Measuring the Benefits of Active Travel

Prepared for Queensland Department of Transport and Main Roads

CDM RESEARCH

Contents

Document history and status

Revision	Date issued	Author	Revision type
1	22/2/2016	C. Munro	Draft-1
2	9/6/2016	C. Munro	Final-1

Distribution of Copies

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

Printed:	9 June 2016
Last saved:	7 June 2016 03:42 PM
File name:	0086 TMR AT Benefits (Final-1).docx
Project manager:	C. Munro
Name of organisation:	Department of Transport and Main Roads
Name of project:	Measuring the Benefits of Active Travel
Project number:	0086

Executive Summary

Evaluating transport projects after their completion should assist policymakers in designing and prioritising among potential future projects. However, *ex post* evaluations are rarely undertaken of transport projects, particularly for active transport projects. The present study sought to redress this shortcoming by:

- developing survey instruments to assist transport agencies in conducting rigorous, consistent evaluations of active transport projects,
- updating monetary unit values for the benefits of active transport for the purposes of business case assessment,
- development of a practitioner-friendly cost-benefit analysis (CBA) tool,
- demonstrate the use of these tools by conducting evaluations of recently completed active transport infrastructure projects in South East Queensland, and
- prepare a methodology and schedule for the evaluation of active transport infrastructure currently under construction and due for completion during 2016.

Moreover, consideration was given to applying these methods for *ex ante* evaluation. That is, the evaluation and prioritisation of projects before they have been built. This is considered to be of critical importance given that the primary benefit of evaluation lies in assisting policymakers to improve decision making.

Survey instruments

The survey instruments consist of an intercept survey of infrastructure users (both pedestrians and bicycle riders) shortly *after* a project has been completed and, optionally, a telephone survey of residents in the catchment. The latter is proposed for projects that have very high costs and high impact and offer lessons transferable to other prospective projects, such as major off-road paths or cycleways or major links such as tunnels and bridges. While intercept surveys have the benefit of quickly capturing data on existing users, telephone surveys can capture occasional or non-users who are unlikely to be captured in an intercept survey. Further, although more expensive than online surveys they provide a means of better controlling for sampling bias.

Cost-benefit analysis

It is common practice in the development of business cases for major transport projects to monetise the social benefits and costs of a proposal so as to determine whether the benefits exceed the costs. Furthermore, the benefit-cost ratio (BCR) can assist in prioritising among proposals so as to best direct scarce resources. Methods of monetising the benefits of active transport are in their infancy, particularly the establishment of reasonable unit values (that is, the benefit per unit of walking or cycling travel). The present study provides additional empirical data to support the estimation of these parameters and has developed an end-user tool to allow the rapid estimation of the economic benefits of an active transport proposal. Given the complexity of this process, and the likely high level of uncertainty in predicting overall demand and the types of users that will be attracted to a

proposal, a probabilistic method is proposed. In other words, rather than estimating a single BCR a range is presented, including a best estimate and the likelihood the BCR will fall below 1.0 (i.e. a situation where the social costs will exceed the benefits).

Application of the methodology

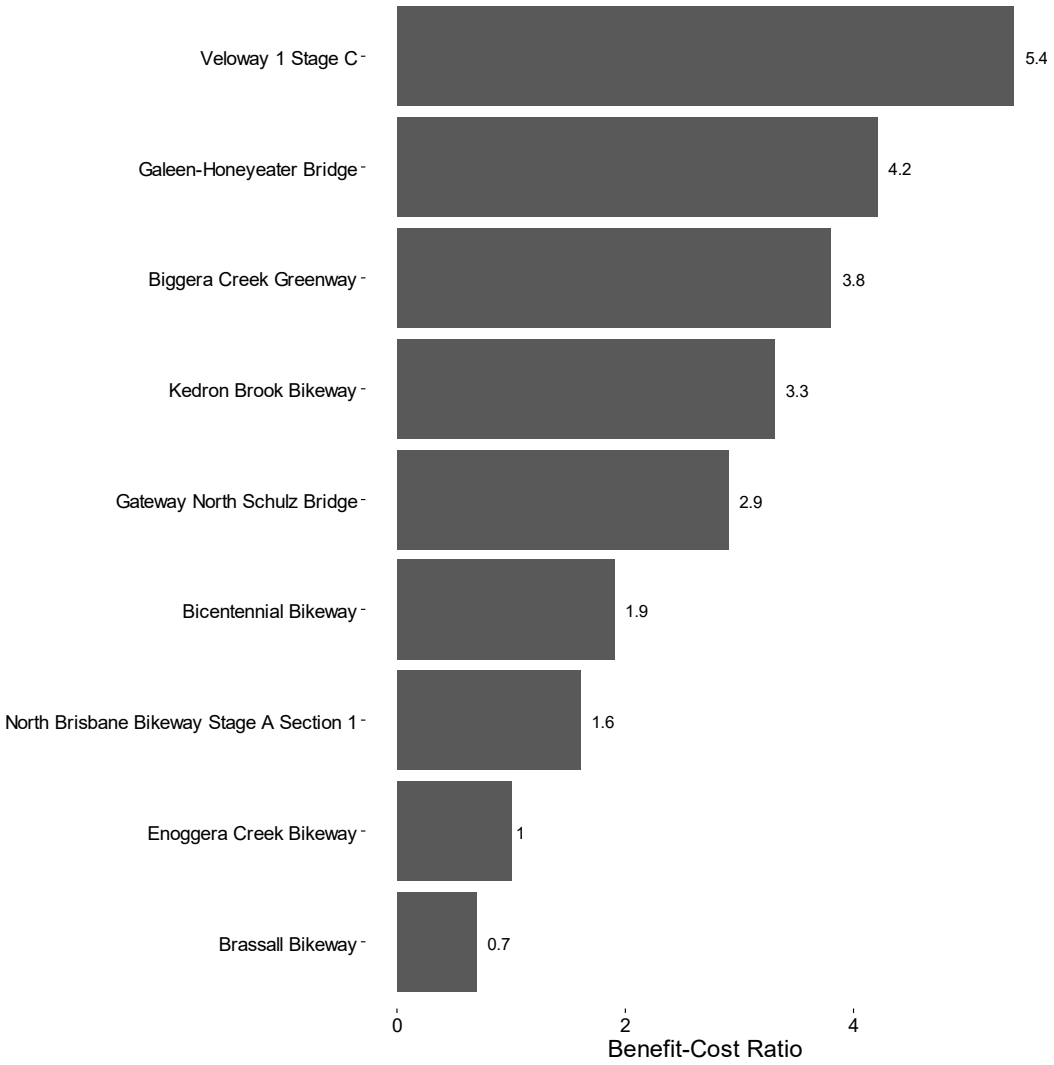
The tools were applied to nine recently completed active transport projects with the following general results:

- users are overwhelmingly positive towards the projects,
- most users of the paths considered in this study would otherwise have used another route, with only a minority diverting from another mode of transport (although this varies widely between sites),
- path users are generally much more physically active than the wider population; almost all appear to meet physical activity guidelines,
- there is a high rate of self-reported increases in cycling and walking activity *as a result* of the facility being built; between 25% and 50% of pedestrians indicated they walked more because of the project, and 33% to 82% of bicycle riders indicated they ride more as a result of the project,
- there is very strong support for segregated walking and cycling paths rather than shared paths on the Bicentennial Bikeway and Kedron Brook Bikeway; more than 90% of both user group indicated they felt more comfortable or much more comfortable after the improvements,
- the economic benefits of active transport projects come overwhelmingly from the direct and indirect health benefits (and avoided costs), rather than more conventional benefits such as travel time savings and safety benefits,
- the health benefits of transferring from car and public transport to cycling and walking exceed the safety disbenefits by at least 3.5:1, and
- most projects were calculated as having positive BCRs (Figure EX.1).

The following are noted with regard to the economic benefits:

- the vast majority of benefits, in almost all instances, accrues from health benefits to bicycle riders – and almost always to those who shift from car or public transport, or are all-new (induced) trips,
- while the injury risk per kilometre travelled is higher for cycling and walking than motorised transport the health benefits outweigh the injury disbenefits by around 4:1,
- there remains some uncertainty in understanding whether new bicycle or walking trips generated by a project are sufficient to increase physical activity levels sufficient to produce favourable health outcomes, although as noted above many path users indicated they rode or walked more often as a result of the facility,
- the economic benefits of avoided car operating costs or public transport fares are generally low, and in most cases are unlikely to be sufficient to justify an active transport project, and

- there remain uncertainties around how, and whether, travel time (dis)benefits to those who shift from car or public transport to active transport should be calculated.



■ **Figure EX.1: Benefit-cost ratios (discount rate 7%)**

Recommendations

The following recommendations are made with regard to evaluation methods of active transport:

- *Survey methodology:*
    - Intercept surveys are a cost effective means of obtaining user data of direct use in business case development, and should be encouraged as standard practice for all active transport projects of significant value; we suggest investments of $2m or over warrant this as standard practice, and at lower levels surveys are warranted if the project is innovative and has potential

wider applicability (hence warranting an understanding of the merits, or otherwise, of the innovation).

- The two-stage survey method using a short intercept survey as a recruitment tool to a longer online survey used in this study was not particularly successful, and is probably not justified for future evaluations. Furthermore, there appear to be substantial biases in those who choose to participate in a second-stage online survey relative to the population of users. Instead, it is suggested that emphasis be placed on the intercept survey alone for data collection.
- Household surveys provide high quality insight into the population-level impacts of a project, and allow for deeper exploration than is practicable from intercept surveys. However, they are very costly and are probably only warranted on larger projects (perhaps investments of $10m or greater).

- Cost-benefit analysis:
  - Our ability to predict the demand for active transport projects remains poor, but is essential to the robust *ex ante* estimation of a proposals' BCR. We suggest this is likely to remain the case, that strategic transport models are highly unlikely to be able to provide reliable estimates of active transport demand, and that instead a pragmatic approach that relies upon reasonable inferences from observed demand of existing, similar projects is warranted. This reinforces the need for road agencies to ensure counts are obtained after the completion of active transport projects, ideally using automatic counters.
  - Our understanding of the benefits to society of active transport expressed in monetary terms are subject to ongoing uncertainty. However, uncertainty applies to all non-market benefits on which transport appraisals rely; this uncertainty is not of itself sufficient justification in our view to exclude a benefit stream.
  - Consistent with much of the other research in this area, we suggest the most significant benefit of active transport investment will accrue from direct and indirect health benefits associated with reduced mortality (i.e. death) and morbidity (i.e. chronic disease). The latter represents a very significant saving to society, both in direct health costs and of the wellbeing of individuals.
  - The challenge remains to demonstrate a conclusive link between the provision of active transport infrastructure and health outcomes. This study has found that a significant proportion of facility users have high levels of physical activity, and that these users attribute these levels of activity at least in part to the presence of the facility. However, more extensive longitudinal studies of catchment populations are likely to be required to conclusively demonstrate causality.

In general, it is suggested that *ex post* evaluation should be required of active transport projects under the following conditions:

- projects funded entirely or partially by TMR with capital costs over $2m should require an intercept survey as a requirement of the investment agreement,
- projects funded entirely or partially by TMR with capital costs over $10m should require a telephone survey of households in the catchment as a required of the investment agreement,
- wherever technically feasible to do so projects with capital costs over $1m should be required to incorporate an automatic cycling counter, and this counter should be installed as part of the construction or immediately thereafter. Only in unusual circumstances, for example where it is technically too difficult to install a counter, should this requirement be relaxed.

However, we suggest that these general conditions may be moderated by the usefulness of the evaluation; if there is unlikely to be wider lessons from the evaluation that will assist policymakers in improving decision making then an evaluation is unlikely to be warranted. Capturing the learnings from evaluations within the decision making process is therefore critical to the success of any ongoing evaluation strategy.

1 Introduction

CDM Research was commissioned by the Queensland Department of Transport and Main Roads (TMR) to develop and implement an evaluation framework for active transport (AT) infrastructure projects. The purpose of this evaluation framework was to provide an objective means for TMR to:

a) determine whether past investments have represented value for money, and

b) improve decision making on future investments by providing a framework to assess whether an active transport project represents value for money, and in prioritising among projects.

This process is similar to that used to assess major roadway and public transport schemes, but has rarely been used to assess active transport projects. Instead, it has been typical to build the investment case around such projects based on a qualitative assessment of the transport, social and safety benefits. While doing so will continue to be essential there remains the challenge of assessing whether qualitative benefits exceed the monetary costs (which are, by comparison, much easier to quantify in advance). It is proposed that a complementary approach that monetises the project benefits will assist policymakers in making reasonable, defensible decisions. While no method can be entirely correct it is suggested that these methods are more likely to guide towards optimum investment decisions than could otherwise be achieved.

1.1 Objectives

The main objectives of this project were as follows:

1. Develop a set of standardised survey instruments that could be used to undertake *ex post* evaluation of active transport infrastructure projects.
2. Apply these survey instruments to a range of recently completed infrastructure projects in South East Queensland.
3. Update a cost-benefit analysis framework for active transport that:
    a. incorporates the primary data from the surveys,
    b. incorporates the latest data on transport unit costs, physical activity levels and health costs, and
    c. implement the framework in an online tool.
4. Prepare a forward evaluation schedule for major active travel infrastructure projects due for completion in 2016.

The key deliverables from this project are this report and the online tool[1].

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

1.2 Background

This project followed from an earlier study commissioned by TMR and undertaken by Sinclair Knight Merz and PriceWaterhouseCoopers (2011) to develop an active transport appraisal framework. That study also reviewed a large number of studies that have been conducted over the preceding years in Australia and New Zealand that attempted to monetise the benefits that accrue from active transport infrastructure. Given that previous study only more recent research is reviewed here.

1.2.1 Economic guidance

The most significant development that has occurred since the previous TMR project in 2011 has been the development of draft national guidance for the evaluation of active transport projects as part of the National Guidelines for Transport System Management (NGTSM). While this guidance was in draft form during the present study it appears probable that the parameters within that guidance will be formally adopted. As such, the methodology used borrows heavily from this guidance.

1.2.2 Link between physical activity and active transport infrastructure

It seems reasonable to assert that the physical environment, and particularly the availability of high quality active transport infrastructure, will encourage greater levels of active transport. There is little doubt that, for example, the high levels of cycling in the Netherlands and Denmark is attributable, at least in part, to the extensive and high quality cycling infrastructure in these countries. However, at the project-scale there is limited empirical evidence to support the assertion that building an active transport project leads to improved physical activity levels. For example:

- A study of a shared path between Cambridge and regional towns in the UK found no effect after one year but an increase in active travel among those living close to the project two years after its' introduction (Goodman, Sahlqvist, and Ogilvie 2014).
- A longitudinal survey of a cohort of households near a new bicycle path in Sydney found no change in cycling frequency among the cohort 12 months after the path opened, although there was a significant increase in bicycle riders along the corridor (Rissel, Greaves, Wen, et al. 2015).
- A review of 24 studies related to active travel and health (of which five involved an intervention) found some limited evidence for health benefits and concluded that the overall evidence was at best suggestive of a causal link (Saunders et al. 2013).
- An evaluation of a number of bicycle sharing systems used a mode substitution question in a survey to estimate the additional time spent physically active as a result of the systems; they found additional minutes per annum ranged from 1.4 million to 74 million minutes (Fishman, Washington, and Haworth 2015). When spread across the populations in these cities the absolute increases are relatively small at the per capita (or per user) level, and thereby raise the question as to whether this additional physical activity is sufficient to improve health outcomes.

There are a number of methodological challenges in identifying the links between physical activity and active transport infrastructure:

- the health benefits may accrue to a small proportion of the catchment population which are very difficult to find in typical sample surveys, and particularly expensive longitudinal studies,
- there is a risk of substitution between physical activities; for example, a person may exchange tennis for riding such that their overall physical activity does not alter,
- health outcomes are not linearly related to physical activity duration; there is evidence to suggest that any increase in activity among sedentary individuals is beneficial while the marginal benefits for already active individuals are much lower,
- the dose may be important; for an exercise session to be beneficial it may need to exceed a specified duration per session,
- repetition is important; irregular physical activity, while likely still to be beneficial, is not likely to be as beneficial as regular activity[2], and
- exertion is important; more intense physical activity will produce more beneficial outcomes for a given duration than less intense activity.

The strength of many of these relationships are debated among public health practitioners, such that there is no definitive agreement on the importance of these effects. However, there is clearly a wide degree of uncertainty in assessing exactly what benefit an individual obtains from a unit of physical activity.

A further consideration, rarely discussed in the literature, is that those attracted to active transport infrastructure are likely to have higher pre-existing levels of physical activity than the population more broadly. There has been no empirical data to evaluate the extent of this effect that we are aware of. However, this becomes important if it is accepted that the incremental health benefits are related to the pre-existing physical activity level.

1.2.3 Other research

We summarise here the pertinent results from the most relevant research released since the previous SKM/PwC study in 2011:

- Estimates of the economic benefits of achieving draft UK targets for doubling cycling trips by 2025 would produce discounted benefits of around GBP7bn (Crawford and Lovelace 2015). The benefits were monetised in accordance with UK Department of Transport guidance, for which by far the most significant benefit stream is health.
- A stated preference survey of commuter cyclists in Sweden found that riders valued travel time savings on roads in mixed traffic 35% more than off-road paths close to roads, while savings on off-road paths far from roads were valued 6% lower than paths near roads (Björklund and Isacsson 2013).

[2] This in turn is an argument in support of active transport where a person makes their trip habitually as part of their daily activity (e.g. their trip to school or work), rather than discretionary travel (e.g. recreational walking or riding).

- Macmillan et al (2014) estimated the benefits of large-scale investment in protected bicycle lanes and speed limit reductions in Auckland and calculated a BCR of 24 by making a range of assumptions around likely demand and safety improvements and using benefit unit values within the NZ Economic Evaluation Manual[3]. The current NZ guidance recommends total benefits of walking of $2.70/km and $1.40/km for cycling (NZD, 2008 values) of which the vast majority is related to health benefits.
- A study for the Royal Automobile Club of WA suggested that a program that achieves an increase in cycling in Perth by one million km/year would achieve a BCR of 3.4 over a 25-year period at a 7% discount rate (CATALYST 2012). The benefits are primary from traffic congestion relief (28%), transport operating costs (26%) and health and road trauma (18%). Health benefits are relatively low in comparison to other studies. Their methodology uses the NZ value for cycling of NZD1.30 and, once converted to AUD, apply the rule of half to the rule amount. By comparison, the draft NGTSM guidance recommends that rule of half only apply to the willingness to pay component.
- A review of economic studies of active transport interventions that included health benefits found wide variation in the quality and magnitude of benefits, and particularly limited evidence on the effect on morbidity and the effectiveness of interventions (V. Brown et al. 2016).

While there continues to be considerable interest in monetising the benefits of active transport, these studies confirm that there remains significant data gaps and methodological issues in doing so. One purpose of the present study was to contribute additional empirical insight into these issues and, perhaps more importantly, propose a pragmatic and defensible way forward for practitioners to incorporate standardised approaches into *ex ante* project evaluation.

[3] https://www.nzta.govt.nz/resources/economic-evaluation-manual

2 Methodology

2.1 Cost-benefit analysis

A key deliverable from this study was intended to be an active transport appraisal tool that can be readily used by practitioners to evaluate active transport projects both before they are built (*ex ante*) and after they have been completed (*ex post*). In order to do this a number of inputs were required, including:

- bicycle rider and pedestrian demand (including distances travelled),
- behaviour changes active travel users have made as a result of the infrastructure (i.e. diversion rates – whether they would have used another mode of transport or not travelled at all in the absence of the infrastructure),
- monetary benefit and cost per kilometre travelled by active travel (i.e. unit values), and
- physical activity status prior- and post-construction of the infrastructure (in order to demonstrate a causal link between the infrastructure and physical activity).

The general approach to the appraisal follows from the previous study commissioned by TMR (Sinclair Knight Merz 2011) and has been updated in accordance with the draft NGTSM guidance. Importantly, it is intended that the appraisal framework be as consistent as possible with this guidance and with well-established economic evaluation methods for motorised transport. Moreover, where there is very little evidence on the monetary value of particular benefits (e.g. urban realm or social inclusiveness) then these benefits are not monetised. Instead, it is suggested that such non-monetary benefits be discussed in a business case in a qualitative sense, as is the current practice.

2.2 Site selection

In order to obtain data useful to developing and testing the appraisal tool it was necessary to select a set of case study sites. These sites were selected using the following general criteria:

- completed within the past five years, such that users may be able to recollect the situation prior to the infrastructure being built,
- projects that involved significant financial expenditure, such that the cost of evaluation seems warranted,
- the projects are of sufficient scale that it seems likely they have had a measurable effect on active travel rates in the local area, and
- the projects have characteristics which are similar to other prospective projects, meaning that lessons learnt from their evaluation can more readily be applied to evaluating future investments.

The general characteristics of the sites are listed in Table 2.1 and are described in more detail in subsequent sections of this report. Many of the projects were funded under the Cycle Network Local Government (CNLG) program.

■ **Table 2.1: Site description**

Site	Description	Cost[1]	Opening year
Bicentennial Bikeway Upgrade (Brisbane)	Widening and segregation from shared path of 3.0 m to cycleway of 3.5 m and footpath of 2.0 m, as well as connections to Go-Between Bridge	$28 m	2013
Biggera Creek Greenway (Gold Coast)	Shared path connection from Keith Hunt Park to Norm Rix Park (1.6 km)	$1.07 m	2014
Brassall Bikeway (Ipswich)	Shared path from North Ipswich to Wulkuraka (5.3 km)	$6.71 m	2013
Enoggera Creek Bikeway (Brisbane)	Missing link on existing shared path underneath Kelvin Grove Road	$3.1 m	2015
Galeen-Honeyeater Bridge (Brisbane)	Walking and riding bridge ("Green Bridge") connecting residential areas in Burleigh Waters across a canal	$2 m	2012
Gateway North Bikeway – Schulz Canal Bridge (Brisbane)	Shared path bridge and connections to Jim Soorley Bikeway and Gateway North Bikeway over Schulz Canal adjacent to Nudgee Road	$7 m	2013
North Brisbane Bikeway – Stage 1A Section 1 (Brisbane)	Shared path from Gilchrist Ave to RNA Showgrounds under Bowen Bridge Road (path is segregated under road)	$6.99 m	2015
Kedron Brook Bikeway (Brisbane)	Construction of additional 2.0 m footpath and redesignation of existing 3.0 m shared path as a cyclist-only path	$6.06 m	2016
Veloway 1 – Section C (Brisbane)	Cyclist-only path from Lewisham Street to Birdwood Road (excl. bridge over Birdwood Road)	$9.51 m	2012

[1] Outturn costs, varying price years.

2.3 Data collection

The survey consisted of video-based manual counts and three survey instruments – an intercept survey, online survey and telephone survey (Table 2.2).

■ **Table 2.2: Data collection methods**

Method	Description	Purpose
Counts	7-day manual count from video recordings (6 am – 7 pm, October 2015)	Obtain classified (bicycle, pedestrian) counts by time of day and direction to input into cost-benefit analysis
Intercept survey	2x weekday morning, 2x weekend intercept survey of facility users	Obtain primary data on purpose, origin-destination, alternative modes. Recruit respondents for more detailed online survey
Online survey	Detailed follow-on to intercept survey, restricted to respondents from intercept survey	Use and perception towards project, changes in physical activity.
Telephone survey (household) (**Bicentennial Bikeway** and **Brassall Bikeway** only)	Telephone survey of households located along the path	Population-level assessment of facility usage, changes in physical activity.

The counts were obtained using manual observation of video recordings. This is a cost effective means of obtaining multiday counts and can be independently verified if required. However, the absence of floodlighting at many of the sites, as well as the probable low night-time user demand, meant that the count period was restricted from 6 am to 7 pm. A full 7-day period of counts were obtained in order to reduce the effect of interday variation on demand. Nonetheless, the subsequent cost-benefit analysis assumed the average daily traffic estimated in this method is equivalent to the average annual daily traffic. This is not necessarily true given the effect of weather and seasonal variation.

Each survey instrument is described in more detail below.

2.3.1 Intercept survey

Intercept surveys were undertaken on two weekday AM periods (usually 6:30 – 8:30 am, although this varied somewhat by site) and on two weekend days (usually 7 – 10 am, although again this varied by site). Interviews were conducted in teams of two, providing a minimum of 20 interviewer hours at each site. In addition, at least one traffic controller was present at the Bicentennial Bikeway site on weekdays to manage the safety of path users and interviewers.

The survey is presented in Appendix A and generally took less than three minutes to complete. Surveys were coded online using LimeSurvey v1.93 and administered using tablet computers. The survey was intended to obtain critical user information in a manner that would not unduly delay respondents. At the completion of the survey respondents were presented with a business card with a URL to complete a more extensive online survey (Section 2.3.2). Response rates were generally high, although the total sample size was limited at quieter sites (e.g. Brassall Bikeway and the Biggera Creek Greenway) because of the infrequent arrival of path users.

Convenience sampling was used to select respondents, all bicycle riders and pedestrians at the intercept location were within scope for the interview. For safety reasons riders were not sought for an interview if they were part of a large group of riders, particularly where that group was riding at high speed.

2.3.2 Online survey

The online survey was intended to complement the intercept surveys by providing for more comprehensive data on path users than could not be practically obtained in a short intercept survey. Respondents to the intercept survey were presented with a business card containing the URL of the survey and a unique code which they were required to enter to access the survey. The use of these unique codes provided a means of controlling access to the survey; a code could not be used twice and individuals could not access the survey without a code. This prevented the URL being shared online and path users who were not interviewed responding; it is highly likely that respondents to surveys posted on social media are not representative of the population of path users. The online survey was coded using LimeSurvey v1.93. The survey script is provided in Appendix B.

2.3.3 Telephone survey

Given the limited time period over which the intercept surveys were undertaken, and the specific times at which they were undertaken, it is likely there would be few individuals who use the path only infrequently. To redress this shortcoming, and to better understand how aware the wider community is of the presence of the path, telephone surveys were undertaken in suburbs adjoining two paths (Brassall Bikeway and Bicentennial Bikeway). The survey was essentially identical to the online survey presented in Appendix B, with only minor grammatical changes to accommodate the telephone presentation.

The survey was conducted using commercially available telephone lists (both landline and mobile) linked to postcodes. Within each household a random household member was selected using the next birthday method (for those aged 15 and over). The survey did not interview household members aged under 15 years of age. No weighting was applied to the survey respondents in the subsequent analysis.

2.3.4 Physical activity instrument

The physical activity status of path users will affect the extent to which incremental additional physical activity produces a health benefit. Ideally, the link between active

transport infrastructure and physical activity would be measured using a longitudinal survey. However, this was not an option in the present study. Instead, it was necessary to rely on respondent recall of their physical activity.

There are a number of standard survey instruments to measure physical activity by respondent recall, of which the two most common are:

- the International Physical Activity Questionnaire (IPAQ)[4], and
- the Physical Activity Recall (PAR) survey (Sallis et al. 1985).

The IPAQ comes in a short form (IPAQ-SF) and long-form (IPAQ-LF) version; the former divides physical activities into vigorous, moderate and walking activity while the latter further separates activity between job, transportation, housework and recreation activities. The IPAQ is very widely used, but there are concerns about the reliability of the short form survey in particular (Lee et al. 2011). The correlation between the self-reported IPAQ-SF physical activity levels and objective standards (e.g. accelerometers) suggest correlations well below 0.50, and a tendency to overstate physical activity levels between 36 to 173%. The longer form survey appears to perform somewhat better, although again there is a tendency to over-report physical activity (Hagstromer et al. 2010). One comparison between the IPAQ and PAR suggested the latter was more accurate (Johnson-Kozlow et al. 2006).

In Australia physical activity is measured at the national level within the National Health Survey (NHS) and National Nutrition and Physical Activity Survey (NNPAS). These surveys, as indeed is the Queensland Health Survey, use physical activity indicators based on the Active Australia Survey. Given the almost universal adoption of the AAS survey format within Australia this has also been used in the present survey except for the addition of questions on cycling, the separation of transport and non-transport purposes and the exclusion of questions on household chores and gardening, and on time spent seating. The wording varies slightly between the various implementations of the survey; the version used in the NHS forms the basis for the present survey.

[4] https://sites.google.com/site/theipaq/home.

3 Survey results: Site comparisons

3.1 Introduction

This section presents and discusses the results of the surveys at each of the ten sites[5] together, to assist in understanding the variation between sites. Each individual site is discussed in more detail in Section 5.

For reference, the sample sizes of respondents at each site, and for each survey, are presented in Table 3.1. These totals correspond to completed surveys once data cleaning and checks were undertaken to remove erroneous surveys.

■ **Table 3.1: Sample sizes**

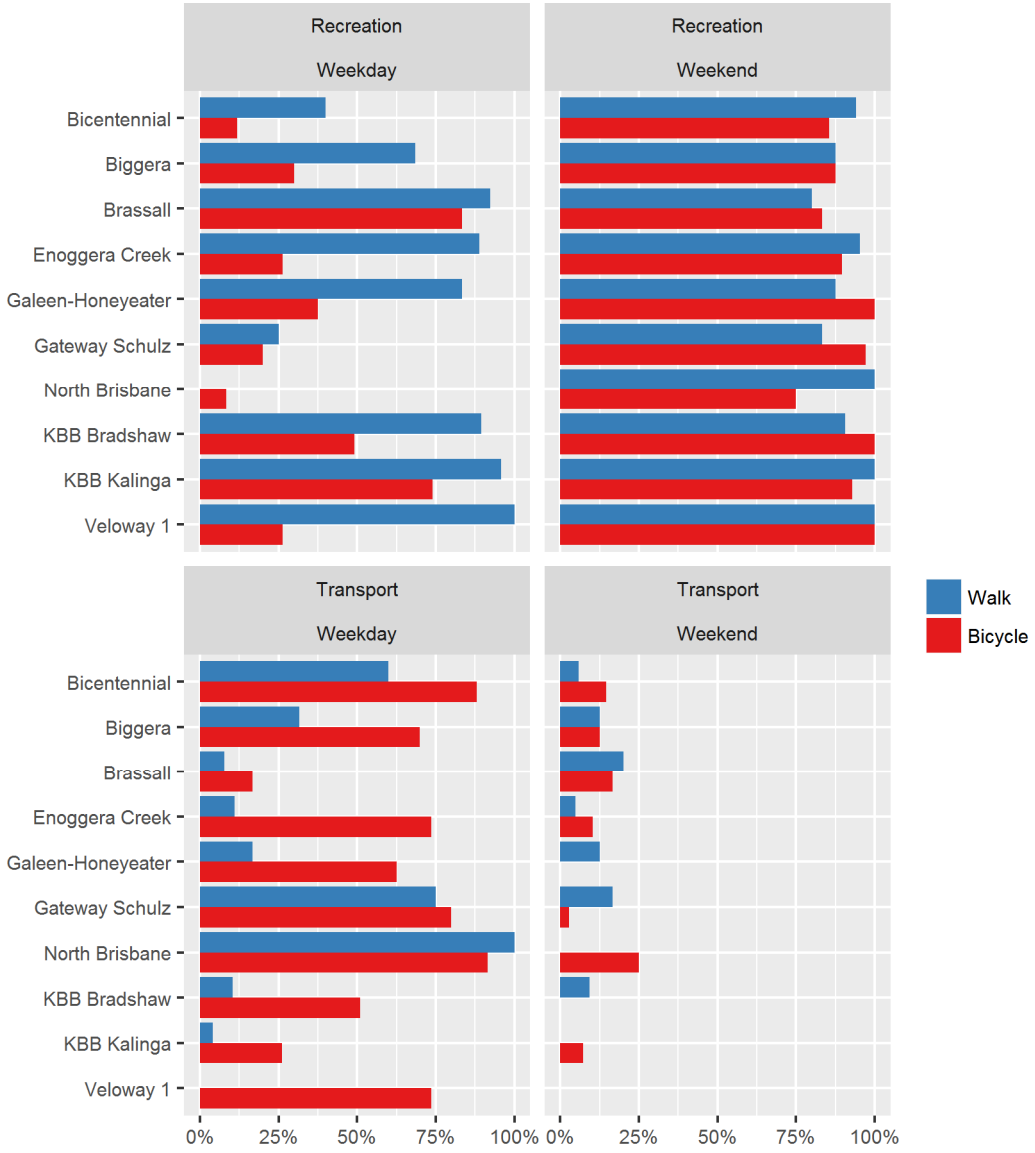
	Intercept		Online		Household *	
Site	**Bicycle**	**Ped.**	**Bicycle**	**Ped.**	**Bicycle**	**Ped.**
Bicentennial Bikeway	238	159	66	24	189	367
Biggera Creek Greenway	19	43	2	5	–	–
Brassall Bikeway	12	41	1	3	39	109
Enoggera Creek Bikeway	49	51	10	4	–	–
Galeen-Honeyeater Bridge	11	20	1	1	–	–
Gateway North Bikeway	85	10	26	1	–	–
North Brisbane Bikeway	67	7	30	1	–	–
Kedron Brook Bikeway (Bradshaw Park)	90	80	23	11	–	–
Kedron Brook Bikeway (Kalinga Park)	74	90	11	10	–	–
Veloway 1 (Greenslopes)	35	29	10	5	–	–
Total	*680*	*530*	*180*	*65*	*228*	*476*

* Mode is based on most recently reported trip on the path.

[5] There were two intercept sites along the Kedron Brook Bikeway – at Bradshaw Park and Kalinga Park, giving a total of ten sites.

3.2 Trip statistics

On weekends the majority of path users at all sites were, unsurprisingly, predominantly using the path for recreation trips (Figure 3.1). On weekday mornings[6] 88% of bicycle trips and 60% of walking trips on the Bicentennial Bikeway were for transport purposes, declining to 17% and 8% respectively on the Brassall Bikeway. With the exception of the Gateway Schulz Bridge and North Brisbane Bikeway, bicycle trips on weekdays were more likely to be for transport purposes than walking trips.

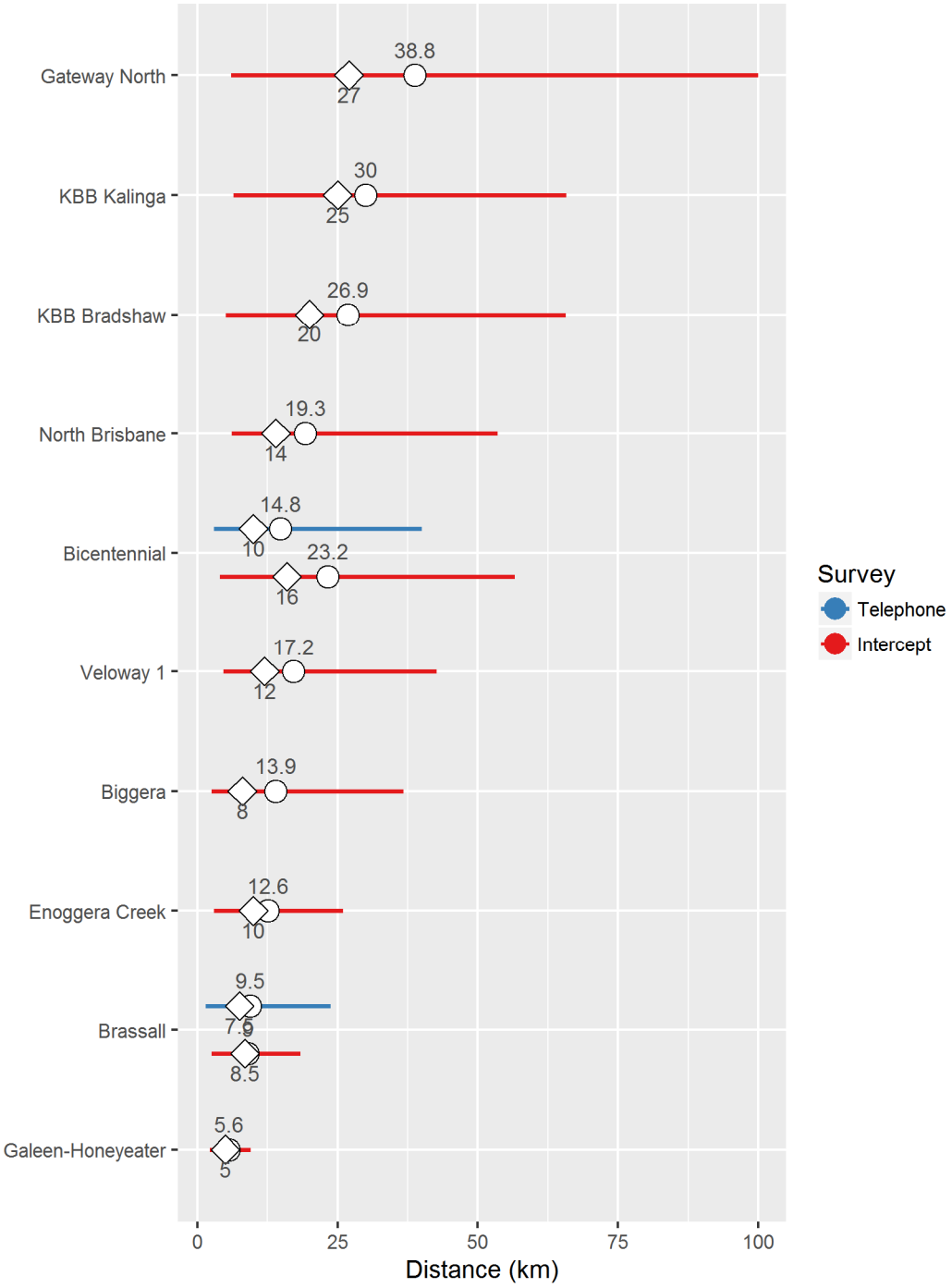


■ **Figure 3.1: Main trip purpose by site, mode and day of week**

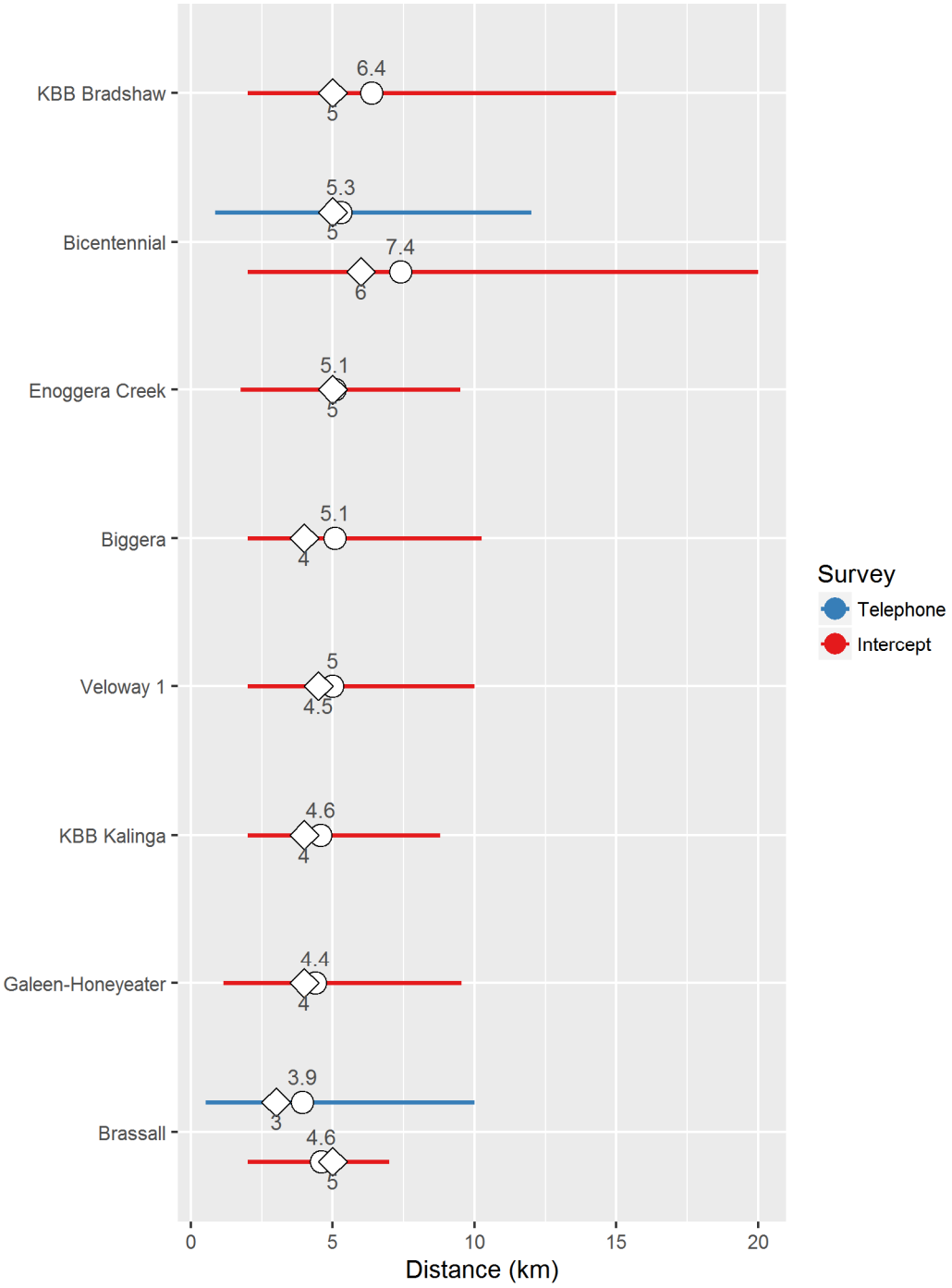
[6] Note that the intercept surveys on which this data was based were only during the AM peak period on weekdays, when commuting travel would be expected to dominate.

The self-reported trip distances by cycling are shown in Figure 3.2 and for walking in Figure 3.3. The longest cycling trip distances were at Gateway Schulz Bridge, Kedron Brook Bikeway and the North Brisbane Bikeway. Trip distances from the telephone survey tended to be somewhat lower than from the intercept survey at the Bicentennial Bikeway, possibly reflecting the sampling bias towards transport purposes in the intercept survey. Average walking trip distances were far more consistent across sites than for riding, with the average trip distances ranging from around 4 km to 7 km.

In almost all instances the self-reported trip distance by cycling was much longer than the length of the facility, indicating that riders are exposure to injury risks not only along the facility itself but also en route to and from the facility.



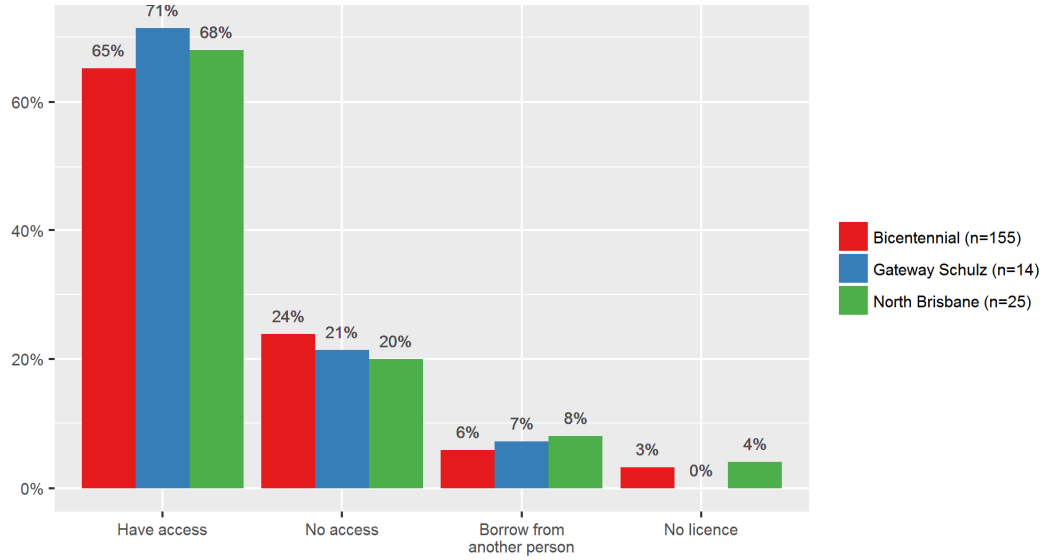
■ **Figure 3.2: Cycling trip distances (circles are averages and diamonds are medians, lines represent 5th to 95th percentiles)**



■ **Figure 3.3: Walking trip distances (circles are averages and diamonds are medians, lines represent 5th to 95th percentiles)**

3.3 Alternative transport modes

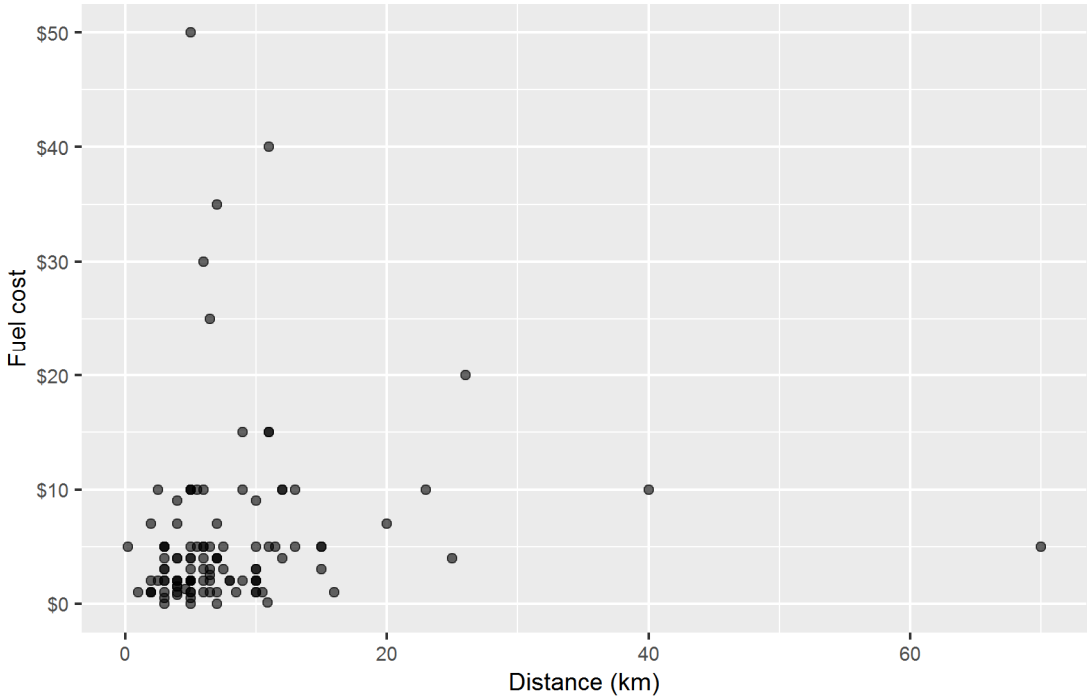
Respondents were asked whether they could have used a motor vehicle or public transport for their journey. This question is likely to only to be meaningful for transport journeys; for those sites where the sample size was adequate around two thirds of respondents indicated they had a motor vehicle available with which to make their trip (Figure 3.4).



Thinking of your most recent trip on the path, which of the following best describes how easily you could have used a car for this trip?

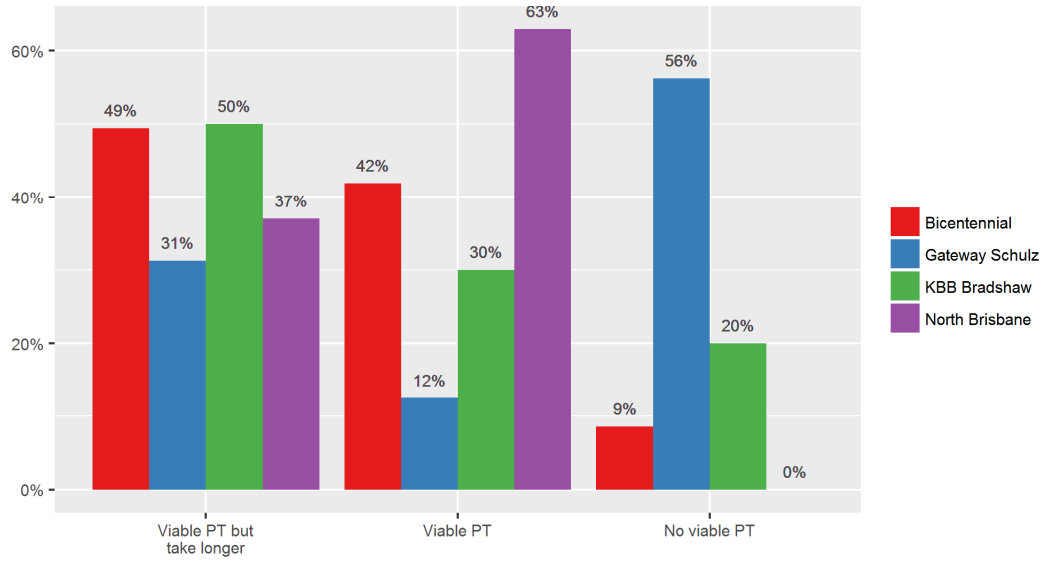
■ **Figure 3.4: Car availability for transport journeys**

Those who had a car available were asked to estimate how much such a journey would have cost them. The only site for which there were a robust number of responses was the Bicentennial Bikeway (n=84). At this site the average reported fuel cost was $5 with a range from $0 to $40. There is no relationship between travel distance and reported fuel cost (Figure 3.5), which we would suggest implies a very weak relationship between fuel costs and the decision to ride or walk. Respondents were also asked about their avoided parking costs; the average for transport trips on the Bicentennial Bikeway was $15 (n=82, range from $0 to $40).



■ **Figure 3.5: Self-reported travel distance and fuel cost (transport trips, Bicentennial Bikeway)**

Most respondents along the Bicentennial Bikeway and Kedron Brook Bikeway indicated they had a public transport alternative, although most felt it would take longer (Figure 3.6).



Thinking of your most recent trip on the path, which of the following best describes how easily you could have used public transport for this trip?

■ **Figure 3.6: Public transport availability for transport journeys**

3.4 Physical activity

If an investment in active transport infrastructure is to produce positive health outcomes it should (Garrard 2009; W. J. Brown et al. 2012):

- attract people to walk or ride who are otherwise sedentary or insufficiently active for whom the additional physical activity is beneficial,
- be of sufficient duration (dose) to have an impact on health, and
- not substitute for some other physical activity of equivalent MET-minutes[7].

While the evidence is contested as to the duration, frequency and types of physical activity which produce optimum health outcomes it is generally accepted that at least 150 minutes of moderate physical activity is required over at least five days per week for adults (ideally 300 minutes). Recently, these guidelines have been updated to allow for a minimum of 75 minutes of vigorous exercise (ideally 150 minutes) per week as an alternative. However, most survey instruments continue to define "sufficient" physical activity as being at least 150 minutes of (at least) moderate physical activity over at least five sessions per week, and this has been the approach adopted herein.

We note two particularly relevant issues with using these guidelines to appraise active transport infrastructure:

1. the users are unlikely to have the same physical activity status as the general population; in other words, new infrastructure is likely to disproportionately attract those already physically active, and
2. there is evidence to suggest that there are decreasing marginal benefits as physical activity increases; in other words, for those sedentary any level of physical activity is highly beneficial, but for those already very active the additional benefits of more physical activity are modest (W. J. Brown et al. 2012).

It is common practice to classify individuals into three groups of physical activity:

- **sedentary:** have undertaken no physical activity over the past week with a duration of 10 minutes or more,
- **insufficiently active:** have undertaken some physical activity of a duration of 10 minutes or more, but not enough to meet the guidelines, and
- **sufficient:** have achieved 150 minutes of physical activity across at least five sessions over the past week, with each activity having a minimum duration of 10 minutes.

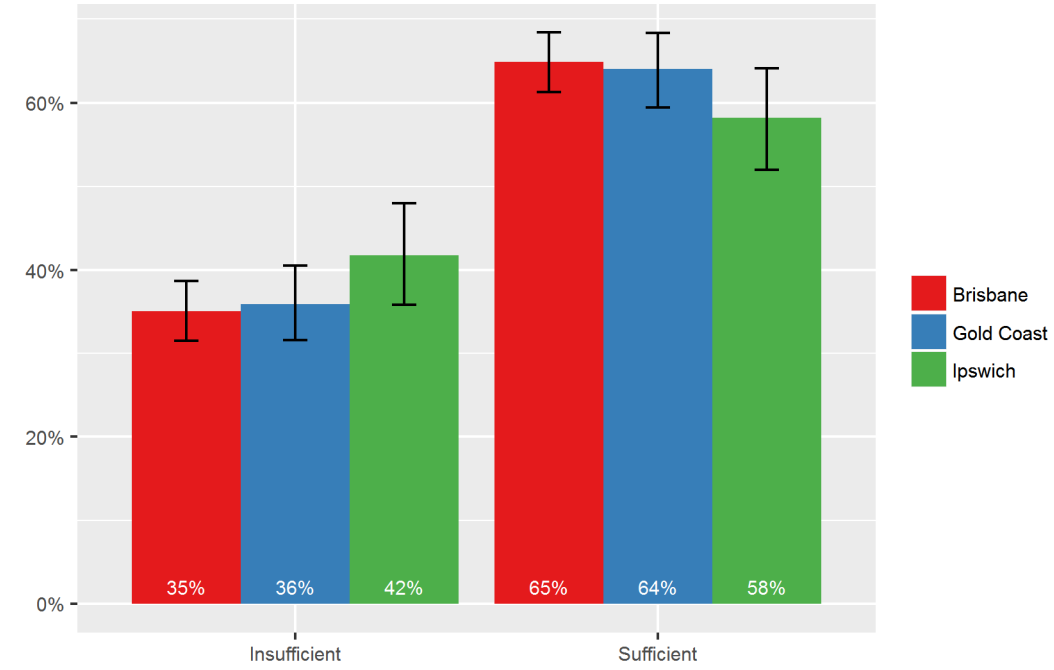
The most recent population estimates for physical activity are shown in Figure 3.7 for the three geographic areas that are considered in the present study. There is no statistically significant difference between the Brisbane and Gold Coast municipal areas, although the Ipswich municipality has significantly higher levels of insufficient activity (42% compared

[7] Metabolic Equivalent of Task (MET) is a measure of energy expenditure in comparison to sitting still. There would be no benefit if a rider were to substitute playing volleyball (MET=8.0) for moderate cycling (MET=8.0) of the same duration. Similarly, substituting a short, high MET activity for a long, low MET activity such as walking would not increase the overall MET-minutes.

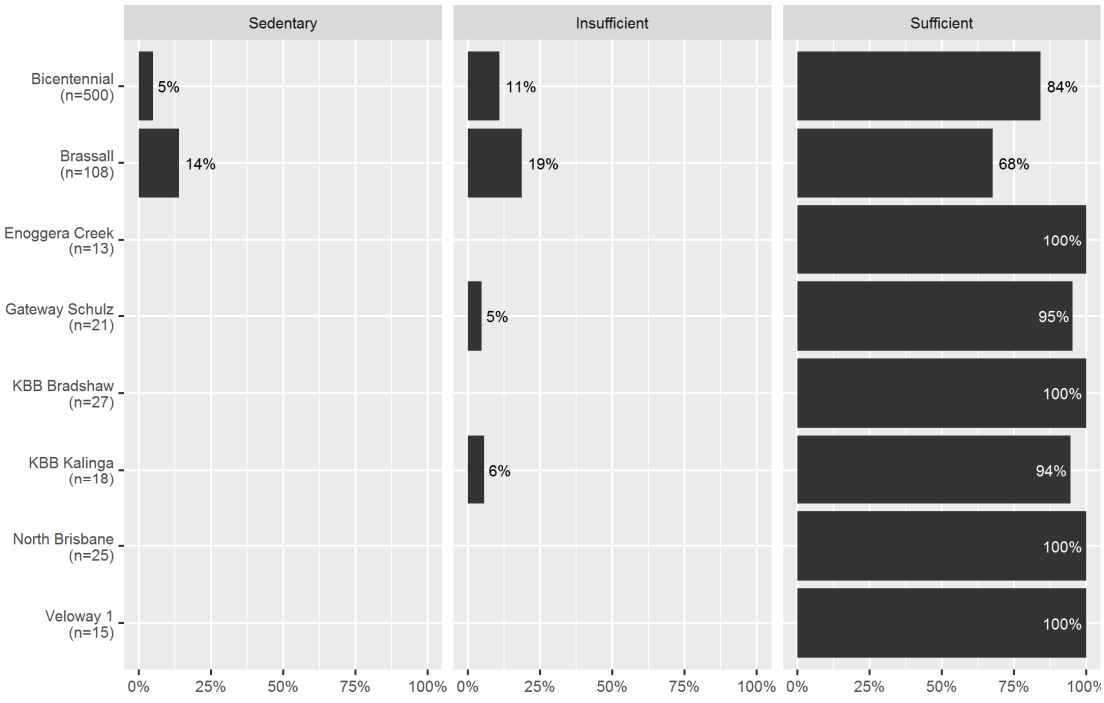
with 35% for Brisbane). The online survey (all sites) and telephone survey (Bicentennial and Brassall Bikeways) asked respondents about their physical activity. This data suggests that path users have a higher physical activity level than the general population (Figure 3.8). For example, 84% of Bicentennial Bikeway users were sufficiently active over the previous week compared with 65% of the wider Brisbane population. In interpreting this graph we note the following:

- At many sites *all* path users had achieved sufficient levels of physical activity over the previous week (although sample sizes for these sites are generally small).
- The online survey method is such that we are highly unlikely to interview respondents who were sedentary over the previous week given that their recruitment is conditional on them having used the path recently; as such, for the non-telephone interview sites the physical activity status will be biased upwards.
- At the telephone interview sites most respondents were recruited via the telephone survey (84% at the Bicentennial Bikeway and 98% at the Brassall Bikeway), such that we expect these estimates to be fairly robust indicators of even infrequent path users.
- 5% of Bicentennial Bikeway users and 14% of Brassall Bikeway users were sedentary over the previous week, but had used the path at least once in the past year. This reflects the irregular physical activity patterns of this cohort, and suggests measures that could encourage this group to use the path more often would have positive health benefits.

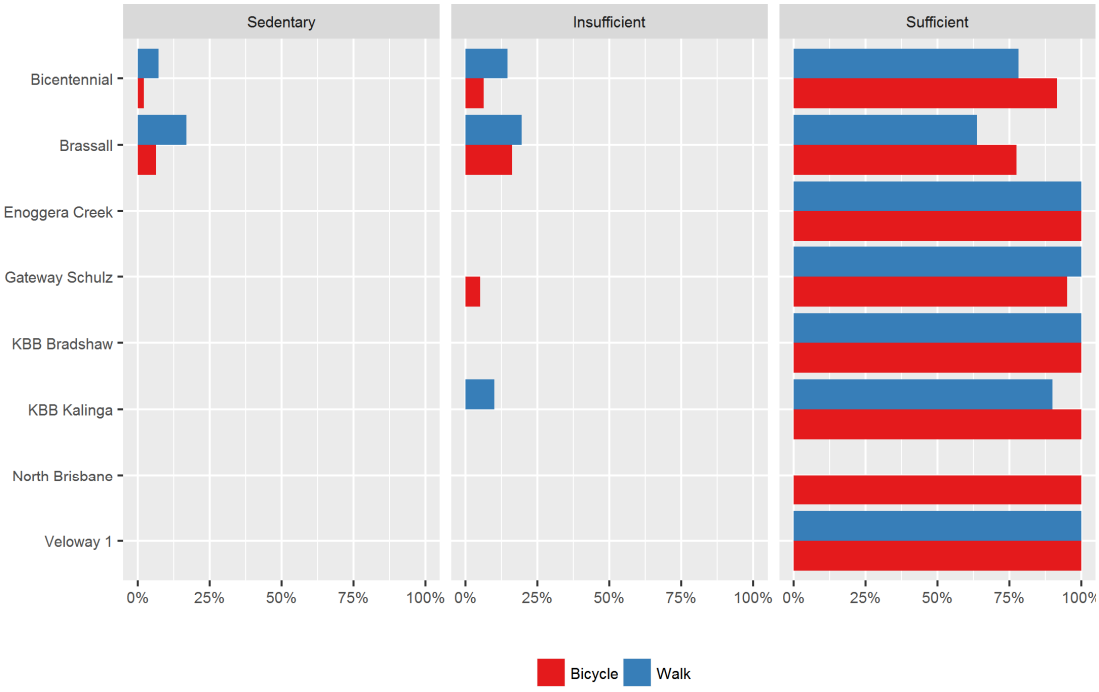
The physical activity status is further broken down in Figure 3.9 by the mode most recently used on the path. The tendency is for pedestrians to be more likely to be insufficiently active than bicycle riders, perhaps reflecting the more discretionary nature of walking (and the lower metabolic rate).



■ **Figure 3.7: Population physical activity status 2013-14 by local government area (Queensland Department of Health 2015)**



■ **Figure 3.8: Physical activity status of path users**



■ **Figure 3.9: Physical activity status by mode last used on the path**

The implications of these findings for the cost-benefit analysis of active transport projects are significant; it appears unreasonably optimistic to assume that path users will reflect the physical activity status of the population from which these users are drawn. Instead, it appears these path users will – in general – be more physically active than the general population. *However*, this does not account for the more fundamental question of causality. Specifically, it does not tell us whether the presence of the active transport infrastructure has directly lead to this higher level of physical activity. This causality is fundamental to being able to reliably allocate economic benefits from health to active transport.

Measuring causality objectively is exceptionally difficult, and would ideally require a large scale prospective cohort study of the affected population before and after the intervention[8]. Such methods are costly, time consuming and will often have limited statistical power[9]. This approach was not practical for this study, particularly given that the infrastructure had already been built. Instead, a retrospective approach was used whereby respondents were asked whether they had changed their amount of walking or riding as a result of the presence of the infrastructure. This question was only asked of those who could recall the situation prior to the infrastructure being built (or, in the case of the Bicentennial Bikeway and Kedron Brook Bikeway, improved). Results for each location where there were 10 or more valid responses are shown in Figure 3.10 for those who had walked along the path in

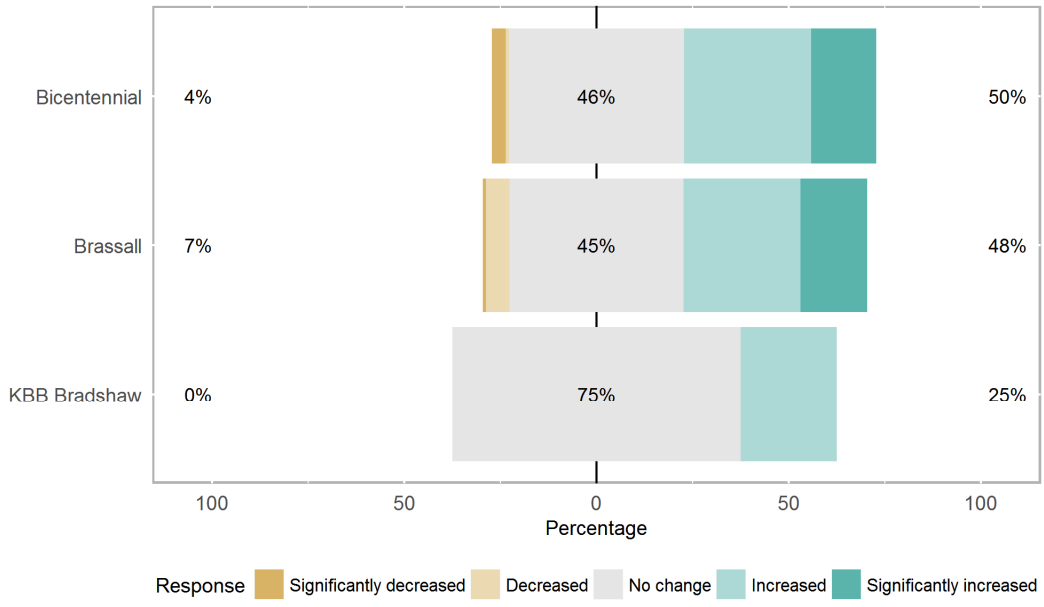
[8] There are limited examples of this being undertaken, but examples include a Sydney protected on-road cycleway (Rissel, Greaves, Crane, et al. 2015) and three shared paths in the UK (Panter and Ogilvie 2015; Sahlqvist et al. 2015).

[9] By this we mean that we will often be looking to detect small changes in large populations, such that the "signal" within the "noise" will be small. This means very large sample sizes will often be required to measure any effect, which may be prohibitively expensive.

the past year, and in Figure 3.11 for those who had ridden along the path in the past year. Respondents overwhelming indicate they have increased their duration of undertaking these activities over the past year. However, we would caveat this by noting that:

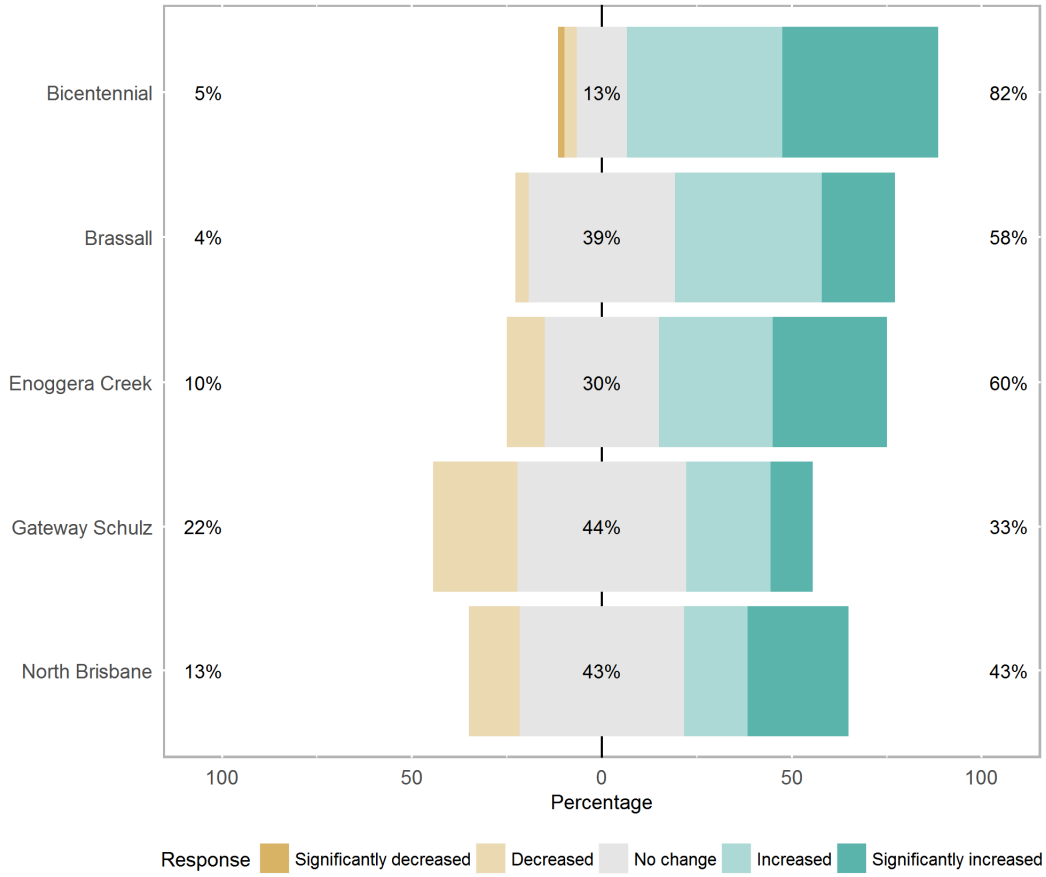
- There is likely to be an acquiescence bias insofar as the objective of the survey will be self-evident to respondents, and therefore a likelihood that respondents will overstate their use of the path to "please" the interviewer, and possibly also because they may see these facilities as "good things" which they want to encourage.
- There is likely to be a social desirability bias insofar as regular physical activity is seen as a "good thing", so respondents are more likely to overstate their behaviour.
- Retrospective methods in general are considered to be fairly unreliable indicators of actual behaviour, and more subject to bias.
- There will be any number of lifestyle factors which can change physical activity participation over time, of which the presence or absence of active transport infrastructure is only one. Although respondents were asked to specifically consider how much their activity has changed as a result of the presence of the path we cannot be certain respondents could reliably report this change.

These caveats aside, we suggest there is fairly strong evidence to suggest the investments have encouraged more cycling and walking than would have occurred in the absence of these investments.



What change, if any, would you say the presence of the path has had on the amount of time you've spent walking over the past 12 months?

■ **Figure 3.10: Self-reported change in walking duration as a result of the path**

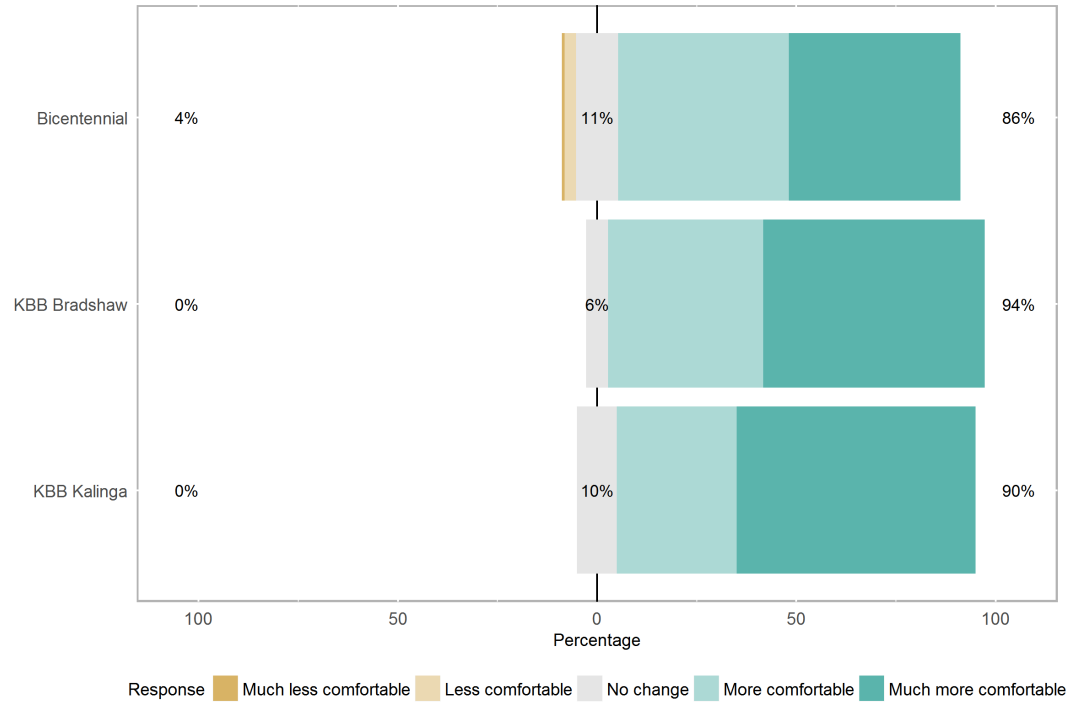


What change, if any, would you say the presence of the path has had on the amount of time you've spent riding over the past 12 months?

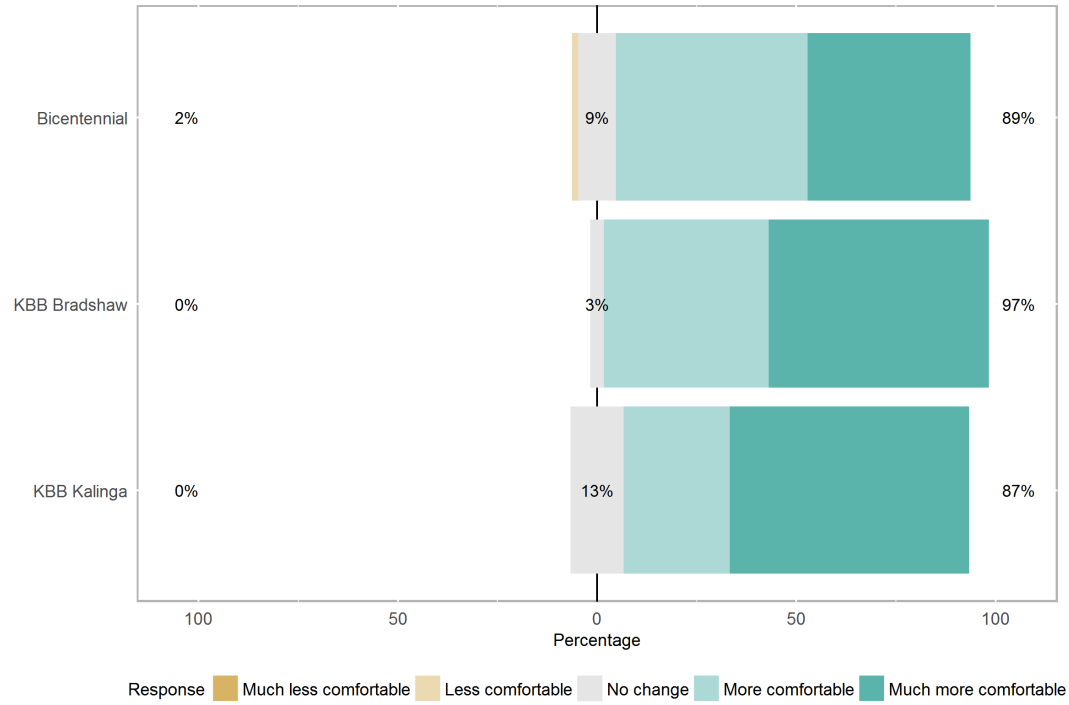
■ **Figure 3.11: Self-reported change in cycling duration as a result of the path**

3.5 Comfort

At the three sites where the path was improved, rather than entirely new, respondents were asked whether they felt more or less comfortable as a result of the changes. These results are shown in Figure 3.12 for those who had walked along the path in the past year, and in Figure 3.13 for those who had ridden along the path in the past year. In all cases path users overwhelmingly indicated they felt more comfortable or much more comfortable.



■ **Figure 3.12: Change in comfort walking on path**



■ **Figure 3.13: Change in comfort riding on path**

3.6 Diversion

The economic benefits that will accrue from an active transport investment will depend not only on how many riders and pedestrians use the facility, but on what they would otherwise have done. For example, we would expect some path users to have driven a car in the absence of the path, while others may have walked or ridden along a different route or not made the trip at all. In this study we refer to this as diversion and specifically to three groups:

- **Reassigned:** trips that previously occurred by active transport using another route, but have now diverted ("reassigned") onto the project,
- **Mode shift:** trips that were previously made by other forms of transport (most notably car or public transport), and
- **Induced:** all-new trips that previously did not occur; these are most likely to be discretionary recreational trips.

Respondents were asked in the context of their most recent trip on the path what they would have done if the path were not there, or in the case of the Bicentennial Bikeway and Kedron Brook Bikeway, before it was widened and segregated. These responses were classified by the mode of travel (bicycle, walk) and the purpose (transport, recreation). The summary diversion rates are shown in Table 3.2. We suggest the key findings from this table are as follows:

- For transport trips:
    - around 60% of bicycle riders and 37% of pedestrians would have taken a different route if the path were not present,
    - very few (7% or less) would not have travelled; this is unsurprising given the transport nature of the trips,
    - on average, around 16% of transport bicycle trips would have used a car if the path were not present, and 9% of walking trips, and
    - public transport diversion varied widely across sites (depending on the availability of these alternatives), but generally ranged from 16% for bicycle and 28% for walk trips for bus, and around half this for train.
- For recreation trips:
    - around two thirds to three quarters of path users would use an alternative route if the path were not present,
    - almost all of the remainder would not have travelled; it is this group for whom we expect there to be health benefits (if these individuals were insufficiently active), and
    - very few would use an alternative mode (car, bus or train) to make their journey – this is unsurprising given the activity of walking or riding is, in many cases, the fundamental reason for the trip occurring.

■ **Table 3.2: Summary diversion rates**

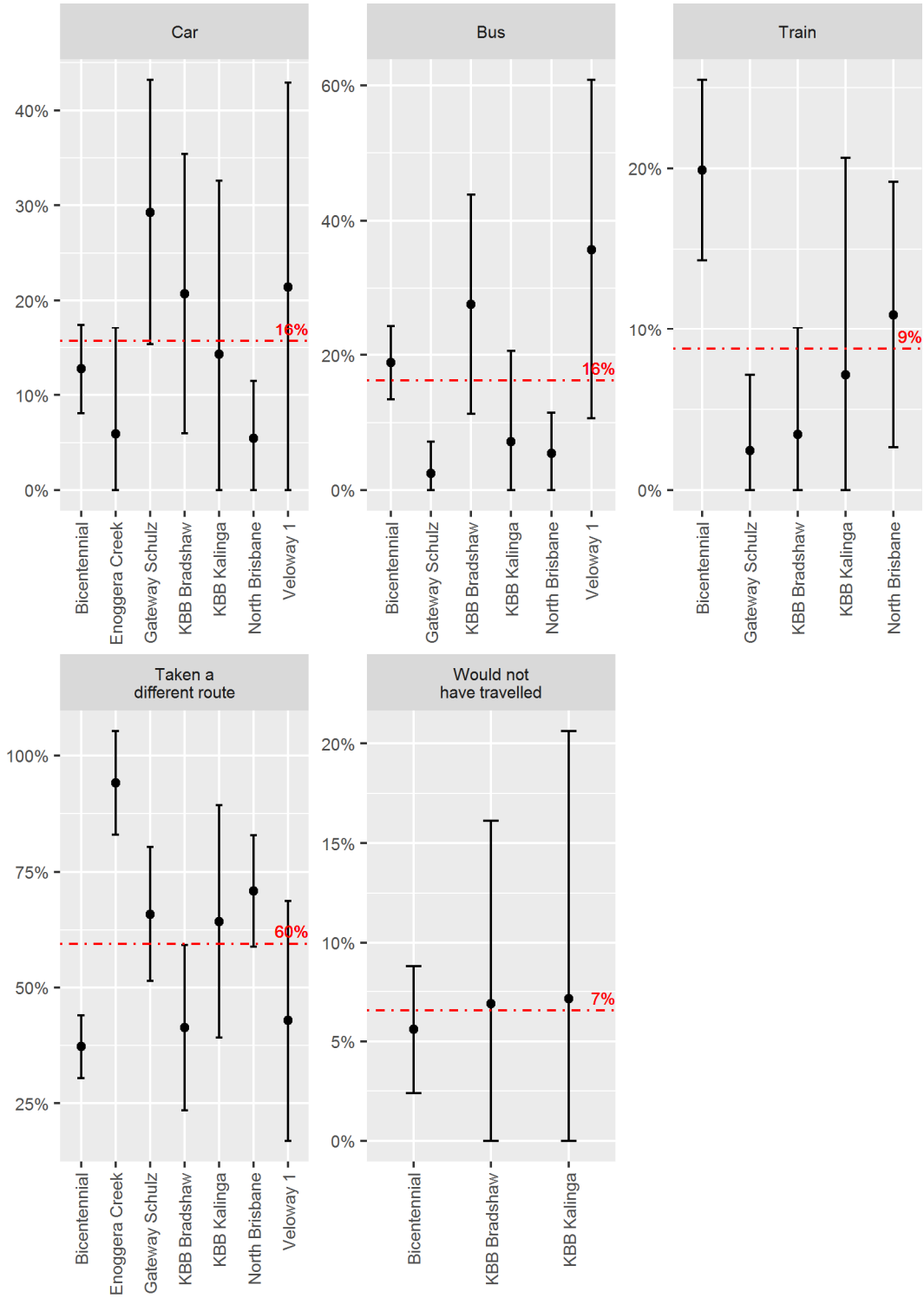
	PURPOSE			
	Transport		Recreation	
TO	**FROM Bicycle**	**FROM Walk [1]**	**FROM Bicycle**	**FROM Walk**
Car	16% (5% - 29%)	9% (–)	4% (2% - 10%)	5% (3% - 7%)
Bus	16% (2% - 36%)	28% (-)	3% (0% - 5%)	6% (2% - 12%)
Train	9% (2% - 11%)	18% (-)	– (-)	– (-)
Taken a different route	60% (37% - 94%)	37% (-)	67% (33% - 90%)	75% (66% - 85%)
Would not have travelled	7% (6% - 7%)	4% (-)	32% (7% - 62%)	19% (15% - 24%)

Values in brackets are minimum – maximums across sites.

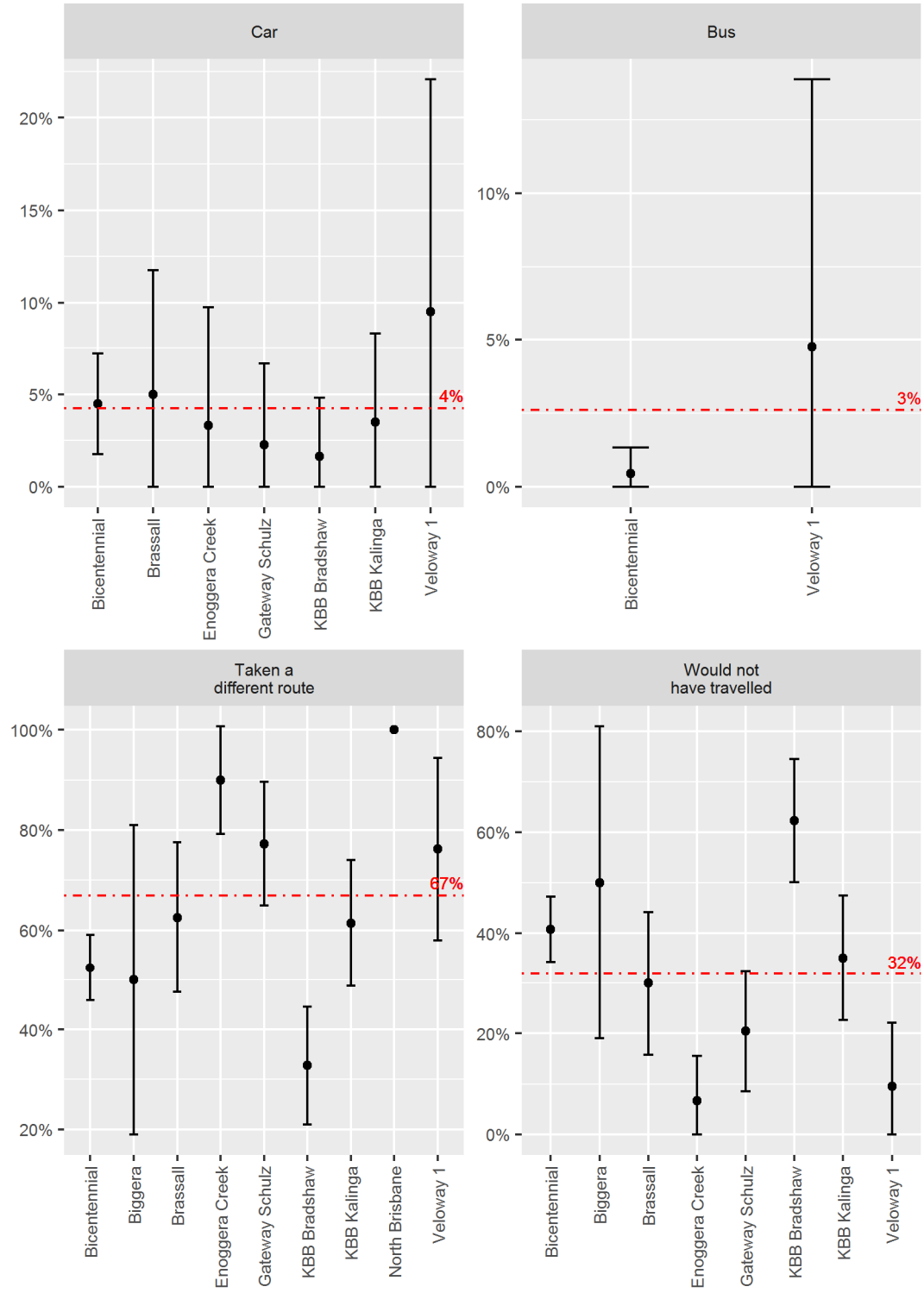
[1] No range given as only one site had a significant number of this group (Bicentennial Bikeway).

There is very wide variation in these diversion rates between sites, as shown by the ranges in the brackets in Table 3.2. Furthermore, the sample sizes are such that the confidence intervals for these estimates within sites are large. This is illustrated in Figure 3.14 for bicycle rider transport trips, and subsequent figures for the other purposes and mode. Given the wide range of diversion rates, and the statistical uncertainty around the central estimates, we suggest the following:

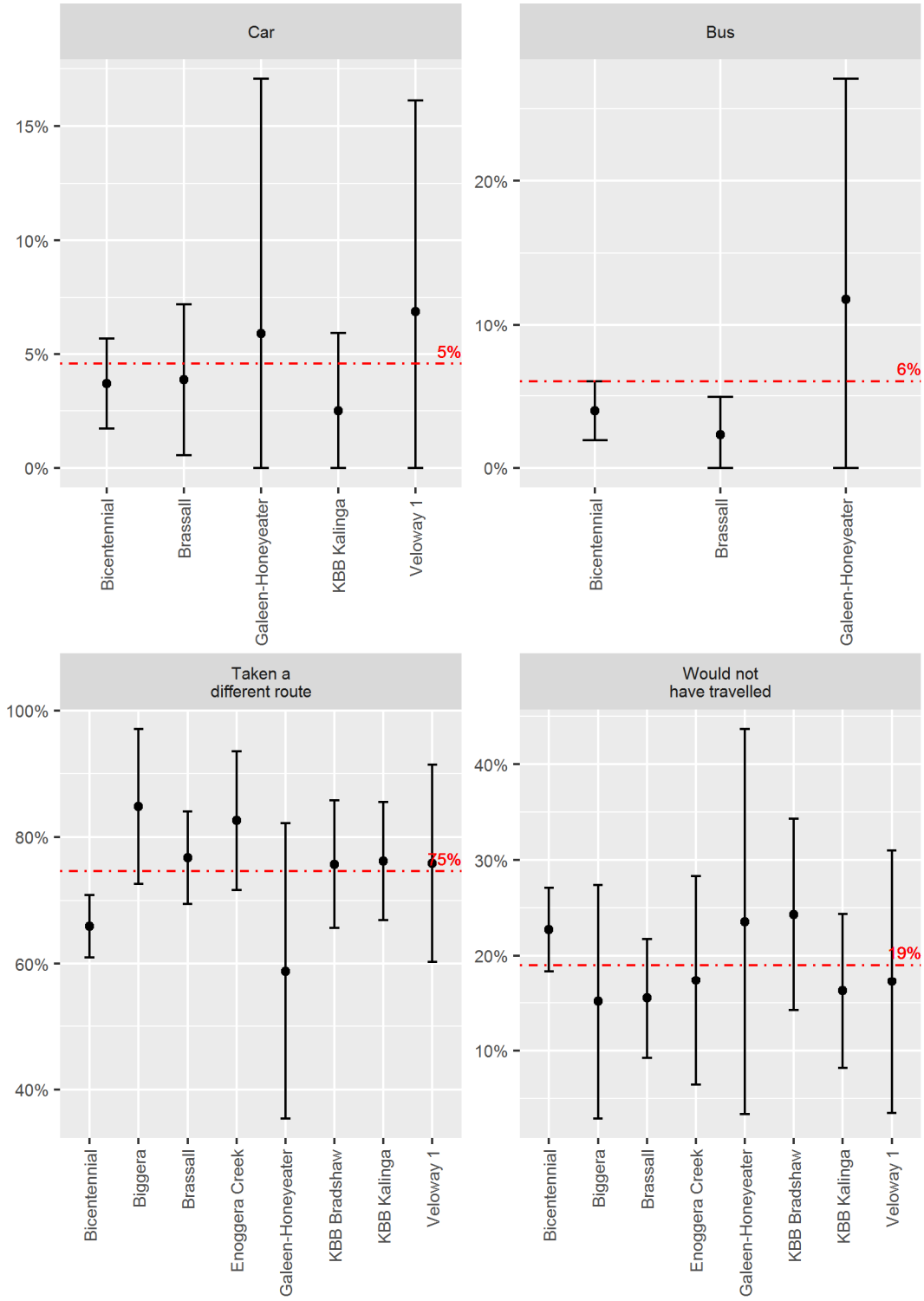
- context is critical: each site will have varying diversion rates depending on the attractiveness of the competing modes, quality of alternative walking/riding routes and the details of the types of trips that are occurring, and
- the analyst should make reasonable assumptions taking into account this context and the data presented herein – these assumptions cannot be considered definitive, but ought be reasonably defensible given the limited state of knowledge.



■ **Figure 3.14: Bicycle rider diversion for transport purposes**



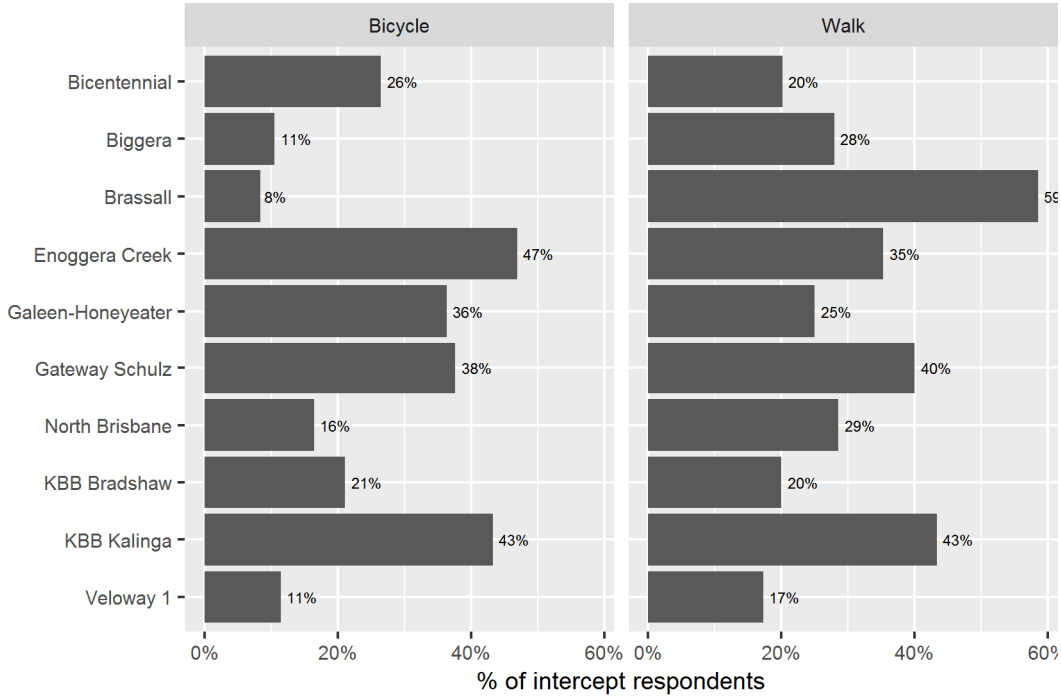
■ **Figure 3.15: Bicycle rider diversion for recreation purposes**



■ **Figure 3.16: Pedestrian diversion for recreation purposes**

3.7 Online survey completion rates

As noted earlier, at the completion of the intercept survey respondents were presented with a business card with a URL and a unique code which they could use to complete a more extensive online survey. The conversion rates from the intercept survey to the online survey varied widely by location and the mode of travel as shown in Figure 3.17. Overall 30% of bicycle riders and 28% of pedestrians completed the online survey. These fairly low conversion rates present problems for some of the subsequent analysis, as sample sizes at many sites for the online survey are low.



■ **Figure 3.17: Intercept survey to online survey completion rates**

4 Cost-benefit analysis

One of the motivations of this study has been to improve upon existing approaches to assigning an economic value to active transport projects. Specifically, the aim has been to provide new empirical data to support these economic assessments. The cost-benefit analysis framework used in the present study leverages heavily off a previous study commissioned by TMR (Sinclair Knight Merz 2011) and the draft update of the National Guidelines to Transport System Management (NGTSM). The purpose of this study was not to reinvent these approaches, both of which are largely consistent with one another, but rather to provide input data to demonstrate their use (and indeed their limitations).

There are numerous benefits of active transport, some of which have market value (e.g. avoided fuel costs or public transport fares) and many which do not (e.g. air pollution, urban amenity). It is suggested that many benefits, and particularly those associated with urban amenity and social inclusion, are very difficult to credibly be monetised. Instead, in a manner identical to the appraisal of other modes of transport, only those benefits which can reasonably be monetised are considered in this section. It is suggested that the non-monetary benefits be described qualitatively in the project business case as a complement to the quantitative BCR calculation.

4.1 Unit values

Unit values are the marginal per-kilometre benefit (or cost) of cycling and walking activity. These are expressed in monetary form in a cost-benefit analysis. There exist standard unit values for use in conventional transport appraisal in Austroads (2012) and NGTSM (Australian Transport Council 2006). However, in the case of active transport it is often suggested that the health benefits accruing from physical activity will represent the most significant benefit stream. There does not currently exist an accepted unit value for health in Australian transport practice, although there is such a value within the New Zealand and UK guidance. However, it is noted that the draft NGTSM update makes recommendations on the calculation of this value using the method derived by Genter et al. (2009) and subsequently adopted with the NZ Economic Evaluation Manual.

4.1.1 Health benefits

The health benefits are calculated using the methods of Genter et al. (2009) and the minor modifications recommended in the draft NGTSM[10]. The indirect health costs of physical inactivity were calculated as follows:

- The value of statistical life is $4,084,027 (2013 prices) using a willingness to pay methodology and indexed using CPI to 2013 prices (as per draft NGTSM),

[10] The most significant change being that the rule of half applies to the willingness to pay (indirect) health cost component. The NZ Economic Evaluation Manual recommends the rule of half be applied to *all* the health benefit, while the previous Sinclair Knight Merz (2011) study did not apply rule of half to health at all.

- Assume there were 613,695 daily adjusted life years (DALYs) lost in Queensland in 2013 (linear interpolation of 2007 estimate (Department of Health 2013) and 2016 projection (Endo et al. 2010))
- The population attributable risk fraction (PAF) due to physical inactivity in Queensland is 6.4% of DALYs (Jardine et al. 2010) giving attributable DALYs of 39,277
- Estimated adult population in Queensland in 2013 of 3,544,909 (ABS 3101.0 Estimated Resident Population, June 2013)
- 57% of the adult Queensland population are sufficiently active, 31% are insufficiently active and 12% are sedentary (Queensland Health 2011)
- The insufficiently active adult Queensland population is 1,524,311 persons
- DALYs per insufficiently active adult is 39,277 / 1,524,311 = 0.0258
- Average age of Queensland residents is 36.6 (ABS 3235.0, 2011 Census of Population and Housing)
- Life expectancy is 81.8 years (QGSO based on ABS data[11])
- Value of per life year remaining is $4,084,027 / (81.8 – 36.6) = $90,355
- Value per capita annual value of 0.0258 x $90,355 = $2,328

The direct health system cost of physical inactivity was calculated as follows:

- Total Queensland health system cost of $29.615 bn in 2013/14[12]
- Health system costs attributable to physical inactivity 6.4% x $29.615 bn = $1.895 bn
- Health system cost per insufficiently active adult $1.895 bn / 1,524,311 = $1,243

The unit values for each physical activity group are derived in Table 4.1 using the per capita costs calculated above and assumptions made by Genter et al. about the distances over which the benefit is received. The overall health benefit for walking is estimated to be $2.53/km and $1.27/km for riding. These values are marginally lower than the draft NGTSM guidelines based on national data ($2.77 and $1.40 for walking and riding, respectively) and are very similar to the NZ values ($2.48 and $1.28 for cycling and walking[13], respectively).

[11] http://www.qgso.qld.gov.au/products/tables/life-expectancy-birth-years-sex-qld/index.php

[12] http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129552833

[13] 2008 values were adjusted to 2013 using NZ CPI inflation of 11.1% over the period and converted to AUD using the average exchange rate for 2013 of 0.826.

■ **Table 4.1: Calculation of health unit values**

	Physical activity group			Comment
Weight	1.00	0.85	0.15	As per Genter et al.
Prevalence	12%	31%	57%	Queensland Health 2011
Walking				
km over which benefits received	625	450	312	As per Genter et al.
$/km	$0.46	$1.66	$4.40	Apply RoH to indirect benefits
Weighted benefit		$2.53		
Bicycle riders				
km over which benefits received	1250	900	624	As per Genter et al.
$/km	$0.23	$0.83	$2.20	Apply RoH to indirect benefits
Weighted benefit		$1.27		

All values are 2013.

Genter et al. (2009) notes that health benefits will accrue among newly active individuals over time. They assume that these benefits ramp linearly to their full value after five years. This assumption is made by default (although it is user adjustable) in the implementation described in Section 4.2. The draft NGTSM guidelines are currently silent on this issue.

In providing an infrastructure link such as a bridge or tunnel that shortens the distance between an origin and a destination there exists the possibility that bicycle riders or pedestrians who were previous using active transport will now travel a shorter distance. Given the health benefit is applied per distance travelled this will in turn result in a health disbenefit to this user group. In practice it is not altogether clear that this will be the result; for recreation users it is probable they will compensate by simply riding or walking to a more distant destination such that their overall physical activity duration will not change. However, for transport users it does seem plausible that physical activity will decrease. As such, the framework assumes that pre-existing riders and pedestrians travelling for transport *will* incur health disbenefits in this cases but that recreation riders and pedestrians will not incur any change in physical activity[14].

[14] Both transport and recreation groups may incur a change in safety risk; this is calculated separately to physical activity.

4.1.2 Injury costs

Both cycling and walking, at least in urban areas, expose users to a greater risk of fatality or serious injury than travelling by car or public transport. While exposure estimates (that is, kilometres travelled by mode) are generally poor, and particularly so for active transport, indicative estimates were used by Sinclair Knight Merz (2011) to estimate the crash risk per mode (Table 4.2).

■ **Table 4.2: Injury risk by mode and severity**

Mode	Kilometres travelled per annum	Injuries [3]			Risk of injury (per million km)		
		Fatal	Serious	Other	Fatal	Serious	Other
Car	40,240.2 [1]	225	4,580	11,285	0.0056	0.1138	0.2804
Cycling	292.5 [2]	9	287	500	0.0296	0.9800	1.7104
Walking	808.6 [2]	39	414	383	0.0486	0.5120	0.4736

[1] *Survey of Motor Vehicle Use, 12 months ended 31 Oct 2007*, ABS Cat. No. 9208.0 provides vehicle km, have estimated person km by assuming an average vehicle occupancy of 1.30.

[2] *SEQTS 2009* expanded to the Queensland population (this assumes cycling and walking rates are the same in SEQ and the rest of Queensland).

[3] Average of 2006-2009 Police reported injuries.

The previous Sinclair Knight Merz study used the then-current human capital approach for estimating statistical life to monetise the injury risks. Given the recent shift towards a willingness-to-pay methodology the injury unit values were re-estimated given the risks in Table 4.2 and are listed in Table 4.3. Note that, similarly to most other studies on this subject, the health benefits are much greater than the injury disbenefits for active transport – by a factor of two for cycling and 5.7 for walking.

■ **Table 4.3: Injury unit values**

Mode	Value
Cycling	-$0.62/km
Walking	-$0.44/km
Motor vehicles	-$0.04/km
Public transport	-$0.01/km

2013 values.

For reference, it is noted that the draft NGTSM recommends national values of $0.95/km for cycling, $1.44/km for walking, $0.21/km for motor vehicle (and motorcycle) and $0.04/km for public transport. At least one of the reasons for the significant variation in these estimates probably relates to the uncertainty in the exposure measures used. Another is the variation

in reporting of injury statistics; it is widely recognised that cycling and walking injuries are heavily underreported[15].

Adjustments for facility type

Many active transport projects are likely to involve some type of dedicated provision that separates active transport from motorised traffic – such as footpaths, bicycle lanes, protected bicycle lanes, cycleways and shared paths. There is limited information internationally on the relative risk of these facilities (compared to mixed traffic roadways), and almost none in Australia[16]. In the absence of high quality data the approximations used by Sinclair Knight Merz (2011) were used (Table 4.4). By way of comparison, the case-crossover method used by Teschke et al. in Canada (2012) reported relative risks of 0.69 for on-road bicycle lanes with kerbside parking (compared with mixed traffic), 0.54 for on-road bicycle lanes without kerbside parking, 0.79 for shared paths and 0.59 for bicycle paths.

■ **Table 4.4: Bicycle rider relative risk by infrastructure type**

Infrastructure	Relative Risk
On-road (no provision)	1.0
On-road bicycle lanes	0.5
Off-road path	0.3
Footpath	1.8

In considering the general applicability of these ratios we note the very wide variation in the quality (and therefore risk) of streets and bicycle infrastructure. We would expect, for example, that providing a fair quality shared path as an alternative to a high speed, narrow roadway with large traffic volumes would produce much greater risk reductions than stated here. Conversely, a shared path that is an alternative to a low speed, quiet street would produce much lower risk reductions[17]. As such, it seems prudent that the practitioner adjusts these factors on a case-by-case basis.

An additional consideration is that almost all cycling and walking trips will not occur entirely within the confines of an active transport project. Instead, users will almost invariably have to navigate the local street network to gain access to the project, and then from the project to their final destination. For example, the average trip distance of bicycle riders using the Bicentennial Bikeway is around 19 km but the path itself is only around 4.5 km long. Even if, for a recreational out-and-back trip, a rider travelled the full length in both directions most of their trip (10 km) would still be away from the path. It is assumed throughout this study,

[15] This applies not just to minor injuries but also serious injuries.

[16] There are a few prospective exposure-based studies underway or completed in Australia. However, most have been unable to identify statistically significant differences in crash risk on different infrastructure – the NSW Safe Cycling Study being one example (Poulos et al. 2015).

[17] Indeed, it could be argued in some instances that the risk actually increases – at least if the path is built to a low standard.

somewhat arbitrarily, that 60% of this travel away from the project is on roads without bicycle lanes, 10% is on off-road shared paths or bikeways and 5% is on footpaths. These assumptions can be altered within the implementation (Section 4.2). However, almost invariably the safety disbenefits that accrue from mode shift and induced travel are due to users who would otherwise have used safer modes (motor vehicle and public transport) diverting to use less safe modes (cycling and walking) *and* being exposed to risks away from the project itself.

4.1.3 Savings in vehicle operating costs

By shifting from car or public transport to active travel the traveller is avoiding fuel, parking and marginal maintenance costs (for car travel) and public transport fares (for public transport).

Austroads (2012) and the forthcoming NGTSM update provide unit values for vehicle operating costs, and are used in this project. Similarly, there are simple parking cost estimates provided in Austroads. In 2013 prices these unit values are around $0.37/km for vehicle operating costs and $0.02/km for parking costs. Note however that the rule of half applies to these benefits so their effective value is around $0.20/km. In comparison to the health benefits of cycling of $1.27/km and $2.53/km for walking these savings are modest. As such, we expect the vehicle operating cost savings to be immaterial in comparison to the health benefits. The only exception to this would be situations where there may be large out-of-pocket costs such as road tolls or parking costs. However, even when considering the latter, we would note that while parking costs in constrained locations such as the Brisbane CBD are comparatively high, these high costs are only likely to apply to a minority of motorists given that a sizeable proportion are likely to have subsidised workplace parking provided.

Savings from those who divert from public transport will consist of the fare saving to the individual and, potentially, community savings in avoided costs for additional public transport vehicles and infrastructure, or running additional services. Rough calculations using current Translink fares suggest peak Go Card fares of around $0.16/km and $0.13/km off peak (with a flagfall of $1.30 to $1.70). Once rule of half is applied to these costs they again become insignificant in comparison to the health benefits.

We suggest the wider network benefits of diverting public transport users to active travel are marginal at best, and may not be positive overall:

- the subsidy requirement will need to *increase* to account for the lost fare revenue of a traveller who shifts to active transport *unless*
- the shifting to active transport precludes the need to purchase additional trains, buses or ferries or expand the public transport infrastructure.

While the latter is theoretically possible for large mode shifts, and even then only at peak periods, the evidence from the surveys conducted as part of this study suggests this is unlikely to occur in practice. Instead, any benefit that will occur is most likely to be felt in perceived crowding benefit for those who remain as public transport users during crowded

periods. Again however, while such crowding benefits may be monetised using various willingness-to-pay methods it would be difficult to argue that a single active transport project can provide such improvements.

4.1.4 Road congestion

The incremental costs of congestion were estimated using the approach used by Sinclair Knight Merz (2011). These costs were updated to 2013 prices and are listed in Figure 4.1.

Congestion level	Value
Busy	$1.14/km
Medium	$0.81/km
Light	$0.21/km

■ **Figure 4.1: Road congestion unit values**

4.1.5 Travel time

Consistent with current Austroads guidance, travel time (dis)savings are valued at $14.10/hr (in 2013 prices and values). This value of time is converted to a per-km value using the assumed effective speeds for each of the modes in the model.

There are two ways in which an intervention can alter the travel time for existing travellers:

- those who divert from other modes (e.g. motor vehicle, public transport) may incur longer or shorter travel times (depending on the context, and the speed at which they walk or ride), and
- the project may lead to a (usually) shorter journey, perhaps by avoiding a circuitous route or providing a grade-separated crossing of a road or railway line.

We would reasonably expect the way in which these travel time (dis)savings would be valued will differ between those travelling for recreation and transport. For those travelling for recreation it seems incongruous to assume they would perceive "value" in having a shorter distance to walk or ride between two locations. Instead, they are more likely to walk or ride farther on the basis that they are seeking a fixed time of activity[18]. Conversely, for those travelling for transport purposes who are already riding or walking providing a shorter route will presumably be valued in much the same way as it is assumed to do for motorised travel. Clearly, it is appropriate to apply travel time savings to this group. It is also likely that those diverting from motorised modes to riding, and especially walking, will incur longer travel times. This will be particularly true in outer urban areas (where congestion is minimal and parking plentiful) and for longer journeys (where the travel time benefits of motor vehicle travel in particular will be increasingly significant)[19]. In the model it is assumed no

[18] This sets aside issues such as journey ambience, which may well be valued by users – but is separate from the issue of travel time savings *per se*.

[19] There is a contrary argument: the user is *choosing* to shift from (say) motor vehicle to bicycle in the knowledge that the trip will take them longer. Clearly, they nonetheless infer a higher utility from doing so that can be

travel time (dis)benefits apply to recreation travellers but that transport travellers who divert from other modes or were pre-existing *will* perceive the travel time (dis)savings.

4.1.6 Other externalities

The other benefits included explicitly within the model are:

- noise,
- air quality,
- greenhouse gas emissions, and
- infrastructure (roadway) maintenance savings.

These savings are all assumed to come from trips shifted from motor vehicles to active travel. The unit values are updated to 2013 prices from Sinclair Knight Merz (2011). All are very small relative to health benefits to the extent that they are immaterial.

4.2 Implementation

In order to assist practitioners to conduct cost-benefit analyses an online appraisal tool has been developed[20]. The tool is implemented online using the Shiny web application framework for the R statistical programming language. This tool provides a quick means for practitioners to undertake appraisals in a manner consistent with the approach adopted in this study. Moreover, it enables practitioners to rapidly test assumptions on the likely economic benefits. However, it does not avoid the need for the practitioner to make reasonable assumptions as to the project cost and demand. These assumptions may come from previous experience or modelling; one of the benefits of the implementation is that sensitivity tests can quickly be performed to understand which parameters are of greatest importance.

4.3 Base assumptions

Unless otherwise stated in this report the following assumptions have been made in appraising the projects described in Section 5:

- a project life (i.e. appraisal period) of 30 years,
- no residual value in the asset at the end of this 30 year period,
- discount rate of 7% (with sensitivity tests of 4% and 10%),
- health benefits ramp up linearly over a 5-year period,
- cyclist and pedestrian cumulative growth of 3% per annum,
- no safety in numbers effect,

attributable to other non-time benefits. Whether these other benefits are fully monetised in this model can be debated, however we suggested they are – at least in part – internalised within the health benefits.

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

- 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[21],
- average effective motorist speeds of 30 km/h, cyclist speeds of 20 km/h, walking speeds of 6 km/h and public transport speeds of 15 km/h,
- cyclist relative risk of injury of 0.5 for on-road bicycle lanes and 0.3 for off road paths in comparison to roadways without provision,
- away from the project 60% of cyclist travel is on-road without bicycle provision, 10% is on-road with bicycle lanes, 25% is on off-road shared paths or cycleways and 5% is on footpaths,
- capital and operating cost estimate to +/-10% at 95% confidence level, and
- demand estimates to +/-20% at 95% confidence level.

[21] These assumptions are consistent with the draft NGTSM guidance.

5 Individual sites

5.1 Bicentennial Bikeway

5.1.1 Project description

This evaluation considered the improvements that Brisbane City Council and TMR have undertaken to progressively widen the Bicentennial Bikeway from Toowong to the Brisbane CBD. These works have been undertaken in stages over a number of years. The most notable improvement has been to widen the pavement from around 3 m to 5.5 m and to segregate pedestrians and bicycle riders using paint delineation (Figure 5.1). The bikeway is around 3.5 m wide and the footpath around 2.0 m wide. The total project cost of the widening from the Go Between Bridge to Toowong has been of the order of $28m, covering design and construction over multiple stages between 2009 and 2013 and connections to the Go Between Bridge.

(a) 3 m shared path

(b) 5.5 m segregated path

■ **Figure 5.1: Bicentennial Bikeway**

5.1.2 Usage

Video-based counts over a 7-day period were conducted from 6 am to 7 pm. These counts found very high levels of usage; the average weekday count was 5,593 bicycle riders and 2,063 pedestrians (Appendix D). Weekend usage was higher at 6,256 bicycle riders and 2,465 pedestrians, although demand was spread more evenly across the day.

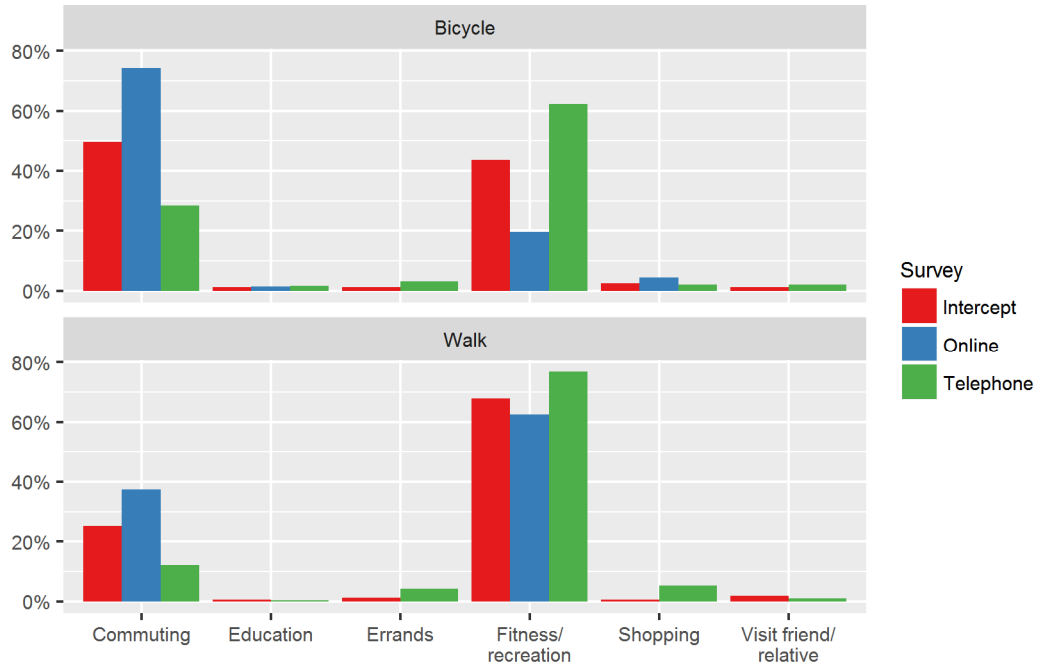
5.1.3 Surveys

Given the importance of the bikeway, the high pedestrian and rider demand and the scale of investment, it was considered appropriate to use all three survey methods for users of this facility. Specifically, this meant an (a) intercept survey of path users, (b) follow-up

online survey for intercept survey participants, and (c) a telephone survey of residents along the corridor.

Intercept surveys were conducted on the path immediately east of the Milton ferry terminal during October 2015 on two weekday mornings and two weekend mornings. The telephone survey was conducted of residents living in suburbs immediately adjacent, or close to, the bikeway. The area consisted of four postcodes (4064, 4066, 4067 and 4068) covering suburbs from Milton to Chelmer, and from St Lucia to Toowong and Taringa.

The interview methods provided a broader coverage of path users than could be obtained with one method alone. This is illustrated in Figure 5.2, where for bicycle trips 50% of trips were for commuting in the intercept surveys compared with 28% of telephone interviews. As would be expected (given the survey periods), the telephone surveys were biased more towards recreational trips than the intercept surveys for both bicycle riders and pedestrians. Irrespective, it appears that around 40% of bicycle trips along the path are for commuting and slightly more than 40% are for recreation purposes. By comparison, less than 20% of walking trips are for commuting; most trips (more than 60%) are for fitness or recreation.



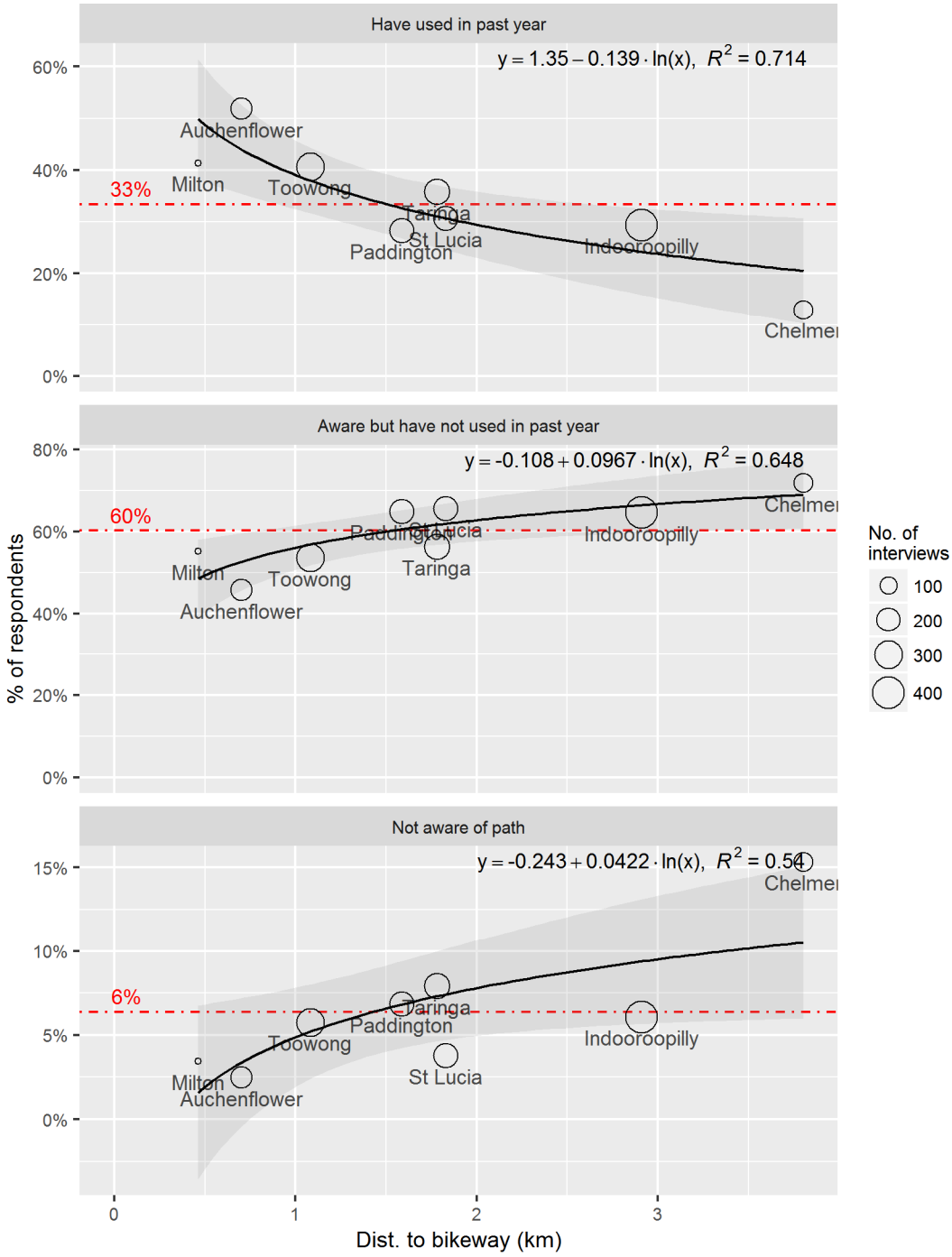
■ **Figure 5.2: Purpose of travel by survey**

5.1.4 Catchment

The telephone interviews provided an indication of the awareness of the presence of the bikeway among the resident population, and their propensity to use the path. This data is summarised in Figure 5.3, and suggest that:

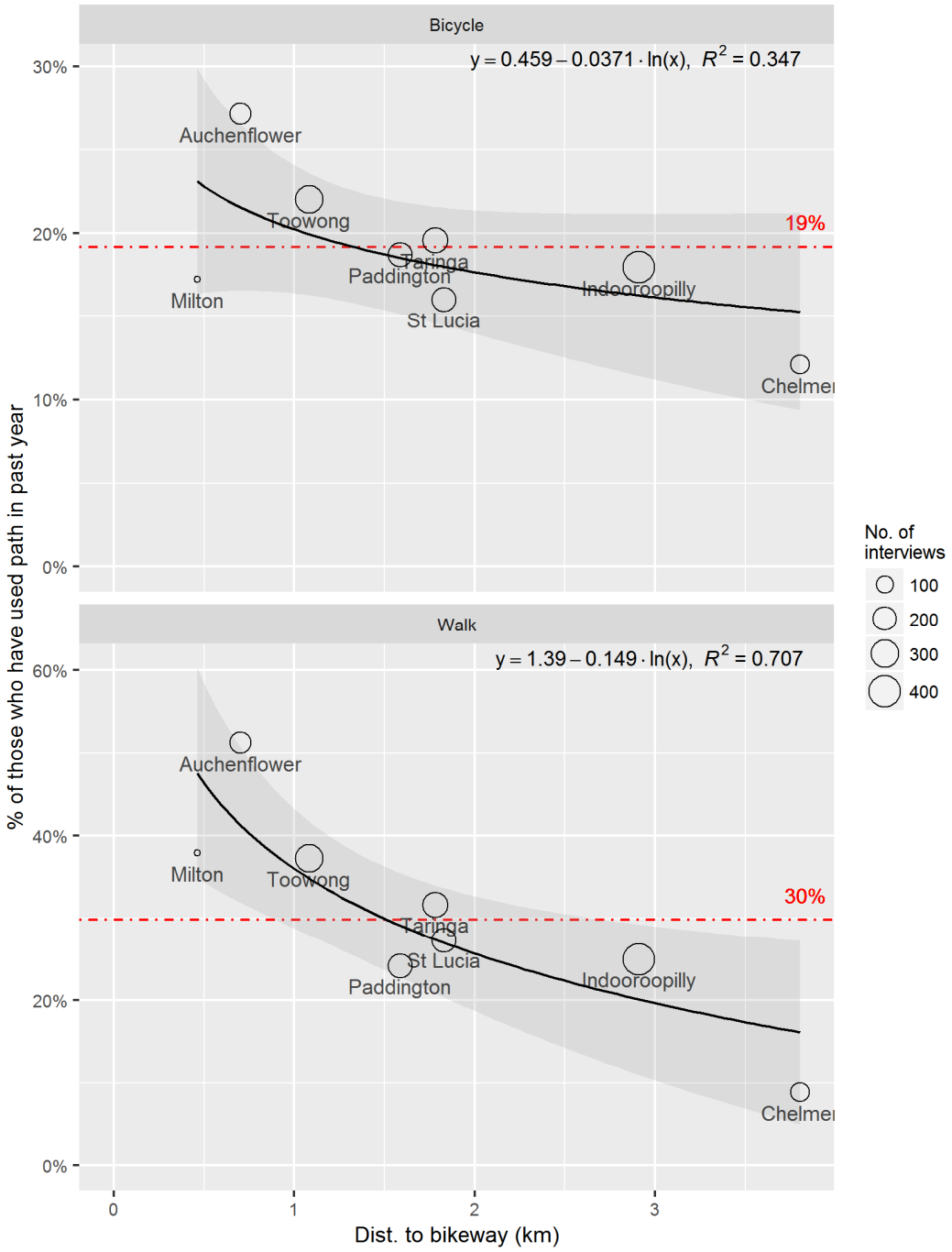
- Awareness of the presence of the path is very high; 93% of respondents were aware of the presence of the path.
- At least occasional usage is fairly high; 33% of respondents had used the bikeway at least once in the past year (either as a pedestrian or as a bicycle rider).
- Awareness and usage both appear to be correlated to the distance[22] the respondent lives from the bikeway. Residents of Chelmer are more likely to be unaware of the existence of the bikeway, and less likely to use it, than those living in suburbs adjoining the path such as Milton, Auchenflower and Toowong.
- Usage and awareness both appear to be well predicted by a logarithmic relationship to the distance from the nearest point on the path from the eight suburbs from which we obtained reasonable (i.e. more than ten) sample sizes.

[22] Distances were determined as the crow flies from the centroid of the suburb to the nearest point on the path.



■ **Figure 5.3: Awareness and usage of path by suburb (excludes suburbs with <10 interviews)**

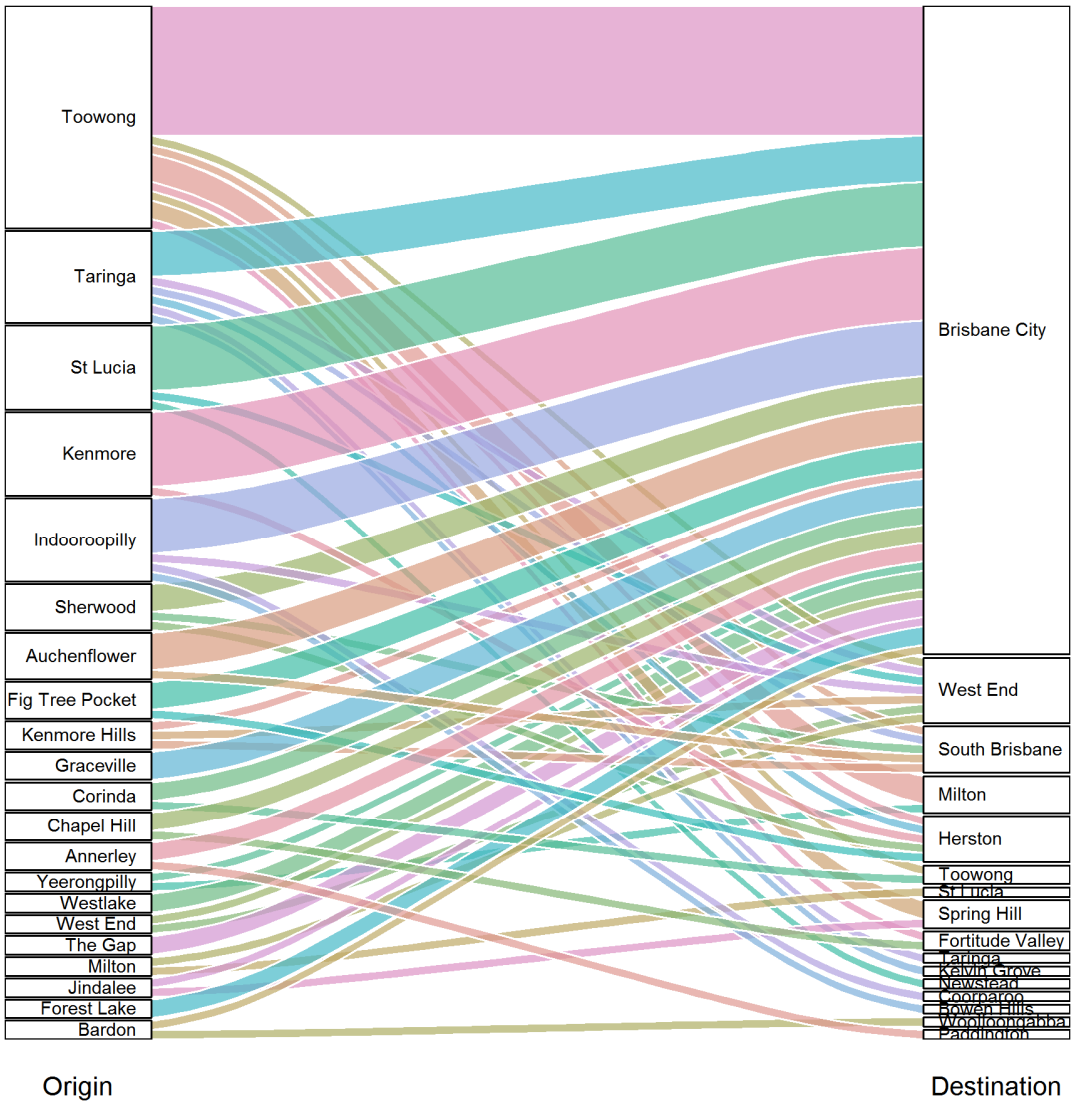
The proportion using the bikeway for riding (over the past year) across the sample was 19%, compared with 30% who had walked at some point on the bikeway (Figure 5.4). The proportion who have walked on the path in Chelmer (9%) is considerably lower than for other, closer suburbs (as one would expect). The relationship between riding and distance from the path is weak, while increasing distance from the path has a fairly strong relationship to walking propensity. Again, this appears to be intuitively reasonable.



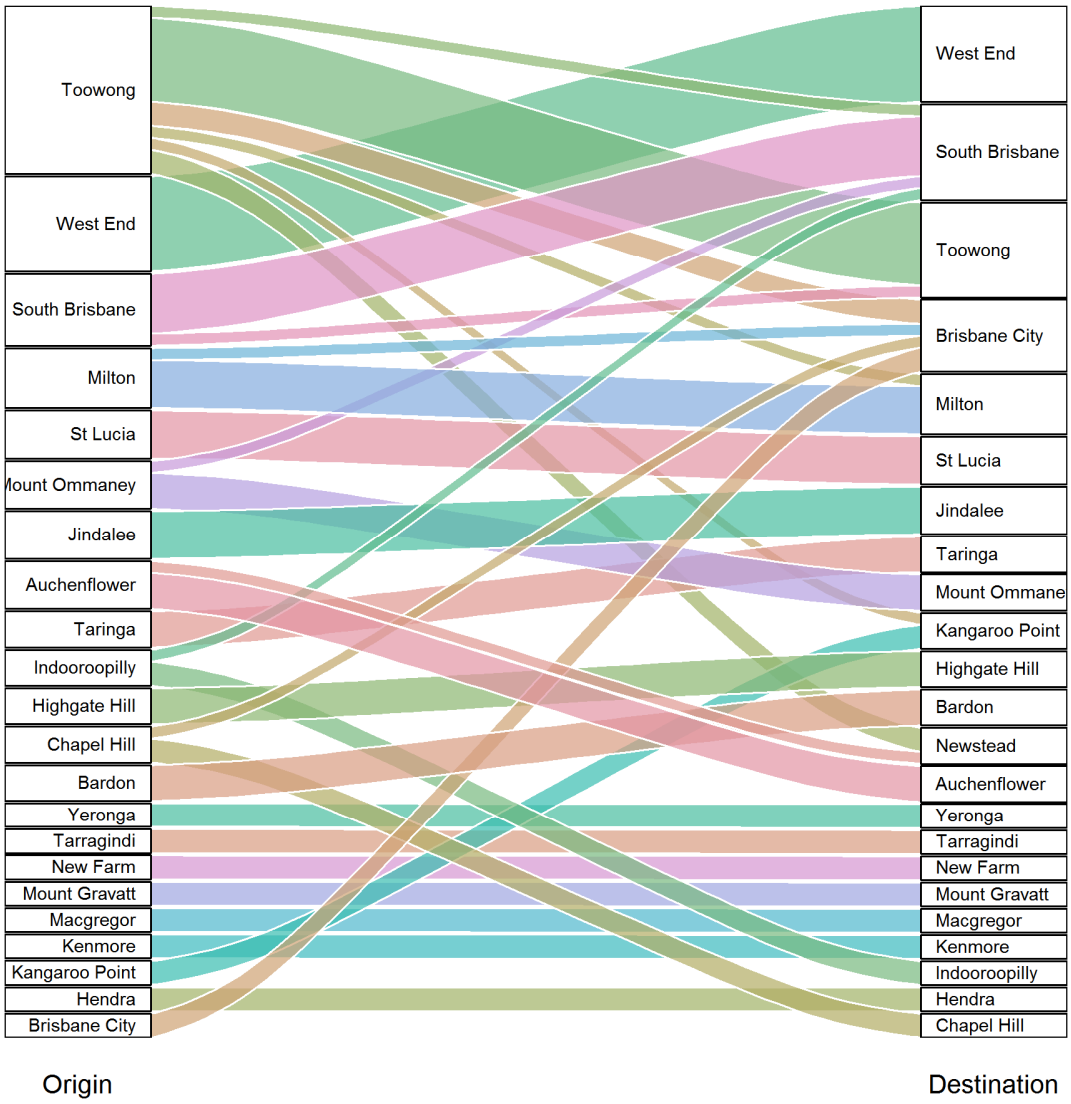
■ **Figure 5.4: Path usage by mode and distance from bikeway (excludes suburbs with <10 interviews)**

The trip origins and destinations by cycling for transport purposes are shown in Figure 5.5. The Brisbane CBD is the destination for 62% of transport trips while the largest origin-destination movement is between Toowong and the CBD (11% of all transport trips), followed by trips to the CBD from Kenmore (6%), St Lucia (5%) and Indooroopilly (5%). Unsurprisingly, most recreation cycling trips start and finish in the same suburb (Figure 5.6); the most common trips being from and to Toowong (7%), South Brisbane (5%), Jindalee, Milton and St Lucia (all 4%).

Bicycle trips originate across a much wider catchment than walking trips. Nonetheless, the single largest source of trips is Toowong for both bicycle (18%) and walking (19%) transport trips. The Brisbane CBD represents the destination for 62% of bicycle transport trips and 40% of walking trips, with Milton accounting for another 40% of walking trips. The origins and destinations for recreation cycling trips are more disperse (Figure 5.6), Toowong accounts for around 13% of recreation trip origins and the Brisbane CBD accounts for only 3% of trip destinations. Recreation walking trips are however more concentrated around the immediately adjoining suburbs.



■ **Figure 5.5: Transport trip origins and destinations by mode (n=129)**



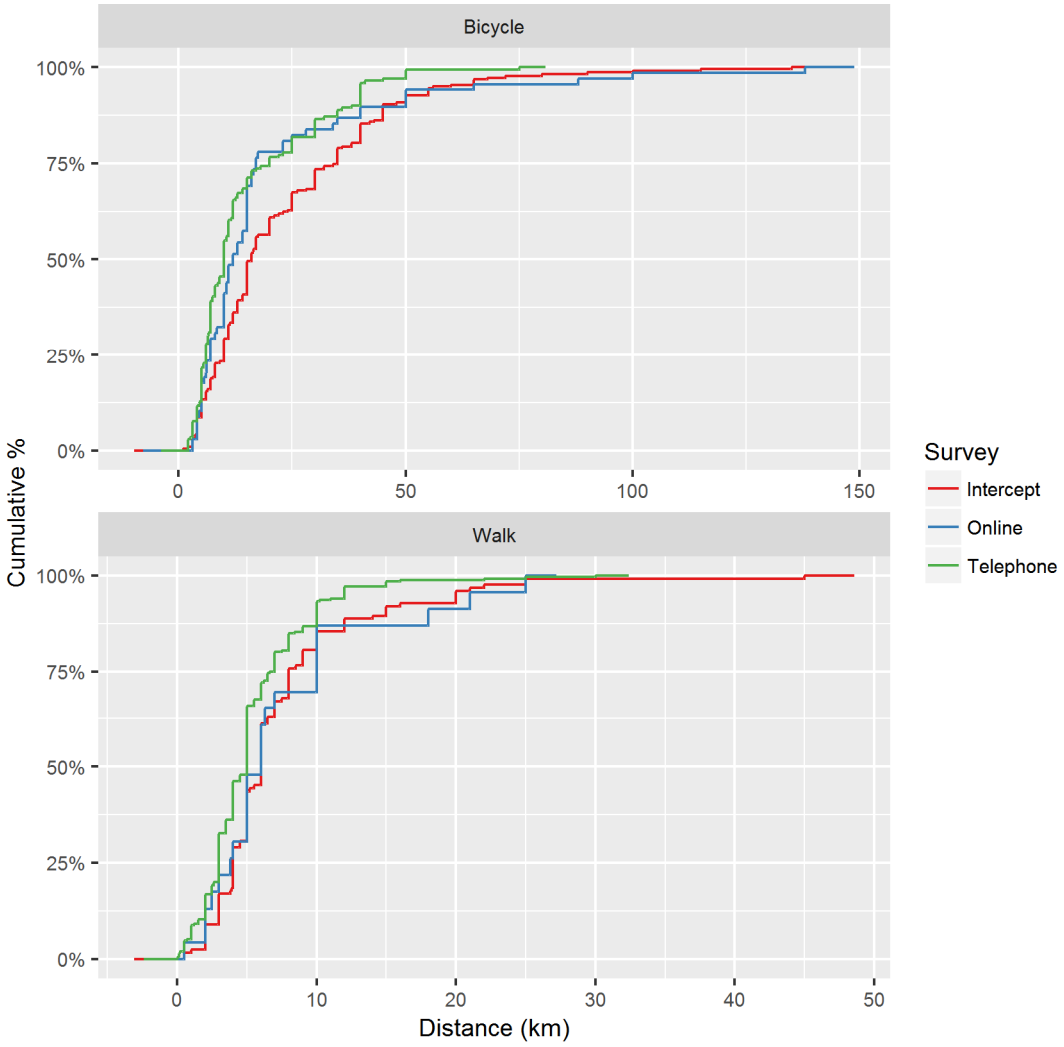
■ **Figure 5.6: Recreation trip origins and destinations by mode (n=104)**

The median trip distance by bicycle for transport trips was 11 km, compared to 35 km for recreation trips (Table 5.1). Given that the bikeway from Toowong to Herschel Street is around 4.5 km long this suggests that riders are travelling on-road for around half of their transport journeys. There is some variation in the reported trip distances by survey (Figure 5.7). There is a bias towards longer journeys for cycling trips, most likely reflecting the higher likelihood from those within this sample to be making longer transport or sport recreation trips.

■ **Table 5.1: Median trip distances (intercept survey)**

Purpose	Bicycle	Walk
Transport	11	5
Recreation	35	6
All	16	6

Units are kilometres. Medians based on intercept survey.



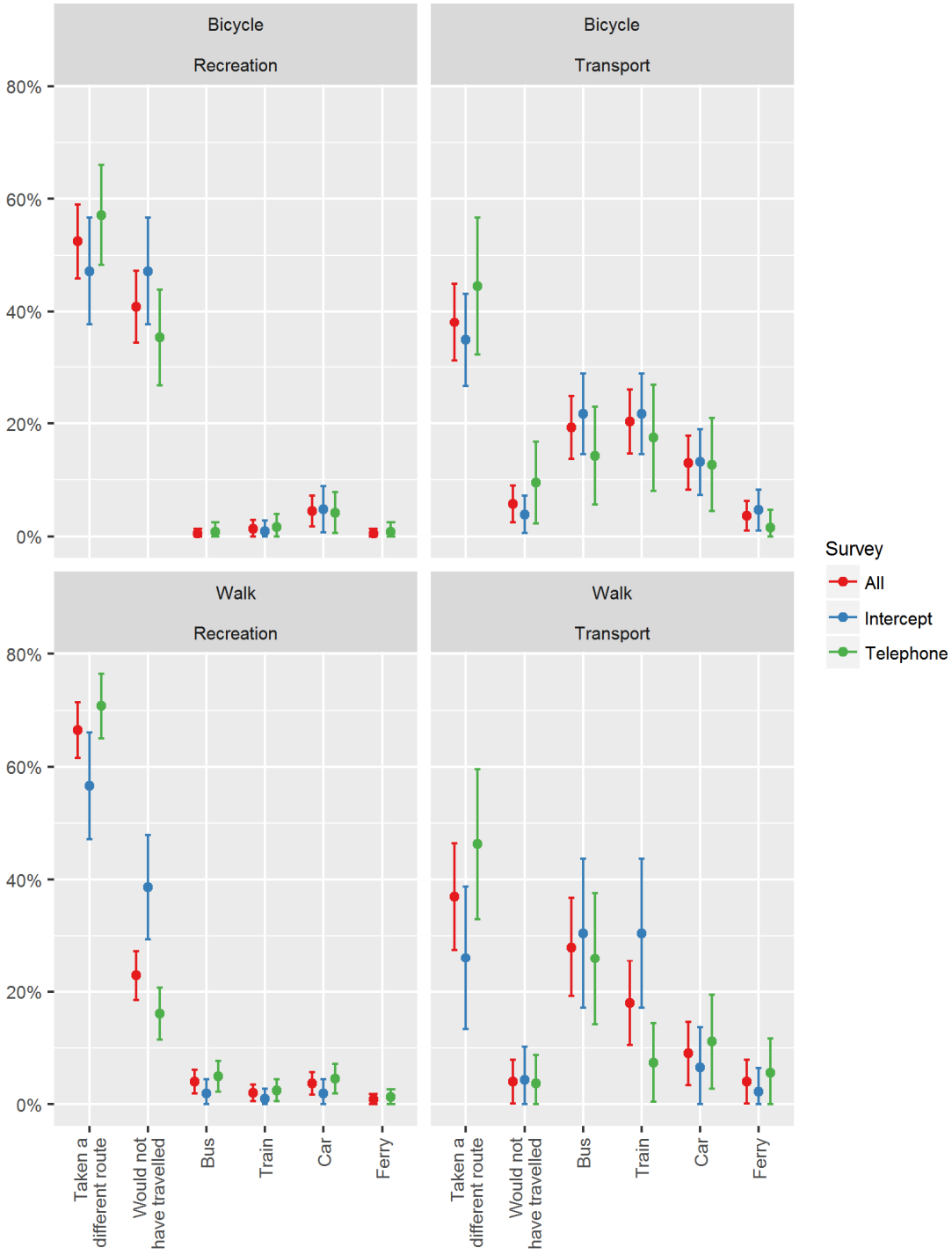
■ **Figure 5.7: Cumulative distance distributions by survey**

5.1.5 User behaviours

In this section we consider the subjective opinions of path users both to the presence of the bikeway at all, and particularly to the improvements that have been made in recent years[23].

Figure 5.8 illustrates the choices respondents would have made if the path had not been present *at all.* Both bicycle riders and pedestrians indicate they were likely to continue to ride or walk, but to have used a different route; 52% of bicycle riders travelling for recreation would have done so, as would 38% of those riding for transport. In most cases the proportions from the intercept and telephone surveys align, giving confidence that sampling bias is not affecting these results.

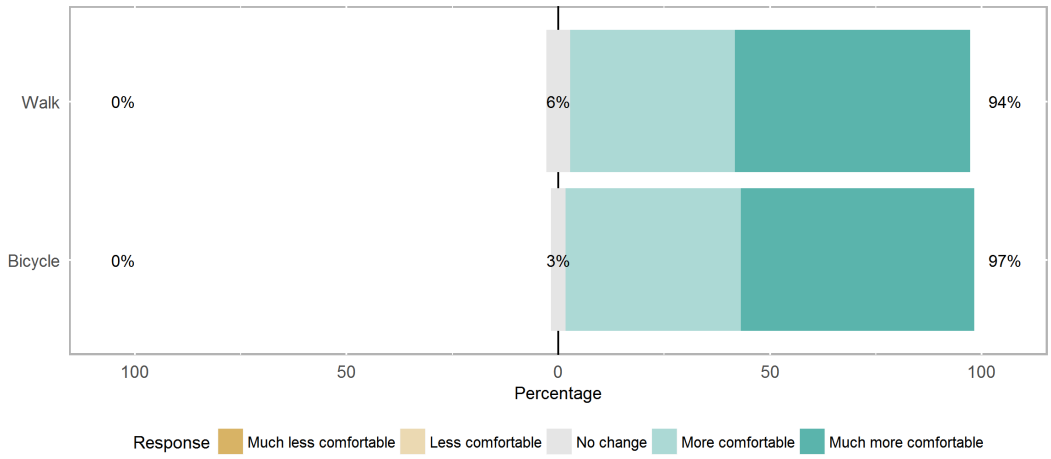
[23] Only those that could recall using the path prior to the improvements were asked for their opinion on the improvements.



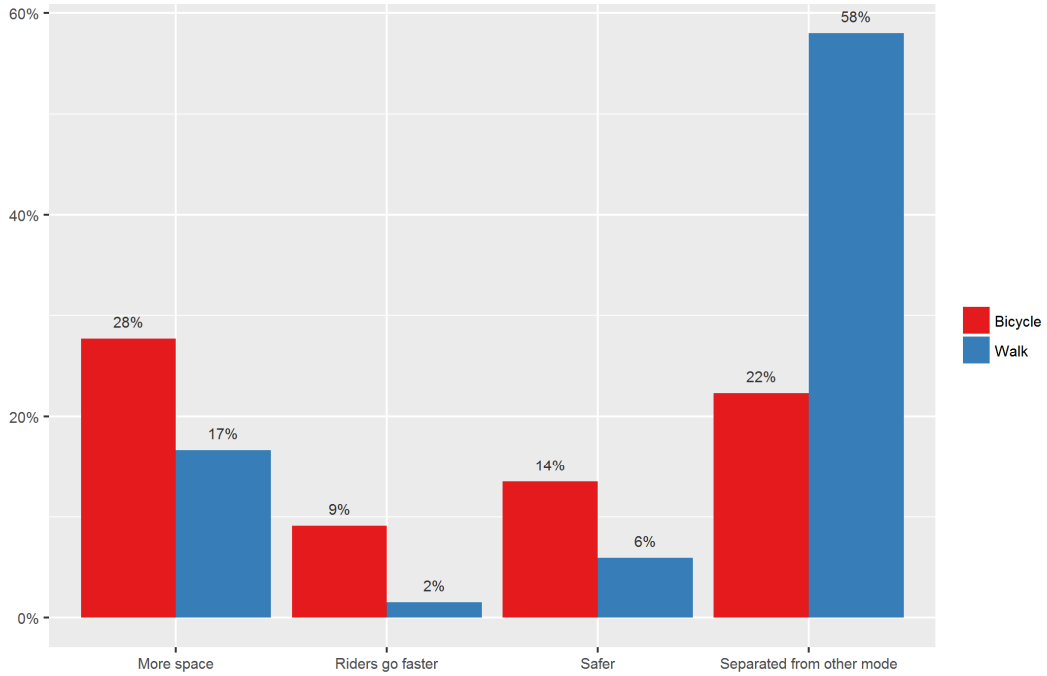
What would you have done if the path wasn't here?

■ **Figure 5.8: Diversion by mode of use, purpose and survey compared to no path**

Path users were then asked whether they could recollect the improvements that have been made to the path. The vast majority of path users had noticed the improvements (95%). Almost all indicated the improvements had made them feel more comfortable or much more comfortable (Figure 5.9). The most commonly cited reason for feeling more comfortable among pedestrians was the separation from bicycle riders (Figure 5.10). Among bicycle riders the most commonly cited reasons were more space and separation from pedestrians.

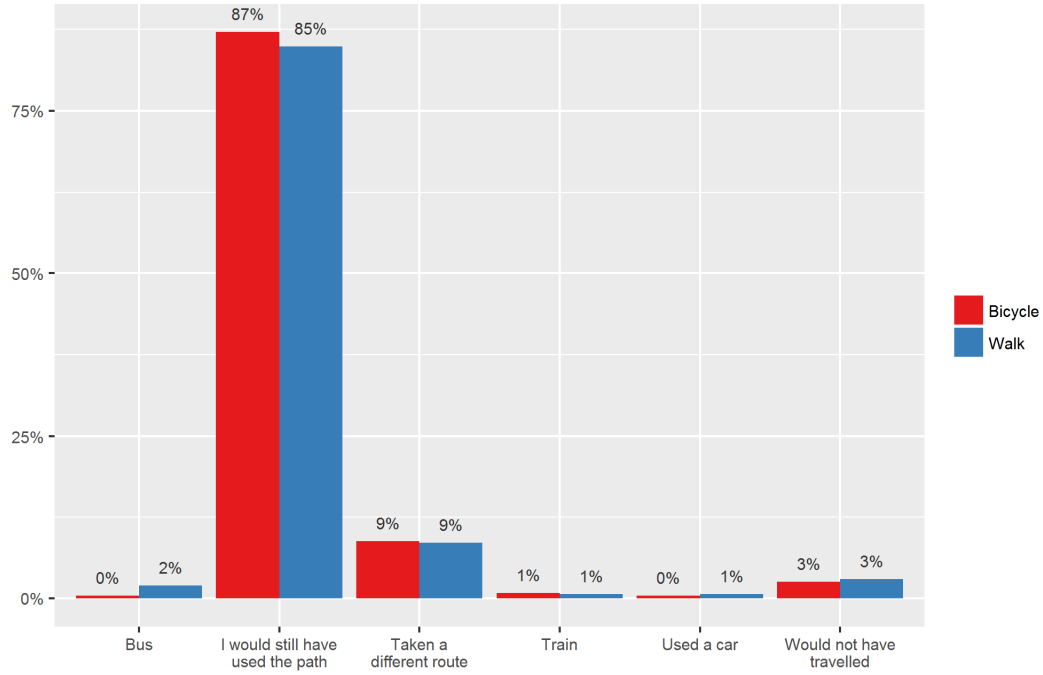


■ **Figure 5.9: Have the changes made you feel more or less comfortable walking/riding than before?**



■ **Figure 5.10: Reasons for change in path user comfort**

Respondents who could recollect the path prior to the improvements were asked what they would if the path were still in its previous (i.e. unsegregated) condition. Unsurprisingly, most would have continued to use the path in this situation (Figure 5.11). However, there does appear to have been a meaningful level of diversion away from other routes (around 9% of trips) and a small proportion of new travel induced by the improvements.

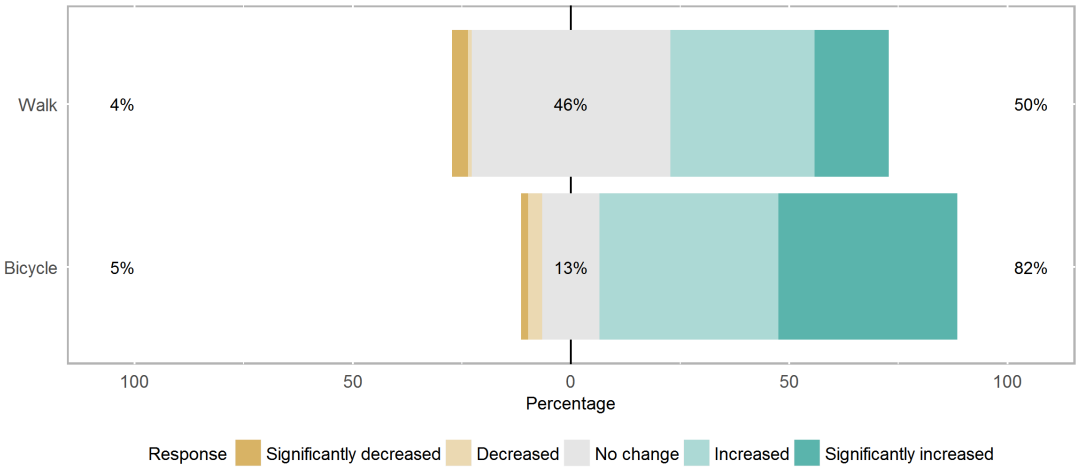


What would you have done if the path was in its original condition? That is, before it was widened and segregated?

■ **Figure 5.11: Diversion compared to shared path**

The improvements to the path appear to have significantly increased the frequency with which pedestrians and bicycle riders have ridden and walked. Half of pedestrians and 82% of bicycle riders indicated they now ride or walk more often (Figure 5.12). The way in this question was phrased was to try to elucidate changes in *overall* cycling and walking, rather than simply substitution effects. In other words, our interest was not so much substitution for riding or walking at other locations to the Bicentennial Bikeway but rather a net increase in activity that could be attributed to the improvement[24].

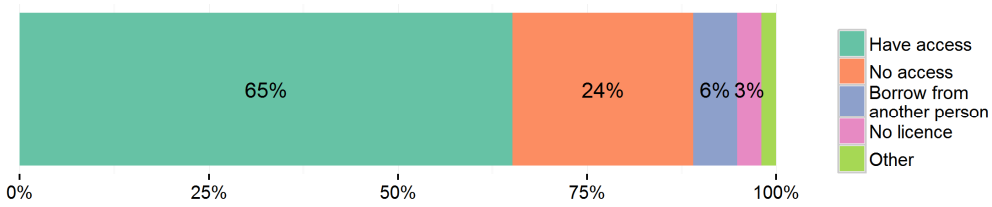
[24] It is noted that this question is likely to be very difficult for respondents to answer, and may be subject to a response bias. Furthermore, the rate of walking or riding over a period is likely to vary markedly due to lifestyle changes that are beyond the presence (or absence) of active transport infrastructure.



What change, if any, would you say the improvements to the path have had on the amount of time you've spent riding/walking over the past 12 months?

■ **Figure 5.12: Effect of improvements on duration of walking/riding**

Around two thirds of respondents indicated they had a car available with which they could have made their transport trip by bicycle or walking (Figure 5.13). Most of the remainder (24%) had no access to a car for the purposes of their trip.



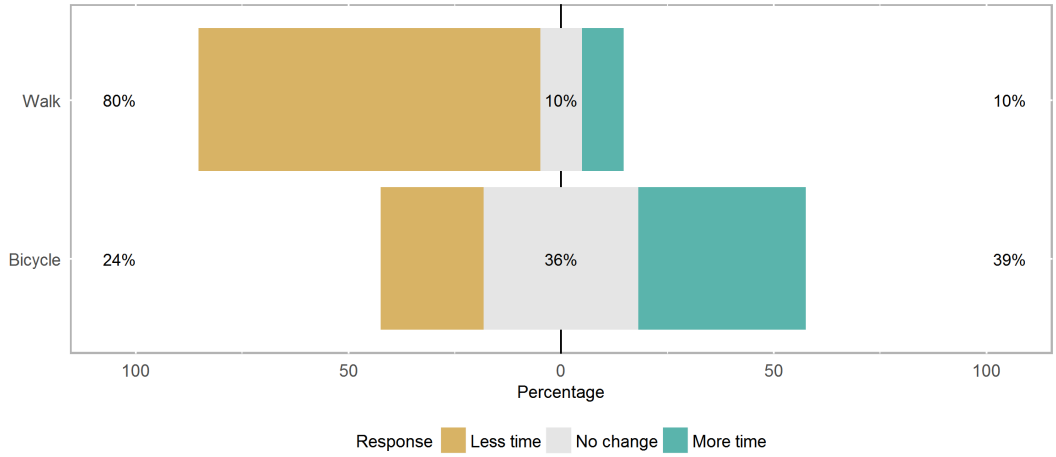
Thinking of your most recent trip on the path, which of the following best describe how easily you could have used a car for this trip?

■ **Figure 5.13: Car availability for transport trips**

For those that did have a car available 80% of those that walked said it would have taken less time to make the journey by car and 10% said it would have taken longer[25] (Figure 5.14). For bicycle trips 39% of respondents felt riding was quicker than car compared with 24% for whom it would have been slower. It is noted that this issue of valuing travel time is critical to the cost-benefit analysis of active transport projects; rationally we would assume travellers would want to minimise travel time (all else being equal), and hence travel time is almost invariably associated with a *cost*. However, the 80% of pedestrians for whom walking is longer are clearly choosing to do so irrespective of the additional travel time. Clearly, and self-evidently, there are issues beyond travel time minimisation which are

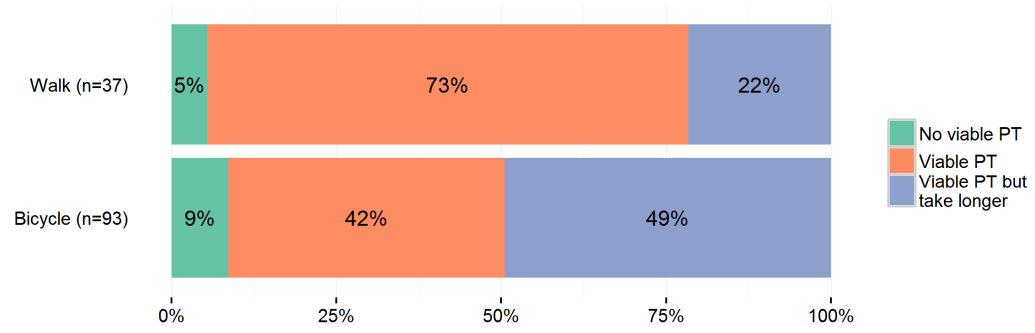
[25] Many of these walking transport trips are multimodal, including those walking to the Milton ferry terminal. It is possible these journeys are faster by walking not because of the walking itself but rather by the use of the public transport.

influencing these travel choices. How these should be handled within an economic appraisal has not been definitively resolved.



■ **Figure 5.14: Would it have taken more or less time to use a car for your transport trip?**

Given the presence of the train, buses and ferries along the corridor it is unsurprising that most respondents indicated they had a viable public transport alternative (Figure 5.15). Furthermore, for most walking trips (73%) and many bicycle trips (42%) the public transport trip was estimated to take a similar amount of time or be quicker. Again, this suggests there are non-travel time related issues which are influencing active transport choices.



■ **Figure 5.15: Availability of a viable public transport alternative by mode of travel for transport trips**

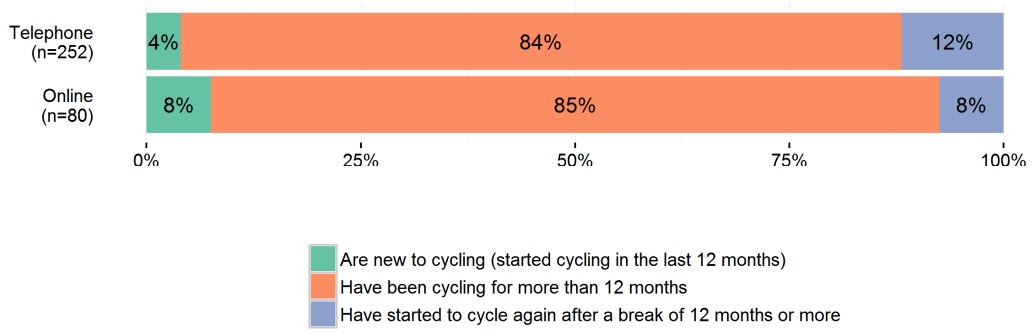
Summary statistics for the self-reported travel time differences for transport cycling trips by car and public transport along the corridor are shown in Table 5.2. Note that the sample sizes here are small and the variability is large. Nonetheless, it is suggested that cycling is time competitive with car and public transport travel along the corridor.

■ **Table 5.2: How much more time would car/PT have taken compared with your transport bicycle trip?**

		Time difference (mins) moving to alternative mode			
Alt. mode	**No. obs.**	**Min.**	**Max.**	**Average**	**Median**
Car	7	-20	0	-6.4	0
PT	11	-30	25	0	0

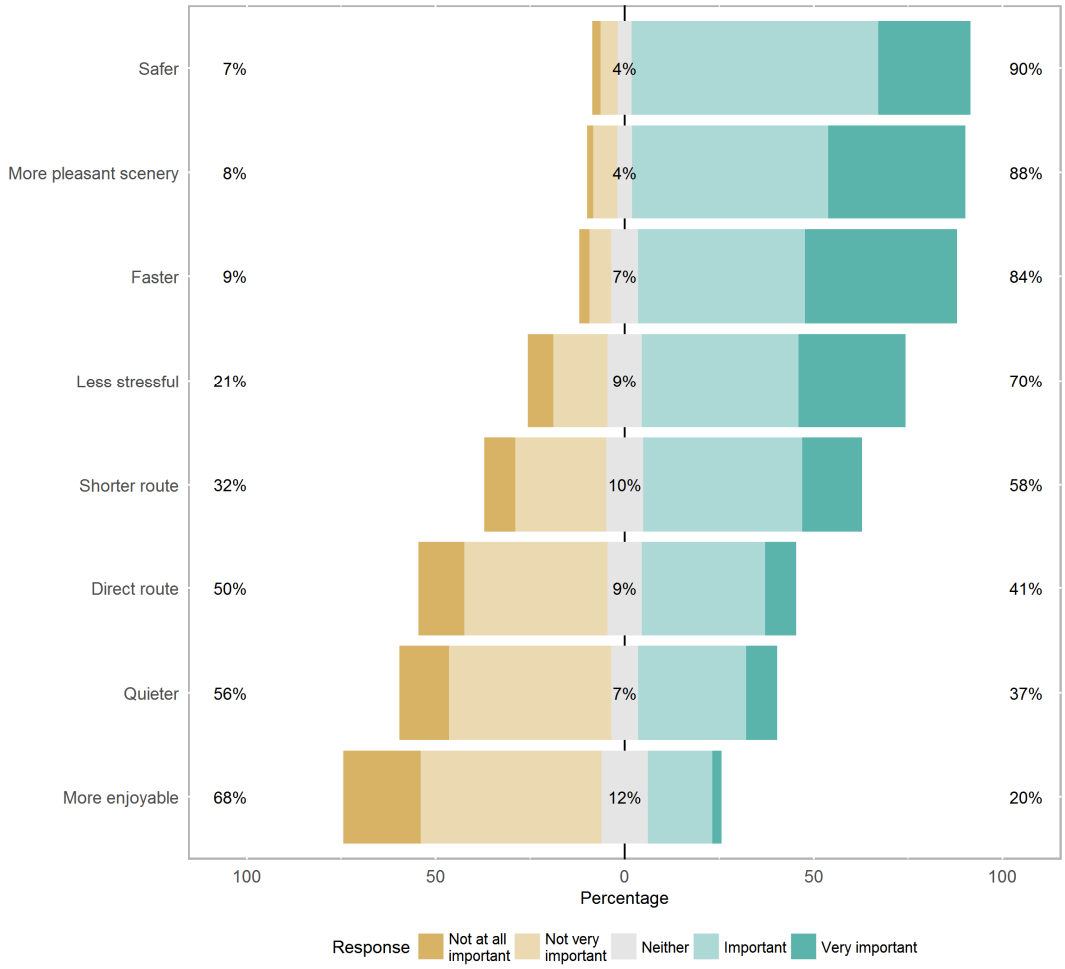
Positive times indicate the alternative mode would be faster than cycling.

Most respondents who had ridden on the path in the past year had been riding continuously for more than 12 months (Figure 5.16). This proportion is higher than at most other sites in this study. That riders along this corridor to be regular riders suggests they are more likely to be achieving sufficient physical activity to improve their health outcomes.



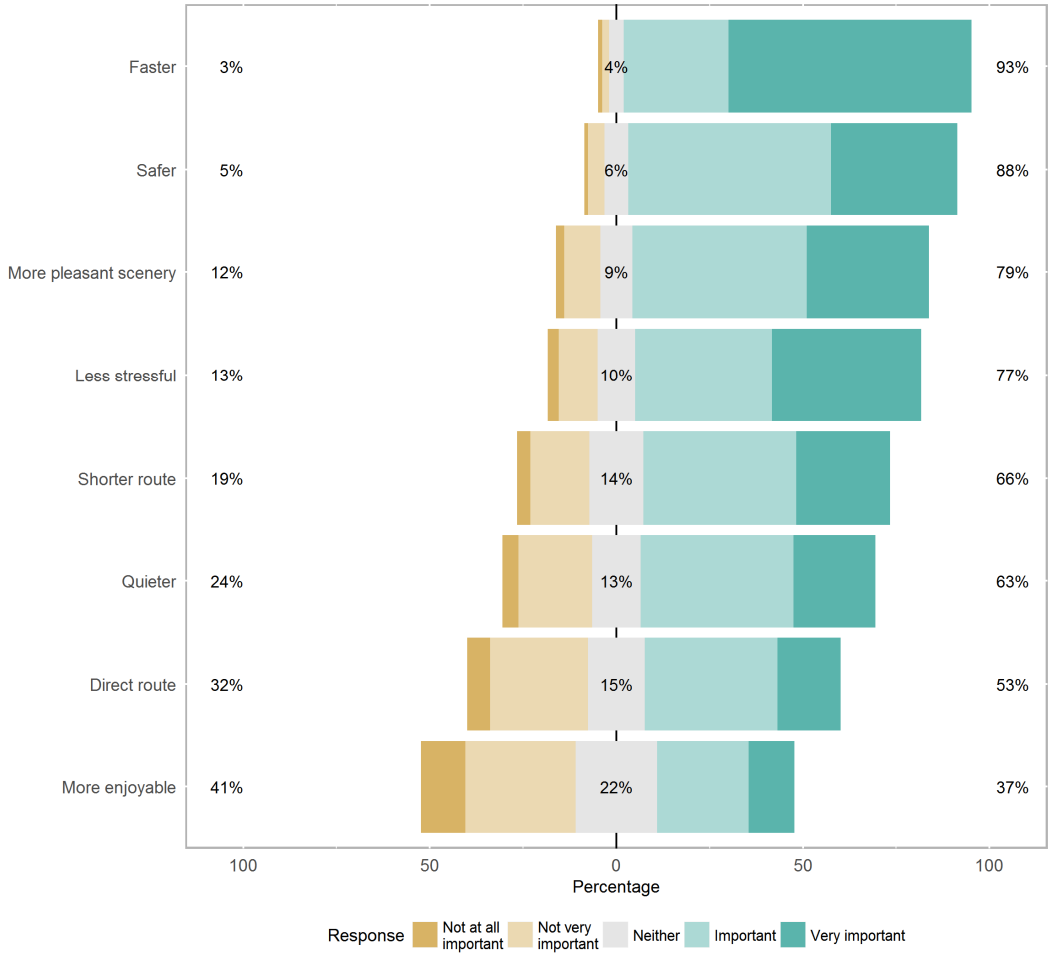
■ **Figure 5.16: Cycling history**

Respondents were asked to rate a number of factors on an importance scale in contributing to their decision to use the path for their trip. For those walking on the Bicentennial Bikeway 90% indicated safety was an important or very important reason, followed closely by the pleasant scenery (88%) and that it was faster (84%) (Figure 5.17).



■ **Figure 5.17: Reasons for using the path in comparison to other routes – walking (n=328)**

For cycling trips the most important factors were the same as for walking; faster (93%), safer (88%) and more pleasant scenery (79%) (Figure 5.18).



■ **Figure 5.18: Reasons for using the path in comparison to other routes – cycling (n=278)**

5.1.6 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Figure 5.3, and are based wherever possible on the survey data.

■ **Table 5.3: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	5,800	Video counts
Average trip distance	19.5 km	Intercept/telephone surveys
% of trips for transport	56%	Intercept/telephone surveys
Diversion: car	1%	Telephone/online surveys
Diversion: PT	1%	Telephone/online surveys
Diversion: walk	0%	Telephone/online surveys
Diversion: reassign	95%	Telephone surveys
Diversion: induced	3%	Telephone surveys
Pedestrians		
Opening year demand (AADT)	2,200	Video counts
Average trip distance	6.0 km	Intercept/telephone surveys
% of trips for transport	30%	Intercept/telephone surveys
Diversion: car	2%	Telephone surveys
Diversion: PT	2%	Telephone surveys
Diversion: reassign	93%	Telephone surveys
Diversion: induced	3%	Telephone surveys
Facility		
Length	2.8 km	Reconstructed path length
Type	Off-road path	
Change in trip distances	0 km	Path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light: 20%	Guesstimate
Investment		
Capital cost	2009: $2.54 m 2010: $3.75 m 2011: $13.18 m 2013: $8.3 m Total: $27.77m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

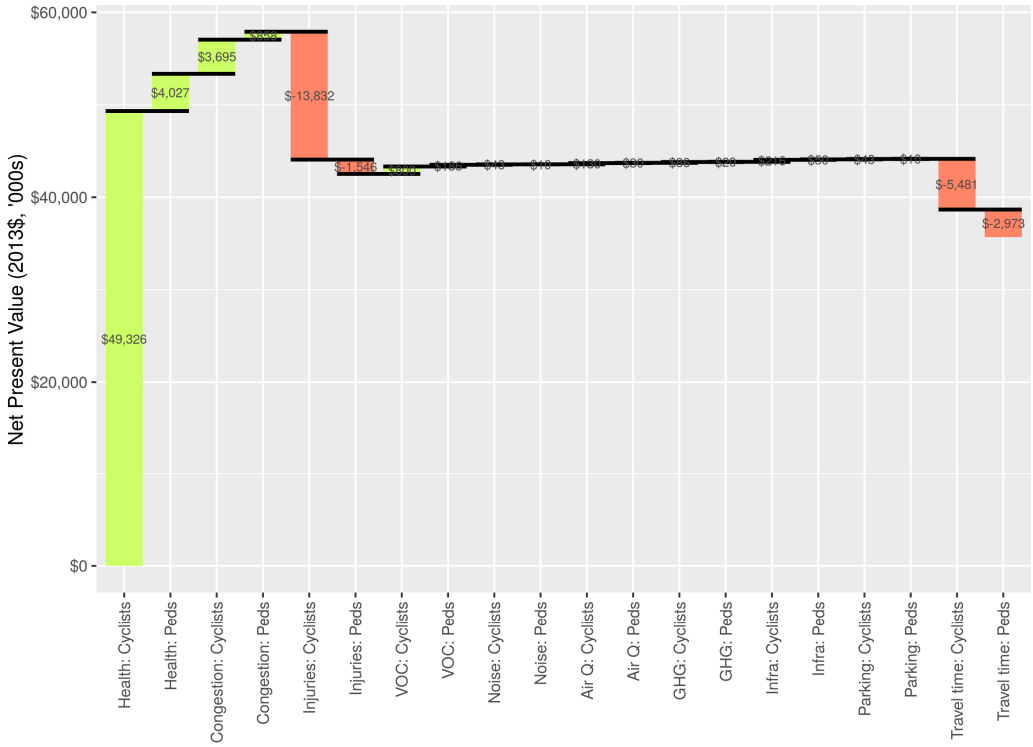
The results of the appraisal are summarised in Table 5.4. For the central discount rate of 7% the BCR is positive at 1.9, with a negligible likelihood that the BCR will fall below 1.0. The BCR remains (marginally) positive even at the highest discount rate of 10%.

■ **Table 5.4: Economic assessment**

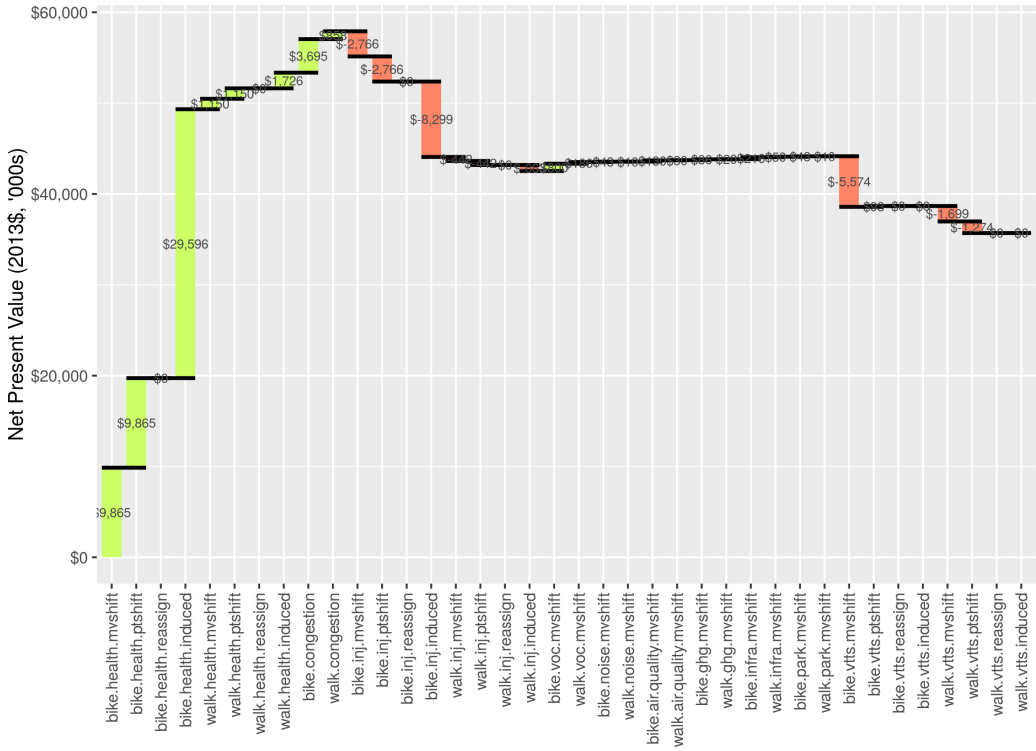
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	3.4	1.9	1.1
Likelihood BCR < 1.0	0%	0%	100%
Net Present Value (NPV)	$66.46 m	$24.97 m	$4.11 m
Present Value of Benefits (PVB)	$94.52 m	$53.03 m	$32.17 m
Present Value of Costs (PVC)	$28.06 m	$28.06 m	$28.06 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.20. The vast majority of the benefit accrues from cyclist health. This benefit exceeds the injury disbenefit by a factor of 3.5:1. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits to both user groups; this is largely attributable to the additional travel time for those who shift from motor vehicles to cycling and walking for transport as shown in Figure 5.20.



■ **Figure 5.19: Summary breakdown of net present value**



■ **Figure 5.20: Detailed breakdown of net present value**

In considering these results we note the following:

- The benefits are primarily due to induced bicycle trips, and to a lesser extent new bicycle trips that would otherwise have occurred by motor vehicle or public transport. These induced and mode shifted trips represent a very small proportion of all trips; according to the intercept surveys they are well under 5% of all trips on the path. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- The benefits are large from this small proportion of users because of the long average distances they travel (19.5 km for bicycle trips and 6 km for walking trips) and the large overall number of trips. It is possible that the induced and mode shifted trips will not be as long as these *average* trip lengths. However, we cannot determine the actual trip lengths for induced or mode shifted trips because the sample size from the survey of these trips was too low to reliably estimate the trip length.
- The model is relatively insensitive to the demand growth assumptions; assuming 1% p.a. cumulative growth the BCR would reduce to 1.4 and at 5% p.a. the BCR would be 2.6 for the central discount rate.

5.2 Biggera Creek Greenway

5.2.1 Project description

The Biggera Creek Greenway is a 3.5 km long shared path in Labrador (Gold Coast). The greenway has been built in stages, of which the there was a 2013-14 CNLG grant to a total value of $1.07 m (including council contribution) to build a missing link from Keith Hunt Park to Norm Rix Park (a length of around 1.6 km). The path connects residential areas with parks and sporting fields along the creek, Labrador State School and Gold Coast University Hospital and Griffith University at the southern end. The path provides an alternative to Kumbari Avenue and Government Road, both of which are single lane collector roads without any form of bicycle provision. The path is, for most journeys, of equivalent length to the road alternative.

5.2.2 Usage

Video-based manual counts over a 13-hour period on the path south of Government Road counted 106 bicycle riders on a typical weekday and 180 pedestrians. On weekends there were 99 bicycle riders and 207 pedestrians.

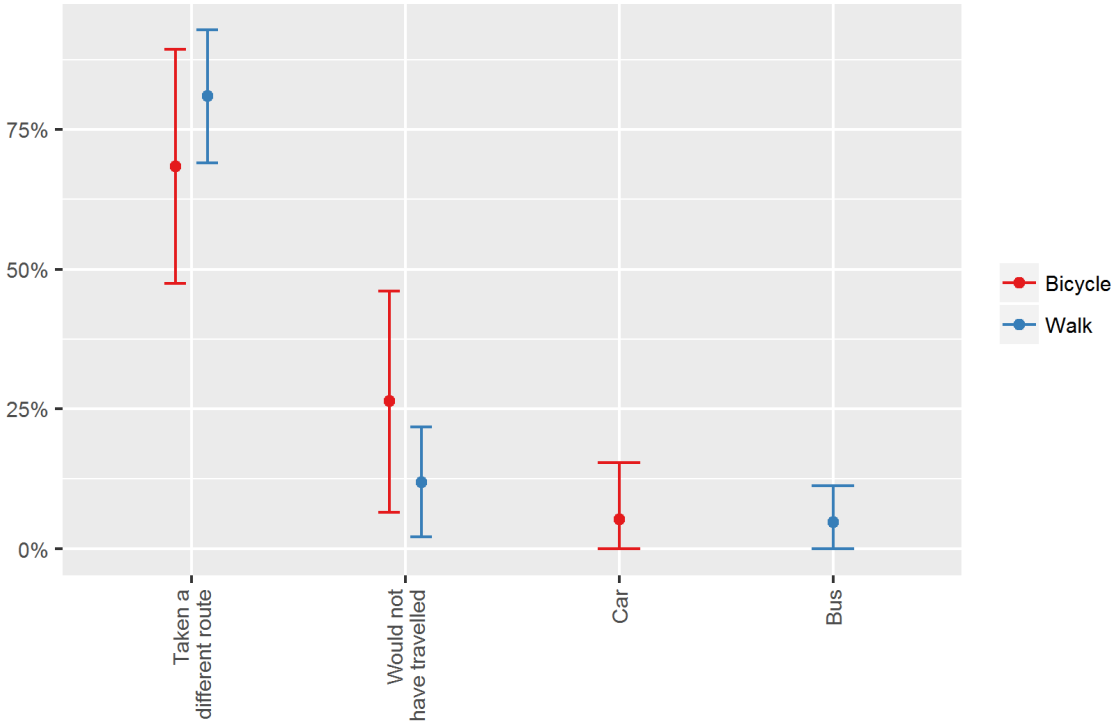
5.2.3 Catchment

The sample size of bicycle riders was small (19 respondents), of which 10 were making recreation trips. Most of these (seven) had started and were finishing their trip in Labrador. Of the eight making transport cycling trips three were starting and finishing in Labrador and a further three were starting in Labrador and finishing at Southport. Similarly, most

pedestrians were making recreation trips (80%) and most of these (82%) were starting and finishing in Labrador.

5.2.4 User behaviours

There were only seven online survey respondents along the Biggera Greenway, which is insufficient to report on cycling history and the reasons riders and pedestrians choose to use the path. However, the intercept surveys provided some evidence on diversion. Whilst noting the small sample sizes 919 bicycle riders and 42 pedestrians) most riders (68%) and pedestrians (81%) would have taken a different route in the absence of the path. However, 26% of riders and 12% of pedestrians would not have travelled at all. This suggests the path may be having some favourable effect on physical activity.



■ **Figure 5.21: Diversion rates**

5.2.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.5, and are based wherever possible on the survey data.

■ **Table 5.5: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	100	Video counts
Average trip distance	13.9 km	Intercept surveys
% of trips for transport	55%	Intercept surveys
Diversion: car	5%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	70%	Intercept surveys
Diversion: induced	25%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	190	Video counts
Average trip distance	5.1 km	Intercept surveys
% of trips for transport	20%	Intercept surveys
Diversion: car	0%	Intercept surveys
Diversion: PT	5%	Intercept surveys
Diversion: reassign	85%	Intercept surveys
Diversion: induced	10%	Intercept surveys
Facility		
Length	1.6 km	Length of missing link
Type	Off-road path	
Change in trip distances	0 km	Path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light: 20%	Guesstimate
Investment		
Capital cost	2014: $1.07 m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

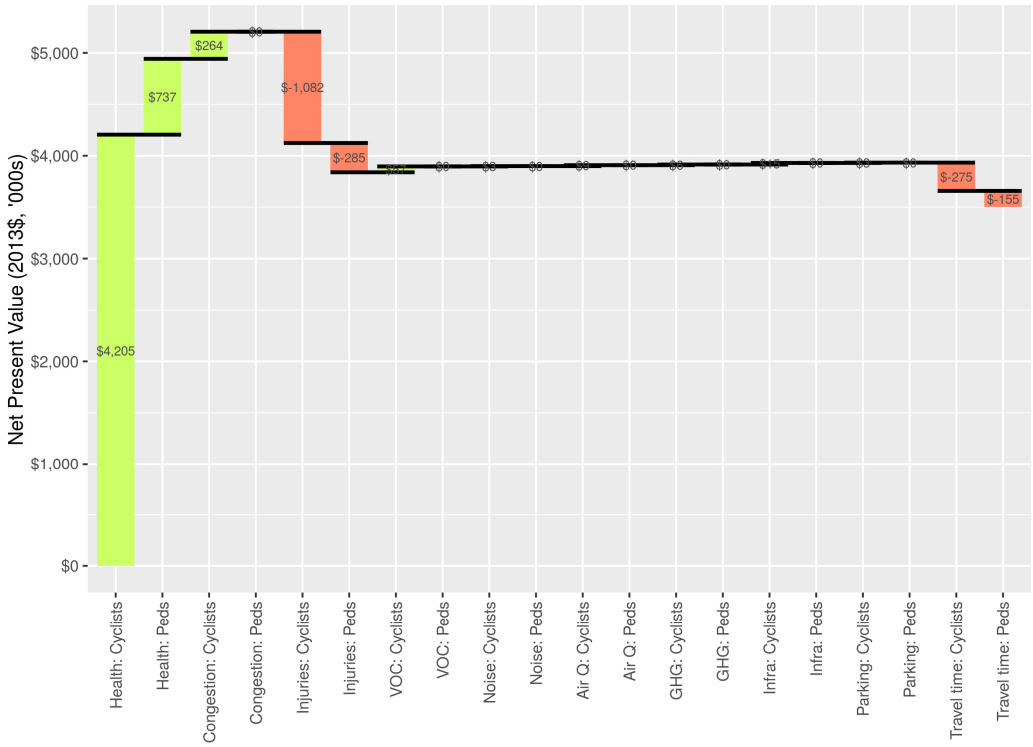
The results of the appraisal are summarised in Table 5.16. For the central discount rate of 7% the BCR is positive at 2.9, and remains positive even for the highest discount rate.

■ **Table 5.6: Economic assessment**

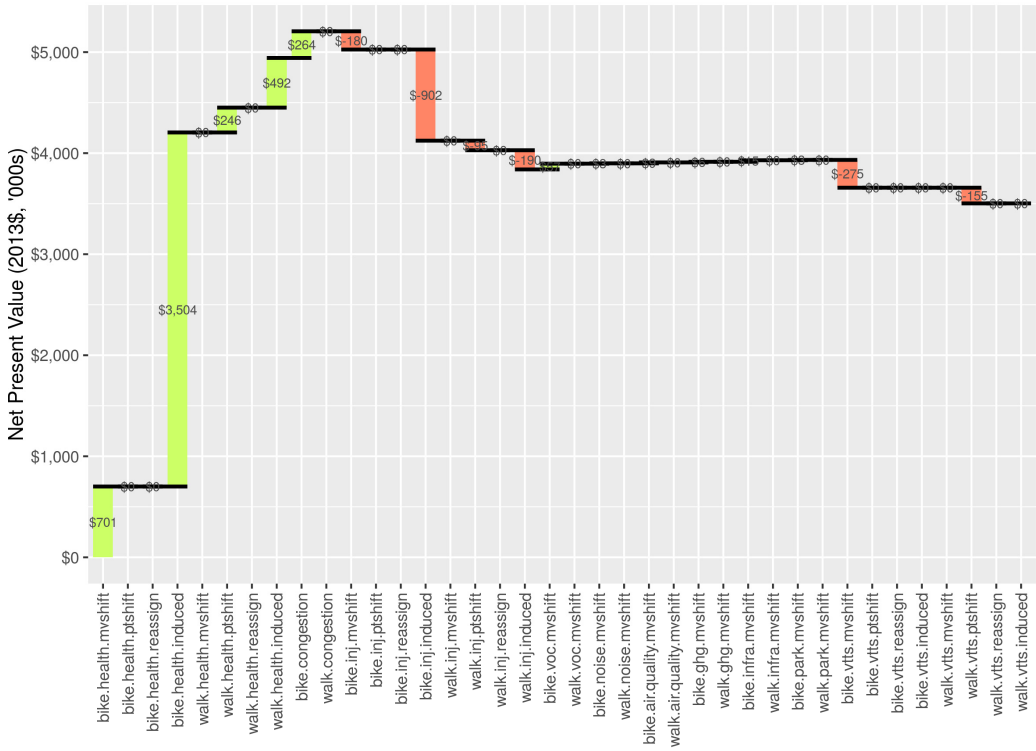
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	6.1	3.8	2.6
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$6.94 m	$3.89 m	$2.19 m
Present Value of Benefits (PVB)	$8.31 m	$5.26 m	$3.56 m
Present Value of Costs (PVC)	$1.37 m	$1.37 m	$1.37 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.22. The vast majority of the benefit accrues from cyclist health. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits; this is largely attributable to the additional travel time for those who shift from motor vehicles and public transport to cycling and walking as shown in Figure 5.23.



■ **Figure 5.22: Summary breakdown of net present value**



■ **Figure 5.23: Detailed breakdown of net present value**

In considering these results we note the following:

- The benefits are primarily due to induced bicycle trips (that is, all new discretionary trips which would not otherwise have occurred). The intercept surveys suggested that around 25% of bicycle trips and 10% of walking trips would not have occurred in the absence of the path. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- Cycling health benefits are much greater than for walking, primarily because of the longer bicycle trip lengths[26]. If the induced cycling trips have lower than average lengths (which seems possible) the benefits will be reduced.
- The BCR is reasonably insensitive to the assumed growth rate in demand; at 1% p.a. cumulative growth the BCR would be 2.9 and at 5% p.a. it would be 5.1. Both BCRs represent good value for money.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.3 Brassall Bikeway

5.3.1 Project description

The Brassall Bikeway is a sealed 3 m shared path through the northern suburbs of Ipswich. It has been constructed in stages starting in North Ipswich to Brassall (2009), Brassall to Ironpot Creek (2012) and most recently Ironpot Creek to Wulkuraka (2013). The total length of the path is around 5.3 km for a cost of around $6.71 m, with construction due to commence shortly on a northern extension.

5.3.2 Usage

Video-based counts were undertaken on the path between Musgrave Street and Haig Street, immediately west of the path connection to Clem Street in Brassall. This location is, presumably, one of the busier on the path as it provides a convenient connection across the creek between Brassall and North Ipswich. Over the 13-hour count period the weekday path count was 330, increasing to 376 on weekends. Most users (between two thirds and three quarters) were pedestrians. The busiest hour was between 6 and 7 am on both weekdays and weekends.

5.3.3 Catchment

Only 12 bicycle riders were subject to the intercept survey, and of these 11 reported reliable origin and destination details. Of this 11 most (six) were starting and finishing their trip in Brassall, with a further three starting and finishing in North Ipswich. Among pedestrians

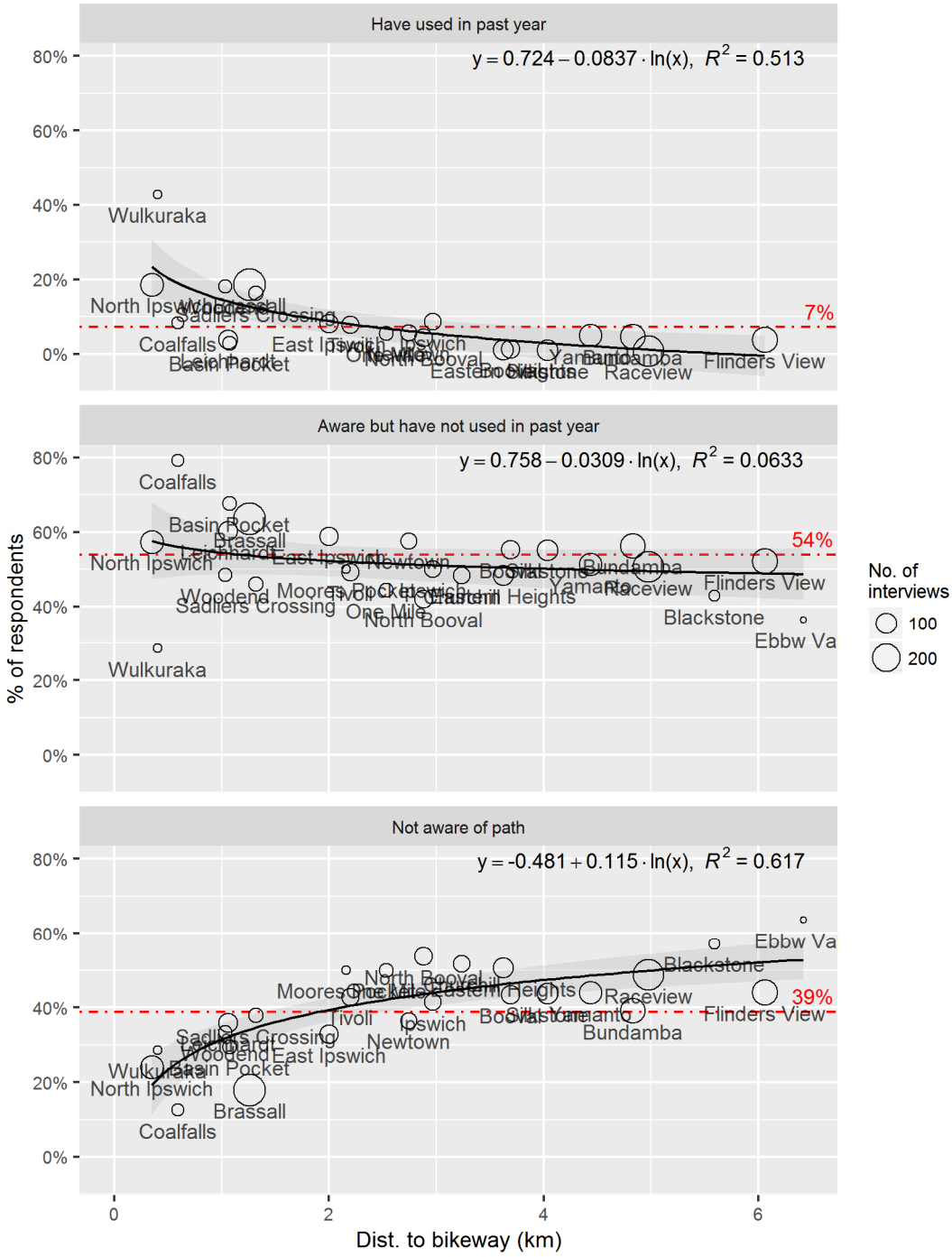
[26] Conversely, this effect is somewhat reduced because the MET ratio for cycling is lower than for walking.

most (77%) had started and finished in Brassall with a further 11% starting and finishing in North Ipswich.

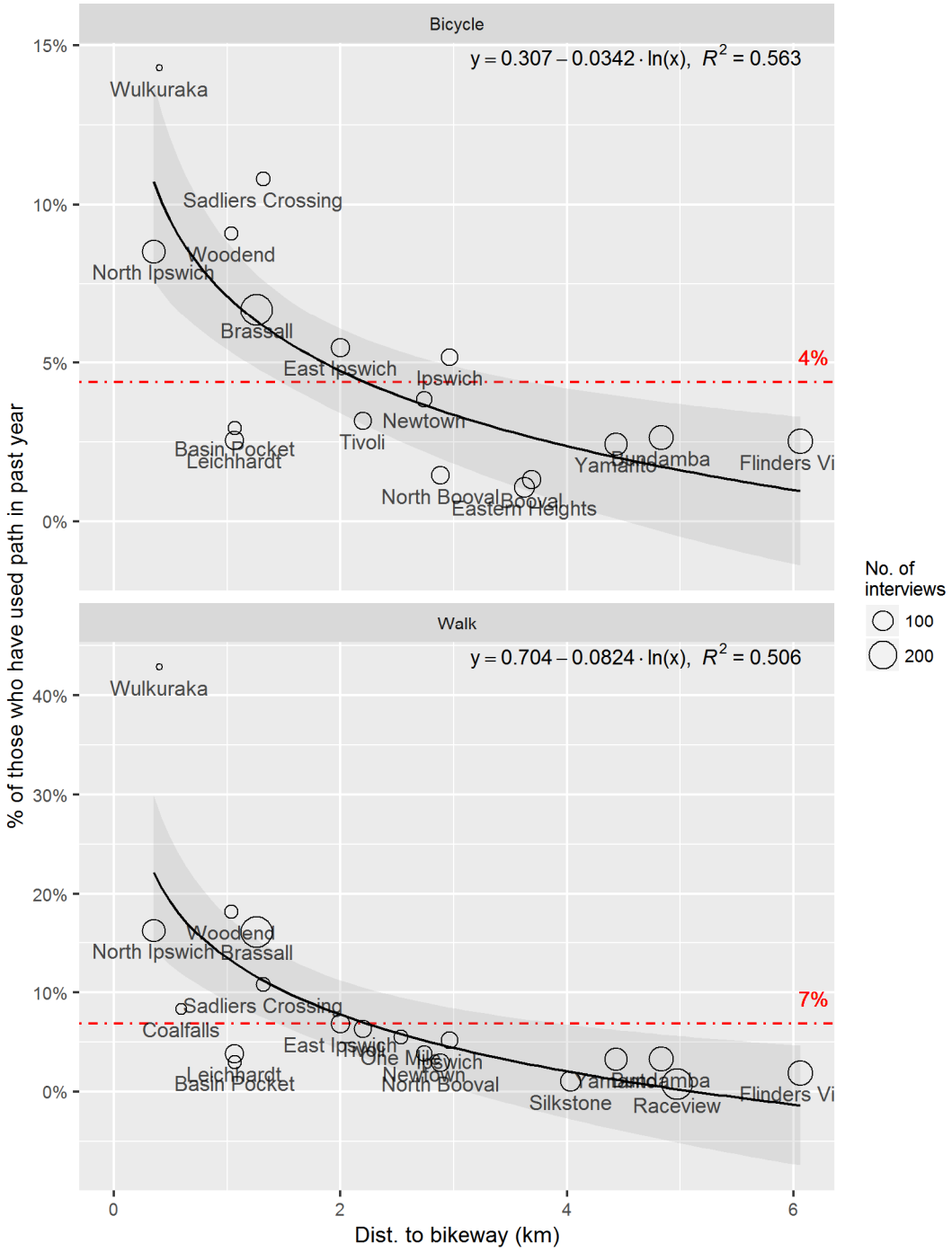
The telephone interviews provided an indication of the awareness of the presence of the bikeway among the resident population, and their propensity to use the path. This data is summarised in Figure 5.24, and suggest that:

- Awareness of the presence of the path is fairly high; 54% of respondents were aware of the path but had not used in the past year while a further 7% of respondents were aware and had used in the path over the past year.
- Awareness of the path appears to be weakly correlated with the distance from the suburb to the path, while usage does not appear to be related to distance from the path. Suburbs located close to the path such as Brassall and North Ipswich have higher awareness than suburbs farther away such as Blackstone, Flinders View and Ebbw Vale.
- Wulkuraka appears to have much higher levels of usage and awareness than other suburbs. Why this would be the case is not clear; it is noted that the sample size from this suburb was 14 households, such that it is likely this result can be attributed to sampling bias.

The proportion of respondents who had used the path in the past year for bicycle riding or walking is shown in Figure 5.25. Again, usage appears to be weakly inversely related to the distance of the suburb from the path. This declining level of usage farther from the path is stronger for walking than cycling, as would be expected. Overall, usage of the path for walking is around twice the usage for cycling.



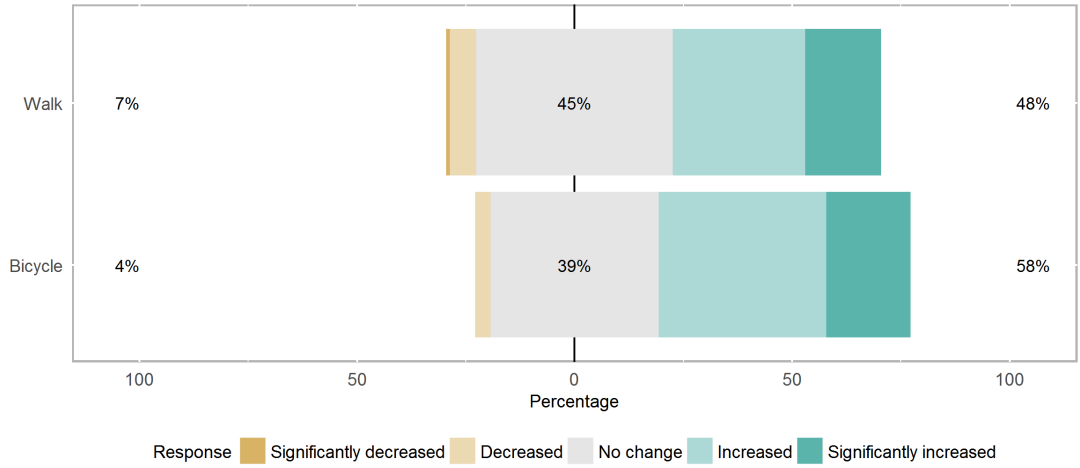
■ **Figure 5.24: Awareness and usage of path by suburb (excludes suburbs with <10 interviews)**



■ **Figure 5.25: Path usage by mode and distance from bikeway (excludes suburbs with <10 interviews)**

5.3.4 User behaviours

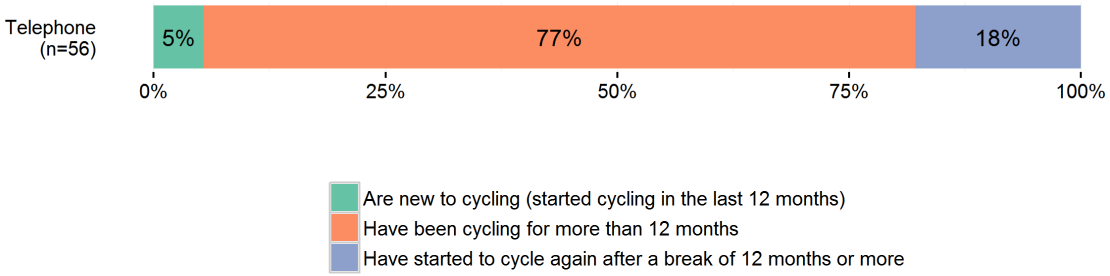
The path appears to have a favourable impact on walking and riding participation, at least among those who have chosen to use the path at least occasionally. Among those who had walked on the path in the past year 48% indicated they had increased the amount of time walking due to the path, while 58% of those who had ridden indicated they had increased their riding time (Figure 5.26).



What change, if any, would you say the path has had on the amount of time you've spent riding/walking over the past 12 months?

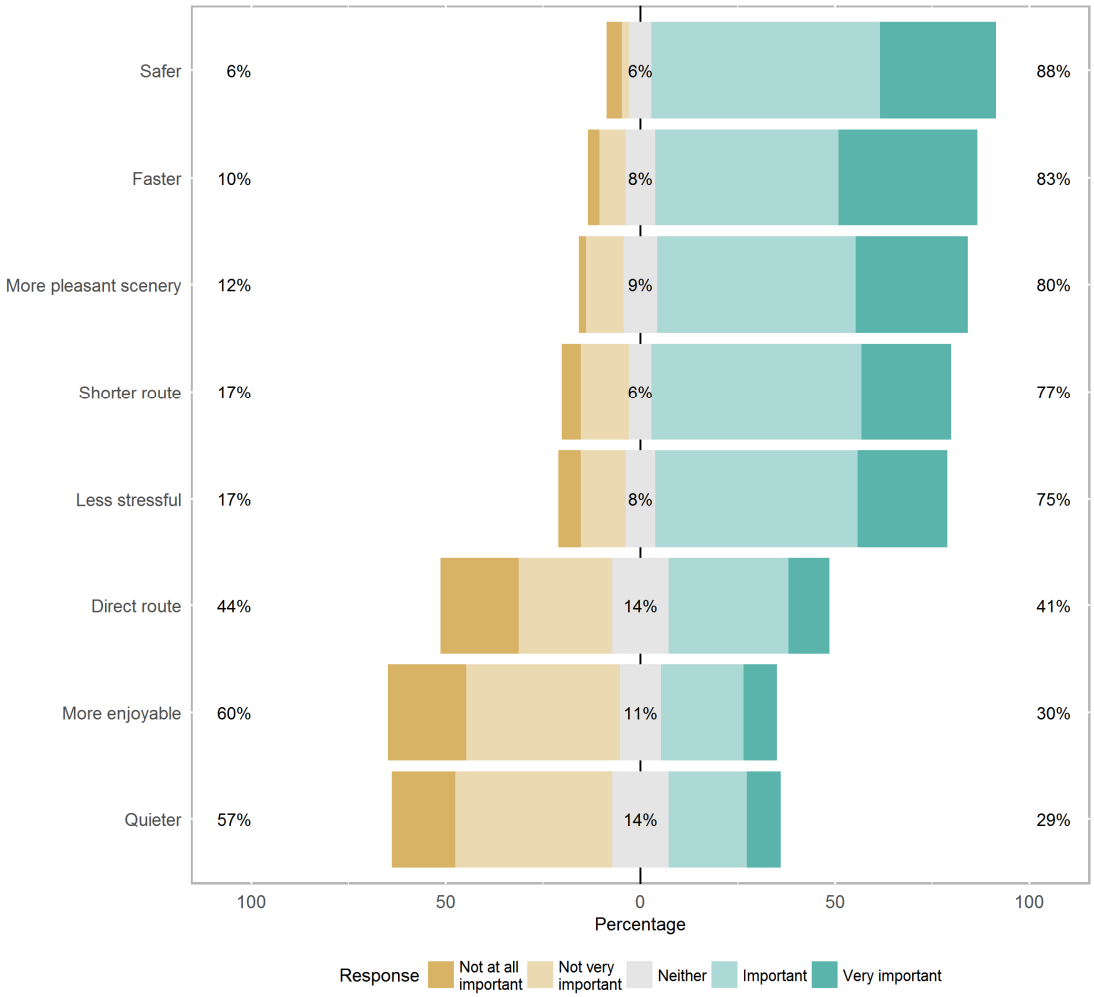
■ **Figure 5.26: Change in walking/riding attributable to the path**

The path may have had a positive impact on encouraging those who have not ridden for some time to recommence riding, although it should be noted that the constant churn in the cycling population means that this proportion cannot be attributed solely to the presence of the path (Figure 5.27).



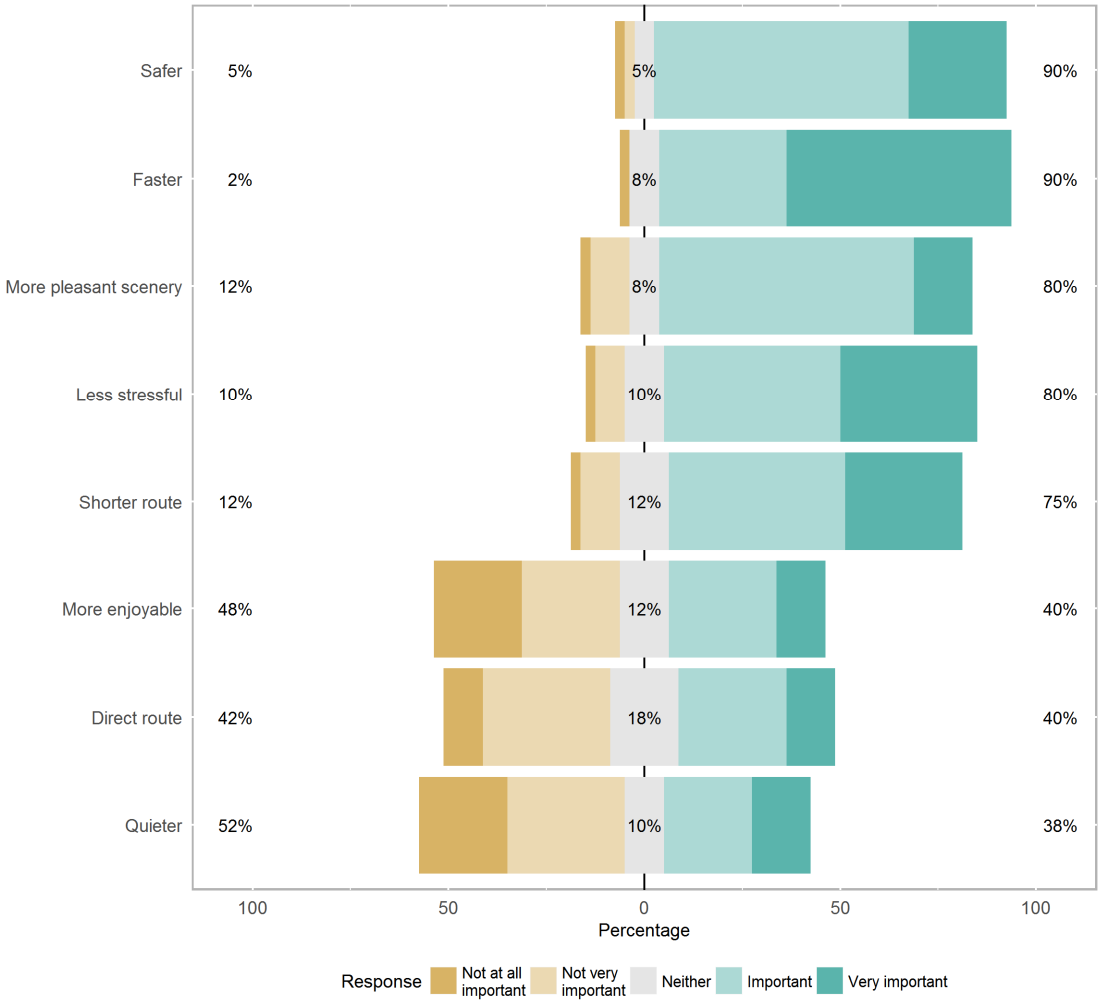
■ **Figure 5.27: Cycling history**

Respondents were asked to rate a number of factors on an importance scale in contributing to their decision to use the path for their trip. For those walking on the Brassall Bikeway 88% indicated safety was an important or very important contributor, followed closely by faster (83%) and the pleasant scenery (80%) (Figure 5.28).



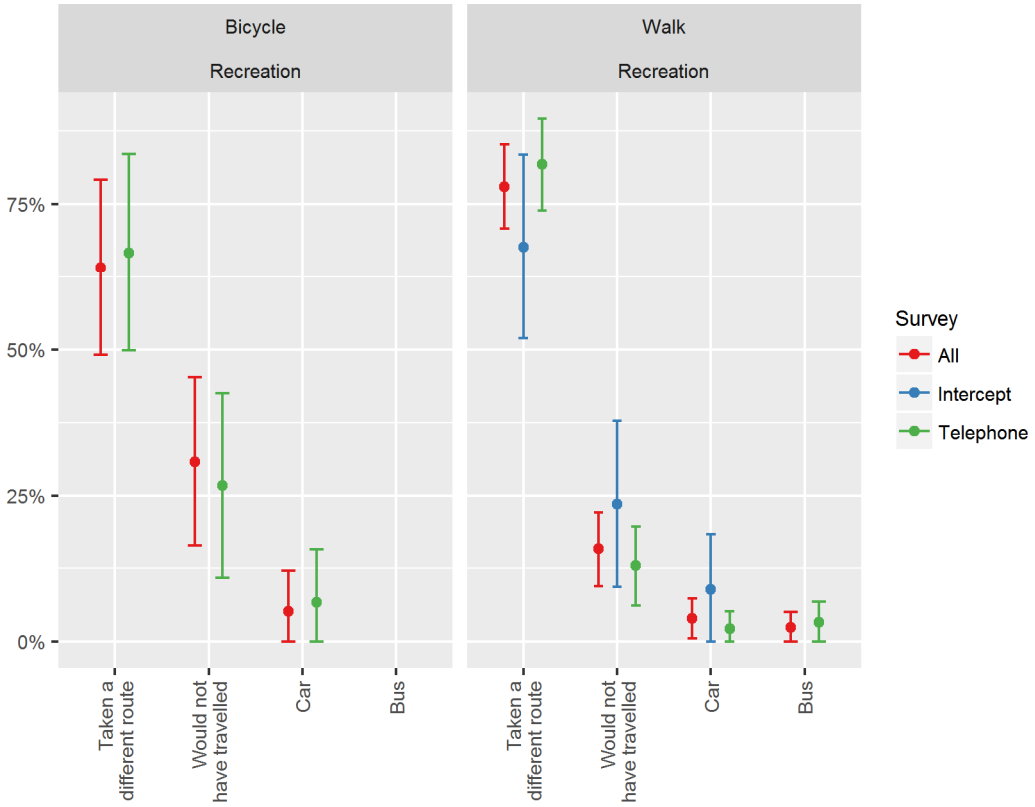
■ **Figure 5.28: Reasons for using the path in comparison to other routes – walking (n=104)**

For cycling trips the main factor riders cited for using the path was that it was safer (90%), faster (90%) and the pleasant scenery (80%) (Figure 5.29).



■ **Figure 5.29: Reasons for using the path in comparison to other routes – bicycle riding (n=40)**

There is evidence from the self-reported behaviours that path users have increased their frequency of walking and cycling as a result of the path. As shown in Figure 5.30 while 67% of bicycle riders and 74% of pedestrians would have taken a different route if the path was not there, most others would not have travelled at all (27% of bicycle riders and 13% of pedestrians). Comparatively few (less than 5%) would otherwise have driven.



■ **Figure 5.30: What would you have done if the path wasn't here?**

5.3.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.7, and are based wherever possible on the survey data.

■ **Table 5.7: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	90	Video counts
Average trip distance	9.3 km	Intercept surveys
% of trips for transport	17%	Intercept surveys
Diversion: car	9%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	64%	Intercept surveys
Diversion: induced	27%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	260	Video counts
Average trip distance	4.2 km	Intercept surveys
% of trips for transport	12%	Intercept surveys
Diversion: car	4%	Intercept surveys
Diversion: PT	2%	Intercept surveys
Diversion: reassign	79%	Intercept surveys
Diversion: induced	15%	Intercept surveys
Facility		
Length	5.3 km	Total path length
Type	Off-road path	
Change in trip distances	0 km	Assume path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 0% Medium: 20% Light: 80%	Assume negligible congestion
Investment		
Capital cost	2007: $0.15 m (planning) 2009: $4.01 m 2012: $0.75 m	Total cost as per TMR/BCC funding agreement for

Parameter	Assumption	Source
	2013: $1.8 m	stages 1-3 incl. planning & design
Operating cost	$10,000 p.a.	Guesstimate

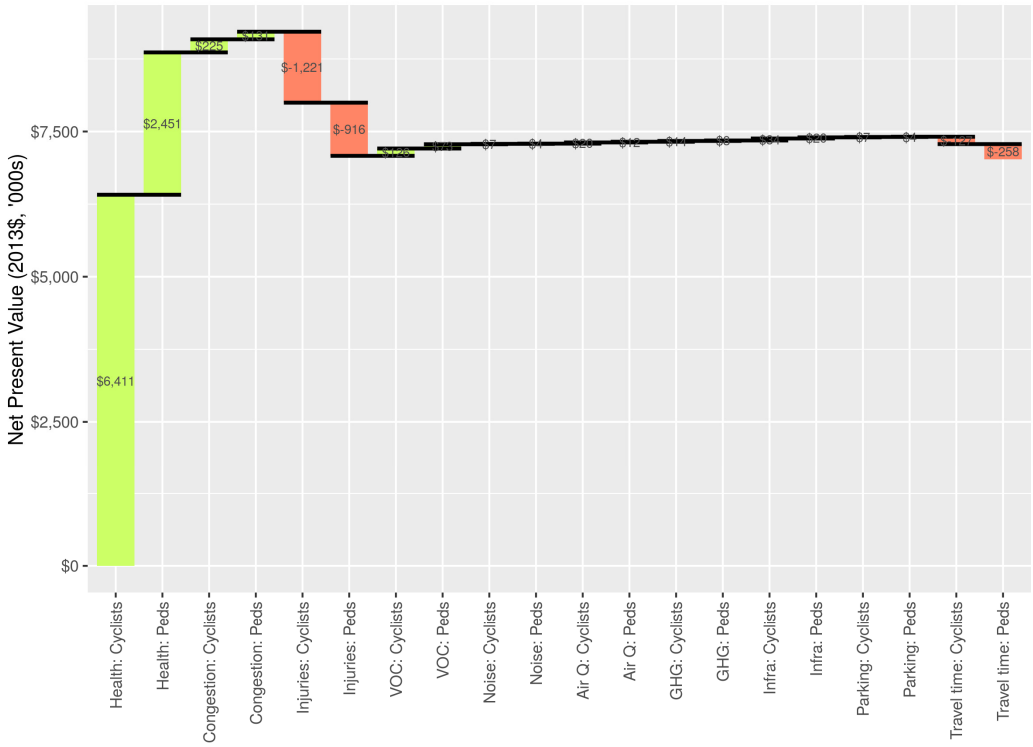
The results of the appraisal are summarised in Table 5.8. For higher discount rates the BCR is significantly lower than 1.0. The BCR is higher for lower discount rates as the benefits are predominantly in the future whereas the costs are almost all in the near-term (and hence are less sensitive to discounting).

■ **Table 5.8: Economic assessment**

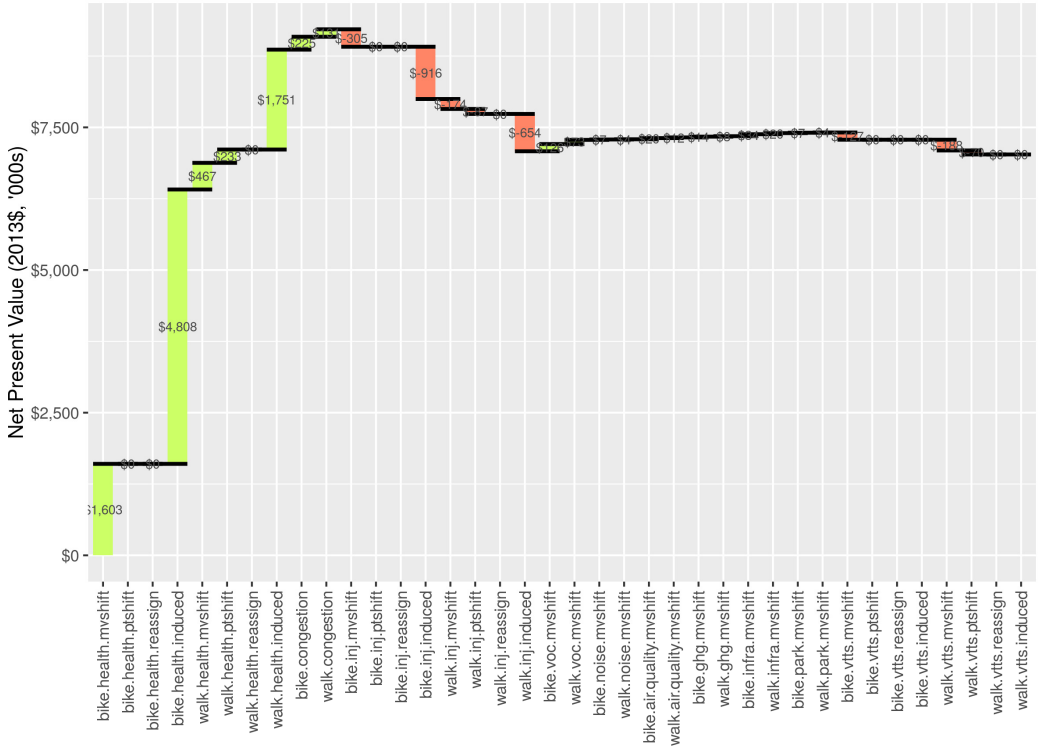
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	1.5	0.7	0.4
Likelihood BCR < 1.0	0%	100%	100%
Net Present Value (NPV)	$3.26 m	-$1.95 m	-$4.27 m
Present Value of Benefits (PVB)	$10.30 m	$5.09 m	$2.77 m
Present Value of Costs (PVC)	$7.04 m	$7.04 m	$7.04 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.31. The vast majority of the benefit accrues from cyclist health. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits; this is largely attributable to the additional travel time for those who shift from motor vehicles and public transport to cycling and walking as shown in Figure 5.32.



■ **Figure 5.31: Summary breakdown of net present value**



■ **Figure 5.32: Detailed breakdown of net present value**

In considering these results we note the following:

- While the rates of mode shifted and (particularly) induced travel are high in comparison to most of the other projects in this study, there are comparatively few path users. This low user demand, combined with the comparatively high overall project capital cost (around $6.71 m) means the costs exceed the (monetised) benefits.
- In noting the above, it must also be recognised that there are unquantified benefits which may weigh the evaluation in a more favourable light. For example, there may be significant social benefits in providing active transport infrastructure in regional towns such as Ipswich where there is a paucity of alternatives.
- It is also recognised that the path does not connect to major trip attractors, most notably Ipswich city centre. This, in combination with the generally low population density and attractiveness of car travel, makes it unlikely the path would ever have demand similar to that of inner city paths. There is then a question of whether there is a spatial equity argument in support of providing paths in regional towns and cities – even if the economic case does not support doing so.

5.4 Enoggera Creek Bikeway (Kelvin Grove)

5.4.1 Project description

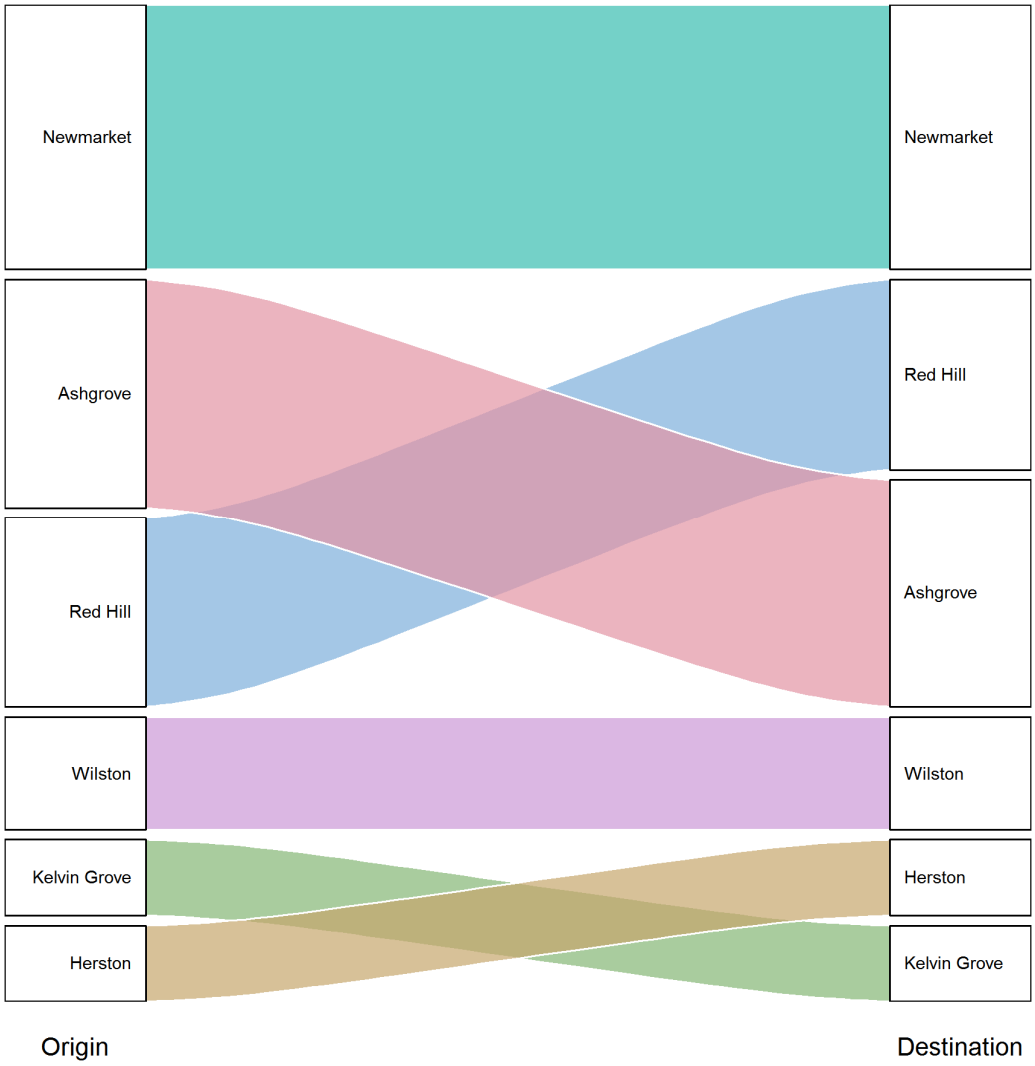
The project evaluated is an underpass of Kelvin Grove Road connecting the existing Enoggera Creek Bikeway in Bancroft Park to the recently reinstated shared path crossing of Enoggera Creek at Bishop Street. The project consists of a 3.0 m concrete shared path extending over a distance of around 700 m, and includes structural works under the Kelvin Grove Road bridge to support the path underpass. The path provides a grade separated alternative to using Bancroft Street, crossing Kedron Brook Road and Bishop Street (a distance of around 770 m). The path was completed in August 2015, around two months prior to the counts and intercept surveys being undertaken. The project cost was around $3.1 m.

5.4.2 Usage

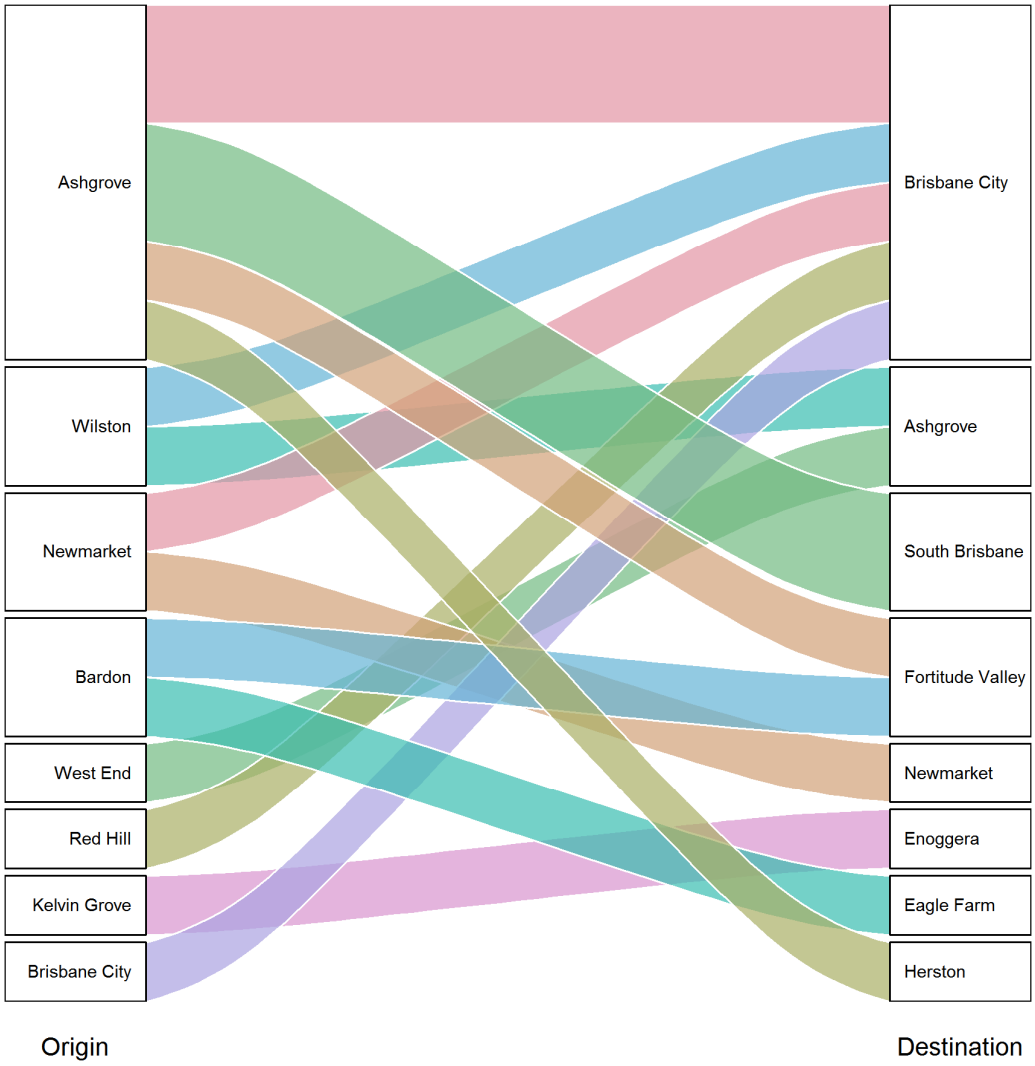
The average daily traffic over the 7-day observation period was 419 users, of which 222 are bicycle riders and 197 pedestrians. Weekends (597 users) are busier than weekdays (348 users).

5.4.3 Catchment

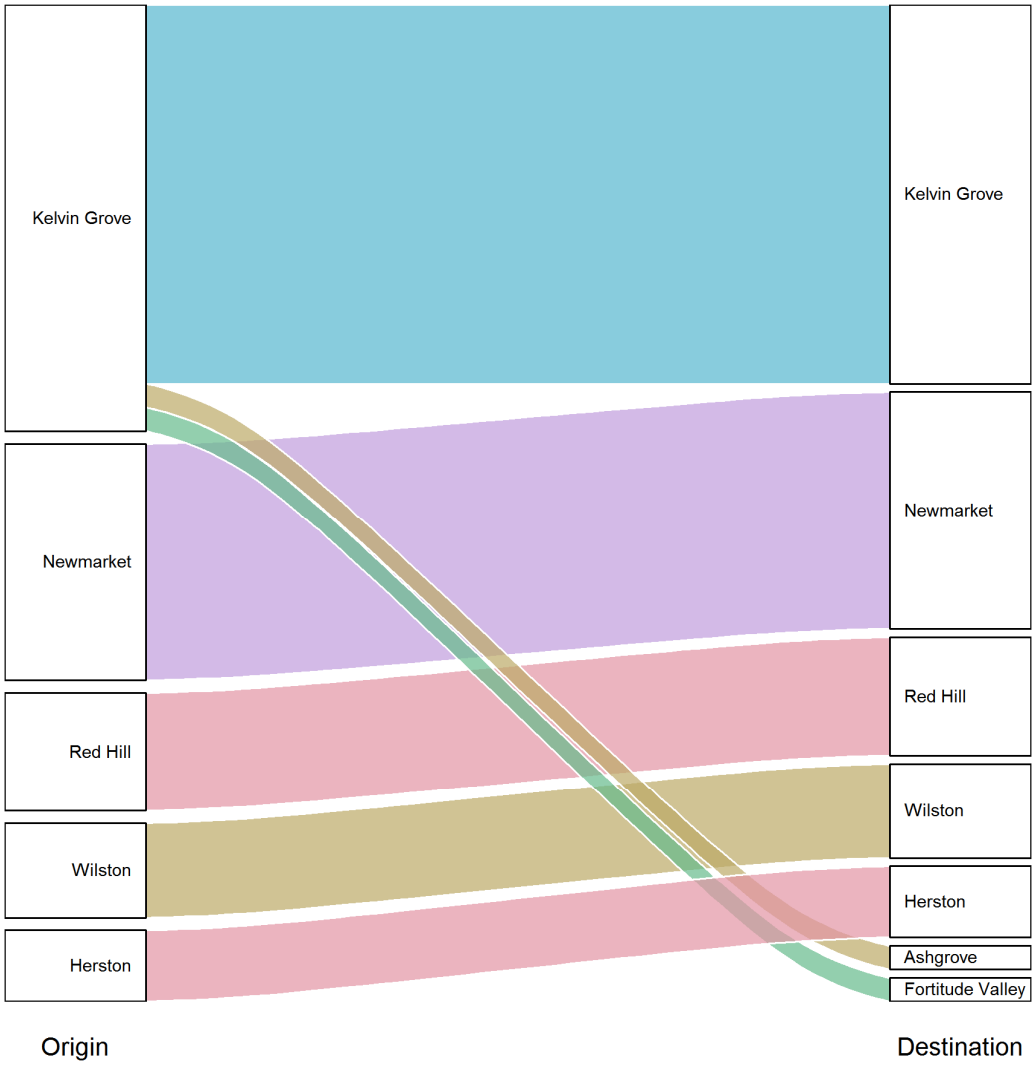
The most common recreation cycling trip started and finished in Newmarket (24%, Figure 5.33) while the most common transport cycling trips were from Ashgrove to Brisbane CBD (12%, Figure 5.34) and Ashgrove to South Brisbane (12%). Walking recreation trips were primarily from and to Kelvin Grove (38%), Newmarket (24%), Red Hill (12%) and Wilston (10%) (Figure 5.35).



■ **Figure 5.33: Cycling trip origins and destinations (recreation purpose, n=29)**



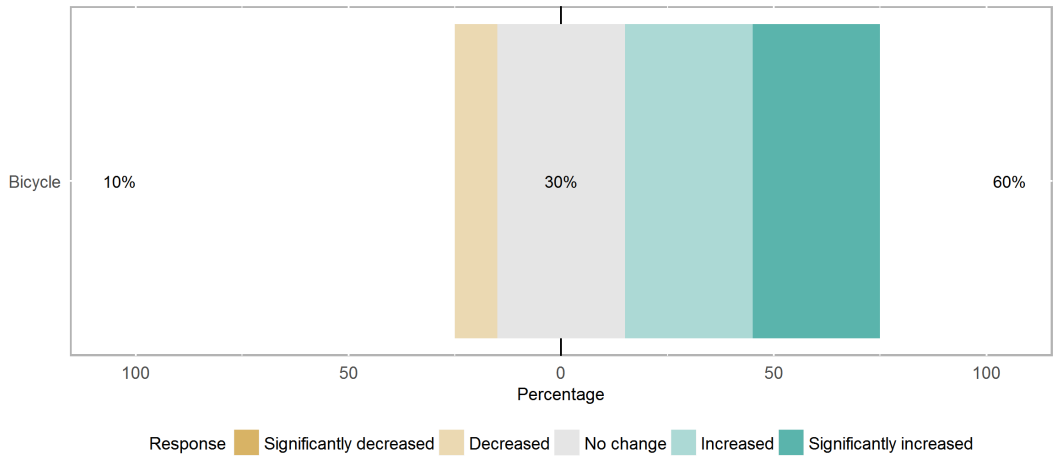
■ **Figure 5.34: Cycling trip origins and destinations (transport purpose, n=16)**



■ **Figure 5.35: Walking trip origins and destinations (recreation purpose, n=42)**

5.4.4 User behaviours

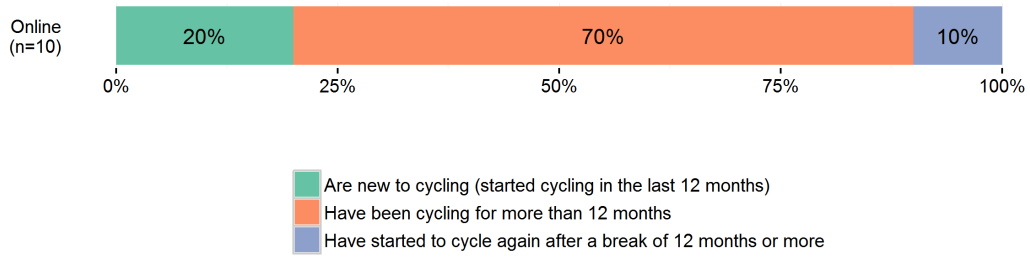
The majority of bicycle riders using the path indicated they had increased or significantly increased their time spent riding over the past 12 months as a result of the presence of the path (Figure 5.36).



What change, if any, would you say the improvements to the path have had on the amount of time you've spent riding over the past 12 months?

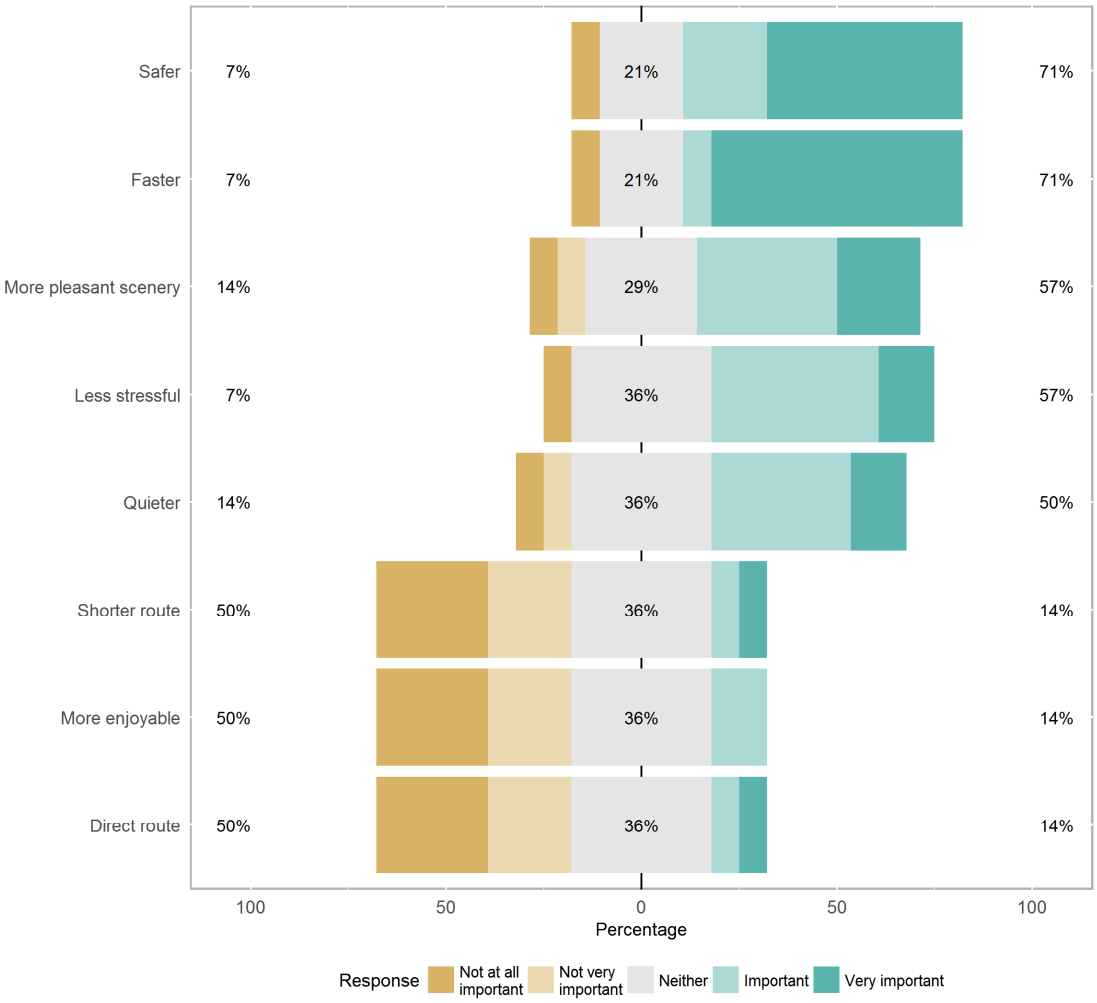
■ **Figure 5.36: Change in riding duration attributable to the path**

The sample of path users at Enoggera Creek who reported their cycling history is small (n=10). Irrespective, among this small sample two had reported that they have taken up cycling only in the past year and another one had restarted cycling after a break of a year or more (Figure 5.37).



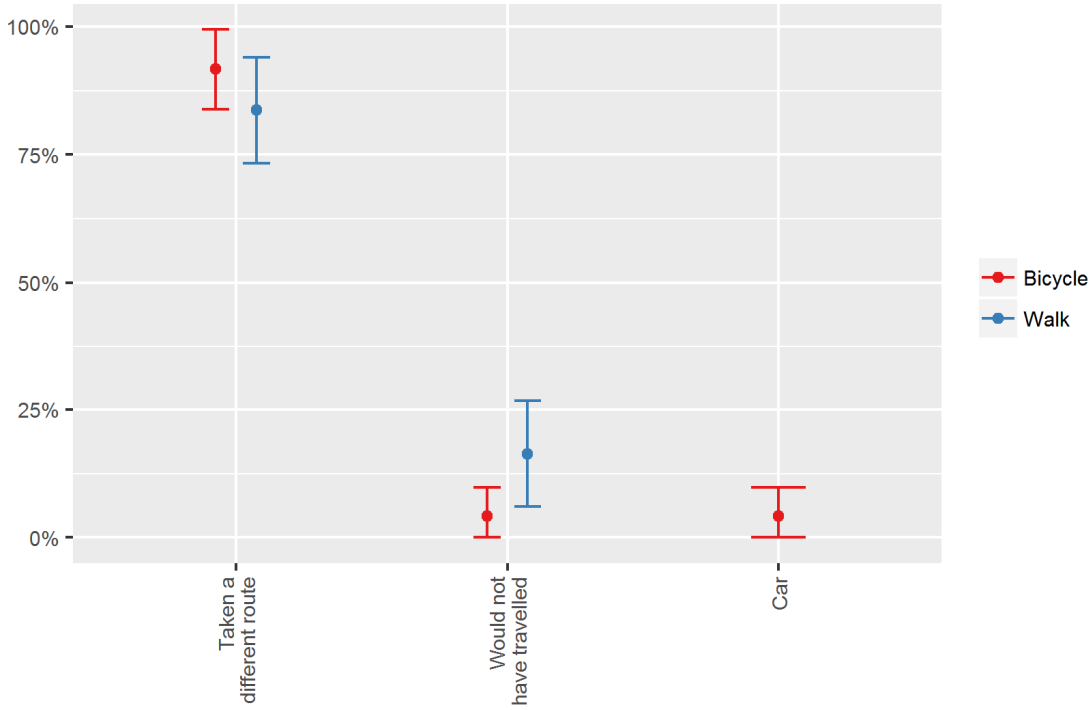
■ **Figure 5.37: Cycling history**

The sample of respondents completing the online survey was fairly low. However, from this small sample most bicycle riders indicated they used the underpass because they felt it was safer and faster than the alternatives (Figure 5.38). There were insufficient walking respondents to obtain meaningful data on route importance.



■ **Figure 5.38: Reasons for using the path in comparison to other routes - bicycle riding (n=14)**

Most path users indicated they would have continued to walk or ride irrespective of the presence of the underpass of Kelvin Grove Road; 91% of bicycle riders and 84% of pedestrians would have used another route (Figure 5.39).



How would you have made this trip if the path wasn't here?

■ **Figure 5.39: Diversion rates**

5.4.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.9, and are based wherever possible on the survey data.

■ **Table 5.9: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	220	Video counts
Average trip distance	12.6 km	Intercept surveys
% of trips for transport	35%	Intercept surveys
Diversion: car	4%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	92%	Intercept surveys
Diversion: induced	4%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	290	Video counts
Average trip distance	5.1 km	Intercept surveys
% of trips for transport	6%	Intercept surveys
Diversion: car	0%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: reassign	84%	Intercept surveys
Diversion: induced	16%	Intercept surveys
Facility		
Length	0.5 km	Length of missing link
Type	Off-road path	
Change in trip distances	0.07 km	Path is around 70 m shorter than road route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light: 20%	Guesstimate
Investment		
Capital cost	2015: $3.1 m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

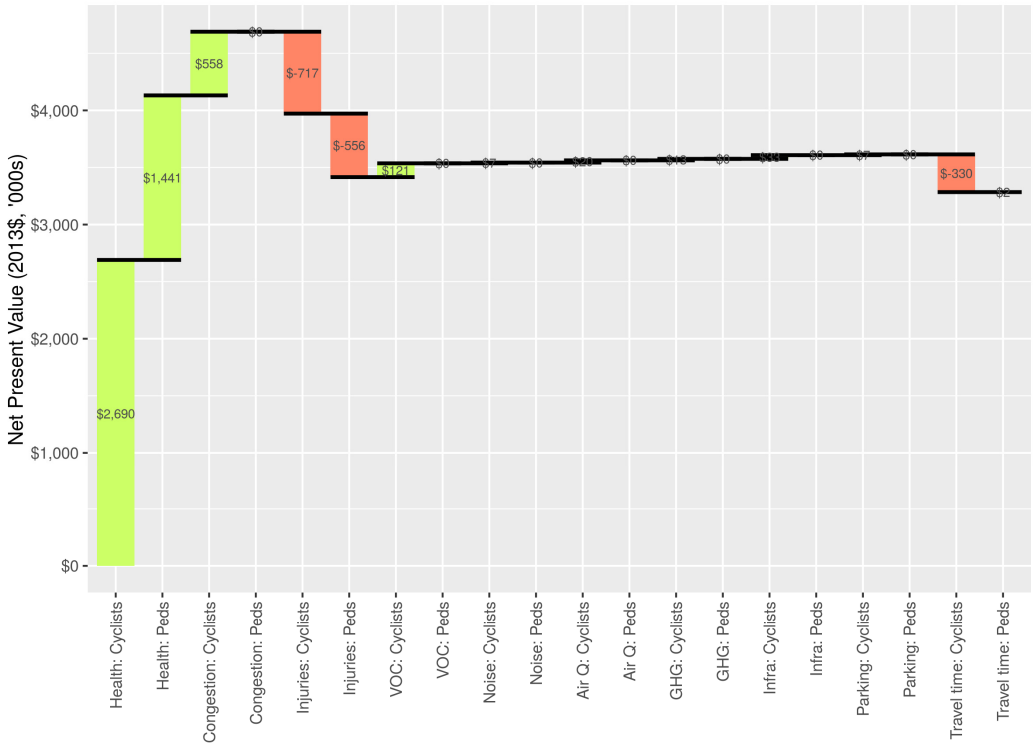
The results of the appraisal are summarised in Table 5.10. For the central discount rate of 7% the BCR is 1.0. It is suggested that the economic case for this project is marginal.

■ **Table 5.10: Economic assessment**

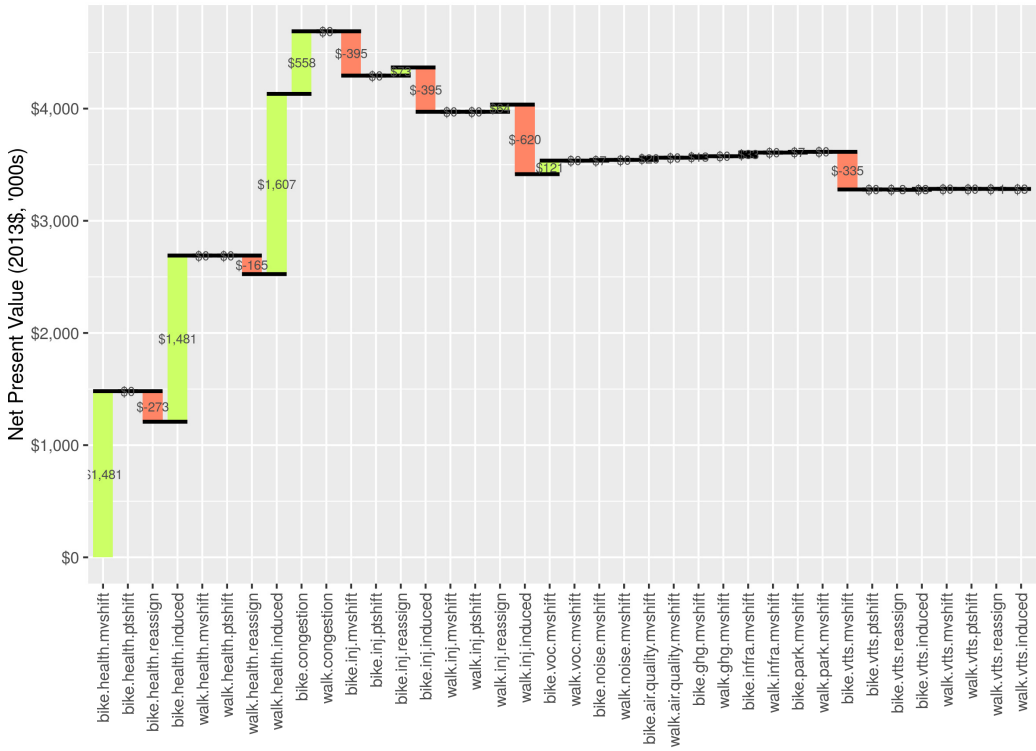
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	1.6	1.0	0.7
Likelihood BCR < 1.0	0%	23%	100%
Net Present Value (NPV)	$2.17 m	$0.14 m	-$1.00 m
Present Value of Benefits (PVB)	$5.57 m	$3.54 m	$2.40 m
Present Value of Costs (PVC)	$3.40 m	$3.40 m	$3.40 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.40. The vast majority of the benefit accrues from cyclist health. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits; these are attributable to the additional travel time for those who shift from motor vehicles to cycling as shown in Figure 5.41.



■ **Figure 5.40: Summary breakdown of net present value**



■ **Figure 5.41: Detailed breakdown of net present value**

We note the following with regard to these results:

- The benefits are primarily due to mode shifted and induced bicycle trips (that is, all new discretionary trips which would not otherwise have occurred). The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- The calculation does not account for the avoided delay at the Kelvin Grove Road / Bishop Street signalised intersection. The average delay incurred at this intersection is unknown. However, if it were assumed that the average delay was 30 seconds then the avoided delay in net present value terms over the 30 year period is in the order of $400,000. This would increase the BCR for the 7% discount rate to around 1.1.
- The calculation does not account for road safety related benefits associated with the avoided road crossing. However, there have been no recorded hospitalisation crashes involving bicycle riders or pedestrians and motorists crossing Kelvin Grove Road between 2009 and 2013. As such, we conclude such events are rare. *However*, this is tempered by noting that a single fatality is valued at around $4 m; avoiding just one fatality[27] would raise the BCR to well above 1.0.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.5 Galeen-Honeyeater Bridge

5.5.1 Project description

The Galeen-Honeyeater Bridge connects Galeen Drive and Honeyeater Drive in Burleigh Waters. The bridge was built in late 2012 at a cost of $2 m and spans 130 m across a canal. The bridge provides a much shorter route compared to the pre-existing road route to the west along Cassowary Drive, a distance of around 2.6 km.

5.5.2 Usage

The video-based 13-hour counts during October 2015 counted 273 bicycle riders and 184 pedestrians on an average weekday, and 210 bicycle riders and 345 pedestrians on a weekend.

5.5.3 Catchment

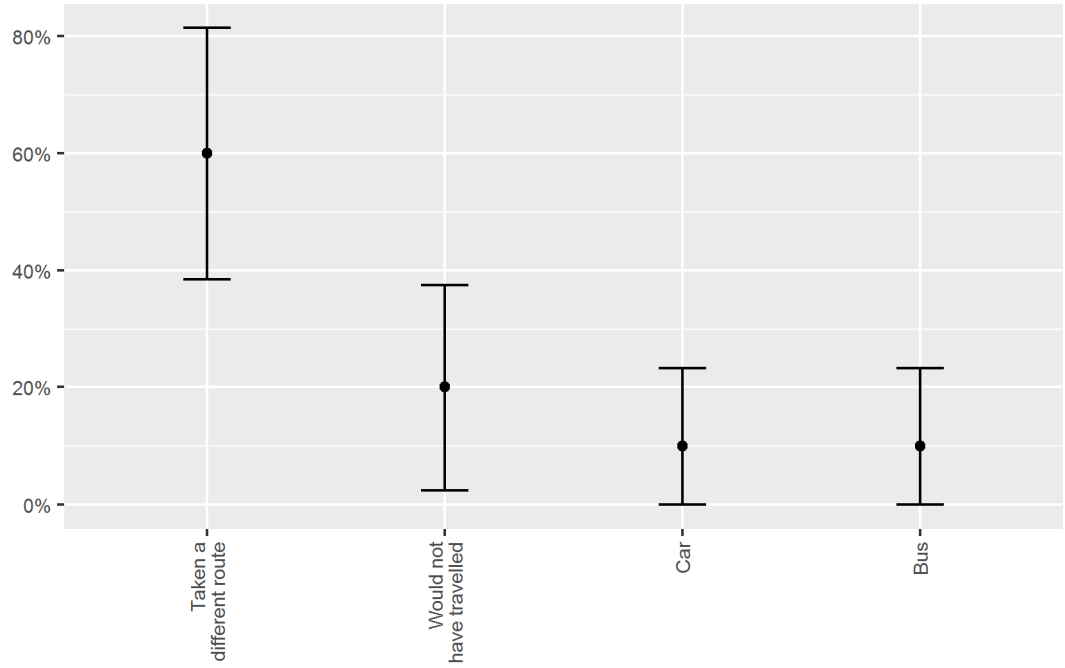
The bridge appears to have a localised catchment. Around three quarters of pedestrians (74%) were starting and finishing their journey in Burleigh Waters. Of the few intercept

[27] With the caveat that a life saved towards the end of the appraisal period is discounted, such that $4 m in nominal terms at year 30 is valued at around $560,000 in net present values (at a discount rate of 7%). Therefore, most benefit is achieved if benefits occur in the near term.

surveys conducted with bicycle riders, three of six recreation riders were starting and finishing their trip in Burleigh Waters.

5.5.4 User behaviours

There were only two respondents to the online survey at this location, hence it was not possible to identify the motivations for using the bridge. However, respondents were asked about what they'd have done *if* the bridge was not present. Around 60% of pedestrians would have walked another way in the absence of the path, while 20% would not have walked at all. There were insufficient cyclist surveys to determine these proportions for this user group.



How would you have made this trip if the path wasn't here?

■ **Figure 5.42: Diversion rates for pedestrians (n=20)**

5.5.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are listed in Table 5.11, and are based wherever possible on the survey data.

■ **Table 5.11: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	255	Video counts
Average trip distance	5.6 km	Intercept surveys
% of trips for transport	45%	Intercept surveys
Diversion: car	27%	Intercept surveys
Diversion: PT	9%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	55%	Intercept surveys
Diversion: induced	9%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	230	Video counts
Average trip distance	4.3 km	Intercept surveys
% of trips for transport	15%	Intercept surveys
Diversion: car	10%	Intercept surveys
Diversion: PT	10%	Intercept surveys
Diversion: reassign	60%	Intercept surveys
Diversion: induced	20%	Intercept surveys
Facility		
Length	0.13 km	Bridge length
Type	Off-road path	
Change in trip distances	2.4 km	Bridge is much shorter than road route
Diverted motor vehicle travel time by period	Busy: 20% Medium: 30% Light: 50%	Guesstimate
Investment		
Capital cost	2012: $2 m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

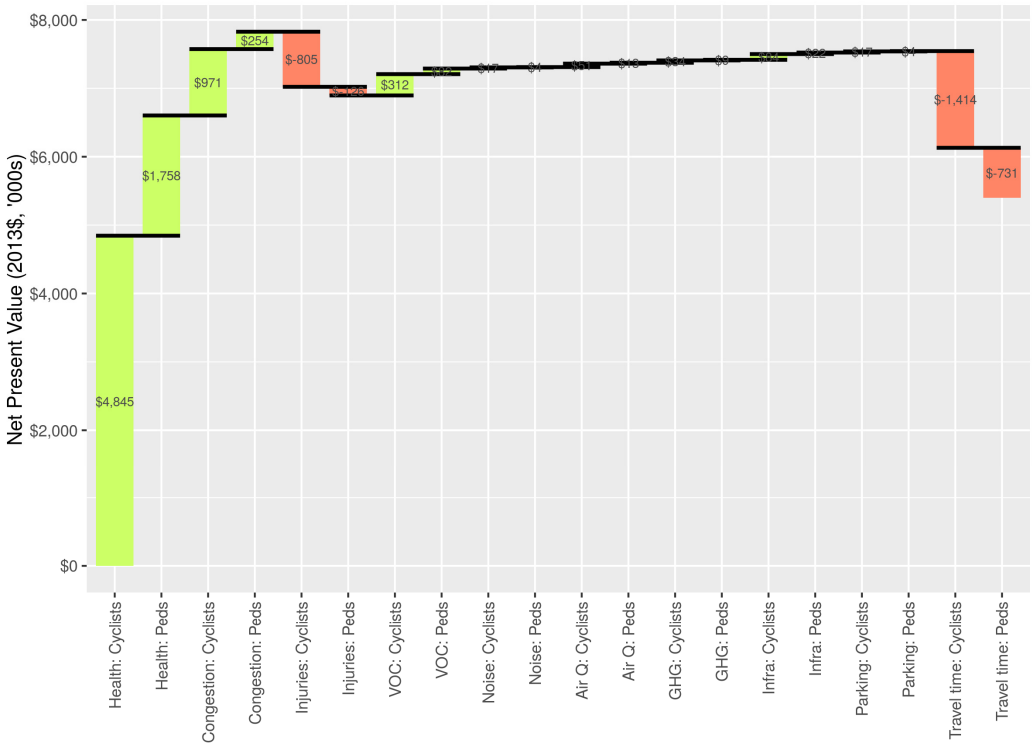
The results of the appraisal are summarised in Table 5.12. For the central discount rate of 7% the BCR is 4.2. For all discount rate assumptions the BCR is highly positive.

■ **Table 5.12: Economic assessment**

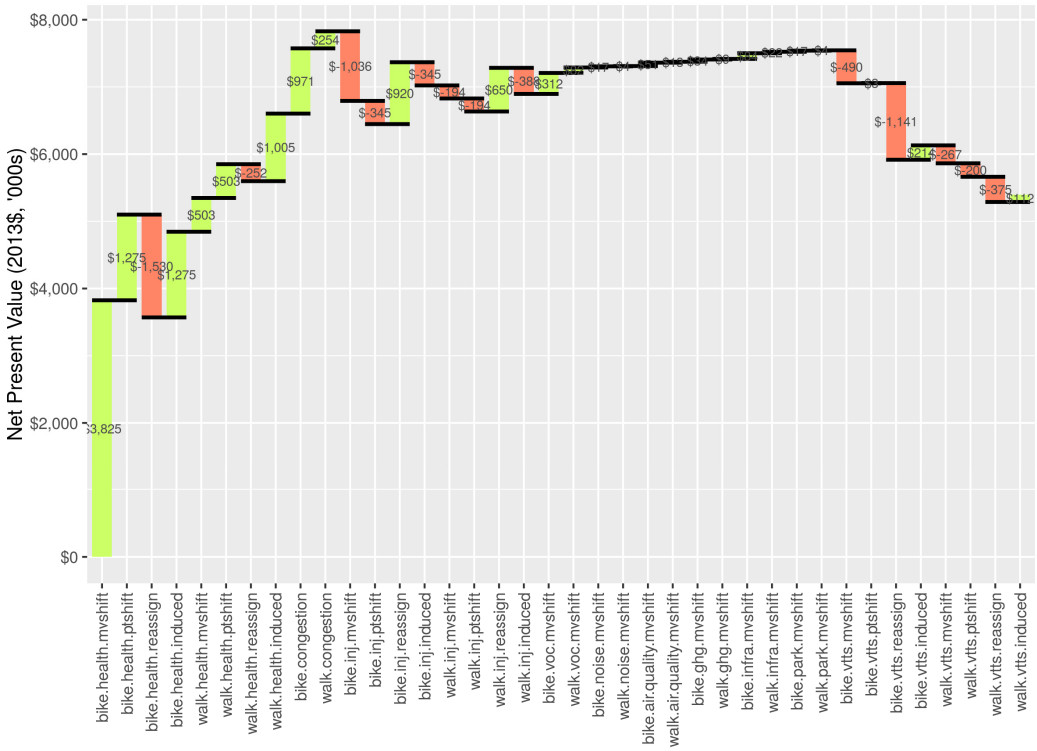
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	6.6	4.2	2.9
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$12.92 m	$7.45 m	$4.39 m
Present Value of Benefits (PVB)	$15.23 m	$9.76 m	$6.70 m
Present Value of Costs (PVC)	$2.30 m	$2.30 m	$2.30 m

All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.43. The vast majority of the benefit accrues from cyclist health. There is marginal pedestrian health benefit and congestion relief and safety disbenefits for those mode shifting onto active transport or all new trips. There are overall travel time disbenefits despite the fact that the bridge provides a much less circuitous route than using the pre-existing paths and roads. While there are small travel time benefits to existing bicycle riders and pedestrians travelling for transport, these benefits are more than compensated by travel time disbenefits which accrue to those who divert from motor vehicle or public transport to riding and walking (Figure 5.44). These travel time benefits and disbenefits are assumed only to apply to those making transport trips – it being unclear what value a recreational traveller would apply to travel time changes. It is also notable that there is a health disbenefit to reassigned (i.e. pre-existing) bicycle riders and pedestrians. Again, these disbenefits are applied only to transport trips and can be attributed to the shorter journeys which the bridge facilitates. In other words, for an unchanged origin-destination pair a rider or pedestrian making a transport trip would save around 2.4 km on their trip. For recreation trips it is assumed they would compensate by riding or walking farther, but for transport trips this distance saving is, presumably, real and results in a reduction in physical activity dose.



■ **Figure 5.43: Summary breakdown of net present value**



■ **Figure 5.44: Detailed breakdown of net present value**

We note the following with regard to these results:

- The intercept surveys suggest fairly high levels of mode shifting from car to cycling (and to a lesser to extent walking). The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.6 Gateway North Bikeway – Schulz Canal Crossing

5.6.1 Path description

The Schulz Canal Crossing consists of a bridge over the Schulz Canal and accompanying path connections immediately to the west of Nudgee Road. The shared bridge provides a connection to the Jim Soorley Bikeway, Gateway North Bikeway and Kedron Brook Bikeway. The project was built in 2013 at a cost of $7 m.

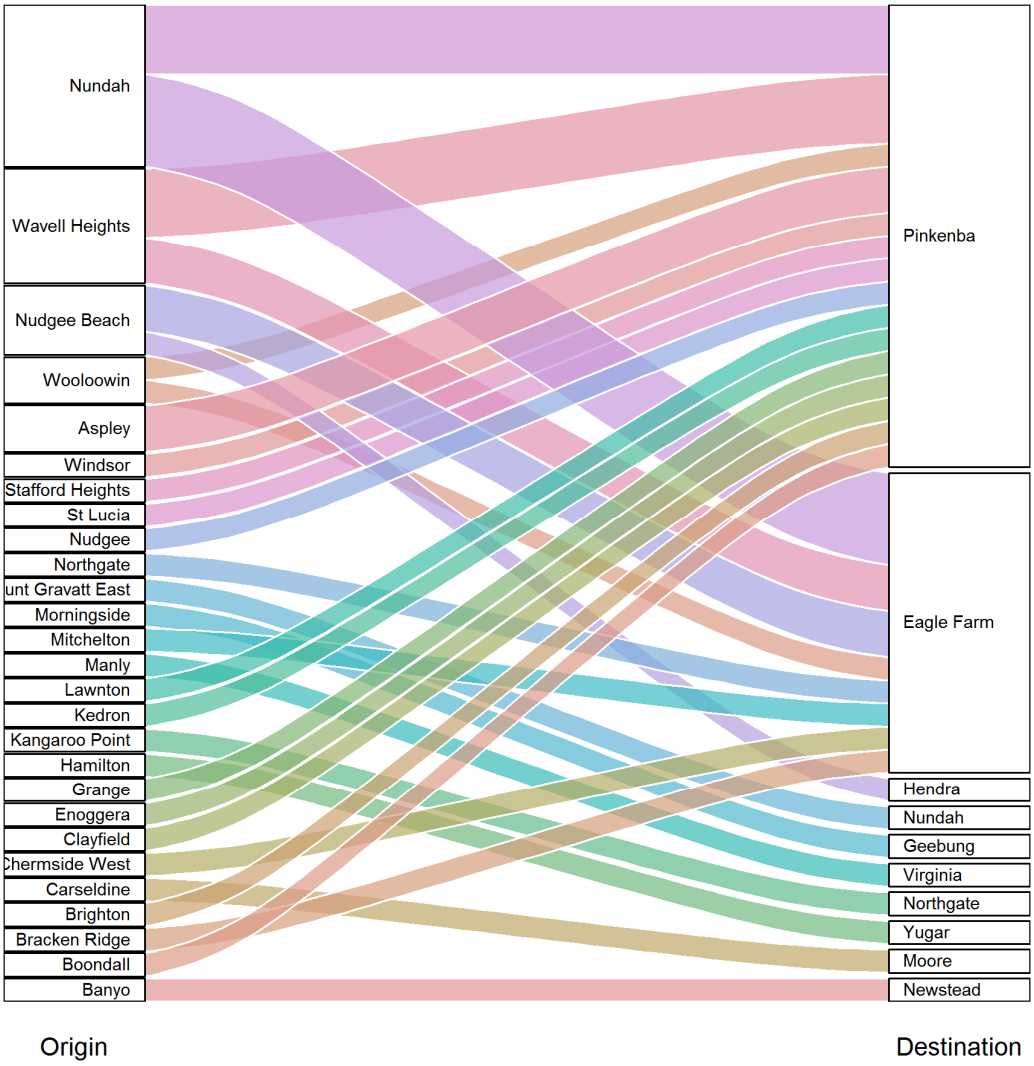
5.6.2 Usage

The average weekday demand between 6 am and 7 pm was 340 path users, of which 292 (86%) were bicycle riders and 48 (14%) were pedestrians. Weekend demand was marginally higher with 332 riders and 53 pedestrians.

5.6.3 Catchment

The most common trip for recreation riders was for trips starting and finishing in Nundah (11%, Figure 5.45). For transport trips the most common trip was from Nundah to Eagle Farm (10%, Figure 5.46) and Nundah and Wavell Heights to Pinkenba (each 7%)

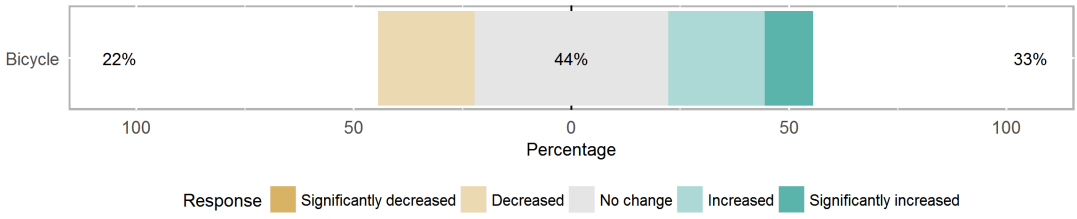
■ **Figure 5.45: Cycling trip origins and destinations (recreation purpose, n=11)**



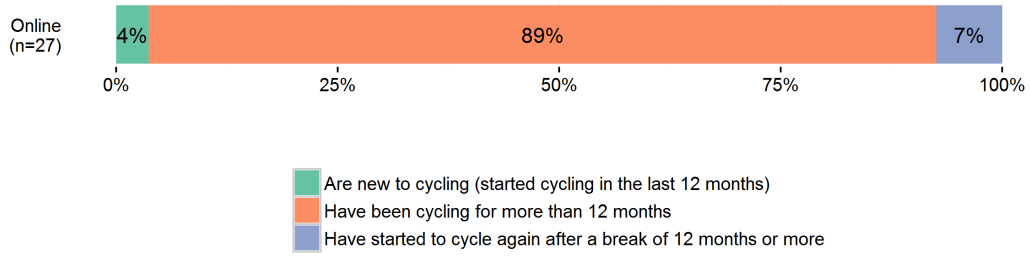
■ **Figure 5.46: Cycling trip origins and destinations (transport purpose, n=41)**

5.6.4 User behaviours

While most bicycle riders indicated they had not changed their riding duration over the past year as a result of the opening of the bridge, more indicated they had increased their riding (33%) than decreased it (22%) (Figure 5.47). Most riders appear to be fairly committed; 89% had been riding continuously for at least the past year (Figure 5.48).

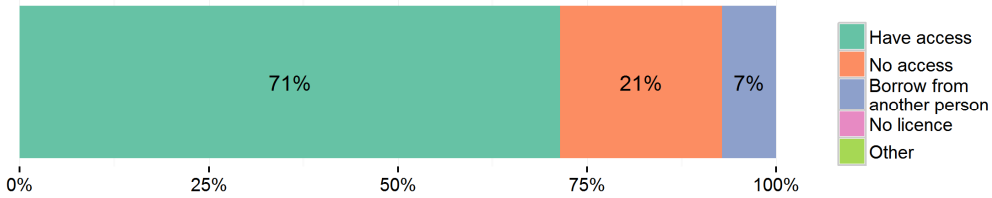


■ **Figure 5.47: Change in duration over the past year (n=27)**



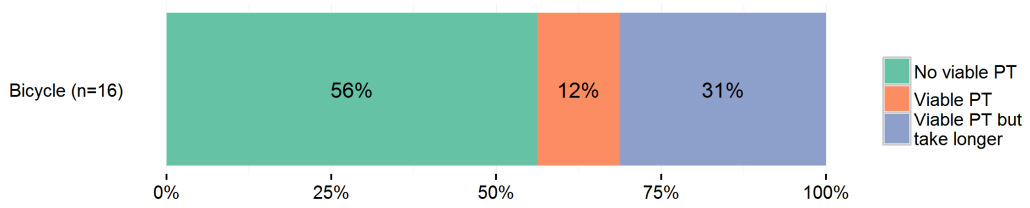
■ **Figure 5.48: Cycling history**

Most path users making transport trips had a car available they could have used for their trip (Figure 5.49), but less than half felt they had a viable public transport alternative (Figure 5.50). This probably reflects the absence of high quality public transport in the area and the disperse trip origins and destinations of path users.



Thinking of your most recent trip on the path, which of the following best describe how easily you could have used a car for this trip?

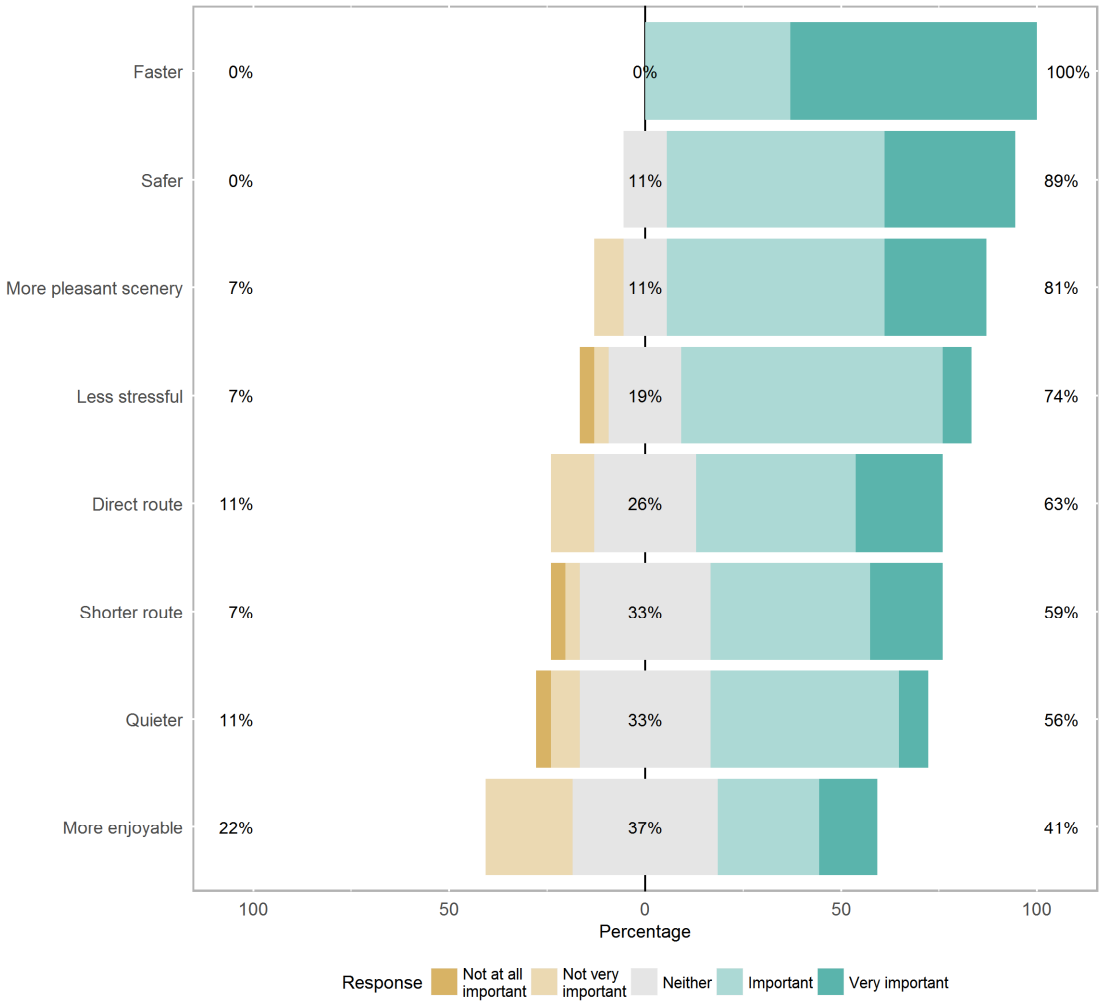
■ **Figure 5.49: Car availability for transport trips**



Thinking of your most recent trip on the path, which of the following statements best describes how easily you could have made this trip by public transport?

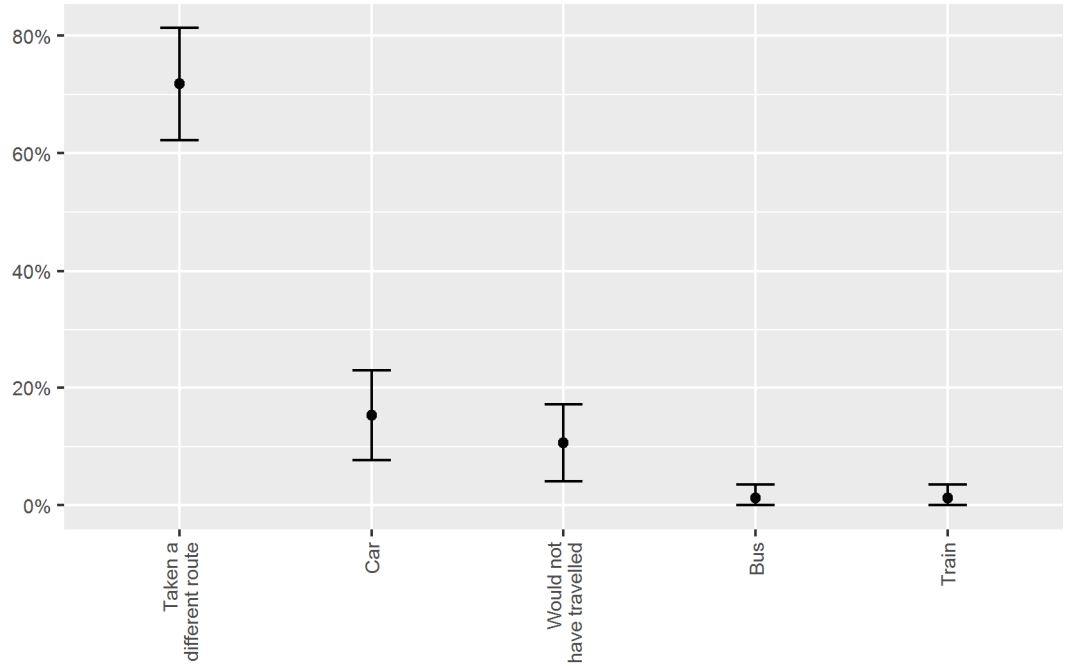
■ **Figure 5.50: Public transport availability for transport trips**

Bicycle riders using the bridge overwhelmingly indicated that the bridge was faster and safer than the alternatives (Figure 5.51).



■ **Figure 5.51: Reasons for using the path - bicycle riders (n=27)**

When asked what they'd have done if the bridge was not present most bicycle riders (72%) said they'd have used another route (presumably Nudgee Road), with a further 15% indicating they would have driven a car. There were insufficient pedestrian interviews to determine these rates for this user group.



How would you have made this trip if the path wasn't here?

■ **Figure 5.52: Diversion rates for bicycle riders (n=85)**

5.6.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.13, and are based wherever possible on the survey data.

■ **Table 5.13: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	292	Video counts
Average trip distance	38.8 km	Intercept surveys
% of trips for transport	48%	Intercept surveys
Diversion: car	15%	Intercept surveys
Diversion: PT	1%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	73%	Intercept surveys
Diversion: induced	11%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	48	Video counts
Average trip distance	7.9 km	Intercept surveys
% of trips for transport	40%	Intercept surveys
Diversion: car	10%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: reassign	90%	Intercept surveys
Diversion: induced	0%	Intercept surveys
Facility		
Length	0.13 km	Bridge length
Type	Off-road path	
Change in trip distances	0 km	Bridge is same length as Nudgee Road
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light: 20%	Guesstimate
Investment		
Capital cost	2013: $7 m	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

For the central discount rate of 7% the BCR is 2.9 (Table 5.14). For all discount rate assumptions, the BCR is highly positive.

■ **Table 5.14: Economic assessment**

	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	4.6	2.9	1.9
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$26.59 m	$13.62 m	$6.40 m
Present Value of Benefits (PVB)	$33.89 m	$20.92 m	$13.70 m
Present Value of Costs (PVC)	$7.30 m	$7.30 m	$7.30 m

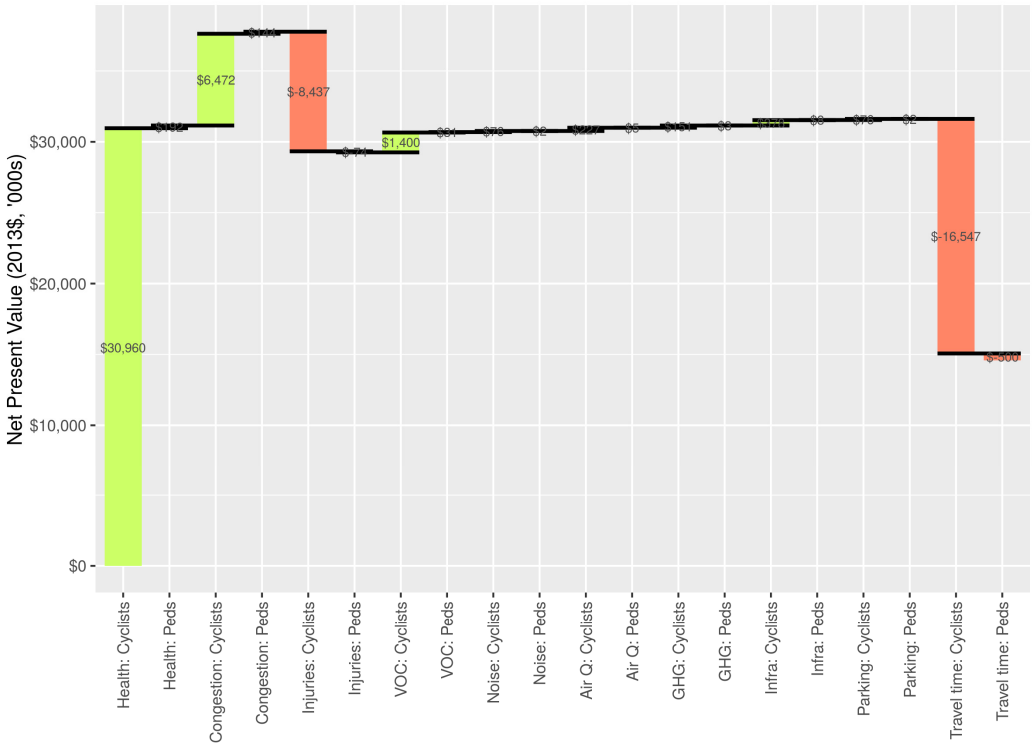
All values are 2013 prices and values.

The breakdown of the NPV for the central discount rate is shown in Figure 5.53. The vast majority of the benefit accrues from cyclist health. These benefits accrue largely from riders who would otherwise have used a motor vehicle or not made their trip (Figure 5.54).

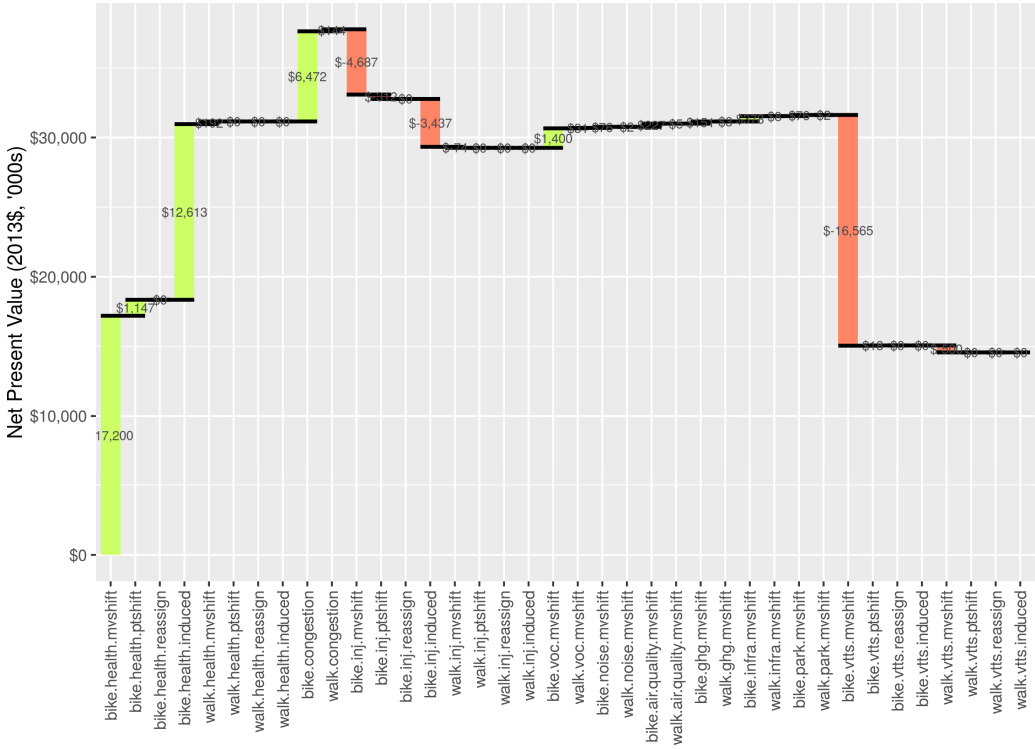
Most of the disbenefits accrue to travel time disbenefits for bicycle riders who would otherwise have driven. The intercept surveys suggest that a significant proportion of bicycle riders would otherwise have driven (15%) *and* that the average trip distance is long (39 km). For the assumed motorist speed of 30 km/h such a journey would take 78 minutes, compared with 117 minutes for cycling (at 20 km/h). Hence, there is a travel time "disbenefit" of 39 minutes for every rider who would otherwise have used a car. This tends to overwhelm the benefits, as illustrated in . In all likelihood this result is not strictly correct because:

- the rider has *chosen* to use their bicycle in preference to their car, and so clearly there is some intrinsic benefit (utility) in them doing so which exceeds any travel time disbenefits, and
- the very long trip distances (39 km) are skewed by the long recreation trip distances (60 km) compared with transport (14 km); it seems likely that most trips by bicycle that would otherwise be made by car are for transport purposes.

However, it is standard transport economics practice to assign monetary values to travel time (dis)benefits, and it is almost certainly true that over distances of these lengths (39 km) car travel will be faster than bicycle travel, particularly in less congested middle and outer suburban areas. As such, for transport trips (which make up a significant proportion of rider demand) we would argue it is reasonable, consistent with standard practice and conservative to account for these travel time disbenefits.



■ **Figure 5.53: Summary breakdown of net present value**



■ **Figure 5.54: Detailed breakdown of net present value**

We note the following with regard to these results:

- The intercept surveys suggest fairly high levels of mode shifting from car to cycling and all-new (induced) cycling trips. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- The self-reported trip distances by cycling in particular are very large (39 km), and are very different between recreation and transport trips. It is probable that most trips attracted from car travel would be for transport purposes, for which the trip distances will be lower. In turn, this means the marginal health benefit will also be lower than estimated here.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.7 Kedron Brook Bikeway

5.7.1 Project description

The Kedron Brook Bikeway improvements consist primarily of widening the path from a 3.0 m shared path of varying quality to a separated 3.0 m bikeway and 2.0 m footpath (Figure 5.55). In most locations the footpath was all-new construction and the existing 3.0 m shared path converted to a bikeway. The configuration is generally similar to the Bicetennial Bikeway (Section 5.1) but with the addition of a grass verge between the bikeway and footpath. Additional works included replacing the bridge under Shaw Road and a number of path connections into the local neighbourhood have been added.

- (a) Shared path before widening

- (a) Separated path after widening
- Figure 5.55: Kedron Brook Bikeway improvements

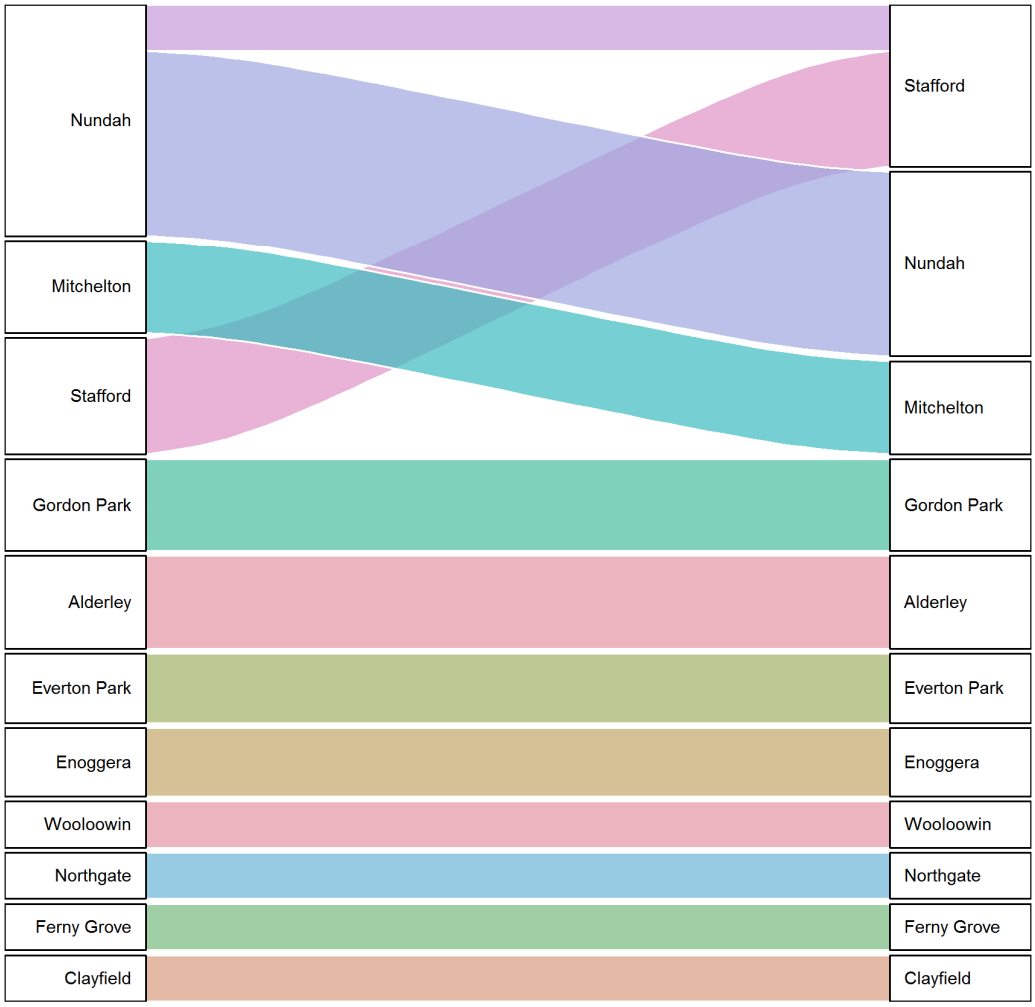
The improvements to the path have been made over a period from 2013 to early 2016, with the most substantial packages being the Lutwyche-Nundah section ($3.7m over 3.4 km, constructed in late 2015) and the Kalinga section ($2.36m over 420m, including the Shaw Road bridge).

5.7.2 Path usage

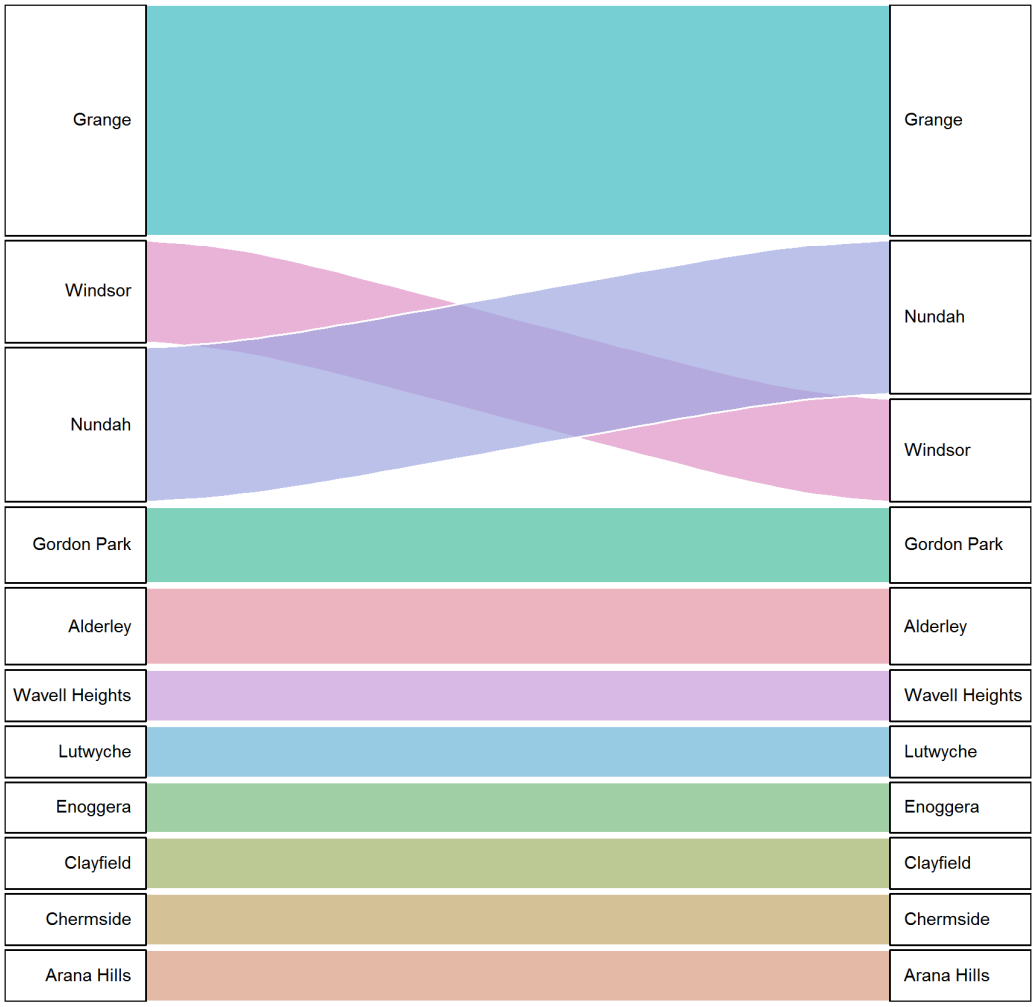
The Kedron Brook Bikeway is subject to comparatively high rider and pedestrian demand; the average weekday count (from 6 am to 7 pm) was very similar at both survey sites, being 1,909 at Bradshaw Park to 2,064 at Kalinga Park. Weekend demand is substantially higher (3,297 at Bradshaw Park and 3,079 at Kalinga Park). Rider and pedestrian demand is fairly evenly split at both sites on weekdays, although on weekends riders tend to make up around 60% of demand at both sites. Peak hour counts are in the order of 200 to 300 users, occurring in the hour starting 6 am on weekdays.

5.7.3 Catchment

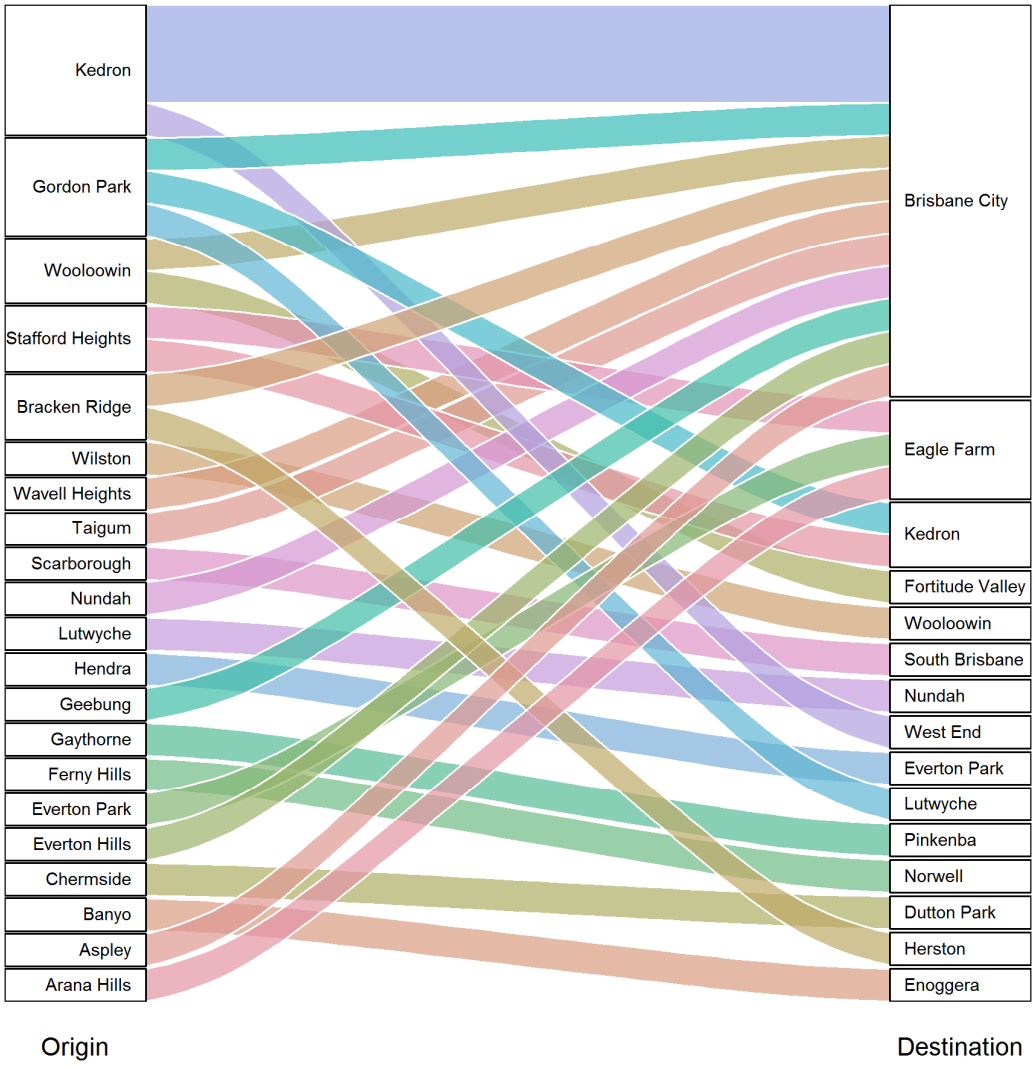
The largest recreation cycling movement at Bradshaw Park is by trips starting and finishing in Nundah (13%, Figure 5.56a). At Kalinga Park the largest recreation cycling movement is for trips starting and finishing in Grange (18%, Figure 5.56b). Almost all recreation cycling journeys start and finish within the same suburb at both sites. By comparison, and unsurprisingly, most transport cycling trips start and finish in different suburbs. At Bradshaw Park the most common cycling transport trip is from Kedron to the Brisbane CBD (10%, Figure 5.57a). The sample size at Kalinga Park is small, but would suggest many transport movements are not city-destined (Figure 5.57).



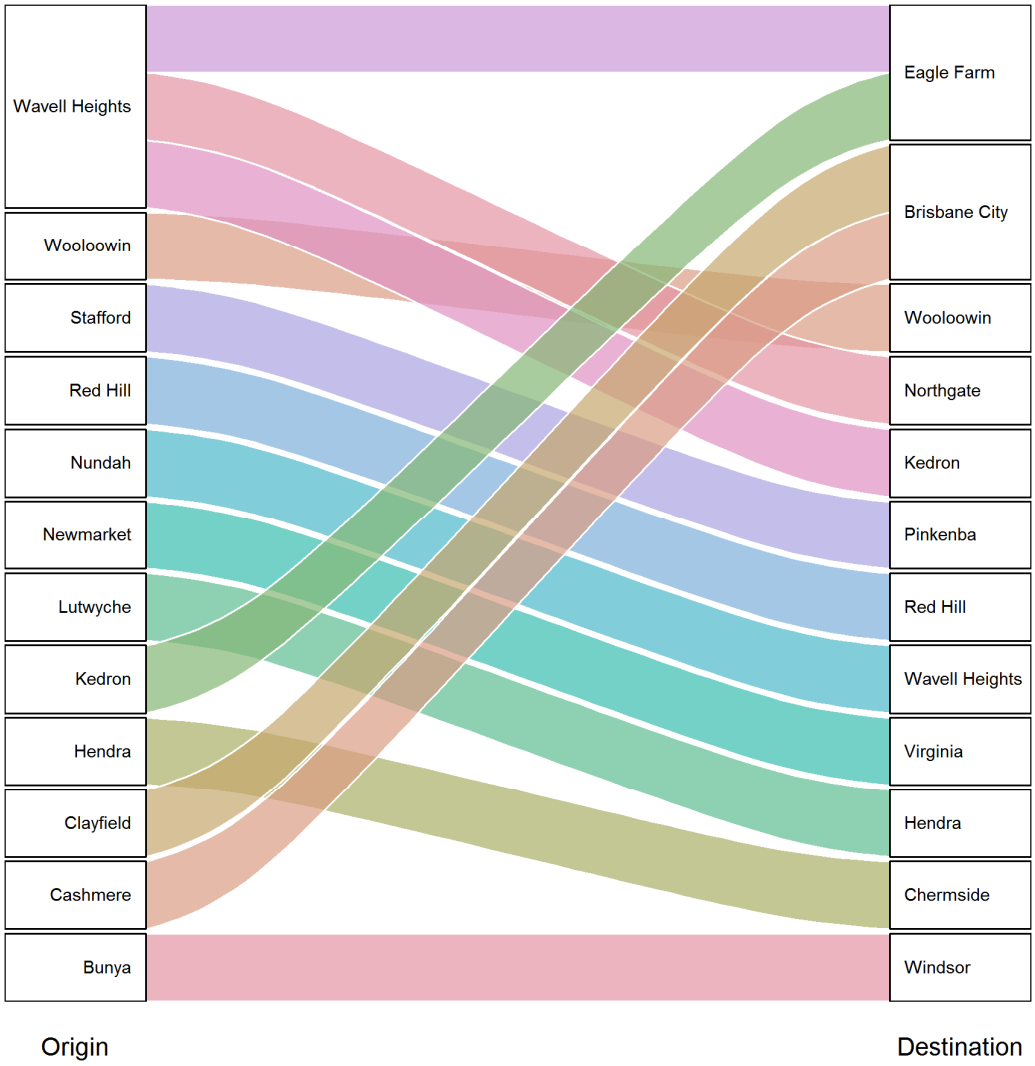
- **(a) Bradshaw Park (n=61)**
- **Figure 5.56: Cycling trip origins and destinations (recreation purpose)**



- **(b) Kalinga Park (n=51)**
- **Figure 5.58 (cont.)**



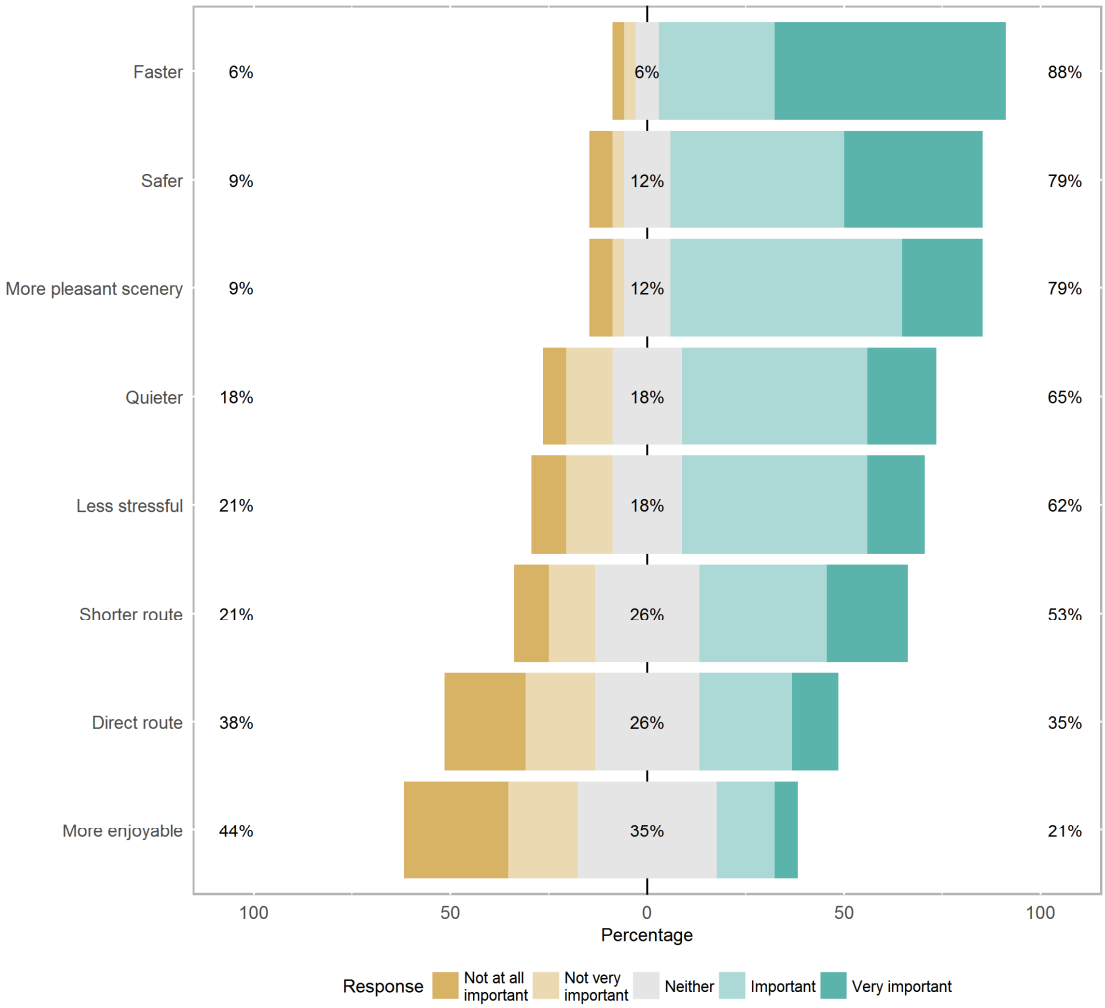
- **(a) Bradshaw Park (n=29)**
- **Figure 5.57: Cycling trip origins and destinations (transport purpose)**



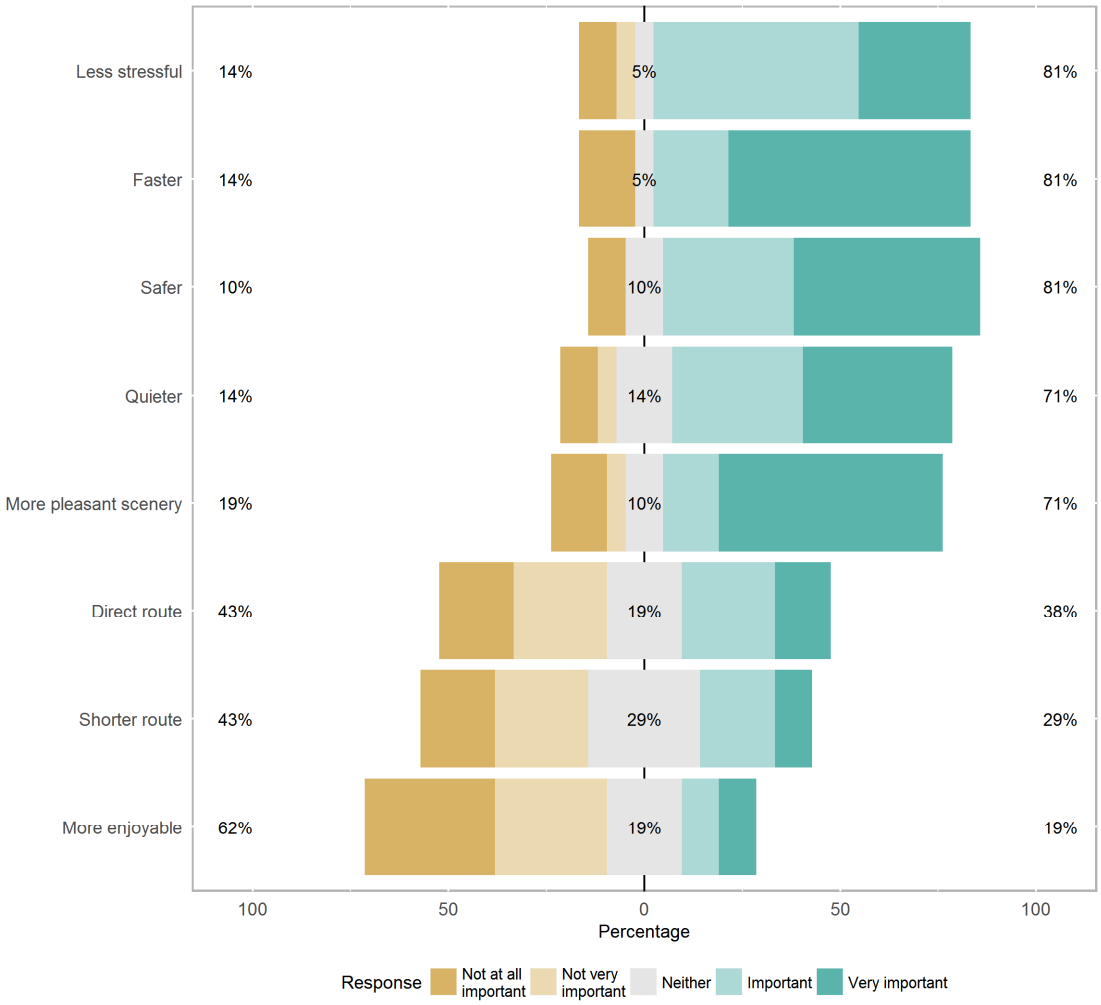
- **(b) Kalinga Park (n=14)**
- **Figure 5.58 (cont.)**

5.7.4 User behaviours

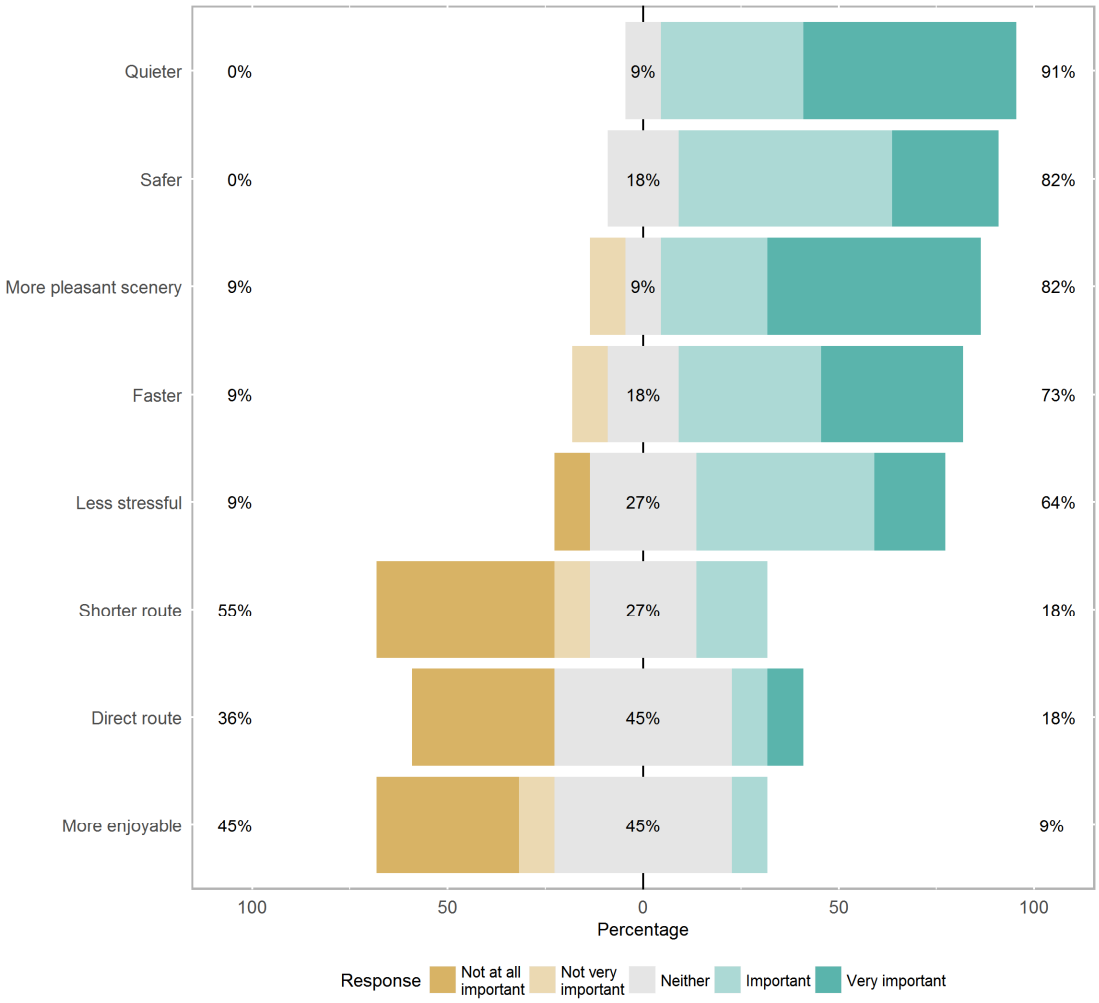
There were comparatively few respondents who completed the online survey at either of the two Kedron Brook Bikeway sites. This limits the extent of the analysis that can be undertaken. However, from the small samples that were available bicycle riders generally chose the path because it was faster, safer and less stressful (Figure 5.58 and Figure 5.59) while pedestrians were attracted by the quietness and perceived safety (Figure 5.60 and Figure 5.61).



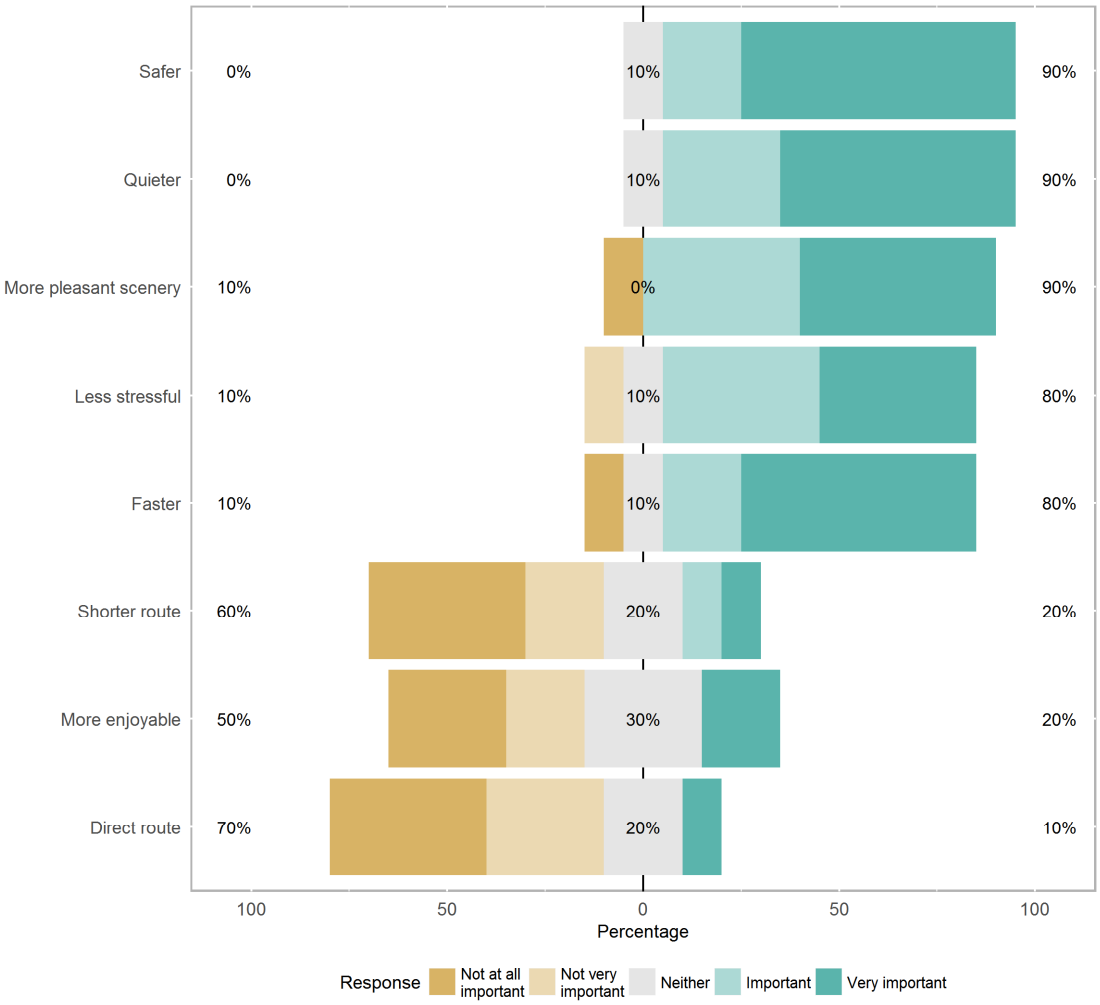
■ **Figure 5.58: Reasons for using the path (Bradshaw Park) - bicycle riders (n=34)**



■ **Figure 5.59: Reasons for using the path (Kalinga Park) - bicycle riders (n=21)**

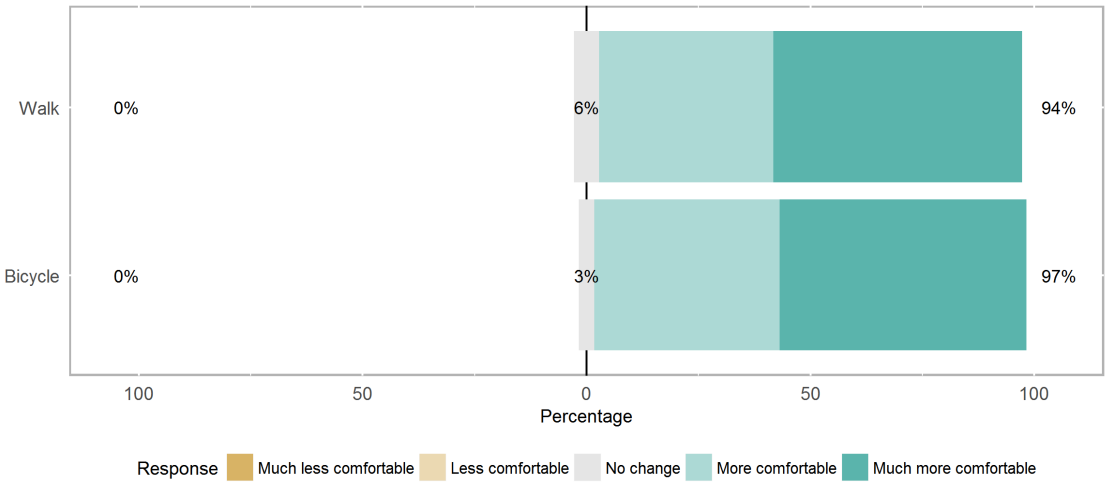


■ **Figure 5.60: Reasons for using the path (Bradshaw Park) - pedestrians (n=11)**

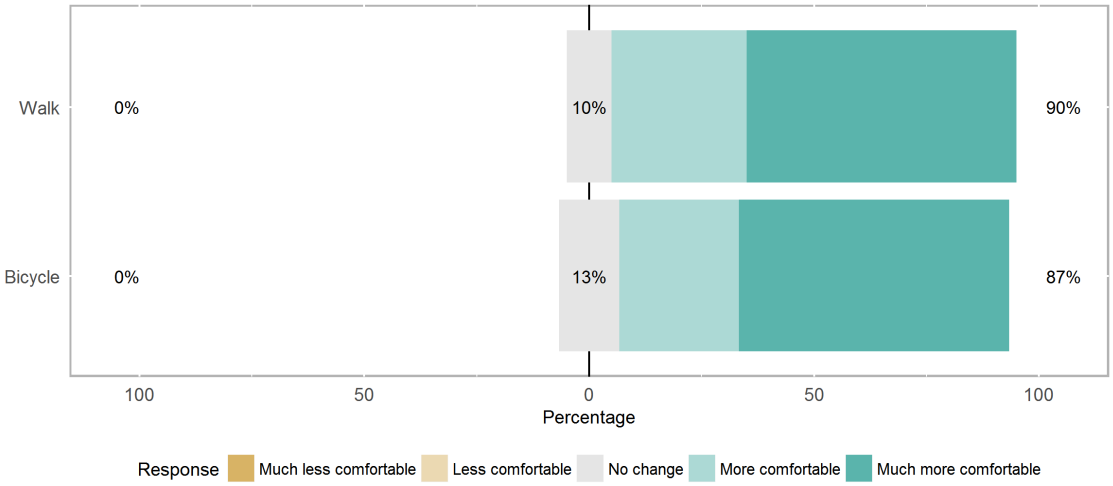


■ **Figure 5.61: Reasons for using the path (Kalinga Park) - pedestrians (n=10)**

All path users had noticed the improvements to the path; namely the segregation of bicycle riders and pedestrians. Furthermore, almost all path users indicated they felt more comfortable using the path as a result (Figure 5.62). Among pedestrians who indicated their sense of comfort had changed most cited the separation from bicycle riders as the most common reason (Figure 5.63)[28].

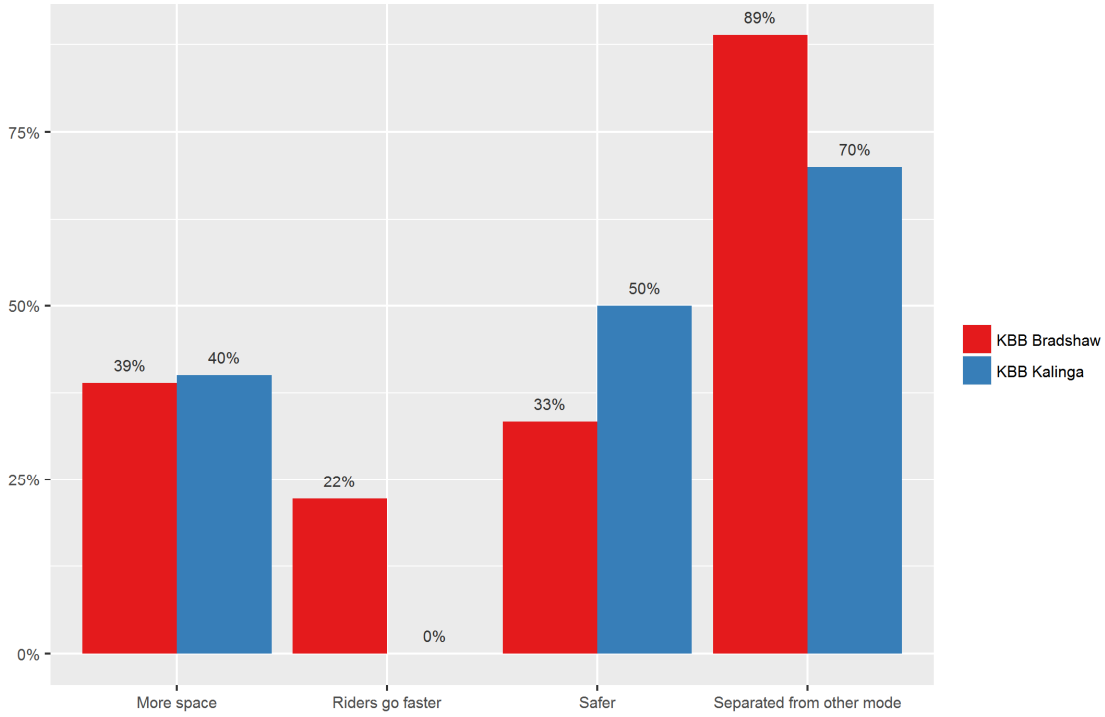


- **(a) Bradshaw Park**



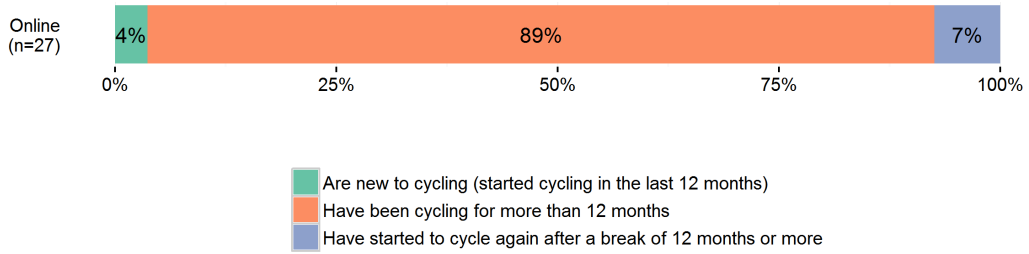
- **(a) Kalinga Park**
- **Figure 5.62: Have the changes made you feel more or less comfortable walking/riding than before?**

[28] Too few bicycle riders answered this question to reliably report results.

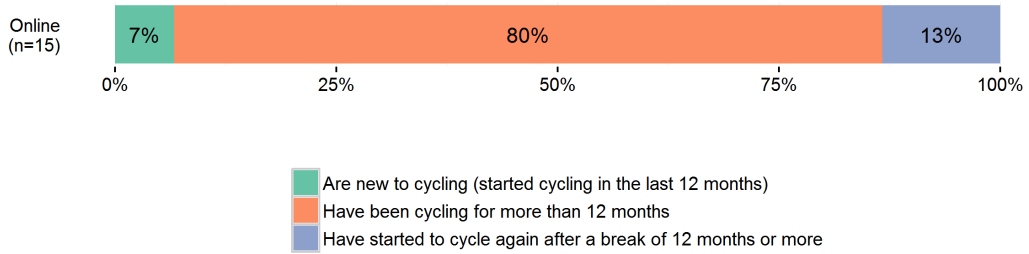


■ **Figure 5.63: Reasons for feeling more comfortable (pedestrians only)**

Most bicycle riders have been riding continuously for a period of 12 months or more (Figure 5.64).



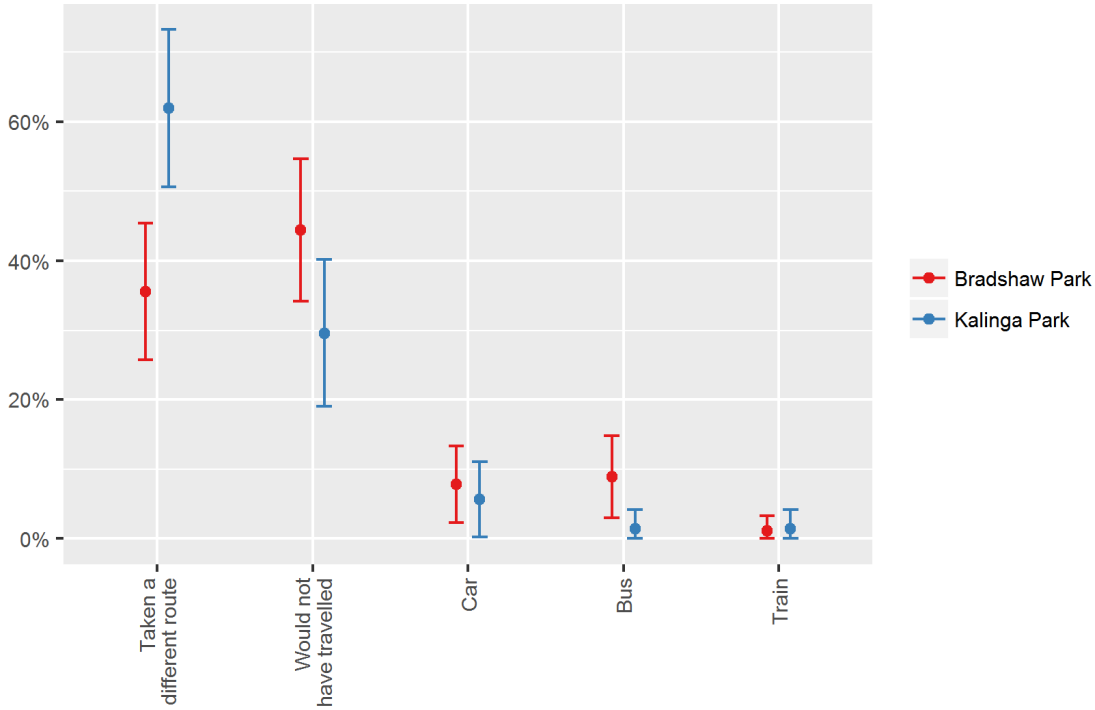
■ **(a) Bradshaw Park**



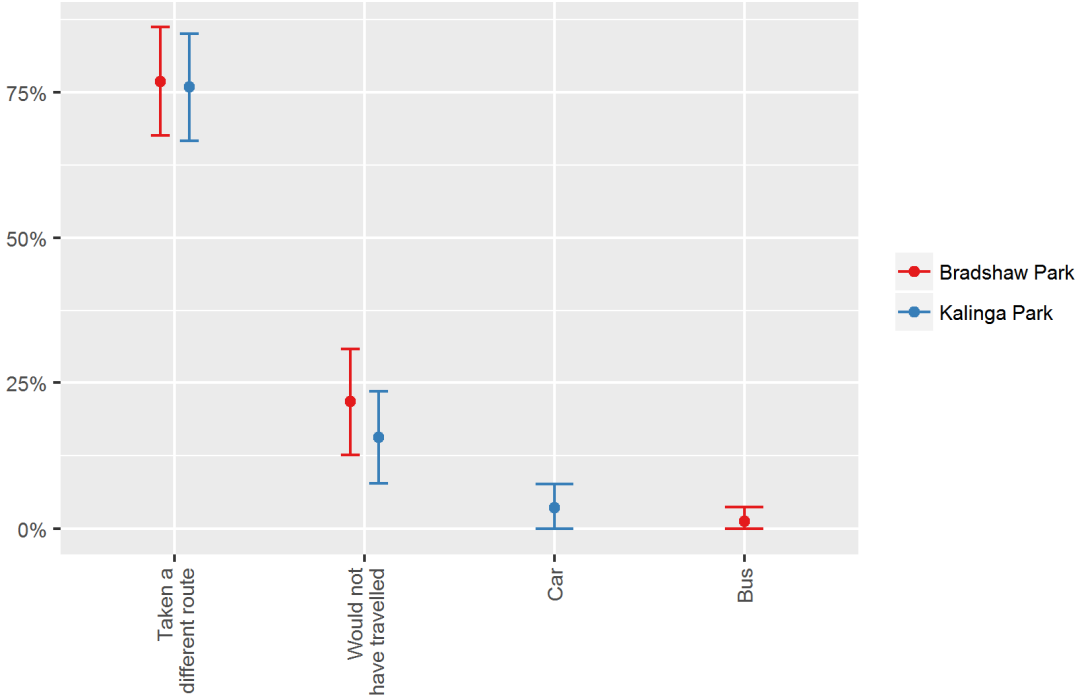
■ **(b) Kalinga Park**

■ **Figure 5.64: Cycling history**

Path users were asked (a) what they would have done if the path wasn't present *at all*, and (b) what they would have done prior to the path being improved. As shown in Figure 5.65 around 50% of bicycle riders would have used a different route if the path were not present at all, and a further 35% would not have travelled at all. This high proportion of induced travel may reflect high recreational cycling use on the path. Only round 6% of bicycle riders would otherwise have used a car for their trip. These proportions are broadly similar for pedestrians; just over 70% would have used another route and 15 – 20% would not have travelled at all.



(a) Bicycle riders



(b) Pedestrians

How would you have made this trip if the path wasn't here?

■ **Figure 5.65: Diversion rates**

5.7.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.15, and are based wherever possible on the survey data.

■ **Table 5.15: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	1,200	Video counts
Average trip distance	28 km	Intercept surveys
% of trips for transport	26%	Intercept surveys
Diversion: car	1%	Telephone surveys
Diversion: PT	1%	Telephone surveys
Diversion: walk	0%	Telephone surveys
Diversion: reassign	95%	Telephone surveys
Diversion: induced	3%	Telephone surveys
Pedestrians		
Opening year demand (AADT)	1,100	Video counts
Average trip distance	6.4 km	Intercept surveys
% of trips for transport	9%	Intercept surveys
Diversion: car	2%	Telephone surveys
Diversion: PT	2%	Telephone surveys
Diversion: reassign	93%	Telephone surveys
Diversion: induced	3%	Telephone surveys
Facility		
Length	3.8 km	Reconstructed path length
Type	Off-road path	
Change in trip distances	0 km	Path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light:20%	Guesstimate
Investment		
Capital cost	2015: $5m, 2016: $1.06m (total $6.06m)	Total cost as per TMR/BCC funding agreement
Operating cost	$10,000 p.a.	Guesstimate

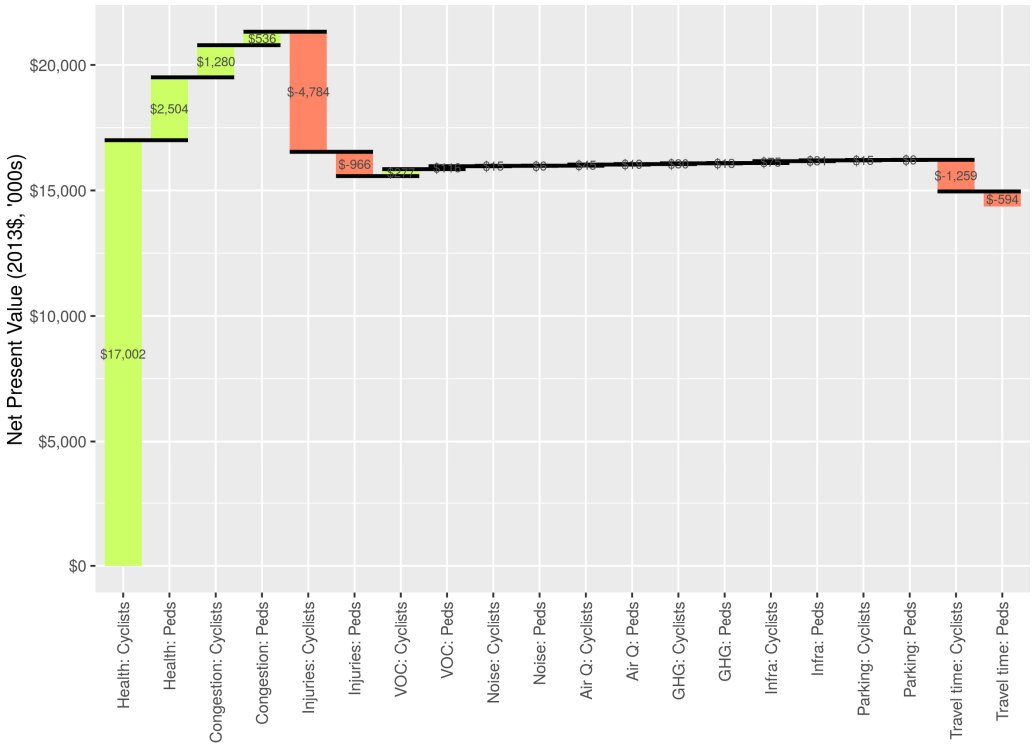
The results of the appraisal are summarised in Table 5.16. For the central discount rate of 7% the BCR is positive at 3.3, with a very low likelihood that the BCR will fall below 1.0.

■ **Table 5.16: Economic assessment**

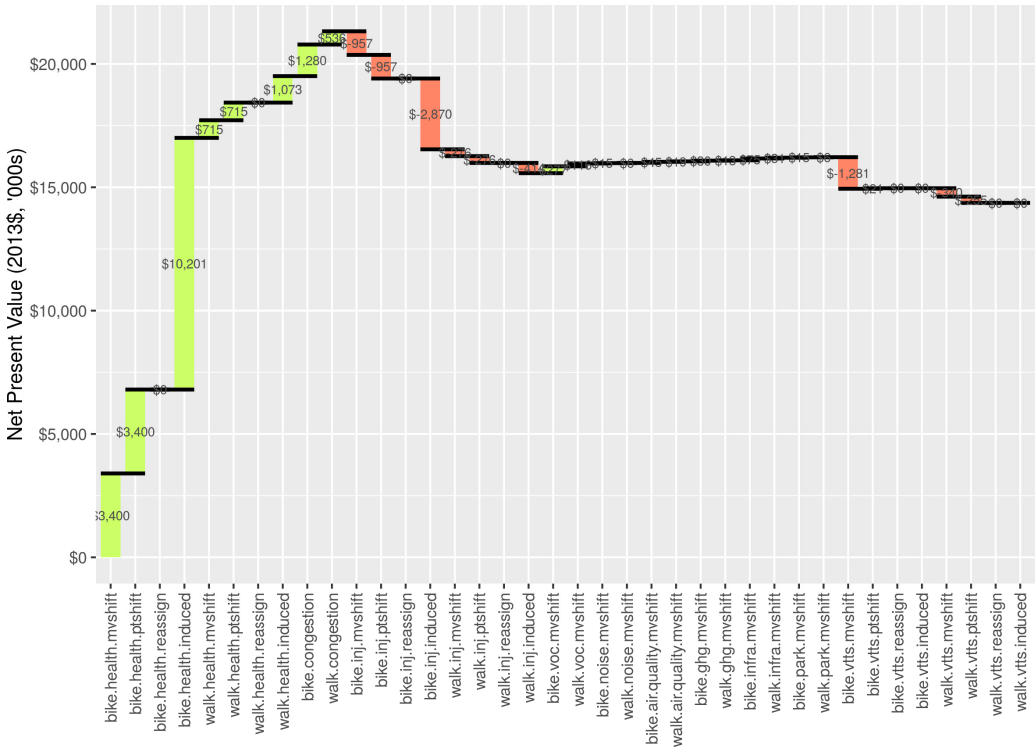
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	5.2	3.3	2.2
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$26.78 m	$14.63 m	$7.84 m
Present Value of Benefits (PVB)	$33.14 m	$20.99 m	$14.19 m
Present Value of Costs (PVC)	$6.36m	$6.36 m	$6.36 m

All values are 2013 prices and values.

The breakdown of the NPV is shown in Figure 5.66. The vast majority of the benefit accrues from cyclist health. This benefit exceeds the injury disbenefit by a factor of 3.5. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits to both user groups; this is largely attributable to the additional travel time for those who shift from motor vehicles to cycling and walking as shown in Figure 5.67.



■ **Figure 5.66: Summary breakdown of net present value**



■ **Figure 5.67: Detailed breakdown of net present value**

In considering these results we note the following:

- The benefits are primarily due to induced bicycle trips, and to a lesser extent new bicycle trips that would otherwise have occurred by motor vehicle or public transport. These induced and mode shifted trips represent a very small proportion of all trips; according to the intercept surveys they are well under 5% of all trips on the path. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- The benefits are large from this small proportion of users because of the long distances they travel (28 km for bicycle trips and 6.4 km for walking trips). It is possible that the induced and mode shifted trips will not be as long as these *average* trip lengths. However, we cannot determine the actual trip lengths for induced or mode shifted trips because the sample size from the survey of these trips was very low.
- The model is sensitive to the demand growth assumptions; assuming 1% p.a. cumulative growth the BCR would reduce to 2.5 and at 5% p.a. the BCR would be 4.4. Irrespective, even under the most conservative growth assumptions the BCR remains highly positive.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.8 North Brisbane Bikeway

5.8.1 Project description

The North Brisbane Bikeway is a shared path that will ultimately connect the Brisbane CBD to Chermside. The project is being delivered in stages, of which Stage 1A – Section 1 from Gilchrist Avenue to the RNA Showgrounds provides a connection under Bowen Bridge Road. At the time of the surveys only this stage was completed, with further stages to the north expected to be constructed during 2016 and subsequent years.

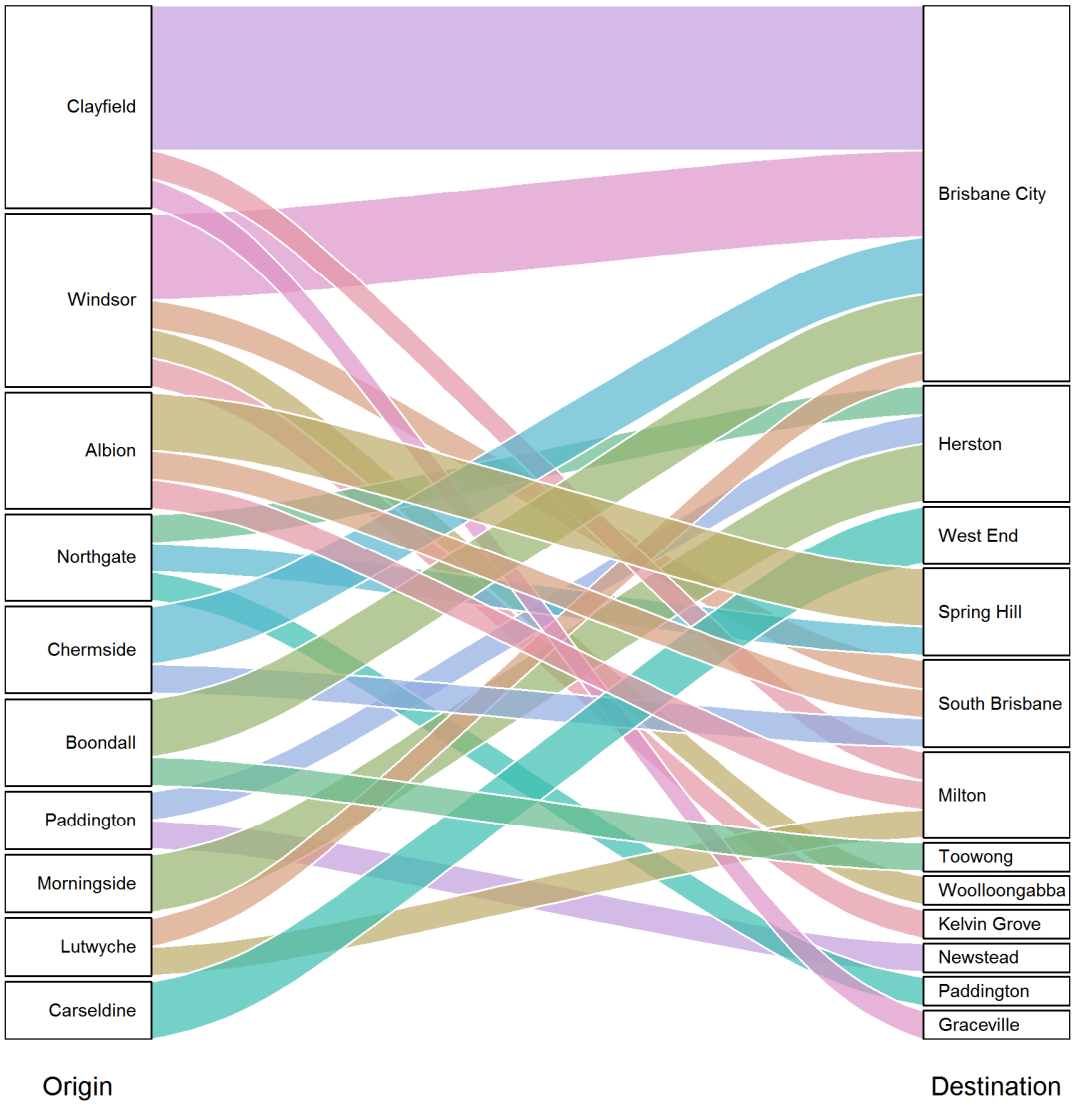
5.8.2 Usage

The average weekday demand between 6 am and 7 pm was 400 path users, of which 344 (86%) were bicycle riders. Demand is somewhat lower on weekends overall, with 201 bicycle riders but a marginally higher number of pedestrians (64 compared with 56 on weekdays).

5.8.3 Catchment

There were 55 interviews with bicycle riders undertaking transport trips for which the origin and destination suburb was reported. Of these, 9% were trips from Clayfield to the Brisbane CBD and 5% were from Windsor to the CBD with most others being local origins

and destinations (Figure 5.68). There were too few recreation cycling trips and walking trips to examine the catchment.

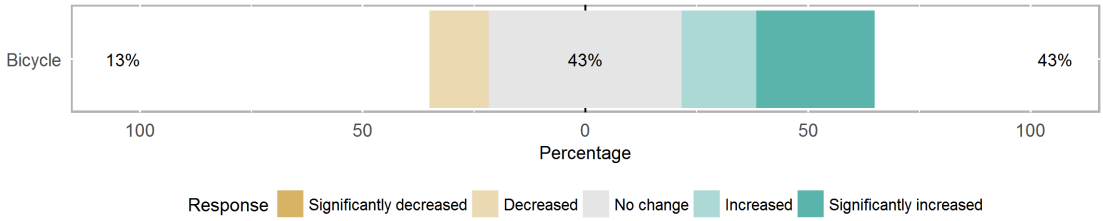


■ **Figure 5.68: Cycling trip origin and destinations (transport purpose, n=55)**

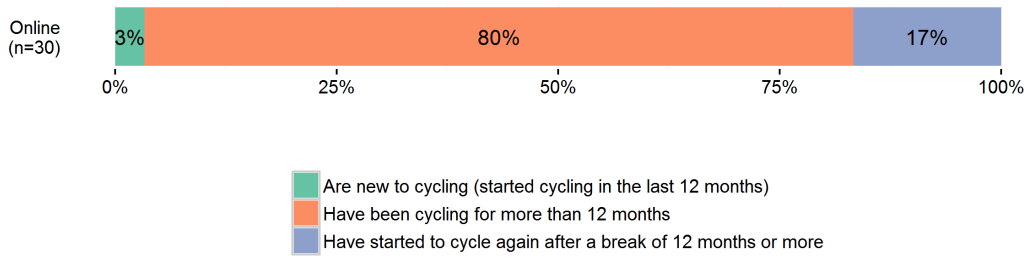
5.8.4 User behaviours

As very few pedestrians were interviewed, either in the intercept survey or online, at this site no data is presented on the user behaviours of pedestrians.

Among bicycle riders 43% indicated they ride for longer now that the path has been built, although an equal proportion indicate it has had no impact on their riding duration (Figure 5.69). Around four fifths of riders have been riding continuously for at least the past year (Figure 5.70).

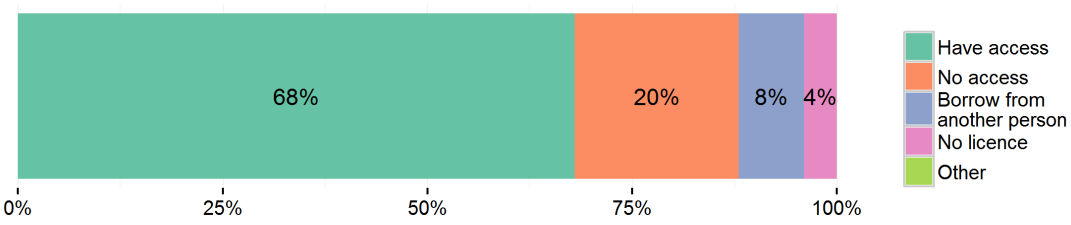


■ **Figure 5.69: Change in duration over past year (n=30)**



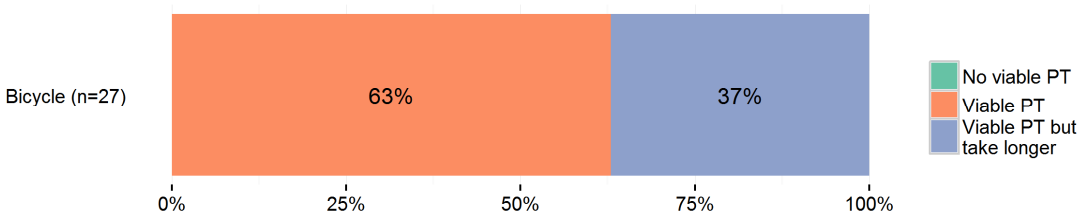
■ **Figure 5.70: Cycling history**

Around two thirds of bicycle riders making transport journeys had a car available as an alternative (Figure 5.71), and just under two thirds had a viable public transport alternative (Figure 5.72).



Thinking of your most recent trip on the path, which of the following best describe how easily you could have used a car for this trip?

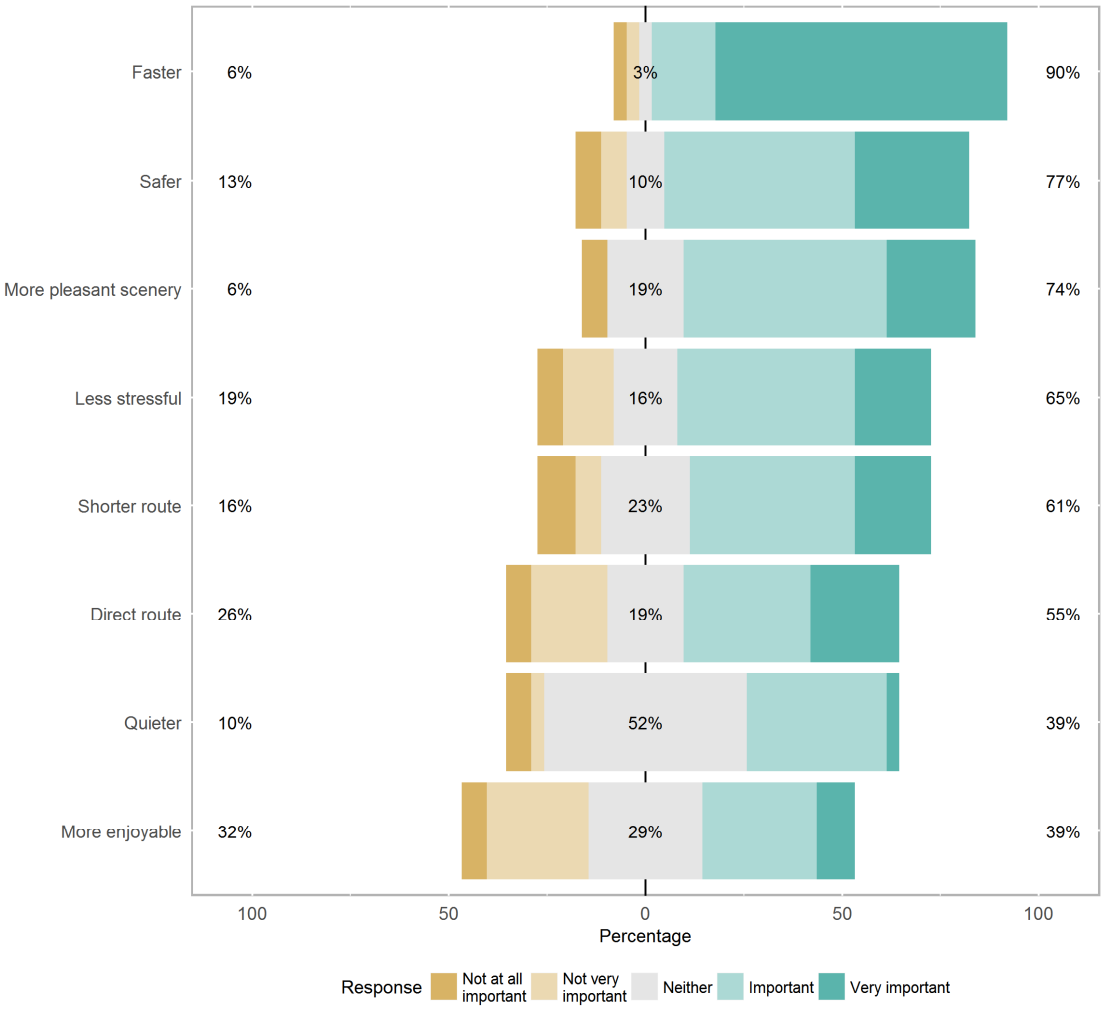
■ **Figure 5.71: Car availability for transport trips**



Thinking of your most recent trip on the path, which of the following statements best describes how easily you could have made this trip by public transport?

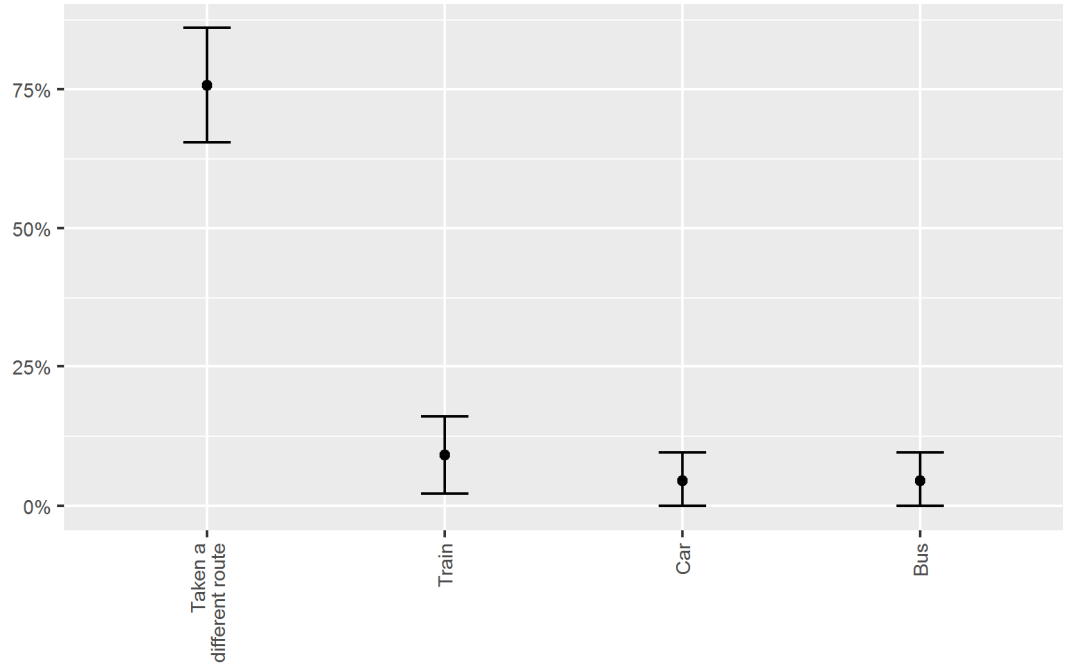
■ **Figure 5.72: Public transport availability for transport trips**

Most riders cited speed and safety as their reasons for choosing to use the path over alternative routes (Figure 5.73).



■ **Figure 5.73: Reasons for using the path - bicycle riders (n=31)**

When asked what they would have done in the absence of the path around 75% of riders indicated they would have taken an alternative route (Figure 5.74). Around 9% would have taken a train and a further 5% a bus.



How would you have made this trip if the path wasn't here?

■ **Figure 5.74: Diversion for bicycle riding (n=66)**

5.8.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.17, and are based wherever possible on the survey data.

■ **Table 5.17: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	300	Video counts
Average trip distance	19.3 km	Intercept surveys
% of trips for transport	83%	Intercept surveys
Diversion: car	5%	Telephone surveys
Diversion: PT	17%	Telephone surveys
Diversion: walk	0%	Telephone surveys
Diversion: reassign	78%	Telephone surveys
Diversion: induced	0%	Telephone surveys
Pedestrians		
Opening year demand (AADT)	50	Video counts
Average trip distance	4.6 km	Intercept surveys
% of trips for transport	57%	Intercept surveys
Diversion: car	0%	Telephone surveys
Diversion: PT	14%	Telephone surveys
Diversion: reassign	72%	Telephone surveys
Diversion: induced	14%	Telephone surveys
Facility		
Length	0.4 km	Path length
Type	Off-road path	
Change in trip distances	0 km	Path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light:20%	Guesstimate
Investment		
Capital cost	2012: $0.1 m 2013: $1.35 m 2014: $2.06 m 2015: $3.48m (total $6.99m)	Estimated total cost based on TMR da100ta
Operating cost	$10,000 p.a.	Guesstimate

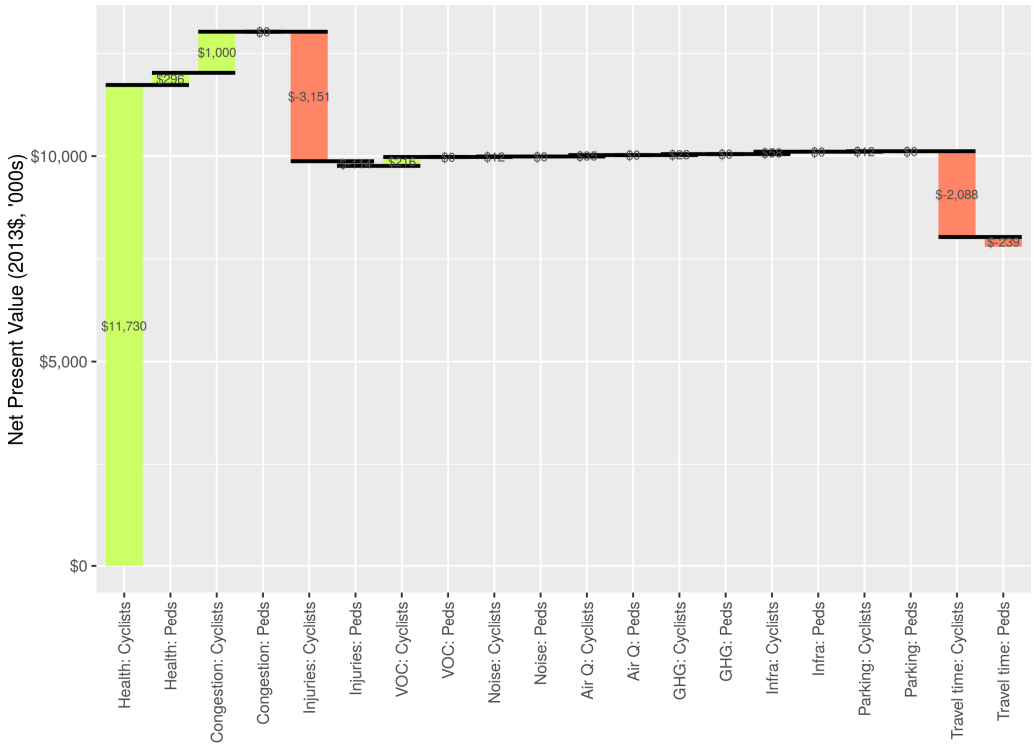
The results of the appraisal are summarised in Table 5.18. For the central discount rate of 7% the BCR is marginally positive at 1.6.

■ **Table 5.18: Economic assessment**

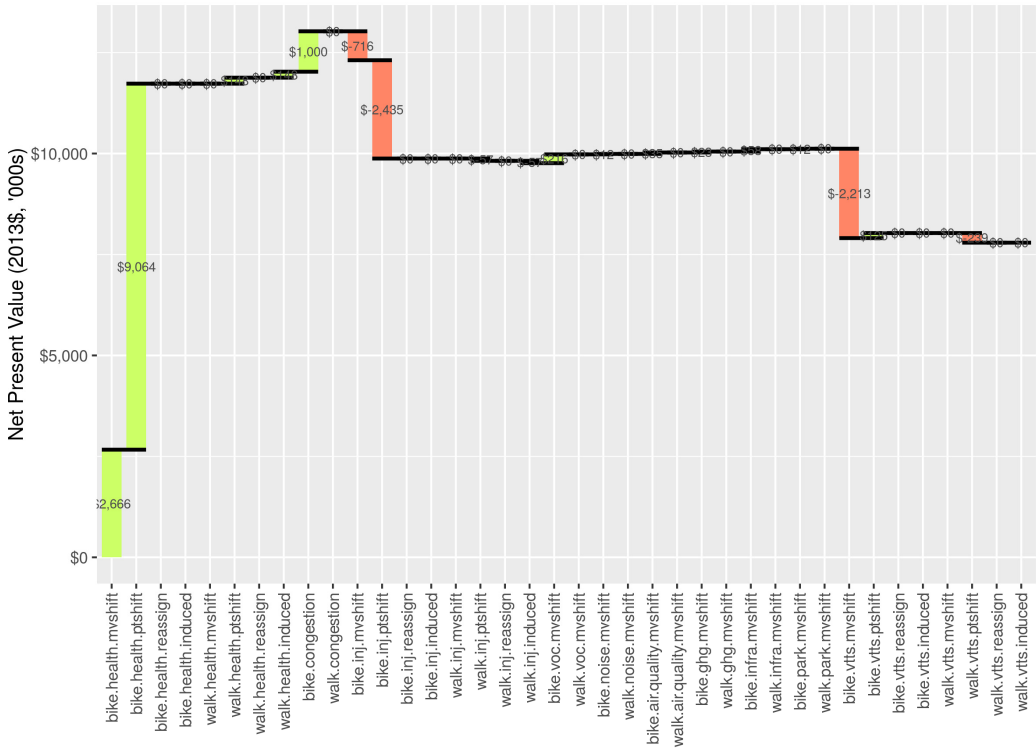
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	2.7	1.6	1.0
Likelihood BCR < 1.0	0%	0%	68%
Net Present Value (NPV)	$12.22 m	$4.06 m	-$0.19 m
Present Value of Benefits (PVB)	$19.53 m	$11.37 m	$7.12 m
Present Value of Costs (PVC)	$7.31 m	$7.31 m	$7.31 m

All values are 2013 prices and values.

The breakdown of the NPV is shown in Figure 5.75. The vast majority of the benefit accrues from cyclist health. This benefit exceeds the injury disbenefit by a factor of four. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits to both user groups; this is largely attributable to the additional travel time for those who shift from motor vehicles to cycling and public transport to walking as shown in Figure 5.76.



■ **Figure 5.75: Summary breakdown of net present value**



■ **Figure 5.76: Detailed breakdown of net present value**

In considering these results we note the following:

- The benefits are primarily due to mode shifted bicycle trips. These mode shifted trips represent a minority of trips; according to the intercept surveys trips that would otherwise have been by public transport account for 17% of trips and a further 5% would have used a car. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- There is travel time disbenefits to those who shift from car to cycling because of the assumption that the average car speed is 30 km/h and bicycle rider speed is 20 km/h. Under different speed assumptions these results will alter.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

5.9 Veloway 1

5.9.1 Project description

The Veloway 1 will ultimately provide a 17 km off-road path from Eight Mile Plains to the Brisbane CBD. The project is being undertaken in stages, with the most recently completed Stage C Package 1 completed in June 2013. This package provided a cyclist-only path from Lewisham Street to Birdwood Road for a length of around 2.1 km. The pre-existing South East Freeway Bikeway running to the west of the freeway remains a shared path accessible to pedestrians and bicycle riders. It is expected that most riders will choose to use the Veloway given it is built to a higher standard than the pre-existing path.

Stage C was subject to an evaluation commissioned by TMR in 2015 which found that the project had expanded the catchment of the V1, encouraged increased usage, reduced travel times and reduced the crash exposure of riders of motor vehicle traffic (TMR 2015). The purpose of the present evaluation was to extend upon this previous work in the context of estimating the monetary benefits that may have accrued. As such, it complements this previous study.

As per the previous study, the counts and intercept surveys were undertaken where the V1 passes the Greenslopes bus station at Ekibin Park.

5.9.2 Usage

The V1 at Ekibin Park was observed to have 912 users per day, of which the vast majority (900) were bicycle riders. This is not surprising given that the path at this location is designated as cyclist-only. Weekday cyclist demand (936) was somewhat higher than weekend demand (811). During the weekday peak hour (Tuesday 7 am) there were 158 riders. By comparison, an automatic counter operated by BCC recorded 543 bicycle riders

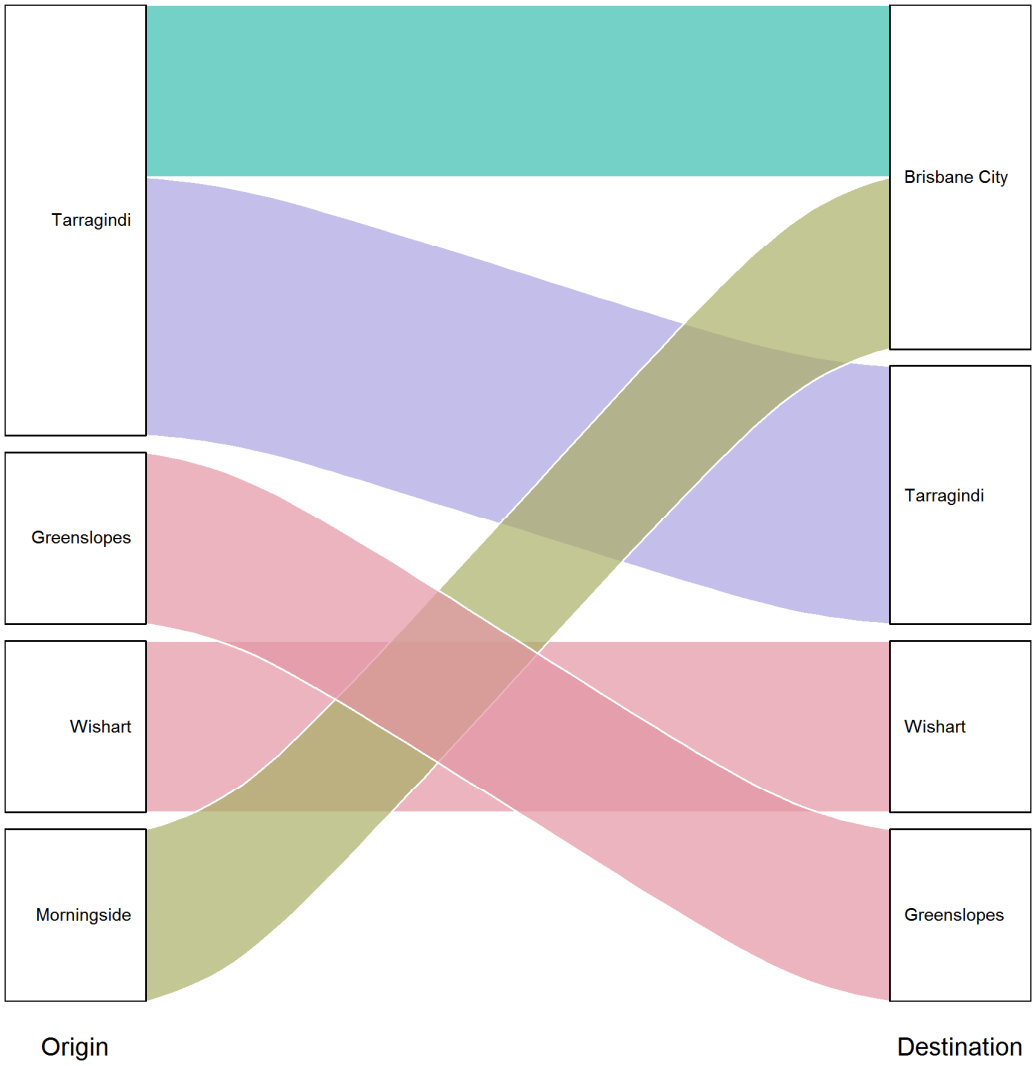
on weekdays and 563 on weekends between 29 May and 28 September 2015[29]. The counter is located within Ekibin Park around 200 m north of the video count site (adjacent to Victoria Terrace) and will also count riders using the South East Freeway Bikeway which runs to the west of the freeway. It is not clear why the automatic counter would appear to be significantly undercounting riders; it is possible there is a seasonal effect, although we suggest the magnitude of the difference is too great to be simply a seasonal effect. Instead, it is possible there is a technical issue with the counter and/or the detector is located in a position where riders are travelling around the counter. Data provided from an automatic counter farther north at Park Road suggests daily average rider counts of around 1,200 per day (TMR 2015), which is more consistent with our one-week 13-hour observations[30].

5.9.3 Catchment

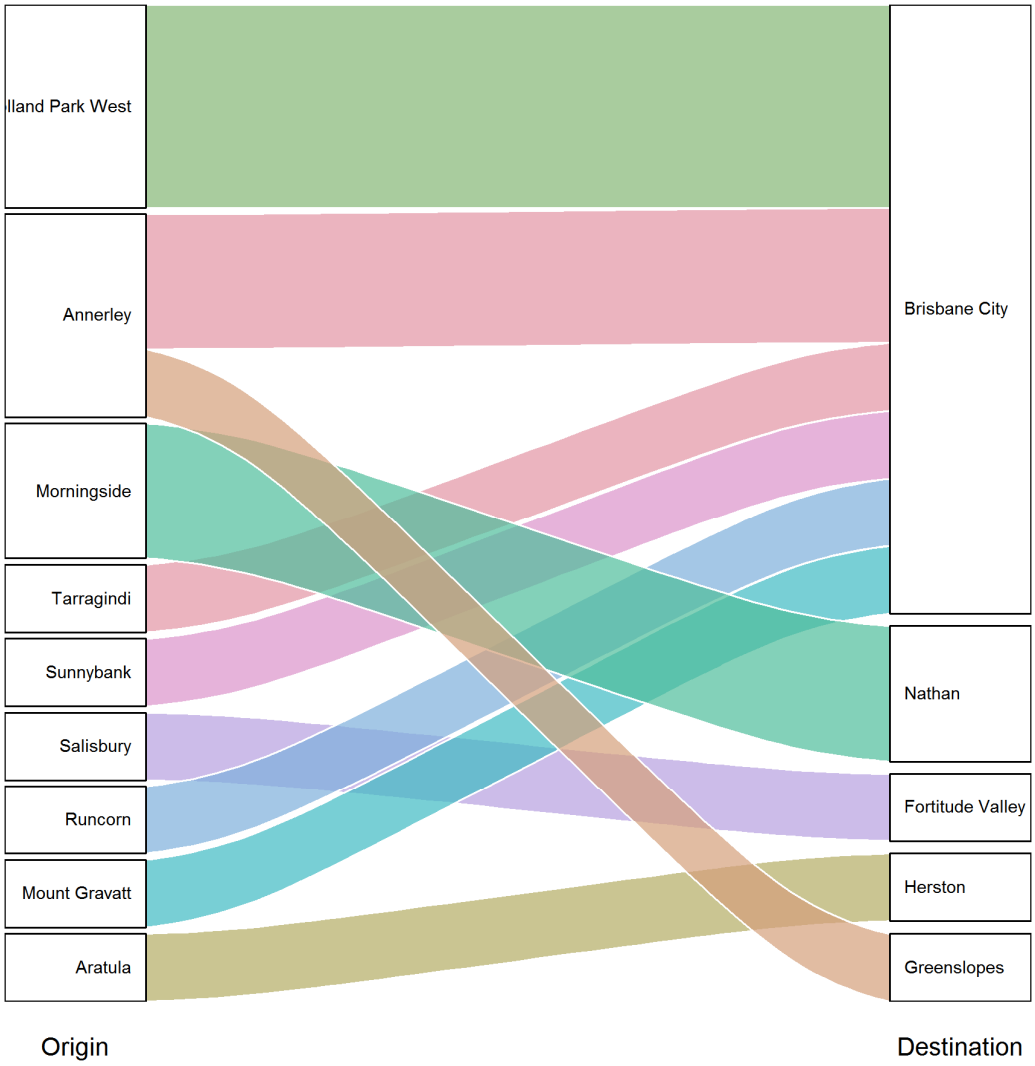
The intercept surveys obtained limited sample sizes of bicycle riders origins and destinations, which are shown in Figure 5.77 for recreation travel and Figure 5.78 for transport purposes. Given the small sample sizes little can reliably be concluded about the trip patterns.

[29] The date was provided by BCC for this date period only.

[30] We note the Park Road count site is around 3 km closer to the city and would be expected to have higher rider volumes.



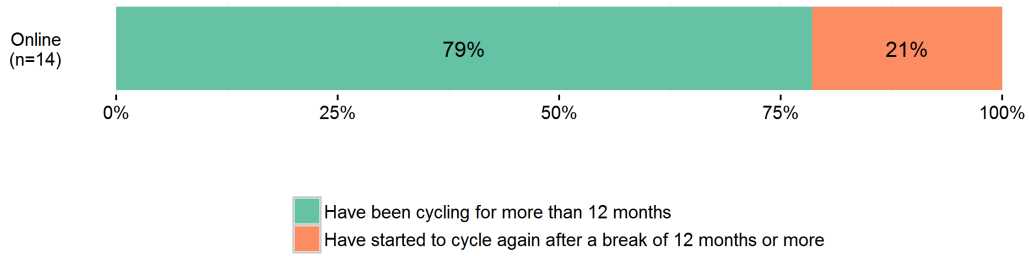
■ **Figure 5.77: Cycling trip origins and destinations (recreation purpose, n=19)**



■ **Figure 5.78: Cycling trip origins and destinations (transport purpose, n=14)**

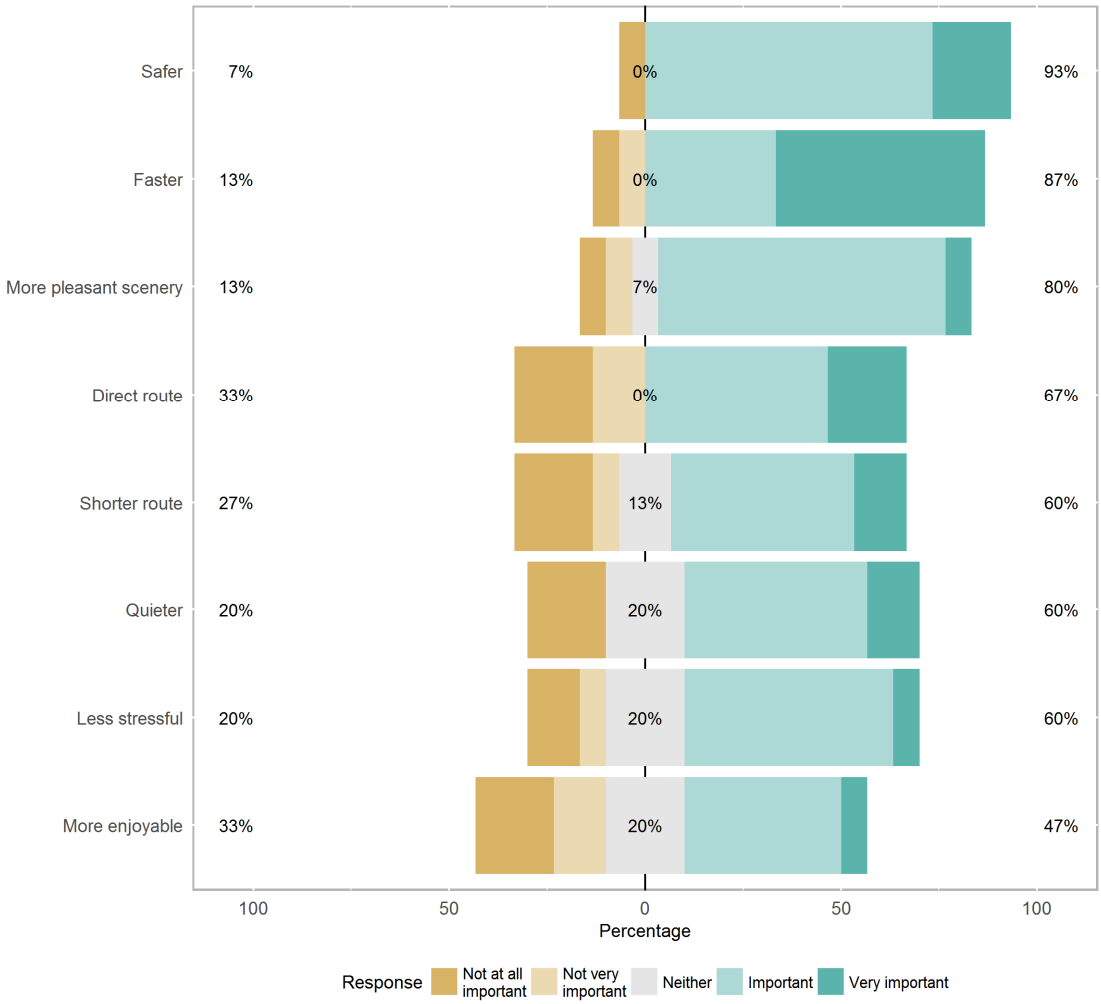
5.9.4 User behaviours

From the modest sample of bicycle riders who completed the online survey around one fifth indicated they had recommenced riding in the past 12 months after a break of a year or more (Figure 5.79).



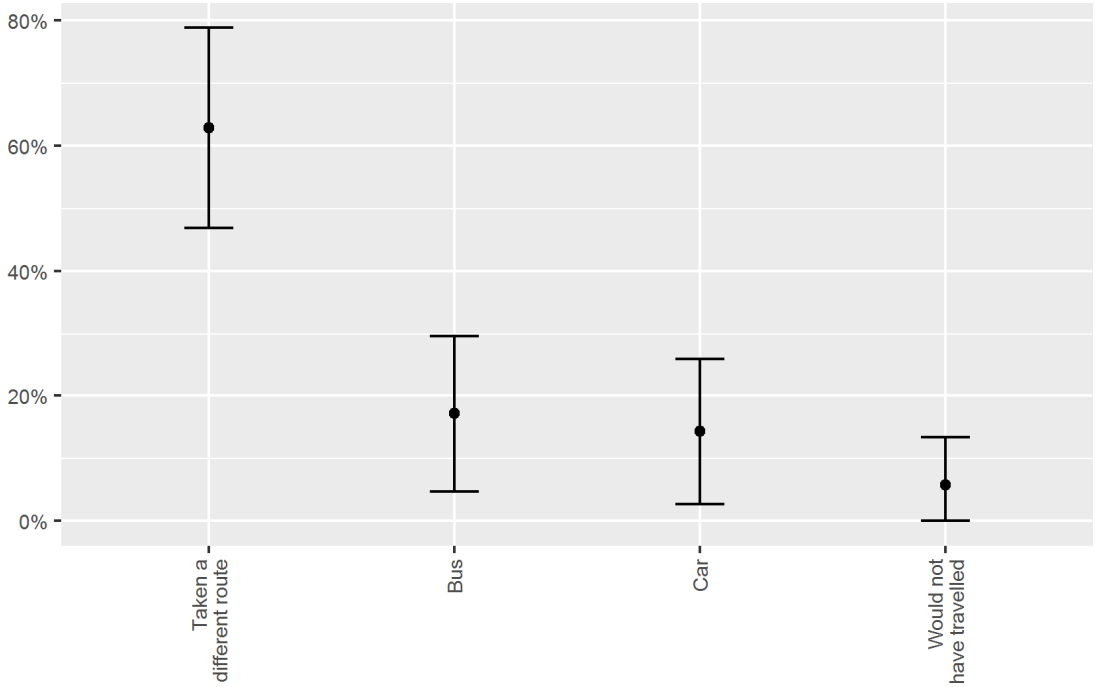
■ **Figure 5.79: Cycling history**

Most riders chose the veloway because it was safer and faster than the alternative routes (Figure 5.80).



■ **Figure 5.80: Reasons for using path - bicycle riders (n=15)**

Most riders would have taken a different route (63%) if the veloway wasn't present, with bus (17%) and car (14%) being the other two most cited alternatives.



How would you have made this trip if the path wasn't here?

■ **Figure 5.81: Diversion from bicycle riding (n=35)**

5.9.5 Cost-benefit analysis

The input assumptions to the cost-benefit analysis are summarised in Table 5.19, and are based wherever possible on the survey data.

■ **Table 5.19: Economic assumptions**

Parameter	Assumption	Source
Bicycle riders		
Opening year demand (AADT)	900	Video counts
Average trip distance	17.2 km	Intercept surveys
% of trips for transport	40%	Intercept surveys
Diversion: car	14%	Intercept surveys
Diversion: PT	17%	Intercept surveys
Diversion: walk	0%	Intercept surveys
Diversion: reassign	63%	Intercept surveys
Diversion: induced	6%	Intercept surveys
Pedestrians		
Opening year demand (AADT)	10	Video counts
Average trip distance	4.6 km	Intercept surveys
% of trips for transport	0%	Intercept surveys
Diversion: car	7%	Intercept surveys
Diversion: PT	0%	Intercept surveys
Diversion: reassign	76%	Intercept surveys
Diversion: induced	17%	Intercept surveys
Facility		
Length	2.1 km	Path length
Type	Off-road path	
Change in trip distances	0 km	Path does not provide a shorter route
Diverted motor vehicle travel time by period	Busy: 50% Medium: 30% Light:20%	Guesstimate
Investment		
Capital cost	2010: $0.2 m 2011: $5.65 m 2012: $3.66 m	Estimated total cost based on TMR data

	(total $9.51m)	
Operating cost	$10,000 p.a.	Guesstimate

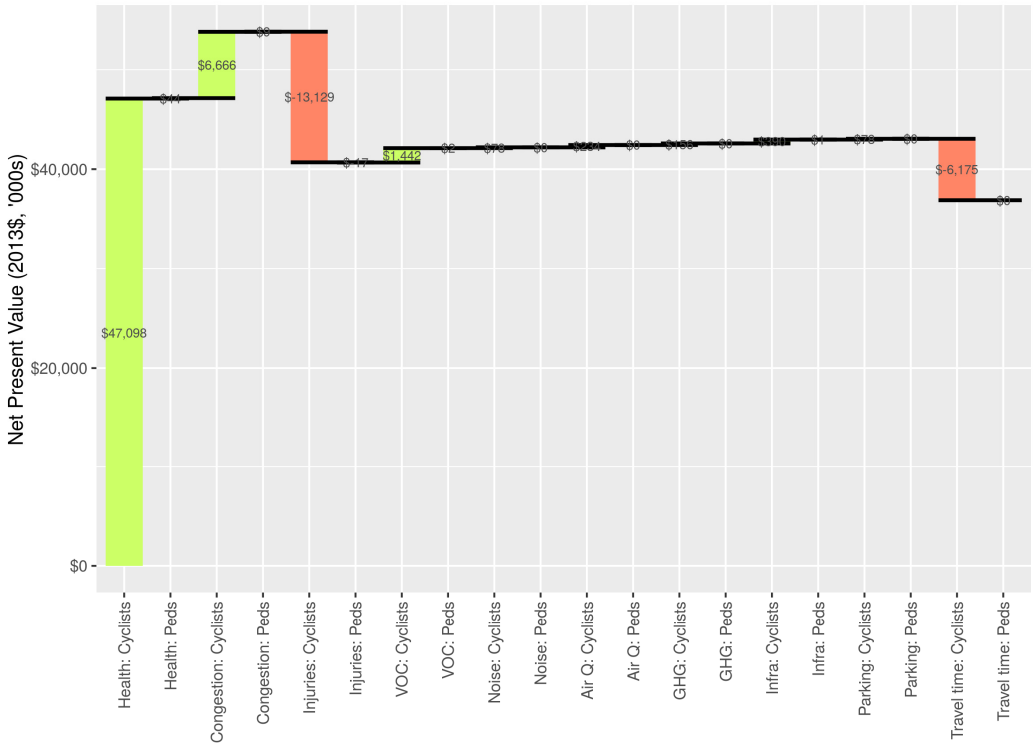
The results of the appraisal are summarised in Table 5.20. For the central discount rate of 7% the BCR is very positive at 5.4.

■ **Table 5.20: Economic assessment**

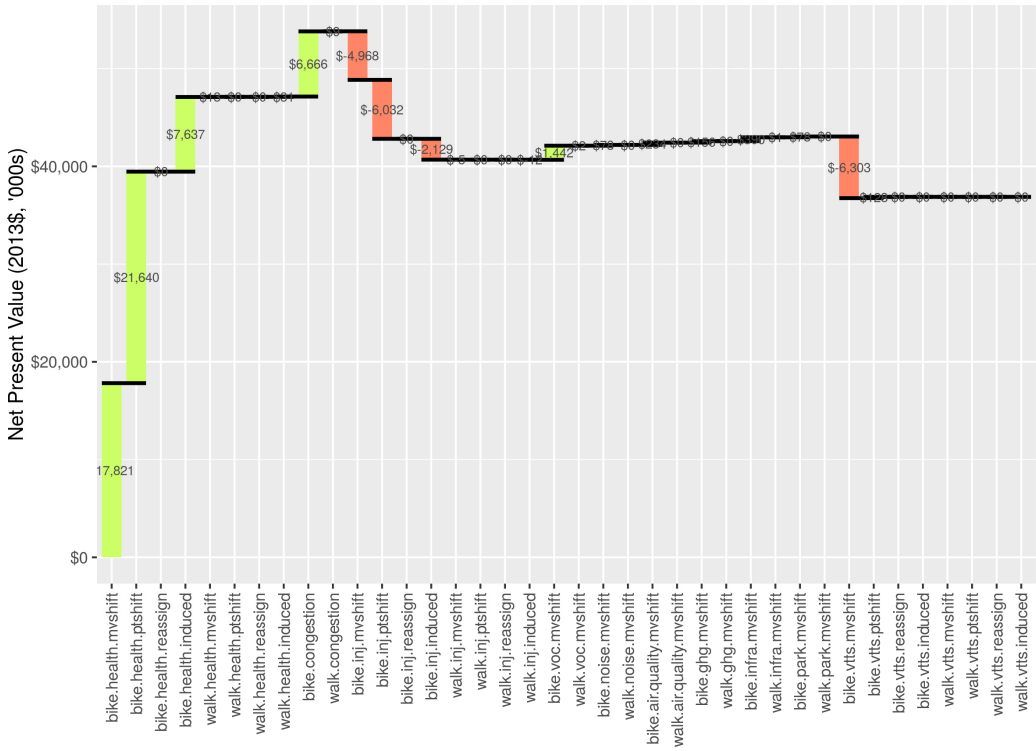
	Discount rate		
Parameter	**4%**	**7%**	**10%**
Benefit-Cost Ratio (BCR)	9.9	5.4	3.2
Likelihood BCR < 1.0	0%	0%	0%
Net Present Value (NPV)	$87.59 m	$43.00 m	$21.33 m
Present Value of Benefits (PVB)	$97.43 m	$5.84 m	$31.17 m
Present Value of Costs (PVC)	$9.84 m	$9.84 m	$9.84 m

All values are 2013 prices and values.

The breakdown of the NPV is shown in Figure 5.82. The vast majority of the benefit accrues from cyclist health. This benefit exceeds the injury disbenefit by a factor of 3.6. There is marginal pedestrian health benefit and congestion relief while all other benefit streams are of negligible significance. There are also travel time disbenefits to cyclists; this is attributable to the additional travel time for those who shift from motor vehicles to cycling as shown in Figure 5.83.



■ **Figure 5.82: Summary breakdown of net present value**



■ **Figure 5.83: Detailed breakdown of net present value**

In considering these results we note the following:

- The benefits are primarily due to car trips that have been replaced with bicycle trips. These mode shifted trips represent a minority of trips; according to the intercept surveys trips that would otherwise have been by car account for 14% of trips. The model is highly sensitive to these diversion rates; should they be lower than the surveys suggest we would expect the BCR to be substantially lower. Conversely, should they be higher we would expect the BCR to be much higher.
- It is implicitly assumed that the distance travelled by those who shift from car to bicycle are the same as the average for all bicycle riders (17.2 km). It is likely that these mode shifted trips do not align with the average distance. Indeed, the intercept surveys suggest the average trip distance by those who would otherwise have used a car is 14.4 km (n = 5). While somewhat lower, the sample size is insufficient to be able to conclude such distances are definitely lower than for all riders.
- There is travel time disbenefits to those who shift from car to cycling because of the assumption that the average car speed is 30 km/h and bicycle rider speed is 20 km/h. Under different speed assumptions these results will alter.
- The BCR would be marginally higher if 24-hour counts were used; as only 13-hour counts across the daytime were used it is probable the overall count is in the order of 10 to 20% higher than used in this calculation.

6 Standardised evaluation methodology

6.1 Introduction

An objective of this project was to develop a standardised evaluation methodology, and to test this against a number of recently completed active transport projects. These activities have been described in previous sections of this report. In this section we offer a general commentary on some of the pertinent issues with evaluation and recommendations for changes to the survey instruments used in this study.

6.2 Standardisation

The project required the development of a "standardised" evaluation methodology. Self-evidently, standardisation offers benefits in terms of time and cost and – most usefully – in comparability between sites. However, we suggest that standardisation cannot be fully achieved – and nor would it be desirable to do so. Indeed, there were variations in the survey instruments used at the sites in this project (most particularly for the Bicentennial Bikeway and Kedron Brook Bikeway, which were not *new* sites but rather *upgrades* of existing facilities) and in the economic benefits (e.g. travel time disbenefits were neglected at the Gateway North Schulz Canal Bridge). Instead, we suggest it is important to evaluate a project against its objectives – and as these will differ between projects, so too should the measures of success and the evaluation methodology. This requires that a projects' objectives be clearly articulated and that the measures of success follow logically from these objectives.

6.3 Before-after evaluation

Obtaining data before a project is constructed can be very useful in providing for a comparison of the before- and after-situation. Most notably, this will usually mean rider and pedestrian counts but could also include subjective measures such as levels of comfort or convenience. While there can often be a strong case for obtaining before-treatment data there are also limitations:

- If a new path is being built where there is nothing currently it may not be clear what the pre-existing routes are from which existing users will be attracted; this may be particularly challenging in dense urban networks where there may be many alternative routes (making counts costly).
- Cyclist and pedestrian counts are subject to significant variation which cannot be entirely explained by the day of week, weather or other measurable factors (such as holidays). As these counts will often be low this natural variation will be *relatively* large[31]. If the project involves fairly small changes the risk is that the increase in demand will be indistinguishable from this variation. In other words, the signal will

[31] Imagine a situation where there were 50 path users per day on one path and 500 on another, and at each the interday variation was in the order of +-10 users. This is equivalent to +/20% at the low volume path and +/-2% at the other path.

not exceed the noise. It is emphasised that this issue *cannot* be handled by simply ensuring a single day count is undertaken on the same day of week at the same time of year under similar or identical weather conditions. While this clearly helps, it is unlikely to be sufficient of itself. Instead, it is suggested that *at least* seven days of counts (covering each day of the week) are required *before* and *after* treatment at a particular site to be able to handle this effect. However, this is caveated by noting that the count period required will be a function both of the absolute count and the likely effect – if the count and effect is high then a shorter period may be acceptable, and conversely if the count and effect are both low a much longer period will be required.

- Perception measures in particular will be subject to sampling variability, such that comparing such measures before- and after a project requires reasonable sample sizes *and* a consistent unbiased approach to sampling. The latter will mean sampling at a similar day of week and time of day at an absolute minimum.

It is difficult to be prescriptive about (a) whether before-data collection is warranted, and (b) what before-data should be collected. Such decisions will need be determined on a case-by-case basis taking into consideration the objective of the project and the quantum of the likely effect.

6.4 Survey changes

We suggest the following changes ought to be considered for future surveys:

- The response to the online survey following the intercept surveys was generally low, and those that did respond appear to be skewed towards more regular facility users. As such, there appears to be little benefit in using the online survey. Instead, it would seem prudent to move the most useful questions from the online survey (mostly related to comfort and cycling history) into the intercept survey.
- The inclusion of the physical activity questions in the telephone survey significantly lengthened the survey, and there are wider questions as to the reliability of these types of recall-based physical activity surveys. Given these issues, and that these questions did not directly provide insight into the *change* in physical activity can be attributed to the active transport project, we suggest not including these in a future survey.
- As a substitution, we suggest including more questions on the self-reported *changes* in physical activity that a user has incurred that they would attribute *directly* to the presence of the facility. We note that this latter link is critical – the general progression of life creates a high level of churn in individuals' physical activity. What we need to ascertain is how much this natural churn can be attributed to the presence of the facility.

7 Forward evaluation schedule

7.1 Introduction

The purpose of this section is to propose a forward workload for evaluations that may be warranted during 2016. In considering whether an evaluation is warranted we would note that:

- There remains only limited knowledge of the *ex post* performance of active transport infrastructure, such that there remains much that can be learned.
- However, this new knowledge will only be useful if it can improve future design making, and most specifically project design and prioritisation.
- Many active transport projects are of comparatively low cost. The expense and effort required to evaluate these projects will often be disproportionate to their scale, and therefore unjustified.
- Some projects may have very low levels of usage but will be perceived as very valuable to this small group of users; it will often be very difficult to measure wider benefits of these projects, and indeed to monetise the benefits that accrue to the few users who do use them. This does not mean such projects are not valuable, or warranted, but does suggest that their evaluation is of limited merit.
- Some projects will have a unique context which is not transferrable to other sites, such that an evaluation would not have wider applicability (and therefore be of limited use). Conversely, some projects will have an innovative component that may be widely applicable and therefore an evaluation should be considered.

Our view is that a pragmatic approach to evaluation is required; while guidance can, and should, be provided by project funding agencies as to when an evaluation should be required there ought be no hard and fast rules. Similarly, while the methods used in the present study are probably fairly widely replicable (and indeed, for consistency and comparability we would recommend that they ought be used) there will often be a need for flexibility in the methodology. This will be particularly true for innovative projects.

Having reviewed TMR's investment program, we have identified a number of projects for which an evaluation may be warranted:

- Moggill Road overpass of the Centenary Motorway Path (opened November 2015),
- Moreton Bay Rail Link (MBRL), 12 km shared path from Petrie to Kippa-Ring due for completion in mid-2016,
- North Brisbane Bikeway Stage 1B (2016), 2 (2017) and 3 (2018),
- Veloway 1 Stage D (2016/17)
- Samford to Ferny Grove Cycle Link (partially opened in January 2016).

The proposed evaluation methodology for each of these projects is now discussed.

7.2 Moggill Road cycle bridge

The Moggill Road cycle bridge provides a grade-separated crossing of Moggill Road, avoiding the need for bicycle riders and pedestrians using the Centenary Cycleway to have to cross the two slip lanes onto the freeway and the main carriageway of Moggill Road. The bridge opened in November 2015.

Between 2009 and 2013 there has been one hospitalisation crash involving a bicycle rider and motor vehicle at this intersection. Video observations have previously been undertaken at this intersection which suggest the average rider delay is around 30 seconds prior to the bridge being constructed. In much the same way that other transport schemes are justified on safety and travel time benefits, it seems reasonable to argue that this project would likewise offer travel time benefits to these path users. It is possible that this project would provide an example for the economic justification of active travel projects on purely conventional benefits – that is, safety and travel time without relying upon health benefits. For this reason, along with the cost of the project, some form of economic evaluation may be warranted.

The availability of the video observations before the installation of the bridge provide an opportunity to measure "real" travel time improvements for path users. As such, it is suggested that an evaluation consist of measuring the travel times before and after treatment as well as undertaking intercept surveys of path users.

■ **Table 7.1: Moggill Road evaluation proposed tasks**

Task	When?	Comments
One-week video-based count	April 2016	Count for estimating economic benefits and comparison to pre-treatment period
Estimate travel time differences pre- and post-treatment	April 2016	Measure delay from existing video from April 2014.
Intercept interviews	April 2016	Riders and pedestrians using bridge to understand likely impact on mode shift and induced travel

7.3 Moreton Bay Rail Link

It is understood that the Moreton Bay Rail Link (MBRL) and accompanying shared path will open around June 2016. At least part of the path will run close to the most obvious road alternative of Anzac Avenue. Given that this road is the only obvious means by which riders can currently travel from Kippa-Ring and Redcliffe towards Brisbane it seems reasonable to expect that the path would attract at least some riders who currently use this road. In order to assist any future evaluation of this project a one-week video-based manual count was obtained along Anzac Avenue between Mewes Road and Bremner Road. These counts suggested there are currently around 200 riders using the road on

weekdays and 600 on weekends (Appendix D). We would expect demand to decrease on Anzac Avenue is constructed and the overall rider count across this cordon to increase. The suggested timeline for evaluating this project is given in Table 7.2. This timeline assumes the path will open around June 2016, allowing 3-4 months for new travel patterns to be established and coinciding with the counts obtained in October 2015.

■ **Table 7.2: MBRL evaluation proposed tasks**

Task	When?	Comments
One-week video-based count on Anzac Av (Mewes Rd – Bremner Rd)	October 2016	Estimate likely route diversion from Anzac Av to MBRL
One-week video-based count on MBRL path south of Bremner Rd	October 2016	In combination with about count obtain overall screenline count
Intercept interviews	October 2016	Riders and pedestrians using MBRL path to understand likely impact on mode shift and induced travel

7.4 North Brisbane Bikeway

North Brisbane Bikeway Stage 1B will provide a 4 m cycleway and 2 m footpath from Federation Street to Somerset Street. This project is currently scheduled for completion in mid-2016. Further stages are due for construction in 2018. It is suggested that counts be undertaken in October 2016 at *both* the Bowen Bridge Road underpass (as per the counts in October 2015) and at a site along the new section of the path. The former will allow for an estimate to be made of the additional demand that the extension has generated while the latter provides an indication of the demand along the new section alone. The proposed tasks are listed in Table 7.3. It is suggested that the count on the new section be located at Somerset Street as this location also features a priority crossing for path users. Such a treatment is novel in Queensland, and is also proposed for minor road crossings of subsequent stages of the North Brisbane Bikeway. Given the novelty of the crossing design, and the proposed additional use of the design, it seems prudent to undertake an evaluation of the intersection. It is suggested that this consist of a video-based observational study of road user interactions to assess whom has priority and how well the intersection appears to be understood. In turn, it seems reasonable to expect that the results of this evaluation could feed into the detail design of the subsequent sections[32]. Additionally, it is suggested that an intercept survey be undertaken to understand any mode shift that has occurred as a result of the new path as well as user-reported interactions at the priority crossing.

[32] However, it is noted that this Somerset Street intersection will not be a conventional minor street crossing, but instead the through road swings around to the right. As such, transferability of the observations at this site to other locations may be somewhat limited.

■ **Table 7.3: North Brisbane Bikeway Stage 1B evaluation proposed tasks**

Task	When?	Comments
One-week video-based count at Bowen Bridge Rd underpass	October 2016	Measure demand change attributable to extension at existing count site
One-week video-based count at Somerset St	October 2016	Demand on new section of path *and* intersection performance (see below)
Priority crossing intersection performance – video observations	October 2016	Video-based observations of interactions between motorists, pedestrians and riders at priority crossing at Somerset St
Intercept survey of path users	October 2016	Identify perceptions and changes in modes and physical activity, and also reported interactions at the priority crossing

7.5 Veloway 1 Stage D

Veloway 1 Stage D is a dedicated cycleway that will connect existing sections of Veloway 1 from O'Keefe Street to Lewisham Street. This path will supplement an existing off-road shared path that runs through a series of parks to the east of the freeway. The Veloway will provide a higher quality dedicated cycleway than this alternative.

It is understood the intention is that the cycleway will be completed in stages over the course of 2016. Once completed it is suggested that the evaluation consist of counts at sites where there are pre-existing counts (namely next to the bus station at Greenslopes), along the new section of path and intercept surveys of riders along the new section of path.

■ **Table 7.4: North Brisbane Bikeway Stage 1B evaluation proposed tasks**

Task	When?	Comments
One-week video-based count at Greenslopes bus station	October 2017	Measure demand change attributable to extension at existing count site
One-week video-based count on Stage D path	October 2017	Demand on new section of path
Intercept surveys of path users	October 2017	Understand user perceptions towards path

7.6 Norman Creek Bridge

The Norman Creek Bridge is a 580 m bridge and shared path between Norman Avenue and Lytton Road in Norman Park. The link will connect a local road alternative to the busy Wynnum Road. The project is co-funded by TMR and Brisbane City Council with an expected cost of $7.54 m. It seems probable the path will attract high demand; counts

undertaken as part of this project found around 1,100 bicycle riders on Wynnum Road between 6 am and 7 pm.

Given the cost of the project, the likely demand and the wider implications for building the case for missing links and alternatives to busy roads for active travel, it seems warranted to evaluate this project. The suggested evaluation framework is listed in Table 7.5. In a manner similar to that used in the present project, it is proposed that multiday counts across a screenline along the creek be used to measure the change in active travel, and that this be complemented by intercept surveys of path users to identify mode shifting and induced travel.

Table 7.5: Norman Creek Bridge evaluation proposed tasks

Task	When?	Comments
One-week video-based count on Wynnum Road	October 2016	Measure demand change attributable to path at existing count site
One-week video-based count on path	October 2016	Demand on new section of path
Intercept surveys of path users	October 2016	Understand user perceptions towards path

8 References

Australian Transport Council. 2006. *National Guidelines for Transport System Management in Australia Part 4: Urban Transport*.

Austroads. 2012. *Guide to Project Evaluation Part 4: Project Evaluation Data*. AGPE04/12. Sydney, N.S.W.: Austroads.

Björklund, Gunilla, and Gunnar Isacsson. 2013. "Forecasting the Impact of Infrastructure on Swedish Commuters' Cycling Behaviour." CTS Working Paper 2013:36. http://www.diva-portal.org/smash/record.jsf?pid=diva2:677865.

Brown, Vicki, Belen Zapata Diomedi, Marj Moodie, J. Lennert Veerman, and Rob Carter. 2016. "A Systematic Review of Economic Analyses of Active Transport Interventions That Include Physical Activity Benefits." *Transport Policy* 45 (January): 190–208. doi:10.1016/j.tranpol.2015.10.003.

Brown, Wendy J., Adrian E. Bauman, Fiona C. Bull, and Nicola W. Burton. 2012. "Development of Evidence-Based Physical Activity Recommendations for Adults (18-64 Years)." Prepared for Australian Department of Health. http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines/$File/DEB-PAR-Adults-18-64years.pdf.

CATALYST. 2012. "A Business Case for Investment in Cycling in Western Australia." Prepared for RAC WA.

Crawford, Fiona, and Robin Lovelace. 2015. "The Benefits of Getting England Cycling." http://eprints.whiterose.ac.uk/83048/.

Department of Health. 2013. "Burden of Disease: A Snapshot in 2013." Brisbane: Department of Health, Queensland Government.

Endo, Taku, Andrew Jardine, Sue-Lynne Macleod, Margaret Bright, and Stephen Begg. 2010. "Projected Burden of Disease and Injury in Queensland, 2007 to 2016." series 2, no. 7. Queensland Burden of Disease and Injury. Brisbane: Queensland Health.

Fishman, Elliot, Simon Washington, and Narelle Haworth. 2015. "Bikeshare's Impact on Active Travel: Evidence from the United States, Great Britain, and Australia." *Journal of Transport & Health* 2 (2): 135–42. doi:10.1016/j.jth.2015.03.004.

Garrard, Jan. 2009. "Active Transport: Adults - An Overview of Recent Evidence." VicHealth. https://www.vichealth.vic.gov.au/~/media/ResourceCentre/PublicationsandResources/Active%20travel/Active_Transport_Adults_FINAL.pdf?la=en.

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.

Goodman, Anna, Shannon Sahlqvist, and David Ogilvie. 2014. "New Walking and Cycling Routes and Increased Physical Activity: One-and 2-Year Findings from the UK iConnect Study." *American Journal of Public Health* 104 (9): e38–46.

Hagstromer, Maria, Barbara E. Ainsworth, Pekka Oja, and Michael Sjostrom. 2010. "Comparison of a Subjective and an Objective Measure of Physical Activity in a Population Sample." *Journal of Physical Activity & Health* 7 (4): 541.

Jardine, Andrew, Taku Endo, Margaret Bright, Sue-Lynne Macleod, and Catherine Harper. 2010. "Risk Factor Impact on the Burden of Disease and Injury in Queensland, 2007." series 2, no. 6. Queensland Burden of Disease and Injury. Brisbane: Queensland Health.

Johnson-Kozlow, Marilyn, James F Sallis, Elizabeth A Gilpin, Cheryl L Rock, and John P Pierce. 2006. "Comparative Validation of the IPAQ and the 7-Day PAR among Women Diagnosed with Breast Cancer." *The International Journal of Behavioral Nutrition and Physical Activity* 3 (March): 7. doi:10.1186/1479-5868-3-7.

Lee, Paul H., Duncan J. Macfarlane, T. H. Lam, and Sunita M. Stewart. 2011. "Validity of the International Physical Activity Questionnaire Short Form (IPAQ-SF): A Systematic Review." *International Journal of Behavioral Nutrition and Physical Activity* 8 (1): 115. doi:10.1186/1479-5868-8-115.

Macmillan, Alexandra, Jennie Connor, Karen Witten, Robin Kearns, David Rees, and Alistair Woodward. 2014. “The Societal Costs and Benefits of Commuter Bicycling: Simulating the Effects of Specific Policies Using System Dynamics Modeling.” *Environmental Health Perspectives*, February. doi:10.1289/ehp.1307250.

Panter, Jenna, and David Ogilvie. 2015. “Theorising and Testing Environmental Pathways to Behaviour Change: Natural Experimental Study of the Perception and Use of New Infrastructure to Promote Walking and Cycling in Local Communities.” *BMJ Open* 5 (9): e007593.

Poulos, R. G., J. Hatfield, C. Rissel, L. K. Flack, S. Murphy, R. Grzebieta, and A. S. McIntosh. 2015. “An Exposure Based Study of Crash and Injury Rates in a Cohort of Transport and Recreational Cyclists in New South Wales, Australia.” *Accident Analysis & Prevention* 78 (May): 29–38. doi:10.1016/j.aap.2015.02.009.

Queensland Department of Health. 2015. “Physical Activity in Queensland Regional Detailed Data.” Queensland survey analytics system (QSAS). https://www.health.qld.gov.au/publications/research-reports/population-health/preventive/qsas-physical-activity.xlsm.

Queensland Health. 2011. “Self Reported Health Status 2011: Physical Activity Levels and Factors Associated with Intentiosn to Increase Physical Activity.” Brisbane.

Rissel, Chris, Stephen Greaves, Melanie Crane, and Chris Standen. 2015. “Short Term Impacts of New Cycling Infrastructure in Sydney, Australia.” *Journal of Transport & Health* 2 (2, Supplement): S29–30. doi:10.1016/j.jth.2015.04.536.

Rissel, Chris, Stephen Greaves, Li Ming Wen, Melanie Crane, and Chris Standen. 2015. “Use of and Short-Term Impacts of New Cycling Infrastructure in Inner-Sydney, Australia: A Quasi-Experimental Design.” *International Journal of Behavioral Nutrition and Physical Activity* 12 (1). doi:10.1186/s12966-015-0294-1.

Sahlqvist, Shannon, Anna Goodman, Tim Jones, Jane Powell, Yena Song, David Ogilvie, and on behalf of the iConnect consortium. 2015. “Mechanisms Underpinning Use of New Walking and Cycling Infrastructure in Different Contexts: Mixed-Method Analysis.” *International Journal of Behavioral Nutrition and Physical Activity* 12 (1): 24. doi:10.1186/s12966-015-0185-5.

Sallis, J. F., W. L. Haskell, P. D. Wood, S. P. Fortmann, T. Rogers, S. N. Blair, and R. S. Paffenbarger. 1985. “Physical Activity Assessment Methodology in the Five-City Project.” *American Journal of Epidemiology* 121 (1): 91–106.

Saunders, Lucinda E., Judith M. Green, Mark P. Petticrew, Rebecca Steinbach, and Helen Roberts. 2013. “What Are the Health Benefits of Active Travel? A Systematic Review of Trials and Cohort Studies.” Edited by Jonatan R. Ruiz. *PLoS ONE* 8 (8): e69912. doi:10.1371/journal.pone.0069912.

Sinclair Knight Merz, PwC. 2011. “Benefits of the Inclusion of Active Transport in Infrastructure Projects.” Prepared for Queensland Department of Transport and Main Roads.

Teschke, Kay, M. Anne Harris, Conor CO Reynolds, Meghan Winters, Shelina Babul, Mary Chipman, Michael D. Cusimano, Jeff R. Brubacher, Garth Hunte, and Steven M. Friedman. 2012. “Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study.” *American Journal of Public Health* 102 (12): 2336–43.

TMR. 2015. “Analysis and Evaluation of Use of the V1 and South East Freeway Bikeway Post Completion of Stage C of the V1.”

Appendix A: Intercept survey script

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

1. INTERVIEWER select site:
    a. Bicentennial Bikeway (Milton)
    b. Biggera Creek Greenway (Southport)
    c. Brassall Bikeway (Ipswich)
    d. Enoggera Creek Bikeway (Kelvin Grove)
    e. Galeen-Honeyeater Bridge (Burleigh Waters)
    f. Gateway North Bikeway (Schulz Canal)
    g. North Brisbane Bikeway (Bowen Hills)
    h. Kedron Brook Bikeway (Bradshaw Park)
    i. Kedron Brook Bikeway (Kalinga Park)
    j. Veloway 1 (Greenslopes)

2. INTERVIEWER enter mode of travel
    a. Bicycle rider
    b. Pedestrian

3. In what suburb did you start your trip, and where will you finish your trip?
    a. Start: _____
    b. Finish: _____

4. How long will the trip take?
    a. Hours: _____
    b. Minutes ____

5. How far is the trip?
    ____ km

6. What is the purpose of your trip?
    a. Commuting to or from work
    b. Fitness, recreation or sport
    c. Shopping
    d. Other: _____

7. How would you have made this trip if the path wasn't here?
    a. Taken a different route
    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: _____

8. IF SITE=BICENTENNIAL OR KEDRON BROOK Over the past few years the path has been improved. Have you noticed the improvements?
    a. Yes
    b. No

9. Have the changes made you feel more or less comfortable walking than before?
    a. Much more comfortable
    b. More comfortable
    c. No change
    d. Less comfortable
    e. Much less comfortable

10. Why do you say this? *Do not read out*
    a. Separated from bike riders
    b. More space
    c. Riders go faster
    d. Safer
    e. Other: _____

11. Have the changes made you feel more or less comfortable bike riding than before?
    a. Much more comfortable
    b. More comfortable
    c. No change
    d. Less comfortable
    e. Much less comfortable

12. Why do you say this?
    a. Separated from pedestrians
    b. More space
    c. Faster
    d. Safer

e. Other: _____

13. We have a longer version of this survey online. Would you mind filling it out when you have time? This card has a unique code to enter on the website.

    INTERVIEWER enter token: _____

14. INTERVIEWER enter any other comments: _____

Appendix B: Online survey

This survey is being undertaken on behalf of the Department of Transport and Main Roads by CDM Research. The purpose of this survey is to understand how the community uses local cycling and walking paths. We'd like to ask you about how often you use the path where you were interviewed, and about your physical activity more generally.

The information we collect in this survey will be used to help plan future improvements of bike and walking paths in your area.

No personally identifiable information will be obtained in this survey.

Please enter the code provided on your card: _____

Use of Path

We'd like to ask you about the << PATH >>, which is a bike and walking path that runs from << DESC1 >> to << DESC2>>.

1. Have you ever walked along the path, even for a short distance?
    - Yes
    - No

2. When did you last walk along the path?
    - In the past 7 days
    - In the past two weeks
    - In the past month
    - In the past year
    - More than a year ago

3. How often have you walked along the path over the past 12 months? *Include walking trips where you may walk along only small sections of the path.*
    - Almost every day
    - Every weekday
    - 3 – 4 days a week
    - 1 – 2 days a week
    - Every fortnight
    - Once a month
    - Several times a year
    - Only once

4. For what purposes have you walked on the path over the past 12 months?
    - ☐ Commuting to or from work

- ☐ To go to shops
- ☐ To go to school or university
- ☐ To visit friends or relatives
- ☐ For recreation or exercise
- ☐ To walk the dog
- ☐ Other: _____

5. What, if anything, prevents you from walking more often on the path?
   - ☐ Not interested in walking more
   - ☐ No spare time
   - ☐ Too far to get to the path
   - ☐ Unsafe access to the path
   - ☐ Bad weather
   - ☐ Fearful of bike riders on the path
   - ☐ Other: _____

6. Have you ever ridden a bike along the path, even for a short distance?
   - o Yes
   - o No

7. When did you last ride a bike along the path?
   - o In the past 7 days
   - o In the past two weeks
   - o In the past month
   - o In the past year
   - o More than a year ago

8. How often have you ridden a bike along the path over the past 12 months? *Include bike trips where you may have ridden only along small sections of the path.*
   - o Almost every day
   - o Every weekday
   - o 3 – 4 days a week
   - o 1 – 2 days a week
   - o Every fortnight
   - o Once a month
   - o Several times a year
   - o Only once

9. For what purposes have you ridden your bike on the path over the past 12 months?
   - ☐ Commuting to or from work

- ☐ To go to shops
- ☐ To go to school or university
- ☐ To visit friends or relatives
- ☐ For recreation or exercise
- ☐ To walk the dog
- ☐ Other: _____

10. What, if anything, prevents you from riding more often on the path?
    - ☐ No spare time
    - ☐ Not interested in riding more
    - ☐ Unsafe roads or paths leading onto the path
    - ☐ Too far from the path
    - ☐ Too many bike riders on the path
    - ☐ Too many pedestrians on the path
    - ☐ Other: _____

11. Which of the following best describes you? Would you say you…
    - o Are new to cycling (started cycling in the last 12 months)
    - o Have started to cycle again after a break of 12 months or more
    - o Have been cycling for more than 12 months

12. And would you say that you…
    - o Cycle more frequently than a year ago
    - o Cycle as frequently as a year ago
    - o Cycle less frequently than a year ago

13. IF SITE=BICENTENNIAL OR KEDRON BROOK Over the past few years Brisbane City Council and the Department of Transport and Main Roads have been improving the path. These improvements have included widening the path and providing separate cycling and walking paths. << SHOW BEFORE-AFTER PICTURES >> Have you noticed these improvements?
    - o Yes
    - o No

14. Have the changes made you feel more or less comfortable walking than before?
    - o Much more comfortable
    - o More comfortable
    - o No change
    - o Less comfortable
    - o Much less comfortable

15. Why do you say this?

- ☐ Separated from bike riders
- ☐ More space
- ☐ Riders go faster
- ☐ Safer
- ☐ Other: _____

16. We'd now like you to think about how the changes to the path may have influenced how often you walk along the path. Have you changed how often you walk along the path since it was improved?
    - o No change
    - o Yes – I now walk more often
    - o Yes – I now walk less often

17. You previously said you usually walk << HOW OFTEN WALK >>along the path. If the path was still in its original condition how often do you think you'd have walked along the path?
    - o Almost every day
    - o Every weekday
    - o 3 – 4 days a week
    - o 1 – 2 days a week
    - o Every fortnight
    - o Once a month
    - o Several times a year
    - o Only once
    - o Not at all

18. What change, if any, would you say the improvements to the path have had on the amount of time you've spent walking over the past 12 months? *We're interested in the total amount of time you've spent walking, not just on the path.*
    - o Significantly decreased (by at least an hour a week)
    - o Decreased (by less than an hour a week)
    - o No change
    - o Increased (by less than an hour a week)
    - o Significantly increased (by at least an hour a week)

19. Have the changes made you feel more or less comfortable bike riding than before?
    - o Much more comfortable
    - o More comfortable
    - o No change
    - o Less comfortable
    - o Much less comfortable

20. Why do you say this?
    - ☐ Separated from pedestrians
    - ☐ More space
    - ☐ Faster
    - ☐ Safer
    - ☐ Other: _____

21. We'd now like you to think about how the changes to the path may have influenced how often you ride a bike along the path.
    - ☐ No change
    - ☐ Yes – I now ride more often
    - ☐ Yes – I now ride less often

22. You previously said you usually ride << HOW OFTEN RIDE >> along the path. If the path was still in its' original condition how often do you think you'd have ridden along the path?
    - ☐ Almost every day
    - ☐ Every weekday
    - ☐ 3 – 4 days a week
    - ☐ 1 – 2 days a week
    - ☐ Every fortnight
    - ☐ Once a month
    - ☐ Several times a year
    - ☐ Only once
    - ☐ Not at all

23. What change, if any, would you say the improvements to the path have had on the amount of time you've spent riding over the past 12 months?
    - ☐ Significantly decreased (by at least an hour a week)
    - ☐ Decreased (by less than an hour a week)
    - ☐ No change
    - ☐ Increased (by less than an hour a week)
    - ☐ Significantly increased (by at least an hour a week)

The new path

24. IF SITE=ENOGGERA CREEK We're interested in how the recent completion of the missing link in the path underneath Kelvin Grove Road may have influenced how often you walk or ride.

25. IF SITE=GATEWAY SCHULZ We're interested in how the recent completion of the bridge over the Schulz Canal may have influenced how often you walk or ride.

26. What change, if any, would you say the presence of the path/bridge has had on the amount of time you've spent walking over the past 12 months? *We are interested in understanding how much you may have changed your walking duration as a result of the presence of the path. In other words, we are asking you to compared to a situation where the path was not there.*
    - Significantly decreased (by at least an hour a week)
    - Decreased (by less than an hour a week)
    - No change
    - Increased (by less than an hour a week)
    - Significantly increased (by at least an hour a week)

27. What change, if any, would you say the presence of the path has had on the amount of time you've spent riding over the past 12 months?
    - Significantly decreased (by at least an hour a week)
    - Decreased (by less than an hour a week)
    - No change
    - Increased (by less than an hour a week)
    - Significantly increased (by at least an hour a week)

Your most recent trip on the path

28. We'd now like you to think about the most recent time you used the path. Did you walk or ride a bike?
    - Walk (including running)
    - Bicycle

29. In what suburb did you start and finish your trip?

    Start: _____

    Finish: _____

30. How long did the trip take?

    Hours: _____

    Minutes: _____

31. How far was the trip?

    _____ kilometres

32. What was the purpose of your trip?
    - ☐ Fitness, recreation or sport
    - ☐ Travelling to or from work
    - ☐ Travelling to or from shops
    - ☐ Other: _____

33. Thinking about your most recent walking trip on the path, how important were each of the following factors in you deciding to use the path over other walking routes?

	Not at all important	Not very important	Neither	Important	Very important
Less stressful	○	○	○	○	○
More pleasant scenery	○	○	○	○	○
Shorter route	○	○	○	○	○
Safer	○	○	○	○	○
Quieter	○	○	○	○	○
More enjoyable	○	○	○	○	○
Faster	○	○	○	○	○
Direct route	○	○	○	○	○

34. Thinking about your most recent bike trip on the path, how important were each of the following factors in you deciding to use the path compared to another route?

	Not at all important	Not very important	Neither	Important	Very important
Less stressful	○	○	○	○	○
More pleasant scenery	○	○	○	○	○
Shorter route	○	○	○	○	○
Safer	○	○	○	○	○
Quieter	○	○	○	○	○
More enjoyable	○	○	○	○	○
Faster	○	○	○	○	○
Direct route	○	○	○	○	○

35. Thinking about your last trip, what would you have done if the path wasn't there at all?

- ☐ Taken a different route
- ☐ Would not have travelled
- ☐ Used a car – as the driver
- ☐ Used a car – as the passenger

- ☐ Motorcycle
- ☐ Train
- ☐ Bus
- ☐ Ferry
- ☐ Taxi
- ☐ Don't know
- ☐ Other: _____

36. What would you have done if the path was in its original condition? That is, before it was widened and segregated?
    - ☐ I would still have used the path
    - ☐ Taken a different route
    - ☐ Would not have travelled
    - ☐ Used a car – as the driver
    - ☐ Used a car – as the passenger
    - ☐ Motorcycle
    - ☐ Train
    - ☐ Bus
    - ☐ Ferry
    - ☐ Taxi
    - ☐ Don't know
    - ☐ Other: _____
37. Thinking of your most recent trip on the path, which of the following best describe how easily you could have used a car for this trip?
    - ☐ I had a car available and could easily have got access to it
    - ☐ I could have got a car from another person where I started my trip (for example, another household member)
    - ☐ I did not have ready access to a car to make this trip
    - ☐ I do not have a drivers' licence
    - ☐ Other: _____
38. We'd like you to think about how much money you may have saved by walking or riding instead of driving. How much money do you estimate you may have saved on this trip instead of driving?
    Fuel: _____
    Parking: _____
    Others (if any): _____
39. Would it have taken more or less time to reach your destination by car?
    - ☐ More time

- ☐ Same time
- ☐ Less time

40. How much more/less time do you think it would have taken?

    Hours: _____

    Minutes: _____

41. We'd like you to think about how much money you may have saved by walking or riding instead of taking public transport. How much money do you estimate you may have saved on this trip instead of taking public transport?

    Fare: _____

    Others: _____

42. Thinking of your most recent trip on the path, which of the following statements best describes how easily you could have made this trip by public transport?
    - ☐ I had a convenient public transport alternative
    - ☐ While I had a public transport alternative it would have taken longer
    - ☐ I did not have a viable public transport alternative
    - ☐ Other: _____

43. Would it have taken more or less time to reach your destination by public transport?
    - ☐ More time
    - ☐ Same time
    - ☐ Less time

44. How much more/less time do you think it would have taken?

    Hours: _____

    Minutes: _____

Physical activity

We would now like to ask you about the physical activity you did in the last week. This activity may have happened anywhere, not only on the path.

The next few questions are about walking for fitness, recreation and sport. Please do not include any other walking that you may have done for other reasons. This will be recorded later.

45. In the last week have you walked for at least 10 minutes continuously, for fitness, recreation or sport?
    - ☐ Yes
    - ☐ No
    - ☐ Permanently unable to walk

46. How many times in the last week did you walk for fitness, recreation or sport for at least 10 minutes continuously?

    _____ times

47. What was the total amount of time you spent walking for fitness, recreation or sport in the last week?

    Hours: _____

    Minutes: _____

48. We'd now like to ask you about walking to and from places like work, shops and so on. Excluding walking for fitness, recreation and sport you've already reported, in the last week, did you walk for at least 10 minutes continuously to get to and from places?

    ☐ Yes

    ☐ No

49. How many times did you walk for at least 10 minutes continuously to get to and from places in the last week?

    _____ times

50. How much time in total did you spend walking to get to and from places in the last week?

    Hours: _____

    Minutes: _____

51. The next few questions are about bike riding for fitness, recreation and sport. Please do not include any other bike riding that you may have done for other reasons. The will be recorded later. In the last week have you ridden a bike for at least 10 minutes continuously for fitness, recreation or sport?

    ☐ Yes

    ☐ No

52. How many times in the last week did you ride a bike for fitness, recreation or sport for at least 10 minutes continuously?

    _____ times

53. How much time in total did you spend bike riding for fitness, recreation or sport in the last week?

    Hours: _____

    Minutes: _____

54. The next few questions are about bike riding to and from places like work, shops and so on. Excluding riding for fitness, recreation or sport you've already reported, in the last week did you ride a bike for at least 10 minutes continuously to get to and from places?

    ☐ Yes

☐ No

55. How many times did you ride a bike for at least 10 minutes continuously to get to and from places in the last week?

_____ times

56. How much time in total did you spend bike riding to get to and from places in the last week?

Hours: _____

Minutes: _____

57. The next few questions are about moderate and vigorous exercise. Please exclude walking or bike riding that you may have done for fitness, recreation or sport, and household chores, gardening or yardwork. In the last week, did you do any exercise which caused a moderate increase in your heart rate or breathing, that is, moderate exercise? (e.g. gentle swimming, social tennis, golf).

☐ Yes

☐ No

A moderate activity will make you breathe somewhat harder than normal and slightly increase heart rate, and a vigorous activity will make you breathe much harder than normal and have a greater effect on heart rate.

Examples of moderate physical activity: gentle swimming, social tennis, golf, dancing, badminton, table tennis, horseback riding, canoeing, kayaking, volleyball, cricket, baseball or softball, downhill skiing, cross-training, surfing and windsurfing.

Examples of vigorous physical activity: jogging, cycling, aerobics, competitive tennis, football (of all types), hockey, squash, cross-country skiing, cross-country hiking (i.e. rough or steep terrain), weight lifting, boxing, rock climbing, basketball, netball, gymnastics, using a rowing machine, martial arts, high-impact and step aerobics.

58. How many times did you do any moderate exercise in the last week?

_____ times

59. What was the total amount of time you spent doing moderate exercise in the last week?

Hours: _____

Minutes: _____

60. In the last week, did you do any exercise which caused a large increase in your heart rate or breathing, that is, vigorous exercise? (e.g. jogging, aerobics, competitive tennis). Please exclude any bike riding you've already reported.

☐ Yes

☐ No

61. How many times did you do any vigorous exercise in the last week?

_____ times

62. What was the total amount of time you spent doing vigorous exercise in the last week?

    Hours: _____

    Minutes: _____

63. Thinking about all the types of exercise you have already told me about, that is walking or bike riding for fitness, recreation or sport, vigorous and moderate exercise, walking or bike riding to get to and from places, how many days in the last week did you exercise?

    Number 0 – 7

64. How many of these days did you exercise for at least 30 minutes per day?

    Number 0 – 7

About You

65. Are you…?

    ☐ Male

    ☐ Female

66. What is your age?

    _____ years

67. Which of the following categories apply to you at the moment?

    ☐ Student – full time

    ☐ Student – part time

    ☐ Work – full time (>35 hours/week)

    ☐ Work – part time (<35 hours/week)

    ☐ Work casual

    ☐ Work – unpaid voluntary work

    ☐ Unemployed and looking for work

    ☐ Home duties

    ☐ Pensioner – not retirement age

    ☐ Retired – on pension

    ☐ Retired – not on pension

    ☐ Refused

    ☐ Other: _____

68. How many registered motor vehicles, owned or used by members of the household were parked at or near your household last night?

    _____ vehicles

Includes all registered cars, vans, trucks, motorcycles and company cars at the household irrespective of whether they are owned by household members.

69. How many bicycles in working order are kept at this address?

    _____ bicycles

A working bicycle is a bicycle that is reasonable mechanical condition such that it could readily be ridden; it may require simple maintenance such as pumping up tyres to do so.

Inclusions:

- *Adult and children's bicycles with two or more wheels*
- *Children's bicycles with trainer wheels*
- *Electric bicycles*
- *Cargo bicycles*

Exclusions:

- *Any vehicle that is registered (e.g. mopeds)*
- *Children's riding toys such as tricycles or scooters*
- *Stationary exercise bicycles*

70. How many people usually live in your household?

    _____ persons

Include all ages – a resident is somewhat who has, or will, live at the households for a period of at least three months.

Appendix C: Intercept survey times

Site	Location	Times (all dates are 2015)
Bicentennial Bikeway	East of Milton Ferry Terminal, near Park St.	Fri 23 Oct, 6:30 – 8:30 Sat 24 Oct, 6:30 – 8:30 Sun 25 Oct, 6:30 – 8:30 Tue 27 Oct, 6:30 – 8:30
Biggera Creek Greenway		Wed 28 Oct, 6:30 – 8:30 Thu 29 Oct, 6:30 – 8:30 Sat 14 Nov, 6:30 – 8:30 Sun 15 Nov, 6:30 – 8:30
Brassall Bikeway		Tue 27 Oct, 6:30 – 8:30 Wed 27 Oct, 6:30 – 8:30 Sat 7 Nov, 7:00 – 10:00 Sun 8 Nov, 7:00 – 10:00
Enoggera Creek Bikeway		Fri 23 Oct, 6:30 – 8:30 Sat 24 Oct, 7:00 – 10:00 Sun 25 Oct, 15:00 – 18:00 Mon 26 Oct, 6:30 – 8:30
Galeen-Honeyeater Bridge		Wed 28 Oct, 6:30 – 8:30 Thu 29 Oct, 6:30 – 8:30 Sat 7 Nov, 7:00 – 10:00 Sun 8 Oct, 7:00 – 10:00
Gateway North Bikeway	Bikeway bridge over canal immediate west of Nudgee Rd	Tue 20 Oct, 6:30 – 8:30 Wed 21 Oct, 6:30 – 8:30 Sat 31 Oct, 7:00 – 10:00 Sun 1 Nov, 7:00 – 10:00
North Brisbane Bikeway		Thu 22 Oct, 6:30 – 8:30 Fri 23 Oct, 6:30 – 8:30 Sat 24 Oct, 7:00 – 10:00 Sun 25 Oct, 7:00 – 10:00
Kedron Brook Bikeway (Bradshaw Park)	Bradford Park between Bradford St and McGregor Av	Thu 22 Oct, 6:30 – 8:30 Mon 26 Oct, 6:30 – 8:30 Sat 7 Nov, 7:00 – 10:00 Sun 8 Nov, 7:00 – 10:00

Site	Location	Times (all dates are 2015)
Kedron Brook Bikeway (Kalinga Park)	Kalinga Park west of Diggers Dr	Wed 21 Oct, 6:30 – 8:30 Mon 26 Oct, 6:30 – 8:30 Sat 31 Oct, 7:00 – 10:00 Sun 1 Nov, 7:00 – 10:00
Veloway 1 (Greenslopes)		Tue 27 Oct, 6:30 – 8:30 Fri 30 Oct, 6:30 – 8:30 Sat 31 Oct, 7:00 – 10:00 Sun 1 Nov, 7:00 – 10:00

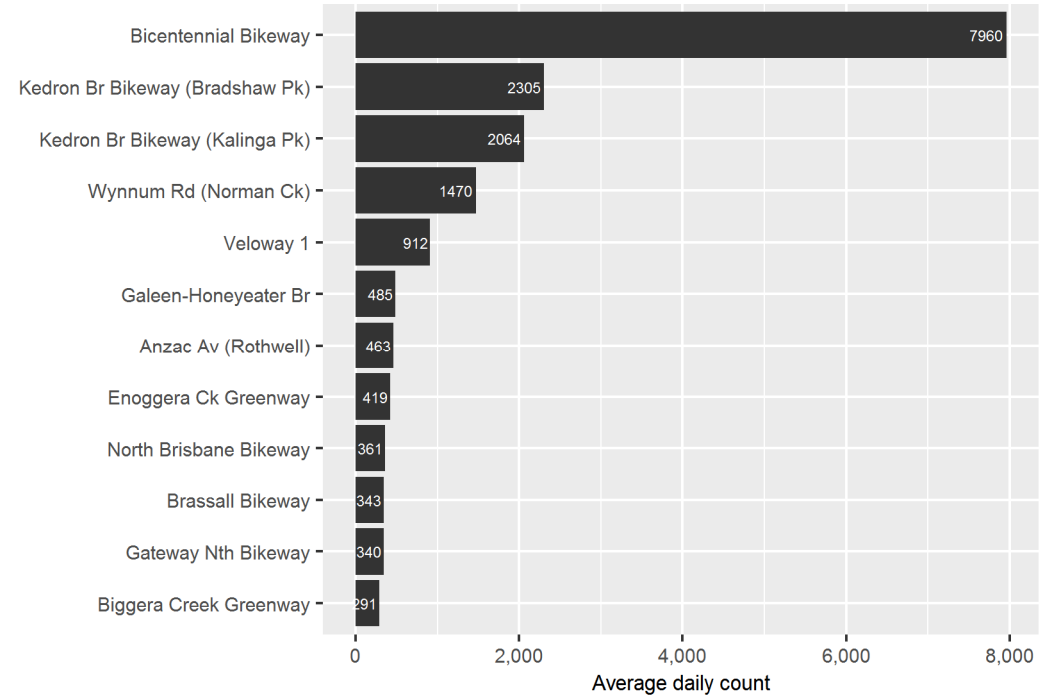
Appendix D: Counts analysis

D.1 Summary statistics

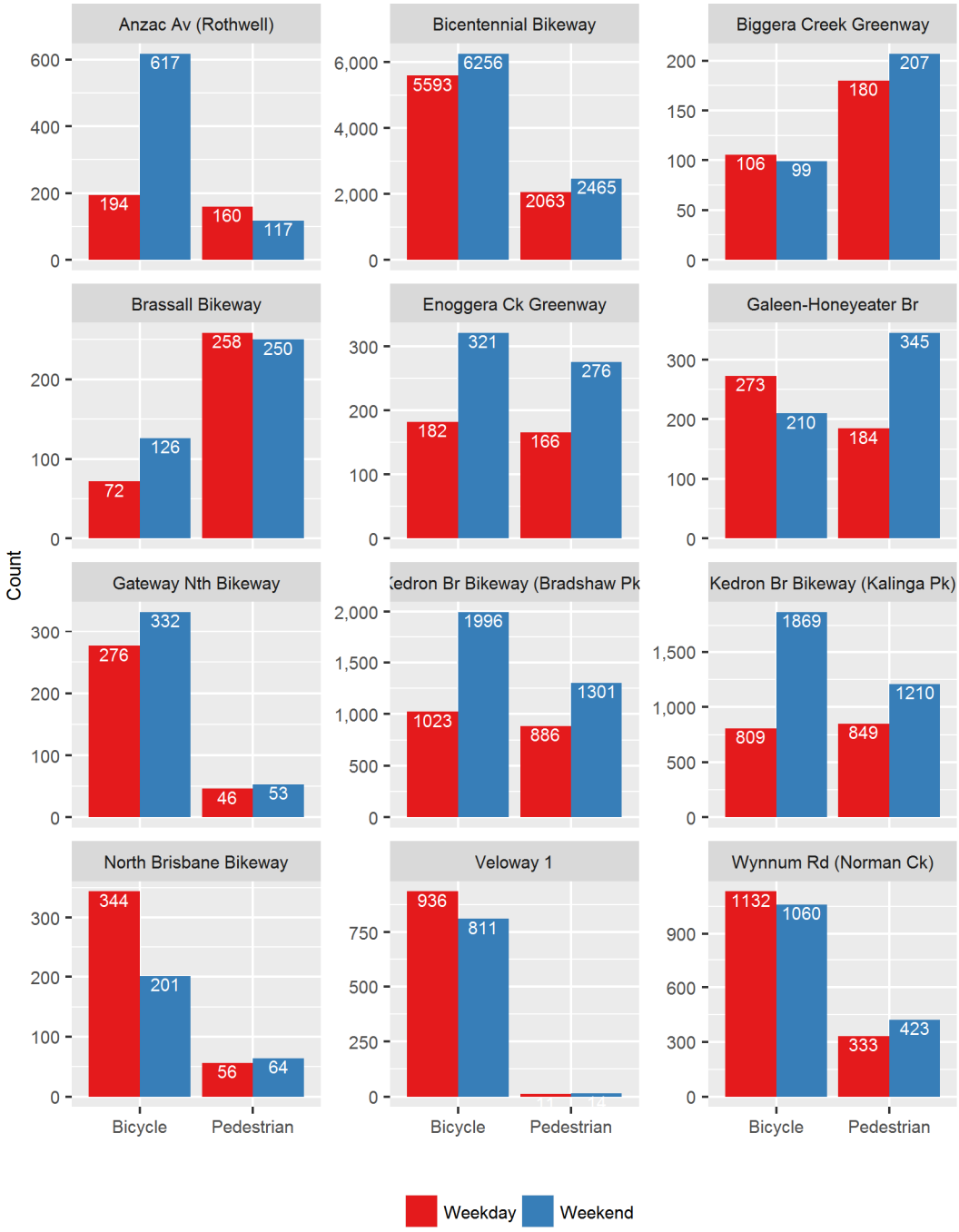
All counts in this appendix refer to a 13-hour period from 6 am to 7 pm. Counts were obtained during October 2015 using manual counts from video observations.

- **Table 8.1: Average daily traffic by mode and day of week**

Site	Day of week	Bicycle	Pedestrian	Total
Anzac Av (Rothwell)	All	315	148	463
	Weekday	194	160	354
	Weekend	617	117	734
Bicentennial Bikeway	All	5,782	2,178	7,960
	Weekday	5,593	2,063	7,656
	Weekend	6,256	2,465	8,721
Biggera Creek Greenway	All	104	188	291
	Weekday	106	180	286
	Weekend	99	207	306
Brassall Bikeway	All	87	256	343
	Weekday	72	258	330
	Weekend	126	250	376
Enoggera Ck Greenway	All	222	197	419
	Weekday	182	166	348
	Weekend	321	276	597
Galeen-Honeyeater Br	All	255	230	485
	Weekday	273	184	457
	Weekend	210	345	555
Gateway Nth Bikeway	All	292	48	340
	Weekday	276	46	322
	Weekend	332	53	385
Kedron Br Bikeway (Bradshaw Pk)	All	1,301	1,004	2,305
	Weekday	1,023	886	1,909
	Weekend	1,996	1,301	3,297
Kedron Br Bikeway (Kalinga Pk)	All	1,112	952	2,064
	Weekday	809	849	1,658
	Weekend	1,869	1,210	3,079
North Brisbane Bikeway	All	303	58	361
	Weekday	344	56	400
	Weekend	201	64	265
Veloway 1	All	900	12	912
	Weekday	936	11	947
	Weekend	811	14	825
Wynnum Rd (Norman Ck)	All	1,111	359	1,470
	Weekday	1,132	333	1,465
	Weekend	1,060	423	1,483



■ **Figure 8.1: Average daily traffic**



■ **Figure 8.2: Average daily count by day of week**

D.2 Peak periods

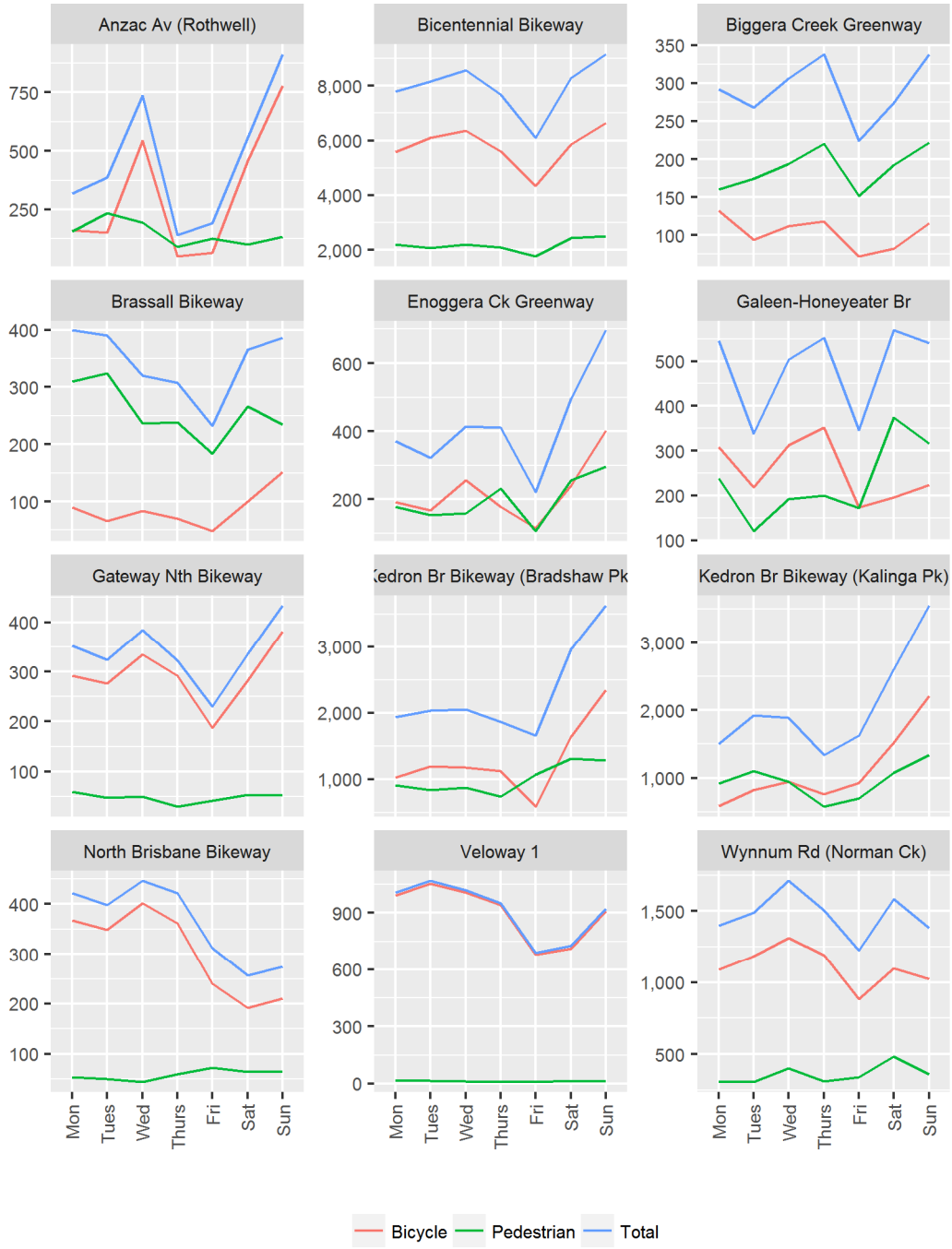
- **Table 8.2: Peak hour by day of week**

Site	Weekday	Weekend
Anzac Av (Rothwell)	111 (Wed 13:00)	195 (Sun 7:00)
Bicentennial Bikeway	955 (Tues 7:00)	722 (Sat 7:00)
Biggera Creek Greenway	36 (Thurs 6:00)	27 (Sun 16:00)
Brassall Bikeway	62 (Tues 6:00)	39 (Sat 6:00)
Enoggera Ck Greenway	44 (Thurs 7:00)	58 (Sun 16:00)
Galeen-Honeyeater Br	66 (Thurs 15:00)	44 (Sat 16:00)
Gateway Nth Bikeway	36 (Wed 7:00)	39 (Sun 6:00)
Kedron Br Bikeway (Bradshaw Pk)	274 (Tues 6:00)	268 (Sun 7:00)
Kedron Br Bikeway (Kalinga Pk)	203 (Wed 6:00)	253 (Sun 16:00)
North Brisbane Bikeway	70 (Wed 7:00)	37 (Sun 10:00)
Veloway 1	158 (Tues 7:00)	84 (Tues 7:00)
Wynnum Rd (Norman Ck)	254 (Wed 7:00)	238 (Sat 6:00)

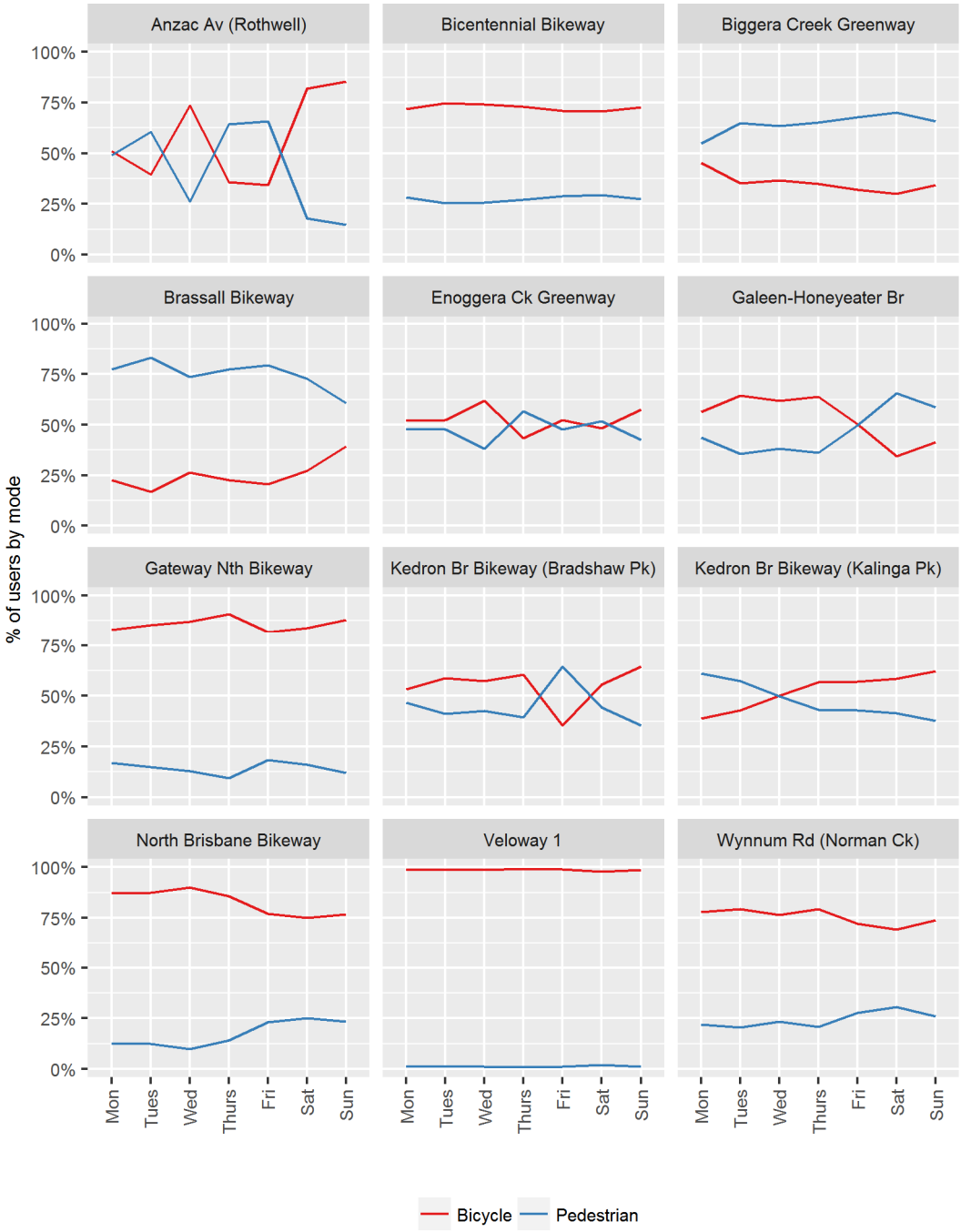
■ **Table 8.3: Peak 15 minutes by day of week**

Site	Weekday	Weekend
Anzac Av (Rothwell)	49 (Wed 13:45)	88 (Sun 7:00)
Bicentennial Bikeway	260 (Tues 7:30)	219 (Sat 6:45)
Biggera Creek Greenway	14 (Thurs 6:45)	11 (Sat 16:45)
Brassall Bikeway	21 (Tues 6:15)	14 (Sat 6:30)
Enoggera Ck Greenway	24 (Wed 10:45)	22 (Sun 16:45)
Galeen-Honeyeater Br	36 (Mon 15:00)	19 (Sat 16:00)
Gateway Nth Bikeway	14 (Wed 6:45)	16 (Sat 9:15)
Kedron Br Bikeway (Bradshaw Pk)	80 (Tues 6:15)	89 (Sun 16:45)
Kedron Br Bikeway (Kalinga Pk)	71 (Wed 17:00)	98 (Sun 11:00)
North Brisbane Bikeway	27 (Wed 7:30)	14 (Sat 7:45)
Veloway 1	50 (Wed 7:15)	29 (Tues 8:30)
Wynnum Rd (Norman Ck)	72 (Wed 7:30)	124 (Sat 6:00)

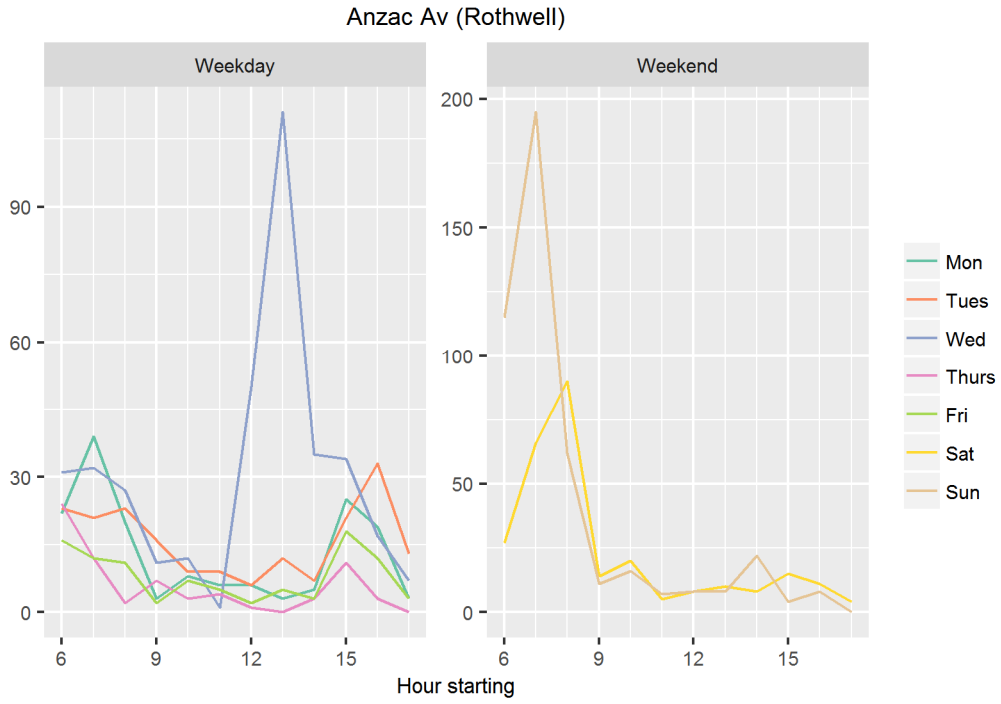
D.3 Day of week profiles

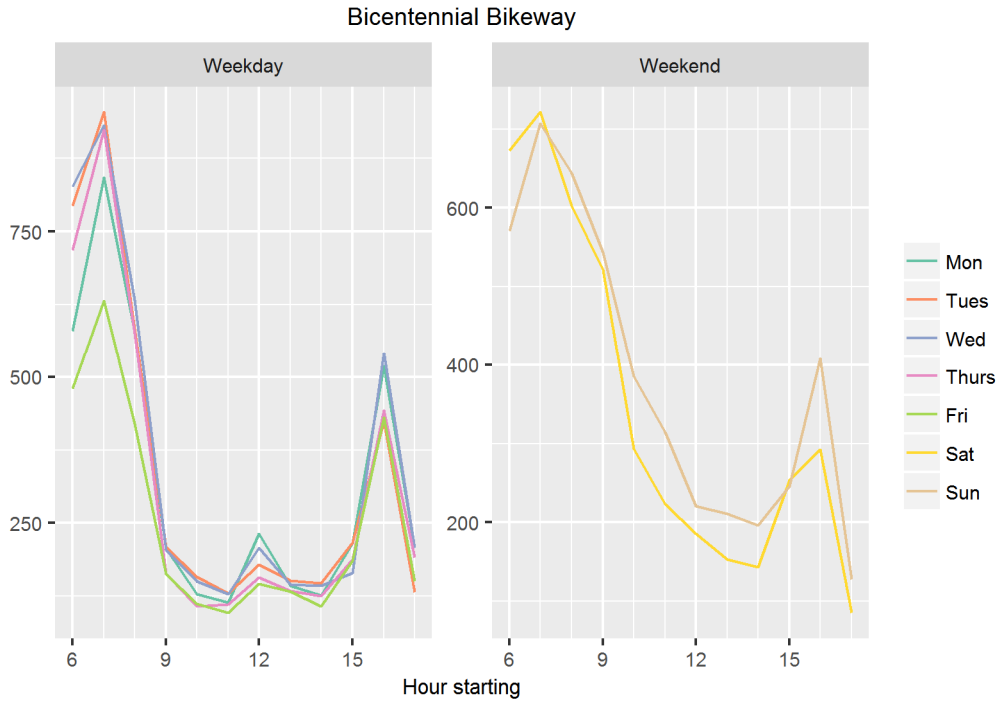


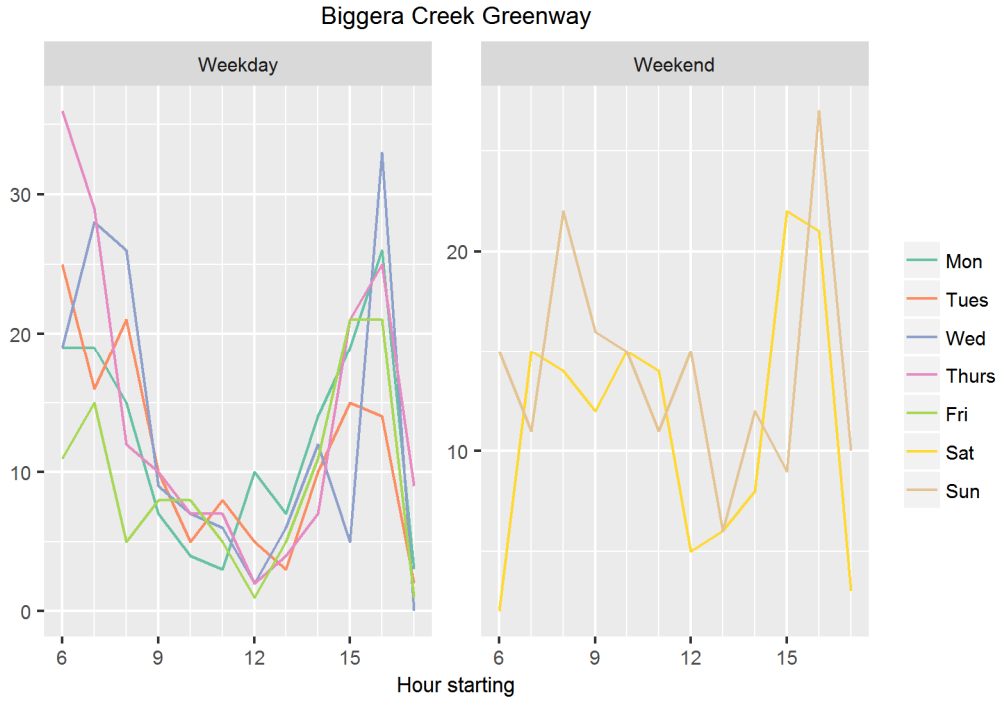
D.4 Mode splits by day of week

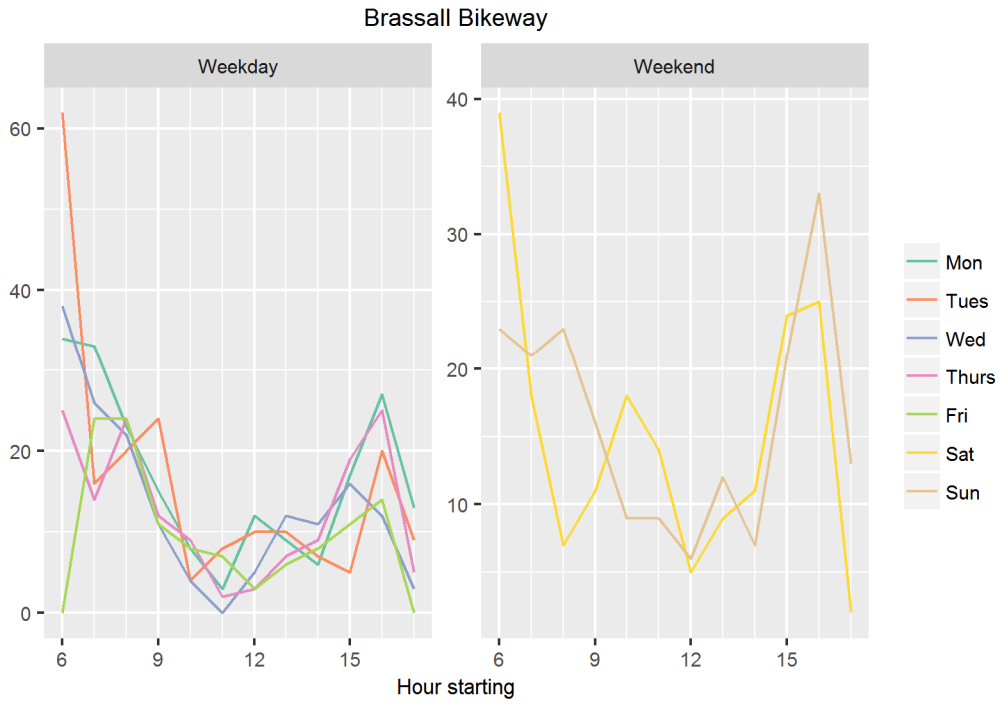


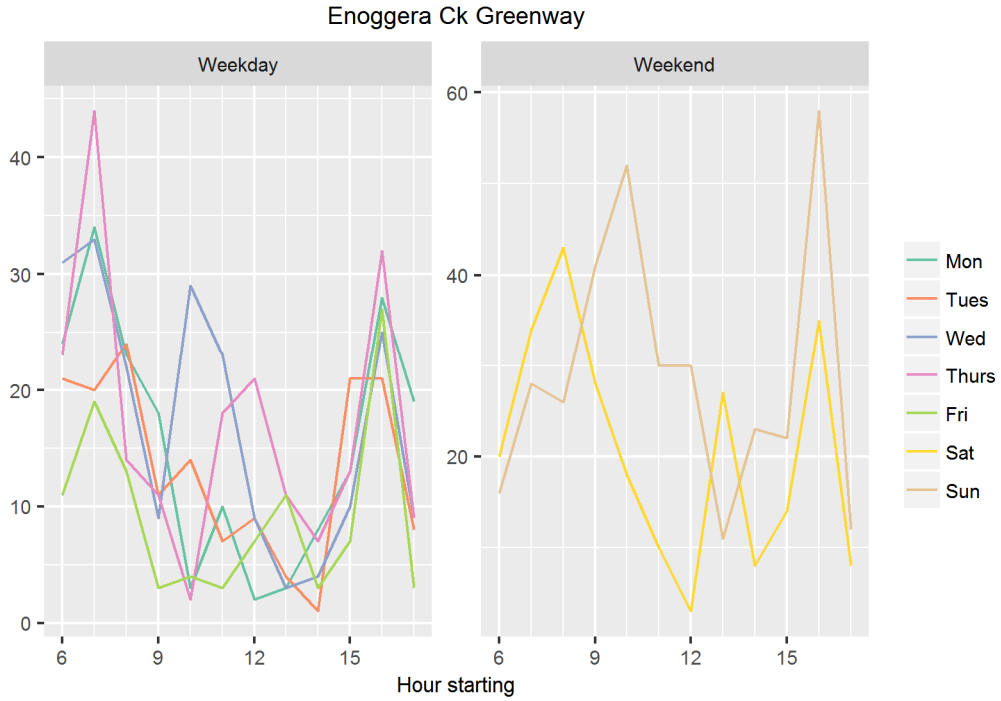
D.5 Time of day profiles

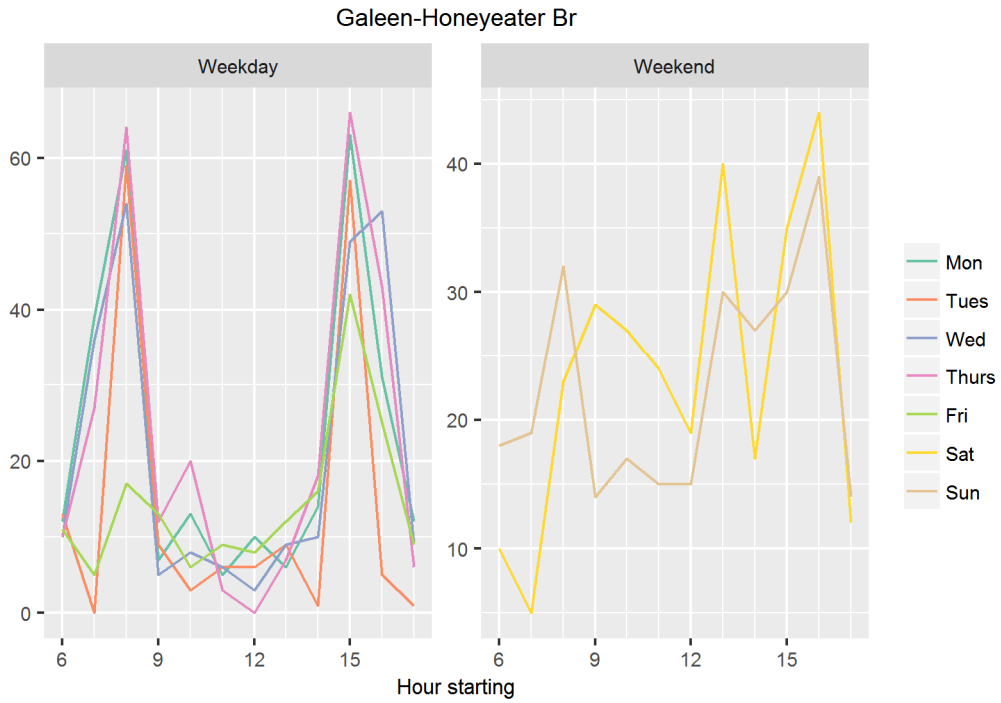


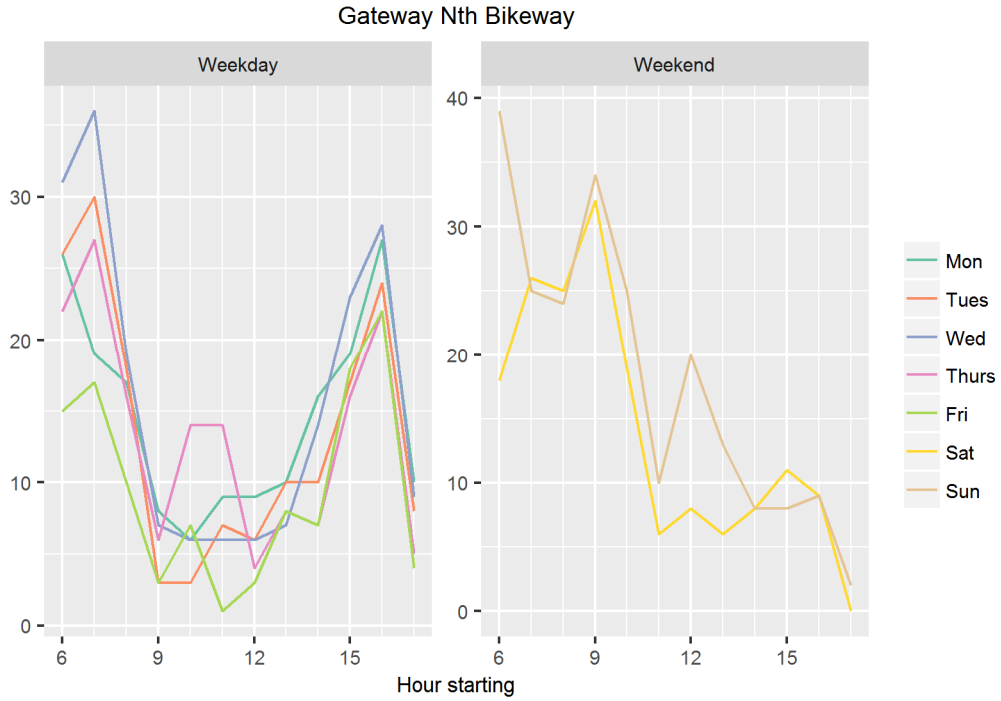


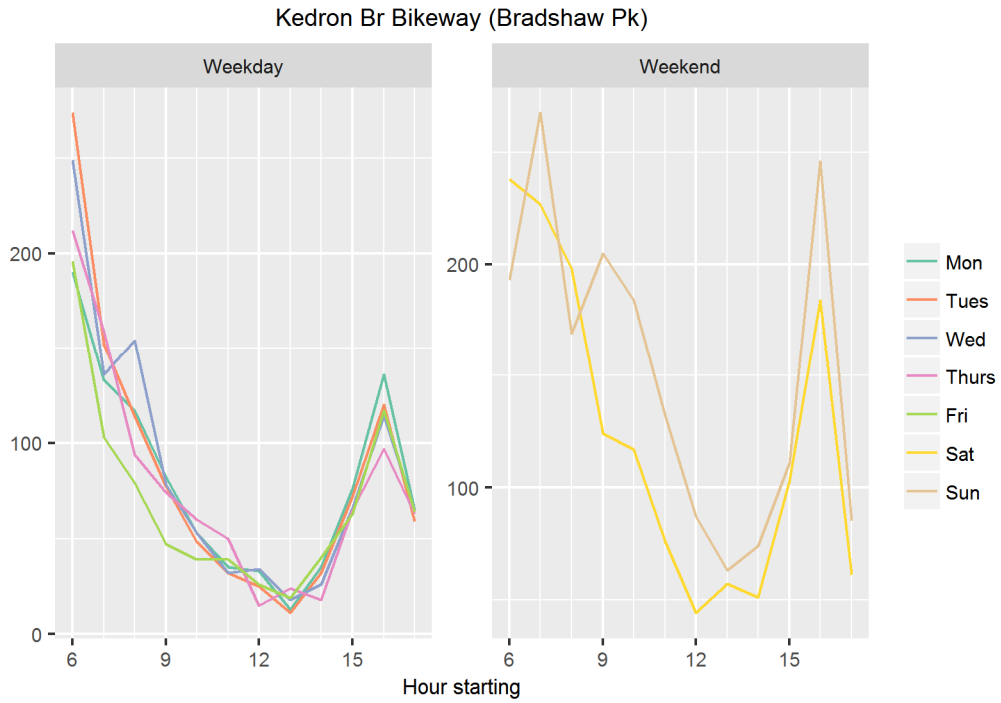

Biggera Creek Greenway
Weekday
Weekend
30
20
10
0
20
10
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

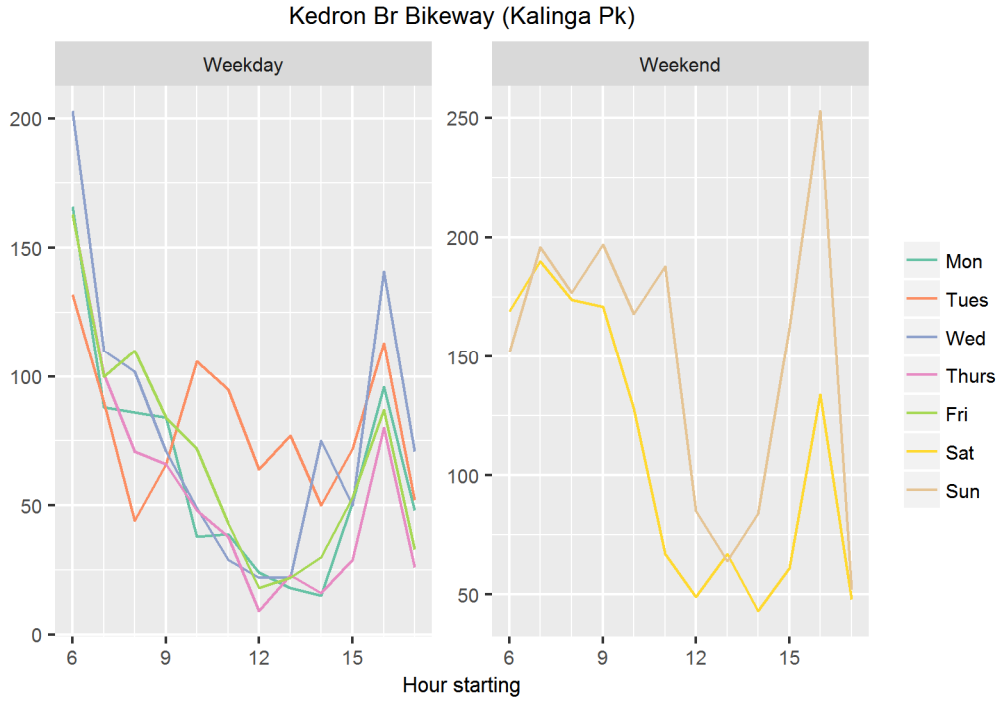

Brassall Bikeway
Weekday
Weekend
60
40
20
0
40
30
20
10
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

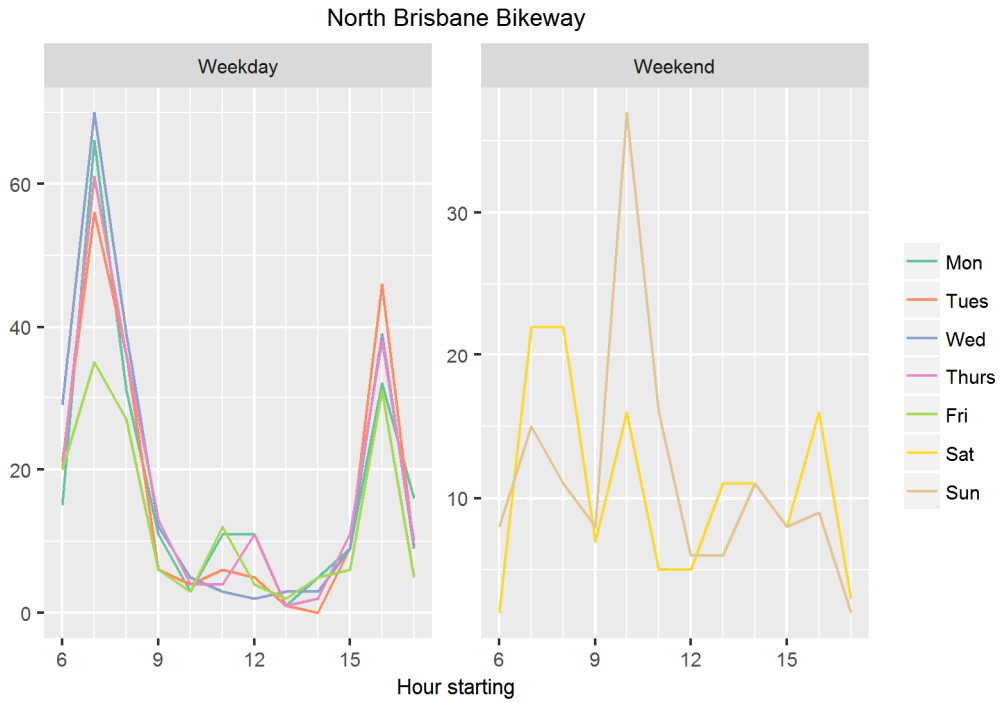

Enoggera Ck Greenway
Weekday
Weekend
0
10
20
30
40
60
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun


Galeen-Honeyeater Br
Weekday
Weekend
0
10
20
30
40
60
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

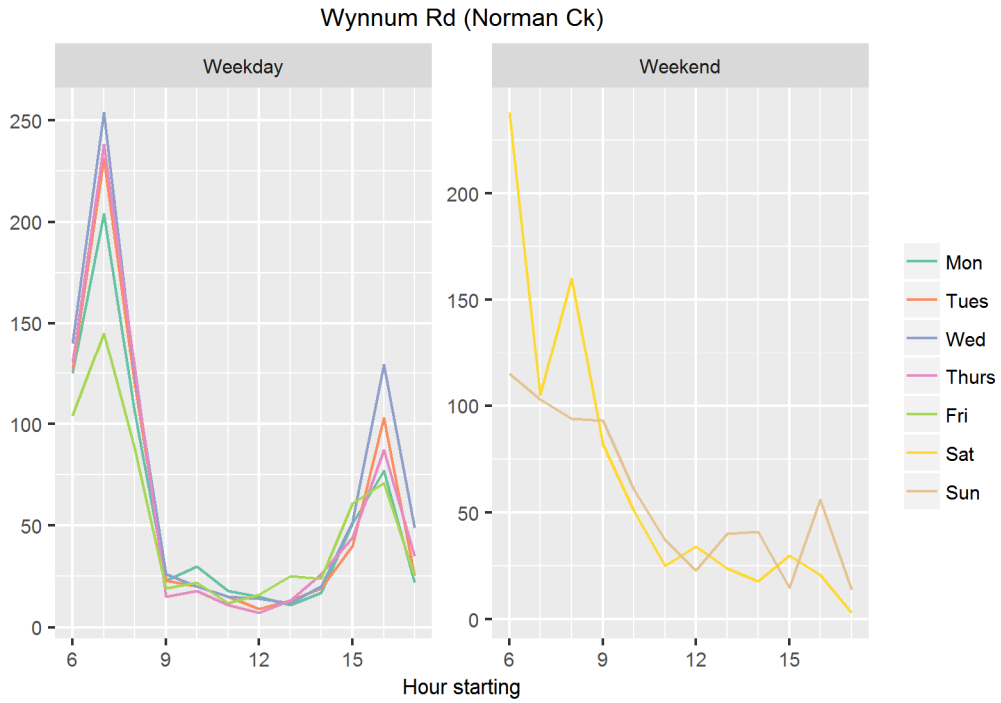

Gateway Nth Bikeway
Weekday
Weekend
0
10
20
30
40
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun


Kedron Br Bikeway (Bradshaw Pk)
Weekday
Weekend
0
100
200
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

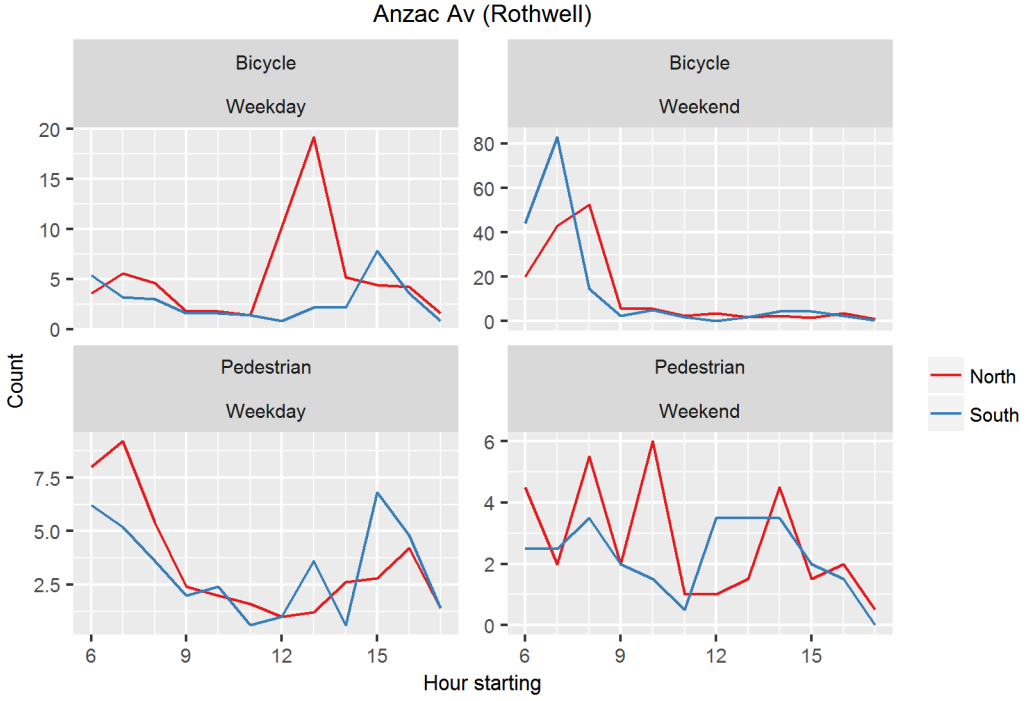

Kedron Br Bikeway (Kalinga Pk)
Weekday
Weekend
200
150
100
50
0
250
200
150
100
50
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

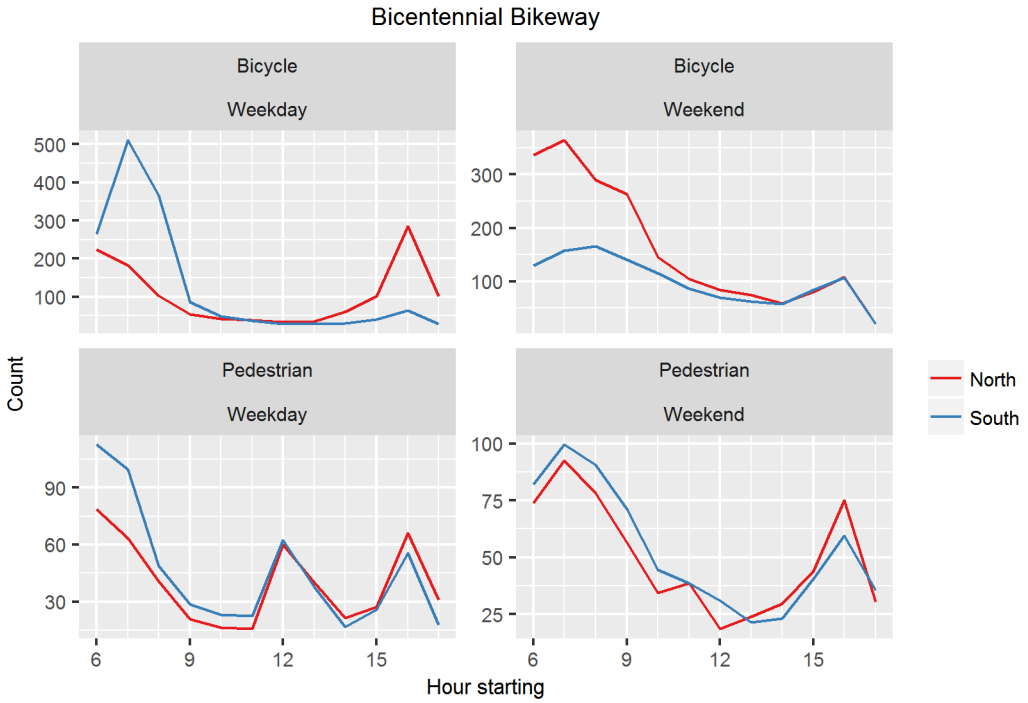

North Brisbane Bikeway
Weekday
Weekend
60
40
20
0
30
20
10
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

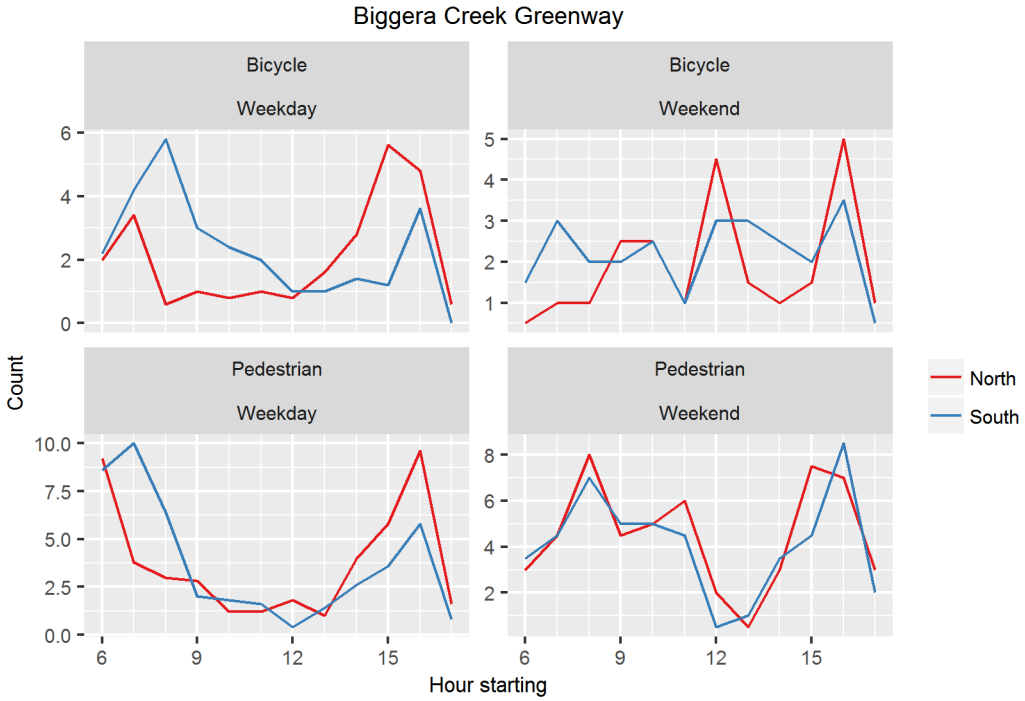

Veloway 1
Weekday
Weekend
150
100
50
0
80
60
40
20
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

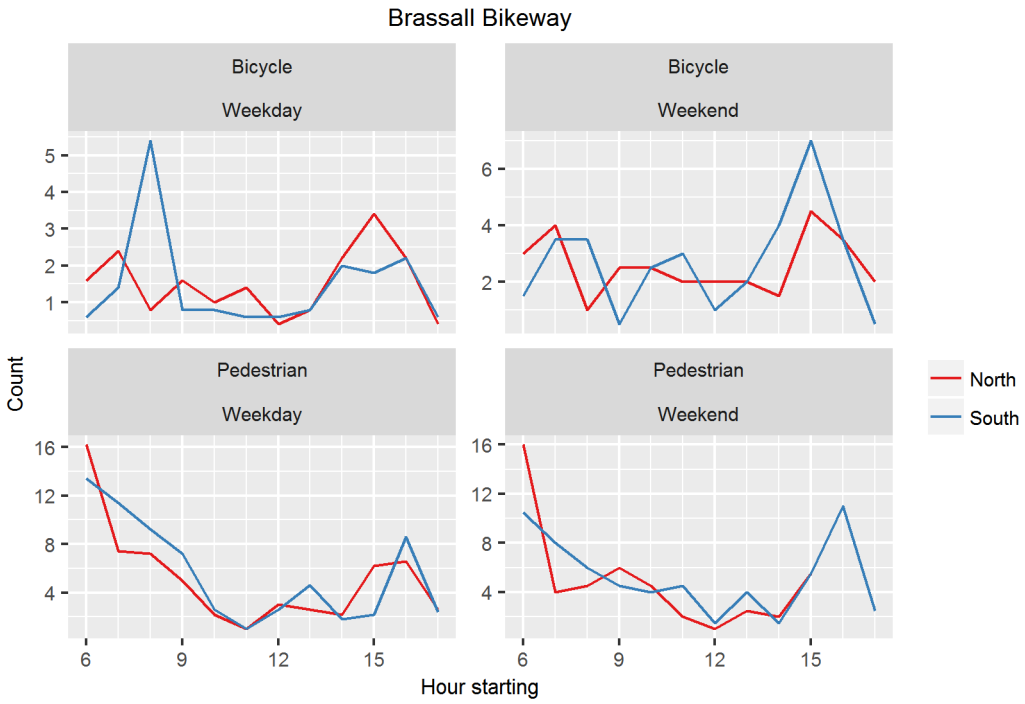

Wynnum Rd (Norman Ck)
Weekday
Weekend
250
200
150
100
50
0
200
150
100
50
0
6
9
12
15
Hour starting
Mon
Tues
Wed
Thurs
Fri
Sat
Sun

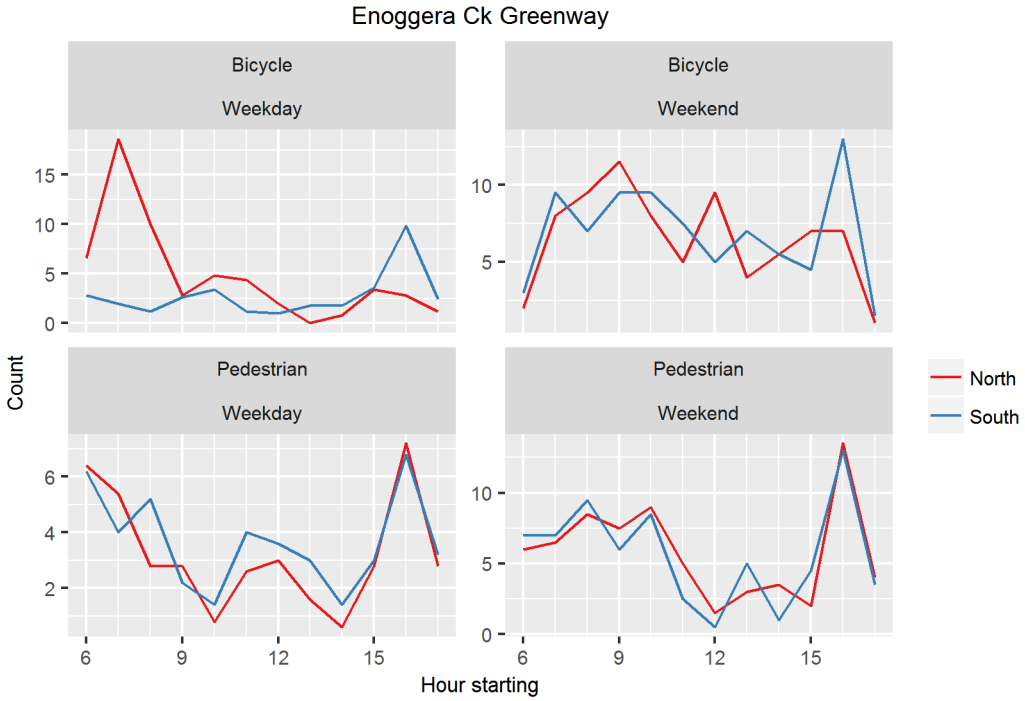
D.6 Time of day profiles by direction, mode and day of week

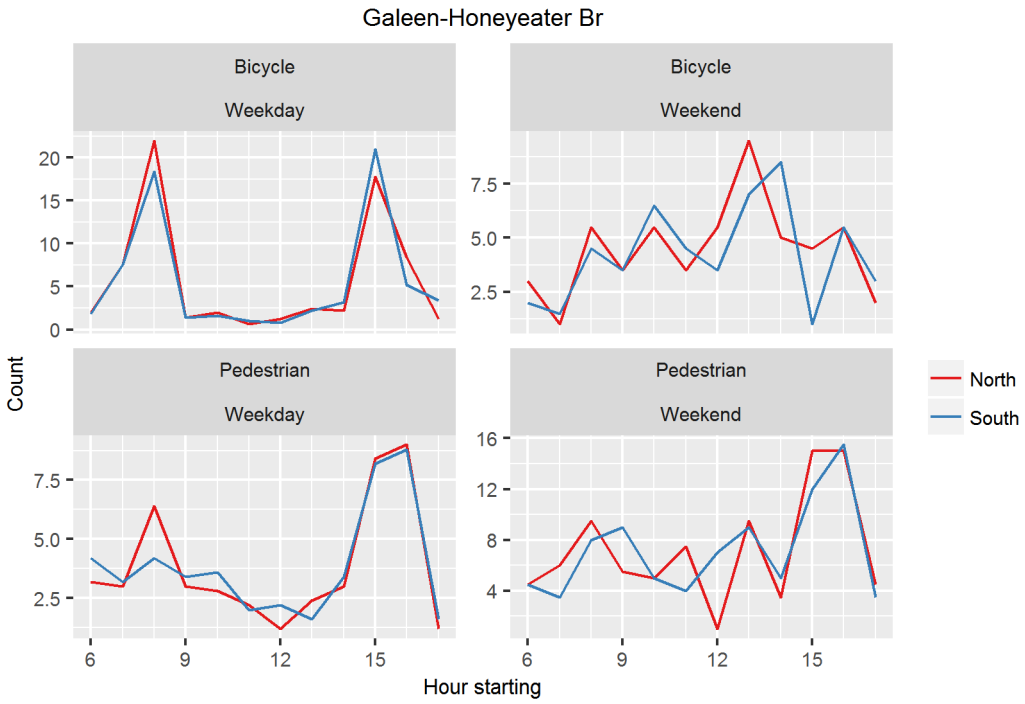


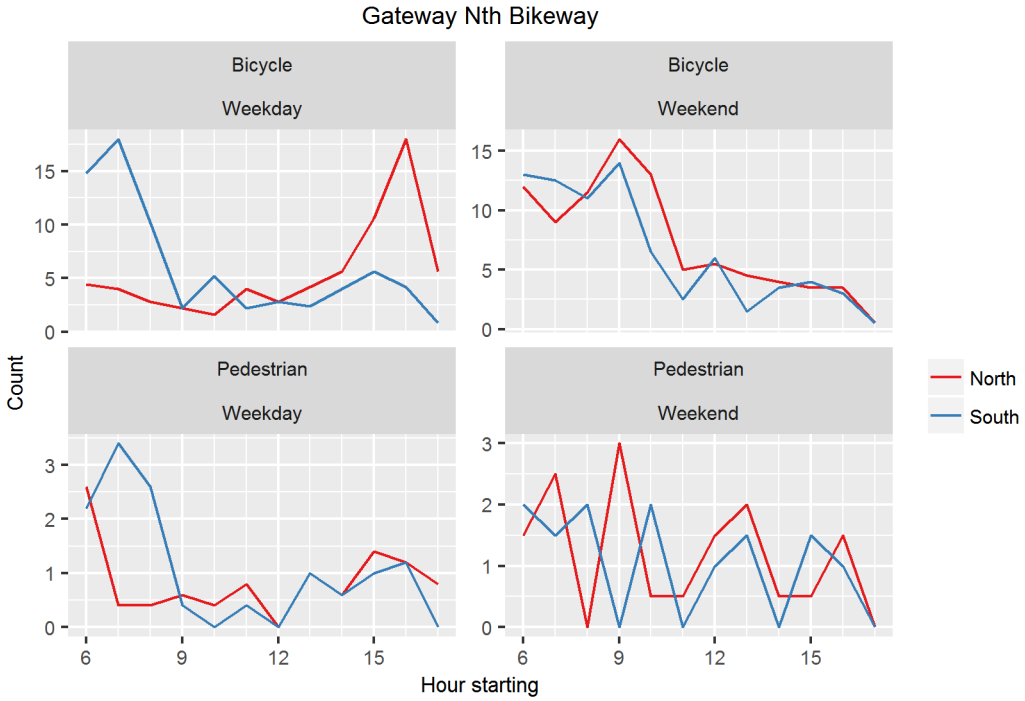


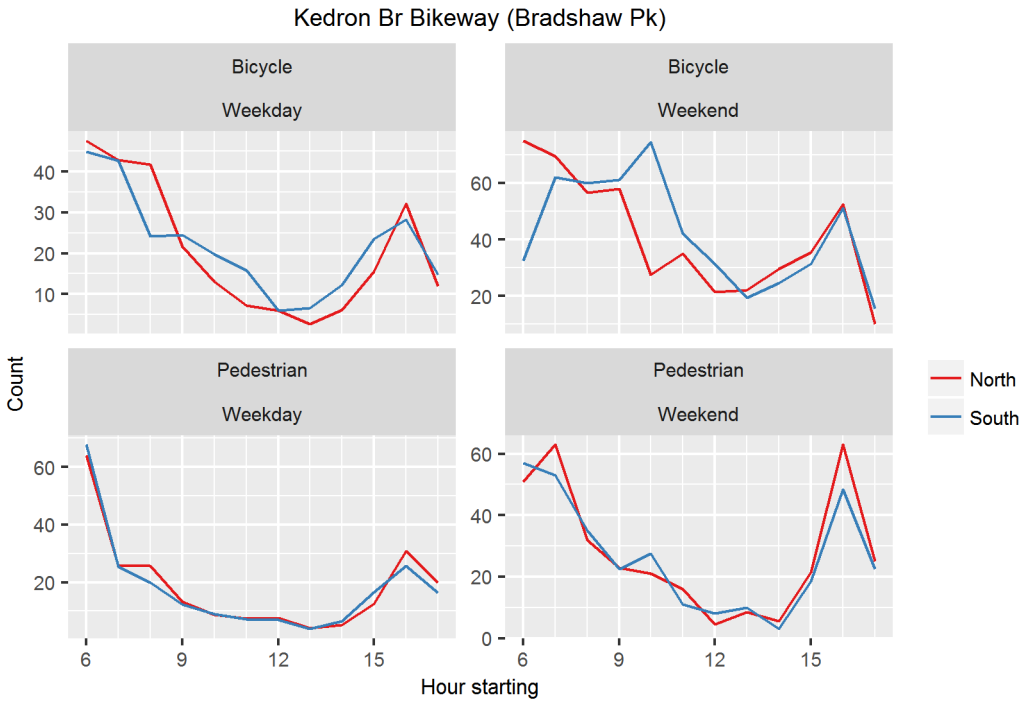

Biggera Creek Greenway
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South

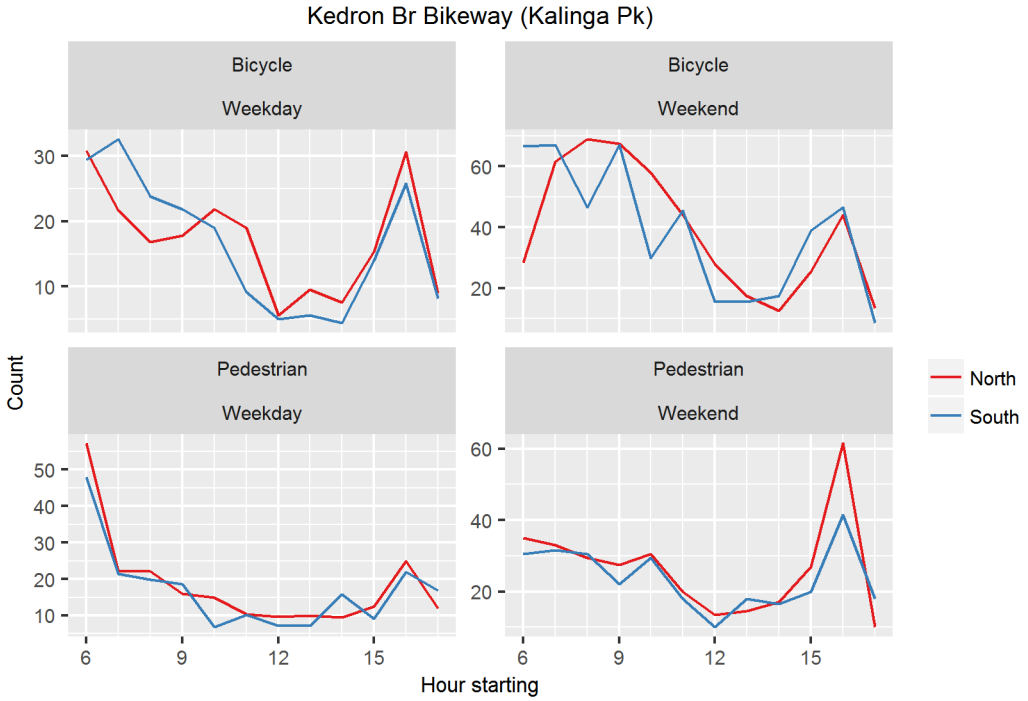

Brassall Bikeway
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South

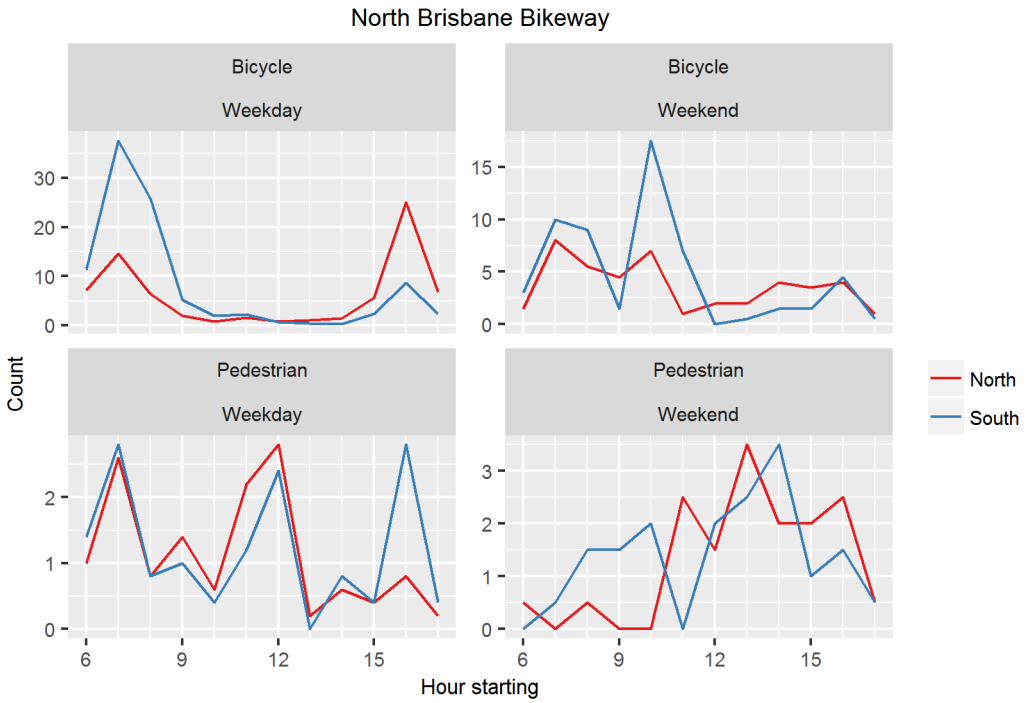

Enoggera Ck Greenway
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South

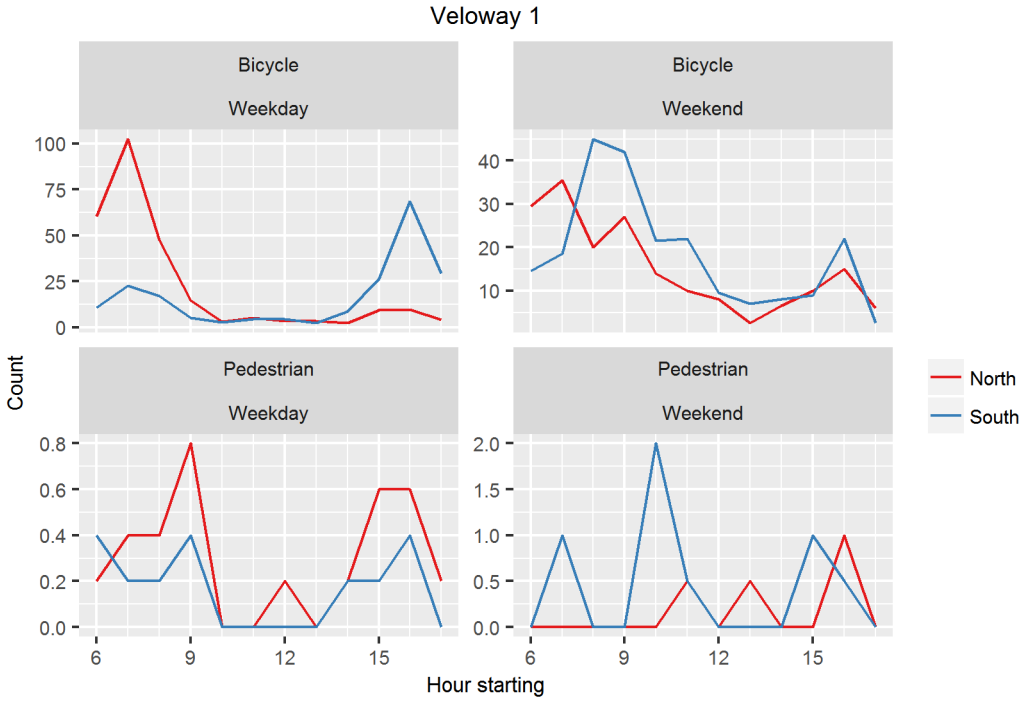

Galeen-Honeyeater Br
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South

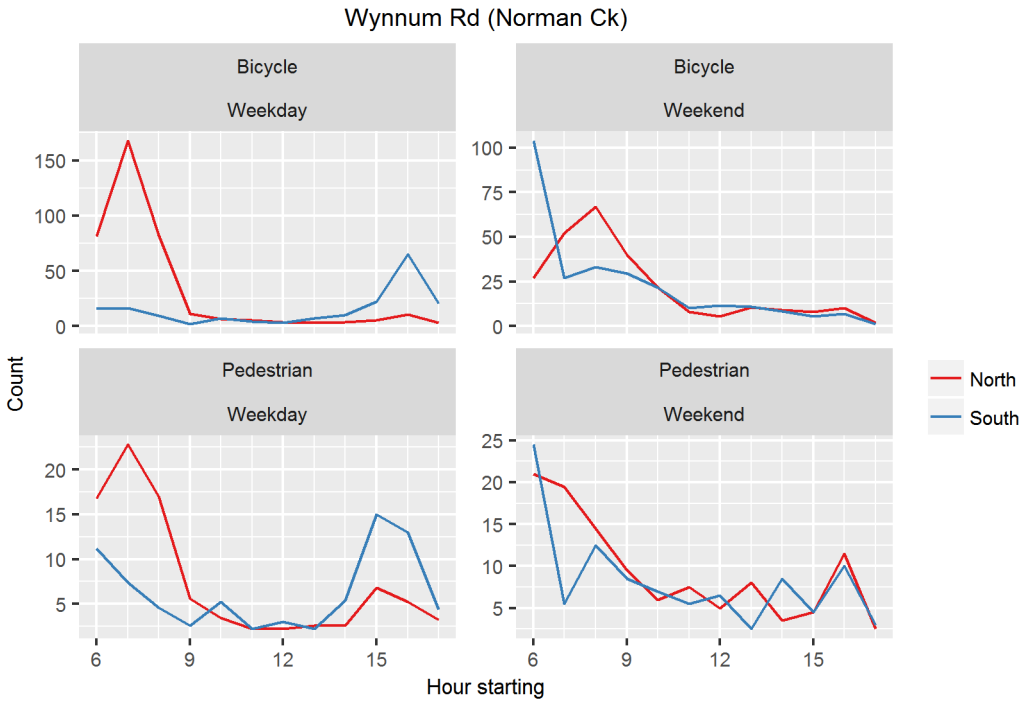

Gateway Nth Bikeway
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South


Kedron Br Bikeway (Bradshaw Pk)
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South


Kedron Br Bikeway (Kalinga Pk)
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South


North Brisbane Bikeway
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South


Veloway 1
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South


Wynnum Rd (Norman Ck)
Bicycle
Weekday
Bicycle
Weekend
Pedestrian
Weekday
Pedestrian
Weekend
Count
Hour starting
North
South

Appendix E: Survey verbatim responses

Survey respondents were invited to add any general comments they may have had at the end of both the telephone and online surveys. These responses are compiled here by site and the respondents' frequency of use of the site by both cycling and walking.

Bikeway	Bicycle	Walk	Comments
Bicentennial	Almost everyday	Once a month	My commuting by bike is also for fitness/training or I will do a training ride which happens to end at work.
Bicentennial	Almost everyday	Once a month	Council has done a brilliant job with bike ways. Please arrive to do more for cyclist safety in the CBD. Thank you.
Bicentennial	Almost everyday	Several times a year	Cycling for transport is a great way to incorporate exercise into daily life. The Bicentennial Bikeway, Western Freeway Bikeway and Centenary Bikeway provide safe, easy access to do so in my area. Sylvan Road is a big let down, as it is extremely stressful with a narrow bike lane occupied by parked cars and with buses, cars and trucks moving at speed at close proximity. It really lets down the experience.
Bicentennial	Almost everyday	Several times a year	I cycle along Sylvan Road from the Toowong car park next to the Bus Depot, this road is challenging and I personally have had two near misses; one with a Glider bus about 7amish and one with a private car who decided to turn left whilst stationary in traffic, nearly taking me out. The improvements to the bike path are excellent and ensure a speedier, safer ride. Thank you for doing the improvements, they are awesome.
Bicentennial	Almost everyday	Several times a year	There is a great bike path along the Western Freeway, and there is a great bike path along the river, but there is a gap in the middle that is substandard (Land St)
Bicentennial	Almost everyday	Only once	There are issues with electronic bikes. There is a guy in what can only be described as a kayak on wheels who uses the bike path. He travels at 50 - 60km/hr. If he hit a cyclist or pedestrian, he would kill them. There needs to be some thought regarding the type of vehicles that are allowed on the bike paths and the speed that they are allowed to travel in order to make it safe for all.
Bicentennial	Almost everyday	Never	The upgrade to Coronation Drive bikeway is excellent. The farce of slopping paint onto a road and calling it bike safe is disgraceful and in my view should be regarded as fraud on the part of any Local Government doing so. When the bikeway was being upgraded, there were significant queues of bikes. I believe (anecdotally) there are studies indicating the bikeway (with all of its inadequate routing - e.g. from the end of the bikeway through to Indooroopilly) carries 10% of the road traffic along Coronation Drive. How much per person/kilometre have our wondrous state and council tunnels cost society (I understand and deplore the "public/private" partnership model to be the cop-out it is) compared with that small link between Coro Drive and

Bikeway	Bicycle	Walk	Comments
			Indooroopilly - I am sure there are dozens of similar examples of Government and Local Government committing billions on ill-conceived and self-defeating infrastructure.
Bicentennial	Almost everyday		The Bicentennial Bikeway is a really good piece of infrastructure and makes a huge difference to bike commuting. I'm also lucky to have the Western Freeway bike path for most of the rest of my Indooroopilly to CBD commute. However, the connections to the Bicentennial Bikeway are quite poor, keeping it from living up to its potential as a good commuting route. On the Western side, the main route along Sylvan Road (I counted last year: it carries hundreds of cyclists daily -- they're 25% of traffic in the morning) is the weakest link. The so-called bike lane on it is really just on road parking, with cars pulling in and out of it, and opening their doors into cyclists' paths especially during typical commuting hours (after all, that's when people go to/from work by car, too). There are also a number of blind spots at intersections that are made worse by badly parked cars (most notably by inconsiderate SUV mums at the Corner Cafe), and pinch points where pointlessly positioned markings and traffic islands squeeze bikes into the path of cars and buses. It would be easily possible to run a proper bi-directional bike lane along one side, and not lose any parking spaces by putting angled parking on the other side, but that ridiculous excuse for an active transport councillor Peter Matic blocks these efforts by claiming that protected bike lanes "are something that is relevant to other jurisdictions, but not currently in Australia". On the CBD end, there is currently no safe, direct and convenient way to get onto the Bicentennial when coming from the city centre, e.g. somewhere close to Central Station. This is mostly due to the poorly designed and built crossings of North Quay, at least one of which could be upgraded to a wide enough corridor to allow cyclists to cross without having to ride along a narrow bumpy footpath first (Ann St), or cross against oncoming traffic because only the right side of the road has a ped crossing (Adelaide St, Herschel St).
Bicentennial	Almost everyday		Your methodology is flawed. Since the survey personnel stop (and give passcodes) to people when the surveyors are free, large groups of riders are underrepresented. Those groups are the "packs" of fast riders drafting off each other -- I suspect they ride farther and for more hours per week. Similarly, since it's a voluntary stop, you're selecting for people going slowly enough to stop practically and willing to stop (groups will be less willing I suspect)
Bicentennial	Every weekday	Almost everyday	Please continue to build more bikeways. Build it and they will come particularly if it is "Safe" transport routes to the City (eg would take someone less than 30min to ride to work in the CBD". I would love to see a dedicated bike way that links Auchenflower/Bardon with the Toowong to City bike path. My idea would be to: Starting at the existing Warburton St

Bikeway	Bicycle	Walk	Comments
			(Bardon) tunnel linking to Baroona Rd and on to Elizabeth St, cross over at Ellena St and continue along Elizabeth st Join back up to Baroona Rd and then use Gregory Park, Frew park and (Future flyover to) Milton park to get to the railway underpass and onto camford St, Kilroe St and Lang Parade to Connect to the river.
Bicentennial	Every weekday	Every weekday	Improvements you have made to the Bicentennial Bikeway are fantastic, so thank you. The danger of people getting hurt through collisions with bicycles has been decreased dramatically, increasing the enjoyment of the walk or cycle on the path. Congratulations!!!!
Bicentennial	Every weekday	3-4 days a week	Thank you for upgrading and putting work into the bikeways around Brisbane. They are a huge part of my life, and allow me to travel safely at a low cost. My quality of life would be much poorer without them.
Bicentennial	Every weekday	3-4 days a week	The Bicentennial bikeway is an excellent example of good bike infrastructure. Please replicate. Also get rid of mandatory helmet laws to encourage uptake of cycling.
Bicentennial	Every weekday	Once a month	I have ridden a bike to work consistently over the past 7 years. The upgrade of the bike way is a massive help to get from point A to B safely. It is a fantastic piece of infrastructure that is being used regularly by an increasing number of people. There should now be a focus on getting more women on bikes, which in my view, will only increase once the safety of the door to door bike commute/journey is guaranteed. For some reason most women are reluctant to play in traffic, likely because they are far more sensible than men. This means more infrastructure. There is a huge potential for Brisbane to continue to embrace cycling as the effective mode of transport within a 15km radius of the CBD. When people are interacting, outside, they are healthier, happier and spend more. My only criticism of the bike path is the blue 'checker flag' type markings at point where the pedestrians cross. It is confusing to everyone as it looks very similar to a zebra crossing, but is not, or is it. Is it a pedestrian crossing? Who has right of way? Who knows?
Bicentennial	Every weekday	Once a month	Now that the bikeway is separated, there needs to be education around SPEED and the types of bikes that can use it. The speed of some electric bikes I have seen is extremely hazardous and makes a safe off-road bike path even feel unsafe. Even some non-electric cyclists travel way too fast, especially in groups and this is not fun!
Bicentennial	Every weekday	Once a month	The gradual improvements in riding lanes and services is great (I use cycle2city). It has got me back to riding. They are also generally kept in good order. I appreciate the efforts and am noticing a gradual increase in cyclists. I think more end trip facilities and encouragement of businesses to support this will also see more take up. I am lucky to be in western suburbs so with coro and western freeway bike lanes I am not on the open road very often

Bikeway	Bicycle	Walk	Comments
Bicentennial	Every weekday	Several times a year	Providing pedestrian and vehicle free paths for bikes to ride on has increased the number of bike riders dramatically over the last 5 years especially women. Putting a bike path along Sylvan Road and bike friendly CBD would be beneficial to bike riders. Busses in the CBD are aggressive and disrespectful toward bike riders.
Bicentennial	Every weekday	Never	Bicentennial Bikeway is great - Brisbane's best bikeway. I had no major problems riding or walking on it from Dec 2011 to now, with or without separation. The problem is what to do when you reach the ends - i.e. cycling in the CBD and on Sylvan Road, Toowong to get to the Western Freeway Bikeway is quite unpleasant.
Bicentennial	Every weekday	Never	Love the path. It is a privilege to use every day. We very much appreciate the council providing such quality infrastructure
Bicentennial	Every weekday	Never	The most unsafe part of my commute to work by bicycle is Silvan road. There are lots of points of conflict with motorists. Taking one side of car parking and making a separated bicycle facility would activate the whole bikeway corridor from the CBD out along the centenary highway. The current treatment for bicycles along Silvan Road places cyclists in the door zone of parked cars or in the car lane. The footpath is narrow and crosses numerous roads making it a poor alternative. This is the missing link for this cycling route please fix.
Bicentennial	Every weekday	Never	Keep up the good work. Bike ways are great.
Bicentennial	Every weekday		Bicentennial bikeway is great, world class even, new world city quality even however, connections are generally poor quality - third world class mostly (actually that is demeaning to places like Bogota). Meaningless yellow bike symbols in many instances. It is like a freeway with dirt tracks connecting to it. Totally underutilised without the rest of the network. At least this bikeway actually goes to a significant destination, unlike many of the others Council is so proud of, which just run along creek corridors. Again, like a freeway from nowhere to nowhere. We would not build a road network this way - but BCC chooses to pretend to build a bike network this way, no wonder so few people choose to ride a bicycle for transport.
Bicentennial	3-4 days a week	3-4 days a week	The cycle-ways and running paths around Brisbane were a contributing factor to my choosing to live in Brisbane.
Bicentennial	3-4 days a week	1-2 days a week	Please consider extending bike paths out to Bayside Brisbane - Manly, Wynnum etc.
Bicentennial	3-4 days a week	Every fortnight	Please have a walkway similar to river walkway/bikeway that goes to UQ. Atm it is too unsafe, whether going up Sir Fred Schonell Drive or on the left's river 'bikeway'. It would get widely used as well and help traffic. The current dirt walkway at UQ is used very often even with the limited access for non-UQ St Lucia residents

Bikeway	Bicycle	Walk	Comments
Bicentennial	3-4 days a week	Once a month	The Bicentennial bikeway improvements are much appreciated. Need more bikeways like this in Brisbane.
Bicentennial	3-4 days a week	Once a month	I prefer to ride roadways and not necessarily defined bike lanes because I can ride faster and do not have to deal with unpredictable pedestrians. Cars can be a problem but on the whole are more predictable. Some policing of both bikes and cars would promote respect from both sides and help to level the playing field. Some pedestrian education with respect to recreational path use would also be good. They just don't think.
Bicentennial	1-2 days a week	3-4 days a week	It would be great to provide parking space so that we could continue to walk from Toowong to the city
Bicentennial	1-2 days a week	1-2 days a week	It would be great if the walking/bike track went all the way to the gateway bridge or perhaps if tracks were put on top of the train lines so we can get in/out to the suburbs. I'd love to ride my bike to work from Murarrie but there is no safe way to get my bike in.
Bicentennial	1-2 days a week	Every fortnight	As I mentioned in the survey that commuters on foot were asked to relocate from the Queensland Rail Toowong commuter park as there had been complaints from train commuters that we were taking up the parks. There are no other places available to park in this area so I will not be continuing to walk to work and do recreational activity on this path. I may try west end to the city but a lot of this path is shared and I hear quite dangerous with the amount and speed of the cyclists. Many thanks
Bicentennial	1-2 days a week	Never	It is great to see so many walking and bike paths provided in the last 20 years!
Bicentennial	Every fortnight	Almost everyday	When I appreciate all efforts to create new walking and cycle ways, and putting cycle lanes onto roads etc, the most important thing is SEPARATED pathways like bicentennial bikeway and Riverwalk - that is what will make my currently scared/nervous/sceptical friends (especially female) get out and walk, run or ride more. This is especially true for outer suburbs where infrastructure is currently poor (e.g. as good as bicentennial bikeway is, it's important that there be good, safe, separated connections to it from suburbs further to the west). Thinking to the future, in terms of the layout of our city, the health of our population, the financial burden of disease, the environment etc, it is so important that whenever a road is created or upgraded, a separated cycle-way is included. Only where this isn't possible, clearly marked cycle lanes are the next best option.
Bicentennial	Every fortnight	3-4 days a week	Public toilets on the pathway between North Quay and Regatta would be great.
Bicentennial	Every fortnight	3-4 days a week	I greatly appreciate the improvements to Brisbane cycle paths, and the painting of cycle paths on the side of the roads. Thanks. (Is there any way to replant some riverside mangroves though?)

Bikeway	Bicycle	Walk	Comments
Bicentennial	Every fortnight	Once a month	The Bicentennial Bikeway is great. If the connections at either end were improved (e.g. Benson St bikeway/footpath is unpleasant and bumpy/narrow) then many more people would choose to ride a bike or walk for getting about. Getting to this bikeway (in a reasonable amount of time) is often unpleasant, requires mixing with motor traffic, and feels unsafe.
Bicentennial	Every fortnight	Only once	Easy connections and the ability to keep moving at a 'normal' speed are key. If I have to get off my bike to cross a road, I might as well just ride with the traffic. Thanks for the bike path.
Bicentennial	Every fortnight	Never	We really need an upgrade to the section of path that goes from the Botanical Gardens onto the path along the river near Edward Street. It's really narrow and can be tricky to manoeuvre if anyone else (bike or pedestrian) is around.
Bicentennial	Every fortnight		Hi, thank you for the opportunity to fill in the survey. The bike paths are great and are what make Brisbane a truly works class city, I would be unhealthy without them. Please consider commuting routes and destinations (including touring destinations) when planning your bike lanes. As a working town planner, I notice that most of the requirements for bike lanes are based on a road hierarchy rather than obvious routes or need for the bike lane. Separate bike paths are the way to go to ensure safety and speed of travel. I am very lucky that my route (Jindalee to City) is well serviced with off road bike paths but more should be done to cover other major commuting routes. Disused railway paths are the perfect gradient to reuse as bike paths.
Bicentennial	Never	Several times a year	Thank you for the bike paths. I do not feel safe riding on the roads so the bike paths make it possible to ride. I especially love the bike path up centenary highway/western freeway and the bicentennial bike path. Please use my rates and taxes to build more bike paths!
Bicentennial		Almost everyday	Really enjoy walking in bushland. Please keep lots of bushland in Brisbane for recreation.
Bicentennial		Every weekday	There is no speed limit for bikes on the bike way - there should be a speed limit
Bicentennial		Every weekday	Thank you for running the survey, that paths are very important to me
Bicentennial	Several times a year	Once a month	Fabulous survey, help us to get more great shared pathways like beside Coronation Drive to encourage more healthy cycling
Bicentennial	Every fortnight	3-4 days a week	I love the bike track as I feel unsafe riding on roads or footpaths, due to the cars, pedestrians and cracks or glass on the ground. More bike tracks would be amazing! Maybe a bike track to connect the bicential bikeway and the centenary bikeway.
Biggera	3-4 days a week	Several times a year	The more paths that keep me out of the traffic the better however they are not as good an exercise as one cannot ride as hard as people use the paths for walking as well.

Bikeway	Bicycle	Walk	Comments
Biggera	1-2 days a week	Every fortnight	A few bins alongside Biggera Creek greenway would reduce littering (hopefully).
Brassall	1-2 days a week	Every weekday	When is the Brassall path going to be joined to the Riverlink path?
Brassall	Every fortnight	Once a month	I would like to see more upkeep of paths, frequently have to get rid of broken glass on bikeways. Sweep or brush glass off the path. Getting a flat tyre from a piece of broken glass can mean a long walk home pushing my bike. Also would like to see the use of Led bulbs in lighting on the paths.....more efficient
Brassall		Almost everyday	I really enjoy using the bikeway, I would use a bike on the path if I had not had young children. I would really like to see the path expanded to reach Riverlinks shopping centre as I would be able to walk the pram to it. I have attempted walking on the current paths but haven't used them again, I know if the bike path was expanded I would use it.
Enoggera Creek	Almost everyday	Several times a year	The best thing about the new bike way under Enoggera Rd is the safety, as it means I miss the intersection at Windsor/Enoggera Rd and do not have to ride down Bishop St.
Enoggera Creek	Every weekday	3-4 days a week	Thank you for building the underpass on Kelvin Grove road. I commute to work almost every day and I happily take a long route on the bike path network to avoid the traffic and riding on busy roads. The new underpass and the rest of the new path that will soon join it, makes cycling everyday far more enjoyable and safer. Thank you for your commitment to make Brisbane a bicycle friendly place.
Enoggera Creek	Every weekday	Several times a year	Love the new bike track. For me the biggest risk in commuting is being near cars. Any chance I can get to avoid car traffic I'll use.
Enoggera Creek	Every weekday	Several times a year	I ride from Everton Park to the city and Ashgrove to the city. There has been apt of great work done to improve the infrastructure. The big issue I see is the lack of courtesy from riders. A lot of riders do not ring their bell when overtaking. They overtake in the wrong place and at high speed. I see many close accidents weekly especially going from the inner city bypass past girls grammar. It would be good to see more signage on the paths indicating how to behave for pedestrians and cyclists. Under the South east freeway path need the new ferry terminal is also terrifying at times. Riders go too fast. You are sometimes too scared to exit on the ramps for fear of being rear ended. There needs to be somebody of painted sign on the floor that indicates a no overtaking zone. Kedron brook is becoming a really good path. Would love to see the last. It of path near the shaw park rugby fields fixed up. It is too narrow. Really like the bike tools at rom street. I think there needs to be more promotion of the bike routes. People believe there is too much traffic but coming from Everton park or Ashgrove there are plenty of quiet roads to use. All in all great job. That bypass under kelvin grove is great. It is 600

Bikeway	Bicycle	Walk	Comments
			metres longer than the Donaldson street lights but is no longer in time
Enoggera Creek	3-4 days a week	Several times a year	Thank you for building the upgrade to the Enoggera path, the more paths that are connected that go into and across the city, the easier, safer and faster it becomes to cycle as a mode of transport, giving Brisbane residents a real alternative to using a car.
Enoggera Creek	3-4 days a week	Several times a year	If it wasn't for this bike path, I would use another route. However if it wasn't for the network of paths which keep me off busy roads, I probably wouldn't ride at all.
Enoggera Creek	1-2 days a week	Every fortnight	Love the new Enoggera Ck extension. Water bubblers would be helpful.
Enoggera Creek	Several times a year	Several times a year	I cycle on the bikeways because ashgrove roads are not bike friendly. If there is connectivity I would go everywhere I could for variety and I am considering riding to work in the Valley (about 35mins at a leisurely ride. But that will mean a mountain style bike purchase due to debris. Keep building bikeways because they will come!
Enoggera Creek	Never	Several times a year	The new underpass will significantly increase our usage of the bike path
Gateway Schulz	Every weekday	Several times a year	I love the cycling - it's a nice way to get to work, and it keeps me healthy - but it's only an option if you work / live in the right areas. The network of dedicated separated bike lanes is far from complete - often it's only a small gap between good paths, but that gap is extremely dangerous. Some places I can't get to safely without competing with cars for the road. I don't feel safe doing that, so instead I drive. I would prefer to ride everywhere, and to not own a car - for personal well-being as well as financial and environmental reasons. Please continue to work on this, riding is the only way I get exercise, and it's fun :-)
Gateway Schulz	Every weekday	Never	I work and ride to the Airport precinct everyday and was a bit disappointed that this information was not captured by the survey. This bridge is a major link to the airport and prior to it's opening riding or walking to the airport was a major challenge.
Gateway Schulz	Every weekday	Never	The section of the bike path which runs under Nudgee Road and Southern Cross Way gets a lot of debris from the roads above. If this area could swept once every 14 days or when lawn mowing, maintenance etc is performed it would be greatly appreciated. Otherwise, it is a great path and all the paths I have used around this area have been great and mostly in very good condition.
Gateway Schulz	3-4 days a week	Every fortnight	The bikepath and bridge at Nundah is great, we need more of them in Brisbane
Gateway Schulz	3-4 days a week	Several times a year	The bike track between Mitchelton and the Domestic Airport is excellent and is used by many people for varying recreational pursuits. Thank you.

Bikeway	Bicycle	Walk	Comments
Gateway Schulz	3-4 days a week	Never	More bike paths and work with Motorists and cyclists about sharing the road is required. Bike paths need to be logistically improved. Often there are bikepaths that all of the sudden stop and go nowhere, leaving the cyclist perplexed as to how to proceed safely. More available information as to where the bike paths are would also be helpful. The young ladies conducting this survey were on the exit of the bikepath veering off to Nudgee Road. They will have missed a lot of people who were simply going straight ahead, not leaving the bikepath to go onto Nudgee Road (prime example of now having nowhere to go.... I now need to enter Nudgee Road, cross the busy intersection for the airport, and enter the bikepath I've just discovered just in front of the railway line, which suddenly drops you off onto a busy road, with no safe way to make it to Kingsford Smith drive, then onto the Gateway bridge bike path). I suppose safe cycling on roads is another department, so thank you for funding this survey. It would be great to provide further safe riding options (paths) for our community.
Gateway Schulz	Every fortnight	Once a month	I use the pedestrian bridge because it is safer than the road bridge which is narrow and has heavy traffic. Having the bridge link to the bikeway which follows the train line is great as I work near the DFO precinct and the commute is very nice.
Gateway Schulz	Every fortnight	Several times a year	Bike paths are a valuable asset to Brisbane and influence our decision as to where we want to live.
Gateway Schulz	Every fortnight	Several times a year	The bridge is a great piece of infrastructure. However, I think you would increase the usage of the bridge if access to the bridge was improved from Nudgee Road. Particularly heading southbound from Toombul Road side (Northern End)
Gateway Schulz	Every fortnight	Only once	Please increase the cycle way to Kingsford Smith Dr. please also make a safer wider cycle way from Racecourse Rd to the ICB.
Gateway Schulz	Once a month	Several times a year	I have been more interested in running than bike riding, however as there seems to be more bikeways being built, and better connection between the bikeways, riding is becoming a really good option. I would really like to be able to ride to the city occasionally, however at the moment this involves riding on the roadways, which does not interest me due to safety concerns.
KBB Bradshaw	Almost everyday	Only once	There are a number of things that might easily be performed to improve the riding safety and participation: 1. Debris, particularly after storms - including dirt, stones, leaves and sticks, needs to be removed by a form or pathway cleaning - similar to road sweeping. 2. Pedestrian awareness of bikes - particularly on the narrow stretches of the path, pedestrians tend not to be aware of bikes - even after audible alerts. Signage might assist with making the use of the paths more enjoyable. 3. Where paths run parallel to the road and intersect with driveways (particularly on Shaw road, on the

Bikeway	Bicycle	Walk	Comments
			entrance to the sports fields), rider and pedestrian safety could be improved by dividing the path (pedestrian/ bikes) and by colour coding the driveway section of the path - so cars giveaway to path users and do not block it. This is a particularly dangerous section at certain time of day, when the field is in high use. 4. The yellow banana shaped poles that restrict non-pedestrian and non-bike traffic are dangerous, particularly where a dual direction path has narrows traffic from two opposing directions. These seem to be everywhere, but are a bureaucrat's solution that create significant danger to users.
KBB Bradshaw	Almost everyday		I ride to work for fitness, convenience and the environment. The survey made me report this separately
KBB Bradshaw	Every weekday	Once a month	Department of Transport and Main Roads should consider using Strava Data to map out information from joggers and cyclists. Also I would highly recommend DTMR instruct construction workers to keep bicycle paths as straight as possible. Often bike lanes bend, twist & turn (by their design) for no apparent reason. The focus of bicycle path infrastructure should be speed if cycling is to be taken as a serious, realistic alternative to driving a car.
KBB Bradshaw	Every weekday	Several times a year	Cannot stress enough the importance of protected separate bike lanes on our roads.
KBB Bradshaw	Every weekday	Several times a year	Great job for this bikeway. Congratulations.
KBB Bradshaw	3-4 days a week	Once a month	additions to paths could include water fountains and toilets
KBB Bradshaw	1-2 days a week	Every weekday	It is great to have the separate paths for bikes and walkers. However where this is not possible I think it would be safer if all the walkers were on one side and all the bikes were on another. ie maintaining the same position on the bike path. I haven't done exact measurements but think the amount of lane available would be the same - it would just have to be marked with symbols rather than having a grass strip in between. What happens now is that the walkers have to cross the line of bike traffic and then cross back again.
KBB Bradshaw	Every fortnight	Once a month	The path improvements, separating bike riders and pedestrians have been a huge improvement for everyone. On a pleasant evening, I often see huge numbers of people out in the outdoors enjoying walking and riding and just getting outside and being physically active.
KBB Bradshaw	Once a month	Several times a year	Make bikeways to schools, so kids are able to walk or bike to school (much better than by car)
KBB Bradshaw	Several times a year	Several times a year	Bike lanes cannot be in the door zone of parked cars. WHO did this? WHY? Bike tracks work because parked cars are not on them. Bike tracks don't work when they are not connected to places people want to go. Why are people allowed to store

Bikeway	Bicycle	Walk	Comments
			their cars on the road? Parking should be limited and nowhere near bike lanes.
KBB Bradshaw		Every weekday	You need to make a site/page that is easy to google, not an address that has to be typed in and is case-sensitive! If you want people to do a survey, make it as easy as possible to find. I googled three things and then had to type the address in twice. Most people would give up.
KBB Bradshaw		Every fortnight	It's been a long time since I road on the KBB. As a runner/walker, I've seen the improvements that have been made over the last couple years. The separation of pedestrian and cycle traffic is a huge improvement. It's safer for pedestrians and also for cyclists. The widening of the cycle path has made the path more practical, as well. I'm pleased to see that lighting has been introduced. As a former commuter cyclist, I can definitely see the value in these changes. I'm very happy with the improvements.
KBB Kalinga	Almost everyday	Never	The lads conducting the on track survey were very pleasant and friendly.
KBB Kalinga	Every weekday	3-4 days a week	Brisbane NEEDS all the little bits of great bikeways joined together in a SAFE network. One look at peak hour single occupant vehicles will tell you that. If I wanted to ride to the city from Lutwyche with my family, they would not be interested as a continuous SAFE corridor does not exist. Stop wasting money on stupid tunnels and start spending it on bikeways to get this city fit.
KBB Kalinga	Every weekday	Once a month	I would like to recognise DMRs excellence in project management and consideration for your Customers. By keeping the existing bike/footbridge open, (1st bridge east of Shaw Rd) I can still enjoy my daily commute to and from work. I understand it is less than ideal for the construction contractor and they are doing a great job managing site access and safety. Well done DMR and your Contractor.
KBB Kalinga	1-2 days a week	3-4 days a week	Improvements to the walking and cycling paths have improved safety for pedestrians. As a member of a fitness group where one participant was seriously injured by a bike travelling too fast on the shared path, I am now very wary of cyclists. The single use paths are excellent and increase useability of the park and paths greatly. Speed limits/signage for cyclists would probably be a good addition.
KBB Kalinga	1-2 days a week	3-4 days a week	Please arrange for additional signage or other means to STOP bike riders using the walking path.
KBB Kalinga	1-2 days a week	Every fortnight	My survey responses are based on the section of park east of Shaw Road. I would like to thank you for keeping Kalinga park so beautiful. I enjoy the park because it is so tranquil and is good for the psyche. The thinning out of the trees has opened up the park and made the paths safe to walk alone. The exercise equipment provided in Kalinga Park is such a bonus and I thank you. Although I don't have a dog, the dog area is a nice idea. In recent times, an effort has been made to separate pedestrians from cyclists. This is a good idea and

Bikeway	Bicycle	Walk	Comments
			makes walking more pleasant as one is not constantly on the lookout for bikes. It is a pity that some cyclists still insist on using paths that are for walking only. Would it be possible to separate pedestrians from cyclists on the path along the river between the railway line and Toombul Shopping Centre please (Kedron Brook Bikeway)? Overall the layout of the park is well thought out and kept neat and tidy and thank you.
KBB Kalinga	Every fortnight	Every weekday	I love the bike and walking paths. My wish list would be for both cycling and walking paths separated. The bike path from Shaw Road (Wavell Heights) to the back of the Emergency Services building (Kedron) would be my priority for the double paths as this is a high use area and would join onto the newly made double paths. It becomes quite dangerous when you have experienced cyclists, people walking and dogs on leads jostling to use the path.
KBB Kalinga	Every fortnight	Every fortnight	Normal exercise bike ride is out and back to Nudgee Beach. If Morton Bikeway was connected through Trade Coast, Schneider Rd to airport DFO and Border Protection locality, huge increase in fitness use, from North to South and vice versa. Redcliffe to Wellington Point sort of links and journeys. Not enough connection on bike paths, not really safe for many to get into the CBD from the North. I can do it, but many would not due to lack of off road, connected bike paths. New infrastructure appears to be hugely over engineered, like the bike bridge across Schultz Canal at Nudgee Road. Enough steel in balustrades to build another two bridges. New bridges around Airport tunnel works three years ago are poorly designed, with normal - could be planned for flood water immediately destroying footings. Wasted money, foregone from building further bike paths. New paths around Bristol road parks are a complete waste of money. Poorly designed, sharp corners, not appropriate for bike riders. IMPORTANTLY not necessary at all, because the streets are all so quiet. This should not have been on the priority list. Same as the two new bridges for KBB in Kalinga Park and Shaw parks, near Shaw Rd. The Shaw Rd crossing for KBB is a much higher priority, and would get more people using the total path if was controlled or separated from traffic.
KBB Kalinga	Once a month	Every weekday	A pedestrian crossing with lights at Shaw Road would make the pathway safer, as Shaw Road is very busy in peak times, and children cross Shaw Road on their bikes, as do many commuters and leisure walkers and riders.
KBB Kalinga	Once a month	Once a month	I have answered this survey to the best of my ability but to be honest my main feedback about cycling and walking infrastructure is philosophical, rather than statistical. I feel like the increase in cycling infrastructure has been inspired by “road rage” between motorists and cyclists. Cyclists have been forced to ride off roads, however this hasn't really fixed anything, because now there is "bike path rage" between cyclists and pedestrians. I can see that providing what I call

Bikeway	Bicycle	Walk	Comments
			"unshared" paths (ie, separated paths for cyclists and pedestrians) may make it seem like something is being done to fix this angst. However I feel that instead, it is making this, and other societal problems, worse. Cyclists and pedestrians aren't learning to share infrastructure; just like motorists and cyclists have not. The government is seeking solutions to bullying, one punch attacks, domestic violence, and radicalisation. At the heart of these issues, in my opinion, is a lack of respect, compassion, and consideration for others; which I feel over time leads to low sense of self worth, belonging, and self esteem. And yet, the government is at the same time building physical infrastructure which inherently devalues consideration and respect for others. It just doesn't make sense to me for the government to support the "me" mentality through the construction of "unshared" bike and pedestrian paths. I am aware that all of this might seem like a long bow, and the easy (and perhaps logical) reaction will be to chuck this response in the bin and write me off as a loopy. I get that. But I am very serious and would very much like you to consider my feedback seriously. I would also like to add that your staff member who conducted the survey with me this morning was incredibly patient and gracious in listening to this feedback. Hats off to him.
KBB Kalinga	Several times a year	Several times a year	I love all the recent new bike paths, bike path upgrades and safer/better connections around Red Hill and the northern suburbs! Signage, or the lack of it, is still a bit of a problem though. It would be good to have riders submit the spots were signing is inadequate/misleading and a survey like this would be a great tool for that.
KBB Kalinga	Only once	3-4 days a week	Some of the pathways have subsided and become flooded after rain and impassable. Even the ground either side is deep in water so you get wet feet. Sections near the duck ponds near Murray Duus park are particularly bad. Drainage needs to run under the path to take water to the creek. I would like to see structures installed to capture rubbish at certain points to stop it flowing downstream. There is a lot of wildlife and we need to protect it.
North Brisbane	Almost everyday	Several times a year	My commute between Chermside and the City would be greatly improved by a better cycling link between the Inner Northern Bikeway and the Kedron Brook Bikeway. Currently, the alternatives rely on traffic and/or truck heavy roadways with insufficient space for bikes
North Brisbane	Almost everyday	Several times a year	I commute by bicycle into the city almost every day. I have only recently started using the new path near the RNA. Before it was built, I rode into the city via Newstead and New Farm. Going via the RNA path adds about 1km to my trip. However, it is safer, nicer and it takes me about the same time. I am very much looking forward to the planned improvements to the North Brisbane Bikeway to the north of the RNA path. According to your plans, within 3 years, I will be able to ride a segregated bike path all the way from near

Bikeway	Bicycle	Walk	Comments
			Wooloowin train station into the city. This will make my commute even more convenient - safer, faster and more pleasant. I strongly encourage that you look at more segregated bike paths within the City. The lanes in George Street are very good, but I believe that they could be extend further down George Street. The north side of George Street From Turbot to Queen Street has exceptionally wide footpaths. I believe that it would be relatively simple and cheap to convert some of that width into bike lanes and extend the bike paths that far.
North Brisbane	Almost everyday	Several times a year	The new bike path near the RNA showgrounds is fantastic. One improvement would be to connect it to the bike path under the freeways through to Albion. The path just ends and it is quite difficult to get through to the path to Albion.
North Brisbane	Almost everyday	Several times a year	My partner does not feel safe riding on roads. Bikeways and shared pathways are important for getting people riding who don't feel confident on the road.
North Brisbane	Almost everyday	Several times a year	I find the surveyed section of bike path (the Ekka Ride) useful, but it is only 500 metres out of 10 kilometres of very mixed or non-existent bicycle infrastructure. It will be much more useful once there is a safe, direct bike connection south from the Ekka Ride to Brisbane City, and to the north reaching Kedron Brook and beyond. It is important that the work to fix the Albion-Wooloowin Death Corridor includes a safe, separated, convenient path to replace the dangerous door zone along Dickson Street. Pictures of bicycles painted under parked cars are not bicycle infrastructure.
North Brisbane	Almost everyday	Several times a year	This bike-way path is a little indirect, but I use it as it is much safer. The connecting bike-way through Bowen Park is inaccessible due to a set of steps, please replace the steps with a ramp for safer connectivity to the North Brisbane Bike-way.
North Brisbane	Almost everyday	Several times a year	I use my commute to increase my health. I appreciate the beauty of Southbank (& sometimes the centennial bikeway) during my trips - it is quite calming. I just need better access along Old Cleveland road (the bike-lane stops and starts).
North Brisbane	Almost everyday	Several times a year	I don’t use the bike path where it goes alongside the Breakfast creek because there are midges there that bite me. I don’t know how they do it when I am riding at speed, but everytime I get 1 or 2 bites, so I just have to use the footpath on Lutwyche road. Some of the bus stops there impede the footpath too much and people waiting there can cut off the whole footpath sometimes.
North Brisbane	Almost everyday	Only once	The underpass opens up new opportunities to get to the city. Bowen Bridge Road was a huge barrier. The connection at Roma Street needs to be done and there is no connection towards other parts of the city.
North Brisbane	Every weekday	3-4 days a week	The bike path under Gympie Road is brilliant. It got me back into cycling to work, which in turn got me back into cycling for

Bikeway	Bicycle	Walk	Comments
			fitness. This, in turn, got me back into doing all sorts of other things for fitness. It's such a great piece of infrastructure!
North Brisbane	3-4 days a week	Several times a year	Commuting cyclists will always find it difficult to choose a longer route over a shorter route. I'd like to see more connections for cyclists to have safe passage out of the CBD and out of the Valley. The 40km speed limit has certainly helped, although my biggest fear are bus drivers who also compete for left hand lane, particularly on Queen St between Ann and Boundary Street. Unfortunately, the impact of mobile phones is diminishing driver's attention as well.
North Brisbane	3-4 days a week	Several times a year	The bikeway / pedestrian path at Herston (from Gilchrist Ave, under Bowen Bridge Rd to the RNA Showgrounds (where I was interviewed) is a very safe and direct route that has made riding to Nudgee Beach / Northern suburbs from the city much easier and more desirable. It has provides a (previously missing) link that allows cyclists to avoid travelling on crowded and busy roads / intersections. The bike path through Bowen Park to the Nth Brisbane bikeway isn't clearly marked and puts cyclists and pedestrians in close proximity to each other. The development of a bike path through Bowen Park that separates cyclists from pedestrians, especially at the bus stop on Bowen Bridge Road, would make the route even safer. Thank you for this safe and efficient route that allows easier transit at Herston - some cyclists avoided travelling to the North Brisbane Bikeway because of the danger of travelling along Bowen Bridge Road)and for the opportunity to complete this survey.
North Brisbane	3-4 days a week	Several times a year	I think the bikeway under Bowen Bridge Road is excellent in that it makes the trip safer, less interrupted and more pleasant.
North Brisbane	3-4 days a week	Several times a year	The path makes a huge difference to my intention to ride to work. It actually got me back on my bike! It is so convenient and smooth. Public transport is too expensive. I'm currently in the process of investing in an electric conversion kit so that I can ride to and from work every day with a bit more ease. Will contribute to reduced congestion, less wear and tear of car etc, reduction cost. I am very lucky that I have access to paths 95% of my commute, otherwise I wouldn't risk my life on the roads. The only recommendation I would make in relation to new pathway is at the set of lights intersecting the northern busway and Gilchrist Ave. If the green bicycle man could be green by default (and then obviously change when buses and cars trigger the lights), then that would be great. Many thanks for a great job on the new section, it's amazing!!
North Brisbane	Every fortnight	3-4 days a week	Note: I have included my commute to work by bicycle as a recreation/exercise activity and not to get from one place to another. The reason I ride to work is for recreation/exercise. This survey does not allow for this as an option and I know many people who ride to and from work for this reason.

Bikeway	Bicycle	Walk	Comments
North Brisbane	Every fortnight	Several times a year	I'm really looking forward to the extension of the bikeway through Bowen Park (to my destination, the RBWH Cycle Centre), as going along the footpath on the eastern side of Bowen Bridge Road past Bowen Park is incredibly dangerous, especially when another cyclist or pedestrian is travelling south on the footpath, with the risk of falling into the oncoming traffic on Bowen Bridge Road. The new tunnel under Bowen Bridge Road is an excellent improvement, even though it takes me to the wrong side of Bowen Bridge Road.
North Brisbane	Several times a year	Several times a year	The reason I use NBB Stage 1A Section 1 is that it is safer than riding on Bowen Bridge Road and Gregory Terrace. It is quicker as I do not have to wait to cross multiple pedestrian crossings. It would be used by more people if the other stages of the NBB were completed. The delay in building Stage 1a Section 2 reduces the benefit of Section 1 as there is no proper northern connector. The lack of safe bikeways further north in Albion and Wooloowin is a major disincentive to people commuting by bike who would then use Stage 1A to reach the CBD.
Veloway 1	Every fortnight	Several times a year	Love the new bike paths compared to what was previously available, 500% better. The concrete surfaces are not as smooth as they seem though, with every join there is high point and between joins are low - it can make for a bumpy ride. In some places; bottom of the hill at Griffith Uni especially the path has lifted and cracked making the path extra bumpy and not great for bicycle maintenance and rider safety. Keep up the good work.
Veloway 1	Once a month	Every weekday	I use the walking path mainly to walk the dog and for fitness for myself. I find a lot of the bike riders who use this path go extremely fast and do not let you know that they are coming. That is they do not ring their bell or say coming through etc. The children that use the path are much more polite and if their bike does not have a bell they will say "coming through". It seems as though the children as a lot more polite than the adult "serious" bike riders. The path needs to be speed controlled for the bike riders as they could cause some serious injuries.
Veloway 1	Several times a year	Several times a year	Thank you gathering this information about recreation habits. It would be great to share the results with people living in the local area, maybe via local councillor?
Veloway 1	Never	Every weekday	if there was a way to not have so many cyclists on the path that is used for pedestrians... that would be good. having cyclists ding their bells and scare pedestrians isn't good advice. please put up signs that don't include this direction. or remove the signs completely.