



Transport Planning and Design
Level 1, 284 Kilmore Street
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Thorndon connections 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

January 2023



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| Quality Assurance Statement | |
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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 *Safe System audit guidelines* (2022).

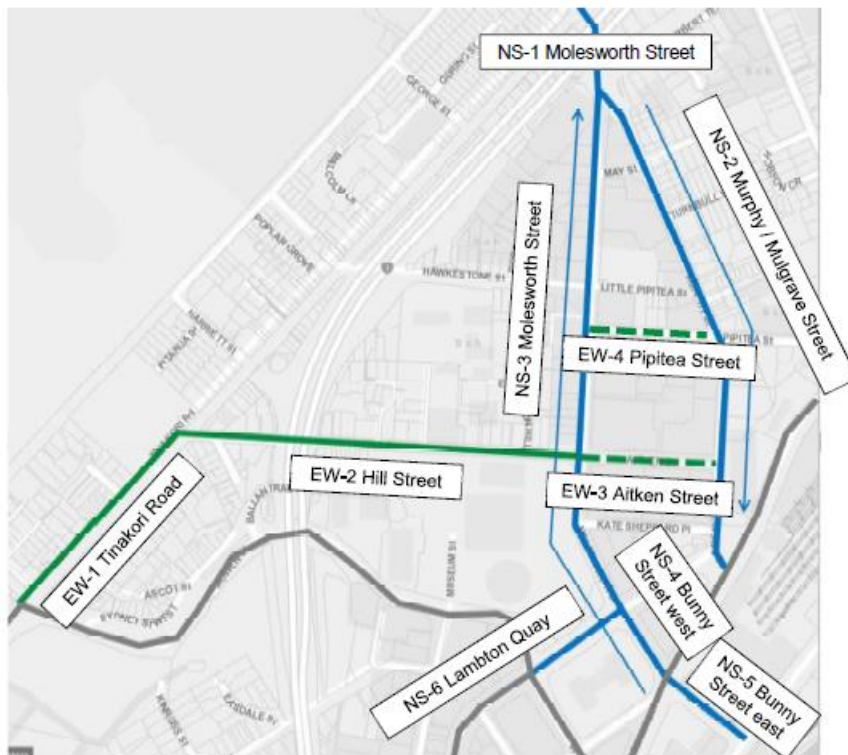


Figure 1-1: Extent of audit

This CASA is for the 90% design stage of the Thorndon Connections (formerly known as “Molesworth-Mulgrave”) routes package, as shown in Figure 1-1.

Previous work on the project includes a Multi Criteria Analysis (WSP, October 2022) to determine treatment types for the various sections, plus associated modelling work. ViaStrada undertook the 30% CASA in November 2022, resulting in some changes to the design.

The infrastructure assessed in this audit includes: painted markings, physically separated cycleways raised platforms, kerb changes, traffic signals and signage.

1.2 The cycleway audit team

The CASA was carried out by the Cycleway Audit Team (CAT) consisting of:

- Megan Gregory, the cycleway audit team leader, of ViaStrada Ltd
- Axel Wilke, Glen Koorey, Nick Reid and John Lieswyn, cycleway audit team members, of ViaStrada Ltd



1.3 Meetings and site visits

A project briefing was conducted online on 14 December 2022, involving representatives from the client, the designer and the CAT. The designer's representative, Chris Groom, briefed the CAT on the 90% designs and clarified the scope of the audit. A subsequent meeting was held on 21 December 2022, to present the CAT's initial audit points and seek further clarifications.

The daytime site visit was undertaken prior to the plans being received, on 28 July 2022, from 2:30 to 4pm. No night-time site visit was undertaken.

1.4 Project information provided

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

Table 1-1: plans reviewed

| Document | Date | Description |
|---|------------|--|
| 5-C3880.32_Molesworth St - Hill St - Aitken signals-C105_C106 | 13/12/2022 | Signal layout and details for Aitken / Hill / Molesworth intersection |
| 5-C3880.32_Molesworth St - Tinakori Rd - Park St signals-C109_C110 | 09/12/2022 | Signal layout and details for Molesworth / Park / Tinakori intersection |
| 5-C3880.32_Mulgrave St - Aitken St signals-C115_C116 | 12/12/2022 | Signal layout and details for Molesworth / Mulgrave intersection |
| 5-C3880.32_Mulgrave St - Pipitea St signals-C113_C114 | 09/12/2022 | Signal layout and details for Mulgrave / Murphy / Pipitea intersection |
| 5-C3880.32_Mulgrave St - Thorndon Qy - Lambton Qy signals-C118_C119 | 12/12/2022 | Signal layout and details for Lambton / Mulgrave / Thorndon intersection |
| 5-C3880.32_Murphy St pedestrian crossing-C111_C112 | 09/12/2022 | Signal layout and details for Muprhy St pedestrian / cycle midblock crossing |
| Thordon_TransitionalCycleway_PMP_P2_DRAFT | 12/12/2022 | WCC Transitional Cycleways Parking Management Plane Stage 2 – Thorndon Connections |
| 5-C3880.32_(General Layout)-C30 to C40(B) | 09/12/2022 | General layout |
| 5-C3880.32_Vehicle tracking-C60_C70(A) | 09/12/2022 | Vehicle tracking at key locations |
| 5-C3880.32_Signage Layout-C70 to C80(A) | 09/12/2022 | Signage layout |

1.5 Design vehicles

For intersections, Austroads *Guide to Road Design Part 4: Intersections and Crossings: General* (AGR4, 2017) describes a design vehicle as the largest vehicle that 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:

- 19 m semi-trailer is the maximum design vehicle expected to use roads connecting to the commercial area.
- 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
- Being in the CBD, users of electric scooter users are expected to be common (including the current public share scooters by Beam and Flamingo). Unless otherwise specified, where an issue description refers to “cycleway users” or simply “cyclists”, this also includes users of electric scooters or other small-wheeled electric devices.

1.6 Items not covered

This 90% CASA does not cover the aspects of:

- Intersection design / operation at:
 - Bunny St / Lambton Quay / Molesworth St
 - Bowen St/ Tinakori Rd
 - Stout St / Whitmore St

2 Audit procedure and report format

This audit follows the Waka Kotahi NZ Transport Agency *Safe System Audit Guidelines* (2022). The primary objective of a Safe System audit is to deliver a project that achieves an outcome consistent with the Safe System approach, that is, minimisation of death and serious injury.

The following section(s) of this report detail the issues identified in the audit.

2.1 Crash probability

The probability of a crash is qualitatively assessed based on expected exposure (how many road users will be exposed to the site) and the likelihood of a crash resulting from the presence of the particular safety issue. Probability ranges from “very likely” to “very unlikely”, and have been based on the categories in the Austroads *Guide to Road Safety part 6: Road Safety Audit* (2022) but adapted for the 4-tier probability structure used in the NZ guide (Waka Kotahi, 2022).

Table 2-1: Relationship between crash probability and frequency

| Probability of a crash occurring | Frequency of crashes expected |
|----------------------------------|--|
| Very likely | One crash every 3 months (4+ crashes / year) |
| Likely | One crash every 3-12 months (1-4 crashes / year) |
| Unlikely | One crash every 1-7 years (0.1-1 crashes / year) |
| Very unlikely | One crash every 7+ years (<0.1 crashes / year) |

2.2 Crash severity

The expected severity outcome of a crash is qualitatively assessed based on factors such as expected speeds, type of collision, and type of user/vehicle/object involved; Figure 2-1, which is based on Austroads *Guide to Road Safety part 6: Road Safety Audit* (2022) but in colour instead of greyscale, gives an indication of the expected crash severity based on these factors. Table 2-2 describes the four crash severities used.

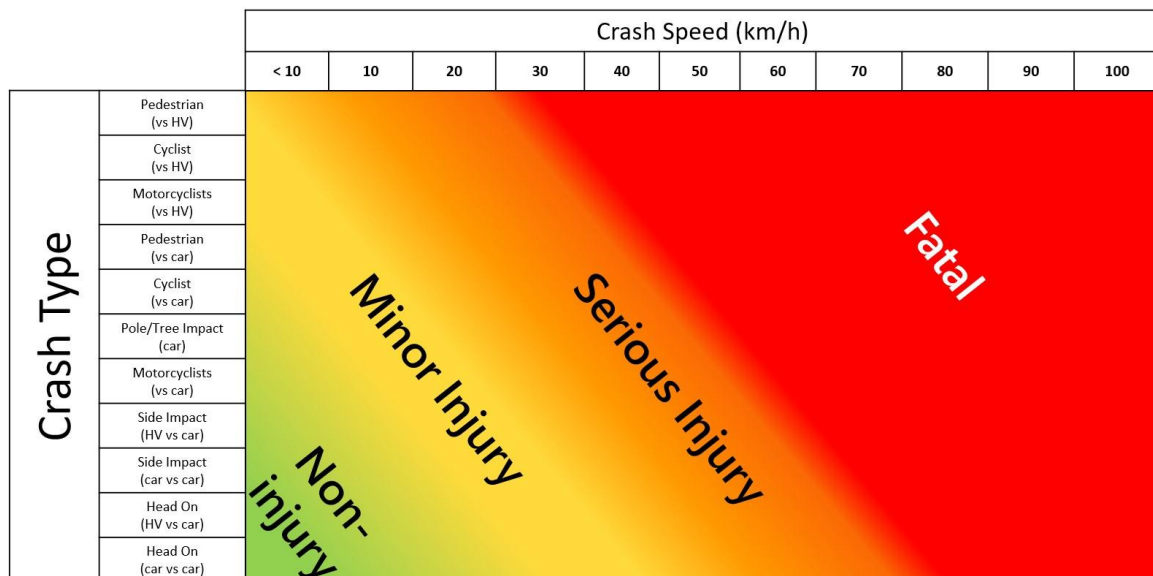


Figure 2-1: Expected crash severity by crash type and crash speed (adapted from Austroads GRS6, 2002)



Table 2-2: Crash severity descriptions (adapted from Waka Kotahi Safe Systems Audit Guidelines, 2022)

| Severity outcome | Description |
|-------------------|--|
| Fatal | Where Safe System boundary conditions are exceeded. A death occurring as the result of injuries sustained in a road crash within 30 days of the crash. |
| Serious | Where Safe System boundary conditions are exceeded. Injury (fracture, concussion, severe cuts or other injury) requiring medical treatment or removal to and retention in hospital. |
| Minor | Where Safe System boundary conditions are met. Injury which is not 'serious' but requires first aid, or which causes discomfort or pain to the person injured. |
| Non-injury | Where Safe System boundary conditions are met. Property damage crashes. |

Reference to historic crash data or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, probability and severity that may result from a particular concern.

2.3 Crash risk rating

The probability and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Waka Kotahi Safety Concern Risk Rating Matrix shown in Table 2-3. The qualitative assessment requires professional judgement and experience from a wide range of projects of varying sizes and locations.



Table 2-3: Safety concern risk rating matrix (from Waka Kotahi Safe Systems Audit Guidelines, 2022)

| | | 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 | Safe System injury threshold | Serious | Serious |
| | Likely | Minor | Moderate | | Serious | Serious |
| | Unlikely | Minor | Minor | | Significant | Serious |
| | Very unlikely | Minor | Minor | | Significant | Significant |

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 2-4.

Table 2-4: 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.

2.4 Recommendations














Each issue is accompanied by a list of recommendations to address the issue. As per the safe systems framework, these are classified as relating to either:

- Primary treatments – i.e. those capable of virtually eliminating death or serious injury resulting from the particular safety issue; or
- Supporting treatments – reduce the overall harm caused by the safety issue.

2.5 Affected user groups

For ease of interpretation, each issue heading in this CASA report includes the severity rating, as well as include letters to denote the main user groups affected. The first row in the table also includes icons to denote possible sub-groups. The user letters and icons are presented in Table 2-5:

Table 2-5: 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 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.



2.6 Project team response process

In accordance with the procedures set down in the Waka Kotahi NZ Transport Agency *Safe System Audit Guidelines* (2022) the audit report will be submitted to the client who will instruct the wider project team to respond.

No changes, however small they may appear, may be made to any of our writings in the main audit section of our report without our express review and consent. This restriction includes our CAT responses.

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

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. Finally, the client decision and action taken against the safety issues will also be recorded.

The following people have been identified by the client for these roles (Table 2-6).

Table 2-6: project team members relevant to this audit (to be completed by the client)

| Role | Name | Organisation |
|-------------------|---------------|--------------|
| Designer response | Chris Groom | WSP |
| Safety engineer | Dennis Davis | WCC |
| Client decision | Brad Singh | WCC |
| Action taken by | Renee Corlett | WCC |



3 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.

The crash history for this project is detailed in the 30% CASA. The largest crash clusters involving motor vehicles are on Bunny Street near the railway station. Other notable crash clusters are present at intersections between Molesworth Street and Kate Sheppard Place, Bowen Street and Tinakori Road, Bowen and Whitmore Street.

4 CASA findings – safety issues

4.1 Hill St approach to Tinakori Rd (C30) – P

Significant



The safety issue is the potential high-speed turns between Hill Street and Tinakori Road which could lead to conflict with pedestrians. The proposed changes to this approach are unlikely to slow vehicles.

The crash type expected is motor vehicle vs. pedestrian.

The risk factors include: the width of Hill Street – i.e. increased pedestrian crossing distance; and the side road angle, which allows for faster right turns in and left turns out of Hill Street.

The relevant standards and guidelines are in the Pedestrian Network Guidance (PNG) section on [crossings](#), which includes reference to the [Austroads Pedestrian Facility Selection Tool](#).

Crashes are expected to be very unlikely (one every 7+ years), but those that do occur would likely result in serious injury, due to the vehicle speeds involved.

The CAT acknowledges that the designer was constrained by the swept path of heavy vehicles.

| | | |
|--|--|----------------|
| Probability of crash occurring | | Unlikely |
| Expected crash severity | | Serious injury |
| Primary treatment recommendations: | | |
| 4.1.1 | <p>Rather than a painted edge line, the area could be filled with river stones set in concrete (similar to the Northlands Mall approach to Sisson Drive in Christchurch – see Figure 4-1). This would be traversable by heavy trucks, but avoided by car drivers.</p> <p>Consider whether the area of the river stone island can be increased above that of the painted edge line currently proposed (based on light vehicle tracking).</p> <p>Ensure a flat pedestrian path through the stony area is included.</p> | |
| Supporting treatment recommendations: | | |
| 4.1.2 | N/A | |



Figure 4-1: River stones on Sisson Drive

| | |
|------------------------|---|
| Responses: | |
| Designer | Agree that the Hill St pedestrian crossing distance is longer than desired and that a traversable kerb buildout could be of use to slow left turning vehicles. However, the use of riverstone material is not in keeping with a transitional approach as this feature cannot be easily changed once installed. The use of low rubber speed humps for buildout would be preferred. |
| Safety Engineer | Agree with Designer - preference for low rubber speed humps in buildout area. |
| Proposed action | Agree with above low rubber speed hump treatment more applicable and raised pedestrian crossing and reduced speed limits will reduce risk here also. |
| Client decision | Agree with Proposed Action |
| Action taken | Add low rubber speed hump to design. |

4.2 Murphy St bus stop / pedestrian crossing / cycle transition (C33) – **C E**

Minor

This location was covered in item 4.8 of the 30% CASA; the recommendations have been largely addressed, but some changes have resulted in new issues to consider.

The safety issue is that the merge point for cyclists and motorists appears to be on the pedestrian crossing platform; this could cause confusion for cyclists or motorists and could ultimately result in motorists failing to merge correctly with cyclists or give way to pedestrians on the crossing.

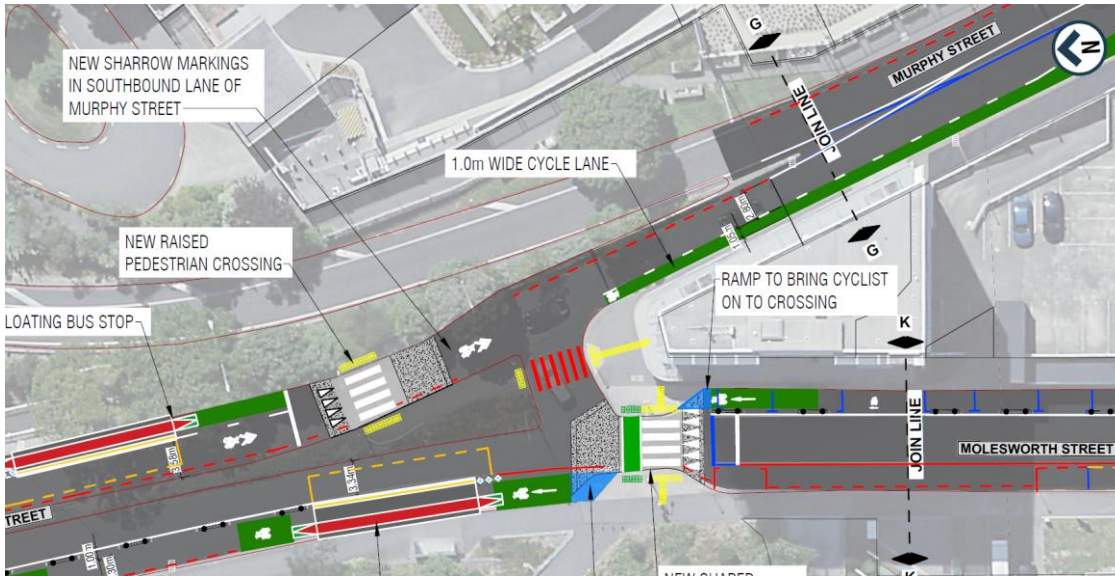


Figure 4-2: cycleway transition in vicinity of bus stop and pedestrian crossing

Firstly, shifting the bus stop back has improved the distance available for cyclists and motorists to merge.

The risk factors include large numbers of pedestrians and the presence of the bus stop which is another feature for cyclists and motorists to negotiate.



Probability of crash occurring

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Expected crash severity

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Primary treatment recommendations:

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There are no specific standards relating to this particular issue of combining bus stops, pedestrian crossings and merge points.

It is anticipated that users will generally apply caution in this location with many features, so crashes will be unlikely. The raised platform on the pedestrian crossing will slow motor vehicles, so crashes that do occur should only result in minor injury.

lane prior to the pedestrian crossing, to avoid having the merge beginning on the crossing itself.

| | |
|------------------------|--|
| Responses: | |
| Designer | Agree with the CAT, to amend design of merge |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |

Action taken

Plans updated

4.3 Murphy St narrow cycle lane (C33) – C E

Significant

The safety issue is the cycle lane on Murphy Street after the pedestrian crossing (see Figure 4-3) is too narrow.

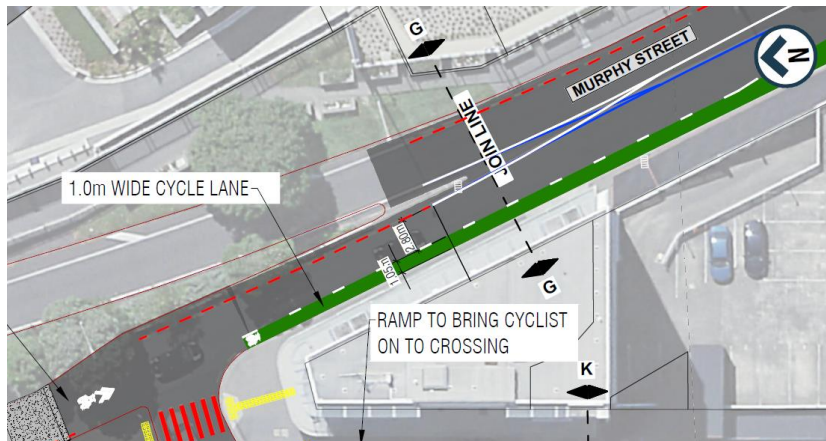


Figure 4-3: narrow cycle lane on Murphy Street

The crash type expected is cyclist vs motorist.

The risk factors include cyclists and motorists having a false sense of security thinking they each have their own spaces when there is not enough width for this form of provision and the carriageway constraints between the solid median island and the footpath kerb.

The relevant standards are outlined in the CNG section on [cycle lanes](#), which specifies an absolute minimum cycle lane width of 1.4 m (adjacent to a kerb, in low speed environments, for short sections).

It is expected that most drivers would judge the situation adequately and therefore crashes are expected to be unlikely. The raised pedestrian crossing and constrained carriageway



| | |
|--------------------------------|----------------|
| Probability of crash occurring | Unlikely |
| Expected crash severity | Serious injury |

Primary treatment recommendations:

4.3.1 Continue the mixed traffic section with sharrowes at least up to the end of the solid median island and begin the cycle lane after that.



means vehicles should be travelling slowly, but possibly around 30 km/h, which would result in serious injury.

| | |
|------------------------|---|
| Responses: | |
| Designer | Agree with CAT, to shift start of cycleway further down Murphy St at which point a full width traffic lane and cycleway can be provided |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |
| Action taken | Plans updated |

4.4 Murphy St mixing lane length (C33) – **C E**

Serious

This was included in the 30% CASA under item 4.6, but appears the issue was not detailed clearly enough.

The safety issue is the long section available for merging in the mixing lane on Murphy St approaching Tinakori / Park. This length means drivers can enter the mixing lane at greater speeds, and cyclists are exposed to conflict over a greater distance.

The crash type expected is conflict between a cyclist and a motor vehicle.

The risk factors are the speed at which motor vehicles enter the mixing lane and the proportion of heavy vehicles.

There is currently little available NZ guidance on the design of mixing lanes, however ViaStrada are currently working on a technical note for Waka Kotahi on the subject.

It is expected that cyclist volumes will be high, as are traffic volumes; given also that mixing lanes are not common in Wellington, the probability of a crash occurring is likely. Given that motor vehicles are expected to be travelling around 30 km/h, crashes that do occur would likely result in serious injury.

The length of the lane itself is determined by queue length requirements, but it is not necessary that the entire length is accessible to merging vehicles. It would be preferable to reduce the length available for merging to reduce speeds of vehicles entering the mixing lane,



| | |
|--|---|
| Probability of crash occurring | Likely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.4.1 | Restrict the merge area of the mixing lanes e.g. by adding flexi-posts along (at least some of) the lane line from the limit line. The extent should be based on vehicle tracking to enter the mixing lane, and vehicle tracking within the lane should also be considered. Figure 4-4 illustrates the concept. |
| Supporting treatment recommendations: | |
| 4.4.2 | N/A |

reduce the size of the zone of potential conflict and increase predictability.

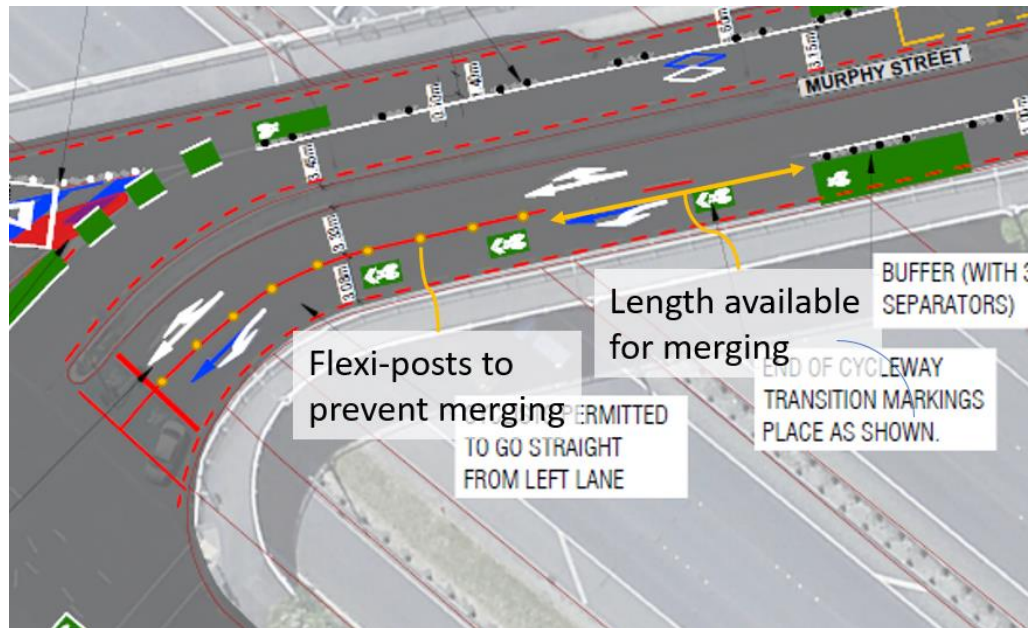


Figure 4-4: Mixing lane with defined merging length

| | |
|------------------------|--|
| Responses: | |
| Designer | Agree with CAT, to restrict length available for merging |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |
| Action taken | Plans updated |

4.5 Aitken / Mulgrave – cyclist LOS (C35/C115) – **C E**

Significant

The safety issue is the fully protected cycle movement at this intersection will increase cyclist waiting time, reduce cyclist LOS, and lead to some cyclists undertaking unsafe manoeuvres.

There are two cycle movements coming from the Mulgrave Street cycleway at this location – the diagonal crossing towards the left, assumedly the main cycle movement, plus the right turn into Aitken Street. Whilst one of the two cycle movements could be accommodated in either the A phase (Mulgrave traffic), and the other in the B phase (right turn from Aitken St) it would not be possible to accommodate both cycle movements, therefore a separate cycle phase has been added.

The problem is that, in either the A or B phase, there will be cyclists waiting at the limit line believing that they could progress safely, and some cyclists will choose to run a red light to improve their efficiency – these are illustrated in Figure 4-5. In the B phase, cyclists travelling along Mulgrave Street would be safe to cross on a sharp diagonal, provided they do not conflict with any pedestrians crossing Mulgrave Street. In the A phase, cyclists turning right might do so, but they would risk conflict with any pedestrians crossing Aitken Street and, of greater concern, they would be at risk of being hit by vehicles turning right into Aitken Street.

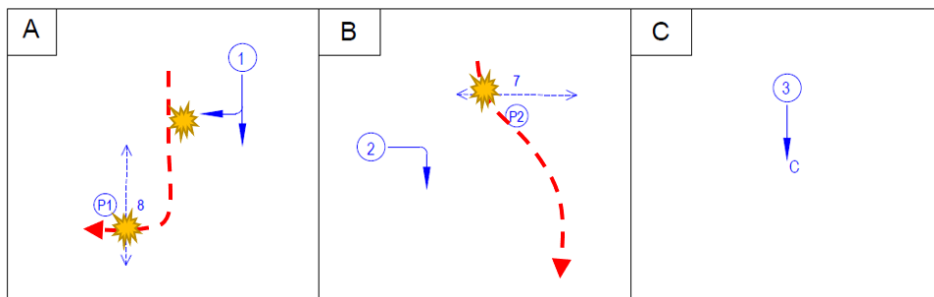


Figure 4-5: Likely cyclist non-compliant manoeuvres and resulting conflicts

Furthermore, whilst one cyclist may be able to judge a safe manoeuvre, subsequent cyclists may follow along without adequately judging the situation. For example, a confident right turning cyclist may move in the B phase, knowing they can make it before an approaching right turning vehicle, but the cyclist behind them may not notice the vehicle or judge the



| | |
|--|--|
| Probability of crash occurring | Unlikely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.5.1 | Provide raised safety platform. |
| Supporting treatment recommendations: | |
| 4.5.2 | Double-cycle the C phase to increase cyclist level of service and decrease the chance of a cyclist waiting at the limit line when there is no conflicting traffic. |
| 4.5.3 | Monitor the intersection to better understand cyclist arrival patterns, cyclist route choice through the intersection, extent of non-compliance and any resulting conflicts. |



timing. Similarly, the following cyclist may assume the cycle phase (C phase) has begun and proceed into the intersection at risk of being hit by conflicting traffic.

Therefore, the crash types expected are motor vehicle vs. cyclist and cyclist vs. pedestrian.

The risk factors include: higher cyclist speeds due to the downhill direction; cyclist arrival patterns with respect to the phasing; whether cyclists have already had to stop at previous intersections along Mulgrave Street (and therefore are pressed to continue); the availability of gaps in the general traffic stream; and the presence of right turning vehicles from Mulgrave Street.

There are no relevant standards relating to acceptable LOS for cyclists.

Cyclists who run red lights at intersections can generally judge whether they can complete the manoeuvre safely, therefore the probability of a crash occurring is unlikely. However, crashes that do occur will likely involve vehicles traveling above the safe system threshold and could therefore result in serious injury.

The ideal solution would be to operate the two cycle movements individually, however this would require additional width to achieve individual approach lanes for the two cycle movements, and some potentially complicated markings / signage to communicate the operation to users. Plus, it would be necessary to use directional cycle signals, which were trialled several years ago but have still not been officially approved as traffic control devices – although it is understood that the trial is being extended to include new sites.

The situation cannot be adequately addressed through the phase sequencing (e.g. using ACB instead of ABC) because the probability of conflict depends on cyclists’ arrival patterns (likely to be scattered due to different cycling speeds and route choices) and the split of right turning vs. left turning cyclists.

| Responses: | |
|------------------------|--|
| Designer | Agree with CAT, proposed operation of the intersection was to have a short cycle time to reduce wait for cyclists. To consider double running phase C as a way to achieve a similar outcome. |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Include in personality creation |

| | |
|------------------------|----------------------------|
| Client decision | Agree with Proposed Action |
| Action taken | Pass to signals team |

4.6 Aitken / Mulgrave – conspicuity of diagonal crossing (C35/C115) – **C E**

Significant

The safety issue is that cyclists on the Mulgrave Street cycleway may not realise that there is a diagonal crossing at Aitken Street, which could lead to them continuing through the intersection into the general traffic lane and mixing with general traffic where this is not the intention.

The crash type expected is motor vehicle vs. cyclist.

The risk factors include: speed differential (tempered by the fact that cyclists are travelling downhill); traffic volumes; and cyclists wanting to rectify a mistake and having to cross two lanes of general traffic.

Crashes due to this issue are expected to be very unlikely, but those that do occur would result in serious injury, due to the motor vehicle volumes involved.



| | |
|--|---|
| Probability of crash occurring | Very likely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.6.1 | Provide cycle continuity markings though the intersection, and distinguish these from the continuity lines for general traffic. |
| Supporting treatment recommendations: | |
| 4.6.2 | N/A |

| | |
|------------------------|--|
| Responses: | |
| Designer | To end Mulgrave St cycleway at Aitken St due to space constraints encountered at the downstream Mulgrave St/ Lambton Quay/ Thorndon Quay intersection. At the Aitken St intersection to provide a cycle exclusive phase and sharrow markings on the exit lanes to direct cyclists. |
| Safety Engineer | Generally, agree with Designer, but not completely sure the issue has been addressed. The Designer's proposed actions should be reviewed by CAT with further discussion, as necessary. |
| Proposed action | This will be picked up by the Transformational team continuing the cycleway to Thorndon Quay intersection as significant civil works required. |



| | |
|------------------------|--|
| Client decision | Depending on the expected date of the transformational changes, this could leave a potentially significant risk for a long period of time. Would suggest that this intersection is actively monitored by the transitional team and changes are made post construction if the safety risk seems uncontrolled by the designers solution. |
| Action taken | Pass to transformational team for inclusion and discussion, ensure this intersection is monitored |

4.7 Molesworth St two-way cycleway crossing Kate Sheppard PI (C37) – C E Serious

This issue was raised in the 30% CASA (item 4.20).

The safety issue is that drivers do not expect to encounter cyclists travelling in the contraflow direction to the adjacent general traffic lane (in this case, the southbound cyclists).

The crash type expected is motor vehicle vs. cyclist.

The risk factors are: the fact that the contraflow cyclists are travelling downhill and therefore faster than normal; the length of the potential conflict zone; the location on a bend in the road; drivers exiting Kate Sheppard PI looking for a gap of traffic (i.e. looking left) knowing it is a one-way street and therefore not looking right towards the southbound (downhill) cyclists; the use of a give way control that encourages drivers to proceed without stopping if they think it is clear; and the rarity of two-way cycleways in Wellington.

There are no specific standards relating to this issue.

Given the factors described above, and the record of pedestrian crashes at Kate Sheppard PI, crashes are expected to be likely. While the speeds of entering vehicles will be reduced by the proposed speed hump and a stop control has been introduced for exiting vehicles, the speed of downhill cyclists mean they could still sustain serious injury.

In the 30% CASA, the primary treatment recommendations were to make Kate Sheppard Place entry-only at Molesworth Street and install a raised platform for the cycleway. Some secondary treatment recommendations were also included to cover the scenario where the primary treatment recommendations were not adopted.

However, having considered the situation further, the CAT is not convinced that any treatment will adequately alert drivers turning out of Kate Sheppard place to the likely



| | |
|--|---|
| Probability of crash occurring | Likely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.7.1 | Make the western end of Kate Sheppard Place entry-only from Molesworth Street. |
| Supporting treatment recommendations: | |
| 4.7.2 | Monitor the eastern end of Kate Sheppard Place; if breaches of the right-turn only restriction increase, request additional police enforcement. |
| 4.7.3 | Consider physical devices that make the illegal movement more difficult, e.g. flexiposts on the edge of the cycle lane. |

presence of contra-flow cyclists, plus the complication that these cyclists will be travelling fast in the downhill direction. Moreover, the CAT was informed that it was decided to retain the two-way functionality of Kate Sheppard Place at Molesworth Street because making it one-way would exacerbate the existing problem of drivers disregarding the right turn-only restriction at the other end of Kate Sheppard Place and crossing three lanes of traffic to access the left turn from Mulgrave Street to Thorndon Quay.

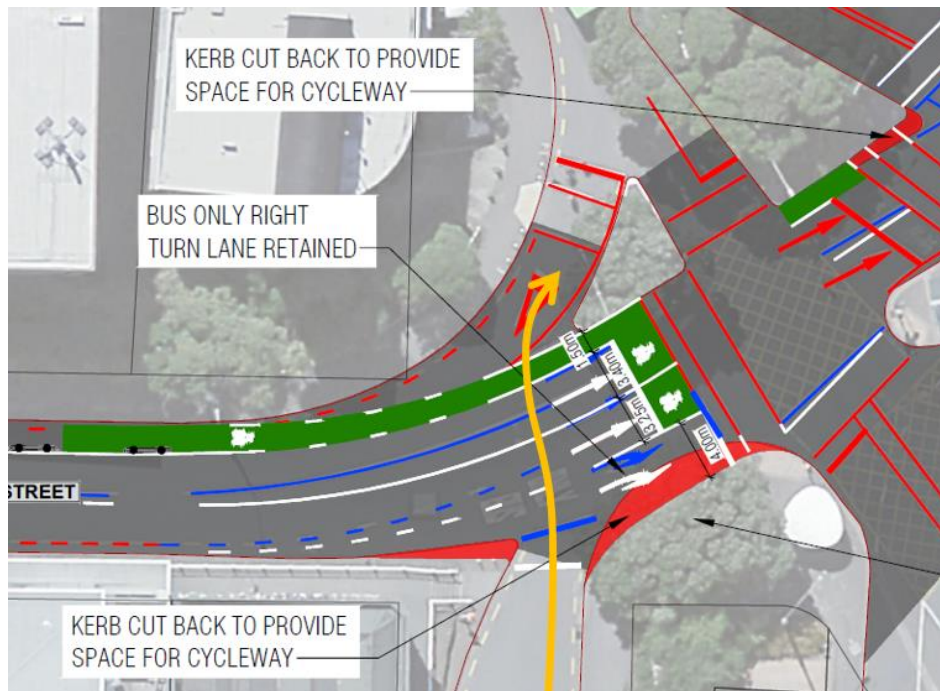


Figure 4-6: Existing illegal manoeuvre from Kate Sheppard Place eastern end

The CAT acknowledges that adding the cycle lane would worsen the consequences of this existing illegal manoeuvre, as drivers then have an additional lane to cross and cyclists are more vulnerable than motorists. However, we suggest that the risk to the cyclists on Murphy Street would not be as great as the risk to the contraflow cyclists on Molesworth Street, as the Murphy Street cyclists are travelling in the same direction as the general traffic and therefore more likely to be seen the drivers exiting Kate Sheppard Place. Furthermore, it



would be easier to enforce the right-turn only out of the eastern end of Kate Sheppard Place than to ensure drivers turning right out of the western end look for contra-flow cyclists.

| | |
|------------------------|---|
| Responses: | |
| Designer | Agree with CAT to make Kate Sheppard Place one-way |
| Safety Engineer | Agree with CAT and Designer. Kate Sheppard Place to be one-way EB. Consider flexi-posts on the edge of the cycle lane to discourage illegal crossing manoeuvre from Kate Sheppard access the Mulgrave left turn into Lambton Quay/Thorndon Quay. Movement to be monitored and additional enforcement requested as necessary. |
| Proposed action | Update plans and monitor |
| Client decision | Agree with Proposed Action |
| Action taken | Plans update add to monitoring list |

4.8 Driveways on Molesworth St contraflow cycleway (C37) – **C E**

Serious

This was covered in issue 4.22 of the 30% CASA.

The safety issue is, as noted in issue 4.7, drivers don't expect cyclists in the contraflow direction, which in this case is in the downhill direction therefore involving higher cycling speeds. The driveway between 54 and 38 Molesworth St will be located within the mixing lane for with-flow cyclists, adding further complexity to the task of drivers trying to exit the driveway.

The crash type expected is motor vehicle vs cyclist.

The risk factors include: the contraflow cyclists travelling in the downhill (fast) direction; the rarity of two-way cycleways in Wellington; and the possibility of cyclists being knocked into the adjacent live traffic lane.

The relevant guidance is the [Technical Note on separated cycleways at side roads and driveways](#) and the [High-use Driveway Treatment for Cycle Paths and Shared Paths Design Guidance note](#).

Given the various risk factors at the two sites, crashes are expected to be likely (at least one



| | |
|--|---|
| Probability of crash occurring | Likely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.8.1 | N/A |
| Supporting treatment recommendations: | |
| 4.8.2 | Apply high-use driveway markings and speed humps at both driveways. |



per year) and would result in serious injury (or worse, where heavy vehicles are involved).

The decision from the 30% CASA was to apply the high-use driveway treatment at the two driveways. Markings have been included at the 2 Molesworth Street driveway, but not at the other driveway (see also issue 4.9) and neither driveways have speed humps indicated.

Responses:

| | |
|------------------------|---|
| Designer | Agree with CAT to add high-use driveway markings to remaining driveways |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |
| Action taken | Plans updated |

4.9 Molesworth St opposite Parliament (C37) – C E

Significant

The safety issue is drivers leaving Parliament turning into the cycleway on the opposite side of Molesworth Street thinking it is either a right turn lane or a southbound lane.

The crash type expected is motor vehicle vs. cyclist.

The risk factors are drivers who may be unfamiliar with Wellington’s one-way streets or cycleways, and contraflow cyclists travelling downhill (as previously discussed in issues 4.6 and 4.8).

There are no relevant standards related to this issue. The CNG section on [cycle lanes](#) gives some guidance on application of coloured surfacing (which is referenced in the section on separated cycleways).

Crashes are expected to be very unlikely as the presence of intermittent cycleway separators and markings upstream / downstream provide clues to unfamiliar drivers. Crashes that do occur could result in serious injury due to the speeds of downhill cyclists and the distance available to motorists to accelerate.



| | |
|--|--|
| Probability of crash occurring | Very unlikely |
| Expected crash severity | Serious injury |
| Primary treatment recommendations: | |
| 4.9.1 | N/A |
| Supporting treatment recommendations: | |
| 4.9.2 | Apply green surfacing in the 2-way cycleway opposite the Parliament driveway |
| 4.9.3 | Mark suitable left-turn arrows at the exit from Parliament |

Responses:



| | |
|------------------------|---|
| Designer | Agree with CAT, to increase green surfacing for this section of cycleway |
| Safety Engineer | Agree with CAT and Designer. Also mark/sign left-turn only arrows at Parliament exit. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |
| Action taken | Plans updated |

5 Comments

The following issues are considered by the CAT as worth mentioning although they are either not likely to result in safety risks, or are outside the CASA scope for this project stage.

5.1 Buffered advanced stop boxes (various locations) – **C E** Comment

Item 5.8 of the 30% CASA recommended upgrading existing advanced stop boxes (ASBs) to buffered ASBs. The designer's response was "Agree, propose to add to Molesworth St approach at Park St/ Tinakori Rd/ Molesworth St intersection. In other locations cyclists will use the cycleway and ASBs will be removed."

The intersection plan for Molesworth / Tinakori / Park (C109) does not indicate buffered ASBs. The CAT does not agree that ASBs should be removed wherever there is a cycleway provided, as some cyclists may still choose to ride on the road and ASBs can help cycle turning movements. Hence the CAT is pleased to see that most ASBs have been retained, but would still prefer to see these marked as buffered ASBs.

Some locations have advanced stop boxes that aren't buffered ASBs are:

- Tinakori St east approach at Bowen St
- Molesworth St approach to Tinakori / Park
- Murphy / Pipitea – all approaches have been adjusted, but without buffered ASBs.
- Mulgrave St approach to Lambton Quay
- Mulgrave St approach to Thorndon Quay



| | |
|--------------------------------|-----|
| Probability of crash occurring | N/A |
|--------------------------------|-----|

| | |
|-------------------------|-----|
| Expected crash severity | N/A |
|-------------------------|-----|

Indicative recommendations:

| | |
|-------|--|
| 5.1.1 | Confirm whether the buffered ASBs should be introduced at locations where only standard ASBs have been marked (based on heavy vehicle volumes and the guidance note). |
|-------|--|

| | |
|-------|---|
| 5.1.2 | The plans should show the green colouring intended for all ASBs wherever the limit lines are to change, or resurfacing is to be undertaken. |
|-------|---|

Responses:

| | |
|------------------------|--|
| Designer | To apply Waka Kotahi buffered advance stop box guidance to all intersections along the route |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |
| Client decision | Agree with Proposed Action |

| | |
|---------------------|---------------|
| Action taken | Plans updated |
|---------------------|---------------|

5.2 Sharrows and speed marking placement at chicanes (C31/32) – C E M

Comment

The two chicanes on Hill Street employ different marking layouts regarding the use of the 30 and sharrows markings (Figure 5-1). It would be preferable to have a consistent design.

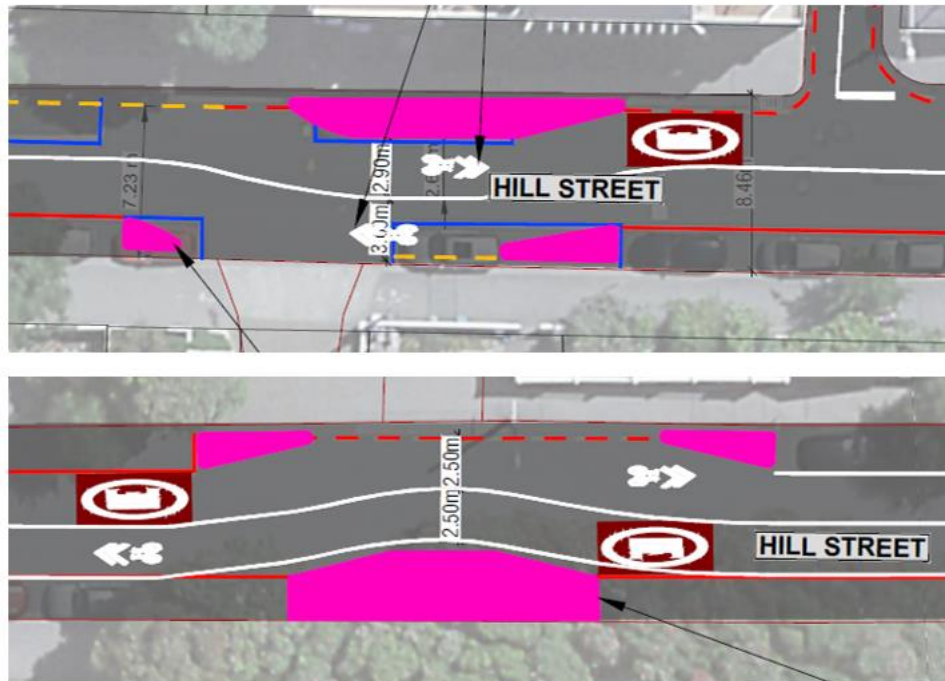


Figure 5-1: Different chicane designs on Hill Street



| | |
|------------------------------------|--|
| Probability of crash occurring | N/A |
| Expected crash severity | N/A |
| Indicative recommendations: | |
| 5.2.1 | Locate the 30 markings at the start of the chicanes (as per the design west of Eccleston Hill) – to ensure drivers approach at a suitable speed. |
| 5.2.2 | Locate the sharrows at the mid-point of the chicane (as per the design west of Selwyn Tce) – to remind drivers that cyclists share this street. |

| | |
|------------------------|----------------------------------|
| Responses: | |
| Designer | Agree with CAT to amend markings |
| Safety Engineer | Agree with CAT and Designer. |

| | |
|------------------------|---|
| Proposed action | Speed humps are now being used not chicanes as more effective traffic calming |
| Client decision | Noted and accepted |
| Action taken | Plans updated |

5.3 Murphy St midblock crossing – gap to limit lines (C34/C111) – P C E

Comment

There is a large gap between the advanced stop line and the pedestrian / cycle midblock crossing line; this is only required to be 200mm – see CNG section on [cyclist waiting facilities at intersections](#).

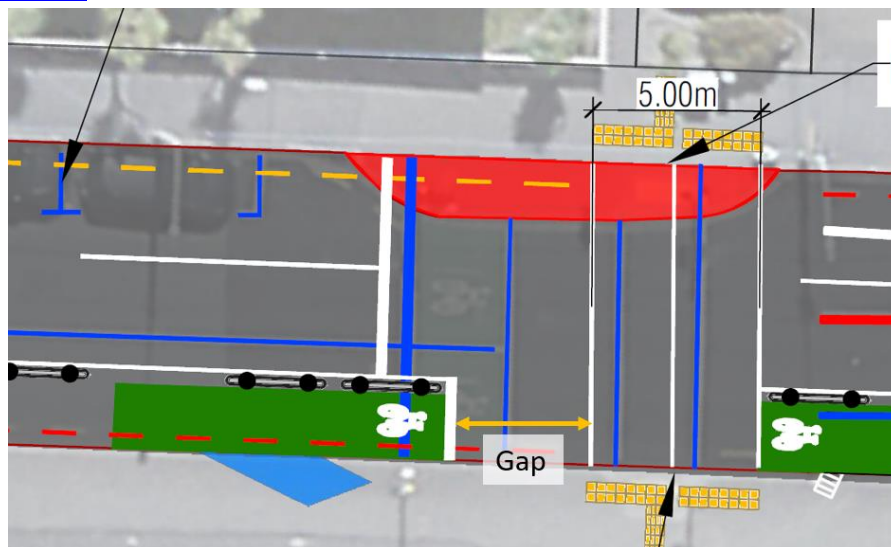


Figure 5-2: Gap between limit line and pedestrian crosswalk



| | |
|--------------------------------|-----|
| Probability of crash occurring | N/A |
| Expected crash severity | N/A |

Indicative recommendations:

- 5.3.1 Reduce the gap between the limit lines and the pedestrian / cycle midblock crossing line.

Responses:

| | |
|------------------------|---|
| Designer | Agree with CAT, to shift cycle limit line |
| Safety Engineer | Agree with CAT and Designer. |
| Proposed action | Update plans |



| | |
|------------------------|----------------------------|
| Client decision | Agree with Proposed Action |
| Action taken | Plans updated |



6 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 6-1.

Table 6-1: Summary of Issues

| | <i>Serious</i> | <i>Significant</i> | <i>Moderate</i> | <i>Minor</i> | <i>Comments</i> | <i>Total</i> |
|-----|---|--------------------|-----------------|--------------|-----------------|----------------|
| | 3 | 5 | 0 | 1 | 3 | 12 |
| | <i>Issue</i> | | | | | <i>Ranking</i> |
| 4.1 | Hill St approach to Tinakori Rd (C30) | | | | | Significant |
| 4.2 | Murphy St bus stop / pedestrian crossing / cycle transition (C33) | | | | | Minor |
| 4.3 | Murphy St narrow cycle lane (C33) | | | | | Significant |
| 4.4 | Murphy St mixing lane length (C33) | | | | | Serious |
| 4.5 | Aitken / Mulgrave – cyclist LOS (C35/C115) | | | | | Significant |
| 4.6 | Aitken / Mulgrave – conspicuity of diagonal crossing (C35/C115) | | | | | Significant |
| 4.7 | Molesworth St two-way cycleway crossing Kate Sheppard PI (C37) | | | | | Serious |
| 4.8 | Driveways on Molesworth St contraflow cycleway (C37) | | | | | Serious |
| 4.9 | Molesworth St opposite Parliament (C37) | | | | | Significant |
| 5.1 | Buffered advanced stop boxes (various locations) | | | | | Comment |
| 5.2 | Sharrows and speed marking placement at chicanes (C31/32) | | | | | Comment |
| 5.3 | Murphy St midblock crossing – gap to limit lines (C34/C111) | | | | | Comment |



Designer: Chris Groom Position Principal Transport Planner

Signature  Date 30 January 2023

Safety Engineer: Dennis Davis Position Principal Transport Engineer

Signature  Date 31 January 2023

Client: Brad Singh Position Manager – Transport & Infrastructure

Signature  Date 16 Feb 2023

Project Manager - action completed: Renee COrlett Position Project lead

Signature  Date 9.02.2023

Audit report distributed on: _____ Date _____

