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Sustainable Transport. Safe Solutions

Lots 1 & 5 Broadhurst Crescent, Bateman
Proposed Child Care Centre

TRANSPORT IMPACT STATEMENT



Prepared for:
St Clarence Investments Pty Ltd

March 2023

Lots 1 & 5 Broadhurst Crescent, Bateman

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Date: 2 March 2023
Project number: U21.064

Version control

Version No.	Date	Prepared by	Revision description	Issued to
U21.064.r01a	24/10/22	Paul Gbantous	FINAL	Dynamic Planning
U21.064.r01b	01/02/23	Paul Gbantous	UPDATED FINAL	Dynamic Planning
U21.064.r01c	25/02/23	Paul Gbantous	REVISED FINAL	Dynamic Planning
U21.064.r01c	02/03/23	Paul Gbantous	REVISED FINAL	Dynamic Planning



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1 Introduction

This Transport Impact Statement has been prepared by Urbii on behalf of St Clarence Investments Pty Ltd with regards to the proposed child care centre, located at Lots 1 & 5 Broadhurst Crescent, Bateman.

The subject site is situated on the south-west corner of Marsengo Road and Broadhurst Crescent, as shown in Figure 1. The site currently accommodates two residential dwellings and is bound by Marsengo Road to the north, Broadhurst Crescent to the east, Islip Court to the south and residential dwellings to the west. The site is surrounded by mostly residential land uses, with Corpus Christi College located nearby to the north.

It is proposed to develop the site into a child care centre catering for up to 82 children and 17 staff.

The key issues that will be addressed in this report include the traffic generation and distribution of the proposed development, access and egress movement patterns, car parking and access to the site for alternative modes of transport.

This TIS has been updated to reflect changes in the proposed development plans after submission of the Development Application. The City of Melville provided preliminary feedback in late December 2022 regarding the proposed development and the plans have been revised to address the feedback.

The City provided further feedback via email in early February 2023. There are three key issues raised in February which have been addressed in this revised TIS:

- A sightline assessment has been undertaken for the on-street parking and the on-street parking has been reduced from 7 bays to 5 bays as a result.
- The impact of the proposed development crossover on existing drainage and kerb ramps has been assessed.
- The proximity of the crossover and the performance of the intersection of Marsengo Road / Broadhurst Crescent have been assessed through a video traffic survey on 16 February 2023 and SIDRA intersection analysis. A follow up site visit was undertaken on 2 March 2023 to assess the effect of recent traffic management measures implemented by the school.



Figure 1: Subject site location



2 Proposed development

The proposal for the subject site is for a child care centre comprising:

- A child care centre with rooms allocated to different age groups;
- Outdoor play area;
- 16 onsite car parking bays, including one ACROD bay;
- 5 on-street car parking bays adjacent to the development;
- Verge seating with public art;
- Bicycle parking for four bicycles;
- End of trip facilities including lockers, a shower and change room; and
- Bin store.

Vehicle access to the site is proposed via one crossover on Broadhurst Crescent. People walking and cycling will access the development from the external path network abutting the site.

The breakdown of age groups is included in the proposed development plan and in Table 1.

Table 1: Age group break-down for the child care centre

AGE GROUP	NO. OF CHILDREN
NURSERY - BIRTH TO 2 YRS	12 CHILDREN
BABIES - BIRTH TO 2 YRS	12 CHILDREN
TODDLERS - 2-3 YRS	14 CHILDREN
TODDLERS - 2-3 YRS	14 CHILDREN
PRESCHOOL - 3-4 YRS	30 CHILDREN
ADDITIONAL STAFF	
TOTAL	82 CHILDREN

The proposed development plans are included for reference in Appendix A.

3 Vehicle access and parking

3.1 Existing vehicle access

The subject site currently features two crossovers on Broadhurst Crescent and one crossover on Islip Court (Figure 2).



Figure 2: Existing vehicle access

3.2 Proposed vehicle access

Vehicle access for the child care centre is proposed to be consolidated via one crossover on Broadhurst Crescent (Figure 3). The existing northern crossover on Broadhurst Crescent is proposed to be moved north by around 5.5m. The other existing site crossovers will be closed as part of the development. It is recommended that the existing traffic island on Broadhurst Crescent be extended past the site crossover to restrict the crossover to left-in/left-out movements. Extension of the traffic island and other crossover design elements will be progressed as part of the detailed design stage of the project.

The site designers tested different configurations and found the car park was best located at the northern end of the site, as the site was too narrow for car parking at the southern end.

Based on the proposed car parking allocations, most parents will use the on-street parking on Broadhurst Crescent for drop-off and pick-up of children. Therefore, there will not be a high volume of traffic using the proposed crossover. Parents will be informed they need to approach the site in a northbound direction on Broadhurst Crescent, to use the on-street parking bays for drop-off and pick-up. If the on-street parking bays are full, parents can then turn left into the site crossover to try parking onsite.

Parents arriving from the north can undertake a U-turn at Islip Court or access Broadhurst Crescent from the eastern intersection on Marsengo Road and drive around to the site.

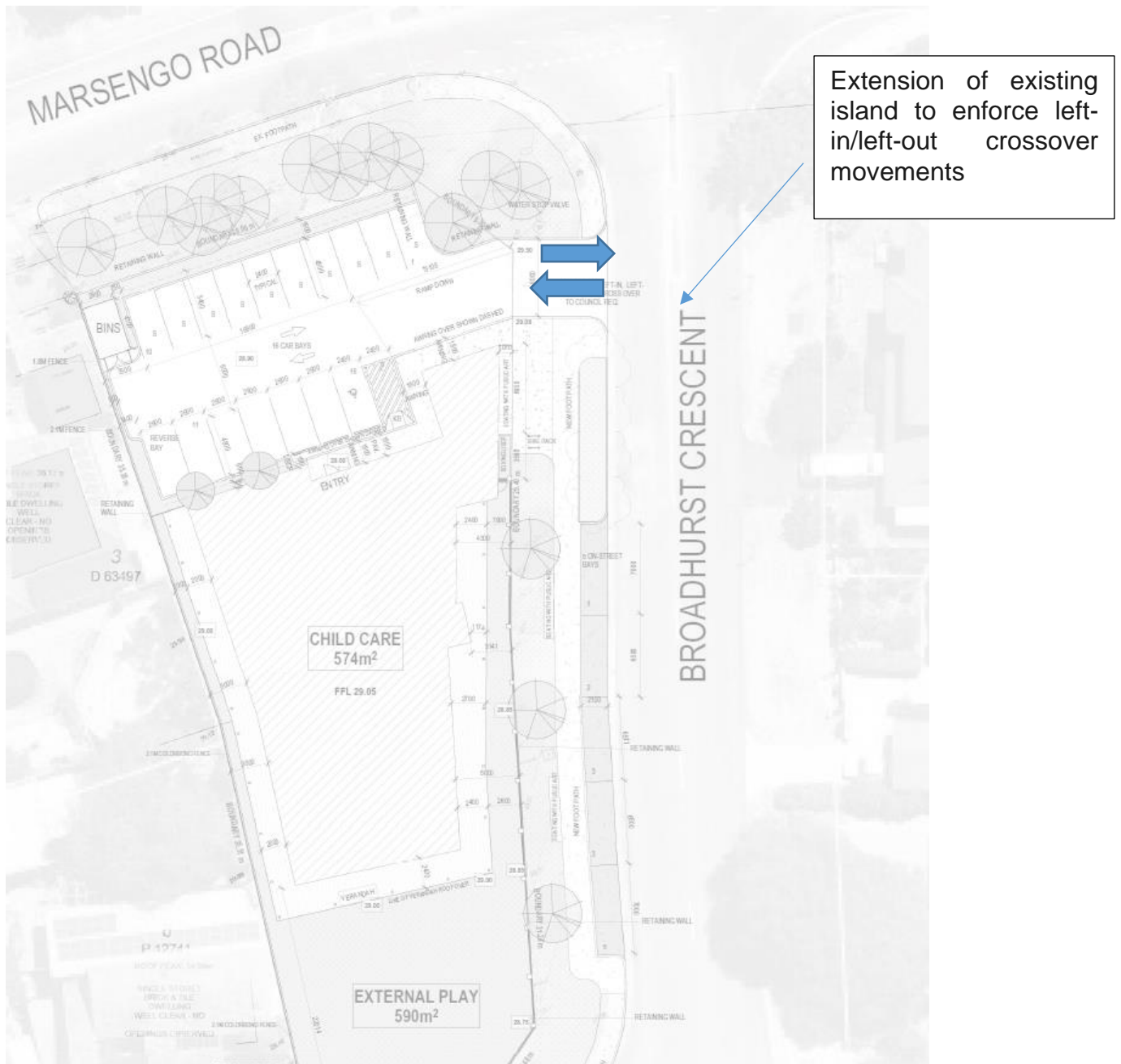


Figure 3: Proposed development vehicle access

3.3 Impact of crossover on road infrastructure (March 2023)

The proposed development plans have been reviewed with an overlay of the feature survey and aerial background. As shown in Figure 4, the drainage access lid in the footpath and the kerb ramp for walk crossing will not be impacted by the crossover.

There is some minor road kerbing adjustment required near the existing location of the side entry pit. The side entry pit will likely require modification to accommodate the crossover. This can be addressed at the detailed design stage of the project.



Figure 4: Existing road infrastructure near proposed crossover

3.4 Crossover sightlines

The crossover sight distance assessment was undertaken in accordance with the Austroads *Guide to Road Design Part 3 – Geometric Design* (AGRD03).

Stopping Sight Distance (SSD) is the distance to enable a normally alert driver, travelling at the design speed on wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road ahead.

SSD is derived from two components:

1. The distance travelled during the total reaction time
2. The distance travelled during the braking time from the design speed to a stop and their relationship is shown in Equation 1.

$$SSD = \frac{R_T V}{3.6} + \frac{V^2}{254(d + 0.01a)} \quad 1$$

where

R_T	=	reaction time (sec)
V	=	operating speed (km/h)
d	=	coefficient of deceleration (longitudinal friction factor)
a	=	longitudinal grade (% , + for upgrades and – for downgrades)

A reaction time of 2.5 seconds was adopted for the analysis, which is conservative as it assumes the driver is not alert. An operating speed of 50km/h was adopted. This is conservative as northbound traffic on Broadhurst Crescent will need to decelerate on approach to the T-intersection with Marsengo Road. The coefficient of deceleration is 0.36.

The required Stopping Sight Distance is 62m. This is considered a sufficient distance for visibility between outbound traffic at the crossover and northbound traffic on Broadhurst Crescent. To achieve the required SSD, two on-street parking bays needed to be removed from the proposed development plans.

As detailed in sketch sk02 in Appendix B, there is over 70m sight distance, which exceeds the minimum SSD requirements.



3.5 Safe Intersection Sight Distance (SISD)

The Safe Intersection Sight Distance at the intersection of Islip Court / Broadhurst Crescent was assessed in accordance with the *Austrroads Guide to Road Design Part 4A – Unsignalised and Signalised Intersections* (AGRD04A).

SISD is the minimum sight distance which should be provided on the major road at any intersection. Equation 2 shows the formula for SISD.

$$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)} \quad 2$$

where

- SISD = safe intersection sight distance (m)
- D_T = decision time (sec) = observation time (3 sec) + reaction time (sec) – refer to *AGRD Part 3* (Austrroads 2016b) for a guide to values
- V = operating (85th percentile) speed (km/h)
- d = coefficient of deceleration – refer to Table 3.3 and *AGRD Part 3* for a guide to values
- a = longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade)

A reaction time of 2 seconds and design speed of 60km/h results in a required SISD of 123m. This is conservative as southbound traffic on Broadhurst Crescent needs to accelerate prior to reaching Islip Court.

As detailed in sketch sk03 in Appendix B, an outbound vehicle turning right from Islip Court can look to the left and see all the way to the end of Broadhurst Crescent. SISD is satisfied with no impact from the proposed car parking.

It should be noted that the provision of on-street car parking embayment will improve sightlines at the crossover and intersection and also improve road safety. During the video survey, cars were observed to presently park on both sides of Broadhurst Crescent adjacent to the subject site, for school pick-up and drop-off. On-street parking against the kerb has a larger impact on sightlines than on-street embayed parking.

Additionally, the embayed parking provides a formal location for people to park on the western side of Broadhurst Crescent and reduces the likelihood of obstructed sightlines.

The embayed parking also provides the added benefit of maintaining increased road width for two-way traffic movements on Broadhurst Crescent, with extra space for traffic to pass cars parked on both sides of the road.

3.6 Car parking layout

Dimensions of car parking aisles and bays are compliant with AS2890.1. Onsite bays are 2.6m wide by 5.4m long and an aisle width of 6.0m has been provided. Staff parking bays are 2.4m wide. The ACROD bay is designed to AS2890.6 with a shared space and bollard. A blind aisle extension has been provided and a space has been reserved for vehicle turnaround at the end of the aisle.

3.7 Parking supply and allocation

It is proposed to provide a total of 21 car parking bays for the child care centre. This includes one ACROD bay. As detailed in Figure 5, the following allocation is proposed:

- Five visitor car parking bays (on-street);
- Six unallocated onsite bays (for shared use by staff and visitors);
- Ten staff car parking bays (onsite).

It is recommended that the visitor car parking bays have time restriction signage installed “1/4P” parking (15 minutes) applicable Monday to Friday between 6:30am to 9:30am and 3:00pm to 6:00pm.

The staff parking bays should be signed “STAFF PARKING ONLY”.

No time restrictions should apply to the ACROD and shared parking bays.



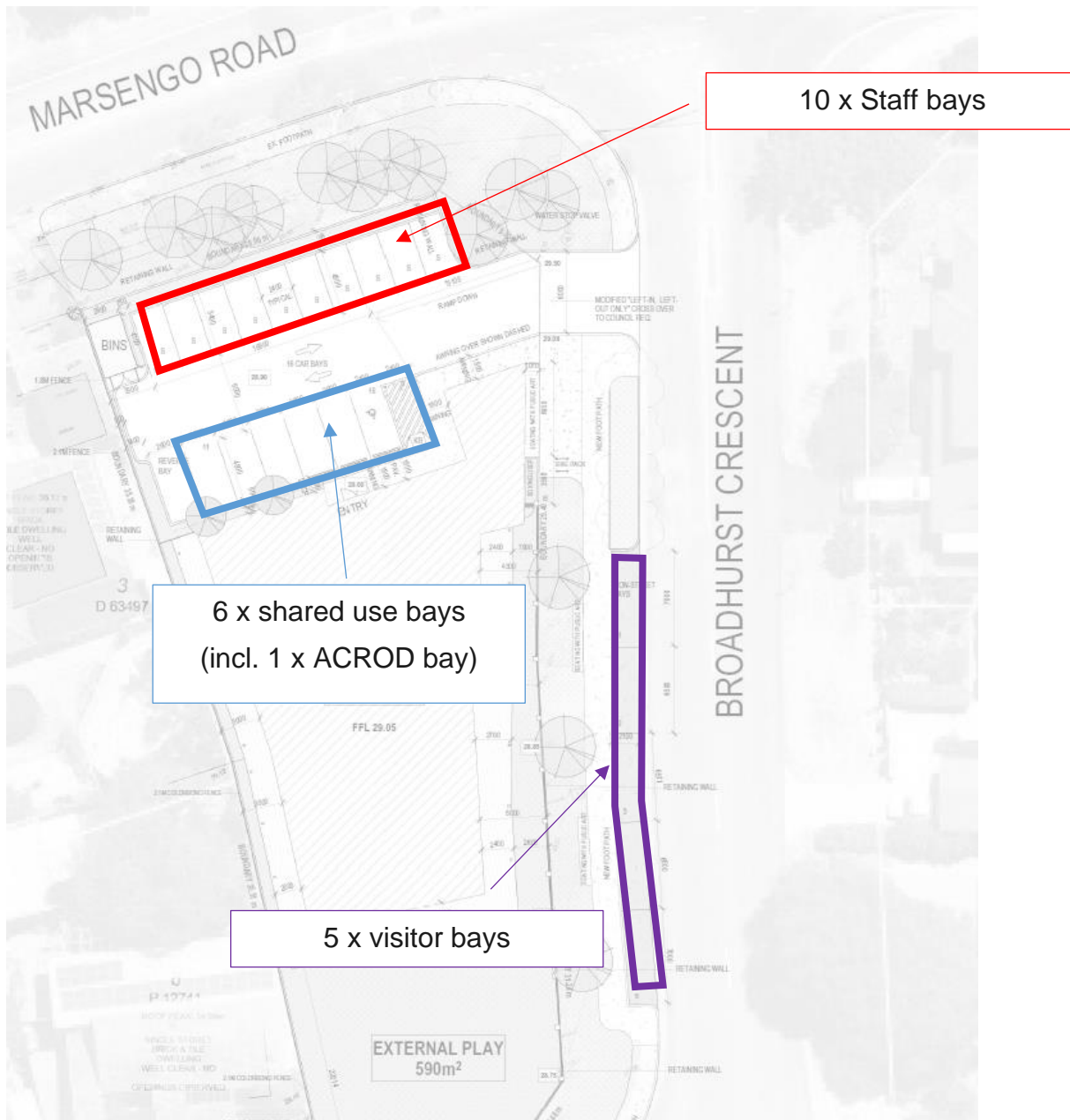


Figure 5: Proposed car parking supply and allocation

3.8 Parking demand for staff

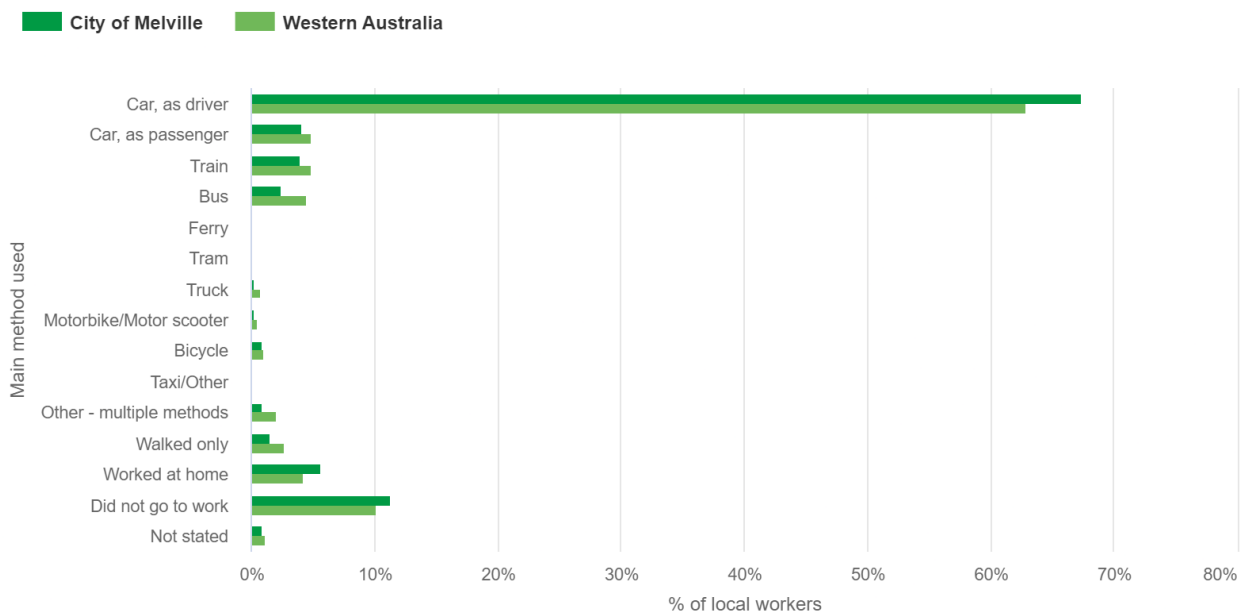
As detailed in Figure 6, 2016 ABS census data indicates that 68% of workers in the City of Melville travelled to work by driving a car.

The subject site has good connectivity to the walking and cycling network and nearby bus services. Therefore, an 80% car driver mode share is considered a reasonable and conservative assumption for staff. The proposed development provides end of trip facilities including a change room and lockers plus bicycle parking for staff, to further encourage sustainable transport to the site.

This results in an anticipated peak parking demand of **14 bays for 17 staff**.

Local workers method of travel to work, 2016

City of Melville - All industries



Source: Australian Bureau of Statistics, Census of Population and Housing, 2016 Compiled and presented in economy.id by .id (informed decisions).



Figure 6: City of Melville – Method of travel to work data (2016)

Source: Australian Bureau of Statistics, Census of Population and Housing, 2016.

3.9 Pick-up / drop-off parking

Modelling was undertaken to estimate the demand for children’s pick-up/drop-off parking. As detailed in Section 6 of this report, the peak inbound traffic for children’s drop-off is estimated to be 33 cars in a 60-minute period. The RTA NSW *Guide to Traffic Generating Developments*, surveyed the average length of stay for drop-offs to be 6.8 minutes.

For conservative analysis, it was assumed that the average length of stay would be 7 minutes. The Poisson Distribution modelling presented in Figure 7 shows that in any 7-minute period during the peak hour, the 95th percentile number of pick-ups/drop-offs within the car park will be **7 vehicles or less**.



3.10 Total parking demand

The total estimated parking demand during the peak hours is **21 bays** (including 14 bays for staff and 7 bays for pick-up/drop-off). This is expected to be contained within the proposed car parking within and adjacent to the child care centre.

Traffic volume	33 (vph)	0.00917 (vps)
Time period	7 (min)	420 (sec)
Mean number of vehicles	3.85	
Probability distribution table	95th percentile:	7 vehicles

(x)	p(x)	P(x)
1	0.08193	0.10321
2	0.15771	0.26092
3	0.20239	0.46331
4	0.1948	0.65811
5	0.15	0.80811
6	0.09625	0.90436
7	0.05294	0.9573
8	0.02548	0.98278
9	0.0109	0.99367
10	0.0042	0.99787
11	0.00147	0.99934
12	0.00047	0.99981
13	0.00014	0.99995
14	3.8E-05	0.99999
15	9.8E-06	1
16	2.4E-06	1
17	5.4E-07	1
18	1.1E-07	1
19	2.3E-08	1
20	4.5E-09	1

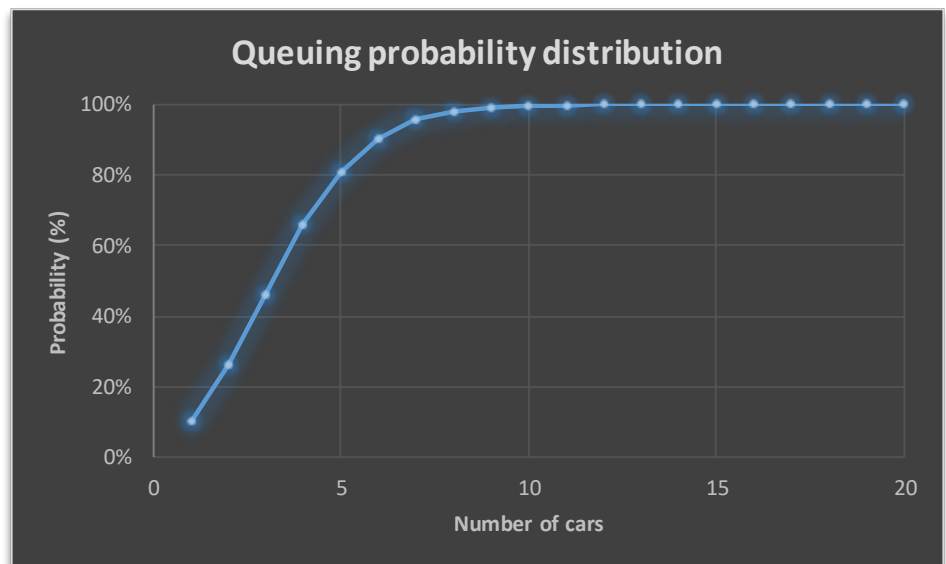


Figure 7: Probability analysis for children’s drop-off/pick-up

3.11 Parking demand management

The analysis presented in this report indicates that there will be enough car parking supply to meet the needs of the development. However, should there be a need to manage car parking demand in the future, several strategies can be considered.

A sustainable transport network should prioritise active and sustainable modes of transport, with walking, cycling, public transport, car sharing, and then single occupancy cars ranked in order of priority (Figure 8).

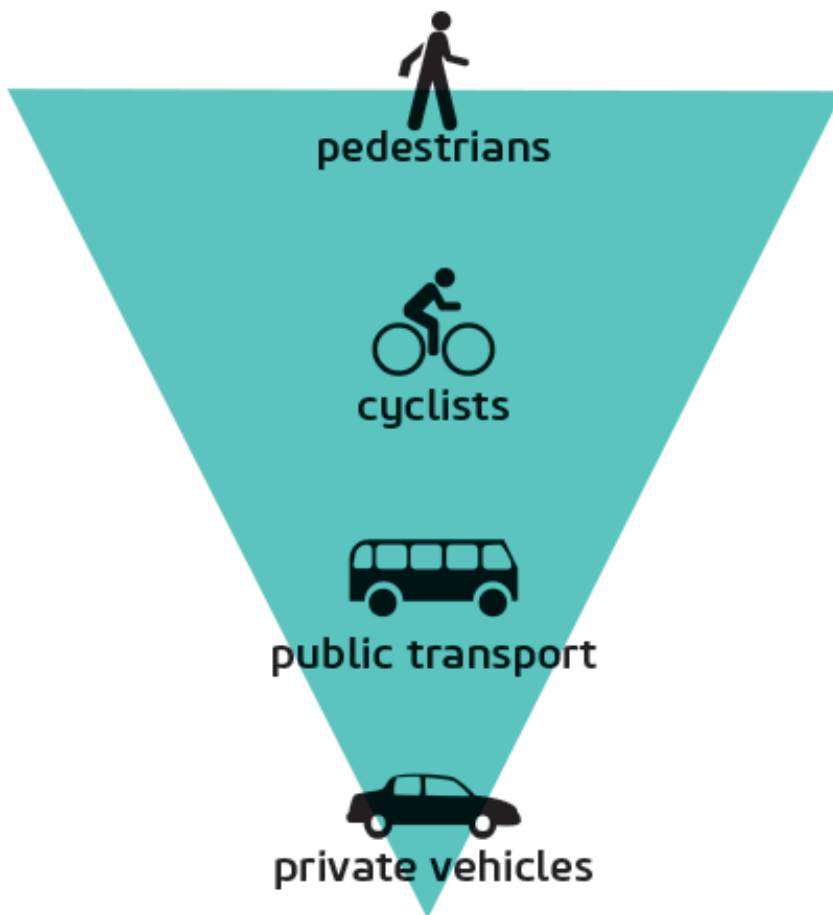


Figure 8: Sustainable transport hierarchy¹

Some strategies which can be considered for promoting sustainable transport and lowering demand for car parking may include, but are not limited to:

- Running healthy, active transport campaigns and promotions in the workplace. For example, tracking walking and active transport and offering prizes or other incentives for participants.
- Educating staff on public transport, walking and cycling travel options as part of training and recruitment.
- Offering subsidies or other incentives for using public transport.
- Monitoring and maintaining bicycle parking to ensure enough parking is provided and is maintained in good condition.
- Providing free charging stations for micro-mobility vehicles such as e-scooters and e-bikes.
- Implementing a car-pooling register for staff to match-up and car pool together. This can also be incentivised by issuing car-pooling badges for display on the dashboard and providing allocated priority car-pooling parking bays within the site.
- Offer tele-commuting work opportunities for staff who can complete work duties remotely, for example administrative staff.

¹ Source: https://www.nationalcapital.gov.au/images/NCA/planning_and_urban_design/west-basin-guidelines/Road-user-hierarchy.png

4 Provision for service vehicles

The proposed development will not generate significant service vehicle traffic. It is recommended that smaller vehicles such as vans or utes be utilised for deliveries to the site. These smaller vehicles can park in a car parking bay for a short time during 'off-peak' periods.

Waste will be collected via kerbside waste collection.

5 Hours of operation

The hours of operation for the child care centre are Monday-Friday 6:30am to 6:00pm. The RTA NSW *Guide to Traffic Generating Developments* indicates that pre-school centres typically have peaks in the periods 8:00am to 9:00am and 2:30pm to 4:00pm.



6 Daily traffic volumes and vehicle types

6.1 Traffic generation

The traffic volume that will be generated by the proposed development has been estimated using trip generation rates derived with reference to the following sources:

- Roads and Traffic Authority of New South Wales *Guide to Traffic Generating Developments* (2002).

The trip generation rates adopted are detailed in Table 2.

Table 2: Adopted trip rates for traffic generation

Land use	Trip rate source	Daily rate	AM rate	PM rate	AM-in	AM-out	PM-in	PM-out
Child Care	RTA NSW	4	0.8	0.8	50%	50%	50%	50%

The RTA Guide specifies a rate of 1.4 trips per child between 7am and 9am (2 hours), so it was assumed that 0.8 trips per child would be generated in the peak hour (8am to 9am). The RTA Guide specifies 0.8 trips per child between 2:30pm and 4:00pm. For simplicity, it was conservatively assumed 0.8 trips per child would also be generated in the PM peak hour.

Child care centres have well defined peak periods in their daily traffic profiles therefore the daily trip rate would be no more than 4 trips per child.

The estimated traffic generation of the proposed development is detailed in Table 3. The proposed development is estimated to generate 328 vehicles per day (vpd), with 66 vehicles per hour (vph) generated during the AM and PM peak hours, respectively.

These trips include both inbound and outbound vehicle movements. It is anticipated that most of the vehicle types would be passenger cars and SUVs.

Table 3: Development traffic generation – Weekday AM and PM peak hour

Land use	Quantity	Daily Trips	AM Trips	PM Trips	AM Peak Trips		PM Peak Trips	
					IN	OUT	IN	OUT
Child Care	82	328	66	66	33	33	33	33

6.2 Impact on surrounding roads

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

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

The proposed development will not increase traffic flows on any roads adjacent to the site by the quoted WAPC threshold of +100vph to warrant further analysis. Therefore, the impact on the surrounding road network is moderate (Figure 9).

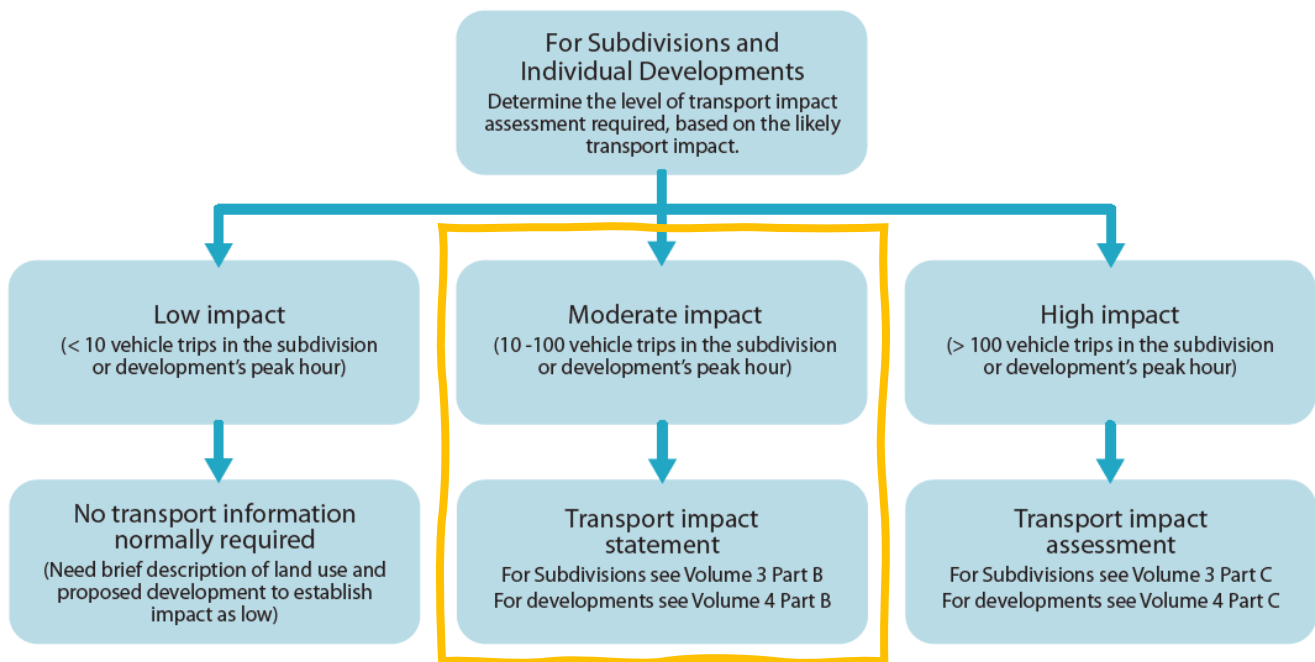


Figure 9: Level of traffic impact for subdivisions and individual developments

Source: WAPC *Transport Impact Assessment Guidelines Volume 4: Individual Developments*, August 2016

6.3 Intersection analysis

Capacity analysis of intersections was undertaken using the SIDRA 9 computer software package. SIDRA 9 is an intersection modelling tool commonly used by traffic engineers for all types of intersections.

An intersection model was developed as shown in Figure 10.

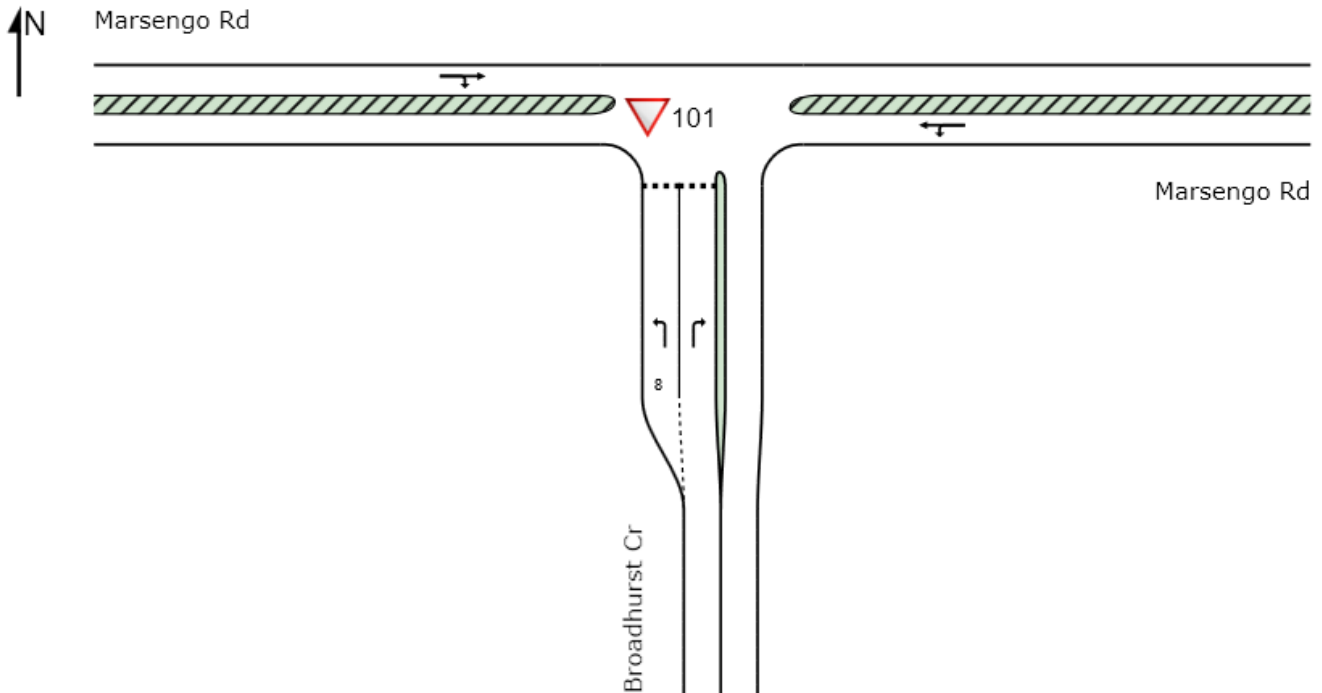


Figure 10: SIDRA model developed for analysis

A video traffic survey was undertaken at the intersection of Broadhurst Crescent / Marsengo Road. The survey was undertaken on Thursday 16 February 2023, on a school day. The survey was undertaken between 7am and 9am in the morning and 2pm and 6pm in the afternoon. Data was collected in 15 minute increments to assist with identifying the peak traffic hours.

The morning peak traffic hour was recorded between 7:45am to 8:45am and the afternoon peak hour was recorded between 2:45pm and 3:45pm.

The surveyed existing peak hour traffic volumes are detailed in Figure 11. Post development intersection volumes are shown in Figure 12.

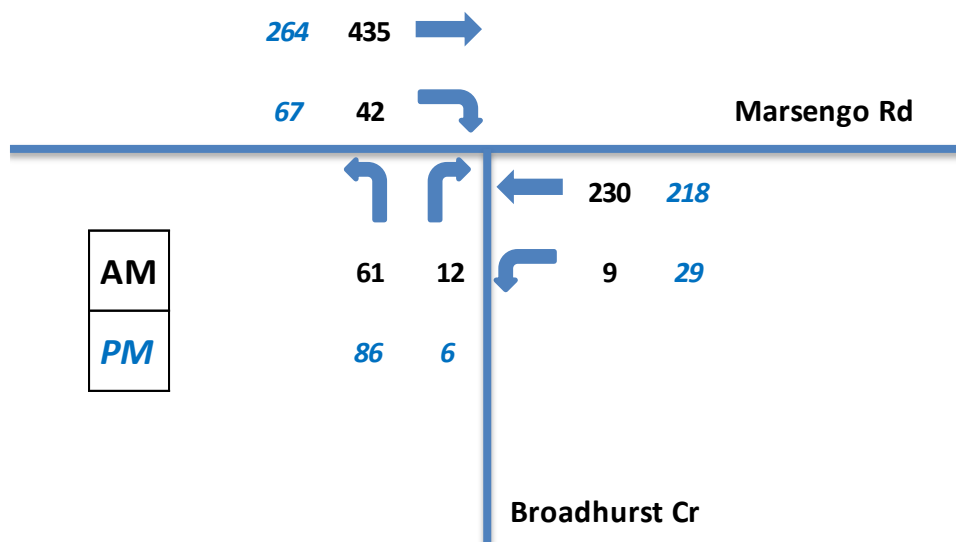


Figure 11: Existing peak hour traffic volumes

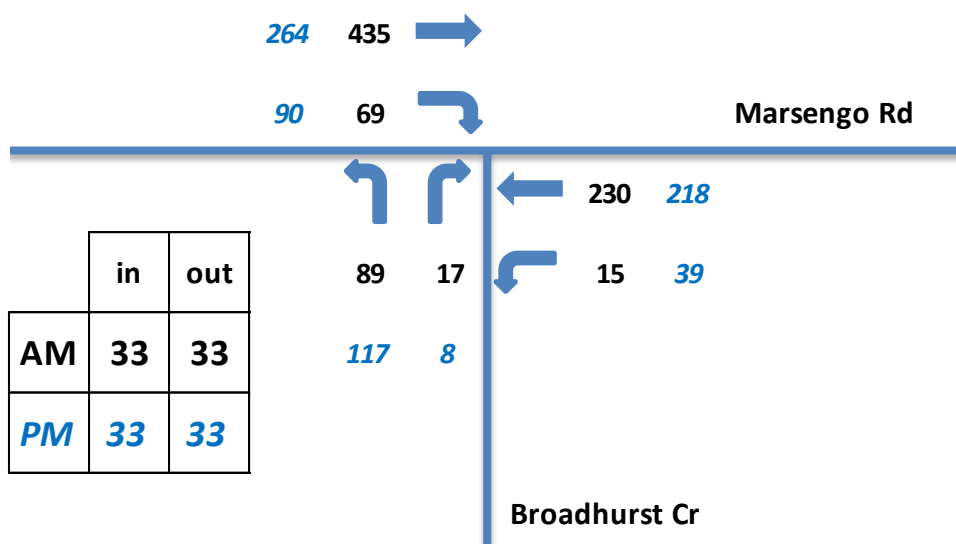


Figure 12: Post development peak hour traffic volumes

In the morning peak hour, some cars were observed to stop on both sides of Broadhurst Crescent for student drop-off. Two cars parked on the west side of Broadhurst Crescent for 26 minutes and 53 minutes respectively. The proposed 15 minute time restriction for the embayed parking will be beneficial in reducing the incidence of extended street parking during the busy AM and PM peak periods. As mentioned in Section 3.7 of this report, it is recommended that the visitor car parking bays (on-street) have time restriction signage installed “1/4P” parking (15 minutes) applicable Monday to Friday between 6:30am to 9:30am and 3:00pm to 6:00pm.

Analysis of the video survey undertaken on 16 February 2023 indicated that for a ten minute period between 8:20am and 8:30am, the eastbound queue of traffic on Marsengo Road extended from the school entry crossover, passed Broadhurst Crescent. This queue cleared reasonably quickly and did not cause congestion on the Broadhurst Crescent leg of the T-

intersection. Most of the time there were no cars waiting on Broadhurst Crescent and a maximum of one car would be queued at any time.

In the afternoon peak hour on 16 February 2023, more cars were observed to stop on both sides of Broadhurst Crescent for student pick-up. At the start of the PM peak hour approximately 6 cars were parked on the east side of Broadhurst Crescent and 2 cars on the west side. The use of Broadhurst Crescent for school pick-up parking reduces the available road width for two-way traffic, with two-way traffic being obstructed. The provision of embayed parking adjacent to the child care centre will allow people to park on Broadhurst Crescent while maintained greater width for two-way traffic to pass parked vehicles.

For a twenty minute period between 3:10pm and 3:30pm, the eastbound queue of traffic on Marsengo Road extended from the school entry crossover, passed Broadhurst Crescent. Most of the time there were no cars waiting on Broadhurst Crescent and a maximum of three cars were observed to be queued on one occasion, which took ten seconds to clear. The SIDRA model was calibrated to reflect the reduced capacity of eastbound traffic on Marsengo Road.

The SIDRA analysis results show that the intersection operates at an overall level of service A during the AM and PM peak hours. Detailed SIDRA outputs are provided in Appendix C, and confirm that the child care centre traffic will not significantly impact intersection operation.

The location of the proposed development crossover will not be obstructed by queues on Broadhurst Crescent and is functional.

It is noted however, that there was significant congestion on Marsengo Road during a ten minute time window in the AM peak hour and a twenty minute time window in the PM peak hour on 16 February 2023. The congestion on Marsengo Road was not related to the volume of traffic passing through the intersection. It was caused by a queue of school traffic extending out of the school and waiting on the road.

Urbii was informed that the school has subsequently completed a number of traffic management measures to address the observed queuing on Marsengo Road. A site visit was undertaken during the afternoon peak hour on 2 March 2023. As demonstrated in Figure 13, it appears a boom gate has been installed to prevent school traffic entry from Marsengo Road. This measure was observed to work well with all queuing and congestion issues on Marsengo Road observed to be resolved on the day of the site visit.

It is strongly recommended that the closure of the site entry during the AM and PM peak hours be maintained as a regular practice by the school, as it was observed to make a substantial improvement to traffic flow.



Figure 13: Closure of school entry on Marsengo Road

Source: Photo captured 02 March 2023 at 3:20pm



Figure 14: Congestion removed from Marsengo Road



7 Traffic management on the frontage roads

Information from online mapping services, Main Roads WA, Local Government, and/or site visits was collected to assess the existing traffic management on frontage roads.

Marsengo Road near the subject site is an approximately 11m wide, two-lane divided road with a painted centre median. Footpaths and cycle lanes are provided along both sides of the road.

Marsengo Road is classified as a *Local Distributor* road in the Main Roads WA road hierarchy (Figure 15) and operates under a built-up area speed limit of 50km/h (Figure 16). A 40km/h school speed zone is applicable between 7:30am and 9:00am and 2:30pm to 4:00pm on school days.

Local Distributor roads are the responsibility of Local Government and typically are for the movement of traffic within local areas and to connect access roads to higher order distributors (Figure 17).

Traffic count data provided by the City of Melville indicates that Marsengo Road carries around 5,000 vehicles per day (vpd).

Broadhurst Crescent near the subject site is an approximately 10m wide, two-lane undivided road. A footpath is provided on the western side of the road.

Broadhurst Crescent is classified as an access road in the Main Roads WA road hierarchy (Figure 15) and operates under a built-up area speed limit of 50km/h (Figure 16). Access roads are the responsibility of Local Government and are typically for the provision of vehicle access to abutting properties (Figure 17).

Traffic count data provided by the City of Melville indicates that Broadhurst Crescent carries around 1,500 vehicles per day (vpd).

Broadhurst Crescent forms a GIVEWAY controlled T-intersection with Marsengo Road to the north. Pedestrian crossings with kerb ramps and median refuge are provided at this intersection.

Islip Court is an approximately 80m long culdesac road carrying relatively low traffic volumes.

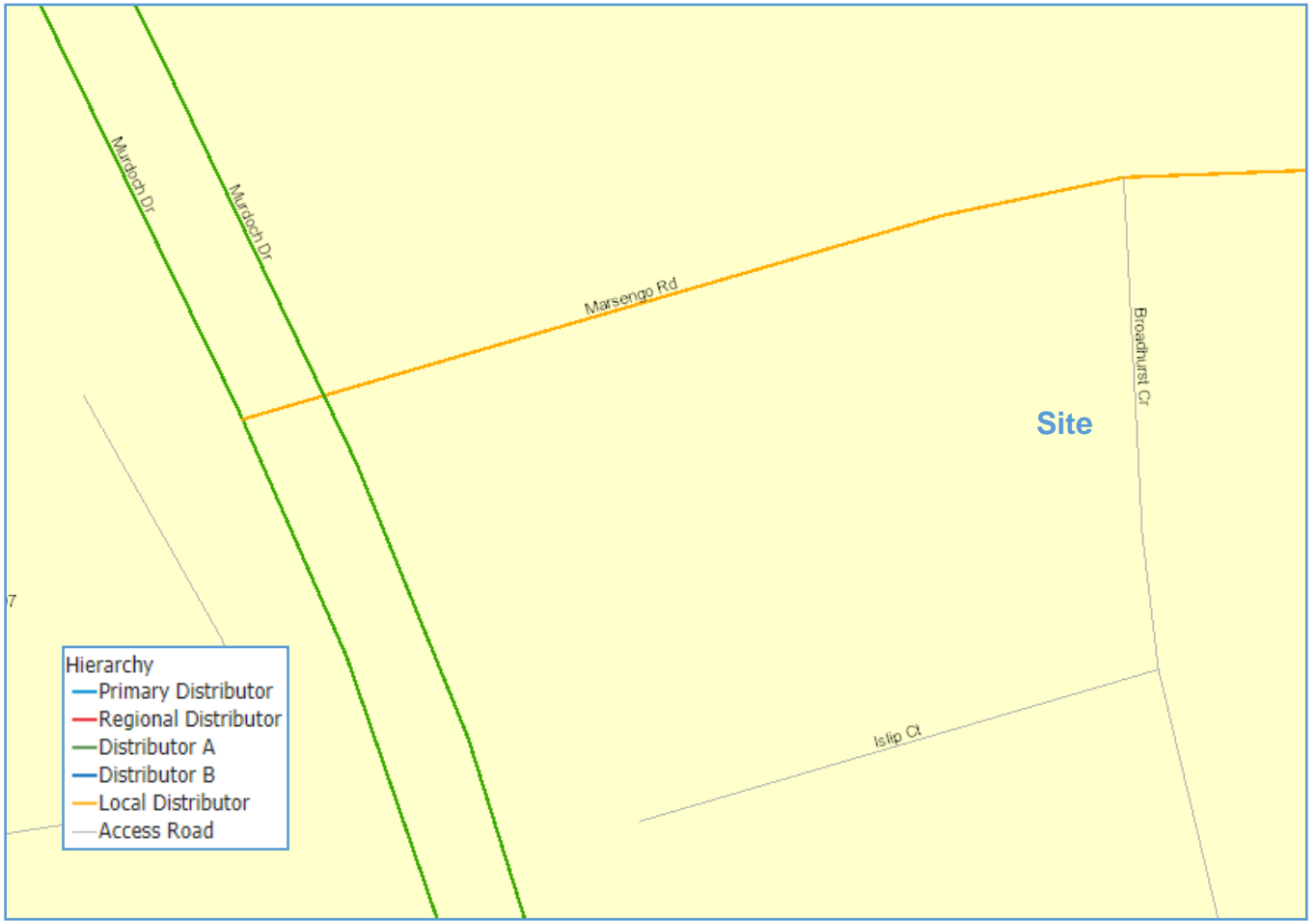


Figure 15: Main Roads WA road hierarchy plan

Source: Main Roads WA Road Information Mapping System (RIM)

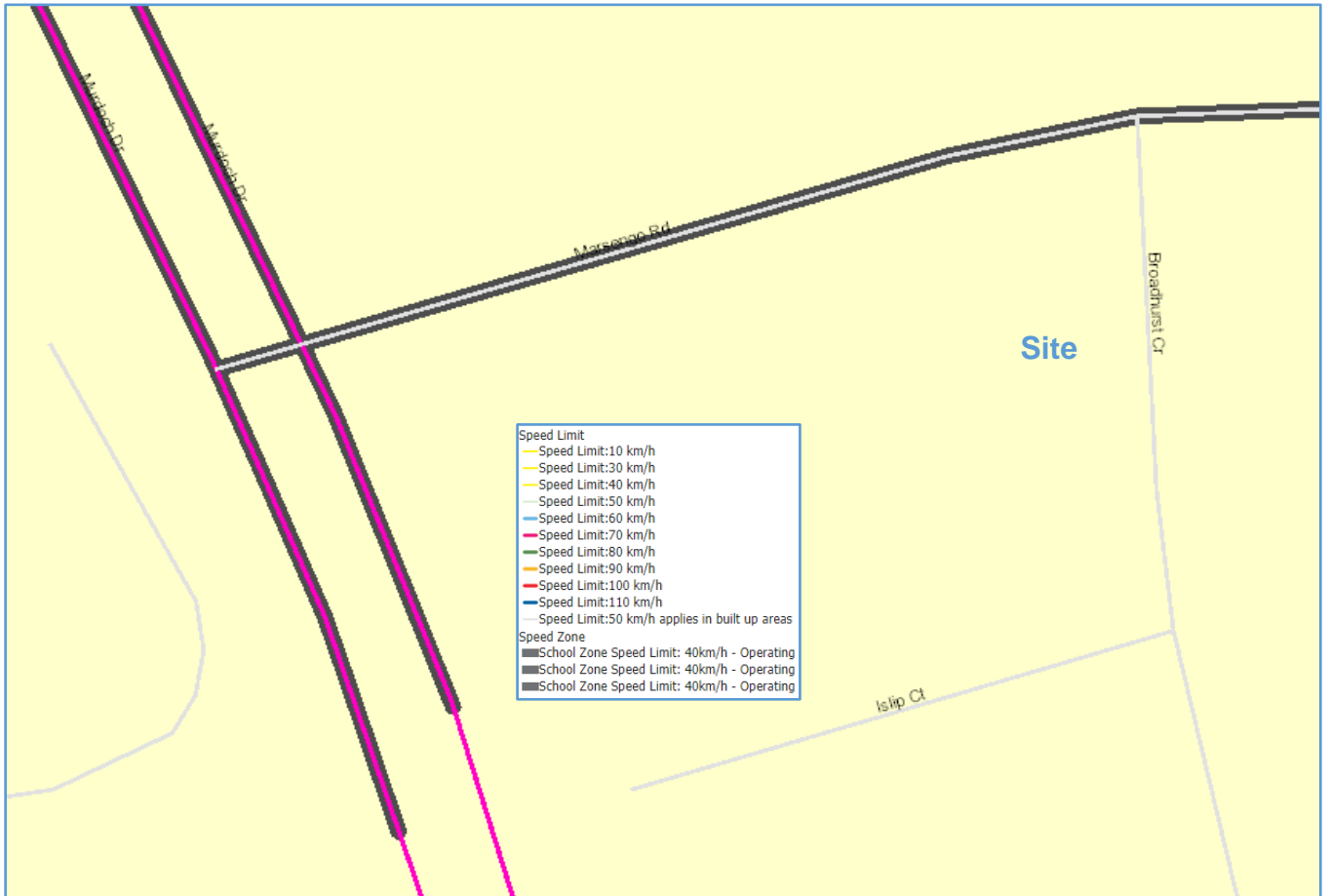


Figure 16: Main Roads WA road speed zoning plan

Source: Main Roads WA Road Information Mapping System (RIM)

**ROAD HIERARCHY FOR WESTERN AUSTRALIA
ROAD TYPES AND CRITERIA (see Note 1)**

CRITERIA	PRIMARY DISTRIBUTOR (PD) (see Note 2)	DISTRICT DISTRIBUTOR A (DA)	DISTRICT DISTRIBUTOR B (DB)	REGIONAL DISTRIBUTOR (RD)	LOCAL DISTRIBUTOR (LD)	ACCESS ROAD (A)
<i>Primary Criteria</i>						
1. Location (see Note 3)	All of WA incl. BUA	Only Built Up Area.	Only Built Up Area.	Only Non Built Up Area. (see Note 4)	All of WA incl. BUA	All of WA incl. BUA
2. Responsibility	Main Roads Western Australia.	Local Government.	Local Government.	Local Government.	Local Government.	Local Government.
3. Degree of Connectivity	High. Connects to other Primary and Distributor roads.	High. Connects to Primary and/or other Distributor roads.	High. Connects to Primary and/or other Distributor roads.	High. Connects to Primary and/or other Distributor roads.	Medium. Minor Network Role Connects to Distributors and Access Roads.	Low. Provides mainly for property access.
4. Predominant Purpose	Movement of inter regional and/or cross town/city traffic, e.g. freeways, highways and main roads.	High capacity traffic movements between industrial, commercial and residential areas.	Reduced capacity but high traffic volumes travelling between industrial, commercial and residential areas.	Roads linking significant destinations and designed for efficient movement of people and goods between and within regions.	Movement of traffic within local areas and connect access roads to higher order Distributors.	Provision of vehicle access to abutting properties
<i>Secondary Criteria</i>						
5. Indicative Traffic Volume (AADT)	In accordance with Classification Assessment Guidelines.	Above 8 000 vpd	Above 6 000 vpd.	Greater than 100 vpd	Built Up Area - Maximum desirable volume 6 000 vpd. Non Built Up Area – up to 100 vpd.	Built Up Area - Maximum desirable volume 3 000 vpd. Non Built Up Area – up to 75 vpd.
6. Recommended Operating Speed	60 – 110 km/h (depending on design characteristics).	60 – 80 km/h.	60 – 70 km/h.	50 – 110 km/h (depending on design characteristics).	Built Up Area 50 - 60 km/h (desired speed) Non Built Up Area 60 – 110 km/h (depending on design characteristics).	Built Up Area 50 km/h (desired speed). Non Built Up Area 50 – 110 km/h (depending on design characteristics).
7. Heavy Vehicles permitted	Yes.	Yes.	Yes.	Yes.	Yes, but preferably only to service properties.	Only to service properties.
8. Intersection treatments	Controlled with appropriate measures e.g. high speed traffic management, signing, line marking, grade separation.	Controlled with appropriate measures e.g. traffic signals.	Controlled with appropriate Local Area Traffic Management.	Controlled with measures such as signing and line marking of intersections.	Controlled with minor Local Area Traffic Management or measures such as signing.	Self controlling with minor measures.
9. Frontage Access	None on Controlled Access Roads. On other routes, preferably none, but limited access is acceptable to service individual properties.	Prefer not to have residential access. Limited commercial access, generally via service roads.	Residential and commercial access due to its historic status. Prefer to limit when and where possible.	Prefer not to have property access. Limited commercial access, generally via lesser roads.	Yes, for property and commercial access due to its historic status. Prefer to limit whenever possible. Side entry is preferred.	Yes.
10. Pedestrians	Preferably none. Crossing should be controlled where possible.	With positive measures for control and safety e.g. pedestrian signals.	With appropriate measures for control and safety e.g. median/islands refuges.	Measures for control and safety such as careful siting of school bus stops and rest areas.	Yes, with minor safety measures where necessary.	Yes.
11. Buses	Yes.	Yes.	Yes.	Yes.	Yes.	If necessary (see Note 5)
12. On-Road Parking	No (emergency parking on shoulders only).	Generally no. Clearways where necessary.	Not preferred. Clearways where necessary.	No – emergency parking on shoulders – encourage parking in off road rest areas where possible.	Built Up Area – yes, where sufficient width and sight distance allow safe passing. Non Built Up Area – no. Emergency parking on shoulders.	Yes, where sufficient width and sight distance allow safe passing.
13. Signs & Linemarking	Centrelines, speed signs, guide and service signs to highway standard.	Centrelines, speed signs, guide and service signs.	Centrelines, speed signs, guide and service signs.	Centrelines, speed signs and guide signs.	Speed and guide signs.	Urban areas – generally not applicable. Rural areas - Guide signs.
14. Rest Areas/Parking Bays	In accordance with Main Roads' Roadside Stopping Places Policy.	Not Applicable.	Not Applicable.	Parking Bays/Rest Areas. Desired at 60km spacing.	Not Applicable.	Not Applicable.

Figure 17: Road types and criteria for Western Australia

Source: Main Roads Western Australia D10#10992



8 Public transport access

Information was collected from Transperth, PTA and site visits to assess the existing public transport access to and from the site.

The subject site has access to the following bus services within walking distance:

- Bus Route 505: Bull Creek Stn - Murdoch Stn via Dean Rd.
- Bus Route 510: Murdoch Stn - Booragoon Bus Stn via Murdoch Dr.
- Bus Route 511: Murdoch Stn - Fremantle Stn via Somerville Blvd & McCombe Av.

The existing public transport network plan is shown in Figure 18. Bus services provide connectivity to the rail line via Bull Creek, Murdoch and Fremantle Train Stations.

The nearest bus stops are indicated in Figure 19. Bus stop *Broadhurst Cr Before Marsengo Rd* (19980) is located on the western side of Broadhurst Crescent directly adjacent to the site. Liaison was undertaken with the PTA to investigate the process for relocating the bus stop. The PTA has advised that this bus stop is superfluous due to the short spacing of stops along this segment of the bus route. The PTA has requested that an “*Application for Works Impacting Bus Stops*” be completed and submitted for the removal of the bus stop. The project proponent plans to complete and submit the form after submission of the Development Application.

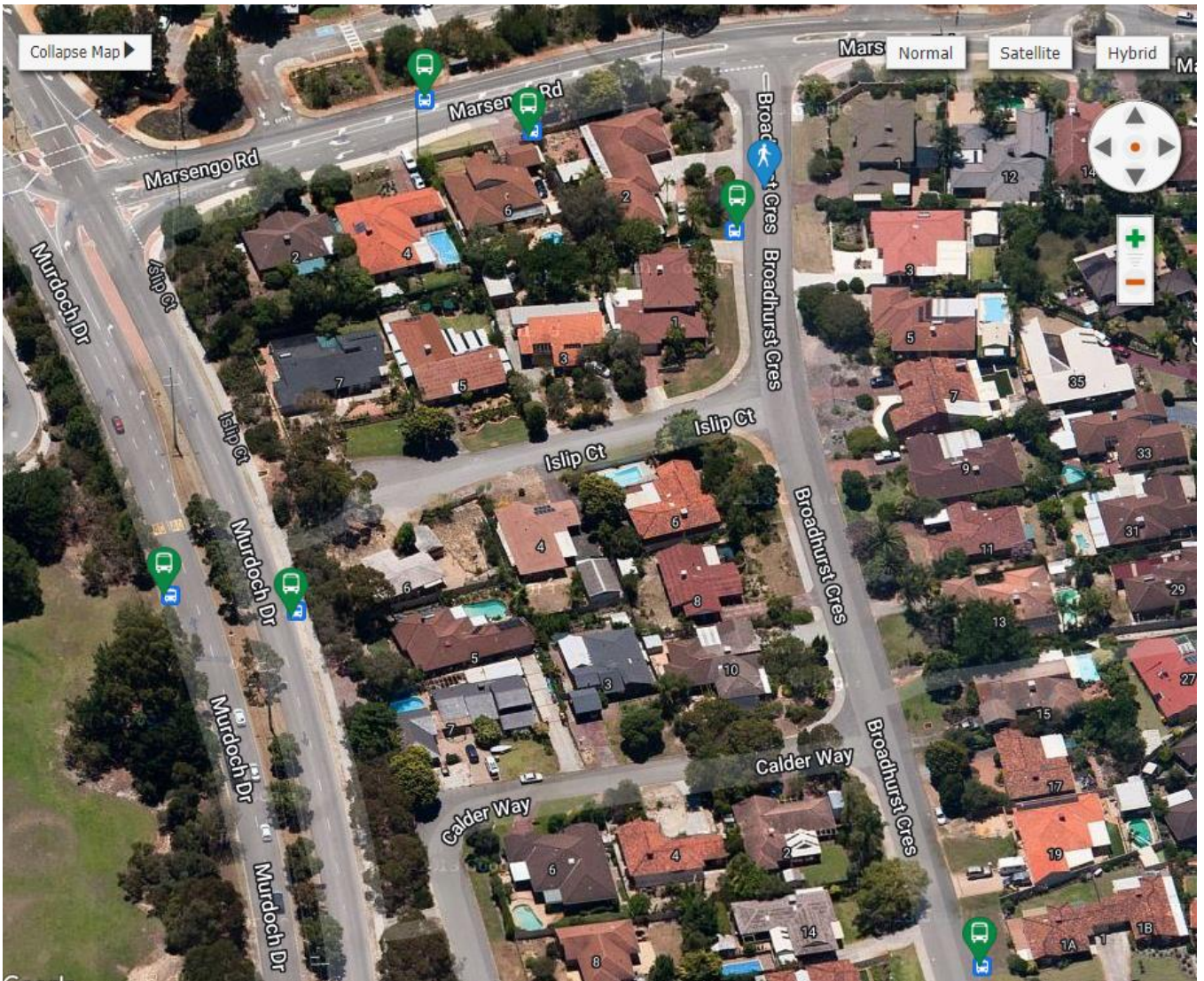


Figure 19: Existing bus stops near the subject site

Source: Transperth

From: Salkeld, Christopher <Christopher.Salkeld@pta.wa.gov.au>
Sent: Friday, 29 April 2022 11:21 AM
To: Paul Ghantous <paulghantous@urbii.com.au>
Cc: Marraffa, Vickie <Vickie.Marraffa@pta.wa.gov.au>
Subject: FW: Ticket: E95466562E52F Re: Bus stop relocation enquiry - Broadhurst Cr Before Marsengo Rd(19980)

Good Morning Paul,

Regarding your request below to relocate stop 19980 Broadhurst Cr Before Marsengo Rd, BATEMAN.

After careful consideration with my colleagues here, we find that stop 19980 is superfluous to needs considering there is a second stop only 65m further on around the corner on Marsengo Rd. Therefore we have no objections with OUR CONTRACTORS removing the stop entirely when the development reaches such as stage that the parking bays begin construction.

To facilitate this process and so that we can track the progress of the development, we ask that you complete the attached "Application for Works Impacting Bus Stops" form and send it back to my colleague Vickie (copied in to this correspondence.) Once the form is returned we will open a file on the development project and advise you of our process going forward including relevant contacts.

Please note that any works impacting the stop after 19980 which is 19971 Marsengo Rd, including but not limited to foot path works, will be subject to automatic upgrade requirements under WALGA agreements. IF at any stage of your development, plans are changed or works impede on the northern verge please inform PTA as soon as possible so that we may investigate potential impacts to stop 19971 or services using that stop.

Chris Salkeld
Project Officer | Transperth Regional And School Bus Services Division
Public Transport Authority of Western Australia
Public Transport Centre, West Parade, Perth, 6000
PO Box 8125, Perth Business Centre, WA, 6849
Tel: (08) 9326 3196 Fax: (08) 9326 2000 Mob: 0477 525 459
Email: christopher.salkeld@pta.wa.gov.au | Web: www.pta.wa.gov.au



Figure 20: Advice from PTA confirming removal of stop 19980



9 Pedestrian access

Information from online mapping services, Main Roads WA, Local Government, and site visits was collected to assess the pedestrian access for the proposed development.

9.1 Pedestrian facilities and level of service

A footpath is provided on the western side of Broadhurst Crescent for walking and cycling access into the site. Pedestrian crossing facilities including kerb ramps are provided at nearby intersections and crossovers which promotes improved access for bicycles, wheelchairs, and prams.

The proposed development will divert the existing footpath adjacent to the site to accommodate the proposed formal on-street car parking (Figure 21). A continuous walking route is provided from the on-street car parking into the main building entry. Seating with public art is also proposed to be provided along the route so people have a place to stop and rest.

The WAPC Transport Impact Assessment Guidelines for Developments (2016) provide warrants for installing pedestrian priority crossing facilities. This is based on the volume of traffic as the key factor determining if pedestrians can safely cross a road. The guidelines recommend pedestrian priority crossing facilities be considered once the peak hour traffic exceeds the volumes detailed in Table 4.

The traffic volumes in this table are based on a maximum delay of 45 seconds for pedestrians, equivalent to Level of Service E. The pedestrian crossing facilities on Broadhurst Crescent and Marsengo Road near the site are sufficient and within the traffic volume thresholds.

Table 4: Traffic volume thresholds for pedestrian crossings

Road cross-section	Maximum traffic volumes providing safe pedestrian gap
2-lane undivided	1,100 vehicles per hour
2-lane divided (with refuge)	2,800 vehicles per hour
4-lane undivided*	700 vehicles per hour
4-lane divided (with refuge)*	1,600 vehicles per hour

10 Bicycle access

Information from online mapping services, Department of Transport, Local Government, and/or site visits was collected to assess bicycle access for the proposed development.

10.1 Bicycle network

The Department of Transport Perth Bicycle Network Map (see Figure 22) shows the existing cyclist connectivity to the subject site. Shared paths are provided on Marsengo Road and Murdoch Drive which connect to the broader cycling network. Cycling lanes are also provided on Marsengo Road.

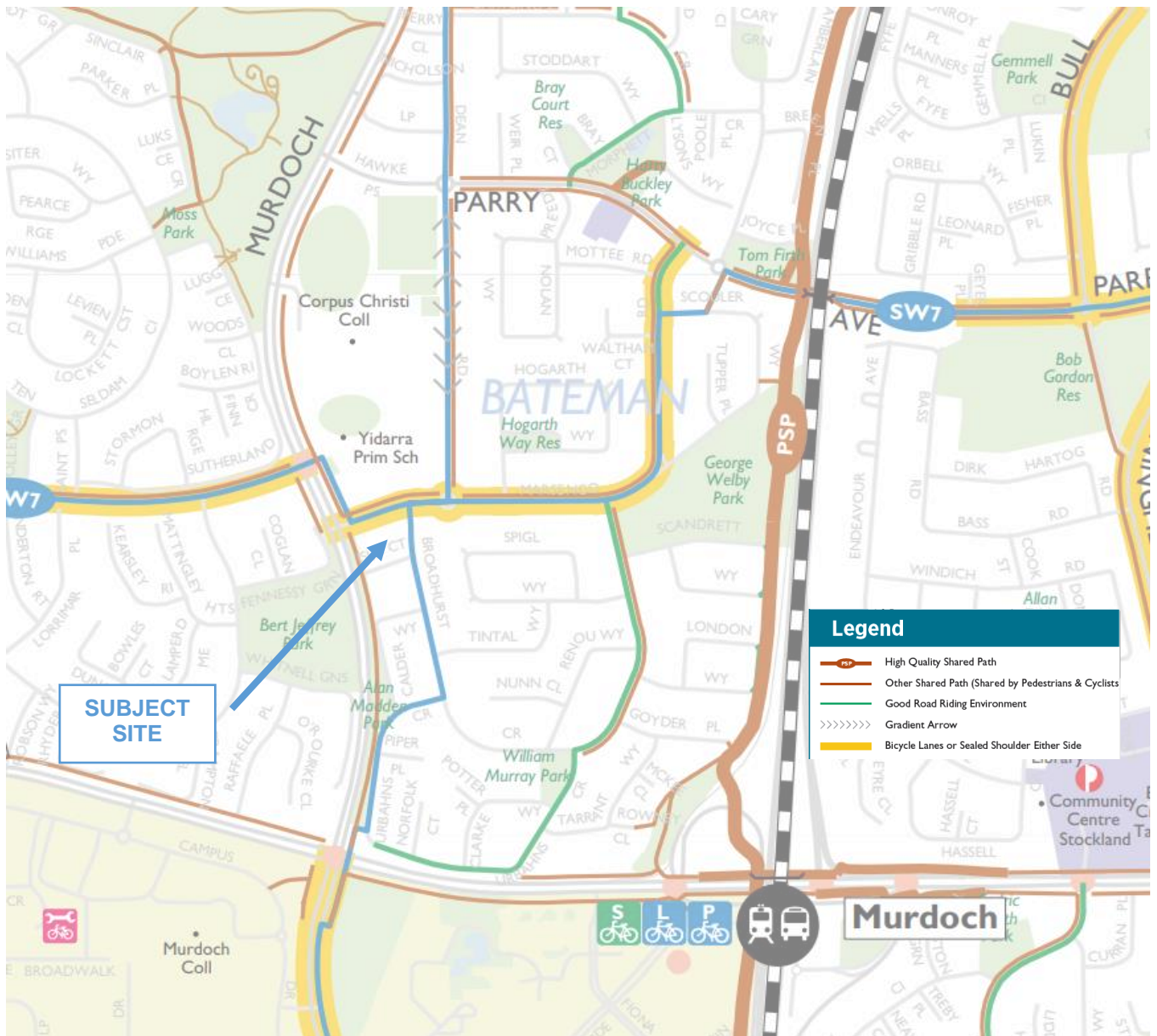


Figure 22: Perth bicycle network plan

10.2 Bicycle parking and end of trip facilities

Bicycle parking for 4 bicycles is provided as part of the proposed development and is conveniently located near the building entrance. End of trip facilities including a change room and lockers are provided to encourage active transport for staff.

10.3 Sustainable transport catchment

As detailed in Figure 23, the subject site is well placed for staff and visitors to travel by sustainable modes of transport. A comfortable 8km or 20-25min cycle provides a large catchment including a spread of suburbs south of the river.

This range can be further increased through a combination of micro-mobility and train travel with close access to train stations.

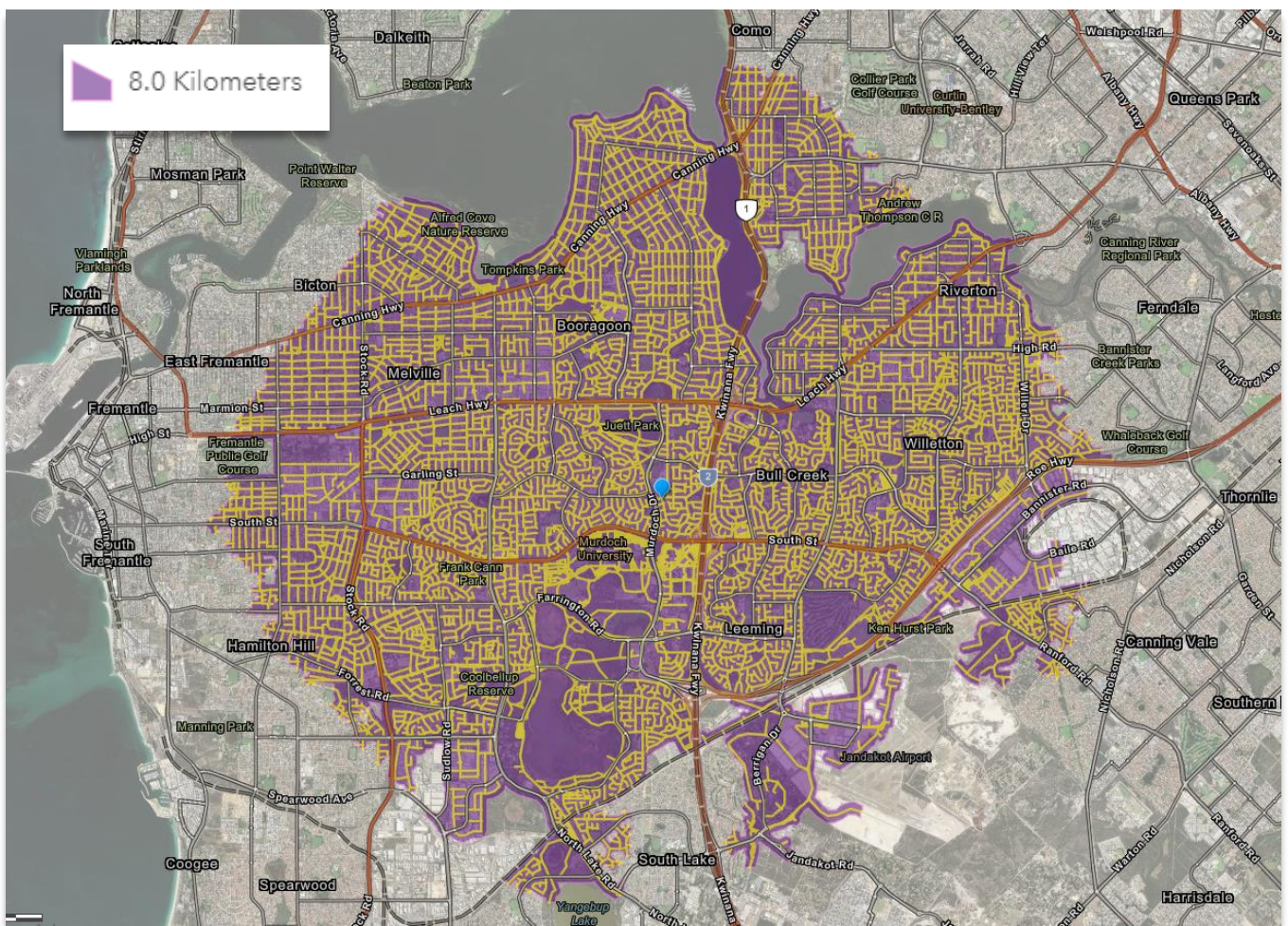
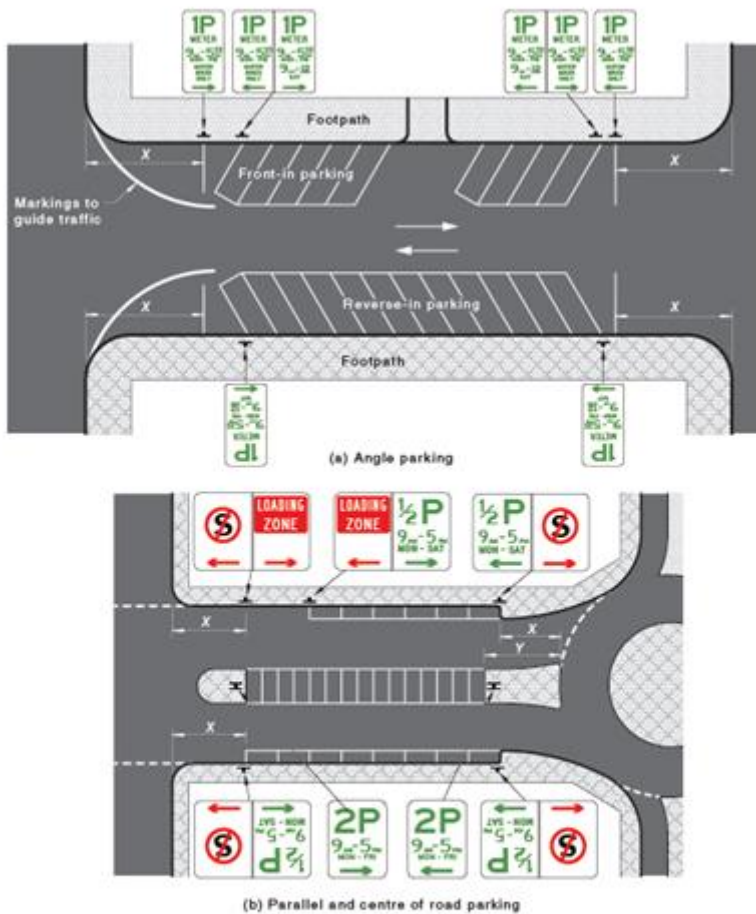


Figure 23: Cycling and micro-mobility catchment





Key
 X = the regulatory or approved no-stopping distance
 Y = the distance required to provide adequate sight distance for entering traffic [see Clause 2.3(b)]

NOTE If $Y < X$, then X is used.

Figure 2.1 — Typical end clearances

© Standards Australia Limited 2020

Figure 25: End clearance requirements for on-street parking (AS2890.5)

11.1.2 Parking on Islip Court

Comment

Remove single parallel bay on Islip Ct. (Amended Plans Required)

Response

This parking bay has been removed as requested.



11.1.3 Non-exclusive use of on-street parking bays

Comment

The on street parallel bays will be treated as public parking facility and will not gain status of exclusive use to the development.

Response

Agreed. This is typical practice and encourages more efficient use of car parking. If these bays are provided within the site, then they will be empty for most of the day. Providing the parking bays on the street will maximise the efficient use of the bays and provide a benefit to the community.

11.1.4 Location of the crossover relative to the intersection

Comment

The proposed crossover is too close to the intersection. AS 2890.1 Figure 3.1 indicates that driveways should not be installed within 6.0m from the tangent point on the kerb return at the intersection. This conflicts with the proposed crossover location. (Amended Plans Required)

Response

We note that the AS2890.1 requirement is quoted correctly. However, we are seeking a waiver of this requirement in this instance.

The radius of the kerb on the south-west corner of Marsengo/Broadhurst is quite large (estimated to be around 12.5m). This means that although the driveway is close to the tangent point, in practical function it is still located around 15m away from the intersection hold line. It is also proposed to make the crossover left-in/left-out by extending the existing traffic island.

A SIDRA analysis has been undertaken, which confirms that queuing on Broadhurst Crescent will not extend to or obstruct the proposed crossover.

12 Safety issues

The five-year crash history in the vicinity of the site was obtained from Main Roads WA. As detailed in Figure 26, one crash was recorded in the locality in the last five years. The detailed crash history is presented in Table 5.

The low traffic generation of the proposed development is unlikely to impact traffic safety in the area.



Figure 26: 5-year crash map in the locality (2017-2021)

Source: MRWA crash mapping tool



Table 5: 5-year crash history in the locality (2017-2021)

Severity	No.	%
Fatal	0	0
Hospital	0	0
Medical	0	0
PDO Major	0	0
PDO Minor	1	100.00

Year	No.	%
2020	1	100.00

Nature	No.	%
Head On	0	0
Hit Animal	0	0
Hit Object	1	100.00
Hit Pedestrian	0	0
Non Collision	0	0
Not Known	0	0
Rear End	0	0
Right Angle	0	0
Right Turn Thru	0	0
Sideswipe Opposite Dirn	0	0
Sideswipe Same Dirn	0	0

Light	No.	%
Dark - Street Lights Not Provided	0	0
Dark - Street Lights Off	0	0
Dark - Street Lights On	0	0
Dawn Or Dusk	1	100.00
Daylight	0	0
Not Known	0	0

Conditions	No.	%
Dry	1	100.00
Not Known	0	0
Wet	0	0

Alignment	No.	%
Curve	1	100.00
Not Known	0	0
Straight	0	0

Total	No.	%
Total	1	

13 Conclusion

This Transport Impact Statement has been prepared by Urbii on behalf of St Clarence Investments Pty Ltd with regards to the proposed child care centre, located at Lots 1 & 5 Broadhurst Crescent, Bateman.

The subject site is situated on the south-west corner of Marsengo Road and Broadhurst Crescent and currently accommodates two residential dwellings. It is proposed to develop the site into a child care centre catering for up to 82 children and 17 staff.

The site features good connectivity with the existing road network. There is good public transport coverage through nearby bus and connecting train services. Connectivity for walking and cycling is also good.

The traffic analysis undertaken in this report shows that the traffic generation of the proposed development is minimal (less than 100vph on any lane) and as such would have insignificant impact on the surrounding road network.

The proposed car parking provision can accommodate the needs of the child care centre. Liaison will be undertaken with the PTA to close the existing bus stop on Broadhurst Crescent, to make space for proposed on-street car parking.

This TIS has been updated to reflect changes in the proposed development plans after submission of the Development Application. The City of Melville provided preliminary feedback in late December 2022 regarding the proposed development and the plans have been revised to address the feedback.

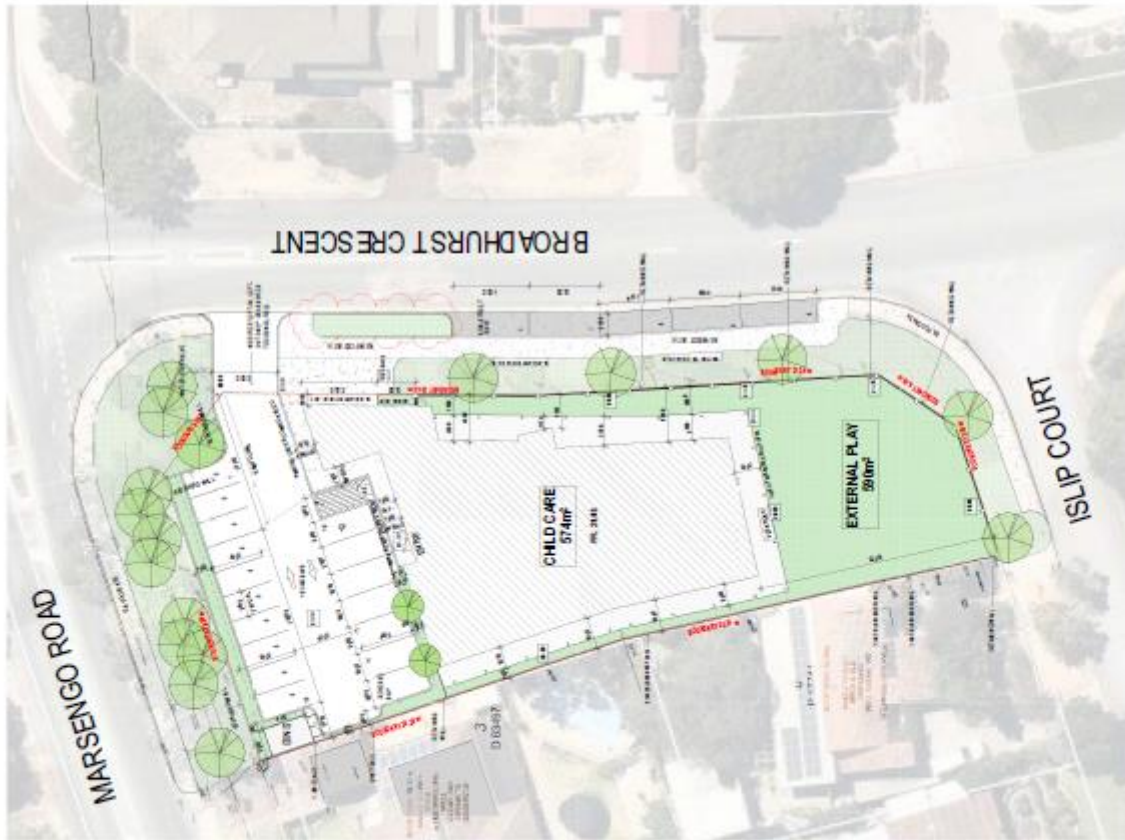
The City provided further feedback via email in early February 2023. There are three key issues raised in February which have been addressed in this revised TIS:

- A sightline assessment has been undertaken for the on-street parking and the on-street parking has been reduced from 7 bays to 5 bays as a result. The proposed on-street embayed parking will improve safety. At present, cars park kerbside on Broadhurst Crescent, which has a bigger impact on sightlines than embayed parking. Additionally, embayed parking creates more road space for two-way traffic to pass parked cars.
- The impact of the proposed development crossover on existing drainage and kerb ramps has been assessed. There is a minor impact on the side entry pit, which can be amended as part of the detailed design. There is no impact on the existing kerb ramp.
- The proximity of the crossover and the performance of the intersection of Marsengo Road / Broadhurst Crescent have been assessed through a video traffic survey and SIDRA intersection analysis. The SIDRA analysis confirms that queuing on Broadhurst Crescent does not obstruct the crossover and it is functional.



Appendices

Appendix A: Proposed development plans



CHILDCARE AT DEVELOPMENT

REQUIREMENT	1: 50 m²	10: 50 m²
MINIMUM CAR PARKING SPACES	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (RESIDENTIAL DEVELOPMENTS)	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (COMMERCIAL DEVELOPMENTS)	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (INDUSTRIAL DEVELOPMENTS)	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (PUBLIC BUILDINGS)	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (SPECIAL PURPOSE DEVELOPMENTS)	10	10
MINIMUM CAR PARKING SPACES PER 100 M² OF GROSS FLOOR AREA (TOTAL)	10	10

PROPOSED CHILDCARE DEVELOPMENT

NO. OF CHILDREN	NO. OF CHILDCARE SPACES	NO. OF CHILDCARE SPACES
0-2	10	10
3-4	10	10
5-6	10	10
7-8	10	10
9-10	10	10
11-12	10	10
13-14	10	10
15-16	10	10
17-18	10	10
19-20	10	10
TOTAL	100	100



PROPOSED CHILDCARE DEVELOPMENT
 11 SLIP CRT 20A/2B BROADHURST CRT, BA TE MAN

Hodge Collard Preston
 ARCHITECTS

DATE: 20.22

PROJECT: 11 SLIP CRT 20A/2B BROADHURST CRT, BA TE MAN

SCALE: 1:100

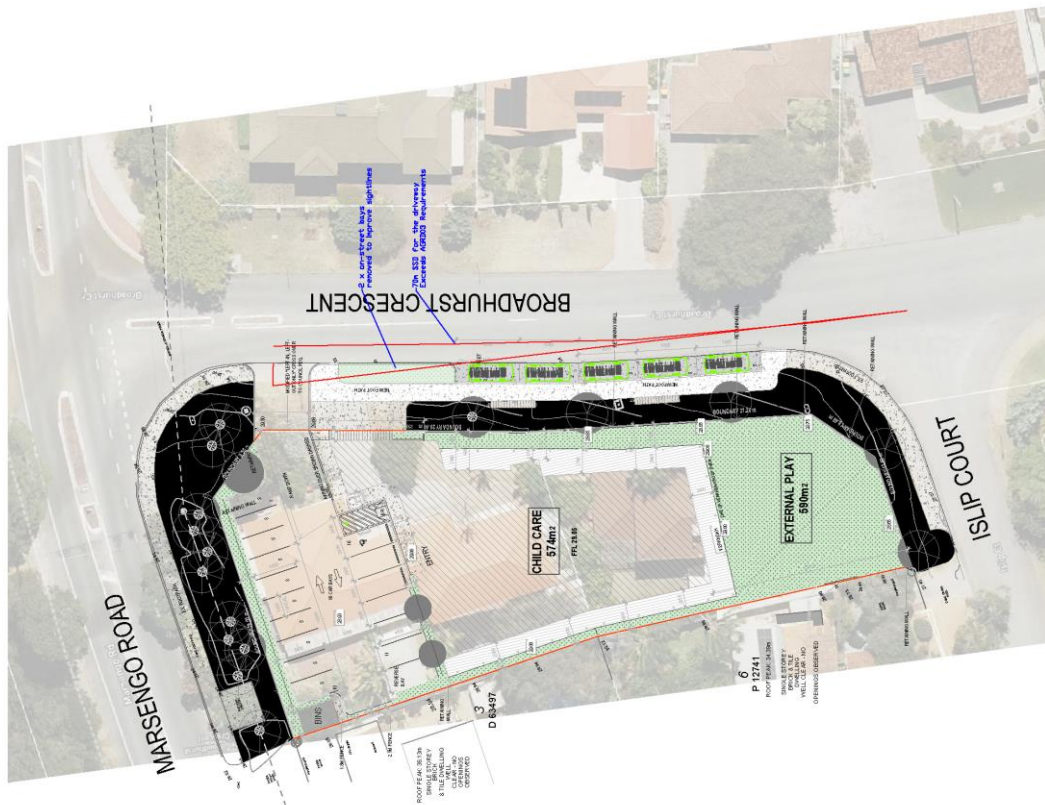
DATE: 20.22

PROJECT: 11 SLIP CRT 20A/2B BROADHURST CRT, BA TE MAN



Appendix B: Sightline assessment sketches





Guide to Road Design Part 3: Geometric Design

Table 6.5: Stopping sight distances for cars on sealed roads

Design speed (km/h)	Absolute minimum values Only for specific road types and situations ⁽¹⁾ based on $d = 0.46(2)(3)$			Desirable minimum values for all road types based on $d = 0.36$			Values for major highways and freeways in flat terrain ⁽⁴⁾ based on $d = 0.26$		
	$R = 1.5 s^4$	$R = 2.0 s^4$	$R = 2.5 s^4$	$R = 1.5 s^4$	$R = 2.0 s^4$	$R = 2.5 s^4$	$R = 2.0 s$	$R = 2.5 s$	$R = 2.5 s$
40	30	36	40	34	40	45	—	—	—
50	42	49	55	48	55	62	—	—	—
60	56	64	73	64	73	81	—	—	—
70	71	81	92	83	92	102	113	123	—
80	86	99	114	103	114	126	141	152	—
90	107	119	132	126	139	151	173	185	—
100	—	141	155	—	165	179	207	221	—
110	—	165	180	—	193	209	244	260	—
120	—	190	207	—	224	241	285	301	—
130	—	217	235	—	257	275	328	346	—

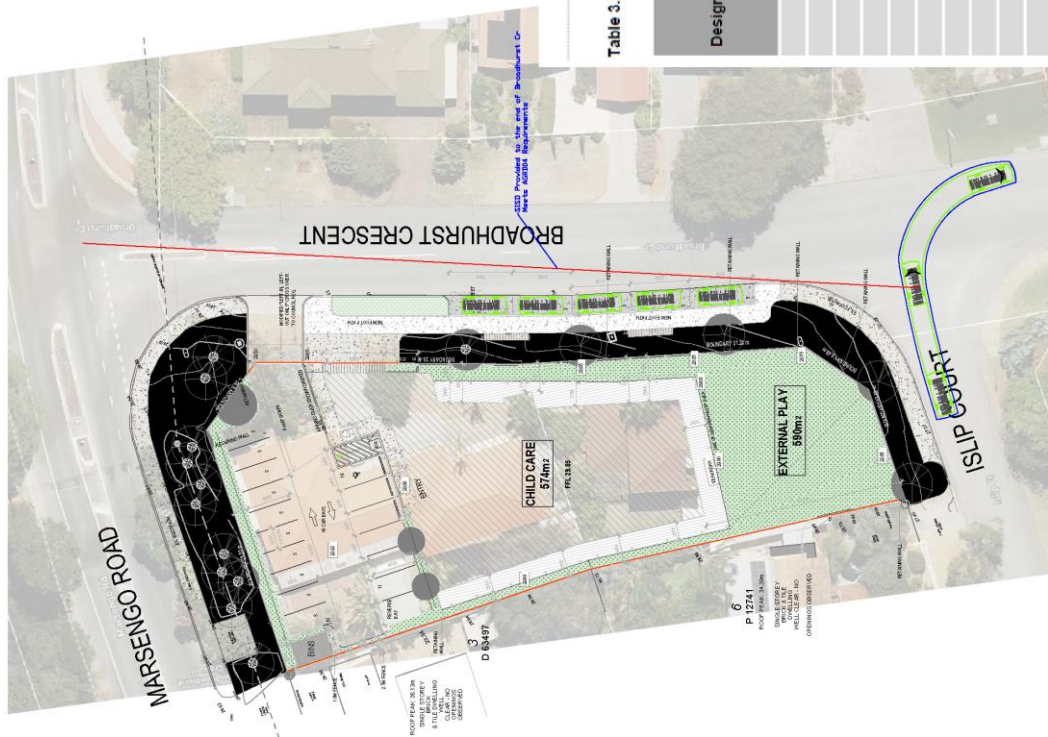
Revision notes:
 Rev: 1 Date: 25/02/2023
 Note: Reaction time = 2.5sec Vehicle speed = 50km/h Stopping Sight Distance (SSD) = 62m
 Assumed design speed of 50km/h is conservative. Northbound traffic terminates at a T-intersection and therefore vehicles will be decelerating on approach to the crossover location.

Drawn by: Paul Ghentous
 Client: St Clarence Investments Pty Ltd

Project: U21.064 - Lots 1&5 Broadhurst Crescent, Bateman
 Proposed Child Care Centre
 Drawing Title: Stopping Sight Distance Assessment
 AGRID Part 3 - Geometric Design

Date: 25/02/2023
 Scale: A3:
 1:500
 Revision: 1 of 2





Guide to Road Design Part 4A: Unsignalised and Signalised Intersections

Table 3.2: Safe intersection sight distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S < L)

Design speed (km/h)	Based on safe intersection sight distance for cars ⁽¹⁾ $h_1 = 1.1; h_2 = 1.25; d = 0.36d^2; \text{Observation time} = 3 \text{ sec}$								
	$R_v = 1.5 \text{ sec}^{(3)}$			$R_v = 2.0 \text{ sec}$			$R_v = 2.5 \text{ sec}$		
	SISD (m)	K	SISD (m)	K	SISD (m)	K	SISD (m)	K	
40	67	4.9	73	6	—	—	—	—	
50	90	8.6	97	10	—	—	—	—	
60	114	14	123	16	—	—	—	—	
70	141	22	151	25	—	—	—	—	
80	170	31	181	35	—	—	—	—	
90	201	43	214	49	226	55	—	—	
100	234	59	248	66	262	74	—	—	
110	—	—	285	87	300	97	—	—	
120	—	—	324	112	341	124	—	—	
130	—	—	365	143	383	157	—	—	

Revision notes:

Rev.	Date
1	25/02/2023

Note:
60km/h design speed assumed for southbound traffic. This is conservative as the Broadhurst Crescent is 8km in length between Marsengo Rd and Islip Court. Southbound traffic will need time to accelerate and may not achieve this speed. For 60km/h design speed, an SISD of 123m is required. The SISD assessment indicates that a driver on Islip Court can see all the way to the termination of Broadhurst Crescent to the north.

Drawn by:
Paul Ghentous

Client:
St Clarence Investments Pty Ltd

Project:
U21.064 - Lots 1&2 Broadhurst Crescent, Baraman
Proposed Child Care Centre

Drawing Title:
Safe Intersection Sight Distance Assessment
AGRD Part 4A - Unsignalised and Signalised Intersect.

Date:
25/02/2023

Scale @ A3:
1:500

Revision on:
SISD



Appendix C: SIDRA analysis outputs

SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- **Degree of Saturation (DoS):** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- **Level of Service (LoS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- **Average Delay:** is the average of all travel time delays for vehicles through the intersection.
- **95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

MOVEMENT SUMMARY

▼ Site: 101 [Marsengo Rd / Broadhurst Cr - AM Existing (Site Folder: General)]

U21.064 - Lots 1&5 Broadhurst Crescent, Bateman
 Intersection Marsengo Rd / Broadhurst Cr
 Existing AM peak hour
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV] %	[Total veh/h]	[HV] %				[Veh. veh]	[Dist] m				
South: Broadhurst Cr														
1	L2	61	3.0	76	3.0	0.060	5.5	LOS A	0.2	1.7	0.34	0.56	0.34	45.8
3	R2	12	0.0	20	0.0	0.094	12.8	LOS B	0.2	1.2	0.74	0.88	0.74	36.5
Approach		73	2.5	96	2.4	0.094	7.0	LOS A	0.2	1.7	0.42	0.62	0.42	44.4
East: Marsengo Rd														
4	L2	9	0.0	20	0.0	0.146	2.5	LOS A	0.0	0.0	0.00	0.04	0.00	48.8
5	T1	230	0.0	264	0.0	0.146	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		239	0.0	284	0.0	0.146	0.2	NA	0.0	0.0	0.00	0.04	0.00	49.7
West: Marsengo Rd														
11	T1	435	1.0	750	1.0	0.712	0.6	LOS A	1.3	9.1	0.08	0.04	0.14	48.8
12	R2	42	12.0	48	12.0	0.712	6.9	LOS A	1.3	9.1	0.08	0.04	0.14	48.7
Approach		477	2.0	798	1.7	0.712	0.9	NA	1.3	9.1	0.08	0.04	0.14	48.8
All Vehicles		789	1.4	1178	1.3	0.712	1.3	NA	1.3	9.1	0.09	0.08	0.13	48.4

MOVEMENT SUMMARY

▼ Site: 101 [Marsengo Rd / Broadhurst Cr - AM Post Development (Site Folder: General)]

U21.064 - Lots 1&5 Broadhurst Crescent, Bateman
 Post Development AM peak hour
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV] %	[Total veh/h]	[HV] %				[Veh. veh]	[Dist] m				
South: Broadhurst Cr														
1	L2	89	3.0	111	3.0	0.088	5.5	LOS A	0.4	2.5	0.35	0.56	0.35	45.8
3	R2	17	0.0	28	0.0	0.144	13.7	LOS B	0.3	1.8	0.76	0.89	0.76	35.8
Approach		106	2.5	140	2.4	0.144	7.2	LOS A	0.4	2.5	0.43	0.63	0.43	44.3
East: Marsengo Rd														
4	L2	15	0.0	33	0.0	0.154	2.5	LOS A	0.0	0.0	0.00	0.06	0.00	48.7
5	T1	230	0.0	264	0.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	49.6
Approach		245	0.0	298	0.0	0.154	0.3	NA	0.0	0.0	0.00	0.06	0.00	49.5
West: Marsengo Rd														
11	T1	435	1.0	750	1.0	0.757	1.1	LOS A	2.4	17.1	0.14	0.06	0.26	47.9
12	R2	69	12.0	78	12.0	0.757	7.5	LOS A	2.4	17.1	0.14	0.06	0.26	48.2
Approach		504	2.5	828	2.0	0.757	1.7	NA	2.4	17.1	0.14	0.06	0.26	48.0
All Vehicles		855	1.8	1266	1.6	0.757	2.0	NA	2.4	17.1	0.14	0.12	0.22	47.6



MOVEMENT SUMMARY

▽ Site: 101 [Marsengo Rd / Broadhurst Cr - PM Existing (Site Folder: General)]

U21.064 - Lots 1&5 Broadhurst Crescent, Bateman
 Intersection Marsengo Rd / Broadhurst Cr
 Existing PM peak hour
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Broadhurst Cr														
1	L2	86	2.0	141	2.0	0.127	6.2	LOS A	0.5	3.6	0.44	0.64	0.44	45.6
3	R2	6	0.0	8	0.0	0.042	9.9	LOS A	0.1	0.4	0.63	0.83	0.63	38.6
Approach		92	1.9	149	1.9	0.127	6.4	LOS A	0.5	3.6	0.45	0.65	0.45	45.3
East: Marsengo Rd														
4	L2	29	0.0	73	0.0	0.244	2.5	LOS A	0.0	0.0	0.00	0.08	0.00	48.5
5	T1	218	1.0	396	1.0	0.244	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	49.4
Approach		247	0.9	469	0.8	0.244	0.4	NA	0.0	0.0	0.00	0.08	0.00	49.3
West: Marsengo Rd														
11	T1	264	2.0	383	2.0	0.752	3.4	LOS A	2.7	19.1	0.32	0.18	0.68	44.5
12	R2	67	4.0	108	4.0	0.752	9.6	LOS A	2.7	19.1	0.32	0.18	0.68	46.4
Approach		331	2.4	491	2.4	0.752	4.8	NA	2.7	19.1	0.32	0.18	0.68	45.1
All Vehicles		670	1.8	1109	1.7	0.752	3.1	NA	2.7	19.1	0.20	0.20	0.36	46.5

MOVEMENT SUMMARY

▽ Site: 101 [Marsengo Rd / Broadhurst Cr - PM Post Development (Site Folder: General)]

U21.064 - Lots 1&5 Broadhurst Crescent, Bateman
 Post Development PM peak hour
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Broadhurst Cr														
1	L2	117	2.0	192	2.0	0.173	6.2	LOS A	0.7	5.1	0.46	0.65	0.46	45.5
3	R2	8	0.0	11	0.0	0.060	10.5	LOS B	0.1	0.5	0.66	0.85	0.66	38.1
Approach		125	1.9	202	1.9	0.173	6.4	LOS A	0.7	5.1	0.47	0.66	0.47	45.3
East: Marsengo Rd														
4	L2	39	0.0	98	0.0	0.257	2.5	LOS A	0.0	0.0	0.00	0.10	0.00	48.4
5	T1	218	1.0	396	1.0	0.257	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	49.3
Approach		257	0.8	494	0.8	0.257	0.5	NA	0.0	0.0	0.00	0.10	0.00	49.1
West: Marsengo Rd														
11	T1	264	2.0	383	2.0	0.850	6.8	LOS A	4.8	34.3	0.40	0.29	1.18	41.0
12	R2	90	4.0	145	4.0	0.850	12.9	LOS B	4.8	34.3	0.40	0.29	1.18	44.4
Approach		354	2.5	528	2.6	0.850	8.5	NA	4.8	34.3	0.40	0.29	1.18	42.3
All Vehicles		736	1.8	1224	1.7	0.850	4.9	NA	4.8	34.3	0.25	0.28	0.59	45.1