

Appendix 3 Traffic Impact Assessment

KCTT Traffic Impact Assessment

TRANSPORT IMPACT ASSESSMENT

Carramar Village

Carramar

May 2018

Rev D

The logo for KCTT features the letters 'kctt' in a bold, lowercase, sans-serif font. The 'k' is stylized with three diagonal lines above it, resembling a stylized 'K' or a set of stairs. The 'c' is a simple, rounded shape. The 't's are tall and have a slight slant. The entire logo is rendered in a dark red color.

kctt



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1. Executive Summary

The developer seeks to amend Carramar South/Tapping North Agreed Structure Plan No. 21B to increase the permitted Retail Net Lettable Area from 4,500 m² to 5,500 m². The amendment will facilitate redevelopment of the shopping centre as further described in this report. Subsequent redevelopment will aim to reduce private vehicle dependency.

Under the jurisdiction of the City of Wanneroo, Carramar Shopping Centre is situated off regional road, Joondalup Drive and is boarded by Rawlinna Parkway and Cheriton Drive. There is a likelihood of an aged and dependant persons dwelling facility, however it will not be constructed in the foreseeable future. For the purposes of this TIA it is included in the calculations throughout the report.

KCTT have completed a crash data analysis and believe that the proposed additional floor area will not have any adverse impact on the safety of the surrounding road network.

According to The City of Wanneroo's District Planning Scheme No. 2 448 parking bays are required. Although no formal reciprocal vehicle parking agreement exists, practically, the subject site, the Community Centre, the school playground and the sporting club already share the parking space. Therefore, KCTT believe that 25% reduction of the total parking requirement for the proposed development would be appropriate based on the reciprocity between the land uses. This makes a total parking requirement of 336 parking bays. KCTT believe that the current number of parking bays has sufficient spare capacity to accommodate for proposed addition in floor space.

A five-day parking survey covering the peak hours of parking activity conducted by KCTT displayed that even in the Saturday peak hours there are 4% completely unoccupied parking bays throughout the carparking area. Additionally, 90% of the remaining parking bays will be available at some point during the peak period. It should be noted that the 450-person soccer club which plays at home in Houghton Park (west of the subject site) is moving next year as it has outgrown its facilities. This will further reduce parking attraction for Saturday morning peak period. Additionally, a new Woolworths recently opened in neighbouring suburb Banksia Grove, which is likely to affect patronage. The parking survey was conducted prior to the opening of Aldi and the new Woolworths.

With considerations to the above findings, KCTT believe that the current number of parking bays in the location has the sufficient spare capacity to accommodate for the proposed development additions.

The parking area is shared between all user classes, pedestrian, cyclists and vehicles. Main pedestrian linkages throughout this area are characterised by red pavement, with zebra pedestrian crossings. KCTT believe that the internal safety of the development will not be affected by the proposed additions in ground floor area.

The existing 13 bicycle racks are situated near the shopping centre entrance. KCTT suggest the provision of an additional 11 bicycle racks in order to comply with the City of Wanneroo's requirement of 34 bicycle parking spaces.

Carramar Shopping Centre provides several loading docks to cater for the service and delivery vehicle requirements. KCTT believe there is no need for conventional parking bays, keeping in mind that the vehicles dwell times depends solely on the loading and unloading of goods.

Total traffic impact of the subject site with the proposed additions would be 7,292 VPD / 211 AM VPH / 799 PM VPH. However, the proposed additions to the shopping centre and possible aged and dependant persons dwelling would result in an additional 743 VPD / 25 AM VPH / 82 PM VPH to the existing traffic on the surrounding road network. According to WAPC this is considered moderate traffic impact. KCTT believe that the proposed expansion will not have any significant impact when taken in context of the surrounding road network.

It should be noted that two major changes have been announced to the surrounding road network:

- Wanneroo Road/Joondalup Drive flyover announced. Joondalup Drive will be elevated over Wanneroo Road.
- A revised roundabout design has been provided for the Cheriton Drive/Joondalup Drive intersection in lieu of a traffic light intersection previously considered.

KCTT have also completed a SIDRA Intersection Analysis for the intersection of Cheriton Drive and Joondalup Drive. The results of the analysis are shown in Appendix 3. This analysis concludes that there will be no future problems catering for traffic volumes at this intersection if it is upgraded to a roundabout in the near future.

2. Transport Impact Assessment

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2.1 Location

Lot Number	Lot 2495
Street Number	7
Road Name	Cheriton Drive
Suburb	Carramar
Description of Site	The subject site is situated off regional road, Joondalup Drive and is boarded by Rawlinna Parkway and Cheriton Drive under the jurisdiction of the the City of Wanneroo. The total site area is 20793m ² .

2.2 Technical Literature Used

Local Government Authority	City of Wanneroo
Type of Development	Mixed Use
Are the R-Codes referenced?	NO
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced?	YES
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 4 - Individual Developments
Are there applicable LGA schemes for this type of development?	YES
<i>If YES, Nominate:</i>	
Number of Scheme	District Planning Scheme No. 2
Name of Scheme	No 2
Are Austroads documents referenced?	YES
Are there applicable DAP schemes for this type of development?	NO
Is the Perth Transport Plan for 3.5 million and Beyond referenced?	NO

2.3 Land Uses

Are there any existing Land Uses YES

If YES, Nominate Land Uses and Yields:

Existing Land Uses

Land use	Yield NLA [m ²]
Woolworths Up Stairs staff area	186
Woolworths/BWS Ground Floor	3,079
Jetts Gym	258
Dentist	212
Food 1	91
Food 2	92
Food 3	106
Beauty Salon (Mistique)	85
Hair Dresser	95
Café	117
Newsagent	104
Kiosk x 2	49
Priceline and Baker	505
Medical Centre	303
Total NLA	5,283
(Total RNLA component)	4,509

How many Land Uses are proposed? 8 new tenancies
 (some of the new tenancies will replace the existing ones)

Nominate Land Uses and Yields:

Proposed Land Uses

Land use	Yield NLA [m ²]
New Restaurant replacing Jetts	258
New Food replacing dentist	212
New Entry & PO Boxes	0
Hair Dresser or New Food	95
Priceline And Baker Reduced in Size	400
New Café/Florist/Salon Tenancy	198
New Medical Centre/Dentist	600
New Gym	260
Total NLA	5,847
(Total RNLA component)	5,092
Plus 30 x 70 m ² aged and dependant persons dwelling*	2100 (30 units, assumed 5 employees)

Note * - There is a likelihood that the aged and dependant persons dwelling will not be constructed in the foreseeable future. However, for the purposes of this TIA it is included in the calculations throughout the report. KCTT have assumed 5 employees for the purposes of this report, it should be noted that this is a rough assumption to provide an approximate impact of the possible aged and dependant persons dwelling.

Are the proposed land uses complimentary with the surrounding land-uses? YES

2.4 Local Road Network Information

How many roads front the subject site? 2

Name of Roads Fronting Subject Site / Road Classification and Description:

Road 1

Road Name	Rawlinna Parkway
Number of Lanes	Varies from one-way/one-lane to two-way/one-lane
Road Reservation Width	14m
Road Pavement Width	6m
Classification	Urban Local Road / Access Road
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Road 2

Road Name	Cheriton Drive
Number of Lanes	two-way / one lane per direction
Road Reservation Width	30m
Road Pavement Width	4.7m+4.7m pavement + 5.6m median
Classification	Significant Urban Local Road / Local Distributor
Speed Limit	50kph
Bus Route	NO
On-street parking	NO

Name of Other Roads within 400m radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	Joondalup Drive
Number of Lanes	two-way / two lanes per direction + cycling lanes
Road Reservation Width	52m
Road Pavement Width	9m+12m pavement + 10m median
Classification	Significant Urban Local Road/ Distributor A
Speed Limit	70kph
Bus Route	YES
<i>If YES Nominate Bus Routes</i>	390 - Joondalup Station - Banksia Grove via Tapping 391 - Joondalup Station - Banksia Grove via Carramar 467 - Whitfords Station - Joondalup Station via Pearsall, Hocking & Ashby 468 - Whitfords Station - Joondalup Station via Wanneroo Rd
On-street parking	NO

Road 2

Road Name	Wanneroo Road
------------------	---------------

Number of Lanes	two-way / varies from one lane per direction to multiple lanes per direction
Road Reservation Width	varies from 50m - 20m
Road Pavement Width	varies from 8m undivided to 30m with a 1.5m median
Classification	Urban Highway / Primary Distributor
Speed Limit	70kph 90kph
Bus Route	YES
<i>If YES Nominate Bus Routes</i>	391 - Joondalup Station - Banksia Grove via Carramar 468 - Whitfords Station - Joondalup Station via Wanneroo Rd
On-street parking	NO

2.5 Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)				Heavy Vehicle % <i>If HV count is Not Available, are HV likely to be in higher volumes than generally expected?</i>	Year	
			AM Peak Time	AM Peak VPH	PM Peak Time	PM Peak VPH		Date of Traffic Count	<i>If older than 3 years multiply with a growth rate</i>
Joondalup Drive	West of Wanneroo Road (SLK 0.39)	50,812	07:45 – 4,096	15:00 – 4,040	8.2%	Feb 2016	-		
	East of Wanneroo Road (SLK 0.88)	34,943	07:45 – 2,778	15:30 – 2,889	5.4%	Dec 2014	-		
	West of Pinjar Road (SLK 2.75)	23,195	07:45 – 1,932	16:30 – 1,981	8.3%	Mar 2016	-		
Wanneroo Road	North of Joondalup Drive (SLK 26.70)	27,390	07:30 – 2,212	16:30 – 2,224	14.6%	Feb 2016	-		
	South of Joondalup Drive (SLK 25.97)	28,473	07:30 – 2,214	15:30 – 2,307	9.4%	Dec 2014	-		

2.6 Vehicular Crash Information

Is Crash Data Available on Main Roads WA website? YES

If YES, nominate important survey locations:

Location 1 Intersection of Joondalup Drive and Cheriton Drive
 Location 2 Intersection of Joondalup Drive and Rawlinna Parkway
 Location 3 Cheriton Drive
 Location 4 Rawlinna Parkway

Road Name	SLK	Road Hierarchy	Functional Classification	Speed Limit	Crash Statistics			
					No of KSI Crashes	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
Joondalup Drive & Cheriton Drive	N/A	Significant Urban Local Road / Significant Urban Local Road	Distributor A/ Local Distributor	70kph/50kph	1	7	18	8
No of MVKT Travelled at Location				approximately 35,000*5yrs*365*0.3 = 19.16 MVKT				
KSI Crash Rate				1 KSI crashes per 19.16 MVKT = 0.05 KSI crashes/MVKT				
Comparison with KSI Crash Density and Crash Rate Statistics				0.05 crashes/MVKT is lower than network average of 0.09				
Other Crash Rate				33 crashes per 19.16 MVKT = 1.72 other crashes / MVKT				
Comparison with Crash Density and Crash Rate Statistics				1.72 crashes/MVKT is lower than network average of 1.99				
Joondalup Drive & Rawlinna Parkway	N/A	Significant Urban Local Road / Urban Local Road	Distributor A/ Local Distributor	70kph/50kph	0	1	0	0
Joondalup Drive	1.46 - 1.61	Significant Urban Local Road	Local Distributor	50kph	0	0	2	0
Cheriton Drive	0.00 - 0.25	Urban Local Road	Local Distributor	50kph	0	0	1	0
Rawlinna Parkway	0.00 - 0.38	Urban Local Road	Local Distributor	50kph	0	0	1	1

The following table shows the Crash Density and Crash Rates on Metropolitan Local Roads as obtained from Main Roads WA on the 21th October 2016 by email request:

CRASH DENSITY AND CRASH RATE ON METROPOLITAN LOCAL ROADS NETWORK ONLY				
	ALL CRASHES		KSI CRASHES (FAT+HOS)	
	DENSITY ALL CRASHES/KM over 5 years	CRASH RATE/MVKT	DENSITY KSI CRASHES/KM over 5 years	CRASH RATE/MVKT
LOCAL - MIDBLOCK	3.29	0.91	0.15	0.04
LOCAL - ALL	7.16	1.99	0.31	0.09

NOTE: BASED ON 5-YEARS DATA FOR THE PERIOD 2011 TO 2015.

KCTT believe that the additions in floor area will not have any adverse impact on the safety on the surrounding road network.

2.7 Parking Requirements

Local Government

City of Wanneroo

Local Government Document Utilised

District Planning Scheme No. 2

Description of Parking Requirements in accordance with Scheme:

The City of Wanneroo's District Planning Scheme No. 2 provides guidance on the requirements for car parking provisions for commercial developments. According to Table 2 – Carparking Table, the following parking requirements should be considered applicable -

Retirement Village - 1 per dwelling plus 1 visitor bay per 10 dwellings (minimum 2) plus 1 per non-resident staff member plus event parking

Shopping Centre – 7 per 100m²NLA (for shopping centres under 10 000 m²)

Calculation of Parking – Future Land Uses

Land Use	Requirements	Yield	Total Parking
Total Shopping Centre	7 per 100m ² NLA	5,847 NLA m ²	410
Possible aged and dependant persons dwelling	1 per dwelling + 1 visitor bay per 10 dwellings (minimum 2) + 1 per non-resident staff member plus event parking	2,100 NLA m ² 30 dwellings and 5 employees	38
Total requirement for the proposed development			448

Volume of Parking Provided by Proponent

The Community Centre	51	
North-eastern car park	46	
Subject Site	332	
Total existing parking bays:		429*

*Note * - The existing parking area formally has 429 parking bays, however during KCTT parking survey 3 of these bays have been temporarily unavailable making a total number of surveyed parking bays 426.*

Parking reciprocity

Although no formal reciprocal vehicle parking agreement exists, practically, the subject site, the Community Centre, the school playground and the sporting club already share the parking space.

Therefore, KCTT believe that 25% reduction of the total parking requirement for the proposed development would be appropriate based on the reciprocity between the land uses. This makes a total parking requirement of 336 parking bays.

Justification

A four-day parking survey covering the peak hours of parking activity conducted by KCTT showed that even in the Saturday peak hours there are 4% completely unoccupied parking bays throughout the carparking area. Additionally, 90% of the remaining parking bays will be available at some point during the peak period.

It should be noted that the 450-person soccer club which plays at home in Houghton Park (west of the subject site) is moving next year which will further reduce parking attraction for Saturday morning peak period. Additionally, a new Woolworths recently opened in Banksia Grove, which is likely to affect patronage.

The proposed future development of 30 aged and dependant persons dwellings when constructed will also bring the development of an undercover deck parking. When developed the deck parking will increase the provision of car parking for the whole centre. The development of the undercover parking area will account for the loss of all the car parks removed due to the development.

Having in mind all of the above KCTT believe that the current number of parking bays has sufficient spare capacity to accommodate for proposed addition in floor space.

Have Vehicle Swept Paths been checked for Parking?

NO

2.8 Parking Surveys

Was a parking survey required? YES

If YES, provide details:

KCTT have been commissioned to determine the percentage of occupancy of the parking within the carparking area of Carramar Village Shopping Centre during peak hours of operation. Focus of the survey was on occupancy of the parking bays during the peak activity period and the practical spare capacity of the surveyed parking area.

The parking has been surveyed in regular increments of 15 minutes.

The entire surveyed area has a total of 426 parking bays available at the time of the survey.

Times and dates of parking survey

- 15:45 – 18:15 on Friday 08.09.2017.
- 10:00 – 14:00 on Saturday 09.09.2017.
- 15:30 – 18:00 on Tuesday 12.09.2017.
- 15.30 – 18:00 on Wednesday 13.09.2017.
- 15.30 – 18.00 on Thursday 14.09.2017.

Provide detailed results of the survey:

The tables below represent a statistical overview of the survey. Parking bays have been surveyed in 15-minute increments in order to determine the percentage of occupancy of the parking in the vicinity of the subject site.

The results were classified in five categories: -

1. 0% - unoccupied
2. 1%-33% occupied – deemed greatly under-utilised
3. 34%-66% occupied – deemed under-utilised
4. 67%-99% occupied – deemed solid-utilised
5. 100% occupied – deemed full utilisation

The percentages refer to the amount of time parking bays were occupied within the surveyed hour.

For graphic presentation of the results, please refer to Appendix 4.

Results of survey conducted on Friday 8th of September from 15:45h to 18:15h

Usage	Total	Percentage
0%	72	16.90%
1% - 33%	94	22.07%
34% - 66%	112	26.29%
67% - 99%	120	28.17%
100%	28	6.57%
Total	426	100.00%

The survey results show that 6.57% of available parking surrounding the subject site can be deemed as fully utilised during the peak hours while 16.9% of total available parking bays have not been used at all during the surveyed period.

Results of survey conducted on Saturday 9th of September from 10:00 to 14:00h

Usage	Total	Percentage
0%	16	3.76%
1% - 33%	80	18.78%
34% - 66%	169	39.67%

67% - 99%	137	32.16%
100%	24	5.63%
Total	426	100.00%

The survey results show that 5.63% of available parking surrounding the subject site can be deemed as fully utilised during the peak hours while only 3.76% of total available parking bays have not been used at all during the surveyed period.

Results of survey conducted on Tuesday 12th of September from 15:30 to 18:00h

Usage	Total	Percentage
0%	111	26.06%
1% - 33%	106	24.88%
34% - 66%	96	22.54%
67% - 99%	96	22.54%
100%	17	3.99%
Total	426	100.00%

The survey results show that only 3.99% of available parking surrounding the subject site can be deemed as fully utilised during the peak hour while 26.06% of total available parking bays have not been used at all during the surveyed period.

Results of survey conducted on Wednesday 13th of September from 15:30 to 18:00h

Usage	Total	Percentage
0%	96	22.54%
1% - 33%	94	22.07%
34% - 66%	111	26.06%
67% - 99%	102	23.94%
100%	23	5.40%
Total	426	100.00%

The survey results show that 5.40% of available parking surrounding the subject site can be deemed as fully utilised during the peak hour while 22.54% of total available parking bays have not been used at all during the surveyed period.

Results of survey conducted on Thursday 14th of September from 15:30 to 18:00h

Usage	Total	Percentage
0%	146	34.27%
1% - 33%	81	19.01%
34% - 66%	83	19.48%
67% - 99%	83	19.48%
100%	33	7.75%
Total	426	100.00%

The survey results show that 7.75% of available parking surrounding the subject site can be deemed as fully utilised during the peak hour while 34.27% of total available parking bays have not been used at all during the surveyed period.

Conclusions

- Between 16% and 35% of all parking bays were unoccupied during the peak shopping period on working days. Very few parking bays have had full utilisation, ranging from 3% to 8% depending on the day. The percentages are mostly evenly distributed for other utilisation categories.

- On Saturday only 3.76% of parking bays were unoccupied. However, as seen from the carparking noise diagrams provided in Appendix 4 and the tables above, overall the parking area can be deemed solidly-utilised, with sufficient spare capacity.
- The preferred parking areas are naturally closest to the shopping centre entry, near the trees and in proximity to trolley bays (however not immediately adjacent to them).
- Northern section of the parking area is considered greatly under-utilised. One of the reasons can be the distance from the shopping centre entrance.
- The distribution of vehicles noted during the surveys is provided in Appendix 4. It can be clearly seen that bays in the vicinity of the shopping centre access points were most utilised while bays located in the vicinity of the verges were least utilised during the surveyed periods.
- Pedestrian movement through the parking is standard – parking is used as shared area for pedestrians and drivers.
- Overall the Carramar Village Shopping Centre carparking is considered to have sufficient spare capacity to accommodate for a possible addition in floor space.

2.9 Bicycle Parking

Local Government

City of Wanneroo

Reference Document Utilised

District Planning Scheme No. 2 states the need for referral to Austroads' Guide to Engineering Practice Part 14: Bicycles for bicycle parking requirements and end of trip facilities in commercial developments and other employment centres.

This document has been superseded by Guide to Traffic Management Part 11: Parking and taken as reference for bicycle parking requirements.

Description of Parking Requirements in accordance with the regulatory document:

“ **Table 4.3: Example of parking ratios:**

Retirement Village:

- *Bicycles (short-stay) - 2 spaces*

Table C2 6: Bicycle parking provisions:

Drive-in shopping centre:

- *Employee parking spaces - 1 per 300 m² sales floor*
- *Visitor/shopper parking spaces - 1 per 500 m² sales floor”*

Parking Requirement in accordance with regulatory documents

Land Use	Requirements	Yield	Total Parking
Shopping Centre	<i>Employee - 1 per 300 m² NLA</i>	5,847 NLA m ²	32
	<i>Visitor/shopper - 1 per 500 m² NLA</i>		
Possible aged and dependant persons dwelling	<i>Bicycles (short-stay) - 2 spaces</i>	2,100 NLA m ²	2
Total required bicycle parking			34

Total Volume of Parking Provided by Proponent

13 bicycle racks

Justification

The existing bicycle racks are installed near the shopping centre entrance. KCTT suggest providing additional 11 bicycle racks in order to comply with the City of Wanneroo requirements.

2.10 ACROD Parking

Class of Building	Class 6, Class 9
Does this building class require specific provision of ACROD Parking?	YES
Reference Document Utilised	Building Code of Australia

Description of Parking Requirements:

“ Class 6: a shop or other building for the sale of goods by retail or the supply of services direct to the public, including—

- (a) an eating room, café, restaurant, milk or soft-drink bar, or*
- (b) a dining room, bar area that is not an assembly building, shop or kiosk part of a hotel or motel; or*
- (c) a hairdresser’s or barber’s shop, public laundry, or undertaker’s establishment; or*
- (d) market or sale room, showroom, or service station.*

Class 9: a building of a public nature—

- (a) Class 9a —a health-care building, including those parts of the building set aside as a laboratory, or*
- (c) Class 9c — an aged care building.*

-Up to 1000 carparking spaces; and 1 space for every 50 carparking spaces or part thereof.”

Parking Requirement in accordance with regulatory documents

Land Use	Requirements	Yield	Total Parking
Shopping Centre	1 space for every 50 carparking spaces	426 parking bays	9
Possible aged and dependant persons dwelling			

Total Volume of ACROD Parking Provided by Proponent

9

Justification

The number of ACROD bays provided are in accordance with the requirements outlined in the Building Code of Australia.

2.11 Delivery and Service Vehicles

Guideline Document used as reference	NSW RTA Guide to Traffic Generating Developments
Requirements	

Supermarkets, shops and restaurants (all spaces adequate for trucks) - 1 space per 400m2 (if GFA < 2,000m2); 5 + 1 space per 1,000m2 over 2,000m2 (if GFA > 2,000m2);

Residential flat buildings (50% of spaces adequate for trucks): < 200 flats or home units = 1 space per 50 flats or home units

Parking Requirement in accordance with regulatory documents

Land Use	Requirements	Yield	Total Parking
Total Shopping Centre	5 + 1 space per 1,000m2 over 2,000m2	5,847 NLA m ² ≈ 7,796 GFA m ² *	11
Possible aged and dependant persons dwelling	1 space per 50 flats or home units	2,100 NLA m ² 30 dwellings	1
Total required delivery and service parking			12

Note * - NSW RTA states: "As a general guide, 100 m² gross floor area equals 75 m² gross leasable floor area."

Total Volume of Parking Provided by Proponent

N/A

Justification

Carramar Shopping Centre provides several loading docks to cater for service and delivery vehicle requirements. KCTT believe there is no need for conventional parking bays, having in mind that the vehicles dwell times depends solely on the loading and unloading of goods.

2.12 Calculation of Development Generated / Attracted Trips

<p>What are the likely hours of operation?</p>	<p>Monday to Friday – 8:00 to 21:00 Saturday – 8:00 to 17:00 Sunday/Public Holidays – 11:00 to 17:00</p>
<p>What are the likely peak hours of operation?</p>	<p>17:00 and 18:00 on Thursday to Friday evenings 11:00 and 12:00 on Saturday mornings.</p>
<p>Do the development generated peaks coincide with existing road network peaks?</p>	<p>NO</p>
<p>Guideline Document Used</p>	<p>WAPC Transport Assessment Guidelines for Developments</p>
<p>Rates from above document:</p>	<p>Retail (Food) AM Peak - 2.5 VPH / 100m² GFA (2.0 IN / 0.5 OUT) PM Peak - 10.0 VPH / 100m² GFA (5.0 IN / 5.0 OUT)</p>
<p>Guideline Document Used</p>	<p>NSW RTA Guide to Traffic Generating Developments</p>
<p>Rates from above document:</p>	<p>Shopping Centre Range in Total Floor Area 0 - 10,000 (GLFA - m2) Daily Generation Rate -Thursday = 121VPD / 100m² GLFA</p>
<p>Guideline Document Used</p>	<p>Housing for aged and disabled persons: 1 - 2 vehicular trips per dwelling PM Peak - 0.1 - 0.2 per dwelling</p>
<p>Guideline Document Used</p>	<p>ITE Trip Generation Handbook 9th Edition</p>
<p>Rates from above document:</p>	<p>Recreational Community Centre: Daily 33.82 VPD per KSF2 = 36.40 VPD per 100m2 GFA AM Peak – 2.05 VPH per KSF2 = 2.21 VPH per 100m2 GFA PM Peak – 2.74 VPH per KSF2 = 2.95 VPH per 100m2 GFA A 66% / 34% IN/OUT split has been assumed for the AM peak and an 49% / 51% IN/OUT split has been assumed for the PM peak.</p>

Future Land Uses	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation	
				AM	PM
Shopping Centre	121VPD / 100m ² GLFA AM Peak - 2.5 VPH / 100m ² GFA PM Peak - 10.0 VPH / 100m ² GFA	5,847 NLA m ² 7,796 GFA m ² *	7,075	195	780

Possible aged and dependant persons dwelling	2 vehicular trips per dwelling PM Peak - 0.2 per dwelling;	2,100 NLA m ² 30 dwellings	60	6	6
Existing Community Centre	36.40 VPD / 100m ² GFA AM Peak - 2.21 VPH/100m ² GFA PM Peak -2.95 VPH/100m ² GFA	≈ 430 GFA m ² *	157	10	13
TOTAL			7,292	211	799
<i>Note* - For the purposes of this report KCTT have assumed GLFA = NLA. NSW RTA states: "The generation rates given are based on (GLFA) which provides a better indication of trip generation than gross floor area. As a general guide, 100 m2 gross floor area equals 75 m2 gross leasable floor area."</i>					

Does the site have existing trip generation / attraction? **YES**

Existing Land Uses	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation	
				AM	PM
Existing Shopping Centre	121VPD / 100m ² GLFA AM Peak - 2.5 VPH / 100m ² GFA PM Peak - 10.0 VPH / 100m ² GFA	5,283 NLA m ² 7,044 GFA m ² *	6,392	176	704
Existing Community Centre	36.40 VPD / 100m ² GFA AM Peak - 2.21 VPH/100m ² GFA PM Peak -2.95 VPH/100m ² GFA	≈ 430 GFA m ² *	157	10	13
TOTAL			6,549	186	717
<i>Note* - For the purposes of this report KCTT have assumed GLFA = NLA. NSW RTA states: "The generation rates given are based on (GLFA) which provides a better indication of trip generation than gross floor area. As a general guide, 100 m2 gross floor area equals 75 m2 gross leasable floor area."</i>					

What is the total impact of the new proposed development?

The proposed additions to the shopping centre and possible aged and dependant persons dwelling would result in an **additional 743 VPD / 25 AM VPH / 82 PM VPH** to the existing traffic on the surrounding road network.

According to WAPC this is considered moderate traffic impact. KCTT believe that the proposed expansion will not have any significant impact when taken in context of the surrounding road network.

It should be noted that two major changes have been announced to the surrounding road network:

- Wanneroo Road/Joondalup Drive flyover announced. Joondalup Drive will be elevated over Wanneroo Road
- A revised roundabout design has been designed for the Cheriton Drive/Joondalup Drive intersection.

KCTT have done a SIDRA Intersection analysis for the intersection of Cheriton Drive and Joondalup Drive. The results of the analysis are shown in Appendix 3.

2.13 Traffic Flow Distribution

How many routes are available for access / egress to the site?

3 routes

Total future traffic from the subject site:

7,292 VPD / 211 AM VPH / 799 PM VPH

Additional future traffic from the proposed expansion:

743 VPD / 25 AM VPH / 82 PM VPH

Route 1

Provide details for Route No 1	North to/from Cheriton Drive
Percentage of Vehicular Movements via Route No 1	20% Total traffic - 1458 VPD / 43 AM VPH / 159 PM VPH Additional traffic – 149 VPD / 5 AM VPH / 16 PM VPH

Route 2

Provide details for Route No 2	East to/from Joondalup Drive
Percentage of Vehicular Movements via Route No 2	40% Total traffic - 2917 VPD / 84 AM VPH / 320 PM VPH Additional traffic – 297 VPD / 10 AM VPH / 33 PM VPH

Route 3

Provide details for Route No 3	West to/from Joondalup Drive
Percentage of Vehicular Movements via Route No 3	40% Total traffic - 2917 VPD / 84 AM VPH / 320 PM VPH Additional traffic – 297 VPD / 10 AM VPH / 33 PM VPH

2.14 Road Safety

Are sight distances adequate at proposed intersections? N/A – there are no proposed intersections

Road safety internal to the development:

The parking area is shared between all user classes, pedestrian, cyclists and vehicles. Main pedestrian linkages are paved red, with zebra pedestrian crossings. KCTT believe that the safety internal to the development will not be affected by the proposed additions in ground floor area.

2.15 Public Transport Accessibility

How many bus routes are within 400 metres of the subject site? Three routes
 How many rail routes are within 800 metres of the subject site? None

Bus / Rail Route	Description	Peak Frequency	Off-Peak Frequency
390	Joondalup Station - Banksia Grove via Carramar	10 minutes	30 minutes
391	Joondalup Station - Banksia Grove via Carramar	10 minutes	30 minutes
467	Whitfords Station - Joondalup Station via	10 minutes	30 minutes
468	Whitfords Station - Joondalup Station via Wanneroo Road	12 minutes	1 hour

Walk Score Rating for Accessibility to Public Transport
 39 - Some Transit. A few nearby public transportation options.

Is the development in a Greenfields area? NO

2.16 Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	Road Name
----------------	-----------

“ Other Shared Path (Shared by Pedestrians & Cyclists)” Cheriton Drive, Joondalup Drive, Millendon Street, Houghton Drive, Woodbine Loop

“ Underpass” Joondalup Drive (south of Rawlinna Parkway)

Unclassified pedestrian paths Rawlinna Parkway, Innesvale Way, Palmerston Crescent, Brightlands Circuit, Allanbi Circuit

There are additional pedestrian paths separate from the road network.

Does the site have existing pedestrian facilities YES

Does the site propose to improve pedestrian facilities? YES

Significant attention has been given to pedestrian walkability throughout the site and to adjacent land uses.

What is the Walk Score Rating?

58 - Somewhat walkable. Some errands can be accomplished by foot.

2.17 Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site? YES

If YES, describe:

Classification	Road Name
<i>“ Other Shared Path (Shared by Pedestrians & Cyclists)”</i>	Cheriton Drive, Joondalup Drive, Millendon Street, Houghton Drive, Woodbine Loop, Golf Link Drive, Wanneroo Drive, Keanefield Drive, Waldburg Drive, Clarkson Avenue, St Stephens Crescent, Berigora Avenue, Harrington Avenue, Meneguz Drive, Maryland Drive, Glenfine Way, Westwood Meander, Labianca Vista
<i>“ Good Road Riding Environment”</i>	Cheriton Drive, Minjah Circle, Fernhill Avenue, Rustic Gardens, Litchfield Crescent, Ankuri Pass, Tahlee Retreat
<i>“ Bicycle Lanes or Sealed Shoulder Either Side”</i>	Joondalup Drive

Are there any PBN Routes within a 400m radius of the subject site? YES

If YES, describe:

Classification	Road Name
<i>“ Other Shared Path (Shared by Pedestrians & Cyclists)”</i>	Cheriton Drive, Joondalup Drive, Millendon Street, Houghton Drive, Woodbine Loop
<i>“ Good Road Riding Environment”</i>	Cheriton Drive, Minjah Circle, Fernhill Avenue

Does the site have existing cyclist facilities? YES

Does the site propose to improve cyclist facilities? YES

If YES, describe the measures proposed.

Area around development site has significant opportunities for cycling trips. Including facilities of shared paths, good road riding environment and bicycle lanes or sealed shoulders on either side of the road. Installation of additional bicycle racks would promote cycling.

2.18 Site Specific Issues and Proposed Remedial Measures

How many site specific issues need to be discussed?

One

Site Specific Issue No 1

Traffic impact of the proposed additions to the shopping centre

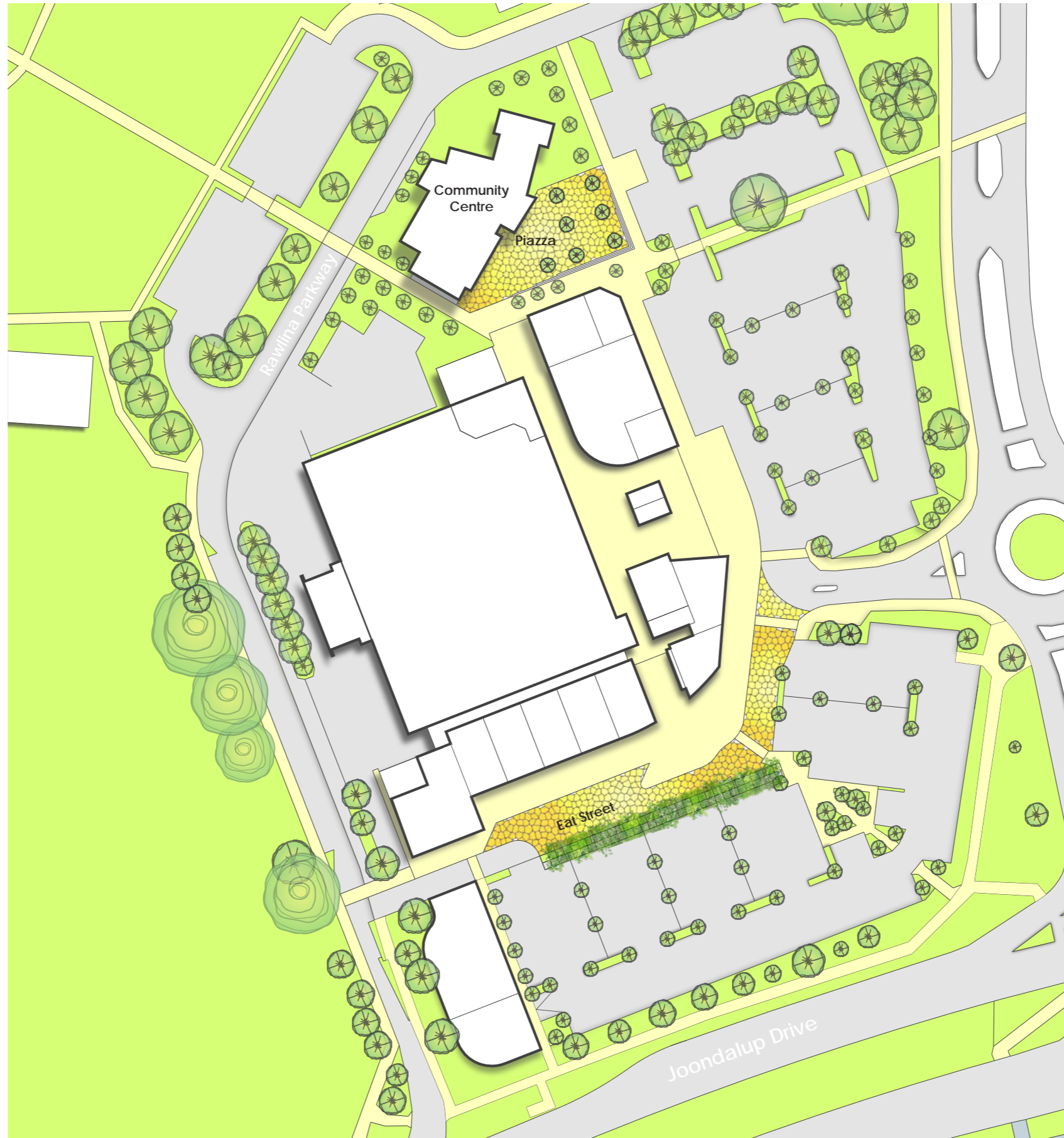
Remedial Measure / Response

The proposed additions to the shopping centre and possible aged and dependant persons dwelling would result in an **additional 743 VPD / 25 AM VPH / 82 PM VPH** to the existing traffic on the surrounding road network.

According to WAPC this is considered moderate traffic impact. KCTT believe that the proposed expansion will not have any significant impact when taken in context of the surrounding road network.

Appendix 1

The Layout of the Proposed Development



Project

Carramar Village Concept Plan
7 Cheriton Drive, Carramar
City of Wanneroo

Scale

1:1000 @ A3



Disclaimer

Issued for design intent only.
All areas and dimensions are
subject to detail design and
survey.

CARRAMAR VILLAGE CONCEPT PLAN

Drawing

CDP_1
Concept Development Plan
(DRAFT)

Job No.

J00193

Revision

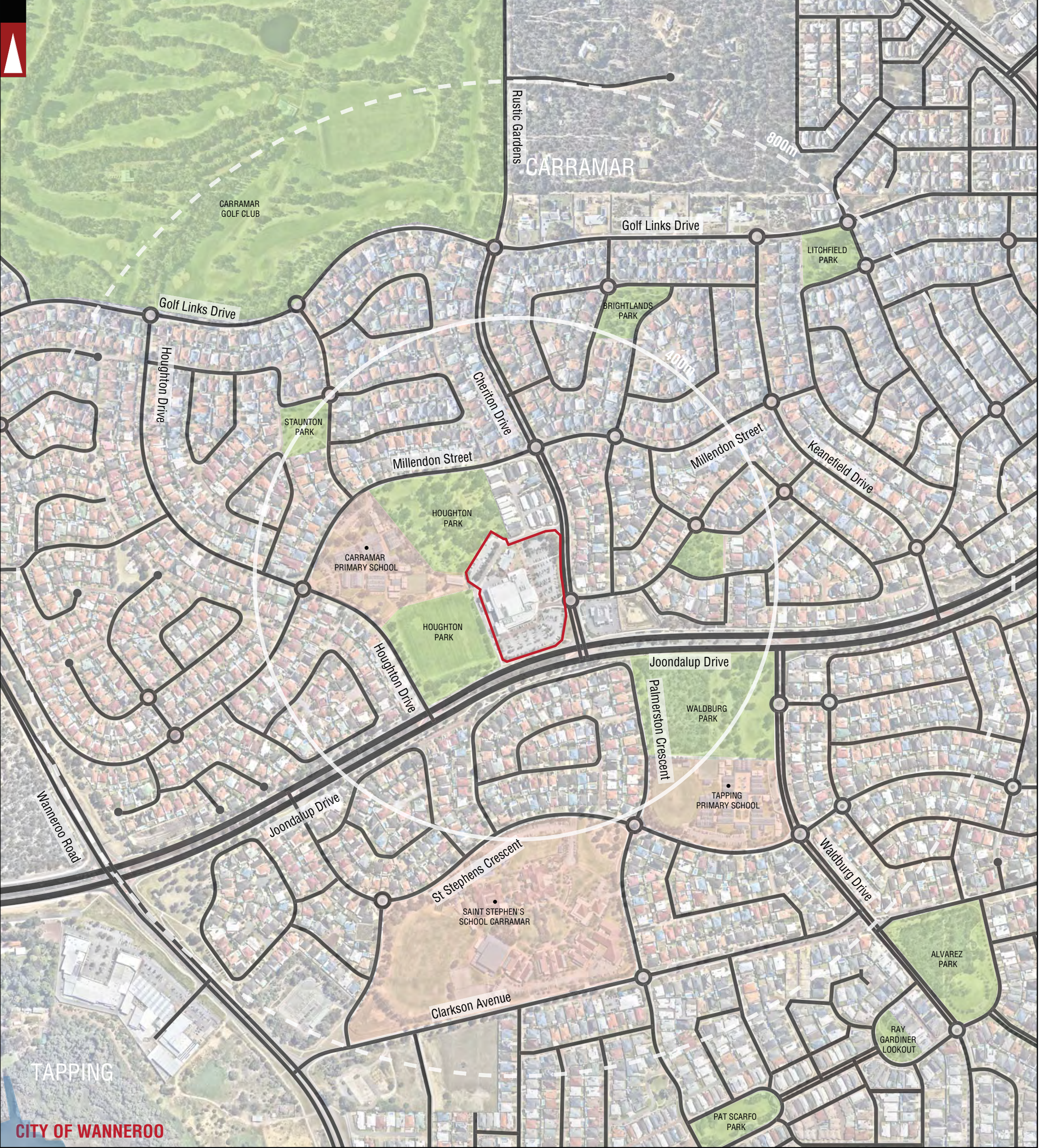
4A
1/02/2018













Likely Yield		Current Yield	
Tenancy	NLA m2	Tenancy	NLA m2
Woolworths Up Stairs staff area	186	Woolworths Up Stairs staff area	186
Woolworths/BWS Ground Floor	3079	Woolworths/BWS Ground Floor	3079
New RESTAURANT replacing Jetts	258	Jetts Gym	258
New FOOD replacing dentist	212	Dentist	212
Food 1	91	Food 1	91
Food 2	92	Food 2	92
Food 3	106	Food 3	106
New Entry & PO Boxes	0	Beauty Salon (Mistique)	85
Hair Dresser OR New Food	95	Hair Dresser	95
Café	117	Café	117
Newsagent	104	Newsagent	104
Kiosk x 2	49	Kiosk x 2	49
Priceline and Baker reduced in size.	400	Priceline and Baker	505
New CAFÉ/FLORIST/SALON Tenancy	198	Medical Centre	303
New Medical Centre/Dentist	600		
New Gym	260		
Total NLA	5847	Total NLA	5283
(Total RNLA component)	5092	(Total RNLA component)	4509
Plus 30 x 70 m2 aged and dependant persons dwelling	2100		

Appendix 2

Transport Planning and Traffic Plans



	PARKS AND RECREATION		ROAD		LOCATION BOUNDARY
	WATERWAYS		STREET NAME		DISTANCE FROM LOCATION
	PUBLIC PURPOSE		LOCAL GOVERNMENT NAME		SUBURB



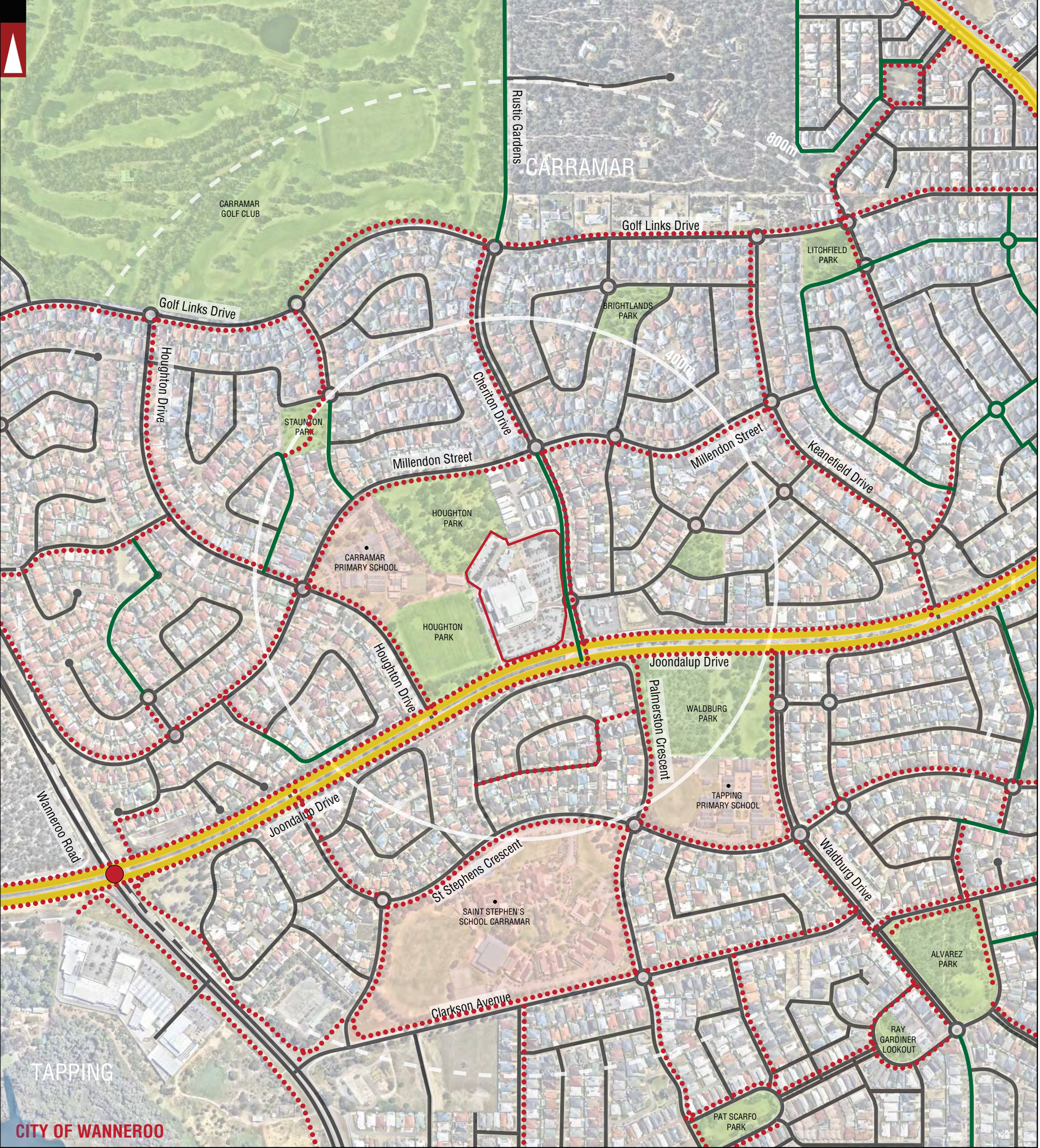
Quality ISO 9001

LEGEND

No	DATE	AMENDMENT
A	01-12-2017	ISSUED FOR REVIEW

PROJECT:	CARRAMAR VILLAGE SHOPPING CENTRE TIA
TITLE:	LOCALITY PLAN - 800M RADIUS
DRAWING NUMBER:	KC00705.000_ S01

DRAWN BY: J.S.	<p>Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021</p> <p>PH: 08 9441 2700 WEB: www.kctt.com.au</p> 
-----------------------	---



PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	BICYCLE LANES OR SEALED SHOULDER EITHER SIDE	TRAFFIC LIGHT
WATERWAYS	STREET NAME	DISTANCE FROM LOCATION	OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)	
PUBLIC PURPOSE	LOCAL GOVERNMENT NAME	SUBURB	GOOD ROAD RIDING ENVIRONMENT	



LEGEND

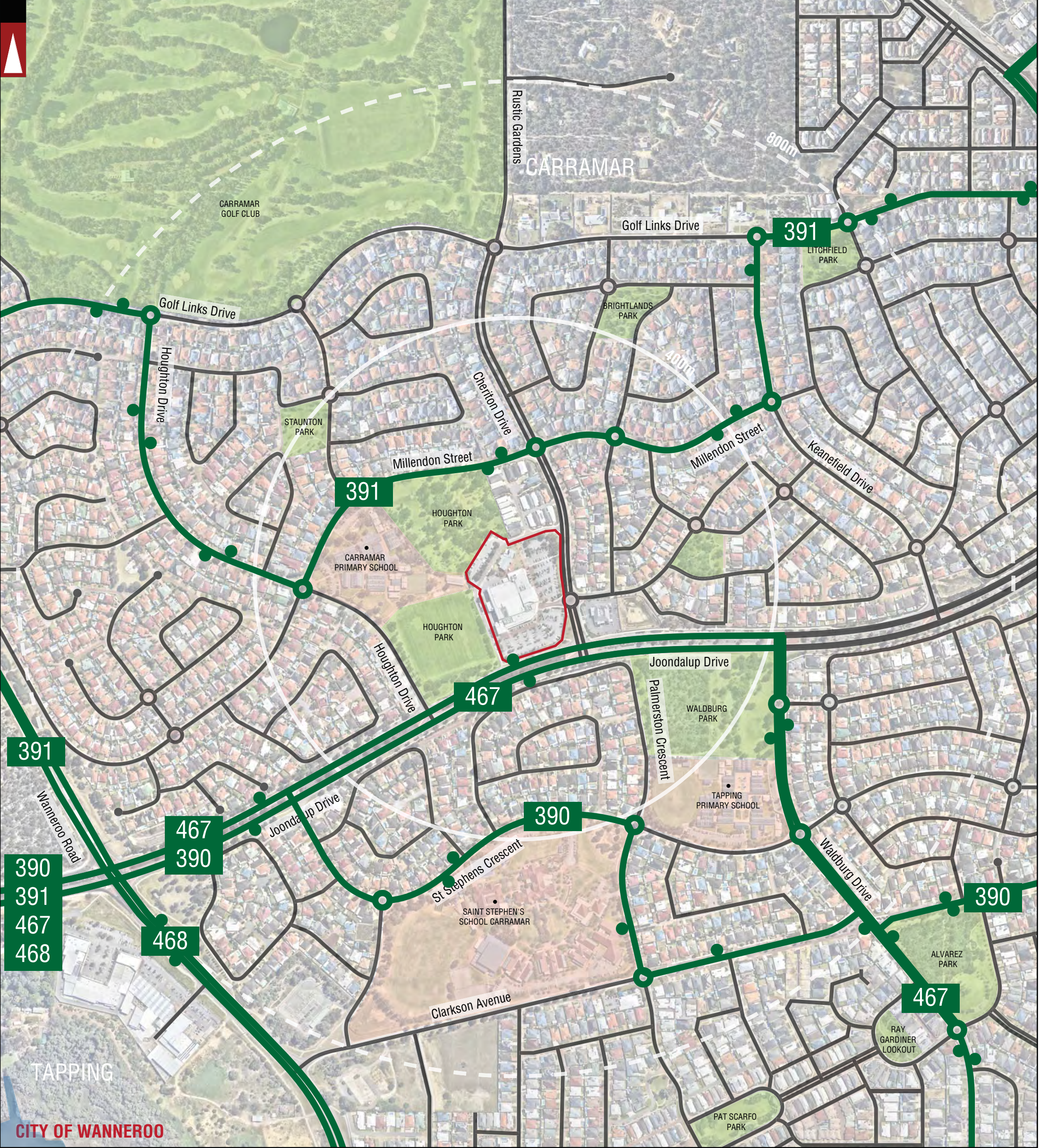
No	DATE	AMENDMENT
A	01-12-2017	ISSUED FOR REVIEW

PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE TIA	DRAWN BY: J.S.
TITLE: BICYCLE NETWORK PLAN - 800M RADIUS	
DRAWING NUMBER: KC00705.000_S02	

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021

PH: 08 9441 2700
WEB: www.kctt.com.au





PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	BUS ROUTE NUMBER	NOTE : FOR MORE INFORMATION REGARDING TO DESCRIPTION OF THE BUS ROUTE AND THEIR INDICATIVE PEAK AND OFF-PEAK FREQUENCIES REFER TO THE REPORT
WATERWAYS	Hay Street STREET NAME	DISTANCE FROM LOCATION	BUS ROUTES / STOPS	
PUBLIC PURPOSE	CITY OF WANNEROO LOCAL GOVERNMENT NAME	NORTHBRIDGE SUBURB		



LEGEND

A	01-12-2017	ISSUED FOR REVIEW
No	DATE	AMENDMENT

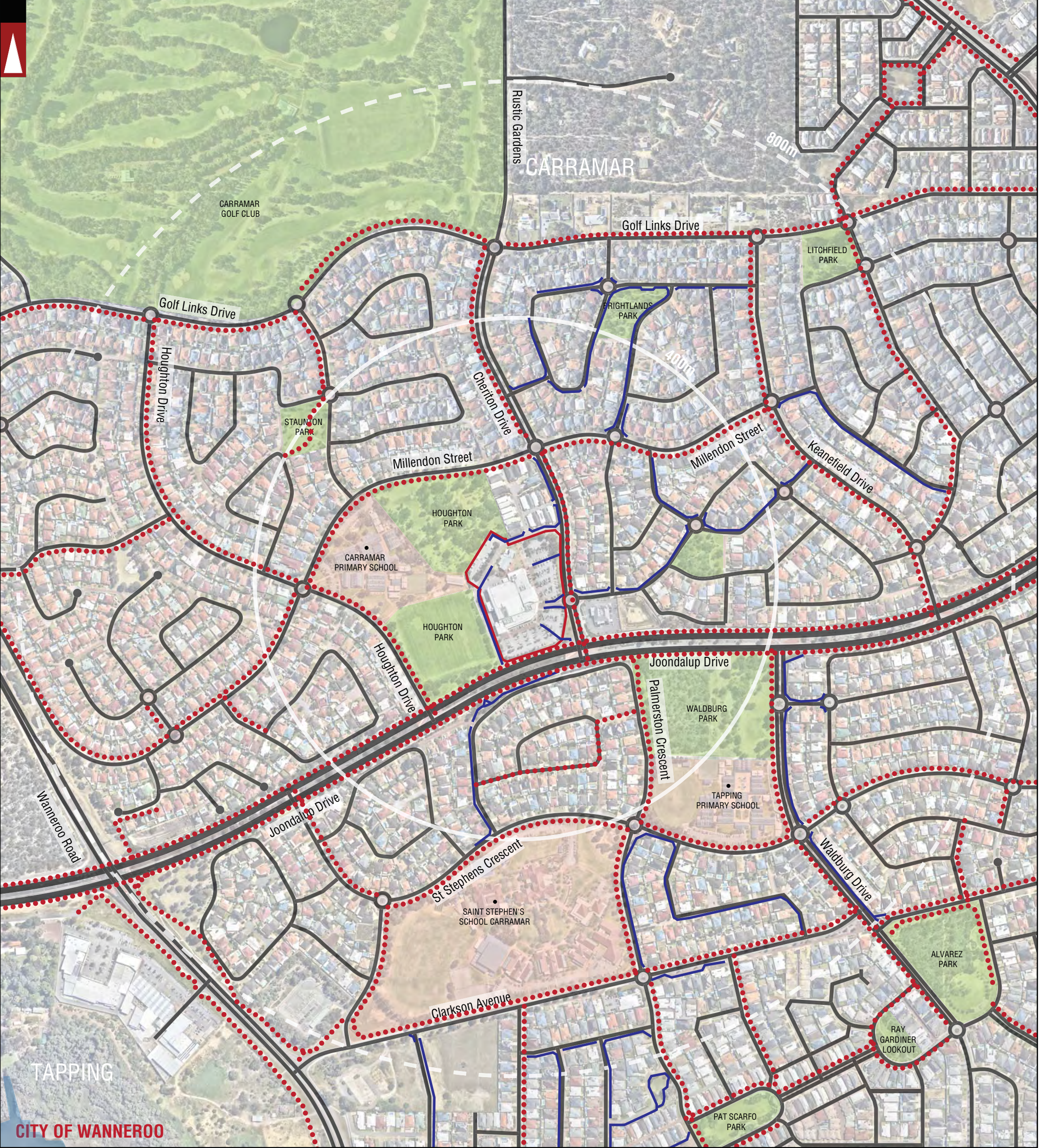
PROJECT:	CARRAMAR VILLAGE SHOPPING CENTRE TIA
TITLE:	PUBLIC TRANSPORT PLAN - 800M RADIUS
DRAWING NUMBER:	KC00705.000_ S03

DRAWN BY: J.S.

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021

PH: 08 9441 2700
WEB: www.kctt.com.au





	PARKS AND RECREATION		ROAD		LOCATION BOUNDARY		PEDESTRIAN PATH
	WATERWAYS		Hay Street STREET NAME		DISTANCE FROM LOCATION		OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)
	PUBLIC PURPOSE		CITY OF WANNEROO LOCAL GOVERNMENT NAME		CITY OF WANNEROO NORTHBRIDGE SUBURB		



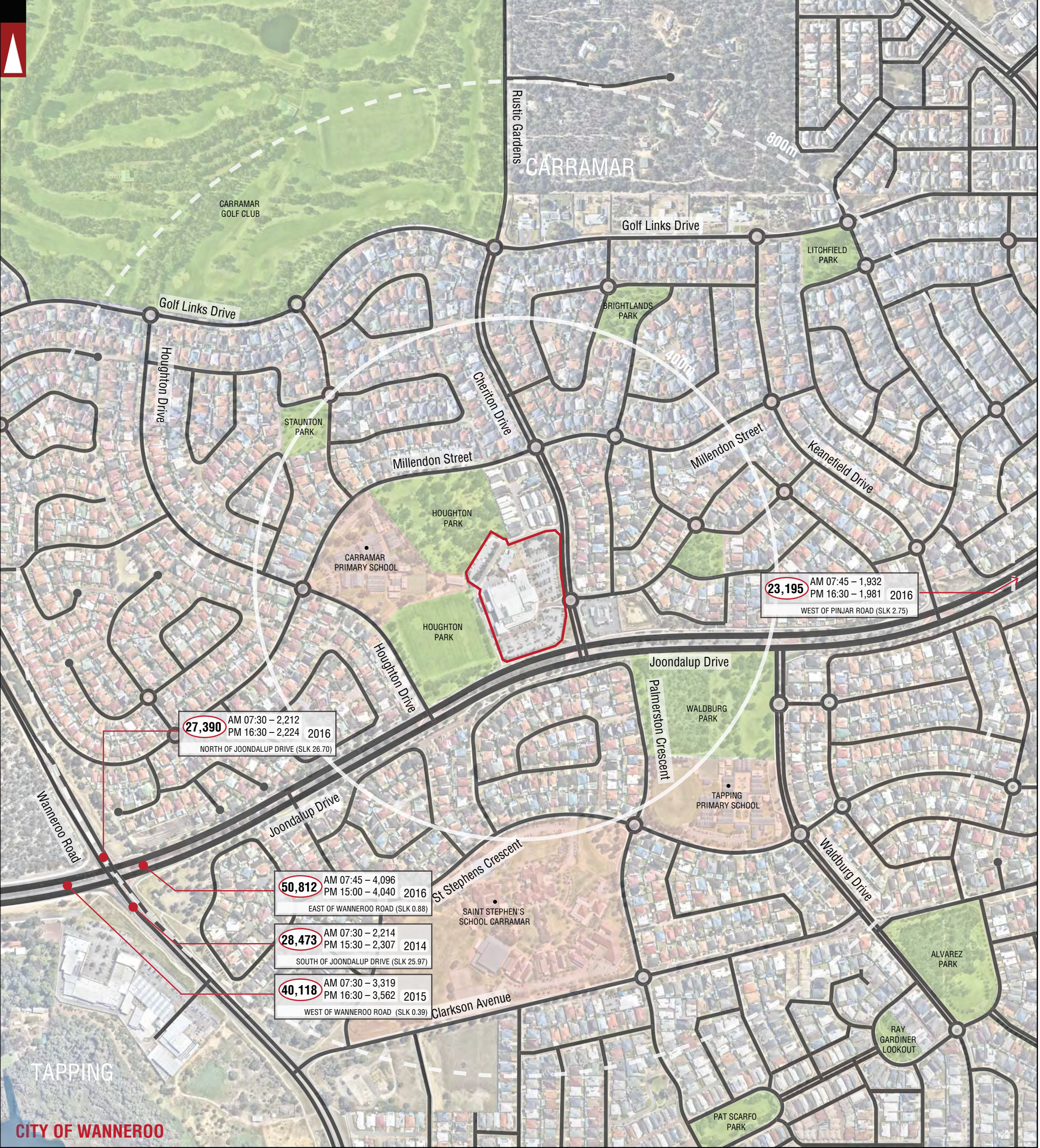
LEGEND

No	DATE	AMENDMENT
A	01-12-2017	ISSUED FOR REVIEW

PROJECT:	CARRAMAR VILLAGE SHOPPING CENTRE TIA
TITLE:	PEDESTRIAN PATHS PLAN - 800M RADIUS
DRAWING NUMBER:	KC00705.000_ S04

DRAWN BY: J.S.
 Civil & Traffic Engineering Consultants
 Suite 7 No 10 Whipple Street Balcatta WA 6021
 PH: 08 9441 2700
 WEB: www.kctt.com.au





PARKS AND RECREATION	ROAD	LOCATION BOUNDARY	5,512 NUMBER OF VEHICLES PER DAY	
WATERWAYS	Hay Street STREET NAME	DISTANCE FROM LOCATION	AM 1145 – 381 PM 1630 – 480 NUMBER OF VEHICLES PER AM PEAK HOUR NUMBER OF VEHICLES PER PM PEAK HOUR	
PUBLIC PURPOSE	CITY OF WANNEROO LOCAL GOVERNMENT NAME	DISTANCE FROM LOCATION	2014 YEAR	
	NORTHBRIDGE SUBURB	EAST OF HARLOW ROAD LOCATION		

LEGEND

Civil & Traffic Engineering Consultants
Suite 7 No 10 Whipple Street Balcatta WA 6021

PH: 08 9441 2700
WEB: www.kctt.com.au

No	DATE	AMENDMENT
A	01-12-2017	ISSUED FOR REVIEW

PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE TIA	DRAWN BY: J.S.
TITLE: EXISTING TRAFFIC COUNTS - 800M RADIUS	
DRAWING NUMBER: KC00705.000_S05	





LOCATION BOUNDARY

ROAD (VARIED WITH ROAD WIDTH)

Lewis Road ROAD NAME

Total future traffic from the subject site

Total future traffic from the subject site on the specific section of road - IN and OUT direction

Additional future traffic from the proposed expansion

Additional future traffic from the proposed expansion on the specific section of road - IN and OUT direction

Traffic Flow IN Direction

Traffic Flow OUT Direction

Certified System

Quality ISO 9001

SAI GLOBAL

LEGEND

			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: A.N.	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021 PH: 08 9441 2700 WEB: www.kctt.com.au
B	03-05-2018	PROPOSED LAYOUT AMENDED	TITLE: TRAFFIC FLOW DIAGRAM		
A	20-12-2017	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S06		
No	DATE	AMENDMENT			





LOCATION BOUNDARY

ROAD (VARIED WITH ROAD WIDTH)

Lewis Road ROAD NAME

Total future traffic from the subject site

Total future traffic from the subject site on the specific section of road - IN and OUT direction

Additional future traffic from the proposed expansion

Additional future traffic from the proposed expansion on the specific section of road - IN and OUT direction

Traffic Flow IN Direction

Traffic Flow OUT Direction

Certified System

Quality ISO 9001

SAI GLOBAL

LEGEND

			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: A.N.	Civil & Traffic Engineering Consultants Suite 7 No 10 Whipple Street Balcatta WA 6021 PH: 08 9441 2700 WEB: www.kctt.com.au
B	03-05-2018	PROPOSED LAYOUT AMENDED	TITLE: TRAFFIC FLOW DIAGRAM - PM PEAK		
A	20-12-2017	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S07		
No	DATE	AMENDMENT			



Appendix 3

SIDRA Intersection Analysis

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1. Introduction

This short report provides details on the SIDRA Analysis conducted to support the findings of the report KC00705.000_R01_Rev A. The intersection of Joondalup Drive and Cheriton Drive has been modelled in the PM peak hour for the years of 2017 (existing geometry), 2018 (existing geometry and proposed roundabout) and 2028 (proposed roundabout).

The dimensions of the existing intersection elements have been scaled from aerial imagery which was obtained through our commercial arrangement with Nearmap and through publicly available Intramaps. These images are suitable for use in concept drafting applications with a level of accuracy to within +/- 10 centimetres.

2. Traffic Generation and Distribution Analysis

What are the likely peak hours of operation? PM 17:00 - 18:00
 Do the development generated peaks coincide with existing road network peaks? YES
 How many routes are available for access / egress to the site in **2018 and 2028?** **3 routes**
Total future traffic from the subject site:
 7,292 VPD / 211 AM VPH / 799 PM VPH
Additional future traffic from the proposed expansion:
 743 VPD / 25 AM VPH / 82 PM VPH

Route 1

Provide details for Route No 1	North to/from Cheriton Drive
Percentage of Vehicular Movements via Route No 1	20%

Route 2

Provide details for Route No 2	East to/from Joondalup Drive
Percentage of Vehicular Movements via Route No 2	40%

Route 3

Provide details for Route No 2	West to/from Joondalup Drive
Percentage of Vehicular Movements via Route No 2	40%

3. Traffic Volumes

Nominate the source(s) for obtaining the traffic data Main Roads WA website

Nominate the assessment year(s) 2017, 2018 and 2028

Annual traffic growth rate used for analysis 3%

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Date of Traffic Count	Year		
			AM Peak	PM Peak			Estimate Peak Traffic Volumes in the Assessment Year(s) using the nominated annual traffic growth rate		
							2017	2018	2028
Joondalup Drive	West of Pinjar Road (SLK 2.75)	23,195	07:45 – 1,932	16:30 – 1,981	8.3%	Mar 2016	1,938	1,996	2,683

**Note: KCTT have sent an e-mail to City of Wanneroo on 24.11.2017 with a traffic counts request for Cheriton Drive and other streets surrounding the shopping centre. No information has been received to the completion date of this report.*

*KCTT have assumed that approximately 200 dwellings in the surrounding area will use the intersection for purposes other than visiting the Carramar Village Shopping Centre in PM peak (0.8vph per dwelling = 160 vph). The estimated traffic generated by the Bar on the opposite corner of Joondalup Drive and Cheriton Drive has also been included (approximately 1,200m² GFA: 5 vph per 100m² GFA = 60 vph). This results in total of 220 vph of passing traffic in the PM Peak. After adding 564 vph (80% of shopping centre traffic was distributed towards the intersection with Joondalup Drive) from the shopping centre, the total estimated traffic on Cheriton Drive in PM Peak is – **784 vph**.*

4. Summary of Results

Nominate the analysed intersections
Describe the models analysed in SIDRA

M01. Intersection of Joondalup Drive and Cheriton Drive
The intersection was analysed in AM and PM peak for the assessment years – 2017, 2018 and 2028. Input traffic volumes for SIDRA models were obtained from traffic data available on Main Roads WA website and through estimating traffic for Cheriton Drive based on yields obtained from aerial imagery and applying traffic generation rates provided in the relevant documents.

2017 - The analysed intersection has been modelled to reflect the current configuration and geometry as seen on the aerial imagery. This scenario was modelled as a Staged Crossing (two stages) to model the intersection and utilisation of the median storage area more accurately.

2018 – The intersection was analysed in two scenarios. With the existing geometry (as a Staged Crossing), and as a proposed roundabout.

2028 – The intersection was analysed as a roundabout.

Describe the Level of Service results

M01. **2017** - model of Intersection of Joondalup Drive and Cheriton Drive shown Level of Service F for the right turn from Cheriton Drive onto Joondalup Drive. This is expected, because this intersection is already planned for upgrading.

2018 - Model with existing geometry has also shown LOS F for the intersection with additional development traffic included. Model with the proposed roundabout performs at LOS A.

2028 – The roundabout is expected to perform at a satisfying level, with LOS for individual lanes ranging from A-B.

Describe the Delay results

M01. Highest delays can also be observed for the right-turn lane on Cheriton Drive in 2017 and 2018 with the existing intersection geometry. High through movement volumes on Joondalup Drive are causing these delays. This is the reason behind plans of upgrading the intersection.

The analysed roundabout does not show any concerning delays in both 2018 and 2028.

Note: The existing geometry models should be re-checked when the traffic counts on Cheriton Drive become available.

Conclusion

If the intersection is upgraded to a roundabout in the near future, KCTT believe that this intersection will not have any problems catering for the future traffic volumes.

A summary of the results of the SIDRA analysis are shown on the following pages. For purposes of clarity we will provide intersection summaries below. The full SIDRA output report can be provided on request.

Note - SIDRA graphic is not an accurate representation of the intersection geometry. It is a simplified tool and its main purpose is to roughly illustrate main intersection elements. The graphic might show median breaks where there are none in reality, oversized splitter islands and central islands for roundabouts etc. The graphic representation does not influence the calculations nor any other output.*

5. SIDRA Intersection Analysis - Output

5.1 M01 – Intersection of Joondalup Drive and Cheriton Drive

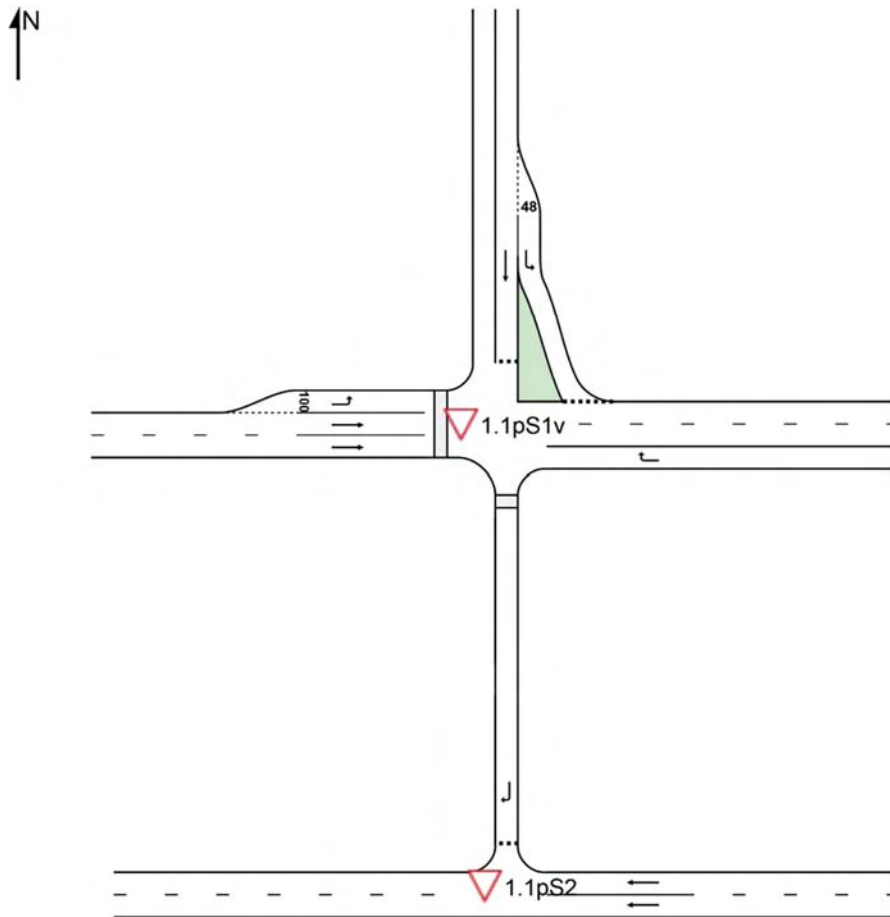


Figure 1 – Intersection of Joondalup Drive and Cheriton Drive – SIDRA Schematic Geometry

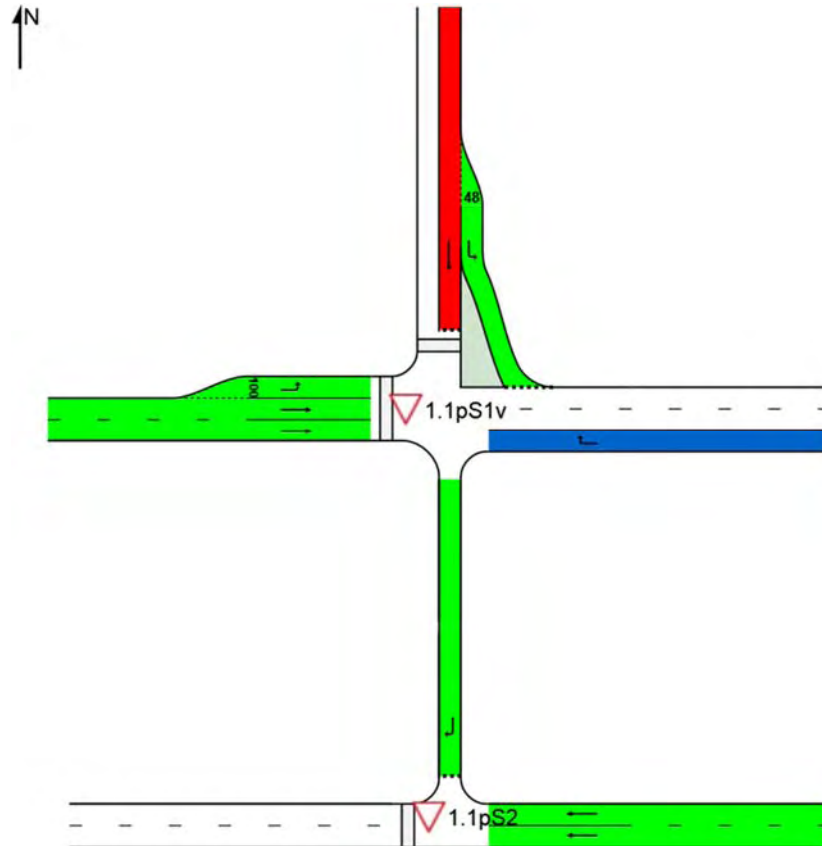


Figure 2 – Intersection of Joondalup Drive and Cheriton Drive– LOS 2017 PM – No development

5.1.1 1.1pS1 Joondalup Drive – Cheriton Drive – 2017 PM – Stage One

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						v/c	%				
	veh/h	%	veh/h	% veh/h											
East: Joondalup Drive															
Lane 1	220	4.0	220	4.0	363	0.606	100	22.2	LOS C	3.2	23.4	Full	100	0.0	0.0
Approach	220	4.0	220	4.0		0.606		22.2	NA	3.2	23.4				
North: Cheriton Drive (Stage 1)															
Lane 1	186	4.0	186	4.0	706	0.264	100	7.6	LOS A	1.1	7.7	Short	48	0.0	NA
Lane 2	193	4.0	193	4.0	176	1.096	100	167.1	LOS F	19.0	137.5	Full	50	0.0	66.7
Approach	379	4.0	379	4.0		1.096		88.7	LOS F	19.0	137.5				
West: Joondalup Drive															
Lane 1	237	4.0	237	4.0	1126	0.210	100	7.5	LOS A	0.9	6.7	Short	100	0.0	NA
Lane 2	528	8.0	528	8.0	1873	0.282	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	528	8.0	528	8.0	1873	0.282	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1293	7.3	1293	7.3		0.282		1.4	NA	0.9	6.7				
Intersection	1892	6.2	1892	6.2		1.096		21.3	NA	19.0	137.5				

Figure 3 – LOS Table (Model 1.1pS1 Joondalup Drive – Cheriton Drive – 2017 PM)

5.1.2 1.1pS2 Joondalup Drive – Cheriton Drive – 2017 PM – Stage Two

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						v/c	%				
	veh/h	%	veh/h	% veh/h											
East: Joondalup Drive															
Lane 1	591	8.0	591	8.0	1873	0.315	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	591	8.0	591	8.0	1873	0.315	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1181	8.0	1181	8.0		0.315		0.0	NA	0.0	0.0				
North: Median Storage Area															
Lane 1	193	4.0	176	4.0	764	0.230	100	5.8	LOS A	0.8	5.2	Full	13	0.0	0.0
Approach	193	4.0	176 ^{N1}	4.0		0.230		5.8	LOS A	0.8	5.2				
Intersection	1374	7.4	1357 ^{N1}	7.5		0.315		0.8	NA	0.8	5.2				

Figure 4 – LOS Table (Model 1.1pS2 Joondalup Drive – Cheriton Drive – 2017 PM)

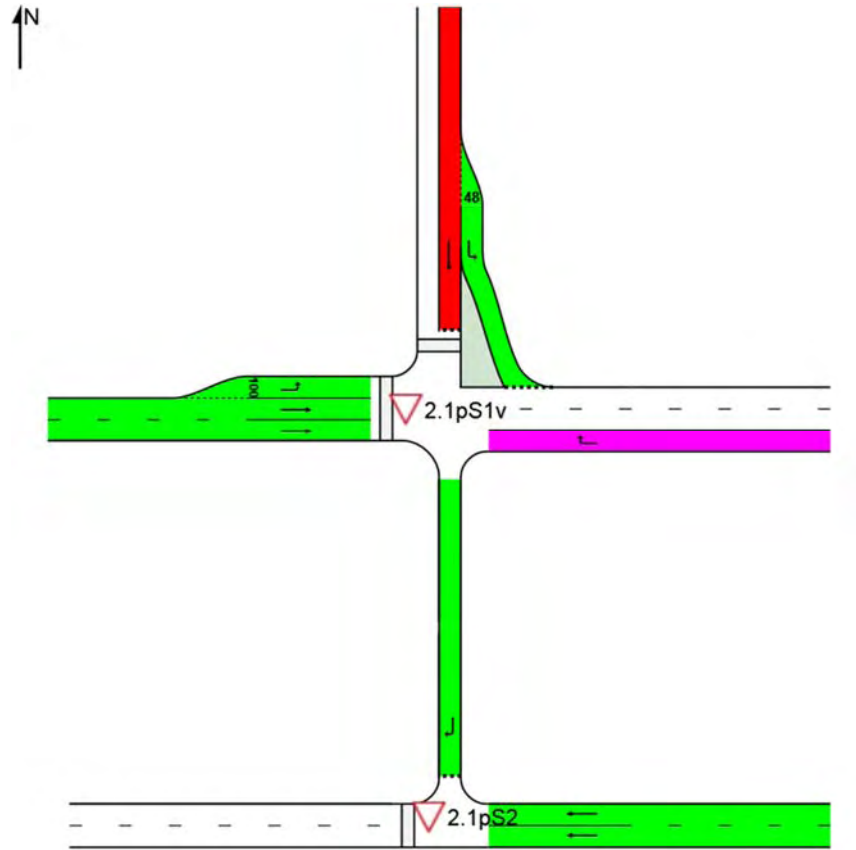


Figure 5 – Intersection of Joondalup Drive and Cheriton Drive – LOS 2018 PM – With Development

5.1.4 2.1pS1 Joondalup Drive – Cheriton Drive – 2018 PM – Stage One

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						v/c	%				
East: Joondalup Drive															
Lane 1	239	4.0	239	4.0	344	0.695	100	26.0	LOS D	4.1	29.6	Full	100	0.0	0.0
Approach	239	4.0	239	4.0		0.695		26.0	NA	4.1	29.6				
North: Cheriton Drive (Stage 1)															
Lane 1	204	4.0	204	4.0	689	0.296	100	8.0	LOS A	1.3	9.1	Short	48	0.0	NA
Lane 2	211	4.0	211	4.0	157	1.340	100	360.0	LOS F	40.1	290.3	Full	50	0.0	100.0
Approach	415	4.0	415	4.0		1.340		186.7	LOS F	40.1	290.3				
West: Joondalup Drive															
Lane 1	256	4.0	256	4.0	1102	0.232	100	7.7	LOS A	1.0	7.5	Short	100	0.0	NA
Lane 2	544	8.0	544	8.0	1873	0.290	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	544	8.0	544	8.0	1873	0.290	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1343	7.2	1343	7.2		0.290		1.5	NA	1.0	7.5				
Intersection	1997	6.2	1997	6.2		1.340		42.9	NA	40.1	290.3				

Figure 6 – LOS Table (Model 2.1pS1 Joondalup Drive – Cheriton Drive – 2018 PM)

5.1.5 2.1pS2 Joondalup Drive – Cheriton Drive – 2018 PM – Stage Two

Lane Use and Performance															
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV	Total	HV						v/c	%				
East: Joondalup Drive															
Lane 1	591	8.0	591	8.0	1873	0.315	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	591	8.0	591	8.0	1873	0.315	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	1181	8.0	1181	8.0		0.315		0.0	NA	0.0	0.0				
North: Median Storage Area															
Lane 1	211	12.0	157	12.0	707	0.222	100	6.2	LOS A	0.7	5.3	Full	13	0.0	0.0
Approach	211	12.0	157 ^{N1}	12.0		0.222		6.2	LOS A	0.7	5.3				
Intersection	1392	8.6	1338 ^{N1}	8.9		0.315		0.8	NA	0.7	5.3				

Figure 7 – LOS Table (Model 2.1pS2 Joondalup Drive – Cheriton Drive – 2018 PM)

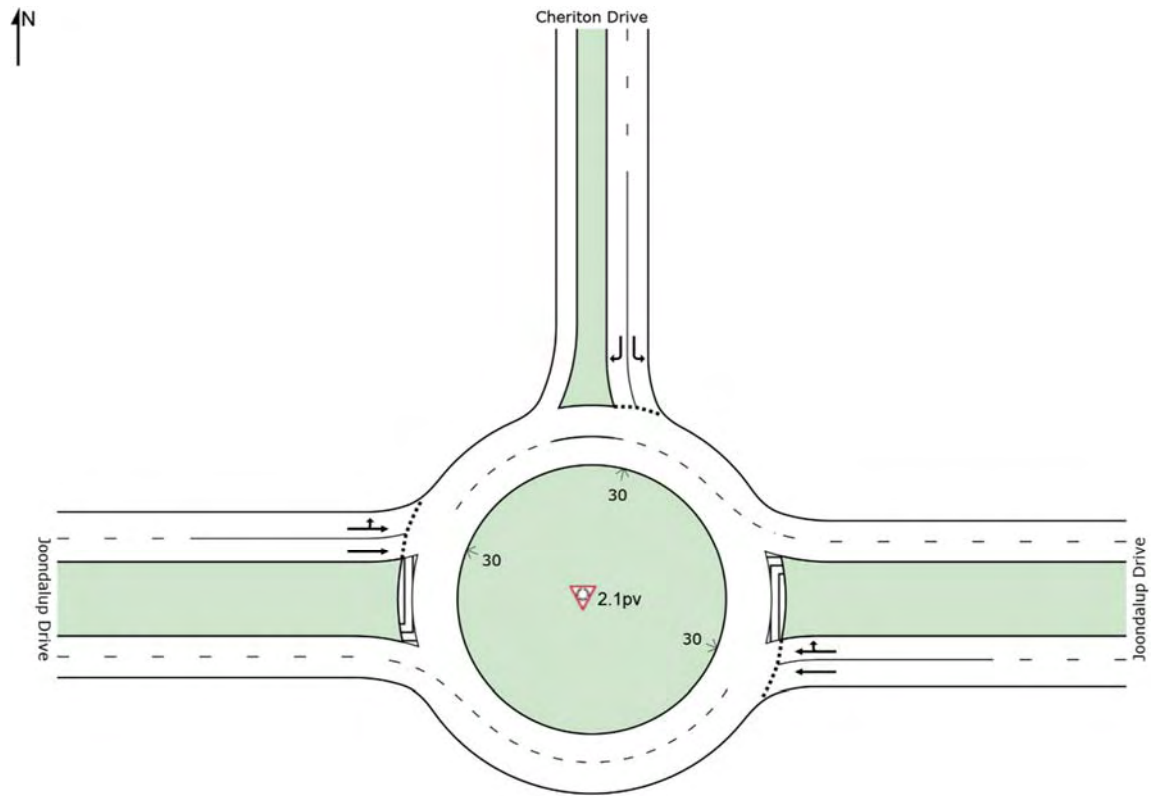


Figure 8 – Proposed Roundabout of Joondalup Drive and Cheriton Drive – SIDRA Schematic Geometry

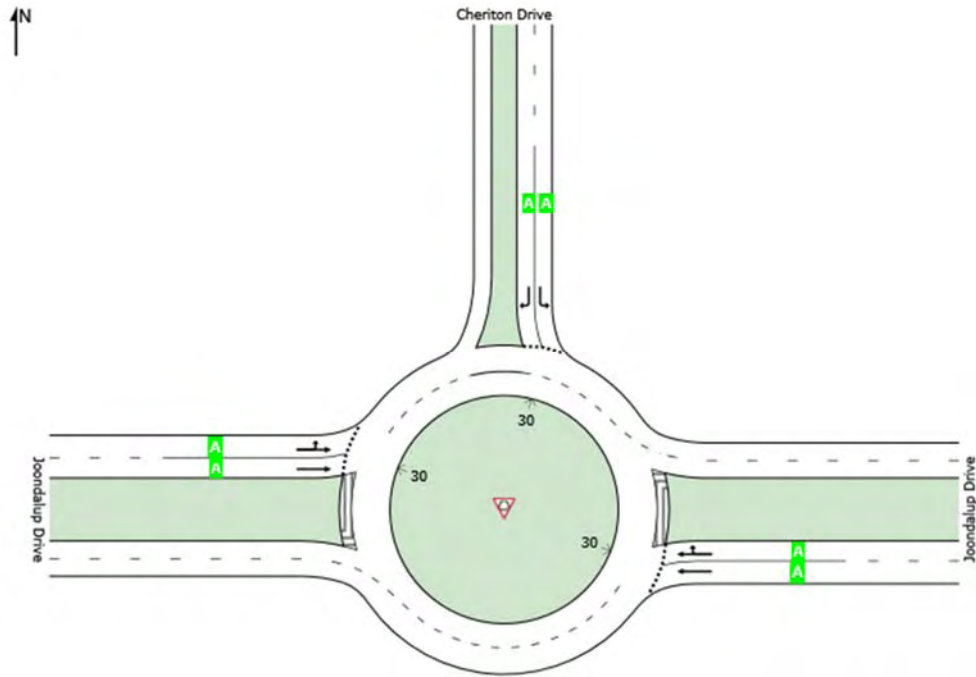


Figure 9 – Proposed Roundabout of Joondalup Drive and Cheriton Drive – LOS 2018 PM – With Development

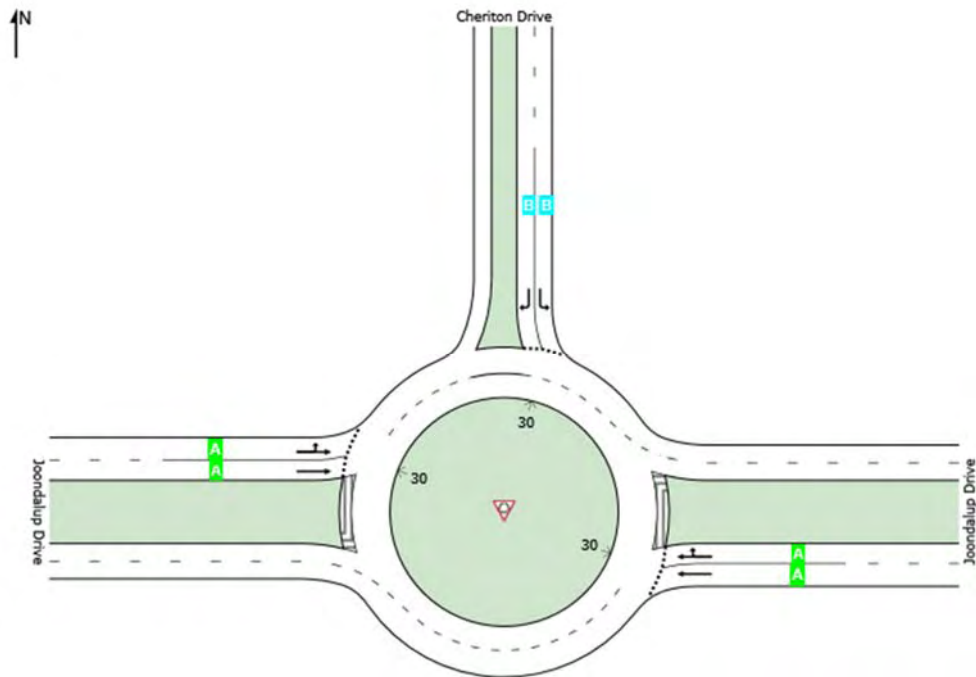


Figure 10 – Proposed Roundabout of Joondalup Drive and Cheriton Drive – LOS 2028 PM – With Development

5.1.6 2.1pRDB Joondalup Drive – Cheriton Drive – 2018 PM – Roundabout

Lane Use and Performance													
	Demand	Flows	Cap.	Deg.	Lane	Average	Level of	95% Back of Queue	Lane	Lane	Cap.	Prob.	
	Total	HV		Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Joondalup Drive													
Lane 1 d	792	8.0	1425	0.556	100	5.8	LOS A	5.0	37.5	Full	500	0.0	0.0
Lane 2	664	6.6	1194	0.556	100	8.3	LOS A	4.8	35.4	Full	500	0.0	0.0
Approach	1456	7.3		0.556		6.9	LOS A	5.0	37.5				
North: Cheriton Drive													
Lane 1	204	4.0	607	0.337	100	6.5	LOS A	1.7	12.5	Full	50	0.0	0.0
Lane 2 d	211	4.0	782	0.269	100	10.0	LOS A	1.4	10.3	Full	50	0.0	0.0
Approach	415	4.0		0.337		8.3	LOS A	1.7	12.5				
West: Joondalup Drive													
Lane 1 d	738	6.6	1412	0.522	100	6.0	LOS A	4.4	32.3	Full	500	0.0	0.0
Lane 2	605	8.0	1159	0.522	100	6.5	LOS A	4.2	31.1	Full	500	0.0	0.0
Approach	1343	7.2		0.522		6.2	LOS A	4.4	32.3				
Intersection	3214	6.9		0.556		6.8	LOS A	5.0	37.5				

Figure 11 – LOS Table (Model 2.1pRDB Joondalup Drive – Cheriton Drive – 2018 PM - Roundabout)

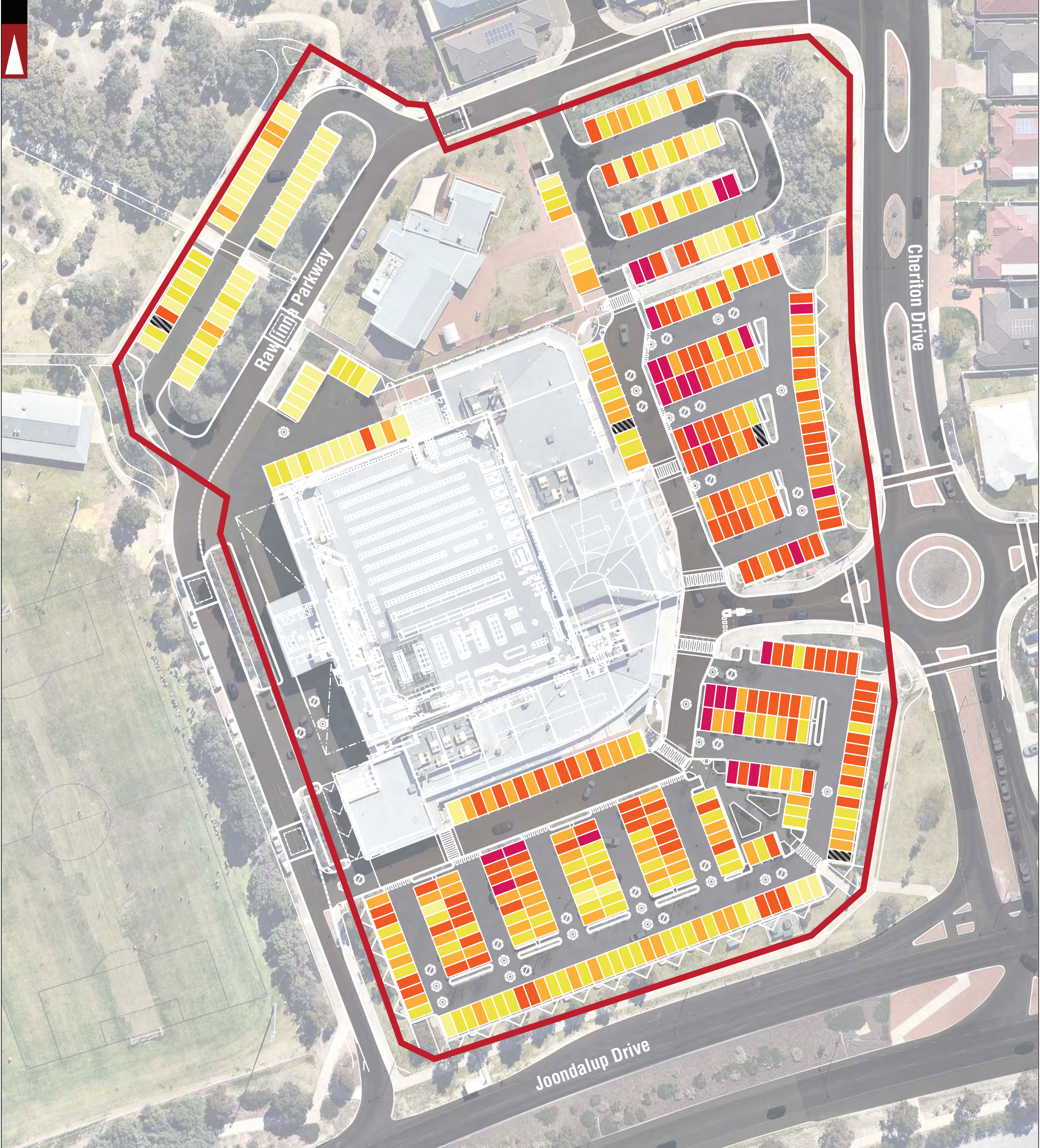
5.1.7 3.1pRDB Joondalup Drive – Cheriton Drive – 2028 PM – Roundabout

Lane Use and Performance													
	Demand	Flows	Cap.	Deg.	Lane	Average	Level of	95% Back of Queue	Lane	Lane	Cap.	Prob.	
	Total	HV		Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Joondalup Drive													
Lane 1 d	1037	8.0	1400	0.741	100	6.8	LOS A	9.4	70.3	Full	500	0.0	0.0
Lane 2	862	7.0	1164	0.741	100	9.7	LOS A	9.6	71.4	Full	500	0.0	0.0
Approach	1899	7.6		0.741		8.1	LOS A	9.6	71.4				
North: Cheriton Drive													
Lane 1	217	5.1	410	0.528	100	11.1	LOS B	3.2	23.1	Full	50	0.0	0.0
Lane 2 d	225	5.0	575	0.392	100	11.9	LOS B	2.4	17.5	Full	50	0.0	0.0
Approach	442	5.0		0.528		11.5	LOS B	3.2	23.1				
West: Joondalup Drive													
Lane 1 d	961	7.1	1365	0.704	100	7.1	LOS A	8.3	61.4	Full	500	0.0	0.0
Lane 2	786	8.0	1116	0.704	100	8.2	LOS A	8.3	62.4	Full	500	0.0	0.0
Approach	1747	7.5		0.704		7.6	LOS A	8.3	62.4				
Intersection	4088	7.3		0.741		8.3	LOS A	9.6	71.4				

Figure 12 – LOS Table (Model 3.1pRDB Joondalup Drive – Cheriton Drive – 2028 PM - Roundabout)

Appendix 4

Carparking Noise Diagrams



* 72/426 available parking bays

	LOCATION BOUNDARY		NOT OCCUPIED		67%-99% OCCUPANCY
	ROAD (VARIED WITH ROAD WIDTH)		< 33% OCCUPANCY		100% OCCUPANCY
Lewis Road	ROAD NAME		34%-66% OCCUPANCY		NOT ACCESSIBLE FOR PARKING

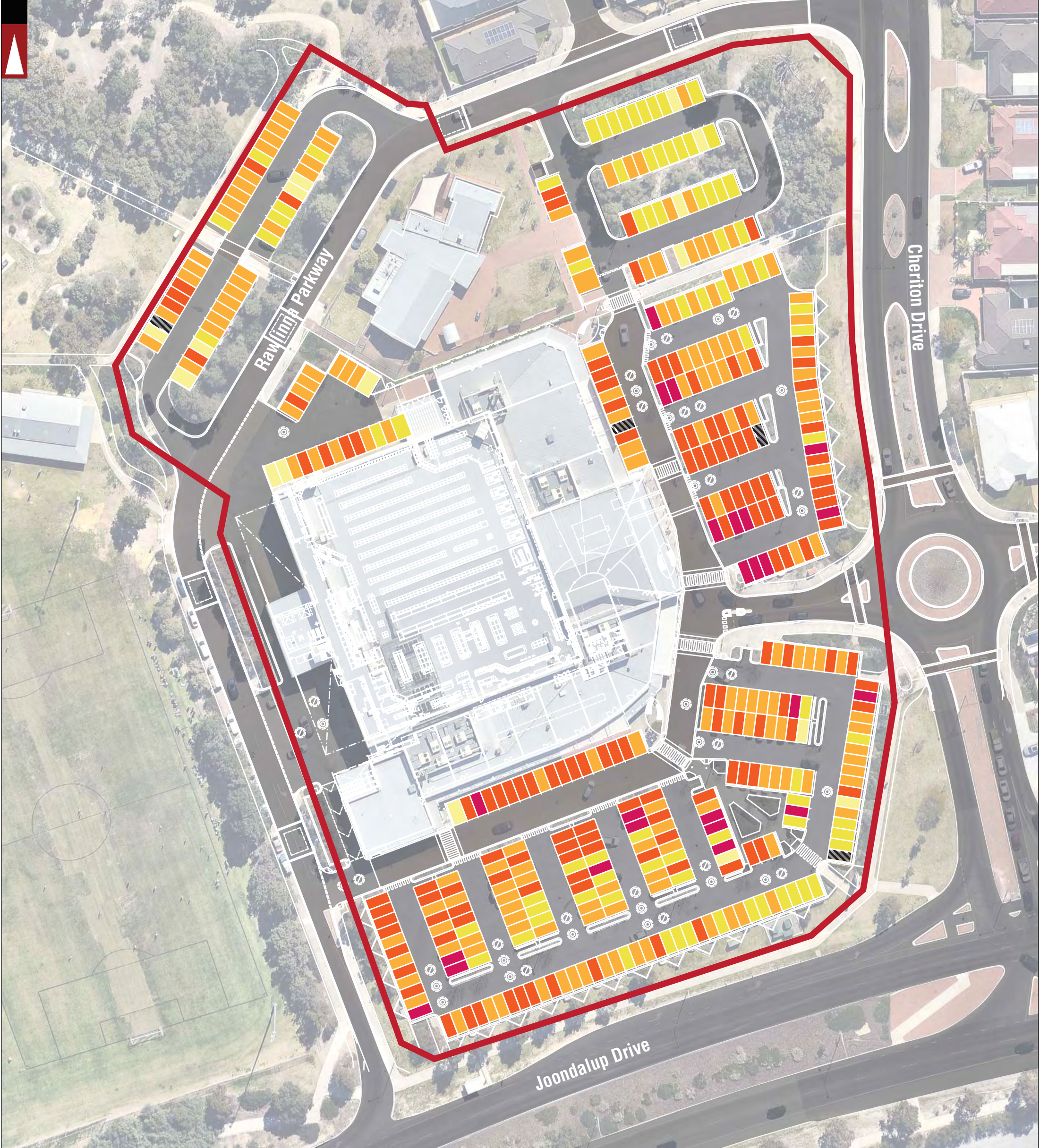
A site visit was conducted on Friday 8th September, 2017; at 15:45-18:15

NOTE: THE PLAN IS COURTESY OF HAMES SHARLEY

LEGEND

			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: A.N.	Civil & Traffic Engineering Consultants 830B Beaufort Street, Inglewood WA 6052 PH: 08 9272 7770 WEB: www.kctt.com.au FTP: www.kctt.wetransfer.com
			TITLE: CARPARKING NOISE DIAGRAM		
A	21-09-2016	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S40		
No	DATE	AMENDMENT			





LEGEND

	LOCATION BOUNDARY		NOT OCCUPIED		67%-99% OCCUPANCY
	ROAD (VARIED WITH ROAD WIDTH)		< 33% OCCUPANCY		100% OCCUPANCY
Lewis Road	ROAD NAME		34%-66% OCCUPANCY		NOT ACCESSIBLE FOR PARKING

* 16/426 available parking bays

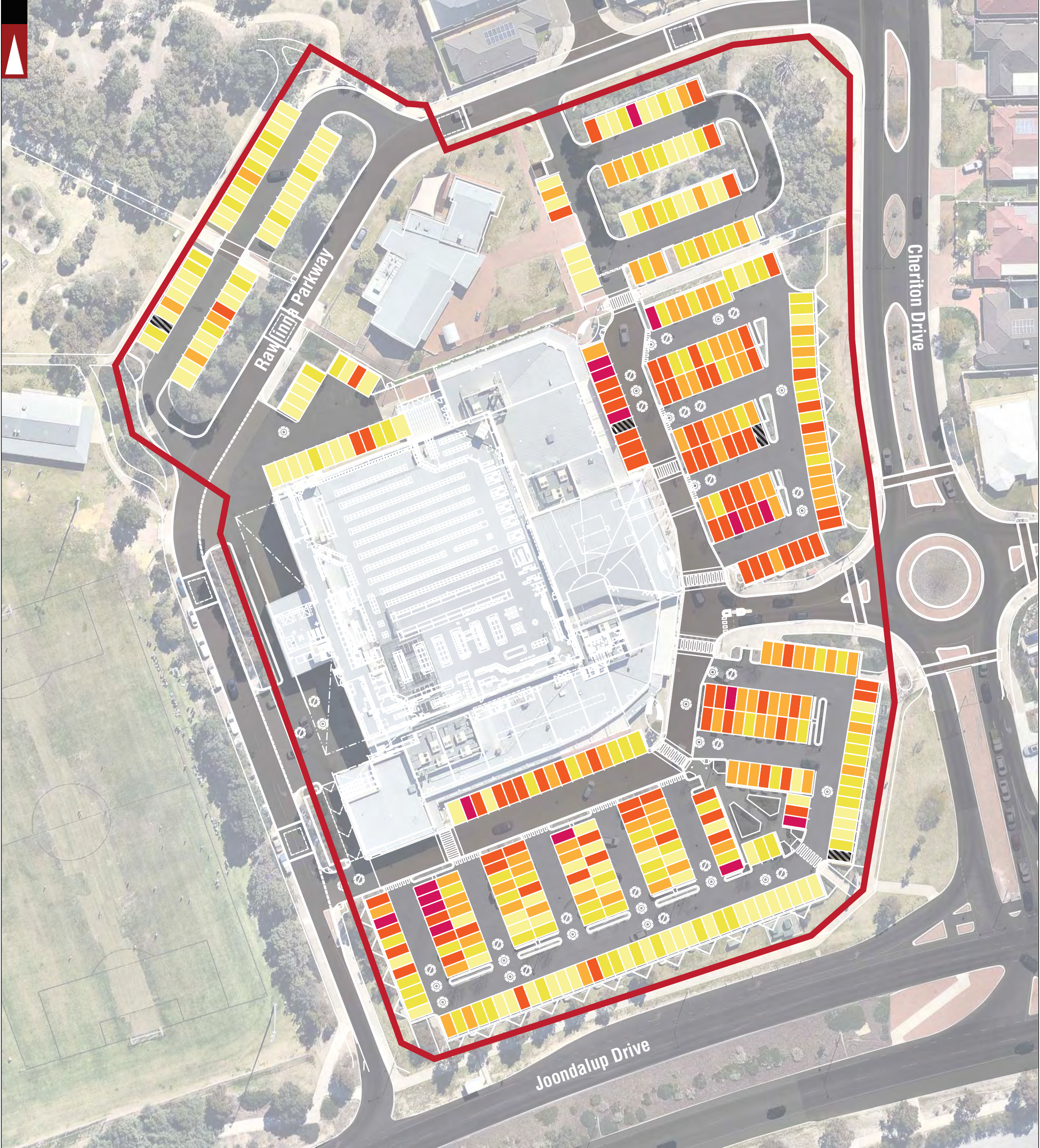
A site visit was conducted on Saturday 9th September, 2017; at 10:00-14:00

NOTE: THE PLAN IS COURTESY OF HAMES SHARLEY









			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: Civil & Traffic Engineering Consultants 830B Beaufort Street, Inglewood WA 6052
			TITLE: CARPARKING NOISE DIAGRAM	A.N.
A	21-09-2016	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S41	
No	DATE	AMENDMENT		

PH: 08 9272 7770
 WEB: www.kctt.com.au
 FTP: www.kctt.wetransfer.com






* 111/426 available parking bays

	LOCATION BOUNDARY		NOT OCCUPIED		67%-99% OCCUPANCY
	ROAD (VARIED WITH ROAD WIDTH)		< 33% OCCUPANCY		100% OCCUPANCY
Lewis Road	ROAD NAME		34%-66% OCCUPANCY		NOT ACCESSIBLE FOR PARKING

A site visit was conducted on Tuesday 12th September, 2017; at 15:30-18:00

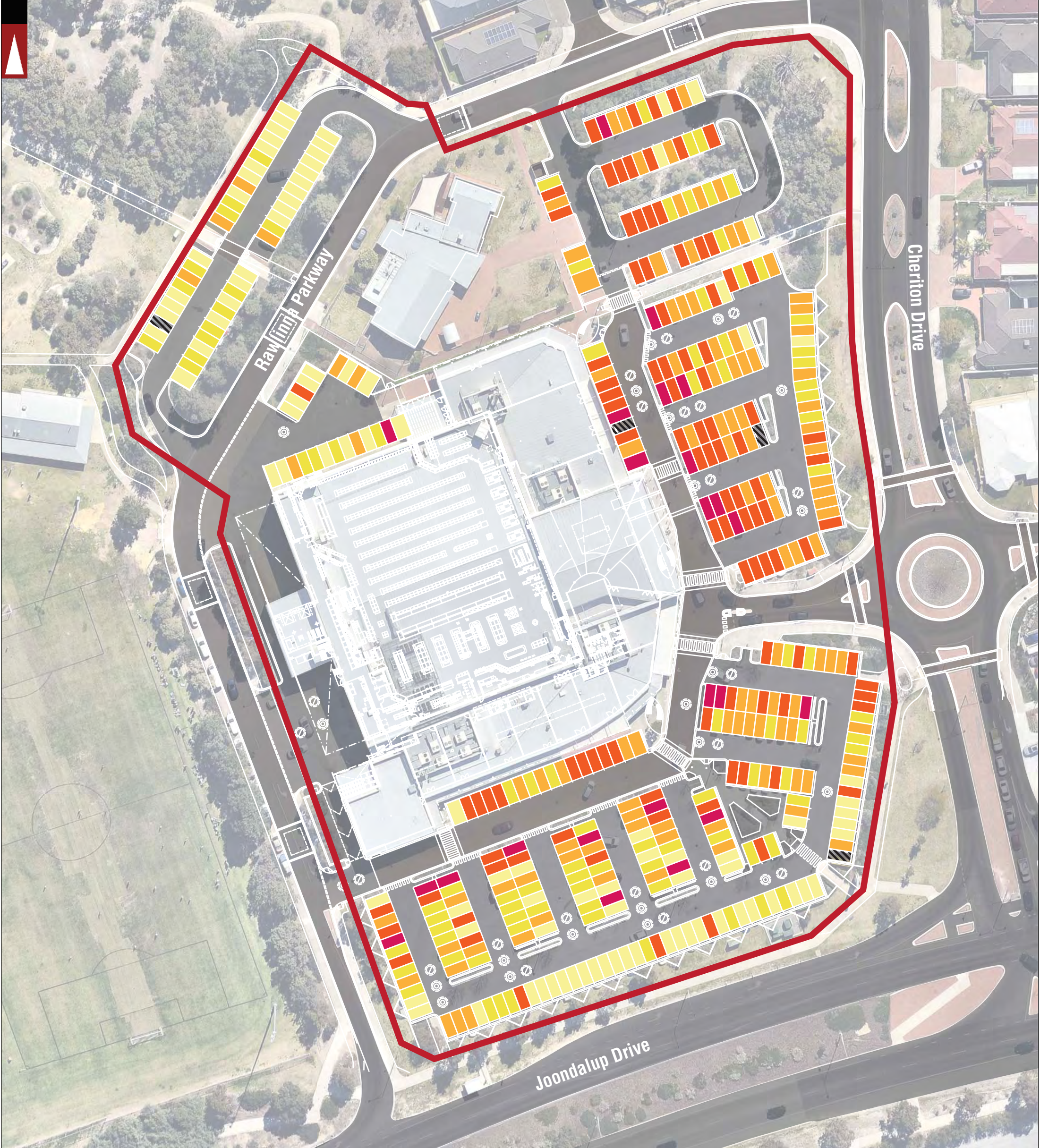
NOTE: THE PLAN IS COURTESY OF HAMES SHARLEY

LEGEND



			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: Civil & Traffic Engineering Consultants 830B Beaufort Street, Inglewood WA 6052
			TITLE: CARPARKING NOISE DIAGRAM	A.N. PH: 08 9272 7770 WEB: www.kctt.com.au FTP: www.kctt.wetransfer.com
A	21-09-2016	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S42	
No	DATE	AMENDMENT		





* 96/426 available parking bays

	LOCATION BOUNDARY		NOT OCCUPIED		67%-99% OCCUPANCY
	ROAD (VARIED WITH ROAD WIDTH)		< 33% OCCUPANCY		100% OCCUPANCY
Lewis Road	ROAD NAME		34%-66% OCCUPANCY		NOT ACCESSIBLE FOR PARKING

A site visit was conducted on Wednesday 13th September, 2017; at 15:30-18:00

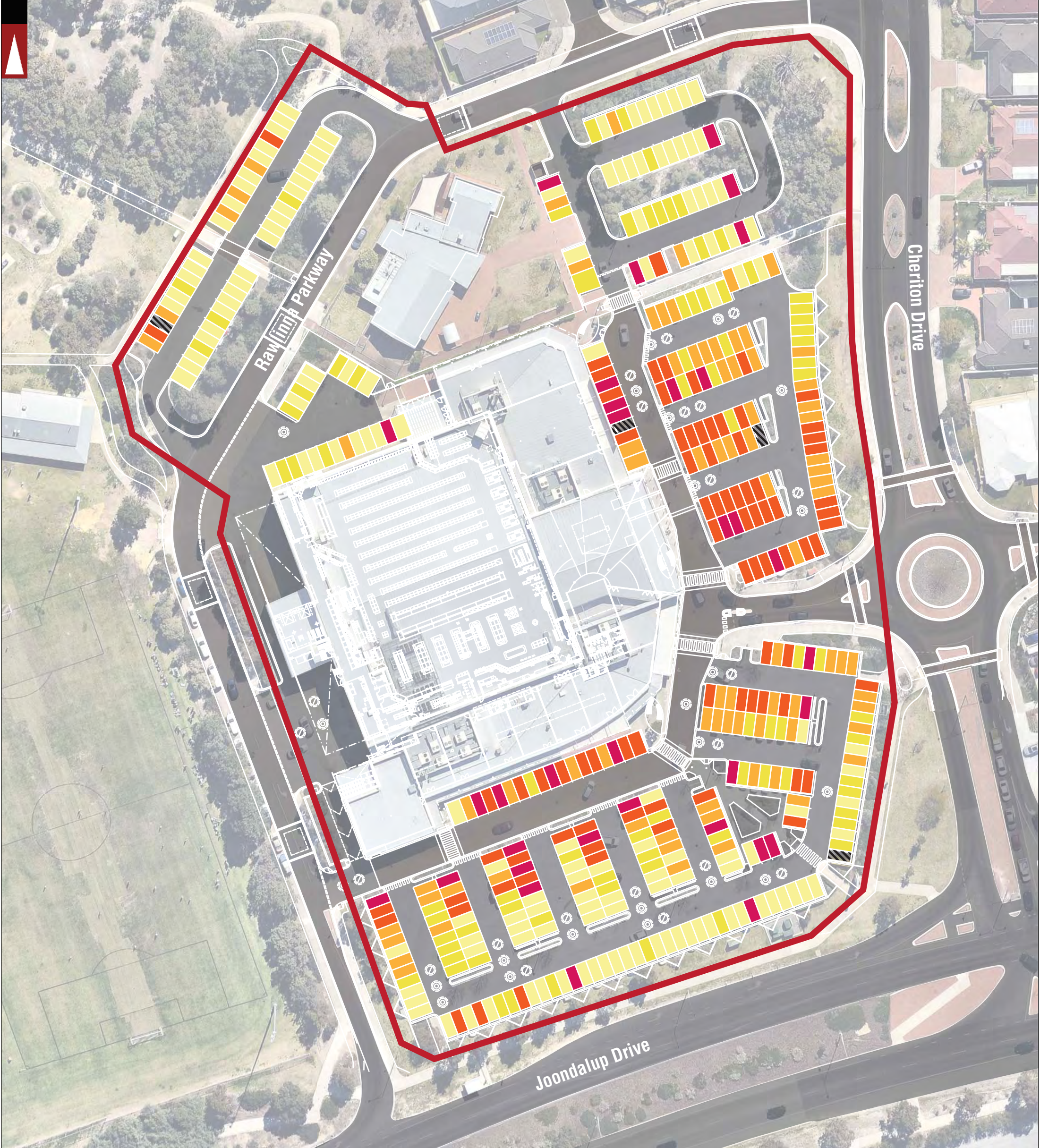
NOTE: THE PLAN IS COURTESY OF HAMES SHARLEY

LEGEND

			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: Civil & Traffic Engineering Consultants 830B Beaufort Street, Inglewood WA 6052
			TITLE: CARPARKING NOISE DIAGRAM	A.N.
A	21-09-2016	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_ S43	
No	DATE	AMENDMENT		

PH: 08 9272 7770
 WEB: www.kctt.com.au
 FTP: www.kctt.wetransfer.com





* 146/426 available parking bays

	LOCATION BOUNDARY		NOT OCCUPIED		67%-99% OCCUPANCY
	ROAD (VARIED WITH ROAD WIDTH)		< 33% OCCUPANCY		100% OCCUPANCY
Lewis Road	ROAD NAME		34%-66% OCCUPANCY		NOT ACCESSIBLE FOR PARKING

A site visit was conducted on Thursday 14th September, 2017; at 15:30-18:00

NOTE: THE PLAN IS COURTESY OF HAMES SHARLEY

LEGEND

			PROJECT: CARRAMAR VILLAGE SHOPPING CENTRE	DRAWN BY: Civil & Traffic Engineering Consultants 830B Beaufort Street, Inglewood WA 6052
			TITLE: CARPARKING NOISE DIAGRAM	A.N.
A	21-09-2016	ISSUED FOR REVIEW	DRAWING NUMBER: KC00705.000_S44	
No	DATE	AMENDMENT		

PH: 08 9272 7770
 WEB: www.kctt.com.au
 FTP: www.kctt.wetransfer.com

