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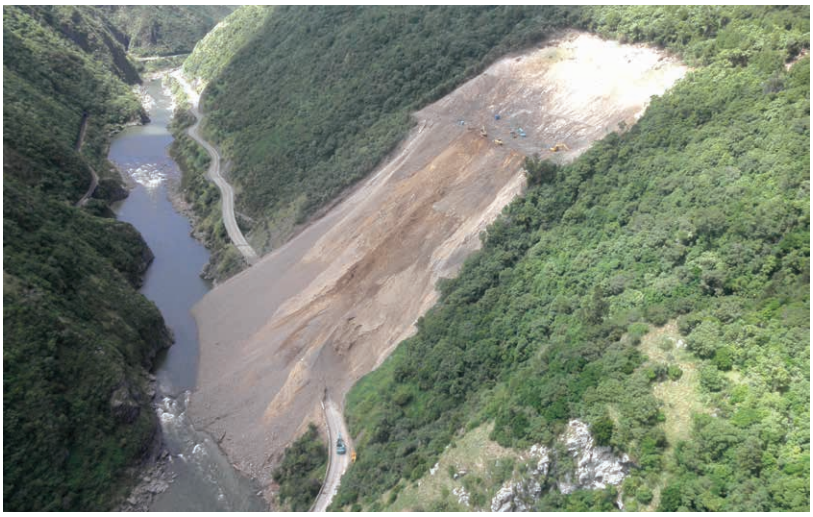
NZTA research

NZ TRANSPORT AGENCY
WAKA KOTAHI



BUILDING RESILIENCE MEANS CONSIDERING BOTH UNPREDICTABLE AND PREDICTABLE HAZARDS

Awareness of predictable hazards is not enough to ensure a resilient transport system and there is growing recognition of the need to consider rare and unpredictable events as well.

Research published in February this year has concluded that measuring resilience from a risk management approach alone is not sufficient and practitioners need to a) consider hazards that fall 'outside of the realms of predictability' and, b) acknowledge that 'failure is inevitable'.

Report co-author James Hughes of AECOM says the risk to critical infrastructure from hazards appears to be increasing globally. These hazards include natural, technological, social and political hazards.

'The ability of the transport system to function during adverse conditions and quickly recover to acceptable levels of service after an event is fundamental to the well-being of communities,' he says.

The NZ Transport Agency's (Transport Agency) interest in ensuring the transport system functions continually and safely has led to a specific focus on the concept of resilience and how this could be defined, measured and improved across the transport network.

This is mirrored in the Treasury's National Infrastructure Plan 2011, which includes the transport sector, and lays out a vision that 'by 2030, New Zealand's infrastructure is resilient and coordinated and contributes to economic growth and increased quality of life'.

'The concept of resilience is wider than natural disasters and covers the capacity of public, private and civic sectors to withstand disruption, absorb disturbance, act effectively in a crisis, adapt to changing conditions, including climate change, and grow over time,' the plan states.

The plan also states that resilience implies transformation, so that not only should the infrastructure service be able to survive or recover, but it should also be adaptable to a changing environment, and could encompass approaches that allow for unknown as well as known hazards.

A PRACTICAL FRAMEWORK AND ASSESSMENT TOOL

The research aimed to develop a practical framework and assessment tool for New Zealand's road and rail network that measured the resilience of the transport system, and which would help with the prioritising of investment decisions.

The report states that resilience is considered the 'ultimate objective in the context of hazard mitigation'.

In assessing resilience, AECOM looked at both technical principles – including robustness, redundancy and 'safe-to-fail'; and organisational principles of change readiness, leadership and culture, and networks.

Based on these principles, a framework to measure resilience was developed which would be applicable to road and rail and allow assessments at various scales: asset, network and region.

continued on page 2

The assessment process consists of a range of questions within each principle, to which the user could assign scores: ranging from 4 (very high resilience – meets all requirements) to 1 (low resilience – poor performance and improvements required). Each individual score could be weighted at the discretion of the user and aggregated if required.

If applied at a regional level, the overall regional scores could be further summarised to give a picture of national resilience for use in National Infrastructure Unit reporting.

The framework could be applied as a non-specific 'all-hazards' approach or a 'hazard-specific' approach. A key difference between these approaches is the inclusion of a risk assessment component.

'An all-hazards approach accounts for the unpredictability of future extreme events and emergent hazards,' says James. 'As these events are inherently unknowable, a likelihood of occurrence cannot be estimated, and as such, a risk assessment is not applicable.

'However, if specific hazards are well known and are required to be assessed, then a risk-based assessment can be undertaken."

The framework is able to evaluate both short-term shock events, such as earthquakes and tsunamis, and longer-term stress events, such as those related to climate change.

NEXT STEPS

Due to project constraints, detailed real-scenario testing of the framework was not undertaken, as specific operator knowledge of assets and the relevant organisations was needed to undertake a meaningful assessment. AECOM recommended that this be considered as a next step.

To further enhance understanding of resilience and help with the implementation of the framework, the researchers also recommend identifying ways to improve understanding of critical transport infrastructure and the factors which may determine criticality, from both an economic and societal point of view. For example, critical routes may include access roads to critical infrastructure nodes (such as control centres or substations) or access to critical community facilities like hospitals.

The report also highlights that further economic and engineering research could be undertaken to better understand and quantify a suitable level of investment in structural resilience. This would generally occur where significant capital expenditure is required and is difficult to justify when funding is limited. A 2013 Australian study, Building our nation's resilience to natural disasters, compared investment in pre-disaster resilience with post-disaster expenditure on relief and recovery through a number of case studies.

'General findings from that study showed that for a vast majority of pre-disaster resilience initiatives, the benefit-cost ratio was favourable, highlighting that the policy response to building resilience to natural disasters must focus on prevention,' says James. 'Similar work is required in a New Zealand context.'

Measuring the resilience of transport infrastructure, NZ Transport Agency research report 546

Available online at **www.nzta.govt.nz/resources/research/reports/546**

BOND STRENGTH AND FLEXIBILITY OF HIGH-FRICTION AND COLOURED SURFACING

Research has significantly advanced understanding of what causes specialist surfacing (coloured and high-friction surfaces) on pavements to fail, and has recommended tests to help prevent failures in future.

The impetus for this research was the premature failing of specialist surfacing in a number of locations nationwide. It was suspected that one of the reasons for these failures was that the surfacing was unable to cope when applied in areas where the underlying pavement was subject to high deflections.

The research has returned promising results, with a suitable test for bond strength identified and recommended for inclusion in future specifications for specialist surfacing. Unexpectedly, flexural beam breakage tests found that specialist surfacing binders have greater flexibility than the underlying asphalt and, hence, are no longer considered a cause of cracking.

It is possible that the cracking results from the thermal expansion and contraction of the asphalt and specialist surface material occurring at different rates. Further research is therefore planned to identify an appropriate test to determine the likelihood of thermal cracking.

SPECIALIST SURFACING

Several different types of specialist pavement surfacing are available in New Zealand and are used for differing purposes and in different contexts. These surfaces tend to be epoxy resin or polyurethane based, rather than constructed using bitumen binders.

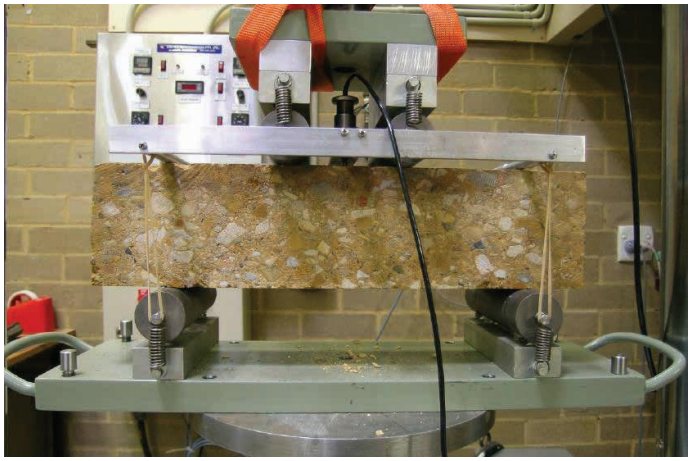
The research focused on testing the epoxy and polyurethane binders used in coloured and high-friction calcined bauxite surfaces. Coloured surfaces are frequently used for bus stops and bus, cycle and transit lanes, while high-friction surfaces are used on intersections, off-ramps and corners. Slurries, another commonly used type of specialist surfacing, were not tested, although the testing developed during the research project could be applied to them in future.

THE RESEARCH

The research sought to explore the respective stiffness of the existing road and the new surfacing, how to ensure these were compatible, and what to do if this was not the case.

The project's initial focus was on surfacing flexibility, with a view to developing deflection criteria that could be used to limit where specialist surfacing could be applied. Testing looked at the strength and flexibility of the different types of surfacing, as well as the bond between the surfacing and the pavement, and the underlying strength of the asphalt.

Flexural beam testing was used, with the bending beam simulating the bending of the specialist surfacing on the pavement under the wheel load.



Flexural beam test
Source: Austroads (2008)

The test was to determine whether or not the specialist surfacing binder was sufficiently flexible to cope with pavement deflection due to traffic loadings, as well as the maximum amount that a pavement could deflect before the surfacing would be damaged. The results were surprising.

Greg Arnold of Road Science who led the research team says, 'It became apparent that our initial assumption, that specialist surfacing couldn't be used in places with high pavement deflections, wasn't correct. What we found was that nearly all of the specialist surfacing resins were, in fact, highly flexible and should be able to cope with very high pavement deflections and rut depths of up to 20mm. It's more probable that the underlying asphalts would crack before the specialist surfaces did.

'Although we found that binder rigidity was not the cause of the premature failures, it is important that the binders used in specialist surfacing are flexible, and we recommend that flexibility criteria are developed so that in future we can continue to ensure that they are.'

The team then turned their attention to the strength of the bond between the surfacing and the underlying asphalt. Leutner shear bond tests were used, as they provide a simple way to test the shear force between two layers. Again the tests returned clear results.

Greg says, 'Our results showed that four out of the five specialist surfacing resins we looked at required asphalt surfaces to be water cut before the surfacing was applied in order to achieve full bond strength. The remaining resin we tested could achieve full bond strength on uncut fresh asphalt surfaces, but it was the exception.'

Full bond strength is achieved when the shear strength of the surfacing at break is equal to the shear strength of the asphalt (also measured using the Leutner shear bond test), indicating it is the asphalt that has failed and not the bond.

From the findings, the research team was able to recommend that Leutner shear tests should be included in future specifications for specialist surfacing, to test the bond strength of the surfacing and asphalt interface, and the shear strength of the asphalt, as both are important to the success of the surfacing. A surfacing is seen to comply with the specification when its tested bond strength exceeds the shear strength of the asphalt mix in the area where it is to be applied.

The team cautions, however, that this should not be an excuse for using a surfacing product that only achieves a low bond strength in areas where the underlying asphalt has low shear strength.

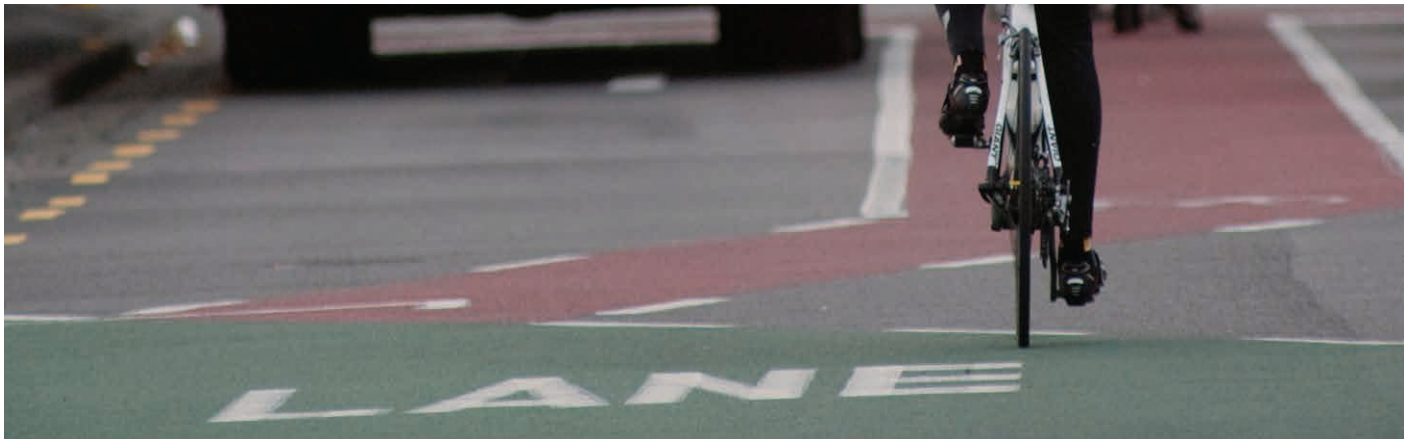
'A better approach is probably to specify a minimum bond strength that all specialist surfacing must achieve, plus a shear strength for the asphalt mix that is suitable for the expected traffic stresses in the area,' Greg says. 'Areas that have high-friction surfacing applied to them, in particular, are subject to high stopping forces, and the pavement has to be strong enough to withstand these or failure will occur.'

Field cores could also be tested (again using the Leutner shear test), post-construction, to check whether or not the full bond strength had been achieved.

The team was unable to recommend a test for binder flexibility, however. The flexural beam test used in the research was considered to be too difficult to interpret, in terms of whether a particular binder passed or failed. Other binder property tests to assess the risk of thermal cracking occurring are potentially more appropriate for inclusion in specifications. Therefore the Transport Agency is funding further research in order to determine this.

Pavement design for specialist surfacings,
NZ Transport Agency research report 543

Available online at **www.nzta.govt.nz/resources/research/reports/543**



NEW LENS TURNED ON ECONOMIC APPRAISAL FOR PUBLIC TRANSPORT INITIATIVES

Research into the economic appraisal of public transport initiatives has made a host of recommendations about the best approaches and procedures to use, and the level of analysis appropriate, for particular types of initiatives and stages in the appraisal process.

The project aimed to develop guidance on the most appropriate economic appraisal (evaluation) methods and associated benefit parameters to use in New Zealand for assessing the viability of public transport initiatives (particularly potential service enhancements).

It focused on two main areas: economic appraisal approaches and procedures; and appropriate parameters and their values for estimating user benefits for public transport initiatives. The recommendations from these areas were then tested in a case study.

ECONOMIC APPRAISAL APPROACHES AND PROCEDURES

The first focus area included a review of international economic and project appraisal approaches and procedures, followed by a more detailed assessment of selected appraisal procedures.

The study identified and assessed five broad approaches to economic-based project appraisal. From these, a multi-criteria analysis framework emerged as the most appropriate for the overall appraisal of transport projects in New Zealand. Within this framework, social cost-benefit analysis was considered the approach best suited to economic appraisal, supported by cost-effectiveness analysis for smaller projects focusing on public transport service and infrastructure changes.

Ian Wallis and Adam Lawrence of Ian Wallis Associates conducted the research together with Neil Douglas (Douglas Economics). Ian says 'This conclusion is consistent with existing practice in New Zealand and practices used extensively internationally. We were therefore recommending that no substantial changes were needed to the current broad approaches to economic appraisal used by the NZ Transport Agency'.

Based on a review of the current procedures used for social cost-benefit analysis and cost-effectiveness analysis in New Zealand, Australia, the UK and the USA, some changes were recommended to the public transport appraisal procedures currently being used in New Zealand. It was suggested that these could be incorporated in the recent (and ongoing) review of the Economic evaluation manual (EEM).

The focus on procedures concluded by addressing how economic appraisal procedures might best be applied to public transport proposals in New Zealand. The research team's main recommendation in this regard was that the level of appraisal should be proportionate, depending on the scale of the initiative being appraised and the stage in the decision-making process. Appraisals were categorised into three levels for this purpose – detailed, rapid and simple. The level allocated to an appraisal determined the approach that should be applied, ranging from full social cost-benefit analysis, through simplified social cost-benefit analysis, to cost-effectiveness analysis (for s maller projects).

USER BENEFIT PARAMETERS FOR PUBLIC TRANSPORT APPRAISAL

The study's second focus area involved a comprehensive review of existing New Zealand and Australian evidence on public transport user benefit parameter values. Findings from 35 market research studies undertaken over the last 20 years were analysed, covering values for travel time in a range of situations, the reliability of travel times, and quality factors for vehicles and for stop and station features.

The evidence was analysed to identify appropriate default values for parameters. The findings were also compared with current values used in the New Zealand EEM and the Australian National guidelines for transport system management.

Recommendations were then made on the parameter values that should be used for: in-vehicle time, headway (frequency), access/egress (walk) time, travel time reliability, seat availability and crowding, interchange (wait time and transfer penalty), vehicle quality and stop/station quality features, and mode-specific factors.

The project concluded with a case study based on the appraisal of short-listed options for the Wellington Public Transport Spine Study. The purpose of the case study was to illustrate how the research recommendations for economic appraisal procedures and user benefit parameter values could be applied in practice, and how these recommendations might affect the estimates of the economic performance of initiatives (eg in terms of benefit-cost ratios).

Ian says, 'Based on our 'detailed appraisal' (using the full procedures in the EEM), we concluded that adoption of our preferred set of public transport user benefit parameter values, in place of the current values in the manual, is likely to make material differences to detailed economic appraisal results for public transport proposals, in both absolute and relative terms. The case study indicated there is a good case for implementing our recommendations on parameter values.'

The case study also examined how the results of applying 'simplified procedures' (included in the EEM) compared with those from applying full procedures. Resulting from this, the team made a series of recommendations on potential changes to the current simplified procedures.

Economic appraisal of public transport service enhancements, NZ Transport Agency research report 533

Available online at **www.nzta.govt.nz/resources/research/reports/433**

PROJECT PRODUCES USEFUL FLOW PATH LENGTH MODEL

Research into the relationship between rut depths and crashes on New Zealand's state highway network was unable to find any significant relationship, due to a paucity of deep ruts (ie ruts in the 10mm to 30mm depth range). This mirrors ambiguous results from research conducted overseas, where the effect of rutting on road safety remains an extremely complicated and much debated topic.

Although the research methodology was able to derive sufficiently robust crash risk relationships for shallower ruts (from 0mm to 10mm depth), which constitute the majority of the ruts on the state highway network, the benefits of filling these ruts was unable to be justified (for economic and safety reasons) on a general basis.

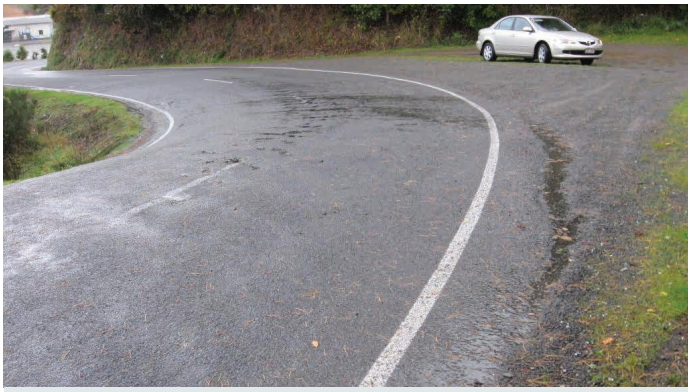
The research did, however, develop a flow path length model, which employs data from the Transport Agency's road assessment and maintenance management (RAMM) geometry table. Although similar models have previously been developed overseas, many of them require inputs that are not available in the RAMM database.

The new model will enable comparisons to be made between predicted flow path lengths and actual surface water depth, as there is a direct relationship between these two variables.

In essence, the longer that water flows along a road (as opposed to running off the side of it) the greater the depth of the water that accumulates. When this accumulated flow encounters surface rutting, ponding can occur, and when combined with changes in the road's gradient (eg sag curves) there are indicators that this increased water depth is more hazardous.

Water is encouraged to run off the road by the road's cross-fall. The new model will enable practitioners to assess whether the cross-fall of a particular section of road is acting as intended. As an example of the model's practical use, the research team looked at expected water flow path lengths for a section of recently constructed highway. The expected flow path lengths, determined from the 'as-built' drawings, were compared with the outputs from the new RAMM-based model, with encouraging results.

Having developed the model, the research team has suggested that, in order to make it more useful and reliable, the flow path and pond depth estimates could be stored in RAMM.



Assessment of the relationship between crash rates and rutting, NZ Transport Agency research report 545

Available online at **www.nzta.govt.nz/resources/research/reports/545**

A BETTER UNDERSTANDING OF THE VALUE OF JOURNEY TIME RELIABILITY FOR FREIGHT

Through its freight planning work, the Transport Agency has received consistent feedback from freight owners and freight transport operators about the importance of travel time reliability for freight.

While travel time delays can have negative consequences for other types of travel, unforeseen delays for freight can create significant costs and, if chronic, have an impact on productivity and ultimately New Zealand's economic competitiveness.

Unpredictable travel delays can result in trucks missing critical 'time gates', such as the loading time for an interisland ferry, the cut-off time for goods to be received at the rail yard, or even missing the time window in which an international ship can accept goods for export. It was for these reasons the Transport Agency wanted to better understand the economic value of journey time reliability in order to assess the impact of freight time delays and develop solutions.

As a first step, the report Reliability and freight – literature and practice review was published in October 2013. The research project reviewed international and New Zealand literature and practice relating to journey time reliability for commercial vehicles and freight. The project brought together researchers from Beca, Ian Wallis Associates, Pinnacle Research and Policy, and the University of Canterbury. Together they produced a proposed programme for future research into journey time reliability in New Zealand, with specific focus areas prioritised according to budget and need.

Andy Lightowler of Beca says, 'Our review was not intended to be exhaustive, as this is a very wide field. Instead, we aimed to review sufficient literature and practice to be able to develop the overall research direction and a programme of work within this. Our plan was that further reviews would then be conducted, as needed, in relation to agreed research areas.'

The research report lays out the proposed structure and content of an ongoing research programme into journey time reliability, identifying specific topics that warrant further research and ranking them using six criteria. The higher priority areas are then organised into a suggested programme of work.

Andy says, 'The programme envisages a number of separate work packages conducted under umbrella project management to ensure coordination and integration within a consistent research framework.'

TRAVEL TIME RELIABILITY

In economic evaluation, the value attributed to journey time reliability relates to the value of travel time savings and losses; this is commonly referred to as the value of time.

At present, the Transport Agency's Economic evaluation manual contains guidance on values of time to be used in economic evaluation. Separate values are given for work, commuting and other travel purposes, with differentiation by car driver, car passenger and public transport passenger.

The manual also provides guidance on evaluating journey time reliability in private road vehicle trips. It does not, however, cover the evaluation of reliability for commercial vehicles and freight.

In Australia, Austroads recently looked at the possibility of including travel time reliability in economic appraisals for projects, but concluded there were a number of challenges that needed to be overcome first.

The current project took up this challenge, looking at a selection of international and local studies and literature on aspects of travel time reliability, including market segmentation for freight, reliability theory and methods, and freight demand elasticities.

The team found there were two general approaches to identifying and assessing the impact of freight time delays and variability.

The first approach involves analysing the consequences of lateness in a freight transport operation, and calculating the related quantifiable costs of this lateness. This approach is usually called the 'factor cost method'. The second approach elicits perceived values for journey time, departure and arrival punctuality from the shipper or transporter. It can use any model of shipper or carrier behaviour to do this, including stated preference and revealed preference techniques.

However, overall the team found there were too many differences, gaps and uncertainties in the studies and literature, and that a structured programme of future research was needed to fill these gaps.

Andy says, 'Our research into and discussion on market segmentation and the concepts of, and approaches to, reliability between passenger transport and freight, and between private and public passenger transport, led us to the conclusion that there are as many differences as commonalities in the subject areas of the research. Also, the research scope for a project such as ours is very broad, with many specific areas that could be pursued. We came to the view this would be more manageable if future research was compartmentalised within an overall framework.'

A PROPOSED RESEARCH FRAMEWORK

As a first step to developing such a framework, the research team divided the many potential research topics into three main areas.

1 Reliability in general road traffic – this applies to both private transport and buses in the general traffic stream, and to road freight. It includes research into interventions to reduce variability of travel time in the general traffic flow and its impact; and the treatment of reliability in traffic network modelling and evaluation using trip data.

2 Reliability in personal transport – research in this area, in contrast to freight research, needs to be closely focused on the theory of reliability valuation, and the identification and evaluation of interventions to improve journey time reliability. The research does not specifically extend to identifying interventions to reduce delay.

3 Value of time, reliability and demand elasticity for freight transport – the freight areas of research are more extensive in that they cover:

   a quantifying the impact of delays and identifying and evaluating interventions to reduce time delays and improve time reliability

   b developing new freight values of time and reliability

   c researching freight demand elasticities.

After being organised into this framework, the topics have been prioritised using six criteria:

1 The importance of the knowledge gap (whether closing it would enable useful new methods of better quality information)

2 Size of each market segment addressed by a research initiative (larger segments and those with potentially larger gains were prioritised)

3 The extent to which the gaps are specific to New Zealand (priority was given to topics that could not be filled by adapting existing or overseas research)

4 Chance of success (and of achieving useful results)

5 Intended research focus (whether the topic fits within it, and has been or is already being researched in New Zealand)

6 Research cost.

The research topics assessed to be of higher priority have been incorporated into a proposed programme of work. The programme has been budget constrained, with areas listed according to their assessed priority and some topics grouped together. The following table summarises the programme, and the research report gives more details of each of the proposed stages.

	RESEARCH AREA AND MILESTONES	ESTIMATED TIME PERIOD, MONTHS
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1	**Review the EEM reliability procedure:**	
1a	Analyse existing survey data	
1b	Development of a revised procedure for private vehicles	
1c	Add a procedure for public transport (bus)	
2	**Review EEM values of CV and driver time:**	
2a	Update CV replacement values, kms/year & depreciation	
2b	Driver costs, hours/year, use of time saved, survey design/test	
2c	Main survey, analysis and report	
3	**Freight time and reliability, values and elasticities**	
3a	Roadside freight and operator surveys	
3a1	- roadside survey design and pilot	
3a2	- freight operator enquiries	
3a3	- review official data and sample expansion method	
3a4	- main survey and analysis	
3b	Stated preference surveys of freight shippers/operators	
3b1	- industry approaches and development of sample frame	
3b2	- preliminary industry surveys	
3b3	- SP survey piloting	
3b4	- main SP survey and analysis	
3b5	- derivation of perceived values and demand elasticities	
3d	Derivation of values of freight time for EEM	
3d1	- interim freight values	
3d2	- final freight values	
4	**Interventions to improve reliability and reduce its impact:**	
4a1	Explore the range of interventions in general road traffic	
4a2	Assess their potential contribution	
4b1	Review of active management of bus regularity	
4c1	Use of ATIS to improve reliability and reduce its impact	
4d1	Measures to mitigate delay on strategic freight routes	
5	**Value of reliability in tourism:**	
5a	Value of reliability for tour buses	
5a1	Initial discussion with representative operators	
5a2	Develop a sample frame and estimate market size	
5a3	Design and pilot an exploratory survey	
5a4	Execute the main survey, analyse and report results	
5b	Value of reliability for airport access	
5b1	Traffic composition on airport access routes	
5b2	Initial scoping passenger survey	
5b3	Main passenger survey and analysis	

Reliability and freight – literature and practice review, NZ Transport Agency research report 538
Available online at **www.nzta.govt.nz/resources/research/reports/538**

NEW RESEARCH REPORTS

New Zealanders' attitudes towards drug-driving and suggested countermeasures

NZ Transport Agency research report 544

Available online at www.nzta.govt.nz/resources/research/reports/544

This study was conducted in New Zealand in 2012 to investigate the attitudes, prevalence, habits and self-reported risks associated with drug-driving, along with possible countermeasures. Telephone and internet surveys were used for a general population sample. Face-to-face interviews, mainly in prisons, surveyed habitual users of four main drug types: alcohol and other drugs, cannabis, methamphetamine and benzodiazepine.

Alcohol was the main substance used before driving, followed by alcohol and cannabis together and cannabis alone. Nearly half the general population respondents had driven after taking drugs or alcohol and a sizable proportion after taking drugs other than alcohol.

Many respondents in the face-to-face group said they took risks when driving. Only a third had a full licence despite driving for more than 10 years. The majority had been involved in a crash, more than half being at fault.

Countermeasures preferred by both the general population respondents and the habitual drug users included randomised roadside testing, vehicle impoundment and enforcement. Social media was considered effective by the general population but not by the face-to-face group. Recommendations include research into the effects of drugs on driving and the development of programmes to reduce risky driving by drug users.

Fatigue design criteria for road bridges in New Zealand

NZ Transport Agency research report 547

Available online at www.nzta.govt.nz/resources/research/reports/547

Road bridges are subjected to millions of cycles of heavy vehicle loading over their design lives, and the introduction of higher vehicle mass limits on New Zealand roads will significantly increase the rates of fatigue damage in bridge superstructures. The Transport Agency's Bridge manual has relied on British and Australian standards for fatigue design criteria, and the aim of this project was to provide the basis for amended fatigue loadings based on New Zealand heavy vehicle characteristics, with allowances for forecast long-term growth in volumes and vehicle masses.

The base fatigue loading was derived from analyses of effects on bridge spans of heavy vehicles recorded at weigh-in-motion sites between 2007 and 2011. The base fatigue loading was then adjusted for increases in legal vehicle masses permitted under Land Transport Rule: Vehicle Dimensions and Mass Amendment 2010 – introducing high-productivity motor vehicles (HPMVs).

The recommended fatigue design vehicle is a 54-tonne 8-axle truck-and-trailer, which represents the dominant freight vehicle on New Zealand roads scaled up to full HPMV higher mass limits. Cycle counts for this vehicle were derived to fit New Zealand routes and growth forecasts. Factors enabling the continued use of the Australian fatigue design vehicle are included.

Other recommended fatigue design criteria draw on the Australian and Eurocode bridge design standards.

Literature review of the costs and benefits of traveller information projects

NZ Transport Agency research report 548

Available online at www.nzta.govt.nz/resources/research/reports/548

The Transport Agency selected URS NZ Ltd to conduct a literature review in 2013 to find available cost and benefit information for traveller information systems (TIS) and associated products. The outcome of this literature review will be used as reference material for current traveller information projects and as the basis for future New Zealand TIS projects.

The study aimed to begin to fill the knowledge gap in the field of TIS and provide detailed information on the costs and benefits associated with the use of TIS. TIS have been credited with providing various direct and indirect benefits to the end user during day-to-day journeys and on key transport routes during the pre-trip and en route travel stages. The claim is that TIS increases travel efficiency by better utilising the existing transportation network. The end users of TIS are essentially anyone who needs to travel – no matter what the mode. This includes pedestrians, cyclists, public transport users and drivers: travellers, motorbike riders, motorists, freight operators, commuters, drivers of emergency vehicles and all other drivers. Many governmental organisations as well as transport operators provide TIS which implies there is some perceived merit to the expenditure.

Literature from New Zealand and around the globe was investigated during the course of this project.

NEW RESEARCH REPORTS

Operating characteristics and economic evaluation of 2+1 lanes with or without intelligent transport systems assisted merging

NZ Transport Agency research report 549

Available online at www.nzta.govt.nz/resources/research/reports/549

Reducing delay and achieving higher traffic flow rates and a reduction in the frequency and severity of crashes is a key component of New Zealand's long-term success in managing its transport network. The research focused around developing, implementing and measuring safe and robust design principles and techniques to understand economic efficiency and operation on New Zealand's highways with a focus on passing lanes and 2+1 passing facilities.

The research built on existing local and international knowledge, captured key observed data in order to develop an understanding of on-road behaviour and operational characteristics, identify the core components of economic costs and savings, establish principles for measuring the optimal economic return from the length and frequency of passing lanes, and evaluate the potential benefits of ITS design treatments of passing facilities.

Transport productivity and sub-industry measures

NZ Transport Agency research report 550

Available online at www.nzta.govt.nz/resources/research/reports/550

This research investigated using four different approaches to measuring the productivity of the sub-industries (ANZSIC three-digit group level) that comprise the New Zealand transport sector. The four approaches investigated were the growth accounting framework, the Tornqvist index, the Malmquist index and the input–output tables-based approach. The unit-record data available from Statistics New Zealand's Integrated Data Infrastructure was applied to enable the analysis.

The productivity indicators derived from the four approaches presented in the report were disaggregated by mode (air, sea, road and rail) and movement type (people and freight). The report offers insights into the sources and components of transport productivity growth and will serve as a starting point to better understand the contributions that various transport services make to the economy.

As part of the research project, the software codes to retrieve and clean the raw data and compute productivity indicators have been placed in Statistics New Zealand's datalab. This means the Transport Agency and other consortium partners will be equipped to replicate the analysis over time.

Car passenger valuations of quantity and quality of time savings

NZ Transport Agency research report 551

Available online at www.nzta.govt.nz/resources/research/reports/551

The objective of this research project was to undertake primary market research in New Zealand, at an exploratory level, to gain greater understanding of car passengers' valuations of travel time savings in a range of situations. Based on this exploratory research, the project assessed the priorities for a more extensive (quantitative) research programme, which would derive a new set of car passenger values for demand modelling and economic evaluation applications in New Zealand.

The research methodology focused on:

- assessment of international and New Zealand literature, research and practice relating to valuations of car passenger travel time savings (in particular relative to the equivalent driver valuations)
- exploratory (primary) market research with a small sample of New Zealand adults, to explore their attitudes and preferences to travelling as a car driver or passenger, including indications of their willingness to pay to save time in a variety of car travel situations (including as a solo driver, as a driver with adult/child passengers, as a passenger, and as a member of a car 'group')
- development and comparative assessment of options for further New Zealand based market research to establish willingness-to-pay valuations by car passengers (and drivers) in a range of car travel situations.

SUPPLEMENTARY ISSUES OF *NZTA RESEARCH*

For the last four years we have been publishing regular supplementary editions of the NZTA research newsletter to promote the large number of research programme reports published by the Transport Agency.

These newsletters are available in sequential order at www.nzta.govt.nz/resources/nzta-research/index.html

We are now reverting to quarterly issues of the newsletter, with the publication of the occasional supplementary issue.

NEW RESEARCH REPORTS

The development of design guidance for bridges in New Zealand for liquefaction and lateral spreading effects

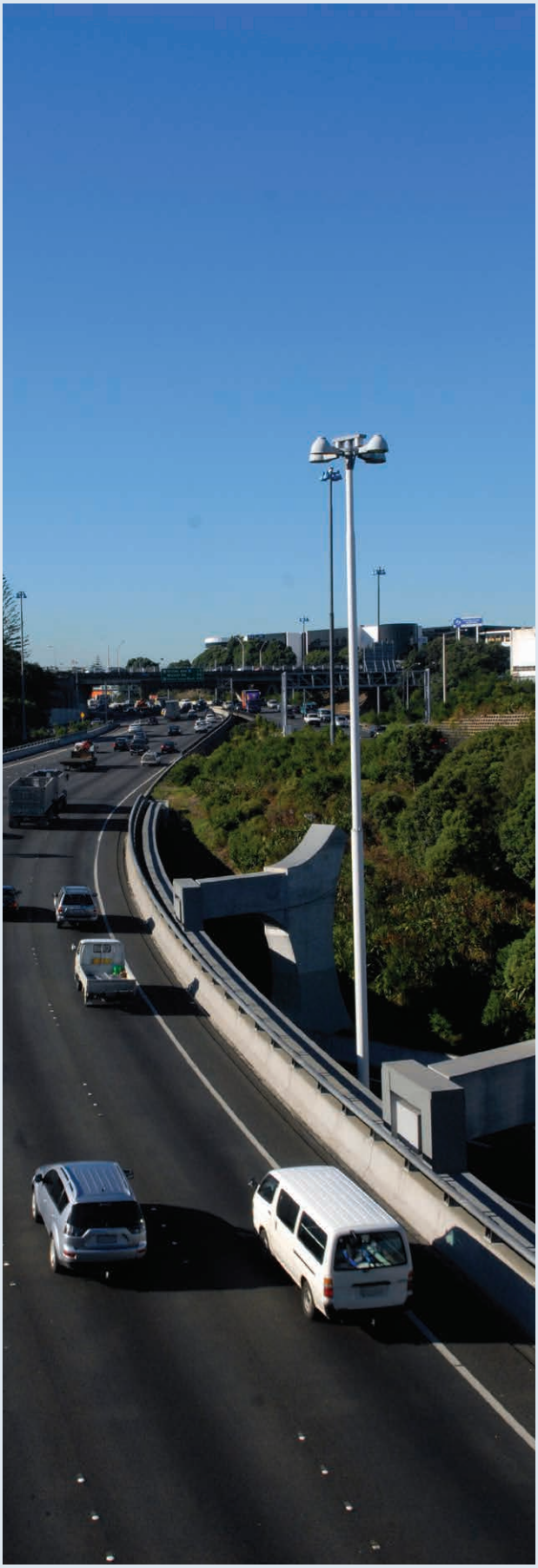
NZ Transport Agency research report 553

Available online at www.nzta.govt.nz/resources/research/reports/553

This report presents a summary of the outcomes from a research project commissioned by the Transport Agency to develop design guidance for bridges in New Zealand for liquefaction and lateral spreading effects. The study involved the review of relevant case studies and available design methods. The report summarises available design procedures that are based on observed seismic behaviour of bridges and on the most recent research findings, and identifies design methods appropriate for New Zealand conditions.

The report also considers issues associated with liquefaction and lateral spreading and their effect on bridge structures and summarises requirements for geotechnical investigations, evaluation techniques for liquefaction and lateral spreading, methods of ground improvements and liquefaction analysis, structural mitigation solutions, construction and monitoring issues.

The report also identifies areas where supporting information is not available and further research work is required. Additional work is recommended to summarise the findings in a form of a technical memorandum which can be later incorporated into the Transport Agency's Bridge manual and disseminated to the wider New Zealand engineering community. This report is intended for engineers who are familiar with geotechnical and structural design practice for static and seismic loading of bridges.



OBTAINING TRANSPORT AGENCY RESEARCH REPORTS

All research reports published since 2005 are available free of cost for downloading from the Transport Agency's website www.nzta.govt.nz/planning/programming/research

PDF scans of research reports published prior to 2005 are available by emailing research@nzta.govt.nz

A NOTE FOR READERS

NZTA research newsletter

NZTA research is published quarterly by the NZ Transport Agency. Its purpose is to report on research invested in through the Transport Agency's Research Programme, to act as a forum for passing on national and international information, and to aid collaboration between all those involved. For information about the Transport Agency's Research Programme, see www.nzta.govt.nz/planning/programming/research.html.

Advertisements of forthcoming conferences and workshops, that are within the newsletter's field of interest, may be published free of charge when space permits.

Published articles may be reproduced and reference made to any part of this publication, provided appropriate credit is given.

All general correspondence, queries related to conference notices, and requests for additions or amendments to the mailing list, should be made to research@nzta.govt.nz

The current edition of the newsletter, NZTA research, is available in hard copy and on the Transport Agency website at www.nzta.govt.nz/resources/nzta-research/. Back editions are available online only.

Disclaimer

The views expressed in *NZTA research* are the outcome of research and should not be regarded as being the opinion, responsibility or policy of the Transport Agency or of any agency of the New Zealand Government.

Email alerts of newly published research reports

Email notifications are provided when new issues of *NZTA research* are published. Notification is also provided when new Transport Agency research reports are published on the Transport Agency's website at www.nzta.govt.nz/planning/programming/research.html. Please email research@nzta.govt.nz if you would like to receive these email alerts.

Do we have your correct details?

We would like to hear from you at research@nzta.govt.nz if you wish to update your name, email or address details, to alter the number of hard copies of *NZTA research* you'd like to receive or to go on to the email list for alerts of the publication of newsletters and research reports.

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DID YOU KNOW...

That there is a spreadsheet on the Transport Agency website listing all published Transport Agency research reports?

The spreadsheet is searchable by several criteria and can be found at **www.nzta.govt.nz/planning/programming/research.html**

The spreadsheet has two worksheets; the first worksheet lists research reports with associated key words and the second lists research reports with the report abstracts.

NZ TRANSPORT AGENCY WAKA KOTAHI

New Zealand Government