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Austin Lakes Structure Plan, South Yunderup

Transport Impact Assessment

PREPARED FOR:
Wolfdene

August 2025

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1 Introduction

This Transport Impact Assessment has been prepared by Transcore on behalf of Wolfdene with regard to the proposed structure plan for Austin Lakes at South Yunderup in the Shire of Murray.

The subject site is located on the western side of Forrest Highway, south of South Yunderup Road, as shown in **Figure 1**. That figure shows the site location in relation to the zones and reservations of the Peel Region Scheme.

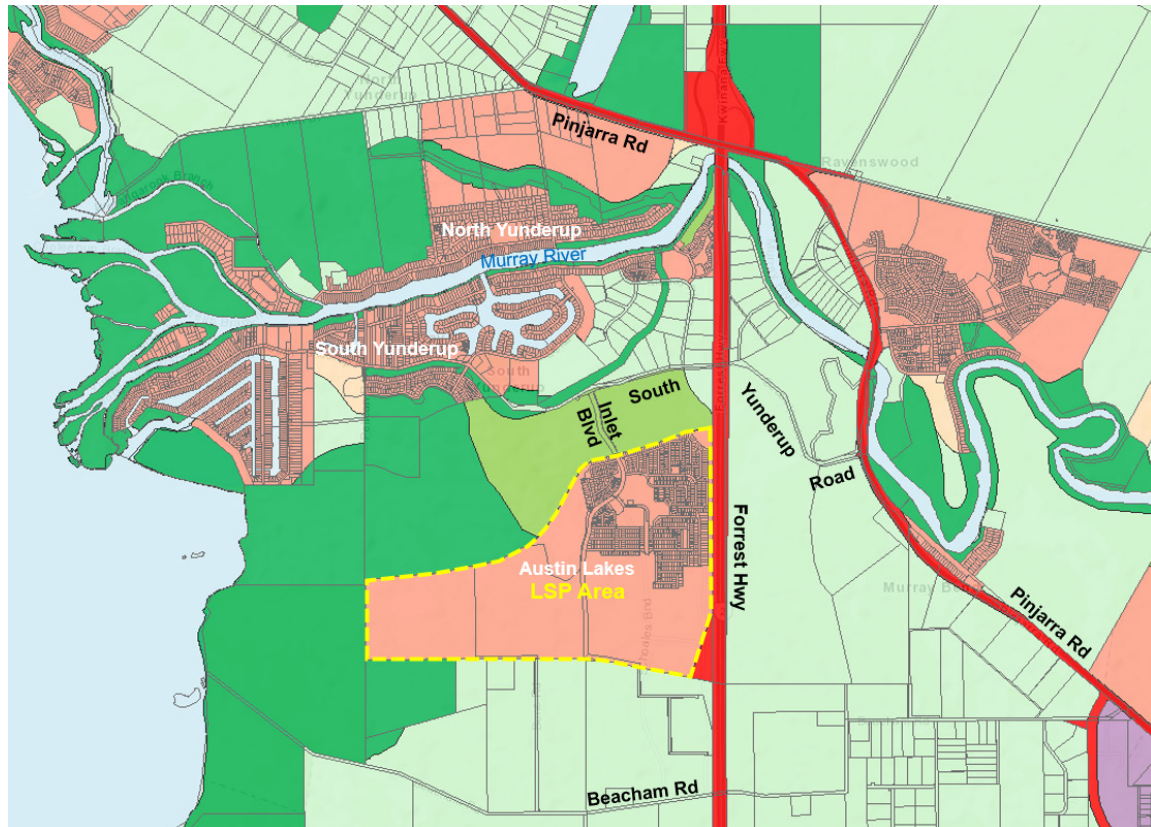


Figure 1: Site location



The Structure Plan also identifies a primary school site in the middle of the structure plan area. For this transport assessment it is assumed this would be a standard pattern primary school to accommodate approximately 540 students.

The Structure Plan will utilise the existing road network connections for Austin Lakes, which consists of:

- Inlet Boulevard – South Yunderup Road to Pinjarra Road in the northeast; and
- Temporary Access Road – Beacham Road to Forrest Highway in the southeast.

Long-term planning for Austin Lakes, as set out in the Austin Lakes Masterplan, indicates a proposed future Forrest Highway interchange adjacent to the southeast corner of the proposed subdivision area. This is also consistent with future access arrangements envisaged in the WAPC's *South Metropolitan Peel Sub-regional Planning Framework*. However, this is anticipated to be a longer term proposition and this transport impact assessment will also consider an interim scenario prior to that future Forrest Highway interchange being constructed.

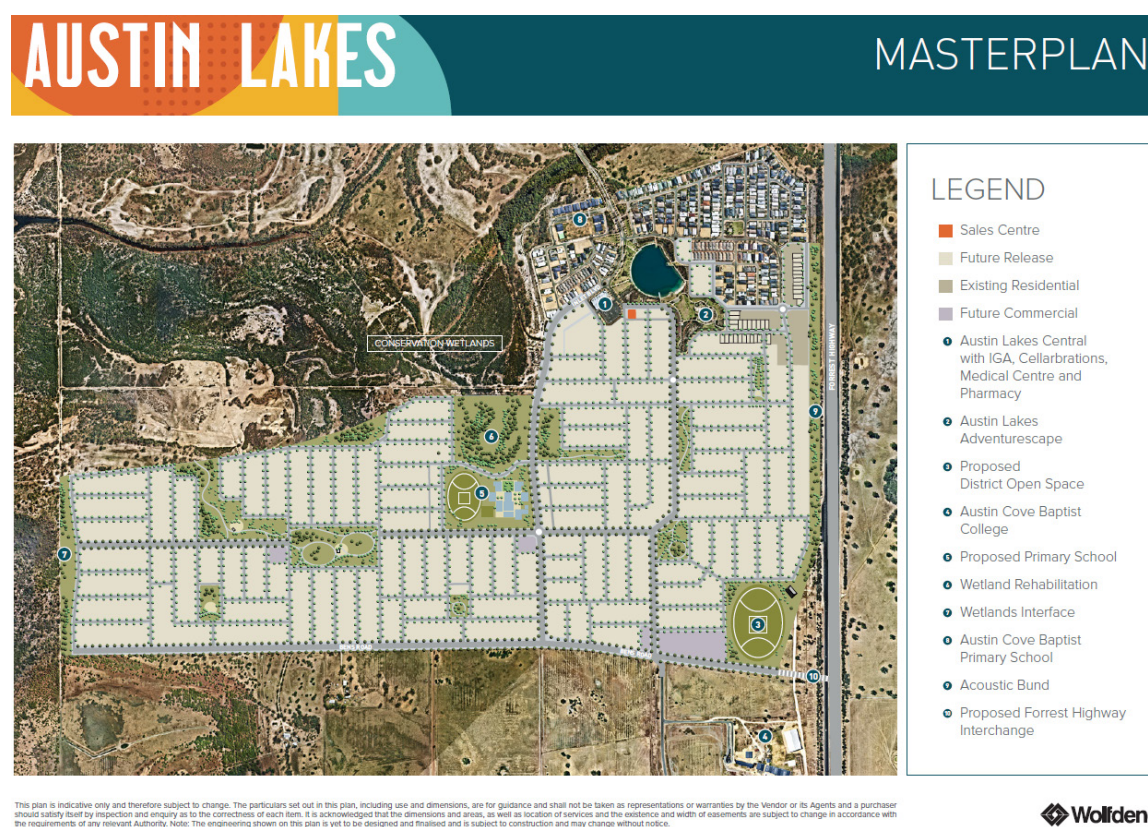


Figure 3: Austin Lakes Masterplan

3 Existing Situation

3.1 Existing Land Use

Subdivision development started in the northeast section of the LSP area around 2009 and has been progressing southward, as seen in **Figure 4**. Existing development includes approximately 600 dwellings and the Austin Lakes Central shopping centre (approximately 1500m² floor area). The southern and western sections of the LSP area are currently still rural.



Figure 4: Existing Land Use

Land to the south and west of the LSP area is also rural land and Forrest Highway separates the LSP area from other rural land to the east.

Austin Cove Baptist College (ACBC) is located approximately 200m south of the LSP area, with access off the Temporary Access Road, as seen in **Figure 4**. Information on the MySchool website indicates ACBC had 705 students in 2024.

Further to the northwest, along South Yunderup Road and along the Murray River, is the existing residential development of South Yunderup, which features a number of canal developments, as shown in **Figure 1**. South Yunderup is estimated to contain approximately 1500 dwellings at present. Two caravan parks also accommodate around 120 caravans and park homes. South Yunderup also has a local activity centre featuring a tavern, restaurants and sporting facilities on the northern side of South Yunderup Road about one kilometre west of Inlet Boulevard.



3.2 Existing Road Network

The existing road network and its classification in the Main Roads WA functional road hierarchy is illustrated in **Figure 5**.

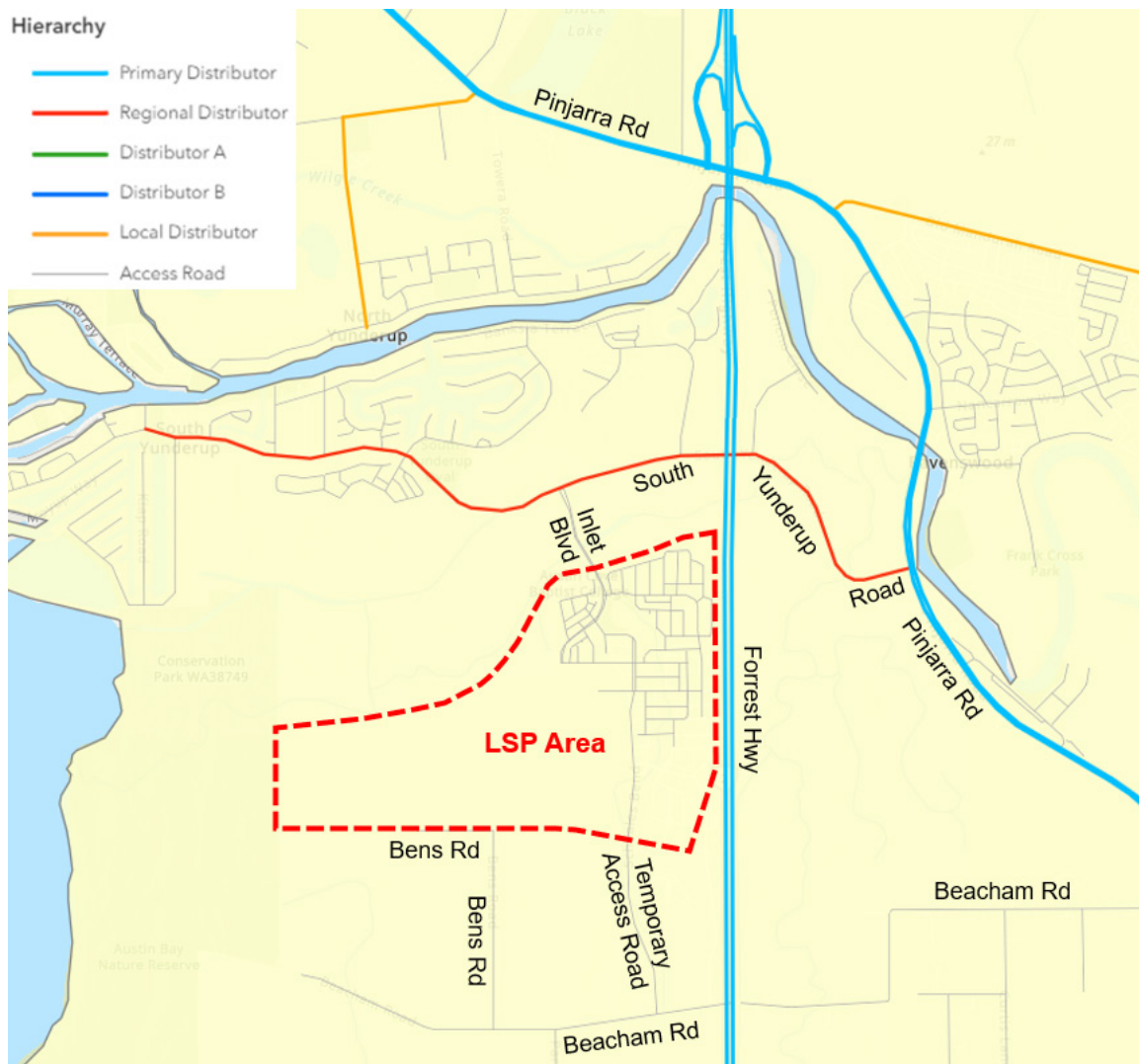


Figure 5: Existing road hierarchy

Forrest Highway is constructed as a dual carriageway rural highway with two lanes in each direction adjacent to the LSP area. It has a wide central median and left and right turn deceleration lanes at existing at-grade intersections. The Pinjarra Rd intersection is constructed as a grade-separated interchange. The posted speed limit on Forrest Hwy is 110km/h.

Forrest Highway is classified as a Primary Distributor in the Main Roads WA functional road hierarchy and is covered by a Primary Regional Roads reservation (a red road) in the PRS, as shown in **Figure 1**. It is a State road under the care and control of Main Roads WA.

Pinjarra Road is constructed as a dual carriageway rural road with two lanes in each direction. It has a central median and left and right turn deceleration lanes at existing at-grade intersections. The Pinjarra Rd / South Yunderup Rd intersection is constructed as a signalised intersection. The posted speed limit on Pinjarra Road is generally 80km/h but drops to 70km/h through this signalised intersection.

Pinjarra Road is classified as a Primary Distributor in the Main Roads WA functional road hierarchy and is covered by a Primary Regional Roads reservation (a red road) in the PRS, as shown in **Figure 1**. It is a State road under the care and control of Main Roads WA.

South Yunderup Road is constructed as a two-lane rural road with two 3.5m traffic lanes. It has a posted speed limit of 80km/h from Pinjarra Rd to the South Yunderup built up area, then drops to 60km/h. South Yunderup Road is classified as a Regional Distributor in the Main Roads WA functional road hierarchy. It is a local authority road under the care and control of the Shire of Murray.

Forrest Highway passes over South Yunderup Road on a bridge with no connection between these two roads. The South Yunderup Rd / Inlet Blvd intersection is constructed as a single-lane roundabout.

Inlet Boulevard is constructed to Integrator B standard with one lane each way, on-road cycle lanes and a 6m wide median. The default speed limit of 50km/h in a built up area applies on Inlet Boulevard.

The Temporary Access Road is a temporary road alignment through the southern part of the existing subdivision and through the proposed subdivision area, providing a connection to Forrest Highway via Beacham Road approximately one kilometre south of the proposed subdivision area. It also provides access to the Austin Cove Baptist College south of the subject site.

The Temporary Access Road is constructed as a two-lane rural road with 3.7m traffic lanes.

It should be noted that this temporary access route will need to remain available as an emergency access route until a second access route into Austin Lakes has been provided.

Beacham Road is constructed as a two-lane rural road with 7m sealed width. It is classified as an access road in the Main Roads WA functional road hierarchy. It connects to Forrest Highway as a full-movement T-intersection with Give Way sign control on the Beacham Road approach.

Bens Road is an unsealed rural road and is classified as an access road in the Main Roads WA functional road hierarchy.



3.3 Existing Traffic Volumes

Existing average weekday traffic (AWT) volumes on the study area road network have been obtained from the Main Roads WA website and are summarised in **Table 1**. A 7-day traffic count was also organised by Transcore on the temporary access road north of Beacham Road in September 2024 and the results are included in **Table 1**.

Table 1: Existing Traffic Volumes

Road Name	Location	AWT (HV)	AM Peak	PM Peak	Date
Forrest Hwy	South of Pinjarra Rd	17,702 (23.5%)	1,418vph 1130-1230	1,427vph 1215-1315	2021/22
Pinjarra Rd	East of Kwinana Fwy	20,197 (12.1%)	1,424vph 1130-1230	1,745vph 1515-1615	2024/25
Pinjarra Rd	North of South Yunderup Rd	19,622	1,545vph 0800-0900	1,724vph 1500-1600	9-15 Feb 2025 (SCATS)
Pinjarra Rd	South of South Yunderup Rd	16,173	1,317vph 0800-0900	1,460vph 1430-1530	9-15 Feb 2025 (SCATS)
South Yunderup Rd	West of Pinjarra Rd	8,950	793vph 0800-0900	817vph 1445-1545	9-15 Feb 2025 (SCATS)
Temporary access road	North of Beacham Rd	1,542	247vph 0800-0900	201vph 1500-1600	4-10 Sep 2024

Existing average weekday AM and PM peak hour traffic flows at the Pinjarra Rd / South Yunderup Rd signalised intersection have been obtained from MRWA SCATS data for 9-15 Feb 2025. The resultant peak hour traffic flows are shown in **Figure 6**.



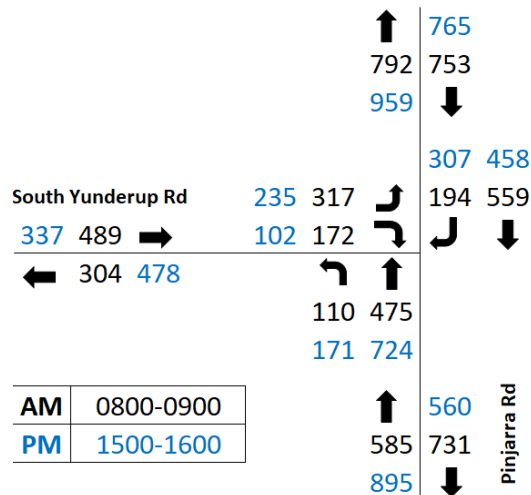


Figure 6: Existing traffic at Pinjarra Rd / South Yunderup Rd intersection

Manual turn traffic counts were undertaken by Transcore at the South Yunderup Rd / Inlet Blvd roundabout for AM and PM peak hour periods on Tuesday 5 December 2023, as shown in **Figure 7**.

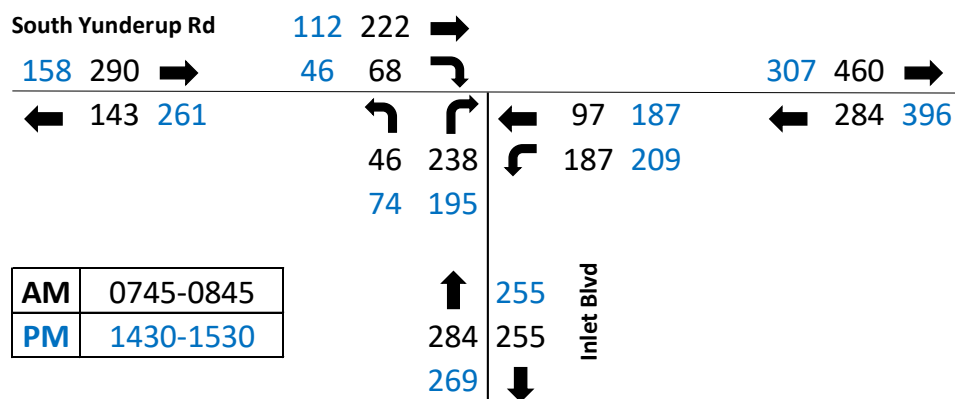


Figure 7: Existing traffic at South Yunderup Rd / Inlet Blvd intersection

Average weekday total daily traffic volume on Inlet Boulevard is estimated to be approximately 5,355vpd. (This has been estimated from those two peak hour traffic counts by assuming the combined AM + PM peak hour traffic on Inlet Blvd represents the same proportion of total daily traffic as on South Yunderup Rd west of Pinjarra Rd in the SCATS data shown in **Figure 6**.)

3.4 Public Transport

The closest existing bus routes to the subject site are as shown in **Figure 8**:

- Bus Route 600 (Mandurah Stn – Pinjarra via Pinjarra Rd & Ravenswood)
- Bus Route 604 (Mandurah Stn – South Yunderup via North Yunderup)
- Bus Route 605 (Mandurah Stn – Pinjarra via Pinjarra Rd, Ravenswood, Murray Bend & Murray River Country Estate)

Together these routes provide up to 18 services per day each way on Pinjarra Road on weekdays (16 on school holiday weekdays) and 7 per day on Saturdays. There is no service on Sundays and public holidays.

Route 604 only provides one or two services per day (weekdays only) but several of the route 600 services (4 per day on school days and 2 per day on Saturdays and school holidays) deviate via Inlet Boulevard to Austin Cove Baptist College.

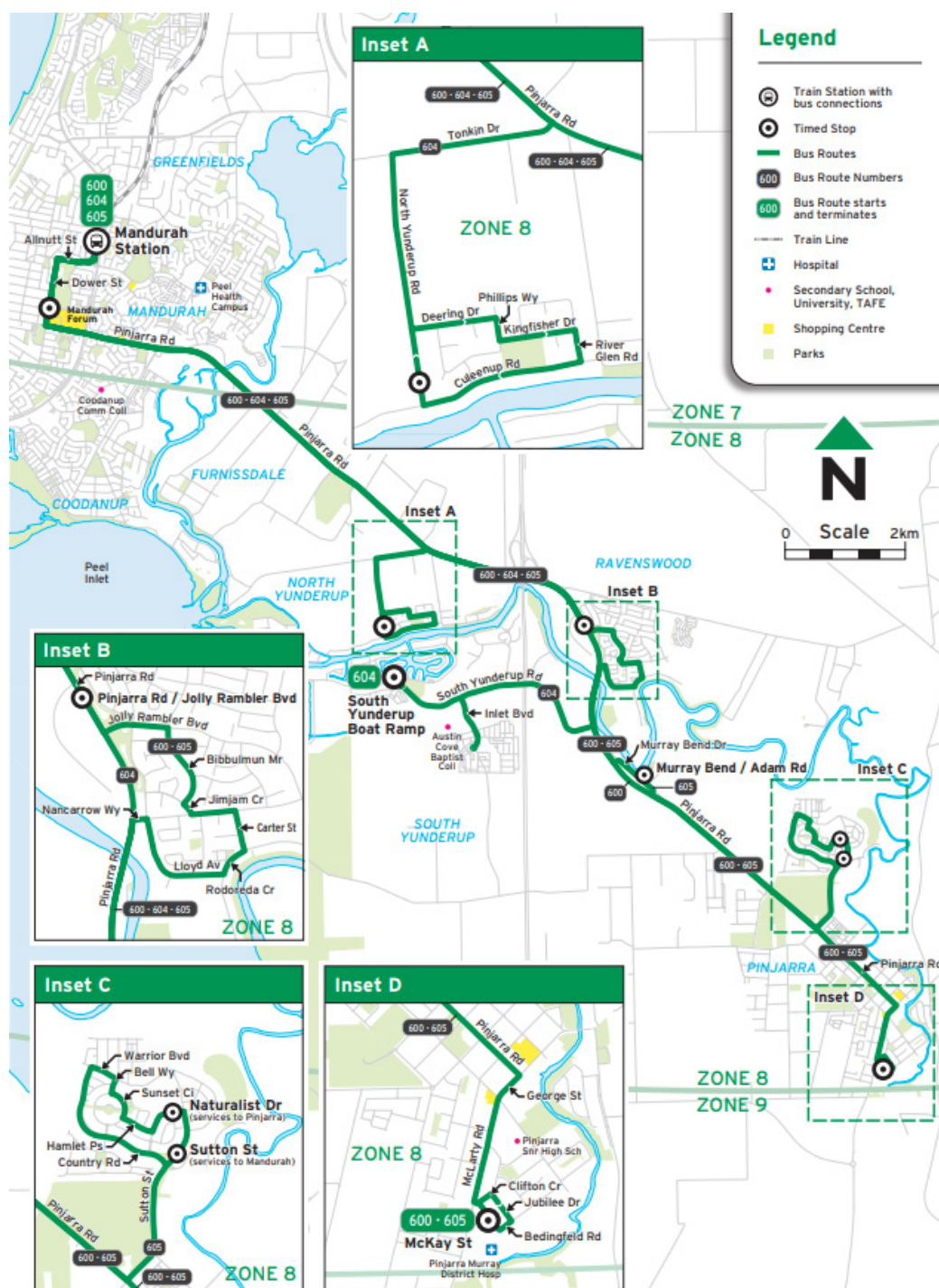


Figure 8: Existing bus routes

3.5 Pedestrian and Cyclist Facilities

There is a 2.5m shared path along the southern side of South Yunderup Road west of Forrest Highway, which connects to the Principal Shared Path on the western side of Forrest Highway north of South Yunderup Road, and on-road cycle lanes on Forrest Highway south of South Yunderup Road.

Inlet Boulevard has 2.5m shared paths on both sides south of South Yunderup Road and 1.5m on-road cycle lanes in both directions.

No pedestrian or cyclist facilities have been provided on the Temporary Access Road but there is a 2m shared path from Austin Lakes to ACBC parallel to Forrest Highway.

Other streets within the existing Austin Lakes subdivision have been provided with a footpath on at least one side in accordance with the requirements of the WAPC *Liveable Neighbourhoods* policy.

3.6 Changes to Surrounding Road Network

As noted in Section 3.2, the Temporary Access Road is a temporary road alignment through the southern part of the existing subdivision and through the proposed subdivision area, providing a connection to Forrest Highway via Beacham Road. It currently provides the secondary emergency access required for the South Yunderup area including Austin Lakes, as well as providing access to the Austin Cove Baptist College south of the subject site.

This emergency access route would need to remain until a second access route into Austin Lakes and South Yunderup has been provided.

In February 2025 (prior to State elections) the State Government announced that a re-elected Labor government will commit funding for upgrades to the Beacham Rd intersection on Forrest Highway. The upgrades will include a new acceleration lane along Forrest Highway and an upgrade to 'Schoales Bend' (i.e. the Temporary Access Road north of Beacham Road). "This will enable residents in Austin Lake to access Forrest Highway via Beacham Road." It is understood that promised funding has subsequently been allocated.

As noted in Section 2, the Austin Lakes Masterplan anticipates a future Forrest Highway interchange adjacent to the southeast corner of the proposed subdivision area. This is also consistent with future access arrangements envisaged in the WAPC's *South Metropolitan Peel Sub-regional Planning Framework*. Future planning for an interchange on Forrest Highway at this location or further south rests with Main Roads WA to determine. From recent discussions with Main Roads WA it is understood this future interchange may consist of a bridge over Forrest Highway with north-facing ramps only (i.e. connections to/from Forrest Highway north, not Forrest Highway south).

4 Proposed Transport Network

4.1 Road Hierarchy

The proposed hierarchy of roads in and around the subject site is illustrated in **Figure 9** using the road hierarchy defined in the Western Australian Planning Commission *Liveable Neighbourhoods* (LN) policy.

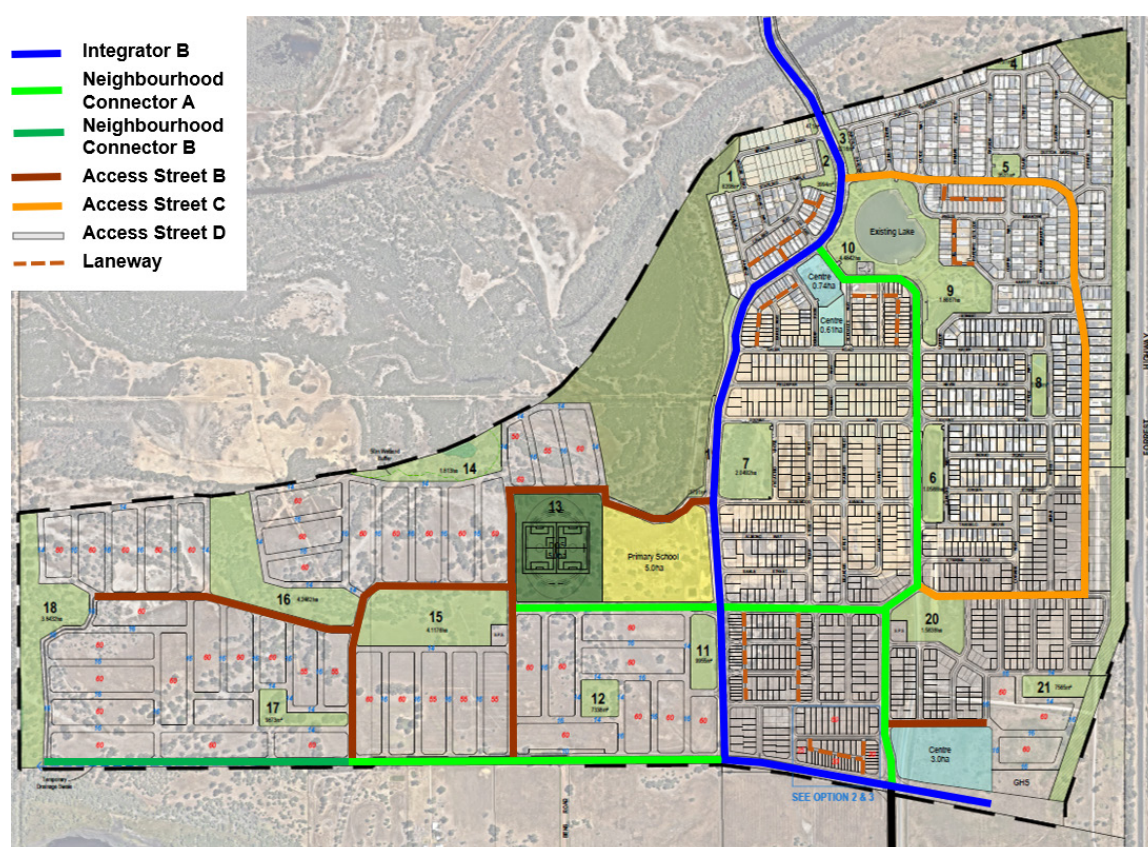


Figure 9: Proposed road hierarchy

The classification of roads in **Figure 9** is based on preliminary analysis of future traffic flows at Section 6.3 of this report and also takes into consideration long term road network changes such as future connection to Forrest Highway.

Integrator B roads are suitable for traffic flows up to 15,000vpd and can accommodate traffic flows up to 20,000vpd with suitable intersection treatments. The Integrator B cross-section in *Liveable Neighbourhoods* includes two 3.5m traffic lanes separated by a 6m median, 1.5m on-road cycle lanes in both directions and may include parking bays indented in the verge where required for adjacent development.

The two roads identified as Integrator B (Inlet Boulevard and Brookton Promenade) are planned with 30m road reserve width in the LSP area.

Neighbourhood Connector A roads are suitable for up to 7000vpd. The Neighbourhood Connector A cross-section in Liveable Neighbourhoods includes two 3.5m traffic lanes separated by a 2m median, 1.5m on-road cycle lanes in both directions and may include parking bays indented in the verge where required for adjacent development.

The north south spine road through the LSP area east of Inlet Boulevard is planned with a 28m road reserve width on the proposed subdivision plan.

The existing Schoales Bend (northeast side of the shopping centre) and Keegan Corner provide the connection from Inlet Boulevard to this north south spine road. Therefore they will require upgrade to a suitable Neighbourhood Connector A standard to accommodate the modelled future traffic flows on this route. Several variations of Neighbourhood Connector A road cross-sections that are illustrated in the WAPC *Liveable Neighbourhoods* policy are recommended for further consideration for those existing road sections.

Neighbourhood Connector B roads are suitable for traffic flows up to 3000vpd. The Neighbourhood Connector B cross-section in Liveable Neighbourhoods includes two 3.5m traffic lanes, no median, no on-road cycle lanes, and parking bays indented in the verge where required for adjacent development.

The east west road south of the primary school site (Keegan Avenue) that is identified as a Neighbourhood Connector A on **Figure 9** is planned with a 28m road reserve width in the proposed LSP.

Older areas in the northeast portion of the LSP area had adopted a typical Access Street D road reserve width of 15m. More recent subdivision stages have adopted 16m road reserves as typical, or 14m road reserve where one verge would be reduced in width abutting POS (as permitted in Liveable Neighbourhoods). They are differentiated as Access Street C or Access Street D on **Figure 9** based on the appropriate road carriageway width. Those shown as Access Street C would have 7.2m sealed width between kerbs and those shown as Access Street D would have 6m sealed width between kerbs. This is compliant with Liveable Neighbourhoods policy.

Key access streets in the southwest portion of the LSP area, west of Inlet Boulevard, are planned as 18m road reserves (or reduced to 16m adjacent to POS). These have been indicatively labelled as Access Street B on **Figure 9**. This includes the street abutting the northern side of the primary school site. The actual cross-section of those roads will be determined at subdivision stage but the 18m road reserve allows extra verge space to accommodate parking indented in the verge where appropriate.

Rear laneways have a standard width of 6m in Liveable Neighbourhoods. Visitor parking is required on-street for lots provided with rear access by these rear laneways.



4.2 Public Transport

Inlet Boulevard and the central north south spine road (Keegan Avenue) east of Inlet Boulevard would be of suitable standard to accommodate bus services through this area in future. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

4.3 Pedestrian and Cyclist Facilities

All of the proposed neighbourhood connectors and integrator B roads shown on **Figure 9** would have paths on both sides in accordance with Liveable Neighbourhoods guidelines, including a shared path on one side. Brookton Promenade (along the southern boundary of the LSP area) may initially only have a path along the northern side until a path on the southern side is warranted by future development to the south or connection to Forrest Highway.

Paths would be required on at least one side of all roads in accordance with Liveable Neighbourhoods guidelines.

On-street cycle lanes are normally included only on Neighbourhood Connector A roads and above, due to traffic flows above 3000vpd on these categories of roads.

The resultant path network within the LSP area is indicated in **Figure 10**.

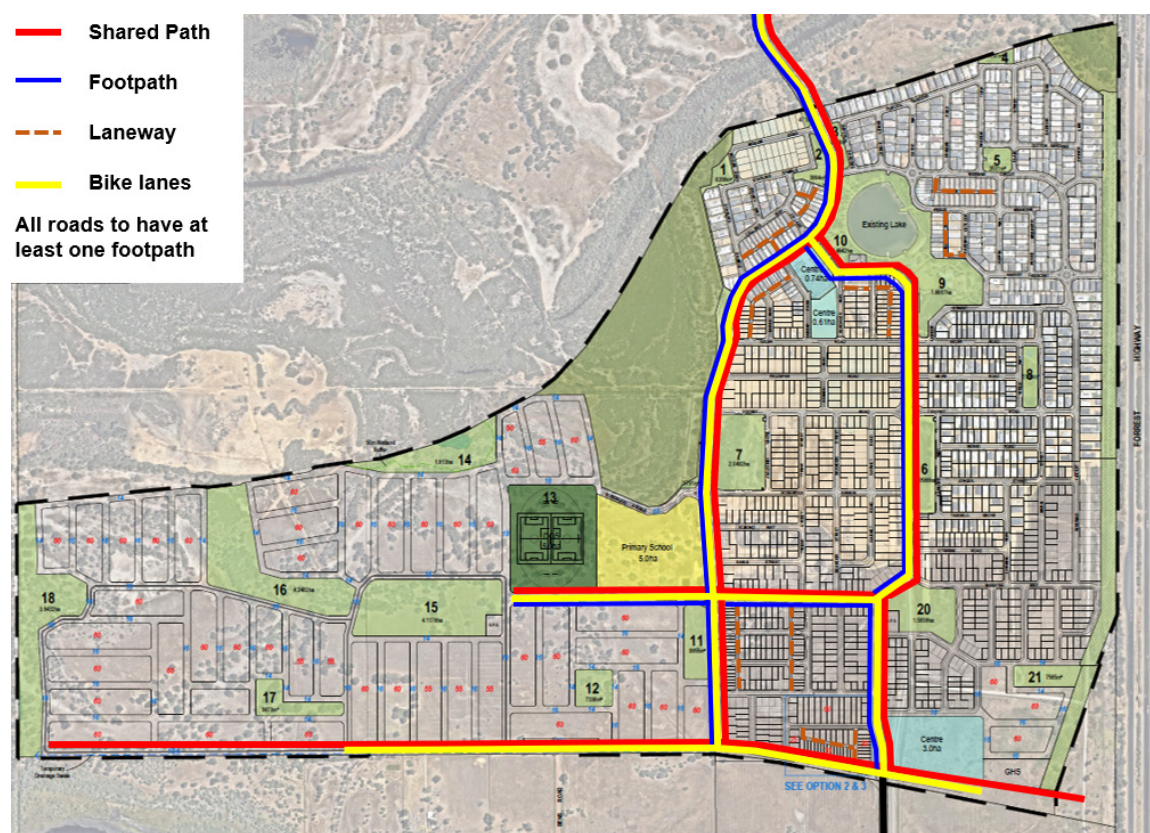


Figure 10: Pedestrian / Cycle Network

5 Integration with Surrounding Area

The proposed Austin Lakes LSP follows the principles set out in the previous Austin Lakes Masterplan (see **Figure 3**) to ensure coordination of future development of the subject site and the surrounding area. The principles and external connections of the Masterplan are maintained to ensure that good connectivity and integration with the surrounding area are achieved.

6 Analysis of the Transport Network

6.1 Assessment Period

The traffic assessment undertaken for the subject site is based on full development of the Austin Lakes LSP area. Assessment of the interface with the external road network is based on a planning horizon of 2041 for the purposes of this report.

6.2 Traffic Generation and Distribution

6.2.1 Existing Situation

Traffic modelling of the South Yunderup / Austin Lakes area has been undertaken for this report and has been calibrated to reflect 2024/25 average weekday traffic flows on South Yunderup Rd (west of Pinjarra Rd, from Feb 2025 SCATS data) and on the Temporary Access Road north of Beacham Road (Sept 2024 traffic count).

Shopping centre trip rates have been sourced from the NSW *Guide to Transport Impact Assessment* (2024) using the following weekday trip rates for small suburban shopping centres (where A is gross leasable floor area):

- 0-1000m² GLFA: 2.022A vpd
- 1000-6000m² GLFA: 0.695A + 1327 vpd
- 6000-10000m² GLFA: 1.684A – 4608 vpd

The existing Austin Lakes Central shopping centre (approximately 1500m² floor area) has been modelled as generating 2370vpd. The various components of the South Yunderup activity centre (approximately 1000m² of tavern, restaurants, etc.) have been assessed as generating approximately 2022vpd. Virtually all of the traffic to these land uses is assumed to come from the local catchment area (South Yunderup and Austin Lakes).

School traffic generation (daily) has been sourced from the NSW *Guide to Transport Impact Assessment* (2024) using regional primary school trip rate of 2.6vpd per student, and the peak hour trip rate of 1vph per student provided by the WAPC *Transport Impact Assessment Guidelines*, so Austin Cove Baptist College has been modelled as generating 1846vpd in 2024. For this report most of these students (72%) are modelled as coming from South Yunderup and Austin Lakes as there are currently no other primary or secondary schools in this area. The remaining 28% of car trips to and from the college are modelled as travelling via Forrest Hwy – Beacham Rd – Temporary Access Road.

Residential traffic generation is typically assessed at a trip rate of 8vpd per dwelling (based on WAPC TIA Guidelines) but applying that trip rate significantly overestimates the existing traffic flows on South Yunderup Rd (west of Pinjarra Rd) and on the Temporary Access Road north of Beacham Road. Analysis of road network traffic

volumes based on different residential trip rates indicates that a residential trip rate of approximately 6.763vpd per dwelling correctly models the existing traffic volumes on those roads.

This slightly lower traffic generation rate in the existing South Yunderup residential area is attributed to lower home occupancy and lifestyle choices (holiday homes, homes of fly in / fly out workers, etc.). The 2021 census recorded 21.6% of dwellings in South Yunderup as unoccupied on census night, compared to 10.9% on average throughout Western Australia.

Applying this residential trip rate of 6.763vpd/dwelling indicates the following existing residential traffic volumes:

- South Yunderup: 1635 dwellings @ 6.763vpd/dwelling = 11,060vpd
- Existing Austin Lakes 583 dwellings @ 6.763vpd/dwelling = 4,640vpd
- Total existing residential traffic generation = 15,700vpd

The existing 'South Yunderup' figure of 1635 dwellings includes approximately 120 caravans and park homes in two caravan parks and 11 properties east of Forest Hwy accessed via South Yunderup Rd.

It should be noted that some of these existing residential trips will be internal trips within this area (to the Austin Lakes Central shopping centre, South Yunderup activity centre and Austin Cove Baptist College, as discussed above).

The existing residential traffic distribution modelled for the South Yunderup / Austin Lakes area is shown in **Table 2**. Austin Cove Baptist College trips are modelled as 72% to/from the South Yunderup / Austin Lakes area and 28% to / from external areas. It should be noted that the existing temporary access road connection to Beacham Road (south of Austin Cove Baptist College) is assumed to be available for normal daily traffic use in this traffic analysis.

Table 2: Residential Traffic Distribution (Existing)

Trip origin / destination	Proportion of Trips
Austin Lakes Central shopping centre	12.9%
South Yunderup activity centre	15.1%
Austin Cove Baptist College	8.5%
Pinjarra Rd – South Yunderup Rd	57.0%
Temporary Access Road to/from Forrest Hwy – Beacham Rd	6.5%
Total	100%



6.2.2 Future Scenarios

In the future scenarios for this transport impact assessment .the Austin Lakes LSP area is fully developed with approximately 3,000 dwellings, new primary school (540 students), Austin Lakes Central shopping centre increased to 4,000m² floor and new Austin Lakes Village of 7,000m² floor area. Outside of the LSP area, the Austin Cove Baptist College is anticipated to grow to 1,200 students.

With full development of the LSP area the overall residential traffic generation in the study area will be as follows:

- South Yunderup: 1635 dwellings @ 6.763vpd/dwelling = 11,060vpd
- Existing Austin Lakes 3000 dwellings @ 6.763vpd/dwelling = 20,290vpd
- Total future residential traffic generation = 31,350vpd

The traffic generation of the modelled non-residential land uses in the future scenarios is as follows:

- Austin Lakes Central (4,000m²): 4,107vpd
- Austin Lakes Village (7,000m²): 7,180vpd
- South Yunderup activity centre: 2,022vpd
- Austin Lakes Primary School: 1,404vpd
- Austin Cove Baptist College: 3,120vpd
- Total non-residential traffic generation: 17,833vpd

It should be noted that some of these existing residential trips will be internal trips within this area, as discussed above.

- It is assumed that Austin Cove Baptist Cove will continue to have 28% of its students from outside of the study area.
- The South Yunderup activity centre, Austin Lakes Central shopping centre and the new primary school are assumed to serve the local catchment area.
- The Austin Lakes Village centre at the southern edge of the LSP area (north of Brookton Prom) is initially assumed to only serve the local catchment area of South Yunderup and Austin Lakes but ultimately, with a future Brookton Prom connection to Forrest Hwy, it is assumed that up to 25% of Austin Lakes Village traffic generation may be attracted from Forrest Highway.

The resulting future residential traffic distribution modelled for the South Yunderup / Austin Lakes area is shown in **Table 3**.



Table 3: Residential Traffic Distribution (Future)

Trip origin / destination	Proportion of Trips	
	No Brookton Prom connection	With Brookton Prom connection
Austin Lakes Village centre	13.2%	13.2%
Austin Lakes Central shopping centre	23.1%	17.3%
Austin Lakes Primary School	4.5%	4.5%
Austin Cove Baptist College	7.2%	7.2%
South Yunderup activity centre	6.5%	6.5%
Pinjarra Rd – South Yunderup Rd	40.8%	25.5%
Temporary Access Road to/from Forrest Hwy – Beacham Rd	4.7%	-
Brookton Prom to/from Forrest Hwy	-	25.8%
Total	100%	100%

6.3 Traffic Flow Forecasts

Future daily (average weekday) traffic volumes within the LSP area and on key roads into Austin Lakes have been modelled for full development of the LSP area, with and without the potential future connection of Brookton Promenade to Forrest Highway.

The resultant total daily traffic flows in the LSP area are shown in **Figure 11** without the Brookton Promenade connection and in **Figure 12** with that future Brookton Promenade connection to Forrest Hwy. Traffic generated by the proposed subdivision is shown in brackets. Subdivision roads that do not have a volume shown in this figure would have daily traffic volumes of less than 1000vpd.

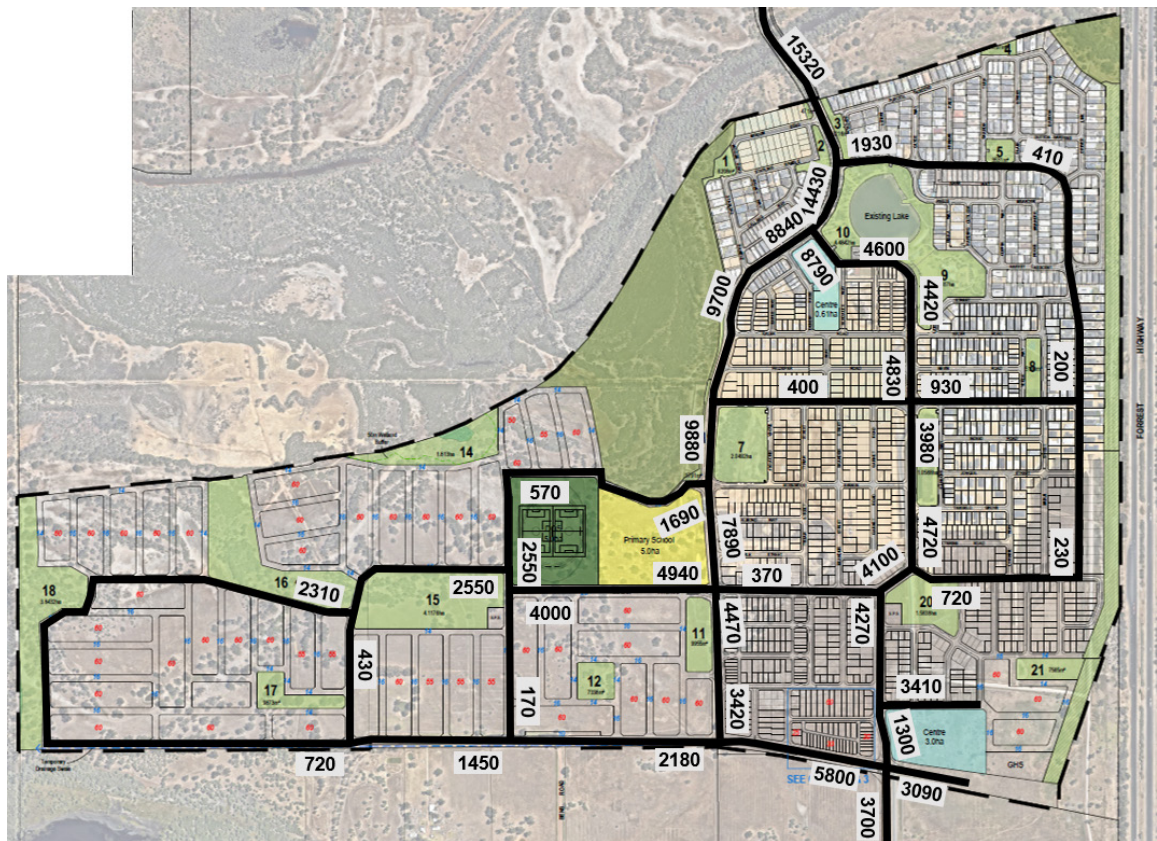


Figure 11: Future traffic flows within LSP area (without Forrest Hwy interchange)

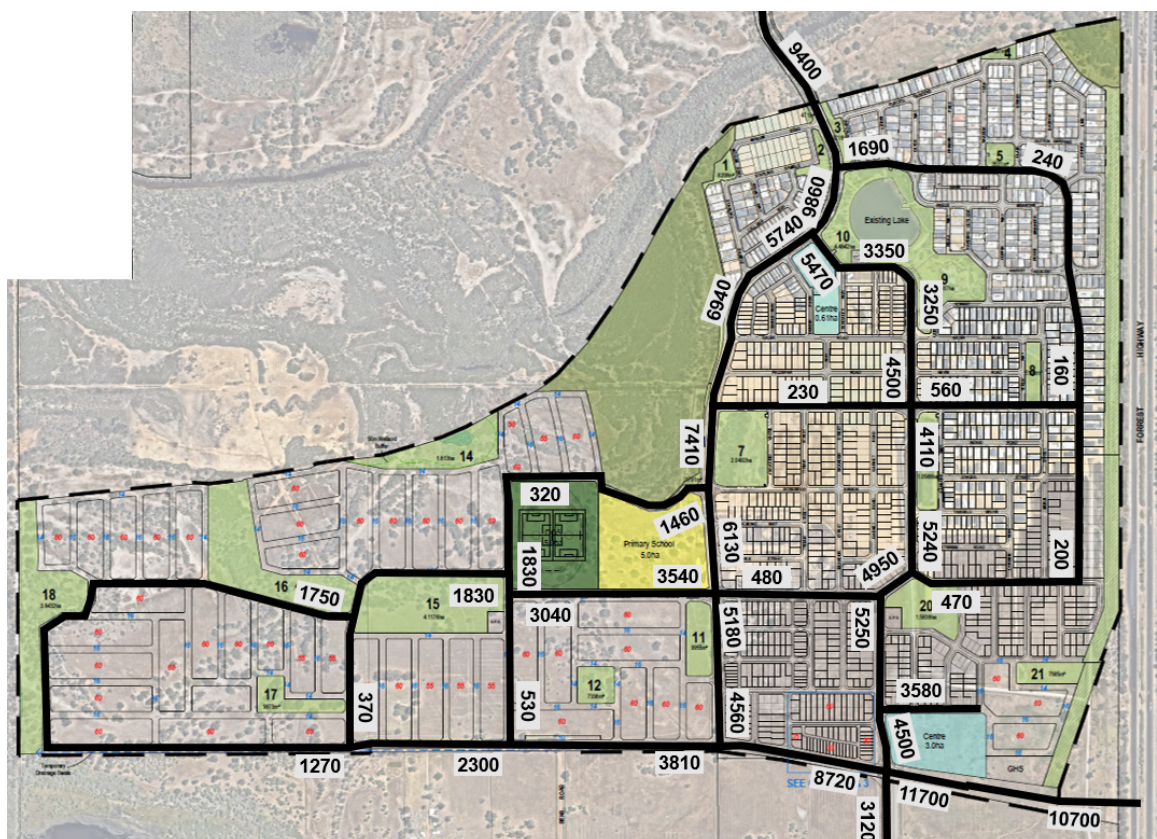


Figure 12: Future traffic flows within LSP area (with Forrest Hwy interchange)

Corresponding daily traffic flows on the key road links through Austin Lakes and South Yunderup are shown in **Figure 13** without the Brookton Promenade connection and in **Figure 14** with that future Brookton Promenade connection to Forrest Hwy. Traffic with an origin or destination within the LSP area is shown in brackets.

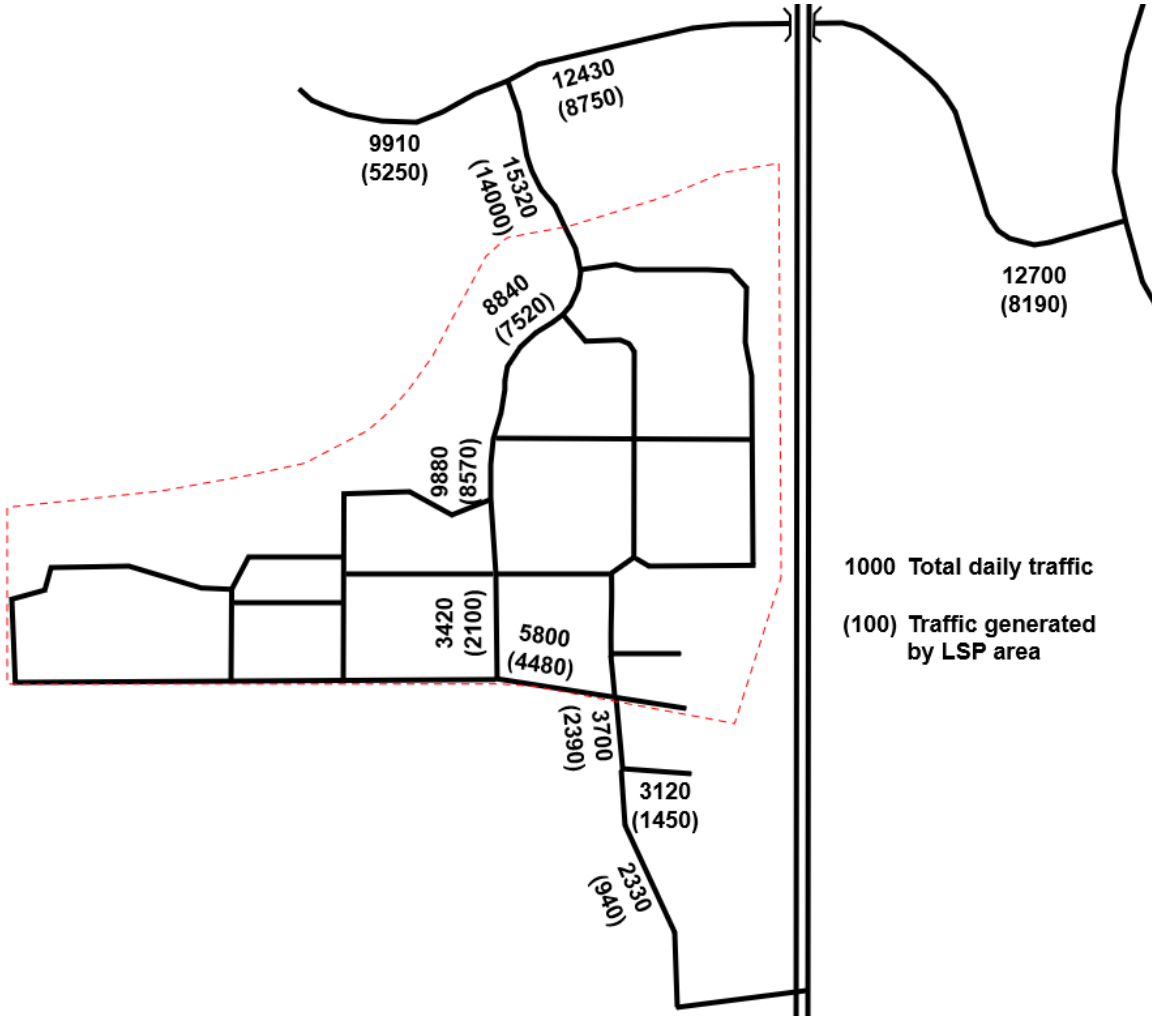


Figure 13: Future traffic flows without future Forrest Hwy interchange



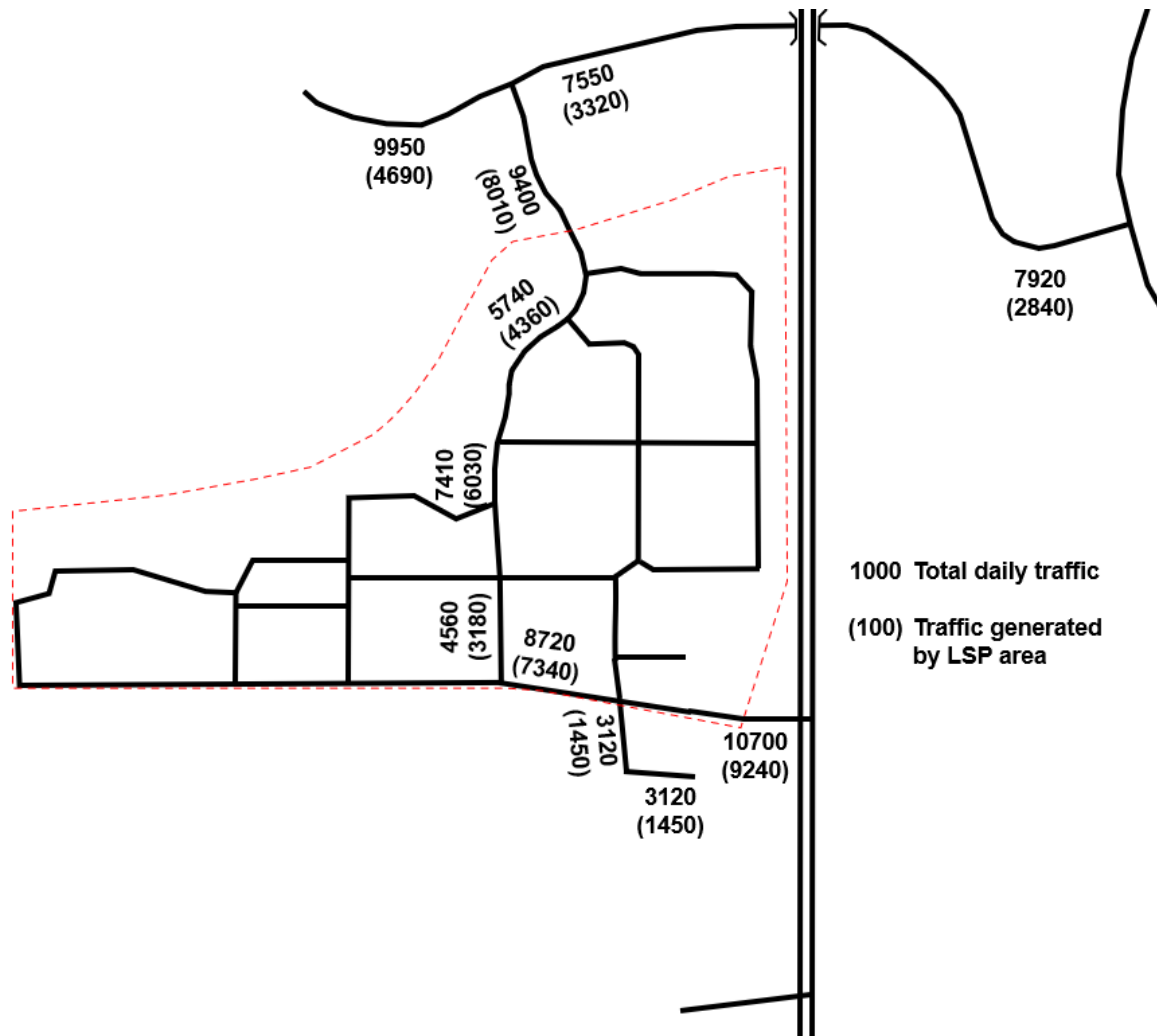


Figure 14: Future traffic flows with future Forrest Hwy interchange

Weekday AM and PM peak hour traffic flows corresponding to the daily traffic volumes in **Figure 13** (without future Forrest Hwy interchange) at the Pinjarra Rd / South Yunderup Rd signalised intersection, the South Yunderup Rd / Inlet Blvd roundabout and the Forrest Hwy / Beacham Rd intersection have been calculated by factoring up existing turn traffic volumes in proportion to the modelled increase in daily traffic flows.

The resultant peak hour traffic flows with full development of the Austin Lakes LSP area (without future Forrest Hwy interchange) are shown in **Figure 15**. These are the highest volumes modelled at all three intersections, so the lower traffic flows at these intersections in **Figure 14** (with Forrest Hwy interchange) have not been evaluated any further.

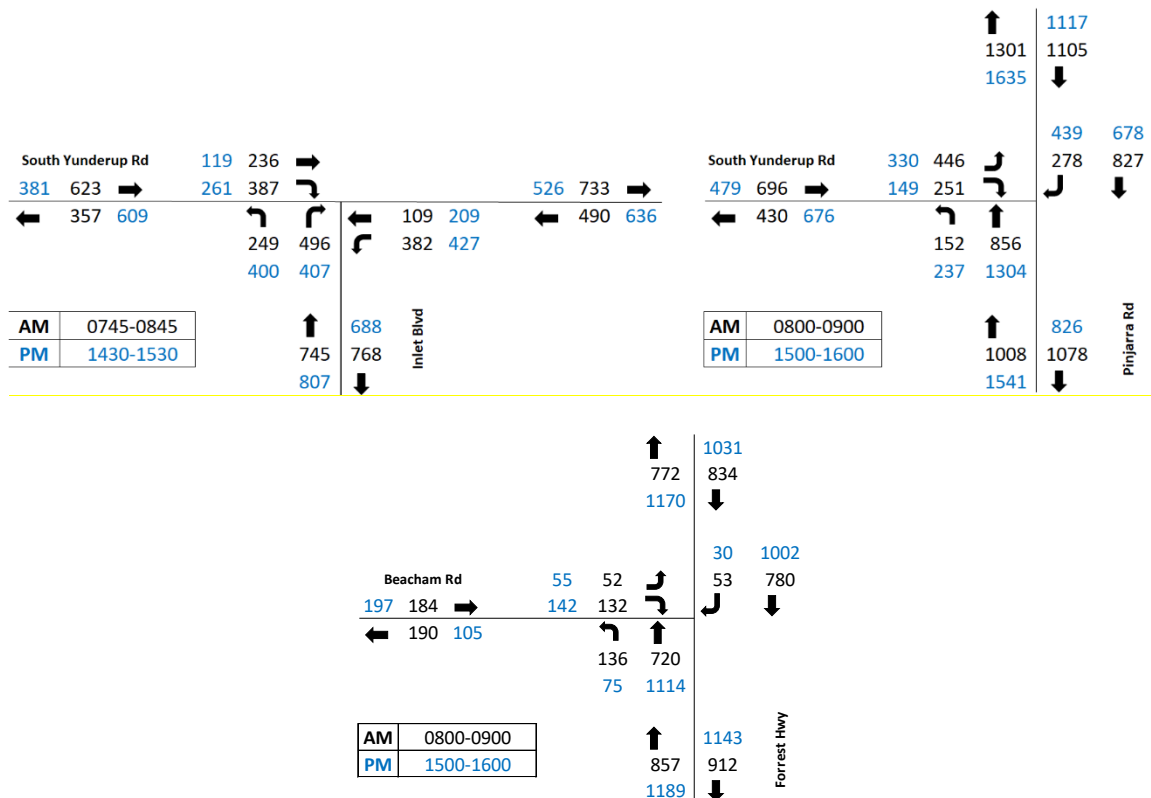


Figure 15: 2041 traffic flows without future Forrest Hwy interchange

Main Roads WA have not provided traffic forecasts for Forrest Highway or Pinjarra Road but have recommended use of a growth rate of 3% per year on Forrest Highway. The same growth rate has been assumed on Pinjarra Road to ensure a robust assessment of that intersection.

Accordingly, **Figure 15** includes growth of through traffic on Forrest Highway and Pinjarra Rd based on that annual traffic growth rate of 3% per year.

6.4 Roads and Intersections

The anticipated future road network in the LSP area has been detailed in section 4 of this transport impact assessment, including discussion of the proposed road hierarchy in Section 4.1.

Key 4-way intersections on Inlet Boulevard and Brookton Promenade are planned as 4-way roundabouts and some others are planned as left in / left out only, as shown in **Figure 16**.

Figure 16 also identifies other 4-way intersections on access streets within the LSP area where it is recommended that threshold treatments should be considered on the side roads to reduce speeds on approach and alert drivers to the presence of the intersection and the need to give way to traffic on the priority road. This may be the same as the treatment that has been implemented on existing 4-way intersections

within previous subdivision stages in Austin Lakes, which involves linemarking and signage of Give Way control on the minor road approaches at these intersections.

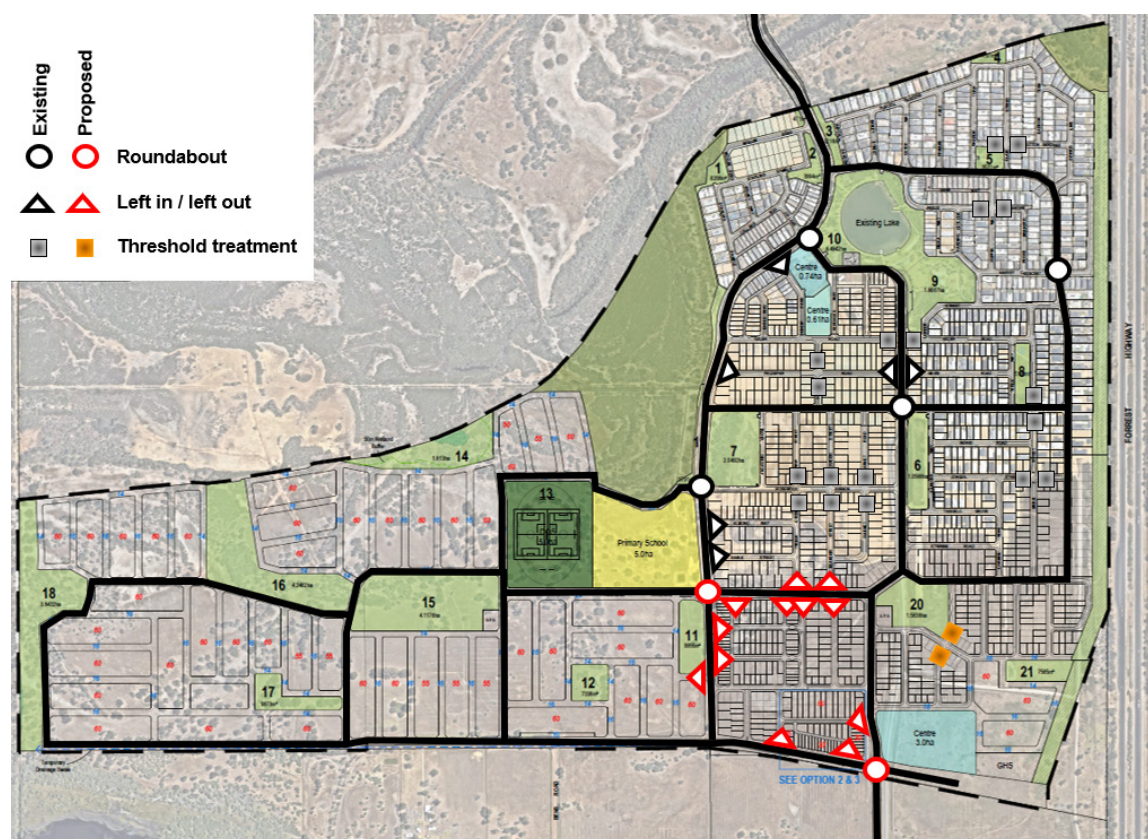


Figure 16: Key intersections

Future development of the rest of the LSP area will result in traffic increases on the Inlet Boulevard – South Yunderup Road route to Pinjarra Road.

Inlet Boulevard is constructed to Integrator B standard with one lane each way, on-road cycle lanes and a 6m wide median. The WAPC *Liveable Neighbourhoods* policy confirms this standard is suitable for traffic flows up to 15,000 vpd and potentially up to 20,000 vpd with appropriate intersection treatments. Therefore Inlet Boulevard will be able to accommodate the forecast traffic flows of up to 15,320vpd shown in **Figure 13**.

The existing South Yunderup Rd is constructed as a two-lane rural road with two 3.5m traffic lanes. This standard of rural road is physically capable of carrying traffic flows in excess of 20,000 vehicles per day (vpd) but would be very congested at that level of traffic flow. It is generally considered that the practical capacity of a rural road is at the upper range of level of service¹ D, which is approximately 13,000 vpd for this

¹ 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

road², so this has been used as the practical capacity for the existing two-lane South Yunderup Rd. Therefore South Yunderup Road will be able to accommodate the forecast traffic flows of up to 12,700vpd shown in **Figure 13**.

It may be noted that the previous *Austin Lakes Subdivision, South Yunderup Transport Impact Assessment* (October 2024) had concluded that South Yunderup Road would reach 13,000vpd (without alternative access via the temporary access road to the south) when residential development in Austin Lakes (i.e. in the LSP area) reaches 1,476 dwellings. However, as discussed in section 3.6, the 2025 election commitment and subsequent funding means that southern access route will remain available and will enable residents in Austin Lake to access Forrest Highway via Beacham Road, so the access scenario considered in the 2024 TIA report no longer applies.

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for the existing Pinjarra Rd / South Yunderup Rd signalised intersection, the existing South Yunderup Rd / Inlet Blvd roundabout and the existing Forrest Hwy / Beacham Rd intersection for the future weekday AM peak and PM peak hour flows shown in **Figure 15** (2041 with full development of the LSP area and with access south to Forrest Hwy via Beacham Rd).

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

- Degree of Saturation 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 infrequent traffic flow up to one for saturated flow or capacity.
- Level of Service 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

operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

² South Yunderup Rd is currently a single carriageway, two-lane road. The traffic capacity of this two-lane road has been estimated from Exhibit 15-30 (Generalized Daily Service Volumes for Two-Lane Highways) in the Highway Capacity Manual 2010. The Highway Capacity Manual indicates this is a suitable indication of capacity and level of service for use in generalised planning and preliminary engineering analysis. A June 2014 Main Roads WA traffic count indicated the highest daily traffic occurred on a Friday with daily flows of 6182vpd and AM and PM peak hour flows of 623 and 625vph (10% of daily traffic) with 61% eastbound in the AM peak and 54% westbound in the PM peak. Therefore values for a 60/40 directional split during the peak hour and approximately 10% of daily traffic in the peak hour have been selected for this analysis as the most suitable values available in Exhibit 15-30. For a class II highway in rolling terrain the table indicates the traffic volume range for LoS D is 7,100 to 13,100vpd. This range would be slightly higher on level terrain but values are not presented in Exhibit 15-30.

Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

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

The results of the SIDRA analysis are summarised in **Appendix C**.

The SIDRA analysis in Tables C1a and C1b indicates that the existing Pinjarra Rd / South Yunderup Rd signalised intersection will operate satisfactorily in both peak periods in 2041 with the forecast future traffic flows for full development of the LSP area (with access south to Forrest Hwy via Beacham Rd). The modelled degree of saturation is 67.5% in the AM peak and 80.0% in the PM peak period. The intersection will operate at level of service C overall in both peak periods and no movement worse than level of service E.

The SIDRA analysis in Tables C2a and C2b indicates that the existing South Yunderup Rd / Inlet Blvd roundabout will operate satisfactorily in both peak periods in 2041 with the forecast future traffic flows for full development of the LSP area (with access south to Forrest Hwy via Beacham Rd). The modelled degree of saturation is 73.8% in the AM peak and 72.5% in the PM peak period. The roundabout will operate at level of service A overall and no movement worse than level of service B.

The SIDRA analysis in Tables C3a and C3b indicates that the existing Forrest Hwy / Beacham Rd T-intersection will not operate satisfactorily in the PM peak period in 2041 with the forecast future traffic flows for full development of the LSP area (with access south to Forrest Hwy via Beacham Rd). The critical movement is the first stage of the right turn out (from Beacham Rd to the median) which has a modelled degree of saturation of 46.8% in the AM peak but 129.7% in the PM peak period. That right turn movement would be at level of service C in the AM peak but level of service F in the PM peak.

Further analysis of the existing Forrest Hwy / Beacham Rd T-intersection indicates that the critical movement would reach level of service F in the PM peak in 2034 (with 2380 lots assumed to be developed in the LSP area by then), as shown in Table C4b. Level of service is based on average delays, with level of service F equating to average delays of more than 50 seconds per vehicle for unsignalised intersections. That right turn movement would technically be operating at 80.0% of capacity at that point but that is considered to be the practical capacity for an unsignalised intersection. It should be noted that the timing of this intersection reaching practical capacity is dictated mainly by the anticipated traffic growth on Forrest Highway – the traffic growth on Beacham Road has some effect on timing but is much less significant in that regard.

Solutions available to address the congestion on that right turn movement could include partial signalisation of the intersection (with traffic signal control of the northbound movement on Forrest Hwy and the two right turn movements, similar to several other existing intersections further south on Forrest Hwy (eg. Forrest Hwy / Grand Entrance in Australind). Alternatively, if Main Roads WA would not agree to

that signalisation, the right turn out from Beacham Road could be closed, which would redirect that portion of the traffic out via the Pinjarra Rd / South Yunderup Rd intersection.

Ultimately, the preferred solution would be construction of a Forrest Hwy / Brookton Prom interchange at the southeast corner of the LSP area, as discussed in Section 2.

6.6 Access to Frontage Properties

The WAPC *Liveable Neighbourhoods* policy requires that “Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over 5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access.”

Brookton Promenade, along the southern boundary of the LSP area, may connect to Forrest Highway in future and would then carry significantly higher traffic flows. Accordingly it is planned as a future Integrator B east of Inlet Boulevard and will not have direct driveway access from residential lots.

Inlet Boulevard is planned with a 30m road reserve in the LSP plan, as a continuation of the existing standard of Inlet Boulevard further north. **Figure 11** indicates Inlet Boulevard is anticipated to carry traffic volumes ranging from 3,420vpd at the southern end to 15,320vpd at the northern end. In Figure 12 (with Brookton Promenade connection to Forrest Hwy) the range changes to 4,560vpd (southern end) to 9,400vpd (northern end). In recent and future subdivision applications along this road the lots fronting this road are planned with rear laneway access in the LSP area.

The wording of the Liveable Neighbourhoods requirement is “should”, not “shall”, so there is some discretion on enforcement of that 5,000vpd threshold. Accordingly, direct driveway access to residential lots along Inlet Boulevard should be deemed acceptable where exceptional circumstances apply, such as previous subdivision approval.

Some southern sections of the north south neighbourhood connector east of Inlet Boulevard are indicated to carry slightly more than 5,000vpd on **Figure 12** (i.e. in the scenario with Brookton Promenade connecting to Forrest Highway). The modelled traffic volumes on those sections are only up to 5,250vpd, so it is recommended that some discretion be used and not rigid enforcement of the 5,000vpd threshold in that Liveable Neighbourhoods requirement.

The existing neighbourhood connector on the northeast side of Austin Lakes Central shopping centre will carry more than 5,000vpd but does not have residential driveway access, so it complies with that Liveable Neighbourhoods requirement.

All of the other roads in the LSP area are expected to carry less than 5,000vpd, so no restriction on vehicular access is required.

7 Conclusions

This Transport Impact Assessment (TIA) relates to the proposed Austin Lakes Local Structure Plan (LSP) at South Yunderup in the Shire of Murray. Planning for the northeastern portion of this LSP area is already set out in the current approved Austin Lakes Outline Development Plan (ODP).

The total residential lot yield of the LSP area will be approximately 3,000 lots, with approximately 600 dwellings already constructed in the ODP area.

The LSP also anticipates expansion of the existing Austin Lakes Central shopping centre and a new activity centre site (Austin Lakes Village) at the southern edge of the structure plan area.

A new primary school site is also included in the LSP area.

This TIA also takes into consideration existing development in South Yunderup (north of the LSP area) and future growth of Austin Cove Baptist College (south of the LSP area).

The LSP area has access via Inlet Boulevard to South Yunderup Road, which connects to a signalised intersection on Pinjarra Road east of Forrest Highway. Secondary access is currently provided via the Temporary Access Road – Beacham Road to Forrest Highway, which also currently provides access to the existing Austin Cove Baptist College south of the LSP area.

Long-term planning for the LSP area set out in the previous Austin Lakes Masterplan anticipates a future Forrest Highway interchange adjacent to the southeast corner of the LSP area. This is also consistent with future access arrangements envisaged in the WAPC's *South Metropolitan Peel Sub-regional Planning Framework*. Future planning for an interchange on Forrest Highway at this location or further south rests with Main Roads WA to determine.

Two future road network scenarios are assessed in this TIA. The first scenario is based on the existing access arrangements via South Yunderup Road to the north and via the Temporary Access Road to the south. The second scenario would have access via South Yunderup Road to the north and a new Brookton Promenade connection to Forrest Highway at the southeast corner of the LSP area.

Residential development of the LSP area is anticipated to generate daily traffic flows of approximately 20,290vpd, based on existing traffic generation of the South Yunderup / Austin Lakes area.

The non-residential land uses in the LSP area (Austin Lakes Central, Austin Lakes Village and the primary school) will generate daily traffic flows of approximately 12,690vpd. Most of this non-residential traffic generation will be local trips within Austin Lakes and South Yunderup.

The LSP area will result in traffic increases on the Inlet Boulevard – South Yunderup Road route to Pinjarra Road but future traffic volumes will depend on what other external access routes are available for the LSP area.

In the first future scenario assessed (access via South Yunderup Rd to the north and the Temporary Access Road to the south), South Yunderup Rd will carry approximately 12,700vpd and the Temporary Access Road approximately 2,330vpd.

In the second future scenario assessed (access via South Yunderup Rd to the north and a new Brookton Promenade connection to Forrest Highway), South Yunderup Rd will carry approximately 7,920vpd and Brookton Promenade approximately 10,700vpd. This scenario includes traffic attracted to Austin Lakes Village from Forrest Highway via the Brookton Promenade connection.

The existing South Yunderup Rd is constructed as a two-lane rural road with two 3.5m traffic lanes. The practical capacity of this standard of rural road is approximately 13,000vpd, so South Yunderup Road will be able to accommodate the projected traffic flows with full development of the LSP area.

Inlet Boulevard is constructed to Integrator B standard. The WAPC *Liveable Neighbourhoods* policy confirms this standard is suitable for traffic flows up to at least 15,000vpd and up to 20,000vpd with appropriate intersection treatments. The northernmost section of Inlet Boulevard will carry up to 15,320vpd without the Brookton Promenade connection to Forrest Highway. Therefore, Inlet Boulevard will be able to accommodate the forecast traffic flows with full development of the LSP area.

Intersection capacity analysis indicates the Pinjarra Rd / South Yunderup Rd signalised intersection will be able to accommodate the forecast traffic flows with full development of the LSP area.

However, the existing Forrest Hwy / Beacham Rd intersection is likely to reach practical capacity by 2034 (depending mainly on rate of traffic growth on Forrest Highway). This could be addressed by partial signalisation of that intersection (similar to other existing intersections such as Forrest Hwy / Grand Entrance in Australind) or by closing the right turn out from Brookton Promenade to Forrest Highway south when practical capacity is reached.

Ultimately, the preferred solution would be construction of a Forrest Hwy / Brookton Prom interchange at the southeast corner of the LSP area, as proposed in the previous Austin Lakes Masterplan.

Inlet Boulevard and the central north south spine road (Keegan Avenue) through the LSP area (east of Inlet Boulevard) will be of suitable standard to accommodate bus services through this area in future.

Pedestrian and cyclist facilities will be provided in accordance with Liveable Neighbourhoods requirements including footpaths on at least one side of all roads, shared paths on neighbourhood connector and integrator arterial roads, and cycle lanes on Neighbourhood Connector A and integrator arterial roads.

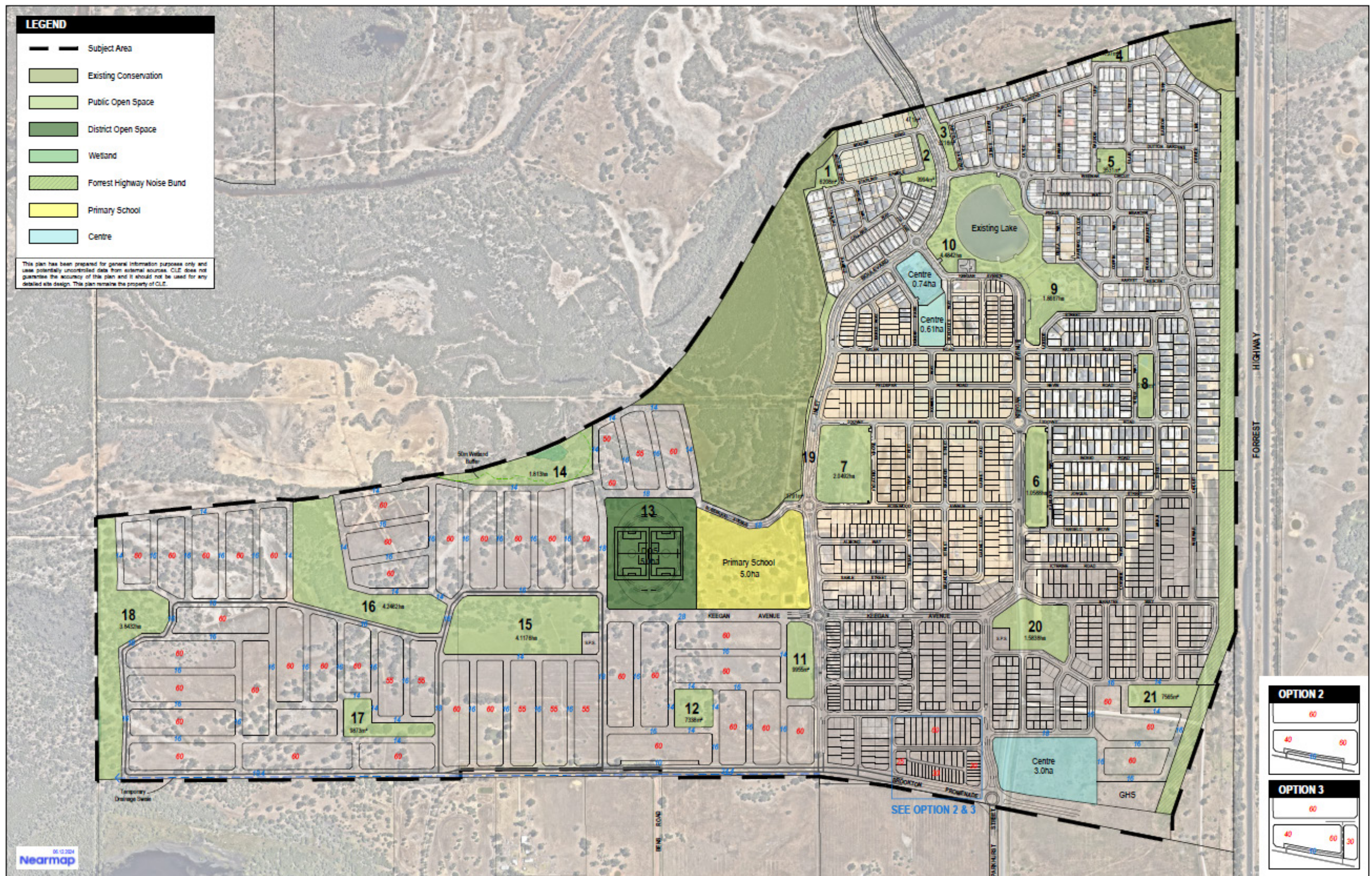


Appendix A

PROPOSED STRUCTURE PLAN



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Appendix B

PREVIOUS APPROVED STAGES



Engineering a better future for over 20 years!

This plan has been prepared for general information purposes only and does not constitute a contract. It is not to be used for any other purpose. The plan is the property of CLE.

DEPARTMENT OF PLANNING, LANDS AND HERITAGE

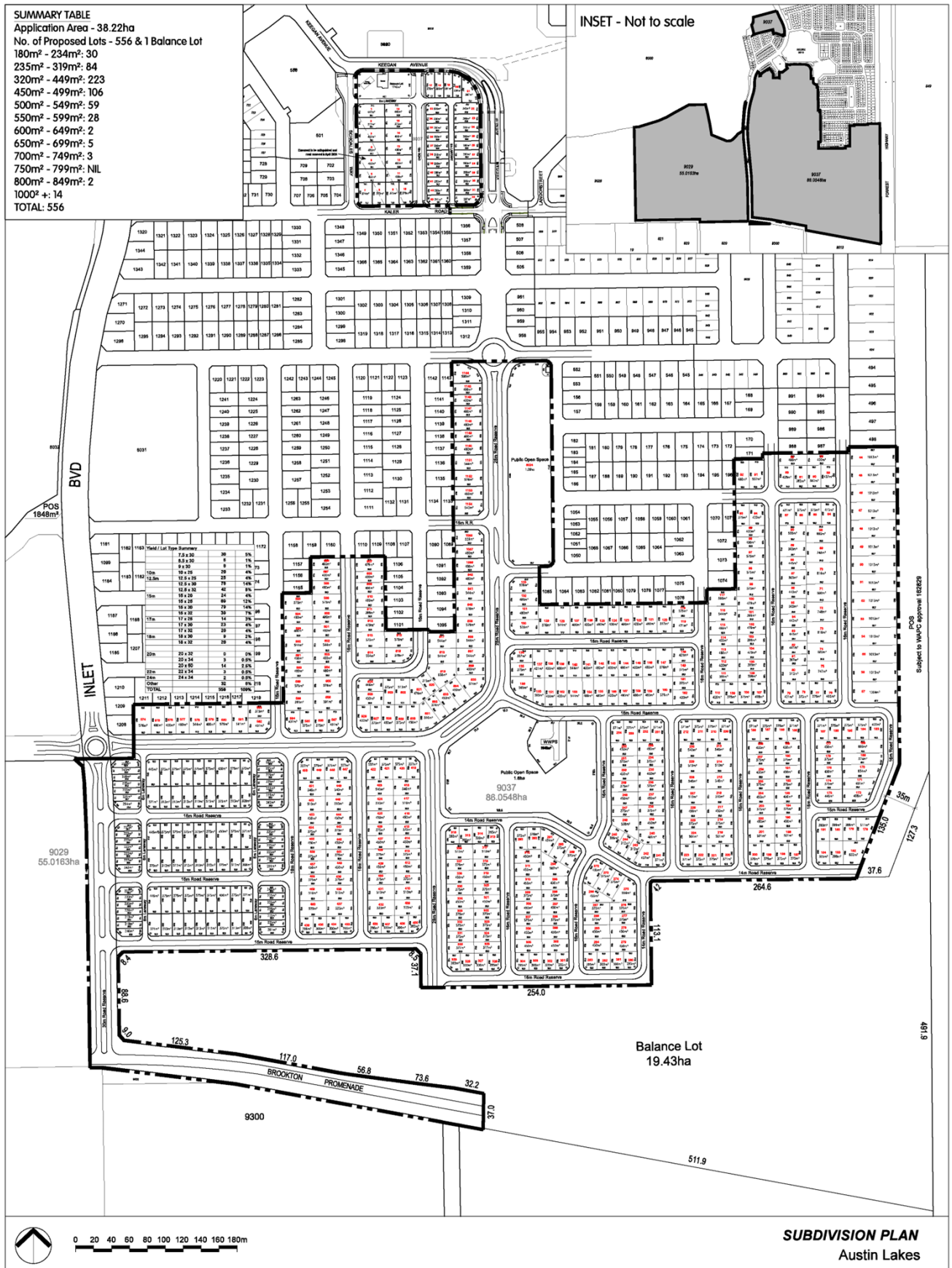
DATE
25-Jul-2022

FILE
162636



SUMMARY TABLE
 Application Area - 38.22ha
 No. of Proposed Lots - 556 & 1 Balance Lot
 180m² - 234m²: 30
 235m² - 319m²: 84
 320m² - 449m²: 223
 450m² - 499m²: 106
 500m² - 549m²: 59
 550m² - 599m²: 28
 600m² - 649m²: 2
 650m² - 699m²: 5
 700m² - 749m²: 3
 750m² - 799m²: NIL
 800m² - 849m²: 2
 1000² +: 14
TOTAL: 556

INSET - Not to scale



NOTE:
 Base Data supplied by Landgate
 Areas and dimensions shown are
 subject to final survey calculations.

Revision	Date	Item

LEGEND:
 SUBJECT LAND

DISCLAIMER:
 Street cell design by CLE Town Planning + Design

CLIENT
 A3 @ 1:3800
 27th OCTOBER 2023
 DATE
 30th AUGUST 2024
 PLAN No.
 REVISION
 C.L.
 PLANNER
 S.B.
 DRAWN

SUBDIVISION PLAN
 Austin Lakes

Rise Urban
 AGILE PLANNING FOR THE NEW NORMAL

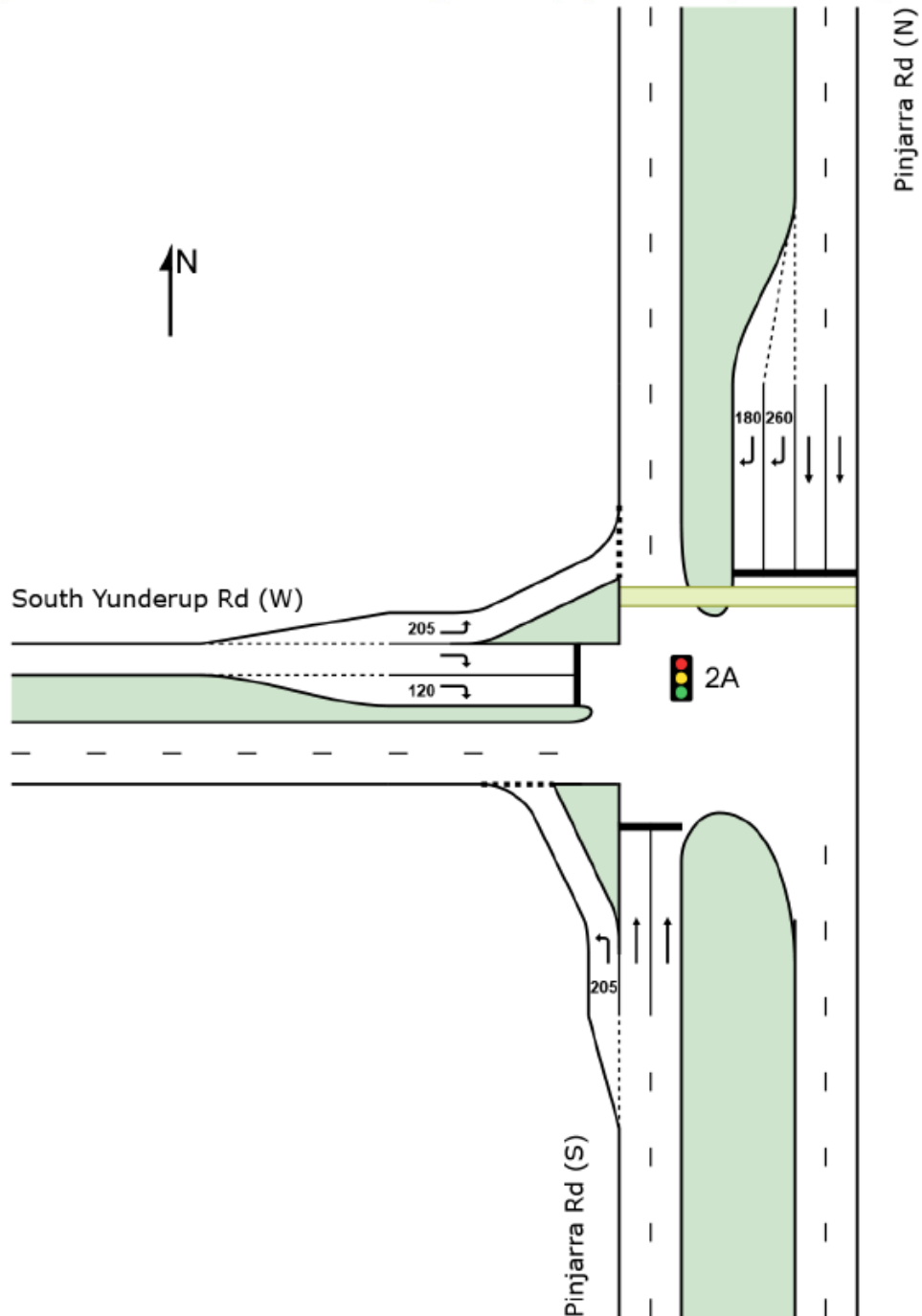
Appendix C

SIDRA INTERSECTION ANALYSIS



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



**Figure C1: Pinjarra Rd / South Yunderup Rd signalised intersection layout
modelled in SIDRA**

Table C1a: SIDRA results – Pinjarra Rd / South Yunderup Rd signalised intersection – 2041 weekday AM peak with full LSP development (with link south to Forrest Hwy via Beacham Rd)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Rate	Number of Cycles to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Pinjarra Rd (S)															
10	L2	All MCs	160	2.0	160	2.0	0.108	7.7	LOS A	0.6	4.4	0.09	0.65	0.09	53.1
11	T1	All MCs	901	13.0	901	13.0	*0.675	24.6	LOS C	16.5	139.2	0.89	0.78	0.89	52.1
Approach			1061	11.3	1061	11.3	0.675	22.1	LOS C	16.5	139.2	0.77	0.76	0.77	52.2
North: Pinjarra Rd (N)															
5	T1	All MCs	871	13.0	871	13.0	0.430	10.7	LOS B	10.4	87.5	0.59	0.52	0.59	64.9
6	R2	All MCs	293	6.0	293	6.0	*0.675	51.1	LOS D	6.6	51.5	1.00	0.84	1.09	32.8
Approach			1163	11.2	1163	11.2	0.675	20.9	LOS C	10.4	87.5	0.69	0.60	0.71	52.0
West: South Yunderup Rd (W)															
7	L2	All MCs	469	4.0	469	4.0	0.507	28.7	LOS C	11.2	86.1	0.70	1.28	0.70	34.7
9	R2	All MCs	264	4.0	264	4.0	*0.295	39.8	LOS D	4.8	36.4	0.85	0.76	0.85	37.2
Approach			734	4.0	734	4.0	0.507	32.7	LOS C	11.2	86.1	0.76	1.09	0.76	32.7
All Vehicles			2958	9.5	2958	9.5	0.675	24.2	LOS C	16.5	139.2	0.73	0.78	0.74	45.4

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped] ped	[Dist] m			sec	m	m/sec
North: Pinjarra Rd (N)												
P2	Full	6	6	38.3	LOS D	0.0	0.0	0.92	0.92	54.9	20.0	0.36
All Pedestrians		6	6	38.3	LOS D	0.0	0.0	0.92	0.92	54.9	20.0	0.36

Table C1b: SIDRA results – Pinjarra Rd / South Yunderup Rd signalised intersection – 2041 weekday PM peak with full LSP development (with link south to Forrest Hwy via Beacham Rd)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Rate	Number of Cycles to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%				[Veh.]	[Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Pinjarra Rd (S)															
10	L2	All MCs	249	4.0	249	4.0	0.160	8.6	LOS A	2.2	16.7	0.15	0.67	0.15	52.4
11	T1	All MCs	1373	13.0	1373	13.0	*0.800	29.0	LOS C	36.1	304.0	0.90	0.83	0.90	49.0
Approach			1622	11.6	1622	11.6	0.800	25.9	LOS C	36.1	304.0	0.79	0.80	0.79	49.5
North: Pinjarra Rd (N)															
5	T1	All MCs	714	13.0	714	13.0	0.291	6.9	LOS A	7.9	66.4	0.38	0.34	0.38	69.6
6	R2	All MCs	462	4.0	462	4.0	*0.800	69.1	LOS E	15.2	116.0	1.00	0.90	1.13	28.3
Approach			1176	9.5	1176	9.5	0.800	31.3	LOS C	15.2	116.0	0.63	0.56	0.68	44.2
West: South Yunderup Rd (W)															
7	L2	All MCs	347	6.0	347	6.0	0.475	52.9	LOS D	13.3	104.2	0.78	1.27	0.78	30.5
9	R2	All MCs	157	6.0	157	6.0	*0.258	65.5	LOS E	4.3	34.0	0.91	0.75	0.91	30.6
Approach			504	6.0	504	6.0	0.475	56.8	LOS E	13.3	104.2	0.82	1.11	0.82	26.6
All Vehicles			3302	10.0	3302	10.0	0.800	32.5	LOS C	36.1	304.0	0.73	0.76	0.75	42.2

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped] ped	[Dist] m			sec	m	m/sec
North: Pinjarra Rd (N)												
P2	Full	6	6	58.2	LOS E	0.0	0.0	0.95	0.95	74.9	20.0	0.27
All Pedestrians		6	6	58.2	LOS E	0.0	0.0	0.95	0.95	74.9	20.0	0.27

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

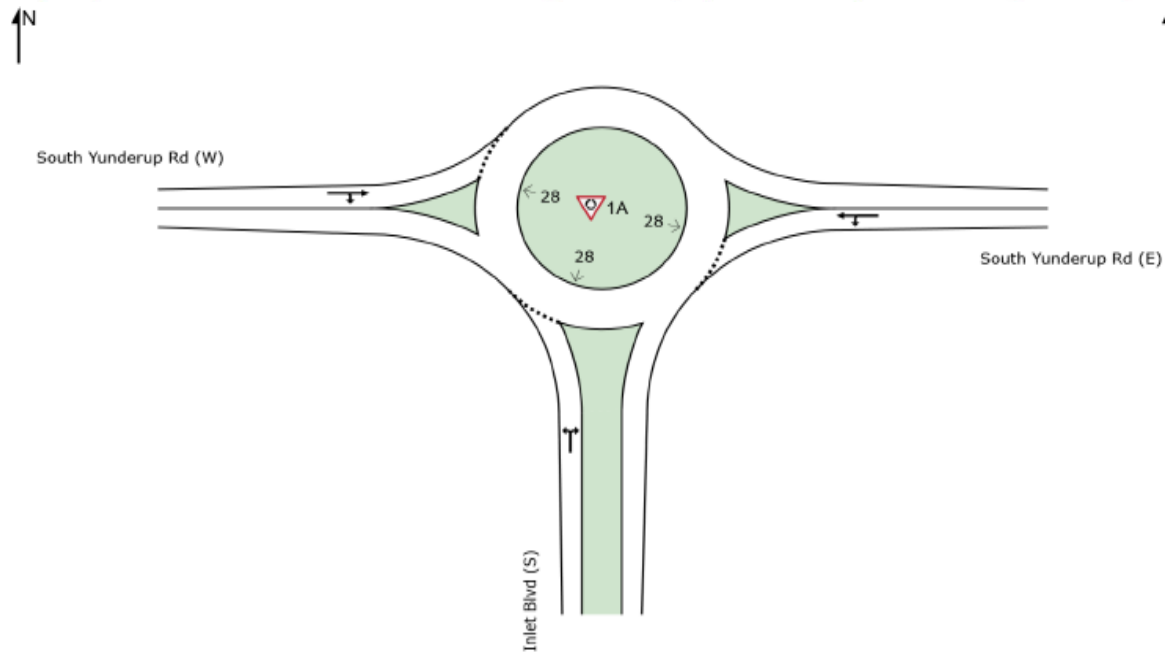


Figure C2: South Yunderup Rd / Inlet Blvd roundabout layout modelled in SIDRA



**Table C2a: SIDRA results – South Yunderup Rd / Inlet Blvd roundabout – 2041
weekday AM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number Rate to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				km/h
			veh/h	%	veh/h	%				veh	m				
South: Inlet Blvd (S)															
10	L2	All MCs	262	4.0	262	4.0	0.579	3.4	LOS A	6.1	46.7	0.53	0.52	0.53	44.8
12	R2	All MCs	522	4.0	522	4.0	0.579	8.4	LOS A	6.1	46.7	0.53	0.52	0.53	44.4
Approach			784	4.0	784	4.0	0.579	6.7	LOS A	6.1	46.7	0.53	0.52	0.53	44.5
East: South Yunderup Rd (E)															
1	L2	All MCs	402	4.0	402	4.0	0.560	6.3	LOS A	5.3	40.3	0.83	0.68	0.89	45.2
2	T1	All MCs	115	4.0	115	4.0	0.560	6.0	LOS A	5.3	40.3	0.83	0.68	0.89	45.4
Approach			517	4.0	517	4.0	0.560	6.3	LOS A	5.3	40.3	0.83	0.68	0.89	45.2
West: South Yunderup Rd (W)															
8	T1	All MCs	248	4.0	248	4.0	0.738	11.1	LOS B	9.7	74.2	0.95	0.95	1.31	41.7
9	R2	All MCs	407	4.0	407	4.0	0.738	16.5	LOS B	9.7	74.2	0.95	0.95	1.31	41.1
Approach			656	4.0	656	4.0	0.738	14.4	LOS B	9.7	74.2	0.95	0.95	1.31	41.3
All Vehicles			1957	4.0	1957	4.0	0.738	9.2	LOS A	9.7	74.2	0.75	0.71	0.89	43.5

**Table C2b: SIDRA results – South Yunderup Rd / Inlet Blvd roundabout – 2041
weekday PM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop Rate	Number Cycles to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				km/h
			veh/h	%	veh/h	%				veh	m				
South: Inlet Blvd (S)															
10	L2	All MCs	421	6.0	421	6.0	0.725	5.6	LOS A	9.3	72.8	0.82	0.64	0.87	44.1
12	R2	All MCs	428	6.0	428	6.0	0.725	10.7	LOS B	9.3	72.8	0.82	0.64	0.87	43.7
Approach			849	6.0	849	6.0	0.725	8.2	LOS A	9.3	72.8	0.82	0.64	0.87	43.9
East: South Yunderup Rd (E)															
1	L2	All MCs	449	6.0	449	6.0	0.615	5.2	LOS A	6.1	47.6	0.76	0.59	0.79	45.5
2	T1	All MCs	220	6.0	220	6.0	0.615	4.9	LOS A	6.1	47.6	0.76	0.59	0.79	45.8
Approach			669	6.0	669	6.0	0.615	5.1	LOS A	6.1	47.6	0.76	0.59	0.79	45.6
West: South Yunderup Rd (W)															
8	T1	All MCs	125	6.0	125	6.0	0.437	5.0	LOS A	3.3	25.5	0.75	0.67	0.75	44.4
9	R2	All MCs	275	6.0	275	6.0	0.437	10.4	LOS B	3.3	25.5	0.75	0.67	0.75	43.7
Approach			400	6.0	400	6.0	0.437	8.7	LOS A	3.3	25.5	0.75	0.67	0.75	43.9
All Vehicles			1919	6.0	1919	6.0	0.725	7.2	LOS A	9.3	72.8	0.78	0.63	0.82	44.5

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

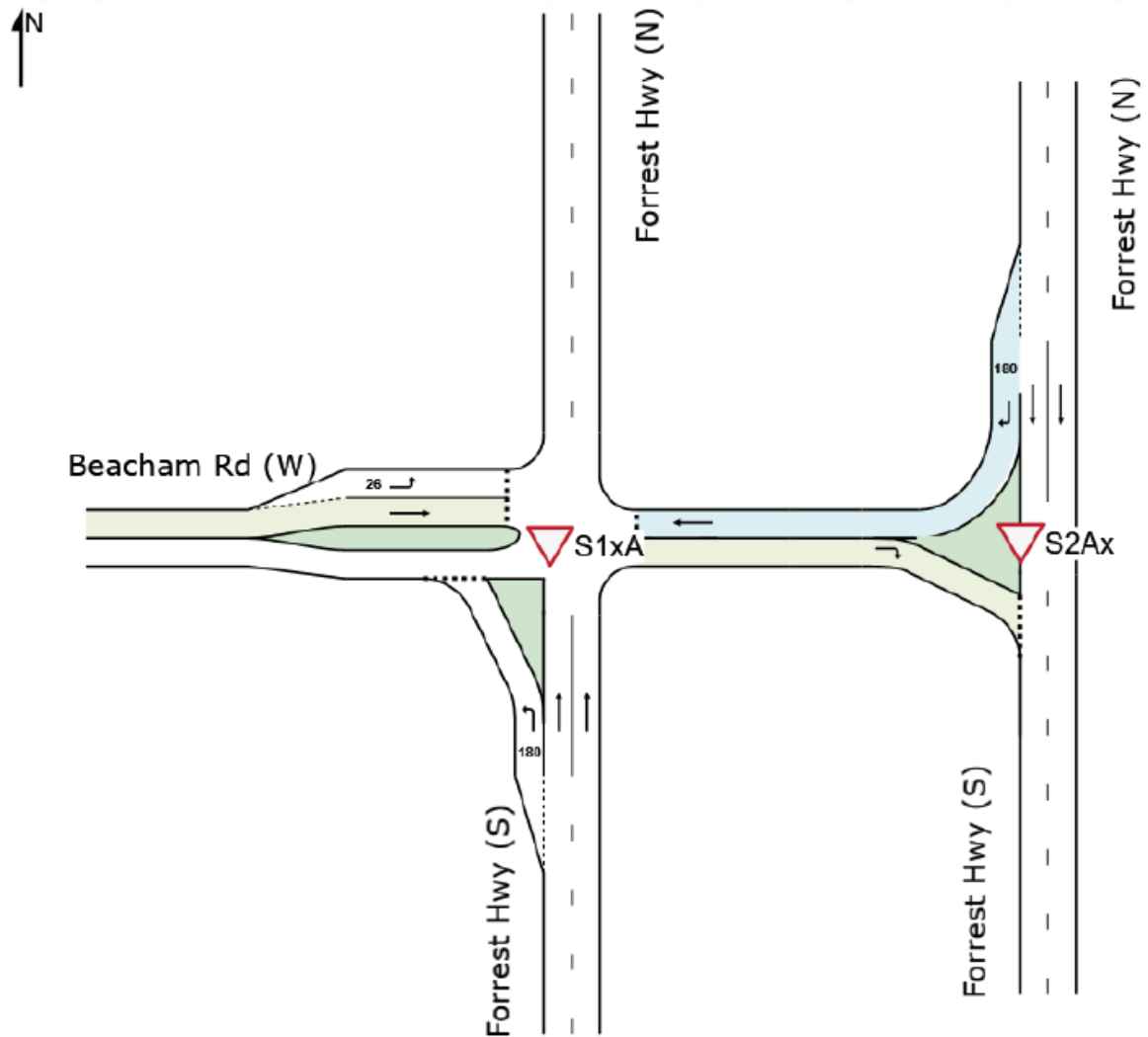


Figure C3: Forrest Hwy / Beacham Rd intersection existing layout modelled in SIDRA Network

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

**Table C3a: SIDRA results – Forrest Hwy / Beacham Rd intersection – 2041
weekday AM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number Rate to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Forrest Hwy (S)															
3	L2	All MCs	143	5.5	143	5.5	0.073	9.0	LOS A	0.4	2.8	0.14	0.60	0.14	65.4
4	T1	All MCs	758	26.1	758	26.1	0.273	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			901	22.8	901	22.8	0.273	1.5	LOS A	0.4	2.8	0.02	0.10	0.02	100.1
East: Median Storage															
5	T1	All MCs	56	5.5	56	5.5	0.101	5.1	LOS A	0.3	2.6	0.63	0.63	0.63	41.8
Approach			56	5.5	56	5.5	0.101	5.1	LOS A	0.3	2.6	0.63	0.63	0.63	41.8
West: Beacham Rd (W)															
1	L2	All MCs	55	5.5	55	5.5	0.055	10.2	LOS B	0.2	1.6	0.46	0.71	0.46	63.2
2	T1	All MCs	139	5.5	139	5.5	0.468	24.6	LOS C	2.0	15.7	0.85	1.01	1.21	38.0
Approach			194	5.5	194	5.5	0.468	20.6	LOS C	2.0	15.7	0.74	0.92	1.00	46.8
All Vehicles			1151	19.1	1151	19.1	0.468	4.8	NA	2.0	15.7	0.17	0.26	0.22	87.3
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number Rate to Depart	Aver. Speed
			[Total HV]		[Total HV]					[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
North: Forrest Hwy (N)															
2	T1	All MCs	821	26.1	821	26.1	0.295	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3	R2	All MCs	56	5.5	56	5.5	0.032	8.0	LOS A	0.0	0.0	0.00	0.70	0.00	74.9
Approach			877	24.8	877	24.8	0.295	0.5	NA	0.0	0.0	0.00	0.04	0.00	108.2
West: Median Storage															
1	R2	All MCs	139	5.5	139	5.5	0.235	5.3	LOS A	0.7	5.3	0.61	0.74	0.68	47.8
Approach			139	5.5	139	5.5	0.235	5.3	LOS A	0.7	5.3	0.61	0.74	0.68	47.8
All Vehicles			1016	22.2	1016	22.2	0.295	1.2	NA	0.7	5.3	0.08	0.14	0.09	98.3

**Table C3b: SIDRA results – Forrest Hwy / Beacham Rd intersection – 2041
weekday PM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Qued	Eff. Stop of Cycles Rate to Depart	Number	Aver. Speed km/h
South: Forrest Hwy (S)															
3	L2	All MCs	79	5.5	79	5.5	0.039	9.0	LOS A	0.2	1.5	0.10	0.61	0.10	65.6
4	T1	All MCs	1173	26.1	1173	26.1	0.422	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
Approach			1252	24.8	1252	24.8	0.422	0.6	LOS A	0.2	1.5	0.01	0.04	0.01	105.7
East: Median Storage															
5	T1	All MCs	32	5.5	32	5.5	0.129	13.8	LOS B	0.4	2.8	0.84	0.84	0.84	33.8
Approach			32	5.5	32	5.5	0.129	13.8	LOS B	0.4	2.8	0.84	0.84	0.84	33.8
West: Beacham Rd (W)															
1	L2	All MCs	58	5.5	58	5.5	0.082	12.2	LOS B	0.3	2.3	0.58	0.82	0.58	60.9
2	T1	All MCs	149	5.5	149	5.5	1.297	333.2	LOS F	25.2	196.4	1.00	2.03	8.54	5.2
Approach			207	5.5	207	5.5	1.297	243.6	LOS F	25.2	196.4	0.88	1.70	6.31	9.0
All Vehicles			1491	21.7	1491	21.7	1.297	34.7	NA	25.2	196.4	0.15	0.29	0.90	56.4
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Qued	Eff. Stop of Cycles Rate to Depart	Number	Aver. Speed km/h
North: Forrest Hwy (N)															
2	T1	All MCs	1055	26.1	1055	26.1	0.379	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
3	R2	All MCs	32	5.5	32	5.5	0.018	8.0	LOS A	0.0	0.0	0.00	0.70	0.00	74.9
Approach			1086	25.5	1086	25.5	0.379	0.3	NA	0.0	0.0	0.00	0.02	0.00	109.0
West: Median Storage															
1	R2	All MCs	149	5.5	115	5.5	0.262	7.7	LOS A	0.7	5.8	0.72	0.85	0.83	45.1
Approach			149	5.5	115	5.5	0.262	7.7	LOS A	0.7	5.8	0.72	0.85	0.83	45.1
All Vehicles			1236	23.1	1202	23.7	0.379	1.0	NA	0.7	5.8	0.07	0.10	0.08	101.3

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

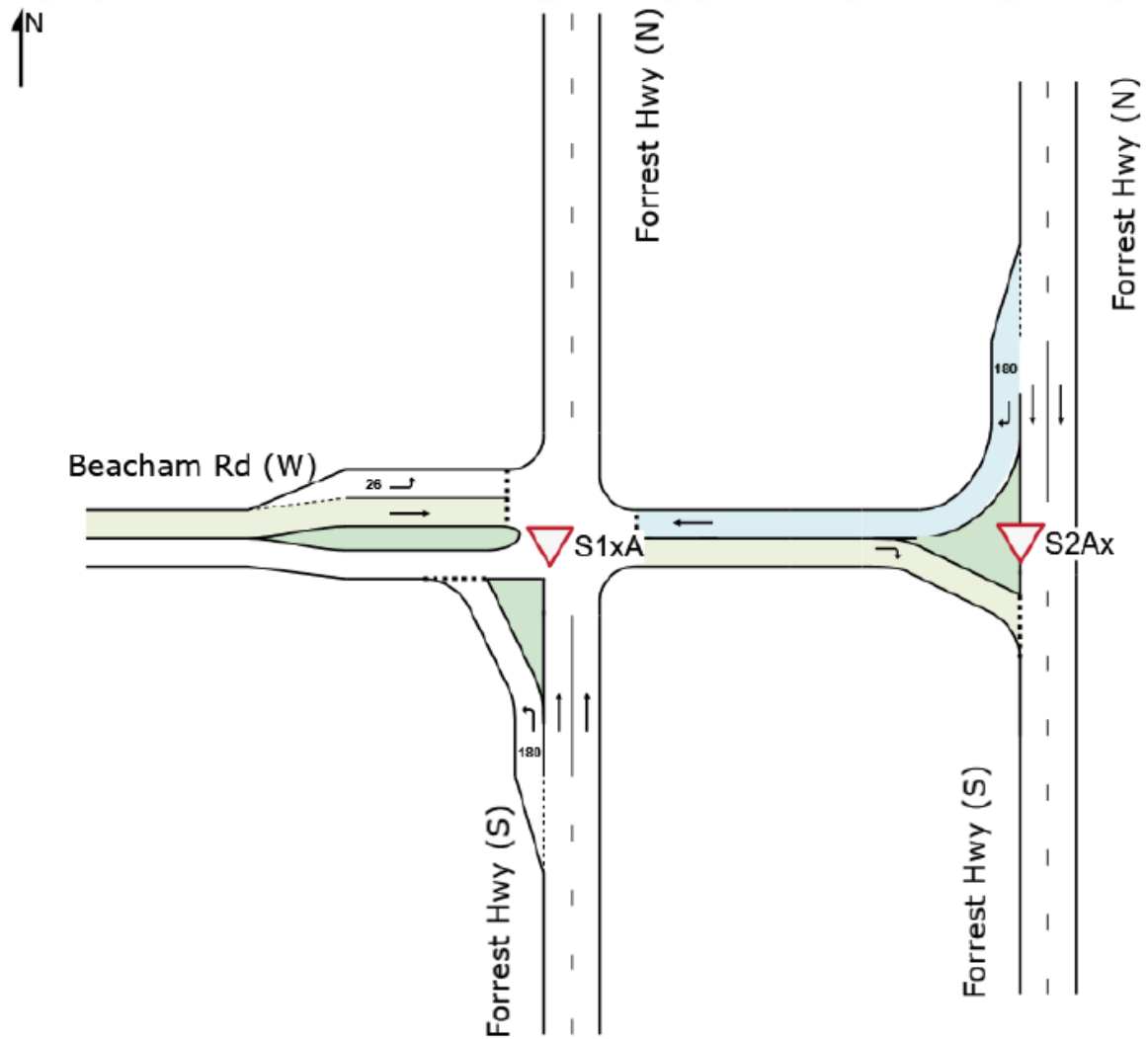


Figure C4: Forrest Hwy / Beacham Rd intersection existing layout modelled in SIDRA Network

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

**Table C4a: SIDRA results – Forrest Hwy / Beacham Rd intersection – 2034
weekday AM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Qued	Eff. Stop of Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Forrest Hwy (S)															
3	L2	All MCs	139	5.5	139	5.5	0.070	9.0	LOS A	0.3	2.7	0.13	0.61	0.13	65.4
4	T1	All MCs	657	26.1	657	26.1	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
Approach			796	22.5	796	22.5	0.236	1.6	LOS A	0.3	2.7	0.02	0.11	0.02	99.2
East: Median Storage															
5	T1	All MCs	48	5.5	48	5.5	0.075	4.0	LOS A	0.2	1.9	0.56	0.54	0.56	43.3
Approach			48	5.5	48	5.5	0.075	4.0	LOS A	0.2	1.9	0.56	0.54	0.56	43.3
West: Beacham Rd (W)															
1	L2	All MCs	47	5.5	47	5.5	0.044	9.9	LOS A	0.2	1.3	0.42	0.68	0.42	63.4
2	T1	All MCs	135	5.5	135	5.5	0.361	19.5	LOS C	1.5	12.0	0.77	0.96	1.00	44.1
Approach			182	5.5	182	5.5	0.361	17.0	LOS C	1.5	12.0	0.68	0.89	0.85	51.0
All Vehicles			1026	18.7	1026	18.7	0.361	4.4	NA	1.5	12.0	0.17	0.26	0.20	87.9
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh Dist] veh m		Prop. Qued	Eff. Stop of Rate	Number of Cycles to Depart	Aver. Speed km/h
North: Forrest Hwy (N)															
2	T1	All MCs	712	26.1	712	26.1	0.256	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3	R2	All MCs	48	5.5	48	5.5	0.027	8.0	LOS A	0.0	0.0	0.00	0.70	0.00	74.9
Approach			760	24.8	760	24.8	0.256	0.5	NA	0.0	0.0	0.00	0.04	0.00	108.2
West: Median Storage															
1	R2	All MCs	135	5.5	135	5.5	0.198	4.2	LOS A	0.6	4.3	0.54	0.64	0.55	49.1
Approach			135	5.5	135	5.5	0.198	4.2	LOS A	0.6	4.3	0.54	0.64	0.55	49.1
All Vehicles			895	21.9	895	21.9	0.256	1.1	NA	0.6	4.3	0.08	0.13	0.08	97.8

**Table C4b: SIDRA results – Forrest Hwy / Beacham Rd intersection – 2034
weekday PM peak with full LSP development (with link south to Forrest Hwy via
Beacham Rd)**

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number Rate to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				km/h
South: Forrest Hwy (S)															
3	L2	All MCs	77	5.5	77	5.5	0.038	9.0	LOS A	0.2	1.4	0.09	0.61	0.09	65.7
4	T1	All MCs	1016	26.1	1016	26.1	0.365	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
Approach			1093	24.7	1093	24.7	0.365	0.7	LOS A	0.2	1.4	0.01	0.04	0.01	105.4
East: Median Storage															
5	T1	All MCs	26	5.5	26	5.5	0.076	9.2	LOS A	0.2	1.8	0.76	0.76	0.76	37.6
Approach			26	5.5	26	5.5	0.076	9.2	LOS A	0.2	1.8	0.76	0.76	0.76	37.6
West: Beacham Rd (W)															
1	L2	All MCs	51	5.5	51	5.5	0.062	11.3	LOS B	0.2	1.8	0.53	0.77	0.53	62.0
2	T1	All MCs	144	5.5	144	5.5	0.800	52.8	LOS F	4.1	31.8	0.96	1.16	2.13	21.7
Approach			195	5.5	195	5.5	0.800	42.0	LOS E	4.1	31.8	0.85	1.06	1.72	30.4
All Vehicles			1314	21.4	1314	21.4	0.800	7.0	NA	4.1	31.8	0.15	0.21	0.28	86.1
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Qued	Eff. Stop of Cycles	Number Rate to Depart	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				km/h
North: Forrest Hwy (N)															
2	T1	All MCs	914	26.1	914	26.1	0.329	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
3	R2	All MCs	26	5.5	26	5.5	0.015	8.0	LOS A	0.0	0.0	0.00	0.70	0.00	74.9
Approach			940	25.5	940	25.5	0.329	0.2	NA	0.0	0.0	0.00	0.02	0.00	109.1
West: Median Storage															
1	R2	All MCs	144	5.5	144	5.5	0.267	6.2	LOS A	0.8	6.2	0.66	0.80	0.76	46.8
Approach			144	5.5	144	5.5	0.267	6.2	LOS A	0.8	6.2	0.66	0.80	0.76	46.8
All Vehicles			1084	22.9	1084	22.9	0.329	1.0	NA	0.8	6.2	0.09	0.12	0.10	99.0