



APPENDIX 6

6. TRAFFIC IMPACT ASSESSMENT

Prepared by: Shawmac

Reference: 160616_TIA_V5

Dated: 2 August 2018



TRANSPORT IMPACT ASSESSMENT

Project:	Lot 19 Sixty Eight Road, Baldivis
Client:	The Glow Developments (WA) Pty Ltd C/o The Spatial Group
Author:	P. Nguyen
Date:	2 nd August 2018
Document #	1606016_TIA_V5

CONSULTING CIVIL AND TRAFFIC ENGINEERS
1 ST. FLOOR, 908 ALBANY HIGHWAY, EAST VICTORIA PARK WA 6101.
PHONE|+61 8 9355 1300
FACSIMILE| +61 8 9355 1922
EMAIL| admin@shawmac.com.au



Document Status

Version	Prepared By	Reviewed By	Approved By	Date
1	P Nguyen	T Shaw	T Shaw	08/07/16
2	P Nguyen	T Shaw	T Shaw	22/07/16
3	R McIllduff	P Nguyen	P Nguyen	13/07/18
4	R McIllduff	P Nguyen	P Nguyen	30/07/18
5	R McIllduff	P Nguyen	P Nguyen	02/08/18

File Reference: Y:\Jobs Active 2016\T&T - Traffic and Parking\Spatial Group_Lot 19 Sixty Eight Road_TA_1606016\Report\Lot 19 Sixty Eight Road_TIA_V5_020818.docx



Contents

1. Introduction	1
2. Structure Plan Outline	3
3. Existing Situation	5
3.1. Land Use	5
3.2. Road Network	5
3.3. Traffic Flows	6
3.4. Crash History	6
3.5. Pedestrian/Cyclist Infrastructure	7
3.6. Public Transport Network	7
4. Proposed Internal Transport Networks	8
5. Changes to External Transport Networks	11
6. Analysis of Internal Transport Networks	13
6.1. Assessment Parameters	13
6.2. Structure Plan Generated Traffic	13
6.3. Non Structure Plan Traffic	13
6.4. Trip Distribution and Assignment	13
6.5. Intersection and Lane Treatments	15
6.6. Pedestrian and Cyclist Facilities	16
6.7. Public Transport	16
7. Analysis of External Transport Networks	17
7.1. Future Traffic Flows	17
7.1.1. Uloth & Associates Assessment – Brightwood Estate	17
7.1.2. Transcore Assessment – Parkland Heights	17
7.2. Roads and Intersections	18
7.2.1. Roads	18
7.2.2. Intersections	19

8. Summary and Conclusions	20
Appendix A: South Baldivis Secondary School – SIDRA Assessment.....	21

Figures

Figure 1: Site Location.....	1
Figure 2: Local Structure Plan Boundary.....	2
Figure 3: Proposed Local Structure Plan.....	3
Figure 4: Sixty Eight Road - West of Proposed School Site	5
Figure 5: Existing Daily Traffic Flows.....	6
Figure 6: Proposed Road Layout and Reserve Widths	8
Figure 7: Typical Neighbourhood Connector B (Liveable Neighbourhoods).....	9
Figure 8: Typical Access Street B (Liveable Neighbourhoods)	9
Figure 9: Typical Access Street C (Liveable Neighbourhoods)	9
Figure 10: Typical Access Street D (Liveable Neighbourhoods)	10
Figure 11: Typical Laneway (Liveable Neighbourhoods).....	10
Figure 12: Approved Brightwood Local Structure Plan (CLE Town Planning).....	11
Figure 13: Approved Parkland Heights Local Structure Plan (Taylor Burrell Barnett)	12
Figure 14: Predicted Daily Traffic Volumes	14
Figure 15: Potential Access Street D.....	15
Figure 16: Future Daily Traffic Flows (Ultimate Development)	18
Figure 17: Typical Neighbourhood Connector A (Liveable Neighbourhoods).....	18

1. Introduction

Shawmac has been engaged by The Spatial Group on behalf of The Glow Developments Pty Ltd to prepare a Transport Impact Assessment for the proposed Local Structure Plan (LSP) for Lot 19 Sixty Eight Road, Baldivis, in the City of Rockingham. The location of the site is shown in **Figure 1** and the LSP boundary is illustrated in **Figure 2**.

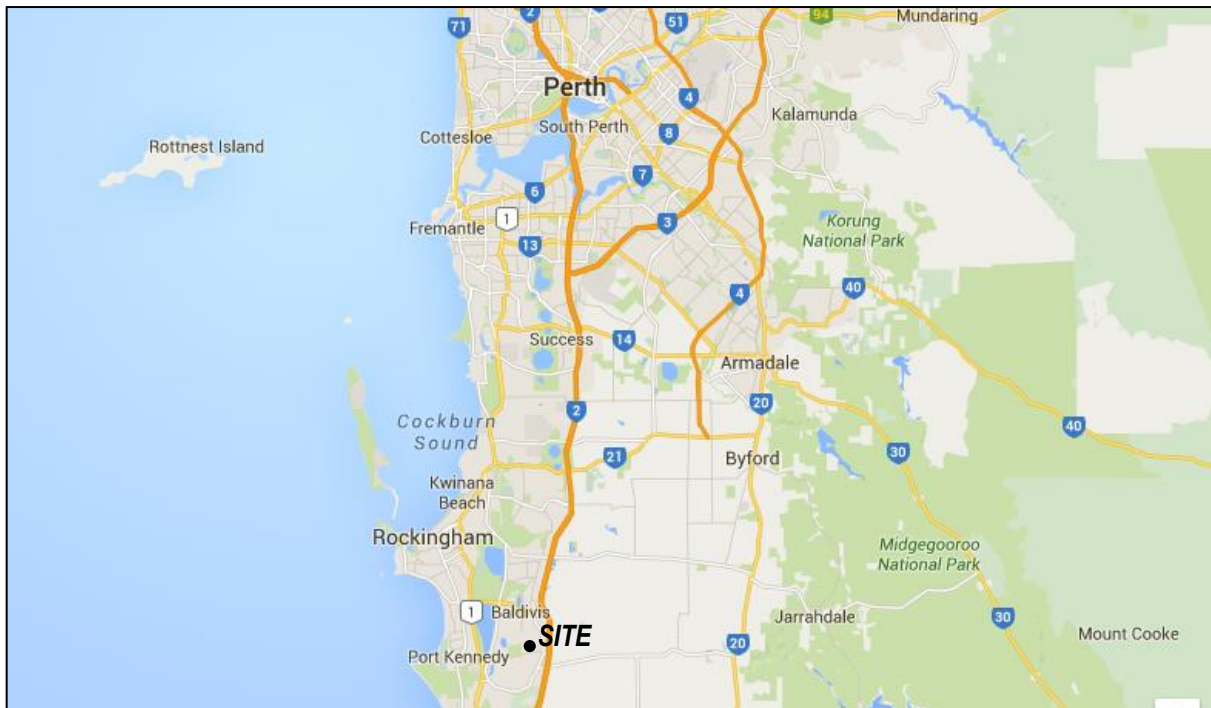


Figure 1: Site Location



Figure 2: Local Structure Plan Boundary

Proposed land uses within the LSP site includes residential, public purpose, public open space (POS) and road infrastructure to service the various land uses.

This assessment has been prepared in accordance with the WAPC *Transport Assessment Guidelines Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans* for submission to the City of Rockingham. The key objectives as per the WAPC guidelines are as follows:

- To assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes (i.e. vehicle, public transport, pedestrian and cyclist);
- To assess the level of transport integration between the structure plan area and the surrounding land uses;
- To determine the impacts of the traffic generated by the structure plan area on the surrounding land uses; and
- To determine the impacts of the traffic generated by the structure plan area on the surrounding transport networks.

Shawmac has also prepared the Transport Assessment for South Baldivis Secondary School (last updated June 2018) which covers a portion of the LSP site.

2. Structure Plan Outline

The proposed structure plan is shown in **Figure 3**.

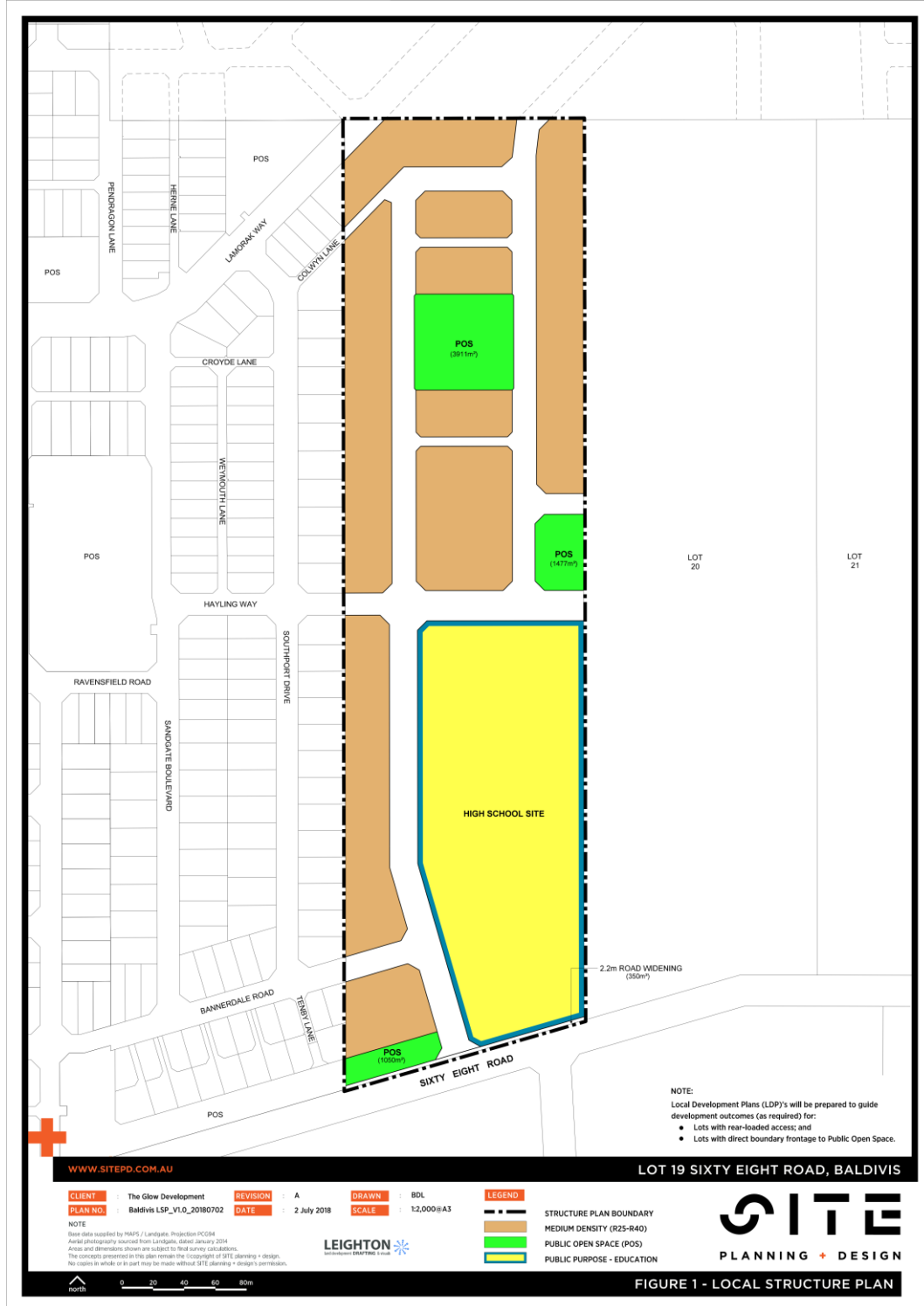


Figure 3: Proposed Local Structure Plan

The proposed land uses within the LSP area comprises residential, POS and a portion of the proposed South Baldivis Secondary School. The remainder of the proposed school lies on parts of Lot 20 Sixty Eight Road and Brightwood Estate (Lot 21 Sixty Eight Road and Lots 569 and 1263 Baldivis Road). The residential yield is understood to include approximately 101 dwellings including 88 standard residential lots, 3 part residential lots and a grouped housing lot comprising 8 to 10 dwellings.

The primary access points to the boundary road system includes:

- A full movement T-intersection with Sixty Eight Road; and
- A continuation of the proposed east-west *Neighbourhood Connector B* road (Solis Boulevard) through Lot 20 which is proposed to extend to Baldivis Road.

The internal road network is to consist of a series of local access roads and laneways which connect to the existing boundary road network in a permeable grid fashion to allow for distribution of locally-generated traffic.

A previous road connection from the LSP area to Lamorak Way in the north-west corner has been removed. The 2.2m widening of the Sixty Eight Road reserve has also been extended across the full boundary of the LSP area.

3. Existing Situation

3.1. Land Use

The subject site is mostly vacant and undeveloped except for a single rural residential dwelling. The surrounding land use is primarily residential development.

3.2. Road Network

Sixty Eight Road along the southern boundary of the site is the only road adjacent to the LSP that has been completed. Sixty Eight Road is classified as a *Local Distributor/Neighbourhood Connector B* road and has been constructed as a rural standard, undivided road with one lane in each direction. Towards the west, Sixty Eight Road has been upgraded to an urban standard with kerbing on both sides and a 7.4m wide pavement. It currently operates under a 70km/h speed limit. **Figure 4** shows a photo of the existing urban cross section of Sixty Eight Road to the west of the subject site.



Figure 4: Sixty Eight Road - West of Proposed School Site

Baldivis Road towards the east is constructed as an undivided rural standard road with one lane in each direction and operates under a 70km/h speed limit. Baldivis Road is classified as a *District Distributor B* road to the north of Serpentine Road and a *Regional Distributor* to the south of Serpentine Road.

Eighty Road towards the west is constructed as an undivided rural standard road with one lane in each direction. It is classified as an *Access Road* and operates under an 80km/h speed limit. To the north of Peckham Boulevard, approximately 860m north of Sixty Eight Road, Eighty Road is classified as a *Local Distributor* road with a 60 km/h speed limit with kerbing on the east side and both sides in some sections.

Smirk Road is constructed as an urban standard, undivided road with one lane in each direction. It is classified as an *Access Road* and has a 50km/h speed limit.

The local road network immediately west of the subject site is almost complete and consists of a network of access roads.

3.3. Traffic Flows

The latest traffic data for the surrounding road network was sourced from the Main Roads Western Australia (MRWA) *Reporting Centre* and from KCTT consultants and are as illustrated in **Figure 5**.

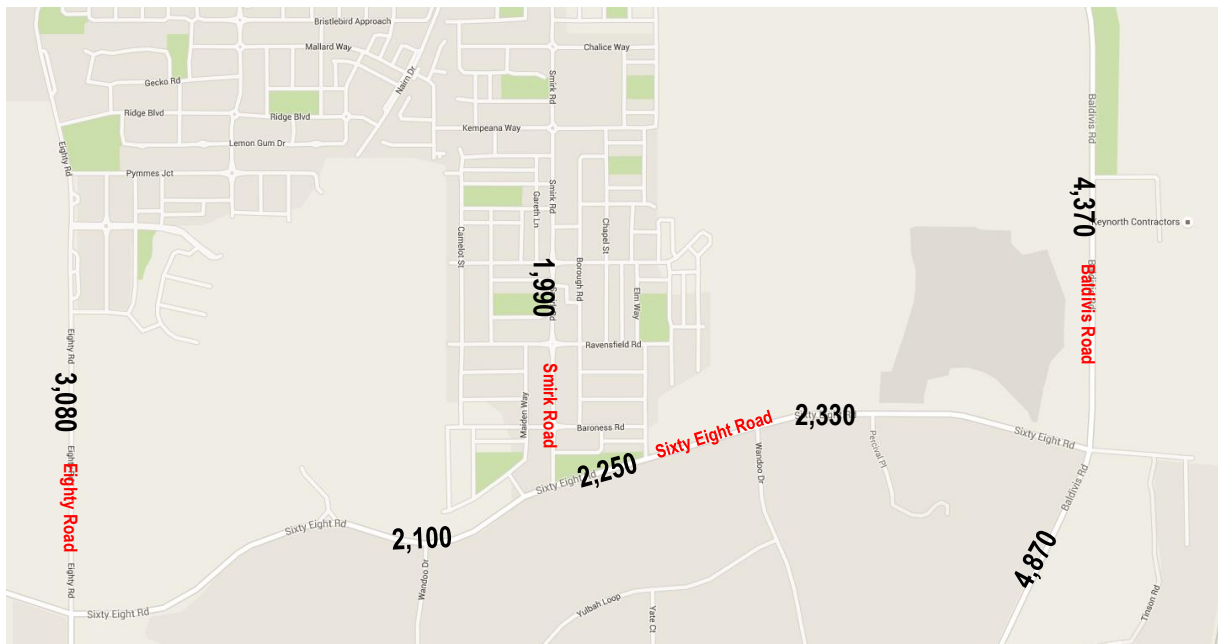


Figure 5: Existing Daily Traffic Flows

3.4. Crash History

The crash history of the boundary road network at intersections and mid-block locations were sourced from the MRWA *Reporting Centre* which details any incidents occurring in the five year period ending December 2014. A total of 10 incidents were recorded along the section of Sixty Eight Road between Smirk Road and Baldivis Road including 1 rear end, 4 right angle crashes, 1 right turn thru crash, 1 hit animal, 1 non collision and 2 other incidents. 7 of these incidents occurred at the intersections of Sixty Eight Road with Smirk Road and Baldivis Road. All incidents were PDO (property damage only) crashes and no incidents resulted in casualties.



The crash history along Sixty Eight Road does not indicate any significant safety issues along this road.

3.5. Pedestrian/Cyclist Infrastructure

There are no existing footpaths or shared paths in the immediate vicinity of the subject site.

3.6. Public Transport Network

The closest existing public transport service is Transperth Bus Route 565 which operates between Warnbro Station and Baldivis. The nearest bus stop is located on Sixty Eight Road approximately 400m west of the site. Services are available approximately every hour with additional services during the morning and afternoon peak hours (approximately every 20 minutes) on weekdays.

4. Proposed Internal Transport Networks

All internal roads will be access streets and laneways except for the main east-west road which will be a Neighbourhood Connector Road as planned. The majority of access streets would be classed as Access Street C which is the most common residential access street according to WAPC *Liveable Neighbourhood* guidelines. The layout of the internal road network is shown in **Figure 6** along with the road hierarchy. Where roads connect through to existing or planned roads, the road reserve will be made consistent with the adjoining areas except to the north where the proposed road reserve will transition from within the site to the planned 16m road reserve within the structure plan to the north. The transition can be made at the bend in the road at the boundary. The intersection between Solas Boulevard, Viva Boulevard and Hayling Way is proposed as a roundabout intersection. The remaining internal intersections will be priority controlled (stop sign or give-way sign).

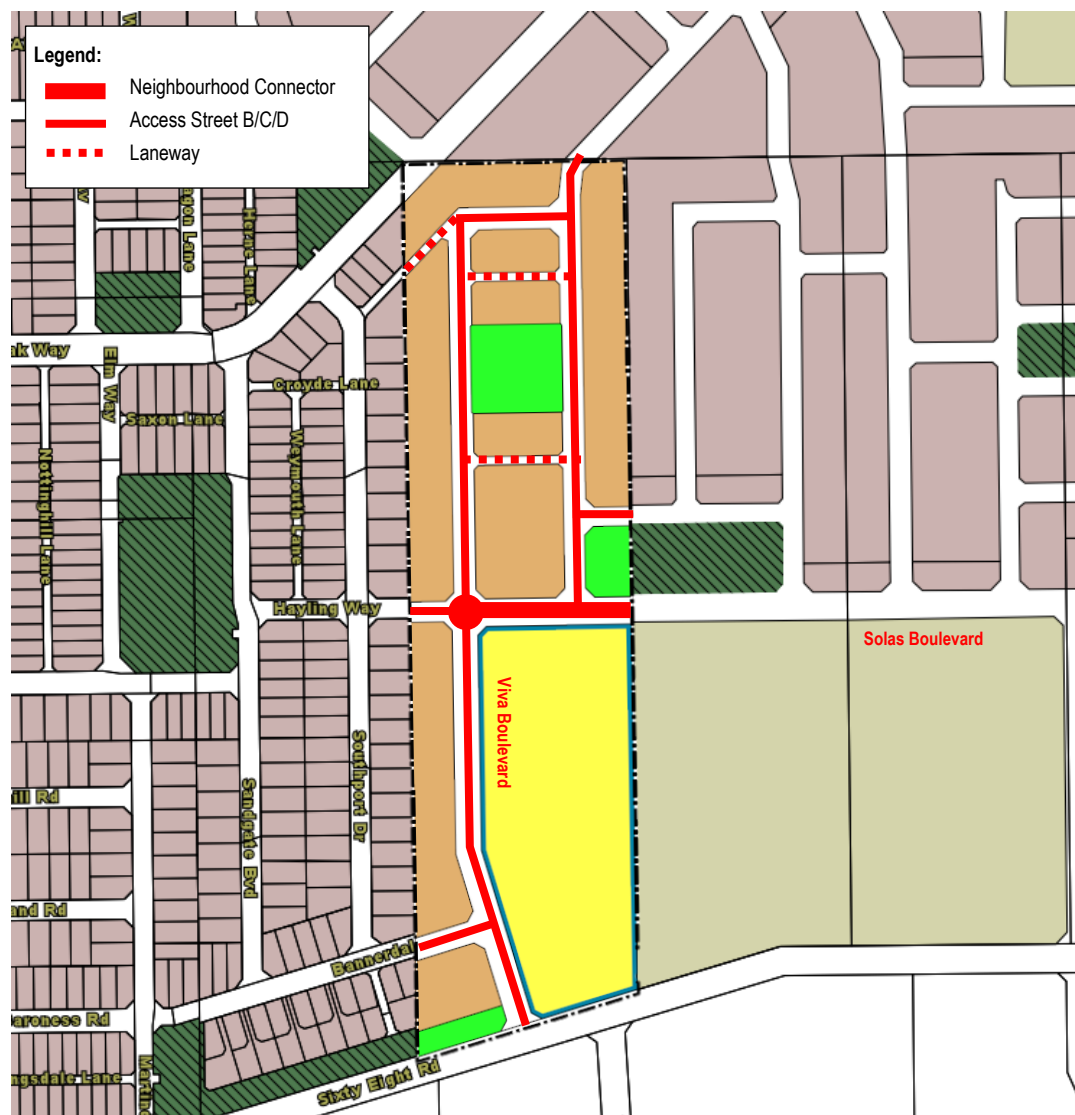


Figure 6: Proposed Road Layout and Reserve Widths

Indicative road cross sections in accordance with WAPC *Liveable Neighbourhood* guidelines are as shown in Figure 7 to Figure 11. It is noted that

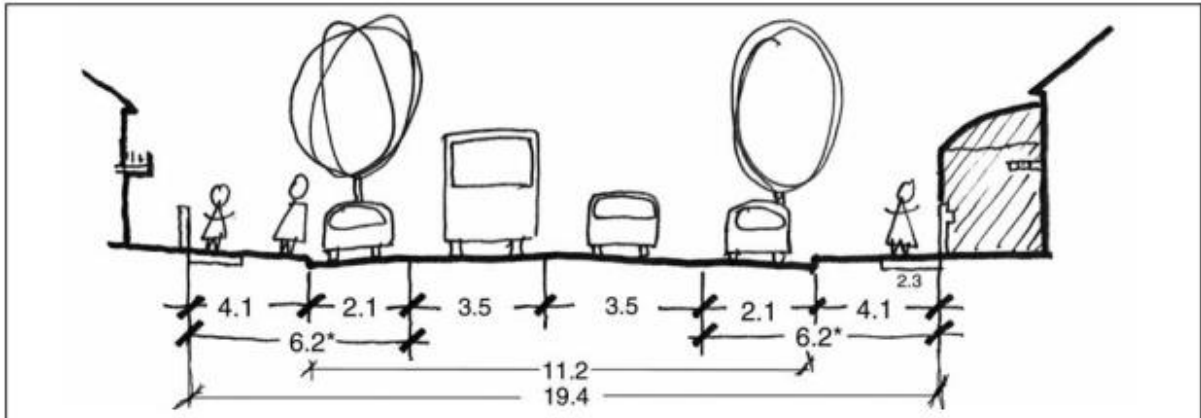


Figure 7: Typical Neighbourhood Connector B (Liveable Neighbourhoods)

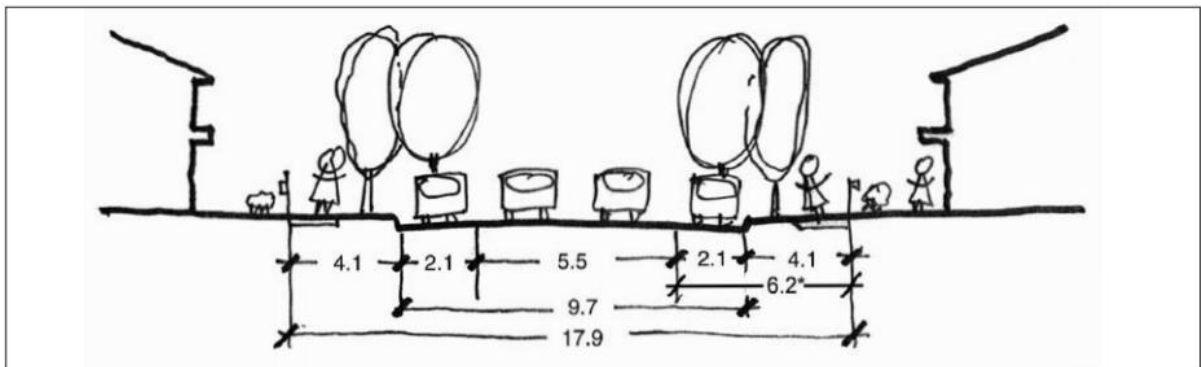


Figure 8: Typical Access Street B (Liveable Neighbourhoods)

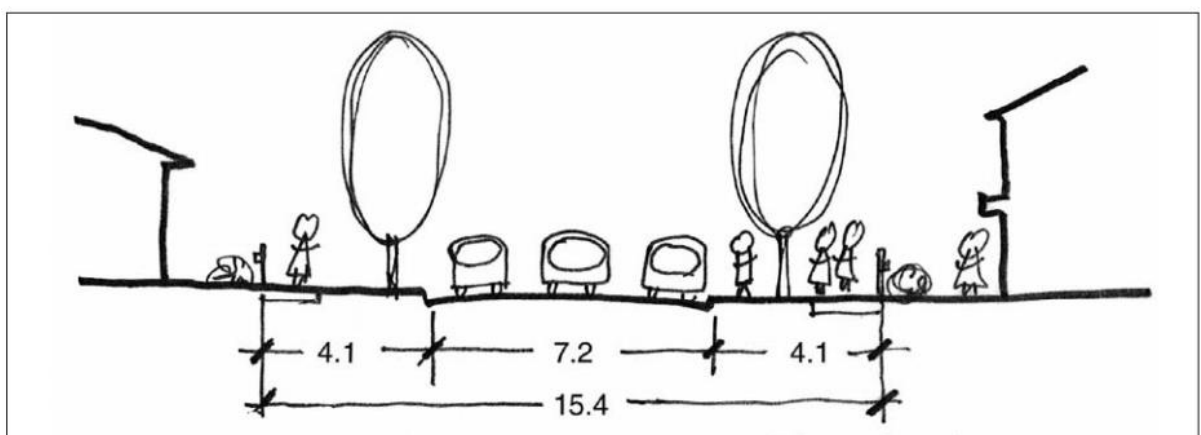


Figure 9: Typical Access Street C (Liveable Neighbourhoods)

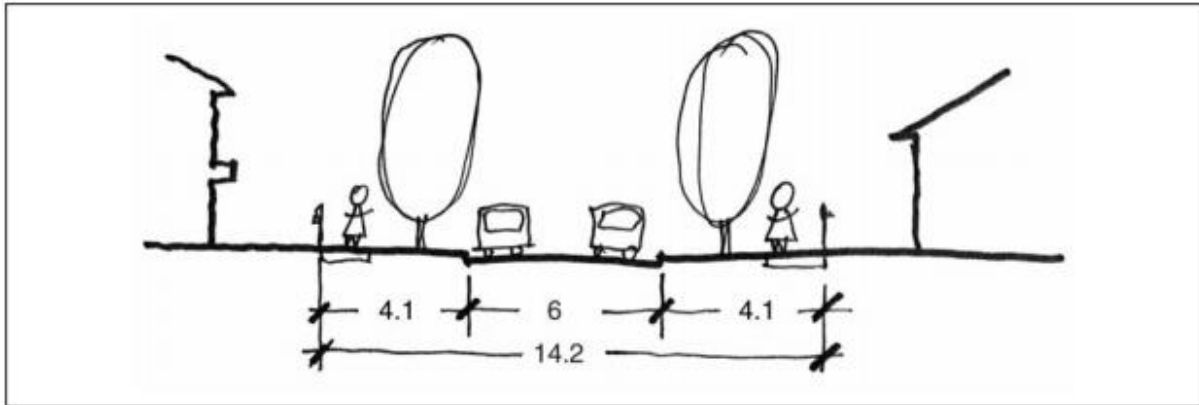


Figure 10: Typical Access Street D (Liveable Neighbourhoods)

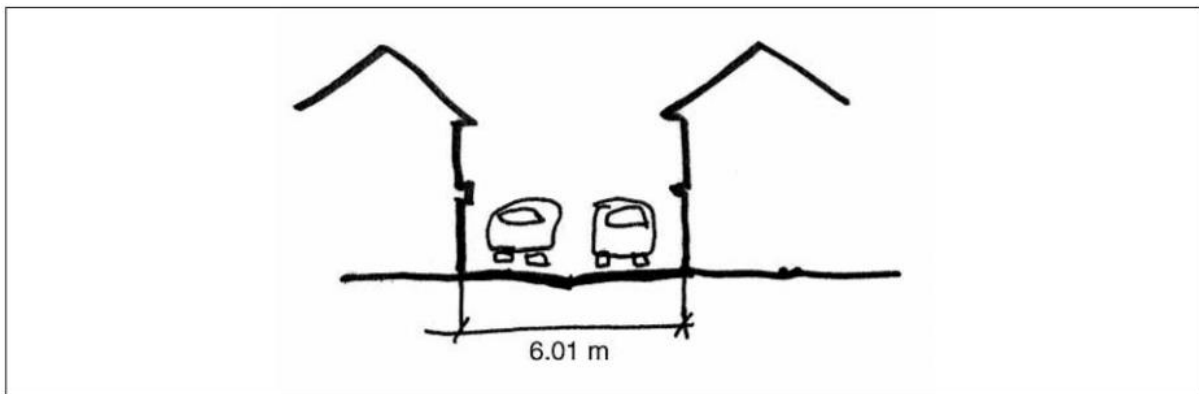


Figure 11: Typical Laneway (Liveable Neighbourhoods)

There are no confirmed public transport routes within the LSP area. It is likely that public transport services may be extended or added along the *Neighbourhood Connector* road as part of the development of the school and the surrounding residential developments.

5. Changes to External Transport Networks

The transport network in South Baldvis is partially complete as the surrounding urban development is ongoing. The road network will gradually be completed as the surrounding areas are developed.

Structure Plans for Lot 20 Sixty Eight Road and Brightwood Estate (Lot 21 Sixty Eight Road and Lots 569 and 1263 Baldvis Road) towards the east have been approved or are currently being prepared. The approved LSP for Brightwood Estate indicates a new east-west Neighbourhood Connector road (Solas Boulevard) along the northern boundary of the proposed school site connecting to Baldvis Road. A new north-south aligned Neighbourhood Connector road is also proposed along the eastern boundary of the school site which connects to Sixty Eight Road and Percival Road to form a new roundabout intersection. This connector road is proposed to intersect with the proposed north-south connector road in a right-left stagger configuration with a roundabout at both intersections. The proposed Local Structure Plan is shown in **Figure 12**.



Figure 12: Approved Brightwood Local Structure Plan (CLE Town Planning)

It is understood that the road reserve of Sixty Eight Road adjacent to Lot 19 Sixty Eight Road, Lot 20 Sixty Eight Road and Brightwood Estate will be widened by 2.2m to the north to 22.2m and upgraded to an urban standard as a condition of subdivision. This widening has been included as part of the structure plan.

Towards the west, Parkland Heights (Lot 1507 Eighty Road) is currently being developed. A significant change

to the transport network as part of the development is the extension of Nairn Drive through to Eighty Road and the reconfiguration of the Eight Road/Nairn Drive/Sixty Eight Road intersections. The approved LSP for Parkland Heights is shown in **Figure 13**.

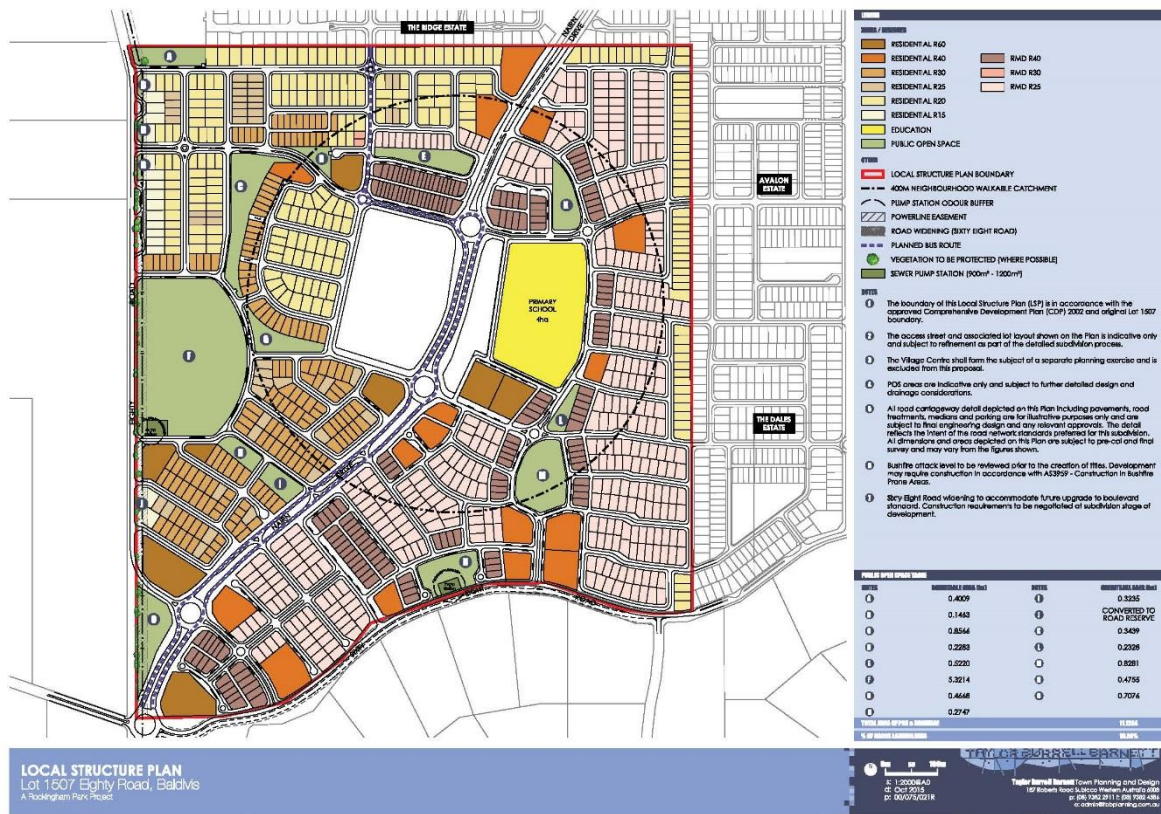


Figure 13: Approved Parkland Heights Local Structure Plan (Taylor Burrell Barnett)

The City of Rockingham Town Planning Scheme No. 2 and the Metropolitan Region Scheme also indicates the future extension of Karnup Road west of Baldivis Road to connect to Nairn Drive and Sixty Eight Road.

6. Analysis of Internal Transport Networks

6.1. Assessment Parameters

As the staging of the surrounding development is not known, the assessment has been undertaken for the period after all development within the LSP area is complete and after all development to the north of Sixty Eight Road is complete. The time periods chosen for analysis are the weekday peak AM and PM hours on the road network which were identified from traffic count data to be 8:00 to 9:00 a.m. and 3:00 to 4:00 p.m.

6.2. Structure Plan Generated Traffic

The daily traffic generation rate for residential development is 8 vehicle trips per day (vpd) per dwelling according to WAPC guidelines. The peak hour traffic generation rate is 0.8 vehicle trips per dwelling for each of the AM and PM peak hours. Based on the estimated 101 dwellings, the residential component of the LSP would generate 808 vpd and 81 vehicle trips during each of the AM and PM peak hours.

The Shawmac Transport Assessment for the proposed school estimated that at completion, the school would generate 3,190 vpd with approximately 1,595 vehicle trips during the AM and PM peak hours.

6.3. Non Structure Plan Traffic

It has been assumed based on the layout of the LSP that the road layout would attract a negligible volume through traffic.

6.4. Trip Distribution and Assignment

As the school is the major traffic generator within the LSP area, the distribution assumptions used on the Shawmac Transport Assessment has been adopted as follows:

- 85% of trips are generated from the north and west as follows:
 - 20% via Eighty Road and Sixty Eight Road;
 - 25% via Smirk Road and Sixty Eight Road;
 - 25% via Baldivis Road and Solis Boulevard;
 - 5% via Hayling Way;
 - 10% via the proposed north-south connector road and Solis Boulevard;
- 15% of trips are generated from the south and east via Karnup Road;

Figure 14 illustrates the predicted daily traffic volumes on the proposed internal road network associated with the development of the LSP.

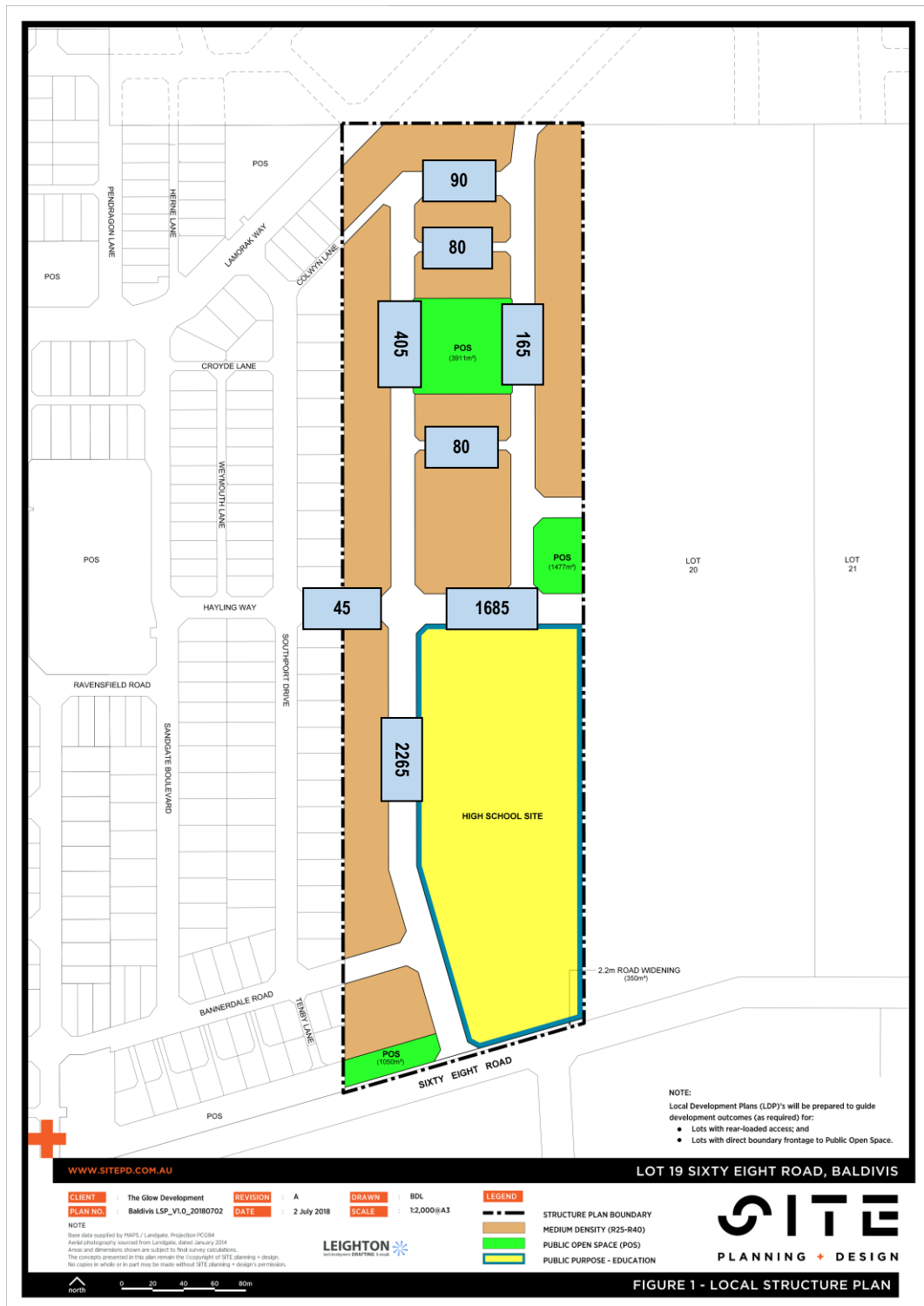


Figure 14: Predicted Daily Traffic Volumes

6.5. Intersection and Lane Treatments

The results of the traffic generation and distribution exercise indicate that all internal roads to the LSP area will carry traffic volumes well within the indicative traffic volumes associated with each road classification as per WAPC *Liveable Neighbourhoods*. The proposed intersection treatments and road hierarchy as mentioned in Section 4 of this report are considered to be appropriate to accommodate for the anticipated level of traffic. A capacity assessment of the proposed internal roundabout was included in the SIDRA assessment for the school as attached in **Appendix A**. The results of the assessment concluded that the roundabout would operate at an acceptable level during peak periods.

It is noted that two of the proposed access streets in north-west corner of the site (indicated in **Figure 15**) could be classified as Access Street D with a 14.2 metre road reserve based on the low traffic volume and relatively short length of road. This can be further considered at the subdivision stage of development.

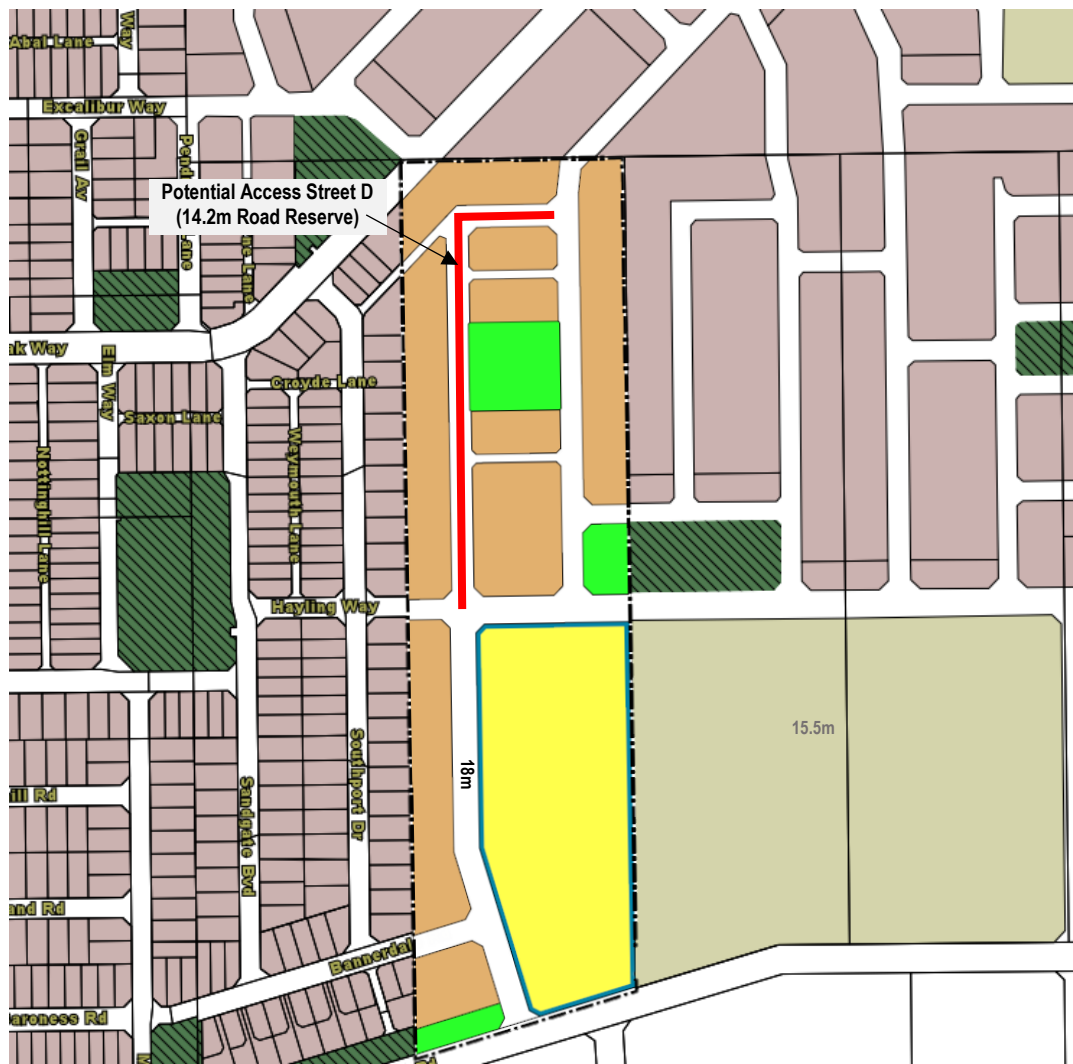


Figure 15: Potential Access Street D

Details relating to line marking, intersection control and local area traffic management measures will be addressed during the detailed subdivision design process.

6.6. Pedestrian and Cyclist Facilities

It is recommended that all internal roads are constructed with at least one footpath or shared path (minimum 1.5 metres wide) per road except for the laneways. The internal pedestrian/cyclist networks including paths, pram ramps and other crossing facilities will be confirmed during the subdivision stages.

6.7. Public Transport

The closest existing public transport service is Transperth Bus Route 565 which operates between Warnbro Station and Baldivis. The nearest bus stop is located on Sixty Eight Road approximately 400m to the west. Services are available approximately every hour with additional services during the morning and afternoon peak hours (approximately every 20 minutes) on weekdays.

Following commissioning of the school and the surrounding urban development additional local bus services may be implemented to cope with the increase in public transport demand as a result of ongoing development in the area. This will also help promote the use of public transport over private vehicle usage.

7. Analysis of External Transport Networks

7.1. Future Traffic Flows

Several transport studies for the adjacent Structure Plans have included modelling of the urban development of the South Baldivis area.

7.1.1. Uloth & Associates Assessment – Brightwood Estate

The Transport Assessment for the approved Brightwood Estate LSP to the east was prepared by Uloth and Associates in 2015 which estimated the long term traffic flows along Sixty Eight Road and the proposed internal Neighbourhood Connector Roads. The LSP map is shown in **Figure 12** of this report. The modelling including data obtained from the Main Roads Western Australia 2031 traffic forecasting model and also included full development of the area bounded by Clyde Avenue, Nairn Drive, Sixty Eight Road and Baldivis Road which includes the current LSP site and the proposed school. The model also included the potential future urban development of the area south of Sixty Eight Road as well as the extension of Karnup Road west of Baldivis Road to connect with Sixty Eight Road.

The results of the modelling indicate that Sixty Eight Road will carry a maximum of 3,370 vpd adjacent to the school site. It should be noted that the Uloth and Associates assessment underestimated the traffic generation potential of the school at 600 vpd as the design population of the school was not known. With the updated school traffic generation estimate (3,190 vpd), the future maximum traffic volume on Sixty Eight Road adjacent to LSP and school site is estimated to be 3,760 vpd.

7.1.2. Transcore Assessment – Parkland Heights

Transcore prepared the Transport Assessment for Parkland Heights (Lot 1507 Eighty Road) towards the west in 2011. The LSP map is shown in **Figure 13** of this report. A subsequent report *Nairn Drive Access Strategy* was prepared in 2012 with an updated traffic forecast model. The traffic model in this assessment made allowance for the future urban development in other parts of Baldivis and Karnup south as envisaged by WAPC *Directions 2031 and Beyond* and also included the potential future urban development south of Sixty Eight Road.

The future maximum traffic volume along Eighty Road was estimated to be 7,200 vpd north of Sixty Eight Road. The future maximum traffic volume along Sixty Eight Road was estimated to be 8,100 vpd between Eighty Road and Wandoo Drive.

The future traffic flows on the surrounding road network after completion of surrounding development as modelled by the two assessments are as shown in **Figure 16**.

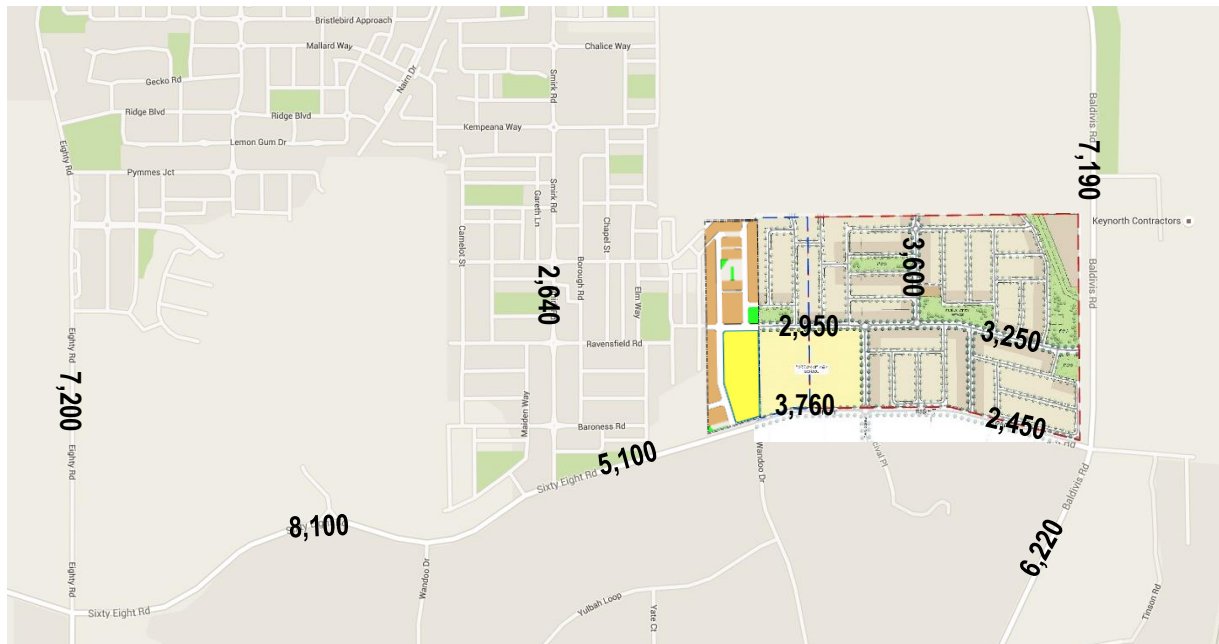


Figure 16: Future Daily Traffic Flows (Ultimate Development)

7.2. Roads and Intersections

7.2.1. Roads

After future urban development of the surrounding areas north and south of Sixty Eight Road, the estimated traffic volume of Sixty Eight Road is estimated to be a maximum of 8,100 vpd east of Baldy Road, 3,760 vpd adjacent to the LSP and school site and 2,450 vpd west of Baldy Road. It is therefore appropriate that Sixty Eight Road is classified as a Neighbourhood Connector A road and the road cross section upgraded to a dual carriageway as per Figure 17 of WAPC *Liveable Neighbourhoods* guidelines and as shown in **Figure 17** below.

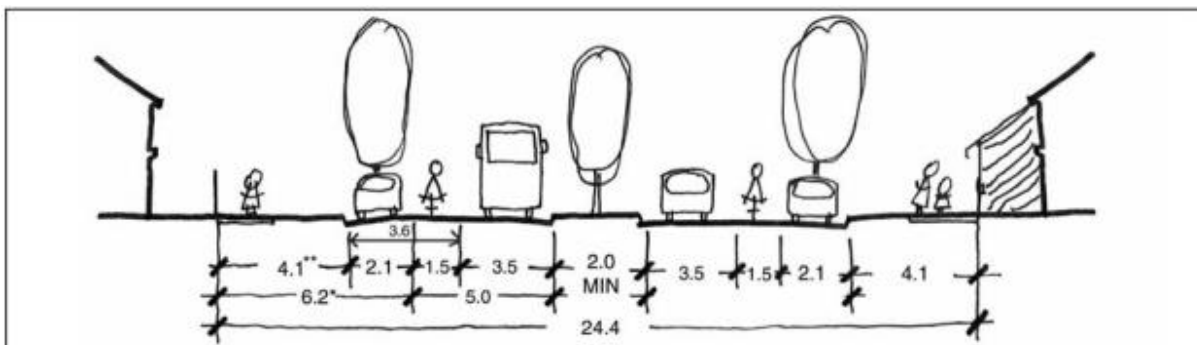


Figure 17: Typical Neighbourhood Connector A (Liveable Neighbourhoods)

The LSP includes the proposed 2.2m widening of the reserve on the north side of Sixty Eight Road to allow for the proposed widening.

7.2.2. Intersections

The future operation of the two key intersection along the western boundary of the school was assessed using SIDRA Intersection 8.0 software as part of the South Baldivis Secondary School Transport Assessment in June 2018. The assessment modelled the peak hour operation of these intersections and school accesses taking into account the ultimate development of the school and the development of the surrounding areas including Lot 19 Sixty Eight Road. The assessment is provided in **Appendix A**. The assessment indicates that all intersections and school crossovers are expected to perform within capacity with an average Level of Service (LOS) A predicted at all locations.

8. Summary and Conclusions

Shawmac has prepared a Transport Impact Assessment for the proposed Local Structure Plan (LSP) of Lot 19 Sixty Eight Road, Baldivis, in the City of Rockingham.

The aim of this exercise was to establish the anticipated traffic volumes which would be generated from the development of the LSP in order to quantify the effect that the additional traffic has on the proposed internal road network and the external road network.

The proposed internal transport network with regards to road types and intersection control are considered to be adequate to accommodate the internal traffic flows. Details relating to line marking, intersection control and local area traffic management measures will be addressed during the detailed subdivision design process. The proposed internal pedestrian/cyclist network is also to be confirmed during the subdivision stage. It has been recommended that minimum of one footpath or shared path is provided along all internal roads except for the footpaths.



Appendix A: South Baldivis Secondary School – SIDRA Assessment

Subject:	South Baldvis Secondary School – SIDRA Assessment		
Date:	11 th June 2018		
Author:	Paul Nguyen	Reviewer:	Leigh Dawson
Client:	Building Management and Works, Department of Finance		

The City of Rockingham have requested a SIDRA assessment of the proposed roundabout in the north-west corner of the South Baldvis Secondary School. The Transport Impact Assessment for stage 1 development of the school (last updated in July 2016) had previously only assessed the Sixty Eight Road / Baldvis Road intersection and the intersection in the south-west corner of the school (Sixty Eight Road / Viva Boulevard).

The two intersections along the western boundary and the four proposed school crossovers have been remodelled in SIDRA Intersection 8.0 as a network to confirm that the road network has adequate capacity to accommodate development traffic flows. The modelled locations are shown in **Figure 1**.

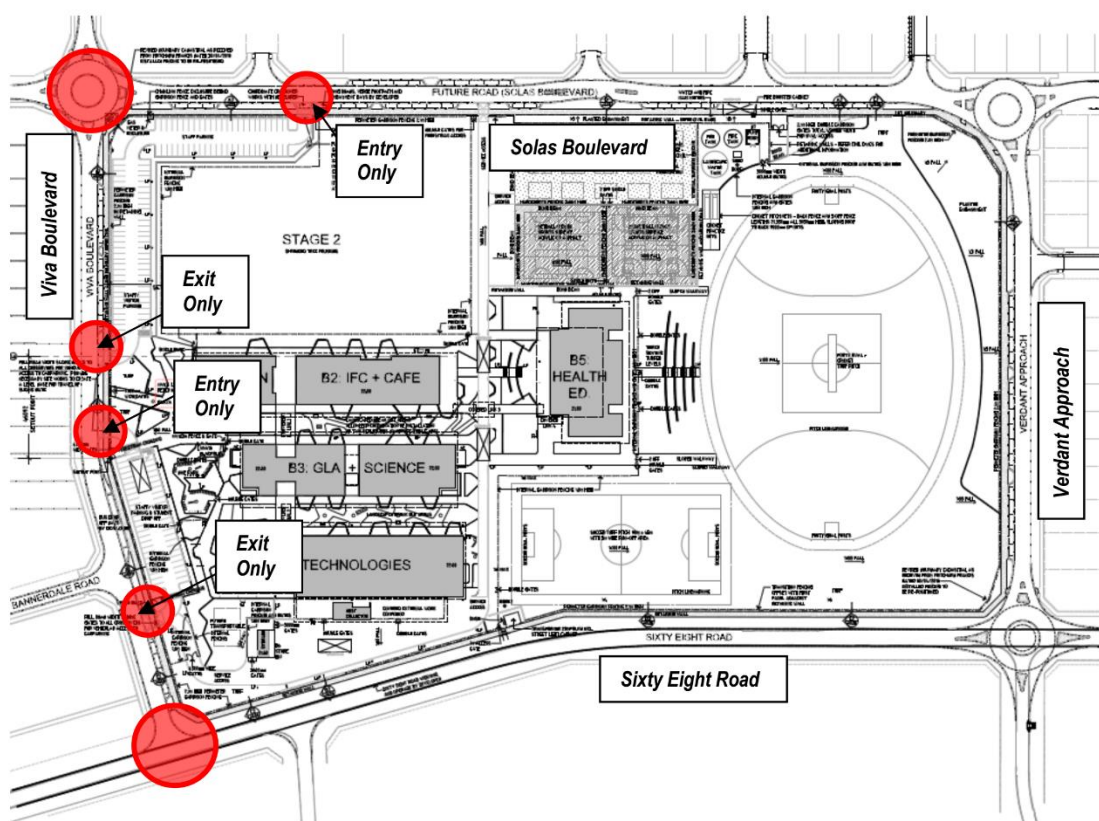


Figure 1: Intersections Modelled

The base traffic flows (taking into account development of the surrounding areas) and the Stage 2 school traffic generation flows generated in the original transport assessment were used. It has been assumed that in Stage 2, the existing car park along Solas Boulevard would be extended east and the crossover also relocated to the east. The morning peak hour base and school traffic flows are summarised in **Figure 2**.

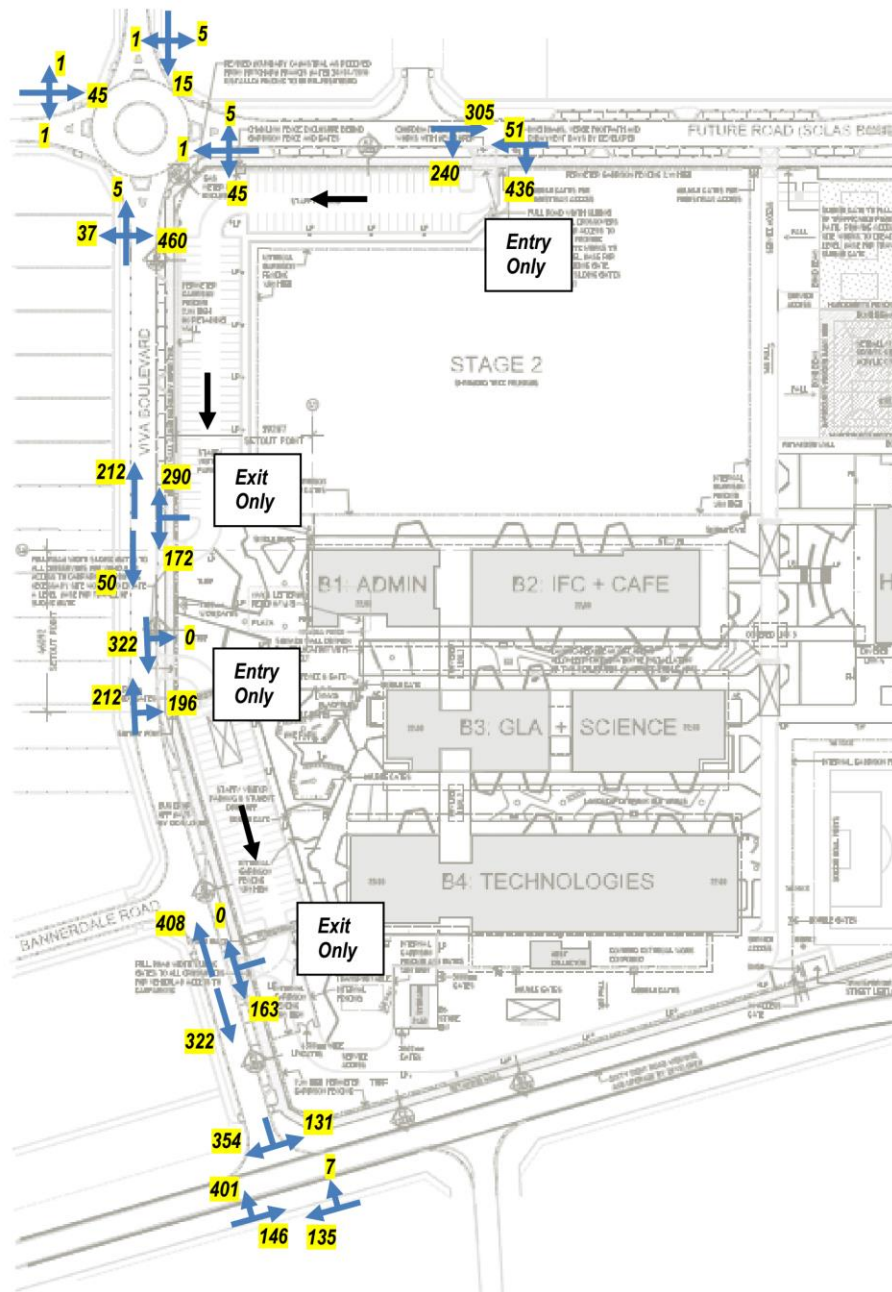


Figure 2: Peak Hour Traffic Flows – Stage 2 Development

The results of the assessment are shown in the **Figure 3** to **Figure 10**. The results indicate that all intersection and crossovers are expected to perform within capacity with an average Level of Service (LOS) A predicted at all locations.

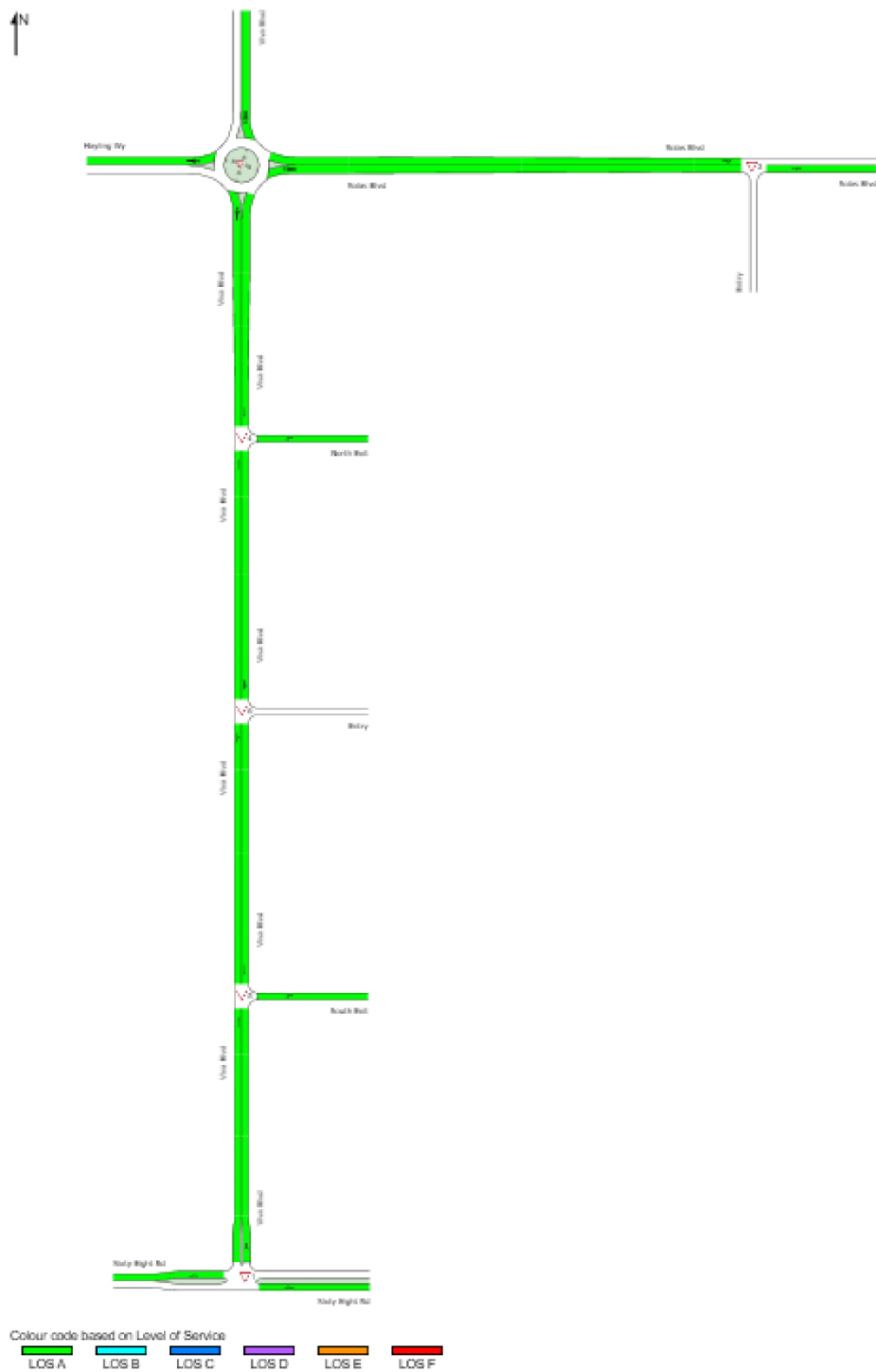


Figure 3: SIDRA Results – Network Level of Service

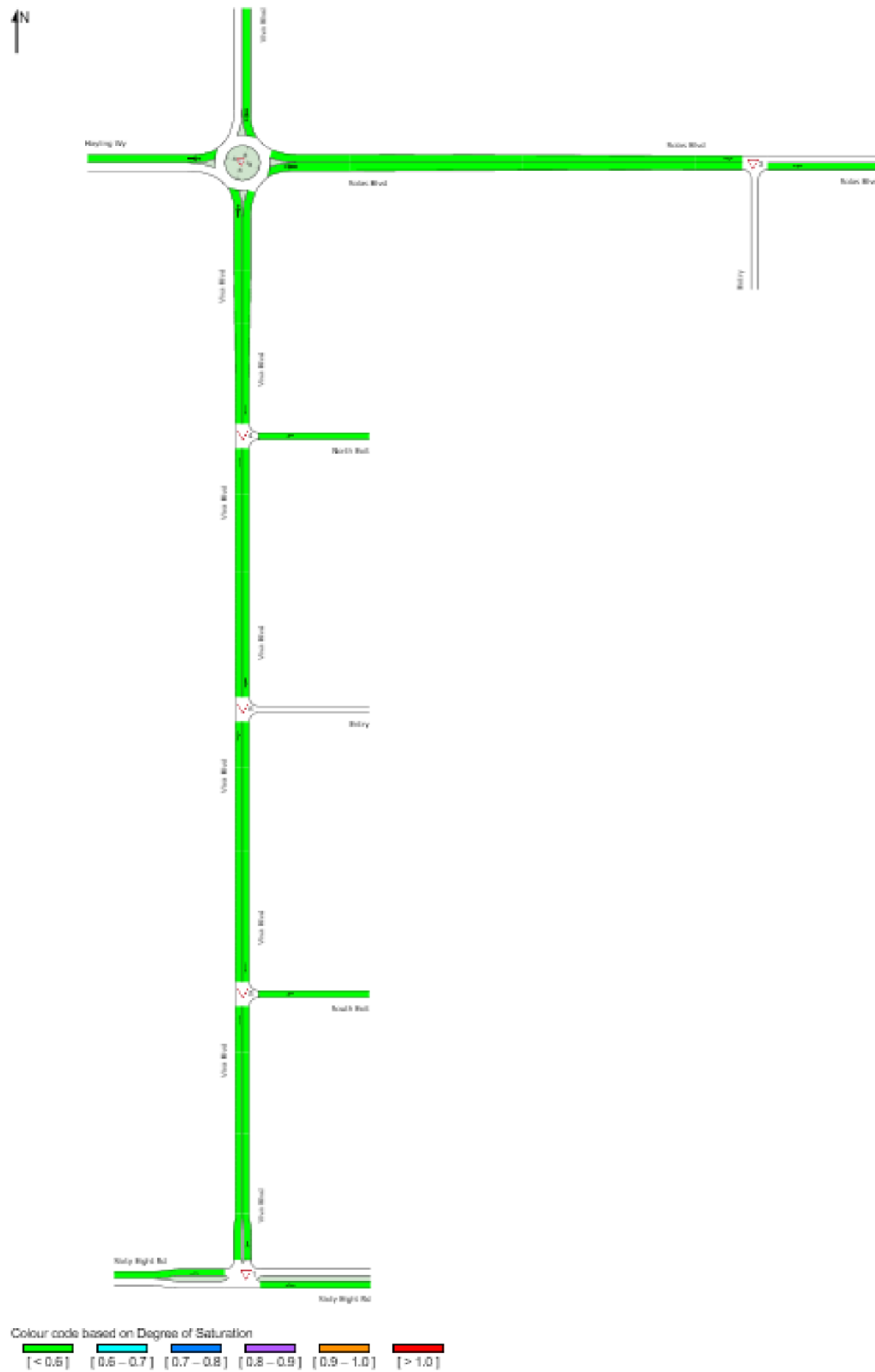


Figure 4: SIDRA Results – Network Degree of Saturation

MOVEMENT SUMMARY

Site: 1 [Sixty Eight Rd - Viva Blvd]

Network: N101 [Network1]

Sixty Eight Road - Viva Road

Site Category: -

Giveaway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	Arrival Flows HV	Arrival Flows Total	Arrival Flows HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Sixty Eight Rd														
5	T1	135	8.4	135	8.4	0.077	0.1	LOS A	0.0	0.2	0.07	0.03	0.07	39.8
6	R2	7	0.0	7	0.0	0.077	5.3	LOS A	0.0	0.2	0.07	0.03	0.07	39.6
Approach		142	8.0	142	8.0	0.077	0.4	NA	0.0	0.2	0.07	0.03	0.07	39.8
North: Viva Blvd														
7	L2	131	0.0	131	0.0	0.312	3.8	LOS A	0.5	3.2	0.28	0.56	0.28	37.1
9	R2	354	0.0	354	0.0	0.312	4.0	LOS A	0.5	3.2	0.28	0.56	0.28	36.6
Approach		485	0.0	485	0.0	0.312	4.0	LOS A	0.5	3.2	0.28	0.56	0.28	36.7
West: Sixty Eight Rd														
10	L2	401	0.0	401	0.0	0.292	3.4	LOS A	0.0	0.0	0.00	0.34	0.00	37.9
11	T1	146	8.4	146	8.4	0.292	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	38.9
Approach		547	2.2	547	2.2	0.292	2.5	NA	0.0	0.0	0.00	0.34	0.00	38.3
All Vehicles		1174	2.0	1174	2.0	0.312	2.9	NA	0.5	3.2	0.12	0.39	0.12	38.0

Figure 5: SIDRA Results – Sixty Eight Road / Viva Boulevard – Movement Summary

MOVEMENT SUMMARY

 Site: 2 [Viva Blvd - Hayling Way - Solas Blvd]

 Network: N101 [Network1]

Viva Blvd - Hayling Way - Solas Blvd

Site Category: -

Roundabout

Movement Performance - Vehicles														
Mov ID	Turn	Demand Total	Flows HV	Arrival Total	Flows HV	Deg. Satn	Average Delay	Level of Service	Aver. Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Viva Blvd														
1	L2	37	0.0	37	0.0	0.306	2.8	LOS A	0.8	5.3	0.06	0.56	0.06	29.7
2	T1	5	0.0	5	0.0	0.306	2.4	LOS A	0.8	5.3	0.06	0.56	0.06	36.0
3	R2	460	0.0	460	0.0	0.306	5.5	LOS A	0.8	5.3	0.06	0.56	0.06	27.1
Approach		502	0.0	502	0.0	0.306	5.2	LOS A	0.8	5.3	0.06	0.56	0.06	27.6
East: Solas Blvd														
4	L2	45	0.0	45	0.0	0.037	2.8	LOS A	0.1	0.6	0.10	0.42	0.10	28.4
5	T1	1	0.0	1	0.0	0.037	2.5	LOS A	0.1	0.6	0.10	0.42	0.10	34.4
6	R2	5	0.0	5	0.0	0.037	5.5	LOS A	0.1	0.6	0.10	0.42	0.10	37.6
Approach		51	0.0	51	0.0	0.037	3.1	LOS A	0.1	0.6	0.10	0.42	0.10	30.8
North: Viva Blvd														
7	L2	5	0.0	5	0.0	0.024	5.4	LOS A	0.0	0.3	0.54	0.53	0.54	33.4
8	T1	15	0.0	15	0.0	0.024	5.0	LOS A	0.0	0.3	0.54	0.53	0.54	33.4
9	R2	1	0.0	1	0.0	0.024	8.1	LOS A	0.0	0.3	0.54	0.53	0.54	30.6
Approach		21	0.0	21	0.0	0.024	5.3	LOS A	0.0	0.3	0.54	0.53	0.54	33.3
West: Hayling Wy														
10	L2	1	0.0	1	0.0	0.053	5.3	LOS A	0.1	0.7	0.53	0.53	0.53	34.4
11	T1	45	0.0	45	0.0	0.053	4.9	LOS A	0.1	0.7	0.53	0.53	0.53	22.2
12	R2	1	0.0	1	0.0	0.053	7.9	LOS A	0.1	0.7	0.53	0.53	0.53	22.2
Approach		47	0.0	47	0.0	0.053	5.0	LOS A	0.1	0.7	0.53	0.53	0.53	23.0
All Vehicles		621	0.0	621	0.0	0.306	5.0	LOS A	0.8	5.3	0.11	0.54	0.11	27.9

Figure 6: SIDRA Results – Viva Boulevard / Solas Boulevard / Hayling Way – Movement Summary

MOVEMENT SUMMARY

Site: 3 [Solus Blvd - Entry]

Network: N101 [Network1]

Solas Blvd - Entry
Site Category: (None)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Solas Blvd														
4	L2	436	0.0	436	0.0	0.258	3.4	LOS A	0.0	0.0	0.00	0.41	0.00	37.1
5	T1	51	0.0	51	0.0	0.258	0.0	LOS A	0.0	0.0	0.00	0.41	0.00	37.5
Approach		487	0.0	487	0.0	0.258	3.1	NA	0.0	0.0	0.00	0.41	0.00	37.1
West: Solas Blvd														
11	T1	305	0.0	305	0.0	0.314	1.3	LOS A	0.7	5.1	0.51	0.30	0.51	37.5
12	R2	240	0.0	240	0.0	0.314	5.6	LOS A	0.7	5.1	0.51	0.30	0.51	26.9
Approach		545	0.0	545	0.0	0.314	3.2	NA	0.7	5.1	0.51	0.30	0.51	35.9
All Vehicles		1032	0.0	1032	0.0	0.314	3.2	NA	0.7	5.1	0.27	0.35	0.27	36.6

Figure 7: SIDRA Results – Solas Boulevard Entry Crossover – Movement Summary

MOVEMENT SUMMARY

Site: 6 [Viva Blvd - Entry]

Network: N101 [Network1]

Viva Blvd - Entry
Site Category: (None)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Back of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Viva Blvd														
11	T1	212	0.0	212	0.0	0.218	0.7	LOS A	0.5	3.2	0.40	0.28	0.40	28.6
12	R2	196	0.0	196	0.0	0.218	4.8	LOS A	0.5	3.2	0.40	0.28	0.40	27.4
Approach		408	0.0	408	0.0	0.218	2.7	NA	0.5	3.2	0.40	0.28	0.40	28.0
North: Viva Blvd														
4	L2	1	0.0	1	0.0	0.164	2.9	LOS A	0.0	0.0	0.00	0.00	0.00	15.5
5	T1	322	0.0	322	0.0	0.164	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	39.9
Approach		323	0.0	323	0.0	0.164	0.0	NA	0.0	0.0	0.00	0.00	0.00	39.7
All Vehicles		731	0.0	731	0.0	0.218	1.5	NA	0.5	3.2	0.22	0.16	0.22	30.4

Figure 8: SIDRA Results – Viva Boulevard Entry Crossover – Movement Summary

MOVEMENT SUMMARY

Site: 4 [Viva Blvd - North Exit]

Network: N101 [Network1]

Viva Blvd - North Exit
Site Category: (None)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Viva Blvd														
11	T1	212	0.0	212	0.0	0.108	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		212	0.0	212	0.0	0.108	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
East: North Exit														
1	L2	272	0.0	272	0.0	0.335	2.0	LOS A	0.6	4.1	0.14	0.46	0.14	19.2
3	R2	290	0.0	290	0.0	0.335	2.3	LOS A	0.6	4.1	0.14	0.46	0.14	19.2
Approach		562	0.0	562	0.0	0.335	2.2	LOS A	0.6	4.1	0.14	0.46	0.14	19.2
North: Viva Blvd														
5	T1	50	0.0	50	0.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		50	0.0	50	0.0	0.025	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		824	0.0	824	0.0	0.335	1.5	NA	0.6	4.1	0.10	0.32	0.10	26.7

Figure 9: SIDRA Results – Viva Boulevard North Exit Crossover – Movement Summary

MOVEMENT SUMMARY

Site: 5 [Viva Blvd - South Exit]

Network: N101 [Network1]

Viva Blvd - South Exit
Site Category: (None)
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	Aver. Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Viva Blvd														
11	T1	408	0.0	408	0.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		408	0.0	408	0.0	0.207	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
East: South Exit														
1	L2	163	0.0	163	0.0	0.134	3.0	LOS A	0.2	1.6	0.39	0.54	0.39	17.3
3	R2	1	0.0	1	0.0	0.134	2.9	LOS A	0.2	1.6	0.39	0.54	0.39	17.3
Approach		164	0.0	164	0.0	0.134	3.0	LOS A	0.2	1.6	0.39	0.54	0.39	17.3
North: Viva Blvd														
5	T1	322	0.0	322	0.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		322	0.0	322	0.0	0.163	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		894	0.0	894	0.0	0.207	0.6	NA	0.2	1.6	0.07	0.10	0.07	36.3

Figure 10: SIDRA Results – Viva Boulevard South Exit Crossover – Movement Summary

In addition, a sensitivity analysis has been undertaken where traffic flows are increased until the network 'capacity' is reached where the degree of saturation reaches 0.9. The analysis showed that the input flows could increase to 194% before reaching 'capacity' as shown in **Figure 11**.

NETWORK GRAPHS - Flow Scale Analysis

Average control delay per vehicle for the worst vehicle movement (seconds) and Highest degree of saturation in any lane
Results for Network (Vehicles)

Network: N101 [Network1]

New Network
Network Category: (None)

Flow Scale Analysis (Practical Capacity): Results for Flow Scale (chosen as largest for any movement) = 194.0 %

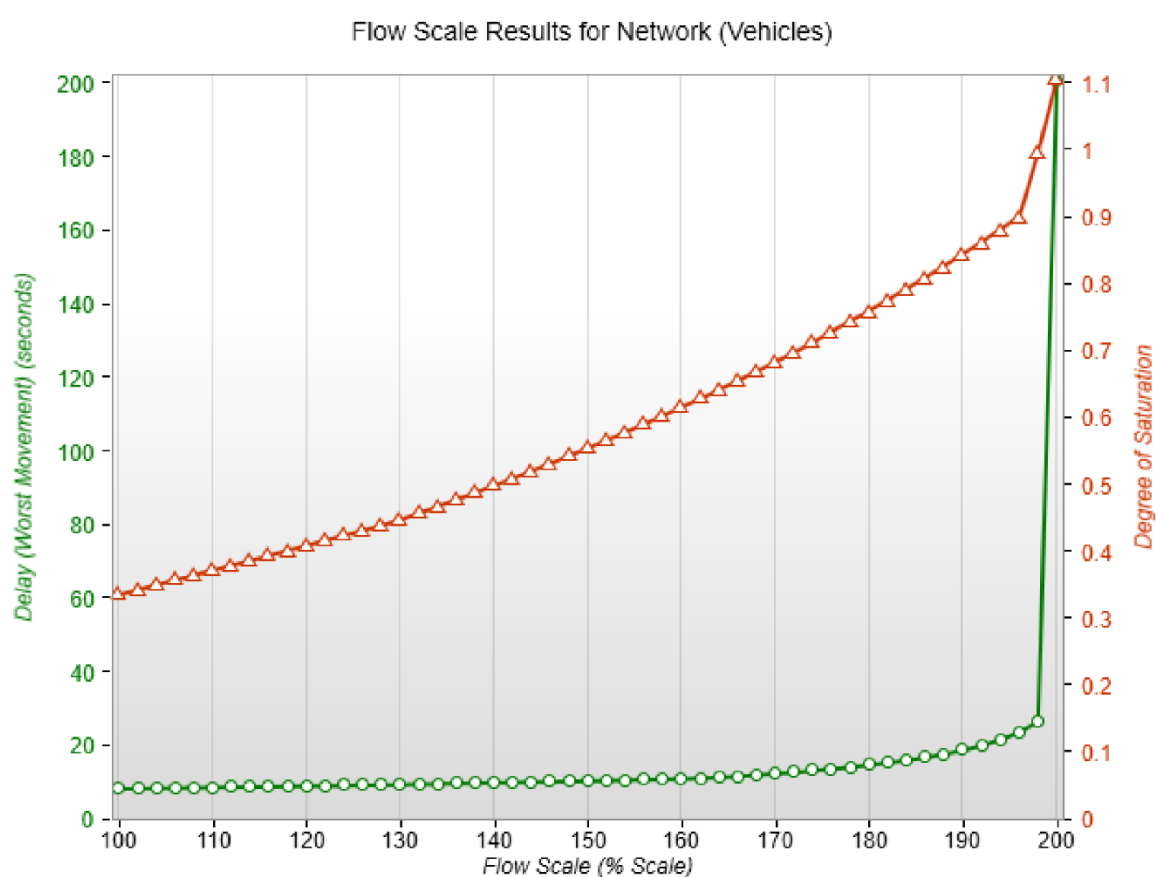


Figure 11: SIDRA Results – Sensitivity Analysis

