

Yarra LAAP Evaluation - Pedestrians and Cyclists

BEFORE AND AFTER REPORT



EVALUATION OF JOHNSTON STREET/NAPIER STREET INTERSECTION TREATMENTS

- V4
- 19 November 2009



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Executive summary

This work investigated the effect of signalling the intersection of Napier Street and Johnston Street in Fitzroy. Napier Street is a popular north-south cycling route and the mix of surrounding land uses also makes it a busy pedestrian area.

Previously the Napier Street approaches were controlled by stop signs. There was a pedestrian operated crossing of Johnston Street just east of Napier Street. These treatments were replaced by intersection traffic signals which included special arrangements for cyclists on the Napier Street approaches. Details of these changes are shown in Chapter 1 of this report.

SKM conducted before and after surveys at the intersection, with video, intercept and online (conducted by Bicycle Victoria) surveys carried out. The before surveys were carried out in mid March and the after surveys were conducted in mid July, approximately one month after the signals became operational.

Main findings

The main findings from this work were:

- There was a decrease in the absolute number of cyclists at the intersection by 6%. However, given the seasonal trends on comparable routes where cyclist volumes have typically reduced by 30-40% between March (time of before survey) and July (time of after survey), this may actually represent a seasonal increase in cycling at the intersection.
- Although the average cyclist delay in crossing Johnston Street was increased after signalisation (from 24 seconds to 28 seconds), there was an increase in the number of cyclists experiencing no delay (increased by 2% from 26% to 28%) and a decrease in maximum waiting time (reduced by 30 seconds from 112 seconds to 82 seconds).
- Despite the signage that was installed directing cyclists to 'push button for green signal', 5% of those interviewed did not know there was a cyclist push button.
- There was overwhelming approval for the signalisation from the cyclists interviewed. All responses to the intercept surveys were either in favour of the signalisation or neutral, with 98% of cyclists reporting the intersection was better than previously and 98% believing the intersection was safer. The online surveys recorded similar approval levels.
- There was a reduction in the number of conflicts involving pedestrians and/or cyclists at this intersection following signalisation. There were 37 'conflicts'¹ observed prior to signalisation

¹ We defined a conflict as a situation where a vehicle, cyclist or pedestrian altered their behaviour due to the presence of another user (i.e. vehicle turning in front of a through cyclist which forced the cyclist to stop or slow).



and only 16 afterwards. More importantly was the clear priority provided by the new signals to assist cyclists, pedestrians and vehicles through the intersection in a much more orderly manner. The 'Keep Clear' marking on the Johnston Street pavement was removed when the intersection signals were introduced. This reduced the number of times one lane of vehicles was queued in Johnston Street while the other was moving. This had previously made it tricky for some pedestrians and cyclists to judge when it was safe to cross and obscured visibility. After the signals were installed, there was also a significant reduction in the number of pedestrians and cyclists observed propping in the middle of Johnston Street, which could be very dangerous. Early starts were provided for cyclists and pedestrians and contributed to the reduction in conflicts at the intersection.

- The overall increase in motorised traffic entering or leaving the intersection from or to Napier Street was 30%. The majority of these additional vehicles used the intersection during the day, with a 17% increase in traffic during the AM period, 56% increase around lunch time and 25% increase during the PM period. We believe that this was quite a modest increase for signalling a side street intersection with a major arterial road.
- Issues experienced after signalisation were almost exclusively the cyclist reassurance light not working.
- Cyclists would like to see more similar signals at other crossings of arterial roads. In particular, four cyclists would like to see a similar treatment at the intersection of Napier Street and Gertrude Street (next major intersection to the south). This intersection is the same in layout at the Napier Street/Johnston Street intersection before it was signalised (with a pedestrian crossing immediately to the east of Napier Street).
- Cyclists would like more grab rails installed for queued cyclists (during the peak periods, there was often more than one cyclist observed waiting at the intersection each cycle).

Unexpected Findings

Some unexpected observations were also made from the video survey after signalisation:

- There was a 35% increase in pedestrians crossing Johnson Street at the intersection after it was signalised. This was quite significant and the large increase was an unexpected result of the signalisation. The intersection is now more pedestrian friendly in all directions, with clear pedestrian routes (crosswalks). In the north-south direction, pedestrians no longer have to wait for a gap in the traffic and pedestrians on the west side do not have to cross to the east side to use a crossing. In the east-west direction, there are new traffic islands which provide refuge for pedestrians and reduce the crossing task, as well as an automatic 'green man' display.
- Some east bound drivers were observed stopping at the far side pedestrian crosswalk (i.e. in the middle of the intersection). This is possibly because they were used to looking for pedestrian operated signals here.



- Drivers were observed turning left from the bicycle lane in the Napier Street south of Johnston Street (only observed once during filming and once during interviews), treating it as a slip lane (stop sign still installed). Once bicycle symbols/green tarmac are installed, this may help with conspicuity of the bicycle lane.
- Anecdotal evidence suggesting an increase in child cyclists at the intersection

Overall Conclusion

We conclude from these studies that the signalisation of the intersection has been successful, with cyclist approval and improved priority, and likely safety.



1. Introduction

This report describes an evaluation of the signalisation of the intersection of Napier Street and Johnston Street in Brunswick. The City of Yarra received funding to evaluate the new signals which were designed and installed under the same funding scheme through VicRoads. This evaluation seeks to understand what effect changes in infrastructure had on walking and cycling behaviour and changes to the perceptions of these groups.

Napier Street is a popular north-south cycling route and the mix of surrounding land uses (retail, residential, educational, transport, green space and hospitals) also makes it a busy pedestrian area.

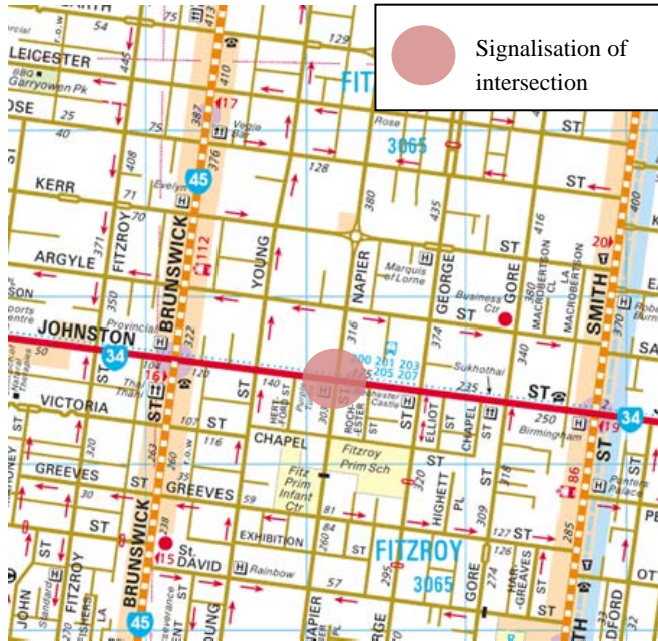
1.1. Location

Improvements were made at the intersection of Napier Street and Johnston Street, as shown in Figure 1. The nearby pedestrian/cyclist crossing was decommissioned and the intersection was signalised. However the new signals are special in that they prioritise calls from pedestrians and cyclists rather than vehicles (similar to *Vancouver style*² signals). In the 'after' situation cyclists had a designated 'call button' which did not require them to go out of their way to place a call. The cyclist button is shown in Figure 2. The signals can detect vehicles, bicycles and pedestrians separately, and each type of user is provided with a separate signal. This means the pedestrians and cyclists crossing Johnston Street can be given a green signal before the parallel traffic phase (called an early start).

² *Vancouver style signals* are intersections that are half signalised (i.e. only the main road approaches face signals) and are very common in Vancouver.



■ **Figure 1 Location of intersection signalisation**



Base map source: Melway Edition 32

■ **Figure 2 Cyclist call button (looking north)**





2. Methodology

We have concentrated on changes to walking and cycling numbers; cyclist delays; perceived safety; and pedestrian, cyclist and driver interactions.

Three different types of surveys were carried out in evaluating these changes:

- Video surveys of the intersection – both before and after the changes
- Intercept surveys where cyclists were interviewed at the kerbside – after the changes
- Online surveys conducted by Bicycle Victoria – both before and after the changes

Each of these is described in more detail in the following sections.

Given the number of factors that affect user route choice and mode, we chose to conduct the ‘after’ surveys about a month after the signalisation rather than one year after the ‘before’ surveys. This way cyclists and pedestrians had a much greater chance of having experienced the ‘before’ conditions and the ‘before’ conditions were much clearer in their memories than a year later. Importantly, a shorter time frame meant the same personnel that were involved in the before surveys were also involved in the after surveys – both at the client and the consultant’s end. This ensured higher efficiency and reduced the chance of inconsistencies in the way the before and after surveys were undertaken. If the after survey was to be conducted one year after the before survey, there would still be variations in the base data. We would expect if nothing was done that the number of cyclists at the intersection would have increased anyway, in line with the year on year increase in cycling that Melbourne is seeing.

2.1. Video surveys

Observations were made using video surveys from which volumes and directions of users could be established, along with behaviour and interactions between users. Video was taken both before the signals were installed and following the changes, with the date and time of each shown in Table 1. The intersection was filmed over two different days both before and after the changes.



- **Table 1 Time of before and after video surveys, maximum Melbourne temperature, cloud cover and rainfall**

Before videos		After videos		
Tuesday 10/03/09 7-9am, 12-2pm, 4-6pm	Monday 16/03/09 7-9am, 12-2pm, 4-6pm ³	Thurs 16/07/09 12-2pm	Fri 17/07/09 7-9am, 12-2pm, 4-6pm	Tuesday 21/07/09 7-9am, 4-6pm
26 deg, overcast, dry	22 deg, cloudy/ overcast, dry	15 deg, clear, dry	15 deg, clear, dry	20 deg, clear/ overcast, dry

The entire intersection of Napier Street and Johnston Street was filmed in each instance, including the adjacent pedestrian crossing. Only cyclists who crossed Johnston Street or turned into/out of Napier Street were recorded on video playback. Therefore cyclists (and others) travelling *along* Johnston Street were not included in the analysis. Pedestrians were only recorded if they crossed Johnston Street (either at the intersection or at the pedestrian crossing).

A pilot video survey was conducted on the morning of Friday 27th February 2009 to determine available locations and angles for filming..

Walking and cycling volumes

We recorded the number and direction of cyclists and pedestrians at the intersection for six hours over each of the two days (i.e. 12 hours = 2 x 2 hour AM period, 2 x 2 hour lunch period and 2 x 2 hour PM period).

The way in which cyclists and pedestrians crossed Johnston Street (i.e. at crossing, at Napier St, dismounted (cyclists only)) was also observed.

Cyclist delays

The major vehicular traffic route at this intersection is east-west, which conflicts with the major north-south route for cyclists. The delay experienced by a random sample of one third of cyclists crossing Johnston Street was determined over one day both before and after the signal installation. This enabled us to quantify the change in delay to cyclists following installation of the signals.

Pedestrian, cyclist and driver interactions

Conflicts between users were observed to indicate of potential safety implications. A ‘conflict’ was defined as a situation where a vehicle, cyclist or pedestrian altered their behaviour due to the presence of one of these other users (i.e. vehicle turning in front of a through cyclist which forced

³ Note that although the video was recording for this period, the footage was corrupted for 20 minutes of the 12-2pm period as well as 20 minutes of the 4-6pm period. Therefore we were unable to observe the intersection for the whole of these periods.



the cyclist to stop/slow). Only conflicts involving pedestrians and/or cyclists were monitored, with the number and type of conflict considered, as well as who legally had priority.

2.2. Intercept surveys

To gauge cyclists' opinions of the intersection signalisation, we compiled an intercept survey in consultation with The City of Yarra and Department of Transport. A pilot survey was conducted on the morning of Wednesday 15th July 2009 to trial the survey. This found that the original survey (consisting of nine questions) was too long for cyclists to answer in the time available in one light cycle. Therefore we reduced the number of questions to six and the final intercept survey is shown in Appendix A.

The intercept surveys were conducted over the morning of Tuesday 21st July and the afternoon of the following Tuesday 28th July. The first cyclist to arrive during a red signal was interviewed, providing a 'random' sample. It also enabled the maximum time in which to conduct the interview before the Napier Street signal turned green.

2.3. Online surveys

Bicycle Victoria (BV) also carried out a parallel online survey asking cyclists who used the Napier Street route about the Napier Street/Johnston Street intersection both before and after signalisation. The before survey was available on the Bicycle Victoria website during March 2009. A link to the survey was sent to BV members, as well as being advertised online. 117 people responded to the 'before' online survey, from which some cyclist characteristics were determined. The survey questions and responses are shown in Appendix A. BV ran a second online survey in August 2009, approximately one month after the intersection was signalised. 84 respondents completed this 'after' survey.



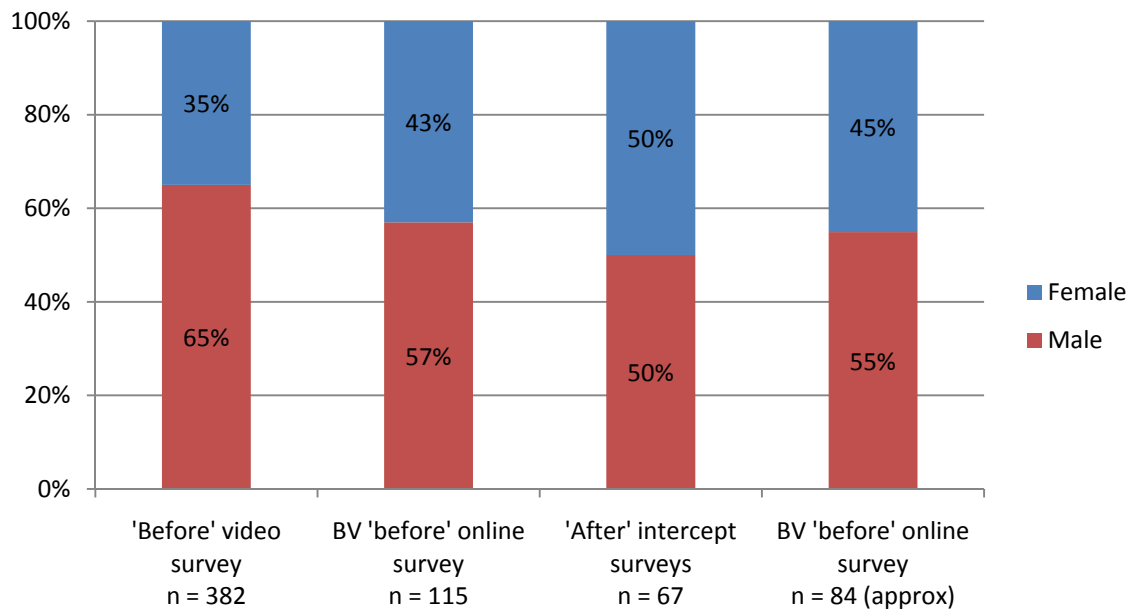
3. Results

3.1. Cyclist characteristics

There were a variety of cyclist ages, genders and bicycle types observed over the survey periods. The bicycle types observed included bicycles with kid trailers, recumbent tricycles, delivery tricycles and even one unicycle!

There was a reasonably even split of cyclist genders overall, with 61% of cyclists observed/responding being male and 39% female. Figure 3 shows that the gender splits observed during the various surveys were relatively consistent both before and after the signalisation.

■ **Figure 3 Gender split observed during each survey**



All respondents to both of the online surveys (before and after signalisation) were over 18 years of age, with the majority between 31 and 40 years old. The split in age groups from both the online survey and cyclist intercept survey (cyclist age was estimated by the interviewer) is shown in Table 2. The representation of ages and genders of those answering the online survey seemed to be typical of cyclists observed in the videos.

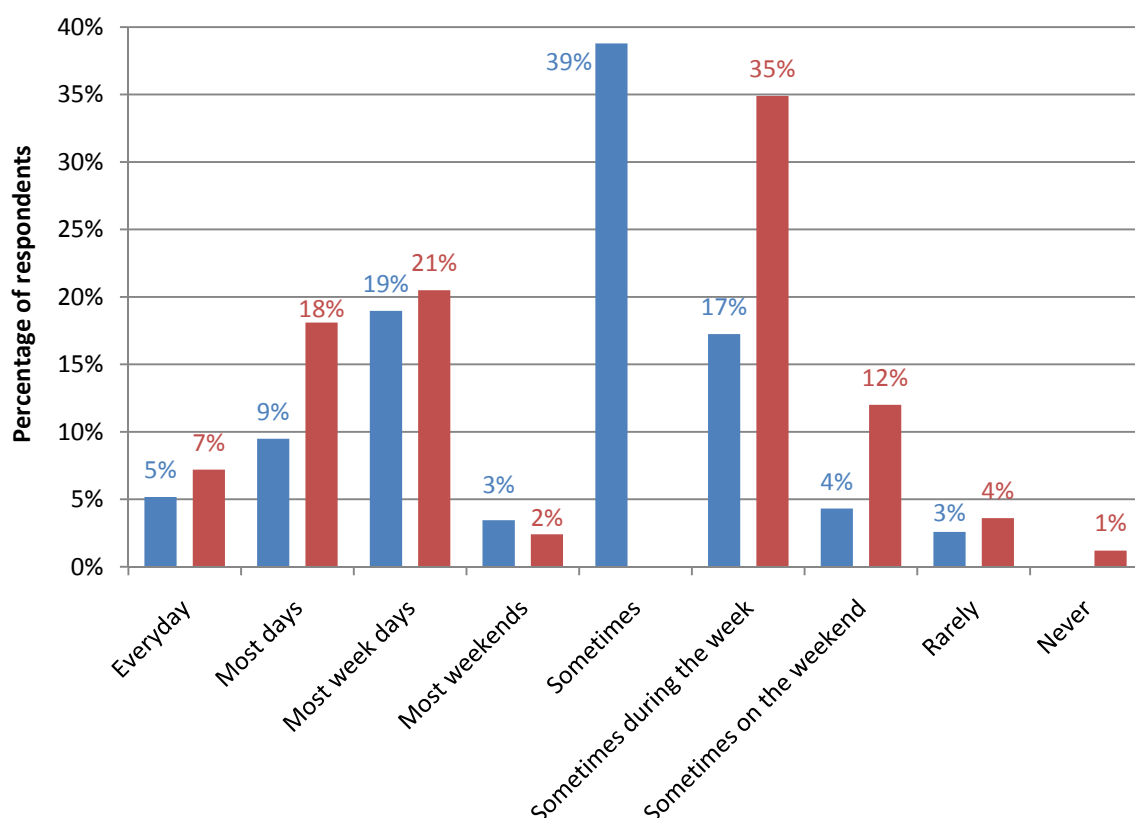


■ **Table 2 Percentage of respondents falling in each age group**

Age group		> 19	19 - 30	31 - 40	41 - 50	51+	Total number of respondents
Online survey	Before	0%	20%	36%	25%	19%	117
	After	0%	20%	33%	32%	15%	84 (approx) ⁴
Intercept survey (approximate age)	After	2%	40%	41%	10%	8%	67

The online survey asked cyclists “How often do you ride along Napier Street?” and found that the highest proportion of respondents ‘sometimes’ ride along Napier Street. The full breakdown is shown in Figure 4. Because of the change in available responses in the before and after surveys (the before survey did not have ‘never’ as an option and the after survey did not have ‘sometimes’ as an option), it is not possible to accurately determine from this if the online respondents were using the intersection more frequently as a result of the signalisation.

■ **Figure 4 Frequency at which respondents ride along Napier Street: Online survey**



⁴ 84 people completed to the online survey, however they were able to skip questions and we do not know how many of the 84 answered this question.



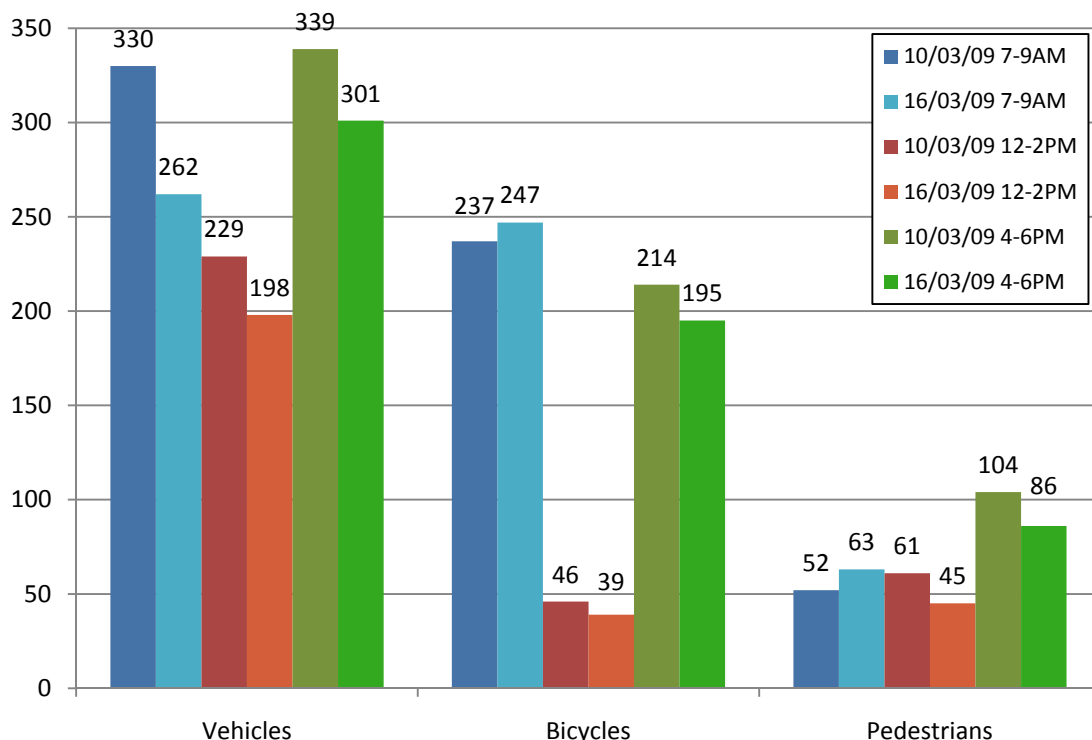
However, the online survey did ask people ‘Are you riding along Napier Street more often now that there are bicycle signals at Johnston Street?’ 56% of respondents indicated that they do ride more often as a result of the signalisation.

3.2. Walking and cycling volumes

User volumes before signalisation

Cyclist and pedestrian numbers before installation of the signals are shown in Figure 5 and Figure 6. Vehicle volumes have also been included because there was a concern that Napier Street could become a ‘rat-run’ as a result of the signalisation.

■ **Figure 5 Vehicle, cyclist and pedestrian volumes before installation of the signals (all movements except through on Johnston St)⁵**



⁵ Recall from Section 2.1 that on 16/03/09, the video footage was corrupted for 20 minutes of the 12-2pm period as well as 20 minutes of the 4-6pm period. Therefore the counts recorded here underestimate the actual volumes (of all users). However given the short time frame before construction was to begin on the intersection and inclement weather, we were unable to conduct a third day of surveys.



Napier Street vehicles slightly outnumbered Napier Street cyclists at this intersection. As shown, the vehicle volumes were highest during the AM and PM periods and about 60% of these volumes during the day.

Cyclist volumes were highest in the AM period. This is probably because people going to work/study often have a predetermined arrival time compared to the way back, when people may leave at various times or do other activities afterward, in which case they were not observed at the intersection during the two hour PM period. Cyclist numbers significantly dropped off during the day.

Pedestrian volumes were reasonably constant in the morning and at lunch time, until the PM period when they significantly increased. There was an average of 206 pedestrians crossing in any direction at the intersection each day during the six hours of surveys.

There were drainage works being undertaken along the northwest side of Napier Street on the second day of filming (Monday 16/03/09) between 8am and 1:30pm. Due to the short time frame before construction was to begin on the intersection and inclement weather, this was the best available day to carry out the survey. However Figure 5 shows that cyclist numbers do not appear to have been affected, although vehicle volumes may possibly have been reduced as a result. The works may have increased pedestrian use of the signalised crossing.



- Figure 6 Cyclist, pedestrian and vehicle turning movements before installation of the signals (total number over 6 x 2 hour periods)

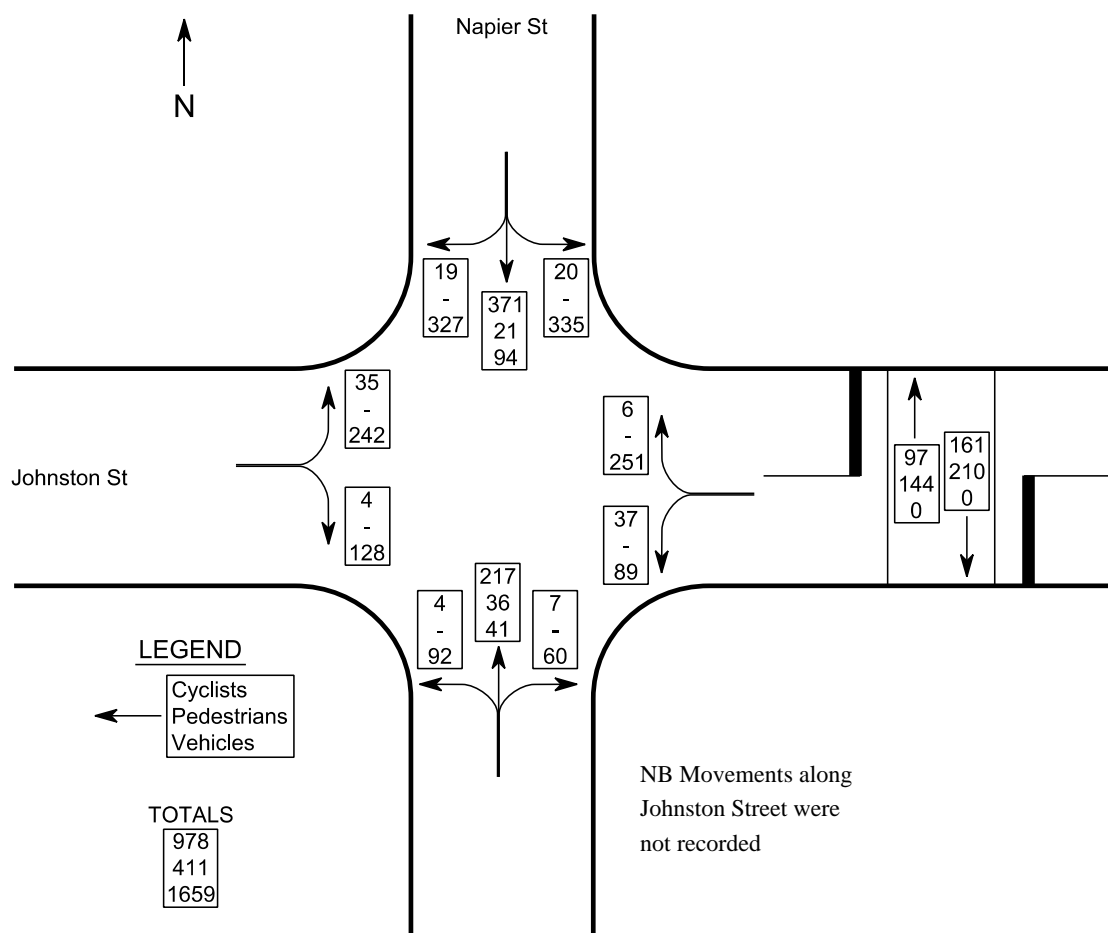


Figure 6 shows that the main cyclist movement was southbound along Napier Street (532 including those who crossed at the pedestrian crossing), followed by northbound along Napier Street (314 including those who crossed at the pedestrian crossing). The lower number of northbound cyclists suggests that some cyclists use a different route in this direction, possibly due to the difficulty in crossing Johnston Street (see Section 3.4 - Cyclist delays (p. 21)). Alternatively the afternoon peak may have been flatter resulting in more afternoon cyclists outside the 2 hours that were filmed. Slightly fewer cyclists were observed using the pedestrian crossing in the southbound direction (30%) than the northbound direction (31%). This was unexpected because northbound cyclists had to cross Napier Street twice to use the crossing. It was also in contrast to the results from the online survey, in which 30% of cyclists in the southbound direction reporting they generally ride over to the lights and push the button, compared to 22% in the northbound direction. Alternatively differences in the amount of traffic or its directional bias in Johnson Street between the morning and the afternoon peaks may have been a factor.



Of the 130 cyclists using the signalised crossing, only 6 cyclists – or 2% – were observed dismounting. Although the crossing had both pedestrian and cyclist displays, cyclists had to ride on the footpath to access the signals, which is technically not legal. There is some uncertainty as to the legality of cyclists riding across pedestrian crossings even when a green cyclist lantern is displayed. It is our understanding that the Victorian Road Rules will be amended in November 2009 to state cyclists must not ride across a pedestrian crossing *unless* a green cyclist lantern is displayed.

Some southbound cyclists who ‘used’ the pedestrian crossing to get across Johnston Street before the installation of the traffic signals would actually ride from the crossing straight across to Napier Street, as in Figure 7.

- **Figure 7 Southbound cyclists ride from the pedestrian crossing directly to Napier Street**

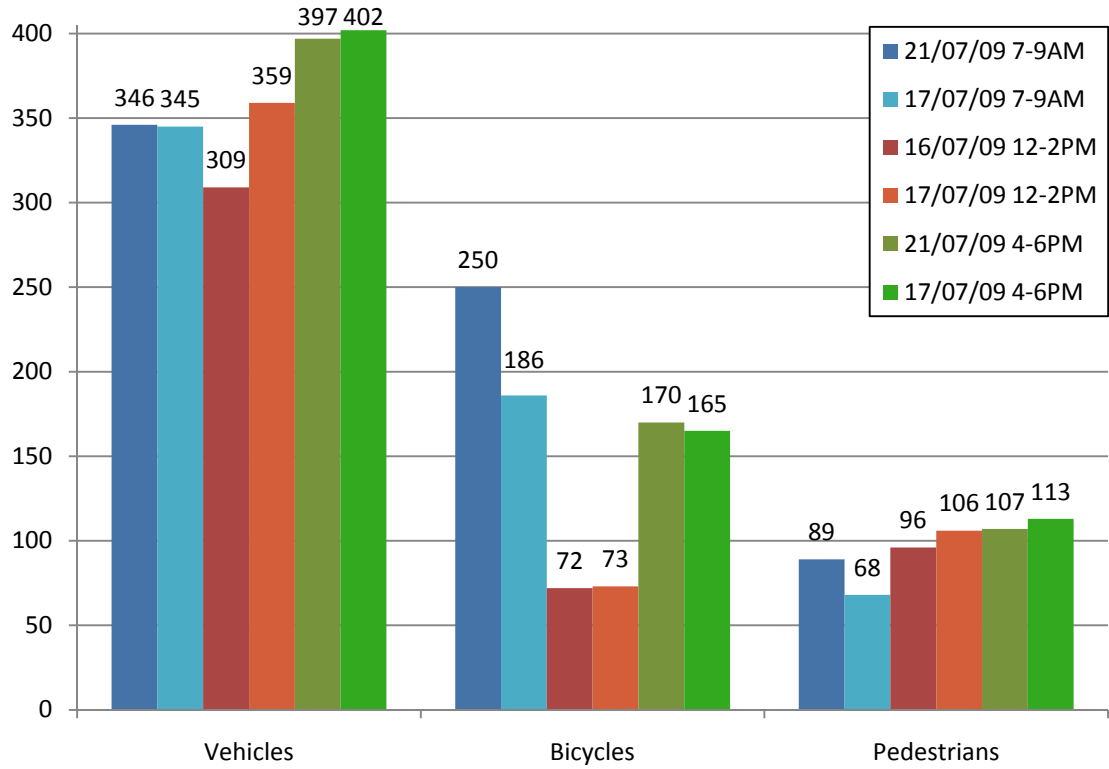


User volumes after signalisation

Figure 8 and Figure 9 show the number of users observed after the intersection was signalised. Pedestrians were only counted if they crossed Johnston Street.

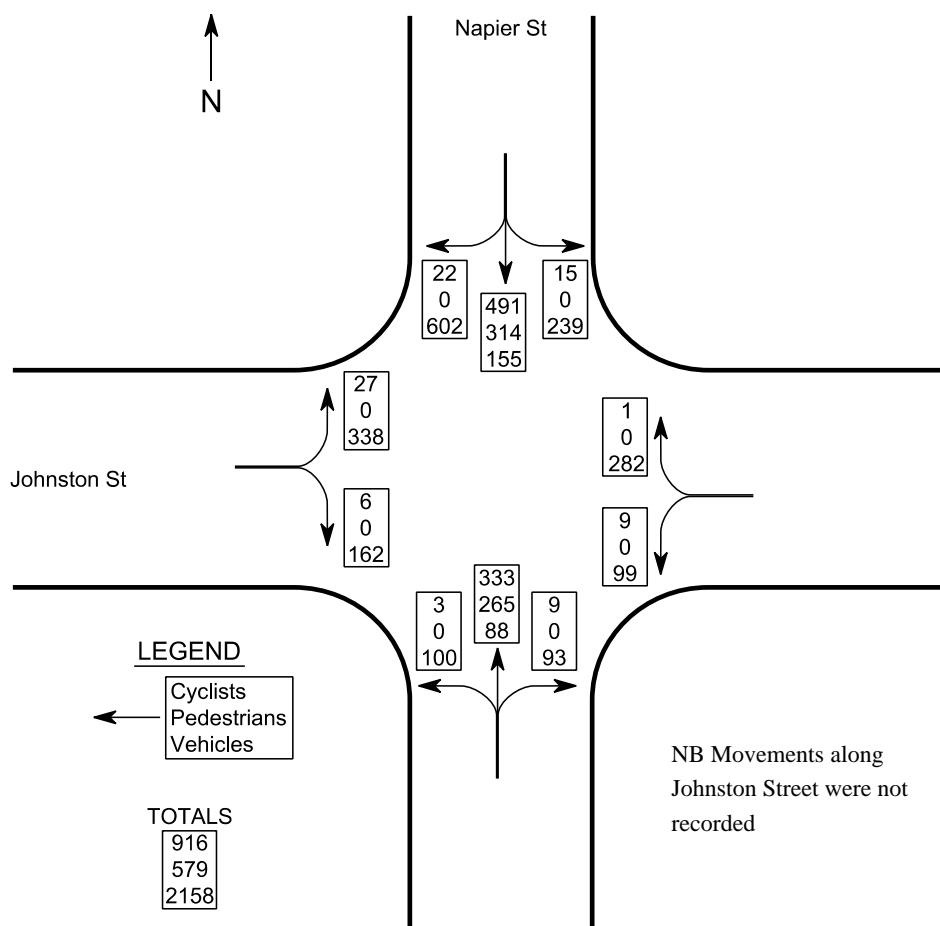


■ **Figure 8 Vehicle, cyclist and pedestrian volumes after installation of the signals (all movements except through on Johnston St)**





■ **Figure 9 Cyclist, pedestrian and vehicle turning movements after installation of the signals (total number over 6 x 2 hour periods)**



Again, vehicles outnumbered cyclists at this intersection. There was a large increase in vehicle volumes in Napier Street during the day, resulting in a relatively consistent number of vehicles throughout the day. The movement with the highest number of vehicles observed (602) was the right turn from Napier Street north to Johnston Street west. This was followed by the equivalent left turn (Johnston Street west to Napier Street north), with 338 vehicles observed. Note that the new intersection signals meant that it was much easier for drivers to turn right from Napier Street (north and south) into Johnston Street.

Cyclist volumes were again highest in the AM period, with fewer in the PM period and fewer again during the day. The most popular movement was still southbound along Napier Street (491), followed by northbound along Napier Street (333).

Pedestrian volumes were reasonably constant throughout the day, with an average of 290 pedestrians observed each day during the survey period.



Comparison of before and after volumes

Figure 10 shows the percentage increase in user volumes at the Napier Street/Johnston Street intersection after it was signalised (i.e. if volumes went from 50 to 100, then this would represent a 100% increase).

- Figure 10 Percentage increase in user volumes**
 Values in red represent a decrease in users. Percentages were only calculated where the observed volumes both before and after were greater than or equal to ten. Pedestrians and cyclists previously using the pedestrian crossing were included in the north and southbound through movements at the intersection.

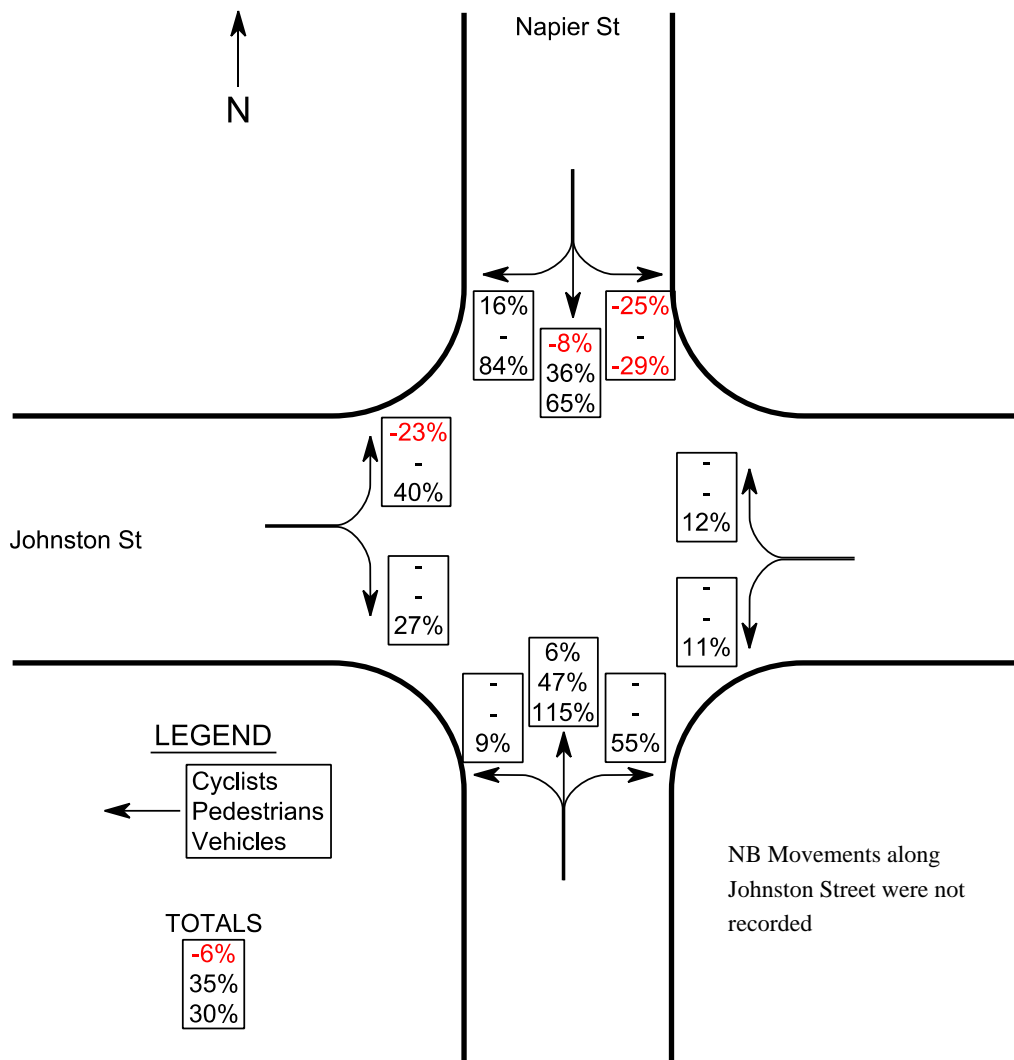




Figure 10 shows that there was an increase in all vehicle movements except for those turning left out of Napier Street north to Johnston Street east. This was likely an easier movement before as drivers only required a gap in the eastbound traffic on Johnston Street. There was an overall increase of 30% in motorised traffic using Napier Street at the intersection. This is consistent with verbal reports from cyclists and drivers who used the intersection, On closer inspection, the majority of these additional vehicles used the intersection during the day, with a 17% increase in traffic during the AM period, 56% increase during the day and 25% increase during the PM period. We believe that this was quite a modest increase for signalling an intersection. There were many occasions during the before surveys when vehicles in Johnston Street were queued across the Napier Street intersection. This would indicate that the signalisation brought little disadvantage to car drivers along Johnston Street during peak periods.

Figure 10 also shows that there was an overall reduction in the number of cyclists at the intersection. Similar to the vehicles, left turners from Napier Street north to Johnston Street east significantly reduced. There was also a significant reduction in cyclists turning left turn from Johnston Street west into Napier Street north, however the equivalent right turn (Napier Street north to Johnston Street west) was more popular than previously. It is possible that some of these cyclists had previously been doing a hook turn instead, therefore would have been recorded as southbound through.

Cyclist volumes at the intersection may have been affected by various factors other than the signalisation, including:

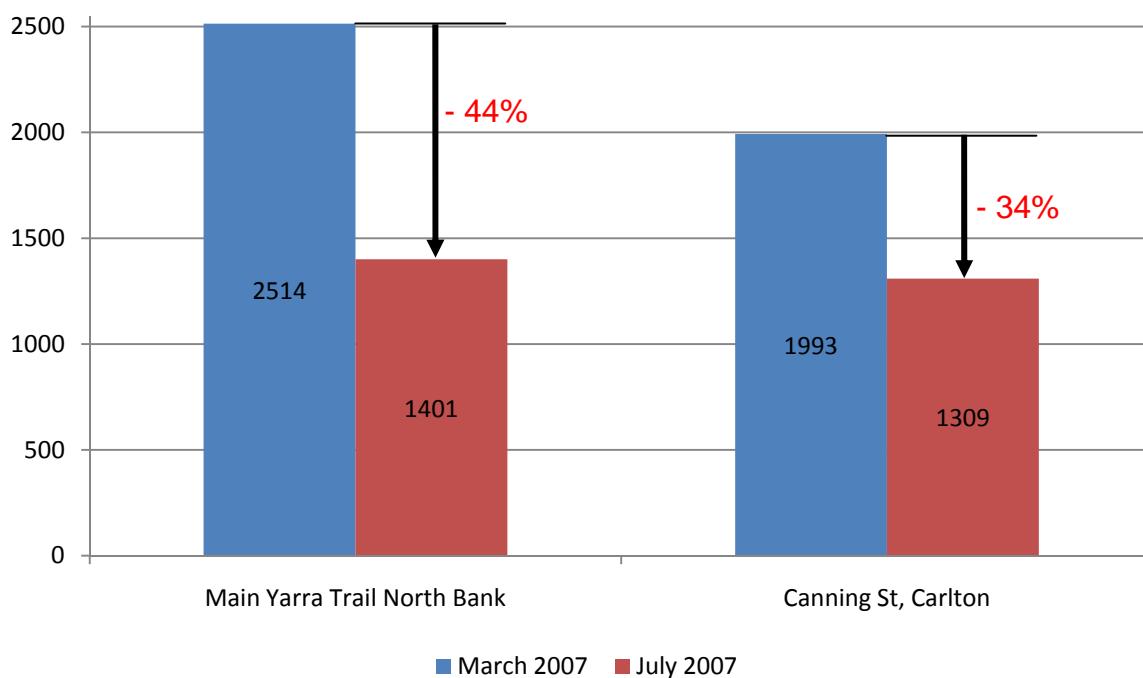
- Time of year – the after surveys were conducted in mid-July (the middle of winter) compared to the before surveys which were conducted in early March (beginning of autumn). Therefore a difference in the temperature, light conditions and weather would be expected, as seen (refer to Table 1 p. 4).
- Day of week – the before surveys were conducted on a Monday and Tuesday, and the after surveys on Tuesday, Thursday and Friday. We would not expect a significant difference in cycling volumes due to the day of week.
- School holidays – Fitzroy Primary School almost immediately south of the intersection may attract some riders, therefore we would expect cyclist volumes to be lower during the school holidays. Both the before and after surveys were conducted during the school term, so this would not be a significant factor.

Further investigations into the time of year were carried out to provide a comparative expectation in the change in cyclist volumes. We used the cycling trends on two nearby routes as control sites; Main Yarra Trail North Bank, Melbourne and Canning Street, Carlton. There are permanent VicRoads' loop counters on each of these trails, located at East of Morrell Bridge and on the South side of Princes Street respectively. The most recent data available from VicRoads loop counters is



from 2007. We would not expect the time of year trend to have significantly changed between 2007 and currently (2009). Figure 11 shows the cycling volumes on these comparative routes decreased from March to July.

- **Figure 11 Average 24 hour cycling volumes on comparative routes decreased – average cyclist volumes in March and July 2007 (weekday only)**



The reduction in cyclists seen on these trails was significantly more than the 6% reduction seen at the Napier Street/Johnston Street intersection. Therefore the 6% reduction in cyclists over this period most likely actually represents a positive impact of signalisation on cycling volumes.

Anecdotal evidence suggests that there was an increase in the number of child cyclists after the intersection was signalised, with one, two or three child cyclists usually riding with an adult cyclist as in Figure 12.

- **Figure 12 Child cyclists with adult cyclist crossing at the intersection (using near side pedestrian crosswalk)**

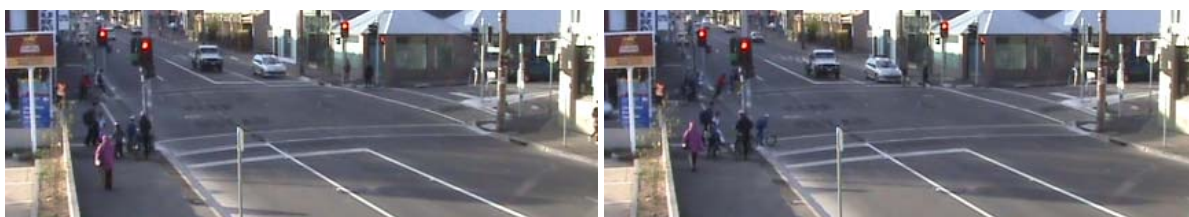




Figure 10 also shows a 35% increase in pedestrians crossing Napier Street at or near the intersection. This was quite significant and the large increase was an unexpected result of the signalisation. The most likely explanation is that pedestrians previously crossed Johnston Street elsewhere, but now cross at the intersection (only those at the pedestrian crossing or immediate intersection were counted in the before survey). Alternatively, pedestrians may have altered their route as a result of the signalisation or people who previously used another mode may now walk. Whatever the reason, this is a very significant result.

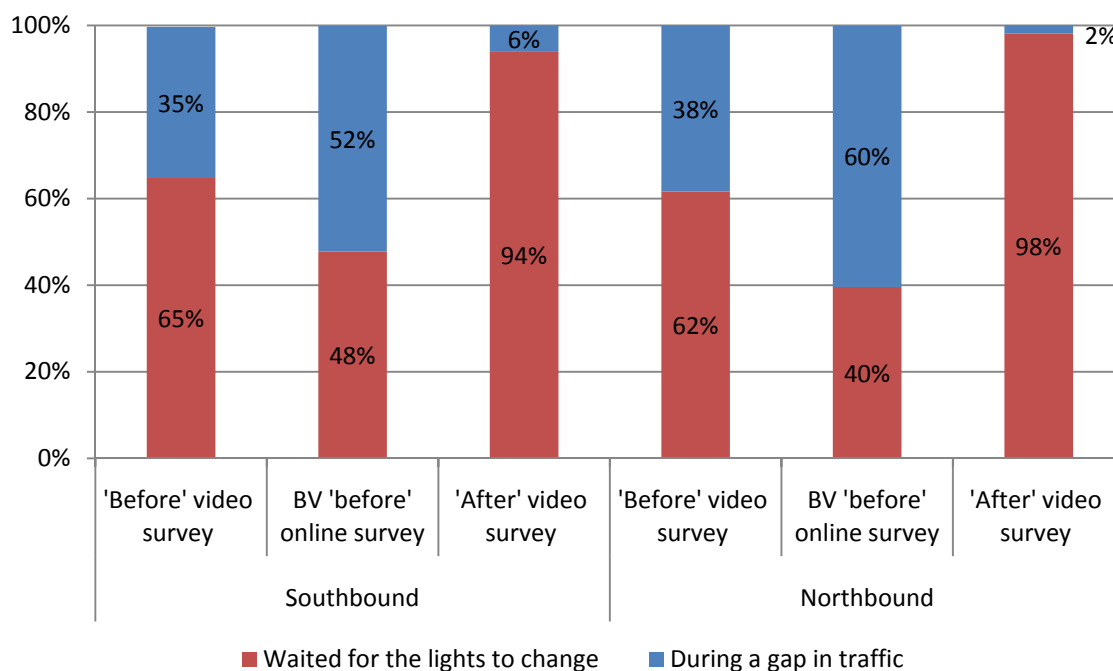
3.3. Walking and cycling behaviour

Figure 13 shows that northbound cyclists were more likely than southbound cyclists to cross during a gap in traffic before the intersection was signalised. After the signalisation, 96% of cyclists observed waited for the green cyclist signal before crossing. Cyclists were more likely to go through on a red signal if they were travelling in the southbound direction, with 6% of those observed running a red signal. The increase in cyclists waiting for the lights to change was no doubt due to the increase in perceived safety in crossing Johnston Street with a green signal. The convenience of the signals (at the intersection rather than adjacent where the previous pedestrian



crossing was) and the legal ramifications (cyclists crossing in a gap now face a red light, making this illegal) were additional factors.

■ **Figure 13 Way in which cyclists crossed Johnston Street⁶**



Before the intersection was signalised, a much higher percentage of respondents were observed crossing with the pedestrian lights (not necessarily *at* the lights) than reported in the online survey. This may be due to how people defined a ‘gap’, perceiving a red light as a gap in traffic. The online survey also asked how cyclists ‘generally’ cross Napier Street, which would be influenced by their experiences and perceptions. The survey assumed cyclists ride through the intersection in both directions. This may not have been accurate (as fewer northbound cyclists were recorded than southbound cyclists). However respondents did have the option of skipping the question, which one person did for the question regarding northbound travel.

After the intersection was signalised, 29% of southbound cyclists⁷ and 52% of northbound cyclists pressed the cyclist push button. This is most likely a reflection of the higher number of southbound cyclists – once someone had already pressed the button it was not necessary for subsequent cyclists

⁶ The ‘before’ online survey gave respondents the choice of “Pick a gap in the traffic and ride across”, “Wait for a pedestrian to trigger the lights” or “Ride over to the lights and push the button”. We have assumed that the second two categories make up the “wait for the light to change” category.

⁷ This is a best approximation as the southbound cyclist push button was obscured from view during filming of the ‘after’ videos.



that arrived in the same phase to also press the button. Of those cyclists who were first to arrive at the intersection, 77% travelling southbound and 93% travelling northbound pressed the cyclist button. One cyclist was observed to press the pedestrian button but ride along the road (the pedestrian button for crossing Napier Street is on the left side of the cycle lane as in Figure 14). Despite the clear signage that was installed directing cyclists to ‘push button for green signal’, 15% of cyclists that were first to arrive at the intersection did not use the cyclist push button. Two cyclists pressed both the cyclist and pedestrian buttons. This could be because some cyclists were unaware of how the intersection operated or because they did not think the cyclist button worked (possibly because the reassurance light on the cyclist push button did not light up when pressed).

As this is one of few cyclist push buttons in Melbourne, cyclists may have expected to get a green only when a vehicle or pedestrian was detected (as at most intersections). As users become more familiar with the intersection, we would expect the percentage of cyclists that know about the cyclist push button to increase.

■ **Figure 14 Some cyclists confused the pedestrian button for the cyclist button**



9% of cyclists observed crossed Johnston Street used the pedestrian crosswalk rather than the road. People riding with children were more likely to use the pedestrian crosswalk. Some of these cyclists were performing a hook turn and so the pedestrian crosswalk provided a safe place to wait.



■ **Figure 15 Cyclist stopping over the pedestrian crosswalk**



Pedestrians crossing Johnston Street before signalisation tended to use the pedestrian crossing (86% of those recorded), with the rest crossing at Napier Street. This increased to near complete compliance once the intersection was signalised (however only people crossing in the near vicinity of the intersection were included). Pedestrians crossing Napier Street (walking along Johnston St) are now given an *automatic* green man with the parallel traffic phase. This is good practice for pedestrians and likely reduces the delay to pedestrians and number of people walking against red.

Before signalisation there were some pedestrians and cyclists who ‘propped’ in the middle of Johnston Street when crossing because there was a gap in traffic only in one direction as shown in Figure 16. This could prove very unsafe for cyclists and pedestrians as they could be squeezed into a narrow space with moving traffic on either side of them. After the intersection was signalised, this was not observed again. There were however some cyclists and pedestrians who crossed Johnston Street while facing a red light, and then had to slow until there was a sufficient gap in the Johnston Street traffic.

■ **Figure 16 A cyclist in yellow top stops in the middle of Johnston Street while crossing**



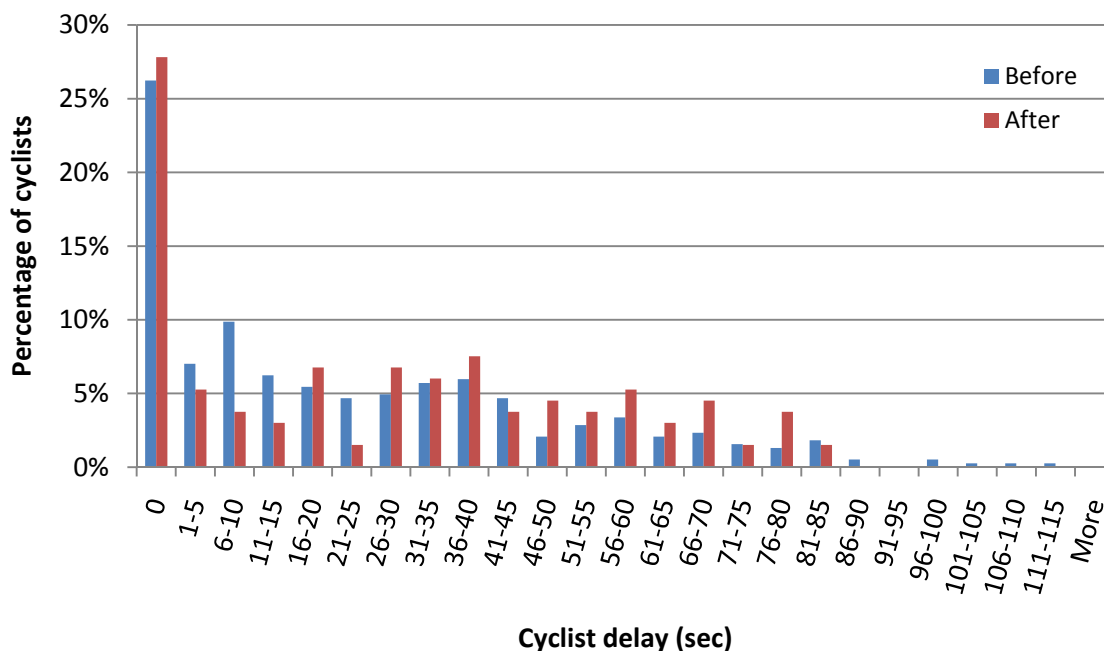


3.4. Cyclist delays

The delays experienced by cyclists crossing Johnston Street at Napier Street before and after the intersection was signalised are shown in Figure 17.



■ **Figure 17 Cyclist delay in crossing Johnston Street**

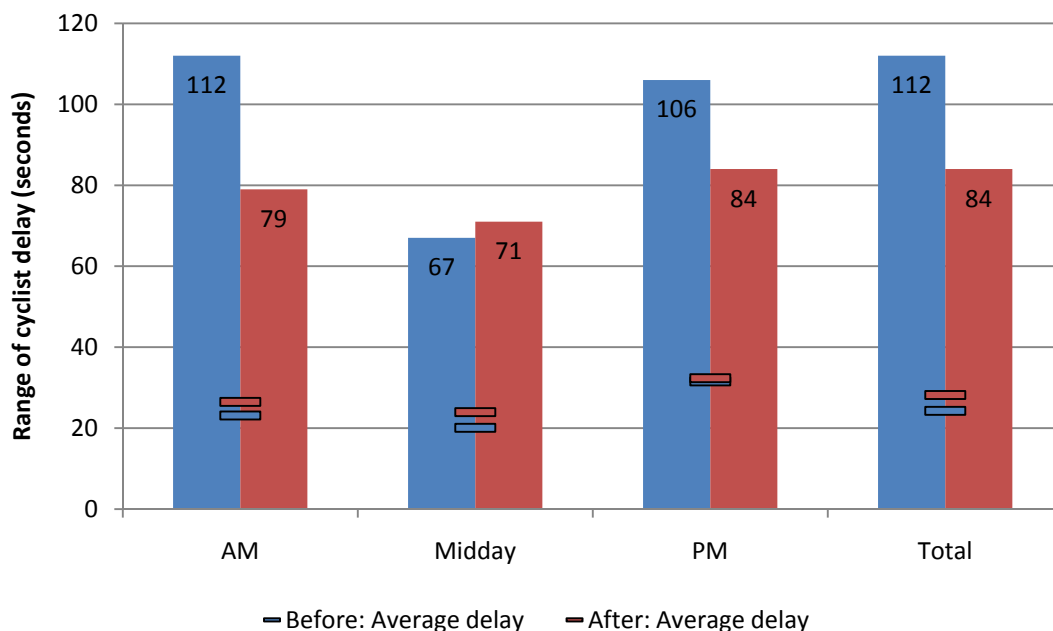


The survey found that 26% of cyclists were able to cross Johnston Street without experiencing any delay prior to installation of the signals, and this rose to 28% afterwards. Before the intersection was signalised, 11% of cyclists waited more than one minute to cross and one cyclist waited almost two minutes (112 seconds). This is compared with the after situation where 14% of cyclists were observed waiting more than one minute, but the longest delay was only 84 seconds. However this delay was for a cyclist who didn't press the button. The longest wait where the cyclist pressed the button was 82 seconds.

Figure 18 shows the range of and average cyclist delay by time of day.



■ **Figure 18 Range of and average cyclist delay by time of day**



On average, the longest delays were experienced by cyclists in the PM period, and tended to be about 50% longer than those experienced in the middle of the day. In both the AM and PM periods the longest delays to cyclists crossing Johnston Street were reduced by over 20%. The longest delay to cyclists during the midday period was slightly increased (6%) after the signals were installed, although this period still had the lowest maximum delay and average delay. The average cyclist delay over the total survey period increased from 24 seconds to 28 seconds after the signals were installed. However the percentage of cyclists experiencing no delay increased slightly and the longest waiting time was significantly reduced (by 28 seconds from 112 to 82 seconds).

3.5. Pedestrian, cyclist and driver conflicts

No actual collisions were observed during the survey periods. However several types of conflicts were observed, which can be loosely classified as shown in Table 3.



■ **Table 3 Conflicts observed before and after signalisation (two days in each case)**

Conflict type	Number observed before	Number observed after
Cyclist swerving around queued or turning vehicle	8	4
Cyclist stranded on Johnston Street	15	0
Cyclist and vehicle (side on)	6	1
Vehicle cuts off cyclist (same direction)	1	0
Pedestrian and vehicle (side on)	3	7
Pedestrian stranded on Johnston Street	4	3
Cyclist and cyclist (side on)	0	1
Total	37	16

The majority of the conflicts before signalisation occurred when cyclists or pedestrians crossed in a one-way gap, leaving them stranded in the middle of the intersection. In most cases, the conflicts were due to the cyclist or pedestrian choosing to cross in an insufficient gap, forcing either the vehicle coming from the side to slow, or the cyclist or pedestrian to hurry. In the after observations, three of the seven 'pedestrian and vehicle (side on)' conflicts occurred when users crossed while facing red. The same applies for the one 'cyclist and cyclist (side on)' conflict. There was an increase in the number of vehicles turning across pedestrians, likely because pedestrians were more confident to cross after the intersection was signalised because they now have priority.

The new signals can independently detect vehicles, cyclists and pedestrians and can operate each cycle according to who is detected. A cyclist early start over the parallel vehicles runs every phase, regardless of whether there are any cyclists detected or not, although it is shorter if no cyclists are detected. When pedestrians are detected, they are given an early start with the cyclists. The video analysis found that the early starts provided most pedestrians and cyclists with enough time to clear the conflict points (and in some cases, the entire intersection) before vehicles turned across their path. This would be one reason for the reduction in conflicts at the intersection.

The conflicts occurring at this intersection are better described in the following pictures (before signalisation) than quantitatively. Figure 19 shows the general chaos that followed when the traffic light turned red with pedestrians and cyclists taking this opportunity to cross, most not at the pedestrian crossing.



- **Figure 19 Before signalisation: Cyclist (yellow top) and pedestrians (white top and red top) take advantage of the red traffic light**





Figure 20 shows a cyclist who rode across to the crossing, pressed the button presumably trying to create a gap in traffic and then returned to Napier Street. The cyclist then crossed in the gap created by the red light, riding in front of the eastbound traffic on Johnston Street.

- **Figure 20 Before signalisation: Cyclist triggers the pedestrian light then returns to Napier Street to wait for gap**

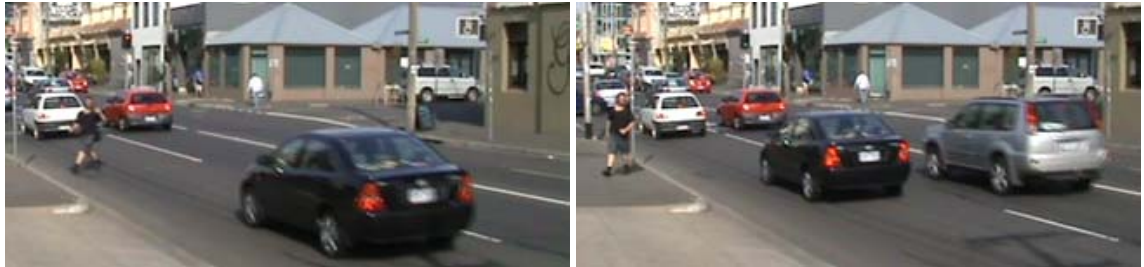




Figure 21 shows a pedestrian crossing away from the lights, forced to run to get across the road before the approaching car. After signalisation of the intersection, far fewer pedestrians were observed crossing in a gap, with almost all crossing at the designated pedestrian crosswalks and waiting for the green pedestrian signal.

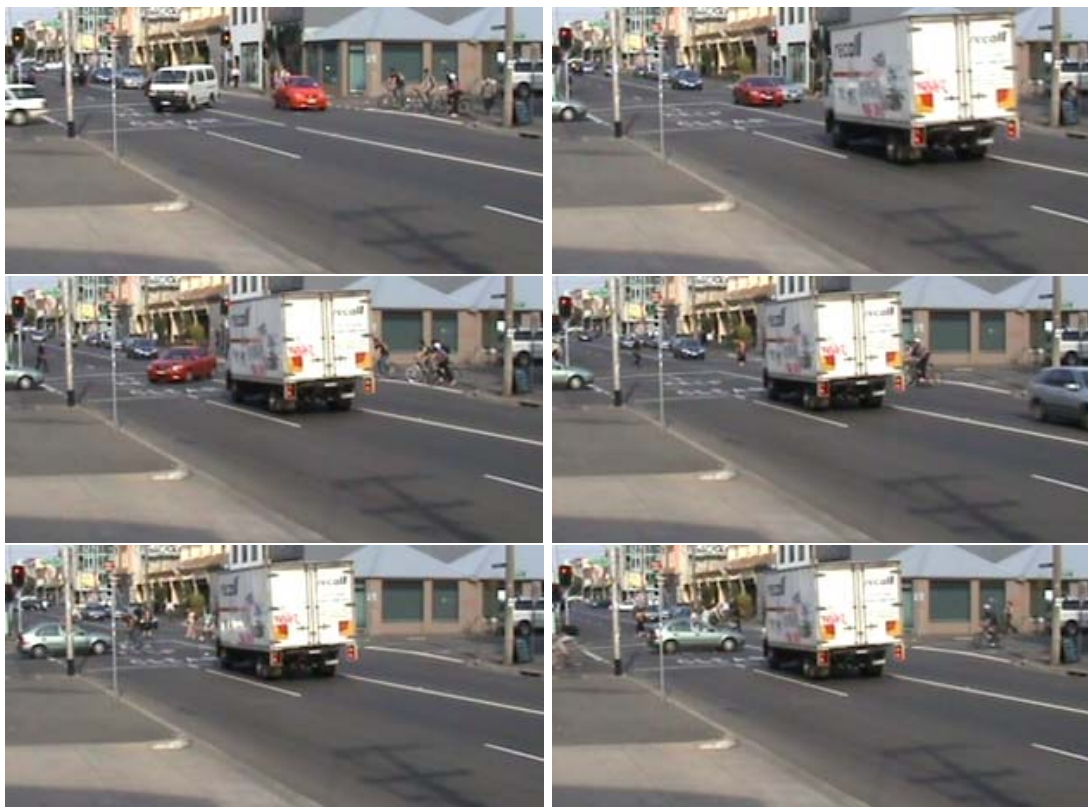
- **Figure 21 Before signalisation: Pedestrian runs across Johnston Street in front of approaching car**





When the pedestrian crossing signal turned red to vehicles, cyclists and drivers had to negotiate who was going first and where, with no clear priority. Sometimes eastbound drivers stopped behind the Keep Clear Zone, allowing cyclists and vehicles to cross in front, and sometimes they would go right up to the stop line at the signals. See Figure 22.

- **Figure 22 Before signalisation: Vehicles and cyclists negotiate when there were vehicles queued at a red light**





3.6. Cyclist perceptions

The intercept surveys asked cyclists on Napier Street about their perceptions of the intersection before and after signalisation. A total of 67 cyclists were interviewed over AM and PM periods after the intersection had been signalised.

94% of respondents to the intercept surveys reported experiencing issues at this intersection prior to signalisation, with only 17% experiencing issues after signalisation. The main issues experienced before signalisation were⁸:

- Used the pedestrian crossing (30%)
- Difficulty in crossing the intersection (25%)
- Long wait time (23%)
- Dangerous (19%)
- Vehicles not stopping for the Keep Clear Zone or the red signal (11%)

Issues experienced after signalisation were almost exclusively the cyclist reassurance light not working (in both the north and southbound directions), therefore cyclists were not confident the cyclist push button placed a call. One respondent had experienced drivers not stopping for the red light and one had experienced vehicles using the cycle lane as a left turn slip lane (further discussed in Section 3.7 - Other observations from the after surveys p. 33).

⁸ Note that cyclists could have more than one issue, so the percentages don't total to 100%



The online surveys found a higher proportion of people experiencing issues *after* the intersection was signalised. 84 people responded to the ‘after’ online survey, although each person did not answer each question. The issues reported included:

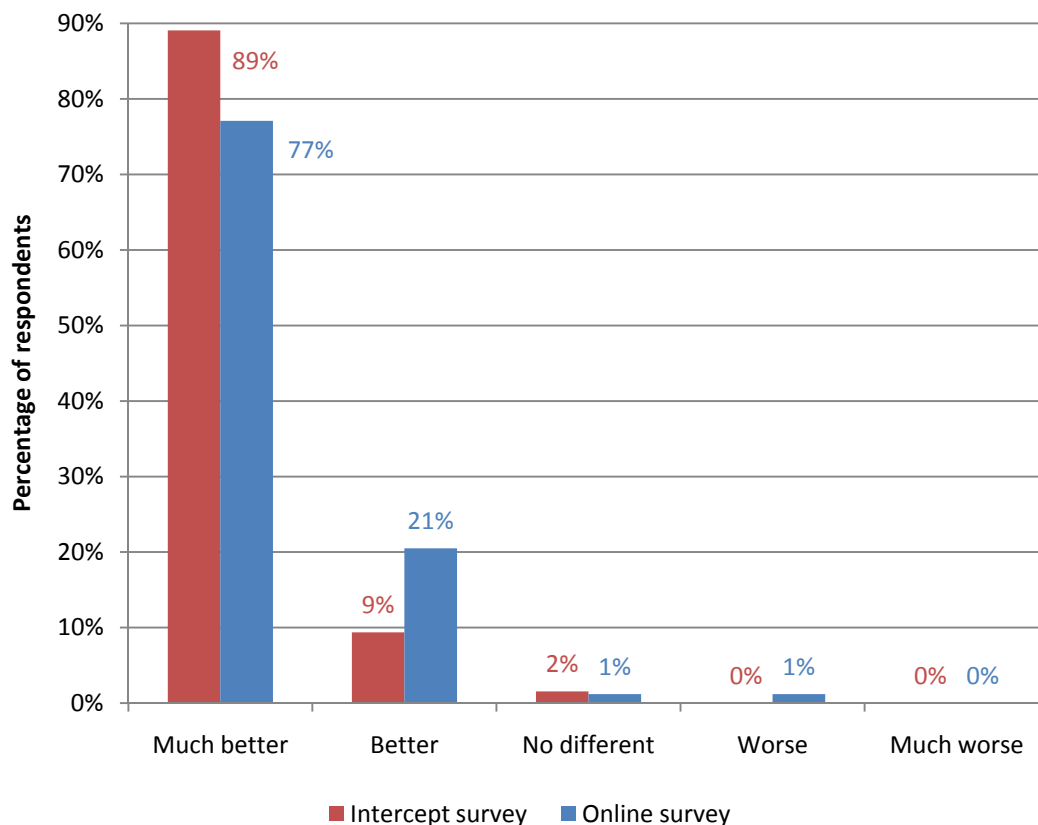
- Motor vehicles going through the red light (39%)
- Riders going through the red light (24%)
- Conflict with pedestrians crossing Johnston Street at the same time (12%)
- Other issues (34%)

The high proportion of respondents to the online survey that reported experiencing issues may be in part due to the way the online question differed from the intercept question. When intercepted, cyclists were asked “Have you experienced any issues since the signals were installed?” and cyclists had to list the issues they had experienced. The online survey asked “Have you experienced any of the following issues since the signals were modified?” and provided participants with the list above. This meant cyclists were more likely to think about these specific issues and respond. The intercept surveys also questioned cyclists about their experience prior to the signalisation. Cyclists were probably thinking about the issues they had experienced previously and that they hadn’t experienced those same issues after signalisation.

98% of cyclists intercepted thought the intersection was better than previously (89% said ‘much better’), with the remaining 2% (one cyclist) saying it was the same. Very similar results were found for the online survey, with 1% (one person) saying it was the same and 1% (one person) saying it was worse, as shown in Figure 23. 98% of those intercepted believed the intersection was safer, again with the remaining cyclist saying there was no change to safety.



■ **Figure 23 Cyclist perception of the modified intersection**



When questioned about the convenience of the cyclist push button, 65% responded that it was very convenient, 25% convenient, 6% neither convenient nor inconvenient, and 5% (3 cyclists) didn't even know about it!

General comments that were made by cyclists (including those not interviewed but overhearing the surveys) included:

- Right turning cyclists are unsure of where to ride and when to turn. For example, a cyclist in the cycle lane may be able to turn right when the cyclist early start begins if they are quick enough to get through the intersection before vehicles get green and there are no cyclists in the opposite direction (who they would have to give way to). Some cyclists were observed choosing to do hook turns instead.
- Cyclists would like to see more similar signals around. In particular, four cyclists would like to see a similar treatment at the intersection of Napier Street and Gertrude Street (next major intersection to the south). This intersection is the same in layout at the Napier Street/Johnston Street intersection before it was signalised (with a pedestrian crossing immediately to the east of Napier Street).

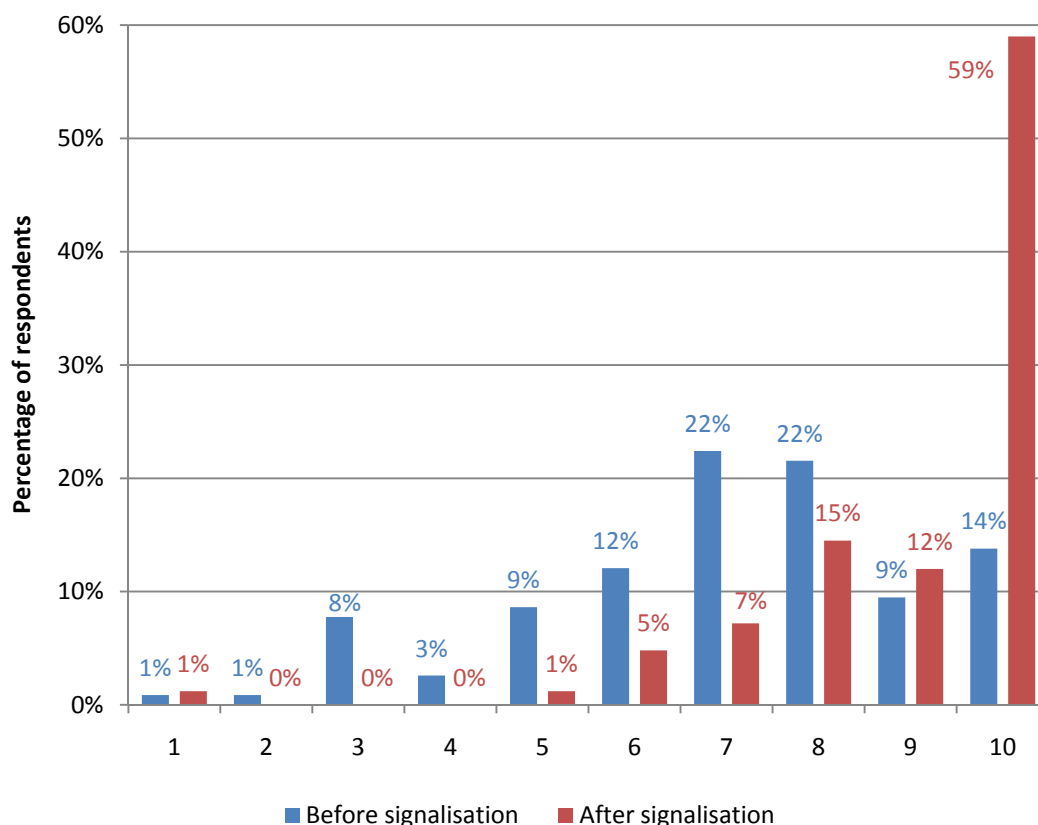


- Cyclists would like more grab rails installed for queued cyclists (during the peak periods, there was often more than one cyclist observed waiting at the intersection each cycle).
- Cyclists raised concerns about traffic using Napier Street as a rat run (see discussion in Section 3.2 - Walking and cycling volumes, from p. 8).
- Cyclists reported seeing vehicles running red lights (further discussed in Section 3.7 - Other observations from the after surveys p. 33)
- Two cyclists reported issues with parked vehicles. One raised the problem of parked vehicles on the south side (the detail of which was not elaborated on, but see Section 3.7 - Other observations from the after surveys p. 33 for further on site observations about this). Another cyclist had observed vehicles (taxis in particular) stopping in the intersection in front of the traffic island and across the bicycle lane (in the pedestrian crossing). This impedes/blocks east-west pedestrians and north-south cyclists.
- One cyclist commented that during construction it was very confusing for both cyclists and pedestrians to know where to cross. Our understanding is that the pedestrian signals were decommissioned prior to the intersection signalisation. This may be a lesson for construction of similar signalisations, where the pedestrian crossing should be decommissioned as late as possible in the process – preferably at the same time as the new signals begin operation. It could also include more information to cyclists and pedestrians about where to cross during construction.

One of the questions the online survey asked cyclists was “would you recommend other riders use the Napier Street bike route?” where 1 was ‘No I would recommend people to avoid it’ and 10 was ‘Yes I would strongly recommend it’. Figure 24 shows most cyclists would recommend it, with a significant increase in people who would ‘strongly recommend’ it after the intersection was signalised.



- **Figure 24 How likely respondents are to recommend the route to others (1 – recommend to avoid, 10 – strongly recommend)**



3.7. Other observations from the after surveys

Although we did not consider vehicle compliance, a general observation was that drivers in Napier Street tended to obey the red when cyclists and pedestrians had a parallel green light.

An unexpected observation made during the surveys was vehicles using the bicycle lane as a left turn slip lane. This was only observed twice – once during filming and once during the cyclist intercept surveys. Both instances were vehicles turning out of the south side of Napier Street, as shown in Figure 25 and Figure 26. Both appeared to be unaware that this was a bicycle lane rather than intentionally using the bicycle lane to avoid the signals. Since the time of the video surveys, bicycle symbols and green paint have been installed in the bicycle lane on the intersection approach. Drivers may now be more aware that this lane is for bicycles and not a left turn slip lane.



- **Figure 25 Vehicle using the northbound bicycle lane as a slip lane** (note vehicle going through red, presumably as they thought the lane was a slip lane, therefore the applicable law is give way. The stop sign also remains, reinforcing the notion of a slip lane.)



- **Figure 26 The white car on the right of the photo uses the bicycle lane as a left turn slip lane and gives way to the right turning blue vehicle**



On several occasions, eastbound drivers were observed stopping at the far side pedestrian crossing (i.e. in the intersection). This is likely out of habit as this is the location of the previous pedestrian crossing and drivers would have been expecting signals at this location. We would expect that over



time, drivers will better understand the new layout and the number of drivers stopping at the far side crosswalk will reduce to zero.

- **Figure 27 The silver car in the right lane stops at the far side pedestrian crosswalk (i.e. in the intersection)**





There were also a few instances of right turning vehicles turning *in front* of left turning vehicles as in Figure 28, which is opposite to the legal priority. This may have been due to uncertainty as to who had priority. Alternatively, as there was only a short time available to drivers out of Napier Street, drivers may have been impatient to get through the intersection and as such drove aggressively.

- **Figure 28 The right turning ute (incorrectly) forces priority over the left turning silver car**



As of late August 2009, after which time the green paint and bicycle symbols had been installed, the parking signs in Napier Street south of Johnston Street still had not been relocated. The number of parking bays was reduced to improve visibility, and the line marking was changed accordingly, however the signage still had not been relocated, as in Figure 29.



- **Figure 29 Parking signs need to be relocated to match the reduction in parking bays**



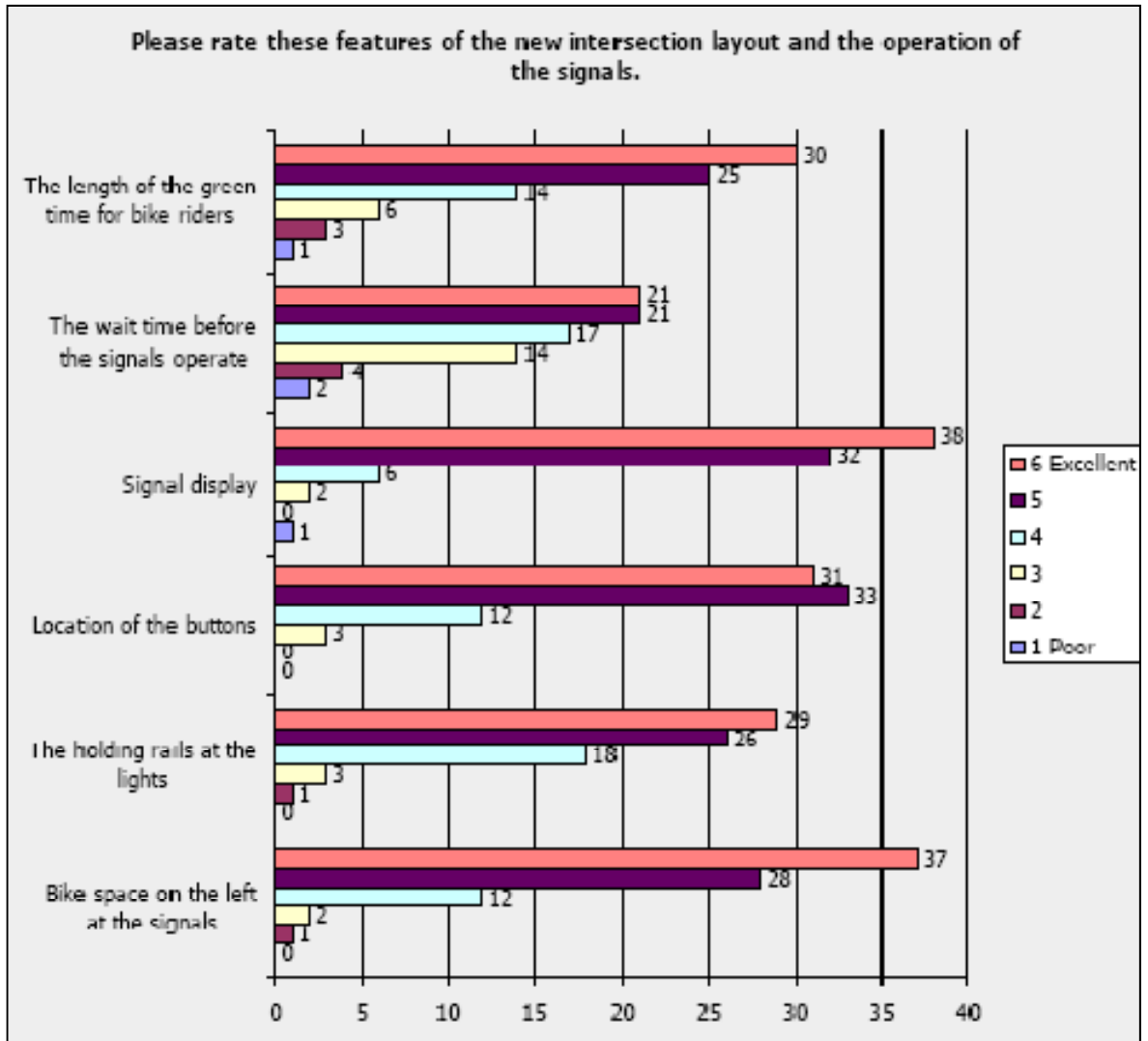
3.8. Other information from the online surveys

The online surveys asked some questions not asked during the intercept surveys.

Figure 30 shows respondents rating for various features of the new signals. Overall, the responses were very positive, with good green time, signal display, button location, holding rails and space available for cyclists. Cyclists believe there is some room for improvement in the wait time for cyclists, however as discussed in Section 3.4 - Cyclist delays (p. 21), the average delay to cyclists increased only slightly and the maximum wait time significantly decreased. Any adjustment to the operation of the signals needs to also consider the requirement for vehicle flow along Johnston St, the major traffic route.



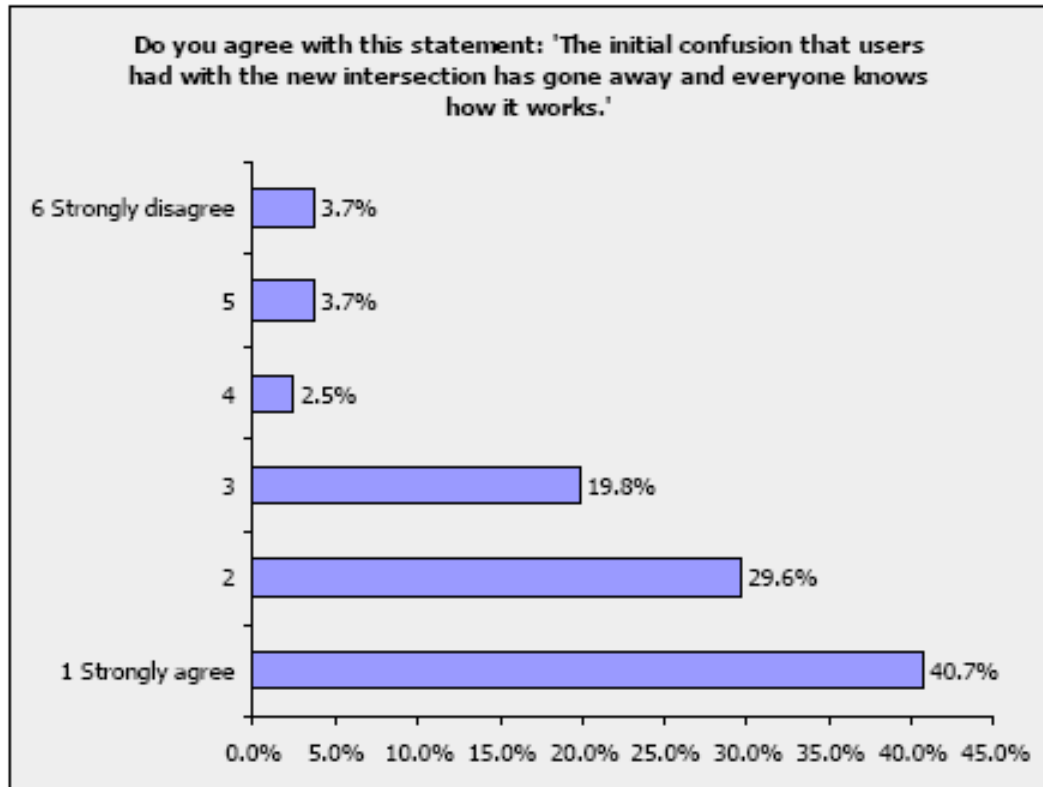
■ **Figure 30 Online survey - rating of various features of the new signals**



It also asked about cyclists’ understanding of how the new signals operate. The majority responded that the initial confusion had gone away, as shown in Figure 31.



■ **Figure 31 Online survey - cyclists' understanding of how the signals operate**





4. Conclusions

Overall, the signalisation of the intersection appears to have benefited pedestrians, cyclists and drivers on Napier Street in some way.

4.1. Cyclist numbers

In summary, before the installation of the signals in the north-south direction we observed an average of:

- 242 cyclists between 7 and 9am
- 43 cyclists between 12 and 2pm
- 205 cyclists between 4 and 6pm

Following signalisation, the number of cyclists observed was:

- 218 cyclists between 7 and 9am
- 73 cyclists between 12 and 2pm
- 168 cyclists between 4 and 6pm

This represents a 6% decrease in total cyclist volumes at the intersection after signalisation. However, given the seasonal trends on comparable routes where cyclist volumes have typically reduced by 30-40% between March (time of before survey) and July (time of after survey), this may actually represent an increase in cycling at the intersection. Cyclist responses to the intercept survey certainly supported this view, with 98% of those interviewed reporting it as 'better' or 'much better' after signalisation and 98% saying it was safer. Anecdotal evidence also suggested that there was an increase in the number of child cyclists at the intersection after it was signalised.

4.2. Cyclist delays

Before signalisation, the average cyclist delay was longest in the PM period at 32 seconds, compared with 23 seconds in the AM period and 20 seconds over the lunch period. 26% of cyclists along Napier Street experienced no delay in crossing Johnston Street, compared to the longest delay observed of 112 seconds.

After the intersection was signalised, the longest average delay was unchanged at 32 seconds in the PM period, compared to 26 seconds in the AM period and 24 seconds over the lunch period. Although the overall cyclist delay at the intersection was increased after signalisation (from 24 seconds to 28 seconds), there was an increase in the number of cyclists experiencing no delay (increased by 2% to 28%) and a decrease in maximum waiting time (reduced by 30 seconds to 82 seconds). Given the improved priority and safety benefits to cyclists, this would appear acceptable.



4.3. Pedestrian volumes

Before the installation of the signals in the north-south direction we observed an average of:

- 58 pedestrians between 7 and 9am
- 53 pedestrians between 12 and 2pm
- 95 pedestrians between 4 and 6pm

After installation of the signals we observed an average of:

- 79 pedestrians between 7 and 9am
- 101 pedestrians between 12 and 2pm
- 110 pedestrians between 4 and 6pm

This represented a 35% increase in pedestrians using the intersection after it was signalised. This was quite significant and the large increase was an unexpected result of the signalisation.

4.4. Cyclist and pedestrian behaviour

The most significant finding of the before surveys was the degree to which cyclists, pedestrians and car drivers mutually negotiate their ways through the Johnston Street/ Napier Street intersection road space. The operation of this intersection prior to signalisation could best be described as 'chaotic'. One of the major benefits of signalising it is that it now provides clear priority for all users (i.e. who should go where and when).

Another significant finding was the reliance that cyclists had on the operation of the pedestrian signals just to the east of the intersection. Figure 13 on p. 18 shows that between 62% and 65% of cyclists waited until the signals gave pedestrians green before they crossed. This is the first hard evidence in Victoria to demonstrate the importance of the 'shadow' of signals when crossing the main road. Once the intersection was signalised, cyclists did not have to rely on the presence of pedestrians or to push the pedestrian button in order to cross Johnston Street.

Despite the signage that was installed directing cyclists to 'push button for green signal', 5% of those interviewed did not know there was a cyclist push button. We also observed a few cyclists triggering the pedestrian push button. As this is one of few cyclist push buttons in Melbourne, cyclists may expect to get a green only when a vehicle or pedestrian is detected (as at most intersection). As users become more familiar with the intersection, we would expect the percentage of cyclists that know about the cyclist push button to increase.

There was a reduction in the number of conflicts involving pedestrians and/or cyclists at this intersection following signalisation. There were 37 conflicts observed prior to signalisation and only 16 afterwards. More importantly however, was the clear priority provided by the new signals



to assist cyclists, pedestrians and vehicles through the intersection in a much more orderly manner. Early starts were provided for cyclists and pedestrians and contributed to the reduction in conflicts at the intersection.

4.5. Cyclist perceptions

There was overwhelming approval for the signalisation from the cyclists interviewed. All responses to the intercept surveys were either in favour of the signalisation or neutral, with the online surveys recording similar approval levels.

94% of respondents to the intercept survey reported experiencing issues at this intersection prior to signalisation, with only 17% experiencing issues after signalisation. The number of people experiencing issues according to the online survey was higher, with at least 39% of respondents reporting issues. The most common comment cyclists made (both when intercepted and online) was that the cyclist reassurance lights weren't working on the cyclist push buttons. Other comments made by cyclists in relation to using the intersection after signalisation included uncertainty in what to do for those turning right, the need for additional grab rails and cars illegally stopping across/driving in the bicycle lane. Many wanted to see more signals like this installed, in particular at the Napier Street/Gertrude Street intersection. One cyclist raised the problems encountered for both cyclists and pedestrians during construction. Our understanding is that the pedestrian signals were decommissioned prior to the intersection signalisation. This may be a lesson for construction of similar signalisations, where the pedestrian crossing should be decommissioned as late as possible in the process – preferably at the same time as the new signals begin operation. It could also include more information to cyclists and pedestrians about where to cross during construction.

4.6. Traffic volumes

The overall increase in motorised traffic at the intersection was 30%. The majority of these additional vehicles used the intersection during the day, with a 17% increase in traffic during the AM period, 56% increase during the day and 25% increase during the PM period. We believe that this was quite a modest increase for signalising an intersection.

4.7. Unexpected findings

- The 35% increase in pedestrians crossing Johnson Street at the intersection was quite significant and an unexpected result of the signalisation. The intersection is now more pedestrian friendly in all directions, with clear pedestrian routes (crosswalks). In the north-south direction, pedestrians no longer have to wait for a gap in the traffic and pedestrians on the west side do not have to cross to the east side to use a crossing. In the east-west direction,



there are new traffic islands which provide refuge for pedestrians and reduce the crossing task, as well as an automatic 'green man' display.

- Some east bound drivers were observed stopping at the far side pedestrian crosswalk (i.e. in the middle of the intersection). This is possibly because they are used to looking for signals here rather than earlier.
- Drivers were observed turning left from the bicycle lane (only observed once during filming and once during interviews), treating it as a slip lane (stop sign still installed). Once bicycle symbols/green tarmac are installed may help with conspicuity of bicycle lane.
- Anecdotal evidence suggesting an increase in child cyclists at the intersection

4.8. Interpretation of before/after results

Following signalisation, the number of conflicts observed at the Napier Street/Johnston Street intersection was reduced and the uncertainty involved for those crossing/turning at Johnston Street was also reduced. Cyclist wait times were not significantly increased, and in fact the maximum wait was reduced. Cyclists interviewed were overwhelmingly in support of the intersection signalisation. Therefore we consider that the signalisation of Napier Street/Johnston Street has improved the intersection for cyclists and pedestrians.



Appendix A Intercept survey used to gauge cyclist opinion of the signalisation

Cyclist Survey

Hello, I am doing a survey on behalf of Yarra City Council and the Department of Transport to investigate cyclists' experience at this intersection.

Do you mind if I ask you a few questions while you're stopped here?

3. Did you experience any issues here prior to the new signals being installed?

Yes (Y)

No (N)

3a. If yes, what sort of issues?

Crossing

Difficult to cross (1a)

Long wait time (1b)

Had to use pedestrian crossing (1c)

Mixing with peds (1d)

Dangerous (1e)

Vehicles

Vehicles stopping across the Keep Clear Zone (2a)

Vehicles not seeing cyclist (2b)

Vehicles in same direction

- In the bike lane/box (2c)

- Turning left – in front (2d)

- Turning left – behind (2e)

- Parking (2f)

- 'Racing' cyclist (2g)

Vehicles in the opposite direction:

- Turning right (2h)

Other cyclists

Stuck behind slow cyclists (3)

Other (4)

4. Is the intersection better or worse than before the signal was installed? Please rate it on a scale of 1-5, where 1 is much better than previously and 5 is much worse than previously.

1 – Much Better (1)

2 – Better (2)

3 – The same (3)

4 – Worse (4)

5 – Much Worse (5)

5. Do you feel more or less safe as a result of the new signals?

Safer (1)

No change (2)

Less safe (3)

7. Please rate the convenience of the cyclist push button on a scale of 1-5, where 1 is very convenient and 5 is very inconvenient.

1 – Very convenient (1)

2 – Convenient (2)

3 – Neither convenient or inconvenient (3)

4 – Inconvenient (4)

5 – Very inconvenient (5)

8. Have you experienced any issues since the signals were installed?

Yes (Y)

No (N)

8a. If yes, what sort of issues?

Slow response times (1)

Vehicles through red light (2)

Dangerous (3)

Mixing with peds (4)

Push button location (5)

Signal display (6)

Confusing (7)

Other (8)

9. Do you have any other comments?

Yes (Y)

No (N)

Thank you for your comments.



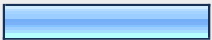


Appendix B Online cyclist survey responses before installation of signals

Napier Street






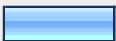
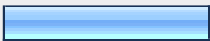
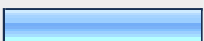

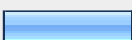
1. How often do you ride along Napier Street?			Response Percent	Response Count
Everyday			5.2%	6
Most days			9.5%	11
Most week days			19.0%	22
Most weekends			3.4%	4
Sometimes			38.8%	45
Sometimes during the week			17.2%	20
Sometimes on the weekend			4.3%	5
Rarely			2.6%	3
			<i>answered question</i>	116
			<i>skipped question</i>	1

2. When I am going south (uphill towards the city) along Napier and reach Johnson Street I generally			Response Percent	Response Count
Pick a gap in the traffic and ride across			52.1%	61
Wait for a pedestrian to trigger the pedestrian crossing lights			17.9%	21
Ride over to the lights and push the button			29.9%	35
			<i>answered question</i>	117
			<i>skipped question</i>	0

3. When I am going north (away from the City and downhill) along Napier and reach Johnson Street I generally:			Response Percent	Response Count
Pick a gap in the traffic and ride across			60.3%	70
Wait for a pedestrian to trigger the pedestrian crossing lights			17.2%	20
Ride over to the lights and push the button			22.4%	26
	<i>answered question</i>			116
	<i>skipped question</i>			1

4. What do you think about the Napier Street bike route when it crosses Johnson Street?		Response Count
		110
	<i>answered question</i>	110
	<i>skipped question</i>	7

5. Would you recommend other riders use the Napier Street bike route? 1 is 'No I would recommend people to avoid it' and 10 is 'Yes I would strongly recommend it'.

		Response Percent	Response Count
1		0.9%	1
2		0.9%	1
3		7.8%	9
4		2.6%	3
5		8.6%	10
6		12.1%	14
7		22.4%	26
8		21.6%	25
9		9.5%	11
10		13.8%	16
		answered question	116
		skipped question	1

6. When you are riding south towards the City where are you generally heading for?

	Response Count
	114
	answered question
	114
	skipped question
	3

7. When you are riding north away from the City where are you generally heading for?

	Response Count
	115
	answered question
	115
	skipped question
	2

8. Gender			
		Response Percent	Response Count
Male		57.4%	66
Female		42.6%	49
answered question			115
skipped question			2

9. Age			
		Response Percent	Response Count
10 or under		0.0%	0
11 to 18		0.0%	0
19 to 30		20.2%	23
31 to 40		36.0%	41
41 to 50		24.6%	28
51 to 60		13.2%	15
61 +		6.1%	7
answered question			114
skipped question			3

10. What is your Bicycle Victoria Rider ID number? (in the subject of emails from Bicycle Victoria)			
		Response Count	
		66	
answered question		66	
skipped question		51	

11. First name		Response Count
		68
	<i>answered question</i>	68
	<i>skipped question</i>	49

12. Last name		Response Count
		66
	<i>answered question</i>	66
	<i>skipped question</i>	51

13. What is your email address?		Response Count
		65
	<i>answered question</i>	65
	<i>skipped question</i>	52

14. Day time phone		Response Count
		51
	<i>answered question</i>	51
	<i>skipped question</i>	66

15. Would you like to receive information on Bicycle Victoria events and activities in the future?

		Response Percent	Response Count
Yes please		4.3%	5
No thanks		18.8%	22
I already receive information thanks		76.9%	90
		<i>answered question</i>	117
		<i>skipped question</i>	0

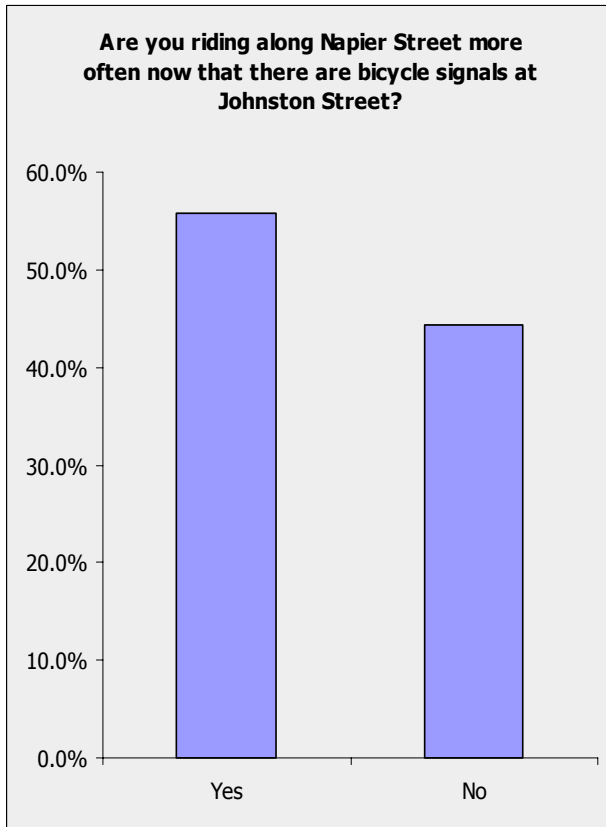


Appendix C Online cyclist survey responses after installation of signals

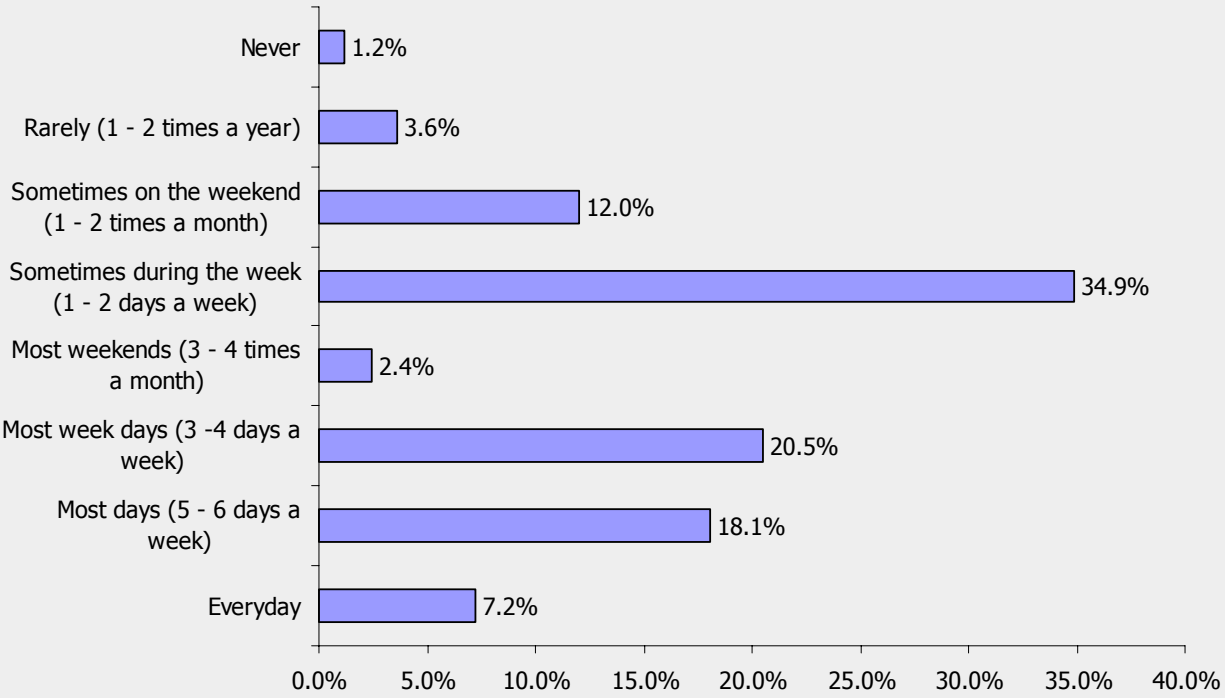
Napier Street - Post Signals Upgrade

Are you riding along Napier Street more often now that there are bicycle signals at Johnston Street?

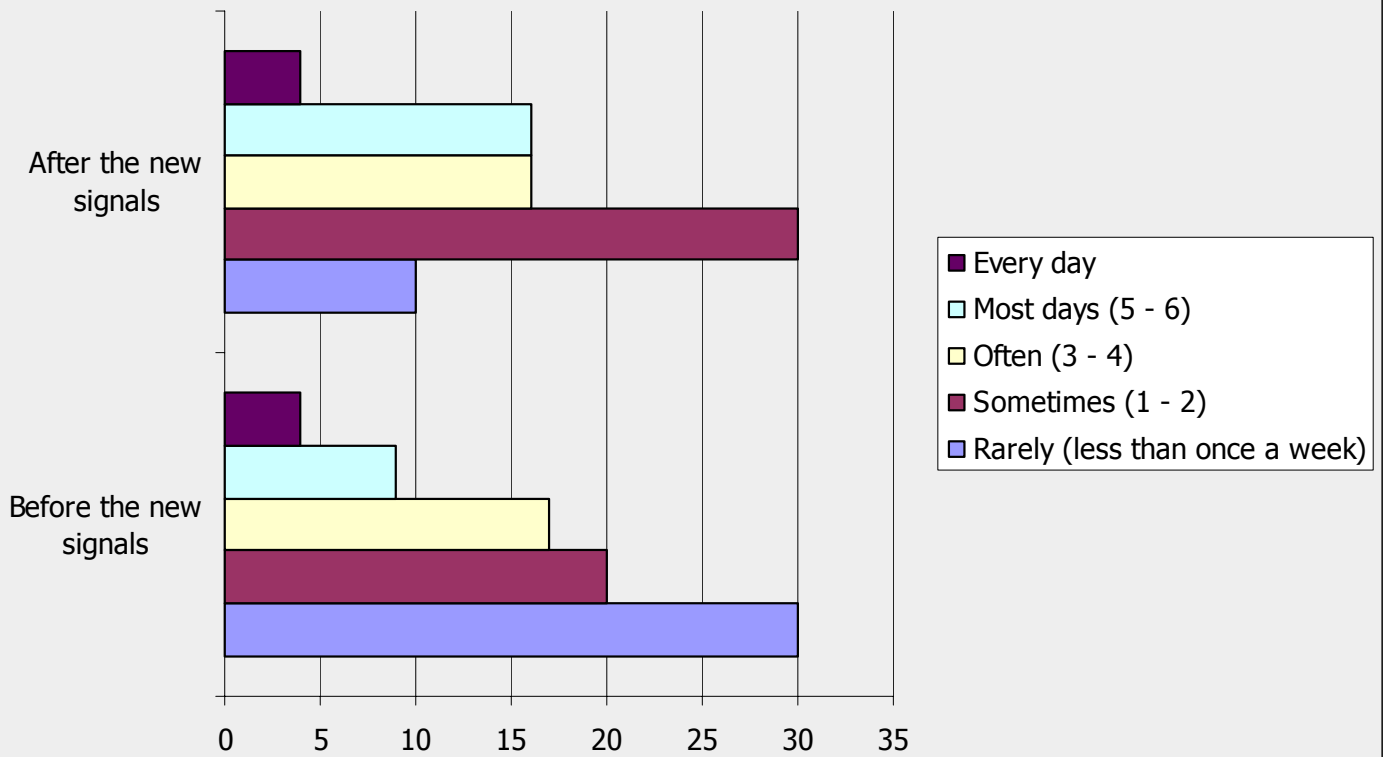
Answer Options	Response Percent	Response Count
Yes	55.7%	44
No	44.3%	35
<i>answered question</i>		79
<i>skipped question</i>		5



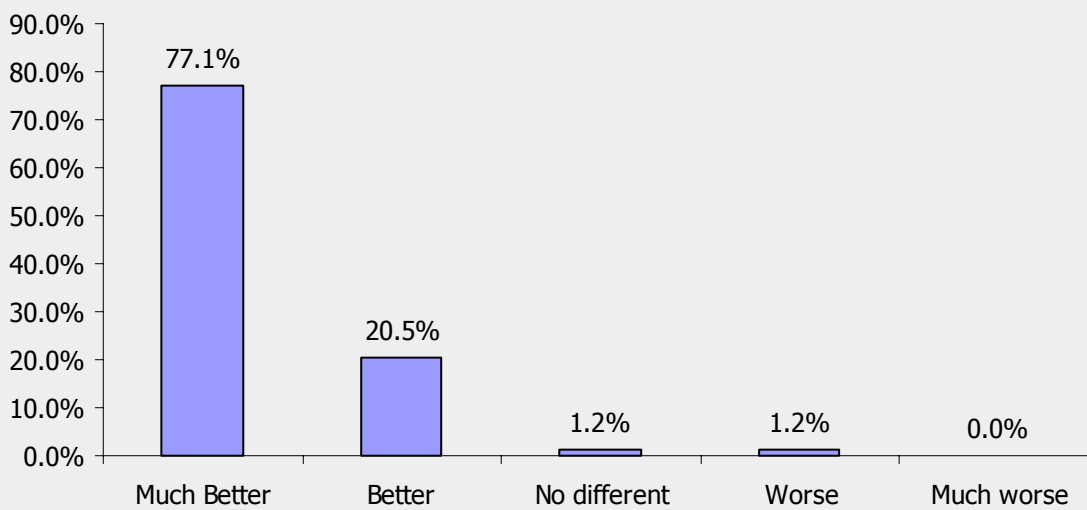
How often do you ride along Napier Street?



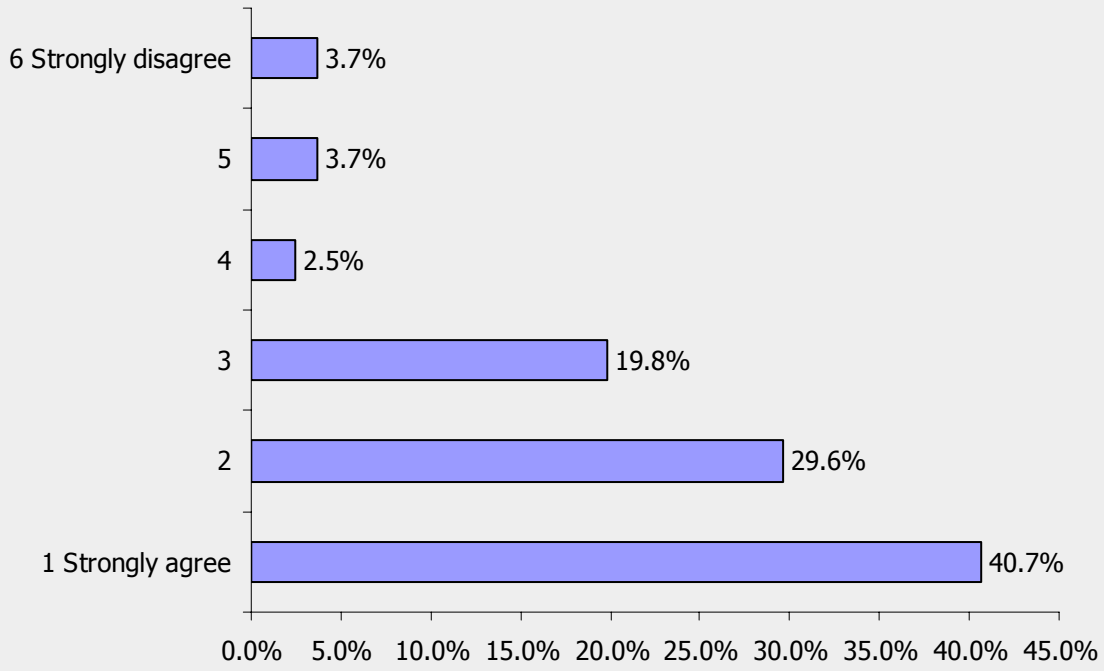
Please indicate your previous and current use of Napier Street.



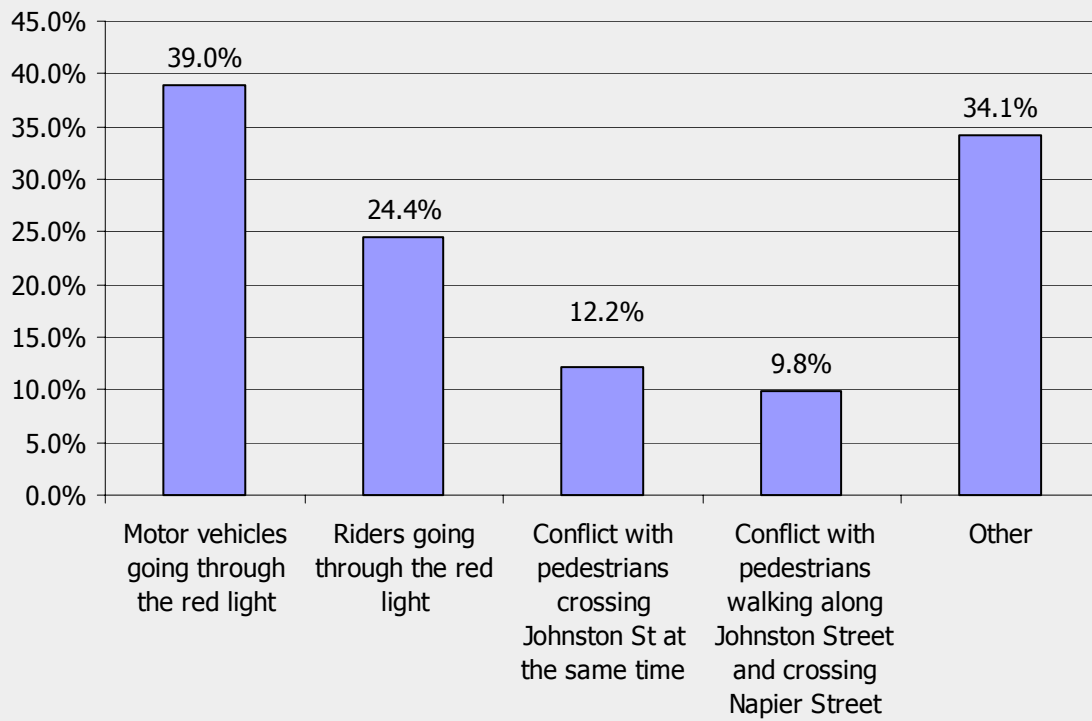
Is the intersection better or worse now that the signals have been modified?



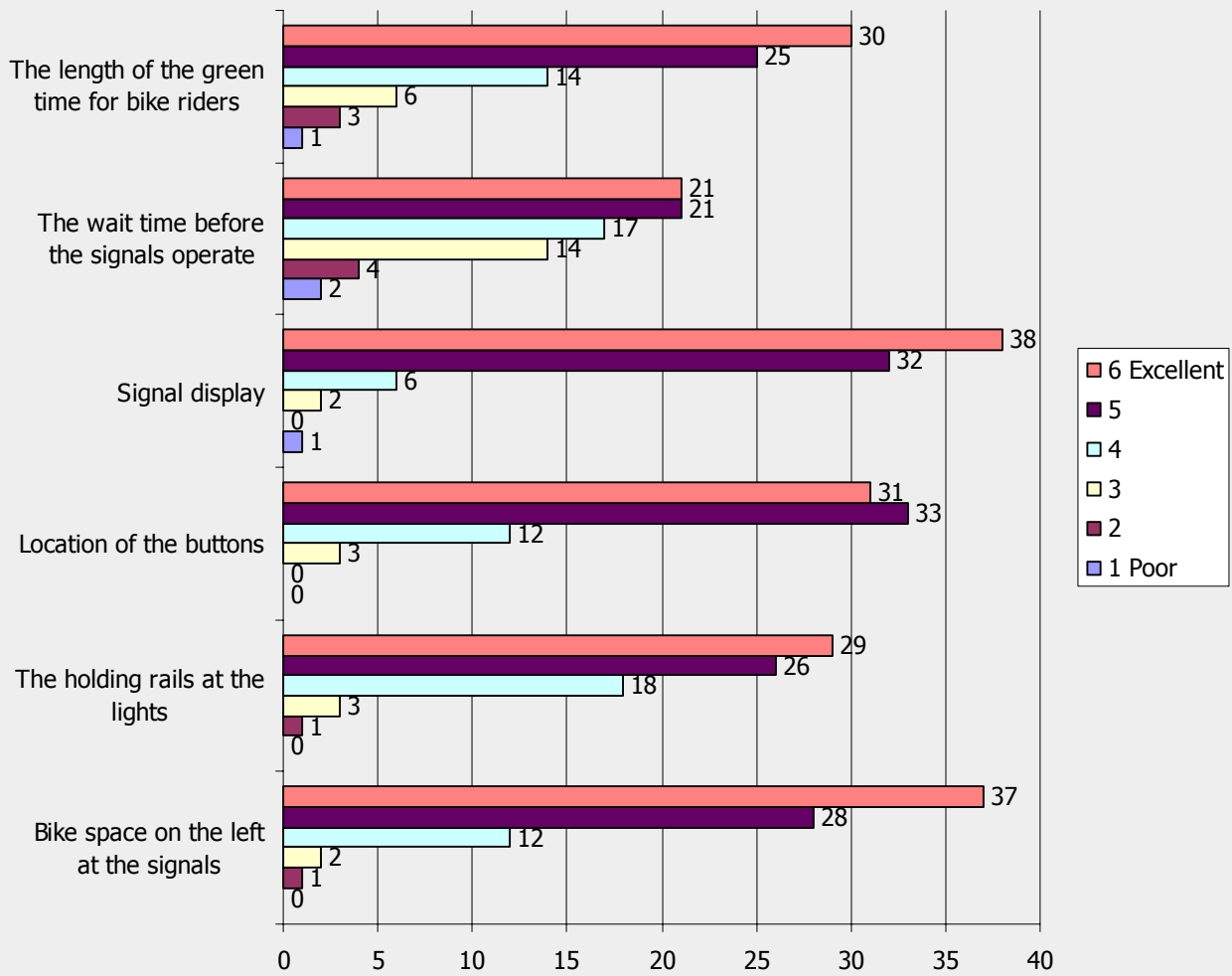
Do you agree with this statement: 'The initial confusion that users had with the new intersection has gone away and everyone knows how it works.'



Have you experienced any of the following issues since the signals were modified?



Please rate these features of the new intersection layout and the operation of the signals.



Would you recommend other riders use the Napier Street bike route?

