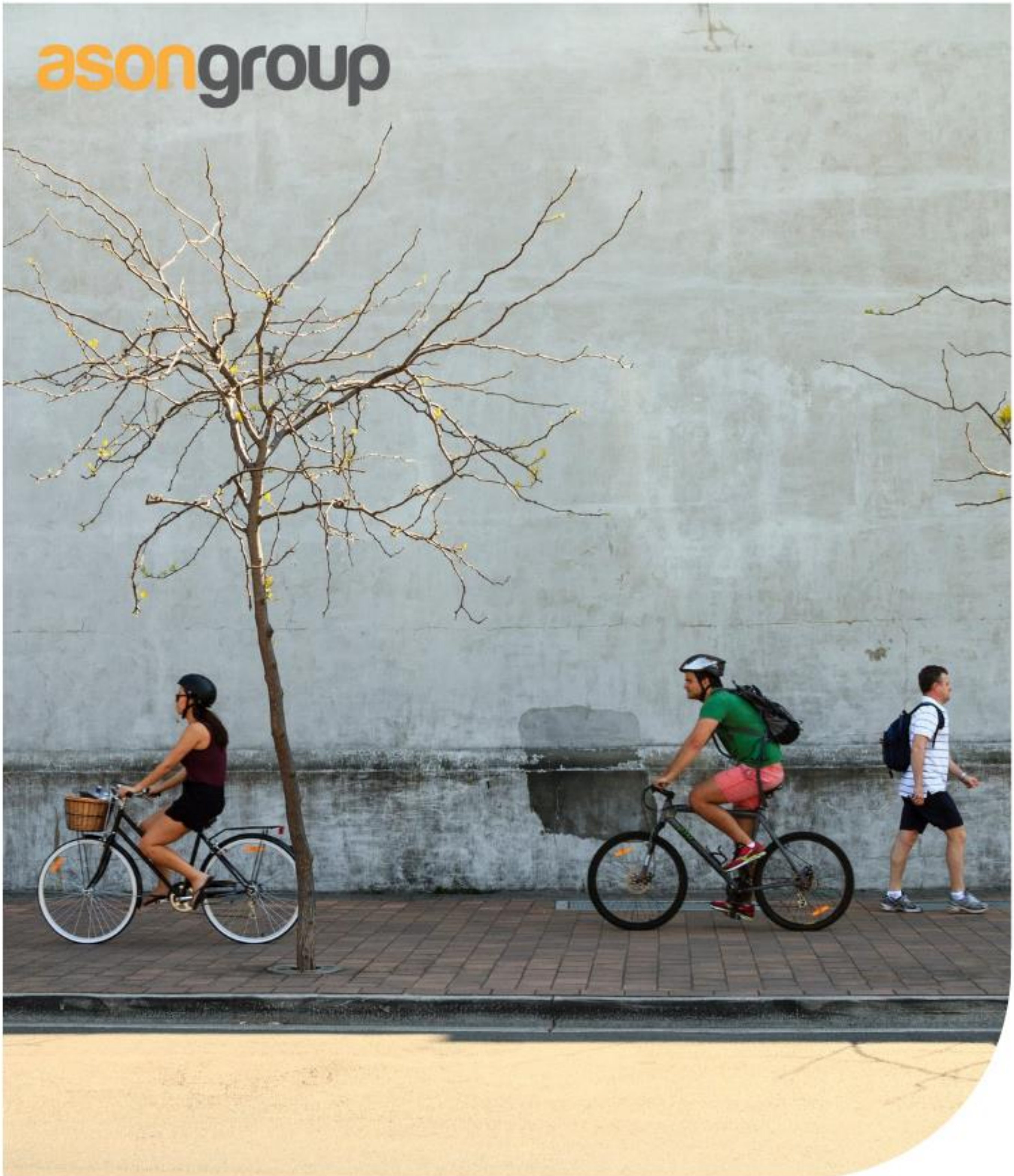

TRANSPORT STATEMENT

Residential Subdivision Development Application

14 John Potts Drive, Junee
12/09/2023
P2330r01v1

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Document Control

Project No	P2330
Project	14 John Potts Drive, Junee – Proposed Residential Subdivision
Client	TJHRR Pty Ltd
File Reference	P2330r01v1 Subdivision DA TS_14 John Potts Dr, Junee

Revision History

Revision No.	Date	Details	Author	Approved by
-	20/07/2023	Draft	N Kim T. Lewis	T. Lewis
01	12/09/2023	Issue	S. Bandaranayake	-

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Glossary

Acronym	Description
AGRD	Austroads Guide to Road Design
AGTM	Austroads Guide to Traffic Management
CC	Construction Certificate
Council	Junee Shire Council
DA	Development Application
DCP	Development Control Plan
DoS	Degree of Saturation
DPIE	Department of Planning, Industry and Environment
FSR	Floor space ratio
GFA	Gross Floor Area
HRV	Heavy Rigid Vehicle (as defined by AS2890.2:2018)
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
MOD	Section 4.55 Modification (also referred as a S4.55)
MRV	Medium Rigid Vehicle (as defined by AS2890.2:2018)
NHVR	National Heavy Vehicle Regulator
OC	Occupation Certificate
RMS Guide	Transport for NSW (formerly Roads and Traffic Authority), Guide to Traffic Generating Developments, 2002
S4.55	Section 4.55 Modification (also referenced as MOD)
S96	Section 96 Modification (former process terminology for a S4.55)
SRV	Small Rigid Vehicle (as defined by AS2890.2:2018)
TDT 2013/04a	TfNSW Technical Direction, Guide to Traffic Generating Developments – Updated traffic surveys, August 2013
TfNSW	Transport for New South Wales
TIA	Transport Impact Assessment
TIS	Transport Impact Statement
veh/hr	Vehicle movements per hour (1 vehicle in & out = 2 movements)

1 Introduction

1.1 Study Purpose

Ason Group has been engaged to prepare a Transport Impact Statement (TIS) in relation to the proposed subdivision of the land at 14 John Potts Drive, Junee (Site). The Site is located within the Junee Shire Council (Council) Local Government Area.

Figure 1: Site Location

1.2 Summary of Proposed Development

1.2.1 On Lot Works

The proposed subdivision envisages a total of 44 Torrens title residential lots (43 lots within the main site accessed via Kitchener Street as shown below, plus 1 x lot within John Potts Drive), including new roads, footpath and other associated infrastructure. A reduced copy of the subdivision plan is provided below for context.

Figure 2: Proposed Subdivision Layout

1.3 Consultation

Council officers provided initial comments on 01 March 2023 which included a requirement for the following:

Traffic Engineering Report prepared by a qualified traffic consultant is to be provided – Report to include projected traffic volumes and impacts on the surrounding street network. Where adverse impacts are identified traffic mitigation measures shall be provided.

This Transport Statement is in response to the above.

Further to the above, an on-site meeting was held on 21 June 2023 with Council officers which has also informed this assessment. From discussions, it was noted:

- There is limited development or other infrastructure planned in the area that would impact the development.
- Noting size of development, the traffic assessment could be of a localised nature, with network performance analysis limited to the intersection of Anzac Avenue / John Potts Drive.
- Council would like to see road design with:
  - 20m road reserve, including 9m sealed carriageway to allow for some on-street parking (i.e. for visitors etc.) in addition to general circulation.
  - Footpath provided on one side of the road (generally the high side)
  - Further consideration regarding the tie-in of the proposed internal roads with the existing Anzac Avenue / Kitchener Street intersection.

- Any access proposal would need to:
  - maintain access to the pedestrian walkway to Pike Place
  - take into consideration the existing School Zone in Kitchener Street and Anzac Avenue

1.4 Scope of Assessment

1.4.1 Study Area

Having regard for the above, this assessment is limited to traffic impacts of the development with the study area of relevant to this assessment determined to include John Potts Drive, Anzac Avenue and Kitchener Street.

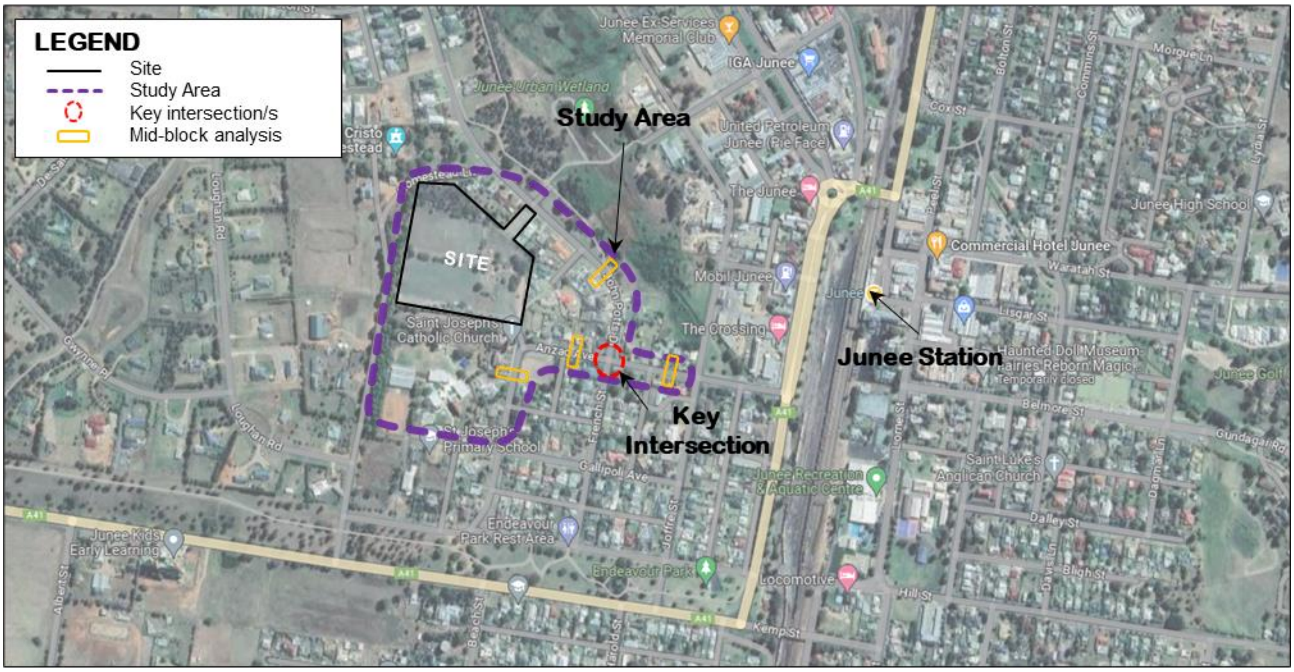

Figure 3: Study Area

1.4.2 Limitations

It does not include:

- Assessment of construction traffic — if required, a detailed Construction Traffic Management Plan can be prepared once further detail regarding staging and construction methods are known. This can be conditioned to be provided following development consent and prior to issue of a Construction Certificate.
- Road design — refer to the civil engineering plans prepared by Lance Ryan Consulting Engineers Pty Ltd for details regarding road design.
- Road Safety Audit — a separate Road Safety Audit (RSA) has been commissioned by the Applicant, a copy of which is included in Appendix A.

- Road Safety Audit Recommendations — separate Road Safety Audit Recommendations (RSAR) have been commission by the Applicant, a copy of which is included in Appendix B.
- Safe Systems Assessment — a separate Safe Systems Assessment (SSA) has been commissioned by the Applicant, a copy of which is included in Appendix C.

2 Existing Conditions

2.1 Land-use

The subject site is located within an RU5 Village zone. It was historically part of the St Joseph's Church site prior to subdivision. At the time of sale, the main site – with access from Kitchener Street – was amalgamated with the smaller parcel with frontages to John Potts Drive. The St Joseph's Church and Primary School are located to the south of the site.

The Monte Cristo historic homestead is located to the north, along with other Torrens title residential blocks a result of an earlier Council subdivision. Beyond that, lies the Junee Hospital approximately 500 metres to the north.

Junee Public School and High School are located approximately 800m to the east and 1.2 kilometres respectively.

Further to the west is R5 Large Lot Residential zoned land; however the land immediately to the west is also zoned RU5 Village.

2.2 Public Transport

Available public transport services are shown in the figure below. 62.1%[1] of Junee residents work locally within The Shire. However, a significant number (34.2%) work elsewhere; the majority of which (27.5%) work within the Wagga Wagga LGA. As such, connectivity to Wagga Wagga is important.

It is noted that school bus services are additional to these services available to the general public. School bus services pick-up/set-down occur from the western side of Kitchener Street, south of Anzac Avenue. However, given proximity of the site to nearby public schools (all within active transport accessible distance), it is not expected that any use of school bus services would be required for future residents.

[1] Based on ABS Census of Population and Housing 2021, sourced from .idcommunity

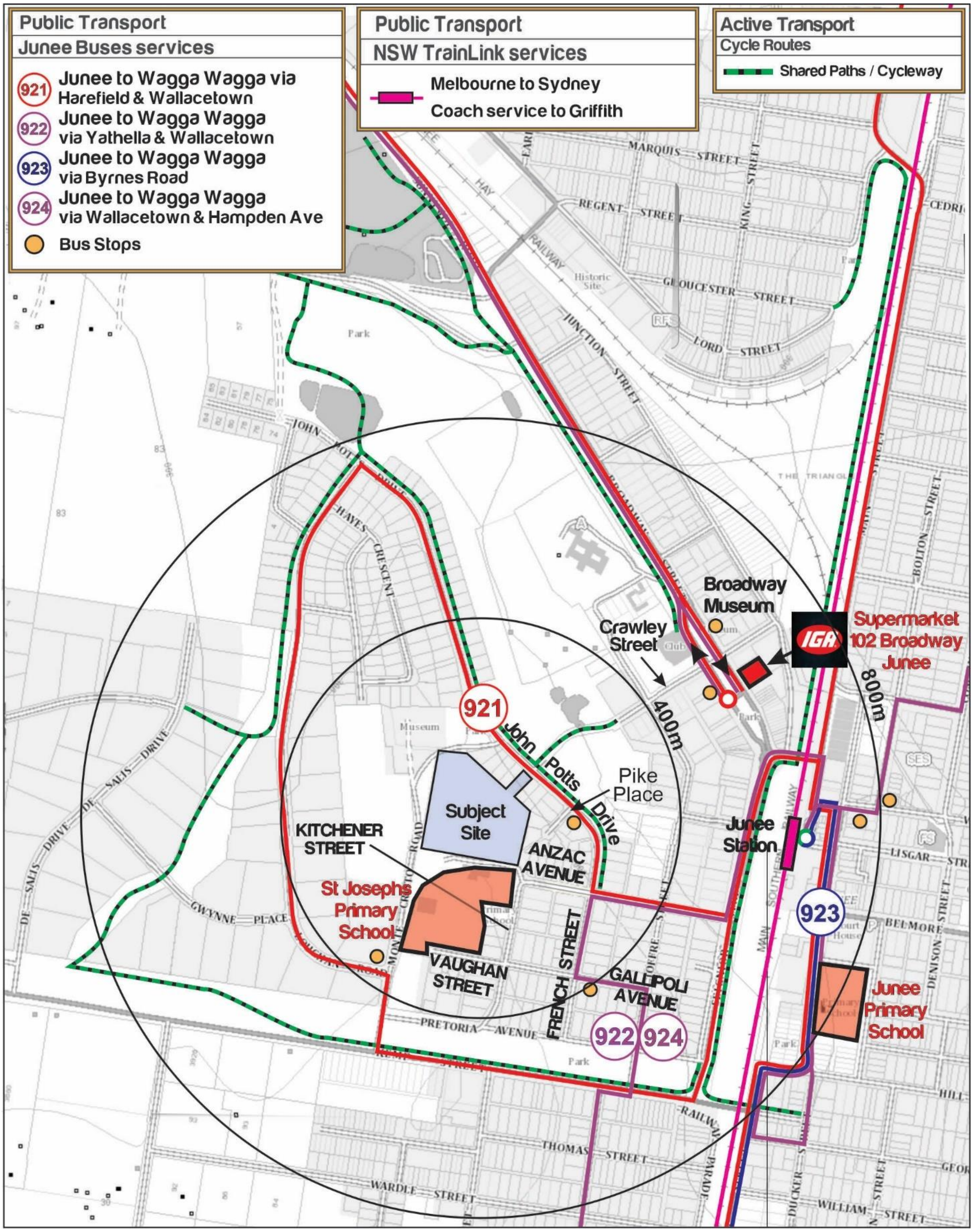

Figure 4: Public Transport Services

Figure 5: View looking north along Kitchener St adjacent to school bus zone

2.3 Active Transport

The site is afforded pedestrian connectivity to a broad range of destinations within the Junee township.

A footpath is provided along the northern side of the Anzac Avenue which connects to Seignior Street. Seignior Street in turn has a footpath on along the western side and a Shared Path within the eastern verge, providing N-S connectivity.

As shown in Figure 4 above, a Shared Path is provided within the John Potts Drive and the Junee Urban Wetland. An additional Shared Path is provided within Endeavour Park to the south.

Importantly, there is an existing pedestrian laneway from Kitchener Street through to Pike Place that shall be retained. This connection provides pedestrian access to John Potts Drive and onwards to Crawley Street and the local shopping area to the north-east of the site.

Figure 6: View looking east along Anzac Ave from Kitchener St

Figure 7: View looking east along John Potts Dr Shared Path

Figure 8: View of Shared Path through Junee Urban Wetland

2.4 Road Network

2.4.1 Road Hierarchy

The surrounding road hierarchy is presented below. Surrounding roads are typically local residential streets with a 50 km/h speed zoning. Anzac Road connects to the Olympic Highway (Seignior Street) and, as such, functionally operates as a ‘collector road’. However, traffic volumes are still relatively low and commensurate with a ‘local road’ categorisation.

It is noted that a School Zone operates in Kitchener Street, north of Vaughan Street, and Anzac Avenue, west of John Potts Drive. Interestingly, this School Zone does not extend to Vaughan Street itself despite the Primary School pick-up/drop-off being located on the southern side of the school in Vaughan Street.

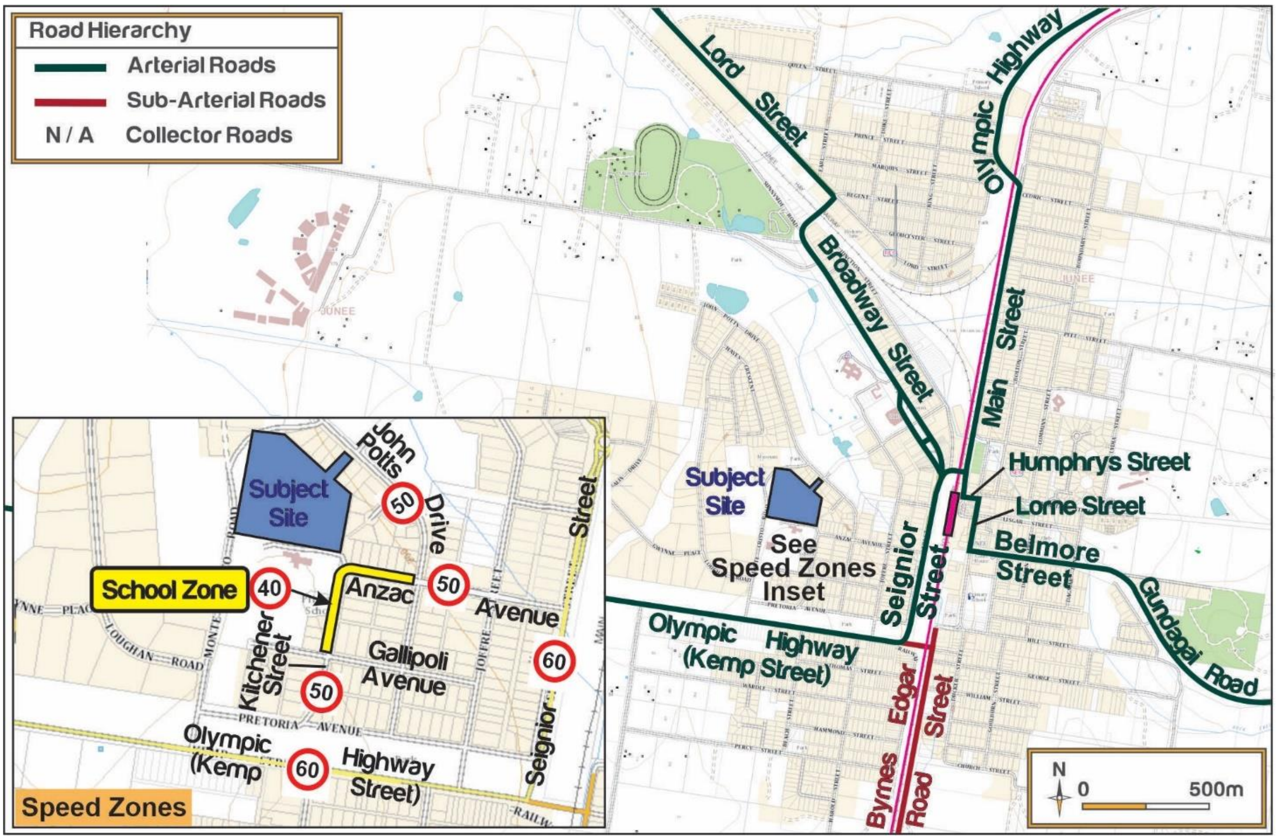

Figure 9: Road Hierarchy

Figure 10: St Joseph's Primary School Setdown Area in Vaughan St

asongroup

2.4.2 Network Crash History

Crash data for the latest five-year period (between 2017-2021) has been reviewed and found no reported crashes within the study area.

2.4.3 Existing Network Volumes

Intersection turning count surveys were undertaken on the afternoon of 21 June and morning of 22 June 2023. The resultant peak hourly traffic volumes at the key intersection of John Potts Drive / Anzac Avenue / French Street are presented below.

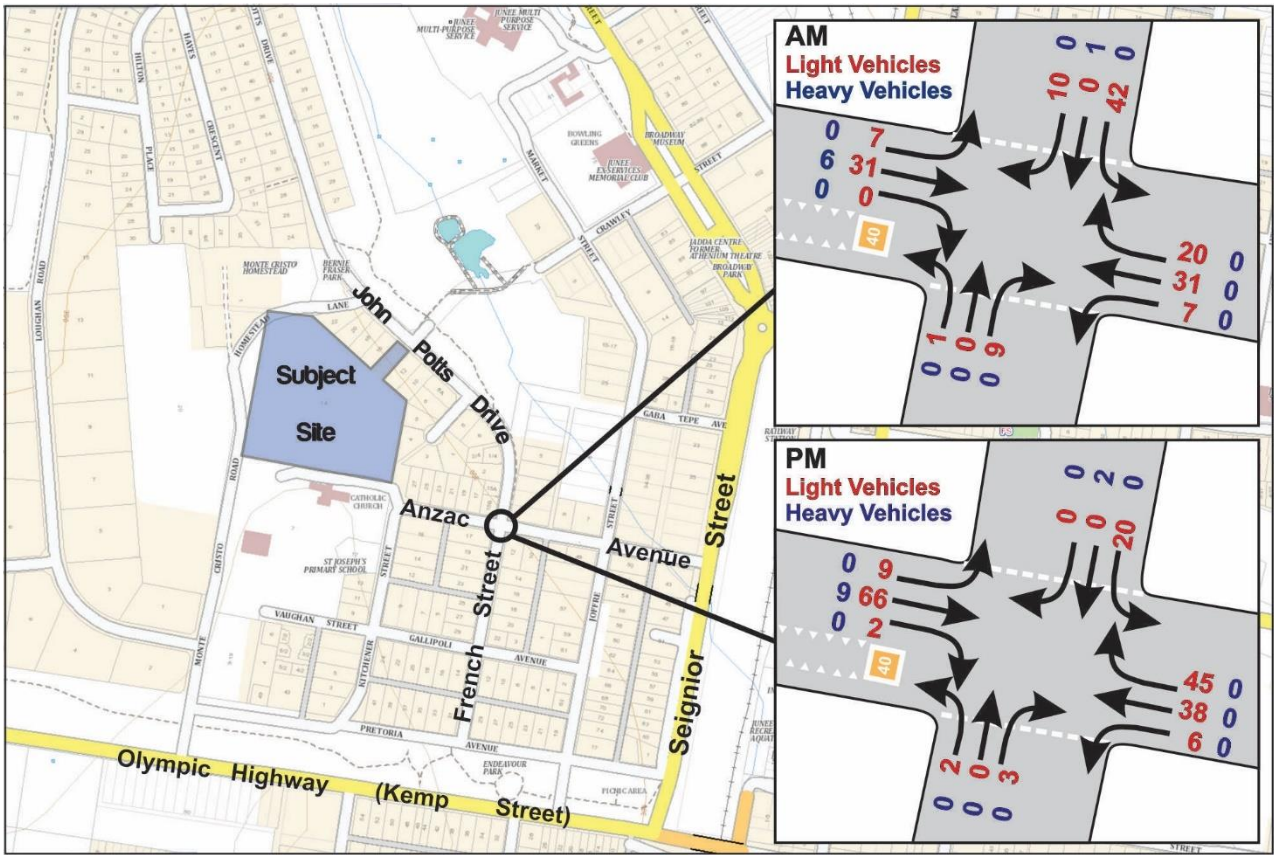

Figure 11: Existing (June 2023) Traffic Volumes

No traffic was observed using the northern leg of the Kitchener Street / Anzac Avenue during the survey periods.

Mid-block volumes can be summarised as follows for the various road segments within the study area.

TABLE 1 EXISTING MID-BLOCK TRAFFIC VOLUMES

Road	Segment	Two-way Traffic Volume (PCE/hr)	
		AM	PM
John Potts Dr	North of Anzac Ave	81	78
Kitchener St	South of Anzac Ave	92	135
Anzac Ave	West of John Potts Dr	92	135
Anzac Ave	East of John Potts Dr	146	193

Notes: 1 PCE = passenger car equivalent | assumes each rigid heavy vehicle as 2.0 'cars'

Section 4.3.5 of the TfNSW Guide nominates the following environmental capacity performance standards for residential streets.

TABLE 2 RESIDENTIAL AMENITY PERFORMANCE STANDARDS

Road Class	Road Type	Speed (km/h)	Max. Peak Hour Volume (veh/hr)
Local	Access Way	25	100
	Street	40	300
Collector	Street	50	500

Notes: 1 Based on Table 4.6 of the TfNSW Guide (2022)
2) Figures reflect absolute maximum volume

It is evident that all roads within the study area operate within the relevant performance criteria thresholds.

3 Operational Traffic Assessment

3.1 Assessment Scenarios

3.1.1 Horizon Years

Given the localised study area and absence of planned infrastructure or significant developments, in the immediate area, it is not expected that consideration of additional background traffic growth on the study area network is warranted for the purposes of this assessment.

3.1.2 Access Arrangements

Access to the site is proposed via Kitchener Street. This location is:

- Consistent with the historic access location for the subject site,
- Provides the most direct connection to the regional road network; thereby reducing Vehicle Kilometres Travelled (VKT) – a key transport planning objective.

However, Council's pre-DA comments included suggestion of an access connection to John Potts Drive. As such, we have included another (sensitivity) scenario to determine the impacts of that connection.

3.1.3 Modelled Scenarios

Having regard for the above, the relevant modelling scenarios are as follows:

- Existing Base Case
- Project Case – Existing plus Development, with access via Kitchener Street only
- Project Case (Option 2) – Sensitivity analysis relating to Existing plus Development, assuming all access via John Potts Drive only

3.2 Trip Generation & Distribution

3.2.1 Traffic Generation

TfNSW Technical Direction (TDT2013/04a) nominates the following traffic generation rates for low-density housing within regional areas.

- AM peak 0.71 veh/hr/dwelling (maximum 0.85)
- PM peak 0.78 veh/hr/dwelling (maximum 0.90)

For the purposes of this assessment, we have conservatively adopted the maximum rates for peak hourly generation. Indeed, the location of the subject site within close walking distance of numerous local schools and other major local destinations (e.g. shopping, hospital and recreational areas) suggests that reduced rates would be more appropriate. Nevertheless, a conservative approach – using the higher trip rates - has been adopted to ensure a robust analysis is undertaken.

3.2.2 Traffic Distribution

Distribution of traffic and assignment to the road network is based upon surveyed volumes on the existing network.

TABLE 3 DEVELOPMENT TRAFFIC GENERATION

Period	Trip Rate (TfNSW Max.)	Traffic Generation		
		TOTAL	In	Out
AM Peak	0.85	**37**	13	24
PM Peak	0.90	**40**	29	11

Notes: 1) Corresponding totals using standard (average) rates are 31 and 34 veh/hr, respectively

3.3 Network Performance

3.3.1 Link Analysis

The assignment of these trips to the network is provided for each access option in Appendix D. A comparison of mid-block demands under each scenario is presented below.

TABLE 4 MID-BLOCK ANALYSIS

Road	Segment	Existing		Project Case (Kitchener St)		*Sensitivity Option (John Potts Dr)*	
		AM	PM	**AM**	**PM**	*AM*	*PM*
John Potts Dr	North of Anzac	81	78	**81 (0)**	**78 (0)**	*118 (37)*	*118 (40)*
Kitchener St	South of Anzac	92	135	**100 (8)**	**140 (5)**	*100 (8)*	*140 (5)*
Anzac Ave	West of JPD	92	135	**121 (29)**	**169 (34)**	*100 (8)*	*140 (5)*
Anzac Ave	East of JPD	146	193	**175 (29)**	**227 (34)**	*175 (29)*	*227 (34)*

Notes: 1 PCE = passenger car equivalent | assumes each rigid heavy vehicle as 2.0 'cars'

It can be seen from above that:

- Mid-block demands remain within relevant thresholds for local streets outlined in the TfNSW Guide (refer Table 2) under ALL scenarios.
- Indeed, traffic volumes within relevant School Zone areas remain under 'desirable' maximum thresholds for residential amenity. As such, additional traffic accessing the site via the School Zone is not considered to result in any unacceptable safety implications.
- Both access options have similar impact to traffic volumes within Kitchener Street and Anzac Avenue, east of John Potts Drive.

It should also be noted that primary desire lines are to the south and east of the site. As such, the proposed site access to Kitchener Street provides the most direct connection, thereby reducing Vehicle Kilometres Travelled (VKT) and ultimately having reduced emissions.

3.3.2 Performance of Key Intersections

In addition to the above link analysis, the performance of the key intersection of John Potts Drive / Anzac Avenue / French Street has also been assessed using SIDRA Intersection (version 9.1).

The results of intersection modelling are included in Appendix E and summarised below.

TABLE 5 INTERSECTION LOS COMPARISON

Intersection	Metric	Existing		**Project Case (Kitchener St)**		***Sensitivity Option (John Potts Dr)***	
		AM	PM	**AM**	**PM**	*AM*	*PM*
John Potts Dr / Anzac Ave / French St	Degree of Saturation (DoS)	0.005 (0.04)	0.003 (0.053)	0.005 (0.041)	0.004 (0.066)	*0.005 (0.058)*	*0.003 (0.068)*
	Average Delay (sec)	5.2 (2.9)	5.4 (2.3)	5.3 (2.5)	5.6 (2)	*5.3 (3.4)*	*5.6 (2.9)*
	Level of Service (LoS)	A	A	A	A	*A*	*A*

Notes: 1)For priority-controlled intersections, key metrics relate to 'worst movement'. Critical movement is the right-turn from French St
2) Figure in brackets ( ) represents overall intersection metrics.

It is evident that:

- The intersection performs well under all scenarios, with minimal delay or queuing.
- There is negligible different to DoS or delay to the critical movement (right-turn from French Street)
- When looking at the intersection performance overall, average delays actually reduce under the Project Case scenario. This is due to the increased traffic being assigned to through movements on the 'major road' (Anzac Avenue) as opposed to minor side road movements that are required to Give-way.
- The Project Case scenario (with access via Kitchener Street) performs better than the Sensitivity Option with regard to overall average delays.

4 Parking Considerations

4.1 Resident Parking

The Junee Shire Council Development Control Plan 2021 (Junee DCP 2021) requires car parking to be provided at the following rates:

Minimum one (1) off-street car parking space on the property for each dwelling located behind the dwelling setback to the street lot boundary (‘building line’). Two (2) car spaces are preferred and may include use of the driveway area in front of any garage/carport.

This application relates to subdivision only and, as such, compliance with the above cannot be confirmed. However, it is expected that any future built-form would comply with this requirement.

The design of any off-street parking shall comply with the requirements of AS2890.1:2004. In accordance with the Junee DCP 2021, driveways shall have a minimum width of 3.0 metres and provide sufficient separation from nearby intersections.

4.2 Visitor Parking

The Junee DCP 2021 stipulates the following with regard to visitor car parking:

Not required. On-street or in driveway sufficient.

In this regard, it is noted that the proposed carriageway width of 9.0 metres is intended to provide sufficient width for on-street parking and thus achieves the objectives of the Junee DCP 2021.

5 Summary and Recommendations

Ason Group has been engaged to prepare a Transport Statement to support a Development Application for subdivision of the site to create 44 Torrens title dwelling lots and associated roads and other infrastructure.

As a result of preliminary feedback from Council, this assessment includes consideration of two separate access strategies:

- Access via Kitchener Street (Proposed)
- Access via John Potts Drive (provided for sensitivity purposes)

5.1 Key Findings

The key findings are summarised as follows:

- The site is located within walking distance from numerous schools, shopping and recreational facilities within the Junee township; supporting the objective of reduced reliance on private vehicle for day-to-day activities.
- The internal design generally meets Council's requirements with regard to road reserve and carriageway widths. Furthermore, a Road Safety Audit has been prepared and will be closed-out, as required, to address any detailed matters as practicable.
- Internal roads include 9m sealed carriageways to facilitate on-street parking to meet the needs of visitors and mitigate impacts to surrounding roads.
- Pedestrian access to the Pike Lane pedestrian pathway shall be retained. To assist speed reduction in advance of the entry road curvature and pedestrian connectivity generally, it is recommended that a Raised Threshold treatment be provided to the northern leg of the Anzac Avenue / Kitchener Street intersection. This will also improve access to the Anzac Avenue footpath which is currently lacking suitable kerb ramp at the intersection (as evidenced Figure 6).
- Future occupation of the subdivided lots is expected to generate the following traffic volumes:
  - AM peak 31 veh/hr
  - PM peak 34 veh/hr
- However, for assessment purposes, we have adopted the following peak hourly volumes based on maximum rates outlined by TfNSW guidance:
  - AM peak 37 veh/hr
  - PM peak 39 veh/hr
- Under all scenarios, traffic volumes in surrounding roads will remain within relevant mid-block thresholds commensurate with a local residential street classification.
  - Mid-block demands remain within relevant thresholds for local streets outlined in the TfNSW Guide (refer Table 2) under ALL scenarios.
  - Indeed, traffic volumes within relevant School Zone areas remain under 'desirable' maximum thresholds for residential amenity. As such, additional traffic accessing the site via the School Zone is not considered to result in any unacceptable safety implications.
  - Both access options have similar impact to traffic volumes within Kitchener Street and Anzac Avenue, east of John Potts Drive.
- In relation to the performance of the key intersection of John Potts Drive / Anzac Avenue / French Street,

- The intersection performs well (*Level of Service* A) under all scenarios, with minimal delays or queuing.
- There is negligible different to *Degree of Saturation* or delay to the critical movement, being the right-turn from French Street.
- When looking at the intersection performance overall:
  - average delays actually reduce from existing under the Project Case scenario with access via Kitchener Street. This is due to the increased traffic within the intersection being assigned to through movements on the 'major road' (Anzac Avenue) with comparatively reduced delay as opposed to minor side road movements.
  - the Project Case scenario (with access via Kitchener Street) performs better than the Sensitivity Option with regard to overall average delays.

5.2 Conclusions

In summary, the proposed subdivision inclusive of 44 Torrens title residential lots (43 lots within the main site accessed via Kitchener Street as shown below, plus 1 x lot within John Potts Drive), including new roads, footpath and other associated infrastructure is considered supportable on transport planning grounds and is not expected to result in any adverse impacts on the surrounding transport network.

Appendix A. Road Safety Audit

RIGORE
ENGINEERING SERVICES

Junee Subdivision

Road Safety Audit

RES2305.40.115-RSA

Date: 2/09/2023
Version: 1.0
Author: Z. Walgers

Document Quality Information

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Date	Version	Author	Approved	Change Reference
25/08/2023	0.1	Z. Walgers	J. Gorrie	Draft Audit Report
02/09/2023	1.0	Z. Walgers	J. Gorrie	Final Audit Report

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1. Audit Statement

Table 1-1 – Audit Details

Project Name:	Junee Subdivision RSA	
Client:	TJHRR Pty Ltd	
Client Representative:	Troy Raulston	Jenna Pollard
Contact Details:	M: 0437 891 147 E: info@trhomeswagga.com.au	M: 0418 421 621 E: jenna.pollard@remax.com.au
Auditors:	James Gorrie (RSA-02-0732 - Level 3) – Lead Road Safety Auditor Zach Walgers (RSA-02-1502 - Level 2) – Road Safety Auditor	
Audit Type	Strategic Design	
Commencement Meeting:	10/05/2023	
Audit Date:	31/07/2023	
Completion Meeting:	14/08/2023	
Previous Audits:	Nil	

We, the undersigned, declare that we have reviewed the material and data listed in this report and identified the risks to road safety listed in Section 4. The reasons are given to explain why an identified item is considered a risk to road safety. The auditors listed are independent to the project.

It should be noted that while every effort has been made to identify potential safety problems, no guarantee can be made that every problem or deficiency has been identified.

It is recommended that identified risks to road safety be investigated and corrective actions implemented as soon as practicable.

James Gorrie
Lead Road Safety Auditor (RSA-02-0732 - Level 3) Date: 02/09/2023

Zach Walgers
Road Safety Auditor (RSA-02-1502-Level 2) Date: 02/09/2023

2. Introduction

Rigore Engineering Services has been engaged by TJHRR Pty Ltd, to undertake a Road Safety Audit on the proposed strategic access options from the proposed subdivision of land at 14 John Potts Drive Junee to the existing Junee Shire Council road network.

2.1. Project Description

The proposed subdivision includes 43 Torrens title residential lots, associated internal road and footpath infrastructure. The proposed site is located within the Junee township between John Potts Drive and Anzac Ave (refer to Figure 2-1 – Site Overview, Junee NSW).

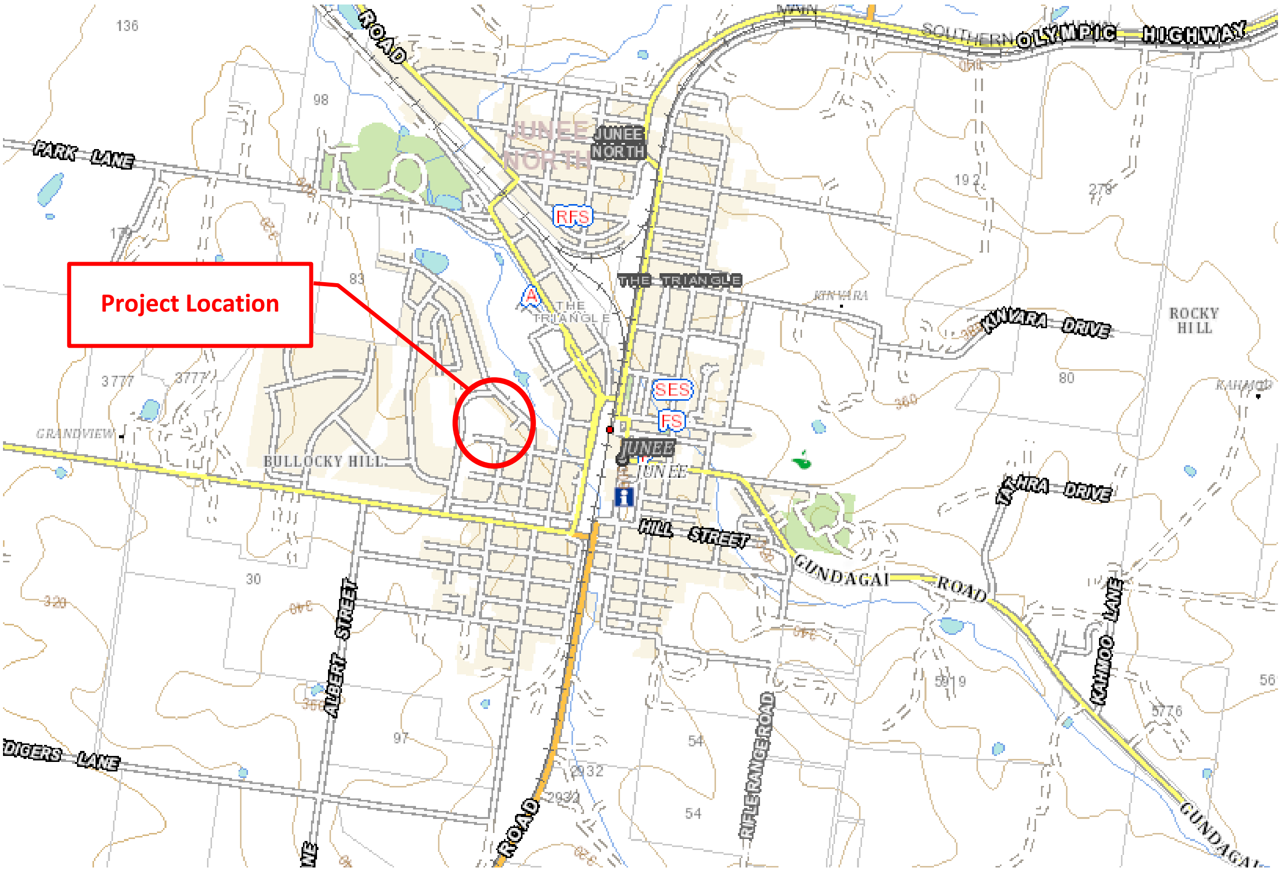


Figure 2-1 – Site Overview, Junee NSW

The proposed strategic access options include the below:

- Option 1 – A single point of network access via Kitchener Street/Anzac Ave

Figure 2-2 – Option 1 Access Location

- Option 2 – A single point of network access via John Potts Drive.

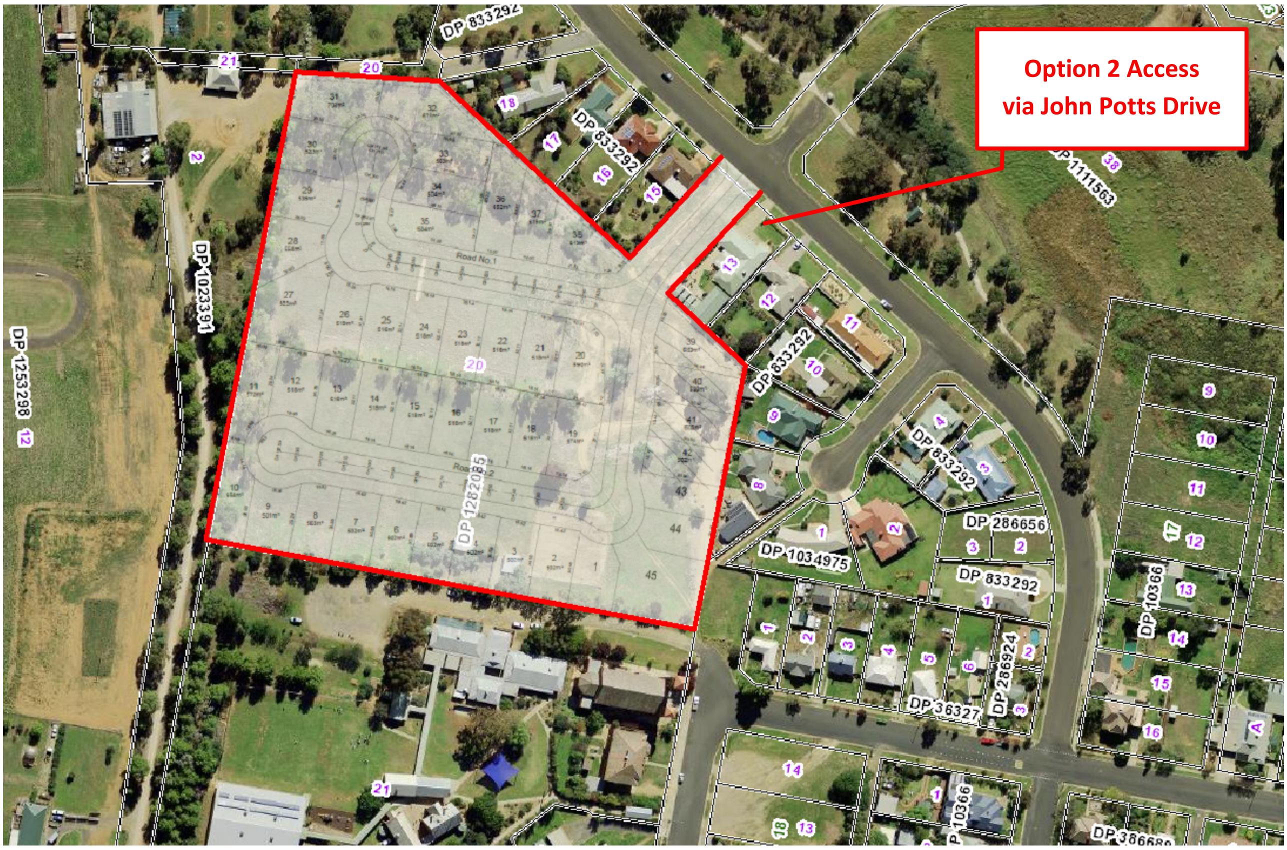


Figure 2-3 – Option 2 Access Location

2.2. Primary Considerations

Complimentary to the Safe Systems Approach, the following primary factors are evident for consideration in this project. The report herein has been undertaken based on the below primary considerations:

2.2.1. Traffic Impact Statement

A Traffic Impact Statement has been provided by Ason Group, *Traffic Impact Statement – Residential Subdivision Application John Potts Drive, Junee, dated 21/07/203.* This report has provided insight into the following items, which have been considered in the preparation of this road safety audit:

- **Consultation –** including discussions with Council representatives on site;
- **Scope of Assessment –** including report limitations: assessment of construction traffic, road design, road safety audit (this document) and safe system assessment;
- **Existing Conditions –** including land use, public transport, active transport, road network, crash history and network traffic volumes;
- **Operational Traffic Assessment –** including assessment scenarios (options), trip generation and distribution and network performance;
- **Parking Considerations –** resident parking and visitor parking;
- **Summary and Recommendations –** key findings and conclusion; and
- **Appendices –** road safety assessment (this document and safe systems and separately prepare safe systems assessment).

2.2.2. Relationship between vehicle speed and the likelihood of Severe Injury

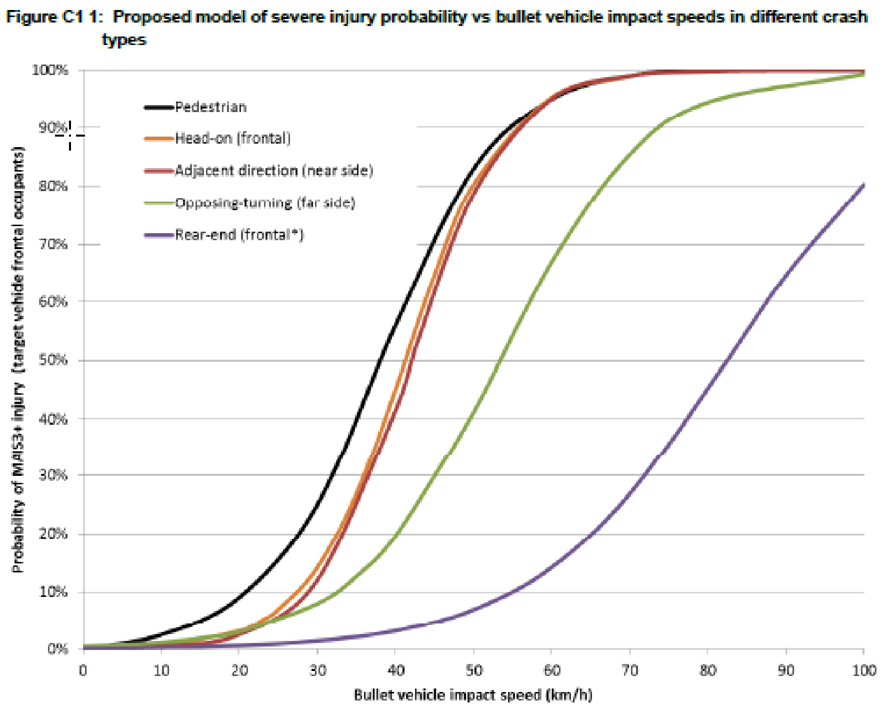


Figure 2-4 – Extract Austroads Guide to Traffic Management Part 6 - 2020

2.2.3. Influence of impact angle and travel speed on transferable kinetic energy

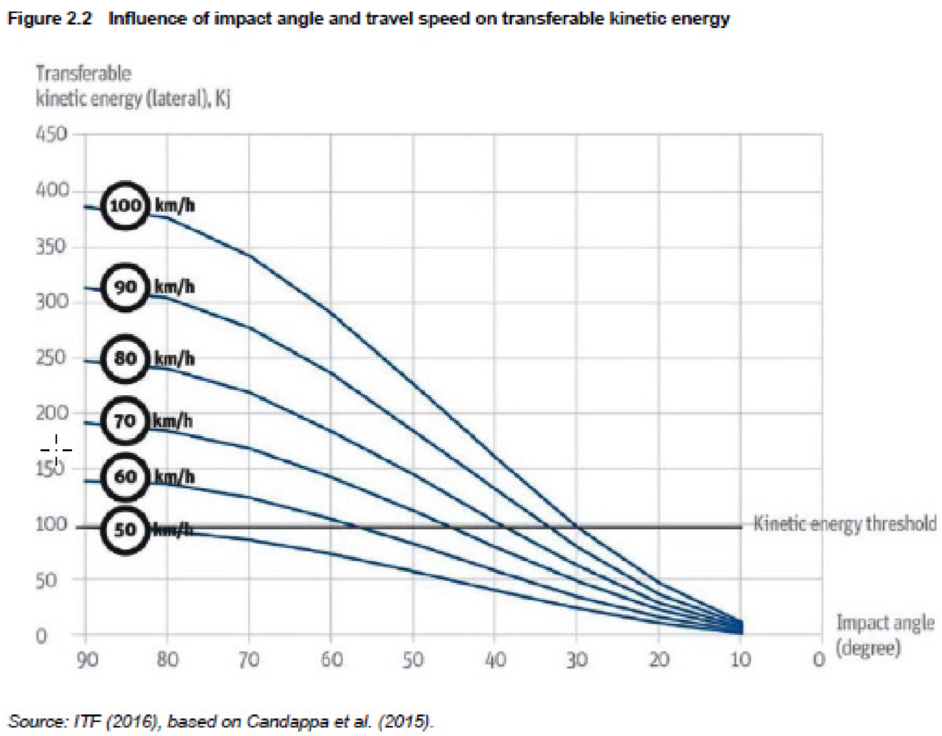


Figure 2-5 – Extract Austroads Guide to Traffic Management Part 6 - 2020

2.2.4. Safe Intersection Sight Distance (SISD)

It is fundamental to the safety of intersections that drivers approaching in all traffic streams are able to:

- recognise the presence of an intersection in time to slow down or stop in a controlled and comfortable manner.
- see vehicles approaching in conflicting traffic streams and give way where required by law or avoid a crash in the event of a potential conflict.

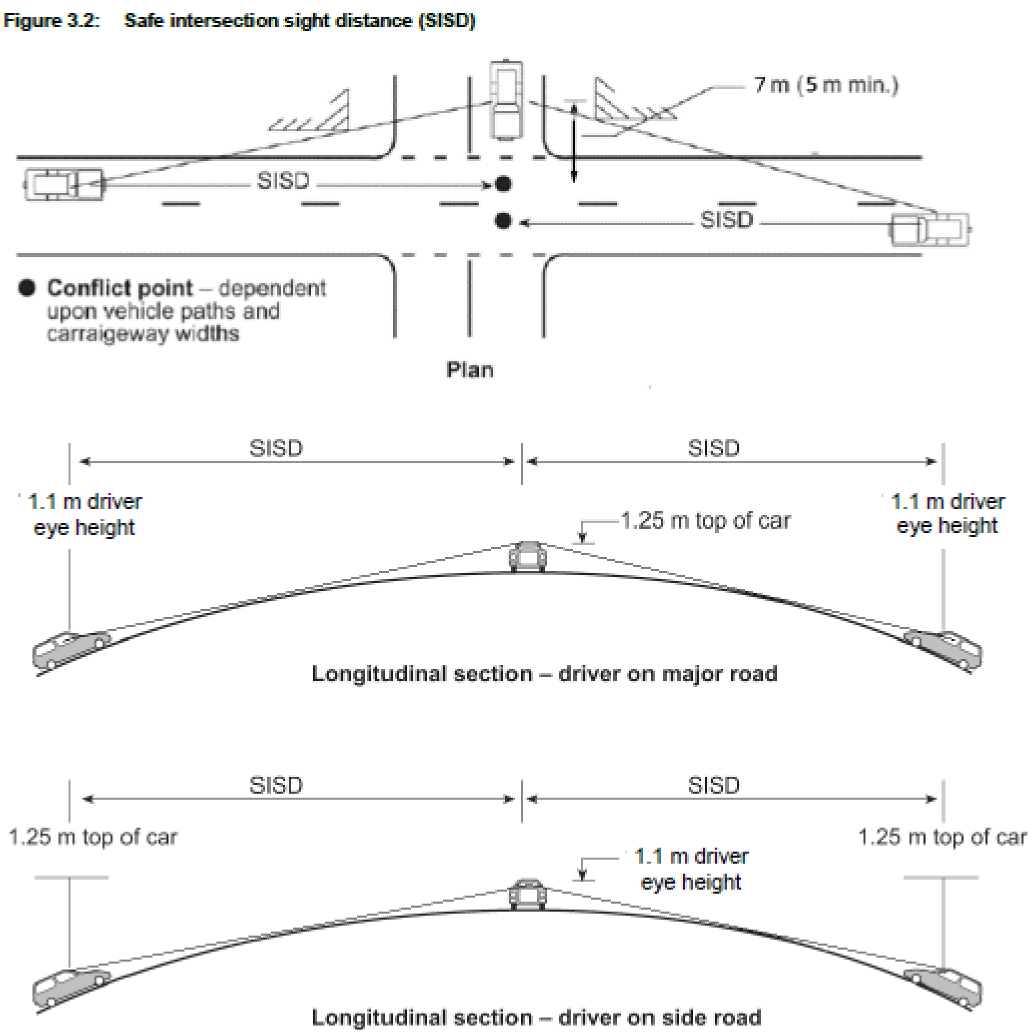


Figure 2-6 – Extract Austroads Guide to Road Design Part 4A – 2021

2.2.5. Approach Sight Distance (ASD)

- the minimum level of sight distance which must be available on the minor road approaches to all intersections to ensure that drivers are aware of the presence of an intersection.

- also desirable on the major road approaches so that drivers can see the pavement and markings within the intersection and should be achieved where practicable. However, the provision of ASD on the major road may have implications (e.g. cost; impact on adjacent land and features) in which case SSD is the minimum sight distance that should be achieved on the major road approaches to the intersection and within the intersection.

- measured from a driver's eye height (1.1 m) to 0.0 m, which ensures that a driver is able to see any line marking and kerbing at the intersection. In some situations, this may not be possible due to the vertical alignment.

Figure 3.1: Application of approach sight distance (ASD)

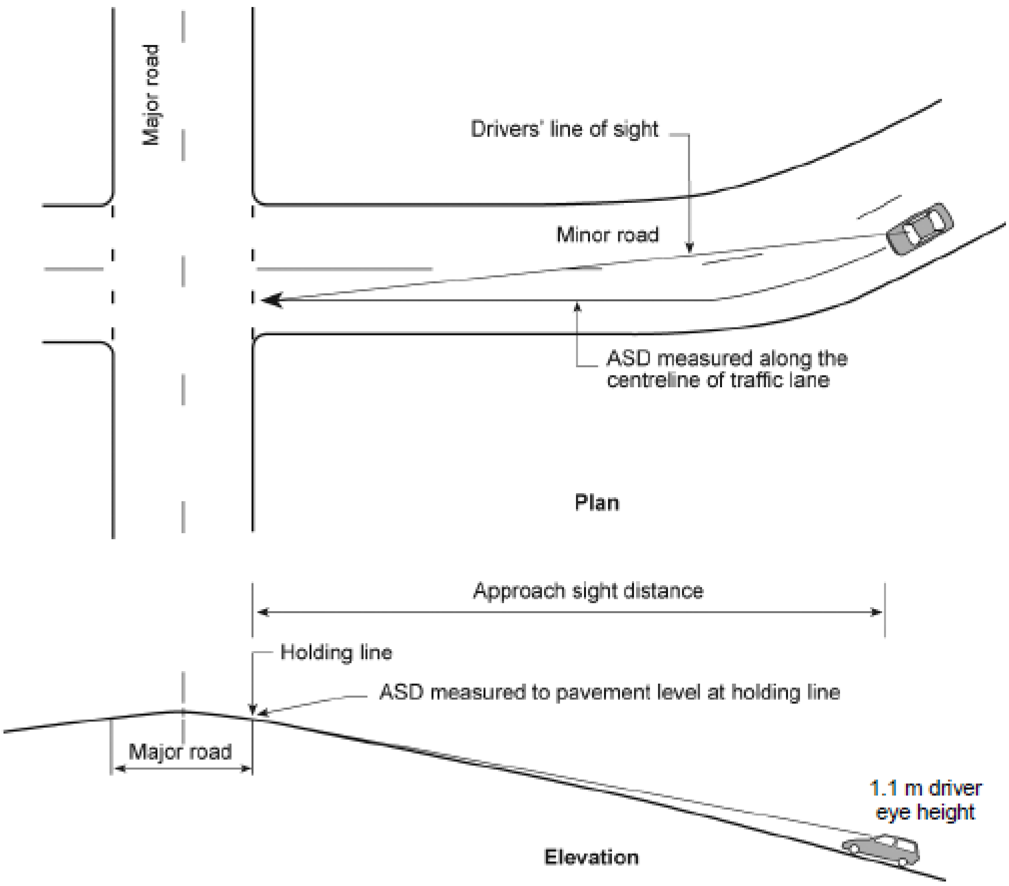


Figure 2-7 – Extract Austroads Guide to Road Design Part 4A – 2021

2.2.6. Stopping Sight Distance (SSD)

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

- It is generally measured between the driver's eye (1.1 m) and a 0.2 m high, stationary object on the road. The object height of 0.2 m represents a hazard that cannot be driven over and hence requires the vehicle to stop to avoid a collision.
- Car stopping sight distance shall be available along all traffic lanes on all roads. This distance is considered to be the minimum sight distance that should be available to a driver at all times.

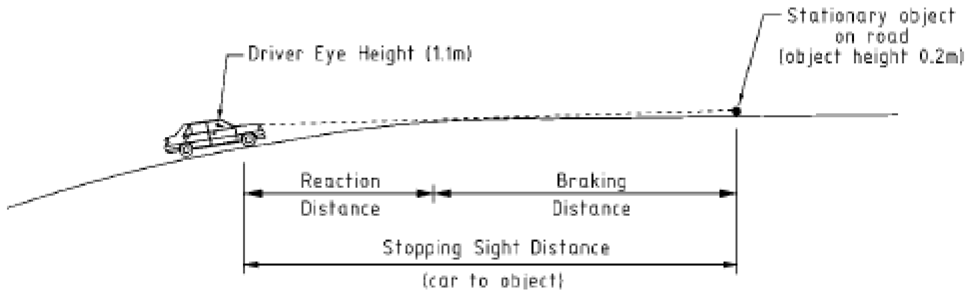


Figure 2-8 – Extract Austroads Guide to Road Design Part 3 – 2021

2.2.7. Pedestrian Sight Distance Requirements (CSD)

There are two key sight distance requirements at pedestrian crossing facilities: ASD and crossing sight distance (CSD).

ASD ensures that approaching drivers are aware of the presence of a pedestrian crossing facility. It is important that this line of sight is not obstructed as it ensures that even if there is no pedestrian actually on the crossing, the driver should be aware of the crossing by seeing the associated pavement markings and other cues, and therefore be alerted to take the appropriate action if a pedestrian steps onto the crossing.

CSD ensures that the pedestrian can see approaching traffic in sufficient time to judge a safe gap and cross the roadway. It also ensures a clear view for approaching drivers to sight pedestrians waiting to cross the roadway.

Pedestrian sight distance requirements are as follows:

- ASD should be provided between approaching vehicles (1.1 m eye height) and the surface of the roadway (generally 0 m or 0.1 m for a wombat crossing) at all formal, marked pedestrian crossings.
- Crossing sight distance (CSD) should be provided between approaching vehicles (1.1 m eye height) and a pedestrian waiting to cross the road (waiting 1.6 m from the pavement edge or kerb line). The pedestrian eye height should be taken as 1.07 m which represents the lower bound of the range applicable to a person in an A80 wheelchair. CSD allows sufficient time for the pedestrian to cross the road, clear of any approaching traffic. CSD should be provided at crossings where the pedestrian does not have the priority or where the pedestrian does have the priority but must be sighted by approaching traffic in order for the approaching traffic to give way (e.g. a zebra crossing). It is also desirable that CSD be provided at crossings controlled by signals in case of signal failure.

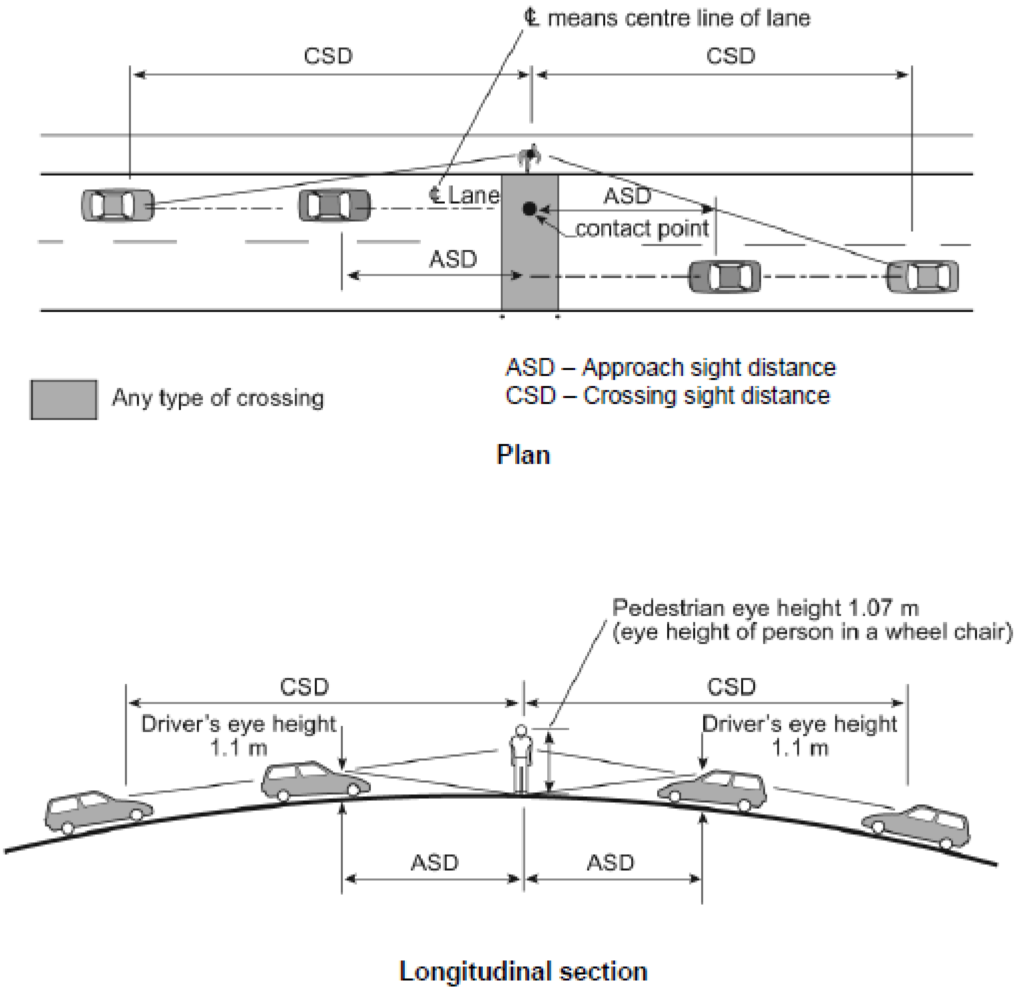


Figure 2-9 – Extract Austroads Guide to Road Design Part 4A – 2021

2.2.8. References

The following list or references provided background information during the audit process:

- TfNSW Guidelines for Road Safety Audit Practices (2011)
- Austroads: Guide to Road Safety Part 6: Road Safety Audit (2022)
- Austroads: Guide to Road Design, Road Safety, Traffic Management and TfNSW Supplements
- Australian Standards AS1742 – Manual of Uniform Traffic Control Devices and TfNSW Supplements
- Australian Standards AS1428 – Design for Access and Mobility and TfNSW Supplements
- Australian Standards AS2890 – Parking Facilities and TfNSW Supplements
- Australian Standards AS1158 – Lighting for Roads and Public Spaces and TfNSW Supplements
- TD 2002/12c TfNSW Technical Direction for Stopping and Parking Restrictions at Intersections and Crossings,
- TS 03631:1.0 TfNSW Speed Zoning Standard (2023)
- TS 05462.1-19 TfNSW Delineation Manual
- NSW Road Rules Legislation

2.2.9. Exclusions

A road safety audit:

- is **not** a way of assessing or rating a project as good or poor;
- is **not** a means of ranking or justifying one project against others in a works program;
- is **not** a way of rating one option against another;
- is **not** a check of compliance with standards;
- is **not** a substitute for design checks;
- is **not** a crash investigation;
- is **not** a redesign of a project;
- is **not** to be applied only to high-cost projects or only to projects involving safety problems; and
- is **not** the name used to describe informal checks, inspections or consultation.

2.2.10. Audit Team

In accordance with the *Austroads Guide to Road Safety Part 6: Road Safety Audits* minimum audit team requirements, Rigore has provided two (2) Level 3 Lead Road Safety Auditors and one (1) Level 2 Road Auditor to form the independent audit team.

Table 2-1 – Audit Team

James Gorrie		
	Position:	Managing Director | Project / Design Manager
	Experience:	20+ years
	Education:	Master of Engineering (Civil) Bachelor of Engineering Technology (Civil)
	Qualifications:	CPEng NER MIEAust APEC Engineer
	Accreditations:	Level 3 Lead/Snr Road Safety Auditor NSW | VIC | QLD | SA Treatment of Crash Location | Prepare Workzone TMP
Zach Walgers		
	Position:	Lead Civil Designer (Road) | Road Safety Auditor
	Experience:	7+ years
	Education:	Master of Engineering / Bachelor of Technology | Current Associate Degree of Engineering (Civil)
	Qualifications:	MIEAust
	Accreditations:	Level 2 Road Safety Auditor NSW

2.2.11. Site Inspections

A day and night site inspection was undertaken by James Gorrie (Lead Road Safety Auditor), and Zach Walgers (Road Safety Auditor) on Monday 1st August 2023 between 3:00am and 6:15pm, the weather was clear for the duration of the inspection. During the inspection, the audit team familiarised themselves with the existing road environment, road user make-up and surrounding land use. The site inspection activities involved measuring features, taking photographs, and recording observed road user behaviour.

2.2.12. Commencement Meeting

The Commencement Meeting was held at Rigore's Office, Level 1/11-15 Baylis Street Wagga Wagga NSW 2650 on Wednesday 10th May 2023 between 4:00pm and 5:00pm. In attendance were James Gorrie (Lead Road Safety Audits), Jenna Pollard and Troy Raulston (TJHRR Pty Ltd representatives). The Commencement Meeting provided the opportunity to define the extent and purpose of the audit.

2.2.13. Completion Meeting

The Completion Meeting was held via Microsoft Teams on Monday 14th August 2023 between 4:00pm and 5:00pm. In attendance were James Gorrie (Lead Road Safety Audits), Jenna Pollard and Troy Raulston (TJHRR Pty Ltd representatives). The draft audit report and findings herein were discussed with preliminary recommendations presented.

3. Risk Assessment

3.1. Methodology

The Road Safety Audit will be conducted in accordance with relevant Austroads Guides to Road Safety, inclusive but not limited to *Austroads Guide to Road Safety Part 6: Road Safety Audits 2022* including the application and consideration of Safe System principles.

The Rigore Road Safety Audit team has undertaken the audit by embedding Safe Systems principles. This is achieved by applying our knowledge, experience and understanding of the Safe Systems Framework to document findings in a manner that describes the road user exposure, crash likelihood and crash severity.

The identification and removal or treatment of road elements that may contribute to crash occurrence or crash severity is a key component of the safe system approach to road safety. A safe system acknowledges that human error within the transport system is inevitable and that when it does occur the system makes allowance for these errors to minimise the risk of serious injury or death. In a safe system, therefore, roads (and vehicles) should be designed to reduce the incidence and severity of crashes when they inevitably occur.

Four key principles form the basis of the Safe System philosophy, as outlined in *Guide to Road Safety Part 1: Introduction & The Safe System*:

- People make mistakes that can lead to road crashes
- The human body has a limited physical ability to tolerate crash forces before harm occurs
- A shared responsibility exists amongst those who plan, design, build, manage and use roads and vehicles and those who provide post-crash care to prevent crashes resulting in serious injury or death
- All parts of the system must be strengthened to multiply their effects; so that if one part fails, road users are still protected.

Safer road user behaviour, safer speeds, safer roads and safer vehicles are the four key elements that make up a safe system. In relation to speed, the *Guide to Road Safety Part 3: Safe Speed*, using *Wramborg* curves, outlines the relationships between a motorized vehicle collision speed and the probability of a fatality for different crash configurations:

Often referred to as the Safe System speeds, the following aspirational operating speeds are as follows:

30km/h	where there is the possibility of a collision between a vulnerable road user and a passenger vehicle or where there is the possibility of a side impact with a fixed object e.g. tree/pole
50km/h	where there is the possibility of a right-angle collision between passenger vehicles
70km/h	where there is the possibility of a head-on collision between passenger vehicles
≥100 km/h	where there is no possibility of side or frontal impact between vehicles or impacts with vulnerable road user impacts.

NOTE: presently there is only limited evidence on cyclist and motorcyclist injury thresholds and an assumption is often made that their injury potential is the same as the pedestrian curve. The curves only represent passenger car interactions and do not account for young and elderly people and heavy vehicles. The curves are also limited in that they only provide the probability of fatality and not serious injury and there is little published evidence demonstrating the origins of the curves.

3.2. Risk Assessment Framework

The Austroads system of risk assessment will be applied with the relative characteristics as follows:

Table 3-1 – How often is the problem likely to lead to a crash?

Likelihood	Description
Almost certain	Occurrence once per quarter
Likely	Occurrence once per quarter to once per year
Possible	Occurrence once per year to once every three years
Unlikely	Occurrence once every three years to once every seven years
Rare	Occurrence less than once every seven years.

Table 3-2 – What is the likely severity of the resulting crash type?

Severity	Description	Examples
Insignificant	Property damage	Some low-speed collisions Pedestrian walks into object (no head injury) Car reverses into post
Minor	Minor first aid	Low speed collisions Pedestrian walks into object (minor head injury) Cyclists fall from bicycle at low speed
Moderate	Major first aid and/or presents to hospital (not admitted)	Some low to medium-speed collisions Cyclists fall from bicycle at moderate speed Left turn rear-end crash in a slip lane
Serious	Admitted to hospital	High or medium-speed vehicle / vehicle collision High or medium-speed single vehicle collision with fixed roadside object Pedestrian struck at high speed
Fatal	At scene or within 30 days of the crash.	High speed multi vehicle crash on Freeway. Car runs into crowded bus stop. Bus and petrol tanker collide Collapse of bridge or tunnel

Table 3-3 – The resulting level of risk

		Severity*				
		Insignificant Property Damage	Minor Minor first aid	Moderate Major first aid and/or presents to hospital (not admitted)	Serious Admitted to hospital	Fatal Death within 30 days of the crash
Likelihood (includes exposure)	Almost Certain One Per Quarter	Medium	High	High	Extreme (FSI)	Extreme (FSI)
	Likely Quarter to 1-year	Medium	Medium	High	Extreme (FSI)	Extreme (FSI)
	Possible 1 to 3 years	Low	Medium	High	High (FSI)	Extreme (FSI)
	Unlikely 3 to 7 years	Negligible	Low	Medium	High (FSI)	Extreme (FSI)
	Rare 7 years +	Negligible	Negligible	Low	Medium (FSI)	High (FSI)

Safe System Crash Outcome Threshold

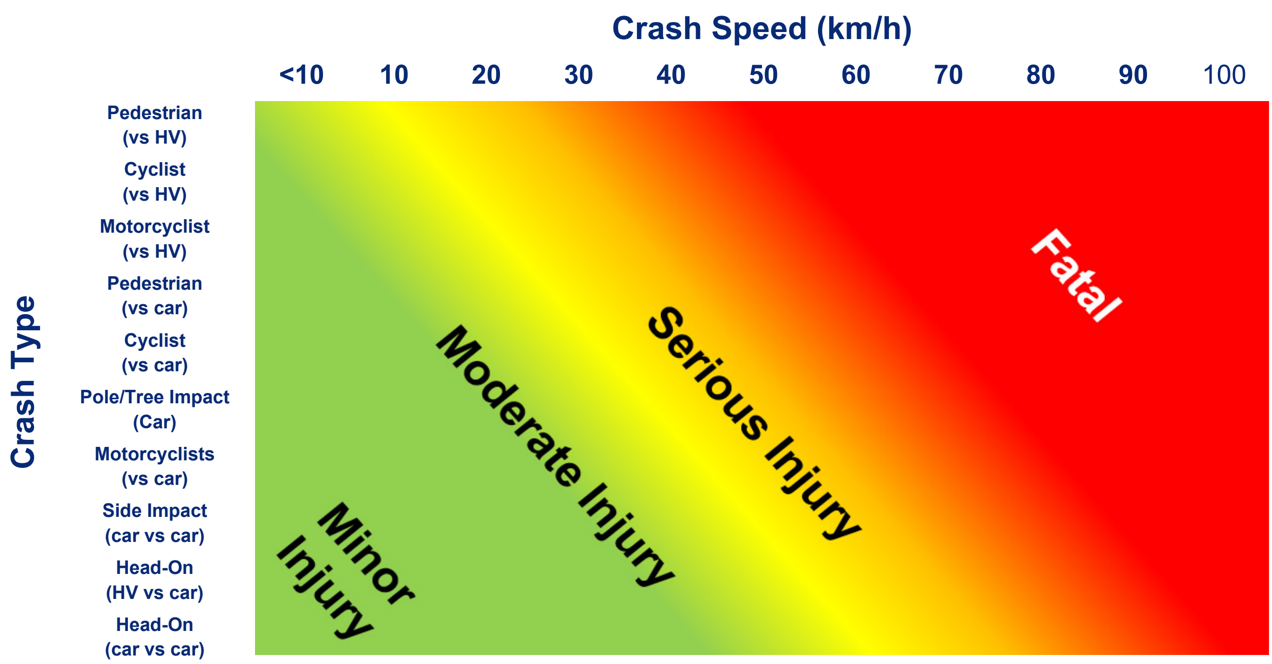
The treatment that Austroads recommend for the above levels of risk is shown in Table 3.4.

Table 3-4 – Treatment approach

Risk	Treatment
Extreme	Must be corrected regardless of cost
High	Should be corrected or the risk significantly reduced even if the treatment cost is high
Medium	Should be corrected or the risk significantly reduced even if the treatment cost is moderate, but not high
Low	Should be corrected or the risk significantly reduced if the treatment cost is low
Negligible	No action required

The risk matrix above shown in *Table 3.3*, is aligned to Safe System principles and has been designed to be used with consideration of a severity guidance sheet which was developed by the Project Working Group. The PWG comprising of representatives from state and local road agencies was established with the primary objective of consolidating and updating the previously issued Parts 6 and 6A (Austroads 2019).

Table 3-5 – The severity guidance sheet – to be used with the risk matrix



4. Audit Results

The results of the audit observations and findings have been reported in two categories:

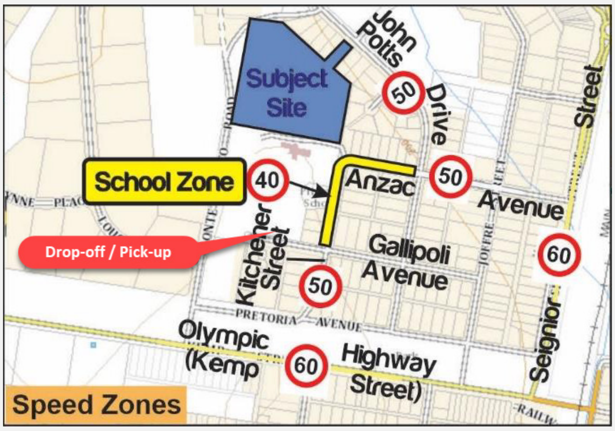
4.1 General Observations
4.2 Identified Risks

The audit findings are provided in Table 4.1 to Table 4.2, together with their risk ranking, as determined using the risk assessment tables in Section 3.

This audit has provided the insights of an independent team to highlight potential road safety deficiencies that should be formally considered by the client representative. The responsibility of responding to the findings of a road safety audit rests with the client, not with the Auditor. The client is under no obligation to accept the audit findings. It is also noted that it is not the role of the Auditor to agree to or approve the client responses to the audit.

4.1 General Observations

Table 4-1 – General Observations

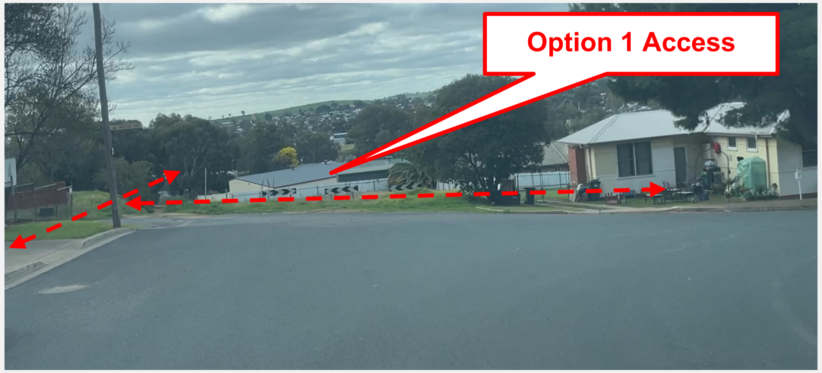
GE	General Observations	Photos / Reference
GE-1	The southern extent of the existing school zone is located north of the Vaughan Street/Gallipoli Ave intersection with Kitchener Street. This does not cover the “School Drop-off Pick-up ZONE” located west of this intersection on Vaughan Street. School children were observed walking south along Kitchener Street towards Endeavor Park area (Pretoria Street). It is unclear why the extent of the school zone does not include the “School Drop-off Pick-up ZONE” located west of this intersection on Vaughan Street.	 ***Looking north on Kitchener Street toward the existing school zone.***  ***Extract: Ason Group Traffic Impact Statement.***

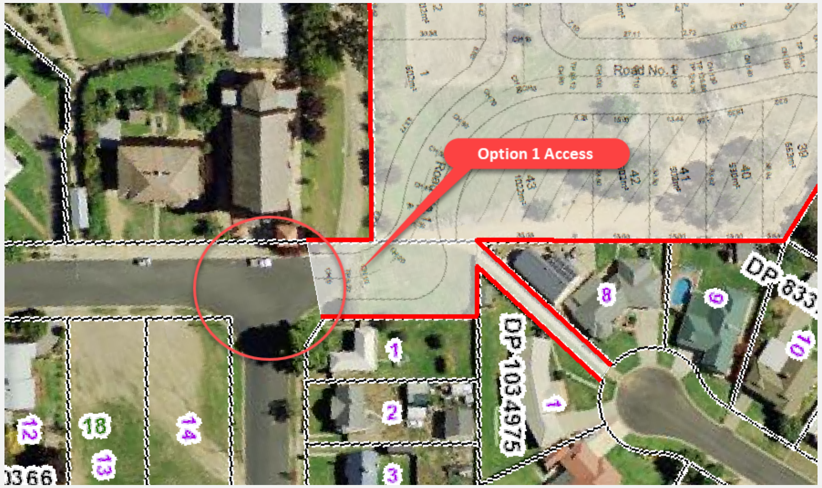
GE	General Observations	Photos / Reference
GE-2	At the time of the PM site inspection, it was observed that the “School Drop-off Pick-up ZONE” did not appear to be in use by parents or staffed by school monitors. It appeared that the area in front of Saint Jospeh’s Catholic Church (north of the bus zone) or the opposing side of Kitchener Street was instead being used by parents picking up children. Considering the availability of the infrastructure on Vaughan Street, this resulted in an undesirable mix of children pick-up and bus stop operations.	 ***Looking east in the “Drop-off Pick-up ZONE”***  ***Looking north toward bus stop on Kitchener St.***
GE-3	At the time of the PM site inspection, a “Walking School Bus” was observed crossing Anzac Ave at the end of Kitchener Street (Option 1 access location), walking children on the northern side of Anzac Ave as far as the northwest corner of Anzac Ave and John Potts Drive intersection (Yellow). Additionally, at the time of the PM site inspection, several children were observed continuing from Anzac Ave at the end of Kitchener Street (Option 1 access location), onto the gravel access track toward the alleyway connecting to Pike Place (Red). It should be noted that Option 2 access (via John Potts Drive) may adversely impact the current access to the Pike Place alleyway, where as Option 1 access (via Anzac Ave/Kitchener Street presents the opportunity to formalise an all weather access to the Pike Place alleyway.	 ***Overview of prominent pedestrian movements.***

GE	General Observations	Photos / Reference
GE-5	There is existing lighting and stormwater infrastructure that would require adjustment at the Option 2 access location (14 John Potts Drive). The existing light post is located in the middle of the vacant block where the proposed development access will be located joining John Potts Drive. The existing stormwater pit is located in the middle of the vacant block where the proposed development access will be located joining John Potts Drive.	 ***Looking southwest toward Option 2 access.***  ***Looking south toward Option 2 access.***
GE-6	It is acknowledged that the provision of artificial lighting will form part of the development requirements. Consideration needs to be given to the adequacy of the existing lighting at the development access location adopted.	 ***Looking north down Kitchener Street at the proposed development intersection.***

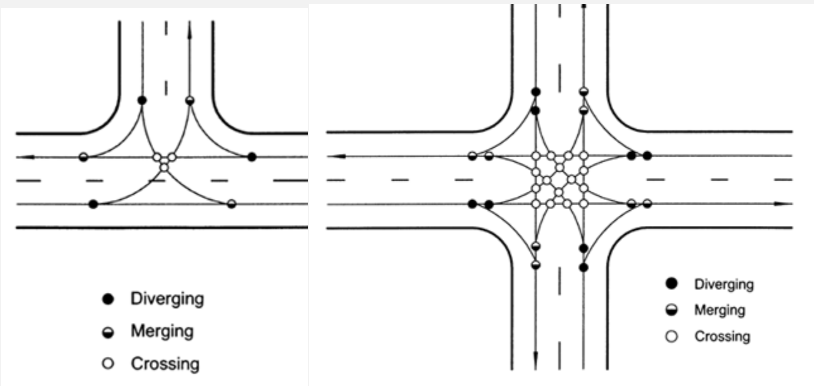
4.1. Identified Risks

Table 4-2 – Identified Risk

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level
ID-1	Proposed Option 1 Access Location (Anzac Ave / Kitchener Street)	 ***Looking north on Kitchener St toward Option 1 access location.***  ***Looking southwest from Pike Place cul-de-sac along alleyway.***	As indicated by GE-3, children currently walk along the west side of Kitchener Street, either crossing to the northern side of Anzac Ave or continuing from Anzac Ave at the end of Kitchener Street onto the gravel access track toward the alleyway connecting to Pike Place. The proposed Option 1 access will generate additional vehicular movements (approximately 34 vehicles per hour) that will inadvertently interact with the current pedestrian movements. The current conceptual layout for the Option 1 access does not demonstrate an allowance for pedestrian infrastructure connectivity or an extension of the existing school zone. This increases the risk of a vehicle and vulnerable road user collision. The likely travel speeds will be low giving drivers/pedestrians sufficient time to avoid a collision, however, should this occur, this may result in an energy transfer great enough to cause a moderate injury to the pedestrian.	Rare	Moderate	L

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level
ID-2	Proposed Option 1 Access Location (Anzac Ave / Kitchener Street)	 *Looking west on Anzac Ave at Option 1 access location.*  *Overview of Anzac Ave & Kitchener Street intersection where Option 1 access is located.*	The current conceptual layout for the Option 1 access does not demonstrate the prioritisation of the Anzac Ave/Kitchener Street intersection. This lack of control (yield/stop condition) increases the risk of a driver failing to give way to another road user passing through the intersection. The likely travel speeds will be low giving drivers sufficient time to avoid a collision, however, should this occur, this may result in impact angles with an energy transfer great enough to cause a moderate injury to occupants. NOTES: - Noting the T-junction type arrangement, the intuitive approach of most drivers would be to give way to the vehicles travelling north-south, however, consideration should be given to prioritising the current movements due to the no-trough road nature of the proposed development. - Although movements are minimal currently, the current arrangement has no control (yield/stop condition) in place.	Unlikely	Moderate	M

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level
ID-3	Proposed Option 2 Access Location (John Potts Drive)	 ***Looking southwest from John Potts Drive to Option 2 access.***	The Option 2 access (via John Potts Drive) introduces a long steep downgrade from the development to the connection with John Potts Drive (the through road). There are several inherent risks associated with steep grades in urban environments, particularly where the grade terminates at a T-junction. There is a risk of brake failure of laden vehicles, for example, furniture removalists, delivery vehicles, car-caravans or similar. This may result in several intersection crash types, particularly cross-intersection crashes at a moderate speed. The resultant energy transfer may be great enough to cause serious harm to occupants. There is a risk of children (or inexperienced) cycling, skateboarding or similar losing control on the steep grade and/or within the intersection. This may result in a vehicular strike of a pedestrian or cyclist at a moderate speed. The resultant energy transfer may be great enough to cause a fatal or serious injury to vulnerable road users. NOTES: - There is also a risk during construction where trucks loaded with plant, equipment and material may be using this access to the development.	**Rare**	**Serious**	**M (FSI)**

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level
ID-4	Proposed Option 2 Access Location (John Potts Drive)	 ***Overview of John Potts Drive intersection where Option 2 access is located.***  ***Diagrams of conflict point comparison between 3 and 4 leg intersections.***	The Option 2 access (via John Potts Drive) introduces a four-leg intersection from the development to the connection with John Potts Drive (the through road) and Crawley Street (providing access to the Junee Urban Wetlands and shared path network). The introduction of an additional leg at this location increases the number of potential conflict points (left). This may result in several intersection crash types, particularly cross-intersection crashes at a moderate speed. The resultant energy transfer may be great enough to cause serious harm to occupants. This may also result in a vehicular strike of a pedestrian or cyclist at a moderate speed. The resultant energy transfer may be great enough to cause a fatal or serious injury to vulnerable road users. NOTES: - The inclusion of a fourth leg increases the number of conflict points from 6 to 24. Also, note that these diagrams do not directly consider the function of on-road/off-road cyclist use which inherently results in additional conflict points.	Unlikely	Serious	M (FSI)

Appendix B. Road Safety Audit Recommendations

Junee Subdivision

Recommendations Report

RES2305.40.115-RSA

Date: 2/09/2023
Version: 1.0
Author: Z. Walgers

Document Quality Information

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Date	Version	Author	Approved	Change Reference
25/08/2023	0.1	Z. Walgers	J. Gorrie	Draft Recommendation Report
02/09/2023	1.0	Z. Walgers	J. Gorrie	Final Recommendation Report

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1. Audit Response Statement

Table 1-1 – Audit Details

Project Name:	Junee Subdivision RSA	
Client:	TJHRR Pty Ltd	
Client Representative:	Troy Raulston	Jenna Pollard
Contact Details:	M: 0437 891 147 E: info@trhomeswagga.com.au	M: 0418 421 621 E: jenna.pollard@remax.com.au
Auditors:	James Gorrie (RSA-02-0732 - Level 3) – Lead Road Safety Auditor Zach Walgers (RSA-02-1502 - Level 2) – Road Safety Auditor	
Audits Details:	RES2305.40.115 Junee Subdivision – Road Safety Audit Report	

We, the undersigned, declare that we have reviewed the material and data listed in the Junee Subdivision – Road Safety Audit Report and developed a list of treatments for the identified risks to road safety listed in Section 4. The responses are given to explain the proposed approach to addressing the identified items that have been highlighted.

It should be noted that while every effort has been made to identify appropriate treatments to the potential safety problems, no guarantee can be made that every problem or deficiency has been eliminated, however every effort has been made to significantly reduce the risk of fatal or serious injury (FSI) crashes.

It is recommended that identified treatments be implemented to address the risks to road safety as soon as practicable.

James Gorrie
Lead Road Safety Auditor (RSA-02-0732 - Level 3)   Date: 02/09/2023

Zach Walgers
Road Safety Auditor (RSA-02-1502-Level 2)   Date: 02/09/2023

2. Introduction

Rigore Engineering Services has been engaged by TJHRR Pty Ltd, to undertake a Road Safety Audit on the proposed strategic access options from the proposed subdivision of land at 14 John Potts Drive Junee to the existing Junee Shire Council road network.

2.1. Project Description

The proposed subdivision includes 43 Torrens title residential lots, associated internal road and footpath infrastructure. The proposed site is located within the Junee township between John Potts Drive and Anzac Ave (refer to Figure 2-1 – Site Overview, Junee NSW).

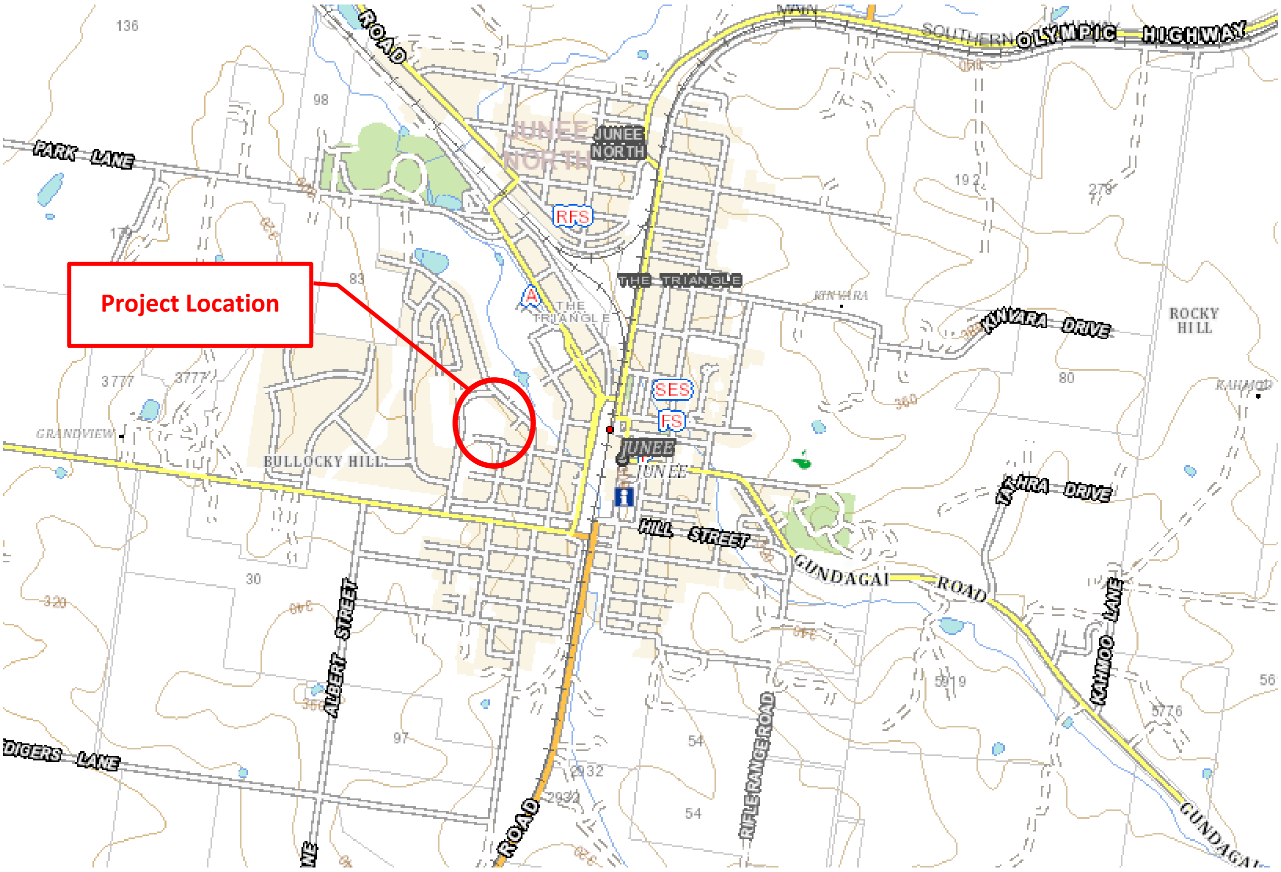


Figure 2-1 – Site Overview, Junee NSW

The proposed strategic access options include the below:

- Option 1 – A single point of network access via Kitchener Street/Anzac Ave

Figure 2-2 – Option 1 Access Location

- Option 2 – A single point of network access via John Potts Drive.

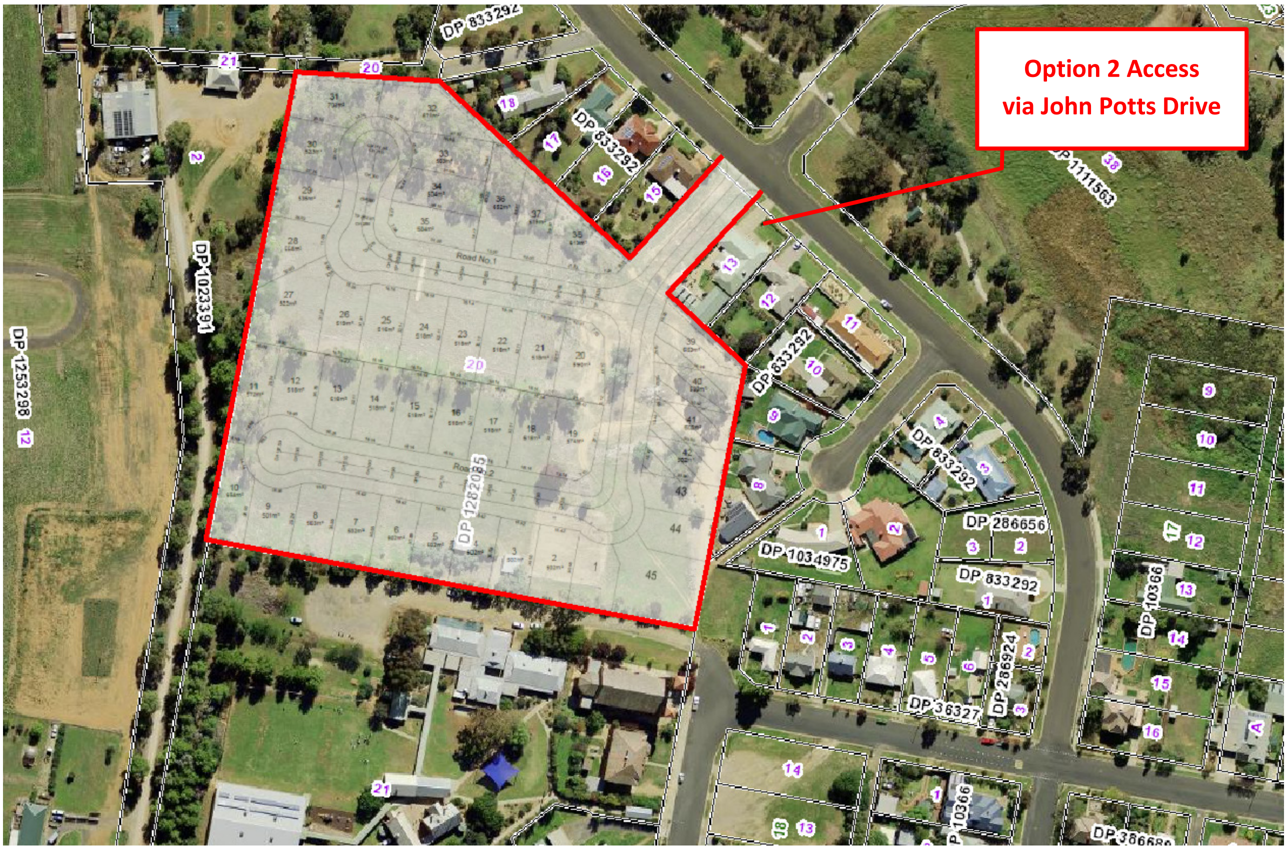


Figure 2-3 – Option 2 Access Location

2.1.1. Project Team

Table 2-1 – Project Team

James Gorrie		
	Position: Experience: Education: Qualifications: Accreditations:	Managing Director | Project / Design Manager 20+ years Master of Engineering (Civil) Bachelor of Engineering Technology (Civil) CPEng NER MIEAust APEC Engineer Level 3 Lead/Snr Road Safety Auditor NSW | VIC | QLD | SA Treatment of Crash Location | Prepare Workzone TMP
Zach Walgers		
	Position: Experience: Education: Qualifications: Accreditations:	Lead Civil Designer (Road) | Road Safety Auditor 7+ years Master of Engineering / Bachelor of Technology | Current Associate Degree of Engineering (Civil) MIEAust Level 2 Road Safety Auditor NSW

2.1.2. Site Inspections

A day and night site inspection was undertaken by James Gorrie (Lead Road Safety Auditor), and Zach Walgers (Road Safety Auditor) on Monday 1st August 2023 between 3:00am and 6:15pm, the weather was clear for the duration of the inspection. During the inspection, the audit team familiarised themselves with the existing road environment, road user make-up and surrounding land use. The site inspection activities involved measuring features, taking photographs, and recording observed road user behaviour.

2.1.3. Client Workshop

The Client Workshop was undertaken immediately following the Completion Meeting held via Microsoft Teams on Monday 14th August 2023 between 4:00pm and 5:00pm. In attendance were James Gorrie (Lead Road Safety Audits), Jenna Pollard and Troy Raulston (TJHRR Pty Ltd representatives). The proposed recommendations were discussed in detail with the attached strategic layouts being produced for assessment using the Safe System Assessment outlined in *AP-R509-16 Austroads Safe System Assessment Framework*.

3. Risk Assessment

3.1. Methodology

The Road Safety Audit will be conducted in accordance with relevant Austroads Guides to Road Safety, inclusive but not limited to *Austroads Guide to Road Safety Part 6: Road Safety Audits 2022* including the application and consideration of Safe System principles.

The Rigore Road Safety Audit team has undertaken the audit by embedding Safe Systems principles. This is achieved by applying our knowledge, experience and understanding of the Safe Systems Framework to document findings in a manner that describes the road user exposure, crash likelihood and crash severity.

The identification and removal or treatment of road elements that may contribute to crash occurrence or crash severity is a key component of the safe system approach to road safety. A safe system acknowledges that human error within the transport system is inevitable and that when it does occur the system makes allowance for these errors to minimise the risk of serious injury or death. In a safe system, therefore, roads (and vehicles) should be designed to reduce the incidence and severity of crashes when they inevitably occur.

Four key principles form the basis of the Safe System philosophy, as outlined in *Guide to Road Safety Part 1: Introduction & The Safe System*:

- People make mistakes that can lead to road crashes
- The human body has a limited physical ability to tolerate crash forces before harm occurs
- A shared responsibility exists amongst those who plan, design, build, manage and use roads and vehicles and those who provide post-crash care to prevent crashes resulting in serious injury or death
- All parts of the system must be strengthened to multiply their effects; so that if one part fails, road users are still protected.

Safer road user behaviour, safer speeds, safer roads and safer vehicles are the four key elements that make up a safe system. In relation to speed, the *Guide to Road Safety Part 3: Safe Speed*, using *Wramborg* curves, outlines the relationships between a motorized vehicle collision speed and the probability of a fatality for different crash configurations:

Often referred to as the Safe System speeds, the following aspirational operating speeds are as follows:

30km/h	where there is the possibility of a collision between a vulnerable road user and a passenger vehicle or where there is the possibility of a side impact with a fixed object e.g. tree/pole
50km/h	where there is the possibility of a right-angle collision between passenger vehicles
70km/h	where there is the possibility of a head-on collision between passenger vehicles
≥100 km/h	where there is no possibility of side or frontal impact between vehicles or impacts with vulnerable road user impacts.

NOTE: presently there is only limited evidence on cyclist and motorcyclist injury thresholds and an assumption is often made that their injury potential is the same as the pedestrian curve. The curves only represent passenger car interactions and do not account for young and elderly people and heavy vehicles. The curves are also limited in that they only provide the probability of fatality and not serious injury and there is little published evidence demonstrating the origins of the curves.

3.2. Risk Assessment Framework

The Austroads system of risk assessment will be applied with the relative characteristics as follows:

Table 3-1 – How often is the problem likely to lead to a crash?

Likelihood	Description
Almost certain	Occurrence once per quarter
Likely	Occurrence once per quarter to once per year
Possible	Occurrence once per year to once every three years
Unlikely	Occurrence once every three years to once every seven years
Rare	Occurrence less than once every seven years.

Table 3-2 – What is the likely severity of the resulting crash type?

Severity	Description	Examples
Insignificant	Property damage	Some low-speed collisions Pedestrian walks into object (no head injury) Car reverses into post
Minor	Minor first aid	Low speed collisions Pedestrian walks into object (minor head injury) Cyclists fall from bicycle at low speed
Moderate	Major first aid and/or presents to hospital (not admitted)	Some low to medium-speed collisions Cyclists fall from bicycle at moderate speed Left turn rear-end crash in a slip lane
Serious	Admitted to hospital	High or medium-speed vehicle / vehicle collision High or medium-speed single vehicle collision with fixed roadside object Pedestrian struck at high speed
Fatal	At scene or within 30 days of the crash.	High speed multi vehicle crash on Freeway. Car runs into crowded bus stop. Bus and petrol tanker collide Collapse of bridge or tunnel

Table 3-3 – The resulting level of risk

			Severity*				
			Insignificant Property Damage	Minor Minor first aid	Moderate Major first aid and/or presents to hospital (not admitted)	Serious Admitted to hospital	Fatal Death within 30 days of the crash
Likelihood (includes exposure)	Almost Certain	One Per Quarter	Medium	High	High	Extreme (FSI)	Extreme (FSI)
	Likely	Quarter to 1-year	Medium	Medium	High	Extreme (FSI)	Extreme (FSI)
	Possible	1 to 3 years	Low	Medium	High	High (FSI)	Extreme (FSI)
	Unlikely	3 to 7 years	Negligible	Low	Medium	High (FSI)	Extreme (FSI)
	Rare	7 years +	Negligible	Negligible	Low	Medium (FSI)	High (FSI)

Safe System Crash Outcome Threshold

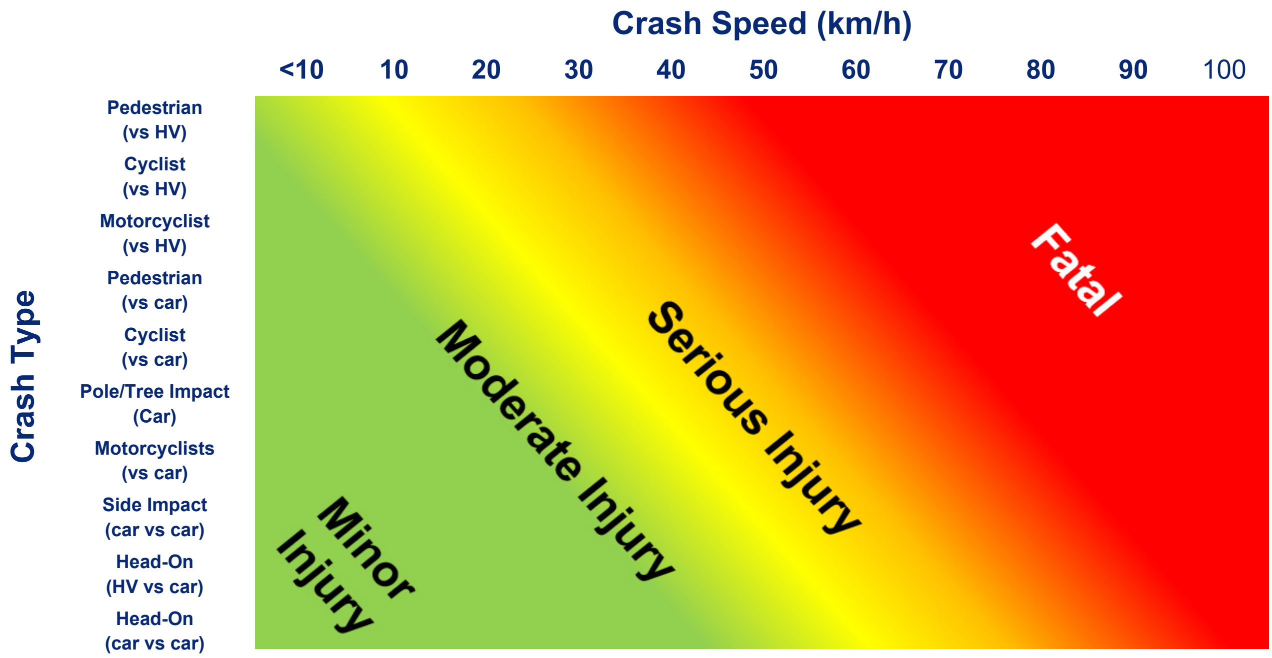
The treatment that Austroads recommend for the above levels of risk is shown in Table 3.4.

Table 3-4 – Treatment approach

Risk	Treatment
Extreme	Must be corrected regardless of cost
High	Should be corrected or the risk significantly reduced even if the treatment cost is high
Medium	Should be corrected or the risk significantly reduced even if the treatment cost is moderate, but not high
Low	Should be corrected or the risk significantly reduced if the treatment cost is low
Negligible	No action required

The risk matrix above shown in *Table 3.3*, is aligned to Safe System principles and has been designed to be used with consideration of a severity guidance sheet which was developed by the Project Working Group. The PWG comprising of representatives from state and local road agencies was established with the primary objective of consolidating and updating the previously issued Parts 6 and 6A (Austroads 2019).

Table 3-5 – The severity guidance sheet – to be used with the risk matrix



4. Audit Results

The results of the audit observations and findings have been reported in two categories:

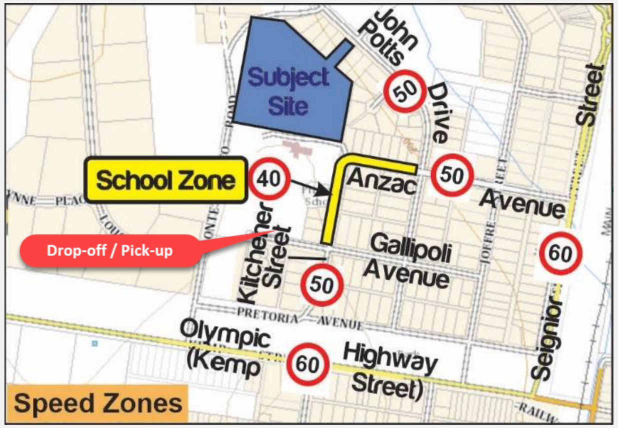
4.1 General Observations
4.2 Identified Risks

The audit findings, recommended countermeasures and client responses are listed in Table 4.1 and Table 4.2, together with the residual risk ranking, as determined using the risk assessment tables in Section 3.

The project team have provided client response/comments on behalf of the client. In summary, we recommend that Option 1, access via Kitchener St and Anzac Ave be considered the preferred location for network integration as there has been no notable risk identified that may result in a fatal or serious injury should the recommended countermeasure be adopted. Additionally, by adopting Option 1 an opportunity is presented to address outlying issues related to the quality and adequacy of the infrastructure related to the St Josephs School Zone and operations.

4.1 General Observations

Table 4-1 – General Observations

GE	General Observations	Photos / Reference	Recommended Actions
GE-1	The southern extent of the existing school zone is located north of the Vaughan Street/Gallipoli Ave intersection with Kitchener Street. This does not cover the “School Drop-off Pick-up ZONE” located west of this intersection on Vaughan Street. School children were observed walking south along Kitchener Street towards Endeavor Park area (Pretoria Street). It is unclear why the extent of the school zone does not include the “School Drop-off Pick-up ZONE” located west of this intersection on Vaughan Street.	 ***Looking north on Kitchener Street toward the existing school zone.***  ***Extract: Ason Group Traffic Impact Statement.***	Raise observation with Council representatives to determine if the issue is in hand and/or resolved through other mechanisms. NOTE: Option 1 will require the inclusion of a School Zone threshold treatment if adopted. Refer Attachment A1.

GE	General Observations	Photos / Reference	Recommended Actions
GE-2	At the time of the PM site inspection, it was observed that the “School Drop-off Pick-up ZONE” did not appear to be in use by parents or staffed by school monitors. It appeared that the area in front of Saint Jospeh’s Catholic Church (north of the bus zone) or the opposing side of Kitchener Street was instead being used by parents picking up children. Considering the availability of the infrastructure on Vaughan Street, this resulted in an undesirable mix of children pick-up and bus stop operations.	 ***Looking east in the “Drop-off Pick-up ZONE”***  ***Looking north toward bus stop on Kitchener St.***	Raise observation with Council representatives to determine if the issue is in hand and/or resolved through other mechanisms.

GE	General Observations	Photos / Reference	Recommended Actions
GE-3	At the time of the PM site inspection, a “Walking School Bus” was observed crossing Anzac Ave at the end of Kitchener Street (Option 1 access location), walking children on the northern side of Anzac Ave as far as the northwest corner of Anzac Ave and John Potts Drive intersection (Yellow). Additionally, at the time of the PM site inspection, several children were observed continuing from Anzac Ave at the end of Kitchener Street (Option 1 access location), onto the gravel access track toward the alleyway connecting to Pike Place (Red). It should be noted that Option 2 access (via John Potts Drive) may adversely impact the current access to the Pike Place alleyway, where as Option 1 access (via Anzac Ave/Kitchener Street presents the opportunity to formalise an all weather access to the Pike Place alleyway.	 ***Overview of prominent pedestrian movements.***	Raise observation with Council representatives for consideration.

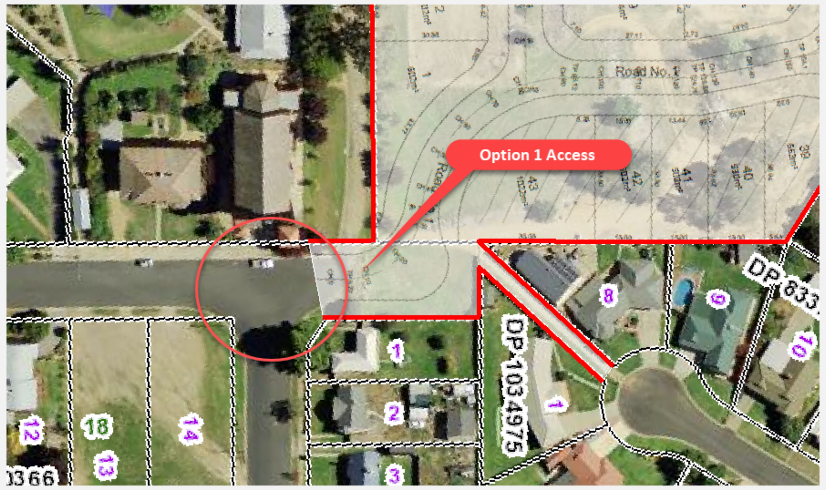
GE	General Observations	Photos / Reference	Recommended Actions
GE-5	There is existing lighting and stormwater infrastructure that would require adjustment at the Option 2 access location (14 John Potts Drive). The existing light post is located in the middle of the vacant block where the proposed development access will be located joining John Potts Drive. The existing stormwater pit is located in the middle of the vacant block where the proposed development access will be located joining John Potts Drive.	 ***Looking southwest toward Option 2 access.***  ***Looking south toward Option 2 access.***	No action is required for Option 1. Option 2 if adopted will need to consider safe alteration.

GE	General Observations	Photos / Reference	Recommended Actions
GE-6	It is acknowledged that the provision of artificial lighting will form part of the development requirements. Consideration needs to be given to the adequacy of the existing lighting at the development access location adopted.	 ***Looking north down Kitchener Street at the proposed development intersection.***  ***Looking southwest toward Option 2 access.***	Consideration needs to be given to the adequacy of the existing lighting at the development access location adopted.

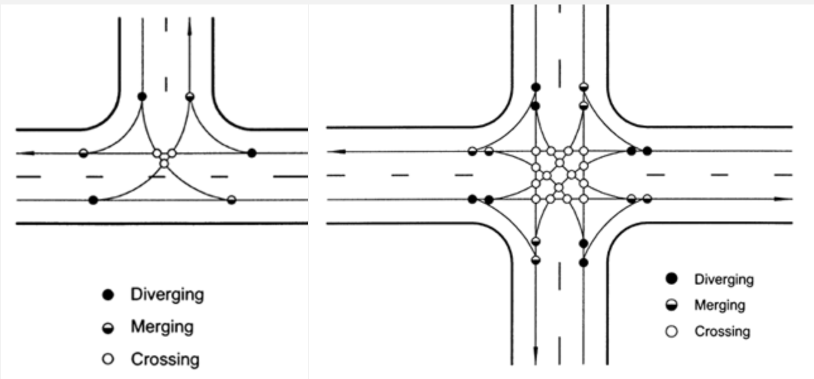
4.2 Identified Risks

Table 4-2 – Identified Risk

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level	Recommended Actions	Likelihood	Severity	Residual Risk Level
ID-1	Proposed Option 1 Access Location (Anzac Ave / Kitchener Street)	 ***Looking north on Kitchener St toward Option 1 access location.***  ***Looking southwest from Pike Place cul-de-sac along alleyway.***	As indicated by GE-3, children currently walk along the west side of Kitchener Street, either crossing to the northern side of Anzac Ave or continuing from Anzac Ave at the end of Kitchener Street onto the gravel access track toward the alleyway connecting to Pike Place. The proposed Option 1 access will generate additional vehicular movements (approximately 34 vehicles per hour) that will inadvertently interact with the current pedestrian movements. The current conceptual layout for the Option 1 access does not demonstrate an allowance for pedestrian infrastructure connectivity or an extension of the existing school zone. This increases the risk of a vehicle and vulnerable road user collision. The likely travel speeds will be low giving drivers/pedestrians sufficient time to avoid a collision, however, should this occur, this may result in an energy transfer great enough to cause a moderate injury to the pedestrian.	**Rare**	**Moderate**	**L**	Implement the recommended actions as shown by Attachment A1: - Provide a raised threshold to provide speed calming and visual prompts to approaching road users; - Provide control through signage and delineation of the intersection of Anzac Ave and Kitchener Street; - Provide an extension of the existing school zone; and - Provide footpath connectivity to the Pike Place cul-de-sac alleyway.	**Rare**	**Minor**	**N**

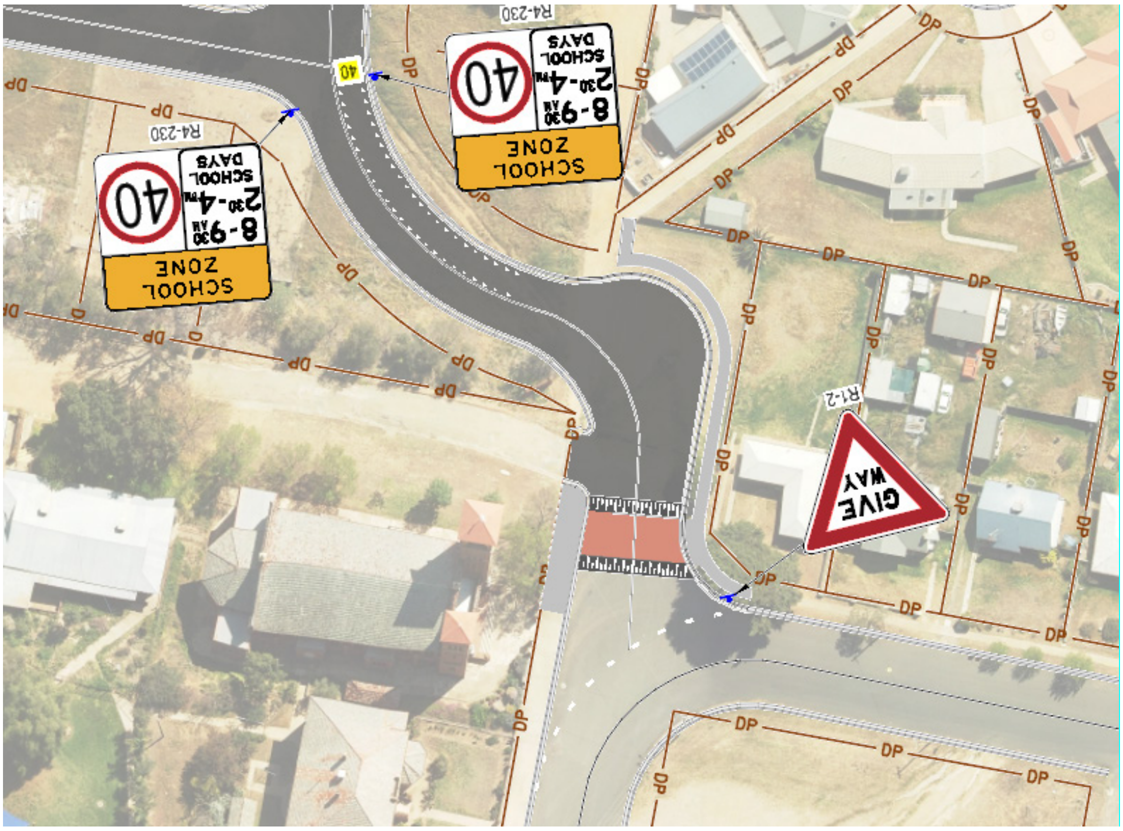
ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level	Recommended Actions	Likelihood	Severity	Residual Risk Level
ID-2	Proposed Option 1 Access Location (Anzac Ave / Kitchener Street)	 ***Looking west on Anzac Ave at Option 1 access location.***  ***Overview of Anzac Ave & Kitchener Street intersection where Option 1 access is located.***	The current conceptual layout for the Option 1 access does not demonstrate the prioritisation of the Anzac Ave/Kitchener Street intersection. This lack of control (yield/stop condition) increases the risk of a driver failing to give way to another road user passing through the intersection. The likely travel speeds will be low giving drivers sufficient time to avoid a collision, however, should this occur, this may result in impact angles with an energy transfer great enough to cause a moderate injury to occupants. NOTES: - Noting the T-junction type arrangement, the intuitive approach of most drivers would be to give way to the vehicles travelling north-south, however, consideration should be given to prioritising the current movements due to the no-trough road nature of the proposed development. - Although movements are minimal currently, the current arrangement has no control (yield/stop condition) in place.	**Unlikely**	**Moderate**	**M**	Implement the recommended actions as shown by Attachment A1: - Provide a raised threshold to provide speed calming and visual prompts to approaching road users; - Provide control through signage and delineation of the intersection of Anzac Ave and Kitchener Street; - Provide an extension of the existing school zone; and - Provide footpath connectivity to the Pike Place cul-de-sac alleyway.	**Rare**	**Minor**	**N**

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level	Recommended Actions	Likelihood	Severity	Residual Risk Level
ID-3	Proposed Option 2 Access Location (John Potts Drive)	 ***Looking southwest from John Potts Drive to Option 2 access.***	The Option 2 access (via John Potts Drive) introduces a long steep downgrade from the development to the connection with John Potts Drive (the through road). There are several inherent risks associated with steep grades in urban environments, particularly where the grade terminates at a T-junction. There is a risk of brake failure of laden vehicles, for example, furniture removalists, delivery vehicles, car-caravans or similar. This may result in several intersection crash types, particularly cross-intersection crashes at a moderate speed. The resultant energy transfer may be great enough to cause serious harm to occupants. There is a risk of children (or inexperienced) cycling, skateboarding or similar losing control on the steep grade and/or within the intersection. This may result in a vehicular strike of a pedestrian or cyclist at a moderate speed. The resultant energy transfer may be great enough to cause a fatal or serious injury to vulnerable road users. NOTES: - There is also a risk during construction where trucks loaded with plant, equipment and material may be using this access to the development.	**Rare**	**Serious**	**M (FSI)**	Implement the recommended actions as shown by Attachment A2: - Provide a raised threshold to provide speed calming and visual prompt to approaching road users.	**Rare**	**Moderate**	**L**

ID	Location	Photos / Reference	Description of Deficiency & Likely Consequence	Likelihood	Severity	Risk Level	Recommended Actions	Likelihood	Severity	Residual Risk Level
ID-4	Proposed Option 2 Access Location (John Potts Drive)	 ***Overview of John Potts Drive intersection where Option 2 access is located.***  ***Diagrams of conflict point comparison between 3 and 4 leg intersections.***	The Option 2 access (via John Potts Drive) introduces a four-leg intersection from the development to the connection with John Potts Drive (the through road) and Crawley Street (providing access to the Junee Urban Wetlands and shared path network). The introduction of an additional leg at this location increases the number of potential conflict points (left). This may result in several intersection crash types, particularly cross-intersection crashes at a moderate speed. The resultant energy transfer may be great enough to cause serious harm to occupants. This may also result in a vehicular strike of a pedestrian or cyclist at a moderate speed. The resultant energy transfer may be great enough to cause a fatal or serious injury to vulnerable road users. NOTES: - The inclusion of a fourth leg increases the number of conflict points from 6 to 24. Also, note that these diagrams do not directly consider the function of on-road/off-road cyclist use which inherently results in additional conflict points.	**Unlikely**	**Serious**	**M (FSI)**	Implement the recommended actions as shown by Attachment A2: - Provide a raised threshold to provide speed calming and visual prompts to approaching road users.	**Unlikely**	**Moderate**	**M**

Attachment A1 – Strategic Layout

A1 – Option 1



Attachment A2 – Strategic Layout

A2 – Option 2


Appendix C. Safe Systems Assessment

RIGORE ENGINEERING SERVICES

Safe Systems Assessment

Junee Subdivision

RES2305.40.115-SSA

Date: 2/09/2023
Version: 1.0
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Document Quality Information

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Date	Version	Author	Approved	Change Reference
28/08/2023	0.1	Z. Walgers	J. Gorrie	Draft Safe System Assessment
02/09/2023	1.0	Z. Walgers	J. Gorrie	Final Safe System Assessment

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Executive Summary

Rigore Engineering Services (Rigore) has been engaged by TJHRR Pty Ltd, to undertake a Safe Systems Assessment on the proposed strategic access options from the proposed subdivision of land at 14 John Potts Drive Junee to the existing Junee Shire Council road network.

The Safe System is a road safety philosophy that requires roads to be designed and managed so that crash-related death and serious injury are avoidable.

A Safe System Assessment (SSA) is a safety examination of a road-related program, project, or initiative. The procedure for undertaking a Safe System Assessment is outlined in *AP-R509-16 Austroads Safe System Assessment Framework*.

A Safe System Assessment (SSA) has been conducted on a total of 2 scenarios as listed below with the Safe Systems Assessment Matrix scores provided in Table 1 – Options Summary.

- Option 1 – A single point of network access via Kitchener Street/Anzac Ave
- Option 2 – A single point of network access via John Potts Drive.

Table 1 – Options Summary

Option	Description	Score
Option 1	Access via Kitchener Street/Anzac Ave	6.25 / 448
Option 2	Access via John Potts Drive.	10.5 / 448

Each option has been assessed according to the framework set out in Austroads AP-R509-16. A Safe System matrix score is generated for each option. The Safe System matrix score is the sum of scores determined for seven major crash types for each of the options provided, summarised in Table 1. Lower scores are safer.

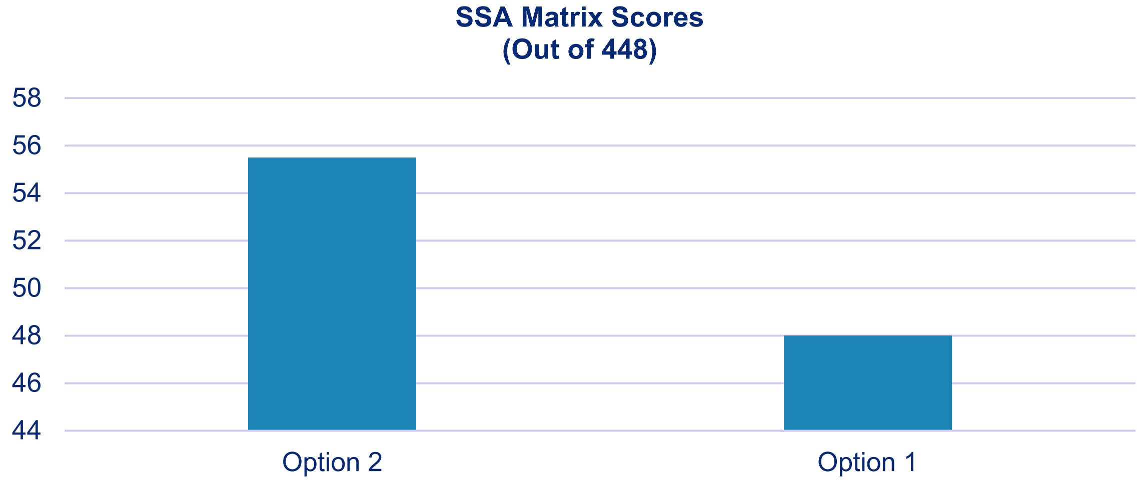


Figure 1 – Safe System Scores

The Safe Systems Assessment undertaking has demonstrated that not only is the proposed development typical of expected changes to the network behaviour but it has also demonstrated that there is a negligible foreseeable change to the road safety performance regardless of the adopted access option, although marginally in favour of Option 1 as detailed herein.

1. Introduction to the Safe System

1.1 Safe System Pillars

The Safe System approach seeks to ensure that no road user is subjected to kinetic energy exchange in a crash that will result in death or serious injury. There is a shared responsibility for safe travel outcomes between system designers (road authorities, vehicle manufactures, road designers etc.) and road users. There are four Safe System pillars: safer vehicles, safer speeds, safer roads, and safer road users. Post-crash response is another element that is often recognised as the fifth pillar. All parts of the system must be considered and strengthened so that road safety outcomes are maximised and to ensure that road users are adequately protected even if one part fails.

Safe System Assessment (SSA) is concerned mainly with the safer roads and safer speeds pillars. A SSA is used to examine road project proposals and aims to identify infrastructure and speed related factors that are likely to contribute to a higher risk of fatal and serious injury (FSI) crashes. It also seeks to identify design or scope changes that will improve the alignment of the project with Safe System principles.

Figure 2 – Safe System Pillars

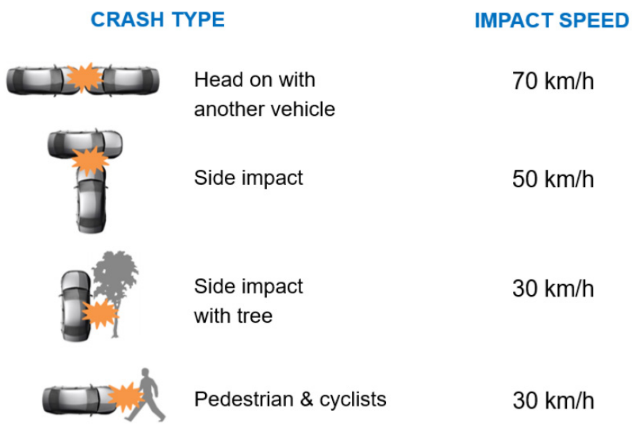


Figure 3 – Safe System Impact Speeds

1.2 Safe System Impact Speeds

The impact speed in a collision is a significant factor that affects the probability of a person being killed or seriously injured in a crash. Safe System impact speeds are speeds below which the chances of survival are high, and the likelihood of serious injury is low.

Figure 3 is a guide to Safe System impact speeds for common crash types. It should be noted that the angle of impact of a collision is also a factor that affects the severity of a crash. As far as is practically possible, infrastructure should be designed, and travel speeds managed so that the impact speeds when a crash occurs are below the thresholds show in Figure 3.

2. Safe System Assessment Process

2.1 Safe System Process

The Safe System Assessment process is based on Austroads Safe System Assessment Framework (Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework)

Steps in the process include:

- Deciding on the type of assessment
- Selecting an appropriate team to conduct the assessment.
- Understanding the project background, context, and objectives
- Collation of information and data for both existing and future conditions
- Inspection of the site
- Consideration of existing conditions and each project design option using the SSA Matrix
- Consideration of the additional Safe System components; road users, vehicles, post-cash care
- Review of the SSA Matrix scores and development of suggested changes to improve alignment with Safe System principles.
- Reporting
- Review of suggested design and scope changes
- Amendment of project scope and design to incorporate the accepted changes.

2.2 Safe System Matrix

To ensure that Safe System elements are considered, or to measure how well a given project (e.g., an intersection, road length, area, treatment type etc.) aligns with Safe System principles, a Safe System matrix has been produced. The purpose of the matrix is to assess different major crash types (those identified as the predominant contributors to fatal and serious crash outcomes) against the exposure to that crash risk, the likelihood of it occurring and the severity of the crash should it occur.

A risk assessment approach has been adopted that includes exposure, likelihood, and severity. Exposure, likelihood, and severity (the rows of the matrix) are defined as follows:

- Road user exposure: this refers to which road users, in what numbers and for how long are using the road and are thus exposed to a potential crash. The measures of exposure include: AADT, side-road traffic volumes, number of motorcycles, cyclists and pedestrians crossing or walking along the road, length of the road, area, and length of time.
- Crash likelihood: groups of factors affecting the probability of a crash occurring. They can be elements which moderate opportunity for conflict (e.g., number of conflict points, offset to roadside hazards, separation between opposing traffic). They can also include elements of road user behaviour and/or road environment. Typically, these are the elements which moderate road user error rates. This includes issues such as level of intersection control (e.g., priority/signals/movement ban), speed, sight distance, geometric alignment, driver guidance and warning. and maintenance (change in practice; implications of timing).
- Crash severity: groups of factors affecting the probability of severe injury outcomes should a crash occur. Typically, these factors are associated with the amount of kinetic energy and its transfer in the crash, e.g., impact speeds and angles, severity of roadside hazards.

Each cell in the matrix is to be manually assigned a score between zero and four. A score of zero indicates that the system is fully aligned with the Safe System vision for that component of a given crash type. The higher the score, the further the project is from a Safe System condition. When quantifying alignment with Safe System principles, reference is made to Austroads report APR509-16 Safe System Assessment Framework Table 4.2 (shown overleaf).

Table 2 – Safe System Matrix Scoring System

Road User Exposure	Crash Likelihood	Crash Severity
0 = there is no exposure to a certain crash type. This might mean there is no side flow or intersecting roads, no cyclists, no pedestrians, or motorcyclists).	0 = there is only minimal chance that a given crash type can occur for an individual road user given the infrastructure in place. Only extreme behaviour or substantial vehicle failure could lead to a crash. This may mean, for example, that two traffic streams do not cross at grade, or that pedestrians do not cross the road.	0 = should a crash occur, there is only minimal chance that it will result in a fatality or serious injury to the relevant road user involved. This might mean that kinetic energies transferred during the crash are low enough not to cause a fatal or serious injury (FSI), or that excessive kinetic energies are effectively redirected/dissipated before being transferred to the road user. Users may refer to Safe System-critical impact speeds for different crash types, while considering impact angles, and types of roadside hazards/barriers present.
1 = volumes of vehicles that may be involved in a particular crash type are particularly low, and therefore exposure is low. For run-of-road, head-on, intersection and 'other' crash types, AADT is < 1 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are < 10 units per day.	1 = it is highly unlikely that a given crash type will occur.	1 = should a crash occur, it is highly unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies must be fairly low during a crash, or the majority is effectively dissipated before reaching the road user.
2 = volumes of vehicles that may be involved in a particular crash type are moderate, and therefore exposure is moderate. For run-of-road, head-on, intersection and 'other' crash types, AADT is between 1 000 and 5 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 10–50 units per day.	2 = it is unlikely that a given crash type will occur.	2 = should a crash occur, it is unlikely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, and the majority of the time they are effectively dissipated before reaching the road user.
3 = volumes of vehicles that may be involved in a particular crash type are high, and therefore exposure is high. For run-of-road, head-on, intersection and 'other' crash types, AADT is between 5 000 and 10 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are 50–100 units per day.	3 = it is likely that a given crash type will occur.	3 = should a crash occur, it is likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are moderate, but are not effectively dissipated and therefore may or may not result in an FSI.
4 = volumes of vehicles that may be involved in a particular crash type are very high, or the road is very long, and therefore exposure is very high. For run-of-road, head-on, intersection and 'other' crash types, AADT is > 10 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are > 100 units per day	4 = the likelihood of individual road user errors leading to a crash is high given the infrastructure in place (e.g. high approach speed to a sharp curve, priority movement control, filtering right turn across several opposing lanes, high speed).	4 = should a crash occur, it is highly likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are high enough to cause an FSI crash, and it is unlikely that the forces will be dissipated before reaching the road user.

3. Assessment Details

3.1 Type of Assessment

Rigore conducted a Safe System Assessment to assess the proposed strategic access options from the proposed subdivision of land at 14 John Potts Drive Junee to the existing Junee Shire Council road network.

3.2 Assessment Team

Table 3 – Assessment Team

James Gorrie		
	Position: Experience: Education: Qualifications: Accreditations:	Managing Director | Project / Design Manager 20+ years Master of Engineering (Civil) Bachelor of Engineering Technology (Civil) CPEng NER MIEAust APEC Engineer Level 3 Lead/Snr Road Safety Auditor NSW | VIC | QLD | SA Treatment of Crash Location | Prepare Workzone TMP
Zach Walgers		
	Position: Experience: Education: Qualifications: Accreditations:	Lead Civil Designer (Road) | Road Safety Auditor 7+ years Master of Engineering / Bachelor of Technology | Current Associate Degree of Engineering (Civil) MIEAust Level 2 Road Safety Auditor NSW

3.3 Assessment Methodology

A Safe System Assessment has been undertaken to examine the Junee Subdivision development. The procedure undertaking aligns with the that outlined in *AP-R509-16 Austroads Safe System Assessment Framework*.

4. Project Description

4.1 Project Background

The proposed subdivision includes 43 Torrens title residential lots, associated internal road and footpath infrastructure. The proposed site is located within the Junee township between John Potts Drive and Anzac Ave (refer to *Figure* 4 – *Site overview, Junee NSW*)

The proposed subdivision development access is yet to select a preferred ingress/egress arrangement. Two separate options for access are being considered with this assessment being one of several inputs put forward to determine the impact on the surrounding road network and roadside environment.

The options include:

- Option 1 – A single point of network access via Kitchener Street/Anzac Ave
- Option 2 – A single point of network access via John Potts Drive.

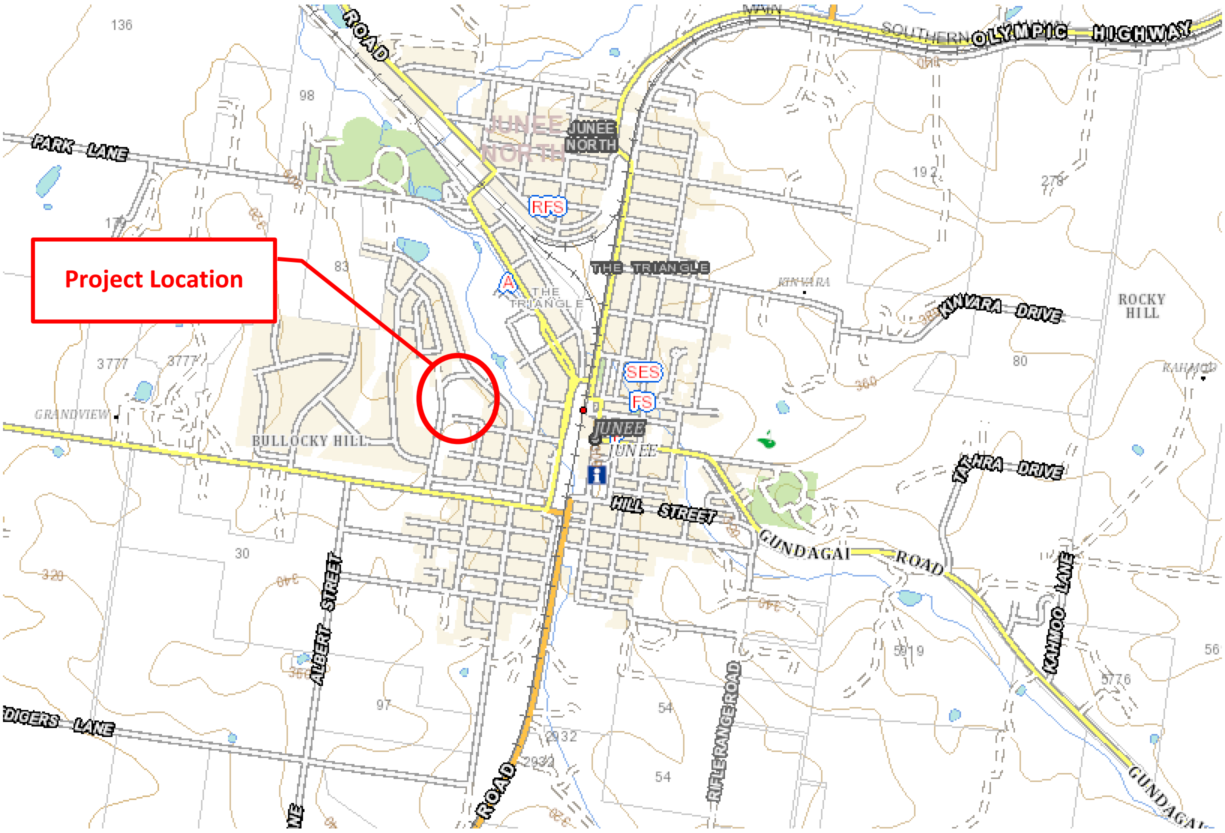


Figure 4 – Site Overview, Junee NSW

The proposed strategic access options include the below:

- Option 1 – A single point of network access via Kitchener Street/Anzac Ave

Figure 5 – Option 1 Access Locations

- Option 2 – A single point of network access via John Potts Drive.

Figure 6 – Option 2 Access Location

4.2 Project Context

Table 4 – Project Context

Prompts	Comments
What is the reason for the project? Is there specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, maintenance/asset renewal, etc.	- There is a proposed residential subdivision development creating 43 Torrens title lots - Provide safe integration, limiting impact to the existing network. - Maintain (or improve) general road user safety - Improve and better manage the increasing traffic volumes due to the subdivision - Improve pedestrian safety accommodating desire lines and increasing volumes. - There is no evident crash type existing in the current environment, however, vulnerable road users associated with the school zone and shared path network as well as intersection adjustments are a primary consideration.
What is the function of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g., upstream and downstream)? What alternative routes exist?	- Either of the adopted access locations will connect to the development of the existing network, inherently introducing additional traffic movements. - The Saint Joseph's Catholic Church influences the operation of the network during morning and afternoon peak times. There is a notable risk but also significant opportunity associated with this factor.
What is the speed environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	- The speed environment at the Option 1 access location is low, particularly in the Option 1 location where the existing through movement is a right-angled turn from/to Anzac Ave to Kitchener Street (operating speed estimated to be 20-30km/h) currently posted at 50km/h - The speed environment at the Option 2 access location is low-moderate where existing through movements are a continuous straight unimpeded flow along John Potts Drive currently posted at 50km/h.
What road users are present? Consider the presence of elderly pedestrians, school children and cyclists. What is the vehicle composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school speed limits, etc.)	- The intersection has several road user types including, light rigid trucks, school buses, cars, motorcyclists, pedal cyclists, and pedestrians (most of which were observed or rightfully have access to this part of the network). - St Joseph's Primary School bus zone is located 300m south of the Kitchener Street / Anzac Drive intersection.

4.3 Proposed Works

4.3.1 Existing Conditions Anzac Ave and Kitchener Street

Figure 7 – Existing Conditions – Kitchener Street/Anzac Drive proposed access.

4.3.2 Design Option 1 – (access via Kitchener Street/Anzac Drive)

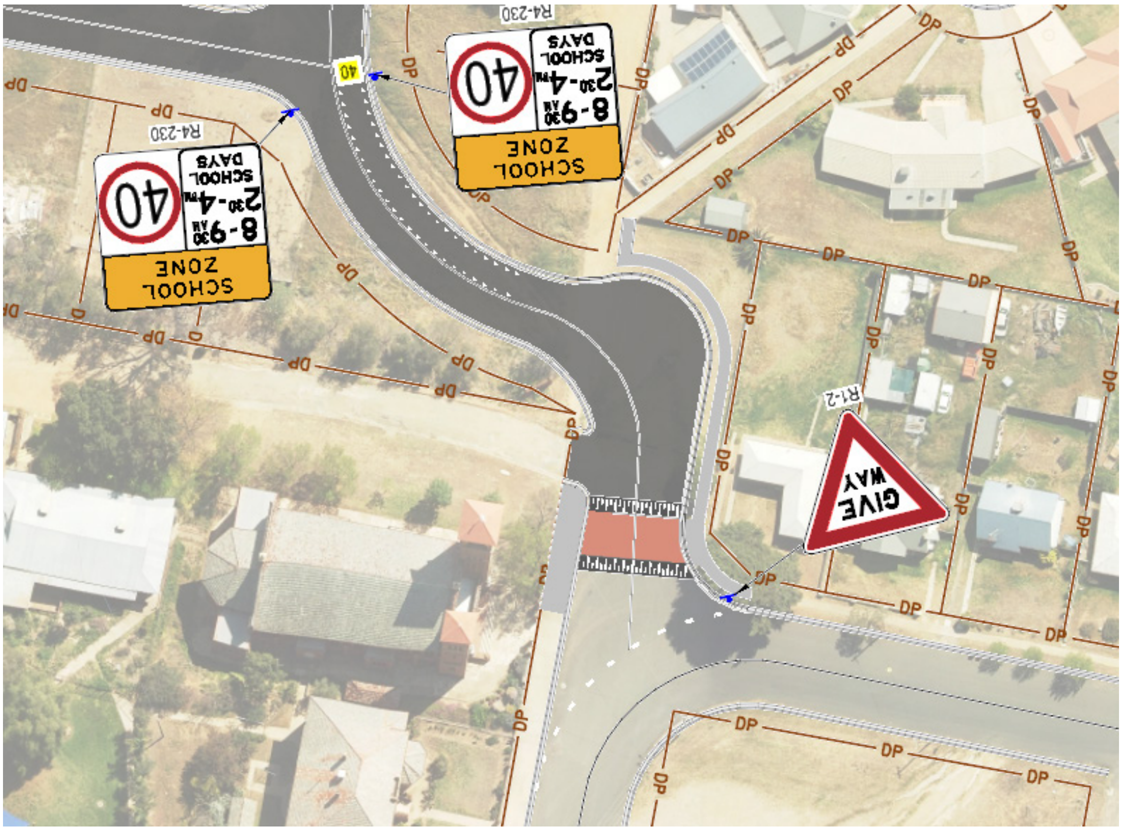


Figure 8 – Option 1 (access via Kitchener Street/Anzac Drive)

4.3.3 Existing Conditions John Potts Drive

Figure 9 – Existing Conditions – John Potts Dr and Vacant Block (Road No.1) proposed access.

4.3.4 Design Option 2 – (access via John Potts Dr)

Figure 10 – Option 2 (access via John Potts Dr)

4.4 Primary Considerations

Complimentary to the Safe Systems Approach, the following primary factors are evident for consideration concerning this project.

4.4.1 Road Safety Audit (and recommendations)

A Road Safety Audit was previously undertaken by Rigore, *RES2305.40.115 Junee Subdivision - Road Safety Audit and Recommendations Report.* This report has provided insight into the following items, which have been considered in the preparation of this Safe Systems Assessment:

- **Introduction and Project Description** – an overview of the project context and the engagement, client details and purpose of the engagement;
- **Primary Considerations** – including the relationship between vehicle speed and the likelihood of severe injury, influence of impact angle and travel speed on transferable kinetic energy, sight distance requirements (SISD, ASD, SSD, CSD);
- **Risk Assessment** – including the adopted methodology and risk assessment framework;
- **Audit Results** – including the general observations and identified risk;
- **Recommendations** – including the recommended treatments/countermeasures to improve road safety outcomes and the associated residual risk rating.

4.4.2 Traffic Impact Statement

A Traffic Impact Statement has been provided by Ason Group, *Traffic Impact Statement – Residential Subdivision Application John Potts Drive, Junee, dated 21/07/2023.* This report has provided insight into the following items, which have been considered in the preparation of this Safe Systems Assessment:

- **Consultation –** including discussions with Council representatives on site;
- **Scope of Assessment –** including report limitations: assessment of construction traffic, road design, road safety audit (this document) and safe system assessment;
- **Existing Conditions –** including land use, public transport, active transport, road network, crash history and network traffic volumes;
- **Operational Traffic Assessment –** including assessment scenarios (options), trip generation and distribution and network performance;
- **Parking Considerations –** resident parking and visitor parking;
- **Summary and Recommendations –** key findings and conclusion; and
- **Appendices –** road safety assessment (this document and safe systems and separately prepare safe systems assessment).

5. Assessment of Project Design Options

5.1 Assessment Summary

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 5. The scores for each crash type are shown in Figure 11 and Figure 12. The detailed assessments are presented in Section 5.2.

Table 5 – SSA Matrix Scores for the Project

Option	Description	Score
Option 1	Access via Kitchener Street/Anzac Ave	6.25 / 448
Option 2	Access via John Potts Drive.	10.5 / 448

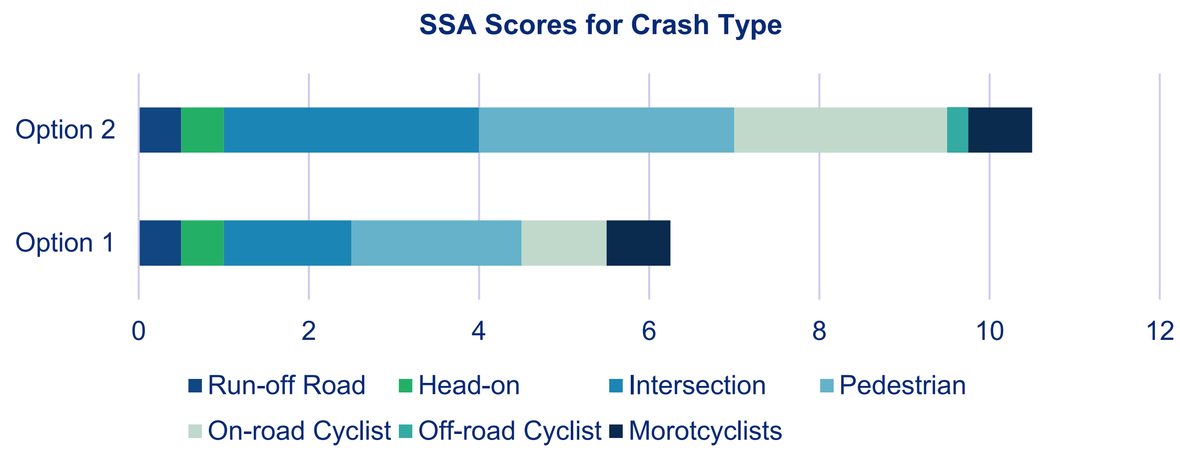


Figure 11 – SSA Scores for Crash Types

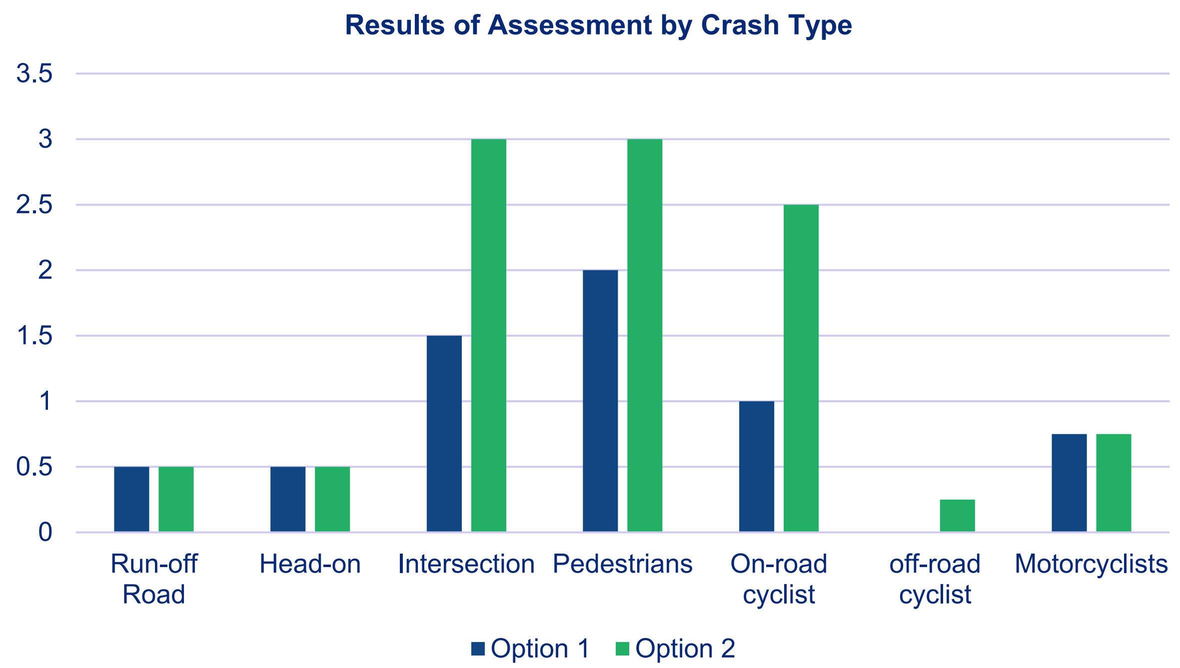


Figure 12 – Results of Assessment by Crash Types

5.2 Safe System Assessment Matrices

5.2.1 Design Option 1 – Single point access

LEGEND:

Normal Text:	Factors between the existing conditions (baseline) and this option.
Red Text:	New or significantly altered in this option when compared to the existing conditions.

Table 6 – SSA Matrix Option 1

	Run-off road	Head-on	Intersection	Pedestrian	On-road Cyclist	Off-road Cyclist	Motorcyclists
Exposure Comments	AADT <1000 (based of Ason TIS)	AADT <1000 (based of Ason TIS)	<40 veh/hr in AM and PM peaks (based of Ason TIS)	10-50 units a day (assumed)	<10 units a day (assumed)	<10units a day (assumed)	<10 units a day (assumed)
Exposure Score	**0.5/4**	**0.5 /4**	**1/4**	**2/4**	**0.5/4**	**0/4**	**0.5/4**
Likelihood Comments	**Factors that increase the likelihood include:** - Negligible change to existing. **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Negligible change to existing. **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Increase trip generation/additional movements within the access intersection (inherent of urban development). **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Existing pedestrian crossing locations will be exposed to Increase trip generation/additional movements within the access intersection (inherent of urban development). **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Increase trip generation/additional movements within the access intersection (inherent of urban development). **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - None (no off road facilities available). **Factors that decrease the likelihood include:** - None	**Factors that increase the likelihood include:** - Increase trip generation/additional movements within the access intersection (inherent of urban development). **Factors that decrease the likelihood include:** - Increased urbanisation of environment of access intersection - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)
Likelihood Score	**0.5/4**	**0.5/4**	**1/4**	**1/4**	**0.5/4**	**0/4**	**0.5/4**
Severity Comments	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None (no off road facilities available). **Factors that decrease the severity include:** - None	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.
Severity Score	**1/4**	**1/4**	**1.5/4**	**2/4**	**2/4**	**0/4**	**1.5/4**
Product	**0.5/64**	**0.5/64**	**1.5/64**	**2/64**	**1/64**	**0/64**	**0.75/64**
						TOTAL	**6.25/448**

5.2.2 Design Option 2 – Two separate accesses

LEGEND:

Normal Text: Factors between the existing conditions (baseline) and this option.

Red Text: New or significantly altered in this option when compared to the existing conditions.

Table 7 – SSA Matrix Option 2

	Run-off road	Head-on	Intersection	Pedestrian	On-road Cyclist	Off-road Cyclist	Motorcyclists
Exposure Comments	AADT <1000 (based of Ason TIS)	AADT <1000 (based of Ason TIS)	<40 veh/hr in AM and PM peaks (based of Ason TIS)	10-50 units a day (assumed)	<10 units a day (assumed)	<10units a day (assumed)	<10 units a day (assumed)
Exposure Score	**1/4**	**1/4**	**2/4**	**1/4**	**0.5/4**	**0/4**	**0.5/4**
Likelihood Comments	**Factors that increase the likelihood include:** - Introduction of a fourth leg to the intersection increase conflict points. **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Introduction of a fourth leg to the intersection increase conflict points. **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Introduction of a fourth leg to the intersection increase conflict points. - The steep downgrade may introduce brake failure or loss of control. **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Increased pedestrian movements across John Potts drive to (inherent of urban development). **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - The steep downgrade may introduce loss of control. **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)	**Factors that increase the likelihood include:** - Increased generation of movements trying to access the shared path/off-road network near wetlands. **Factors that decrease the likelihood include:** - The proximity/awareness of the shared path/off-road network may increase awareness.	**Factors that increase the likelihood include:** - Increase trip generation/additional movements within the access intersection (inherent of urban development). **Factors that decrease the likelihood include:** - Increased signage and delineation of access intersection (control of priority) - Threshold treatment (speed calming and visual queues)
Likelihood Score	**0.5/4**	**0.5/4**	**1.5/4**	**1.5/4**	**1/4**	**0.5/4**	**0.5/4**
Severity Comments	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - Speed grade may increase speed of impact/ kinetic energy transfer. **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.	**Factors that increase the Severity include:** - Speed grade may increase speed of impact/ kinetic energy transfer. **Factors that decrease the severity include:** - None	**Factors that increase the Severity include:** - None **Factors that decrease the severity include:** - Threshold treatment (speed calming and visual queues), reduces kinetic energy transfer and likely trauma.
Severity Score	**1/4**	**1/4**	**2.0/4**	**2/4**	**2.5/4**	**0.5/4**	**1.5/4**
Product	**0.5/64**	**0.5/64**	**3/64**	**3/64**	**2.5/64**	**0.25/64**	**0.75/64**
						TOTAL	**10.5/448**

6. Treatments to Improve Safe System Alignment

Table 8, Table 9 and Table 10 list treatments that will improve the Safe System alignment of the project.

Primary treatments are those measures that have the potential to eliminate or come close to eliminating the risk of fatal and serious injury (FSI) crashes.

Supporting treatments are effective in reducing the risk of FSI crashes but not to the extent of primary treatment (i.e., there is a residual moderate or significant FSI crash risk). Implementation of a primary treatment should be given priority over a supporting treatment that may be targeting a similar crash risk.

Table 8 – Primary Treatments

Treatments for Consideration	Option
Nil	N/A

Table 9 – Supporting Treatments

Treatments for Consideration	Option
Adequate artificial lighting should be provided at the adopted access location	ALL

Table 10 – Other Treatments (General)

Treatments for Consideration	Option
Consultation with the surrounding community and school	ALL

7. Additional Safe Systems Components

As part of this SSA, consideration has been given to other components that comprise the Safe System i.e., road users, vehicles, and post-crash care. Issues identified as relevant to this project are listed in Table.

Table 11 – Other Safe System Components

Pillar	Prompts	Comments
Road User	*Are road users likely to be alert and compliant? Are there factors that might influence this?* *What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules and driving hours)? What is the likelihood of driver fatigue? Can enforcement activities be conducted safely?* *Are there special road users (e.g., entertainment precincts, elderly, children, on-road activities, motorcyclist route), distractions by environmental factors (e.g., commerce, tourism) or risk-taking behaviours?*	The proposed access locations are within an urban environment where road users are reasonably expected to be alert. The presence of children in the AM and PM peaks within this part of the surrounding network is represented by the existing conditions. The St Joseph's Catholic operation may require specific consideration during events such as weddings and funerals where a greater than usual network demand may be present.
Vehicles	*What level of alignment is there with the ideal of safer vehicles?* *Are there factors that may attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed / existing road design? Is this route used by recreational motorcyclists?* *Are there resources in the area to detect non-roadworthy, overloaded, or unregistered vehicles and thus remove them from the network? Can enforcement activities be undertaken safely?* *Has vehicle breakdown been catered for?*	Both access locations proposed are restricted to moderate-light vehicles only. The roadside environment is built up with kerb and gutter and wide shoulders for vehicles to safely pull over and park.
Post-crash Care	*Are there issues that might influence safe and efficient post-crash care in the event of a severe injury (e.g., congestion, access, stopping space)?* *Do emergency and medical services operate as efficiently as possible?* *Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there reliable information available via radio, VMS etc?* *Is there provision for e-safety (i.e., safety systems based on modern information and communication technologies, C-ITS)?*	The proposed development access is located in Junee. The closest medical centre is Junee District Hospital which is located 1.2km from the site. There are available detour routes if needed post-crash.

8. Conclusions

The project team have assessed the proposed options utilising the Safe System Assessment process outlined within Austroads Safe System Assessment Framework (Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework).

The Safe Systems Assessment undertaking has demonstrated that not only is the proposed development typical of expected changes to the network behaviour but it has also demonstrated that there is a negligible foreseeable change to the road safety performance regardless of the adopted access option, although marginally in favour of Option 1 as detailed herein.

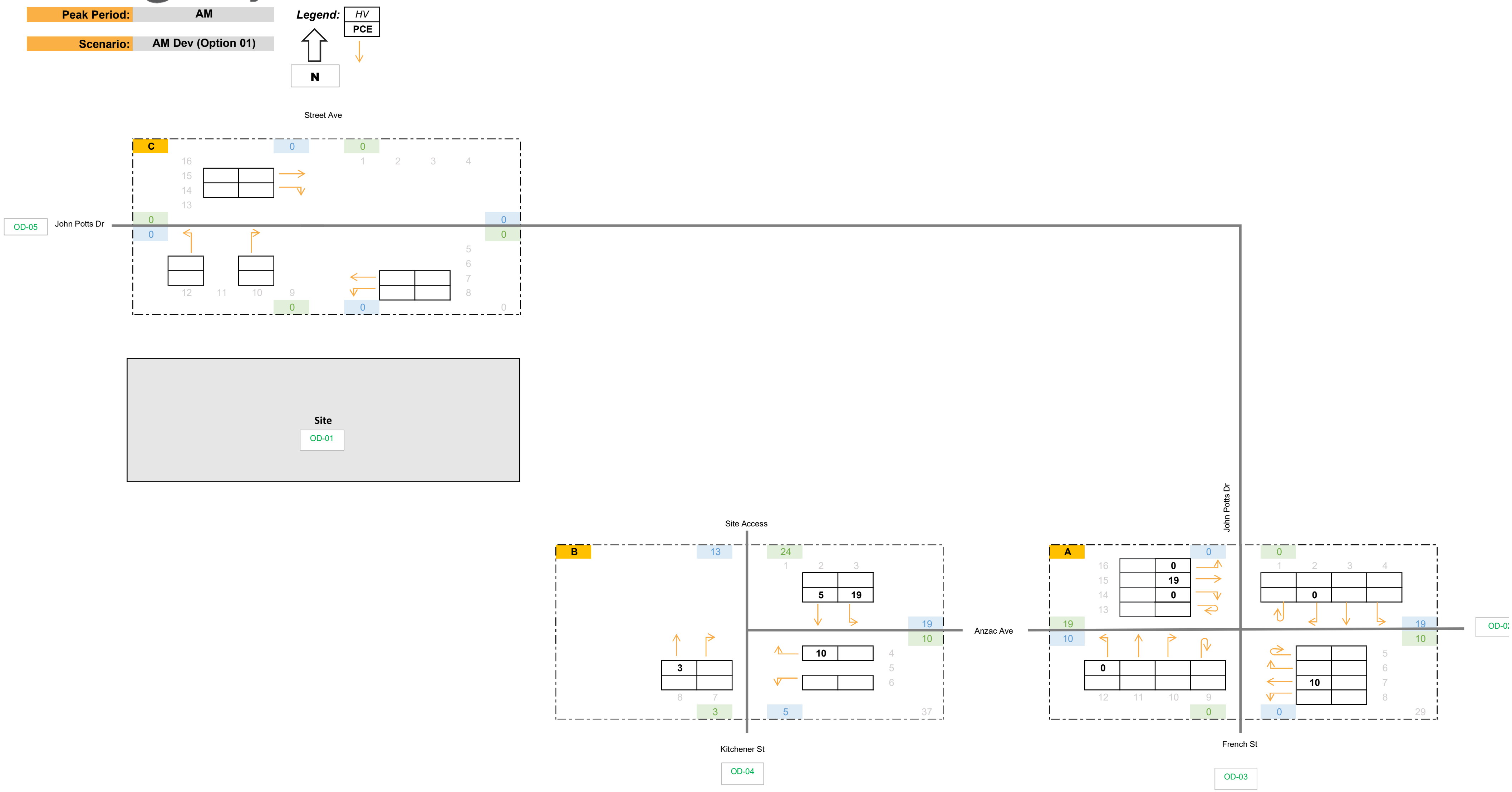
There has been no notable risk identified that may result in a fatal or serious injury should Option 1 be implemented. Option 1 also presents the opportunity to address outlying issues related to the quality and adequacy of the infrastructure related to the St Josephs School Zone and operations.

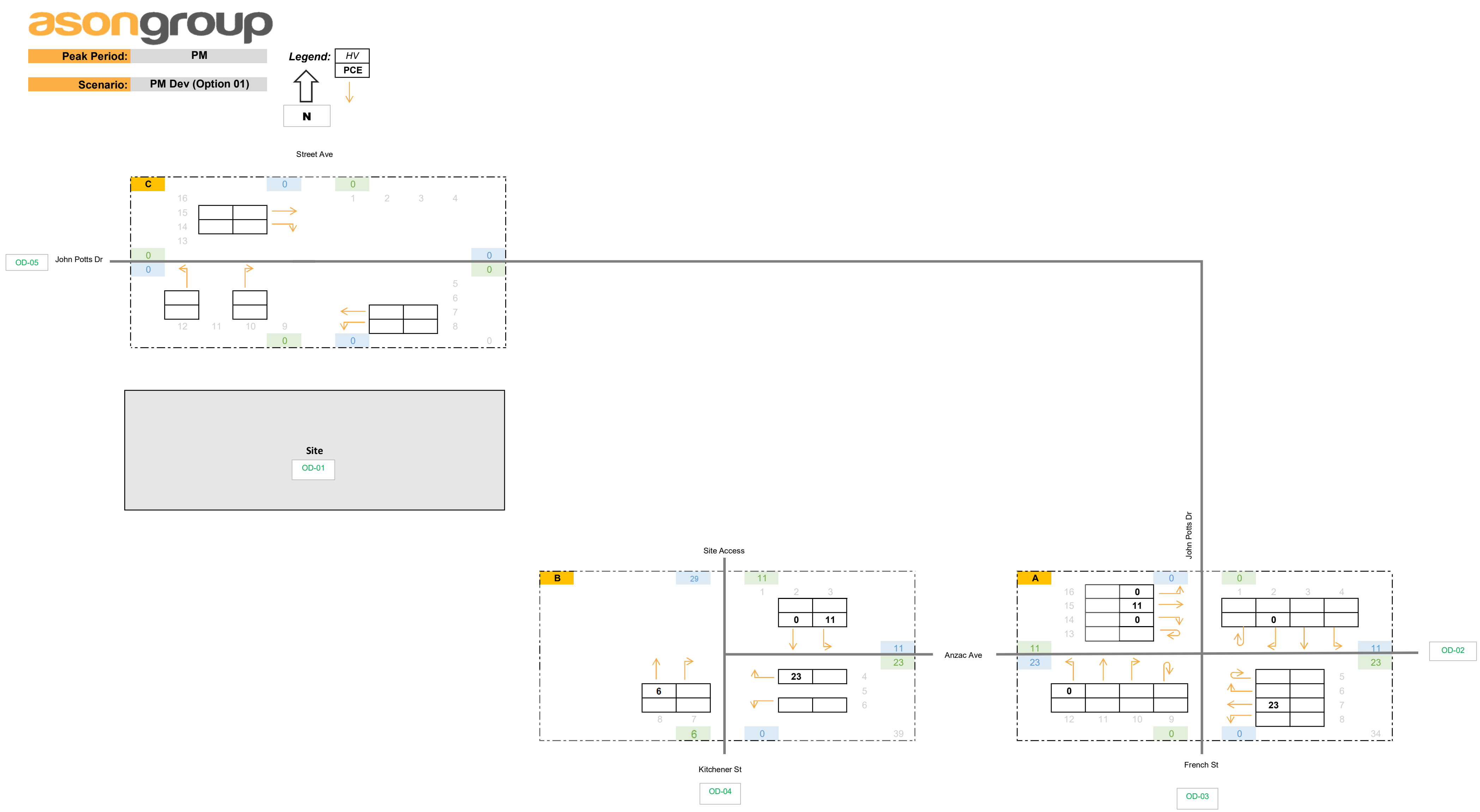
In summary, we recommend that Option 1, access via Kitchener St and Anzac Ave be considered the preferred location for network integration.

Appendix D. Traffic Assignment

Traffic Assignment – Proposed Development

Peak Period:	**AM**
Scenario:	**AM Dev (Option 01)**





asongroup
Peak Period: PM
Scenario: PM Dev (Option 01)
Legend:
HV
PCE
N
Street Ave
C
John Potts Dr
OD-05
Site
OD-01
Site Access
B
Kitchener St
OD-04
Anzac Ave
A
John Potts Dr
OD-02
French St
OD-03

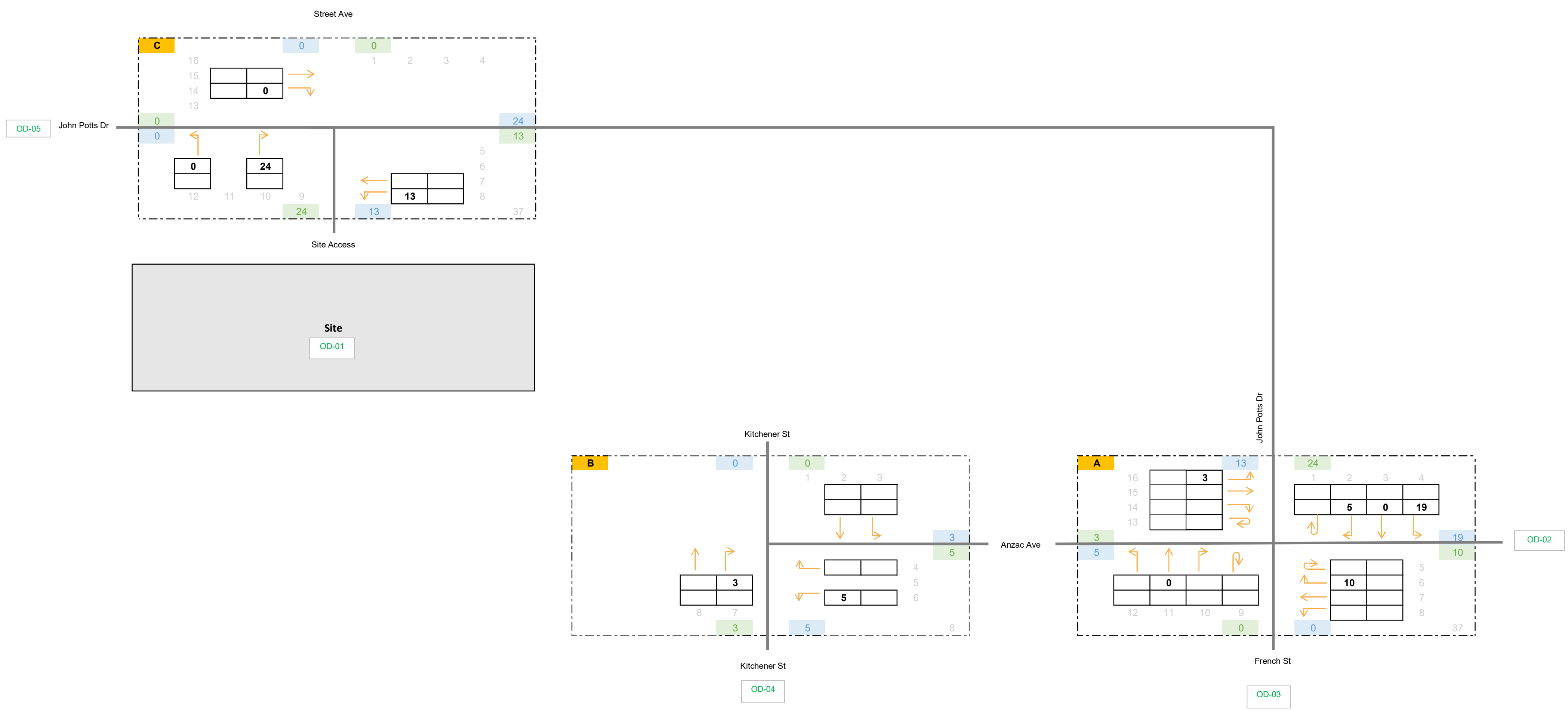
Traffic Assignment – Sensitivity Analysis (Option 2)

Peak Period: AM

Scenario: AM Dev (Option 02)

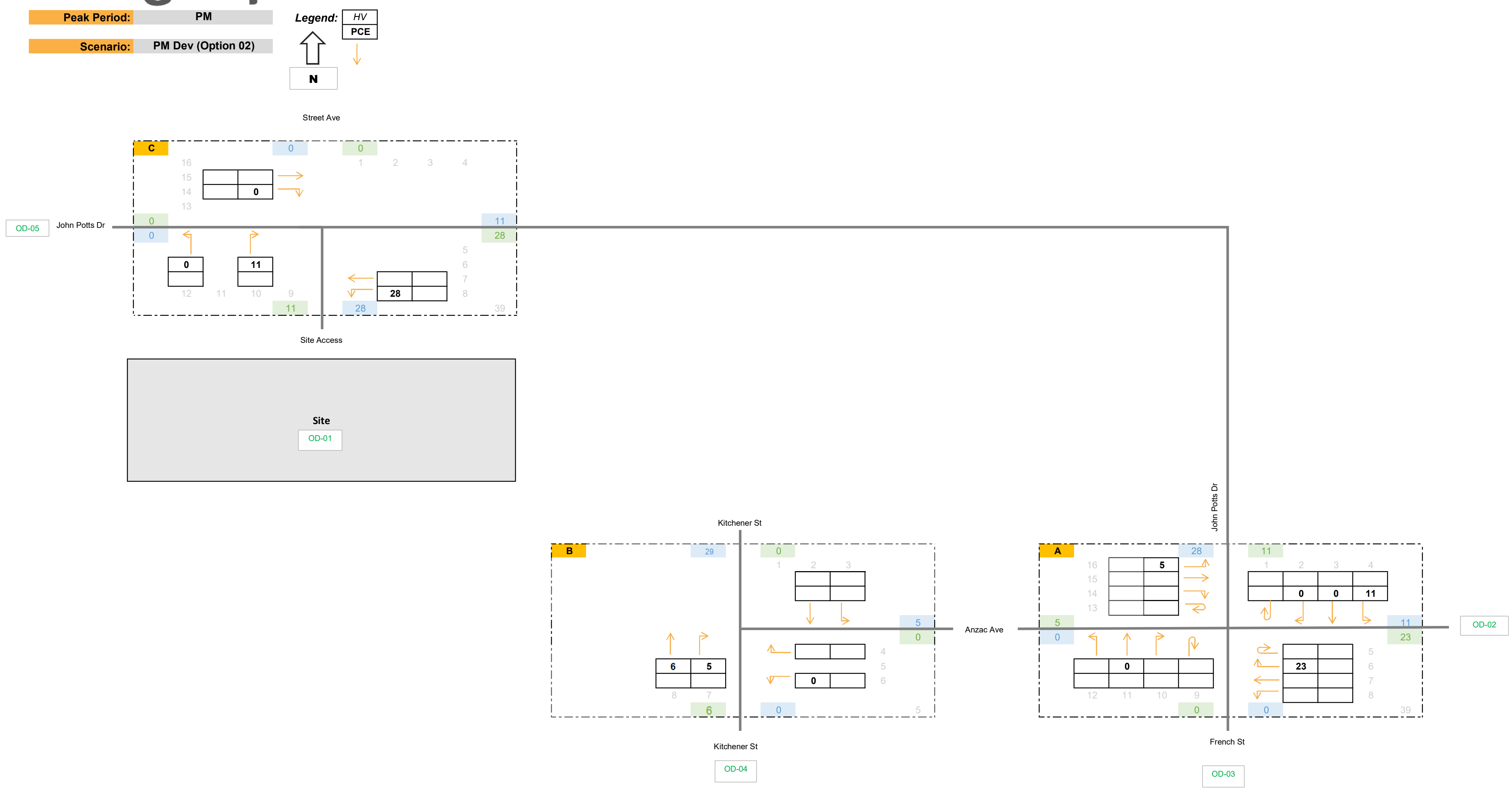
Legend: HV / PCE

N



Peak Period: PM

Scenario: PM Dev (Option 02)



Appendix E. SIDRA Outputs

SIDRA Outputs – Existing

Model Validation Notes

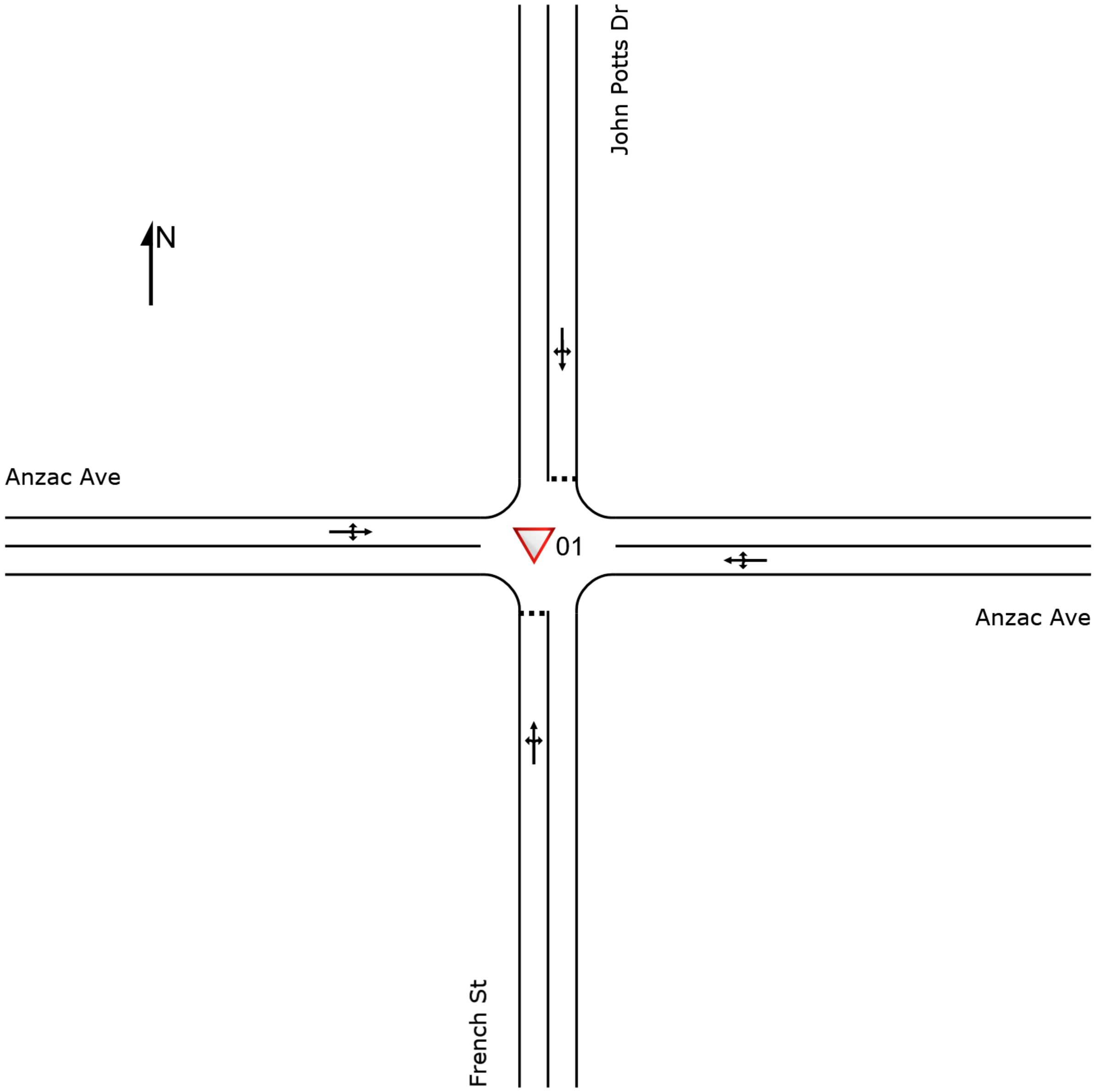
During the site visit, minimal queuing was observed at the key intersection which is consistent with that modelled. Due to the limited queuing, it was not possible to validate gap acceptance and, as such, SIDRA default values have been adopted.

SITE LAYOUT

▽ Site: 01 [John Potts Dr / Anzac Ave_AM_Existing (Site Folder: 2023 Existing)]

John Potts Dr / Anzac Ave_AM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

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



MOVEMENT SUMMARY

Site: 01 [John Potts Dr / Anzac Ave_AM_Existing (Site Folder: 2023 Existing)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_AM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: French St															
1	L2	All MCs	1	0.0	1	0.0	0.005	4.6	LOS A	0.0	0.1	0.17	0.50	0.17	35.9
2	T1	All MCs	1	0.0	1	0.0	0.005	3.5	LOS A	0.0	0.1	0.17	0.50	0.17	41.9
3	R2	All MCs	3	0.0	3	0.0	0.005	5.2	LOS A	0.0	0.1	0.17	0.50	0.17	40.8
Approach			5	0.0	5	0.0	0.005	4.7	LOS A	0.0	0.1	0.17	0.50	0.17	40.2
East: Anzac Ave															
4	L2	All MCs	7	0.0	7	0.0	0.033	4.6	LOS A	0.1	0.8	0.10	0.37	0.10	43.2
5	T1	All MCs	33	0.0	33	0.0	0.033	1.2	LOS A	0.1	0.8	0.10	0.37	0.10	42.2
6	R2	All MCs	21	0.0	21	0.0	0.033	4.9	LOS A	0.1	0.8	0.10	0.37	0.10	44.2
Approach			61	0.0	61	0.0	0.033	2.8	NA	0.1	0.8	0.10	0.37	0.10	43.1
North: John Potts Dr															
7	L2	All MCs	44	0.0	44	0.0	0.040	4.7	LOS A	0.2	1.1	0.12	0.50	0.12	42.7
8	T1	All MCs	1	100.0	1	100.0	0.040	4.8	LOS A	0.2	1.1	0.12	0.50	0.12	39.9
9	R2	All MCs	11	0.0	11	0.0	0.040	5.0	LOS A	0.2	1.1	0.12	0.50	0.12	38.8
Approach			56	1.9	56	1.9	0.040	4.7	LOS A	0.2	1.1	0.12	0.50	0.12	42.1
West: Anzac Ave															
10	L2	All MCs	7	0.0	7	0.0	0.028	3.4	LOS A	0.0	0.1	0.01	0.08	0.01	42.8
11	T1	All MCs	39	16.2	39	16.2	0.028	0.0	LOS A	0.0	0.1	0.01	0.08	0.01	44.7
12	R2	All MCs	1	0.0	1	0.0	0.028	3.6	LOS A	0.0	0.1	0.01	0.08	0.01	39.8
Approach			47	13.3	47	13.3	0.028	0.6	NA	0.0	0.1	0.01	0.08	0.01	44.3
All Vehicles			169	4.3	169	4.3	0.040	2.9	NA	0.2	1.1	0.08	0.34	0.08	42.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 01 [John Potts Dr / Anzac Ave_PM_Existing (Site Folder: 2023 Existing)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_PM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: French St															
1	L2	All MCs	2	0.0	2	0.0	0.003	4.7	LOS A	0.0	0.1	0.15	0.48	0.15	36.1
2	T1	All MCs	1	0.0	1	0.0	0.003	3.8	LOS A	0.0	0.1	0.15	0.48	0.15	42.0
3	R2	All MCs	1	0.0	1	0.0	0.003	5.4	LOS A	0.0	0.1	0.15	0.48	0.15	40.9
Approach			4	0.0	4	0.0	0.003	4.6	LOS A	0.0	0.1	0.15	0.48	0.15	39.1
East: Anzac Ave															
4	L2	All MCs	6	0.0	6	0.0	0.053	4.6	LOS A	0.2	1.6	0.18	0.41	0.18	42.4
5	T1	All MCs	40	0.0	40	0.0	0.053	1.2	LOS A	0.2	1.6	0.18	0.41	0.18	41.5
6	R2	All MCs	47	0.0	47	0.0	0.053	5.0	LOS A	0.2	1.6	0.18	0.41	0.18	43.6
Approach			94	0.0	94	0.0	0.053	3.3	NA	0.2	1.6	0.18	0.41	0.18	42.7
North: John Potts Dr															
7	L2	All MCs	21	0.0	21	0.0	0.018	4.8	LOS A	0.1	0.5	0.18	0.49	0.18	42.6
8	T1	All MCs	2	100.0	2	100.0	0.018	5.5	LOS A	0.1	0.5	0.18	0.49	0.18	39.7
9	R2	All MCs	1	0.0	1	0.0	0.018	5.4	LOS A	0.1	0.5	0.18	0.49	0.18	38.6
Approach			24	8.7	24	8.7	0.018	4.9	LOS A	0.1	0.5	0.18	0.49	0.18	42.2
West: Anzac Ave															
10	L2	All MCs	9	0.0	9	0.0	0.052	3.4	LOS A	0.0	0.1	0.01	0.06	0.01	43.1
11	T1	All MCs	79	12.0	79	12.0	0.052	0.0	LOS A	0.0	0.1	0.01	0.06	0.01	45.0
12	R2	All MCs	2	0.0	2	0.0	0.052	3.6	LOS A	0.0	0.1	0.01	0.06	0.01	40.1
Approach			91	10.5	91	10.5	0.052	0.4	NA	0.0	0.1	0.01	0.06	0.01	44.7
All Vehicles			213	5.4	213	5.4	0.053	2.3	NA	0.2	1.6	0.11	0.27	0.11	43.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA Outputs – Project Case

MOVEMENT SUMMARY

▽ Site: 01 [John Potts Dr / Anzac Ave_AM_2023 Project Case (Site Folder: 2023 Project Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_AM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: French St															
1	L2	All MCs	1	0.0	1	0.0	0.005	4.7	LOS A	0.0	0.1	0.20	0.50	0.20	35.8
2	T1	All MCs	1	0.0	1	0.0	0.005	3.6	LOS A	0.0	0.1	0.20	0.50	0.20	41.7
3	R2	All MCs	3	0.0	3	0.0	0.005	5.3	LOS A	0.0	0.1	0.20	0.50	0.20	40.7
Approach			5	0.0	5	0.0	0.005	4.9	LOS A	0.0	0.1	0.20	0.50	0.20	40.1
East: Anzac Ave															
4	L2	All MCs	7	0.0	7	0.0	0.039	4.6	LOS A	0.1	0.9	0.11	0.33	0.11	44.3
5	T1	All MCs	43	0.0	43	0.0	0.039	0.8	LOS A	0.1	0.9	0.11	0.33	0.11	45.1
6	R2	All MCs	21	0.0	21	0.0	0.039	5.0	LOS A	0.1	0.9	0.11	0.33	0.11	45.1
Approach			72	0.0	72	0.0	0.039	2.4	NA	0.1	0.9	0.11	0.33	0.11	45.0
North: John Potts Dr															
7	L2	All MCs	44	0.0	44	0.0	0.041	4.7	LOS A	0.2	1.1	0.16	0.50	0.16	42.6
8	T1	All MCs	1	100.0	1	100.0	0.041	5.1	LOS A	0.2	1.1	0.16	0.50	0.16	39.7
9	R2	All MCs	11	0.0	11	0.0	0.041	5.2	LOS A	0.2	1.1	0.16	0.50	0.16	38.7
Approach			56	1.9	56	1.9	0.041	4.8	LOS A	0.2	1.1	0.16	0.50	0.16	42.0
West: Anzac Ave															
10	L2	All MCs	7	0.0	7	0.0	0.038	3.4	LOS A	0.0	0.1	0.01	0.08	0.01	45.1
11	T1	All MCs	59	10.7	59	10.7	0.038	0.1	LOS A	0.0	0.1	0.01	0.08	0.01	49.4
12	R2	All MCs	1	0.0	1	0.0	0.038	3.6	LOS A	0.0	0.1	0.01	0.08	0.01	42.7
Approach			67	9.4	67	9.4	0.038	0.5	NA	0.0	0.1	0.01	0.08	0.01	48.8
All Vehicles			200	3.7	200	3.7	0.041	2.5	NA	0.2	1.1	0.09	0.30	0.09	44.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 01 [John Potts Dr / Anzac Ave_PM_2023 Project Case (Site Folder: 2023 Project Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_PM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: French St															
1	L2	All MCs	2	0.0	2	0.0	0.004	4.7	LOS A	0.0	0.1	0.19	0.48	0.19	35.9
2	T1	All MCs	1	0.0	1	0.0	0.004	4.0	LOS A	0.0	0.1	0.19	0.48	0.19	41.8
3	R2	All MCs	1	0.0	1	0.0	0.004	5.6	LOS A	0.0	0.1	0.19	0.48	0.19	40.8
Approach			4	0.0	4	0.0	0.004	4.8	LOS A	0.0	0.1	0.19	0.48	0.19	39.0
East: Anzac Ave															
4	L2	All MCs	6	0.0	6	0.0	0.066	4.6	LOS A	0.3	1.8	0.17	0.35	0.17	44.1
5	T1	All MCs	64	0.0	64	0.0	0.066	0.7	LOS A	0.3	1.8	0.17	0.35	0.17	45.6
6	R2	All MCs	47	0.0	47	0.0	0.066	5.2	LOS A	0.3	1.8	0.17	0.35	0.17	45.0
Approach			118	0.0	118	0.0	0.066	2.7	NA	0.3	1.8	0.17	0.35	0.17	45.2
North: John Potts Dr															
7	L2	All MCs	21	0.0	21	0.0	0.018	4.8	LOS A	0.1	0.5	0.20	0.50	0.20	42.5
8	T1	All MCs	2	100.0	2	100.0	0.018	5.9	LOS A	0.1	0.5	0.20	0.50	0.20	39.6
9	R2	All MCs	1	0.0	1	0.0	0.018	5.6	LOS A	0.1	0.5	0.20	0.50	0.20	38.6
Approach			24	8.7	24	8.7	0.018	4.9	LOS A	0.1	0.5	0.20	0.50	0.20	42.1
West: Anzac Ave															
10	L2	All MCs	9	0.0	9	0.0	0.058	3.4	LOS A	0.0	0.1	0.01	0.06	0.01	44.0
11	T1	All MCs	91	10.5	91	10.5	0.058	0.0	LOS A	0.0	0.1	0.01	0.06	0.01	46.8
12	R2	All MCs	2	0.0	2	0.0	0.058	3.6	LOS A	0.0	0.1	0.01	0.06	0.01	41.2
Approach			102	9.3	102	9.3	0.058	0.4	NA	0.0	0.1	0.01	0.06	0.01	46.4
All Vehicles			248	4.7	248	4.7	0.066	2.0	NA	0.3	1.8	0.11	0.25	0.11	45.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA Outputs - Sensitivity

MOVEMENT SUMMARY

▽ Site: 01 [John Potts Dr / Anzac Ave_AM_2023 Sensitivity Case (Site Folder: 2023 Sensitivity Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_AM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: French St															
1	L2	All MCs	1	0.0	1	0.0	0.005	4.6	LOS A	0.0	0.1	0.18	0.50	0.18	35.9
2	T1	All MCs	1	0.0	1	0.0	0.005	3.6	LOS A	0.0	0.1	0.18	0.50	0.18	41.8
3	R2	All MCs	3	0.0	3	0.0	0.005	5.3	LOS A	0.0	0.1	0.18	0.50	0.18	40.7
Approach			5	0.0	5	0.0	0.005	4.8	LOS A	0.0	0.1	0.18	0.50	0.18	40.2
East: Anzac Ave															
4	L2	All MCs	7	0.0	7	0.0	0.039	4.6	LOS A	0.2	1.1	0.12	0.40	0.12	43.3
5	T1	All MCs	33	0.0	33	0.0	0.039	1.2	LOS A	0.2	1.1	0.12	0.40	0.12	42.3
6	R2	All MCs	32	0.0	32	0.0	0.039	5.1	LOS A	0.2	1.1	0.12	0.40	0.12	45.2
Approach			72	0.0	72	0.0	0.039	3.3	NA	0.2	1.1	0.12	0.40	0.12	43.9
North: John Potts Dr															
7	L2	All MCs	64	0.0	64	0.0	0.058	5.0	LOS A	0.2	1.6	0.13	0.52	0.13	44.4
8	T1	All MCs	1	100.0	1	100.0	0.058	5.0	LOS A	0.2	1.6	0.13	0.52	0.13	40.8
9	R2	All MCs	16	0.0	16	0.0	0.058	5.4	LOS A	0.2	1.6	0.13	0.52	0.13	40.9
Approach			81	1.3	81	1.3	0.058	5.1	LOS A	0.2	1.6	0.13	0.52	0.13	43.8
West: Anzac Ave															
10	L2	All MCs	11	0.0	11	0.0	0.029	4.1	LOS A	0.0	0.1	0.01	0.12	0.01	44.0
11	T1	All MCs	39	16.2	39	16.2	0.029	0.0	LOS A	0.0	0.1	0.01	0.12	0.01	44.7
12	R2	All MCs	1	0.0	1	0.0	0.029	3.6	LOS A	0.0	0.1	0.01	0.12	0.01	39.8
Approach			51	12.5	51	12.5	0.029	0.9	NA	0.0	0.1	0.01	0.12	0.01	44.5
All Vehicles			208	3.5	208	3.5	0.058	3.4	NA	0.2	1.6	0.10	0.38	0.10	43.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 01 [John Potts Dr / Anzac Ave_PM_2023 Sensitivity Case (Site Folder: 2023 Sensitivity Case)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

John Potts Dr / Anzac Ave_PM_Existing (2023)
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: French St															
1	L2	All MCs	2	0.0	2	0.0	0.003	4.7	LOS A	0.0	0.1	0.16	0.48	0.16	36.1
2	T1	All MCs	1	0.0	1	0.0	0.003	3.9	LOS A	0.0	0.1	0.16	0.48	0.16	42.0
3	R2	All MCs	1	0.0	1	0.0	0.003	5.6	LOS A	0.0	0.1	0.16	0.48	0.16	40.9
Approach			4	0.0	4	0.0	0.003	4.7	LOS A	0.0	0.1	0.16	0.48	0.16	39.1
East: Anzac Ave															
4	L2	All MCs	6	0.0	6	0.0	0.068	4.6	LOS A	0.3	2.2	0.20	0.45	0.20	42.7
5	T1	All MCs	40	0.0	40	0.0	0.068	1.2	LOS A	0.3	2.2	0.20	0.45	0.20	41.7
6	R2	All MCs	72	0.0	72	0.0	0.068	5.3	LOS A	0.3	2.2	0.20	0.45	0.20	44.7
Approach			118	0.0	118	0.0	0.068	3.9	NA	0.3	2.2	0.20	0.45	0.20	43.8
North: John Potts Dr															
7	L2	All MCs	33	0.0	33	0.0	0.026	5.2	LOS A	0.1	0.7	0.18	0.51	0.18	44.4
8	T1	All MCs	2	100.0	2	100.0	0.026	5.8	LOS A	0.1	0.7	0.18	0.51	0.18	40.6
9	R2	All MCs	1	0.0	1	0.0	0.026	5.5	LOS A	0.1	0.7	0.18	0.51	0.18	39.6
Approach			36	5.9	36	5.9	0.026	5.2	LOS A	0.1	0.7	0.18	0.51	0.18	44.1
West: Anzac Ave															
10	L2	All MCs	15	0.0	15	0.0	0.054	4.3	LOS A	0.0	0.1	0.01	0.09	0.01	44.4
11	T1	All MCs	79	12.0	79	12.0	0.054	0.0	LOS A	0.0	0.1	0.01	0.09	0.01	45.0
12	R2	All MCs	2	0.0	2	0.0	0.054	3.6	LOS A	0.0	0.1	0.01	0.09	0.01	40.1
Approach			96	9.9	96	9.9	0.054	0.7	NA	0.0	0.1	0.01	0.09	0.01	44.8
All Vehicles			254	4.6	254	4.6	0.068	2.9	NA	0.3	2.2	0.12	0.32	0.12	44.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.