# EXISTING CYCLE INFRASTRUCTURE REVIEW: PRIORITISATION PROCESS AND TREATMENT OF EXISTING CYCLE ISSUES


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|---|---|---|
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## 1 ABSTRACT


Auckland Transport has identified a number of operational and maintenance type issues affecting cyclists. Loosely termed “pinch points”, these are existing infrastructure that are hazardous for cyclists and require further investigation in order to remedy or mitigate the hazard.

To appropriately assess each issue as it arises a prioritisation matrix has been developed to rank the issues with respect to their importance and priority. The prioritisation matrix uses a range of criteria to understand how an identified issue ranks against other issues, with the issues categorised as high, medium and low priority. The matrix developed to date has been tailored to the Auckland region.

To provide consistent design solutions to any cycle safety issues identified, a design tool box is being established to provide practitioners with guidance as to the measures available to remedy or mitigate an identified issue. The cycle issues are grouped into themes, and under each theme a generic set of remedial measures has been identified for issues ranked high, medium and low priority. The generic set of remedial measures is by no way a definitive list of measures – but has been developed to provide guidance as to what could be expected to be required.

# 2 BACKGROUND

Auckland Transport is committed to making the existing road network safer for cyclists. This reflects the desire to encourage this as a viable alternative mode of travel, while also protecting the vulnerable users from other road users. Given the desire to grow cycling within Auckland this has become an increasingly important direction of many of the policies guiding the region. This means it is vital to ensure that the network cyclists' use is safe and encourages increased use.

However, over the past few years it has become apparant that there are a number of existing cycle safety related issues that place our existing cyclists in danger and discourage new cyclists from adopting this mode of travel, particularly commuter cyclists. Two examples of existing cycle safety issues identified on the Auckland road network are illustrated below

**Figure 1: 37 Tamaki Drive**

This is the most popular cycle route in Auckland and due to a recent fatality has come under scrutiny with respect to cycle safety. This cycle safety issue is located at the western end of Mission Bay and represents a zebra crossing where the side and central raised islands result in a pinch point for cyclists.

**Figure 2: 2 New North Road**

This issue has been identified in a recent safety audit completed by Auckland Transport and relates to the merging of the two westbound traffic lanes as on-street parking also begins. This restricts the room available for cyclists, as well as the merge area being quite ambiguous in this location due to a lack of road markings

The cycle safety related issues identified can be categorised into two distinct categories, the first being existing infrastructure issues (where the design of road infrastructure that puts cyclists at risk) and the second being maintenance type issues (for example, the finished quality of a reseal and where the edge of seal meets the channel). Both are hazardous for cyclists and need to be addressed to ensure a safe environment is offered.

# 3 OBJECTIVE OF THE PROJECT

The objectives of this project are to address the existing infrastructure issues that are currently on our road network – with the focus being on addressing on-road issues as these represent those with the greatest risk for cyclists. That is, we are focussed with identifying, prioritising and then remedying, mitigating or eliminating existing issues on our road network. To that end, this project aims to:

- provide clarity of approach for stakeholders and advocate groups as to how a particular issue ranks and the measures that may be considered in addressing the issue.
- identify principles and operational policy regarding the use of cycle infrastructure and treatments
- provide a consistent approach to the use of cycle infrastructure and treatments and how to address cycle safety issues on the existing corridors throughout the region

It is stressed that the objectives of this project are to address ***existing*** cycle issues caused by existing infrastructure and/or maintenance issues. Auckland Transport has recently developed the document "Providing Bicycle Facilities as Part of Transport Projects – Guiding Principles for Auckland" (Auckland Transport 2012 (B)). This document establishes criteria for providing cycle facilities as part of transport projects, remedial work or maintenance. The goal of this document is to:

- Consider the needs for cyclists at an early stage of a transport project
- Improving the cycling environment as part of any remedial works or maintenance, regardless of the reason for the remedial works or maintenance.

The guiding principles identify six criteria for assessing cycling in transport projects, remedial works or maintenance. These are:

1. All transport projects led by Auckland Transport must assess cycling opportunities as part of project scoping and design
2. Remedial work must consider how opportunities for cycling could be improved
3. Maintenance projects must assess opportunities for cycling
4. The Auckland Cycle Network plan informs new projects, remedial work and maintenance work
5. Road safety risks to cycling inform remedial work
6. A points system determines whether cycling facilities are included in planning and remedial works now, later or likely never.

**With these Guiding Principles now adopted and in use by Auckland Transport it is expected that new infrastructure built on the road network will avoid new cycle issues being created without due consideration given to the cycle environment**

# 4 OBJECTIVE OF THE PRIORITISATION PROCESS

There is a considerable number of existing issues about the Auckland roading network that are hazardous to cyclists. There is a need to identify these, and once identified to prioritise those that require immediate attention, and those that may be of a lesser priority. In identifying the issues we are reliant on route audits undertaken by Auckland Transport and/or advocate groups, user feedback, and "requests for service" identified by the public.

The issues identified range in severity, and can be subjective depending on the cyclists' skill level as well as the surrounding road and land use environment.

With a range of issues already identified throughout the Auckland network, and with the likelihood of this list potentially growing over time as cycling increases and cyclists find other cycle safety issues, there is a need to appropriately and consistently assess each documented issue and prioritise it accordingly. To that end a prioritisation matrix has been developed to rank the issues with respect to their importance and priority. Using the prioritisation matrix, an Auckland Transport officer (or in the case of this being developed nationally, a Road Controlling Authority officer), scores the problem on a range of criteria to

understand how an identified issue ranks against other reported issues. This is important as Auckland Transport needs to be able to understand which issues are of greater importance for remedial works.

The prioritisation matrix ranks the issues high, medium or low – with the priority rankings also helping to provide an indication of the scale of remedial works that may be undertaken. In other words a high priority issue is more likely to see a greater level of remedial works given the importance of the location and/or the severity of the safety issue. Likewise, a low priority issue is likely to see a lesser scale of remedial works, commensurate with the location and severity of the issue.

# 5 DEVELOPMENT OF THE PRIORITISATION MATRIX

Similar examples of prioritisation processes were identified following a literature review and web search. The following sources helped to guide the development of the Prioritisation Matrix

- City of Chula Vista, Bikeway Master Plan 2011
- U.S. Department of Transportation, 2012,"Bicycle Road Safety Audit Guidelines and Prompt Lists
- Auckland Transport, 2012 (C), "Proposed scoring matrix for prioritisation of cycle routes/network."

The development of the prioritisation matrix saw a number of iterations worked through with a working group of key stakeholders within the Auckland Transport organisation. The prioritisation matrix is based on 11 criteria, with each criterion identifying a range of considerations, with each consideration then given a scoring. Overall this enables a site to be scored on each criterion, with the overall mark representing how a site ranks compared with other sites that have been assessed. The criteria used to assess each site are summarised in Table 1.

Based on these criteria, a prioritisation matrix has been developed (Table 2.) to rate an identified cycle related issue against each criterion, thereby measuring the severity of the issue and the importance of the route on which the cycle issue occurs. The matrix scores a particular cycle issue against each of the criteria, with a maximum score of 100 available for the "worst" cycle issue.

In terms of prioritising an issue and understanding how it compares with other issues, Table 3 then categorises each issue into a high, medium and low priority. As previously mentioned the priority categories also indicate the scale of remedial works that may need to be undertaken.

It would be expected that a site visit and further consideration of the remedial works required would be given following the prioritising of each safety issue. This may see the need to "re-prioritise the projects dependent on the complexity of addressing the safety issue.

**Table 1: Background Explanation to the Prioritisation Matrix**

| CRITERIA DESCRIPTION | EXPLANATION |
|---|---|
| STRATEGIC ALIGNMENT | This identifies whether the issue is on a route identified as part of a Regional Cycle Network[1]. Routes on the Regional Cycle Network are given a higher priority as these are routes where cyclists are encouraged to travel and are expected to have a higher level of infrastructure provided for cyclists. They also typically represent more direct routes between areas |
| EXISTING FACILITIES - ON ROAD | Existing facilities to be considered include cycle lanes, shared paths or bus lanes. Rationale behind this criteria is that these are the locations where we are encouraging cyclists, hence the need to provide the "safest" environment for the cyclist.<br>Therefore if there is an existing safety issue on a route with existing facilities then it is given a higher priority as essentially this is where a greater number of cyclists may be exposed to risk. |
| ROUTE POPULARITY | This considers how well used, or likely to be used, a particular route may be. Of particular interest is the routes locality to key people attractors like schools, town centres, community facilities, office parks or Public Transport Interchanges. These land uses should be easily accessible by cyclists, with a safe route provided to encourage this as a mode of travel.<br>This criterion also considers whether the route is a popular commuter and/or recreational route, again ensuring that issues arising on popular cycling routes are given priority over issues arising on less popular routes.<br>The popularity of a route is a slightly subjective assessment and relies on the person using the prioritisation matrix having knowledge of well used cycle routes within a region. Alternatively there may be cycle count information available (AADT) to justify the popularity of a route.<br>Within the matrix there are five measures of a route popularity, with these being cumulatively added together |
| TRAFFIC VOLUMES | This criterion establishes bands of traffic volumes to determine how busy a particular route may be. Higher traffic volumes suggest a greater exposure rate for cyclists, and hence the need to address any issues sooner |
| HEAVY VEHICLE PERCENTAGE | This criterion considers the heavy vehicle percentage of a route. Routes with a high heavy vehicle percentage can be intimidating for cyclists, therefore there is the need to ensure any issues are dealt with accordingly |
| 85% VEHICLE OPERATING SPEED | This is similar to the traffic volume criteria, but focuses on the vehicle operating speed, with higher vehicle speeds increasing the speed differential between a cyclist and therefore increasing the severity of an crashes |
| CYCLE CRASH HISTORY | Scoring for this criterion is based on a CAS search, with the search focussed on the crash history 50 m either side of the safety issue A review of the corridor as a whole (say 800m about the safety issue) may also identify cycle safety concerns - indicating the presence of cyclists on this route.<br>The safety issue may also be identified based on the number of complaints or “near misses” reported by cyclists and/or motorists. |
| CYCLE RISK MAP | A risk map has been developed by Auckland Transport[2], and identifies the collective and personal risk for cyclists on corridors throughout the region for cyclists, identifying routes with low, medium and high risk to cyclists. These are completed for a corridor as a whole, and therefore not necessarily reflective of a particular site with a safety issue. |

[1] Auckland Transport 2012 (A)
[2] Auckland Transport 2012 (D)

**Table 2: Background Explanation to the Prioritisation Matrix**

| CRITERIA DESCRIPTION | EXPLANATION |
|---|---|
| MINIMUM AVAILABLE WIDTH AT SITE | With respect to understanding some of the geometric limitations this criterion ranks the width a cyclist and motorist have to share. As this width narrows, the potential for a "side swipe" type crash increases |
| FORWARD VISIBILITY | This measurement determines the forward visibility between a vehicle and a cyclist negotiating through an area of concern – essentially a sight visibility assessment between a motorist and the location of the safety issue |
| TOPOGRAPHY | The topography through an area of concern can affect the speed of the cyclist, and therefore also affect the speed differential between the cyclist and the motorist. A cyclist travelling uphill is also more likely to "weave" back and forward as they traverse the grade. Roads with a higher speed differential are more dangerous for cyclists; issues on those roads should be addressed with priority. |

**Table 3: Prioritisation Matrix**

| RANKING OF ISSUE | | | | |
|---|---|---|---|---|
| **STRATEGIC ALIGNMENT** | The site is on the existing Regional Cycle Network (RCN) /Auckland Cycle Network (ACN) | The site is on the future RCN / ACN | Not on the RCN / ACN- but potential to cater for a relative level of cyclists | No and unlikely to be a busy route for cycling |
| **SCORING** | **15** | **10** | **5** | **1** |
| **EXISTING FACILITIES - ON ROAD** | Cycle facilities are provided on or within 100m of the site via bus lane, cycle lane, shared path etc | No dedicated cycle facility, but sufficient road width at or within 100m of site to suggest cyclists can share with vehicles | No existing facilities provided on or near the site | |
| **SCORING** | **9** | **6** | **3** | |
| **TRAFFIC VOLUMES** | Greater than 30,000 AADT | 15,000 - 30,000 AADT | 5000-15,000AADT | 5000 AADT |
| **SCORING** | **5** | **3** | **2** | **1** |
| **HEAVY VEHICLE %** | Greater than 10% | 6 – 10% | 3-6 | 3% or less |
| **SCORING** | **4** | **3** | **2** | **1** |
| **85% VEHICLE OPERATING SPEED** | >70 km/h | 60-70 km/h | 50-60 km/h | Vehicle speeds are less than 50km/h |
| **SCORING** | **7** | **5** | **2** | **1** |
| **CYCLE CRASH HISTORY** | There is a known cycle crash history or safety issue at this location | There are a number of complaints regarding this cycle issue suggesting near misses | There is an existing cycle crash history within the vicinity of this location (200m) | There is no crash history evident nor any evidence of near misses |
| **SCORING** | **15** | **10** | **5** | **1** |

**Table 4: Prioritisation Matrix**

| RANKING OF ISSUE | | | | |
|---|---|---|---|---|
| **CYCLE RISK MAP** | The cycle issue is on a medium to high or high risk route identified as a black or red line | The cycle issue is on a medium risk route identified as an orange line | The cycle issue is on a low to medium or low risk route identified as a green or yellow line | The cycle issue is not located on an identified risk route |
| **SCORING** | **12** | **8** | **4** | **0** |
| **FORWARD VISIBILITY** | less than 40 m | 40-65 m | 65-90 | greater than 90 |
| **SCORING** | **7** | **5** | **3** | **1** |
| **ROUTE POPULARITY (add each of the responses together)** | There are educational facilities within 300m of the site | There are educational facilities within 600m of the site | There are no educational facilities near the site | |
| | **5** | **3** | **0** | |
| | The site is located on a popular[3] commuter route | The site is located on a potentially popular commuter route | The site is not located on a potentially popular commuter route | |
| | **4** | **2** | **0** | |
| | The site is located within 300m of a town centre or shopping centre | The site is located within 600m of a town centre or a shopping centre | The site is not located near a town or shopping centre | |
| | **3** | **1** | **0** | |
| | The site is located within 300m of a major bus or train station | The site is located within 600m of a major bus or train station | The site is not located near a major bus or train station | |
| | **2** | **1** | **0** | |
| | The site is located on a popular route for recreational cyclists | The site is located on a route that is potentially interesting for recreational cyclists | The site is not located on a route that is interesting for recreational cyclists | |
| | **2** | **1** | **0** | |
| **MINIMUM AVAILABLE WIDTH AT LOCATION** | 3 m or less | Between 3 - 3.5 | 3.5 to 4.0 m | 4.0 to 4.2 m |
| **SCORING** | **7** | **5** | **3** | **1** |
| **TOPOGRAPHY** | The site accommodates uphill and downhill cyclists | The issue is likely to be met predominately by cyclists travelling uphill | The cycle issue is located on flat topography | The cycle issue is likely to be met by cyclists travelling downhill |
| **SCORING** | **3** | **2** | **1** | **0** |

[3] The popularity of a route is a subjective assessment and relies on knowledge of key commuter and/or recreational cycle routes

**Table 5: Priority Category**

| PRIORITY CATEGORY | RATING SCORE | PRINCIPLE FOR EACH PRIORITY CATEGORY |
|---|---|---|
| HIGH PRIORITY | 70-100 | A high priority cycle issue will be eliminated and must be addressed as soon as possible |
| MEDIUM PRIORITY | 40-69 | A medium priority cycle issue will be eliminated or the risk minimised. Works will be to a scale commensurate with the issue |
| LOW PRIORITY | 0-39 | A low priority cycle issue will be minimised with lesser intervention and cost. It may result in no action being taken if no discernible risk can be identified |

The Prioritisation Matrix outlined above has been through a number of iterations with respect to the scoring given to each issue as well as adjusting the issues within the Prioritisation Matrix. An initial version of the Prioritisation Matrix was applied to six existing sites where cycle issues had been identified to understand how the sites ranked against each other. This process saw the weightings adjusted to reflect sites where a greater level of priority was necessary. In essence the weightings were adjusted to provide greater differentiation between sites. A total of ten sites were then assessed using the Prioritisation Matrix above to ensure the changes to the weighting were appropriate.

The Prioritisation Matrix has been developed as a “desk-top” exercise. However visiting the site is imperative in order to understand the issue first-hand. This can either be done as part of completing the Prioritisation Matrix, or can be undertaken following the ranking of a number of sites, focussing on the high priority sites in the first instance.

There is also a need to consider whether there is any proposed rehabilitation or maintenance works planned for a corridor that could then address an existing cycle safety issue. This may allow the issue to be addressed as part of regular corridor maintenance and enable some of the low or medium priority issues to be dealt with irrespective of their rankings.

# 6 DESIGN TOOL BOX

A number of existing cycle design guidelines were reviewed in order to understand how cycle issues were addressed elsewhere. The guidelines and standards reviewed are identified at the end of this paper. One thing that became evident through this review was that many of the existing cycle design guidelines gave more “generic” advice/guidance as to how to develop cycle facilities. There were not many that specifically dealt with the particular cycle safety issues identified on the Auckland network.

To provide a consistent approach to addressing a particular cycle safety issue a design tool box is in the process of being developed to provide practitioners with key design guidance as to the measures available to remedy or mitigate an identified issue. The key design guidance has been grouped into themes, with the themes being issues that are similar in nature, and therefore able to be dealt with in a similar manner. The themes that have been

identified are based on the current cycle safety related issues already known to Auckland Transport.

Under each theme a generic set of remedial measures has been identified for issues ranked high, medium and low priority. The generic set of remedial measures is by no means a definitive list of measures – but has been developed to provide guidance and inspiration to designers and engineers as to what is required. To further populate the design tool box a number of existing cycle safety issues have been considered, with these issues ranked and addressed by way of a concept design. This therefore takes real life issues, ranks them, and then identifies how these can be addressed on site, conceptually, to ensure the safety issue is remedied or mitigated.

The design tool box outlined is by no ways a complete design guide and only provides some of the sketches and ideas developed to date. It is also recognised that it is impossible to come up with a "one size fits all" approach as the issues can vary from site to site; meaning any solution also has to vary. However this gives an indication of what the typical interventions could be. The diagrams have been developed based on the authors' experience, input from Auckland Transport and Flow Transportation Specialists and a review of some of the known cycle safety issues about the Auckland region.

## 6.1 Themes

The identified cycle issue themes are:

- Pinch points (sudden narrowing in the available road width)
- Markings and signage (or lack thereof)
- Maintenance (deep catch pits, deteriorated surface quality etc)
- Lane merging (without space for cyclists)
- Lane continuity and network connectivity (sudden ending of a cycle lane)

Our investigations to date have dealt predominantly with the pinch point theme, as well as addressing the lane merging and lane continuity issues as these also lead to a cyclist being "pinched" on their route. "Pinch point" is a phrase used regularly when describing a cycle related issue, but there can be a number of different types of pinch points. To that end pinch points that have been identified and/or defined have been grouped further as follows:

- Physical Pinch Points – these are "physical" in nature as they generally involve raised islands of some form – hence this pinch point is permanently an issue
- Notional Pinch Points – these are pinch points that occur either, temporarily (on street parking use), as a result of a discontinuous cycle facility, or at a location where there may be a high number of conflicts. These pinch points do not necessarily represent a physical obstruction, as there may be the ability for a vehicle to safely change lanes to avoid the cyclist. However these are locations where a cyclist is exposed to a greater degree of risk given the road layout.

# 7 PHYSICAL PINCH POINTS

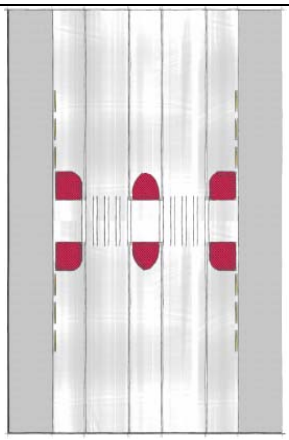
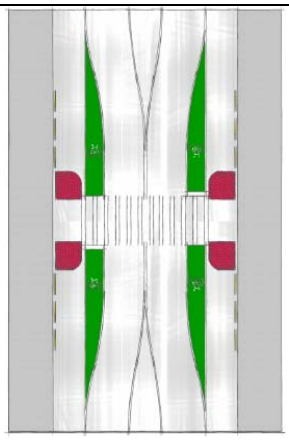
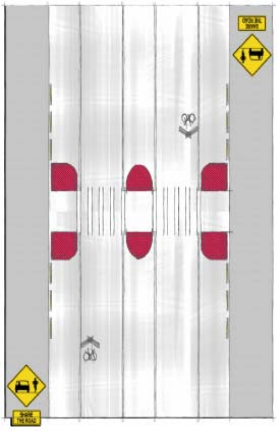
A definition of a physical pinch point was developed by an Auckland Transport Working Group in order to better understand what constituted a physical pinch point. This definition suggests that a pinch point is *"a localised physical narrowing (constraint) of the road where a vehicle/cyclist is unable to safely manoeuvre"*

Physical pinch points typically refers to kerb build outs or raised central islands where it is not physically possible for a vehicle to safely manoeuvre around a cyclist. A safe manoeuvre is considered possible where there is 4.2 m of road width or more available. If less than 4.2 m is available, it is not possible for a cyclist and motorist to "share the space". The definition also suggests that a vehicle that is able to change lanes (if there are two travel lanes in one direction) or has the ability to make use of a flush median may not constitute a pinch point. A width of 4.2 m essentially gives 3 m of space for the vehicle and 1.2 m for the cyclist. It is reiterated that the design tool box outlined as follows, is by no ways a complete design guide and only provides some of the sketches and ideas developed to date. However this gives an indication of what the typical interventions could be. Each intervention is cognisant of the priority given to the site via the Prioritisation Matrix. Therefore a high priority issue is anticipated to require a greater level of intervention, with a low priority issue likely to see a much lower level of intervention, with signage and/or road markings likely.

## 7.1 Zebra Crossings

Zebra crossings are often equipped with side islands and a pedestrian refuge/centre island to reduce the crossing distance for pedestrians. These islands can result in pinch points for cyclists as it narrows the available road width for a cyclist and motorist to safely share.

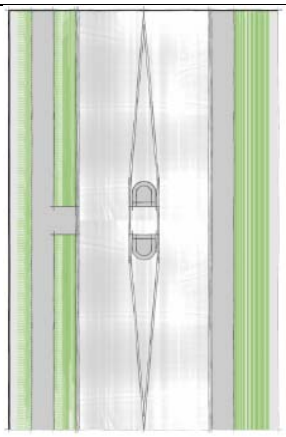
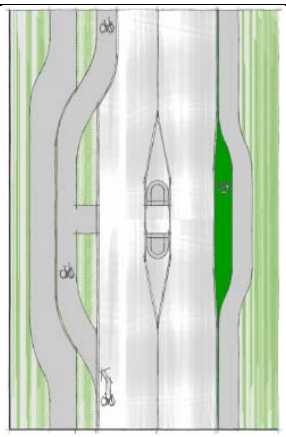
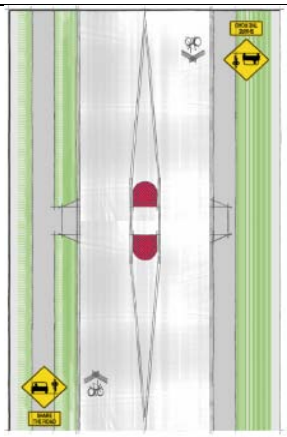
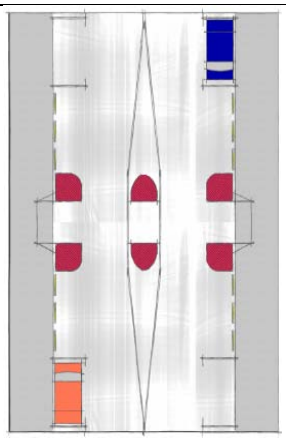
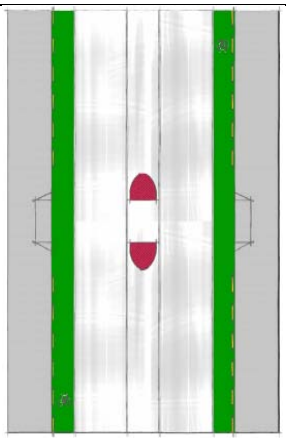
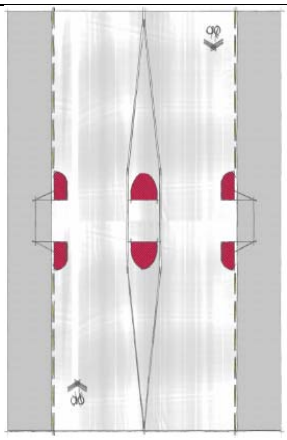
**Figure 3: Zebra Crossing**

| EXISTING ISSUE | HIGH PRIORITY POSSIBLE SOLUTIONS | MEDIUM AND LOW PRIORITY POSSIBLE SOLUTIONS |
|---|---|---|
|  |  |  |
| Existing zebra crossing with side and central islands that narrow the available lane width | Cycle lanes introduced through the pinch point, central raised island removed, side island extent reduced. Other solutions could reduce side islands , or a cycle by-pass created. | Signage and/or road markings to alert cyclist and motorist of "pinch point" and provide greater awareness of the issue and promote sharing of the road through the pinch point |

## 7.2 Pedestrian Refuge

Pedestrian refuge islands provide a safer crossing for pedestrians, but can cause safety issues for cyclists. A cyclist approaching the centre island can be sideswiped by a car tracking towards the left of the carriageway to avoid the centre islands. Particularly when the lane width at the location of the centre island is 4.2 m or less, the cyclist might get caught by a car encroaching on its space. This issue is heightened as vehicle speeds increase.

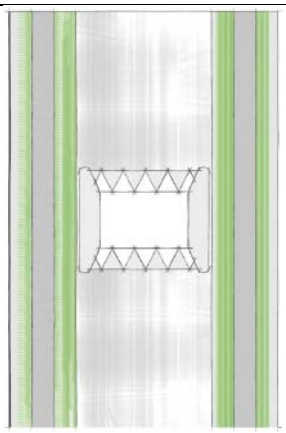
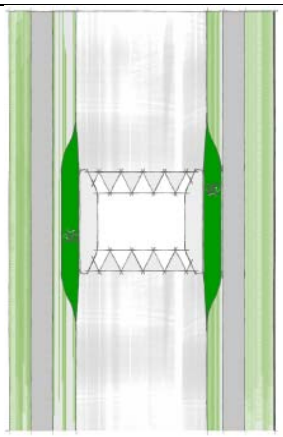
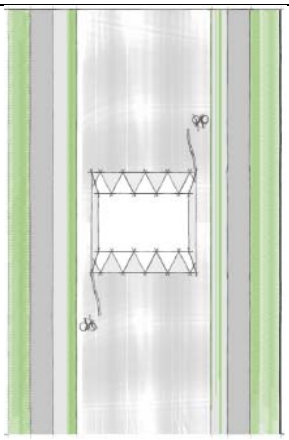
**Figure 4: Pedestrian Refuge**

| EXISTING ISSUE | HIGH PRIORITY POSSIBLE SOLUTIONS | MEDIUM AND LOW PRIORITY POSSIBLE SOLUTIONS |
|---|---|---|
|  Pedestrian refuge island narrows the lane widths, reducing the room available for a cyclist and motorist to travel through the site together |  Cycle facility provided through either<br>• a short section of cycle lane achieved through berm reduction or<br>• off road facility to bypass the site |  Signage and/or road markings to alert cyclist and motorist of "pinch point" and provide greater awareness of the issue and promote sharing of the road through the pinch point |
|  Side and centre refuge islands with on street parking |  Cycle lanes introudced, parking on street removed over the section |  Signage and/or road markings to alert cyclist and motorist of "pinch point" and provide greater awareness of the issue and promote sharing of the road through the pinch point |

## 7.3 LATM Measures

Speed tables and road narrowing (through chicanes or one way movement only) are used to lower traffic speeds in low volume streets. Speed tables introduce a hazard for cyclists because they are often narrower than the traffic lane before and after the speed table and they form an obstacle for cyclists, who have to slow down significantly.

**Figure 5: LATM Measure**

| EXISTING ISSUE | HIGH PRIORITY POSSIBLE SOLUTIONS | MEDIUM AND LOW PRIORITY POSSIBLE SOLUTIONS |
|---|---|---|
|  |  |  |
| Carriageway narrowed and/or vertical deflection introduced to slow vehicle speeds. | A cycle by pass is created wither side of the LATM measure | Signage and/or road markings to alert cyclist and motorist of "pinch point" and provide greater awareness of the issue and promote sharing of the road through the pinch point |

# 8 NOTIONAL PINCH POINTS

Much of the recent publicity regarding cycle pinch points relates to the conflict area caused by the merging of vehicle lanes as a result of on street parking, with the on street parking forcing the cyclists to merge into the live vehicle lanes at the point where the vehicles are merging. This has, to date, typically been identified on the downstream arm of an intersection, but can occur in a number of places about the street network. In addressing a pinch point caused by on street parking there is a number of design features that can be used to address these, including:

- Removal or relocation of the on street parking to eliminate or mitigate the issue
- Continuity lines from the edge of seal to the rear of the car park should help to alert cyclists that their path of travel is shifting into the live vehicle lane. This would seem to be one of the more simple solutions – and is identified in Manual of Traffic Signs and Markings - MOTSAM (NZTA 2009) is a typical marking for on street parking. If there is enough street width it may be possible to implement an edge line around the entire length of on street parking
- Symbol road markings, for example shared lane markings or "sharrows", could look to be marked on the road surface to alert the cyclist of the narrowing ahead – this could

be way of an angled arrow to alert cyclists to shift to the right. This would also alert drivers of the possibility of cyclists merging into the live vehicle lane

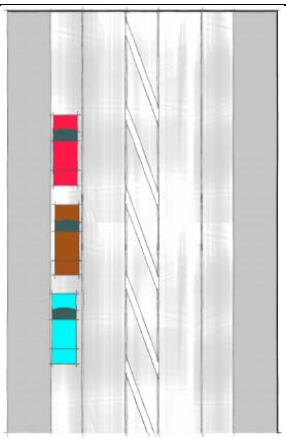
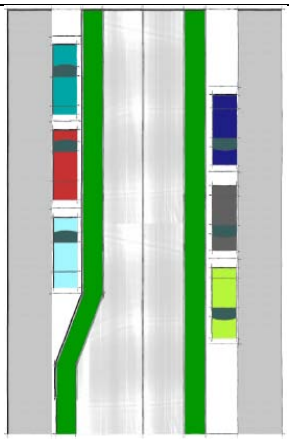
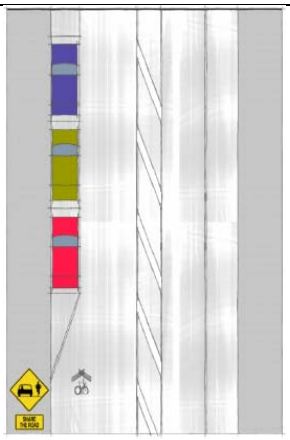
- If the parking pinch point occurs in the vicinity of a lane merge – can the parking be removed or relocated? Motorists in this situation may be focussed on merging with the traffic stream and less focussed on potential cyclist
- The ability to narrow traffic lanes, parking spaces or flush medians to provide additional space for cyclists. This could then be "safeguarded" with the use of an edge line – similar to the MOTSAM standards
- The ultimate solution and particularly if the issue occurs on the RCN/ACN, is for dedicated facilities to be provided to cyclists, likely to result in a full reconfiguration or widening of the existing carriageway.

Signage may be of some use – but bear in mind a cyclist's visibility is different to that of a motorists. Cyclists are regularly scanning the surface of the road, what is directly in front of them etc. Signage may be difficult to observe. Coupled with this is the regular "complaint" about signage clutter – so signage may prove less successful.

## 8.1 Parking

Parking can be a hazard for cyclists when they suddenly have to merge right to avoid collision with a parked car. This is often the case downstream from an intersection, where vehicles in the traffic lane are accelerating and cyclists have to merge suddenly. The following does not necessarily address the hazard of car doors opening onto a cyclist.

**Table 6: Parking**

| EXISTING ISSUE | HIGH PRIORITY POSSIBLE SOLUTIONS | MEDIUM AND LOW PRIORITY POSSIBLE SOLUTIONS |
|---|---|---|
|  Parking causes cyclists to merge into live vehicle lane |  Assuming no widening, cycle lanes are introduced at the expense of the flush median |  Signage and/or road markings to alert cyclist and motorist of "pinch point" and provide greater awareness of the issue and promote sharing of the road through the pinch point |

## 8.2 Lane Continuity

There have been a number of issues identified where an existing cycle lane, shared path or intersection lead in lane does not consider the safety of the cyclist after the facility is discontinued. That is, where a cycle lane ends, consideration may not have been given as to how cyclists are reintroduced into a live vehicle lane. This can also be of concern where a cycle facility finishes on one side of an intersection and does not continue downstream. Typically these issues can be addressed through reconfiguring the carriageway to achieve safe merging distances for the cyclist to enter the live vehicle lane.

# 9 WORK IN PROGRESS

Auckland Transport is continuing to progress the prioritisation matrix and the design tool box. The information to date has been circulated nationally to road controlling authorities for further feedback regarding the applicability of the prioritisation matrix nationally as well as the suitability of developing a design tool box to address existing cycle safety issues. The ultimate goal is to develop a process that can be used nationally in order to ensure consistency across the country.

**Given the desire to develop a Prioritisation Matrix and design tool box that can be used nationally we appreciate any feedback you may have on this.**

# 10 CONCLUSION

Auckland Transport has developed the Priritisation Matrix and Design Tool Box to appropriately assess cycle safety issues that currently exist about the road network. The prioritisation matrix uses a range of criteria to understand how an identified issue ranks against another issue, and ranks these according to high, medium and low priority. The Prioritisation Matrix ranks each cycle safety issue with respect to their importance and priority, helping to identify works and enable funding to be made availabe as appropriate.

The matrix developed to date has been tailored to the Auckland region, however the output has been recently circualted to road controlling authorities about NZ to seek their feedback on the appropriateness of developing this for use nationally..

To provide consistent design solutions to any cycle safety issues identified, a design tool box is being established to provide practitioners with guidance as to the measures available to remedy or mitigate an identified issue. The cycle issues are grouped into themes, and under each theme a generic set of remedial measures has been identified for issues ranked high, medium and low priority. The generic set of remedial measures is by no way a definitive list of measures – but has been developed to provide guidance as to what could be expected to be required.

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