Niche Living Tapping

TRAFFIC IMPACT STATEMENT

email: info@flyt.com.au twitter.com/flytplan web: www.flyt.com.au

PROJECT	81113-436-FLYT-TRS-0001			
Revision	Description	Originator	Review	Date
A	First Draft	CXS	MDR	20/12/2018
0	Issued	CXS	MDR	21/12/2018

Contents

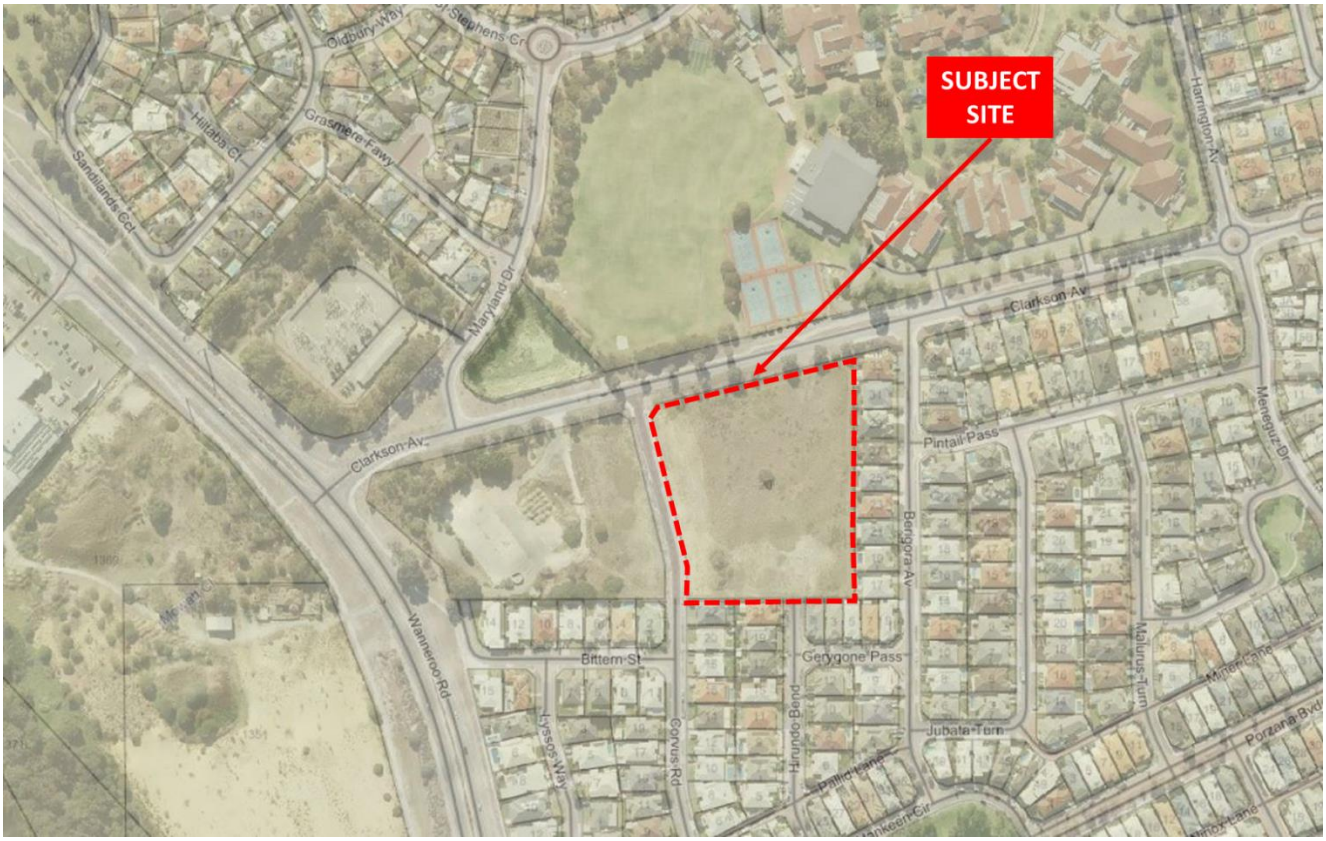
1. INTRODUCTION

1.1 Development Introduction

This report has been prepared in support of the proposed residential development at Lot 1001 Clarkson Avenue, Tapping.

The development site is to the south of Clarkson Avenue, also bounded by Corvus Road to the west, and residential properties fronting Berigora Avenue, as shown in Figure 1. The site is located within the City of Wanneroo.

Figure 1 Development site context (source: City of Wanneroo)

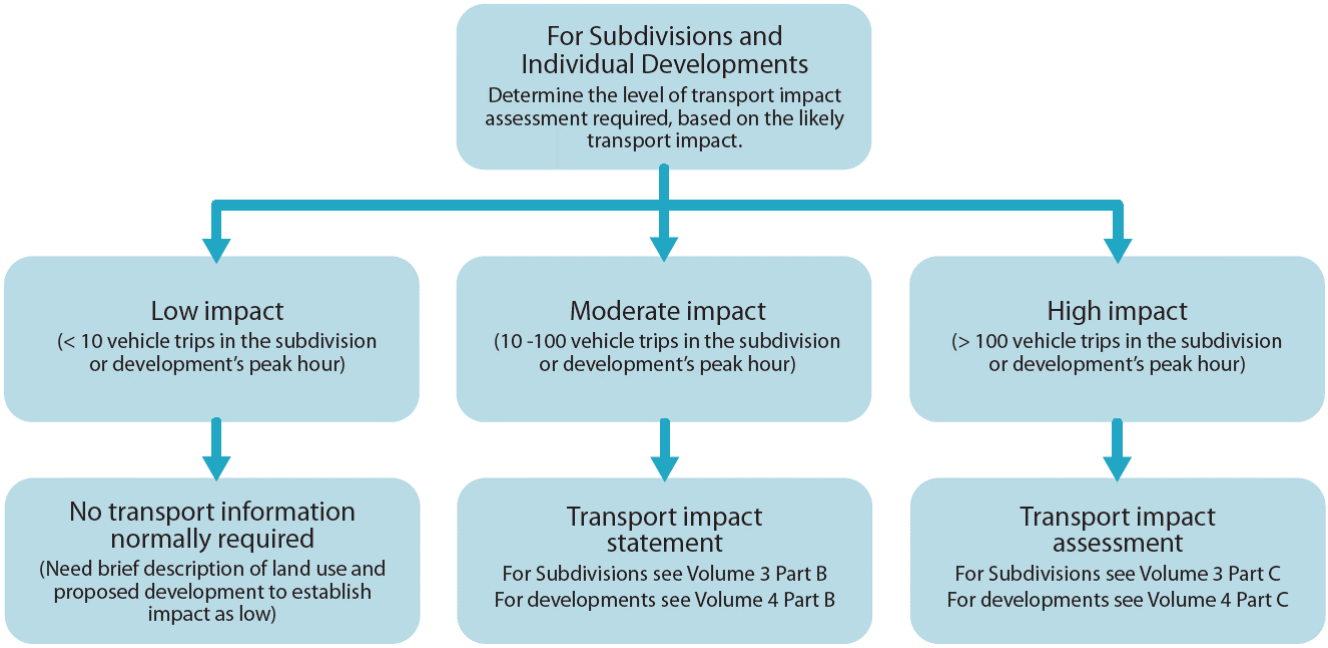


1.2 Transport Impact Statement

The report has been prepared in accordance with the WA Planning Commission's (WAPC) Transport Impact Assessment Guidelines (Volume 4 – Individual Developments). The Guidelines promote three levels of assessment, where the required detail is dependent on the likely level of traffic impact, as follows (and as shown in Figure 2):

- Low impact – less than 10 peak hour trips, no assessment required;
- Moderate impact – between 10 and 100 peak hour trips, Transport Impact Statement required; and
- High impact – more than 100 peak hour trips, full Transport Impact Assessment required.

Figure 2 Level of transport impact assessment required (source: WAPC Transport Impact Assessment Guidelines, 2016)



The traffic attributable to the proposed development has been determined to be less than 100 vehicle trips in the operating peak hour, therefore the required level of assessment is a Traffic Impact Statement.

1.3 Report Structure

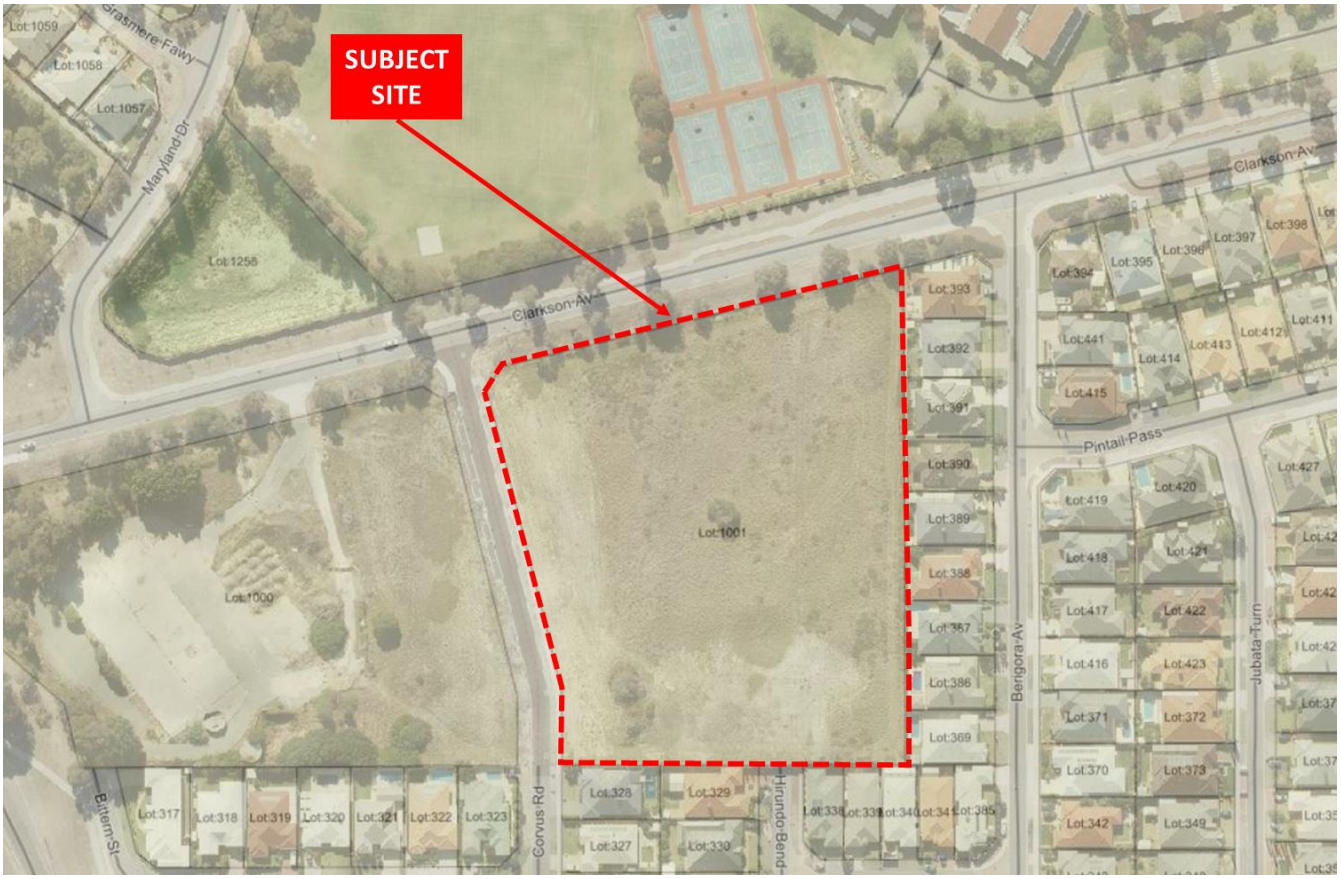
The report is structured as required by the Transport Impact Assessment Guidelines, with the following Sections:

- Proposed development;
- Vehicle access and parking;
- Provision for service vehicles;
- Hours of operation;
- Daily traffic volumes and vehicle types;
- Traffic management on frontage streets;
- Public transport access;
- Pedestrian access;
- Cycle access;
- Site specific issues;
- Safety issues.

2. PROPOSED DEVELOPMENT

The development site is located at 1001 Clarkson Avenue, Tapping. The development site is to the south of Clarkson Avenue, also bounded by Corvus Road to the west, and residential properties fronting Berigora Avenue. The site is currently vacant land, as shown in Figure 3. St Stephens School, which accommodates students from kindergarten to year 12, is located to the north of Clarkson Avenue.

Figure 3 – Development site (source: City of Wanneroo)



The subject land is zoned 'Urban Development' under the City of Wanneroo Town Planning Scheme No. 2 (TPS2) and is zoned 'Residential' with an R60 density coding under the East Wanneroo Structure Plan (EWSP).

The Local Development Plan (LDP) for Lot 1001 Clarkson Avenue, as shown in Figure 4, was adopted by the City of Wanneroo in November 2018.

The LDP for commercial development on the vacant land on the opposite side of Corvus Road, adopted by the City of Wanneroo in March 2018, is shown in Figure 5. The timing for the commercial development is unknown at this stage.

Figure 4 – Local Development Plan for Lot 1001 Clarkson Avenue, Tapping (source: City of Wanneroo)

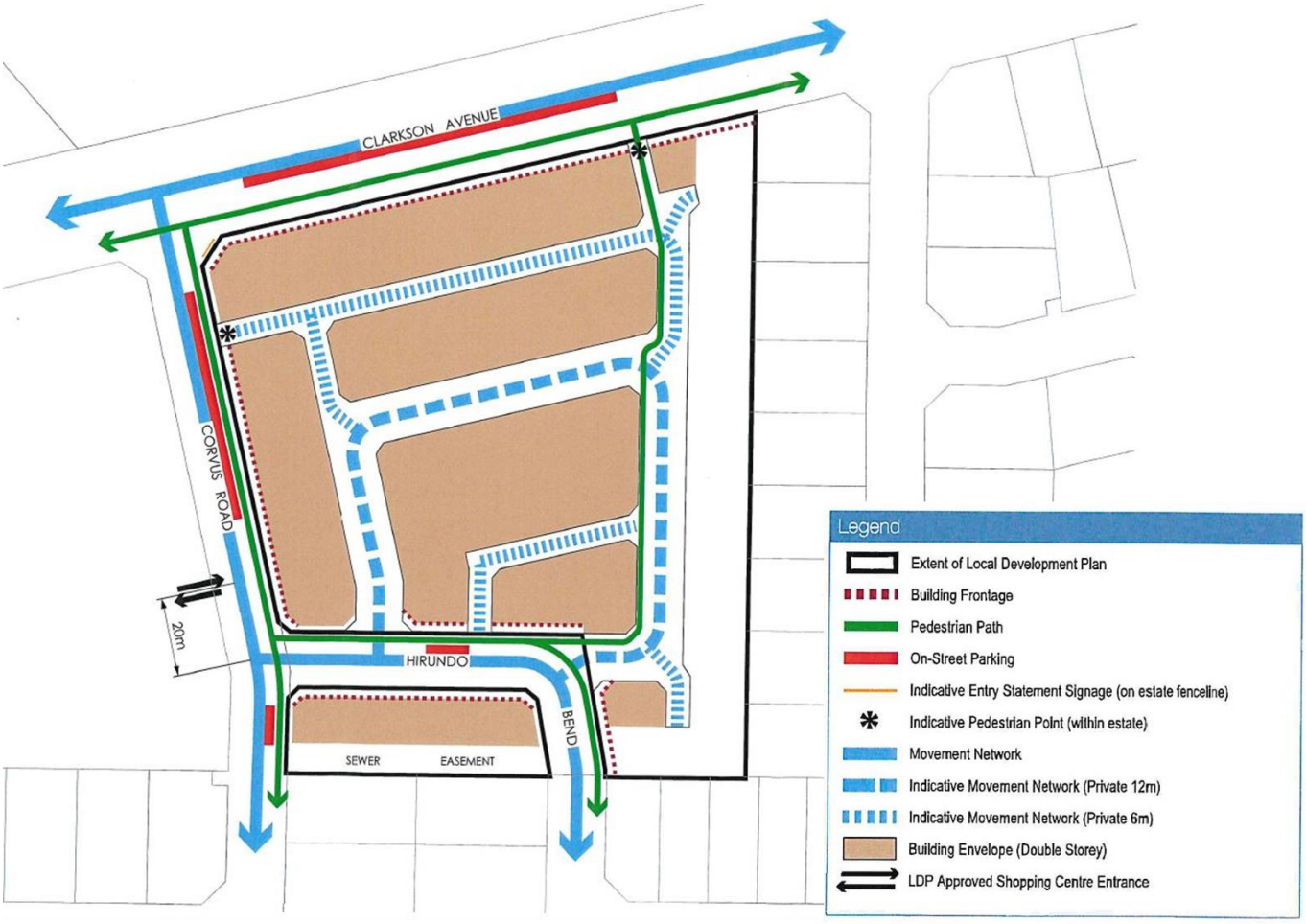
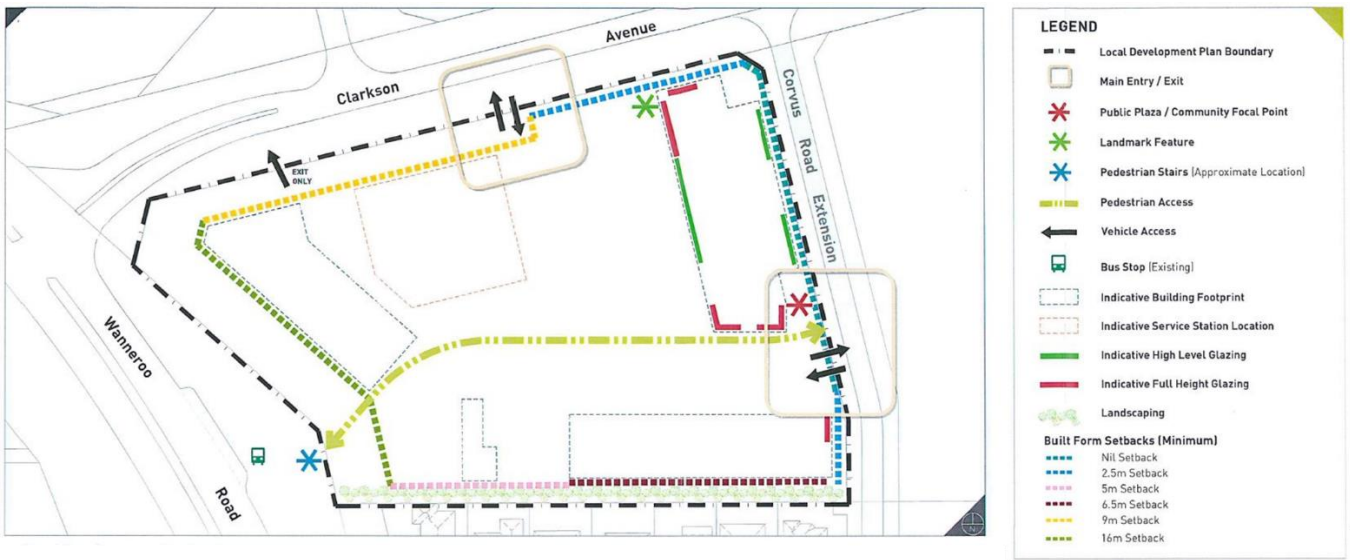
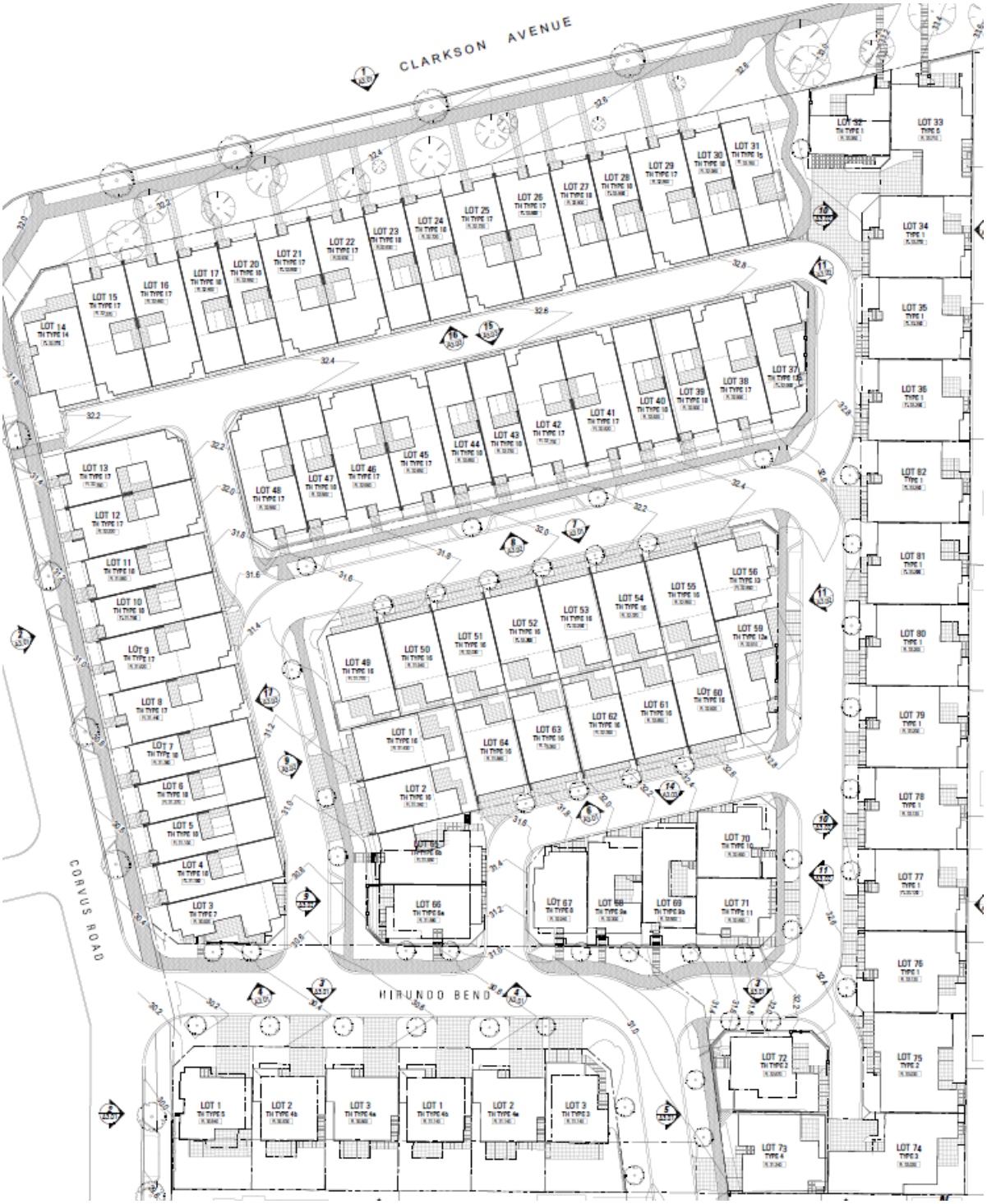


Figure 5 – Local Development Plan for commercial development on opposite site (source: City of Wanneroo)



The proposed development site plan, showing 84 lots and the associated road network, is shown in Figure 6.

Figure 6 –Development site plan (source: Zuideveld Marchant Hur)



3. VEHICLE ACCESS AND PARKING

3.1 Vehicle Access

Vehicle access to the residential development is proposed via Corvus Road, a north westward extension of Hirundo Bend and a network of private roads (accessed via Hirondu Bend), as shown in Figure 7.

Figure 7 – Proposed vehicle access (source: Zuideveld Marchant Hur)

3.2 Parking

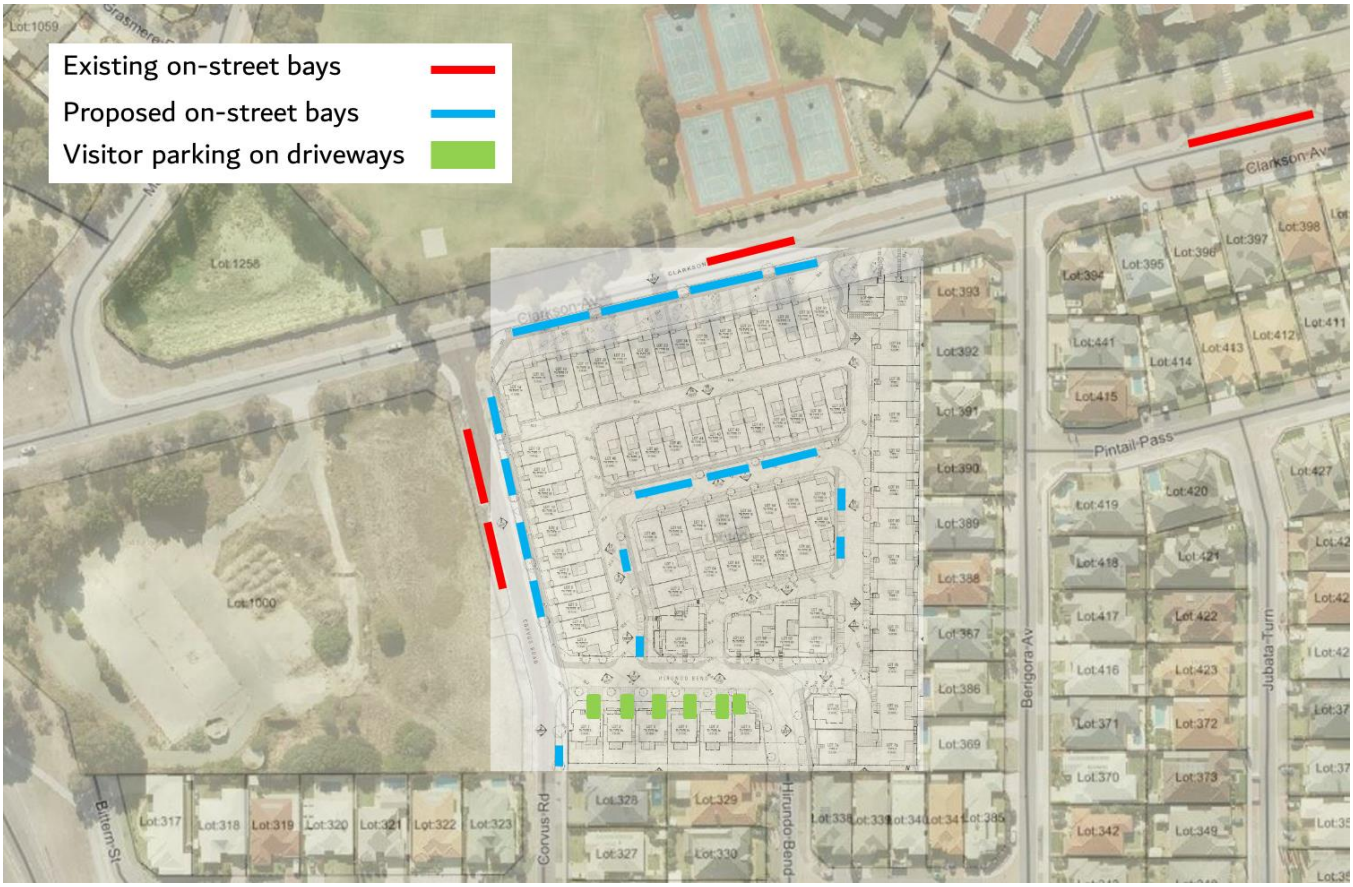
The proposed parking provision is shown in Figure 8. The LDP (shown in Figure 4) proposed on-street parking along the southern side of Clarkson Avenue, eastern side of Corvus Road and a single bay on the northern side of Hirundo Bend.

The proposed parking includes 12 on-street bays internal to the development, plus a further 9 on-street bays within the eastern verge of Corvus Road and another 12 bays within the southern verge of Clarkson Avenue. The 6 properties to the south of Hirundo Bend are proposed with driveways that can accommodate at least 1 visitor bay each.

There are currently 7 on-street bays on the western side of Corvus Road, and 5 bays on the northern side of Clarkson Avenue, both opposite the development site.

The R Codes require 1 visitor bay for every 4 dwellings, resulting in 21 bays. The 33 proposed parking bays, Corvus Road driveways and the existing on-street parking along Corvus Road and Clarkson Avenue ensure the development has adequate parking, well beyond the R Code requirements.

Figure 8 – Proposed parking provision (source: Zuideveld Marchant Hur)



4. PROVISION FOR SERVICE VEHICLES

The private roads within the development have been designed to accommodate the turning movements of an 8.8m medium rigid vehicle (MRV). This includes the private refuse collection vehicles which will service the site.

5. DAILY TRAFFIC VOLUMES AND VEHICLE TYPES

5.1 Trip Generation

The WAPC's Transport Impact Assessment Guidelines Volume 5 – Technical Guidance suggest peak hour trip rates for residential uses, based on the Perth and Regions Travel Surveys (PARTS) data averaged over the range of dwelling types. The recommended rate for residential land use is 8 vehicle trips per dwelling per day with 0.8 vehicle trips per dwelling for the AM and PM peak hours, split as follows:

- AM peak 25% IN, 75% OUT
- PM peak 67% IN, 33% OUT

Based on a total of 84 dwellings, the development is forecast to generate 672 daily trips, with 67 trips in each of the AM and PM peak hours, as summarised in in Table 1.

Table 1 – Peak hour trip rates

Period	IN	OUT	Total
AM Peak	17	50	67
PM Peak	45	22	67
All Day	336	336	672

5.2 Trip Distribution

Trips to and from the site have been distributed according to the proportion of existing left and right turning vehicles at the intersections of Clarkson Avenue / Corvus Road and Wanneroo Road / Clarkson Avenue.

- AM Peak hour: To development
  - 70% from Clarkson Ave west (42% from Wanneroo Rd south, 58% from Wanneroo Rd north);
  - 30% from Clarkson Ave east;
- AM Peak hour: From development
  - 73% to Clarkson Ave west (45% to Wanneroo Rd south, 55% to Wanneroo Road north);
  - 27% to Clarkson Ave east;
- PM Peak hour: To development
  - 70% from Clarkson Ave west (30% from Wanneroo Rd south, 70% from Wanneroo Rd north);
  - 30% from Clarkson Ave east;
- PM Peak hour: From development
  - 80% to Clarkson Ave west (34% to Wanneroo Rd south, 66% to Wanneroo Road north);
  - 20% to Clarkson Ave east.

6. TRAFFIC MANAGEMENT ON FRONTAGE STREETS

6.1 Frontage Streets

The site is bordered by Clarkson Avenue to the north and Corvus Road to the west. The road hierarchy surrounding the development site is shown in Figure 9 and the speed zoning is shown in Figure 10.

Figure 9 – Road hierarchy surrounding development site (source: MRWA)

Figure 10 – Speed zoning surrounding development site (source: MRWA)

Wanneroo Road Street is classified as a Primary Distributor provides a connection between the Perth CBD and Yanchep. Adjacent to the development site, Wanneroo Road is constructed as two carriageways separated by a 2m solid median. The southbound carriageway has two 3.5m wide lanes and a bus embayment. The northbound carriageway has two 3.5m through lanes and a right turning deceleration lane. The Wanneroo Road cross section is shown in Figure 11.

Figure 11 – Wanneroo Road cross section looking north (source: Google Street View)

The posted speed limit of Wanneroo Road is 70 kph. Shared paths are provided along both sides of Wanneroo Road.

The most recent traffic count for Wanneroo Road, undertaken in 2017 between Clarkson Avenue and Joondalup Drive, revealed traffic volumes of 23,400 vehicles per day (vpd), with 12,100 vpd in the northbound direction and 11,300 vpd in the southbound direction. Heavy vehicles made up approximately 8.5% of all traffic along Wanneroo Road.

Clarkson Avenue is classified as a Local Distributor Street. Along the development frontage it is constructed to a width of 7.4m, with a single lane of travel in each direction. On-street parking is currently accommodated along the northern side of the street. A cross section of Clarkson Avenue is shown in Figure 12. The posted speed limit is 50 kph, although the section of road adjacent to the development site is within a school zone, subject to a reduced speed limit of 40 kph between 7:30 and 9:00 AM and 2:30 and 4:00 PM. A shared path is located along the northern side of Clarkson Avenue, with a minimum width of 2.5m.

Figure 12 – Clarkson Avenue Road cross section looking west (source: Google Street View)

Corvus Road is classified as an Access Street, with a posted speed limit is 50 kph. Along the development frontage it is constructed to a width of 6m, with a single lane of travel in each direction. Seven on-street parking bays are located along the western side of the street. A 2m wide footpath is located on the eastern side of the street. A cross section of Corvus Road is shown in Figure 13.

Figure 13 – Corvus Road cross section looking north (source: Flyt)

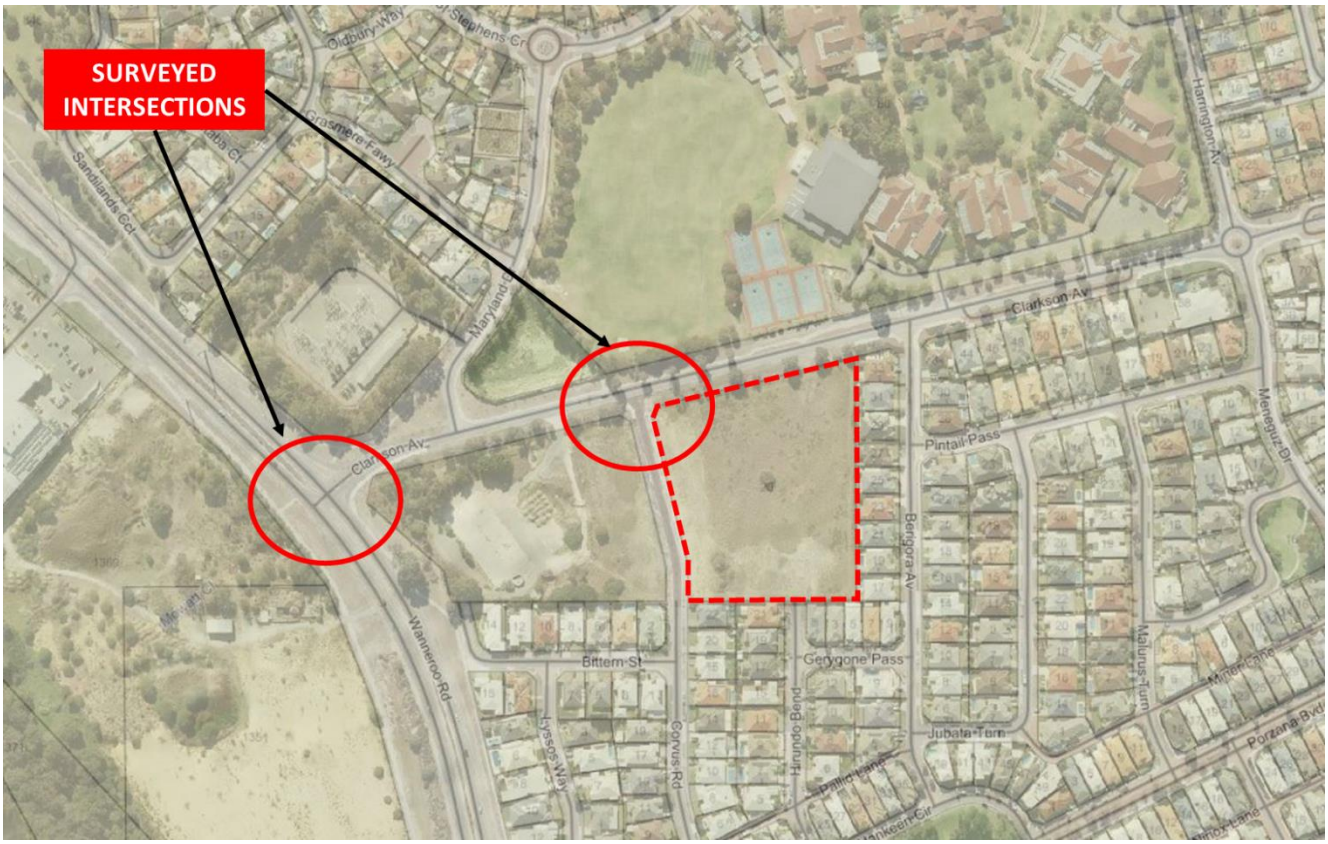
6.2 Surrounding Intersections

There are two existing intersections in the immediate vicinity of the development site, identified in Figure 14. These are:

- Wanneroo Road / Clarkson Avenue – priority-controlled (Give Way sign) intersection;
- Clarkson Avenue / Corvus Road – priority-controlled intersection.

As part of the Wanneroo Road and Joondalup Drive interchange project, commencing construction in December 2018, the priority controlled intersection of Wanneroo Road and Clarkson Avenue will be signalised. The analysis presented in this report is based on the existing configuration. Once the intersection is signalised the capacity for right turning movements will increase.

Figure 14 – Intersections surrounding development site



Peak hour traffic counts at the intersection of Wanneroo Road and Clarkson Avenue were undertaken by Main Roads WA on Wednesday September 13th 2017. The peak periods were found to occur between 7:45 and 8:45 AM and between 3:00 and 4:00 PM (because of the proximity to St Stephen's School). Turning count data was also collected for the period between 4:30 PM and 5:30 PM which represents the PM peak time for development traffic. Peak hour traffic counts for the intersection of Clarkson Avenue and Corvus Road were undertaken on Wednesday December 5th, 2018, for the development traffic peak hours (7:45 to 8:45 AM and 4:30 PM to 5:30 PM).

The existing peak hour traffic volumes through each of the surrounding intersections are shown in Table 2.

Table 2 – Existing peak hour turning traffic volumes

Approach	Movement	AM Peak	PM Peak
Clarkson Avenue / Corvus Road			
Clarkson Avenue eastbound	Through	161	122
	Right	7	9
Corvus Road	Left	11	9
	Right	4	2
Clarkson Avenue westbound	Left	3	4
	Through	251	91
Wanneroo Road / Clarkson Avenue			
Wanneroo Road northbound	Through	946	1019
	Right	84	45
Clarkson Avenue	Left	133	34
	Right	159	66

Approach	Movement	AM Peak	PM Peak
Wanneroo Road southbound	Left	114	111
	Through	887	668

6.2.1 Existing Intersection Performance

SIDRA Intersection 7.0 has been used to assess the existing peak hour performance of the two intersections. It should be noted that the PM peak hour assessed is the development peak hour, and not the road network peak which corresponds to the finish time of St Stephen's School. The development is expected to generate very little traffic between 3:00 and 4:00 PM. The SIDRA models have been calibrated to try to match the queuing and delays observed on-site.

The SIDRA predicted AM peak hour results are summarised in Table 3 while the PM peak hour results are summarised in Table 4. Detailed SIDRA output is provided in Appendix 1.

Table 3 – SIDRA predicted existing intersection performance – AM Peak

Approach	Turn	Level of Service	Delay (s)	95th % Back of Queue (m)
Clarkson Avenue / Corvus Road				
Clarkson Avenue eastbound	Through	A	0	0
	Right	A	5.4	0.4
Corvus Road	Left	A	5.3	0.3
	Right	A	6.2	0.3
Clarkson Avenue westbound	Left	A	4.6	0
	Through	A	0	0
Wanneroo Road / Clarkson Avenue				
Wanneroo Road northbound	Through	A	0	0
	Right	C	15.9	5.6
Clarkson Avenue	Left	A	6.5	3.7
	Right	C	21.2	17.6
Wanneroo Road southbound	Left	A	6.9	2.3
	Through	A	0	0

Table 4 – SIDRA predicted existing intersection performance – PM Peak

Approach	Turn	Level of Service	Delay (s)	95th % Back of Queue (m)
Clarkson Avenue / Corvus Road				
Clarkson Avenue eastbound	Through	A	0	0
	Right	A	4.8	0.4
Corvus Road	Left	A	4.8	0.2
	Right	A	5.3	0.2
Clarkson Avenue westbound	Left	A	4.6	0
	Through	A	0	0

Approach	Turn	Level of Service	Delay (s)	95th % Back of Queue (m)
Wanneroo Road / Clarkson Avenue				
Wanneroo Road northbound	Through	A	0	0
	Right	B	11.8	2.0
Clarkson Avenue	Left	A	5.7	0.8
	Right	B	13.6	4.7
Wanneroo Road southbound	Left	A	6.7	2.0
	Through	A	0	0

The SIDRA analysis shows that the two intersections are currently operating at a level of service (LOS) A in both peak periods.

The intersection of Clarkson Avenue with Corvus Street currently carries low traffic volumes and SIDRA predicts all movements operate at a LOS A in both peak periods.

The intersection of Wanneroo Road with Clarkson Avenue carries a larger volume of traffic. SIDRA predicts both right turning movements currently operate at a LOS C in the AM peak and LOS B in the PM peak. All other movements are predicted operate at a LOS A in both peak periods.

6.2.2 Forecast Intersection Performance

Based on a total of 84 dwellings, the development is forecast to generate 67 trips in both the AM peak and PM peak hours.

Using the distribution as discussed in Section 5.2, the forecast additional AM and PM peak hour traffic volumes attributable to the proposed development are shown in Table 5.

Table 5 – Forecast additional peak hour traffic volumes

Approach	Movement	AM Peak	PM Peak
Clarkson Avenue / Corvus Road			
Clarkson Avenue eastbound	Through		
	Right	+12	+31
Corvus Road	Left	+36	+18
	Right	+14	+4
Clarkson Avenue westbound	Left	+5	+14
	Through		
Wanneroo Road / Clarkson Avenue			
Wanneroo Road northbound	Through		
	Right	+5	+9
Clarkson Avenue	Left	+16	+6
	Right	+20	+12
Wanneroo Road southbound	Left	+7	+22
	Through		

The forecast traffic volumes through the intersections of Clarkson Avenue with Corvus Road and Wanneroo Road with Clarkson Avenue (including the potential additional traffic) are summarised in Table 6.

Table 6 – Forecast peak hour turning traffic volumes

Approach	Movement	AM Peak	PM Peak
Clarkson Avenue / Corvus Road			
Clarkson Avenue eastbound	Through	161	122
	Right	19	40
Corvus Road	Left	47	27
	Right	18	6
Clarkson Avenue westbound	Left	8	18
	Through	251	91
Wanneroo Road / Clarkson Avenue			
Wanneroo Road northbound	Through	946	1019
	Right	89	54
Clarkson Avenue	Left	150	40
	Right	179	78
Wanneroo Road southbound	Left	121	133
	Through	887	668

SIDRA Intersection 7.0 has been used to assess the potential future peak hour performance of the two intersections. The AM peak hour results are summarised in Table 7 while the PM peak hour results are summarised in Table 8. Detailed SIDRA output is provided in Appendix 2.

Even though the intersection of Wanneroo Road and Clarkson Avenue will soon be signalised, the analysis presented in this report is based on the existing configuration. Once the intersection is signalised the capacity for right turning movements will increase.

Table 7 – SIDRA predicted future intersection performance – AM Peak

Approach	Turn	Level of Service	Delay (s)	95th % Back of Queue (m)
Clarkson Avenue / Corvus Road				
Clarkson Avenue eastbound	Through	A	0.1	1.1
	Right	A	5.5	1.1
Corvus Road	Left	A	5.4	1.5
	Right	A	6.4	1.5
Clarkson Avenue westbound	Left	A	4.6	0
	Through	A	0	0
Wanneroo Road / Clarkson Avenue				
Wanneroo Road northbound	Through	A	0	0
	Right	C	16.0	6.0
Clarkson Avenue	Left	A	6.5	4.2
	Right	C	21.6	21.0
Wanneroo Road southbound	Left	A	6.9	2.5
	Through	A	0	0

Table 8 – SIDRA predicted future intersection performance – PM Peak

Approach	Turn	Level of Service	Delay (s)	95th % Back of Queue (m)
Clarkson Avenue / Corvus Road				
Clarkson Avenue eastbound	Through	A	0.1	1.8
	Right	A	4.9	1.8
Corvus Road	Left	A	4.8	0.6
	Right	A	5.5	0.6
Clarkson Avenue westbound	Left	A	4.6	0
	Through	A	0	0
Wanneroo Road / Clarkson Avenue				
Wanneroo Road northbound	Through	A	0	0
	Right	B	11.9	2.5
Clarkson Avenue	Left	A	5.7	0.9
	Right	B	13.9	5.6
Wanneroo Road southbound	Left	A	6.7	2.5
	Through	A	0	0

For the intersection of Clarkson Avenue with Corvus Road, the forecast development traffic is predicted to have very little impact in either of the peak hours. SIDRA predicts all movements will continue operate at a LOS A in both peak periods. The only impact will be increased queue lengths for Corvus Road and the right turn from Clarkson Avenue.

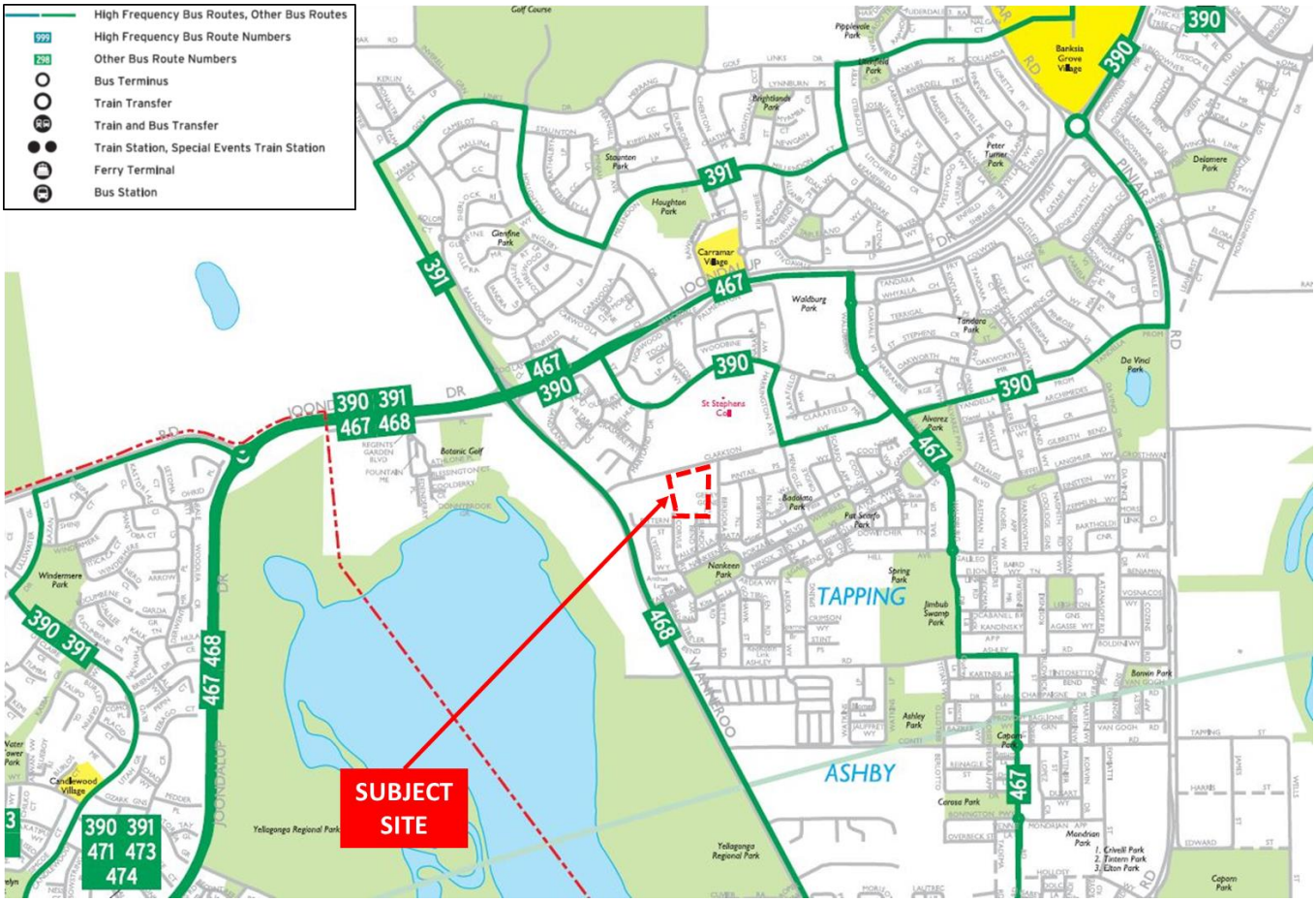
SIDRA predicts the intersection of Wanneroo Road with Clarkson Avenue will continue to operate with right turning movements at a LOS C in the AM peak and LOS B in the PM peak. All other movements are predicted operate at a LOS A in both peak periods.

The traffic impact of the 67 additional trips attributable to the development in each of the AM and PM peak hours is therefore considered to be low.

7. PUBLIC TRANSPORT ACCESS

The subject site is serviced by bus routes 468 and 390 which travel along Wanneroo Road or Clarkson Avenue, as shown in Figure 15. Bus stops are located between 270m and 550m from the proposed development, as shown in Figure 16.

Figure 15 – Adjacent bus routes (source: Transperth)



Bus route 468 is a service between Joondalup and Whitfords Stations, running via Wanneroo Road. Bus route 390 runs between Joondalup Station and Banksia Grove via Tapping. More detail of bus route services and frequencies is provided in Table 9.

Table 9 – Bus frequency and service numbers

Route	Direction	Weekday Summary		Saturday Summary	Sunday/ Public Holiday Summary
		No. of Services	AM/ PM Peak Frequency		
468	To Whitfords	42	15 mins / 20 mins	hourly	hourly
	To Joondalup	41	20 mins / 15 mins	hourly	hourly
390	To Banksia Grove	38	20 mins / 15 mins	hourly	hourly
	To Joondalup	41	15 mins / 20 mins	hourly	hourly

Figure 16 – Closest bus stops (source: Transperth)

The LDP for the commercial development site on the vacant land on the opposite side of Corvus Road, as shown in Figure 5, includes an east-west pedestrian connection between Corvus Road and the bus stop on Wanneroo Road.

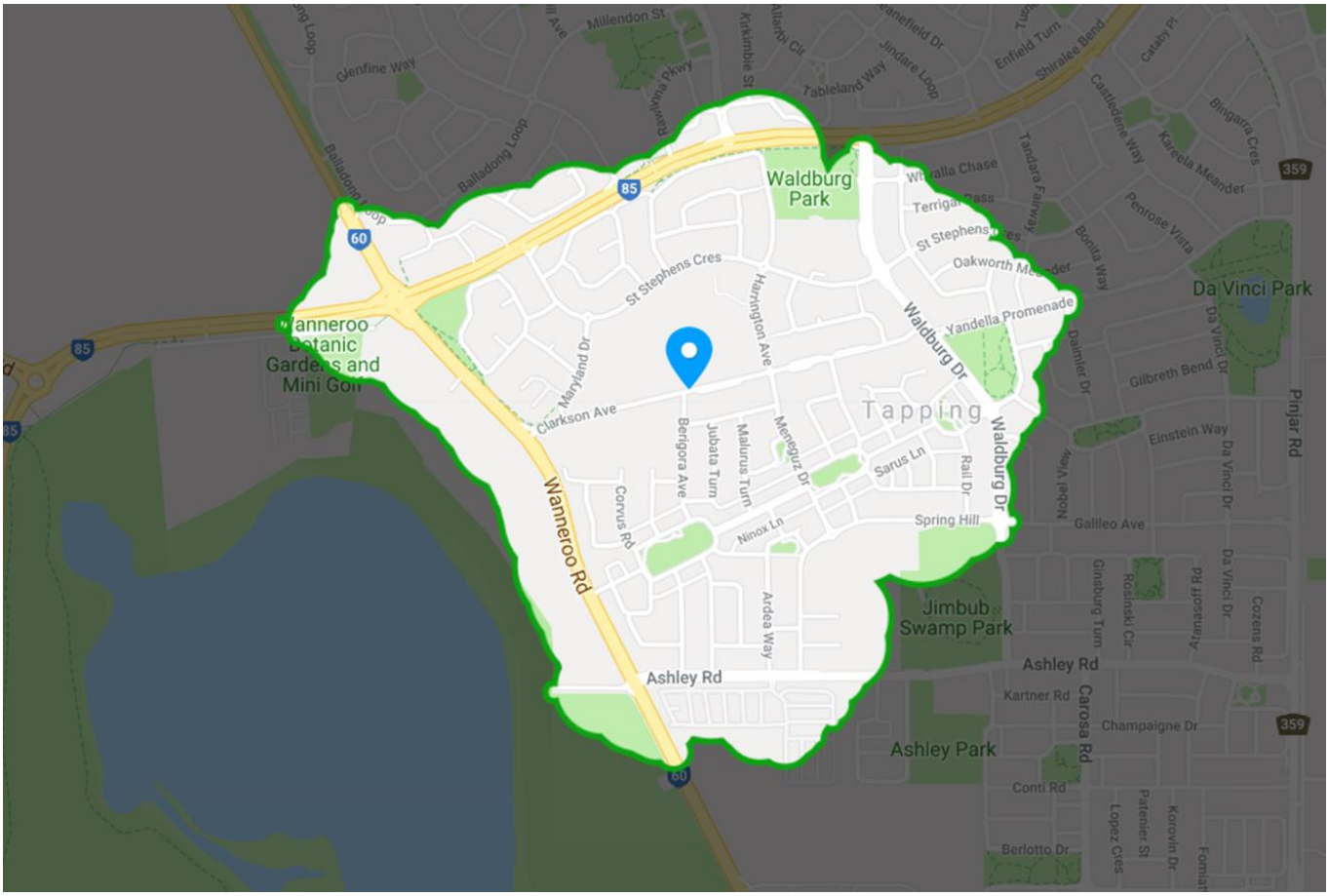
8. PEDESTRIAN ACCESS

8.1 Existing Pedestrian Network

There is a 2m wide shared path on the eastern side of Corvus Road and a shared path on the northern side of Clarkson Avenue. The WalkScore walkability assessment tool considers the development site to be car dependent (most errands requiring a car), with a walk score of 33 out of 100, as shown in Figure 17. The 15-minute walkable catchment from the development centre is shown in Figure 18.

Figure 17 – WalkScore rating for surrounding area (source: WalkScore)

Figure 18 – Walkable catchment in 15 minutes (source: WalkScore)



8.2 Development Proposals

In addition to the existing shared path along the eastern verge of Corvus Road, the LDP proposes a shared path along the southern side of Clarkson Avenue, a footpath along the northeastern side of Hirundo Bend, and an internal connection along the eastern most private road linking Hirundo Bend with Clarkson Avenue directly opposite St Stephen's School.

The proposed development includes additional 1.2m wide footpaths along all private roads with direct frontage and pedestrian access to more than 10 dwellings, plus an additional connection to Corvus Road.

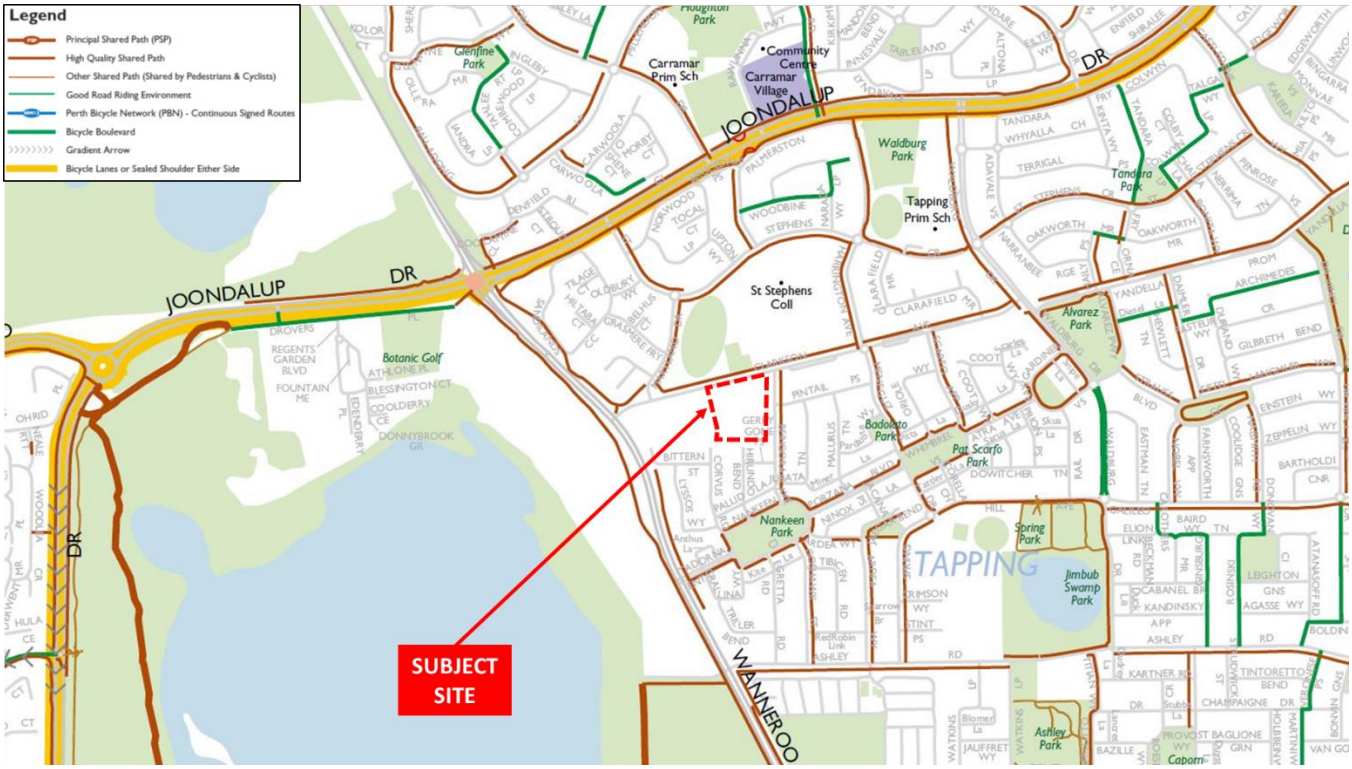
The footpath along the northern side of Hirundo Bend is proposed to be located adjacent to the kerb and will be widened by 300mm to 1.8m.

9. CYCLE ACCESS

9.1 Existing Cycle Network

The development site is in close proximity to a network of shared paths as shown in Figure 19.

Figure 19 – Cyclist network surrounding development site (source: Department of Transport)



9.2 Development Proposals

In addition to the existing shared path along the eastern verge of Corvus Road, the LDP proposes a shared path along the southern side of Clarkson Avenue. The private roads within the development have no specific provisions for cyclists; however, cycling can be safely accommodated on-street due to the very low traffic volumes, and low traffic speeds, or within the footpaths.

10. SITE SPECIFIC ISSUES

The development site is located on the opposite side of Clarkson Avenue to St Stephen's School Carramar Campus. The school accommodates students from kindergarten to year 12 and is a significant generator of vehicle trips, as well as pedestrian and cycle trips.

The proposed street and pedestrian network within the development will be able to accommodate pedestrian and cyclist movements between residential areas to the south and the school.

11. SAFETY ISSUES

In the five-year period ending December 31st 2017, there were 7 reported crashes (including 3 casualty crashes) at the intersection of Wanneroo Road with Clarkson Avenue (which is within the expected range given the traffic volumes through the intersection). As part of the Wanneroo Road and Joondalup Drive interchange project, commencing construction in December 2018, this intersection will be signalised and right turn crashes are expected to reduce.

There were no reported crashes at the intersection of Clarkson Avenue and Corvus Road.

12. SUMMARY AND CONCLUSIONS

This report has been prepared in support of the proposed residential development at Lot 1001 Clarkson Avenue, Tapping.

The report has been prepared in accordance with the WA Planning Commission's (WAPC) Transport Impact Assessment Guidelines (Volume 4 – Individual Developments). The traffic attributable to the proposed development has been determined to be less than 100 vehicle trips in the operating peak hour, therefore the required level of assessment is a Traffic Impact Statement.

Based on a total of 84 dwellings, the development is forecast to generate 672 daily trips, with 67 trips in each of the AM and PM peak.

SIDRA Intersection 7.0 has been used to assess the existing and forecast (with development traffic) peak hour performance of the intersections of Clarkson Avenue with Corvus Road and Wanneroo Road with Clarkson Avenue.

For the intersection of Clarkson Avenue with Corvus Road, the forecast development traffic is predicted to have very little impact in either of the peak hours. SIDRA predicts all movements will continue operate at a LOS A in both peak periods. The only impact will be increased queue lengths for Corvus Road and the right turn from Clarkson Avenue.

SIDRA predicts the intersection of Wanneroo Road with Clarkson Avenue will continue to operate with right turning movements at a LOS C in the AM peak and LOS B in the PM peak. All other movements are predicted operate at a LOS A in both peak periods.

The intersection of Wanneroo Road and Clarkson Avenue will soon be signalised, as part of the Wanneroo Road and Joondalup Drive interchange project. The analysis presented in this report is based on the existing configuration. Once the intersection is signalised the capacity for right turning movements will increase.

The traffic impact of the 67 additional trips attributable to the development in each of the AM and PM peak hours is therefore considered to be low.

Visitor parking, pedestrian and cycle movements are well catered for, including enhanced connections to existing public transport.

MOVEMENT SUMMARY

Site: 2 [Corvus Existing AM]

Clarkson Ave / Corvus Rd
Existing volumes
AM Peak hour
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: Corvus Rd											
1	L2	11	0.0	0.013	5.3	LOS A	0.0	0.3	0.33	0.54	45.9
3	R2	4	0.0	0.013	6.2	LOS A	0.0	0.3	0.33	0.54	45.4
Approach		15	0.0	0.013	5.6	LOS A	0.0	0.3	0.33	0.54	45.8
East: Clarkson Ave east											
4	L2	3	0.0	0.132	4.6	LOS A	0.0	0.0	0.00	0.01	49.5
5	T1	251	2.4	0.132	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		254	2.4	0.132	0.1	NA	0.0	0.0	0.00	0.01	49.9
West: Clarkson Ave west											
11	T1	161	3.7	0.090	0.1	LOS A	0.1	0.4	0.04	0.02	49.8
12	R2	7	0.0	0.090	5.4	LOS A	0.1	0.4	0.04	0.02	48.8
Approach		168	3.6	0.090	0.3	NA	0.1	0.4	0.04	0.02	49.7
All Vehicles		437	2.7	0.132	0.3	NA	0.1	0.4	0.03	0.03	49.7

MOVEMENT SUMMARY

Site: 2 [Corvus Existing PM]

Clarkson Ave / Corvus Rd
Existing volumes
PM Peak hour
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: Corvus Rd											
1	L2	9	0.0	0.008	4.8	LOS A	0.0	0.2	0.17	0.50	46.2
3	R2	2	0.0	0.008	5.3	LOS A	0.0	0.2	0.17	0.50	45.8
Approach		11	0.0	0.008	4.9	LOS A	0.0	0.2	0.17	0.50	46.1
East: Clarkson Ave east											
4	L2	4	0.0	0.049	4.6	LOS A	0.0	0.0	0.00	0.02	49.4
5	T1	91	0.0	0.049	0.0	LOS A	0.0	0.0	0.00	0.02	49.9
Approach		95	0.0	0.049	0.2	NA	0.0	0.0	0.00	0.02	49.8
West: Clarkson Ave west											
11	T1	122	0.0	0.068	0.0	LOS A	0.1	0.4	0.03	0.04	49.7
12	R2	9	0.0	0.068	4.8	LOS A	0.1	0.4	0.03	0.04	48.7
Approach		131	0.0	0.068	0.4	NA	0.1	0.4	0.03	0.04	49.6
All Vehicles		237	0.0	0.068	0.5	NA	0.1	0.4	0.03	0.05	49.5

MOVEMENT SUMMARY

Site: 1 [Clarkson Existing AM part 1]

Wanneroo Road / Clarkson Avenue part 1
September 2017
AM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Clarkson Ave											
4	L2	133	3.0	0.129	6.5	LOS A	0.5	3.7	0.48	0.67	50.2
5	T1	159	1.3	0.404	15.6	LOS C	2.0	13.8	0.81	0.99	32.9
Approach		292	2.1	0.404	11.4	LOS B	2.0	13.8	0.66	0.84	39.0
North: Wanneroo Rd north											
7	L2	114	4.4	0.076	6.9	LOS A	0.3	2.3	0.18	0.55	52.5
8	T1	887	6.3	0.237	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
Approach		1001	6.1	0.237	0.8	LOS A	0.3	2.3	0.02	0.06	67.4
West: Median break											
11	T1	84	1.2	0.203	9.6	LOS A	0.8	5.6	0.75	0.80	28.1
Approach		84	1.2	0.203	9.6	LOS A	0.8	5.6	0.75	0.80	28.1
All Vehicles		1377	4.9	0.404	3.6	NA	2.0	13.8	0.20	0.27	54.4

MOVEMENT SUMMARY

Site: 1 [Clarkson Existing AM part 2]

Wanneroo Road / Clarkson Avenue part 2
September 2017
AM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wanneroo Road south											
2	T1	946	4.5	0.250	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
3	R2	84	1.2	0.046	6.3	LOS A	0.0	0.0	0.00	0.66	58.7
Approach		1030	4.3	0.250	0.5	NA	0.0	0.0	0.00	0.05	68.9
East: Median											
6	R2	159	1.3	0.154	5.1	LOS A	0.5	3.8	0.55	0.75	38.0
Approach		159	1.3	0.154	5.1	LOS A	0.5	3.8	0.55	0.75	38.0
All Vehicles		1189	3.9	0.250	1.1	NA	0.5	3.8	0.07	0.15	62.1

MOVEMENT SUMMARY

Site: 1 [Clarkson Existing PM part 1]

Wanneroo Road / Clarkson Avenue part 1
September 2017
PM peak hour
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
East: Clarkson Ave											
4	L2	34	0.0	0.028	5.7	LOS A	0.1	0.8	0.38	0.56	51.1
5	T1	66	0.0	0.115	8.7	LOS A	0.5	3.2	0.62	0.78	35.0
Approach		100	0.0	0.115	7.6	LOS A	0.5	3.2	0.54	0.70	39.2
North: Wanneroo Rd north											
7	L2	111	0.0	0.070	6.7	LOS A	0.3	2.0	0.12	0.55	52.8
8	T1	668	2.1	0.174	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		779	1.8	0.174	1.0	LOS A	0.3	2.0	0.02	0.08	66.8
West: Median break											
11	T1	45	0.0	0.074	5.5	LOS A	0.3	2.0	0.60	0.62	29.0
Approach		45	0.0	0.074	5.5	LOS A	0.3	2.0	0.60	0.62	29.0
All Vehicles		924	1.5	0.174	1.9	NA	0.5	3.2	0.10	0.17	58.6

MOVEMENT SUMMARY

Site: 1 [Clarkson Existing PM part 2]

Wanneroo Road / Clarkson Avenue part 2
September 2017
PM peak hour
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: Wanneroo Road south											
2	T1	1019	1.3	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
3	R2	45	0.0	0.024	6.3	LOS A	0.0	0.0	0.00	0.66	59.1
Approach		1064	1.2	0.263	0.3	NA	0.0	0.0	0.00	0.03	69.4
East: Median											
6	R2	66	0.0	0.065	4.9	LOS A	0.2	1.5	0.54	0.70	38.2
Approach		66	0.0	0.065	4.9	LOS A	0.2	1.5	0.54	0.70	38.2
All Vehicles		1130	1.2	0.263	0.6	NA	0.2	1.5	0.03	0.07	66.2

MOVEMENT SUMMARY

Site: 2 [Corvus Forecast AM]

Clarkson Ave / Corvus Rd
Existing + development volumes
AM Peak hour
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: Corvus Rd											
1	L2	49	0.0	0.059	5.4	LOS A	0.2	1.5	0.34	0.57	45.8
3	R2	18	0.0	0.059	6.4	LOS A	0.2	1.5	0.34	0.57	45.4
Approach		67	0.0	0.059	5.7	LOS A	0.2	1.5	0.34	0.57	45.7
East: Clarkson Ave east											
4	L2	8	0.0	0.135	4.6	LOS A	0.0	0.0	0.00	0.02	49.4
5	T1	251	2.4	0.135	0.0	LOS A	0.0	0.0	0.00	0.02	49.9
Approach		259	2.3	0.135	0.2	NA	0.0	0.0	0.00	0.02	49.9
West: Clarkson Ave west											
11	T1	161	3.7	0.098	0.1	LOS A	0.1	1.1	0.09	0.06	49.4
12	R2	19	0.0	0.098	5.5	LOS A	0.1	1.1	0.09	0.06	48.4
Approach		180	3.3	0.098	0.7	NA	0.1	1.1	0.09	0.06	49.3
All Vehicles		506	2.4	0.135	1.1	NA	0.2	1.5	0.08	0.11	49.1

MOVEMENT SUMMARY

Site: 2 [Corvus Forecast PM]

Clarkson Ave / Corvus Rd
Existing + development volumes
PM Peak hour
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: Corvus Rd											
1	L2	27	0.0	0.025	4.8	LOS A	0.1	0.6	0.18	0.51	46.2
3	R2	7	0.0	0.025	5.5	LOS A	0.1	0.6	0.18	0.51	45.8
Approach		34	0.0	0.025	5.0	LOS A	0.1	0.6	0.18	0.51	46.1
East: Clarkson Ave east											
4	L2	18	0.0	0.056	4.6	LOS A	0.0	0.0	0.00	0.09	49.0
5	T1	91	0.0	0.056	0.0	LOS A	0.0	0.0	0.00	0.09	49.5
Approach		109	0.0	0.056	0.8	NA	0.0	0.0	0.00	0.09	49.4
West: Clarkson Ave west											
11	T1	122	0.0	0.088	0.1	LOS A	0.3	1.8	0.12	0.14	48.9
12	R2	41	0.0	0.088	4.9	LOS A	0.3	1.8	0.12	0.14	48.0
Approach		163	0.0	0.088	1.3	NA	0.3	1.8	0.12	0.14	48.7
All Vehicles		306	0.0	0.088	1.5	NA	0.3	1.8	0.08	0.16	48.6

MOVEMENT SUMMARY

Site: 1 [Clarkson Forecast AM part 1]

Wanneroo Road / Clarkson Avenue part 1
September 2017 + development volumes
AM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Clarkson Ave											
4	L2	150	2.7	0.145	6.5	LOS A	0.6	4.2	0.48	0.67	50.2
5	T1	180	1.1	0.458	16.5	LOS C	2.3	16.6	0.82	1.02	32.6
Approach		330	1.8	0.458	12.0	LOS B	2.3	16.6	0.67	0.86	38.8
North: Wanneroo Rd north											
7	L2	121	4.1	0.081	6.9	LOS A	0.3	2.5	0.19	0.55	52.5
8	T1	887	6.3	0.237	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
Approach		1008	6.1	0.237	0.9	LOS A	0.3	2.5	0.02	0.07	67.2
West: Median break											
11	T1	89	1.1	0.215	9.7	LOS A	0.8	6.0	0.75	0.81	28.1
Approach		89	1.1	0.215	9.7	LOS A	0.8	6.0	0.75	0.81	28.1
All Vehicles		1427	4.8	0.458	4.0	NA	2.3	16.6	0.22	0.30	53.5

MOVEMENT SUMMARY

Site: 1 [Clarkson Forecast AM part 2]

Wanneroo Road / Clarkson Avenue part 2
September 2017 + development volumes
AM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wanneroo Road south											
2	T1	946	4.5	0.250	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
3	R2	89	1.1	0.048	6.3	LOS A	0.0	0.0	0.00	0.66	58.7
Approach		1035	4.3	0.250	0.6	NA	0.0	0.0	0.00	0.06	68.8
East: Median											
6	R2	180	1.1	0.175	5.1	LOS A	0.6	4.4	0.56	0.75	38.0
Approach		180	1.1	0.175	5.1	LOS A	0.6	4.4	0.56	0.75	38.0
All Vehicles		1215	3.8	0.250	1.2	NA	0.6	4.4	0.08	0.16	61.4

MOVEMENT SUMMARY

Site: 1 [Clarkson Forecast PM part 1]

Wanneroo Road / Clarkson Avenue part 1
September 2017 + development volumes
PM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Clarkson Ave											
4	L2	40	0.0	0.033	5.7	LOS A	0.1	0.9	0.38	0.57	51.1
5	T1	78	0.0	0.138	8.9	LOS A	0.5	3.8	0.63	0.80	35.0
Approach		118	0.0	0.138	7.8	LOS A	0.5	3.8	0.55	0.72	39.2
North: Wanneroo Rd north											
7	L2	133	0.0	0.085	6.7	LOS A	0.4	2.5	0.14	0.55	52.7
8	T1	668	2.1	0.174	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		801	1.7	0.174	1.1	LOS A	0.4	2.5	0.02	0.09	66.3
West: Median break											
11	T1	55	0.0	0.091	5.6	LOS A	0.4	2.5	0.61	0.63	29.0
Approach		55	0.0	0.091	5.6	LOS A	0.4	2.5	0.61	0.63	29.0
All Vehicles		974	1.4	0.174	2.2	NA	0.5	3.8	0.12	0.20	57.3

MOVEMENT SUMMARY

Site: 1 [Clarkson Forecast PM part 2]

Wanneroo Road / Clarkson Avenue part 2
September 2017 + development volumes
PM peak hour
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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wanneroo Road south											
2	T1	1019	1.3	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
3	R2	55	0.0	0.030	6.3	LOS A	0.0	0.0	0.00	0.66	59.1
Approach		1074	1.2	0.263	0.4	NA	0.0	0.0	0.00	0.03	69.3
East: Median											
6	R2	78	0.0	0.077	5.0	LOS A	0.3	1.8	0.54	0.71	38.2
Approach		78	0.0	0.077	5.0	LOS A	0.3	1.8	0.54	0.71	38.2
All Vehicles		1152	1.1	0.263	0.7	NA	0.3	1.8	0.04	0.08	65.7