ACT Government

BODDINGTON CRESCENT AND O'HALLORAN CIRCUIT, KAMBAH

SAFE SYSTEMS INFRASTRUCTURE ASSESSMENT

TRANSPORT CANBERRA AND CITY SERVICES

FINAL

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Consulting Engineers

BODDINGTON CRESCENT AND O'HALLORAN CIRCUIT, KAMBAH

SAFE SYSTEMS INFRASTRUCTURE ASSESSMENT

Prepared for Transport Canberra and City Services

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1. SUMMARY

Project Name:	Boddington Crescent and O'Halloran Circuit, Kambah – Safe System Infrastructure Assessment
Assessment for:	Transport Canberra and City Services
Telephone:	(02) 6205 3208
Project Officer	Jayanthy Vikneson
Assessors:	[redacted] Senior Traffic Engineer, Lead Level 3 Road Safety Auditor [redacted] Senior Designer, Level 2 Road Safety Auditor
Meetings:	No meetings with Roads ACT were undertaken as part of this assessment
Site Inspections:	Tuesday 25 August 2020 between: • 8:30 am – 9:30 am • 2:30 pm – 3:30 pm (school afternoon) • 4:30 pm – 5:30 pm
Site Description	Both roads are two way two lane Major Collector Roads with divided sections. Existing 60 km/h speed limit with 40 km/h school zone on both roads. Urban road with access to single and multi-dwelling, playing fields and schools. Access is provided to St Thomas the Apostle's Primary School from Boddington Crescent. Access is provided to Namadgi School from O'Halloran Circuit.
Assessment Options	The assessment was undertaken on the following road sections: • Boddington Crescent; o Divided section; o Undivided section; • O'Halloran Circuit; o Divided section, and o Undivided section.
Design Options:	The assessment was undertaken for the following design options: • Speed reduction to 50 km/h; • Vertical deflection devices; • Pedestrian crossing improvements, and • Traffic lane narrowing with marking shoulders.

The Safe System Matrix scores for the existing conditions and the score that would be achieved if the identified design options were to be incorporated are provided in **Table 1-1**.

Table 1-1 Safe System Matrix scores

Option	Score
Boddington Crescent (Divided section)	
Existing conditions	188/448
Design Option	82.5/448
Boddington Crescent (Undivided section)	
Existing conditions	267/448
Design Option	118.5/448
O'Halloran Circuit (Divided section)	
Existing conditions	148/448
Design Option	55/448
O'Halloran Circuit (Undivided section)	
Existing conditions	222/448
Design Option	100.5/448

1.1 Conclusion

The installation of the treatments associated with the proposed design options would provide benefit to the safety of the assessed street. It is recommended that the following be undertaken:

- Boddington Crescent (Divided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between McLeod Place and Broad Place, and
    - Install pavement markings on sections of the divided section to provide a visual narrowing of the traffic lanes.
- Boddington Crescent (Undivided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Bacchus Street and Barritt Street;
    - Install pavement markings to provide a visual narrowing of the traffic lanes, and
    - Install a pedestrian refuge island between Barritt Street and Carleton Street to align with the bus stop location and path connection and between Crozier circuit (north and south) to align with the path connection.

- O'Halloran Circuit (Divided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Jenke Circuit and Ashby Circuit;
    - Install kerb blisters at the crossing locations near Springbett Street to reduce the pedestrian crossing distance, and
    - Install pavement markings on sections of the divided section to provide a visual narrowing of the traffic lanes.
- O'Halloran Circuit (Undivided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Boddington Crescent and McKillop Circuit Street, and
    - Install pavement markings to provide a visual narrowing of the traffic lanes.

2. ASSESSMENT DETAILS

2.1 Assessment Scope

The purpose of this Safe Systems Assessment is to assess existing conditions against proposed infrastructure so it aligns with the Safe Systems principles and the objectives to eliminate collisions that result in fatal and serious injuries.

2.2 Assessment Team

The following team members involved with this project:

- [redacted] R D Gossip Pty Ltd Senior Traffic Engineer, Lead Level 3 Road Safety Auditor
- [redacted] R D Gossip Pty Ltd Senior Designer, Level 2 Road Safety Auditor

2.3 Meeting and Site Inspections

2.3.1 Meetings

No meetings were held between RDG and Roads ACT as part of this assessment.

2.3.2 Site Inspections

Site inspections were on Tuesday 25 August 2020 between:

- 8:30 am – 9:30 am;
- 2:30 pm – 3:30 pm, and
- 4:30 pm – 5:30 pm.

A summary of the key observations are listed below for the respective periods.

2.3.2.1 General Comments

- There are several intersections and driveways on both roads provided on the inside of curves at various sections of the road, reducing sight distance. This impacts on vehicles exiting from the intersecting roads and driveways. This is of particular concern for vehicles reversing from driveways.
- It appeared that the majority of road users using both roads are local except for traffic associated with the schools.
- There is some evidence of antisocial behaviour on the road in various locations.

2.3.2.2 AM Inspection (8:30 am – 9:30 am)

- Besides local traffic, traffic generated by the schools appeared to contribute to the majority of the traffic generated.
- There was a very high number of pedestrians using the paths along Boddington Crescent and O'Halloran Circuit. These movements were a combination of school children, public transport orientated and recreational. Some pedestrians were observed crossing the road in close proximity to pedestrian underpasses.
- There were a combination of on-road and off-road cyclists on Boddington Crescent. The majority of cyclists observed on O'Halloran Circuit were in close proximity to Namadgi School.
- The majority of the intersections were observed to operate satisfactorily. The intersection of Boddington Crescent with Barritt Street experienced delays (circa 30-40 seconds) for vehicles

turning right from Barritt Street into Boddington Crescent close to 9:00 am. This was associated with school activities.

- There were instances on both roads where roads users exiting intersections turned when there were unacceptable gaps in the traffic and required approaching vehicles in the travelling in the same direction to slow.
- The majority of the road users appeared to travel at or below the 40 km/h school zone speed limit in proximity to the schools when the school zones were operational. However, multiple road users appeared to exceed the 40 km/h school zone speed limit away from the school frontages.
- There were several instances where vehicles that appeared to be travelling at the speed limit were tailgated. There was an instance where a tailgating vehicle sounded their horn when the front vehicle slowed to turn into a driveway (appropriate indication was provided).

2.3.2.3 PM School Inspection (2:30 pm – 3:30 pm)

- Similar conditions to the AM inspection.
- Queuing on Boddington Crescent in both directions at the entry of the St Thomas the Apostle's Primary School was observed, with some vehicles entering the school from the "exit only" driveway. The school uses the internal car park/ paved area for storage for pick up activities.
- Some cars were parked on the northern side of O'Halloran Circuit near Namadgi School.

2.3.2.4 PM Inspection (4:30 pm – 5:30 pm)

- Similar conditions to the AM inspection.
- There was slightly less traffic during the PM period than the AM period.
- More on-road cyclists were observed during the evening peak. These cyclists appeared to be commuters.

3. PROJECT CONTEXT AND DESCRIPTION

3.1 Existing Conditions

3.1.1 Road Description

3.1.1.1 Boddington Crescent

Boddington Crescent, Kambah, is a Major Collector road in the ACT road hierarchy with a speed limit of 60 km/h. The section on between the Bacchus Circuit and the pedestrian underpass south of Carleton Street is a 40 km/h school zone.

Boddington Crescent is circa 2.1 km in length and circa 10.4 m wide. The section of road between Drakeford Drive and Bacchus Circuit and between O'Halloran Circuit and Bateman Street is divided. It provides access to the western component of Kambah.

Boddington Crescent has multiple curves in the road alignment. All the intersections are priority controlled T-intersections with priority to Boddington Crescent.

Paths are provided on both sides of Boddington Crescent.

The road currently does not have any traffic calming devices.

3.1.1.2 O'Halloran Circuit

O'Halloran Circuit, Kambah, is a Major Collector road in the ACT road hierarchy with a speed limit of 60 km/h. The section on between the Drakeford Drive and Ashby Circuit is a 40 km/h school zone.

O'Halloran Circuit is circa 2.2 km in length and circa 10.4 m wide. The section of road between Drakeford Drive and Boddington Crescent and between Snodgrass Crescent (east) and Drakeford Drive is divided. It provides access to the western component of Kambah.

O'Halloran Circuit has multiple curves in the road alignment. All the intersections are priority controlled T-intersections with priority to O'Halloran Crescent.

Paths are provided on both sides of O'Halloran Circuit.

The road has the following traffic calming devices:

- Rubber speed cushions and a children's crossing between Jenke Circuit (east and west), and
- Two refuge islands.

3.1.2 Traffic Volume and Speed Data

Traffic volume and speed data were collected at three locations each on Boddington Crescent and O'Halloran Circuit in 2017. The results are provided in **Table 3-1**.

Table 3-1 Traffic Volumes and Speed Data

Towards	Survey Start Date	Weekday Average (vpd)	Weekday Average Speed (km/h)	Weekday 85 %ile Speed (km/h)
Boddington Crescent				
Between Barritt Street and Bacchus Circuit (School zone – during school hours)				
Bacchus Circuit (EB)	10/08/2017	2,007	44.4	50.9
Barritt Street (WB)		1,640	37.4	43.2
Between Barritt Street and Bacchus Circuit (School zone – outside school hours)				
Bacchus Circuit (EB)	17/08/2018	1,634	59.4	66.1
Barritt Street (WB)		1,906	53.1	60.2
	Total Volume	**7,187**		
Between Castley Circuit and Carleton Street				
Carleton Street (NB)	31/05/2017	2,894	54.8	61.8
Castley Circuit (SB)		3,324	54.4	61.3
	Total Volume	**6,218**		
Between McLeod Place and Broad Place				
Broad Place (EB)	31/05/2017	1,078	59.6	65.4
McLeod Place (WB)		946	57.3	63.5
	Total Volume	**2,024**		
O'Halloran Circuit				
Between Boddington Crescent and McKillop Circuit				
Boddington Crescent (NB)	28/03/2017	1,487	53.0	60.7
McKillop Circuit (SB)		1,514	62.0	71.7
	Total Volume	**3,001**		
Between Snodgrass Crescent (west) and Vansittart Crescent				
Vansittart Crescent (EB)	28/03/2017	1,312	55.7	63.3
Snodgrass Crescent (west) (WB)		1,362	55.5	62.0
	Total Volume	**2,674**		
Between Jenke Circuit (west) and Jenke Circuit (east) (School zone –during school hours)				
Jenke Circuit (east) (EB)	31/05/2017	817	41.5	50.5
Jenke Circuit (west) (WB)		1,205	36.7	45.0
Between Jenke Circuit (west) and Jenke Circuit (east) (School zone – outside school hours)				
Jenke Circuit (east) (EB)	31/05/2017	1,109	54.9	64.2
Jenke Circuit (west) (WB)		1,082	50.2	61.2
	Total Volume	**4,213**		

The data indicates over 3,000 vehicles per day use both Boddington Crescent and O'Halloran Circuit. The traffic volumes are typical to a major collector road classification (3,000 to 6,000 daily vehicles). A section of Boddington Crescent between Drakeford Drive and Bateman Street exceeds 6,000 vehicles per day. This could be contributed to road users using Learmonth Drive when travelling to/ from the Tuggeranong Town Centre.

Speed data indicates that the average road user complies with the 60 km/h speed limit. There are sections where the 85th percentile motorist is travelling circa 5% above the 60 km/h speed limit at some areas. During the school hours within the school zone, the average road user complies with the speed limit, however, the 85th percentile speed is above the 40 km/h school zone speed limit. Note that rubber cushions were installed on O'Halloran Circuit in 2018 after the speed data was collected. This would have influenced the speed through this section of O'Halloran Circuit.

3.1.3 Collision History

3.1.3.1 Boddington Crescent

In the five year period from 1 January 2015 to 31 December 2019, a total of 25 collisions occurred on Boddington Crescent, excluding collisions at the intersections with Drakeford Drive (91 collisions) and O'Halloran Circuit (5 collisions).

There were no collisions which resulted in a fatality. Three collisions resulted in injuries.

14 collisions occurred at intersections and 11 collisions occurred in midblock sections.

There were two collisions involving a pedestrian occurred in midblocks. One collision occurred between the two intersections with Crozier Circuit resulting in the pedestrian receiving medical treatment. The other collision occurred between Bacchus Circuit and Drakeford Drive resulting in the pedestrian being admitted to hospital. Both collisions occurred on a Saturday. Further historical data indicates that there was a collision with a pedestrian in the midblock between Barritt and Carleton Streets in 2014.

A cyclist was involved in a collision with a vehicle at the Boddington Crescent/ Barritt Street intersection. Further historical data indicates that there were two other collisions at this intersection involving cyclists in 2013.

Three collisions involved motorcycles. One collision involved a rear end collision at the Boddington Crescent/ Barritt Street intersection resulting in an admission to hospital. The other two collisions were single vehicle collisions where the motorcyclists lost control (one on a dry surface, one on ice/snow surface.

Below are the following trends in collisions on this section of road:

- Four collisions occurred at both the Castley Circuit (west) and Barritt Street intersections with Boddington Crescent.
- Four collisions involved a single vehicle losing control into objects (RUM Codes 70 and 80).

3.1.3.2 O'Halloran Circuit

In the five year period from 1 January 2015 to 31 December 2019, a total of 36 collisions occurred on O'Halloran Circuit, excluding collisions at the intersections with Drakeford Drive (north) (45 collisions) and Drakeford Drive (south) (35 collisions).

There were no collisions which resulted in a fatality. Four collisions resulted in injuries.

20 collisions occurred at intersections and 16 collisions occurred in midblock sections.

There were no collisions involving pedestrians or cyclists in the five year period. In 2013 a pedestrian was struck by a vehicle between Jenke Circuit and Drakeford Drive resulting in property damage.

A motorcycle was involved in a single vehicle collision losing control resulting in property damage.

Below are the following trends in collisions on this section of road.

- There were 10 loss of control collisions, with 9 of these collisions occurring within midblocks.
- 7 collisions involved manoeuvring and parked cars.
- 70% of the collisions at intersections involved turning movements.

3.1.3.3 Lighting lux levels

- Lighting under the light columns generally achieves the minimum 3.5 Lux lighting required along Boddington Crescent and O'Halloran Circuit, however, the majority of the midblock sections checked do not achieve the 3.5 Lux lighting required due to foliage and the spacing of the light columns. Additionally, some of the divided sections did not achieve the 3.5 Lux lighting opposite light columns.
- Circa 20-30 Lux was recorded under the light columns and circa 1-5 Lux between light columns.
- At the time of the inspection, all the street lights were operating.

3.1.4 Context of Assessment

Table 3-2 Project Context

Austroads AP-R509-16 Prompts	Comments
What is the reason for the **project**? Is there specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, maintenance/asset renewal, etc.	• The project aims to improve safety for all users on Boddington Crescent and O'Halloran Circuit.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)? What alternative routes exist?	• The roads provide a connection to Drakeford Drive, with connecting roads to Kambah Pool Road (via Barritt Street) and Athllon Drive (via Bateman Street and Vansittart Crescent to Learmonth Drive). • Both streets are a mix of residential and educational use, with access to local shops. • The speed limit is 60 km/h with 40 km/h school zones. • The intersections are priority controlled T-intersections (Give Way) with priority to O'Halloran Circuit and Boddington Crescent. O'Halloran Circuit has priority at the intersection with Boddington Crescent. • Bus services in both direction on both roads.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	• Both roads have a 60 km/h speed limit with 40 km/h school zones. • Potential consideration to reduce the speed limit to 50 km/h to align with the residential nature of the road.

Austroads AP-R509-16 Prompts	Comments
What **road users** are present? Consider the presence of elderly pedestrians, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school speed limits, etc.)	• Majority of the road users are expected to be passenger vehicles. • Pedestrian activity is school children, local recreational activities and movements connected to the bus stops. • Underpasses provided at three locations along Boddington Crescent and four locations along O'Halloran Circuit. • Neither road is classified as an on-road cycle route.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	• It is expected that at least 95% of vehicles would be passenger sized vehicles (including utes). • Circa 4% are estimated to be heavy vehicles including buses • Circa 1% would be motorcycles.

3.2 Improvement Treatments

3.2.1 Design Considerations

The following needs to be considered as part of the selection of the proposed treatments:

- Devices should be visible for approaching road users from 73 m at 60 km/h and 55 m at 50 km/h (not accounting for corrections due to grade).
- Lighting – 3.5 Lux is required within 3 m of the device.

Based on the site inspections, road geometry and observations and the review of the traffic volume, speed and collision data, the following options could be considered.

3.2.1.1 Speed reduction to 50 km/h

Generally, road users are travelling at the speed limit, with the average speed limit slightly below 60 km/h speed limit. However, there are sections with high 85th percentile speed.

Based on the volume of traffic, road geometry and the number of property accesses, a speed reduction to 50 km/h is considered appropriate for both Boddington Crescent and O'Halloran Circuit and aligns with AS 1742.4 (Manual of uniform traffic control devices Part 4: Speed controls). The speed reduction will align with the residential nature of the street. It would also reduce the sight distance requirements at intersections and driveways, particularly located on the inside of curves where vegetation impedes on sight distance.

The reduction of the speed would reduce the kinetic energy transferred in a collision. Through reducing the speed limit, and with the assistance of other measures and enforcement, there is potential that it could increase the number of road users travelling at a lower speed, reducing the 85th percentile speed. Scientists at the University of Adelaide estimate that the risk of a serious collision circa doubles for every 5 km/h above 60 km/h, with the serious collision risk reducing correspondingly for speeds below 60 km/h. Therefore it may be expected that the risk of a serious collision would be reduced fourfold through encouraging motorised vehicles to travel at 50 km/h rather than 60 km/h. This aligns with the Safe Systems Principals to reduce the exposure to impact forces associated with vulnerable users.

It is recommended that the speed reduction should include Barritt Street, Bateman Street and Vansittart Crescents, with consideration to include Learmonth Drive, so all the urban roads in Kambah on the western side of Drakeford Drive have a maximum speed of 50 km/h.

Traffic calming measures and police or speed camera van presence would be required to support the reduction in the posted speed to 50 km/h.

3.2.1.2 Pedestrian crossing improvements

There are three pedestrian underpasses provided on Boddington Crescent and four pedestrian underpasses on O'Halloran Circuit. There are also two refuge islands and a children's crossing on O'Halloran Circuit. There are several bus stop on both sides of both roads, with path connections and crossing locations at various locations. There are crossing locations within the divided sections on both roads, including the children's crossing.

2 of the 25 collisions that occurred on Boddington Crescent involved pedestrians crossing the road. These collisions occurred at existing crossing locations near bus stops.

Enhancements to active travel infrastructure through improved crossing safety would provide benefit to pedestrians and cyclists using the path network. The improved crossing safety has the potential to encourage additional users that previously avoided walking/ cycling due to concerns over limited safe road crossing locations. The provision of crossing improvements can decrease crossing distance and time that pedestrians/ cyclists are exposed to the trafficable section of the road. It would also improve the pedestrian crossing sight distance at locations where the sight distance is reduced due to the curvature of the road.

The required pedestrian crossing sight distance (CSD) is circa 208 m for 60 km/h for the 10.4 m wide road (173.3 m for 50 km/h). The CSD is not achieved on sections of the road due to the horizontal alignment of the road (circa 110 m to 140 m on the inside of curves). The design of a major collector road depends on the age of the suburb. Some of the older major collector roads in residential areas, such as Boddington Crescent and O'Halloran Circuit, have a combination of width and alignment that results in a non-achievable CSD at key crossing locations (i.e. bus stops, local access paths connections, etc.). As a result, pedestrian crossing improvements such as refuge islands or kerb blisters are installed to achieve CSD by reducing the crossing distance and/or providing the opportunity for pedestrians to cross the road in stages. Pedestrian crossing improvements (i.e. refuge island) reduce the CSD to 74 m for 60 km/h/ (62 m for 50 km/h) and assists in calming traffic movements. A refuge island on Boddington Crescent and O'Halloran Circuit would provide a location with a compliant CSD.

Improvements to pedestrian crossing facilities and network connections should be considered as part of an assessment of connectivity through the suburb. There are locations where crossing activities occur that are away from underpasses and existing refuge locations. The locations considered appropriate for a refuge island are:

- Boddington Crescent between Barritt Street and Carleton Street – Bus stops located on both sides of the road and close to a path connection to Buckley Circuit.
- Boddington Crescent between Crozier Circuit (north and south) – Pedestrian spine through the suburb, with a straight section of road with high speeds.
- O'Halloran Circuit between Chirnside Circuit and Springbett Street – Dual lane section in both directions, with a straight section of road with high speeds, with amenities on the southern side of O'Halloran Circuit that attracts pedestrians and cyclists.

3.2.1.3 Traffic Calming – Deflection Devices

With a reduction in the posted speed limit, there would be a requirement to reinforce the speed reduction with the installation of traffic calming measures to reduce the travel speed.

Vertical deflection devices can be designed to accommodate all types of vehicles, with the option to install either rubber cushions or asphalt humps. The recently installed asphalt humps are considered a more appropriate solution due to the forecasted lifecycle and installation cost. They are also easier traversed meaning that road users abiding by the speed limit do not have to significantly decrease speed to the same extent as at a rubber cushion. However, asphalt humps should not be installed in proximity to pedestrian crossing locations due to potential confusion that the device is a raised pedestrian crossing.

A location where vertical deflection (asphalt humps) devices are considered appropriate are:

- Boddington Crescent between Bacchus Circuit and Barritt Street – the speed data indicated of a high 85th percentile speed in the eastbound direction during and outside school hours.
- Boddington Crescent between McLeod Place and Broad Place – the speed data indicated of a high 85th percentile speed in both directions.
- O'Halloran Circuit between Boddington Crescent and McKillop Circuit – the speed data indicated of a high 85th percentile speed in the southbound direction.
- O'Halloran Circuit between Jenke Circuit and Ashby Circuit – although the speed data indicated relatively good compliance at this location, during the site inspection southbound road users appeared to exceed the speed limit when away from the school frontage.

The devices would also assist with the speed limit reduction to 50 km/h.

3.2.1.4 Traffic lane width reduction

The undivided section of Boddington Crescent and O'Halloran Circuit is circa 10.4 m wide with circa 5.2 m lanes in both directions.

The narrowing of the traffic lanes with the provision of marked on-road cycle lanes/ marked shoulder would assist with encouraging road users to conform to the speed limit through constraining lane widths.

This option would also assist with encouraging the 85th percentile road users to conform to the 50 km/h speed limit.

Note that some of the existing pavement markings are currently faded along sections of both roads.

3.2.2 Assessment Options

An assessment was undertaken for the divided and undivided sections of Boddington Crescent and O'Halloran Circuit. The assessment is based on the worst case scenario for the road section. The assessment for this section of road was undertaken for the following design options:

- Pedestrian crossing facility;
- Traffic lane width reduction;
- Speed reduction to 50 km/h, and
- Vertical deflection devices.

It is proposed to include the above options within the school zones with the continuation of the speed reduction to 50 km/h to align with the section outside the school zone.

4. ASSESSMENT OF DESIGN OPTIONS

4.1 Assessment Summary

The Safe System Assessment (SSA) Matrix scoring was based on Austroads Safe System Assessment Framework Table 4.4 Safe System matrix scoring system (refer Appendix 1).

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in **Table 4-1**. The scores for each crash type are shown in **Figure 4-1**, **Figure 4-2**, **Figure 4-3** and **Figure 4-4**. The detailed assessments are presented in **Section 4.2**.

Table 4-1 SSA Matrix Scores for the Project

Option	Score
Boddington Crescent (Divided section)	
Existing conditions	188/448
Design Option	82.5/448
Boddington Crescent (Undivided section)	
Existing conditions	267/448
Design Option	118.5/448
O'Halloran Circuit (Divided section)	
Existing conditions	148/448
Design Option	55/448
O'Halloran Circuit (Undivided section)	
Existing conditions	222/448
Design Option	100.5/448

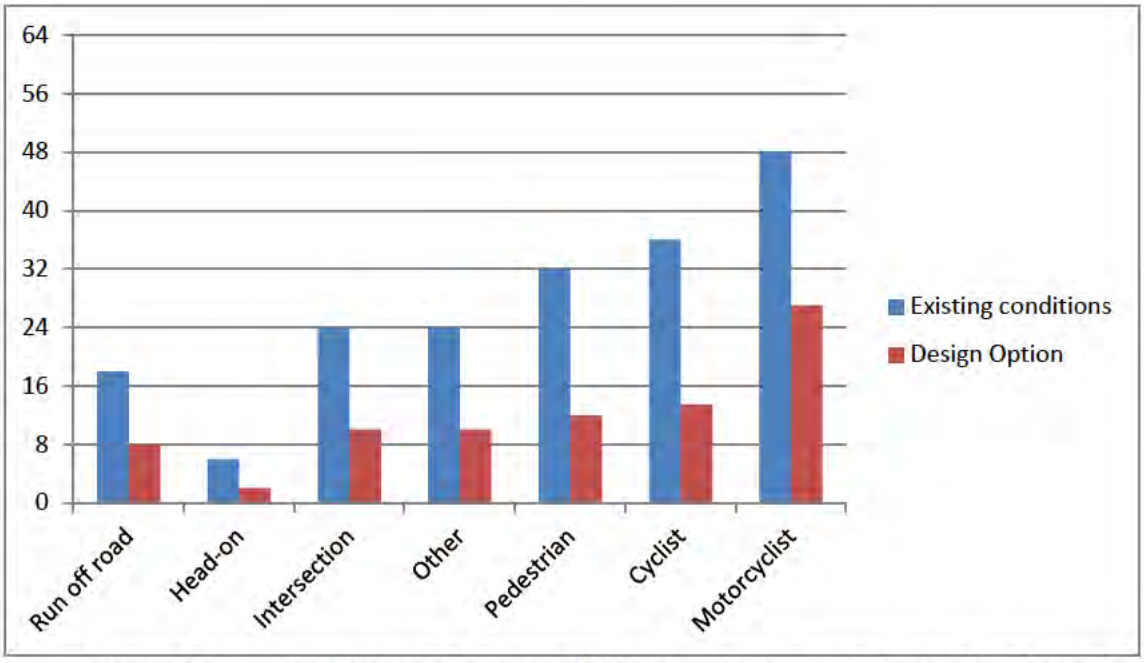

Figure 4-1 Boddington Crescent (Divided section) SSA Scores for Crash Types

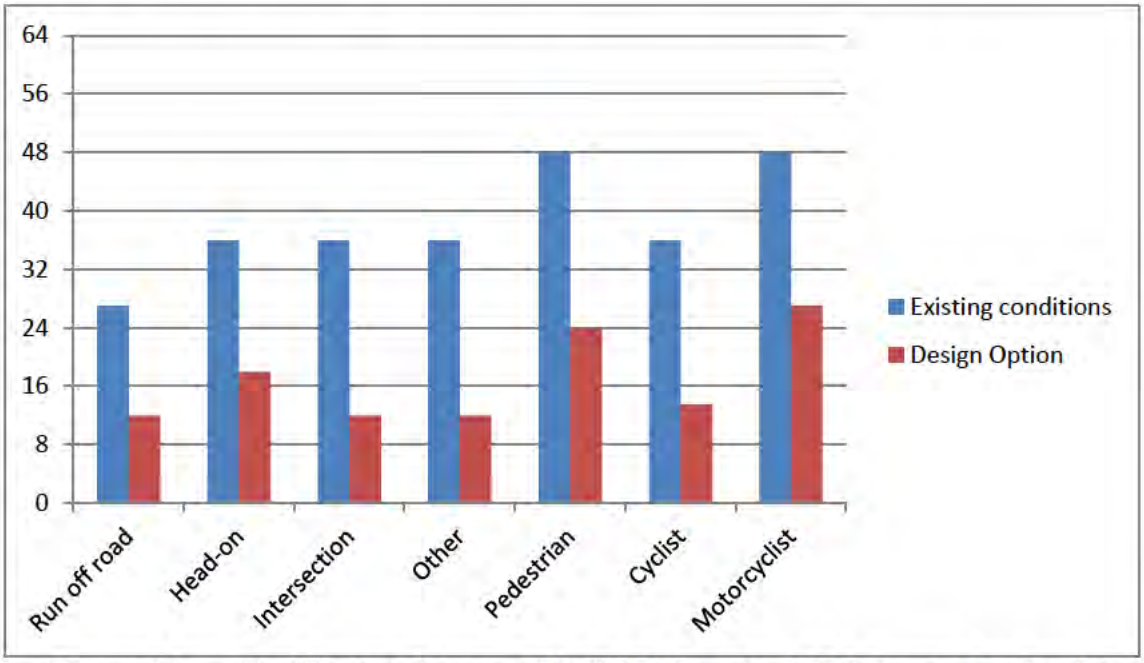

Figure 4-2 Boddington Crescent (Undivided section) SSA Scores for Crash Types

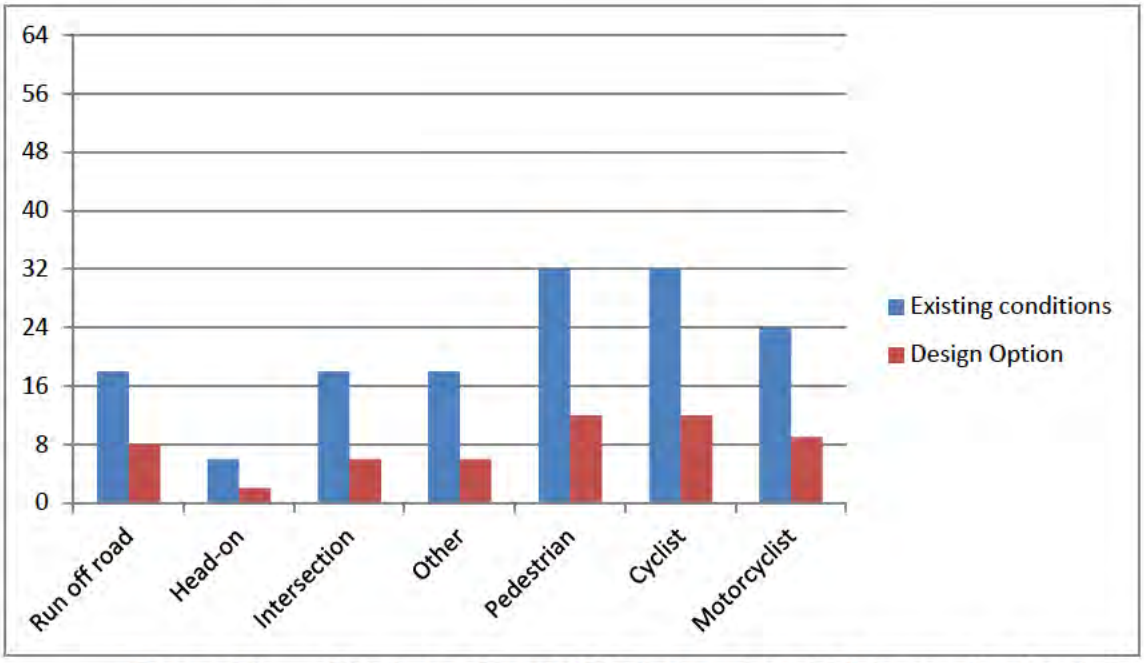

Figure 4-3 O'Halloran Circuit (Divided section) SSA Scores for Crash Types

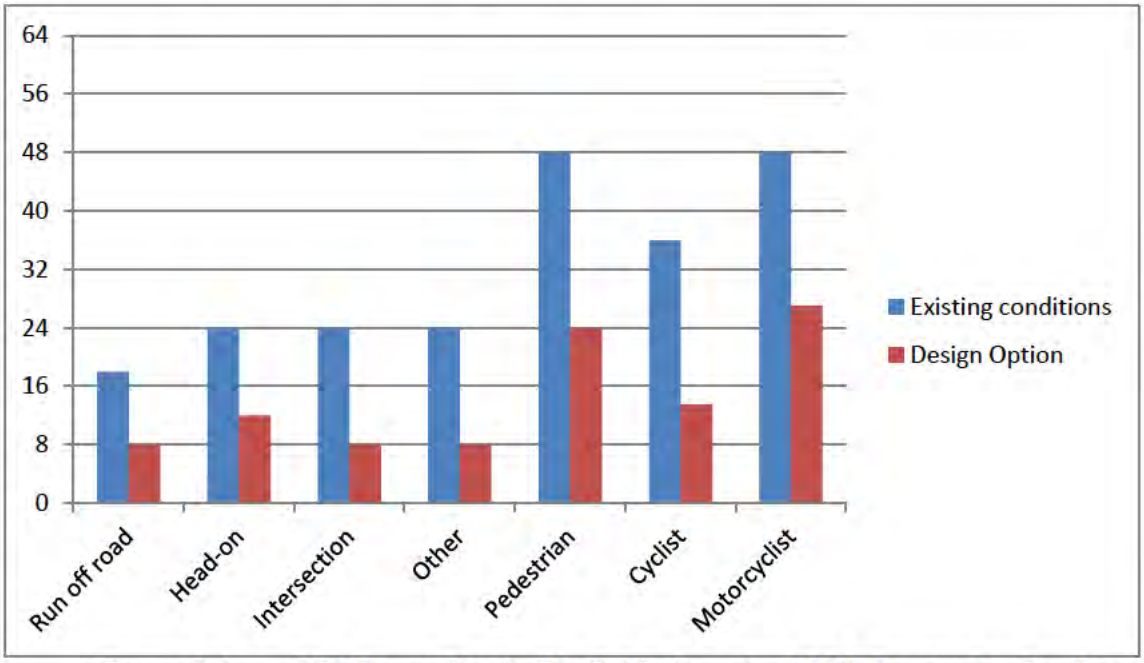

Figure 4-4 O'Halloran Circuit (Undivided section) SSA Scores for Crash Types

4.2 Safe System Assessment Matrices

The columns of the Safe System matrix show the crash types that represent the main crash and road user types that contribute to death and serious injury.

As scores vary along routes and between intersections, an average score is taken for the project as a whole. Detailed matrix assessments were undertaken to determine the overall scores.

Reference is made to *AP-R509-16 Table 4.2* which is used to quantify the risk rating scores, with *AP-R509-16 Table 4.4* used as a scoring index.

Table 4-2 Safe System Assessment Matrix – Boddington Crescent (Divided section) Existing Conditions

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	2/4	2/4	2/4	2/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication).	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Curvature of the road. • Wide vegetated median could result in vehicles turning at intersections against the traffic. Factors that **decrease** the likelihood include: • Road is divided.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. • Potential for vehicles not to stop in the median midblock of the intersections. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Pedestrians crossing one direction of traffic at a time with adequate storage in the median.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Cyclists crossing one direction of traffic at a time with adequate storage in the median.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • None.
Score:	3/4	1/4	4/4	4/4	2/4	3/4	4/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.
Score:	3/4	3/4	3/4	3/4	4/4	4/4	4/4
Product	18/64	6/64	24/64	24/64	32/64	36/64	48/64
						TOTAL	**188/448**

Table 4-3 Safe System Assessment Matrix – Boddington Crescent (Undivided section) Existing Conditions

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	3/4	3/4	3/4	3/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication).	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • The road is undivided. • Curvature of the road. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Underpasses provided.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • None.
Score:	3/4	4/4	4/4	4/4	3/4	3/4	4/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.
Score:	3/4	3/4	3/4	3/4	4/4	4/4	4/4
Product	27/64	36/64	36/64	36/64	48/64	36/64	48/64
						TOTAL	**267/448**

Table 4-4 Safe System Assessment Matrix – O'Halloran Circuit (Divided section) Existing Conditions

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (>100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	2/4	2/4	2/4	2/4	4/4	4/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication).	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the likelihood include: • Road is divided.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. • Potential for vehicles not to stop in the median midblock of the intersections. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided. • Pedestrians crossing one direction of traffic at a time with adequate storage in the median. • Existing children's crossing (when operational).	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • On street parking permitted. Factors that **decrease** the likelihood include: • Off road alternative route options. • Existing children's crossing (when operational). • Underpasses provided. • Cyclists crossing one direction of traffic at a time with adequate storage in the median	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the likelihood include: • None.
Score:	3/4	1/4	3/4	3/4	2/4	2/4	2/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.
Score:	3/4	3/4	3/4	3/4	4/4	4/4	4/4
Product	18/64	6/64	18/64	18/64	32/64	32/64	24/64
						TOTAL	**148/448**

Table 4-5 Safe System Assessment Matrix – O'Halloran Circuit (Undivided section) Existing Conditions

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	2/4	2/4	2/4	2/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication).	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • The road is undivided. • Curvature of the road. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • None.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided. • Refuge islands	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Underpasses provided.	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • None.
Score:	3/4	4/4	4/4	4/4	3/4	3/4	4/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • None.
Score:	3/4	3/4	3/4	3/4	4/4	4/4	4/4
Product	18/64	24/64	24/64	24/64	48/64	36/64	48/64
						TOTAL	**222/448**

Below is the legend for the following tables:

- Black text — Common factor between this plan and the existing conditions
- ~~Strikethrough~~ — Factor that is removed or significantly diminished between the existing conditions and this option
- *Blue italic text* — New or significantly altered in this option compared to the existing conditions

Table 4-6 Safe System Assessment Matrix – Boddington Crescent (Divided section) Design Options

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	2/4	2/4	2/4	2/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication). • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Curvature of the road. • Wide vegetated median could result in vehicles turning at intersections against the traffic. Factors that **decrease** the likelihood include: • Road is divided. • *Lower posted speed limit reduces the distance of travel after response to the hazard.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. • Potential for vehicles not to stop in the median midblock of the intersections. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Pedestrians crossing one direction of traffic at a time with adequate storage in the median. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Cyclists crossing one direction of traffic at a time with adequate storage in the median. • *Lower posted speed limit, reduce the sight distance requirements and distance of travel after response to the hazard.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit, reduce the sight distance requirements and distance of travel after response to the hazard.* • *Reduction of speed by LATM at selected locations.* • *Improved delineation.*
Score:	*2*/4	*0.5*/4	*2.5*/4	*2.5*/4	*1*/4	*1.5*/4	*3*/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries. • *Reduction in kinetic energy due to speed limit reduction.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*
Score:	2/4	2/4	2/4	2/4	*3*/4	*3*/4	*3*/4
Product	*8*/64	*2*/64	*10*/64	*10*/64	*12*/64	*13.5*/64	*27*/64
						TOTAL	***82.5*/448**

Table 4-7 Safe System Assessment Matrix – Boddington Crescent (Undivided section) Design Options

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	3/4	3/4	3/4	3/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication). • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • The road is undivided. • Curvature of the road. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Underpasses provided. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*
Score:	2/4	3/4	2/4	2/4	2/4	1.5/4	3/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries. • *Reduction in kinetic energy due to speed limit reduction.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*
Score:	2/4	2/4	2/4	2/4	3/4	3/4	3/4
Product	12/64	18/64	12/64	12/64	24/64	13.5/64	27/64
						TOTAL	**118.5/448**

Table 4-8 Safe System Assessment Matrix – O'Halloran Circuit (Divided section) Design Options

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day	AADT is between 1,000 and 5,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (>100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	2/4	2/4	2/4	2/4	4/4	4/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication). • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the likelihood include: • Road is divided. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. • Potential for vehicles not to stop in the median midblock of the intersections. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided. • Pedestrians crossing one direction of traffic at a time with adequate storage in the median. • Existing children's crossing (when operational). • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • On street parking permitted. Factors that **decrease** the likelihood include: • Off road alternative route options. • Existing children's crossing (when operational). • Underpasses provided. • Cyclists crossing one direction of traffic at a time with adequate storage in the median. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*
Score:	2/4	0.5/4	1.5/4	1.5/4	1/4	1/4	1/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries. • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*
Score:	2/4	2/4	2/4	2/4	3/4	3/4	3/4
Product	8/64	2/64	6/64	6/64	12/64	12/64	9/64
						TOTAL	**55/448**

Table 4-9 Safe System Assessment Matrix – O'Halloran Circuit (Undivided section) Design Option

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day	AADT is between 5,000 and 10,000 veh/day Crash types: Rear end, manoeuvring	Pedestrian volumes are expected to be very high based on visual observations (>100 units/ day).	Cyclists volumes are expected to be high based on visual observations (50-100 units/ day).	For motorcyclist crash types, AADT is estimated between 50-100 vehicles per day
Score:	3/4	3/4	3/4	3/4	4/4	3/4	3/4
Likelihood Comments:	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Uncontrolled intersections meaning that vehicles are likely to run off the road avoiding a vehicle entering or exiting the side road. • Some roadside hazards close to the lane. • The curvature of the road. Factors that **decrease** the likelihood include: • Delineation by kerb alignment (existing pavement markings require reapplication). • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • The road is undivided. • Curvature of the road. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Controlled by give way signs. • Poor visibility at intersections on the inside of curves. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Intersections on the inside of curves. • Driveways on the inside of curves. • Driveways with a high number of reversing movements. • Vehicles tailgating. • Stopping sight distance not achieved. • Vehicles parking close to intersections and on the verge. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Width of road. • Pedestrian crossing sight distance not achieved in some location. Factors that **decrease** the likelihood include: • Underpasses provided. • Refuge islands • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • No on-road cycle lane. • Driveways with a high number of reversing movements. • On street parking permitted. • Intersections on the inside of curves. Factors that **decrease** the likelihood include: • Off road alternative route options. • Underpasses provided. • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.* • *Improved safe and formal crossing locations.*	Factors that **increase** the likelihood include: • 85th percentile exceeding the 60 km/h speed limit. • Visibility at intersections on the inside of curves. • Driveways with a high number of reversing movements. Factors that **decrease** the likelihood include: • ~~None.~~ • *Lower posted speed limit reduces the sight distance requirements and distance of travel after response to the hazard.* • *Decrease in speed at key locations based on crash data.* • *Improved delineation.*
Score:	*2*/4	3/4	*2*/4	*2*/4	*2*/4	*1.5*/4	*3*/4
Severity Comments:	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Trees and non-frangible, structures located in the clear zone. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • For head on crash types, the operating speeds (60-70 km/h) are considered to be close to tolerable levels for fatalities, however not serious injuries. • *Reduction in kinetic energy due to speed limit reduction.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. • Right angle collisions. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*	Factors that **increase** the severity include: • 85th percentile exceeding the 60 km/h speed limit. Factors that **decrease** the severity include: • ~~None.~~ • *Reduction in kinetic energy due to speed limit reduction.* • *Additional reduction in kinetic energy at hump locations.*
Score:	*2*/4	*2*/4	*2*/4	*2*/4	*3*/4	*3*/4	*3*/4
Product	*18*/64	*18*/64	*12*/64	*12*/64	*24*/64	*13.5*/64	*27*/64
						TOTAL	***100.5*/448**

4.3 Safer Vehicles, People and Post-Crash Care

Table 4-10 provides a general high level overview of additional safe systems components associated with the assessed roads.

Table 4-10 Additional Safe System Component

Pillar	Prompt	Comment
Road User	Are road users likely to be alert and compliant, or are there factors that might influence this?	• The roads are mainly used by residents of Kambah. Treatments associated with the design options would assist with providing guidance to road users. • Potential there could be an objection from older drivers regarding the vehicle deflection devices due to driver discomfort.
	What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Can enforcement of these issues be conducted safety?	• There is potential for road users to use these roads when travelling from an event/ club, etc. to home that could be under the influence of alcohol/ drugs. This would occur network wide and should be addressed correspondingly.
	Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	• Schools frontages are provided on both roads.
Vehicle	What level of alignment is there with the ideal of safer vehicles?	• There is nothing to indicate this project contravenes the ideals of safer vehicles.
	Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design?	• The distribution of vehicle types will likely remain. • No factors are considered to affect unsafe vehicles.
	Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network? Can enforcement of these issues be conducted safety?	• Inspections of vehicle roadworthy are undertaken network wide. Potential to undertake additional reviews network wide at locations where compliance could be an issue (i.e. schools). • Nothing constrains enforcement.
	Has vehicle breakdown been catered for?	• The road width is generally sufficient for a vehicle to pass a broken down vehicle.
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury?	• No identified issues.
	Do emergency and medical services operate as efficiently and rapidly as possible?	• Emergency services are in close proximity. It is assumed that there would be an efficient post-crash response and care.
	Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there reliable information available via radio, VMS etc.?	• Opportunity to close either road where an event has occurred with minimal impact to road users. • A detour of road users could be implemented depending on the location of the event.
	Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	• Not applicable for this location due to the road side environment

5. CONCLUSION

The design of the proposed options can be undertaken to align with Safe System principles.

The installation of the treatments associated with the proposed design options would provide benefit to the safety of the assessed street. It is recommended that the following be undertaken:

- Boddington Crescent (Divided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between McLeod Place and Broad Place, and
    - Install pavement markings on sections of the divided section to provide a visual narrowing of the traffic lanes.
- Boddington Crescent (Undivided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Bacchus Street and Barritt Street;
    - Install pavement markings to provide a visual narrowing of the traffic lanes, and
    - Install a pedestrian refuge island between Barritt Street and Carleton Street to align with the bus stop location and path connection and between Crozier circuit (north and south) to align with the path connection.
- O'Halloran Circuit (Divided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Jenke Circuit and Ashby Circuit;
    - Install kerb blisters at the crossing locations near Springbett Street to reduce the pedestrian crossing distance, and
    - Install pavement markings on sections of the divided section to provide a visual narrowing of the traffic lanes.
- O'Halloran Circuit (Undivided section);
    - Reduce the speed limit to 50 km/h. Enforcement would be required to support the reduced speed restriction;
    - Discuss the preferred hump type (asphalt or rubber) with a hump installed between Boddington Crescent and McKillop Circuit Street, and
    - Install pavement markings to provide a visual narrowing of the traffic lanes.

APPENDIX 1 SAFE SYSTEM MATRIX SCORING SYSTEM

Table A-1 Safe System Matrix Scoring System

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

Road user exposure	Crash likelihood	Crash severity
4 = volumes of vehicles that may be involved in a particular crash type are very high, or the road is very long, and therefore exposure is very high. For run-of-road, head-on, intersection and 'other' crash types, AADT is > 10 000 per day. For cyclist, pedestrian and motorcycle crash types, volumes are > 100 units per day.	4 = the likelihood of individual road user errors leading to a crash is high given the infrastructure in place (e.g. high approach speed to a sharp curve, priority movement control, filtering right turn across several opposing lanes, high speed).	4 = should a crash occur, it is highly likely that it will result in a fatality or serious injury to any road user involved. Kinetic energies are high enough to cause an FSI crash, and it is unlikely that the forces will be dissipated before reaching the road user.

APPENDIX 2 OPTION PRELIMINARY COSTING

	Description	Estimated Costs (Excl. GST)
Boddington Crescent Design Option		
Vertical Deflection Devices	2 asphalt cushions (excludes lighting)	$40,000.00 ($20,000 per hump)
Pedestrian crossing facility	2 Pedestrian refuge island and connecting paths (excludes lighting)	$60,000
Channelisation treatment	3.5 m traffic lanes and marked shoulder	$5,000
50 km/h sign	7 x 50 km/h signs	$3,000.00
	Sub-total	***$108,000.00* (excl. GST)***
O'Halloran Circuit Design Option		
Vertical Deflection Devices	2 asphalt cushions (excludes lighting)	$40,000.00 ($20,000 per hump)
Pedestrian crossing facility	Blister islands, kerb ramp improvements, including lighting.	$40,000
Channelisation treatment	3.5 m traffic lanes and marked shoulder	$5,000
50 km/h sign	7 x 50 km/h signs	$3,000.00
	Total	***$88,000.00* (excl. GST)***

Note:

* A review of services has not been undertaken and the impact of work on existing services is unknown. Estimated costs are indicative only and exclude relocation of services.

APPENDIX 3 CONCEPT SKETCH OF OPTIONS

Boddington Crescent and O'Halloran Circuit Safe Systems Infrastructure Assessment - Design Option

MARCONI CR
KAMBAH GROUP CENTRE
SUMMERLAND CCT
SUMMERLAND CCT
N
BACCHUS CCT
60
DRAKEFORD DR
DRAKEFORD DR
60
DRAKEFORD
60
JENKE CCT
KAMBAH DISTRICT PLAYING FIELD
KAMBAH DISTRICT PLAYING FIELD
NAMADGI SCHOOL
O'HALLORAN CCT
SHOPS
O'HALLORAN CCT
60
BARRITT ST
ST THOMAS THE APOSTLE PRIMARY SCHOOL
JENKE CCT
KAMBAH WOOLSHED
CHIRNSIDE CCT
SPRINGBETT ST
KAMBAH
ASHBY CCT
MOUNT NEIGHBOUR PRESCHOOL
BODDINGTON CR
60
PRE-SCHOOL
SNODGRASS CR
CARLETON ST
SHOPS
BODDINGTON CR
BROAD PL
VANSITTART CR
60
CASTLEY CCT
SPRINGBETT ST
MCKILLOP CCT
CASTLEY CCT
SNODGRASS CR
CROZIER CCT
MCLEOD PL
O'HALLORAN CCT
MCKILLOP CCT
CROZIER CCT
50
BATEMAN ST

0 200 400 Meters

ACT Government

Legend

- Lane width reduction (3.5m traffic lanes and circa 1.8m wide shoulder)
- 50 Speed Limit
- Speed hump
- Refuge Island

Calibre Professional Services Pty Ltd
GPO Box 261 | Canberra ACT 2601
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+61 2 6211 7100 | ABN 55 070 683 037

Our Ref: 20-000509

10 November 2020

Transport Canberra & City Services
GPO Box 158
Canberra ACT 2601

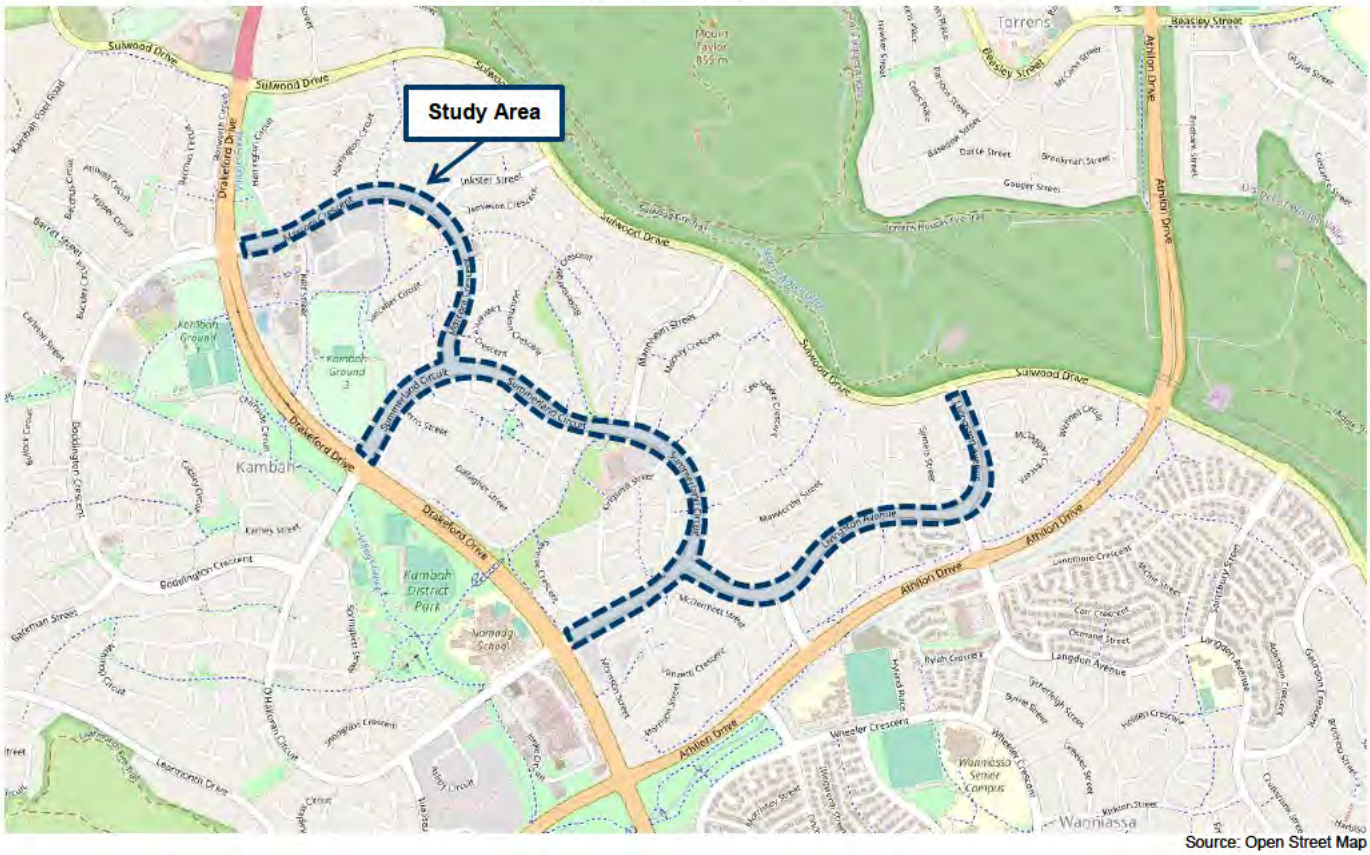
Attention: Jayanthy Vikneson

Dear Jayanthy

Traffic Investigation on Marconi Crescent, Summerland Circuit and Livingston Avenue, Kambah

Transport Canberra and City Services ('TCCS') has engaged Calibre Professional Services Pty Ltd ('Calibre') to investigate the operation of Livingston Avenue, Marconi Crescent and Summerland Circuit in Kambah. The primary aim for this investigation is to identify any existing safety or operational risks to road users and to recommend potential mitigation measures. The study area for this investigation is presented below at Figure 1 and includes:

- Livingston Avenue, between Sulwood Drive and Summerland Circuit,
- Marconi Crescent, between Drakeford Drive / Tuggeranong Parkway and Summerland Circuit, and
- Summerland Circuit, between Drakeford Drive (northwest) and Drakeford Drive (southeast).



Source: Open Street Map

Figure 1 Study Area

Background Information

Historical Data

This investigation is based on a range of historical data, provided by TCCS including:

- Historical crash data, within the study area, from the five (5) years to 31 December 2019, and
- Automatic traffic count data (including vehicle speeds), from the following seven (7) locations:
  - Livingston Avenue, between Maxworthy Street and Symers Street (2018),
  - Livingston Avenue, between Maxworthy Street and Vanzetti Crescent (2018),
  - Livingston Avenue, between McTaggart Crescent and Sulwood Drive (2018,
  - Marconi Crescent, between Harrington Circuit and Sinclair Street (2018),
  - Marconi Crescent, between Hutchison Crescent and Lascelles Circuit (2015),
  - Summerland Circuit, between Gallagher Street and Hutchison Crescent (2017), and
  - Summerland Circuit, between Lee Steere Crescent and Livingston Avenue (2017).

Site Visits

Calibre staff undertook site visits during the morning and evening commuter peak hours and at night, on Tuesday 18 August and Wednesday 19 August 2020.

It is noted that observations were made along Livingston Avenue and the south-eastern half of Summerland Circuit on the Tuesday, while observations on Marconi Crescent and the north-western half of Summerland Circuit were made on the Wednesday. Observations for the whole study area were made after last light on Tuesday night.

Furthermore, it is noted that the weather was overcast on Tuesday and rainy on Wednesday. A mobile speed camera was also noted opposite Taylor Primary School during the morning peak hour on Wednesday.

Traffic Investigations

Traffic ingestions including data review, observations and recommendations are included in the sections below for each road.

Livingston Avenue

Livingston Avenue is a major collector road that extends approximately 1.6km from Sulwood Drive in the northeast to Summerland Circuit in the southwest. Livingston Avenue typically comprises a single carriageway of approximately 10.2m width, which supports a discontinuous 1.5m wide unprotected on-road bicycle lane and a single traffic lane in each direction. Local widenings and narrow median islands are provided at the Atkins Street, Summerland Circuit and Vosper Street intersections. The full length of Livingston Avenue is subject to a posted 60km/h speed limit. Strategically, the section of Livingston Avenue between Summerland Circuit and Vosper Street is designated as a local community active travel route. Livingston Avenue is not designated as a heavy vehicle or public transport route.

Traffic Data

Automatic Traffic Counts undertaken in May 2018 identified the traffic demands and speeds at three (3) locations along Livingston Avenue. Figure 2 below presents a summary of the key traffic statistics at the three (3) survey locations. Further details of the traffic data are presented as an attachment to this document.

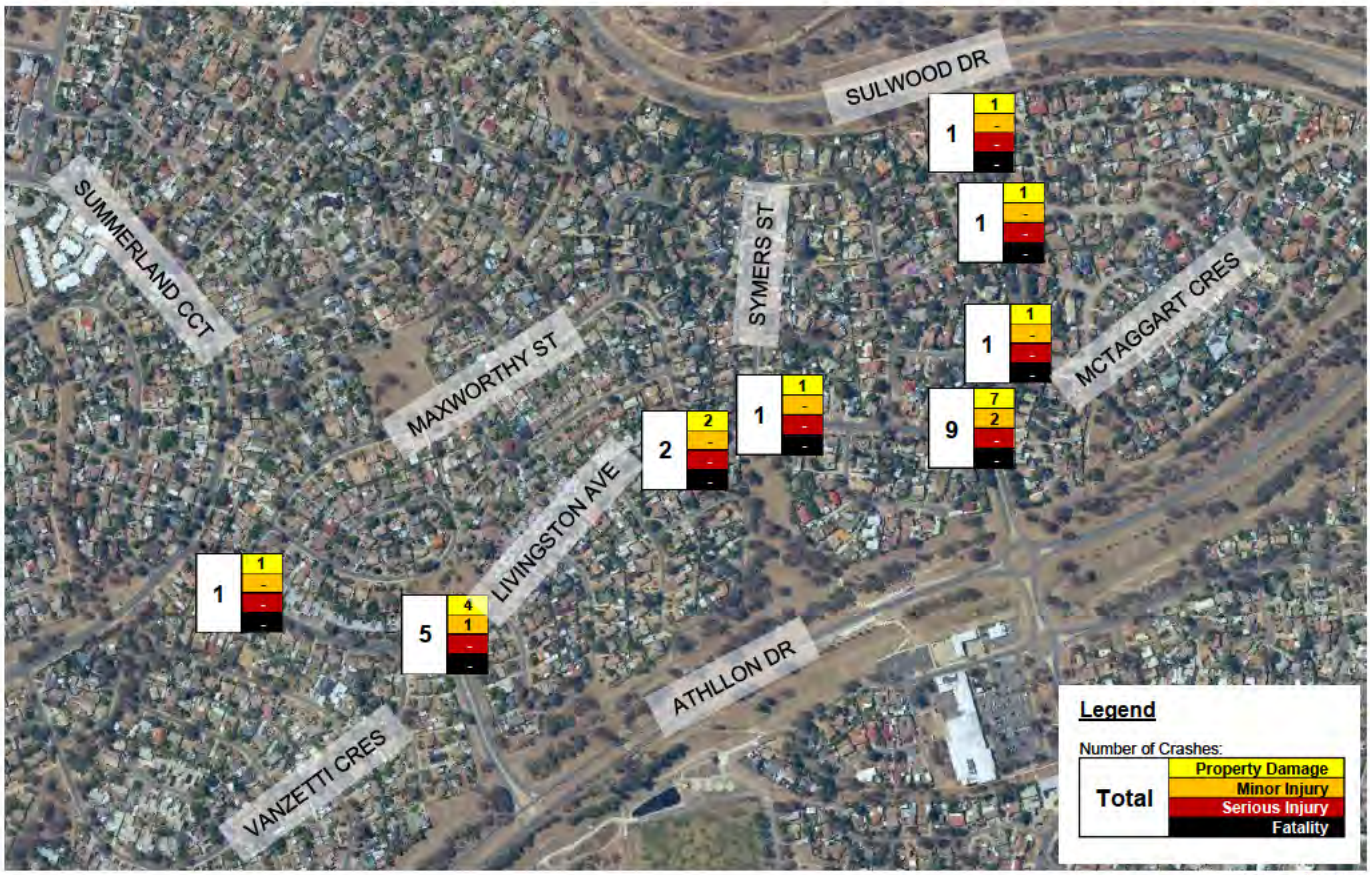
Source: ACTMapi

Figure 2 Traffic Data – Livingston Avenue

These surveys found that Livingston Avenue carried approximately 3,000-3,400 vehicles per day, including up to 5.4% heavy vehicles. These daily traffic demands and heavy vehicle percentages are considered to be appropriate. Furthermore, it was found that the 85th percentile speed of traffic on Livingston Avenue varied between 58.3km/h and 62.7km/h, with up to 920 vehicles per day exceeding the posted 60km/h speed limit. The 85th percentile speed itself, while greater than the posted speed limit at two (2) locations) is not considered to be problematic in itself. However, the number of vehicles observed to be exceeding the speed limit along Livingston Avenue does indicate the presence of a traffic speed issue.

Crash History

In the five (5) year period to 31 December 2019 a total of 21 crashes were recorded along Livingston Avenue, including three (3) minor injury crashes. There were no fatal or serious injury crashes recorded on Livingston Avenue within the analysis period. Figure 3 below presents the spatial distribution of recorded crashes along Livingston Avenue. A crash matrix showing the historical crashes along Livingston Avenue is presented as an attachment to this document.



Source: ACTMapi

Figure 3 Crash History – Livingston Avenue

Nine (9) of the recorded crashes along Livingston Avenue, during the analysis period, occurred at the Atkin Street / Livingston Avenue intersection. Of these crashes four (4) involved vehicles making a right-turn from the west approach (Livingston Avenue), failing to give way to through traffic from the east approach (Livingston Avenue). A further two (2) crashes involved vehicles turning right from the south approach (Atkin Street), failing to give way to through traffic from the east approach (Livingston Avenue), while one crash involved a vehicle turning right from the south approach (Atkin Street), failing to give way to a right-turning vehicle from the west approach (Livingston Avenue). Ultimately, this indicates that drivers are having difficulty selecting appropriate gaps in the opposing traffic streams. It is noted that no patterns related to time-of-day, visibility, weather or road surface conditions were identified.

Five (5) of the recorded crashes along Livingston Avenue, during the analysis period, occurred at the Livingston Avenue / Vosper Street intersection. Of these crashes three (3) involved a vehicle turning right from the west approach (Livingston Avenue), failing to give way to through traffic from the east approach (Livingston Avenue). The remaining two (2) crashes involved one (1) instance each of a vehicle turning right from the south approach (Vosper Street), failing to give way to through traffic from the east and west approaches (Livingston Avenue). Ultimately, this indicates that drivers are having difficulty selecting appropriate gaps in the opposing traffic streams. It is noted that no patterns related to time-of-day, visibility, weather or road surface conditions were identified.

Findings & Observations

The following sections summarise the findings drawn from the aforementioned data and observations made during the site visits.

Atkin Street / Livingston Avenue

The crash history at the Atkin Street / Livingston Avenue intersection indicates that drivers are having difficulty selecting appropriate gaps in the opposing traffic streams.

During the site visit, confusion over which movements have priority (particularly between the left- and right-turns into Atkin Street) were observed. This is exacerbated by high vehicle speeds through the intersection due to the wide approaches and large radius turns via the left-turn slip-lanes on the south and east approaches (Atkin Street and Livingston Avenue, respectively).

Furthermore, the poor condition of the pedestrian paths and long crossing distances at the intersection were noted. Both of these factors, along with the high vehicle speeds through the intersection, contribute to create poor pedestrian amenity and safety at the intersection.

Figure 4 below presents photographs of the Atkin Street / Livingston Avenue intersection.

Figure 4 Atkin Street / Livingston Avenue Intersection

Livingston Avenue / Vosper Street

The crash history at the Livingston Avenue / Vosper Street intersection indicates that drivers are having difficulty selecting appropriate gaps in the opposing traffic streams.

During the site visit, a near-miss was observed between a child, cycling to school, crossing the road from north to south and a vehicle travelling through the intersection from west to east. While the child failed to look for traffic before beginning to cross the road, the speed of the vehicle through the intersection is expected to have been significantly in excess of the safe system speed for pedestrian and cyclist crashes and on this basis would be expected to have a high likelihood of resulting in serious injury or death. In addition to high vehicle speeds through the intersection, the poor-quality pedestrian facilities and long crossing distances at the intersection, both contributed to the conflict.

Figure 5 below presents photographs of the Livingston Avenue / Vosper Street intersection.


Figure 5 Livingston Avenue / Vosper Street Intersection

Pedestrian Paths and Kerb Ramps

Along the length of Livingston Avenue, the poor condition of pedestrian facilities was noted. This included missing links, uneven pedestrian paths, paths blocked by vehicles and vegetation, misaligned kerb ramps, and paths located at the back of kerb, close to high speed traffic.

Missing links and uneven pedestrian paths present trip hazards, particularly for less mobile members of the community. As such, they reflect poor pedestrian amenity and discourage the community from making short trips on-foot.

Misaligned kerb ramps are particularly hazardous for members of the community with low vision, as well as those travelling with wheeled devices including bicycles, prams and wheelchairs, as they are directed into the centre of the intersection, rather than directly towards the complimentary kerb ramp.

Similarly, pedestrian paths located at the back of kerb result in poor pedestrian amenity due to their close proximity to vehicular traffic. This can also be hazardous, due to the limited separation between vehicles and pedestrians.

Figure 6 below presents photographs of the poor condition of pedestrian facilities along Livingston Avenue.


Figure 6 Pedestrian Paths and Kerb Ramps – Livingston Avenue

Carriageway Width

The traffic data collected in May 2018 identified a high number of vehicles exceeding the speed limit as an issue. The width of the carriageway, particularly with the lack of on-street parking observed, was considered to be a key contributor to this issue. By providing traffic lanes of effectively 5.0m width in each direction, the road environment gives drivers the impression that their path is clear of conflicts, encouraging high vehicle speeds across a large proportion of drivers.

Figure 7 below presents photographs showing the wide carriageway along Livingston Avenue.

Figure 7 Carriageway Width

On-Road Bicycle Lanes

An unprotected on-road bicycle lane, of approximately 1.4m width, serving only westbound cyclists, was noted at the Atkins Street and Vosper Street intersections. While this bicycle lane is formalised (through the provision of 'Bicycle Lane' signs), the discontinuity and lack of protection from vehicular traffic, is unlikely to encourage 'Interested but Concerned' cyclists to make trips by bicycle. Furthermore, in other sections of Livingston Avenue, informal and conspicuously discontinuous bicycle lane linemarking is provided. This appears only to reinforce the lack of quality bicycle infrastructure along Livingston Avenue.

Figure 8 below presents photographs of the discontinuous on-road bicycle lanes along Livingston Avenue.

Figure 8 Discontinuous On-Road Bicycle Lanes

Street Lighting

LED street lighting was observed to provide suitable lighting conditions, at night, along the length of Livingston Avenue.

Figure 9 below presents photographs of the street lighting conditions along Livingston Avenue.

Figure 9 Street Lighting Conditions – Livingston Avenue

Initial Safe System Assessment

An initial safe system assessment has been undertaken based on the existing conditions along Livingston Avenue. This assessment was separated into three sections, based on the cross section of the road and roadside environment. These sections were as follows:

1. Single carriageway road with property access (between Summerland Circuit and Vosper Street, Vosper Street and Atkins Street, and Atkins Street to the south entrance of McTaggart Crescent.)
2. Single carriageway road without property access (between the south entrance of McTaggart Crescent to Sulwood Drive.)
3. Main intersections (Livingston Avenue / Atkins Street and Livingston Avenue / Vosper Street.)

For the areas of Livingston Avenue with single carriageway with property access, the assessment returned a score of 167 / 448. The key elements that increase the safe system score are the moderately high vehicle speeds (which exceed the safe system speeds for most crash types), the wide carriageway width, the minor priority-controlled intersections with many conflict points, the presence of driveway access directly onto the street, the presence of road hazards near the back of kerb, and the lack of facilities for pedestrians, cyclists and motorcyclists.

Table 1 below presents a breakdown of the safe system assessment scoring for the sections of Livingston Avenue complying with the section 1 environment, under the existing conditions.

Table 1 Safe System Matrix – Livingston Avenue Single Carriageway with Driveway Access – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	3 / 4	3 / 4	2 / 4	3 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**12 / 64**	**27 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**167 / 448**

For the areas of Livingston Avenue with single carriageway and no property access, the assessment returned a score of 134 / 448. The key elements that increase the safe system score are the moderately high vehicle speeds (which exceed the safe system speeds for most crash types), the wide carriageway width, the presence of road hazards near the back of kerb, and the lack of facilities for cyclists and motorcyclists.

Table 2 below presents a breakdown of the safe system assessment scoring for the sections of Livingston Avenue complying with the section 2 environment, under the existing conditions.

Table 2 Safe System Matrix – Livingston Avenue Single Carriageway with no Driveway Access – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	1 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	2 / 4	2 / 4	2 / 4	4 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**8 / 64**	**18 / 64**	**4 / 64**	**16 / 64**	**32 / 64**	**32 / 64**	**134 / 448**

For the major priority-controlled intersections, the assessment returned a score of 172 / 448. The key elements that increase the safe system score are the moderately high vehicle speeds (which exceed the safe system speeds for most crash types), the large size of the priority-controlled intersections, the presence of road hazards near the back of kerb, and the discontinuity of facilities for cyclists.

Table 3 below presents a breakdown of the safe system assessment scoring for the sections of Livingston Avenue complying with the section 2 environment, under the existing conditions.

Table 3 Safe System Matrix – Livingston Avenue Major Intersections – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	2 / 4	4 / 4	2 / 4	3 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**8 / 64**	**36 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**172 / 448**

Full details of the safe system assessments for each of the areas are presented as an attachment to this document.

Recommendations

The following sections present the range of treatments recommended to address the issues identified along Livingston Avenue.

Atkins Street and Vosper Street Intersections

To reduce speeds through the intersections of Livingston Avenue with Atkins Street and Vosper Street and improve safety and amenity for pedestrians, several changes are recommended. The removal of the left turn slip lanes both into and out of the side streets would be beneficial to reducing the turning speeds for vehicles and allowing the opportunity to improve pedestrian crossing facilities. Although Livingston Avenue is not currently a bus route, it is noted that the intersections would still be navigable by busses with this reduction.

The narrowing of the approaches to the intersection so lane widths are around 3.5m is also recommended. This could be accomplished through a combination of increasing the width of the concrete medians or expanding the road shoulder, either through the use of paint or kerbing. These improvements would also allow for improvement of the pedestrian crossing facilities along all legs of the intersection. Adequate provisions for the relevant design and check heavy vehicle turning paths at intersections would need to be confirmed in detailed design.

The total costs for civil works are expected to be in the magnitude of $230,000 for the construction of both intersections. It is noted that existing streetlights are unlikely to be impacted and not pedestrian priority crossings are proposed so no additional costs are expected to be associated with lighting.

Local speed reduction measures in the form of speed cushions are also recommended on the approach to each of these intersections. These speed cushions would reduce the vehicle speed on approach to the intersections to below 50km/h and improve safety for vehicles turning out of either of the minor legs. The cost of installation of these items is expected to be in the magnitude of $40,000 for the three sets of speed cushions.

Traffic Management

In order to reduce vehicle speeds to a safer level along this road, it is recommended that the speed limit be reduced to 50km/h. This reduction of speed would greatly reduce the likelihood of serious injury and death occurring from a two-vehicle side impact collision as compared to the existing speed. The lower speeds also allow more time for road users and pedestrians to react, as well as reducing vehicle stopping distances and the likelihood of a vehicle losing control. These factors help lower the number of crashes which are expected to occur.

The section of Livingston Avenue from McTaggart Crescent south to Sulwood Drive could continue as a 60km/h zone, due to its lack of driveway access directly onto the road and expected lower pedestrian volumes. However, as the length of road is short and the painted shoulder is proposed to be implemented along the entirety of Livingston Avenue, leaving the speed at 60km/h for this small section would likely detract from the safety and legibility of the proposed measures.

To implement the speed change, it is recommended that all the existing 60km/h speed signs be replaced with 50km/h speed signs. As part of the works undertaken in 2013 there were a number of repeater signs placed along the road, resulting in a large number of speed signs along the roadway. It is also recommended to install gated speed signs at the start of the 50km/h areas. This would result in the installation of 9 new signs and 2 new posts for a cost of around $8,000.

To encourage drivers to self-enforce the new posted speed limit, it is recommended to reduce the width of each lane along Livingston Avenue to around 3.5m. This could be accomplished through the application of painted shoulders along both sides of the road, which could then be utilised as an informal bicycle lane if desired. It is noted that as these widths are predominantly proposed to be implemented through line marking, widths below 4m would still suitable for busses. It would not be necessary to formalise the bicycle lanes with signage, but the inclusion of “no parking” or other signs may be considered along some sections of the road in the future if it is seen to create conflicts. The cost for the installation of the painted shoulders along the side of the road is expected to be approximately $15,000.

Alternatively, if painted shoulders are not preferred, a painted median could be included to reduce lane width to 4m or less. This treatment would allow for additional pedestrian refuges to be included at footpath crossing locations, providing greater safety with active travel. It would however remove the allowance for on-road cycling. With the exception of the Atkins Street and Vosper Street intersection there are not expected to be strong desire lines for pedestrian crossings and provision of painted shoulders is considered a better outcome.

Pedestrian Facilities

The site investigations identified two (2) key missing links in the pedestrian path network. It is recommended that 790m of pedestrian paths be constructed to complete the following missing links:

- The east side of Livingston Avenue between Sulwood Drive and McTaggart Crescent (north) (approx. 180m), and
- The northwest and west side of Livingston Avenue between Sulwood Drive and Symers Street (east) (approx. 550m).

While there were some worn trails observed along these routes, it is noted that there is no pedestrian crossing on Sulwood Drive at Livingston Avenue and not property frontages along these two links.

It is also recommended to reconstruct pedestrian paths at the following three (3) locations to address the trip hazards presented by the existing uneven paths:

- The south side of Livingston Avenue, approximately 60m east of Oldfield Court,
- The south side of Livingston Avenue, approximately 15m east of Oldfield Court, and
- The southeast side of Livingston Avenue, approximately 1m south of Cutbush Street (north).

These could be improved through maintenance and concrete grinding to reduce the trip hazards.

Along Livingston Avenue, there is a total of 360m of pedestrian paths located at the back of kerb. Ideally, to improve pedestrian amenity and safety, it would be beneficial to reconstruct these pedestrian paths with at least 400mm, preferably 1.0m, separation from the roadway. It is noted however that installation of new path sections and improvement of low-quality path networks would provide greater benefit then the relocation of the existing path. As such, this recommendation is of low priority. The sections of Livingston Avenue with pedestrian paths located at the back of kerb include:

- The southeast and east side of Livingston Avenue between McTaggart Crescent (north) and Atkin Street (approx. 270m length), and
- The north side of Livingston Avenue between Livingston Avenue service road (east) and Livingston Avenue service road (west) (approx. 80m).

The kerb ramps at the following 17 locations have been identified as misaligned to such a degree that reconstruction is recommended:

- McTaggart Crescent (north), at Livingston Avenue,
- McTaggart Crescent (south), at Livingston Avenue,
- Symers Street (east), at Livingston Avenue,
- Symers Street (west), at Livingston Avenue,
- Livingston Avenue, just east of Maxworthy Street (east),
- Livingston Avenue, just west of Maxworthy Street (east),
- Maxworthy Street (east), at Livingston Avenue,
- Livingston Avenue, just west of Oldfield Circuit,
- Livingston Avenue, just north of Cutbush Street (north),
- Livingston Avenue, just south of Cutbush Street (north),
- Cutbush Street (south), at Livingston Avenue,
- Livingston Avenue service road (east), at Livingston Avenue,
- Vosper Street, at Livingston Avenue,
- Vanzetti Crescent, at Livingston Avenue,
- Livingston Avenue, just west of Vanzetti Crescent,
- Maxworthy Street (west), at Livingston Avenue, and
- Livingston Avenue, at Summerland Circuit.

It is expected that the upgrade and repair of the path network and kerb ramps will be undertaken as part of a separate project.

Maintenance of Existing Assets

To ensure the existing traffic management measures are still operating as expected, it is recommended that any existing signage which is faded or damaged be replaced, along with any missing signs. It is also recommended to reinstate all faded linemarking, with a focus on the road centreline and at intersections.

Trimming of established trees and vegetation should also be undertaken where the branches are noted to be obstructing signage, lighting or sight distances. Ongoing maintenance of Territory assets, such as stormwater structures, is also recommended for the length of the road to minimise any risks produced from their operation such as localised flooding.

It is expected that these actions will be undertaken as part of a separate project.

Revised Safe System Assessment

A revised safe system assessment has been undertaken for each of the three identified sections, considering the adoption of the improved intersections of Atkins Street and Vosper Street, reduction of speed limit to 50km/h, narrowing of the traffic lanes through painted shoulders, and the installation of speed cushions, as discussed above.

In general, the key improvements between the initial and revised safe system scores relate to the likelihood of impact to pedestrians and cyclists, and the likelihood and severity of run-off road and head-on crashes.

For pedestrians, the reduction of road width from 10m to 7-8m reduces the crossing time and reduces the likelihood of vehicle impact.

For cyclists, the proposed shoulder present along each edge of the road will allow for greater separation between vehicles and cyclists.

For run-off road, the greater separation between the traffic lane and roadside hazards due to the shoulder, along with the reduced speed due to traffic calming devices will reduce both likelihood and severity of collisions.

For intersections, the reduction of speed along the road corridor and the reduction of intersection size through narrowing of lane widths and removal of slip lanes results in improvements across all categories.

The assessment of the sections of Livingston Avenue which are single carriageway and have direct driveway access have improved the score from 167/448 under existing to a score of 112 / 448. The breakdown of these scores can be seen in Table 4.

The assessment of the sections of Livingston Avenue which are single carriageway and have no driveway access have improved the score from 134/448 under existing to 104 / 448. It is noted that the reduction of lane width and reduction of speed is insufficient to reduce the likelihood of pedestrian crashes in this section. This is due to the existing missing / poor path network but is not critical due to the expected low pedestrian volume. The breakdown of these scores can be seen in Table 5.

The assessment of the sections of Livingston Avenue major priority-controlled intersections improved the score from 172/448 under existing to a score of 108 / 448. The main intersections also expect a reduction in the likelihood of head-on crashes due to the widening of the medians and reduction of speed. The breakdown of these scores can be seen in Table 6.

Table 4 Safe System Matrix – Livingston Avenue Single Carriageway with Driveway Access – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**8 / 64**	**8 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**112 / 448**

Table 5 Safe System Matrix – Livingston Avenue Single Carriageway with no Driveway Access – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	1 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	4 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**8 / 64**	**8 / 64**	**4 / 64**	**16 / 64**	**24 / 64**	**32 / 64**	**104 / 448**

Table 6 Safe System Matrix – Livingston Avenue Major Intersections – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	1 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**4 / 64**	**8 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**108 / 448**

Full details of the safe system assessments are presented as an attachment to this document.

Marconi Crescent

Marconi Crescent is a major collector road that extends approximately 1.4km from Summerland Circuit in the southeast to Boddington Crescent / Drakeford Drive in the northwest. From Summerland Circuit to Harrington Circuit, Marconi Crescent typically comprises a single carriageway of approximately 10.2m width, which supports a single traffic lane in each direction. In this section, local widening and a median island are provided at the Summerland Circuit intersection. The section between Harrington Circuit and Boddington Crescent / Drakeford Drive, has a wider cross-section which typically provides dual carriageways of approximately 7.2m width, each of which support a 1.2m wide unprotected on-road bicycle lane and two (2) 3.0m wide traffic lanes in each direction. Pedestrian refuges are located approximately 65m southeast of the Inkster Street intersection and approximately 80m west of the Sinclair Street intersection, while a Children's Crossing is located approximately 20m east of Sinclair Street, opposite Taylor Primary School. Outside of school hours, the full length of Marconi Crescent is subject to a posted 60km/h speed limit, while during school hours, the section along the frontage of the primary school is subject to a 40km/h School Zone. Strategically, the length of Marconi Crescent is designated as a public transport route. Marconi Crescent is not designated as a heavy vehicle or active travel route.

Traffic Data

Automatic Traffic Counts undertaken in August 2015 and May 2018 identified the traffic demands and speeds at two (2) locations along Marconi Crescent. Figure 10 below presents a summary of the key traffic statistics at the two (2) survey locations. Further details of the traffic data are presented as an attachment to this document.

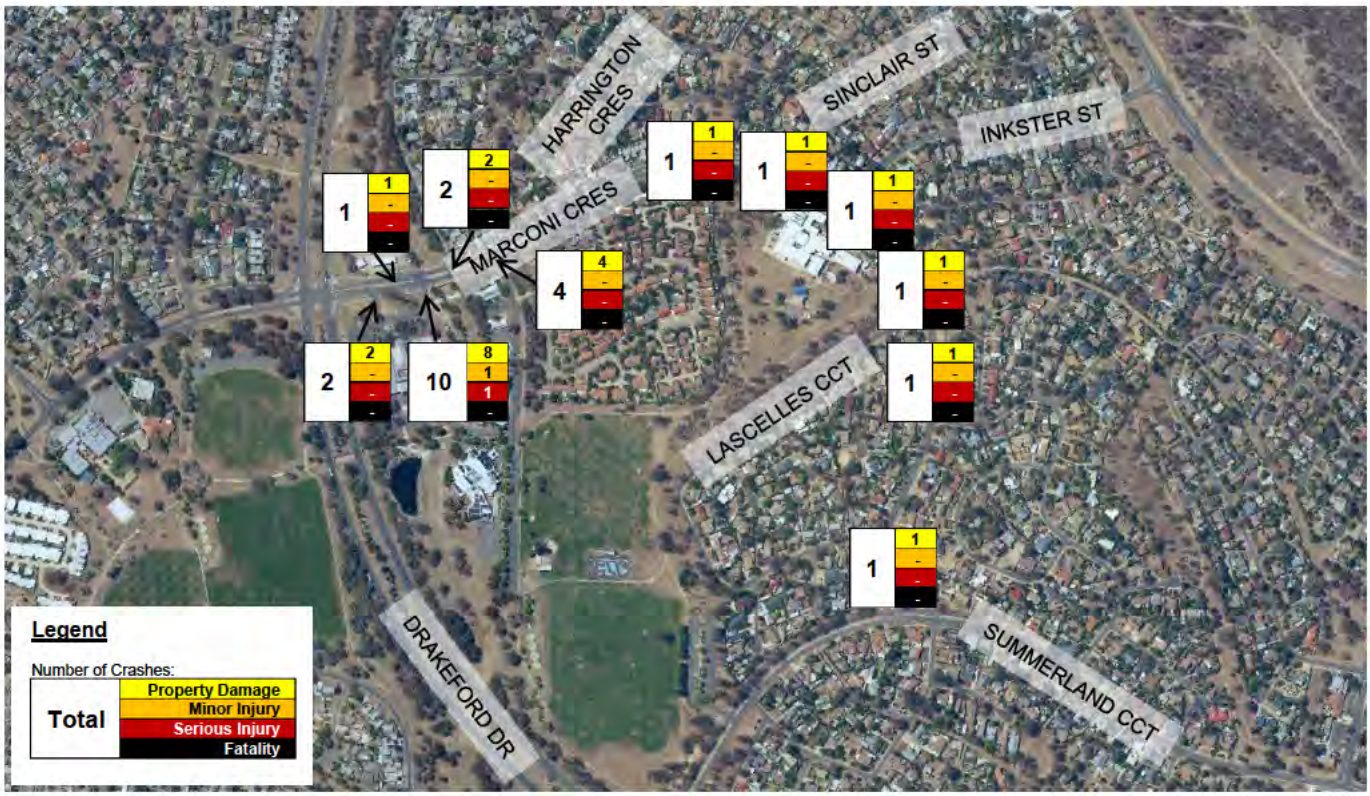
Source: ACTMapi

Figure 10 Traffic Data – Marconi Crescent

These surveys found that Marconi Crescent carried approximately 4,600 vehicles per day to the west of Taylor Primary School, and approximately 2,400 vehicles per day to the east. This included up to 5.4% heavy vehicles. These daily traffic demands and heavy vehicle percentages are considered to be appropriate. Furthermore, it was found that the 85th percentile speed of traffic on Marconi Crescent varied between 59.5km/h and 60.5km/h outside of school zone hours, with up to 350 vehicles per day exceeding the applicable speed limit. During school hours, the 85th percentile speed was found to be 47.4km/h, significantly exceeding the applicable 40km/h speed limit. This is further reflected in the total of 1128 vehicles observed to be exceeding the speed limit. This indicates the presence of a traffic speed issue during school hours.

Crash History

In the five (5) year period to 31 December 2019 a total of 26 crashes were recorded along Marconi Crescent, including one (1) minor injury crash and one (1) serious injury crash. There were no fatal crashes recorded on Marconi Crescent within the analysis period. Figure 11 below presents the spatial distribution of recorded crashes along Marconi Crescent. A crash matrix showing the historical crashes along Marconi Crescent are presented as an attachment to this document.



Source: ACTMapi

Figure 11 Crash History – Marconi Crescent

Ten of the recorded crashes along Marconi Crescent, during the analysis period, occurred at the Marconi Crescent / Primmer Street intersection. Of these crashes five (5) involved vehicles failing to give way to through traffic from the east approach (Marconi Crescent). Three (3) of which (including the serious injury crash) involved vehicles turning right from the south approach (Primmer Street). A further two (2) crashes at the intersection involved vehicles failing to give way to through traffic from the west approach (Marconi Crescent). Ultimately, this indicates that drivers are having difficulty selecting appropriate gaps in the opposing traffic streams. It is noted that no patterns related to time-of-day, visibility, weather or road surface conditions were identified.

Four (4) of the recorded crashes along Marconi Crescent, during the analysis period, occurred at the Kett Street / Marconi Crescent intersection. Three (3) of these crashes involved a vehicle on the south approach (Kett Street) failing to give way to through traffic from the east approach (Marconi Crescent). Ultimately, this indicates that drivers are having difficulty selecting appropriate gaps in the westbound traffic stream. It is noted that in all of these cases the visibility of the vehicle on the south approach was recorded as 'other' indicating that poor sight distances may be a contributing factor in these crashes. No patterns related to time-of-day, weather or road surface conditions were identified.

Findings & Observations

The following sections summarise the findings drawn from the aforementioned data and observations made during the site visits.

Kett Street and Primmer Street Intersections

The aforementioned crash history on Marconi Crescent indicated that drivers on Kett Street and Primmer Street are having difficulty identifying appropriate gaps in the westbound traffic flow along Marconi Crescent. Sight distance at both locations was observed to be sufficient as per Table 3.1 and Table 3.2 of the *AUSTROADS Guide to Road Design Part 4A*, however, glare was observed during the morning peak hour. Given that no patterns were identified in the visibility or time of day data, this is not considered to be a key contributor to this crash history.

During the site visits, high speeds of westbound vehicles were noted. This may have contributed to the crash history at these locations, through both increased crash frequency (drivers have less time to react) and increased severity (higher energy crashes).

Figure 12 below presents photographs of the sight distance to the east along Marconi Crescent from Primmer Street (left image) and Kett Street (right image).

Figure 12 Sight Distance to the east along Marconi Crescent

Children's Crossing

TCCS have advised that concerns have been raised by the community in relation to poor driver compliance with the children's crossing adjacent to Taylor Primary School. This poor compliance was observed during the site visits with numerous drivers (from both directions) failing to stop for children (without adults) waiting to cross the road. This occurred within approximately 20m of the mobile speed camera. Furthermore, it was noted that when drivers did stop for pedestrians, the pedestrians appeared uncomfortable when crossing the road (i.e. rushed / jogged across the road, waved apologetically to the drivers).

As demonstrated by the photographs at Figure 13 below, sight distance at the crossing is unimpeded. While it was noted that buses in the indented bus bay (westbound) did limit sight distance to the east of the crossing, this was not considered to be a significant issue, given the infrequency of bus services (30 minute headways) and the remaining available sight distance.

Figure 13 Marconi Crescent Children's Crossing

Pedestrian Paths and Kerb Ramps

Along the length of Marconi Crescent, the poor condition of pedestrian facilities was noted. This included pedestrian paths blocked by vehicles and vegetation, misaligned kerb ramps, paths located at the back of kerb and crossings requiring pedestrians to select gaps in traffic streams coming from multiple directions.

Misaligned kerb ramps are particularly hazardous for members of the community with low vision, as well as those travelling with wheeled devices including bicycles, prams and wheelchairs, as they are directed into the centre of the intersection, rather than directly towards the complimentary kerb ramp.

Similarly, pedestrian paths located at the back of kerb result in poor pedestrian amenity due to their close proximity to vehicular traffic. This can also be hazardous, due to the limited separation between vehicles and pedestrians.

Figure 14 below presents photographs of the poor condition of pedestrian facilities along Marconi Crescent.

Figure 14 Pedestrian Paths and Kerb Ramps – Marconi Crescent

Irresponsible Driving

Instances of irresponsible driving (e.g. extreme tailgating, unnecessary acceleration and deliberately losing traction) were observed in both the morning and evening peak hours at various locations along Marconi Crescent. While this type of behaviour was not observed to be widespread, the road environment which promotes the unconstrained use of private motor vehicles is considered to contribute to this behaviour.

Street Lighting

LED street lighting was observed to provide suitable lighting conditions, at night, along the length of Marconi Crescent.

Figure 15 below presents photographs of the street lighting conditions along Marconi Crescent.

Figure 15 Street Lighting Conditions – Marconi Crescent

Initial Safe System Assessment

An initial safe system assessment has been undertaken based on the existing conditions along Marconi Crescent. This assessment was separated into three sections, based on the cross section of the road and roadside environment. These sections were as follows:

1. Dual carriageway (between Drakeford Drive and Harrington Circuit)
2. Single carriageway within the school zone (between Harrington Circuit and the northern entrance of Lascelles Circuit)
3. Single carriageway with property access (between northern entrance of Lascelles Circuit and Summerland Circuit)

For the dual carriageway area, the assessment returned a score of 122 / 448. The key elements that increase the safe system score are the moderate vehicle speeds (which exceed the safe system speeds for most crash types), the lack of separated, dedicated cyclist facilities, and the lack of facilities for motorcyclists. Table 7 below presents a breakdown of the safe system assessment scoring for this section of Marconi Crescent under the existing conditions.

Table 7 Safe System Matrix – Marconi Crescent Dual Carriageway – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	0 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**0 / 64**	**18 / 64**	**4 / 64**	**32 / 64**	**24 / 64**	**32 / 64**	**122 / 448**

For the section of Marconi Crescent which is currently a school zone, the assessment returned a score of 164 / 448. The key elements that increase the safe system score are the high volume of pedestrian traffic expected, the moderate vehicle speeds outside of school hours (which exceed the safe system speeds for most crash types), and the lack of facilities for cyclists and motorcyclists. Table 8 below presents a breakdown of the safe system assessment scoring for this section of Marconi Crescent under the existing conditions.

Table 8 Safe System Matrix – Marconi Crescent School Zone – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	3 / 4	2 / 4	2 / 4	3 / 4	4 / 4	4 / 4	-
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**18 / 64**	**12 / 64**	**18 / 64**	**4 / 64**	**48 / 64**	**32 / 64**	**32 / 64**	**164 / 448**

For the section 3 area, the assessment returned a score of 167 / 448. The key elements that increase the safe system score are the moderate vehicle speeds (which exceed the safe system speeds for most crash types) and the lack of facilities for pedestrians, cyclists and motorcyclists.

Table 9 Safe System Matrix – Marconi Crescent Single Carriageway – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	3 / 4	3 / 4	2 / 4	3 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**12 / 64**	**27 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**167 / 448**

Full details of all the safe system assessments are presented as an attachment to this document.

Recommendations

The following sections present the range of treatments recommended to address the issues identified along Marconi Crescent.

Traffic Management

In order to reduce vehicle speeds to a safer level along this Marconi Crescent, it is recommended that the speed limit be reduced to 50km/h for the sections of road which are only a single carriageway. This reduction of speed would greatly reduce the likelihood of serious injury and death occurring from a two-vehicle side impact collision as compared to the existing speed. The lower speeds also allows more time for road users and pedestrians to react, as well as reducing vehicle stopping distances and the likelihood of a vehicle losing control. These factors help lower the number of crashes which are expected to occur.

The sections of the road which are dual carriageway do not require the speed reduction which is recommended for the single carriageway sections. This is due to the lower safe system scores and crash likelihood expected for this section. The presence of the median completely removes the likelihood of head-on collisions, and provides storage for pedestrians crossing the road. The separation between the carriageways is also sufficient to store a turning vehicle at intersections, allowing for staged crossings and reducing the likelihood of crashes. Narrowing of the traffic lanes is also not recommended for these sections as lane widths are already approximately 3.3m wide and possess a one metre wide cycle lane along each carriageway. As such, this measure would have limited impact on the safety of the road.

To implement this change, it is recommended that all the existing 60km/h speed signs be replaced with 50km/h speed signs. It is also recommended to install gated speed signs at the start of the 50km/h areas. This would result in the installation of 5 new signs and 2 new posts costing around $6,000.

To encourage drivers to self-enforce the new posted speed limit, it is recommended to reduce the width of each lane along Marconi Crescent to around 3.5m. This could be accomplished through the application of painted shoulders along both sides of the road, which could then be utilised as an informal bicycle lane if desired. It is noted that as these widths are predominantly proposed to be implemented through line marking, widths below 4m would still suitable for busses.

This would also have the advantage of increasing the buffer distance between the roadway and the pedestrian path along the northern verge between Harrington Circuit and Sinclair Street. It would not be necessary to formalise these as bicycle lanes with signage but the inclusion of “no parking” or other signs may be considered along some sections of the road in future if it is seen to create conflicts. The cost for the painted shoulders along the side of the road is expected to cost approximately $13,000 to install.

Alternatively, if painted shoulders are not preferred, a painted median could be included to reduce lane width to 4m. This treatment would allow for additional pedestrian refuges to be included at footpath crossing locations, providing greater safety with active travel. This method would however remove the allowance for on-road cycling. Apart from the school crossing, the main pedestrian crossing desire lines are serviced by underpasses and thus the painted shoulder is seen to provide a better outcome.

The inclusion of a set of speed cushions just to the south of Lascelles Circuit (North) is also recommended to reduce vehicle speeds along the road. This positioning of the speed humps is still expected to reduce speeds on approach to the school zone and Inkster Street intersection to the north and should also result in speed reductions down to Lascelles Circuit (South).

As a high pedestrian volume and a large number of turning vehicles is expected in this area, reduction of speeds would be beneficial to the safety of both user groups. The cost of installing this measure is expected to be in the magnitude of $15,000.

Improvements to Inkster Street

Due to no vehicle data being provided for Inkster Street, limited assessment has occurred for this road. However, to allow some consistency between Inkster Street and Marconi Crescent, it is recommended to reduce the speed limit of this road down to 50km/h as well. Given the short length of the road, its proximity to the existing school zone, and the presence of driveway access along most of the road, the reduction in speed is expected to have a significant impact on the safety of this street and provide greater consistency throughout the network. This upgrade would require the installation of 3 new signs and one new post, costing around $3,000.

To help enforce this new speed limit, it is recommended that a painted shoulder be adopted for use as on-street parking. As opposed to Marconi Crescent, it is recommended that this shoulder only be located on the southern side of the road. This will create lateral deflection and provide a parking lane along the side of the road where there is direct residential access to allow greater storage space for vehicles. It is estimated that these works will cost approximately $2,000, provided they are completed at the same time as the rest of the Marconi Crescent line marking.

Children’s Crossing

In order to improve driver compliance at the children’s crossing, it is recommended that the children’s crossing be raised onto a platform. This will increase driver awareness of the crossing as well as acting to locally reduce vehicle speeds. This raised platform could also be utilised as an additional speed hump in front of the school, reducing speeds to below 40km/h.

It is noted that as Marconi Crescent is a designated public transport route, the grades of the ramps at the raised crossing will need to be designed to accommodate bus movements. The cost of constructing this crossing to a raised crossing is expected to be in the magnitude of $50,000, including the installation of signage and linemarking. It is assumed that the existing lighting at this location almost directly overhead is acceptable for a children’s crossing and so no additional lighting is recommended.

Another possible recommendation to improve the safety of the children’s crossing is the hiring of a permanent crossing supervisor. A Crossing Supervisor will increase safety at the crossing by controlling both vehicle and pedestrian movements.

Pedestrian Facilities

The kerb ramps at the following nine (9) locations have been identified as misaligned to such a degree that reconstruction is recommended:

- Marconi Crescent, between Harrington Circuit and Primmer Court,
- Harrington Circuit (west), at Marconi Crescent,
- Harrington Circuit (east), at Marconi Crescent,
- Taylor Primary School (west), at Marconi Crescent,
- Sinclair Street, at Marconi Crescent,
- Inkster Street, at Marconi Crescent,
- Taylor Primary School (east), at Marconi Crescent,
- Marconi Crescent, at pedestrian laneway from Lawrence Crescent, and
- Marconi Crescent, at Summerland Circuit.

Along Marconi Crescent, there is a total of 710m of pedestrian paths located at the back of kerb. Ideally, to improve pedestrian amenity and safety, it is recommended to reconstruct these pedestrian paths with at least 400mm, preferably 1.0m, separation from the roadway. It is noted however that installation of new path sections and improvement of low-quality path networks would provide greater benefit then the relocation of the existing path. As such, this recommendation is of low priority. Sections of Marconi Crescent with pedestrian paths located at the back of kerb include:

- The north and northeast side of Marconi Crescent between Harrington Circuit (west) and Sinclair Street (approx. 500m length), and
- The south and southwest side of Marconi Crescent between Taylor Primary School (west) and Taylor Primary School (east) (approx. 210m).

It is expected that if the relocation and upgrade of the existing path network is to occur, it will be undertaken as part of a separate project.

Maintenance of Existing Assets

To ensure the existing traffic management measures are still operating as expected, it is recommended that any existing signage which is faded or damaged be replaced, along with any missing signs. It is also recommended to reinstate all faded linemarking, with a focus on the road centreline and at intersections.

Trimming of established trees and vegetation should also be undertaken where the branches are noted to be obstructing signage, lighting or sight distances. Ongoing maintenance of Territory assets, such as stormwater structures, is also recommended for the length of the road to minimise any risks produced from their operation. It is expected that these actions will be undertaken as part of a separate project.

Revised Safe System Assessment

A revised safe system assessment has been undertaken for each of the three identified sections, considering the adoption of the 50km/h reduced speed limit, the narrowing of the traffic lanes through painted shoulders, installation of speed cushions, and raising of the children's crossing, as discussed above.

For the dual carriageway section, no works are proposed along this section and as such the assessment returned the same score as seen in the existing conditions (122 / 448). As the main areas of safety concern at this intersection are with cyclists and pedestrians, upgrades to the off-road path network and crossing facilities would be required to effectively reduce this score. Table 10 below presents a breakdown of the safe system assessment scoring for this section of Marconi Crescent, under the recommended future conditions.

For the remaining two sections, key improvements between the initial and revised safe system scores relate to the likelihood of impact to pedestrians, cyclists, and run-off road crashes, the likelihood and severity of run-off road crashes, and all three criteria for intersections.

For pedestrians, the reduction of road width from 10m to 7-8m reduces the crossing time and in extension, the likelihood of vehicle impact.

For cyclists, the proposed shoulder present along each edge of the road will allow for greater separation between vehicles and cyclists along the road.

For run-off road, the greater separation between the traffic lane and roadside hazards due to the shoulder, along with the reduced posted speeds will reduce both likelihood and severity of collisions.

For intersections, the reduction of speed along the road corridor and the reduction of intersection size through narrowing of lane widths and removal of slip lanes results in improvements across all categories.

The assessment of the sections of Marconi Crescent which is a school zone improved the score from 164/448 under existing to a score of 104 / 448. It is noted that the raising of the children's crossing and installation of a speed cushion within this section is expected to have a greater increase to pedestrian safety and speed reduction than was observed in the other sections, thus leading to the reduction in pedestrian crash severity. The breakdown of these scores can be seen in Table 11.

The assessment of the sections of Marconi Crescent which is a single carriageway improved the score from 167/448 under existing to a score of 112 / 448. The breakdown of these scores can be seen in Table 12.

Table 10 Safe System Matrix – Marconi Crescent Dual Carriageway – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	0 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**0 / 64**	**18 / 64**	**4 / 64**	**32 / 64**	**24 / 64**	**32 / 64**	**122 / 448**

Table 11 Safe System Matrix – Marconi Crescent School Zone – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	4 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	2 / 4	1 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	2 / 4	2 / 4	2 / 4	1 / 4	3 / 4	4 / 4	4 / 4	-
Product	**8 / 64**	**8 / 64**	**4 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**104 / 448**

Table 12 Safe System Matrix – Marconi Crescent Single Carriageway – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**8 / 64**	**8 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**112 / 448**

Full details of the safe system assessments are presented as an attachment to this document.

Summerland Circuit

Summerland Circuit is a major collector road that extends approximately 2.3km from Drakeford Drive / O'Halloran Circuit (south) in the southeast to Drakeford Drive / O'Halloran Circuit (north) in the northwest. From Vanzetti Crescent to Hutchison Crescent, Summerland Circuit typically comprises a single carriageway of approximately 10.2m width, which supports a single traffic lane in each direction. In this section, pedestrian refuges are provided approximately 25m and 90m east of the Mannheim Street intersection, opposite the Eucalyptus Montessori childcare and pre-school and between two (2) bus stops, respectively. The remainder of Summerland Circuit typically forms dual carriageways, of approximately 7.6m width, separated by a raised median. Each carriageway supports two (2) traffic lanes for the majority of its length. The section of Summerland Circuit between Mason Street and Gallagher Street runs in front of a childcare centre and is subject to a posted 50km/h speed limit, while the remainder of Summerland Circuit is subject to a posted 60km/h speed limit. Strategically, the section of Summerland Circuit from Livingston Avenue to approximately 80m west of Mannheim Street is designated as a local community active travel route. Furthermore, the length of Summerland Circuit between Drakeford Drive / O'Halloran Circuit (south) and Marconi Crescent, is designated as a public transport route. Summerland Circuit is not designated as a heavy vehicle route.

Traffic Data

Automatic Traffic Counts undertaken in August 2017 identified the traffic demands and speeds at two (2) locations along Summerland Circuit. Figure 16 below presents a summary of the key traffic statistics at the two (2) survey locations. Further details of the traffic data are presented as an attachment to this document.

Source: ACTMapi

Figure 16 Traffic Data – Summerland Circuit

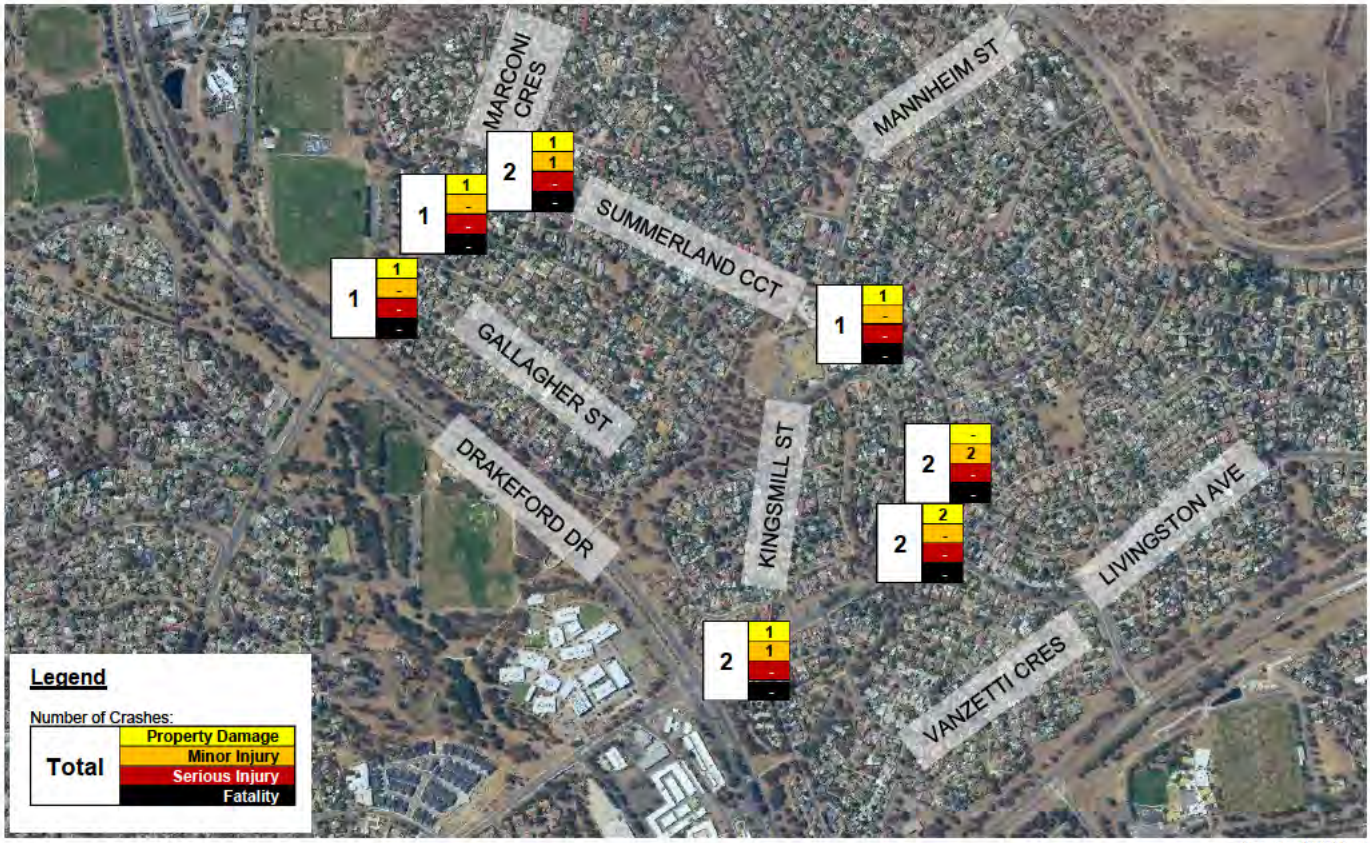
These surveys found that Summerland Circuit carried approximately 2,100-2,500 vehicles per day, including up to 6.9% heavy vehicles. These daily traffic demands, and heavy vehicle percentages are considered to be appropriate, however, the heavy vehicle percentages are noted to be approaching the upper limit for a residential area. It was noted that aerial images from 2017 (the year of the survey) show construction work was still occurring around the childcare centre, which may have increased the heavy vehicle percentage in the surveys. This isn't known for certain as the exact date of construction works is unknown.

Furthermore, it was found that the 85th percentile speed of traffic on Summerland Circuit varied between 61.2km/h and 63.8km/h, with up to 635 vehicles per day exceeding the posted 60km/h speed limit. The 85th percentile speed itself, while greater than the posted speed limit is not considered to be problematic in itself. However, the number of vehicles observed

to be exceeding the speed limit along Summerland Circuit does indicate the presence of a traffic speed issue. Due to the extent of the data and the time which the surveys were taken, it is uncertain what the compliance was with the 50km/h zone and whether the 85th percentile speed was through this section.

Crash History

In the five (5) year period to 31 December 2019 a total of 11 crashes were recorded along Summerland Circuit, including four (4) minor injury crashes. There were no fatal or serious injury crashes recorded on Summerland Circuit within the analysis period. Figure 17 below presents the spatial distribution of recorded crashes along Summerland Circuit. A crash matrix showing the historical crashes along Summerland Circuit are presented as an attachment to this document.



Source: ACTMapi

Figure 17 Crash History – Summerland Circuit

Two (2) of the recorded crashes along Summerland Circuit, during the analysis period, occurred between Drakeford Drive / O'Halloran Circuit (south) and Kingsmill Street. Both of these crashes involved only eastbound vehicles, including one (1) rear-end crash and one (1) side-swipe crash. Ultimately, this indicates that drivers are having difficulty merging from two (2) lanes into one (1) within this section. It is noted that no patterns related to time-of-day, visibility, weather or road surface conditions were identified.

The 2 minor injury crashes between Lee-Steere Crescent and Livingston Avenue were a head on and a single vehicle off carriageway to the left. Introducing a physical item at this location could assist navigating this curved section of the road.

Findings & Observations

The following sections summarise the findings drawn from the aforementioned data and observations made during the site visits.

Unclear Lane Arrangement

The aforementioned crash history indicates that drivers are having difficulty merging from two (2) lanes into one (1) when travelling eastbound on Summerland Circuit between Drakeford Drive and Kingsmill Street. While glare was identified at this location during the morning peak hour, patterns relating to visibility or time-of-day were not identified in the crash data.

During the site visits vehicles were observed travelling two (2) abreast beyond the Kingsmill Street and Vanzetti Crescent intersections. This is likely due to the lack of signage and linemarking delineating the merge and carriageway width which varies from approximately 17m at the end of the median to approximately 13.5m at Vanzetti Crescent.

Figure 18 Unclear Lane Arrangement

Pedestrian Paths and Kerb Ramps

Along the length of Summerland Circuit, the poor condition of pedestrian facilities was noted. This included discontinuous and uneven pedestrian paths, paths blocked by vehicles and vegetation and misaligned kerb ramps.

Figure 19 below presents photographs of the poor condition of pedestrian facilities along Summerland Circuit.

Figure 19 Pedestrian Paths and Kerb Ramps – Summerland Circuit

Water Ponding on Roadway

Water ponding on the roadway was observed at two (2) locations along Summerland Circuit during the evening peak hour during the Wednesday site visit. The westbound traffic lane, just west of Hutchison Crescent and the eastbound traffic lane at the Summerland Circuit before Mannheim Street bus stop, where both observed to have significant ponded water. In both of these locations, vehicles were observed using the opposing traffic lane to avoid the surface water.

Figure 20 below presents photographs of these two (2) locations.

Figure 20 Water Ponding on Roadway

Street Lighting

LED street lighting was observed to provide suitable lighting conditions, at night, along the length of Summerland Circuit.

Figure 21 below presents photographs of the street lighting conditions along Summerland Circuit.

Figure 21 Street Lighting Conditions – Summerland Circuit

Initial Safe System Assessment

An initial safe system assessment has been undertaken based on the existing conditions along Summerland Circuit. This assessment was separated into three sections, based on the cross section of the road and roadside environment. These sections were as follows:

1. Dual carriageway road with property access (between Drakeford Drive to just past Gallagher Street, Drakeford Drive and Kingsmill Street.)

2. Single carriageway road without property access (Between just past Gallagher Street to Kingsmill Street.)

For the areas of Summerland Circuit with a dual carriageway, the assessment returned a score of 128 / 448. The key elements that increase the safe system score are the moderate vehicle speeds (which exceed the safe system speeds for most crash types), as well as the lack of facilities for cyclists and motorcyclists. Table 13 below presents a breakdown of the safe system assessment scoring for this section, under the existing conditions.

Table 13 Safe System Matrix – Summerland Circuit Dual Carriageway – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	0 / 4	2 / 4	3 / 4	2 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**0 / 64**	**18 / 64**	**6 / 64**	**16 / 64**	**32 / 64**	**32 / 64**	**128 / 448**

For the areas of Summerland Circuit with a single carriageway, the assessment returned a score of 176 / 448. The key elements that increase the safe system score are the moderate vehicle speeds along the majority of the road (which exceed the safe system speeds for most crash types), the priority-controlled intersections with many conflict points and the lack of facilities for cyclists and motorcyclists. Table 13 below presents a breakdown of the safe system assessment scoring for this section, under the existing conditions.

Table 14 Safe System Matrix – Summerland Circuit Single Carriageway – Existing Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	3 / 4	4 / 4	2 / 4	3 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**12 / 64**	**36 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**176 / 448**

Full details of the safe system assessments are presented as an attachment to this document.

Recommendations

The following sections present the range of treatments recommended to address the issues identified along Summerland Circuit.

Merge Signage and Linemarking

To provide more clarity to the lane arrangement on Summerland Circuit between Drakeford Drive and Kingsmill Street, it is recommended that installation of 'Form One Lane' signage be included before the road narrows. Installation of a 'Form One Lane' pavement marking, as well as all linemarking surrounding a merge should also be installed at this location. The works associated with this are expected to cost around $8,000, including traffic management costs.

Traffic Management

In order to reduce vehicle speeds to a safer level along this Summerland Circuit, it is recommended that the speed limit be reduced to 50km/h for the sections of road which are a single carriageway. This reduction of speed would greatly reduce the likelihood of serious injury and death occurring from a two-vehicle side impact collision as compared to the existing speed. The lower speeds also allows more time for road users and pedestrians to react, as well as reducing vehicle stopping distances and the likelihood of a vehicle losing control. These factors help lower the number of crashes which are expected to occur.

The sections of the road which are dual carriageway do not have the same risk and so do not require the speed reduction which is recommended for the single carriageway sections. This is due to the lower safe system scores and crash likelihood

expected for this section. The presence of the median removes the likelihood of head-on collisions, and provides storage for pedestrians crossing the road. The separation between the carriageways is also sufficient to store a turning vehicle at intersections, allowing for staged crossings and reducing the likelihood of crashes. Narrowing of the traffic lanes is also not recommended for these sections as lane widths are already approximately 3.5m wide.

To implement this change, it is recommended that all the existing 60km/h speed signs along the single carriageway section would be replaced with 50km/h speed signs. It is also recommended to install gated speed signs at the start of the 50km/h areas. This would result in the installation of 8 new signs and 2 new posts costing around $7,000. No changes to the existing 50km/h speed signs between Gallagher Street and Mason Street would be required.

To encourage drivers to self-enforce this speed limit, it is also recommended to reduce the width of each lane along Summerland Circuit to around 3.5m. It is noted that, given road width reduction is implemented through line marking, that these widths are still suitable for busses. This width reduction could be accomplished through the application of painted shoulders along both sides of the road, which could then be utilised as an informal bicycle lane if desired. It would not be necessary to formalise these bicycle lanes with signage. The cost for installing the painted shoulders along the side of the road is expected to be approximately $21,000.

The key pedestrian crossing points along Summerland Circuit are catered for with underpasses or pedestrian refuges. This reduces the risk to the majority of pedestrian crossings. One location which could benefit from an additional treatment where road crossings occur is the path links and bus stops between Lee-Steere Crescent and Livingston Avenue. A pedestrian refuge is proposed here to assist with crossings. The presence of a refuge would also prevent vehicles from overtaking buses around a blind corner which could result in crashes. The refuge crossing location would be behind each bus stop encouraging pedestrians to cross behind the buses. There are other refuges further along Summerland Circuit which would already impact the continuity for cyclists of a painted shoulder. The transition from painted shoulders to a central refuge creates additional lateral deflection acting as a traffic calming measure. The location is adjacent existing lights and additional lighting is not considered necessary. The cost for installing the painted pedestrian refuge is expected to be approximately $35,000.

It is believed that reduction of lane width, introduction of signage and of an additional pedestrian refuge will be sufficient to encourage drivers to obey the new speed limit along this section. Should this be observed to be insufficient in the future however, the installation of speed cushions at key locations along Summerland Circuit could assist in decreasing speeds to acceptable levels. Possible locations for speed cushions include either side of the childcare, to reduce speeds along the frontage of this property and passing through the Mannheim Street intersection. Speed cushions either side of the Livingston Avenue intersection would also be beneficial for reducing speeds through this intersection.

Improvements to Mannheim Street

As no traffic data is available along Mannheim Street, no assessment of the conditions has been undertaken at this stage. It is however noted that approximately 180m of Mannheim Street from Summerland Circuit is already 50km/h. To improve consistency with the rest of the suburb, it is recommended to reduce the speed along the rest of the road to 50km/h. This would require the installation of 3 new signs and one new post costing around $3,000.

To help enforce the 50km/h speed limit, it is recommended to adopt a painted shoulder for use as on-street parking. As opposed to Summerland Circuit, it is recommended that this shoulder only be located on the southern side of the road. This will create lateral deflection and provide a parking lane along the side of the road where there is direct residential access to allow greater storage space for vehicles. It is estimated that these works will cost approximately $4,000 provided they are completed at the same time as the rest of the Summerland Circuit line marking.

Pedestrian Facilities

The site investigations identified a key missing links in the pedestrian path network. It is recommended that 190m of pedestrian paths be constructed to complete the following missing link:

- The west side of Summerland Circuit between Drakeford Drive and Ferris Street (approx. 190m).

The kerb ramps at the following two (2) locations have been identified as misaligned to such a degree that reconstruction is recommended:

- Summerland Circuit, at pedestrian laneway from Scholl Place, and
- Summerland Circuit, at pedestrian laneway from McCullock Place.

It is expected that the upgrade of the path network will be undertaken as part of a separate project.

Stormwater Drainage

To prevent the ponding of water within the gutters along Summerland Circuit, it is recommended that additional stormwater sumps be constructed at the locations where ponding was noticed to be a problem and at locations where longitudinal grade is noted as being flat or in a sag point. The inclusion of these additional sumps should reduce any localised flooding during storm events. Based on what was found from the site inspection, it is expected that an additional two (2) to three (3) stormwater sumps might be required. It is expected that these actions will be undertaken as part of a separate project.

Maintenance of Existing Assets

To ensure the existing traffic management measures are still operating as expected, it is recommended that any existing signage which is faded or damaged be replaced, along with any missing signs. It is also recommended to reinstate all faded linemarking, with a focus on the road centreline and at intersections.

Trimming of established trees and vegetation should also be undertaken where the branches are noted to be obstructing signage or sight distances. Ongoing maintenance of Territory assets, such as stormwater structures, is also recommended for the length of the road to minimise any risks produced from their operation.

It is expected that these actions will be undertaken as part of a separate project.

Revised Safe System Assessment

A revised safe system assessment has been undertaken, considering the adoption of the 50km/h reduced speed limit, the narrowing of the traffic lanes through painted shoulders, installation of the merge signmarking, as discussed above.

For the dual carriageway section, no works are proposed along this section and as such the assessment returned the same score as seen in the existing conditions (128 / 448). As the main areas of safety concern at this intersection are with cyclists and pedestrians, upgrades to the off-road path network and crossing facilities would be required to effectively reduce this score. Table 15Table 10 below presents a breakdown of the safe system assessment scoring for this section of Summerland Circuit, under the recommended future conditions.

For the single carriageway area, key improvements between the initial and revised safe system scores relate to the likelihood of impact to pedestrians and cyclists, the likelihood and severity of run-off road crashes, and all three criteria for intersections.

For cyclists, the proposed 1.5m wide shoulder present along each edge of the road will allow for greater separation between vehicles and cyclists along the road.

For run-off road, the greater separation between the traffic lane and roadside hazards due to the shoulder, along with the reduced posted speed will reduce both likelihood and severity of collisions.

For intersections, the reduction of posted speed along the roadway along with the reduction of intersection size through narrowing of lane widths results in improvements across all categories.

The assessment of the sections of Summerland Circuit which is a single carriageway improved the score from 176/448 under existing to a score of 116 / 448. Table 16 below presents a breakdown of the safe system assessment scoring for Summerland Circuit, under the recommended future conditions.

Table 15 Safe System Matrix – Summerland Circuit Dual Carriageway – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	2 / 4	2 / 4	-
Likelihood	3 / 4	0 / 4	2 / 4	3 / 4	2 / 4	4 / 4	4 / 4	-
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**24 / 64**	**0 / 64**	**18 / 64**	**6 / 64**	**16 / 64**	**32 / 64**	**32 / 64**	**128 / 448**

Table 16 Safe System Matrix – Summerland Circuit Section 2 – Recommended Future Conditions

Measure	Run-Off Road	Head-On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	-
Likelihood	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	3 / 4	4 / 4	-
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	-
Product	**12 / 64**	**8 / 64**	**12 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**116 / 448**

Full details of the safe system assessments are presented as an attachment to this document.

Potential Staging

Based on the expected costs, timings and disruptions of each of the recommendations for the three roads discussed above, it is advised that the works be broken down into three stages. The proposed staging is as follows:

1. Stage 1 – Signage and line marking along all roads
    - Install a painted shoulder along all roads to reduce lane width;
    - Replace existing speed signs and install new speed signs to change posted speed to 50km/h; and
    - Install merge signage and road markings along Summerland Circuit.
2. Stage 2 – Traffic Calming Measures
    - Installation of speed humps along the roads; and
    - Raising of the children's crossing along Marconi Crescent.
    - Installation of pedestrian refuge along Summerland Circuit between Lee-Steere Crescent and Livingston Avenue.
3. Stage 3 – Civil Works
    - Complete civil works around the intersections of Livingston Avenue with Atkins Street and Vosper Street, including
        - Removal of both left turn slip lanes
        - Narrowing of lanes on approach to the intersection

It is also recommended to review the below activities, as they are expected to further improve safety and amenity of the road and path network. These options are not included within the abovementioned staging as it is understood they will likely be completed as part of separate projects. The additional recommendations are as follows:

- Repair or replace damaged, faded and missing signage;
- Reinstall all faded linemarking along all three roads;
- Trim established trees and vegetation which obscures signage and sight distance or intrudes on footpaths;
- Clear blocked stormwater drainage sumps;
- Hire a crossing supervisor for the children's crossing along Marconi Crescent
- Repair of existing footpath;
- Relocation of footpath back from kerb;
- Realignment of kerb crossings;
- Construction of missing links within the footpath network; and
- Construction of additional stormwater sumps in areas where pooling was noticed or at areas where longitudinal grade is flat or at a sag point.

Conclusions

Calibre Professional Services ('Calibre') have undertaken a series of investigations into the operation of Livingston Avenue, Marconi Crescent and Summerland Circuit in Kambah, to identify any existing safety or operational risks to road users.

The basis of the site investigations along the three (3) roads were the historical crash and traffic count data, along with the observations from site visits conducted on the 18th and 19th August 2020. From this information, the key safety issues noted across all of the sites were as follows:

- Missing links in the existing pedestrian footpath network and sections of uneven pavement;
- Misaligned kerb ramps;
- Sections of existing footpath located directly off the back of kerb; and
- Overly wide (approx. 10m) carriageway resulting in increased driver speeds.

Several site-specific concerns were also noted along each of the roads. Livingston Avenue was noted to have a moderate number of crashes at the intersections with Atkins Street and Vosper Street, predominantly attributed to drivers having difficulty selecting gaps. Confusion over which movements have right-of-way was also observed at these intersections. Discontinuous sections of on-road bicycle lanes were also noted at several locations along Livingston Avenue, highlighting the lack of quality cycling infrastructure within the area.

Along Marconi Crescent, concerns have been raised around poor driver compliance regarding a children's crossing adjacent to Taylor Primary School. Irresponsible driving was also observed infrequently along the length of the road.

Along Summerland Circuit, a site of unclear merging arrangements was noted between Drakeford Drive and Kingsmill Street, where two (2) lanes merged without signage or road markings. Issues with water ponding within the gutters was also observed at several locations along the road, signifying poor drainage and resulting in unsafe driving actions.

To address the observed issues at each of these locations, the following treatment methods are proposed. Based on the costs, impacts and timeframes of these works, a recommended staging has been proposed as is as follows:

1. Stage 1 – Signage and Linemarking along all roads
    - Install painted shoulders along roads (including Inkster St and Mannheim St) to reduce lane width ($55,000)
    - Reduce posted speed to 50km/h by replacing existing signs and installing new gated signs ($27,000)
    - Install merge signage and road markings along Summerland Circuit ($8,000)
2. Stage 2 – Improvements to all main roads
    - Installation of speed cushions along the roads ($55,000)
    - Raising of the children's crossing along Marconi Crescent ($50,000)
    - Installation of the pedestrian refuge ($35,000)
3. Stage 3 – Civil Works
    - Complete civil works around the intersections of Livingston Avenue with Atkins Street and Vosper Street ($230,000)
        - o Removal of both left turn slip lanes
        - o Narrowing of lanes on approach to the intersection

These rates do not include design and assume that the works would be packaged and not undertaken as individual projects.

The proposed location of each of these recommendations can be seen within Attachment 5 of this report. It is noted that within this Masterplan, the orientation of the signposts is indicative of the proposed direction of the sign along the road.

By adopting the recommendations listed within stages 1 to 3, it is expected that the safe systems score for each of the road sections assessed can be improved. This will predominantly be accomplished through the reduction of vehicle speeds and intersection size, as well as improvement of the cyclist provisions along the road.

In addition to the abovementioned recommendations, it is also recommended that the following activities be completed as part of separate projects:

- Maintenance Activities
  - Repair or replace damaged, faded and missing signage;
  - Reinstall all faded linemarking along all three roads;
  - Trim established vegetation which obscures signage and sight distance or intrudes on footpaths
  - Clear blocked stormwater drainage sumps
- Hire a crossing supervisor for the children's crossing along Marconi Crescent
- Repair of existing footpath
- Construction of missing footpath links
- Realignment of existing footpaths away from back of kerb
- Realignment of kerb crossings
- Construction of additional stormwater sumps in areas where pooling was noticed or at areas where longitudinal grade is flat or at a sag point

The completion of these activities would also be expected to improve the safe systems assessment scores if they are undertaken.

Yours sincerely

Calibre Professional Services

[redacted]

[redacted]
Infrastructure Leader

Attachments

1. Traffic Data Summary
2. Crash Matrices
3. Safe System Assessments – Existing Conditions
4. Safe System Assessments – After Proposed Works
5. Proposed Works Masterplan

Location	Year	Daily Traffic Volume			AM Peak Hour					
		NB/EB	SB/WB	Combined	NB/EB	% of Total	SB/WB	% of Total	Combined	% of Total
Livingston Avenue	2018	1,759	1,596	3,355	290	16.5%	87	5.5%	377	11.2%
Maxworthy Street to Symers Street					8am-9am		8am-9am		8am-9am	
Livingston Avenue	2018	1,450	1,539	2,989	196	13.5%	98	6.4%	294	9.8%
Maxworthy Street to Vanzetti Crescent					8am-9am		8am-9am		8am-9am	
Livingston Avenue	2018	1,608	1,581	3,189	263	16.4%	98	6.2%	361	11.3%
McTaggart Crescent to Sulwood Drive					8am-9am		8am-9am		8am-9am	
Marconi Crescent (School Hours)	2018	1,171	1,222	2,393	233	19.9%	193	15.8%	426	17.8%
Harrington Circuit to Sinclair Street					8am-9am		8am-9am		8am-9am	
Marconi Crescent (Outside School Hours)	2018	1,123	1,089	2,212	134	11.9%	120	11.0%	254	11.5%
Harrington Circuit to Sinclair Street					7am-8am		7am-8am		7am-8am	
Marconi Crescent	2015	1,229	1,175	2,404	167	13.6%	83	7.1%	250	10.4%
Hutchison Crescent to Lascelles Circuit					8am-9am		8am-9am		8am-9am	
Summerland Circuit	2017	1,018	1,041	2,059	112	11.0%	110	10.6%	222	10.8%
Gallagher Street to Hutchison Crescent					8am-9am		8am-9am		8am-9am	
Summerland Circuit	2017	1,234	1,312	2,546	96	7.8%	163	12.4%	259	10.2%
Lee Steere Crescent to Livingston Avenue					8am-9am		8am-9am		8am-9am	

Location	PM Peak Hour						85th %ile Speed [km/h]			# of Motorists > Speed Limit		
	NB/EB	% of Total	SB/WB	% of Total	Combined	% of Total	NB/EB	SB/WB	Combined	NB/EB	SB/WB	Combined
Livingston Avenue	140	8.0%	211	13.2%	351	10.5%	64.1	61.2	62.7	590	330	920
Maxworthy Street to Symers Street	5pm-6pm		5pm-6pm		5pm-6pm							
Livingston Avenue	129	8.9%	189	12.3%	318	10.6%	57.2	59.4	58.3	114	212	326
Maxworthy Street to Vanzetti Crescent	5pm-6pm		5pm-6pm		5pm-6pm							
Livingston Avenue	109	6.8%	235	14.9%	344	10.8%	64.4	60.8	62.6	571	301	872
McTaggart Crescent to Sulwood Drive	5pm-6pm		5pm-6pm		5pm-6pm							
Marconi Crescent (School Hours)	182	15.5%	251	20.5%	433	18.1%	45.8	48.8	47.4	387.0	741.0	1128.0
Harrington Circuit to Sinclair Street	3pm-4pm		3pm-4pm		3pm-4pm							
Marconi Crescent (Outside School Hours)	229	20.4%	264	24.2%	493	22.3%	61.4	59.6	60.5	171.0	130.0	301.0
Harrington Circuit to Sinclair Street	5pm-6pm		5pm-6pm		5pm-6pm							
Marconi Crescent	115	9.4%	147	12.5%	262	10.9%	58.3	60.8	59.5	137	213	350
Hutchison Crescent to Lascelles Circuit	5pm-6pm		5pm-6pm		5pm-6pm							
Summerland Circuit	104	10.2%	106	10.2%	192	9.3%	65.1	62.6	63.8	366	269	635
Gallagher Street to Hutchison Crescent	3pm-4pm		5pm-6pm		5pm-6pm							
Summerland Circuit	133	10.8%	111	8.5%	244	9.6%	61.7	60.8	61.2	264	226	490
Lee Steere Crescent to Livingston Avenue	5pm-6pm		5pm-6pm		5pm-6pm							

Location	% of Motorists > Speed Limit			% Heavy Vehicles		
	NB/EB	SB/WB	Combined	NB/EB	SB/WB	Combined
Livingston Avenue	33.5%	20.7%	27.4%	5.6%	5.1%	5.4%
Maxworthy Street to Symers Street						
Livingston Avenue	7.9%	13.8%	10.9%	2.1%	2.3%	2.2%
Maxworthy Street to Vanzetti Crescent						
Livingston Avenue	35.5%	19.0%	27.3%	3.4%	1.5%	2.5%
McTaggart Crescent to Sulwood Drive						
Marconi Crescent (School Hours)	33.0%	60.6%	47.1%	3.5%	3.5%	3.5%
Harrington Circuit to Sinclair Street						
Marconi Crescent (Outside School Hours)	15.2%	11.9%	13.6%	2.4%	2.3%	2.3%
Harrington Circuit to Sinclair Street						
Marconi Crescent	11.1%	18.1%	14.6%	4.8%	6.0%	5.4%
Hutchison Crescent to Lascelles Circuit						
Summerland Circuit	36.0%	25.8%	30.8%	7.6%	6.2%	6.9%
Gallagher Street to Hutchison Crescent						
Summerland Circuit	21.4%	17.2%	19.2%	9.0%	2.0%	5.4%
Lee Steere Crescent to Livingston Avenue						

Livingston Ave

		RUM Code																		
		102	104	105	107	201	202	301	302	303	305	307	308	506	704	706	707	803	804	Total
Year	2015						3			1				2						6
	2016							1		1							1			3
	2017	1		1			2									1				5
	2018	1	2							1						1				5
	2019						2													2
Total		2	2	1	0	0	7	1	0	3	0	0	0	2	0	2	1	0	0	21
Day	Weekday	1	2	1			7	1		2				2		2	1			19
	Weekend	1								1										2
Time	AM Peak						2	1								1				4
	Interpeak		2							1				1						4
	PM Peak	2		1			1			1										5
	Nighttime						4			1				1		1	1			8
Severity	Property Damage	2	1				6	1		3				2		2	1			18
	Minor Injury		1	1			1													3
	Serious Injury																			0
Surfa	Good dry surface	1	2	1			5	1		3				1		2				16
	Wet surface	1					2							1			1			5
Weather	Fine	1	2	1			5	1		3				1		2				16
	Cloudy or Overcast																			0
	Light rain	1					1							1			1			4
	Heavy rain						1													1

Marconi Cres

		RUM Code																		
		102	104	105	107	201	202	301	302	303	305	307	308	506	704	706	707	803	804	Total
Year	2015		1		1		1					1	1					1		6
	2016		2							1	1							2		6
	2017	1	1		1				1						1					5
	2018	1					1	1			1									4
	2019		2		1		1			1										5
Total		2	6	0	3	0	3	1	1	2	2	1	1	0	1	0	0	3	0	26
Day	Weekday	2	5		3		1	1	1	1	2	1						2		19
	Weekend		1				2			1			1		1			1		7
Time	AM Peak				1			1												2
	Interpeak		4		2		1			1			1		1					10
	PM Peak	1	1				2		1	1										6
	Nighttime	1	1								2	1						3		8
Severity	Property Damage	2	5		3		2	1	1	2	2	1	1		1			3		24
	Minor Injury						1													1
	Serious Injury		1																	1
Surfa	Good dry surface	2	6		3		3	1	1	2	2	1	1		1			2		25
	Wet surface																	1		1
Weather	Fine	2	6		3		3	1	1	2	2		1		1			2		24
	Cloudy or Overcast											1								1
	Light rain																	1		1
	Heavy rain																			0

Summerland Cct

		RUM Code																		Total
		102	104	105	107	201	202	301	302	303	305	307	308	506	704	706	707	803	804	
Year	2015		1								1				2				1	5
	2016									1		1								2
	2017					1														1
	2018				1			1												2
	2019														1					1
Total		0	1	0	1	1	0	1	0	1	1	1	0	0	3	0	0	0	1	11
Day	Weekday		1			1		1		1	1	1			3				1	10
	Weekend				1															1
Time	AM Peak				1			1		1		1			1				1	6
	Interpeak																			0
	PM Peak														1					1
	Nighttime		1			1					1				1					4
Severity	Property Damage		1		1					1	1	1			2					7
	Minor Injury					1		1							1				1	4
	Serious Injury																			0
Surfa	Good dry surface				1	1		1			1	1			3				1	9
	Wet surface		1							1										2
Weather	Fine				1	1		1			1	1			3				1	9
	Cloudy or Overcast																			0
	Light rain		1							1										2
	Heavy rain																			0

Score	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	AADT Length of road segment	AADT Length of road segment	AADT at each approach Intersection size	AADT Length of road segment	AADT Pedestrian numbers Crossing width Length of road segment	AADT Cyclist numbers Length of road segment	AADT Motorcyclist numbers Length of road segment
Crash Likelihood	Speed Geometry Shoulders Barriers Offset to hazards Guidance and delineation	Geometry Separation Guidance and delineation Speed	Type of control Speed Design Visibility Conflict points	Speed Sight distance Number of lanes Surface friction	Design of facilities Separation Number of conflicting directions Speed	Design of facilities Separation Speed	Design of facilities Separation Speed
Crash Severity	Speed Roadside features and design (e.g. flexible barriers)	Speed	Impact Angles Speed	Speed	Speed	Speed	Speed

Pillar	Prompts	Comment
Road User	Are road users likely to be alert and compliant? Are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours)? What is the likelihood of driver fatigue? Can enforcement of these issues be conducted safety? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities, motorcyclist route), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	Driver fatigue unlikely however road users may be complacent due to their familiarity with the area. Primarily a short distance through traffic route which also provides access to adjacent properties.
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Is this route used by recreational motorcyclists? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network? Can enforcement of these issues be conducted safety? Has vehicle breakdown been catered for?	Route not expected to be used by recreational motorcyclists (except for travelling to recreational routes elsewhere).

Post-Crash Care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury (e.g. congestion, access stopping space)? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there reliable information available via radio, VMS etc. Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	No significant barriers to emergency services identified.

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

Assessment Information

Location	Livingston Avenue, Kambah
Option	Existing Conditions - Single carriageway road with no property access
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Livingston Avenue. Historical crashes predominantly occurred at intersections, but were minimal in number within this section of the road. Traffic data collected in May 2018 indicated that 85th percentile speeds marginally exceeded the posted 60km/h speed limit, the number of vehicles observed to exceed the speed limit was the primary concern.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Livingston Avenue is classified as a major collector road and as such balances both movement and access functions. The road is wide enough to support on-street parking but as there are no property accesses off this section of Livingston Avenue, it is not often utilised. Livingston Avenue carries up to approx. 3,200vpd along this section.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	Livingston Avenue is subject ot a posted speed limit of 60km/h. This exceeds the safe system speed for all except head-on crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Livingston Avenue is not designated for any active travel activities between Atkins Street and Sulwood Drive. There are few facilities provided for vulnerable road users, with no specific facilities for pedestrians to cross the road and only a discontinuous unseparated on-road bicycle lane provided near the intersection of Atkins Street for cyclists wishing to use the roadway.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.2% cyclists, 0.7% motorcyclists, 93.7% light vehicles and 2.5% heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	1 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	2 / 4	2 / 4	2 / 4	4 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	24 / 64	8 / 64	18 / 64	4 / 64	16 / 64	32 / 64	32 / 64	134 / 448

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) Large intersections for the road classification	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be low (<10 pedestrians / day) due to minimal pedestrian paths along the road and limited direct access from dwellings. Short section of road (~350m)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day) Short section of road (~350m)
	2	2	3	2	1	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~5m wide lanes No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking adequate	Curved geometry No separation provided Signage and linemarking adequate Moderate posted speed limit (60km/h)	2 priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility adequate.	Moderate posted speed limit (60km/h) Generally adequate sight distances Single traffic lane in each direction Average surface friction assumed	Minimal pedestrian crossing facilities Pedestrian paths are either not present or are not seperated from kerb. Approx. 10m crossing width Traffic from multiple directions Moderate posted speed limits (60km/h)	No on-road bicycle lanes No off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	3	2	2	2	4	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Assessment Information

Location	Livingston Avenue, Kambah
Option	Existing Conditions - Single carriageway road with direct property access
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Livingston Avenue. Historical crashes predominantly occurred at intersections, but were minimal in number within this section of the road. Traffic data collected in May 2018 indicated that 85th percentile speeds marginally exceeded the posted 60km/h speed limit, the number of vehicles observed to exceed the speed limit was the primary concern.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Livingston Avenue is classified as a major collector road and as such balances both movement and access functions. On-street parking is generally permitted adjacent to driveways. Livingston Avenue carries up to approx. 3,400vpd, including approximately 36 public transport services in each direction between Summerland Circuit and Vosper Street.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	Livingston Avenue is subject ot a posted speed limit of 60km/h. This exceeds the safe system speed for all except head-on crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Livingston Avenue is designated as a local off-road active travel route between Summerland Circuit and Vosper Street. There are few facilities provided for vulnerable road users, with no specific facilities for pedestrians to cross the road and only a discontinuous unseparated on-road bicycle lane provided on the approach to the major intersections, for cyclists wishing to use the roadway.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.2% cyclists, 0.7% motorcyclists, 93.7% light vehicles and 5.4% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	3 / 4	3 / 4	2 / 4	3 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**24 / 64**	**12 / 64**	**27 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**167 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd) Short lengths of the road (~650m lengths)	Moderate AADT (~3,000vpd) Short lengths of the road (~650m lengths)	Moderate AADT (~3,000vpd) Wide intersections for the road classification	Moderate AADT (~3,000vpd) Short lengths of the road (~650m lengths)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Circuitious pedestrian crossing paths (25-30m) Short lengths of the road (~650m lengths)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day) Short lengths of the road (~650m lengths)
	2	2	3	2	3	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~5m wide lane with minimal shoulder No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking adequate	Curved geometry No separation provided Signage and linemarking adequate Moderate posted speed limit (60km/h)	9 priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Driveway access directly onto the road Visibility ranges from poor to adequate.	Moderate posted speed limit (60km/h) Generally adequate sight distances Single traffic lane in each direction Average surface friction assumed	Minimal pedestrian crossing facilities Pedestrian paths generally set-back ~3.5m from road. Noted there are sections of path with no seperation from kerb. Approx. 10m crossing width Traffic from multiple directions Moderate posted speed limits (60km/h)	Discontinuous and unprotected on-road bicycle lanes No off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	3	3	3	2	3	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Assessment Information

Location	Livingston Avenue, Kambah
Option	Existing Conditions - Major priority-controlled intersections
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Livingston Avenue. Historical crashes predominantly occurred at the major intersections with Vosper Street and Atkins Street, and involve drivers failing to give way to opposing traffic. Traffic data collected in May 2018 indicated that 85th percentile speeds marginally exceeded the posted 60km/h speed limit on approach to these intersections, with the number of vehicles observed to exceed the speed limit being the primary concern.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Livingston Avenue is classified as a major collector road and as such balances both movement and access functions. Livingston Avenue carries up to approx. 3,400vpd, including approximately 36 public transport services in each direction between Summerland Circuit and Vosper Street. The busses are noted to turn into and out of Vosper Street.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	This part of Livingston Avenue is subject ot a posted speed limit of 60km/h. This exceeds the safe system speed for all except head-on crash types. The speed limit along Vosper Street is also 60km/h, while Atkins Street has a speed limit of 50km/h.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Livingston Avenue is designated as a local off-road active travel route between Summerland Circuit and Vosper Street, with the route continuing down Vosper Street. There are few facilities provided for vulnerable road users, with no specific facilities for pedestrians to cross the road and only a discontinuous unseparated on-road bicycle lane provided for cyclists wishing to use the roadway.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.2% cyclists, 0.7% motorcyclists, 93.7% light vehicles and 5.4% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	2 / 4	4 / 4	2 / 4	3 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**24 / 64**	**8 / 64**	**36 / 64**	**4 / 64**	**36 / 64**	**32 / 64**	**32 / 64**	**172 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd) Moderate sized intersections for the road classification	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Circuitious pedestrian crossing paths (25-30m)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day)
	2	2	3	2	3	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~5.0m wide lanes No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking adequate	Curved geometry Narrow medians provided to separate traffic Signage and linemarking adequate Moderate posted speed limit (60km/h)	Two (2) priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (60km/h) Designs do not limit number of conflict points Visibility adequate Crash history at both intersections	Moderate posted speed limit (60km/h) Adequate sight distances Single traffic lane in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities provided at each intersection. Pedestrian paths set-back ~3.5m from road, with some sections directly against the kerb. ~5m crossing width with narrow pedestrian storage in the median Traffic from multiple directions Moderate posted speed limits (60km/h)	Discontinuous and unprotected on-road bicycle lanes No off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	3	2	4	2	3	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at the intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Assessment Information

Location	Marconi Crescent, Kambah
Option	Existing Conditions - Dual Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Marconi Crescent. Historical crashes predominantly occurred at intersections, and involve drivers failing to give way to opposing traffic. Traffic data collected in May 2018 indicated that the 85th percentile speeds within the dual carriageway areas were just over the posted speed limit of 60km/h, and the number of vehicles exceeding this are low compared to the daily traffic.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Marconi Crescent is classified as a major collector road and as such balances both movement and access functions. The road is seperated into two carriageways, with narrow on-road cycle lanes provided along the majority of this section. Marconi Crescent carries up to approx. 4,600vpd, including approximately 36 public transport services in each direction between Drakeford Drive and Summerland Circuit.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	The dual carriageway sections of Marconi Crescent are subject to a posted speed limit of 60km/h. The 60km/h speed limit exceeds the safe system speed for all except head-on crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Marconi Crescent is not designated as an active travel route. There are several non-priority pedestrian crossing facilities located along the length of the road, generally located in the vicnity of key pedestrian destinations and desire lines. There are narrow on-road cycle lanes provided along the majority of this section.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.1% cyclists, 0.5% motorcyclists, 96.4% light vehicles and 3% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	0 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**0 / 64**	**18 / 64**	**4 / 64**	**32 / 64**	**24 / 64**	**32 / 64**	**122 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Large intersections for the road classification	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Pedestrian volume expected to be high (>100 pedestrians / day) Generally direct crossing paths (10-15m) Short section of road (~500m)	Moderate AADT (~4,600vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~4,600vpd) Moderate motorcycle volume (~12 motorcycles / day) Short section of road (~500m)
	2	2	3	2	4	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~3.3m wide lane width, two lanes and a ~1m painted shoulder in each direction. No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	3.5-4.5m wide median between the two carriageways Signage and linemarking adequate Moderate posted speed limit (60km/h)	Five (5) priority-controlled 'T'-intersections, one (1) priority-controlled cross-intersection Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Median wide enough to store vehicles, allows for potential staged crossing Visibility ranges from poor to adequate	Moderate posted speed limit (60km/h) Generally adequate sight distances Two lanes in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities Some pedestrian paths set-back ~3.5m from road, others located on back of kerb Approx. 6m crossing width with adequate storage room within medians. Traffic from multiple directions Moderate posted speed limits (60km/h)	Generally ~1m wide shoulder painted as an on-road cycle lane along southern edge of road. ~1m wide shoulder on the north can be used as informal on-road cycle lane. Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	2	0	2	2	2	3	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road but separated by painted shoulders. Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	3	1	4	4	4

Assessment Information

Location	Marconi Crescent, Kambah
Option	Existing Conditions - School Zone
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Marconi Crescent. Historical crashes predominantly occurred at intersections, but only occured irregularly within this section. Traffic data collected in May 2018 indicated that the 85th percentile vehicle speed through the school zone in excess of the posted speed of 40km/h during school hours, with the number of vehicles observed to exceed the school zone speed limit being a large portion of daily traffic. Driver compliance was far higher outside of school hours, with the 85th percentile speed only just exceeding the posted speed limit of 60km/h.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Marconi Crescent is classified as a major collector road and as such balances both movement and access functions. Marconi Crescent carries up to approx. 4,600vpd, including approximately 36 public transport services in each direction between Drakeford Drive and Summerland Circuit.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	Marconi Crescent along the frontage of Taylor Primary School is generally subject to a posted speed limit of 60km/h, but is subject to a posted 40km/h school zone speed limit during school hours. The 60km/h speed limit exceeds the safe system speed for all except head-on crash types, while the 40km/h school zone speed limit exceeds the safe system speed for all except head-on and intersection type crashes.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Marconi Crescent is not designated as an active travel route. There are several on-road pedestrian crossing facilities located near the school, including an at-grwade childrens crossing. There are also seperated underpass crossings either side of the school. There are no specific facilities for cyclists.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.1% cyclists, 0.5% motorcyclists, 96.4% light vehicles and 3% heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	3 / 4	2 / 4	2 / 4	3 / 4	4 / 4	4 / 4	
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**18 / 64**	**12 / 64**	**18 / 64**	**4 / 64**	**48 / 64**	**32 / 64**	**32 / 64**	**164 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Large intersections for the road classification	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Pedestrian volume expected to be high (>100 pedestrians / day) Generally direct crossing paths (10-15m) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~4,600vpd) Moderate motorcycle volume (~12 motorcycles / day) Short length of road (~0.5km)
	2	2	3	2	4	2	2
Crash Likelihood	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Curved geometry Generally ~5m wide lane No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking adequate	Curved geometry No separation provided in places Signage and linemarking generally adequate Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours	Two (2) priority-controlled 'T'-intersections Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours. Generally low speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges from poor to adequate	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Generally adequate sight distances Single traffic lane in each direction for much of road. Average surface friction assumed	A priority school crossing and several non-priority pedestrian crossing facilities along the road. Two pedestrian underpasses which connect the school to the wider path network. Some pedestrian paths set-back ~3.5m from road, others located on back of kerb Approx. 10m crossing width Traffic from multiple directions low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours	No on-road bicycle lanes or off-road shared path low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours	Motorcyclists share lanes with general traffic low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours
	3	3	2	2	3	4	4

Crash Severity	low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes) outside of school crashes	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Low posted speed limit (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes) outside of school hours	low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	low posted speed limits (40km/h) during school hours, moderate posted speed limit (60km/h) outside of school hours Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	3	1	4	4	4

Assessment Information

Location	Marconi Crescent, Kambah
Option	Existing Conditions - Single Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Marconi Crescent. Historical crashes predominantly occurred at intersections, and involve drivers failing to give way to opposing traffic. Traffic data collected in May 2018 indicated that the 85th percentile vehicle speeds fall just below the posted speed limit of 60km/h, with the proportion of drivers exceeding the speed limit also being low.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Marconi Crescent is classified as a major collector road and as such balances both movement and access functions. On-street parking is generally permitted adjacent to driveway access. Marconi Crescent carries up to approx. 2,400vpd along this section, including approximately 36 public transport services in each direction between Drakeford Drive and Summerland Circuit.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	Marconi Crescent is subject to a posted speed limit of 60km/h. The 60km/h speed limit exceeds the safe system speed for all except head-on crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Marconi Crescent is not designated as an active travel route. There areseveral pedestrian crossing facilities located along the length of the road, generally located in the vicnity of key pedestrian destinations and desire lines. There are no specific facilities for cyclists.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in May 2018 indicated that the vehicle composistion is approximately 0.1% cyclists, 0.5% motorcyclists, 94% light vehicles and 5.4% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	3 / 4	3 / 4	2 / 4	3 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	24 / 64	12 / 64	27 / 64	4 / 64	36 / 64	32 / 64	32 / 64	167 / 448

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Large intersections for the road classification	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Pedestrian volume expected to be moderate (50-100 pedestrians / day) Generally direct crossing paths (10-15m) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,400vpd) Moderate motorcycle volume (~12 motorcycles / day) Moderate length of road (~0.8km)
	2	2	3	2	3	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~5m wide lane No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	Curved geometry No separation provided Signage and linemarking generally adequate Moderate posted speed limit (60km/h)	Three (3) priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges from poor to adequate	Moderate posted speed limit (60km/h) Generally adequate sight distances Single traffic lane in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities Some pedestrian paths set-back ~3.5m from road, others located on back of kerb Approx. 10m crossing width Traffic from multiple directions Moderate posted speed limits (60km/h)	No on-road bicycle lanes or off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	3	3	3	2	3	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Assessment Information

Location	Summerland Circuit, Kambah
Option	Existing Conditions - Dual Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Summerland Circuit. Historical crashes occurred both at intersections and midblock locations, but infrequently and in low volumes. Traffic data collected in May 2018 indicated that the 85th percentile speeds of vehicles exceeded the posted speed limit of 60km/h, with the number of vehicles exceeding this speed noted to be significant.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Summerland Circuit is classified as a major collector road and as such balances both movement and access functions. On-street parking is generally permitted along the length of Summerland Circuit. Summerland Circuit carries up to approx. 2,500vpd, including approximately 36 public transport services in each direction between Drakeford Drive (south) and Marconi Crescent.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	The dual carriageway section of Summerland Circuit is subject to a posted speed limit of 60km/h. The 60km/h speed limit exceeds the safe system speed for all except head-on crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Summerland Circuit is not designatedfor any active travel route within this section. There are several pedestrian crossing facilities located along the length of the road. There are no specific facilities for cyclists.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in August 2017 indicated that the vehicle composistion is approximately 0.1% cyclists, 0.4% motorcyclists, 92.6% light vehicles and 6.9% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	0 / 4	2 / 4	3 / 4	2 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**24 / 64**	**0 / 64**	**18 / 64**	**6 / 64**	**16 / 64**	**32 / 64**	**32 / 64**	**128 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Large intersections for the road classification	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Generally direct crossing paths (10-15m) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,500vpd) Moderate motorcycle volume (~12 motorcycles / day) Short length of road (~0.7km)
	2	2	3	2	2	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~3.5m wide lane width, two lanes in each direction No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	3.5-4.5m wide median between the two carriageways Signage and linemarking adequate Moderate posted speed limit (60km/h)	3 priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), generally moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges generally adequate Median generally wide enough to store vehicles, allows for potential staged crossing	Moderate posted speed limit (60km/h) Generally adequate sight distances Two lanes in each direction in parts Average surface friction assumed	Some non-priority pedestrian crossing facilities Pedestrian paths generally set-back ~3.5m from road Approx. 7m crossing width with adequate storage room within the medians Traffic from multiple directions Moderate posted speed limits (60km/h)	No on-road bicycle lanes or off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	3	0	2	3	2	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Assessment Information

Location	Summerland Circuit, Kambah
Option	Existing Conditions - Single Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Assessment Context

Prompt	Comment
What is the reason for the **project**? Is there a specific crash type risk? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	TCCS has received a number of public enquiries regarding high vehicle speeds and road safety on Summerland Circuit. Historical crashes occurred both at intersections and midblock locations. Traffic data collected in May 2018 indicated that the number of vehicles observed to exceed the posted speed limit was the primary concern.
What is the **function** of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	Summerland Circuit is classified as a major collector road and as such balances both movement and access functions. On-street parking is generally permitted adjacent to driveway accesses. Summerland Circuit carries up to approx. 2,500vpd, including approximately 36 public transport services in each direction between Drakeford Drive (south) and Marconi Crescent.
What is the **speed** environment? What is the current speed limit? Has it changed recently? Is it similar to other roads of this type? How does it compare to Safe System speeds? What is the acceptability of lowering the speed limit at this location?	Summerland Circuit is subject to a posted speed limit of 60km/h along the majority of its length. The 60km/h speed limit exceeds the safe system speed for all except head-on crash types. A small section of Summerland Circuit between Gallagher Street and Mason Street is signposted at 50km/h. The 50km/h speed limit exceeds the safe system speed for all crash types except head-on crashes and intersection crash types.
What **road users** are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	Summerland Circuit is designated as a local community active travel route between Livingston Avenue and Mannheim Street. There are several pedestrian crossing facilities located along the length of the road. There are no specific facilities for cyclists.
What is the **vehicle** composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	Traffic data collected in August 2017 indicated that the vehicle composistion is approximately 0.1% cyclists, 0.4% motorcyclists, 94.1% light vehicles and 5.4% heavy vehicles heavy vehicles.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	3 / 4	3 / 4	4 / 4	2 / 4	3 / 4	4 / 4	4 / 4	
Severity	4 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	24 / 64	12 / 64	36 / 64	4 / 64	36 / 64	32 / 64	32 / 64	176 / 448

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Large intersections for the road classification	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Pedestrian volume expected to be moderate (50-100 pedestrians / day) Generally direct crossing paths (10-15m) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,500vpd) Moderate motorcycle volume (~12 motorcycles / day) Moderate length of road (~1.7km)
	2	2	3	2	3	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) for majority of road. Curved geometry Generally ~3.5m wide lane No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	Curved geometry No separation provided in places Signage and linemarking generally adequate Moderate posted speed limit (60km/h) for majority of road.	10 priority-controlled 'T'-intersections Moderate posted speed limit (60km/h) for majority of road, generally moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges generally adequate	Moderate posted speed limit (60km/h) for majority of road. Generally adequate sight distances Single traffic lane in each direction for much of road Average surface friction assumed	Some non-priority pedestrian crossing facilities Pedestrian paths generally set-back ~3.5m from road ~10m crossing width Traffic from multiple directions Moderate posted speed limits (60km/h) for majority of road.	No on-road bicycle lanes or off-road shared path. Wide painted shoulders serve as unnofficial on-road cycle lanes for most of the length of the road. Moderate posted speed limits (60km/h) for majority of road.	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h) for majority of road.
	3	3	4	2	3	4	4
Crash Severity	Moderate posted speed limit (60km/h) for majority of road. Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) for majority of road. Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) for majority of road. Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) for majority of road. Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) for majority of road. Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) for majority of road. Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) for majority of road. Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	4	2	3	1	4	4	4

Score	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	AADT Length of road segment	AADT Length of road segment	AADT at each approach Intersection size	AADT Length of road segment	AADT Pedestrian numbers Crossing width Length of road segment	AADT Cyclist numbers Length of road segment	AADT Motorcyclist numbers Length of road segment
Crash Likelihood	Speed Geometry Shoulders Barriers Offset to hazards Guidance and delineation	Geometry Separation Guidance and delineation Speed	Type of control Speed Design Visibility Conflict points	Speed Sight distance Number of lanes Surface friction	Design of facilities Separation Number of conflicting directions Speed	Design of facilities Separation Speed	Design of facilities Separation Speed
Crash Severity	Speed Roadside features and design (e.g. flexible barriers)	Speed	Impact Angles Speed	Speed	Speed	Speed	Speed

Pillar	Prompts	Comment
Road User	Are road users likely to be alert and compliant? Are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours)? What is the likelihood of driver fatigue? Can enforcement of these issues be conducted safety? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities, motorcyclist route), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	Driver fatigue unlikely however road users may be complacent due to their familiarity with the area. Primarily a short distance through traffic route which also provides access to adjacent properties.
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Is this route used by recreational motorcyclists? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network? Can enforcement of these issues be conducted safety? Has vehicle breakdown been catered for?	Route not expected to be used by recreational motorcyclists (except for travelling to recreational routes elsewhere).

Post-Crash Care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury (e.g. congestion, access stopping space)? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there reliable information available via radio, VMS etc. Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	No significant barriers to emergency services identified.

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

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Livingston Avenue, Kambah
Option	Single Carriageway with no Property Access Conditions - Improvements & traffic speeds reduced to 50km/hr
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Installation of speed cushions on approaches to the intersections of Vosper Street and Atkins Street

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	1 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	4 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**8 / 64**	**8 / 64**	**4 / 64**	**16 / 64**	**24 / 64**	**32 / 64**	**104 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) moderate intersection sizes for the road classification	Moderate AADT (~3,000vpd) Short section of road (~350m)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be low (<10 pedestrians / day) due to minimal pedestrian paths along the road and limited direct access from dwellings. Short section of road (~350m)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day) Short section of road (~350m)
	2	2	2	2	1	2	2
Crash Likelihood	Moderate posted speed limit (50km/h) Curved geometry Generally ~4.0m lane with an additional 1m wide painted shoulder on the road. No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) but separated from vehicles by wide painted shoulders Signage and linemarking adequate	Curved geometry No separation provided Signage and linemarking adequate Moderate posted speed limit (50km/h)	Two (2) priority-controlled 'T'-intersections Moderate posted speed limit (50km/h), moderate speed limits on intersecting roads (50km/h) Designs do not limit number of conflict points Visibility adequate	Moderate posted speed limit (50km/h) Adequate sight distances Single traffic lane in each direction Average surface friction assumed	Minimal pedestrian crossing facilities Pedestrian paths are either not present or are not seperated from kerb. Approx. 8m crossing width Traffic from multiple directions Moderate posted speed limits (50km/h)	Wide painted shoulders along road can serve as a continuous unprotected on-road bicycle lanes No off-road shared path Moderate posted speed limits (50km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (50km/h)
	2	2	2	2	4	3	4
Crash Severity	Moderate posted speed limit (50km/h) Non-frangible trees and streetlight poles offset from traffic lanes but still near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (50km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (50km/h) Impact speeds likely to equal the Safe System Speed at high risk locations (50km/h for side impact crashes)	Moderate posted speed limits (50km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	2	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Livingston Avenue, Kambah
Option	Single Carriageway with Property Access Conditions - Improvements & traffic speeds reduced to 50km/hr
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Installation of speed cushions on approaches to the intersections of Vosper Street and Atkins Street

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	12 / 64	8 / 64	8 / 64	4 / 64	24 / 64	24 / 64	32 / 64	112 / 448

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd) Moderate length of road (~1.6km)	Moderate AADT (~3,000vpd) Moderate length of road (~1.6km)	Moderate AADT (~3,000vpd) Moderate sized intersections for the road classification	Moderate AADT (~3,000vpd) Moderate length of road (~1.6km)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Circuitious pedestrian crossing paths (25-30m) Moderate length of road (~1.6km)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day) Moderate length of road (~1.6km)
	2	2	2	2	3	2	2
Crash Likelihood	Moderate posted speed limit (50km/h) Curved geometry Generally ~3.5.0m wide lanes with an additional wide painted shoulder on the road. No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) but separated from vehicles by wide painted shoulders Signage and linemarking adequate	Curved geometry No separation provided Signage and linemarking adequate Moderate posted speed limit (50km/h)	Nine (9) priority-controlled 'T'-intersections Moderate posted speed limit (50km/h), moderate speed limits on intersecting roads (50km/h) Designs do not limit number of conflict points Driveway access directly onto the road Visibility ranges from poor to adequate	Moderate posted speed limit (50km/h) Adequate sight distances Single traffic lane in each direction Average surface friction assumed	Minimal pedestrian crossing facilities. Pedestrian paths set-back ~3.5m from road. No sections of path directly against the kerb. Approx. 8m crossing width Traffic from multiple directions Moderate posted speed limits (50km/h)	Wide painted shoulders along road can serve as a continuous unprotected on-road bicycle lanes No off-road shared path Moderate posted speed limits (50km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (50km/h)
	2	2	2	2	2	3	4
Crash Severity	Moderate posted speed limit (50km/h) Non-frangible trees and streetlight poles offset from traffic lanes but still near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (50km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (50km/h) through major intersections Impact speeds likely to equal the Safe System Speed at high risk locations (50km/h for side impact crashes)	Moderate posted speed limits (50km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	2	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Livingston Avenue, Kambah
Option	Major Priority-Controlled Intersections - Conditions with Improvements & traffic speeds reduced to 50km/hr
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Civil works at the intersections of Vosper Street and Atkins Street to remove left turn slip-lanes.
Treatment 4	Installation of speed cushions on approaches to the intersections of Vosper Street and Atkins Street.

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	1 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**4 / 64**	**8 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**108 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd) Reduced sized intersections	Moderate AADT (~3,000vpd)	Moderate AADT (~3,000vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Circuitious pedestrian crossing paths (25-30m)	Moderate AADT (~3,000vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~3,000vpd) Moderate motorcycle volume (~12 motorcycles / day)
	2	2	2	2	3	2	2
Crash Likelihood	Moderate posted speed limit (50km/h) Curved geometry Generally ~4.0m wide lanes with an additional wide painted shoulder on the road. No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) but separated from vehicles by wide painted shoulders Signage and linemarking adequate. Traffic calming achieved through nearby speed cushions	Curved geometry Medians provided to separate traffic Signage and linemarking adequate Moderate posted speed limit (50km/h) enforced by speed cushions	Two (2) priority-controlled 'T'-intersections Moderate posted speed limit (50km/h) enforced by speed cushions, generally moderate speed limits on intersecting roads (50km/h) Designs do not limit number of conflict points Visibility adequate	Moderate posted speed limit (50km/h) Adequate sight distances Single traffic lane in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities provided at Atkins St intersections. Pedestrian paths set-back ~3.5m from road, with some sections directly against the kerb. Approx. 3.5m crossing width with pedestrian storage allowed for in the median Traffic from multiple directions Moderate posted speed limits (50km/h)	Wide painted shoulders along road can serve as a continuous unprotected on-road bicycle lanes No off-road shared path Moderate posted speed limits (50km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (50km/h)
	2	1	2	2	2	3	4

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Crash Severity	Moderate posted speed limit (50km/h) Non-frangible trees and streetlight poles offset from traffic lanes but still near road. Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes).	Moderate posted speed limit (50km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (50km/h) but reduced speeds (50km/h) through major intersections Impact speeds likely to equal the Safe System Speed at high risk locations (50km/h for side impact crashes)	Moderate posted speed limits (50km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	2	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Marconi Crescent, Kambah
Option	Future Conditions with Improvements - Dual Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

No treatments considered for this section of the road due to existing performance and road layout

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	3 / 4	2 / 4	4 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	0 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**0 / 64**	**18 / 64**	**4 / 64**	**32 / 64**	**24 / 64**	**32 / 64**	**122 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Large intersections for the road classification	Moderate AADT (~4,600vpd) Short section of road (~500m)	Moderate AADT (~4,600vpd) Pedestrian volume expected to be high (>100 pedestrians / day) Generally direct crossing paths (10-15m) Short section of road (~500m)	Moderate AADT (~4,600vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~4,600vpd) Moderate motorcycle volume (~12 motorcycles / day) Short section of road (~500m)
	2	2	3	2	4	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~3.3m wide lane width, two lanes and a ~1m painted shoulder in each direction. No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	3.5-4.5m wide median between the two carriageways Signage and linemarking adequate Moderate posted speed limit (60km/h)	Five (5) priority-controlled 'T'-intersections, one (1) priority-controlled cross-intersection Moderate posted speed limit (60km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Median wide enough to store vehicles, allows for potential staged crossing Visibility ranges from poor to adequate	Moderate posted speed limit (60km/h) Generally adequate sight distances Two lanes in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities Some pedestrian paths set-back ~3.5m from road, others located on back of kerb Approx. 6m crossing width with adequate storage room within medians. Traffic from multiple directions Moderate posted speed limits (60km/h)	Generally ~1m wide shoulder painted as an on-road cycle lane along southern edge of road. ~1m wide shoulder on the north can be used as informal on-road cycle lane. Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	2	0	2	2	2	3	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road but separated by painted shoulders. Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	3	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Marconi Crescent, Kambah
Option	Future Conditions with Improvements - School Zone
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h outside of school hours
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Installation of speed cushions on the approach to the school from the south
Treatment 4	Upgrade of the existing children's crossing to a raised crossing
Treatment 5	Reduction of speed limit to 50km/h along Inkster Street

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	4 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	1 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	2 / 4	2 / 4	2 / 4	1 / 4	3 / 4	4 / 4	4 / 4	
Product	8 / 64	8 / 64	4 / 64	4 / 64	24 / 64	24 / 64	32 / 64	104 / 448

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Moderate sized intersections for the road classification	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Pedestrian volume expected to be high (>100 pedestrians / day) Generally direct crossing paths (10-15m) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~4,600vpd) Moderate motorcycle volume (~12 motorcycles / day) Short length of road (~0.5km)
	2	2	2	2	4	2	2
Crash Likelihood	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Curved geometry Generally ~3.5m wide lane with painted shoulders No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking adequate	Curved geometry No separation provided in places Signage and linemarking adequate Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours. Raised school crossing and speed cushion used to slow traffic	Two (2) priority-controlled 'T'-intersections Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours. low speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges from poor to adequate Raised school crossing and speed cushion used to slow traffic	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Generally adequate sight distances Single traffic lane in each direction for much of road. Average surface friction assumed	A priority raised school crossing and several non-priority pedestrian crossing facilities along the road. Two pedestrian underpasses which connect the school to the wider path network. Some pedestrian paths set-back ~3.5m from road, others located on back of kerb Approx. 7m crossing width Traffic from multiple directions low posted speed limits (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours	Painted shoulders along road can serve as a continuous unprotected on-road bicycle lanes No off-road shared path Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours	Motorcyclists share lanes with general traffic Low posted speed limit (40km/h)
	2	2	1	2	2	3	4

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Moderate sized intersections for the road classification	Moderate AADT (~4,600vpd) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Pedestrian volume expected to be high (>100 pedestrians / day) Generally direct crossing paths (10-15m) Short length of road (~0.5km)	Moderate AADT (~4,600vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~4,600vpd) Moderate motorcycle volume (~12 motorcycles / day) Short length of road (~0.5km)
	2	2	2	2	4	2	2
Crash Severity	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes) outside of school hours	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Impact speeds likely to equal the Safe System Speed (50km/h for side impact crashes) outside of school hours	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Approach speeds exceed the Safe System Speed (20-30km/h for pedestrian crashes) in both periods. Vehicle speeds over the raised children's crossing are likely to be around 20km/h and below the Safe Systems Speed.	Low posted speed limit (40km/h) during school hours, moderate posted speed limit (50km/h) outside of school hours Approach speeds exceed the Safe System Speed (20-30km/h for cyclist crashes)	Low posted speed limit (40km/h) Approach speeds exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	2	2	2	1	3	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Marconi Crescent, Kambah
Option	Future Conditions with Improvements - Single Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Installation of speed cushion just south of Lascelles Street (North)
Treatment 5	Reduction of speed limit to 50km/h along Inkster Street
Treatment 5	Reduction of lane width through linemarking along Inkster Street

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**8 / 64**	**8 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**112 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Moderate sized intersections for the road classification	Moderate AADT (~2,400vpd) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Pedestrian volume expected to be moderate (50-100 pedestrians / day) Generally direct crossing paths (10-15m) Moderate length of road (~0.8km)	Moderate AADT (~2,400vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,400vpd) Moderate motorcycle volume (~12 motorcycles / day) Moderate length of road (~0.8km)
	2	2	2	2	3	2	2
Crash Likelihood	Moderate posted speed limit (50km/h) Curved geometry Generally ~3.5m wide lane with wide painted shoulder No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) but seperated from traffic by wide painted shoulder. Signage and linemarking adequate.	Curved geometry No separation provided Signage and linemarking adequate Moderate posted speed limit (50km/h).	Three (3) priority-controlled 'T'-intersections Moderate posted speed limit (50km/h), moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility adequate	Moderate posted speed limit (50km/h) Generally adequate sight distances Single traffic lane in each direction Average surface friction assumed	Some non-priority pedestrian crossing facilities ome pedestrian paths set-back ~3.5m from road, others located on back of kerb ~8m crossing width Traffic from multiple directions Moderate posted speed limit (50km/h)	No formal on-road bicycle lanes. Wide painted shoulders serve as unnofficial on-road cycle lanes for the length of the road. No off-road shared path Moderate posted speed limit (50km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limit (50km/h)
	2	2	2	2	2	3	4
Crash Severity	Moderate posted speed limit (50km/h) Non-frangible trees and streetlight poles located near road but separated from vehicles by wide shoulder Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes).	Moderate posted speed limit (50km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes). Traffic calming speed cushions	High impact angles likely at all intersections Moderate posted speed limit (50km/h) Impact speeds likely to be equal the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limit (50km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limit (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limit (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limit (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	2	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Summerland Circuit, Kambah
Option	Future Conditions with Improvements - Dual Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

No treatments considered for this section of the road due to existing performance and road layout

Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	3 / 4	3 / 4	2 / 4	4 / 4	4 / 4	
Severity	3 / 4	2 / 4	3 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**8 / 64**	**18 / 64**	**6 / 64**	**16 / 64**	**32 / 64**	**32 / 64**	**124 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Large intersections for the road classification	Moderate AADT (~2,500vpd) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Pedestrian volume expected to be moderate (10-50 pedestrians / day) Generally direct crossing paths (10-15m) Short length of road (~0.7km)	Moderate AADT (~2,500vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,500vpd) Moderate motorcycle volume (~12 motorcycles / day) Short length of road (~0.7km)
	2	2	2	2	2	2	2
Crash Likelihood	Moderate posted speed limit (60km/h) Curved geometry Generally ~3.5m wide lane width, two lanes in each direction No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) Signage and linemarking generally adequate	3.5-4.5m wide median between the two carriageways Signage and linemarking adequate Moderate posted speed limit (60km/h)	3 priority-controlled 'T'-intersections Moderate posted speed limit (60km/h), generally moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges generally adequate Median generally wide enough to store vehicles, allows for potential staged crossing	Moderate posted speed limit (60km/h) Generally adequate sight distances Two lanes in each direction in parts Average surface friction assumed	Some non-priority pedestrian crossing facilities Pedestrian paths generally set-back ~3.5m from road Approx. 7m crossing width with adequate storage room within the medians Traffic from multiple directions Moderate posted speed limits (60km/h)	No on-road bicycle lanes or off-road shared path Moderate posted speed limits (60km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	2	2	3	3	2	4	4
Crash Severity	Moderate posted speed limit (60km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (60km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (60km/h) Impact speeds likely to exceed the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (60km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (60km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	3	1	4	4	4

Safe System Assessment - With Recommended Treatments
Summary

Assessment Information

Location	Summerland Circuit, Kambah
Option	Future Conditions with Improvements - Single Carriageway
Date	Monday, October 19, 2020
Assessor	[redacted]

Recommended Treatments Considered

Treatment 1	Reduction of posted speed to 50km/h
Treatment 2	Reduction of lane width through linemarking
Treatment 3	Installation of signposting and linemarking for merge lane between Drakeford Drive and Kingsmill Street
Treatment 5	Reduction of speed limit to 50km/h along the full length of Mannheim Street
Treatment 5	Reduction of lane width through linemarking along Mannheim Street

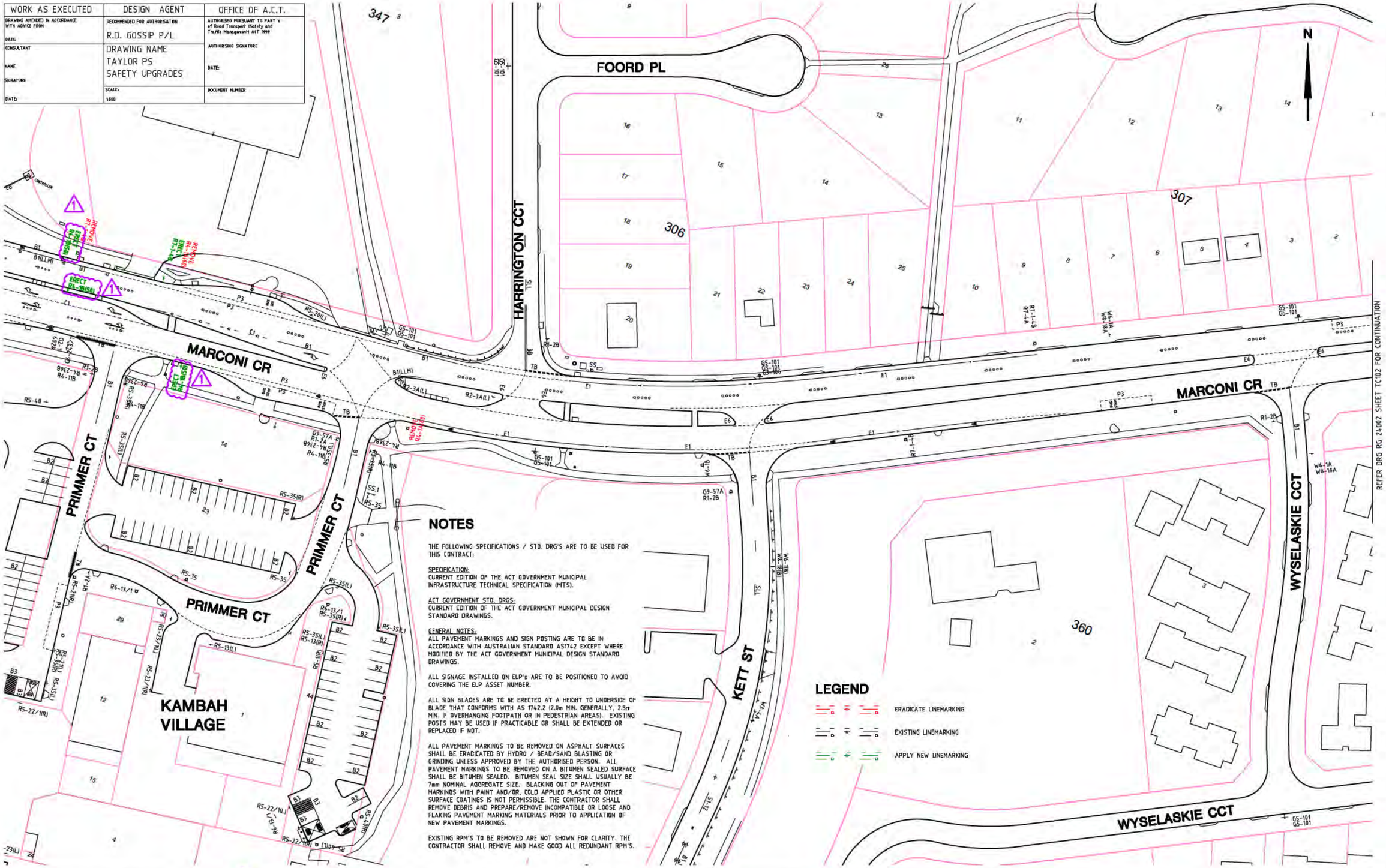
Safe System Matrix (lower is better)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	
Exposure	2 / 4	2 / 4	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	
Likelihood	2 / 4	2 / 4	3 / 4	2 / 4	2 / 4	3 / 4	4 / 4	
Severity	3 / 4	2 / 4	2 / 4	1 / 4	4 / 4	4 / 4	4 / 4	
Product	**12 / 64**	**8 / 64**	**12 / 64**	**4 / 64**	**24 / 64**	**24 / 64**	**32 / 64**	**116 / 448**

Category	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Road User Exposure	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Reasonably sized intersections for the road classification	Moderate AADT (~2,500vpd) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Pedestrian volume expected to be moderate (50-100 pedestrians / day) Generally direct crossing paths (10-15m) Moderate length of road (~1.7km)	Moderate AADT (~2,500vpd) Cyclist volume assumed to be moderate (10-50 cyclists / day)	Moderate AADT (~2,500vpd) Moderate motorcycle volume (~12 motorcycles / day) Moderate length of road (~1.7km)
	2	2	2	2	3	2	2
Crash Likelihood	Moderate posted speed limit (50km/h) Curved geometry Generally ~3.5m wide lane with painted median No crash barriers Trees and streetlight poles located close to kerb (~1.5-2.0m) but seperated from traffic by a painted shoulder Signage and linemarking adequate.	Curved geometry No separation provided in places Signage and linemarking generally adequate Moderate posted speed limit (50km/h)	10 priority-controlled 'T'-intersections Moderate posted speed limit (50km/h), generally moderate speed limits on intersecting roads (50km/h) Intersection designs do not limit number of conflict points Visibility ranges generally adequate.	Moderate posted speed limit (60km/h) Generally adequate sight distances Single traffic lane in each direction for much of road. Average surface friction assumed	Some non-priority pedestrian crossing facilities Pedestrian paths set-back ~3.5m from road. ~7m crossing width Traffic from multiple directions Moderate posted speed limits (50km/h)	No formal on-road bicycle lanes, but the painted shoulders act as a unofficial on-road bicycle lane. No off-road shared path alongside the road Moderate posted speed limits (50km/h)	Motorcyclists share lanes with general traffic Moderate posted speed limits (60km/h)
	2	2	3	2	2	3	4
Crash Severity	Moderate posted speed limit (50km/h) Non-frangible trees and streetlight poles located near road Vehicle speed likely to exceed the Safe System Speed (30-40km/h for tree/pole crashes)	Moderate posted speed limit (50km/h) Vehicle speeds likely to be less than Safe System Speed (70km/h for head-on crashes)	High impact angles likely at all intersections Moderate posted speed limit (50km/h) Impact speeds likely to equal the Safe System Speed (50km/h for side impact crashes)	Moderate posted speed limits (50km/h) Vehicle speeds unlikely to result in FSI for vehicles in same direction crashes	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for pedestrian crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for cyclist crashes)	Moderate posted speed limits (50km/h) Approach speeds significantly exceed the Safe System Speed (20-30km/h for motorcyclist crashes)
	3	2	2	1	4	4	4


Marconi Crescent, Summerland Circuit, Livingston Avenue Safe Systems Infrastructure Assessment – Design Option
Legend
Lane width reduction (painted shoulders)
Wide shoulder (parking lane one side)
Intersection safety upgrades
Raised crossing
Speed cushion
Formalise signage and line marking
Pedestrian refuge island
50km/hr signage
Marconi Cres
Drakeford Dr
Sinclair St
Inkster St
Jamieson Cres
Sulwood Dr
Bissenberger Cres
Mannheim Cres
MacKay Cres
Gallagher St
Lee-Steere Cres
Bellingham Cres
Kingsmill St
McDermott St
Vanzetti Cres
Athllon Dr
Makworthy St
Broadhurst St
McTaggart Cres
Longmore Cres
Ryan Cres
Darke St
REFUGE ISLAND
FORM 1 LANE
ACT Government and City Services www.tccs.act.gov.au
20/10/20 Note: Locations of treatment shown on the map are indicative only

WORK AS EXECUTED	DESIGN AGENT	OFFICE OF A.C.T.
DRAWING AMENDED IN ACCORDANCE WITH ADVICE FROM DATE:	RECOMMENDED FOR AUTHORISATION R.D. GOSSIP P/L	AUTHORISED PURSUANT TO PART V of Road Transport (Safety and Traffic Management) ACT 1999 AUTHORISING SIGNATURE
CONSULTANT NAME SIGNATURE DATE:	DRAWING NAME TAYLOR PS SAFETY UPGRADES	DATE:
	SCALE: 1:500	DOCUMENT NUMBER:



NOTES

THE FOLLOWING SPECIFICATIONS / STD. DRG'S ARE TO BE USED FOR THIS CONTRACT:

SPECIFICATION:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL INFRASTRUCTURE TECHNICAL SPECIFICATION (MITS).

ACT GOVERNMENT STD. DRGS:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL DESIGN STANDARD DRAWINGS.

GENERAL NOTES:
ALL PAVEMENT MARKINGS AND SIGN POSTING ARE TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARD AS1742 EXCEPT WHERE MODIFIED BY THE ACT GOVERNMENT MUNICIPAL DESIGN STANDARD DRAWINGS.

ALL SIGNAGE INSTALLED ON ELP's ARE TO BE POSITIONED TO AVOID COVERING THE ELP ASSET NUMBER.

ALL SIGN BLADES ARE TO BE ERECTED AT A HEIGHT TO UNDERSIDE OF BLADE THAT CONFORMS WITH AS 1742.2 (2.0m MIN. GENERALLY, 2.5m MIN. IF OVERHANGING FOOTPATH OR IN PEDESTRIAN AREAS). EXISTING POSTS MAY BE USED IF PRACTICABLE OR SHALL BE EXTENDED OR REPLACED IF NOT.

ALL PAVEMENT MARKINGS TO BE REMOVED ON ASPHALT SURFACES SHALL BE ERADICATED BY HYDRO / BEAD/SAND BLASTING OR GRINDING UNLESS APPROVED BY THE AUTHORISED PERSON. ALL PAVEMENT MARKINGS TO BE REMOVED ON A BITUMEN SEALED SURFACE SHALL BE BITUMEN SEALED. BITUMEN SEAL SIZE SHALL USUALLY BE 7mm NOMINAL AGGREGATE SIZE. BLACKING OUT OF PAVEMENT MARKINGS WITH PAINT AND/OR, COLD APPLIED PLASTIC OR OTHER SURFACE COATINGS IS NOT PERMISSIBLE. THE CONTRACTOR SHALL REMOVE DEBRIS AND PREPARE/REMOVE INCOMPATIBLE OR LOOSE AND FLAKING PAVEMENT MARKING MATERIALS PRIOR TO APPLICATION OF NEW PAVEMENT MARKINGS.

EXISTING RPM'S TO BE REMOVED ARE NOT SHOWN FOR CLARITY. THE CONTRACTOR SHALL REMOVE AND MAKE GOOD ALL REDUNDANT RPM'S.

LEGEND

- ERADICATE LINEMARKING
- EXISTING LINEMARKING
- APPLY NEW LINEMARKING

SIGN SCHEDULE

DESCRIPTION		HAND	SIZE	NO. OF.
SIGNS TO BE ERECTED				
R4-1	SPEED RESTRICTION (50)	-	B	3
R7-1-4	BICYCLE LANE	-	B	1
SIGNS TO BE REMOVED				
R4-1	SPEED RESTRICTION (60)	-	A	2
R7-1-4	BICYCLE LANE	-	B	1

AMENDMENTS

AMENDMENT	APPROVAL	DATE
1 ISSUED FOR CONSTRUCTION. SPEED RESTRICTION (50) CHANGED TO B SIZE	[redacted]	07/08/24

DRAWING STAGE - LATEST DATE INDICATES DRAWING STATUS

Conceptual Design: --/--/--	Final Sketch Plan: 23/02/24	Final Design: 05/04/24
For tendering purposes only: 30/05/24	Issued for construction: 07/08/24	W.A.E.: --/--/--

Scale: 0m 10m 20m 30m 40m
SCALE: A1 1:500, A3 1:1000

Design Agent: R.D. Gossip Pty Ltd Consulting Engineers, Unit 126, 12 Provan Street, Campbell ACT 2612, Ph 02 6251 6819

Designed by [redacted] | Drawn by [redacted] | Checked by [redacted] | Approved by [redacted]

Client: Project Officer: Justin Curry — ACT Government

Project: SCHOOL SAFETY CONSTRUCTION WORKS

Date: 07/08/24

Drawing Title: TAYLOR PS, KAMBAH TRAFFIC CONTROL DEVICE PLAN - 1 OF 4

Drg. No.	Sheet	Revision
RG 24002	TC101	1

WORK AS EXECUTED	DESIGN AGENT	OFFICE OF A.C.T.
DRAWING AMENDED IN ACCORDANCE WITH ADVICE FROM DATE:	RECOMMENDED FOR AUTHORISATION R.D. GOSSIP P/L	AUTHORISED PURSUANT TO PART V of Road Transport (Safety and Traffic Management) ACT 1999 AUTHORISING SIGNATURE
CONSULTANT NAME SIGNATURE	DRAWING NAME TAYLOR PS SAFETY UPGRADES	DATE:
DATE:	SCALE: 1:500	DOCUMENT NUMBER:

NOTES

THE FOLLOWING SPECIFICATIONS / STD. DRG'S ARE TO BE USED FOR THIS CONTRACT:

SPECIFICATION:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL INFRASTRUCTURE TECHNICAL SPECIFICATION (MITS).

ACT GOVERNMENT STD. DRGS:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL DESIGN STANDARD DRAWINGS.

GENERAL NOTES:
ALL PAVEMENT MARKINGS AND SIGN POSTING ARE TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARD AS1742 EXCEPT WHERE MODIFIED BY THE ACT GOVERNMENT MUNICIPAL DESIGN STANDARD DRAWINGS.

ALL SIGNAGE INSTALLED ON ELP'S ARE TO BE POSITIONED TO AVOID COVERING THE ELP ASSET NUMBER.

ALL SIGN BLADES ARE TO BE ERECTED AT A HEIGHT TO UNDERSIDE OF BLADE THAT CONFORMS WITH AS 1742.2 (2.0m MIN. GENERALLY, 2.5m MIN. IF OVERHANGING FOOTPATH OR IN PEDESTRIAN AREAS). EXISTING POSTS MAY BE USED IF PRACTICABLE OR SHALL BE EXTENDED OR REPLACED IF NOT.

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EXISTING RPM'S TO BE REMOVED ARE NOT SHOWN FOR CLARITY. THE CONTRACTOR SHALL REMOVE AND MAKE GOOD ALL REDUNDANT RPM'S.

HARRINGTON CCT
HALLETT PLACE
SINCLAIR ST
MARCONI CR
INKSTER ST
TAYLOR PRIMARY SCHOOL
314
315
361
362
REFER DRG RG 24002 SHEET TC101 FOR CONTINUATION
REFER DRG RG 24002 SHEET TC103 FOR CONTINUATION

LEGEND

ERADICATE LINEMARKING
EXISTING LINEMARKING
APPLY NEW LINEMARKING

SIGN SCHEDULE

	DESCRIPTION	HAND	SIZE	NO. OF.
SIGNS TO BE ERECTED				
R3-1	PEDESTRIAN CROSSING	–	A	4
R4-1	SPEED RESTRICTION (50)	–	B	1
R5-20	BUS ZONE	L	–	1
R5-35	NO STOPPING	L,D,R	–	2,1,1
W3-4	HUMP AHEAD	–	A	2
W3-4-3	HUMP AHEAD	L	A	1
W6-2-1	PEDESTRIAN CROSSING AHEAD (TfNSW)	L	A	1
W6-3	CHILDREN	–	A	1
W8-25	REFUGE ISLAND	–	A	1
SIGNS TO BE REMOVED				
R3-3	CHILDREN'S CROSSING FLAG AND POST	–	–	2
R4-1	SPEED RESTRICTION (60)	–	A	1
R5-20	BUS ZONE	L	–	1
R5-35	NO STOPPING	L,R	–	1,1
W6-3	CHILDREN	–	A	1
W6-4	SCHOOL	–	A	1
W6-5	SCHOOL CROSSING AHEAD	–	A	2
W8-22	CROSSING AHEAD	–	B	1
W8-25	REFUGE ISLAND	–	A	1

AMENDMENTS

AMENDMENT	APPROVAL	DATE
1 ISSUED FOR CONSTRUCTION. SPEED RESTRICTION (50) CHANGED TO B SIZE	[redacted]	07/08/24

DRAWING STAGE – LATEST DATE INDICATES DRAWING STATUS

Conceptual Design: --/--/--	Final Sketch Plan: 23/02/24	Final Design: 05/04/24
For tendering purposes only: 30/05/24	Issued for construction: 07/08/24	W.A.E.: --/--/--

Scale: 0m 10m 20m 30m 40m
SCALE: A1 1:500, A3 1:1000

Design Agent: R.D. Gossip Pty Ltd, Consulting Engineers, Unit 126, 12 Prevan Street, Campbell ACT 2612, Ph: 02 6201 6318
Designed by [redacted] Drawn by [redacted] Checked by [redacted] Approved by [redacted]

Client: Project Officer: Justin Curry — ACT Government

Project: SCHOOL SAFETY CONSTRUCTION WORKS

Drawing Title: TAYLOR PS, KAMBAH TRAFFIC CONTROL DEVICE PLAN – 2 OF 4

Date: 07/08/24
Drg. No.: RG 24002
Sheet: TC102
Revision: 1

WORK AS EXECUTED	DESIGN AGENT	OFFICE OF A.C.T.
DRAWING AMENDED IN ACCORDANCE WITH ADVICE FROM DATE:	RECOMMENDED FOR AUTHORISATION R.D. GOSSIP P/L	AUTHORISED PURSUANT TO PART V of Road Transport (Safety and Traffic Management) ACT 1999
CONSULTANT NAME SIGNATURE	DRAWING NAME TAYLOR PS SAFETY UPGRADES	AUTHORISING SIGNATURE DATE:
DATE:	SCALE: 1:500	DOCUMENT NUMBER:

ROAD HUMP MARKING DETAIL

NOTES

THE FOLLOWING SPECIFICATIONS / STD. DRG'S ARE TO BE USED FOR THIS CONTRACT:

SPECIFICATION:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL INFRASTRUCTURE TECHNICAL SPECIFICATION (MITS).

ACT GOVERNMENT STD. DRGS:
CURRENT EDITION OF THE ACT GOVERNMENT MUNICIPAL DESIGN STANDARD DRAWINGS.

GENERAL NOTES:
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LEGEND

ERADICATE LINEMARKING

EXISTING LINEMARKING

APPLY NEW LINEMARKING

SIGN SCHEDULE

DESCRIPTION		HAND	SIZE	NO. OF.
SIGNS TO BE ERECTED				
R4-1	SPEED RESTRICTION (50)	–	B	1
R5-15/2	15 MINUTE – 7.30AM–6PM MON–FRI PUB HOL EXCEPTED	L	–	1
R5-20	BUS ZONE	L,R	–	2,2
R5-35	NO STOPPING	R	–	2
W3-4	ROAD HUMPS AHEAD	–	A	2
W5-10	ROAD HUMP	–	A	2
W8-2	ADVISORY SPEED (20KM/H)	–	A	2
SIGNS TO BE REMOVED				
R4-1	SPEED RESTRICTION (60)	–	A	1
R5-35	NO STOPPING	R	–	1

AMENDMENTS

AMENDMENT	APPROVAL	DATE
1 ISSUED FOR CONSTRUCTION. SPEED RESTRICTION (50) CHANGED TO B SIZE	[redacted]	07/08/24

DRAWING STAGE – LATEST DATE INDICATES DRAWING STATUS

Conceptual Design: --/--/--	Final Sketch Plan: 23/02/24	Final Design: 05/06/24
For tendering purposes only: 30/05/24	Issued for construction: 07/08/24	W.A.E.: --/--/--

Scale: 0m 10m 20m 30m 40m
SCALE: A1 1:500, A3 1:1000

Design Agent: R.D. Gossip Pty Ltd Consulting Engineers, Unit 120, 12 Prevan Street, Campbell ACT 2612, Ph 02 6251 6919
Designed by [redacted] Drawn by [redacted] Checked by [redacted] Approved by [redacted]

Client: Project Officer: Justin Curry — ACT Government

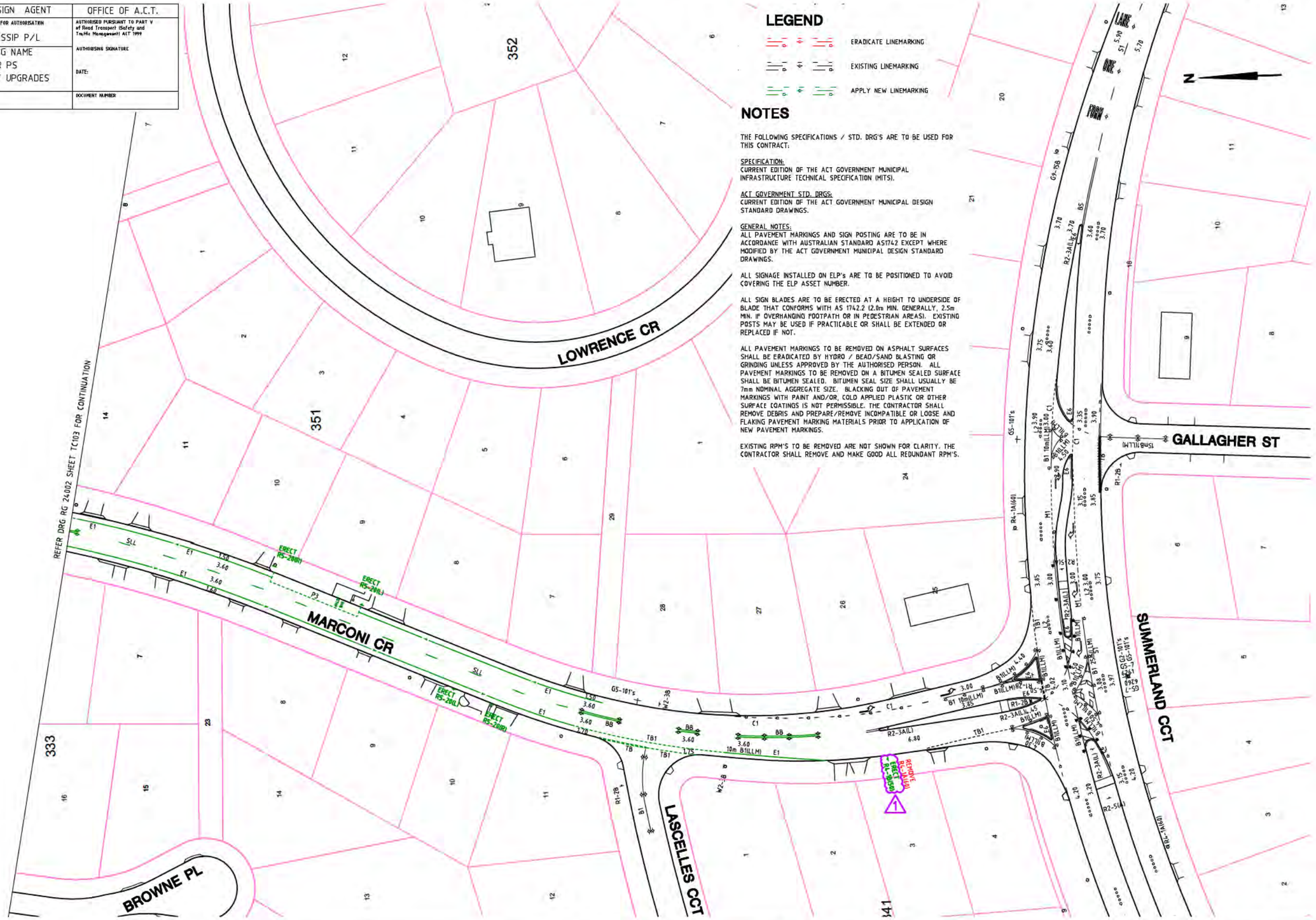
Project: SCHOOL SAFETY CONSTRUCTION WORKS

Date: 07/08/24

Drawing Title: TAYLOR PS, KAMBAH TRAFFIC CONTROL DEVICE PLAN – 3 OF 4

Drg. No.	Sheet	Revision
RG 24002	TC103	1

WORK AS EXECUTED	DESIGN AGENT	OFFICE OF A.C.T.
DRAWING AMENDED IN ACCORDANCE WITH ADVICE FROM DATE:	RECOMMENDED FOR AUTHORISATION R.D. GOSSIP P/L	AUTHORISED PURSUANT TO PART V of Road Transport (Safety and Traffic Management) ACT 1999 AUTHORISING SIGNATURE
CONSULTANT NAME SIGNATURE	DRAWING NAME TAYLOR PS SAFETY UPGRADES	DATE:
DATE:	SCALE: 1:500	DOCUMENT NUMBER



LEGEND

- ERADICATE LINEMARKING
- EXISTING LINEMARKING
- APPLY NEW LINEMARKING

NOTES

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SIGN SCHEDULE

DESCRIPTION		HAND	SIZE	NO. OF.
SIGNS TO BE ERECTED				
R4-1	SPEED RESTRICTION (50)	-	B	1
R5-20	BUS ZONE	L,R	-	2,2
SIGNS TO BE REMOVED				
R4-1	SPEED RESTRICTION (60)	-	A	1

AMENDMENTS

AMENDMENT	APPROVAL	DATE
1 ISSUED FOR CONSTRUCTION. SPEED RESTRICTION (50) CHANGED TO B SIZE	[redacted]	07/08/24

DRAWING STAGE - LATEST DATE INDICATES DRAWING STATUS

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Design Agent: R.D. Gossip Pty Ltd, Consulting Engineers, Unit 126, 12 Piverin Street, Campbell ACT 2612, Ph: 02 6251 6819

Designed by [redacted] | Drawn by [redacted] | Checked by [redacted] | Approved by [redacted]

Client: Project Officer: Justin Curry — ACT Government

Project: SCHOOL SAFETY CONSTRUCTION WORKS

Date: 07/08/24

Drawing Title: TAYLOR PS, KAMBAH TRAFFIC CONTROL DEVICE PLAN - 4 OF 4

Drg. No.	Sheet	Revision
RG 24002	TC104	1