Roads Safety Audit

Intersection of McAuleys Lane and Mullumbimby Road, Myocum

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Prepared for: Ardill Payne & Partners

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UPR	Description	Issued By	Date Issued
4319-1001	Version 1	Michelle Erwin	24/06/2022
4319-1002	Version 2	Michelle Erwin	28/06/2022

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1. Project Information

1.1 Background

Ardill Payne and Partners (APP) has engaged GeoLINK to undertake a Road Safety Audit (RSA) for the concept design of the proposed upgrade works at the intersection of McAuleys Lane and Mullumbimby Road in Myocum.

1.2 Site Description

The area audited as shown in the concept design plan is an intersection with associated driveways. The audit has been generally limited to 100 m beyond Mullumbimby Road being approximately 650 m long. Refer to **Figure 1.2** and **Sections 1.4** and **1.5**.

McAuleys Lane is approximately 3.8 km in length linking Myocum Road in the west to Mullumbimby Road in the east. It is a rural, low traffic volume road, assumed to be predominantly used by local traffic. In the vicinity of the intersection with Mullumbimby Road, particularly within the first 20 m, the pavement is in poor condition.

The existing intersection of McAuleys Lane and Mullumbimby Road comprises an auxiliary left turn treatment and a basic right turn treatment from the major road (Mullumbimby Road). With the exception of the auxiliary left turn lane allowing for deceleration of vehicles entering McAuleys Lane from the south on the downhill gradient, there are no other turning or acceleration lanes provided for traffic entering or exiting McAuleys Lane.

The throat of McAuleys Lane at the intersection is wide and includes edge lines and a double barrier centreline but no holding line. Approximately 40 m along McAuleys Lane is a white advisory sign with the text, 'Bridge Load Limit 7_T R 14_T T. 2.2 km Ahead'. Less than 50 m further along McAuleys Lane there is an 'Open Speed / Drive to Conditions' symbol road sign on the left-hand side of the alignment, and a 'Koala' symbol warning sign (W5-47) on the right-hand side, both for traffic approaching from Mullumbimby Road. On the reverse side of the 'Koala' warning sign is a 'T intersection, straight approach' symbol warning sign (W2-3).

Mullumbimby Road is the main route into the township of Mullumbimby for motorists approaching from the south. It has relatively high traffic volumes, including commuters, tourists, buses and heavy vehicles. Cyclists also utilise Mullumbimby Road, however pedestrian activity in the area is assumed to be uncommon due to the remoteness of the locality and there are no dedicated pedestrian or cyclist facilities.

The road falls from approximately 350 m northwest and 300 m southeast of the McAuleys Lane intersection, with the intersection located close to the sag point. The gradient northwest of the intersection is relatively gentle whereas the gradient to the southeast is quite steep.

The sign posted speed zone is 80 km/h within this section of Mullumbimby Road and there are double barrier lines for the full length of the area audited with a short break at the intersections with McAuley Lane and Saddle Road.

There is a bus stop and shelter located on the south-western side of Mullumbimby Road 70 m southeast of the McAuley Lane intersection, and a driveway providing access to No. 110 Mullumbimby Road roughly opposite the shelter. There are two more driveways within the audited area on the north-eastern side of Mullumbimby Road: one at the crest 350 m northwest of the McAuleys Lane intersection (No. 160) and another 110 m northwest of the McAuleys Lane intersection (No. 130).

Approximately 340 m northwest of the intersection, there is a 'Bicycle' warning sign (W6-7) alerting southbound motorists of the possible presence of cyclists, together with a 'Be Safe, Be Seen' sign reminding cyclists to employ appropriate measures to ensure they are visible to motorists. The same sign arrangement is provided again for southbound traffic immediately southeast of the intersection with Saddle Road. A short distance beyond the latter sign (i.e. approximately 60 m southeast of the Saddle Road intersection) is a 'Wildlife Crossing' warning sign, and an '80 km/h' speed limit sign another 80 m further southeast.

Approximately 100 m northwest of the McAuleys Lane intersection is a 'Side Road Intersection' sign (W2-4) alerting southbound motorists to the presence of McAuleys Lane. Opposite the intersection with McAuleys Lane there is another W2-4 sign for southbound traffic, this time installed on an 'Advance Road Name' green directional sign with the text 'Saddle Rd. 200 m'. There is also a Bidirectional Hazard Marker facing traffic approaching Mullumbimby Road from McAuleys Lane.

The intersection of Saddle Road and Mullumbimby Road is located approximately 250 m southeast of the intersection with McAuleys Lane. It is controlled by a stop sign and although there is a double barrier centreline at the intersection and a Bidirectional Hazard Marker, there is no holding line. The intersection is located approximately 65 m southeast of a crest on the Mullumbimby Road alignment, limiting sight distance to the northwest.

Saddle Road (or The Saddle Road) is a narrow, partially sealed rural road providing access to a small number of rural landholdings. It provides a link through to the roundabout at the Pacific Highway offramp providing access to Brunswick Heads and Mullumbimby. However, it is unlikely to be used by through-traffic given the proximity to Gulgan Road which offers the same link at a higher standard.

Figure 1.1 Site Locality ***[Source: Whereis.com]***

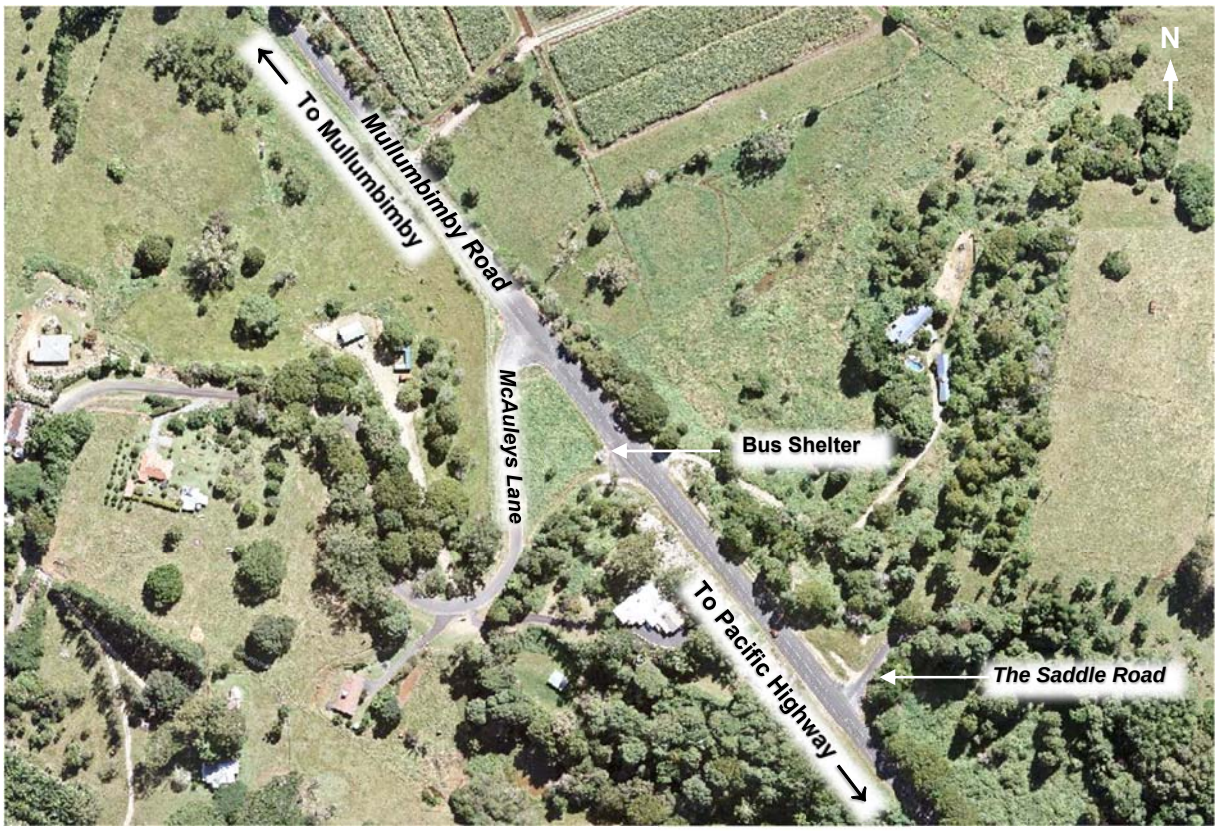

Figure 1.2 Site Context *[Source: SIX Maps]*

1.3 Project Description

The proposed works shown in the concept design plan are to upgrade the McAuleys Lane and Mullumbimby Road intersection, including the following:

- 75 m (incl. taper) channelised right turn lane for traffic entering McAuleys Lane.
- 125 m (incl. taper) auxiliary left turn lane for traffic entering McAuleys Lane.
- 130 m 3.0 m wide acceleration lane for traffic exiting McAuleys Lane to the southeast, plus an 80 m merge length.
- Chevron/solid painted islands associated with the aforementioned turn lanes.
- 3.5 m wide through lanes.
- 1.0 m wide shoulders.
- 'Give Way' (R1-2) sign, holding line and centre barrier line for traffic exiting McAuleys Lane.
- Replace existing 'Side Road Intersection' sign (W2-4) currently located northwest of the intersection with a modified green 'Advance Road Name' directional (G1-207) sign, including the text, 'McAuleys Lane'.
- Provision of new modified green 'Advance Road Name' directional (G1-207) sign 125 m southeast of the intersection, including the text, 'McAuleys Lane'.
- Widening at the driveway to No. 110 Mullumbimby Road to facilitate left turns in and out of the property, a painted splitter island and an 'All Traffic Turn Left' (R2-14) sign for vehicles exiting onto Mullumbimby Road.
- Separation kerb with flexible delineators.
- 'Crest' warning signs (W5-11) (both directions) at the crest located between McAuleys Lane and Saddle Road.
- Hold line at Saddle Road intersection to accompany existing Stop signs and continuation of painted edgelines.
- 'No U Turns' (R2-5) sign immediately northwest of the Saddle Road intersection facing northwest.

1.4 Information Provided by the Client

The concept design plan to be audited was prepared by APP. Details of the plan are provided below.

Table 1.1 Design drawing audited

Drawing no.	Rev	Date	Title
10431 SK01	D	17/06/2022	Concept Intersection Layout

1.5 Audit Scope

This RSA will assess the proposed intersection upgrade as per the concept design plan, including (where relevant) road alignment, cross section, pedestrian/cyclist safety, signage, property access, roadside obstacles, and other related infrastructure within the audit scope. The audit will be carried out to consider the perspective of all road users.

The scope of the RSA is limited to the proposed works as shown on the concept design plan.

The objective of the RSA is to identify any potential road safety issues or design deficiencies associated with the existing road that may need to be mitigated or rectified.

Although the RSA will not check the existing roadway against relevant standards and guidelines, some design-related compliance issues may be raised during the audit process.

Positive aspects of the road and infrastructure have not been recorded.

1.6 Audit Team

The audit has been carried out by suitably qualified team members registered as Road Safety Auditors by Transport for NSW.

1. **Michelle Erwin**
   BE (Civil)(Hons), MTraf, CPEng, NER
   Senior Civil Engineer, GeoLINK
   Level 3 Lead Road Safety Auditor
2. **Leon Petrohelos**
   BE (Civil)(Hons), BBus, MTeach, CPEng, NER, APEC Eng IntPE
   Senior Civil Engineer, GeoLINK
   Level 2 Senior Road Safety Auditor

2. Audit Process

2.1 Methodology and Responsibilities

The RSA has been undertaken in accordance with:

- Austroads *Guide to Road Safety Part 6: Road Safety Audit* (AGRS06, 2022); *and*
- NSW TfNSW (formerly RMS) *Guidelines for Road Safety Audit Practices* (2011),

The RSA process includes the steps listed in the table below together with the party responsible for each task.

Table 2.1 Example GeoLINK Black table format

Steps	Responsibility
Select the audit team	Client or Designer
Provide background information	Client or Designer
Hold a commencement meeting	Client and/or Designer and the Audit Team
Assess the documents / Inspect the site	Audit Team
Write the audit report and issue to client	Audit Team
Hold a completion meeting	Client and/or Designer and the Audit Team
Write the responses	Client and Designer
Implement the changes	Client or Designer

The client and designer in this case are both Ardill Payne & Partners (APP).

2.2 Commencement Meeting

An initial meeting was held over the phone with Tony Cromack from APP (the client) and Michelle Erwin from GeoLINK (lead auditor) on Tuesday the 21st of June 2022. During the meeting, the scope of the audit was confirmed, as described in this report.

In particular, it was confirmed that the audit was to be limited to the area shown in the concept design plan and that significant upgrades to The Saddle Road and Mullumbimby Road intersection were outside the scope of the design. Mr Cromack also indicated that Council was particularly concerned with the safety associated with the driveway to No. 110 Mullumbimby Road. No other specific concerns were discussed.

During the audit process, Ms Erwin contacted Mr Cromack to clarify some aspects of the plan. The following additional information was provided by Mr Cromack via email (24th June 2022):

- The dark grey shaded island at the McAuley Lane intersection is to be painted only.
- The dark grey shaded island at the driveway to No. 110 is to be a raised concrete island.
- The channelised right turn lane is to be 3.5 m in width.
- The existing auxiliary left turn lane is approximately 3.0 m in width.

2.3 Site Inspections

A site inspection is not strictly required for a design stage audit. However, the lead auditor has travelled to the site to inspect the existing intersection and existing conditions of the road network in the vicinity of the site. Photos and video footage has been provided to the audit team.

The site investigation was undertaken on the morning of Thursday the 23rd of June 2022 at approximately 9:00 am. The weather was fine at the time of the site visit and there had been no recorded raining in the 48 hours prior.

2.4 Previous Audits

It is understood that no previous RSAs have been carried out at this site or for this project.

2.5 Safe System

The Safe System approach is regarded as international good practice in road safety and provides an outcome whereby death and serious injury are virtually eliminated amongst users of the road system. The Safe System includes safe roads, safe speeds, safe people, and safe vehicles. There are four key principles that form the basis of the Safe System philosophy:

- People make mistakes that can lead to road crashes.
- The human body has a limited physical ability to tolerate crash forces before harm occurs.
- A shared responsibility exists amongst those who plan, design, build, manage and use roads and vehicles and provide post-crash care to prevent crashes resulting in serious injury or death.
- All parts of the system must be strengthened to multiply their effects. If one part fails, road users are still protected.

In accordance with AGRS06, the Safe System principles must be given due consideration in all activities within the road safety management of a road network, including the RSA. This can be achieved during the RSA process by:

- Identifying and considering key crash types that result in fatal and serious injuries (FSI).
- Relating possible crash forces to tolerable levels, regardless of the likelihood, when identifying and assessing risks/hazards.
- Consideration of audit findings and mitigation measures by their alignment with the Safe System e.g. in terms of operating speed, impact angles etc.

This audit has focused on the specific crash types that are known to result in higher severity outcomes at relatively lower speed environments to meet Safe System requirements of reducing the risk of fatal and serious injury crashes.

2.6 Completion Meeting

The objective of the completion meeting is to allow the auditor(s) to discuss the findings with the client for corrective action, where required. Although the meeting is not an occasion for the client to disagree with the audit findings, it is an opportunity for misunderstandings to be explained.

The completion meeting was held on Tuesday the 28th of June 2022 by telephone between Michelle Erwin (Lead Auditor) and Tony Cromack (APP, the client), following submission of the audit report.

3. Risk Matrix

The audit findings include a risk ranking, determined using the following tables, based on AGRS06.

Table 3.1 How often is the problem likely to lead to a crash?

Likelihood	Description
Almost certain	Once or more per quarter (four times a year or more)
Likely	Once a year
Possible	Every one to three years
Unlikely	Every three to seven years
Rare	Less than once every seven years

Table 3.2 What is the likely severity of the resulting crash type?

Severity	Description
Insignificant	Property damage
Minor	Minor first aid
Moderate	Major first air and/or presents to hospital (but not admitted)
Serious	Admitted to hospital
Fatal	Death within 30 days of the crash

Table 3.3 Resultant risk level

	Rare	Unlikely	Possible	Likely	Almost Certain
Insignificant	Negligible	Negligible	Low	Medium	Medium
Minor	Negligible	Low	Medium	Medium	High
Moderate	Low	Medium	High	High	High
Serious	Medium	High	High	Extreme	Extreme
Fatal	High	Extreme	Extreme	Extreme	Extreme

The heavy dashed line in **Table 3.3** represents the Safe System crash outcome threshold whereby everything below the line is expected to result in a FSI crash. In accordance with the Safe System, hazards should be removed, or risks reduced to avoid a resultant risk level below the threshold.

Priorities for mitigation are categorised as **Table 3.4**.

Table 3.4 Treatment approach

Frequency	Description
Negligible	No action required
Low	Should be corrected or the risk reduced if the treatment cost is low
Medium	Should be corrected of the risk significantly reduced, if the treatment cost is moderate but not high
High	Should be corrected or the risk significantly reduced, even if the treatment cost is high.
Extreme	Must be corrected, regardless of cost

Note that no definitive guidance can be given as to the respective monetary values of the terms 'low', 'moderate' or 'high' regarding treatment costs, but it is expected that consideration against the total project cost would be an important factor when categorising mitigation of each risk.

The risk matrix above is aligned to Safe System principles and has been designed to be used with consideration of a 'severity guidance sheet', replicated from AGRS06 below.

It is stressed that the information contained within the severity guidance sheet is a general indication only and that professional engineering judgement is required with its usage.

Table 3.5 Severity guidance sheet

Crash Type	Crash Speed (km/h)										
	< 10	10	20	30	40	50	60	70	80	90	100
Pedestrian (vs HV)											
Cyclist (vs HV)											
Motorcyclist (vs HV)											
Pedestrian (vs car)						Fatal					
Cyclist (vs car)											
Pole/tree impact (car)					Serious injury						
Motorcyclist (vs car)											
Side impact (HV vs car)				Moderate injury							
Side impact (car vs car)											
Head-on (HV vs car)		Minor injury									
Head-on (car vs car)											

4. Audit Findings

The following table details the RSA findings. The client responses were provided by Tony Cromack (APP) and added in the second issue of this report.

Table 4.1 Audit findings

Audit findings	Risk Ranking	Client	
		Accept	Comments
1. Exiting McAuleys Lane Vehicles travelling in the auxiliary left turn lane may prevent motorists exiting the McAuley Lane intersection from seeing northwest bound through traffic. There is a risk that a motorist will proceed through the intersection unaware that there are vehicles travelling towards them in the through-lane at speed on a downhill gradient. This may result in a rear-end or left near collision (e.g. vehicles turning left out of McAuleys Lane) or a right near collision if the vehicle exiting McAuleys Lane was turning right. The latter has the potential to result in a fatal injury given the likely speed of the through traffic. However, the low volumes of traffic utilising the auxiliary left turn lane reduce the expose to this hazard.	*Rare* *Fatal* **High**	N	There is no accident history as far as we know related to this issue. Left turn in volumes are low. Downgrade in the approach to the left turn would assist in sight distance (seeing over the approaching car). Leave turn lane as is.
2. Crest on Mullumbimby Road between McAuleys Lane and The Saddle Road The proximity of the crest on Mullumbimby Road to the intersection of The Saddle Road and Mullumbimby Road significantly limits the sight distance available for vehicles exiting The Saddle Road. There is a risk that a motorist will proceed through the intersection unaware that there are vehicles approaching from the northwest at speed. This may result in a rear-end or left near collision (e.g. vehicles turning left out of The Saddle Road) or a right near collision if the vehicle exiting The Saddle Road was turning right. The latter has the potential to result in a fatal injury given the likely speed of the through traffic. It is noted, however, that this risk is an existing safety issue and the proposed works do not in any way exacerbate the situation.	*Possible* *Serious* **High**	N	Noted, but issue not related to McAuleys Lane intersection design.
3. Vegetation at The Saddle Road intersection Vegetation on the eastern side of The Saddle Road intersection limits the sight distance available for vehicles exiting The Saddle Road. There is a risk that a motorist turning right out of The Saddle Road will proceed through the intersection unaware that there are vehicles approaching from the southeast at speed. This may result in a right near collision. It is noted, however, that this risk is an existing safety issue and the proposed works do not in any way exacerbate the situation.	*Possible* *Serious* **High**	N	Noted, but issue not related to McAuleys Lane intersection design.

Audit findings	Risk Ranking	Client	
		Accept	Comments
4. Bus Stop on Mullumbimby Road The bus stop and shelter on Mullumbimby Road is located shortly after a crest vertical curve. Bus drivers will not be able to see if there are patrons waiting at the bus shelter until the bus is over the crest. There is a risk that a bus travelling northwest will need to break sharply to stop at the shelter. This may result in a rear-end collision involving a vehicle travelling closely the behind the bus at 80 km/h.	*Rare* *Serious* **Medium**	Y	Issue accepted. Will discuss further with Council and bus companies. May not be practical to relocate bus stop
5. Proposed raised island at driveway to No. 110 Mullumbimby Road The proposed raised concrete island appears to be located directly behind the southeast-bound travel lane on Mullumbimby Road. The loss of shoulder space creates a pinch point for cyclists travelling along Mullumbimby Road in a south-easterly direction. There is a risk that a cyclist will abruptly move from the shoulder into the travel lane and be struck by traffic travelling at speed in the same direction.	*Unlikely* *Fatal* **Extreme**	Y	At design stage, island will be designed to allow shoulder users to pass
6. Driveway to No. 110 Mullumbimby Road – Comment Only The site visit revealed significant safety issues associated with the proximity of the crest on Mullumbimby Road to the driveway providing access to No. 110 Mullumbimby Road. Although there is sufficient sight distance available to the right (northwest), the crest severely limits sight distance to the left (southeast). The measures to prevent right turns in or out of this driveway proposed in the concept design remove the exposure to this hazard.	Comment only	-	Noted
7. Proposed G1-207 at driveway to 130 Mullumbimby Road – Comment Only The proposed replacement of the 'Side Road Intersection' sign located approximately 100 m northwest of McAuleys Lane with a larger G1-207 sign may impede sight distance for drivers exiting the driveway. Caution should be taken to ensure this sign is located so as not to adversely impact the sight distance of motorists existing the driveway.	Comment only	Y	At design stage, sign will be located with consideration of sight distance from driveway

5. Concluding Statement

5.1 Identified Deficiencies

The audit process seeks to identify potential safety hazards. However, there is no guarantee that every deficiency has been identified. Further, even if all audit findings are addressed, this will not necessarily guarantee a safe site. Rather, addressing the findings of this report should improve the level of safety offered by the existing road network within the audit area.

As per **Section 4**, several deficiencies have been identified. The risk associated with each issue has been assessed. As per **Table 3.4**, any issue with a risk ranking of 'medium' should be corrected if the cost of treatment is moderate. Issues with a risk rating of 'high' or 'extreme' should be corrected or the risk significantly reduced even if the cost of treatment is high.

5.2 Responding to the Audit

As set out in the RSA guidelines, responsibility for the road design always rests with the client, and not with the auditor. A client is under no obligation to accept all the audit findings. Also, it is not the role of the auditor to agree to or approve of the client's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the client, in conjunction with all other project considerations.

This formal RSA report should be responded to in writing, giving reasons for each rejection of an audit finding. Acceptance of a finding may require no further comment, but explanation of how or when the action will be taken may be useful. The audit response does not need to be provided to the audit team but should be kept on file as a record of due diligence.

5.3 Concluding Statement

Each member of the audit team has examined the documents provided and/or inspected the site as documented in this report. The audit has been carried out independently of the designers in accordance with Austroads *Guide to Road Design Part 6: Road Safety Audit* (2022). The audit has been carried out for the sole purpose of identifying any risks found within the audit scope which could be mitigated to improve the safety of the project. The risks and any associated mitigation measures have been recorded in this report for consideration by the client for implementation.

24 June 2022

Michelle Erwin (Audit Team Leader)

24 June 2022

Leon Petrohelos (Audit Team Member)

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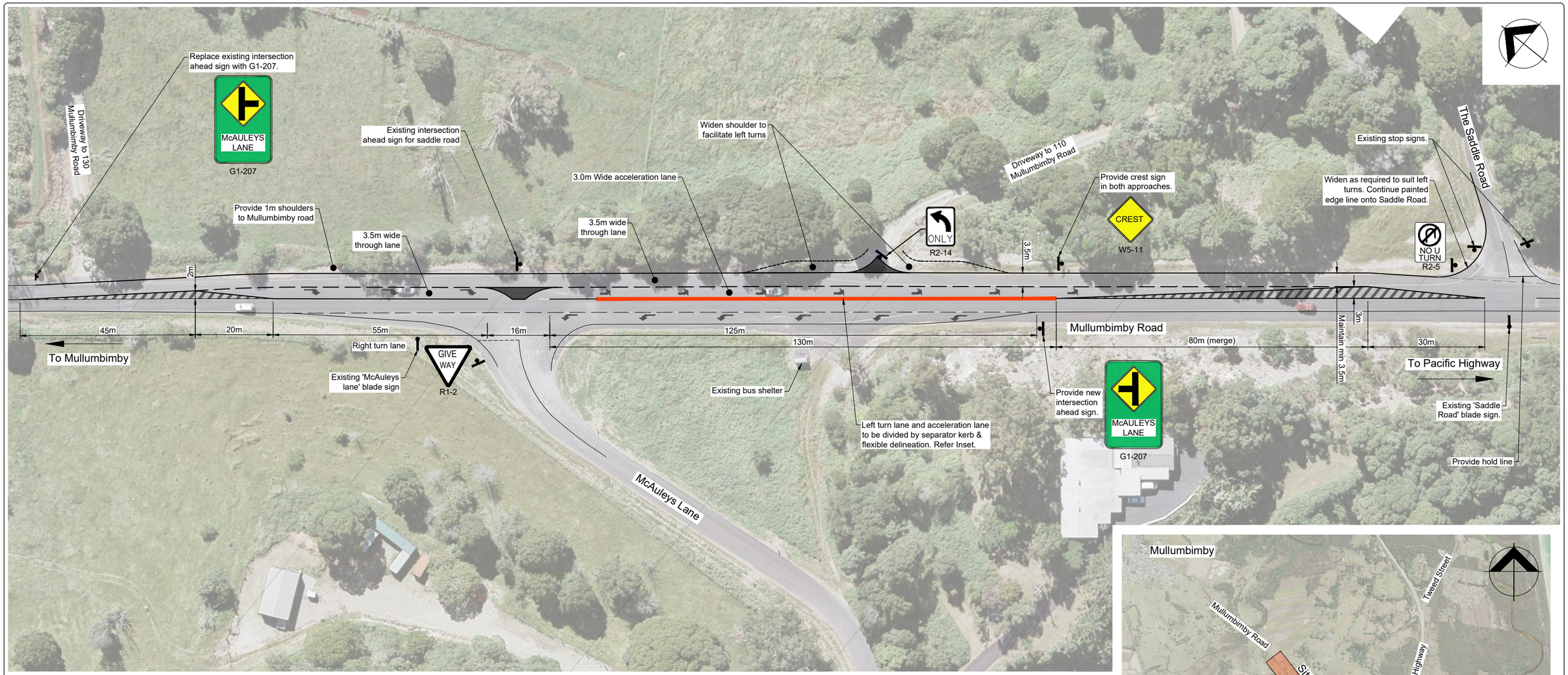
Appendix A

Audited Plans



Intersection Layout
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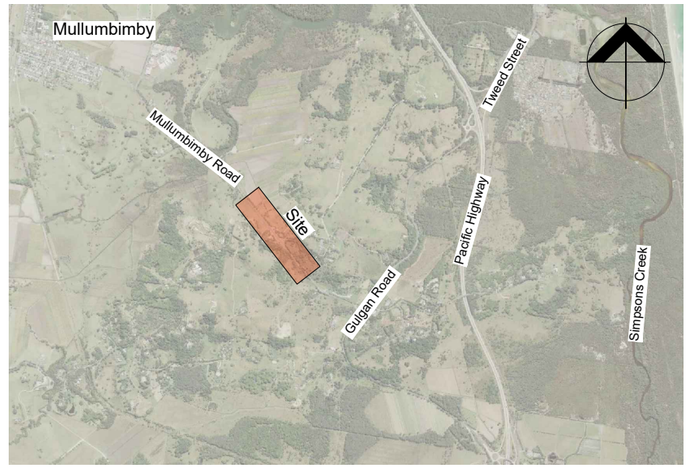

Site Locality
1:25000 @ A1

PLANS ARE CONCEPT ONLY

This plan is NOT to be used for construction purposes unless it carries the approval stamp of the local authority.

Issue	Date	Description	App'd
D	17/06/2022	Amended Intersection Layout	EMR
C	19/05/2022	LAYOUT AMENDMENTS	TC
B	17/03/2022	RURAL BAL ADDED TO THE SADDLE ROAD	AH
A	07/12/2020	ORIGINAL ISSUE	TC

Client: McAuleys No.1 PTY LTD

Project: 53 McAuleys Road, Myocum, NSW

Title: Concept Intersection Layout

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Design	TC	Scale	1:500 @ A1, 1:1000 @ A3
Drawn	EMR		0 5 10 15 20 25
Checked	AH	Datum	
Approved	TC	Drafting File	10431_Intersection_Linemarking_IssD.dwg
Date	07/12/2020	Design File	
Job No.	10431	Dwg No.	SK01
		Issue	D

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