



Transport Planning and Design  
Level 1, 284 Kilmore Street  
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# Aro Valley cycleway audit - safety and accessibility

90% design audit



Report prepared for

**Paneke Pōneke**  
Bike network plan

**Absolutely Positively**  
**Wellington City Council**

Me Heke Ki Pōneke

October 2022



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## Disclaimer

The findings and recommendations in this report are based on the site visit undertaken by the cycleway audit team (CAT), an examination of available relevant plans, the specified road and environs, and the CAT's professional knowledge and experience. However, it must be recognised that no audit can guarantee the elimination of all possible safety concerns as all traffic environments consist of a multitude of elements that are never completely within the control of engineering design.

Safety and accessibility audits, by nature, focus on aspects relating to safety and accessibility and therefore do not constitute a complete review of design or assessment of standards with respect to engineering or planning documents. Similarly, the safety audit focuses on the plans provided and the relevant design stage.

This audit applies to the stated project. Whilst some issues covered are general and might be applicable to other locations, the CAT does not take any responsibility for transferral of concepts to other projects or locations.

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 CAT or their organisation(s).



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# 1 Introduction

## 1.1 Brief and project description

ViaStrada (the cycleway audit team, a.k.a. CAT) have been commissioned by the client to audit for Paneke Pōneke – Wellington’s transitional cycle network. The audit is to be a combination of road safety and accessibility audits and is henceforth referred to as a CASA – i.e. “Cycleway audit – safety and accessibility”. A number of CASAs will be undertaken on the various routes / packages at various design stages. The CASA process complies with Waka Kotahi NZ Transport Agency guidelines

This CASA is for the 90% stage of the Aro Valley route, which links the western side of the CBD at Willis Street to Chaytor Street, which is on the Karori side of the Karori tunnel (see Figure 1.1-1). This CASA refers to two directions of travel along the route: Citybound, which is generally downhill and Karori-bound, which is generally uphill.



**Figure 1.1-1: Extent of Aro Valley route**

The cycleway provision along the route varies between a buffered cycle lane in the Karori-bound direction plus on-road cycling in the city-bound direction, and on-road cycling in both directions, with some shorter sections of shared paths.

There is an additional section that links Aro Street just east of Willis Street to Ghunzee Street. After the 30% audit, the CAT was informed by the designer and client that it is an informal route.

The proposed treatment for the Aro Valley route, whilst being an improvement on the existing situation, is only expected to attract cyclists of the “strong and fearless” or “enthused and confident” categories (according to the Geller classification). This was detailed in the 30% audit and confirmed by the designer and client. This is considered acceptable given the difficulty of providing a temporary treatment on a route with challenging space availability and topography, but a permanent solution in



the future should aim to provide more separation from motor traffic to attract a wider cycling audience.

## 1.2 The cycleway audit team

The CASA was carried out in accordance with the [NZTA Road Safety Audit Procedure for Projects Guidelines - Interim release May 2013](#), by the Cycleway Audit Team (CAT) consisting of:

- Megan Gregory, the CAT leader, of ViaStrada Ltd
- Axel Downard-Wilke, a CAT member, of ViaStrada Ltd
- Glen Koorey, a CAT member, of ViaStrada Ltd
- Nick Reid, a CAT member, of ViaStrada Ltd

## 1.3 Meetings and site visits

Members of the CAT and the client team had an online meeting to discuss the CASA scope and project locations on 18 July 2022. John Lieswyn, the CASA project manager and client liaison, received the draft 30% designs and met with the client representative on Friday 29 July 2022 at Wellington City Council.

- The daytime site visit was undertaken on Friday 29 July 2022 from 10:15am to 12:30pm and 2:00pm to 3:00pm.
- A night-time site visit was not undertaken.
- An exit meeting was not held, initial points were provided to Jonathan Kennett on 8 August 2022.

## 1.4 The project team

The safety issues raised in this audit will require responses from the designer and, after the CAT has had a chance to clarify issues further, the project safety engineer. The client decision and action taken against the safety issues will also be recorded. The following people are identified for these roles (Table 1.4-a).

**Table 1.4-a: project team members relevant to this audit**

Role	Name	Organisation
Designer response	Graeme Corin	FutureGroup
Safety engineer	Dennis Davis	Wellington City Council
Client decision	Jonathan Kennett	Wellington City Council
Action taken by	Transitional Cycleways team	Wellington City Council

## 1.5 Design vehicles

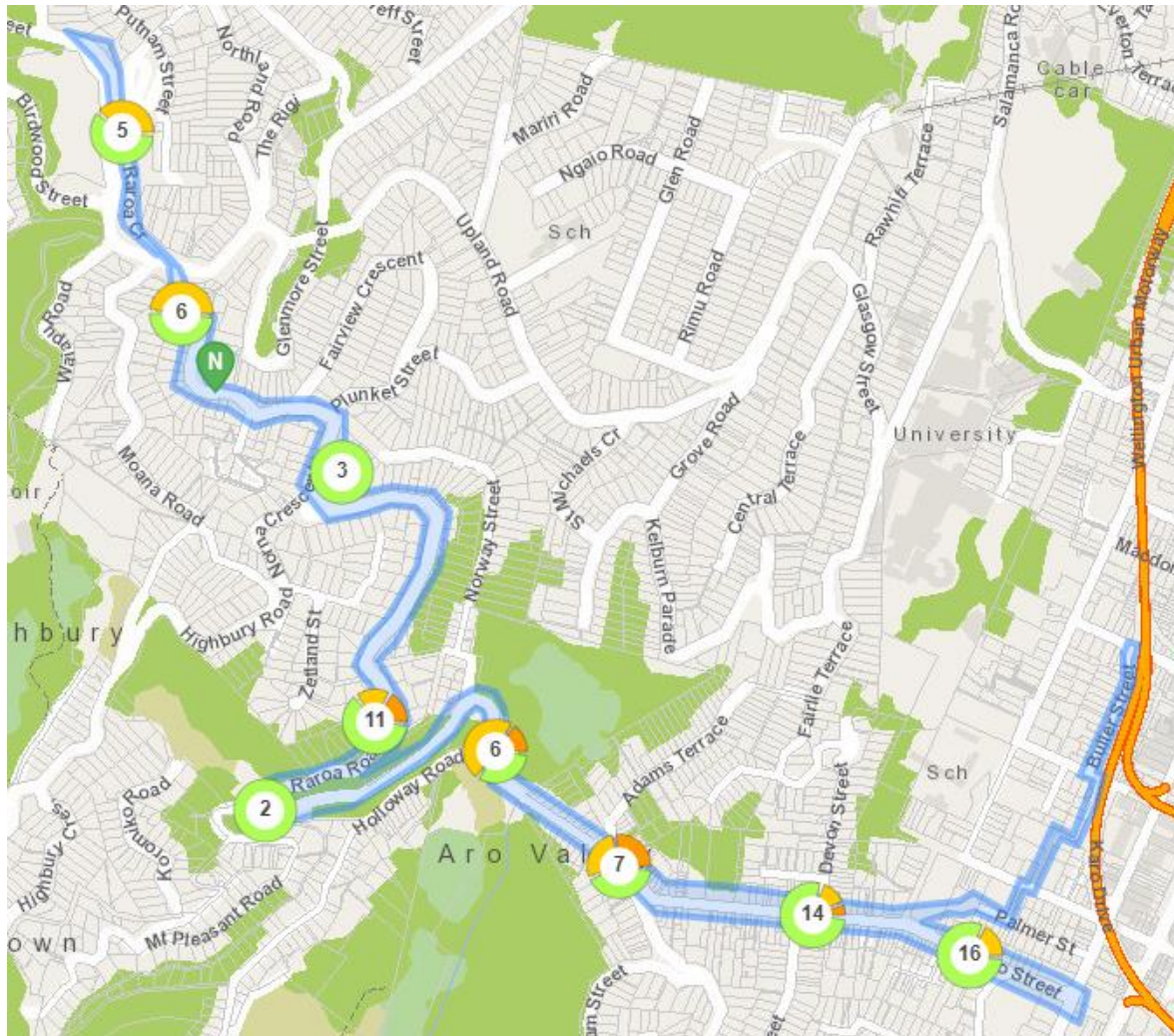
For intersections, Austroads GRD4 (2009) describes a design vehicle as the largest vehicle which can perform any particular turning movement from the appropriate approach lane to the appropriate departure lane with adequate clearances to features such as kerbs and roadside furniture.

The CAT has assumed the following design vehicles for this project:

- 11.5 m rigid truck or urban bus on the main subdivision road network.
- People on bikes are anticipated to be confident riders with at least cycling competency of Grade 2 intermediate skills

## 1.6 Crash history

Waka Kotahi holds a national database of crashes (CAS) for New Zealand. Crashes are generally investigated for the previous five years to ensure a crash pattern is monitored, rather than one off events. All reported crashes (including but not limited to those involving cyclists), from CAS over the five-year period 2017-2021 (inclusive) are plotted in Figure 1.6-1.

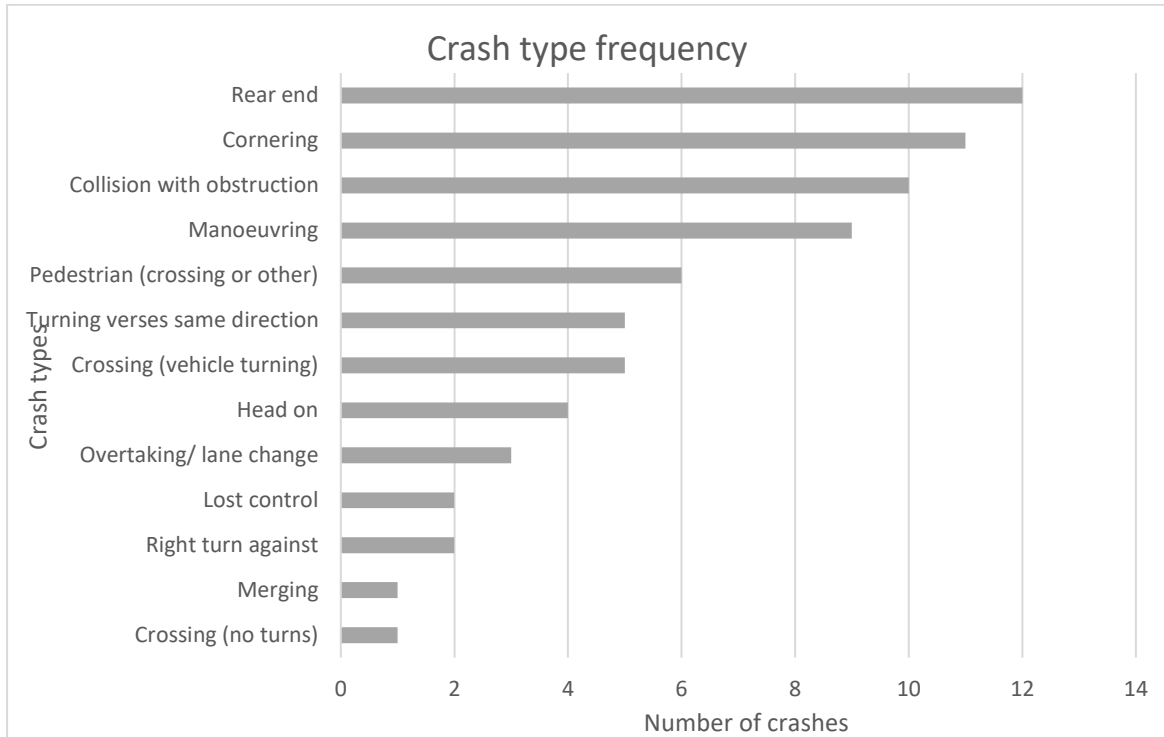


**Figure 1.6-1: all crashes reported in the proposed Aro corridor**

A total of 72 crashes were reported along the proposed Aro project corridor over the five-year period. Six of these were serious (two involving cyclists), 18 minor (one involving a cyclist) and 48 non-injury. Of those involving cyclists, two were at the Holloway Road intersection (one causing serious and one minor injury) and one on the stretch of road between Mount Pleasant Road and Raroa Road (causing serious injury).

Crashes are slightly clustered towards the Willis Street end of the route, at Devon Street and Durham Street intersections, between Mount Pleasant Road and Raroa Road, and at the Northland Tunnel Road intersection. While there are clusters, no predominant crash pattern or black spots are present aside from typical intersection crash issues. See Appendix A for further details regarding these locations.

All crash factors by group are presented in Figure 1.6-2. Each crash may have several factors thus there are more factors at play than just the number of crashes.

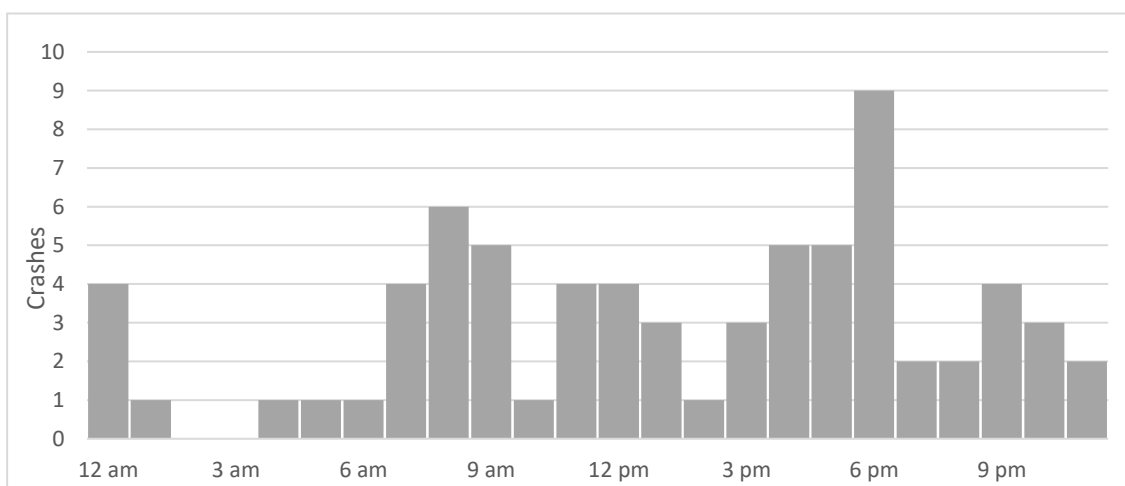


**Figure 1.6-2: Reported crash factors (grouped)**

The top four crash factors (rear end, cornering, collision with obstruction and manoeuvring) all point to the constricting alignment of the road and amount of traffic on the route. Given the lack of alternative options for alignment and the nature of the corridor these are unavoidable risks that should be minimised through design, including reductions in travel speeds.

In addition to these crash factors, the data show some common trends:

- Crashes most commonly occur on Thursday, Friday, and Saturday
- Crashes peak with expected increases in traffic volumes (Figure 1.6-3):
- Crashes resulting in serious injury often involved cyclists (33% of all causing serious injury)
- Crashes are increasing in frequency since 2017



**Figure 1.6-3: crashes over time**





## 1.7 Project information

The CAT has received the following plans and information on the roads and traffic within the audit area:

**Table 1.7-a: plans reviewed**

Document	Date	Description
310204910-01-001-200-GA AND MARKING - 90%	7 Sep 2022	Road marking layout plan
310204910-01-001-300-SIGNS - 90%	7 Sep 2022	Signage layout plan
		Scheme report

## 1.8 Items not covered

This 90% CASA does not cover the aspects of:

- Intersection design at the project extents (Willis Street and Chaytor Street) – but the CAT has been advised that these will be undertaken in separate projects and will be constructed at or before the time the Aro Valley transitional cycleway is implemented.
- Vehicle turning movements have not been provided

## 1.9 Audit procedure

The audit follows the NZ Transport Agency Road Safety Audit procedures for projects. The expected crash frequency is qualitatively assessed based on 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 based on factors such as expected speeds, type of collision, and type of vehicle/object involved. The audited facility caters for pedestrians and cyclists who are “vulnerable road users” with a higher likelihood of death or serious injury if involved in a conflict with a motor vehicle.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the NZTA Concern Assessment Rating Matrix in Table 1.9-a. The qualitative assessment requires professional judgement and experience from a wide range of projects of varying sizes and locations.

**Table 1.9-a: Severity rating matrix**

Likelihood of death or serious injury	Frequency (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

It should be noted that the severity rating assigned to the likelihood assigned to ‘Death or Serious Injury’ is often “Likely” or “Very likely” because crashes between non-motorised users and motor vehicles often result in serious injury or fatality.

The ranking of the frequency of crashes has been assessed in accordance with Table 1.9-b.

**Table 1.9-b: Indicative crash frequency**

Crash Frequency	Indicative description
Frequent	Multiple crashes (more than 1 per year)
Common	1 every 1 – 5 years
Occasional	1 every 5 – 10 years
Infrequent	Less than 1 every 10 years

While all safety concerns should be considered for action, the client will make the decision as to what action will be adopted. This report gives safety ranking guidance and it is acknowledged the client must consider factors other than safety alone. The suggested action for each concern category is given in Table 1.9-c.

**Table 1.9-c: Concern categories**

Risk	Suggested Action
Serious	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.

In addition to the ranked safety issues it is appropriate for the CAT to provide additional comments about items that may have a safety implication but lie outside the scope of the CASA. 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; an opportunity for improved safety that is not necessarily linked to the project itself, or drawing/signage issues that should be addressed but are not necessarily safety related. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the CAT.

We invite our clients to suggest changes for our consideration as part of a client review process. Our preference for this is to use the track changes function of the editing software. We do not consent to any changes, however small they may appear, to be made to any of our writings in the main audit section of our report. This restriction includes our CAT responses.














We do not consent to any changes ... to be made to the main audit section of our report.



### 1.10 Audit report format

The following section(s) of this report detail the issues identified in the audit. The severity rating of each issue (see explanation in section 2) is included to the right of the issue heading. The issue headings also include letters to denote the main user groups affected, plus icons to denote possible sub-groups:

**Table 1.10-a: User groups included**

Main user group	Heading letter	Possible sub-groups
Pedestrians	P	Vision impaired pedestrians 
		Mobility impaired pedestrians 
		Wheelchair users 
		Bus patrons (waiting / alighting) 
		All pedestrians 
Cyclists	C	Enthusied & confident cyclists 
		Interested but concerned cyclists 
		Cyclists using electric bikes 
		All cyclists 
E-scooter / device users	E	E-scooter users; other electric small-wheeled devices 
Motorists	M	Drivers 
		Buses 
		Motorcyclists / moped users 

Section 2.6 presents a summary of the issues identified and the audit statement to be signed by the designer, responding auditor, safety engineer, project manager and project sponsor.

## 2 CASA findings - general

### 2.1 ~~Information lacking~~ Bus stop timing point – **C E** Moderate



Probability of crash occurring	Infrequent
Likelihood of serious / fatal injury	Likely

The CAT has not yet been provided sufficient information on:

- 90% design report, which may cover
  - Cycle lane “safety buffer” design details
  - Bus stop timing point / layover locations – multiple bus stops in cycle lane; and if any of these are a timing point, MetLink will need to be told to change the location to a stop that is not in a cycle lane (or the design modified).
- New design for transition from cycle lane to mixed traffic for uphill sections (refer issue 2.5)
- Modifications to sharrow placement post-discussion between client, CAT and designers after the 90% plans had been received.

-----  
 Post-audit assessment. The above issues have been addressed. One issue remains, and the severity rating refers to this. The client has advised that the uphill bus stop at Holloway Road is a timing stop. Given the large speed differential between people cycling (uphill) and driving, there should be an option to undertake a parked bus. This would avoid conflict between cyclists and drivers on the road.

#### Recommendations

2.1.1	Provide the information listed above so the CAT can undertake a thorough audit of all relevant aspects.
<b>Responses</b>	
<b>Designer</b>	Updated drawings will include cycle lane separator kerb details.
<b>Safety Engineer</b>	Agree with CAT.
<b>Client</b>	Agree.
<b>Action</b>	Designer to provide updated drawings and Project Lead to discuss bus stops with Metlink.

### 2.2 Lane widths for mixed traffic – **C E** Moderate



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

The TCD manual part 5 gives guidance for shared lanes. In general, they should be 4.2 m or greater (for side-by-side cyclists and motor vehicles) or no wider than 3.0 m (for single-file cyclists and motor vehicles) where buses are not present. While the TCD manual does not specify narrow lane widths for bus routes, the CAT recommends that 3.2 m is sufficient (this is what has been included in the CNG section on mixed traffic, which predates the TCD manual).



There are several locations along the route where mixed traffic is applied that fall in the “in-between” width range (3.3 m – 4.1 m) that should be avoided. There are some locations (in particular for the city-bound lane) where the lane widths are not shown plus other locations where the width from kerb to centreline is shown but this covers parking plus the live traffic lane; each of these situations could also fall in the in-between width range:

**City-bound direction:**

- 32 - 46 Aro Street (approximately 3.3 m, so not disastrously “in-between”)
- 150-176 Aro Street
- There are several downhill bends where the in-between width might instead be allocated as a narrow lane with flush median, which we suggest would reinforce the need to consciously overtake safely or remain behind the rider claiming the lane
  - opposite Holloway Road (this was identified in issue 3.12 of the 30% CASA)
  - by Entrance Street
  - opposite Entrance Street
  - opposite 134-140 Raroa Road
- 93-123 Raroa Road (includes a bend and straight sections)
- Approach to Plunket Street roundabout
- 23-33 Raroa Road (including the bend opposite Cluny Avenue)
- East of Moana Road
- Various sections between Moana Road and Chaytor Street

**Karori-bound direction:**

- Various sections between Moana Road and Chaytor Street

The concern of the in-between range is that motorists may attempt to overtake cyclists where there is not sufficient space to do so safely. This would be likely to result in serious injury to the cyclists, and is expected to occur occasionally.

**Recommendations**

2.2.1	Ensure lane widths for mixed traffic are $\leq 3.2$ m or $\geq 4.2$ m.
2.2.2	Mark parking lanes / spaces where parking is permissible.

**Responses**

<b>Designer</b>	<ul style="list-style-type: none"> <li>• 32 – 46 Aro St. – propose to leave at 3.30 m as only marginally outside the desired range</li> <li>• 150 – 176 Aro St. – agree design to be updated</li> <li>• Opposite Holloway Rd. – agree design to be updated</li> <li>• Opposite Entrance St – agree design to be updated</li> <li>• Opposite 134 – 140 Raroa Rd – agree design to be updated</li> <li>• 93 – 123 Raroa Rd. – this would likely require the removal of a significant number of parks. Given parking here is high demand, the effective lane width falls within the range of less than 3.20 m, no change proposed</li> <li>• East of Moana Road – design to be updated</li> <li>• Moana Road and Chaytor Street – cycle shoulder added (city bound)</li> <li>• Moana Road and Chaytor Street – gradient is steep enough for cyclists to own the lane, no change proposed.</li> </ul>
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<b>Safety Engineer</b>	Agree with CAT and Designer, noting that the shared downhill lane past 93-123 Raroa is 3.5m but will not have much speed differential that would cause an overtaking issue.
<b>Client</b>	Agree with Designer.
<b>Action</b>	Actions as proposed by Designer above.

### 2.3 Parking near pedestrian crossings / raised platforms – **PE** Minor



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Unlikely

This issue was partly identified in the 30% CASA. It was agreed that broken yellow lines would be marked on the approaches (6 m) and departures (at least 3 m) to pedestrian crossings, to ensure intervisibility between pedestrians and motorists. However, there is one location where this has not been included:

- Flush zebra crossing west of Moana Road – no broken yellow lines on departure in Karori-bound direction

Furthermore, the designer noted in the 30% CASA that there are some locations involving a raised platform that is not a zebra crossing. These will likely be used as informal pedestrian crossing points / courtesy crossings and thus should also follow the BYL rule. In particular:

- 144 Aro Street –the city-bound approach side; there is garage in this location, but people may still park on-street here if they own the garage or know it is not in use.

Crashes resulting from parked vehicles near a pedestrian crossing obscuring the view of approaching motorists are expected to occur occasionally, and although pedestrians are vulnerable, the raised platform would slow motor vehicles such that it would be unlikely to result in serious injuries.

#### Recommendations

2.3.1	Ensure no-parking by marking broken yellow lines on the approaches (6 m) and departures (at least 3 m) to pedestrian crossing points
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#### Responses

<b>Designer</b>	Agree, design to be updated to include extra no stopping lines
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.
<b>Action</b>	Update drawings to include extra no stopping lines.

### 2.4 Cycle lanes on inside of curves – **CE** Moderate



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

There are several sections, particularly along Raroa Road where there is a cycle lane without buffers or separators on the inside of a curve (e.g. Figure 2.4-1). In such locations, motorists are likely to track into the cycle lane while cornering.



**Figure 2.4-1: Cycle lane on inside of curve, Raroa Road**

Locations of particular concern include the curves in the vicinity of:

- 150 Raroa Road
- 146 Raora Road
- 82 Raroa Road
- 44 Raroa Road
- 2 Cluny Avenue
- 6 Raroa Road (see Figure 2.4-1)
- 1 Moana Road

Motorists cutting the corner into the cycle lane will be a frequent occurrence, and while most motorists will adjust their course if a cyclist is present, crashes may still result occasionally. Such crashes are likely to result in serious injury to the cyclist.

This issue was raised in the 30% CASA, with the recommendation to install either flexiposts or audio-tactile profiled (ATP) line-marking leading up to and around a cycle lane on the inside of a curve. The designer noted that buses would need to encroach on the cycle lane around the corners. The decision from the safety engineer and client was to install ATP, but these have not been indicated on the plans.

**Recommendations**

2.4.1	Install audio-tactile profiled (ATP) line-marking leading up to and around a cycle lane on the inside of a curve.
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**Responses**

<b>Designer</b>	ATP to be added to the drawing package at locations identified above.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.

<b>Action</b>	Add ATP on identified corners. Use longitudinal edge line ATPs as defined Waka Kotahi P30 Section 8.2.1.
---------------	--

## 2.5 Transition from cycle lane to mixed traffic – **C E** **Moderate**



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

We have retained this issue for completion once the new transition design (no longer using sharrows uphill) is developed.

If there are any of the old-style transitions left (cycle lane to mixed traffic) – make sure sharrows are in the centre of the lane, not too close to the centreline.

Post-audit comment: the uphill transitions have been removed. The one remaining transition is on a downhill section, which is acceptable due to the lower speed differential. The rating as shown is for the original audit; as it is now, it would not have been included in our audit.

### Recommendations

2.5.1	
2.5.2	
2.5.3	
2.5.4	

### Responses

<b>Designer</b>	
<b>Safety Engineer</b>	
<b>Client</b>	90% designs have been updated and no longer use sharrows uphill. There is a transition at Raroa/Moana.
<b>Action</b>	Return to CAT for meeting. And trial 'cycle shoulder' with Waka Kotahi.

## 2.6 Sharrows next to parking – **C** **Serious**



Probability of crash occurring	Common
Likelihood of serious / fatal injury	Very likely

Some sharrows have been marked too close to on-street parking. Locations include:

- 28 Buller Street (opposite side of road)
- Raroa Road north-west of Mount Pleasant Road (but will not need to be changed if no-stopping is introduced as per issue 3.6.)
- 147 Raroa Road
- 57-119 Raroa Road
- 25 Raroa Road (see Figure 2.6-1)
- 7 Raroa Road (just south of)
- 21 Raroa Crescent (opposite side of road); although this site may have low to no parking demand and therefore the positioning may be acceptable
- Northland Tunnel Road to Chaytor Street (both sides of road)



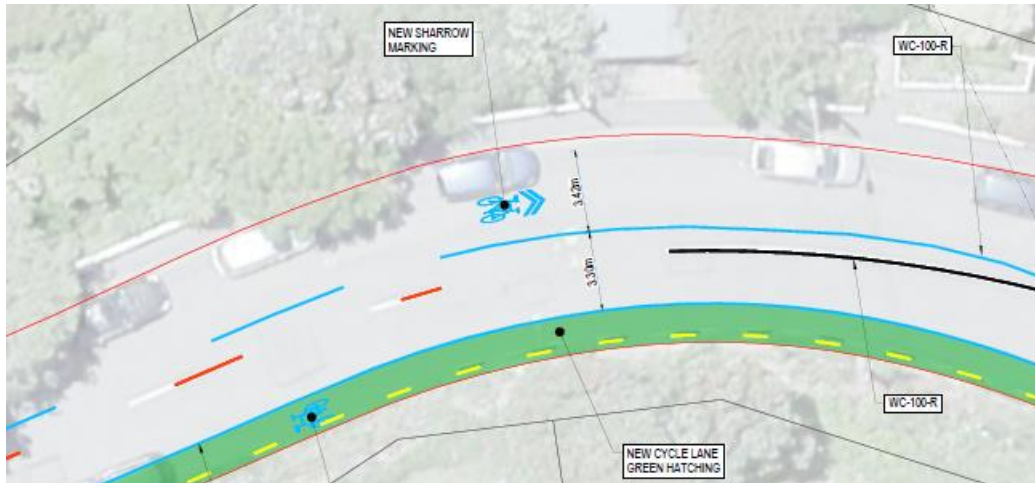


Figure 2.6-1: Sharrow too close to parking – 25 Raroa Road

This may encourage cyclists to ride in the “door zone” of parked vehicles. If a driver opens their door and a cyclist collides with it, they will likely fall into the path of traffic, which would be very likely to result in serious injury due to the vehicle speeds involved and the vulnerability of cyclists lying on the ground. Given the parking demand along the route, such incidents are expected to be common.

**Recommendations**

2.6.1	Where on-street parking is provided / permitted and parking demand is high, mark sharrows closer to the centreline, to discourage cyclists from tracking in the door zone of parked cars.
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**Responses**

<b>Designer</b>	Agree, design to be updated.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.
<b>Action</b>	Sharrows to be moved closer to the centre line where passing parked cars.

2.7 Signs and markings – **P C E M**

**Comment**

	Probability of crash occurring	N/A
	Likelihood of serious / fatal injury	N/A

A number of minor items regarding signs and markings have been noted:

- Sheet 18 – existing keep right double disc on island on approach to Holloway Road has been noted as “RG-17.1” but this is the MOTSAM code for a keep left. The keep right code is RG-34.1. However, given that the proposed cycle lane alignment is to the left of the splitter island (pending the CAT’s recommendations in issue 3.3) it is preferable to omit the sign and place reflectorised markers on the top of the island.
- Sheet 38 – a “Cycle Lane Ends” RG-26/RG-26.2 combo has been displayed but is not linked to any pole. Signs are not required at the end of a cycle lane. We should be prudent with the use of signs (reduce sign clutter) so that driver attention can be focused on situations where a sign is really needed; sharrow markings are suggested to be sufficient. An alternative would be to use PW-35 signs to warn motorists about the presence of cyclists.



Figure 2.7-1: the leading edge of an island kerb where cycle traffic keeps left and motor traffic keeps right is not to be sign-posted

**Recommendations**

2.7.1	Sheet 18: use reflectorised markers (not keep left or right signs) on the top of islands that split two streams of traffic that are different road user types
2.7.2	Sheet 38: signs are not needed at the end of cycle lanes; if a sign is desirable at a particular location then use a PW-35 CYCLISTS sign instead

**Responses**

<b>Designer</b>	2.7.1 – Agree, design to be updated 2.7.2 – Agree, sign deleted. PW-35 sign added closer to Moana Road (sheet 39)
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree
<b>Action</b>	Signs to be updated.

### 3 CASA findings – specific locations

3.1 Aro Street to Ghuznee Street section – **P C E** Comment



Probability of crash occurring	N/A
Likelihood of serious / fatal injury	N/A

There is an additional section that links Aro Street just east of Willis Street to Ghunzee Street. The CAT raised several issues for this design of this section in the 30% audit (issues 3.23-3.30) but was informed by the designer and client that it was an informal route and most recommendations were out of scope. The issues raised in the 30% audit were:

- Pathway connection unclear – safety issues related to the proximity of the pathway joining Aro Street the Garage Project Brewery driveway.
- Advertising sign limits visibility – at the Aro Street pathway connection.
- Shared path width and shy space – clearance to lamp posts beside path and accommodation of user volumes.



- Pinch point approaching Abel Smith Street – created by utility boxes near blind corner for path users.
- Connection to Abel Smith Street – lack of crossing treatment between pathway and Inverloch Place.
- Car park bollards at Oak Park Avenue – restricting path width and visibility (the chosen action was to remove this section from the plans, as it was private land, however the plans still show sections either side of this private property).
- Intersection priority at Buller Street – non-standard intersection that would be complicated by addition of cycle route trajectory.

While the 90% plans give less detail than the 30% plans, it is the CAT’s position that a route is not informal if it is included in design plans, and the proposed sharrows will suggest to users that this is a route. Therefore, the CAT considers the issues raised in the 30% CASA to still be of relevance.

In addition, some minor points about the 90% plans for this section:

- There is a sharrow placed on the very end of Oak Park Avenue where it connects to Buller Street. This location is designed as a driveway crossing a footpath. Sharrows shouldn’t be used on footpaths.
- There is a cycle symbol marked on the existing footpath on Palmer Street. This is incorrectly labelled as “new sharrow marking” and should be accompanied by a pedestrian symbol if the intent is to provide a shared path. The 30% CASA included the recommendation to remove parking and provide a kerb ramp outside the alleyway that joins Palmer Street and Abel Smith Street, this was because on-road cycling for this short stretch of Palmer Street would be preferable to a shared path.
- There is no signage or markings for the shared path sections (including the alleyway) between Aro Street and Abel Smith Street. Markings are recommended in all cases; to reduce sign clutter only install signs as recommended in Sections 4 and 5 of [Signs and markings to designate paths for pedestrians and cyclists guidance note](#).

**Recommendations**

3.1.1	Reconsider the 30% CASA recommendations for the Aro to Ghunzee section, because the public and users will likely interpret this section as a formal route.
3.1.2	Relocate the sharrow at the Oak Park Avenue connection to Buller Street so that it does not coincide with the footpath.
3.1.3	Change the Palmer Street section to be on-road cycling denoted by sharrows, remove parking and provide a kerb ramp at the alleyway entrance.
3.1.4	Mark (and in limited locations, sign) shared paths (including the alleyway between Palmer Street and Abel Smith Street) as per the <a href="#">Signs and markings to designate paths for pedestrians and cyclists guidance note</a> .

**Responses**

<b>Designer</b>	3.1.1 – Minor changes to the path width now proposed, but in general no change proposed 3.1.2 – Agree, design to be updated 3.1.3 – Agree, design to be updated 3.1.4 – Agree, design to be updated
<b>Safety Engineer</b>	Generally agree with CAT and Designer. Shared path markings in Little Palmer Lane and Aro Park, and sharrows on Abel Smith Street should be installed to aid wayfinding on the informal cycle route.

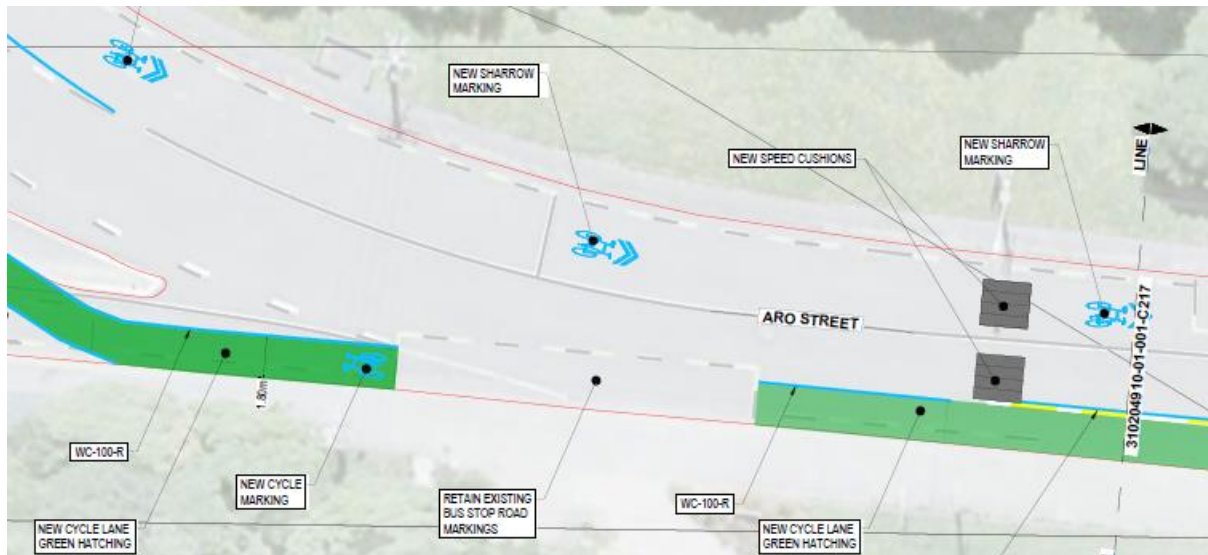
<b>Client</b>	Agree with Designer and Safety Engineer. This section is not a primary or secondary bike route. The primary route goes down Aro St and Willis St, but work on Willis St will not be completed for several years. In the meantime, only minor works are recommended for Aro St to Buller Street to improve the current situation without making it a major bike route.
<b>Action</b>	As outline by Designer and Safety Engineer.

### 3.2 Speed cushions approaching Holloway Road – **C E** Moderate



Probability of crash occurring	Infrequent
Likelihood of serious / fatal injury	Likely

If there is a bus parked in the Karori-bound bus stop on the approach to Holloway Road (see Figure 3.2-1) approaching cyclists will have to wait until passing the speed cushion before entering the general traffic lane to pass the bus. This is a reasonably tight manoeuvre and will be complicated by available gaps in the motor traffic, plus uphill riding.



**Figure 3.2-1: Speed cushions near bus stop, east of Holloway Road**

This is not a high frequency bus route, so it is expected that crashes occurring due the geometry in this location will be infrequent. But the vulnerability of cyclists and speed of motor vehicles means that it is likely to result in serious injury. Therefore, this is a moderate issue.

#### Recommendations

3.2.1	Relocate the proposed speed cushions just west of Holloway Road. Consider placing them westwards, a bit past the bus stop so that cyclists passing a bus have a chance to re-enter the cycle lane before encountering a speed cushion.
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#### Responses

<b>Designer</b>	Cushions removed in this location.
<b>Safety Engineer</b>	Agree with Designer. However, speeds should be monitored, and alternate speed mitigation installed if necessary.
<b>Client</b>	Agree with Safety Engineer

**Action** | Remove speed cushions and monitor. Add speed mitigation if necessary.

### 3.3 Holloway Road intersection – **C E**

**Moderate**



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

This intersection was identified in the 30% CASA for two reasons – the alignment of the Karori-bound cycle lane crossing Holloway Road, and the width of the lane for departing Holloway Road. The 90% design has addressed the width of the lane for turning out of Holloway Road by using safe-hit posts to narrow the lane. The CAT also notes a draughting error showing broken yellow lines across the cycle lane in this location.

The issue with the Karori-bound cycle lane alignment remains. The cycle lane bends behind an existing island – to motorists turning into or out of Holloway it may appear that cyclists are turning into Holloway and not realise they are following the cycle trajectory along Aro Street (see Figure 3.3-1).



**Figure 3.3-1: Holloway Road intersection design**

In the 30% CASA it was recommended to bend the cycleway out further away from Aro Street (at least one car’s length) with a raised platform and give way line for motorists. However, this was rejected on the basis that the project cannot add another raised platform. If this is not an option, it would be preferable to retain the cycle lane on the main carriageway, so that the trajectory of cyclists is unambiguous to turning motorists.

Given that Holloway Road has local traffic only, crashes due to the design of the cycle lane and intersection width are expected to be only occasional, but the intersection geometry allows for fast speeds, so would be likely to result in serious injury to cycleway users.

**Recommendations**

3.3.1	If the recommendations from the 30% CASA cannot be achieved, retain the cycle lane on the main carriageway.
3.3.2	Rectify the draughting error that shows broken yellow lines across the cycle lane.

**Responses**

<b>Designer</b>	3.3.1 – although I agree with the suggestions, cyclists currently favour cycling through the breaks in the islands. No change proposed.
<b>Safety Engineer</b>	3.3.1. Agree with Designer. 3.3.2 Agree with CAT.
<b>Client</b>	Agree with Safety Engineer. Cyclists are currently choosing a balance between safety and efficiency and riding where the designs have the cycle lane marked.
<b>Action</b>	Retain cycle lane as marked and amend BYLs.

### 3.4 E-bike short-cut on Raroa Road loop – C Moderate

	Probability of crash occurring	Infrequent
	Likelihood of serious / fatal injury	Likely

In the 30% CASA (issue 3.13) it was identified that e-bike riders (and very fit/fast unpowered bike riders) are likely to use the existing (steeper) footpath as a short-cut uphill rather than ride the cycleway around the Raroa Road loop near Entrance street. The CAT’s recommendation to provide a kerb cut down at the upper end of the footpath, to enable e-bikers to rejoin the carriageway was agreed upon by the designer and client, but this has not yet been added to the 90% plans.



**Figure 3.4-1: E-bike short cut on existing path on Raroa Road loop**

There are overhanging trees that could hinder e-bikers, plus no kerb ramp from the footpath to the carriageway at the end of the short cut. The former could result in an e-biker falling onto the path, the latter could result in them falling onto the live carriageway and being hit by a motor vehicle. Both are expected to be infrequent occurrences, as e-bikers would generally anticipate and avoid the hazards, but falling onto the live carriageway would be likely to result in serious injury.

#### Recommendations

3.4.1	Remove tree branches overhanging existing footpath around the circle in Figure 3.4-1. (this is to be forwarded to maintenance for action – no response needed from designer)
3.4.2	Provide kerb ramp from footpath to carriageway where plans note “2m cycle lane transitions back on to road” in Figure 3.4-1.

#### Responses

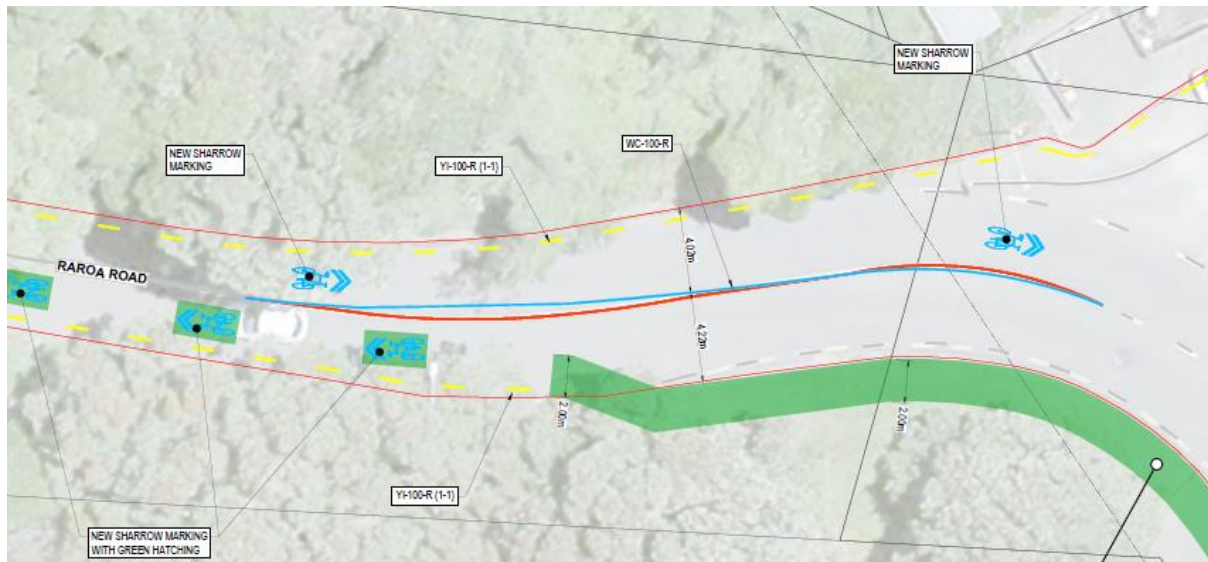
<b>Designer</b>	3.4.2 – agree, design to be updated to include kerb ramp.
<b>Safety Engineer</b>	3.4.2 Agree with CAT and Designer. 3.4.1 Agree with CAT.
<b>Client</b>	Agree.
<b>Action</b>	Add kerb ramp and pass issue of tree branch to Parks and Reserves.

### 3.5 Raroa Road path transition – **C E** Moderate



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

The 30% CASA identified an issue with the transition of the Karori-bound off-road cycle path to mixed traffic on Raroa Road, which involved safe-hit posts that appeared to result in a traffic lane narrower than the legal minimum width of 2.5 m. The 90% design (see Figure 3.5-1) has removed the flexiposts but still appears to have a short section of on-road cycle lane which would result in a section of the general traffic lane being approximately 2.3 m wide.



**Figure 3.5-1: Off-road cycleway transitions to mixed traffic on Raroa Road**

Furthermore, without the safe-hit posts, the cycle lane creates an unacceptable taper on the general traffic lane.

This could result in cyclists thinking they have a dedicated lane as they enter the carriageway, without there being sufficient space for motorists to pass them. Given the ambiguity, resulting crashes are expected to be occasional, and, given the speeds involved and vulnerability of cyclists, likely to cause serious injury.

#### Recommendations

3.5.1	Modify the design to achieve suitable lane widths and taper lengths OR:
3.5.2	Do not continue the cycleway green onto the carriageway. Start the sharrows at the transition point, to make it clear to cyclists that they are entering a mixed traffic area.

#### Responses

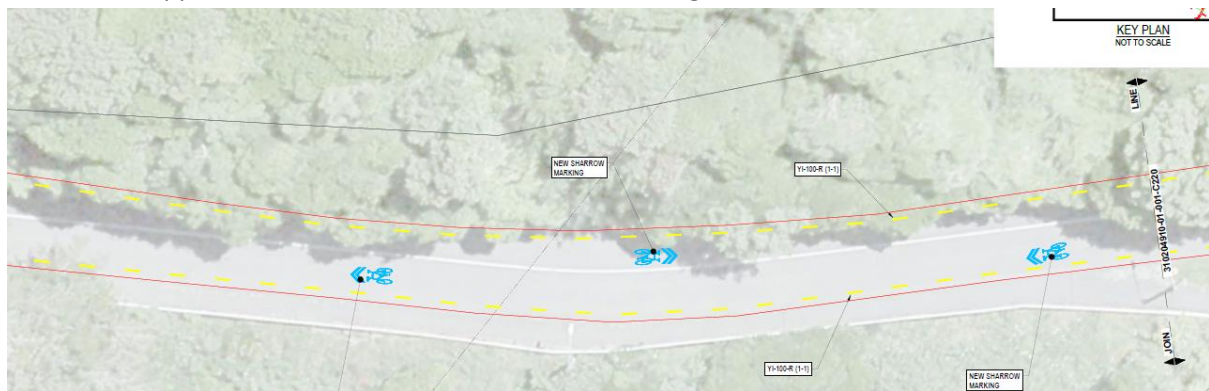
<b>Designer</b>	Path as been extended to the west, and now feeds cyclists into the trial 750 mm “cycle shoulder”.
<b>CAT</b>	
<b>Safety Engineer</b>	Agree with Designer. To be included in monitoring plan, and modified if necessary.
<b>Client</b>	Agree.
<b>Action</b>	Extend path and merge into ‘cycle shoulder’

### 3.6 Raroa Road – lane widths – **C E** Moderate



Probability of crash occurring	Common
Likelihood of serious / fatal injury	Likely

There is a section of Raroa Road east of Entrance Street (sheet 21 of the 90% plans) where the city-bound lane appears to be narrower than the minimum legal lane width of 2.5 m.



**Figure 3.6-1: Narrow sections of Raroa Road in city-bound direction**

This is located in a hilly, winding section of road where people cycle in mixed traffic. Having a lane that is too narrow, in combination with these other factors, could result in conflict between cyclists and motor vehicles in either direction.<sup>1</sup>

#### Recommendations

3.6.1	Ensure the legal minimum lane width is achieved throughout the route.
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#### Responses

<b>Designer</b>	I suspect this is an error with the GIS data as the lane widths are compliant. Design is being updated to include 750 mm Karori bound “cycle shoulder” to trial.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.
<b>Action</b>	Check final 90% design lane widths.

<sup>1</sup> Note that this only applies because the “2 minus 1” common in the Netherlands or “advisory bike lanes” of North America where general traffic lanes are less than the New Zealand minimum width are not found here. Should such treatments become common, then driver expectations would likely change and this would not be an issue.

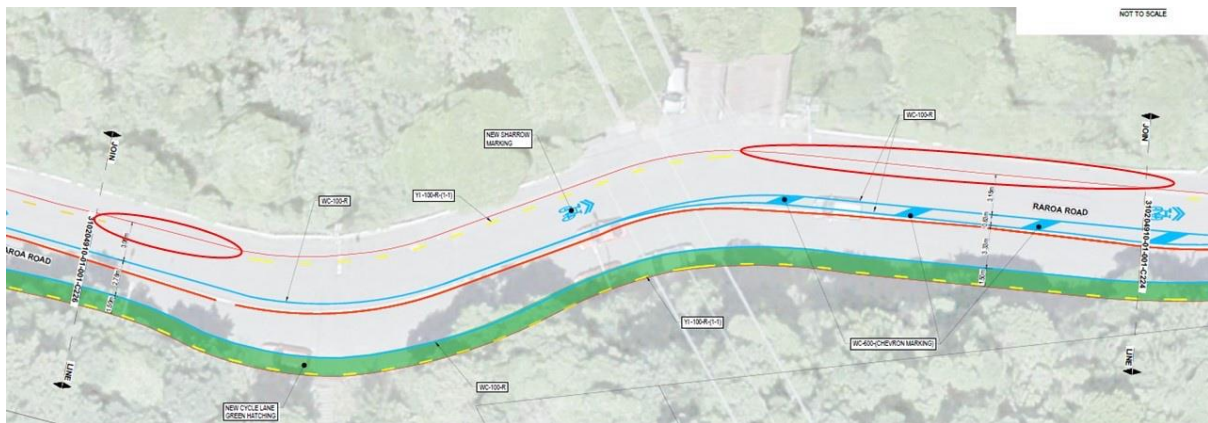


### 3.7 Raroa Road no-stopping – **C** Moderate



Probability of crash occurring	Infrequent
Likelihood of serious / fatal injury	Likely

Raroa Road forms a hairpin bend at Mount Pleasant Road and has a steep gradient. Near 166 Raroa Road, some no-stopping restrictions have been added to accommodate the new cycle lane and flush median. However, the CAT suggests that it would be preferable to also add no-stopping in the sections circled in red in Figure 3.7-1, to provide a consistent stretch of route.



**Figure 3.7-1: No-stopping in the vicinity of 166 Raroa Road**

If vehicles are parked in the sections circled in red in Figure 3.7-1, the available lane width will be too narrow for moving vehicles to stay in their lane while passing the parked vehicle. Drivers may be too overloaded thinking about avoiding hitting the parked car, watching for oncoming traffic, negotiating the gradient and bends etc to also remember to look out for cyclists travelling in the mixed traffic lane.

Parking demand in this location is expected to be low, so such crashes would be infrequent, but still likely to result in serious injury if they do occur.

#### Recommendations

3.7.1	Continue the broken yellow no-stopping lines in the sections circled in red in Figure 3.7-1 in the vicinity of 166 Raroa Road.
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#### Responses

<b>Designer</b>	Agree, design to be updated.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.
<b>Action</b>	Extend BYLs.

### 3.8 Cycle lane at bus stop after Mount Pleasant Rd – **C E** Comment



Probability of crash occurring	N/A
Likelihood of serious / fatal injury	N/A

There is an in-lane bus stop in the Karori-bound cycle lane soon after it crosses Mount Pleasant Road – see Figure 3.8-1.

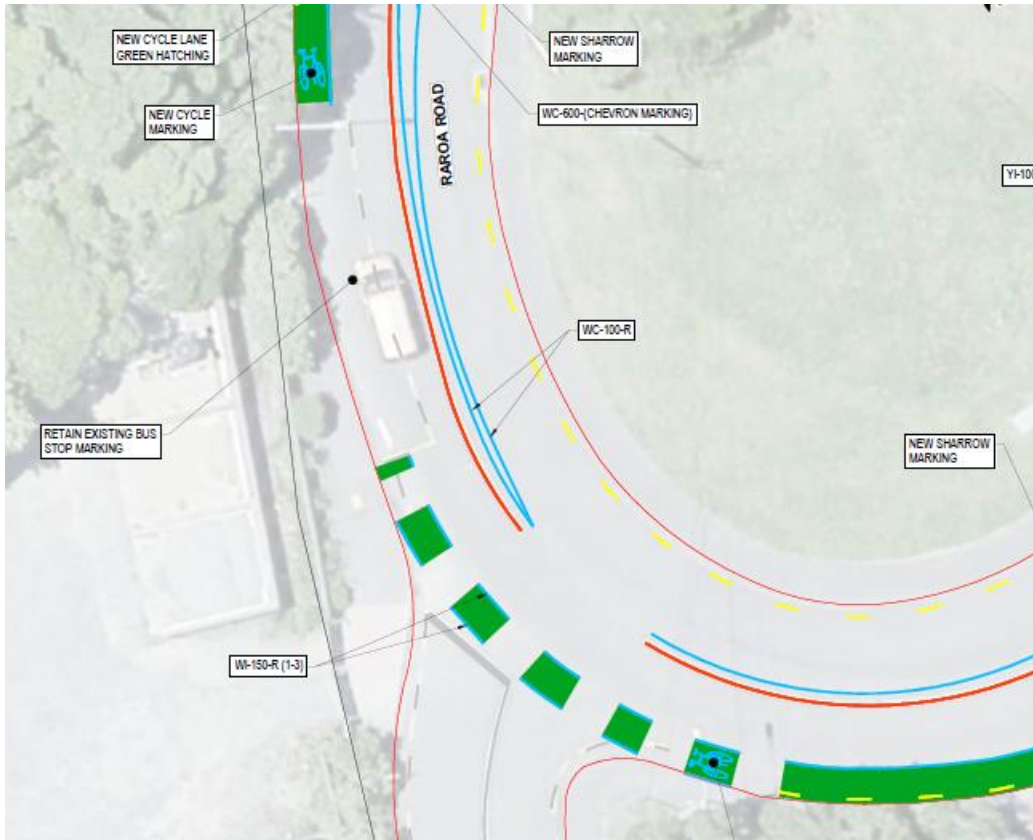


Figure 3.8-1: Cycleway across Mount Pleasant Road, approaching in-lane bus stop

The proposed design extends the green blocks for side street crossings past the side street, resulting in a small block prior to the bus stop. It would be preferable to have a longer section of cycle lane with solid colour prior to the bus stop, to distinguish the bus stop from the side road, particularly for cyclists and motorists turning left out of Mount Pleasant Road.

**Recommendations**

3.8.1	Colour in the last gap in the cycle lane green prior to the bus stop after Mount Pleasant Road.
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**Responses**

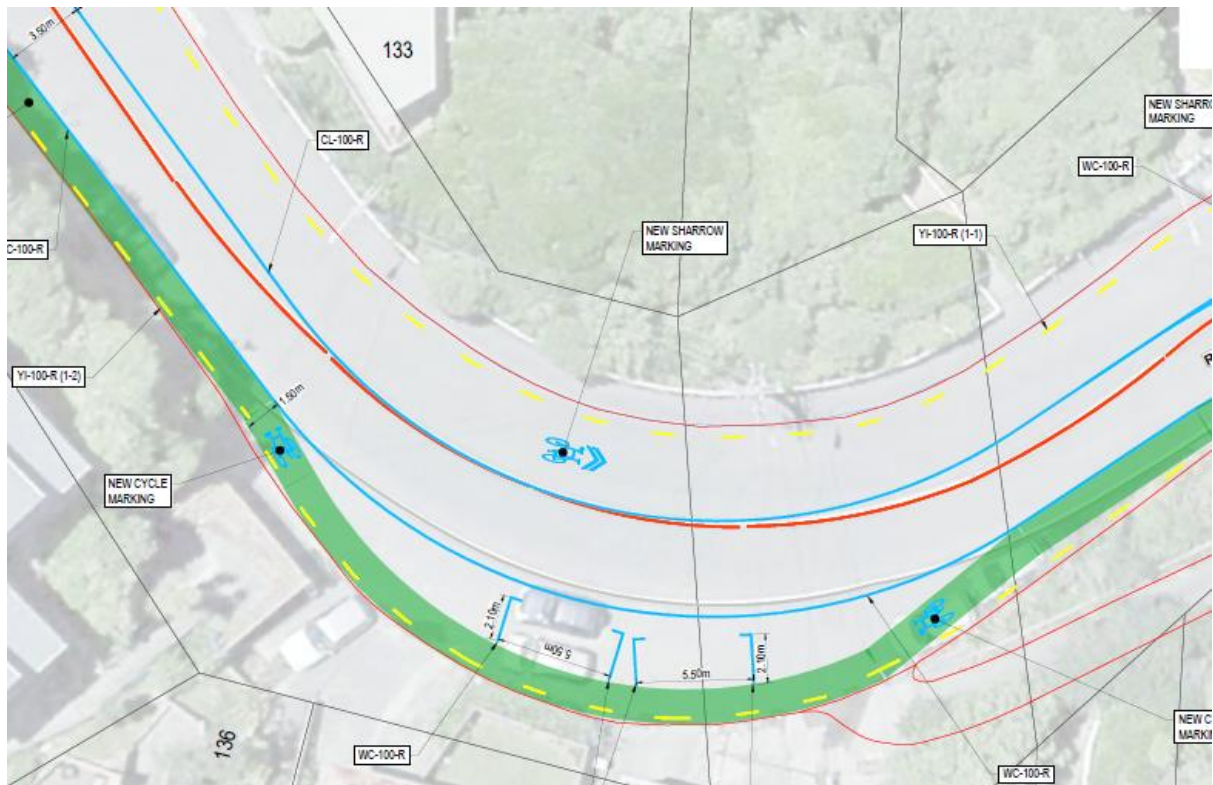
<b>Designer</b>	Agree, design to be updated.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree.
<b>Action</b>	Colour the last gap green.

**3.9 Parking spaces by Raroa Road cycle lane – C E Moderate**



Probability of crash occurring	Infrequent
Likelihood of serious / fatal injury	Likely

The design shows two marked parking spaces adjacent to the Karori-bound cycle lane in a bend on Raroa Road – as shown in Figure 3.9-1:



**Figure 3.9-1: Marked parking spaces adjacent to cycle lane**

There is no physical measure to stop cars encroaching on the cycle lane here. The aerial photos show two cars parked side-by-side – this suggests a high parking demand which may make it likely drivers will park a little over the cycle lane. It also shows that drivers are not concerned about parking close to the general traffic lane, and therefore it could be acceptable to move the proposed parking spaces slightly away from the cycle lane to accommodate a physical barrier, which will also help prevent passenger dooring incidents.

Cars encroaching on the cycle lane will cause a pinch point for cyclists and, in extreme cases may cause cyclists to leave the cycle lane and enter the general traffic lane – if this occurs suddenly it may result in a crash with motor vehicles. Such crashes would be infrequent but likely to result in serious injury.

There is also the question about the legality of providing a marked parking space to the right of a broken yellow (no-stopping) line).

**Recommendations**

3.9.1	Provide a physical barrier (e.g., wheel stops) between the cycle lane and marked parking spaces – move the parking spaces slightly to accommodate this.
3.9.2	Do not mark broken yellow lines adjacent to the car parking spaces.

**Responses**

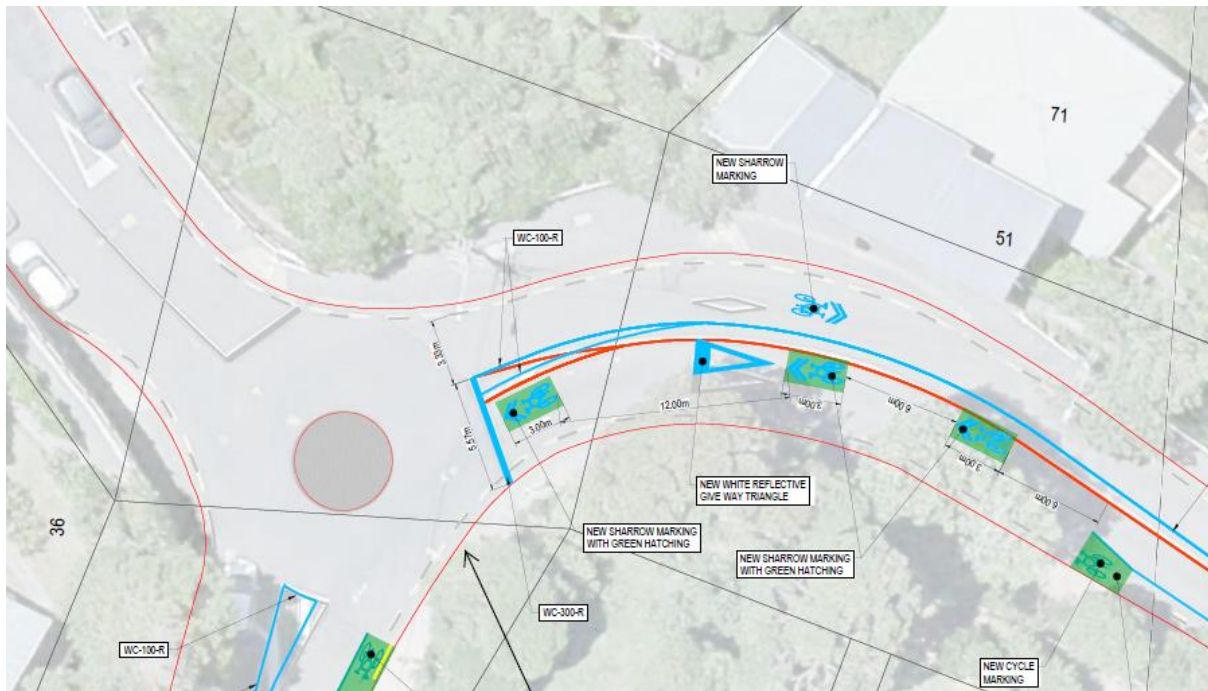
<b>Designer</b>	Design is updated so the cycle lane is parallel with the edge line and parks are pushed out kerb side to stop the issue described above occurring.
<b>Safety Engineer</b>	Agree with Designer.
<b>Client</b>	Design has been updated.
<b>Action</b>	Refer to updated design.

### 3.10 Plunket Street roundabout approach – **C E** Moderate



Probability of crash occurring	Occasional
Likelihood of serious / fatal injury	Likely

As per the 30% CASA (issue 3.16) the Karori-bound approach to the Plunket Street roundabout has been modified to transition to mixed traffic rather than have a kerbside cycle lane up to the limit line – see Figure 3.10-1.



**Figure 3.10-1: Plunket Street roundabout**

However, there are some concerns with the way this has been implemented. Firstly, the sharrows are too close to the centreline – they should be positioned in the centre of the lane.

Secondly, the approach lane is wide enough that drivers might form two approach queues. This could make it difficult for cyclists to manoeuvre and cause conflict on the approach, or if they get stuck on the wrong side of motor vehicles, conflict travelling through the roundabout.

These issues are expected to be occasional sources of crashes, which would be likely to cause serious injury.

#### Recommendations

3.10.1	Position sharrows centrally in approach lane.
3.10.2	Add flush median to reduce Karori-bound approach lane width, to minimise the chance of two queues forming.

#### Responses

<b>Designer</b>	3.10.1 – agree, design to be updated. 3.10.2 – agree, design to be updated.
<b>Safety Engineer</b>	Agree with CAT and Designer.
<b>Client</b>	Agree
<b>Action</b>	Update designs as per CAT recommendation.



## 4 Audit statement

We certify that we have used the available plans, and 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 to improve safety.

The safety issues identified and noted in this report are summarised in Table 3.10-a.

**Table 3.10-a: Summary of Issues**

<i>Serious</i>	<i>Significant</i>	<i>Moderate</i>	<i>Minor</i>	<i>Comments</i>	<i>Total</i>
<b>1</b>	<b>1</b>	<b>11</b>	<b>0</b>	<b>3</b>	<b>16</b>
<i>Issue</i>					<i>Ranking</i>
2.1	Information lacking Bus stop timing point				Moderate
2.2	Lane widths for mixed traffic				Significant
2.3	Parking near pedestrian crossings / raised platforms				Moderate
2.4	Cycle lanes on inside of curves				Moderate
2.5	Transition from cycle lane to mixed traffic (to be completed)				No issue
2.6	Sharrows next to parking				Serious
2.7	Signs and markings				Comment
3.1	Aro Street to Ghuznee Street section				Comment
3.2	Speed cushions approaching Holloway Road				Moderate
3.3	Holloway Road intersection				Moderate
3.4	E-bike short-cut on Raroa Road loop				Moderate
3.5	Raroa Road path transition				Moderate
3.6	Raroa Road – lane widths				Moderate
3.7	Raroa Road no-stopping				Moderate
3.8	Cycle lane at bus stop after Mount Pleasant Road				Comment
3.9	Parking spaces by Raroa Road cycle lane				Moderate
3.10	Plunket Street roundabout approach				Moderate

Designer: Graeme Corin Position: Principal designer

Signature:  Date: 04/10/2022

Safety Engineer: Dennis Davis Position: Principal Transport Engineer, WCC

Signature:  Date: 07/10/2022




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Project Manager:	<u>Jonathan Kennett</u>	Position	<u>Project Lead, WCC</u>
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Signature	<u></u>	Date	<u>31/10/2022</u>
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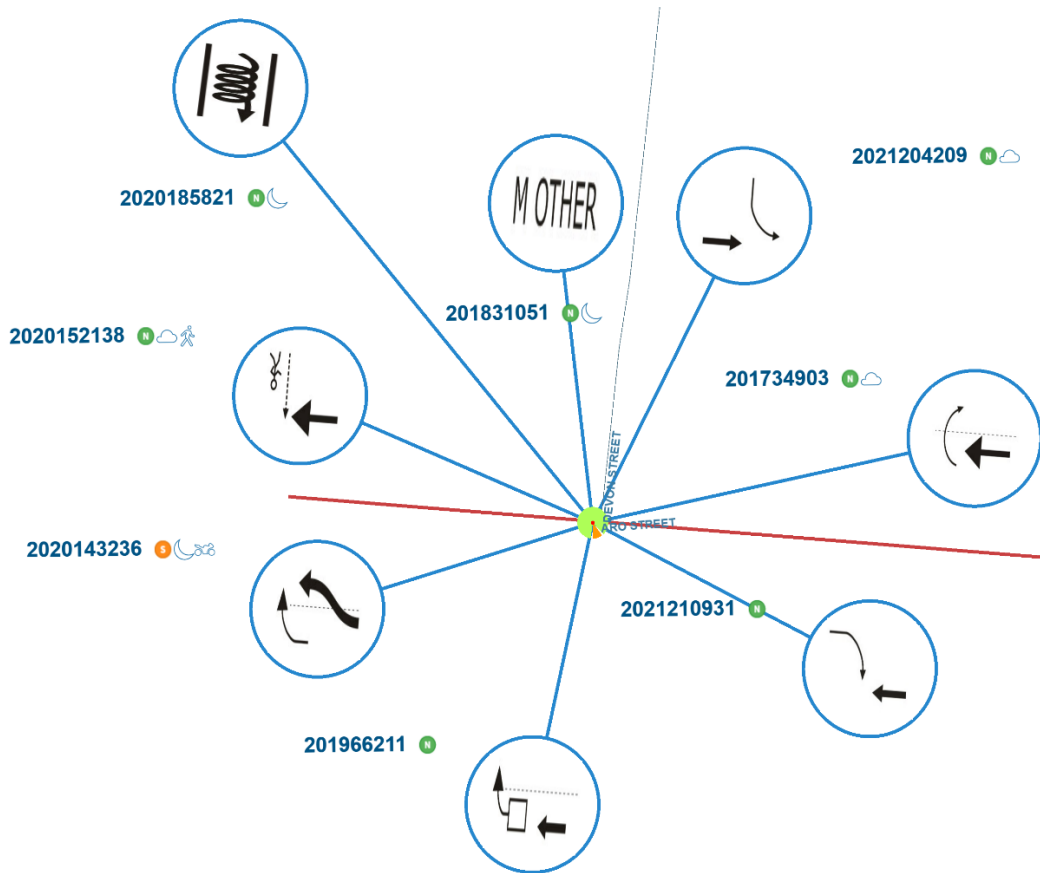
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<b>Project sponsor - action completed:</b>	<u>Claire Pascoe</u>	Position	<u>Transitional Programme Manager</u>
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Signature	<u></u>	Date	<u>31/10/2022</u>
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Audit report distributed on:		Date	<u>31/10/2022</u>
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## Appendix A Intersection crash information



**Figure Appendix A-1**

Crash data for the Devon Street intersection indicates that:

- A wide range of crash types, often to do with manoeuvring
- No crashes involved cyclists and one involved a pedestrian
- All crashes occurred in good weather
- Three crashes were at night
- Crashes were all between Thursday – Sunday (most often Friday and Sunday)
- 5 of the 8 crashes were in 2020 and 2021