ASSET PERFORMANCE MONITORING WORKING GROUP
DEVELOPMENT OF BENCHMARKS
Last version: Report No. 2 – May 2007

1.0 INTRODUCTION

1.1 Purpose

The objective of the Asset Performance Monitoring Group is to create a set of high-level benchmark indicators that Road Controlling Authorities (RCA) can use to:

- show progress on against the objectives of the Land Transport Management Act 2003 (LTMA); and
- drive and demonstrate continuous improvement.

This report summarises progress to-date and looks at the way forward.

1.2 Legislation and Government Policy

1.2.1 Land Transport Management Act 2003 (LTMA)

The objectives of the LTMA are set out in the New Zealand Transport Strategy (NZTS) released in 2002. For the benchmark indicators to show progress on the LTMA, they must align with the principles and objectives as set out in the NZTS.

To summarise, the Government's overall vision for transport is –

"By 2010 New Zealand will have an affordable, integrated, safe, responsive, and sustainable transport system."

The vision is underpinned by four principles:
- Sustainability
- Integration
- Safety
- Responsiveness

The Government's objectives for transport are:
- To assist economic development
- To assist safety and personal security
- To improve access and mobility
- To protect and promote public health
- To ensure environmental sustainability

1.2.2 Updated New Zealand Transport Strategy (uNZTS)

In December 2007 the Government released a discussion document as a forerunner to creating an update for the NZTS. This document has clearly stated high level outcome targets for 2040. These are stretch targets which are focused on the LTMA objectives:

1.2.3 Government Policy Statement (GPS)

The first GPS is expected to be released at the end of July 2008

2.0 BENCHMARKING STRUCTURE

2.1 Key Result Areas

Eight key result areas have been identified, which will be monitored to show progress against the LTMA objectives, the NZTS targets, and demonstrate good business practices. The alignment of the indicators with the LTMA objectives is summarised in Table 1, and with the targets in the uNZTS in Table 2. A large tick ✓ shows direct correlation with the objective or target, and the smaller bracketted (✓) denotes where the key result area contributes to the objective or target.

2.2 Indicators

A series of indicators have been selected, which relate to the key result areas and give a perspective on the direction of progress in these areas. Further measures provide data that shows the direction of movement in an indicator, which in turn implies the direction of progress in the key result area, and hence progress against the objectives of the LTMA.

Some of the indicators are hard measures which can be quantified and which relate directly to the key result area. Others are measurable but only imply the direction of progress in the key result area because they share a correlation with the issues, eg. if the number of deaths and injury from road crashes decreases, then by implication, safety improves. Some of the indicators are soft measures because they are obtained from survey results and other subjective data sources.

The indicators and measures are deliberately set at a high level and it is possible and in fact necessary, to drill down into other measures and data to support or further explain the direction of the indicator. Many of these sub-measures will differ between Road Controlling Authorities (RCA) as they account for local factors.

2.3 Benchmarking

The indicators have been or will be developed to enable direct comparison of performance over time, between RCAs and where possible between countries.

Individual RCAs can benchmark their progress in a range of ways:

- internally, exploring their own progress over time;
- they can compare their achievement with the national performance of all RCAs or the average of all the other contributing RCAs
- they can track their progress against a pre-set target;
- they can compare their results with sub-sets of RCA that share similar issues, or local conditions, i.e. various peer groups.

In comparing the range of achievement between RCAs, exceptional performance (very high or very low) can be identified and analysed. It is in looking at these outliers - particularly in the form of a case study, that we have the potential to uncover innovations that can enable step improvements in performance.

With some indicators, there are issues regarding their benchmarking potential. Some lend themselves more to comparison at a National level and will be weak or misleading at a disaggregated level. Given local issues, some indicators will not be relevant to some networks. Where these concerns are present, they are noted against the indicator.

2.4 Presentation of Data

The way the data is reported and presented enhances the value of contributing to a benchmarking system.

Various forms of presentation work better for the different types of comparison. Wherever possible, visual representation is used in preference to text, or straight numerical representation.

The ultimate outcome would be an interactive system, preferably at a website, which allowed contributors to select indicators and comparisons as required, rather than be restricted to prescribed sets of data. This will be explored further once the structure of the benchmarks is established and trialled.

Table 1: Key Result Areas & Alignment of Indicators with LTMA Objectives

No.	Key Result Areas	Indicator	Objectives				
			Economic Development	Safety & Security	Access & Mobility	Public Health	Environmental Sustainability
1	**Safety**	1.1 Fatals/VKT	(✓)	✓		✓	
		1.2 Serious Injury/VKT	(✓)	✓		✓	
2	**Satisfaction**	2.1 Stakeholder	✓	✓	✓	✓	✓
		2.2 Customer	✓	✓	✓	✓	✓
3	**Vehicle Use**	3.1 Car VKT/population	(✓)		(✓)	(✓)	✓
		3.2 HCV VKT/GDP	✓		(✓)	(✓)	
4	**Asset Condition**		✓	✓	(✓)	(✓)	(✓)
5	**Investment Efficiency**	5.1 Maintenance $/VKT	(✓)	(✓)			
		5.2 New $/VKT	✓	(✓)	✓		
6	**Management Ability**		✓	✓	✓	✓	✓
7	**Environment/Energy Use**					(✓)	✓
8	**Route Reliability**	8.1 Congestion	✓		✓	(✓)	(✓)
		8.2 Route Security	✓		✓		

Table 2: Key Result Areas & Alignment of Indicators with uNZTS targets.

Table refer page 19 of the uNZTS

2.5 RCA Forum - Our Benchmarking Club

Overseas models show that benchmarking provides greater value where it is coupled with a forum where contributors can discuss their performance and share case studies and experiences.

It is in seeking out variance and explaining it, that the valuable lessons are learnt. The RCA Forum is an already established body that can fill this role immediately.

3.0 KEY RESULT AREAS - DEVELOPMENT

The following pages show the development to-date of the eight key result areas, and highlight any issues relating to them. Their further development is also itemised.

Key Result Area 1: Safety - Kaye

Description of the Result Area:

Two indicators are used to show progress in improving Road Safety:

The Road Safety to 2010 goal ***"is to reduce the number of road deaths per year to no more than 300 and hospitalisations to no more that 4,500 by 2010."***

The uNZTS detailed target is to have ***no more that 200 deaths per annum by 2040.***

Description of the indicators:

1.1 Number of fatal crashes divided by vehicle kilometres travelled (VKT)
1.2 Number of serious injury crashes divided by vehicle kilometres travelled (VKT)

The measure is divided by VKT to enable comparisons between RCAs. By apportioning an authority's share of the national VKT, targets can be set to align with the 2010 goals

Drilling Down

There are very well-developed techniques and data sets which enable an RCA to explain the performance of these indicators. These including crash reduction studies, blackspot analysis, crash factors, and so on.

Data Availability/Robustness – Comment

Data for this measure is readily available through the Crash Analysis Systems (CAS) reporting system although there can be a delay in the data being available for use. The VKT information comes from the Road Asset and Maintenance Management (RAMM) database. This data is produced by multiplying the length of road by the number of vehicles travelling on it. Traffic count data must be kept up to date for this measure to be robust and each controlling authority needs to ensure their counting strategy (including the location of counting stations and the frequency at which counts are taken) is robust. This would be seen as a data area that requires improvement.

Desired Trends

The expected trend is a downward line such that the Road Safety to 2010 targets are met in 2010, after which we would continue to aim for a downward trend.

There are issues with benchmarking for individual RCAs particularly those with small sets of data. These RCAs are likely to experience wide fluctuations in the indicators from year-to-year.

Benchmarking Issues

Disaggregated results for small RCAs with small sample sizes, will be distorted. The VKT normalises the data for comparison and an assessment has been made to set the 2010 target within this context; specifically an assumption of annual traffic growth of around 2% per annum has been used.

Results that we have:

Graph 1 - total National Fatals / VKT over time with Target 2010 line.
Graph 2 - total National Serious Injury / VKT over time with Target 2010 line.
Graph 3 - current year 'fatals' by RCA / VKT - highest to lowest.
Graph 4 - current year 'serious injury' by RCA / VKT - highest to lowest.

Case Study Proposed

Determine from Graphs 3 & 4.

Further Development

The Ministry of Transport and Land Transport NZ are currently undertaking a joint study to improve the area of traffic counting. The " Project to improve the quality of traffic flow data in RAMM" is being carried out as a pilot study for delivery by the end of 2007 and roll-out thereafter.

Key Result Area 2: Satisfaction – Rob

Description of Indicator

This will be designed to show progress on all five of the LTMA objectives. With this purpose to fulfil, a survey methodology will be developed that asks the appropriate questions of the relevant sample of customers and stakeholders. There is a requirement to define "customer" and "stakeholder" adequately as part of the development of these indicators.

The output could be a nationally undertaken survey or a set of questions and sample criteria that an RCA can integrate into their existing survey protocols.

Drilling Down

[under development]

Data Availability/Robustness – Comment

Currently most road controlling authorities undertake some type of customer feed back survey but these surveys have not been set up in a consistent manner so the results cannot be benchmarked.

The robustness of the data is dependant upon creating a strong methodology, which is consistently applied by each RCA. It will take several years to gather trending data and some RCAs may wish to continue asking their survey questions to provide a transition period.

Desired Trends

The expected trend for customer satisfaction scores, would be to converge on a score considered appropriate such as 7-8 on a scale of 1-10 (on the basis that scores less than 6 were not optimal but scores of 9 and 10 indicated over delivery). Alternatively a system such as that used by the National Highways Best Value benchmarking club in the UK could be applied where the data from all members' surveys is gathered allowing individual RCAs to compare themselves with the average trends of their peers.

Benchmarking Issues

[under development]

Results that we have:

[under development]

Case Study Proposed – Highs and Lows

[under development]

Further Development

The Consultant has been asked to prepare a proposal to develop these two indicators as described above. A key part of the brief is to ensure that existing practices are investigated and wherever appropriate, are integrated and co-ordinated into this process rather than 'reinvented'.

Key Result Area 3: Vehicle Use - Kaye/Balt

Description of the Key result Area

The Updated NZ Transport Strategys' 2040 targets:

- Double passenger transport mode share to 7% (now 2-3%)
- Increase public transport mode share at peak travel times in Auckland, Wellington and Christchurch to 20% (now 9%)
- Lift coastal shippings' share of inter regional freight to 30% tonnes/km (now 15%)
- Lift Rails share of domestic freight to 25% tonnes/km (now 18%)

Two indicators have been selected:

3.1 light vehicle kilometres travelled annually divided by population; and
3.2 heavy commercial vehicle kilometres travelled annually divided by Gross Domestic Product.

The first indicator shows the use of cars and by inference, over time it will hopefully show the level of use of alternative transport options or that a reduction in vehicle use was occurring.

The second indicator implies efficiency in transportation of freight from the perspective of economic development.

Drilling Down

Sub-measures used to explain or support the trends evident in the indicators could include:

- Passenger Transport numbers
- Cycle/walk surveys
- mode split freight
- weight of freight/VKT

Data Availability/Robustness – Comment

VKT is derived by multiplying the length of road by the traffic count taken on it. The selected denominators are population (taken from the latest census) and GDP (available from Statistics NZ).

The traffic count and length data is available from RAMM and is not considered robust for several reasons:

- not all road controlling authorities have a tidy database;
- not all RCA have a robust traffic counting strategy, or methodology to apply these counts to the total network in RAMM;
- not all counts are classified so the HCV content is often assumed rather than measured;

Having said that, VKT will still be appropriate to show changes over time.

Benchmarking Issues

Indicator 3.1 will be strongest when applied Nationally or to large urban environments, such as Auckland, Wellington, Christchurch, Hamilton, etc.

Indicator 3.2 will also only be meaningful at a national level since a large portion of freight movement is long haul and traverses across regions.

Desired Trends will be meaningful when applied to total National data, but may not disaggregate meaningfully for individual RCAs.

The expected trend for both Indicators would be decreasing over time.

Results that we have:

Graph 1 – National data over time – $VKT_{\text{light vehicle}}$ / Population
Graph 2 – Graphs for Major Cities – $VKT_{\text{light vehicle}}$ / Population
Graph 3 –National data over time - VKT_{HCV} / GDP
Graph 4 – National data over time - Tonnage of freight moved / VKT_{HCV}

Case Study Proposed – Highs & Lows

[under development]

Further Development

The Ministry of Transport and Land Transport NZ are currently undertaking a joint study to improve the area of traffic counting. The " Project to improve the quality of traffic flow data in RAMM" is being carried out as a pilot study for delivery by the end of 2007 and roll-out thereafter.

Key Result Area 4: Asset Condition - Chris

Description of Indicator

The indicators used will be:

4.1 Smooth Travel Exposure – (STE)
4.2 Skid Resistance (SCRIM)
4.3 Surface Condition Index (CI)
4.4 Pavement Integrity Index (PII)

These indicators, when available, will be presented either as a composite single index or pictorially such as on a radar diagram.

Drilling Down

In explaining the condition of an asset, contextual data such as expenditure on capital improvements, and maintenance and renewals need to be taken into account. Historical factors such as the timeframe in which the asset was built, the build quality at the time, underlying soil conditions, loadings on the network and so on, would also explain trends.

Data Availability/Robustness – Comment

Considerable data is available and has been consistently collected thanks to RAMM and the use of dTIMS. The key issue with these indicators is that they statistically focus on the outlying 5-10% of the bell curve and do not have a focus on whether or not the median is remaining within an acceptable range or not.

[pictorial explanation to be developed]

Desired Trends

This will depend on the nature of the indicators and how they are presented for benchmarking.

Benchmarking Issues

[under development]

Results that we have

[under development]

Case Study Proposed

[under development]

Further Development

[under development]

Key Result Area 5: Investment efficiency - Balt

Description of Indicator

Two indicators are proposed:

5.1 Capital expenditure/VKT
5.2 Renewal and maintenance expenditure/VKT.

The expenditure is divided by the vehicle kilometres travelled to allow comparison across geographical areas and to test the logic that higher traffic roads require more investment. Offsetting this is the understanding that roads require a certain level of maintenance regardless of the traffic loading.

Drilling Down

Reference to the asset condition indicators could explain or support trends in these indicators.

Data Availability/Robustness - Comment

The issue of the calculation of VKT as described under key result areas 1 and 3, applies here as well.

The expenditure data would initially be taken from the data reported to Land Transport NZ. This would give weight to the consistency of the data although in some areas it would be incomplete as Land Transport NZ only collect data on works for which they provide a subsidy.

The expenditure is based on gross figures (including both subsidy and local share) and will be shown as costs in the year that they occurred. A contextual line for trends in the level of inflation would provide the context to explain some of the movement in the expenditure trend.

Desired Trends [under development]

Benchmarking Issues

[under development}

Results that we have
Graph 1 – National annual expenditure on capital or new works / VKT
Graph 2 – Annual expenditure on capital or new works by RCA / VKT ranked highest to lowest
Graph 3 – National annual expenditure on maintenance and renewals / VKT
Graph 4 – Annual expenditure on maintenance and renewals by RCA / VKT ranked highest to lowest

Case Study Proposed [under development]

Further Development

Further development would address the issue of whether or not to include non-subsidised work categories to give a more balanced view and include alternatives to road transport.

Key Result Area 6: Management Ability - Joe

Description of the indicator

Two indicators measure management ability:

6.1 A self assessment questionnaire that asks road asset mangers to rate the quality of the organisation's asset management systems. Systems are:
- Asset management plan
- Safety management system
- Asset management gap analysis
- Network risk assessment
- Asset management systems
- Pavement deterioration model
- Emergency response plan
- Business continuity and recovery plan.

6.2 Reporting on the achievement of the annual programme.

This indicator is under development and could take the form of a comparison of the number of projects proposed in a Long Term Council Community Plan (LTCCP) or an Annual Plan and the actual number achieved in any one corresponding financial year.

Drilling down

[under development]

Data availability/robustness - comment

Much of the data for indicator 6.1 will be subjective. Indicator 6.2 would be based on more robust figures.

Desired trends

For indicator 6.1 we would expect self-assessment scores to converge at an acceptable rating such as say 6-8 out of a score of 10. For indicator 6.2 you would expect to target 100% achievement each year.

Issues with benchmarking
[under development]

Results that we have [under development]

Case study proposed [under development]

Further development

It is recommended that an online questionnaire be developed to allow the self-assessment to be carried out with a component of independent audit such as those already carried out by Land Transport New Zealand and Audit New Zealand.

Key Result Area 7: Environmental Impact / Energy Use - Balt

Description of the Key Result Area

The Updated NZ Transport Strategys' 2040 targets:

- To halve per capital domestic greenhouse gas transport emissions

Public health
Noise

No net loss of indigenous vegetation or fauna from infrastructure construction or maintenance

Two indicators have been selected:

7.1 Total fuel consumption/VKT
7.2 Proportion of national Green House Gas (GHG) emissions attributed to road transport

These indicators represent inputs to land transport and outputs from land transport. They relate to vehicles and therefore cannot be directly influenced by individual RCAs. Nevertheless there should be an awareness of them.

Drilling Down

The many environmental impacts of land transport include resource consumption (both during construction of vehicles and infrastructure and during their operation), emissions to air, noise, vibration, stormwater runoff quantity and quality, and solid waste. The selected indicators may be regarded as 'representative' environmental impacts in which there is presently particular interest. Awareness of the other impacts is growing rapidly and location-specific identification and monitoring of problems (and solutions) is already occurring.

Data Availability/Robustness – Comment

Fuel for motor vehicle use is distributed through outlets throughout NZ but those outlets supply non-vehicle use and the vehicles travel widely. Thus, while there is a reasonably good understanding of fuel consumption at national level, information at the RCA level is not considered a reliable indicator of local use. Presently the best (most consistent) estimates would be obtained by proportioning fuel use using local VKT.

There is no direct measurement of the emission of greenhouse gases from the motor vehicle fleet although there have been studies leading to an understanding of emissions from individual vehicles. Estimates of green house gas emissions from the national fleet have therefore been derived from modelling and RCA level estimates have been obtained by proportioning using local VKT.

The issue of the calculation of VKT as described under key result areas 1 and 3, applies here as well.

Desired Trends

Increasing fuel efficiency of the fleet and a decline in the use of fossil fuels, should produce a downward trend in total fuel consumption / VKT.

A decreasing impact of land transport on greenhouse gas emissions will be evidenced by a declining VKT / population and a drop in the proportion of national GHG emissions attributable to road transport.

Benchmarking Issues

Both indicators will only be suitable for benchmarking at a national level.

Results that we have:

Graph 1 – total national fuel use for land transport / VKT over time
Graph 2 – GHG emissions from land transport / total national GHG emissions.

Case Studies Proposed

[under development]

Further Development

An awareness of other vehicle and infrastructure impacts on the environment is growing rapidly, as is the identification and monitoring of problems, hence the development of solutions will increasingly be necessary on a location-specific basis. Examples will include dealing with congestion, recycling of pavements, the treatment of runoff, erecting barriers for noise etc.

Key Result Area 8: Route Reliability – Congestion - Siri

Description of Indicator – 8.1 Congestion

Travel time reliability – Travel times by modes will be predictable

Two indicators are proposed for the measurement of congestion in urban centres

- "Variability of Travel Time "
- "Average Travel Speed".

Options/Drilling Down

Other indicators such as "actual travel time", "variability of travel time", "nominal travel time" and "congestion indicator" can be used to measure or explain congestion. In 2004 the Ministry of the Environment recommended these four indicators for transport (Refer: Monitoring and Data Management Protocol: Environmental Indicators 2004).

Data Availability / Robustness

The data required for these indicators is gathered in accordance with AUSTROADS floating car method, which can be modified by using Global Positioning Systems (GPS) technology to log positions.

The calibration of survey equipments and timing of surveys needs to be consistent in order to ensure accurate information is gathered and to enable the benchmarking of results.

Desired Trends

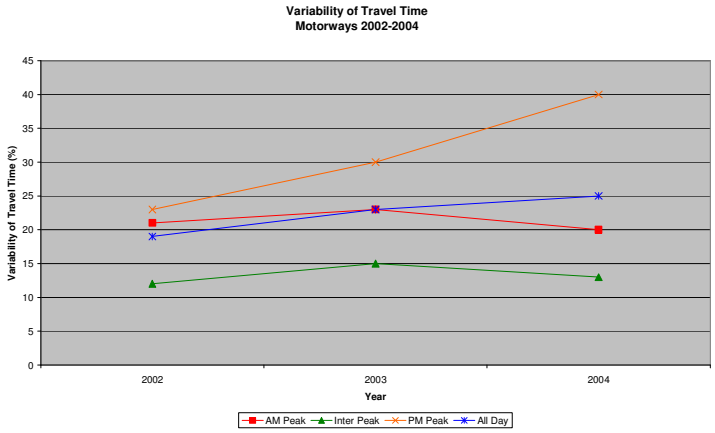
The objective is to keep the variability of travel time, and travel speed, to a minimum in order to ensure route reliability. If a minus variation is achieved it means that the travel time is decreasing and it is an indication that the route is getting less congested. Hence the desired trend would be to converge on a variance of zero.

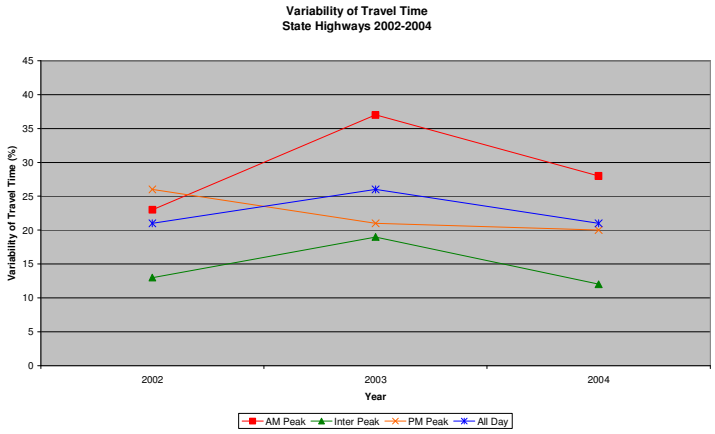
Issues with Benchmarking

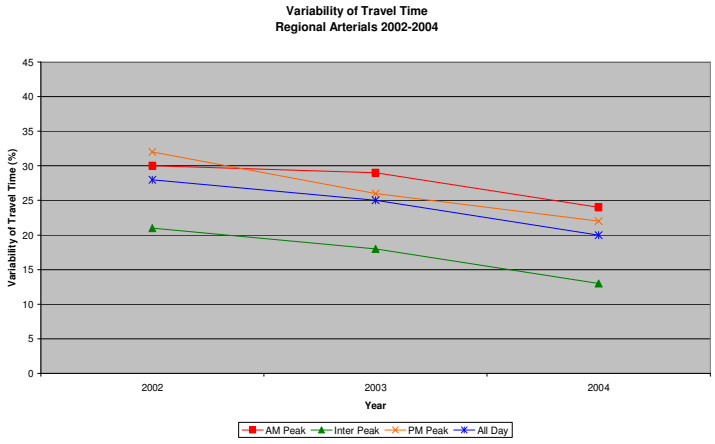
Only RCAs with areas of urban traffic would be collecting this level of data. Benchmarking between urban centres could pose difficulties and this will be looked at in more detail, as the measures are refined.

Results

Sample results from Auckland region are produced below to provide an example of the indicators and the type of results possible.







Road Category	Variation in Travel Time											
	AM Peak			Inter Peak			PM Peak			All Day		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
Motorway	21%	23%	20%	12%	15%	13%	23%	30%	40%	19%	23%	25%
State Highway	23%	37%	28%	13%	19%	12%	26%	21%	20%	21%	26%	21%
Regional Arterial	30%	29%	24%	21%	18%	13%	32%	26%	22%	28%	25%	20%

Comparison of the Variability of Travel Time by Road Category for 2002, 2003, and 2004 Surveys (from Auckland Traffic System Performance Monitoring Report – November 2004)

Case Studies

[under development]

Future Development

The future developments may include:

- Refine in the methodologies for data capture including timing and frequency of surveys and selection of routes for surveys etc.
- Central location for the recording and management of the data (would RAMM be a suitable repository?)
- Development of a unified methodology for the presentation of results

Key Result Area 8: Route Reliability – Route Security - Kaye

Description of Indicator 8.2 – Route Security

The indicator is a measure of the potential vehicle kilometres of travel that road users are denied due to the closure of a road.

The measure is calculated by multiplying the length of the closure, as taken from available detour points either side of the block, by the Average Annual Daily Traffic (AADT) as apportioned to the duration of the closure.

Measure (VKT) = length (km) x duration of closure/24 (hours) x AADT (vehicles)

The measure can be compared to the total annual VKT of a network to obtain a percentage that the network is operational over, for example, an annual period.

Drilling Down

In collecting the data on road closures the RCA should also record the nature of the closure:

- Discretionary closure (such as an event, road works and so on)
- Emergency closure (such as crashes, events, slips, flooding etc)

The nature of the reasons and causes of closures will reflect the topography, climate, geotechnical conditions, and vehicle use on the network. Where high numbers of closures were due to vehicle crashes, a safety problem will be implied.

Data collected might also track a contractor's response time, recording the time elapse from receipt of the phone call notifying of the need for an emergency closure to the commencement of the closure.

Data Availability/Robustness – Comment

The duration of a closure and reasons/causes would have to be collected manually, but as each RCA is probably monitoring these events now this would not be difficult. The issue of the calculation of VKT as described under key result areas 1 and 3, applies here as well.

Desired Trends

The measure should remain static or decrease from the perspective of providing a service level to the road users. Fluctuations on networks with small sample sizes would be explainable.

Benchmarking Issues

This measure can be benchmarked although networks with small sample sizes may produce results, which fluctuate markedly when compared to larger networks.

Results that we have:

Under development although Transit New Zealand has some data available which can be presented in the next report. This is an indicator that will build up a history over time.

Case Studies Proposed

[under development]

Further Development

Based on the amount of data available and its analyses, development projects may be identified in the future.