Junee Subdivision

Road Safety Audit

RES2305.40.115-RSA

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Document Quality Information

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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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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).

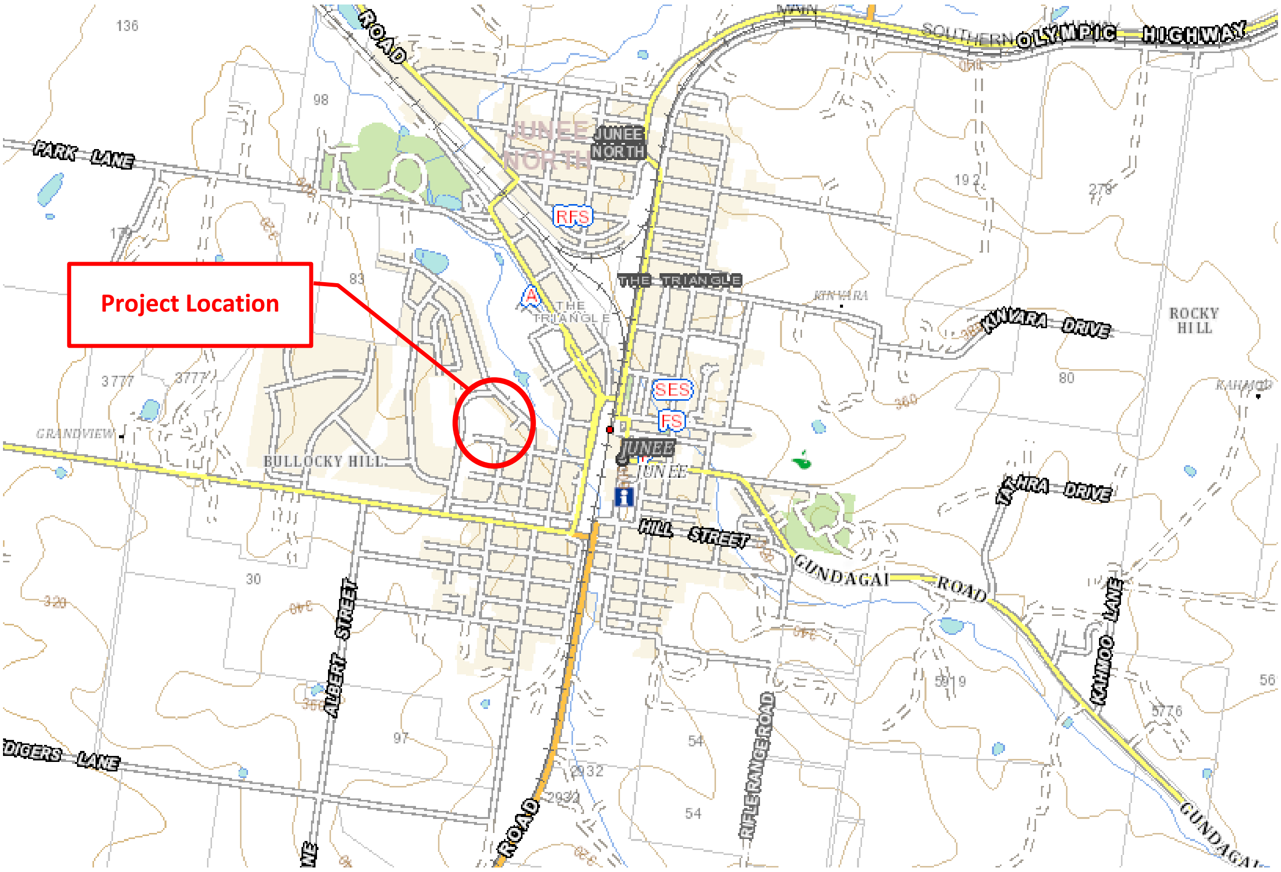


Figure 2-1 – Site Overview, Junee NSW

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.

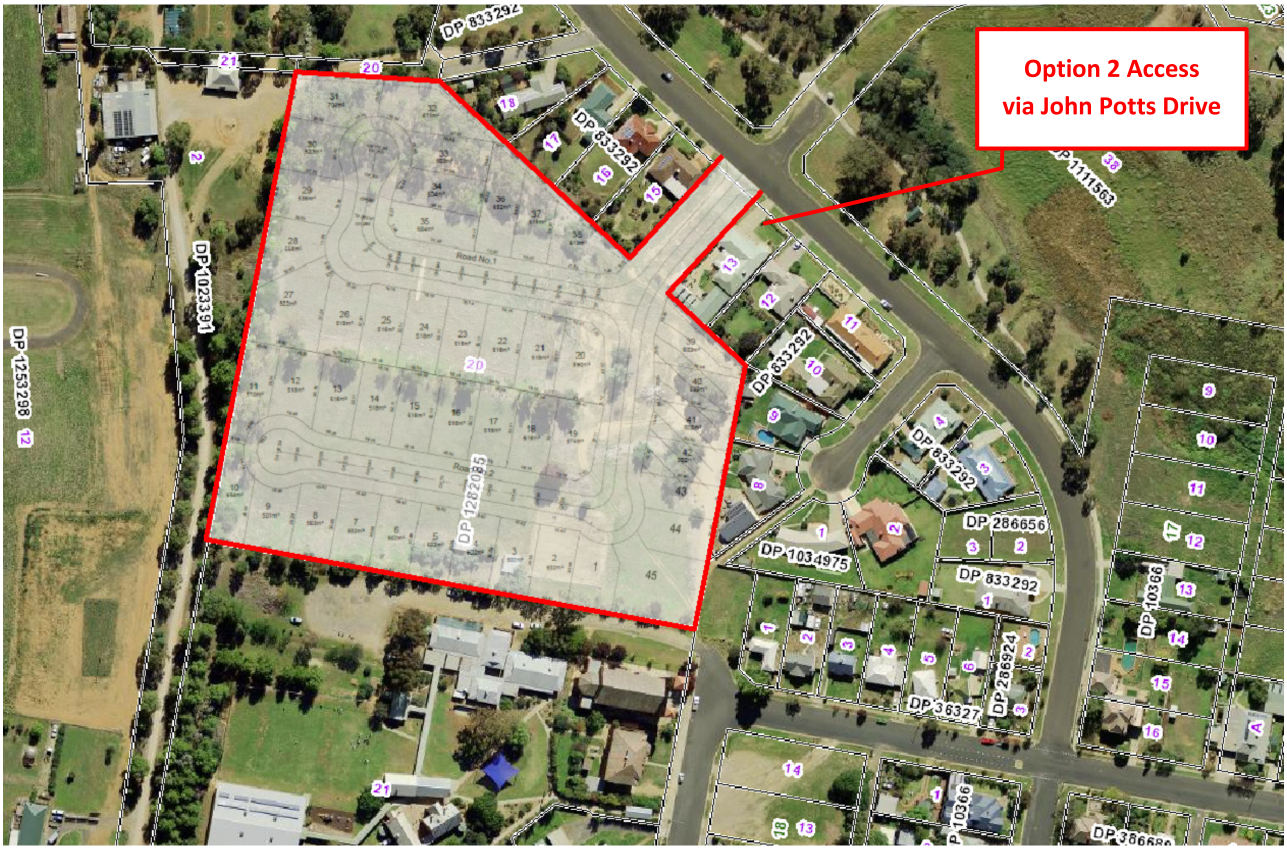


Figure 2-3 – Option 2 Access Location

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 C1 1: Proposed model of severe injury probability vs bullet vehicle impact speeds in different crash types

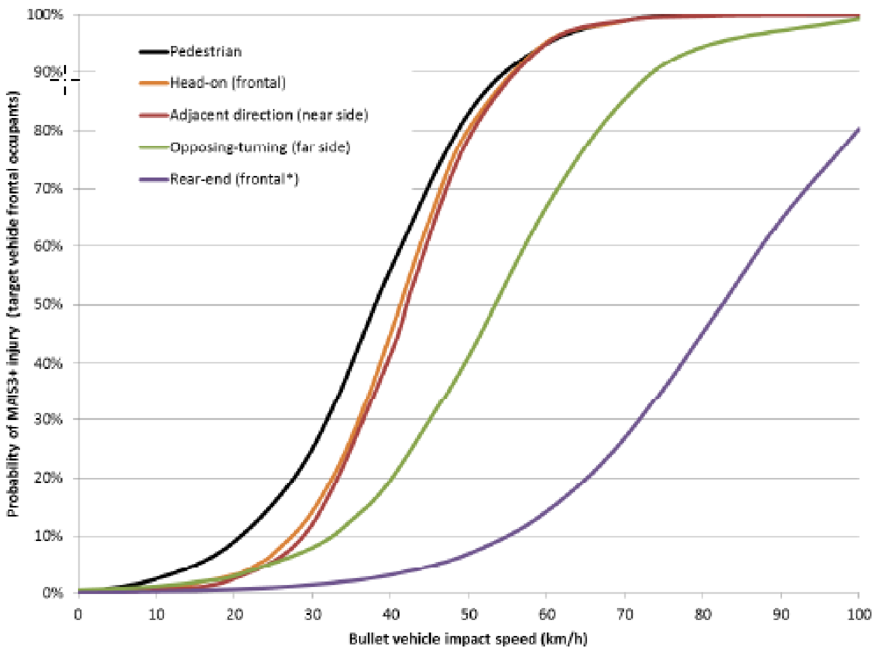
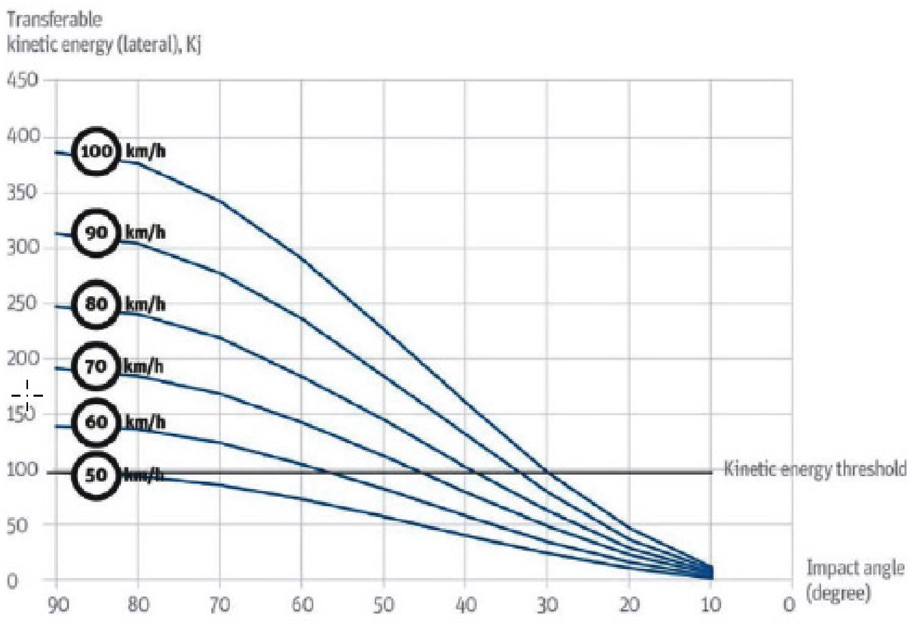


Figure 2-4 – Extract Austroads Guide to Traffic Management Part 6 - 2020

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

Figure 2.2 Influence of impact angle and travel speed on transferable kinetic energy



Source: ITF (2016), based on Candappa et al. (2015).

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 3.2: Safe intersection sight distance (SISD)

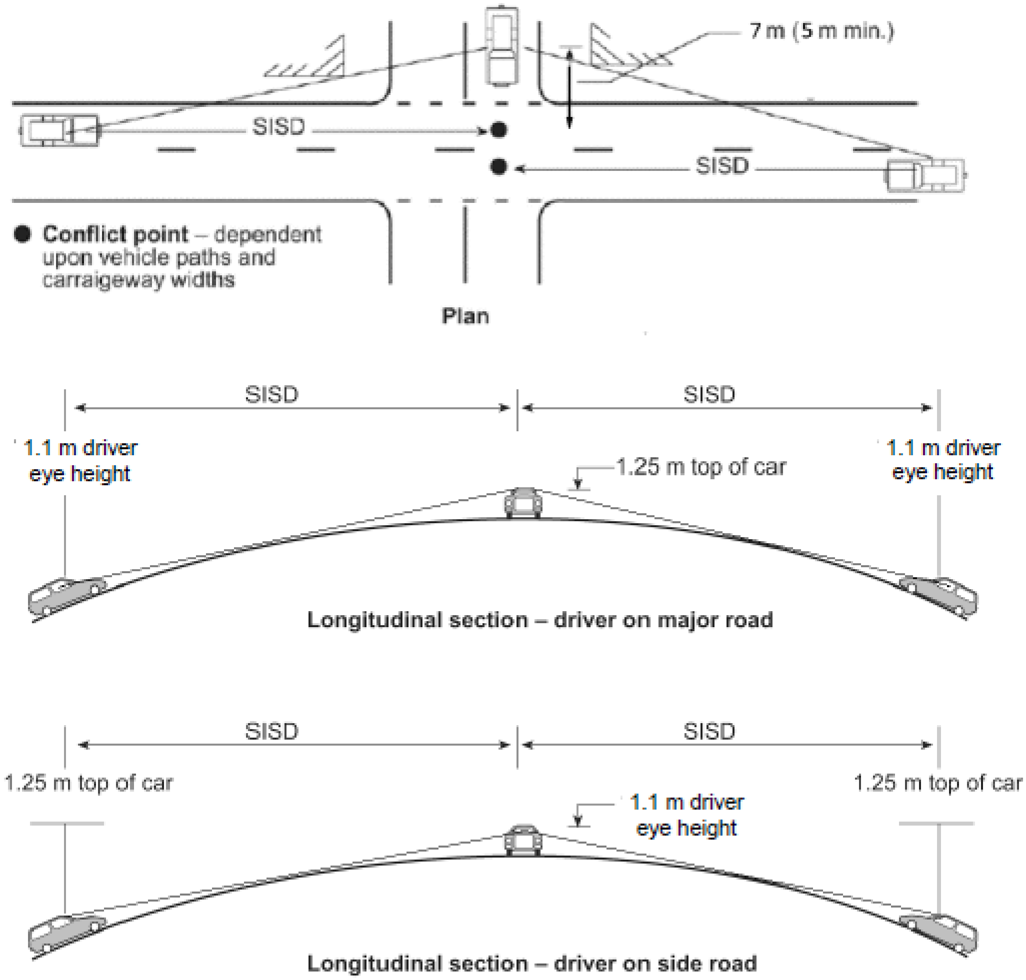


Figure 2-6 – Extract Austroads Guide to Road Design Part 4A – 2021

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)

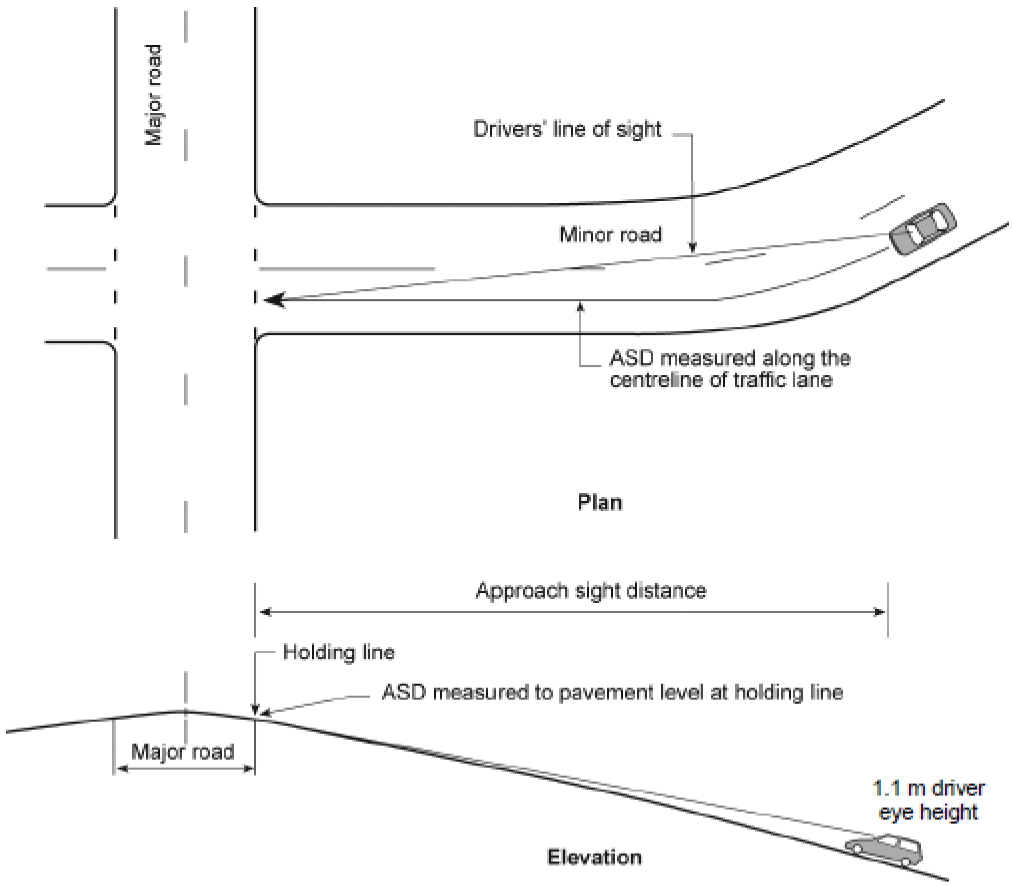


Figure 2-7 – Extract Austroads Guide to Road Design Part 4A – 2021

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.

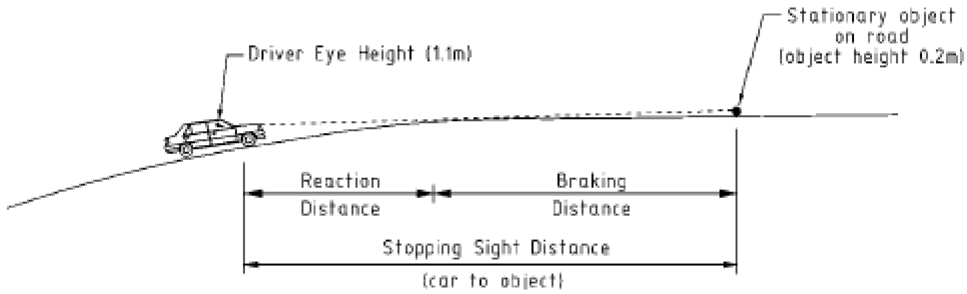


Figure 2-8 – Extract Austroads Guide to Road Design Part 3 – 2021

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.

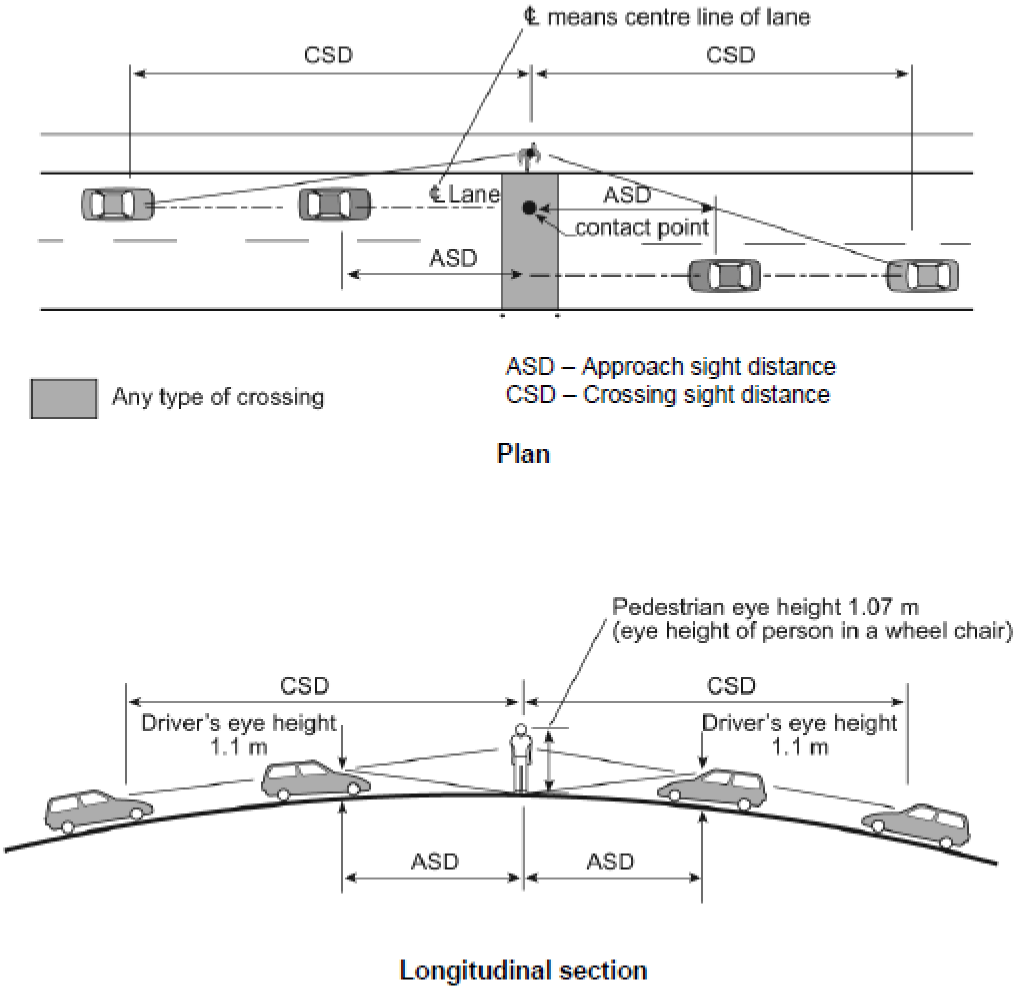


Figure 2-9 – Extract Austroads Guide to Road Design Part 4A – 2021

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

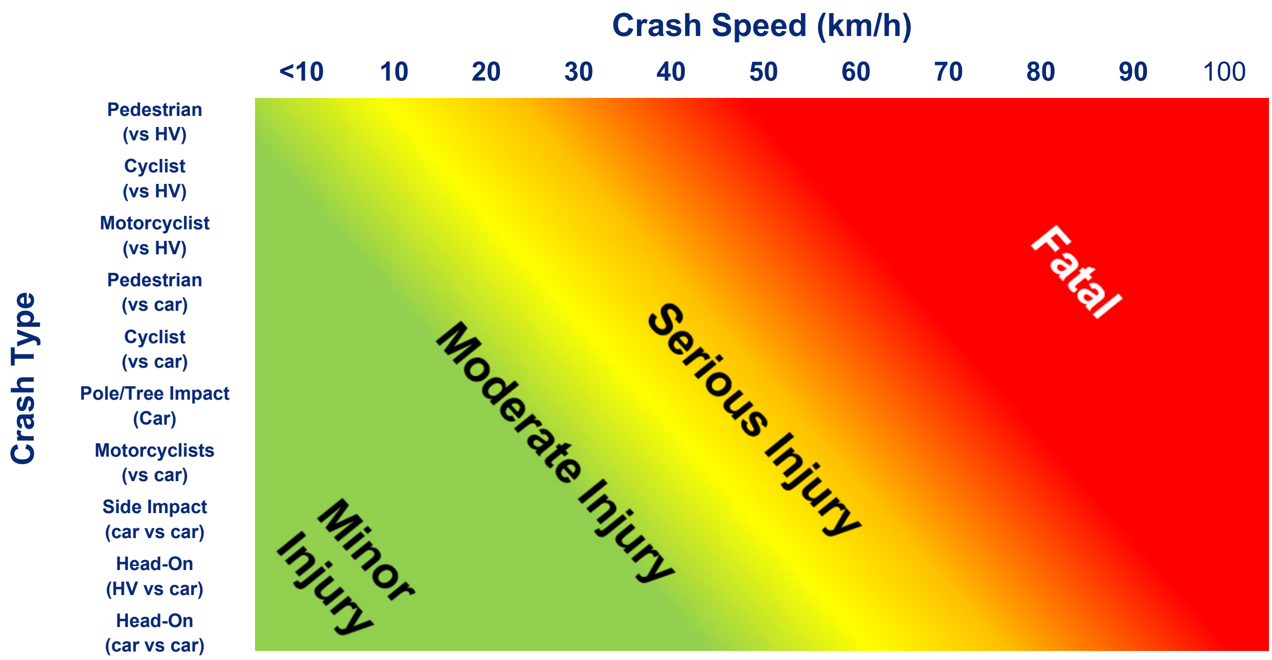
The treatment that Austroads recommend for the above levels of risk is shown in Table 3.4.

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:

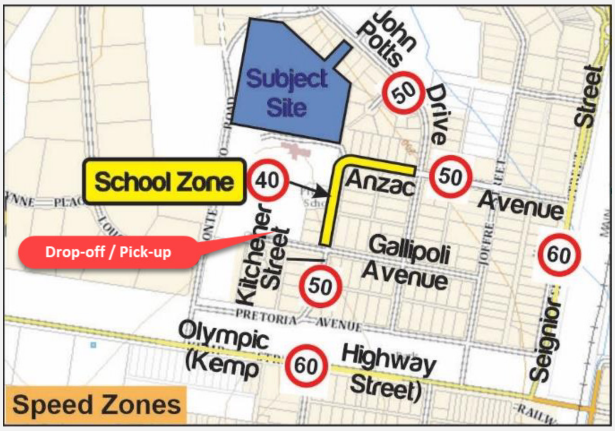
4.1 General Observations
4.2 Identified Risks

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

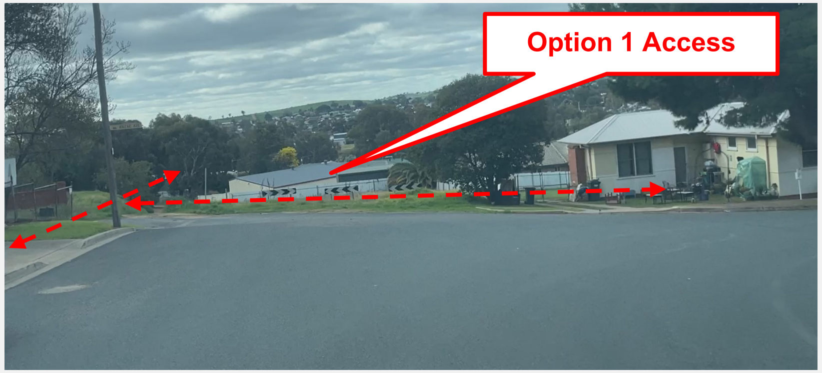
GE	General Observations	Photos / Reference
GE-1	The southern extent of the existing school zone is located north of the Vaughan Street/Gallipoli Ave intersection with Kitchener Street. This does not cover the “School Drop-off Pick-up ZONE” located west of this intersection on Vaughan Street. School children 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.***

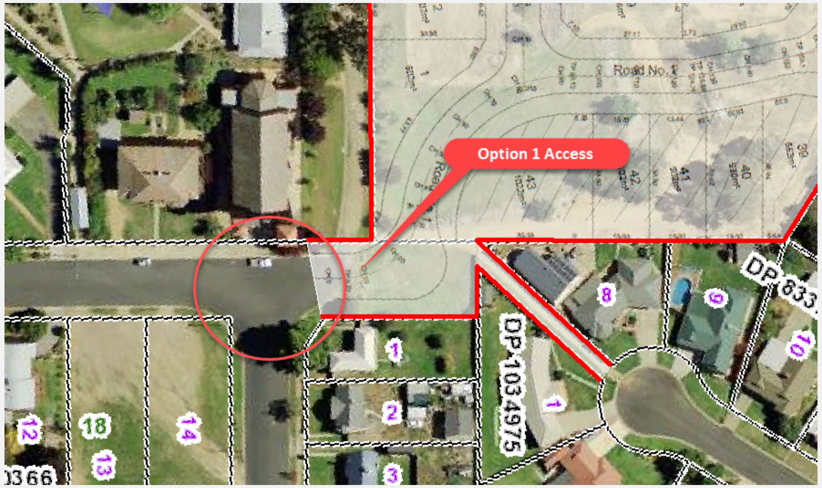
GE	General Observations	Photos / Reference
GE-2	At the time of the PM site inspection, it was observed that the “School Drop-off Pick-up ZONE” did not appear to be in use by parents or staffed by school monitors. It appeared that the area in front of Saint Jospeh’s Catholic Church (north of the bus zone) 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.***

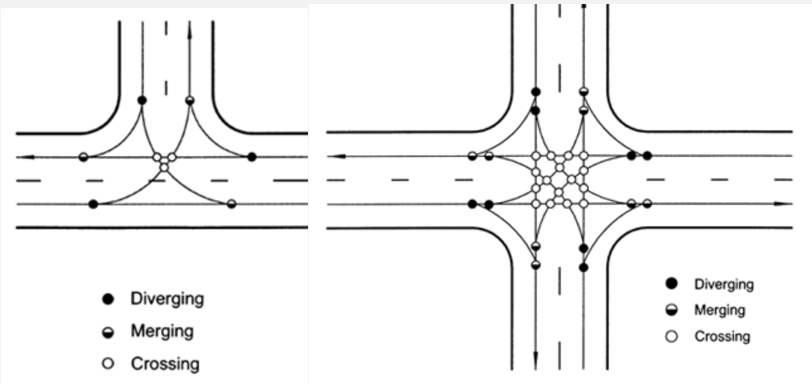
4.1. Identified Risks

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)**