

NZTA Wide Centreline Trial

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1 Executive Summary

The NZTA Wide Centreline Trial aims to improve safety on rural State Highways through a reduction in head-on crash risk. This report summarises four trial sites:

- SH22 Pukekohe
- SH1 Huntly
- SH1 Waikanae
- SH1 Woodend

The markings to be trialled were designed in late 2010, and 'before' surveys took place to measure speed and lateral position at each site. After implementation of the new markings, 'after' surveys were carried out to measure the effectiveness of the trial.

It was found that overall, provision of a 1.0m 'wide centreline' increased lateral separation across the four sites, by an average of 0.6m. There was no significant change in speed within or downstream of the trial sites as a result of the changed markings.

2 Introduction

This report summarises progress from June 2010 to July 2011 on the NZTA wide centreline trial. It includes a description of consultation, design and site selections processes, and includes trial results for the first four completed sites.

2.1 Project objectives

The NZTA Wide Centreline Trial aims to improve safety on rural State Highways through a reduction in head-on crash risk. Specific objectives for the project are:

- Reduction in head-on crashes (long-term measure)
- Increase in lateral separation of opposing traffic (short-term measure)
- Decrease in centreline crossings
- No increase in edgeline crossings
- No increase in speed (within or downstream of trial sites)

2.2 Consultation

Consultation involved a meeting with key stakeholders representing NZTA and road user groups. Stakeholders were invited to participate in deriving the trial design, and to comment on proposed trial locations.

2.3 Design development

Design incorporated findings from consultation and research into similar treatments overseas. The following typical detail (**Figure 1**) was derived for design.

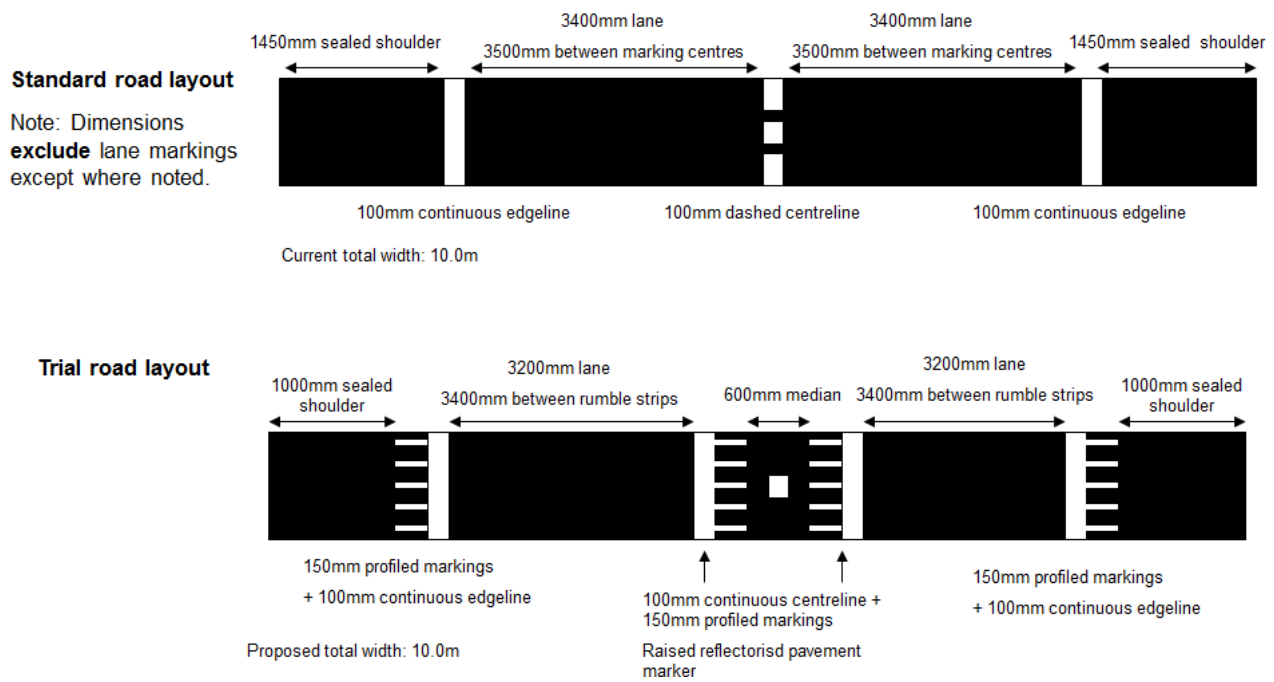


Figure 1 Trial Design

Site-specific designs were developed for each trial site. Elements varying across sites included lane, median and shoulder widths, presence of thermoplastic and/or profiled markings (rumble strips), and the treatment of right turn bays within trial lengths. The decision whether or not to include profiled markings was primarily due to the proximity of residential buildings through the site. Due to geographic constraints, some right turn bays were included in the treatment, and some were not.

2.4 Site selection

The following sites were selected based on fulfilling criteria of high volume, high risk, single carriageway rural roads. The sites listed are those for which trial implementation and analysis is complete. They are listed from north to south:

- SH22 Pukekohe (RP 0/1.360 – 0/7.360)
- SH1N Huntly (RP 502/9.700 – 502/12.400)
- SH1N Waikanae (RP 1012/2.310 – 1012/3.712)
- SH1S Woodend (RP 317/200 – 317/2200)

3 Study Methods

3.1 Speed survey

To determine whether the trial resulted in a change in speed within or downstream of the trial sites, speed tubes were installed for one week at each site before the markings were changed. Tubes were installed within, and at least one kilometre up- and downstream of each site. Tubes were continuous loop counters operating for a minimum of seven days.

3.2 Lateral position survey

To determine whether the trial resulted in a change in vehicle position relative to the centre of the road carriageway, video surveys were carried out for four hours in each direction at each site, before and after the markings were changed. The surveys were carried out on weekend days and weekdays (two hours per survey). The surveys coincided with the speed surveys, so that the pneumatic tubes themselves could be used to help calibrate the video, and so that data could be coordinated between the two surveys if required. The speed tubes were marked at 1.0m intervals to help calibrate the resulting lateral position data.

Vehicle position was measured from the video data, using motion-capture software to convert the video to a series of still shots. Only vehicles with at least five seconds headway to the vehicle in front were captured, to avoid effects of following on lateral position. An example still shot is shown in Figure 2.



Figure 2 Example lateral position still shot

4 Results

4.1 SH22 Pukekohe

The trial site northeast of Pukekohe (SH22 RP 0/1.360 – 0/7.360) involved a section of the link between Pukekohe and the Auckland Southern Motorway, as shown below.



Results from this site show an average *increase* in lateral separation of 0.54m, from 2.5m to 3.0m. The 5th percentile separation (those vehicles travelling the closest to the centre of the road carriageway) *increased* from 0.5m to 1.0m.

As the trial implementation included removal of a passing lane at the survey location, there was a measured decrease in speed at the trial site. This is unlikely to be related to the change in markings.

Lateral separation results for the Pukekohe site are shown in **Figure 3**.

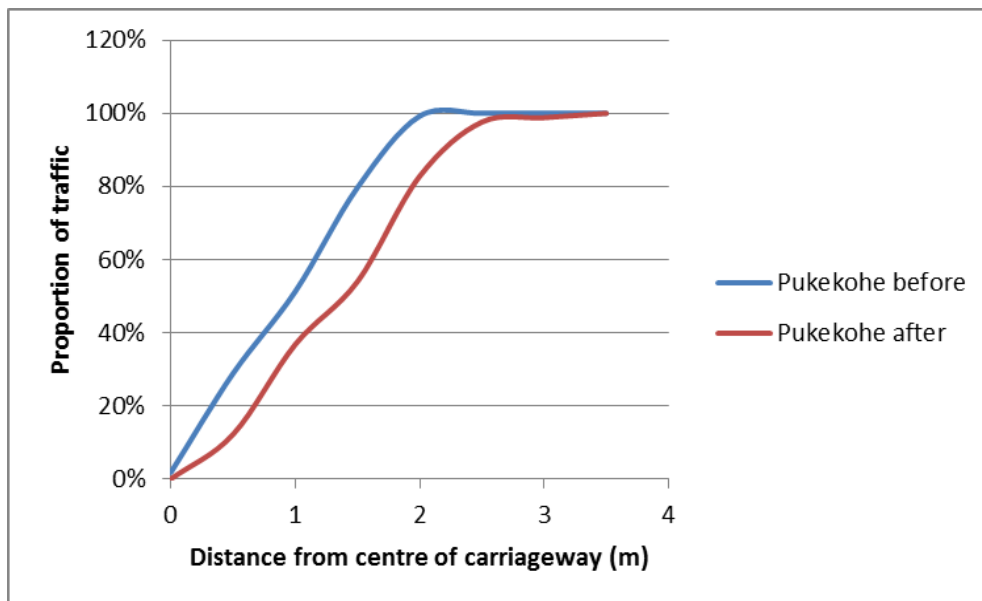
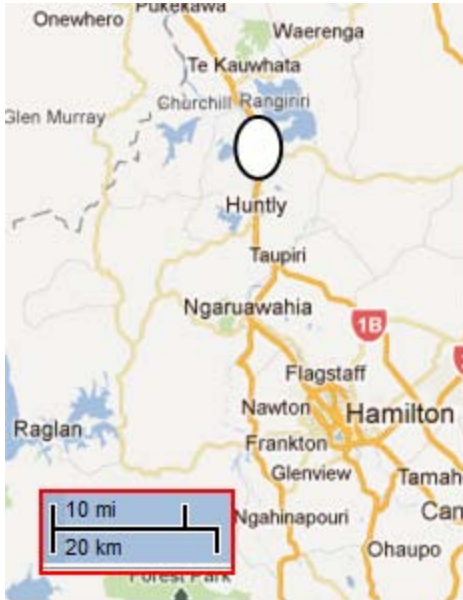


Figure 3 Lateral separation, SH22 Pukekohe

4.2 SH1 North of Huntly

From the south, the trial site north of Huntly (SH1N RP 502/9.700 – 502/12.400) started at the 100km/h speed change north of Huntly and extended north to just south of the start of the Waikato Expressway, as shown below.



Results from this site show an average *increase* in lateral separation of 0.19m, from 2.7m to 2.9m. The 5th percentile separation (those vehicles travelling the closest to the centre of the road carriageway) *increased* from 1.6m to 2.0m.

There was *no* significant increase in speed within, or downstream of the trial site.

Lateral separation results for the Huntly site are shown in **Figure 4**.

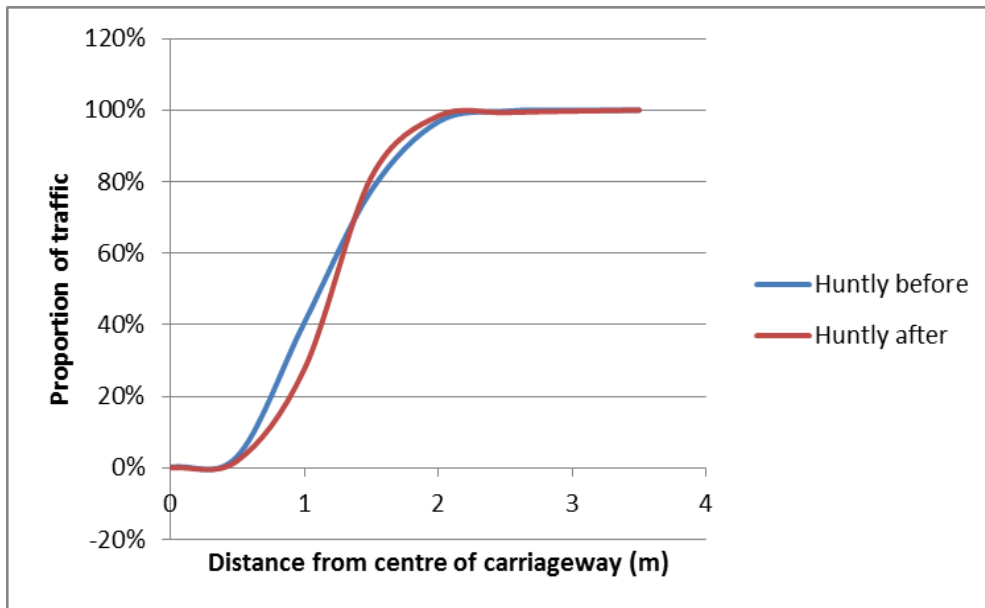


Figure 4 Lateral separation, SH1 Huntly

4.3 SH1 Waikanae

The trial site north of Waikanae (SH1N RP 1012/2.310 – 1012/3.712) started at the 100km/h speed change north of Waikanae and extends north for approximately 1.4km.



Results from this site show an average *increase* in lateral separation of 0.28m, from 1.9m to 2.2m. The 5th percentile separation (those vehicles travelling the closest to the centre of the road carriageway) *increased* from 1.5m to 1.7m.

There was *no* significant increase in speed within, or downstream of the trial site.

Lateral separation results for the Waikanae site are shown in **Figure 5**.

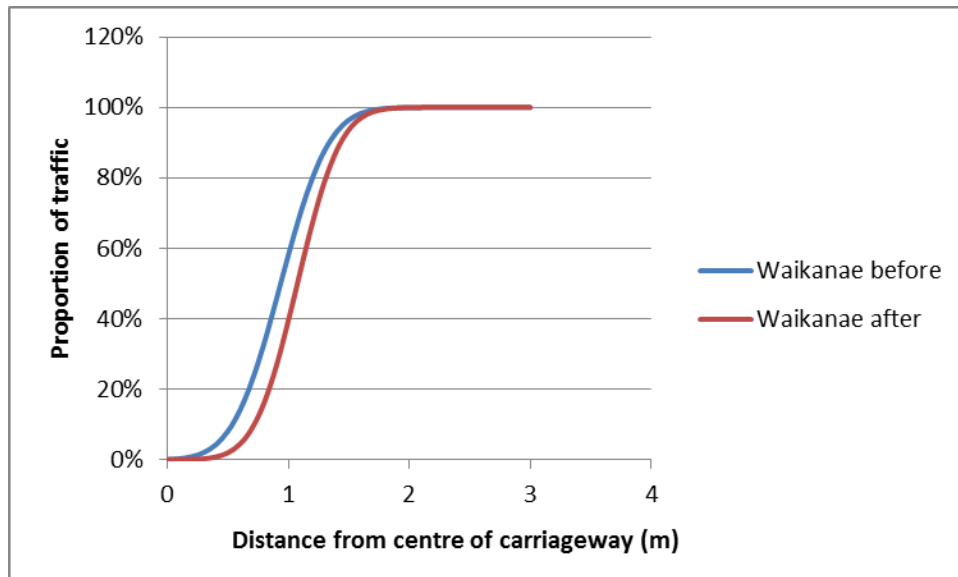


Figure 5 Lateral separation, SH1 Waikanae

4.4 SH1 Woodend

The trial site south of Woodend (SH1S RP 317/200 – 317/2200) starts north of the junction with SH71 ends south of the township of Woodend, as shown below.



Results from this site show an average *increase* in lateral separation of 0.14m, from 2.6m to 2.8m. The 5th percentile separation (those vehicles travelling the closest to the centre of the road carriage way) *decreased* from 1.8m to 1.3m.

There was *no* significant increase in speed within, or downstream of the trial site.

Lateral separation results for the Woodend site are shown in **Figure 6**.

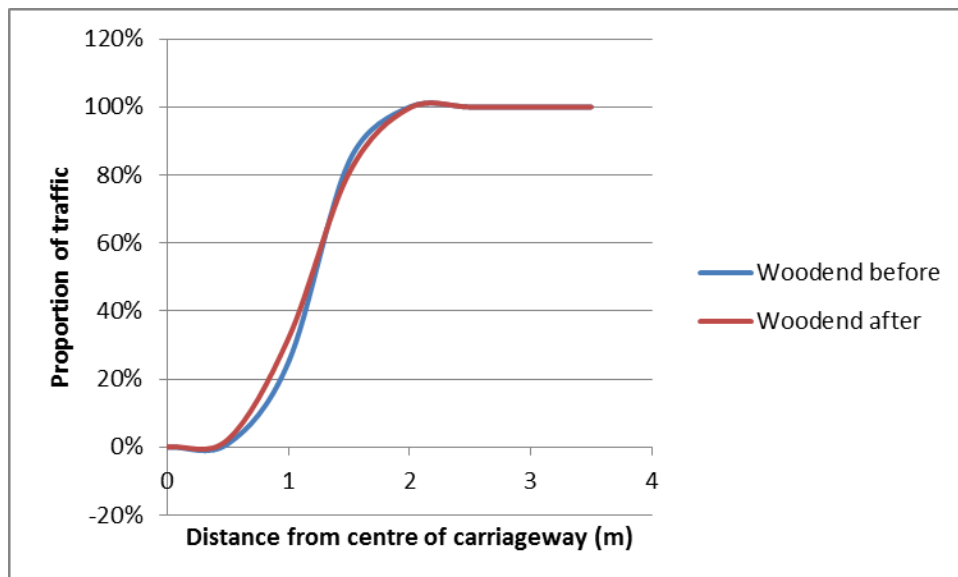


Figure 6 Lateral separation, SH1 Woodend

4.5 Combined results

Though all sites are different in terms of marking type and lane dimensions, the combined change in distance from the centre of the road carriageway is a significant increase from 1.2m to 1.5m.

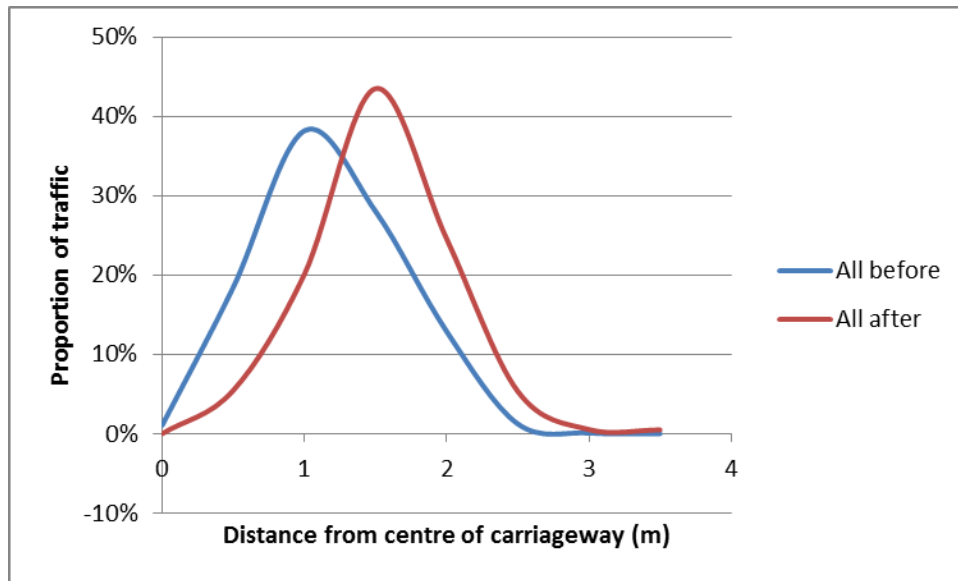


Figure 7 Combined lateral separation results

As-built construction data was collected to investigate reasons for differing results in the extent of lateral separation achieved by the wide centreline marking implementation. One site (SH1 Huntly) showed a range in cross-section parameters as follows:

- Sealed shoulder width: 1.72m – 2.10m
- Lane width: 3.09m – 3.55m
- Median width (between centreline markings): 0.76m – 1.02m
- Total carriageway width: 11.58m – 12.17m

Mean change in lateral separation was compared to the wide centreline gap, and annual average daily traffic volume, as shown in **Figures 8** and **9** below.

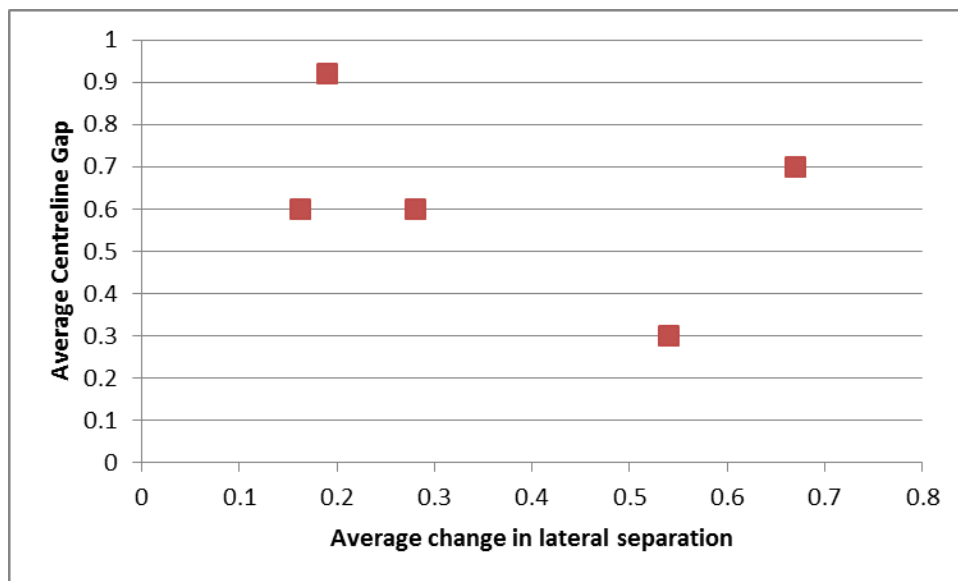


Figure 8 Change in lateral separation vs mean wide centreline gap*

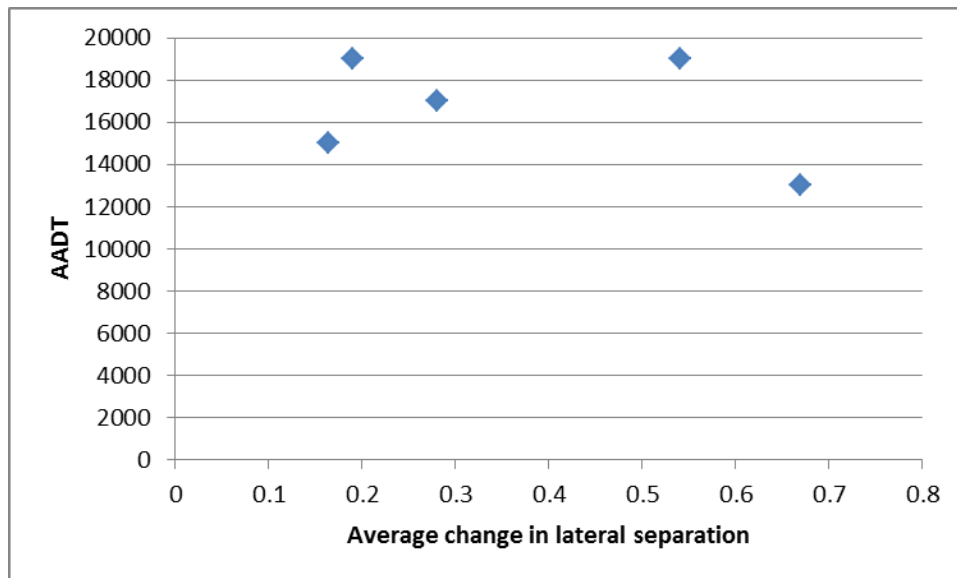


Figure 9 Change in lateral separation vs AADT*

*note that these charts include data from a fifth site, SH3 Rukuhia, recently included in trial results

There is no meaningful correlation between the change in separation, either centreline gap, or AADT. Other site parameters investigated included lane width, change in carriageway width, presence of profiled markings and shoulder width. The large variation in these parameters within and between sites is considered too great to meaningfully compare them in terms of correlation with lateral separation changes.

5 Analysis and discussion

5.1 Project objectives

Project objectives have been addressed as follows:

- Reduction in head-on crashes (long-term measure)

The head-on crash rate within each trial site will be monitored over time. It is too soon to assess the within-site benefit or otherwise in terms of crash numbers. The downstream speed survey results suggest that the trial will not affect crash rate downstream, in terms of the relationship between crash risk and speed.

- Increase in lateral separation of opposing traffic (short-term measure)

All sites showed a significant increase in lateral separation of opposing traffic. It is interesting to note however the wide range of separation changes, from an increase of around 0.2m at two sites, to a relatively large increase of 1.4m at the Waikanae site. There are likely to be several contributory factors to the variability in lateral position (for example, cross section, roadside features, upstream environments etc) but there is insufficient consistency in this data to enable meaningful comparison. It may be that with additional sites added to the trial, multiple linear regression techniques can be used to investigate the relative contribution of different factors to lateral separation.

- Decrease in centreline crossings
- No increase in edgeline crossings
- No increase in overtaking

There was no observable difference (increase or decrease) in centreline and edgeline crossings for any of the trial sites. There was no observable difference in overtaking noted. The video time (four hours per site) did not show high enough numbers of any of these factors to enable meaningful comparison.

- No increase in speed (within or downstream of trial sites)

With the exception of the Pukekohe site which included removal of a passing lane, there was no significant change in speed within or downstream of the trial sites.

6 Conclusion and Recommendations

Initial trial results from the four sites presented here suggest that objectives are being met in terms of increased lateral separation, and no other adverse effects on safety.

Further investigation is warranted in the following areas:

- Understanding of construction differences at each site, to investigate causes for differing trial results
- Analysis of the effects of the treatment on curves. All lateral position surveys to date took place on straight, flat sections of road.
- Road user perception survey to determine drivers' impressions, and understanding of the trial and its effects.
- Consideration of the wider effects of different road marking treatments on New Zealand rural roads, and how they might form part of a Safe System approach to road safety.