

Tyre/Road Noise Research

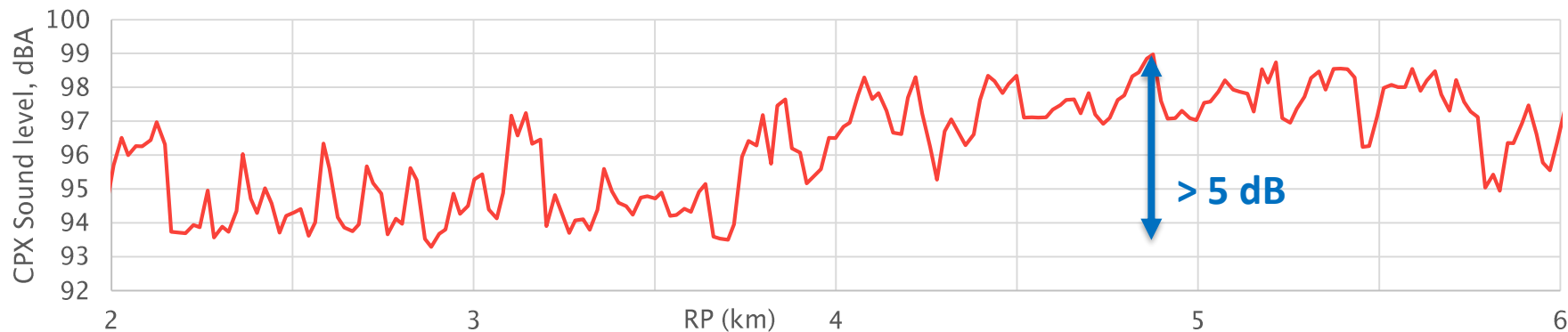
Validation of CPX results

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Road Traffic Noise in NZ

- The tyre/road interaction dominates road noise emission
- Chipseal covers 75% of NZ state highway network
- OGPA is our primary tool for mitigating road noise
- NZ OGPA is highly variable in noise emission



NZTA want to optimise the specification of OGPA, and the CPX trailer is an instrument capable of directing that effort

Study Objectives

Primary aim was to validate the measurements of the epoxy OGPA trial surfaces on John's Road, Christchurch.

General objectives:

- Identify a link between CPX and wayside noise levels
- Does CPX rank OGPA surfaces 'correctly'?
- Does the CPX standard tyre behave like 'typical' car tyre?
- Side study: new vs old 'typical' car tyre



CPX

**OGPA trial:
5 surfaces**



CPX Measurements

5 trial sections, 4 test tyres, 3 runs for each combination



P1 – TigerPaw



H1 – Avon AV4

What is a 'typical' NZ passenger car tyre?

- The tyre fitted to the most common model
- The most common single tyre size and design

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195/60R15

CPX Measurements

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P1 – TigerPaw



H1 – Avon AV4



Supercat (new)



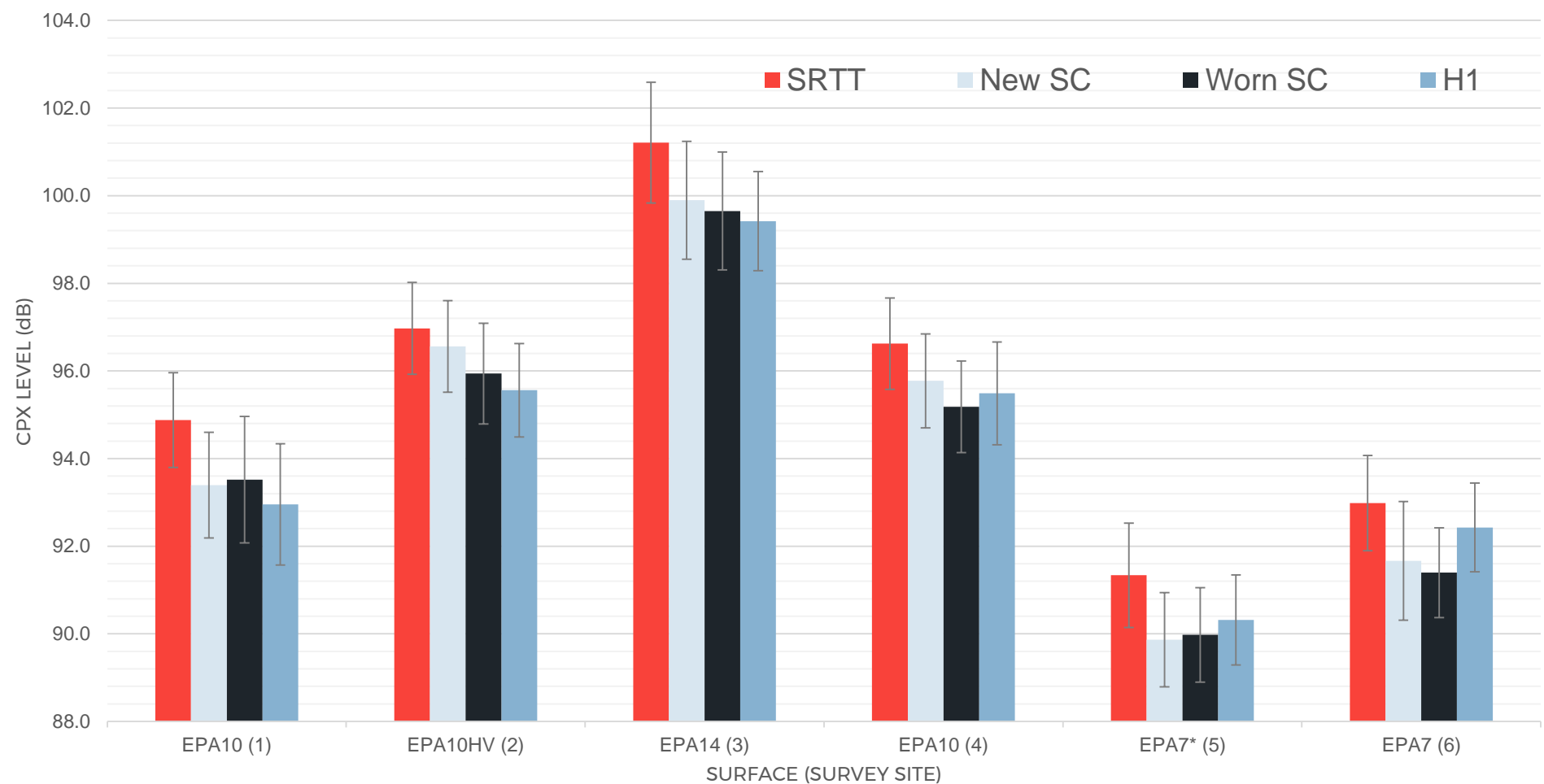
Supercat (worn)

What is a 'typical' NZ passenger car tyre?

- The tyre fitted to the most common model
- The most common single tyre size and design

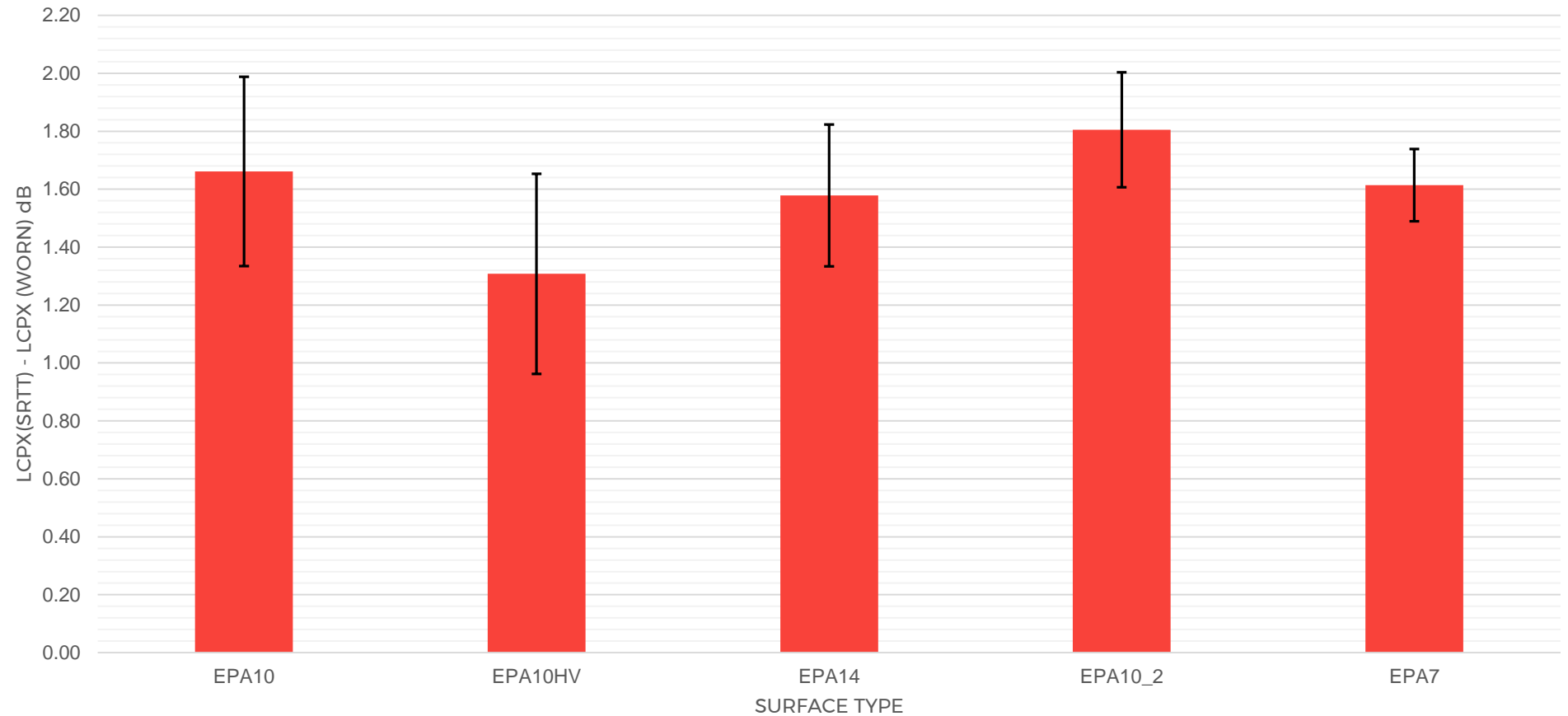
195/60R15

Ranking the Surfaces using CPX



Does the P1 respond to OGPA like NZ car tyres do?

P1 minus worn SC



CPX Findings

Typical tyre – New vs. Worn

- Tidy experiment with few confounding variables
- Worn tyre is (0.3 ± 0.1) dB quieter than new tyre on OGPA

Typical tyre compared to standard test tyre P1

- More variables but still a good experiment
- P1 is (1.6 ± 0.1) dB louder than worn tyre on OGPA

Comparison between four test tyres

- All tyres maintained a consistent relationship over 5 surfaces

CPX vs. Wayside



Wayside Noise Measurements

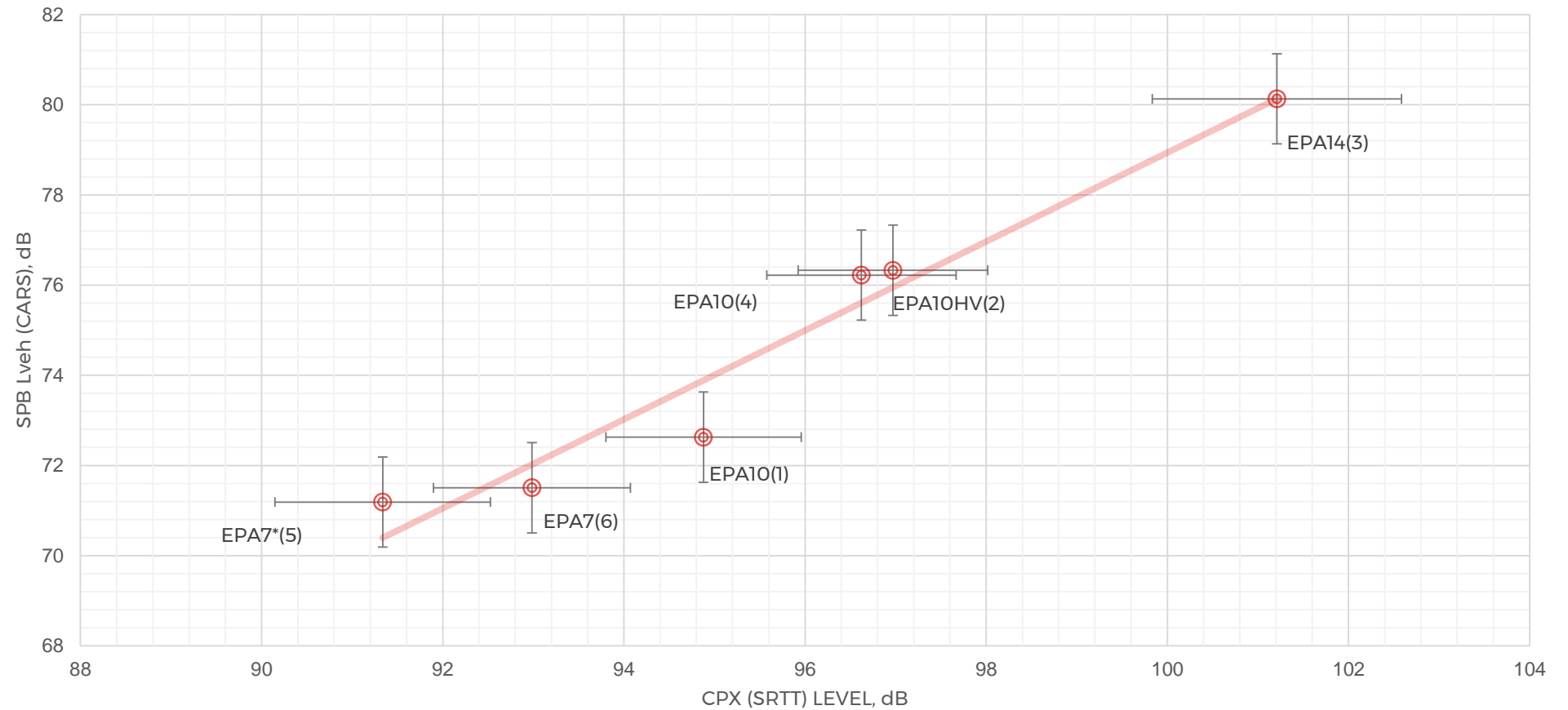
- Statistical Pass-by (SPB) methodology chosen
- 6 sites selected (4 different specifications)
- Captured L_{Amax} from 100 car and 30 truck passes per site



CPX(P1) vs SPB(cars)



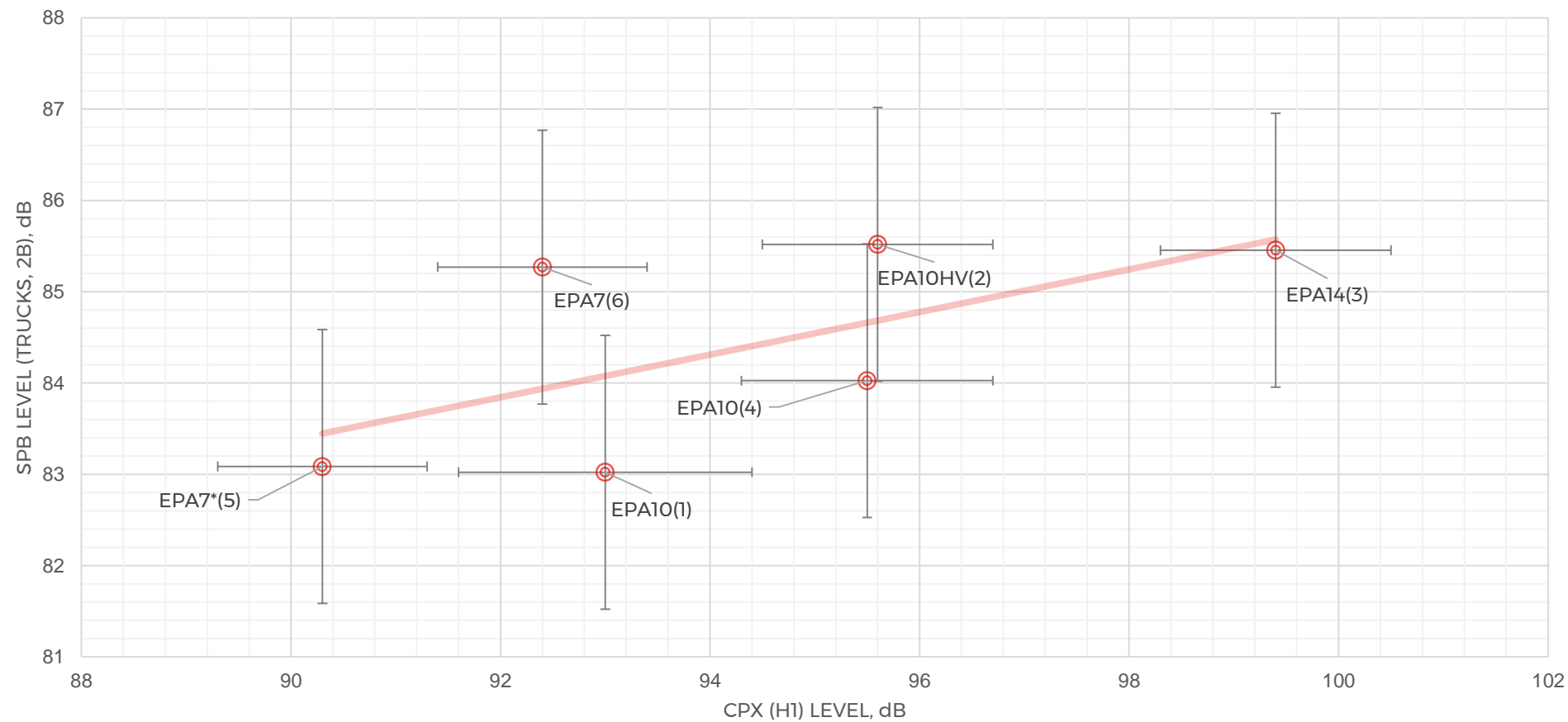
$$\text{SPB}_{\text{cars}} = 0.99 * \text{CPX}_{\text{P1}} - 19.7 \quad r^2 = 0.95$$



CPX(H1) vs SPB(trucks)



$$\text{SPB}_{\text{trucks}} = 0.23 * \text{CPX}_{\text{H1}} + 62.3 \quad r^2 = 0.40$$



OGPA Study Conclusions

- Strong relationship exists between CPX and wayside levels from passenger cars at 80 km/h on OGPA.
- Weak relationship between CPX using H1 tyre and wayside levels from trucks at 80 km/h on OGPA.
- The relationship between the 4 test tyres remained consistent across the different OGPA test surfaces.
- Sections of nominally the same surface type presented different CPX and wayside levels, as seen previously.
- There was no evidence that 'high voids' OGPA provided additional benefit at the wayside compared to CPX.

Chipseal Study

Early Results



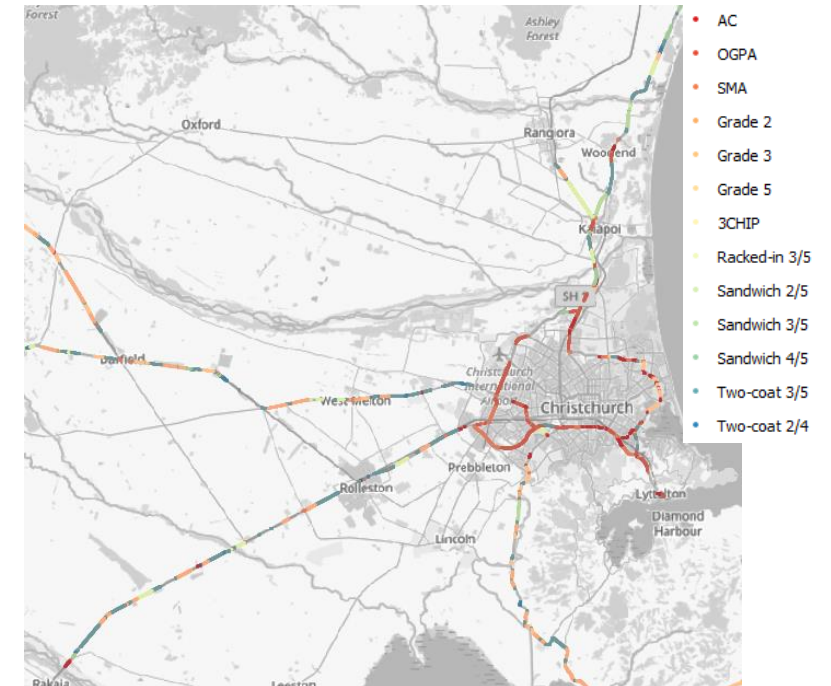
Chipseal CPX Study

Objectives:

- Get an indication of range of CPX levels ‘in the wild’
- Test CPX against wayside levels on non-asphaltic surfaces

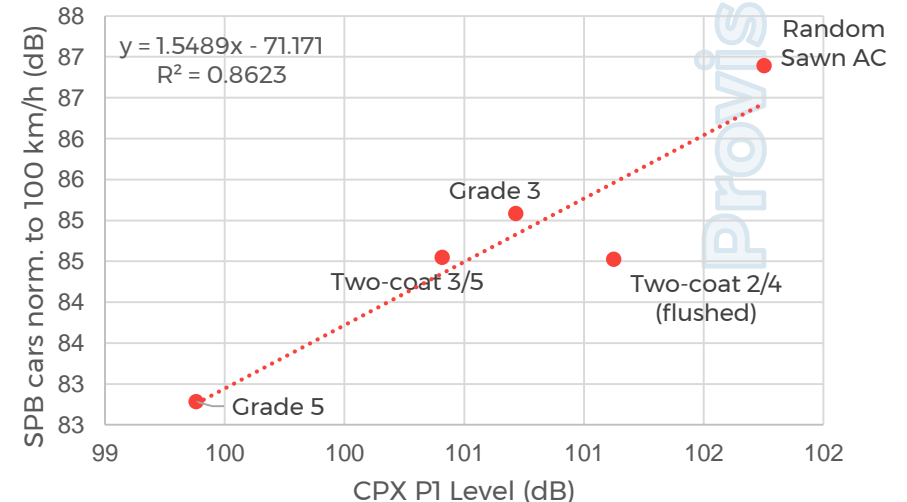
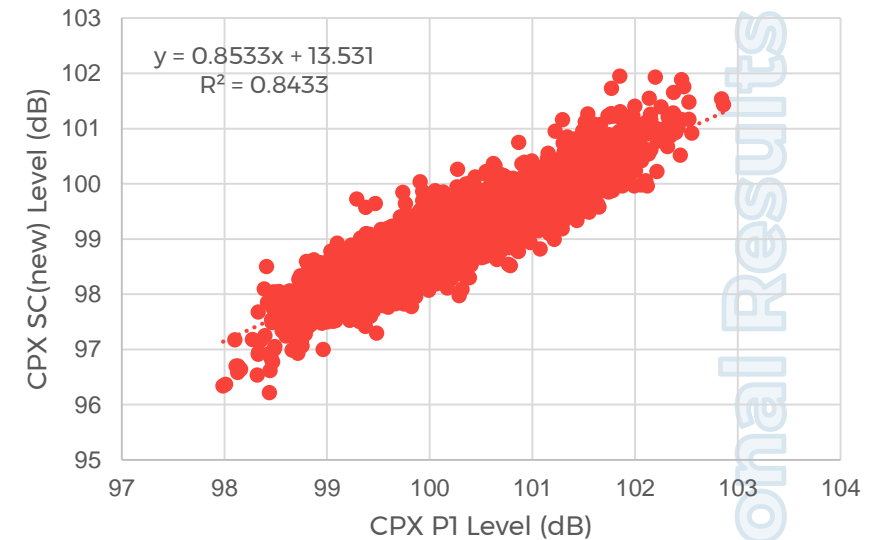
Survey:

- Minimise: bumps, hills, < 80 km/h
- Maximise: surface types & ages
- SH73 ideal for repeated runs
- SH1 to extend survey distance
- Pick a week with lovely weather

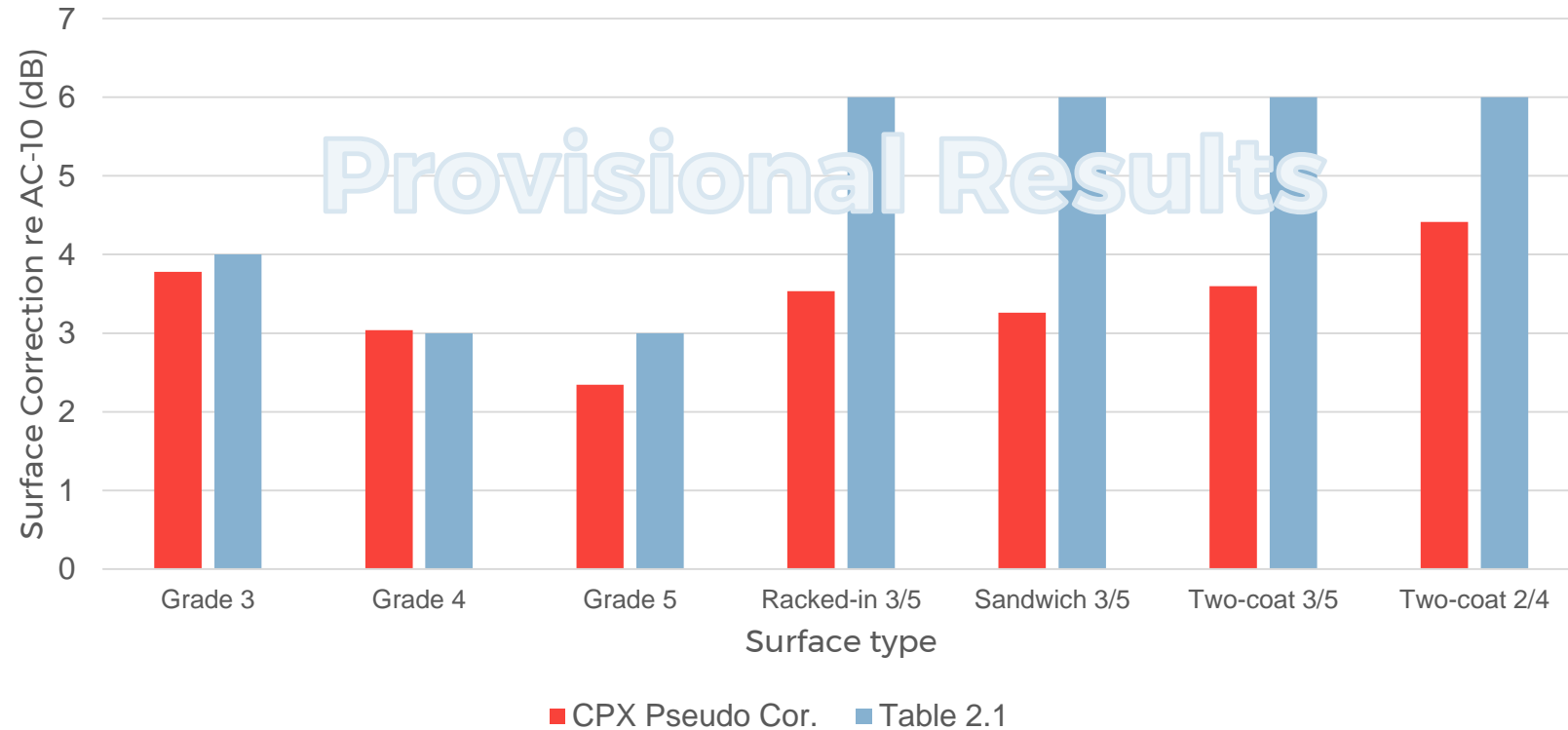


Early Results

- 750 km of CPX measurements
- 5 SPB surveys (focussed on cars)
- Found reasonable agreement between CPX using P1, SC new, and H1 tyres on SH73
- Good agreement between CPX and SPB measurements
- Interesting that slope is higher than unity: P1 insensitive? (but it is a small sample)



CPX emission by surface type



Normalised to AC indirectly via SMA-10 minus 1.5 dB (no suitable AC available)

All CPX and wayside pairs (OGPA and Chipseal)

