Summary

- This paper reviews data relating to patterns of traffic movements on the main arterial routes between the Waimakariri District and Christchurch City.
- Monthly average daily traffic movements across the Northern Motorway Waimakariri River Bridge southbound for 2008 – 2013 show significant increases in traffic volumes, and also considerable monthly variation.
- Peak traffic monthly traffic volumes occur in October/November and March each year, and the records for November for 2009 – 2013 show that there has been an overall increase of 21.7 percent in the number of traffic movements, with an increase of 19.8 percent for light vehicles and 53.2 percent for heavy vehicles.
- Between 2009 and 2013 there has been a 70.4 percent increase in the number of vehicles entering the Northern Motorway from Tram Road, with the majority of these likely to be doing so during the morning peak travel time.
- A comparison of the vehicle movements across the Northern Motorway Bridge (southbound) show that there has been a shift in the time at which people are choosing to travel. The peak numbers of traffic movements in March 2014 was between 6.30am and 6.45am compared with 6.45am and 7.15am in March 2013.
- Traffic movements across the Old Main North Road Bridge are approaching 10,000 per day representing an additional number of traffic movements per day between the District and Christchurch City in the vicinity of 20 – 25 percent.
- The establish pattern of a higher number of traffic movements during the afternoon peak travel time compared with the morning peak travel time across the Old Main North Road Bridge continues, with a marked increase being recorded for September 2013 compared with May 2012.
- The increases in the difference between average actual travel times and averaged scheduled travel times recorded for buses travelling between Kaiapoi and Belfast since early 2013 indicate that there is increasing congestion on this route.
- In 2013 approximately 10750 people from the District were working in Christchurch with approaching 2,800 of these people working in the Riccarton/Blenheim/Lincoln Roads area.
- An estimated 800 – 850 children from the District were attending schools in Christchurch in 2013, and up to 500 people living in the District could have been attending tertiary institutions in the City.
- It is anticipated that the number of people travelling into Christchurch to work will continue to increase as new dwellings are completed in the Waimakariri District.
- Options available to improve the flow of traffic on the northern arterial roads have the potential to provide incremental improvements.
- For a more radical approach involving the introduction of a rail service to succeed would need to be seen as an integrated solution involving “park and ride” and linking bus services.
1 Introduction

This occasional paper reviews data relating to the patterns of traffic movement on the main arterial routes between the Waimakariri District and Christchurch City. In recent months the volume of traffic on the Northern Motorway (State Highway 1) across the Waimakariri River Bridge southbound has reached a point where the impact on travel times of additional vehicles is out of proportion to the number of extra vehicles on the route. This phenomenon is identified as a ‘congestion curve’, and it is important that the traffic patterns which are contributing to it are understood.

While the congestion on the Northern Motorway appears the most immediate problem faced by people seeking access to the City from the Waimakariri District during the morning peak, those moving around Christchurch during this time also face significant delays in reaching their destinations. These delays result from a combination of changes in travel patterns because of businesses relocating from the centre City, and the need to constrain access to key roads across the City to affect repairs to earthquake damaged infrastructure.

2 Northern Motorway traffic patterns

A good deal of data is available relating to traffic patterns on the Northern Motorway. Figure 1 provides an overview of the fluctuation of traffic volumes by month since 2008.

Figure 1

Although the data sequences are not complete, figure 1 shows that despite quite wide monthly fluctuations, there has clearly been a substantial increase in the numbers of the monthly average daily traffic movements southbound across the
Waimakariri Bridge on State Highway 1 (SH1). While some of these variations would appear to be seasonal variations, others such as the steep declines in the number of traffic movements in 2011 can most probably be attributed to the ongoing earthquakes being experienced particularly in the City throughout most of that year.

While figure 1 focuses attention on southbound movements, figure 2 sets out the total average daily traffic movements across the Waimakariri River Bridges on SH1 for light and heavy vehicles for November 2009 - 2013. This month has been chosen as it has recorded the highest average daily counts for each year under review.

**Figure 2**

![Figure 2: State Highway 1: Waimakariri Motorway Bridges total light and heavy vehicle average daily counts, Nov 2009 - Nov 2013](image)

Figure 2 shows that for November 2013 compared with November 2009 there was an increase of 8426 (21.7 percent) in the number of total traffic movements between the City and the Waimakariri District. For light vehicles there was an increase of 7247 (19.8 percent), and for heavy vehicles there was an increase of 1179 (53.2 percent).

3 **The morning traffic peak on the Northern Motorway**

There are two key issues associated with understanding the morning traffic peak travelling south from the Waimakariri District, the distribution for vehicles entering the Northern Motorway and leaving it, and the times at which people are choosing to travel.

Figure 3 sets out the numbers of vehicles on the Northern Motorway at various points between the Ohoka Road (south Kaiapoi) on-ramp and SH1 at Belfast.
Figure 3 shows that there has been a substantially greater increase in the vehicle counts for the Waimakariri River Bridge than for SH1 either north or south of the Ohoka Road on-ramp. The increases recorded over the period 2009 – 2013 were for north of Ohoka Road 1,250 (10.0 percent), south of Ohoka Road 1,506 (9.2 percent), the Waimakariri River Bridge 3,438 (18.0 percent), north of Dickeys Road 2,560 (17.2 percent) and south of Dickeys Road 2,761 (17.0 percent).

The increases between south of the Ohoka Road on-ramp and the Waimakariri River Bridge are attributable to traffic from Tram Road entering SH1. In 2009 there was an increase of 2759 in average daily traffic movements between the two points, but by 2013 the difference was 4691. This represents an increase of 1,932 (70.4 percent). The decreases between the Waimakariri River Bridge and north of Dickeys Road are attributable to changes in the number of vehicles leaving SH1 for the Marshlands Road route into the City, the business area at Bridge End or the Styx communities to the south of the Waimakariri River. The number of vehicles leaving SH1 after crossing the Waimakariri River Bridge increased by 878 (12.8 percent) between 2009 and 2013.

While these are daily counts, it can be assumed that much of the increase in traffic volume is being generated during the morning peak time traffic. The timing of these peaks is also a factor in determining the extent of congestion generated. Figures 4 and 5 set out the hourly traffic counts for weekdays in October/November 2013 and March 2014. It should be noted that the each of the weeks selected involved five working days. The weeks in which Labour Day and Christchurch Anniversary Day (Show Day) occurred were omitted from figure 4.
Figures 4 and 5 show that the total number of traffic movements for the period 6 am to 10 am was higher in the October/November period the number of traffic movements occurring between 6 am and 7 am was higher during March 2014. During the four weeks in October/November 2013 there was an average of 10,103 traffic movements per day during the 6 am to 10 am period, compared with an average of 9,298 traffic movements per day during the same hours in March 2014.

Figures 6 and 7 provide more detailed data comparing the quarter hourly counts for the week beginning Monday 11 March 2013 with the week beginning Monday 10 March 2014.
The distribution in figure 7 when compared with figure 6 shows clearly the peak in traffic movement has shifted to 6.30 – 6.45 am from 6.45 – 7.15 am 12 months earlier. Figure 7 also shows the very rapid decline in number of traffic movements after 7.00 am also evident in Figure 5.

4 Traffic movements on the Old Main North Road Bridge

The Old Main North Road Bridge over the Waimakariri River provides an alternative to the Northern Motorway Bridges, and it also carries significant traffic volumes. While traffic counts are available for this bridge, they are not as comprehensive as those available for the Northern Motorway Bridges, and recent counts for 2011 – 2013 are set out in Figure 8.
Figure 8 shows that there was a sharp increase in the total number of vehicle movements per day for September 2013 compared with May 2012. With approaching 10,000 vehicle movements per day on the Old Main North Road Bridge in September 2013, this represents an additional 20 – 25 percent of vehicles in addition to the average number using the Motorway Bridges of approximately 45,000 to 47,000 in late 2013.

Figure 8 also shows a greater increase in the number of traffic movements using this bridge during the afternoon peak travel time than for the morning peak travel time. In addition there was a sharper increase in the number using the Old Main North Road Bridge between 3pm-7pm than between 6am-10am in September 2013 compared with May 2012.

The pattern of a higher level of use of the Old Main North Road Bridge in the afternoon peak travel time than in the morning peak travel time is well established. It is considered that this is in part attributable to the tendency for people travelling out of Christchurch via Marshlands Road to continue on the Old Main North Road rather than deviating to access the Motorway and having to join the peak time traffic on the right hand lane. More recently, the afternoon congestion in Belfast created by the merging of the traffic on the Main North Road with that from Johns Road may be persuading more people to choose to travel out of Christchurch on Marshlands Road.

Figure 9 shows variations between the scheduled time and the times recorded by buses travelling between Kaiapoi and Belfast. These buses travel between these two centres on the Old Main North Road not via the Northern Motorway.
Figure 9 shows that the average actual times being taken by buses to travel between Kaiapoi and Rangiora increased sharply from the beginning of 2013. This can be seen as evidence that significant congestion has been occurring on the Old Main North Road at peak times since early 2013. In early 2014 there were also occasions when traffic on the left lane on the Northern Motorway stalled because of the build-up of vehicles exiting to the Old Main North Road.

As far as the issue of travel times for buses servicing the route between the Waimakariri District and the City, advice was received in April 2014 from Environment Canterbury that the delays on the route were more significant during the afternoon peak travel time than during the morning peak travel time.

5 Anticipated future traffic volumes

The 2013 Census found that 10,725 people, 41.5 percent of the Waimakariri District’s usually resident workforce was working in Christchurch. This was an increase of 1,794 (20.1 percent) compared with the number recorded at the 2006 Census.

Figure 10 sets out the distribution for people living in the Waimakariri District and working in Christchurch for 2006 and 2013, and compares this with the distribution for these years for the City’s daytime work force.
Figure 10 shows that in 2013 the highest numbers of people from the Waimakariri District were working in the area of Christchurch bounded by Riccarton, Blenheim and Lincoln Roads, including the outer areas of Hornby, Sockburn and Islington. When considering the changes in the distribution of the post-earthquake workforce across Christchurch some commentators classify these outer areas as part of the “outer west”. When considering issues relating to travel to work from the perspective of people living in the Waimakariri District the current congestion on Johns Road at peak travel times, it could well be easier to travel to work through the City if an efficient rail and bus service became available.

In addition, the 2013 Census results suggested that there are in the vicinity of 800 to 850 school aged children from the Waimakariri District attending schools in Christchurch. The Waimakariri District Council’s recent surveys suggest that a significant proportion of these children are likely to be attending the major Christchurch secondary schools – Christchurch Boys and Girls High Schools, St. Bede’s College, St Andrew’s College, St Margaret’s College, Rangi Ruru Girls’ School and Christ’s College. Surveys of households that have recently moved into the District from Christchurch also show that children from these households are often continuing to attend schools in Christchurch, many of these in the east of the City as many of these new households involve people relocating from red zoned areas.

Other surveys also indicate that there are students living in the District attending Canterbury University and the Christchurch Polytechnic Institute of Technology (CPIT), but it is not possible to identify the numbers of these students accurately. The 2013 Census, however, reported that there were 2727 people 15 years and over living in the Waimakariri District studying full-time. If the 15 – 17 years age group (2240) are discounted it is reasonable to suggest that there were at least 500
full-time tertiary students living in the District in 2013, and a considerable number of these people could well have been attending Canterbury University or CPIT.

Since the 2013 Census the number of occupied dwellings in the Waimakariri District has continued to increase, with approximately 75 – 80 Code Compliance Certificates being issued by the Council for new dwellings each month. Although the number of applications for consents for new dwellings being lodged per month may have begun to decline, the number of currently being received by the Council is still significantly higher than historic trends.

Current estimates suggest that the District’s population is likely to reach approximately 60,000 in 2017/18 about four years earlier than previously projected by Statistics New Zealand. While the employment opportunities available in the District continue to increase, recent Council surveys indicate that where households with people in the paid workforce relocated from Christchurch approximately 60 percent of these people will be working in Christchurch. This is higher than the Census results for the District’s work force as a whole which was 41.5 percent.

The overall conclusion concerning anticipated future traffic volumes likely to be travelling between the Waimakariri District and the City, particularly at peak times is only likely to increase in the short to medium. In view of the fact that until the completion of the major roading projects that will provide additional capacity on the northern routes into Christchurch due for completion in 2017 and 2020/21, this suggest that congestion on the northern arterial routes into the City will continue to increase over the next few years.

6 Options to improve the situation

Considerable attention is being paid to strategies to improve the situation for people travelling on the northern arterial routes into the City. Many of these are likely to produce incremental improvements. The most radical of the options currently under review is the introduction of a rail service between the District and the City, and this would offer the advantage of not only removing people and vehicles from the northern arterial routes at peak time but also from the traffic volumes in the City as well.

There is considerable skepticism about the feasibility of the provision of rail services, with concern mainly focusing on cost and the extent to which a rail service would take people to where they need to go. When considering a rail service as a short-term solution to peak time congestion, it is probably reasonable to consider confining any service to one that runs in the mornings and late afternoon/evening. For example, it could involve three trains leaving Rangiora at 6.45am, 7.15am and 7.45 am, with the late afternoon/evening service leaving Tower Junction at 5.00pm, 5.30pm and 6.00pm or a similar schedule. It would probably be necessary to recognise that some of the people travelling on the morning service might return on a bus earlier in the afternoon.
In terms of concerns about whether a rail service would take people to where they wanted to go, it is important to note that with the movement of the work force to the Riccarton/Blenheim/Lincoln Roads area increases the attractiveness of a rail service which would terminate at Tower Junction.

It is also envisaged that a rail service would involve stop at Papanui and Mona Vale, and would thus offer opportunities for people working in Papanui to commute by rail. Existing bus services from Papanui will provide opportunities for people leaving the train at Papanui to change to a bus to reach locations towards the centre of the City, such as St Andrew’s and St Margaret’s Colleges. Some might also choose to leave the train at Papanui and travel by bus to Central City locations.

The Mona Vale stop would provide easy access to other main secondary schools attended by young people from the District. In fact, prior to the opening of Rangiora Boys High School some of the secondary school students from the District attended Christchurch Boys High School and travelled to school each day on the railcar service that existed at that time. An existing bus service travels via Kilmarnock and Kahu Roads to Creek Road, and would allow Canterbury University students to change mode at Mona Vale. Buses travelling on the Riccarton Road route would also be readily accessible to people leaving a commuter train at this stop. In addition, consideration might be given to providing a special bus service from Mona Vale for people working at the Christchurch Hospital, and others working in the Central City.

Some of those travelling through to Tower Junction might be able to walk to their place of work. For others, consideration should probably be given to identifying their final destinations and providing linking bus services to meet the incoming trains. For example, a bus service could be provided from Tower Junction along Moorhouse Avenue for CPIT students. People using this commuter service could also be encouraged to identify others who work close to their work place, and to organize their own transport either by taxi or mini-bus.

7 Conclusion

A review of the current traffic movements on the arterial routes between the District and Christchurch city, particularly during the morning peak travel time on the southbound routes suggests that there may be some scope for encouraging those using the roads at that time to consider delaying the time they travel to spread the period of peak demand. The on-going growth in the number of dwellings in the District suggests that the number of people living in the District and working in Christchurch will continue to increase, despite the relatively rapid increase in the number of employment opportunities opening up in the District. The first of the New Zealand Transport Agency’s projects that will increase the capacity on the northern arterial routes into the City is not scheduled to start until 2016/17. Under these conditions any significant improvement in the situation with respect to congestion on the northern arterial roads cannot be expected until 2017/18 at the earliest.
A rail service for commuters offers an opportunity to remove some of the traffic from the road network. The key points to recognise when considering the possible introduction of a rail service is that, to be successful, it would have to be part of an integrated service. From the District’s perspective it would involve the provision of “park and ride” car parks, something that has been discussed on a number of occasions. In the context of a rail service, however, the area provided for parking would need to be close to the railway line. In Christchurch, the rail service would have to be supported by bus services some of which are already available and others which might have to be introduced. If the decision were to be made to “experiment” with rail, it would also need to be supported by customer surveys to ensure that every effort was made to meet the needs of those choosing to use the service.