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THE SURFACING PERFORMANCE OF SEALED STATE HIGHWAYS

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Presentation Outline

- Introduction
- Project Objectives
- Project issues
- Key parameters
- Analysis graphs
- Key findings
- What next?

SH Surfacing Performance: key issues

Project Objectives

- Understand factors influencing SH surfacing performance
- Develop a tool(s) to help understanding

Factors

- Understanding RAMM quality issues
- Minimising project costs and timeframes
- Developing the prototype tool and then modifying
- Providing high level compared to detailed level analysis
- Undertaking further enhancements arising from improving understanding of the key parameters

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SH Surfacing Performance: parameters

Key Parameters

RAMM default life for a surface type is influenced by chip size and traffic volume - these 3 are defined as "surface category".

The key parameters included:

- The underlying pavement – typically thin flexible
- The layer number – usually analysed layer 2 which is that most recently resurfaced (immediately below top layer 1)
- Whether 1st, 2nd coat or reseal – usually ignored 1st coats
- The binder (and additive) type – mainly bituminous
- The reason for resurfacing or last skid resistance metrics

The horizontal stress was later added, requiring developing a special routine to split the treatment lengths by radius range.

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SH Surfacing Performance: analysis

Spreadsheet tool

A spreadsheet was chosen as the tool to use for the analysis of the regional RAMM data. This enabled easy inspection of the data, modification of the data (e.g. RAMM layer number and surface type), ease of making changes, and ease of reporting.

An iterative process was applied:

- Identifying the combinations output in the summary tables
- Deriving the various types of graphs for different purposes
- Modifying the user-input for answering different questions
- Refining to make the tool more user-friendly and robust

An Access database link was adopted (macros) when analysis and summarising of each of the 23/24 networks was required

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SH Surfacing Performance: graphs

A picture says a thousand words (or numbers)

With much flexibility in analysis comes heaps of numbers! Standard graphs were created for the most common surface categories for each network (as determined for layer 2).

Examples of the various types of graphs are given overleaf – black bars (or lines) refer to the RAMM default (or design) life for the particular surface category.

An national summary table was later added with statistics provided for grouping the networks into 6 different groups.

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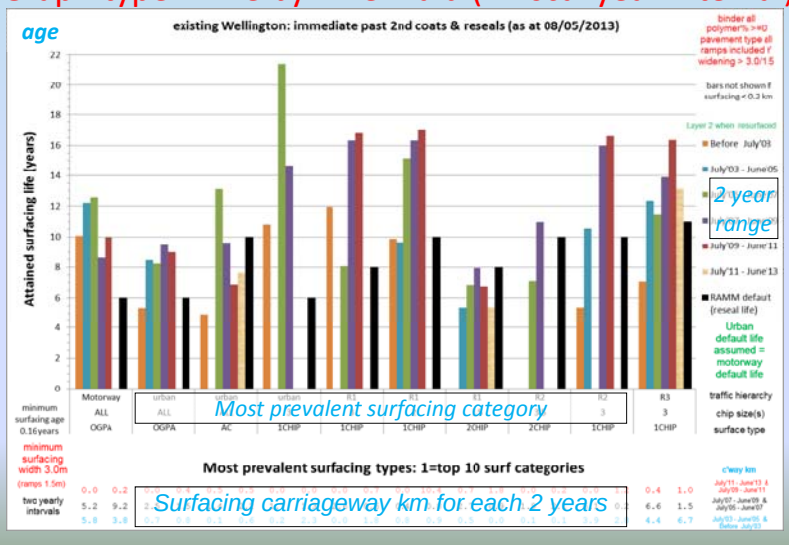
SH Surfacing Performance: historical

Graph type 1: life by when laid (2 fiscal year interval)



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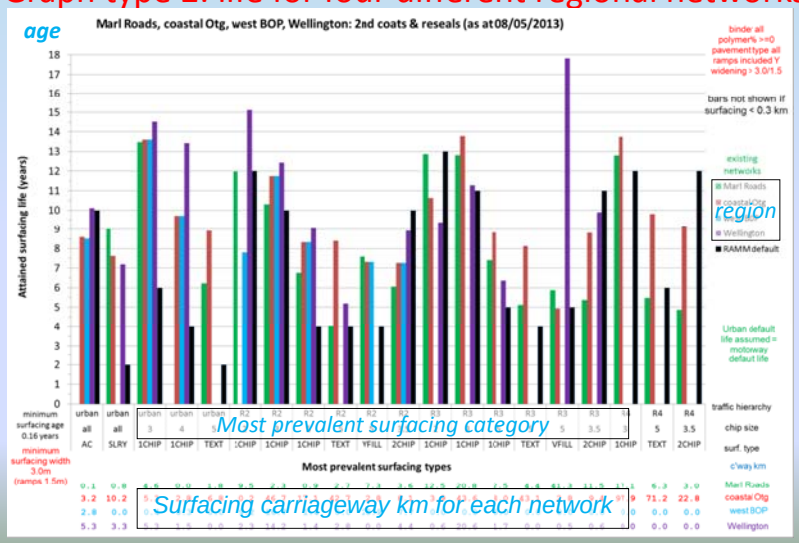
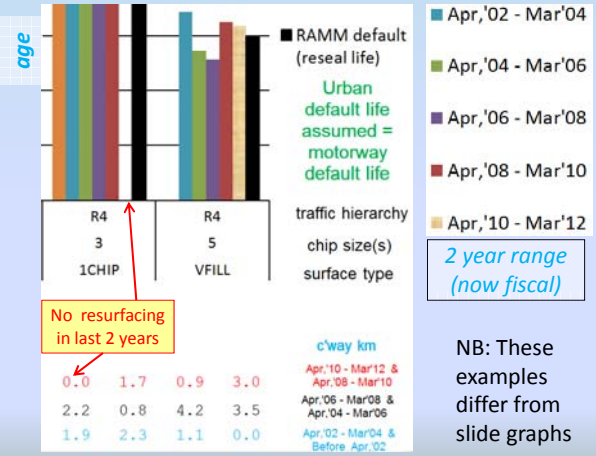
SH Surfacing Performance: comparison

Graph type 2: life for four different regional networks



SH Surfacing Performance: legend

Type 1: life by when laid
(default range 2 fiscal years)

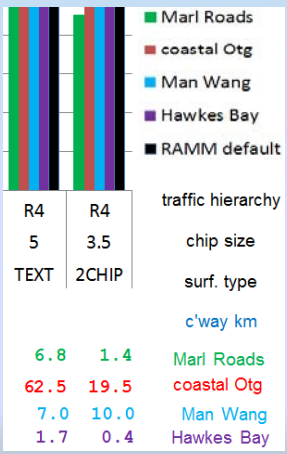


Surfacing carriageway km for each 2 years

2 year range (now fiscal)

NB: These examples differ from slide graphs

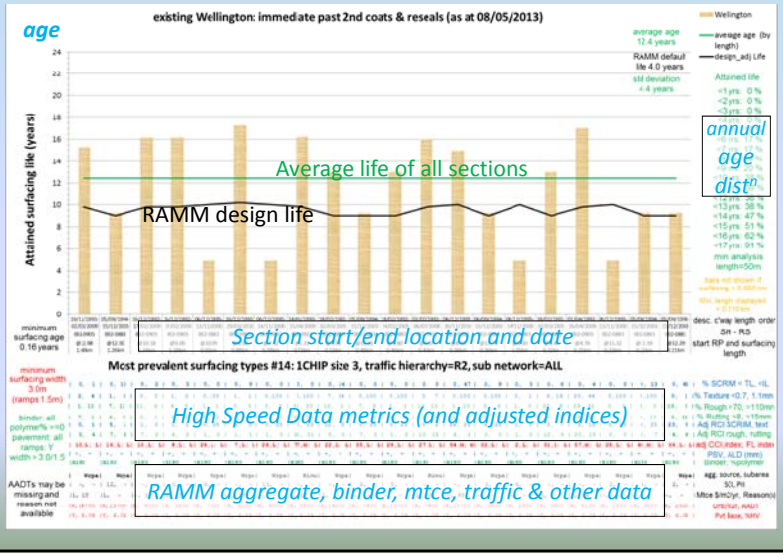
Type 2: life by region
(existing or proposed)



Surfacing km by region

SH Surfacing Performance: detailed

Graph type 3: detailed for one network surface type



SH Surfacing Performance: detail data

Graph type 3: details for one network surface type

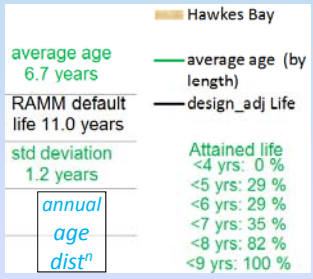
HSD data

RAMM data

21/01/2005-11/12/2009	01/12/2004-09/02/2012	03/12/2001-28/01/2010	01/12/2004-09/02/2012	desc. c'way length order
002-0533	002-0608	005-0190	002-0608	SH - RS
@5.45 0.48km	@15.16 0.36km	@11.03 0.30km	@15.52 0.17km	start RP and surfacing length

#30: 2CHIP size 3.5, traffic hierarchy=R3

4, 27	35, 76	0, 43	41, 79	% SCRIM < TL, <IL
9, 15	0,100	0,100	0,100	% Texture <0.7, 1.1mm
44, 8	33, 6	38, 16	39, 11	% Rough >70, >110mm
12, 2	14, 6	23, 0	33, 8	% Rutting >8, >15mm
16, 6	56, 25	22, 25	60, 25	Adj RCI SCRIM, text
21, 7	16, 10	21, 12	20, 21	Adj RCI rough, rutting
50,M; L	107,H; H	80,M; M	126,H; H	adj CCI,index; FL index
58, 9.1	56, 8.6	55, 9.9	56, 8.6	PSV, ALD (mm)
B80	B80	B80	B80	Binder, %polymer
XXX,nWra	XXX,nWra	XXX,SH 5	XXX,nWra	agg. source, subarea
-, 0	-, 0	-, 0	-, 0	SCI, PII
L, FL	-, CR	-, FL	-, CR	Mtce $/m2/yr, Reason(s)
R, 1800	R, 1050	R, 2700	R, 500	Urb/Rur, AADT
T,18.0%	T,16.6%	T,17.2%	T,16.5%	Pvt Base, %HV



minimum surfacing age 0.16 years

minimum surfacing width 3.0m (ramps 1.5m)

binder: all polymer% >=0 pavement: all

min. analysis length=50m

bars not shown if surfacing < 0.050 km

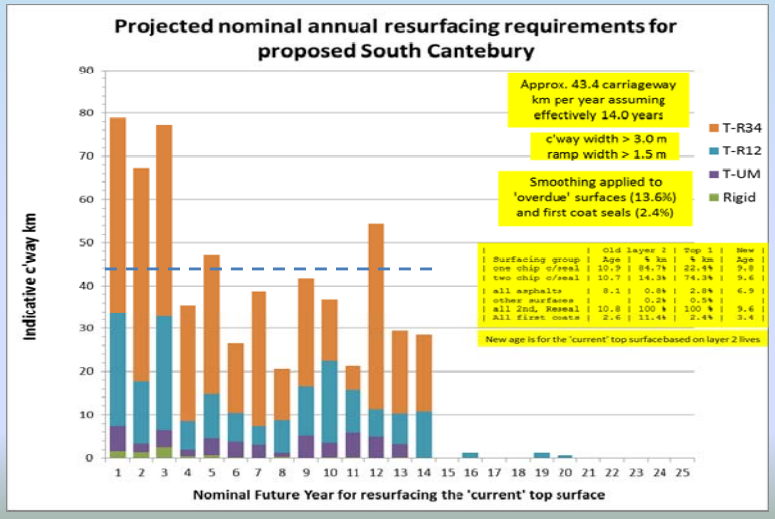
Min. length displayed = 0.050 km

Selection and display criteria

(Figures are for the existing Hawkes Bay, not Wellington)

SH Surfacing Performance: FWP

Graph type 5: Indicative future network resurfacing



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SH Surfacing Performance: FWP legend

Graph type 5: Indicative future network resurfacing

T-R34	Thin pavement: Rural traffic hierarchies 3 and 4 (< 4000 vpd)
T-R12	Thin pavement: Rural traffic hierarchies 1 and 2 (> 4000 vpd)
T-UM	Thin pavement: Urban and Motorway traffic hierarchies
Rigid	Other pavements (Bridge, Concrete, Structural): all traffic

Surfacing group	Old layer 2 Age	Old layer 2 % km	Top 1 % km	New Age
one chip c/seal	8.1	72.8%	36.0%	7.3
two chip c/seal	6.4	22.2%	54.9%	6.0
all asphalts	7.7	1.1%	5.1%	8.1
other surfaces		4.0%	4.1%	
all 2nd, Reseal	7.8	100 %	100 %	6.6
All first coats	3.0	26.9%	6.0%	2.9

New age is for the 'current' top surface based on layer 2 lives

33% shift from one to two chip chipseals and 4% shift from one chips to asphalts

High historical % of first coat seals in RAMM data

(Figures are for the existing Hawkes Bay, not proposed S Canty)

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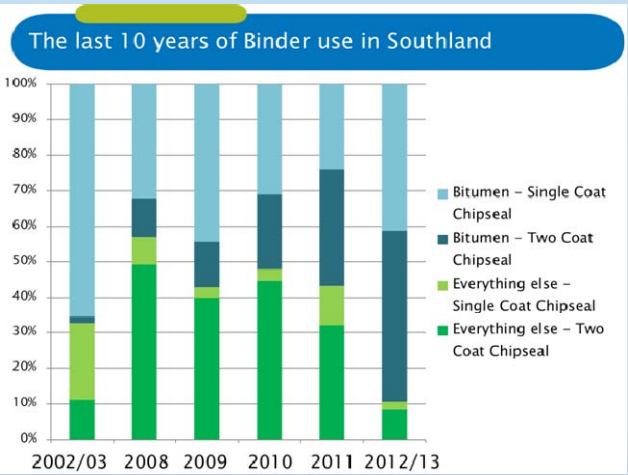
SH Surfacing Performance: binders

Example examination of the binder type (Towler, 2013)



Large increase in the amount of two coat chipseals, although they cost more and tend to have shorter lives – however more research & analysis is required.

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SH Surfacing Performance: findings

General analysis findings:

- Shift in increasing use of two coat chipseals
- Ignoring the effect of horizontal stress, two chip chipseals had a shorter average life than one chip chipseals
- The average attained life for a surface category can vary considerably for different regional networks
- The attained life slightly decreases with increased traffic
- Grade 2 chips have similar or shorter life to grade 3 chips
- Initial research into the effect of stress indicates decreasing life with increasing stress, the effect is more apparent for one chip coats than for other surfaces
- There are some inconsistencies when comparing the Forward Works Programme results for some networks with the NZTA “base preservation levels” 2013 project.

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SH Surfacing Performance: what next?

What next?

- Further use of the tool, for example to support current and future research projects
- Establishing peer group networks and comparing them
- Close examination by local practitioners of the good and bad performing sections to attempt to establish what other causal factors might be influencing the attained life
- Examination of the effect of skid resistance metrics and reasons for resurfacing on the attained life
- Other initiatives (hopefully about to progress)

Acknowledgement

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