

Road Safety Audit Course Assignment 3
Complete yellow highlighted sections

McKenzie St x Baillieu St, Wonthaggi

Road Safety Audit

Audit Stage: Preliminary Design



Road Safety Audit Training Course

Reference: S20210422

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List of Abbreviations

1. Introduction

Thomas Ruddell was assigned by Safe System Solutions Pty Ltd to undertake a training road safety audit (herein referred to as RSA) for McKenzie St and Baillieu St in Wonthaggi.

The proposed design proposes for a roundabout at the intersection of McKenzie St and Baillieu St. The roundabout is proposed to have 1 x pedestrian crossing to replace the existing pedestrian crossing at Baillieu St.

The location of the audit is shown in Figure 1



Figure 1 Locality plan

1.1 Purpose of this report

The purpose of this report is to document the findings of the completed road safety audit McKenzie St and Baillieu St and offer recommended mitigations to identified road safety risks and hazards.

1.2 Scope and limitations

This report has been prepared by Thomas Ruddell for the Safe System Solutions Pty Ltd training course and may only be used as a training output. This is not an official road safety audit.

2. Guidance for road safety audits

The Guide to Road Safety Part 6: Road Safety Audit (Austroads, 2022) is the primary guidance for undertaking road safety audits in Australia.

Road safety audit is a term used internationally to describe a recognised process which identifies road safety related risks and hazards. The primary objective of the audit is to reduce road trauma at the audit location.

A road safety audit is not a review or check of compliance with standards and/or guidelines for design projects or existing roads and it is possible that not every risk or hazard that affects road user safety has been identified.

Although the adoption of the audit recommendations will improve the level of safety of the audit location it will not, however, eliminate all the road user safety risks.

Road safety audit is a formal process and responses to audit findings and recommendations should be documented by the client in writing. If recommendations are not accepted by the client then reasons should be included within the written response. A client is under no obligation to accept all the audit findings and recommendations and should consider these in conjunction with all other project considerations. It is not the role of the auditor to approve the client's response to an audit.

2.1 Road safety audits within the Safe System

The road safety audit pre-dates the emergence of the Safe System approach. Within the Safe System, a road safety audit is relevant as it is recognised that full compliance with road standards alone may not result in a road system that eliminates fatal or serious injury road crashes.

The Guide to Road Safety Part 6: Road Safety Audit states:

Safe System principles must be given due consideration in all activities within the road safety management of a road network, including RSA.

In basic terms this is to be achieved during the RSA process by:

- *Identifying and considering key crash types that result in fatal and serious injury*
- *Relating possible crash forces to tolerable levels, regardless of the likelihood, when identifying and assessing risks/hazards*
- *Consideration of audit findings and mitigation measures by their alignment with the Safe System e.g. in terms of operating speed, impact angles etc.*

While road safety audits are intended to identify risks and hazards associated with all crash types, increased focus is required to identify risks and hazards that may result in fatal and serious injury crashes. For this reason, sound knowledge in the Safe System is essential for all participants in the road safety audit process.

VicRoads Safe System Assessment Guidelines (2018) states that a Safe System Assessment *must* be undertaken for any Victorian Government project greater than \$5M in value, is *desirable* for where the project value is greater than \$2M and *optional* for projects under \$2M. Where A Safe System Assessment is not undertaken, the project team should document how the project has considered Safe System alignment. Safe System Assessments are most valuable when conducted during the early stages of a project.

2.2 The road safety audit process

The process for to undertake a road safety audit is shown by Figure 8.1 (Austroads, 2022), reproduced as Figure 2.



Figure 2 Road safety audit process (source: Austroads, 2022)

3. Road safety audit

3.1 Supplied information

Table 1 lists the supplied information for the road safety audit.

Table 1: Supplied information

Name	Author / Assessor / Designer	Document Number
Safe System assessment	N/A	N/A
Previous road safety audit	N/A	N/A
Crash statistics	N/A	N/A
Drawings	None	None

3.2 Selection of the audit team

It is a requirement that road safety audits are undertaken in teams of two or more, with at least one Senior Road Safety Auditor. Each auditor must be accredited and registered on VicRoads Register of Road Safety Auditors (www.vrsa.com.au). Table 2 provides details of the road safety audit team.

Table 2: Road Safety Audit Team

Name	Accreditation	Employer
Thomas Ruddell	Road Safety Auditor in Training	Bass Coast Shire Council

3.3 Commencement meeting

A commencement meeting is an opportunity for the client to confirm the audit objectives, scope, any focus, and timeframe.

As this is a training exercise, no Commencement Meeting was undertaken. A briefing was given during the training course on Zoom.

3.4 Existing conditions

In its existing state – the intersection is a T intersection with a Median Right Turn Lane for McKenzie St South bound traffic turning right into Baillieu St. Traffic Speed outside of school pick-up/drop off times (as signposted) on Baillieu St is restricted to 50 km/hr whereas for McKenzie St the speed limit is 60 km/hr for both directions. During school school pick-up/drop off times (as signposted) all roads are restricted to 40 km/hr.

Traffic on McKenzie St is typically small private vehicles travelling to and from the residential areas to the South of the intersection. However School Busses frequently utilise this intersection on McKenzie st as students are transported Wonthaggi Secondary College McBride Ave Campus and the campus at the end of McKenzie st to the south of the intersection.

Pedestrians utilise a footpath on the western side of McKenzie St and have a designated pedestrian crossing that crosses Baillieu St at the site of the intersection. A bike lane is in place on Mckenzie St on both approaches to the intersection however the South Bound Bike Lane terminates just prior to the intersection.

3.4.1 Site inspection

A site inspection was not completed as part of the audit.

Table 3 lists site inspections completed for the road safety audit.

Table 3: Site inspections

Activity	Location	Date	Time
Pre-audit meeting	N/A	N/A	N/A
Day site inspection	McKenzie St x Baillieu St	13/12/2022	8:00 am
Night site inspection	Training Course so omitted for OH&S Reasons.	N/A	N/A

A photo showing the Auditor during the site inspection is included in Appendix A.

3.4.2 Risk assessment

Risk and hazards identified by the audit have been assigned a risk rating based on the **likelihood** and **severity** of the crash type associated with the risk or hazard. Definitions of **likelihood** and **severity** are as follows:

The Austroads risk assessment matrix (Figure 10.2, Austroads, 2022) is reproduced as Figure 3.

			Severity*				
			Insignificant	Minor	Moderate	Serious	Fatal
			Property damage	Minor first aid	Major first aid and/or presents to hospital (not admitted)	Admitted to hospital	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)

*see Severity Guidance Sheet

Safe System crash outcome threshold

Figure 3 Risk assessment matrix (source: Austroads, 2022)

Corresponding to the assessed level of risk, Austroads provides the priorities for mitigation:

- Negligible – no action required
- Low – should be corrected or the risk reduced if the treatment cost is low

- Medium – should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high
- High – should be corrected or the risk significantly reduced, even if the treatment cost is high
- Extreme – must be corrected regardless of cost

The risk matrix is intended to be used in conjunction with the severity guidance sheet (Figure 10.3, Austroads 2022), reproduced as Figure 4. The severity guidance sheet provides an indication of crash severity outcomes for a range of crash types and crash speeds. Professional engineering judgement is required to confirm the severity outcomes indicated by the guidance sheet, as research into Safe System tolerance speeds continues to evolve.

Severity Guidance Sheet

		Crash Speed (km/h)										
		< 10	10	20	30	40	50	60	70	80	90	100
Crash Type	Pedestrian (vs HV)											
	Cyclist (vs HV)											
	Motorcyclists (vs HV)											
	Pedestrian (vs car)											
	Cyclist (vs car)											
	Pole/Tree Impact (car)											
	Motorcyclists (vs car)											
	Side Impact (HV vs car)											
	Side Impact (car vs car)											
	Head On (HV vs car)											
	Head On (car vs car)											

General indication only – professional judgement required

Figure 4 Severity guidance sheet (source: Austroads, 2022)

3.4.3 Making recommendations

Recommendations are provided for all identified risks and hazards. Recommendations are categorised into one of the Safe System treatment categories described in Table 4.

Table 4: Safe System treatment categories

Treatment category	Description
Primary	Road planning, design and management considerations that practically eliminate the potential of fatal and serious injuries occurring in association with the foreseeable crash types.
Supporting (step towards)	Road planning, design and management considerations that improve the overall level of safety associated with foreseeable crash types, but not expected to virtually eliminate the potential of fatal and serious injury occurring. Improves the ability for a Primary Treatment to be implemented in the future.
Supporting	Road planning, design and management considerations that improve the overall level of safety associated with foreseeable crash types, but not expected to virtually eliminate the potential of fatal and serious injury occurring.

	Does not change the ability for a Primary Treatment to be implemented in the future.
Non-Safe System	Road planning, design and management considerations that are not expected to achieve an overall improvement in the level of safety associated with foreseeable crash types occurring.
Other Elements	Reduces the ability for a primary treatment to be implemented in the future.

Source: Austroads (2018a).

4. Audit findings and recommendations

A table containing audit findings and recommendations table is included as **Appendix B**.

4.1 Overarching Comments

Findings from the audit showed safety hazards that do not currently exist on the intersection, therefore consideration is to be in place as to whether this proposal should go ahead or not.

The majority of risks were seen to be associated with Northbound traffic on approach to the intersection, the identified risks are primarily raised by the removal of the right turn median lane for McKenzie St Southbound traffic.

5. Conclusion

This road safety audit has been conducted in accordance with the Guide to Road Safety Part 6: Road Safety Audit (Austroads, 2022).

The findings and recommendations of the audit are provided for consideration and response by the client.

Auditor in Training:


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13/12/2022

Thomas Ruddell

Road Safety Auditor in Training

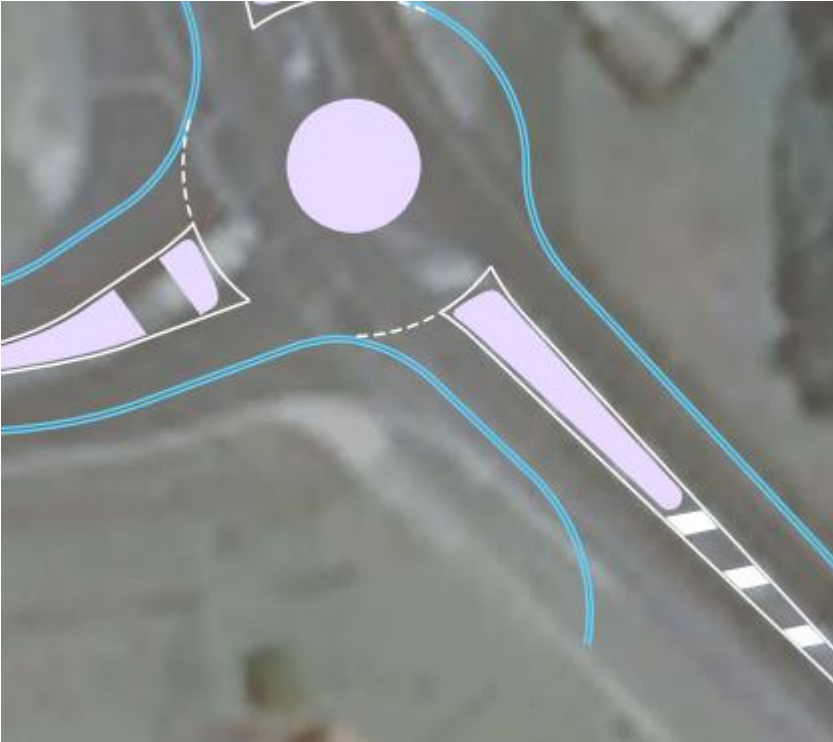
Appendix A: Site photo



Photo 1: Squinty McSquint Squint!

Appendix B: RSA findings and recommendations

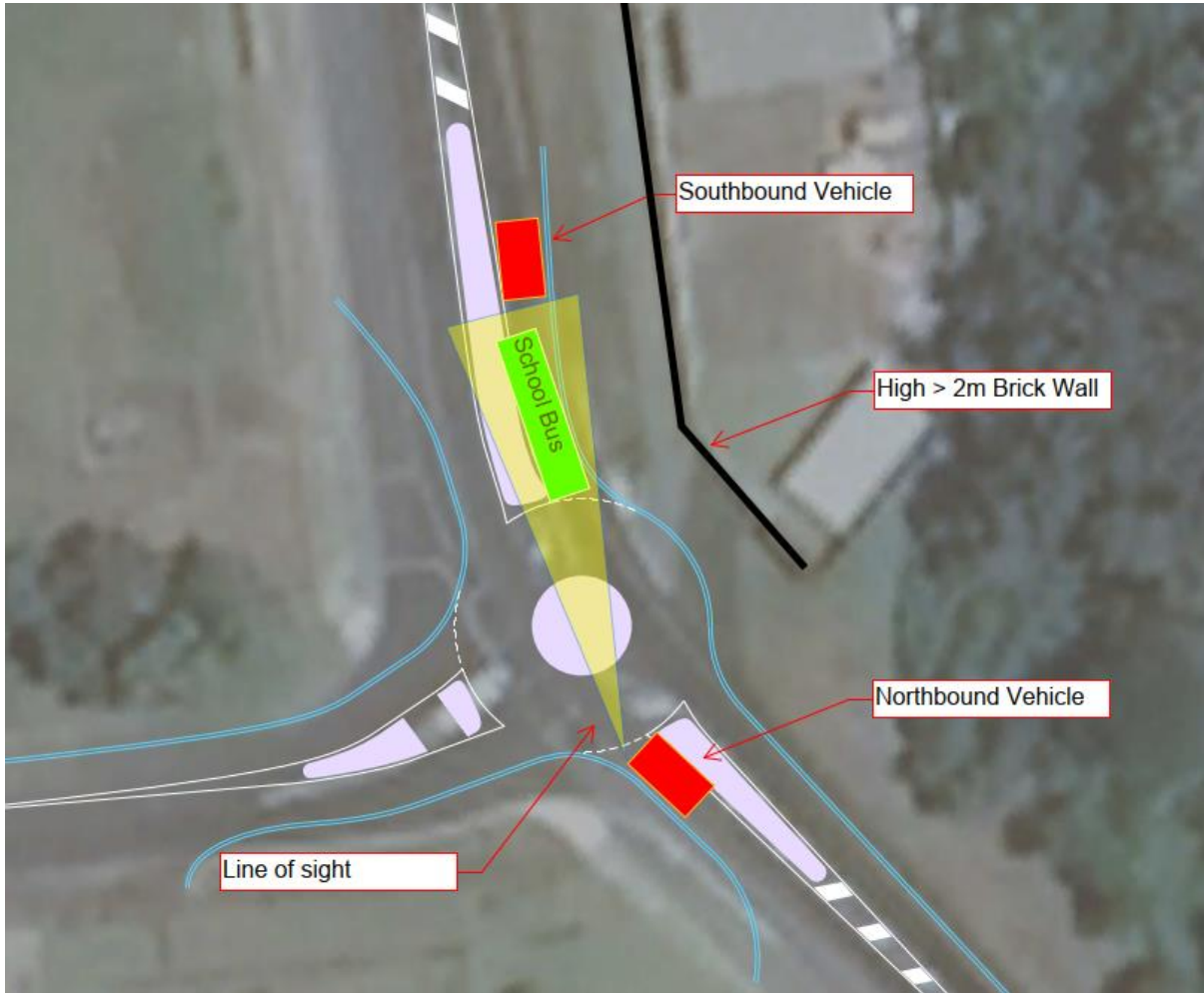
Audit Findings	Level of Risk (inc. FSI)	Recommendations P – Primary S – Supporting	Responsible Officer	
			Accept Yes/No	Comments
i. For the intersection of Pethericks Rd and Epsom – Barnadown Rd, and the intersection of Epsom-Barnadown Rd (west) and Axedale – Goornong Rd, vehicles using the left turn lanes may create a dynamic visual obstruction for motorists at the hold line looking for through vehicles. This increases the likelihood of ‘right through’/side impact crashes involving vehicles turning out of the side road. The volume of vehicles on both roads is low which reduces the likelihood of this crash, however the proportion of larger vehicles turning left into Epsom – Barnadown Road is high which increases the chance of a dynamic visual obstruction occurring. The design is consistent current Austroads and VicRoads design guidance, the auditors believe it still presents a safety issue. 	Rare Serious Medium (FSI)	Implement measures to reduce the speed and/or angle of impact at this location. This could be achieved with a roundabout (P). If this cannot be achieved, implement measures to improve the sightlines at this location such as - Increasing the offset of the left turn lane (S) - Relocating the hold line forward, provided that this can be done so safely (S)		

Audit Findings	Level of Risk (inc. FSI)	Recommendations P – Primary S – Supporting	Responsible Officer	
			Accept Yes/No	Comments
For the proposed intersection of McKenzie St and Baillieu St vehicles utilising the McKenzie St North Bound carriageway does not have any ‘left-turning entry curve’ on approach to the roundabout. The lack of traffic calming on approach to the roundabout increases the likelihood of unsafe vehicle speed on approach to intersection therefore increasing the likelihood of ‘right through’/side impact crashes from right turning traffic from McKenzie St South bound carriageway as well as ‘loss of control’ for vehicles entering the roundabout at unsafe speeds from the south . Existing driver behaviour at this intersection does not have to give way to right turning traffic from McKenzie St Southbound carriageway – this changes with the implementation of the proposed roundabout design. The volume of vehicles on Baillieu St is low however the volume of vehicles utilising McKenzie St is moderate. There is also a lack of traffic calming along McKenzie increasing the likelihood of drivers ‘speeding’ on approach to this intersection increasing the likelihood of unsafe vehicle entry to the intersection. Austroads guide to road design part 4B: roundabout specifies that a minimum treatment for approach to roundabouts is the provision of ‘left turning entry curve’ for the entry path of a single lane entry. 	Possible Moderate High (FSI)	Introduce ‘left turning entry curve’ for single lane entry as per Austroads guide to road design (P).		[leave blank]

At the intersection of McKenzie St and Baillieu St, Busses utilising the Southbound carriageway of McKenzie St can create a ‘Dynamic Visual Obstruction’ for Northbound McKenzie St traffic looking to give way to McKenzie St traffic turning right into Baillieu St. This Dynamic Visual Obstruction is exacerbated by the Brick Wall that blocks sight distance on approach to the intersection and reduces the likelihood of a Northbound car from seeing a south bound car driving behind the bus on approach to the intersection. This increases the likelihood of ‘right through’/side impact crashes. Existing driver behaviour at this intersection does not have to give way to ‘right turning traffic’ from McKenzie St into Baillieu St.

School Busses are frequent on approach to this intersection on the morning commute to the Wonthaggi Secondary Campus at the southern end of McKenzie St this also coincides with the ‘peak traffic’ volumes within Wonthaggi. However as a holistic view this intersection has only ‘low’ volumes of traffic.

The design is consistent current Austroads and VicRoads design guidance, the auditors believe it still presents a safety issue.



Unlikely
Moderate
Medium
(FSI)

Leave intersection as is – do not introduce a roundabout **(P)** – **Question to assesor - Can I do this?**

Create Multi Lane Intersection with restrictions on turning within lanes – ie right turn lane only/through and left turn lane only **(P)**

Adjust Entry Curve Radii/introduce approach reverse curve for either or both North and South Bound McKenzie St traffic so that the ‘Dynamic Visual Obstruction’ is removed **(S)**.

[leave blank]

Audit Findings	Level of Risk (inc. FSI)	Recommendations P – Primary S – Supporting	Responsible Officer	
			Accept Yes/No	Comments
				
At the intersection of McKenzie St and Baillieu St, cyclists utilising the McKenzie St Northbound carriageway suddenly have their Bike Lane terminated without warning on approach to a roundabout with little to no traffic calming geometry on approach. The existing intersection has a Bike Lane across the intersection. This increases the likelihood of cyclist/vehicle crashes especially for Northbound vehicles turning left into Baillieu St. The number of cyclists using this road is ‘low’ and can vary dependant on School commuter uses, Vehicle use on the road is utilised at speeds greater than 30 km/hr and has moderate volume therefore consideration to cyclists is required at this intersection. Austrorads guide to road design section 5.3.3 details design considerations for cyclists which is still an ongoing study.	Unlikely Serious High (FSI)	Introduce Bike Path and transition Bike lane onto bike path at safe radius prior to approach to intersection (P) Place a Bike Lane end sign to indicate to cyclists that the lane is coming to an end – adjust line marking to suit (S)		[leave blank]