Safer speeds: public acceptance and compliance

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Abbreviations and acronyms

AA	New Zealand Automobile Association
AADT	average annual daily traffic
ARRB	Australia Road Research Board Group Ltd
CBD	central business district
DCC	Dunedin City Council
DIER	(Tasmanian) Department of Infrastructure, Energy and Resources
HCC	Hamilton City Council
HDC	Hastings District Council
MoT	New Zealand Ministry of Transport
NHTSA	United States National Highway Traffic Safety Administration
NSSAB	United States National Survey of Speeds Attitude & Behavior
SH	state highway
SLNZ	Land Transport Rule: Setting of Speed Limits (2003)
SRA	Swedish Road Administration
Transport Agency	New Zealand Transport Agency
TDC	Tauranga District Council

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Executive summary

Achieving a road network with safer speeds, or one where the travel speeds are unlikely to cause fatal or serious crashes, is one of the four elements of a Safe System approach, adopted by the NZ Transport Agency ('the Transport Agency'). It is apparent that much of the New Zealand roading network is not safe at its current posted speed limit given the increased likelihood of fatal and serious crashes at high speeds. It is not affordable to upgrade most of the national roading network to achieve an environment where the current speeds are adequate. Hence, for the foreseeable future New Zealand will need to rely on speed management interventions for roads of winding terrain and/or low traffic volume. For existing road infrastructure this is achieved primarily by reducing operating speeds through speed limit reductions, rather than engineered solutions to achieve safer speeds. It is unlikely the public will accept a speed reduction to the levels where the fatal and serious crash risk is statistically low (eg less than 70km/h on undivided rural roads) and hence, the focus will be on reducing speeds to levels that drivers will accept and comply with.

Purpose and objectives

The purpose of this research was to assess the effectiveness of education, enforcement and perceptual changes to the road and road environment, to achieve acceptance of and compliance with lowered speed limits in both rural and urban environments across New Zealand. The key objectives were to:

- undertake a focused literature review on relevant research from New Zealand and overseas
- understand the current level of compliance in New Zealand with speed limit reductions
- gain knowledge of New Zealanders' attitudes to, and acceptance of, lower speed limits
- assess the effectiveness of various levels of education, enforcement and road environment, and their impact on compliance with lower speed limits.

Literature review

There is considerable research supporting the road safety benefits of reduced speed limits. The most quoted being the power models of Nilsson (1984) and Elvik (2009), which show the road safety benefits of reducing operating speeds. Research collated by Austroads (2014) and Job (2014) in Australia on both rural and urban roads, also shows the total crash and causality reduction benefits of reducing speed limits by 10km/h and 20km/h can be in the order of 20% or more.

There is limited literature internationally on the acceptance of and compliance with reduced speed limits, the main focus of this study. Most of the research focuses on drivers' attitudes and their compliance with standard urban and open road speed limits and the move towards more enforcement of such limits.

For many years European research has acknowledged and understood the fundamental benefits of speed limit reductions. A general attitudinal study in Europe found greater acceptance of lower speed limits in urban residential areas compared with extra-urban high-speed roads, where compliance with existing limits was already lower. A study into 80km/h rural roads demonstrated the importance of ensuring that road characteristics better matched the drivers' perceptions of an appropriate speed limit. Road curvature and sight distances were strongly correlated with speed perception. The authors concluded, although there would never be a speed limit on a particular road section that would be credible for all drivers, there would be a speed limit that would be more credible for everyone. Anund and Svensson (2009) and Forsberg et al (2011) showed that, while people often disagreed with lower speed limits, a high proportion of respondents did travel slower subsequent to the changes and less than a fifth considered the lower speed limit had impeded the accessibility of the road.

A survey conducted by Australian automobile clubs, demonstrated low acceptance levels of speed limit changes in the absence of background information and justification being provided to the community. A more definitive survey study showed that, in contrast to Europe, acceptance of lower speeds on some classes of rural roads was quite good, with less support for urban arterials and residential roads. When presented with some of the facts regarding the benefits of speed reductions, acceptance was higher, although likely compliance without matching enforcement levels might be less forthcoming.

Compliance with speed limits

The current level of compliance with reduced speed limits in New Zealand was assessed by looking at the results of 'before and after' studies carried out by various road controlling authorities across New Zealand. The assessment considered a range of different speed limit changes on urban and rural roads with different levels of traffic volume, alignment and roadside environment.

The trial of speed zoning by the Transport Agency in 2005 and 2006 and recently reduced speed limits on the Otago Peninsula, show good compliance with reduced speed limits on winding hilly and/or mountainous rural roads. In most cases the speed limit applied was close to, or above the 85th percentile operating speed, so the interventions were targeting drivers travelling at speeds above those deemed safe for the conditions. The only concern with the new speed limits was on some roads there was evidence of speed targeting; ie where speed increased due to the speed limit being more achievable.

The Hastings data showed that good reductions in travel speed can be achieved by reducing speed limits on certain local authority rural roads from 100km/h to 80km/h. Reductions ranging from 2km/h to 17km/h resulted, depending on the current operating speed. However, the Hastings experience also involved considerable opposition (poor acceptance) to these reduced speed limits. The acceptance web survey undertaken as part of the study supported this opposition, revealing there was very little support (9%) for a reduction in the general open road speed limit to 80 km/h, while there was some support (33%) for the more modest reduction to 90km/h.

The application of reduced speed limits on high-speed, high-volume and high crash rate state highways was shown in the SH2 (SH1 to SH25) and SH1 Dome Valley case studies. The result of the speed limit reduction has considerably lowered the mean and particularly 85th percentile speed on both roads, especially in Dome Valley (where the speed limit was dropped to 80km/h – it was lowered to 90km/h on SH2). In both areas there has been a heightened level of police enforcement, given the high historical crash rates on these road sections. It is likely this police enforcement has contributed to the high reduction in operating speeds.

The application of suburban 40km/h speed limits in Hamilton showed the biggest reduction in operating speed was generally as a result of engineering improvements. The installation of the speed limit signs and markings themselves had a limited impact on the operating speeds. The public's opposition to the 40km/h speed restrictions programme for suburban streets in Hamilton has grown over time. This is consistent with the acceptance survey undertaken as part of this research, which showed there was little support for dropping speed limits on suburban streets below 50km/h.

Acceptance web survey

An acceptance web survey was conducted to understand drivers' attitudes to safer (or reduced) speeds and received almost 250 responses. The survey was compared with other relevant surveys collected in New Zealand, Australia and the USA. When analysed by gender, females had much stronger support for safer speeds than males.

The majority of drivers agreed that New Zealand roads would be safer if we all drove a little slower. There was also a high level of understanding that fatal and serious crashes are related to travel speeds. There

was support for lower speed limits to reduce road trauma. The USA and Australian research also supports drivers' understanding that speed does have an impact on the occurrence of a fatal crash.

The USA research (2011), while not focused on lower speed limits, did provide a relatively detailed insight into drivers' attitudes to speeding. A majority would prefer lower speeds as they feel less safe at higher speeds, which is similar to the New Zealand results. A large proportion indicated they drive faster so as not to hold up traffic, because they do not want to delay others. The solution supported by most was increased police enforcement of traffic laws, including speed limits, so that other drivers slow down and they can then drive slower without delaying others. This suggests increased speed enforcement, lower tolerance levels for speeding, and while not covered in the USA research, reduced speed limits.

In the New Zealand survey, drivers' acceptance of reducing speed limits in rural areas, suburban areas and in commercial areas was also examined. The strongest level of support was for 40km/h speed limits in shopping areas, the least popular being 80km/h speed limits on rural roads and 40km/h speed limits in suburban streets. See the table below for results of survey.

Speed reduction	Far too high	A bit too high	About right	A bit too low	Far too low
100km/h to 90km/h – rural roads	2%	3%	28%	50%	17%
100km/h to 80km/h – rural roads	1%	0%	8%	26%	65%
50km/h to 40km/h – shopping streets	2%	7%	49%	35%	7%
50km/h to 30km/h – shopping streets	0.5%	0.5%	12%	37%	50%
50km/h to 40km/h – residential streets	1%	3%	22%	59%	15%

The acceptance web survey also showed that just under half of respondents would slow down if supplementary signage stating 'safer speeds' was posted to explain the reason for the speed limit reduction. If additional information such as 'school', 'high crash site' or 'busy shopping street' was added supplementary to the speed limit roundel, then even more respondents said they would slow down. This indicates that drivers would like affirmation of the reason for slowing down and want to see it displayed.

Effectiveness of engineering, education and enforcement

A variety of engineering measures have been used in conjunction with speed limit reductions around New Zealand. In urban areas the results indicated that engineering measures on wider roads, such as traffic calming, are much more effective at reducing operating speeds than the installation of speed limit signs and markings alone. This is consistent with the literature review findings.

AA research (Turner 2014) also indicates drivers do not associate a high level of risk with roadside hazards and priority controlled intersections. On rural roads of a relatively flat and straight alignment, with a medium to wide cross-section, drivers expect to travel at the open speed limit. However many roads of this nature have a high crash rate due to the frequent occurrence of severe roadside hazards, frequent priority controlled intersections and high opposing traffic volumes.

This was the case with many rural roads in the Hastings district, on SH2 (between SH1 and SH25) and SH1 through Dome Valley. On this type of road there is generally a low acceptance of reduced speeds, because the engineering of the road in terms of alignment and cross section, indicates higher speeds are possible. Despite low levels of acceptance of reduced speeds on such roads, there have been relatively good speed reductions, considering only the speed signage and some road marking was changed. This was consistent with the literature which indicated while there may be considerable opposition to reducing speeds, that once the new speed limits were introduced, many road users would comply with the lower speed limit.

The impact of education, media campaigns and consultation practices of three speed limit reduction programmes across New Zealand was examined. The Otago Peninsula Safer Speed Area programme was a typical streamlined consultation and media programme. Of the three programmes it has had the least opposition. However this was attributed to higher levels of public acceptance of lower speed limits on gravel roads and narrow winding sealed roads.

Extensive consultation and media campaigns were run by Hastings District Council and Hamilton City Council to introduce their respective safer speed areas. According to council staff at each authority, both programmes experienced considerable opposition from groups and individuals, which has grown since the reduced speed limit areas were introduced. In both cases, despite the extensive education programme, there seems to be a large section of society that does not understand the road safety benefits that justify the speed limit reductions.

While some attempts were made (on SH2) to understand the impact of enforcement on compliance with reduced speed limits, the results were unable to be produced. This would have measured the impact of both active speed enforcement (using cameras) and passive police enforcement (through regular police patrols). Further research in this area is required to understand the impacts of enforcement.

Abstract

A key element of the Safer Journeys national road safety strategy is safer speeds. In some cases, particularly where investment to make roads safer at current speeds cannot be justified, this means reduced speed limits for both urban and rural roads. This research considered the level of acceptance of and compliance with reduced speed limits. It examined information from a number of speed limit changes around New Zealand, including town centres, along strip shopping, suburban streets, mountainous roads, flat state highways and local roads. Before and after speeds were compared for any speed reductions and driver compliance.

The acceptance of reduced speed limits was researched using the limited literature available on this topic, a web questionnaire survey and the experience of three local councils. These showed a greater acceptance of reduced speed limits on hilly and mountainous rural roads and in shopping streets. There was less acceptance for reduced speed limits in suburban streets (except immediately around schools) and on straight flat rural roads with a lot of roadside hazards and frequently occurring priority intersections. Drivers do not appear to understand the crash risks of these scenarios, even when relatively extensive media and consultation programmes are undertaken.

1 Introduction

1.1 Study purpose and outline of report

Achieving a road network with safer speeds, or one where the travel speeds are unlikely to cause serious or fatal crashes, is one of the four elements of a Safe System approach, adopted by the NZ Transport Agency (the Transport Agency) for the 10-year road safety strategy *Safer journeys* (MoT 2010). It is accepted that much of New Zealand's low-volume, lower classification rural roading network is not safe at its current posted speed limit. It is not affordable, nor potentially desirable, to upgrade (eg median divide) most of these roads to achieve an environment where the current speed limits (primarily 100km/h for rural roads and 50km/h for urban roads) are adequate. Hence, for the foreseeable future New Zealand will need to rely on speed management interventions, primarily reduced speed limits on unsafe low-volume rural roads, to achieve safer speeds for the current road infrastructure. On urban roads where there are high volumes of pedestrians and cyclists, it is now generally accepted that a speed limit of 50km/h is unsafe to protect active mode road users from death or serious injury.

In the near future at least, the public is unlikely to accept reducing speed down to the levels where serious and fatal risk is statistically low, eg less than 70km/h on undivided rural roads. Hence, the focus will be on reducing speeds to levels that drivers will be willing to accept and comply with, to which a significant reduction in serious and fatal crashes can be achieved. Overseas research indicates that high reductions in risks can be achieved by reducing speed by 5km/h to 10km/h at higher speeds (at the top end of set speed limits). The power models developed in Europe by Nilsson (1984) and Elvik (2009) have shown a strong link between reduced risk of serious and fatal crashes and lower travel speeds.

Reducing speed limits alone, especially on straight and flat rural routes and wide shopping and residential streets, will have limited effectiveness without other interventions, such as increased enforcement, focused education and changes to the road environment. The latter can be further divided into low-cost perceptual changes or more significant physical changes. Urban examples of low-cost measures include enhanced signs and marking. More significant cost measures may include self-explaining road type measures (or traffic calming measures), such as kerb extensions, planter boxes and mini-roundabouts. This research focused on how effective each of these types of intervention would be in gaining acceptance of lower speed limits and improving compliance of such limits.

The purpose of this research was to assess the effectiveness of education, enforcement and perceptual changes to the road and road environment in achieving acceptance of and compliance with lowered speed limits in both rural and urban environments across New Zealand.

The research involved a combination of assessing and applying the findings of relevant local and international research on this topic, and undertaking new research to both validate the findings of previous research (to New Zealand conditions) and filling any gaps within the research that had already been undertaken. The key objectives of this research included:

- undertaking a focused literature review on relevant research in New Zealand, Australia and internationally on the acceptance of and compliance with speed limit reductions
- understanding the current level of compliance in New Zealand with speed limit changes on rural and urban routes (predominately 100km/h to 80km/h and 50km/h to 40km/h) under different levels of education, enforcement and changes to the road environment

- gaining knowledge through a survey questionnaire about New Zealanders' attitudes to, and acceptance of lower speed limits on rural and urban roads, and exploring the factors (eg residential or shopping areas), which contributed to their acceptance of lower speed limit
- identifying the effectiveness of various levels of education, enforcement and changes to the road environment on compliance with lower speed limits.

There is a considerable documentation internationally and within New Zealand on travel speeds. The remainder of the introduction outlines some of this documentation and data, including:

- road safety benefits of reducing speed limits (mainly from overseas studies)
- New Zealand rules and methods for setting speed limits
- data collected by the Ministry of Transport (MoT) and the Automobile Association (AA) on travel speeds and attitudes to speeding
- international research on drivers' attitudes to travel speed and speeding.

The following chapters cover each of the objectives listed above. Chapter 2 contains a targeted literature review that looks at compliance with, and attitudes to, reduced speed limits. Chapter 3 provides data from across New Zealand on compliance or otherwise with reduced speed limits in different road environments. Chapter 4 details the on-line survey that was undertaken to understand drivers' attitudes to and acceptance of reduced speed limits. Chapter 5 discusses case studies undertaken in locations with reduced speed limits. Finally chapters 6 and 7 outline the main conclusions of the study and recommendations for future research.

1.2 Crash benefits of reduced speeds

The main reason for reducing speed limits (and operating speeds) is to achieve improved road safety. As presented below there is very strong evidence that reduced speeds lead to a reduction in the number of crashes, especially fatal and serious crashes. It is a key intervention for addressing road trauma.

Austroads (2014) released a research report on setting speed limits in high-risk locations. This report presented a table of crash reductions due to various speed limit trials. Only locations where speed and/or crash data changes were evaluated are listed in table 1.1[1]. It is important to note that road infrastructure improvements and increased enforcement accompanied many of these projects.

[1] Austroads (2014, table 6.2). All references in the table can be found in Austroads (2014).

Table 1.1 Summary of safety outcomes of speed limit reduction trials at higher-risk road sections

Trial location and type	Risks addressed	Initial speed limit (km/h)	Speed limit during trial (km/h)	Speed reduction (km/h)	% Crash reduction
Pedestrian activity areas					
Victoria strip shopping centres – part-time application of 40km/h speed limits	Crash history	60	40	Not available	8% casualty crashes 17% pedestrian casualty crashes
City of Hull, UK – 20mph (32km/h) speed limits with traffic calming	Pedestrian and child casualties on local roads	48	32	Not available	90% fatal and serious injuries 54% child casualties
London, UK – 20mph speed limits with traffic calming	Road injuries, pedestrian and cyclist focus	48	32	Not available	42% road casualties 33% pedestrian casualties 50% child fatalities and serious injuries 17% cyclist casualties Statistically significant
Rural roads					
Sections of Bruce Highway, Warrego Highway and Mount Lindesay Highway – speed limit reduction, signage improvements and increased enforcement	Casualty crashes	100	90	Mean speeds – 8km/h 85th percentile speeds – 9km/h	Not available
Adelaide Hills, South Australia – speed limit reduction	Adverse road alignment	100	80	Mean speeds – 2.5km/h 85th percentile speeds – 4.3km/h	15% casualty crashes
Great Ocean Road, Victoria – speed limit reduction, targeted infrastructure improvements and extra enforcement	Run-off-road crashes on curves, road alignment, hazardous roadside environment	100	80	Mean speeds – 3km/h– 12km/h	28% fatal and serious injury crashes
Rural roads in the Netherlands – area-based speed limit reductions plus low-cost engineering measures	High crash risk, wide variety of road users on rural roads	80	60	Not available	24% casualty crashes 44% intersection casualty crashes

Trial location and type	Risks addressed	Initial speed limit (km/h)	Speed limit during trial (km/h)	Speed reduction (km/h)	% Crash reduction
Freeways/motorways					
Abu Dhabi to Dubai motorway, UAE – speed limit reduction	Variability in speed between motorists	160	120	Not available	33% casualty crashes (four months after installation)
A7 motorway, France – variable speed limits 70km/h–100km/h	High number of crashes and traffic congestion	100	90 or 70 (via variable message signs)	Not available	20% all crashes
A61 and A24, Germany – introduction of 130km/h speed limit	Serious and fatal crash risk	None	130	Not available	30% A61 – fatal and serious injury crashes 57% A24 – casualty crashes
Intersections					
Bruce Hwy/Tandur Rd, near Gympie, Queensland (sign-controlled) – speed limit reduction, signage improvements and increased enforcement	Intersection crashes	100	80	Mean speeds – 7km/h–8km/h	60% casualty crashes
Warrego Highway, at Brisbane Valley Highway and at Lowood Minden Road, Queensland (sign-controlled) – speed limit reduction, vehicle activated signage and increased enforcement	Intersection crashes	100	80	Mean speeds – 5km/h–10 km/h	Not available

The conclusion reached by Austroads on this data was as follows:

> *The general conclusion from the evaluations of speed limit reductions on higher-risk roads and intersections in [*table 1.1] *was that speed limit reductions were frequently associated with mean speed reductions, and with reductions in casualty and severe crashes/injuries. It should be pointed out, however, that many of the speed limit reductions were accompanied by other interventions such as traffic calming, signage and increased speed limit enforcement. Thus, it was not possible to attribute the effects to the reduced speed limit reduction alone.*

Further research on this topic was presented by Job (2014). This paper includes examples of lowered speed limits and their effect in reducing serious and fatal crashes:

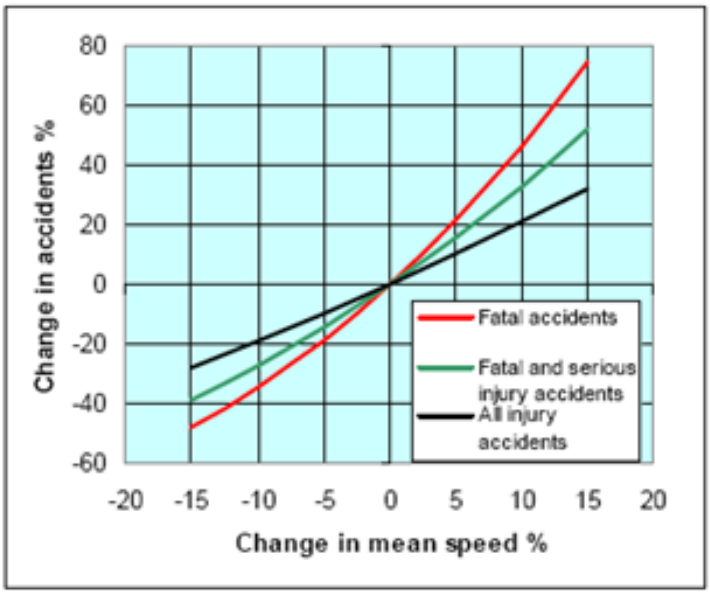
- Great Western Highway, NSW, reduced from 110km/h to 100km/h; 26% reduction in casualty crashes.
- Australia urban default down from 60km/h to 50km/h; 25% decrease in casualty crashes.
- NSW school zones down to 40; 46% decrease in casualty crashes.

- Most extreme example recorded by Sliogeris in Victoria. Speed limit up 10km/h; casualty crashes up 25%. Speed limit back down 10km/h; casualty crashes down 20%.

Job goes on to make the comparison that we are now at the same point in the debate we were at many years ago with smoking, in that speeders are more likely to die young and there is evidence to support that speeding is killing many people. He also states there is real evidence to show we greatly underestimate the role of speed in serious crashes, and also underestimate the role of low-level speeding.

The Australian research supports the work undertaken internationally by Nilsson and Elvik on this topic. Nilsson (1984) produced the Power Model, which shows the general relationship between speed and various severities of road crashes. He states that even a small change in mean speed has a notable impact on the safety of road users. For example, a 1km/h difference in mean speed, say from 44km/h to 43km/h, is actually close to a 2% reduction in speed, which would equate to roughly an 8% drop in the risk of a fatality and a 6% drop in the risk of serious injuries.

Figure 1.1 Nilsson Power Model – relationship between change in speed and crashes



1.3 New Zealand rules around setting of speed limits

Two methods are used in New Zealand for setting speed limits. The traditional method, which is outlined in the Land Transport Rule (MoT 2003), was based primarily around the level of roadside development in the past. This method is also the only legal method available for setting speed limits in New Zealand.

The second (trial) method, speed zoning, is based on a suitable speed for the road geometry and the current 85th percentile speed. This latter method has been used selectively, primarily on more mountainous and narrow rural roads where the current open road speed limit is set too high. The speed zoning trial method is not currently used in New Zealand. However, there is now greater use of operating speeds data and crash data (as opposed to just land-use data) in decision making around speed limits under the traditional approach. So to a degree the ideas behind the speed zoning method are now influencing speed limit setting under the Land Transport Rule, especially on rural roads. Both methods are discussed here to demonstrate the rigour that is required for changing speed limits.

The Land Transport Rule: Setting of Speed Limits 2003 (SLNZ) and its ensuing amendments, define the legal procedures for setting speed limits in New Zealand. The following three paragraphs are quoted directly from section 1.1 of SLNZ.

> *The objective of speed limits policy is to balance the interests of mobility and safety by ensuring speed limits are safe, appropriate and credible for the level of roadside development and the category of road for which they are set. They must also be nationally consistent.*
>
> *Road users are more likely to comply with a speed limit if it is consistent with limits on other roads in the network with similar characteristics, and if limits in general reflect the factors that most influence speed choice. The level of roadside development and the function of a road are the primary determinants of the appropriate speed limit. Consistency is an important aspect of road users' perceptions of a reasonable speed limit and will influence their willingness to comply.*
>
> *Although road geometry is also a factor in determining a speed limit, it is secondary to roadside development. In situations where the road geometry encourages road users to travel at a higher speed than the speed limit determined by roadside development, engineering techniques should be used to lower vehicle speeds. When a road in a built-up area primarily serves through traffic, engineering techniques and access controls should be used to provide safety at the higher speeds that will prevail.*

The rule requires road controlling authorities to use SLNZ to calculate the speed limit for any public road to ensure consistent application of speed limits policy across the public road network. SLNZ sets out the method for calculating the speed limit for a section of road from the following information:

- the existing speed limit
- the character of the surrounding land environment (eg rural, fringe of city, fully developed)
- the function of a road (ie arterial, collector or local)
- detailed roadside development data (eg number of houses, shops, schools, etc)
- the number and nature of side roads
- carriageway characteristics (eg median divided, lane width and number of lanes, road geometry, street lighting, footpaths, cycle lanes, parking, setback of fence line from carriageway)
- vehicle, cycle and pedestrian activity
- crash data
- speed survey data.

To review and set a speed limit under the rule, the road controlling authority must:

- calculate the speed limit using SLNZ
- consult with people and organisations affected by the speed limit
- make a bylaw
- notify the Director and the Commissioner of Police
- record the details of the speed limit in a register
- erect speed limit signs.

The second (trial) method extends beyond a focus on adjoining roadside development and is considered useful for rural roads that have little roadside development. Edgar (2006) outlined the work that was undertaken by Land Transport NZ (now the NZ Transport Agency) around methods for setting speed limits. The 'speed zoning' project considered two methods of determining speed limits for rural roads: using an 85th percentile speed profile; and/or using a risk-based calculation.

Edgar concluded that combining both the 85th percentile speed profile and the risk-based calculation method was the best approach. He promoted selecting a speed limit initially based on the 85th percentile speed, targeting only the most 'antisocial' drivers (who drove above this speed). In mountainous terrain the 85th percentile is often well below the open road speed limit. Next a risk-based method was used to determine whether the speed limit should be lowered further, especially if the road was deemed to have a high crash risk, based on alignment, cross section and roadside environment. Some subjective judgements would be required by experts for the risk-based calculation. This method was used for a few years in New Zealand but is not currently used for setting speed limits.

Austroads (2008) guidance on speed limits and speed management states that crash history is the most important consideration when reviewing a speed limit of an existing road. It also considers the following:

- current operating performance
- road and roadside infrastructure, geometry and roadside development.

The Austroads guide seems to support moving towards the 'speed zoning' trial method for setting speed limits.

1.4 New Zealand speed surveys

1.4.1 Ministry of Transport – speed surveys

Since 1994 the Ministry of Transport (MoT) has undertaken an annual survey that gauges the New Zealand public's attitude to road safety. The survey focuses on alcohol, speed and safety belts. While not focused specifically on reduced speed limits, these surveys do have some relevance to the research topic and driving attitudes to speeding and speed enforcement. Below are some of the results extracted from the overview of the 2013 survey:

- The majority of New Zealanders recognised that drink-driving and speeding increased the chance of a crash. One in six people thought that the risk of a crash when speeding was small, as long as you were careful.
- Public support for alcohol, speed and safety belt enforcement continued to be high. Ninety-three percent of New Zealand adults said they would like police efforts to enforce road safety laws increased (40%) or maintained at the current level (53%).
- Three-quarters of New Zealanders said that speed enforcement (76%) helped to lower the road toll.
- One in four people thought that the risk of being caught speeding was low. This was slowly trending down in the past two years after five years of no change of percentage.
- A new question in 2013 asked about the effectiveness of roadside speed indicator devices at slowing the respondents down, 86% said they were very or quite effective.
- Overall, public support for police enforcement remained high. Forty percent of New Zealanders said police effort to catch people breaking road safety laws should be increased further. A further 53%

wanted that effort maintained at current levels. Only 6% thought police effort should be decreased. These results are similar to those of recent years.

Other notable results published in the report about the public perception to speed are:

- Seventeen percent of New Zealanders agreed with the statement 'there is not much chance of an accident when speeding if you are careful'. Young males aged 15 to 24 were most likely to think speeding was not dangerous as long as they were careful (25%).
- Two-fifths (40%) of drivers said they enjoyed driving fast on the open road. Young drivers were more likely to say they liked driving fast than older drivers.
- As in recent years, the great majority of New Zealanders (86%) said speed limits on the roads they normally used were about right. Six percent said they were too high and 7% said they were too low.
- When people were asked directly whether the 100km/h speed limit should be raised, lowered or kept as it is, 74% said they wanted it kept as it was, 6% thought it should be lowered and 20% thought it should be raised. People who had received speeding tickets were most likely to say the speed limit should be raised.
- Support for retaining the current 50km/h speed limit was similarly strong; 84% of New Zealanders said the urban 50km/h speed limit should be retained and a further 7% said it should be lowered. Since these questions were first asked in 1995, there has been a gradual decline in support for raising the urban speed limit, from 21% in 1995 to 8% in 2013.

The following graphs are extracted from the MoT (2014) report. An increasing trend is the desired result for figure 1.2, while a decreasing trend is desirable for figure 1.3.

Figure 1.2 Attitudes to speed enforcement

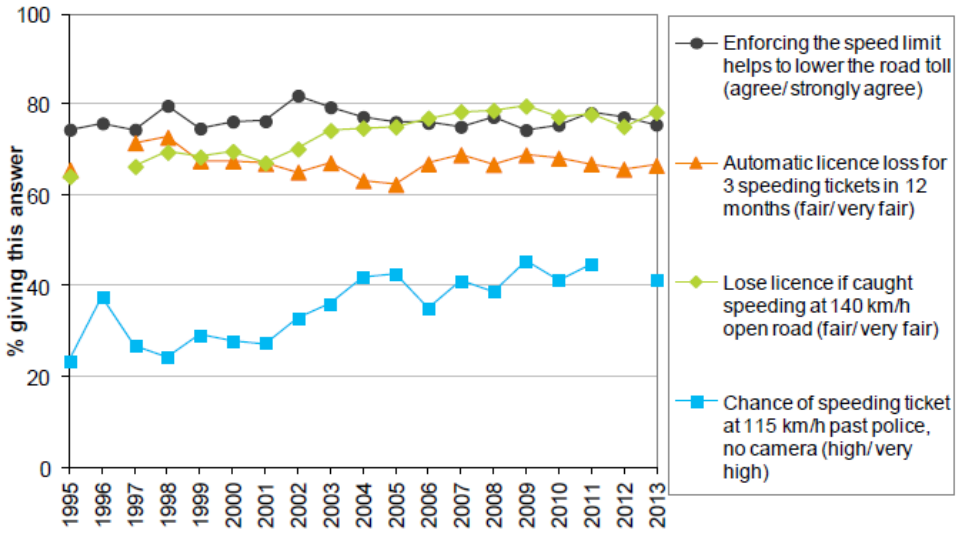
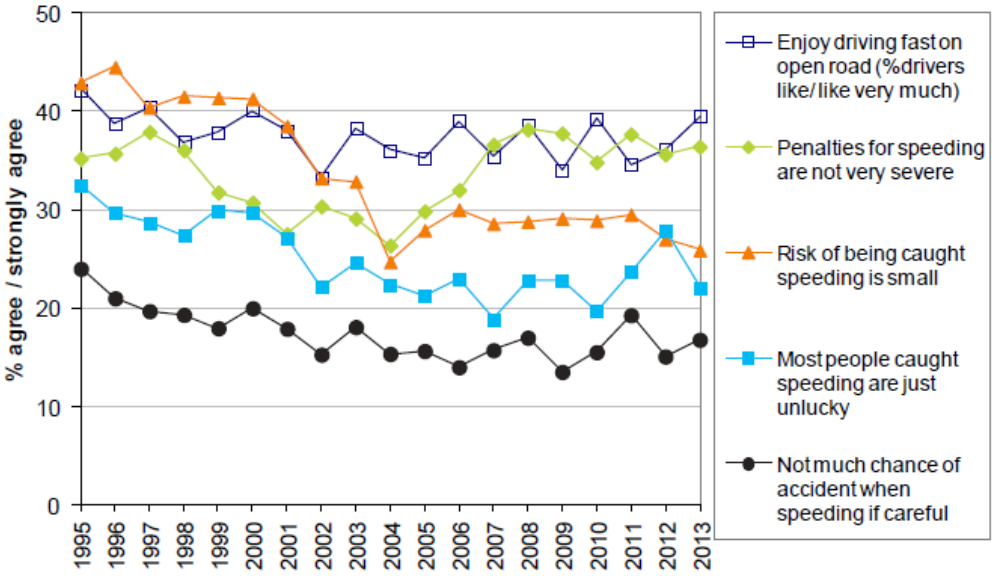


Figure 1.3 Attitudes to speed and speed enforcement



The MoT also publishes an annual report of New Zealand's open road and urban speeds, which dates back to 1995. The *Speed survey 2013: results summary* (MoT 2014) shows that the decreasing trend has been ever present, though in 2013 some of the result parameters increased for the first time. Figure 1.4 shows the considerable decrease in 85th percentile speeds from 115km/h in 1995 down to 102km/h by 2013. This is very encouraging as crash severity levels have reduced greatly. The dramatic decrease between 1996 and 2003 might be explained as the delayed effect of the speed camera introduction into New Zealand in 1993. By this stage motorists would have realised they were unlikely to be ticketed by police around the 105km/h speed, given the speed tolerance was nominally 10km/h above the speed limit.

A similar pattern emerges for urban speed limits shown in figure 1.4, which have decreased greatly since 1995. In both graphs the mean and 85th percentile speeds appear to have normalised since 2005/06 and the reduction in speeds has slowed considerably.

Figure 1.4 New Zealand open road speeds

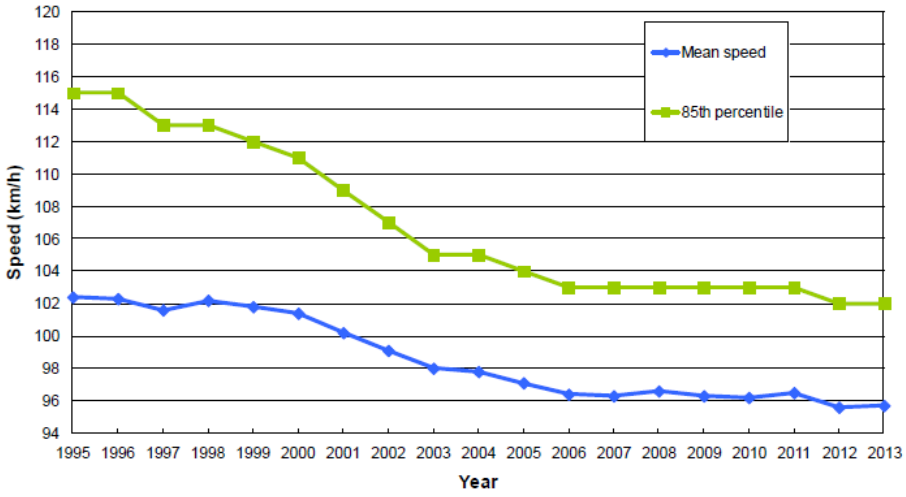
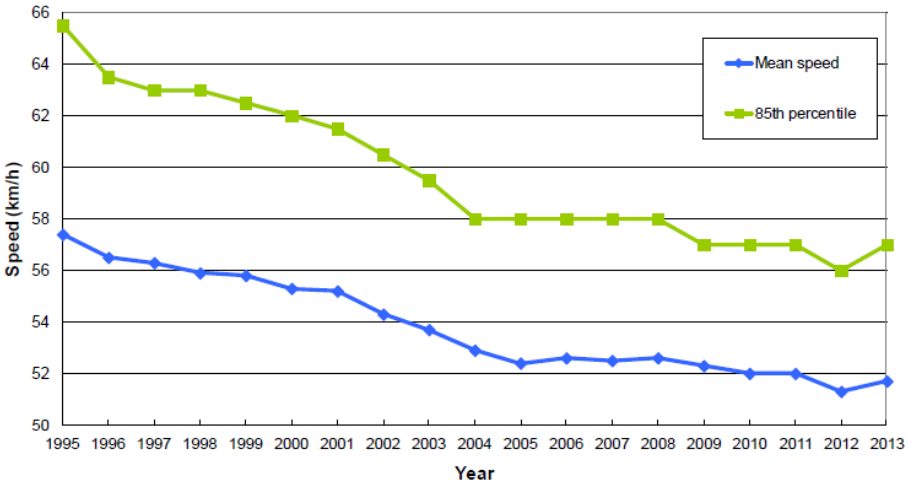


Figure 1.5 New Zealand urban speeds



1.4.2 Automobile Association – speed surveys

The AA regularly surveys their members on a number of topics, including attitudes towards speed and speeding. In its 2006 survey, members were asked what speed they targeted when driving on the open road. The most popular speed range was 100km/h–105km/h with 44% of respondent selecting this option; 21% targeted the 106km/h–110km/h range; 2% of people targeted speeds greater than 110km/h; and 20% less than 100km/h.

The AA also asked their members in 2006 whether they would support the police dropping the speed tolerance threshold from 10km/h to 5km/h over the posted speed limit. Support for the initiative was low at only 23%, compared with 55% of those who responded with a level of opposition. A July 2007 survey also showed that 57% of AA members would like the 10km/h speed tolerance to be retained in 50km/h speed limit zones, while 37% would accept a 5km/h tolerance.

On their website the AA states that it supports graduated speed limits and would like to see more speed limits set at 'realistic levels' more in tune with the nature of the road. However, it warns against too many varying speed limits as motorists may get confused about what speed zone they are in. The AA also requests that before any posted speed limit is changed, affected communities and road user groups, including the AA, must always be consulted (this is standard practice in New Zealand).

The AA believes the police are right to rigorously enforce speed limits, but agree with the Police Association in cautioning that any ticketing 'quota system' undermines goodwill towards road safety enforcement and the police. Ticketing motorists for speeding in areas where the speed limit is set too low for the road conditions, undermines public goodwill and diverts traffic enforcement away from hazard areas.

While the AA does represent motorists it needs to be acknowledged that its surveys only present a sample of drivers, which is likely to be biased towards older drivers. Hence caution needs to be applied when interpreting the results and drawing conclusions on wider views of the New Zealand driving population.

1.5 Overseas surveys of attitudes to speed and speeding

A number of other countries survey public attitudes to speed limits and speeding. We have selected the USA (due to large sample size) and Australia (likely to have similar attitudes to New Zealanders) attitude studies in this case. Some of the attitudes to speed limits and speeding are similar to those found in New Zealand, and some differ.

1.5.1 USA

In 2011, the US National Highway Traffic Safety Administration (NHTSA) conducted their third National Survey of Speeding Attitudes and Behavior (US DoT 2013). It is a comprehensive telephone survey of 6,144 US households. Previous surveys were conducted in 1997 and 2002. While there is little focus on reducing speed limits and questions about this, the survey is one of the largest internationally and provides useful insights into drivers' attitudes to speeds and speeding. Some of the notable findings were:

- 30% classed themselves as speeders, 40% as sometimes speeders and 30% as non-speeders. Males were more inclined to state they were speeders than female respondents.
- 91% agreed that 'Everyone should obey the speed limits, because it is the law'. Females were more inclined to agree with this statement.
- 82% agreed that vehicles should keep up with the traffic flow.
- 42% agreed that 'Driving at or near the speed limit makes it difficult to keep up with the traffic'.
- 82% agreed that 'Driving at or near the speed limit makes it easier to avoid dangerous situations'. Females were marginally more inclined to agree with this statement.
- 79% agreed that 'Driving at or near the speed limit reduces my chances of an accident'.
- 48% agreed that it was very important that something was done to reduce speeding on the nation's roadways. Percentage of females who agreed with this was 56% and males 40%.
- Close to half of all respondents (48%) said the speed limit should be enforced all of the time. Percentage of females who agreed strongly was 53% and males 42%.
- The most popular speeding countermeasures were electronic roadside speed warning signs and increasing public awareness.
- Two-thirds thought more frequent ticketing for speeding was a good idea.
- Four-fifths thought the increased use of speed cameras in black spot locations was a good idea.
- 61% of drivers would like an in-car device that warned you when you were speeding, with female drivers having a higher agreement with this idea.
- 86% of drivers agreed speed cameras would be useful in school zones and 74% in construction zones.
- 27% of drivers agreed that 'I enjoy the feeling of driving fast'.
- 27% of drivers agreed that 'Speeding is something I do without thinking'.

While it appears most drivers (91%) accept that everyone should obey the speed limit, a high percentage of drivers also think it is important to keep up with the flow of traffic (82%). Hence they may drive above the speed limit as they do not want to hold others up, which would be impolite. Most appear to support the police doing more enforcement of speeds so they can go a 'safer' or lower speed without holding people up. This appears to support lower speed tolerances and lower speed limits where appropriate.

1.5.2 Australia

The Australian Government Department of Infrastructure and Regional Development (2014) produced the research report *Community attitudes to road safety – 2013 survey report*. The survey found that Australian communities continued to identify speed as the factor that most often led to road crashes (31%). They identified the problem as nearly three times greater than drunk driving (11%) on the road.

When respondents were queried on their attitudes to speed and speed regulation:

- The majority of respondents (63%) strongly supported limits of 40km/h or lower on streets with high pedestrian activity, such as shopping areas.
- 89% of respondents agreed that 'an accident at 70km/h will be a lot more severe than an accident at 60km/h[2]'.
- 66% of respondents agreed that 'If you increase your driving speed by 10km/h you are significantly more likely to be involved in an accident'.

The survey then asked respondents their perceived acceptable and actual speed tolerances. A large proportion of the community (52%) supported quite strict speed enforcement (nominating speeds of 60km/h–64km/h as acceptable in a 60km/h speed zone). In contrast, only 15% thought speeds above 65km/h should be tolerated. Eighteen percent of the adult community thought zero tolerance was applied in urban 60km/h zones.

In relation to rural 100km/h zones, 25% of the population were of the view that no speed in excess of 100km/h was acceptable. A further 30% supported speeds of 101–105km/h and 4% supported speeds of 106km/h–109km/h. The most common view (29%) was that 110km/h was an acceptable speed for someone to drive in a 100km/h zone in a rural area without being booked, while 9% thought speeds above 110km/h should be tolerated.

The most common responses when looking at perceived actual speed tolerances in 100km/h zones in rural areas were 21% suggesting driving at 105km/h was permitted and 20% suggesting driving at 110km/h was permitted.

Finally respondents were asked for their attitude to speed enforcement and speeding penalties. Overall, 36% supported an increased amount of speed limit enforcement, 13% supported a decrease and 48% wanted no change. Just over one-third (36%) strongly approved of the use of point-to-point speed enforcement cameras on main roads (equating to 66% total approval). Strong approval was lower amongst motorcycle licence holders (23%), residents of the Northern Territory (25%) and frequent distance drivers (28%).

Chapter 4 shows the results of the current project's research on drivers' attitudes to speeding and particularly to reduced speed limits. Some elements of the research findings can be compared with the USA, Australian and other New Zealand research (by MoT and AA) above. However, there are likely to be some differences as the studies above looked at standard speed limits while the focus of this research was on reduced speed limits.

[2] It should be noted that 60km/h used to be the default urban speed limit in Australia and still applies to many urban roads.

2 Literature review on compliance and acceptance of safer (lower) speed limits

2.1 Introduction

An international literature review was undertaken to determine the research and key findings already available on the acceptance of and compliance with reduced speed limits in Australia and other countries. The review considered both metropolitan and rural roads. It was found that while much research has been carried out into issues of speed limit acceptance and compliance in general (as covered in chapter 1), there have been few published research studies that address these two topics for roads where the speed limit has been reduced, especially without other (engineering) measures being implemented concurrently with the speed reductions.

The international literature centred primarily around two countries, the Netherlands and Sweden. The use of variable speed limits, primarily for environmental benefits and congestion management was examined in the Netherlands in the mid-1990s, while Sweden made the decision to implement lower speed limits as part of Vision Zero in the early years of this century. The outcomes of this decision were examined in a number of reports published by the Swedish Road Administration (Vägverket) (SRA), although these were all issued in Swedish only, albeit with an English abstract.

In Australia, there have been few published attempts to date evaluating driver attitudes to reduced speed limits, with the notable exception of the Kingsborough trial in the state of Tasmania (see section 2.2.2). Attitudes to speed are likely to have a significant cultural basis and, as a result, attitudes and levels of compliance in Europe, the USA or Australia might not necessarily translate to the New Zealand cultural and road environment.

2.2 Findings

2.2.1 International experience

2.2.1.1 North America

One of the earliest studies of changed speed limits was carried out in the USA. The Federal Highway Administration (Parker 1997) experimented with changing speed limits on a number of streets and highways in urban and rural settings across 22 states of the USA during the period 1986–1989. Freeways (limited access highways) were not included in the results. Speed limits were both lowered and raised over road segments of generally less than two miles (3.2km) in length, with only one speed change per site during the study period. Where speeds were lowered, the range was 5, 10, 15 or 20mph (8, 16, 24 or 32km/h). Free-flow speeds were measured, with headways of 4s or greater being used to indicate unimpeded travel for drivers.

Speed limits were lowered at 57 sites. At two sites the limit was lowered by 20mph (32km/h), with this category being grouped for analysis purposes with the seven sites where the limit was lowered by 15mph (24km/h). At 34 sites the speed limit was reduced by 10mph (16km/h), with the remaining 14 locations having speed limits reduced by 5mph (8km/h). A variety of speed data was collected in order to ascertain any changes in driver behaviour resulting from the speed limit changes including - among others – mean free speeds over a 24-hour period, standard deviation, percentile speeds and percentage of vehicles exceeding the speed limit.

Parker (1997) found that changing the speed limit had little overall effect on driver behaviour, as measured by 85th percentile speeds, regardless of the magnitude of the speed limit change. Where speed limits were reduced by 5mph, for example, 85th percentile speeds varied between a reduction of around 3mph (5km/h) and an increase of 1–2mph, with an average reduction of about 0.3mph (0.5km/h) measured. Of the speed limit reductions, the smallest reduction was also the most effective, with the -10mph and -15/-20mph adjustments showing a very small non-zero speed reduction. The change in speed at the -5mph test sites was, however, matched by a similar speed reduction at the comparison sites. Mean speeds showed a similar trend, with practically no change within any of the reduced speed zones at either test or comparison sites. Overall, very few changes in driver speed characteristics were observed for any of the speed limit reductions.

Driver compliance, as measured by the percentage of drivers remaining within the posted speed limit, was quite poor before the study commenced, with only 24%–55% of drivers remaining within the speed limit in speed limit zones of 30, 35 and 40mph (48, 56 and 64km/h). In higher speed limit zones (45, 50 and 55mph – 72, 80 and 89km/h), between 76% and 90% of drivers were compliant. Driver compliance was quite different at the comparison sites, with between 20% and 45% complying in the lower speed limit zones (less than 45mph) and 41%–79% compliant in speed zones of 45mph and above. Consequently, the speed limit reductions simply resulted in lower levels of driver compliance with posted speed limits. The study admitted that it did not address enforcement levels or practices in any of the participating jurisdictions.

The study examined some contiguous sections, where two experimental sections flanked a section with no speed limit change. No speed changes of greater than 1mph (1.6km/h) were observed on these sections either.

In summary, the author noted one limitation of their study being that sites were not able to be selected randomly, but drawn from a list of sites already chosen by agencies for a speed limit change for separate reasons. Also presented was a summary of other research studies carried out within the continental USA from the 1960s to the 1980s showing similarly negligible changes.

Rossy et al (2011) investigated speeds on US residential streets, finding that a reduction in posted speed limit on such streets gave measurable reductions in speed. They highlighted that this finding was in contrast to higher-speed roads where, as observed in the Parker (1997) study, travel speeds changed little after a speed limit change.

Subsequent to the signing of a petition by 180 residents in one neighbourhood in Springfield, Missouri, the local road authority agreed to reduce the posted speed limit from 30mph to 25mph (~50km/h to ~40km/h). The standard US speed limit signs were enhanced with an oversized yellow border accompanied by a safety message, including ‘kid friendly’, ‘respect the limit’ and ‘set the pace’. The latter referred to a scheme where local residents agreed to drive at the new limit and ‘pace’ other drivers at the lower speed. Speed signs were also moved to temporary islands in the centre of the road to increase their conspicuity. The experiment ran for 12 months from late 2005 and no specific enforcement activities were carried out during the trial.

All of the roads where the speed limit was reduced experienced reductions in average speed of between 0.4mph (0.7km/h) and 4.0mph (6.4km/h), with minimal changes in variance that implied uniform compliance with the new limit. On five of the eight sites surrounding the experimental area, speeds also reduced by between 0.5km/h and 1.9km/h, which the authors attributed to a carry-over of the benefits. However, the authors did not take measurements at any unconnected control locations to address the issue of whether these were a true flow-on effect of the changes or the result of other large-scale effects.

Subsequent to this study, two neighbourhoods in Columbia, Missouri also decided to trial a similar speed limit reduction. In one of the areas, two stages were carried out: (1) baseline with no treatments and (2)

reduced speed limit signs. In the other area an additional stage involving an education campaign was added. The new speed limit signs had an oversized yellow border, but it is not clear whether the safety messages were also used.

The results in Columbia were less conclusive than in Springfield, although there were statistically significant reductions in average speed. The results were potentially confounded by the fact that one street experienced queuing due to traffic around a school, which the authors suspect influenced pre-speed limit change speeds. Also, standard deviations were much higher than in the Springfield trial.

The survey administered to residents showed a greater awareness of the speed limit changes among those who had been exposed to the education campaign, but the largest group of survey respondents were of the opinion that the changed speed limits would not influence their decision to walk or cycle in their neighbourhood streets.

There seem to be some flaws in this study, but it does indicate the potential for speed reductions in residential streets using speed limit reductions in conjunction with raising driver awareness.

The City of Edmonton reduced residential speed limits from 50km/h to 40km/h in six residential communities and investigated community perceptions prior to the initiation of the project and following its conclusion (El-Basyouny and El-Bassiouni 2013). Confirmatory factor analysis was used on the results of two 300 resident telephone surveys. A two-group three-factor model was used to assess the perceptions of residents about their speeding behaviour (referred to by the authors as 'speeding'), traffic safety concerns ('concerns') and traffic safety perceptions ('safety'). Comparing pre- and post-speed limit reductions, the authors found there was a decrease in both 'speeding' ($p = 00.21$) and 'concerns', ($p<0.001$) accompanied by an increase in 'safety' ($p = 0.003$). The data was also analysed to identify relationships among the three factors. The results of this revealed that 'concerns' increased significantly with 'speeding', and that both 'concerns' and 'speeding' caused 'safety' to decrease. The analysis also showed that the impact of 'concerns' on 'safety' was direct and that 'speeding' on 'safety' was indirect, occurring through 'concerns'. Overall, the authors concluded that speed limit reductions – at least in the residential area studied – were effective in improving community perceptions.

2.2.1.2 Europe

The European experience is quite different, with much better acceptance overall of the benefits of reduced speeds. The fundamental benefits of reduced speeds were studied by Coesel and Rietfeld (1998), showing benefits to the Netherlands of between DFL0.5b and DFL3.2b (approximately NZ$0.3b to NZ$3.0b in 1998 terms) from reducing speed limits and enforcing them. These benefits were inclusive of the 'costs' of increased travel times. The authors concluded that, despite the obvious benefits, the psychological factors associated with higher speeds might be difficult to overcome, with an emphasis on the safety benefits essential. They also recommended addressing urban areas first, as acceptance would be more likely.

Although not entirely relevant to this review, van den Hoogen and Smulders (1994) published findings of a study experiment looking at the control of motorway traffic through variable speed signs. Their aim was to homogenise traffic through the implementation of temporary reduced speed limits, from 90km/h to 70km/h. In addition to evaluating motorway performance elements, the authors also investigated driver acceptance and behaviour. Five months after the commencement of the trial 1,300 drivers were asked how they felt about the system as well as how it had influenced their driving behaviour. According to the authors, the majority said that they had benefited from the variable speed limit system through improved traffic flow, better warning of impending heavy traffic and a less hectic experience overall. Acceptance was found to be greater among those drivers who were aware of the system's existence than among the 20% who did not know the purpose of the speed signalling devices. With regard to driver behaviour, average

speeds decreased by 1.0–1.5m/s and the proportion of headways less than one second decreased by up to 20%. More importantly, average headway increased and headway variation dropped. No investigations were made into the safety effects of the changes and this study is of limited relevance to this review due to the specific nature of the application of reduced speed limits.

Acknowledging that lowering driving speeds would contribute to environmental and safety benefits, Rienstra and Rietveld (1996) administered a survey to car drivers and public transport users to determine the acceptance of policies to reduce speed limits. The survey was conducted among almost 1,000 people in the Netherlands recruited at four petrol stations and a train/metro station, and addressed issues of car choice (maximum speed), the speed behaviour of respondents on different types of road, acceptance of lower speed limits and acceptance of speed limiters.

One quarter of respondents were public transport users and the remainder drivers. The survey results showed that most respondents were of the opinion that, while their speed behaviour was normal, it was other drivers who drove faster than them, although few participants thought that other drivers drove 'too fast'. The study reported that safety reasons would be the most important reason to adhere to prevailing speed limits. It noted that self-reported speed transgressions were widespread on roads with higher rather than lower speed limits. Most survey respondents considered that travelling speeds 5km/h to10km/h higher than the 120km/h speed limit were 'acceptable' and, perhaps as a consequence, 80% of respondents were opposed to a 100km/h speed limit on the highest speed road type. In contrast, speeding in 50km/h speed zones was undertaken 'sometimes' or 'never', but fewer than 10% of respondents indicated moderate or strong advocacy for acceptance of a 10km/h reduction in speed limit and nearly half thought it was 'not useful'. Similar results were found for 80km/h and 100km/h roads, with an even higher proportion of drivers on the latter road type admitting to exceeding the speed limit regularly.

Acceptance of lower speed limits was broken down by various age, gender and socio-economic categories. Acceptance of lower speed limits was negatively correlated with:

- drivers of cars with high maximum speeds (on high-speed roads)
- drivers with higher annual kilometres driven
- drivers with higher incomes
- drivers with company cars (on high-speed roads).

The authors did not find age, educational level, gender or crash history significantly influenced acceptance of lower speed limits.

In summary, it appears the relationship between speed and safety was acknowledged by survey respondents, but in spite of this the majority admitted to exceeding current speed limits and were not prepared to accept lower speed limits, particularly on highways. The authors concluded that speed limit policy changes were going to have difficulty finding acceptance.

Oei (1996) investigated a number of aspects of automated speed enforcement in the Netherlands, with one study into reduced speed limits being of partial relevance to this research. An intersection on a two-lane rural arterial in Friesland with a significant crash history was subjected to a localised reduced speed limit of 70km/h, reduced from the 100km/h of the surrounding road section. The change was supported by an information campaign, a permanent sign showing the new speed limit, a permanent sign advising drivers to slow down and a flashing warning sign about speeding. After the change in the speed limit in mid-1991, mean speeds through the intersection reduced from 80km/h to 63km/h, with the percentage of non-compliant drivers remaining roughly constant despite the reduced speed.

Goldenbeld and van Schagen (2007) looked at the effects of both driver and road/road environment characteristics on the credibility of speed limits on 80km/h rural roads in the Netherlands. Their study addressed the issue of a driver's judgement, given the characteristics of the road and its surroundings, of the most appropriate speed limit or travel speed. The concept of 'credibility' was proposed as being synonymous with the terms 'realistic' and 'acceptable'. They asserted that this was an important concept, since if drivers doubted the credibility or appropriateness of the speed limit on a road section they were more likely to make their own decision regarding an appropriate travel speed and, should this trend be repeated across many sections of road, the speed limit setting system might be brought into disrepute.

In this study, a sample of 717 Dutch drivers was shown 35 photographs of actual road scenes, presented in random order. The characteristics examined included road width, presence of a curve, roadside trees, signs, centre and edge lines, access roads, and lines of sight to both sides and other traffic.

Over the whole sample of 80km/h roads, respondents considered the average safe speed was 83.7km/h (standard deviation 8.7km/h) and would prefer to travel at 87.9km/h (standard deviation 9.8km/h), meaning that on average, respondents were comfortable well above speeds they perceived as safe. Preferred speeds varied between 73.1km/h and 95.1km/h, with large standard deviations indicating large differences between drivers. For none of the examples was the preferred speed lower than or equal to the perceived safe speed, with the difference being between 3.2km/h and 5.1km/h for all 27 road scenes evaluated.

For both preferred speeds and perceived safe speeds, higher values corresponded with absence of roadside buildings, less road curvature, better than average sight distances, clearer views to the right (the nearside in the Netherlands) and better than average 'clarity of situation'. Road curvature and sight distance had the strongest effects. Participants with a higher sensation-seeking score[3] had the highest correlations with higher preferred and perceived safe speeds. Higher levels of sensation-seeking also correlated with the number of speeding tickets and number of crashes in the previous three years. Since this variable was correlated with a number of other variables, including the dependent speed variables, the authors conducted a further analysis to control for this factor. It was found that the preferred speed of drivers aged 18–25 years was significantly higher than for drivers in the age range 40–55 years. Preferred speeds for those in the latter group were significantly higher than those in the oldest age group of 56 years plus. Similar patterns were observed for the perceived safe travel speed, with the two younger age groups considering the safe speed limit to be significantly higher than the oldest group of drivers. All of the preceding relationships were found to be statistically significant. Drivers with two or more speeding tickets preferred higher speeds and perceived higher safe speeds than those drivers with no speeding infringements.

The authors drew the following conclusions:

- Speed limit credibility was influenced by identifiable features of both the road and roadside. Therefore, they asserted that better credibility might be achieved by either adjusting the speed limit to suit the features, or tailoring roadside features to suit the speed limit.
- There were large differences between groups of drivers with regard to the most credible speed limit and it would therefore be difficult to set a speed limit that would be considered credible by all drivers.
- There were, however, only small differences in road and roadside features that influenced credibility for the different driver groups. Consequently, the authors proposed that it would be possible to set a limit that was, if not sufficiently credible, more credible for all drivers.

[3] A personality trait defined by the readiness of an individual to take risks of a physical, social or financial nature (for example) in order to have more varied and intense experiences and feelings.

The authors acknowledged a number of limitations with their study, mostly arising from the use of static images displayed on a computer monitor rather than actual moving scenes experienced in real life. They suggested the relativities between the variables would likely still be valid, if not the absolute values.

This research, while not directly relevant to a literature review addressing compliance with and acceptance of lower speed limits, gives valuable pointers into some of the factors that might influence drivers in New Zealand when faced with roads where speed limits have been newly set with safety as a higher priority than existing driver speed choice.

Sponsored by the SRA, a study was conducted in Sweden shortly after the implementation of a new speed limit system in Sweden (Anund and Svensson 2009). While some speed limits were raised, a greater number were lowered to bring them closer to the philosophy of Vision Zero, with travel speeds at levels within the biomechanical limits of the human body to avoid serious injury or death in the event of a crash. The study utilised a roadside interview with drivers stopped for routine licence and alcohol checks. It appears that interviews were conducted on a variety of different road types, with speed limits increased from 90km/h to 110km/h at one location (Brattby), from 90km/h to 100km/h at another (Kålltorp) and reduced by 10km/h to 20km/h at four locations. A total of 344 participants were interviewed.

Recognition of the applicable speed limit varied between 75% and 95%. Levels of agreement with the revised speed limit were 60%–70% for the two sections where the limit had been increased from 90km/h to 100km/h (Kålltorp) and 90km/h to 110km/h (Brattby) respectively. At the two sites where the limit was reduced from 90km/h to 80km/h (Hol and Sandhusen) and for the site that was reduced from 110km/h to 90km/h (Valsfäboda), around 44% of respondents believed the new speed limit was appropriate. There was greater acceptance for a change from 70km/h to 60km/h (Tollarp), with 59% accepting the revised limit. Nevertheless, a notable proportion of survey participants disagreed with the changes. The previous 110km/h speed limit at Valsfäboda was considered more appropriate by 49% of respondents, and this was also the case at Hol where the 90km/h speed limit was preferred.

Self-reported compliance tended to match the respondents' opinions of the changed speed limits. With 49% believing the Valsfäboda section should have stayed at 110km/h, 29% of respondents admitted that they continued to drive at the same speed. A further 29% said they now drove faster than before. Encouragingly, on Hol and Sandhusen, 72%–75% said they now drove more slowly, with a similar proportion (69%) doing so at Tollarp.

For the most part, drivers considered the accessibility of the road sections was unchanged, despite the speed limit reductions, with only between 12% and 18% of participants believing the reduced speed limit had disadvantaged their mobility on the road section. Similar to acceptance of the speed limit, the lower-speed roads appeared to engender fewer complaints about reduced mobility than the higher-speed sections. Also encouraging was the fact that just over half (51%–57%) of participants believed the change had improved safety.

The results were inconclusive, but younger people were more likely than older to believe motorists would comply with the new speed limits. Women were more likely than men to believe the speed limit reductions were appropriate.

Forsberg et al (2011) conducted focus groups in rural and urban areas to garner opinions on the new Swedish speed limit system for the SRA. Participants in vulnerable road user groups in urban areas appeared to understand and see the logic behind the new Swedish speed limit system. Rural residents, on the other hand, had 'mixed feelings' about the new limits, acknowledging that while the situation might improve for vulnerable road users, they believed it would also lead to worse speed compliance and increased traffic congestion. The authors reported that rural residents seemed generally not to see the

logic behind the new limit system. They concluded that the criteria used to set speed limits needed to be made more explicit and include the effects of speed on safety, mobility and the environment.

As an aside, Jongen et al (2011) conducted a study into the effects of sign repetition on 70km/h roads where a 90km/h speed limit had formerly been in place. They concluded that more sign repetition led to lower travel speeds, with speeds increasing as drivers continued to proceed beyond the most recent speed limit sign. The roads involved were low workload, with a new speed limit lower than the impression provided by the design of the road.

The organisational challenges of reducing speed limits were highlighted in an SRA report (in Swedish only) (Nyberg and Svensson 2012). Qualitative interviews with decision makers across the country were conducted to gauge their attitudes to the implementation of the new speed limits. Respondents acknowledged the efforts by the SRA to better indicate the deficiencies in the design of individual road sections that resulted in the recommendation for lower speed limits, as well as the organisation's efforts to specify the measures required to retain the previous limit. Respondents considered there was uncertainty about the accountability, funding availability and time frames for actions required to retain higher speed limits. There was a marked perception that the SRA had changed its stance in this area during the process to date.

Respondents highlighted their belief that the SRA did not sufficiently allow for the politically charged nature towards speed limits at regional level, attributed to the assumed relationships between travel speeds, mobility, travel times and regional development. Their advice was that regional authorities needed more time to allow politicians to absorb the idea of the changes and propagate these ideas and make the required decisions through the political process.

Finally, the authors, backed up by many study participants, indicated an urgent need to follow up on the consequences of the changes in speed limits and the supposed links with many other factors. They recommended that the relationship between the measured effects needed to be connected back with the objectives proposed originally for the new speed limit system and therefore better define the causal chain from lower speeds to the benefits touted from their implementation, thereby providing strengthened arguments for future implementation.

2.2.2 Australasia

Excell (2005), representing the Royal Automobile Association of South Australia, conducted a study surveying community acceptance of lower speed limits on urban arterial roads, a source of a significant proportion of serious trauma in Australia. The corresponding clubs in Queensland, Western Australia and New South Wales did the same and were reported for comparison in the paper. The stated purpose of the survey was to both 'take the temperature' of the South Australian community with regard to speed limits as well as to assess attitudes towards speed enforcement tolerances; however, only the first is covered in this review.

Just over 600 residents of South Australia over the age of 18 were surveyed, two-thirds metropolitan residents and one-third from extra-urban areas. No educational material was included in the survey about the benefits or disadvantages of increases or decreases in speed limits. Respondents were required to have a driver licence and make at least three car trips per week. At the time of the survey, the default speed limit in such areas was 60km/h.

Participants were older than the general population, with 19% being over 65 and 11% aged 18–24 years. Respondents were asked, 'To what extent would you support or oppose existing 60km/h speed limits on main roads being reduced to 50km/h?' Nearly three-quarters were opposed or strongly opposed to the change as worded. Strongest opposition was found among those aged 25–30 (93%), those who made more

than 30 trips per week (87%) and those in metropolitan areas (81%). The next question asked how participants would feel about the extra travel time added to their driving from the aforementioned speed limit reduction. This question apparently did not address the issue of how much or how little this 'extra travel time' might be, nor the practical consequences of what it might mean. Nevertheless, just fewer than half the respondents reported 'not being concerned at all' and just over half 'concerned' or 'very concerned'. Asked at what speed they normally drove on a 60km/h road with the traffic 'flowing well', 61% reported they drove at 60km/h, with the remainder at other speeds between 50km/h and 70km/h. The authors did not report on the distribution of speeds above and below the speed limit of the remaining respondents.

Compared with similar surveys conducted in three other states of Australia, the responses to the questions documented above were similar, with opposition to a change in existing urban speed limits varying between 71% and 79% and the imposition of the undefined additional travel time being of concern to 50%–57% of participants. A slightly higher percentage of Queensland respondents (71%) reported travelling at 60km/h in that speed zone when they could.

The author concluded that the community would not be able to receive openly a decision to introduce 50km/h speed limits on urban arterials. This result is perhaps not unexpected given the lack of background provided to participants as to the reasons behind the proposed change, as was done with most of the other studies documented in this review.

A similar study to Goldenbeld and van Schagen (2007) was conducted in Australia by Lahausse et al (2010). In contrast to the Dutch study, the authors provided a selection of quite different road types, from rural gravel roads to residential urban streets. The stated aim of the study was to gain an understanding of Australian attitudes towards current and lowered speed limits in urban and rural areas. Survey respondents provided a variety of demographic data and driving history as well as examining photographs online. Participants were not presented with questions implying a reduced speed limit, but asked questions about a specific speed limit instead, with this specific speed often being lower than what might be currently posted at the site.

The study did not report the number of valid survey responses received, but indicated that the pool of responses was close to being representative of the Australian population, with the exception of the sample being significantly more likely to be university educated than the population as a whole.

Respondents typically reported travelling at close to the speed limit on 50km/h residential and 60km/h urban arterials and were generally effective at judging the speed limits of these street scene types. Interestingly, they reported travelling at well below the 100km/h speed limit on undivided rural (85km/h) and gravel roads (67km/h) as well as underestimating the speed limit on these road types as well (86km/h and 72km/h respectively). When asked for their views regarding the appropriate speed limit for the different road types, almost three-quarters (71%, 95% CI, 70–72km/h) considered the current speed limits were appropriate. A similar proportion thought new limits of 10km/h lower would be too low. In contrast, a 90km/h speed limit for a two-lane undivided rural road was considered to be 'about right' by almost half the respondents, as was an 80km/h speed limit for a rural gravel road. Only 17% considered the reduced speed limits on these two road types were too low.

A number of questions were asked to establish participants' reasons for exceeding the speed limit. Relevant to this review, 42% 'sometimes believed the speed limit was too low; with almost 18% holding this view 'most of the time' or 'always'.

A statistical analysis was conducted of participants divided automatically into 'clusters'. Cluster 1 contained those who favoured lower speed limits, drove more slowly and believed the speed limits to be lower. Cluster 3 featured those at the opposite end of the spectrum. Cluster 2 featured those with

moderate views, while Cluster 4 favoured a lower speed limit for gravel roads, although the authors did not state whether their other characteristics were aligned closely with any of the other clusters. Cluster 1 was found to comprise females residing and driving in urban areas, driving the shortest weekly distances and most likely to be university graduates. Cluster 3 was primarily males living in rural areas and comprised a high proportion of people over 55 and retired. They drove longer distances and were less well-educated than the norm. Aside from these highlights presented by the authors, the results for this analysis are not particularly instructive. All four clusters stated a speed choice on rural residential roads of between 49.5km/h and 50.7km/h, while their speed choice on urban arterials was between 58km/h and 62km/h. More widely varying results were observed for undivided rural roads, with Cluster 1 respondents guessing an average speed limit of 65km/h and stating a travelling speed close to this value. Conversely, Cluster 3 thought the speed limit was a little over 100km/h and stated that they would drive at about 1km/h below this level. Preferred speeds on gravel roads varied between 52km/h for Cluster 1 and 79km/h for Cluster 3, perhaps reflecting an increased confidence level with the latter road category. In contrast to the Dutch study and perhaps reflecting the high profile of speed enforcement in Australia, all of the clusters reported travelling speeds of mostly at or slightly beneath what they perceived the posted speed limit to be.

The authors speculated that lower speed limits might meet with acceptance, giving the apparent level of support for 50km/h limits in urban residential areas as an example of an initiative that the survey did not show to be unacceptable, despite it having been introduced relatively recently. Finally, the fact that only 8% of survey respondents correctly identified the current speed limit in rural areas implied that better education about rural default speed limits and their purpose might be of value.

The Tasmanian Department of Infrastructure, Energy and Resources (DIER) commissioned survey research to investigate residents' views on current and proposed speed limits (AMR Interactive 2009). The stated objectives of the study were to assess community knowledge of existing speed limits and attitudes towards possible limit changes. A total of just under 800 participants over the age of 18 years were interviewed by telephone during June 2009. The results of the survey were weighted to be representative of the population with regard to age, gender and residential location.

The survey found respondents understood that a reduction in speed limits led to a reduction in the severity of crashes, but were much less likely to believe it would also reduce crash occurrence. Acceptance of reduced speed limits was found to be strongly correlated with a perception of a reduction in crashes, so the authors concluded that once this connection could be drawn in the minds of the community, acceptance of lower speed limits would be more forthcoming. A further issue was that participants did not believe reducing speed limits was effective in addressing speeding or the cause of crashes.

Knowledge of existing speed limits was reported as being mixed, with awareness of the speed limit on gravel roads being lowest, with the majority thinking the existing speed limit (100km/h) was much lower. For many people, their nominated speed where possible on sealed and unsealed roads was lower than the prevailing speed limit.

There was strong support for the lowering of the unsealed road speed limit to 80km/h. On two-lane undivided rural roads, the biggest proportion of respondents considered 90km/h or less would be the most appropriate speed on this type of road. Participants were less receptive to speed limit changes on major arterial roads and highways. More than half reported driving at or above the 110km/h limit, with three-quarters considering this limit was about right and 20% 'too high'. When suggested change to 100km/h was proposed, 64% considered it 'about right' or 'too low'.

From a demographic standpoint, females reported safer behaviour, safer driving attitudes and greater acceptance of lower speed limits compared with males. Drivers over the age of 75 were the most positive

about lowered limits, while young drivers were somewhat mixed in their responses: they were among the least accepting of lower speed limits, but their perceptions and behaviour were better than those in the 21–55-year-old groups. Drivers in the latter group reported higher preferred travel speeds and poorer perceptions regarding the association between speed and safety outcomes.

A similar study (Lahausse et al 2009) was conducted across Victoria, South Australia, Western Australia and Tasmania with the twofold aim of understanding community attitudes to speed limits and speeding, and investigating some of the underlying factors.

A total of 4,100 responses were received, primarily from licensed drivers, and weighted by area of residence, age and gender. The survey was conducted online, with four road types addressed by the study:

1 A local residential street (current limit 50km/h)

2 An undivided urban arterial (current limit 60km/h)

3 A two-lane undivided rural road (current limit 100km/h)

4 A rural gravel road (current limit 100km/h).

With the exception of the rural gravel road, most respondents considered the prevailing speed limits were 'about right', although those who thought the limit was 'a bit too high' or 'far too high' comprised around 50% for the two-lane undivided rural road and almost 90% for the gravel road.

Respondents were proposed a speed limit 10km/h lower for each of the sealed road types and 20km/h lower for the rural gravel road. The proportion who considered the speed limit was 'about right' on both the local residential street and the urban arterial fell from about 70% to around 30% when the speed limit was proposed at 40km/h and 50km/h respectively. A 90km/h speed limit on the undivided rural road gained higher levels of acceptance, with just over half the respondents judging the new limit 'about right' compared with around 40% for a 100km/h limit. For the rural gravel road, about 45% thought 80km/h was acceptable, with a further 45% still believing it to be 'a bit too high'. The authors concluded there was fairly strong support for a reduction in the rural speed limits proposed, with a lesser level for urban areas. They did note that those who thought the proposed lower urban speed limits for the sample images shown were 'far too low', were in the minority.

In order to assess community understanding of the relationship between speed limits and important outcomes, participants were asked a number of questions. They were first asked how true a particular statement was, then a follow-up question was put to them asking to what extent they would support speed limit reductions if the statement was true. The authors acknowledged that this technique might have caused some internal conflict for participants if they did not believe the initial statement to be at all true. The highest level of belief was associated with the statement, 'lowering the speed limit would reduce the severity of injury if a crash occurs', with 80% believing or strongly believing this to be true. Also showing above 50% recognition were, 'lowering speed limits would make the roads safer for pedestrians and cyclists', 'driving at 110km/h uses 25% more fuel than at 90km/h' and 'the main reason police target speeding motorists is to make money for the government'. Similar to previous studies, only a third of the respondents believed or strongly believed that lowered speed limits would reduce crash occurrence. Perhaps encouragingly in light of the findings of Excell (2005), around 45% believed or strongly believed that a 10km/h reduction would not affect trip travel times. This view partly negates the most common argument used by many opponents of lower speed limits.

When respondents were asked again about some of the important outcomes, subject to various statements being asserted as true, some interesting views emerged. Overall, the study suggested that participants' level of belief was often higher than their level of support, indicating that although they

believed the facts, it did not necessarily lead them to support the initiative. This was true for the associations between lower speed limits and injury severity, vulnerable road user safety and reduced fuel usage. The opposite was true for emissions, amenity ('more enjoyable and healthier environment') and crash risk. The study conducted a multiple regression analysis to determine which belief statements were associated to a statistically significant extent with support for lower speed limits. The following statements were all significant predictors of levels of support for lowered speed limits:

1 'Lowering the current speed limits would reduce crashes on the roads'

2 'A 10km/h speed limit reduction in all urban and build-up areas would not significantly impact trip travel times'

3 'Lowering the current speed limits would reduce the severity of injury when a crash occurs'

4 'Lowering the current speed limits would create a more enjoyable and healthier environment for you and your family to live in'

5 'Lowering the current speed limits would make our roads safer for pedestrians and cyclists'.

The authors asserted that this demonstrated community knowledge of speed-related issues had a significant impact on the acceptance of lower speed limits and the issues listed above were therefore worthy of promotion.

The DIER in Tasmania trialled lower speed limits in two regions, Kingborough, centred around Kingston 15 minutes south of Hobart and the Tasman municipality, located on the Tasman Peninsula around 90 minutes' drive from the capital. In each of the regions, the default rural speed limit was reduced from 100km/h to 90km/h, and to 80km/h on gravel roads. Signs were set up informing drivers as they entered the demonstration area. A 12-month evaluation of Tasman from December 2008 has been published (Langford 2010), with a corresponding one for Kingborough at 24 months (Langford 2011). The stated purpose of the trials was to reduce the number and severity of crashes in each area, determine the level of community knowledge and attitudes to speed limits and to measure driver compliance with the revised speed limits.

In summary, the Tasman trial found that for the sealed roads in the trial, there was a high level of awareness of the reduced speed limit, with around 80% of respondents either supporting the introduction of the limit or desiring further reductions. Similarly for gravel roads, there was an increase in community knowledge between the beginning of the trial and the one-year mark, and 97% of respondents supported the new default or wanted further reductions.

Driver compliance was less dramatic. Six sealed road locations in the demonstration area and six in a control area were measured. Speed reductions in the demonstration area averaged 2.4km/h compared with 0.5km/h in the control region. Based on the speed distribution, however, it appeared that the speed reductions in the demonstration area were largely due to reductions in the proportion of drivers travelling at 90km/h or greater, with only 27% doing so at 12 months compared with 36% at the beginning of the study. Compliance fell from 88% (with the 100km/h limit) to 73% (with the 90km/h limit), compared with a constant 85% in the control region. There was an insufficient number of crashes to draw any conclusions regarding improved safety over the period studied in the report. The author presented no data for any gravel road sections.

The Kingborough trial commenced in October 2008. On the sealed sections, a similar proportion of the community (54%) was able to recall the correct limit pre-demonstration compared with two years after its commencement. There was a trend towards greater support for the new 90km/h speed limit, with 64% agreeing that it was appropriate, compared with 53% who regarded the previous 100km/h limit in the

same light, although this trend was not statistically significant. On gravel roads, the level of awareness of the new speed limit compared with the old increased by a statistically significant amount from 17% to 51%, with 53% supporting the new limit compared with fewer than 12% who supported the previous gravel road default limit.

Mean free travel speeds on sealed roads reduced by 0.9km/h from 82.1km/h to 81.2km/h in Kingborough compared with 1.6km/h in the control region (82.8km/h to 81.2km/h). The mean speed on gravel roads in Kingborough reduced from 70.6km/h to 68.2km/h, a more substantial 2.4km/h reduction. Compliance rates on sealed roads fell from 91% to 80% in Kingborough, while remaining at 90% in the control region.

These two reports again highlight the fact that while approval for lower speed limits is often expressed by a significant proportion of people, voluntary compliance is less forthcoming. Neither the Kingborough nor Tasman trials mention whether there was any accompanying enforcement with the speed limit changes, so it is perhaps likely there were no special efforts made to ensure compliance with the demonstration limits.

Most recently, Raftery et al (2013) reviewed speed education resources (except for media campaigns) in an attempt to identify those that might be useful to help improve public acceptance of lowered speed limits. Relying only on those adopting an evidence-based approach, they selected nine resources, all of which used safety-based arguments.

2.3 Literature review conclusions

Overall, there have been few studies published documenting the acceptance of and compliance with reduced speed limits, with similar studies addressing existing speed limits being far more prevalent. Some of the earliest work found originated in the USA in the mid- to late 1980s, where speed limits were raised or lowered on a variety of non-freeway roads in 22 states, with reductions of up to 20mph (32km/h). Perhaps not surprisingly, with no accompanying enforcement or awareness campaigns, little change was found in post-change mean speeds and driver compliance was poor both before and after the speed limit revisions. Another study found more support for a residential area speed limit reduction accompanied by more emotive publicity, although no explanation was made of some background effects that might have been present but not acknowledged by the authors.

In Europe, the fundamental benefits of speed limit reductions have been acknowledged and understood for many years. An early study looked at variable speed in a motorway environment and found good awareness and compliance. A more general attitudinal study found greater acceptance of lower speed limits in urban residential areas compared with extra-urban high-speed roads, where compliance with existing limits was lower already. A study into 80km/h rural roads demonstrated, in isolation from any knowledge by drivers of the social consequences of higher speeds, the importance of ensuring that road characteristics are a better match for drivers' perceptions of an appropriate speed limit. Road curvature and sight distances were most strongly correlated with speed perception. The authors concluded that although there would never be a speed limit on a particular road section that would be credible for all drivers, there would be a speed limit that would be more credible for everyone.

Studies by the SRA showed, while people often disagreed with lower speed limits, a statistically significant proportion of respondents did travel more slowly subsequent to the changes and less than a fifth believed the lower limit had impeded the accessibility of the road. Another study concluded that the setting of speed limits needed also to include the dissemination of the effects of speed limits on safety, mobility and the environment.

From an organisational viewpoint, the local authorities responsible for implementing speed limit changes prescribed by the central organisation needed to be supported with post-hoc demonstrations of the

benefits of the changes they had made in order to gain support from local politicians and the local community by completing the causal chain between speed and its outcomes.

Similarly in Australasia, a survey conducted by the automobile clubs demonstrated low acceptance levels of speed limit changes in the absence of background information and justification being provided to the community. In contrast, a more definitive survey study showed, in contrast to Europe, acceptance of lower speeds on some classes of rural road (undivided two-lane roads and gravel roads) was quite good, with less support for urban arterials and residential roads. When presented with some of the facts regarding the benefits of speed reductions, however, acceptance was higher although likely compliance without matching enforcement levels might be less forthcoming.

Overall, it could be concluded that while the driving public might not yet be ready to accept lower travelling speeds without question, the compelling arguments for their implementation are likely to help drivers rationalise the changes and justify their acceptance, backed up – as with practically all road safety messages – by levels of enforcement to ensure compliance in the short to medium term until such time as the majority of road users accept the new regime as the norm.

3 Speed limit compliance – existing sites

A number of road controlling authorities around New Zealand have reduced speed limits in urban and rural areas and a variety of routes in both these areas have been treated. For this study the various locations have been categorised into the following site types.

1 Mountainous (slow-speed) routes – 80km/h speed limit (or less)

2 High-speed but narrow local authority rural road – 80km/h speed limit

3 High-volume and speed/high-crash state highway – 80km/h and 90km/h safe speed areas

4 Suburban streets – 40km/h speed limit

5 Urban commercial shopping streets – 30km/h and 40km/h speed limit

There are other site types that were not included in this study due to shortage of data or due to complexity. For example the application of speed limits in and around new sub-divisions, especially on the urban–rural (peri-urban) fringe. There can be a number of unique issues around these speed limit changes that are difficult to translate into a case study for wider reference. The staging of development may require speed limits on some roads to be changed earlier or later than normal. This occurs when there are rural and urban elements along roads leading to new subdivisions.

Local councils and the Transport Agency have used a combination of engineering, education and, to a limited extent, enforcement measures to support the reduced speed limits. Engineering measures have ranged from installing speed limit signs, sometimes with parallel road markings through to highly modified self-explaining road layouts.

Before and after data on speeds and traffic volumes has been collected for many of the sites where a reduced speed limit has been introduced. This section discusses a number of the speed limit reduction programmes that have been put in place around the country and the key combined findings from these programmes. But first the results of previous work undertaken in this area by the Transport Agency are discussed.

3.1 Mountainous (slow speed) routes 80km/h speed limit (or less)

A number of reduced speed limits have been applied on hilly and mountainous (local authority and state highway) rural roads around the country. Along most of the rural routes there is very little development, and so the decision to apply a reduced speed limit has been made based on the low-speed environment, as measured by the 85th percentile speed. This method is commonly called speed zoning. An outline of this method for setting speed limits can be found in Edgar (2006). Two studies are profiled in this section. The first is a report by the Australia Road Research Board Group (ARRB) (2009), which has before and after data for a number of routes where speed zoning was applied in 2005 and 2006. The second study is the more recent application of speed zoning to sealed and unsealed roads on the Otago Peninsula, as part of an area-wide 70km/h speed limit.

3.1.1 ARRB speed compliance analysis (2009)

A draft report for the ARRB group by Pyta and Turner (2009) analyses before and after speed data, collected at New Zealand trial sites of lowered speed limits during 2005 and 2006. This report was never finalised, but extracts of the draft report are provided below to show the key finding of this work (in

italics). The study looked at 69 sites on nine routes across New Zealand, ranging from low- to medium-volume local authority roads. All of the routes in the speed zoning trials were two-lane undivided roads with varying degrees of horizontal and vertical curvature.

> *The overall reduction in mean speeds* (combined at all sites) *was 1.6 km/h, which is small but statistically significant. This is tentative confirmation of the hypothesis that speed zoning can help to reduce travelling speeds at locations where the operating speed is below the posted speed limit. There was some evidence of speed targeting* (where mean speeds increase) *where the original operating speed had been lower than the new posted speed limit.*
>
> *The change in mean speed was heavily influenced by the magnitude of the reduction in the speed limit* (with some having large, 40km/h, and other small changes, 10km/h). *However, the results were not uniform across all of the sites. This gives rise to the hypothesis that both the magnitude of the speed limit reduction and individual differences at the different route locations interact with the effect of the speed zoning. Variables such as the degree of horizontal and vertical curvature, visible police presence and weather conditions at the time of the speed survey would be valuable in any future modelling of the speed data. The amount of site characteristic data available in the current data set is currently insufficient for this purpose.*
>
> Table 3.1 *and* Table 3.2 *summarise the effects of the magnitude of the speed limit reductions on mean travelling speed, standard deviation, 85th percentile speed and level of compliance with the speed limit* (for each group of sites). *All results were statistically significant (p <.05).*

The sites were grouped into common before and after speeds (eg 100km/h down to 80km/h). The impact on each speed indicators is discussed below:

> ***Mean travelling speed***
>
> - *Mean travelling speed decreased in all speed limit categories except for the 90 km/h category. The decreases ranged between -0.8 and -2.5km/h at the sites where the speed limit reduced. The mean travel speed decreased by 6.5km/h at the sites where no change in speed limit occurred. It should be noted that the sample size for the 'no change' category is a lot smaller than the other sites.*
> - *The mean speed was consistently below the speed limit before and after the changes was implemented.*
> - *It should be noted that the increase in mean speed at 90km/h sites coincided with a decrease in traffic volumes between the two survey periods. Traffic volumes increased substantially in every other speed limit category and this coincided with a decrease in mean speed for all other speed limit categories.*

Table 3.1[4] Effects of the magnitude of speed limit reductions (speed before reductions=100km/h)

		No change	Speed limit reduced from 100km/h to …				
			90km/h	80km/h	70km/h	60km/h	50km/h
Mean	Before	65.7	72.7	72.9	64.2	53.1	44.7
	After	59.2	74.8	70.4	62.4	50.4	44.0
	Change	-6.5	2.1	-2.5	-1.8	-2.7	-0.8
Standard deviation	Before	16.7	16.6	13.3	14.6	13.3	10.4
	After	13.5	14.8	14.5	13.6	13.3	10.3
	Change	-3.2	-1.9	1.2	-1.0	0.0	-0.1
85th percentile	Before	82	89.8	86	79	66	56
	After	73	89	84.6	76	64	55
	Change	-9	-0.8	-1.4	-3	-2	-1
Compliance	Before	99.2%	95.7%	98.0%	99.1%	99.8%	100.0%
	After	100.0%	87.6%	76.0%	61.7%	78.8%	73.3%
	% Change	0.8%	-8.5%	-22.4%	-37.7%	-21.1%	-26.7%
Number of vehicles	Before	266	13,114	4,419	15,559	12,372	44,938
	After	333	11,959	6,624	17,515	14,260	51,211

Table 3.2[5] Effects of the magnitude of speed limit reductions (speed before reductions <100km/h)

Statistic	Survey period	No change in speed limit…				Speed limit reduced from 70km/h to 50km/h
		50km/h	60km/h	70km/h	80km/h	
Mean	Before	49.3	54.6	71.7	79.3	61.4
	After	47.1	57.5	66.4	78.2	56.5
	Change	-2.1	2.9	-5.3	-1.1	-4.9
Standard deviation	Before	9.2	8.2	13.1	9.1	11.5
	After	10.3	7.3	14.5	8.5	10.9
	Change	1.2	-0.9	1.4	-0.5	-0.7
85th percentile	Before	57	62	83	88	72
	After	57	64	78	85	66
	Change	0.0	2.0	-5.0	-3.0	-6.0
Compliance	Before	55.1%	78.7%	47.3%	55.6%	81.7%
	After	63.6%	68.9%	66.0%	60.6%	23.5%
	% Change	15.4%	-12.4%	39.6%	9.1%	-71.2%
Number of vehicles	Before	17,623	469	4,575	387	3,475
	After	17,539	450	4,647	462	3,440

[4] Pyta and Turner (2009, p6, table 3-1)

[5] Pyta and Turner (2009, p7, table 3-2)

Standard deviation of mean travelling speed

- *Standard deviations of mean travel speed reduced at most sites (between -0.1 and -3.2km/h). The exceptions were the 80km/h speed limit category which recorded a 1.2km/h increase in the standard deviation and the 60km/h speed limit category which recorded no change in the standard deviation.*

85th percentile speeds

- *The 85th percentile speeds reduced for every speed limit category – the reductions ranged between -0.8 and -9.0km/h. After the change in speed limits, the 85th percentile speeds at the new 50km/h, 60km/h, 70km/h and 80km/h sites were higher in aggregate than their new speed limits.*

Compliance with speed limits

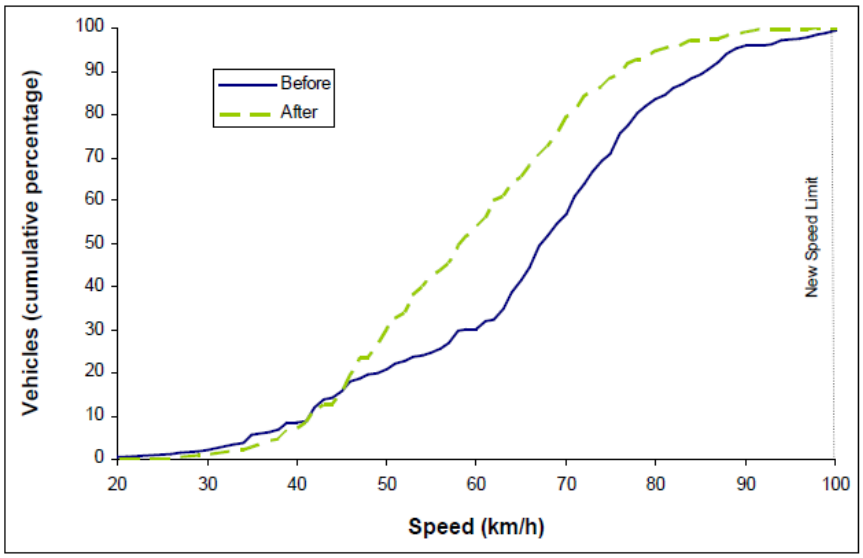
- *Compliance was high (between 95.7% and 100.0%) before the speed limits were reduced. Compliance deteriorated after the introduction of the new speed limits despite the general decreases in 85th percentile speeds. As a general rule, the lower the new speed limit, the worse the compliance levels became.*

The results of the ANOVA indicated a small but statistically significant interaction between survey period and magnitude of the change in speed limit. The overall R^2 value for the model was .456 (i.e. the variables included in the model accounted for 45.6% of the variance in vehicle travelling speeds). This can be partitioned as follows: survey period accounting for 0.01%, magnitude of change in speed limit accounting for 45.3% and the interaction accounting for 0.03%.

Figure 3.1 to figure 3.6[6] *show the cumulative distribution of travel speeds before and after the speed limit reductions for each speed limit reduction category. They show a general shift towards lower travelling speeds for the 50km/h, 60km/h and 70km/h speed limit categories but a slight shift towards slightly higher travelling speeds for the 80km/h and 90km/h speed categories. The 'no change' category also showed quite a shift towards lower travelling speeds.*

[6] Pyta and Turner (2009, pp8–10, figures 3.4 to 3.9)

Figure 3.1 Cumulative distribution of free travel speeds before and after change in speed limits for the sites where the speed limit remained 100km/h



The sites plotted in figure 3.1 show a typical distribution of speeds in these mountainous low-speed environments, hence the speeds are lower than would be expected on a high-quality highway alignment of similar speed limit posting.

Figure 3.2 Cumulative distribution of free travel speeds before and after change in speed limits for the sites where the speed limit reduced from 100km/h to 90km/h

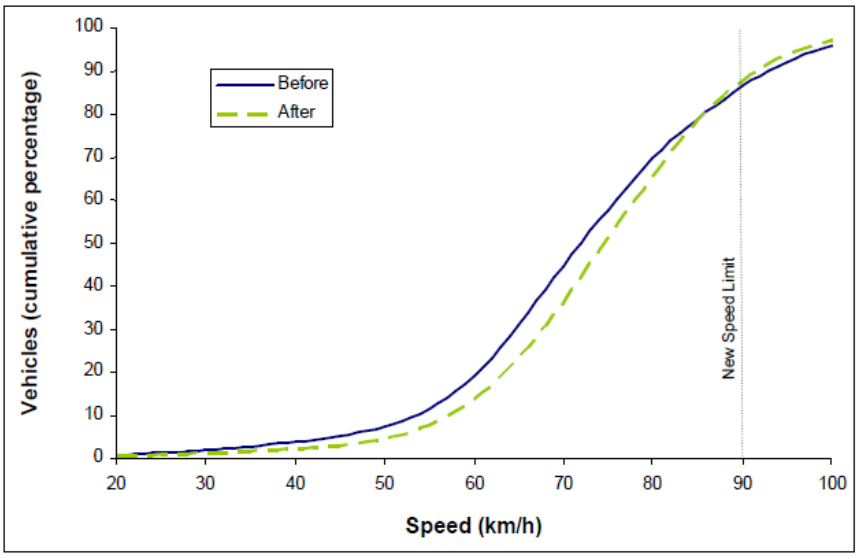


Figure 3.3 Cumulative distribution of free travel speeds before and after change in speed limits for the sites where the speed limit reduced from 100km/h to 80km/h

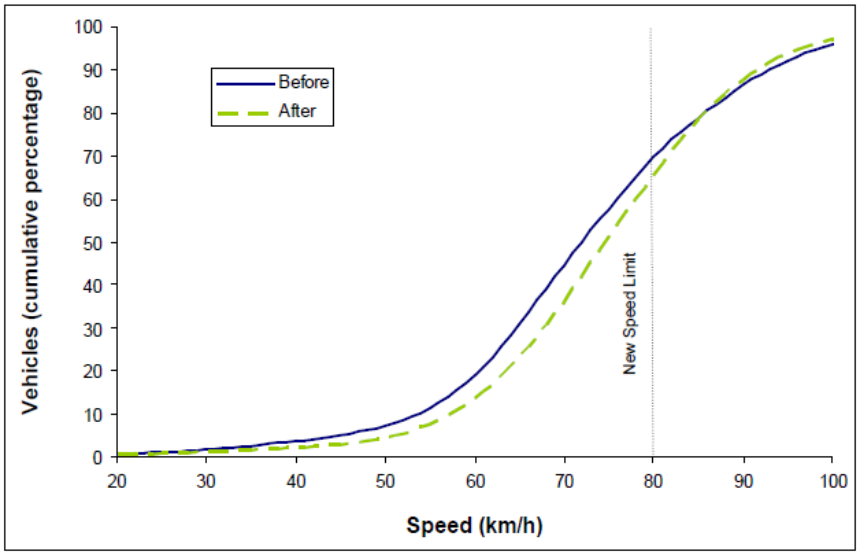


Figure 3.4 Cumulative distribution of free travel speeds before and after change in speed limits for the sites where the speed limit reduced from 100km/h to 70km/h

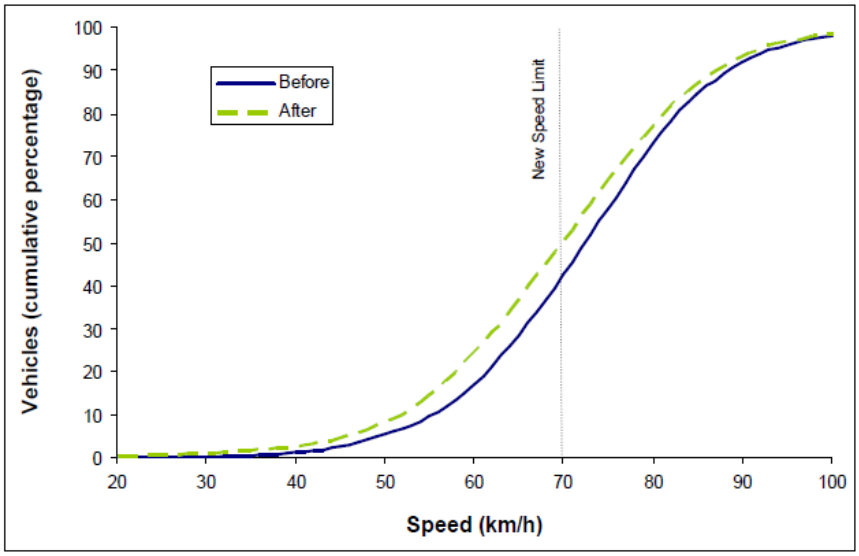


Figure 3.5 Cumulative distribution of free travel speeds before and after change in speed limits for the sites where the speed limit reduced from 100km/h to 60km/h

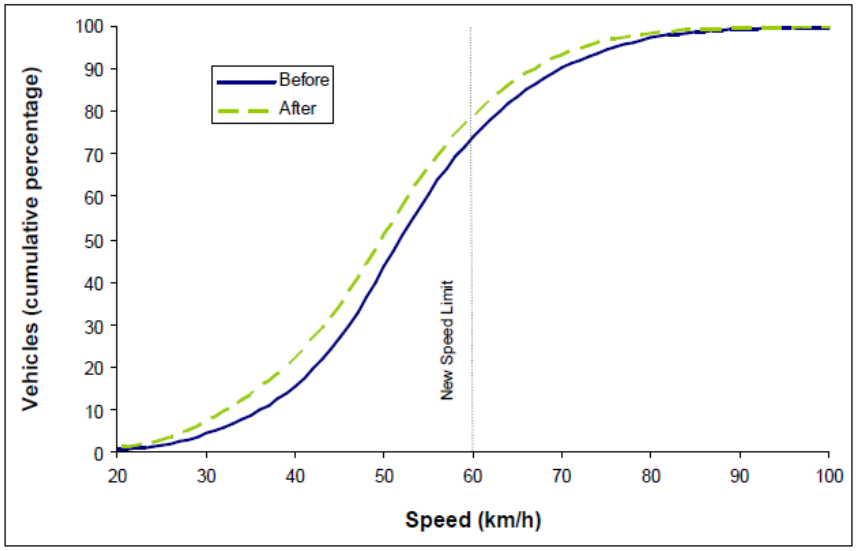
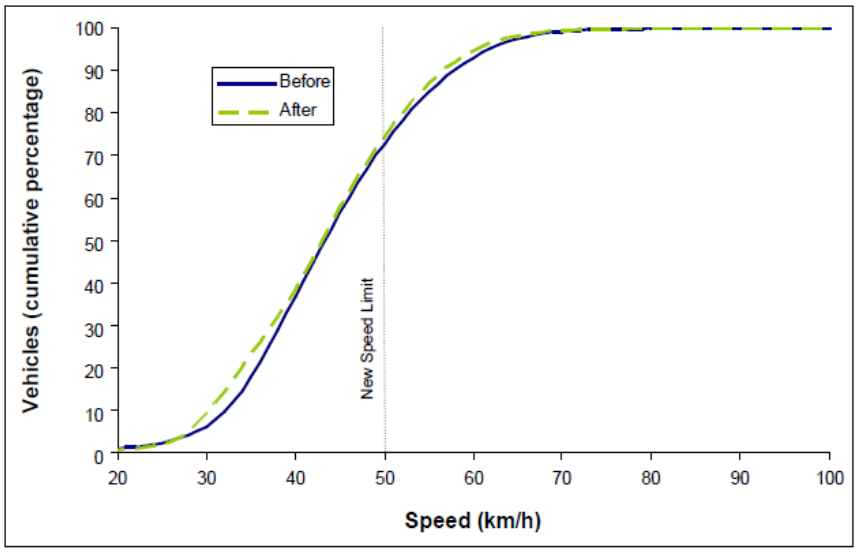


Figure 3.6 Cumulative distribution of free travel speeds before and after change in speed limits from 100km/h to 50km/h



The key outcome of this work was getting rural speed limits closer to actual operating speeds based on geometry; hence it was more about slow-speed mountainous highways. However, the speed limits were not reduced too low (ie to match 50th percentile or otherwise) so as to avoid the possibility of speed targeting.

Speed targeting can eventuate when speed limits are lowered to closely match the operating speed. The mean 'after' speed increases over the mean 'before' speed, when the mean 'before' speed was already below that of the newly lowered speed limit. In such a scenario, it is assumed that some drivers will now drive at the new posted speed limit, rather than to the conditions, as they most likely did in the before situation. Speed targeting can be minimised by ensuring additional curve advisory speed signs are installed at low-speed curves.

The survey details and results of the ARRB report are included in appendix A.

3.1.2 Otago Peninsula, Dunedin

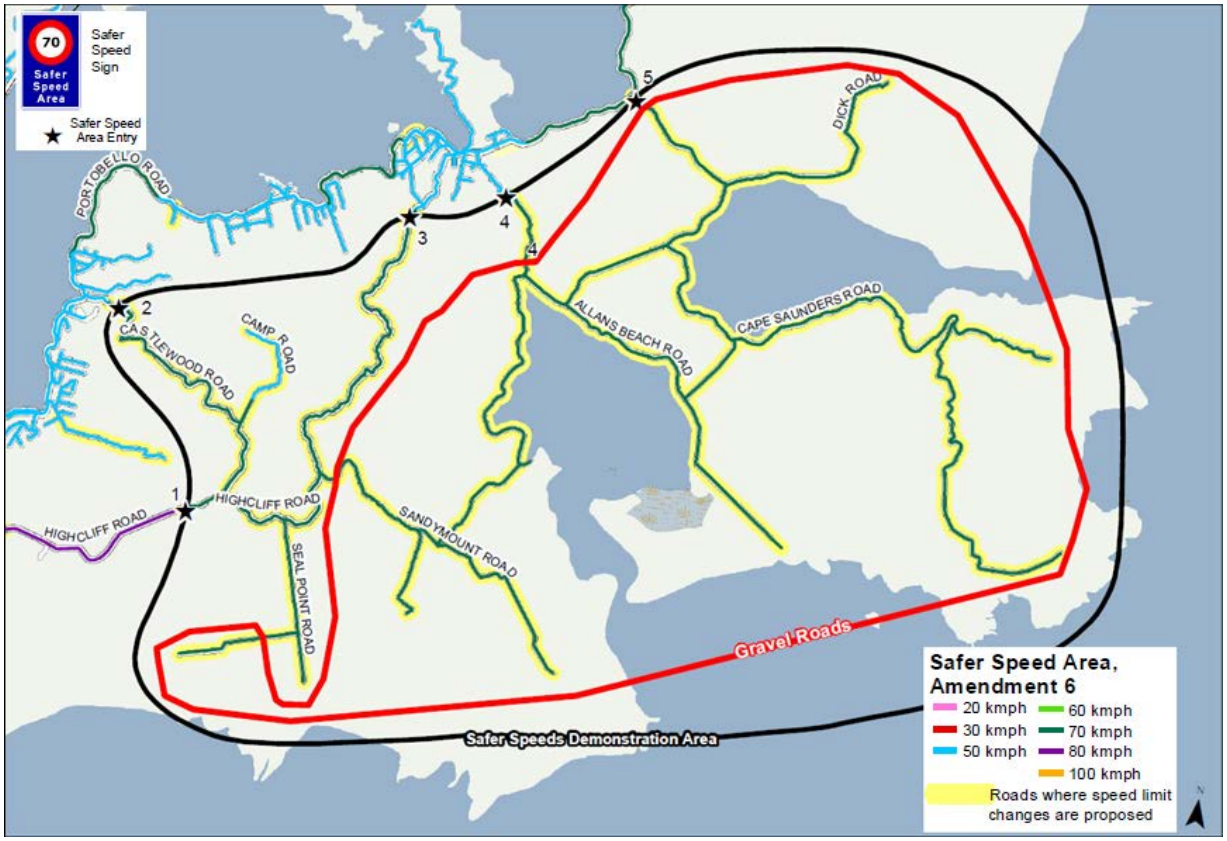
3.1.2.1 Site description

In January 2012, Dunedin City Council (DCC) engineers started a speed limit review process, which culminated with the decision by DCC to reduce the Otago Peninsula rural speed limit from the existing 100km/h to 70km/h. In March 2013 the new speed zone of 70km/h was implemented.

The rural speed limits on the Peninsula were reviewed following concerns raised by the Otago Peninsula Community Board and residents that the 100km/h speed limit on many of the rural roads was unsafe given the mix of narrow winding often unsealed roads and the high proportion of tourists, cyclists and walkers using the roads, alongside motorists who used it to commute to the city. They also considered there were inconsistencies with speed limits, with one road having 80km/h yet other adjoining lower standard roads having 100km/h speed limits, which could be confusing to the many international tourists who come to the area to see the unique wildlife and scenery.

The roads encapsulated by the project are shown in figure 3.7 and are gated by 70km/h threshold signs as indicated by the starred locations on the map.

Figure 3.7 Map showing extents of the safer speeds area



3.1.2.2 Speed limit changes

The following sections of the Otago Peninsula have had their speed reduced from 100km/h to 70km/h:

- Allans Beach Road (Mt Charles Track end – gravel)
- Allans Beach Road (Hoopers Inlet Road – Treetop Drive)

- Camp Road (Castlewood Road – Highcliff Road)
- Highcliff Road (Seal Point Road – Sandymount Road)
- Hoopers Inlet Road
- Seal Point Road

3.1.2.3 Safer system compliance

Safer speeds

The speed limit change from 100km/h to 70km/h was designed to reduce the severity of crashes on DCC's rural roads. The new speed limit also better reflected the measured average speeds in the area, of no more than 70km/h. The routes are all popular with cyclists, walkers and tourists, particularly the wildlife attractions and Larnach Castle.

This lowered speed limit is supported by speed limit signs and road markings at the five threshold locations. The benefit of the five threshold locations is that all motorists must pass through one of these in order to access the targeted roads. An example of the gated signage and road markings used at thresholds is shown in figure 3.8.

Figure 3.8 Example of signage and road markings used on the Otago Peninsula

Safer roads and roadsides

No changes have been made to the road or roadside to encourage a safer road environment as part of this project. The road environment, with narrow (or no) shoulders, winding and rolling terrain, tends to support a lower speed limit. The road alignment including poor horizontal and vertical alignment (some of which is not obvious to drivers), makes higher speeds less safe.

Safer road use – education and media campaigns

The DCC undertook consultation (community engagement) and a media campaign prior to the introduction of the reduced speed limits.

The council engaged with the local community board and representatives from other stakeholder groups, including the AA and the police. Groups representing walkers, cyclists and tourists were not consulted. A letter was prepared and distributed to all land-owners in the affected area, outlining the proposed speed

limit changes. The council also meet with local businesses, including the Larnach Castle operators. Copies of the Transport Agency flyer *Speed limit: How you can be involved* was provided to all interested parties (see appendix B).

A request was made for submissions on the plan and a public hearing was held to discuss any concerns with the planned speed limit change. A total of 54 submissions were received, with 28 fully in support, 21 partially supporting the changes (some wanted a lower speed limit) and five in opposition. The council made one change to the plan in response to the hearing discussion. Camp and Castlewood Roads were dropped to 70km/h rather than the proposed 80km/h in response to community wishes.

The media campaign consisted of advertisements in local newspapers and information on the council website. The key theme of the campaign was 'safe | appropriate | credible'. During the first week following the speed limit change the council used their speed trailer to inform drivers of the speed they were travelling on each route with the new speed limit. This allowed the public to see if their speed was within or above the new speed limit and to adjust their speeds if needed.

Appendix B also includes excerpts from articles published in the local media about the speed limit change.

Since the speed limits were introduced, the public response has been very positive, with most wanting to retain the new speed limit or even reduce it further. The lessons learnt from the process are:

- There is considerable work involved in changing speed limits (and it is important to allocate sufficient time to the process).
- Communication with the public and stakeholders is very important.
- Publicity is important (especially if change is controversial) and to be conservative with the change and not to go for too low a speed limit (some people will want it lower but this may create opposition from others).

3.1.2.4 Traffic speed statistics

The following roads were surveyed one month before, one month after and 12 months after the safer speed area was instigated. It should also be noted that the values reported for the 'change in speed' of the surveys conducted 'twelve months after the speed limit change', were in relation to the speed 'one month before', not the speed 'one month after'. The sample sizes were not provided.

Table 3.3 Allans Beach Road (Mt Charles Track end – gravel)

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	41.5km/h	53.6km/h	12.2km/h
One month after speed limit change	42.3km/h	54.4km/h	12.4km/h
Change in speed	+0.8km/h	+0.8km/h	
Twelve months after speed limit change	42.8km/h	53.6km/h	11.2km/h
Change in speed from before	+1.3km/h	0.0km/h	

Table 3.4 Allans Beach Road (Hoopers Inlet Road – Treetop Drive)

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	56.7km/h	67.7km/h	11.2km/h
One month after speed limit change	55.5km/h	65.5km/h	10.3km/h
Change in speed	-1.2km/h	-2.2km/h	
Twelve months after speed limit change	55.2km/h	53.6km/h	11.2km/h
Change in speed from before	-1.5km/h	-1.8km/h	

Table 3.5 Camp Road (Castlewood Road – Highcliff Road)

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	54.9km/h	64.4km/h	9.6km/h
One month after speed limit change	55.0km/h	64.4km/h	10.4km/h
Change in speed	+0.1km/h	0.0km/h	
Twelve months after speed limit change	54.6km/h	64.4km/h	11.2km/h
Change in speed from before	-0.3km/h	0.0km/h	

Table 3.6 Highcliff Road (Seal Point Road – Sandymount Road)

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	41.3km/h	48.6km/h	7.8km/h
One month after speed limit change	41.5km/h	48.2km/h	7.2km/h
Change in speed from before	+0.2km/h	-0.4km/h	

Table 3.7 Hoopers Inlet Road

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	44.4km/h	56.5km/h	12.3km/h
One month after speed limit change	42.3km/h	52.6km/h	10.3km/h
Change in speed	-2.1km/h	-3.9km/h	
Twelve months after speed limit change	39.3km/h	49.7km/h	10.1km/h
Change in speed from before	-5.1km/h	-6.8km/h	

Table 3.8 Seal Point Road

100km/h → 70km/h	Mean speed	85th %ile speed	Standard deviation
One month before speed limit change	73.5km/h	87.8km/h	15.2km/h
One month after speed limit change	73.6km/h	88.2km/h	14.2km/h
Change in speed	+0.1km/h	+0.4km/h	
Twelve months after speed limit change	73.1km/h	88.2km/h	15.2km/h
Change in speed from before	-0.4km/h	+0.4km/h	

Summary

The lowering of the speed limit from 100km/h to 70km/h has not had a major effect on mean and 85th percentile speeds. However, there is now much improved guidance for tourist drivers, which highlights the fact that these New Zealand roads are not ones that should be driven at 100km/h. Given the nature of the winding and mountainous topography in the Otago Peninsula, motorists are not travelling at speeds anywhere near the old posted speed limit (of 100km/h and 80km/h); instead they are driving to the conditions (except on Seal Point Road).

The standard deviations have remained fairly static at most sites. A reduction in standard deviation would suggest a concentration of speeds, which can lead to safety benefits.

Hoopers Inlet Road (table 3.7) was one road to have a major decrease in speeds, both one month after the safer speed area was introduced and 12 months thereafter. The mean speed reduced by 5.1km/h and the 85th percentile by 6.8km/h in the 12 months after the safer speed area was introduced. It is not known why this occurred at this particular location. The alignment of Seal Point Road, being straight, is the reason why its operating speed is above the new speed limit (70km/h). Of all the roads in the area this route is the one that will be the most challenging in terms of getting a reduction in speeds.

3.2 High-speed narrow local authority rural road 80km/h safe speed area

There are a number of local authority roads around New Zealand with modest traffic volumes but a relatively high crash rate due to roadside hazards, including ditches, poles and trees and a relatively high density of high-speed priority intersections. Several local authorities including Hamilton City Council and Hastings District Council are trialling 80km/h speed limits on these road types. The Hamilton city trial of 80km/h speed limit is discussed in chapter 5.

3.2.1 Hastings District Council 80km/h areas

3.2.1.1 Site description

In 2013 Hastings District Council (HDC) requested their Traffic Engineer to examine and assess what effect any proposed speed limit change would have on efficiency and safety for road users travelling on their local network. The safe speed area focused on roads in the district's Heretaunga Plains close to Hastings.

The engineer's assessment found that reduced speed limits were in fact the best balance of safety and efficiency for the particular roads included within the safe speed area.

3.2.1.2 Consultation and campaigns

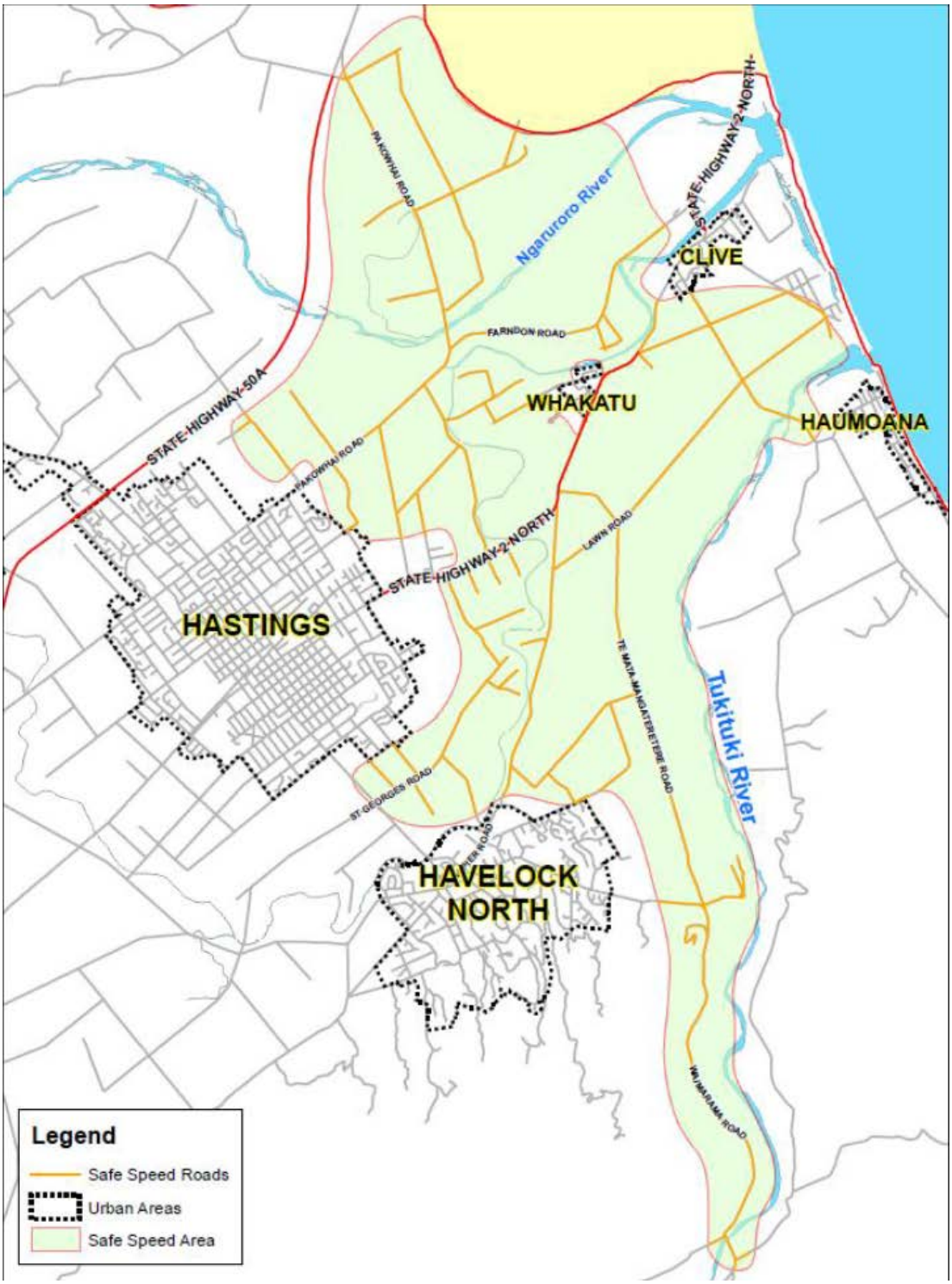
HDC ran an extensive consultation and media campaign given the extent of the area covered by the speed limit change. In all cases speed limits would be dropped from 100km/h to 80km/h, with little if any engineering measures, other than some signs and marking.

During the consultation phase HDC set up a citizen panel of over 1,000 people. It also used a 'one voice container' where members of the public could drop in and discuss their concerns about the proposed speed limit changes. A key finding of this exercise was that the public seemed to have little understanding of the road safety risks along many of the rural roads, including hitting or entering into roadside hazards and also collisions at priority controlled intersections. This is not a surprise, as research for the AA (Turner 2014) on risk perception indicated that drivers placed very little emphasis on roadside hazards and only a moderate level of weight on priority controlled intersections, when assessing the risk of a road. The main factors that influence drivers' perception of risk are winding and narrow roads. Given that most of the roads treated in Hastings district are flat and fairly straight it is no surprise that many drivers do not perceive them to be unsafe. The crash record on many of the roads, however, shows there is a road safety problem.

HDC called for submissions on the proposed speed limit change and approximately 65% of the submissions were in support of the proposed speed limit reductions and 35% were opposed. A more detailed review of the submissions showed that many of the submitters opposing the speed limit change were from Napier or outside the Hastings district and were concerned with the travel time impact on their journey to Hastings (in some cases the travel time impacts quoted were well beyond what the true effect of the speed limit change would cause). Many of those in support of the speed limit change lived along the roads affected and would directly benefit from it in terms of accessing driveways and intersections more safely.

Since the speed limit changes were introduced, there has been an increase in community opposition and a call to increase the speed limits again on some of the roads. This has included community groups undertaking petitions/campaigns and running private surveys. HDC is planning to undertake further consultation and a new survey of residents to determine the wider community's attitude to the speed limit changes. As with many transport changes there is often a large group that benefits from such changes, but once they are introduced move on to other concerns. In the event that speed limits are increased again, those benefiting from the change or in support of it may rally and want the speed limits dropped again. As with many controversial changes, it is to be expected that the community will be split and decisions should be made on the best possible evidence.

Figure 3.9 Hastings safe speed area



3.2.1.3 Traffic speed statistics

Tables 3.9 to 3.15 give some of the locations where the safer speed area has been implemented, together with the mean speed, 85th percentile speed and standard deviation. Compliance with the new speed limit was also recorded by HDC. Again sample sizes were not available.

Table 3.9 Napier Road

Napier Road	Mean speed	85th %ile speed	Std deviation	Compliance level
100 km/h zone	87km/h	95km/h	10km/h	-
80 km/h zone	81km/h	87km/h	9km/h	93%
Change	-6km/h	-8km/h		

Table 3.10 Lawn Road, sites 1 & 2

Lawn Road Sites 1 & 2	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	95km/h	108km/h	15km/h	-
80km/h zone	78km/h	87km/h	12km/h	93%
Change site 1	-17km/h	-21km/h		
100km/h zone	90km/h	100km/h	12km/h	-
80km/h zone	83km/h	91km/h	9km/h	86%
Change site 2	-7km/h	-9km/h		

Table 3.11 Pakowhai Road, sites 1, 2 & 3

Pakowhai Road Sites 1, 2 & 3	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	70km/h	80km/h	12km/h	-
80km/h zone	74km/h	81km/h	9km/h	98%
Change site 1	+4km/h	+1km/h		
100km/h zone	87km/h	96km/h	10km/h	-
80km/h zone	78km/h	85km/h	8km/h	97%
Change site 2	-9km/h	-9km/h		
100km/h zone	90km/h	98km/h	10km/h	-
80km/h zone	80km/h	87km/h	9km/h	94%
Change site 3	-10km/h	-11km/h		

Table 3.12 Richmond Road (Clive)

Richmond Road	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	75km/h	87km/h	14km/h	-
80km/h zone	73km/h	84km/h	13km/h	95%
Change	-2km/h	-3km/h		

Table 3.13 Elwood Road

Elwood Road	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	80km/h	91km/h	12km/h	-
80km/h zone	74km/h	83km/h	11km/h	96%
Change	-6km/h	-8km/h		

Table 3.14 Pilcher Road

Pilcher Road	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	79km/h	88km/h	10km/h	-
80km/h zone	76km/h	83km/h	9km/h	97%
Change	-3km/h	-5km/h		

Table 3.15 Mill Road

Mill Road	Mean speed	85th %ile speed	Std deviation	Compliance level
100km/h zone	79km/h	88km/h	11km/h	-
80km/h zone	75km/h	83km/h	9km/h	97%
Change	-4km/h	-5km/h		

Summary

The sample of sites from Hastings shows there has generally been a big drop in mean and 85th percentile speeds as a result of lowering the speed limit from 100km/h to 80km/h. The only exceptions were sites that already had a low operating speed, often below the current speed limit. There is some evidence of speed targeting, where the speed actually increased with the new speed limit.

3.3 High-volume and speed/high crash state highway 80km/h and 90km/h safe speed areas

This section discusses the use of reduced speed limits on a high-volume state highway, which traditionally had a high number of crashes, due to the higher operating speeds. Such speed limits were generally lower than the road geometry would suggest, ie most motorists would travel around the open speed limit.

3.3.1 SH2 (from SH1 to SH25)

3.3.1.1 Site description

In 2011, the speed limit on three sections of SH2 was reduced from 100km/h to 90km/h. The safer speed limit was introduced as a safety measure to help address severe crashes, which were over-represented along this section of highway. This section of road has average annual daily traffic (AADT) of approximately 13,000 vehicles per day over the last five years. The majority of the route is in a rural environment with most of the adjoining land use being farming. The three sections of road with the speed limit reduction are:

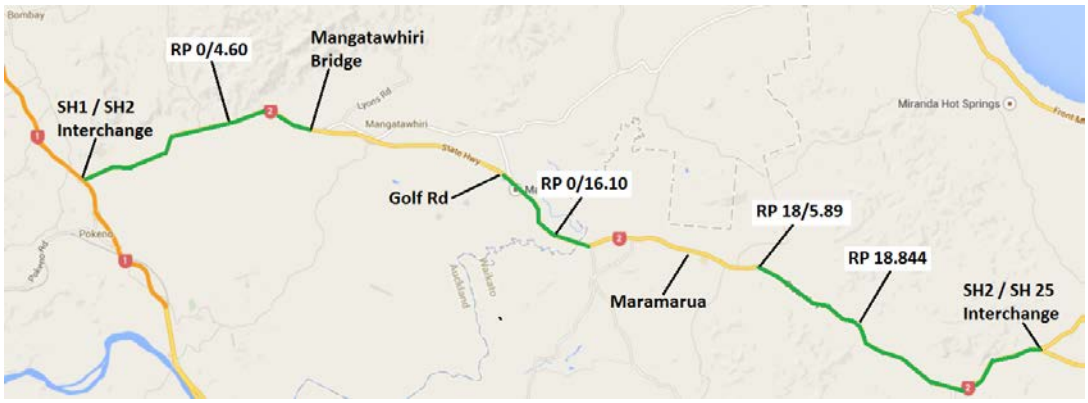
1 SH1 and SH2 interchange to Mangatawhiri Bridge (start of the Mangatawhiri deviation/bypass)

2 Golf Road to Western Maramarua (beginning of the urban speed limit)

3 Eastern Maramarua to SH2 and SH25 intersection (Thames turn-off).

An overview of the road and the key locations is shown in figure 3.10.

Figure 3.10 Sections of SH2 with lowered speed limits and speed survey locations



To evaluate the effectiveness of the reduced speed limit, speed surveys were collected at four sites: one in the first two sections and two surveys in the third section. Floating car surveys were used to select sites where the speed was representative of each section. The following sites were surveyed:

1 SH2 RP 0/4.60

2 SH2 RP 0/16.10

3 SH2 RP 18/5.89

4 SH2 RP 18/8.44

The locations of the speed surveys are shown in figure 3.10.

3.3.1.2 Safer system compliance

Safer speeds

The speed limit change from 100km/h to 90km/h was designed to reduce the severity of any crashes that were likely to occur. This lowered speed limit was supported by speed limit signs and road markings. Examples of the signage and road marking used throughout the project are shown in figure 3.11.

Figure 3.11 Examples of signage and road markings used on SH2

Safer roads and roadsides

No changes were made to the road or roadside to encourage a safer road environment as part of this project. The road environment, with wide shoulders, passing lanes and guard rails, tends to support a higher speed limit. The road alignment including poor horizontal and vertical alignment (some of which is not obvious to drivers), and some narrow bridges, makes higher speeds less safe, as reflected in the high crash rate.

Enforcement

SH2 has been identified as a high-risk route and due to this receives considerable attention from the NZ Police. Roughly half the route is patrolled by the Counties Manukau Police, while the remaining part is patrolled by the Waikato Police. In addition to regular patrols and enforcement, the route is targeted with speed cameras at a number of high-risk locations.

Safer road use

A public consultation period was initiated where the Transport Agency called for public submissions on the project.

3.3.1.3 Traffic speed statistics

Only 'free speeds' were recorded and analysed, unlike most other sites mentioned throughout this report. A free speed is one where a driver is not influenced by a driver in front. In this case, vehicles speeds were recorded when the headway between vehicles was greater than four seconds.

Table 3.16 SH2 RP 0/4.60

SH2 RP 0/4.60	Speed limit change	Mean speed	85th %ile speed	Std deviation	% > 100km/h	Sample size
Northbound	Before	95.2km/h	105.1km/h	10.6km/h	30%	16,930
	After	89.3km/h	96.5km/h	7.8km/h	7%	18,666
Change		-5.9km/h	-9.6km/h		Reduced	
Southbound	Before	91.5km/h	99.0km/h	7.9km/h	12%	19,229
	After	89.7km/h	96.8km/h	7.7km/h	8%	21,318
Change		-1.8km/h	-2.2km/h		Reduced	

Table 3.17 SH2 RP 0/16.10

SH2 RP 0/16.10	Speed limit change	Mean speed	85th %ile speed	Std deviation	% > 100km/h	Sample size
Northbound	Before	95.8km/h	103.0km/h	8.3km/h	27%	15,423
	After	90.9km/h	98.3km/h	8.3km/h	11%	17,291
Change		-4.9km/h	-4.7km/h		Reduced	
Southbound	Before	97.4km/h	104.8km/h	8.4km/h	35%	17,260
	After	94.5km/h	101.9km/h	8.2km/h	22%	19,864
Change		-2.9km/h	-2.9km/h		Reduced	

Table 3.18 SH2 RP 18/5.89

SH2 RP 18/5.89	Speed limit change	Mean speed	85th %ile speed	Std deviation	% > 100km/h	Sample size
Northbound	Before	96.0km/h	103.3km/h	7.8km/h	29%	16,399
	After	90.9km/h	99.4km/h	9.0km/h	14%	18,408
Change		-5.1km/h	-3.9km/h		Reduced	
Southbound	Before	92.4km/h	100.4km/h	8.0km/h	17%	17,563
	After	85.3km/h	93.2km/h	8.5km/h	4%	18,282
Change		-7.1km/h	-7.2km/h		Reduced	

Table 3.19 SH2 RP18/8.44

SH2 RP18/8.44	Speed limit change	Mean speed	85th %ile speed	Std deviation	% > 100km/h	Sample size
Northbound	Before	100.3km/h	108.7km/h	8.9km/h	51%	18,220
	After	97.0km/h	104.8km/h	8.1km/h	34%	20,607
Change		-3.3km/h	-3.9km/h		Reduced	
Southbound	Before	94.2km/h	101.5km/h	8.1km/h	21%	15,886
	After	91.9km/h	99.0km/h	8.0km/h	13%	17,316
Change		-2.3km/h	-2.5km/h		Reduced	

Figure 3.12 Northbound changes in mean and 85th percentile speeds at each site

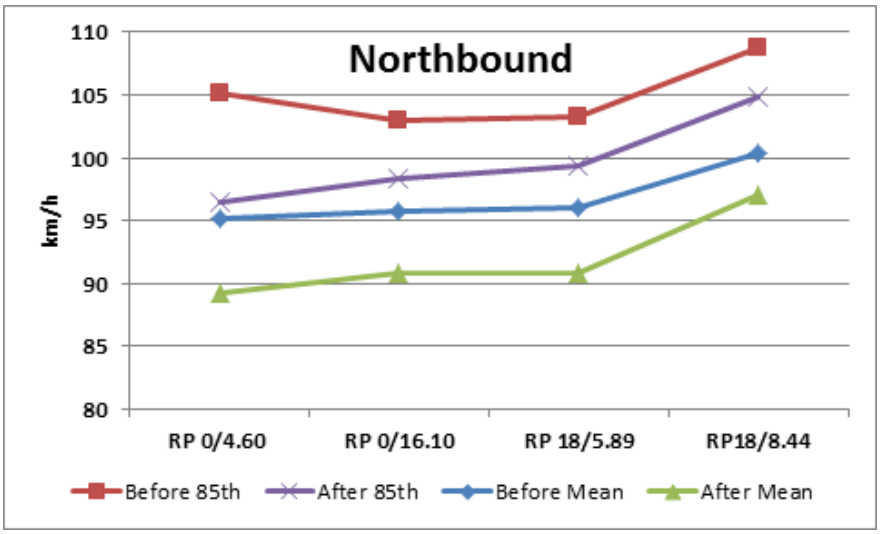
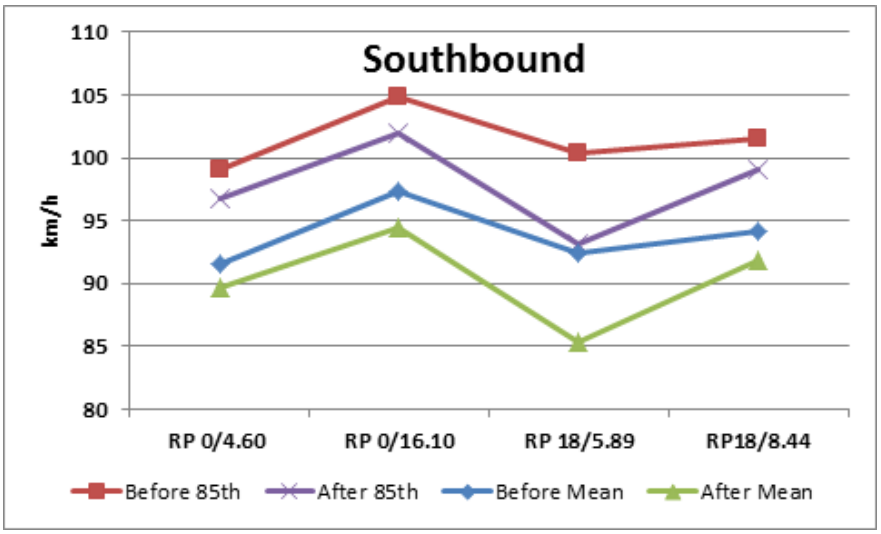


Figure 3.13 Southbound changes in mean and 85th percentile speeds at each site



Discussion

Typically the speed reduced by 3km/h to 6km/h, which is quite a good reduction in speeds given no change was made to the road layout. This reduction in speed was likely to be due in part to the increased presence of police to enforce the reduced speed limit. All sites experienced a reduction in the percentage of vehicles exceeding 100km/h with the sites with higher mean speeds experiencing the largest reduction in vehicles exceeding 100km/h. The 85th percentile speeds for all but two sites are less than 100km/h. All sites also have a more consistent standard deviation of around 8km/h.

3.3.2 SH1 – Dome Valley

3.3.2.1 Site description

In 2007, the Transport Agency implemented a reduction in speed limit from 100km/h to 80km/h on a section of SH1 at Dome Valley (north of Warkworth). This section of road is located approximately 4km south of Wellsford and goes from the Wayby Valley Road to L Phillips Road. It is approximately 9km in length and is in a rural environment with the majority of land use being forestry. The location of the lowered speed limit area is shown in figure 3.14. This section of SH1 has had a poor crash history in the past. It has been targeted by a road safety taskforce, who introduced a range of measures including engineering, education and enforcement. Under a safer system framework it continues to get attention across the various areas, with reducing the speed limit being one of the measures introduced.

Figure 3.14 Location of lower speed limit area and traffic survey locations

To evaluate the effectiveness of the speed reduction, five traffic speed surveys were conducted at the following locations, as shown in figure 3.14:

1 Wayby Valley Road (RP 346/4.54)

2 North of Waitaraire Bridge (RP 346/6.09)

3 South of Saunders Road (RP 346/8.78)

4 Waiwhui Road (RP 346/11.56)

5 L Phillips Road (RP 346/14.31).

3.3.2.2 Safer system compliance

Safer speeds

The speed limit change from 100km/h to 80km/h was designed to reduce the severity of crashes that were occurring. The lowered speed limit was supported by speed limit signs and road markings on the northern entry to the targeted sections of the road. There is also a separate sign near the speed limit sign, explaining that it is a high crash area. Examples of these signs are shown in figure 3.15.

Figure 3.15 Examples of signs when entering lowered speed limit area

Safer roads and roadsides

No changes were made to the roads or roadsides in this project.

3.3.2.3 Traffic speed statistics

The before surveys were conducted in 2005, but only reported on the 85th percentile speed of the site. They did not report on the direction of travel either, therefore their results were taken as an 85th percentile for the site in both directions. The after studies showed there could be quite differing 85th percentile (and mean) speeds for either direction.

Table 3.20 Wayby Valley Road

	Direction of travel	Mean speed	85th %ile speed	Std deviation
Before speed limit change	Both directions		101km/h	-
After speed limit change	Northbound	76km/h	84km/h	8.5km/h
	Southbound	87km/h	97km/h	9.4km/h

Table 3.21 North of Waitaraire Bridge

	Direction of travel	Mean speed	85th %ile speed	Std deviation
Before speed limit change	Both directions	-	100km/h	
After speed limit change	Northbound	68km/h	77km/h	10.1km/h
	Southbound	65km/h	74km/h	7.7km/h

Table 3.22 South of Saunders Road

	Direction of travel	Mean speed	85th %ile speed	Std deviation
Before speed limit change	Both directions	-	97km/h	-
After speed limit change	Northbound	76km/h	83km/h	6.9km/h
	Southbound	75km/h	80km/h	6.0km/h

Table 3.23 Waiwhui Road

	Direction of travel	Mean speed	85th %ile speed	Std deviation
Before speed limit change	Both directions		95km/h	
After speed limit change	Northbound	62km/h	75km/h	14.6km/h
	Southbound	73km/h	79km/h	7.6km/h

Table 3.24 L Phillips Road

	Direction of travel	Mean speed	85th %ile speed	Std deviation
Before speed limit change	Both directions		97km/h	
After speed limit change	Northbound	83km/h	91km/h	8.7km/h
	Southbound	82km/h	91km/h	9.3km/h

The lowering of the speed limit from 100km/h to 80km/h has reduced the 85th percentile at all sites surveyed and the reduction ranges between 6km/h to 26km/h. A direct comparison with the before survey is difficult given it was not split by direction of travel; however, there was enough evidence to support a notable decrease in speed, with mean speeds below the 80km/h speed limit at all locations except L Phillips Road and the southbound traffic on Wayby Valley Road.

Crash history

The Transport Agency's Crash Analysis System (CAS) database was used to collate the crash history for the five years preceding the 80km/h safer speed zone and five years thereafter, to understand whether the speed limit change had improved safety for road users. This is outlined in tables 3.25 and 3.26.

Table 3.25 SH1 Dome Valley crash history 2003–12

Crash severity	Before (100km/h speed limit)					After (80km/h speed limit)				
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fatal crashes	0	4	2	2	2	1	0	2	0	0
Serious crashes	1	1	0	4	1	2	3	2	2	2
Minor injury crashes	4	5	8	7	7	6	6	12	14	4
Non-injury crashes	22	24	22	22	25	19	20	24	16	9
Total	**27**	**34**	**32**	**35**	**35**	**28**	**29**	**40**	**32**	**15**

Table 3.26 Crash history statistics

Crash severity	Total 2003–07	Total 2008–12	Difference	Percentage change	Average per year	
					2003–07	2008–12
Fatal crashes	10	3	-7	-70%	2.0	0.6
Serious crashes	7	11	+4	+57%	1.4	2.2
Minor injury crashes	31	42	+11	+35%	6.2	8.4
Non-injury crashes	115	88	-27	-23%	23.0	17.6
Total	**163**	**144**	**-19**	**-12%**	**32.6**	**28.8**

Overall the number of crashes reduced in total by 19 in the five years after the 80km/h speed limit was implemented. Encouragingly the number of fatal crashes reduced by 70% from 10 to 3, but the number of serious crashes increased by 57% and minor injury crashes by 35%. It is possible that the fatal crashes migrated to the serious crash severity, as the likelihood of a fatal crash is reduced when the operating speed reduces from 100km/h to 80km/h. Unfortunately the number of injury crashes overall increased by 17% from 48 crashes during the before period, to 56 in the after period.

In real terms the overall crash rate decrease was greater, as the traffic volume increased over the observed periods. The Transport Agency's traffic count site 1N:01N00352 has collected count data since 2005. Between 2005 and 2012 traffic grew on average by 1.2% per annum from 10,574 AADT to 11,258 AADT. This means there was a decrease in the overall number of crashes per vehicle-kilometre-travelled (VKT).

3.4 Suburban streets – 40km/h speed limit

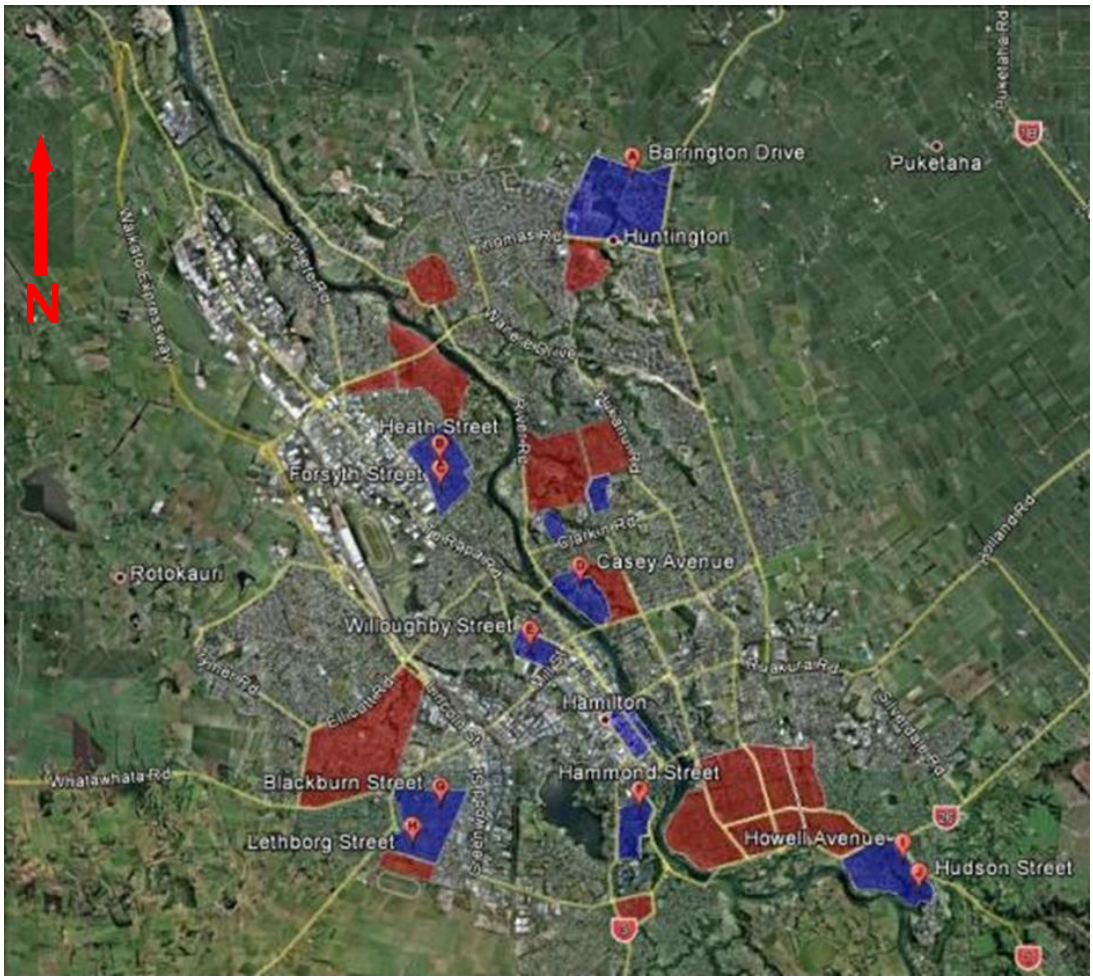
Many cities and towns across New Zealand have introduced 40km/h speed limits outside schools. A natural extension of this programme is to look at extending the speed limit reduction into suburban streets where children often walk and cycle to and from school and where councils are looking to improve amenity by reducing travel speeds and traffic volumes, for the benefit of all road users. Reduced speed limits can reduce traffic volumes by discouraging the use of local roads by 'rat-runners' who are trying to avoid main streets, often when they are congested. This section discusses the wide application of 40km/h suburban speed limits that have been introduced in Hamilton city.

3.4.1 Hamilton city area wide treatments

3.4.1.1 Site description

In 2010, Hamilton City Council (HCC) started conducting a demonstration project to evaluate the installation of a permanent 40km/h speed limit for local residential streets. Works to install the 40km/h speed limit were completed in late 2011 in nine neighbourhoods around Hamilton. This demonstration project was considered a success and an extra nine neighbourhoods were proposed to have the speed limit reduced to 40km/h in 2012/13 (HCC 2012). A map of the demonstration areas and proposed areas is shown in figure 3.16.

Figure 3.16 Demonstration (blue areas) and proposed (red areas) 40km/h areas, also locations of speed surveys



Note: Image courtesy of Google Earth

There were two distinct phases in implementing these lowered residential speed limits. The first phase was the installation of engineering devices (where necessary) to slow traffic down to ensure a mean speed within 5km/h of the installation of a 40km/h speed limit in compliance with the SLNZ. The second phase was the installation of the signs and road markings and reduced speed limits.

To evaluate the effectiveness of the demonstration project a series of speed surveys were conducted before the scheme was implemented, after the engineering works were completed and after the signs and road markings were installed. The roads evaluated were:

1 Barrington Drive located in the Huntington area (post-engineering and post-speed limit change)

2 Heath Street located in the Saint Andrews area

3 Forsyth Street located in the Saint Andrews area (post-engineering and speed limit change only)

4 Casey Avenue located in the Fairfield area

5 Willoughby Street located in the Whitiora area

6 Hammond Street located in the Hamilton Lake area (no traffic calming works were conducted in this area)

7 Blackburn Street located in the Dinsdale area (pre-engineering and post-engineering)

8 Lethborg Street located in the Dinsdale area

9 Howell Avenue located in the Riverlea area

10 Hudson Street located in the Riverlea area (post-engineering and post speed limit change).

The locations of all of these roads within Hamilton are shown in figure 3.16. The results from each of these sites are presented later in section 3.4.1.3.

3.4.1.2 Safer system compliance

Safer speeds

The speed limit change to 40km/h was designed to encourage safer speeds in local residential streets, and was supported by speed limit signs and road marking. Examples of the signage and road markings used throughout the project are shown in figure 3.17. A combination of different markings and different signage was used on different streets.

Figure 3.17 Examples of signage and road markings used

Safer roads and roadsides

Safer roads and roadsides are achieved by the introduction of engineering techniques designed to slow down vehicles. The first stage for the many of the roads in the project was the introduction of traffic calming treatments, which consisted of:

1 Threshold treatments at the entrance to the areas where there was high traffic volume and/or speeds

2 Improvements for pedestrian access within the areas. This included pedestrian refuge island and pedestrian platforms at key pedestrian crossing locations.

Given their low operating speed, some roads needed no engineering changes.

The second stage was the introduction of a lowered speed limit and installation of signs and road markings. An example of the physical works undertaken in each stage is shown in figure 3.18.

Figure 3.18 Examples of physical works conducted during the first stage

Safer road use (education/public consultation)

It is a requirement for setting speed limit rules that public consultation is undertaken. In Hamilton, safer road use in the demonstration sites for safer speed areas was supported by marketing and education and engagement with key stakeholders. The marketing campaign consisted of a safer speed areas website, posters, online messages, radio advertising, inserts for school newsletters and brochures for commercial operators.

The posters used in the campaign started with messages about the impact of a safer speed area on families (eg 'For My Family's Sake') and then progressed into messages about the benefit to the wider community ('For Our Sake' showing a cross-section of people from across the community). A copy of these two posters can be found in appendix D.

The safer speed areas website contained information on:

- what are safer speed areas
- where are the safer speed areas
- why we have safer speed areas
- how to register a road for the safer speed area programme
- email contact addresses
- links to related websites.

HCC monitored its marketing campaign by checking the amount of internet traffic generated by online messaging and website traffic to the safer speed areas website. HCC also conducted a questionnaire for residents within the safer speed areas and a brand recognition survey to assess the other marketing devices. Some of the results of this monitoring are shown in table 3.27.

Table 3.27 Result of monitoring marketing mediums

Marketing medium	Marketing device	Effectiveness
Online	Dedicated website	3,600 unique visitors in 9 months
	Online messaging	0.1% of visitors to Stuff.co.nz and Yahoo and 0.04% of visitors to Facebook clicked on the advertising banner for the dedicated website.

Marketing medium	Marketing device	Effectiveness
Print	Posters	38% of residents within the safer speed areas and 8% of the general community had seen a safer speed area poster
	School newsletter inserts	No questions specific questions asked regarding these marketing devices.
	Commercial operator brochures	
Radio	Radio advertising	15% of residents within the safer speed areas and 8% of the general community had heard a safer speed area radio advertisement.

The resident survey was sent to 4,000 households within the safer speed areas and received 468 responses. These were positive and indicated that:

- there was a good understanding of the safer speed areas, and the lowered speed limits were not an inconvenience and were good for the community
- there had been no noticeable change in rat-running or activities of 'hoons' resulting from the safer speed areas
- respondents related safer speed areas with preventing people being injured or killed
- the changes to the environment made residents feel safer, and drivers were more courteous and tried to ensure they were below the 40km/h speed limit
- 29% of respondents were more willing to walk or cycle in the area.

  Key finding: The same number of people agreed safer speed areas should be in all local streets as those who disagreed.

The community questionnaire results are located in appendix D.

A general community survey of 499 people about the safer speed areas indicated that:

- there were varying degrees of knowledge about safer speed areas
- the majority of respondents thought the signs were self-explaining
- the safer speed area signs were the key component seen by the respondents
- most people had not seen or heard any of the advertising.

As with Hastings, there has been increasing opposition over time to the speed limit reductions. This intensified following police enforcement of one of the 40km/h limits where there was a large number of violators. From discussions with HCC, it was explained that this received considerable negative media attention.

As a result of this increase in opposition to the speed limit reduction, the initial programme of rolling out the 40km/h speed restriction across the entire Hamilton suburban roading network has been suspended. It is also possible that some of the speed limits will be increased back to 50km/h. This, however, is also likely to face opposition as the surveys show there is strong support for retaining the lower speed limits, particularly from many residents of these streets. As with Hastings, it appears that many of those who oppose the lower speed limits use suburban streets for rat-running. Support for the reduced speed limits is strongest from those who live in the streets with the lower speed limit, and whose families walk and cycle on the street.

3.4.1.3 Traffic speed statistics

Speed surveys at all locations were collected using tube counts over eight-day periods to get seven complete days of data.

Barrington Drive

Barrington Drive is on the outskirts of Hamilton near the suburb of Huntington. The traffic survey sites were located outside 101 Barrington Drive for the post-engineering/pre-speed limit change and post-speed limit change. The results of the traffic surveys are shown in table 3.28.

Table 3.28 Traffic speed statistics on Barrington Drive

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50 km/h	Vehicles per day; 7 day average
Pre-speed limit change	43.9km/h	54.4km/h	10.7km/h	31%	577
Post-speed limit change	43.5km/h	53.3km/h	10.2km/h	27%	514
Change	-0.4km/h	-1.1km/h		Reduction	

The introduction of the lowered speed limit resulted in a small reduction in mean speed, 85th percentile speed, standard deviation and the percentage exceeding 50km/h in this case. This road is relatively new and was designed to a standard where vehicles were already travelling at a slower speed, which may have reduced the impact of a lowered speed limit.

Heath Street

Heath Street is located near the Hamilton suburb of Saint Andrews. The traffic survey sites for the post-engineering and post-speed limit surveys were located outside 54 Heath Street. The results of these traffic surveys are shown in table 3.29.

Table 3.29 Traffic speed statistics on Heath Street

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	49.7km/h	57.6km/h	-	-	2,237
Post engineering/pre-speed limit change	43.4km/h	51.8km/h	9.1km/h	22%	1,815
Change	-6.3km/h	-5.8km/h	-	-	
Post-speed limit change	43.6km/h	51.8km/h	9.1km/h	23%	1,613
Further change	+0.2km/h	0.0km/h		Increase	

The introduction of the engineering measures resulted in a decrease in mean speed and 85th percentile speed. However the introduction of the lowered speed limit resulted in a slight increase in mean speed and percent exceeding 50km/h, a slight decrease in standard deviation and no change to the 85th percentile speed.

Forsyth Street

Forsyth Street is located near the Hamilton suburb of Saint Andrews. The traffic survey sites for the post-engineering and post-speed limit surveys were located outside 16 Forsyth Street. Unfortunately no traffic survey data was available for the pre-engineering condition. The results of these traffic surveys are shown in table 3.30.

Table 3.30 Traffic speed statistics on Forsyth Street

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Post engineering/pre-speed limit change	40.3km/h	47.2km/h	7.6km/h	7%	904
Post-speed limit change	41.0km/h	46.8km/h	7.0km/h	8%	1,028
Change	+0.7km/h	-0.4km/h		Increase	

The introduction of the lowered speed limit resulted in a slight increase in the mean speed of traffic and percent exceeding 50km/h and a slight decrease in the 85th percentile speed and standard deviation. This was potentially due to the low speed of traffic before the speed limit change targeting the lowered speed limit after the speed limit change.

Casey Avenue

Casey Avenue is located near the Hamilton suburb of Fairfield. All of the traffic speed surveys were located outside 73 Casey Avenue. The results of these traffic surveys are shown in table 3.31.

Table 3.31 Traffic speed statistics on Casey Avenue

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	59.4km/h	68.4km/h	10.3km/h	86%	1,635
Post engineering/pre-speed limit change	47.6km/h	56.2km/h	9.0km/h	40%	1,111
Change	-11.8km/h	-12.2km/h		Reduction	
Post-speed limit change	47.4km/h	55.8km/h	8.8km/h	39%	1,105
Further change	-0.2km/h	-0.4km/h		Reduction	

The introduction of a lower speed limit resulted in a slight decrease in the mean speed, 85th percentile speed, percent exceeding 50km/h and standard deviation of traffic. The introduction of engineering measures resulted in a decrease in the mean speed, 85th percentile speed, standard deviation and percentage exceeding 50km/h.

Willoughby Street

Willoughby Street is located near the Hamilton suburb of Whitiora. The post-engineering and post-speed limit change traffic surveys were observed reasonably close together outside 48 and 52 Willoughby Street. The pre-engineering traffic surveys were conducted on Willoughby Street, north of Mill Street. The results of these traffic surveys are shown in table 3.32.

Table 3.32 Traffic speed statistics on Willoughby Street

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	48.5km/h	55.4km/h	8.1km/h	44%	5,723
Post engineering/pre-speed limit change	48.1km/h	54.0km/h	7.2km/h	40%	3,925
Change	-0.4km/h	-1.4km/h		Reduction	
Post-speed limit change	45.9km/h	52.9km/h	8.2km/h	30%	2,447
Further change	-2.2km/h	-1.1km/h		Reduction	

The introduction of the lowered speed limit resulted in a significant decrease in the mean speed and percent exceeding 50km/h with a slight decrease in the 85th percentile speed of traffic while standard deviation experienced a slight increase. The engineering measures resulted in only a slight drop in mean speed, 85th percentile speed, standard deviation and percentage exceeding 50km/h. This was potentially due to the significant decrease of approximately 38% in traffic volume between the traffic surveys. The proximity of Willoughby Street to the major arterial roads of Mill Street and Ulster Street may have resulted in a large amount of rat-running. This rat-running was likely to have decreased with each extra speed reduction measure resulting in less driver speeding through the area.

Hammond Street

Hammond Street is located near the Hamilton central business district (CBD). The traffic surveys for pre-engineering and post-speed limit changes took place outside 12 Hammond Street. No engineering works were conducted on this road. The results of the traffic surveys are shown in table 3.33.

Table 3.33 Traffic speed statistics on Hammond Street

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-speed limit change	49.2km/h	56.9km/h	8.5km/h	48%	2884
Post-speed limit change	45.6km/h	52.9km/h	8.1km/h	28%	2403
Change	-3.6km/h	-4.0km/h		Reduction	

This site experienced a moderate reduction in mean speed, 85th percentile speed and standard deviation with a significant reduction in percentage exceeding 50km/h after the reduced speed limit was introduced. This could have been due to the proximity of the CBD with drivers leaving the CBD expecting lower speeds.

Blackburn Street

Blackburn Street is located near the Hamilton suburb of Frankton in the Lethborg area. The traffic surveys for the pre-engineering and post-engineering were conducted outside 19 Blackburn Street. There is no traffic survey data available for the post-speed limit change. The results of the traffic surveys are shown in table 3.34.

Table 3.34 Traffic speed statistics on Blackburn Street

50km/h → 4 km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	39.1km/h	45.0km/h	7.0km/h	3.4%	842
Post-engineering	37.8km/h	44.3km/h	7.0km/h	2.8%	984
Change	-1.3km/h	-0.7km/h		Reduction	

No speed surveys were conducted on this site after the speed limit was reduced so only the effect of engineering treatments can be assessed at this site. The engineering treatments conducted at this site resulted in a moderate decrease in mean speed and a slight decrease in 85th percentile speed. The percentage exceeding 50km/h experienced a slight decrease, which was probably due to the low speeds before any work was completed.

Lethborg Street

Lethborg Street is located near the Hamilton suburb of Dinsdale in the Lethborg area. The traffic surveys for the post-engineering and post-speed limit changes were conducted outside 20 Lethborg Street. The physical location of the pre-engineering surveys was not specified except that it was on Lethborg Street. The results of these traffic surveys are shown in table 3.35.

Table 3.35 Traffic speed statistics on Lethborg Street

50km/h → 40 km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	48.1km/h	56.2km/h	9.5km/h	41%	757
Post engineering/pre-speed limit change	43.7km/h	51.5km/h	9.2km/h	21%	502
Change	-4.4km/h	-4.7km/h		Reduction	
Post-speed limit change	43.0km/h	51.1km/h	9.2km/h	19%	477
Further change	-0.7km/h	-0.4km/h		Reduction	

The introduction of the lowered speed limit resulted in a slight decrease in mean speed, 85th percentile speed, standard deviation and percent exceeding 50km/h. The introduction of the engineering measures resulted in a significant decrease in mean speed, 85th percentile speed and percentage exceeding 50km/h.

Howell Avenue

Howell Avenue is located near the Hamilton suburb of Silverdale in the Howell area. All of the traffic surveys were conducted outside 11 Howell Avenue. The results of these traffic surveys are shown in table 3.36.

Table 3.36 Traffic speed statistics on Howell Avenue

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Pre-engineering	45.7km/h	53.6km/h	8.4km/h	30%	1,305
Post engineering/pre-speed limit change	43.5km/h	50.8km/h	7.8km/h	18%	1,355
Change	-2.2km/h	-2.8km/h		Reduction	
Post-speed limit change	43.9km/h	51.5km/h	7.9km/h	20%	1,214
Further change	+0.4km/h	+0.7km/h		Increase	

The introduction of the lowered speed limit at this site resulted in a slight increase in mean speed, 85th percentile speed, standard deviation and percentage exceeding 50km/h. The introduction of the engineering measures at this site resulted in a moderate decrease in mean speed, 85th percentile speed, standard deviation and percent exceeding 50km/h.

Hudson Street

Hudson Street is located near the Hamilton suburb of Silverdale in the Howell area. The speed surveys for post-engineering and post-speed limit change situations were conducted outside 18 Hudson Street. There was no traffic survey data available for the pre-engineering situation. The results of these traffic surveys are shown in table 3.37.

Table 3.37 Traffic speed statistics on Hudson Street

50km/h → 40km/h	Mean speed	85th %ile speed	Std deviation	% > 50km/h	Vehicles per day; 7 day average
Post engineering/pre-speed limit change	49.0km/h	57.6km/h	9.7km/h	48%	750
Post-speed limit change	45.8km/h	54.7km/h	9.7km/h	33%	638
Change	-3.2km/h	-2.9km/h		Reduction	

The introduction of the lowered speed limit at this site resulted in a reduction in mean speed, 85th percentile speed and percentage exceeding 50km/h while the standard deviation remained static.

Summary of traffic speed statistics

The key points of this case study are:

- Engineering measures have a larger effect on traffic mean speed, 85th percentile speed and standard deviation than lowering the speed limit. Engineering lowered the mean speed and 85th percentile speed by an average 4.4km/h and 4.6km/h respectively. The reduction in mean speed varied from 0.4km/h to 11.8km/h and 85th percentile speed varied from 0.7km/h to 12.2km/h.
- The introduction of the lower speed limit to re-engineered roads generally results in a small reduction in the mean speed and 85th percentile speed, while standard deviation changes tend to vary and be small decreases. The sites that experienced an increase in mean speed (speed targeting) tended to have mean speed close to the new 40km/h speed limit. One site that experienced a moderate decrease in mean speed and 85th percentile speed was located near a major intersection and had a significant reduction in traffic volume after the speed limit change, which could be due to reduced volumes of rat-running traffic.

3.5 Urban commercial shopping streets – 30km/h and 40km/h speed limit

A number of local councils have applied lower speed limits in commercial areas or are looking to make such changes. This includes Auckland, Hamilton, Tauranga, Wellington, Christchurch and Dunedin cities. Typically the speed limits are being reduced from 50km/h to either 40km/h or 30km/h. This section discusses speed limit changes that have been made in Tauranga (Mount Maunganui shopping area) and Auckland (Ponsonby Street). We are aware that Wellington city has also introduced and evaluated a number of lower speed limits in shopping areas (30km/h), including the CBD.

3.5.1 Mount Maunganui shopping area

3.5.1.1 Site description

In 2011, Tauranga District Council (TDC) decided to install a 30km/h speed limit in the main shopping area of Mount Maunganui. The speed limit change was a reduction from 50km/h to 30km/h encompassing all of the streets north of Salisbury Avenue. The area where the speed limit reduction occurred is shown by the blue area in figure 3.19. Prior to the reduction in speed limit the majority of this area already had traffic calming treatments. Following the apparent success of this scheme the TDC is currently considering introducing a 30km/h speed limit in the Tauranga CBD.

To evaluate the effectiveness of the reduced 30km/h speed limit some speed surveys were conducted before and after the scheme was implemented. The roads evaluated in figure 3.19 were:

1 The Mall

2 Maunganui Road.

Figure 3.19 Location of reduced speed limit area and traffic surveys used for before and after comparison

3.5.1.2 Safer system compliance

Safer speeds

The speed limit change to 30km/h was designed to encourage safer speeds by the small percentage of drivers who were driving too fast in the retail and residential areas within Mount Maunganui. This lowered speed limit was supported by gated speed limit signs and road marking as vehicles entered the 30km/h speed limit area. Figure 3.20 shows an example of the speed limit signs and road markings that vehicles see when entering the 30km/h speed limit area.

Figure 3.20 Example of speed limit signs and road marking entering 30km/h speed limit area

Safer roads and roadsides

Safer roads and roadsides are achieved by the existing engineering techniques used to improve the pedestrian environment. The land use throughout the lower speed limit area consists of a built-up retail shopping area, residential areas and a beach side road through the residential areas (Marine Parade). The diversity of land uses in this area is illustrated in figure 3.21. The road in the major retail areas is narrow, which increases side friction and reduces speeds. The majority of residential areas have some form of traffic calming (often threshold treatments); however, some sections of the residential part of the 30km/h area have had traffic calming.

Figure 3.21 Examples of streetscaping in 30km/h speed limit area. Left: retail areas, right: residential areas

South end of Maunganui Road

Marine Parade

North end of Maunganui Road

Leinster Avenue

3.5.1.3 Traffic speed statistics

The Mall

The Mall is located on the western shore of the Mount Maunganui area. The speed survey site was located outside 34 The Mall. This road has mostly residential housing on the eastern side and an ocean reserve on the western side. The results of these speed surveys are shown in table 3.38.

Table 3.38 Traffic speed statistics on The Mall

50km/h → 30km/h	Speed limit	Mean speed	85th %ile speed	Std deviation	% > 50km/h
Northbound	Before	37.5km/h	47km/h	9.2km/h	9%
	After	38.8km/h	48km/h	8.8km/h	10%
Change		+1.3km/h	+1km/h		Increase
Southbound	Before	38.5km/h	46km/h	8.0km/h	6%
	After	38.5km/h	46km/h	7.8km/h	6%
Change		0.0km/h	+0km/h		

The lowering of the speed limit at this site did not have an effect on the mean speed or 85th percentile speed for southbound traffic but increased the mean speed and 85th percentile speed for northbound traffic while both directions experienced a slight decrease in standard deviation.

Maunganui Road

Maunganui Road is a main road through Mount Maunganui and connects the main retail area of Mount Maunganui to SH2. The traffic survey site was located approximately 75m north of Salisbury Avenue. The area around the traffic survey site is predominately retail with some engineering to accommodate the increased number of pedestrians. The road width is also fairly narrow with a 10m carriageway with parallel parking on both sides. The results of the speed surveys are shown in table 3.39.

Table 3.39 Traffic speed statistics on Maunganui Road

50km/h → 30km/h	Speed limit	Mean speed	85th %ile speed	Std deviation	% > 50km/h
Northbound	Before	23.6km/h	30km/h	6.6km/h	0.1%
	After	23.6km/h	30km/h	6.7km/h	0.1%
Change		+0.0km/h	+0.0km/h		
Southbound	Before	23.8km/h	30km/h	6.6km/h	0.1%
	After	23.6km/h	30km/h	6.5km/h	<0.1%
Change		-0.2km/h	+0.0km/h		Reduction

The lowering of the speed limit at this site had little effect on the mean speed, 85th percentile speed and standard deviation. This is because the mean speed was well below the lowered speed limit so it only targeted the 0.1% who drive over 50km/h. The lower speed limit now gives more credibility to the appropriate speed environment.

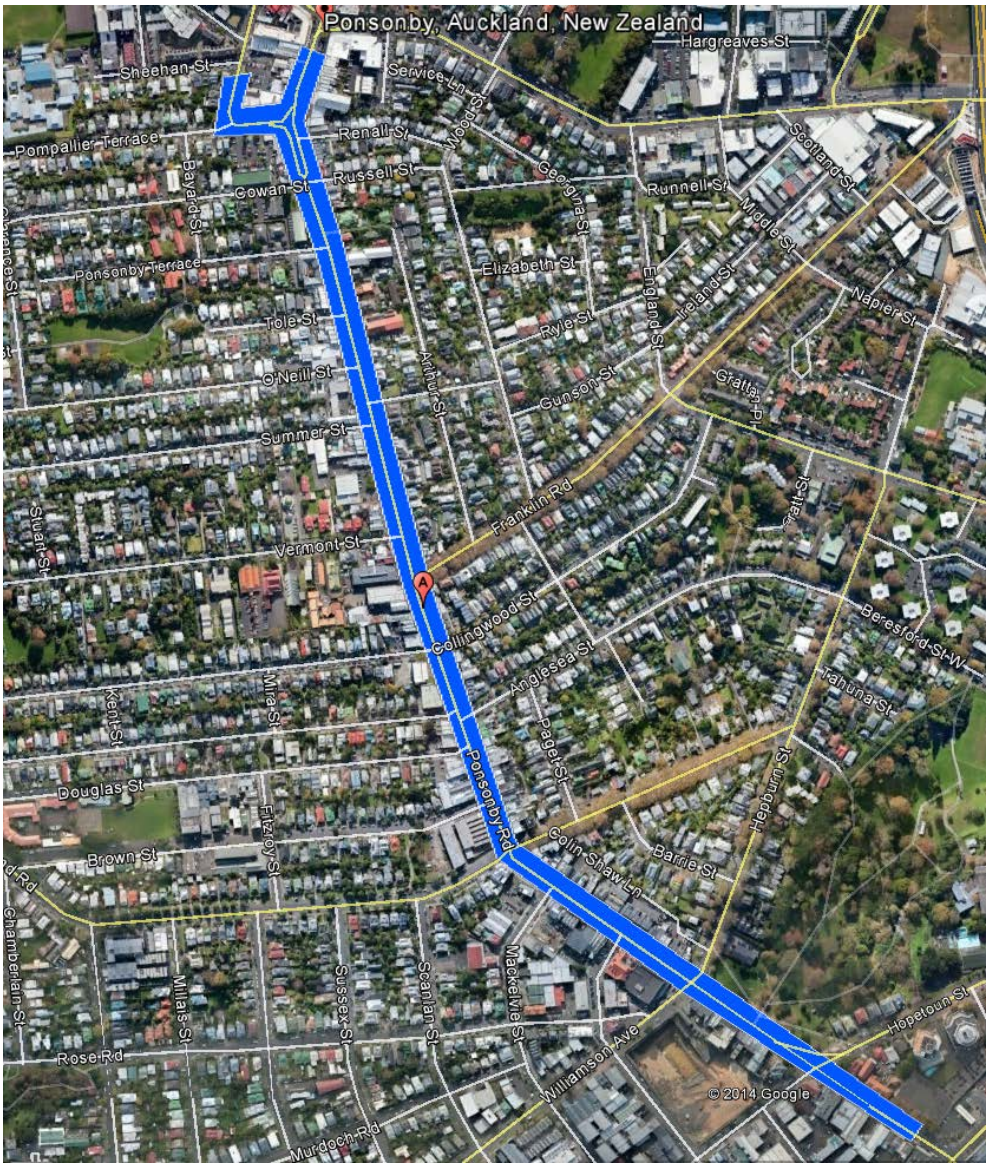
In these cases, lower speed limits are just reflecting the existing practice and therefore not influencing it further. But they do give more credibility to the appropriate speed environment.

3.5.2 Ponsonby Road, Auckland City

3.5.2.1 Site description

In 2009, the speed limit on the entire length of Ponsonby Road was reduced from 50km/h to 40km/h after several crashes involving pedestrians, which included one fatality in 2006 (Rein 2009). Ponsonby Road is 1.5km long and is located within the Auckland suburb of Ponsonby. A plan showing the area with the speed limit reduction can be seen in figure 3.22.

Figure 3.22 Plan view of Ponsonby Road speed limit reduction area and traffic survey locations



To assess the success of the speed limit reduction a speed survey was conducted between Franklin Road and Collingwood Street. The location of the speed surveys is indicated in figure 3.22 by the 'A' marker.

3.5.2.2 Safer system compliance

Safer speeds

The speed limit change to 40km/h was designed to encourage safer speeds on Ponsonby Road. This lowered speed limit was supported by speed limit signs and road markings. Road markings were also repeated at approximately 300m spacing, except without the coloured background. An example of the signage and road markings used when entering the Ponsonby Road lowered speed limit zone is shown in figure 3.23. Some road markings have been changed to include a painted background.

Figure 3.23 Example of signage and road markings visible when entering the Ponsonby Road lowered speed limit zone

Safer road and roadsides

No changes have been made to the road or roadside to make a safer road environment.

Safer road use

Safer road use was supported by a public consultation period and newspaper articles about the speed limit change.

3.5.2.3 Traffic speed statistics

Speed data was collected by Auckland Transport at a number of sites along Ponsonby Road. Data was only provided for one site as shown in table 3.40. Unfortunately most of the 'before' survey data was misplaced during the Auckland City Council merger into Auckland Super City and is unavailable. There was only complete information for one site at the time of writing this report and this shows there was little change in operating speeds as a result of the speed limit change, given the mean speed of most vehicles was already low.

Table 3.40 Traffic speed statistics on Ponsonby Road

Between Franklin Road and Collingwood Street

	Speed limit change	Mean speed	85th %ile speed
Northbound	Before	40km/h	49km/h
	After	39km/h	47km/h
Change		-1km/h	-2km/h
Southbound	Before	40km/h	50km/h
	After	39km/h	48km/h
Change		-1km/h	-2km/h

4 Safer speeds online survey

At the end of 2013, a quantitative web survey canvassing levels of acceptance of lower speed limits and the 'levers' for influencing future acceptance was completed by approximately 240 participants across New Zealand. The survey examined the public's attitudes to speed limits, reductions in both rural and urban speeds and what factors influenced their acceptance of lower speed limits, eg proximity to a school or a very winding rural road. A copy of the survey questionnaire can be found in appendix C.

The results for certain questions highlight the differences of opinion found between genders, age groups and between those who regularly drive in rural areas and those who regularly drive in urban areas.

4.1 Survey publicity

The following details outline the reach of the online survey to the public.

1 The survey was sent to Christchurch City Council and SCIRT (Stronger Christchurch Infrastructure Rebuild Team) employees.

2 Beca (an Engineering Consultancy Company) promoted the survey internally to all staff.

3 Dunedin City Council (DCC) was contacted for promotion on its social media sites and for use on its website. DCC posted the survey to its website.

4 Survey Monkey response gathering service was used to assist in collating the responses.

Other organisations were asked to distribute the survey but for various reasons declined to assist.

4.2 Survey bias

It is accepted that there was some bias in the results, given the composition of the companies/entities the survey was distributed amongst. Therefore the results may not wholly reflect the opinions of the general public and this should be considered when interpreting them. A large portion of the respondents were from the Canterbury region.

4.3 Survey format

It should be noted that participants were not required to answer every question in order to advance through the survey. Therefore not all questions received the possible 239 responses.

4.4 Survey demographic

Of the 239 respondents, 58% were male and 42% were female as outlined in figure 4.1. The most common age group to respond were the 36–45 year olds at 25%, closely followed by the 26–35 year-old age group with 21%. Of the respondents, 89% held a New Zealand full driver licence, 9% held a restricted or learner licence, 2% held no licence at all; 21% held a motorcycle licence and 11% held a heavy vehicle licence.

Figure 4.1 Survey demographic

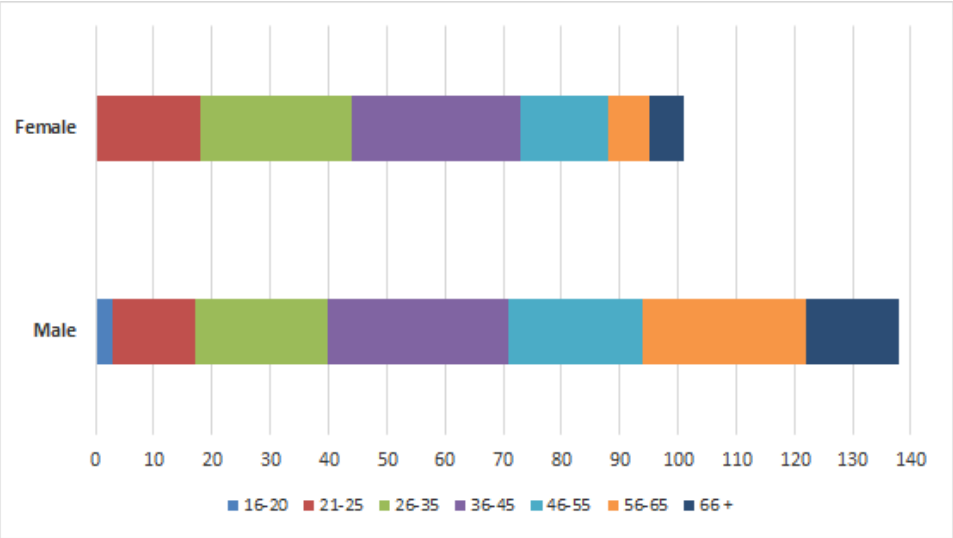


Figure 4.2 Survey population vs 2013 Census population

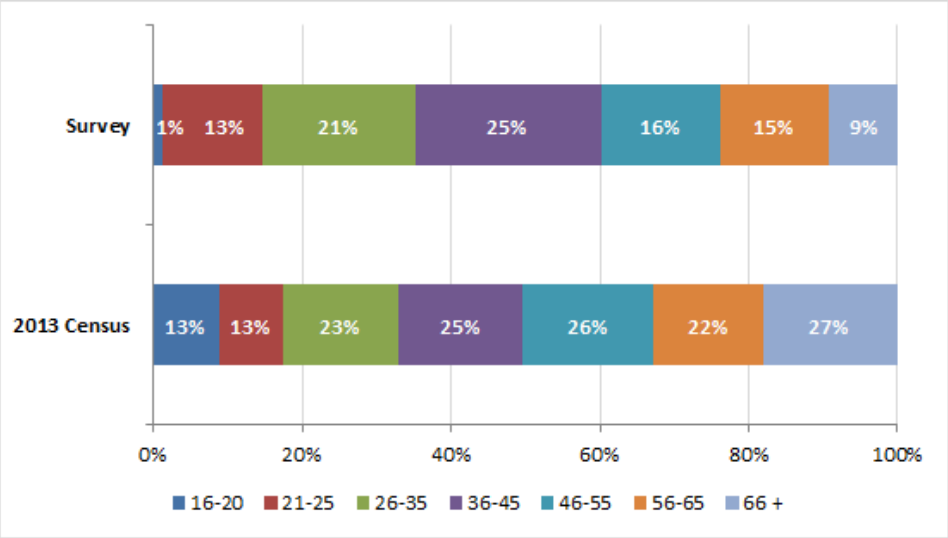


Figure 4.2 compares the survey population with that of the 2013 Census results. Both groups excluded the population under 15 years of age. It should also be noted that the Census age groups generated were offset by one year, eg the bottom age group was 15–19 years, followed by 20–24 years etc. For the purposes of an indicative comparison, the figures satisfy.

Most respondents (66%) lived on a local residential street, 11% stating they lived on a busy main road and 14% lived on a street connecting to a busy main road. Only 8% said they lived rurally or on a highway. To that end, 87% of respondents lived on a road with a 50km/h speed limit.

The distribution of trips was generally in towns or built-up areas (55%), rural trips were 1.8% of trips and 43% of people made trips that were generally a mixture of the two.

In general there were approximately 220 respondents for all questions as some participants chose not to answer all questions in the survey. The six age groups were reduced into three age groups to provide stronger comparisons between the groups.

4.5 Acceptance of safer speeds

The following survey questions focused on safer/lower speeds and the respondent's perception.

Figure 4.3 When you drive does safety influence your choice of speed? – all responses

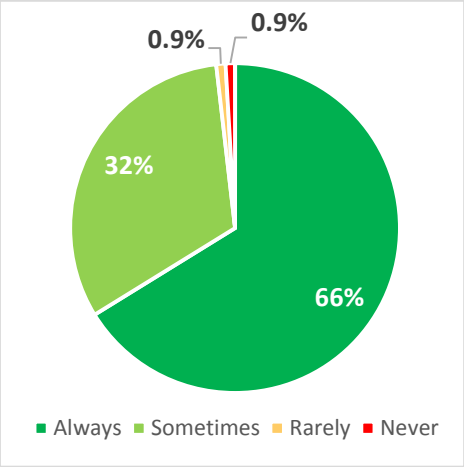
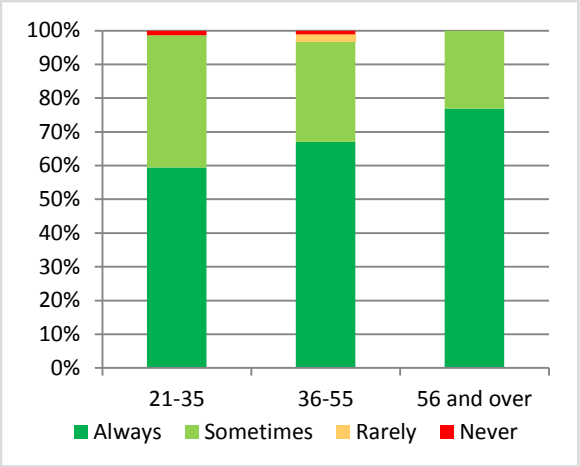


Figure 4.4 When you drive does safety influence your choice of speed? – by age group



When asked whether safety influenced their choice of speed (figure 4.3), encouragingly 66% of respondents stated that safety always influenced their speed choice and for 98% of respondents it provided some level of influence. Figure 4.4 shows when analysed by age group, safety 'always' influencing drivers increased as road users aged. This result is consistent with the notion that younger drivers are more likely to be reckless or not consider safety when driving.

Figure 4.5 If all drivers drove a little slower, then the roads would be? – all responses

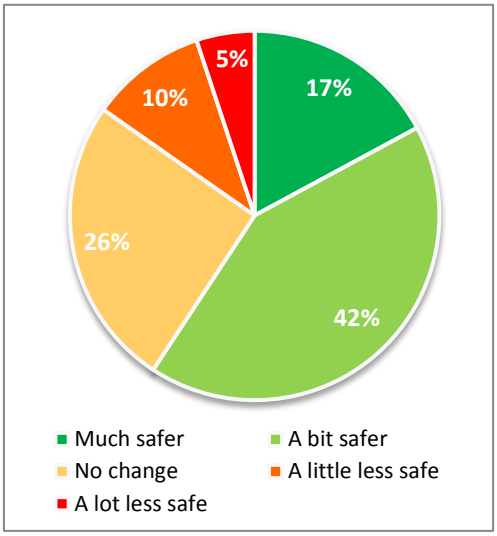


Figure 4.6 If all drivers drove a little slower, then the roads would be? – by age group

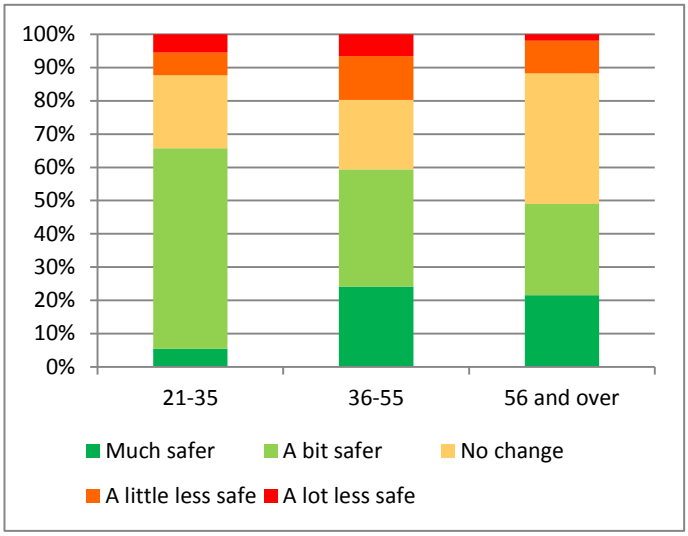


Figure 4.5 shows that 59 % of respondents agreed that roads would be safer if all drivers drove a little slower. Interestingly the older the respondent, the less likely they were to agree the roads would be safer. The 56 and over age group easily had the largest percentage of drivers who thought there would be no change, but overall had a similar proportion to younger drivers who thought the roads would be less safe

to a degree. Although not shown here, females were also more inclined to agree that roads would be safer with lower speeds at 72% compared with males at 50%.

The higher percentage of positive answers to these two questions suggests that the public correlates slower speeds with safety.

This high level of agreement did not continue through to the next two questions. Only 16% of respondents strongly agreed that 'Fewer crashes would happen if drivers slowed down' and 42% of respondents somewhat agreed with this statement (58% positive). Agreement was more common with females (66%) than males (53%). Figure 4.7 shows that drivers who predominantly drive in urban areas were inclined to agree to this statement (64%), compared with those who also drive regularly in higher-speed rural zones (51%). This suggests that those who drive in higher speed limit zones may feel more comfortable driving at faster speeds than those who predominantly drive in town. Therefore they are less likely to suggest slower speeds would make a discernable difference.

When analysed by age group, the older generation had the lowest agreement to the statement (52%), while the youngest age group was more inclined to agree (62%). This difference might be related to the increased level of driver education younger drivers are exposed to, when compared with the education received by the older generation in their formative driving years. It might be that advertising campaigns have been effective on the younger group and a generational acceptance of slower speeds is occurring.

Figure 4.7 Fewer crashes would happen if drivers slowed down? – driving type

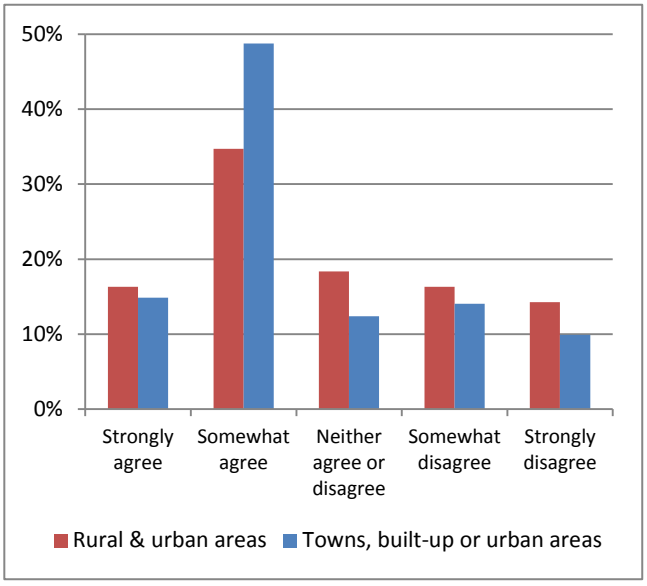
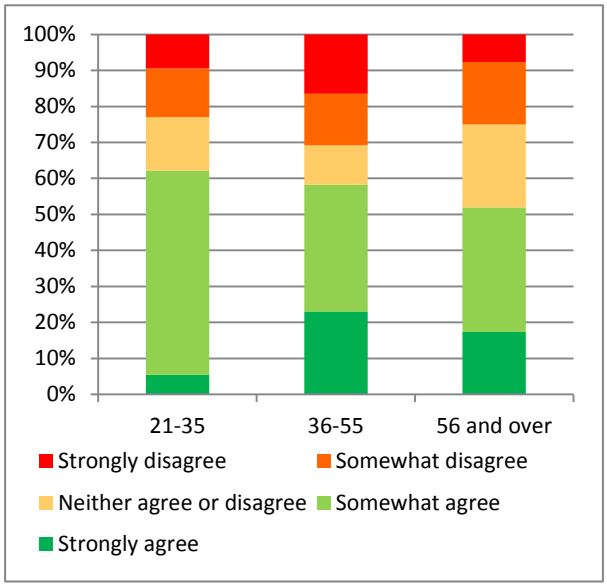


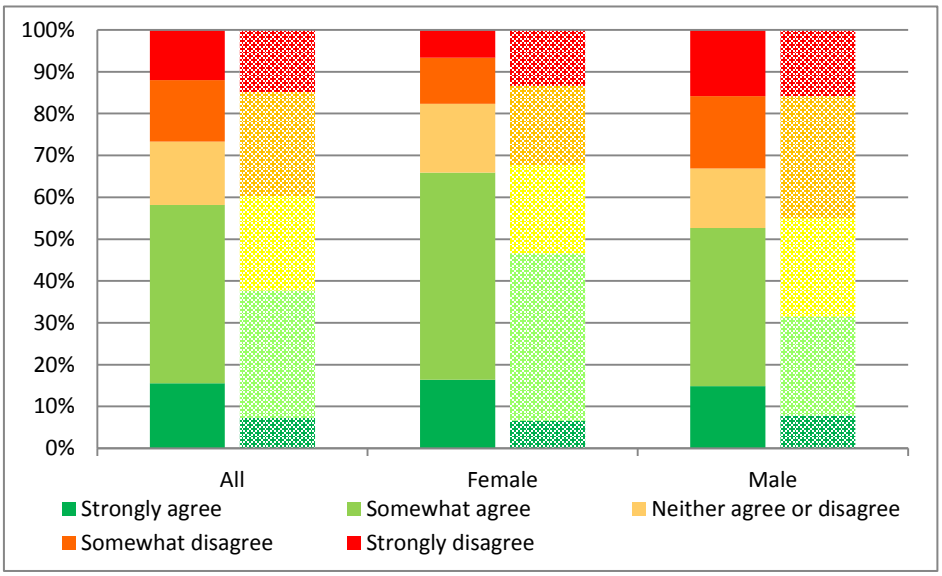
Figure 4.8 Fewer crashes would happen if drivers slowed down? – by age group



When asked if 'Lowering speed limits would reduce the number of crashes on our roads', only 7% strongly agreed and 30% somewhat agreed. More people were opposed to this statement with 40% disagreeing, compared with 38% agreeing (either strongly or somewhat). It is not surprising there was greater disagreement to this question, as it relates to lowering speed limits. Drivers dislike speed limits being reduced as they see it negatively affecting their travel time. They prefer to be able to choose the speed they travel on a road in accordance with their circumstances at the time of travel. The strongest level of disagreement came from those drivers who drive more frequently on rural roads (21%). As they tend to cover a greater distance on their journey than urban drivers, they see speed limit reductions as having a greater negative impact on their journey time, whereas an urban driver may often be travelling at speeds below the speed limit due to congestion and will therefore regard it as less of an issue.

Figure 4.9 illustrates the reluctance of drivers to accept reduced speed limits. The last two questions are related to reducing crashes via speed reduction, whether the speed reduction is driver initiated or legally set. Figure 4.9 compares the responses to the two questions, first by all responses and then by gender. It clearly shows the reluctance to reduce speed limits. The graph displays the 'driving slower' results as solid fill, and 'lower speed limit' results as hatched fill.

Figure 4.9 Fewer crashes would happen if drivers slowed down vs Reduce crashes by lowering speed limits – by all and by gender



Across both genders the disagreement with lowering speed limits to reduce crashes when compared with drivers voluntarily lowering their speed is quite evident. The level of acceptance dropped below 50% for both genders when questioned about lower speed limits.

When respondents were asked if 'People would be less seriously injured if drivers slowed down', 45% of people strongly agreed and 39% somewhat agreed (84% positive response). Only 9% of people disagreed with this statement and 7% were neutral. Females were 9% more likely to agree with this statement than males, and there was a similar difference between drivers who drove mainly in urban areas compared with those who mixed rural and urban driving. When analysed by age, all three categories had a total positive response above 80%, with the youngest group of 21–35 year olds being around 4% more positive than each of the 35–55 and the 56+ age groups.

The Ministry of Transport road safety attitudes survey outlined in this report's introduction (MoT 2013) found that one in six people thought the risk of a crash was small, as long as you were careful. In a similar vein, one in eight people from our survey strongly disagreed that if drivers slowed down fewer crashes would happen.

In a similar vein to the previous questions, the follow up question was similar but placed the onus on speed limits. Respondents were asked if they agreed that 'Lowering speed limits would result in people being less seriously injured if a crash does occur'. Unlike earlier where the agreement dropped off considerably when lowering the speed limit was suggested, the general populace agreed with the statement (73% positive).

Figure 4.10 Lowering speed limits would result in people being less seriously injured if a crash does occur? – by gender

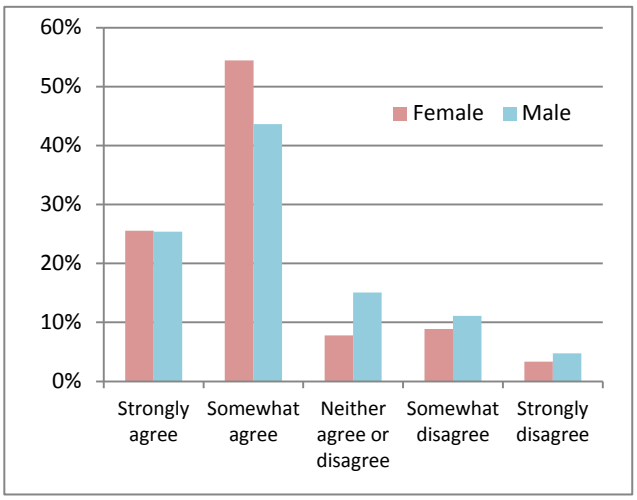


Figure 4.11 Lowering speed limits would result in people being less seriously injured if a crash does occur? - by age group

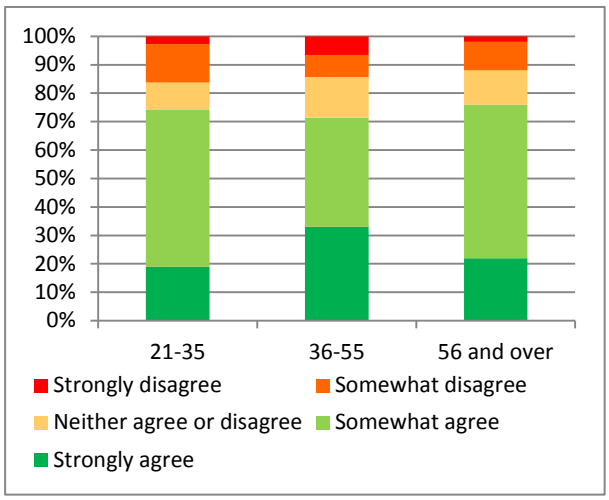


Figure 4.10 shows again females (80%) are more inclined to agree than males (69%). An interesting observation in figure 4.11 is that 33% of the middle age group strongly agree with this statement. This is 14% higher than the younger age group and 11% higher than the older age group. Whether there is any correlation between this age group thinking more about the seriousness of injury to others and being more likely to have young children in their home, is not known.

Figure 4.12 Less serious injury crashes by driving slower vs Less serious injury crashes by lowering speed limits

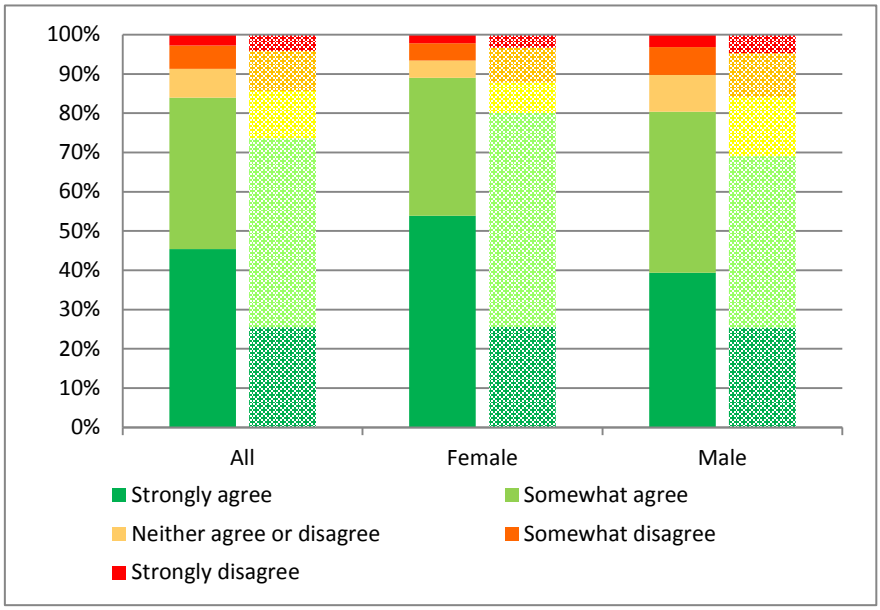


Figure 4.12 displays the strong acceptance across the last two questions and that the drop in acceptance when mentioning lowering speed limits is not as significant as the previous example. Again the responses relating to driving slower are in bold and those relating to speed limits are hatched.

4.6 Journey travel speeds

The survey queried drivers about the speeds they would travel at in various scenarios. The first scenario asked, 'What speed do you typically travel on a road with a 100km/h limit when there is no traffic congestion?' The bulk of drivers stated they would drive at the 100km/h (27%), 105km/h (35%) and 110km/h (19%). Figure 4.13 illustrates the spread of speeds across age groups. The 36–55 age group was the most likely to drive at or above 110km/h, not the younger group as might be expected from media reports.

The AA survey results outlined in this report's introduction (Turner 2014) had 44% of respondents in the 100km/h to 105km/h bracket, 21% in the 106km/h to 110km/h bracket and 2% targeting over 110km/h. The survey for this report would suggest that respondents appear to target higher speeds than the AA users, who as previously stated tend to be of an older age bracket.

Figure 4.13 What speed do you typically travel on a road with a 100km/h limit when there is no traffic congestion? – by age group

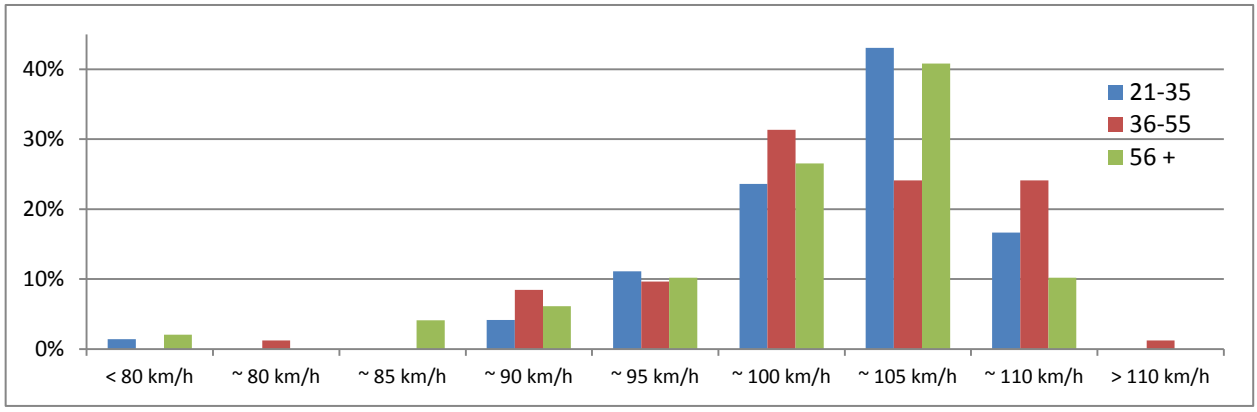
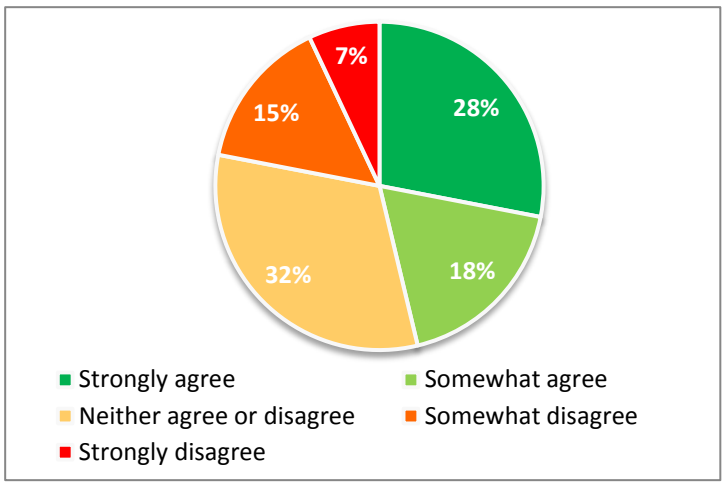


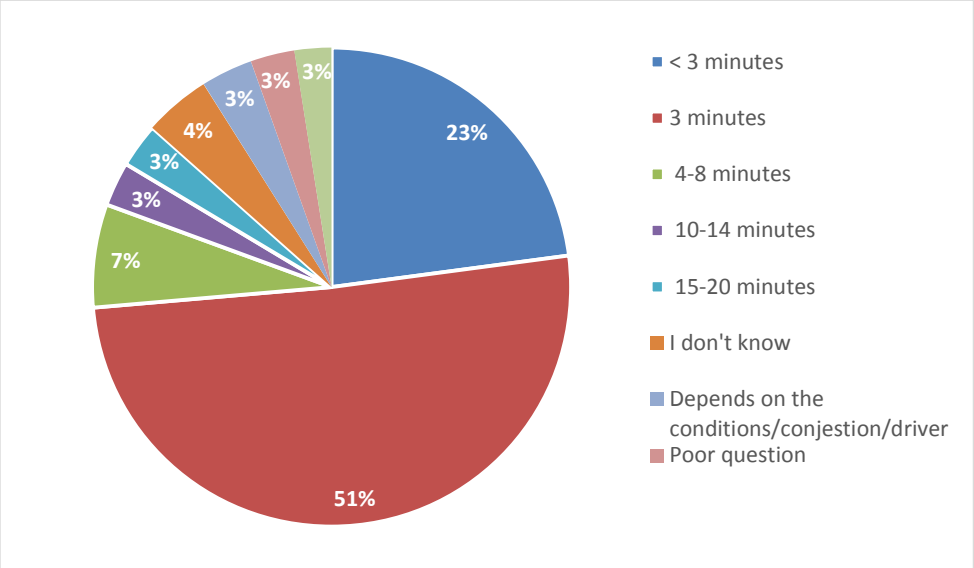
Figure 4.14 queried if 'A reduction of all current speed limits by 10km/h would result in a significant increase in travel time'. Forty-six percent of respondents agreed with this statement (28% strongly, 18% somewhat). Only 22% of respondents did not agree with this statement. Men were more likely than women to agree to this statement.

Figure 4.14 A 10km/h reduction of all current speed limits would result in a significant travel time increase



Following this question, participants were asked an arithmetical question about the extra time it would take to travel 10km if a road speed limit was changed from 50km/h to 40km/h. The correct answer was three minutes and 51% of respondents calculated this correctly. The most common responses are shown in figure 4.15.

Figure 4.15 If the speed limit sign on an urban road was changed from 50km/h to 40km/h, how much longer would it take (in minutes) to drive 10km on that road?



As the question was open ended the responses were often quite varied, so a best attempt was made to amalgamate the answers into common groups to provide a simplified graph. Just over half of the respondents (51%) answered correctly with three minutes, although 14 of the 102 persons who did answer correctly, suggested that it would only be three minutes if ideal conditions were met (not shown in graph). A further 23% thought that the effect would be less than three minutes. Only 13% of respondents incorrectly calculated that it would take longer than three minutes. The most incorrect duration provided was 20 minutes and four people calculated that it would take 15 minutes longer.

In addition to the 14 people who gave the correct answer while mentioning it depended on external inputs (conditions, topography, driver, congestion etc), another seven people offered a similar answer but without a duration calculation (shown as 3% in graph). Six people thought it was a poor question or irrelevant.

Some of the more interesting comments from participants in addition to their calculation are given below:

- *No change, drivers would just refuse to travel that speed*
- *Three minutes longer, if people adhered to the new limit*
- *Depends if people went at the new speed limit or not*
- *Rubbish -road speed should be selected on environment not a blanket imposition of speed*
- *Zero. I reckon people will just drive the speed the road is comfortable to drive at. Sometimes lower speed limits result in higher actual speeds*
- *It depends entirely on the road conditions. Rephrase the question, and stop fishing for the answer you want to hear*
- *I would ignore it*

- *It depends how fast you drive, not the speed limit*
- *Not as long as I would think*
- *Zero just because the sign changes. Or 3 min if you obey the sign*
- *Much greater than the three minutes theoretical difference due to missing traffic lights*
- *In Christchurch it probably wouldn't made a difference as we're lucky to hit 50km/h at the best of times*
- *I think the time would be negligible. What would be the issue would be getting cars to drive that slow. It's quite hard to keep the car at 50 sometimes. Reducing the limit to 40 would cause frustration for drivers with limited benefits in terms of reduced accidents. Enforce the current speed limit more and that is where benefits will be seen*
- *No change, people will not drive at 40km/h. Driving at 40km/h was in the 1930s with model T, and it will hold up traffic, hard to extrapolate the delayed travel time*
- *This is an erroneous question. Of course there is a simple arithmetic answer. The real question is what would be the reduction in capacity of the road and would this increase congestion thereby significantly increasing travel times many times more than the simplistic answer prompted for. Obviously insufficient information has been given to accurately answer this question*
- *Three mins....add that up over a week....3mins each way (x2) 5 days a week...that's an extra half an hour of travelling! And what about traffic light synchronization? I already find that travelling at 50-55km/h is barely fast enough to get through a succession of lights over a distance of say 2-3km.*

4.7 Acceptance of reduced speed limits

The survey proceeded to ask respondents for their opinion about reducing the speed limit on rural roads. 'Consider two lane undivided rural roads – the normal sealed road, not big highways nor major arterial roads; there are no speed limit signs but the default speed limit is 100 km/h. What would you think if the speed limits on roads like this (two-lane undivided rural roads) currently with a default 100km/h speed limit was lowered to 90km/h?'

Twenty-eight percent of respondents agreed that this speed was 'about right', with the majority (50%) stating it was a 'bit too low' and 17% stating it was 'far too low'. Men were more likely than women to state the reduction was 'too high'. There was no major difference between those who drove regularly in rural areas and those who drove primarily in urban areas, or between the age groups, except that the 35–55 age group had the largest rejection of the notion at 22% compared with younger respondents (20%) and the 56 and older group (12%).

Respondents were then asked the same question, but instead at a reduction from 100km/h to 80km/h. The overwhelming response to this suggestion by 92% of respondents was the reduction was far too low. Only 0.9% of respondents thought the speed was still too high for this type of road (two people). Ninety-four percent of males and 88% of females were against the reduction.

Figures 4.16 and 4.17 show drivers' responses to both speed limit reductions. No respondents selected the 80km/h speed limit as being 'a bit too high', therefore the respective pie chart consists of only four segments.

Figure 4.16 What would you think if the speed limit on undivided rural roads currently with a default 100km/h speed limit was lowered to 90km/h?

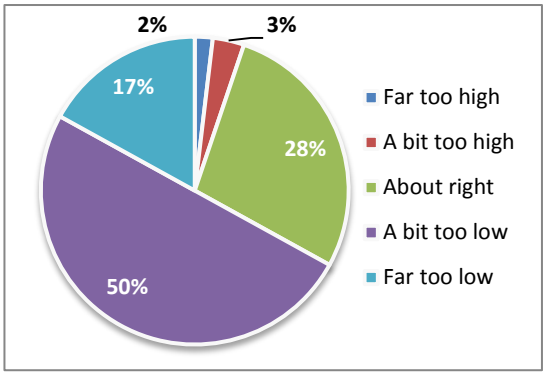


Figure 4.17 What would you think if the speed limit on undivided rural roads currently with a default 100km/h speed limit was lowered to 80km/h?

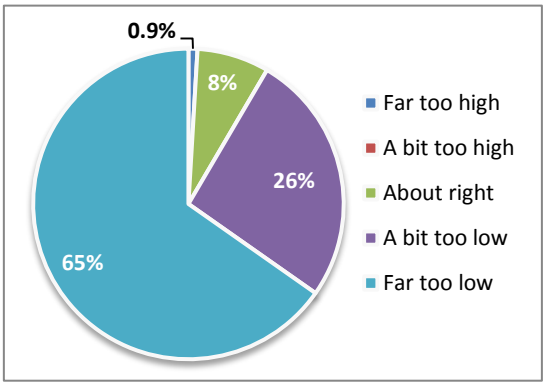
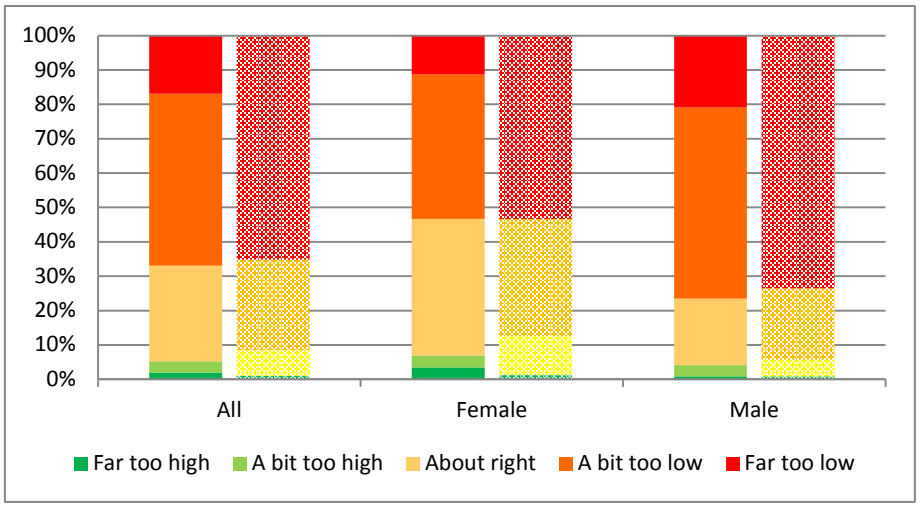


Figure 4.18 clearly illustrates the stronger aversion males have to further reducing the 100km/h speed limit to 80km/h rather than to 90km/h. In both genders the number of 'far too low' for 80km/h closely matches the sum of the 'far too low' and 'a bit too low' combined for the 90km/h reduction.

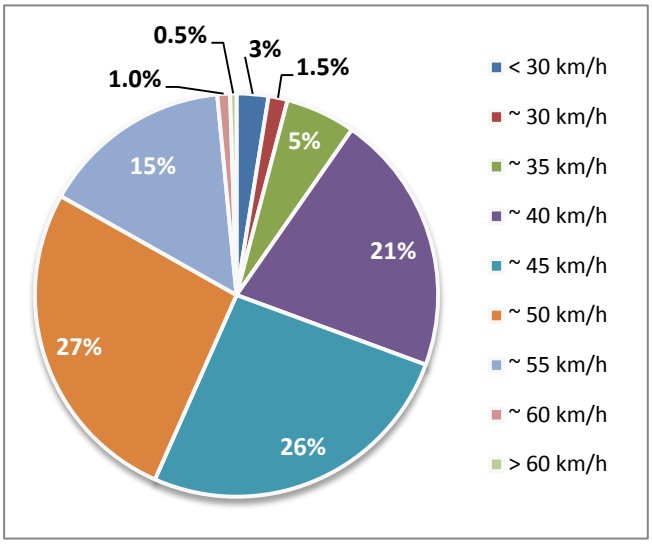
Figure 4.18 Reduce 100km/h rural road to 90km/h vs Reduce 100km/h rural road to 80km/h – by gender



The questions then moved from 100km/h rural roads to speed limits in busy shopping areas. Respondents were first asked: 'Now let's consider roads and streets in busy shopping areas where pedestrian activity is high and the speed limit is currently set at 50km/h. What speed do you typically travel at on a street in busy shopping area when car traffic does not restrict your speed choice but there is a reasonable amount of pedestrian traffic?'

Figure 4.19 outlines that 83% of all respondents stated they drive at or below the 50km/h speed limit in a busy shopping street. Surprisingly more women (18%) than men (15%) stated they drive above the speed limit. The percentage difference is not large, but it would not be expected given the general answers so far, that females would continue to desire or drive at faster speeds. Two-thirds of those women driving over the speed limit were in the age range of 26–45 years old.

Figure 4.19 What speed do you normally travel at in a busy shopping street of 50km/h? – by all



Staying with busy shopping areas, the next two questions asked: 'What would you think if the speed limit on roads like this, currently set at 50km/h, was lowered to 40km/h?' and 'What would you think if the speed limit on roads like this, currently set at 50km/h, was lowered to 30km/h?'.

There was much more support for a 40km/h speed limit, than a 30km/h one. Both 50% of males and females were strongly opposed to a 30km/h speed limit, compared with less than 10% for each gender strongly opposed to a 40km/h speed limit. Nearly 50% of respondents believed 40km/h to be 'about right', with males more in favour (52%) than females (44%).

When analysing the responses by age group, those respondents who thought 40km/h was 'about right' for this scenario decreased with age as follows: 54% of the youngest age group, 48% of the middle age group and 42% of the oldest age group. The oldest age group was more likely to disagree with both speed limit reductions, though shared commonality with the 26–35 year olds on the 30km/h reduction. Those aged 36–55 were most likely to agree that 30km/h was 'about right'; again it is not known if this age group was more accepting because they were more likely to be parents of small children which influenced their decision. The consistent factors were the support for 40km/h zones and very little support for reducing the speed limit to 30km/h. Again respondents may have considered it had a negative impact on their travel time. The results are shown in figures 4.20 and 4.21.

Figure 4.20 Reduce 50km/h busy shopping street to 40km/h vs Reduce 50km/h busy shopping street to 30km/h – by gender

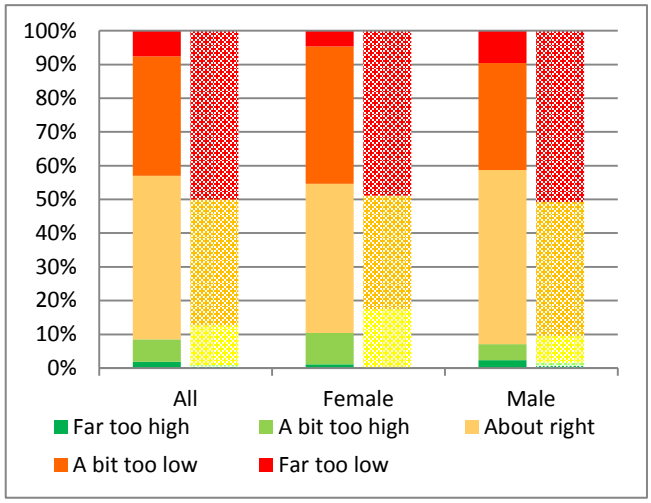
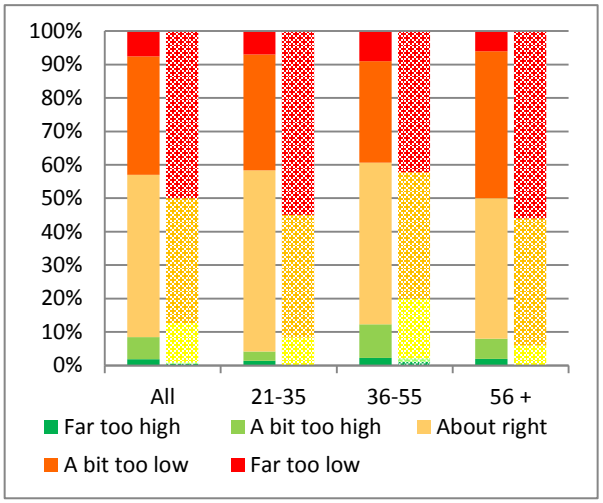


Figure 4.21 Reduce 50km/h busy shopping street to 40km/h vs Reduce 50km/h busy shopping street to 30km/h – by age group



From busy shopping streets, the same line of questioning was applied to residential streets. The survey asked: 'Now let's consider local residential streets that allow local residents to access the main roads; the default speed limit is currently set at 50km/h. What speed do you typically travel at on this type of street when car traffic does not restrict your choice of travel speed?'

Nearly two thirds of all respondents (figure 4.22) stated they travelled at or below the 50km/h speed limit. Males were marginally more likely to drive above the speed limit. Respondents who drove in urban areas only (figure 4.23), were more likely to drive above the speed limit than those who drove in a mix of rural and urban areas. In fact 76% of rural and urban drivers drove at or below the 50km/h speed limit, compared with 62% of urban drivers. The group with the largest percentage of drivers obeying the 50km/h limit was the one including respondents aged 56 years and over, at 78%. The group least likely to obey the speed limit was that of the 21–35 year olds at 56%, just under half admitted to generally driving above the speed limit.

Figure 4.22 What speed do you normally travel at in a residential street of 50km/h? – by all

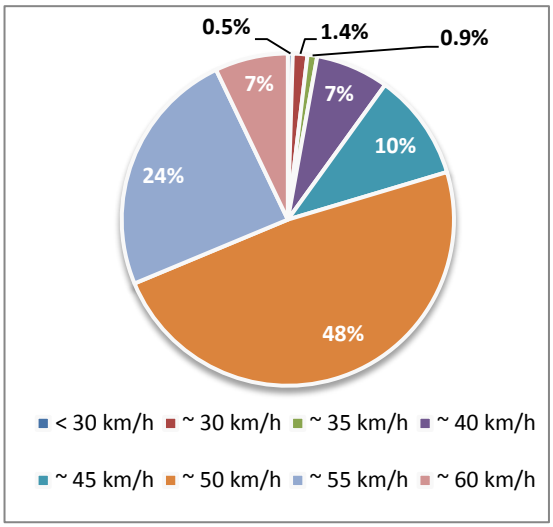
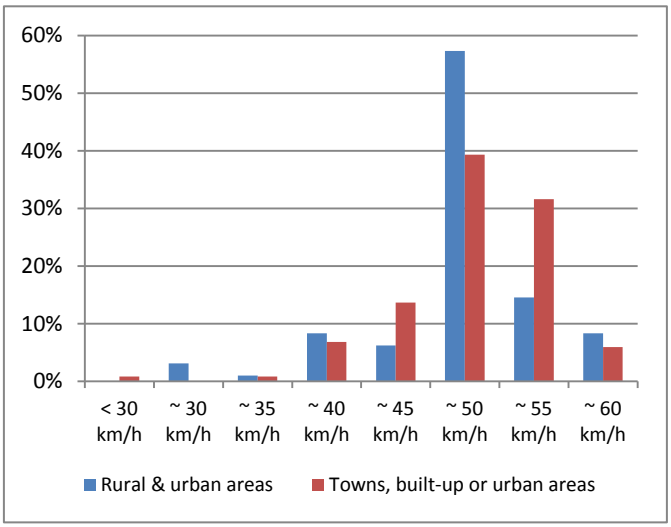


Figure 4.23 What speed do you normally travel at in a residential street of 50km/h? – by normal journey type



When asked; 'What would you think if the speed limit on local residential streets like this, currently set at 50km/h, was lowered to 40km/h?', approximately one in four respondents thought this speed was 'about right' or still too high. Figure 4.24 illustrates overwhelmingly that respondents decided the speed limit should remain at 50km/h for residential streets.

Figure 4.24 Reduce 50km/h residential street to 40km/h – by all

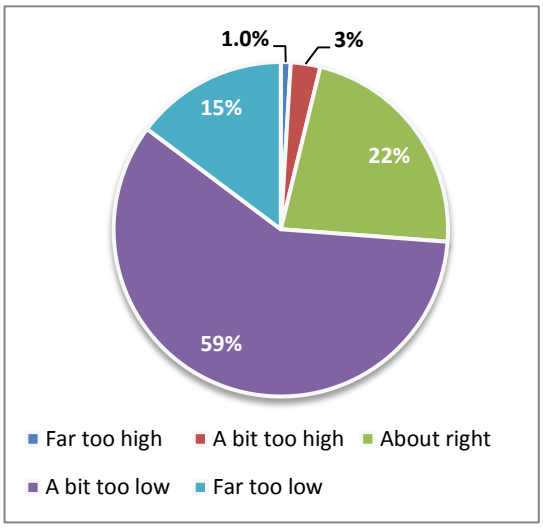
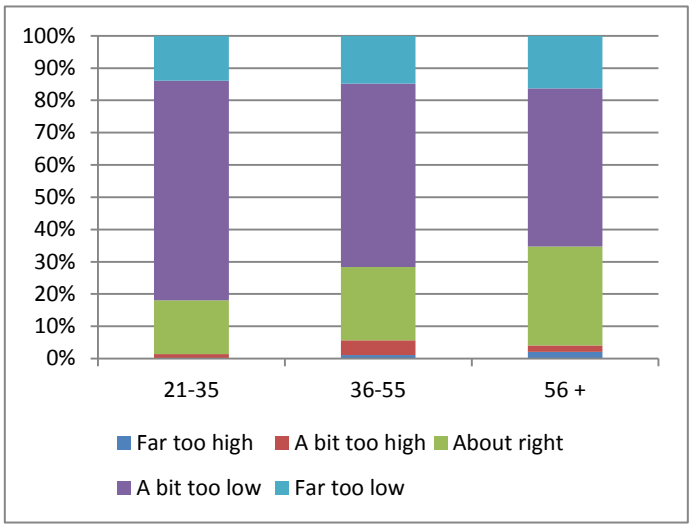


Figure 4.25 Reduce 50km/h residential street to 40km/h – by age group



The eldest age group of 56 and over was the most accepting (35%) of a residential speed limit reduction. This support fell to 28% for the middle age group and only 18% of the youngest respondents. Each age group was a similar percentage (14%–16%) at choosing the reduction to be 'far too low'. The biggest difference was in the respective percentages who thought it was 'a bit too low'.

4.8 Safer speed zones

The final section of the survey asked drivers two questions about their acceptance of safer speed zones. The first question was: 'Look at the picture of the speed limit sign (figure 4.26) – do you think that the reference to "Safer Speed Area" will help you slow down more than you might have normally?'

Figure 4.26 Safer speed area picture used in the survey

Just under half of respondents at 47% agreed they were likely to 'slow down more than they might have normally' for the safer speed area and 29% said they were unlikely to.

Those respondents who did a mix of rural and urban driving were more inclined to ignore the sign (36%) than urban only drivers (22%). At 53% the 21-35 year olds were more likely to slow down than the 36-55 year olds with 41% stating they were likely to slow down.

The final question of the survey asked: 'Now consider another type of speed limit sign where, under the speed limit, is an explanation of why you should slow down – such as 'high crash zone', 'children crossing' or 'busy shopping street'. Do you think that these speed signs with the extra wording will help you to slow down more than you might have normally?'

There was a positive response to this question; respondents said they were more likely to slow down if they had further explanation for the slower speed zone. The positive response increased overall to 82% of all respondents. This equates to a 77% increase in positive answers. Females were now 40% 'very likely' to obey the informative safer speed sign (previously 14%) and the '56 years +' group increased from 12% to 42%.

Figure 4.27 Would you slow down for a safer speed sign vs Would you slow down for an informative safer speed sign – by gender

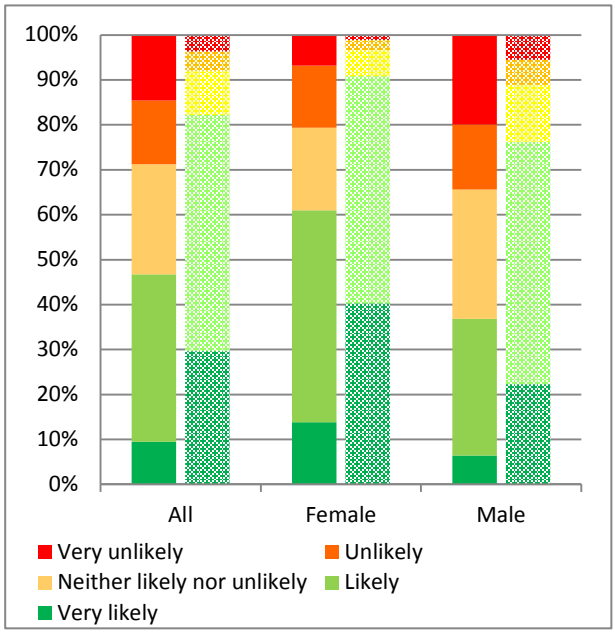
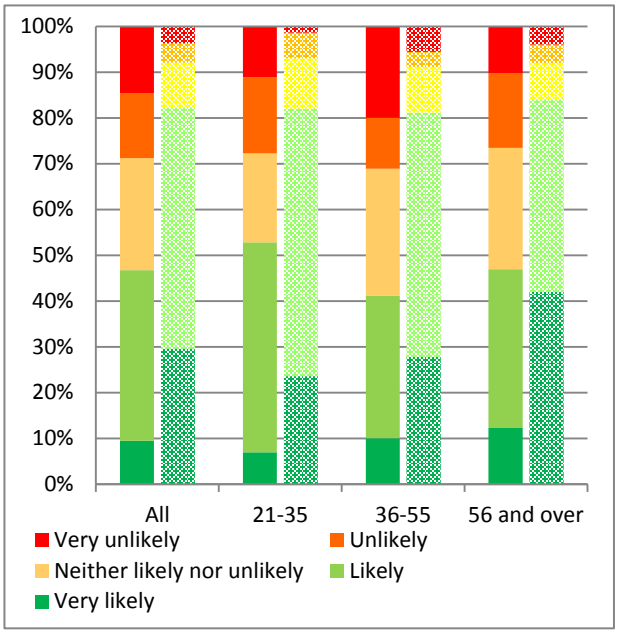


Figure 4.28 Would you slow down for a safer speed sign vs Would you slow down for an informative safer speed sign – by age group



Figures 4.27 and 4.28 illustrate the increased support for safer speed zones, especially when signs are more informative about the reason for slowing down. The hatched columns represent the response to an informative speed sign. Females are more inclined to slow down than males if more information is provided. It must be noted that male support doubles from 37% to 76% when more information is provided on the sign, while female support increases by 50% from 61% to 91%. The other large increase in acceptance is by the 36-55 year olds, who double from 41% up to 81%. Those most likely to slow down are again females and the oldest age group, both at approximately 40%.

One finding from the Hamilton community survey in section 3.4, was that respondents considered the signs were self-explaining. So it is important that any signs adopted for future projects are clear and concise.

4.9 Summary of survey results

Numerous outcomes from this survey are listed below. Some are encouraging for those working in the safer speed field, while there are still some areas where road users need more consultation and education to get them to buy into any proposed changes.

- 98% of respondents stated that safety does influence their choice of speed. So there is a base to work from, in that most of the population considers safety when driving. The key is how differently people perceive safety. Drivers may travel at certain speeds, which they consider to be safe for themselves, while not considering the safety of vulnerable road users. Other drivers may consider the same speeds to be unsafe even for them to drive at normally.
- Females were more inclined to say they agree with certain safety statements as posed by the survey, than males were. This reinforces the perception that males are less likely to be concerned with safety and are more likely to take risks than females are.
- The survey suggests that 40km/h shopping street zones appear more likely to get public support, rather than reducing speed limits in residential areas to 40km/h.
- There is little support for reducing shopping street zones to 30km/h.
- Two-thirds of respondents are against lowering the default 100km/h speed limit on two-laned undivided roads by 10km/h.
- 92% of respondents are against lowering these same roads by 20km/h.
- Drivers are much more inclined to obey safer speed area signs if they are informed of the reason to slow down.

5 Case studies

To supplement the available research around compliance with safer (reduced) speeds, additional data was collected and analysed on three case study routes.

1 NZ Transport Agency (Waikato) – SH2 – 90km/h safer speed area

2 Dunedin City – Otago Peninsula – 70km/h safer speed area

3 Hamilton City Council – Gordonton Road – 80km/h speed limit extension

5.1 SH2 90km/h safer speed treatment – police passive enforcement surveys

In addition to the SH2 safer speed zone analysis reported in chapter 3, speed detectors were set up at four locations (different from previous locations used for the 90km/h analysis) along the route between SH1 and SH25 to attempt to record the standard deviation with either active or passive enforcement. The active enforcement involved a police speed camera set up to capture speeding motorists and issuing official speeding tickets. Passive enforcement involved police patrols within the vicinity of the speed detectors. All sites were operated in cooperation with the both the Counties Manukau and Waikato Police Forces during November and December 2013.

The MOT (2013) annual survey referred to in the introduction, states that public support for police enforcement is high. Therefore it is regarded as an effective tool in lower operating speeds on our roads.

Figure 5.1 Location of the four speed detectors

5.1.1 Passive enforcement

It was arranged with the Counties Manukau Police to keep a record of the times when they were patrolling along SH2, between the SH1 intersection and Maramarua. Three speed survey locations were set up in the following 90km/h zones:

- 002 – 0000/4.055 between Serpell Road and Dobson Road
- 002 – 0000/6.155 east of Pendergrast Road
- 002 – 0000/16.225 between Wyatt Road and Kopuku Rd.

These are outlined in figure 5.1 above.

Between 27 November and 18 December there were 28 occasions when the police were patrolling in the vicinity of the speed detectors. The time of day the police patrolled the area ranged from 7.40am to 9.00pm and was normally conducted in one- to two-hour durations at a time. As the patrols ranged along the 21km length of SH2 and not specifically at the speed tube locations, it can only be stated that the police were known to be in the vicinity at the time, rather than patrolling specifically at a speed detector.

The speed measurement data was extracted into 15-minute time slices using four-second headways, to only record vehicles travelling in free-flow conditions. For each 15-minute period both the mean and 85th percentile speed were calculated. Using the patrol times supplied by the police, the speed survey records for the three sites were filtered to isolate only the time periods that matched the police patrol times provided. Therefore all speed data before 7.40am and after 9.00pm was excluded and also excluded were 15-minute time periods when fewer than 15 vehicles were recorded, as these were deemed too small a sample for reliable mean and 85th percentile results. Table 5.1 outlines the mean and 85th percentile speeds at the three sites, with the '+' and '-' symbols in the police patrolling columns, denoting an increase or decrease against when the police were patrolling.

To compare the mean speeds of when police were patrolling, the same time slices (patrol periods) on days the police were not patrolling were collated, eg if police patrolled between 9:00am and 10:30am on one occasion, then data for all days they did not patrol during this time were collated. Therefore the same time of day and similar traffic volume characteristics could be compared to see whether a difference (reduction) in mean speed existed due to police presence or not.

Site 2 was recorded on two occasions as the detector failed on 5 December and was reset again on 14 December. The large reduction in mean and 85th percentile speeds may be due to the effect of the lowered police speed tolerance of +4km/h (from +10km/h), which started on 1 December.

Table 5.1 Mean and 85th percentile recorded speeds

Site location	Dates patrolled	Police not patrolling			Police patrolling		
		Mean (km/h)	85th %ile (km/h)	Sample size	Mean (km/h)	85th %ile (km/h)	Sample size
Site 1	25 Nov – 9 Dec	82.2	86.5	29,355	82.4 (+)	86.6 (+)	4,754
Site 2a	25 Nov – 4 Dec	90.8	95.2	16,209	91.4 (+)	95.9 (+)	3,128
Site 2b	12 Dec – 19 Dec	80.5	84.8	13,402	79.7 (-)	84.3 (-)	2,215
Site 3	26 Nov – 9 Dec	86.7	91.3	25,904	86.0 (-)	90.2 (-)	4,041

Sites 2b and 3 both show lower mean and 85th percentile speeds when the police were patrolling than when they were not. Sites 1 and 2a for the most part show slighter faster speeds for when the police were patrolling than when they were not, but the effect is small.

Based on the limited data it is not possible at this stage to estimate what effect passive enforcement has on operating speeds. A much larger number of sites would need to be monitored and perhaps tighter restrictions on the area covered by police in relation to any speed surveys. This would help to better define if any discernable speed difference exists while police are patrolling.

5.2 Otago Peninsula journey speeds

In chapter 3, point speed surveys collected by DCC through the Otago Peninsula safer speed area were presented before and after the 70km/h speed limit was applied. To supplement this data, speed profile data was collected (GPS distance collected every few metres) along two of the sealed roads on the

Peninsula. The effectiveness of speed trailers in bringing down speeds was also examined. It is acknowledged that, on lower volume routes like these, police enforcement is very unlikely. The location of the speed trailer is illustrated by the orange cross on Seal Point Road in figure 5.2. The speed profile surveys required the driver to drive as they would normally, within the current speed limit of the time, along Highcliff Road (red) and Seal Point Road (green) as shown in figure 5.2. The free-flow speed was recorded when the driver was not following another vehicle. Unfortunately the same drivers were not available for both the before and after surveys and this will have biased the results. Therefore caution should be taken when interpreting these results due to the small sample size and likely driver bias.

Figure 5.2 Otago Peninsula journey speed routes

Each route was driven on five occasions during the 'before' survey and on 10 occasions during the 'after' survey. To produce the graphs the speeds across the runs were averaged for each direction and a trend-line of all the spot speeds for all runs was created using a 15-period moving average. The elevation of each route is plotted on the secondary axis, showing the change in height along each route. As Seal Point Road is relatively straight, it defines the road geometry very well. The winding horizontal geometry of Highcliff Road is not represented in the following graphs; however, it can be accepted that certain speed decreases are due to the presence of tight bends in the road geometry.

5.2.1 Seal Point Road

Seal Point Road intersects with High Cliff Road and its vertical geometry runs steeply downhill from the intersection towards the coastline. The road profile falls at an average of 1m every 12m (1:12). For this reason Seal Point Road was expected to be one of the few locations within the safer speed area where the speed limit could be regularly exceeded by very high speeds.

Figure 5.3 shows the running mean speeds for the two survey periods. To quantify these results, they are compared with the mean speeds recorded at the speed trailer site. The speed trailer was located 300m from the start of Seal Point Road, as denoted by the green line on figure 5.3. It should be noted that when the two speed trailer surveys were conducted, they did not coincide with either the 2013 or 2014 journey survey runs.

There were two surveys of mean speed recorded at the speed trailer site (to compare if the trailer's presence affected the driver operating speed). When the trailer was not present the mean speed was 70.3km/h, and when it was present the mean speed was 72.1km/h.

At the same 300m location the '2013 before' mean journey speed sits around 72km/h, while the '2014 after' mean speed sits higher at around 75km/h. Therefore the result of the 2013 survey is consistent with the mean speeds of the public.

Figure 5.3 Seal Point Road southbound

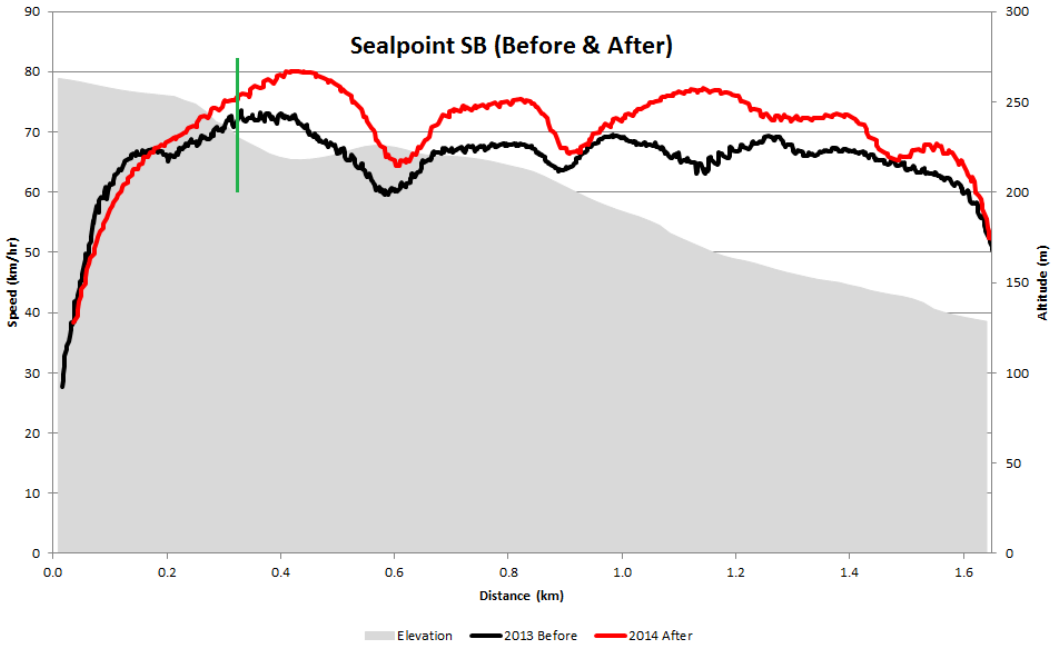
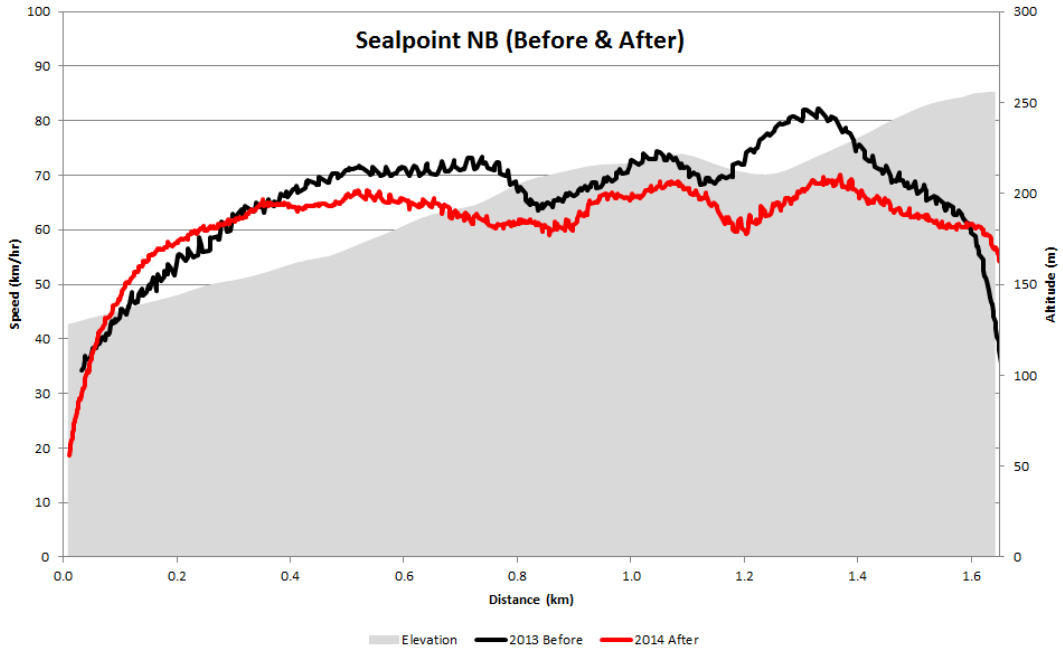


Figure 5.3 shows that the 2014 survey driver spent a considerably longer portion of time exceeding the 70km/h speed limit compared with the 2013 survey driver, so there is a bias. The 2013 survey driver only exceeded the 70km/h limit at the fastest section of Seal Point Road.

Figure 5.4 Seal Point Road northbound



In figure 5.4 when driving back up Seal Point Road, the 2014 survey driver did not exceed the 70km/h speed limit, whereas the 2013 survey driver exceeded 70km/h on a number of occasions, particularly when beginning to drive back up the steepest section to the intersection. It should be remembered that the speed limit in 2013 was 100km/h.

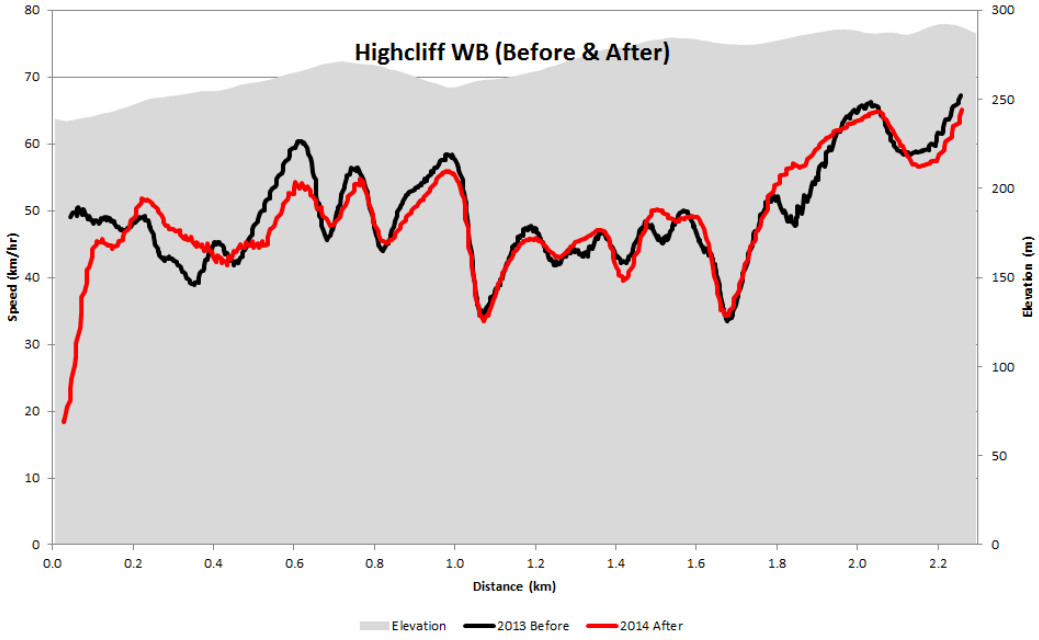
The first 400m of Seal Point Road has the steepest decline/incline of elevation. This section coincides with the fastest mean speeds for both survey periods for each direction. The highest point on the road section is where Seal Point Road intersects with Highcliff Road, which explains the speed increase and decrease in figures 5.3 and 5.4 respectively.

The Seal Point Road journey speed surveys produced inconclusive results due to the low sample size and the driver bias. There was weak evidence to support that speeds had reduced in the segment above 80km/h of the uphill northbound direction.

5.2.2 Highcliff Road

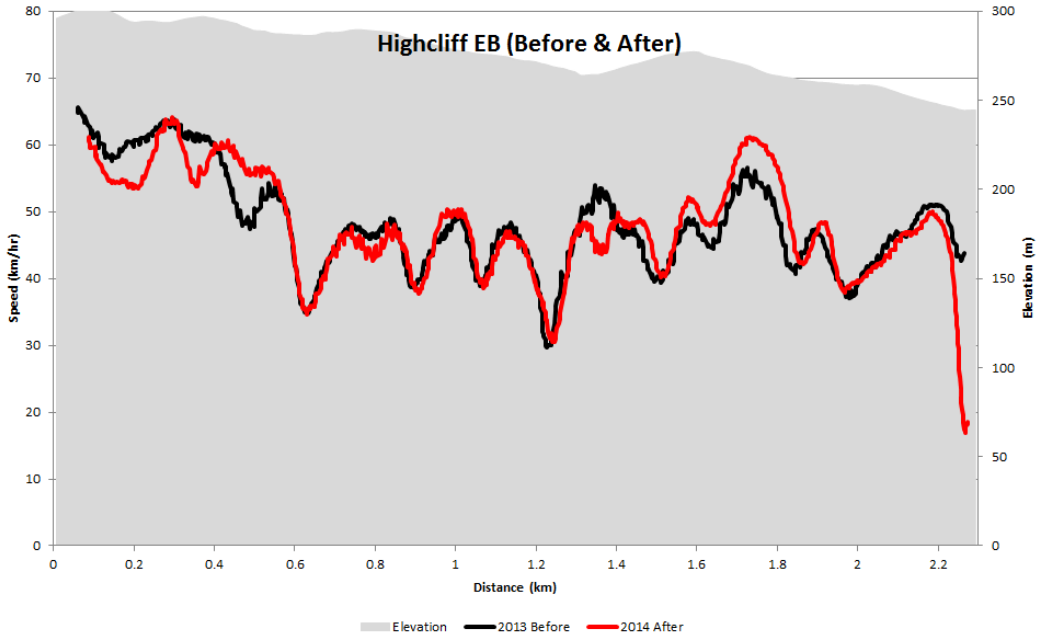
For Highcliff Road the before and after journey speed surveys were very similar in nature. At no point did the 2014 driver's mean speed exceed the new 70km/h speed limit while travelling in the westbound direction. As mentioned previously, Highcliff Road is much more winding than Seal Point Road, which explains the lower mean journey speeds. The difference in speeds at the start of the section can only be explained by slightly differing start points for being 'up to speed' (normal travelling speed) by each team of surveyors.

Figure 5.5 Highcliff Road westbound



When analysing the mean journey speeds in the eastbound direction in figure 5.5, the speeds again matched up fairly consistently especially at troughs in the mean speed similar to those in figure 5.6. Again the speed did not exceed 70km/h in either survey, which suggests the new 70km/h speed limit is a suitable speed limit for this section of the peninsula.

Figure 5.6 Highcliff Road eastbound



The graphed results confirm drivers are driving to the conditions and not the posted speed limit. The installation of the safer speed zone will help tourist drivers better understand that the roads are not suitable for open road speeds.

5.2.3 Discussion

The two Highcliff Road graphs show there is little difference between mean journey speeds prior and post the speed limit reduction to 70km/h. Both graphs show that the 2014 after survey driver can sometimes be slower or faster than the 2013 before survey driver, but they appear to balance out overall. The speed 'troughs' and 'crests' on both Highcliff Road surveys are consistently at the same speed and location, which is consistent with the vertical and horizontal geometry.

The Seal Point Road surveys are quite different from one another. Figure 5.4 shows the northbound 2014 after mean driver journey speed to be slower than the before driver survey in most instances, but is consistently under the 70km/h speed limit. The southbound 2013 after mean driver journey speed in figure 5.3 is consistently faster than the 2013 before mean driver journey speed. This was not expected, as the before survey was consistently below 70km/h (when the speed limit was 100km/h), and the after survey driver was consistently over the new 70km/h speed limit. The difference might lie in the fact that different drivers were used for each survey period.

5.2.3.1 Speed advisory trailer

From 22 January to 11 February 2014, speed data was captured 'before' and 'during' a speed advisory trailer deployment (which advised drivers of their spot speed) on both Seal Point Road and Camp Road. Seal Point Road was selected because the operating mean speed was above the new speed limit, and it was hoped the speed trailer might reinforce the lower speed limit and reduce the operating speeds. Camp Road was selected because it already had a low mean and 85th percentile speed and it was of interest to see whether the speed trailer would have any effect on mean speed up or down. The data for both sites was collected for 12 days without the trailer and eight days while the speed trailer was in place.

Figure 5.7 Speed trailer as set up on Seal Point Road

Seal Point Road RP 0.30

Seal Point Road was chosen as one of the speed trailer sites due to its straight and downhill geometry, which lends itself to higher speeds. Figure 5.7 is captured looking downhill and southwards towards the coast. This sag curve is where motorists could achieve the highest speeds on the road.

Table 5.2 Seal Point Road RP 0.30

	Mean speed	85th %ile speed	Standard deviation	% > 70km/h	Maximum speed	Sample size
Without speed trailer	72.1km/h	86.0km/h	14.4km/h	57%	141.2km/h	2,673
With speed trailer	70.1km/h	82.8km/h	13.3km/h	51%	133.7km/h	1,976
Change	-2.0km/h	-3.2km/h		Reduction		

Seal Point Road is a relatively straight road, with approximately the first 400m a moderate downhill grade. This location was chosen based on its alignment, which is likely to encourage higher speeds in a southbound direction. The speed data captured supports the initial assumption.

With the speed trailer in place the mean speed dropped by 2.0km/h and the 85th percentile by 3.2km/h. The percentage of vehicles exceeding the 70km/h speed limit did reduce from 56.8% to 50.9%. It is apparent there is an issue with speeding vehicles at this location, with more than half of all vehicles over a 20-day period exceeding the speed limit (4,649 vehicles in total). While the speed trailer was in place, vehicles exceeding 100km/h did drop from 2.7% to 1.3%. Figures 5.7 and 5.8 illustrate why higher speeds are often attained by drivers on this road. Potentially some of the speed reduction is due to the close proximity of the speed trailer to the road edge line.

Figure 5.8 Typical straight section on Seal Point Road

Camp Road RP 0.30. Source Google

Camp Road is the only access road to Larnach Castle, which is a popular tourist destination in the region. The speed trailer appears to have had little effect on the speeds travelled by vehicles over the 20-day survey period. The mean speed only reduced by 0.1km/k and the 85th percentile by 0.3km/h. The percentage of vehicles travelling over the speed limit reduced by half a percent, with only approximately 6% of all vehicles exceeding the speed limit (9,647 total vehicles). Figure 5.9 shows an indicative cross-section of Camp Road near the speed trailer location.

Table 5.3 Camp Road RP 0.30

	Mean speed	85th %ile speed	Standard deviation	% > 70km/h	Max speed	Sample size
Without Speed Trailer	54.6km/h	64.4km/h	9.8km/h	6.2%	95.7km/h	5,666
With Speed Trailer	54.5km/h	64.1km/h	9.9km/h	5.7%	105.6km/h	3,981
Change	-0.1km/h	-0.3km/h		Reduction		

Figure 5.9 Approximate location of speed trailer on Camp Road

Source Google

5.3 Gordonton Road, Hamilton

As discussed in an earlier section, HCC implemented a number of different speed limit reductions throughout the city. One objective of the Hamilton safer speed programme was to drop the speed on all the council's rural roads from 100km/h to 80km/h. Hamilton city has very few high-speed rural roads and so all changes were implemented in the same year (2013). One concern has been that adjacent councils have not changed their speed limits as well. All speed limit changes therefore commence at this boundary irrespective of whether there are any road or roadside features to support the speed change.

Motorists driving down a road are often unaware they are crossing a council boundary and will normally react to a change in the road layout or roadside development by adjusting their speed. These visual cues are often not present with the Hamilton city boundary 80km/h speed limit changes, and the only cue is the speed limit sign. It is of particular interest whether the signage alone will create the speed reduction desired.

While most of HCC rural roads are low volume, Gordonton Road in the north-east of the city does link through to other parts of the rural road network (eg SH1B) and carries a relatively high traffic volume. To assess the effectiveness of the 80km/h speed drop on the treated section of Gordonton Road, data from travel time surveys within the section and on either side of it was collected and analysed.

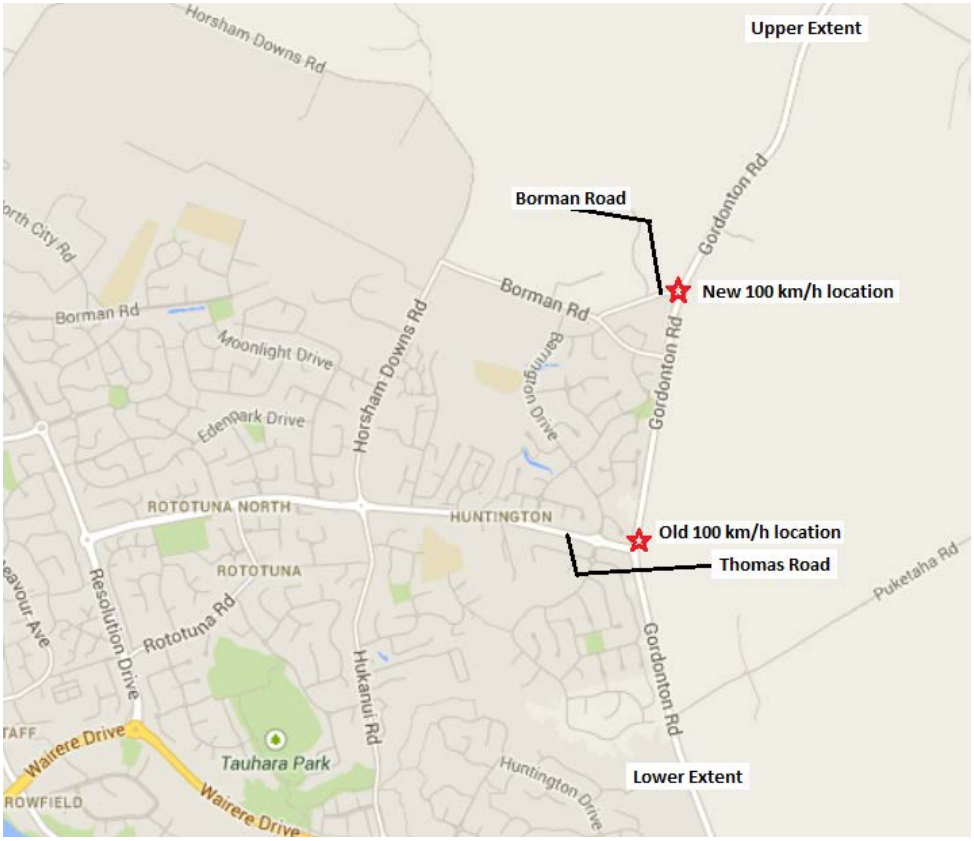
As a disclaimer it should be noted that this data was based on a small sample size and used for indicative purposes only.

5.3.1 Site description

Gordonton Road is located along the eastern boundary of HCC, extending from the SH1/1B intersection in the north, to Wairere Drive in the south. The northern-most section (north of Thomas Road) is still rural and originally had a 100km/h speed limit (see figure 5.10). There is residential development to the west of Gordonton Road between Thomas Road and Borman Road, but no direct access. North of Borman Road there is only rural roadside development.

This study examines the section of Gordonton Road from 1.0km south of Thomas Road to 1.25km north of Borman Road. The previous 100km/h threshold was located just north of the Thomas Road intersection, but was moved 2.1km north in May 2013 to the city boundary, which is just north of Borman Road. The two locations are shown on figure 5.10.

Figure 5.10 Map showing extents of the safer speed area under analysis



5.3.2 Safer system compliance

5.3.2.1 Safer speeds

The speed limit change from 100km/h to 80km/h was implemented by Hamilton City Council to continue their work in reducing crashes within their boundaries.

5.3.2.2 Safer roads and roadsides

No changes were made to the road or roadside to encourage a safer road environment as part of this project.

5.3.2.3 Safer road use

Public consultation was undertaken for this speed limit change and is discussed in section 3.4.

5.3.3 Traffic speed statistics

Every six months the council, in conjunction with the Transport Agency, commissions car following speed surveys along popular commuter routes around the city. These are captured in March and November of every year, whereby each route is driven in both directions by one vehicle on all five weekdays, during a one-week period, morning, inter-peak and evening periods. The particular route used for this analysis was route 21. Therefore each mean speed calculation comes from five survey runs.

In May 2013, the location of the speed limit was changed, therefore the March 2013 and November 2013 surveys have been used in comparison. While the survey sample is small with effectively only five vehicle

speeds recorded for each period, the data can still be used as an indicative sample of the speed changes along the route. The data is therefore more sensitive to interference on a particular day, if the survey vehicle is delayed by a short-term obstruction, ie larger traffic volumes or congestion due to a crash.

Three segments within route 21 of the Gordonton Road section are compared based on their mean speed. These three segments are:

Segment A. 1.25km long: north of Borman Road (100km/h on both occasions)

Segment B. 2.1km long: Borman Road to Thomas Road roundabout (100km/h in March, 80km/h in November) – speed zone change

Segment C. 1.0km long: south of Thomas Road roundabout (80km/h on both occasions).

5.3.3.1 North to south (inbound) direction

Tables 5.4 to 5.6 show the inbound mean speeds in the AM peak (AM), inter-peak (IP) and PM peak (PM) for the two survey periods (March and November 2013).

Table 5.4 Gordonton Road inbound AM peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	93.4km/h	-9.3km/h
	November	100km/h	84.1km/h	
Segment B: speed zone change	March	100km/h	82.4km/h	-9.1km/h
	November	80km/h	73.3km/h	
Segment C: south of Thomas Road	March	80km/h	62.4km/h	+5.4km/h
	November	80km/h	67.8km/h	

Table 5.5 Gordonton Road inbound inter-peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	87.5km/h	- 0.4km/h
	November	100km/h	87.1km/h	
Segment B: speed zone change	March	100km/h	83.7km/h	- 3.6km/h
	November	80km/h	80.1km/h	
Segment C: south of Thomas Road	March	80km/h	63.0km/h	+ 7.9km/h
	November	80km/h	70.9km/h	

Table 5.6 Gordonton Road inbound PM peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	90.0km/h	+ 0.9km/h
	November	100km/h	90.9km/h	
Segment B: speed zone change	March	100km/h	81.6km/h	- 6.1km/h
	November	80km/h	75.5km/h	
Segment C: south of Thomas Road	March	80km/h	58.6km/h	+ 11.0km/h
	November	80km/h	69.6km/h	

Figures 5.11 to 5.16 show the data on graphs for each survey period. The solid red line in each of the figures defines the posted speed limit for Gordonton Road. Note the change in the November 2013 graphs after the reduced speed limit was implemented. The solid black line defines the mean speed for the five survey car runs. The three different levels define the mean speed for each of the three segments.

The major speed decrease at the Gordonton Road/Thomas Road intersection is due to the roundabout controlled intersection, therefore the survey vehicle may come to a complete stop in order to give way to circulating traffic. The Gordonton Road/Borman Road intersection is priority controlled, with Gordonton Road the priority route, therefore the survey vehicle need not stop when driving by.

Figure 5.11 March inbound AM peak

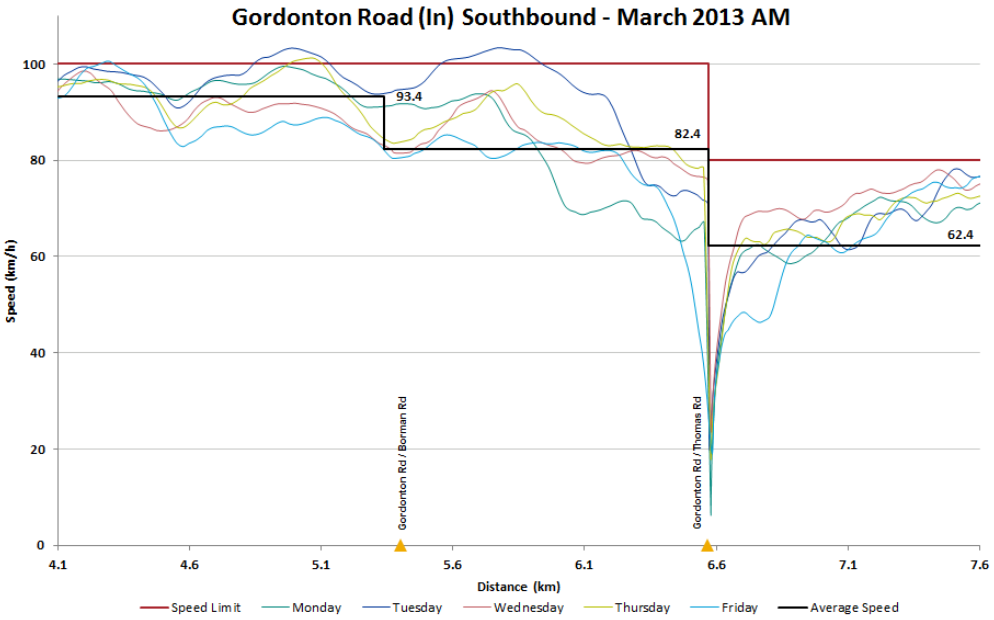


Figure 5.12 November inbound AM peak

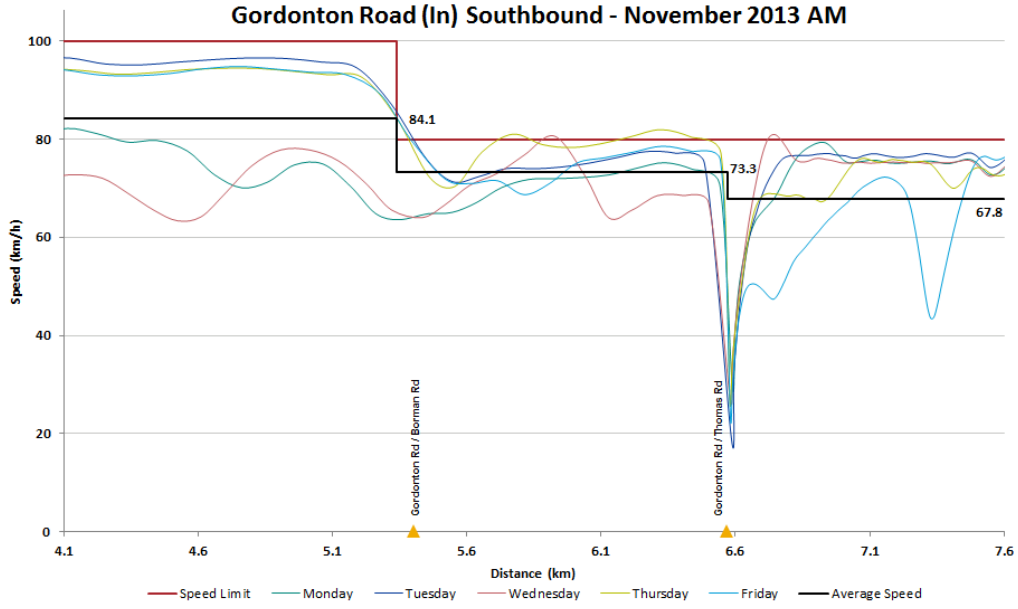


Figure 5.13 March inbound inter-peak

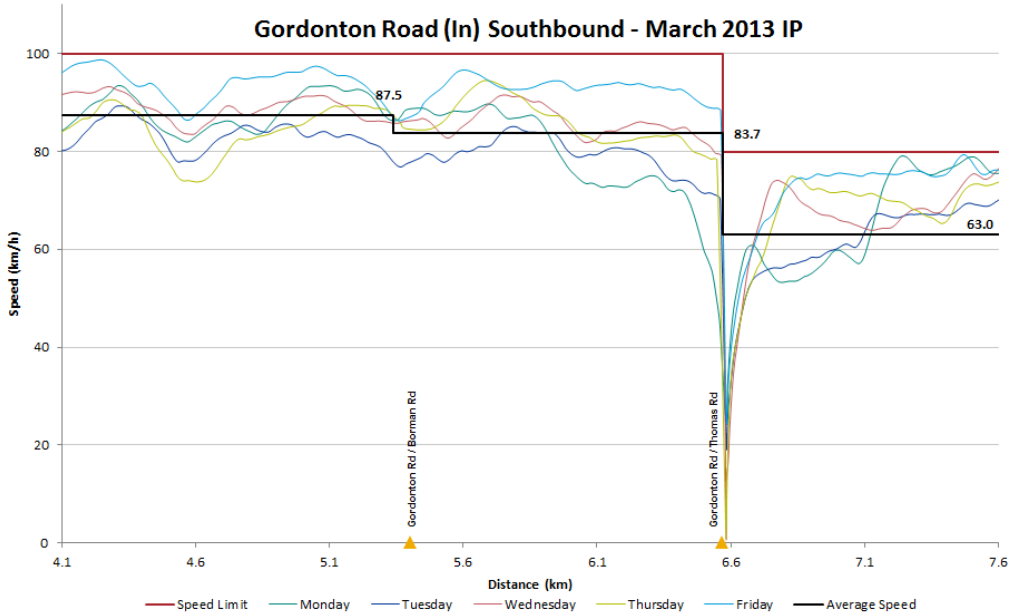


Figure 5.14 November inbound inter-peak

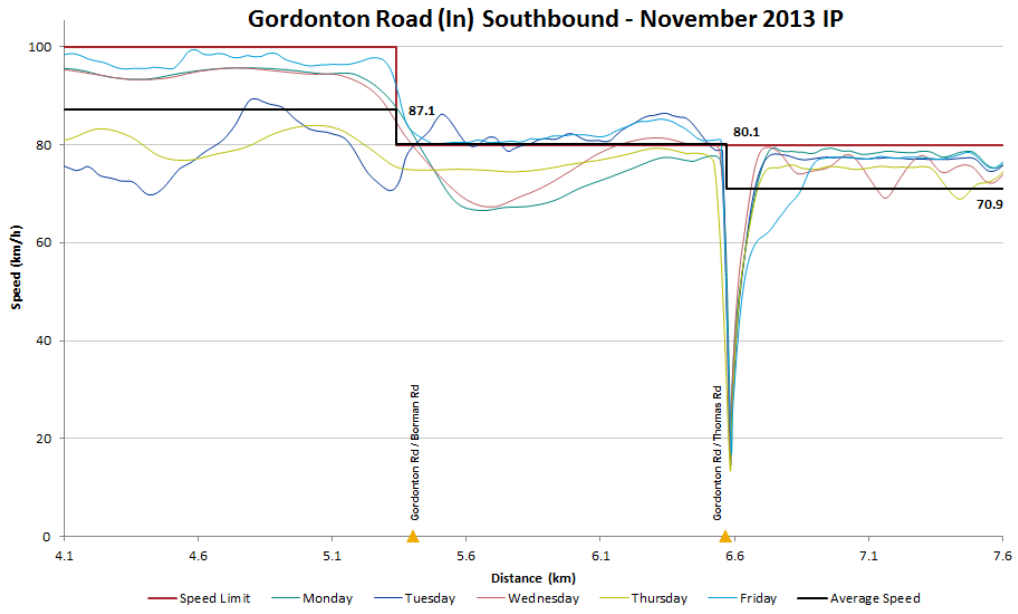


Figure 5.15 March inbound PM peak

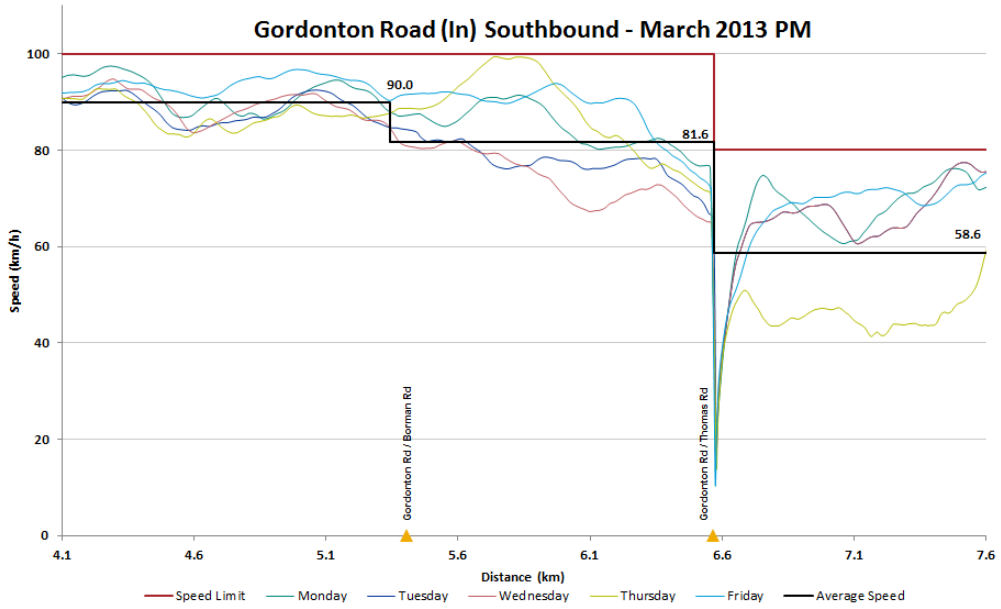
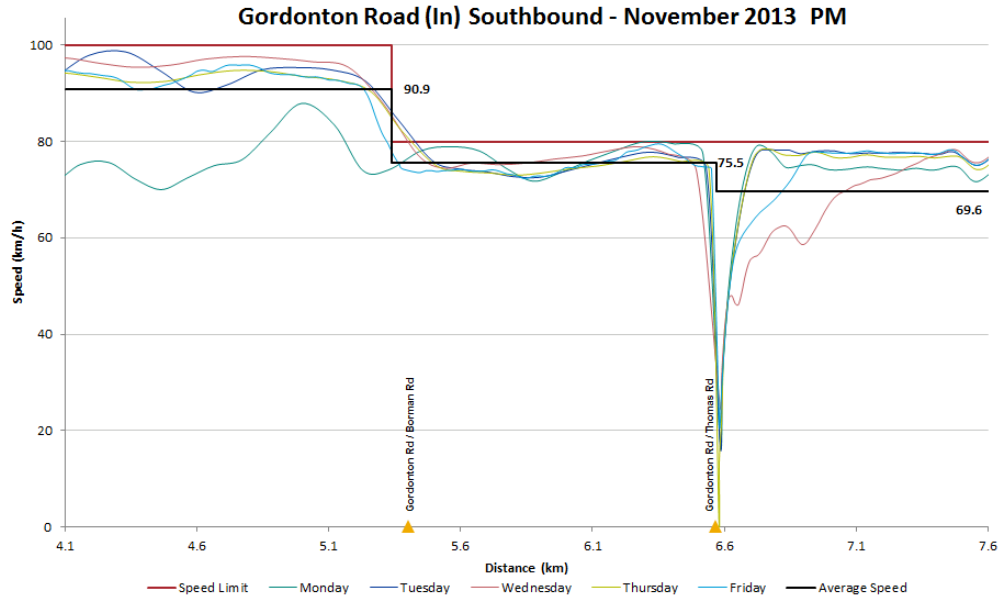


Figure 5.16 November inbound PM peak



5.3.3.2 South to north (out-bound) direction

Tables 5.7 to 5.9 show the out-bound mean speeds in the AM peak (AM), inter-peak (IP) and PM peak (PM) for the two survey periods (March and November 2013).

Table 5.7 Gordonton Road outbound AM peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	91.4km/h	-1.6km/h
	November	100km/h	89.8km/h	
Segment B: speed zone change	March	100km/h	82.6km/h	-8.5km/h
	November	80km/h	74.1km/h	
Segment C: south of Thomas Road	March	80km/h	62.7km/h	+8.8km/h
	November	80km/h	71.5km/h	

Table 5.8 Gordonton Road outbound inter-peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	85.2km/h	+8.5km/h
	November	100km/h	93.7km/h	
Segment B: speed zone change	March	100km/h	79.2km/h	+1.3km/h
	November	80km/h	80.5km/h	
Segment C: south of Thomas Road	March	80km/h	62.8km/h	+6.3km/h
	November	80km/h	69.1km/h	

Table 5.9 Gordonton Road outbound PM peak

Segment	Period	Speed limit	Mean speed	Change in mean speed
Segment A: north of Borman Road	March	100km/h	89.7km/h	+2.1km/h
	November	100km/h	91.8km/h	
Segment B: speed zone change	March	100km/h	78.0km/h	+0.2km/h
	November	80km/h	78.2km/h	
Segment C: south of Thomas Road	March	80km/h	61.5km/h	+5.7km/h
	November	80km/h	67.2km/h	

Figures 5.17 to 5.22 show this data on graphs for each survey period.

Note that the distance shown on the horizontal axis is only a running distance and not a route position. Hence the intersection locations do not match up with the distance numbers of the inbound graphs.

Figure 5.17 March outbound AM peak

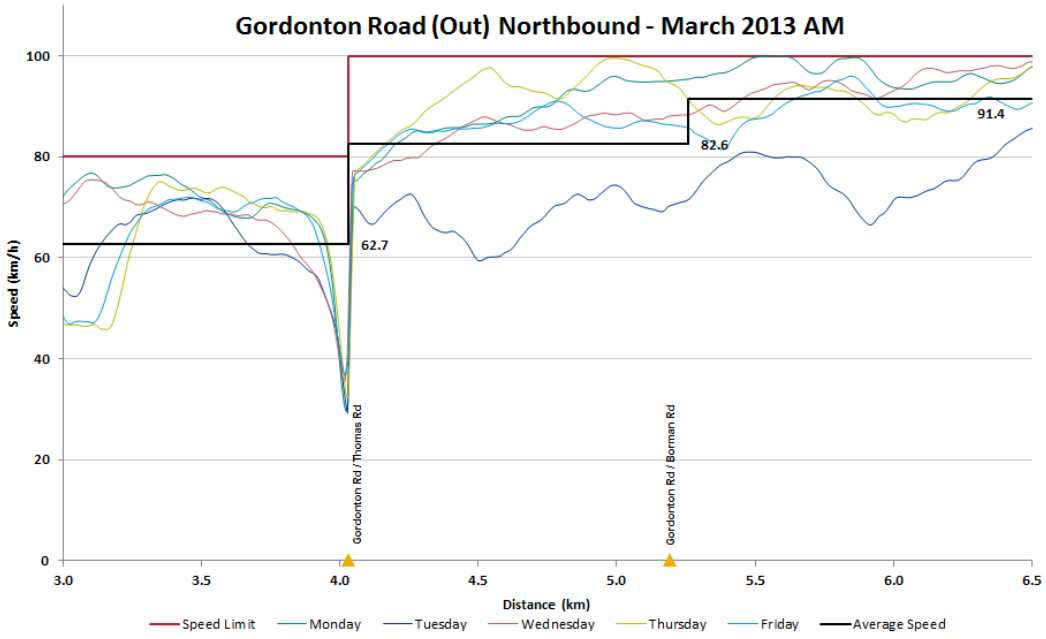


Figure 5.18 November outbound AM peak

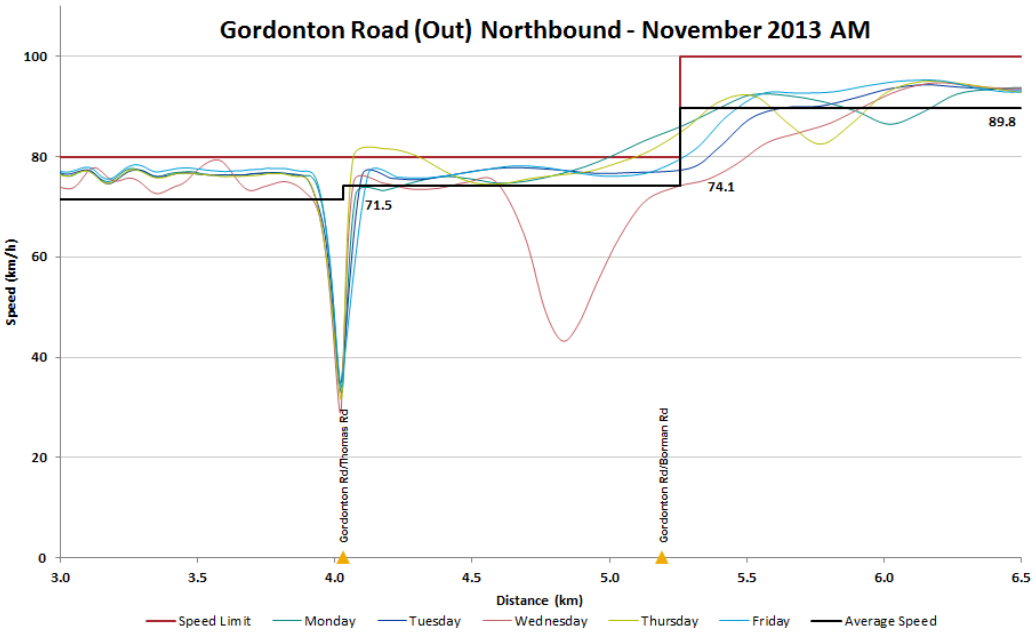


Figure 5.19 March outbound inter-peak

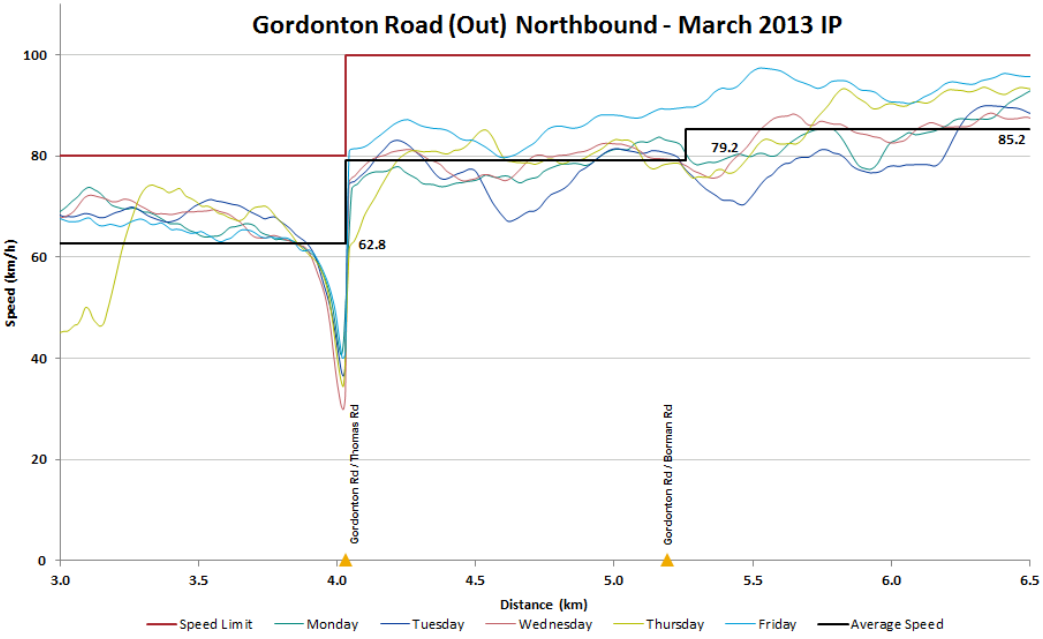


Figure 5.20 November outbound inter-peak

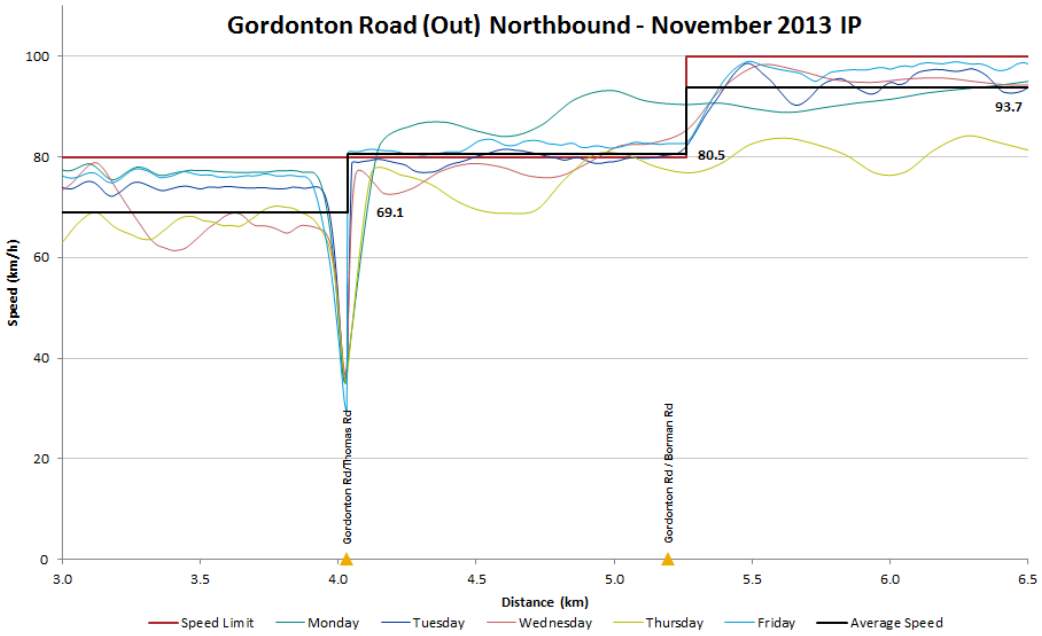


Figure 5.21 March outbound PM peak

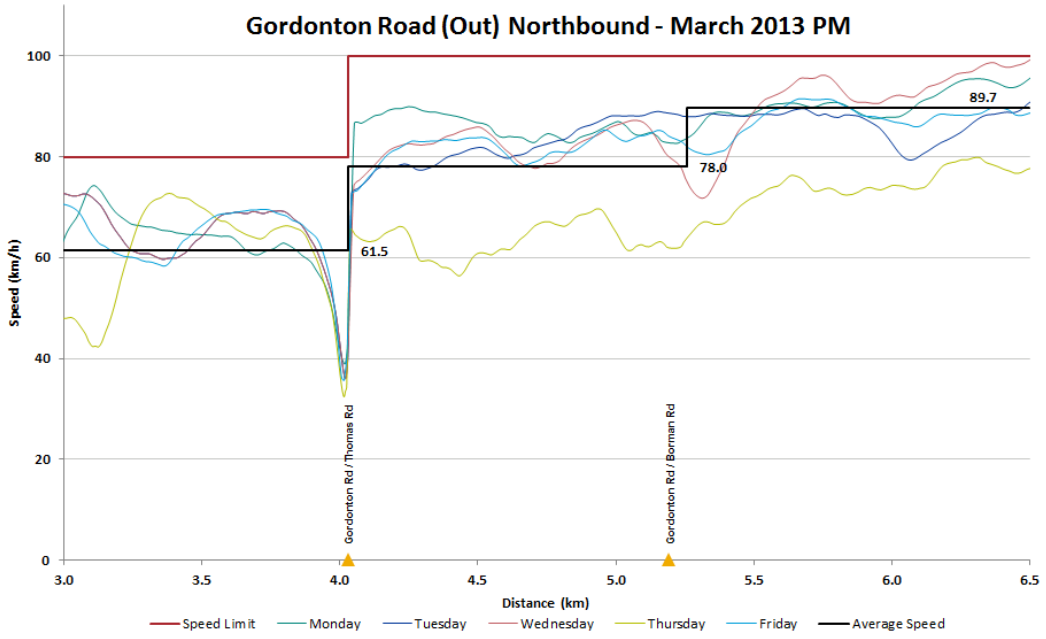
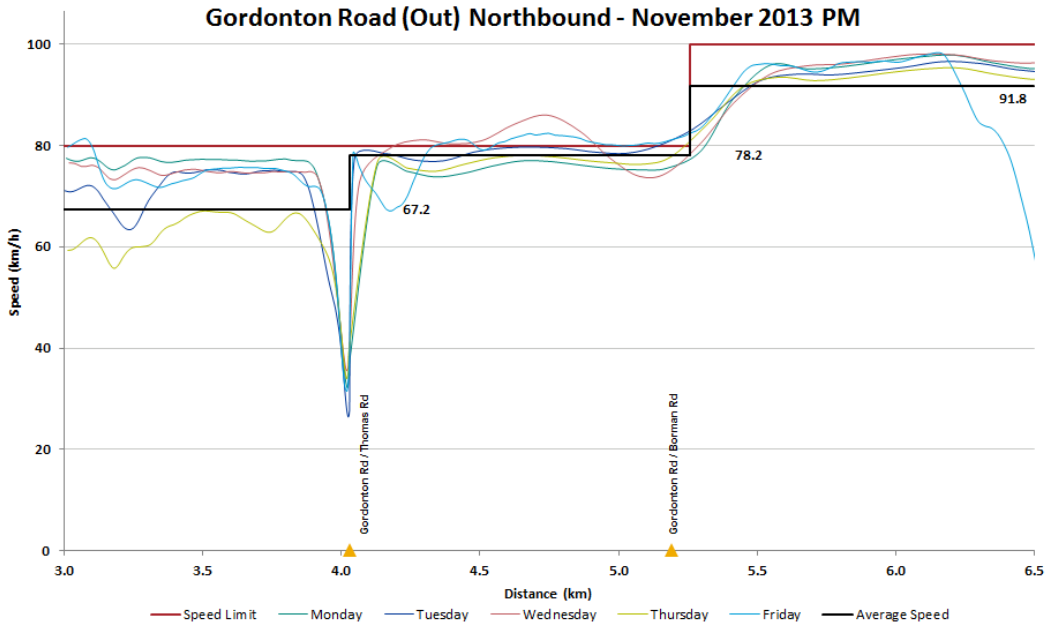


Figure 5.22 November outbound PM peak



Summary

In Segment B, where the speed limit reduction was applied between Borman and Thomas Roads, the mean speed reduced for each of the three inbound survey peak periods: -9.1km/h AM; -3.6km/h IP; and -6.1km/h for the PM peak. The outbound surveys were more varied with differences of: -8.5km/h AM; +1.3km/h IP; and +0.2km/h for the PM peak.

On two occasions the mean speed for Segment B exceeded the new posted 80km/h speed limit during November. On both occasions it was the inter-peak period when lower traffic volumes could be expected,

rather than the AM and PM peak periods. On both occasions the mean speed only exceeded by less than 1.0km/h.

Segment C south of the Thomas Road roundabout experienced significant mean speed increases during November after the speed limit reduction in Segment B. The mean speed increase ranged from +5.4km/h up to +11km/h. However, all of the November mean speeds were still below the existing 80km/h speed limit, with the highest mean being 71.5km/h.

6 Discussion

6.1 Literature review

There is limited literature internationally on the acceptance of and compliance with reduced speed limits, the main focus of this study. Most of the research focuses on driver attitudes and their compliance with standard urban and open road speed limits, and the move toward more enforcement of such speeds. Some of the best research comes from Europe where the fundamental benefits of speed limit reductions have been acknowledged and understood for many years.

A general attitudinal study in Europe found greater acceptance of lower speed limits in urban residential areas than on extra-urban high-speed roads, where compliance with existing limits was lower already. A study into 80km/h rural roads demonstrated, in isolation from any knowledge by drivers of the social consequences of higher speeds, the importance of ensuring that road characteristics were a better match for drivers' perceptions of an appropriate speed limit. Road curvature and sight distances were most strongly correlated with speed perception. The authors concluded that although there would never be a speed limit on a particular road section credible for all drivers, there could be a speed limit more credible for everyone.

Studies by the SRA showed that, while people often disagreed with lower speed limits, a significant proportion of respondents did travel more slowly subsequent to the changes and less than a fifth believed the lower limit had impeded the accessibility of the road. Another study concluded that the setting of speed limits also needed to include the dissemination of the effects of speed limits on safety, mobility and the environment.

In Australia a survey conducted by the automobile clubs, demonstrated low acceptance levels of speed limit changes in the absence of background information and of justification being provided to the community. In contrast, a more definitive survey study showed that, compared with Europe, acceptance of lower speeds on some classes of rural road (undivided two-lane roads and gravel roads) was quite good, with lesser support for urban arterials and residential roads. When presented with some of the facts regarding the benefits of speed reductions, however, acceptance was higher although likely compliance without matching enforcement levels might be less forthcoming.

It could be concluded that while the driving public might not yet be ready to accept lower travelling speeds without question, the compelling arguments for their implementation are likely to help drivers rationalise the changes and justify their acceptance, backed up – as with practically all road safety messages – by levels of enforcement to ensure compliance in the short-to-medium term until such time as the majority of road users accept the new regime as the norm.

6.2 Compliance with speed limits

The trial of speed zoning by the Transport Agency in 2005 and 2006, and the recent reduced speed limits on the Otago Peninsula, show that on winding hilly and mountainous rural roads (site type 1) there is good compliance with reduced speed limits. In most cases the speed limit being applied was close to or above the 85th percentile operating speed, so this intervention was really targeting drivers travelling at speeds above those deemed safe for the conditions. The only concern with the new speed limits was that on some roads there was evidence of speed targeting. This is where drivers increase their speed as the new speed limit is more attainable than the old open road speed limit. This has the potential to increase the risk of serious and fatal crashes, so needs careful monitoring. Based purely on the Otago Peninsula consultation

at this stage, there is evidence that the community is supportive of reduced speed limits in such areas, with little opposition. This is consistent with the findings of the survey of motoring clubs in Australia where there was support for reducing speed limits on gravel roads and some low-volume sealed roads.

The Hastings data shows that good reductions in mean speed (2km/h to 17km/h) can be achieved by reducing speed limits on local authority rural roads from 100km/h to 80km/h. This is dependent on the current operating speed, which is linked to the road cross-section. However, the Hastings experience also involved considerable opposition (poor acceptance) to reduced speed limits on these roads. Countering this was good support from many residents of reduced speed limits. This lack of acceptance of reduced rural speed limits can be seen in the acceptance web survey undertaken as part of this study. There was very little support for a reduction of the general open road speed limit to 80km/h. There was some support for a more modest reduction to 90km/h, but even in this case there was a lot of opposition. It appeared from the public consultation in Hastings that there was little awareness of the road safety risks on these local authority rural roads. This was confirmed in the AA research on perceived risk (Turner 2014), which indicated that drivers' perception of risk was related to the curvature of the road and its width, and not to the presence of roadside hazards and to a certain degree (priority) intersections. This perception of risk is perhaps the reason why there is support for lower speed limits on the mountainous roads discussed above, but not for most of the roads in Hastings, which are flat and straight. Some of these roads are narrow and so this will have some impact on perception of risk. The crash statistics indicate many of these roads are unsafe, which is in part due to drivers not adequately understanding the level of crash risk and driving to the conditions. Educating the public to understand road safety risks is part of the challenge in successfully introducing reduced speed limits on these types of road.

The application of reduced speed limits on high-speed, high-volume and high crash rate state highways is shown in the SH2 (SH1 to SH25) and SH1 Dome Valley case studies. The result of the speed reduction has considerably lowered the mean and particularly 85th percentile speed on both roads, especially on Dome Valley (where the speed limit was dropped to 80km/h – it was lowered to 90km/h on SH2). In both areas there is a heightened level of police enforcement given the high historical crash rates on these road sections. This police enforcement (general patrolling and speed cameras) is likely to contribute to the high reduction in operating speeds, although it has not been possible to measure this. For obvious reasons the police are not willing to vary their level of enforcement on these routes to allow its effect to be measured. A key area of future research is to monitor the impact of police enforcement on other routes where the speed limit may be lowered. This could be achieved by starting with lower levels of enforcement and increasing these over time, and monitoring the operating speeds. There is no information on the public's acceptance or otherwise of these reduced speed limits.

The application of suburban 40km/h speed limits in Hamilton shows the biggest reduction in operating speed is generally as a result of engineering improvements. The installation of the speed limit signs and road markings themselves has a limited impact on the operating speeds. The public's opposition to the 40km/h speed restrictions in suburban streets in Hamilton has grown over time. This is consistent with the acceptance survey undertaken as part of this research, which shows there is little support for dropping speed limits on suburban streets below 50km/h. This is also consistent with the surveys undertaken by the motoring clubs in Australia, which show support for reducing speed limits on some rural roads, but not on urban roads. The European studies show there is support for dropping speed limits on urban streets, which may be due to stronger advocacy by the communities that live in those streets. It appears, based on the Hamilton experience that local communities need to be more vocal in calling for reduced suburban speed limits, or they are unlikely to be installed in the future. In part the solution is to engineer the road so that drivers travel at lower speeds. This is the general approach (self-explaining roads) used by Auckland Transport, rather than dropping the speed limits.

A number of cities are looking at reducing speed limits in their CBD areas and other shopping areas, particularly strip shopping. In both Mt Maunganui in Tauranga and Ponsonby Road in Auckland, the new speed limits (30km/h for Mt Maunganui and 40km/h for Ponsonby Road) closely match the current operating speeds. Hence the speed limits are being installed to target the small proportion of drivers who choose to travel above these new limits. Interestingly the web acceptance surveys show there is fairly good support for dropping speed limits in these areas to 40km/h, with less support to dropping them to 30km/h. The level of acceptance is probably linked to the type of adjoining land use, whether it is a destination or through route, and the current layout of the road. The narrow road widths in Wellington strip shopping areas and the traffic calming in Mt Maunganui do tend to reinforce the need for lower speeds. Further research is required to understand whether drivers accept a 30km/h speed limit in such areas, given most already drive in them at around 30km/h.

6.3 Acceptance surveys

An acceptance web survey was conducted to understand drivers' attitudes to safer (or reduced) speeds. A total of almost 250 responses were received. Given the sample size the results of the survey were compared with other surveys collected in New Zealand, Australia and the USA, where relevant. When broken down by gender females tended to more strongly support safer speeds than males.

The majority of drivers agreed that our roads would be safer if we all drove a little slower. There was also a high level of understanding that serious and fatal crashes are related to travel speeds. There was support for lower speed limits to reduce road trauma and to a lesser degree injury crashes. There was stronger support for drivers to reduce speeds to reduce injury crashes and trauma, indicating that some drivers do not support reduced speed limits to achieve this. USA and Australian research also shows that drivers understand that speed can be responsible for fatal crashes.

The USA research, while not focused on lower speed limits, did provide a relatively detailed insight into drivers' attitudes to speeding. It appears that the majority of drivers class themselves as speeders or sometimes speeders. However a majority would prefer lower speeds, as they feel less safe at higher speeds, which is similar to the New Zealand results. A large proportion indicated they drive faster so they do not hold up traffic. They do not want to delay others. The solution supported by most is that police provide more enforcement of traffic laws, including speed limits, so that other drivers slow down and therefore they can drive slower without delaying others. This would tend to support more speed enforcement, lower tolerance levels for speeding, and while not covered in this survey, reduced speed limits. This is an area that requires further research as on the surface these survey results would seem to support safer speeds. A more comprehensive survey of this type would need to be undertaken in New Zealand to see if attitudes around speeding are similar. The data from the MoT seems to support more enforcement. But it is unclear around New Zealanders' attitudes to lower tolerance levels and whether they share the same attitudes of not holding up traffic and partly speed for this reason.

Drivers' acceptance of reducing speed limits in rural areas, suburban areas and in commercial areas was also examined, with the strongest level of support being for 40km/h speed limits in shopping areas, the least popular being 80km/h speed limits on rural roads and 40km/h speed limits in suburban streets. Drivers were also asked about supplementary advice giving the reason for the speed limit changes and whether this would make them slow down. Just under half of the respondents stated they would slow down if safer speeds signage alone was used. If additional information to support the safer speed area was supplied in addition to the speed limit roundel, eg 'school', 'high crash site' or 'busy shopping street' signs, then even more people said they would slow down. This indicates that drivers would like affirmation of the need to slow down and want to see it displayed with the speed limit roundel. This is an area that

requires further research as there is potential for greater acceptance and subsequently compliance with reduced speed limits, if the public understand why they are slowing down.

6.4 Effectiveness of engineering, education and enforcement

A variety of engineering measures have been used in conjunction with speed limit reductions around New Zealand. This has varied from major engineering changes (self-explaining roads) to various levels of traffic calming (eg installation of a pedestrian crossing refuge) through to installation of simple speed limit signs and road markings. In urban areas the results indicate that on wider roads engineering measures, such as traffic calming measures, are much more effective in driving down speeds than simply installing speed limit signs and road markings. This is consistent with the literature review findings.

In rural areas the design of the road impacts on drivers' perceptions of risk and the speed they think is safe. In hilly and mountainous areas travel speeds are often low, especially on gravel and narrow roads. Research by the AA (Turner 2014) on perceived risk shows a link between road alignment (engineering) and safer speeds. Drivers assessed roads with poor alignment as having a lower safer speed. The data collected in this research shows that drivers do travel slower on these roads, and that often when lower speed limits are introduced they only impact on the higher-speed drivers.

The AA research also indicated that drivers do not perceive a high level of risk associated with roadside hazards and priority intersections. On rural routes with a relatively flat and straight alignment combined with a cross-section that is a medium to wide width, drivers expect to be able to travel at higher speeds. However, there are many roads of this type that have a high number of severe roadside hazards and frequently occurring priority intersections or high opposing traffic volume and several have high crash rates. This is the case on many rural roads in Hastings, on SH2 between SH1 and SH25 and on SH1 through Dome Valley. On these types of road there is generally low acceptance of reduced speeds as the engineering of the road in terms of alignment and cross-section indicates higher speeds are possible. However, despite low levels of acceptance of reduced speeds on such roads, there have been relatively good reductions in speed on them given that generally only the speed signage and some road marking has been changed. This is consistent with the literature, which indicates that while there may be considerable opposition to reducing speeds, once new speed limits are introduced many do comply with the lower speed limit. These case studies indicate it is possible to reduce speed limits on rural roads without extensive engineering changes.

To consider the impact of education, the media campaigns and consultation practices of three speed reduction programmes across New Zealand (Otago Peninsula 70km/h safer speed areas, Hamilton city 40km/h safer speed areas and Hastings district 80km/h safer speed areas) were examined. The Otago Peninsula safer speed area programme was a more typical streamlined consultation and media programme. It consisted of a letter drop to affected residents and discussions with major stakeholders, requests for submissions and a hearing on the planned works. Media releases consisted of articles in the local newspapers and information on DCC's website. Of the three programmes this had the least opposition. However, this was attributed to higher levels of public acceptance of lower speed limits on gravel roads and narrow winding sealed roads. Indeed many residents wanted the speed limits to be below 70km/h. DCC has advised that other speed limit changes in urban areas have faced more opposition this is likely due to lower levels of acceptance.

More extensive consultation and media campaigns were held in Hastings and Hamilton for their safer speed areas. In the case of Hamilton this included radio advertising and development and use of strong

media messages on posters. In Hastings a more extensive consultation was held with the public, not just affected landowners but wider public, including people who travel through some of the routes from outside the district (ie from Napier). Both programmes experienced considerable opposition, which has grown since the reduced speed limit signs have been installed. In both cases, despite the extensive education programme, there seems to be a larger group of the public that do not understand the road safety reasons that justify the speed limit reductions. The information collected did indicate that only a limited group of people heard the radio advertisements, saw the posters, viewed the safer speeds website or engaged in the consultation. It appears that even an enhanced level of education through consultation and media has had a limited impact on changing people's acceptance of reduced speeds in these circumstances. The web surveys indicated low levels of acceptance in reducing open road speed limits below 100km/h, especially down to 80km/h and in reducing speed limits on suburban roads to 40km/h. It appears that the best way to gain acceptance is through communication on supplementary signage about the reason for the reduced speed limit (eg school ahead) and to engineer the road so the speed limit is self-explaining. Further research is required on how best to communicate the reasons for reduced speed limits. This is likely to require more than just the use of safer speed area information.

While some attempts were made (on SH2) to understand the impact of enforcement on compliance of reduced speed limits, a measurable impact of both active speed enforcement (using cameras) and passive police enforcement (through regular police patrols) was not produced. There is information already that speed cameras do reduce speeds on 100km/h roads, although there is a halo effect around the camera, so the speed reduction is fairly localised. Whether the same effect occurs when lower speeds are operating still needs to be studied in New Zealand. While some speed data was collected with and without police patrolling on SH2 there was no measurable differences in the speeds observed. To study this area in more detail it would be necessary to vary the level of police activity over perhaps a period of a year with increased police present over time, to see if speeds do reduce. This was not an option along SH2.

7 Conclusions and recommendations

7.1 Conclusions

The literature review found that in Europe there was greater acceptance of reduced speed limits in urban areas compared with higher speed roads. In Australia there was further acceptance of reduced speed limits on some rural roads, especially gravel and low-standard sealed roads.

The acceptance survey undertaken in this study indicated there is some support for reduced speed limit in some parts of urban areas, but less support for reducing rural speed limits. The strongest level of support is for 40km/h speed limits in shopping areas; the least popular being 80km/h speed limits on rural roads and 40km/h speed limits in suburban streets.

The trial of speed zoning by the Transport Agency in 2005 and 2006, and the recent reduced speed limits on the Otago Peninsula, show that on winding hilly and mountainous rural roads there is good compliance with reduced speed limits. Based purely on the Otago Peninsula consultation at this stage, there is evidence that the community is supportive of reduced speed limits in such areas, with little opposition.

The Hastings data shows that good reductions in mean travel speed (2km/h to 17km/h) can be achieved by reducing speed limits on local authority rural roads from 100km/h to 80km/h. However, the Hastings experience also involves considerable opposition (poor acceptance) to reduced speed limits on these roads, often by people who do not live on these roads. Countering this was good support from many local residents of the reduced speed limits. Good speed reductions were also observed on SH2 (SH1 to S25) following the reduction in speeds from 100km/h to 90km/h. In this case, heightened levels of police enforcement were likely to have contributed to good speed reductions.

The application of suburban 40km/h speed limits in Hamilton shows that the biggest reduction in operating speed is a result of engineering improvements. Speed limit signs and road markings on their own have a limited impact on the operating speeds. The public's opposition to the 40km/h speed restrictions in suburban Hamilton streets has grown over time. This is consistent with the acceptance survey undertaken as part of this research which shows there is little support for dropping speed limits on suburban streets below 50km/h. However, there is also strong support from the local residents for a reduced speed limit.

The acceptance web survey shows that the majority of drivers agreed our roads would be safer if we all drove a little slower. There was also a high level of understanding that serious and fatal crashes are related to travel speeds. There was general support for lower speed limits to reduce road trauma and to a lesser degree injury crashes. The USA and Australian research also shows that drivers understand speed can be responsible for fatal crashes.

The acceptance survey also shows that drivers would be more likely to slow down, if certain supplementary information explaining the reason for speed limit change was provided. Just under half of the respondents stated they would slow down if only safer speeds signage was used. If additional information to support the safer speed area was supplied, eg 'school', 'high crash site' or 'busy shopping street' signs, then even more people said they would slow down. This indicates that drivers would like affirmation of the need to slow down and want to see it displayed with the speed limit roundel. However a further survey needs to be undertaken to tease out what 'reasons' are likely to be more effective.

A variety of engineering measures have been used in conjunction with speed limit reductions around New Zealand. In urban areas the results indicate that on wider roads, engineering measures such as traffic

calming measures, are much more effective in driving down speeds than simply installing speed limit signs and road markings. In rural areas the design of the road impacts on drivers' perceptions of risk and the speed they think is safe. Research shows that drivers do travel more slowly on these roads, and that often when lower speed limits are introduced they only impact on the higher-speed drivers.

To consider the impact of education, media campaigns and the consultation practices, three of the speed reduction programmes across New Zealand (Otago Peninsula 70km/h safer speed areas, Hamilton city 40km/h safer speed areas and the Hastings 80km/h safer speed areas) were examined. Of the three programmes, Otago Peninsula's had the least opposition. This was attributed to higher levels of public acceptance of lower speed limits on gravel roads and narrow winding sealed roads. Indeed many residents wanted the speed limits to be reduced further to below 70km/h.

The other two programmes (Hamilton and Hastings) experienced considerable opposition which has grown over time, despite extensive education programmes. The web acceptance surveys show there are low levels of support for dropping speed limits on suburban streets and rural roads with relatively good road alignments. In both cases there seems to be a larger group of the public that does not understand the road safety reasons that justify the speed limit reductions. Hence the opposition could be expected and it is therefore important to plan for such opposition and also encourage local residents who support such changes to be vocal in promoting them.

While there is some evidence that increased speed enforcement on SH2 (SH1 to SH25) is helping with compliance of the 90km/h speed limit, this study has not be able to show strong evidence of this. This is an important area where further research is required.

7.2 Recommendations

We recommend further research be undertaken in the following areas:

- Survey the public's attitudes around what information needs to be provided to support reduced speeds at certain locations, on signs and markings and in general media messages.
- Gain a better understanding of attitudes around speeds, including the link between improved safety of lower speeds, desire to keep up with traffic flow and the view that police should enforce speed limits to make drivers safer.
- Collect more before and after data on reduced speed limits to better understand compliance or otherwise.
- Study active and passive speed enforcement and the levels required to get better compliance.

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Appendix A: ARRB report findings

APPENDIX A SURVEY DETAILS

Route No.	Route Name	Region	Date of baseline survey	Weather conditions	12 months later	Weather conditions	Survey equipment used
1	Akatawara Rd	Wellington	June 2006	???	April 2007	Cloudy / rain	"Loops"
2	Blue Mountains Rd	Otago	May 2005	Not known	June 2006	Not known	Not known
3	Coatesville to Riverhead	Auckland	June 2006	???	May 2007	???	Radar gun
4	Makahara	Wellington	June 2006	???	June 2007	???	"Tubes"
5	Middleton Rd	Wellington	May 2005	Not known	May 2007*	Not known	Not known
6	Ohakune Mountain Rd	Wellington	June 2006	???	July 2007	???	"Loops"
7	Queen Charlotte Drive	Wellington	September 2006	???	September 2007	???	"Tubes"
8	Porirua / Kapiti Coast	Wellington	May 2005	???	April 2006**	???	???
9	Port Underwood Road	Marlborough	July 2005	???	June 2007*	???	"Tubes"

* Two year gap between surveys

** Some surveys taken in July due to vandalism of equipment

APPENDIX B INDIVIDUAL SITE RESULTS

		Before survey						After survey					
		Spd Limit	Mean	Std. Dev.	P85	% Comply	N	Spd Limit	Mean	Std. Dev.	P85	% Comply	N
Route 1	Site 1	100.00	56.9	8.0	64.0	100.0%	7759	50.00	55.0	7.5	62.0	21.3%	9845
	Site 2	100.00	63.4	10.7	73.3	99.9%	4870	70.00	61.8	10.7	71.9	80.7%	6094
	Site 3	100.00	53.7	8.9	62.2	100.0%	2265	70.00	53.3	9.0	61.8	96.7%	3052
	Site 4	100.00	51.2	9.0	59.6	100.0%	1624	70.00	52.4	8.5	60.9	.0%	2189
	Site 5	100.00	35.6	7.7	42.9	100.0%	1017	50.00	30.8	5.5	36.0	100.0%	1395
Route 2	Site 1	50.00	51.7	6.6	59.0	42.4%	151	50.00	50.4	7.2	57.0	48.1%	291
	Site 2	100.00	47.9	9.5	58.0	100.0%	101	50.00	44.7	6.7	50.0	87.3%	205
	Site 3	100.00	38.1	6.1	45.0	100.0%	77	50.00	40.6	6.6	47.0	95.2%	189
	Site 4	100.00	39.4	7.2	46.0	100.0%	50	100.00	46.4	6.9	53.0	100.0%	133
Route 3	Site 1	100.00	78.2	10.2	88.0	97.4%	453	80.00	70.8	9.3	80.0	87.5%	200
	Site 2	100.00	76.9	9.6	87.0	99.0%	402	80.00	79.0	9.1	88.0	56.1%	301
	Site 3	60.00	54.6	8.2	62.0	78.7%	469	60.00	57.5	7.3	64.0	68.9%	450
	Site 4	100.00	79.0	10.5	89.0	98.3%	356	80.00	79.5	6.7	86.0	53.7%	307
	Site 5	100.00	78.3	10.8	89.0	98.4%	320	80.00	81.7	8.9	90.0	45.1%	355
	Site 6	70.00	69.0	8.1	76.0	61.2%	389	70.00	64.8	7.9	72.0	79.6%	456
	Site 7	80.00	79.3	9.1	88.0	55.6%	387	80.00	78.2	8.5	85.0	60.6%	462
	Site 8	100.00	71.8	11.5	84.0	99.1%	216	100.00	67.7	9.5	77.0	100.0%	200
Route 4	Site 1	100.00	44.9	5.0	50.0	100.0%	7129	50.00	42.6	5.3	48.0	94.9%	7677
	Site 2	100.00	62.4	16.6	78.0	99.3%	2876	60.00	58.5	15.3	73.0	48.3%	3210
	Site 3	100.00	58.8	12.4	71.0	99.8%	1302	60.00	56.4	13.7	69.0	64.3%	1481
	Site 4	100.00	49.0	9.0	58.0	100.0%	962	60.00	45.2	10.0	55.0	95.0%	1291
	Site 5	100.00	51.7	8.0	59.0	100.0%	1735	60.00	48.4	8.3	56.0	92.9%	1850
	Site 6	100.00	47.6	7.9	55.0	100.0%	2365	60.00	46.2	8.8	54.0	96.5%	2698
	Site 7	70.00	61.4	11.5	72.0	81.7%	3475	50.00	56.5	10.9	66.0	23.5%	3440
	Site 8	100.00	36.1	4.0	40.0	100.0%	5866	50.00	32.4	4.0	36.0	100.0%	6051

		Before survey						After survey					
		Spd Limit	Mean	Std. Dev.	P85	% Comply	N	Spd Limit	Mean	Std. Dev.	P85	% Comply	N
Route 5	Site 1	50.00	55.1	7.5	62.0	25.5%	255	50.00	51.3	5.7	57.0	47.5%	200
	Site 2	70.00	65.1	10.5	75.0	76.1%	306	70.00	60.5	7.2	67.0	92.5%	200
	Site 3	100.00	64.0	8.8	72.0	100.0%	218	70.00	59.1	6.9	66.0	93.0%	200
	Site 4	50.00	48.5	5.7	54.0	67.1%	307	50.00	49.9	4.8	55.0	59.0%	200
Route 6	Site 1	100.00	38.8	8.2	47.7	100.0%	2741	50.00	41.0	9.2	50.9	82.9%	3746
	Site 2	100.00	66.8	12.4	79.9	99.5%	742	80.00	65.8	13.3	80.0	85.1%	1620
	Site 3	100.00	72.1	14.8	86.7	96.6%	727	80.00	72.4	15.5	88.0	71.1%	1651
	Site 4	100.00	66.2	14.6	79.6	98.6%	621	80.00	65.1	16.2	81.1	83.5%	1466
	Site 5	100.00	34.0	6.1	39.7	100.0%	593	60.00	33.4	6.5	40.1	100.0%	1310
Route 7	Site 1	100.00	71.6	15.9	87.0	97.8%	6005	70.00	71.9	14.0	85.0	44.1%	5624
	Site 2	100.00	47.2	6.6	54.0	100.0%	5364	50.00	47.1	6.8	54.0	72.3%	5053
	Site 3	100.00	40.7	5.1	46.0	100.0%	5281	50.00	44.8	5.7	50.0	85.2%	4960
	Site 4	100.00	65.8	10.8	76.0	100.0%	4898	90.00	70.0	11.4	81.0	97.1%	4393
	Site 5	100.00	77.2	17.8	94.0	92.8%	5351	90.00	78.8	14.6	93.0	80.5%	4840
	Site 6	100.00	76.2	18.5	93.0	93.9%	2865	90.00	75.2	17.4	91.0	84.8%	2726
	Site 7	50.00	50.4	10.1	60.0	51.0%	2450	50.00	52.4	10.6	62.0	41.3%	2369
	Site 8	100.00	52.1	9.9	62.0	100.0%	2388	60.00	54.4	9.5	63.0	76.6%	2299
	Site 9	50.00	50.0	11.3	61.0	49.0%	2817	50.00	51.7	11.2	62.0	42.7%	2465
	Site 10	100.00	29.5	7.4	37.0	100.0%	1857	50.00	35.9	4.7	41.0	99.5%	2680
	Site 11	100.00	53.4	9.2	62.0	99.8%	3307	50.00	53.5	9.4	62.0	37.1%	3155

		Before survey						After survey					
		Spd Limit	Mean	Std. Dev.	P85	% Comply	N	Spd Limit	Mean	Std. Dev.	P85	% Comply	N
Route 8	Site 1	100.00	75.1	10.1	86.0	99.5%	200	80.00	76.1	7.3	84.0	74.5%	200
	Site 2	100.00	67.7	7.1	74.0	100.0%	200	80.00	68.0	6.7	75.5	97.5%	200
	Site 3	50.00	49.6	5.4	55.0	60.5%	200	50.00	55.3	5.9	61.0	18.0%	200
	Site 4	100.00	45.1	8.0	54.0	100.0%	105	60.00	52.6	7.1	60.0	90.9%	77
	Site 5	100.00	47.3	6.7	55.0	100.0%	46	60.00	45.0	8.4	51.0	97.7%	44
	Site 6	50.00	40.3	7.4	46.0	92.5%	106	50.00	39.1	6.5	44.5	93.8%	80
	Site 8	100.00	69.5	7.9	77.0	100.0%	174	70.00	61.4	7.2	69.0	90.4%	94
	Site 9	100.00	71.7	11.6	84.0	99.0%	200	70.00	61.1	9.0	70.0	85.6%	187
	Site 10	100.00	72.4	6.4	80.0	100.0%	203	70.00	74.5	9.6	82.0	37.3%	75
	Site 11	100.00	84.0	12.2	97.0	88.9%	198	80.00	77.2	8.3	86.0	71.1%	149
	Site 12	100.00	71.0	10.9	82.0	99.0%	200	80.00	73.4	11.3	84.0	78.3%	175
	Site 13	50.00	52.3	6.4	59.0	41.8%	201	50.00	52.4	5.8	58.0	39.1%	207
Route 9	Site 1	50.00	48.7	8.4	56.0	57.8%	11136	50.00	44.7	9.5	53.0	74.4%	11527
	Site 2	100.00	47.6	9.8	57.0	100.0%	840	50.00	43.1	8.3	51.0	82.4%	2244
	Site 4	100.00	35.7	12.3	49.0	100.0%	335	50.00	32.2	12.2	46.0	93.3%	435
	Site 5	100.00	35.5	8.5	44.0	100.0%	201	50.00	32.6	7.3	40.0	99.6%	264
	Site 7	100.00	44.0	11.0	55.0	100.0%	387	50.00	42.0	11.5	53.0	77.0%	378
	Site 8	100.00	38.1	7.3	46.0	100.0%	1292	50.00	36.5	6.4	43.0	98.3%	1405
	Site 9	100.00	44.7	9.9	54.0	100.0%	1384	50.00	40.7	9.0	49.0	88.0%	1529
	Site 11	70.00	72.6	13.5	84.0	43.6%	3880	70.00	66.9	15.3	79.0	63.1%	3991

Appendix B: Otago Peninsula media

Considerations when setting and reviewing speed limits

Here are some things road controlling authorities take into account when setting speed limits:

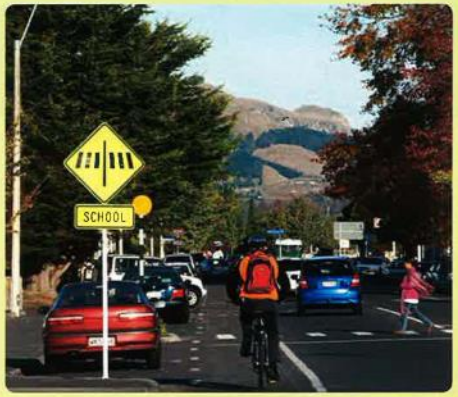
- **Speed limits must make sense to drivers.**
  Motorists are less likely to comply with speed limits that are seen as too low for the road. Realistic and credible limits are observed by most drivers, and are more effective in regulating speeds and reducing crashes.
- **Lowering a speed limit does not always lower vehicle speeds.**
  If speed limits are in place but not observed by many drivers, it can provide a false sense of security for other road users, particularly pedestrians.
  Unrealistically low speed limits can give people the impression that drivers are travelling slower than they actually are.
  While reducing a speed limit has some impact on driver speeds, the main factors influencing a driver's choice of speed are the road environment and the traffic and journey conditions.
- **The 'speed limit' and a 'safe speed' may differ.**
  The speed limit is the maximum legal speed for a driver on the road in perfect conditions.
  Drivers should adjust their speeds to the conditions, including weather, traffic congestion, pedestrians on the road and activity from roadside areas such as schools, shopping centres and leisure facilities.
- **The speed limit should support what the road is used for.**
  Different roads can have different functions. Some are designed and located to make walking and cycling the preferred, safe and easy option (30km/h), others are better suited to a mixed use by cars, buses, and pedestrians (40-60km/h), while some are better suited only to cars, heavy vehicles and freight movement (50-100km/h).

How can you be involved?

You have the opportunity to be involved in setting new speed limits through your road controlling authority's consultation process.

If you want to request a review of an existing limit on a local road, please contact your local city or district council in the first instance.

To request a review of a speed limit on a state highway or on a local road, within Dunedin City Council boundaries, please contact your local NZTA office or the Dunedin City Council as appropriate.



For more information

For more information on the setting of speed limits, please refer to the NZTA's website www.nzta.govt.nz and search for 'Land Transport Rule: Setting of Speed Limits 2003'.

Dunedin City Council
Transport Operations
Transportation Engineer
Ph (03) 477 4000

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

Speed limits
How you can be involved

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

Speed limits are an important component of making our roads safe for those who use and live near them.

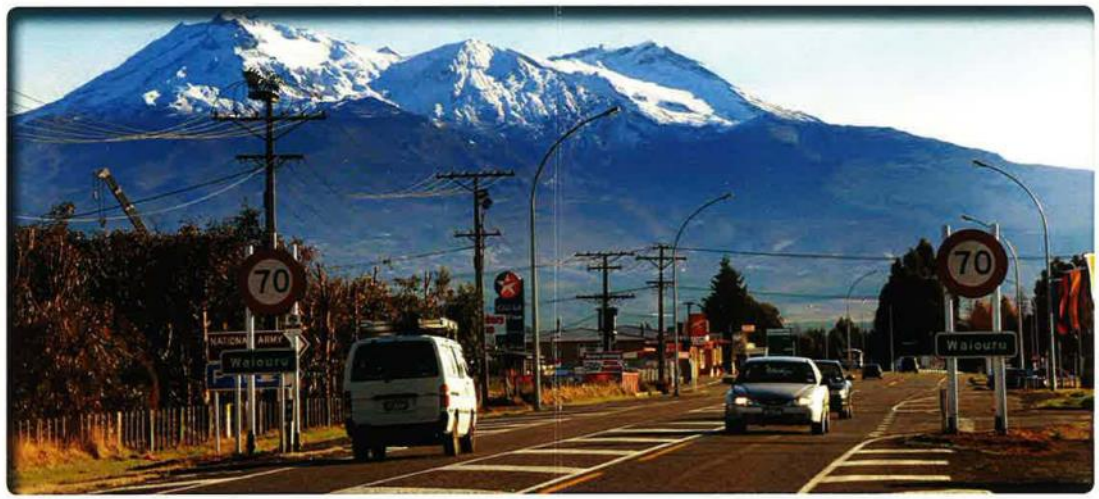
Local road controlling authorities (councils) set speed limits for local roads, and the NZ Transport Agency (NZTA) sets them for state highways.

Safe speed limits take into account the amount of roadside development (schools, houses, shops) and reflect the nature, design, function and use of roads.

Road controlling authorities are able to set speed limits from 10 to 100km/h, in increments of 10km/h. They are also able to set variable (changeable) speed limits (eg 40km/h variable speed limits outside schools).

Speed limits can be a source of concern to communities. If you're concerned about the speed limit on a stretch of road in your area, you can request that your road controlling authority review the speed limit in line with the current legislation[1].

1 Land Transport Rule: Setting of Speed Limits 2003.



The legislation in a nutshell

- A speed limit can be changed, following review and consultation, if a different limit would be safe and appropriate according to the nature, function and use of the road.
- In urban areas a permanent speed limit lower than 50km/h may be set where the road has been engineered so that travel speeds are not more than 5km/h over the lower limit.

Communities can influence decisions on speed limits

Legislation requires road controlling authorities to consult local communities that are affected by a proposed speed limit change, giving them the opportunity to be involved in the process.

You can also request that your road controlling authority review an existing speed limit.

As speed limits are not looked at in isolation and many factors are taken into account when setting them, your views will be valuable in shaping decisions on safe solutions. Changing speed limits is most effective for improving safety on our roads when undertaken as part of a package of actions.

A Safe System approach, as outlined in *Safer Journeys: New Zealand's road safety strategy 2010–2020* (www.saferjourneys.govt.nz), looks at all parts of the roading system:

- Safe road use.
- Safe roads and roadsides.
- Safe speeds.
- Safe vehicles.

All these elements are looked at as a whole as part of the bigger safety picture.

As part of *Safer Journeys*, the NZTA will be reviewing New Zealand's current speed management policy so that it better reflects a Safe System approach to setting speed limits across New Zealand. Setting speed limits using a Safe System approach may require changes to current legislation.

Otago Peninsula media coverage

Source: Dunedin City Council (2012)

1. Otago Daily Times Chris Morris on Wed, 20 Jun 2012

Life in the slow lane likely for Peninsula

Speed limits could be about to come down on Otago Peninsula roads as part of a push to improve road safety. The DCC is to consult the public over results of a speed limit review, which recommended lower limits for 30 sections of roads across Otago Peninsula, including parts of Portobello and Highcliff Rds. The changes would see the end of 100kmh speed limits on the Peninsula, with all remaining sections reduced to lower limits of 80kmh, 70kmh or 50kmh, Otago Peninsula Community Board chairman John Bellamy said.

'There's very few places you can actually do that with any safety. It was a no-brainer really,' he said.

The review, commissioned last year, had also recommended a lower 30kmh speed limit for John Wilson Ocean Dr, once the road reopened to vehicles. The results were presented to a recent planning and environment committee meeting, with councillors voting to release the list of changes for public consultation beginning on July 2. Submissions would close on August 2, with a public hearing to follow if required, before councillors signed off on changes in September, a report by council transportation engineer Diana Munster said. Mr Bellamy told the *Otago Daily Times* the review came after the board last year asked the council to bring forward the next scheduled review of Peninsula speed limits, which was not due until 2014. Board members wanted to end the "ridiculous" situation under which roads without posted speed limits automatically defaulted to 100kmh, he said. That was despite the "narrow and winding" nature of many Peninsula roads, he said. "We always thought that was a ridiculous situation for the back bays and the small roads ... our aim was always to try and get a blanket 70kmh [limit] over the entire Peninsula, and then have each individual road signified to be what it should be." The changes would help ensure the safety of all road users and address the spread of housing into higher-speed zones, he said. The review also followed the announcement earlier this month nine sites along Portobello Rd had been prioritised for remedial work in the 2012-13 year, following a council investigation into the number of cars crashing into Otago Harbour. In the speed limit review, council staff assessed 28 roads across the Peninsula, including all those with a 100kmh limit, and three - Portobello, Highcliff and Harington Point Rds - with lower 70kmh or 80kmh limits but higher crash rates, the report said. The review recommended "credible and consistent" limits that took into account safety, road characteristics and the environment, road users and surrounding developments, the report said. The results had identified "inconsistencies" in some speed limits, and recommended changes to 30 sections of roads - including, in some cases, multiple sections of the same road - across the Peninsula. Of the Peninsula's major roads, Harington Point Rd's limits were considered appropriate, but changes were recommended on Portobello Rd, reducing the limit from 70kmh to 50kmh between Nicholas St and Seaton Rd. That reflected Portobello's expanding village boundary, as well as safety concerns raised by police, the report said. Highcliff Rd should also have a lower speed limit between Pukehiki and Seaton Rd, down from 80kmh to 70kmh, the report said.

That was due to the road's high crash rate and one-lane sections along the section of road. Councillors in December also asked for John Wilson Ocean Dr to be added to the review, which recommended lowering the road's 50kmh limit to 30kmh to match planned traffic-calming measures.

Mr Bellamy said submissions would show whether anyone thought the Peninsula changes went too far, but "as far as the board's concerned that's not really a valid issue".

"The issue is road safety, pedestrian safety, and people just have to abide by sensible speed limits." chris.morris@odt.co.nz

2. **Otago Daily Times.** David Loughrey on Sat 2 July 2011

Speed limits on Otago Peninsula roads will be the subject of the next DCC speed limit review, after passionate arguments about road safety problems in the area in May.

3. **Otago Daily Times.** Debbie Porteous on Mon 10 Sep 2012

50 make submissions on peninsula speed limits

More than 50 people have made a submission on lowering speed limits on more than 30 sections of road on Otago Peninsula, most of them in favour of the proposal. The DCC proposes to reduce the speed limits on most rural roads on the peninsula to 70kmh, with a maximum of 80kmh on others. The speed limits were reviewed after the Otago Peninsula Community Board sought an end to the situation of roads without posted speed limits, many of them narrow and winding, automatically defaulting to 100kmh. Council staff assessed 28 roads across the peninsula and recommended changes, based on safety, road characteristics, the environment, road users and surrounding developments.

The council consulted the public over the proposals in July and a hearings subcommittee of councillors Kate Wilson, Fliss Butcher and Jinty MacTavish will hear from 12 of 54 submitters on Wednesday. A staff report to the subcommittee said 28 of the submissions were in full support of the proposed changes, 21 were partly supportive - most wanted lower limits on specific roads - and five were opposed. Supporters included police, the Otago Peninsula Community Board, Larnach Castle and the Road Transport Association. Only four of the 10 submitters supported the proposed speed limit. Of the 12 submitters to speak to their submissions, most supported having a lower speed limit than proposed on specific roads. **The report noted some submitters wanted 50kmh or 60kmh limits on some or all roads, especially outer peninsula gravel roads within Hoopers Inlet, Papanui Inlet and Sandymount, but the staff report said that by the time the road user reached those lower-standard roads, it was expected they would adjust to the environmental cues anyway, and a 70kmh limit was considered appropriate**.

Any changes would be ratified by the council in December and come into effect on February 1, 2013.

4. **Otago Daily Times.** Debbie Porteous on Thu 13 Sep 2012

Move to cut speed limits around city:

Kate Wilson said travellers on some Otago Peninsula roads could be taking life in an even slower lane from March next year, if the DCC agrees to recommendations made by its speed limits bylaw subcommittee yesterday. Subcommittee chairwoman Cr Kate Wilson said the exercise of hearing submissions on proposed reductions to speed limits on the peninsula to a maximum of 80kmh was refreshing, as many submitters remarked how happy they were with the consultation council transportation staff had undertaken in drafting their proposals.

The commendations from the community were so impressive that the subcommittee, of Crs Wilson, Fliss Butcher and Jinty MacTavish, suggested the consultation example be shared with other departments and with staff undertaking the council's consultation review, as a model that worked well. The councillors heard from 12 of 54 submitters at a hearing yesterday, after which they deliberated and made their recommendations.

From the original proposed speed limits on 30 sections of the peninsula's roads, announced in June, only four changes would be made in the subcommittee's recommendations to council. They were that speed limits be reduced to 70kmh on Camp and Castlewood Rds, to 50kmh on Tomahawk Rd (from Centre Rd to the end) and Southdale Rd. The latter decision followed some "very good" submissions that suggested the speed limit be lowered, Cr Wilson said.

The subcommittee recommended the changes take effect by March 1. It also recommended further liaison with the community and Otago Peninsula Community Board and a report be provided, with information on

signage and budget implications, on a staff suggestion that the council consider participation in a safer speeds demonstration trial.

Being part of the trial would mean the effect of the speed limit changes would be monitored and reviewed and the findings used to assist in developing national guidelines under the Government's safer journeys action plan.

The council will be asked to ratify the new speed limits and other recommendations next month.

5. By Debbie Porteous on Wed 31 Oct 2012

The top speed on the Otago Peninsula will be 80kmh from March, after the DCC this week approved sweeping speed-limit reductions in the area.

Councillors also agreed some of the rural peninsula area reviewed would be part of a national study which would contribute to developing best practice for implementing safe speed limits.

The council voted unanimously on Monday to accept the recommendations from the speed-limit bylaws hearing subcommittee to reduce the speed limits on 29 peninsula roads, from up to 100kmh to a maximum of 80kmh.

The recommendations followed extensive council staff consultation with peninsula residents and 54 submissions during a formal public consultation process, which showed most people supported the reduction of speed limits in the area.

Councillors also voted to participate in a safe-speeds demonstration trial, although only after more information on signage and budget implications was received and further discussions with the community and the Otago Peninsula Community Board.

The trial would be part of national research to better understand "safe" speed limits by setting up demonstration areas where speeds had actually been specifically set to be safe and appropriate, as councillors had decided to do on the peninsula.

The main difference between a safe-speeds demonstration area and business as usual would be special signage and markings in the area and more intensive surveying of road use and the local community, and publicity, transportation engineer Diana Munster told councillors in a report.

She said there was a lack of information about what speeds were actually safer on rural roads, and the purpose of the research was to increase the general understanding of the impact of "safe" speed limits on traffic speed and safety, and what the limits meant to road users and the community.

The area involved in the trial would be bounded by Highcliff Rd (Pukehiki village to Portobello), Castlewood, Allans Beach and Weir Rds, which, with the exception of a 50kmh limit on Camp Rd, has a new area-wide 70kmh limit.

Participating would come at a cost of $25,000 more than the $30,000 budgeted in the annual plan for signage to change speed limits across the peninsula, but the money would be sourced from external funding.

Given there was a lack of guidance nationally regarding setting safe speed limits, the benefits to the council of participating in the trial would be ensuring any national guidelines developed were appropriate to Dunedin and that the city was at the forefront of the development of safe speed limits, Ms Munster said.

debbie.porteous@odt.co.nz

Appendix C: Online survey

Community Attitudes to Speed Limits

1. About You

We are conducting a survey to get your ideas and your opinions about speeding and speed limits on New Zealand roads. We would be very grateful for your help. This survey should only take 15 minutes to complete.

Your answers are confidential and you personal details will not be passed on to anyone else. Please answer the questions as truthfully as you can as your responses will help in tackling this important issue.

The first few questions are about you and then we look at your travel patterns

1. Are you male or female?

- ○ Male
- ○ Female

2. Are you in the age group...

- ○ 16-20
- ○ 21-25
- ○ 26-35
- ○ 36-45
- ○ 46-55
- ○ 56-65
- ○ 66 and over

3. Do you currently hold any of the following? (tick one or more boxes)

- ☐ New Zealand Learner licenece
- ☐ New Zealand Restricted drivers licence
- ☐ New Zealand Full driver licence
- ☐ New Zealand Motorcycle licence
- ☐ New Zealand Heavy vehicle licence
- ☐ International licence
- ☐ No licence

*4. What is the post code of where you live?

City/Town:

Postal Code:

Page 1

Community Attitudes to Speed Limits

2. Travel Patterns

5. What type of road or street is your house on?

- ○ Busy main road
- ○ Local residential street
- ○ Street joining busy main road to local residential street
- ○ Rural road or highway
- ○ Other

6. What is the speed limit of the road or street that your house is on?

- ○ 40 km/h
- ○ 50 km/h
- ○ 60 km/h
- ○ 70 km/h
- ○ 80 km/h
- ○ 90 km/h
- ○ 100 km/h

7. Do you regularly use a car?

- ○ As a driver only
- ○ As a passenger only
- ○ Both driver and passenger
- ○ Don't travel by car

Page 2

Community Attitudes to Speed Limits

3. Travel Patterns

8. In what area are most of your trips as a driver?

- ○ Towns, built-up or urban areas
- ○ Country/rural areas
- ○ Combination of both

9. On average, how far do you normally drive in a week?

- ○ Up to 50km per week (2,500km per year)
- ○ 51-100km per week (2,501-5,000km per year)
- ○ 101-200km per week (5,001-10,000km per year)
- ○ More than 200km per week (10,000km per year)

Page 3

Community Attitudes to Speed Limits

4. Speed and Speeding

We are now going to seek your opinion on speeding and speed limits. Your answers will be kept fully confidential.

Please think about times when there is no traffic congestion and drivers are unimpeded by other traffic

10. When you drive does safety influence your choice of speed?

- ○ Always
- ○ Sometimes
- ○ Rarely
- ○ Never

11. If all drivers drove a little slower, then the roads would be

- ○ Much safer
- ○ A bit safer
- ○ No change
- ○ A little less safe
- ○ A lot less safe

12. Do you agree or disagree with the following statement: "If drivers slow down, then people will be less seriously injured if a crash happens"

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree or disagree
- ○ Somewhat disagree
- ○ Strongly disagree

Page 4

Community Attitudes to Speed Limits

13. Do you agree or disagree with the following statement: "If drivers slow down, then fewer crashes will happen"

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

Please explain why you think this

14. "Lowering speed limits would reduce the number of crashes on our road". Do you agree or disagree with this statement?

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

15. "Lowering speed limits would result in people being less seriously injured if a crash does occur". Do you agree or disagree with this statement?

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

Page 5

Community Attitudes to Speed Limits

16. "A reduction of all current speed limits by 10 km/h would result in a significant increase in travel time". Do you agree or disagree with this statement?

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree or disagree
- ○ Somewhat disagree
- ○ Strongly disagree

17. If the speed limit sign on an urban road was changed from 50km/h to 40km/h how much longer would it take (in minutes) to drive 10km on that road?

Page 6

Community Attitudes to Speed Limits

5. Views on Speed Limits and Travel Speeds

We are now seeking your opinion regarding speed zones and what limits should be set. Please remember that we are after your honest opinion and there are no right or wrong answers.

Consider two-lane undivided rural roads - the normal sealed road, not the big highways nor major arterial roads; there are no speed limit signs but the default speed limit is 100km/h

18. What speed do you typically travel at on this type of road with a 100km/h limit when there is no traffic congestion?

- ○ Greater than 110 km/h
- ○ About 110 km/h
- ○ About 105 km/h
- ○ About 100 km/h
- ○ About 95 km/h
- ○ About 90 km/h
- ○ About 85 km/h
- ○ About 80 km/h
- ○ Less than 80 km/h
- ○ Other (please specify)

19. What would you think if the speed limit on roads like this (two-lane undivided rural roads) currently with a default 100km/h speed limit was lowered to 90km/h?

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

Page 7

Community Attitudes to Speed Limits

20. What would you think if the speed limit on roads like this (two-lane undivided rural roads) currently with a default 100km/h speed limit was lowered to 80km/h?

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

Page 8

Community Attitudes to Speed Limits

6. Views on Speed Limits and Travel Speeds

Now let's consider roads and streets in busy shopping areas where pedestrian activity is high and speed limits are currently set at 50 km/h

21. What speed do you typically travel at on street in busy shopping area when car traffic does not restrict your speed choice but there is a reasonable amount of pedestrian traffic?

- ○ Greater than 60 km/h
- ○ About 60 km/h
- ○ About 55 km/h
- ○ About 50 km/h
- ○ About 45 km/h
- ○ About 40 km/h
- ○ About 35 km/h
- ○ About 30 km/h
- ○ Less than 30 km/h
- ○ Other (please specify)

22. What would you think if the speed limit on roads like this, currently set at 50km/h, was lowered to 40km/h?

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

23. What would you think if the speed limit on roads like this, currently set at 50km/h, was lowered to 30km/h?

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

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Community Attitudes to Speed Limits

7. Views on Speed Limits and Travel Speeds

Now let's consider local residential streets that allow local residents to access the main roads; the default speed limit is currently set at 50km/h

24. What speed do you typically travel at on this type of street when car traffic does not restrict your choice of travel speed?

- ○ Less than 30 km/h
- ○ About 30 km/h
- ○ About 35 km/h
- ○ About 40 km/h
- ○ About 45 km/h
- ○ About 50 km/h
- ○ About 55 km/h
- ○ About 60 km/h
- ○ Greater than 60 km/h

Other (please specify)

25. What would you think if the speed limit on local residential streets like this, currently set at 50km/h, was lowered to 40km/h?

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

26. Do you think that the speed at which traffic travel along the road or street where you live is:

- ○ Far too low
- ○ A bit too low
- ○ About right
- ○ A bit too high
- ○ Far too high

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Community Attitudes to Speed Limits

8. Views on Speed Limits and Travel Speeds

27. Look at the picture of the speed limit sign above: do you think that the refeerence to "Safer Speed Area" will help you slow down more than you might have normally?

- ○ Very likely
- ○ Likely
- ○ Neither likey nor unlikely
- ○ Unlikely
- ○ Very unlikely

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Community Attitudes to Speed Limits

28. Now consider another type of speed limit sign where, under the speed limit, is an explanation of why you should slow down - such as "high crash zone", "children crossing" or "busy shopping street".

Do you think that these speed signs with the extra wording will help you to slow down more than you might have normally?

- ○ Very likely
- ○ Likely
- ○ Neither likely nor unlikely
- ○ Unlikely
- ○ Very unlikely

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Community Attitudes to Speed Limits

9. Speed and Speeding

We are now going to seek your opinion on speeding and speed limits and speed limits. Your answers will be kept fully confidential.

Please think about times when there is no traffic congestion and drivers are unimpeded by other traffic

29. When you drive does safety influence your choice of speed?

- Always
- Sometimes
- Rarely
- Never

30. If all drivers drove a little slower, then the roads would be

- Much safer
- A bit safer
- No change
- A little less safe
- A lot less safe

31. Do you agree or disagree with the following statement: "If drivers slow down, then people will be less seriously injured if a crash happens"

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

Page 13

Community Attitudes to Speed Limits

32. Do you agree or disagree with the following statement: "If driver slow down, then fewer crashes will happen"

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

Please explain why you think this

33. "Lowering speed limits would reduce the number of crashes on our road". Do you agree or disagree with this statement?

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

34. "Lowering speed limits would result in people being less seriously injured if a crash does occur". Do you agree or disagree with this statement?

- Strongly agree
- Somewhat agree
- Neither agree or disagree
- Somewhat disagree
- Strongly disagree

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Community Attitudes to Speed Limits

35. "A reduction of all current speed limits by 10 km/h would result in a significant increase in travel time". Do you agree or disagree with this statement?

- ○ Strongly agree
- ○ Somewhat agree
- ○ Neither agree or disagree
- ○ Somewhat disagree
- ○ Strongly disagree

36. If the speed sign on an urban road was changed from 50km/h to 40km/h how much longer would it take (in minutes) to drive 10km on that road?

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Community Attitudes to Speed Limits

10. Thank You

37. If you would like to be in to win a $150 Prezzi card please fill in your details below

Name:	
Address 1:	
Address 2:	
City/Town:	
ZIP/Postal Code:	
Country:	
Email Address:	
Phone Number:	

Thank you for helping us with our survey which has been conducted for NZ Transport Agency.

If you have any questions about this survey please contact us at nzspeedsurvey@beca.com

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Appendix D: Hamilton safer speed information

Attachment 1

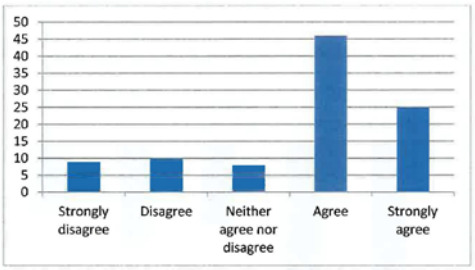
Safer Speed Area Community Questionnaire Results

February 2012

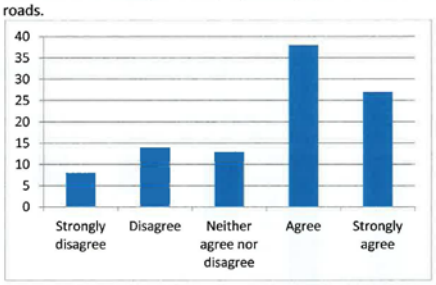
A total of 4000 questionnaires were delivered to the eight demonstration Safer Speed Areas and 468 were received back – a response rate of 11.7%.

All results are expressed as a %age of the responses received.

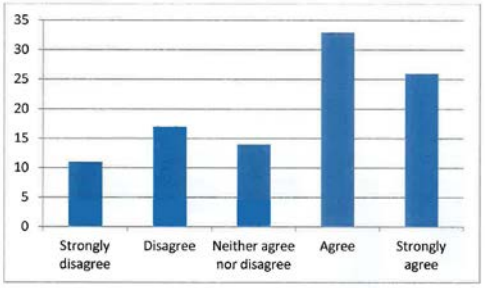
A Safer Speed Area encourages drivers to slow down.



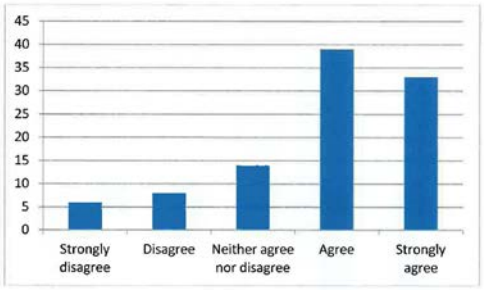
Safer Speed Areas help prevent people being injured or killed on local roads.



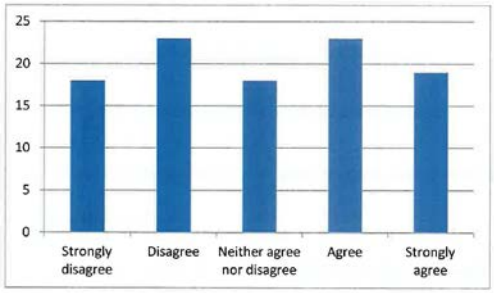
Safer Speed Areas make me safer on my street.



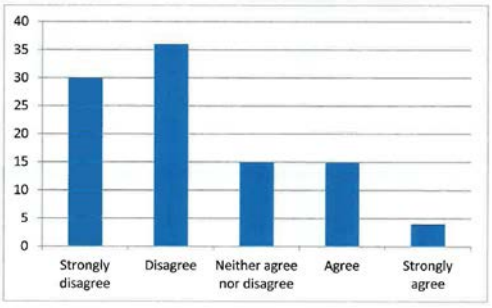
Safer Speed Areas are good for the local community.



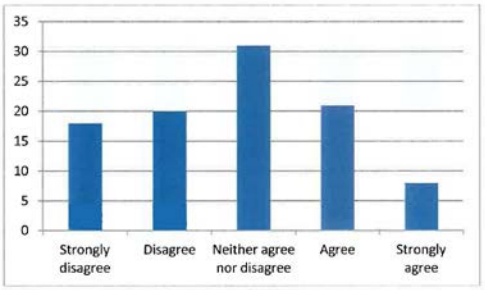
A Safer Speed Area should be installed in all local streets in Hamilton.



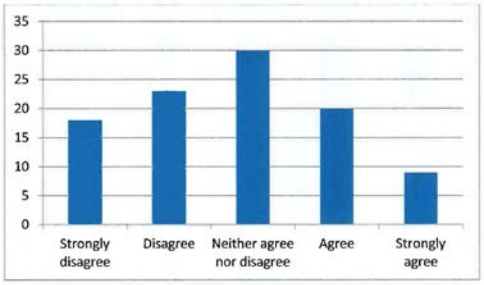
A Safer Speed Area inconveniences me.



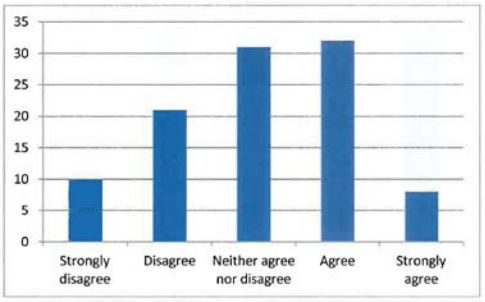
There is less "rat running"/short cutting now we have a Safer Speed Area.



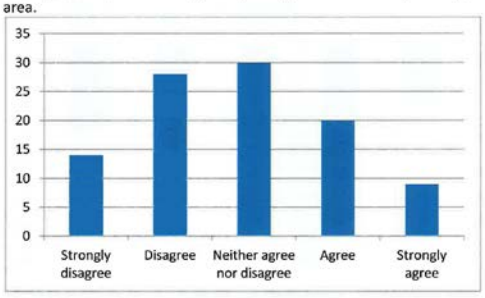
There are less "hoons" in our street now we have a Safer Speed Area.



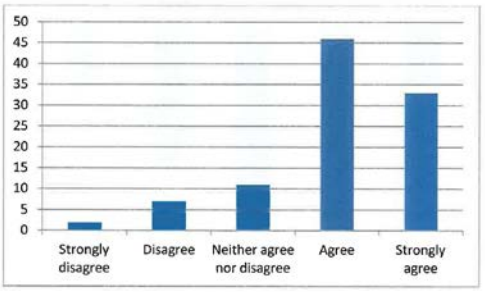
Drivers are more courteous in a Safer Speed Area.



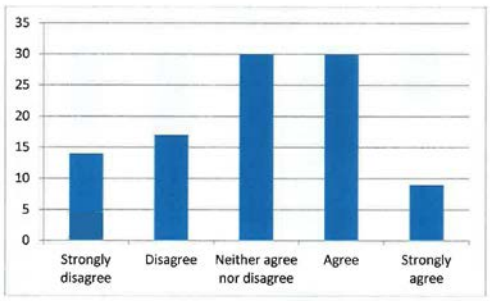
Safer Speed Areas have changed my willingness to walk or cycle in my area.



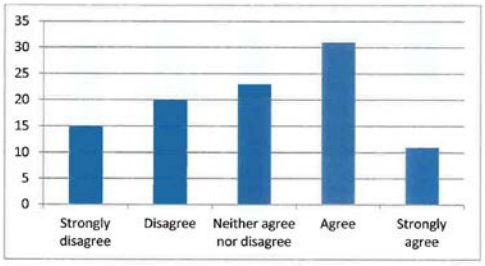
I try to stay at 40km/h when I drive in a Safer Speed Area.



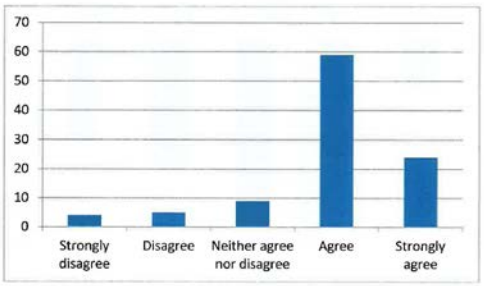
Safer Speed Areas have changed the way others drive in my area.



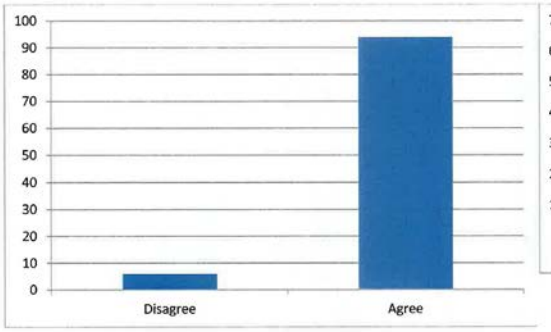
The changes made in my street have improved safety.



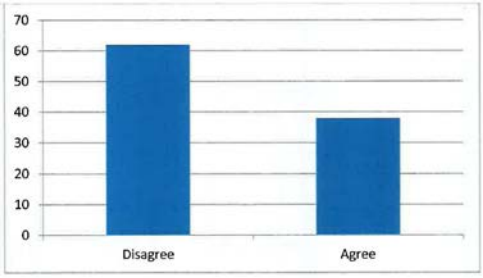
I know when I am entering a Safer Speed Area.



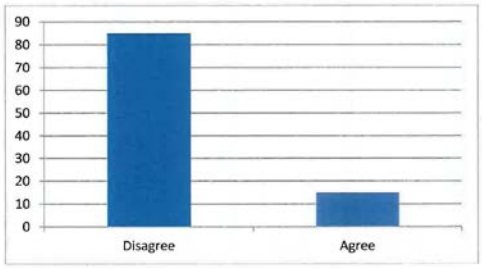
I have seen the Safer Speed Area road signs.



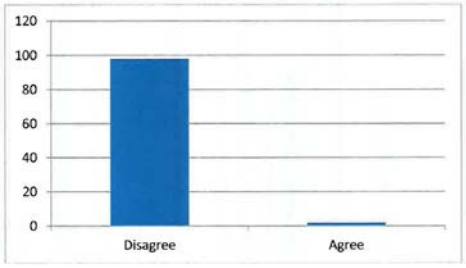
I saw a Safer Speed Area poster.



I heard a Safer Speed Area radio advertisement.



I visited the Safer Speed Area website.



Attachment 2

Safer Speed Areas Brand Recognition Survey

Total number of surveys 499

What do you know about a safer speed area?

	# of responses	%
They are in residential areas	32	6
You must drive 40 kph	109	22
They are for the communities safety	23	5
They are around schools	220	44

Are the street signs self explanatory?

	# of responses	%
Yes	486	97
No	13	3

Did you hear a Safer Speed Area radio advert?

	# of responses	%
Yes	41	8
No	458	92

Did you see a Safer Speed Area poster?

	# of responses	%
Yes	27	5
No	472	95

Did you see a Safer Speed Area newspaper advert?

	# of responses	%
Yes	15	3
No	484	97

Did you see a Safer Speed Area street sign?

	# of responses	%
Yes	313	63
No	186	37


For more information
visit www.saferspeedarea.org.nz
or email roads@hcc.govt.nz
Proudly supported by
Hamilton City Council
Te kaunihera o Kirikiriroa
Safer Journeys
For My Family's sake
40
Safer Speed Area

Safer Speed Areas

Protecting the safety of Hamilton neighbourhoods with new 40km/h Safer Speed Areas.


Raised crossing

What is a Safer Speed Area?

Safer Speed Areas are being implemented in residential neighbourhoods to improve people's safety. These areas have 40km/h speed limits at all times of the day and night, meaning residents can safely access their homes.

How do they work?

Safer Speed Areas have a permanent 40km/h speed limit and may also have minor physical changes. These changes may include signage, traffic islands, or pedestrian facilities.

Where are they?

Safer Speed Areas will be progressively implemented throughout Hamilton in local residential streets. For a list of current Safer Speed Areas please visit **www.saferspeedarea.org.nz**

Signage


Pedestrian facility


Threshold and signage

Why do we need these?

Speeds of 50km/h are too dangerous for residential areas. For more information please visit **www.saferspeedarea.org.nz**

Children and other residents will be safer in their neighbourhoods.

Cycling and walking will be safer for residents.

64% of the community that responded to the 2012/13 road safety survey asked for a Safer Speed Area in their neighbourhood.

How can my community get one?

Register your interest at www.saferspeedarea.org.nz

For more information visit: www.saferspeedarea.org.nz


For Our sake
40
Safer Speed Area
Do you live, work or play in an area where you feel pedestrians would be safer if it was a 40km/h area. If so please visit www.saferspeedarea.org.nz and you can register your area to be considered.
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