Evaluation of the North Brisbane Bikeway Stage 1B

Prepared for Queensland Department of Transport and Main Roads

CDM RESEARCH

Contents

Document history and status

Revision	Date issued	Author	Revision type
1	10/11/2016	C. Munro	Draft-1

Distribution of Copies

Revision	Media	Issued to
1	PDF	Department of Transport and Main Roads

Printed:	10 November 2016
Last saved:	10 November 2016 03:23 PM
File name:	0100 TMR North Brisbane Bikeway Stage 1B Evaluation (Draft-1).docx
Project manager:	C. Munro
Name of organisation:	Department of Transport and Main Roads
Name of project:	Evaluation of the North Brisbane Bikeway Stage 1B
Project number:	0100

Executive Summary

The Department of Transport and Main Roads (TMR) commissioned CDM Research to undertake an evaluation of North Brisbane Bikeway Stage 1B, which opened in late September 2016 and extends over a distance of around 920 m from Federation Street, Bowen Hills to Somerset Street, Windsor. The project cost was around $3.52 m.

Two fieldwork activities were undertaken to obtain input data for the evaluation:

- video-based manual counts classified by mode, direction of travel and time of day over a sequential 7-day period (Saturday 8 October 2016 to Friday 14 October 2016), and
- intercept surveys with bikeway users undertaken over three weekday AM periods and two weekend days.

The data was input into a cost-benefit analysis to estimate the monetary project benefits. The key results of this evaluation were as follows:

- Average daily traffic on the path at Somerset Street of around 360 bicycle riders and 70 pedestrians.
- The intercept surveys suggested that more than 90% of transport bicycle riders and 78% of recreation riders had diverted from other routes. Around 17% of recreation cycling trips would not have occurred in the absence of the bikeway, and 6% of transport cycling trips would otherwise have been made by public transport. There has been negligible shift from car travel. Around 30% of walking trips would not have occurred in the absence of the bikeway.
- The average cycling trip for recreation was reported as being about 30 kilometres, compared to 10 kilometres for transport trips. The average recreation walking trip was 4 kilometres.
- The main transport cycling trips were from Woolowin, Wavell Heights, Nundah, Luttwyche and Kedron to the Brisbane CBD (23% of weekday AM period transport cycling trips). The most common source of recreation cycling trips was Windsor (14%), The Gap (8%) and Ashgrove (6%). Unsurprisingly, most walking trips started and/or finished in Windsor (62%).
- Respondents reported varying changes in the amount of time they'd spent riding or walking because of the bikeway. Around 83% of transport bicycle riders indicated the amount of riding they had done had decreased, presumably because the bikeway provided a more direct route to the alternative road routes. Even among recreation riders more (44%) indicated the bikeway had reduced the time they'd been riding compared to increasing it (22%). However, among recreation walkers more had increased their walking duration (37%) than decreased it (26%).
- If they could not have ridden around two thirds of recreation riders (62%) would not have travelled. Among those riding for transport most would have used a train (47%) or bus (26%) with a further 18% driving a car.

- More than four fifths of path users travelling for transport had a motor vehicle available for their trip, with more bicycle riders indicating driving would have taken longer (39%) than less time (26%) than riding.
- Just under two thirds of path users travelling for transport could have used public transport, with most saying it would have either taken the same time or longer than riding.
- The cost-benefit analysis suggests the project represents good value for money; the BCR for the central discount rate of 7% was around 2.5. The benefits accrued primarily from health benefits for bicycle riders who would not otherwise have travelled, or would otherwise have used public transport. These benefits significantly outweigh the injury disbenefits.
- The surveys would suggest there is a travel time benefit to bicycle riders in using the bikeway which is not accounted for in the cost-benefit analysis. This would further enhance the BCR.
- The counts and surveys were undertaken several weeks after the opening of the bikeway, such that we would expect demand to grow over time. Furthermore, proposed future sections of the bikeway farther north would be expected to increase demand above what has been assumed in this evaluation.

1 Introduction

1.1 Background

CDM Research was commissioned by the Queensland Department of Transport and Main Roads (TMR) to undertake an evaluation of North Brisbane Bikeway Stage 1B, which opened in late September 2016 and extends over a distance of around 920 m from Federation Street, Bowen Hills to Somerset Street, Windsor. The project cost around $3.52 m.

1.2 Methodology

This evaluation adopted a cost-benefit analysis (CBA) methodology as developed previously for TMR (CDM Research 2016). The CBA tool is implemented online[1]. The methodology requires a number of inputs, of which the most important are:

- average daily pedestrian and cyclist counts,
- average distances walked/ridden, and
- diversion rates and induced travel proportions.

The latter refer to the proportion of demand that:

- was already walking/riding before the project, and have changed their route to use the project,
- have diverted from other transport modes (e.g. private car, public transport), and
- all-new trips that would not have otherwise occurred in the absence of the project.

In order to obtain these input parameters two fieldwork activities were undertaken:

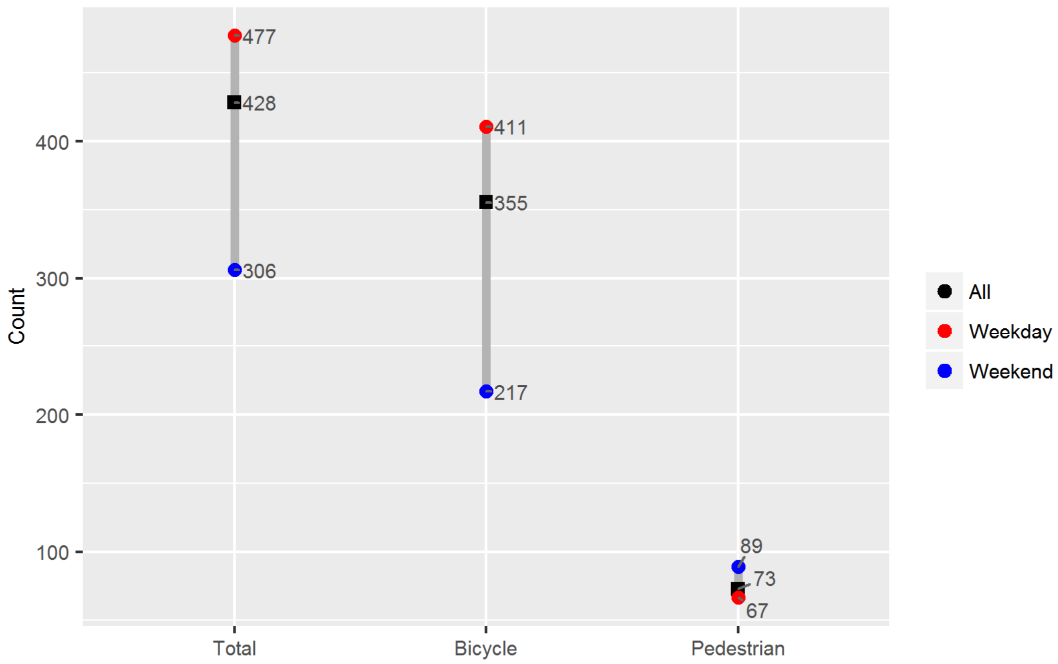
1. video-based manual counts classified by mode, direction of travel and time of day from 5 am to 7 pm between Saturday 8 October 2016 and Friday 14 October 2016 at the Somerset Street crossing, and
2. intercept surveys with bikeway users undertaken between 6 am and 9 am on Wednesday 19 October to Friday 21 October 2016, from 7 am to 10 am on Saturday 22 October and 2:30 pm to 5:30 pm on Sunday 23 October 2016.

This report first presents the summary data obtained from the fieldwork activities before then providing the output of the cost-benefit analysis.

[1] https://cdmresearch.shinyapps.io/ActiveTravelBenefits/

2 Counts

The average daily count at the Somerset Street crossing over the seven-day count period was 428 users per day[2], of which 83% were bicycle riders (Figure 2.1)[3]. Average cyclist demand was higher on weekdays than weekends, and pedestrian demand was highest on weekends.

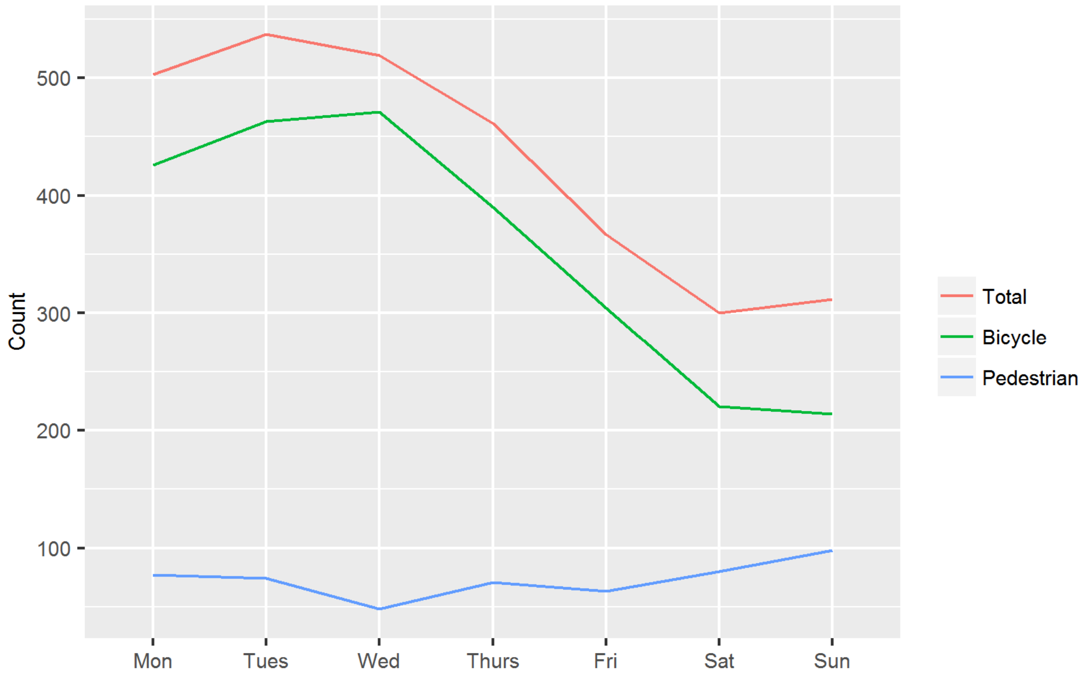


■ **Figure 2.1: Average count by mode and day of week**

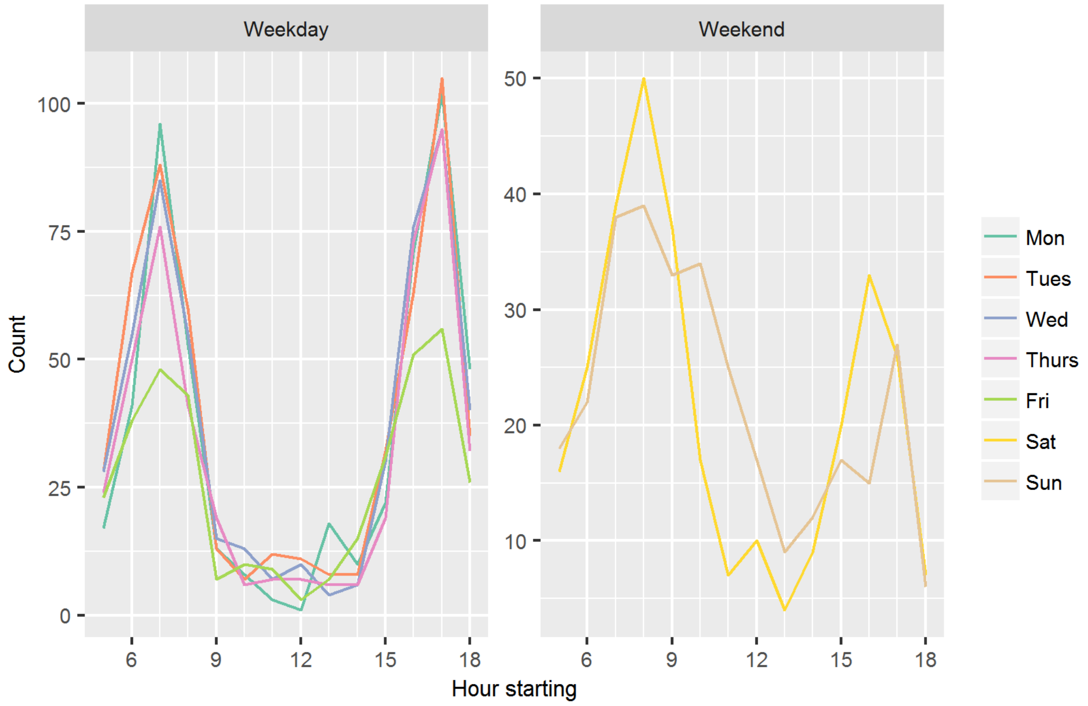
The counts by day of week fluctuated markedly, as shown in Figure 2.2. The pedestrian count varied from a low of 48 on the Wednesday to a high of 98 on the Sunday. The bicycle rider count was lowest on the Sunday (214 riders) and highest on the Wednesday (471 riders). The time of day profile suggests demand is strongest early on weekday mornings and in the afternoons (Figure 2.3). Cyclist demand on both weekdays and weekends is highest during the early morning and late afternoon, while pedestrian demand is highest in the late afternoon (Figure 2.4).

[2] Note the counts were from 5 am to 7 pm, or 14 hours such that they do not correspond to a 24-hour day. Full 24-hour counts may be of the order of 10% higher.

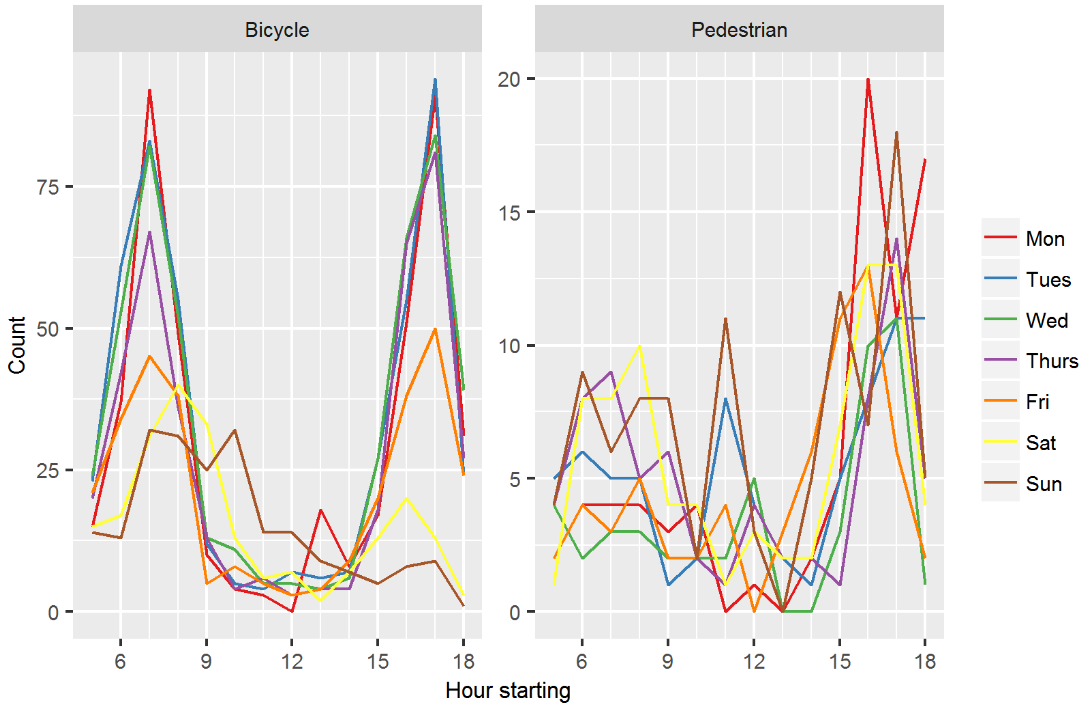
[3] By comparison, demand farther south at Bowen Park during October 2015 was 300 bicycle riders and 50 pedestrians. This is suggestive of strong growth in usage of the bikeway as it has been extended north.



■ **Figure 2.2: Day of week by mode**



■ **Figure 2.3: Time of day by day of week (hourly bins) for all modes**

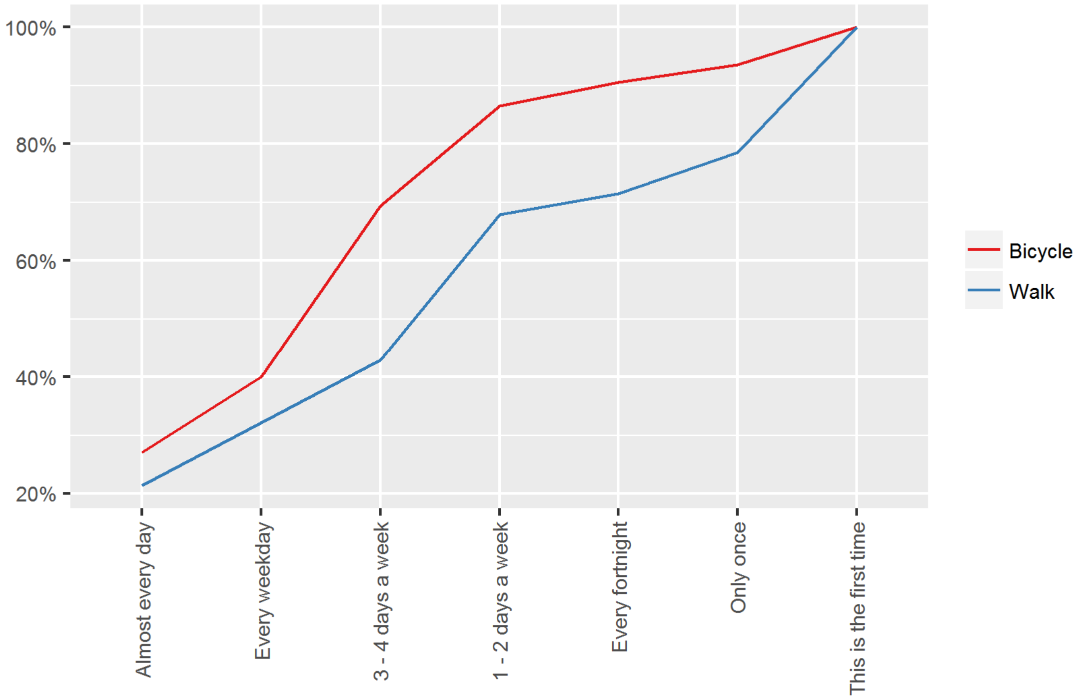


- **Figure 2.4: Time of day by day of week and mode (hourly bins)**

3 Intercept surveys

Intercept surveys were conducted with bikeway users between Wednesday 19 October and Sunday 23 October 2016. A total of 198 complete interviews were obtained, of which 170 (86%) were bicycle riders and the remaining 28 (14%) were pedestrians.

Familiarity with the path is high; 86% of bicycle riders and 68% of pedestrians indicated that they use the path at least once a week (Figure 3.1). Bicycle riders appear to use the path more frequently than pedestrians. Almost all bicycle riders (98%) and most pedestrians (89%) were aware the path was new.



- **Figure 3.1: Cumulative frequency of use by mode[4]**

All bicycle riders on weekends were travelling for fitness or recreation, compared with 29% of weekdays (Figure 3.2). By contrast, 60% of pedestrians on weekdays were travelling for recreation increasing to 94% of weekends.

[4] The proportions here are cumulative frequencies from most often to least often usage.

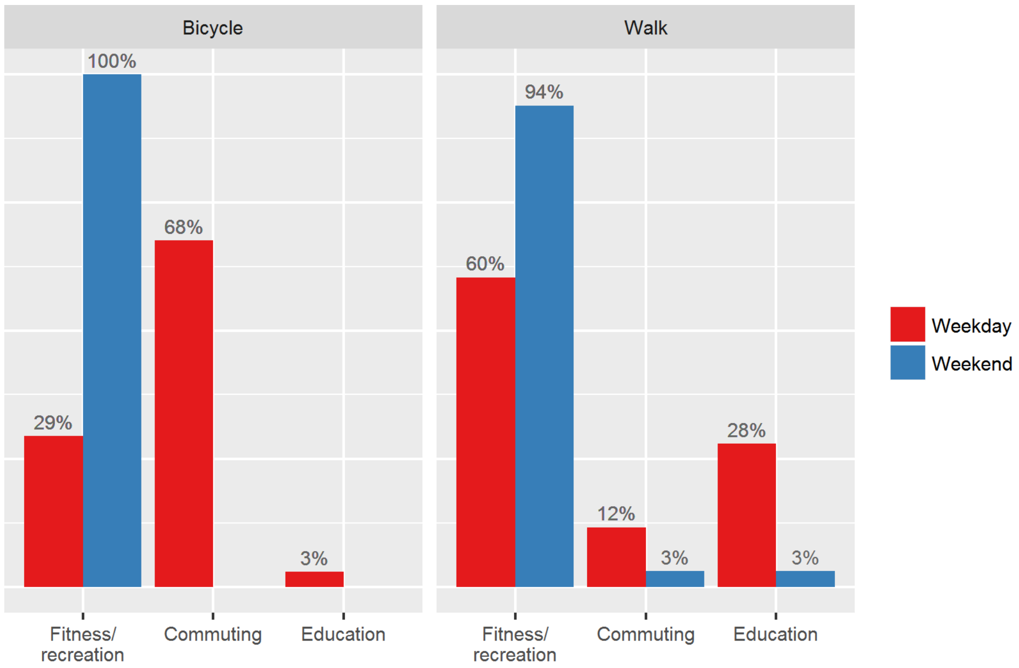
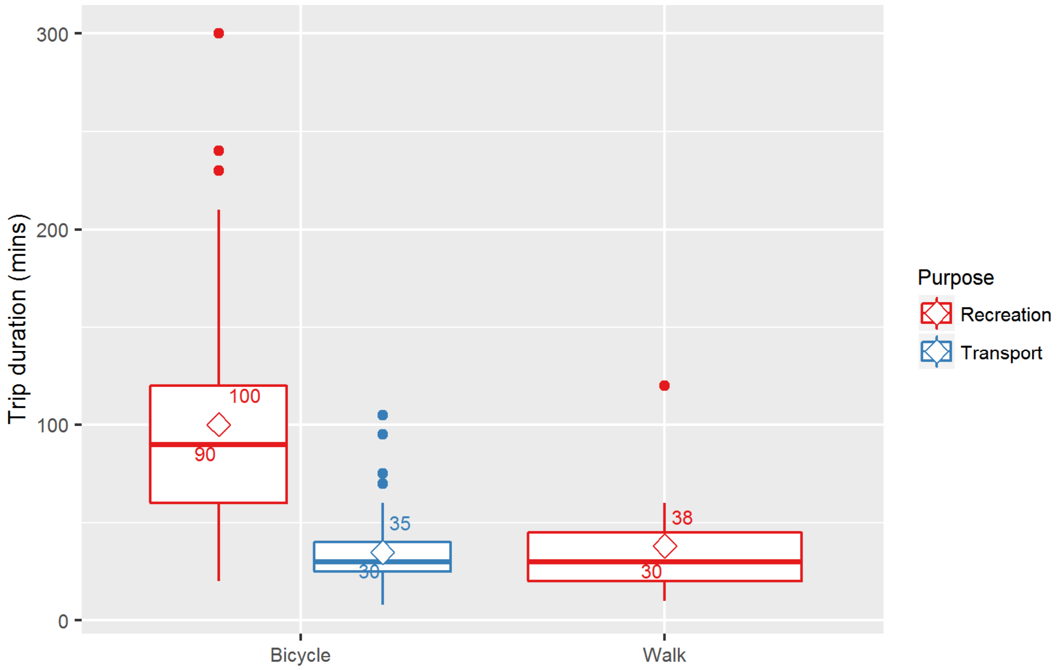


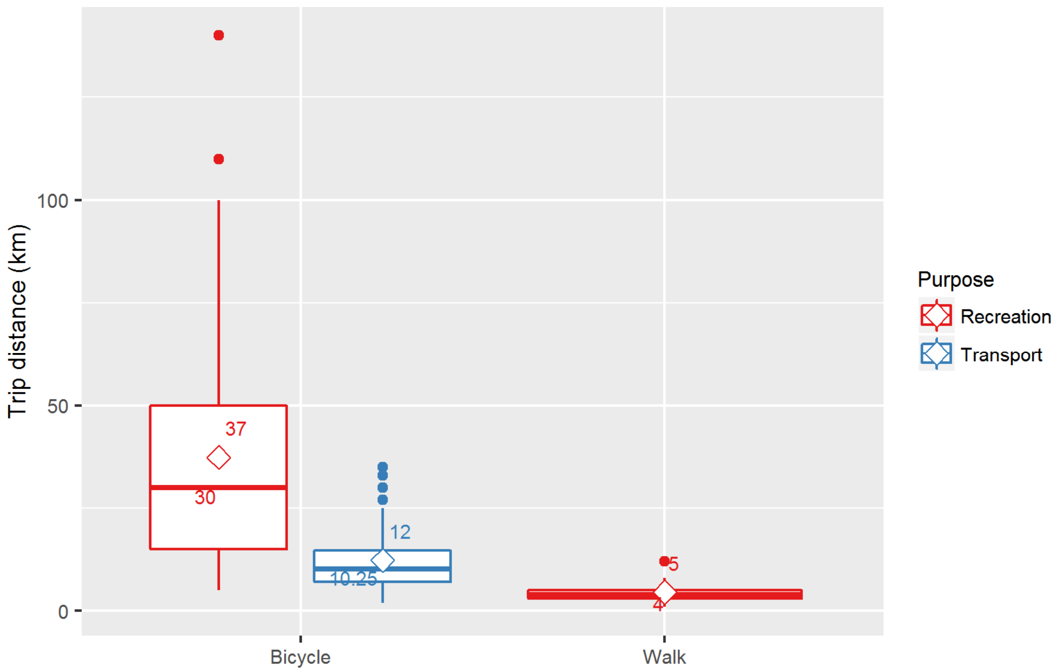
Figure 3.2: Trip purpose by mode and day of week

The average bicycle trip for recreation had a duration of 100 minutes (Figure 3.3) over 37 kilometres (Figure 3.4). Transport cycling trips were shorter, with an average duration of 35 minutes over 12 kilometres[5]. Walking trips for recreation lasted on average 30 minutes over 4 kilometres. There were only five walking for transport trips, so trip distances and durations are not reported for this group.

[5] The overall average cycling trip distance of 19.9 km was remarkedly similar to that observed during intercept surveys undertaken at Bowen Park in October 2015, where the average cycling trip distance was 19.3 km.



■ **Figure 3.3: Trip duration by mode and purpose**

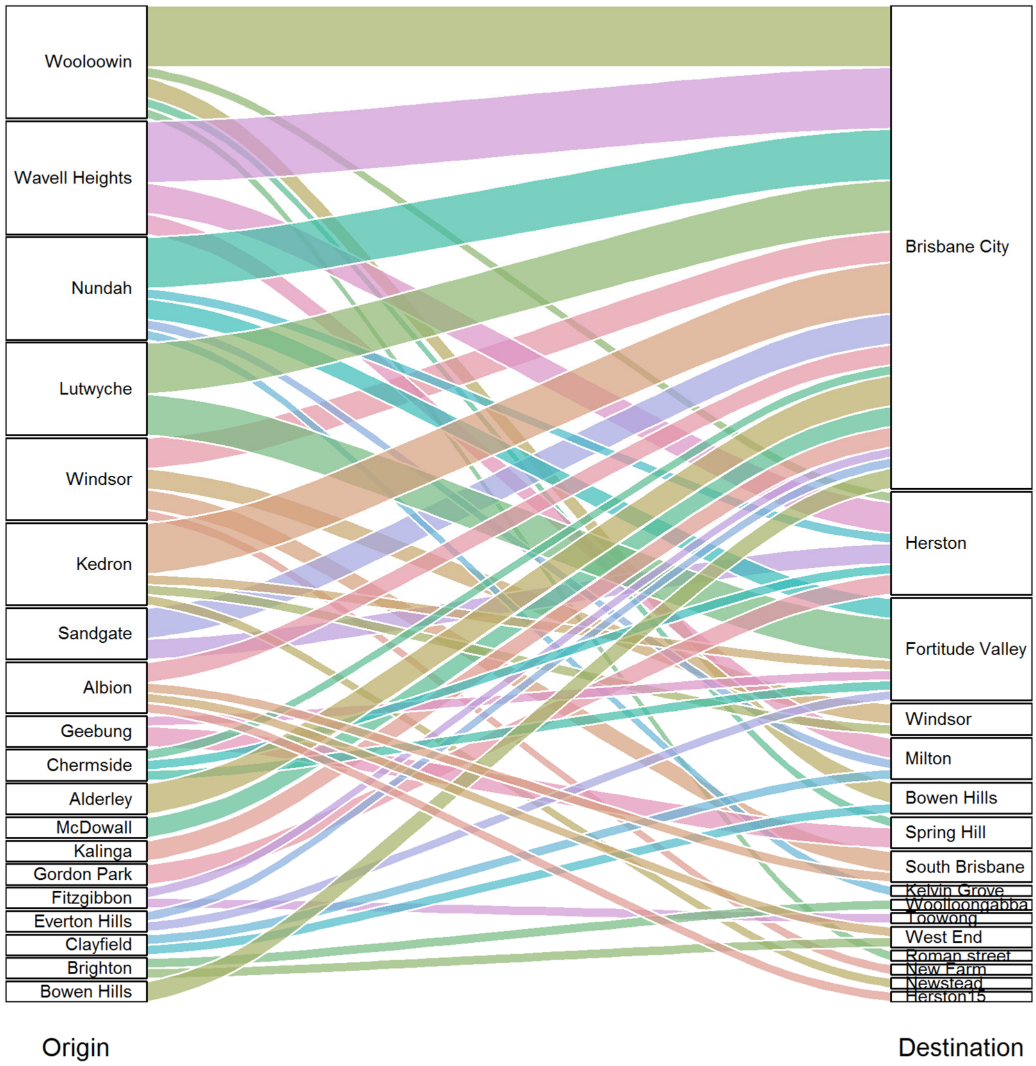


■ **Figure 3.4: Trip distance by mode and purpose**

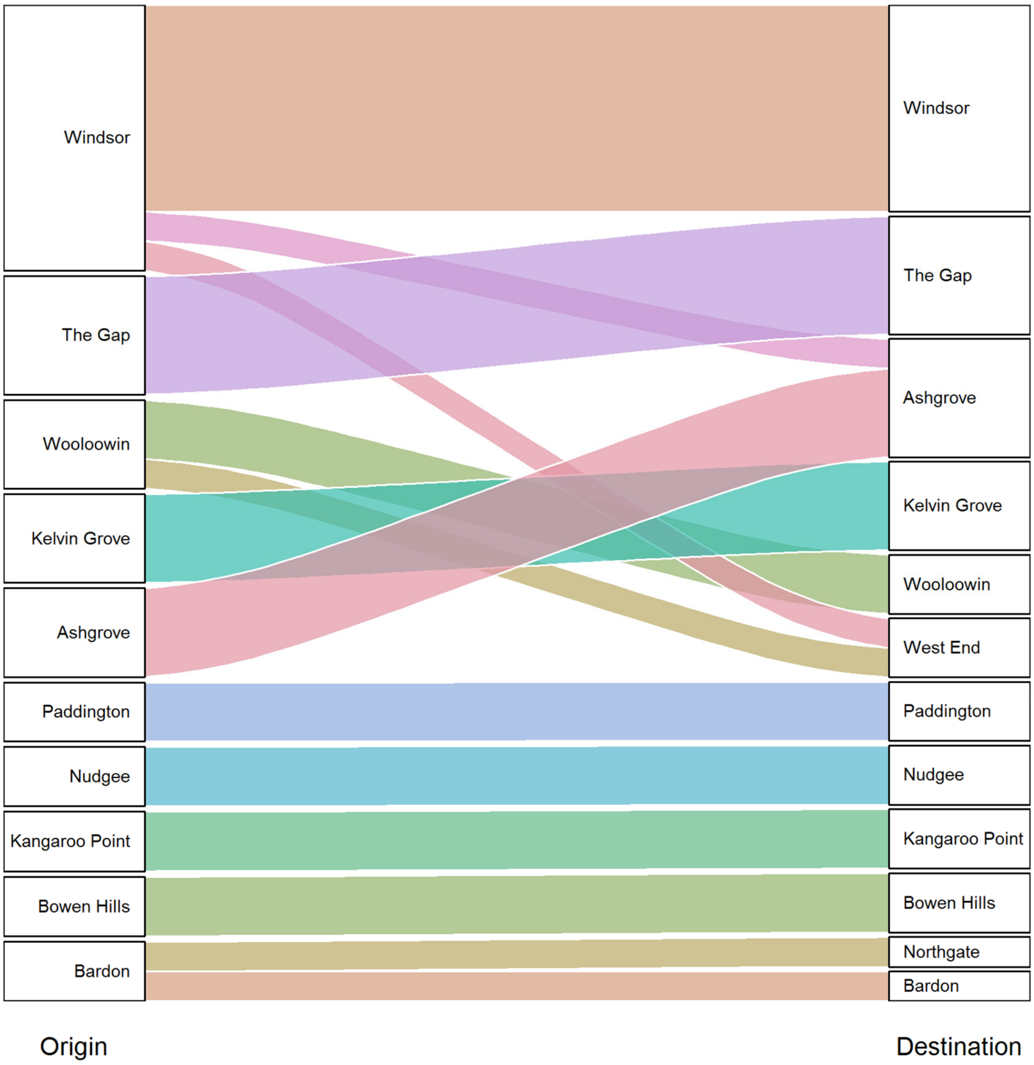
The trip origin and destination suburbs by mode of travel and purpose are illustrated in Figure 3.5 and subsequent figures. The predominant trip flows are as follows:

- 23% of all transport cycling trips were from Woolowin, Wavell Heights, Nundah, Lutwyche or Kedron to Brisbane City (Figure 3.5).

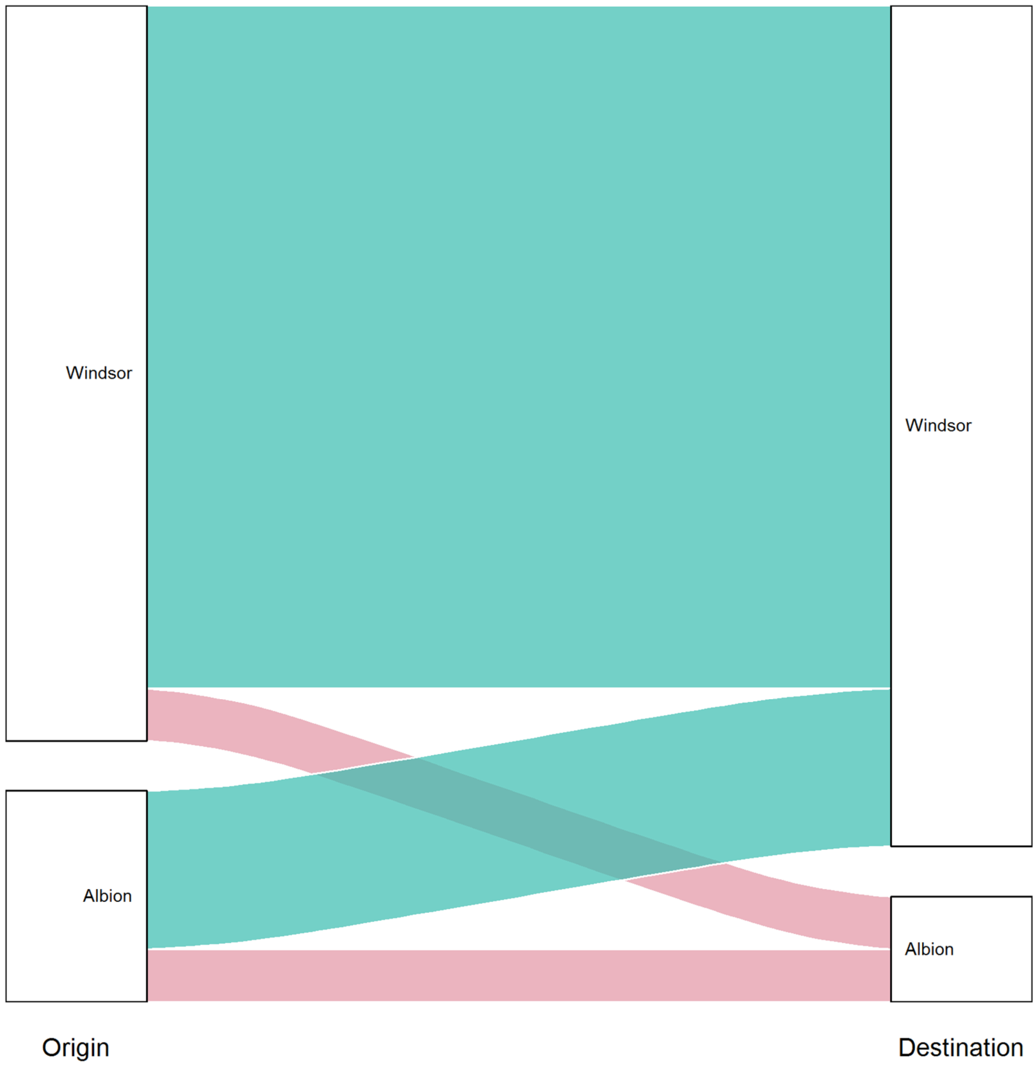
- 44% of all transport cycling trips were destined for Brisbane City, followed by 9% to Herston and 9% to Fortitude Valley.
- Unsurprisingly, most recreation cycling trips started and finished in the same location; 14% started and finished in Windsor, 8% in The Gap and 6% in Ashgrove and Kelvin Grove (Figure 3.6).
- Most recreation walking trips started and finished in Windsor (62%) (Figure 3.7).



- **Figure 3.5: Origins and destinations of cycling trips for transport (n=116)**

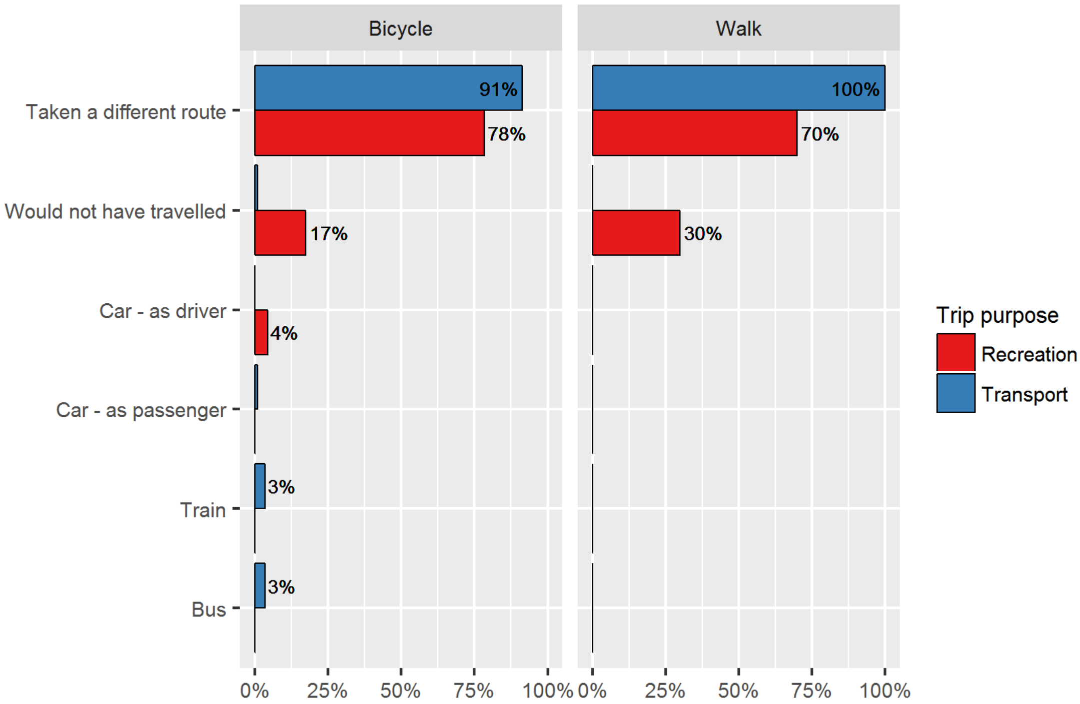


■ **Figure 3.6: Origins and destinations of cycling trips for recreation (n=50)**



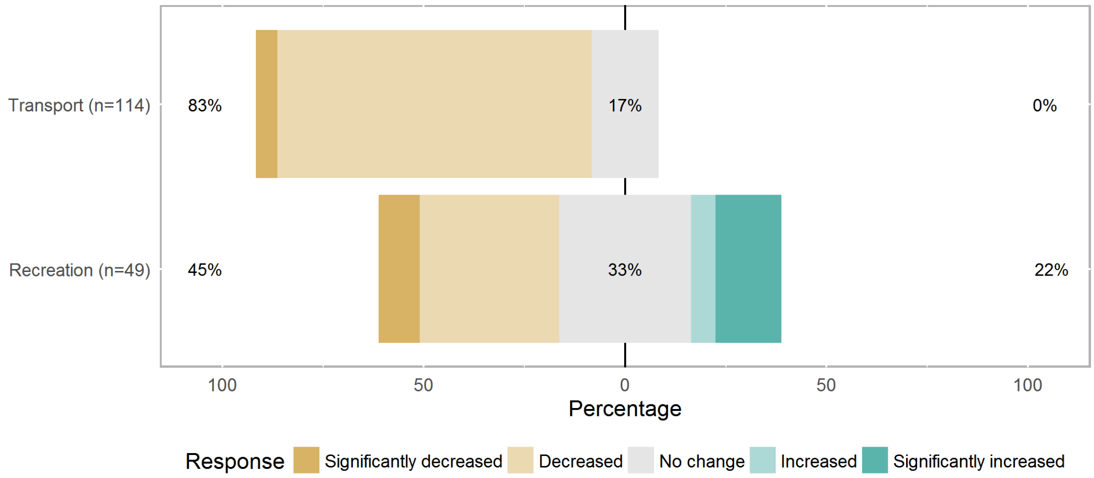
■ **Figure 3.7: Origins and destinations of walking trips for recreation (n=21)**

Respondents were asked what they would have done for their trip if the path were not present. In most cases the respondents indicated they would have taken an alternative route (Figure 3.8). Almost all transport riders who would not have taken another route would have used public transport (6%). Only one respondent indicated they would have used a car. Around 17% of bicycle riders and 30% of pedestrians travelling for recreation indicated they would not have made their trip in the absence of the path. This is suggestive of beneficial physical activity for these respondents.

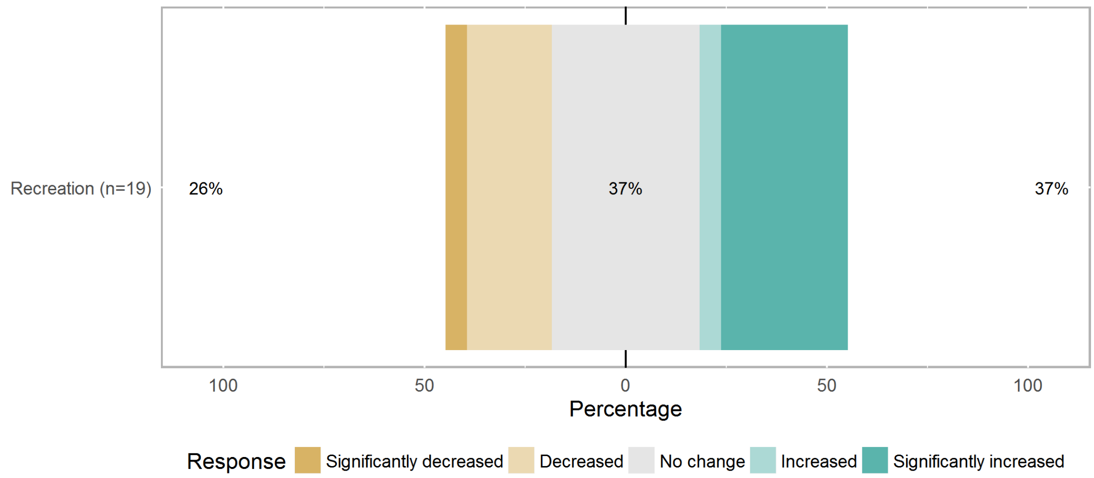


■ **Figure 3.8: What would you have done if this bikeway was not here?**

While a sizeable minority of recreation bikeway users indicated they would not otherwise have made their trip, most indicated the bikeway had the net effect of decreasing the amount of riding they'd done over the preceding month (Figure 3.9). Around 83% of transport riders and 45% of recreation riders indicated they were riding less duration now than prior to construction of the bikeway. We attribute this decline to the more direct route the path affords compared to the on-road routes that were the only options prior to the bikeway being completed.

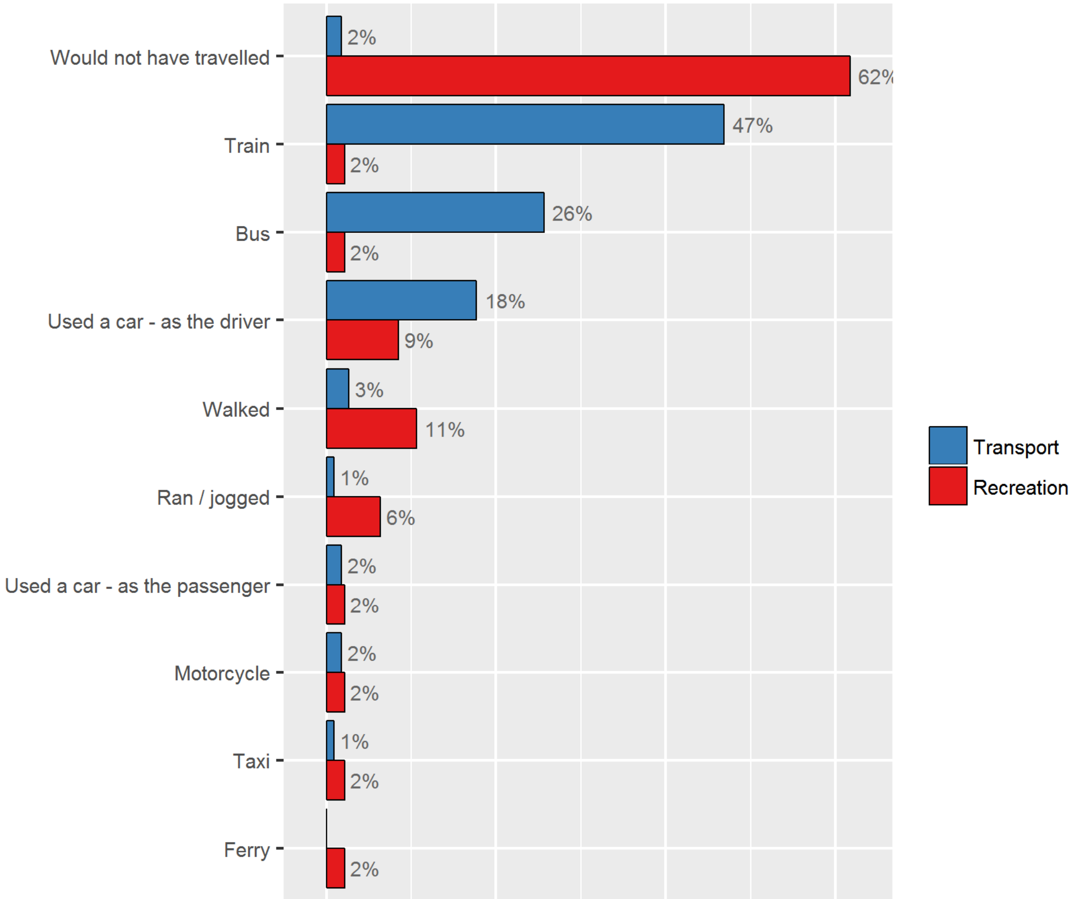


■ **Figure 3.9: Has the bikeway changed the amount of time you've spent riding over the past month?**



■ **Figure 3.10: Has the bikeway changed the amount of time you've spent walking over the past month?**

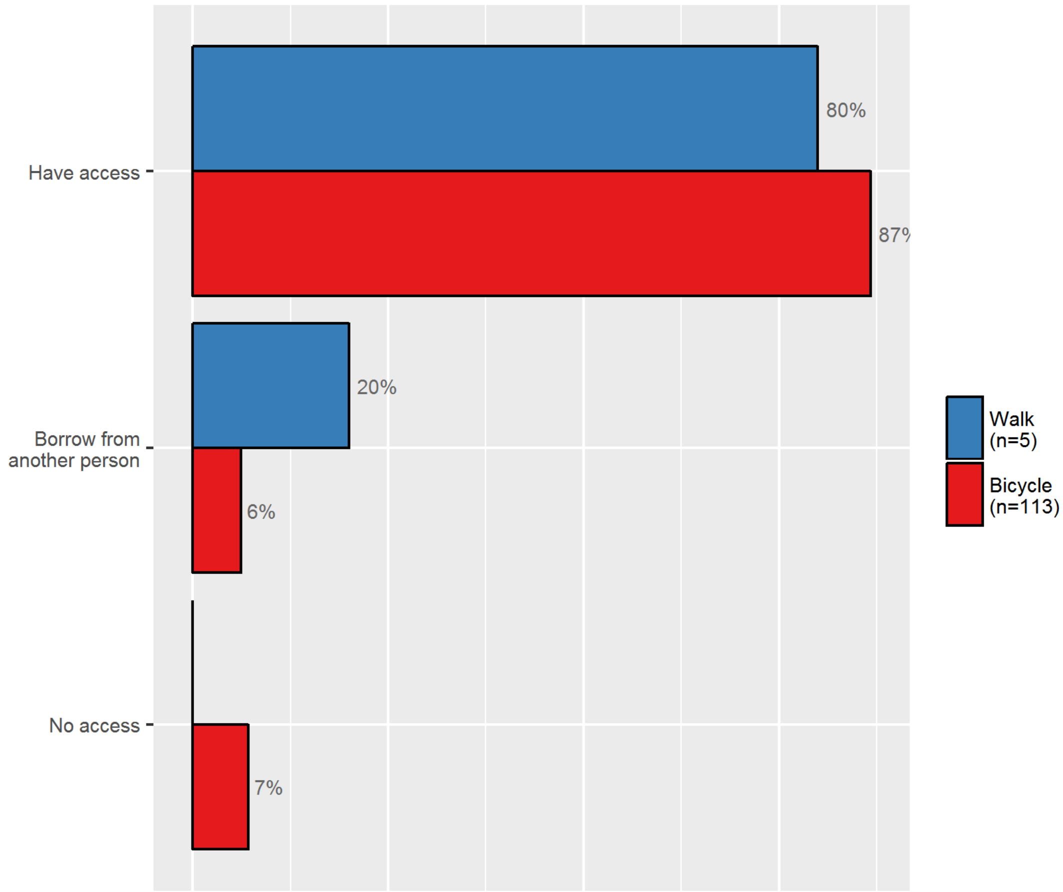
Bicycle riders were also asked what they would have done if they could not have used their bicycle for their trip. Just under half of transport cyclists indicated they would have used a train (47%) with a further 26% using a bus (Figure 3.11). Only a minority (18%) would have driven or not travelled at all (2%). Among recreation cyclists almost two thirds would not have travelled at all, while most of the remainder would either have walked (11%) or ran (6%).



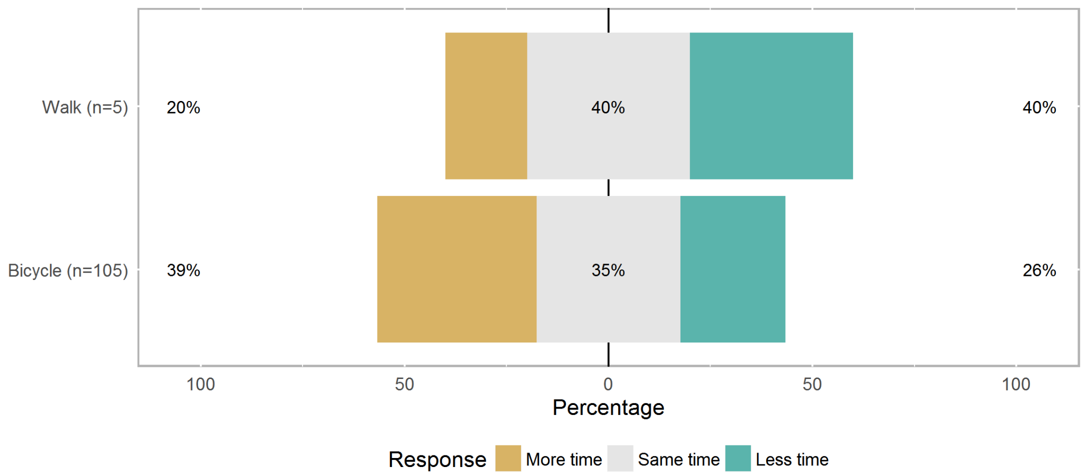
■ **Figure 3.11: What would you have done if your bicycle was not available for this trip?**

Respondents who were travelling for transport purposes (e.g. commuting, education, shopping) were asked whether they could have used a motor vehicle for their trip. Most bicycle riders (87%) indicated they could readily have used a motor vehicle (Figure 3.12). More bicycle riders indicated making their trip by car would have taken longer (39%) rather than shorter (26%) (Figure 3.13). This result is notable insofar as it suggests these active transport trips are providing travel time savings to these users, although it should be noted that very few indicated they would have used a car in the absence of the bikeway (Figure 3.8).

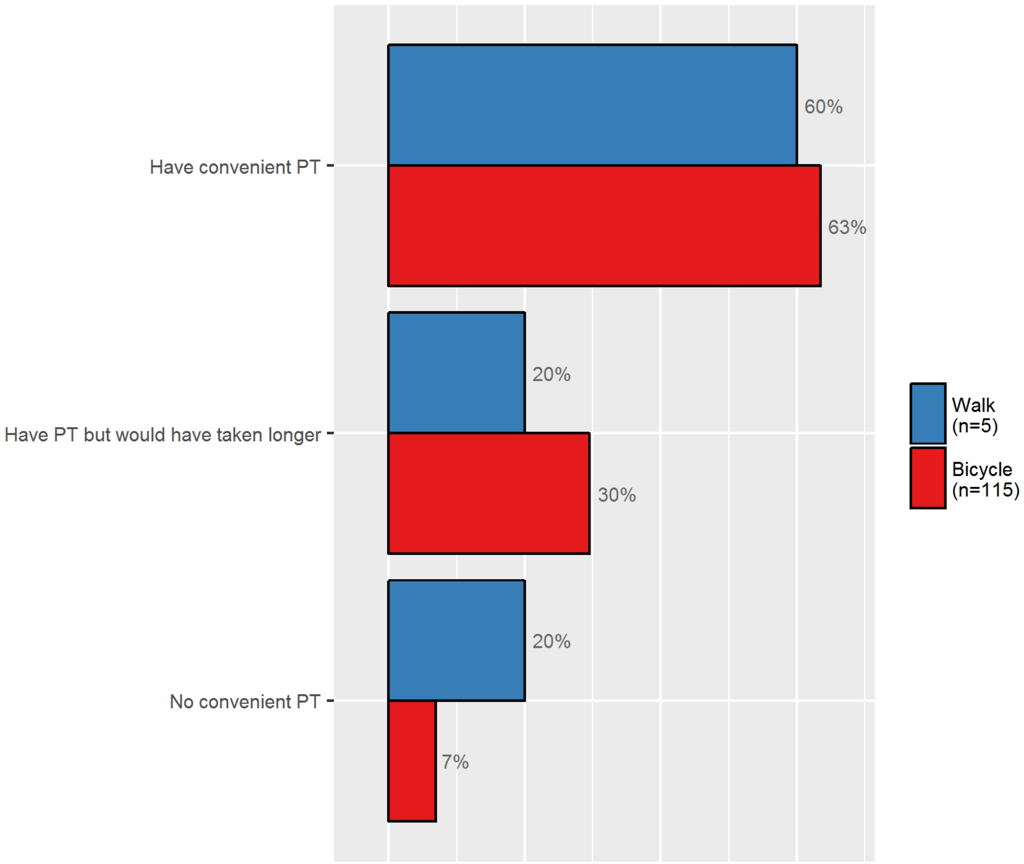
Respondents were also asked about the availability of a public transport alternative for their trip; 63% of bicycle riders indicated they had a viable public transport option (Figure 3.14). While just over half (55%) of bicycle riders indicated their public transport alternative would take a similar time to riding 27% indicated it would take longer compared to 18% who thought it would take less time. This result is significant insofar as it suggests a travel time saving for the minority of bicycle riders who would otherwise have taken public transport if the bikeway was not present.



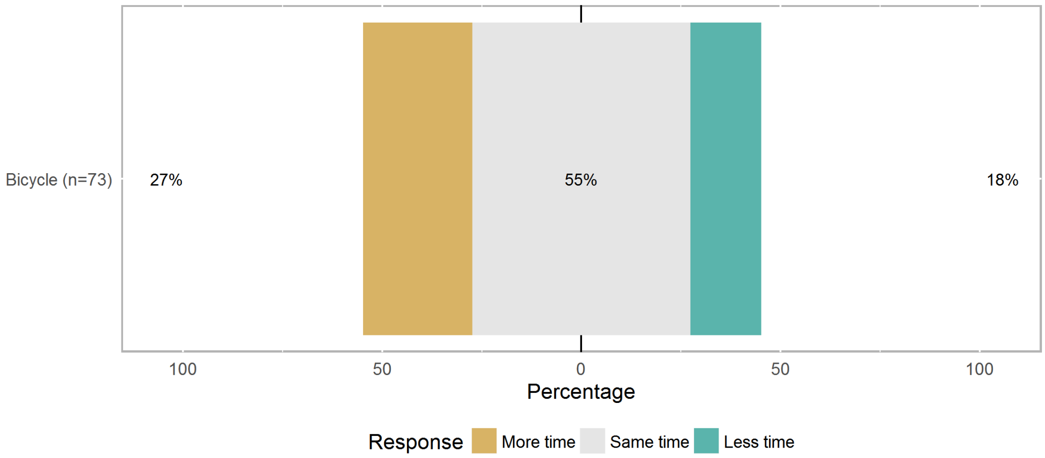
■ **Figure 3.12: Car availability by mode for transport trip purposes**



■ **Figure 3.13: Change in travel time for those who could have used a car (transport trip purpose only)**



■ **Figure 3.14: Public transport availability by mode for transport trip purposes**



■ **Figure 3.15: Change in travel time for those who could have used public transport (transport trip purpose only)**

Respondents were invited to offer any other thoughts at the completion of the survey. The main themes in these responses were:

- strong support for the bikeway,
- frequent (unprompted) comments about the proposed extensions northward, with strong support for doing so,
- seemingly long delays in constructing and opening the path,
- lack of vegetation directly alongside path, and
- water runoff from the retaining wall at the railway underpass.

4 Cost-benefit analysis

The cost-benefit analysis framework as described in CDM Research (2016) was used to estimate the monetary benefits against the costs of the project. The key elements of this framework are:

- broad consistency with the current national guidelines (Transport and Infrastructure Council 2016),
- 30-year economic life with no residual value at the end of the appraisal period,
- estimates mortality and morbidity health benefits using a willingness to pay methodology for valuing statistical life,
- no safety in numbers effect,
- 60% of bicycle travel in the area occurs on-road without provision, 10% on-road with bicycle lanes, 25% on off-road shared paths and 5% on footpaths,
- relative risks for bicycle lanes of 0.5, off-road shared paths of 0.3 and footpaths of 1.8 (all relative to on-road with no provision),
- cumulative annual demand growth of 3%,
- rule-of-half applies to the willingness-to-pay component of health costs, vehicle operating and parking costs, PT fares for all users and travel time savings for new users only,
- Monte Carlo simulation to represent parameter uncertainty,
- capital and operating cost estimates to +/-10% at 95% confidence level, and
- demand estimates to +/-20% at 95% confidence level.

The input assumptions to the cost-benefit analysis are summarised in Table 4.1, and are based wherever possible on the survey data.

Table 4.1: Economic assumptions

Parameter	Assumption	Source
General assumptions		
Economic life	30 years	
Discount rate	3%, 7%, 10%	
Health benefit ramp-up period	5 years (linear)	Genter et al. (2009)
Effective average motorist speed	30 km/h	Estimate
Effective average cyclist speed	20 km/h	Estimate
Effective average walking speed	6 km/h	Estimate
Effective average PT speed	15 km/h	Estimate
Bicycle riders		
Opening year demand (AADT)	355	Video counts
Average trip distance	19.9 km	Intercept surveys
Diversion: car	2%	Intercept surveys
Diversion: PT	4%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	88%	Intercept surveys
Diversion: induced	6%	Intercept surveys
Transport purpose split	74%	Intercept survey
Change in trip distances	0 km	Assume no change
Pedestrians		
Opening year demand (AADT)	73	Video counts
Average trip distance	5.7 km	Intercept surveys
Diversion: car	0%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: reassign	76%	Intercept surveys
Diversion: induced	24%	Intercept surveys
Transport purpose split	28%	Intercept survey
Change in trip distances	0 km	Assume no change
Facility		
Length	0.9 km	New path
Type	Off-road path	
Diverted motor vehicle travel time by period	Busy: 50%	Guesstimate

Parameter	Assumption	Source
	Medium: 30% Light: 20%	
Investment		
Capital cost	2016: $3.52 m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

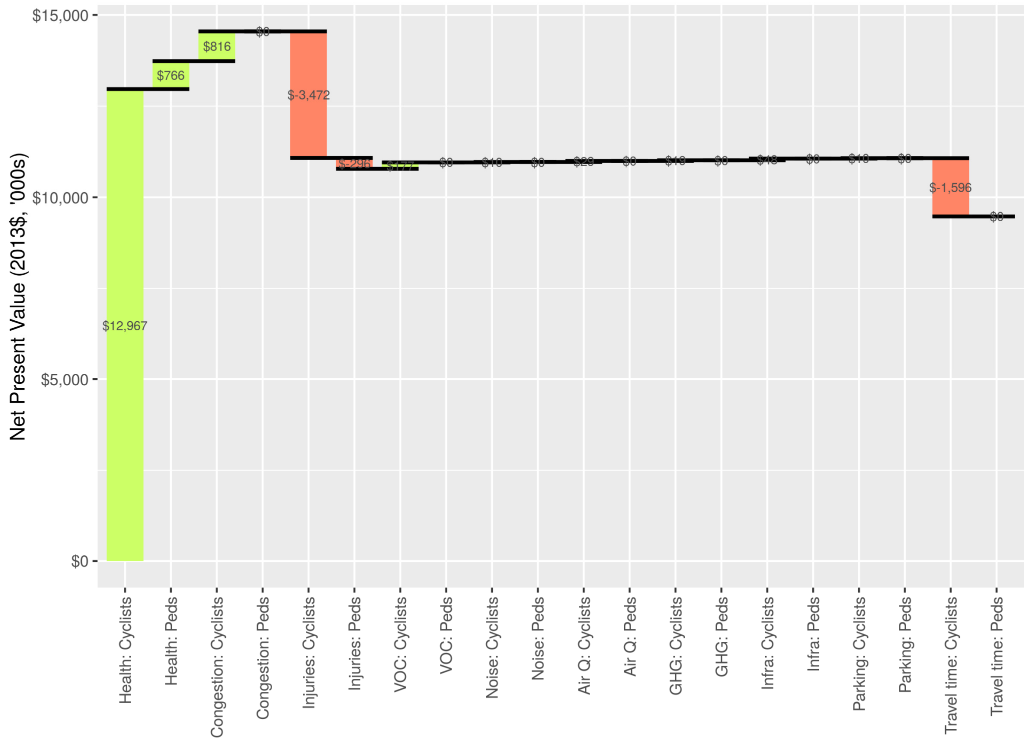
The results of the cost-benefit analysis are summarised in Table 4.2. For the central discount rate of 7% the BCR is 2.5, indicating good value for money.

- **Table 4.2: Economic assessment**

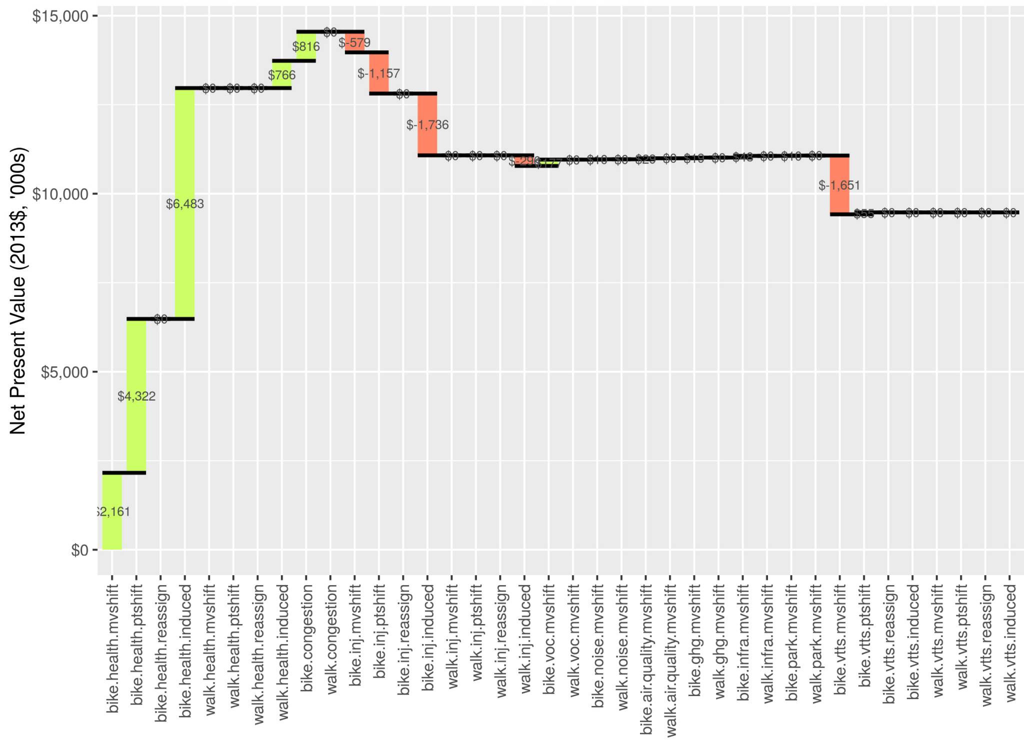
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	3.8	2.5	1.7
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$10.61 m	$5.66 m	$2.79 m
Present Value of Benefits (PVB)	$14.43 m	$9.48 m	$6.61 m
Present Value of Costs (PVC)	$3.82 m	$3.82 m	$3.82 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 4.1. Almost all benefits accrue from health benefits to cyclists. Around half of these benefits are attributable to induced (i.e. all new) cycling trips with most of the remainder due to a shift from public transport (Figure 4.2). Most disbenefits are associated with an increased injury burden. We would expect there to be additional cycling injuries due to the additional induced travel, as well as for those who shift from public transport to cycling. It should be noted that much of the additional cycling exposure will not occur on the bikeway itself but rather on paths and roads leading to and from the bikeway. As many of these roads lack dedicated cyclist provision we may reasonably expect an increased injury burden because of crashes involving motorists and bicycle riders. However, as illustrated in these figures, the health benefits very significantly outweigh the injury disbenefits.



■ **Figure 4.1: Summary breakdown of net present value**



■ **Figure 4.2: Detailed breakdown of net present value**

5 Discussion

The North Brisbane Bikeway Stage 1B is one element of the much larger North Brisbane Bikeway project that will extend as far north as Albion. Stage 1B has cost around $3.52 m and opened in September 2016, following Stage 1A – Section 1 in May 2015 and Stage 1A – Section 2 in May 2016. There is no doubt the bikeway is valued by those that choose to use it. However, the issue is whether the benefits to these users exceed the financial costs. This is the purpose of the cost-benefit analysis, which attempts to assign monetary values to the benefits and costs of the project over its economic lifetime.

The reported BCR of around 2.5 suggests the project represents very good value for money. This result is primarily attributable to three factors:

- the high user demand,
- long travel distances – especially by bicycle riders, and
- a small but not inconsequential level of diversion from public transport and induced travel.

The latter factor is particularly significant given that most of the project benefits accrue from the health benefits attributed to active travel among those who divert from public transport or which are all-new (induced) trips. No physical activity benefits are assigned to bicycle riders or pedestrians who would have ridden or walked prior to construction of the bikeway. While there will be safety benefits to this group, the length of Stage 1B (around 900 m) only represents a small fraction of the average cycling trip (19.9 km). The result is at best marginal safety benefits for existing bicycle riders and safety disbenefits for new riders, for whom on much of their trip they will remain exposed to motor vehicle traffic on shared roadways.

It is possible that demand will increase more rapidly than the 3% cumulative growth rate assumed herein given that the bikeway was only very new when the surveys were undertaken. Increasing awareness may lead to greater overall usage, and particularly all-new trips, over time. Further, there will be complementary benefits to this project stage once further stages are completed farther north. In time, it seems reasonable to expect Stage 1B will experience significantly higher demand that has been observed in the present evaluation. These effects will have favourable impacts on the project BCR.

We note the following caveats to this evaluation:

- no reduction in physical activity (and hence health benefits) was assumed for existing bicycle riders and pedestrians despite most of the former reporting the bikeway has reduced the amount of time they've spent riding,
- no travel time benefits are incorporated for existing bicycle riders, for whom the bikeway has provided a shorter (and faster) route, and
- it is likely to have been difficult for respondents to isolate their responses to questions about Stage 1B from the other recently completed stages.

These first two caveats are likely to compensate one another, at least partially. The way in which these two factors influence the evaluation will differ by the journey purpose:

- transport riders are likely to value the travel time saving, and unlikely to compensate by extending their ride – hence the evaluation has not entirely captured their benefits, and
- recreation riders are unlikely to assign value to the travel time savings, indeed to the contrary they may extend their ride farther to compensate for the shorter travel distance and thereby achieve the same health benefit.

Finally, the intercept survey found strong user support for the project and its' extension farther north. This favourable user response combined with the seemingly high BCR suggests the project represents a good investment.

References

CDM Research. 2016. 'Measuring the Benefits of Active Travel'. Prepared for Queensland Department of Transport and Main Roads.

Genter, J. A., S. Donovan, B. Petrenas, and H. Badland. 2009. 'Valuing the Health Benefits of Active Transport Modes'. Research Report 359. Wellington, N.Z.: NZ Transport Agency.

Transport and Infrastructure Council. 2016. 'Australian Transport Assessment and Planning Guidelines: M4 Active Travel'. http://atap.gov.au/mode-specific-guidance/active-travel/files/m4_active_travel.pdf.

Appendix A: Intercept survey script

We're completing a quick survey on the path. Could you help us?

1. INTERVIEWER enter mode of travel
   a. Bicycle rider
   b. Pedestrian
2. In what suburb did you start your trip, and where will you finish your trip?
   a. Start: ___________
   b. Finish: __________
3. How long will the trip take?
   a. Hours: _____
   b. Minutes ____
4. How far is the trip?

   ____ km
5. What is the purpose of your trip?
   a. Commuting to or from work
   b. Fitness, recreation or sport
   c. Shopping
   d. School, university or other education activity
   e. Other: _________
6. How often have you walked/ridden here in the past month?
   a. Almost every day
   b. Every weekday
   c. 3 – 4 days a week
   d. 1 – 2 days a week
   e. Every fortnight
   f. Only once
   g. This is the first time
7. This bikeway has only recently been built. Are you aware that it's new?
   a. Yes
   b. No
8. How would you have made this trip if this bikeway wasn't here?
   a. Taken a different route (incl. used the road)
   b. Would not have travelled

c. Car – as driver
d. Car – as passenger
e. Motorcycle
f. Train
g. Bus
h. Ferry
i. Taxi
j. Don't know
k. Other: _________

9. What change, if any, would you say the construction of the bikeway has had on the amount of time you've spent walking/riding over the past month?
   a. Significantly decreased (by at least an hour a week)
   b. Decreased (by less than an hour a week)
   c. No change
   d. Increased (by less than an hour a week)
   e. Significantly increased (by at least an hour a week)
10. IF BICYCLE RIDER: What would you have done if you couldn't ride your bike for this trip?
   a. Would not have travelled
   b. Used a car – as the driver
   c. Used a car – as the passenger
   d. Motorcycle
   e. Train
   f. Bus
   g. Ferry
   h. Taxi
   i. Walked
   j. Ran / jogged
   k. Don't know
   l. Other: ___________
11. IF TRANSPORT PURPOSE: Which of the following best describe how easily you could have used a car for this trip?
   a. I had a car available and could easily have got access to it
   b. I could have got a car from another person where I started my trip (e.g. another household member)
   c. I did not have ready access to a car to make this trip
   d. I do not have a drivers licence
   e. Other: _________

12. IF COULD HAVE USED CAR: Would it have taken more or less time to reach your destination by car?
    a. More time
    b. Same time
    c. Less time
13. IF TRANSPORT PURPOSE: Which of the following best describes how easily you could have made this trip by public transport?
    a. I had a convenient public transport alternative
    b. I had a public transport alternative but it would have taken longer
    c. I did not have a viable public transport alternative
    d. Other: _________
14. IF COULD HAVE USED PUBLIC TRANSPORT: Would it have taken more or less time to reach your destination by public transport?
    a. More time
    b. Same time
    c. Less time
15. INTERVIEWER enter any other comments: _______________