



APPENDIX 5

5. TRANSPORT IMPACT STATEMENT

Shawmac

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Transport Impact Assessment

Project: Vietnamese Cultural Centre
1 Curtis Way, Girrawheen

Client: Vietnamese Community in Australia WA Chapter
c/- Parry and Rosenthal Architects

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1. Introduction and Background

1.1. Proponent

Shawmac Pty Ltd has been engaged by the Vietnamese Community in Australia WA Chapter to prepare a Transport Impact Assessment (TIA) for a proposed Vietnamese Cultural Centre in Girrawheen.

1.2. Site Location

The site address is 1 Curtis Way, Girrawheen. The general site location is shown in **Figure 1**.

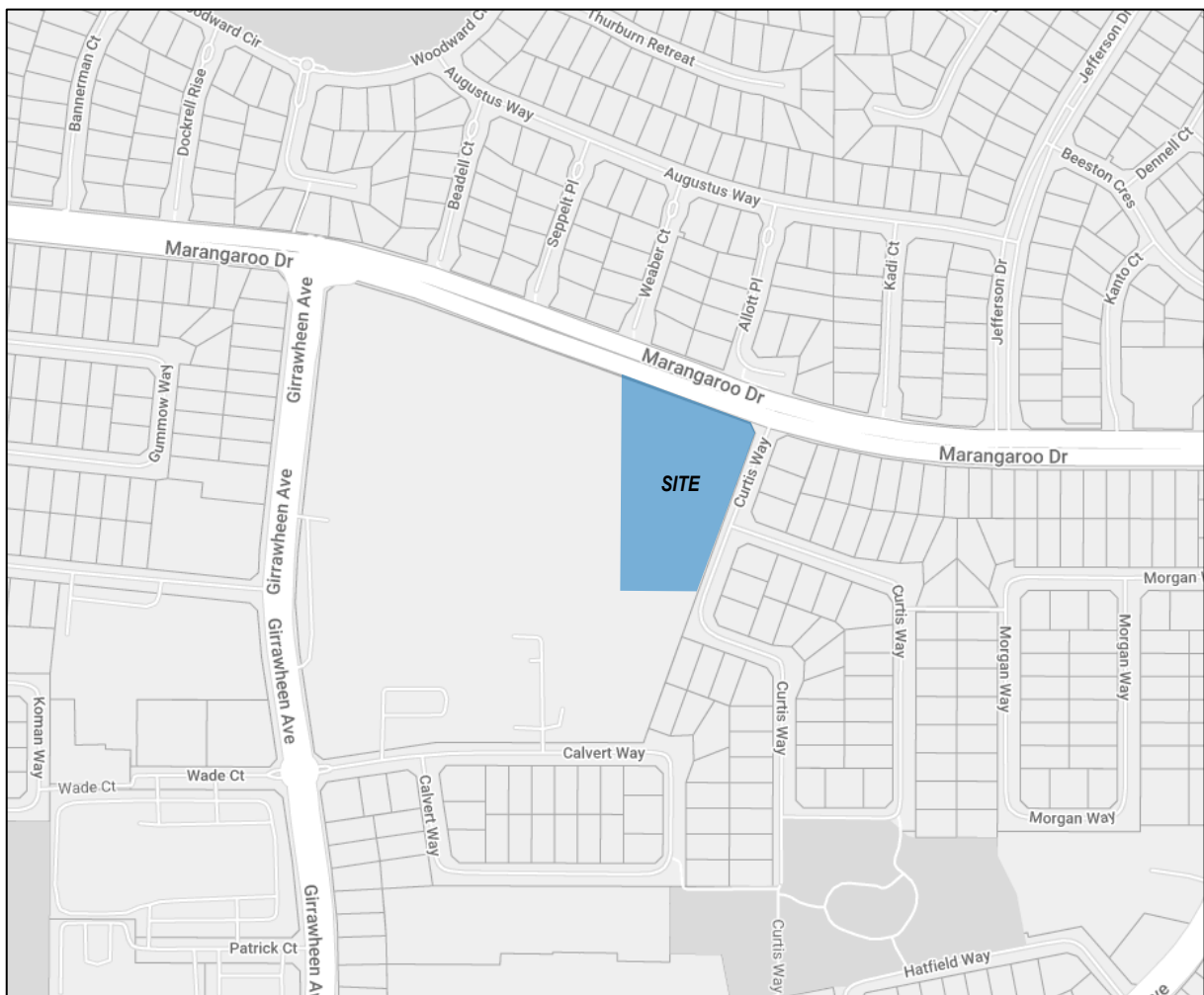


Figure 1: General Site Location

An aerial view of the existing site is shown in **Figure 2**.



Figure 2: Aerial View of the Site (December 2022)

1.3. Scope

This TIA has been prepared in accordance with the Western Australian Planning Commission's (WAPC) *Transport Impact Assessment Guidelines*. According to the TIA guidelines, the key objectives of a TIA are to:

- assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes, that is, vehicles, public transport, pedestrians and cyclists;
- assess the level of transport integration between the development and the surrounding land uses;
- determine the impacts of the traffic generated by the development on the surrounding land uses; and
- determine the impacts of the traffic generated by the development on the surrounding transport networks.

2. Development Proposal

2.1. Land Uses

The proposed Vietnamese Cultural Centre comprises a main building (large hall / court, reception, meeting room, change rooms, kitchen and store rooms), an outdoor amphitheatre, a car park and landscaping.

The facility will accommodate a range of community activities including sports, music, dancing and special events such as Vietnamese festivals and holidays.

The overall capacity of the facility will be approximately 300 people. As advised by the client, the operating profile of the facility is expected to be as follows:

- On a day-to-day basis, the facility will accommodate an average of 50 to 100 people between 9am and 9pm (typically seniors in the morning for dancing and music and then youth in the afternoon/night for sports).
- Approximately 1 day per month, there may be a larger activity or event (e.g. wedding) with up to 200 people.
- A capacity event with up to 300 people is estimated to occur approximately 1 to 2 times per year.

The facility may also be made available for hire by other community groups on an as needs basis with allowance for up to 300 people. External use of the facility is mostly expected to occur on weekends.

The site plan is shown in **Figure 3**.

3. Existing Situation

3.1. Road Network

3.1.1. Layout and Hierarchy

The layout and hierarchy of the existing local road network according to the Main Roads WA *Road Information Mapping System* is shown in **Figure 4**.

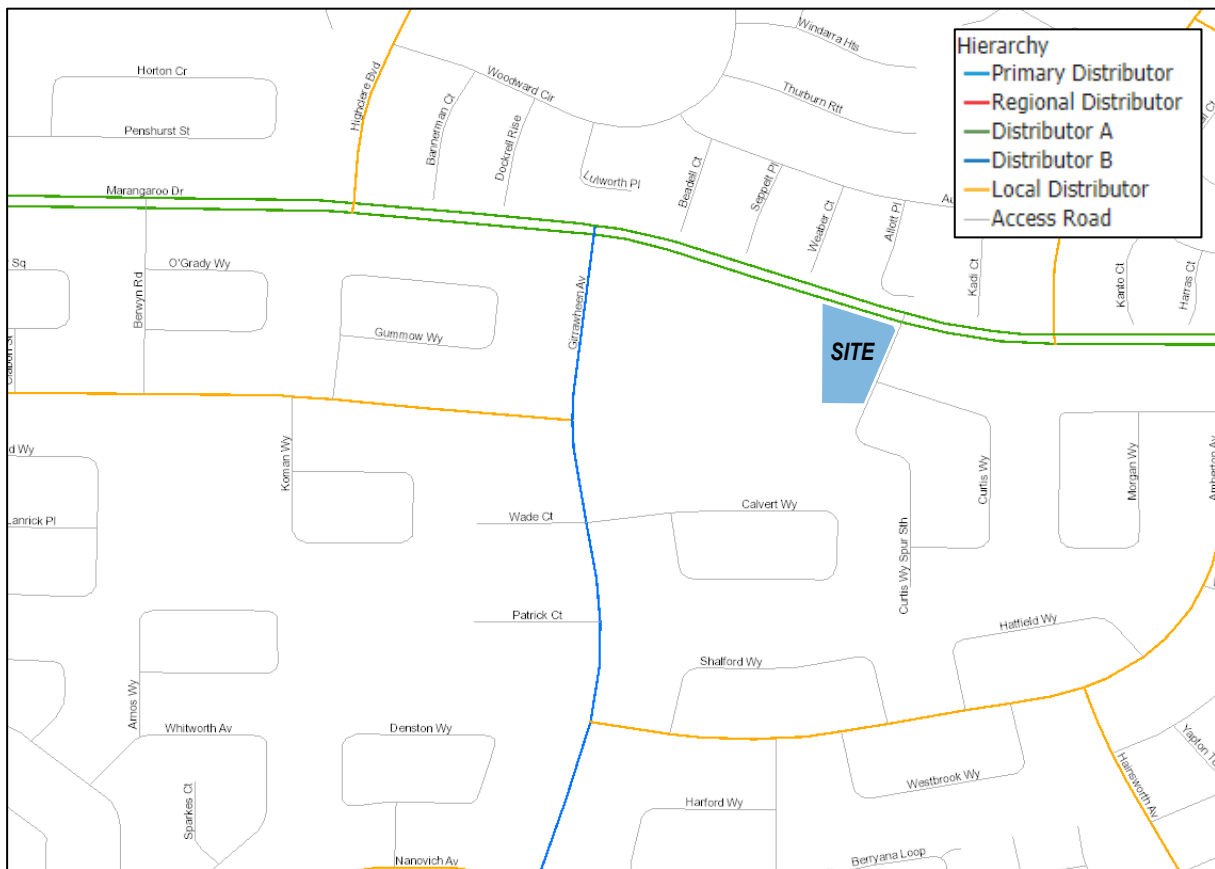


Figure 4: Existing Road Network Hierarchy

As shown Marangaroo Drive is currently classified as a District Distributor A road. It is also reserved as an Other Regional Road under the Metropolitan Region Scheme and so access to this road is regulated under the WAPC Development Control Policy DCP 5.1 *Regional roads (vehicular access)*.

Marangaroo Drive is currently constructed as a four-lane, dual carriageway road with a central median. The Marangaroo Drive / Curtis Way intersection has an existing right turn lane as shown in **Figure 5**.



Figure 5: Marangaroo Drive / Curtis Way Intersection

The existing speed limits are shown in **Figure 6**. The 40km/h school zone speed limit applies on school days along the sections highlighted in black during the school peak periods from 7:30 to 9am in the morning and 2:30 to 4pm in the afternoon.

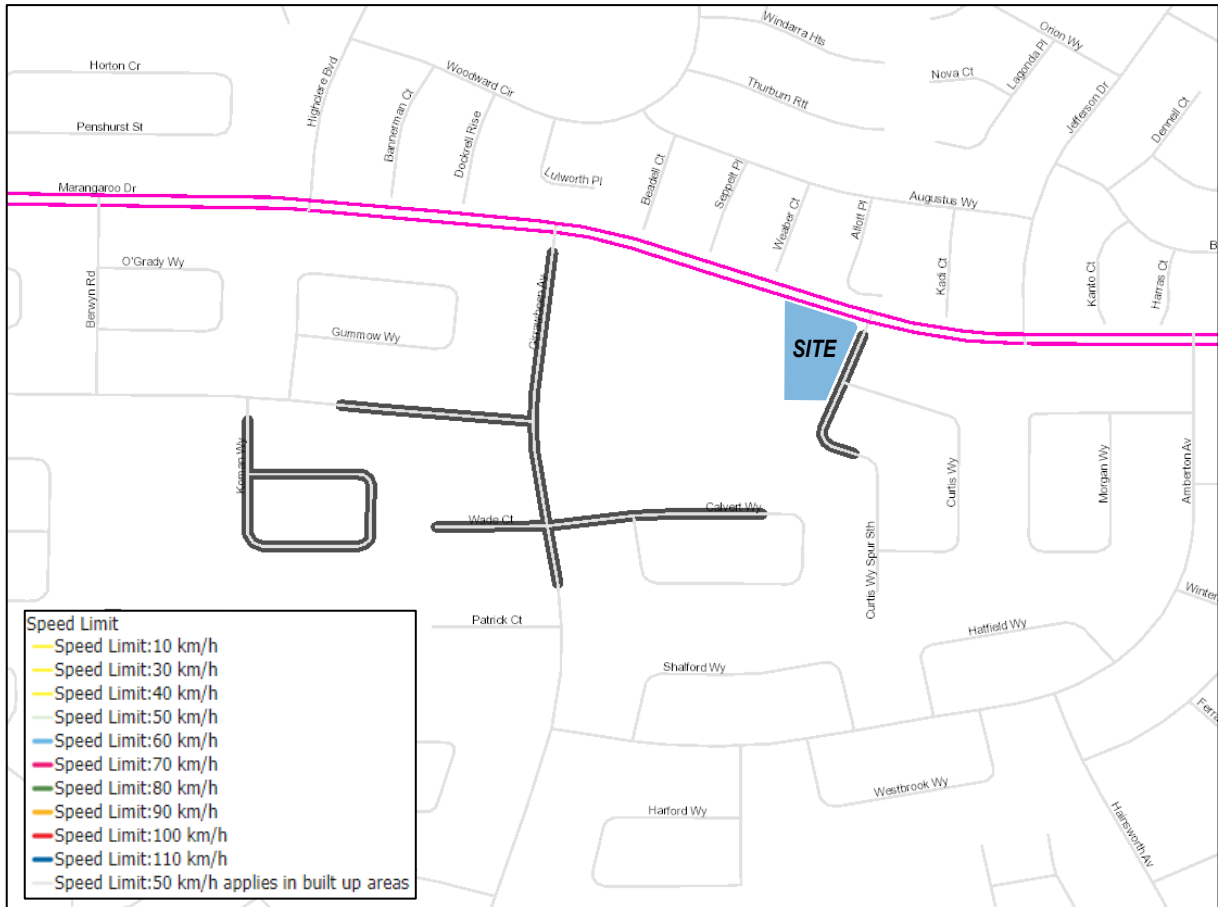


Figure 6: Existing Speed Limits

3.2. Traffic Counts

3.2.1. Marangaroo Drive

The latest traffic volumes along Marangaroo Drive were obtained from Main Roads WA *Traffic Map* as shown in **Figure 7** and **Figure 8**.

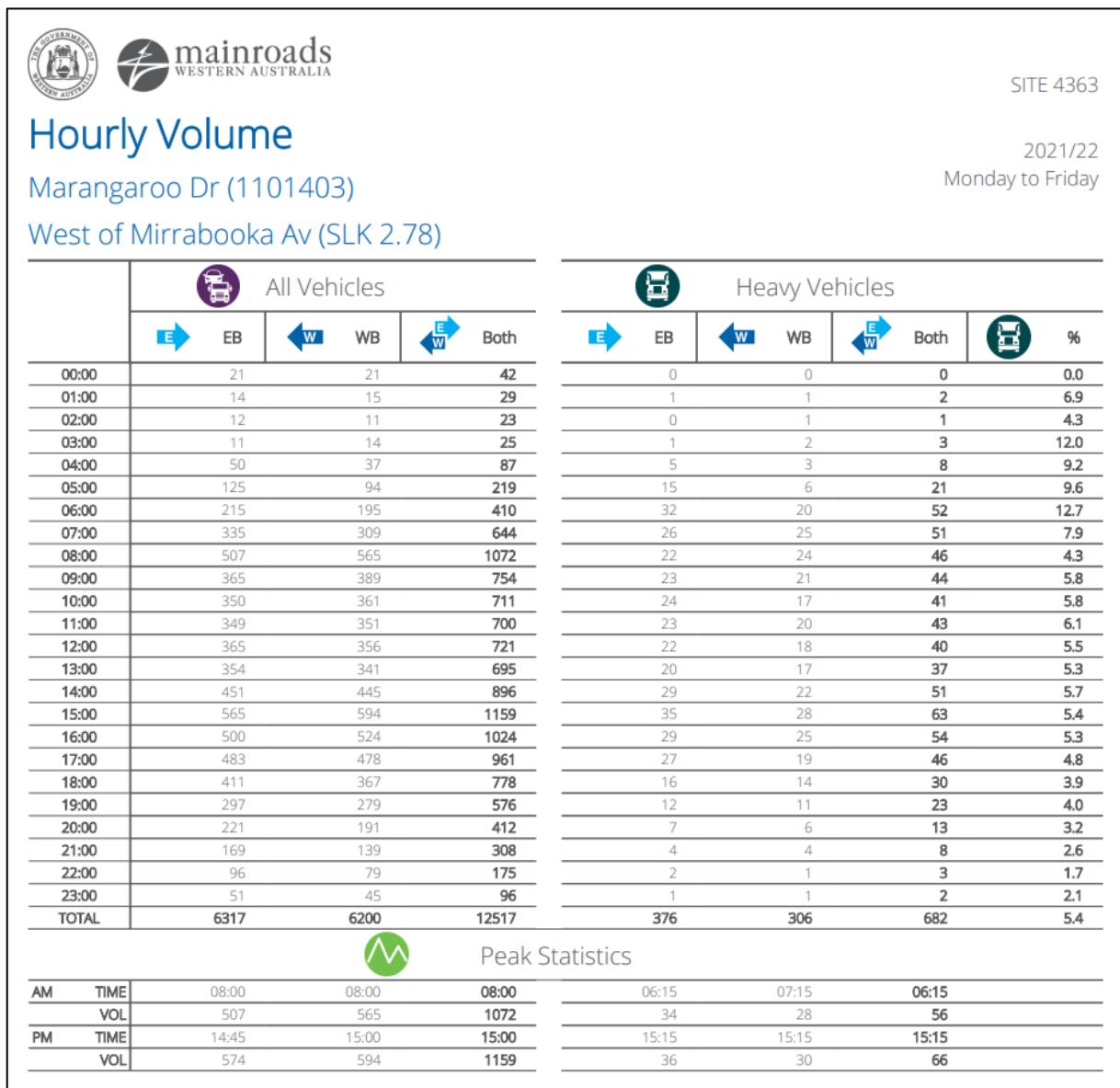


Figure 7: Weekday Traffic Counts (November 2021)

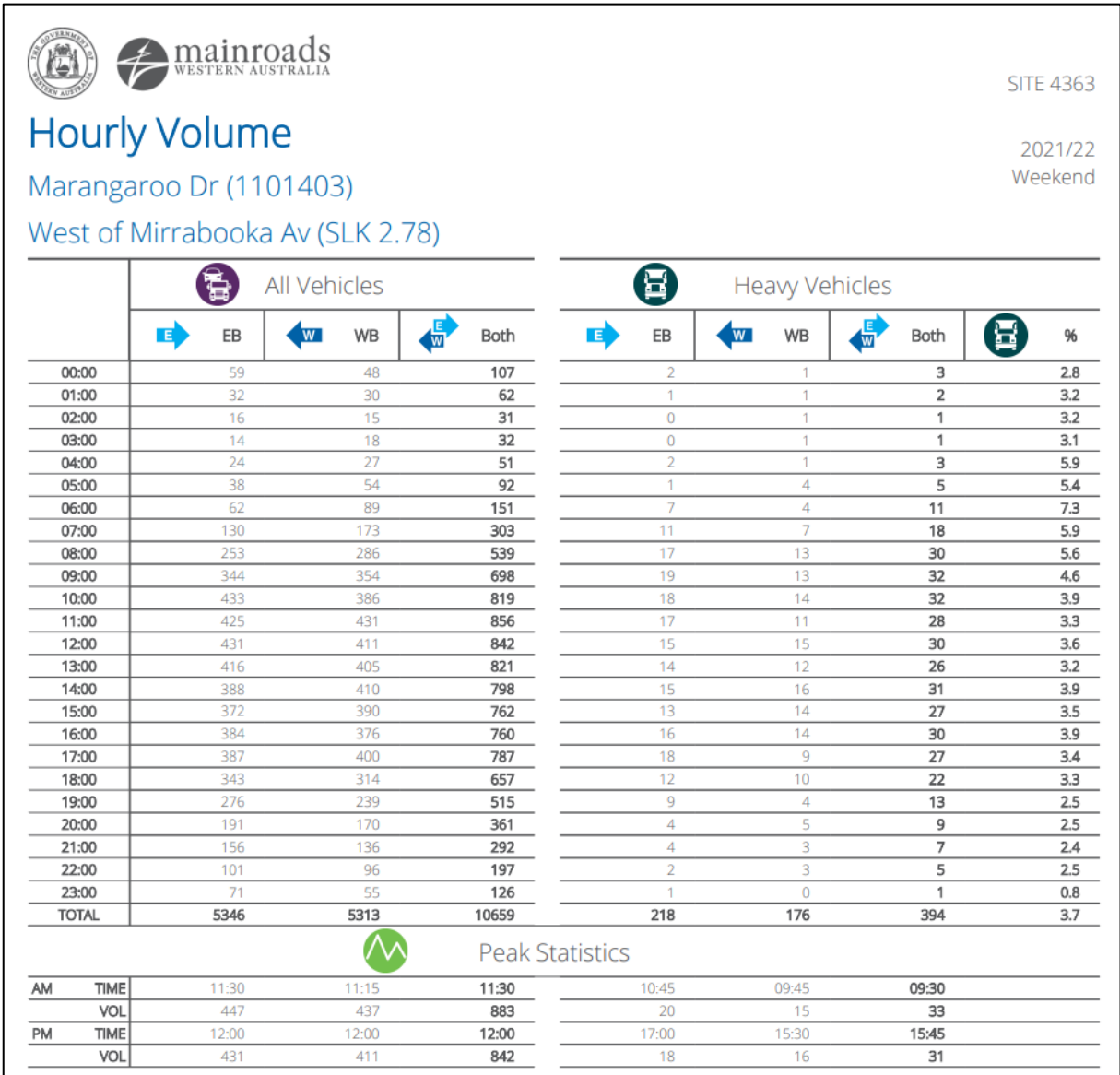


Figure 8: Weekend Traffic Counts (November 2021)

As shown, the weekday daily and peak hour traffic volumes are higher than on the weekend.

As mentioned previously, Marangaroo Drive is currently classified as a District Distributor A road and is currently constructed as a four-lane, dual carriageway road. According to Liveable Neighbourhoods, the target maximum daily traffic volume for a four-lane Integrator / Distributor A road is 35,000vpd. The current daily traffic volumes is well within the target maximum daily volume.

The typical hourly mid-block capacities for urban roads (per traffic lane) according to Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* are detailed in **Figure 9**.

Table 5.1: Typical mid-block capacities for urban roads with interrupted flow

Type of lane	One-way mid-block capacity (pc/h)
Median or inner lane	
Divided road	1000
Undivided road	900
Middle lane (of a 3 lane carriageway)	
Divided road	900
Undivided road	1000
Kerb lane	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

Source: Table 5.1 in Austroads (2013).

Figure 9: Austroads Typical Mid-block Capacities for Urban Roads

As there is no parking, the hourly lane capacity of Marangaroo Drive would be approximately 900 vehicles per hour (vph) or 1,800vph in each direction. The current peak hour traffic volumes along Marangaroo Drive are well below 1,800vph in each direction and there appears to be plenty of spare mid-block capacity to accommodate increased traffic volumes along Marangaroo Drive.

3.2.2. Marangaroo Drive / Curtis Way Intersection

A peak hour traffic survey was undertaken at the Marangaroo Drive / Curtis Way intersection in April 2022 to determine the existing intersection traffic flows.

The results of the survey are summarised in **Figure 10**.

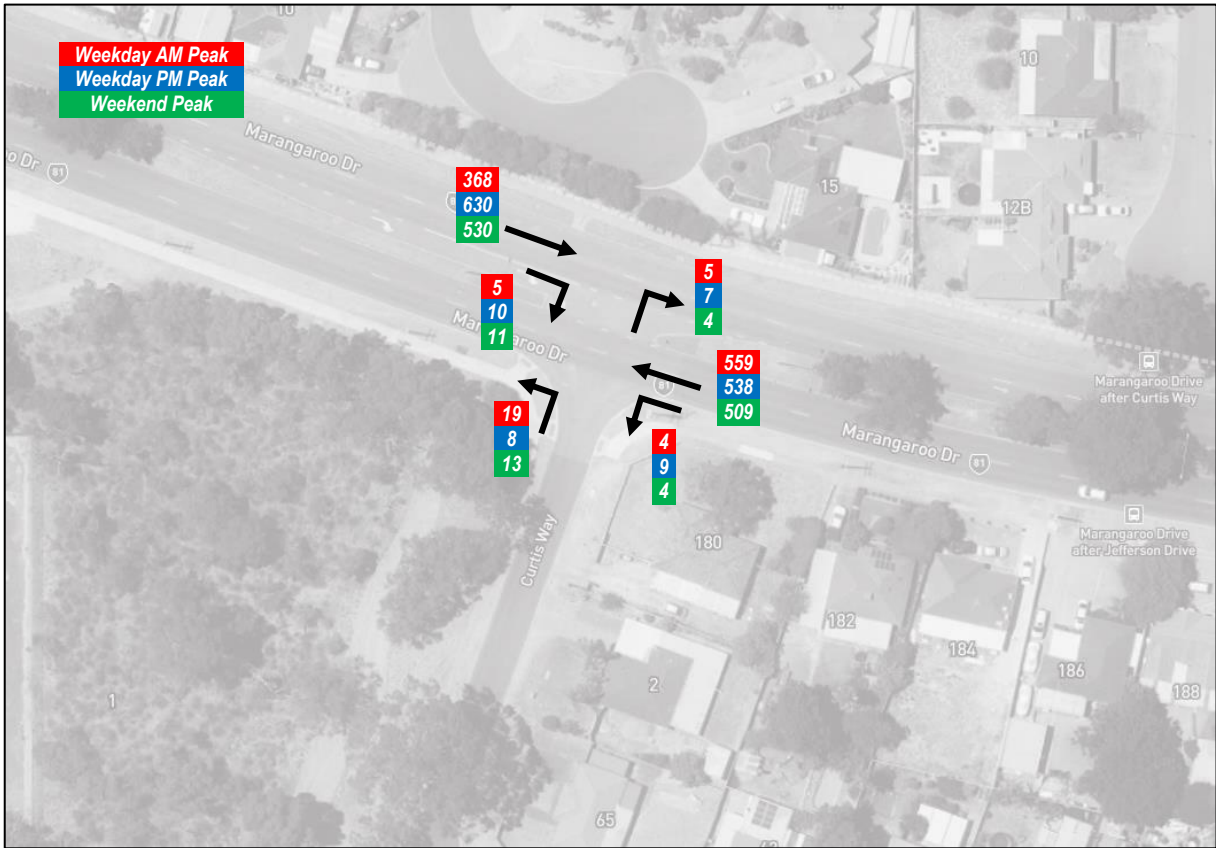


Figure 10: Marangaroo Drive / Curtis Way Peak Hour Traffic Flows

3.3. Changes to Surrounding Transport Networks

The surrounding road network is well established and there are no known major changes planned.

3.4. Integration with Surrounding Area

The development itself is an attractor of traffic with the key generator being the residential development in the surrounding areas.

The main traffic route to and from the site and the surrounding areas is along Marangaroo Drive. The transport network along Marangaroo Drive is well established and no major deficiencies have been identified.

4. Transport Assessment

4.1. Assessment Parameters

Based on the existing traffic volumes and the proposed operating profile, the following critical peak scenarios have been assessed.

- Weekday morning peak hour on the road network (8 to 9am) – regular facility use (100 people)
- Weekday afternoon peak hour on the road network (3 to 4pm) – regular facility use (100 people)
- Saturday morning peak hour on the road network (11am to 12pm) – large activity/event (300 people arriving)
- Saturday morning peak hour on the road network (11am to 12pm) – large activity/event (300 people departing)

It is noted that the above represent that 'worst-case' scenarios assuming that arrivals and departures coincide with the peak hours on the road network.

4.2. Traffic Generation

For the purposes of the traffic impact analysis, it is conservatively assumed that the average car occupancy for all activities is 2 people per car. The estimated traffic generation during each of the above peak scenarios is as follows:

- Weekday morning peak hour = 100 people arriving = 50 vehicles in
- Weekday afternoon peak hour = 100 people arriving and 100 people leaving = 50 vehicles in / out
- Saturday morning peak hour = 300 people arriving = 150 vehicles in
- Saturday morning peak hour = 300 people leaving = 150 vehicles out

4.3. Mid-block Capacity

As discussed previously, the existing daily and peak hour mid-block traffic flows along Marangaroo Drive and Curtis Way are well within the capacity of the existing road. There would be adequate spare capacity to accommodate the above increases in peak hour traffic flows.

4.4. Intersection Capacity

The peak hour capacity of the access intersection Marangaroo Drive / Curtis Way intersection has been undertaken in SIDRA intersection 9.1. The intersection model has been set up according to Main Roads WA's *Operational Modelling Guidelines* and has been modelled as a network to account for the staged right turns. The same four critical peak scenarios have been modelled. The base traffic volumes were derived from peak hour surveys undertaken in April 2022.

The modelled layout is shown in **Figure 11**.

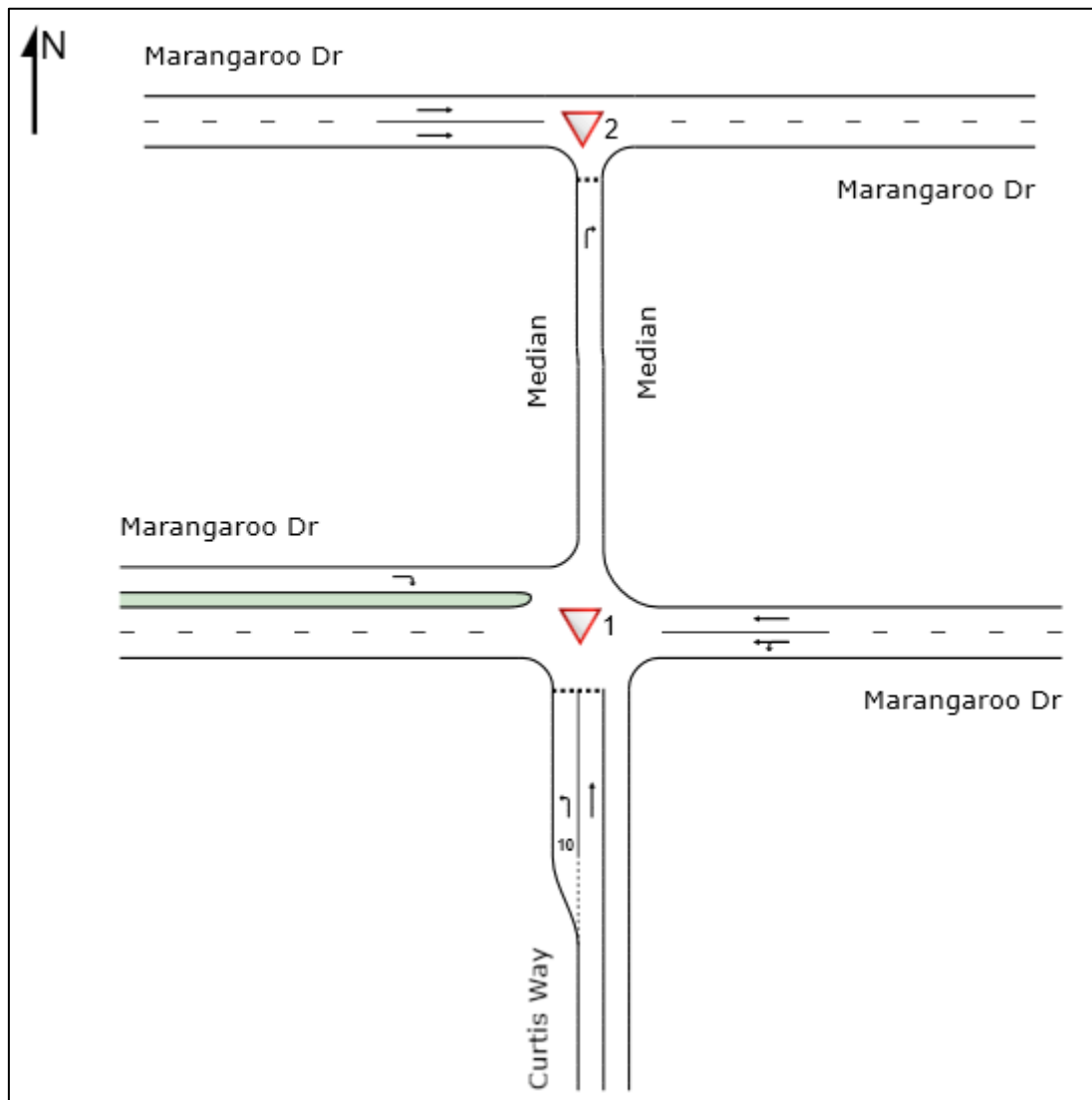


Figure 11: Intersection Model Layout



The results of the assessment are included as **Appendix A** and summarised in **Table 1**.

Table 1: SIDRA Intersection Capacity Analysis Results Summary

Scenario	DOS	Average Delay	Worst Delay	Maximum Queue	Average LOS	Worst LOS
Weekday AM Peak Hour – regular use	0.156	0.6s	9.4s	0.4m	A	A
Weekday PM Peak Hour – regular use	0.167	0.8s	9.4s	0.5m	A	A
Saturday AM Peak Hour – capacity event arrival	0.155	1.2s	9.9s	1.2m	A	A
Saturday AM Peak Hour – capacity event departure	0.139	1.1s	9.7s	0.8m	A	A

As shown, all scenarios are predicted to operate well within capacity with an average Level of Service A.

4.5. Intersection Capacity – Long Term (2033)

It is standard practice to assess a long-term scenario approximately 10 years after the opening of the development. Historical traffic counts to the west near Wanneroo Road indicate that traffic volumes on Marangaroo Drive have increased by approximately 3% per year and so the through volumes have been factored up accordingly.

The results of the long term assessment are also included in **Appendix A** and summarised in **Table 2**.

Table 2: SIDRA Intersection Capacity Analysis Results Summary – Long Term Analysis

Scenario	DOS	Average Delay	Worst Delay	Maximum Queue	Average LOS	Worst LOS
Weekday AM Peak Hour – regular use	0.207	0.5s	11.2s	0.5m	A	B
Weekday PM Peak Hour – regular use	0.225	0.7s	11.0s	0.6m	A	B
Saturday AM Peak Hour – capacity event arrival	0.202	1.0s	11.4s	1.5m	A	B
Saturday AM Peak Hour – capacity event departure	0.187	0.9s	10.4s	0.8m	A	B

As shown, all long-term scenarios are also predicted to operate well within capacity with an average Level of Service A.

5. Road Safety

5.1. Crash History

The crash history of the adjacent road network was obtained from the MRWA Reporting Centre. The search included Curtis Way and the section of Marangaroo Drive between Girrawheen Avenue and Jefferson Drive. A summary of the recorded incidents over the five-year period from January 2017 to December 2021 is shown in **Figure 12**. Crash data for 2022 and 2023 is not yet available.

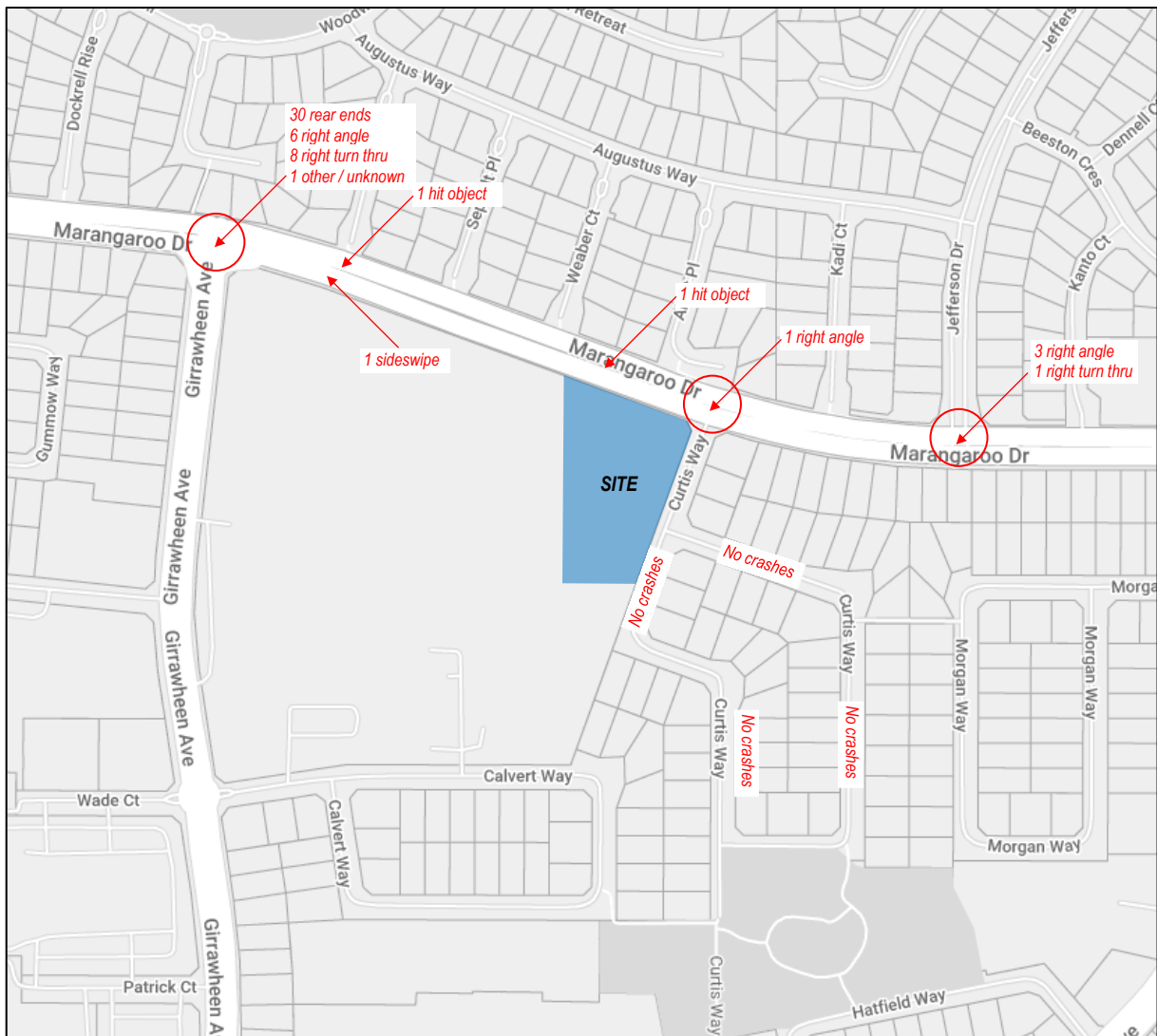


Figure 12: Crash History January 2017 to December 2021

As shown, a relatively high number of crashes have been recorded at the Marangaroo Drive / Girrawheen Avenue intersection over the past 5 years including 30 rear end crashes, 6 right angle crashes and 8 right turn thru crashes. This intersection was nominated by the City of Wanneroo to receive funding under the Federal and State Government Black Spot programs to upgrade the intersection to a modified dual-lane roundabout.



The intersection was not approved for funding under the 2022/23 Federal Government Black Spot Program and funding for the 2022/23 Stage Government Black Spot Program is currently under review. If unsuccessful, it is understood that the City will seek alternative funding options.

The number and types of crashes in other areas do not appear to indicate a major safety issue.

6. Public Transport Access

The site has good access to existing public transport services. The following services operate within walking distance of the site:

- Transperth Bus Route 344 which operates between Morley Bus Station and Warwick Station via Ballajura and Alexander Heights.
- Transperth Bus Route 374 which operates between Mirrabooka Bus Station and Whitfords Station via Girrawheen Avenue and Madeley.
- Transperth Bus Route 375 which operates between Mirrabooka Bus Station and Alexander Heights via Finchley Crescent and Hainsworth Avenue.
- Transperth Bus Route 385 and 386 which operates between Perth and Kingsway Shopping Centre via Wanneroo Road and Girrawheen Avenue.

The closest stops are located within short walking distance of the site as shown in **Figure 13**.

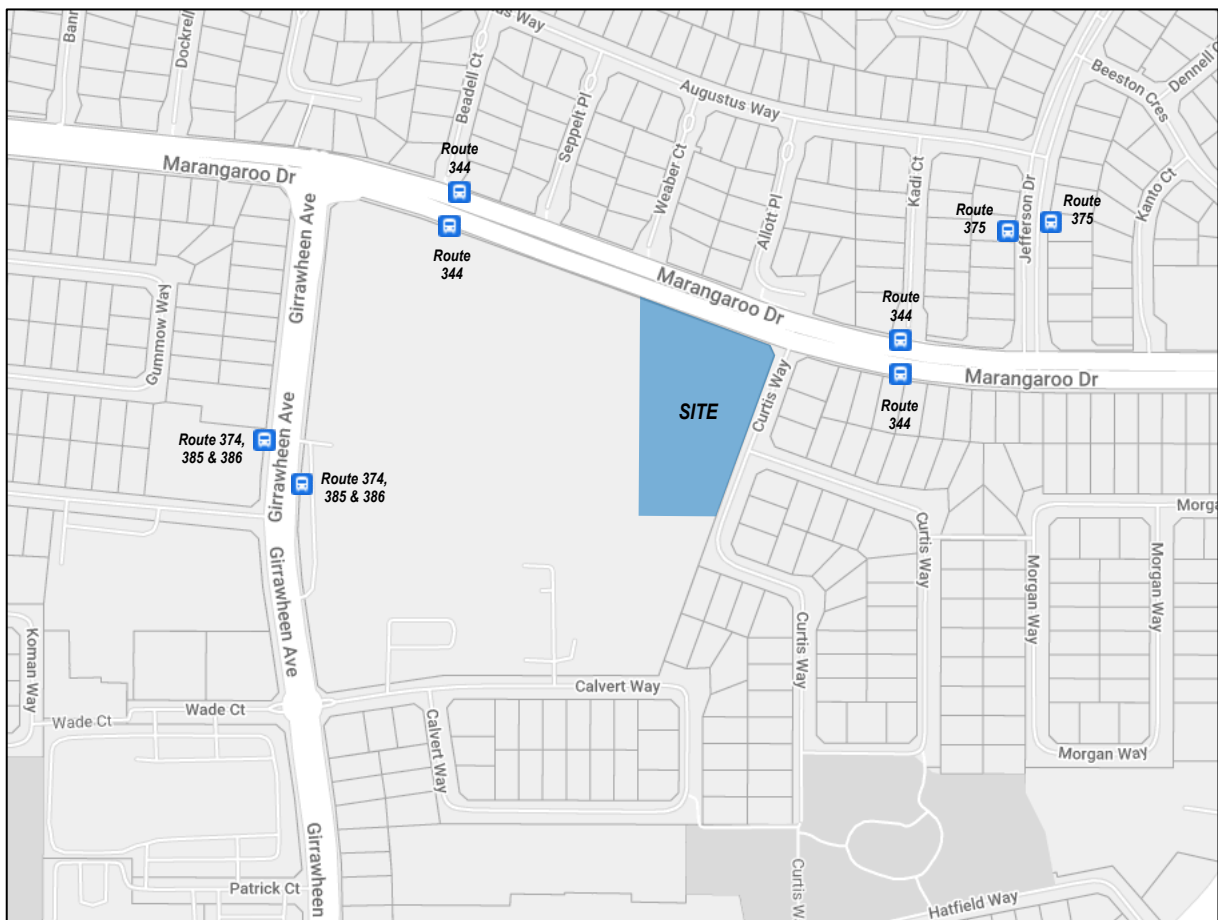


Figure 13: Bus Stops

The existing services are considered to be adequate to meet the likely demand for public transport use.



7. Pedestrian / Cycle Access and Amenity

There are paths along both sides of Marangaroo Drive and a path along the west side of Curtis Way. In the broader area, most roads have at least one footpath except for short, low volume, low speed roads (cul-de-sacs and laneways). There are crossing points at the nearby intersections including median breaks and pram ramps for crossing Marangaroo Drive.

The existing path network is considered to be adequate to allow for the safe and efficient movement of pedestrians and cyclists and no deficiencies have been identified.

8. Vehicle Access and Parking Assessment

8.1. Vehicle Access

Vehicle access to and from the site is proposed a new crossover on Curtis Way as shown in **Figure 14**.

A one-way traffic flow will be adopted within the car park. It is proposed to accommodate overflow parking on the existing hardcourts on the western portion of the site. A driveway connection is proposed to link the new car parking area and the hardcourts. This area will also be used for any service/delivery vehicles. The driveway will be gated and access will be managed by the operator as required.

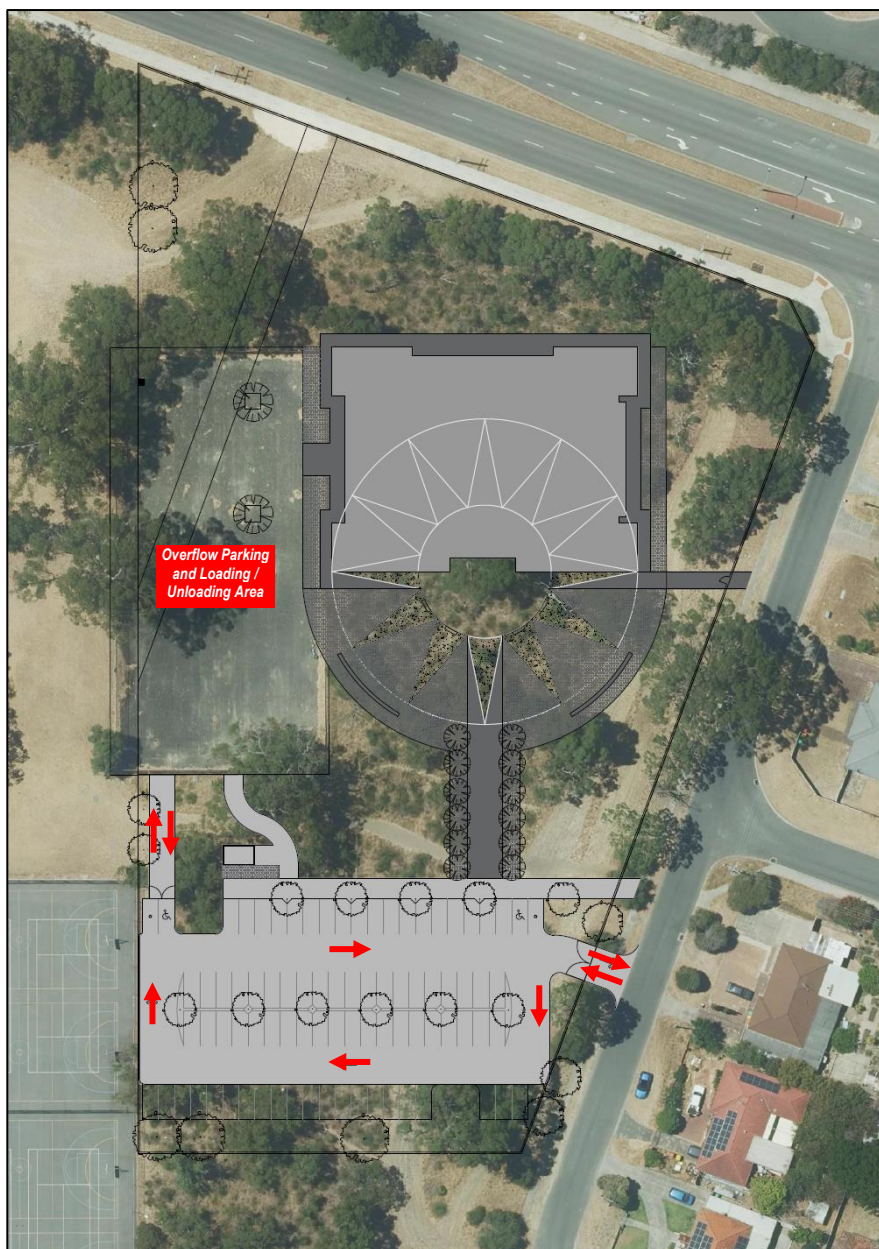


Figure 14: Vehicle Access Arrangement

8.2. Sight Distance

Sight distance requirements from vehicle exit points are defined in Figure 3.2 of Australian Standard AS2890.1-2004 *Parking facilities Part 1: Off street car parking* (AS2890.1) which is shown in **Figure 15**.

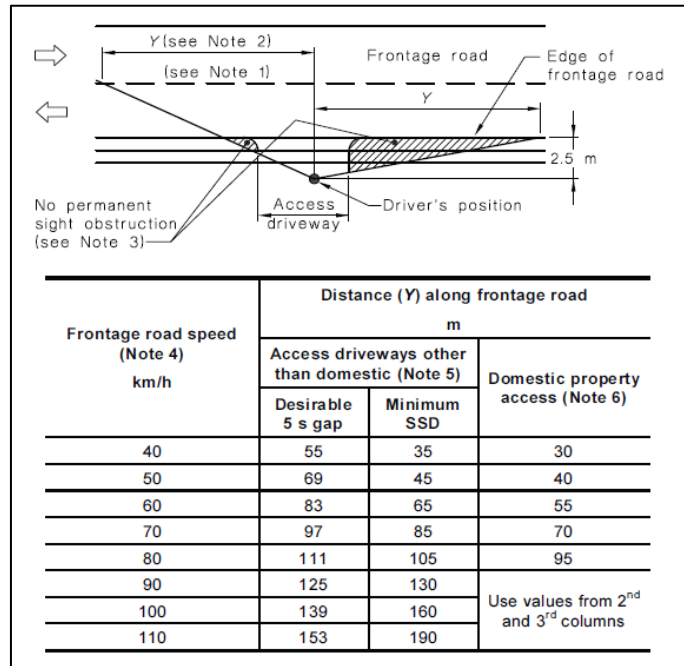


Figure 15: AS2890.1 Sight Distance Requirements

Based on the 50km/h speed limit along Curtis Way, the minimum required sight distance is 45m. The available sight distance is shown in **Figure 16**.

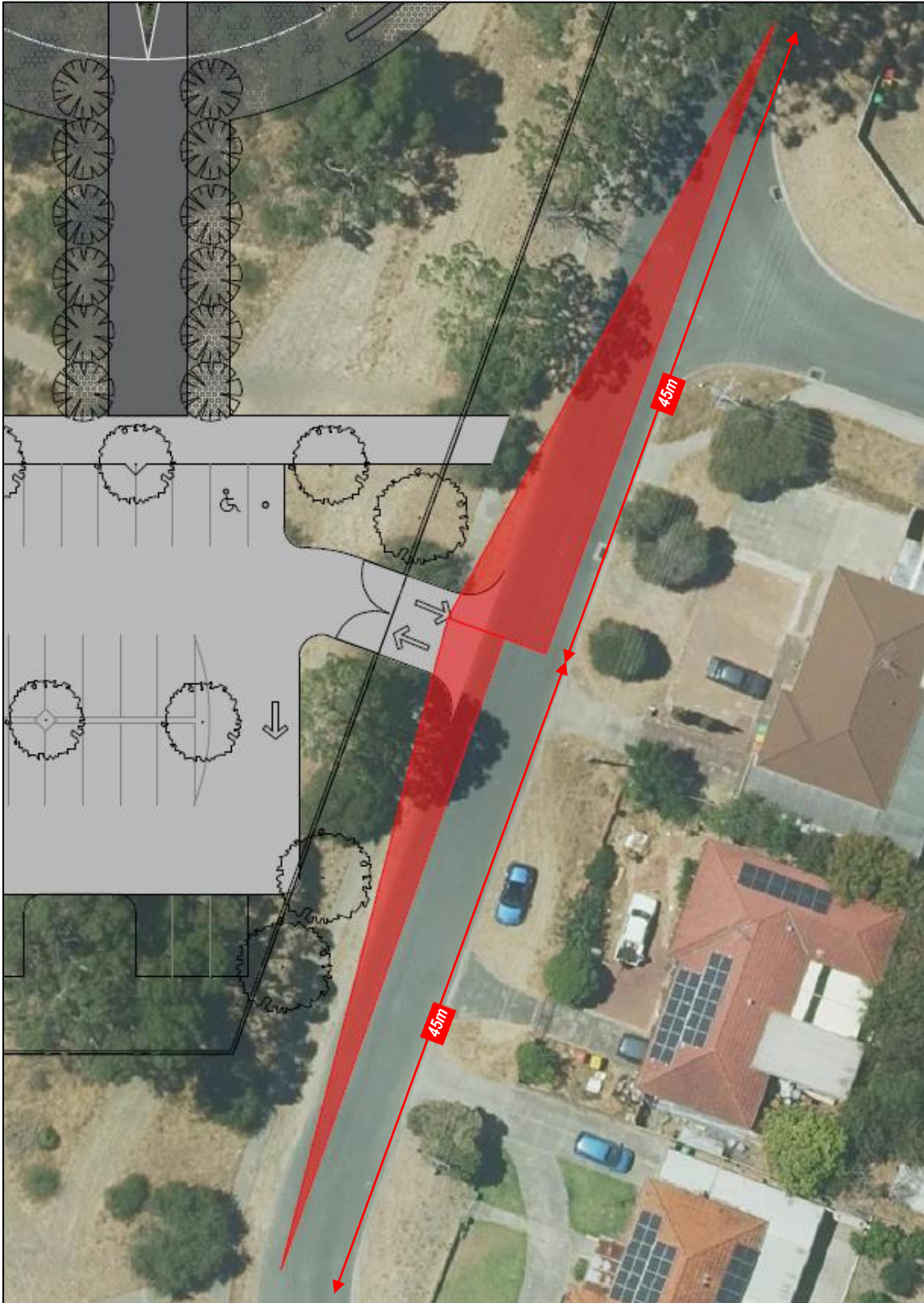


Figure 16: Sight Distance Check

As shown, the minimum sight distance is clearly achieved towards the north.

Towards the south, the canopy of one of the large verge trees appears to be within the sight triangle. However, as shown in **Figure 17**, the canopy of this tree is well above the driver line of sight (about 1m from the ground) and so the sight distance is also achieved towards the south.



Figure 17: Existing Verge Tree South of Proposed Exit Crossover

Vertically, the geometry of Curtis Way is relatively flat with no major crests or sags that impede sight distance.

8.3. Car Parking Provision

According to the City of Wanneroo's District Planning Scheme No 2 (DPS2), the minimum car parking requirement for various community type facilities (club, hall, place of assembly, recreation centre) is 1 bay per 4 people accommodated.

As discussed previously, for the majority of the year, the typical maximum attendance throughout the year will be approximately 100 people. A capacity event with up to 300 people is only expected to occur once or twice a year.

Based on the regular capacity of 100 people, the parking requirement is 25 bays which can be accommodated within the proposed car park

During a capacity event with up to 300 people, the parking requirement is 75 bays and additional parking will be required. As mentioned previously, overflow parking is proposed to be accommodated on the existing hardcourts along the western side of the building.

The following is also noted:

- The site has good access to public transport and the path network is well established. Therefore many patrons may walk, cycle or use public transport to travel to and from the site.
- As indicated on the site plan, an additional 21 car parking bays may be provided in the future which would bring the total supply to 81 bays.

8.4. Car Parking Layout

The parking layout will need to comply with the requirements of Australian Standard AS2890.1. The user class will depend on the purpose of the bay as detailed in **Figure 18**.

9		AS/NZS 2890.1:2004	
TABLE 1.1			
CLASSIFICATION OF OFF-STREET CAR PARKING FACILITIES			
User class	Required door opening	Required aisle width	Examples of uses (Note 1)
1	Front door, first stop	Minimum for single manoeuvre entry and exit	Employee and commuter parking (generally, all-day parking)
1A	Front door, first stop	Three-point turn entry and exit into 90° parking spaces only, otherwise as for User Class 1	Residential, domestic and employee parking
2	Full opening, all doors	Minimum for single manoeuvre entry and exit	Long-term city and town centre parking, sports facilities, entertainment centres, hotels, motels, airport visitors (generally medium-term parking)
3	Full opening, all doors	Minimum for single manoeuvre entry and exit	Short-term city and town centre parking, parking stations, hospital and medical centres
3A	Full opening, all doors	Additional allowance above minimum single manoeuvre width to facilitate entry and exit	Short term, high turnover parking at shopping centres
4	Size requirements are specified in AS/NZS 2890.6 (Note 2)		Parking for people with disabilities

Figure 18: Classification of Parking Facilities

The most appropriate classification would be User Class 2 which generally provides for medium-term parking. An assessment of the AS2890.1 parking requirements is detailed in **Table 3**.

Table 3: AS2890.1 Car Parking Compliance

Dimension	Requirement	Provided
90 degree parking – Class 3 – Medical centres		
Car Bay Width	2.5m	2.5m
Car Bay Length	5.4m	5.5m
Parking Aisle Width	5.8m	6.0m

As shown, all relevant dimensions are compliant with AS2890.1.



8.5. Bicycle Parking and End of Trip Facilities

The City's DPS2 states that local government may require the provision of bicycle parking and end-of-trip facilities such as showers, change rooms and lockers in commercial developments and other employment centres in accordance with *Austrroads' Guide to Engineering Practice Part 14: Bicycles*.

The above guideline has since been replaced by *Austrroads Guide to Traffic Management Part 11: Parking Management Techniques (AGTM11)*. The recommended parking requirements are outlined in Table 5.3 of AGTM11. For community purposes, the recommended bicycle parking provision is 1 short-stay space per 200m² NFA with a minimum requirement of 2 spaces. The approximate area of the building is 1,540m² and so the recommended bicycle parking provision is 8 spaces. There is no requirement outlined for long-stay spaces.

According to AGTM11, end-of-trip facilities are required where a development is required to provide long-stay bicycle parking. As no long-stay spaces are required, then no end-of trip facilities are warranted.

9. Conclusions

The Transport Impact Assessment for the proposed Vietnamese Cultural Centre concluded the following:

- For the majority of the year, the proposed development will generate a low to moderate volume of traffic.
- A peak hour capacity analysis of the Marangaroo Drive / Curtis Way intersection indicates that the intersection will operate well within capacity under all assessed scenarios.
- The crash history of the adjacent road network identified a high number of crashes at the Marangaroo Drive / Girrawheen Avenue intersection. The City of Wanneroo is investigating options to improve this intersection including applying for funding under the Federal and State Government Black Spot Programs. The intersection was not approved for funding under the 2022/23 Federal Government Black Spot Program and funding for the 2022/23 State Government Black Spot Program is current under review.
- The existing public transport services are considered to be adequate.
- The existing pedestrian and cyclist network around the site is considered to be adequate to allow for the safe and efficient movement of pedestrians and cyclists and no deficiencies have been identified.
- The minimum required sight distance is achieved from the proposed site crossover in both directions.
- Throughout the majority of the year, the proposed 60 on-site parking bays will likely be sufficient to accommodate the parking demand of the facility.
- During larger events, additional parking is likely to be required and will be accommodated on the existing hardcourts on the site.
- The car parking layout is assessed as being compliant with AS2890.1 requirements.
- For community purposes, the recommended bicycle parking provision is 1 short-stay space per 200m² NFA with a minimum requirement of 2 spaces. The approximate area of the building is 1,540m² and so the recommended bicycle parking provision is 8 spaces.
- As no long-stay bicycle spaces are required, then no end-of trip facilities are warranted.



Appendix A – SIDRA Intersection Capacity Analysis Results

MOVEMENT SUMMARY

▼ Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: Weekday AM Peak - Regular Use)]

■ Network: N101 [Weekday AM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE 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: Curtis Way														
10	L2	19	0.0	19	0.0	0.015	5.4	LOS A	0.0	0.2	0.33	0.53	0.33	51.4
11	T1	5	0.0	5	0.0	0.004	9.2	LOS A	0.0	0.0	0.48	0.69	0.48	38.2
Approach		24	0.0	24	0.0	0.015	6.2	LOS A	0.0	0.2	0.36	0.56	0.36	49.5
East: Marangaroo Dr														
1	L2	29	0.0	29	0.0	0.156	6.4	LOS A	0.0	0.0	0.00	0.06	0.00	63.9
2	T1	575	2.3	575	2.3	0.156	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	69.4
Approach		604	2.2	604	2.2	0.156	0.3	NA	0.0	0.0	0.00	0.03	0.00	69.1
West: Marangaroo Dr														
9	R2	30	0.0	30	0.0	0.040	9.4	LOS A	0.1	0.4	0.53	0.72	0.53	50.4
Approach		30	0.0	30	0.0	0.040	9.4	NA	0.1	0.4	0.53	0.72	0.53	50.4
All Vehicles		658	2.0	658	2.0	0.156	1.0	NA	0.1	0.4	0.04	0.08	0.04	66.8

MOVEMENT SUMMARY

▼ Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: Weekday AM Peak - Regular Use)]

■ Network: N101 [Weekday AM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE 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: Median														
12	R2	5	0.0	5	0.0	0.002	0.3	LOS A	0.0	0.0	0.21	0.09	0.21	51.7
Approach		5	0.0	5	0.0	0.002	0.3	LOS A	0.0	0.0	0.21	0.09	0.21	51.7
West: Marangaroo Dr														
8	T1	379	2.1	379	2.1	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	70.0
Approach		379	2.1	379	2.1	0.097	0.0	NA	0.0	0.0	0.00	0.00	0.00	70.0
All Vehicles		384	2.1	384	2.1	0.097	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: Weekday PM Peak - Regular Use)]

Network: N101 [Weekday PM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	Dist] m				
South: Curtis Way														
10	L2	33	0.0	33	0.0	0.025	5.4	LOS A	0.0	0.3	0.33	0.54	0.33	51.4
11	T1	32	3.1	32	3.1	0.028	9.4	LOS A	0.0	0.3	0.48	0.75	0.48	38.1
Approach		65	1.5	65	1.5	0.028	7.3	LOS A	0.0	0.3	0.40	0.64	0.40	46.4
East: Marangaroo Dr														
1	L2	34	0.0	34	0.0	0.151	6.4	LOS A	0.0	0.0	0.00	0.07	0.00	63.7
2	T1	554	2.0	554	2.0	0.151	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	69.3
Approach		588	1.9	588	1.9	0.151	0.4	NA	0.0	0.0	0.00	0.04	0.00	69.0
West: Marangaroo Dr														
9	R2	35	0.0	35	0.0	0.045	9.3	LOS A	0.1	0.5	0.52	0.72	0.52	50.5
Approach		35	0.0	35	0.0	0.045	9.3	NA	0.1	0.5	0.52	0.72	0.52	50.5
All Vehicles		688	1.7	688	1.7	0.151	1.5	NA	0.1	0.5	0.06	0.13	0.06	64.9

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: Weekday PM Peak - Regular Use)]

Network: N101 [Weekday PM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	Dist] m				
South: Median														
12	R2	32	3.1	32	3.1	0.018	0.5	LOS A	0.0	0.1	0.29	0.19	0.29	50.0
Approach		32	3.1	32	3.1	0.018	0.5	LOS A	0.0	0.1	0.29	0.19	0.29	50.0
West: Marangaroo Dr														
8	T1	648	2.3	648	2.3	0.167	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		648	2.3	648	2.3	0.167	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles		680	2.4	680	2.4	0.167	0.1	NA	0.0	0.1	0.01	0.01	0.01	69.2



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: Saturday AM Peak - Capacity Event Arrival)]

Network: N101 [Saturday AM Peak - Capacity Event Arrival (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Curtis Way															
10	L2	All MCs	13	0.0	13	0.0	0.010	5.2	LOS A	0.0	0.1	0.30	0.51	0.30	50.8
11	T1	All MCs	4	0.0	4	0.0	0.004	9.9	LOS A	0.0	0.0	0.48	0.69	0.48	37.6
Approach			17	0.0	17	0.0	0.010	6.3	LOS A	0.0	0.1	0.34	0.55	0.34	48.7
East: Marangaroo Dr															
1	L2	All MCs	79	0.0	79	0.0	0.155	6.4	LOS A	0.0	0.0	0.00	0.17	0.00	60.8
2	T1	All MCs	524	1.5	524	1.5	0.155	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	68.7
Approach			603	1.3	603	1.3	0.155	0.8	NA	0.0	0.0	0.00	0.08	0.00	67.7
West: Marangaroo Dr															
9	R2	All MCs	86	0.0	86	0.0	0.113	9.7	LOS A	0.2	1.2	0.55	0.77	0.55	49.4
Approach			86	0.0	86	0.0	0.113	9.7	NA	0.2	1.2	0.55	0.77	0.55	49.4
All Vehicles			706	1.1	706	1.1	0.155	2.1	NA	0.2	1.2	0.07	0.18	0.07	63.6

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: Saturday AM Peak - Capacity Event Arrival)]

Network: N101 [Saturday AM Peak - Capacity Event Arrival (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Median															
12	R2	All MCs	4	0.0	4	0.0	0.002	0.4	LOS A	0.0	0.0	0.26	0.13	0.26	50.8
Approach			4	0.0	4	0.0	0.002	0.4	LOS A	0.0	0.0	0.26	0.13	0.26	50.8
West: Marangaroo Dr															
8	T1	All MCs	546	0.7	546	0.7	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach			546	0.7	546	0.7	0.139	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles			550	0.7	550	0.7	0.139	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: Saturday AM Peak - Capacity Event Departure)]

Network: N101 [Saturday AM Peak - Capacity Event Departure (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Curtis Way															
10	L2	All MCs	88	0.0	88	0.0	0.068	5.4	LOS A	0.1	0.8	0.34	0.56	0.34	50.7
11	T1	All MCs	79	0.0	79	0.0	0.064	9.7	LOS A	0.1	0.7	0.46	0.77	0.46	37.8
Approach			167	0.0	167	0.0	0.068	7.4	LOS A	0.1	0.8	0.39	0.65	0.39	46.1
East: Marangaroo Dr															
1	L2	All MCs	4	0.0	4	0.0	0.135	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	63.4
2	T1	All MCs	524	1.5	524	1.5	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach			528	1.5	528	1.5	0.135	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.8
West: Marangaroo Dr															
9	R2	All MCs	11	0.0	11	0.0	0.013	8.9	LOS A	0.0	0.1	0.49	0.65	0.49	50.1
Approach			11	0.0	11	0.0	0.013	8.9	NA	0.0	0.1	0.49	0.65	0.49	50.1
All Vehicles			706	1.1	706	1.1	0.135	1.9	NA	0.1	0.8	0.10	0.17	0.10	62.4

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: Saturday AM Peak - Capacity Event Departure)]

Network: N101 [Saturday AM Peak - Capacity Event Departure (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Median															
12	R2	All MCs	79	0.0	79	0.0	0.041	0.4	LOS A	0.0	0.3	0.27	0.18	0.27	50.8
Approach			79	0.0	79	0.0	0.041	0.4	LOS A	0.0	0.3	0.27	0.18	0.27	50.8
West: Marangaroo Dr															
8	T1	All MCs	546	0.7	546	0.7	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach			546	0.7	546	0.7	0.139	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles			625	0.6	625	0.6	0.139	0.1	NA	0.0	0.3	0.03	0.02	0.03	68.2



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: 2033 Weekday AM Peak - Regular Use)] Network: N101 [2033 Weekday AM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV] %	[Total veh/h]	HV] %				[Veh. veh]	Dist] m				
South: Curtis Way														
10	L2	19	0.0	19	0.0	0.016	5.8	LOS A	0.0	0.2	0.40	0.56	0.40	51.1
11	T1	5	0.0	5	0.0	0.005	10.1	LOS B	0.0	0.1	0.54	0.72	0.54	37.4
Approach		24	0.0	24	0.0	0.016	6.7	LOS A	0.0	0.2	0.43	0.59	0.43	49.2
East: Marangaroo Dr														
1	L2	29	0.0	29	0.0	0.207	6.4	LOS A	0.0	0.0	0.00	0.05	0.00	64.1
2	T1	774	2.3	774	2.3	0.207	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	69.5
Approach		803	2.2	803	2.2	0.207	0.3	NA	0.0	0.0	0.00	0.02	0.00	69.3
West: Marangaroo Dr														
9	R2	30	0.0	30	0.0	0.052	11.2	LOS B	0.1	0.5	0.61	0.81	0.61	49.1
Approach		30	0.0	30	0.0	0.052	11.2	NA	0.1	0.5	0.61	0.81	0.61	49.1
All Vehicles		857	2.1	857	2.1	0.207	0.8	NA	0.1	0.5	0.03	0.07	0.03	67.3

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: 2033 Weekday AM Peak - Regular Use)] Network: N101 [2033 Weekday AM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV] %	[Total veh/h]	HV] %				[Veh. veh]	Dist] m				
South: Median														
12	R2	5	0.0	5	0.0	0.003	0.4	LOS A	0.0	0.0	0.25	0.12	0.25	51.6
Approach		5	0.0	5	0.0	0.003	0.4	LOS A	0.0	0.0	0.25	0.12	0.25	51.6
West: Marangaroo Dr														
8	T1	509	2.2	509	2.2	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		509	2.2	509	2.2	0.131	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles		514	2.1	514	2.1	0.131	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: 2033 Weekday PM Peak - Regular Use)] Network: N101 [2033 Weekday PM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV] %	[Total veh/h]	HV] %				[Veh. veh]	Dist] m				
South: Curtis Way														
10	L2	33	0.0	33	0.0	0.028	5.8	LOS A	0.0	0.3	0.39	0.57	0.39	51.2
11	T1	32	3.1	32	3.1	0.034	10.2	LOS B	0.1	0.4	0.55	0.79	0.55	37.3
Approach		65	1.5	65	1.5	0.034	7.9	LOS A	0.1	0.4	0.47	0.68	0.47	46.0
East: Marangaroo Dr														
1	L2	34	0.0	34	0.0	0.200	6.4	LOS A	0.0	0.0	0.00	0.06	0.00	63.9
2	T1	744	2.0	744	2.0	0.200	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	69.4
Approach		778	1.9	778	1.9	0.200	0.3	NA	0.0	0.0	0.00	0.03	0.00	69.2
West: Marangaroo Dr														
9	R2	35	0.0	35	0.0	0.058	11.0	LOS B	0.1	0.6	0.60	0.80	0.60	49.3
Approach		35	0.0	35	0.0	0.058	11.0	NA	0.1	0.6	0.60	0.80	0.60	49.3
All Vehicles		878	1.8	878	1.8	0.200	1.3	NA	0.1	0.6	0.06	0.11	0.06	65.7

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: 2033 Weekday PM Peak - Regular Use)] Network: N101 [2033 Weekday PM Peak - Regular Use (Network Folder: General)]

Site Category: -
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV] %	[Total veh/h]	HV] %				[Veh. veh]	Dist] m				
South: Median														
12	R2	32	3.1	32	3.1	0.020	0.8	LOS A	0.0	0.1	0.35	0.26	0.35	49.8
Approach		32	3.1	32	3.1	0.020	0.8	LOS A	0.0	0.1	0.35	0.26	0.35	49.8
West: Marangaroo Dr														
8	T1	872	2.4	872	2.4	0.225	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach		872	2.4	872	2.4	0.225	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles		904	2.4	904	2.4	0.225	0.1	NA	0.0	0.1	0.01	0.01	0.01	69.4



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: 2033 Saturday AM Peak - Capacity Event Arrival)]

Network: N101 [2033 Saturday AM Peak - Capacity Event Arrival (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Curtis Way															
10	L2	All MCs	13	0.0	13	0.0	0.011	5.5	LOS A	0.0	0.1	0.36	0.53	0.36	50.6
11	T1	All MCs	4	0.0	4	0.0	0.004	10.6	LOS B	0.0	0.0	0.54	0.72	0.54	36.9
Approach			17	0.0	17	0.0	0.011	6.7	LOS A	0.0	0.1	0.40	0.58	0.40	48.4
East: Marangaroo Dr															
1	L2	All MCs	79	0.0	79	0.0	0.202	6.4	LOS A	0.0	0.0	0.00	0.13	0.00	61.4
2	T1	All MCs	705	1.6	705	1.6	0.202	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	68.9
Approach			784	1.4	784	1.4	0.202	0.7	NA	0.0	0.0	0.00	0.06	0.00	68.1
West: Marangaroo Dr															
9	R2	All MCs	86	0.0	86	0.0	0.143	11.4	LOS B	0.2	1.5	0.62	0.85	0.62	48.2
Approach			86	0.0	86	0.0	0.143	11.4	NA	0.2	1.5	0.62	0.85	0.62	48.2
All Vehicles			887	1.2	887	1.2	0.202	1.8	NA	0.2	1.5	0.07	0.15	0.07	64.5

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: 2033 Saturday AM Peak - Capacity Event Arrival)]

Network: N101 [2033 Saturday AM Peak - Capacity Event Arrival (Network Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Median															
12	R2	All MCs	4	0.0	4	0.0	0.002	0.6	LOS A	0.0	0.0	0.31	0.18	0.31	50.7
Approach			4	0.0	4	0.0	0.002	0.6	LOS A	0.0	0.0	0.31	0.18	0.31	50.7
West: Marangaroo Dr															
8	T1	All MCs	734	0.8	734	0.8	0.187	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach			734	0.8	734	0.8	0.187	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles			738	0.8	738	0.8	0.187	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8



MOVEMENT SUMMARY

Site: 1 [Marangaroo Drive / Curtis Way - Stage 1 (Site Folder: 2033 Saturday AM Peak - Capacity Event Departure)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [2033 Saturday AM Peak - Capacity Event Departure (Network Folder: General)]

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Curtis Way															
10	L2	All MCs	88	0.0	88	0.0	0.074	5.8	LOS A	0.1	0.8	0.40	0.59	0.40	50.5
11	T1	All MCs	79	0.0	79	0.0	0.076	10.4	LOS B	0.1	0.8	0.53	0.82	0.53	37.1
Approach			167	0.0	167	0.0	0.076	8.0	LOS A	0.1	0.8	0.46	0.70	0.46	45.7
East: Marangaroo Dr															
1	L2	All MCs	4	0.0	4	0.0	0.182	6.4	LOS A	0.0	0.0	0.00	0.01	0.00	63.4
2	T1	All MCs	705	1.6	705	1.6	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.8
Approach			709	1.6	709	1.6	0.182	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.8
West: Marangaroo Dr															
9	R2	All MCs	11	0.0	11	0.0	0.017	10.2	LOS B	0.0	0.2	0.56	0.71	0.56	49.1
Approach			11	0.0	11	0.0	0.017	10.2	NA	0.0	0.2	0.56	0.71	0.56	49.1
All Vehicles			887	1.2	887	1.2	0.182	1.7	NA	0.1	0.8	0.09	0.14	0.09	63.7

MOVEMENT SUMMARY

Site: 2 [Marangaroo Drive / Curtis Way - Stage 2 (Site Folder: 2033 Saturday AM Peak - Capacity Event Departure)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [2033 Saturday AM Peak - Capacity Event Departure (Network Folder: General)]

NA
Site Category: NA
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	Aver. Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				
South: Median															
12	R2	All MCs	79	0.0	79	0.0	0.045	0.6	LOS A	0.0	0.3	0.32	0.24	0.32	50.7
Approach			79	0.0	79	0.0	0.045	0.6	LOS A	0.0	0.3	0.32	0.24	0.32	50.7
West: Marangaroo Dr															
8	T1	All MCs	734	0.8	734	0.8	0.187	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	69.9
Approach			734	0.8	734	0.8	0.187	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.9
All Vehicles			813	0.7	813	0.7	0.187	0.1	NA	0.0	0.3	0.03	0.02	0.03	68.5

6. HYDRAULIC SERVICES REPORT

Maclean and Lawrence Pty Ltd

SITE doc ref: 220602 - VCA Hydraulic Advice MC&L



**Vietnamese Cultural Centre WA
H1, Lot 501 Curtis Way Girrawheen
(Corner of Marangaroo Drive)**

Hydraulic Services Report

13th April 2022

Ref 14090

MACLEAN AND LAWRENCE PTY LTD

**CONSULTING ENGINEERS
HYDRAULIC | GAS | SUBDIVISIONS | CIVIL | CO-ORDINATING**

ISO 9001
BUREAU VERITAS
Certification





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SECTION 1.0 - SEWER

An existing Water Corporation easement currently runs north/south thru the western corner of the site. The easement contains a 150 diameter AC sewer line approximately 3.8 metres deep. Application to Water Corporation will need to be made for a new sewer boundary connection to be provided off this Water Corporation sewer to provide a gravity sewer connection to the site. The depth of the sewer line should be sufficient to enable a gravity sewer to be provided for the new building and a sewerage pump station should not be required.

A permanent building structure over this sewer easement is not permitted so consideration of the building location will be required to avoid this easement. Buildings can be constructed up to the edge of the easement but piling may be required to support the building at the edge of the easement as Water Corporation may require to replace this sewer at a future date.

A grease trap will be required to be installed on the soil drains from the Kitchen to comply with Water Corporation Trade Waste requirements.

SECTION 2.0 - COLD WATER

An existing 100 diameter Water Corporation water main is located on the western side of Curtis Way adjacent to the property boundary. Application to Water Corporation will need to be made for a new cold water boundary connection to be provided off this Water Corporation main to provide a domestic potable water connection to the site.

As this is a new boundary connection to the site, Water Corporation headworks charges will be required to be paid for the new cold water boundary service. For example, if a 25mm service is required at a flow rate of 60l/min then the cost for these headworks is approximately \$25,000.00.

An RPZ boundary backflow assembly will be required on this new cold water boundary service.

SECTION 3.0 - HOT WATER

For this type of building we would recommend gas instantaneous water heaters to be used where possible for hot water heating and Kitchen cooking equipment, as they do not consume energy unless hot water is being drawn off.

SECTION 4.0 - FIRE SERVICE

An existing 100 diameter Water corporation water main is located on the western side of Curtis Way adjacent to the property boundary. Application to Water Corporation will need to be made for a new fire service boundary connection to be provided off this Water Corporation main to provide a fire service connection to the site.

A boundary backflow assembly will be required on this new fire boundary service.

Buildings with a fire compartment more than 500 sq/m require fire hydrant coverage of the building. As the proposed building exceeds this floor area, fire hydrant and fire hose reel coverage of the building will be required.

We recommend a flow and pressure test be carried out off the street hydrant on the existing 100 dia Water Corporation main in Curtis Way to determine if there is sufficient flow and pressure in this main to provide fire hydrant coverage to this site. If sufficient flow and pressure cannot be provided from this Water Corporation main, then fire tanks and pumps will be required.

SECTION 5.0 - GAS SERVICE

An existing 100 diameter ATCO gas main is located on the southern side of Marangaroo Drive and a 50 diameter ATCO gas main is located on the eastern side of Curtis Way. Application to ATCO Gas will need to be made for a new gas boundary connection to be provided to the site. ATCO gas may require the site boundary connection to be brought off the main in Marangaroo Drive as this is the larger main.

We would recommend gas be connected to this site for water heating and Kitchen cooking equipment.

SECTION 6.0 - STORMWATER

Stormwater from the roof of the new Building will be collected and discharged into local stormwater drains and soakwells, with capacity in accordance with City of Wanneroo containment requirements. Stormwater system will need to be designed to provide a detention volume for a 100 year ARI event.

SECTION 7.0 - CONCLUSION

From the available Authority records, this site appears to have all the required sewer, water, fire and gas services available to provide the required connections to this site.

As previously stated in this report we would recommend a flow and pressure test be conducted of the water main in Curtis Way, to determine if fire tanks and pumps are required. This will assist to determine costs budgets and Master Planning for the site.

Information on the potable cold water, fire service and gas service has been obtained from the relevant authority drawings available at the time of this report being prepared.

Yours faithfully,



D. Barnes

MACLEAN AND LAWRENCE PTY LTD