E x p r e s s T r a f f i c
E n g i n e e r i n g S o l u t i o n s

8 Jarring Street
Pemulwuy NSW 2145
Australia
Email: saeed9403@yahoo.com
Mob: 0425819206

Date: 15/8/2017

To: Al Mabarrat Benevolent Society

RE: Proposed school, Seventeenth Avenue, Austral-Council concerns

ETS has reviewed the recent comments and the concerns raised by Council officers in regards to the proposed school development. The following are the responses against each of the traffic management concerns raised:

1. **Council concern**: The proposed combined driveway off the north-south road is too close to the intersection.

   Response:

   During a consultation meeting with Council's traffic engineers it was agreed by both parties that this access will be deleted. The parking lot next to it will be designated for staffs and accessed via the proposed driveway off Seventeenth Avenue. A revised plan will reflect this.

2. **Council concern**: The applicant is to address the pavement width and conditions of Seventeenth Avenue and its suitability to be utilised as a bus route. All bus bays should be located in the proposed roads and not in Seventeenth Avenue. Seventeenth Avenue is to be widened along the frontage of the property prior to enrolment of the 150th student.

   Response:
   As per Austral and Leppington North (ALN) precincts Indicative Layout Plan, Seventeenth Avenue is on a more direct route in the area wide street network, compared to the proposed north-south road and more suitable for a bus route.

   During the consultation meeting with Council's traffic engineers it was agreed by both parties that the proposed bus bays both in Seventeenth Avenue and the proposed north-south ILP road will be retained. However, both of the bus bays will be designated as on-street public bus zone.

   Indented bus bays have been proposed on both Seventeenth Avenue and the north-south road which is in excess of the ILP road width. The bus bays are separated from trafficable lanes. Therefore no potential conflicts between a stopped bus and traffic within traffic lane.

3. **Council concern:** Seventeenth Avenue and all new roads are to be in accordance with the DCP Indicative Layout Plan.

   Response:

   The existing Craik Avenue, Seventeenth Avenue and the proposed north-south and east-west roads are in accordance with the Indicative Layout Plan (ILP). The width proposed for the north-south and east-west road exceeds the ILP requirement.

4. **Council concern**: There is no information on 'school zones' and external pedestrian crossing facilities.

   Response:

   The location of a proposed pedestrian crossing in Seventeenth Avenue has been identified in the revised plan. The proposed driveway is approximately 20m to the west of the proposed access off Seventeenth Avenue and approximately 40m to the east of Craik Avenue intersection. The 40m length between Craik Avenue and the proposed pedestrian crossing is likely to be sufficient to contain any queue of vehicle giving way to pedestrians crossing Seventeenth Avenue.

5. **Council concern**: The assumption that about 60% of students will use bus services and 40% of students will be driven to and from school (with a vehicle occupancy rate of 2 per vehicle) is very high and needs to be verified.

   Response:

   A further assessment has been undertaken with a revised modal split, vehicle occupancy rate and development traffic distribution pattern. In the revised assessment it is assumed that 20% of students will use bus services and 80% of students will be driven to and from school. A vehicle occupancy rate of 1.2 has been used. As part of the assessment, the impact of the development traffic at the intersection of Craik Avenue and Seventeenth Avenue has been assessed by way of intersection modeling using SIDRA. All the related background information has been reproduced below along with the revised assumptions and analysis.

   The proposed development site is subject to rezoning under Austral and Leppington North (ALN) precincts. In the Indicative Layout Plan for the precinct Craik Avenue is classified as Collector Road and Seventeenth Avenue is classified as local road. The following Table-1 has been extracted form Austral and Leppington North (ALN) Precincts Transport Assessment Post-Exhibition Traffic Report (Addendum) prepared by AECOM. Table-1 shows the predicted **year 2036** mid-block traffic volume and the classification of the roads within the precinct.

Table: 1: Future background traffic Austral and Leppington Precinct

3.7 Road network analysis and classification (road hierarchy)

(In response to Submission ID 599293 – Transport for NSW, changes to Table 8)

Table 8: Forecast 2036 peak hour flows for proposed road network

Location	Direction	AM Peak	PM Peak	AADT	Classification
Bringelly Road (W of Dickson Road)	Eastbound	3,430	1,230	46,100	Principal Arterial
	Westbound	940	3,380		
Bringelly Road (E of Dickson Road)	Eastbound	3,240	810	40,800	Principal Arterial
	Westbound	630	3,270		
Bringelly Road (E of Cowpasture Road)	Eastbound	3,890	1,440	55,000	Principal Arterial
	Westbound	1,270	4,060		
Fifteenth Avenue (E of Fourth Avenue)	Eastbound	1,230	810	22,100	Transit Boulevard
	Westbound	740	1,400		
Fifteenth Avenue (E of Craik Avenue)	Eastbound	2,040	570	27,300	Transit Boulevard
	Westbound	690	2,110		
Fourth Avenue (N of Bringelly Road)	Northbound	240	650	11,400	Sub-Arterial
	Southbound	560	490		
Fourth Avenue (N of Seventh Avenue)	Northbound	270	330	7,400	Collector Road
	Southbound	400	410		
Fourth Avenue (N of Tenth Avenue)	Northbound	410	250	8,400	Collector Road
	Southbound	260	590		
Fourth Avenue (S of Fifteenth Avenue)	Northbound	490	300	9,300	Collector Road
	Southbound	300	630		
Edmondson Avenue (N of Bringelly Road)	Northbound	880	830	16,500	Transit Boulevard
	Southbound	660	820		
Edmondson Avenue (N of Seventh Avenue)	Northbound	600	560	12,300	Transit Boulevard
	Southbound	430	670		
Edmondson Avenue (N of Tenth Avenue)	Northbound	1,020	480	15,000	Transit Boulevard
	Southbound	480	1,000		

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Revision D - 04 July 2012

The predicted year 2036 traffic volumes in Table-1 above is considered the future background traffic for the purpose of this study and has been used to predict the traffic volume on Craik Avenue.

Seventeenth Avenue is classified as local road and estimated to have low traffic volumes and generally have volumes less than 1500 to 2000 vehicles per day and 200 vehicles in the peak hour. A fourth leg has been proposed at this intersection as part of the precinct plan street network.

As no turning volumes at the intersections have been shown in the traffic and transport study for Austral and Leppington North Precinct prepared by AECOM, the following assumptions have been made in order to estimate the traffic distribution at the intersection of Craik Avenue and Seventeenth Avenue for the purpose of this study:

1. The highest predicted mid-block volumes for a collector road as stipulated in Table-1 have been assumed to be the mid-block volumes for Craik Avenue in the year 2036.

2. The mid-block peak hour volume for Seventeenth Avenue assumed to be 200 vehicles in the peak hour given that it is classified as a local road. This equates to 2000 vehicles daily.

3. The morning peak has been considered to be most critical compared to evening peak, as the commuter peak (4pm-6pm) do not coincide with school afternoon peak (2:30pm-4pm).

4. It is reasonable to assume that majority of the precinct traffic (80%) will be leaving the precinct via collector roads and 20% of the trips will be within the precinct.

5. In order to test the worst-case-scenario it is also assumed that 85% of the proposed school traffic will arrive and depart via the intersection of Craik Avenue and Sevententh Avenue and the remaining 15% will be via Seventeenth Avenue East.

The following Figure-1 shows the individual approach distribution of future background traffic at the intersection of Craik Avenue and Seventeenth Avenue in year 2036 that has been estimated considering the above assumptions.

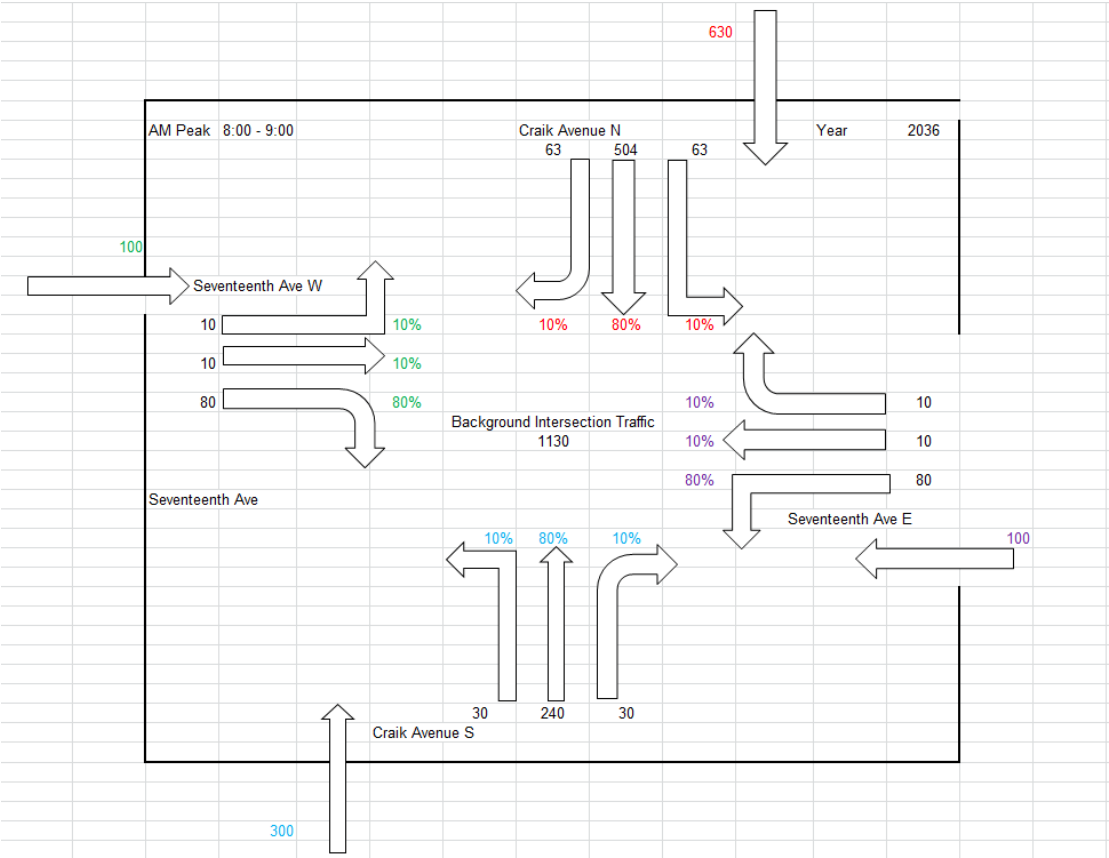

Figure 1: Background Peak hour approach traffic and assumed approch distribution pattern

The development trips have been calculated in the following table applying first hand principle:

Table 2: Development Traffic

	Development Trip Generation		
Total Students		800	
Staff		36	
Students bus transport @	20%	160	
Students car transport @	80%	640	
Student car occupancy @	1.2		
Number of vehicles transporting student		533	
Morning Peak Period	8:00am-9:30am		
		Incoming	Outgoing
Staff		36	0
Students		533	533
Total Morning Peak Period Trips		569	533
Total Morning Peak Hour Trips (60 mins)		380	356
Total combined trips in the peak hour			735
Through intersection of Craik and Seventeenth Ave	85%	323	302
Total development Traffic			625

85% of the total school trips from Table- 2 have been distributed at the intersection of Craik Avenue and Seventeenth Avenue applying the distribution pattern shown in Figure-2.

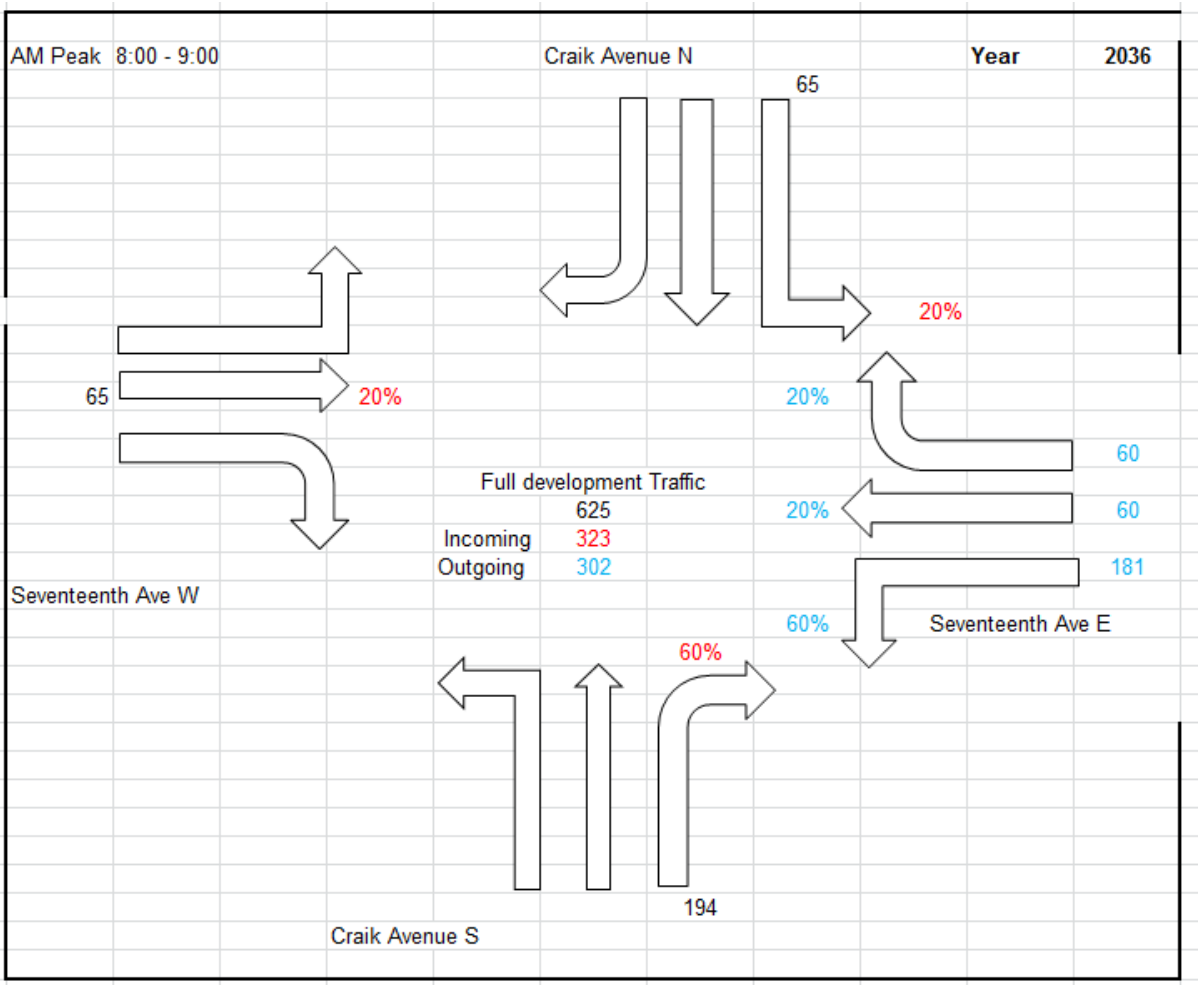

Figure 2: Peak period development traffic distribution

Figure-3 below is showing the background plus the development traffic distribution at the intersection of Craik Avenue and Seventeenth Avenue in **year 2036**.

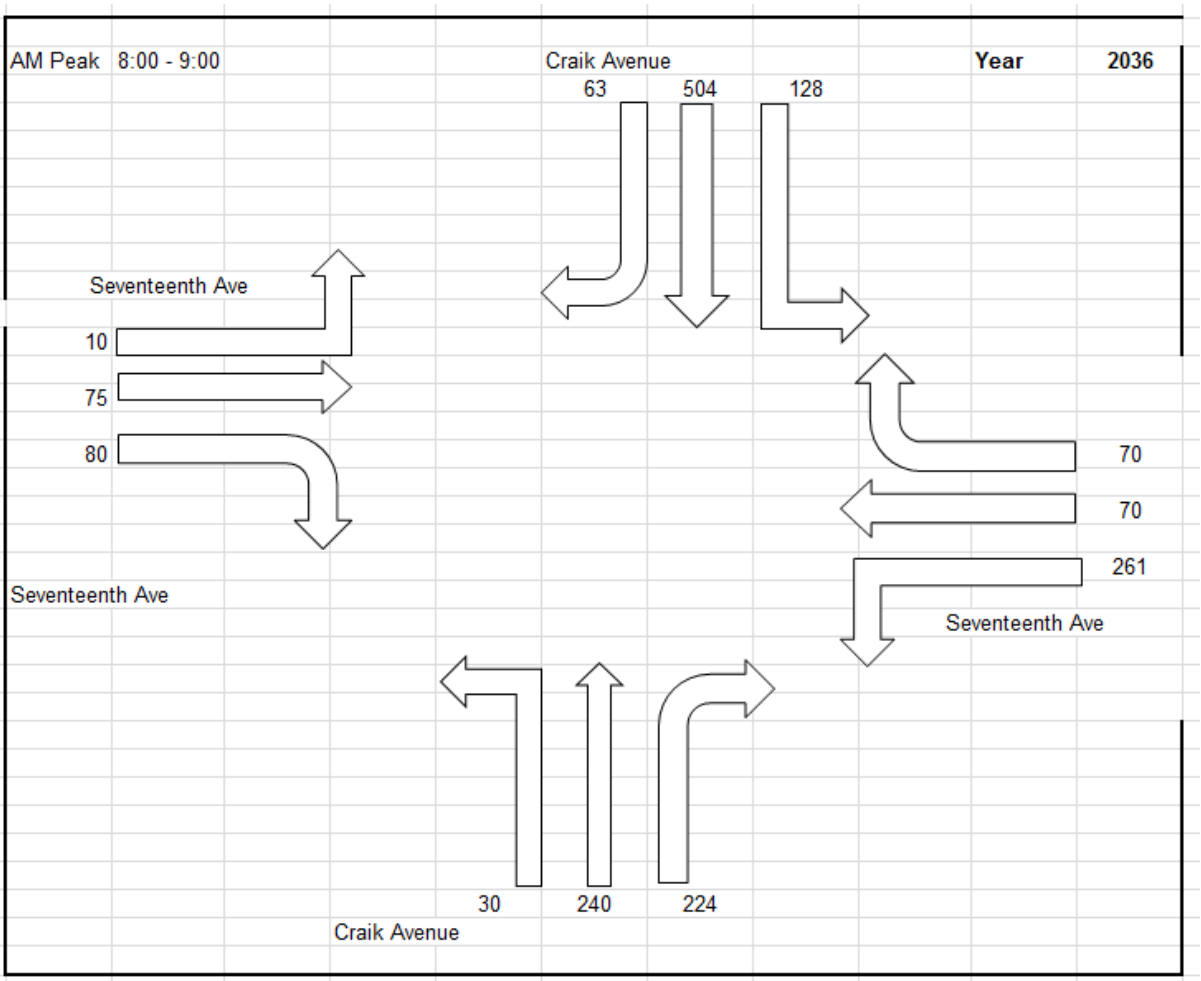

Figure 3 : Background + development Peak hour traffic distribution

An intersection count has been undertaken at the intersection of Craik Avenue and Seventeenth Avenue which is currently a T-intersection in order to capture the traffic generated form the existing school at 88 Gurner Avenue that have been using this intersection. The summary of the survey results have been shown in Figure -4.

Currently there are approximately 188 students enrolled in the existing school in Gurner Avenue. The current approval is for 350 students. The surveyed traffic volume in Figure-4 with respect to 188 students have been extrapolated for the current approval of 350 students and shown in Figure-5.

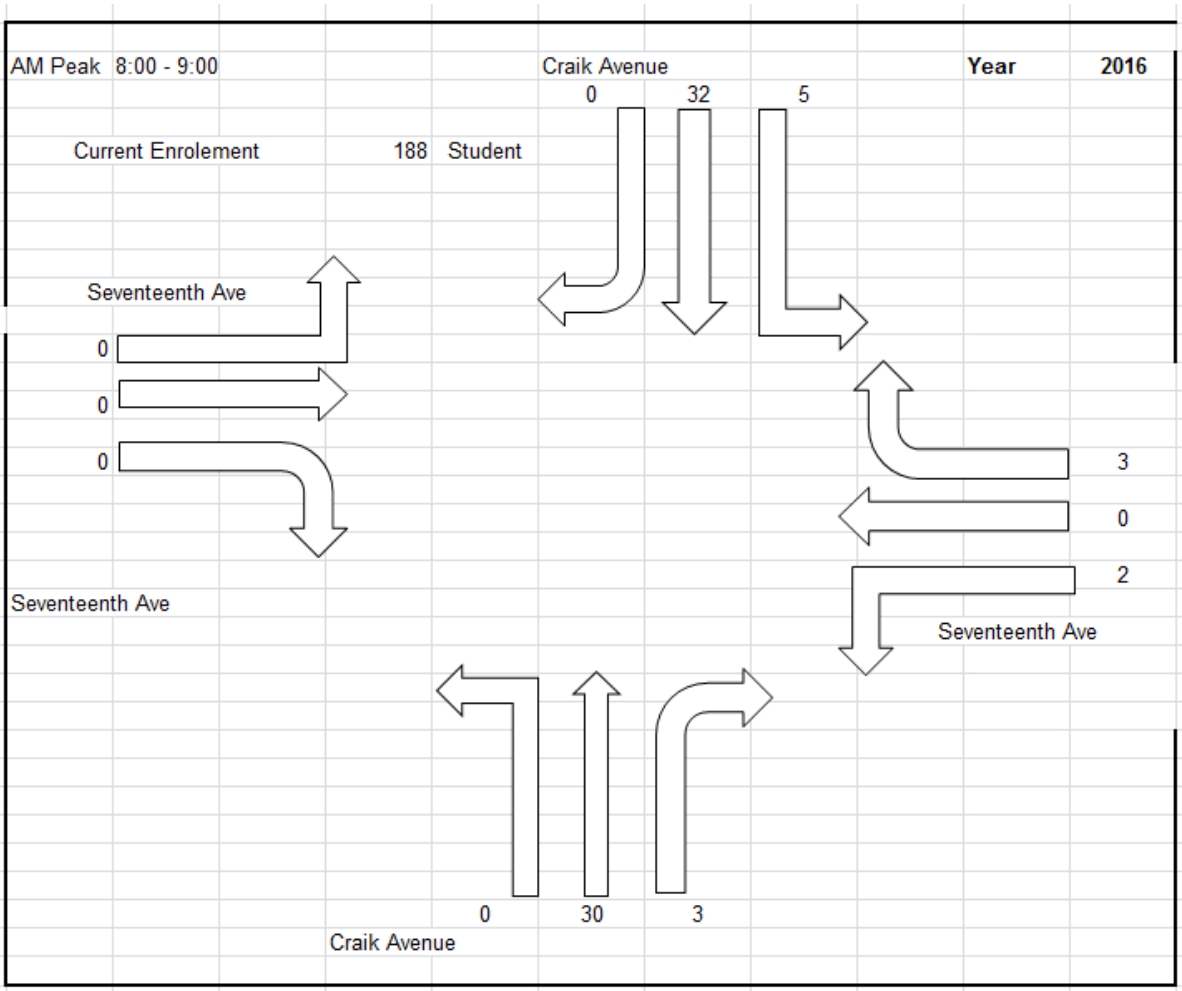

Figure 4 : Surveyed existing school peak hour traffic

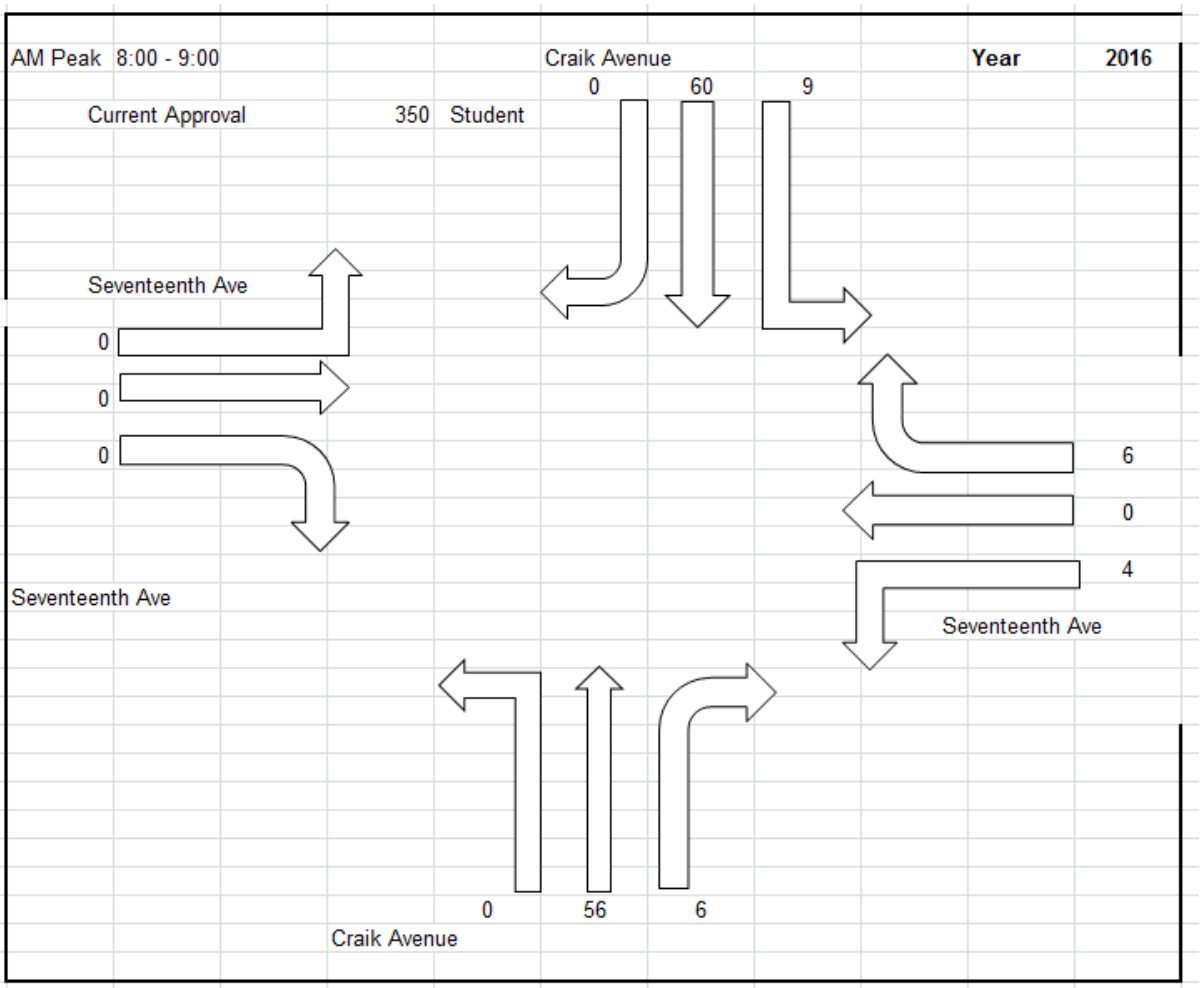

Figure 5 : existing school peak hour traffic extrapolated for 350 students

In order to identify the cumulative impact of the proposed development in year 2036, the existing school traffic that have been utilising the intersection of Craik Avenue and Seventeenth Avenue forecasted for current approval of 350 students has been added to the future background precinct traffic and the proposed school development traffic and shown in Figure-6.

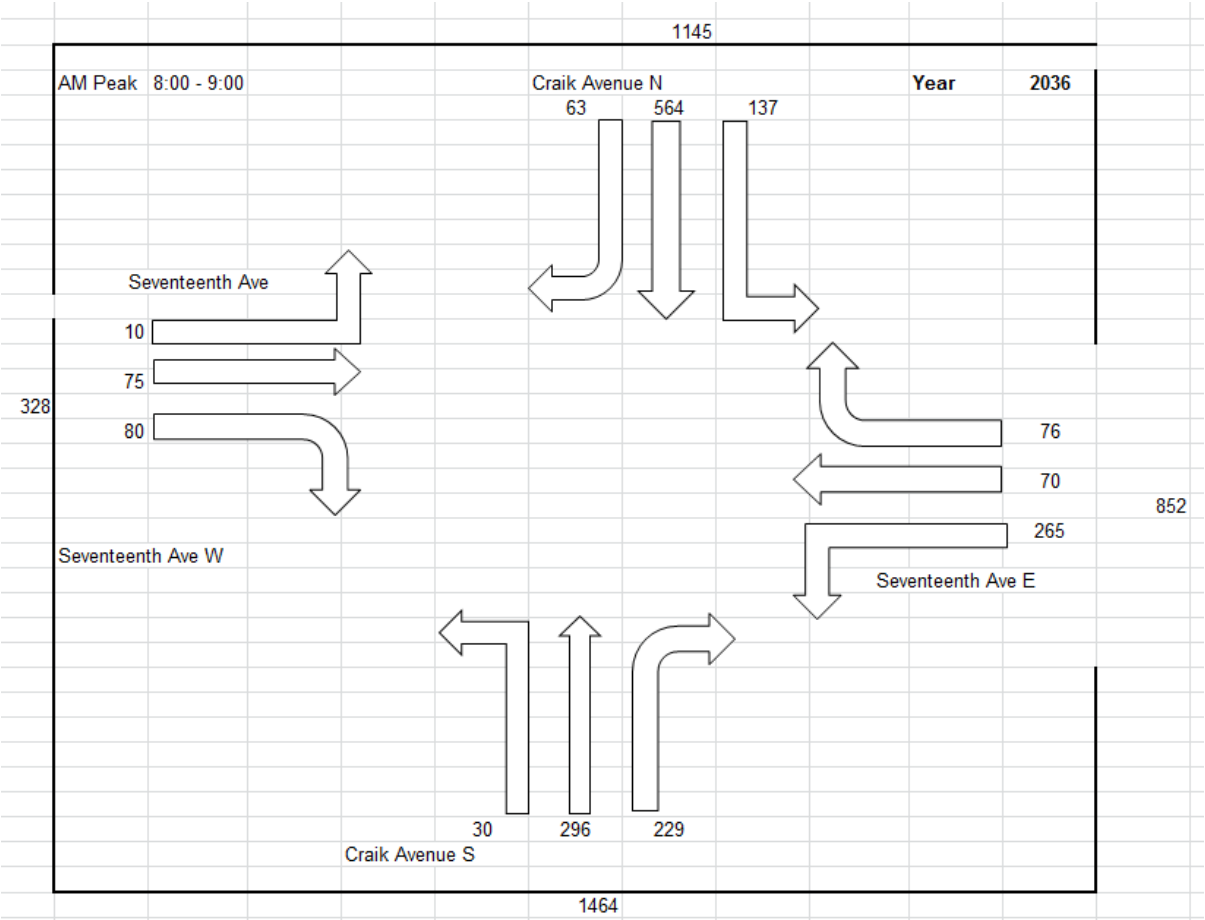

Figure 6 : Total cumulative peak hour traffic in year 2036

The intersection of Craik Avenue and Seventeenth Avenue, Austral has been modelled using computer based micro-simulation software 'SIDRA Intersection' to analyse various traffic parameters of the intersection for the future scenario.

SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating which indicates the relative performance of that intersection with regard to the average delay (seconds per vehicle) experienced by vehicles at the intersection. The average delay reported for signalised intersections is taken over all movements, while for unsignalised intersections the average delay is reported for the worst movement only.

The Level of Service criteria set by the RTA is outlined in **Table-3**

Table- 3: Level of Service Criteria (LoS)

Level of Service	Average Delay (seconds/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 accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity, requires other control mode
F	More than 70	Roundabouts require other control mode	

Source: Guide to Traffic Generating Developments, RTA 2002.

The traffic volumes in Figure-6 have been used as input volumes in the micro-simulation software 'SIDRA Intersection' in order to test the cumulative impact of the proposed school development. The intersection has been modelled as a 'Give Way' sign controlled intersection.

The results of the SIDRA analysis of the intersection of Craik Avenue and Seventeenth Avenue under the estimated traffic volume in the year 2036 are shown in **Table-4** below.

Table-4: Intersection operation Craik Avenue/Seventeenth Avenue Austral (Morning peak)

Intersection	*Scenario*	*Year*	*Worst Approach AM Peak*		*Intersection*	
			LoS	Average Delay (Seconds)	DoS	Average Delay (Seconds)
Craik Ave/ Seventeenth Ave	Future Cumulative	**2036**	D	45.6	0.9	14.5

The results of the analysis show that the worst approach of the intersection is operating at a Level of Service (LoS) of 'D' in the morning peak hour under the estimated traffic volumes in the year 2036. This includes the cumulative traffic of the proposed school development, existing school in Gurner Avenue and the Austral Precinct traffic in the year 2036. Therefore modelling results of the intersection

indicated that the intersection will be operating at an acceptable level as a sign controlled intersection. Detailed SIDRA outputs of the model have been attached.

6. **Council concern**: The applicant is to address the provision of a roundabout at the intersection of Seventeenth Avenue and Craik Avenue.

   Response:

   Based on the analysis above the proposed school development will have minimal impact on the operation of the intersection of Craik Avenue and Seventeenth Avenue. The intersection can operate as a sign controlled intersection under the future traffic load in the area which includes the proposed school development at its full capacity in year 2036. Therefore the control of the intersection of Craik Avenue and Seventeenth Avenue is not essential to be altered to a roundabout due to the proposed school development in Seventeenth Avenue.

If you need any further information or clarification please give me a call on 0425819206

Yours Sincerely

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Abdun Noor
BE(Civil) MS(Transportation) MIEAust.
Senior Traffic and Transport Engineer
L2 Road Safety Auditor/TCP Designer
Express Traffic Engineering Solution

MOVEMENT SUMMARY

Site: AM PEAK-GIVE WAY-80:20-1.2

Craik Avenue/Seventeenth Avenue
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Craik Avenue S											
1	L2	32	1.0	0.178	5.6	LOS A	0.0	0.0	0.00	0.05	57.8
2	T1	312	1.0	0.178	0.0	LOS A	0.0	0.0	0.00	0.05	59.5
3	R2	241	1.0	0.217	8.4	LOS A	1.0	7.4	0.65	0.82	50.9
Approach		584	1.0	0.217	3.8	NA	1.0	7.4	0.27	0.37	55.5
East: Seventeenth Ave E											
4	L2	279	1.0	0.902	35.8	LOS C	13.2	93.5	0.88	1.87	35.4
5	T1	74	1.0	0.902	47.6	LOS D	13.2	93.5	0.88	1.87	35.5
6	R2	80	1.0	0.902	51.0	LOS D	13.2	93.5	0.88	1.87	35.3
Approach		433	1.0	0.902	40.6	LOS C	13.2	93.5	0.88	1.87	35.4
North: Craik Avenue N											
7	L2	144	1.0	0.385	5.6	LOS A	0.0	0.0	0.00	0.12	57.2
8	T1	594	1.0	0.385	0.1	LOS A	0.0	0.0	0.00	0.12	58.9
9	R2	66	1.0	0.037	6.3	LOS A	0.2	1.4	0.42	0.59	52.0
Approach		804	1.0	0.385	1.6	NA	0.2	1.4	0.03	0.16	57.9
West: Seventeenth Ave W											
10	L2	11	1.0	0.812	29.0	LOS C	4.6	32.5	0.94	1.28	33.7
11	T1	79	1.0	0.812	43.3	LOS D	4.6	32.5	0.94	1.28	33.8
12	R2	84	1.0	0.812	50.3	LOS D	4.6	32.5	0.94	1.28	33.6
Approach		174	1.0	0.812	45.8	LOS D	4.6	32.5	0.94	1.28	33.7
All Vehicles		1995	1.0	0.902	14.5	NA	13.2	93.5	0.37	0.69	47.7

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

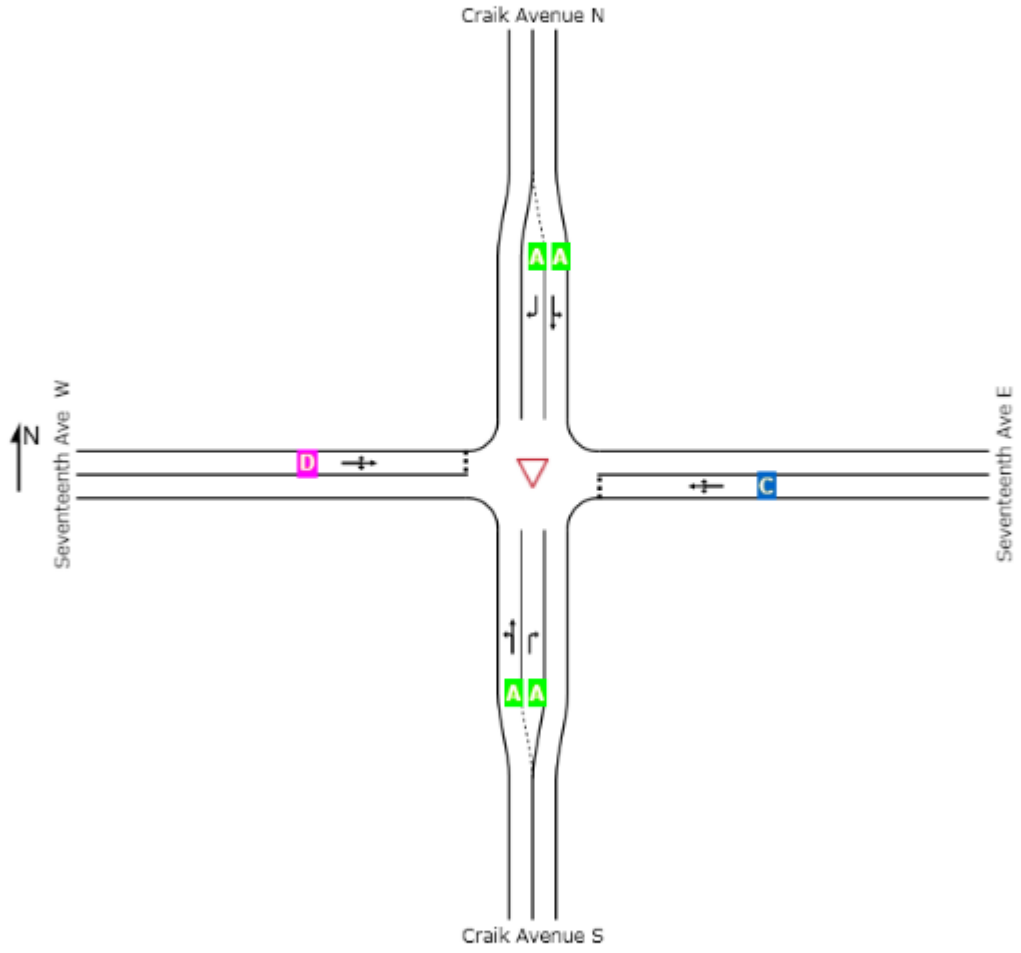
LEVEL OF SERVICE

▽ **Site: AM PEAK-GIVE WAY-80:20-1.2**

Craik Avenue/Seventeenth Avenue
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	North	West	Intersection
LOS	NA	C	NA	D	NA



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 is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

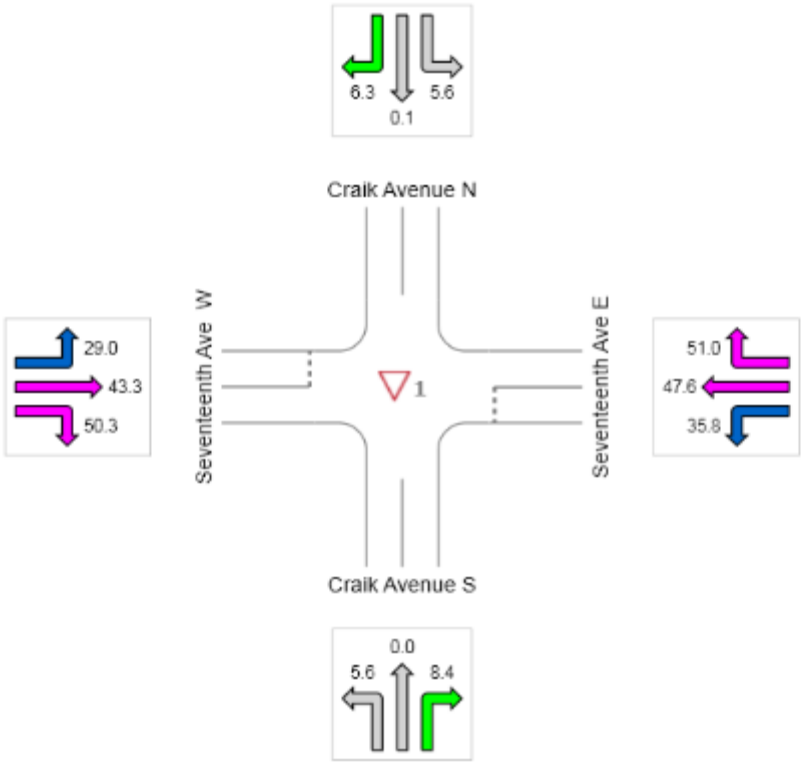
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: AM PEAK-GIVE WAY-80:20-1.2

Craik Avenue/Seventeenth Avenue
Giveway / Yield (Two-Way)

All Movement Classes

	South	East	North	West	Intersection
	3.8	40.6	1.6	45.8	14.5
LOS	NA	C	NA	D	NA



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F | Continuous

Level of Service Method: Delay (RTA NSW)
SIDRA Standard Delay Model is used. Control Delay Includes Geometric Delay.