



transport planning
traffic engineering
modelling

Proposed Child Care Centre

54 & 56 Rochester Drive, Mindarie

Transport Impact Statement

PREPARED FOR:
UZP Pty Ltd ATF Mindarie Unit Trust

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1 Introduction

This Transport Impact Statement (TIS) has been prepared by Transcore on behalf of UZP Pty Ltd ATF Mindarie Unit Trust with regard to a proposed childcare centre (CCC) to be located at 54 and 56 Rochester Drive, Mindarie in the City of Wanneroo.

The subject site is located at the southwest corner of the T-intersection of Rochester Drive and Marmion Avenue as illustrated in **Figure 1**. The subject site currently consists of two residential dwellings, each with one crossover on Rochester Drive. The site is bounded by Rochester Drive to the north, Marmion Avenue to the east and residential dwellings to the west and the south.

The location of the site in the context of the Metropolitan Region Scheme (MRS) is shown in **Figure 2**. Marmion Avenue adjacent to the subject site is classified as an Other Regional Road (Blue Road) in the MRS.

The Transport Impact Assessment Guidelines (WAPC, Vol 4 – Individual Developments, August 2016) states: *“A Transport Impact Statement is required for those developments that would be likely to generate moderate volumes of traffic¹ and therefore would have a moderate overall impact on the surrounding land uses and transport networks”*.

Section 6.1 of Transcore’s report provides details of the estimated trip generation for the proposed development. Accordingly, as the total peak hour vehicular trips are estimated to be less than 100 trips, a Transport Impact Statement is deemed appropriate for this development.

Key issues that will be addressed in this report include the traffic generation and distribution of the proposed development, access and egress movement patterns, and parking supply and demand.

¹ *Between 10 and 100 vehicular trips per hour*



Figure 1: Location of the subject site

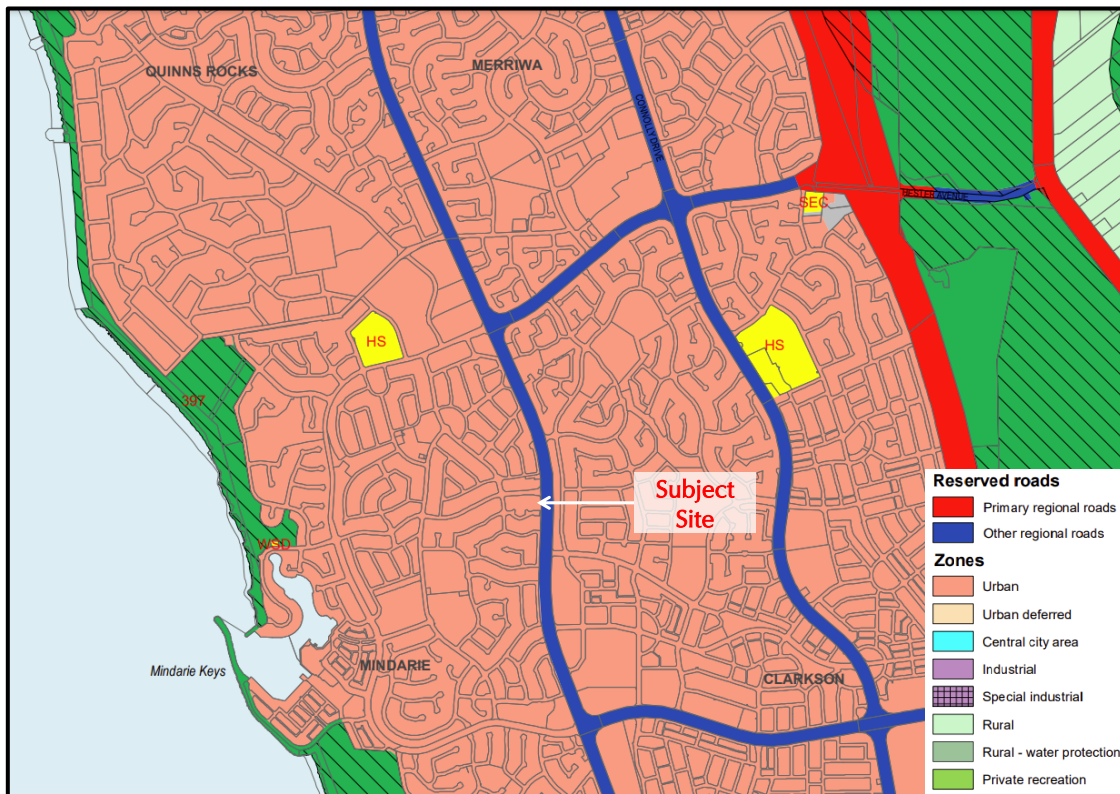


Figure 2: MRS Map

2 Proposed Development

The development application is for a child care centre (CCC) to be located at 54 and 56 Rochester Drive in Mindarie.

A single-storey building has been designed to accommodate up to 85 children and 15 staff.

Vehicular access to the subject site is currently available via two crossovers on Rochester Drive (one full movement crossover and one left in/left out). As part of the proposed development, the subject site crossovers will be rationalised to just one full movement crossover on Rochester Drive as detailed in **Section 3.1** of this report. The existing central median island opposite the subject site would need to be modified to facilitate full movement crossover in accordance with the City's specifications.

The development plan in **Appendix A** indicates a total of 24 single bays and two tandem bays. The tandem bays are located at the south eastern corner of the car parking area and dedicated to staff. Accordingly, the proposed development provides a total of 26 bays on site inclusive of one ACROD bay. One turning bay is provided at the western side of the car parking area to ensure efficient vehicular circulation within the site. The development also provides four bicycle racks at the southern side of the car park to promote use of this alternative mode of transport.

A bin storage area is provided at the south eastern corner of the car parking area. Waste collection and deliveries will be accommodated within the site. Waste collection is anticipated to take place when the facility is closed or outside peak operating periods.

It is proposed to construct a new pedestrian path link adjacent to the subject site with ramps on either side of Rochester Drive, providing access to the existing shared path on the northern side of Rochester Drive.

The proposed development plan is provided in **Appendix A**.

3 Vehicle Access and Parking

3.1 Access

Vehicular access to the subject site is currently available via two crossovers on Rochester Drive (one full movement crossover and one left in/left out).

As part of the proposed development, the subject site crossovers will be rationalised to just one full movement crossover on Rochester Drive as shown in **Figure 3**. This is located approximately 60m from the traffic lanes of Marmion Avenue and is located as far as possible from Marmion Avenue within this site frontage. This is considered the most appropriate location for this driveway crossover. The existing central median island opposite the subject site would need to be modified to facilitate full movement crossover in accordance with the City's specifications.

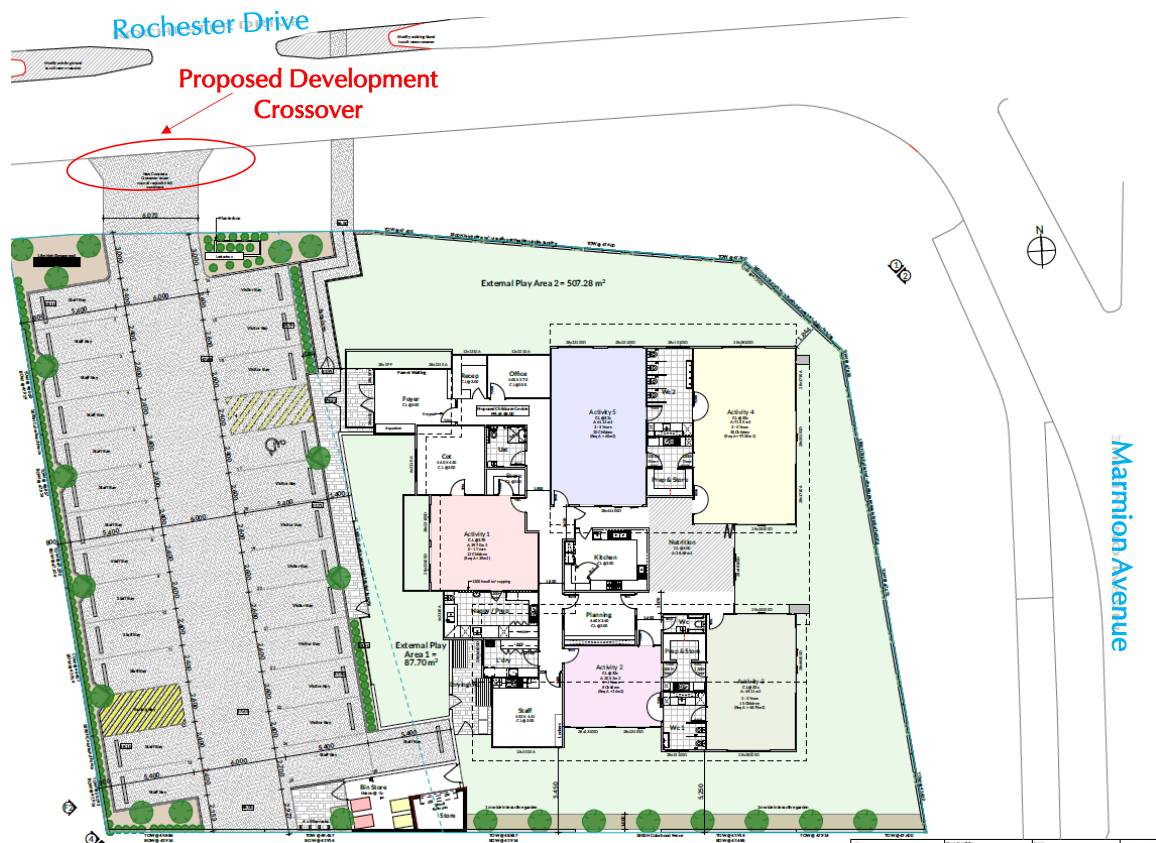


Figure 3: Location of proposed development crossover

3.2 Parking Supply and Demand

According to the City of Wanneroo Planning and Sustainability Local Planning Policy 2.3 Child Care Centres, the parking requirements applicable to the proposed CCC are:

- 1 space per employee; plus,
- 9 bays plus 1 per 8 children accommodated in excess of 54.

The proposed CCC will accommodate up to 85 children and 15 staff members. According to the City's policy the proposed CCC requires a parking provision of 28 car parking bays. The proposed CCC provides a total of 26 car parking bays which represents a theoretical shortfall of two bays. The parking supply and demand is further discussed in the following section of this report.

3.3 Estimated Actual Parking Demand Based on Trip Generation

Transcore has undertaken a parking analysis based on the anticipated peak hour traffic generation of the proposed child care centre, to estimate the actual peak parking demand of the centre.

Section 6.1 of this report details the anticipated peak hour traffic generation of the proposed CCC. It was established that the calculated morning peak hour trip generation of the proposed CCC is 34 vehicles in and 30 vehicles out of the car park (afternoon peak hour is expected to generate less trips).

This represents a potential 34 vehicles using the child care centre car park during the critical peak hour.

The NSW *"Guide to Traffic Generating Developments"* section on childcare centres provides commentary on childcare centre mode share, parking utilisation and parking length of stay. It should be noted that the commentary provided in the NSW guide is based on surveys of actual parking activity undertaken in New South Wales. The NSW guide indicates highest parking demand of 0.23 cars per child (which results in a parking requirement of 20 bays for the proposed development) and the average recorded length of stay for all surveyed child care centres of 6.8 minutes.

Conservatively assuming that the length of stay for pick-up/drop-off parking for the proposed child care centre is 10 minutes, it is calculated that each parking bay can accommodate a turnover of up to 6 vehicles per hour. Therefore, if 6 visitor bays are provided, they can accommodate a total of 36 vehicles per hour, which is sufficient for the 34 vehicles anticipated at this proposed development.

Accordingly, a minimum of 6 bays should be reserved for pick-up and drop-off activities during peak hour periods which result in actual parking demand of 21 bays (15 bays for staff + 6 pickup/drop off bays).

The proposed development provides a total of 26 bays on site which satisfies and exceeds the estimated actual parking demand of the proposed child care centre.

In addition, a public car parking facility is available within the nearby park (north of Rochester Drive) which is within the walking distance of the subject site. This public car park will be available to accommodate any overflow of parking during peak hours if required. A new pedestrian path is proposed to be constructed adjacent to the site providing connection to the existing shared path on the northern side of Rochester Drive which would improve pedestrian access and connectivity to nearby public car park.



4 Provision for Service Vehicles

A bin storage area is located at the south eastern corner of the car parking area. Waste collection will take place within the site.

The waste collection truck will be able to enter the site via the Rochester Drive crossover in forward gear, reverse into a suitable position near the bin store to collect the waste, then exit the site via the same crossover in forward gear onto Rochester Drive.

Turn path analysis carried out for 8.0m waste collection truck in **Appendix B** confirms satisfactory circulation within the site.

It is expected that the child care centre will generate a small volume of service vehicle traffic primarily associated with the deliveries for the child care centre. It is recommended that smaller vehicles such as vans should be used for deliveries.

The onsite service and waste collection activities will take place when the facility is closed or outside peak operating periods of the CCC.

5 Hours of Operation

The child care centre is proposed to operate during weekdays between 6:30AM to 6:30PM Monday to Friday.



6 Daily Traffic Volumes and Vehicle Types

6.1 Proposed Development Trip Generation

In order to establish an accurate traffic generation rate for the proposed child care centre, traffic count surveys undertaken by Transcore at similar centres in the Perth metropolitan area were sourced.

Discussions with the respective centre managers revealed that the peak drop-offs and pick-ups for each of these centres occur between the hours of 7:00AM– 10:00AM and 3:00PM–6:00PM.

From the total number of children at each of the centres on the surveyed days, the following average generation rates were established for the morning and afternoon surveyed periods:

- + 7:00AM–10:00AM: 1.58 trips per child (52% in / 48% out); and,
- + 3:00PM–6:00PM: 1.67 trips per child (47% in / 53% out).

From this information, the traffic generation rate for the combined period of 7:00AM–10:00AM and 3:00PM–6:00PM was calculated as 3.25 trips per child. To convert this figure to a daily generation rate, this figure was increased to 3.5 trips per child to account for any trips outside of the surveyed times. It was assumed that the daily in and out split for vehicle trips was 50/50.

Furthermore, the following peak hour generation rates were established from the surveys for the Child Care Centres:

- + AM peak hour: 8:00AM – 9:00AM: 0.75 trips per child (52% in / 48% out); and,
- + PM peak hour: 4:30PM – 5:30PM: 0.49 trips per child (43% in/ 57% out);

Comparison of the six-hour generation rates and the peak hour generation rates confirms that the distribution of traffic from these centres is spread over the peak periods and that full concentration of traffic does not occur in the peak hour. The AM peak hour represents 47% of the 3-hour AM peak period traffic generation and the typical school PM and road network PM peak hours represent 36% and 29% of the 3-hour PM peak period traffic generation, respectively. As such, childcare centres operate quite differently to schools as their peak period is spread out.

Accordingly, the following number of trips was estimated for the proposed child care centre, assuming a maximum scenario of 85 children being present (i.e., centre at full capacity):

- + AM peak hour: 64 trips generated (34 in / 30 out);
- + PM peak hour: 42 trips generated (18 in / 24 out); and,
- + Daily traffic generation: 298 trips generated (149 in / 149 out).

6.2 Traffic Flow

Based on the general spatial distribution of existing residential developments in the immediate area, permeability of the local road network and the assumption that all traffic attracted to the proposed child care centre would arrive/ depart via Rochester Drive, the child care centre's traffic distribution adopted for this analysis is as follows:

- 50% to/from Rochester Drive west;
- 25% to/from Marmion Avenue north; and
- 25% to/from Marmion Avenue south.

Figure 4 illustrates trip generation and traffic distribution over the local road network for the proposed development.



Figure 4: Estimated traffic movements for the subject site
AM Peak/PM Peak/Total daily trips

For this project a video survey of the existing traffic flows at the intersection of Rochester Drive/Marmion Avenue was undertaken on Thursday 2nd December 2021. The existing AM and PM peak hour traffic flows recorded at this intersection are illustrated in Figure 5.

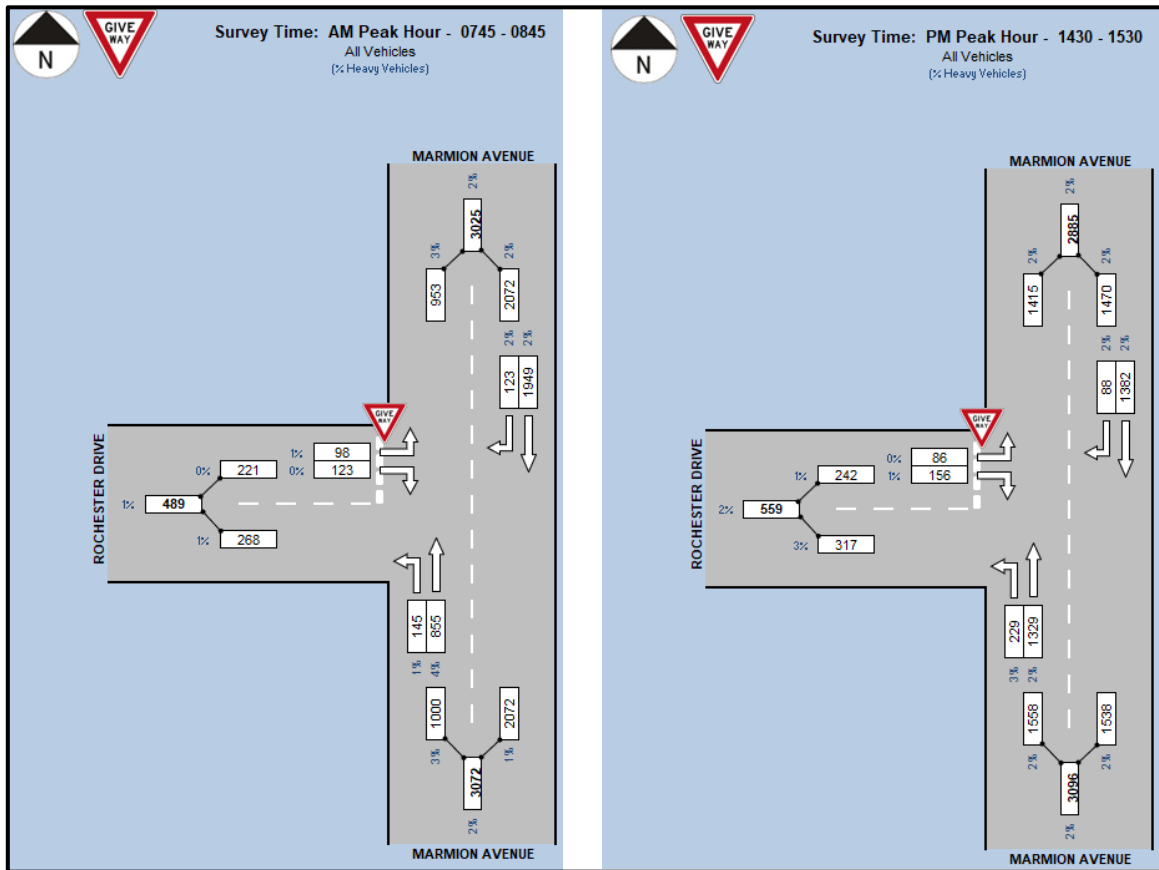


Figure 5: Existing traffic flows at Rochester Drive/Marmion Avenue

6.3 Analysis of Intersection and Development Access

The operation of the Rochester Drive/Marmion Avenue intersection and the site crossover has been analysed for the weekday AM and PM peak hours.

A SIDRA Network model was developed for the analysis in order to assess the operation of the intersection and driveway crossover during AM and PM peak periods with and without the proposed development.

SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- ✚ Degree of Saturation (DoS): is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- ✚ Level of Service (LoS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

- ✚ Average Delay: is the average of all travel time delays for vehicles through the intersection.
- ✚ 95% Queue: is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are attached in **Appendix C** and briefly discussed in the following paragraphs.

The SIDRA analysis of the existing Rochester Drive/Marmion Avenue intersection (without the proposed development) in Tables C1a and C1b indicates the intersection is currently operating at degree of saturation 0.534 in the AM peak and 0.816 in the PM peak (i.e., 53.4% and 81.6% of capacity, respectively). The SIDRA results rate the right turn movements as level of service B in the AM peak and level of service E in the PM peak based on the calculated average delays.

The SIDRA analysis of the Rochester Drive/Marmion Avenue intersection (with the proposed development) in Tables C2a and C2b indicates the intersection would operate at degree of saturation 0.534 in the AM peak and 0.845 in the PM peak (i.e. 53.4% and 84.5% of capacity, respectively). The SIDRA results still rate the right turn movements as level of service B in the AM peak and level of service E in the PM peak, so the proposed development will not result in any significant change in the existing intersection performance.

Tables C3a and C3b show that the driveway crossover for the proposed development will operate at level of service A with minimal queues and delays, and queues from the Marmion Avenue intersection are not expected to extend back to block this driveway crossover, so the proposed development access will operate satisfactorily during the critical weekday AM and PM peak periods.

6.4 Impact on Surrounding Roads

The WAPC Transport Impact Assessment Guidelines (2016) provides guidance on the assessment of traffic impacts:

“As a general guide, an increase in traffic of less than 10 per cent of capacity would not normally be likely to have a material impact on any particular section of road but increases over 10 per cent may. All sections of road with an increase greater than 10 per cent of capacity should therefore be included in the analysis. For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 per cent of capacity. Therefore, any section of road where development traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.”

It is clear that the traffic increase from the proposed development would be significantly less than the critical threshold (100vph per lane). As detailed in **Section 6.1**, the proposed development will not increase traffic on any lanes on the surrounding road network by more than 100vph, therefore the impact of the development traffic on the surrounding road network will not be significant and does not require further assessment.

7 Traffic Management on the Frontage Streets

Marmion Avenue, east of the subject site is constructed as a dual-divided carriageway with landscaped median in the immediate vicinity of the subject site as shown in **Figure 6** and **Figure 7**.

Marmion Avenue also features pedestrian paths and on street cycle lane on both sides of the road. It is classified as a Primary Distributor road in the Main Roads WA Functional Road Hierarchy and Other Regional Road (Blue Road) in the MRS. It operates under the posted speed limit of 80km/h.



Figure 6: Northbound view along Marmion Avenue



Figure 7: Southbound view along Marmion Avenue

According to the information obtained from Main Roads WA, Marmion Avenue (south of Hester Avenue) carried average weekday traffic volume of 30,178 vehicles per day (vpd) in 2017/18. The video survey undertaken for this project on Thursday 2nd of December recorded 24-hour traffic flows of 35,613vpd on Marmion Avenue north of Rochester Drive and 37,770vpd south of Rochester Drive. AM and PM peak hour traffic flows from that traffic count are illustrated in **Figure 5**.

Rochester Drive is a single carriageway, two lane divided road with a central median defined by raised paved traffic islands separated by sections of line-marking, as shown in **Figure 8** and **Figure 9**. It provides pedestrian paths on the northern side of the road.

Rochester Drive is classified as a Local Distributor Road in the Main Roads WA Functional Road Hierarchy and operates under the default built up area speed limit of 50km/h.

The video survey undertaken for this project on Thursday 2nd of December recorded 24-hour traffic flows of 4,847vpd on Rochester Drive west of Marmion Avenue.



Figure 8: Westbound view along Rochester Drive



Figure 9: Eastbound view along Rochester Drive

8 Public Transport Access

Existing public transport services in the vicinity of the subject site are shown in **Figure 10**. The closest existing bus services in the vicinity of the subject site are Transperth routes 480 and 482 which operate along Marmion Avenue adjacent to the subject site. These bus routes run between Clarkson Station and Butler Station via Marmion Avenue.

The nearest bus stop is located on Marmion Avenue approximately 145m walking distance to the north of the site.

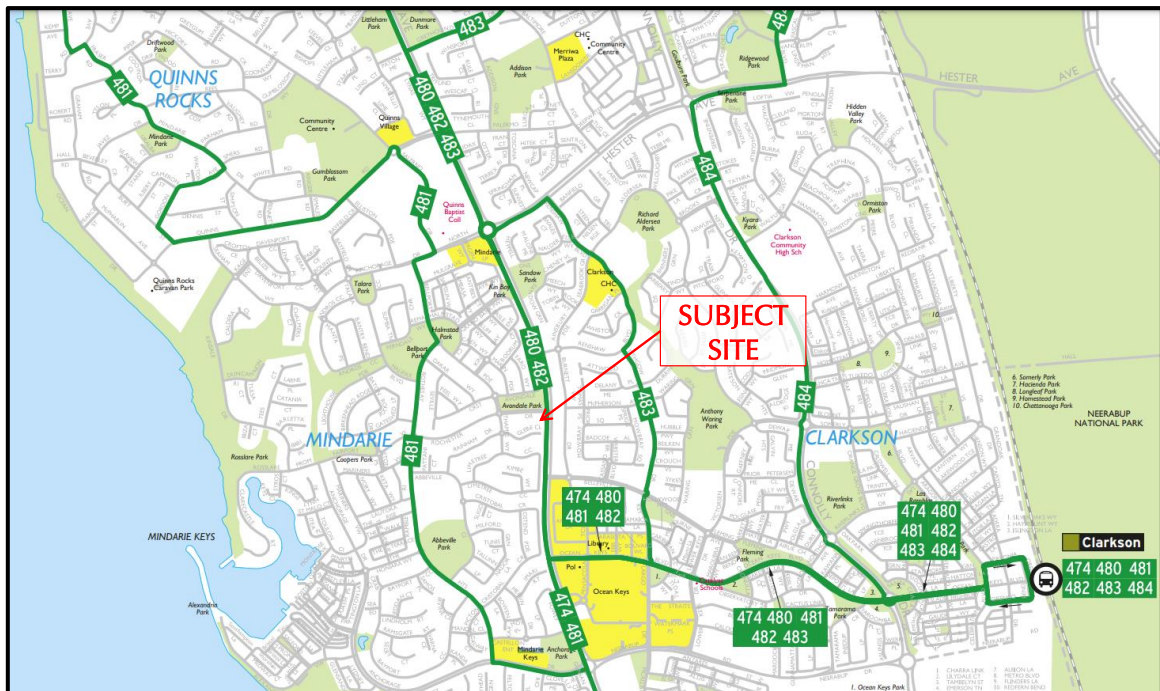


Figure 10: Public transport services (Transperth Maps)

9 Pedestrian Access

It is proposed to construct a new pedestrian path link adjacent to the subject site with ramps on either side of Rochester Drive, providing access to the existing shared path on the northern side of Rochester Drive.

Pedestrian crossing opportunity is provided at the traffic island on Rochester Drive at the T- intersection of Rochester Drive/Marmion Avenue.

10 Cycle Access

The Perth Bicycle Network Map illustrated in **Figure 11** shows an excellent cyclist connectivity to the subject site.

Rochester Drive fronting the subject site has a shared path along the northern side of the road and is also classified as a good road riding environment.

On street cycling lanes and a shared path are available on Marmion Avenue adjacent to the subject site, which provides safe access opportunity to other alternative routes in the vicinity of the subject site.

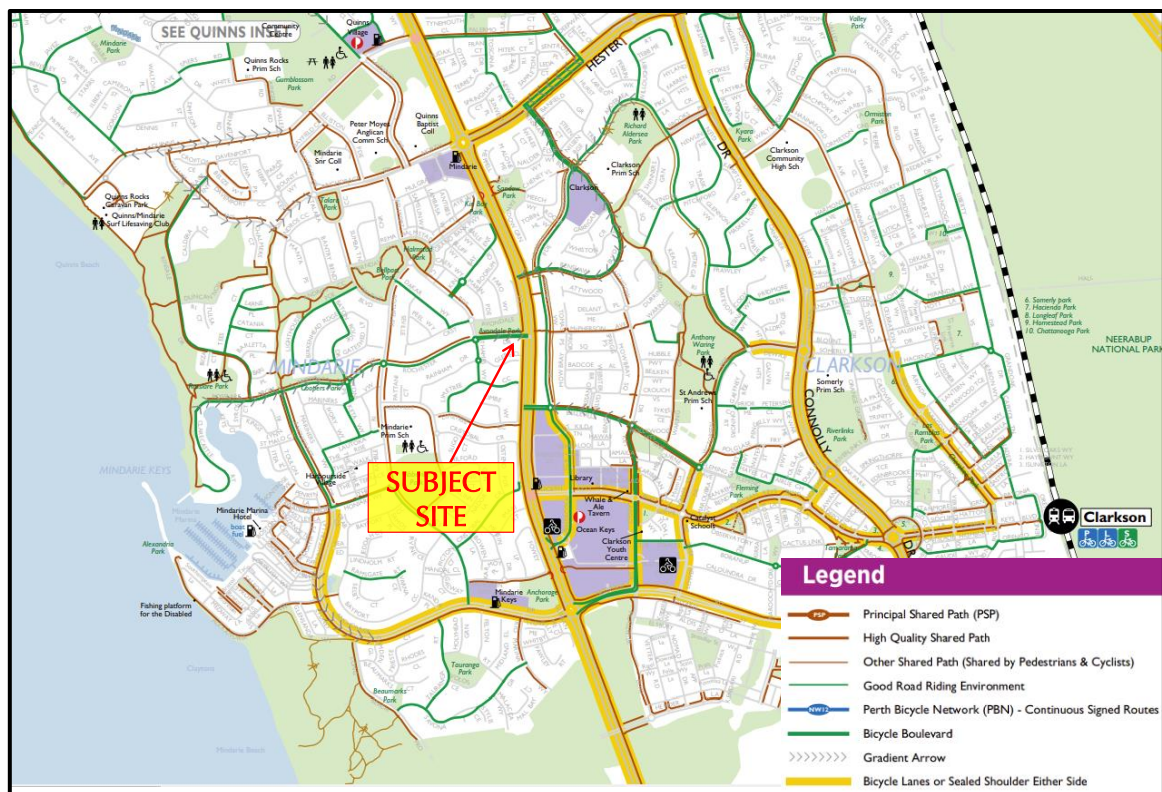


Figure 11: Extract from Perth Bicycle Network (Department of Transport)

11 Site Specific Issues

No site-specific issues have been identified for the proposed development.



12 Safety Issues

No particular safety issues have been identified for the proposed development.



13 Conclusions

This Transport Impact Statement (TIS) has been prepared by Transcore on behalf of UZP Pty Ltd ATF Mindarie Unit Trust with regard to a proposed childcare centre (CCC) to be located at 54 and 56 Rochester Drive, Mindarie in the City of Wanneroo.

The proposed CCC development entails a single storey building which will accommodate up to 85 children and 15 staff.

Vehicular access to the subject site is currently available via two crossovers on Rochester Drive (one full movement crossover and one left in/left out). As part of the proposed development, the subject site crossovers will be rationalised to just one full movement crossover on Rochester Drive. This is located approximately 60m from the traffic lanes of Marmion Avenue and is located as far as possible from Marmion Avenue within this site frontage. This is considered the most appropriate location for this driveway crossover. The existing central median island opposite the subject site would need to be modified to facilitate full movement crossover in accordance with the City's specifications.

The traffic analysis undertaken in this report shows that the traffic generation of the proposed development is relatively low and would not have any significant impact on the surrounding road network.

Based on the assessment undertaken in this report, the proposed parking supply of 26 parking bays represents two bays theoretical shortfall under the City's policy but is considered to be sufficient to cater for the actual parking demand expected to be generated by the proposed development and should therefore be considered satisfactory.

Waste collection and delivery activity for the CCC will be accommodated within the site and will occur outside the peak operating periods or when the facility is closed.

The site features good connectivity with the existing road network, pedestrian path and cyclist network. The site enjoys good public transport access through the existing bus services operating in close proximity of the site. A new pedestrian path is proposed to be constructed adjacent to the site providing connection to the existing shared path on the northern side of Rochester Drive which would improve pedestrian access and connectivity to the nearby public car park.

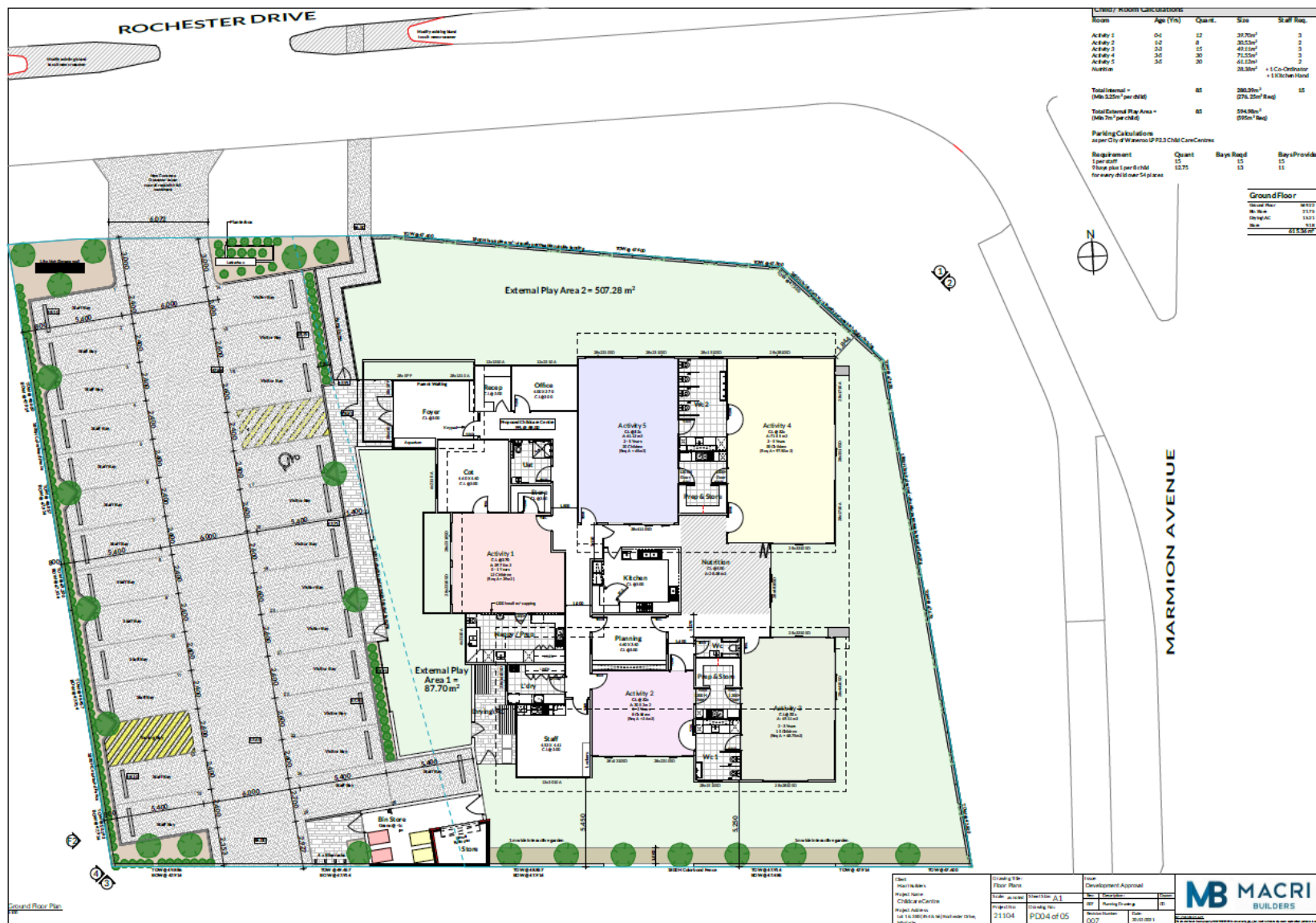
The operation of the proposed development crossover on Rochester Drive and the T-intersection of Rochester Drive/Marmion Avenue have been analysed using SIDRA Network modelling software. The analysis result indicates satisfactory traffic operation of the development crossover and minimal impact on the T-intersection of Rochester Drive/Marmion Avenue as a result of the proposed development.

It is concluded that the findings of this Transport Impact Statement are supportive of the proposed development.

Appendix A

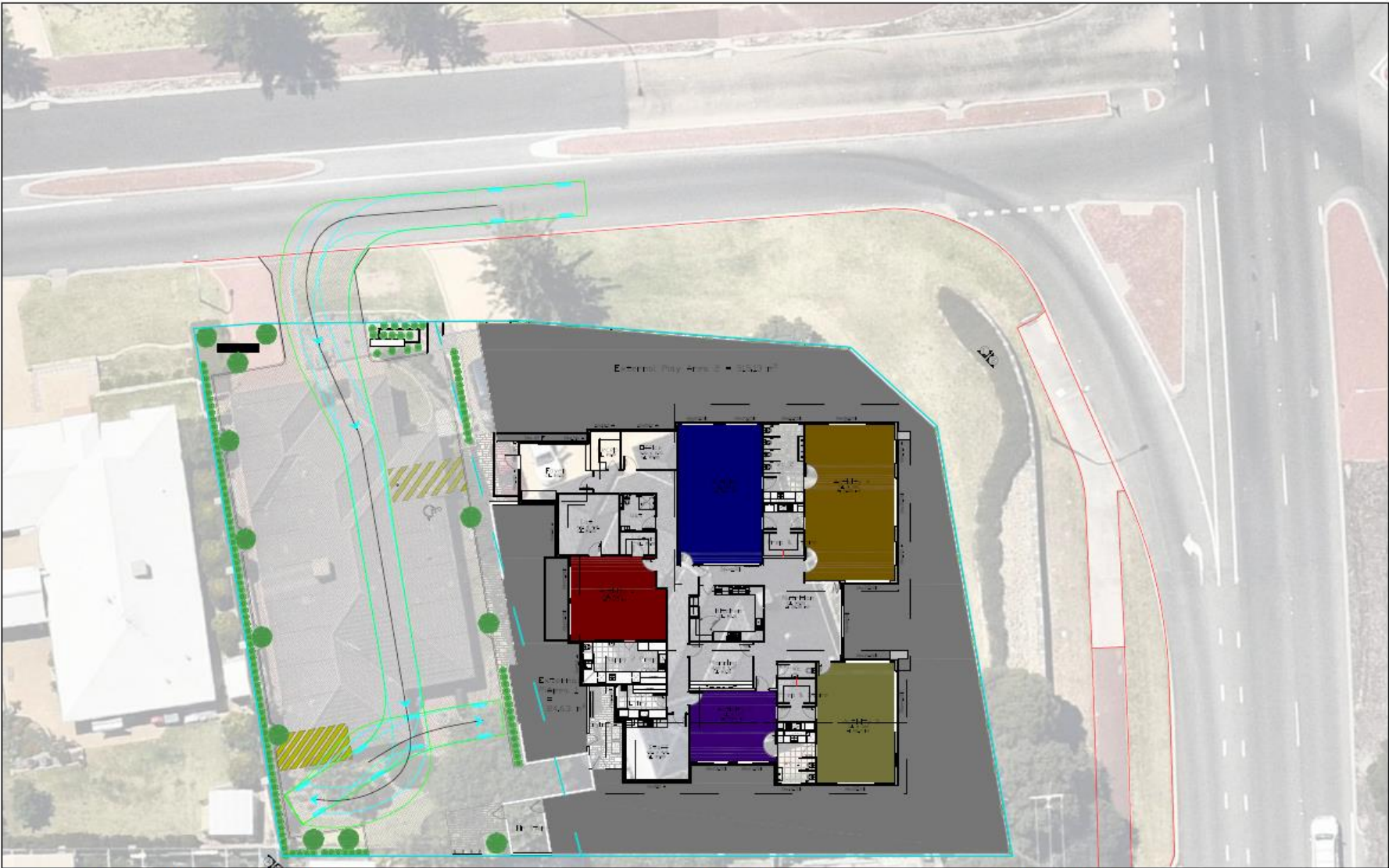
PROPOSED DEVELOPMENT PLAN





Appendix B

TURN PATH ANALYSIS

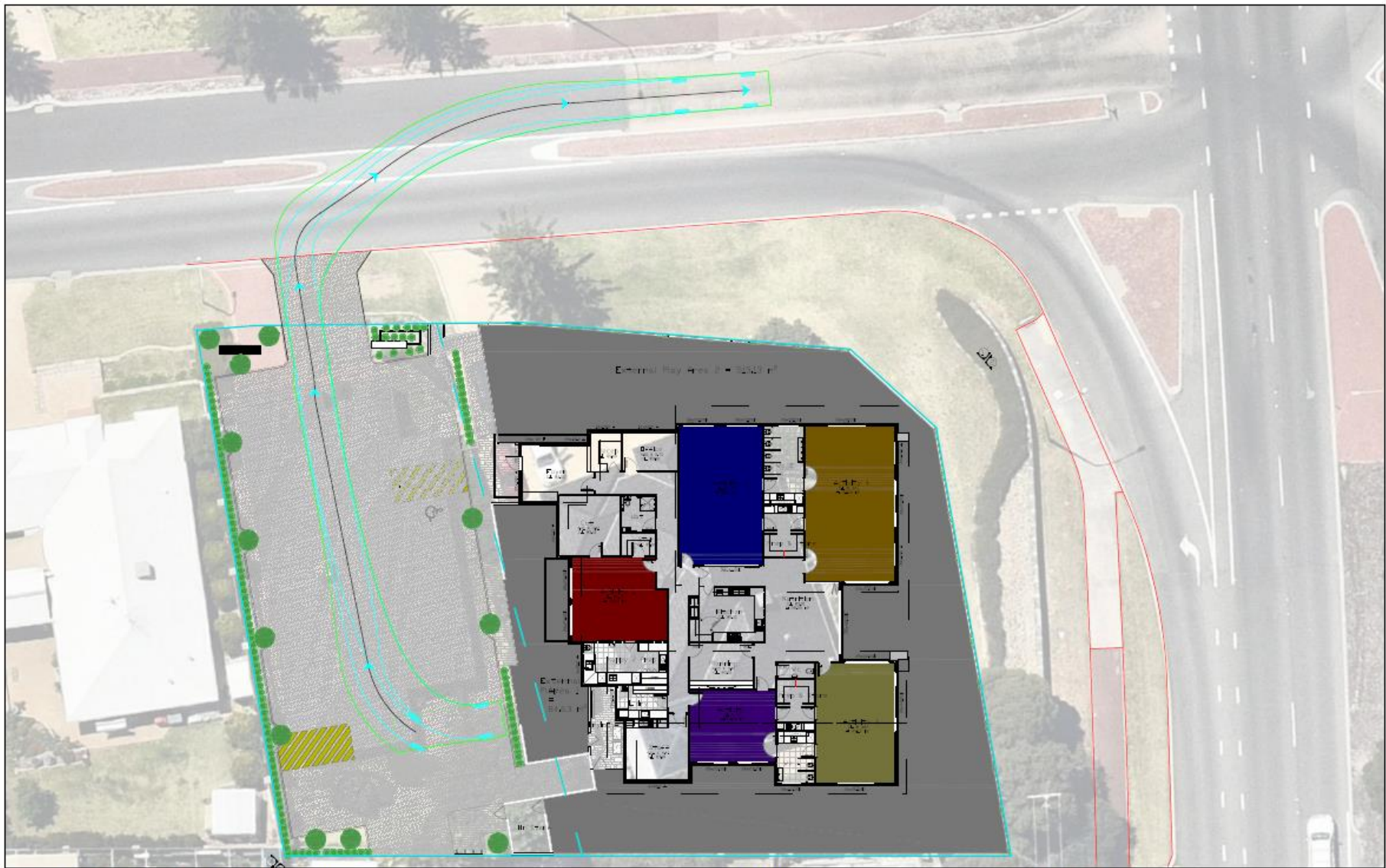


54 & 56 Rochester Way, Mindarie
 8.0m Waste Collection Truck - Option 2
 Waste Truck Entry

LEGEND
 Vehicle Body █
 Wheel Path █

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 1/12/2021
 Scale: 1:250 @ A3





54 & 56 Rochester Way, Mindarie
 8.0m Waste Collection Truck - Option 2
 Waste Truck Exit

LEGEND
 Vehicle Body
 Wheel Path



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 Scale: 1:250 @ A3



Appendix C

SIDRA INTERSECTION ANALYSIS

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

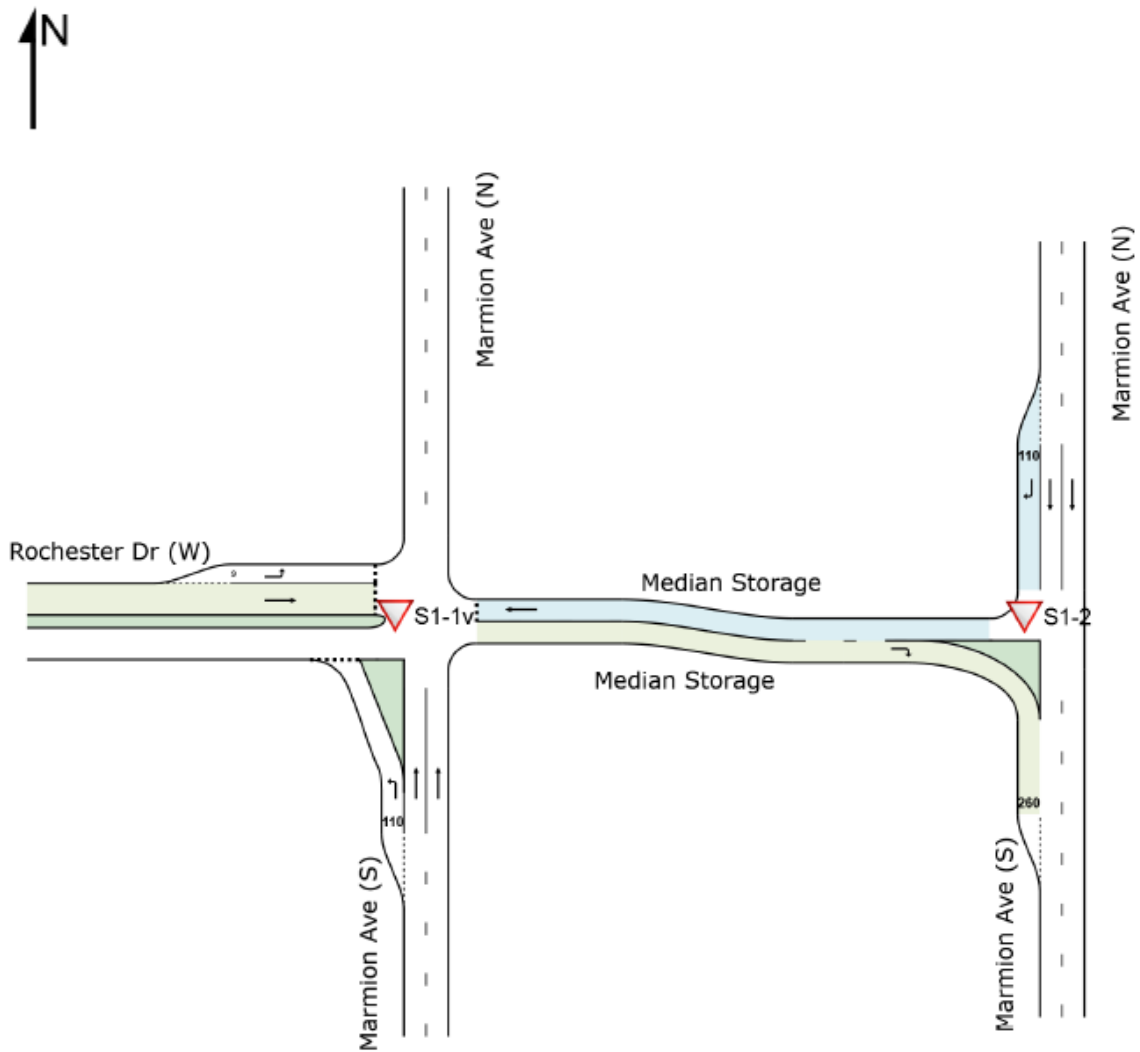


Figure C1. Existing Marmion Ave / Rochester Dr intersection layout analysed in SIDRA Network

(Not to Scale.)

Note: The Marmion Avenue T-intersection is modelled as a network of two intersections linked together to allow analysis of the right turn out from the side road in two stages (from side road to median then from the median into the southbound traffic flow).

Table C1a. SIDRA results – Marmion Ave / Rochester Dr intersection – existing weekday AM peak

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Marmion Ave (S)														
3	L2	153	2.1	153	2.1	0.106	7.8	LOS A	0.4	3.2	0.22	0.58	0.22	50.4
4	T1	900	5.7	900	5.7	0.243	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		1053	5.2	1053	5.2	0.243	1.2	LOS A	0.4	3.2	0.03	0.08	0.03	74.1
East: Median Storage														
5	T1	129	4.9	129	4.9	0.219	6.7	LOS A	0.8	6.3	0.66	0.80	0.68	33.9
Approach		129	4.9	129	4.9	0.219	6.7	LOS A	0.8	6.3	0.66	0.80	0.68	33.9
West: Rochester Dr (W)														
1	L2	103	2.0	103	2.0	0.160	9.3	LOS A	0.6	4.5	0.64	0.83	0.64	42.6
2	T1	129	0.8	129	0.8	0.281	10.7	LOS B	1.0	7.8	0.70	0.87	0.81	29.5
Approach		233	1.4	233	1.4	0.281	10.1	LOS B	1.0	7.8	0.67	0.85	0.74	36.7
All Vehicles		1415	4.5	1415	4.5	0.281	3.1	NA	1.0	7.8	0.20	0.28	0.21	63.8
Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
North: Marmion Ave (N)														
2	T1	2052	2.6	2052	2.6	0.534	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.4
3	R2	129	4.9	129	4.9	0.073	6.9	LOS A	0.0	0.0	0.00	0.67	0.00	51.4
Approach		2181	2.8	2181	2.8	0.534	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.2
West: Median Storage														
1	R2	129	0.8	129	0.8	0.070	5.8	LOS A	0.0	0.0	0.00	0.51	0.00	42.7
Approach		129	0.8	129	0.8	0.070	5.8	NA	0.0	0.0	0.00	0.51	0.00	42.7
All Vehicles		2311	2.6	2311	2.6	0.534	0.8	NA	0.0	0.0	0.00	0.07	0.00	76.1

Table C1b. SIDRA results – Marmion Ave / Rochester Dr intersection – existing
weekday PM peak

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Marmion Ave (S)														
3	L2	241	3.5	241	3.5	0.162	7.7	LOS A	0.7	5.3	0.19	0.58	0.19	50.2
4	T1	1399	3.3	1399	3.3	0.367	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach		1640	3.3	1640	3.3	0.367	1.2	LOS A	0.7	5.3	0.03	0.09	0.03	73.9
East: Median Storage														
5	T1	93	4.5	93	4.5	0.316	15.3	LOS C	1.1	8.6	0.85	0.96	1.01	25.0
Approach		93	4.5	93	4.5	0.316	15.3	LOS C	1.1	8.6	0.85	0.96	1.01	25.0
West: Rochester Dr (W)														
1	L2	91	2.3	91	2.3	0.284	17.6	LOS C	1.1	7.9	0.85	0.97	0.98	35.3
2	T1	164	3.8	164	3.8	0.816	43.4	LOS E	4.3	33.1	0.96	1.34	2.21	13.1
Approach		255	3.3	255	3.3	0.816	34.2	LOS D	4.3	33.1	0.92	1.21	1.77	20.1
All Vehicles		1987	3.4	1987	3.4	0.816	6.1	NA	4.3	33.1	0.18	0.27	0.30	59.4
Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
North: Marmion Ave (N)														
2	T1	1455	3.4	1455	3.4	0.382	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
3	R2	93	4.5	93	4.5	0.052	6.9	LOS A	0.0	0.0	0.00	0.67	0.00	51.4
Approach		1547	3.5	1547	3.5	0.382	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.4
West: Median Storage														
1	R2	164	3.8	164	3.8	0.092	4.1	LOS A	0.0	0.0	0.00	0.51	0.00	41.4
Approach		164	3.8	164	3.8	0.092	4.1	NA	0.0	0.0	0.00	0.51	0.00	41.4
All Vehicles		1712	3.5	1712	3.5	0.382	0.8	NA	0.0	0.0	0.00	0.09	0.00	74.5

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

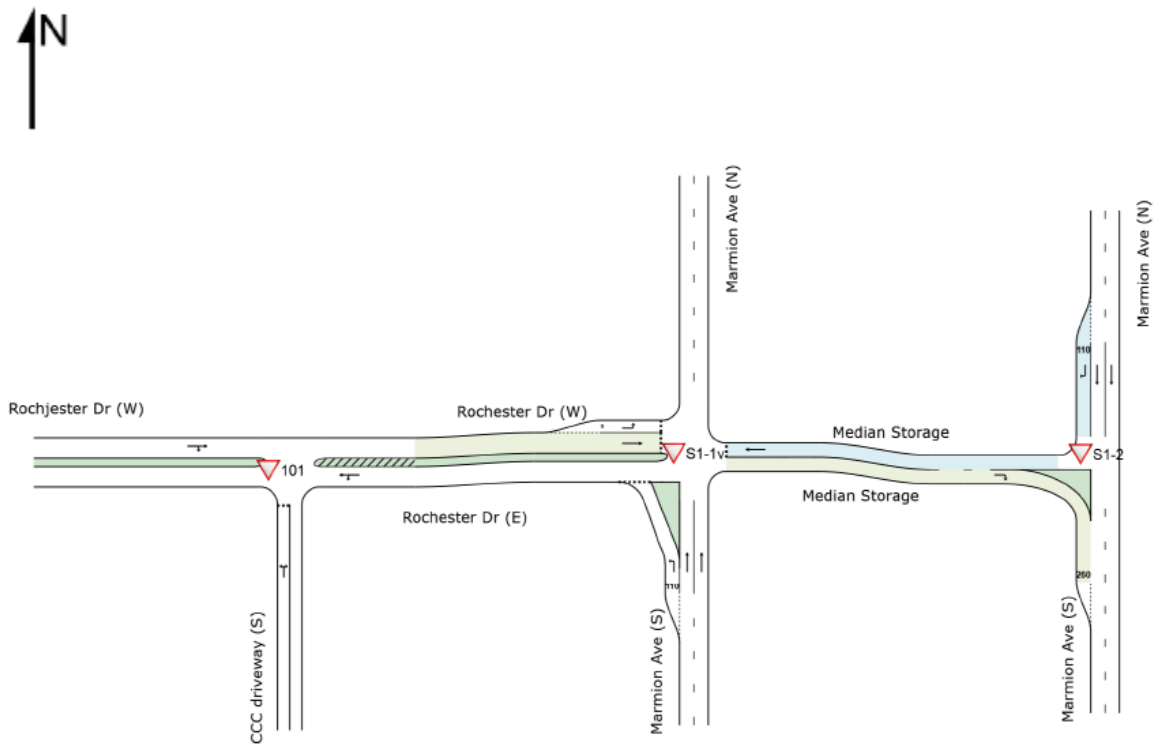


Figure C2. Marmion Ave / Rochester Dr intersection and proposed CCC driveway layout analysed in SIDRA Network

(Not to Scale)

Note: The Marmion Avenue T-intersection is modelled as a network of two intersections linked together to allow analysis of the right turn out from the side road in two stages (from side road to median then from the median into the southbound traffic flow).

Table C2a. SIDRA results – Marmion Ave / Rochester Dr intersection – existing weekday AM peak with proposed CCC development

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
South: Marmion Ave (S)														
3	L2	162	1.9	162	1.9	0.113	7.8	LOS A	0.5	3.4	0.23	0.59	0.23	50.8
4	T1	900	5.7	900	5.7	0.243	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		1062	5.2	1062	5.2	0.243	1.2	LOS A	0.5	3.4	0.04	0.09	0.04	75.9
East: Median Storage														
5	T1	138	4.6	138	4.6	0.233	6.7	LOS A	0.9	6.8	0.66	0.81	0.70	11.0
Approach		138	4.6	138	4.6	0.233	6.7	LOS A	0.9	6.8	0.66	0.81	0.70	11.0
West: Rochester Dr (W)														
1	L2	111	1.9	111	1.9	0.171	9.1	LOS A	0.7	4.9	0.64	0.83	0.64	40.4
2	T1	138	0.8	138	0.8	0.299	10.6	LOS B	1.1	8.4	0.71	0.88	0.84	16.7
Approach		248	1.3	248	1.3	0.299	9.9	LOS A	1.1	8.4	0.68	0.86	0.75	31.0
All Vehicles		1448	4.4	1448	4.4	0.299	3.2	NA	1.1	8.4	0.21	0.29	0.22	66.3
Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
North: Marmion Ave (N)														
2	T1	2052	2.6	2052	2.6	0.534	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.4
3	R2	138	4.6	138	4.6	0.077	6.9	LOS A	0.0	0.0	0.00	0.67	0.00	51.4
Approach		2189	2.7	2189	2.7	0.534	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.1
West: Median Storage														
1	R2	138	0.8	138	0.8	0.074	5.9	LOS A	0.0	0.0	0.00	0.51	0.00	42.7
Approach		138	0.8	138	0.8	0.074	5.9	NA	0.0	0.0	0.00	0.51	0.00	42.7
All Vehicles		2327	2.6	2327	2.6	0.534	0.8	NA	0.0	0.0	0.00	0.07	0.00	75.9

Table C2b. SIDRA results – Marmion Ave / Rochester Dr intersection – existing weekday PM peak with proposed CCC development

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
South: Marmion Ave (S)														
3	L2	246	3.4	246	3.4	0.167	7.7	LOS A	0.7	5.4	0.20	0.58	0.20	51.1
4	T1	1399	3.3	1399	3.3	0.367	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach		1645	3.3	1645	3.3	0.367	1.2	LOS A	0.7	5.4	0.03	0.09	0.03	75.9
East: Median Storage														
5	T1	97	4.3	97	4.3	0.329	15.4	LOS C	1.2	9.1	0.86	0.96	1.03	5.5
Approach		97	4.3	97	4.3	0.329	15.4	LOS C	1.2	9.1	0.86	0.96	1.03	5.5
West: Rochester Dr (W)														
1	L2	97	2.2	97	2.2	0.303	17.5	LOS C	1.1	8.6	0.85	0.98	1.00	31.5
2	T1	171	3.7	171	3.7	0.845	46.6	LOS E	4.8	36.7	0.97	1.40	2.42	5.1
Approach		267	3.1	267	3.1	0.845	36.1	LOS E	4.8	36.7	0.93	1.25	1.91	12.9
All Vehicles		2009	3.4	2009	3.4	0.845	6.5	NA	4.8	36.7	0.19	0.28	0.33	59.7
Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
North: Marmion Ave (N)														
2	T1	1455	3.4	1455	3.4	0.382	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
3	R2	97	4.3	97	4.3	0.054	6.9	LOS A	0.0	0.0	0.00	0.67	0.00	51.4
Approach		1552	3.5	1552	3.5	0.382	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.4
West: Median Storage														
1	R2	171	3.7	171	3.7	0.095	4.1	LOS A	0.0	0.0	0.00	0.51	0.00	41.5
Approach		171	3.7	171	3.7	0.095	4.1	NA	0.0	0.0	0.00	0.51	0.00	41.5
All Vehicles		1722	3.5	1722	3.5	0.382	0.8	NA	0.0	0.0	0.00	0.09	0.00	74.4

Table C3a. SIDRA results – Rochester Dr / CCC driveway– existing weekday AM peak with proposed CCC development

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	Dist m				
South: CCC driveway (S)														
1	L2	16	0.0	16	0.0	0.033	3.9	LOS A	0.1	0.8	0.38	0.58	0.38	35.7
3	R2	16	0.0	16	0.0	0.033	5.3	LOS A	0.1	0.8	0.38	0.58	0.38	20.5
Approach		32	0.0	32	0.0	0.033	4.6	LOS A	0.1	0.8	0.38	0.58	0.38	31.2
East: Rochester Dr (E)														
4	L2	18	0.0	18	0.0	0.146	4.3	LOS A	0.0	0.0	0.00	0.03	0.00	39.9
5	T1	282	3.4	282	3.4	0.146	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.1
Approach		300	3.2	300	3.2	0.146	0.3	NA	0.0	0.0	0.00	0.03	0.00	48.8
West: Rochester Dr (W)														
11	T1	233	1.4	233	1.4	0.125	0.1	LOS A	0.2	1.2	0.07	0.04	0.07	47.2
12	R2	18	0.0	18	0.0	0.125	5.7	LOS A	0.2	1.2	0.07	0.04	0.07	42.4
Approach		251	1.3	251	1.3	0.125	0.5	NA	0.2	1.2	0.07	0.04	0.07	46.8
All Vehicles		582	2.2	582	2.2	0.146	0.6	NA	0.2	1.2	0.05	0.07	0.05	47.1

Table C3b. SIDRA results – Rochester Dr / CCC driveway– existing weekday PM peak with proposed CCC development

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	Dist m				
South: CCC driveway (S)														
1	L2	13	0.0	13	0.0	0.028	4.1	LOS A	0.1	0.7	0.42	0.60	0.42	35.1
3	R2	13	0.0	13	0.0	0.028	5.7	LOS A	0.1	0.7	0.42	0.60	0.42	19.7
Approach		25	0.0	25	0.0	0.028	4.9	LOS A	0.1	0.7	0.42	0.60	0.42	30.5
East: Rochester Dr (E)														
4	L2	9	0.0	9	0.0	0.168	4.3	LOS A	0.0	0.0	0.00	0.02	0.00	40.5
5	T1	334	3.8	334	3.8	0.168	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.5
Approach		343	3.7	343	3.7	0.168	0.1	NA	0.0	0.0	0.00	0.02	0.00	49.4
West: Rochester Dr (W)														
11	T1	255	3.3	255	3.3	0.132	0.1	LOS A	0.1	0.7	0.04	0.02	0.04	48.5
12	R2	9	0.0	9	0.0	0.132	5.9	LOS A	0.1	0.7	0.04	0.02	0.04	43.2
Approach		264	3.2	264	3.2	0.132	0.3	NA	0.1	0.7	0.04	0.02	0.04	48.2
All Vehicles		633	3.3	633	3.3	0.168	0.4	NA	0.1	0.7	0.03	0.04	0.03	48.2