



Assessing Future Regional Road Safety Investment

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This document supports the development of the Auckland Regional Land Transport Strategy 2010. It is the culmination of work developed by the RLTS Safety Working Group and the Technical Advisory Committee (TAC) to support the Auckland Regional Transport Committee. These groups include representatives from all local territorial authorities, Auckland Regional Transport Authority, Auckland District Public Health Board and other technical experts.

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A handwritten signature in black ink, appearing to read 'Don Houghton', written in a cursive style.

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Assessing Future Regional Road Safety Investment

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1 Purpose

This report has been prepared to assist the Auckland Regional Transport Committee with preparation of the Auckland Regional Land Transport Strategy 2010.

2 Executive summary

This paper builds on the work completed in 2005 to assess road safety investment in the region in relation to regional road safety targets. The purpose is to inform the safety component in the Regional Land Transport Strategy (RLTS) by providing a summary of strategic considerations relevant to road safety and broader transport safety for the Auckland region. This paper needs to be read in conjunction with the revised Regional Road Safety Plan (RRSP), which outlines key regional priorities, accompanying solutions and more detailed road safety issue analysis and evidence.

The paper summarises the overall process used in 2005 for establishing the regional road safety investment required and updates that work in relation to new information, with particular reference to the New Zealand Transport Strategy (NZTS), the release of the Government Policy Statement on Land Transport Funding (GPS), an updated RRSP and related regional transport initiatives.

As was advised at the time by the Ministry of Transport and the Land Transport Safety Authority, it was most appropriate to focus increased investment on safety engineering, particularly as enforcement enhancements were reliant on national legislative changes. This paper has assumed a similar focus, as the underlying assumptions in the 2005 paper remain, while it is acknowledged that increased safety benefits could be achieved through further education and enforcement efforts as was the case in 2005.

As the transport environment is also required to consider broader safety and personal security issues, an overview of how these issues could be further integrated is presented, especially given the overlapping goals of increasing active modes and safety of vulnerable road users. Finally, a series of safety policies are outlined for consideration within the RLTS.

2.1 Context

The NZTS and GPS introduce challenging national road safety targets, while also outlining challenging increases in active transport trips. Specifically, by 2040, the government is seeking that there will be fewer than 200 deaths and 1,500 serious injuries.

The RLTS provides a broad context for transport within the region and provides general guidance for the Regional Road Safety Plan 2009 to 2012 (RRSP). The RRSP builds on previous plans that focus on a long-term “vision zero” approach to road safety and highlights the importance of a broader public (or population) health approach advocated internationally and locally. The RRSP has a proposed 2012 goal of no more than 400 fatal and serious injury crashes in one year. This is an ambitious vision requiring an increased investment in safety engineering, enforcement, education and related community activity. The RRSP also highlights regional road safety priorities and a

range of actions to achieve improved road safety outcomes that need to be reflected in the RLTS.

The Auckland Regional Transport Committee is required to prepare a RLTS for the region which it is reviewing. In relation to road safety, the review needs to consider a longer timeframe (out to 2041 or 2051), the role of education and enforcement, how rail and road safety should be addressed, and outline an appropriate Auckland target for road safety.

To achieve this, the national and regional policy context has been reviewed, along with a review of the safety investment assessment carried out in 2005 in relation to the current safety engineering investment.

2.2 Injury burden

Improvements to road safety over recent years have been made, but road deaths and injuries continue to be a major issue for the Auckland region. On average one person dies every five days on the region's roads, road-related hospitalisations account for approximately 10 per cent of all hospitalisations in the region and overall it was estimated that road crashes resulted in a regional social cost of \$945m. While rail crashes are few in the region, rail safety is of concern, due to the planned increased frequency of services and the potentially major impacts of any rail crash. Given the small proportion of rail crashes in the region, resources need to continue to focus on road safety. Safety and personal security issues are often major barriers to people choosing to walk, cycle or use passenger transport. Increased rates of active and more sustainable transport would have significant public health benefits and increased trips using these modes need to be further promoted, while concurrently improving the safety environment for people using these modes. Some population groups have poorer road safety outcomes than others with well-documented higher rates of injury in communities with high deprivation scores, including higher hospitalisation rates experienced by Maori and Pacific people. Children and young people (especially as novice drivers) also tend to have higher injury rates than other age groups. Older people have significantly higher fatality rates than other age groups per kilometres travelled. However, further research at a regional level in relation to these inequalities is required to further inform prioritisation and programme development.

2.3 Continuing the progress made

In the Auckland region over the last eleven years, death rates have been declining faster than serious injury/total injury rates, possibly due to improvements in vehicle standards, crash response/medical technology, and safer roads. The number of deaths show a relatively consistent downward trend, while serious injuries are more variable from year to year, but are showing a long-term slight downward trend.

Continuing to improve safety and personal security of the transport system will be increasingly challenging as our regional community grows. That is, further reductions

in deaths and serious injuries require significant reductions in the casualty rates per population. Improvements in vehicles standards are likely as the vehicle fleet increasingly includes air bags and other protective features. Gains in driver and road user behaviour are difficult to predict, but would require ongoing and increasingly innovative programmes along with improvements in enforcement (requiring central government/legislative action). Safety engineering initiatives have potential to support crash reductions (frequency and severity) but are increasingly expensive when systematically implemented across the region as they should be. The RRSP outlines key actions for prioritising implementation across engineering, education and enforcement over the next few years based on an analysis of regional issues and international best-practice, including the need to address underlying inequalities in road safety outcomes between different population groups.

2.4 Estimating possible targets

Three approaches for estimating the longer-term (2040 or beyond) Auckland region targets and related death and casualty rates have been carried out. The three options provide a range of potential rates/targets to be considered under the RLTS. In summary, the options included:

- A straight line reduction based on current trends (Option 1) for deaths (no more than 19) and serious injuries (no more than 412).
- An alternative estimation method (Option 2) used a population proportion of the national 2040 target of no more than 200 deaths and 1500 serious injuries using the same death rate and serious injury rate for the Auckland region as the current baseline (2005 to 2007 averages). This produced an Auckland region target of no more than 40 deaths and 361 serious injuries for 2040.
- A final option (Option 3) used an estimation of the current proportion of the 2010 Auckland region target (deaths plus hospitalisations) to the national target and converted this to a 2040 target using the new national target for 2040 of no more than 200 deaths and serious injuries (200 and 1500 respectively) and projected population figures for 2040. Option 3 provided a combined deaths and serious injury figure for 2040 of no more than 411.

The relative consistency between the three options provided the working group (established to support the development of this paper) some confidence that an overall deaths and serious injuries target of approximately no more than 400 was a “reasonable” target and that the deaths figure of no more than 40 in Option 2 was possibly more realistic given population growth. Therefore, possible Auckland region targets for 2040 for consideration in the RLTS would be no more than 40 deaths and no more than 360 serious injuries.

2.5 Safety engineering

The RRSP reinforces the continuing need for agencies and the community to work together to bring about change. An emphasis on safety engineering is highlighted, particularly on local authority arterial roads where safety gains are most urgently required. A key barrier for an increased level of safety engineering is the funding mechanisms for local roads, which require local authorities to apply for funding and provide a “local share” for any safety projects.

Overall crash rates are influenced by a range of factors that have not been comprehensively analysed or considered in relation to this paper. An example is the emerging evidence that reducing car trips could impact on reducing car crash injury and mortality rates.

The data and analysis provided in this paper further highlight the gap in current safety engineering funding, particularly on local arterial roads as originally identified in 2005. Further analysis indicates that the investment on state highways is most likely at an adequate level as the state highway contribution to regional crash targets are, by and large, currently being met. Cost increases for safety engineering are likely to have increased by over seven per cent per annum since the 2005 assessment and it is likely that these increases will continue.

The current baseline in safety engineering expenditure is estimated at a total of \$78m (\$54m on state highways and \$24m on local authority roads). Depending on time frame (but excluding inflationary costs), it is estimated that the regional annual investment over five years would need to be approximately \$190m (\$58m on state highways and \$132+million on local authority roads), or over ten years, \$124m (\$58m on state highways and \$66+million on local authority roads). A ten year timeframe would delay achievement of the targets, as it delays safety engineering investment and therefore benefits. Even over the longer timeframe, the increased investment will be very challenging to achieve given current budgets and funding mechanisms. More effective use of current budget levels through improved regional safety engineering co-ordination as proposed within the Regional Road Safety Plan (RRSP) could partially offset the gap in safety engineering funding. While a decrease in the local share required by local authorities may increase the level of safety engineering projects, it may also lead to an overall funding homeostasis, with local authorities adjusting their budgets to accommodate their increased subsidies. Therefore, other means of encouraging local authorities to increase safety engineering funding and projects will be required.

2.6 Enforcement and education provide an adjunct to engineering

Detailed assessments of enforcement and education investment have not been carried out as part of this review, but in summary, enforcement investment was \$68m in 2007/08 and education and community programmes were funded at around \$3m for the Auckland region and both have increased over the years. Both enforcement and

education provide an adjunct to safety engineering, but also add independent safety benefits that are worthy of consideration in terms of increased funding.

While some progress has been made on infrastructure for pedestrians and cyclists, further efforts are required as a primary means to improve safety and encourage people to use these modes in a safe manner. This includes continued education programmes and greater acceptance by motorists to be aware of other road users, especially in town centres and other areas where pedestrians and cyclists travel. Motorists require improved roads and programmes that reinforce safe driving habits such as observing give-way rules and driving to the conditions. Speed management is also central to reducing injuries on local roads and rural roads, and visible enforcement is often the key. The police require new or enhanced tools to address serious offenders such as repeat drink-drivers, a rising number of drink-drivers, and red light runners. Regional priorities and key actions are outlined in the RRSP.

2.7 Road user hierarchy

The concept of a “road user hierarchy” has been established overseas and adopted by the New Zealand Transport Agency (refer pedestrian planning and design guidelines prepared by Land Transport New Zealand) for use in planning and design processes for new developments and proposed traffic management schemes. The hierarchy is used in appropriate locations to place pedestrians at the top, followed by cyclists, then public transport, with unaccompanied private car users last. The objective of such a hierarchy is to ensure that the needs of the most vulnerable road users are fully considered in all road schemes. This type of hierarchy would foster overall safety benefits (in the context of the aim to achieve a substantial increase in sustainable transport activity), and is consistent with the “vision zero” approach adopted in the previous RRSP.

2.8 Rail safety

The region still does not have a regional rail safety plan which identifies key safety priorities and a co-ordinated strategy to enhance overall rail safety and personal security. Given the small number of rail crashes in the region, rail transport remains one of the safest forms of land transport. However, increased frequencies in the region from the greater use of rail for both public transport and freight could result in an increased number of rail related crashes. Significant investment in safer level crossings (involving cars and trains) has commenced, and some efforts around trespass have occurred, but a more comprehensive approach is required. Detailed international protocols guide New Zealand’s approach to operational crashes (such as collisions, derailments and rail passenger accidents), but again, increasing frequency will bring new challenges that require analysis and identification of additional safety initiatives.

2.9 Safety and personal security

Personal security needs a greater focus within road, rail, walking, cycling and general passenger transport plans. Real and perceived threats to personal security can affect the willingness of individuals to walk, cycle or use public transport. Improvements to the security of the transport environment, particularly at transport interchanges and surrounding areas will encourage more people to make these travel choices. The revised RRSP recommends that Crime Prevention Through Environmental Design (CPTED) measures are built into upgrades to the public transport system, including places where people are likely to walk, cycle or otherwise access public transport, and establishment of regional guidelines on using CPTED are warranted. The transport sector also needs to work with local authority urban planners and designers to ensure CPTED is well integrated into urban development activities.

2.10 Conclusion

In conclusion, an assessment of safety engineering investment across the region in relation to current and possible future targets highlights that a substantively increased investment will be required. How this increased investment is achieved, especially in relation to local arterial roads' is not straight forward as evidenced by a significant under-investment in relation to the priority it was given in the 2005 RLTS. To achieve the region's targets and make progress towards "vision zero" (ie to continue the road safety progress achieved and to achieve the desired crash reduction rate on local authority arterial and other roads) an increased investment in road safety engineering will be required by local authorities over the next five to 10 years along with improved regional co-ordination of safety engineering efforts to ensure cost-efficient implementation of best-practice initiatives. To address inequalities experienced in road safety outcomes by different population groups, priority will need to be given to communities with high socioeconomic deprivation, including specific programmes for Maori communities, and programmes for children and young adults. Increases in investment for enforcement and education are also warranted along with continued innovation and use of new enforcement technologies. The introduction of a road user hierarchy, further infrastructure development for walking and cycling, coupled with proactive traffic demand management initiatives, and viewing road safety from a public (or population) health approach are all important contextual considerations to improving safety outcomes under the RLTS.

3 Introduction

This paper builds on the work completed in 2005 as a precursor to the preparation of the current RLTS. The paper summarises the overall process used in 2005 for establishing the regional road safety investment required and updates that work in relation to new information, with particular reference to:

- The release of the NZTS requiring the RLTS to contribute to all of the Land Transport Management Amendment Act 20081 (LTMA) objectives, address the role of education and enforcement explicitly in the strategy and safety targets to reduce road deaths to no more than 200 per annum and reduce serious injuries to no more than 1500 per year by 2041.
- The update of the Auckland Regional Road Safety Plan (ie draft released in 2008) prepared by the Auckland Regional Transport Authority (ARTA) and the RoadSafe Auckland group.
- The release of the Government Policy Statement on Land Transport Funding (GPS²) that includes a target to reduce fatalities and serious injuries by 2015 (general goal until government's road safety strategy is reviewed in 2010).

A number of other documents including: ARTA's³ Regional Arterial Road Plan (RARP), Sustainable Transport Plan 2006-16 (STP), Auckland Transport Programme (ATP), other RLTS Technical Papers, NZTS, GPS, and Road Safety 2020 (currently in preparation, due 2010).

3.1 Background

The Auckland Regional Transport Committee (RTC) is required to prepare a Regional Land Transport Strategy (RLTS) for the region. Under current legislation the RLTS needs to be reviewed, and from a road safety perspective needs to consider:

- A longer timeframe (out to 2041 or 2051).
- The role of education and enforcement for road safety (as part of an integrated approach to the New Zealand Transport Strategy or NZTS⁴).
- How rail and road safety should be addressed?

¹ The Land Transport Management Amendment Act was created to introduce a raft of recommendations that came out of the "Next Steps Review of the Government Land Transport Sector" released in April 2007. The Act introduced the single New Zealand Transport Agency combining Land Transport New Zealand and Transit New Zealand. Also in relation to Auckland, the Auckland Regional Council Transport Authority (ARTA) was responsible for compiling the land transport activities of Auckland local government into a land transport programme. State highway activities are to be added to this programme and it will become the Regional Land Transport Programme for Auckland. ARTA will need to consult the Auckland Regional Transport Committee before preparing the Regional Land Transport Programme. The Regional Transport Committee will remain responsible for the Auckland Regional Land Transport Strategy (see <http://www.transport.govt.nz/ltma-act-questions-and-answers-1/>).

² See <http://www.transport.govt.nz/new-zealand-transport-strategy-2/>.

³ See <http://www.arta.co.nz/publications-projects/test/publications.html>.

⁴ See <http://www.transport.govt.nz/new-zealand-transport-strategy-2/>.

- An appropriate Auckland target for road safety (to be included within the final RLTS).

The following outlines the national policy context, a summary of the safety investment assessment carried out in 2005, an introduction to current safety engineering investment, and an overview of the current draft Regional Road Safety Plan, as background to this paper.

3.1.1 The NZTS and GPS

The recent launch of the New Zealand Transport Strategy 2008 (NZTS) and the Government Policy Statement (GPS) on Land Transport Funding provides a framework of national targets for transport and an expectation of a series of regional targets that will contribute to the achievement of these national targets. The RLTS is a key document for outlining regional targets. In summary, the NZTS sets targets for progress across the five transport objectives, mostly to be achieved by 2040, while the GPS sets targets to 2015. The New Zealand Transport Agency (NZTA) notes that:

“The GPS makes clear that regional targets will take account of the particular issues or features of the transport system in each region. However, the combined total of the regional targets will need to equal each associated national target within the GPS (NZTA, 2008: 1).”

The NZTS contains fifteen targets, including two specific road safety targets under the heading “assisting safety and personal security”. The targets are: “reduce road deaths to no more than 200 per annum by 2040” and “reduce serious injuries on roads to no more than 1,500 per annum by 2040”.

NZTA advise that:

“Regionalised NZTS targets that set out the contribution each transport region is seeking to make towards these national targets should be developed based on negotiation between MoT, the NZ Transport Agency, RTCs, their constituent local authorities (and Auckland Regional Transport Authority (ARTA) in Auckland). Negotiations may also involve other players (such as regional representatives of the rail, aviation and maritime sectors) as appropriate.

Where possible, regional targets based on the above should be included in the next round of RLTSs. However, for some targets (for example, those relating to critical routes) this may not be possible given the timescales involved. If so, these will need to be included instead in the following RLTSs as part of the six yearly review.

The NZTS will be revised in 2010, and is likely to include new targets that may need to be regionalised. Again if this is not possible to do before the next round of RLTSs, then regional targets for these outcomes will need to be included in the following RLTS revision. RTCs may choose to include regionalised GPS targets, which are expressed to 2015, as interim targets in RLTSs (NZTA, 2008: 3).”

The GPS outlines six targets including a non-measurable road safety goal.

These road safety targets are outlined in Table 1 below and show that currently the Auckland region makes up 14 per cent of the road deaths in the country and 18 per cent of the people seriously injured in road crashes. This compares to the Auckland region population being approximately 33 per cent of the whole country.

	Baseline (average 2005 to 2007)	2007	2015 Target (GPS)	2040 Target (NZTS)
New Zealand				
Deaths	407	422	Decreasing	200
Serious injuries (casualties)	2605	2654	Decreasing	1500
Auckland region				
Deaths	74	61	n/a	n/a
Serious injuries (casualties)	537	483	n/a	n/a
% deaths in Auckland region	18%	14%		
% serious injuries in Auckland region	21%	18%		

Table 1: NZTS and GPS targets for road safety

3.1.2 Regional road safety plan 2009-2012

A review of the RRSP was undertaken during 2008 and a Draft RRSP was released for public comment in June 2008; and submissions closed in August 2008. The plan has been revised and will be presented to ARTA management for approval in February 2009.

The RRSP builds on a strong history of agencies and organisations working together to achieve improved road safety outcomes within the Auckland region. The RRSP details key road safety priorities, broad strategies and key actions.

Priorities included in the RRSP:

- speed-related road fatalities and injuries,
- alcohol-related road fatalities and injuries,
- pedestrian deaths and injuries,
- motor-vehicle-related deaths and injuries at intersections,
- bends and roadside hazard-related deaths and injuries,

- motorcyclist fatalities and injuries,
- cyclist fatalities and injuries,
- restraint use,
- passenger transport promotion and safety initiatives contribute to an overall reduction in transport-related deaths and injuries.

Strategies included in the RRSP:

- enhanced safety management, planning and engineering,
- effective speed management and other initiatives that support a growing community acceptance of speed limits,
- well targeted drink-drive enforcement, integrated driver rehabilitation and visible host responsibility,
- improved pedestrian safety,
- improved intersection safety,
- improved bends and roadside hazard safety,
- initiatives tailored to the needs of at-risk and vulnerable road users,
- integrated passenger transport safety.

The revised RRSP outlines a three E approach with a strong focus on enhancing safety engineering, while further improvements to enforcement and education initiatives being advocated. The plan also provides some focus on vulnerable road users, especially in relation to sustainable transport activities.

The RRSP provides an agreed implementation approach for key agencies working collaboratively within the region and will contain crash targets for 2012 for the region, broken down to local authority and state highway road levels.

An internationally recognised outcomes framework has been incorporated into the current RRSP. The so-called, "road safety management system" developed by Bliss and Breen (2008) utilises a hierarchy of road safety outcomes and processes in relation to best practice "Interventions" across a range of processes (institutional management functions) that in turn deliver improved road trauma reduction or "Results". This framework has been adapted for the Auckland region and is included in Appendix 1. In terms of high level road safety outcomes, there are a number of measures that are used internationally and which have been outlined in the RRSP. The following table has been adapted from the RRSP shows that across various measures, progress is being made in the Auckland region. The RRSP also outlines various regional and international comparisons. Some of these data have been used in the target setting outlined in Section Three and within Appendix 4.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Social Cost of crashes in 2008 dollars										
Total \$ million.	\$1,192	\$1,1218	\$1,078	\$901	\$1,001	\$985	\$1,040	\$999	\$1,074	\$945
Population (000).	1,173	1,190	1,208	1,232	1,266	1,306	1,332	1,353	1,374	1,411
\$ per population.	\$1,016	\$1,023	\$892	\$731	\$791	\$754	\$781	\$738	\$782	\$670
100 million vehicle kilometres travelled (vkt).	NA	NA	NA	100.98	103.4	107.97	110.77	114.01	117.34	118.53
Cents per vkt.	NA	NA	NA	8.9c	9.7c	9.1c	9.4c	8.8c	9.2c	8.5c
Road casualties										
Number of road deaths.	105	89	70	74	84	81	93	77	84	61
Serious injuries.	527	575	530	560	639	545	576	503	624	483
Sub-total serious and fatal injuries.	632	664	600	634	723	626	669	580	708	543
Minor injuries.	2,893	3,032	2,597	2,803	3,111	3,561	3,482	3,595	3,786	3,760
Total casualties.	3,525	3,697	3,197	3,437	3,834	4,187	4,151	4,175	4,494	4,304
Casualties per 10,000 people.	30	31	26.5	27.9	30.3	32.1	31.2	30.9	32.7	30.5
Casualties per 100 million vkt.	NA	NA	NA	34	37.1	38.8	37.5	36.6	38.3	36.3
Road crashes										
Number of fatal crashes.	99	85	63	70	77	77	81	69	77	56
Serious crashes.	434	475	430	437	545	428	432	411	488	373
Sub-total fatal plus serious crashes.	533	560	493	507	622	505	513	480	565	429
Fatal and serious crashes per 100 million vkt.	NA	NA	NA	5.02	6.02	4.68	4.63	4.21	4.82	3.62
Deaths plus Hospitalisations										
Deaths plus hospitalisations of more than one day.	1,077	952	828	846	858	787	818	905	988	896
Deaths plus hospitalisations of more than three days.	765	652	588	603	608	547	579	639	663	614
Total deaths plus hospitalisations.	1,816	1,938	2,174	2,640	2,706	2,524	2,556	2,878	3,206	2,937
Deaths plus hospitalisations per 10,000 people.	15.5	16.3	18	21.4	21.4	19.3	19.2	21.3	23.3	20.8
Deaths plus hospitalisations per 100 million vkt.	NA	NA	NA	26.1	26.2	23.4	23.1	25.2	27.3	24.8

Table 2: High level road safety outcomes in the Auckland region between 1998 and 2007

In summary, the table above shows that the various measures have fluctuated over the last 10-years, with 2006 having poorer road safety outcomes than many previous years. The following year, 2007, shows improved outcomes. The most consistent trend is the decline in road deaths, which is offset by a fluctuating trend of serious injuries and an increase in minor injuries.

Lastly, the RRSP provides analysis of targeting resources to cost density and crash risk by road category. The table below outlines this analysis, which highlights that local authority urban arterials are likely to be the highest priority for increased safety engineering (and/or enforcement/education) initiatives.

Road type (Auckland region)	Cost density (\$/km of road)	Risk (\$/vehicle kilometres travelled)	Priority for increased safety engineering
Motorway	High	Low	Medium
State highway	High	Medium	Medium
Major urban arterials	High	High	High
Minor urban road	Low	Low	Low
Rural road	Low	High	Medium

Table 3: Average cost density and risk for Auckland region roads by category (Adapted from RRSP, 2009)

3.1.3 Summary of TP 19 2005

In the lead up for the preparation of the 2005 RLTS, the RLTS Technical Advisory Committee (TAC) established two work stream projects to provide a better understanding of the safety investment assumptions required for 2016. The road safety work stream projects were led by the Regional Road Safety Co-ordinator through a TAC safety sub-group and RoadSafe Auckland and included engineering and non-engineering initiatives.

The 2005 Technical Paper 19 set out an assessment of regional road safety investment required to achieve 2010 targets. On the recommendation from Land Transport Safety Authority (LTSA) at the time, additional safety benefits for the region needed to be realised principally from road engineering improvements. LTSA estimated this cost to be \$490m based on safety engineering projects with a benefit and cost ratio of 3:1 and 100 per cent of the benefits attributed to safety. It included contributions from TAs, was rounded to the nearest \$5m and was an assessment of the work required over and above the approved projects on the National Land Transport Programme as at June 2003.

Further, the LTSA noted that 80 per cent of the social cost of Auckland region crashes is on local authority roads and principally on arterial roads, hence a focus on these arterial roads.

To gain a more accurate assessment of costs, three case studies were carried out. One was carried out in Auckland City (completed September 2004) and the other in North Shore City (completed December 2004) to determine urban arterial costs and benefits. A final study was carried out in Rodney District to determine rural arterial costs and benefits. The results of these studies were then extrapolated across the whole region (ie costs/kilometre were multiplied by the total estimated length of local authority arterial road and annual savings generated). See Appendix 2 for a summary of the figures used for each local authority.

The Auckland City cost per kilometre was \$366,000 (it was noted that Auckland City arterial network is generally older and more constrained than other areas' networks).

The North Shore City cost was \$674,000 and had similar annual benefits to the Auckland City study. The greater cost was explained by the fact that a "more comprehensive approach" was taken with benefits likely beyond 2010.

As the Auckland City and North Shore studies pertained to predominantly urban arterials, further work was carried out to assess benefits and costs on rural roads. A specific stretch of road (14kms Coatesville and Riverhead highway) was investigated and assessed at costing just over \$8.5m (ie approx \$608,000 per km). This was considered the least accurate of the three studies as it focused on a single stretch of road and it was noted as being a very conservative estimate. The Auckland City estimate and the Rodney District estimates were used in the final calculations.

Each of the studies included an assessment of the benefits, specifically, the expected savings in relation to fatalities and serious injuries. Overall figures used in the calculations were 0.024 fatalities per kilometre and 0.285 serious injuries per kilometre to 2010 for urban arterials and 0.019 and 0.209 respectively for rural arterials. The BCR for the Auckland study was 2.15, while the North Shore study had a BCR of 0.96.

The recommended safety investment and benefits from these two projects (urban arterials and rural arterials) were assessed against the draft RLTS vision and objectives. An estimate of extra funding for community road safety (including regional programmes and advertising) was also considered. In summary, TP 19 recommended that an extra \$512.35m (made up of \$507.1m for safety engineering on arterial roads and \$5.25m for additional safety education) to be spent on road safety over a five year period to achieve the Auckland region contribution of the national 2010 target, or no more than 670 deaths plus hospitalisations of one-day or more by 2010. Without the investment it was predicted that the figure would be 870.

The safety engineering figure was arrived at by extrapolating the findings of two pilot projects (ie the Auckland City figure was used for urban roads and the Rodney District figure was used for rural roads) across the estimated total length of arterial roads within the region. The overall figure was similar to estimates derived by the then Land Transport Safety Authority (ie \$507.1m compared with \$490m).

3.1.4 Safety engineering investment

Investment in safety engineering is difficult to accurately quantify as funding comes from multiple sources and safety projects are often bundled into other projects, or not specifically named as such.

3.1.4.1 Expenditure outlined in the 2005 RLTS

The 2005 RLTS indicates that road safety expenditure over the ten-year period of the strategy be set at four per cent (ie four per cent additional to expenditure currently provided by Transit NZ or state highway, and additional to current TA expenditure – footnote page 64, 2005 RLTS) of the total regional land transport budget. The 4 per cent figure is derived by dividing the \$510m “nominally” allocated to road safety by the total anticipated budget for all transport activity of \$10,990m.

Further, although it is not stated in the 2005 RLTS the \$510m was expected to be front-loaded to achieve the 2010 safety targets and therefore was theoretically to be invested by the end of 2010 (a five-year period), or an annual amount of \$102m.

It is possible that, readers of the 2005 RLTS mistakenly believed that the total road safety expenditure was \$510m or annually four per cent of transport budgets (regional/TA/state highway). Further, the original calculations to achieve the safety targets estimated the expenditure required on local authority arterial roads only. Therefore, the total annual road safety expenditure for the region should be somewhat greater than \$102m if regional 2010 road safety targets were to be realistically achieved.

3.1.4.2 Estimation of current expenditure

In the draft RRSP 2008-2012, an estimation of the total road safety expenditure for the region was provided. For 2007/08, a total of \$124m was estimated, but included \$68m spent on enforcement (direct police road safety funding only), \$3m on education and \$53m on safety engineering (including \$24m on state highways provided at 100 per cent government funding, and \$29m on local authority roads at 50 per cent government funding).

An assessment of the Auckland Land Transport Programme (ALTP) for 2008/09 carried out in November 2007 shows that safety engineering funding for that year is greater than 2007/08. These figures are outlined below, but it is important to note that the figures are amounts applied for, rather actual expenditure.

	Total (\$000)	Road safety (\$000)	%
• Waitakere City Council	\$85,153	\$2812	3.3%
• Manukau City Council	\$36,139	\$2520	7.0%
• North Shore City Council	\$48,248	\$2739	5.7%
• Auckland City Council	\$83,745	\$10,808	12.9%
• Rodney District Council	\$68,020	\$2846	4.2%

	Total (\$000)	Road safety (\$000)	%
• Franklin District Council	\$8403	\$1231	14.6%
• Papakura District Council	\$6996	\$666	9.5%
Sub-total local authorities	\$336,705	\$23,621	7.0%
TA Routine Road Maintenance	\$177,555	\$0	0.0%
ARTA (small project fund)*	\$225,529	\$20	0.0%
ARTA - ARC Funded (rail)	\$99,845	\$0	0.0%
IA Grants (walk and cycle projects)	\$17,112	\$1159	6.8%
Transit NZ (state highways)	\$572,716	\$54,291	9.5%
ONTRACK (DART)	\$203,250	\$21,563	10.6%
Total Expenditure	\$1,632,712	\$100,654	6.2%

Note: *The \$20,000 RoadSafe Auckland small project fund has been included under the road safety category, but the \$150,000 regional advertising cost has not.

Table 4: Assessment of road safety expenditure applied for in the 2008/09 ALTP
(Source: Ross Rutherford/ARTA, Nov-07)

From the figures above, overall road safety expenditure is approximately six per cent of the total regional transport cost planned for 2008/09. The percentage of road safety expenditure varies across local authorities with Franklin and Auckland having the highest percentage expenditures of approximately 15 per cent and 13 per cent respectively and Waitakere and Rodney having the lowest, three per cent and four per cent respectively. The local authority average is seven per cent. Transit NZ (state highways) is 9.5 per cent.

In actual dollar terms, it is estimated that road safety expenditure in the Auckland region is approximately \$24m by local authorities, \$54m for state highways and a further \$1m for specific regional walk and cycle projects (eg South Western Cycleway, Manukau cycle routes, Bayswater School Travel Plan, Twin Stream Walk and cycle way), totalling approximately \$79m plus a further \$22m on road safety and rail projects.

3.1.4.3 Engineering cost increases

It is likely that the safety engineering costs estimated in 2005 have increased and that if a re-calculation of any additional investment in safety engineering is still required then the cost per kilometre figures will need to be adjusted accordingly. To assess any across the board cost increases, road maintenance costs/kilometre were compiled from the NZTA LTP Online, under the Maintenance category (figures supplied by Kumar Kumarasamy, ARTA). From the figures outlined in the table below an annual average cost increase is estimated to be 7.6 per cent across the region, or just over 30 per cent from 2005/06 to 2008/09. See Appendix 3 for data and related calculations applied to overall safety engineering costs increases.

3.1.5 Use of safety targets and goals

The use of targets and goals within road safety strategies has been common practice since the first national road safety plan in 1991 which set targets for the number and rate of road crash casualties, and key behaviours and attitudes of road users. The 1997-2001 Regional Road Safety Plan introduced regional goals and targets based on the 1995 National Road Safety Plan. For example, the 1998 target was no more than 84 deaths (or 8.6 deaths per 100,000 people) and the 2001 target was 64 deaths (or 6.9 deaths per 100,000 people; nationally this was 420 or 11.0 deaths per 100,000). The 1997-2001 RRSP also included targets for "injury crashes per 100,000" and crash targets for key priority areas such as alcohol, speed, failure to give way, pedestrian safety (fatalities and number of injuries) and behavioural targets for occupant restraint use. The 1995 NRSP also introduced a target for the number of hospitalisations due to road crashes.

The Road Safety to 2010 strategy released in October 2003 focused attention on targets based on deaths plus hospitalisations, but also included traditional targets of number of deaths and deaths per population, deaths per vehicle kilometres travelled, and deaths per number of vehicles. Nationally for 2010, these figures were 300 deaths, 7.3 deaths per 100,000 people, 6.1 deaths per billion vehicle-km, and 1.1 deaths per 10,000 vehicles. No regional 2010 targets were set in the 2010 strategy, but RoadSafe Auckland and the Auckland Regional Council outlined a regional target of achieving less than 670 road deaths plus hospitalisations of more than one day within the RRSP 2004 to 2010. This was an extrapolation of the 2004 regional target in road safety to 2010 of 840. More recently, the Ministry of Transport has provided 2010 regional targets and goals in its quarterly monitoring reports.

The Auckland region through its successive RRSPs has outlined regional targets in relation to available national targets. The revised draft Auckland RRSP has set a target of no more than 400 fatal and serious crashes in 2012 compared with an annual 2005 to 2007 average of 490⁵. This is an 18 per cent decrease and a more realistic target than originally set. The focus on crashes as opposed to deaths and casualties was decided based on feedback from local authorities as it is considered a more relevant figure in terms of the "crash prevention" focus taken and the ability to establish specific local authority targets in relation to the overall regional target.

Converting the RRSP 2010 target of crashes to casualties would equate to a target of 515 deaths and serious injuries, if crashes are 79 per cent of death and serious injuries in 2010) or 517, if a 27 per cent decrease on the total of 708 deaths and serious injuries reported in 2006 was achieved. This is somewhat less, approximately 18 per cent, than is estimated using current trends, ie 604 to 609 deaths and serious injuries by 2010.

The next national target is for 2040 and outlined in the 2008 New Zealand Transport Strategy (NZTS). The NZTS contains fifteen targets, including two specific road safety targets under the heading "Assisting safety and personal security". The targets are: "Reduce road deaths to no more than 200 per annum by 2040" and "Reduce serious

⁵ This target was developed by translating the national 2010 target of deaths plus hospitalisations using a trend in actual deaths plus hospitalisations over actual fatal/serious injury crashes.

injuries on roads to no more than 1,500 per annum by 2040". A recently released government policy statement on transport included a general 2015 target to "Reduce fatalities and hospitalisations from road crashes by 2015."

3.1.6 Public health perspective of road safety

Increasingly a public health (or population health) approach is advocated for road safety. Internationally, this has been well articulated in the World Report on Road Traffic Injury Prevention (World Health Organisation, 2004), which comprehensively reviewed road safety evidence and advocated for the following approach to be taken:

- Road crash injury is largely predictable and preventable; it is a human made problem amenable to rational analysis and countermeasure.
- Road safety is a multi-sector issue and public health issue – all sectors need to be fully engaged in responsibility, activity and advocacy for road crash injury prevention.
- Common driving errors and common cycling or pedestrian behaviour should not lead to death and serious injury – the traffic system should help all users to cope with increasingly demanding conditions.
- The vulnerability of the human body should be a limiting design parameter for the traffic system and speed management is central.
- Road crash injury is a social equity issue – equal protection to all road users should be aimed for since non-motor vehicle users bear a disproportionate share of road injury and risk.
- Technology transfer needs to fit local conditions and local knowledge needs to inform the implementation of local solutions.

Locally, a public health approach to the transport system whereby active modes are encouraged, safety is improved and a range of other health impacts are considered has been advocated by the Auckland Regional Public Health Service (2006).

The draft RRSP attempts to bring together some of these issues in relation to walking and cycling as follows:

... a systems approach is essential to integrating road safety and sustainability. Promotion of walking and cycling without appropriate safety measures could lead to increased pedestrian and cyclist deaths and injuries. It is important to acknowledge this relationship and foster interventions that both encourage increased walking and cycling while making these modes safer, by providing improved infrastructure for pedestrians and cyclists and by lowering vehicle speeds.

The aim is to achieve a "safety in numbers effect". Cities with higher rates of walking, cycling and passenger transport use have reduced road trauma, and having more pedestrians and cyclists in a particular local area is associated with a lower crash rate for pedestrians and cyclists.

The promotion of active modes will assist broader health goals aimed at addressing chronic diseases such as heart disease, some cancers, obesity and diabetes (Auckland Regional Public Health Service, 2006).

Walking and cycling are distinct travel modes and pedestrians and cyclists have diverse needs. Designing pedestrian and cycling networks and facilities requires attention to these diverse and sometimes conflicting needs (Ministry of Transport, 2005).

The Sustainable Transport Plan (Auckland Regional Transport Authority, 2006) supports initiatives such as walking school buses, school and work place travel plans and neighbourhood accessibility plans. These initiatives have potentially significant safety benefits. For example, travel plans and town centre upgrades often involve engineering improvements that include safety engineering aspects, improved access to passenger transport, and traffic calming (ARTA, 2008:8).

3.1.7 Road safety inequities

The World Report on Road Traffic Injury Prevention (World Health Organisation, 2004) highlights that road traffic injury is a social equity issue. In New Zealand, health outcomes are inequitable both by socioeconomic status and by ethnicity. There has been much research in recent years establishing these widespread inequities both in hospitalisation and mortality. Three key reports have documented clearly that ethnicity is a cause of inequity over and above the over-representation of Maori and Pacific people in high deprivation deciles.

These disparities are evident for road traffic injury, particularly for children. National evidence for this comes from both overall unintentional injury data, and transport crash data for adults. Over the period 2000-2004, 60 per cent of transport crashes were the main cause of accidental death among Maori. The rate of fatal transport crashes was 89% higher for Maori than non-Maori (Robson and Harris, 2007). Tatau Kahukura (Maori Health Chartbook, Ministry of Health, 2006) clarifies further, stating:

“Māori adults in both age groups (15–64 and 65+ years) had unintentional injury hospitalisation rates one-and-a-half times those of non-Māori adults. For adults aged 15 to 64 years, Māori had an unintentional injury mortality rate twice that of non-Māori (RR 2.2, CI 1.9–2.4). For older adults aged 65 years or more, Māori had a mortality rate 1.7 times the non-Māori rate (RR 1.7, CI 1.3–2.3).”

Furthermore, the rates for Maori children reported in that national chartbook are also higher than for non-Maori:

“Māori children had a slightly higher unintentional injury hospitalisation rate than non-Māori children (RR 1.1, CI 1.1–1.2), and an unintentional injury mortality rate twice that of non-Māori children (RR 2.0, CI 1.6–2.6).”

More recent reports on the health of Pacific Children and Young People in New Zealand (Craig et al, 2008), and in Counties Manukau (Craig and Jackson, 2008)

examine the effects of both income and ethnicity on injury rates for children and youth. For under 14 year old children, there is an increasing risk by socioeconomic deprivation, as well as a significantly increased risk for Maori children (RR 1.2), and increased risk for boys (RR 1.88). The pattern is similar for 15-24 year olds, with an even stronger risk for males in this age group (RR 2.28).

Regional hospitalisation data for all ages between 2000 and 2004 presented by the Auckland Regional Public Health Service (2006) showed that Maori had a significantly higher rate than other ethnic groups. Age breakdowns using age standardised rates or relative risks between groups for Auckland regional data (NZTA crash data and/or hospitalisation data) have not been published and this is an area for further investigation in terms of understanding the regional picture and more up-to-date trends. However, it is likely that to achieve regional targets some prioritisation of efforts will be required, especially in relation to Maori, communities with high socioeconomic deprivation, and children and young adults.

Older adults have a higher death rate from motor vehicle crashes and are particularly vulnerable as drivers and pedestrians including longer hospitalisation stays (Ministry of Transport, 2008). Much of the increased risk for older people, particularly with drivers, pertains to the fragility of older drivers (ie more easily injured and more likely to suffer a serious or fatal injury) and the relatively lower vehicle kilometres driven (Sullivan, 2004).

4 Regional target setting

This section summarises work to develop regional safety targets that could be considered for inclusion in the RLTS.

4.1 Three options used to consider possible regional targets

The three approaches for estimating Auckland region targets and related death/casualty rates have been carried out (See Appendix 4 for detailed working and description of the approaches used). The three options provide a range of potential rates and targets to be considered under the RLTS. It is important to note that the methods have not been peer-reviewed or otherwise assessed for accuracy. Further, it is also assumed that the current investment in safety is at least maintained and most likely would need to be increased to achieve these reductions.

In the Auckland region over the last eleven years, death rates have been declining faster than serious injury and total injury rates, possibly due to improvements in vehicle standards, crash response and medical technology, and safer roads. Deaths show a relatively consistent downward trend, while serious injuries are more variable from year to year, but are showing a long-term slight downward trend.

The sustainability of these reductions will become increasingly challenging in relation to projected population increases. That is, further reductions in deaths and serious injuries require significant reductions in the rates per population. Improvements in vehicles standards are likely as the vehicle fleet increasingly includes air bags and other protective features. Gains in driver and road user behaviour are difficult to predict, but would require ongoing and increasingly innovative programmes along with improvements in enforcement (requiring central government/legislative action). Safety engineering initiatives have potential to support crash reductions (frequency and severity) but are increasingly expensive when systematically implemented across the region as they should be.

The Working Group convened by the ARC has reviewed the three options and possible targets for use within the RLTS. The group has initially indicated a preference for an overall lower target for 2040 based on a combination of the three options. In summary, the options included:

- A straight line reduction based on current trends (Option 1) for deaths (no more than 19) and serious injuries (no more than 412).
- An alternative estimation method (Option 2) used a population proportion of the national 2040 target of no more than 200 deaths and 1500 serious injuries using the same death rate and serious injury rate for the Auckland region as the current baseline (2005 to 2007 averages). This produced an Auckland region target of no more than 40 deaths and 361 serious injuries for 2040.

- Option 3 looked at the previous LTSA national target and the proportion of this associated with Auckland. This proportion was then applied to the new target to determine an Auckland rate. This resulted in a combined deaths and serious injury figure of no more than 411 for Auckland by 2040. See Appendix 4 for more detail.

The three 2040 target estimation options are summarised in the table below using the lowest target where a range has been generated.

Estimated Auckland region targets for 2040	Option 1	Option 2	Option 3
Number of deaths.	19	40	n/a
Number of serious injuries.	412	361	n/a
Combined deaths plus serious injuries.	431	401	411

Table 5: Range of potential overall regional targets for 2040

The Working Group has noted that the number of deaths and serious injuries is influenced by a number of potential factors (eg mode share changes, economic conditions, age demographic changes, vehicle kilometres travelled, price of petrol, etc). US research indicates that a raise in petrol price/taxes has a resulting impact on fatality rates (per population and vehicle kilometres travelled) (Grabowski and Morrissey, 2006). Recent research from the US indicates that substantial year-to-year reductions in motor vehicle fatalities cannot be fully explained by the reductions in petrol sales and distance driven alone. Rather, it may be that a major shift in driver behaviour, resulting in disproportionate reductions in distance driven for more risky driving conditions, and for drivers with less income (ie drivers who tend to have higher crash rates). It may also include changed behaviours to save petrol consumption such as reducing speeds has occurred (Sivak, 2008). These factors have not been taken into account in any of the estimation options.

4.2 Proposed regional targets

The relative consistency between the three options provided the working group with some confidence that an overall deaths and serious injuries target of approximately no more than 400 was a “reasonable” target and that the deaths figure of no more than 40 in Option 2 was possibly more realistic, given population growth. Therefore, possible Auckland region targets for 2040 for consideration in the RLTS would be no more than 40 deaths and no more than 360 serious injuries.

If these lowered targets are adopted, this would translate to the Auckland region aiming to have significantly lower death and casualty rates than are currently experienced and see a continuation of the region being “safer” than the country as a whole. Table 4 below outlines these figures and compares the current proportion of deaths and serious injuries to the proposed targets. The slight increase in percentage of the regional contribution is partially due to the significant population growth

projected by 2040 that is, from approximately 33 per cent of the country to around 40 per cent by 2040.

To achieve the proposed targets, safety investment would need to increase substantially on the current investment, particularly in relation to safety engineering on local arterial roads. See the following section for more discussion.

	Average 2005 to 2007	% of NZ	2040	% of NZ
Auckland region				
Number of deaths.	74	18%	40	20%
Number of serious injuries.	537	21%	360	24%
Combined deaths plus serious injuries.	611	20%	400	24%
New Zealand				
Number of deaths.	407		200	
Number of serious injuries.	2605		1500	
Combined deaths plus serious injuries.	3011		1700	

Table 6: National and possible regional targets for 2040

5 Assessment of road safety investment into the future

This section summarises work to assess current road safety investment in relation to regional targets that could inform safety funding into the future.

5.1 Safety engineering

An assessment on current safety engineering spending in relation to regional targets shows that there is a significant under-spend on local arterial roads in relation to 2010 targets, but that the investment on state highways is most likely at an adequate level. The following two sections outline this assessment.

5.1.1 Local arterial safety engineering

It is apparent from the data outlined in Section 2.1.4, and summarised in the Table 7 below, that the region is under-spending on road safety engineering by at least 70 per cent across the region for local authority roads⁶. Some local authorities appear to be under-spending significantly more than others, but this needs to be read with caution as it is acknowledged that many safety benefits are also incorporated into other road projects and therefore not necessarily reflected in the costs outlined.

Local authority	2007/08 (\$m)	2008/09 (\$m)	%2007/08 under	%2008/09 under
Auckland		10.8		42%
North Shore		2.7		70%
Manukau		2.5		89%
Waitakere		2.8		82%
Papakura		0.7		89%
Rodney		2.9		86%
Franklin		1.2		87%
Total	29	23.6	71%	77%

Table 7: Summary of local authority safety engineering investment and estimated minimum percentage under-spend

⁶ ie estimated total expenditure divided by estimated ideal annual arterial safety expenditure of \$102m.

The level of under-spending is supported by the regional target setting work included in the draft RRSP and recently updated for the revised draft RRSP. In summary, the target setting shows that for local roads, both arterial and non-arterial, an overall reduction of nine per cent is required to reach the revised 2012 target that is, 320 crashes compared with 352 occurring in 2007, compared with a seven per cent reduction on all roads (target of 400 crashes compared with 429 occurring in 2007) and an increase on the state highways target of 80 crashes compared with 77 occurring in 2007.

Given the current level of under-spending on road safety engineering and the likely increase in costs per kilometre to achieve 2010 targets it is likely that an increased investment in road safety engineering will be required by local authorities over the next 5-10 years to continue the road safety progress achieved and to achieve the desired crash reduction rate on local authority arterial and other roads.

5.1.2 State highway safety engineering

As the 2005 TP 19 provided no assessment of state highway expenditure it is difficult to outline a similar comparison with the local arterial investment outlined above. However, an assessment of regional targets shows that crashes on state highways across the region are within the 2012 targets and crash reductions are required on local roads.

Therefore, it could be assumed that current investment in safety engineering on state highways is more optimal. For 2008/09 (See Table 2, page 7 above) this was just over \$54m or 9.5 per cent of the overall Auckland regional state highway budget.

5.1.3 Assessment of safety engineering investment for 2009 onwards

Even given the lack of precision in the current safety engineering investment it is obvious that the region is not investing a sufficient level of resource on safety engineering to achieve 2010 or longer-term crash reduction targets. The cost of safety engineering is likely to continue to increase by around seven per cent per annum, further eroding the level of investment in real terms.

Assessing the increase in investment required to better achieve the road safety targets draws on the work completed in 2005. The difficulty of using the 2005 approach is that it quantified additional investment as opposed to an overall budget. Therefore, the following assumptions have been generated to enable the development of an overall safety engineering budget for the region.

- The 2005 calculation of an additional \$507.1m spread over five years is still required as only a small proportion of this investment has been made by local authorities, despite having priority within the RLTS.
- The cost of safety engineering has increased by an estimated 30 per cent between 2005 and the current year and if the 2005 figures are recalculated, this would equate to \$659.3m (as opposed to \$507.1m) required to be spent over the next five

years, plus any ongoing increase in annual cost at around seven per cent per annum.

- State highway safety engineering is required at least to the same levels (currently 9.5 per cent of the state highway budget or \$54m) plus any increase in costs at around seven per cent per annum.

Table 8 below shows the estimated safety engineering funding required in 2009/10 and onwards, to achieve safety targets for the Auckland region over a five and ten year time frame. A ten year timeframe would delay achievement of the targets as it delays safety engineering investment and therefore benefits.

	2008/09 Baseline (Estimated \$millions)	2009/10 onwards (plus seven per cent per annum increase in costs)	
		5-year time frame	10-year time frame (delayed targets)
Local authority non-arterial roads	n/a	n/a	n/a
Local authority arterials	n/a	\$132	\$66
Local authority roads (total)	\$24	\$132+	\$66+
State highways	\$54	\$58	\$58
Total region	\$78	\$190	\$124

Table 8: Estimated safety engineering budget required for 2009/10 onwards for the Auckland region

It is unrealistic to expect local authorities to significantly increase investment above current levels without a change in funding structures that is, the local share or FAR of around 50 per cent. An increase in the FAR to 75 per cent or higher may trigger an increase in investment. However, a decrease in the local share required by local authorities may also lead to an overall funding homeostasis, with local authorities adjusting their budgets to accommodate their increased subsidies.

Recent changes to the funding manual⁷ have reportedly raised the funding profile of some projects, including the ability to group a series of projects, and may encourage some local authorities to apply for funding subsidies for more safety projects. Further, improved regional engineering co-ordination proposed within the RRSP may also result in cost efficiencies and/or more safety projects being put forward. Regardless of any increase in funding levels, these mechanisms for encouraging local authorities to put forward more safety projects require ongoing regional leadership from NZTA and ARTA.

Ideally the increase in investment is required as a quantum jump from current levels, but it may be more pragmatic to aim to incrementally increase funding over a period of time. Further, as some local authorities appear to apply differing percentages of safety engineering investment and are achieving to varying degrees on the safety targets, it may be appropriate to facilitate investment in some local authorities over others,

⁷ ie NZ Transport Agency Planning Programming and Funding Manual or PPFM.

although, it is important to note that an across the board increase is required. This could be a role for the RRSP as opposed to the RLTS. However, annual monitoring under both should include an assessment of investment levels.

The overall road budget for the region has been outlined in the NZTA document titled "Indicative regional allocation by activity class⁸" with lower and upper ranges indicated out to 2019 for 11 different activity classes. Safety engineering could conceivably be drawn from several of these activity classes, but if regional targets are to be achieved, then the upper limits may provide the best chance of achieving an appropriate level of safety engineering investment, and even then maybe investment constrained due to requirements for a local contribution.

5.2 Enforcement

Like 2005, detailed assessment on current enforcement spending in relation to regional targets has not been carried out. However, as noted in 2005, enforcement budgets are set nationally and enhancements rely on legislative changes, many of which were proposed under the Road Safety to 2010 strategy but have not been implemented (Breen, 2004).

Enforcement investment was approximately \$68m in 2007/08 for the Auckland region and has increased over the years. Further increases are warranted along with enhancements in enforcement technology. A key priority is alcohol enforcement given a recent increase in drink driving and an increasing trend in casualties (draft RRSP, 2008). Sustaining current overall downward crash trends will require ongoing and increasingly innovative enforcement programmes largely requiring central government/legislative action. Examples include, the introduction of 0.05 alcohol limit, alcohol interlocks, and speed camera demerit points, all with relatively strong proven cost-benefits. Advocacy for these enhancements could continue to be driven from the regional and local levels along with active uptake of recent innovations such as the red light camera trial if it proves to be effective.

An increased investment is also warranted as road lengths increase through the development of more state highways, motorway extensions and local roads requiring an increased workforce to cover these increases.

The RRSP contains further information on priority enforcement activity for the region.

5.3 Education and community action

A detailed assessment on current educational and community action spending in relation to regional targets has not been carried out. In 2005 it was assessed that an additional \$5.25m was required over five years. Currently around \$3m is invested in total per annum and these funds have increased over time.

⁸ Available from: www.landtransport.govt.nz/funding/stepping-forward/docs/indicative-regional-allocations.pdf

It is likely that an increased investment in education and community action type programmes is warranted in the region, especially as the population continues to grow making it more difficult to work with bigger and bigger communities without increasing the level of investment.

The RRSP contains further information on priority education and community action activity for the region.

5.4 Rail safety

Rail transport remains one of the safest forms of land transport in relation to the very small number of reported crashes in the region.

Between 2001 and 2006⁹ there were nine rail/road crashes in the Auckland region; nationally during the same period there were between 15 and 20 deaths per annum. This included one fatal incident, seven minor injury incidents and one non-injury incident. Currently a programme of grade separation at level crossings in the Auckland region is being planned and has received substantial funding.

Trespass and crime incident data are not available at the time of writing, but ARTA note that it appears that the incident rate of illegal or anti-social behaviour at stations is trending lower than in previous years. This was attributable to greater visibility, better procedures, awareness from community, upgraded infrastructure and better support from the NZ Police. The majority of incidents related to interrupting anti-social behaviour, with the worst incidents being thefts, assaults, drunk or drugged and disorderly conduct. Trespass and vandalism pose important safety issues for the rail network and there is a need for them to be addressed, especially with a move to 10-minute services and double tracking, as these initiatives have the potential to increase injury and crime.

In relation to trespass and route crime, a range of different programmes to influence and reduce trespass behaviour have been developed internationally and have had success in reducing rates of trespass and resulting incidents. It makes sense to incorporate successful elements in developing a strategy and approach for Auckland. A pro-active approach to targeting and addressing trespass on the Auckland network is currently being developed. A profiling exercise to establish the type and extent of trespass currently occurring will be followed by a gradual programme of targeting and addressing trespass hot spots using a three Es (engineering, education and enforcement) approach.

The 2005 RLTS included a number of rail safety policies including one relating to the preparation of a regional rail safety strategy. To date, the region still does not have a regional rail safety plan which identifies key safety priorities and a co-ordinated strategy to enhance overall rail safety and personal security. However, key agencies involved in rail safety meet on a regular basis as the Regional Rail Safety Group (RRSG)

⁹ More up-to-date data were requested from Veolia, but they were unable to provide the author with any current data.

and some safety work is co-ordinated across the region that could provide a foundation for a more comprehensive approach.

In summary, increased frequencies in the region from the greater use of rail for both public transport and freight could result in an increased number of rail related crashes. Significant investment in safer level crossings, involving cars and trains, has commenced, and some efforts around trespass have occurred, but a more comprehensive approach is required. Detailed international protocols guide New Zealand's approach to operational crashes such as collisions, derailments and rail passenger accidents, but again, increasing frequency will bring new challenges that require analysis and identification of additional safety initiatives.

6 Safety and personal security at passenger transport stops and environs

6.1 Overview of safety and personal security

The purpose of this section is to provide an overview of safety and personal security in relation to vulnerable road users, such as pedestrians, cyclists, people with disabilities, and passenger transport users generally at passenger transport stops and environs as a background to the 2009 Regional Land Transport Strategy.

6.1.1 Background

Safety and personal security of vulnerable road users has been considered in previous Regional Land Transport Strategies and has been inherent in the vision for the Auckland transport system for example, achieving vibrant town centres, ensuring streets are community places, and getting around by all modes is integrated, safe and effective¹⁰). A focus has been on road safety, which continues, but which also requires a broader view, especially in the context of an increasingly multi-modal transport system within the region along with an aim to increase passenger transport, walking and cycling trips. As efforts to encourage more people to walk, cycle and use passenger transport continue, a broader and more systematic safety and personal security approach is warranted. This was signalled in the previous Regional Land Transport Strategy and requires further attention into the future.

For example, specific outcomes sought in the 2005 Auckland Regional Land Transport Strategy¹¹ included:

- a safe and secure environment for vulnerable users of the transport system,
- public transport is safe to use at all times, on the vehicle or in the surrounds of the stop or terminal,
- a rail environment is engineered to reduce conflict between rail and other transport modes.

The 2005 Auckland Regional Land Transport Strategy noted that:

Personal security needs to be addressed as part of this Regional Land Transport Strategy. Real and perceived threats to personal security can affect the willingness of individuals to use alternative modes such as walking, cycling or public transport. The strategy's increased emphasis on these

¹⁰ Refer page 37, 2005 Auckland Regional Land Transport Strategy.

¹¹ Refer page 39, 2005 Auckland Regional Land Transport Strategy.

modes needs to be accompanied by an increased emphasis on improvements to the security of the transport environment for their users (p. 72).

The 2005 Auckland Regional Land Transport Strategy included four specific policies relating to safety and personal security of vulnerable road users as follows:

- 1.3.2 Include safety and security related issues in the development of roading, public transport, ridesharing, motorcycling, cycling, walking and other transport projects and programmes. (Transit, TAs, ARTA).
- 1.3.3 Ensure at-risk road users and communities get priority for regional safety initiatives including engineering and strategies to promote walking, cycling and public transport. (Transit, TAs, ARTA, Land Transport NZ).
- 1.3.4 Include the security needs of walkers, cyclists and public transport users (including lighting and surveillance requirements) in the design and assessment of town centre developments, new subdivisions and major redevelopment proposals. (TAs).
- 1.3.6 Where at grade rail crossings are provided they should be designed in a way that they maintain safety for both the rail and road network while adequately providing for pedestrians. (ARTA, TAs, OnTrack).

More recently the New Zealand Transport Strategy (2008) has noted that:

“Personal security relates to crime directed at the individual, particularly when it happens on public transport and while cycling and walking. It is concerned not just with incidents of crime, but also with the fear of crime and the impact this can have in deterring people from using these forms of transport. Many local authorities have put measures in place to address personal security concerns. Guidance on the design of public spaces to minimise personal security risks has also been published by the Ministry of Justice¹². In 2008, Land Transport New Zealand commissioned a report on personal security and public transport, and is working through its findings. Improving personal security on public transport, cycling and walking networks requires partnership action at the local level involving local authorities, transport providers and the police. Specific measures that improve personal security include:

- o design public spaces to prevent crime,
- o information gathering to determine the number and severity of incidents, and to assess public perceptions of the threat to personal security,
- o identification of locations where significant numbers of incidents have been reported and those that are perceived to be unsafe,

¹² National guidelines for Crime Prevention through Environmental design in New Zealand, 2005 (2 parts).

- o where cost-effective, installation of surveillance, lighting, the removal of vegetation or other measures to minimise the risk of incidents and the fear of them,
- o policing to apprehend offenders, deter future offenders and reassure transport users (p. 60)."

6.1.2 Safety perceptions

Data on perceptions of safety for walking and cycling, along with private transport and passenger transport, are regularly compiled by the Auckland Regional Council (ARC) as part of the monitoring of the Regional Land Transport Strategy, and should continue.

The ARC notes that this indicator examines transport users' perceptions of safety of the transport system, across different modes. For the 2006 survey, participants when asked, "how safe do you feel when using the following transport mode in the region?" 85 per cent (c.f. 75 per cent in 2000) responded "always safe" or "mostly safe" for private transport and 69 per cent (c.f. 62 per cent in 2000) for PT. In contrast, 59 per cent (c.f. 52 per cent in 2002) had this response for walking and only 22 per cent (c.f. 19 per cent in 2000) for cycling. Only 24 per cent said they felt always or mostly safe when motorcycling (c.f. 22 per cent in 2004). Motorcycling was a new category included in the 2004 survey.

Available data for the 2000, 2002, 2004 and 2006 surveys are outlined in the following charts 1 to 5 below in order of highest perception of safety to lowest.

In summary, it is apparent that private motor vehicle users perceive they are the safest of all modes, and have an increasing perception of safety, followed by passenger transport users and walking which showed a slightly improving perception of safety. Motorcycling and cycling both showed a slightly worsening perception of safety.

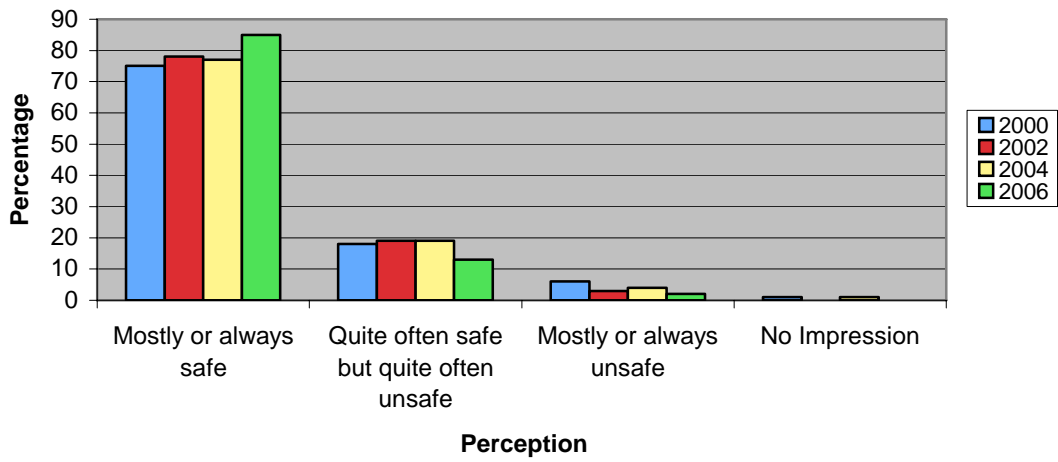


Figure 1: Perceptions of safety in the transport system for private transport (Source: Community perceptions of personal transport choices, ARC 2000, 2002, 2004 and 2006).

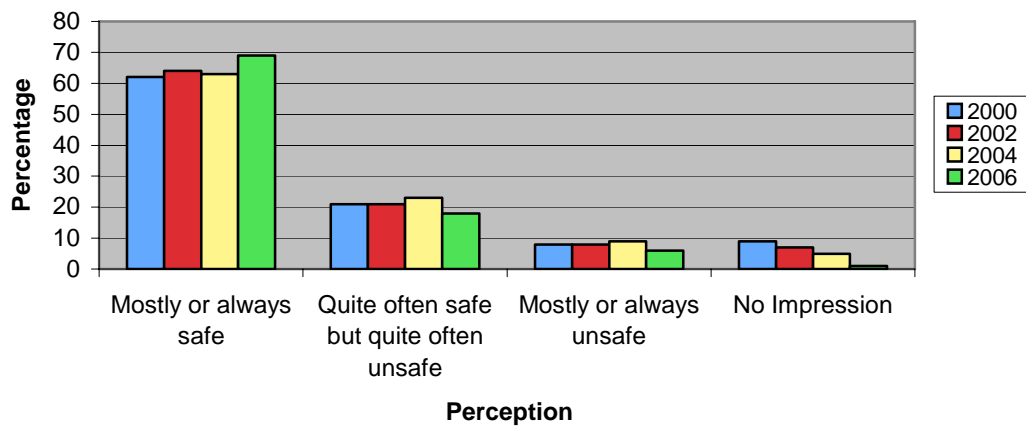


Figure 2: Perceptions of safety in the transport system for public transport (Source: Community perceptions of personal transport choices, ARC 2000, 2002, 2004 and 2006).

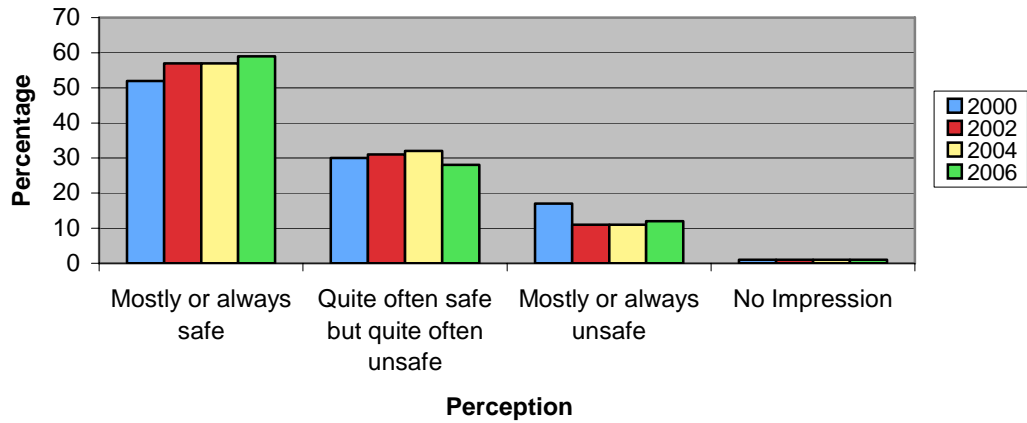


Figure 3: Perceptions of safety in the transport system for walking (Source: Community perceptions of personal transport choices, ARC 2000, 2002, 2004 and 2006).



Figure 4: Perceptions of safety in the transport system for motorcycling (Source: Community perceptions of personal transport choices, ARC 2004 and 2006).

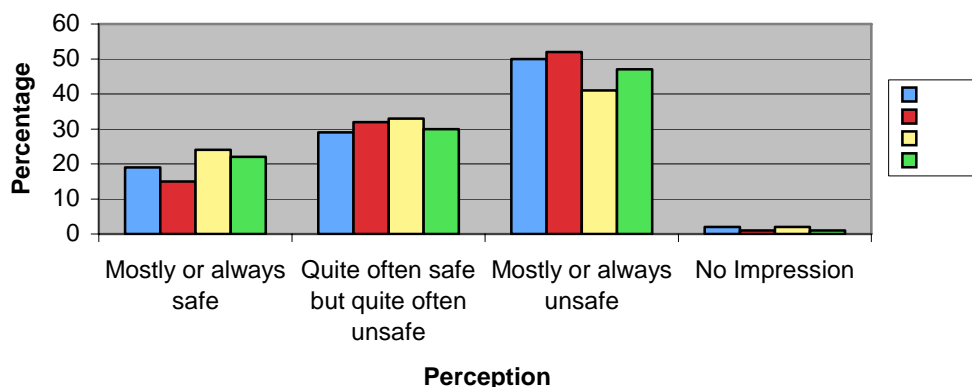


Figure 5: Perceptions of safety in the transport system for cycling (Source: Community perceptions of personal transport choices, ARC 2000, 2002, 2004 and 2006).

6.1.3 Crime, personal safety and security incident data

Data on the number and type of crime, personal safety and security incidents at transport stops and environs are not readily available. However, Police involved in this issue are often able to draw on anecdotal evidence or cases to highlight issues with specific locations or types of location. There is merit on compiling an overview of appropriate data to assist planning.

6.2 Approaches to improve safety and personal security of vulnerable road users

A key focus for improving the safety and security of vulnerable road users is through consideration of urban planning and design under the term, “crime prevention through environmental design” or CPTED. The Ministry for the Environment within their urban design toolkit¹³ includes a range of tools that may be useful, particularly the CPTED “safety audit” and “safety site assessment”¹⁴. An Auckland focus has been developed by Auckland City under their safer city programme¹⁵ and other local authorities also reference CPTED in a variety of policies and plans. The Auckland city guidelines provide a definition of CPTED and principles to be considered, including example photos of poor design and accompanying better design, along with other guidelines.

The other focus for improving safety and personal security for vulnerable road users is to ensure that these issues are considered with broader transport activities such as travel demand management, behaviour change (mode shifting) programmes such as travel plans and overall road safety activity. Adopting a “3-E” approach as with road safety has merit, where appropriate combinations of engineering, predominantly

¹³ Refer: www.mfe.govt.nz/publications/urban/urban-toolkit-apr07/html/index.html

¹⁴ Refer: www.mfe.govt.nz/publications/urban/urban-toolkit-apr07/html/page4.html

¹⁵ Refer: www.aucklandcity.govt.nz/auckland/introduction/safer/default.asp

CPTED but other safety engineering initiatives, enforcement in general crime policing and traffic policing, especially speed enforcement and education, for example community programmes. Police work at the local level with local authorities and similarly support a CPTED approach.

So-called vulnerable road users perceive less safety and personal security than private motor vehicle users. Data on actual safety and personal security are not available to support this perception, but safety and personal security concerns are an important consideration in achieving the Auckland region's transport vision.

There are inherent reasons for more effort to be applied through urban planning and design to improve the safety and personal security environment for vulnerable road users. Guidelines on CPTED are widely available and recognised as a key tool to improve safety and personal security, but could be more firmly embedded within overall regional transport policy and implementation.

Efforts to encourage greater uptake of passenger transport, walking and cycling will be limited without accompanying activity to improve perceptions of safety and personal security. While some progress has been made on infrastructure for pedestrians and cyclists, further efforts are required as a primary means to improve safety and encourage people to use these modes in a safe manner, along with continued education programmes. Motorists need to be aware of other road users, especially in town centres and other areas where pedestrians and cyclists travel. A comprehensive programme of safety and personal security assessments and upgrades for transport stops is also warranted across the region.

The development of a regional rail safety plan that would identify key safety priorities and a co-ordinated strategy to enhance overall rail safety and personal security would assist gains in this area.

In summary, personal security needs a greater focus within road, rail, walking, cycling and general passenger transport plans. Real and perceived threats to personal security can affect the willingness of individuals to walk, cycle or use public transport. Improvements to the security of the transport environment, particularly at transport interchanges and surrounding areas will encourage more people to make these travel choices. The draft RRSP recommends that CPTED measures are built into upgrades to the public transport system including places where people are likely to walk, cycle or otherwise access public transport and establishment of regional guidelines on using CPTED are warranted. The transport sector also needs to work with urban planning and design to ensure CPTED is well integrated into urban development activities.

7 Discussion and conclusions

Improvements to road safety over recent years have been made, but road deaths and injuries continue to be a major issue for the Auckland region. On average one person dies every five days on the region's roads, road-related hospitalisations account for approximately ten per cent of all hospitalisations in the region and overall it was estimated that road crashes resulted in a regional social cost of \$945m. Safety and personal security issues are often major barriers to people choosing to walk, cycle or use passenger transport. Continuing to improve safety and personal security of the transport system will be increasingly challenging as our regional community grows. Increased rates of active and more sustainable transport would have significant public health benefits that need to be harnessed.

7.1 The RLTS and RRSP working together

The RLTS provides an overarching context for transport within the region and provides broad guidance for the Regional Road Safety Plan 2009 to 2012 (RRSP). The RRSP builds on previous plans that focus on a long-term "vision zero" approach to road safety. It has a 2012 goal of no more than 400 fatal and serious injury crashes in one year. This is an ambitious vision requiring an increased investment in safety engineering, enforcement, education and related community activity.

The RRSP highlights road safety priorities and identifies key actions, while reinforcing the continuing need for agencies and the community to work together to bring about change. An emphasis on safety engineering is highlighted, particularly on local authority arterial roads where safety gains are most urgently required. A key barrier is the funding mechanisms for local roads, which require local authorities to apply for funding and provide a "local share" for any safety projects. The data and analysis provided in this paper further highlight the gap in current safety engineering funding, particularly on local arterial roads.

While some progress has been made on infrastructure for pedestrians and cyclists, further efforts are required as a primary means to improve safety and encourage people to use these modes in a safe manner, along with continued education programmes and greater acceptance by motorists to be aware of other road users, especially in town centres and other areas where pedestrians and cyclists travel. Motorists require improved roads and programmes that reinforce safe driving habits such as observing give-way rules and driving to the conditions. Speed management is also central to reducing injuries on local and rural roads. The police require new or enhanced tools to address serious offenders such as repeat drink-drivers, a rising number of drink-drivers, and red light runners. The RRSP outlines regional priorities, key actions and evidence for recommended initiatives.

The concept of a "road user hierarchy" has been established overseas and adopted by NZTA (refer pedestrian planning & design guidelines prepared by Land Transport New

Zealand¹⁶) for use in planning and design processes for new developments and proposed traffic management schemes. The hierarchy is used in appropriate locations and places pedestrians at the top, followed by cyclists, then public transport, with unaccompanied private car-users last. The objective of such a hierarchy is to ensure that the needs of the most vulnerable road users are fully considered in all road schemes. This type of hierarchy would foster overall safety benefits in the context of the aim to achieve a substantial increase in sustainable transport activity and has been incorporated into the RRSP as it is highly consistent with a “vision zero” approach and the region’s aim for more accessible transport.

The region still does not have a regional rail safety plan which identifies safety priorities and a co-ordinated strategy to enhance overall rail safety and personal security. In terms of reported crashes, rail transport remains one of the safest forms of land transport in the region. However, increased frequencies in the region from the greater use of rail for both public transport, and freight, could result in an increased number of rail related crashes. Significant investment in safer level crossings involving cars and trains has commenced, and some efforts around trespass have occurred, but a more comprehensive approach is required. Detailed international protocols guide New Zealand’s approach to operational crashes, such as collisions, derailments and rail passenger accidents, but again, increasing frequency will bring new challenges that require analysis and identification of additional safety initiatives.

Personal security needs a greater focus within road, rail, walking, cycling and general passenger transport plans. Real and perceived threats to personal security can affect the willingness of individuals to walk, cycle or use public transport. Improvements to the security of the transport environment, particularly at transport interchanges and surrounding areas will encourage more people to make these travel choices. The draft RRSP recommends that CPTED measures are built into upgrades to the public transport system, including places where people are likely to walk, cycle or otherwise access public transport and establishment of regional guidelines on using CPTED are warranted. The transport sector also needs to work with urban planning and design to ensure CPTED is well integrated into urban development activities.

Traditionally, land-use policies have been aimed at producing efficiency for motor vehicles on the network. However, the NZTS sets out national targets for an increased use of public transport and walking and cycling in urban areas which will have a significant impact on the efficiency of private motor vehicle transport. The likely effects of planning decisions to do with transport or land-use on the whole of the transport system should therefore be considered at an early stage to avoid unintended adverse consequences for road safety. To address this ARTA has developed the integrated transport assessment (ITA) guidelines (ARTA, 2007) to assist in identifying how a development will interact with the existing transport networks, where traffic capacity constraints may occur, where passenger transport services are sufficient, or where extra services are required, and the level of accessibility for walking and cycling.

¹⁶ Available from: www.ltsa.govt.nz/road-user-safety/walking-and-cycling/pedestrian-planning-design-guide/index.html

7.2 Conclusions

An assessment of safety engineering investment across the region in relation to current and possible future targets highlights that a substantively increased investment will be required. How this increased investment is achieved, especially in relation to local arterial roads, is not straight forward as evidenced by a significant under-investment in relation to the priority it was given in the 2005 RLTS. To achieve the region's targets and make progress towards "vision zero" (ie to continue the road safety progress achieved and to achieve the desired crash reduction rate on local authority arterial and other roads) an increased investment in road safety engineering will be required by local authorities over the next five to 10 years along with improved regional co-ordination of safety engineering efforts to ensure cost-efficient implementation of best-practice initiatives. To address inequalities experienced in road safety outcomes by different population groups, priority will need to be given to communities with high socioeconomic deprivation, including specific programmes for Maori and Pacific communities, and programmes for children and young adults. Increases in investment for enforcement and education are also warranted, along with continued innovation and use of new enforcement technologies. The introduction of a road user hierarchy, further infrastructure development for walking and cycling, coupled with proactive traffic demand management initiatives, and viewing road safety from a public health approach, are all important contextual considerations to improving safety outcomes under the RLTS.

7.3 Draft safety policies for consideration within the RLTS

Outlined below are a range of potential safety policies derived by a review of the 2005 RLTS policies, (references to 2005 policies are noted in square brackets on the policies below), discussions with the Working Group and the material included within this report.

Land use

[new policy] Establish a regional road user hierarchy for use on nominated road types and locations that promotes active modes, urban amenity and vulnerable road users' safety in all road projects, including infrastructure maintenance and development. So that on:

- all roads not otherwise specified, identify schools, hospitals and other destinations for vulnerable road users and provide for their safety and access,
- arterial roads identified in the RARP with a "place" function (eg high density and town centres, schools, or hospitals etc) include design for vulnerable road users' safety and amenity as a priority,
- community focussed local roads such as high density centres, town centres, and regional growth corridors where pedestrians and cyclists (including the mobility impaired) have priority, the following hierarchy should be used:

- o reducing traffic volumes on the adjacent roadway considered first; followed by reducing the traffic speed on the adjacent roadway,
- o reallocating space in the road corridor to pedestrians,
- o providing direct at-grade crossing treatments,
- o improving pedestrian routes on existing desire lines,
- o where 1-4 cannot be addressed, provide new pedestrian route alignment, such as segregated paths and grade separation.

(ARTA, NZTA, TAs, RoadSafe Auckland group members).

[relates to 1.3.1] Implement the key road safety strategies identified in the Regional Road Safety Plan 2009 to 2012 through a combination of enhanced safety management, planning and engineering, advocacy for legislative changes, further enforcement and education to develop a regional safety culture that focuses on:

- Effective speed management and other initiatives that support a growing community acceptance of speed limits.
- Well targeted drink-drive enforcement, integrated driver rehabilitation and visible host responsibility.
- Improved pedestrian safety.
- Improved intersection safety.
- Improved bends and roadside hazard safety.
- Initiatives tailored to the needs of at-risk and vulnerable road users (including children/youth, cyclists, motorcyclists, etc).
- Integrated passenger transport safety.

(RoadSafe Auckland group members, ARTA).

[relates to 1.3.5] Co-ordinate road safety initiatives through annual monitoring and review of the Regional Road Safety Plan that is reported to the Regional Transport Committee (ARC, RoadSafe Auckland group, ARTA).

[relates to 1.3.5] ARC to commission an independent review of regional road safety every three years from 2009 (ARC, RoadSafe Auckland group, ARTA).

[new policy] Develop a region-wide speed management policy (including urban design and planning considerations, enforcement considerations, safety engineering considerations and safety promotion/community action considerations) that enables further promotion of active modes, increased passenger transport use, accessibility, and overall improved safety performance of the transport network (RoadSafe Auckland group members, ARTA, NZTA, TAs).

[new policy, partially relates to 1.3.1] Support implementation of speed enforcement measures such as the reduction of speed tolerance as a means to reduce injury risk to vulnerable road users around schools, as is the current New Zealand Police policy, town centres and other locations (RoadSafe Auckland group members, ARTA).

[new policy] Identify and carry out safety impact assessments (as part of Integrated Transport Assessments) for new developments (RoadSafe Auckland group members, ARTA, NZTA, TAs).

[relates to 1.3.8 and incorporates 1.3.6] Establish a regional rail safety strategy or framework that outlines a programme of rail safety and personal security actions to be implemented and monitored that focuses on:

- Trespass and route crime (involving the public on tracks without authorization) safety.
- Level crossings (involving cars and trains) safety.
- Operational crash (such as collisions, derailments and rail passenger accidents) safety.
- Personal safety and security at transport interchanges and surrounding areas.

(ARTA, NZTA, NZ Rail Corp, TAs, NZ Police, Operators).

[Relates to 1.3.7] Provide leadership and co-ordination for groups working co-operatively in the field of road and rail safety. (ARTA, NZ Rail Corp, NZTA).

[new policy] Support a project to investigate inequalities of road safety/injury outcomes within the region by socioeconomic status and ethnicity and possible implications for road safety programme implementation (Ministry of Health, NZTA, ARC, ARTA, Auckland Regional Public Health Service).

Travel behaviour

[new policy] Travel behaviour change programmes will incorporate safety and personal security initiatives (ARTA, NZTA, TAs).

Improving PT & active modes

[relates to 1.3.4] Include the security needs of walkers, cyclists and public transport users (including lighting and surveillance requirements and other crime prevention through environmental design principles) in the design and assessment of town centre developments, transport interchanges and surrounding areas, new subdivisions and major redevelopment proposals (ARTA, NZTA, TAs).

[relates to 1.3.4] Prioritise communities, especially with areas of high socioeconomic deprivation for environmental interventions to address the security needs of walkers, cyclists and public transport users (ARTA, NZTA, TAs)

Also, see policies under land use planning.

Network management

[relates to 1.3.2 and 1.3.3] Advocate for increased explicit safety engineering funding for widespread implementation across the region with an increased focus on local authority arterial roads, including consideration of a decreased local share for key safety projects and/or other means of encouraging increased investment by local authorities, and prioritisation to at-risk communities, road users, and locations such as schools and town centres (ARC, ARTA, NZTA, TAs).

[new policy, partially relates to 1.3.1] Advocate for increased speed enforcement and increased drink-driving-related (including sale of alcohol) enforcement, and new and enhanced tools for preventing drink driving (specifically, introduction of a 0.05 alcohol limit and alcohol interlocks) and speeding (specifically, introduction of demerit points for speed cameras) (RoadSafe Auckland group members, ARTA).

[new policy] Identify and carry out safety impact assessments and hazard management assessments/management plans on priority routes, and roads to priority sites, identified by the Auckland Engineering Lifelines Group (ARC, ARTA, NZTA, TAs).

New road capacity

[new policy] Apply best-practice safety engineering and transport planning principles to all new road projects including: application of a road user hierarchy that prioritises vulnerable road users; safety auditing throughout the project lifecycle; and health impact assessments as required (ARTA, NZTA, TAs).

8 Acknowledgements

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9 References

Auckland Regional Council, (2005). Regional Land Transport Strategy Technical Paper 19: Assessing future regional road safety investment.

Auckland Regional Transport Authority, (2008). Draft Auckland Regional Road Safety Plan 2008-2012.

Auckland Regional Public Health Service, (2006). Improving health and wellbeing: A public health perspective for local authorities in the Auckland Region.

Breen, J., (2004). Review of the Road Safety to 2010 Strategy – Recommendations. Available from: www.transport.govt.nz

Bliss, A. and Breen, J. (2008), Implementing the Recommendations of the World Report on Road Traffic Injury Prevention, Global Road Safety Facility, World Bank.

Craig, E. and Jackson, C., (2005), The health status of children and young people in Counties Manukau 2005.

Craig, E., Taufa, S., Jackson, C. and Han, D.Y., (2008), *The health of Pacific children and young people in New Zealand* Ministry of Health.
[http://www.paediatrics.org.nz/Files/The%20Health%20of%20Pacific%20Children%20and%20Young%20People%20in%20New%20Zealand%20\(Full%20Report\).pdf](http://www.paediatrics.org.nz/Files/The%20Health%20of%20Pacific%20Children%20and%20Young%20People%20in%20New%20Zealand%20(Full%20Report).pdf)

Grabowski, D. C., and Morrissey, M. A., (2006). Do higher gasoline taxes save lives? *Economic Letters*, 90. p.51-55.

Ministry of Health, (2006). Tatau Kahukura. Maori health chartbook.

Ministry of Transport, (2005). Getting there – on foot, by cycle: A strategy to advance walking and cycling in New Zealand transport.

Ministry of Transport, (2005). Rail safety targets: Position paper. Strategy working document.

Ministry of Transport, (2008). Motor vehicles crashes in New Zealand 2007.

Sivak, M., (2008). *Is the U.S on the path to the lowest motor vehicle fatalities in decades?* The University of Michigan Transportation Research Institute, Report No. UMTRI-2008-39, July 2008.

Sullivan, C., (2004). Review: older driver crash statistics. Report for the Ministry of Transport by Capital Research, April 2004.

World Health Organisation, (2004). *World report on road traffic injury prevention* (available from: www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/index.html).

10 Appendix 1: Road safety management system pyramid

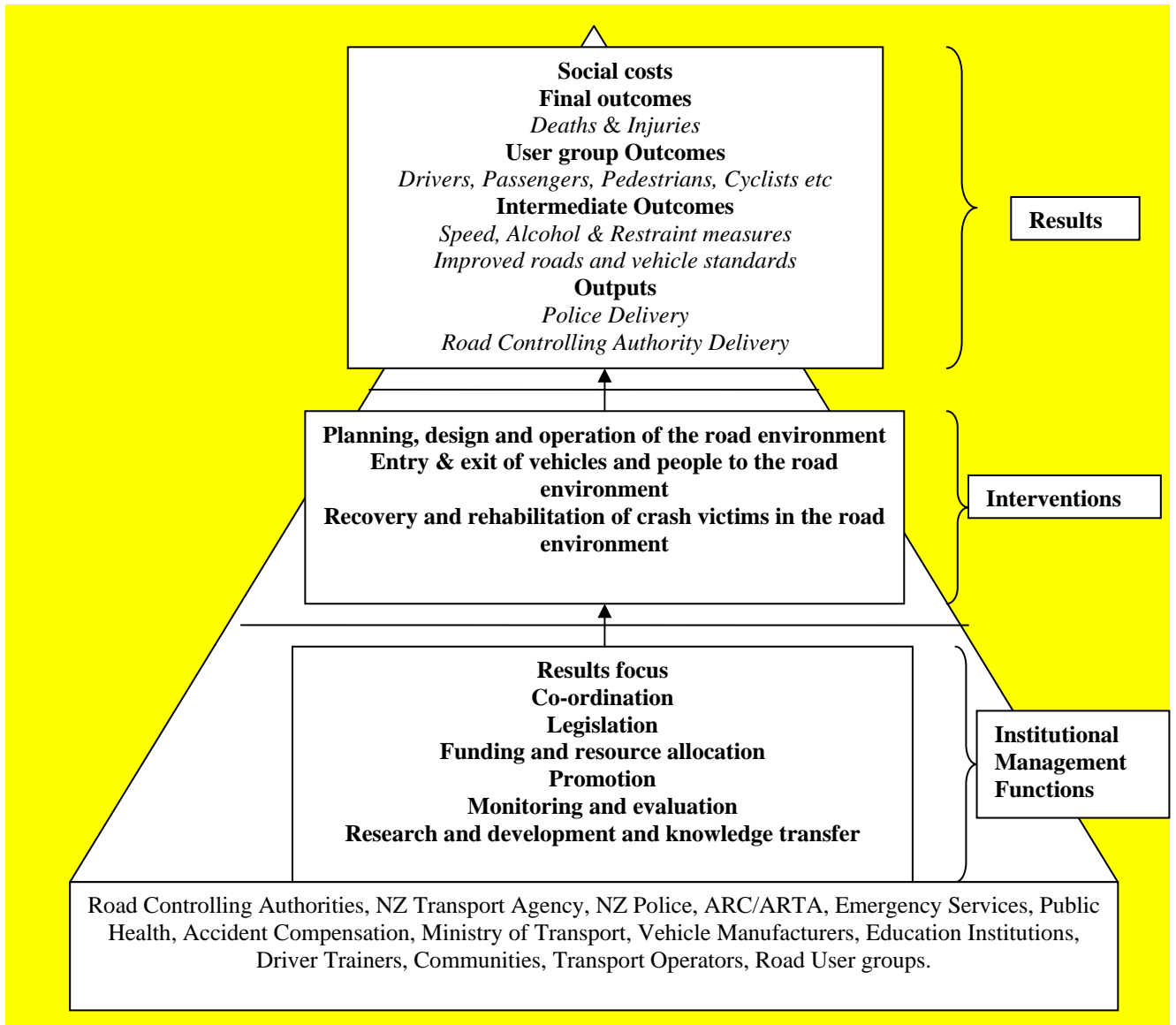


Figure 6: Road Safety Management System Pyramid (adapted from Bliss and Breen, 2008) from the revised draft RRSP (2009)

11 Appendix 2: 2005 calculation summary

The following table outlines the figures used in the 2005 calculation.

Local authority	Length (km)	Cost (\$m)	Yearly fatality saving	Yearly ser inj saving	Length (km)	Cost (\$m)	Yearly fatality saving	Yearly ser inj saving	Length (km)	Cost (\$m)	Yearly fatality saving	Yearly ser inj saving
Auckland	253	\$92.6	6.1	72	0	\$0.0	0.0	0	253	\$92.6	6.1	72
North Shore	121	\$44.3	2.9	34	0	\$0.0	0.0	0	121	\$44.3	2.9	34
Manukau	106	\$38.8	2.5	30	115	\$69.9	2.2	24	221	\$108.7	4.7	54
Waitakere	97	\$35.5	2.3	28	70	\$42.6	1.3	15	167	\$78.1	3.7	42
Papakura	35	\$12.8	0.8	10	33	\$20.1	0.6	7	68	\$32.9	1.5	17
Rodney	20	\$7.3	0.5	6	161	\$97.9	3.1	34	181	\$105.2	3.5	39
Franklin	16	\$5.9	0.4	5	65	\$39.5	1.2	14	81	\$45.4	1.6	18
Total	648	\$237.2	15.6	185	444	\$270.0	8.4	93	1,092	\$507.1	24.0	277

Table 9: Local authority estimated additional arterial road safety engineering costs (5-year total) and benefits (annual) to achieve 2010 targets (Source: TP19, 2005)

12 Appendix 3: Engineering cost increase data

The tables below outline the estimated increase in engineering costs based on actual increases reported for maintenance between 2005/06 and 2008/09.

Local authority	2005/06 (\$m)	2006/07 (\$m)	2007/08 (\$m)	2008/09 (\$m)	Network (km)	Annual average change	Annual average % change
Costs							
Auckland	41.0	51.6	57.6	58.5	1435	4.4	10.7%
North Shore	13.5	19.1	19.2	20.2	695	1.7	12.4%
Manukau	25.5	28.3	29.9	31.0	1278	1.4	5.4%
Waitakere	14.5	17.5	18.0	18.8	788	1.1	7.4%
Papakura	4.3	5.0	5.6	5.8	297	0.4	8.7%
Rodney	23.3	26.0	26.0	27.3	1710	1.0	4.3%
Franklin	13.6	14.2	14.9	15.4	1624	0.5	3.3%
Total	135.7	161.7	171.2	177.0	7827	10.3	7.6%
Local authority	2005/06 (\$000)	2006/07 (\$000)	2007/08 (\$000)	2008/09 (\$000)	Network (km)	Annual average change	Annual average % change
Costs/km							
Auckland	28.6	36.0	40.1	40.8	1435	3.0	10.7%
North Shore	19.4	27.5	27.6	29.1	695	2.4	12.4%
Manukau	20.0	22.1	23.4	24.3	1278	1.1	5.4%
Waitakere	18.4	22.2	22.8	23.9	788	1.4	7.4%
Papakura	14.5	16.8	18.9	19.5	297	1.3	8.7%
Rodney	13.6	15.2	15.2	16.0	1710	0.6	4.3%
Franklin	8.4	8.7	9.2	9.5	1624	0.3	3.3%
Total	17.3	20.7	21.9	22.6	7827	1.3	7.6%

Table 10: Maintenance road engineering costs between 2005/06 and 2008/09 (Source NZTP, Nov-07)

Assuming that maintenance cost increases are comparable to cost increases across a range of safety engineering activities, then the 2005 TP cost per kilometre figures should be inflated by a similar rate (30 per cent increase), especially for any 2009 baseline re-calculations. This would provide an urban cost/kilometre figure of \$475,800 and a rural cost of \$790,400. These figures are outlined in the table below.

	2005 TP figures	30% increase	Proposed 2009 baseline figures
Urban	\$366,000	\$109,800	\$475,800
Rural	\$608,000	\$182,400	\$790,400

Table 11: 2005 TP cost per kilometre figures inflated by 30 per cent for a 2009 baseline

13 Appendix 4: Target Estimation Options

13.1 Introduction

This appendix provides an overview of recent crash data along with three options for estimating a regional contribution to the national 2040 targets that could then be incorporated into the Auckland Regional Land Transport Strategy (RLTS). The Appendix purpose is to provide an estimation of possible regional road safety targets for use within the RLTS.

13.2 Auckland region crash data times series 1997 to 2007

Analysis of Auckland region crash data between 1997 and 2007 (11 years) is outlined below.

13.2.1 Road casualties by seriousness of injury

In summary:

Overall deaths are declining

- Percentage change between 1997 and 2006 was -27.0 per cent (-2.7 per cent annual average).
- Percentage change between 1998 and 2007 was -41.9 per cent (-4.2 per cent annual average).
- Percentage change between three year periods of 1997-1999 to 2004-2006 was -17.8 per cent (-2.5 per cent annual average).
- Percentage change between three year periods of 1998-2000 to 2005-2007 was -15.9 per cent (-2.3 per cent annual average).

Overall serious injuries are declining slightly

- Percentage change between 1997 and 2006 was 11.8 per cent (1.2 per cent annual average).
- Percentage change between 1998 and 2007 was -8.3 per cent (-0.8 per cent annual average).
- Percentage change between three year periods of 1997-1999 to 2004-2006 was 2.6 per cent (0.4 per cent annual average).
- Percentage change between 3-year periods of 1998-2000 to 2005-2007 was -1.3 per cent (-0.2 per cent annual average).

Minor and total injuries are increasing.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Number of road deaths	115	105	89	70	74	84	81	93	77	84	61
Serious injuries	558	527	575	530	560	639	545	576	503	624	483
Minor injuries	3297	2893	3032	2597	2803	3111	3561	3482	3595	3786	3760
Unknown	6	0	1	0	0	0	0	0	0	0	0
Total	3976	3525	3697	3197	3437	3834	4187	4151	4175	4494	4304

Table 12: Road casualties by seriousness of injury for the Auckland region 1997 to 2007

13.2.2 Proportion of different types of injuries

In summary:

- Overall proportion of deaths to total number of injuries is declining.
- Overall proportion of serious injuries to total number of injuries is declining.
- Proportion of deaths to serious injuries is declining.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
%death/total	2.9%	3.0%	2.4%	2.2%	2.2%	2.2%	1.9%	2.2%	1.8%	1.9%	1.4%
%serious injuries/total	14.0%	15.0%	15.6%	16.6%	16.3%	16.7%	13.0%	13.9%	12.0%	13.9%	11.2%
%death/serious injuries	20.6%	19.9%	15.5%	13.2%	13.2%	13.1%	14.9%	16.1%	15.3%	13.5%	12.6%

Table 13: Table: Proportion of different types of injury for the Auckland region 1997 to 2007

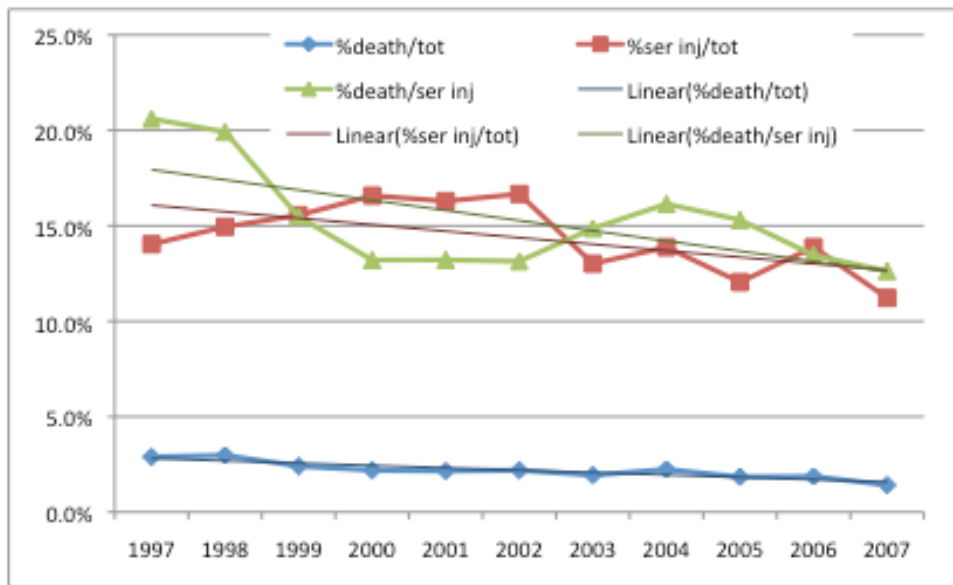


Figure 7: Proportion of different types of injury for the Auckland region 1997 to 2007

13.2.3 Deaths plus serious injuries

In summary:

- High of 723 in 2002.
- Low of 580 in 2005.
- Ten year average (1998-2007) was 638.
- Trend is downward, but increasingly variable:
 - Percentage change between 1997 and 2006 was 5.2 per cent (0.5 per cent annual average).
 - Percentage change between 1998 and 2007 was -13.9 per cent (-1.4 per cent annual average).
 - Percentage change between three year periods of 1997-1999 to 2004-2006 was -0.6 per cent (-0.1 per cent annual average).
 - Percentage change between three year periods of 1998-2000 to 2005-2007 was -3.4 per cent (-0.5 per cent annual average).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Deaths + serious injuries	673	632	664	600	634	723	626	669	580	708	544

Table 12: Deaths plus serious injuries for the Auckland region 1997 to 2007



Figure 8: Death plus serious injuries for the Auckland region 1997 to 2007

13.3 Options for estimating regional targets

Three options are outlined below for estimating regional targets. Rationale and assumptions are described for each option.

13.3.1 Estimated targets using straight line decreasing trend (Option 1)

The table below outlines potential regional targets for number of road deaths, number of serious injuries, number of deaths plus serious injuries and population rates for deaths and serious injuries using a range of decreasing straight line trends (ie standard annual average percentage decrease) based on an analysis of trends between 1997 and 2007 (see above).

	Baseline (av 2005 to 2007)	2007 (Actual)	Estimates only					
			2008	2010	2015 (GPS)	2031 Projected Population	2040 (NZTS)	2041 (RLTS)
Auckland region population (000s)	1,371	1,394	1,414	1,449	1,554	1,932	2,200	2,230
Deaths - no.								
Low (-4%PA)	74	61	71	65	53	28	19	18
Med (-3%PA)	74	61	72	68	58	36	27	26
High (-2%PA)	74	61	73	70	63	46	38	37
Deaths - pop. rate								
Low (-4%PA)	0.54	0.44	0.50	0.45	0.34	0.14	0.09	0.08
Med (-3%PA)	0.54	0.44	0.51	0.47	0.37	0.18	0.12	0.12
High (-2%PA)	0.54	0.44	0.51	0.48	0.41	0.24	0.17	0.17
Serious Injuries - no.								
Low (-0.8%PA)	537	483	533	524	504	443	412	409
Med (-0.2%PA)	537	483	536	534	528	512	503	502
High (-0.1%PA)	537	483	536	535	533	524	520	519
Serious Injuries - pop. rate								
Low (-0.8%PA)	3.91	3.46	3.77	3.62	3.24	2.29	1.87	1.83
Med (-0.2%PA)	3.91	3.46	3.79	3.68	3.40	2.65	2.28	2.25
High (-0.1%PA)	3.91	3.46	3.79	3.69	3.43	2.71	2.36	2.33
Deaths plus Serious injuries - no.								
Low target	611	544	604	590	557	471	431	427
Med target	611	544	608	601	586	547	530	528
High target	611	544	609	605	596	570	558	556

Table 15: Estimated targets using a straight line decreasing trend

Key assumptions:

- Current broad downward trends continue, ranges are estimated based on an analysis of the last 11 years.
- Decreasing number of deaths continues downward trend of between two to four per cent per annum resulting in lower death rate per population
- Decreasing number of serious injuries continues mainly downward trend of less than one per cent per annum, but it is important to note that the trend has a high degree of variability with periods of upward trends. High, med, and low percentage decreases are all assuming a downward trend and it is possible this will not occur, especially if the safety investment is only maintained at current levels or is reduced.
- Baseline is the average of the three-year period 2005 to 2007.

- Population figures are projected resident population for the Auckland region.

13.3.2 Estimated targets using proportion of 2040 national target (Option 2)

The table below outlines potential regional targets for number of road deaths, number of serious injuries, number of deaths plus serious injuries and population rates for deaths and serious injuries using a range of high or low proportions of the 2040 national target of less than 200 deaths and 1,500 serious injuries.

	Baseline (av 2005 to 2007)	2007 (Actual)	Estimates only					
			2008	2010	2015 (GPS)	2031 Proj Pop	2040 (NZTS)	2041 (RLTS)
Auckland region population (000s)	1371	1394	1414	1449	1554	1932	2200	2230
Deaths - no.								
Low (50% of NZ)	74	61	n/a		n/a		40	
High (same rate as NZ)	74	61	n/a		n/a		79	
Deaths - pop. Rate/10,000 people								
Low (50% NZ rate)	0.54	0.44	n/a		n/a		0.18	
High (same rate as NZ)	0.54	0.44	n/a		n/a		0.36	
Serious Injuries - no.								
Low (60% of NZ)	537	483	n/a		n/a		361	
High (same rate as NZ)	537	483	n/a		n/a		601	
Serious Injuries - pop. Rate/10,000 people								
Low (60% of NZ)	3.91	3.46	n/a		n/a		1.64	
High (same rate as NZ)	3.91	3.46	n/a		n/a		2.73	
Deaths plus Serious injuries - no.								
Low target	611	544	n/a		n/a		401	
High target	611	544	n/a		n/a		680	

Table 16: Estimated targets using population proportion of 2040 national target

Key assumptions:

- Auckland regional deaths and serious injuries calculated as a population rate of the 2040 national target based on projected population and either a low target (ie using current better safety performance of the region to NZ as a whole) or a high target using the same population rate for Auckland as NZ as a whole (ie Auckland region would have a worsening safety performance in comparison to NZ as a whole).
- Auckland region currently has a death rate approximately 50 per cent of that of NZ as a whole, ie an average of 0.54 deaths per 10,000 people between 2005 and 2007 for the Auckland region compared with an average of 0.97 for NZ.
- Auckland region currently has a serious injury rate approximately 60 per cent of that of NZ as a whole, ie an average of 3.91 serious injuries per 10,000 people between 2005 and 2007 for the Auckland region compared with an average of 6.22 for NZ.
- A national death rate of 0.36 deaths per 10,000 people is calculated based on a 2040 target of 200 or less and a serious injury rate of 2.73 injured people per 10,000 people is calculated on a 2040 target of 1500 or less.
- Population figures are projected resident population for the Auckland region, which means that the Auckland region increases its proportion of the population from approximately 33 per cent at baseline to 40 per cent at 2040.

13.3.3 Applying the Auckland 2010 proportion of the national target to NZTS 2040 target (Option 3)

An alternative option for estimating regional targets was suggested by the Project Sponsor in relation to the above two options. This included looking at the LTSA regionalised 2010 national targets and the population in 2010, to work out the proportion of the national target, per capita, expected of Auckland to achieve, and then applying that proportion to the 2040 national per capita rate.

Calculations

LTSA/Land Transport NZ has never “officially” provided a regional 2010 target, but reports on a “regional goal” which is presented as a target and which Andrew has converted into the current 2010 target of “deaths + serious injury crashes” within the draft RRSP 2008-12.

The Ministry of Transport figure monitored: By 2010 (Dec 1/4) to have no more than 690 deaths plus hospitalisations of 1 day or more.

Draft RRSP: By 2010 to have no more than 408 fatal plus serious injury crashes.

It is estimated that a figure of 515 deaths plus serious injuries (ie casualties not crashes) for 2010 by assuming that the 2006 proportion of crashes to casualties was 79 per cent (ie dividing 408 by 79 per cent) [compared with the 690 deaths plus hosp target divided by 1.5 = 460].

As the tables below show, “deaths plus hospitalisation of one day or more” are approximately the 1.5 times “deaths plus serious injuries” in the Auckland region. The

three years below show some variability and are different to the national figures (approximately 1.1 times).

Auckland region	Deaths + hosp 1 day	Deaths + serious injuries	Ratio deaths/hosp to deaths/serious injuries
2005	905	580	1.56
2006	988	708	1.40
2007	896	544	1.65
Average	930	611	1.52

NZ	Deaths + hosp 1 day	Deaths + serious injuries	Ratio deaths/hosp to deaths/serious injuries
2005	3226	2936	1.10
2006	3348	3022	1.11
2007	3439	3076	1.12
Average	3338	3011	1.11

Nationally, the MoT target for 2010 is 2500 deaths plus hospitalisations of one day or more making the Auckland region proportion 27.6 per cent. The MoT use approximately 27 per cent throughout their times series from 2004 onwards. I am not sure if this is based on a population rate; it looks like it probably isn't.

Anyway, if we convert the 2010 regional "target" into a population rate the figures work through in the following table:

	Deaths + hosp 1 day	Deaths + serious injuries	2040 pop rate (deaths + serious injuries)
2010 target	690	460 (690/1.5)	
2010 Auckland population rate	4.76	3.17	1.87 (3.10x0.60)
2010 National population rate	5.79	5.26	3.10
Ratio Auckland/NZ rates	0.82	0.60	0.60
National 2010 target	2500	2273 (2500/1.1)	
National 2040 target	1870 (1700 x 1.1)	1700 (200 + 1500)	
Auckland 2040 estimated target	617 (411 x 1.5)	411 (Projected Auckland population x 1.87)	

	Deaths + hosp 1 day	Deaths + serious injuries	2040 pop rate (deaths + serious injuries)
Auckland reg target/NZ target (population %)			
2010 (33.5%)	27.6%	20.2%	
2040 (40.1%)	33.0%	24.2%	

Key:

Blue = actual target/calculated rate

Key notes and assumptions:

- These figures are rough estimates only.
- As the 2010 targets are “deaths + hospitalisations one day or more” and the 2040 targets are “deaths” and “serious injuries”, to compare these, the 2010 death and serious injuries figure is estimated by multiplying the death + hospitalisations number by 1.5 (the approximate average of the actual ratio of these figures between 2006 and 2007 in the Auckland region. Note: different to national ratio of 1.1, which has been used for national conversions).
- The estimated 2010 deaths and serious injuries figure for the Auckland region used in the calculations above (460) is less than the 515 estimated by using the 408 deaths and serious crashes stated in the draft RRSP.
- The latest three year average of deaths and serious injuries is 611, 2007 had the lowest figure of 544 in the last 10 years, but the 10-year average is 638. The 515 figure (est. from the draft RRSP) is possible by 2010, but would need to be an outstanding year. A more likely estimation using a range of straight line trends for 2010 is a range from 590 to 605.
- Population projection figures as per tables from previous paper.
- For the deaths and serious injuries figures, combined population rates have been calculated, ie 3.17 deaths + serious injuries per 10,000 population in the Auckland region based on a target of 460. Similarly, the national rate of 5.26 is based on an estimated 2,273 deaths + serious injuries (2,500/1.1, the estimated national ratio of deaths and hospitalisations to deaths and serious injuries).
- Historically, the death rate has been decreasing at a greater rate than the reduction in serious injury rate. Therefore, projections into the future should ideally factor this in. The figures above have assumed that the rates will decrease in unison, ie at the same rate, not with deaths decreasing faster than serious injuries.
- The deaths plus hospitalisations figures appear to “give” the Auckland region a more equitable proportion of the targets (ie closer to the actual population proportions) than the deaths plus serious injury figures (significantly less than the population proportions).

Option 3 conclusion

Using the figures above, the suggestion that we apply the 2010 Auckland region/national proportion to the 2040 national target utilising a per capita rate is feasible, but fraught with inaccuracy due to the need to convert between different measures (ie 2010 deaths plus hospitalisations of one day or more and 2040 deaths and serious injuries). The estimated 2040 target of 411 is below the lowest estimate target (419 to 759) using the other two estimation options and possibly reflects the challenging (and most unlikely to be met) target set for 2010.

13.4 Summary of casualty (and crash) rates and targets

The table below outlines a summary of casualty and crash rates and targets that are known or currently outlined in policy and strategy documents.

Figures that are bold are actual targets. Bold italic represents an actual target translated into a rate.

	Baseline (average 2005 to 2007)	2007	2010	2015 (GPS)	2031 Projected Pop	2040 (NZTS)	2041 (RLTS)	2051 (RLTS)	
Auckland region population	1,371,000 ¹⁷	1,394,000 ¹⁸	1,449,000 ¹⁹	1,554,000 ³	1,932,300 ²⁰	2,200,000 ³	2,230,000 ³		
NZ Population	4,184,600 ¹	4,228,300 ²	4,320,000 ²¹	4,496,000 ⁵	5,089,700	5,487,000 ⁵	5,531,000 ⁵		
% Auckland reg to NZ pop	32.8%	33.0%	33.5%	34.6%	38.0%	40.1%	40.3%		
Auckland deaths per 10,000 population	0.54	0.44							
Auckland serious injuries per 10,000 population	3.91	3.46							
NZ Deaths per 10,000 population	0.97	1.00				0.36			
NZ Serious injuries per 10,000 pop	6.22	6.28				2.73			
			Targets						
Auckland region deaths	74	61		n/a		?RLTS and/or 2020 strategy [19 to 79]	?	?	
Auckland region Serious injuries	537	483		n/a		?RLTS and/or 2020 strategy [400 to 680]	?	?	
Auckland deaths + Serious injury crashes	561 ²² compared with 708 casualties (79%)		408 (if 79%, then 515 casualties)			[335 to 607 crashes or 419 to 759 casualties]			
NZ deaths	407	422		Decreasing		200			
NZ serious injuries	2,605	2,654		Decreasing		1,500			

Table 17: Summary of targets and underlying data

¹⁷ Projected resident population as at 30 June 2006 (Source: Auckland Region Quarterly Review March 2008, Statistics New Zealand, Subnational Population Projections, 2006 base).

¹⁸ Estimated population as at 30 June 2007 (Source: Statistics New Zealand, Subnational Population Estimates as at June 2008, <http://www.stats.govt.nz/products-and-services/hot-off-the-press/subnational-population-estimates/subnational-population-estimates-jun08-hotp.htm?page=para004Master> accessed Nov-08).

¹⁹ Projected resident population 2006 increased by the estimated annual increase of 1.4 per cent for each year rounded to the nearest 1,000.

²⁰ Projected resident population as at 30 June 2031 (Source: Auckland Region Quarterly Review March 2008, Statistics New Zealand, Subnational Population Projections, 2006 base).

²¹ Projected resident population 2006 increased by the estimated annual increase of 0.8 per cent for each year rounded to the nearest 1,000.

²² Reported number of fatal + serious injury crashes in 2006 (Draft RRSP, 2008).

Note: Bold is actual target. Bold italic is actual target translated into a rate.

13.5 Target estimation discussion²³

The use of targets and goals within road safety strategies has been common practice since the first national road safety plan in 1991 which set targets for the number and rate of road crash casualties, and key behaviours and attitudes of road users. The 1997-2001 Regional Road Safety Plan introduced regional goals and targets based on the 1995 National Road Safety Plan. For example, the 1998 target was 84 deaths (or 8.6 deaths per 100,000 people) and the 2001 target was 64 deaths (or 6.9 deaths per 100,000 people, nationally this was 420 or 11.0 deaths per 100,000). The 1997-2001 RRSP also included targets for 'injury crashes per 100,000' and crash targets for key priority areas such as alcohol, speed, failure to give way, pedestrian safety (fatalities and number of injuries) and behavioural targets for occupant restraint use. The 1995 NRSP also introduced a target for the number of hospitalisations due to road crashes.

The Road Safety to 2010 strategy released in October 2003 focused attention on targets based on deaths plus hospitalisations, but also included traditional targets of number of deaths and deaths/population, deaths per vehicle kilometre travelled, and deaths/number of vehicles. Nationally for 2010, these figures were 300, 7.3 deaths per 100,000 people, 6.1 deaths per billion vehicle-km, and 1.1 deaths per 10,000 vehicles. No regional 2010 targets were set in the 2010 strategy, but RoadSafe Auckland and the Auckland Regional Council outlined a regional target of achieving less than 670 road deaths plus hospitalisations of more than one day within the RRSP 2004 to 2010. This was an extrapolation of the 2004 regional target in Road Safety to 2010 of 840. More recently, the Ministry of Transport has provided 2010 regional targets/goals in its quarterly monitoring reports.

The Auckland region through its successive RRSPs has outlined regional targets in relation to available national targets. The current draft Auckland RRSP has set a target of no more than 408 of fewer fatal and serious crashes in 2010 compared with 561 reported in 2006²⁴. This is a 27 per cent decrease. The focus on crashes as opposed to deaths/casualties was decided based on feedback from local authorities as it is considered a more relevant figure in terms of the 'crash prevention' focus taken and the ability to establish specific local authority targets in relation to the overall regional target.

Converting the RRSP 2010 target of crashes to casualties would equate to a target of 515 deaths and serious injuries (if crashes are 79 per cent of death and serious injuries in 2010) or 517 (if a 27 per cent decrease on the total of 708 deaths and serious injuries reported in 2006 was achieved). This is somewhat less (approximately 18 per cent) than is estimated using current trends, ie 604 to 609 deaths and serious injuries by 2010.

²³ This information is contained within Section 3.1.5 of the report. However this appendix details the process of setting the targets.

²⁴ This target was developed by translating the national 2010 target of deaths plus hospitalisations using a trend in actual deaths plus hospitalisations over actual fatal/serious injury crashes.

Currently the next national target is for 2040 and outlined in the 2008 New Zealand Transport Strategy (NZTS). The NZTS contains fifteen targets, including two specific road safety targets under the heading 'Assisting safety and personal security'. The targets are: "Reduce road deaths to no more than 200 per annum by 2040" and "Reduce serious injuries on roads to no more than 1,500 per annum by 2040". A recently released government policy statement on transport included a general 2015 target to "Reduce fatalities and hospitalisations from road crashes by 2015."

13.5.1 Estimation options conclusion²⁵

The three approaches for estimating Auckland region targets and related death/casualty rates outlined above provide a range of potential rates/targets to be considered under the RLTS. It is important to note that the methods have not been peer-reviewed or otherwise assessed for accuracy. It is also assumed that the current investment in safety is at least maintained and most likely would need to be increased to achieve these reductions.

Over the last eleven years, death rates have been declining faster than serious injury/total injury rates, possibly due to improvements in vehicle standards, crash response/medical technology, and safer roads.

The sustainability of these reductions will become increasingly challenging in relation to projected population increases. That is, further reductions in deaths and serious injuries requires significant reductions in the population rate. Improvements in vehicles standards are likely as the vehicle fleet increasingly includes air bags and other protective features. Gains in driver/road user behaviour are difficult to predict, but would require ongoing and increasingly innovative programmes along with improvements in enforcement (requiring central government/legislative action). Safety engineering has potential to support crash reductions (frequency and severity) but are increasingly expensive when systematically implemented across the region as they should be.

The Working Group convened by the ARC has had some initial discussions of the three options and possible targets for use within the Regional Land Transport Strategy (RLTS). The group has initially indicated a preference for an overall lower target for 2040 based on a straight line reduction based on current trends (Option 1) for deaths (19) and serious injuries (412). An alternative estimation method (Option 2) used a population proportion of the national 2040 target of 200 deaths and 1500 serious injuries using the same death rate and serious injury rate for the Auckland region as the current baseline (2005 to 2007 averages). This produced an Auckland region target of 40 deaths and 361 serious injuries for 2040. A final option (Option 3) used an estimation of the current proportion of the 2010 Auckland region target (deaths plus hospitalisations) to the national target and converted this to a 2040 target using the new national target for 2040 of 200 deaths and serious injuries (200 and 1500 respectively) and projected population figures for 2040. Option 3 provided a combined

²⁵ The first two paragraphs of this section are contained in the main body of the paper in Section 4.1.

deaths and serious injury figure for 2040 of 411. The three 2040 target estimation options are summarised in the table below using the lowest target where a range has been generated.

Estimated Auckland region targets for 2040	Option 1 (preferred)	Option 2	Option 3
Number of deaths	19	40	n/a
Number of serious injuries	412	361	n/a
Combined deaths plus serious injuries	431	401	411

Table 18: Range of potential overall regional targets for 2040

The Working Group has noted that the number of deaths and serious injuries is influenced by a number of potential factors (eg mode share changes, economic conditions, age demographic changes, etc). These factors have not been taken into account in any of the estimation options.