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NEW VARIABLES PROMISE GREATER ACCURACY FOR ESTIMATING SKID RESISTANCE

Research into in-service skid resistance on New Zealand's rural state highway network has identified four variables that have the most influence on skid resistance, with pavement aggregate source foremost amongst these.

Opus Central Laboratories and Statistics Research Associates have used statistical modelling to develop a means of reliably predicting the expected in-service skid resistance of sections of New Zealand's rural state highway network that are surfaced with chipseal.

The research was in response to industry demand for the identification of sources of natural aggregate that displayed high in-service resistance to polishing and wear. Access to this information would enable designers and contractors to construct pavements better suited to increasing vehicle numbers and use, and to guarantee the skid resistance of these pavements (as is being increasingly required by contracts).

Because all of the data required for the research was already available, the investigations and modelling were carried out purely as a desktop exercise. The data came from the NZ Transport Agency's 2006–07 high-speed condition survey of New Zealand's entire state highway network (a total sealed length of 23,113 lane kilometres).

The full research report discusses the principal findings from the modelling and their implications for pavement design, and future research and data collection.

BACKGROUND

The main objective of the modelling was to determine whether the source of an aggregate used for pavement surfacing is a better determinant of how it will perform in service (with respect to skid resistance) than its polished stone value (PSV). PSV is a laboratory-derived ranking of an aggregate's ability to resist the polishing action of heavy commercial vehicles.

At present, PSV is heavily relied on by pavement designers to achieve compliance (at the design stage) with national specifications for in-service skid resistance. However, it has been demonstrated that, in practice, different aggregates with the same PSV can provide different levels of skid resistance when subjected

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to the same volumes of traffic, and that even aggregates from the same source may vary in the skid resistance they provide.

In addition, the regression model currently relied on by designers to specify the PSV of aggregates does not correlate particularly well to how those aggregates perform on site.

This led the research team to investigate whether the quarry that an aggregate was sourced from would be a better determinant of in-service skid resistance. Source quarry is a categorical parameter that encompasses not only the PSV of an aggregate, but also other important factors such as chip shape, chip hardness, mineralogical properties and crusher type.

KEY CONCLUSIONS

Of the variables tested through the modelling, pavement aggregate source emerged as the one with the most influence on in-service skid resistance. Skid resistance was measured using SCRIM (sideways-force coefficient routine inspection machine) coefficients, averaged over a 10m pavement length.

Peter Cenek of Opus says, 'Pavement aggregate source had the greatest ability to alter in-service skid resistance, with the difference between the best-performing and the worst-performing sources being 0.15 SCRIM coefficient. When you take into account that under the NZTA's specification for skid resistance management every 0.5 increase in the SCRIM coefficient correlates to an additional risk ranking level, this shows how important it is to identify appropriate aggregate sources for pavement design at the outset.'

Other variables that emerged as influential through the modelling were the horizontal curvature of the road section, the traffic and the size of the sealing chip.

As anticipated, the modelling confirmed that the correlation between the in-service skid resistance (SCRIM coefficient) and the PSV of the aggregate used was not very strong. Peter says, 'What this shows is that there is at least one other variable represented within the categorical parameter of pavement aggregate source that has a significant effect on skid resistance. We suspect this may be related to the shape or abrasion resistance of the sealing ship, but this needs to be confirmed through further research.'

WHAT THIS MEANS IN PRACTICE

Five pavement aggregate sources (from those represented in the database) emerged through the research as top-performing for in-service skid resistance: Waitohai (Bay of Plenty), Longburn (Manawatu/Whanganui), Waioeka River (Bay of Plenty), Maketu (Bay of Plenty) and Mangatainoka (Manawatu/Whanganui). Pavements constructed from any of these aggregates could be expected to maintain a skid-resistance level above the threshold in the national specification, throughout their expected service life, even when used in the most arduous situations.

A further five aggregates were identified whose performance was at odds (either much better or much worse) with that suggested by their PSV. Detailed investigations of these aggregates are required to understand why this was the case, focusing in particular on which of the aggregates' characteristics, other than PSV, was creating this variance in result.

The research also found that single-coat chipseals constructed from smaller-sized sealing chips (grade 4 or less) have greater skid resistance than those made with larger chips (grade 2 and 3). They were also slightly more skid resistant than two-coat chipseals, although this may in part be due to the high-risk locations where two-coat seals are used.

Peter says, 'On the basis of our research, we think there is a strong case for using statistical modelling, such as we've developed, to complement PSV test results when ranking suppliers of surface aggregates.'

The model developed by the research team is available as an Excel spreadsheet on the NZTA's website: www.nzta.govt.nz/resources/research/reports/470. Entitled 'Aggregate selection for skid resistance', the spreadsheet will perform the calculations to estimate the in-service skid resistance of particular aggregates.

The team suggests that the model could be further refined as more information about aggregate sources becomes available through the NZTA's RAMM (road assessment and maintenance management system) database.

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Selection of aggregates for skid resistance, NZ Transport Agency research report 470

Available online at www.nzta.govt.nz/resources/research/reports/470

Photo courtesy of Mobile Screening & Crushing (NZ) Ltd

REDUCING TRAVELLING TIME MAY NOT SUIT ALL COMMUTERS

A surprising number of people enjoy their time commuting to work or study – especially those who walk or bike, live in the inner city and/or like their jobs – and new research has found that some would get absolutely no benefit from reducing that travel time.

Currently, studies into travel time assume that people want to reduce the time they spend travelling to work or study. When Wellington-based Pinnacle Research and Policy and Ian Wallis Associates used a 2011 online survey to look into how over 500 Wellington- and Auckland-based commuters taking different modes of transport use and value their travel time, they found that 40% of commuters actually enjoyed this time.

Carolyn O'Fallon of Pinnacle Research says, 'The results of our research support the assertion by other researchers that, from the perspective of some commuters, time spent travelling by any mode may not be all lost.'

The research showed that most people had an ideal commute time of less than 20 minutes one way, and that many were currently spending about 10 minutes more time travelling than they would like to be.

A typical worker spent 20 minutes commuting as a driver, 15 minutes as a walker or 30 minutes on public transport. The typical student spent 30 minutes driving, 10 minutes walking or 35 minutes on public transport.

While most people would like to reduce their travel time, many did not want to do away with their commute altogether. Results indicated a minimum commute time of about 10 minutes was desirable.

This means that reducing travel times below this ideal level could have little or no value at all to these people, says Carolyn.

The research also found that people tended to use 5-minute units when thinking about travel time. This suggested that very small travel time savings (eg several seconds or a minute or two) may be relatively meaningless to them, and therefore should not be valued.

Even if people could save time commuting, few would use it to do work or study, as presumed by some previous studies, but instead would spend more time on activities such as sleeping, getting ready for work, eating breakfast, family time, household chores and reading.

A small core of commuters (12%) were clear they would not be interested in changing their commute time at all, mostly because they wanted to have transition or 'down time' between home and work, or have time to think or read.

Mode of transport made a big difference to enjoyment of commuting. Most people who walked or cycled to work said they enjoyed their time travelling. About a third of all car commuters and those taking public transport felt the same way.

Carolyn says that people who liked their jobs were also twice as likely to enjoy the time getting to work.

While listening to music or the radio was the main pastime of all commuters, those who enjoyed their travel also used the time to prepare for the day ahead, relax, think, talk to people around them or do a bit of people watching. Walkers tended to be more interested in the exercise aspect and the scenery or fresh air.

Based on their responses to various questions and attitude statements, the researchers were able to separate survey respondents into three distinctive categories:

- 'Contented commuters' (34%) valued their travel time, saying it was enjoyable and/or a useful transition between work and home. They were relatively content with their usual commute time of around 20 minutes and, even if they had the choice to halve it or teleport instead, one-fifth of them would not change a thing. Women made up 63% of this group, and were also more likely to walk and enjoy the benefits of exercise. They were also less inclined to use public transport.
- 'Discontented commuters' (19%) were more likely to be male and considered commuting a waste of time. But this group's usual commute time of 30 minutes was about 10 minutes longer than the others, which may explain why a whopping 96% would choose to teleport or halve their commute trip if they could.
- The main group of 'ambivalent commuters' were somewhere in the middle, had a regular commute time of 20 minutes, and would opt for teleporting or reducing their travel time if they could.

Travel time was clearly important: most commuters who were travelling more than their ideal commute time, and whose commute time was more than 30 minutes, would prefer to halve their travel times. Public transport users were more than twice as likely as other mode users to prefer a commute that was half the time.

Basically, the longer the commute, the less enjoyable it was, so those living outside the central business district in both Wellington and Auckland who had further to travel were not as happy, the most common reasons being traffic delays and having better things to do with their time.

When drivers were asked which form of transport they would choose if travel time (and costs in the case of public transport) were the same between driving and walking or driving and public transport, 89% said they were willing to change modes at least some of the time. But drivers clearly favoured walking over public transport.

The study concluded that current practice for stated preference surveys for valuation of travel time and travel time savings 'does not consider that some/many people may want to travel, may value their travel time and may choose to drive rather than walk or cycle, not because it is the quickest method of travel, but because they derive some utility from it'.

Furthermore, the results indicate that at least some people have a travel time threshold below which time savings have no value (and they will 'lose' their other perceived benefits) and, given the skewed range of commute times (both existing and preferred), that it may be inappropriate to use a mean value for travel time savings in economic evaluation.

Future stated preference surveys could explore these issues by including questions on time use and attitudes to it, along with ideal commute times, possibly by mode and trip purpose. Looking at 'acceptable' travel time may also prove useful, as commuters may not expect to achieve their ideal commute time.

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A wider look at how travellers value the quality and quantity of travel time, NZ Transport Agency research report 469

Available online at www.nzta.govt.nz/resources/research/reports/469

ESTIMATING INDIRECT BENEFITS FOR PUBLIC TRANSPORT ECONOMIC APPRAISALS

An exploratory study into households' willingness to pay for enhanced rail and bus services drew on the economic concepts of option value and non-use value. The aim was to understand if and how these concepts could be applied to social cost–benefit appraisals of public transport proposals.

At present in New Zealand, evaluations of the socio-economic benefits associated with changes to public transport services generally focus on changes in the 'generalised costs' of travel. These are assessed for people who would actually use the service, and for other people who would experience changes in travel conditions as a result of the service changes (for example, where a proposed service will reduce congestion).

However, another category of benefits flows from public transport services that people may be willing to pay for, even though they would not directly use the service. These are:

- the option value – this is the benefit of having the service available for potential use sometime in the future, even though the option may never be taken up
- the non-use value – this is the benefit an individual derives from the continuing existence of a service or good, even though they do not personally use it and never intend to (people's motivations for desiring the continuing existence of the service vary from context to context).

Option and non-use benefits can be measured and assigned specific monetary values based on what people are willing to pay for them. An example would be how much a person is prepared to pay for a proposed new train service serving their community, even if at present they would not choose to use it.

Although commonly applied in environmental economics, option and non-use values are not included in the NZ Transport Agency's current *Economic evaluation manual* (2010), and are rarely used in social cost–benefit analyses conducted for transport project evaluations in New Zealand.

The research project explored how option and non-use values might be estimated and applied to public transport proposals. Overseas studies indicated that these values are likely to be most significant in situations where substantial changes are proposed for public transport services. These might be where a service is being withdrawn from an area where service levels are already low, or where a new service is being proposed for an area that currently has none. (Transport evaluation procedures in the UK already recommend that option values should always be assessed in these 'substantial change' situations.)

The project firstly developed appropriate market research methods for assessing option and non-use values for public transport projects. These were then applied to a number of New Zealand case study situations, which focused on the outer commuter catchment areas for several main centres (Auckland, Wellington, Christchurch and Hamilton). At the time of the research, most of these areas were poorly (or not at all) served by public transport.

The market research involved telephone-based interview surveys conducted with 100 households in each case study area. The issue explored was how much households would be willing to pay for enhanced rail or bus services to and from their nearby major centre, over and above any use they would expect to make of the services (and compared with the existing situation in all the communities of no, or minimal, services).

A contingent valuation approach was used, based around two key questions:

- How much (per week or per year) would your household be willing to pay (as a maximum) to have each of the specified public transport service options?
- In reaching your view about household willingness to pay, what is the relative importance of various factors that the service might contribute to (eg personal use, use by others in the community, reduced traffic congestion or environmental benefits)?

The project team used the data collected through the research surveys to estimate the distribution of willingness-to-pay values for the option and non-use benefits. These were compared with values reached through similar research conducted overseas and found to be generally comparable (for broadly similar situations). The team then went on to make recommendations about how these values could be incorporated in the economic evaluation procedures for public transport projects in New Zealand.

RESULTS

Based on the survey results, the project team made two willingness-to-pay estimates for each surveyed household and for the sample community overall: first, the total household willingness to pay for each service option (the 'total economic value'); and then the option value and non-use value components of this total (representing an additional economic value that would not be covered by conventional economic appraisals for transport projects, and referred to as the additionality component).

The latter included willingness to pay for the service so that it was available for use by friends, family and others in the community, or for occasional use by household members, none of which are currently covered by transport project economic evaluation procedures.

Summary of total economic value (TEV) and 'additionality' component results (all figures in NZ$/household/year, 2010/11 prices)*

Locality	Major centre	Rail options		Bus options		Notes
		TEV	Additionality component	TEV	Additionality component	
Featherston	Wellington	$231	$132	$60	$34	Figures relative to no service (rail service currently operates)
Oxford**	Christchurch	–	–	$98	$59	Direct bus service
				$66	$40	Indirect bus service
Te Kuiti	Hamilton	$44	$25	$60	$35	Rail service has inconvenient access at both ends of trip
Tuakau	Auckland	$157	$86	$45	$25	

* The table gives mean values derived from each survey. The 95% confidence interval for these results is around ±20% to 25% of these mean values.
** No rail options were examined in the Oxford case (but two bus options were assessed).

Substantial variations were found in willingness-to-pay estimates between the four communities surveyed, reflecting differing community characteristics (household income, size, distance from centre of local community), public transport service characteristics (travel time, frequency and convenience, etc), characteristics of the alternative trip by car (speed, reliability, road quality, etc), and how strong the connection was between the local community and the main centre that the proposed services would link to.

APPLICATION TO NEW ZEALAND ECONOMIC EVALUATIONS

The research recommended that a two-pronged approach be adopted for estimating and applying option values and non-use values for significant public transport service proposals outside urban centres in New Zealand.

First, all relevant service proposals should have the default amounts (estimated from the research) for their option value and non-use value applied, either as part of their main benefit appraisal or as a sensitivity test to that appraisal.

This default appraisal would comprise two components: determination of an appropriate unit value per household in the relevant catchment area; and estimation of the number of households in the catchment area to which this value applied. The result would be an overall option and non-use value for the project that could then be included in the economic appraisal.

The research suggests three default option non-use values, based mainly on the characteristics of the proposed service and how attractive it is likely to be to potential users (given the characteristics of the community they live in).

Proposed default option values/non-use values for economic evaluation

Category	Notes on typical characteristics	Typical catchment area (km radius)	Default value (2010 $ per year/household)	Surveyed option values within category (and additionality values)
High	• Good level of service (eg frequency, reliability, travel time) • Car alternative relatively poor (eg congestion, difficult road conditions) • Service well-matched to desired origins/destinations (eg stop locations)	20–35km	$130	• Featherston – rail ($132) • Carterton – rail ($216)
Medium	• Between 'high' and 'low' characteristics*	10–25km	$75	• Tuakau – rail ($86) • Oxford – direct bus ($59)
Low	• Poor level of service (eg frequency, travel time, need to transfer) • Car alternative relatively good • Service poorly matched to desired origins/destination (eg rail station away from town centre)	10–15km	$35	• Oxford – indirect bus ($40) • Te Kuiti – bus ($35) • Featherston – bus ($34) • Tuakau – bus feeder ($25) • Te Kuiti – rail ($25)

* It is difficult to be more specific about the typical characteristics of the 'medium' category, beyond saying that they are substantially worse overall than the 'high' characteristics and substantially better overall than the 'low' characteristics.

Second, situation-specific surveys should be undertaken for more major service proposals, or cases where the option and non-use values are likely to be pivotal in deciding whether or not a project should go ahead, The survey will provide more accurate option and non-use values for that project in that particular location. Values calculated from these surveys could, over time, be used to refine the default values.

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The benefits of public transport – option values and non-use values, NZ Transport Agency research report 471

Available online at www.nzta.govt.nz/resources/research/reports/471

NEW METHOD DEVELOPED FOR TESTING AND PAVEMENT DESIGN OF STABILISED AGGREGATES

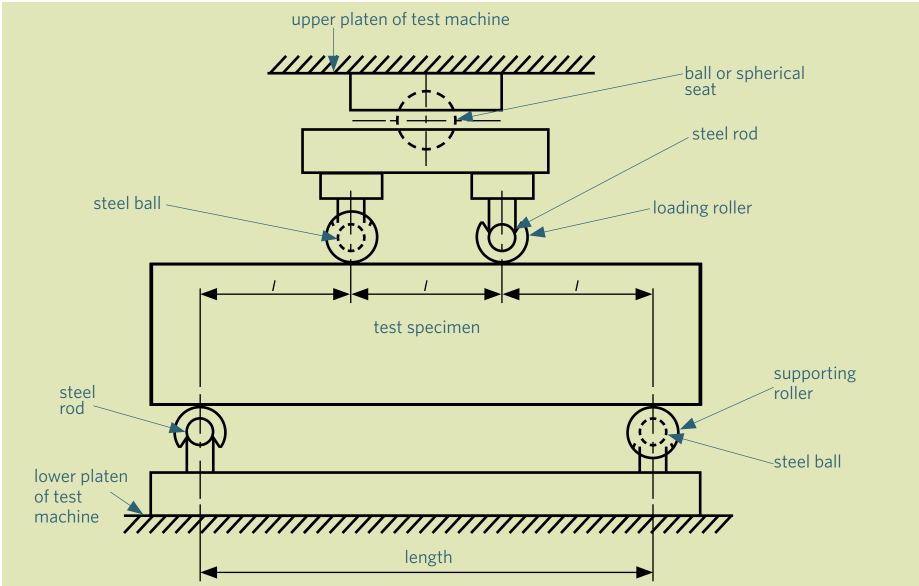
Recent research has explored a new way of testing stabilised aggregates using flexural beam tests. The result is a proposed pavement design method, based on the beam test results.

THE NEED FOR THE RESEARCH

There is currently no test and associated design method for stabilised aggregates used on New Zealand roads that considers cracking or a return to unbound aggregates as a mode of failure. At present, designers tend to ignore cracking or return to unbound, because of the conservative nature of the Austroads pavement design criteria for bound materials.

Previous research had established that both indirect tensile and flexural beam tests were appropriate for testing the strength, modulus and fatigue life of cemented materials. However, subsequent research has reported that indirect tensile testing is inaccurate and does not reflect the beam bending behaviour that occurs in real pavements.

Four-point beam testing apparatus



THE APPROACH

The current project drew on research into flexural beam testing protocols commissioned by Austroads in Australia. The main differences from the Australian approach were the beam size and manufacturing methods adopted for the tests. The variation was necessary because of the significant difference in the size of the aggregates used in pavement manufacture in each country (the maximum aggregate size is 40mm in New Zealand and 20mm in Australia).

Greg Arnold of Road Science explains, 'We were aware that any proposed test needed to be relatively easy to manufacture, so that it could be easily adopted as part of routine design testing.

'We used a rectangular foot mounted on a vibrating hammer to compact the beam samples in moulds until they reached the required density. This enabled us to construct 530mm long by 150mm square samples, substantially larger than the beams cut from a slab that were used in the Australian research. Subsequent testing showed that this method achieved beams of similar strengths to sawn cut ones.'

Flexural beam breakage and fatigue tests were subsequently carried out on beams constructed in this way from a range of stabilised aggregate materials. The results showed that the tensile fatigue relationship for several fatigue tests under repetitive loading could be approximated by single flexural beam breakage tests.

The report proposed a design approach as a starting point, based on the equation:

$$N = \left(\frac{k}{tensile\_microstrain} \right)^{12}$$

Greg says, 'The resulting tensile fatigue relationships led to significantly longer pavement lives than would result from the Austroads pavement design guide for bound materials, yet these lives were still shorter than what actually happened when testing the stabilised aggregate at the Canterbury Accelerated Pavement Testing Indoor Facility [CAPTIF] test track.'

The report urges designers to trial the proposed beam test and associated tensile fatigue design procedure and feed back any observations on its use. Further research is needed to validate the procedure against actual field data.

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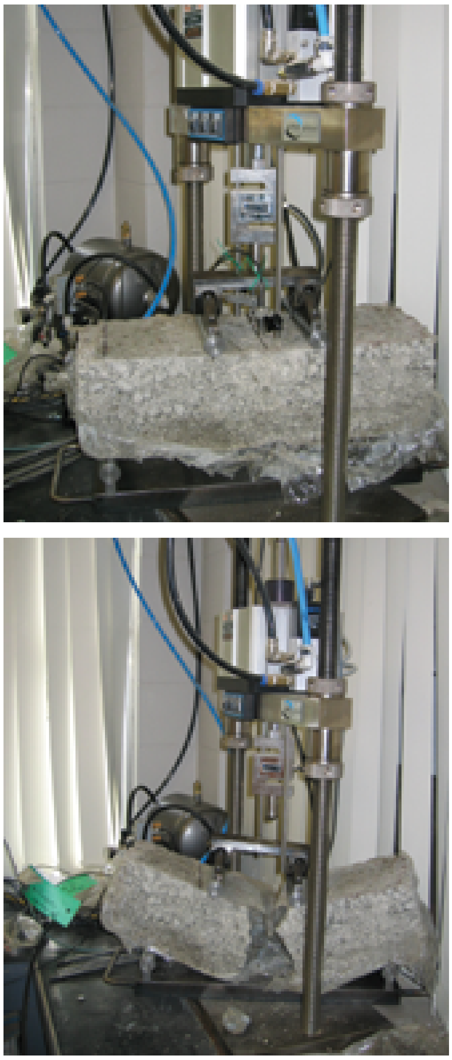
Development of tensile fatigue criteria for bound materials, NZ Transport Agency research report 463

Available online at www.nzta.govt.nz/resources/research/reports/463



Test set-up for measuring flexural beam properties, with the beam at breaking point after the initial test

FURTHER RESEARCH INTO HOUSEHOLD TRAVEL REVEALS CHANGING TRENDS AND LOCAL VARIATIONS

Further research on data from the ongoing New Zealand Household Travel Survey (NZHTS) provides insight into how travel behaviour in particular areas is changing over time.

The research, conducted by Abley Transportation Consultants, aimed to make best use of the information held within the NZHTS database, and was the second part of a two-part project.

Part A, reported in NZ Transport Agency research report 353 *National travel profiles part A: description of daily travel patterns* (Abley et al, 2008), focused on the trip leg patterns that emerged from the survey data between 2003 and 2006.

The current part, part B, draws on an additional four years of data to examine changes in people's travel behaviour over time. It also compares how particular travel behaviours (such as journey times, trip complexity, mode choice and trip generation rates) vary between different areas.

THE NEW ZEALAND HOUSEHOLD TRAVEL SURVEY

The NZHTS is a series of ongoing travel surveys that has been conducted continuously since 2003 by the Ministry of Transport. Its purpose is to increase understanding and build up data about travel behaviour by people in New Zealand, including travel by car as a driver or passenger, walking and cycling.

Households participating in the survey are chosen from within randomly selected census mesh blocks. Within a period of 5–7 years, every household within the mesh block will be invited to take part. Participating households record all travel undertaken by all members of the household for all purposes within a specified 48-hour period. Because of the survey's continuous nature, its data is particularly valuable for detecting and analysing emerging and long-term travel trends, and can be used to inform government policy and for monitoring purposes.

The current research analysed data collected through the survey between July 2003 and June 2010 (representing interviews with 40,160 people from 21,587 households). The data is divided into nine main categories (see the table below). The research project focused on the first three of these: household, person and trip data.

MAIN DATA CATEGORIES AND DESCRIPTIONS

Main data category	Description
Household	Details about the household and its response to the survey
Person	Details about people in the household (information such as age, sex, driving/cycling experience, accident totals, occupation, income, driving, work and school locations)
Trip	Purpose, mode, destination, date, time, duration and distance of each trip leg, and vehicle information
Vehicle	Type, make, model, year, engine size and owner information for vehicles driven during the survey
Alcohol	Drinking session times and locations
Accident	Accident involvement over the last two years
Address	Text description of trip destinations
Accident locations	Text description of accident locations
Trip geocoding	Trip location (map references) and geocoded distance estimates

TRIP LEGS AND CHAINS

Information within the 'trip' category of data is collected about individual trip legs. Trip legs are defined by the Ministry of Transport as a section of travel by a single mode with no stops. So, if a person walks to the bus stop, catches the bus to town and walks to their workplace, they have completed three trip legs (home to bus stop; bus stop 1 to bus stop 2; bus stop 2 to work).

In some cases, trip legs are insufficient to understand travel behaviour, in which case they can be linked into trip chains. Trip chains describe how people link their travel between significant locations, such as home, work or education. Chains are defined as a series of trip legs where no stop between legs exceeds a specified time: typically 30 or 90 minutes.

The main purpose of the chain is defined by the final leg of the trip (the ultimate destination). So, for example, a trip from home to work, with a stop at the shop en route would be a trip chain whose main purpose was to get to work. Purposes for trip legs and chains can include travelling to home, employment, education, shopping, social visits, recreation and 'other' (a catch-all category for purposes not captured elsewhere).

The main travel mode for a chain is considered to be the mode used for the longest leg.

WHAT THE DATA TELLS US ABOUT TRAVEL BEHAVIOUR

The research analysed the data to detect changes in travel behaviour over time. Changes were expressed in trip chains for a range of journey purposes and modes of travel. Comparisons between areas distinguished between the main urban areas of Wellington, Auckland and Canterbury, other main and secondary urban areas, and rural areas.

The following significant changes were detected:

- There was some evidence that trips per household had declined over time.
- For the Wellington and Canterbury main urban areas, there was some indication that commuters were starting their morning commute earlier.
- There was no evidence that commuting distances were increasing over time within the main urban areas of Auckland, Wellington and Canterbury (in Auckland there were marginal decreases potentially reflecting changes in road infrastructure). This contrasted with the other main and secondary urban areas, where consistent increases in commuting distances were detected.
- Trip durations for drivers in the Wellington and Canterbury main urban areas had increased.
- There were contrasting trends for vehicle driver mode share (the proportion of people driving a car to travel) in the three main urban areas of Auckland (showed consistent increases), Wellington (showed consistent decreases) and Canterbury (showed no consistent trends).
- While trip complexity had changed, there did not appear to be any consistent pattern to this in any of the areas.

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Other trends emerged relating to the type of area being surveyed:

- There was higher public transport use in the larger urban areas, with Wellington having the highest proportion of people travelling from home to work and education by public transport (and also the highest proportion walking).
- Motorised transport, particularly public transport, was associated with the most complex trip chains. Walking led to the least complex.
- Wellington had the highest amount of complex trip chains, reflecting its residents' greater use of public transport.
- The main urban areas had higher vehicle driver trip times than other areas, mainly due to congestion.
- Most children travelled to pre-school and primary school as a vehicle passenger. Cycling to school was more common in secondary urban areas, while in Wellington one-quarter of all school-related travel occurred by bus (almost double the proportion in Auckland and Canterbury).

APPLICATIONS FOR THE DATA

One of main aims of the research was to explore the possibility of using the NZHTS data in a predictive way for transport policy and planning. In particular, the study sought to better understand the predictors of travel demand, by mode and purpose, for a range of variables including car ownership, region type, area type, year group and household composition.

However, the research found that the possibilities for using the data in a predictive manner were limited. This was mainly because the database does not contain information about issues and factors that may affect future travel choice (for example, improvements in public transport in an area or changes in fuel prices).

Several new applications for the data did emerge through the research, though, including the possibility of developing new school and household trip generation models. The data can also be used to build a picture of travel movements by mode throughout the day, enabling public transport providers to schedule services to respond to peak demand, and transport planners to target travel demand management measures at specific user groups.

The project developed a series of interactive models (available at www.abley.com/NZHTSmodels and www.nzta.govt.nz/resources/research/reports/467) that practitioners can use to make a range of enquiries from the database about area-specific travel behaviours.

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National travel profiles part B: trips, trends and travel prediction, NZ Transport Agency research report 467

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A NOTE FOR READERS

NZTA research newsletter

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