

# Wellington to Hutt Valley Walking and Cycling Path – Petone to Melling

Opus International Consultants

Preliminary Design Stage

**Safety Audit Report**

**Date:** June 2017

Released under the Official Information Act 1982

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# 1. Background

## 1.1. Safety Audit Procedure

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

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

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

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

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

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

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

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

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

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

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

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

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

## 1.2. The Safety Audit Team

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

- s 9(2)(a), Audit Team Leader, Senior Transportation Engineer, Opus
- s 9(2)(a), Audit Team Member, Senior Road Safety Specialist, Opus

The Safety Audit Team (SAT) met at the NZ Transport Agency offices, Wellington to review the drawings on Friday 26 May. The designer's representative s 9(2)(a) (AECOM) briefed the safety audit team on the project and clarified the scope of the audit. A site inspection was subsequently undertaken on Monday 29 May.

An exit meeting was held with AECOM and the Transport Agency on Friday 2 June.

## 1.3. Report Format

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

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

Reference to historic crash rates 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, frequency and likely severity that may result from a particular concern.

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

Severity (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

**Table 1: Concern Assessment Rating Matrix**

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 2 below.

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

**Table 2: Concern Categories**

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

#### 1.4. Scope of Audit

This audit is a Preliminary Design Stage Safety Audit of the Wellington to Hutt Valley Walking and Cycling Path (Petone to Melling) drawings produced by AECOM on behalf of the Transport Agency.

#### 1.5. Documents Provided

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

- 60306339-SK-3513-3514
- 60306339-SK-3611-3612
- 60306339-SK-3711-3715

- 60306339-SK-3811-3812
- 60306339-SK-4014 (2)
- 60306339-SK-4051-4065
- 60306339-SK-4070
- 60306339-SK-4080-4090
- 60306339-SK-7101-7111
- 60306339-SK-7501-7507
- 60306339-SK-3901
- 60306339-SK-3903
- 60306339-SK-3905
- 60306339-SK-3906
- 60306339-SK-3912
- 60306339-SK-3917-3918
- 60306339-ST-0008-0020
- P2M Draft Design Statement

Also provided for background information only:

- Number of expected users is 140 per day (Petone roundabout to Petone Station) and 110 per day (for rest of route) assuming Ngauranga to Petone section is also constructed.

## 1.6. Disclaimer

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

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

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

## 1.7. Project Description

Construct a shared / cycling path alongside the rail corridor between Petone and Melling, including:

- Shared path between Hutt Road (south end) and the north end of Petone Station including an underpass across the rail corridor and through the park-and-ride carpark;
- Two-way cycle only path between the north end of Petone Station and Parliament Street, including an underpass back across the rail corridor prior to Parliament Street;
- Two shared path connection options between Parliament Street and Marsden Street using the local road network; and

- Reconfigured park-and-ride carpark at Petone.

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## 2. Safety Audit Findings

### 2.1. General

#### 2.1.1. Signage

#### Comment

Signage details have not been included in the current design stage except for indicative Posted Speed Limit (PSL) signage. Care will need to be taken to ensure PSL signage does not create confusion for adjacent sections of road.

At detailed design the following types of signage should be considered:

- Regulatory signage;
- Warning signage; and
- Way-finding signage.

#### 2.1.2. Lighting

#### Comment

Lighting details have not been included in the current design stage. It is understood that lighting will be to P3 standard. According to AS/NZS 1158.3.1: 2005 P3 category is for medium pedestrian / cycle activity and a low risk of crime which seems appropriate for this environment.

Care should be taken to ensure that lighting columns do not encroach into the clear path width.

Lighting will also need to be considered for the new and reconfigured carpark areas.

#### 2.1.3. Delineation

#### Comment

Delineation details have not been included in the current design stage. Care will need to be taken to ensure that all hazards are appropriately delineated for day and night time use.

On the shared sections of the path, appropriate delineation should be included for the visually impaired.

#### 2.1.4. Hold rails

#### Comment

Details of the crossing facilities have not been included in the current design stage. Cycle hold-rails and other supporting infrastructure should be included during detailed design.

2.2. Petone Connection and Rail Station

2.2.1. Cyclist speed

**Minor**

The section of shared path from Hutt Road to the northern end of the Petone station platform is to be posted at 10km/h. There is the potential for cyclists to ignore the posted speed and travel at a faster speed. The landings on the ramp into the underpass should help to reduce cycle speeds, however, some cyclists may still use the downgrade into the underpass to help them get up the upgrade out of the underpass.

North of the underpass there is approximately 450m of relatively straight shared path through the carpark. From a cyclists perspective this section may be perceived as low risk and therefore a speed of 10km/h may seem unreasonable especially as travelling at that speed will add approximately two minutes to their journey (compared to travelling at 30km/h). However, hazards still exist with the path shared with pedestrians travelling along and across the path.

**Recommendation:**

Consider separating pedestrians (wider path) to safely accommodate higher cycle speeds or consider other measures to slow cyclists through this section. Measures that could be considered include cycle appropriate rumble strips, delineation and constraining the environment.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Occasional</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<i>Designer Response: Measures to slow cyclists will be investigated. A wider path in the carpark would result in significantly more carparks being lost, which would most likely not be supported by GWRC.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.2.2. Sight distance through underpass

**Minor**

Although the stopping sight distance for cyclists travelling at 10km/h is very low and looks to be achieved through the approach curves to the underpass there is still a risk of a cyclist approaching at a higher speed and colliding with a user in the underpass.

**Recommendation:**

Provide a centreline and “keep left” markings / signage through the underpass and approaches to minimise the potential for conflicts.

Consider providing mirrors to improve visibility through the underpass.

<i>Designer Response: A centreline will be provided on the ramps and in the underpasses to keep users (cyclists and pedestrians) left</i>
---

<b>Designer Response:</b>	<i>A centreline will be provided on the ramps and in the underpasses to keep users (cyclists and pedestrians) left</i>
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.2.3. Chicane at north end of platform

**Minor**

The chicane at the northern end of the platform that connects the shared path to the south with the cycle only path to the north is immediately adjacent to the proposed speed limit change. The radii of the curves through the chicane are less than the minimum required for 30km/h and could lead to higher speed cyclists travelling through at higher than desirable speed.

**Recommendation:**

Increase curve radii or shift proposed speed limit change further north.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Occasional</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<b>Designer Response:</b> <i>I think the auditors mean that the radii are larger than the 30 km/hr design speed leading to higher speeds. Measures to slow southbound cyclists at the northern end of the carpark will be incorporated such as rumble strips and markings</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.2.4. Access to cycle only path

**Minor**

No details are provided on how pedestrians and vehicles are proposed to be restricted from the cycle only path.

**Recommendation:**

Provide regulatory signage / bollards.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<b>Designer Response:</b> <i>Bollards and signage will be provided</i>	



<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.2.5. Underpass fins

**Minor**

The decorative fins proposed on underpass and ramp walls could cause a serious injury in the event of a crash and could create a trip / snag hazard at the bottom of the wall adjacent to the path.

**Recommendation:**

Consider removing or reducing the hazard created by the fins.

<b>Frequency Rating:</b> Crashes are likely to be <b>Infrequent</b>	<b>Severity Rating:</b> Death or serious injury is <b>Likely</b>
<b>Designer Response:</b> <i>As a minimum, fins will be rounded and further discussion with urban designers undertaken re the removal of the fins.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.2.6. Underpass and ramp barriers

**Moderate**

There is a potential risk of vehicles or debris from Hutt Road, WelTec, Petone station carpark, the rail-line and rail access corridor entering the approach ramps to the underpass and injuring a path user.

The current design indicates either a nominal 1.2m high pedestrian barrier, the existing railway security fence or a 150mm concrete upstand to retain ballast.

The risk of falling debris or a train derailment is very unlikely and the proposed treatment appears appropriate.

The risk of a vehicle entering from Hutt Road is also low given the separation from the carriageway (parallel parking, kerb, 3.5m footpath) is also very low. However, if the footpath remains a shared path then the height of the barrier should be raised to a height appropriate for cyclist fall protection. Any fence treatment could also include a small upstand to restrain the wheels of an errant vehicle in the unlikely event of a crash. If parking was removed or the existing footpath narrowed, then a safe-system compliant crash-tested barrier system should be provided.

The risk of a vehicle entering from the WelTec / Petone station overflow carpark is also unlikely given the low vehicle volumes and speeds. However, a small upstand (in conjunction with the proposed pedestrian barrier) could be considered to restrain the wheels of an errant vehicle in the unlikely event of a crash. If vehicle volumes or speeds through this area are expected to increase then a safe-system compliant crash-tested barrier system should be provided.

**Recommendation:**

Consider the use of a small upstand at the edge of the underpass ramps to restrain the wheels of an errant vehicle in the unlikely event of a crash.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Very likely</b>
<b>Designer Response:</b> <i>A concrete upstand 200mm high will be installed.</i>	
<b>Safety Engineer:</b>	<a href="#">Click here to enter text.</a>
<b>Client Decision:</b>	<a href="#">Click here to enter text.</a>
<b>Action Taken:</b>	<a href="#">Click here to enter text.</a>

2.2.7. Station platform ramps

**Minor**

The proposed design ramps the path up to platform level either side of the current stairs to the platform. No details are provided of the proposed fall protection from the ramps / stairs.

The proposed solution introduces risks to users from falling from height and conflicts with cycles using the platform.



**Recommendation:**

Change the proposed solution to have the stairs inset into the platform (should be possible with some minor modification to the platform shelter).

If the proposed solution is retained then provide fall protection from the proposed stairs and ramps and prevent cycle access onto the platform.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<i>Designer Response: Inserting the stairs into the platform is not supported by GWRC as it interferes with the normal flow of pedestrians along that part of the platform. Fall protection will be provided alongside the stairs (as in the above photo) and also along the proposed shared path where it is elevated above the existing ground level.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.2.8. Existing subway barrier

**Moderate**

The fence protecting the existing subway will be immediately adjacent to the proposed path. The existing fence is unsuitable as it is climbable and too short to protect cyclists from falling.

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**Recommendation:**

Replace existing fence with cycle friendly building code compliant alternative.

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Infrequent</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Very likely</b></p>
<p><b>Designer Response:</b> Will implement safety auditor's recommendations</p>	
<p><b>Safety Engineer:</b> <input type="text" value="Click here to enter text."/></p>	
<p><b>Client Decision:</b> <input type="text" value="Click here to enter text."/></p>	
<p><b>Action Taken:</b> <input type="text" value="Click here to enter text."/></p>	

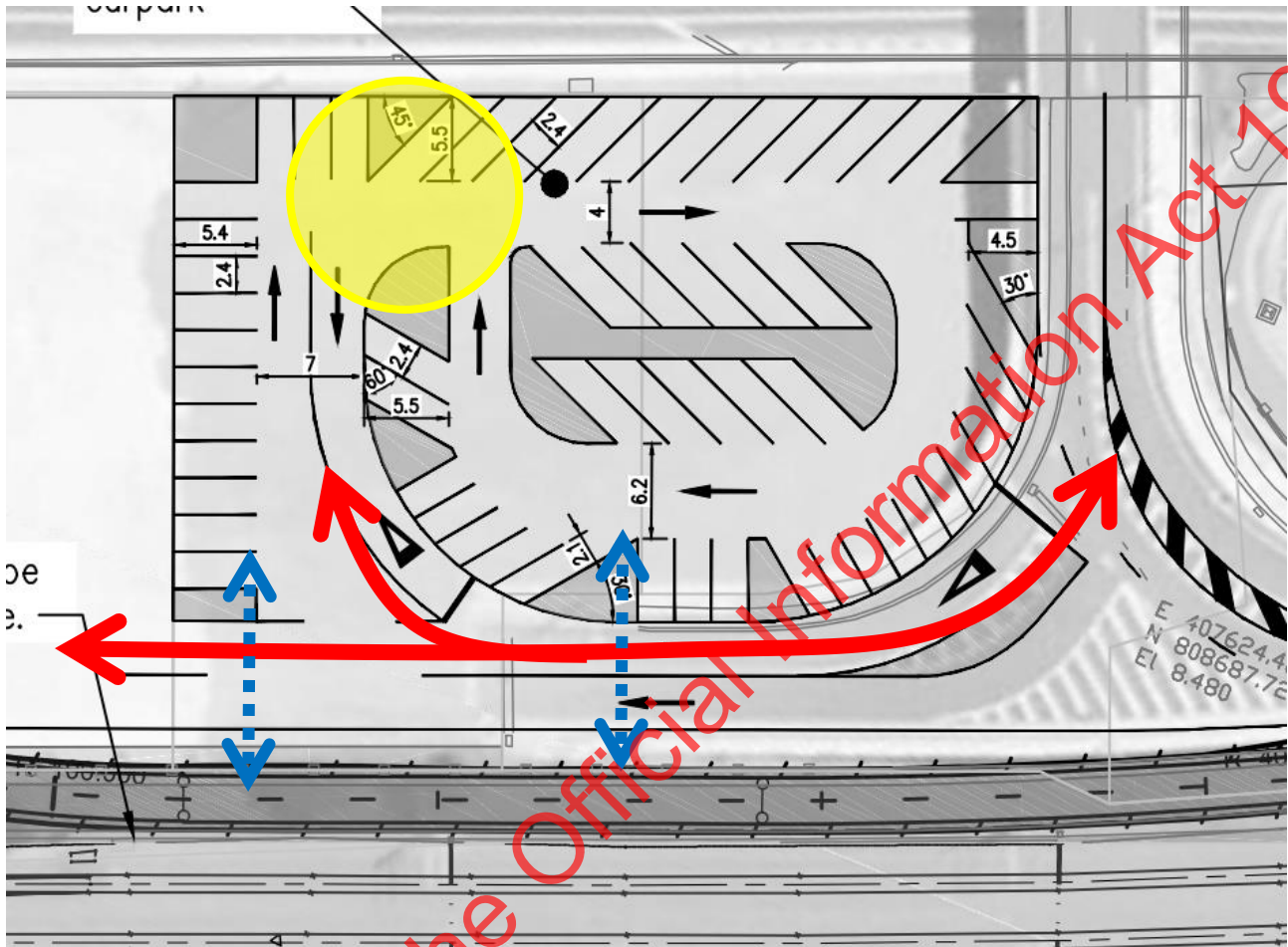
2.2.9. Compensation carpark layout

**Minor**

There are no identified safe access routes to the proposed path from carpark which could result in pedestrians unnecessarily walking through the car-park / crossing the access road in areas of poor visibility. Pedestrians may be tempted to walk up the access road to access the station which has no provision for pedestrians and could create conflicts with vehicles.

The area highlighted in yellow below appears too narrow for two-way traffic especially given the u-turn required to exit the carpark.

No information has been provided about the use of wheel stops or solid islands. If physical constraints are not provided, vehicles could appear unexpectedly into the path of other vehicles or pedestrians.



**Recommendation:**

Consider identifying safe walking paths from the carpark and directing pedestrians to the proposed shared path. Review the carpark layout to ensure compliance with AS/NZ 2890 and vehicle tracking is possible. Include wheel stops and / or solid islands to constrain vehicles to the designated routes.

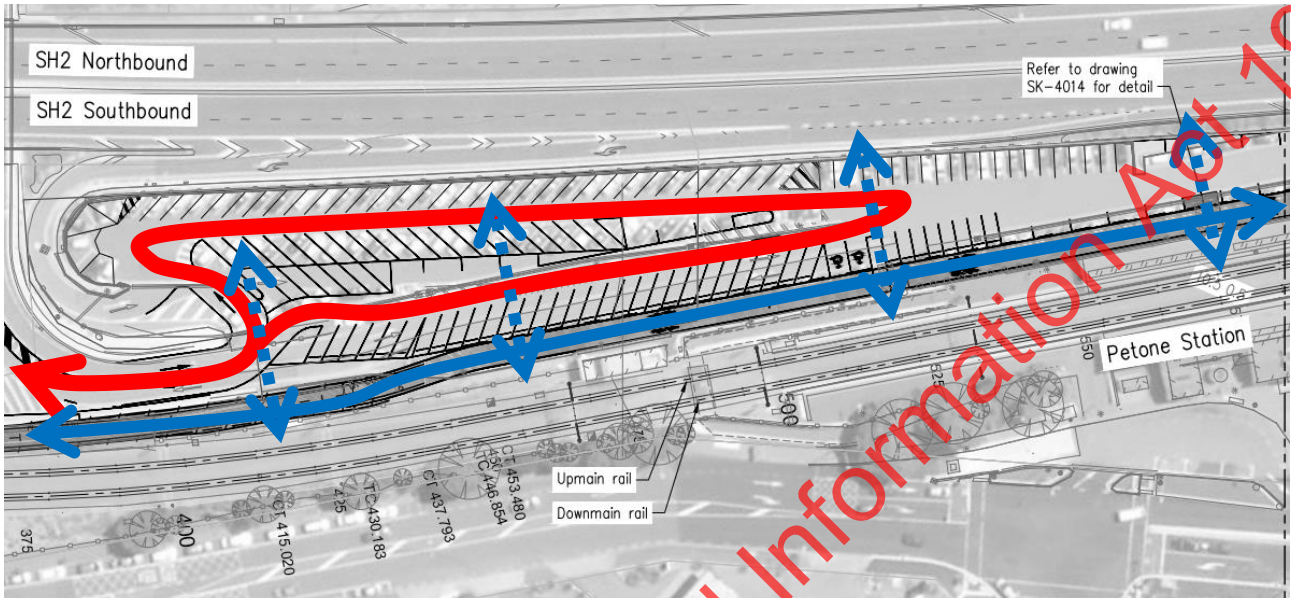
<p><b>Frequency Rating:</b> Crashes are likely to be <b>Occasional</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Unlikely</b></p>
<p><b>Designer Response:</b> Will implement safety auditor's recommendations</p>	
<p><b>Safety Engineer:</b></p>	<p>Click here to enter text.</p>
<p><b>Client Decision:</b></p>	<p>Click here to enter text.</p>
<p><b>Action Taken:</b></p>	<p>Click here to enter text.</p>



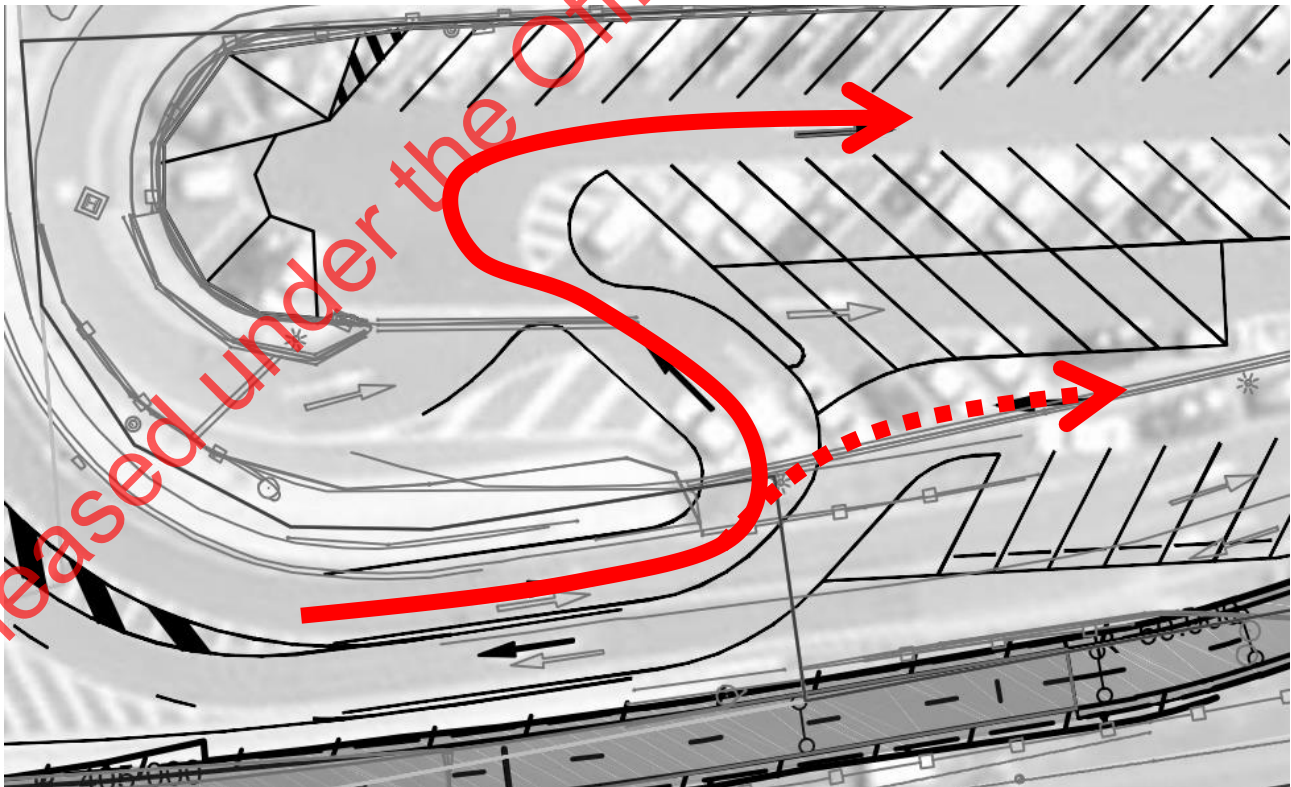
2.2.10. Main car-park layout

Minor

There are no identified safe access routes to the proposed path from carpark which could result in pedestrians unnecessarily walking through the car-park / crossing the access road in areas of poor visibility.

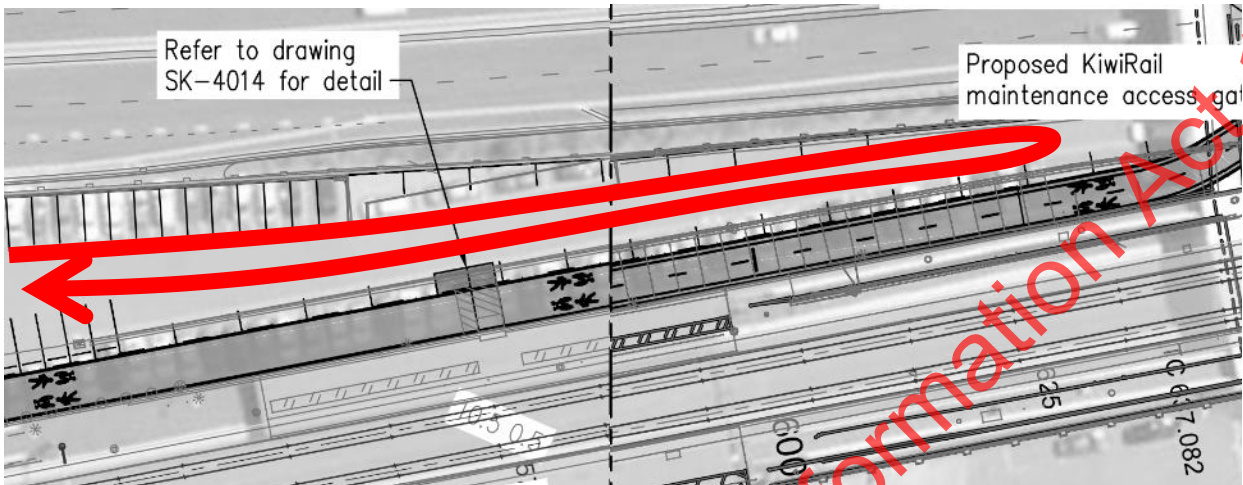


The layout shown below could result in vehicle driving the wrong way through the car-park especially if they see an available park directly in front of them.



No information has been provided about the use of wheel stops or solid islands (except for adjacent to the proposed path). If physical constraints are not provided, vehicles could appear unexpectedly into the path of other vehicles or pedestrians.

The layout at the northern end of the carpark includes no safe turning facility and is likely to result in vehicle reversing a significant distance through the carpark which could lead to conflicts with vehicles and pedestrians.



The section of carpark shown above includes parallel parks directly adjacent to the shared path. Parallel parks create a risk of cycle conflicts with car doors.

No information is provided about the relocation of existing lighting

**Recommendation:**

Consider identifying safe walking paths from the carpark and directing pedestrians to the proposed shared path. Review the carpark layout to ensure compliance with AS/NZ 2890 and vehicle tracking is possible. Include wheel-stops, vertical delineation posts and / or solid islands to constrain vehicles to the designated routes.

Provide a safe turning facility at the northern end of the carpark.

Provide a safe separation between the parallel parks and the shared path.

<b>Frequency Rating:</b> Crashes are likely to be <b>Infrequent</b>	<b>Severity Rating:</b> Death or serious injury is <b>Unlikely</b>
<i>Designer Response: Will implement safety auditor's recommendation. With regard to a safe turning area at the north end of the carpark, vehicle drivers are most likely to use the proposed shared path (at the chicane area) as the practical means of finding space to turn. Separation between parallel parks and the shared path will be done by using wheel stops.</i>	
<b>Safety Engineer:</b>	<input type="text" value="Click here to enter text."/>
<b>Client Decision:</b>	<input type="text" value="Click here to enter text."/>
<b>Action Taken:</b>	<input type="text" value="Click here to enter text."/>



2.2.11. Access road to carparks

**Minor**

The current carpark is posted as 50 km/h but the geometry of the carpark and access road from Pito One are designed for a lower design speed.

The current intersection at the eastern end of McKenzie Bridge has limited visibility and poor vertical geometry and will need to cater for more vehicle traffic to accessing the compensation car park.



**Recommendation:**

Include give way signs as well as the markings proposed (consider whether a Stop control is warranted).

Provide physical channelisation of the hatched islands if practical.

Reduce the posted speed limit and speed environment (using traffic calming) of the carpark and access roads to something that better reflects the design speed and operating environment.

**Frequency Rating:**

Crashes are likely to be **Occasional**

**Severity Rating:**

Death or serious injury is **Unlikely**

*Designer Response: Give way signs and markings will be provided. Physical channelization will compromise the ability of large loads (WelTec and KiwiRail) to access and egress the site and will not be installed. Will discuss with NZTA and HCC about posting a lower speed limit encompassing the area from the intersection of Pito-one Road.*



<i>Safety Engineer:</i>	<a href="#">Click here to enter text.</a>
<i>Client Decision:</i>	<a href="#">Click here to enter text.</a>
<i>Action Taken:</i>	<a href="#">Click here to enter text.</a>

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## 2.3. Two-way Cycle Path

### 2.3.1. Cycle path width / cross section

### Moderate

The path width guidance in Austroads and referenced in the design statement provided states that the desirable width between cyclists in different directions is 1.0 and the most desirable clearance on high speed paths is greater than 1.0m. The proposed path width of 3.5m reduces the desirable clearances to absolute minimum for both separation and lateral clearance. In one location the path width is reduced even further to 3.0m between obstacles (although not found in the design cross sections).

In a number of locations (chainage 775-800, 1125-1500) the path is directly behind the guardrail (either existing w-section or proposed nu-guard). In these locations the deflections of the guardrail in an impact could result in the guardrail and vehicle encroaching into the path and conflicting with path users. Also the bolts and posts of the guardrail systems can be a snag hazard for cyclists.

In a number of locations (chainage 2100, 2150 and 2750) the embankment behind the guardrail is proposed to be cut away for the cycle path. This may affect the performance of the barrier if the required slope and support behind posts is compromised.

In one location (chainage 850) there appears to be a ditch between the edge of the path and the barrier which could cause cyclists to lose control if their wheel went into it.

The standard cross-section detail includes a sump within the 3.5m width, this could cause a cyclists to lose control if not constructed appropriately.

#### **Recommendation:**

Widen shared path to include desirable clearance requirements where possible.

Highlight constraints in path width to users especially if the width constraints coincide with horizontal path deviations.

Provide a safe separation between the path and the guardrail on SH2 both for the safety of path users and the performance of the guardrail. If this is not possible then consider rigid barriers, or nesting the guardrail / adding posts to reduce the design deflection. If guardrail remains, then a cycle friendly rub-rail on the back of the guardrail would also be desirable.

Remove any hazards (ditches / sumps) from the useable path width of treat appropriately to protect cycle users.

#### **Frequency Rating:**

Crashes are likely to be **Occasional**

#### **Severity Rating:**

Death or serious injury is **Likely**

**Designer Response:** Where the edge of the cycle corridor is directly behind the SH2 barrier, there is a 0.5m shoulder (clearance zone) prior to the actual edge of path, thereby meeting Austroads minimum standard for clearance to obstacles. Space constraints within the project site dictate that minimum widths will fit into the rail corridor, whilst wider widths will not. Advise that minimum widths are accepted by NZTA, acknowledging that the overall corridor (usable width is 3.5m) provides clearance for the safety manoeuvring of cyclists. A rubrail will be provided on the back of the guardrail. The 0.5m shoulder provides acceptable clearance for deflection of the existing TL-3 barrier and proposed TL-4 nu-guard. The risk of errant state highway vehicles deflecting barrier at same time as cyclist in the path's shoulder is highly

<i>unlikely and that this risk is accepted.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.3.2. Hazard protection

### Minor

Railway security fence is proposed along the rail side of the route.

In some locations the fence protects a drop onto the rail line (for example chainage 1500), the fence needs to be of sufficient height to protect cyclists from falling (1.4m).

In one location identified (chainage 1775) the fence is on the edge of the path. The standard security fence creates a snag hazard for pedals and handlebars and cause cyclists to crash.

On the road side of the route hazards also exist.

At chainage 1650 the SH2 southbound cycle bypass is elevated above the adjacent road and barrier by 0.5m with no edge protection and a 1:2 slope. Cyclists riding near the edge of the path could lose control and crash if they leave the path.

No information is available about whether protection is required from the stormwater intake structure under Dowse interchange.

#### **Recommendation:**

Where cyclists could be riding directly adjacent to the railway security fence or require protection from falling the fence should be replaced with a cycle appropriate barrier.

Hazards on the road side of the path should be protected using a cycle appropriate barrier.

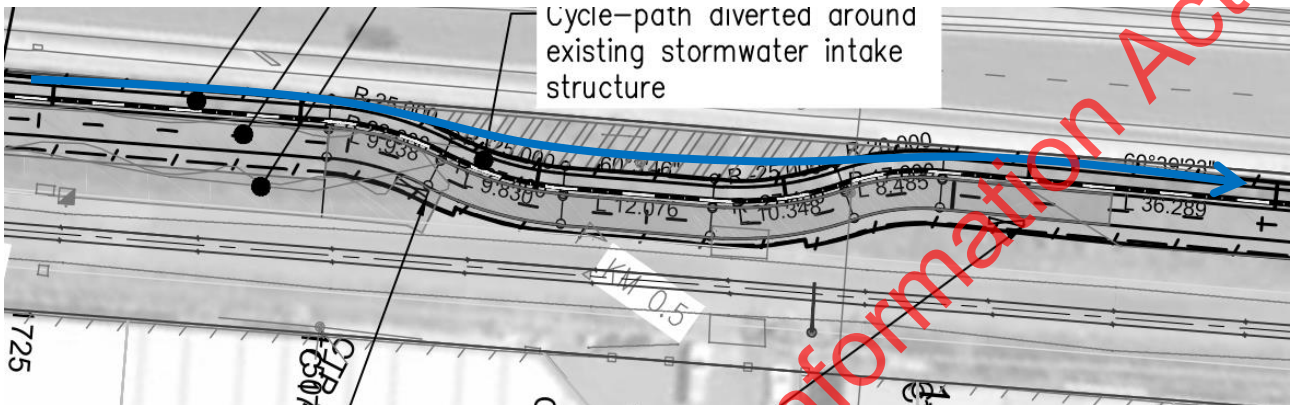
<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Likely</b>
<i>Designer Response: No action required. Similar installations eg Tawa to Porirua along the rail corridor have the same security fence as proposed for P2M, therefore do not agree that this risk warrants specific measures. The stormwater intake will have a cycle friendly banquette installed around the edge to prevent cyclists from falling.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.3.3. SH2 southbound cycle bypass

**Moderate**

The proposed SH2 southbound cycle bypass is expected to be used by high speed cyclists (>30km/h), the proposed horizontal curve geometry includes 20m radii curves which cause cyclists to lose control if travelling at high speeds.

Vertical delineator posts are proposed to be used to separate the bypass from the main path, depending on post placement the bypass could be used by northbound cyclists to 'straight-line' through chicane sections as shown below. This could lead to conflicts with bypass users.



**Recommendation:**

Ease curves on bypass route to cater for a minimum design speed of 40km/h.

Consider delineation and signage to identify / differentiate the bypass route from the main path.

Provide advance guidance for cyclists on SH2 of the existence of the cycle bypass.

<b>Frequency Rating:</b> Crashes are likely to be <b>Occasional</b>	<b>Severity Rating:</b> Death or serious injury is <b>Likely</b>
<i>Designer Response:</i> Cycle Bypass to be designed for 40 km/hr design speed. Delineation through the use of Flexi Guide 300 delineator posts will be provided to separate bypass users from other users. Discuss with NZTA if appropriate signage in MOTSAM can be used as advanced signage for SH2 cyclists and install if appropriate.	
<b>Safety Engineer:</b>	<input type="text" value="Click here to enter text."/>
<b>Client Decision:</b>	<input type="text" value="Click here to enter text."/>
<b>Action Taken:</b>	<input type="text" value="Click here to enter text."/>

2.3.4. CCTV Box and other hazards

**Minor**

The chicane around the NZ Transport Agency CCTV camera pole and controller box includes curves with radii less than the posted speed. This tight chicane could cause cyclists to lose control.

There are a number of large signs north of the CCTV pole which will be hazard for path users.



**Recommendation:**

Relocate controller box (rotate parallel to road) or ease curve radii through chicane.

Remove / relocate signs

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Occasional</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Unlikely</b></p>
<p><i>Designer Response:</i> Curves will be eased to match design speed and signage relocated or raised</p>	
<p><b>Safety Engineer:</b></p>	<p><input type="text" value="Click here to enter text."/></p>
<p><b>Client Decision:</b></p>	<p><input type="text" value="Click here to enter text."/></p>
<p><b>Action Taken:</b></p>	<p><input type="text" value="Click here to enter text."/></p>



## 2.4. Northern Connection Options

### 2.4.1. Underpass speed and visibility

**Minor**

The section of path from either side of the underpass is to be posted at 10km/h. There is the potential for cyclists to ignore the posted speed and travel at a faster speed. The landings on the ramp into the underpass should help to reduce cycle speeds, however, some cyclists may still use the downgrade into the underpass to help them get up the upgrade out of the underpass.

Although the stopping sight distance for cyclists travelling at 10km/h is very low and looks to be achieved through the approach curves to the underpass there is still a risk of a cyclist approaching at a higher speed and colliding with a user in the underpass.

**Recommendation:**

Consider other measures to slow cyclists through this section. Measures that could be considered include cycle appropriate rumble strips, delineation and constraining the environment.

Provide a centreline and “keep left” markings / signage through the underpass and approaches to minimise the potential for conflicts.

Consider providing mirrors to improve visibility through the underpass.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Occasional</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<b>Designer Response:</b> <i>A centreline will be provided on the ramps and in the underpasses to keep users (cyclists and pedestrians) left</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

### 2.4.2. Access to cycle only path

**Minor**

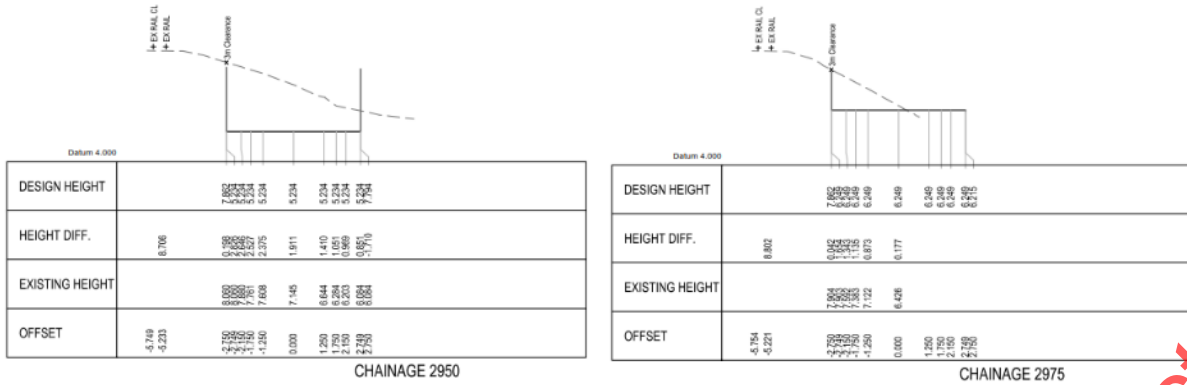
No details are provided on how pedestrians and vehicles are proposed to be restricted from the cycle only path.

**Recommendation:**

Provide regulatory signage / bollards.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<b>Designer Response:</b> <i>Signage will be provided defining intended users</i>	
<b>Safety Engineer:</b>	Click here to enter text.





**Recommendation:**

Provide detail of protection of underpass from the rail corridor.

Replace the SH2 barrier above the ramp / underpass with an approved rigid barrier as required by the bridge manual.

Protect the exposed wall on Parliament Street from errant vehicles.

<b>Frequency Rating:</b> <i>Crashes are likely to be Occassional</i>	<b>Severity Rating:</b> <i>Death or serious injury is Very likely</i>
<i>Designer Response: A rigid barrier will be provided along the western ramp to protect cyclists from state highway traffic and to prevent vehicles from falling into the ramp area. A cycle balustrade will also be incorporated to prevent persons from climbing the rigid barrier and falling into the ramp area. The KiwiRail side of the ramps will be protected with a fall-from-height balustrade on top of the secant piled wall. Nu-guard will protect vehicles from falling into the ramp adjacent to Parliament Street. Where ramp/cycle path is at same level as Parliament Street, the 0.5m shoulder/clearance is not required as no obstacles and the existing kerb forms part of the clearance zone. Cycle path becomes 3.0m in width with 0.5m of parliament street used as shoulder/clearance area. No parking on Parliament Street next to cycle path. Recommend accepting the risk of errant vehicles striking the ramp wall beyond the end of the Nu-guard</i>	
<b>Safety Engineer:</b>	<input type="text" value="Click here to enter text."/>
<b>Client Decision:</b>	<input type="text" value="Click here to enter text."/>
<b>Action Taken:</b>	<input type="text" value="Click here to enter text."/>

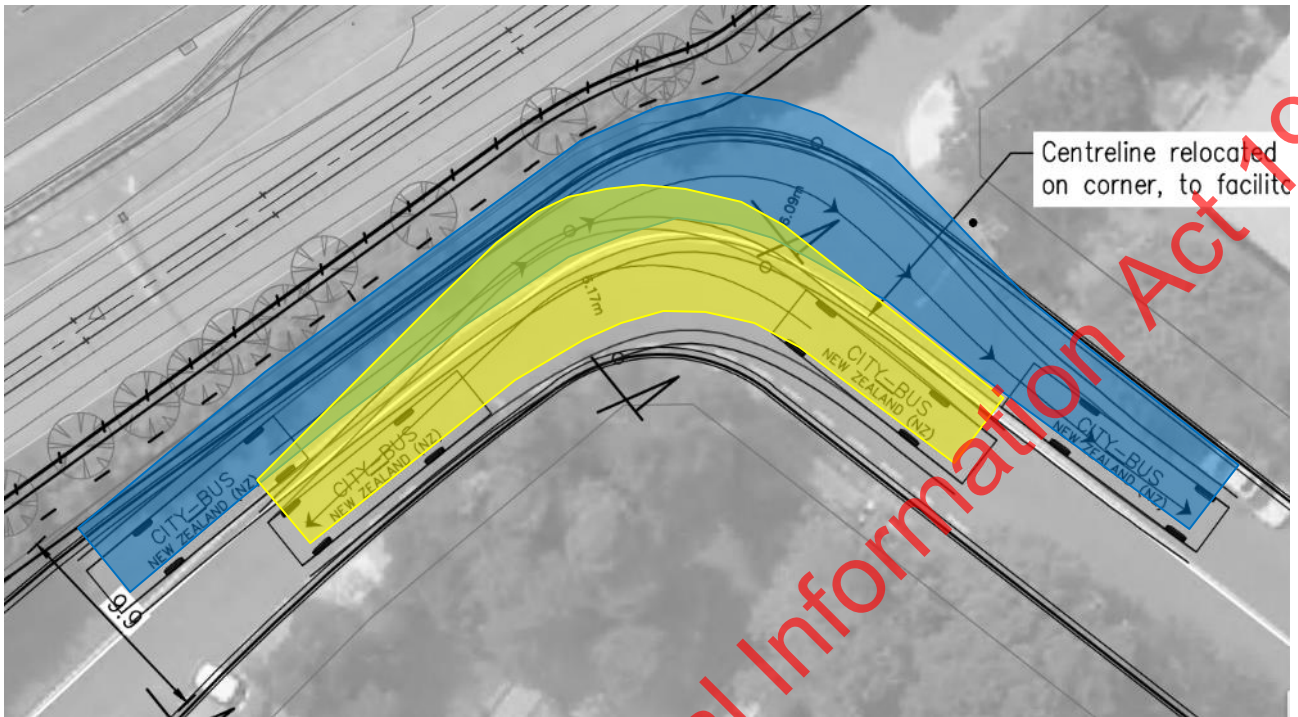
2.4.4. Parliament Street/Bridge Street intersection **Serious**

The proposed design narrows the carriageway through this right angle bend by approximately one metre. Observations on site identified that buses track over the centreline through the intersection / curve, this is reinforced by the tracking provided to SAT (shown below).

The tracking shows that the southbound bus movement takes up almost 50% of the northbound lane which creates a significant conflict for any vehicle travelling in the opposite direction.



Average daily traffic volumes (2012) from mobileroad.org indicate that there are ~4,200 vehicles travelling through here every day (4% heavy vehicles). The Western Hills bus route (# 150) travels two way along the route at a frequency of 30 minutes increasing to 20 minutes in the peak. In the peak hour vehicles can be expected approximately every 10 seconds.



The current layout incorporates chevron boards as shown below which will need to be incorporated into the proposed design without creating a hazard for vehicles or path users



**Recommendation:**

Retain kerb in current position and shift path toward rail line.

If kerb must be moved then consider other mitigation, including relocating bus route / banning long vehicles or ITS warning system to stop traffic in one direction when long vehicle detected.



<b>Frequency Rating:</b> Crashes are likely to be <b>Frequent</b>	<b>Severity Rating:</b> Death or serious injury is <b>Likely</b>
<i>Designer Response: Discussions are underway with KiwiRail to lessen their safety zone to 2.5m as opposed to the standard 3.0m. The angle of the existing kerbline, correlated to the recommendation in 2.4.3 above will keep the kerbline in the same position as existing, thereby the current risk from buses encroaching over the centreline remains as is. Discuss with HCC if acceptable.</i>	
<b>Safety Engineer:</b>	<a href="#">Click here to enter text.</a>
<b>Client Decision:</b>	<a href="#">Click here to enter text.</a>
<b>Action Taken:</b>	<a href="#">Click here to enter text.</a>

2.4.5. Route A – Parliament Street cul-de-sac

**Minor**

No detail is provided on the proposed treatment of the proposed path along the cul-de-sac. Potential conflicts exist with vehicles (narrow width) and accesses.



**Recommendation:**

Provide appropriate treatment of the space to minimise conflicts with residents vehicles.

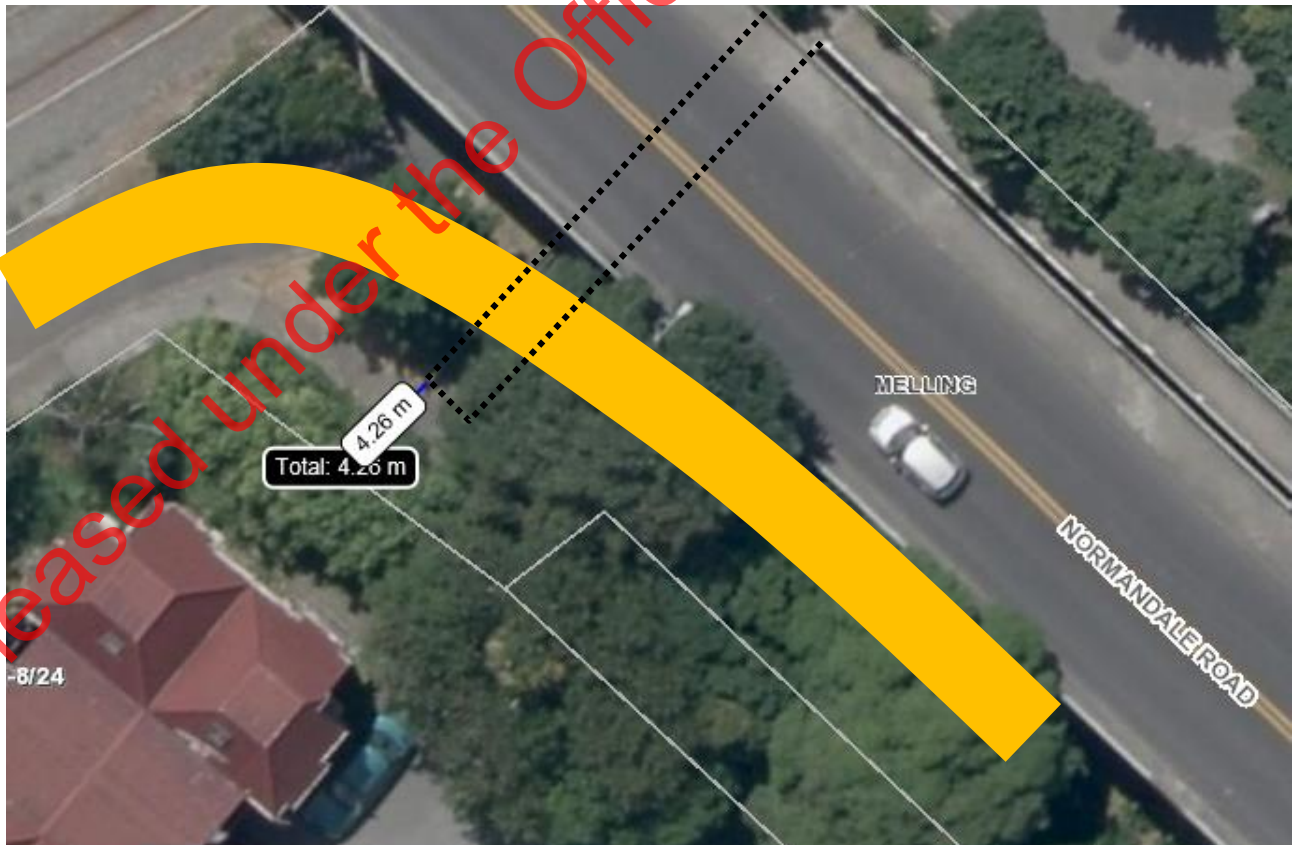
<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Infrequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Unlikely</b>
<b>Designer Response:</b> <i>Cycle markings will be provided on the western side of Parliament street indicating a formal space along with no parking lines. This enables Council to forcibly remove vehicles parked on the area where cyclists are to travel without compromising the existing parking. Pedestrians will use the existing footpath.</i>	
<b>Safety Engineer:</b>	<input type="text" value="Click here to enter text."/>
<b>Client Decision:</b>	<input type="text" value="Click here to enter text."/>
<b>Action Taken:</b>	<input type="text" value="Click here to enter text."/>

2.4.6. Route A – under Normandale Bridge

**Moderate**

The route shown in the proposed drawings conflicts with the pedestrian ramp from Normandale Bridge (see below).

The space between the edge of the pedestrian ramp and the property boundary is limited which would result in a very tight chicane manoeuvre and creates a conflict with ramp users. It might be possible to pass under the ramp on the other side of the bridge but vertical clearances would need to be checked.







The route parallel to the bridge is quite damp and shaded which could lead to a slippery path and possible loss of control crashes for cyclists.



No detail has been provided around the treatment of the maintenance access and gate off Pharazyn Street (see below). The path should continue full width through this section and be separate from the maintenance parking area.





**Recommendation:**

Investigate alternative access under the pedestrian ramp from Normandale Bridge.

Remove vegetation and ensure a well-drained path to minimise potential for a slippery surface.

Consider appropriate treatment of gate and maintenance access/ parking.

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Common</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Unlikely</b></p>
<p><i>Designer Response:</i> The bottom section of the pedestrian ramp from Normandale Road is to be rotated to provide adequate clearance for the cycleway. Vegetation is to be removed, the area well lit and security cameras installed monitored by the NZTA TOC. Bollards will replace the existing gate.</p>	
<p><b>Safety Engineer:</b> <input type="text" value="Click here to enter text."/></p>	
<p><b>Client Decision:</b> <input type="text" value="Click here to enter text."/></p>	
<p><b>Action Taken:</b> <input type="text" value="Click here to enter text."/></p>	

2.4.7. Route A – Pharazyn Street Crossing

**Moderate**

The proposed design for the route A crossing of Pharazyn Street is generally good with sight distance to approaching vehicles in both directions.

No detail has been provided on the proposed signage for path users or vehicles. Path signage or delineation should indicate that path users need to stop and give-way to vehicles. Similarly, warning signage is required for vehicles to identify the path crossing, speed cushions and median islands.

The access crossing of the footpath on the west side is not currently cycle friendly with steep cross fall and raised lips, existing access shown below.



The over-height signage on the bridge may also need to be reviewed based on the changes in carriageway location.

**Recommendation:**

Ensure signage and delineation for path and road users is consistent with best practice from MOTSAM and Austroads.

The cycle crossing of the footpath on the west side should be re-constructed to ensure a flat level approach to the crossing.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Occasional</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Likely</b>
<i>Designer Response:</i> The footpath will be re-constructed to ensure a flat level approach to Pharazyn Street.	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.4.8. Route B – Parliament Street crossing

**Minor**

No detail is provided on the proposed treatment of the route B path crossing the Parliament Street cul-de-sac. Potential conflicts exist with vehicles entering and exiting the access.





**Recommendation:**

Provide appropriate treatment of the space to minimise conflicts with resident's vehicles.

<b>Frequency Rating:</b> Crashes are likely to be <b>Infrequent</b>	<b>Severity Rating:</b> Death or serious injury is <b>Unlikely</b>
<i>Designer Response:</i> Cycle path will run along the western side of Parliament Street. Pedestrians will use existing footpath. Appropriate signage will guide peds/cyclists to designated location correlated to mode..	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.4.9. Route B – path along Bridge Street

**Moderate**

Few details are provided about the proposed path but the section between Parliament Street and Pharazyn Street appears to be widened into the carriageway with no parking restrictions.

The potential conflicts along this section include vehicle accesses, signs and utility poles. The no parking restrictions will assist with visibility at the accesses along this section.





The section between Pharazyn Street and Normandale Road appears to be behind the existing kerb through the park.

The potential conflicts along this section include parallel parking, signs, utility poles, a bus stop and seating.



**Recommendation:**

Relocate any signs / utility poles / seating within the proposed path.

Provide a safe separation between the path and parallel parking.

Provide cycle friendly treatment of vehicle accesses (refer section below for further discussion) and bus stop.

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Occasional</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Likely</b></p>
<p><b>Designer Response:</b> <i>If this option is chosen as the preferred option, then the auditor's recommendations will be adopted.</i></p>	
<p><b>Safety Engineer:</b></p>	<p><a href="#">Click here to enter text.</a></p>
<p><b>Client Decision:</b></p>	<p><a href="#">Click here to enter text.</a></p>

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**Action Taken:** [Click here to enter text.](#)

2.4.10. Route B – crossing of Pharazyn Street **Serious**

The proposed treatment for the crossing of Pharazyn Street is similar to that proposed for Normandale Road (see section below) with a median refuge islands and speed cushions on all approaches.

Visibility to the north from the east side of the intersection is extremely limited (vegetation – see below).

There are numerous conflicts to check before crossing (including looking back over the shoulder) and there is a bus stop on the southern side of the intersection.

Moderate traffic volumes (ADT ~4,500 and 4% heavy vehicles) on Pharazyn Street.

No detail has been provided on the proposed signage for path users, path signage or delineation should indicate that path users need to stop and give-way to vehicles.



**Recommendation:**

Remove vegetation from corner.

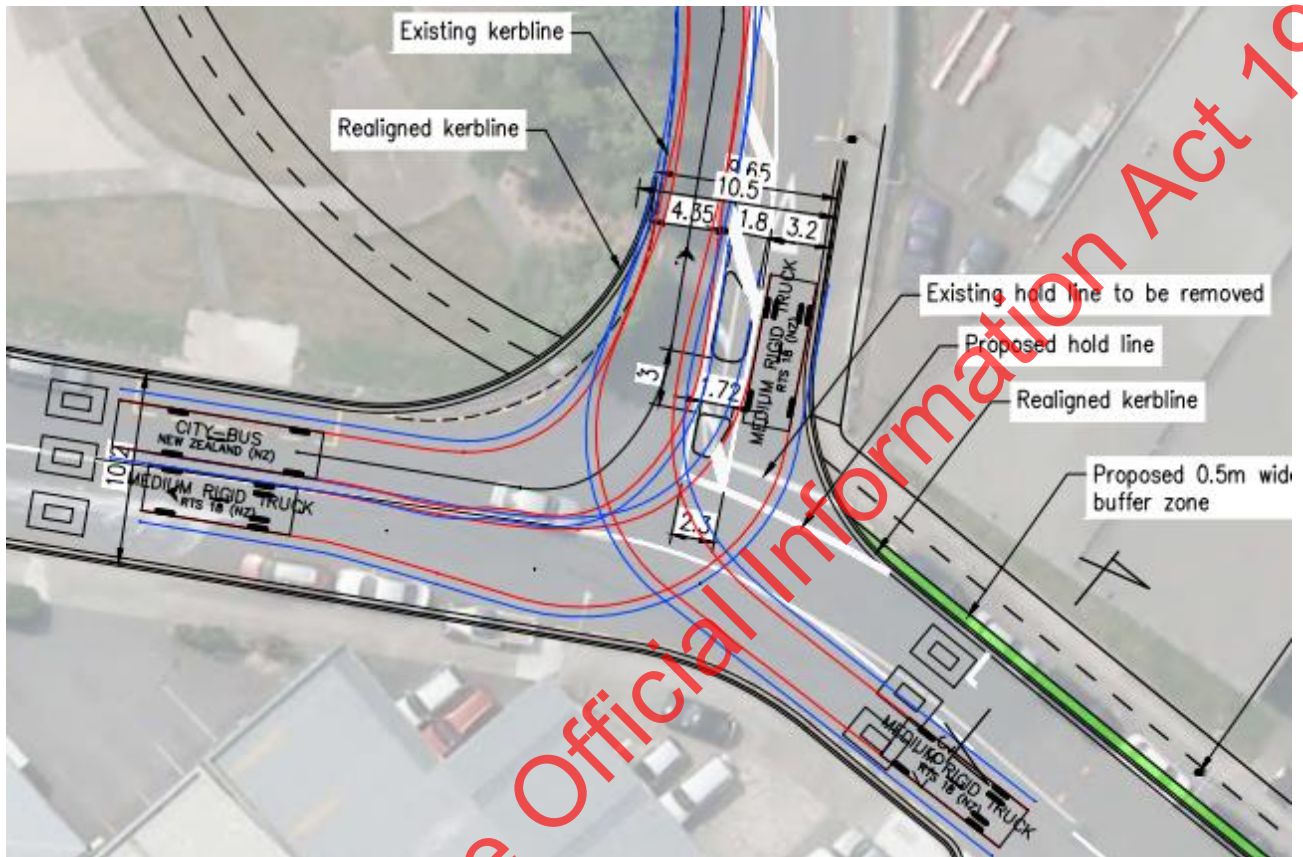
Relocate bus stop and remove parking from intersection.

Square up corners to reduce vehicle speeds and reduce crossing distance.

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Frequent</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Likely</b></p>
<p><b>Designer Response:</b> <i>If this option is chosen as the preferred option, then the auditor's recommendations will be adopted</i></p>	
<p><b>Safety Engineer:</b> <a href="#">Click here to enter text.</a></p>	
<p><b>Client Decision:</b> <a href="#">Click here to enter text.</a></p>	
<p><b>Action Taken:</b> <a href="#">Click here to enter text.</a></p>	

#### 2.4.11. Both routes – Normandale Road crossing **Serious**

The proposed design for Normandale Road crossing is shown below and is assumed to be the same for both options.



The SAT have identified a number of concerns including:

- Median refuge offset from desire line of path;
- Crossing not perpendicular to road;
- Crossing of western side is ~8.5m wide;
- Absolute minimum storage space in refuge for a cyclist;
- Path users on east side of intersection waiting to cross will block access for pedestrians travelling along Normandale Road;
- Moderate traffic volumes (ADT ~3,500 and 4% heavy vehicles) on Bridge Street (including buses and fire appliances);
- Limited visibility to north from west side of intersection (vegetation);
- Potential for bus stop and on-street parking to block visibility from the intersection;

- No detail has been provided on the proposed signage for path users, path signage or delineation should indicate that path users need to stop and give-way to vehicles.
- Numerous conflicts to check (including looking back over the shoulder) before crossing (traffic on Normandale Road, Bridge Street, Herbert Street, Aligonby Street and property accesses);
- Placement of speed cushions could lead to buses straddling the centreline (to avoid parked cars) and stopping in the lane (inability to reach kerb after straddling centreline); and
- Potential vehicle tracking conflicts (especially if two buses turning – not shown).

**Recommendation:**

Signalise intersection to reduce conflicts (or other improvements that address the concerns raised).

Remove or relocate speed cushions, bus stop and on-street parking as necessary.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Frequent</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Likely</b>
<i>Designer Response: Cushions will be located about the centre of each lane. Discussions with HCC will be held with regard to signalising the intersection. If not signalised, recommend accepting the risk, which is the same as the current risk, although slightly less due to median refuge.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

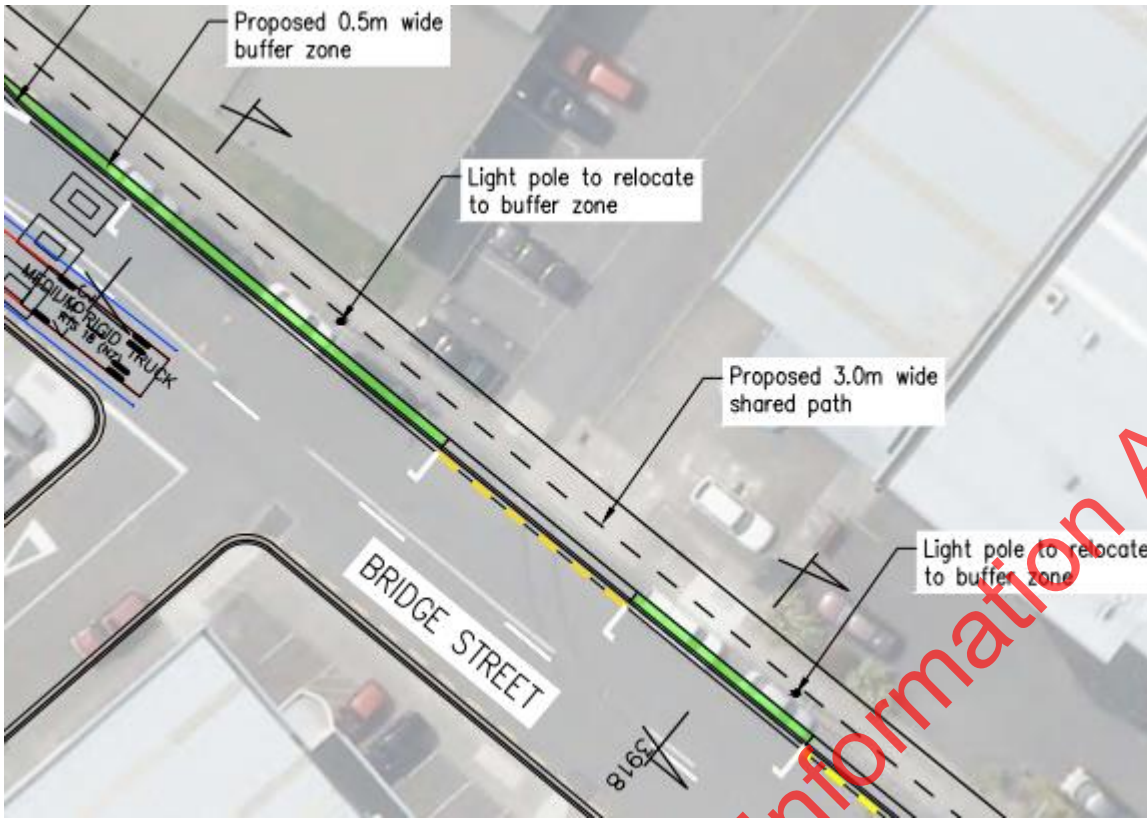
2.4.12. Both routes – Bridge Street

**Significant**

The proposed detail for Bridge Street between Normandale Road and Marsden Street is shown below.

The relocation of hazards and the buffer zone outside the parallel parking is good.





There is no buffer between the path and the properties and as below, some businesses have parking directly adjacent to the path which will be a conflict with path users as currently proposed and restricts visibility for vehicles using the accesses and path users.

No detail is provided of the treatment of the accesses. The accesses appeared well used during the brief site visit undertaken. Parking and fences on the boundary and parking on the road will limit visibility of vehicles to path users and vice-versa.





**Recommendation:**

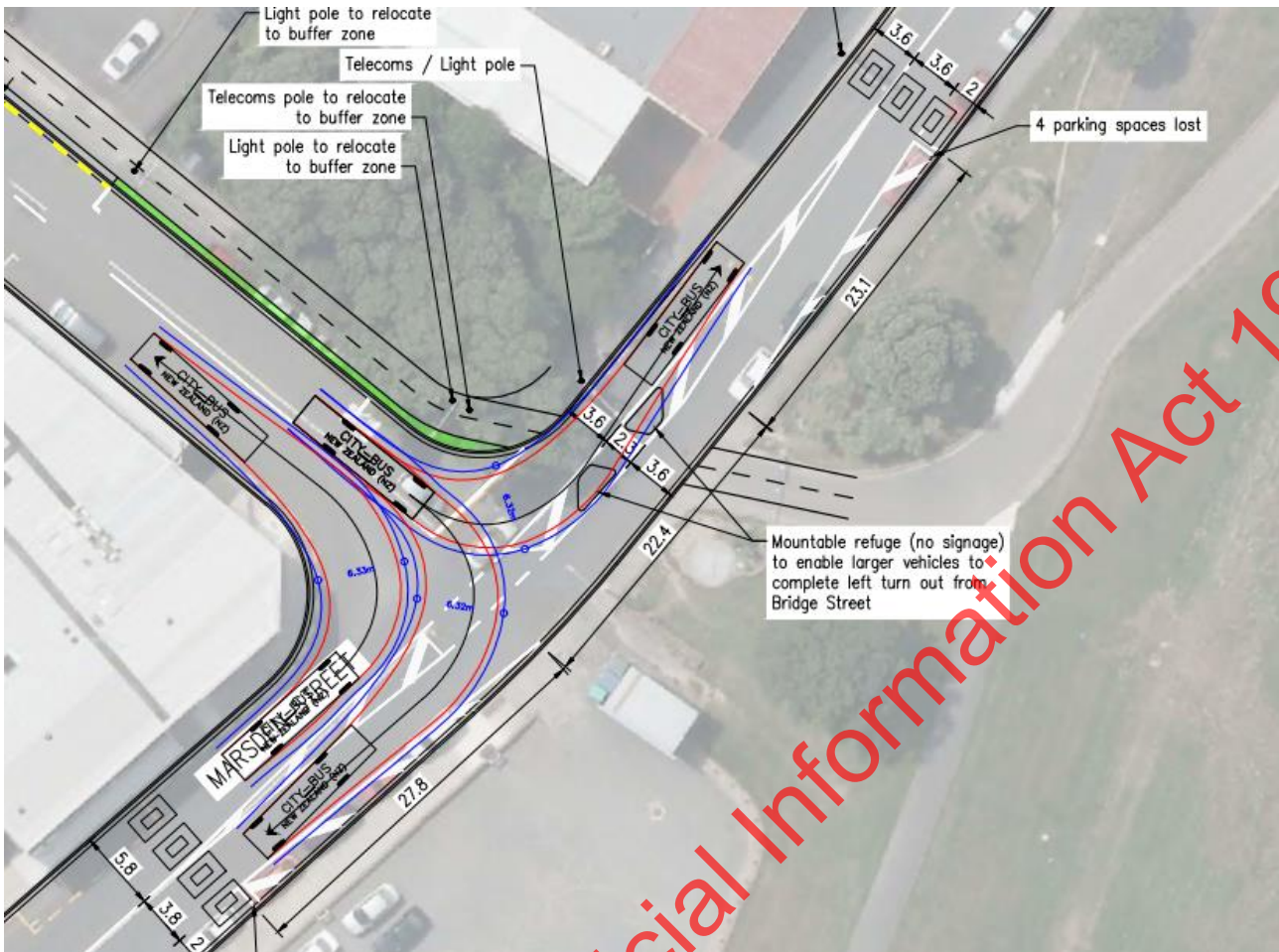
Provide physical separation of properties from path away from accesses to minimise vehicle manoeuvring on the shared path and improve visibility.

Provide appropriate treatment of the vehicle accesses to slow vehicles down and warn path users and cyclists of potential conflicts. Consider work undertaken by Wellington City Council on treatment of accesses on Hutt Road and other national best-practice guidance.

<b>Frequency Rating:</b> <i>Crashes are likely to be</i> <b>Common</b>	<b>Severity Rating:</b> <i>Death or serious injury is</i> <b>Likely</b>
<i>Designer Response: Current-practice treatments will be provided at vehicle crossings. Discussions will be held with HCC to see if parking can be removed from the other side of Bridge Street in this location to create additional width to minimise the conflict with exiting vehicles that cross the shared path.</i>	
<b>Safety Engineer:</b>	Click here to enter text.
<b>Client Decision:</b>	Click here to enter text.
<b>Action Taken:</b>	Click here to enter text.

2.4.13. Both routes – Marsden Street crossing **Serious**

The proposed treatment for the crossing of Marsden Street is shown below with a median refuge and speed cushions on all approaches.



The SAT have identified a number of concerns including:

- Crossing not perpendicular to road;
- Median refuge doesn't provide any protection from vehicles;
- Limited visibility to the west from the north side of the intersection (vegetation – see below);
- No detail has been provided on the proposed signage for path users, path signage or delineation should indicate that path users need to stop and give-way to vehicles.
- Numerous conflicts to check (including looking back over the shoulder) before crossing (traffic on Bridge Street, Marsden Street and property accesses);
- No detail has been provided around the treatment of the gate opposite Bridge Street (see below) and vertical grade down from the stop bank;
- High traffic volumes (ADT ~7,500 and 4% heavy vehicles) on Marsden Street (including buses and fire appliances);
- Placement of speed cushions could lead to buses straddling the centreline (to avoid parked cars); and
- Vehicle tracking conflicts (with median refuge and other vehicles – see above).





**Recommendation:**

Signalise intersection to reduce conflicts (or other improvements that address the concerns raised).

Remove or relocate speed cushions, bus stop and on-street parking as necessary.

Provide appropriate treatment of access to stop bank.

<p><b>Frequency Rating:</b> Crashes are likely to be <b>Frequent</b></p>	<p><b>Severity Rating:</b> Death or serious injury is <b>Likely</b></p>
<p><i>Designer Response:</i> Discuss with HCC the provision of a signalised intersection. Turning paths are for buses. Discuss with HCC the provision of Stop signage to minimise vehicle speed for those exiting Bridge Street onto Marsden Street and accept risk for cyclists crossing Marsden Street at same time as buses/large vehicles turning. Speed cushions will be provided in the centre of each lane. Discussions with GWRC are on-going to determine access to stop bank.</p>	
<p><b>Safety Engineer:</b></p>	<p>Click here to enter text.</p>
<p><b>Client Decision:</b></p>	<p>Click here to enter text.</p>
<p><b>Action Taken:</b></p>	<p>Click here to enter text.</p>

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### 3. 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 in order to improve safety. The problems identified have been noted in this report.

Signed: ..... Date: 2/06/17  
s 9(2)(a) [redacted], MIPENZ, CPEng  
Audit team leader, Senior Transportation Engineer, Opus

Signed: ..... Date: 2/06/17  
s 9(2)(a) [redacted], MEng  
Audit team member, Senior Safety Consultant, Opus

**Designer:** Name ..... Position .....

Signature ..... Date .....

**Safety Engineer:** Name ..... Position .....

Signature ..... Date .....

**Project Manager:** Name ..... Position .....

Signature ..... Date .....

**Action Completed:** Name ..... Position .....

Signature ..... Date .....

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

**Date:** .....

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