Improving school travel systems
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Abbreviations and acronyms

ARTA	Auckland Regional Transport Authority
CAS	Crash analysis system
DFT	Department for Transport, UK
NAP	Neighbourhood accessibility plans
NZTA	New Zealand Transport Agency
PT	Public transport
SASTA	Road Safety Coordinators' Association
SER	Self-explaining roads
STP	School travel plan
TERNZ	Transport Engineering Research New Zealand
WALGA	Western Australian Local Government Association

Contents

Executive summary

In developed countries, travel to and from school is associated with a number of significant issues such as traffic congestion, poor road safety and increased child obesity, which are likely to be related to the increasing reliance on private motor vehicles for school commuting. Preliminary evidence has shown that school travel plans (STPs) may have had a positive impact by reducing the number of motorised trips to school and improving road safety. However, there appears to be a 'missing link' in that there is no national-level policy or strategy that sets out the specific transport outcomes that are desired for schools, and the *system* requirements that are needed to produce these outcomes. As a result, current initiatives are relatively fragmented, with no requirement for schools or funding agencies to prioritise school travel initiatives, despite a range of potentially significant benefits.

The purpose of this research was to:

- investigate evidence for prioritising school travel initiatives
- develop an evidence-based toolkit for the design of school travel systems, to supplement existing school travel initiatives – including infrastructure and other measures that, when implemented, will create safe and user-friendly environments for economically sensible and sustainable transport modes to school, while also integrating with the wider transport system.

There are a number of reasons why improvements to school travel systems are warranted:

- There is tangible evidence of a relationship between school travel and overall traffic congestion, so ineffective school travel places an economic burden on communities and on the nation.
- The top-performing OECD countries, in terms of child road safety, have a strong commitment to fostering high levels of walking and cycling, and most have implemented a comprehensive package of integrated traffic safety measures focused on children.
- Parental *perception* of safety and risk of harm to their children is very significant, and this needs to be addressed alongside *actual* safety issues.
- There is growing evidence for links between active transport and positive health outcomes.
- Shifts to active transport modes have been suggested as part of the climate-change solution.
- School travel improvements support the Government Policy Statement theme of economic growth and productivity by:
  - improving journey-time reliability and easing severe road congestion through mode shifts to active modes during peak hours
  - making better use of existing transport capacity
  - providing a more secure and resilient transport network
  - reducing deaths and serious injuries as a result of road crashes
  - providing more transport choices where appropriate, particularly for those with limited access to cars
  - reducing the adverse environmental effects of land transport
  - contributing to positive health outcomes.

System-centred, human-centred and socio-ecologic perspectives may help to improve school travel by helping to identify the complex reasons for current school travel decision making, and then providing a more comprehensive and user-friendly approach to school travel solutions.

In addition to suggesting a system approach to school travel, existing overseas guidance for improved travel systems around schools tends to have a theme of:

- including a clear explanation of why it is important to focus on school travel (often with substantial evidence)
- giving specific design guidance with tangible examples of how transport systems around schools could be improved.

Consultation with 11 professionals who are involved with school travel found the following themes:

- the transport, education and health sectors need to be more coordinated in providing guidance
- the budgets to support the infrastructure changes that are needed to support STPs are often inadequate because school travel is not considered to have 'high strategic fit' in the NZ Transport Agency's (NZTA) Investment and Revenue Strategy.
- there are a number of issues regarding school bus safety and access
- the strategic importance of schools within communities, and the transport around them, seem to get little political recognition
- changing parental attitudes and perceptions regarding the convenience and safety of school travel is an issue
- it is inherently difficult to provide solutions for schools located on high-speed rural roads, especially if the speed limit is greater than 50km/hr.

This report offers a school travel system toolkit to supplement existing school travel planning processes. It is intended for school travel planners and other personnel who are involved in the provision of school travel systems or infrastructure.

The toolkit provides a model of an overall school travel system, and a 'status diagram' is suggested as a way of ensuring that all parts of the system are addressed (or at least recognised), and that progress towards a functional school travel system is tracked. A simple 'traffic-light' method is suggested to identify the status of each element of the system, with red indicating areas of highest priority, amber indicating areas that are operating reasonably well but where outstanding issues exist, and green indicating areas that are currently functioning well or are well provided for. An uncoloured 'unresolvable for now' status is proposed when the element is not feasible within currently accepted travel system parameters (eg walking and cycling in high-speed rural environments). Although descriptors are provided for each status level within each system component, an operational version of this system would require an audit system to assign status levels.

For each school travel system component, good-practice examples and links to more detailed sources of information are given. Three case studies demonstrate how the model might be applied to actual schools. These case studies also demonstrate that there are particular differences in the requirements of urban and rural schools, which need further consideration.

Based on the evidence and information that has been provided in this report, the following recommendations are suggested:

- More strategic importance could be given to school travel, given the economic, safety, health and environmental costs that it currently incurs. A combined Ministry of Transport, Ministry of Education and Ministry of Health 'School Travel Strategy' or revised 'Active Transport Strategy' (containing a significant school component) could be developed to give clearer leadership, direction and coordination to existing and new school travel initiatives.
- A more comprehensive and user-friendly approach to school travel is needed, giving weight to all parts of the school travel system and more recognition to the requirements and capabilities of young people. A school travel system model should be adopted for use at strategic and operational levels, both nationally and regionally. The model presented in this report could be a starting point.
- In order to support a school travel system model, more comprehensive guidance (and in some cases, further research) is needed for specific problem areas, including:
  - cycling to school
  - door-to-door school bus safety and bus access
  - the environments around schools and routes to school
  - rural schools in high-speed environments
  - road safety education and training for young people (currently being reviewed).

These recommendations are not intended to place undue pressure on school travel planners to deliver more from already stretched resources. Rather, this approach is intended to demonstrate clearly to everyone, from central government transport decision makers to regional school planners, that a number of areas need to be systematically addressed if New Zealand is to realise the benefits of an optimised school travel system.

Although outside the scope of this report, further work is needed to balance the possible impacts of school travel initiatives against other projects, such as state highway development, which might also have a positive impact on the wider transport system – a necessary step when there is competition for scarce funds. However, it is proposed that significantly improved school travel may be justified as a deliberate way to improve transport network performance (in the same way the Roads of National Significance have been prioritised). This report suggests that there is evidence to increase the priority of school travel systems, including infrastructure and other measures.

Abstract

The purpose of this research, carried out between 2008 and 2010, was to investigate the evidence for prioritising school travel initiatives, and to develop an evidence-based toolkit for the design of school travel systems, to supplement existing school travel initiatives.

There are tangible economic, safety, health and environmental reasons for giving greater priority to school travel initiatives, and a more coordinated approach to optimising school travel systems could be adopted. This would also help the government address its Government Policy Statement (GPS) theme of economic growth and productivity, although further work is needed to balance the impacts of school travel initiatives against other projects, such as state highway development, which might also have a positive impact on the wider transport system.

This report clearly demonstrates that a number of areas – such as cycling to school, bus safety and access, road environments around schools, rural schools, and road safety education and training for young people need to be systematically addressed if New Zealand is to realise the benefits of an optimised school travel system.

The proposed school travel system toolkit is intended to supplement existing school travel planning processes, and includes a status diagram to help evaluate different parts of the school travel system and track improvements. The toolkit and status diagram are intended for school travel planners and other personnel who are involved in the provision of school travel systems or infrastructure.

1 Introduction

In developed countries, school travel is associated with a number of significant issues, including traffic congestion, reduced road safety and increased child obesity. Many of these problems are likely to be related to an increased reliance on private motor vehicles for school commuting. According to Ministry of Transport data for the years 1989/90 and 2004/08, the number of primary school students being driven to school in New Zealand increased from 31 to 56%, and in the same period, the number of secondary school students being driven or driving to school increased from 24% to 39% (Ministry of Transport 2008).

Encouragingly, recent evaluations of school travel plans (STPs) have provided preliminary evidence that initiatives such as walking school buses may have had a positive effect in recent years by increasing the number of students walking to and from school. A range of other initiatives aimed at improving road safety and modifying travel behaviour for school students have also been developed and implemented. Examples include:

- Safe Routes to School/Neighbourhood Accessibility Planning
- various road safety education packages (such as the NZ Transport Agency's *Being road smart for school*, *School traffic safety team manual* and *School bus safety information* (2010), and New Zealand Police road safety education material)
- *RoadSense/Ata haere* (NZTA 2008) – a handbook for teachers for road safety education within the school curriculum (discontinued in 2009, and superseded by material from the NZTA Education Portal)
- SafeKids New Zealand, which has regular campaigns related to a range of child safety issues, periodically including road safety issues such as wearing a bike helmet (although there is a view that the SafeKids approach, in some cases, can discourage children's cycling)
- the NZTA's guide for the set-up and delivery of cycle training in New Zealand
- engineering (associated with STPs) that is related to issues such as speed and traffic management.

However, there appears to be a 'missing link' in that there is no national-level[1] policy or strategy that sets out the specific transport outcomes that are desired for schools and the *system* requirements that are needed to produce these outcomes. As a result, current initiatives are relatively fragmented, some areas (such as cycling to school) have not progressed, and there is no requirement for schools or funding agencies to prioritise school travel initiatives, despite a range of potentially significant benefits. It could also be argued that rural school travel has not benefited in the same way as schools in larger urban centres.

The New Zealand Transport Strategy that was developed by the previous government did not specifically address travel to and from school, and that administration's Walking and Cycling Strategy *Getting there: on foot, by cycle* (MoT 2005), also did not specifically target the requirements of school students. (Note: the current government has not endorsed these documents.) School issues are specifically mentioned in the more recent NZ Transport Agency's 2007 *Pedestrian planning and design*

1 Some regional targets exist – for example, the Auckland Regional Land Transport Strategy (ARC 2005) has a target of 9% fewer car trips to school by 2016, as part of a wider target of 20,000 fewer car morning-peak journeys to school, work and in the community in general.

guide and in the 'Safer walking and cycling' part of the *Safer journeys – New Zealand's road safety strategy 2010–2020* (MoT 2010). Despite these recent policy inclusions, this report proposes that given the strategic importance of school travel, specific school travel policy and leadership is needed.

Meanwhile, the school travel initiatives that do exist within New Zealand are heavily oriented towards 'soft' initiatives for urban schools, with much less priority given to important engineering changes or to rural schools. It should be acknowledged that in recent years, STPs such as Safe Routes to School and more recently, Neighbourhood Accessibility Plans (NAP) have started to address this. Too often the engineering changes that are implemented do not result in truly safe and attractive transport environments for students, particularly for those who might choose active transport modes. The consequence is that parents are still afraid for their children's safety, and so driving them to school continues to be the most common mode.

Often there are significant barriers to providing truly attractive and safe routes for walking and cycling to school, such as major arterial roads next to schools. Emerging approaches to the use of road space such as 'self-explaining roads' (SER) or 'mixed-use arterial road design', where road-user priorities may change near schools, may provide better solutions for school students and wider communities.

While there is a lot of design guidance for traffic management, pedestrians and cyclists, it usually focuses on capable adults. The particular capabilities of children (or older people) are often not considered, yet there are substantial differences between the requirements of young people and adults. In addition, road safety education and training (which is currently being reviewed), cycling, door-to-door bus safety and access, traffic speed, and rural school travel in general, are specific areas that have outstanding issues. SERs and NAPs are approaches that do consider children's capabilities and requirements.

In addition to the more obvious economic, safety, health and environmental considerations, there are further strategic reasons for giving particular attention to school travel systems. Today's children are tomorrow's adults, so in addition to the immediate benefits of improved school travel systems, school students who regularly use active or public transport modes may be more likely to use these modes as adults. Certainly, children and young people who are physically active are more likely to be active adults, resulting in health benefits across the life course (Trost et al 2002; Kjonniksen et al 2008, cited in Gerrard 2009). Furthermore, adults who have experienced walking or cycling to school as children may be more likely to encourage their own children to walk or bike to and from school.

Schools are also community hubs that are used for sports, recreation, community meetings and on-going adult education, and they are usually situated within the heart of communities. Improvements to school travel systems would also have benefits for non-school transport within communities. Furthermore, environments that are built with reference to the capabilities of children are likely to also be suitable for older people – a fast-growing proportion of New Zealand's population.

The purpose of this research was to:

- investigate evidence for prioritising school travel initiatives
- develop an evidence-based toolkit for the design of school travel systems, to supplement existing school travel initiatives – including infrastructure and other measures that, when implemented, will create safe and user-friendly environments for economically sensible and sustainable transport modes to school, while also integrating with the wider transport system.

1.1 Structure of this report

This report is intended to be used by anyone who has a role in the improvement of road safety and the promotion of active transport for school journeys. The evidence-based logic diagram in chapter 3 is for the use of those who are responsible for school travel leadership, governance and policy, while the school travel system model and specific design guidance is for the use of those who have an operational role, such as school travel planners and engineers.

This report has six main sections:

- Introduction: This section explains the issues that exist within current school travel systems, introduces a rationale for paying more attention to school travel, and concludes with the purpose of this research.
- Existing information: This section builds a comprehensive and evidence-based rationale for focusing more attention on school travel, suggests approaches that might be useful, and outlines initiatives and information that currently exist in New Zealand and overseas. It concludes with some good-practice examples of school travel approaches in New Zealand.
- Logic diagram for improving school travel: This diagram demonstrates how the existing information about school travel provides a rationale for further work to improve school travel.
- Proposed toolkit for improving school travel: This section introduces a simple school travel system model, and then explains and gives current and good-practice examples for components of the model.
- Case studies: Three case studies are given (rural, semi-rural and urban) – the existing travel plan initiatives for each school are outlined, and the school travel system model is applied to identify good practice and gaps. The specific themes are as follows:
  - rural case study – traffic speed, bus access and safety
  - semi-rural case study – 'the right trips for the right people'
  - urban case study – street design and cycling.
- Recommendations: Based on the contents of the report, recommendations are given for future action.

2 Existing information

2.1 Why focus on school travel?

2.1.1 Congestion and economic inefficiency

Congestion is estimated to cost the Auckland region $755million per annum (ARTA 2009). Higher fuel bills, lost time and productivity, uncertainty and poor air quality have direct economic costs to individuals and businesses, while health impacts and stress are examples of less tangible costs (in monetary terms).

To most people, it is obvious that congestion levels in urban areas are tangibly worse during the school term. The Auckland Regional Transport Authority (ARTA) estimates that a third of morning-peak trips (7–9am) in Auckland are to school (ARTA 2007), and in Christchurch, 34% of morning peak-time travel is education related (Greater Christchurch 2008). In the UK, the 2008 National Travel Survey found that at the peak travel-to-school time of 8.45am on weekdays during term time, 2 in 10 (20%) car trips by residents of urban areas were generated by the 'school run' (DfT 2008). In the US, estimates from multiple cities indicate that the motor vehicle traffic generated by travel to and from school adds 20–30% more traffic volume to the roads (PBIC 2007).

School-related congestion experiment

As a practical demonstration of the effects of school travel on traffic flow, an exercise was carried out to examine traffic flows both during and outside of the school term. Using traffic-speed data from Auckland's Southern Motorway, north of the Greenlane on-ramp (city-bound), 10 days of weekday speed data in the school holidays was compared with 10 days of data in the school term that started on 20th July 2009. For the hour between 8 and 9am, it was found that the average traffic speed was 56km/hr during school holidays and 36km/hr during the school term (ie 35% slower), with the difference being statistically significant ($P<0.05$, paired t-test).

While this relatively quick and small-scale analysis would need further work to establish its repeatability, it does support the common observation that general traffic congestion is worse during the school term, and it may be that local congestion around schools is even worse still. Given that traffic congestion has a clear economic cost, improving school travel systems is likely to have economic benefits for communities.

Some of the decrease in congestion during the school term may be the result of some parents not travelling to work, as they go on holiday or stay home to care for their children – but this is possibly more so during the summer holidays. Displacement of trips to less congested times also need to be considered. Nevertheless, it is hard to ignore the fact that during school holidays, almost 400,000[2] New Zealanders are not travelling to and from school by car.

2 This figure represents 45% (the approximate percentage of school children who travel to school by car) of the total number of primary- and secondary school-aged children in New Zealand in 2006–7 (from the New Zealand Official Yearbook 2008).

School-related travel appears to have a tangible and significant effect on traffic congestion. Given that traffic congestion has a significant economic cost, it therefore makes sense that reducing school-related car trips would have a material effect on traffic congestion and economic productivity in urban areas.

2.1.2 Safety

In OECD countries, over all transport modes, the absolute risk of fatality for those aged 0–14 years is low (Gerrard 2009). Schofield et al's 2008 research in New Zealand found that although there is an increased risk of injury or death when cycling and walking to school (compared with other modes on a per-trip basis), the risk is still small – they estimated that approximately 3.0 cycling and 2.8 walking school travel trips each day resulted in an injury, out of a total of 795,000 school-aged people (5–17 years) in 2006–7 (Statistics NZ 2008).

Less encouragingly, it appears that compared with other countries, New Zealand has a poor track record for unintentional child injury, including transport-related injuries. An analysis of unintentional child injury data in New Zealand (Alatini 2009) reported that for the period 1991–95, New Zealand was listed 22nd of 26 nations on the standardised UNICEF Child Injury Death League. New Zealand's child fatality rate of 13.7 per 100,000 children was more than twice the rate of countries such as Sweden (5.2, the lowest rate), the UK (6.1), Italy (6.1) and the Netherlands (6.6). New Zealand's child fatality rate was also 1.5 times that of Australia (ibid). More recently, New Zealand has been reported as having the *worst* score (out of 24 OECD countries) for deaths from accidents and injuries per 100,000 population under 19 years (UNICEF 2007). Between 2001 and 2005, transport-related injuries (grouped together) were the largest cause of child death from unintentional injury, accounting for over half of all injury-related child fatalities in New Zealand. This included deaths of children as vehicle occupants, pedestrians, cyclists, and while riding motorised vehicles (including motorbikes and all-terrain vehicles).

The RoadSafe Auckland website (www.roadsafeauckland.org.nz/school-safety/) states that in the Auckland region, over 30% of all pedestrian-related injury crashes involve school-aged children, most of them on their journey to or from school.

An unpublished 'crash analysis system' (CAS) analysis focusing on injury crashes has been carried out by Transport Engineering Research NZ (TERNZ), as part of a previous analysis of school bus safety. Many of these crashes (albeit an unknown proportion) are likely to be related to education-related trips, as they occurred during school travel times.

The results of the analysis were as follows:

Conditions:

- Time period: 1987–2008
- Age of injured person: 0–17 years
- Times of day: 7–9am, and 2–4pm, excluding public and school holidays.

Table 2.1 Crashes associated with young people during school commuting hours

	Severity	All areas	Within 250m of school
Number of crashes	Fatal	270	44
	Serious	4363	1251
	Minor	17,369	6183
Average number of crashes per year	Fatal	13.5	2.2
	Serious	218	63
	Minor	868	309

At 2009 prices[3] the above table corresponds with an annual social cost of $173 million for young-person crashes in all areas during school commuting hours, and an annual social cost of $44 million for young-person crashes within 250m of a school during school commuting hours.

While fatal crashes can cause a lifetime of grief and heartache for loved ones and are often the centre of attention, serious crashes – especially those resulting in permanent disability – can also have long-lasting effects on individuals and families, and have significant social costs. In the above analysis, serious crashes contributed much more than fatal and minor crashes did to overall social costs.

The road environment has been shown to affect child pedestrian injury rates. Children are more likely to be injured as vehicle speeds and traffic volumes increase (Wazana et al 1997), especially if there is inadequate provision for their safety. Top-performing countries for pedestrian safety (Sweden, Netherlands, Finland, Germany and Denmark) have a strong commitment to fostering high levels of safe walking and cycling, and most have implemented a comprehensive package of integrated traffic safety measures including:

- a strong approach to infrastructure measures for pedestrian safety
- compulsory road safety education for children aged 6–9 years
- conducting *national* road safety campaigns once a year or more (most other countries conduct regional publicity)
- speed-reduction measures, including environmental modification and 30kph speed limits and signalised crossings in most areas, including very low speed limits outside schools
- legislation that assumes driver responsibility in an accident that involves a child pedestrian
- commissioned research on child pedestrian safety
- support for a range of child pedestrian safety initiatives (Christie et al 2004, cited in Gerrard 2009).

2.1.3 Perceived safety

When parents are making the decision whether or not to let their child walk or cycle to school, perceived safety is a major consideration and is a key reason for reduced independent mobility among children (Granville et al 2002, Mackie 2009, Rice 2008 and Thomson 2009). Thomson points out:

> *... there are essentially two broad categories of barriers to children's independent mobility. The first are social and cultural barriers which include time poor parents, peer pressure from other parents and the over-scheduling of children with extra-curricular activities outside*

3 *The social costs of road crashes and injuries June 2009 – update* (Ministry of Transport, October 2009).

school hours. The second are physical and environmental barriers which include fear of death and injury to child pedestrians by motor vehicle crashes as well barriers in local neighbourhoods.

It may be that an extremely low crash rate is needed before parents feel that walking or cycling to school is deemed inherently safe – and even then, it is the *perception* of it being unsafe that is likely to be the biggest barrier. While the absolute number of the 3.0 cycling and 2.8 walking school-travel trips each day that result in an injury (Schofield et al 2008) might seem relatively small, their influence on the general population is probably much larger when all those who learn of the injuries are counted. For example, if a child was knocked from their bike and needed to go to hospital with a broken leg, a typical scenario might be that in addition to the child's family, the entire school community would learn of this incident through social networking and accordingly, a large number of people would form their own judgements about the relative safety of cycling to school. If the crash resulted in a fatality, the entire country would probably learn about it through the media. When two or three crashes per day are accumulated over a year and spread throughout the country, a large number of people will have some knowledge of a school-related walking or cycling crash, and their judgement of the safety of these modes will be affected. No doubt, acceptance of risk, and the perceived risk of the occurrence of a very serious crash (which is likely to be completely unacceptable to most parents), would also affect overall perceived safety within the decision-making process regarding active transport.

However, perceived poor safety and risk aversion may be something that is modifiable. There is some evidence that environmental factors (such as commuting distance and the presence of safe routes) would have an effect on a parent's decision to let their child commute to school independently, using active or public modes (Yeung et al 2008, Mackie 2009). Nevertheless, avoidance of risk and an unwillingness by parents to expose their children to traffic environments they perceive to be unsafe (despite introducing other potentially damaging behaviours such as inactivity) is a significant issue that needs to be tackled at a much wider scale than within school travel initiatives alone.

2.1.4 Health

The 2006/07 New Zealand Health Survey (Ministry of Health 2004) found that more than 1 in 3 adults was overweight (36.3%) and more than 1 in 4 was obese (26.5%). One in 5 children aged 2–14 years was overweight (20.9%) and 1 in 12 was obese (8.3%). The World Health Organisation now describes the world-wide prevalence of obesity as an epidemic (WHO 2000), and highlights that one of the causes of this epidemic (within the wider context of modernised living) has been an increased reliance on motorised transport. A recent report by the UK Government Office for Science (Foresight 2007) shows that the obesity problem is very complex, and interventions to overcome obesity at a population level will need to be comprehensive and sustained. Children's active transport was suggested as having an important role to play in fighting obesity. This is mirrored in the US, in the recent *White House task force on childhood obesity – report to the President* (Executive Office of the President of the United States 2010), where the enhancement of the Safe Routes to School programme, and other active transport initiatives, are suggested as one of a number of initiatives to combat obesity. It also sets a target of increasing the percentage of children aged 5–18 taking safe walking and biking trips to and from school by 50% by 2015.

There is also growing evidence for the link between active transport and positive health outcomes in children (Davidson et al 2008, Cooper et al 2006). It therefore makes sense that by increasing the availability of active transport to and from school, children's (and eventually adults') health would improve, yielding economic benefits for the nation. In turn, links between active transport and urban form have also been demonstrated for both children (Davison et al 2008) and older people (Berke et al 2007). However, when all approaches are considered, the determinants of children's use of active transport

modes are not yet clear, and are likely to differ between groups such as older and younger children (Gerrard 2009). This suggests that for now, all methods of improving active transport (engineering, education, encouragement and enforcement) should be given equal weight within a system approach. Gerrard's findings also suggest that more research is needed to examine the factors that are likely to have the greatest impact on increasing active transport in children.

There is also New Zealand-based evidence of the harmful effects of transport emissions on human health and the environment (Fisher et al 2002). Although initiatives such as the Ministry of Transport's Vehicle Emissions Rule in 2003 would no doubt help reduce the mortality associated with exposure to vehicle emissions, further improvements could be made by converting vehicle-based school trips to active modes.

2.1.5 Environmental benefits and future proofing

The transport sector's contribution to overall world greenhouse gas (GHG) emissions is well documented, but shifts to active transport modes could potentially have a significant part to play in decreasing GHG emissions (Kahn Ribeiro et al 2007). It is essential for the future sustainability of transport that children learn sustainable and healthy transport habits. School students who grow up with safe access to sustainable transport to and from school are more likely to expect transport of this nature in the future. Current trends will result in an entire generation of parents who have not experienced walking, cycling and public transport as normal and intuitive transport options when they were children. As part of well-designed school travel systems and infrastructure, a large and sustained effort to restore healthy transport habits among children is needed to reverse the current trends towards increased reliance on private motorised transport.

2.1.6 School travel a key in achieving government priorities

Economic growth and productivity is a key theme of the current Government Policy Statement (GPS) on Land Transport Funding (Ministry of Transport 2009). The expected impact of the policies in this statement that would contribute to economic growth and productivity include:

- improvements in the provision of infrastructure and services that enhance transport efficiency and lower the cost of transportation through:
  - improvements in journey-time reliability
  - the easing of severe congestion
  - more efficient freight supply chains
  - better use of the existing transport capacity
  - better access to markets, employment and areas that contribute to economic growth
  - a secure and resilient transport network
- other impacts such as:
  - reductions in deaths and serious injuries as a result of road crashes
  - more transport choices where appropriate, particularly for those with limited access to cars
  - reductions in the adverse environmental effects of land transport
  - contributions to positive health outcomes.

Given the effects of school travel and the government priorities outlined above, optimised school travel systems could have a role to play in delivering the government's transport objectives. This, in turn, would indicate that there would be merit in lifting the priority of initiatives to improve school travel systems.

2.1.7 Gaps in the current school travel system?

There are some examples that demonstrate the need to improve school travel systems:

- Cycling to school: The barriers faced by students who want to bike to school (along with some solutions) have been demonstrated in New Zealand (Horspool 2006, Mackie 2009). As a travel option for school students, cycling has decreased significantly in the past 20 years and has remained low, despite the potential for cycling to deliver many benefits, including improved health. Cycling infrastructure for school commuting is typically inadequate, given traffic speed and volumes, and students often receive mixed messages, with cycling sometimes being promoted and sometimes discouraged. When cycling to school does occur, it is often not clear to students where they should ride – the law states that they must cycle on the road, yet this is often unrealistic, as many traffic environments are entirely unsuitable for children to commute by bicycle.
- School bus safety: The current speed limit of 20km/hr while travelling past a school bus is almost never observed, even in urban areas. For rural students, getting to and from buses is often problematic. A recent report (Baas et al 2010) covers this issue.
- Infrastructure around schools and on routes to school: While 40km/hr school signs have generally been perceived as being effective, and in some cases STPs have resulted in engineering improvements at problem areas, there has been no systematic approach to the design of environments around schools and on routes to schools.
- Rural schools: Transport solutions for rural schools are often very limited, and high-speed environments near schools often create safety risks. The specific challenges that rural schools face are often not well appreciated, and because the issues can be difficult to overcome, they are often not confronted.
- Road safety education and training for young people: Currently leadership, resources and delivery are still very fragmented, despite the development in 2006 of a Road Safety Education Strategic Framework by the National Road Safety Committee of the Ministry of Transport. The Ministry of Transport has recently commissioned a review of the effectiveness of road safety education available for young people in New Zealand. A lot of effort goes into educating primary school-aged children in road safety, but education and training for secondary school students, and in particular those students who are about to reach driving age, is still a problem area – nationally, the 15–19-year-old group has the second-highest proportion of fatalities and the highest proportion of injuries. The place of road safety education and training with the wider transport system may also need to be considered, as recent evidence suggests that many previous initiatives have been largely ineffective (McKenna 2010).

2.2 A system approach

By considering school travel as a system, it is less likely that elements of the system will be neglected, and more likely that a comprehensive approach to school travel will be achieved. An example of a system approach is the comprehensive system for obesity that has been developed (Foresight 2007). The system map that is part of this approach includes a large number of variables and many causal linkages, providing confirmation of the complex nature of this issue. The obesity example also demonstrates that

the complex nature of systems can mean that trying to match system thinking with an operational programme of work can be difficult, as it is often easier to work on specific system elements in isolation. Nevertheless, an understanding of a system helps to identify the relative contribution of each element, which can make specific work programmes more meaningful. A system approach also allows overall progress to be monitored.

It also needs to be considered that the school travel system is part of the wider transport system, and within the context of transport, the concept of systems sitting within larger systems has been reported (DFT 2008). This means that changes to the school travel system, where improvements might be focused on public and active transport, are likely to impact (positively or negatively) on other road users in other parts of the transport system. A typical example of this is the trade-off between safety for school pedestrians and travel time for other motorists that occurs when slow-speed environments are introduced. In this situation, it is important to have a good understanding of the overall benefits and costs of alternative scenarios, and robust data and evidence. For example, stronger evidence regarding travel-time disbenefits from speed-limit reductions is needed, as only a few seconds would be added to a trip by reducing vehicle speeds from 50 km/hr to 40 km/hr for a few hundred metres.

A system approach to road safety has recently been stated in the government's Safer Journeys Strategy. Within the road safety context, the school travel system sits within the Strategy's overall safety system, which aims for 'a safe road system increasingly free of death and serious injury'. The Safer Journeys Strategy also takes a human-centred approach where people's capabilities and limitations are key to the system design.

2.3 A human-centred approach

School travel systems could benefit from taking a human-centred approach (which is commonly used in the field of ergonomics or human factors) to complement the traditionally engineering-focused approach within transport. Increasingly, transport design is considering the limitations and requirements of humans as part of the system, as demonstrated by the Safer Journeys Strategy. The long history of the human-centred approach in other fields offers concepts and principles that might apply to transport systems. Although evidence of the study of machine/person or human system interactions stretch back to ancient Greece (Marmaras et al 1999), in the 20th century the discipline of ergonomics or human factors developed significantly during World War 2 (HFES 2010), and organisations such as the International Ergonomics Society (IEA), the US Human Factors and Ergonomics Society and the UK Ergonomics Society developed from this point. Pilot error and operational performance during World War 2, and safety in civilian environments since then, are examples of typical human factors applications.

The International Ergonomics Association (IEA) defines ergonomics in the following way:

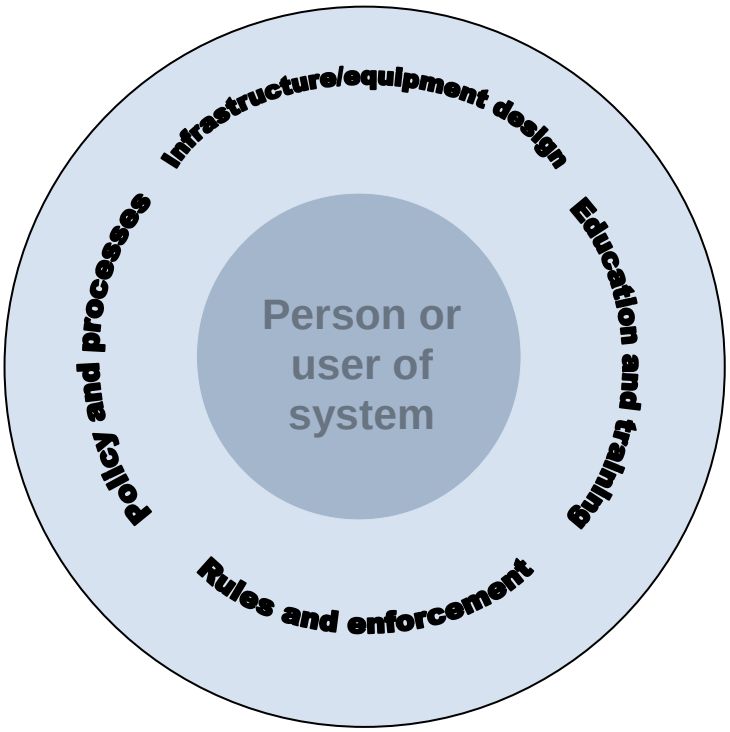
> *Ergonomics (or human factors) is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design in order to optimize human well being and overall system performance. Practitioners of ergonomics, ergonomists, contribute to the planning, design and evaluation of tasks, jobs, products, organizations, environments and systems in order to make them compatible with the needs, abilities and limitations of people.*

Today, while ergonomics stereotypically evokes images of correctly configured computer workstations, the field is actually much wider than that and overlaps with many transport-related areas of study, including vehicle and road design. Systems and organisational ergonomics take a much broader view and consider

how these complex structures work in a way that is compatible with the requirements of people. Increasingly, the effects of the environment on disease and chronic conditions (such as obesity) are being investigated, in addition to the more traditional areas of ergonomics such as injury and safety.

The main principle of ergonomics is that systems should be designed around the capabilities of users or people (see figure 2.1), in order to optimise the system, minimise the risk of injury and harm, and maximise efficiency and productivity.

Figure 2.1 A human-centred approach, where all parts of a system are designed around the requirements and capabilities of the system's users



Within the context of school travel systems, some practical examples of an ergonomics or human-factors approach might include the following:

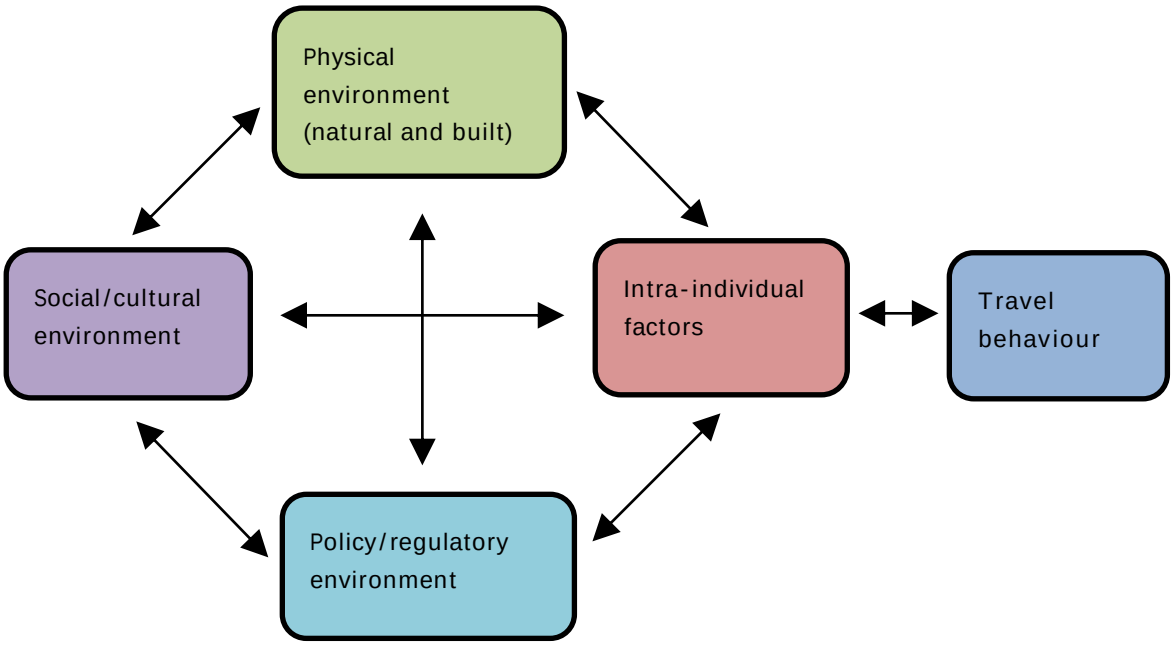
- Roads, paths, routes and crossings should be designed to be easy to use, safe and compatible with the capabilities of young people.
- Training and education should be focused on the requirements of children as they grow through life and should be delivered in a way that is effective for them.
- Legislation, governance and guidance should all be structured in a way that maximises the likelihood of a 'user-friendly' system. For example, within school travel, training and education may not translate into effective skills and practices if training is delivered by a number of different agencies in an ad hoc manner. End-user requirements should always underpin school travel initiatives, even at the governance and policy levels.

2.4 A socio-ecologic approach

A socio-ecologic model (see figure 2.2) also has relevance for school travel (Gebel et al 2005, cited in Gerrard 2009), where the environmental influences on active travel are both perceived and real. Using this

approach, environmental, social, individual and regulatory factors all combine to affect travel behaviour. Interactions also occur between all parts of the model; for example, car reliance (a social/cultural factor) contributes to urban sprawl (built environment), and urban sprawl in turn leads to car reliance.

Figure 2.2 A socio-ecologic model showing environmental influences on children's travel behaviour (adapted from Gebel et al 2005, cited in Gerrard 2009)



While the system and the human-centred approaches both allow the actual school system components to be appreciated in a way that is compatible with people and their requirements, the socio-ecologic approach considers the interactions between wider socio-demographic factors to explain why people behave the way they do. These approaches are complementary – the socio-ecologic approach allows a comprehensive understanding of current behaviour and suggests approaches that might help in any intervention, and the system and human-centred approaches have more relevance for the design of any programme of intervention in the operational context.

2.5 Existing guidance and initiatives for improving school travel systems in New Zealand

Details of existing and best-practice examples for each component of the school travel system are given in section 4. However, some of the major guiding documents and processes are detailed below.

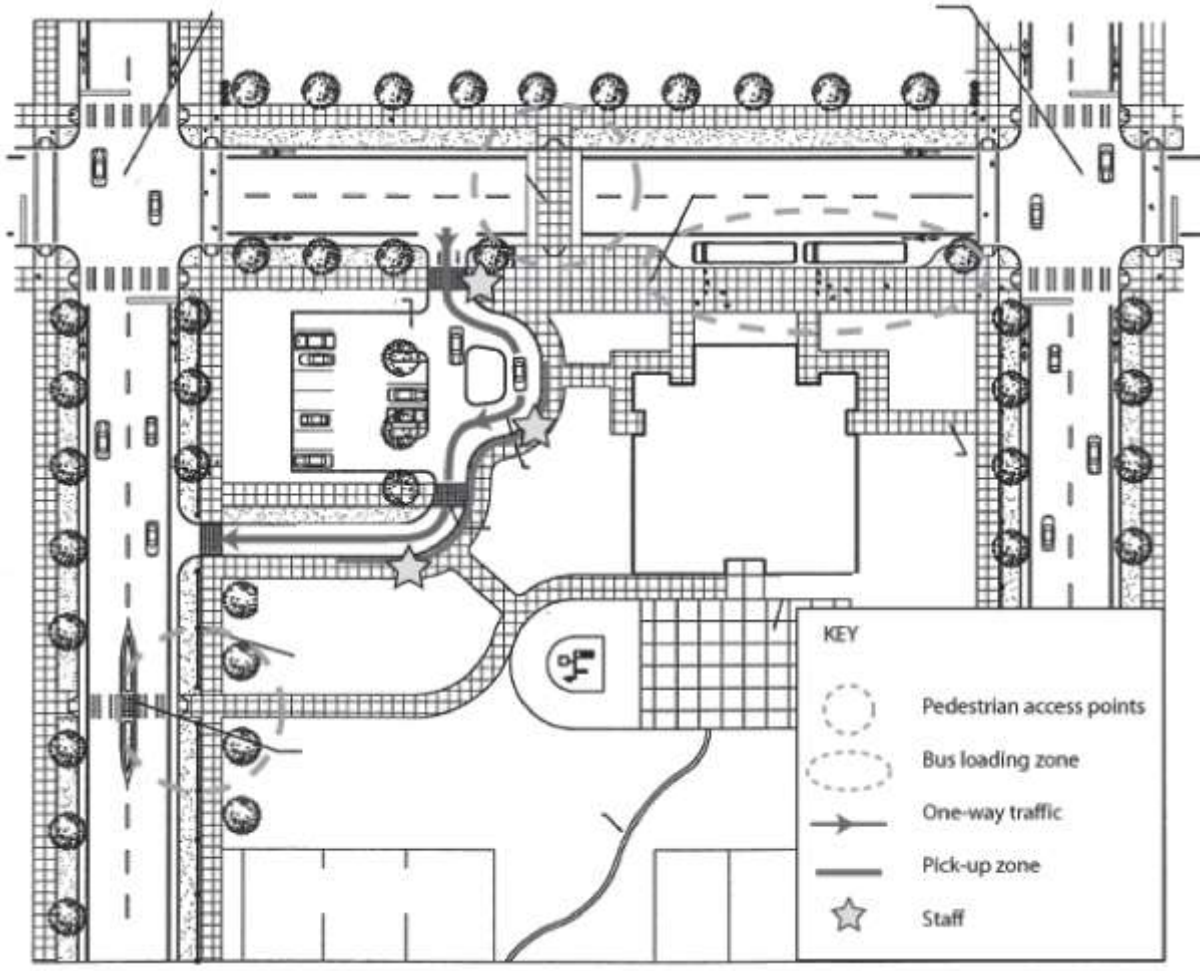
2.5.1 Ministry of Education's *Property management handbook*

The Ministry of Education's *Property management handbook* (2007) includes a section on traffic management (section 6.22) that includes basic information about implementing a STP, designing school accesses and considering parking. Their pictorial example of an efficient access system is shown on the next page in figure 2.3. The associated principles are as follows:

- Car traffic flows in a clearly marked one-way direction.
- Pedestrian access points are located separately from car access points.

- The bus bay is separate from car and pedestrian access points.
- An off-street drop-off/pick-up zone is provided.
- Staff are stationed at key points to manage traffic flow.
- Car access is separate from car parking.

Figure 2.3 Example of school access design (Ministry of Education 2007)



2.5.2 School travel plans (STPs)

The school travel planning process is currently the main mechanism for improving school travel in New Zealand. The *School travel plan coordinator's guide* (Land Transport NZ 2007) sets out a detailed explanation of the process that should be followed, along with resources for those carrying out a school travel plan and suggestions for increasing the likelihood of success.

Travel planning involves five phases:

- set-up
- data collection
- action planning
- implementation

- monitoring.

Actions that can come from STPs include setting up walking school buses, road safety education, traffic-calming measures, parking restrictions, putting in safe pedestrian crossings, putting in cycleways, and promotional activities to encourage carpooling, walking, cycling and passenger transport (Travelwise 2010).

The Guide outlines the seven key factors required to make a STP successful. It should:

- be owned by the school community
- have benefits for the school
- be tailored to the school's needs
- have STP champions
- have a coordinator (as an essential link between the school and council)
- be built on positive relationships
- have the commitment of the stakeholders.

There are regional variations of the school travel planning process. In Christchurch, school travel planning is part of the wider Safer Routes to School programme, while in Auckland, school travel planning sits within the regional Travelwise programme. The Travelwise programme was established to deliver the travel plan components of the Auckland Regional Land Transport Strategy, which set a target of 20,000 fewer car trips each morning peak by 2016 (ARTA 2008).

A recent internal evaluation of the Travelwise programme (ARTA 2008) states that schools with travel plans have, on average, achieved a 3.71% drop in car use and a corresponding increase in walking, public transport and carpooling. No statistical analyses of the comparative data are given, so it is difficult to determine whether the improvements are 'meaningful' or not. Another paper (Hinckson and Badland, in press) showed that following STPs in the Auckland region, the overall increase in active transport of 5.9% (std dev 6.8%) was not statistically significant, but may provide preliminary evidence of the benefits of STPs. In both studies, there appear to be large variations in the results, indicating that the effectiveness of STPs is highly variable between schools (no doubt for a number or reasons).

Nevertheless, most would agree that the Travelwise programme has had a positive impact in Auckland. It is suggested that overall, the TravelWise programme takes 6492 car trips off the road each morning peak, and is tracking just ahead of its 10-year target to achieve 20,000 fewer car trips each morning by 2016 (ARTA 2008). The report states that the value of travel plans that began in 2008, in terms of reduced traffic and health and environmental benefits, is $127million (net present value), giving a benefit–cost ratio of 4:1.

Recommendations for continuous improvement from the ARTA report (ARTA 2008) mainly suggest more targeted education and information. Interestingly, there is little mention of a need for increased investment in user-friendly environments for walking and cycling, although the point 'Systematically address the concerns of parents and schools so that students who want to cycle are supported to do so' is made to address a specific issue. Given that the primary concerns of parents and schools regarding cycling are around safe infrastructure (Mackie 2009, Horspool 2006), this could mean that increased investment in cycling-friendly infrastructure is indirectly suggested. A previous STP evaluation has also highlighted concerns about the traffic environment as a reason for parents not allowing their children to walk or cycle to school (Hinckson et al 2007).

In a preliminary evaluation of the safety effects of STPs in Auckland, crash analysis system (CAS) data around primary and intermediate schools was examined in order to assess actual safety outcomes from STP programmes (NZTA 2010). Crash data within a 500-metre radius around 10 Auckland City primary and intermediate schools with STPs was extracted from CAS, and 'before' and 'after' data was compared. The results indicated that there may be a safety benefit from STPs, although the analysis had a number of limitations and no statistical tests were given. It is understood that further work is being carried out to provide robust findings.

2.5.3 Feet First initiative

The Feet First project works concurrently with other projects, including those already established in walking or cycling (Feet First 2010). This includes projects that support the lowering of congestion around school locations and improved health and physical well-being, complementing and supporting STPs and walking school buses. Teachers can draw from a range of comprehensive curriculum resources that link to the benefits – environmental, social, economic and health – of travelling by foot. This includes lesson ideas, unit plans, 'HOT (hooked on thinking) topics' and 'inquiry learning'.

Students and teachers are encouraged to consider the wider issues related to walking, such as urban design, community development and the environment. They could study family history, looking at 'how we used to walk to school', or look at the health benefits of active travel.

2.5.4 Neighbourhood Accessibility Plans (NAP)

The earlier Land Transport NZ Safe Routes to School programme was superseded by Neighbourhood Accessibility Plans (NAP). Although NAP has a wider focus than just schools, NAP can help to provide better infrastructure for schools as part of a wider neighbourhood treatment plan. NAP projects aim to give safe access to active and shared transport users of all ages in neighbourhoods (NZTA 2009). The overall objective of Neighbourhood Accessibility Planning is for local authorities and other relevant agencies to involve community groups in:

- identifying cyclist, pedestrian and shared-mode user safety and access issues (including perceived barriers)
- developing and implementing actions (based on engineering – including environmental improvement, education, enforcement, promotion and policy) to address identified issues.

The underlying principles of NAP projects are that they:

- benefit all ages and abilities of cyclists, pedestrians and shared-mode users
- are initiated in high-risk communities and/or in neighbourhoods that have strategic significance
- involve a balanced and integrated range of actions (particularly engineering and environmental improvements when road safety is an issue)
- involve and empower local communities.

Johnson (2008) carried out an evaluation of the NAP programme to better understand the barriers, challenges and benefits of eight Safer Routes/NAP projects that had been implemented. Some of the challenges identified were general lack of 'buy-in' from councils (and therefore a lack of strong leadership on NAP projects) and insufficient funding to make meaningful changes.

2.5.5 Model Communities

The Model Communities programme, currently being implemented in Hastings and New Plymouth, aims to reduce congestion by providing user-friendly environments for walking and cycling. Although this programme is intended to have a wider scope than school travel alone, school travel improvements may be targeted within community-wide approaches.

2.5.6 Rotorua in Gear (RIG)

Although not specifically aimed at schools, Rotorua in Gear is an initiative that is being led by Bike NZ to increase the number of people cycling in Rotorua. The programme will run over three years from 2009 to 2012, and the early stages have had a significant school focus with a roll-out of 'fundamental skills training' to a large number of year 5 and 6 students. It is envisaged that RIG will be a pilot project for similar initiatives to be implemented around New Zealand.

2.5.7 'Green Star' building rating system

Green Star is a relatively new comprehensive, national, voluntary environmental rating scheme that evaluates the environmental attributes and performance of New Zealand's buildings, using a suite of rating toolkits developed to be applicable to each building type and function (NZ Green Building Council 2010). This education tool extends to the rating of entire school campuses, including the transport infrastructure. Transport inputs into the education tool include:

- car park minimisation – eg two points are awarded where 5% fewer car parking spaces than the minimum relevant local government car parking requirements are provided within the construction zone
- fuel-efficient transport – eg one point is awarded if 10% of new car parks are dedicated to fuel-efficient vehicles (ie 5-star rated by RightCar)
- cyclist facilities – eg two points are awarded if a minimum of two secure storage spaces are provided for every 20 students
- mass-commuting transport – eg points are awarded for having a high frequency of public or private mass transport available to staff and students
- travel plan – eg one point is awarded if an STP is implemented, including the provision of dedicated pedestrian and cycle paths linking buildings, storage areas and campus access points.

2.6 Existing overseas guidance for improving transport systems around schools

There are a number of overseas documents that outline key issues for school travel and suggest solutions for better school travel systems. The following are key documents, but there are likely to be many more, especially at regional levels within countries.

2.6.1 *Keeping children safe in traffic* (OECD 2004)

This report pulls together best practice and research to show how child casualties can be reduced whilst at the same time encouraging children to develop into safe, active and independent road users. The main areas of focus are:

- education, training and publicity

- children and the road environment
- vehicle standards and safety equipment.

The rationale for the need for specific guidance on child safety in traffic is the fact that road-related crashes in many OECD countries are the leading cause of fatalities among schoolchildren under the age of 15. As discussed earlier, between 1996 and 2000 New Zealand had the third-worst traffic fatality rate among children aged 0–14 years.

The following recommendations from the OECD report may be of particular use for improving transport systems around New Zealand schools:

- Design a road environment that recognises children's capabilities as well as their limitations – this will benefit all road users, since what constitutes a safe road environment for children will usually be safe for the general public, and particularly for older people.
- Facilitate children's safe mobility by the design of residential areas that incorporate traffic-calming techniques and low-speed zones to favour walking and cycling as the dominant modes.
- Initiate speed reduction in order to protect vulnerable road users.
- Set speed limits according to the function of roads within a hierarchy.
- Have lower speed limits on lower-volume rural roads, and make sure foot and bicycle paths are available.
- Incorporate road safety education in the national education curriculum at all levels from pre-school onwards, with regular high-quality inputs to develop children's skills, risk awareness, attitudes and knowledge.
- Use effective education, training and publicity to make sure drivers are aware of their responsibilities to their passengers and other road users, and that they understand the limitations of children's behaviour in traffic.
- Run publicity campaigns to raise drivers' awareness of how children behave – alert them to their responsibilities to protect car occupants, child pedestrians and child cyclists by highlighting such issues as choice of speed, and inform them of the importance of correct fitting and use of child restraints and seat belts in cars.
- Encourage the implementation of traffic-calming devices that improve the overall safety of road users, particularly children – top-performing countries use area-wide traffic-calming devices and have a wide range of infrastructure safety measures.
- Create safe places to cross roads, particularly outside residential zones, where low speed limits are less feasible and roads are wider with heavy traffic flows. Where necessary, encourage safety with the use of zebra crossings, signalised intersections, pedestrian islands and school crossing patrols. For very busy roads, it might be necessary to separate pedestrians from motorised traffic by the use of well-lit foot bridges and tunnels.
- Whenever new educational facilities are developed, consider safe access for all travel modes (especially cycling, walking and public transport).
- Maintain a better road environment, including the siting of neighbourhood play areas and safe access to them – failure to repair damage to roads or clear away obstructions can contribute to further deterioration.

The OECD report emphasises that teaching children and other road users to adapt their behaviour in order to interact safely with traffic is only part of what is needed to keep them safe – traffic engineers, urban designers and planners also have a duty to design systems that consider children's mobility needs, travel behaviour, and differences in perceptual and reactive capabilities, in order to maximise their safety and mobility.

2.6.2 *Guidelines for road safety around schools* (Western Australian Local Government Association 2007)

These guidelines were produced by the Western Australian Local Government Association (WALGA) for the purpose of enhancing the safety of children travelling to and from, and around, schools by:

- providing information on many of the major road safety issues involved
- providing information on how best to maintain or improve road safety for children travelling to and from schools, as well as advising where further assistance might be obtained
- providing answers to commonly asked questions about road safety issues around schools.

Among a number of suggestions for improving transport around schools, specific engineering suggestions are given on the issues of traffic speeds, parking, bus facilities, road crossings, applications for children's crossings, safe routes to schools, bicycle safety, and fencing and landscaping barriers.

A section titled 'The ideal school' suggests the following elements of good engineering design:

- *Road access to schools should be provided by the school having roads on at least two, but desirably three sides. It is preferable that one is a local distributor/connector road.*
- *The entrances to the school should be from a local road.*
- *Off-road parking for parents/carers where speeds are restricted by raised plateaus.*
- *Indented on-road parking away from entrance on the local road(s).*
- *Pick-up and set down area on a one way service road near the front of the school or on the local road in front of the school (this is achieved by installing No Parking signs along the road that may need periodic enforcement).*
- *Traffic circulation should be enhanced by treatments that encourage vehicles to travel in a direction that enables dropping-off and picking-up on the school side of the road.*
- *Turn around areas should be provided where necessary such as roundabouts at convenient nearby intersections.*
- *Pedestrian and school children bicycle access ways not conflicting with motorised traffic.*
- *School staff parking away from other parking and on school grounds.*
- *Median refuges on the local distributor road next to school.*
- *Bus stops on the school side away from main congestion areas (main entrance).*
- *School recreational areas adjacent to the school.*
- *Visibility at all entry points/driveways and road crossings must be very good.*
- *Traffic speeds on local roads around the school should be limited by engineering treatments to not more than 40km/h (roundabouts, general streetscape modifications) and these may require periodic enforcement.*

- *School warning signs should be installed and clearly visible on all school approaches.*
- *No Stopping kerbside prohibitions should be imposed on the side of the road opposite the school for an hour before and after school times (this may require periodic enforcement).*
- *Children's crossings (where warranted) should be located where children congregate to cross roads (as long as it is determined to be the safest place to cross, eg refer to Safe Routes to Schools process for developing travel patterns maps).*
- *Paths (footpaths and shared paths) should provide easy access to schools and be located on the school side of the road.*
- *RoadWise (WALGA) should be consulted where a safe routes to schools program has not been implemented.*
- *Where one road is a cul de sac there must be a very generous car park/turn around area at the end of a cul de sac.*

2.6.3 *School environment safety guidelines* (Queensland Government 2005)

These Guidelines were published as part of a comprehensive collection of programmes, schemes, and initiatives (called SafeST) designed to improve the travel safety of schoolchildren in Queensland, Australia. The Guidelines give a systematic approach to the assessment and improvement of road safety near schools. They are intended to provide a single point of reference for any organisation or authority involved with, or seeking information about, road safety near schools, including road and transport authorities, school communities, parent associations, educational authorities, and the police. In many ways the SafeST process is similar to the STP process in New Zealand. A crucial difference is that one of the initial steps of the SafeST process is for the school community to form a SafeST committee that works through the issues with the relevant authorities, which possibly gives the school community a good deal of ownership of the process and improvements.

The SafeST package was developed after wide consultation and in partnership with the State Government's School Transport Safety Consultative Committee, and includes the following sections:

- SafeST Subsidy Scheme
- School Crossing Supervisor Scheme
- Educational Resources
- Safe School Bus Routes Programme
- Safe Walking and Pedalling Programme
- Speed Awareness at Schools Programme
- SafeST Public Information
- Other SafeST Initiatives.

The Guidelines highlight that while drivers need to recognise that children are impulsive, unpredictable and inexperienced, and that caution should be exercised in the vicinity of a school, safety around schools can also be improved by the use of devices to manage pedestrian/vehicle interaction, from one or more of the following categories:

a School Pedestrian Facilities

b School Parking Facilities

c School Cyclist Facilities

d School Warning Facilities

e Speed Management.

A significant amount of specific design guidance is given for each of these categories. Please refer to the Guidelines for further information.

2.6.4 *Travelling to school: a good practice guide,* UK (Department for Education and Skills and Department for Transport 2003)

This DfT/Department for Education and Skills Guide aims to have:

- as many children as possible walking or cycling to school
- more children catching the bus to school instead of being driven there by their parents, if they live too far away to walk or cycle
- as many parents as possible having the option of carpooling, where walking, cycling or public transport are not feasible
- children with special educational needs (SEN) receiving appropriate levels of support on their journeys to and from school, so that where possible, the children can travel independently
- sustainable travel and road safety promoted in the classroom, within the framework of the national curriculum
- active travel plans in all schools before the end of the decade.

These aims (and others) are supported by information on why it is important to achieve these aims, and how they might be achieved. There are two points that may be of particular use to New Zealand:

- The Guide is a joint initiative between the Department for Transport and the Department for Education and Skills. In New Zealand, the equivalent might be a joint initiative between the Ministry of Transport, the NZ Transport Agency and the Ministry of Education.

The Guide sets out clear aims for what is wanted for school travel systems. New Zealand could also benefit from setting out clear aims and objectives for school travel, along with a plan for how they might be achieved. Currently, there are many activities fostering improvements, but they lack a coherent and overarching leadership. The development of Scotland's School Road Safety Charter (Scottish Executive Social Research 2006) and the UK Department for Transport's Child Road Safety Strategy (2007) are further overseas examples of initiatives that provide more clarity and direction within school road safety.

2.6.5 *Safe routes to school guide*, US (PBIC–UNC 2007)

The Safe Routes to School (SRTS) concept originated in the 1970s in Odense, Denmark, from concern about the safety of school children who were walking or bicycling to school (EU 2006, Troels 2006). The SRTS concept spread internationally, with programmes developing in other parts of Europe, Australia, New Zealand, Canada and the US. The first SRTS programme was started in the Bronx (New York) in 1997 (PBIC 2007). There may be compatibilities between the US version of the SRTS programme and New Zealand applications because of similarities in road design.

The SRTS process is based on education, encouragement, enforcement and engineering initiatives. In New Zealand, the adoption of the SRTS process has been superseded by the NAP process. However, the New Zealand guidance is focused on the process that is to be followed to carry out a NAP project, whereas the

SRTS guidance from the US has a significant amount of specific guidance for engineering, enforcement, encouragement and education initiatives. For example, the *Safe routes to school guide* has a whole section on design considerations within the school zone. There is also information on why SRTS initiatives are important, with particular emphasis on the health problems currently faced by children and the role that increased walking and cycling might play in overcoming obesity.

2.6.6 *Streets ahead: supporting children to get active in their neighbourhoods* (VicHealth 2010)

The main aim of the Streets Ahead initiative is to increase physical activity in children aged 4–12 years, and to give children freedom and autonomy through active transport and independent mobility. Streets Ahead builds on the lessons from VicHealth's Walking School Bus programme with the development of comprehensive, flexible 'independent mobility demonstration projects for children' in six communities. It aims to help communities create supportive environments that enhance children's active transport and independent mobility in all aspects of their community life, including travelling to and from school. VicHealth has funded six councils to implement the Streets Ahead programme from July 2008 to June 2011.

2.6.7 Sustrans Links to Schools

The UK sustainable-transport charity, Sustrans, runs a programme called Links to Schools, which is funded by the Department for Transport. This project connects schools and their communities to the National Cycle Network in a variety of ways, from new cycle routes to pedestrian crossings, providing the safe routes that young people need to cycle or walk to school. The design standards outlined for the National Cycle Network call for the routes to be suitable for use by a novice adult cyclist, a family with young children, or a sensible unaccompanied 12-year-old.

2.6.8 First Student school transport service

In the US, Canada and UK, a school bus service company called First Student provides specialised third-party school bus services to schools. Part of the rationale for this service is that schools should be focusing on education, and a specialised school transport company is best-placed to provide safe, reliable and effective transport services for school students. Some of the school bus-service innovations provided by the company include CCTV cameras on buses, dedicated seating, anti-bullying strategies, trained and screened drivers, and even Radio Frequency Identification Device (RFID) tags to monitor students entering or leaving buses.

Summary: Existing guidance for improved transport systems for schools – key points for New Zealand

1 Guidance documents related to school travel often include a clear explanation of why it is important to focus on school travel, often with substantial evidence.

2 Specific design guidance is usually given, in addition to information about processes and procedures and practical examples of how transport systems for schools could be improved.

2.7 Other school travel-related transport literature

There are some other school travel-related research studies in New Zealand that have relevance to school travel systems.

2.7.1 *School journey safety: a comparative study of engineering devices* (Wigmore et al 2006)

This study aims to improve the safety of children on their journeys between home and school. It compares the effectiveness of engineering safety devices used both in New Zealand and overseas, to provide a framework for the development of a comprehensive toolbox to assist engineering practitioners and the community in selecting appropriate devices.

A range of engineering recommendations are offered, based on a substantial review of literature and survey of professionals in New Zealand. Their conclusions were as follows:

- There is no single engineering device that can solve the issue of safety among school children.
- Engineering devices need to be tailored for individual situations and user groups.
- The addition of complementary devices and design details enhances safety gains.
- There are obvious differences in the impact of engineering devices between urban and rural settings.
- There is a need for a comprehensive document providing a range of best-practice engineering treatments in New Zealand.
- The development of best-practice guidelines needs to incorporate the findings of the literature.

Further recommendations were:

- A toolbox to aid practitioners and the community to improve child pedestrian safety should be further developed, with the involvement of key stakeholders.
- The toolbox should provide:
  - a process for identifying the specific needs of specific environments
  - a fit with national standards, guidelines and policies
  - a matrix of appropriate 'best-practice' devices to address real and perceived problems.
- The gaps in knowledge identified in their research should be addressed.
- A long-term study to evaluate the area-wide effectiveness of devices used to improve school journey safety should be initiated.

2.7.2 *School bus safety* (Baas et al 2010)

This recently completed report aims to identify and advance measures that have the most potential to improve school bus safety. The study provides an evaluation of safety measures associated with the safety of children crossing the road to or from a school bus, and the safety of children while on a school bus. The following measures were investigated:

- *Eliminating the need for students to cross the road:*
  - *Encourage caregivers to meet their children at the bus stop.*
  - *Rearrange bus routes to reduce the number of children who have to cross roads.*

  - *Improve bus stops.*
- *Preventing children from running heedlessly across the road:*
  - *Conduct an awareness campaign aimed at improving the supervision of children crossing the road.*
  - *Increase road safety education in schools.*
- *Minimising the consequences by slowing the traffic when children are crossing the road:*
  - *Change the law to enable effective enforcement.*
  - *Ensure the law is enforced.*
  - *Install signs and flashing lights on school buses.*
  - *Conduct a driver awareness campaign.*
- *The safety of children while travelling on a school bus:*
  - *Improve school bus management standards.*
  - *Install occupant protection measures.*
  - *Install seat belts.*

2.8 Consultation with New Zealand school travel personnel

A total of 11 personnel variously related to school travel were consulted via a mass email (5) and physical interviews (6), either through professional contacts or through an email request for information via the Road Safety Coordinators' Association (SASTA). The feedback represented approximately 11% of this 100-member group – thus the following themes do not necessarily represent the overall views of all of those working in this area. Most of the respondents were involved with travel planning within local authorities, but the views of the New Zealand Police and SafeKids NZ were also represented. Information about the issues facing school travel and possible solutions (along with best-practice examples) were sought. The following themes emerged:

- School travel issues span the transport, education and health sectors – funding for STPs comes from the NZ Transport Agency; schools are owned and under the governance of the Ministry of Education; and there are child health issues (such as crashes, and conditions related to obesity) that concern the Ministry of Health. For progress to be made, coordinated guidance from all three agencies working together would be needed.
- The budgets for the infrastructure changes needed to support STPs are often inadequate. This often means that lots of 'soft' measures are implemented that do not address parents' and schools' greatest concerns (usually to do with traffic speed and unsafe crossings). The view is that school travel is not considered to have 'high strategic fit' in the NZTA's Investment and Revenue Strategy.
- School buses can be ill-equipped, and many families don't have access to them. One person mentioned the recent introduction of a small school bus with seat belts, which was very popular, effective, and allowed very few behavioural issues (compared with a half-empty large bus with students jumping around at the back).
- The strategic importance of schools within communities gets little political recognition.

- There is a need for behaviour change regarding parental attitudes and perceptions about the convenience and safety of the various school travel options.
- There are specific issues for schools on state highways and other rural arterial roads (especially when the speed limit is greater than 50km/hr – see figure 2.4), often due to competing safety and efficiency objectives.
- School gates need to be kept car-free, with car parking away from the school and high-quality walkways connecting parking areas with the school.
- STPs should be based on common sense and have simple objectives that deliver something to those taking part – usually time saving or an increased feeling of safety.

Figure 2.4 Plans to improve school student safety on state highways that run alongside schools can be problematic, partly because of the coordination that is needed between agencies (left – Dairy Flat School, Rodney District; right – Devon Intermediate, New Plymouth)

Good practice: Snell's Beach School – getting it right from the start

Snells Beach School took a very proactive approach to school travel. Prior to the school's opening in 2009, a travel plan was carried out and priority was given to walking, cycling and bus transport.

Along with initiatives to encourage and educate students (photo A) and enforce appropriate road safety behaviour, the following measures have, in turn, created an environment that encourages active transport to school:

1 safe entry and exit points from the school car park and safe bus-bay area (photo B)

Photo A

Photo B

2 a wide shared pathway and a new pedestrian crossing on Dawson Rd from Mahurangi East Rd to the school entrance (photo C)

3 a wide concrete pathway linking the rear of the school to nearby residential streets, providing a very user-friendly active transport link and drop-off facility from the direction of the town centre (photo D)

4 'School zone thresholds' on approaching arterial roads.

Photo C

Photo D

Good practice: Cycling to school, a normal part of life at Broadgreen Intermediate (Nelson) and Mt Maunganui Intermediate

At Broadgreen Intermediate School in Nelson, 60–70% of students cycle to school on a good day. The school is an example of what can be achieved when every opportunity is given to students who might cycle to school.

The school actively promotes cycling – all classes receive a module on cycling in the first term. All bikes must pass a warrant of fitness, and lunch-time activities include cycle-skills courses. The school has been very involved in Bikewise promotions, which is run by Nelson City Council. Bikes are securely stored in a lock-up bike cage.

It is also school policy that students must use the off-road cycle path (the old railway reserve) to the rear of the school, to avoid the busy road frontage – the school is neighboured by a college, primary school, kindergarten and swimming pool. The cycle path is very well used. Students living up to 5km away commonly cycle to school using the cycleway.

At Mt Maunganui Intermediate, approximately 20% of students regularly cycle to school and there is a definite sense that cycling is considered a normal way to travel to school. The suburban environment around the school has a relatively large and well-connected network of residential streets, often with helpful connecting pathways, although there are some busy roads that need to be crossed.

Following recommendations to improve the environment for cyclists, an extra off-road pathway has recently been constructed as a key link to school, and access via a cul-de-sac to the rear of the school has allowed convenient and safe access to the school.

3 Logic diagram for improving school travel systems

This diagram demonstrates how the existing information provides a rationale for further work to improve school travel.

There are a number of significant costs assocated with school travel related to:

- congestion - safety - health - the environment

Some initiatives in some regions have had preliminary success (eg school travel planning and walking school buses in the larger centres). However, given the costs to society as mentioned above, more such initiatives could be prioritised, and particular areas could be improved, eg:

- national leadership and coordination of school transport initiatives
- cycling to school
- school bus safety
- transport infrastructure around schools
- rural school transport
- road safety education and training

The following three approaches could help to provide more comprehensive and user-friendly solutions:

- a systems approach
- a human-centred approach
- a socio-ecologic approach.

Actual solutions might include:

- a national cross-sectoral/ministerial (MOT, MOE, MOH) 'School Travel Strategy', with associated collaborative structure and workplan (beyond the scope of this report)
- the development and use of a user-friendly school systems model
- more specific guidance on initiatives for school transport system components.

4 Proposed toolkit for improving school travel

4.1 Who is this toolkit for?

This toolkit is intended to supplement existing school travel planning processes, and therefore is intended for school travel planners and other personnel who are involved in the provision of school travel systems or infrastructure.

4.2 The school travel system

In Western Australia, the document *Guidelines for road safety around schools* (WALGA 2007) endorses a 'system' approach to road safety around schools. The purpose of these guidelines is not to replace the excellent initiatives that exist, such as Safe Routes to School, but more to build on existing information and processes by providing guidance for all the areas that need to be considered within a safe school travel system. There is a heavy emphasis on improved engineering, including giving specific attention to areas such as traffic speeds, parking, bus facilities, road crossings, and engineering for bicycle safety. There is also a section titled 'The ideal school', which identifies specific engineering requirements for a safe school travel environment.

The same approach could be used in New Zealand. The next section of this report outlines how a system approach to school travel could provide some strategic direction and a more comprehensive approach to school travel initiatives, as well as a monitoring system to track progress and identify areas of ongoing concern. It also details the specific elements of a school travel system that need to be considered, and gives examples of good practice.

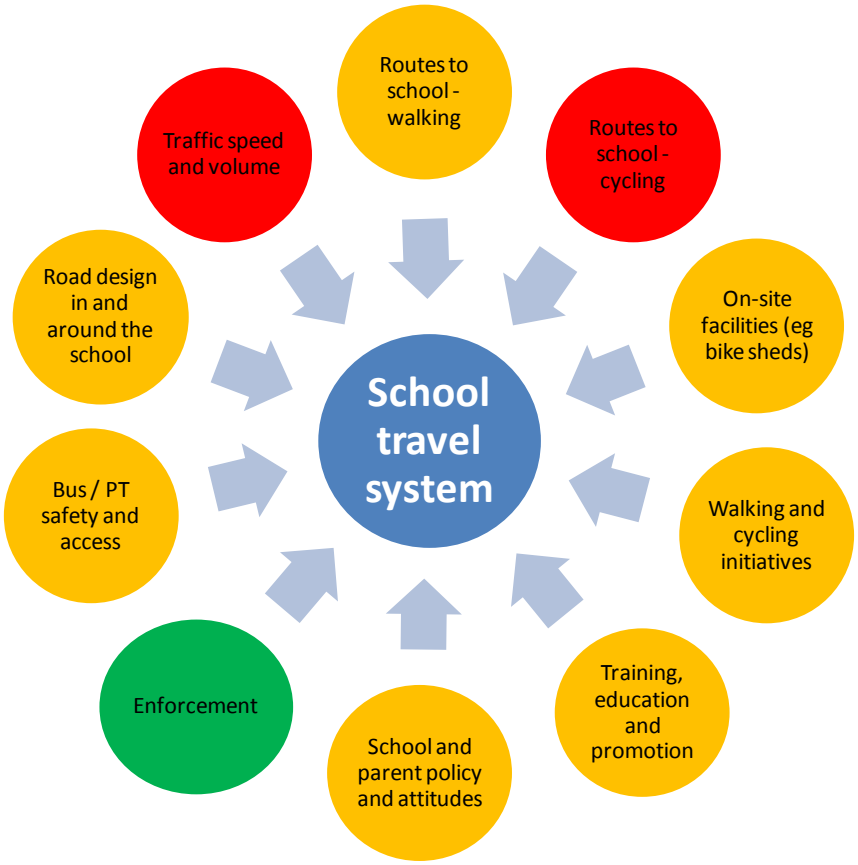
Ultimately, a range of elements contribute to safer and more sustainable school travel and less congestion on roads around schools. Figure 4.1 on the next page proposes a 'status diagram' for school travel systems. A simple 'traffic-light' method has been used to denote the status of each element of the system, with red indicating areas of highest priority, amber indicating areas that are operating reasonably well but have some outstanding issues, and green indicating areas that are currently functioning well. An uncoloured 'unresolvable for now' status is proposed when the element is not feasible within currently accepted transport system parameters. An example of this is walking or cycling to a school that is located on a state highway, with most students living some distance away (eg the Dairy Flat School example that is outlined in the 'Case studies' section of this report). By including this status level, schools or planners would be relieved of pressure to deliver something that would be inherently unsafe, and it also recognises that a fundamentally different approach is needed to make walking and cycling in rural environments realistically feasible.

This status diagram could be used to track the effectiveness of school travel planning initiatives over time. Ideally, eventually a school would score green status for each of the elements, although in reality, funding constraints and priorities are likely to mean there will always be areas that could be improved and might therefore remain amber. A standardised audit process would need to be developed and implemented to objectively assign the status for each system component.

In reality, a school travel system model would demonstrate interactions between system elements and might be much more complex than the model shows – for example, quiet streets are likely to benefit both pedestrian and cycle routes to school. However, this system model has been deliberately kept very simple so that it is more likely to be used operationally.

It is important to note that this approach is NOT intended to replace initiatives such as the current TravelWise award system, but rather to complement it. The TravelWise scheme gives schools a bronze, silver or gold award (including certificates and a financial support package) for completion of phases of the travel planning process. For example, a bronze award is given when the planning stages of a STP are completed. The proposed status diagram could be used in conjunction with the Travelwise awards scheme in the travel plan development process (part of the bronze phase) and in the ongoing monitoring process (part of the gold phase). The proposed status diagram could be a tool to ensure that each award phase is being adequately met and that each part of the school travel system is being considered as part of the travel planning process. This could lead to a more comprehensive approach to school travel initiatives.

Figure 4.1 **A proposed 'status diagram' for defining a** school travel system (example only). A simple 'traffic-light' method could be used to identify elements of the system that are working well/where more work might be done/where urgent attention is needed.



4.3 System components

4.3.1 Routes to school – walking

Part of the decision to walk to school is based on consideration of the level of service offered by the route to school by foot (Davison 2006). The length of journey, presence and quality of footpaths, along with personal safety and crossing locations and design, can all have a significant effect. It should be noted that pedestrians include those who are travelling on small-wheeled devices, such as scooters, which are popular with younger students and may present a significant opportunity for promoting sustainable travel in the future.

In most rural areas, walking to school is generally not an option, as footpaths are not provided on rural roads. In semi-rural environments, footpaths are often missing, despite relatively dense housing within walking distance of the school – adding a pathway could have significant effects on the modal share of students' means of travelling to school. A new shared path serving Waitoki School in Rodney District is an example of this (figure 4.2).

Figure 4.2 A shared pathway in a rural environment (Waitoki, Rodney District) has created walking and cycling opportunities for primary school students

Footpaths are usually present in urban environments, although their condition can sometimes be so poor they represent a barrier. A more common barrier to those who might walk (or cycle) to school is the presence of busy roads with few or 'unfriendly' formal crossing opportunities, eg an excessively long 'red man' signal phasing at the crossing. The NZ Transport Agency *Pedestrian planning and design guide* (NZTA 2007) includes sections on school crossing requirements and design considerations. The following are some key points from the guidelines:

- There is a wide variation in level of road safety amongst school students, from young primary school students to older high school students. These differences should be considered when designing crossings and routes to school.
- Obvious locations for infrastructure are near the school, as this is where the largest concentrations of students converge. However, consideration also needs to be given to major pedestrian routes and crossings further away from the school – this is often where actual crash risks to individual students may be higher, as motorists are less tuned in to a 'school zone' mode of thinking.
- Interestingly, the NZ Transport Agency's *Pedestrian planning and design guide* suggests that the so-called 'chaos at the school gate' helps to tame traffic speeds, and although user behaviour may need some management, care should be taken to ensure it is not so well managed that caution diminishes and traffic speeds increase.

To improve the safety of pedestrians and cyclists, the Safer Journeys Strategy suggests:

- providing safe and convenient routes for pedestrians and cyclists, especially to and from work and school
- reducing vehicle speeds on roads that are frequently used by pedestrians and cyclists.

Figure 4.3 Major arterial roads that are near schools and have infrequent crossing opportunities can be a major barrier to students walking to school (Photo: Hamish Mackie)

4.3.1.1 **Possible 'traffic-light' status levels for routes to school** – walking

The following categories might describe four status levels for *Routes to school – walking*:

Routes to school – walking	All school students living in urban environments within 1km of school can easily and safely walk to school (with a parent if the student is young). There are no major barriers such as inadequate footpath facilities or arterial/major rural roads without crossing facilities. Traffic speeds around the school are relatively low.
Routes to school – walking	Some students living in urban environments within 1km of school can easily and safely walk to school (with a parent if the student is young). There are some major barriers for some students, eg inadequate footpath facilities or arterial/major rural roads without crossing facilities.
Routes to school – walking	There are significant barriers to students walking to school, and measures to overcome these barriers should be given high priority.
Routes to school – walking unresolvable for now	Walking to school is currently not feasible because of sparsely populated rural environments with high-speed roads. Significant infrastructure investment, which is unlikely to be feasible, would be needed before children could safely walk to school.

4.3.2 Routes to school – cycling

A recent report by the Ministry of Transport (2008) stated that in the period 1989–1990, young people aged 13–17 cycled just over 8km per person per week. During the period 2003–2006, this figure dropped to approximately 2.5km per person per week. Cycling to school has diminished considerably in the past 20 years, despite the numerous benefits it brings (Mackie 2009).

Recent research (Horspool 2006, Mackie 2009) suggests that establishing safe and user-friendly cycle routes to school is likely to have a positive effect on school cycling numbers, while also reducing safety concerns. Research evidence from New Zealand and overseas suggests that cycling to school should be promoted, with a corresponding emphasis on suitable infrastructure and safety (Mackie 2009). Local streets, shared pathways alongside busier roads and through parks and reserves (see figure 4.4), with user-friendly bike crossings, are likely components of cycling routes to school.

Such routes should be established and promoted to complement and support the route-planning exercises that students and parents often participate in as part of STPs. This would mean that students are not faced with planning their own routes to school along unattractive and potentially dangerous routes. An area of development might be a trial of various options for alerting motorists to the presence of cyclists along a route. This might include the use of advisory cycle markings on the road (outside of their use within cycle lanes) and the use of active warning signs at troublesome locations.

Figure 4.4 Shared pathways through parks and reserves are feasible components of a school cycle network in most cases (left – Photo: Sarah Burrows) and advisory signs within the road environment might help to improve the safety and attractiveness of school cycle routes (right – Photo: Mark Edwards)

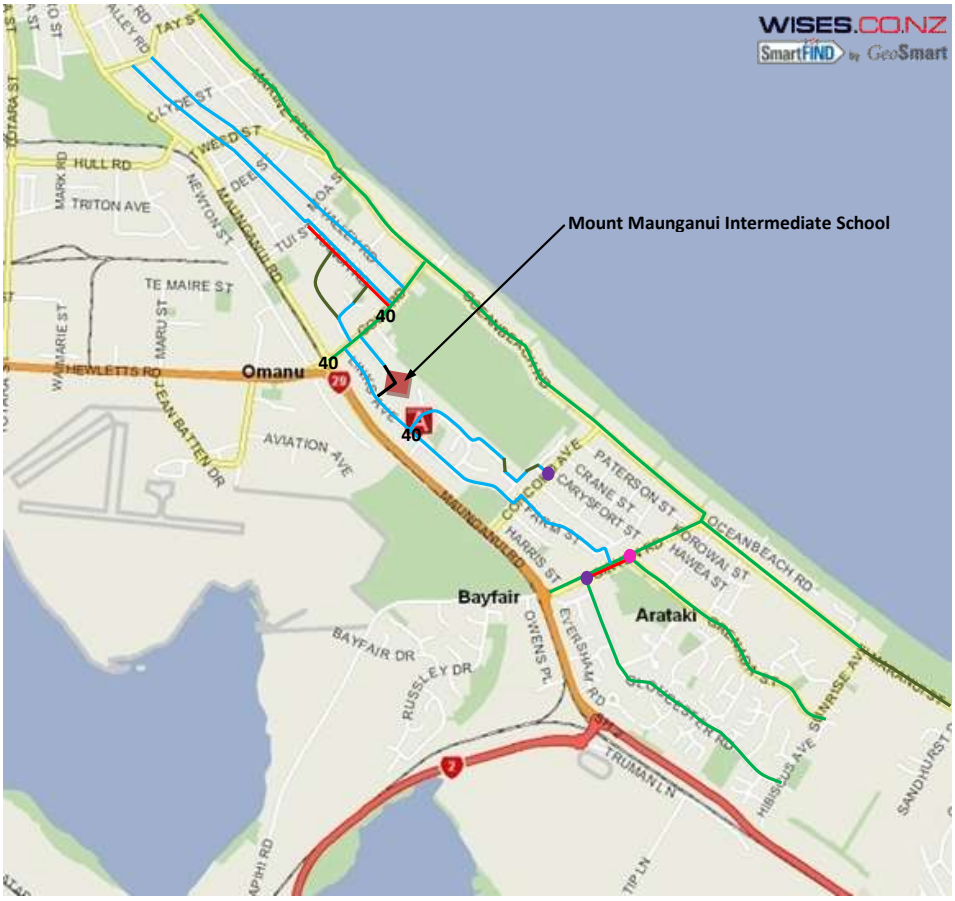
Mackie (2009) developed example school cycle networks for six intermediate schools in the North Island. An analysis of the six examples revealed that in many cases, the engineering works required to create safe and user-friendly bike routes to school were limited to a few trouble spots (usually crossing a busy arterial road, or connecting the local network with arterial crossings). For a number of reasons, even with good provision cycling is likely to be a realistic option for a lower subset of students than walking. Mackie estimated that a realistic cycling target for most schools might be in the order of 20–40% of the school roll.

In Christchurch a concept called 'cycle bubbles' refers to an approach whereby:

- a 'bubble' around a school is identified, with a radius equivalent to the maximum estimated acceptable cycling distance

- trouble spots for cyclists are identified within the bubble and prioritised for remedial engineering works – by systematically treating the trouble spots, safe routes to school by bike will, in theory, be established over time.

Figure 4.5 An example school cycle network – Mt Maunganui Intermediate (Wises map)



Key:
- Suburban on-road route (no bike lane)
- Off-road route
- Share with care footpath
- On-road bike lane
- Must walk with bike
- Controlled or pedestrian crossing at major road
- Proposed signalised intersection or pedestrian crossing
- 40 Proposed 40 km/hr school low speed zone

4.3.2.1 **Possible 'traffic-light' categories for routes to school** – cycling

The following categories might describe four status levels for *Routes to school – cycling:*

	Most students who live in urban environments within 2–3 km of school can cycle to school easily and safely. For most, there are no major barriers, such as busy roads without well-connected crossing facilities or separated pathways. Traffic speeds around the school are relatively low and there are no conflicts with motorised traffic in and around the school.
	Some students who live in urban environments within 2–3km of school can cycle to school easily and safely. Some major barriers still exist, such as busy roads without well-connected crossing facilities or separated facilities. Traffic speeds around the school are relatively low and there are no conflicts with motorised traffic in and around the school.
	There are significant barriers to students cycling to school, and measures to overcome these barriers should be given high priority.
	Cycling to school is not feasible because of sparsely populated rural environments with high-speed roads. Significant infrastructure investment, which is unlikely to be feasible, would be needed before children could safely cycle to school.

4.3.3 On-site facilities eg bike storage

Adequate facilities are needed at school to make walking, cycling or scootering an attractive or viable option for students. The following issues need to be considered:

- Bike storage: Ideally, bikes should be protected from the elements, but most importantly, they should be stored in a place that is secure. The best location is at the front of the school (which is also a good way to make a statement about the priority the school gives to cycling), or where there is significant foot traffic. In the past, bike racks and sheds have been placed out of the way at the rear of schools, which has probably contributed to theft and vandalism. Providing well-designed and well-positioned bike racks or storage sheds can have a significant influence on cycling participation at schools (Gerrard 2009), and the absence of good bike storage has consistently been cited as a barrier to cycling to school (Horspool 2006, Mackie 2009). In the UK, sustainable-transport charity Sustrans provides detailed information on suitable bike storage at schools (Sustrans 2010).

Figure 4.6 Basic but strategically placed bike racks at the front of Kowhai Intermediate School, Auckland. The open window in the background is the location of the principal's office.

- Storage for personal belongings: The loads that students must carry to, from and around school can be a considerable burden (Mackie et al 2004, Mackie and Legg 2008) and this has been reported as a reason for not walking to school (Kearns 2010). An example narrative from a student is:

  I could walk but it takes ages and ... I have heaps of bags to carry. I've got like 3 bags and like if I have hockey then I have like 4 or 5 so ...

  Having somewhere to store belongings during the school day can significantly reduce this burden and therefore make walking to and from school easier.

- Storage for scooters: Scooters are an enjoyable and effective way for students to travel to school. Like bikes, they need to be stored somewhere secure at school to prevent theft. Kowhai Intermediate School in Auckland has scooter storage in the main reception area of the school.

- Showers: For students travelling relatively long distances by bike in summer, shower facilities may be needed. School gyms usually have showers, and so this shouldn't be a problem for most schools.

4.3.3.1 Possible 'traffic-light' categories for on-site facilities

The following categories might describe three status levels for *On-site facilities*:

On-site facilities eg bike storage	On-site facilities support cycling, scootering and walking by providing highly visible, secure and sufficient storage for bikes, scooters and personal belongings.
On-site facilities eg bike storage	On-site facilities mostly support cycling, scootering and walking, but there may be some areas where secure and sufficient storage for bikes, scooters and personal belongings needs improving.

On-site facilities eg bike storage	The lack of on-site facilities for storage related to cycling, scootering and walking to school represents a significant barrier to these modes being used. Significant improvements are needed.

4.3.4 Walking and cycling initiatives

'Walking and cycling initiatives' refers to ongoing programmes that support walking and cycling to school. Examples might include 'walking school buses', 'cycle trains/buses' and 'cycle buddies'. These are different from training, education and promotional activities, which are short-term or periodic activities aimed at improving safety or stimulating travel behaviour change. In New Zealand, by far the most common walking and cycling initiative is the walking school bus. This is now an established part of school travel in many areas and tends to be the cornerstone of many STPs. The nationwide Feet First initiative is another example.

The Park and Walk and Kids on Feet concepts are used by some schools, wherein there are drop-off zones for parents to park away from the school gate and then walk their children the rest of the way (or arrange for their children to walk with groups of friends). This strategy is especially helpful for families who live too far from the school to walk the whole way or who do not have a safe route to school. Kids on Feet was implemented by the Tauranga City Council in 2004 as part of the travel plan for Greerton Village School.

Planning for walking and cycling, including walking school buses, usually happens as part of an STP. The NZ Transport Agency's guidelines '*School travel plan coordinator's guide*' (Land Transport NZ 2007) contains detailed information about the STP process.

As mentioned in this report's sections about walking and cycling routes to school, to some degree the ability to establish ongoing walking and cycling initiatives (such as walking school buses or cycle trains) depends on the surrounding environment. In truly rural areas with high-speed roads and no separated pathways, walking and cycling initiatives are not an option, but they may be possible in semi-rural environments by installing well-positioned pathways.

There may also be some cultural and socio-economic differences in the uptake of walking and cycling initiatives. Cycling may be more common in wealthy areas (Mackie 2009) and there may still need to be more awareness about the issues for different ethnic groups as regards walking and cycling initiatives.

Figure 4.7 Walking school buses are now widespread in New Zealand (TravelWise 2010)

4.3.4.1 **Possible 'traffic-light' categories for walking and cycling** initiatives

The following categories might describe four status levels for *Walking and cycling initiatives*:

	The possibilities for walking and cycling initiatives have been investigated (including less common initiatives such as cycle trains) and the most appropriate options have been implemented and are functional.
	Some effort has been made to investigate the feasibility of walking and cycling initiatives and some action has resulted, but more work could reasonably be done in this area.
	Little or no effort has been made in the area of walking and cycling initiatives, despite a clear need for them.
	Walking and cycling initiatives are not feasible because of sparsely populated rural environments with high-speed roads. Significant infrastructure investment, which is unlikely to be feasible, would be needed before children could safely cycle to school.

4.3.5 Education, training and promotion

Road safety and the promotion of sustainable transport both require sustained education, training and promotional activities alongside infrastructure, enforcement and other initiatives. In New Zealand there are a number of training, education and promotional resources and initiatives that are designed to assist with transport around schools:

- *RoadSense/Ata haere* (NZTA 2008) – a handbook for teachers about road safety education within the school curriculum (this initiative has recently been discontinued)
- the NZTA Education Portal (NZTA 2010), which includes a significant amount of school curriculum material (among other resources and information) and involves a whole-of-school approach that has, at its centre, the theme of 'Children making safer journeys'
- *Cyclist skills training* (NZTA 2010) for the set-up and delivery of cycle training (regions tend to have their own programmes for delivery)
- NZ Transport Agency's various school road safety education packages – *Being road smart for school*, *School traffic safety team manual*, and *School bus safety information* (NZTA 2010)
- Regional controlling authority-level initiatives such as TravelWise, Road Safe Auckland, and Cycle Safe in Christchurch

- a wide range of school road safety resources as part of the New Zealand Police Youth Education Service (YES). The New Zealand Police Road Safe Series includes:
  - Stepping Out (years 0–3) – aims to encourage and assist children to behave in a safe way as pedestrians or passengers in a traffic environment
  - Riding By (years 4–6) – aims to encourage children to develop knowledge, skills and positive attitudes to keep themselves safe on or near the road when they are passengers, pedestrians, cyclists, or involved in leisure activities
  - Out and About (years 7–8) – aims to enable young people to participate safely as road users, aware of their own place in the traffic environment, as well as that of others
  - Changing Gear (years 9–10, not yet driving) – aims to empower young people to participate safely as responsible road users, aware of their own place in traffic, as well as that of others
  - Safe Wheels (years 11–13) – aims to encourage and empower young people to develop responsible attitudes and behaviour with regard to driving and travelling in cars.
- regular campaigns by SafeKids New Zealand on a range of child safety issues, which periodically include road safety issues, such as wearing a bike helmet
- *Safer young drivers* (National Road Safety Committee 2008) – summarises what research and road safety experts (both here and overseas) consider best practice in terms of road safety education for young novice drivers, with the intention of disseminating this knowledge to everyone with an interest in road safety education
- SADD (Students Against Drunk Driving) – a peer education programme that has been in New Zealand secondary schools for over 20 years, with a primary objective of reducing the harm caused on our roads by drink-drivers. The programme is run by students and can be incorporated into the school curriculum. The organisation is open to any student at any year level.
- The Roadshow Trust – aims to reduce injury and trauma on the roads by researching, promoting, delivering and facilitating effective road safety education in the community. The Trust is currently working on the issue of parents as role models for their children's behaviour on the road, including parents' behaviour and attitudes as pedestrians and while driving, and the influence of parental driving on the driving style of new drivers.
- Safer Journeys Strategy – aims to increase cycle-skills training in schools, and increase the effectiveness of road user education, to make it safer to walk and cycle to school.

Although there are many education and training initiatives that apply to school travel, they are not particularly well coordinated. This may be because there is no nationally driven vision or strategy for what is needed for school travel. An exception, at least in the area of road safety education, might have been the National Road Safety Committee's (2007) *Road safety education strategic framework*, but this was not widely adopted.

A review of the effectiveness of road safety education for young people in New Zealand is currently being carried out by the Ministry of Transport. It is expected that this will include a review of international best practice for integration into New Zealand road safety education initiatives.

4.3.5.1 **Possible 'traffic-light' categories for** education, training and promotion

The following categories might describe three status levels for *Education, training and promotion*:

	Nationally recognised education, training and promotional activities have been identified, planned and carried out as part of the STP process, focusing on particular areas of need along with more general education and promotion.
	Some education, training and/or promotional activities have been identified, planned or carried out as part of the STP process – however, there are areas where more could be provided to meet demand.
	Little or no education, training or promotion has been carried out at the school, or there are some very specific areas that need to be urgently addressed.

4.3.6 School/parent policy and attitudes

Strongly linked with training, education and promotion, the policies and attitudes of schools and parents can have a big impact on issues related to school travel (Christie et al 2004, Davison et al 2008). For example:

- Some schools actively discourage cycling to school, mostly because of safety concerns.
- Some schools are passive about school travel issues because it is external to the primary tasks of delivering education.
- Some schools actively encourage walking and cycling to school (usually in conjunction with STP activities or proper training for cycling).
- Some parents give little or no thought to how their children get to and from school – taking the car seems to be the easiest option.
- Many parents are fearful about their children's safety ('stranger danger' or road safety) and therefore do not allow their children to walk or bike to school.
- Some parents actively encourage their children to walk or cycle to school (when it is feasible) because they see that the benefits of doing so outweigh any risks.

For many schools and/or parents, driving to and from school is simply the obvious, easiest or normal thing to do. In some ways this presents an opportunity, because through education, training or promotional activities, they might come to see a potentially better way for their children to commute as reasonable or even attractive. In these instances, it is essential that active travel is somehow made more advantageous than getting to school in a private car, as most people will simply do what is most convenient for them.

4.3.6.1 **Possible 'traffic-light' categories for school**/parent policy and attitudes

The following categories might describe three status levels for *School/parent policy and attitudes:*

	Both parents and school staff are well aware of the options available to children for travelling to and from school (usually following a programme of training, education or promotion). If walking, cycling and public transport are safe and viable modes, students are being encouraged by parents and school staff to use these modes.
	Parents and school staff have some awareness of the options available to children for travelling to and from school, but students are still not being encouraged to walk, cycle or use public transport, despite these modes being viable options.
	Probably as a result of little or no training, education or promotion, there is no culture of encouraging students to walk, cycle or use public transport to travel to and from school, even though these are viable options. In some cases these modes are actively discouraged.

4.3.7 Enforcement

Enforcement is considered an essential ingredient within school travel systems, as there are always a few people who operate outside the law or outside accepted school norms. Enforcement can occur in a number of ways, and through a variety of people:

- New Zealand Police: School road policing is usually carried out in conjunction with local transport authorities. Initiatives are usually programmed in response to problems at specific schools, in addition to the community policing routine of overseeing busy crossings or monitoring motorists running red traffic lights during school commuting hours.
- Local authorities: Initiatives such as Auckland City's 'Chaos at the School Gate' seeks to improve traffic behaviour around school gates by placing parking officers on patrol outside schools to observe non-compliant behaviours and issue tickets to those who are illegally parked.
- Teachers and parents: Most schools have teachers and parents overseeing school crossings, which is important for ensuring correct student behaviour. These people are also important for detecting illegal and dangerous driving around schools, such as failure to stop at crossings and red lights.
- Students: Positive or negative behaviour can be reinforced or even 'policed' by peers. Younger children especially will often comment on a friend or sibling's behaviour if it deviates from what they have learned as 'the right thing to do', and even report bad behaviour to teachers or parents. This tends to happen less at high school. Students who have learned desirable behaviour at school may also 'police' their own parents if they attempt to park illegally or break school rules. 'Student policing' is potentially a very powerful mechanism that could be used more often and to greater effect.

4.3.7.1 Possible 'traffic-light' categories for enforcement

The following categories might describe three status levels for *Enforcement*:

	Enforcement is active at all levels (from police through to peer enforcement) through a culture of behaving correctly. Those deviating from the law or accepted school rules are seen as outsiders or exceptions. This might be demonstrated by very high compliance with correct 'drop-off' procedures.
	Enforcement is active at some levels (from police through to peer enforcement), though some enforcement activities and unacceptable behaviour is sometimes detected and acted upon. A culture of 'self-enforcement' is not yet established and periodic infringing is common.
	Enforcement is rare and a culture of 'self-enforcement' is non-existent. Deviation from the law or school rules is common, evidenced by congestion and unsafe road-user behaviour near schools.

4.3.8 Bus/PT safety and access

Bus access and safety is a high-priority issue for rural schools, partly because it is often the only available transport alternative to the private car. Walking and cycling are often not realistic in rural environments because of high traffic speeds and a lack of separated walking and/or cycling facilities.

A recent NZ Transport Agency report (Baas et al 2010) specifically addresses school bus safety. Approximately 100,000 children are transported to and from schools daily by Ministry of Education-funded bus services. There is considerable concern in the community, especially in rural areas, about the number of children being killed or seriously injured when crossing the road to or from school buses. However, research both in New Zealand and internationally shows that school buses are actually one of the safest ways for students to travel to and from school. In New Zealand, children travelling to school by car between the years 2003–2005 were, per trip, 2.3 times more likely to be injured than children travelling by bus. However, bus travel in New Zealand is significantly less safe than in similar countries such as the UK, Australia and the US. In Scotland, a child travelling by bus is 7 times less likely to be a road traffic casualty than a child travelling by car; in Australia, bus travel is 14 times safer than travel in a private car; and in the US, bus travel is reported to be 8 times safer than car travel. These figures indicate that New Zealand still has considerable scope for improving the safety of school buses. Given that approximately 23% of schoolchildren travel to and from school by bus, an improvement in school bus safety has the potential to reduce road safety risk for a substantial proportion of New Zealand children.

There are two aspects to safety related to school buses (Baas et al 2010):

- The safety of children crossing the road to or from a school bus:
  Actions to improve this include:
  - encouraging caregivers to meet their children at the bus stop and to organise the timing of their bus runs to reduce the number of children who have to cross at one time

- improving the visibility and condition of bus stops
- assisting younger children with crossing the road
- improving road safety awareness and skills
- slower speeds for traffic that is passing a school bus that is picking up or dropping off children.

The order of priority for these actions should be:

- eliminating the need for students to cross the road
- preventing children from running heedlessly across the road
- minimising the consequences of this by slowing down the traffic when children are crossing.

- The safety of children while travelling on a school bus:
  Actions to improve this include improving the safety of school buses, through:
  - how they are managed and maintained (including social issues such as bullying)
  - how they are driven
  - passive safety systems to protect bus occupants should a crash occur.

Most of the focus so far has been on the safety of children crossing the road to or from a school bus, as this represents the area with the most safety risk. Some work on this topic that is currently underway is the speed of traffic passing stationary school buses. A recent trial (Baas et al 2010) evaluated the effects of different bus-mounted signs on passing traffic speeds and motorists' perceptions. Figure 4.8 shows the sign that resulted in the lowest traffic speeds past a school bus – 57km/hr in the same direction as the bus, and 67km/hr in the opposite direction to the bus. The original sign, which simply said 'School', led to almost no reduction in traffic speed, compared with speeds when no bus was present.

Figure 4.8 A sign that was effective at slowing down motorists passing school buses while children were boarding or exiting the bus (Photo: Peter Baas)

The design of school bus stopping and drop-off areas is also important, and Baas et al's report gives a great deal of attention to this aspect, mostly taken from Australia. The design of new schools includes greater consideration of bus and other vehicular drop-off facilities (see figure 4.9) and some existing schools have also made efforts to design safer and more efficient facilities (see figure 4.10).

Figure 4.9 Bus and other vehicle drop-off facilities, as per recommended design practice, Orewa Primary (Photo: Sarah Burrows). It should be noted that drop-off/pick-up facilities are also important along bus routes, and not only at schools.

Figure 4.10 Bus drop-off facilities at Waitoki school (Photo: Peter Baas)

Access to bus and public transport services are also important considerations for all schools. Having access to bus services can be problematic for some people in rural areas, and it is not uncommon to hear of half-full school buses travelling past the gates of students who don't qualify for state-funded bus services. Students under 10 years old qualify for school bus services if they live more than 3.2km from school, or for students who are 10 years or older, more than 4.8km. (These rules do not necessarily apply to private schools, which contract bus services directly.) Because walking such a distance is unrealistic, from the perspectives of time/effort and safety, being dropped off by private car is the only option for these rural students.

Part of the problem for bus services in rural areas is that the distribution of students' homes is always changing as individuals attend and then leave the school. This makes it difficult to plan for, and invest in, pick-up and drop-off points, as the demand for them is always changing. Nevertheless, in many instances improvements could be made in this area, including improvements to core bus stop locations that are

unlikely to change. Rural feeder services connecting to major school bus routes might be an option worthy of further investigation.

A lack of shelter can also be an issue for students waiting for buses in rural areas. An interesting initiative from the private sector is the Undercover Kids Programme by Totalspan, a steel shed and building supplier. Since 2008, 194 steel bus shelters have been allocated to schools and communities throughout New Zealand, with a further 100 planned for allocation during 2010.

In urban environments, good access to public transport means that students can conveniently and safely walk or cycle to, and wait for, buses or trains that take them to and from school. Some of the considerations that are given to walking and cycling routes to school can be applied to the routes to public transport services. Significant numbers of students commute to school via pubic transport in places where there are convenient public transport links near the school, eg in Auckland, St Peters School and Kings College (which has a dedicated train stop that is used during school commuting hours).

4.3.8.1 Possible **'traffic-light' categories for bus**/PT safety and access

The following categories might describe three status levels for *Bus/PT safety and access*:

	Students can access bus/PT services safely and conveniently, made possible by well-designed drop-off and pick-up facilities and procedures, along with safe and convenient routes to buses and trains. Neither road nor personal safety issues represent significant barriers to accessing bus/PT services.
	Students can sometimes access bus/PT services safely and conveniently, but there may be some outstanding areas of concern related to drop-off and pick-up facilities and procedures, or safe and convenient routes to buses and trains. There may be some outstanding personal or road safety issues related to accessing bus and PT services.
	Despite bus or PT travel being a realistic option for many students, little or no effort has been made to improve safety or access for students and considerable barriers still exist.

4.3.9 Road design in and around the school

The road design within the school grounds and in the immediate vicinity of the school is an important part of the school travel system, because this is where all students converge in the morning and diverge in the afternoon. Regardless of the mode used to travel to school, all students use this part of the network. Interestingly, the NZ Transport Authority's *Pedestrian planning and design guide* (2007) points out that crash statistics show that crossing outside school is the safest part of a walking trip to school. The 'chaos at the school gate' helps to tame traffic speeds, and although user behaviour may need some management, care should be taken to ensure it is not managed so well that caution diminishes and traffic speeds increase. On the other hand, poorly planned environments around schools may lead to excessive congestion, which may have some effect on the surrounding transport network.

While focus on design around the school gate is important, the presence of a large number of students does at least make motorists aware that young people are commuting in the area. Care is needed to make

sure that locations further afield (see the discussion on walking and cycling routes to school) receive equal attention, as these are areas where motorists are not expecting to encounter students walking or cycling.

New schools are increasingly being planned with all transport modes in mind (and ideally, even the very location of the school is planned with transport in mind). Properly designed bus and car drop-off areas, and walking and cycling routes to the gate (and then on to school buildings), are considerations. However, most schools that already exist were built in a time when transport patterns were different and specific consideration to each mode may not have been given. In these cases, schools have retrofitted engineering and school policies to create safe environments for their students.

Figure 4.11 Glasshouse Mountains School, Queensland – The road reserve outside schools in rural/semi-rural areas can be physically separated into school drop-off and through-traffic areas, in order to avoid conflicts between travel modes. The narrower 'through lanes' also encourage traffic to slow down (Photo: Hamish Mackie)

There are a number of documents that suggest or specify engineering measures for school environments, including:

- *School environment safety guidelines* – Queensland Government (2005)
- *Guidelines for road safety around schools* – WALGA (2007)
- School journey safety: a comparative study of engineering devices – *LTNZ research report 271* (2006)
- I want to ride my bike: overcoming barriers to cycling to intermediate schools – *NZTA research report 380* (2009)
- *Pedestrian planning and design guide* – NZ Transport Agency (2007).

Some of the key points from these documents include the following:

Drivers need to recognise that children are impulsive, unpredictable and inexperienced, and that caution should be exercised in the vicinity of a school. However, pedestrian/vehicle interaction to improve safety around schools can be managed by means of devices from one or more of the following categories (Queensland Government 2005):

- school pedestrian facilities

- school parking facilities (associated parking management could be added to this)
- school cyclist facilities
- school warning facilities
- speed management.

This point is reinforced by the OECD (2004) report *Keeping children safe in traffic*. As mentioned earlier in chapter 2, this points out that designing a road environment that recognises children's capabilities, as well as their limitations, will benefit all road users, since what constitutes a safe road environment for children will usually be safe for the general public, and particularly for older people.

Section 2.6.2 of this report also outlined a number of features that the Western Australian Local Government Association recommends for the ideal school.

In order to reduce the concentration of vehicles around school gates, some schools in New Zealand and overseas have designated drop-off points some distance (up to five minutes walk) from the school, and dropping off at the school gate is not permitted.

Other significant treatments that have been found to be very effective in improving safety on the school journey is the implementation of traffic-management or traffic-calming measures (Wigmore et al 2006). These area-wide types of treatment are often combined with Safe Routes to School programmes. The combination of engineering, education and enforcement is a common feature in 'best-performing' countries with regards to children's safety on the roads.

As students get closer to the school, different transport modes converge. School cycle networks need to ensure that cyclists can arrive at the school gate without conflicting with other modes. Slow zones and shared paths may have particular relevance (Mackie 2009). Cyclists might also need to dismount near the school gate and wheel their bikes through the school grounds, to avoid conflict with pedestrians.

Figure 4.12 Separated car drop-off and bus drop-off areas at Arrowtown School (Photos: Alan Turner)

4.3.9.1 A self-explaining roads (SER) approach to school zones

In New Zealand, active 40km/hr warning signs around schools are becoming more common (see figure 4.13), and the Safer Journeys Strategy suggests them as an action to improve walking and cycling safety. Because conditions and guidelines for their use have been developed by central government (see NZ Transport Authority Traffic Note 56, 2008), there is a consistent approach to their use throughout the country. Motorists are slowly becoming familiar with school zones, and this familiarity will help drivers immediately recognise a different environment that needs particular attention. Other active and 'smart'

signs are also proving to be effective in other situations, and may have applications for school environments.

Figure 4.13 **Increasingly popular 'school zone' signs** (left – Photo: Hamilton City Council)**, and an 'active feedback' sign (right –** Photo: Mark Edwards)

A recognisable environment is also a feature of the SER approach, where recognisable and distinguishable road categories lead to familiarity and different expectations at each level (see figures 4.14 and 4.15). An evaluation of an SER trial in Point England, Auckland, showed how this approach might be used throughout New Zealand (Charlton et al 2010). This approach does not require a standardised design to be replicated around the country, but rather a design process that reflects principles such as low speed and recognisable and consistent environments. A 'Slow – School' zone might be designed differently in various neighbourhoods, but they would all reinforce slower speeds and would be recognisable as environments where school-aged pedestrians and cyclists are common.

Further guidance on appropriate road design around schools may also be given by the recently revised subdivision standard NZS 4404, which provides considerably updated road-design guidance.

Figure 4.14 In addition to variable active speed-warning signs, consistently designed roads near and outside schools could be designed using SER principles, such as extra-wide footpaths, narrow traffic lanes, minimal road marking, gateway treatments, and planting on the road reserve, to create inherently low-speed environments that might be applied to school zones. Consistent use of crossing design, textured surfacing and roadmarking could be used to create a consistent arterial **'school zone' format around schools** (Photos/pictures: Dale Projects, Hamish Mackie, Jennifer Esterman)

Figure 4.15 An SER concept example – the main purpose is to extend current 'school zone' concepts, which use signs and sometimes threshold treatments, to provide a road environment that results in consistent and safe motorist behaviour. Wi**thout a 'special' road environment, there can be conflict between** the messages of signs that encourage traffic to slow down, and of existing road designs that encourage speed. NOTE: The example below is for Hill Street at Warkworth Primary School (Dale Projects). Actual designs may vary, to reflect the environments of different schools, but the principle of a recognisable school zone, with lower motorist speed, managed parking and excellent amenity for pedestrians and cyclists, is important for any location.

A less costly treatment option for roads immediately adjacent to schools is currently being implemented throughout New South Wales in Australia. 'Dragon's Teeth' road markings (see figure 4.16) are being applied to remind motorists that they are within a school zone (RTA 2009).

Although roadmarkings alone are likely to be less effective than a road that has been purposefully designed for slower speeds, given the much lower costs of the Dragon's Teeth, their use here should at least be considered – a trial in New Zealand may be useful.

Figure 4.16 **Dragon's Teeth road markings in New South Wales (Photo**: RTA 2009)

An emerging area of focus in New Zealand is the appropriate design for mixed-use arterial roads, particularly suburban centres and main streets, where the various road users often have a conflict of interest – pedestrians, buses and cyclists all need priority on these roads. As work progresses to establish appropriate designs for arterial roads in towns and cities (see figure 4.17), similar attention also needs to be given to the design of arterial (and other) distributor roads near schools.

Figure 4.17 The consideration that is increasingly being given to a wide range of road users when designing arterial roads through town centres could be extended to those parts of arterial roads that pass by schools (Photo: Phil Jones)

In rural areas, threshold treatments are increasingly being used to slow vehicles down from open-road speeds to lower speeds through town centres or higher-density rural residential areas. School zone thresholds are also increasingly common. The problem with only providing a threshold treatment is that if the road environment doesn't change following the threshold, vehicle speeds can creep back up to an undesirable level. A change in road design would give perceptual cues to match the lower speed

requirement and would help to further reduce speeds after threshold treatments, which would make this approach more effective for use around schools.

Figure 4.18 A typical threshold treatment (left – from the Manual of traffic signs and markings (MOTSAM) (NZTA 2010) can be effective at the treatment location, but the design of the road should also change beyond the threshold to maintain the reduced speed. Looking from within a slower speed environment at Clevedon (right – Photo: Hamish Mackie), shoulder treatments have been used to create a road environment that is significantly different from the typical open-road design.

4.3.9.2 Possible **'traffic-light' categories for r**oad design in and around the school

The following categories might describe three status levels for *Road design in and around the school*:

Road design in and around the school	An area-wide investigation of the road design around the school has been carried out, improvements are consistent with nationally agreed principles, guidelines and designs have been planned, and all works have been completed.
Road design in and around the school	Some effort has been made to investigate and possibly implement improved road design around the school, but there are areas that still require attention.
Road design in and around the school	Little or no effort has been made to improve the road design around the school and there are outstanding safety issues or barriers to active transport.

4.3.10 Traffic speed and volume

Although traffic speed and volume is largely an outcome of road design, this element has a major impact on school travel systems – and because there are a number of factors that can affect traffic speed and volume, it has been given its own system component. It is well established that relatively high traffic speeds and volumes are significant barriers to walking and cycling, and it is equally well established that one of the single most effective approaches to creating safer and more attractive walking and cycling opportunities is to slow traffic down. This is partly related to the risk of death and serious injury that is expected at higher speeds (Archer et al 2008).

Figure 4.19 Risk of death and serious injury if a pedestrian is struck by a car (Archer et al 2008)

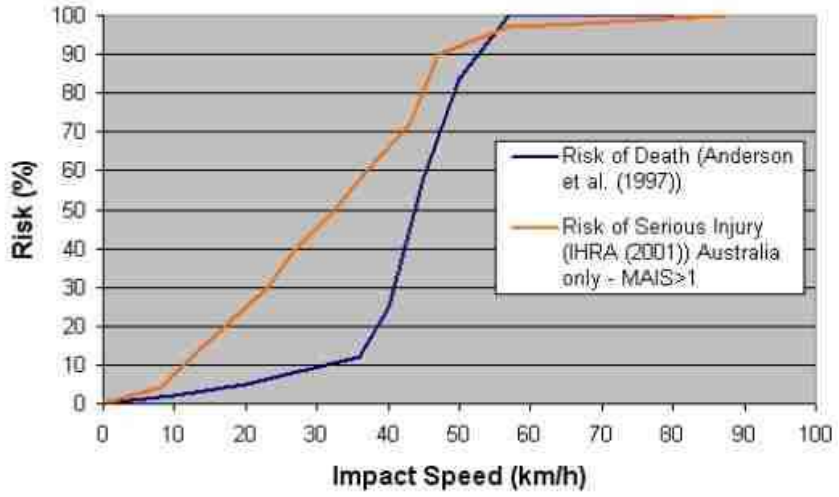


Figure 4.19 shows that there is clearly an elevated risk of death when collision speeds are higher than 30km/hr – the risk of serious injury at 30km/hr is approximately 45%, and at 40km/hr it is approximately 70%. Therefore there is logic in creating 30km/hr zones in areas where pedestrians are common, such as within school zones. In New Zealand, the Point England SER trial aimed for, and achieved, 30km/hr local roads (Charlton et al 2010). In the UK, 20mph (32km/hr) limits are currently being encouraged in city streets and areas that are primarily residential in nature, where pedestrian and cyclist movements are high (eg around schools, shops, markets and playgrounds), and these are not part of any major through route (DFT 2006, 2009).

In New Zealand, 40km/hr speed zones are increasingly being used around schools. Because of the reduced risk of death and serious injury at 30km/hr (compared with 40km/hr) there may be a justification for changing New Zealand school speed zones to 30km/hr – however, this issue is beyond the scope of this study. Also, as shown in Charlton et al's Point England SER study (2010), the design of the road environment may have a bigger effect on speed than signposting – where the road design was changed, but there was no change in speed limits, the mean speed was approximately 30km/hr (see figure 4.20).

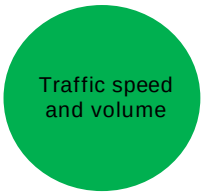
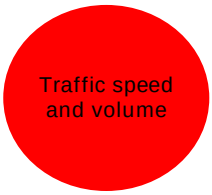
Figure 4.20 Road layout changes resulted in a mean speed of approximately 30km/hr on local streets in the Point England SER study, highlighting the importance of engineering in creating safe speeds

Another safety issue and barrier to active transport can be traffic volume. On local streets near schools where excessive 'rat-running' (taking short-cuts through local streets) is occurring, steps can be taken to discourage traffic, such as traffic-calming measures, self-explaining local roads and partial road closures. This is more difficult on distributor roads, and schools that adjoin busy arterial roads face considerable challenges. However, as mentioned in the road design section, at locations where busy roads pass schools, consideration needs to be given to the safety and routes for all road users, including school students. It might be argued that for the 500m or so outside schools on rural roads (such as Dairy Flat School, shown in figure 4.21), the safety of school students might take priority over passing motorists' travel times, and perhaps a stepped reduction in speed to 50 or 60km/hr (with appropriate engineering changes) might be appropriate, especially during school commuting hours.

Figure 4.21 On major rural roads and other high-volume roads, reduced speed and engineering treatments to encourage lower speeds outside schools may be appropriate to ensure the safety of school students at these locations

4.3.10.1 Possible 'traffic-light' categories for traffic speed and volume

The following categories might describe three status levels for *Traffic speed and volume*:

	An area-wide investigation of the traffic speeds around the school has been carried out, improvements are consistent with nationally agreed principles, guidelines and designs have been planned, and traffic speeds and volume no longer present barriers to walking and cycling to school.
	Some effort has been made to investigate and possibly manage traffic speed and volume around the school, but traffic speeds and/or volume may still present safety issues or barriers to walking and cycling (where these modes would otherwise be feasible).
	Little or no effort has been made to analyse and manage traffic speed and volumes around the school and these create outstanding yet modifiable safety issues or barriers to active transport.

5 Case studies

5.1 Rural case study: Dairy Flat School – traffic speed, bus access, safety around buses

5.1.1 Background

Dairy Flat Primary School (240 students) is located on State Highway 17 in Rodney District. The speed limit outside the school is 80km/hr and the only access to the school is via the main entrance of SH17. The environment around the school is rural (see figure 5.1) and almost all students who attend the school live in rural environments. Figure 5.2 shows the distribution of students' homes around the school.

Figure 5.1 Aerial image of Dairy Flat Primary School within its surrounding rural environment (Google Maps)

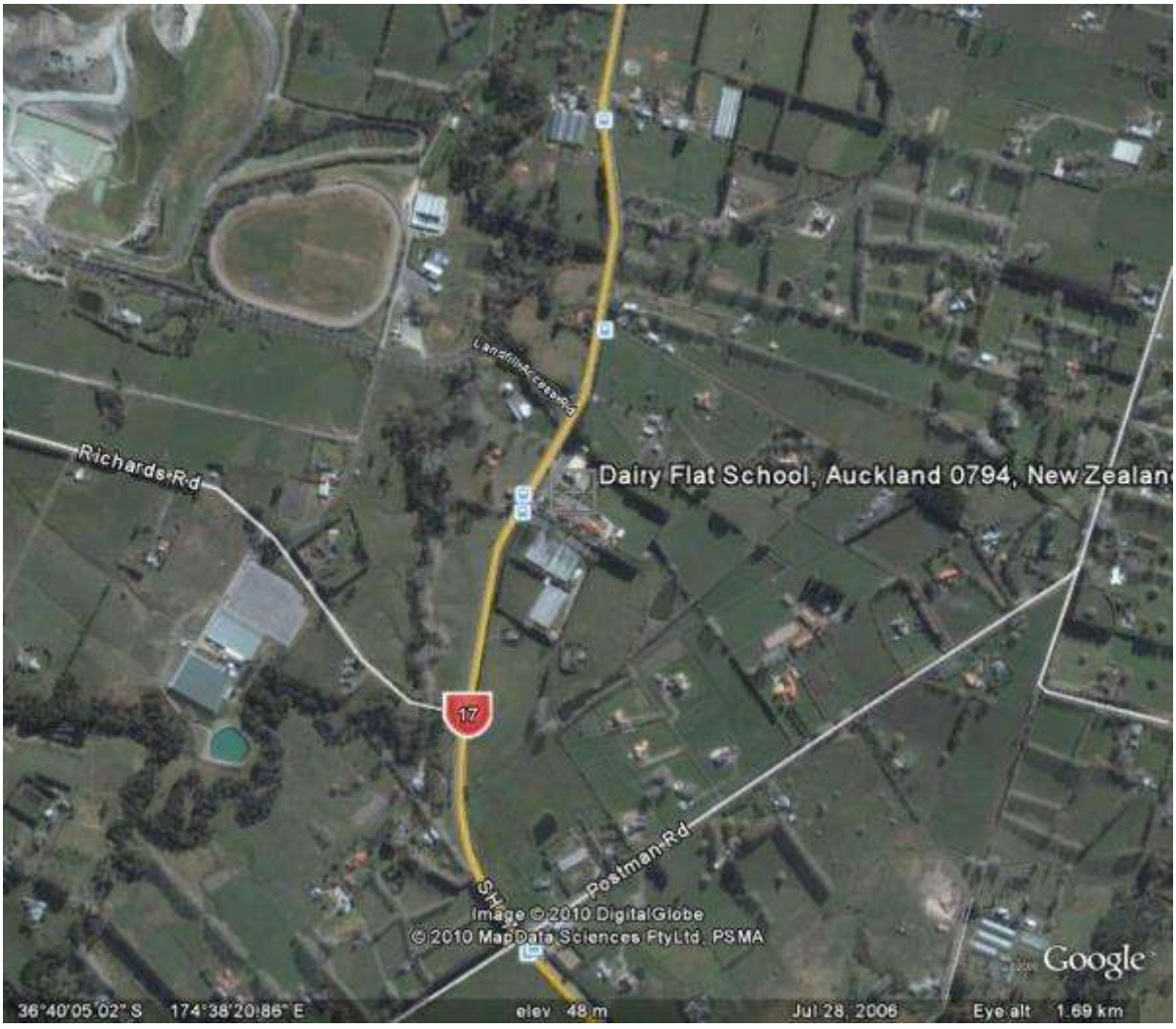
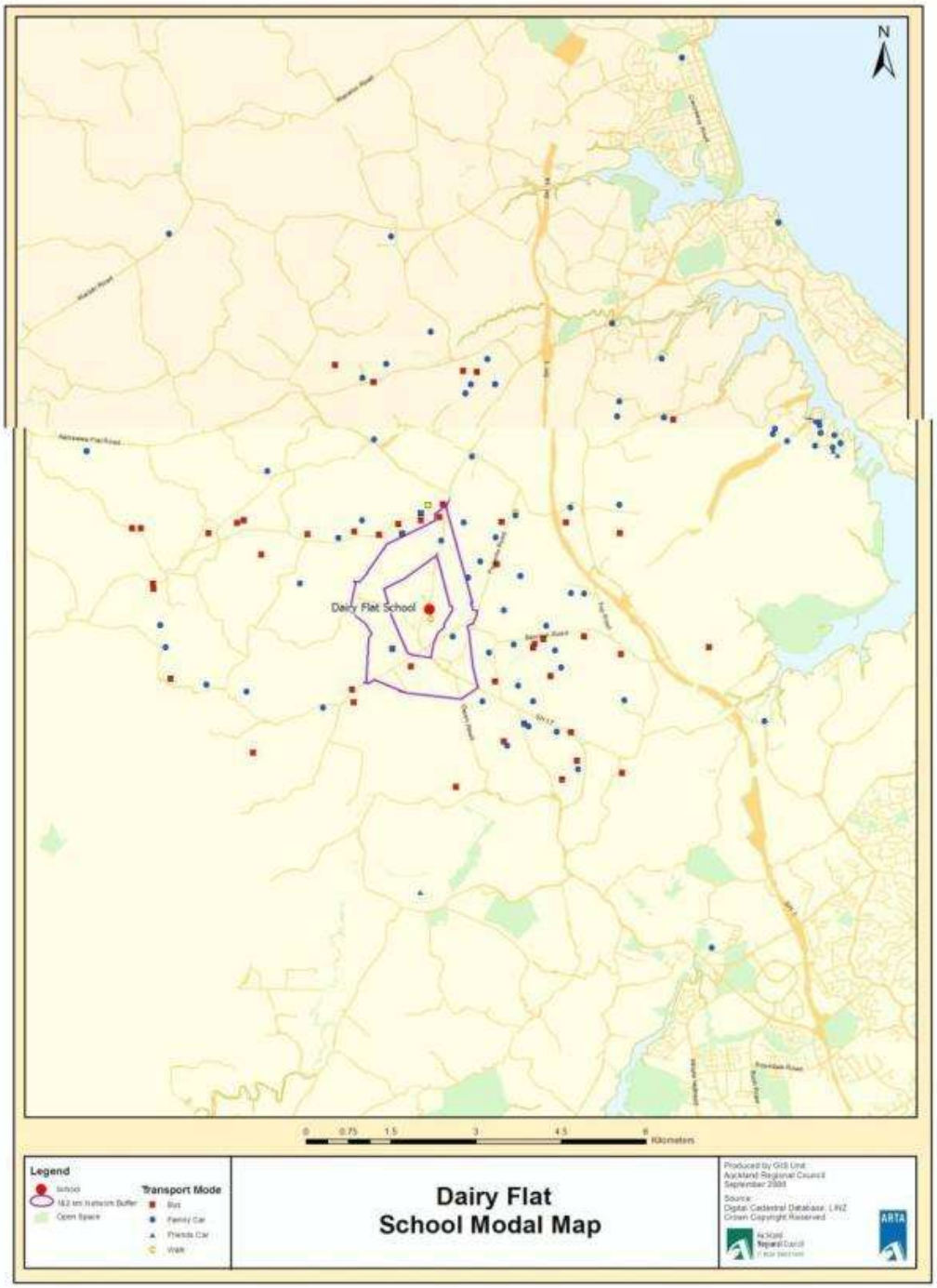


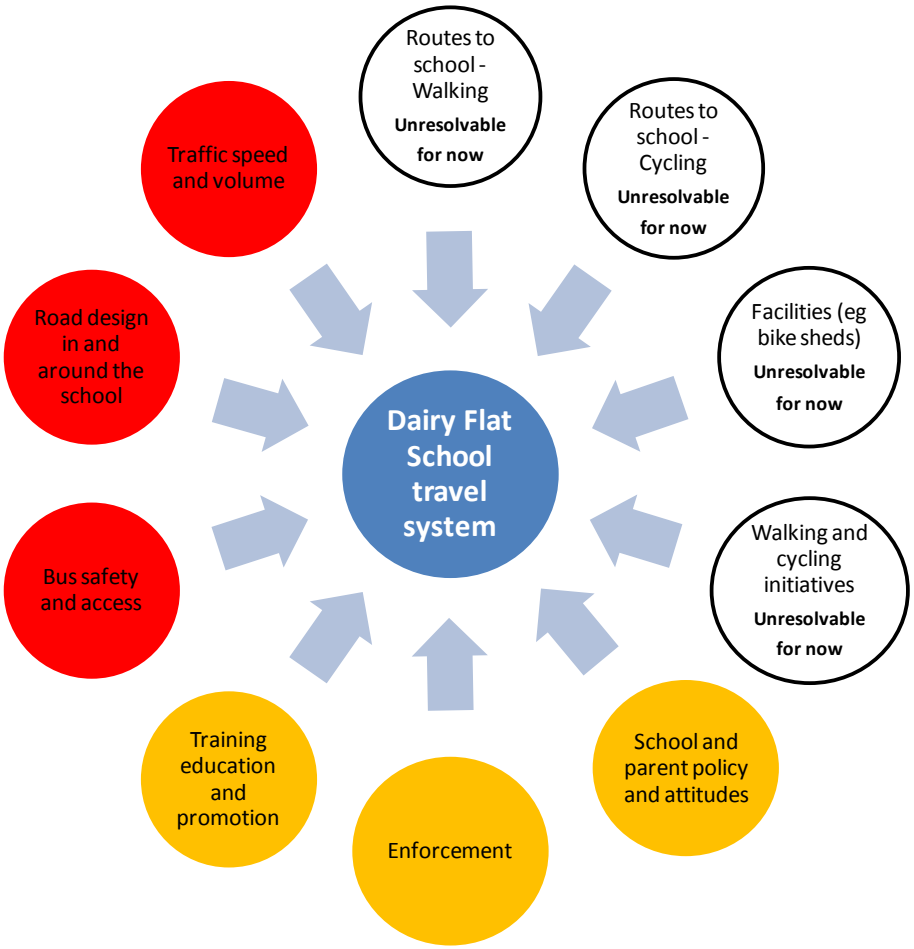
Figure 5.2 Modal map for Dairy Flat School (Rodney District Council)



= cycle
= walk
= family car
= friend's car
= bus

An estimate for the status of Dairy Flat School's transport system prior to any STP intervention is shown in figure 5.3. For the purpose of this case study, the status levels were assigned by the researcher in consultation with school-travel personnel. If they were to be used operationally, a more formal audit system would be needed to assign a more precise status to each system component.

Figure 5.3 The travel system for Dairy Flat Primary School before STP intervention



Because car and bus travel to school were students' only realistic options, the safety of the road environment directly outside the school, and of bus use, were the areas of focus.

The following explains the 'status red' elements of the system:

- Traffic volume and speed: Because of its location on SH17, traffic speed was a potential safety hazard for those entering or exiting Dairy Flat Primary School. The school did have a parking/drop-off bay, but turning into or out of this was still problematic, according to many parents.
- Road design in and around the school: Related to the comment above, changes to the road environment could make entering and leaving Dairy Flat School safer and more user-friendly. At the time of this research, the only concession made for school safety was a reduced speed limit of 80km/hr.
- Bus safety and access: This was a major issue for the school. Changes to bus services had meant a reduction in the number of students travelling to school by bus. Also, there was often little or no provision for bus stops, which concerned the parents. The modal map (figure 5.2) shows that many students were being driven to school (blue dots), even though they lived some distance from the school and near other students who caught the bus (red dots).

Figure 5.4 The road environment outside Dairy Flat School. The speed limit is 80km/hr, but from the south, the change from 100km/hr is quite close to the school

5.1.2 School travel report for Dairy Flat School

In 2006, a travel report for Dairy Flat Primary school found that approximately 66% of students travelled to school using the family car, 30% by bus, 3% in a carpool, and 1% by walking. Parents clearly had concerns about traffic speed, bus access and safety around buses.

As part of the report, the following suggestions were made by parents:

- Make buses more visible with better signage.
- Reduce the speed limits outside the school to 50km/hr.
- Create better pedestrian facilities for countryside residents.

However, it was considered that the opportunities for making changes were limited, partly because while the STP would be led by Rodney District Council, the road outside the school was a state highway (SH17) under the control of the NZ Transport Agency. This presented a conflict of interest between the local community, which wanted slower traffic speeds past the school, and the NZ Transport Agency's need for efficient traffic flow on a state highway network. If this part of SH17 could be reclassified as a locally controlled road, it would be possible to create a safer environment outside the school in the future. At the time of this research, walking and cycling to school were neither safe nor practical because of the traffic speeds and road design around the school.

5.1.3 What more might be done?

The following changes to the road environment and bus stops and operations could improve transport for Dairy Flat School:

- As outlined for Warkworth Primary School (see section 5.2), a contextually sensitive state highway would reflect the road-user priorities of different areas. This could include the establishment of 80km/hr zones further away from the school, and then a further reduction to 50km/hr (or less) within the vicinity of the school, in accordance with a nationally agreed rural school-zone treatment. Road treatments, including threshold treatments, textured surfacing, landscaping and lane narrowing, could also be used to help slow down traffic outside the school.
- Improved bus signage, bus stop design and better routing could improve the safety of travelling to school by bus, as outlined in recently completed TERNZ research on school bus safety (Baas et al

2010). Also, Rodney District Council has undertaken a programme of work to improve bus stop amenity, which could have a tangible effect on the safety and amenity of the students. However, because bus routes are often changed, the improved bus stops may become redundant in the future. The school bus safety report by Baas et al should be consulted for further guidance.

5.2 Semi-rural case study: Warkworth School – the right trips for the right people

5.2.1 Background

Located in the heart of the northern ward of Rodney District, Warkworth School is a large (500+ pupils), state primary school (Years 1–6). The community has a mixture of families living on urban and rural road environments (figure 5.5). Many students are transported daily to school by car or bus, owing to the travelling distances. The junior side of the school (Years 1–3) and the senior side (Years 4–6) are divided by Hill St, a 50km/hr collector road. Warkworth itself is divided by State Highway 1, and many students must cross this road in order to travel to school.

Figure 5.5 Aerial image of Warkworth, which **might be characterised as 'semi-rural'** (Google Maps)

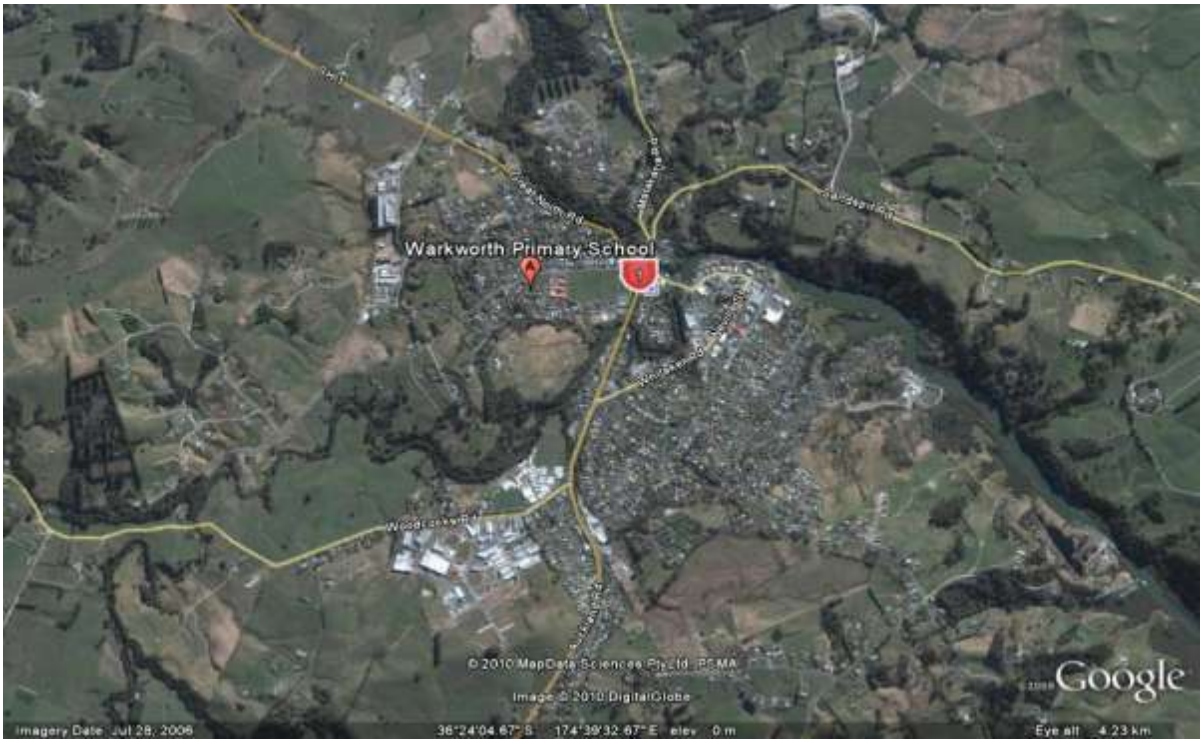
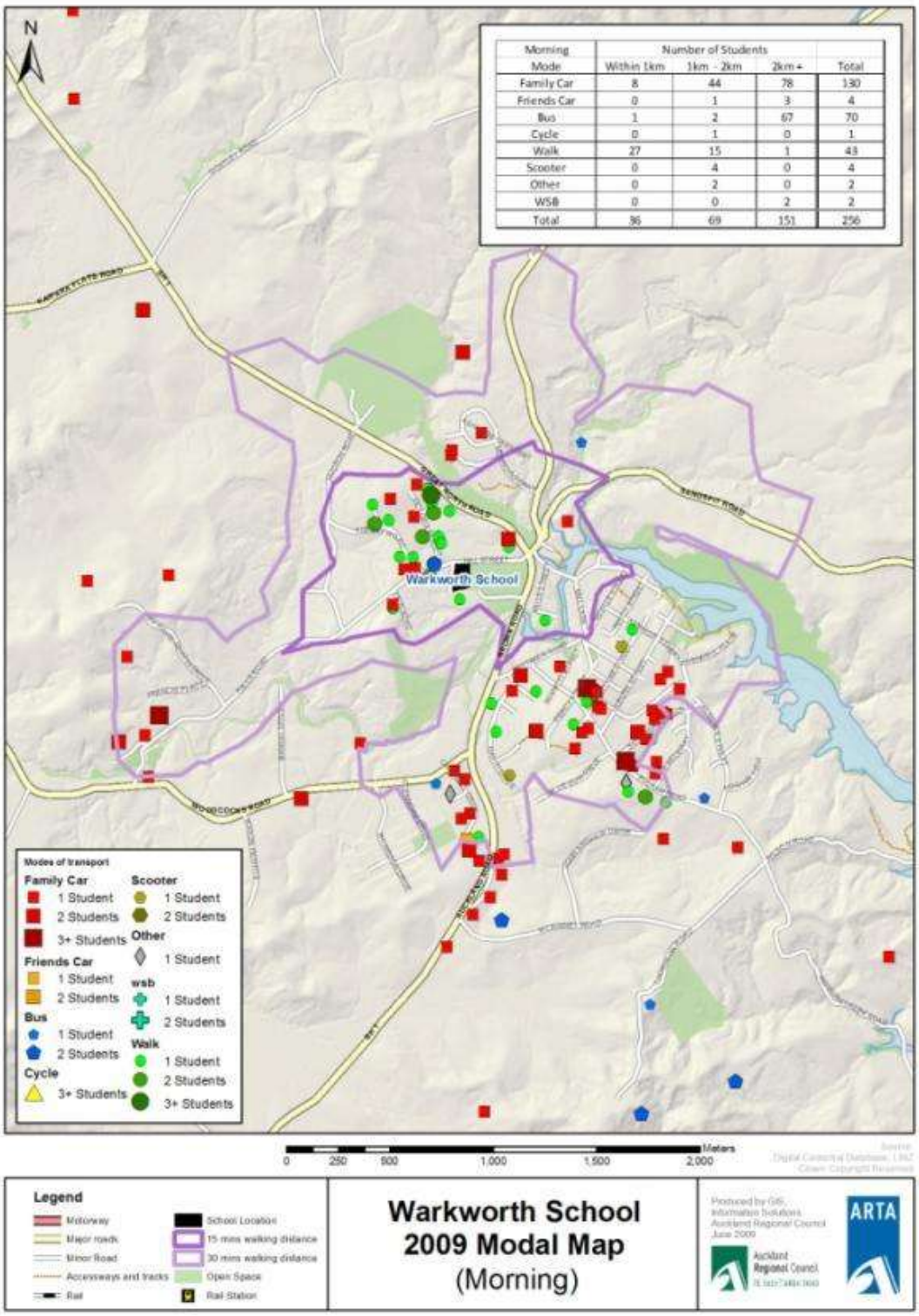


Figure 5.6 Modal **map for students'** morning travel to Warkworth School



= cycle
= walk
= family car
= friend's car
= bus

An estimate for the status of Warkworth School's transport system prior to any STP intervention is shown in figure 5.7. For the purpose of this case study, the status levels were assigned by the researcher in consultation with school-travel personnel. If they were to be used operationally, a more formal audit system would be needed to assign a precise status to each system component.

Figure 5.7 The travel system for Warkworth School before STP intervention

The following explains the 'status red' elements of the system:

- Traffic volume and speed: There were concerns about traffic speed on Hill St (next to the school), and traffic volume and speed on SH1 created a barrier for students wanting to walk or cycle to school from the eastern side of town.
- Routes to school – Cycling: No cycling routes to school had been identified or promoted. While there were no off-road pathways in the area, there were some routes on quiet residential streets and footpaths that would be practical for some students. Ideally, footpaths would need to be upgraded to shared pathways.
- Walking and cycling initiatives: Prior to the STP, walking initiatives such as walking school buses did not exist. Cycling was not encouraged at Warkworth School.
- Training, education and promotion: Prior to the STP, there had been little in the way of training, education and promotion of safe and sustainable transport (apart from messages from the principal).
- Road design in and around the school: Hill St's connection to a higher-speed road (Falls Rd), a downhill gradient, and a lack of any speed-reducing elements all tended to encourage speed near the

school, although a one-way bridge in the nearby rural environment was helping to manage the speed transition for those entering the suburban environment. Kaspar St had no curb and channelling, and informal parking on both sides of the road (along with vehicles exiting Kaspar St) was creating a potentially hazardous environment during school drop-off and pick-up times.

5.2.2 School travel plan for Warkworth School

The school travel survey found that approximately 55% of students travelled to school by car, 24% by bus, 18% by walking and walking school bus, and 2% by cycle or scooter. The STP's emphasis was on encouraging students to walk, cycle and utilise the school bus more, and therefore reduce congestion around the school.

Unlike schools in completely urban environments, where a large proportion of the school roll could potentially walk or cycle to school, the mix of road environments surrounding Warkworth School meant that for some, walking and cycling could be realistically promoted, while for others, an emphasis on using the bus and safe car drop-off practices was more realistic.

As part of the STP, the following engineering works were proposed:

- Add a footpath between Victoria and Albert Sts to provide a more connected route to school for students living on the north-western side of Hill St.
- Use school threshold treatments to reduce speed on Hill St, especially as it is continuous with a 100km/hr road (Falls Rd).
- Use anti-skid, coloured pavement treatment on the approaches to the pedestrian crossing on Hill St to ensure that vehicles slow down prior to the pedestrian crossing and can stop if necessary, thus making it safer for those crossing.
- Upgrade Kaspar St with a footpath on one side, a turning bay at the end, and 'no stopping' signs on the side of road opposite the school. Bollards placed along the school side, nearer to the intersection with Hill St, would discourage parents from dropping off children there and making dangerous turning manoeuvres on Kaspar St (nearest Hill St). This would help to make dropping off and picking up children safer in general. Another idea was to not use Kaspar St for dropping off and picking up students, as entering and leaving Kaspar St provides an additional hazard at the intersection with Hill St, and there is plenty of parking on Hill St.

Figure 5.8 Recent engineering work to reduce speed and improve crossing safety on Hill St (Photos: Shane Dale)

In addition to the engineering works, the following initiatives were planned or have been implemented:

- Run various walking promotion and education initiatives, including three walking school buses.
- Investigate school bus use and safety.
- Investigate carpooling initiatives, linked with parent/teacher evenings.
- Promote cycling and provide cycle education.
- Promote the STP within the community.

If these proposals were all implemented, an updated status diagram for Warkworth School would be as shown in figure 5.9.

Figure 5.9 The transport system for Warkworth School, following STP intervention

5.2.3 What more might be done?

- As all of the engineering works have been (or will soon be) carried out, except for the upgrade of Kaspar St, the reduction of speed and improvement of road safety on Hill St will help walking to and from school become a safer and more attractive option. In order to achieve truly safe speeds on Hill St in the vicinity of the school (ie a 30km/hr environment), further engineering may be needed, including road narrowing, shrub planting, or even speed tables or textured surfacing.

Figure 5.10 A possible slower-speed environment for Hill St (Dale Projects)

- Changes to SH1, which separates the east and west sides of the town, are needed. As with other schools that have state highways running past or near them (eg Dairy Flat Primary School, Huapai School in Rodney District, and Devon Intermediate in New Plymouth), problems arise from the clash between the interests of local road safety and state highways, which are generally for the efficient and safe movement of inter-regional traffic. A contextually sensitive state highway travelling past (or through the catchment) of the school should change in its form to reflect the road-user priorities of the area, giving higher priority to walking, cycling and school travel in general. This is unlikely to have a detectable impact on the overall travel times of road users. The design expertise for such a modification exists; it simply requires a wider view of the function of roads in different areas.
- A longer-term consideration is the proposed Puhoi–Wellsford highway, bypassing Warkworth. This would reduce the traffic on the existing SH1 and more importantly, return the control of the road to the local authority, making local safety treatments easier. Nevertheless, it will still be a relatively busy arterial road, which could potentially remain as a barrier to school travel. Even following the STP, many of the elements of the transport system will remain at status amber because of the likely traffic speeds on Hill Street and the traffic speed and volume on SH1.

Figure 5.11 The proposed route for the Puhoi–Wellsford highway (orange) would bypass Warkworth and create opportunities for a safer school travel environment for Warkworth schools

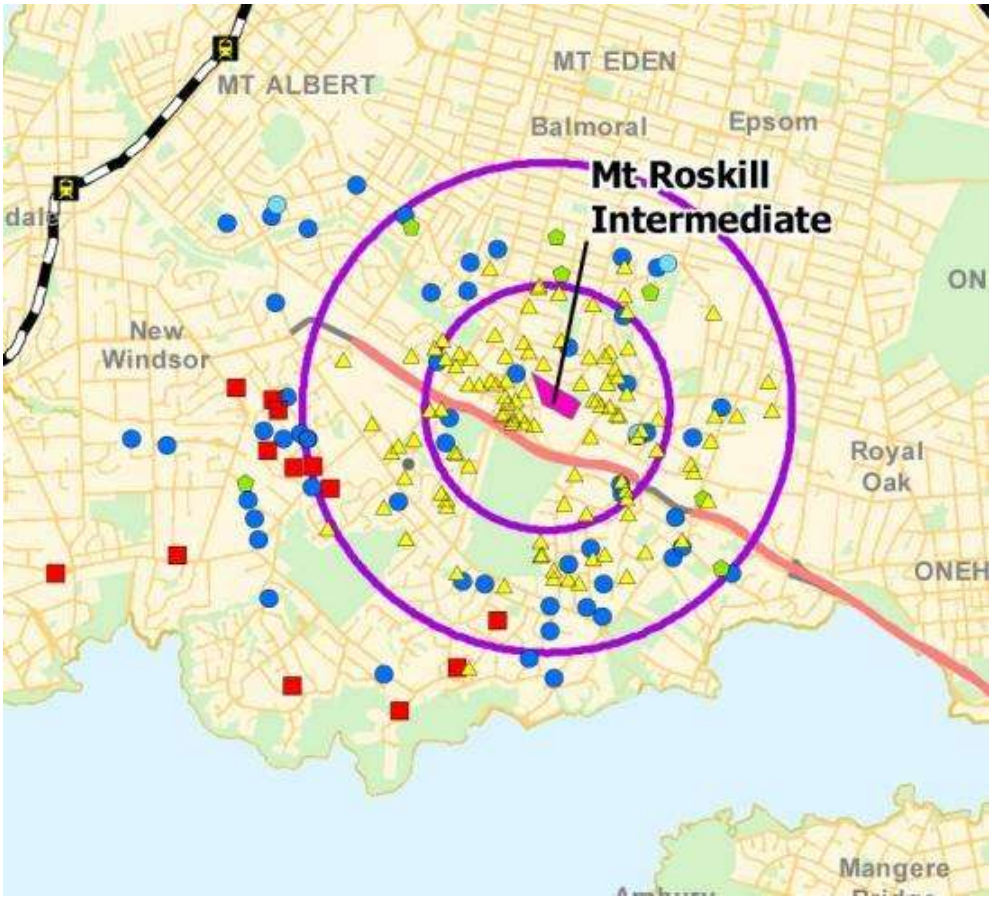
- At the time of this research, cycling, even for older students, was discouraged at Warkworth Primary School, making it unlikely that any cycling initiatives would gain traction. However, there is general evidence (Mackie 2009) that for older students, carefully planned routes to school, along with training and good bike storage, may be sufficient for parents (and school staff) to allow the children to bike to school, which is often the students' preferred option. There are many areas around Warkworth that would make cycling to school a realistic option for many students, but they need to be carefully identified, with trouble spots being engineered accordingly. For now, the cycle routes to school remain at status red.

5.3 Urban case study: Mount Roskill Intermediate – street design and cycling

5.3.1 Background

Mount Roskill Intermediate School is on a site next to Mount Roskill Primary and Grammar Schools in West Auckland. A unique feature of the location of these schools is the new motorway (SH20) that has recently been built immediately to the south of them. A significant amount of infrastructure supporting the motorway, such as pedestrian and cycle bridges and off-road paths, has improved the level of service for those walking or cycling to school from the south and south-west. The motorway has also created a reduction in through traffic in the immediate vicinity of the schools, which has helped with road safety and the attractiveness of walking and cycling, although concerns regarding traffic speed and volumes persist.

Figure 5.12 Modal map for students around Mt Roskill Intermediate School

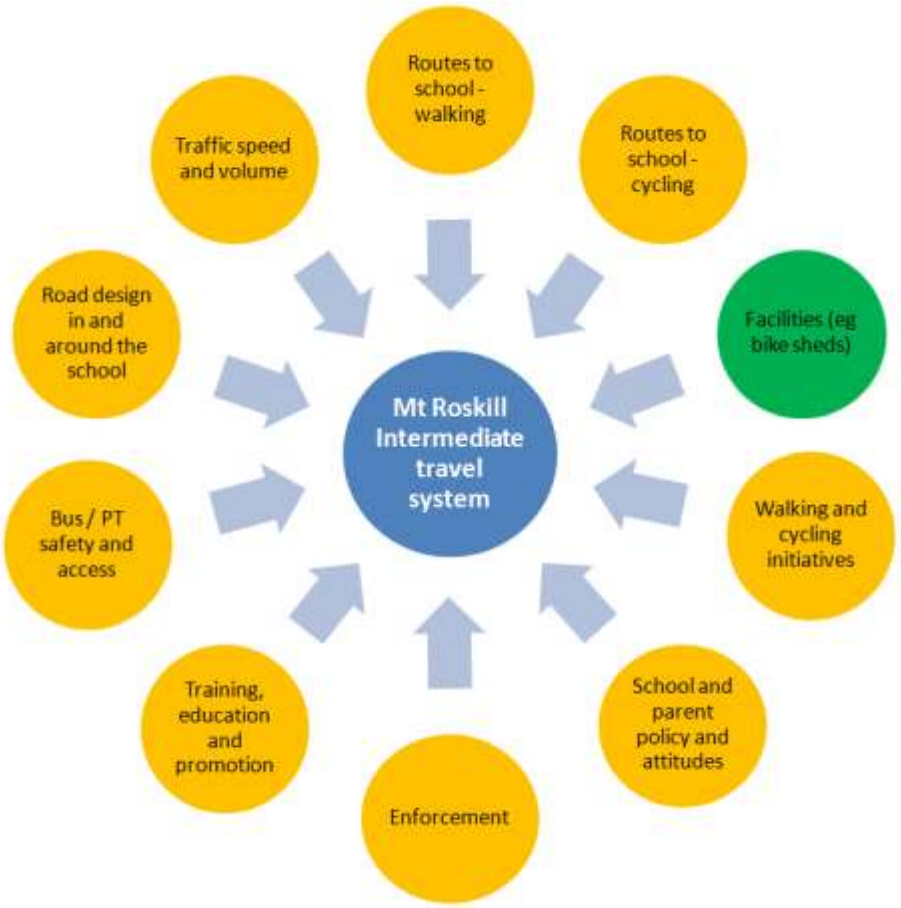


Key:

= cycle
= walk
= family car
= friend's car
= bus

As can be seen in the modal map for Mount Roskill Intermediate (figure 5.12), while many students walk to school, a significant number who live within easy walking or cycling distance travel by private car, and few students cycle to school. Related to this, a school cluster travel survey highlighted that parents were concerned about congestion at locations around the school and the associated increased road safety risk. The survey showed that the areas parents were most concerned about were Carr/Frost Rds, immediately east of the school, and Denbigh Rd, on the west side of the school (between Dominion Rd and the school). The current status of each component of the Mount Roskill school travel system is shown in figure 5.13. For the purpose of this case study, the status levels were assigned by the researcher in consultation with school-travel personnel. If they were to be used operationally, a more formal audit system would be needed to assign a precise status to each system component.

Figure 5.13 Components of current overall transport system component status at Mount Roskill Intermediate



5.3.2 What is planned

- Traffic volume and speed on the roads surrounding the schools are an over-arching theme, and the planned installation of a 40km/hr school speed zone on these roads will help with this.
- Plans for engineering modifications are focused on the areas of most concern, ie around the Denbigh Rd area. They will improve safety for students walking to school, especially from the west of the school. Details of the planned modifications are given in table 5.1.

Table 5.1 Planned engineering improvements for Mt Roskill schools

Planned improvements	Rationale
Frost/Carr Rds intersection up to Denbeigh Ave • Install active warning 'school zone' signs.	To alert drivers to the school nearby
Frost Rd • Widen the footpath on each side of the road to provide more waiting space for pedestrians at both existing crossings. • Check signage, visibility, road marking etc.	The area where children wait on the grass gets muddy

Planned improvements	Rationale
Denbigh Ave/Somerset Rd intersection • Implement a 40km school speed zone. • Investigate installing a new zebra crossing on the other side of Somerset Rd. • Investigate installing a roundabout. • Upgrade the two existing pedestrian refuge islands on Denbigh Ave and Somerset Rd, and mark flush median roadmarking.	High traffic volume and heavy vehicles Reduced traffic speeds would make it safer to cross
Denbeigh/Dominion Rds • Investigate installing a new zebra crossing on Denbigh Ave at the western leg of Dominion Rd/Denbigh Ave roundabout.	Improve connectivity for pedestrians to cross these roads
May Rd/Memorial Ave • Investigate installing an additional 'pedestrian refuge island' on May Rd on the other side of the May Rd/Memorial Ave intersection. • Investigate installing a 'splitter island' on Memorial Ave at the May Rd/Memorial Ave intersection.	Improve safety for students walking via Memorial Park
Stamford Park Rd • Investigate installing an additional pedestrian facility.	Improve safety for students crossing the road to walk to school via Keith Hay Park

5.3.3 What more might be done?

Some areas that might receive more attention in the future to create a truly user-friendly school travel system for Mount Roskill include the following:

- Use road design to create genuinely slow areas at key locations, including near school gates and key crossing locations near the school. This would require the school area context having a high priority, even on collector and arterial roads with regional strategic importance, and using design principles that would afford a high level of service for students walking and cycling to school. Also, decisions about road-user priority would need to be made in order to provide a safe school travel system through the industrial area to the immediate east of the school, which was not user-friendly at the time of this research.
- A strategic examination of drop-off and parking around the school should be carried out to determine whether any modifications could be made. In general, dropping off at nodes some distance from the school, with students walking the remainder of the trip, is the preferred approach, as it reduces congestion at the school itself.
- Route improvements need to be made for students wanting to cycle to and from Mount Roskill Intermediate School, but currently do not because of a lack of safe and attractive routes to school. The research found that the identification and development of a school cycle network could substantially help with this issue, and would be the most effective way to promote cycling to school in the eyes of parents. The focus of a school cycle network should be on utilising existing infrastructure wherever possible, and engineering trouble spots to create safe and attractive routes to school. Much of the network would simply require identification and promotion. Figure 5.14 shows what a school cycle network for Mt Roskill Intermediate (and the primary and grammar school on the same campus) might look like.

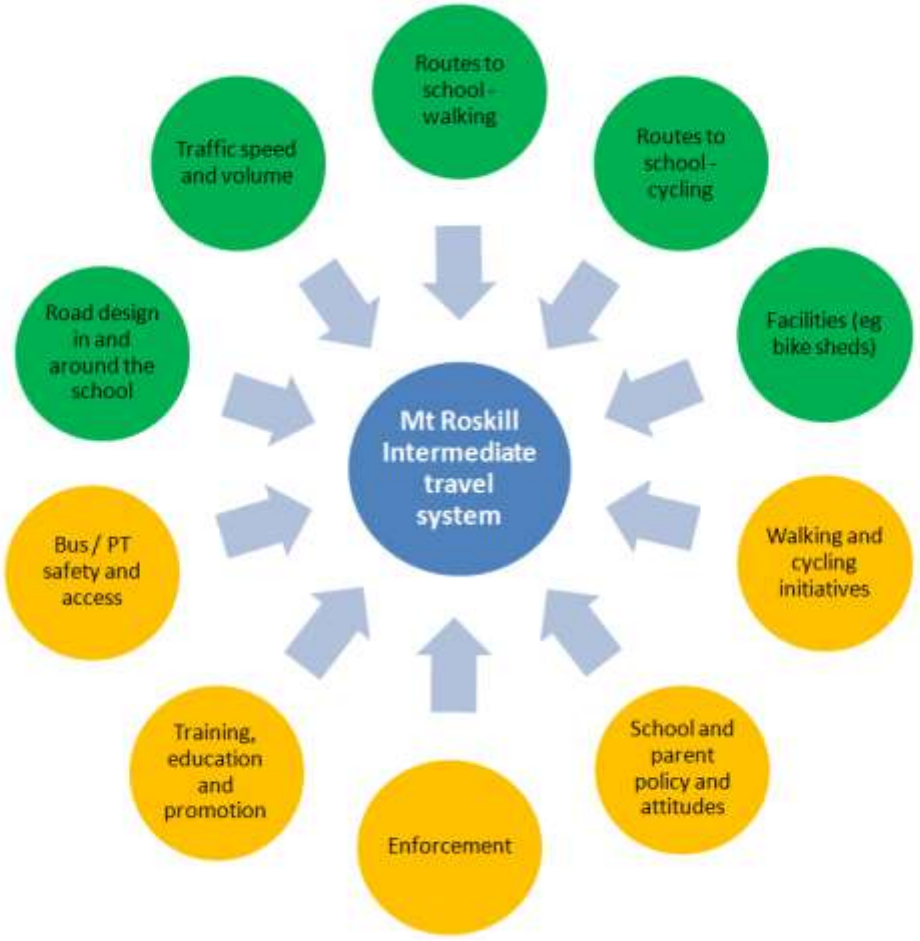
Figure 5.14 A school cycle network for Mount Roskill Intermediate would help to create a more complete and effective transport system for the school

KEY:

needs attention
local road route
off road

After the implementation of these suggestions, the status of each component of the Mount Roskill School travel system might be as shown in figure 5.15.

Figure 5.15 Possible transport system effectiveness at Mount Roskill Intermediate following suggested modifications



6 Recommendations

Based on the evidence and information that has been provided in this report, the following recommendations are suggested:

- More strategic importance could be given to school travel, given the wide-ranging costs that it currently incurs. A combined Ministry of Transport, Ministry of Education and Ministry of Health 'School Travel Strategy' or revised 'Active Transport Strategy' (containing a significant school component) could be developed to give clearer leadership, direction and coordination to existing and new school travel initiatives.
- A more comprehensive and user-friendly approach to school travel is needed, giving weight to all parts of the school travel system and giving more recognition to the requirements and capabilities of young people. A school travel system model should be adopted for use at strategic and operational levels, both nationally and regionally. The model presented in this report could be a starting point.
- In order to support a school travel system model, more comprehensive guidance (and research) is needed for some problem areas in particular, such as:
  - cycling to school
  - door-to-door school bus safety and bus access
  - the environments around schools and routes to school
  - rural schools in high-speed environments
  - road safety education and training for young people.

These recommendations are not intended to place undue pressure on school travel planners to deliver more with already stretched resources. Rather, this approach is intended to demonstrate clearly to everyone, from central government transport decision makers to regional school planners, that a number of areas need to be systematically addressed if New Zealand is to realise the benefits of an optimised school travel system.

Although outside the scope of this report, further work is needed to balance the impacts of school travel initiatives against other projects that might also have a positive impact on the wider transport system, a necessary step when there is competition for scarce funds. However, it is proposed that significantly improved school travel may be justified as a deliberate way to improve transport network performance (in the same way the Roads of National Significance have been prioritised). This report suggests that there is evidence for increasing the priority of school travel systems, including infrastructure and other measures that, when implemented, will create safe and user-friendly environments for economically sensible and sustainable transport modes to school.

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