ROAD SAFETY INSPECTION

Spencers Brook Road Slk 3.26 – 23.87

Prepared for:

Tinus Nagel of Italia Stone Group

By:

Advanced Traffic Management

Report Issue Date: **8/06/2018**

Revision 1

Road Safety Inspection Document Control Sheet

Project Location:	Spencers Brook Road Slk 3.26 – 23.87
Prepared for:	Tinus Nagel of Italia Stone Group
Prepared by 1:	Advanced Traffic Management
Inspection Team Leader:	Benjamin Hawkins
Inspection Team Leader Organisation:	Advanced Traffic Management
Report Issue Date:	8/06/2018

Contents

1. INTRODUCTION

1.1 Scope of the Inspection

A Road Safety Inspection is a formal examination of an existing road or road related area in which an independent, qualified team report on the crash potential and likely safety performance of the location. (Formerly known as an 'Existing Road Safety Audit')

This Road Safety Inspection has been conducted following the general principles detailed in *Austroads Guide to Road Safety Part 6: Road Safety Audit* and in accordance with the requirements contained in the Main Roads Western Australia Policy and Guidelines for Road Safety Audit.

This report results from a request for a Road Safety Inspection to be conducted at Spencers Brook Road Slk 3.26 – 23.87.

The background and objective of the inspection is to identify any safety issues prior to permitting the increase of Network 3 vehicles on Spencers Brook Road requiring access to the quarry at Slk 3.26. The proposal is to transport 20 vehicles of +50 tonne per day.

Spencers Brook Road is a Regional Distributor Road providing connectivity between Northam, York, and Clackline. Spencers Brook Road has a posted speed limit of 110km/h which reduces to 80km/h within the Spencers Brook area.

The area surrounding Spencers Brook Road is typically a farming environment.

The Road Safety Inspection was undertaken by Benjamin Hawkins of Advanced Traffic Management with reference to the details provided by the client.

The Road Safety Inspection comprised an examination of the area identified by Tinus Nagel of Italia Stone Group.

All the findings described in Section 2 of this report are considered by the inspection team to require action in order to improve the safety of the existing road environment and to minimise the risk of crash occurrence and reduce potential crash severity.

The inspection team has examined and reported only on the road safety implications of the road infrastructure as presented.

1.2 The Inspection Team

Auditor No.	Name	Role	Organisation
284 (S)	Benjamin Hawkins	Inspection Team Leader	Advanced Traffic Management
101 (S)	David Wilkins	Inspection Team Member	i3 Consultants WA

The inspection team visited the site on Friday 1st June at 1.00 PM. At the time of the site visit the weather was a maximum of 18 degrees and the existing road surface was dry.

A night-time site visit was undertaken on Friday 1st June at 7.00 PM.

1.3 Specialist Advisors

Others present during the daytime visit were:

Name	Role	Organisation
Paul Kher	Technical Officer	Shire of Northam

1.4 Safe System Findings

The aim of Safe System Findings is to focus the Road Safety Inspection process on considering safe speeds and by providing forgiving roads and roadsides. This is to be delivered through the Road Safety Inspection process by accepting that people will always make mistakes and by considering the known limits to crash forces the human body can tolerate. This is to be achieved by focusing the Road Safety Inspection on particular crash types that are known to result in higher severity outcomes at relatively lower speed environments to reduce the risk of fatal and serious injury crashes.

The additional annotation "**IMPORTANT**" shall be used to provide emphasis to any Road Safety Inspection finding that has the potential to result in fatal or serious injury, or findings that are likely to result in the following crash types above the related speed environment: head-on (>70 km/h), right angle (>50 km/h), run off road impact object (>40 km/h), and crashes involving vulnerable road users (>30 km/h), as these crash types are known to result in higher severity outcomes at relatively lower speed environments.

The exposure and likelihood of crash occurrence shall then be considered for all findings deemed "**IMPORTANT**" and evaluated based on an auditors professional judgement. Auditors should consider factors such as, traffic volumes and movements, speed environment, crash history and the road environment, and apply road safety engineering and crash investigation experience to determine the likelihood of crash occurrence. The likelihood of crash occurrence shall be considered either "**VERY HIGH**", "**HIGH**", "**MODERATE**" or "**LOW**" and this additional annotation shall be displayed following the "**IMPORTANT**" annotation on applicable findings.

1.5 Previous Road Safety Inspections

A Road Safety Inspection was undertaken by Shawmac in February 2018 document number 1802022_1.

The items raised in the previous Road Safety Inspection have been addressed with the exception of the items listed below. These items are discussed again in this Road Safety Inspection.

Earlier Inspection Finding Ref.	Description	Inspection Item Ref.
4.2	Number of signs	2.22
4.4 - 4.6	Multiple intersection related	2.5

1.6 Background Data

1.6.1 Crash History

A study of the recent crash history has been conducted in the location considered in the inspection for the five-year period to the end of December 2017. This showed that there were 14 reported crashes within the extracted data which is summarised below:

- 2 occurred within an intersection (2 Medical);
- 1 involved overtaking vehicles (Medical);
- 2 involved crashes with an object (1 PDA major and 1 PDO minor);
- 5 involved vehicles travelling off path on a straight (1 fatal, 2 hospital and 2 PDO major); and
- 4 involved vehicles travelling off path on a curve (1 hospital and 3 PFO major).

Crash History Heat Map

1.6.2 Traffic and Speed Data

A summary of recent traffic data is provided below:

Location	Vehicles per day (% classed as heavy)	Date	Source
Spencers Brook Road Slk 4.0	732 AVG (14.4%)	May 2018	LGA
Spencers Brook Road Slk 4.0	778 AVG (8.9%)	November – December 2016	LGA
Spencers Brook Road Slk 8.2	322 AVG (15.3%)	August – September 2017	LGA
Spencers Brook Road Slk 10.4	437 AVG (29%)	May 2018	LGA
Spencers Brook Road Slk 22.8	446 AVG (25.8%)	May 2018	LGA

Recent speed data is provided below:

ClassMatrix-477
Site: Spencers Brook 4.0.1NS
Description: **Spencers Brook Road SLK4.00 (600m South of Quarry)**
Filter time: **0:00 Saturday, 5 May 2018 => 0:00 Friday, 18 May 2018**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)	Class 1	2	3	4	5	6	7	8	9	10	11	12	Speed Totals	
10 - 20	2	.	1	2	.	.	.	.	.	.	.	.	5	0.1%
20 - 30	14	.	.	.	.	.	.	.	.	.	.	.	14	0.2%
30 - 40	11	1	2	.	.	.	.	.	.	.	.	.	14	0.2%
40 - 50	9	.	4	3	.	.	.	.	.	1	.	.	17	0.2%
50 - 60	27	1	6	1	.	.	1	.	.	.	.	.	36	0.4%
60 - 70	101	10	12	4	1	1	2	1	.	.	1	.	133	1.4%
70 - 80	480	26	64	12	2	3	6	4	1	.	4	.	602	6.5%
80 - 90	1345	67	197	11	1	7	16	5	9	.	21	.	1679	18.0%
90 - 100	2127	79	314	15	5	14	9	12	10	3	15	.	2603	28.0%
100 - 110	2359	35	310	10	3	7	4	1	8	1	7	.	2745	29.5%
110 - 120	1041	12	154	.	.	3	.	.	1	.	.	.	1211	13.0%
120 - 130	164	.	24	.	.	.	.	.	.	.	.	.	188	2.0%
130 - 140	41	.	9	.	.	.	.	.	.	.	.	.	50	0.5%
140 - 150	8	.	1	.	.	.	.	.	.	.	.	.	9	0.1%
150 - 160	5	.	.	.	.	.	.	.	.	.	.	.	5	0.1%
	7734	231	1098	58	12	35	38	23	29	5	48	0	9311	
	83.1%	2.5%	11.8%	0.6%	0.1%	0.4%	0.4%	0.2%	0.3%	0.1%	0.5%	0.0%		

Class Totals

ClassMatrix-475

Site:	Spencers Brook 10.4.0.1EW
Description:	**Spencers Brook Road SLK20.4 (1.3km South of Trimmer Road)**
Filter time:	**0:00 Saturday, 5 May 2018 => 0:00 Friday, 18 May 2018**
Scheme:	Vehicle classification (AustRoads94)
Filter:	Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)	Class 1	2	3	4	5	6	7	8	9	10	11	12	Speed Totals	
10 - 20	1	.	1	.	.	.	.	.	.	.	.	.	2	0.0%
20 - 30	4	.	.	1	.	.	2	.	.	.	.	.	7	0.1%
30 - 40	6	1	3	1	1	.	2	.	1	.	.	.	15	0.3%
40 - 50	6	.	3	2	.	.	.	1	1	.	1	.	14	0.3%
50 - 60	5	.	3	2	.	.	.	.	.	.	.	.	10	0.2%
60 - 70	31	6	14	.	.	1	.	1	.	.	.	.	53	0.9%
70 - 80	76	12	30	1	1	8	3	1	.	.	.	.	132	2.4%
80 - 90	294	24	117	6	.	14	19	13	.	.	12	.	499	8.9%
90 - 100	697	49	270	13	1	25	22	32	13	16	20	.	1158	20.7%
100 - 110	1198	45	352	14	3	15	15	19	11	26	29	.	1727	30.9%
110 - 120	1051	17	312	.	2	15	3	.	1	.	.	.	1401	25.1%
120 - 130	327	3	81	.	2	5	.	.	2	.	.	.	420	7.5%
130 - 140	70	.	27	.	1	.	.	.	.	.	.	.	98	1.8%
140 - 150	30	.	7	.	.	.	.	.	.	.	.	.	37	0.7%
150 - 160	10	.	.	.	.	.	.	.	.	.	.	.	10	0.2%
	3806	157	1220	40	11	83	66	67	29	42	62	0	5583	
	68.2%	2.8%	21.9%	0.7%	0.2%	1.5%	1.2%	1.2%	0.5%	0.8%	1.1%	0.0%		
	Class Totals													

ClassMatrix-476

Site:	Spencers Brook 22.8.0.1EW
Description:	**Spencers Brook Road SL22.8 (100m Southeast of Old Spencers Road)**
Filter time:	**0:00 Saturday, 5 May 2018 => 0:00 Friday, 18 May 2018**
Scheme:	Vehicle classification (AustRoads94)
Filter:	Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)	Class 1	2	3	4	5	6	7	8	9	10	11	12	Speed Totals	
10 - 20	2	.	1	.	.	.	.	.	.	.	.	.	3	0.1%
20 - 30	3	.	.	.	.	.	.	.	.	.	.	.	3	0.1%
30 - 40	10	.	.	1	1	1	.	.	.	.	.	.	13	0.2%
40 - 50	4	.	5	.	.	.	.	.	.	.	.	.	9	0.2%
50 - 60	10	1	2	1	.	.	1	.	.	1	.	.	16	0.3%
60 - 70	45	7	15	2	2	.	5	1	.	.	3	.	80	1.4%
70 - 80	188	30	47	4	2	6	8	2	2	4	17	.	310	5.5%
80 - 90	622	50	171	10	1	11	22	18	4	21	27	.	957	17.0%
90 - 100	1173	56	302	12	5	16	25	5	14	6	20	.	1634	29.1%
100 - 110	1200	27	309	5	1	19	8	.	4	1	2	.	1576	28.1%
110 - 120	573	2	191	.	1	10	2	.	.	.	.	.	779	13.9%
120 - 130	124	.	65	.	.	1	1	.	.	.	.	.	191	3.4%
130 - 140	32	.	9	.	.	.	.	.	.	.	.	.	41	0.7%
140 - 150	3	.	.	.	.	.	.	.	.	.	.	.	3	0.1%
150 - 160	3	.	.	.	.	.	.	.	.	.	.	.	3	0.1%
	3992	173	1117	35	13	64	72	26	24	33	69	0	5618	
	71.1%	3.1%	19.9%	0.6%	0.2%	1.1%	1.3%	0.5%	0.4%	0.6%	1.2%	0.0%		
	Class Totals													

1.6.3 Increased heavy vehicle movement statement

Section 1.6.2 indicates that Heavy Vehicle traffic has varied between 9% and 29% between 2016 and 2018 at various locations along Spencers Brook Rd, increasing heavy vehicle movements by 20 trips per day equates to a heavy vehicle component of around 33% at Slk 10.4. It is expected that Spencers Brook Rd already carries additional heavy vehicle movements during harvest season.

The crash record states that there has been one reported crash involving heavy vehicles in the 5 year reporting period to end of 2017.

The crash history (Section 1.6.2) indicates that Spencers Brook Rd can continue to experience less than 1 heavy vehicle crash every five to ten years, i.e. a frequency of 'Occasional' (Table 4.1 AGRS06).

In 2013 (the latest HV data sourced), the HV crash record was 320 with 259 PDO (81%), 6 killed and 55 injured (19%), i.e. a severity of 'Minor' (Table 4.1 AGRS06). This results in a risk level of 'Low' (Table 4.1 AGRS06).

The crash history (Section 1.6.2) indicates that without intervention Spencers Brook Rd can continue to experience 13 light vehicle crashes every five years, i.e. a frequency of 'Probable' (Table 4.1 AGRS06).

The crash history record is 1 Fatal, 3 Hospital, 2 Medical (43%) i.e. a severity of between 'Minor' and 'Serious' (Table 4.1 AGRS06). This results in a risk level of between 'High' and 'Intolerable' (Table 4.1 AGRS06).

Based on the above, the accepted risk management process indicates that **the risk associated with additional trucks is Low, and less than that associated with additional cars.**

1.6.4 Appendices

Appendix A – Road Safety Inspection Findings Location Plan
Appendix B – Road Safety Inspection Photographs
Appendix C – Crash Reports
Appendix D – Corrective Action Report (CAR)

2. ITEMS RAISED IN THIS ROAD SAFETY INSPECTION

2.1 Finding – Steep Batter Slopes within clear zone

There are batters within the assessed Clear Zones that are steeper than 3:1.

Justification of the finding:

Batters which are steeper than 3:1 or are in poor condition which may increase risk to road users should they leave the road at these sections.

Recommendation

Review the level of risk associated with the steep or poor condition batters and consider treatments appropriate with the level of risk. Treatment options may include delineation, flattening the batters or barrier protection.

[IMPORTANT | HIGH]

2.2 Finding – Non frangible items within Clear Zone

It was observed a number of non-frangible items were present along the road within the audit scope. These included power poles, non-frangible vegetation, culverts, and star pickets.

Items particularly noted included: Power poles at Slk 3.95, culvert at Slk 3.95 tree at Slk 6.09 (which is also resulting in damage to the road).

Justification of the finding:

If an errant vehicle collides with a non-frangible item such as a power pole, serious injury to fatality is likely to occur.

Recommendation

Review the clear zone along Spencers Brook Road and ensure all non-frangible items are outside the clear zone or protected.

Design speed (km/h)	Design ADT[4]	Clear zone width (m)						
		Fill batter			Cut batter			
		6:1 to flat	4:1 to < 6:1	Steeper than 4:1[2]	6:1 to flat	4:1 to < 6:1	4:1 to 3:1	Steeper than 3:1[3]
110	<750	6.0	8.0	(2)	5.0	5.0	3.5	(3)
	750 - 1500	8.0	11.0[1]	(2)	6.5	6.0	5.0	(3)
	1501 - 6000	10.0[1]	13.0[1]	(2)	8.5	7.5	6.0	(3)
	>6000	10.5[1]	14.0[1]	(2)	9.0	9.0	7.5	(3)

1. Where a site specific investigation indicates a high probability of continuing crashes, or such occurrences are indicated by crash history, the designer may provide clear zone distances greater than the clear zone shown in Table 4.1. A jurisdiction may limit clear zones to 9 m for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.

2. For fill batters steeper than 4:1 the batter width shall be treated as non-recoverable and not be considered as part of the clear zone. If a clear zone is to be provided then:

- Providing that the embankment is not considered hazardous (refer to Sections 4.3.3 - 4.3.4) then the clear zone can be provided by the recoverable area at the top and bottom of the embankment. If this summation is equal to or greater than the required clear zone for the appropriate slopes of these areas then the clear zone is satisfied.
- If the embankment is hazardous, then unless the embankment is offset a distance equal to the clear zone for the appropriate slope from the edge of the travelled way to the embankment it is within the clear zone.

3. No clear zone widths are provided for cut batters steeper than 3:1. Therefore unless an appropriate clear zone is provided prior to the cut batter it shall be treated as being within the clear zone. The cut batter and any objects contained on it shall be assessed in accordance with Section 4.5.5.

[IMPORTANT | HIGH]

2.3 Finding – Road Width

Some sections along the road within the audit scope did not meet 3.5m lane width, some sections had measured as low as 2.7m which was found at Slk 7.8, and Slk 11.73 (Trimmer Road intersection).

Justification of the finding:

Road users on narrow roads may drive into the shoulder when another vehicle approaches from the opposite direction which may result in loss of traction, and damage to the roads edge. Narrow roads also encourage road users driving closer to the centre of the road which increases the risk of head on collisions occurring should road users meet around locations of poor sight distance IE Trimmer Road

Main Roads WA Supplement to Austroads Guide to Road Design – Part 3 details the following:

Element	Design (PCUs / Day)			
	150 - 500	500 - 1000	1000 - 3000	3000 - 8000
Traffic Lanes[1]	7m (2 x 3.5m)	7m (2 x 3.5m)	7m (2 x 3.5m)	7m (2 x 3.5m)
Total Shoulder	1m	1.5m	1.5m / 2m	2m / 2.5m
Minimum Shoulder Seal[2][3][4][5][6]	1m	1.5m	1.5m / 2m	2m / 2.5m
Wide Centreline	-	-	1m / Not Used	1m / Not Used
Total Carriageway	9m	10m	11m	12m

Table 4.5: Single Carriageway Rural Road Widths

Recommendation

Provide adequate road width at locations where Spencers Brook Road is narrow.

[IMPORTANT | HIGH]

2.4 Finding – Quarry Access

Evidence suggests previously the northern access was used by heavy vehicle entry, and the southern access was used for heavy vehicle existing, and light vehicle entry.

Due to the restricted width at the northern end, heavy vehicles required to manoeuvre onto the shoulder to ensure they could safely turn into the Quarry. It would appear heavy vehicles exiting at the southern access would exit onto Spencers Brook Road at an approximate angle of 25 degrees.

The sight distance to the south of the quarry is also too short.

Justification of the finding:

Heavy vehicles making manoeuvres from within the shoulder will likely result in damage to shoulder and the traffic lane edge. Frequent movements will result in ongoing maintenance and associated costs. Damage to the traffic lane edge may also result in damage to vehicles or loss of control should a vehicle drive onto a damaged surface.

Main Roads WA 'Guide to Road Design – Driveways' recommends a 90 degree angle for driveways, but in special circumstances permits a minimum of 70 degrees. Failure to provide an appropriate exiting angle for vehicles reduces the available sight distance of vehicles approaching the driveway from the north (in this circumstance). Should a heavy vehicle driver fail to see a car on the approach a thru-left collision may occur.

Austroads Guide to Road Design Part 4A SISD Equation 2 requires the following SISD to be provided (based on a large vehicle) – 110 Km/h zone = 318m, or 80 km/h = 198m. As this minimum sight distance is not available a collision may occur between a road users, and a vehicle entering or exiting the quarry.

Recommendation

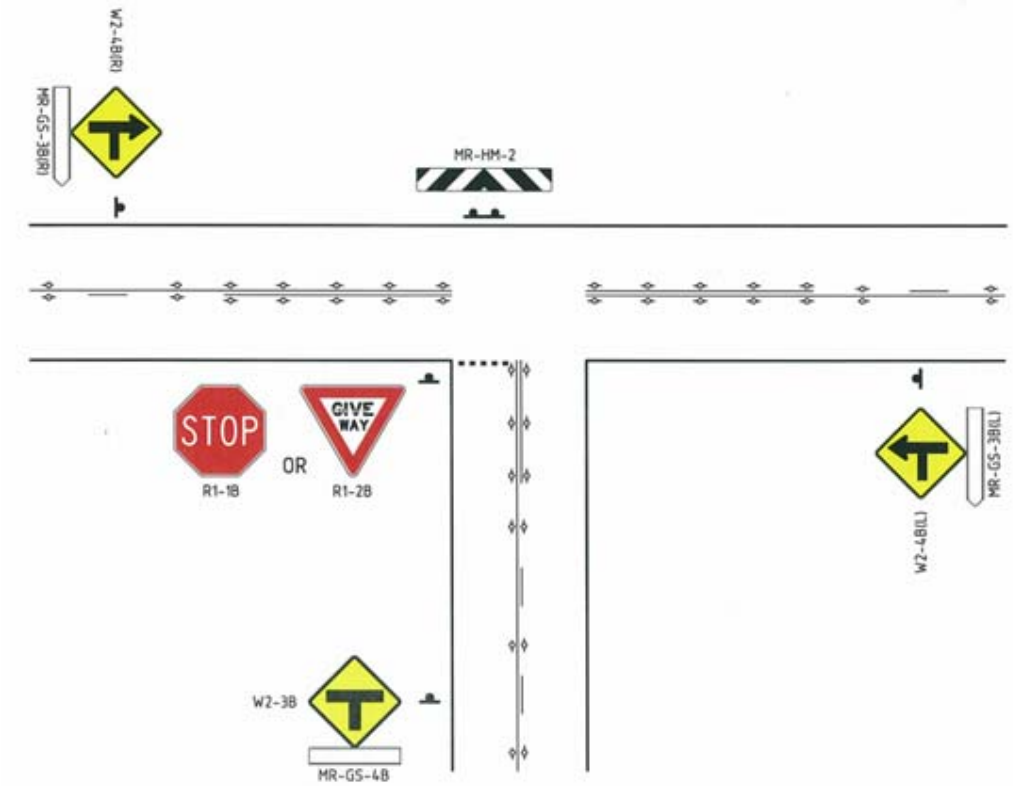
Consideration is required for the entry and exit accesses from the quarry. Vehicles existing the quarry should exit onto Spencers Brook Road at a minimum angle of 70 degrees. The minimum safe intersection sight distance should also be available at the entry/exit points.

Should gates be locked for the quarry access, the gates should be relocated further from the road. Should a driver of a long vehicle require unlocking the gate, providing sufficient room within the property will allow the driver to park between the road and the gate, rather than remaining stationary on the road.

[IMPORTANT | HIGH]

2.5 Finding – Intersection Warning Signs

MRWA guideline drawing 201031-0008 shows the recommended typical intersection sign and device installation. It was observed that most intersections within the audit scope do not have the recommended installation if signs and devices.



Justification of the finding:

Installing the recommended signs and devices (including RRPM's and holding lines) will highlight the presence of the intersection to road users. Displaying the side road name in advance of the intersection may also reduce road users reducing their speed around intersections trying to identify the road name.

Recommendation

Install the recommended signs and devices (including RRPM's and holding lines) in accordance with MRWA requirements at all intersections (note use of MR-HM-2).

[IMPORTANT | MODERATE]

2.6 Finding – Vegetation Maintenance

It was observed vegetation obstructed warning devices (signs and guideposts), sight distances, and hazards (ie culverts) along the road within the audit scope.

Justification of the finding:

Warning devices along the route are only effective if they are visible to roads users. Should a warning device be obstructed by vegetation the road user does not receive the required information to proceed safely IE vegetation obstructing a curve warning sign. If guide posts are covered by vegetation this would impact on a drivers ability to determine the road alignment. Low level vegetation was also observed to restrict visibility of culverts at some of the locations, if a road user was to pull over into the shoulder, they may not see the culvert and proceed into the hazard.

Trees also result in tree branches falling on or adjacent the road which was observed at Old Spencers Brook Road intersection.

Recommendation

Undertake vegetation clearing works to reinstate sight visibility and assess large trees in close proximity to the road with the aim of removing braches that could fall onto or close to the road.

[IMPORTANT | MODERATE]

2.7 Finding – Pavement markings removed from roadwork's

Recent works have resulted in pavement markings being removed or covered. Pavement markings were observed to be absent near the Quarry, and around Spencers Brook-York Road.

Justification of the finding:

After the roadworks have been completed, line marking should be reinstated as soon as practicable, particularly around intersections and railway crossings.

Recommendation

Have all pavement markings reinstated. In the short term temporary warning signs should be installed warning road users of the lack of line marking.

[MODERATE]

2.8 Finding – Loose material on road

It was observed at the Quarry, Fettlers Lane, and opposite Old Spencers Brook Road, loose material was present on the traffic lane.

Justification of the finding:

Loose material on the traffic lane can become hazardous to road users, particularly motorcyclists, as it reduces the skid resistance of the road surface, or may result in a road user driving around the material into the path of oncoming vehicles.

Recommendation

Remove the loose material and ensure loose material does not reoccur.

[MODERATE]

2.9 Finding – Safety issues around culverts

Currently a number of culverts exist along the road within the audit scope which are within the clear zone, and have no warning of the location of these culverts.

Justification of the finding:

If an errant vehicle collides with a non-frangible item or drives into a culvert, serious injury to fatality is likely to occur. Culverts have the potential to result in vehicles coming to a sudden stop if collided with resulting in injury to a driver.

Culvert posts are recommended to mark the location of culvert headwalls. If a road user is not provided warning for the culvert then may inadvertently drive into the culvert if they pull over into the shoulder.

Review the level of risk associated with culverts and consider treatments appropriate with the level of risk.

The culvert at Slk 6.74 requires specific consideration as the area prior to the culvert looks to be a suitable pull over area for road users, the culvert at this location is hazardous to road users if they proceed into the culvert.

Spencers Brook Road Slk 6.74 – Widened section prior to culvert

Recommendation

Extent the culverts to ensure the headwalls are outside of the clear zone, install a traversable end treatment, or provide protection to the road users from the culvert. Provide warning of the culverts in accordance in accordance with MRWA requirements.

[IMPORTANT | HIGH]

2.10 Finding – Surface Condition

Multiple locations along the road within the audit scope had surface defects which included, pot holes, rutting, and road deformations.

Road deformation was noted at two locations – Quarry access, and SLK 4.28.

Justification of the finding:

Road defects can be hazardous to motorists, particularly motorcyclists as it may result in loss of control of the vehicle.

Recommendation

Undertake repair works to remove any defects found along the road.

[IMPORTANT | HIGH]

2.11 Finding – Sudden Road Width Change

It was observed that recent works undertaken at SLK 5.42 widened the available road width, however a change in the road width between the newly widened section, and the old section exist.

Justification of the finding:

A road user driving on the widened section may not realise the road width suddenly changes and may partially drive onto the shoulder when they reach the section which is not widened, resulting in loss of control.

Recommendation

The road should be widened to ensure it meets the minimum road width required. Ideally edge line marking would be installed to provide warning to road users, however sufficient road width is required for implementing an edge line. Changes to the road width should be through a taper, rather than sudden changes.

[IMPORTANT | MODERATE]

2.12 Finding – Damage to Warning Devices

It was observed that damage has occurred to some warning devices along the road within the audit scope. These included guide posts, and warning signs. Those noted included but not limited to: guide posts around Slk 5.42, curve warning sign located at Slk 6.73.

Justification of the finding:

Warning devices which are damaged no longer provide the required warning to the road user resulting in the road user unaware of the hazard for example the curve ahead.

Recommendation

Undertake remedial works to any damage warning devices

[MODERATE]

2.13 Finding – Muresk Road Intersection

A few safety issues had been identified at this location.

Items include:

- Multiple conflict points associated with private property access;
- Barrier kerb used around the intersection.

Other items had been identified, however covered in multiple areas of this report.

Justification of the finding:

Property access at No. 705 appeared to have multiple access points which created additional conflict points, which have the potential to cause a collision between a road user, and property owner.

Barrier kerbing should not be used on high speed roads as it has the potential for vehicles to lose control, particularly motorcyclists, if struck.

Recommendation

The property access for No. 705 should be reassessed to ensure the location and driver behaviour does not encourage unsafe movements entering or exiting the road.

The need for kerbing in the area should be assessed, should the need for kerbing exist, a more appropriate kerbing should be installed.

[MODERATE]

2.14 Finding – Bridge's

Multiple bridges exist along the route within the audit scope. It would appear the barrier systems of some of these bridges may not compliant with current MRWA requirements included length required to protect errant vehicles. Should increased traffic be permitted, the bridge load rating will also require being assessed to ensure it is capable of handling additional weight.

Justification of the finding:

Significant injury to road users would be expected if the barrier system does not effectively manage an errant vehicle. Should the bridge not be suitable for the expected weight of vehicles, extensive structure damage would be expected.

Recommendation

Have the barrier systems reviewed and upgraded as required. Ensure bridges weight rating is reviewed to ensure it is capable of handling additional weight.

[IMPORTANT | HIGH]

2.15 Finding – Intersection sight distance

Multiple intersections within the audit scope failed to meet the minimum Safe Intersection Sight Distance (SISD). Vegetation appeared to be the main factor affecting sight distance. Trimmer Road was noted as having very poor sight distance.

Justification of the finding:

Restricted sight distances from intersections has the potential for increased likelihood of Left/Right Thru crashes. Due to the restricted sight distance at Trimmer Road there is also risk of Thru Right incidents.

Austroads Guide to Road Design Part 4A SISD Equation 2 requires the following SISD to be provided (based on a large vehicle) – 110 Km/h zone = 318m, or 80 km/h = 198m

Recommendation

Vegetation around intersections which have restricted sight distance should be trimmed to increase available sight distance. Sight distance should be reassessed to determine if appropriate distance is available after works undertaken.

[IMPORTANT | HIGH]

2.16 Finding – Sign and warning devices condition

Along the road within the audit scope multiple signs had been observed to have substandard reflectivity or were in poor condition.

Justification of the finding:

Signs/warning devices with substandard reflectivity or in poor condition may result in roads users not being able to read the sign and drive towards a hazard unaware, thereby increasing the risk to the road user.

Recommendation

Undertake an audit on all signs to determine retro reflective compliance and condition, and replace all warning signs as required.

[MODERATE]

2.17 Finding – Sign Spacing

It was observed that 3 warning signs in advance of Old Spencer Road (Eastbound) where in close proximity to each other.

Justification of the finding:

Signs spaced closely together are masked by the previous sign which reduces the sight distance a road user can see the warning sign within.

Recommendation

Determine if all signs are required, ensure spacing between signs allows road users to observe all signs with sufficient notice.

[LOW]

2.18 Finding – Access Track

An unofficial access track exists opposite Old Spencers Brook Road, which appears to be associated with the pedestrian heritage trail, however it appears vehicles also use this track as a short cut to Gooch Road.

Justification of the finding:

Intersection warning signs exist for Old Spencers Brook Road on the northern side, as the track exists on the southern side, road users may not be observant of cars exiting from the side track, increasing the risk of collision. Vehicles exiting the side road will also have restricted sight distance due to vegetation. Debris from the access track has also spilled onto Spencers Brook Road, due to a combination of rain, and vehicles.

Recommendation

Implement measures to ensure vehicles are not able to use the access track.

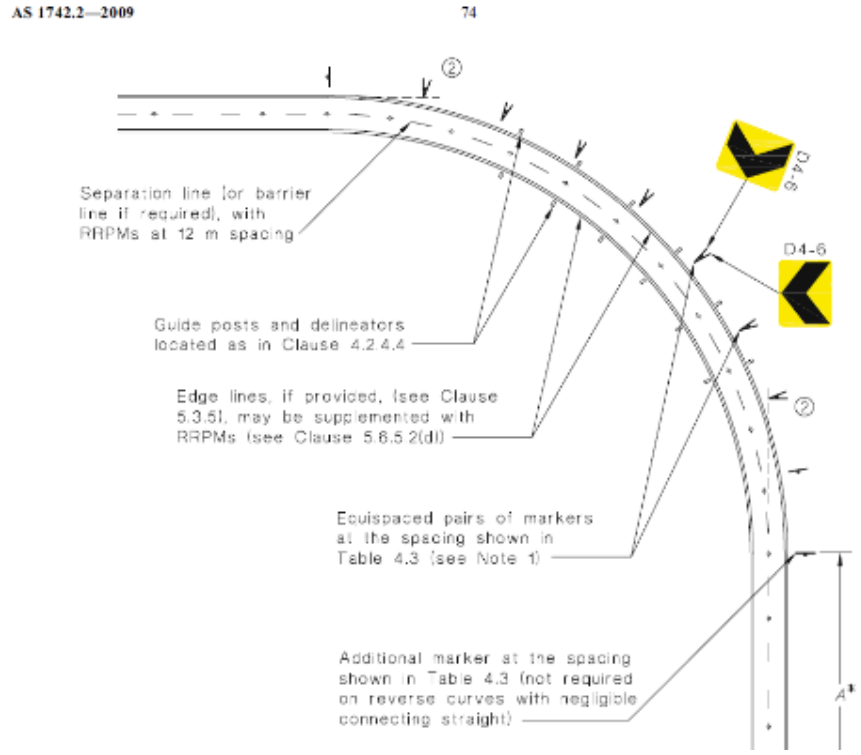
[IMPORTANT | MODERATE]

2.19 Finding – Curved Alignment Markers

The Curved Alignment Markers near Slk 23.65 are incorrect.

Justification of the finding:

The correct Curved Alignment Markers are more prominent than the markers which are installed.



Recommendation

Install the correct Curved Alignment Markers in accordance with AS1742.2 and MRWA requirements.

[HIGH]

2.20 Finding – Intersection warning sign for Lockyer Road and Eadine Road

The intersection warning sign eastbound for Eadine Road do not incorporate Lockyer Road.

Justification of the finding:

Intersection warning signs which are in advance of an intersection should display all intersections.

Recommendation

Replace the current intersection warning sign with a sign which reflects the intersection.

[LOW]

2.21 Finding – Great Eastern Highway Intersection Warning Sign

The intersection warning sign eastbound for Great Eastern Highway does not detail the road name on the left hand side. The signs are also different sizes on either side of the road.

Justification of the finding:

Name tags for an intersection should be placed on all intersection warning signs. Signs which are placed on both sides of the road should be the same size.

Recommendation

Add 'GT EASTERN HWY' name tag to left hand side, and ensure both intersection warning signs are the same size.

[LOW]

2.22 Finding – Spencers Brook York Road Intersection signs

Too many signs exist at the Spencers Brook York Road intersection.

Justification of the finding:

Too many signs at the intersection can lead to important information being lost and drivers making mistakes leading to collisions.

Recommendation

Reduce the amount of signs displayed at the intersection.

[LOW]

2.23 Finding – Posted Speed Limit

Spencers Brook Road has a posted speed limit of 110km/h which reduces to 80km/h within the Spencers Brook area.

Justification of the finding:

Due to the available road width, and multiple non-frangible items within clear zone, having a posted speed limit of 110km/h increases the consequence of collisions which may occur.

Recommendation

The speed limit of Spencers Brook Road should be reassessed in accordance with MRWA guidelines.

[IMPORTANT | HIGH]

2.24 Finding – Curve Warning Signs

Multiple curves along the route within the audit scope do not have curve warning signs on the approaches.

Justification of the finding:

Failure to provide curve warning signs on the curves present fails to provide warning to the road user of the curve ahead. 28% of crashes occurred on curves in this area.

Recommendation

Review all curves along the route to determine what curves require curve warning signs. Curves should also be assessed to determine the need for advisory speed limits, or curved alignment markers.

[MODERATE]

2.25 Finding – Railway Level Crossing

There is a railway level crossing at Slk 7.83 with substandard sealed approach and holding lane widths.

Justification of the finding:

Special consideration of road safety issues associated with the railway crossing is considered warranted using the Australian Level Crossing Assessment Model (ALCAM).

Recommendation

Undertake a detailed assessment of the existing level crossing using the using the Australian Level Crossing Assessment Model (ALCAM).

[MODERATE]

3. ROAD SAFETY INSPECTION TEAM STATEMENT

I hereby certify that the inspection team have examined the identified location in undertaking this Road Safety Inspection. I also confirm that this inspection has been conducted following the general principles detailed in *Austroads Guide to Road Safety Part 6: Road Safety Audit* and in accordance with Main Roads Policy and Guidelines for Road Safety Audit.

The inspection has been carried out for the sole purpose of identifying any features of the existing road environment which could be altered or removed to improve the safety of the road infrastructure. The identified issues have been noted in this report. The accompanying findings and recommendations are put forward for consideration by the asset owner for implementation.

Inspection Team Leader

Benjamin Hawkins

Roadworks Traffic Manager
Advanced Traffic Management

0418 430 455

rtm@advancedtraffic.com.au

Signature

Date

Disclaimer

This report contains findings and recommendations based on examination of the site and/or relevant documentation. The report is based on the conditions viewed on the day of inspection and is relevant at the time of production of the report. Information and data contained within this report is prepared with due care by the Road Safety Inspection Team. While the Road Safety Inspection Team seeks to ensure accuracy of the data, it cannot guarantee its accuracy.

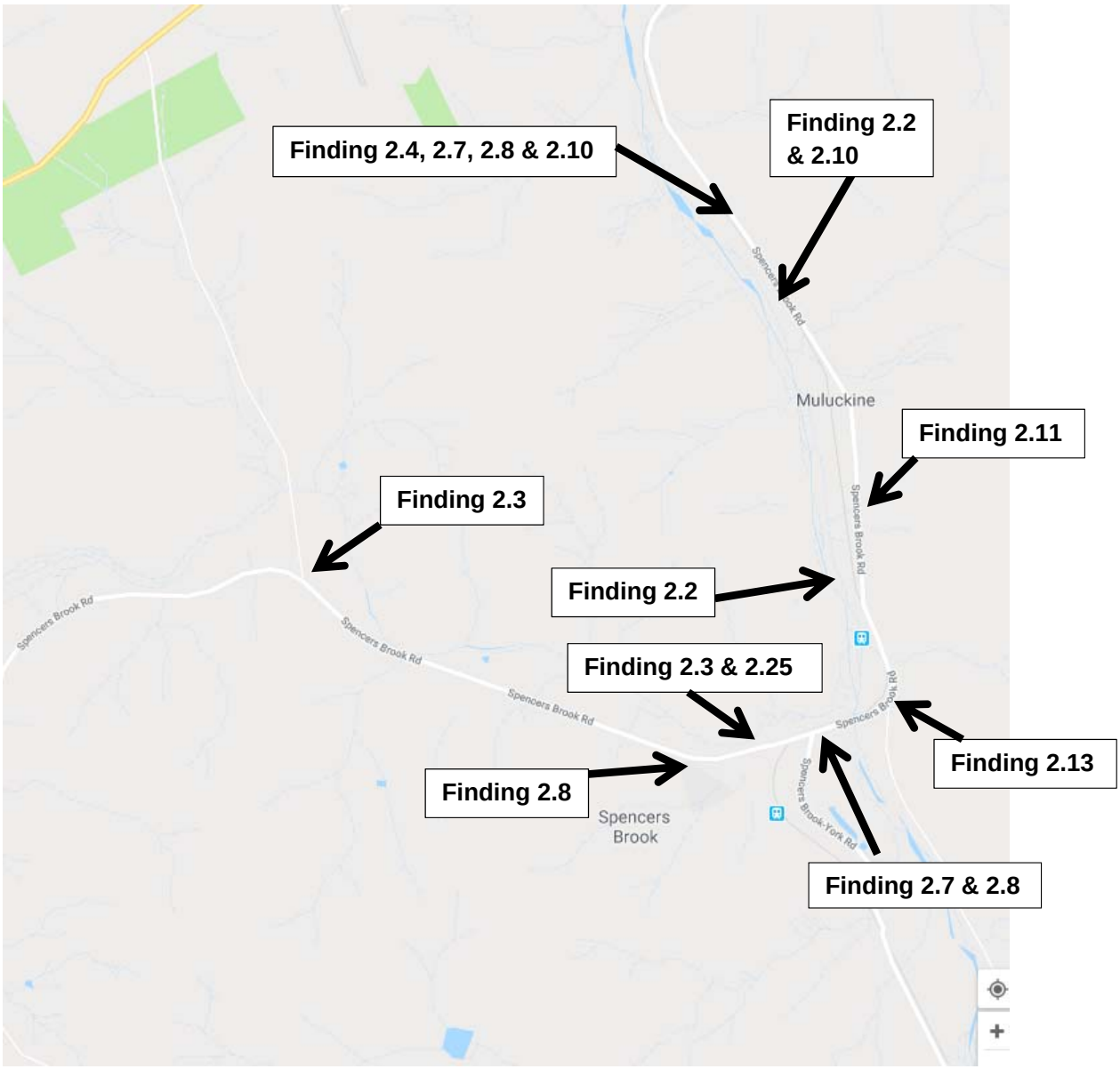
Readers should not solely rely on the contents of this report or draw inferences to other sites. Users must seek appropriate expert advice in relation to their own particular circumstances.

The Road Safety Inspection Team does not warrant, guarantee or represent that this report is free from errors or omissions or that the information is exhaustive. Information contained within may become inaccurate without notice and may be wholly or partly incomplete or incorrect. Before relying on the information in this report, users should carefully evaluate the accuracy, completeness and relevance of the data for their purposes.

Subject to any responsibilities implied in law which cannot be excluded, the Road Safety Inspection Team is not liable to any party for any losses, expenses, damages, liabilities or claims whatsoever, whether direct, indirect or consequential, arising out of or referrable to the use of this report, howsoever caused whether in contract, tort, statute or otherwise.

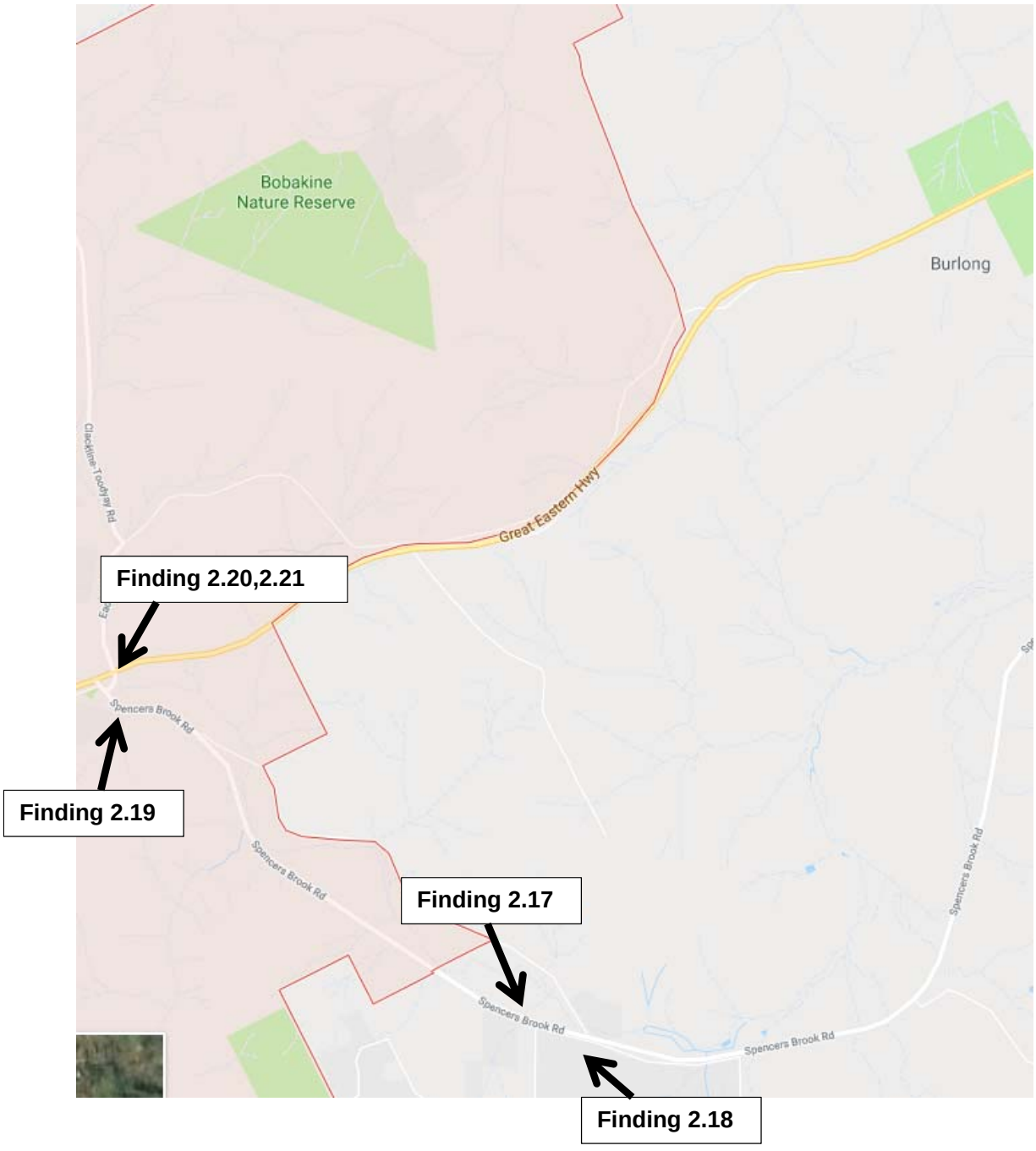
APPENDIX A

ROAD SAFETY INSPECTION FINDINGS LOCATION PLAN



Inspection Findings Location Plan

***Some items identified are in multiple locations along the route**



Inspection Findings Location Plan

***Some items identified are in multiple locations along the route**

APPENDIX B

ROAD SAFETY INSPECTION PHOTOGRAPHS

Finding 2.2 – Non Frangible items within clear zone

Finding 2.4 – Quarry Access – Sight Distance to the south

Finding 2.4 – Quarry Access – Evidence (old) of large vehicles using shoulder

Finding 2.4 – Quarry Access – Evidence (old) of vehicles exiting the quarry

Finding 2.5 – Intersection warning signs –Example of incorrect sign used

Finding 2.6 – Vegetation Maintenance – Vegetation obstructing warning sign

Finding 2.7 & 2.25 – Pavement markings missing removed from roadworks, and narrow approach seal 2.7m – Also note singled sided speed zone

Finding 2.9 – Safety issues around culvert – Widened area prior to culvert

Finding 2.9 – Safety issues around culvert – Tall culvert within clear zone with no warning or protection other than a single guidepost (that is typical treatment of the road without culvert hazards)

Finding 2.9 – Safety issues around culvert –Culvert within clear zone with no protection

Finding 2.9 – Safety issues around culvert – Tall culvert within clear zone with no warning or protection

Finding 2.10 – Surface Condition – Road Deformation

Finding 2.10 – Surface Condition – Example of road damage

Finding 2.11 – Sudden Road Width Change

Finding 2.12 – Damage to warning sign

Finding 2.13 – Muresk Road intersection – Barrier kerbing used

Finding 2.14 – Bridges – Barrier system length would not provide protection of errant vehicle

Finding 2.15 – Intersection sight distance – Example of poor SISD (note sun glare in sunset conditions)

Finding 2.16 – Sign and warning device sign condition

Finding 2.17 – Sign spacing

Finding 2.18 – Access Track – Debris on road

Finding 2.18 – Access Track – Used by vehicles

Finding 2.19 – Curved alignment markers – Incorrect and damaged signs present

Finding 2.20 – Intersection warning sign for Lockyer Road and Eadine Road

Finding 2.21 – Great Eastern Highway warning signs

Finding 2.22 – Spencers Brook York Road Intersection Signs

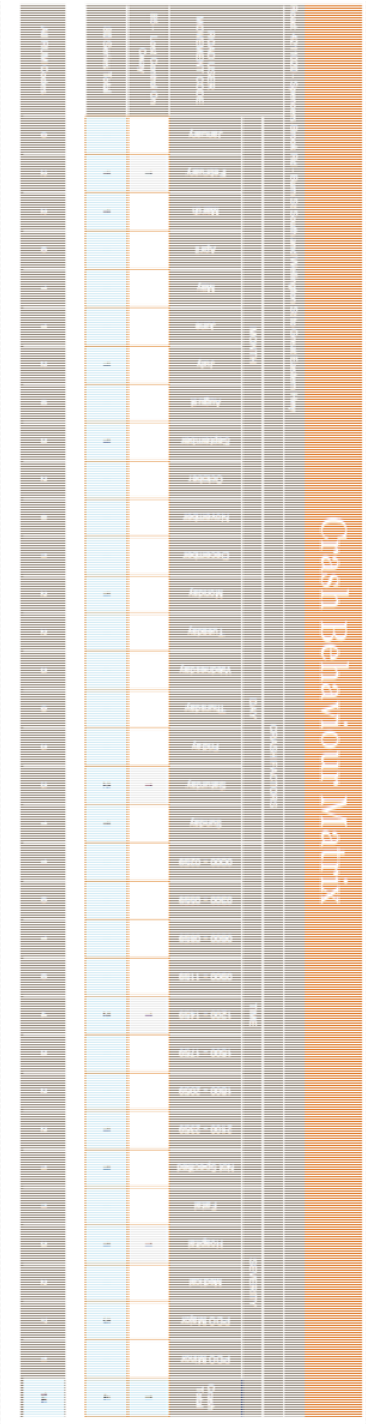
APPENDIX C

CRASH REPORTS

Crash Behaviour Matrix

Road: 4211020 - Spencers Brook Rd - Burn St South and Wellington St to Great Eastern Hwy

ROAD USER MOVEMENT CODE	Crash Total	SEVERITY				CRASH FACTORS																		MONTH											
		PDO Minor	PDO Major	Medical	Hospital	Fatal	Not Specified	2100 - 2359	1800 - 2059	1500 - 1759	1200 - 1459	0900 - 1159	0600 - 0859	0300 - 0559	0000 - 0259	Sunday	Saturday	Friday	Thursday	Wednesday	Tuesday	Monday	December	November	October	September	August	July	June	May	April	March	February	January
14 - Thru - Right	2	1		1							2								1							1								
10 Series Total	2	1		1							2							1	1							1								
10 Series : INTERSECTION	2	1		1							2							1	1							1								
56 - Into Right Turn	1										1											1											1	
50 Series Total	1										1											1											1	
50 Series : OVERTAKING	1										1											1											1	
67 - Temp Obj On Cway	1								1											1														
60 Series Total	1								1											1														
59 - Hit Animal	1			1								1					1																
60 Series : ON PATH	2			1					1			1					1			1														
71 - Off Left Cway	1						1											1								1								
72 - Off Left Cway Obj	3	1		1						1	2											1				1								
73 - Left Turn - Intx	1			1														1				1												
70 Series Total	5	2		2			1		1	1	2							1				1				1								
70 Series : OFF PATH, ON CURVE	5	2		2			1		1	1	2							1				1				1								
82 - Off Right Bend In Obj	2		2				1				1							1				1				1								
84 - Off Left Bend In Obj	1			1																													1	
70 Series : OFF PATH, ON STRAIGHT	1																																	


Crash Behaviour Matrix

APPENDIX D

CORRECTIVE ACTION REPORT

Corrective Action Report – Spencers Brook Road Slk 3.26 – 23.87

Road Safety Inspection

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments

Finding – Steep Batter Slopes within clear zone There are batters within the assessed Clear Zones that are steeper than 3:1. ***Recommendation*** Review the level of risk associated with the steep or poor condition batters and consider treatments appropriate with the level of risk. Treatment options may include delineation, flattening the batters or barrier protection.	Choose an item.		
Finding – Non frangible items within Clear Zone It was observed a number of non-frangible items were present along the road within the audit scope. These included power poles, non-frangible vegetation, culverts, and star pickets. Items particularly noted included: Power poles at Slk 3.95, culvert at Slk 3.95 tree at Slk 6.09 (which is also resulting in damage to the road). ***Recommendation*** Review the clear zone along Spencers Brook Road and ensure all non-frangible items are outside the clear zone or protected	Choose an item.		

Finding – Road Width Some sections along the road within the audit scope did not meet 3.5m lane width, some sections had measured as low as 2.7m which was found at Slk 7.8, and Slk 11.73 (Trimmer Road intersection). ***Recommendation*** Provide adequate road width at locations where Spencers Brook Road is narrow.	Choose an item.		

Finding – Quarry Access Evidence suggests previously the northern access was used by heavy vehicle entry, and the southern access was used for heavy vehicle existing, and light vehicle entry. Due to the restricted width at the northern end, heavy vehicles required to manoeuvre onto the shoulder to ensure they could safely turn into the Quarry. It would appear heavy vehicles exiting at the southern access would exit onto Spencers Brook Road at an approximate angle of 25 degrees. The sight distance to the south of the quarry is also too short. ***Recommendation*** Consideration is required for the entry and exit accesses from the quarry. Vehicles existing the quarry should exit onto Spencers Brook Road at a minimum angle of 70 degrees. The minimum safe intersection sight distance should also be available at the entry/exit points. Should gates be locked for the quarry access, the gates should be relocated further from the road. Should a driver of a long vehicle require unlocking the gate, providing sufficient room within the property will allow the driver to park between the road and the gate, rather than remaining stationary on the road.	Choose an item.		

Finding – Intersection Warning Signs MRWA guideline drawing 201031-0008 shows the recommended typical intersection sign and device installation. It was observed that most intersections within the audit scope do not have the recommended installation if signs and devices. ***Recommendation*** Install the recommended signs and devices (including RRPM's and holding lines) in accordance with MRWA requirements at all intersections (note use of MR-HM-2).	Choose an item.		
Finding – Vegetation Maintenance It was observed vegetation obstructed warning devices (signs and guideposts), sight distances, and hazards (ie culverts) along the road within the audit scope. ***Recommendation*** Undertake vegetation clearing works to reinstate sight visibility and assess large trees in close proximity to the road with the aim of removing braches that could fall onto or close to the road.	Choose an item.		

Finding – Pavement markings removed from roadwork's Recent works have resulted in pavement markings being removed or covered. Pavement markings were observed to be absent near the Quarry, and around Spencers Brook-York Road. ***Recommendation*** Have all pavement markings reinstated. In the short term temporary warning signs should be installed warning road users of the lack of line marking.	Choose an item.		
Finding – Loose material on road It was observed at the Quarry, Fettlers Lane, and opposite Old Spencers Brook Road, loose material was present on the traffic lane. ***Recommendation*** Remove the loose material and ensure loose material does not reoccur.	Choose an item.		

Finding – Safety issues around culverts Currently a number of culverts exist along the road within the audit scope which are within the clear zone, and have no warning of the location of these culverts. ***Recommendation*** Extent the culverts to ensure the headwalls are outside of the clear zone, install a traversable end treatment, or provide protection to the road users from the culvert. Provide warning of the culverts in accordance in accordance with MRWA requirements.	Choose an item.		
Finding – Surface Condition Multiple locations along the road within the audit scope had surface defects which included, pot holes, rutting, and road deformations. Road deformation was noted at two locations – Quarry access, and SLK 4.28. ***Recommendation*** Undertake repair works to remove any defects found along the road.	Choose an item.		

Finding – Sudden Road Width Change It was observed that recent works undertaken at SLK 5.42 widened the available road width, however a change in the road width between the newly widened section, and the old section exist. ***Recommendation*** The road should be widened to ensure it meets the minimum road width required. Ideally edge line marking would be installed to provide warning to road users, however sufficient road width is required for implementing an edge line. Changes to the road width should be through a taper, rather than sudden changes.	Choose an item.		
Finding – Damage to Warning Devices It was observed that damage has occurred to some warning devices along the road within the audit scope. These included guide posts, and warning signs. Those noted included but not limited to: guide posts around Slk 5.42, curve warning sign located at Slk 6.73. ***Recommendation*** Undertake remedial works to any damage warning devices	Choose an item.		

Finding – Muresk Road Intersection A few safety issues had been identified at this location. Items include: • Multiple conflict points associated with private property access; • Barrier kerb used around the intersection. Other items had been identified, however covered in multiple areas of this report. ***Recommendation*** The property access for No. 705 should be reassessed to ensure the location and driver behaviour does not encourage unsafe movements entering or exiting the road. The need for kerbing in the area should be assessed, should the need for kerbing exist, a more appropriate kerbing should be installed.	Choose an item.		

Finding – Bridge's Multiple bridges exist along the route within the audit scope. It would appear the barrier systems of some of these bridges may not compliant with current MRWA requirements included length required to protect errant vehicles. Should increased traffic be permitted, the bridge load rating will also require being assessed to ensure it is capable of handling additional weight. ***Recommendation*** Have the barrier systems reviewed and upgraded as required. Ensure bridges weight rating is reviewed to ensure it is capable of handling additional weight.	Choose an item.		

Finding – Intersection sight distance Multiple intersections within the audit scope failed to meet the minimum Safe Intersection Sight Distance (SISD). Vegetation appeared to be the main factor affecting sight distance. Trimmer Road was noted as having very poor sight distance. ***Recommendation*** Vegetation around intersections which have restricted sight distance should be trimmed to increase available sight distance. Sight distance should be reassessed to determine if appropriate distance is available after works undertaken.	Choose an item.		
Finding – Sign and warning devices condition Along the road within the audit scope multiple signs had been observed to have substandard reflectivity or were in poor condition. ***Recommendation*** Undertake an audit on all signs to determine retro reflective compliance and condition, and replace all warning signs as required.	Choose an item.		

Finding – Sign Spacing It was observed that 3 warning signs in advance of Old Spencer Road (Eastbound) where in close proximity to each other. ***Recommendation*** Determine if all signs are required, ensure spacing between signs allows road users to observe all signs with sufficient notice.	Choose an item.		
Finding – Access Track An unofficial access track exists opposite Old Spencers Brook Road, which appears to be associated with the pedestrian heritage trail, however it appears vehicles also use this track as a short cut to Gooch Road. ***Recommendation*** Implement measures to ensure vehicles are not able to use the access track	Choose an item.		

Finding – Curved Alignment Markers The Curved Alignment Markers near Slk 23.65 are incorrect. ***Recommendation*** Install the correct Curved Alignment Markers in accordance with AS1742.2 and MRWA requirements.	Choose an item.		
Finding – Intersection warning sign for Lockyer Road and Eadine Road The intersection warning sign eastbound for Eadine Road do not incorporate Lockyer Road. ***Recommendation*** Replace the current intersection warning sign with a sign which reflects the intersection.	Choose an item.		

Finding – Great Eastern Highway Intersection Warning Sign The intersection warning sign eastbound for Great Eastern Highway does not detail the road name on the left hand side. The signs are also different sizes on either side of the road. ***Recommendation*** Add 'GT EASTERN HWY' name tag to left hand side, and ensure both intersection warning signs are the same size.	Choose an item.		
Finding – Spencers Brook York Road Intersection signs Too many signs exist at the Spencers Brook York Road intersection. ***Recommendation*** Reduce the amount of signs displayed at the intersection.	Choose an item.		

Finding – Posted Speed Limit Spencers Brook Road has a posted speed limit of 110km/h which reduces to 80km/h within the Spencers Brook area. ***Recommendation*** The speed limit of Spencers Brook Road should be reassessed in accordance with MRWA guidelines.	Choose an item.		
Finding – Curve Warning Signs Multiple curves along the route within the audit scope do not have curve warning signs on the approaches. ***Recommendation*** Review all curves along the route to determine what curves require curve warning signs. Curves should also be assessed to determine the need for advisory speed limits, or curved alignment markers.	Choose an item.		

Finding – Railway Level Crossing There is a railway level crossing at Slk 7.83 with substandard sealed approach and holding lane widths. ***Recommendation*** Undertake a detailed assessment of the existing level crossing using the using the Australian Level Crossing Assessment Model (ALCAM).	Choose an item.		

Corrective Action Report - Spencers Brook Road Slk 3.26 – 23.87

Road Safety Inspection

NOTE:

- This Corrective Action Report is to be read in conjunction with the full Road Safety Inspection Report and its findings and recommendations.
- The asset owners (MRWA and/or LGA) **must** be informed of these findings, recommendations and proposed actions.
- Items not under the responsibility of this project representative must be forwarded to the persons / agencies who are responsible.

These findings and recommendations have been considered, and the actions listed will be taken accordingly.

Responsible Project Representative	**Company / Agency / Division**	**Position**	**Date**

Asset Owner Representative	**Company / Agency / Division**	**Position**	**Date**