

The Closure of Brisbane's Riverside Expressway

- How people changed their travel behaviour

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The views expressed in this paper are those of authors and do not necessarily represent those of the Queensland Department of Transport and Main Roads or the Queensland Government.

The paper has been developed principally from unpublished technical papers and analysis prepared for the Queensland Department of Transport and Main Roads regarding the impacts of the closure of the Riverside Expressway in Brisbane during October 2006. The main contributors to that work were Paolo Marinelli, Michael Roth, Viki Watson, Barry Henderson, Jane Tietzel-Hardley, Erica Van Uitregt, Gerard Reardon and Patrick Dennehy with technical editing by Cherie Beaumont-Tyson.

ABSTRACT

The closure of one of Queensland's busiest roads – Brisbane's Riverside Expressway – had a major effect on the city road network with traffic increases on major arterials within one kilometre of the Brisbane CBD. Beyond that, affects tailed off quickly. Public transport patronage increased by approximately 8 per cent during the closure with the majority moving to train. Overall 29 per cent of people in Greater Brisbane reported some affect on them – either positive or negative. However, in many northern suburbs of Brisbane, where a large scale (70,000 household) voluntary travel behaviour change program had just been completed, only 14 per cent of people reported any affect on them. Despite being less affected by the closure they were more likely to switch modes, mainly from car to public transport.

1.0 OBJECTIVES OF THIS PAPER

The closure of Brisbane's Riverside Expressway between 17 October and 20 October 2006 provided a unique insight into the capability of Greater Brisbane's transport system and its managers to respond to a major incident or infrastructure failure.

Figure 1 – Key Event Timeline of the Riverside Expressway Closure in October 2006

Tuesday 17 October	<ul style="list-style-type: none">➤ Hairline crack discovered in Ann St on-ramp➤ Riverside Expressway and ramps closed to traffic
Friday 20 October	<ul style="list-style-type: none">➤ Riverside Expressway re-opened to all traffic, Alice & Ann St ramps remain closed
Friday 27 October	<ul style="list-style-type: none">➤ Ann & Alice St ramps re-open to traffic with restrictions

A wide range of data and other information sources, covering a spectrum of issues, were collected and analysed as part of the consideration of the event of the then two lead transport agencies in Queensland (Queensland Transport and Department of Main Roads).

This paper analyses and compares, in more depth, some of those information sets so as to:

- review the impact of the closure of the Riverside Expressway on the trip decisions of people in Greater Brisbane;
- consider the influence of a voluntary travel behaviour change program called TravelSmart on those trip decisions; and
- draw any conclusions evident from the above analysis.

2.0 SETTING THE SCENE

The Brisbane River bisects Greater Brisbane (the Brisbane Statistical Division) into roughly two equal halves and, due to its numerous meanders, forms the most significant natural barrier for north-south and east-west movements in Brisbane. The CBD itself sits on the northern side of the river as does the majority of the CBD Frame (For this paper the CBD Frame includes City, Spring Hill, Fortitude Valley, Milton, South Brisbane and Kangaroo Point).

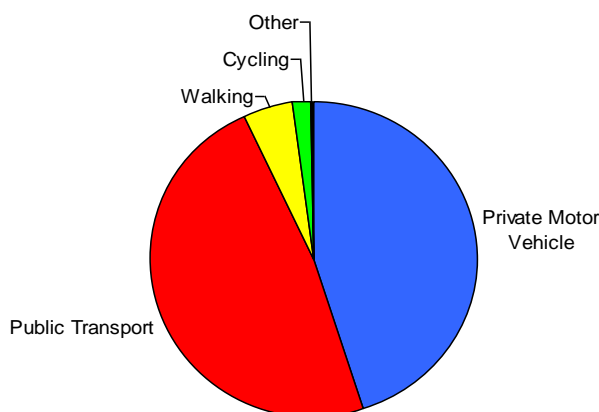
The Captain Cook Bridge connects the Pacific Motorway on the south side with the Riverside Expressway which sits over the northern bank of the river and tracks in an east west direction. The Riverside Expressway has numerous ingresses and egresses with the CBD and then becomes Coronation Drive to the west of the CBD.

In 2006 the Captain Cook Bridge/Riverside Expressway carried approximately 150,000 vehicles per day which equated to about 180,000 people movements in total. In addition, over 600 scheduled bus services used the Riverside Expressway both ways on a typical weekday which is about 18,000 people movements. (TransLink unpublished data 2006).

The resident population in the Brisbane City Council area in 2006 was 992,000, while the resident population in Greater Brisbane was 1.82 million (ABS 2008). The *South East Queensland Travel Survey 2003/04* revealed that on an average weekday there were approximately 6.3 million private person trips a day in Greater Brisbane across all modes. About 8 per cent (490,000) of these private person trips were to the CBD Frame. The most recent comprehensive mode split data is from the 2006 ABS Census - Journey to Work data sets. Figure 2 below shows the typical weekday private journeys to the CBD Frame.

Figure 2 – Typical Weekday Private Journeys to CBD Frame in 2006

Mode	Share
Public Transport	47.7%
Private Motor Vehicle	45.3%
Walking	5.1%
Cycling	1.7%
Other	0.2%
Total	100%



3.0 MAJOR TRANSPORT SYSTEM NETWORK CHANGES

The following data sets were considered to determine how the transport system was affected by the closure:

- actual road traffic and public transport ticket counts; and
- reported household travel data derived from surveys.

3.1 Private Vehicle Road Network Impact Analysis (based on traffic counts)

The road network analysis was primarily based on traffic data from counters maintained by Main Roads and Brisbane City Council. A broad cross section of the major corridors in Greater Brisbane were included in the analysis and provided an accurate but not complete picture of traffic volumes and network changes during the closure. Analysis of Main Roads' traffic data was based on a comparison of data collected on Wednesday 18 October 2006 with the average Wednesday traffic data for October 2006.

The closure of the Riverside Expressway had a major effect on the city road network with traffic increases of between 10 and 20 per cent on the major arterials within one kilometre of the CBD centre.

During the closure, on Wednesday 18 October 2006, there were approximately 34,000 (24 per cent) fewer vehicles on the Pacific Motorway at Gaza Road (approximately 8 kms south of the CBD) than on the previous Wednesday 11 October. If it is assumed that on average 1.2 people travelled in each vehicle, a total of 41,000 commuters made alternative transport arrangements such as different route, mode, deferment or cancellation of trip.

The Gateway Motorway and Gateway Bridge (the only river crossing east of the CBD Frame; distance approximately 8km) and some eastern arterial roads were also affected while most other roads one kilometre from the CBD Frame generally experienced little impact.

The road counter data (displayed in Figure 3 below and in the Tables 1 to 3 and Graphs 1 to 6 in the Appendix) showed that during the closure there was:

- very little change in traffic north of the Brisbane River
- a significant redistribution of traffic within the CBD Frame
- a significant increase in traffic on alternate river crossings
- a significant decrease in traffic on the Pacific Motorway to the Riverside Expressway
- an increase in traffic on the eastern corridor of Gateway Bridge and arterials; and
- a lessening of the effects of the impact the further away one was from the CBD.

Figure 3 – Traffic volume changes across Brisbane during the Expressway Closure

Figure 3a - Northern Suburbs Wednesday 18 October compared to Wednesday 11 October 2006

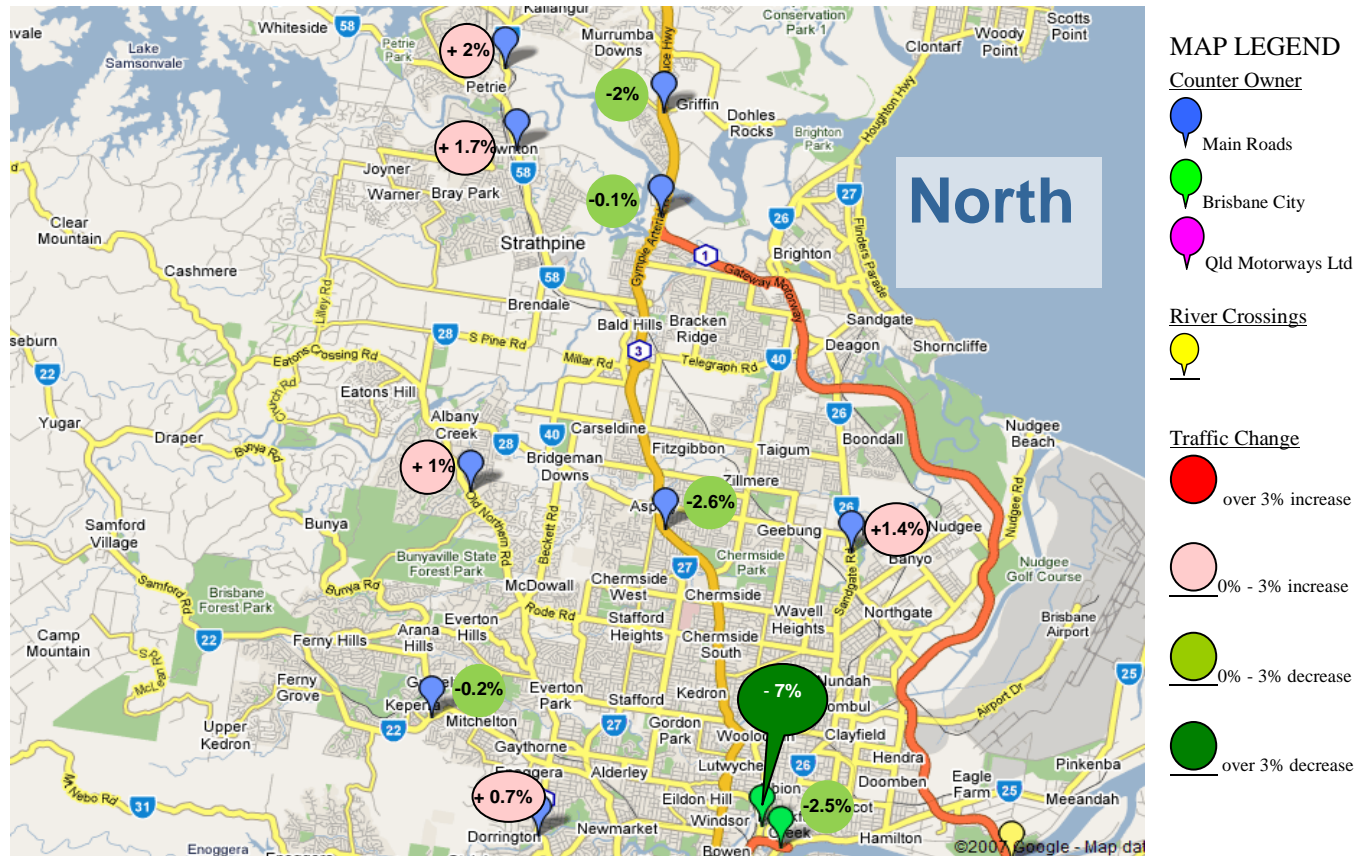
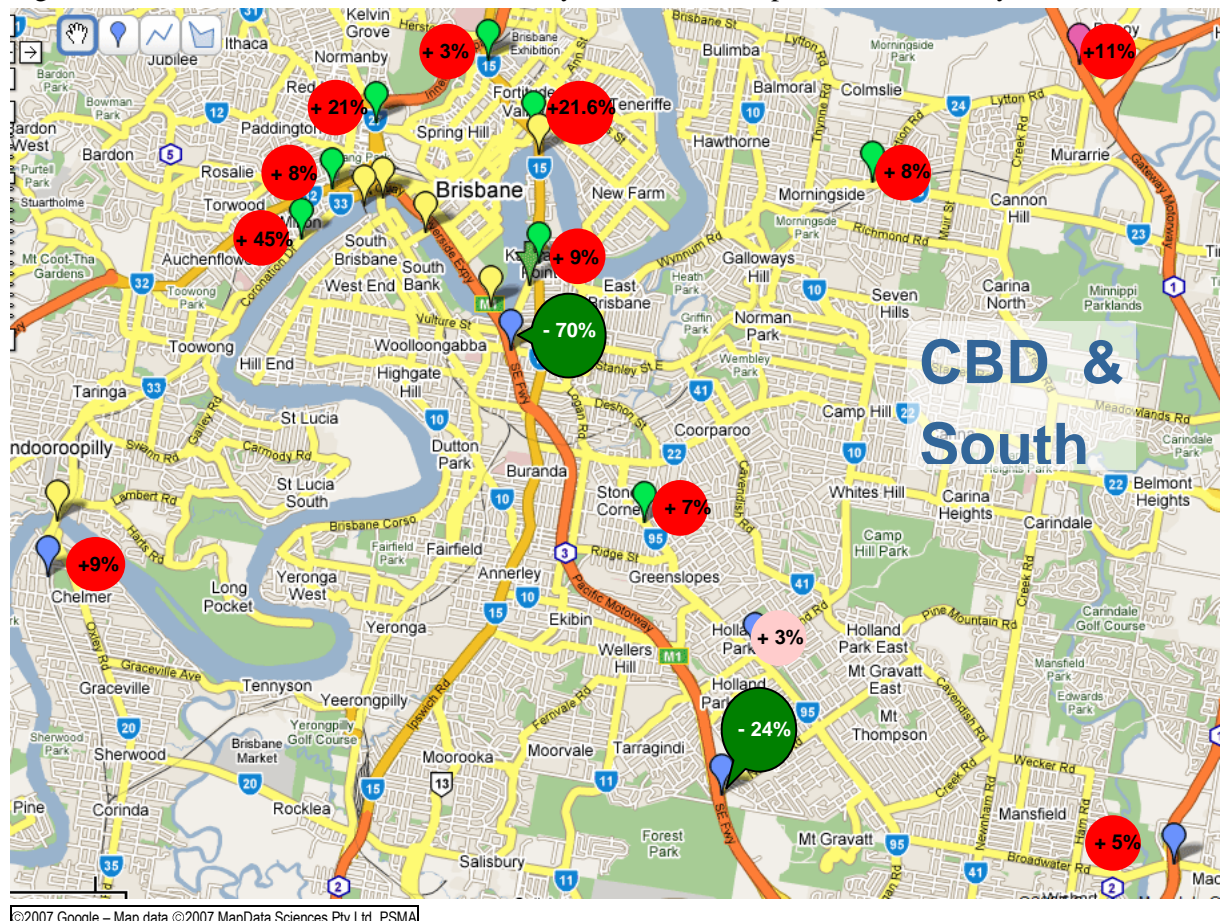


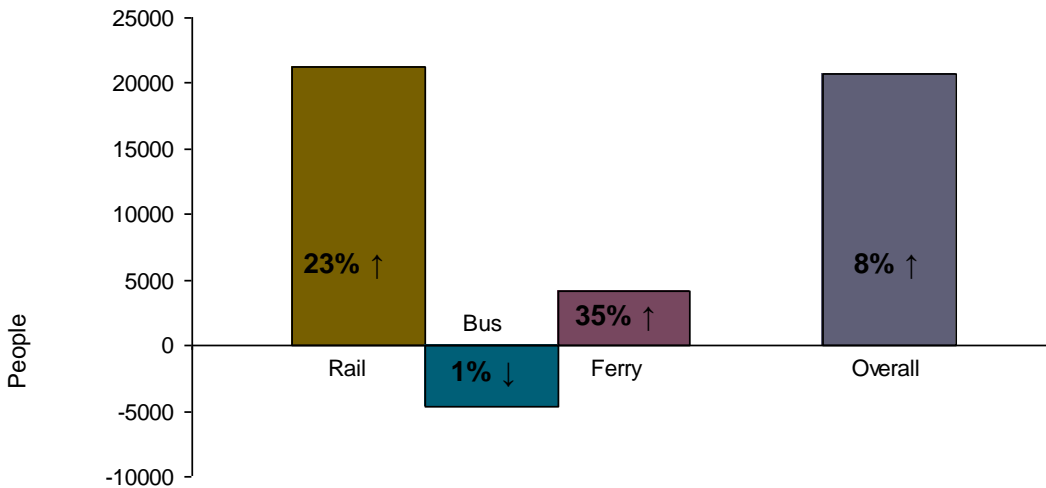
Figure 3b – CBD/Southern Suburbs Wednesday 18 October compared to Wednesday 11 October 2006



3.2 Public Transport Patronage Analysis (based on ticket counts)

A review of the actual public transport ticket data during the period indicates that public transport patronage increased by approximately 8 per cent during the Expressway closure. See Figure 4 below.

Figure 4 – Public transport mode shift during the Expressway closure



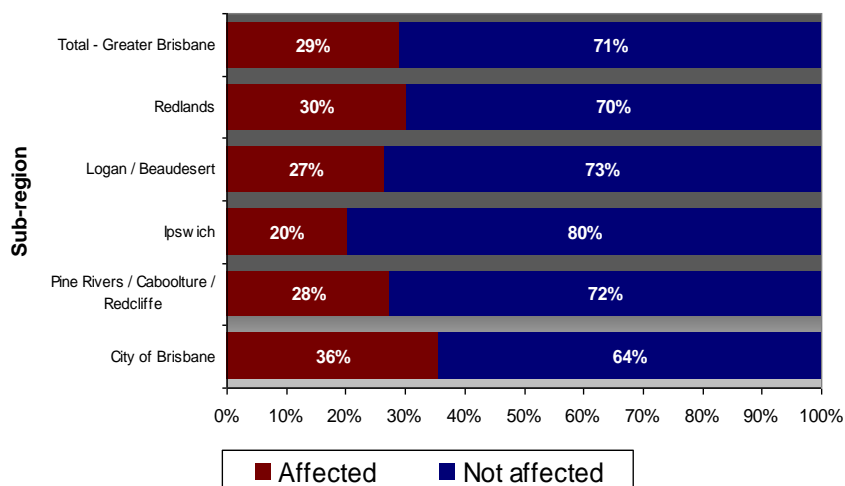
4.0 TOTAL PEOPLE MOVEMENT CHANGES (BASED ON TRAVEL SURVEYS)

4.1 Greater Brisbane

To provide a more complete understanding of total mode choice change (more comprehensive than the road traffic counts and public transport ticket data sets were able to illustrate) a travel survey of 2,085 households in Greater Brisbane (the Brisbane Statistical Division) was undertaken about four weeks after the closure.

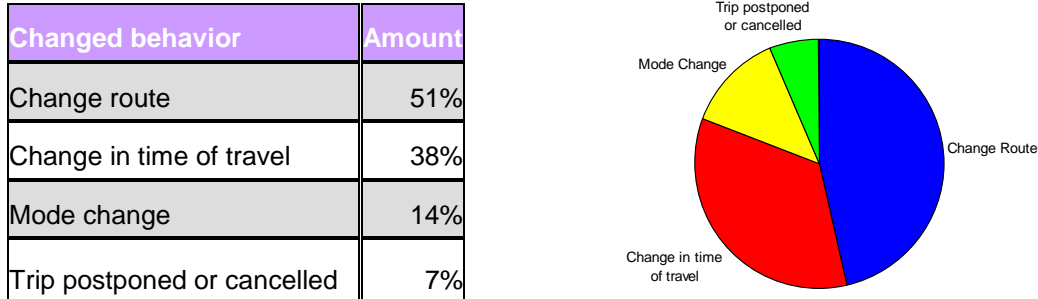
The household travel survey showed that 29 per cent of people (resident adults over 18) in Greater Brisbane were affected in some way (positively or negatively) by the closure. This level of affect varied across the major sub-regions with residents of Brisbane City Council most affected, as Figure 5 below shows. Further analysis within sub region was not easily achieved due to data coding constraints. However given that Brisbane City Council residents were most affected it is reasonable to assume that this increased closer to the CBD Frame.

Figure 5 – Greater Brisbane residents affected by the Expressway closure by sub region



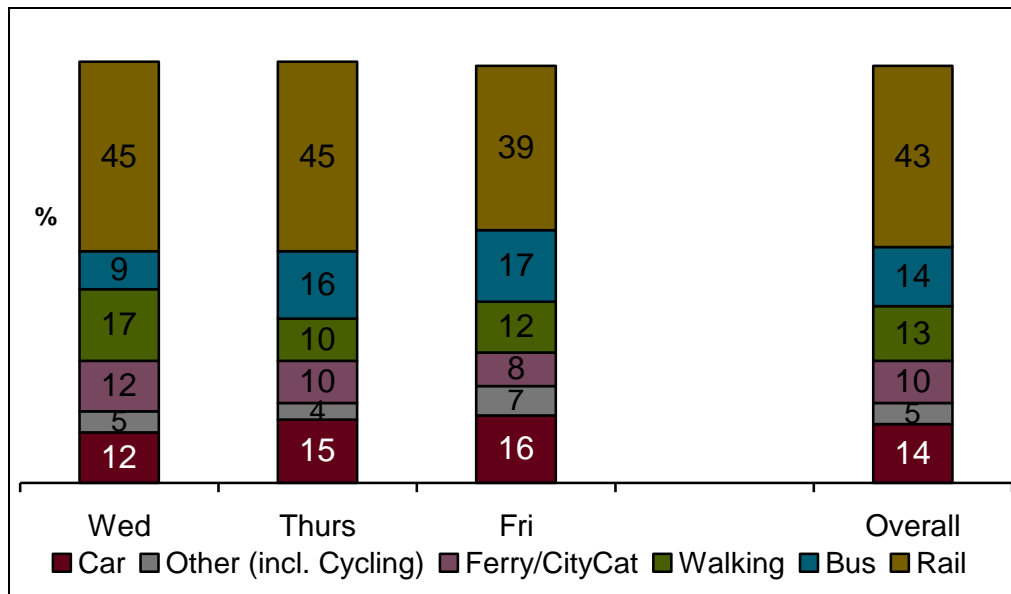
Returning to a consideration of the overall Greater Brisbane result of those 29 per cent who were affected, the major decisions people made as a result are shown in Figures 6 and 7 below.

Figure 6 – Behaviour change for affected Greater Brisbane population during Expressway closure



Most people made route and time changes. 14 per cent changed mode and only 7 per cent postponed or cancelled their trip. Option choice was not exclusive, with some people combining options such as route, time and mode changes.

Figure 7 – Mode shift for affected Greater Brisbane population during Expressway closure



Of the 14 per cent who changed mode, the majority shifted to rail followed by bus.

It is worth noting that this data set implies (in contradiction to the bus ticket data in Figure 4 which shows a 1 per cent drop in total bus use) that in fact, bus patronage increased during the closure. Anecdotal observations of bus operators support this conclusion and a likely explanation of the contradictory data is the high level of ticket confusion (for example, all rail tickets were valid on bus; many no ticket checks on buses in particular) during the event.

4.2 Brisbane North

By coincidence, a large scale voluntary travel behaviour program had just been completed in 70,000 northern suburbs households before the Riverside Expressway closure. A separate travel survey of 4,153 people in randomly selected households in five of the application suburbs (Nundah, Wavell Heights, Bracken Ridge, Bald Hills and Brighton) participating in the *TravelSmart Brisbane North Project* was carried out. (Socialdata Australia Pty Ltd. 2006, p.9). These five suburbs are typical Brisbane suburbs in the 8-20km range and provide a good representation of all residents in the 70,000 households of the Brisbane North TravelSmart project zone. This allows for an assessment of the impact of the TravelSmart Project on a participant's ability to adopt new travel behaviours during the Expressway closures and some comparison to non participants in the rest of Greater Brisbane.

TravelSmart is a voluntary travel behaviour change technique that provides tailored travel choice information to interested people. Its household based large scale applications in various cities in Australia, Europe and North America generally results in a significant drop in vehicles kilometres travelled (VKT) and a shift to the more sustainable modes of walking, cycling, public transport and ride sharing in targeted areas. In Australia, TravelSmart typically achieves VKT reductions ranging from 4 to 15 per cent (Australian Greenhouse Office 2005, p.5).

The TravelSmart survey showed that only 14 per cent of people in Brisbane North were affected by the closure, as compared to the 29 per cent for Greater Brisbane (as revealed in the general household survey). Of the 14 per cent of affected Brisbane North residents, the vast majority (87 per cent) that shifted mode were motor vehicle drivers, as compared to 71 per cent for Greater Brisbane. On average for the whole of Brisbane North, 66 per cent of those affected made no changes to their trip. Overall, residents of Brisbane North were much more likely to change mode during the closure (21 per cent compared to 14 per cent for Greater Brisbane).

Direct comparison of these five suburbs between the data generated by the Greater Brisbane household survey (2,085 households) and Brisbane North survey (4,153 persons) was not possible due to the small sample sizes the Greater Brisbane survey generated at the individual suburb level.

None the less, it is reasonable to assume that the much larger sample size of the Brisbane North TravelSmart survey in a smaller area would generate more reliable results and, when considered along with the road traffic data, there is strong evidence to support the view that residents in Brisbane North were less affected by the Expressway closure than others.

Based on this analysis, it is reasonable to conclude that Brisbane North residents would have less actual or perceived reasons than others to modify their normal trip decisions during the closure.

Their actual trip modification however was not as expected, as Figures 8 and 9 below show.

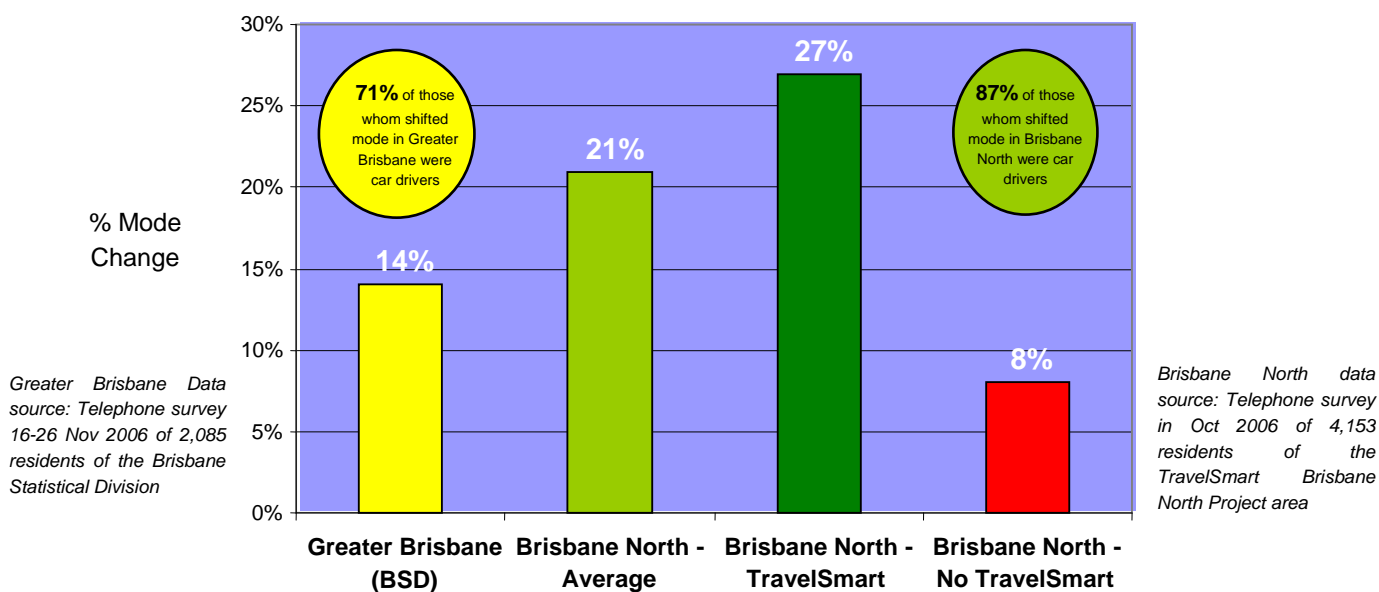
Figure 8 – Behaviour change of affected Brisbane North population during Expressway closure

Total (Average) %	Changes	With TravelSmart %	Without TravelSmart %
21	Changed mode	27	8
- 12	- Public Transport	- 14	- 6
- 3	- Walking and Cycling	- 4	- 0
- 3	- Motor vehicle as passenger	- 5	- 2
- 3	- Motor vehicle as driver	- 4	- 0
9	Changed route	10	8
4	Stayed home, cancelled trip	5	3
66	No change	58	81
100	Total	100	100

Figure 8 derived from Socialdata Australia Pty Ltd. 2006 – Table 5

Those who had been serviced with information by the TravelSmart project were even more likely to change their travel behaviour in response to the closure, having a 27 per cent mode shift. This was almost twice the Greater Brisbane average of 14 per cent and over three times the mode shift of their peers in Brisbane North whom did not to participate in TravelSmart.

Figure 9 - Mode change of affected populations - Brisbane North compared to Greater Brisbane



This change is quite significant, even when allowing for the possibility that Brisbane North residents did not know that northern suburbs roads and approaches to the CBD were least affected by the closure. In actuality, Brisbane North car drivers had less than average reason to change mode during the closure and at worst (based on a misperception) no more reason to change. The fact they did change at twice the rate of the rest of Greater Brisbane suggest that TravelSmart and its tailored information approach was an important factor in that change.

5.0 REALISING THE POTENTIAL FOR CHANGE

5.1 Explaining the Brisbane North results – information enabling change

An important indicator for potential change motivation for residents of Brisbane North is the fact that those whom had received the TravelSmart project information obtained significantly higher positive experience levels if they switched to Public Transport.

Those Brisbane North those residents that had received TravelSmart had a positive to negative experience ratio of 2.5 to 1 (10 per cent positive to 4 per cent negative), with their public transport trip during the closure. This is in contrast to a positive to negative experience ratio of 1 to 1 (3 per cent positive to 3 per cent negative) for those that declined to participate in TravelSmart but still chose public transport for their trip requirements during the closure. (Socialdata Australia Pty Ltd. 2006, Table 6). Figure 10 below shows this in more detail.

Figure 10 – Experience of affected Brisbane North population during Expressway closure

Total (Average) %	Experience with Public Transport	With TravelSmart %	Without TravelSmart %
12	Changed to Public Transport	14	6
- 8	- positive	- 10	- 3
- 4	- negative	- 4	- 3
22	Other changes	29	13
66	No change	57	81
100	Total	100	100

Figure 10 derived from Socialdata Australia Pty Ltd. 2006 – Table 6

These increased satisfaction levels suggest that they were better informed and possessed a greater understanding of alternate mode choices. ‘Other changes’ includes all other inter-modal modifications and no trips. Reporting of the positive to negative ratios for ‘Other changes’ and ‘No change’ was not done at the time of the original consultants report in 2006. Further analysis of these other categories might provide further evidence to support the conclusion that tailored information is an important enabler to both more informed choice and unlocking the potential for change.

5.2 Understanding the potential for more change

During 2004 and 2005 the then Queensland Transport commissioned household travel surveys specifically focused on understanding people’s trip decision choices – the *Potentials Analysis* (Socialdata Australia Pty Ltd. 2005, p.1). This analysis showed that there was significantly more untapped potential for people in Brisbane to change mode. This occurred not only during extreme events such as major road closures, but as a normal part of travel choice when the system is functioning normally.

The *Potentials Analysis* was updated in 2006 to help analyse the Expressway closure. It resulted in a travel behaviour survey of 6,924 people (including a sub-sample of 1,003 Face-to-Face interviews) across randomly selected households in a group of inner, middle and outer ring suburbs to represent ‘Brisbane’. The Face-to-Face interviews focused specifically on people’s perceptions and attitudes about the different modes and potentials for behaviour change. (Socialdata Australia Pty Ltd. 2006, pp.9-10).

Figure 11 below shows that, on average, every motor vehicle in 'Brisbane' in 2006 made 914 trips for the year. Of these, 53 per cent of motor vehicle trips experienced a constraint or had no viable alternative. Constraints include mobility impairments, luggage requirements and so on. Alternatives are considered viable if:

- the car trip distance is less than twice the average walk or cycle distance
- the door-to-door public transport trip time is less than twice the motor vehicle trip time or 20 minutes longer (whichever is the least).

It is also often assumed that the financial costs in switching from private vehicle to other modes (for example those with free parking whom now have to buy a PT ticket) would be a high ranking factor contributing to objective barriers. However, less than 1 per cent of those surveyed in-depth sighted the financial cost of switching to PT as important. (Socialdata Australia Pty Ltd. 2005 – pp.15-16).

According to these definitions and the findings, Figure 11 below therefore shows us that almost half (47 per cent) of all motor vehicle trips had a viable alternative. Deeper analysis of the actual trip requirements of this group revealed that:

- 35 per cent of all motor vehicle trips could have been substituted by bicycle trips
- 13 per cent by walking
- 18 per cent could be substituted by existing public transport services (noting that given current public transport system loads some additional peak capacity would be required).

Figure 11 – Replaceable Motor Vehicle Trips per Year 'Brisbane' 2006

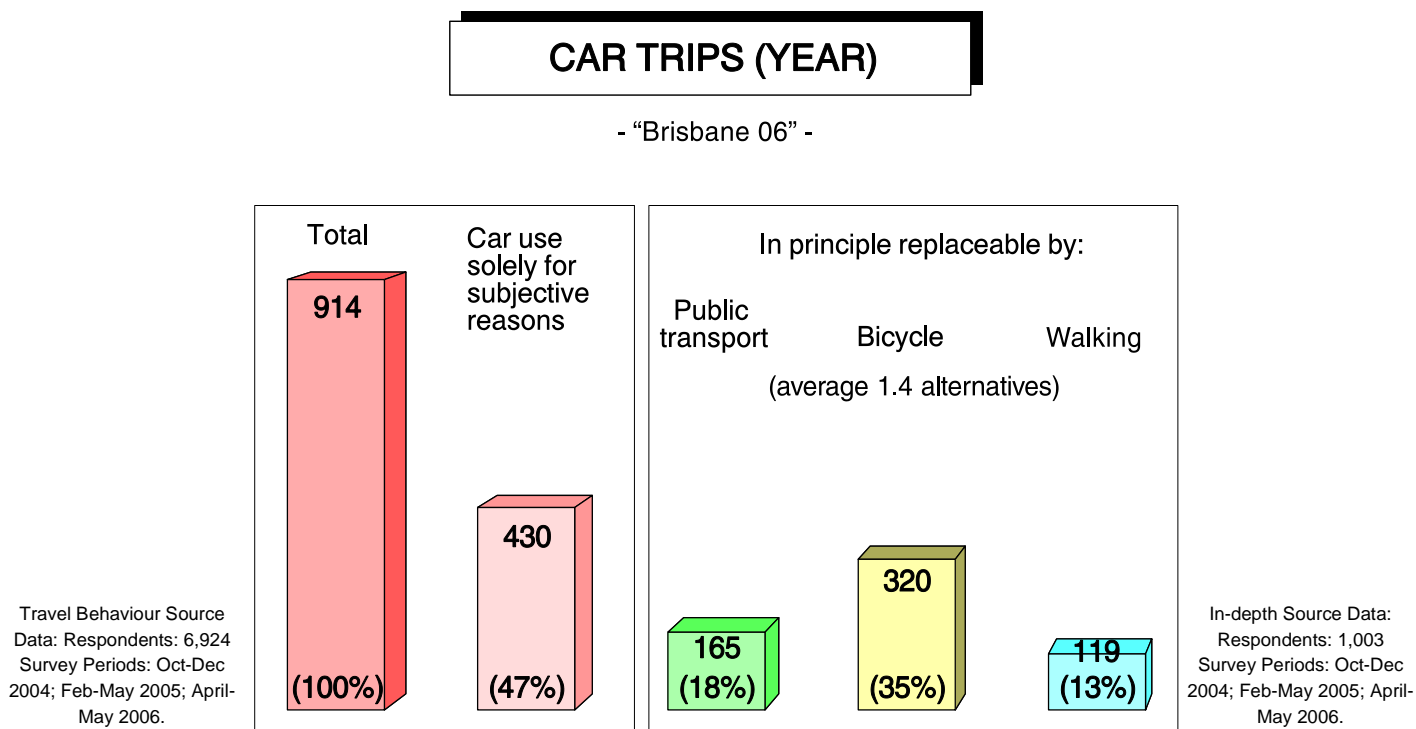


Figure 11 reproduced from Socialdata Australia Pty Ltd. 2006, p.4

5.3 Unlocking the potential for more change in the transport system

The Potentials Analysis shows us that there is a very large untapped market segment of current car trips that could shift, relatively easily, to alternate modes.

All residents of Brisbane North had a fairly equal opportunity to receive information on alternates for their trip needs during the closure via standard media (television, radio, print and online). Their higher mode shift out of car coupled with greater satisfaction levels with their choice indicate that TravelSmart's user focused tailored information was significantly more successful than standard mass marketing techniques.

The large scale TravelSmart Brisbane North application demonstrated this emerging untapped market segment in action – the group with the least need to shift out of their cars during an extreme event had the highest rates of mode shift. People were motivated to make choices that not only better-suited them better but are arguably better for the transport system.

6.0 IN SUMMARY

The closure of the Riverside Expressway was a significant event that caused disruption to a number of people's travel plans. The closure had a major effect on the city road network with traffic increases of between 10 and 20 per cent on the major arterials within one kilometre of the CBD. Beyond that, affects tailed off quickly.

Ticket data analysis showed that public transport patronage increased by approximately 8 per cent during the closure with the majority moving to rail. This analysis was supported by the findings of a large scale household travel survey of Greater Brisbane which indicated that overall mode change during the closure was approximately 14 per cent, with almost three quarters of the reported mode shift coming from car to other modes. The vast majority of affected commuters modified their travel behaviour mainly through a combination of route and time changes. Very few people cancelled or postponed their intended trips.

Across Greater Brisbane, 29 per cent of people reported some affect on them – either positive or negative. However in Brisbane North, where a large scale voluntary travel behaviour change program had, by coincidence, just been completed only 14 per cent of people reported being affected by the closure. Despite being less affected, Brisbane North residents were much more likely to change mode during the closure, with those who had participated in TravelSmart having a 27 per cent mode shift (almost twice the Greater Brisbane average).

This behaviour by Brisbane North residents was somewhat unexpected. An explanation can be found in the *Potentials Analysis* which showed that almost half the car trips in Brisbane (47 per cent) could shift, relatively easily, to alternate modes. The Brisbane North TravelSmart application tapped this emerging market segment at a large scale by providing tailored travel choice information to interested people. During the closure the better informed residents of Brisbane North not only made greater mode shift out of cars but were more satisfied with that choice.

7.0 CONCLUSIONS

- People can and will change their normal trip patterns if they have a reason and the opportunity to do so, and overwhelmingly prefer a trip modification over postponing or cancelling an activity.
- Relevant, timely information is critical to people making the most informed trip choice and the better informed they are the more likely they are to choose alternates to the car, even during a severe transport system event.
- The development of tailored information is a critically important factor in tapping into and mobilising an untapped segment of potentially more sustainable trips currently undertaken by car. This in turn is an important step in building a user-focussed sustainable transport system for Greater Brisbane.

8.0 REFERENCES AND SOURCES

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Appendix 1 – Traffic Volumes and Comparisons

Table 1 – Wednesday Traffic Volume Changes during REX Closure - North of Brisbane River

Traffic Counter Location (and Owner)	Percentage Change (+/-) Wednesday 18 October compared to Wednesday 11 October 2006
Abbotsford Road @ Burrows Street, Bowen Hills (BCC)	-7.00
Anzac Avenue @ Petrie Street, Petrie (Main Roads)	+2.07
Breakfast Creek Road @ Kingsford Smith Drive, Newstead (BCC)	-2.50
Bruce Highway @ Dohles Rocks Road, Murrumba Downs/Griffin (Main Roads)	-2.13
Bruce Highway @ Gateway Merge, Bald Hills (Main Roads)	-0.05
Gympie Road near Darwin @ Aspley (Main Roads)	-2.63
Gympie Road near Todds Road, Lawnton (Main Roads)	+1.78
Moggill Road near Cedarleigh, Chapel Hill (Main Roads)	+0.36
Old Northern Road near Keong , Albany Creek (Main Roads)	+1.02
Samford Road near Dawson Parade, Keperra (Main Roads)	-0.21
Sandgate Road near Pritchard Street, Virginia (Main Roads)	+1.37
Wardell Street @ Fraser Street, Ashgrove (Main Roads)	+0.73

Table 2 – Wednesday Traffic Volume Changes during REX Closure - South of Brisbane River

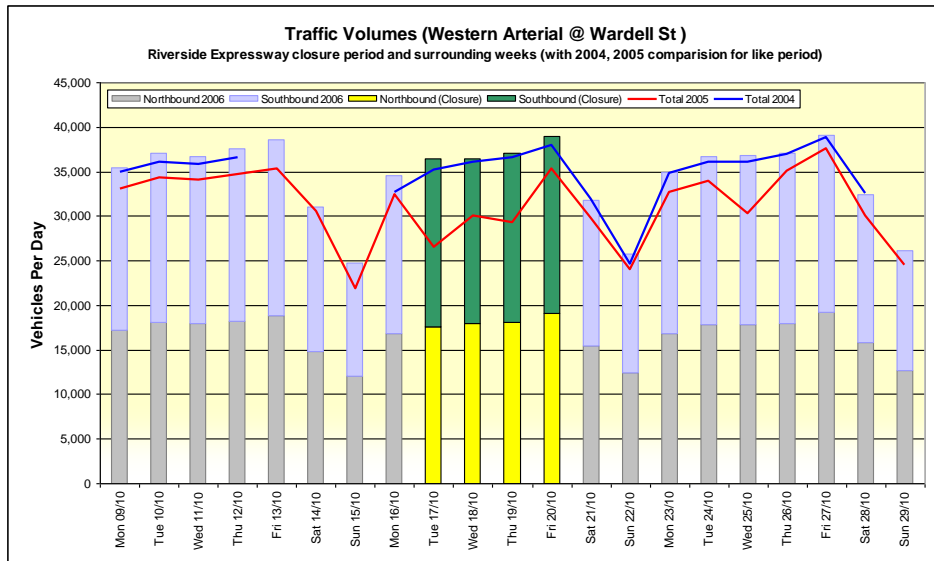
Traffic Counter Location (and Owner)	Percentage Change (+/-) Wednesday 18 October compared to Wednesday 11 October 2006
Beaudesert Road near Boundary Road, Acacia Ridge (Main Roads)	+2.73
Gateway Motorway @ Mt Gravatt Capalaba Road, Mackenzie (Main Roads)	+5.20
Gateway Motorway @ Bridge toll booths (QML)	+11.0
Honour Av near Hurlton, Graceville (BCC)	+9.00
Ipswich Motorway near Francis @ Redbank (Main Roads)	+1.37
Ipswich Motorway @ Goodna (Main Roads)	+1.28
Logan Road @ Juliette Street, Stones Corner (BCC)	+7.00
Logan Road near Marshall Road , Holland Park West (Main Roads)	+2.55
Pacific Motorway @ Gaza Road On ramp, Mt Gravatt (Main Roads)	-23.93
Pacific Motorway @ Stanley Street On ramp (Main Roads)	-69.70
Wynnum Road at Junction Road, Morningside (BCC)	+8.20

Table 3 – Wednesday Traffic Volume Changes during REX Closure – CBD Frame

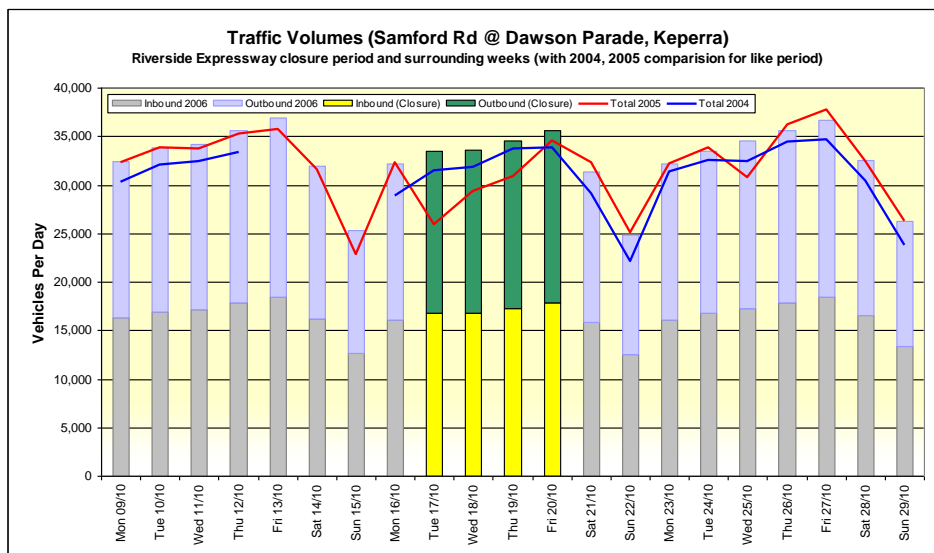
Traffic Counter Location (and Owner)	Percentage Change (+/-) Wednesday 18 October compared to Wednesday 11 October 2006
Bowen Bridge Road @ Gregory Terrace, Fortitude Valley (BCC)	+32.50
Coronation Drive @ Graham Street, Milton (BCC)	+45.00
Elizabeth Street On Ramp @ William Street, CBD (BCC)	Incomplete data
Grey Street Bridge @ Saul Street, North Quay (BCC)	Incomplete data
Kemp Place (North bound), (BCC)	+21.60
Margaret Street On ramp @ George Street, CBD (BCC)	Incomplete data
Milton Road @ Castlemaine Street, CBD (BCC)	+8.00
Normanby Fiveways @ Spring Hill (BCC)	+21.00
River Terrace @ Main Street, Kangaroo Point (BCC)	+19.00

2004 to 2006 Traffic Volume Changes during REX Closure – North of the Brisbane River

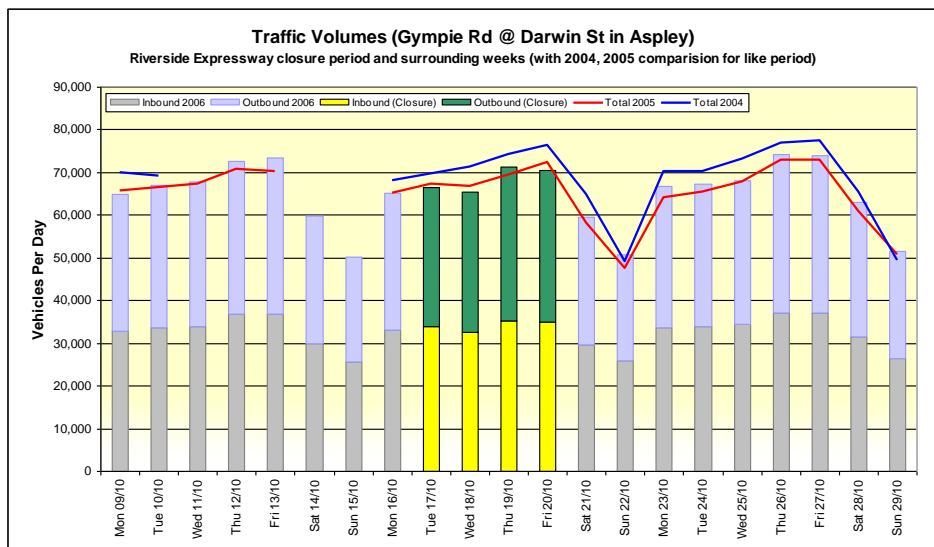
Graph 1 – Western Arterial at Wardell Street (6 kms from the CBD)



Graph 2 – Samford Road at Dawson Parade Keperra (9 kms from the CBD)

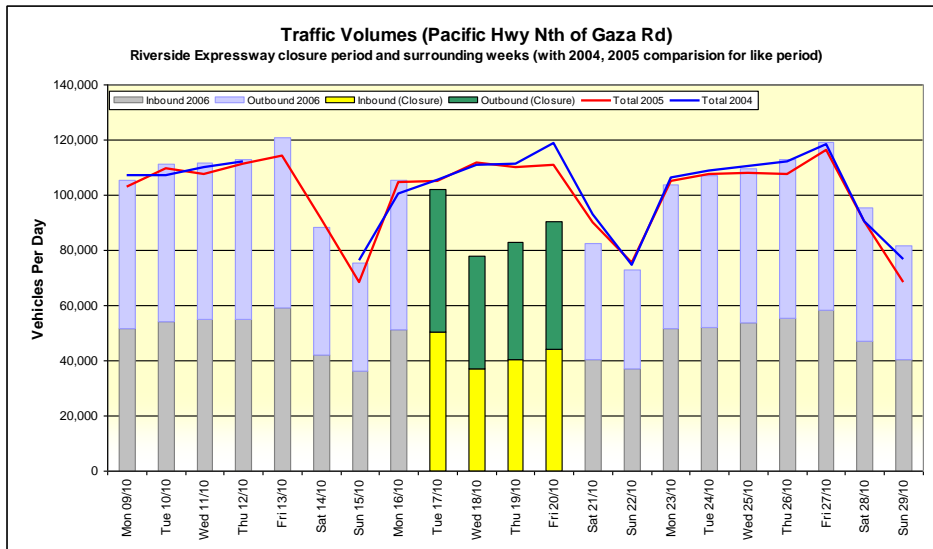


Graph 3 - Gympie Road at Darwin Street Aspley (11 kms from the CBD)

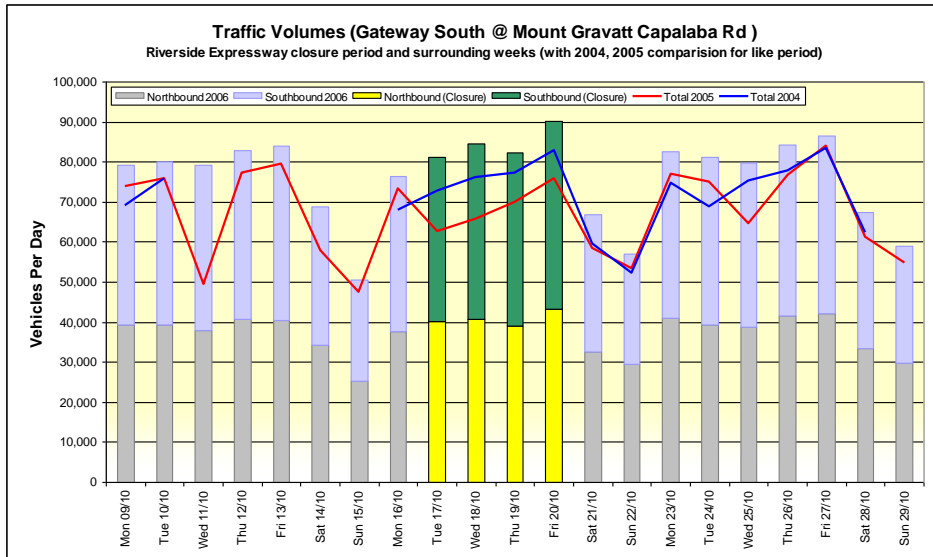


2004 to 2006 Traffic Volume Changes during REX Closure – South of the Brisbane River

Graph 4 – Pacific Motorway at Gaza Road (8 kms from the CBD)



Graph 5 – Gateway South at Mt Gravatt Capalaba Road (12 kms from the CBD)



Graph 6 – Pacific Motorway at Park Road (20 kms from the CBD)

