The Economics of Travel for Education in New Zealand

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An Important Note for the Reader

Acknowledgments

Booz Allen Hamilton acknowledge the agreement from Environment Canterbury to use results from their recent (2000) review of school bus services in the Canterbury Region.

The contributions made by Wellington and Auckland Regional Councils and the Bus & Coach Association of NZ (BCA) are also gratefully acknowledged.

The report has been peer reviewed by John Collyns, Executive Director of the Bus & Coach Association of New Zealand.

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Executive Summary

Introduction

A study undertaken in 2001-02 on the economics of travel for education had the following objectives:

- to gain a better understanding of travel to school and its contribution to urban traffic volumes;
- to examine alternatives to car use for travel to school, and to assess their likely costs and benefits;
- to ascertain the impediments to switching travel modes.

Over the last ten years travel related to the journeys to and from school has become a significant contributor to urban road traffic levels. Research in the UK has found that 18% of cars on the road in urban areas at the morning peak time are taking children to school. The reduced level of urban congestion experienced in New Zealand during school holidays suggests that a similar phenomenon is occurring in this country.

UK research has also found that the proportion of journeys to school made by car has nearly doubled over the last ten years, from 16% to 30%, and that the average length of journey to school for secondary pupils has gone up by over a third. Similarly, the 1997/98 New Zealand Travel Survey (NZTS) found that, since the previous survey in 1989/90, car passenger trips have doubled for secondary school students in cities, and now outstrip walking as the most common means of transport to school.

At the same time, a number of regional councils are questioning the value of the school buses which they operate, especially as they appear to require a high level of subsidy. A recent study of Canterbury school bus services concluded that:

- although school buses require a relatively high level of subsidy, this is not surprising given that the buses are less intensively used than other buses, and the passengers are all paying half fare;
- despite this, the benefits (such as decongestion) of using school buses more than exceed costs, although they may not meet current ATR (Alternatives to Roading) funding criteria.

Review of UK & US Experience

Travel to school appears to be a significant contributor to peak-hour traffic in New Zealand, as in other countries, but limited (if any) evidence is available to substantiate this. Decision-makers in key local bodies thus do not have the necessary information to allow them to address the issue effectively. Therefore a review of published UK and US information addressing the issue of school transport was carried out.

Case Studies in New Zealand

To determine the contribution of school trips to the general traffic flow, especially that in morning peak periods in New Zealand, case studies were based on traffic data from telemetry sites at the merge of State Highways 1 and 2 leading into Wellington CBD, and at the Auckland Harbour Bridge. Some earlier work from Christchurch was also used.

Although identifying changes in traffic during school holidays is not easy, a drop of 5-7% in total morning peak traffic levels was recorded during the winter school holiday (June-July).

Travel to School in New Zealand

School bus services (SBS) arrangements in rural areas and in three urban areas are described. The total amount spent on SBS in Wellington, Auckland and Christchurch cities is some NZ$5.5M annually. Transfund provides 40% of this, i.e. $2.2M. Current trends indicate that travel to school is likely to be an increasing problem, which may spread to smaller urban areas.

Travel Mode Choice Issues

The advantages and disadvantages of the travel modes of car, driver, walk, bus and cycle for the school trip are covered, and also whether significant shifts to other modes can be achieved.

From historical data, three trends are clear:

- the bus share has remained constant;
- car passenger share has increased by over half;
- walking and cycling accounted previously for half the total trips, but is now only a third.

The attraction of the car, road and personal safety, poor perceptions of public transport, and bus operational factors are important issues to be addressed if SBS are to be better patronised.

Economic Evaluation of Education Travel

The economics of encouraging the use of alternatives to the private car, such as bus, walk and cycle, are investigated and the likely costs and benefits are assessed. Scenarios for the three main cities and three levels of public transport investment are presented for a change in modal split reflecting a change to public transport, at three levels. Efficiency ratios (ER), comparable to the benefit:cost ratio, are calculated. A low public transport investment scenario gives the highest ER, with diminishing returns as investment is increased.

Conclusions

Travel to school is not an insignificant contributor to urban congestion. While the areas around schools are particularly affected, the effects spread to other parts of the road network.

Experience in the UK is similar to that in New Zealand but, in view of the much greater level of urbanisation there, the problem has a higher political profile.

The proportion of children who travel to school by car increased substantially during the 1990s. The most important factors are likely to be: concerns over child safety; a constant or declining level of service in public transport generally and in school bus services in particular; an increasingly dispersed pattern of trip-making; and the general trend to the 'car culture'. These issues have to be addressed if SBS are to be used more.

A general economic analysis indicates that the benefits of providing school buses more than exceed their costs. The ER indicates that values of the order of 2, 3 and 4 can be expected for Christchurch, Wellington and Auckland (low to high) respectively. However it also shows diminishing returns in the event of increasing numbers of students switching mode. Achieving a transfer from car to modes such as walking and cycling slightly improves the economic case.

While not all the ERs meet the current funding cut-off, Transfund is increasingly funding schemes on the basis of other criteria, which include specific reference to ATRs and schemes relieving congestion. School buses qualify on both counts.

Operational issues arise because school starting times coincide with the morning traffic peak, when buses and their crews are already being used to the maximum possible extent.

A number of alternatives to the Regional Council contracting school services are possible, for example, private contracts by schools and parents in particular, or using timetabled services. However, the latter may have the effect of deterring other full-fare paying passengers.

School student rolls are forecast to increase in the short to medium term. This, combined with general increases in traffic and the increasing use of car for school trips (assuming recent trends are continued), all point to the problem increasing in the future.

Recommendations

Further research that would be useful includes:

- An examination of smaller urban centres (e.g. Palmerston North) to assess the impact of school travel there and how this might change in the future.
- A trial evaluation of a (proposed or existing) school bus service as an ATR, taking into account expected trends over the next few years.
- The use of the travel data recently collected in Wellington (as part of the development of the Regional Traffic Model) to look at school travel in more detail than is presently possible.

The present problems could be addressed as follows:

- Experience from the UK indicates that the best approach to achieving a move away from car use for school trips is a holistic one. This approach could include safe routes to school for walking and cycling, school travel plans, and the inclusion of transport issues as part of the school curriculum.
- The holistic approach would involve the school, parents, bus operators and the Regional Council in developing solutions which meet the needs of all parties.
- A trial in one of New Zealand's urban centres of involving all parties would be highly informative, and could point the way to a more efficient approach to school transport in future.
- Education of parents, in particular in terms of attitudes to car use, would also be appropriate.
- Changing school hours on a trial basis.

Abstract

A study undertaken in 2001-02 on the economics of travel for education had the following objectives:

- to gain a better understanding of travel to school and its contribution to urban traffic volumes;
- to examine alternatives to car use for travel to school, and to assess their likely costs and benefits;
- to ascertain the impediments to switching travel modes.

UK and US experiences of travel to school and effect on traffic flows are reviewed, and the contribution of school trips to the traffic flows of Wellington and Auckland is ascertained. The arrangements for school bus services in New Zealand are outlined and issues determining the choice of travel mode are discussed. An economic evaluation of encouraging the use of alternatives to private car for education travel is attempted, based as it is on the best, albeit limited, available data.

The best approach to achieving a move from car use to bus services for school trips is a holistic one, and a trial in a New Zealand city of such an approach is recommended.

1. Introduction & Background

This report presents the findings of a study undertaken in 2001-02, funded by Transfund New Zealand under its 2001/02 Research Programme.

As set out in the proposal made to Transfund in March 2002, the objectives of the study are to:

- gain a better understanding of travel to school and its contribution to urban traffic;
- examine alternatives to car use for travel to school, and to assess their likely costs and benefits;
- ascertain the impediments to switching travel mode.

Over the last ten years travel related to the journeys to and from school has become a significant factor in urban road traffic levels. Research in the UK has found that 18% of cars on the road in urban areas at the morning peak time are taking children to school. The reduced level of urban congestion experienced in New Zealand during school holidays suggests that a similar phenomenon is occurring in this country.

UK research has also found that the proportion of journeys to school made by car has nearly doubled over the last ten years, from 16% to 30%, and that the average length of journey to school for secondary pupils has gone up by over a third. Similarly, the 1997/98 New Zealand Travel Survey (NZTS) found that, since the previous survey in 1989/90, among secondary school students in cities, car passenger trips have doubled and now outstrip walking as the most common means of transport to school.

At the same time, a number of regional councils are questioning the value of the school buses which they operate, especially as they appear to require a high level of subsidy. A recent study by Booz Allen Hamilton (2000) for Environment Canterbury concluded that:

- although school buses require a relatively high level of subsidy, this is not surprising given that the buses are less intensively used than other buses, and the passengers are all paying half fare;
- despite this, the benefits of school buses (such as decongestion) more than exceed costs, although they may not meet current ATR (Alternatives to Roading) funding criteria.

While it would appear that travel to school is a significant contributor to peak-hour traffic in New Zealand, as in other countries, limited (if any) evidence is available to substantiate this, and decision-makers in key local bodies do not have the necessary information to allow them to address the issue effectively.

The study proposal outlined a series of tasks and this report broadly follows the same structure. Following Task A (Project Inception), the tasks were as follows:

- B: International literature and practice –reported in Chapter 2 of this report;
- C: Contribution of school trips to general traffic – Chapter 3;
- D: Discuss with key stakeholders – Chapter 4;
- E: Alternative modes to car;
- F: Impediments to mode-switching – this and task E are discussed in Chapter 5;
- G: Benefit calculation;
- H: Costs of different modes;
- I: Conclusions on the economic case – this and tasks G and H are reported in Chapter 6;

Conclusions are reached in Chapter 7.

2. International Experience of Education Travel

2.1 Introduction

The findings of a review of how the issue of school transport is addressed overseas are discussed. The search had concentrated primarily on the United Kingdom (UK) and, to a lesser extent, the United States (US) where most (albeit limited) relevant information has been published.

2.2 Experience in the United Kingdom

2.2.1 Introduction

The contribution of the journey to school (or henceforth JTS) to overall traffic levels, and its growth through time, has been a cause of growing concern in the UK for a number of years now. As a result the Government there has taken a number of initiatives – including research and pilot projects – many of which have been reported on by the Department for Transport (UK DfT, undated).

2.2.2 Transport and Societal Factors

A number of reasons are behind the increasing use of car for the journey to school, many of them not directly related to transport *per se.* The key ones have been cited as:

- the option for the parental choice of schools is encouraging longer journeys;
- local education authorities, especially in England, have cut back on free school transport;
- fears of both road and personal safety if a child undertakes all or part of the trip to school alone;
- lack of locker space at school, combined with more participation in extra-curricular activities, means that pupils have to carry large numbers of books and equipment which (it is perceived) can be more readily carried by car;
- increasing second car ownership means it is easier for a parent (or other family member) to drive pupils to school; in practice, however, the school run is often also one of the factors in deciding to buy a second car;
- peer pressure, combined with a poor image of public transport;
- many young people aged 17 or over (this being the lower limit for driving in the UK) now have their own car; additionally, licence holding and car usage in the 17-21 age group has risen rapidly in recent years;
- negative perceptions of public transport which, if it is available at all, is seen as being of high cost and poor quality;
- general laziness and convenience; the 'car culture'.

Available statistics from the UK back up the belief that school trips are a major contribution to congestion, even in smaller urban areas (not just the major cities).

For example, almost one in five (18%) of cars on the road in urban areas in the morning peak is taking children to school. In the last 10 years the proportion of school trips made by car has gone from 16% to 30%. In the same time, the average length of the JTS has gone up by one-third.

Part of these behavioural trends presents a classic 'vicious circle', in the same way that declining public transport patronage in recent years also reflects a downward spiral of reducing usage leading to lower service levels which, in turn, drive down usage further. In this case, fears about traffic safety lead to less use of walking and cycling for the school journey, which causes a shift to car, thereby increasing traffic and leading to a belief that 'slow' modes are even less safe.

Nonetheless, as they grow up children need to develop independence and making their own way to school is one way of achieving this. The exercise which is provided by walking and cycling (even if only for part of the school journey) is also important in a society which is becoming increasingly sedentary. Experience has shown that, once they have tried using buses for the JTS, children enjoy the interaction and independence which it brings.

The increasing number of cars on the road for school trips will cause further congestion for the traffic already present. Increasing car use and the associated congestion also brings other disbenefits to society, particularly environmental ones such as noise, pollution and the production of greenhouse gases.

2.2.3 Disincentives to Bus Use

Parents often pass on to their children their own negative views of buses; however these may be unfounded or not based on recent experience. These views include a tendency to emphasise the dangers of bus travel, while ignoring those of car dependency.

Timetabled bus services, in contrast to those specifically for school students, tend not to serve schools or fit their timetables. Additionally, fare levels may be such as to discourage younger riders (e.g. more than half adult fare for 16-and-under, adult fare over 16), leading parents to believe that car is cheaper.

Traffic congestion affects bus service reliability and pupils are concerned over possible punishment for late arrival. This is another example of a vicious circle as discussed above, since the increasing congestion is in part related to mode shift away from bus in the trip to school.

Other deterrents which are often cited include:
- poor quality vehicles;
- low standards of cleanliness and repair on the vehicle;
- long walking distances between home and bus stop;
- long wait times, poor shelter and the perceived danger of waiting at bus stops.

2.2.4 Economic and Operational Factors

In the UK, local authorities spend over £400M (about NZ$1.2bn) on school transport annually. While this is a considerable amount, the state spending in the US, which has four times the population, is ten times that amount (Section 2.3 of this report). The UK Government acknowledges that extending free or subsidised school transport would cause mode shift but that this would be at a cost.

A number of operational issues also relate to the possible extension of school bus services. Operators in urban areas do not have the additional buses necessary to accommodate significant growth in the number of school pupils travelling by bus, and in many places they also do not have enough drivers. Moreover, operators are reluctant to invest in additional vehicles without an insurance of a certain return on the investment.

To a large extent these operational issues are directly attributable to schools starting during the morning peak hour, when the bus fleet is fully utilised, usually with passengers who are paying full fare. A considerable saving in vehicle and manpower requirements could therefore be made by staggering school hours to allow double loading of contract buses. Peak vehicles are expensive and under-utilised for the rest of the day, and even to some extent in the evening peak because schools finish before most workers. One way to achieve these savings might be for the operator to consider offering some of their cost savings to the school, so that, for example, the school could fund additional staff to supervise children while waiting for buses.

Also of note is the interaction between school bus services and timetabled routes: carrying school children on the former relieves the latter of school children and hence improves perceptions of, and patronage on, timetabled services.

2.2.5 Achieving Mode Shift away from Car

A number of ways of persuading children to travel to school by bus have been tried in UK, and the experience provides a useful reference. At one school in West Sussex, a scheme giving children quarter fares increased bus use from 60 to 300 trips per day. This was achieved in conjunction with other enhancements such as providing improved information and more closely matching services to needs. However a number of adverse impacts were recorded, notably the costs of the scheme and the large numbers of school children who used non-school services.

The use of season tickets has been suggested as a way of encouraging bus use while at the same time providing a guaranteed source of revenue for the operator. A further selling point could be to consider allowing the tickets to be used for evening and weekend (not school-related) travel. Another possibility is to consider continuing to provide lower priced travel for school children beyond the age of 16: this step might take the form of a pass which allows the owner to travel on a child fare.

In terms of the operational requirements for new school bus services, the following are suggested as desirable:

- pick-up and set-down locations should be close to home or school and not exposed to danger;
- services should be timed to arrive at school with a reasonable 'margin' of time;
- prompt collection at the end of day, but with a degree of flexibility to cater for after-school activities;
- reliable, reasonably priced services;
- good publicity material which appeals to younger people.

The use of modern technology such as Real Time Information (RTI) may also help overcome some of the perceived uncertainties associated with bus use. Popular aspects of the yellow buses widely used in the US (see Section 2.3) are the use of regular drivers and demand-responsive routeing. These are now being trialled in a number of locations in the UK.

Overall, no single measure is likely to be sufficient and all alternative modes to car must be considered. A plan, similar to an employer travel plan, which would embrace all aspects of travel to school, is most likely to be successful. This would include actions relating to all alternatives, for example safe routes for cyclists and walkers. Involvement by all parties, including local authorities, schools and bus operators is important. This involvement could be further extended to getting 'buy in' from pupils by raising awareness and by covering transport as a discussion topic in lessons.

Many parents would prefer not to drive their children to school but believe they have no reasonable alternative because of factors such as the distance involved and concerns over security. When interest is shown in provision of an improved service, this reflects dissatisfaction with the present service about issues such as overcrowding and safety.

Once improvements have been made, monitoring usage quantitatively is helpful but it is also necessary to look at qualitative aspects, perhaps through focus groups involving community and parents.

2.3 Experience in the United States

2.3.1 Institutional Arrangements

Within each state of the US student travel to school is controlled in the first instance by the education department which is responsible for:

- Bus inspection;
- Fleet renewal assistance;
- Route information;
- Driver Education Programs;
- Training for bus drivers, supervisors, and other personnel;
- Technical assistance; and
- Monitoring and evaluation of state and local operations.

In some cases these types of controls on school transportation are implemented by the county school boards.

At the national level a number of organisations exist to manage school travel and these include:

- **The National Association of State Directors of Pupil Transportation Services** – which represents the 50 states with the purpose of providing *"safe, efficient, economical, and high-quality transportation to school children on their trips to and from school and school-related activities".*

- **The National Association for Pupil Transportation (NAPT)** – whose objectives are to work particularly for the improvement of the safety, efficiency, and economy of pupil transportation, to serve as an agency for the collection and dissemination of information and to provide a newsletter, conferences, research and other services that promote NAPT objectives.

- **The School Bus Information Council** – which appears to be concerned with the safety side of pupil transportation.

At the Federal Government level, a number of organisations have interests in school travel statistics, including the US Departments of Transportation and Education, the US Bureau of Census, and the Bureau of Transportation Statistics. Nevertheless an extensive website search has revealed no detailed information on modal splits for the school trip.

2.3.2 Relevant Statistics

School transportation appears to be a significant source of expenditure across the US. While isolating specific sectors, such as primary and secondary or rural and urban students, has not been possible, and while considerable variations exist between states, the national figures make interesting reading. The available data are based on the year 1998 but is unlikely to be very different today (obtained from www.schoolbusfleet).

The total number of school students in the US is 52.5 million, of whom 23.8m (45%) use the bus to get to school. This proportion varies considerably, from about 11% in California to almost all in some states. Almost US$5.8bn is paid annually in State aid and the total expenditure on school transportation is US$12.7bn. Use of car for the school journey is understood to be a problem, but this problem is less than in other countries, not least because the qualifying distance thresholds are less than in most other countries. Some 458,000 buses are used, meaning that each carries on average 52 pupils on each trip. Each bus operates 14,500 km annually. Converted to New Zealand currency, the average operating cost per bus-km is NZ$4. As will be seen in Section 4.2 of this report, this is around twice the value for rural bus services in New Zealand.

3. Contribution of School Trips to Traffic Volumes

3.1 Introduction

Most drivers who regularly commute into the major urban areas in New Zealand (and elsewhere) are aware that traffic levels drop during the school holidays. However the experience of this seems to be largely anecdotal. In this chapter traffic data from Wellington and Auckland are reviewed in an attempt to establish empirical evidence. This is then discussed in the light of other available data.

As with other forms of travel, however, the underlying behavioural pattern will be complex. When schools are on holiday a number of families will have one parent (or both) who may take time off work in order to look after the children, in addition to family holidays. In other families the journey to work will still take place but without the need to make a detour to take children to school. Thus overall the journey will be shorter but the impact on the congested parts of the network may be small.

Given, however, that the most congested parts of the network are operating close to capacity in the peak, any reduction in demand will have a noticeable effect on travel times. In very general terms, a reduction of 1% in demand could lead to a 2% drop in travel times in a congested situation. It goes without saying that significant 'hot spots' near schools will all but disappear during school holidays, giving significant decongestion benefits to other traffic. Lower demand levels may also show up as peak contraction, so that the 'peak of the peak' is no less high but lasts for a shorter time.

Finally, much of the above argument relates only to the morning peak. As already alluded to in Chapter 2, in the afternoons the impact of school traffic is less (except, of course, near the schools themselves) because the school day ends before the main commuter peak really starts.

3.2 Case Studies in Wellington and Auckland

In order to ascertain the impact of the school trip on the congested periods of normal urban traffic, a full set of traffic counts was collated from the telemetry sites at the Ngauranga Gorge in Wellington. The sites are approximately 400 m to the north of the point where State Highways 1 and 2 merge and diverge with each other, a critical point in the strategic feeder network to Wellington.

Over the full day no discernible difference could be seen between traffic flows during term time and during the school holidays. However, when the comparison was made over the morning peak, the data did show a drop during school holidays. Figure 3.1 shows the flows southbound (i.e. towards the Wellington CBD) between the morning peak times of 0700 and 0930 during a period in June and July 2001 covering the mid-winter school holiday.

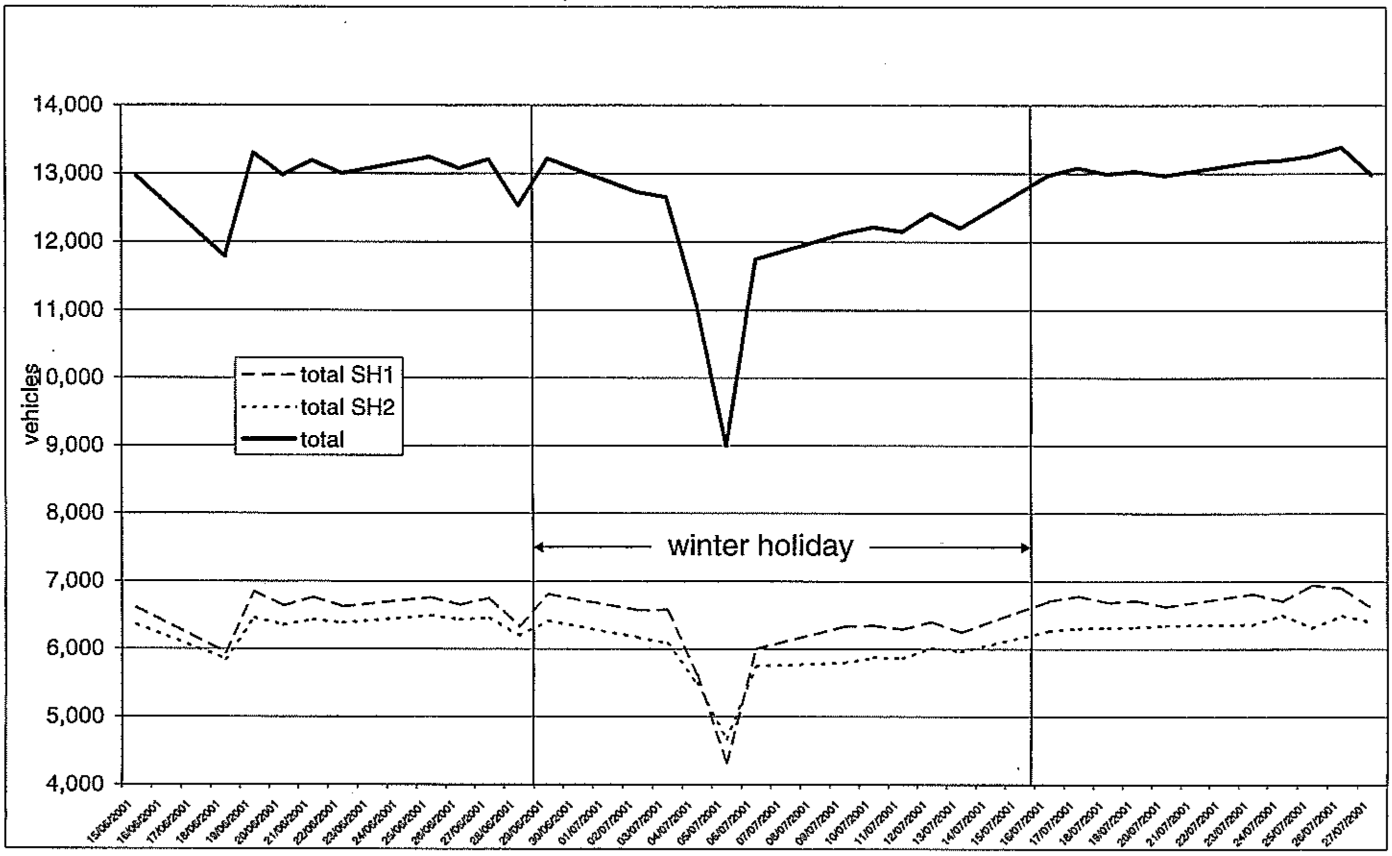

Figure 3.1 Daily southbound, weekday morning peak period (0700-0930), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

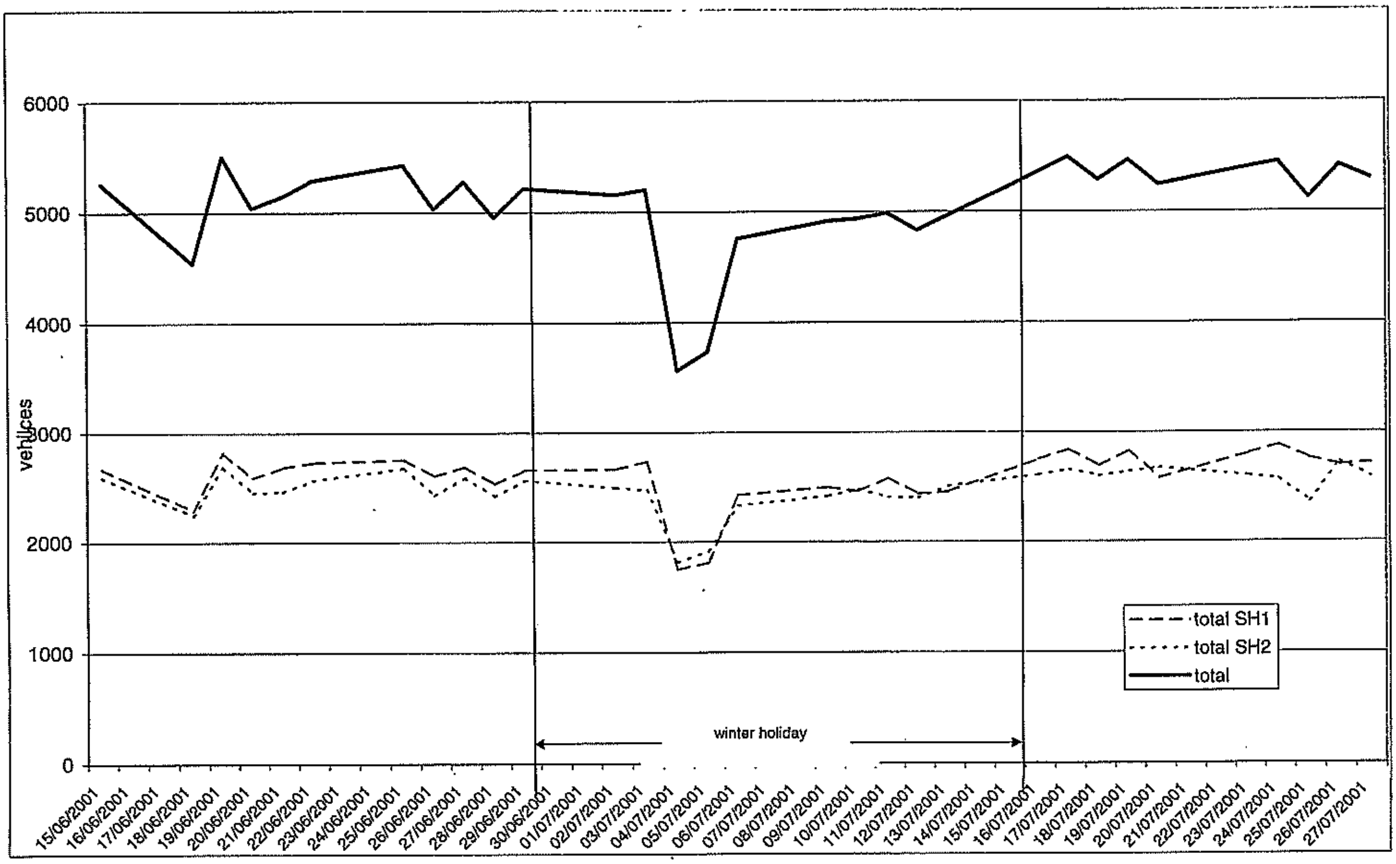

Figure 3.2 Daily southbound, weekday morning peak period (0800-0900), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

In the period leading up to this two-week holiday, the traffic is at a level approximating to 13,000 vehicles (weekday average) and this is also the case after the break. However, for the two weeks of the holiday itself, average flows drop to 12,100 vehicles which equates to a reduction of approximately 7%. (Notice the apparent 'blip' in the data later in the first holiday week which has been ignored as it was a data collection fault.)

If the time period analysed is more restricted, then the drop in traffic flows becomes clearer. This can be seen in Figure 3.2, which shows the data plotted for the time period 0800 to 0900 only. The drop in flow in this time period equates to a 9% reduction for traffic in the holiday period when compared with the normal working weeks before and after.

In the northbound direction, a similar analysis for the evening peak period shows no significant drop, as can be seen from Figure 3.3. In fact on average no reduction occurs in trips between the pre-holiday, during holiday, and post-holiday periods. However, this is not an unreasonable result as schools, especially primary schools, finish earlier in the day than the main evening peak and so the impact is less noticeable.

Overall then, at this important site in Wellington, at a time of year when the effect of other holidays will be minimal, a drop of almost 10% occurs in the level of traffic during the busiest hour of the morning peak, and around 7% in total peak traffic. This can apparently be attributed to the school holiday.

A similar analysis has been undertaken of traffic crossing the Auckland Harbour Bridge southbound to the Auckland CBD in the morning peak period. Analysing different periods during the morning peak showed that the greatest decrease in traffic, of around 10%, was recorded during the period 0830 to 0930 (Figure 3.4). While most schools will start during the first half of this period (and so students' trips will have been completed before 0830), this decrease is probably a result of other factors such as active trip re-timing, and also travellers reaching their destination sooner because of lower traffic levels. Overall it probably equates to 5% of total peak traffic.

However in this context the Auckland Harbour Bridge cannot be considered representative of the network as a whole. In a number of parts of the city, such as Epsom, a high concentration of schools causes an increase in local traffic at start and finish times. This has an impact on non-school traffic, both on private vehicles in the area for other reasons and on timetabled bus services. Delays to scheduled buses will have an additional impact on passengers further along the route. While it has not been possible to quantify this in this study (but see comments in Section 3.3 in relation to Christchurch), anecdotal evidence from operators suggests that the additional congestion caused may be of the order of 30%.

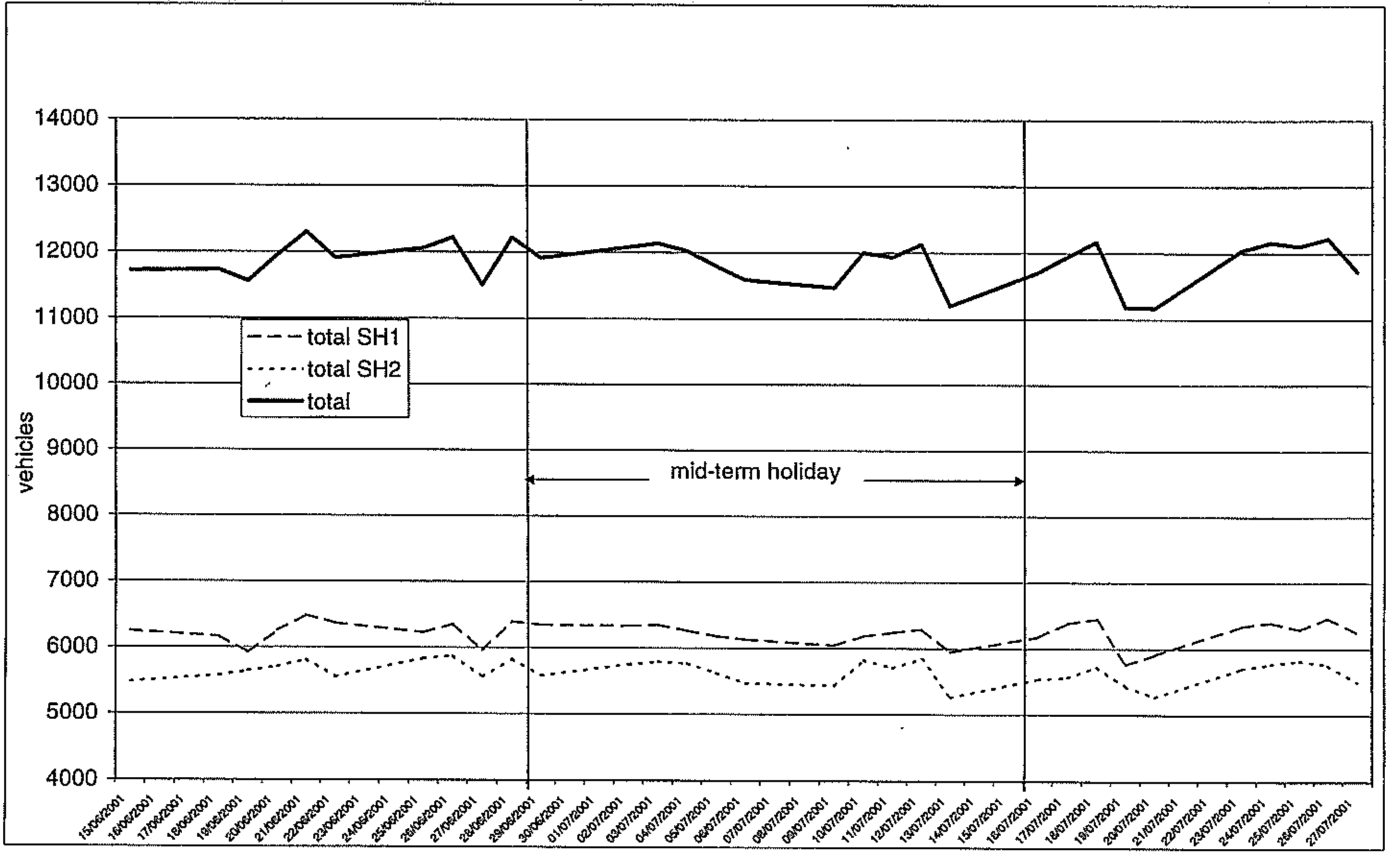

Figure 3.3 Daily northbound, weekday evening peak period (1630-1900), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

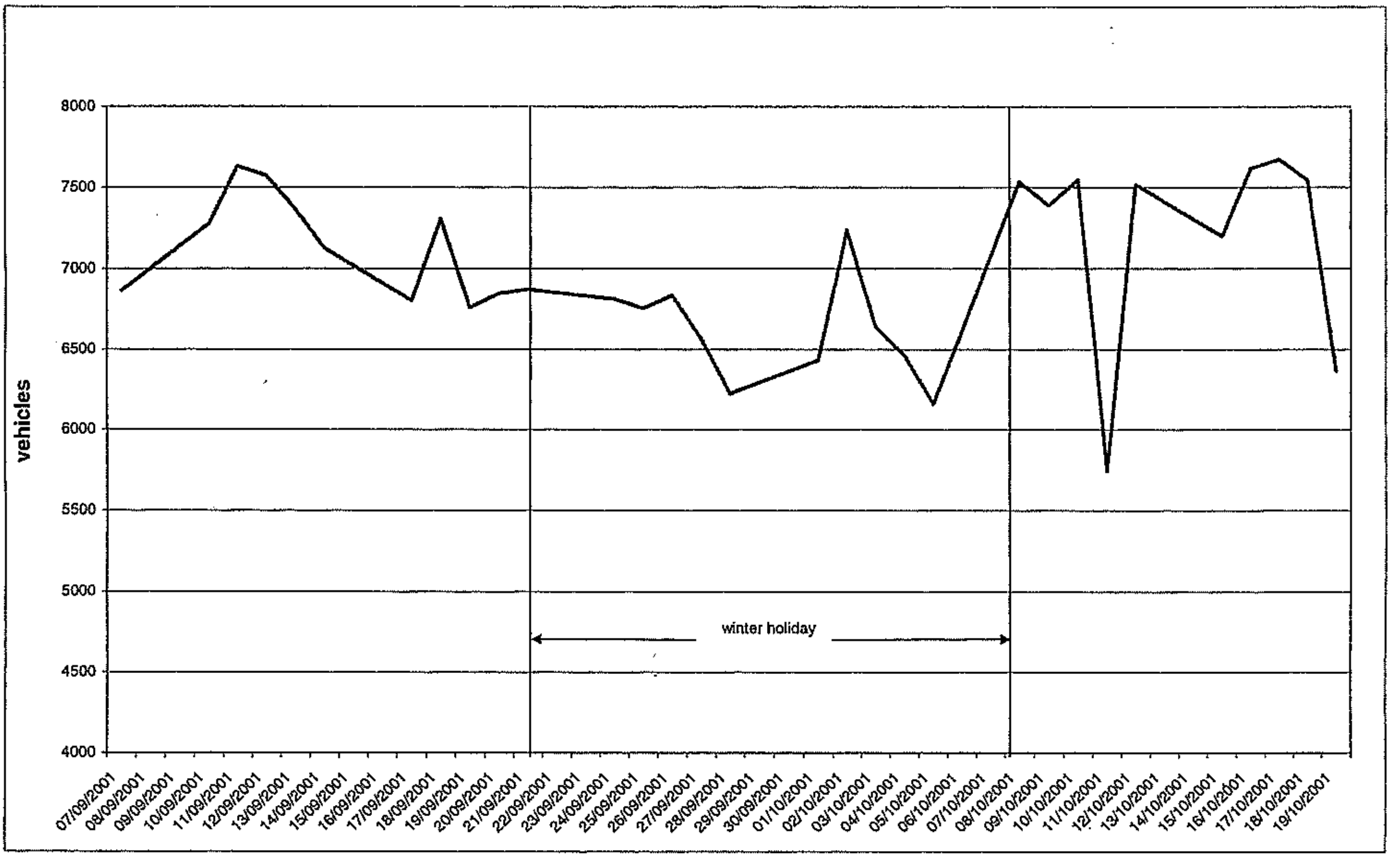

Figure 3.4 Daily southbound, weekday morning peak period (0830-0930), average traffic flows for Auckland Harbour Bridge, June – July 2001.

3.3 Previous Work in Christchurch

Section 3.2 examined general commuter traffic on two of the main arterials leading to Wellington and Auckland CBDs. However, as discussed in Section 3.1, local effects will also occur in the neighbourhood of schools, particularly for larger schools or where more than one school is located on the same campus.

In the earlier work for Environment Canterbury (Booz Allen Hamilton 2000), the school bus services to a number of large colleges in Christchurch were examined. As part of this work, the Canterbury Strategic Traffic Model was used to explore the impact of additional traffic in the locality of the schools. This indicated that the economic benefit of each vehicle-km removed from the network in that area was of the order of half the equivalent value for the CBD. This is much higher than would be expected away from the main commuter routes. The economics of the school trip are discussed in greater detail in Chapter 6 of this report.

3.4 Summary

Because of the highly dispersed pattern of trips in any urban area, combined with the complex behaviour which drives trip making, identifying changes in the traffic during school holidays at the 'macro' level is not easy. Factors such as peak contraction may also mask the situation to some extent. Nonetheless, evidence points to a drop of 5%-7% in total morning peak traffic levels during the winter holiday (June-July), when the population as a whole is less likely to be taking time off. This is sufficient to give the congestion relief for which there is anecdotal evidence.

Looked at from a different perspective, consider the case of Wellington. From available data about 130,000 students are at school, of whom about 40% (52,000) travel by car (either as driver or passenger). Allowing for a relatively high number of students per car, say 1.6, this equates to 32,500 trips. However many of these trips will be local (i.e. will not affect the main commuter routes), and others will still take place during the school holidays but without trips serving multiple purposes (e.g. a parent drives to work directly rather than via school (see Section 3.1)). If one third of these trips is the true reduction impacting on other traffic, this equates to 11,000 trips. From the regional traffic model the total number of car trips is around 150,000 in the 2-hour am peak, so a reduction of 7% would be expected. While all these numbers are (of necessity) approximate, clearly a reasonable degree of internal consistency is apparent.

4. Travel to School in New Zealand

4.1 Introduction

The findings about travel to school in New Zealand draw on discussions with a number of key stakeholders, including the main Regional Councils (RC), Ministry of Education (MoE), and the Bus and Coach Association of New Zealand (BCA).

Overall, while the picture in rural areas is relatively clear, it is less so in the conurbations. In the three main cities (Auckland, Wellington, Christchurch), the relative proportions of SBS which are organised by the relevant Regional Council and those which are arranged by parents and/or the school varies.

In summary, children travelling to school by bus in urban areas may travel by one of a number of types of service:
- public, commercial;
- public, contracted by the Regional Council;
- school, commercial;
- school, contracted by the Regional Council;
- school, contracted by school/parents.

4.2 Rural School Buses

4.2.1 Institutional Arrangements

The means of delivering school transport assistance falls into two broad categories: placement on a school transport service, and payment of a conveyance allowance for the hiring of taxi services. The emphasis has always been on providing a place on a bus where possible. However, where the cost (based on a per capita limit per pupil) prohibits this, or a service is impractical to establish (e.g. because of unsafe roads), the allowance is paid instead. Another possibility is that a student may be paid an allowance for part of the distance and transported on a school bus for the remainder (MoE 1991, Booz Allen Hamilton 2002).

In the case of travel by school buses, the services are purchased either by the MoE or by individuals or groups of schools. The latter is known as direct resourcing (or DR). It is up to the discretion of schools as to whether or not they opt for DR. If they do opt for DR, they are paid a per pupil allowance by the MoE so they can contract an operator for a required route. If, after letting the route, money is remaining, schools can use it as they see fit. Ministry routes are let by competitive tender every six years, and this has been the system for well over a decade. Before then the MoE built and operated their own fleet. Half the routes were re-tendered in 2001, and the remainder are due to be let in November 2002. For all school buses no payment is made at point of use, but for taxis, the conveyance allowance is paid to the families who then pay the taxi driver.

Most bus routes operated are between 60 km and 110 km long. Contract rates are typically between $1.50 and $3.00 per kilometre. In 1999/2000 the amount spent by the Ministry on contracted daily and technology bus services was $54.75M, with a further $21.87M on DR services.

Vehicle quality standards are in place for the MoE routes. These state that, in order to be suitable, a bus must be under 26 years old and have achieved three certificates of fitness out of four inspections without re-checks of the major safety items of brakes, steering, suspension and tyres. This is not the case for the DR routes and, because schools are not required to meet Ministry standards, vehicles deemed unsuitable for MoE routes may cascade down to DR routes, where contract rates are usually lower.

Figure 4.1 Age profile of vehicles used for MoE or DR bus routes in New Zealand.

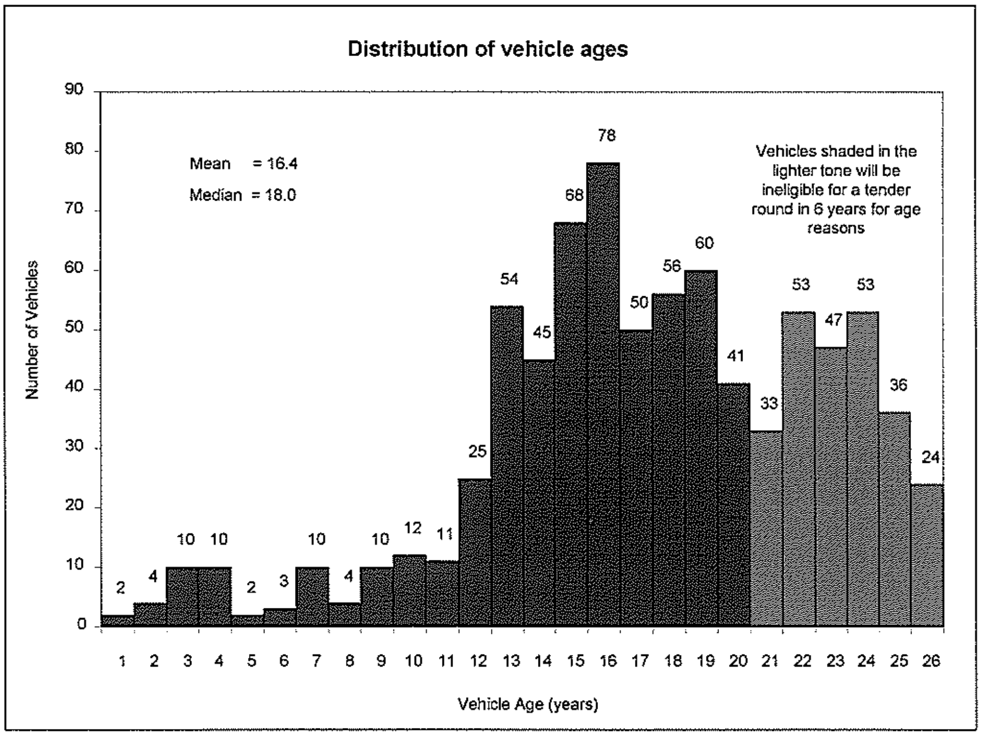

Figure 4.1 shows the distribution of vehicle ages. As can be seen, few new vehicles are entering the system and the average vehicle age is 17 years old. It also shows that a significant proportion of current vehicles will be ineligible for the next tender round on age grounds.

4.2.2 Eligibility Criteria

The three main categories of students eligible for daily home to school transport assistance are:

- School students of all ages travelling from home to the nearest state school or the nearest school that meets the character with which their parents identify.

- School students of all ages with special transport needs (temporary or permanent) who cannot be reasonably expected to make their own way between home and school.
- Children of early childhood age enrolled in a special education institution or class.

To actually qualify for assistance the following criteria must be met:

- The distance between the student's home and the nearest school must be more than 3.2 km if the student is under 10 years of age, or more than 4.8 km for those aged 10 years of over.
- Suitable public passenger transport must not be available to the student at student concession fares. A service is deemed unsuitable if: the distance is more than 2.4 km between home or school and the pick up or set down point; the transport takes an unreasonably complicated route or requires more than one change of vehicle; or if it has timetabling which is unsuitable for the school hours.
- Exception is made for students who, because of zoning requirements, are obliged to attend a school more than 4.8 km from their home even though a nearer school is available.

4.3 Urban School Buses

4.3.1 Wellington Region

As at November 2001, Wellington Regional Council (WRC) had a total of 36 contracts with bus operators to run school bus services (SBS). The total cost of these was a little over $1.6M annually. Transfund views SBS as social services and pays 40% of the net cost. On average, each service carries 27 passengers and the annual total number of passenger trips is 1.1 million. Based on available data on student numbers and mode split, this probably amounts to one sixth of the total journeys to school by public transport.

In a similar way to general bus services, a number of 'commercial' SBS are not subsidised by WRC or Transfund. As would be expected, no information is available on these, but they are generally chartered by either parents or the school. The number of such services in Wellington is believed to be small.

The number of school students in Wellington and the SBS operated have been relatively stable in recent years. New services usually arise from a request by a school to WRC. When this happens, WRC will look first at whether existing services, including school services, can be adjusted in some way before introducing a new SBS. It would appear that there is no pro-active attempt by WRC to promote school services as a means of addressing congestion or other issues.

A number of school and college students in the Wellington region also have passes allowing them to travel to school by rail. In this case the subsidy to students forms part of the subsidy payment made by WRC to Tranz Rail. No data have been found on the number of such students.

The current Wellington RLTS (produced in 1999) included the following on the subject of school services (pp. 70-71):

- *Schools' and parents' expectations have increased as a result of the Government's education policy which emphasises parental choice rather than attendance at the nearest school* [note that this is no longer current]. *Parents and schools have come to regard half fares for students, and special school bus services, as a right. The cost of the 'right' falls increasingly on the Regional Council and the regional community.*

- *The Regional Council will, over the next three years, review the appropriateness of funding concessions and special services for school students.*

- *The Regional Council also recognises the fact that if special services are provided, this reduces congestion on public bus services, and may reduce the use of private cars to take students to and from schools.*

- *In the meantime, and subject to the availability of funding:*
  - *pre-schoolers (all children aged less than 5) will be carried free of charge on all services, if accompanied by an adult or child ten years of age or over; and*
  - *school students aged 5-15 inclusive, plus full time secondary students under the age of 20 (with appropriate proof of school attendance), will be charged half-fare on all services at all times, subject to some 'Adult Fares Only' restrictions where school students have a reasonable alternative service available to them.*

- *The Regional Council will maintain the Concessionary Fares Scheme whereby passenger transport operators are refunded a proportion of the difference in fare between the child fare and the equivalent adult fare.*

- *Special services will be provided for school children where volumes are sufficient for this to be a lower cost option than carrying them on scheduled services, or where distance and/or safety considerations make it desirable and no suitable alternative public services are available.*

4.3.2 Auckland Region

In Auckland, the Regional Council (ARC) undertook a review of school transport in April 1995. This gave the objectives of providing SBS to:

- maximise safety;
- reduce congestion;
- improve the efficiency and effectiveness of public transport;
- provide services which are responsive, cost-effective and equitable.

(The third of these appears to relate to deterring school children from using public buses.)

The review stated that, in 1991, about 20% of children travelled to school by public transport (usually bus), with the remainder split equally between walk/cycle and car.

It gave the cost to ARC of contracted SBS in 1992/93 as $1.5M (the current figure is given below) and pointed out that travel by children on concessionary fares (40% below adult) is also subsidised by ARC.

While accepting the benefits of providing SBS, the review also raised an issue of wider interest relating to parental choice of schools. It does not seem to be 'equitable' to provide subsidised services which allow parents to send their children to a school of choice some distance from where they live, particularly if alternative schools are closer. This choice of schools is largely dictated by Government policy on school 'zoning', which has recently changed again away from full freedom of choice. It should also be mentioned that, in a situation with no zoning, the demand for travel to school becomes much more dispersed and hence harder to satisfy with public transport.

Since 1995 a number of other reports have been prepared by ARC but little seems to have changed in the way of SBS provision. In May 1996, a report was prepared addressing the impact of zoning being abolished. This proposed a move to either services being specified and tendered by ARC (in a similar way to public services), or an output-based subsidy, with a preference for the latter. In the event, the feedback received was limited but a report in August 1996 proposed a combination of both. An ARC Committee Paper in February 1999 expressed concern over overcrowding and about the impact of congestion on SBS arrival times.

Section 2.2.3 of the current (1999) Auckland Regional Passenger Transport Action Plan (ARC PTAP) makes specific reference to School Services:

> *The Council will identify core school bus services and will develop a set of service guidelines. Existing opportunities will be maintained as far as practicable to minimise loss of destinations for existing users. A vehicle quality standard for school bus services is included in the Vehicle Quality Standards manual.*

It is not clear how far the development of core services has progressed. In line with Wellington and Canterbury, the Vehicle Quality Standards are lower for school buses than for general services, and SBS are generally operated by the oldest vehicles in the fleet.

From discussions with ARC, the pattern of SBS now operated has developed incrementally to meet demand but is based on the historical pattern. School service contracts now cost around $3.5M annually and the concessionary fare scheme around $3.9M. As in Wellington, 40% of the former is paid for by Transfund.

An issue raised by both Auckland and Canterbury Regional Councils was that as the urban area extends, the Ministry of Education re-defines 'rural' as 'urban' and responsibility passes to the Regional Council. This change in responsibility occurred recently in Whangaparoa Peninsula.

Finally, it is understood that in Auckland, unlike Wellington, an appreciable number of school services are contracted to schools or parents. However no information is available on this, so no quantification is possible.

4.3.3 Canterbury Region

The overall picture is similar to the other two main cities, with students travelling to school on a number of different types of service (both public and SBS), and the Regional Council, Environment Canterbury, coming under pressure to provide more school services. In 1998 Environment Canterbury funded nine schools contracts, providing 176,000 trips annually and costing almost half a million dollars, amounting to an average subsidy of around $2.60 per trip. In general, however, the preference is to carry school children on public services, where the average subsidy is around $0.90 per trip. One and a half million trips to school were made on timetabled services in 1998, accounting for about one sixth of all bus trips.

The current Canterbury Passenger Transport Plan (dated February 2002) contains a number of references to school transport, as follows:

- *Policy 1.3: "... purpose-specific services* [which includes SBS] *shall operate in addition to, or instead of, regular scheduled services, where there is a recognised community need and where they are more cost-effective for Environment Canterbury to provide them scheduled services."*

- *Policy 2.5 indicates that the minimum capacity constraints for SBS is the same as for other peak services (max 25% passengers standing).*

- *Policy 2.10 specifies that buses with a chassis over 25 years old shall only be used on SBS.*

- *In the explanation of Policy 3.2 (relating to cost recovery): "dedicated school bus services achieve far less than 50% cost recovery ... ... however, they take the pressure off the peaks ....(and) are more cost-effective than providing additional capacity on normal services."*

4.3.4 Summary

A number of common themes emerge from the three main centres:

- the Regional Councils appreciate the beneficial role of SBS;
- however, SBS are seen to be costly and have to compete with numerous other calls on Regional Council funds;
- the concessionary fare scheme is a further cost associated with children using public transport;
- the Regional Councils do not have a problem with the oldest buses being used for SBS;
- the extent of privately contracted services cannot be ascertained;
- equity issues are associated with parental school choice.

In terms of finance, the total amount spent on SBS in the three main centres is some $5.5M annually. The cost to Transfund will be 40% of this, or $2.2M. Based on data from Auckland, the funding of concessionary fares will be a similar or slightly greater amount, giving a total of $4.5M. This should be compared with Transfund's total funding of community services, which amounted to $7M in 1999/2000.

In terms of the split between students travelling on timetabled bus services and those on SBS, data availability is variable between the three centres. However the daily total on SBS has been estimated (using information supplied by the respective Regional Councils) as around 6,000 in each of Wellington and Auckland, with a further 1,000 in Christchurch. From the mode split data given in Section 6.2 of this report, the daily total travelling to school by public transport in the three centres is around 68,000. Overall, then, probably four school students are travelling on timetabled services for every one on SBS. This would indicate a further subsidy of travel to school in the region of $20M, not allowing for smaller centres.

4.4 Future Student Numbers

Projections obtained from MoE (undated) indicate that, in the short term at least, the number of children at school is expected to continue to rise. The total number of students is forecast to peak in 2005, while for years 9+ that will happen in 2007, at a level 13% above the present. Thereafter, school rolls are expected to decline, but the present level of college students will not be reached again until 2020.

Thus, three factors are at work which all reinforce one another:

- increasing numbers of college students in the short to medium term;
- increasing traffic levels due to other factors;
- modal shift towards car use for the journey to school.

Against this, the recent Government policy decision to re-introduce zoning should lead to shorter trips to school as zoning works through the age groups. However, the removal of zoning in the mid-1990s can be expected to have led to longer school trips and this may have accelerated the switch to car. As will be discussed in Chapter 5 of this report, once this change has been made it can be very difficult to reverse.

Current trends, and experience from the UK, would indicate that travel to school is likely to become an increasing problem in smaller urban areas than those covered in this study.

5. Mode Choice Issues

5.1 Introduction

The different issues relating to choice of mode for the journey to school are discussed, primarily about the advantages and disadvantages of each travel mode but also covering the important question of whether significant shifts to other modes can be achieved.

By way of background, Table 5.1 shows the national mode split for the journey to school obtained from the most recent (1997/8) New Zealand Travel Survey (NZTS) and the comparable figures from the 1989/90 Survey (LTSA website).

Table 5.1 Mode split for travel to school in New Zealand, based on NZ travel surveys (LTSA 1989/90, 1997/98).

Mode	Mode Split (%) 1989/90	Mode Split (%) 1997/98
Car Passenger	23	38
Driver	4	6
Walk	30	19
Bus	18	19
Cycle	20	10
Other	1	5

A number of trends are clear:

- the bus share has remained constant;
- the car passenger share increased by over half;
- while walking and cycling previously accounted for half the total trips, they are now less than a third.

5.2 The Attraction of the Car

Reference has already been made (Section 2.2.2 of this report) to the impact of the 'car culture' on school travel in the UK. In New Zealand, one of the 'top three' countries in the world for car ownership, this effect is likely to be even more evident.

The vicious circle of declining patronage leading to declining services, causing further declines in patronage, has been experienced in general by the bus industry since the 1970s. Mode choice for school travel reflects this wider trend and is compounded by related issues such as perceptions of safety. As with the wider situation, evidence points to the fact that once users have switched from bus to car it is particularly difficult to persuade them to reverse that decision. While cutting services may be financially expedient, the decision to do so should not be taken lightly as the consequences cannot easily be reversed.

There may also be less obvious side-effects of car use. Psychologists are increasingly arguing that more alert and healthier children who have not been driven to school settle more quickly in class and seem to be more receptive to learning (S. Thornthwaite 2002, pers.comm.).

5.3 Road and Personal Safety

While reliable data on exposure to accidents are notoriously difficult to obtain, school buses, as with other forms of public transport, have a record of very low involvement in accidents. For example, data were obtained by the BCA from LTSA records for 1991-2000, exclusively for accidents to school children between 0700-0900 hours and 1500-1700 hours.

The number of serious accidents recorded for buses in urban areas was 1, while that for cyclists and pedestrians was over 500. For cars and motorcycles the corresponding figure was around 80. It is therefore reasonable to assume that the accident risk associated with bus travel is negligible.

On the other hand both cycling and walking are generally perceived to be dangerous modes, partly as a result of their vulnerability (although other clear factors include conspicuity). Using data from PEM (Transfund 1997), the average accident cost for all modes is of the order of 4-5c per km travelled. Recent work by Booz Allen on pedestrian travel indicates that the equivalent figure for walk alone is around 20c per km. In their work on school travel for Canterbury Regional Council (Booz Allen Hamilton 2000), an equivalent figure of 40c per km was derived for cycling. Similar results emerged from the Booz Allen 2002 study which determined the basis of the current scheme of patronage funding. Although these numbers are only indicative, they do demonstrate the increased risk of travel by 'slow' modes. That said, use of cars by school-age children also carries a higher risk than the average for all ages.

However the 'vicious circle' referred to in Section 5.2 also comes into play here. At least some of the accidents to those who walk or cycle to school will be the result of congestion at or near the school gate, which arises from increasing car use. There is also an argument that increasing cycle use leads to drivers becoming increasingly 'cycle aware', and thus to fewer cycle accidents (see, for example, Wood 1999).

In addition to the perceived road safety benefits of travel by car, personal safety ('stranger danger') is also a factor in mode choice. Girls and younger children in particular are seen to be vulnerable to attack when walking or cycling in certain areas or when waiting for a bus. These issues are now beginning to be addressed in some places through measures such as safe routes to school and 'walking school buses'. However, tangible data on this is particularly elusive.

5.4 Perceptions of Public Transport

The perceived cost of using a bus, compared to the limited out-of-pocket expenditure of a car trip, will generally mitigate in favour of the latter. In the case of school transport, the deterrent effect of high cost will probably be reinforced by a poor image of the service, arising from factors such as the age of the vehicle. From the operator's point of view, however, each extra school bus leads to the requirement for an additional peak vehicle, and its cost recovery will be particularly demanding. A trial in the UK with quarter fares for school students was successful in increasing patronage but the additional costs would need to be covered, probably from the public purse. Economic issues such as this are explored in Chapter 6 of this report.

While the economic reasons for using older vehicles are clear, such buses will act as a deterrent for some students and/or their parents. Another argument is that negative perceptions of public transport gained from school buses are carried through life and may serve as a deterrent for many years afterwards.

5.5 Operational Factors

Present school start times coincide with the morning commuter peak so requirements for additional vehicles and drivers at that time will place a particular strain on operators. Indeed, the required resources may simply not be available. Any proposal to increase the use of bus for school journeys must take this into account.

On more than on occasion, in New Zealand and elsewhere, the shifting of school start times has been mooted as a means of addressing this problem. To date, however, no progress appears to have been made. In 1999 a review (the 'Austin' report) was undertaken of the Length of the School Day and the School Year (MoE 1999). However, the transport issues were all but ignored, with the main reference to them being under section 33 of the review, *Focus Groups*:

> *Public bodies suggested that the Working Party consider the flow of traffic at peak periods that may coincide with the start and finish of the school day.*

However, the issue is not addressed in the review's Recommendations.

During consultation on the Austin report, the BCA made a submission arguing for a delayed start to the school day, perhaps to 0900 or 0915 hours, on the grounds of the bus scheduling efficiencies that this would make possible. This has the added advantage that the consequent later closure of schools would still not affect the main evening commuter peak. The issue would seem to be worth revisiting if greater efforts are to be made to encourage the use of school buses, without making a serious impact on bus operational requirements.

Carrying school children on timetabled services with their better buses will certainly address the poor perceptions arising from the use of older vehicles. It may also allow the fleet to be scheduled more efficiently and possibly give an increased service to the general public. On the other hand, as was raised in the Canterbury study, the general public may be deterred from using a bus with a high number of school children on it.

6. Economic Evaluation

6.1 Introduction

The economics of encouraging the use of alternatives to private car (primarily bus but also walk and cycle) for the trip to school are investigated, and the likely costs and benefits of such schemes are assessed. The analysis which has been carried out is based on the best available data but is intended to be **indicative only**, given that data are limited and detailed information on certain critical factors has had to be estimated.

Starting with the current mode split for the school journey in each of Auckland, Wellington and Christchurch, a number of scenarios representing changes in mode split have been modelled and subjected to an economic evaluation.

6.2 Student Numbers and Mode Split

Data supplied by the MoE (2001) gives the number of pupils attending school within the regions of Auckland, Wellington and Christchurch as for the 2001 school year. These numbers are given in Table 6.1 below.

Table 6.1 Number of students attending New Zealand schools in the three main cities, at 1 July 2001.

City	Years 1 to 8	Years 9 to 13	Total
Auckland	152,021	74,690	226,711
Wellington	51,875	77,460	129,335
Christchurch	54,780	30,475	85,255

Travel mode statistics have been taken from the LTSA New Zealand Travel Survey (NZTS) for 1997 and 1998. Table TR1 of the LTSA survey report gives the modal split by trip purpose, and Table RE2 shows the national modal splits for all trip purposes. The two sets of statistics have been merged because the national educational trip modal split cannot be simply applied to each of the three cities being considered, as each city presents a different case. The modal split percentages have therefore been manually adjusted to reflect, for instance, the proclivity in Auckland to use the private car for many trips, the relatively high emphasis in Wellington on commuting by public transport, and the higher likelihood of people walking or cycling in Christchurch.

The resultant estimated modal splits are in Table 6.2, which also shows the national average from the NZTS for comparison.

Table 6.2 Modal splits (%) for education trips for New Zealand and adjusted for the three cities.

Travel Mode	National unadjusted (%)	Auckland (%)	Wellington (%)	Christchurch (%)
Public Transport	15	15	17	14
Walking	32	34	35	33
Cycling	7	4	7	10
Driving	10	11	7	10
Car Passenger	36	36	34	33
Total	100	100	100	100

6.3 Cost Aspects

The modelling has assumed that, if a shift to using bus can be achieved, then an associated cost of operation of the additional buses required will accrue. Based on other work carried out by Booz Allen in New Zealand, typical costings from the bus industry have been used on the basis of three components:

- Peak vehicle requirement, computed on the basis of 50 passengers per bus and allowing for school services tending to use older vehicles;
- Vehicle-hours of operation, assuming 3 hours per vehicle per day and 200 (school) days in a year;
- Vehicle-km of operation, based on the hours and an average speed of 20 kph.

In addition, an estimate has been made of revenue earned. Given the special nature of the service, in particular the high proportion of passengers paying reduced fares, the revenue per km operated has been taken from the earlier study of school buses in Christchurch in preference to a more general figure. The costs have been offset by the revenue to give a 'funding gap' of the type which would be used in an ATR evaluation.

Notice that the costs are average values which take no account of the availability of vehicles or drivers, or of the fact that in some circumstances a larger fleet may have an impact on other cost factors such as garaging requirements. Equally, if school hours could be changed the need for extra vehicles may be reduced, thus improving the economic case.

6.4 Benefit Aspects

If the mode split to school can be changed and some transfer from car achieved, a series of associated benefits and disbenefits will accrue. These have been evaluated using the most accurate data possible, drawing on previous work by Booz Allen in a number of different studies.

Four main sources of benefit have been evaluated:

- Benefits associated with additional walking;
- Benefits associated with additional cycling;
- Decongestion from a reduction in car traffic;
- Disbenefits experienced by mode switchers.

If additional walking results from the shift in mode, then an increase in accidents to pedestrians is likely to occur. In other work by Booz Allen, funded by the Transfund Research programme and Wellington Regional Council, the accident cost has been estimated at 20c/km walked and that figure has been used here. It is higher than the values given in PEM but this reflects the much greater vulnerability of pedestrians. An average walk trip length of 3 km has been taken, but the health benefits from additional exercise have not been evaluated.

In terms of cycling, an accident cost of 40c/km has been used. This was derived from a special study of the topic undertaken as part of the previous study of school buses in Christchurch. Again, no health benefits have been assumed (although a figure of 10c/km has recently been proposed by Transfund); but the inclusion of these is unlikely to have a major impact on the outcome.

Decongestion benefits by removing car traffic have been taken direct from the Patronage Funding study carried out by Booz Allen (2002) for Transfund. These have different values for the three main cities, reflecting different levels of congestion, and are used by Transfund in funding new passenger transport schemes in the light of their expected impact on congestion. The benefits cover travel time savings, vehicle operating costs, accidents and environmental aspects.

Finally, if a traveller changes mode from car then they can expect to experience a disbenefit. This will be highly personal and the exact amount and nature will vary considerably. In this analysis, a general disbenefit of 5 minutes of travel time has been taken as the average value per traveller.

No benefits have been assumed to accrue to bus operators.

6.5 Impact of Changed Mode Split

For each of the three cities under consideration three tests have been used and these are specifically detailed in Table 6.3. The tests were:

- A change in modal split reflecting a significant transfer to public transport.
- A medium switch towards public transport.
- A switch of mode choice reflecting a small move to public transport.

Corresponding changes were made in the other mode shares, including smaller shifts to walking and cycling.

Table 6.3 Change from the modal splits for testing 3 levels of change in transport mode (see Table 6.2).

Travel Mode	Level (%) of Change from Modal Split		
	High	Medium	Low
Public Transport	+8	+5	+2
Walking	+1	+1	+1
Cycling	–	+1	–
Driving	–2	–3	+1
Car Passenger	–6	–4	+2

In each of the three cities, the three scenarios were subject to an economic evaluation as described above, taking the existing situation as the Do Minimum scenario. No discounting was done as the costs and benefits were assumed either to be constant through time or to change at the same rate. The shorter length of the school year (compared to the working year) was taken into account. The resulting values of the Efficiency Ratio (ER) are given in Table 6.4. The ER is the equivalent of the benefit:cost ratio (BCR) in the situation where payment is made. (In this case there is revenue to the operator.) The Appendix contains a typical calculation.

Table 6.4 Efficiency ratios for each scenario at the three levels of change.

City	ER for 3 Levels of Change		
	High	Medium	Low
Auckland	4.6	5.4	5.7
Wellington	2.6	3.5	3.9
Christchurch	1.6	2.0	2.8

It should be reiterated that these figures, while being based on the most accurate data available, are intended to be indicative only. However the results are undoubtedly informative.

Table 6.4 shows two points clearly, which are that:

- the ER increases with the level of congestion in the respective cities, being highest in Auckland and lowest in Christchurch;
- in each city the low public transport investment scenario gives the highest ER, with diminishing returns as investment is increased.

All the scenarios give a result which is worthwhile in economic terms, i.e. the benefits exceed the costs. All of the Auckland schemes have an ER in excess of the present funding cut-off of 4 (which applies to both ER for public transport schemes and BCR for roading schemes), and the low investment scheme in Wellington is very close.

The other two investment options in Wellington all fall below 4 and all three Christchurch options are below 3. (It is pointed out that the Christchurch results for the medium scenario are very similar to those which emerged from the earlier, more accurate study of three specific school services.) However, this does not take into account the fact that Transfund no longer assesses schemes solely on the basis of the BCR or ER and indeed that special consideration is now given both to ATRs and to schemes which reduce congestion. School buses qualify on both these counts.

The issues associated with achieving in practice a switch in mode of the extent that has been modelled, were addressed in Chapter 5 of this report. Clearly, the economic results would change if, for example, fares were set at an especially low level to attract users. Practical issues, such as the availability of buses and drivers, have also not been addressed. Overall, however, there would appear to be an economic case for an increased investment in the provision of public transport to school in the main urban areas.

Sensitivity tests using the same general approach have also been carried out with greater emphasis on transfer to walk and cycle. This has the effect of reducing the costs associated with bus operation but increasing the accident disbenefits. In practice the decongestion benefits per car trip removed will be less if a shift to cycling occurs, because the additional cycles on the roads will cause some congestion. Overall, the resulting ER values are similar to, or slightly higher than, those shown in Table 6.4.

7. Conclusions & Recommendations

7.1 Conclusions

This review of travel to school, focusing on the three main urban centres in New Zealand, has confirmed the anecdotal evidence that such travel is not an insignificant contributor to urban congestion. While the areas around schools are particularly affected (as would be expected), the effects spread to other parts of the road network. This is borne out by traffic data in the two locations examined.

Experience in the UK is similar to that in New Zealand but, in view of the much greater level of urbanisation there, the problem has a higher political profile, in that central government is undertaking a programme of research, including the trialling of a number of action plans.

New Zealand statistics show that the proportion of children who travel to school by car increased substantially during the 1990s. A number of factors contribute but perhaps the four most important are: concerns over child safety; a constant or declining level of service in public transport generally and in school bus services in particular; an increasingly dispersed pattern of trip-making; and the general trend to the 'car culture'. While the third and fourth of these are relatively tangible, the first two are as much to do with perceptions as with fact. However, the earlier decline in both public transport patronage and perceptions is now showing clear signs of reversal.

A general economic analysis has been undertaken and indicates that the benefits of providing school buses more than exceed their costs. An Efficiency Ratio (ER) has been calculated under a number of mode split scenarios and indicates that ER values of the order of 2, 3 and 4 can be expected for Christchurch, Wellington and Auckland respectively. However it also shows diminishing returns in the event of increasing numbers of students switching mode. Achieving a transfer from car to modes such as walking and cycling slightly improves the economic case. While not all the ERs meet the current funding cut-off, Transfund is increasingly funding schemes on the basis of other criteria, which include specific reference to ATRs and schemes relieving congestion. School buses qualify on both counts.

While the provision of school services has benefits, operational issues arise as a result of school starting times coinciding with the morning traffic peak. At this time buses and their crews are already being used to the maximum possible extent and the provision of additional services would be at a high cost. While using older vehicles for school services helps with the cost, it may have a deterrent effect which the passenger remembers long after leaving school. Slightly delaying school start times can be expected to reduce resource requirements and has been mooted on a number of occasions, but has never been put into effect.

A number of alternatives to the Regional Council contracting school services are possible. For example, services being privately contracted by schools and parents in particular, and children using timetabled services. While in some cases it may be more operationally efficient, the former may also be a deterrent to adult (full fare paying) passengers. The extent to which the latter already takes place cannot readily be ascertained but the private contract approach may have a number of advantages, especially as it overcomes the adverse impacts of car travel to school while not requiring additional public expenditure.

Finally, school student rolls are forecast to increase in the short to medium term. This, combined with general increases in traffic and the increasing use of car for school trips (assuming recent trends are continued), all point to the problem increasing in size in future.

7.2 Recommendations

The study has identified areas where further research would be beneficial, and also how the present problems might be addressed.

Further research that would be useful includes:

- An examination of smaller urban centres (such as Palmerston North) to assess the impact of school travel there and how this might change in the future.
- A trial evaluation of a (proposed or existing) school bus service as an ATR, taking into account expected trends over the next few years.
- The use of the travel data recently collected in Wellington (as part of the development of the Regional Traffic Model) to look at school travel in more detail than is presently possible.

The present problems could be addressed as follows:

- Experience from the UK indicates that the best approach to achieving a move away from car use for school trips is a holistic one. This approach could include safe routes to school for walking and cycling, school travel plans, and the inclusion of transport issues as part of the school curriculum.
- The holistic approach would involve the school, parents, bus operators and the Regional Council in developing solutions which meet the needs of all parties.
- A trial in one of New Zealand's urban centres of involving all parties would be highly informative and could point the way to a more efficient approach to school transport in future.
- Education of parents, in particular in terms of attitudes to car use, would also be appropriate.
- Changing school hours on a trial basis.

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Appendix: Sample ER Calculation

Wellington low public transport investment approach

	PT	walk	cycle	car driver	car pax
Pupils, years 1 to 8 (2001)	51875				
Pupils, years 9 to 13 (2001)	77460				
Total pupils in scope	129335				
Mode share - current national education trip based	15%	32%	7%	10%	37%
Adjusted Wellington	17%	35%	7%	7%	34%
Mode share - future	19%	36%	7%	6%	32%
Difference (%)	2%	1%	0%	-1%	-2%
Difference (number)	2587	1293	0	-1293	-2587

	unit value		Costs	Benefits
1) PT costs				
Vehicle requirement @ X seats	50	51.734		
PV cost pa	$ 25,000	$ 1,293,350		
Veh-hours pa	$ 19	$ 589,768		
Veh-km pa	$ 0.72	$ 446,982		
Total cost		$ 2,330,099		
Revenue (@X per veh-km operated)	$ 0.70	-$ 312,887	$ 2,017,212	
2) Accidents to pedestrians				
Extra walk km per peak	3	3880.05		
Extra walk km per year	400	1552020		
Accidents cost per km	$ 0.20	$ 310,404		-$ 310,404
3) Accidents to cyclists				
Extra cycle km per peak	7	0		
Extra cycle km per year	400	0		
Accidents cost per km	$ 0.40	0		0
4) Decongestion				
Difference in VKT	7	27160.35		
Benefit per peak	$ 0.83	$ 22,543		
Benefit pa	400	$ 9,017,236		$ 9,017,236
5) Disbenefits to mode switchers				
Assume X mins per switch	5	19400.25		
Value per peak	$ 6.00	$ 1,940		
Annual value	400	$ 776,010		-$ 776,010
TOTALS			$ 2,017,212	$ 7,930,822
Efficiency Ratio				3.9

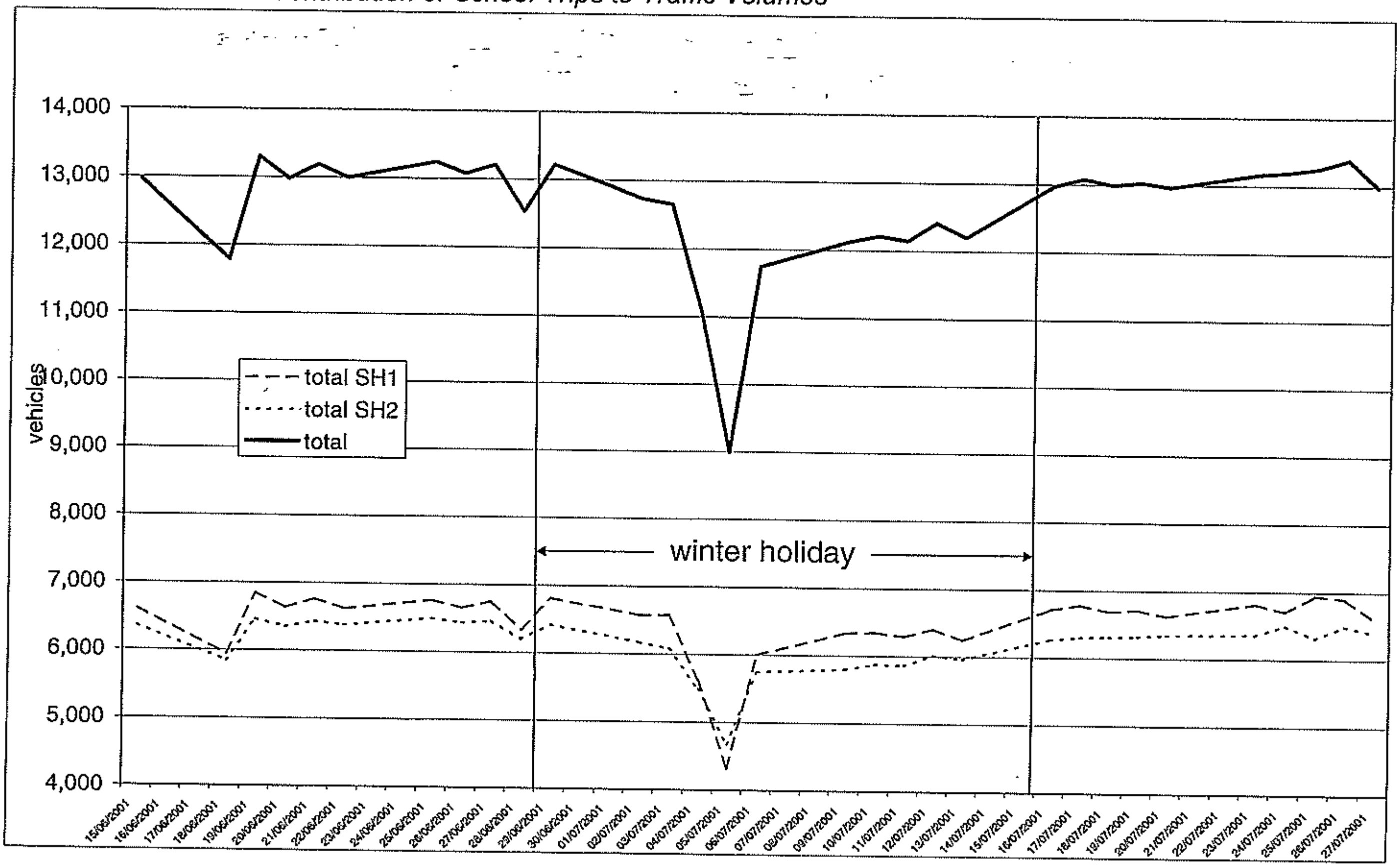

Figure 3.1 Daily southbound, weekday morning peak period (0700-0930), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

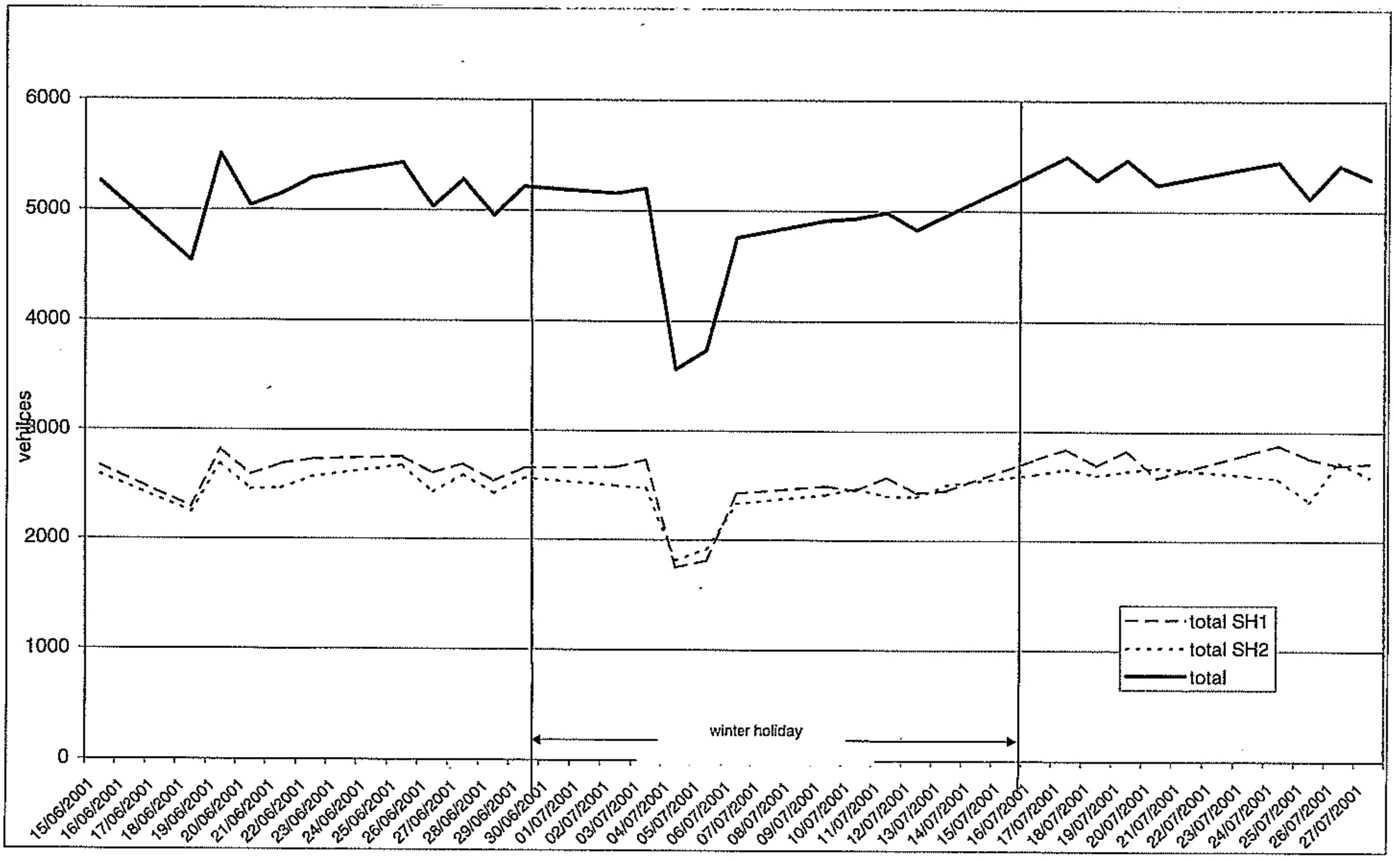

Figure 3.2 Daily southbound, weekday morning peak period (0800-0900), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

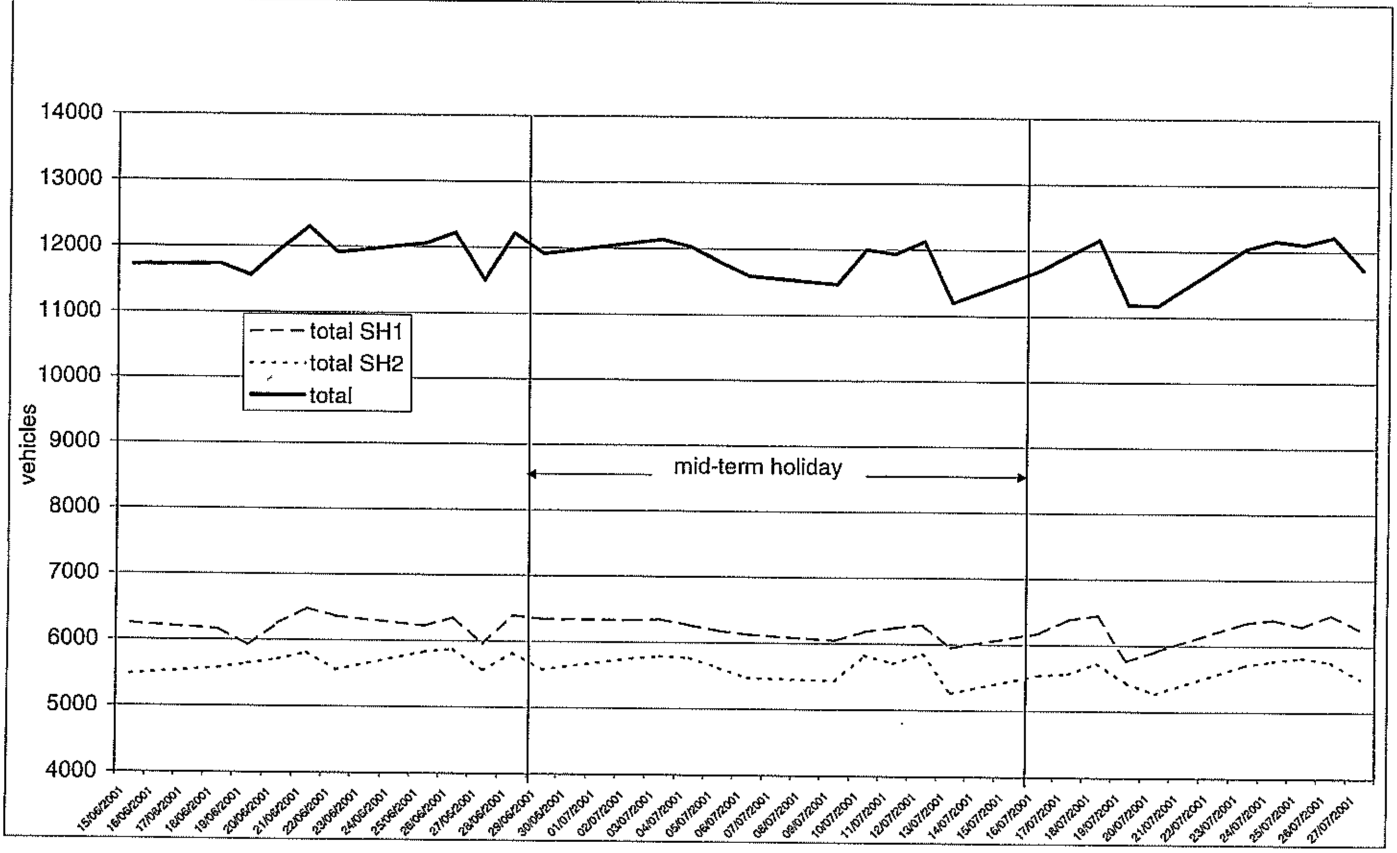

Figure 3.3 Daily northbound, weekday evening peak period (1630-1900), traffic flows at Ngauranga Gorge, Wellington, June – July 2001.

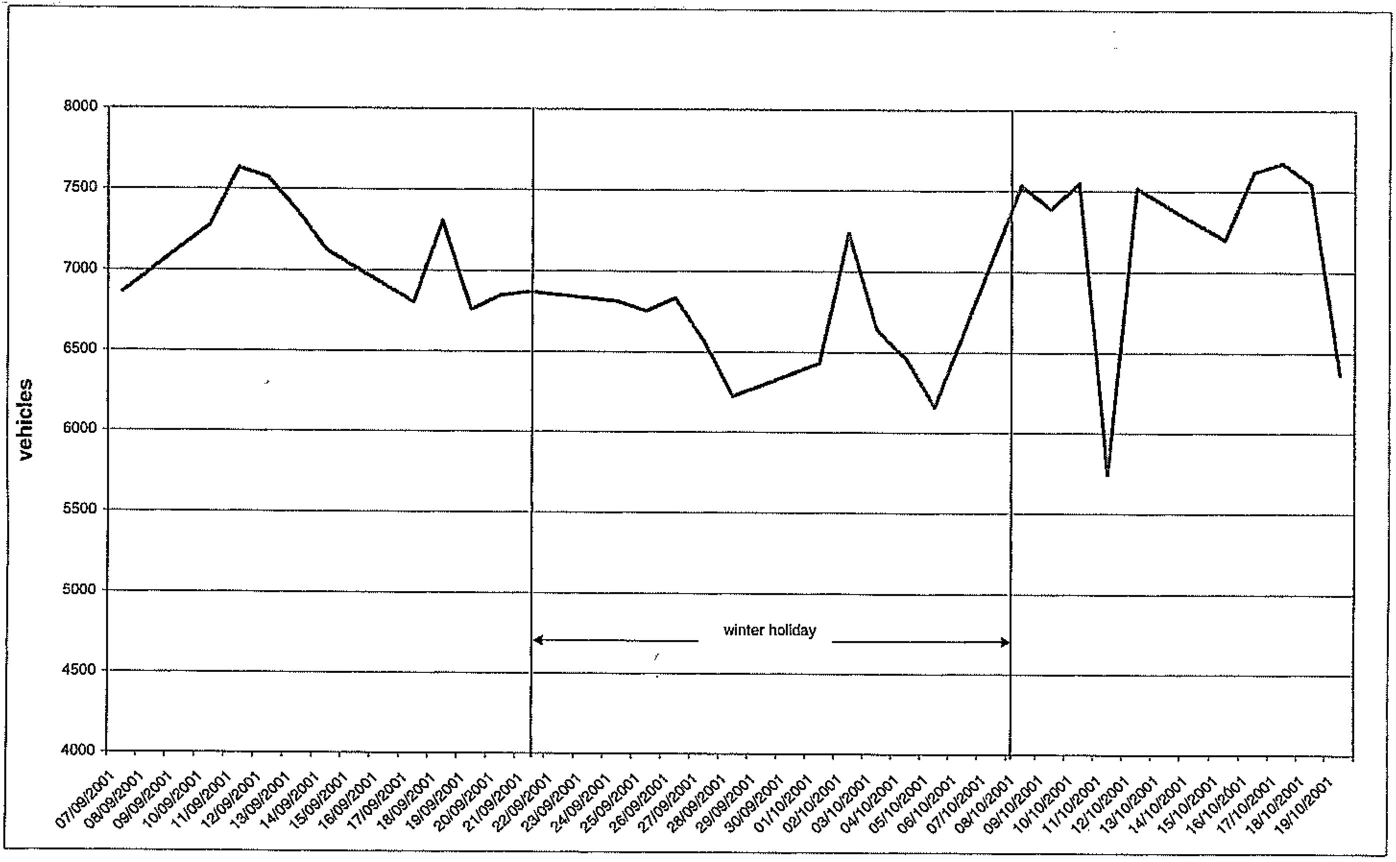

Figure 3.4 Daily southbound, weekday morning peak period (0830-0930), average traffic flows for Auckland Harbour Bridge, June – July 2001.

Appendix: Sample ER Calculation

Wellington low public transport investment approach

		PT	walk	cycle	car driver	car pax
Pupils, years 1 to 8 (2001)	51875					
Pupils, years 9 to 13 (2001)	77460					
Total pupils in scope	129335					
Mode share - current national education trip based		15%	32%	7%	10%	37%
Adjusted Wellington		17%	35%	7%	7%	34%
Mode share - future		19%	36%	7%	6%	32%
Difference (%)		2%	1%	0%	-1%	-2%
Difference (number)		2587	1293	0	-1293	-2587

		unit value		**Costs**	**Benefits**
1) PT costs					
Vehicle requirement @ X seats		50	51.734		
PV cost pa	$	25,000	$ 1,293,350		
Veh-hours pa	$	19	$ 589,768		
Veh-km pa	$	0.72	$ 446,982		
Total cost			$ 2,330,099		
Revenue (@X per veh-km operated)	$	0.70	-$ 312,887	$ 2,017,212	
2) Accidents to pedestrians					
Extra walk km per peak		3	3880.05		
Extra walk km per year		400	1552020		
Accidents cost per km	$	0.20	$ 310,404		-$ 310,404
3) Accidents to cyclists					
Extra cycle km per peak		7	0		
Extra cycle km per year		400	0		
Accidents cost per km	$	0.40	0		0
4) Decongestion					
Difference in VKT		7	27160.35		
Benefit per peak	$	0.83	$ 22,543		
Benefit pa		400	$ 9,017,236		$ 9,017,236
5) Disbenefits to mode switchers					
Assume X mins per switch		5	19400.25		
Value per peak	$	6.00	$ 1,940		
Annual value		400	$ 776,010		-$ 776,010
TOTALS				$ 2,017,212	$ 7,930,822
Efficiency Ratio					3.9