

# Australian Profile Specifications for Data Collection Down Under



Road Profiler User Group 2006  
Des Moines, Iowa

*Richard Wix*



# What We Will Discuss

- Cake
- The impact of variety
- The 1997 NZ Experience
- Ensuring consistency
- Life on the road (or isn't funny what you see)

# Acknowledgements

This presentation has been prepared with the assistance of the following personnel:

- Michael Moffat, ARRB Group
- Paul Robinson, ARRB Group
- Dave Robertson, Transit New Zealand

# Chocolate Cavity Maker Cake

Submitted by: Caitlin Koch



Photo by: laurenbowen

"Chocolate, chocolate, chocolate. This cake is so moist and rich there's absolutely no need for frosting. This cake made me an instant star with my clients. I quickly became known as 'that incredible chocolate cake lady!'"

Original recipe yield: 1 - 10 inch Bundt pan.

**Prep Time:**

30 Minutes

**Cook Time:**

1 Hour

**Ready In:**

2 Hours

**Servings:**

12

## INGREDIENTS:

- 1 (18.25 ounce) package dark chocolate cake mix
- 1 (3.9 ounce) package instant chocolate pudding mix
- 1 (16 ounce) container sour cream
- 3 eggs
- 1/3 cup vegetable oil
- 1/2 cup coffee flavored liqueur
- 2 cups semisweet chocolate chips

## DIRECTIONS:

1. Preheat oven to 350 degrees F (175 degrees C). Grease and flour a 10 inch Bundt pan.
2. In a large bowl, combine cake mix, pudding mix, sour cream, eggs, oil and coffee liqueur. Beat until ingredients are well blended. Fold in chocolate chips. Batter will be thick. Spoon into prepared pan.
3. Bake in preheated oven for 1 hour, or until cake springs back when lightly tapped. Cool 10 minutes in pan, then turn out and cool completely on wire rack.



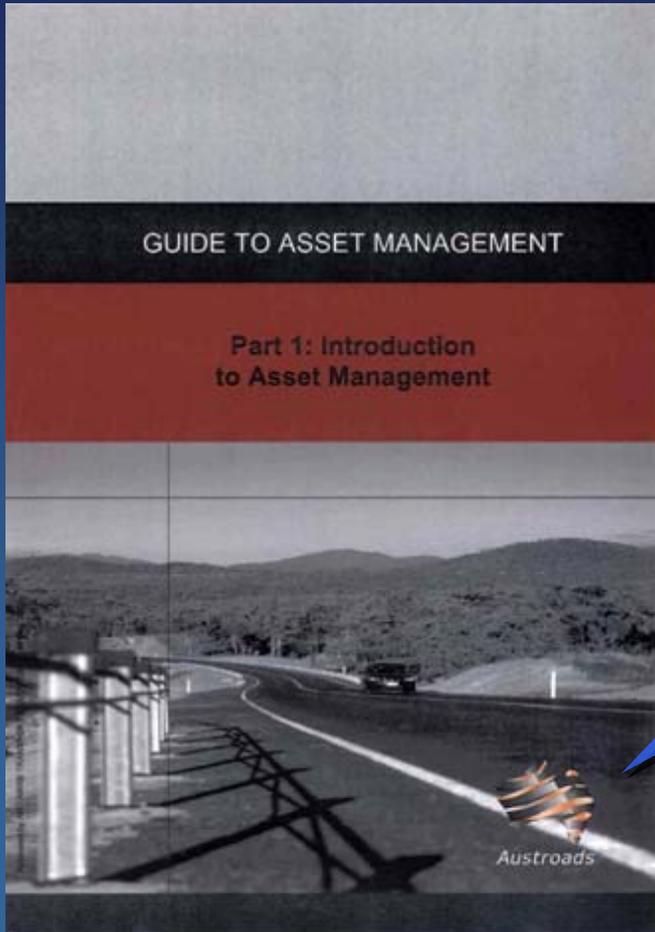
# Automated data collection is like a chocolate cake .....

- It comes in many different varieties but they may not always be to your liking
- View of supplier and purchaser may not be the same



But I'm still a chocolate cake!

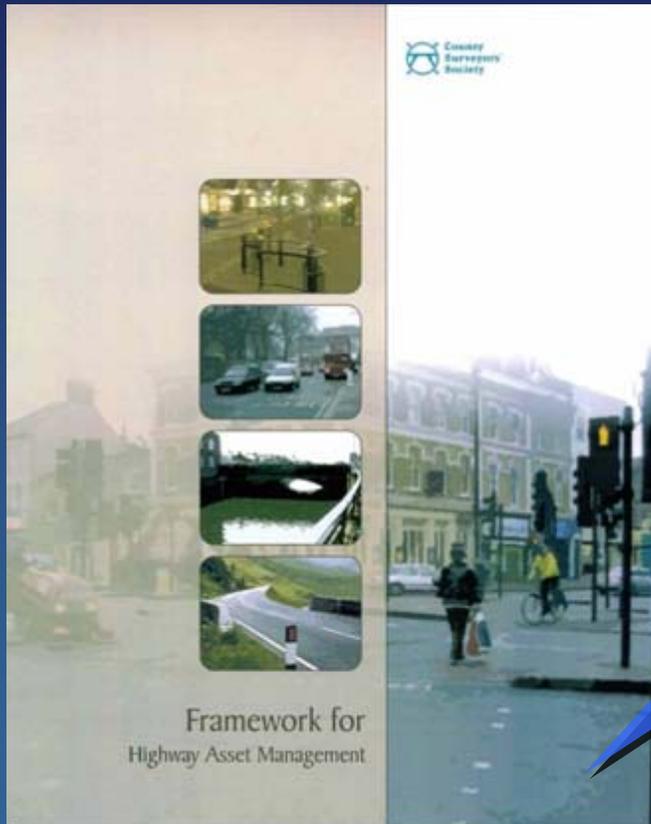
# Why is the recipe important?



***[data] informs the analyses and decisions taken throughout the asset management process***

# Why is the recipe important?

***Data is the foundation  
of highway asset  
management***



# The NZ Experience 1997



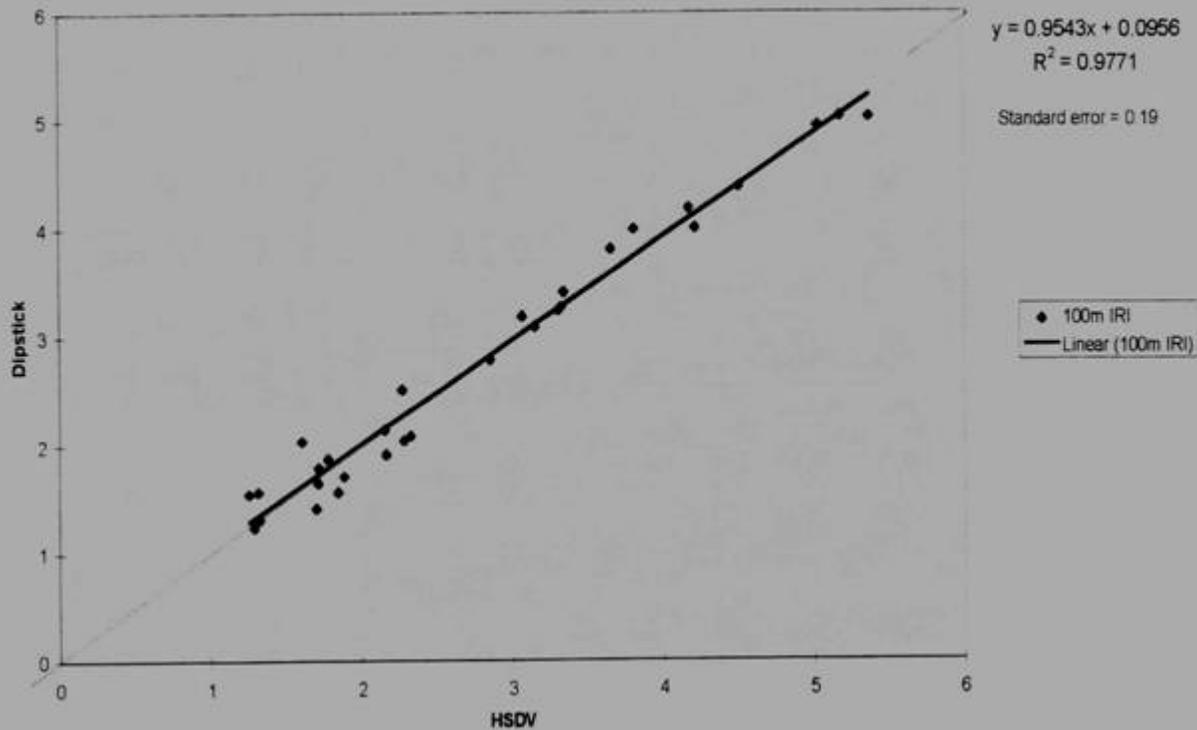
1999-796

## New Supplier, new roughness results

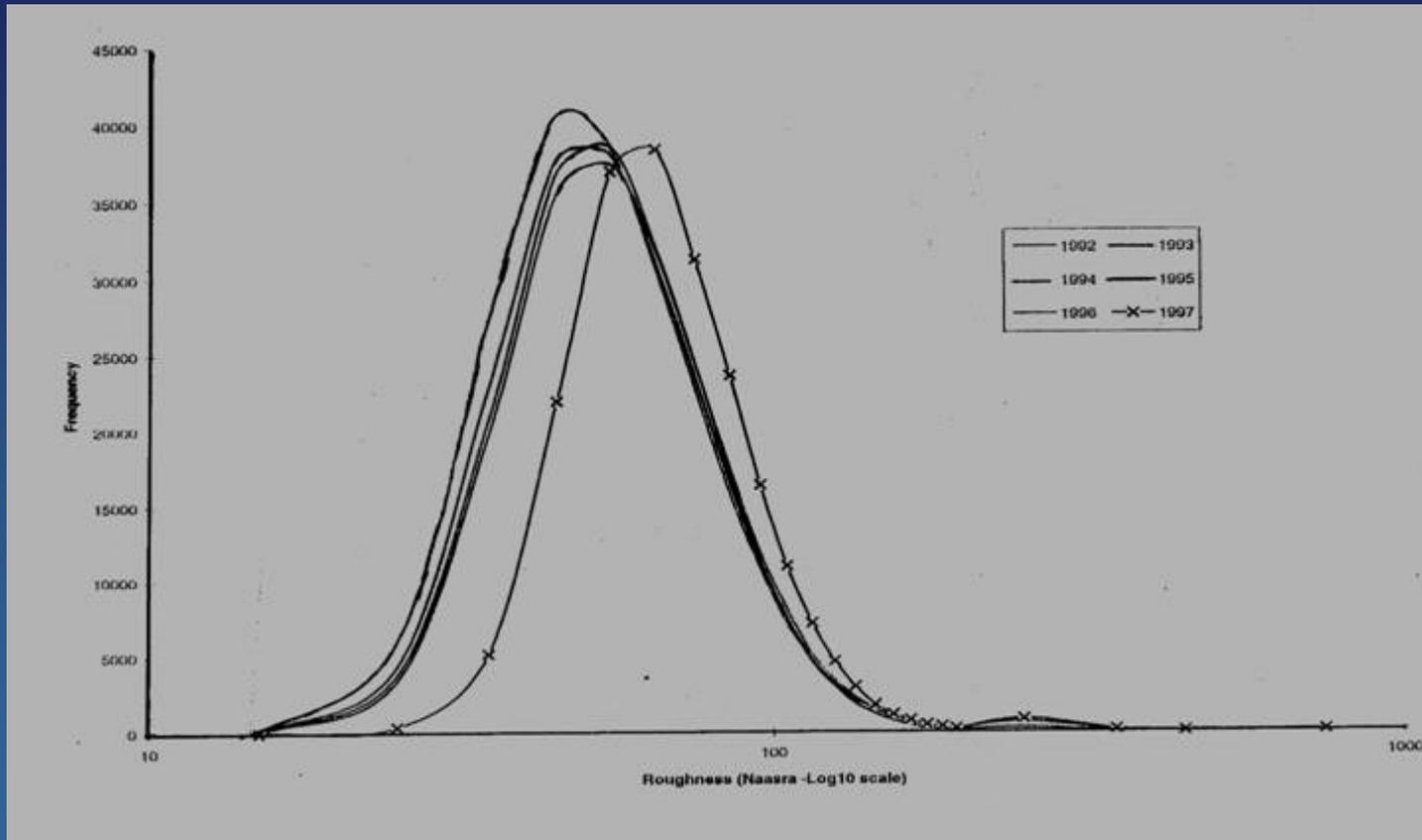
- 14% increase across the network
- Met the contract requirements
- Extensive investigations
- “*Annus horribilus*” (Quotation from contract manager)

# Looked OK

Figure 13 : All sites mean of ten 10m IRI both wheelpaths at 50kph

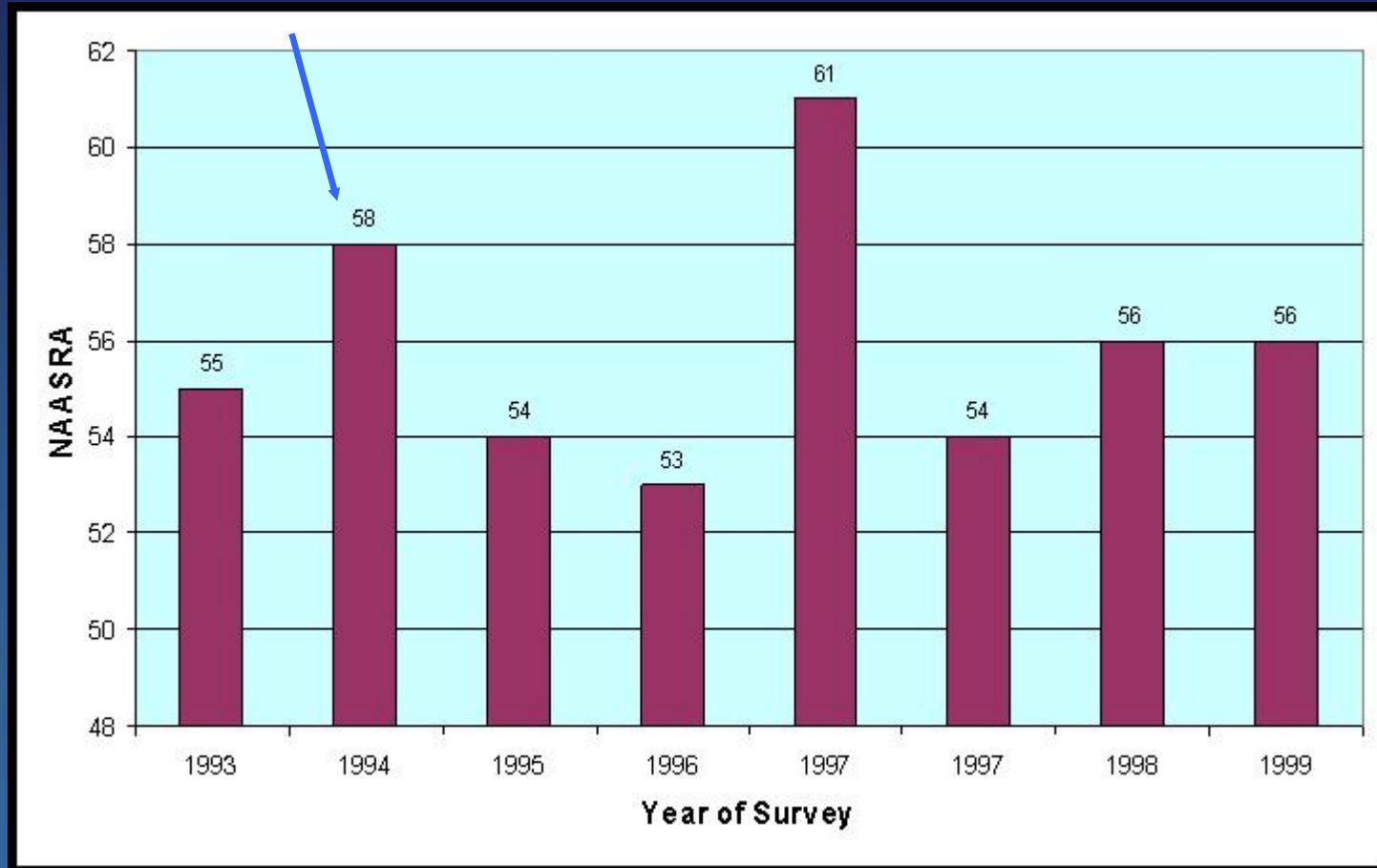


But....



# And....

## Road works



Sounds like a job for....



*Austroroads*

# Austroads

- Austroads is the association of Australian and New Zealand road and traffic authorities
- 11 members include
  - Federal government - DOTARS
  - Six states – NSW, Vic, Qld, WA, SA, Tas
  - Two territories – ACT, NT
  - Australian Local Government Association
  - Transit NZ

# Austrroads Purpose

- Facilitate collaboration between road agencies to avoid unnecessary duplication
- Promote consistency, uniformity and harmonisation between agencies
- Identify and promote best practice
- Commission Research
- Provide Technical Reports and Manuals

Website [www.austrroads.com.au](http://www.austrroads.com.au)

# Austrroads Guidelines

In 1997 Austrroads via AMRG commissioned (BS.A.65)

Development of Draft Guidelines for Data Collection

- Only useful road condition data is collected
- Cost efficiency of collecting and processing road condition data is improved
- Quality of road condition data is improved
- Road condition data collected will be of increased value to road owners

# Australian Road Network

## Australian Road Network

- 1980 - 260,000 km sealed, 540,000 km unsealed
- 1997 - 316,000 km sealed, 487,000 km unsealed
- Little increase in overall length but net increase of 56,000 km in sealed network
- Need for improved management of a maturing network



# Pavement Condition Parameters of Import in Australia

- Roughness
- Rutting
- Texture
- Cracking
- Strength
- Friction



(Primarily collected automatically)

# How collected?





# Roughness forms the largest data set

- Historically collected via response meter until late 1980s
- Laser profiler from late 1980s

# Response Type Meter (NAASRA or Bump Integrator)

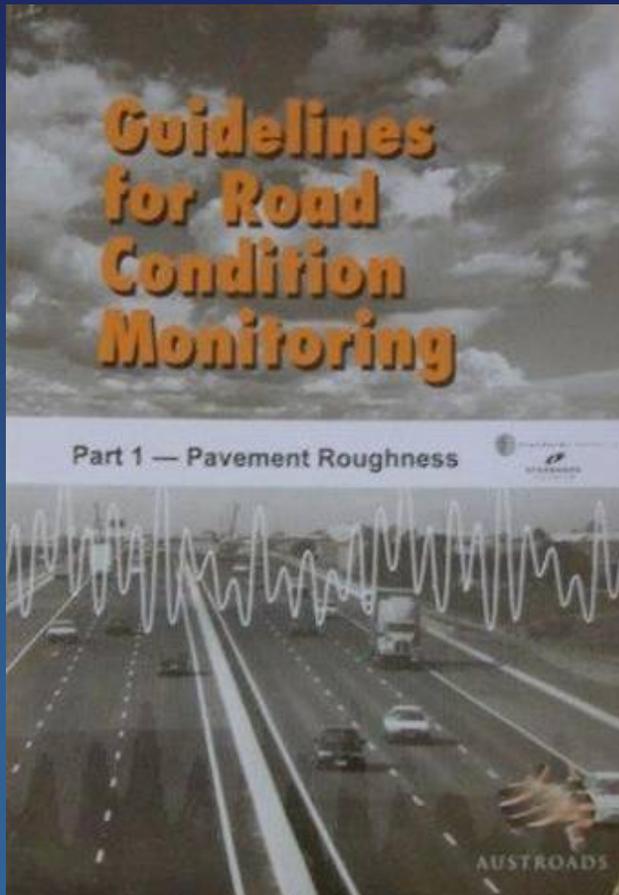
- may be vehicle or trailer mounted
- response Type Road Roughness Measuring System
- measures axle body displacement
- output dependant on dynamics of host vehicle, speed and tyre pressure



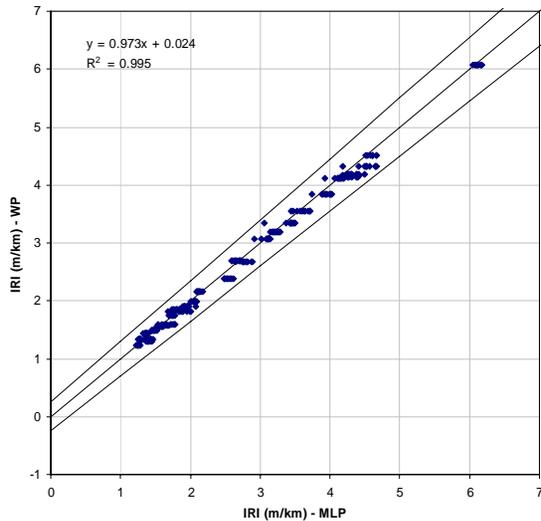
# Scope of Guidelines

- The guidelines are intended to form the basis of specifications for collecting and reporting information for monitoring of road networks.
- Outline the minimum requirement for national harmonisation and are not intended to replace individual SRA specifications or technical notes
  - roughness
  - rutting
  - strength
  - cracking

# In some instances the wheels of progress turn slowly

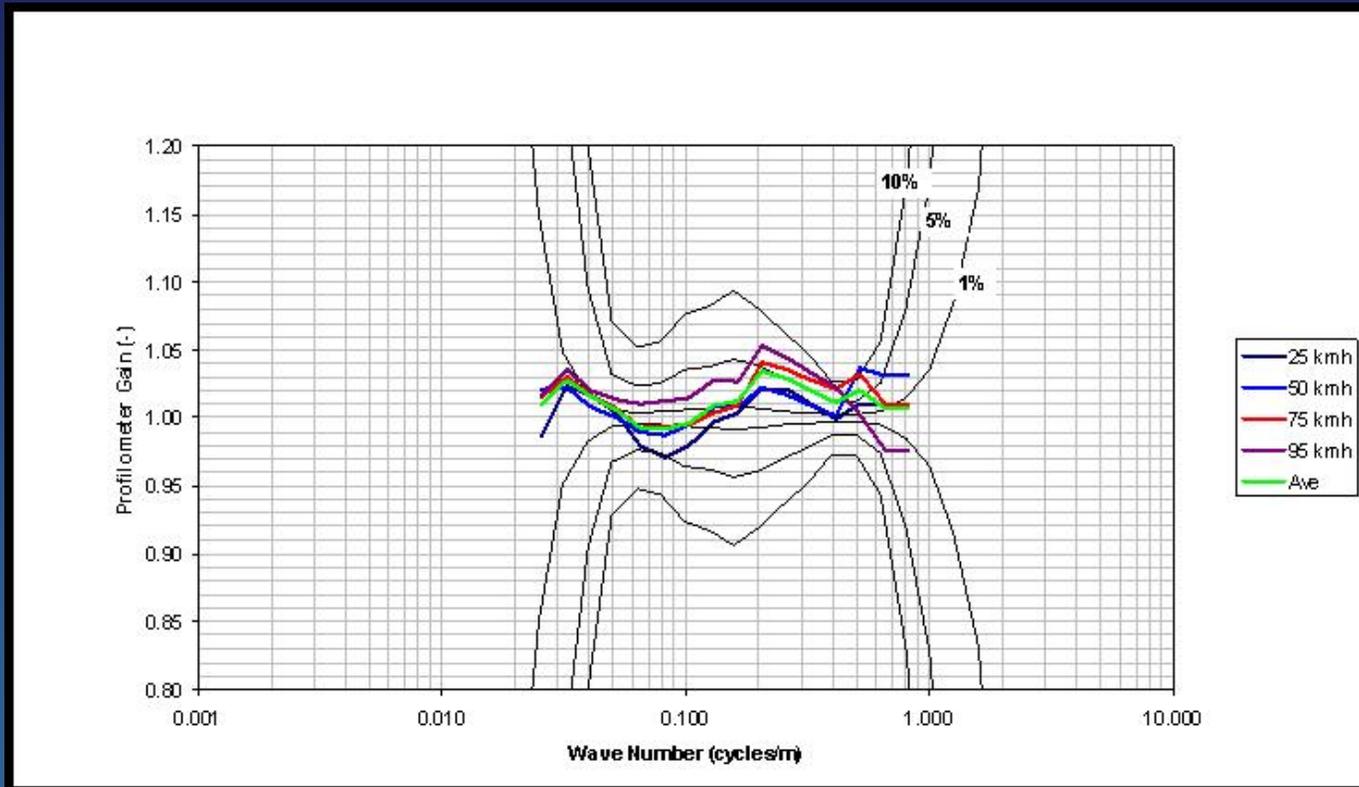


# Roughness Verification



Verification of IRI measurement via comparison with Class 1 profile measuring device e.g. Walking Profiler

# Roughness Verification



Verification of Roughness via Transfer Function Gain

# 2003 road condition data workshop

- identified needs and set priorities
- top priority 'needs':
  - more consistency in methods and specifications
  - inter-jurisdictional acceptance of validations
  - ability to cater for:
    - different data capture machines
    - different data collection service providers
    - appropriate accuracy targets
  - common data dictionary for inventory and condition data
  - guidelines and specifications for use of image data

## 2005 - Take 2

Scope limited to:

- laser profile measurement
  - roughness, rutting and macro-texture
- strength
  - FWD and Deflectograph
- test methods for data collection and validation of equipment
- network level applications rather than project level
- focus on the local road network as well as the state and national networks

# Guiding principles

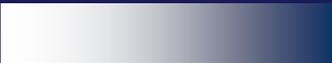
- test methods and specifications:
  - must be relevant to:
    - national networks
    - state networks
    - local government networks
    - people managing those networks
- avoid specification requirements that cannot readily be measured or assessed
- standardisation of practice is desirable
- inter-jurisdictional acceptance of validation desirable

## Focus on

laser profilometers:

- roughness
- rutting
- macro texture





# How?

Collate current Australasian documentation

Collate international documentation

Prepare and circulate initial drafts

Workshop of key players

Prepare new drafts

Feedback sought from key players





# What?

# Format of specifications and test methods

Document type	Description
Test method	<ul style="list-style-type: none"><li>• instructions for carrying-out a specific activity</li></ul>
Specification	<ul style="list-style-type: none"><li>• statements about which activities to undertake and when to undertake them</li><li>• list of roads to be surveyed</li><li>• details of the client's referencing system</li><li>• details of the data format for the presentation of the final data</li></ul>

# Format of specifications and test methods

Document type	Description
Additional contract documentation	<ul style="list-style-type: none"><li>• legal terms of contract</li><li>• quality plan and procedures</li><li>• provision for risk (insurances)</li><li>• definitions of responsibilities (e.g. traffic control)</li><li>• additional requirements</li><li>• specific exclusions from Austroads specification</li></ul>

# General form

- Test methods:
  - collection test method
  - validation test method(s)
  - ongoing repeatability and bias error checks
- Specification:
  - refers to collection test method
  - refers to validation test method(s)
  - refers to ongoing repeatability and bias error test method
  - requires a 'sanity check' for large surveys (> 3,000 km)
    - 100km: collection ⇒ processing ⇒ reporting

# Validation methods

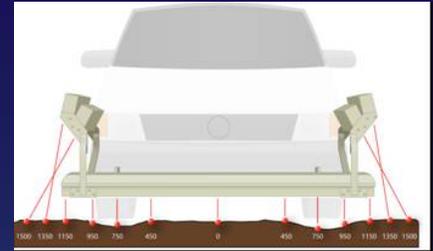
- Specifications require that a validation exercise was conducted within last 12 months
- Specifications do not require that the validation be undertaken within the jurisdiction of the client
- Specifications require ongoing assessment of repeatability and bias error during surveys (every 30 days)

# Validation methods

- Reference device method
  - outputs of device being tested are compared to an independent reference device
  - validation sites selected to ensure a range of conditions
  - statistical tools used to compare the tested device data to the reference data



# Validation Methods



- Select five test sections of road pavement, each 500 m long
- At least one 500 m test section must have an average rut depth of between 3.0 and 6.0 mm (based on rutting reported at 100 m), i.e. the average of the five 100 m segments must fall within these limits.
- Similarly, at least one section must have average rutting of between 6.0 and 9.0 mm
- Similarly, at least one section must have average rutting of 9.0 and 12.0 mm.
- The remaining two sections must have average rutting values greater than 5.0 mm and less than 25 mm.
- At least two of the total 25 individual 100 m segments must have a rutting of 15 mm or greater.

# Typical Analysis

$$RutDepth_{Base} = A \cdot RutDepth_{Profilometer} + B$$

where

$RutDepth_{Base}$  = Rut Depth calculated from the base reference measurements (i.e. either transverse profile logger, straight edge or staff and level)

$RutDepth_{Profilometer}$  = Rut Depth calculated from the operational laser profilometer

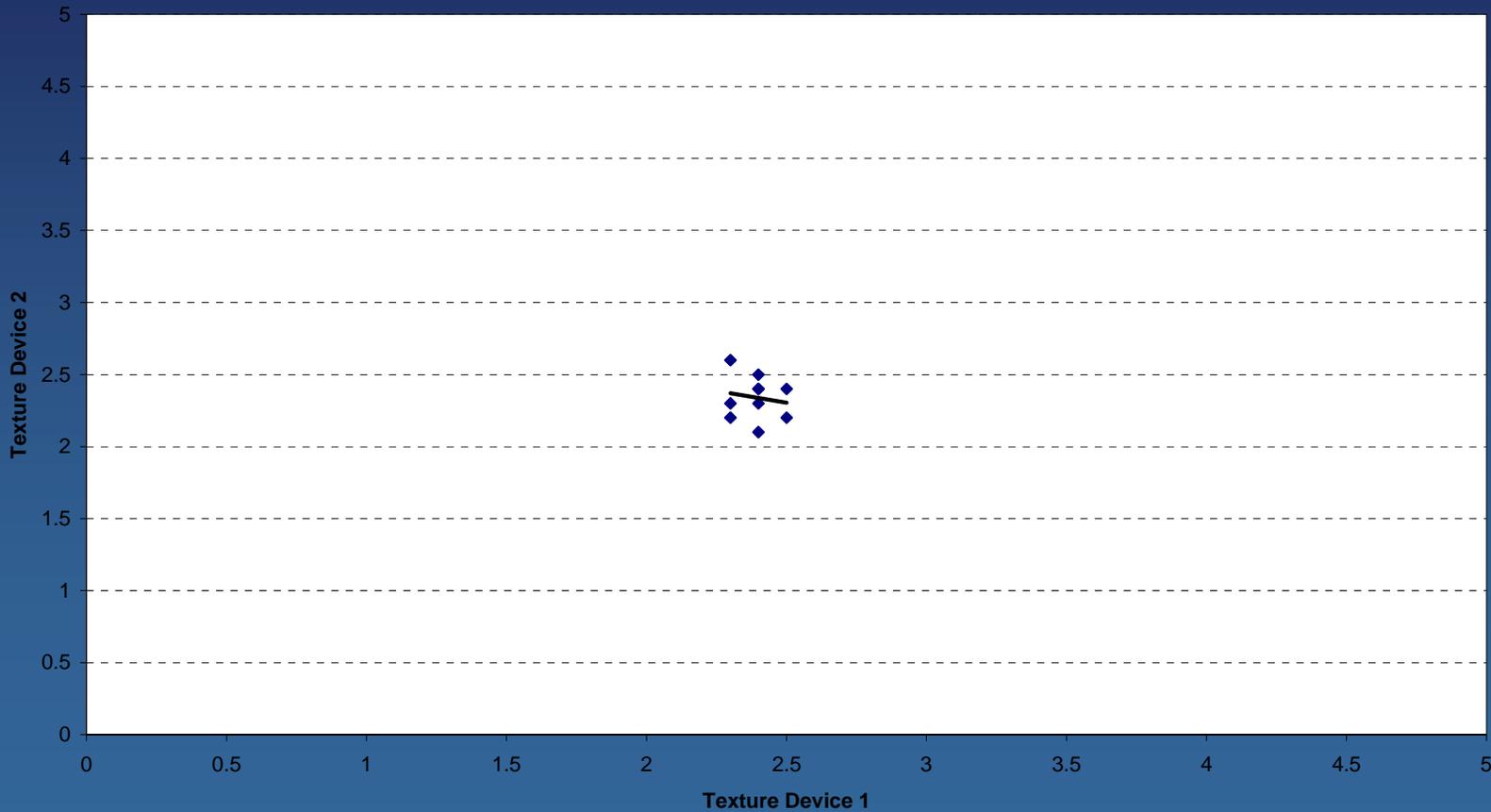
$A$  = regression equation slope

$B$  = regression equation intercept

The coefficient of determination,  $r^2$ , for each regression must also be determined.

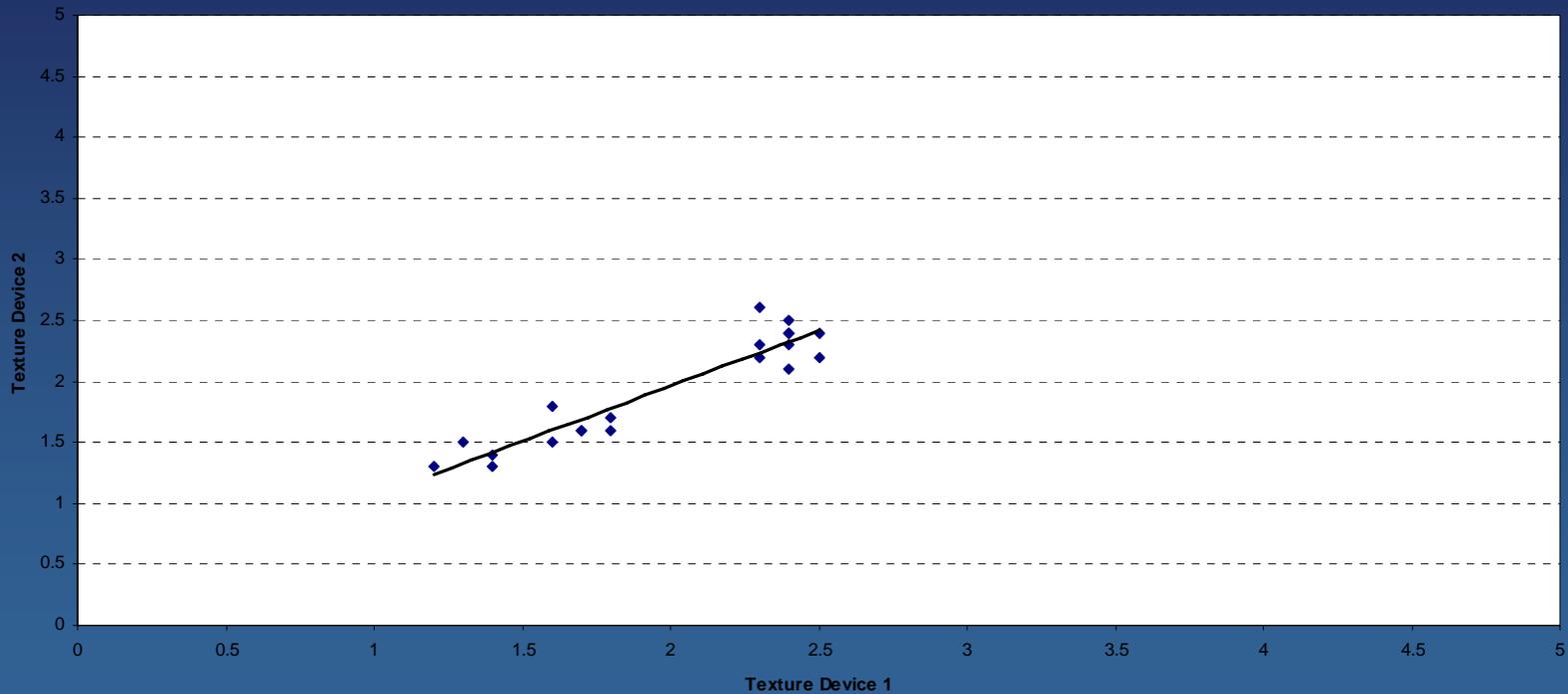
# Lack of range

Texture Correlation - One Site



# Better range

Texture Correlation - Two Sites



# Validation method

- Loop method
  - outputs of device being tested are compared to the outputs of a similar device
  - statistical tools used to compare the tested device data to the reference data



# Validations



# Risk analysis

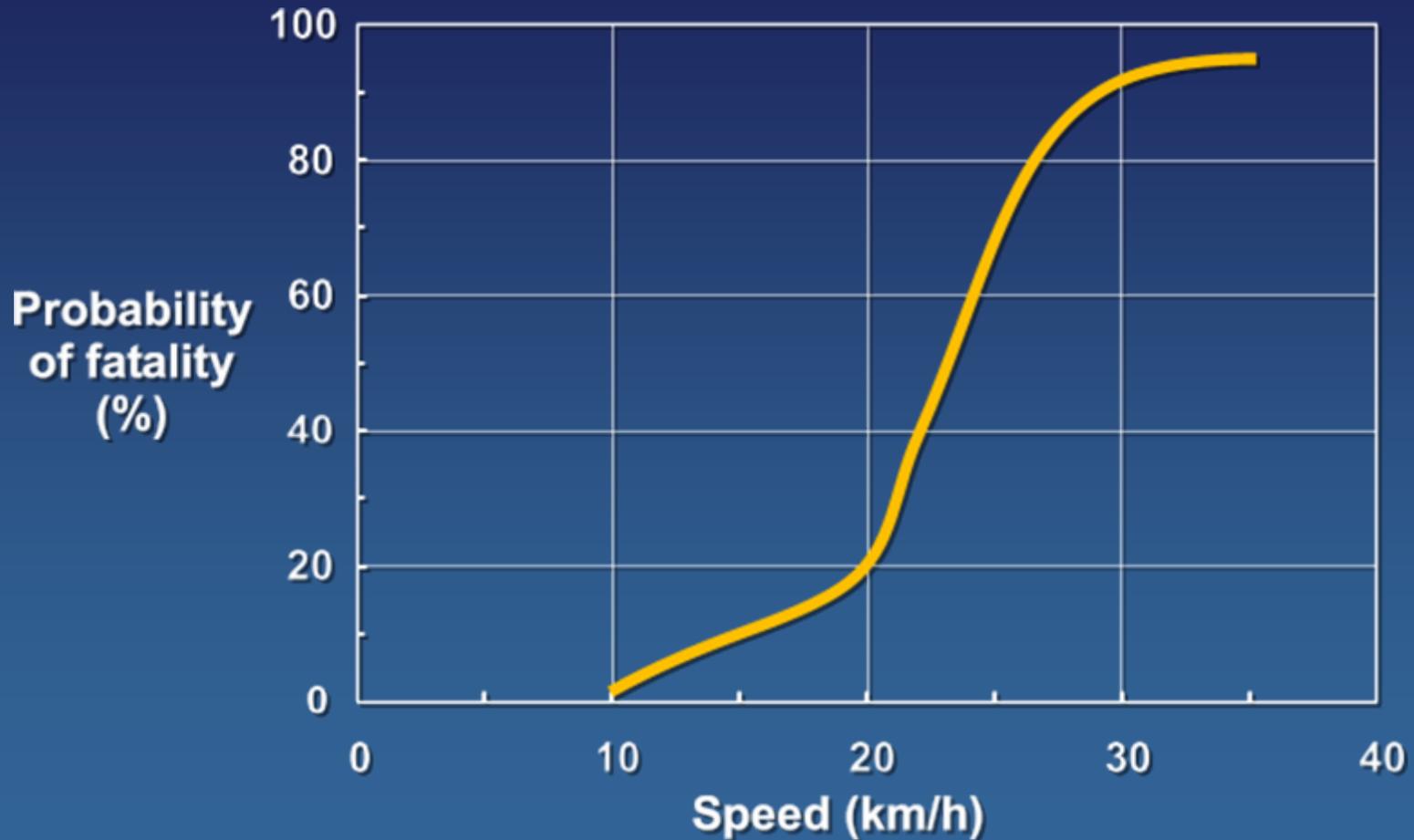
Risk Factor =  $f$  ( probability, consequence )

# Probability of crash



More validation exercises **➡** higher probability

# Consequence of crash



# Validations



## Benefits

- a uniform basis for collecting and reporting road condition data
- improved quality of data collection
- inter-jurisdictional acceptance of equipment validation provides potential for 5-15% p.a. savings for large survey contracts
- greatly assists local government in adopting condition survey practices

# Summary

- new framework for specifying condition survey works
- new standard test methods for:
  - surveys
  - equipment validation
  - ongoing equipment quality checks
- specifications and test methods not dependent upon service provider or the equipment manufacturer
- already being implemented
- specification / test methods will be available at [www.austrroads.com.au](http://www.austrroads.com.au)

**If the recipe is the same...**



**The cake should be too!**

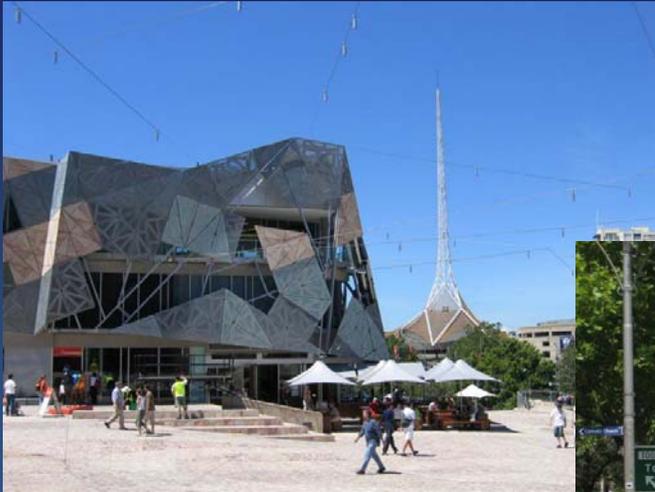
# Different service providers can provide the same cake





# The life and times of a surveyor.... or things that happen out on the road!

# Melbourne, twice voted the world's most livable city



# The Westgate Bridge



# Watch the trailer



# Spot the tourist



# Anyone seen the movie 'Duel'?



..... how about 'Easyrider'?



# Field Challenges



**Not all roads are like this**

# Field Challenges



# Field Challenges



# Thank -you

- Questions

