



Nanga Road, Waroona WA

Road Improvements between Slk 0.37 – 2.02.

Road Safety Audit

Stage 3 - Detailed Design

Audit Ref: bbc2020.197

Prepared for:

Shire of Waroona

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Report Issue Date: **7/07/2021**

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1. INTRODUCTION

1.1 Scope of Audit

A Road Safety Audit is a formal, systematic, assessment of the potential road safety risks associated with a new road project or road improvement project conducted by an independent qualified audit team. The assessment considers all road users and suggests measures to eliminate or mitigate any risks identified by the audit team.

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

This report results from a Stage 3 Detailed Design Road Safety Audit carried out on the proposed road Improvements between Slk 0.37 – 2.02 Nanga Road, Waroona.

The background and objectives of the proposed project are to improve safety for the traffic using the road. The audit was undertaken by Brad Brooksby of Brad Brooksby Consulting with reference to the details provided in the Audit Brief.

The audit comprised an examination of the information supplied by Murry Bracknell from the Shire of Waroona as listed in Appendix D and onsite meeting.

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

The audit team has examined and reported only on the road safety implications of the project as presented and has not examined or verified the compliance of the design to any other criteria.

1.2 The Audit Team

Auditor No.	Name	Role	Organisation
158 (S)	Bradley Brooksby	Audit Team Leader	Brad Brooksby Consulting
217 (A)	Deane Forder	Audit Team Member	Consultant

The audit team visited the site on 7th July 2021 between 1:30 - 4:00 pm. At the time of the site visit, the weather was cool, and the existing road surface was wet. A night site visit was not deemed necessary for the scope of work.

1.3 Specialist Advisors

Others present during the site visit were:

Name	Role	Organisation
Murry Bracknell	Local Knowledge	Shire of Waroona
Rikki Pulfer	Local Knowledge	Shire of Waroona

1.4 Safe System Findings

The aim of Safe System Findings is to focus the Road Safety Audit process on considering safe speeds and by providing forgiving roads and roadsides. This is to be delivered through the Road Safety Audit 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 Audit 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 audit 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 auditor’s 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 (Utilising Table 4.4: Safe System matrix scoring system from Austroads Safe System Assessment Framework – 2016).

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 Safety Audits

No previous Road Safety Audits have been undertaken or have been found.

1.6 Background Data

1.6.1 Crash History

A study of the recent crash history has been conducted for the Shire of Waroona for the most current five-year period to the end of December 2020. There have been 4 reported crashes along Nanga Road for the current five-year period, 2 of these are within the section Slk 0.37 – 2.02. Note, the previous data that included 2015 included a fatal crash at 2.02 Slk.

All four crashes were in dry conditions and on a curve, resulting in Property Damage.

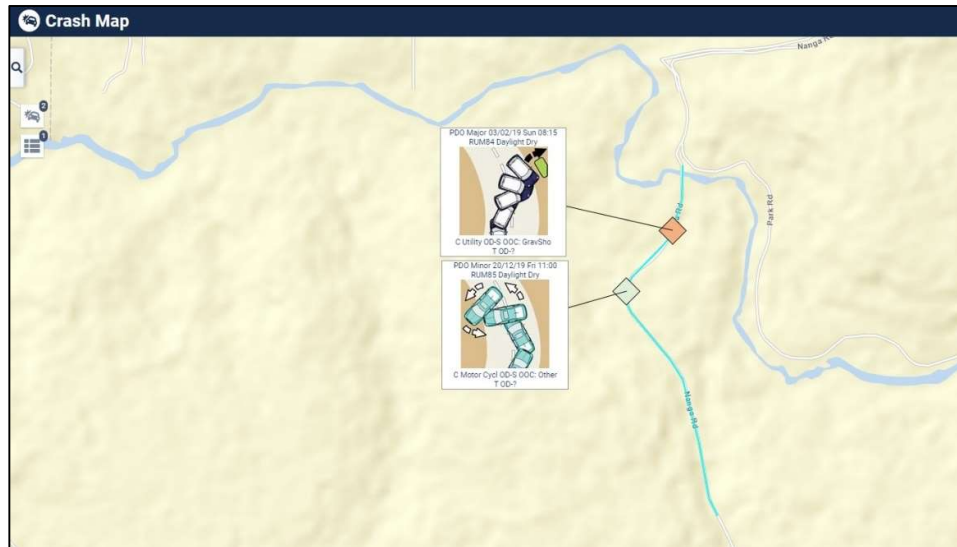


Figure 1 - Crash Map from MRWA CARS website

The Shire of Waroona had 64 recorded crashes on Shire maintained roads for the current 5-year period. 56 of these crashes were at midblock locations and 10 were at intersections.

Of the 56 midblock crashes, the most common crash types are summarised below:

- Four RUM code (21) - Opposite Direction: Head On crashes, resulting in one Medical and three Property Damage severity,
- Six RUM code (67 – 69) Hit Animal crashes, resulting in one Hospital, five Property Damage severity,
- Thirteen RUM code (71 – 75) Off Path Straight crashes, resulting in two Hospital, two Medical and nine Property Damage severity, and
- Twenty-four RUM code (81 – 85) Off Path Curve crashes, resulting in four Fatal, nine Hospital and eleven Property Damage severity.

58% of all crashes on the Shire maintained roads are Run Off road crashes and at a curve is the most common crash.

1.6.2 Traffic and Speed Data

A summary of recent traffic data is provided below:

Location	Vehicles per day (% heavy vehicles)	Date	Source
Nanga Road Average per week	287 7.6%	Nov 2018	Shire of Waroona
Nanga Road Average weekend	1,106	Nov 2018	Shire of Waroona

A summary of recent speed data is provided below:

Location	Average Speed (km/h)	85 th Percentile Speed (km/h)	Date	Source
Nanga Road	56.70 km/h Not Zoned	67.79 km/h	Nov 2018	Shire of Waroona

1.6.2 Road Details

Nanga Road (Road Number 2090074) connects to Pinjarra Williams Road in the north and runs north-south along the scarp past numerous camping locations to Clarke Road near Hoffmans Mill. The road is approximately 40 kms long and is a combination of sealed and gravel road pavement. The road is a tourist attraction with undulating terrain and forests on both sides.

The section of road reviewed in this report is a single carriageway with a sealed (10 mm aggregate) surface in fair condition approximately 6.0 m in width with 0.5 m gravel shoulders in poor condition. The road is only delineated with guideposts and advance curve warning signs.

The road has very steep batters in sections and is typically forested on both verges for much of its length with the tree line approximately 2 - 3 m from the edge of the traffic lane.

RAV Route

Nanga Road between 0.00 – 5.55 Slk is a RAV Tandem Drive Network 3 with the condition a RAV must travel to a maximum speed 40 km/h and display an amber flashing warning light on the prime mover.

RAV 3 are generally B Doubles 2.5 m wide and 27.5 m long.

2. ITEMS RAISED IN THIS DETAILED DESIGN AUDIT

2.1 Finding – Non-Frangible objects near the traffic lane.

Large trees are close to the traffic lane.

Justification of the finding:

There are large trees located on the verge, close to the traffic lane that pose a risk to vehicle occupants in the event an errant vehicle leaves the road, particularly those on the outside of curves.

Hazards close to the traffic lane should be removed, suitably protected or be frangible to the impact of a vehicle. Austroads: Guide to Road Design Part 6 - Roadside Design Safety and Barriers (2020). “Previously, the clear zone concept was used to define the area beside the road to be evaluated for roadside safety. It was considered that hazards outside the clear zone were acceptable. This is no longer appropriate. The designer must consider all hazards in the road reservation and that a clear area is now considered a mitigating treatment option.”

The basic options include:

- installing barriers,
- installing audio-tactile line markings (ATLM),
- removing the hazard,
- relocating the hazard to a position where it is less likely to be struck (ideally as far from the road as possible),
- reducing the impact severity posed by the hazard (e.g., redesign so that a hazardous feature can be safely traversed, use of frangible poles, lower speed zone etc.),
- improving the delineation of the road, and
- accepting the risk of the untreated hazard where the frequency of hitting the hazard and severity are both low. In this case, the risk should be monitored.

Austroads Guide provides details to determine the Network Roadside Risk Intervention Threshold (NRRIT) of hazards using traffic volume, speed of traffic and urban or rural environment.

The Shire’s crash history, while not reviewed in detail does show 57 recorded crashes over the past five-year period for midblock crashes, with most being on curves.

Providing a balance between errant vehicles hitting a non-frangible object without being seriously injured and environmental considerations needs to be reviewed. Providing sealed shoulders, audio-tactile edge line markings, guideposts, advance warning signs, low speed zone, and barriers can be mitigations for various hazards.

Note: Main Roads WA has not currently accepted Austroads: Guide to Road Design Part 6 - Roadside Design Safety and Barriers (2020), as they are reviewing the changes. Main Roads WA has adopted the Safe Systems approach, so it is likely that they will accept most of the Guide.

The Guide to Road Design Part 6 - Roadside Design Safety and Barriers (2010), suggested a Clear Zone of 3.5 m for a road with less than 750 vehicles per day and a speed zone of 70 - 80 km/h.

Recommendation

Determine the Network Roadside Risk Intervention Threshold for the road. If the action is to treat only the isolated hazards, then those that present a higher risk should be treated first. These will be the isolated hazards that are closer to the road.

Alternatively, use the Austroads: Guide to Road Design Part 6 - Roadside Design Safety and Barriers (2010) Table 4.1: Clear zone distances from the edge of through travelled way and provide a suitable clear zone.

[IMPORTANT | MODERATE]

2.2 Finding – Insufficient Safe Intersection Sight Distance.

There are several camping areas and small side-tracks with restricted sightlines due to vegetation.

Justification of the finding:

The limited sight distance can result in restart intersection crashes where the driver stops at the intersection, then restarts resulting in a crash. Restart crashes can be the result of insufficient Safe Intersection Sight Distance (SISD), drivers pulling out in front of an approaching vehicle, hidden by vegetation resulting in a right-angle crash.

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersection indicates that Safe Intersection Sight Distance is the minimum distance which should be provided on the major road at an intersection. Using an operating speed of 70 km/h and reaction time of 2.0 seconds the required Safe Intersection Sight Distance is 151 m measured 3 m back from the holding line on the side road.

Recommendation

Clear the vegetation to provide Safe Intersection Sight Distance at the intersection locations.

Remove access from tracks where access is unsuitable.

[IMPORTANT | MODERATE]

2.3 Finding – Isolated Curves of Small Radius.

An isolated substandard curve causing a sudden speed reduction may catch a driver unaware.

Justification of the finding:

An isolated substandard curve elevates the risk of a run off road impact object crashes casualty crash.

Austroads - Guide to Road Design Part 3: Geometric Design (2016) details sudden reductions in standard, such as an isolated curve of small radii (particularly at the end of long straights), introduce an element of surprise to the driver and should be avoided. The result of drivers not recognising the required action for these geometric features greatly increases the chance of a single vehicle accident occurring.

When horizontal curves cannot be increased in radii, additional measures should be considered. When the curve is up to 10 km/h lower than the posted speed then advance curve warning sign should be installed. For curves that are 10 – 20 km/h lower than the posted speed, then curve warning signs with advisory speed signage should be installed. When the curve is greater than 20 km/h below the posted speed additional measures such as pavement widening, additional guideposts on approach to the curve and edge line marking, raised pavement markers and signage such as curve alignment markers should be considered to guide the road user.

There are numerous horizontal curves, some of which were signed with curve warning signs and speed tags and others not signed. It is important to provide a consistent approach to signage and treatments so that the road user is not caught unaware. Determine the appropriate speed for each curve and place curve warning signs and speed advice if required.

Recommendation

Install advance signage and delineation to guide the road user through the curve.

[IMPORTANT | MODERATE]

2.4 Finding – Gravel Shoulder

The existing gravel shoulder is very narrow and in poor condition.

Justification of the finding:

There is a risk of run off road crashes as the result of inadequate shoulder width.

The crash history along this route shows a high off-path crash nature.

Austroads Guide to Road Design Part 3: Geometric Design indicates that a traffic function of the shoulder is to provide an initial recovery area for any errant vehicle and the most important benefit of sealed shoulders is that they reduce crash rates,

particularly with respect to run-off road crashes, with most of the benefit being achieved by shoulder seal width of 0.5 to 1.5 m. Austroads Guide to Road Design Part 3: Geometric Design indicate 7.0 m sealed traffic lanes with 2.5 m shoulders of which 0.5 m is sealed shoulder should be provided on routes where traffic volumes are 500 – 1,000 AADT.

Traffic volumes on this route range 200 – 300 vpd weekday traffic and 1,100 vpd weekend traffic.

Recommendation

Widen and improve the surface of the shoulder.

[IMPORTANT | MODERATE]

2.5 Finding – Steep Verge Batters

The batter from the gravel shoulder to the natural ground is too steep in several sections.

Justification of the finding:

An errant vehicle may roll over when the batter of the verge is steeper than 3:1 for cars resulting in occupants being injured.

Guide to Road Design Part 6: Roadside Design, Safety and Barriers (2020) describes in section 1.9.2 Description of Significant Hazards.

Significant hazards for the purpose of evaluating the Network Roadside Risk Intervention Threshold have a Trauma Index of approximately 6 and higher and include:

- down slopes, parallel to the road, between than 2 m and 5 m high and with a slope of 2:1 or steeper.

Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers indicates the use of road safety barriers is rated very high as an effective treatment to prevent an off path incident.

Recommendation

Provide a suitable road safety barrier along the road section when verge batters trigger a high Network Roadside Risk Intervention Threshold.

[IMPORTANT | MODERATE]

2.6 Finding – Vegetation obscuring Warning Signs.

Vegetation close to the traffic lane obscures warning signs and guideposts.

Justification of the finding:

Vegetation close to the traffic lane results in drivers shying away from the edge of the road and crossing the centreline into approaching traffic lane which could result in a head on crash. Vegetation that obscures warning signs and or guideposts may result in the road user traveling too fast for curves or crests or misjudge the road layout ahead.

Recommendation

Remove vegetation that is close to the road and or obscures advance warning signs and guideposts.

[IMPORTANT | MODERATE]

2.7 Finding – Guideposts.

Many guideposts were damaged, of a poor standard or missing and did not provide clear guidance to the road user.

Justification of the finding:

A lack of guideposts does not provide clear guidance to the road user, particularly in poor light conditions. This can result in the road user misjudging the road layout resulting in a runoff road crash.

Austroroads Guide to Road Design Part 6B: Roadside Environment provides guidance: Guideposts are used to mark the edge of the carriageway. They assist the road user by indicating the alignment of the road ahead, especially at horizontal and vertical curves, and under some circumstances, by providing a gauge with which to assess the available sight distance. They provide guidance to drivers in poor light and dark conditions.

AS 1742.2 Part 2: Traffic control devices for general use, provides guidance that guideposts shall be provided at or near the edge of the road formation at a constant distance (generally between 1.2 - 3.0 m) from the pavement edge.

Recommendation

Replace guideposts to the Austroroads guidelines.

[IMPORTANT | LOW]

2.8 Finding – RAV Route.

Nanga Road from 0.00 – 5.50 SIK is a Restricted Access Vehicle (RAV) Route Tandem Drive Network 3 with the conditions a RAV must travel to a maximum speed 40 km/h and display an amber flashing warning light on the prime mover.

Justification of the finding:

There is a risk mixing a high number of tourists with RAV's could result in a crash.

Nanga Road has a high traffic volume on weekends with an influx of tourists that may not know the road well. If Restricted Access Vehicles used the road on a weekend or public holiday they would be traveling slowly. Road users could become impatient following a large vehicle and take risks in overtaking.

The road also forms part of the Munda Biddi Trail which likely results in high use of hikers and cyclists using the road on weekends and public holidays.

Recommendation

The conditions for RAV using the road be reviewed to include “No Operation on Weekends or Public Holidays”.

[IMPORTANT | LOW]

2.9 Finding – RAV Speeding.

Large vehicles (RAV 3) travelling faster than the approved speed limit for RAV’s may become unstable or travel close to the centreline.

Justification of the finding:

RAV’s travelling at speed will result in other vehicles having to move closer to the gravel shoulder when passing, placing them at a higher risk of an Off-Path event.

The road is a RAV 3 route with the condition maximum speed 40 km/h.

Traffic count data within the RAV sections was not available, however several Road Safety Audits recently conducted at other RAV route sites have found a high percentage of RAV travelling over the restricted speed limit.

Of the 56 midblock recorded crashes on Shire of Waroona roads, 4 have involved trucks resulting in one Fatal, one Hospital one Medical severity and one Property Damage. The crash statistics for trucks are significant with the high rate of casualty crash severity.

Signage reminding drivers of the restricted speed limit for Restricted Access Vehicles can alter driver behaviour and allow other road users to report large vehicles that are travelling too fast.

Recommendation

Place advisory signage for speed restriction for Restricted Access Vehicles along the road.

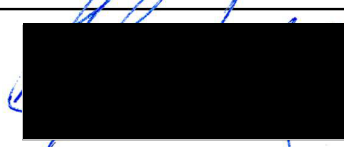
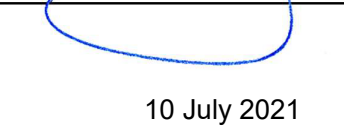
[LOW]

3. AUDIT TEAM STATEMENT

I hereby certify that the audit team have examined the documents listed in Appendix D and have inspected the site in undertaking this Road Safety Audit. I also confirm that this audit has been carried out independently of the design team following the general principles detailed in *Austrroads Guide to Road Safety Part 6: Road Safety Audit* and in accordance with Main Roads Policy and Guidelines for Road Safety Audit.

The audit has been carried out for the sole purpose of identifying any features of the design which could be altered or removed to improve the safety of the proposal. The identified issues have been noted in this report. The accompanying findings and recommendations are put forward for consideration by the Client for implementation.

Audit Team Leader

[Redacted]	 Signature
Traffic Consultant	
Brad Brooksby Consulting	
[Redacted]	 10 July 2021
[Redacted]	

Disclaimer

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

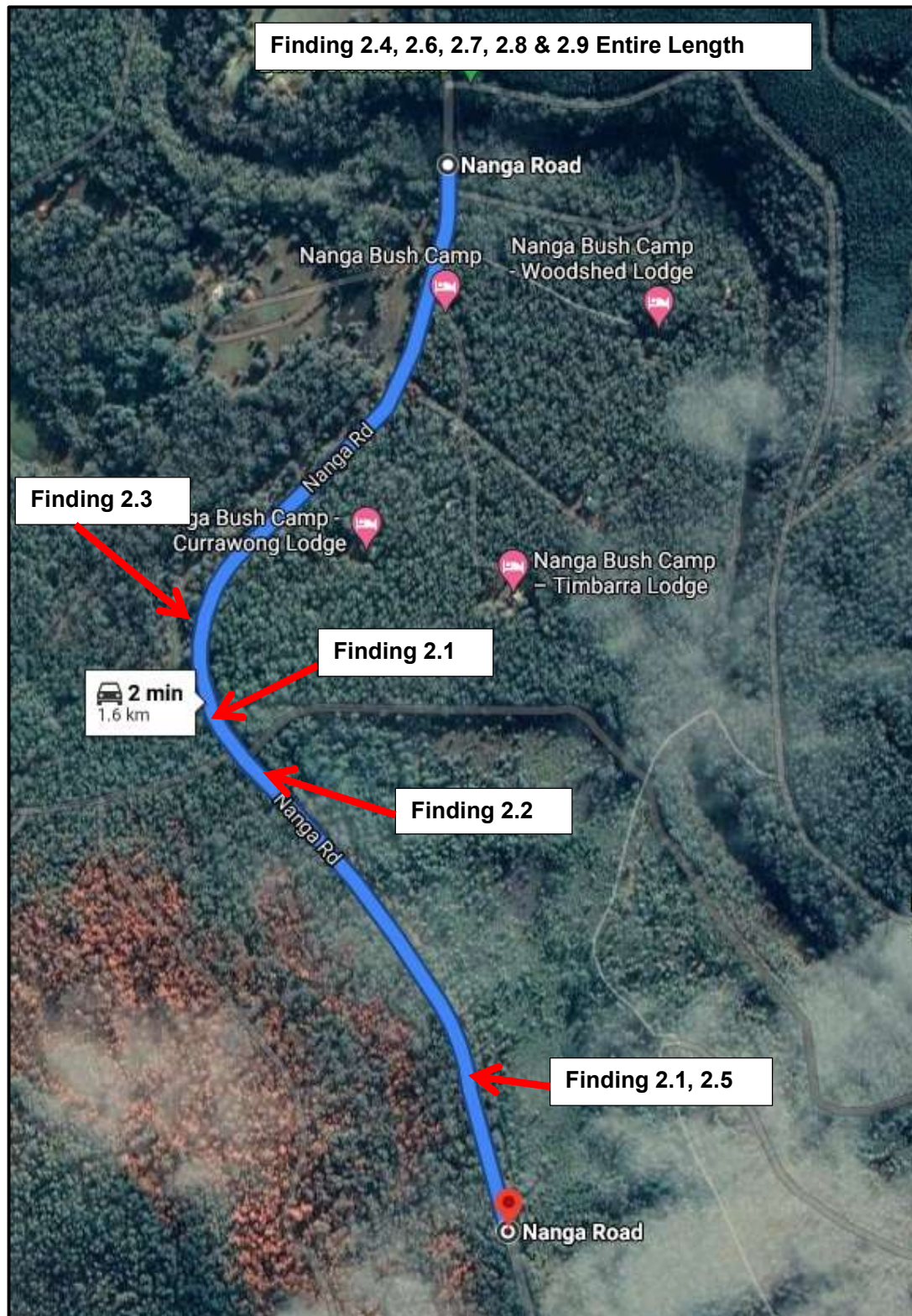
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Subject to any responsibilities implied in law which cannot be excluded, the Road Safety Audit Team is not liable to any party for any losses, expenses, damages, liabilities or claims whatsoever, whether direct, indirect or consequential, arising out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

APPENDIX A

AUDIT FINDINGS LOCATION PLAN



Location Plan

(Many findings are included throughout the length of the road)

APPENDIX B

AUDIT PHOTOGRAPHS



Finding 2.1 Non frangible trees close to the traffic lane, a hazard to an errant vehicle.



Finding 2.1 Non frangible trees close to the traffic lane, a hazard to an errant vehicle.



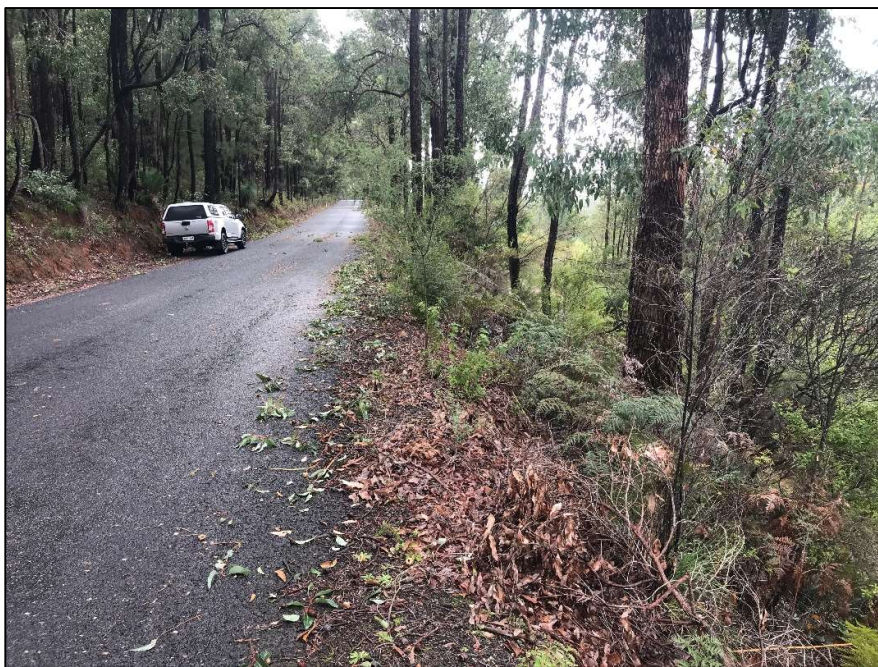
Finding 2.2 – Insufficient sight distance from the side-track. Consider closing the access to the road.



Finding 2.2 – – Insufficient sight distance from the side-track. Consider closing the access to the road.



Finding 2.4 – Gravel Shoulder is narrow and in poor condition.



Finding 2.5 – Steep bank close to close to the traffic lane, a hazard to an errant vehicle.



Finding 2.6 – Advance warning sign obscured by vegetation could result in the road user approaching the curve too fast.



Finding 2.6 – Advance warning sign obscured by vegetation could result in the road user approaching the curve too fast.

APPENDIX C

CRASH REPORTS

Detailed Crash History

Report Criteria																															
Road	SUK	CWY																													
2090074 - Nanga Rd	0.00 to 3.55	All																													
Parameter																															
From Date	31/12/2016																														
To Date	31/12/2020																														
Crash Type	All																														
Severity	All																														
Road	Road Name	SUK	CWY	True Dist	Intersection	Date	Day	Time	Severity	Crash No.	Type	Light Cond	Road Cond	Speed Limit	Traffic Control	Road Feature	Road Alignment	Speed Factor	MS Nature	Location	RUM	Unit	Unit Type	From Dir	To Dir	Vehicle Move	First Object Ht	Second Object Ht	Third Object Ht	Target Impact Point	
2090074	Nanga Rd	0.37	S	0.37		03/02/2019	Sunday	0815	POD Major	20180	Midbook	Daylight	Dry	51	No Sign Or Control		Curve		Hit Object	On Right Verge After Leaving Onway	Hit Off Path On Curve: On Left Side of Onway	Colliding	Utility	S	N	Out Of Control: Onway Shoulder	Tree	Tree			
2090074	Nanga Rd	0.81	S	0.81		20/12/2019	Friday	1100	POD Minor	20183	Midbook	Daylight	Dry	51	No Sign Or Control		Curve		Non Collision	On Onway	Hit Off Path On Curve: Lost Control: On Onway	Colliding	Motor Cycle	S	N	Out Of Control: Other					

Figure 3 Detailed Crash History.

APPENDIX D

LIST OF DOCUMENTS PROVIDED FOR THE AUDIT

APPENDIX E

CORRECTIVE ACTION REPORT

Corrective Action Report – Stage 3 Detailed Design - Nanga Road, Waroona WA
Road Improvements between Slk 0.37 – 2.02.

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
3.1 Finding – Non-Frangible objects near the traffic lane. Large trees are close to the traffic lane.			
Recommendation Determine the Network Roadside Risk Intervention Threshold for the road. If the action is to treat only the isolated hazards, then those that present a higher risk should be treated first. These will be the isolated hazards that are closer to the road. Alternatively, use the Austroads: Guide to Road Design Part 6 - Roadside Design Safety and Barriers (2010) Table 4.1: Clear zone distances from the edge of through travelled way and provide a suitable clear zone. [IMPORTANT MODERATE]	Choose an item.		
3.2 Finding – Insufficient Safe Intersection Sight Distance. There are several camping areas and small side-tracks with restricted sightlines due to vegetation.			
Recommendation Clear the vegetation to provide Safe Intersection Sight Distance	Choose an item.		

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
<p>at the intersection locations.</p> <p>Remove access from tracks where access is unsuitable.</p> <p>[IMPORTANT MODERATE]</p>			
<p>3.3 Finding – Isolated Curves of Small Radius.</p> <p>An isolated substandard curve causing a sudden speed reduction may catch a driver unaware.</p>			
<p>Recommendation</p> <p>Install advance signage and delineation to guide the road user through the curve.</p> <p>[IMPORTANT MODERATE]</p>	Choose an item.		
<p>3.4 Finding – Gravel Shoulder</p> <p>The existing gravel shoulder is very narrow and in poor condition.</p>			
<p>Recommendation</p> <p>Widen and improve the surface of the shoulder.</p> <p>[IMPORTANT MODERATE]</p>	Choose an item.		

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
3.5 Finding – Steep Verge Batters The batter from the gravel shoulder to the natural ground is too steep in several sections.			
Recommendation Provide a suitable road safety barrier along the road section when verge batters trigger a high Network Roadside Risk Intervention Threshold. [IMPORTANT MODERATE]	Choose an item.		
3.6 Finding – Vegetation obscuring Warning Signs. Vegetation close to the traffic lane obscures warning signs and guideposts.			
Recommendation Remove vegetation that is close to the road and or obscures advance warning signs and guideposts. [IMPORTANT MODERATE]	Choose an item.		

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
3.7 Finding – Guideposts. Many guideposts were damaged, of a poor standard or missing and did not provide clear guidance to the road user.			
Recommendation Replace guideposts to the Austroads guidelines. [IMPORTANT LOW]	Choose an item.		
3.8 Finding – RAV Route. Nanga Road from 0.00 – 5.50 Slk is a Restricted Access Vehicle (RAV) Route Tandem Drive Network 3 with the conditions a RAV must travel to a maximum speed 40 km/h and display an amber flashing warning light on the prime mover.			
Recommendation The conditions for RAV using the road be reviewed to include “No Operation on Weekends or Public Holidays”. [IMPORTANT LOW]	Choose an item.		

Findings and Recommendations	Project Manager		
	Agree / Disagree	Reason for Disagreeing	Proposed Action and Comments
3.9 Finding – RAV Speeding. Large vehicles (RAV 3) travelling faster than the approved speed limit for RAV's may become unstable or travel close to the centreline.			
Recommendation Place advisory signage for speed restriction for Restricted Access Vehicles along the road. [LOW]	Choose an item.		.

Corrective Action Report – Stage 3 Detailed Design - Nanga Road, Waroona WA
Road Improvements between Slk 0.37 – 2.02.

NOTE:

- This Corrective Action Report is to be read in conjunction with the full Road Safety Audit 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

APPENDIX F

OTHER ITEMS

4. OTHER ITEMS

4.1 . W Beam

On Nanga Road just north of the bridge, there is an existing section of W beam on Nanga Road to the north in the Shire of Murray that appears to have installed many years ago.

A visual inspection showed it seemed to have been side swiped a couple of times with minor damage not requiring repair. The ground being gravel appears to be suitable to instal the W beam without the full 600 mm to the hinge point.

This barrier is not to current standards as it does not have blockouts and looked a little low. It also has no delineation and the end treatment is a width marker sign.



Photo 1 – W Beam in Shire of Murray appears to be in good condition.



Photo 2 – W Beam in Shire of Murray with Width Marker signage and WA Melt end treatment.

Main Roads design sheet for W Beam suggests

- A minimum length of 28 m including end treatments.

- New systems shall be installed with approved solid blockouts

- Post installed at hinge point which requires the use of a longer post and requires the post spacing to be reduced to 1.0 m. This treatment can be used at batters slopes up to and including 2 (H):1 (V).

See Main Roads drawing 200931-0002.

W beam has a recommended minimum distance between the rear of the system and the hinge point of the batter – 600mm. The dynamic deflection at 2.0m post spacing is 1.0m. There should not be any trees or fixed objects within 1.0 m of the barrier to allow deflection when it is hit.

4.2 Nanga Brook Road Speed Zone

Nanga Brook Road is speed zoned at 90 km/h, many of the horizontal curves have curve warning signs and speed advice signs of 70 km/h. The road is approximately 20 kms long, so a vehicle traveling at 90 km/h would take approximately 13 minutes to travel from end to

end. If the speed zone was reduced to 80 km/h, then the travel time would be increased by about 2 minutes. The road has many horizontal curves which are below the design speed and numerous sections with non-frangible objects (trees) close to the traffic lane and sections with steep verges which may result in casualty crashes in the event of an errant vehicle.

Nanga Brook Road has 10 recorded crashes,

- Off Path resulting in 2 Fatal severity crashes

- Off Path resulting in 3 Hospital severity crashes

- On Path resulting in 1 Medical severity crash and

- Off Path resulting in 4 Property Damage severity crashes.

A reduction in speed zone should reduce the severity of crashes on Nanga Brook Road.



Photo 3 – 90 km/h repeater sign, poorly located placed just prior to the narrow tunnel.

Recommendation:

Request Main Roads to reduce the speed zoning on Naga Brook Road to 80 km/h.

Relocate repeater speed zone signs to appropriate places, not just prior to a narrow section of road or a substandard curve etc.