



Kerferd Rd, Montague St,
Herbert St - Intersection,
Albert Park



Road Safety Audit

Audit Stage: Existing Conditions

Report for City of Port Phillip





Information Page

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Issue	Date	Description	Prepared By	Reviewed By	Approved By
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Executive Summary

Safe System Solutions Pty Ltd has been engaged by the City of Port Phillip to undertake an existing conditions Road Safety Audit of the intersection of Kerferd Road, Montague Street, Herbert Street, Albert Park.

A number of issues have been identified associated with the following areas which require further consideration:

- a) Intersection layout
- b) Roadside hazards
- c) Cyclists
- d) Pedestrians

These issues are detailed in Table 9 of the Road Safety Audit report.

A number of recommendations have been made that could reduce the risk to road users. These have been detailed in Table 9, and also in the overarching comments in Section 3 of this report.

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List of Abbreviations

AADT – Average Annual Daily Traffic

HV – Heavy Vehicle

RSA – Road Safety Audit

VPD – Vehicles Per Day

1. Background

1.1 Road Safety Audit Procedure

Road safety audit is a term used internationally to describe an independent review of a road project or existing road to identify any safety or performance concerns. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement. The team also considers other factors that are relevant to the existing site.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc.) or an existing road, carried out by an independent qualified team who identify and document road safety concerns. The objective of a road safety audit is to provide reasonable (but not absolute) assurance that potential, foreseeable hazards for all road users when a road is operational which may result in injury (in particular fatal and serious injury) are identified.

A road safety audit is intended to help deliver a safe road system and is **not** a review of compliance with standards.





1.2 The Safe System

The Austroads Guide to Road Safety Part 6 (2019): Managing Road Safety Audits states that: *“for any project, there is a responsibility on the road authority to maximise alignment with Safe System principles”*. The Guide continues to offer two methods for achieving this:

1. Undertake a Safe System Assessment in the early stages of the project.
2. Integrate Safe System principles into 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.

Table 1: Safe System Kinetic Energy

	Crash Type	Tolerable (10%) Speed (passenger vehicle)
	Head-On	~70km/h
	Side Impact (90°) Side Impact (45°)	~50km/h ~60km/h
	Side Impact into Point Source Hazard (eg. Tree, Power Pole)	30 – 40km/h
	Pedestrian, Cyclist, Motorcyclist	~30km/h

Source: Austroads (2018).

This RSA has been undertaken to conform with AGRS Part 6: Managing Road Safety Audits (2019). As such, an assessment has been undertaken for each RSA finding to determine if the kinetic energy associated with the possible crash is above tolerable levels (as set out above). Also, each recommendation has been categorised into one of the Austroads Safe System treatment categories described in Table 2 below.

Table 2: Safe System Treatment Categories

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 Other Elements	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. Reduces the ability for a primary treatment to be implemented in the future.

Source: Austroads (2018a).

1.3 The Safety Audit Team

It is a requirement in Victoria 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). The team consisted of:

Table 3: Road Safety Audit Team

Senior Road Safety Auditors	Road Safety Auditor
Kenn Beer Safe System Solutions Pty Ltd	Tom Bowrey Safe System Solutions Pty Ltd

1.4 Site inspections and meetings

A list of site inspections and meetings associated with this road safety audit is provided in the table below:

Table 4: Inspection and meetings

Activity	Location	Date	Time
PRE-AUDIT MEETING	Virtual Meeting	15.10.20	1300
DAYTIME SITE INSPECTION	Kerferd Rd, Montague St, Herbert St intersection, Albert Park	20.10.20	1800
NIGHTTIME SITE INSPECTION	Kerferd Rd, Montague St, Herbert St intersection, Albert Park	20.10.20	2130

1.5 Documents Assessed

The documents listed in the table below have been reviewed by the auditors as part of the road safety audit process.

Table 5: Documents Assessed

Document Type	Author/Assessor/Designer	Document Number
TRAFFIC COUNT DATA	Trans Traffic Survey AusTraffic	1543 & 1222 5558
CRASH DATA	City of Port Phillip	QR026-556946
CYCLIST DATA	City of Port Phillip	Data-Matrix
MEETING MINUTES	City of Port Phillip	Report 10.1
MEETING MINUTES	City of Port Phillip	N/a
OFFICER REPNSES	City of Port Phillip	F20/1

1.6 Audit process

This road safety audit has been conducted in accordance with the procedures set out in the *Austroads Guide to Road Safety Part 6: Managing Road Safety Audits (2019)* and *Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019)*. A review of the site has been completed and the details contained within the supporting documentation examined to identify issues that affect road user safety and other relevant issues. The auditors cannot guarantee that every issue that affects road user safety has been identified. Although the adoption of the audit recommendations will improve the level of safety of the site it will not, however, eliminate all the road user safety risks.

Road safety audit is a formal process and the 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.

1.7 Risk assessment

The potential road safety problems identified have been assigned a risk rating based on the **likelihood** of a crash occurring as a result of the deficiency together with the potential **consequence** of that crash.

The risk ratings adopted are:

- ⇒ **Intolerable**
- ⇒ **High**
- ⇒ **Medium**
- ⇒ **Low**

Tables 6 to 8 below show the risk rating process.

Table 6: Likelihood of a crash (Austroads, 2019)

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five to ten years
Improbable	Less often than once every ten years

Table 7: Likely severity of a crash (Austroads, 2019)

Severity	Description	Examples
Catastrophic	Likely multiple deaths	<ul style="list-style-type: none"> - High speed, multi-vehicle crash on a freeway - Car runs into crowded bus stop - Bus and petrol tanker collide - Collapse of a bridge or tunnel

<p>Serious</p>	<p>Likely deaths or serious injury</p>	<ul style="list-style-type: none"> - High or medium speed vehicle/vehicle collision - High or medium speed collision with a fixed roadside object - Pedestrian or cyclists struck by a car
<p>Minor</p>	<p>Likely minor injury</p>	<ul style="list-style-type: none"> - Some low speed vehicle collisions - Cyclist falls from bicycle at low speed - Left-turn rear-end crash in a slip lane
<p>Limited</p>	<p>Likely trivial injury or property damage only</p>	<ul style="list-style-type: none"> - Some low speed vehicle collisions - Pedestrian walks into object (no head injury) - Car reverses into post

Table 8: Resulting level of risk (Austroads, 2019)

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

2. Scope of Audit

The audit location is the intersection of Kerferd Road, Montague Street and Herbert Street in Albert Park. Herbert Street has a two-way, six lane divided cross-section, inclusive of on-street parking on either side of the roadway and additional on-street bicycle lanes. Herbert Street road users are subject to a 60km/h speed limit.

Herbert Street and Montague Street are minor roads and intersect with Kerferd Road as a staggered T-intersection, with Montague Street skewed. A diagonal break in Kerferd Roads' wide centre median enables motorists to move directly between Herbert Street and Montague Street. Approaches from either minor road have a Give-Way condition with an additional Give-Way condition within the median break.

Herbert Street and Montague street have two-way, four lane cross-sections inclusive of on street angled parking on either side of the roadway. Road users on Herbert Street and Montague Street are subject to 40 km/h speed limits.

Provided AusTraffic data shows an AADT of 13,885 vpd (3.2% HV) on Kerferd Road, between Herbert Street and Carter Street in July 2019. AusTraffic data also indicates an 85th percentile speed of 58.5 km/h. Provided Trans Traffic Survey data shows an AADT of 3,655 vpd (6.87% HV) on Montague Street, between O'Grady Street and Kerferd Place. This data also shows an AADT of 816 vpd (3.11% HV) on Herbert Street, between Herbert Place and Young Street record in the year, 2015.

Provided City of Port Phillip - Bike Count data shows between the hours of 0700 and 1000 a weekday count of 333 cyclists used Kerferd Road.

Five crashes have occurred at the intersection within a ten-year period prior to 31/12/2019. One of the five crashes has been categorised as a Serious Injury crash. Four of the crashes involved motorists failing to Give-Way (DCA 110, 116, 121 and 119), the fifth crash has been coded as Unknown (DCA 199).

Figure 1: Map of audit location (source: OpenStreetMap)



3. Overarching Comments

The existing skewed and staggered T intersection presents a number of road safety risks. This is largely due to the potential for high-speed side-impact crashes, as well as crashes involving pedestrians and cyclists.

The main factors influencing the risk are the dual lanes on Kerferd Road (making for high acceleration movements from the median into side road), the speed through the intersection from vehicles on Kerferd Road and the skewed angle of the median crossing.

The risk has presented as crashes at this location with a history failure to Give-Way crashes from the minor road approaches to the intersection.

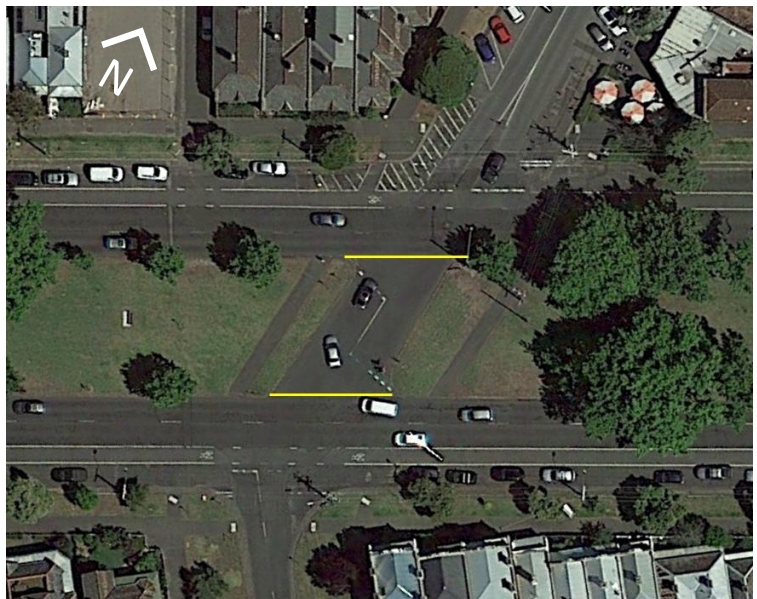
The Road Safety Audit has identified a range of safety concerns associated with the existing intersection. Whilst recommendations are made to address many of these issues, it is important to recognise the inherent level of risk associated with a Give-Way controlled intersection in a dual lane 60 km/h speed environment. Many of these issues are also likely to be exacerbated as traffic (including pedestrians and cyclists) volumes grow.

The greatest improvement in safety can be achieved by addressing the potential for high-speed side-impact crashes at the intersection and vulnerable road users, which may be achieved through a variety of ways, depending on the strategic function of Herbert/Montague Street. In discussion with Council we understand that Montague Street and Herbert Street are local streets that predominantly service residential dwellings, and do not provide major strategic traffic function. Thus, measures to address the risk that reduce the ease of throughput across this intersection (Herbert <-> Montague) are considered the most effective and appropriate treatment. In this case:

1. Closing the median break.

This would eliminate many of the conflict points at this intersection. It is predicted that traffic distribution will mean vehicles move to safer intersections and routes. The Auditors also consider the amount of permeability across Kerferd Road to be excessive for passenger vehicles with four crossing points within ~500m in this section. There are low risk u-turn opportunities within close proximity to this intersection providing ample local access.

The design could consider measures to retain cyclist permeability across the intersection. This could be achieved via low cost treatments or a more permanent infrastructure.



2. Partial Median Closure

If there are concerns about the traffic impact on Ferrars Street/Canterbury Road intersection, a partial closure would reduce the risk by squaring the crossing and simplifying the crossing point. It should be noted that this will not be as effective in risk reduction as the full closure.

This option should be complemented with treatments #5, #6 and #7 below.

This could be achieved via low cost treatments or a more permanent infrastructure.



When considering recommendation 1 and 2, a number of additional lower cost measures could also be implemented to complement these treatments, including:

- 3. **Reducing speeds on Kerferd Road** via a regulatory speed limit reduction.
- 4. **Providing pedestrian crossing facilities** over Herbert Street and Montague Street along with speed reduction measures on the approaches (either speed cushions or raised crossing points)
- 5. **Improvements to the signage and line marking.**
- 6. Reduce speeds of turning traffic and improve road legibility through **installation of kerb extensions, reinstalling compliant bollards.**

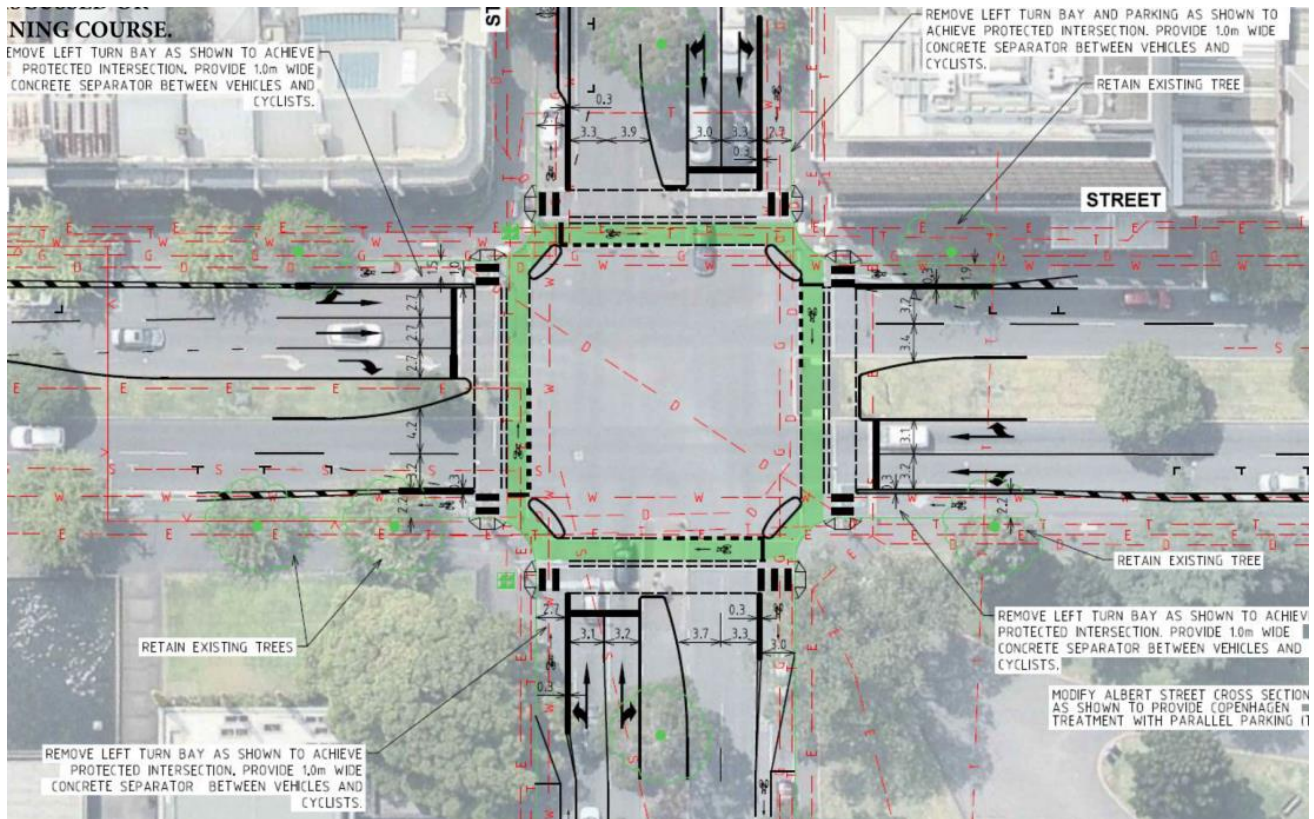
In the event that Council determines that these streets intersection (Herbert <-> Montague) need to have a higher strategic transport function, a number of infrastructure treatments could facilitate this in a safer manner. This could include:

7. Converting the intersection to a protected roundabout ie. with appropriate pedestrian and cyclist facilities.

(the picture to the right is a Dutch style protected roundabout. Similar examples can be seen on Moray Street, South Melbourne. Design work would be required to cater for the intersection stagger between side roads)



8. Converting the passive controlled intersection to a **protected signalled intersection** (similar to Albert Street/Lansdowne Street, East Melbourne (design snip below)).

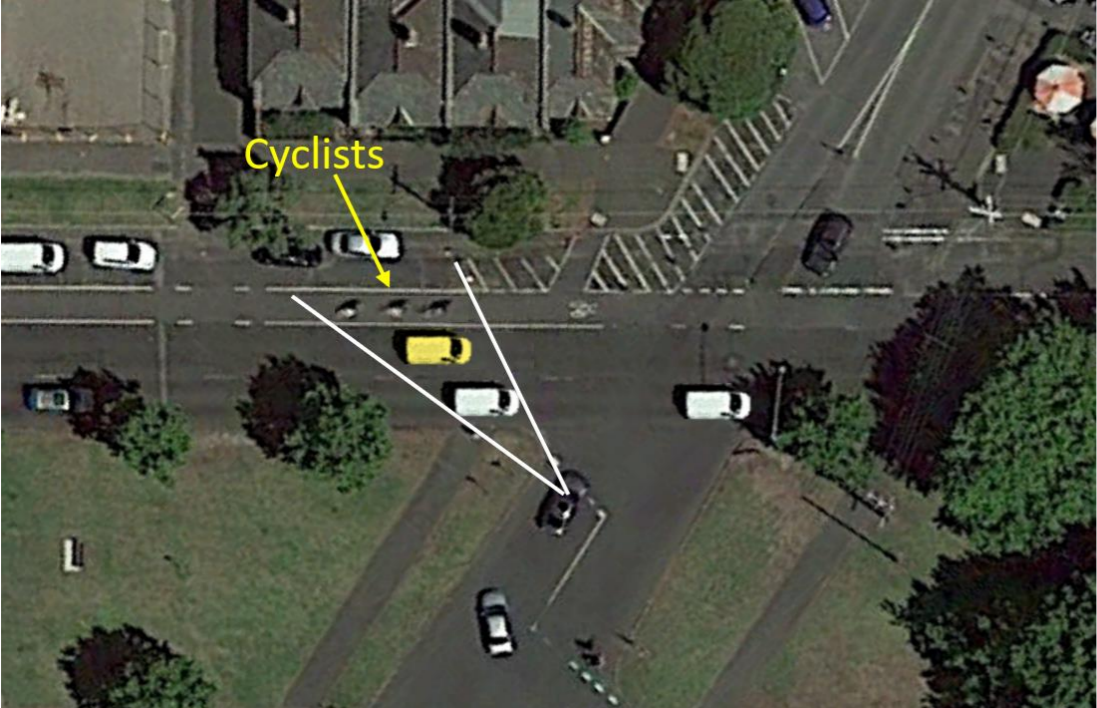


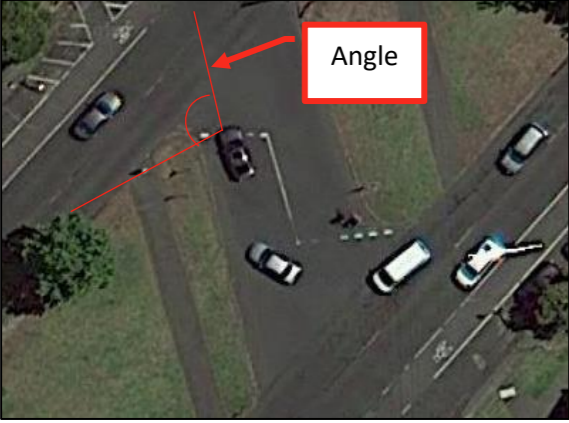

It should be noted that both these options (#7 and #8) are high cost and would not be as effective in reducing risk as the intersection closure. Further detailed work would be required to determine the most appropriate treatment between a roundabout or traffic signals, and how the treatment best caters for pedestrians and cyclists.

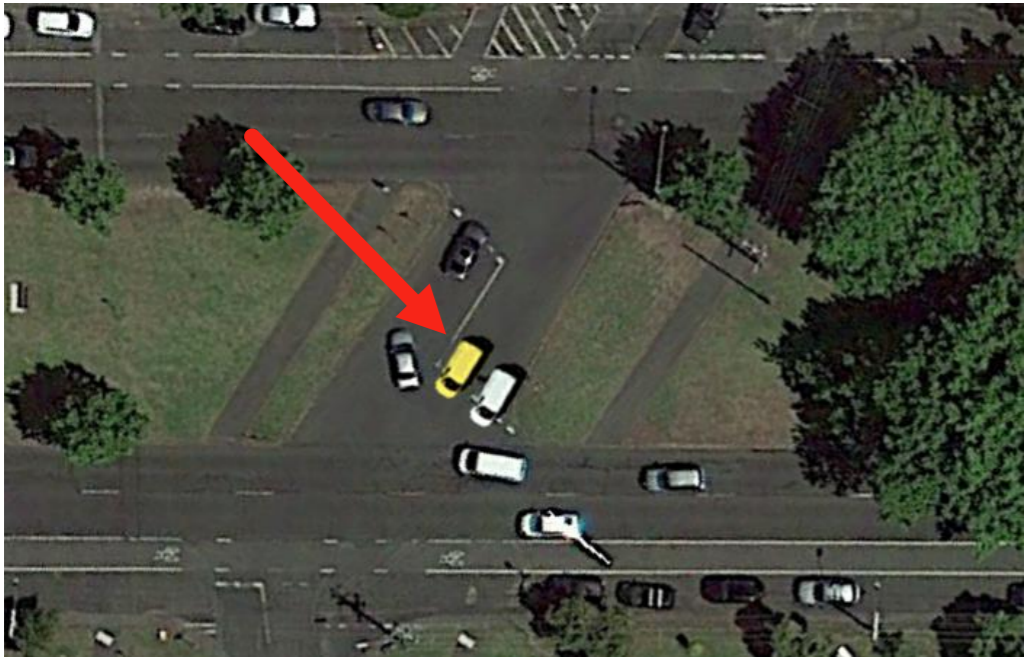
4. Audit Findings and Recommendations



The findings and recommendations of the Road Safety Audit can be found in the table below.


Table 9: Findings and Recommendations

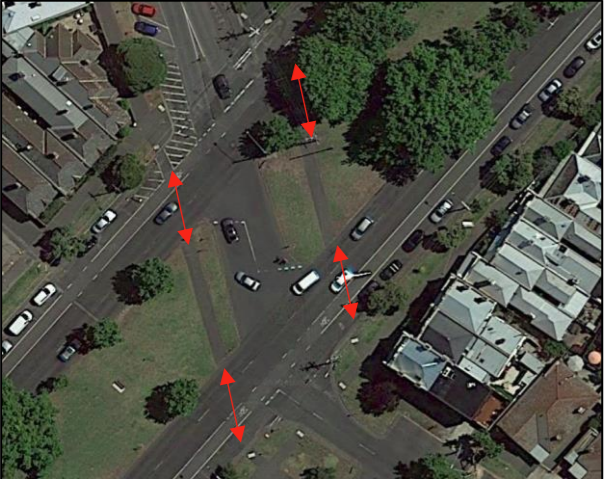

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
4.1 Sight Lines for Vehicles Exiting Median					
<p>1. There are a number of issues hampering sight lines for vehicles exiting the median into the side roads. These include the dynamic visual obstruction possibility, the angle and the trees. These are described in more detail below:</p> <p>Dynamic Visual Obstruction (masking) Because Kerferd Road is two lanes, there is potential for a dynamic visual obstruction (masking) type issue. The sketch below shows that the yellow van, and the three cyclists would be hidden by the white van for the vehicle exiting the median. If vehicles were banked back from the signalised intersection, or if the masking vehicle was further back on Kerferd Road, the vehicle exiting the median may take a hard acceleration and collide with the yellow car, or the cyclist.</p>  <p>An additional issue related to the dynamic visual obstruction associated with the dual lanes is the high cognitive load on a driver exiting the median. The driver is required to be alert to two traffic lanes, one cyclist lane and pedestrians crossing the side road.</p>	<p>Occasional Serious High</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider the options presented on page 9 and 10 above, with the preferred option from the Auditors being:</p> <ul style="list-style-type: none"> Close the median break (P) 		

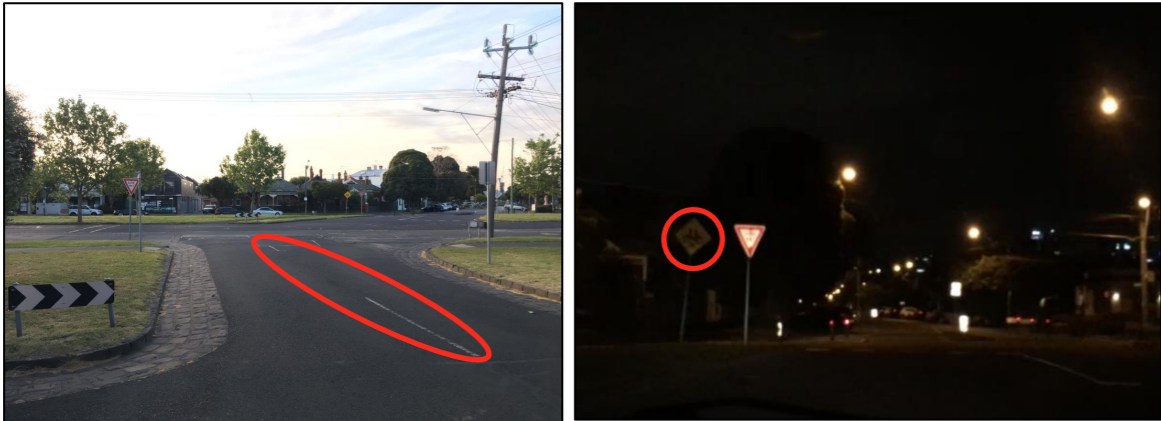
Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
<p>Angle Within the median break, traffic lanes intersect with Kerferd Road on a skewed angle (greater than 90 degrees) with a Give-Way condition. Angles greater than 90 degrees can be difficult for some motorists to turn their heads far enough to observe through traffic.</p>  <p>A potential front seat passenger may impede a motorist's sight line as they are forced to observe traffic from behind their shoulder, in line with said passenger.</p> <p>Trees An established tree line is also present in close proximity to the roadway impeding sightlines to smaller road users such as motorcyclists and cyclists.</p> <p>A motorist may fail to observe a through vehicle, these issues compound to increase the likelihood of failure to Give-Way crashes.</p> 	(...continued from above)	(...continued from above)	(...continued from above)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
<p>4.2 Median Opening Width</p> <p>1. There are very wide lanes in the median opening. The skewed angle of the opening means these may be required for the swept path of larger vehicles. Unfortunately this causes two issues; a. There is the possibility of two vehicles storing side-by-side while one waits to turn right and the other waits to travel straight (see mock up below with the yellow and white vans). This causes a dynamic visual obstruction (masking) issue. This may result in the crashes as identified in finding #1. b. The wide lanes encourage higher speeds for vehicles making a dash through the intersection.</p> 	<p>Improbable Serious Medium</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider the options presented on page 9 and 10 above, with the preferred option from the Auditors being:</p> <ul style="list-style-type: none"> • Close the median break (P) 		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
<p>4.3 Strike Hazards in Roadway</p> <p>1. Where Montague Street intersects Kerferd Road, and to the northeast of Herbert Street, wooden bollards and signage have been installed in front of the kerb. It is assumed that these treatments in conjunction with pavement markings have been installed to a pseudo kerb-outstand thus reducing the speed of left turning vehicles and providing better sight lines for exiting vehicles. While the Auditors support the principles and compliment the low-cost innovative treatment, the bollards and signs in these locations are close to the cyclist running lane and could pose a strike hazard to a cyclist, motorcyclist or a vehicle.</p> <div style="display: flex; flex-direction: column; align-items: flex-start;">   </div>	<p>Occasional Minor Medium</p>	<p>Within tolerable levels</p>	<p>Consider measures that provide a safe road environment to all road users, such measures could include:</p> <ul style="list-style-type: none"> Removing bollards and signage, installing kerb extensions, reinstalling compliant bollards and signage as required (S). <p>Additional raised thresholds could be considered for pedestrian safety as per the recommendations below.</p>		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
<p>4.4 Unexpected Bicycles</p> <p>1. Kerferd Road has dedicated bicycle lanes which provides cyclists road width. However, due to the complexity of the intersection and the number of lanes, motorists that approach the intersection from the minor roads may not detect a through cyclist. This increases the likelihood of a collision between a cyclist and a motorist.</p> 	<p>Occasional Serious High</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider measures to slow vehicles on the approach to Kerferd Road and measures to highlight the potential presence of cyclists. This may include:</p> <ul style="list-style-type: none"> • Raised threshold treatments (S) • Installing a green pavement treatment within the bicycle lanes on the approach and through the intersection (S) 		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
4.5 Pedestrians					
<p>1. Kerferd Road pedestrian crossing points do not align perpendicular to the carriageway. This results in pedestrians crossing the roadway at a diagonal angle. A pedestrian crossing a roadway on a diagonal angle increases the time they are exposed to through traffic. This increases the likelihood of a collision between a pedestrian and a motorist.</p> 	<p>Improbable Serious Medium</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider:</p> <ul style="list-style-type: none"> Installing pedestrian priority crossing points (P) Realigning kerb ramps so the crossing points are perpendicular to the roadway (S) <p><i>It is noted the current diagonal crossing points are likely to suit pedestrian desire lines and any realignment works should take this into consideration.</i></p>		
<p>2. Motorists wishing to exit the median, and drive onto the minor roads are required to give-way to motorists in the two through lanes and cyclists in the bicycle lane. This may result in a motorist exiting the median through a small break in the traffic flow and accelerating quickly (shown as the yellow vehicle in the image below). A pedestrian wishing to cross the minor road may not expect the yellow vehicle to accelerate through a small break and may walk out into the roadway. This increases the likelihood of a crash between a pedestrian and a motorist.</p> 	<p>Improbable Serious Medium</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider the options presented on page 9 and 10 above, with the preferred option from the Auditors being:</p> <ul style="list-style-type: none"> Closing the median break (P) Installing a raised pedestrian priority crossing (P) Installing a raised threshold (ST) 		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer	
				Accept Yes/No	Comments
<p>3. Some of the signage and line marking are faded on the approach and through the intersection (see images below for examples). This reduces the clarity of the intersection which is already complicated. This in turn adds to the cognitive load on a driver which may result in them colliding with another vehicle or a pedestrian, cyclist or motorcyclist.</p> 	<p>Improbable Serious Medium</p>	<p>Exceeds tolerable levels (important)</p>	<p>Consider the options presented on page 9 and 10 above, with the preferred option from the Auditors being:</p> <ul style="list-style-type: none"> • Closing the median break (P) • In the interim of any major works, consider updating the signage and line marking (S) 		

5. Conclusion

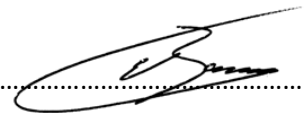
This road safety audit has been conducted in accordance with the procedures set out in the *Austrroads Guide to Road Safety Part 6: Managing Road Safety Audits (2019)* and *Austrroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019)*. The site has been inspected and the supporting documentation has been examined. The findings, recommendations and Safe System elements are provided for consideration by the client and any other interested parties.

Auditors:



29.10.2020

Kenn Beer BEng (Hons), RPEng
Senior Road Safety Auditor



29.10.2020

Tom Bowrey BEng (Hons)
Road Safety Auditor

Appendix A: Photos



Photo 1: Kerferd Road, northeast of intersection, southwest bound traffic lanes



Photo 2: Herbert Street, south of intersection, looking north



Photo 3: Kerferd Road, northeast of intersection, northeast bound traffic lanes



Photo 4: Kerferd Road, northside of median, looking north



Photo 5: Montague Street, north of intersection, looking south (night)

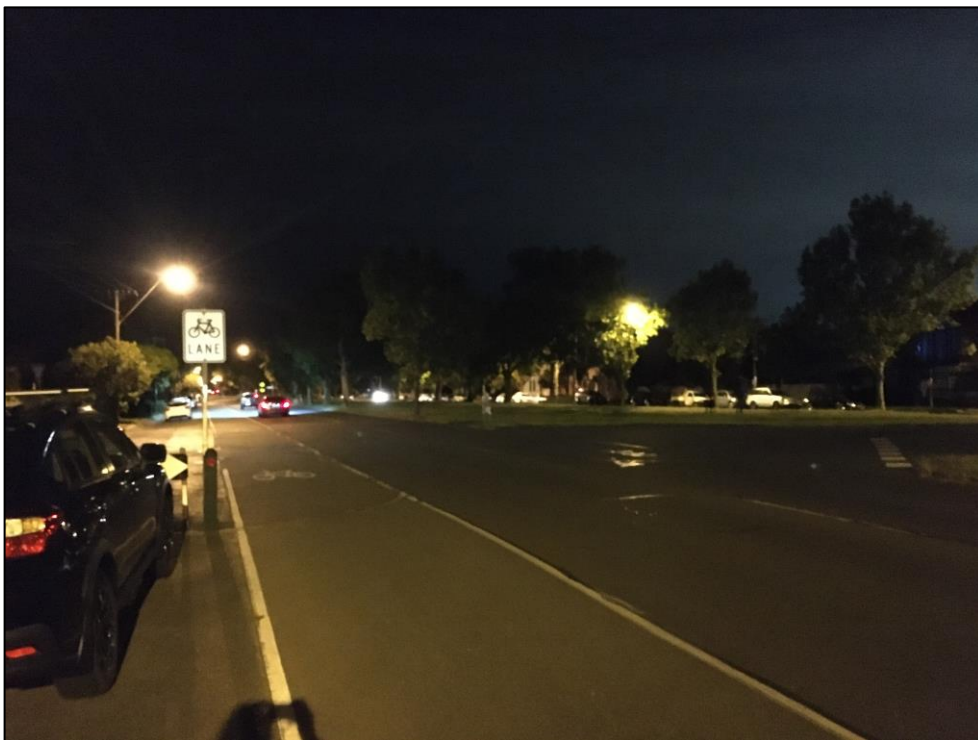


Photo 6: Kerferd Road, northeast of intersection, southwest bound traffic lanes (night)



Photo 7: Kerferd Road, west of intersection, northeast bound traffic lanes (night)

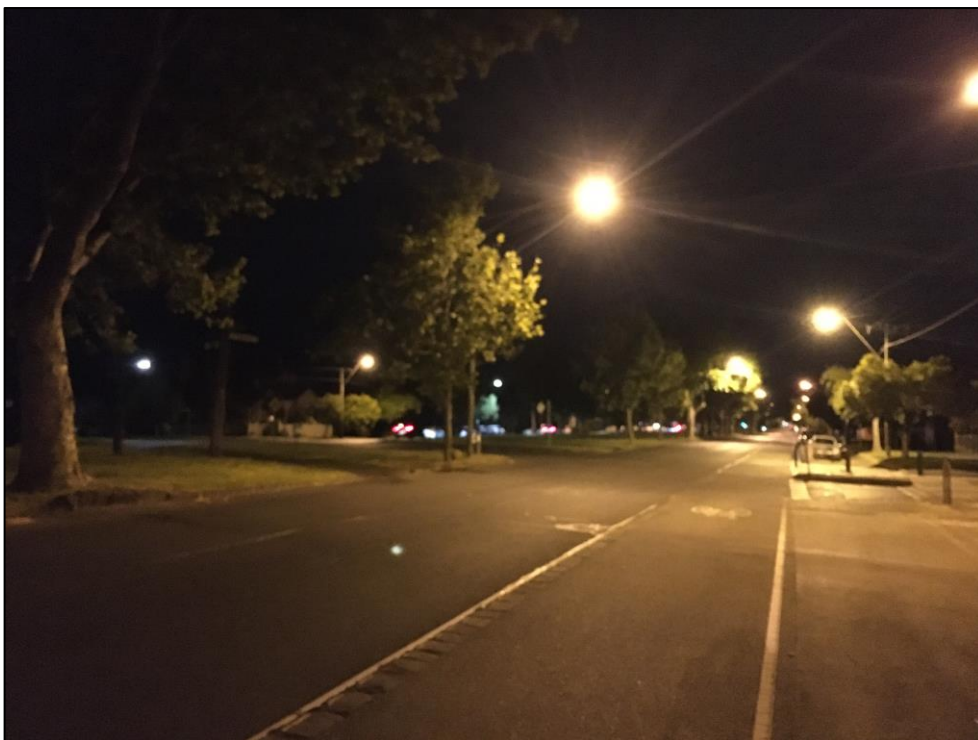


Photo 8: Kerferd Road, northeast of intersection, northeast bound traffic lanes (night)