Preliminary Design Road Safety Audit

Tahimana Development

Tasman

September 2024

Contents

1. Background

1.1. Safety Audit Procedure

A road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc), carried out by an independent competent team who identify and document road safety concerns.

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

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, that is, minimisation of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

> *To deliver completed projects that contribute towards a safe road system that is increasingly free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.*

A road safety audit should desirably be undertaken at project milestones such as:

- Concept Stage (part of Business Case);
- Scheme or Preliminary Design Stage (part of Pre-Implementation);
- Detailed Design Stage (Pre-implementation / Implementation); and
- Pre-Opening / Post-Construction Stage (Implementation / Post-Implementation).

A road safety audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the *"NZTA Road Safety Audit Procedures for Projects Guidelines - Interim release May 2013"* the audit report should be submitted to the client who will instruct the designer to respond. The designer should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the designer, safety engineer and client for each issue documenting the designer response, client decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members.

1.2. The Safety Audit Team

The road safety audit was carried out in accordance with the "NZTA Road Safety Audit Procedure for Projects Guidelines - Interim release May 2013", by:

- Gary Clark, Director, Traffic Concepts Limited
- Josh Orringe, Director, Civil & Transportation Design Limited, and

A site visit was undertaken on 21 August 2024 with Gary Clark being on site and Josh Orringe being on a video call.

1.3. Report Format

The potential road safety problems identified have been ranked as follows:

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

In ranking specific concerns, the auditors have considered the objectives of the Safe System approach, i.e., to minimise fatal or serious injury crashes.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Concern Assessment Rating Matrix in **Table 1** below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

		Severity outcome			
		Non-injury	**Minor**	**Serious**	**Fatal**
		Property damage only (PDO)	Injury which is not 'serious' but requires first aid, or which causes discomfort or pain to the person injured.	Injury (fracture, concussion, severe cuts or other injury) requiring medical treatment or removal to and retention in hospital.	A death occurring as the result of injuries sustained in a road crash within 30 days of the crash.
Probability of a crash	**Very likely**	Minor	Moderate	Serious	Serious
	Likely	Minor	Moderate	Serious	Serious
	Unlikely	Minor	Minor	Significant	Serious
	Very unlikely	Minor	Minor	Significant	Significant

Safe System injury threshold

Table 1: Concern Assessment Rating Matrix

In ranking specific concerns, the auditors must have considered the objectives of the Safe System approach, ie, to minimise fatal or serious injury crashes.

In undertaking this assessment, the Safety Audit Team have utilised the following descriptor tables to enable a fair and reasonable rating of the risks.

Table 2 provides details on the criteria that the crash frequency is assessed.

Crash Frequency	Indicative Description
Very Likely	Multiple crashes (more than 1 per year)
Likely	1 crash every 1-5 years `
Unlikely	1 crash every 5-10 years
Very Unlikely	Less than 1 crash every 10 years

Table 2: Crash Frequency Descriptor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide, a suggested action for each concern category is given in **Table 3** below.

Table 3: Concern Categories

RISK	Suggested Action
Serious	A major safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate concern that should be addressed to improve safety
Minor	Minor concern that should be addressed where practical to improve safety.

Table 3: Risk Descriptor

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

1.4. Scope of Audit

The safety audit process is designed to identify safety issues. If there are no safety issues, then the need to provide measures is not required.

This audit is a Preliminary Design Safety Audit of a proposed 141 lot subdivision accessed off the end of Stagecoach Road in Tasman. This audit covers the section of Stagecoach Road from the development start point (CH1720 – CH 3020).

A separate Safe System Audit and Road Safety Audit has been completed on the section of Stagecoach Road upgrade prior to the development. (CH 0 – CH 1720)

1.5. Documents Provided

The SAT has been provided with the following documents for this audit:

- Tahimana Ltd, Stagecoach Road Development Tasman, Resource Consent Application Drawings. Drawing number 12498-RC-1, Revision K Sheets, 1 – 74, dated 22 August 2024.

1.6. Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the SAT. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

2. Safety Audit Findings

It is understood that the design speed of Stagecoach Road is 60 km/h and was required by Council. As such the road safety audit has been completed with this design speed in mind.

2.1. Vertical Curves **Significant**

Several of the proposed vertical curves shown on the road longitudinal sections are less than the recommended design values for the corresponding design speed.

Vertical curves should be large enough with sufficient K values to enable safe stopping distance. Not providing sufficient vertical curves increases the risk and severity of crashes and especially in high operating speed environments. The auditors noted that the vertical curve at change 2400 on Stagecoach Road limits the safe stopping distance to the south. This issue is discussed separately below. The remaining vertical curves are considered under this section.

The design speed for the roads within the subdivision are expected to be 60 km/h or less. Head on crashes and run off road crashes could occur as a result of short forward sight lines. At 70 km/h these crashes can be more serious. With the operating speed expected to be less than 70 km/r the severity of a crash is likely to be minor.

Recommendation 1

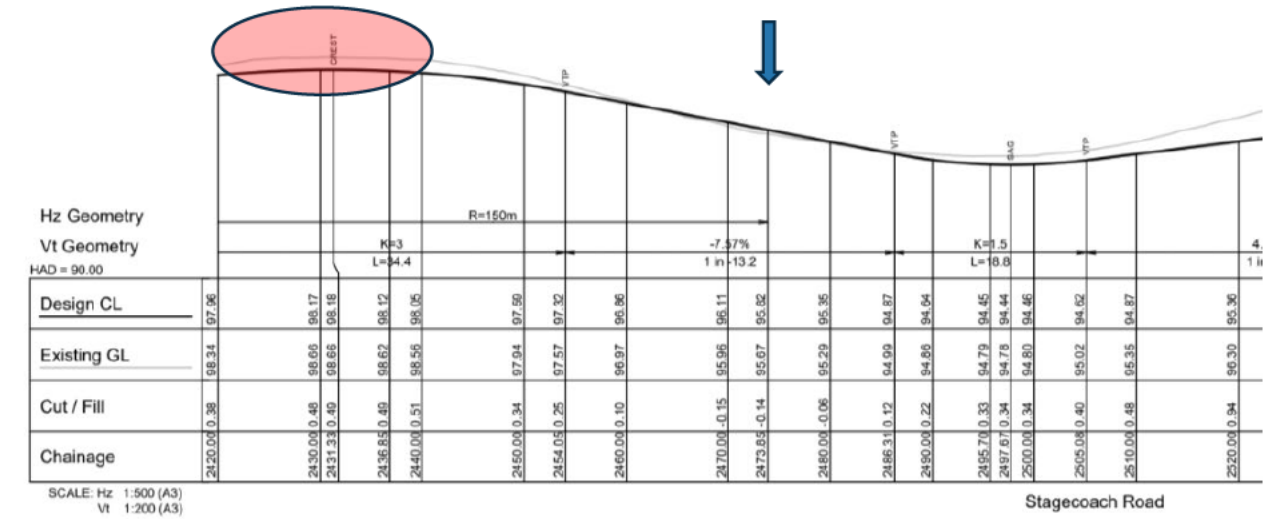
1. Review the vertical curve design.
2. Consider designing vertical curves to meet the operating speed.

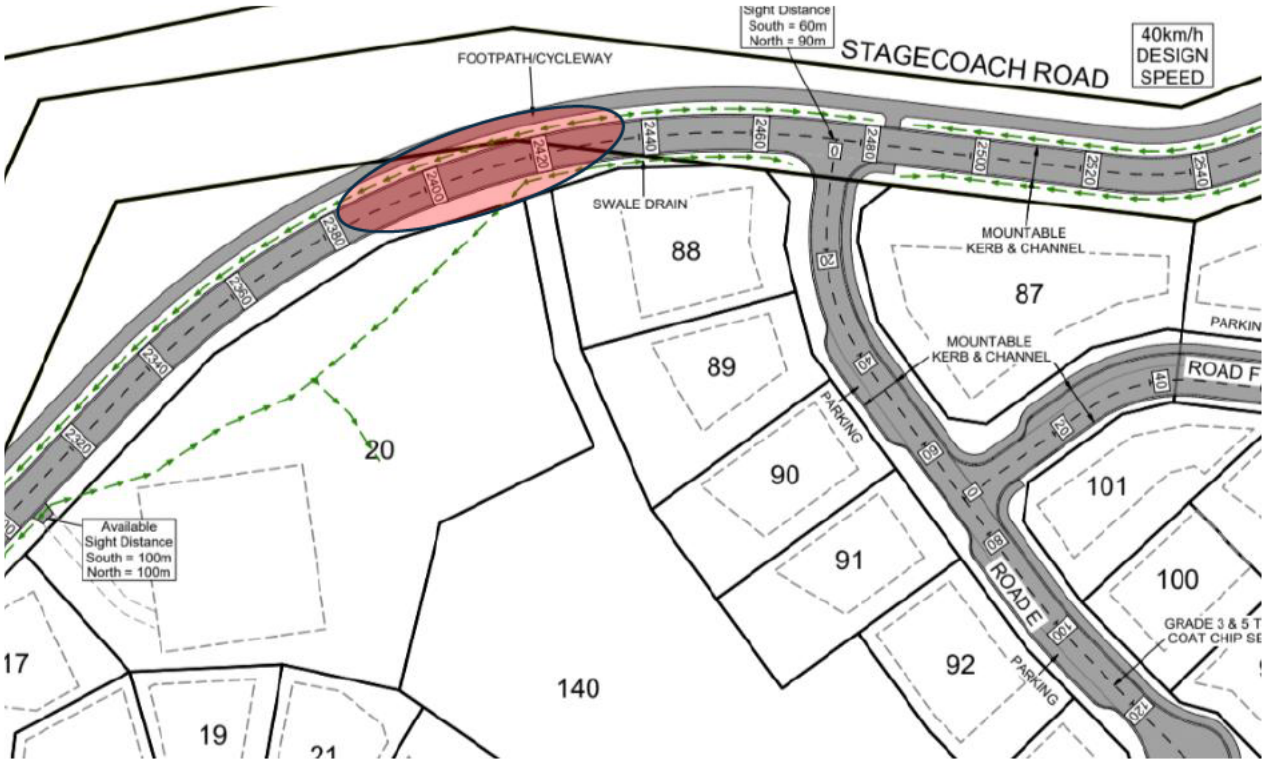
Significant	**Frequency Rating: Unlikely**	**Severity Rating: Serious**
Designer Response:	Vertical geometry to be reviewed at detailed design phase to ensure that SSD requirements are met for the appropriate design speed. Design speeds for roads within the development are to be: Road A 50km/h Roads B-G 30km/h	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.2. Road E Intersection with Stagecoach Road Sightline **Significant**

The plans note that available sight distance from the Road E intersection with Stagecoach Road is 60m to the south and 90m to the north.

The NTLDM requires a minimum of 73 metres of sight line to meet SSD requirements with an SISD distance of 123 metres for a design speed of 60 km/h. The auditors also noted that there is a vertical curve to the south which further restricts the safe stopping distances as shown below.





While it is possible to see more than the noted distances to the south and north, it relies on adjacent properties not to install fences or high vegetation. These properties are unlikely to place obstructions in these areas. However, this cannot be guaranteed and therefore measures or a change in the design is required.

The auditors also noted that someone turning right out of Road 1 was likely to be very rare as all of the movements are expected to be to and from the south.

The approach speeds from the south are likely to be around 60 km/h and side impact speeds over 50 km/h can lead to a serious injury crash.

The approach speeds from the north are likely to be less than 40 km/h due to the horizontal curve and will meet SSD and SISD requirements.

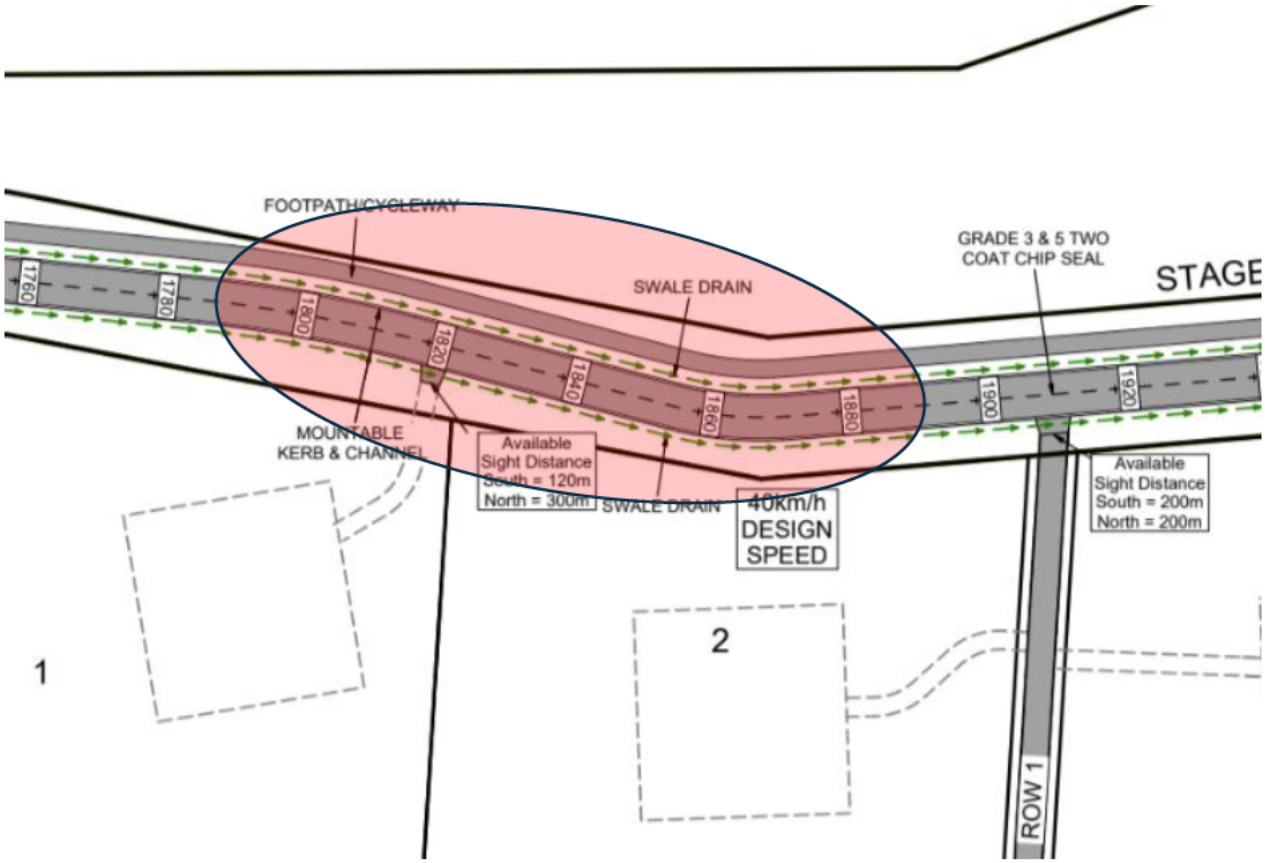
Recommendation 2

1. Redesign the horizontal and vertical curve and/or,
2. Refine the boundary frontage of Lot 88 to achieve the required 60 km/h sightlines for at least SSD and preferrable SISD, or
3. Reduce the curve radius to the south to achieve SISD. or
4. Place covenant on Lot 88 and Lot 20 so the land covered under the SISD triangle has planting less than 900mm and no fencing.

Significant	**Frequency Rating: Unlikely**	**Severity Rating: Serious**
Designer Response:	The vertical and horizontal design in this area of Stagecoach Road is to be reviewed at detailed design stage to ensure that SSD requirements are met for the design operating speed at this location of Old Coach Road.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.3. Stagecoach Road Curve Alignment (CH 1760 - 1900) Minor

The proposed alignment of Stagecoach Road shows a reverse curve at CH 1800 leading into a smaller radius curve at CH 1860. This alignment may increase the risk of loss of control crashes, or head on crashes due to vehicles crossing the centreline. The design speed of 60 km/hr reduces the severity of the crash.



Head on and run off the road crashes above 70 km/h can lead to serious injury crashes. The design speed is less than 70 km/h and therefore the likelihood of a serious crash is low.

The curve at chainage 1860 has a design speed of 40 km/h which will help reduce the speed at chainage 1800. The curve at chainage 1860 will likely require an advisory speed sign which will also guide motorists to slow down as they approach the curve at chainage 1800.

Recommendation 3

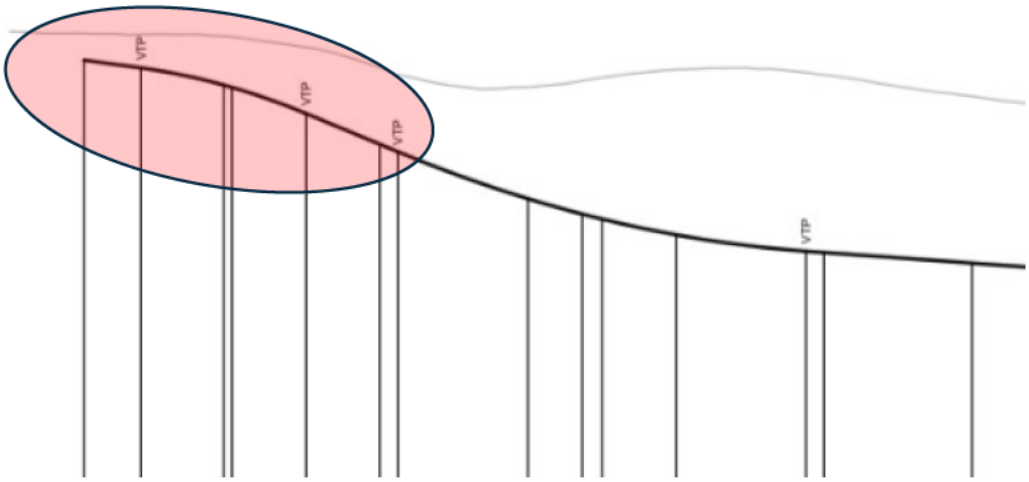
1. Consider improving the geometry of the road by removing the curve at CH 1800 and increasing the radius at CH 1860.
2. Consider the installation of curve warning signs.

Minor	**Frequency Rating: Unlikely**	**Severity Rating: Minor**
Designer Response:	The design radius of the horizontal curve at CH1860 is to be reviewed at detailed design stage. Curve warning signs may be included in the detailed design if deemed appropriate as part of reviewing the horizontal curve.	
Council Safety Engineer		
Client Decision		

Action Taken: (To be agreed between Council and the Client if needed.)	

2.4. Road C Longitudinal Section Minor

The longitudinal section of Road C shows a gradient at the intersection of Road A of 5.5% for 3.9m followed by a vertical curve and a downgrade of 16.65%.



Austroads design guidelines state *"A steep upgrade on the approach to an intersection generally results in both sight distance and operational problems. Upgrades greater than 3% on the minor approach to an intersection are undesirable, especially where traffic has to stop before entering. Where such approach grades are necessary, preferred practice is to grade the road at 3% or less for a minimum distance of 10 m from the lip of the channel or edge line (maximum of 4%)"*

The crash side impact speeds at the intersection of Road A and Road C are likely to be less than 60 km/h. This operating speed is likely to be a minor injury rather than a serious injury. The good approach sight lines also provide some mitigation of a potential crash and reduced impact speeds.

Recommendation 4

1. Reconsider the vertical geometry at Road C to provide a flatter slope at the intersection for the first 10 metres.

Minor	Frequency Rating: Very Unlikely	Severity Rating: Minor
Designer Response:	Review and redesign if necessary at detailed design stage to flatten slope of waiting area.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.5. Roadside Batter Slope Minor

The proposed typical sections show a roadside batter at a slope of 1:3 adjacent mountable kerb along Stagecoach Road. Should a vehicle accidentally mount the kerb and batter, the slope makes it difficult to recover if the vehicle goes outside the swale.

The expected design speed of 60 km/h on Stagecoach Rd and 40 km/h on Road A reduces the severity and likelihood of the crash. The shape of the swale also provides some mitigation.

Recommendation 5

1. Consider providing a recoverable batter slope flatter than 1:6 adjacent Stagecoach Rd.

Minor	Frequency Rating: Very Unlikely	Severity Rating: Minor
Designer Response:	Flatter roadside batter slopes are not achievable due to adjacent ground topography. The auditors have noted that this is an unlikely event with no serious or fatal risk.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.6. Batter slope adjacent Shared Path Minor

The typical sections show a proposed shared path directly adjacent a 1:2 batter slope on Stagecoach Road and 0.6m off the back of the shared path on proposed Road A. A steep down slope adjacent a shared path makes it difficult to recover if a cyclist inadvertently rides off the line of the path. This increases the risk of cyclist crashes.

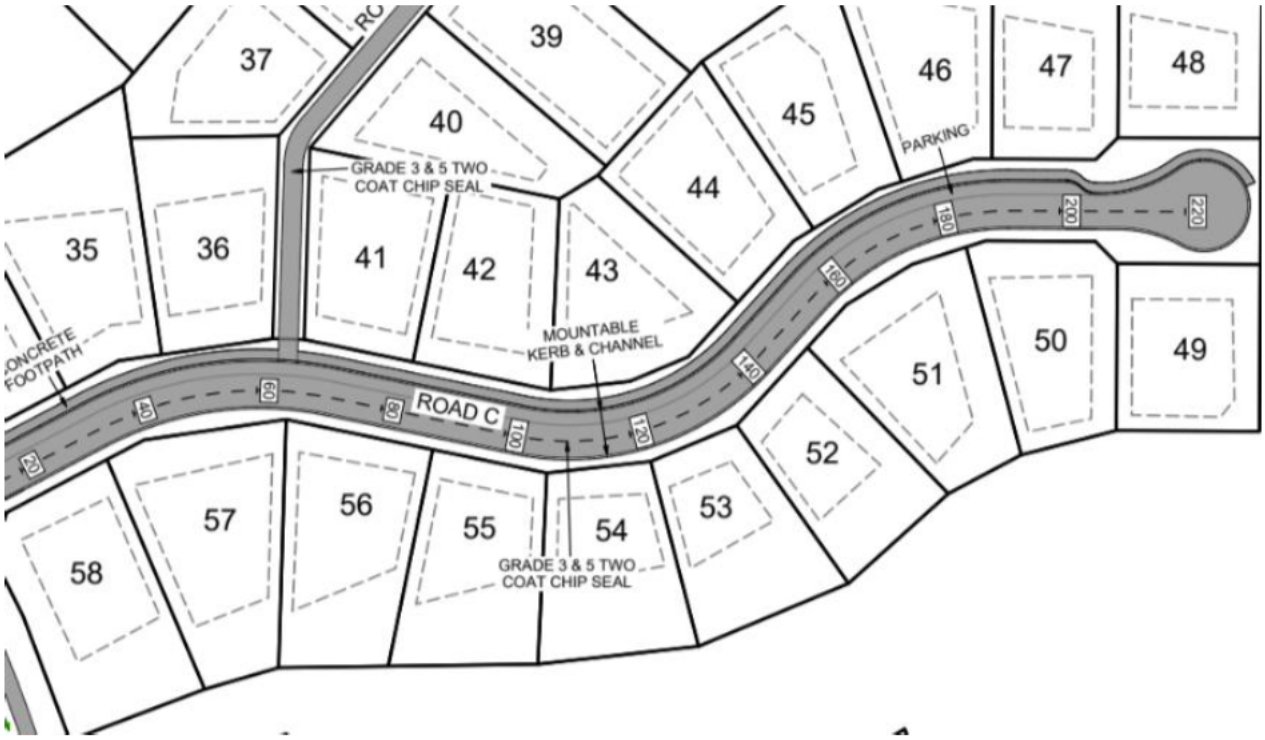
Recommendation 6

1. Consider providing a 1.5 metre wide buffer from the back off the shared path to the steeper downslope.

Minor	Frequency Rating: Unlikely	Severity Rating: Minor
Designer Response:	Review and redesign at detailed design phase. Unlikely to achieve 1.5m width due to adjacent ground topography and location of the road alignment, but some separation may be able to be provided.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.7. Speed calming on side roads **Minor**

The design layout shows several indented parking bays on proposed Roads A to G. When these parking areas are empty it will increase the width of the road, which could encourage higher vehicle speeds increasing the risk and severity of crashes.



These crashes are likely to be head on or rear end collision with a parked vehicle. The speeds are expected to be lower than 70 km/h where the severity is reduced and would not be a serious crash.

Recommendation 7

1. Consider providing traffic calming measures in areas of indented parking bays to reduce vehicle speeds.

Minor	Frequency Rating: Very Unlikely	Severity Rating: Minor
Designer Response:	Agree with auditors and will add traffic calming in detailed design.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.8. Stagecoach Road End Minor

The plans show that the proposed upgrade of Stagecoach Road comes to an abrupt end past the development. From the end of the new road the formation changes to an unsealed track. This could increase the risk of loss of control crashes for unsuspecting drivers. The risk is increased by lack of streetlighting.

Recommendation 8

1. Install installing suitable road seal ends warning signage.
2. Consider no exit signage

Minor	Frequency Rating: Very Unlikely	Severity Rating: Minor
Designer Response:	Appropriate signage to be included in detailed design indicating end of formed road.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.9. Curve Design **Minor**

The plans show 40 km/h design speed curves in several locations on Stagecoach Road which has an expected design speed of 60 km/h. The change in design speed on the curves could make it difficult for motorists to judge, increasing the risk of loss of control and run off road crashes. Due to the expected design speed being 60 km/h the likelihood and severity of a crash is low.

MOTSAM curve advisory guidelines state that curves with a design speed of 45 km/h or less should have curve advisory signage to be installed when the design speed is 60 km/h.

The auditors noted that due to the minor ranking that this could be addressed as part of the post construction audit.

Recommendation 9

1. Install curve advisory signage in accordance with MOTSAM guidelines, or
2. Consider increasing the curve radius to achieve a consistent design speed along the route.

Minor	**Frequency Rating: Unlikely**	**Severity Rating: Minor**
Designer Response:	Review curve radius at detailed design. Appropriate advisory signs to be installed as required.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.10. Total Vehicle Crossing Width (Lots 75 76 77) **Minor**

The vehicle crossings to Lots 75, 76 & 77 are shown as a combined triple vehicle crossing. Wide vehicle crossings can be a hazard to negotiate for pedestrians/cyclists due to their combined width and multiple crossing points, increasing the risk of vulnerable road users and vehicle conflicts.

Recommendation 10

1. Consider separating vehicle crossings so no more than two vehicle crossings are combined.

Minor	**Frequency Rating: Very Unlikely**	**Severity Rating: Minor**
Designer Response:	Review potential for separating of crossings at detailed design phase.	

Council Safety Engineer	
Client Decision	
Action Taken: (To be agreed between Council and the Client if needed.)	

2.11. Vehicle Crossing Sightlines (Lots 75, 76 & 77) Minor

The proposed lot boundaries appear to obscure sightlines for vehicles exiting lots 75,76 & 77. This increases the risk of vehicle and pedestrian crashes. The location of the driveways is near the end of the Road A where users of the footpath will be low and vehicle speeds will be low.

The operating speeds will be low which will reduce the likelihood and severity of any crash.

Recommendation 11

1. Consider providing the appropriate pedestrian splays for the driveways.
2. Consider that any fencing installed at the interface of Lots 75/77 and Lots 77/76 and the road boundary is low enough to allow vehicles to sight pedestrians on the footpath.

Minor	**Frequency Rating: Very Unlikely**	**Severity Rating: Minor**
Designer Response:	Review at detailed design phase and consider reduced fence heights, vegetation along with provision of boundary splays.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

2.12. Vertical gradient access Minor

The contours appear to show steep areas of vehicle crossing directly behind the footpath and into lot boundaries (for example Lot 60). Normal practice is to provide a flat waiting area from the back of the footpath to enable an exiting driver to wait clear of the footpath.

A steeper gradient increases the risk of vehicle and pedestrian crashes due to the need for a driver to increase speed to compensate for the steep access at the footpath interface.

Recommendation

1. Review the vehicle crossing design and provide a gradient of no more than 1:10 for the first 5m behind the footpath.

Minor	**Frequency Rating: Very Unlikely**	**Severity Rating: Minor**
Designer Response:	Review vehicle crossing approach grades as part of the detailed design phase.	
Council Safety Engineer		
Client Decision		
Action Taken: (To be agreed between Council and the Client if needed.)		

3. Comments

3.1 Entrance treatment

The plans provided show a proposed entrance treatment on Stagecoach Road at the start of the development and at the intersection of Road A. The SAT are curious to know the purpose of this treatment and its configuration and if any safety issues arise. This can be reviewed in detail design audit.

3.2 Typical Section Dimensions

The SAT have noted that the majority of the typical section carriageway dimensions are to face of kerb. However, the dimensions shown on Typical Section Stagecoach Road is shown to lip of kerb. To avoid confusion the designers should consider providing consistent dimension reference points.

3.3 Road marking / Signage

The plans provided do not show any details for road marking and signage. These should be provided for review during detailed design.

3.4 Right of Way dimensions

No Right of Way dimensions have been shown on plans. These should be provided for review during detailed design.

3.5 Lighting

No lighting has been shown on plans. The designers should at the very least consider flag lighting at intersections. Some councils/communities are seeking “dark sky” environments. The auditors considered that at least the intersection of Stagecoach Road and Road A should be a flag light with other intersections having a bollard light.

4. Audit Statement

We certify that we have used the available plans. We have examined the specified roads and their environment to identify features of the project we have been asked to look at, that could be changed removed or modified in order to improve safety. The problems identified have been noted in this report.

Signed: Date: 6th September 2024

Gary Clark
NZCE (Civil), REA, CMEngNZ
Certified Road Safety Auditor and Safe System Assessor
Director – Traffic Concepts Limited

Signed: Date: 6th September 2024

Josh Orringe
BEngTech(Civil), NZDE (Civil)
Director – Civil & Transportation Design Limited

Design Team:	*Name* Staig and Smith – Darrin Canton	*Position* Design Lead
	Signature 	*Date* 15 October 2024
Safety Engineer:	*Name*……	*Position*……..
	Signature……..	*Date*……..
Project Manager:	*Name*……	*Position*……..
	Signature……..	*Date*……..
Action Completed:	*Name*……	*Position*……..
	Signature……..	*Date*……..

Project Manager to distribute audit report incorporating decision to design team, Safety Audit Team Leader, Safety Engineer and project file.

Date: ……