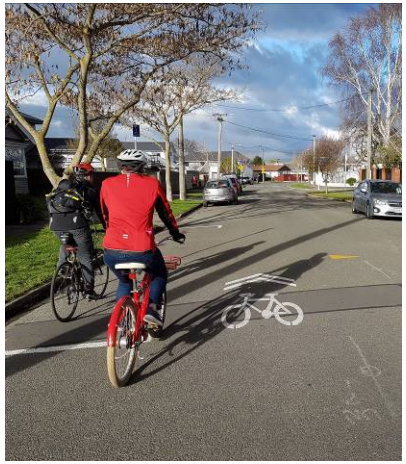
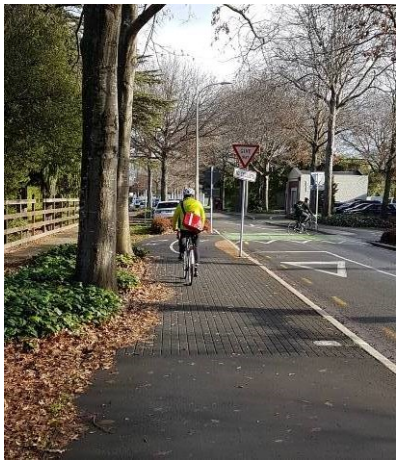
Post Implementation Review

Urban Cycleways Programme





September 2018

The purpose of NZ Transport Agency Post Implementation Reviews are to:

- assess how well a project (or package) has delivered its expected benefits
- explain any variation between actual results and expected benefits and costs
- identify any lessons learned that can be used to improve future projects

Executive Summary

The Urban Cycleways Programme (UCP) aims to make significant improvements to cycling infrastructure in the main urban centres through the investment of $333 million. The programme comprising 54 cycling projects was originally expected to be delivered between 2014 and 2018. To date, only approximately one-third of the projects have been delivered and are open to the public. Current estimates envisage that the UCP work programme will be delivered by June 2021. The Transport Agency has increased the level of support available to approved organisations to assist in the delivery of outstanding projects/packages. A snapshot of individual project/package progress is provided in Appendix A.

Based on a sample of completed projects, this review of the UCP found that:

- Cycling facilities have generally been constructed to good practice standards. It is not possible to determine whether completed cycleways have achieved their expected benefits by undertaking a simple comparison between expected and actual cyclist user numbers. This reflects the fact that cyclist estimates generated at the design phase are for project economic evaluation purposes, rather than for post-construction performance monitoring. As such, many cyclist user number estimates relate to a future date, which has not yet arrived. However, the growth rate in user numbers suggests that completed cycling facilities have been successful in attracting and maintaining cyclist numbers, where such data is available.

- In the delivery phase projects were generally successful in providing safe, comfortable and pleasant environments for cycling, but did cost around 14% more on average than the approved budget. Individual project cost variations were not examined in detail as part of this review. The variance observed may however reflect that approved budgets are based on preliminary design stage information. At this stage in a project, construction scope has not been fully determined and it may be difficult to determine an appropriate level of project contingency.

- The review highlighted a number of good practice examples and considerations for future projects. Most notably, such items include:
    - It is safest to construct facilities at 'high-risk' locations such as intersections prior to links to ensure early adopters are well catered for;
    - Improved alignment between expected cyclist user numbers and surfacing options is required; and,
    - An increased focus on the 'safe systems approach' is recommended to support improved safety outcomes.

The terms of reference governing the scope of this review is contained in Appendix B.

1. Urban Cycleway Programme Review Background

Review rationale

In 2014 the Urban Cycleways Programme (UCP) received a substantial $100m increase of government funding. Combined with local government and National Land Transport Fund (NLTF) funding contributions, this increased investment has been directed into a $333 million programme of 54 urban cycling projects around the country for the 2014-18 period. An overview of the projects and packages included in the UCP is illustrated in Appendix A.

It is now timely to review overall programme performance given that around one-third of the UCP has been delivered and high levels of investment in cycling are expected to continue. It is through an assessment of completed cycling projects that it is possible to draw findings relating to the programme. The objective of this review is to determine retrospectively whether completed cycling projects have achieved their anticipated outcomes and identify aspects that may enhance the outcomes of future cycling projects.

Review methodology

The number of projects in the programme and their geographical spread has necessitated that our review be based on a limited sample of projects. The projects included in the sample were selected on their ability to provide coverage across different regions, cycle facility types (lanes and shared paths), and value of investment. The nine projects included in this review and the overall evaluation process is respectively outlined/illustrated in Figure 1 and Figure 2.

Figure 1: Sampled cycling projects forming the basis of this review[1]

Project	Region	Cycle Facility Type	Value of Investment
Grafton Gully Cycleway	Auckland	Dedicated cycleway	$14.5m
Lightpath and Nelson Street Cycleway	Auckland	Shared path (Lightpath) / dedicated cycleway (Nelson Street)	$16.7m
Quay Street Cycleway	Auckland	Dedicated cycleway	$2.5m
Beach Road Cycleway	Auckland	Dedicated cycleway	$6.4m
Glen Innes to Meadowbank Cycleway	Auckland	Shared path	$12.0m
Grovetown to Spring Creek	Marlborough	Shared path	$0.6m
Passchendaele Memorial Walk/Cycle path	Canterbury	Shared path	$2.1m
Papanui Parallel Cycleway (Stages 1 & 2)	Canterbury	Dedicated cycleway	$13.9m
Uni-Cycle	Canterbury	Dedicated cycleway	$8.3m

Figure 2: Outline of the process used to review UCP performance

[1] While the Grafton Gully and Beach Road cycleways do not form part of the UCP the project's intent is similar to the overall programme and has therefore been included in this review.

2. Urban Cycleway Programme Review Findings

This section presents the overall findings of UCP performance and is based on aggregated project outcomes. Individual project performance data is presented in Appendix C.

All cycling projects formed part of a wider cycling strategy

Based on the sample of projects reviewed all were found to be supported by a broader cycling strategy. Cycling strategies help to ensure that cycling infrastructure is connected, consistent and designed with a cyclist user type in mind.

Levels of service generally fit for purpose but further refinement could provide better value for money outcomes

A well connected facility that is coherent, minimises user delay (and physical effort required) while maximising comfort (collectively referred to as a facility's level of service) will influence the facility's success in attracting cyclists. Increasing levels of service often correlates to an increasing project delivery cost, but a diminishing return in cyclist user numbers. As a result, ensuring appropriate levels of service is critical to obtaining value for money outcomes.

The level of service afforded to cyclists was generally considered appropriate, based on the sample of projects reviewed. Figure 3 summarises notable observations relating to the levels of service provided by facilities visited, and aspects that should be considered in the design and delivery of future cycling projects. Relevant, but less critical considerations are summarised in Appendix D.

Figure 3: Notable observations made on site pertaining to levels of service (LOS)

Riding surface (form and material)	
	Surfacing materials used on cycling facilities directly impact on a cyclist's level of comfort and how fast they can travel for their level of physical exertion. A cyclist's desire for comfort and speed will largely depend on the purpose of their journey (e.g. commuter vs recreation) and the type of bicycle they ride (e.g. road bike vs mountain bike). In addition, surfacing material selection directly influences whole of life costs; typically with greater costs associated with higher LOS surfaces (such as asphalt and concrete). Generally the surfacing material used appeared appropriate for the type of cycling facility. However, in the case of the Passchendaele Memorial facility we considered the application of asphaltic concrete was an unnecessarily expensive surfacing choice given the number and type of cyclists targeted.

	We encourage the consideration and inclusion of design features to support accessibility for all people, including those in wheelchairs. The incorporation of such facilities must however consider any adverse impacts such facilities may have on the primary target user group. At the Meadowbank facility we considered the provision of accessible ramps (and associated level platforms) to be a poor design choice. Given the significant length and elevation differences of the shared path, few wheelchair users would likely utilise the path. Due to the inclusion of accessible ramp features we experienced sudden changes in weight when travelling downhill resulting in decreased comfort. To alleviate this discomfort we needed to reduce speed significantly or rise from our seats. Cyclists travelling at speed, not in the seated position and experiencing sudden weight changes will have less control over their bike and therefore be exposed to greater crash risk.
Traffic signals and associated facilities	
	We visited a number of cycle facilities that required cyclists to cross signalised intersections and observed distinct differences in the level of service afforded to cyclists around the country. In Christchurch we noted the use of automated and advanced cyclist detection loops on intersection approaches. This enabled cyclists to 'call' for a green phase prior to arrival (reducing cyclist wait times at intersections) and without the need to push a call button. While such technology will undoubtedly add to a project's delivery cost, on well-utilised facilities it is likely to be cost-effective.
	In Auckland and Christchurch we observed that crossing facilities generally differentiated between pedestrians and cyclists. This is considered good practice as the time required for cyclists to cross is less than that required by pedestrians. Distinguishing between pedestrian and cyclist users enables the correct amount of 'green time' to be provided and avoids unnecessary delay to other road users.

	Hold rails improve levels of service for cyclists by enabling cyclists to remain seated on their bike while waiting to cross; this is particularly helpful to those cyclists using toe clips or cleats. Of the facilities visited, we found most had hold rails installed; and that the design of these varied around New Zealand. In Christchurch we noted wear on the horizontal foot rail, indicating that some cyclists likely have a preference for a foot rail. Consideration should be given to incorporating a foot rail into hold rail standards. It is possible that the bottom rail may also allow easier detection of the hold rail by visually impaired users utilising a cane. *Note: foot rails alone should not be provided as they may be hard to see.*

Unclear whether estimated user numbers have been achieved, but annual growth rates are significant

Projects estimated cyclist numbers for the post-construction period to satisfy project funding requirements. Understanding the expected number of cyclists at the planning/design phase ensures facilities provide sufficient capacity and that projects provide an overall economic benefit. In estimating cyclist user numbers, a wide range of approaches were found. Some projects forecast annual average daily cyclist user numbers at project completion, while others at a future date[2]. In other instances forecasts reflected average cyclist user numbers for a selected time of year, such as during school term times.

The approaches used to estimate cyclist user numbers are considered acceptable and robust. These approaches enable project success to be measured, but require either future cyclist count data, or data manipulation to align datasets[3]. With the data readily available for this review, we are only able to report that the Grovetown to Spring Creek facility exceeded cyclist user number estimates by 32%. In lieu of such simple comparison for the remaining projects, annual cyclist user growth rates provide a useful surrogate measure for project success[4].

Figure 4 illustrates annual cyclist user growth rates for those facilities that have been open to cyclists for a period of 12months or more. Combined, these projects have a non-weighted average annual cyclist user growth rate of 7.4%. This growth rate is greater than that typically used in economic analysis and is more than double the growth rate for vehicle travel in New Zealand[5].

2 Particularly where wider cycle network connections would result in increased catchment areas and therefore cycling potential.

3 For example by converting annual average daily cyclist trip data to align with selected times of the year.

4 Growth rates directly infer a facility's ability to maintain existing user numbers and attract new users.

5 As reported by the Ministry of Transport for road vehicle kilometres travelled (VKT) for the period between 2012 and 2016.

Figure 4: Annual cyclist trip growth rates

Project	Annual Cyclist Growth Rate
Grafton Gully Cycleway	3.9% ▲
Lightpath and Nelson Street Cycleway	15.9% ▲
Beach Road Cycleway	2.6% ▲
Uni-Cycle	7.0% ▲

User safety consistently considered throughout the delivery process, but opportunities for improvement exist

The 'Planning and Investment Knowledge Base' (PIKB) stipulates that cycling projects require a safety audit procedure be followed[6] to be considered for funding approval. Road safety audit guidance outlines four stages during the project delivery process where such audits should be considered:

- concept stage (part of a business case);
- scheme or preliminary design stage (part of pre-implementation);
- detailed design stage (pre-implementation or implementation); and,
- pre-opening or post-construction stage (implementation or post-implementation).

Based on the scale and nature of the projects included in our sample it is our opinion that road safety audits should have been completed at both the detailed design and pre-opening/post-construction phases. In undertaking a road safety audit at the detailed design phase the risk of incorporating design features that could present a hazard to road users (and/or be costly to rectify once constructed) is minimised. Pre-opening/post-construction road safety audits provide an opportunity to identify/remedy safety hazards that were either not identified earlier in the road safety audit process, or that arose due to unexpected road user behaviour (or design changes made onsite during construction). As illustrated in Figure 5, our road safety audit expectations were met for all completed projects.

Figure 5: Compliance with our road safety audit expectations

Detailed design phase road safety audits completed	Pre-opening/post-construction road safety audits completed[7]
100% ✓	100% ✓

6 Guidance refers to 'Road Safety Audit Procedures for Projects' (NZTA, 2013).

7 Or in the process of being undertaken or finalised.

To gain a cyclists' view of the facilities provided by the UCP we rode each of the sample projects. Overall we consider that the facilities generally felt safe[8] and provided safe[9] corridors for cyclist activity. Figure 6 summarises notable observations relating to safety that should be considered in the design and delivery of future cycling projects. Relevant, but less critical considerations are summarised in Appendix E (in no particular order).

Figure 6: Notable observations made on site pertaining to road user safety

Safe "Roads and Roadsides"	
	Bollards pose an inherent and significant safety risk to cyclists due to their non-frangible nature, and because they can, in some instances, be hard to see. In consideration of the safe systems approach[10], bollards (and staples[11]) should only be used when alternative approaches to restricting vehicular access is not available, and where the safety hazard posed by a vehicle or to vehicle occupants[12] is greater than that of a permanent bollard. We observed a bollard layout on the Passchendaele Memorial walk/cycle path that restricted vehicular access to a shared path facility, while minimising collision risks to vulnerable road users. The layout achieved this by funnelling vehicles through a narrow single lane so that vehicles were not able to make a right angle turn onto the shared path facility. In taking this approach an opening in the line of bollards for the full width of the shared path was possible[13].
	We observed inconsistency in the way cyclists were alerted to bollard hazards. The use of sufficiently sized, spaced and conspicuous bollards in conjunction with the inclusion of white lines to provide cyclists advance warning is considered good practice (where bollards are required). Based on cyclist dimensions in Austroads, it is however suggested that white lines should indicate the safe trafficable area and therefore provide at least 375mm separation from hazards (or more when hazards are located on curves). We note in such instances, additional cycle facility width may be required. Based on cyclist dimensions we also recommend that all facility side furniture (such as fence posts and signs) be located at least 375mm from the edge of the cycling facility to ensure that they do not present an immediate safety hazard.

8 User perceived safety.

9 Actual and likely safety of users.

10 With particular regard to 'safe roads and roadsides'.

11 Staples are staple shaped bollards, effectively comprising a horizontal component linking two bollards.

12 Taking into account the probability of a vehicle being present and the associated risks to both vulnerable road user safety and asset damage.

13 In this example however we do not recommend the use of steel wire ropes which can be hard to see, or the flaring of the shared path prior to the bollard layout.

	Wheels have a tendency to follow the contours of the surface they are on (commonly referred to as 'tramlining'). We noted a number of instances where surface levels (on or directly adjacent to cycle facilities) could expose inexperienced or unwary cyclists to a tramlining risk. Changes in surface level should be located at right angles to a cyclists' actual and expected travel desire line to mitigate such risks. Where this is not possible, we recommend site specific risk mitigation measures be implemented. For examples similar to that illustrated, such measures could include: realignment of the cycle facility, widening of the speed table to provide greater separation between cyclists and the kerb line, and/or the provision of a white line to indicate the safe trafficable area.
	Cycle facilities were found to generally terminate in appropriate locations and with adequate advanced warning ensuring cyclists could make appropriate decisions as to how they might continue on their journey. In two instances cycle facilities were found to terminate abruptly and/or in unsafe locations.
Safe "Road Use"	
	In a number of locations roadside parking was directly adjacent to cycling facilities. In such instances, there is a risk that a car door could open into the path of oncoming cyclist and result in a crash. To minimise this risk, we observed a number of instances where coloured and/or textured surfaces had been applied to encourage cyclists to shy away from the door opening zone. This was observed to be effective and is considered good practice. Similar to the treatment of bollards, an increase in cycle facility width may be required where such treatments are necessary.

	Cycle logo markings were found to provide two functions. They were used to indicate cycle facilities, and they were used to raise awareness to other road users that cyclists may be present. In the illustrated example, cyclists may misunderstand the purpose of logos as indicating the correct riding position, rather than their intended purpose which was to warn vehicles. Such interpretation would put cyclists at greater risk of conflict with those leaving adjacent properties[14]. Care is required in the application of cycle logo markings in such circumstances and an alternative approach should be considered.
	Signalised intersections including cyclist phases were generally found to operate safely. In the illustrated example, however, a cyclist green phase allowed cyclists to come into direct conflict with pedestrians who were also on a green phase (crossing at right angles to the cycle facility). Greater consideration of phasing and the separation of cyclist and pedestrian flows is required where dedicated cycle lanes cross a pedestrian facility.

This review did not include an analysis of cycle crash records due to most projects in the sample having been so recently completed[15] and in consideration of the high under-reporting rates of vulnerable road user crashes.

Projects average 15% over-budget and some opportunities to maximise value for money missed

Project delivery costs were reviewed for a total of eight completed cycling projects. Compared to the approved construction budget, project delivery costs ranged from 17% under-budget to 71% over-budget. Aggregated together, the eight projects had a construction delivery cost $7.8million (14%) over the approved construction budget. When the Lightpath and Nelson Street cycleway, which was 71% over budget, is

[14] Due to reduced visibility at the property boundary and reduced safe stopping distances compared to that afforded when cyclists are positioned on the facility, situated to the right of the concrete channel visible in the photo.

[15] Typically at least five years post-construction crash data is required to undertake meaningful analysis.

removed from the sample, construction delivery costs of the remaining projects were 3% over budget. The variance in approved project budget and actual project delivery costs are illustrated in Figure 7 below.

Figure 7: Approved Budgets and Actual Project Delivery Costs

Project	Approved Construction Budget	Actual Construction Cost	Construction Cost Compared to Approved
Grafton Gully Cycleway	$10.62m	$14.53m	37% ▲
Lightpath and Nelson Street Cycleway	$9.76m	$16.67m	71% ▲
Quay Street Cycleway	$2.18m	$2.47m	13% ▲
Beach Road Cycleway	$6.13m	$6.42m	5% ▲
Grovetown to Spring Creek	$0.77m	$0.65m	-16% ▼
Passchendaele Memorial walk/cycle path	$1.44m	$1.66m	15% ▲
Papanui Parallel Cycleway (Stages 1 & 2)	$15.83m	$13.86m	-12% ▼
Uni-Cycle	$10.03m	$8.30m	-17% ▼

Following the approval of implementation funding, the Transport Agency generally had limited involvement in project design and delivery. Continued collaboration with approved organisations during these project phases could however provide ongoing opportunities to test value for money. Surfacing the Passchendaele Memorial walk/cycle path with asphalt instead of a chipseal surface, for example, is likely to have increased construction costs significantly while only marginally improving project outcomes. Similarly, we consider that the design of the Stage 3 Glen Innes to Meadowbank cycleway does not reflect value for money principles. In summary this project involves the construction of a new timber boardwalk, 600m long, directly adjacent to an existing timber boardwalk in an estuary. The new structure, founded on fixed piles, has been designed so the decks of the two structures are positioned at the same height[16], in taking this approach:

- parts of the new super-structure are already below the high-tide water mark, likely reducing the structure's service life (impacts which could be exacerbated by impacts associated with climate change); and,
- the existing boardwalk will also receive a new deck to tie in with the new boardwalk, despite the existing deck appearing to be in perfectly sound condition.

[16] Rather than the new boardwalk having an increased height.

3. Good Practice Identified

This section captures good practice activities relevant to future cycle facility projects. The items included in this section are predominately based on lessons learnt by project delivery personnel.

To maximise cyclist safety construct intersections first, then links

Project managers commented that cyclists were often found using cycling facilities prior to construction being completed. To accommodate early adopters safely, they stated that intersection treatments should be delivered prior to the provision of the links in between. Where there is a desire to deliver projects in phases, the risks posed by non-continuous facilities, and the adverse impacts on economic returns[17] should be considered.

Dedicated design teams help concentrate cycle facility design expertise

One approved organisation had two dedicated cycle facility design consortia on longer-term contracts. This approach to delivering cycle facilities enabled the concentration of cycle facility design expertise and the rapid and successful integration of evolving design best practice and lessons learnt. In addition, this approach enabled the approved organisation to utilise the two well-experienced design teams to undertake design review work for each other and support greater consistency between cycle facilities.

Parks and reserves contractors may have more appropriate maintenance gear then roading contractors

Maintenance activities on one cycle facility were undertaken by an approved organisation's parks and reserves contractor. In the case of this facility, such arrangement were well considered due to the contractor's appropriately sized plant and expertise, and the light construction of the facility. We note that maintenance activity must meet temporary traffic management expectations and be recorded in accordance with general funding assistance requirements.

Off the shelf bridge designs reduce project delivery costs

For one cycle facility, project personnel utilised pre-existing bridge designs and applied the same bridge design at multiple stream crossings. This approach reduced facility design costs, and will have simplified construction efforts while simultaneously having simplified future maintenance activities (due to reduced variation in assets).

[17] Economic returns are not maximised where investment activity occurs well in advance of investment benefits being achieved.

4. Consideration for Future Projects

This section outlines suggestions that may support improved delivery of future cycle facility projects that have not already been highlighted in the sections above.

Improve the richness of cyclist count and survey data to assist future network planning

All new cycle facilities had cycle count data. Some provided an added significantly more detailed analysis of project outcomes that could help inform future projects. For example, one survey counted not only the number of cyclists on the new facility, but also on the adjacent footpath and road. This information can stimulate and support detailed analysis of a facility where the proportion of cyclists using the facility is higher or lower than expected. One approved organisation surveyed cyclist displacement to understand where new cyclists had come from. Knowing where cyclists have come from provides a valuable understanding of not only the success in attracting existing cyclists, but also the projects 'zone of influence'. The zone of influence can assist future cycle network planning (for example through providing a better understanding of possible spacing requirements between parallel cycling routes). This approach could be enhanced by collecting the same survey data for existing parallel routes (including those with no cycle facilities). Understanding cyclist activity on parallel routes would remove sampling bias, and provide and highlight whether the new facility has resulted in cyclist displacement away from the new facility (which can occur with some cyclist user types in certain instances).

Understanding pedestrian use will support appropriate activity management

Levels of service afforded to pedestrians and cyclists on shared use facilities will depend not only on the physical characteristics of the facility, but also on pedestrian and cyclist user numbers and type, and the proportion between travel modes. To appropriately manage a facility for the activity, an understanding of both activities is required.

Don't delay the opening of completed cycling facility sections (where possible)

While not included in the scope of this review, we found a new cycling facility that had been significantly completed but was unavailable to cyclists. Only very minor temporary measures would have been required to open significant sections of this facility. In doing so, early returns from investment would have been gained through more immediate use.

Bollards to prevent vehicular access should be avoided wherever possible

We encountered a number of instances where bollards and staples were placed on a facility presumably to prevent vehicular access. While preventing vehicular access will be required in some instances, the placement of bollards on a cycle facility does not comply with the safe systems approach to ensure 'safe roads and roadsides'. With specific regard to the New Zealand Road Code cyclists are not required to use

front lights that illuminate the path in front of them[18], with even good reflective strips bollards can therefore pose a significant hazard to cyclists. Wherever possible alternative means to prevent vehicular access should be thoroughly considered and bollards should only be used as a last resort.

Improved connectivity considerations could help increase cyclist numbers

Cyclist user numbers were likely restricted on some facilities due to the suitability of their connections with the wider transport network. In some instances cycle facilities started/ended on arterial roads where 'interested but concerned' cyclists would likely be deterred. Facilities catering for less confident cyclists should start/end in locations where a suitable environment is provided for such cyclists. Additionally, facilities should provide suitable connections to mid-route destinations. For example, cycle lanes adjacent to busy urban areas did not always provide suitable opportunity for cyclists to leave a facility to connect with a mid-route destination without risking conflict with either cyclists or pedestrians.

Traffic signal heads need to be appropriately sized or located to be visible

We encountered at least one instance where the length of the intersection crossing made it difficult to see the cycle signal head on the opposite side of the intersection. Signal heads should be appropriately sized and/or located to ensure visibility to cyclists.

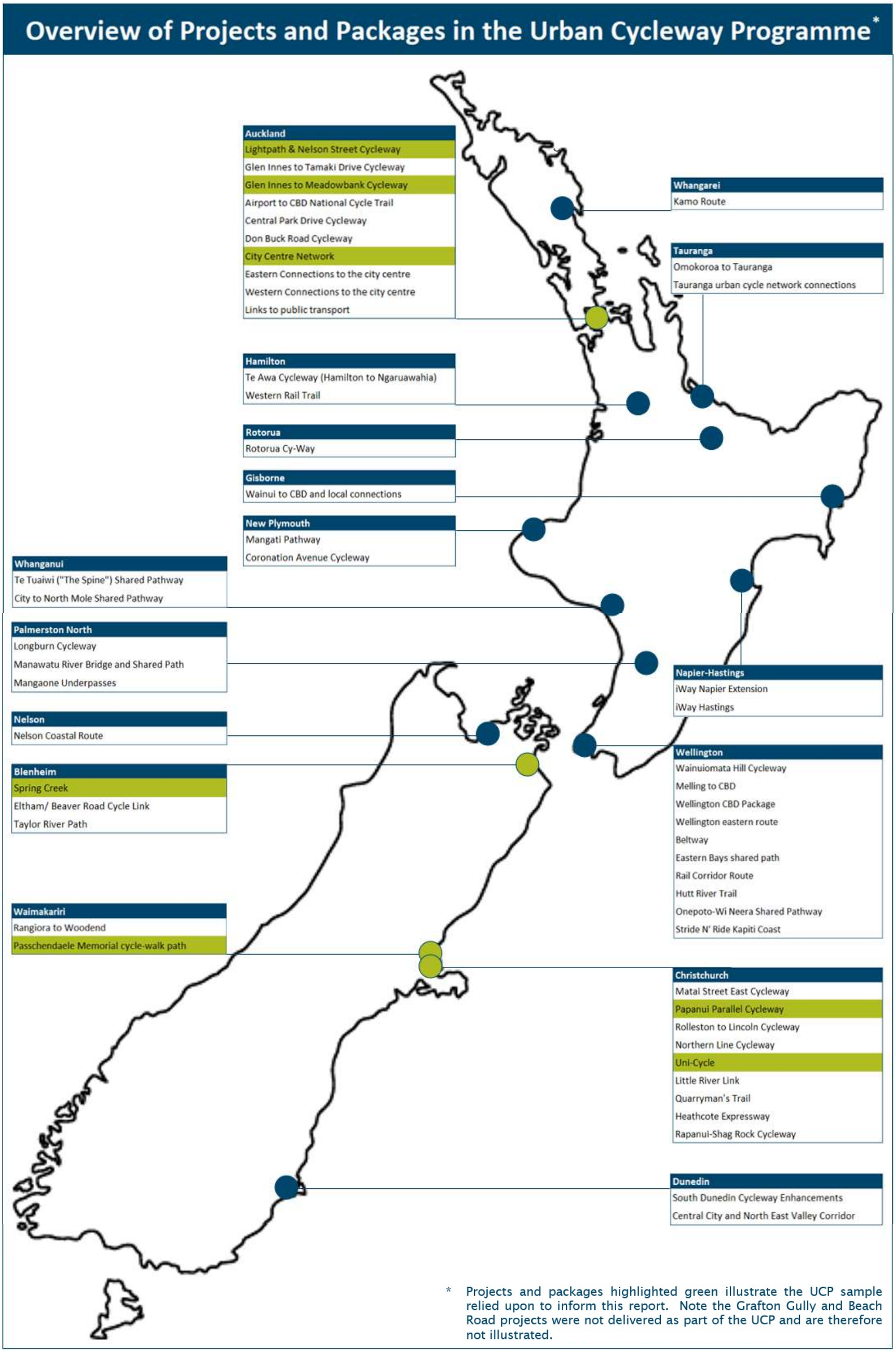
Future maintenance considerations

While maintenance regimes were not examined as part of this review it was discussed in a number of instances. Where approved organisations are relying on 'customer complaints' to fulfil the needs of regular routine inspections, we recommend customer service phone numbers or QR codes[19] be displayed at suitable intervals to improve the likelihood and ease of such reporting. In any case, we recommend that cycle facilities be inspected at least annually, with consideration also being given to undertaking an inspection at night.

[18] The Road Code only requires that "headlights that can be seen at night from a distance of 200 metres".

[19] Linked to a website 'customer complaint' form for that particular cycleway.

Appendix A –Location of UCP Projects/Packages



Progress of UCP Projects/Packages (as at July 2018)

Project Name	Phase	Organisation	Estimated Construction Start	Estimated Construction Completion
Kamo Route	Construction	Whangarei District Council	18 Dec 2017	30 Jun 2019
Don Buck Cycleway	Complete	Auckland Transport	–	–
Airport to CBD	Complete	Auckland Transport	–	–
Central Park Drive	Complete	Auckland Transport	–	–
Nelson St Cycleway	Complete	Auckland Transport and NZTA	–	–
City Centre Network	Construction	Auckland Transport	12 Mar 2016	30 Sep 2019
Western Connections to City centre	Construction	Auckland Transport	1 Feb 2017	14 Dec 2020
Eastern Connections to City centre	Construction	Auckland Transport and NZTA	16 Sep 2017	30 Jun 2021
Glen Innes to Meadowbank	Complete	Auckland Transport and NZTA	–	–
Links to public transport	Construction	Auckland Transport	13 Mar 2018	30 Mar 2021
Western Rail Trail	Complete	Hamilton City Council	–	–
Te Awa	Complete	Te Awa Trust	–	–
Omokoroa to Tauranga	Construction	Western Bay of Plenty District Council	5 Aug 2016	30 Jun 2019
Tauranga urban CBD connections	Complete	Tauranga City Council	31 Dec 2015	30 Jun 2018
Wainui to CBD and local connections part 1	Construction	Gisborne District Council	31 May 2018	30 Jan 2019
Rotorua Cy-Way	Construction	Rotorua Lakes Council	30 Apr 2016	30 Jun 2019
iWay Napier extension	Construction	Napier City Council	4 Apr 2016	30 Jun 2019
iWay Hastings extension	Construction	Hastings District Council	14 Nov 2015	30 Jul 2018
Mangati Pathway – Parklands Ave to Coastal Path	Complete	New Plymouth District Council	–	–
Coronation Ave – Upjohn St to Coronation Ave (SH3)	Complete	New Plymouth District Council	26 Feb 2018	15 Jun 2018
Te Tuaiwi ("The Spine")	Construction	Wanganui District Council	8 Feb 2017	30 Sep 2018
City to North Mole Cycleway	Construction	Wanganui District Council	15 May 2016	30 Jun 2019
Manawatu River Bridge and shared path	Construction	Palmerston North City Council	9 May 2016	30 Apr 2019
Mangaone Underpasses	Complete	Palmerston North City Council	–	–
Longburn Cycleway	Complete	Palmerston North City Council	–	–
Rail Corridor Route	Construction	Upper Hutt City Council	25 Oct 2016	30 Jun 2019
Seal and Widening Hutt River Trail	Construction	Upper Hutt City Council	17 Oct 2016	31 Dec 2018
Beltway	Design	Hutt City Council	1 Sep 2018	30 Jun 2019
Eastern Bays shared path	Design	Hutt City Council	1 Jul 2018	30 Jun 2019
Wainuiomata Hill	Construction	Hutt City Council	24 Nov 2017	30 Jun 2019
Stride n' Ride Kapiti Coast	Complete	Kapiti Coast District Council	14 Dec 2016	30 Jun 2018
Onepoto – Wi Neera shared path	Design	Porirua City Council	20 Jul 2018	30 Jun 2019
Melling to Petone	Design	NZTA	30 Apr 2018	TBC – beyond 30 Jun 2021
CBD route package	Complete	Wellington City Council	–	–
Eastern Route package	Construction	Wellington City Council	4 Sep 2017	30 Sep 2019
Ngauranga to Bunny St	Construction	Wellington City Council	17 Oct 2016	30 Sep 2018
Spring Creek	Complete	Marlborough Roads	–	–
Taylor River Reserve	Complete	Marlborough District Council	–	–
Eltham Rd Cycle Link	Construction	Marlborough District Council	16 Apr 2018	31 Aug 2018
Nelson Coastal Route	Construction	Nelson City Council and NZTA	8 Feb 2018	30 Jun 2020
Papanui Parallel – Stage 1	Complete	Christchurch City Council	–	–
Matai Street East	Complete	Christchurch City Council	–	–
Rapanui – Shagrock Cycleway	Complete	Christchurch City Council	24 Oct 2016	30 Jun 2018
Heathcote Expressway	Construction	Christchurch City Council	8 Jan 2018	31 Dec 2018
Papanui Parallel	Complete	Christchurch City Council	–	–
Northern Line Cycleway	Design	Christchurch City Council	On Hold	
Little River Link City End	Complete	Christchurch City Council	–	–
Quarryman's Trail	Construction	Christchurch City Council	2 Oct 2017	31 Jul 2018
Uni-Cycle	Complete	Christchurch City Council	–	–
Rolleston to Lincoln	Complete	Selwyn District Council	–	–
Rangiora to Kaiapoi – including Southbrook links	Complete	Waimakariri District Council	–	–
Rangiora to Woodend	Complete	Waimakariri District Council	1 Oct 2017	23 Jun 2018
Central City Cycle Network	Construction	Dunedin City Council and NZTA	26 Dec 2017	DCC – 20 Dec 2018 NZTA – 30 Oct 2019
South Dunedin Cycleway Enhancements	Complete	Dunedin City Council	–	–

Audit & Assurance

Urban Cycleways Programme Post Implementation Review

Terms of Reference **March 2018**

Background and Purpose

Funding for urban cycleway projects has increased substantially in recent years with the Urban Cycleways Programme. Introduced by the previous government in 2014, this programme injected $100m additional government funding into cycling investment over 2014-18. Combined with local government and NLTF funding contributions, this increased investment has been directed into a $333 million programme of 54 urban cycling projects around the country.

Construction of around one-third of the cycling projects in the programme has been completed. With increased investment in cycling infrastructure expected to continue under the current government, it is timely to evaluate how well completed projects are delivering their expected benefits. This evaluation can also help identify opportunities to facilitate better outcomes from future projects.

Scope and Objectives

Objectives

The objectives of this review are to:

- Assess the extent to which a sample of completed cycleways have achieved their expected benefits and been constructed to good practice standards,
- Explain any variation between actual results and expected benefits and costs, and
- Identify lessons learned and examples of good practice or innovation which can be applied to improve future projects.

Scope

The review will specifically cover:

- Benefits realisation evaluation – especially with how well the actual number of cyclists (and pedestrians with shared paths) compare with predicted user numbers.
- Safety and user-friendliness of cycle/path facilities – how well provided facilities are safe, comfortable, and intuitive to use. Any available CAS crash records will be analysed and reported for safety assessment as required. (However, it should be noted it is likely there will be minimal crashes recorded due to significant under-reporting associated with cycle crashes unless Police attend.)
- How well facilities and infrastructure have been constructed, promoted and maintained to ensure capital investment provides long term benefits and best meet users' needs.
- Project delivery costs – assurance over prudent expenditure; comparison of actual against budgeted costs, with explanation of significant variances.

- General commentary on progress of the Urban Cycleways Programme, including number of projects completed to date, and status of remaining projects in programme.

The following aspects are excluded from the review's scope:

- Non-infrastructure deliverables (for example: education programmes)
- Procurement processes
- Cycle trails
- Impact of cycleways on modal transfer & user views

Risks & Opportunities

The following key risks and opportunities were identified during the planning phase. These will be reviewed and updated as required during the course of the review.

Risks

- Actual usage of completed cycleways may be significantly below what was predicted in their funding applications. Closely related to this, there may be insufficient monitoring of actual usage numbers for this review to fully evaluate benefits realisation.
- Lack of suitable maintenance of completed cycleways may be found, reducing their levels of service provided. This could reduce both the long-term benefits derived from capital investment and present safety issues for cyclists (and pedestrians).
- Non-adherence to Austroads standards and guidance for cycleway infrastructure may be identified.
- Significant variation in costs and standards for cycleway facilities targeting similar cyclist numbers and user type may be identified (i.e. lack of consistent cost effectiveness across the wider Urban Cycleways Programme).
- Actual project costs for constructing cycleways may be significantly higher than budgeted.

Opportunities

- Analysis of project costs against standard of facilities may assist with identifying cost-effective treatments which can be applied to future projects, leading to overall programme cost savings.
- The provision of cycle facilities which are both safe and pleasant to use maximise the opportunity to attract users and maximise project benefits.
- Innovative and/or cost effective approaches may be identified in individual cycleway projects which should be disseminated wider as good practice.

Approach

The following methodology will be used for the review:

1. Sample selection

A sample of completed projects has been selected, mostly from the whole Urban Cycleways Programme (Appendix 1).[20] A total of eight cycleway projects will be reviewed, as summarised in Table 1 below.

The general approach for selecting a sample was to try and get coverage across different regions, infrastructure type (lanes and shared paths), targeted benefits/outcomes, and value of investment. The ability to tightly follow this approach has been constrained by significant and relatively widespread delays with construction of projects included in the Urban Cycleways Programme. As of February 2018, 19 (35%) of the 54 projects had been completed. Furthermore, problems with pre-construction planning and consultation have resulted in significant delays in particular regions. Most notable is Wellington region, where construction for nine out of the ten projects in the programme has not started. The proposed sample is therefore concentrated in Auckland and Christchurch.

Table 1: Proposed sample of completed projects to review

Project	Approved Organisation	Estimated cost	Comments regarding inclusion in sample
1. **Lightpath and Nelson Street Cycleway**	Auckland Transport and NZ Transport Agency	$11.0m	These four projects connect to each other to effectively form a loop circuit around the Auckland CBD. They therefore provide network connectivity through a mix of dedicated on-road cycle lanes and off-road cycleways.
2. **Quay Street Cycleway**	Auckland Transport	$2.2m	
3. **Beach Road Cycleway**	Auckland Transport	$7.1m	
4. **Grafton Gully Cycleway**	NZ Transport Agency	$14.9m	
5. **Glen Innes to Meadowbank Cycleway**	Auckland Transport	$7.5m	Suburban connection
6. **Passchendaele Memorial cycle-walk path (Rangiora to Kaiapoi**	Waimakariri District Council	$1.1m	Semi-rural/provincial facility
7. **Papanui Parallel Cycleway (Stages 1 & 2)s**	Christchurch City Council	$14.8m	Suburban to city connectivity. Aimed at attracting range of users.
8. **Uni-Cycle**	Christchurch City Council	$7.1m	Seeks to connect main education sites (uni & high schools) and attract school and uni students

[20] The Beach Road and Grafton Gully Cycleway projects were not part of the Urban Cycleways Programme but are included because of their direct connectivity to the Nelson and Quay Street projects.

2. **Project documentation review**

   Desktop review of project data sourced from relevant approved organisations, Transport Agency databases and project webpages. The review will concentrate on:

   - Cyclist user numbers anticipated during the design phase
   - Actual cyclist user numbers achieved (post-construction counts)
   - Road safety audit reports
   - Route length & width data (detailed design plans)
   - Construction cost data
   - Maintenance and inspection plan
   - Lessons learnt reviews

3. **Visit selected cycle facilities and travel by bike to obtain an unbiased view of facility.**
4. **Interviews with project delivery and area maintenance management and staff.**
5. **Analysis of findings and development of recommendations.**
6. **Reporting.**

Other Associated Reviews

A separate post implementation review of the Gisborne 'Wainui to CBD and local connections' project (stage 1) was completed as part of the 2016/17 assurance programme. This project is part of the Urban Cycleways Programme.

Sign off

The terms of reference have been agreed:

Review Sponsors: Sarah Downs
Portfolio Manager, Design Portfolio 2, Regional Development

Jenny Fildes
Practice Manager Audit & Assurance

Appendix C – Project Evaluation Summary Tables

The following tables capture performance data relating to the individual projects reviewed.

Project	Supported by a Wider Cycling Strategy	Target Cyclist Type	Road Safety Audits Completed for:			Design Standards Review Completed	Safety in Design Review Completed	BCR
			Preliminary Design	Detailed Design	Post Construction Period			
Grafton Gully Cycleway	✓	Basic Competence	✓	✓	✓	✓	✗	3.3
Lightpath and Nelson Street Cycleway	✓	All Confidence Levels	✗	– Only Part of Route	✓	✗	✗	3.3
Quay Street Cycleway	✓	All Confidence Levels	✗	✓	✓	✓	✓	2.1
Beach Road Cycleway	✓	– Not Detailed	✓	✓	✓	✓	✓	1.9
Glen Innes to Meadowbank Cycleway	✓	Commuter & Recreation	✓	✓	✓	✓	✓	3.6 (full project)
Grovetown to Spring Creek	✓	All Confidence Levels	✗	✓	✓	✗	✗	3
Passchendaele Memorial walk/cycle path	✓	Commuter & Recreation	✓	✓	✓	✗	✗	3.5
Papanui Parallel Cycleway (Stages 1 & 2)	✓	All Confidence Levels	✓	✓	✓	✓	✓	3.2
Uni-Cycle	✓	Commuter & Recreation	✓	✓	✓	✓	✓	5.9

Project	Length	Predominant Surfacing Material	Facility Cyclists Only	Approved Construction Budget	Construction Cost Compared to Approved
Grafton Gully Cycleway	1.9km	Concrete	✗	$10.4m	43% ↑
Lightpath and Nelson Street Cycleway	3.5km	Asphaltic concrete	✗	$9.8m	71% ↑
Quay Street Cycleway	1.0km	Concrete	✓	$2.2m	13% ↑
Beach Road Cycleway	1.3km	Concrete	✓	$6.1m	5% ↑
Glen Innes to Meadowbank Cycleway (Stages 1 & 3)	6.75km (full project)	Timber/Concrete	✗	$11.9m	1% ↑
Grovetown to Spring Creek	2.4km	Chipseal	✗	$0.8m	-16% ↓
Passchendaele Memorial walk/cycle path	8.0km	Asphaltic concrete	✗	$1.4m	15% ↑
Papanui Parallel Cycleway (Stages 1 & 2)	5.5km (full project)	Asphaltic concrete	✓	$15.8m	-12% ↓
Uni-Cycle	5.6km	Asphaltic concrete	✓	$10.0m	-17% ↓

Appendix D – Additional considerations relating to levels of service provision

	**Alternating between shared spaces and dedicated cycle lanes can be confusing.** A number of cycle facilities alternated between shared spaces and dedicated cycle lanes. This resulted in a significant number of signs being used to indicate such changes. As new users to such facilities we found such alternating to be confusing, and we observed a significant majority of facility users ignoring them (while still exhibiting safe and courteous behaviour). We recommend greater effort into providing continuous facilities, or using design principles that negate the need for signs or markings to indicate and encourage the desired user behaviour. Additionally we note that the number of regulatory signs fixed to each pole must comply with Traffic Control Devices Manual requirements, if the intended conditions are to be enforceable.
	**Incorrect signage can result in cyclists deviating away from provided facility.** Ensure signage provided is correct for all users. In the example illustrated the road was signed as a 'no exit' for all road users, however onward provision for cyclists and pedestrians was available. Failure to accurately reflect road conditions may result in cyclists and/or pedestrians unfamiliar with the area using alternative parallel routes which may provide a lower level of service, and/or encourage such users to disregard road signs at other locations.
 	**Directional signage can be particularly helpful, especially for tourist routes.** The provision of advanced directional signage (and maps) was observed on a number of routes. Directional signage is considered particularly useful for new cyclists, so would be particularly beneficial on routes that regularly attract new users (such as tourist routes). We noted one instance where intersection layout signage was used, which could be helpful in navigating complex intersections where the use of signage and markings may distract road/facility users. We note that New Zealand directional signage specifcations is due out soon.

	**Designing intersections before construction improves build quality.** Ensure the design of intersection treatments is given thorough consideration prior to the construction phase so that the necessary path width can be provided without the need to provide patches. Patches reduce ride quality and may increase maintenance needs in future.
	**Road markings require sufficient contrast to be effective.** White cycle logo markings situated on light pavements were hard to see, particularly when faded. Consideration should be given to colour contrasting to maximise marking visibility.
	**Minimise cyclist delay at signalised intersections to provide improved levels of service.** Where cyclists are required to cross two legs of an intersection in order to continue along a cycle facility, the green phases for cyclists on each leg should be coordinated so minimise delay and ensure cyclists only need to wait once. Additionally, when cyclists call a cycle crossing phase, a green phase should be provided within the current signal phasing cycle (and have a wait time of no longer than 120 seconds). This reduces delay to cyclists, minimising the risk that cyclists cross an intersection during a red phase either due to frustration, or cyclists considering that there is an error/fault with the phase call button.

Appendix E - Additional considerations relating to safety

	**Avoid layouts that encourage pedestrian and cyclist conflict.** Where pedestrians and cyclists are segregated, care should be taken to avoid the 'flipping' of pedestrian and cyclist alignments. Flipping alignments introduces conflict as users are required to cross the path of one another. For example, in the situation illustrated, pedestrians and cyclists were required to swap sides within the traffic island (from left to right and vice versa) in order to comply with the indicated markings. In some instances this can result in high levels of non-compliance, and due to some users complying and others choosing not to comply, this can create conflict and frustration between pedestrian and cyclist users.
	**Forward visibility, operating speeds, and slippery surface risks require consideration.** Additional design consideration may be required on south facing slopes where the lack of sun, dampness and insufficient tracking create opportunities for moss/mould growth that can result in slippery surfaces. Such design considerations could include improved vegetation control/removal, increased maintenance activity (particularly during winter months when such build up is more likely) or surface considerations such as the use of unbound materials. Prolonged and steep downhill sections can result in significant cyclist speeds. Consideration of forward visibility requirements is required, particularly given that many cyclists will take the straightest line available through bends. With the increasing prevalence of electric bicycles, there is an increasing likelihood of uphill cyclists also travelling quickly. The combined speed of cyclists approaching one another could therefore conceivably be in excess of 60km/hr. A crash at this speed would likely be very significant. Adequate forward visibility will also reduce the probability of cyclists misinterpreting a cycle facility's alignment, and unintentionally leaving the facility. We noted one facility where this risk would be significant in low light conditions. At this facility a short extension was provided to give access to a raised viewing platform, which was positioned on the outside of a sharp downhill bend. Positioned on the outside of a bend, and constructed of the same construction materials meant that the viewing platform approach provided the first visual cue of the facility's possible, but incorrect, alignment. Combined with potentially high cycling speeds and limited forward visibility this poses a significant risk to cyclists unfamiliar with the facility (particualrly in low light conditions).

	**Large, high quality delineation devices for night time cyclists can reduce safety risks.** Providing reflective boards to help alert cyclists to hazards such as tight bends and bridge ends is good practice. Consideration could also be given to white edge lines to further assist cyclists avoid hazards at night. In cases where there is a drop off (such as to a water course) consideration should be given to the inclusion of white sighting boards.
 	**Care is required to avoid the placement of furniture that can pose a risk to cyclists.** Kerb blocks installed on cycle lanes to separate cyclists travelling in opposing directions pose an inherent safety risk due to the risk that they may be struck. This risk is particularly pronounced for cyclists who may be passing slower cyclists, and their view to such kerb blocks being obscured by the cyclist in front. The placement of safe hit posts on the kerb blocks will not alleviate this risk and create additional maintenance needs. Additionally design elements should not reduce the available facility width or pose a safety hazard to passing cyclists.
	**Advanced warning signs good practice.** Where the provision of adequate forward visibility is difficult[21] and where the removal of hazards is not possible, the use of advanced warning signs is good practice.

[21] Considering expected and possible cyclist speeds.

	**Design considerations for cycle hold rails.** To reduce cyclist effort to remain stationary while waiting to cross an intersection, it is helpful if the surface adjoining the cycle hold rails is level. Cycle hold rails should be sufficiently set back to ensure front wheels of bicycles are at least 300mm away from the road edge when waiting. Where cyclists need to make tight right angle turns, designers should consider whether the benefit provided by hold rails is greater than the hindrance posed by decreasing the space available (to make the right turn). Consideration is also required to ensure the hold rails do not impede the path of pedestrians.
	**Adequate sign set back required to avoid risk of cyclist collision.** Care is needed to ensure signs and support poles are suitably set back from cycling facilities to mitigate the risk of cyclists striking them.
	**Ensure cycle facility markings meet cyclist expectations.** Caution is required when providing zebra crossings in shared facilities as they may not be expected. To maximise legibility and familiarly to cyclist users the zebra crossing arrangement should follow standard design layouts which include orange globes on both sides of the crossing, an advanced diamond pavement marking and a give way limit line.