

# ROAD SAFETY AUDIT EXISTING CONDITIONS

Kialla West Primary School, Kialla West

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**TABLE OF CONTENTS**

Table of Contents.....	1
Executive Summary.....	2
Quality information page.....	3
1. Introduction to the Safe System.....	4
Meetings and Site Inspections .....	5
2. Project description .....	6
2.1. Project background and objective .....	6
2.2. Existing conditions and context .....	7
Road network: General Overview .....	7
3. Movement and Place.....	8
3.1. Strategic Focus Score .....	8
3.2. Movement and Place objectives.....	10
4. Road Safety Audit .....	11
Risk rating assessment.....	11
Safety audit findings and recommendations .....	12
4.1. Options considered .....	21
Options discussions .....	22
Options evaluation .....	23
5. Concluding Statement .....	27
Appendix 1 – Site photographs .....	28
Appendix 2: SMART LED Inground Stud Light .....	29
Appendix 3: Speed Display .....	30

## EXECUTIVE SUMMARY

This report seeks to assess the existing conditions on Shepparton-Seymour Road (A39) in the vicinity of Kialla West Primary School in view of assessing the existing safety performance of the road, with a focus on school accessibility and pedestrian movements.

Shepparton-Seymour Road makes up part of the Goulbourn Valley Highway, an arterial highway which provides state and regional connectivity. Goulbourn Valley Highway is an important heavy vehicle route and heavy vehicles make up a significant proportion of the total traffic volume, at 20%. Goulbourn Valley Highway is also a motorcycle tourism route which attracts recreational, and often inexperienced, motorcyclists in warmer months. The subject location makes up part of the Calder Woodburn Memorial Avenue, a nearly twenty-kilometre length of the highway with heritage listed eucalyptus trees on both side of the road<sup>1</sup>. Recommendation in this report seek to avoid any vegetation removal. Consequently, some options are not discussed or considered e.g., roundabout installation.

In the local context, Shepparton-Seymour Road provides access to the larger nearby township of Shepparton, and to the subject Kialla West Primary School. During school start and finish times in the AM and PM peaks a diverse range of road users, such as passenger vehicles, heavy vehicles, buses, and vulnerable road users, are present through the site. The high level of interaction between these road users of varying mass and speed creates a high-risk environment where a crash is likely to have a severe outcome. The issue is compounded by vehicle queuing and congestion as a result of a high volume of turning movements without separated turning lanes to facilitate them.

Potential solutions have been explored on a long term, medium term, and short-term basis with focus on reducing the impact on the heritage listed trees present on the roadsides. Adopting some of the recommendations is expected to improve safety conditions for both pedestrians and vehicles by controlling vehicles speeds on approach to the site and increasing visibility of pedestrian crossing points.

The recommendations include:

### Long term

- Installation of traffic signals at the intersection of Shepparton-Seymour Road and Cemetery Lane adjacent to the school.

### Medium term

- Closure of existing drop off and pick up zone and installation of staff car park within existing drop off and pick up zone
  - Use Cemetery Lane as a drop off and pick up lane with a turn point at the end of the street
- Installation of Channelised Right Turn into Cemetery Road

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<sup>1</sup> [Vicplan \(mapshare.vic.gov.au\)](http://mapshare.vic.gov.au)

- Installation of a wide median near the existing pedestrian flag crossing

**Short term**

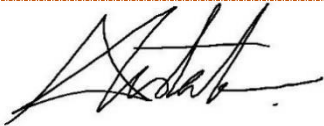
- Speed enforcement measures
- Installation of red antiskid pavement on the approach to the pedestrian flag crossing with white paint: “School Crossing”
- Installation of fog visible in-pavement stud lights activated during school times
- Installation of “Your Speed” display sign.

**QUALITY INFORMATION PAGE**

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Audit Team: Daniel Mustata – Senior Road Safety Auditor, Road Solutions Pty Ltd

Duc Phan – Senior Road Safety Auditor, Road Solutions Pty Ltd

Revision	Date	Details	Name	Authorised
A	05.07.2022	Draft report	Daniel Mustata	
B		-		
C				

**1. INTRODUCTION TO THE SAFE SYSTEM**

This road safety audit has been conducted in accordance and compliance with the Safe System approach and principles. The Safe System approach seeks that no road user is exposed to the risk of serious injury or death and establishes a shared responsibility for safe travel outcomes between system designers and road users.

The Safe System is comprised of four pillars (Figure 2) which establish its core principles: safer vehicles, safer speeds, safer roads, and safer road users. Post-crash response is another element that is often recognised as the fifth pillar. The Safe System also identifies impact speeds above which, in the event of a crash, are intolerable to the human body and highly likely to result in serious injury or death.

This road safety audit takes into consideration and complies with both the Safe System pillars and Safe System impact speeds in issue identification and recommendation making.



Figure 2: Safe System Pillars





CRASH TYPE	IMPACT SPEED
 Head on with another vehicle	70 km/h
 Side impact	50 km/h
 Side impact with tree	30 km/h
 Pedestrian & cyclists	30 km/h

Figure 1: Safe System Impact Speeds



Figure 3: Rear-end and fixed object collision maximum impact speeds

## MEETINGS AND SITE INSPECTIONS

A site inspection was undertaken on 28 June 2022. The weather conditions were clear. Traffic volumes were observed to be moderate and there were no vulnerable road users present at the intersection.

In addition, a high-resolution desktop aerial investigation was undertaken.

Activity	Day Inspection
<b>Day</b>	Tuesday
<b>Date</b>	28 June 2022
<b>Time</b>	15:00 – 16-00
<b>Senior Road Safety Auditor</b>	D. Mustata
<b>Weather Conditions</b> (Clear, Raining, Snowing, Fog, Dust, Smoke, Unknown or Not Applicable)	Clear
<b>Light Conditions</b> (Light, Dark Dusk Dawn, Light and Dark, Unknown or Not Applicable)	Light
<b>Road Surface Conditions</b> (Dry, Wet, Muddy, Snowy, Icy, Unknown or Not Applicable)	Dry

Table 1 - Site Inspection Details

**2. PROJECT DESCRIPTION**

**2.1. PROJECT BACKGROUND AND OBJECTIVE**

This project seeks to assess pedestrian and vehicle safety in the vicinity of Kialla West Primary School, with an emphasis on improving safety and efficiency around school access.

A school crossing is present in front of the main parking area at the school, however high levels of congestion during AM and PM peaks, low visibility of the school to approaching vehicles, and a high proportion of heavy vehicles results in a high risk for pedestrian movements at the crossing area. A serious injury crash occurred in 10 September 2018 when six persons were involved in a crash resulting in serious injury<sup>2</sup>.

Potential solutions were explored on an immediate, interim, and long-term basis with a focus on reducing impact to the heritage listed trees present on the roadsides. The full list of considered options and their evaluations is contained in Chapter 4.1.



Figure 4: Site layout

<sup>2</sup>

[https://public.tableau.com/views/Crashstatfacts/Mapviewbycrashes?%3Aembed=y&%3Adisplay\\_count=yes&%3AshowTabs=y&%3AshowVizHome=no#1&%3Adisplay\\_count=yes&%3Atoolbar=no&%3Arender=false](https://public.tableau.com/views/Crashstatfacts/Mapviewbycrashes?%3Aembed=y&%3Adisplay_count=yes&%3AshowTabs=y&%3AshowVizHome=no#1&%3Adisplay_count=yes&%3Atoolbar=no&%3Arender=false)

## 2.2. EXISTING CONDITIONS AND CONTEXT

### ROAD NETWORK: GENERAL OVERVIEW

Goulbourn Valley Highway (A39) is a major arterial highway which provides regional and state connectivity. In a regional context the road provides direct access between Shepparton and Seymour and is accordingly named Shepparton-Seymour Road within the project scope. The road is a national heavy vehicle route, with heavy vehicles making up approximately 20% of the traffic volumes at the subject location. The posted speed at the subject location is 80 km/h, with a 40 km/h school zone in place during school start and finish times.

Shepparton-Seymour Road is configured as a one-lane, two-way road with an undivided carriageway. Within the project scope there are wide paved road shoulders on both sides of the road. Facilities for vulnerable road users are limited within the scope, however there is a school crossing point outside of Kialla West Primary School.



**Figure 5: Shepparton-Seymour Road at the school crossing point**

Kialla West Primary School provides two main parking areas, located in front of the school on the east side of Shepparton-Seymour Road, and on the north side of the school accessible by the cemetery minor access road (hereby referred to as Cemetery Road). A left-turn lane is provided on Shepparton-Seymour Road to allow access to southbound traffic, however there is no right-turn lane present which was seen to result in vehicle queuing while vehicles wait for the right-turning driver to make a safe gap selection.

A bus stop is also located just north of the school crossing points on the west side of the road, servicing school buses for the primary school and secondary school in Shepparton.

The land usage at the site location is mixed, with the main residential area in Kialla West located just west of the site, and largely agricultural land usage to the east. A cemetery is located slightly behind the primary school and is accessible via the school access road. The site also makes up part of the Calder Woodburn Memorial Avenue, a nearly twenty-kilometre length of the highway with eucalyptus trees on both side of the road. The memorial avenue is a heritage site listed in the Victorian Heritage Register.

### 3. MOVEMENT AND PLACE

Under the Movement and Place (M&P) framework, Shepparton-Seymour Road is classified as an M1P5 within the project scope, indicating mass movement of people and/or goods within a place of local significance. Cemetery Road is classified as an M5P4, indicating local movement within a place of neighbourhood significance.

Given the roads regional and state-level connectivity, Shepparton-Seymour Road has a freight classification of F1, and is also considered a motorcycle tourism route. A relatively high walking classification (given the speed environment) of W3 is present, creating a conflict with the high movement functions served by Shepparton-Seymour Road.

The local access function of the road conflicts with and is dominated by the network context in which Shepparton-Seymour Road is used, and this can be seen in the strategic focus scores which identify movement as having the largest aspirational gaps in safety performance.

Segment			Classifications										
Road	Start	End	Place	Movement	General Traffic	Tram	Bus	Freight	Cycling	Walking	Interchange	Tourist Route	Biodiversity
Goulbourn Valley Highw	Bennetts Road	No. 7358 GVH	P5	M1	GT3	N/A	N/A	F1	N/A	W3	N/A	TR1	BD1
Kialla West PS Access R	Goulbourn Valley Hwy	Cemetery	P4	M5	GT5	N/A	N/A	N/A	N/A	W3	N/A	TR1	BD1

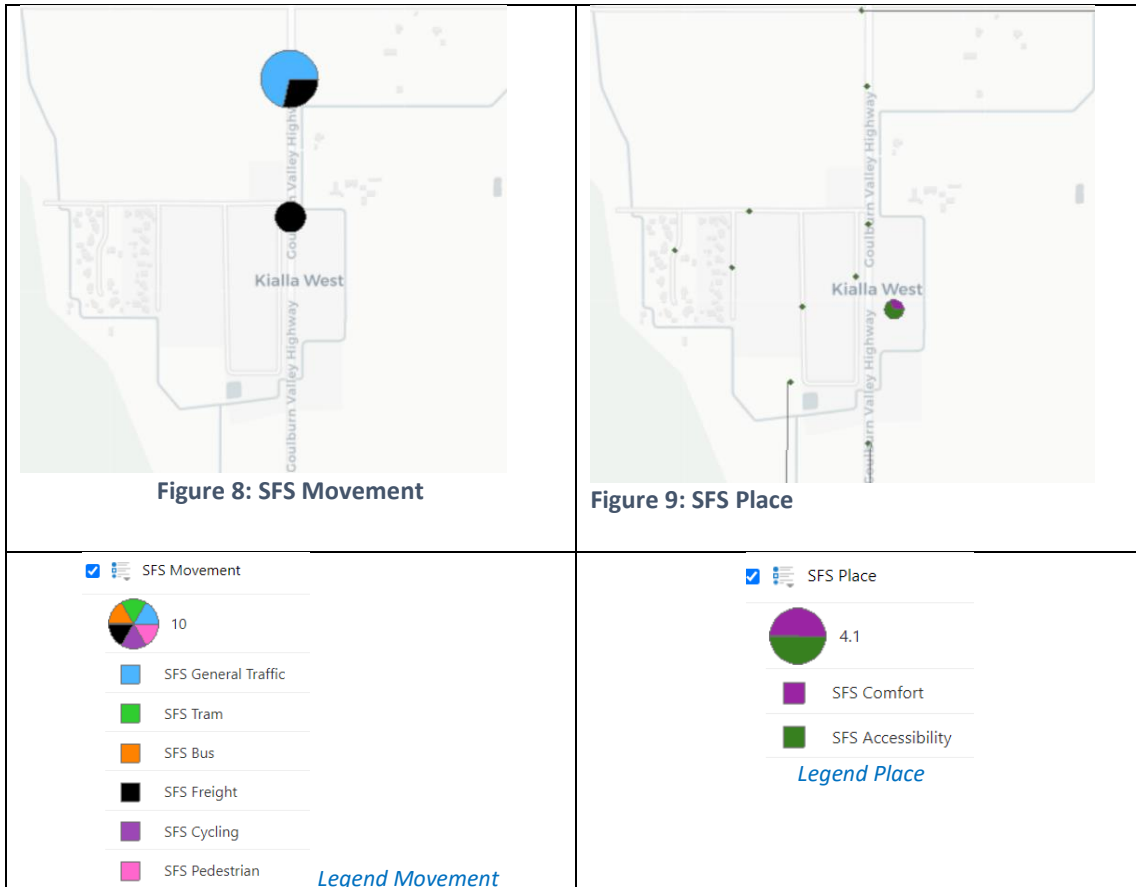
Figure 6: Movement and Place classification

#### 3.1. STRATEGIC FOCUS SCORE

The Strategic Focus Score (SFS) is a relative measure of how the network is currently performing against the desired / aspirational state informed by the network classifications. Network performance indicators for each of the M&P themes have been developed and inform the SFS, which is represented by a pie chart. The size of the pie chart reflects the size of the performance gap (the bigger the pie, the bigger the problem) and the M&P themes and modes can be compared to understand the relativity of the issues.



Figure 7: SFS Total



Figures seven, eight, and nine (shown above) identify the modal performance gaps from which project objectives may be derived to address these gaps.

**SFS: Movement**

Within the Movement scoring, general traffic and freight are shown to be key issues affecting the site’s performance. This is expected given the high levels of congestion experienced at the site during school start and finish times, as well as the level of interaction between heavy vehicles and passenger vehicles. To address this gap, project objectives should seek to remedy the turning movement conflicts which are a main contributor to the congestion level and provide infrastructure upgrades which acknowledge the heavy percentage of heavy vehicles and accommodate their movements on advance to, and through the site.

**SFS: Place**

Within the Place scoring, accessibility is identified as the key issue. The high operating speed on Shepparton-Seymour Road, and limited infrastructure to support safe and controlled pedestrian movements are main contributors to poor accessibility to the school area and nearby bus stop.

Despite the fact that the mapping does not show environmental or road safety gaps in the total SFS, there are known risks in both environment and road safety such as the typically high noise levels associated with high volumes of heavy vehicles, and an increased risk of both intersection and non-

intersection crashes. The proposed recommendations are expected to address these issues to an extent as well.

### 3.2. MOVEMENT AND PLACE OBJECTIVES

Following the evaluation of the strategic focus scores, the objectives for potential improvements are defined and shown in the table below.

Objective Strength	Objective Description
Very Strongly	<p><b>Objective 1:</b> Support changes to improve general traffic movement and freight efficiency</p> <ul style="list-style-type: none"> <li>• Reduce delays to the general traffic and freight</li> <li>• Enable over-size heavy vehicles movement along the corridor</li> </ul>
Strongly	<p><b>Objective 2:</b> Support changes to improve Place (accessibility)</p> <ul style="list-style-type: none"> <li>• Access to the school</li> <li>• Access to the public transport</li> </ul>

## 4. ROAD SAFETY AUDIT

The road safety audit undertook daytime inspections on June 28<sup>th</sup> from 15:00 to 16:00.

The audit addresses physical features of the existing road condition that may affect road user safety, as well as assessing the existing conditions in view of addressing any road safety issues at the subject intersection. Audit reports cover exceptions only. Those items in the design that are not considered to present a safety concern, or which are fully agreed with by the audit team, are not listed in this report.

This road safety inspection has been undertaken in accordance with the Safe System principles and the latest Austroads Part 6 Managing Road Safety Audit Edition January 2022.

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### RISK RATING ASSESSMENT

The two risk parameters and their categories considered are likelihood and severity as follows<sup>3</sup>:

- Likelihood
  - 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.
- Severity<sup>4</sup>
  - Insignificant – property damage
  - Minor – minor first aid
  - Moderate – major first aid and/or presents to hospital (not admitted)
  - Serious – admitted to hospital
  - Fatal – at scene or within 30 days of the crash.

The risk matrix below, was developed by the PWG to show how likelihood and severity are considered within a standard risk matrix to give a 'priority' for risk mitigation.

The corresponding priorities for mitigation are categorised as:

- 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

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<sup>3</sup> Exposure is factored into likelihood

<sup>4</sup> Severity is the likelihood of the outcome occurring

			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 10: Austroads RSA Risk Matrix


		Crash Speed (km/h)										
		< 10	10	20	30	40	50	60	70	80	90	100
Crash Type	Pedestrian (vs HV)	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Minor Injury</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Moderate Injury</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Serious Injury</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Fatal</div> </div>										
	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)												


Figure 11: Severity guidance sheet

**SAFETY AUDIT FINDINGS AND RECOMMENDATIONS**

The table below contains the findings of this road safety audit with risk ratings attached. It also contains recommendations which have been added to this audit report to improve safety of the subject road, and to prevent and reduce and severity of a crash should this occur. A Safe System analysis is provided for each recommendation, showing the level of alignment with Safe System principles, as well as the main safety element and risk addressed by the recommendation.


The auditors did not make any comments or recommendations outside of the scope of the project or on existing infrastructure that is not part of the scope of this project.


No.#	SAFETY CONCERN	RISK	PHOTO	CLIENT RESPONSE
1	<p>Vehicles exiting Kialla West Primary School are doing so at a Y-angle resulting in reduced visibility to oncoming traffic as a result of geometry and some existing signage, creating an increased risk of a cross-traffic type crash. In addition, most exiting vehicles turn right towards Shepparton which increases the exposure risk of collision with through vehicles.</p>	<p><b>MED (FSI)</b></p>		<p>Accepted:</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Comments:</p>
<b>RECOMMENDATION</b>		<b>SAFE SYSTEM ANALYSIS</b>		
<p>It is recommended that the exit point to the western carpark is closed, and the space is used solely as a staff carpark, with all pick up and drop off movements redirected to Cemetery Road.</p>		<p><b>Safety Element addressed</b></p> <p><input checked="" type="checkbox"/> Exposure</p> <p><input checked="" type="checkbox"/> Likelihood</p> <p><input type="checkbox"/> Severity</p>	<p><b>Safe System Treatment Alignment</b></p> <p><input type="checkbox"/> <b>Primary Treatment</b></p> <p><input checked="" type="checkbox"/> <b>Step Towards</b></p> <p><input type="checkbox"/> <b>Supporting</b></p> <p><input type="checkbox"/> <b>Non Safe System treatment</b></p>	<p><b>Predominant Crash Risk Addressed</b></p> <p><input type="checkbox"/> Run off road</p> <p><input type="checkbox"/> Head-On</p> <p><input checked="" type="checkbox"/> Intersection</p> <p><input type="checkbox"/> Pedestrians</p> <p><input type="checkbox"/> Cyclists</p> <p><input type="checkbox"/> Motorcycle</p>


No.#	SAFETY CONCERN	RISK	PHOTO		CLIENT RESPONSE
2	<p>If pick-up / drop-off activities in the western car park are disallowed and redirected to Cemetery Lane (as per the previous recommendation), there will be a greater operational strain on the right-turn movement out of Cemetery Lane which is already a source for traffic queueing. Traffic queueing may result in drivers performing an unsafe gap selection due to perceived pressure from queued traffic or impatience, resulting in an increased risk of a crash.</p>	<b>MED (FSI)</b>			<p>Accepted:</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Comments:</p>
	<b>RECOMMENDATION</b>	<b>SAFE SYSTEM ANALYSIS</b>			
<p>It is recommended that the existing school crossing and bus stop are relocated 65 metres north, near the Cemetery Lane intersection, and a pedestrian operated signal is installed with traffic loops on Cemetery Lane, so that the pedestrian signal phase also allows a traffic gap for vehicles to turn out of Cemetery Lane. It is also recommended that a painted 'Keep Clear' zone is installed on Shepparton-Seymour Rd at the subject intersection so that vehicles stopping at the pedestrian operated signals do not block the path of right-turning vehicles.</p>	<b>Safety Element addressed</b>	<b>Safe System Treatment Alignment</b>	<b>Predominant Crash Risk Addressed</b>		
<p><input checked="" type="checkbox"/> Exposure</p> <p><input checked="" type="checkbox"/> Likelihood</p> <p><input type="checkbox"/> Severity</p>	<p><input type="checkbox"/> <b>Primary Treatment</b></p> <p><input checked="" type="checkbox"/> <b>Step Towards</b></p> <p><input type="checkbox"/> <b>Supporting</b></p> <p><input type="checkbox"/> <b>Non Safe System treatment</b></p>	<p><input type="checkbox"/> Run off road</p> <p><input type="checkbox"/> Head-On</p> <p><input type="checkbox"/> Intersection</p> <p><input checked="" type="checkbox"/> Pedestrians</p> <p><input type="checkbox"/> Cyclists</p> <p><input type="checkbox"/> Motorcycle</p>			


No.#	SAFETY CONCERN	RISK	PHOTO		CLIENT RESPONSE
3	<p>Uncontrolled turning movements out of Cemetery Lane are considered to pose an increased risk of intersection type crashes. The typical vehicle queueing present on Cemetery Lane may result in driver impatience and thus unsafe manoeuvres when exiting. Under the proposed conditions outlined in the previous recommendation, an impatient driver who feels they have been queueing for an undesirable time may perform a right turn before the pedestrian phase triggers and provides a clear opportunity.</p>	<p><b>MED (FSI)</b></p>			<p>Accepted:  <input type="checkbox"/> Yes                      <input type="checkbox"/> No  Comments:</p>
<b>RECOMMENDATION</b>		<b>SAFE SYSTEM ANALYSIS</b>			
<p>Alignment with Safe System principles would require installation of traffic signals in conjunction with raised platforms (or a roundabout) at the Cemetery Lane intersection so that turning movements onto Shepparton-Seymour Road only occur during the designated phase. Nevertheless, the speed on Shepparton-Seymour Rd is too high for the raised platforms to be considered. Hence, installation of traffic signals would be more appropriate.</p>		<b>Safety Element addressed</b>	<b>Safe System Treatment Alignment</b>	<b>Predominant Crash Risk Addressed</b>	
		<input checked="" type="checkbox"/> Exposure  <input checked="" type="checkbox"/> Likelihood  <input type="checkbox"/> Severity	<input type="checkbox"/> <b>Primary Treatment</b> <input checked="" type="checkbox"/> <b>Step Towards</b> <input type="checkbox"/> <b>Supporting</b> <input type="checkbox"/> <b>Non-Safe System treatment</b>	<input type="checkbox"/> Run off road <input type="checkbox"/> Head-On <input checked="" type="checkbox"/> Intersection <input checked="" type="checkbox"/> Pedestrians <input type="checkbox"/> Cyclists <input type="checkbox"/> Motorcycle	

No.#	SAFETY CONCERN	RISK	PHOTO	CLIENT RESPONSE
4	<p>School children will have to cross a 15-metre section to access the bus stop from the school or vice versa, with the desired walking line passing through the road shoulder. The proximity to traffic increases the risk of a pedestrian collision, particularly when considering the potential erratic behaviour of children.</p>	<p><b>MED</b></p>		<p>Accepted:  <input type="checkbox"/> Yes                      <input type="checkbox"/> No  Comments:</p>
<b>RECOMMENDATION</b>		<b>SAFE SYSTEM ANALYSIS</b>		
<p>Installation of a pedestrian fence is recommended to contain pedestrian movements to the desired path shown in green on the right.</p>	<p style="text-align: center;"><b>Safety Element addressed</b></p> <input type="checkbox"/> Exposure <input type="checkbox"/> Likelihood <input type="checkbox"/> Severity	<p style="text-align: center;"><b>Safe System Treatment Alignment</b></p> <input type="checkbox"/> <b>Primary Treatment</b> <input type="checkbox"/> <b>Step Towards</b> <input type="checkbox"/> <b>Supporting</b> <input type="checkbox"/> <b>Non Safe System treatment</b>	<p style="text-align: center;"><b>Predominant Crash Risk Addressed</b></p> <input type="checkbox"/> Run off road <input type="checkbox"/> Head-On <input type="checkbox"/> Intersection <input type="checkbox"/> Pedestrians <input type="checkbox"/> Cyclists <input type="checkbox"/> Motorcycle	

No.#	SAFETY CONCERN	RISK	PHOTO			CLIENT RESPONSE
4	There is a risk that through traffic or vehicles unfamiliar with area don't adhere to the school zone speed limit and continue through the site at high speed.	<b>HIGH</b>				Accepted: <input type="checkbox"/> Yes <span style="margin-left: 150px;"><input type="checkbox"/> No</span> Comments:
	<b>RECOMMENDATION</b>	<b>SAFE SYSTEM ANALYSIS</b>				
	Installation of traffic detection speed displays which activate during school hours is recommended.	<b>Safety Element addressed</b> <input type="checkbox"/> Exposure <input checked="" type="checkbox"/> Likelihood <input type="checkbox"/> Severity	<b>Safe System Treatment Alignment</b> <input type="checkbox"/> Primary Treatment <input checked="" type="checkbox"/> Step Towards <input type="checkbox"/> Supporting <input type="checkbox"/> Non Safe System treatment	<b>Predominant Crash Risk Addressed</b> <input type="checkbox"/> Run off road <input type="checkbox"/> Head-On <input checked="" type="checkbox"/> Intersection <input checked="" type="checkbox"/> Pedestrians <input type="checkbox"/> Cyclists <input type="checkbox"/> Motorcycle		

No.#	SAFETY CONCERN	RISK	PHOTO	CLIENT RESPONSE
5	<p>The concern under this finding is following on from the assumption made in recommendation no 4 above that there is an existing risk of vehicle speeding.</p> <p>Where it is determined that the 85<sup>th</sup> percentile or average number of vehicles are speeding during the school times above the 40km/h that is a risk to pedestrians as well as the turning vehicles. The risk is exacerbated given that the Shepparton-Seymour Road is a freight route and heavy vehicles need a longer stopping distance.</p>	<p><b>HIGH (FSI)</b></p>		<p>Accepted:</p> <p><input type="checkbox"/> Yes <span style="margin-left: 150px;"><input type="checkbox"/> No</span></p> <p>Comments:</p>
<b>RECOMMENDATION</b>		<b>SAFE SYSTEM ANALYSIS</b>		
<p>It is recommended speed survey is undertaken to determine the level of speeding at this location.</p> <p>If speeding occurs, it is recommended that permanent speed enforcement measurement are deployed at the site e.g. speed cameras.</p>	<p><b>Safety Element addressed</b></p> <p><input checked="" type="checkbox"/> Exposure</p> <p><input checked="" type="checkbox"/> Likelihood</p> <p><input checked="" type="checkbox"/> Severity</p>	<p><b>Safe System Treatment Alignment</b></p> <p><input checked="" type="checkbox"/> <b>Primary Treatment</b></p> <p><input type="checkbox"/> <b>Step Towards</b></p> <p><input type="checkbox"/> <b>Supporting</b></p> <p><input type="checkbox"/> <b>Non Safe System treatment</b></p>	<p><b>Predominant Crash Risk Addressed</b></p> <p><input type="checkbox"/> Run off road</p> <p><input type="checkbox"/> Head-On</p> <p><input checked="" type="checkbox"/> Intersection</p> <p><input checked="" type="checkbox"/> Pedestrians</p> <p><input type="checkbox"/> Cyclists</p> <p><input type="checkbox"/> Motorcycle</p>	

No.#	SAFETY CONCERN	RISK	PHOTO		CLIENT RESPONSE
6	<p>When approaching the site from the south, the roadside environment obscures the presence of the primary school making it difficult for an approaching driver to appreciate the built-up nature of the location. There is a risk that a driver unfamiliar with the location may adopt an inappropriate speed or driving behaviour through the location as a result.</p>	<b>HIGH</b>			<p>Accepted:</p> <p><input type="checkbox"/> Yes <span style="margin-left: 150px;"><input type="checkbox"/> No</span></p> <p>Comments:</p>
	<b>RECOMMENDATION</b>	<b>SAFE SYSTEM ANALYSIS</b>			
	<p>Installation of red pavement with white 'School Zone' lettering is recommended on both approaches to the school.</p>	<p style="text-align: center;"><b>Safety Element addressed</b></p> <p><input type="checkbox"/> Exposure</p> <p><input checked="" type="checkbox"/> Likelihood</p> <p><input type="checkbox"/> Severity</p>	<p style="text-align: center;"><b>Safe System Treatment Alignment</b></p> <p><input type="checkbox"/> <b>Primary Treatment</b></p> <p><input checked="" type="checkbox"/> <b>Step Towards</b></p> <p><input type="checkbox"/> <b>Supporting</b></p> <p><input type="checkbox"/> <b>Non Safe System treatment</b></p>	<p style="text-align: center;"><b>Predominant Crash Risk Addressed</b></p> <p><input type="checkbox"/> Run off road</p> <p><input type="checkbox"/> Head-On</p> <p><input checked="" type="checkbox"/> Intersection</p> <p><input checked="" type="checkbox"/> Pedestrians</p> <p><input type="checkbox"/> Cyclists</p> <p><input type="checkbox"/> Motorcycle</p>	

No.#	SAFETY CONCERN	RISK	PHOTO	CLIENT RESPONSE
7	The site, and the broader surrounding area, are prone to experiencing fog which significantly reduces visibility and increases the likelihood of several crash types.	<b>HIGH</b>		Accepted: <input type="checkbox"/> Yes <input type="checkbox"/> No Comments:
<b>RECOMMENDATION</b>		<b>SAFE SYSTEM ANALYSIS</b>		
Installation of stud lights is recommended to provide greater visibility and delineation of the road environment on foggy days.	<b>Safety Element addressed</b> <input type="checkbox"/> Exposure <input checked="" type="checkbox"/> Likelihood <input type="checkbox"/> Severity	<b>Safe System Treatment Alignment</b> <input type="checkbox"/> <b>Primary Treatment</b> <input checked="" type="checkbox"/> <b>Step Towards</b> <input type="checkbox"/> <b>Supporting</b> <input type="checkbox"/> <b>Non Safe System treatment</b>	<b>Predominant Crash Risk Addressed</b> <input checked="" type="checkbox"/> Run off road <input type="checkbox"/> Head-On <input checked="" type="checkbox"/> Intersection <input checked="" type="checkbox"/> Pedestrians <input checked="" type="checkbox"/> Cyclists <input checked="" type="checkbox"/> Motorcycle	

#### 4.1. OPTIONS CONSIDERED

##### Long term options

- Installation of traffic signals at the intersection of Shepparton-Seymour Road and Cemetery Road adjacent to the school.

##### Medium term options

- Closure of existing drop off and pick up zone and installation of staff car park within existing drop off and pick up zone
  - Use Cemetery Road as a drop off and pick up lane with a turn point at the end of the street
- Installation of Channelised Right Turn into Cemetery Lane road
- Installation of a wide median near the existing pedestrian flag crossing

##### Short term options

- Speed enforcement measures
- Installation of red antiskid pavement on the approach to the pedestrian flag crossing with white paint: "School Crossing"
- Installation of fog visible in-pavement stud lights activated during school times
- Installation of "Your Speed" sign

OPTIONS DISCUSSIONS

A systemic treatment response is analysed below in

Table 2: Options discussion from the Safe System perspective.

Table 2: Options discussion is considering four elements: road, speed, user, and technology. Each of these elements are assessed for each section of the intersection including the approach.

**Table 2: Options discussion**

Variable category	Solution	MP objective	Exposure	Likelihood	Severity
Road	Installation of a wide median near the existing pedestrian flag crossing	2	↓	↓	↔
	Installation on Traffic signals on 'Cemetery Lane' road	2	↓	↓	↔
	Closure of the existing pick up and drop off lane	2	↓	↓	↓
	Installation of Channelised Right Turn into 'Cemetery Lane' road	1	↓	↓	↔
Speed	Red pavement on approach to the school crossing	2	↔	↓	↔
Road User	Use 'Cemetery Lane' road as a drop off and pick up lane with a turn point at the end of the street	2	↔	↓	↔
	Installation of permanent speed enforcement cameras	2	↓	↓	↓
Technology	In ground flashing LED studs activated by school zone timings	2	↔	↓	↔
	Installation of "Your Speed" sign	2	↔	↓	↔

**Legend:**

↔: No change to existing conditions

↓: Lower risk

↑: Higher risk

OPTIONS EVALUATION

Following the systemic analysis (part 4.1) and the Movement and Place assessment (Part 6 read in conjunction with **Error! Reference source not found. Error! Reference source not found.**) which identified the project objectives options that are considered viable are assessed from a Safe System perspective, risk, and opportunities for the subject intersection

**Table 3: Options assessment and evaluation**

Treatment No	Proposed Treatment	Safety Element Exposure (E) Likelihood (L) Severity (S)	Cost	Benefits and risks
1	Installation of traffic signals at the intersection of Shepparton-Seymour Road and the Cemetery Lane adjacent to the school.	L; S	\$\$\$\$ <sup>5</sup>	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Control of vehicle movements in and out of the school</li> <li>- Introduction of a signal-controlled pedestrian crossing</li> <li>- Cemetery Lane will have adequate sight distance</li> <li>- Consistent with the signalised intersection 2.7km north at River Road</li> <li>- Most likely only operational during school times</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- Introduction of delays to general traffic and freight during school times</li> <li>- Potential to introduce crash type not currently present</li> </ul>
1a	Installation of Pedestrian Operated Signals at the current pedestrian crossing in	L; S	\$\$\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- The existing school crossing is maintained</li> </ul>

<sup>5</sup> Each '\$' sign equals approximately \$200,000

	conjunction with the installation of a traffic loop at the intersection of Shepparton-Seymour Road and the Cemetery Road			<ul style="list-style-type: none"> <li>- Vehicles exiting Cemetery Lane will benefit from having gaps in the traffic due to the provision of the traffic loop triggering a red signal</li> <li>- Better visibility of the pedestrian crossing</li> <li>- Unlikely to impact on the transport efficiency outside school hours</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- A red signal at the pedestrian crossing is triggered without the presence of a pedestrian</li> <li>- May impact on transport efficiency during school times</li> <li>- Costly option not fully addressing pick-up and drop-off issues</li> </ul>
2	<p>Closure of existing drop off and pick up zone on west side of school, and repurpose solely for staff parking</p> <ul style="list-style-type: none"> <li>- Use Cemetery Lane as a drop off and pick up lane with a turn point at the end of the street</li> </ul>	L; S	\$\$ - \$\$\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- The existing exit of the pick-up / drop-off zone on the west side of the school forms a Y-shaped geometry with Shepparton -Seymour Road. Removing this type of exit will reduce crash risk</li> <li>- Cemetery Lane is also used for pick-up and drop-off. Removing the existing exit of the pick/up drop off zone will reduce exposure by rationalising the numbers of entry and exit points</li> <li>- Cemetery Lane has good sight distance and forms a 90° angle with Shepparton-Seymour Road</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- Increase exposure at one location and may create queues on the Cemetery Lane</li> </ul>
3	Installation of Channelised Right Turn into Cemetery Lane	L	\$\$\$\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Increased efficiency and safety for general traffic and freight</li> <li>- Provision of separated turning movements</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- May negatively impact on environment</li> <li>- Costly treatment</li> </ul>

4	Installation of a wide median near the existing pedestrian flag crossing	L	\$\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- A wide median will act as a gateway treatment and raise driver’s awareness</li> <li>- Provide a refuge for pedestrians (although not safe to store at the posted speed)</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- May negatively impact on environment due to road widening</li> <li>- May impact on efficiency of the over-size freight</li> </ul>
5	Installation of red antiskid pavement on the approach to the pedestrian flag crossing with white paint: “School Crossing”	L	\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Increase driver’s awareness on the approach to the pedestrian crossing</li> <li>- Cost effective treatment as an interim solution until a long-term option is further analysed</li> <li>- Red pavement is skid resistant also assisting with the stopping distance</li> <li>- Better visibility during fog conditions</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- May negatively impact on environment due to road widening</li> <li>- May impact on efficiency of the over-size freight vehicles</li> </ul>
6	Installation of permanent speed enforcement cameras	E; L; S	\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Increase driver’s awareness on the approach to the pedestrian crossing</li> <li>- Cost effective solution to address speeding with an established high Crash Reduction Factor</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- May negatively impact on public perception</li> </ul>

7	Installation of fog visible in-pavement stud lights activated during school times	L	\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Increased driver awareness on approach to the school crossing</li> <li>- Better visibility during fog conditions</li> <li>- Better speed compliance</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- Required wiring hence is prone to breakdowns</li> <li>- Potential vandalism of the stud lights</li> </ul>
8	Installation of "Your Speed" sign	L	\$	<p><b>Benefits:</b></p> <ul style="list-style-type: none"> <li>- Increased driver awareness and speed compliance on approach to the school crossing</li> <li>- Better visibility during fog conditions</li> <li>- Can be solar powered</li> </ul> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- Potential vandalism</li> <li>- May become dysfunctional and require additional maintenance</li> </ul>

## 5. CONCLUDING STATEMENT

This existing conditions road safety audit has been carried out in accordance with the audit process detailed in Guide to Road Safety Part 6: Managing Road Safety Audits (2022). for the purpose of identifying any features of the proposal that could be altered, redesigned or removed to improve safety. The audit team has inspected the site and its environment. The identified safety concerns are noted in this report.

### DOCUMENTS USED DURING THE AUDIT

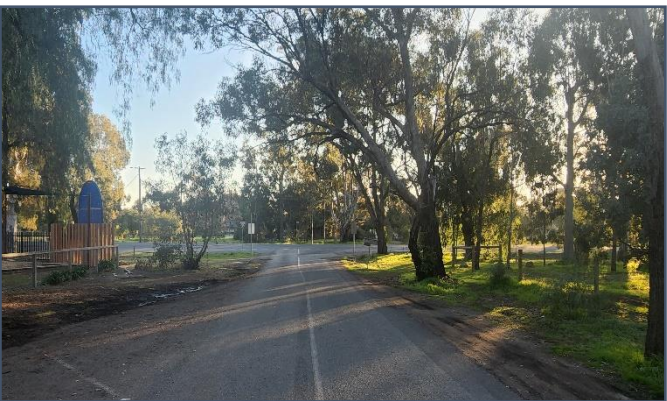
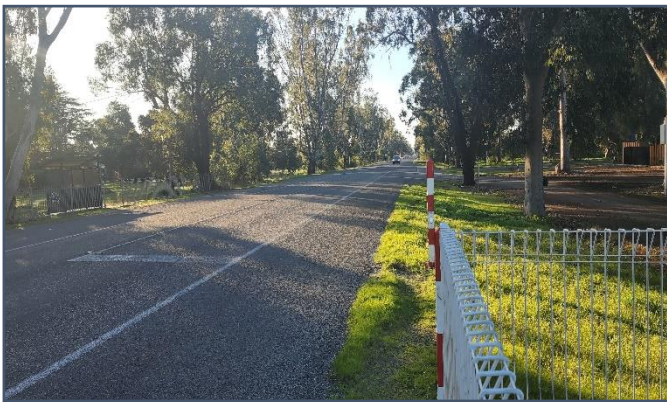
DOCUMENT NAME	Date
AUSTROADS 'Road Safety Audit' guidelines	2009
Austrroads Guide to Road Safety Part 6: Managing Road Safety Audits	2019
Austrroads Guide to Road Safety Part 6A: Implementing Road Safety Audits	2022



Daniel Mustata (Senior Road Safety Auditor)

05 / 07 / 2022

APPENDIX 1 – SITE PHOTOGRAPHS



**APPENDIX 2: SMART LED INGROUND STUD LIGHT**

**Standard (HB20-CL) : 6mm above road surface**



**Snow Plow (HB25-CL) : 0mm above road surface**



Size	: W148 X D148 X H82
Weight	: 1.2Kg
Body/Lenz	: Body : Al Die-casting Lenz: poly-carbonate
LED	: 6 pcs /Cree LED
LED Color	: RGBW . (red, green, blue, white)
LED Brightness	: 6,000mcd
LED lighting	: Steady or Flashing
Controller	: 32bit Micro-processor
Input voltage	: DC24Volt
Output Voltage	: DC 12Volt
Current	: 0.1~1.0A
Life Span	: Over 5 Years
Compression strength:	: Over 600KN (60Ton)
Dust/ Water Proof	: IP68
Usual temperature	: -20°C ~ +70°C

**Installation:** pedestrian crossing

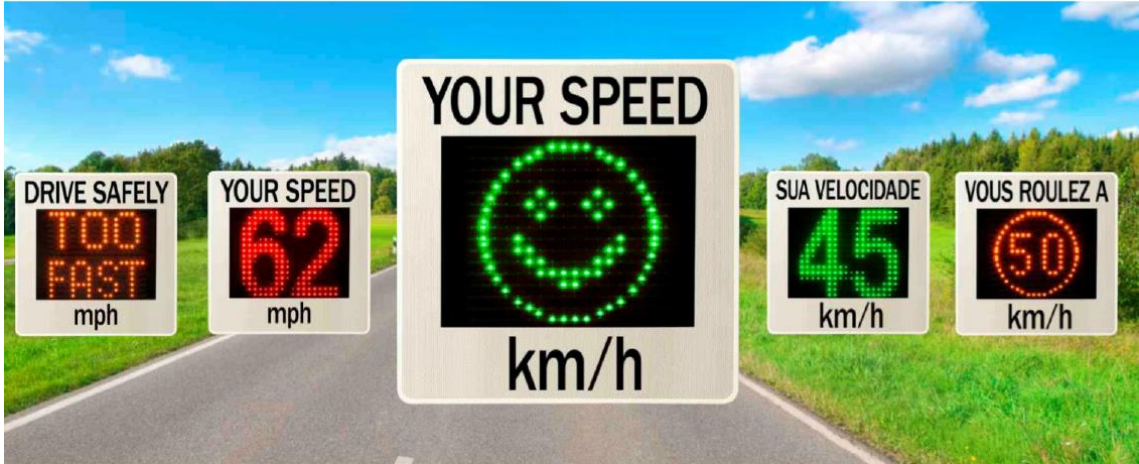


**Applications:** pedestrian crossings, bike lanes, sudden curved roads, merging traffic, level crossing, etc.



APPENDIX 3: SPEED DISPLAY

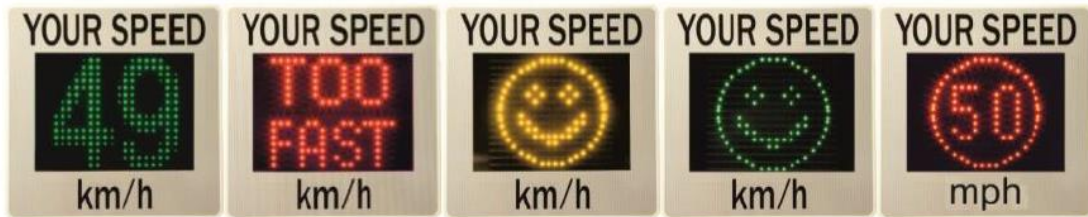
**VIVACITY** We design, manufacture & supply some of the world's most advanced lighting and display systems



Examples of what the Speed Display (YELLOW) can show:

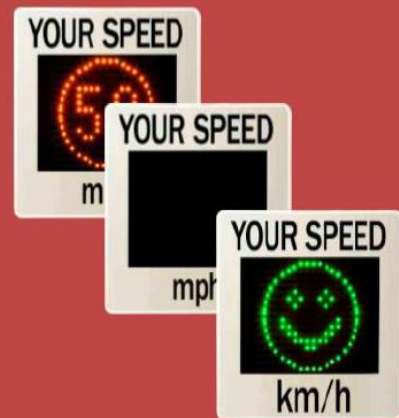


Examples of what the Speed Display (GREEN, YELLOW, RED) can show:



**Scope of Delivery**

- Speed Display
- Software: BT-Comm/GRS/Android App
- Pole Brackets (60 or 76 mm)
- Power supply Cable 12V
- Optional: Variable Pole Clamps
- Optional: Batteries and Solar Power Supply
- Optional: Remote Control Unit RC1



**ROAD SOLUTIONS.**

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