23.5	815	0.021	100	7.8	LOS A	0.1	0.6	500	-	0.0	0.0
Approach	13	0	4	17	23.5		0.021		7.8	LOS A	0.1	0.6				
North: McIntyre Road (N)																
Lane 1	3	25	0	28	57.1	1413	0.020	100	0.8	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	3	25	0	28	57.1		0.020		0.8	NA	0.0	0.0				
Intersection				259	12.4		0.147		4.1	NA	0.7	5.2				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: PM McIntyre - School

McIntyre Road - School Drive Intersection
 (PM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
South: McIntyre Road (S)																
Lane 1	0	33	16	49	34.7	1325	0.037	100	3.0	LOS A	0.2	1.5	500	-	0.0	0.0
Approach	0	33	16	49	34.7		0.037		3.0	NA	0.2	1.5				
East: School Drive																
Lane 1	93	0	4	97	6.2	1011	0.096	100	7.2	LOS A	0.4	2.7	500	-	0.0	0.0
Approach	93	0	4	97	6.2		0.096		7.2	LOS A	0.4	2.7				
North: McIntyre Road (N)																
Lane 1	2	108	0	110	0.9	1937	0.057	100	0.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	2	108	0	110	0.9		0.057		0.1	NA	0.0	0.0				
Intersection				256	9.4		0.096		3.4	NA	0.4	2.7				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: AM School - Private Road

School Drive - Private Road Intersection
 (AM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back Vehicles veh	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: School Drive (E)																
Lane 1	0	6	29	35	2.9	856	0.041	100	6.3	LOS A	0.2	1.2	500	-	0.0	0.0
Approach	0	6	29	35	2.9		0.041		6.3	NA	0.2	1.2				
North: Private Road																
Lane 1	3	0	0	3	0.0	392 ¹	0.008	100	6.6	LOS A	0.0	0.1	5 Turn Bay		0.0	0.0
Lane 2	0	0	10	10	20.0	674	0.015	100	8.2	LOS A	0.1	0.5	500	-	0.0	0.0
Approach	3	0	10	13	15.4		0.015		7.8	LOS A	0.1	0.5				
West: School Drive (W)																
Lane 1	96	8	0	104	3.8	1814	0.057	100	6.0	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	96	8	0	104	3.8		0.057		6.0	NA	0.0	0.0				
Intersection				152	4.6		0.057		6.2	NA	0.2	1.2				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

¹ Reduced capacity due to a short lane effect

LANE SUMMARY

Site: PM School - Private Road

School Drive - Private Road Intersection
 (PM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: School Drive (E)																
Lane 1	0	12	1	13	7.7	1691	0.008	100	0.9	LOS A	0.1	0.4	500	-	0.0	0.0
Approach	0	12	1	13	7.7		0.008		0.9	NA	0.1	0.4				
North: Private Road																
Lane 1	50	0	0	50	0.0	400 ¹	0.125	100	6.7	LOS A	0.2	1.1	5 Turn Bay		0.0	0.0
Lane 2	0	0	69	69	1.4	852	0.081	100	7.1	LOS A	0.3	2.3	500	-	0.0	0.0
Approach	50	0	69	119	0.8		0.125		6.9	LOS A	0.3	2.3				
West: School Drive (W)																
Lane 1	9	21	0	30	6.7	1837	0.016	100	2.0	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	9	21	0	30	6.7		0.016		2.0	NA	0.0	0.0				
Intersection				162	2.5		0.125		5.5	NA	0.3	2.3				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

¹ Reduced capacity due to a short lane effect

LANE SUMMARY

Site: AM Tomago - McIntyre

Tomago Road - McIntyre Road Intersection
 (AM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	310	16	326	12.3	1675	0.195	100	3.5	LOS A	1.5	11.3	500	-	0.0	0.0
Approach	0	310	16	326	12.3		0.195		3.5	NA	1.5	11.3				
North: McIntyre Road																
Lane 1	6	0	0	6	16.7	523	0.011	100	12.5	LOS A	0.0	0.3	20 Turn Bay		0.0	0.0
Lane 2	0	0	32	32	56.3	148	0.216	100	35.0	LOS C	0.7	7.4	500	-	0.0	0.0
Approach	6	0	32	38	50.0		0.216		31.4	LOS C	0.7	7.4				
West: Tomago Road (W)																
Lane 1	180	412	0	592	7.9	1824	0.325	100	3.2	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	180	412	0	592	7.9		0.325		3.2	NA	0.0	0.0				
Intersection				956	11.1		0.325		4.4	NA	1.5	11.3				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: PM Tomago - McIntyre

Tomago Road - McIntyre Road Intersection
 (PM peak) Existing Peak Conditions
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	408	14	422	9.0	1722	0.245	100	4.4	LOS A	2.6	19.3	500	-	0.0	0.0
Approach	0	408	14	422	9.0		0.245		4.4	NA	2.6	19.3				
North: McIntyre Road																
Lane 1	31	0	0	31	0.0	678 ¹	0.046	100	10.2	LOS A	0.1	1.0	20 Turn Bay		0.0	0.0
Lane 2	0	0	164	164	2.4	414	0.396	100	17.8	LOS B	1.7	12.5	500	-	0.0	0.0
Approach	31	0	164	195	2.1		0.396		16.6	LOS B	1.7	12.5				
West: Tomago Road (W)																
Lane 1	42	388	0	430	8.6	1833	0.235	100	1.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	42	388	0	430	8.6		0.235		1.1	NA	0.0	0.0				
Intersection				1047	7.5		0.396		5.3	NA	2.6	19.3				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

¹ Reduced capacity due to a short lane effect

LANE SUMMARY

Site: 2011 AM Existing layout
Tomago-School Drive Stage 1 +
Midal

Existing layout Tomago-School Drive
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows						Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h										
East: Tomago Road (E)																
Lane 1	0	432	42	474	11.8	1590	0.298	100	4.6	LOS A	2.6	20.2	500	-	0.0	0.0
Approach	0	432	42	474	11.8		0.298		4.6	NA	2.6	20.2				
North: School Drive																
Lane 1	6	0	5	11	0.0	379	0.029	100	15.2	LOS B	0.1	0.6	500	-	0.0	0.0
Approach	6	0	5	11	0.0		0.029		15.2	LOS B	0.1	0.6				
West: Tomago Road (W)																
Lane 1	10	577	0	587	7.6	1856	0.316	100	0.2	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	10	577	0	587	7.6		0.316		0.2	NA	0.0	0.0				
Intersection				1072	9.4		0.316		2.3	NA	2.6	20.2				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2011 PM Existing layout
Tomago-School Drive Stage 1 +
Midal

Existing layout Tomago-School Drive
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows						Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h										
East: Tomago Road (E)																
Lane 1	0	581	10	591	8.0	1808	0.327	100	3.7	LOS A	3.3	24.4	500	-	0.0	0.0
Approach	0	581	10	591	8.0		0.327		3.7	NA	3.3	24.4				
North: School Drive																
Lane 1	68	0	20	88	0.0	467	0.188	100	13.9	LOS A	0.6	4.5	500	-	0.0	0.0
Approach	68	0	20	88	0.0		0.188		13.9	LOS A	0.6	4.5				
West: Tomago Road (W)																
Lane 1	3	525	0	528	6.4	1872	0.282	100	0.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	3	525	0	528	6.4		0.282		0.1	NA	0.0	0.0				
Intersection				1207	6.7		0.327		2.8	NA	3.3	24.4				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2011 AM Tomago - McIntyre -
Stage 1 - CHR Intersection

Tomago-McIntyre Stage 1 (CHR intersection)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	416	0	416	12.9	1799	0.231	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	16	16	0.0	606	0.026	100	13.5	LOS A	0.1	0.5	20 Turn Bay		0.0	0.0
Approach	0	416	16	432	12.4		0.231		0.5	NA	0.1	0.5				
North: McIntyre Road																
Lane 1	6	0	0	6	16.7	381	0.016	100	15.4	LOS B	0.1	0.4	20 Turn Bay		0.0	0.0
Lane 2	0	0	32	32	56.3	91	0.350	100	57.2	LOS E	1.2	11.9	500	-	0.0	0.0
Approach	6	0	32	38	50.0		0.350		50.6	LOS D	1.2	11.9				
West: Tomago Road (W)																
Lane 1	180	571	0	751	7.9	1830	0.410	100	2.5	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	180	571	0	751	7.9		0.410		2.5	NA	0.0	0.0				
Intersection				1221	10.8		0.410		3.3	NA	1.2	11.9				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2011 PM Tomago - McIntyre - Stage 1 - CHR Intersection

Tomago-McIntyre Stage 1 (CHR intersection)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	567	0	567	8.1	1853	0.306	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	14	14	35.7	491	0.028	100	15.3	LOS B	0.1	0.7	20	Turn Bay	0.0	0.0
Approach	0	567	14	581	8.8		0.306		0.4	NA	0.1	0.7				
North: McIntyre Road																
Lane 1	31	0	0	31	0.0	624	0.050	100	11.2	LOS A	0.2	1.2	20	Turn Bay	0.0	0.0
Lane 2	0	0	164	164	2.4	306	0.537	100	24.7	LOS B	2.5	17.7	500	-	0.0	0.0
Approach	31	0	164	195	2.1		0.537		22.5	LOS B	2.5	17.7				
West: Tomago Road (W)																
Lane 1	42	494	0	536	8.2	1841	0.291	100	0.9	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	42	494	0	536	8.2		0.291		0.9	NA	0.0	0.0				
Intersection				1312	7.5		0.537		3.9	NA	2.5	17.7				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2011 AM Tomago - McIntyre - Stage 1 - Seagull Intersection

AM Tomago - McIntyre - Stage 1 - Seagull Intersection
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	416	0	416	12.9	1799	0.231	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	16	16	0.0	530	0.030	100	15.4	LOS B	0.1	0.7	20	Turn Bay	0.0	0.0
Approach	0	416	16	432	12.4		0.231		0.6	NA	0.1	0.7				
North East: Median (RT Stage 2)																
Lane 1	0	0	32	32	56.2	345	0.093	100	14.8	LOS B	0.3	3.0	10	-	0.0	0.0
Approach	0	0	32	32	56.2		0.093		14.8	LOS B	0.3	3.0				
North: McIntyre Road (RT Stage 1)																
Lane 1	6	0	0	6	16.7	381	0.016	100	19.7	LOS B	0.1	0.4	20	Turn Bay	0.0	0.0
Lane 2	0	0	32	32	56.3	151	0.211	100	42.2	LOS C	0.8	8.0	500	-	0.0	0.0
Approach	6	0	32	38	50.0		0.211		38.6	LOS C	0.8	8.0				
West: Tomago Road																
Lane 1	180	571	0	751	7.9	1830	0.410	100	2.5	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	180	571	0	751	7.9		0.410		2.5	NA	0.0	0.0				
Intersection				1253	12.0		0.410		3.2	NA	0.8	8.0				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2011 PM Tomago - McIntyre - Stage 1 - Seagull Intersection

PM Tomago - McIntyre - Stage 1 - Seagull Intersection
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	567	0	567	8.1	1853	0.306	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	14	14	35.7	471	0.030	100	17.1	LOS B	0.1	1.0	20	Turn Bay	0.0	0.0
Approach	0	567	14	581	8.8		0.306		0.4	NA	0.1	1.0				
North East: Median (RT Stage 2)																
Lane 1	0	0	164	164	2.4	568	0.289	100	11.1	LOS A	1.2	7.3	10	-	0.0	0.0
Approach	0	0	164	164	2.4		0.289		11.1	LOS A	1.2	7.3				
North: McIntyre Road (RT Stage 1)																
Lane 1	31	0	0	31	0.0	624	0.050	100	15.2	LOS B	0.2	1.2	20	Turn Bay	0.0	0.0
Lane 2	0	0	164	164	2.4	519	0.316	100	20.2	LOS B	1.6	11.1	500	-	0.0	0.0
Approach	31	0	164	195	2.1		0.316		19.4	LOS B	1.6	11.1				
West: Tomago Road																
Lane 1	42	494	0	536	8.2	1841	0.291	100	0.9	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	42	494	0	536	8.2		0.291		0.9	NA	0.0	0.0				
Intersection				1476	7.0		0.316		4.3	NA	1.6	11.1				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2011 AM Tomago - McIntyre - Stage 1 + Midal - Seagull Intersection

AM Tomago - McIntyre - Stage 1 + Midal - Seagull Intersection
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	416	0	416	12.9	1799	0.231	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	16	16	0.0	462	0.035	100	16.5	LOS B	0.1	0.8	20	Turn Bay	0.0	0.0
Approach	0	416	16	432	12.4		0.231		0.6	NA	0.1	0.8				
North East: Median (RT Stage 2)																
Lane 1	0	0	34	34	56.0	346	0.098	100	14.8	LOS B	0.3	3.2	10	-	0.0	0.0
Approach	0	0	34	34	56.0		0.098		14.8	LOS B	0.3	3.2				
North: McIntyre Road (RT Stage 1)																
Lane 1	6	0	0	6	16.7	353	0.017	100	20.5	LOS B	0.1	0.4	20	Turn Bay	0.0	0.0
Lane 2	0	0	34	34	56.3	137	0.248	100	46.4	LOS D	0.9	9.5	500	-	0.0	0.0
Approach	6	0	34	40	50.3		0.248		42.5	LOS D	0.9	9.5				
West: Tomago Road																
Lane 1	248	571	0	819	7.9	1824	0.449	100	3.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	248	571	0	819	7.9		0.449		3.1	NA	0.0	0.0				
Intersection				1325	11.9		0.449		3.8	NA	0.9	9.5				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2011 PM Tomago - McIntyre - Stage 1 + Midal - Seagull Intersection

PM Tomago - McIntyre - Stage 1 + Midal - Seagull Intersection
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	567	0	567	8.1	1853	0.306	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	14	14	35.7	468	0.030	100	17.1	LOS B	0.1	1.0	20	Turn Bay	0.0	0.0
Approach	0	567	14	581	8.8		0.306		0.4	NA	0.1	1.0				
North East: Median (RT Stage 2)																
Lane 1	0	0	232	232	2.4	568	0.409	100	12.2	LOS A	2.0	12.2	10	-	0.0	11.2
Approach	0	0	232	232	2.4		0.409		12.2	LOS A	2.0	12.2				
North: McIntyre Road (RT Stage 1)																
Lane 1	31	0	0	31	0.0	622	0.050	100	15.2	LOS B	0.2	1.2	20	Turn Bay	0.0	0.0
Lane 2	0	0	232	232	2.4	518	0.448	100	21.9	LOS B	2.7	19.3	500	-	0.0	0.0
Approach	31	0	232	263	2.2		0.448		21.1	LOS B	2.7	19.3				
West: Tomago Road																
Lane 1	44	494	0	538	8.3	1840	0.292	100	0.9	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	44	494	0	538	8.3		0.292		0.9	NA	0.0	0.0				
Intersection				1614	6.6		0.448		5.6	NA	2.7	19.3				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2021 AM Tomago - McIntyre - Stage 1 - CHR Intersection

Tomago-McIntyre Stage 1 (CHR intersection)
(2021 traffic growth, Midal and Redlake Volumes)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	511	0	511	12.9	1799	0.284	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	21	21	0.0	447	0.047	100	15.7	LOS B	0.1	0.9	20	Turn Bay	0.0	0.0
Approach	0	511	21	532	12.4		0.284		0.6	NA	0.1	0.9				
North: McIntyre Road																
Lane 1	8	0	0	8	16.7	240	0.033	100	21.2	LOS B	0.1	0.8	20	Turn Bay	0.0	0.0
Lane 2	0	0	44	44	56.8	44 ²	1.000 ⁴	100	326.5	LOS F	6.4	66.8	500	-	0.0	0.0
Approach	8	0	44	52	50.6		1.000		279.5	LOS F	6.4	66.8				
West: Tomago Road (W)																
Lane 1	303	697	0	1000	7.8	1825	0.548	100	3.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	303	697	0	1000	7.8		0.548		3.1	NA	0.0	0.0				
Intersection				1584	10.8		1.000		11.4	NA	6.4	66.8				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

² Minimum Capacity

⁴ x = 1.00 due to minimum capacity

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LANE SUMMARY

Site: 2021 PM Tomago - McIntyre - Stage 1 - CHR Intersection

Tomago-McIntyre Stage 1 (CHR intersection)
(2021 traffic growth, Midal and Redlake Volumes)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	692	0	692	8.1	1853	0.374	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	18	18	35.7	403	0.045	100	17.0	LOS B	0.1	1.1	20	Turn Bay	0.0	0.0
Approach	0	692	18	710	8.8		0.374		0.4	NA	0.1	1.1				
North: McIntyre Road																
Lane 1	40	0	0	40	0.0	500	0.080	100	13.0	LOS A	0.3	1.9	20	Turn Bay	0.0	0.0
Lane 2	0	0	282	282	3.4	203	1.386	100	741.7	LOS F	104.8	754.6	500	-	0.0	18.9
Approach	40	0	282	322	2.9		1.386		651.2	LOS F	104.8	754.6				
West: Tomago Road (W)																
Lane 1	57	612	0	669	8.6	1835	0.365	100	1.0	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	57	612	0	669	8.6		0.365		1.0	NA	0.0	0.0				
Intersection				1701	7.6		1.386		123.8	NA	104.8	754.6				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2021 AM Tomago - McIntyre - Stage 1 - Seagull Intersection

AM Tomago - McIntyre - Stage 1 - Seagull Intersection
(2021 traffic growth, Midal and redlake Volumes)
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	511	0	511	12.9	1799	0.284	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	21	21	0.0	303	0.069	100	21.0	LOS B	0.2	1.5	20	Turn Bay	0.0	0.0
Approach	0	511	21	532	12.4		0.284		0.8	NA	0.2	1.5				
North East: Median (RT Stage 2)																
Lane 1	0	0	44	44	56.2	268	0.164	100	18.7	LOS B	0.6	5.2	10	-	0.0	0.0
Approach	0	0	44	44	56.2		0.164		18.7	LOS B	0.6	5.2				
North: McIntyre Road (RT Stage 1)																
Lane 1	8	0	0	8	16.7	240	0.033	100	25.5	LOS B	0.1	0.8	20	Turn Bay	0.0	0.0
Lane 2	0	0	44	44	56.8	84	0.526	100	83.7	LOS F	2.1	21.6	500	-	0.0	0.0
Approach	8	0	44	52	50.6		0.526		74.7	LOS F	2.1	21.6				
West: Tomago Road																
Lane 1	303	697	0	1000	7.8	1825	0.548	100	3.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	303	697	0	1000	7.8		0.548		3.1	NA	0.0	0.0				
Intersection				1628	12.0		0.548		5.1	NA	2.1	21.6				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2021 PM Tomago - McIntyre - Stage 1 - Seagull Intersection

PM Tomago - McIntyre - Stage 1 - Seagull Intersection
(2021 traffic growth, Midal and redlake Volumes)
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	692	0	692	8.1	1853	0.374	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	18	18	35.7	348	0.052	100	20.2	LOS B	0.2	1.6	20	Turn Bay	0.0	0.0
Approach	0	692	18	710	8.8		0.374		0.5	NA	0.2	1.6				
North East: Median (RT Stage 2)																
Lane 1	0	0	282	282	3.4	449	0.628	100	17.9	LOS B	3.7	22.8	10	-	0.0	41.5
Approach	0	0	282	282	3.4		0.628		17.9	LOS B	3.7	22.8				
North: McIntyre Road (RT Stage 1)																
Lane 1	40	0	0	40	0.0	500	0.080	100	16.9	LOS B	0.3	1.9	20	Turn Bay	0.0	0.0
Lane 2	0	0	282	282	3.4	412	0.684	100	30.5	LOS C	5.3	38.0	500	-	0.0	0.0
Approach	40	0	282	322	2.9		0.684		28.8	LOS C	5.3	38.0				
West: Tomago Road																
Lane 1	57	612	0	669	8.6	1835	0.365	100	1.0	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	57	612	0	669	8.6		0.365		1.0	NA	0.0	0.0				
Intersection				1983	7.0		0.684		7.7	NA	5.3	38.0				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2021 AM Tomago - School - Stage 1 - CHR Intersection

Tomago-School Stage 1 (CHR intersection)
 (2021 traffic growth, Midal and redlake Volumes)
 Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	532	0	532	12.9	1799	0.296	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	50	50	0.0	629	0.079	100	13.5	LOS A	0.2	1.5	20 Turn Bay		0.0	0.0
Approach	0	532	50	582	11.8		0.296		1.2	NA	0.2	1.5				
North: School Drive																
Lane 1	10	0	4	14	0.0	338	0.041	100	16.5	LOS B	0.1	0.9	500	-	0.0	0.0
Approach	10	0	4	14	0.0		0.041		16.5	LOS B	0.1	0.9				
West: Tomago Road (W)																
Lane 1	13	705	0	718	7.6	1856	0.387	100	0.2	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	13	705	0	718	7.6		0.387		0.2	NA	0.0	0.0				
Intersection				1314	9.4		0.387		0.8	NA	0.2	1.5				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2021 PM Tomago - School -
Stage 1 - CHR Intersection

Tomago-School Stage 1 (CHR intersection)
(2021 traffic growth, Midal and redlake Volumes)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	710	0	710	8.1	1853	0.383	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	10	10	0.0	656	0.015	100	13.0	LOS A	0.0	0.3	20 Turn Bay		0.0	0.0
Approach	0	710	10	720	8.0		0.383		0.2	NA	0.0	0.3				
North: School Drive																
Lane 1	70	0	30	100	0.0	341	0.293	100	18.6	LOS B	1.1	7.6	500	-	0.0	0.0
Approach	70	0	30	100	0.0		0.293		18.6	LOS B	1.1	7.6				
West: Tomago Road (W)																
Lane 1	7	653	0	660	6.4	1871	0.353	100	0.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	7	653	0	660	6.4		0.353		0.1	NA	0.0	0.0				
Intersection				1480	6.7		0.383		1.4	NA	1.1	7.6				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2021 AM Tomago - School - Stage 1 - Existing layout

Existing layout Tomago-School Drive
(2021 traffic growth, Midal and redlake Volumes)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	532	50	582	11.8	1551	0.375	100	6.8	LOS A	4.6	35.5	500	-	0.0	0.0
Approach	0	532	50	582	11.8		0.375		6.8	NA	4.6	35.5				
North: School Drive																
Lane 1	10	0	4	14	0.0	301	0.046	100	17.8	LOS B	0.1	1.0	500	-	0.0	0.0
Approach	10	0	4	14	0.0		0.046		17.8	LOS B	0.1	1.0				
West: Tomago Road (W)																
Lane 1	13	705	0	718	7.6	1856	0.387	100	0.2	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	13	705	0	718	7.6		0.387		0.2	NA	0.0	0.0				
Intersection				1314	9.4		0.387		3.3	NA	4.6	35.5				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2021 PM Tomago - School - Stage 1 - Existing layout

Existing layout Tomago-School Drive
(2021 traffic growth, Midal and redlake Volumes)
Giveaway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road (E)																
Lane 1	0	710	10	720	8.0	1807	0.398	100	5.8	LOS A	5.8	43.2	500	-	0.0	0.0
Approach	0	710	10	720	8.0		0.398		5.8	NA	5.8	43.2				
North: School Drive																
Lane 1	70	0	30	100	0.0	294	0.340	100	21.3	LOS B	1.3	8.9	500	-	0.0	0.0
Approach	70	0	30	100	0.0		0.340		21.3	LOS B	1.3	8.9				
West: Tomago Road (W)																
Lane 1	7	653	0	660	6.4	1871	0.353	100	0.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	7	653	0	660	6.4		0.353		0.1	NA	0.0	0.0				
Intersection				1480	6.7		0.398		4.3	NA	5.8	43.2				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

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LANE SUMMARY

Site: 2021 AM Tomago - School - Stage 1 - Seagull Intersection

Tomago-School - Seagull Intersection
(2021 traffic growth, Midal and Redlake Volumes)
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	532	0	532	12.9	1799	0.296	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	50	50	0.0	566	0.088	100	15.2	LOS B	0.3	2.2	20	Turn Bay	0.0	0.0
Approach	0	532	50	582	11.8		0.296		1.3	NA	0.3	2.2				
North East: Median (RT Stage 2)																
Lane 1	0	0	4	4	0.0	578	0.007	100	9.5	LOS A	0.0	0.1	10	-	0.0	0.0
Approach	0	0	4	4	0.0		0.007		9.5	LOS A	0.0	0.1				
North: School Drive (RT Stage 1)																
Lane 1	10	0	4	14	0.0	405	0.035	100	19.1	LOS B	0.1	0.8	500	-	0.0	0.0
Approach	10	0	4	14	0.0		0.035		19.1	LOS B	0.1	0.8				
West: Tomago Road																
Lane 1	13	705	0	718	7.6	1856	0.387	100	0.2	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	13	705	0	718	7.6		0.387		0.2	NA	0.0	0.0				
Intersection				1318	9.4		0.387		0.9	NA	0.3	2.2				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.

LANE SUMMARY

Site: 2021 PM Tomago - School - Stage 1 - Seagull Intersection

Tomago-School - Seagull Intersection
(2021 traffic growth, Midal and Redlake Volumes)
Stop (Two-Way)

Lane Use and Performance																
	Demand Flows			Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
	L veh/h	T veh/h	R veh/h													
East: Tomago Road																
Lane 1	0	710	0	710	8.1	1853	0.383	100	0.0	LOS A	0.0	0.0	500	-	0.0	0.0
Lane 2	0	0	10	10	0.0	635	0.016	100	14.1	LOS A	0.1	0.4	20	Turn Bay	0.0	0.0
Approach	0	710	10	720	8.0		0.383		0.2	NA	0.1	0.4				
North East: Median (RT Stage 2)																
Lane 1	0	0	30	30	0.0	434	0.069	100	12.1	LOS A	0.2	1.3	10	-	0.0	0.0
Approach	0	0	30	30	0.0		0.069		12.1	LOS A	0.2	1.3				
North: School Drive (RT Stage 1)																
Lane 1	70	0	30	100	0.0	466	0.214	100	18.7	LOS B	0.8	5.6	500	-	0.0	0.0
Approach	70	0	30	100	0.0		0.214		18.7	LOS B	0.8	5.6				
West: Tomago Road																
Lane 1	7	653	0	660	6.4	1871	0.353	100	0.1	LOS A	0.0	0.0	500	-	0.0	0.0
Approach	7	653	0	660	6.4		0.353		0.1	NA	0.0	0.0				
Intersection				1510	6.6		0.383		1.6	NA	0.8	5.6				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

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 lanes.

SIDRA Standard Delay Model used.



Please refer to electronic files provided for all other SIDRA results contained in this report.



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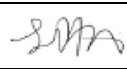
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