Rumbling through the Bay

Are the audio tactile profiled (ATP) roadmarkings still effective?

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Overview

- Some issues with the life of audio tactile profiled roadmarkings (ATP)
- Ways in which ATP roadmarkings could fail
- Road-traffic noise and making “pictures” of noise
- How ATP roadmarkings work
- Review of NZTA research project 478 that established minimum effective height of ATP roadmarkings
- Applying NZTA research project 478 to in-situ ATP roadmarkings
- Findings
- Implications for maintenance

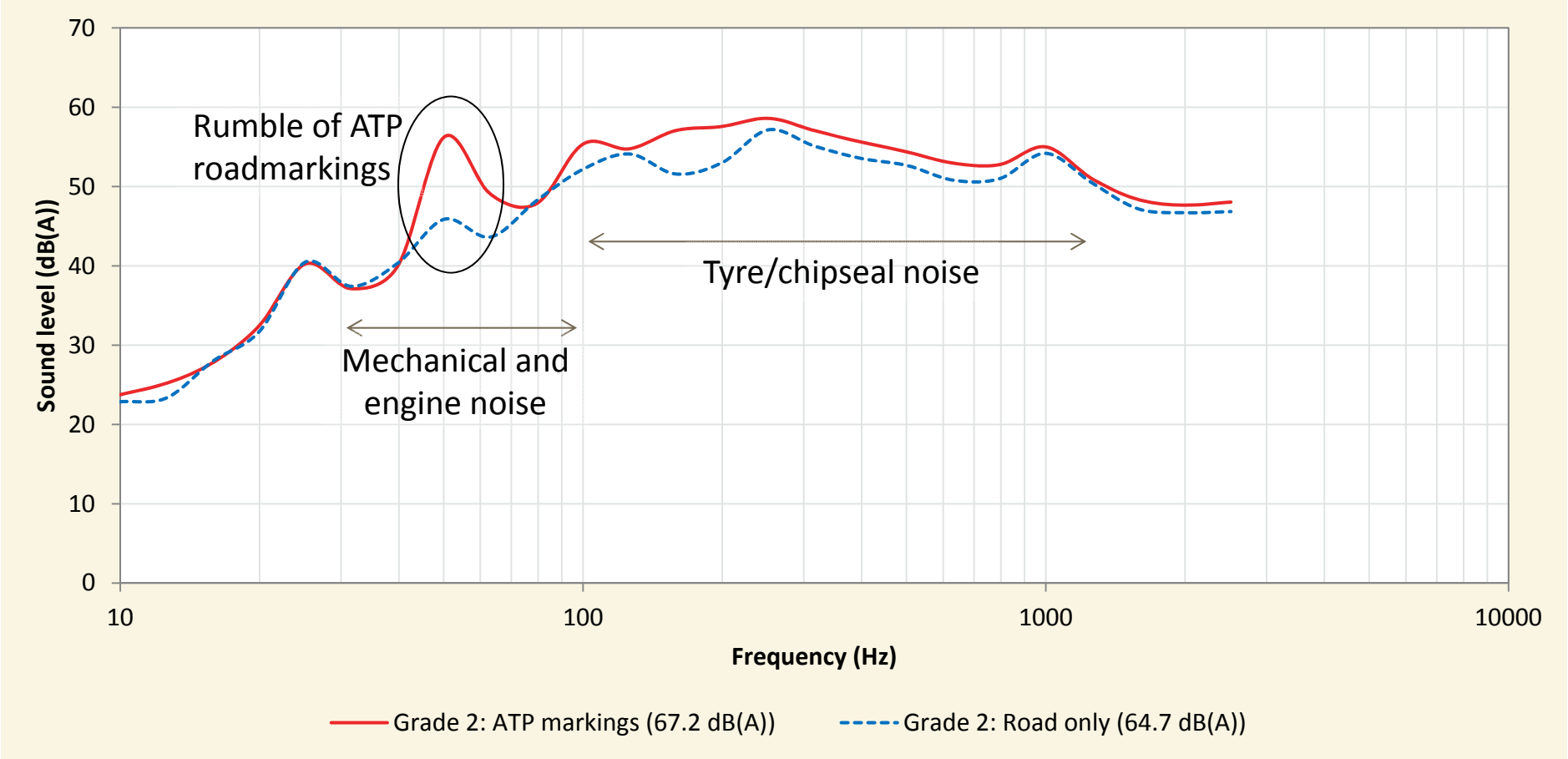
Issues with life of ATP roadmarkings

- How long do ATP roadmarkings remain effective? Do ATP roadmarkings laid 4-6 years ago still have an effective life?
- If they still have an effective life how can this be carried through into the next reseal cycle?
- How can we assess whether ATP roadmarkings are still effective in-situ given the various ways in which they may fail?

How ATP markings can deteriorate

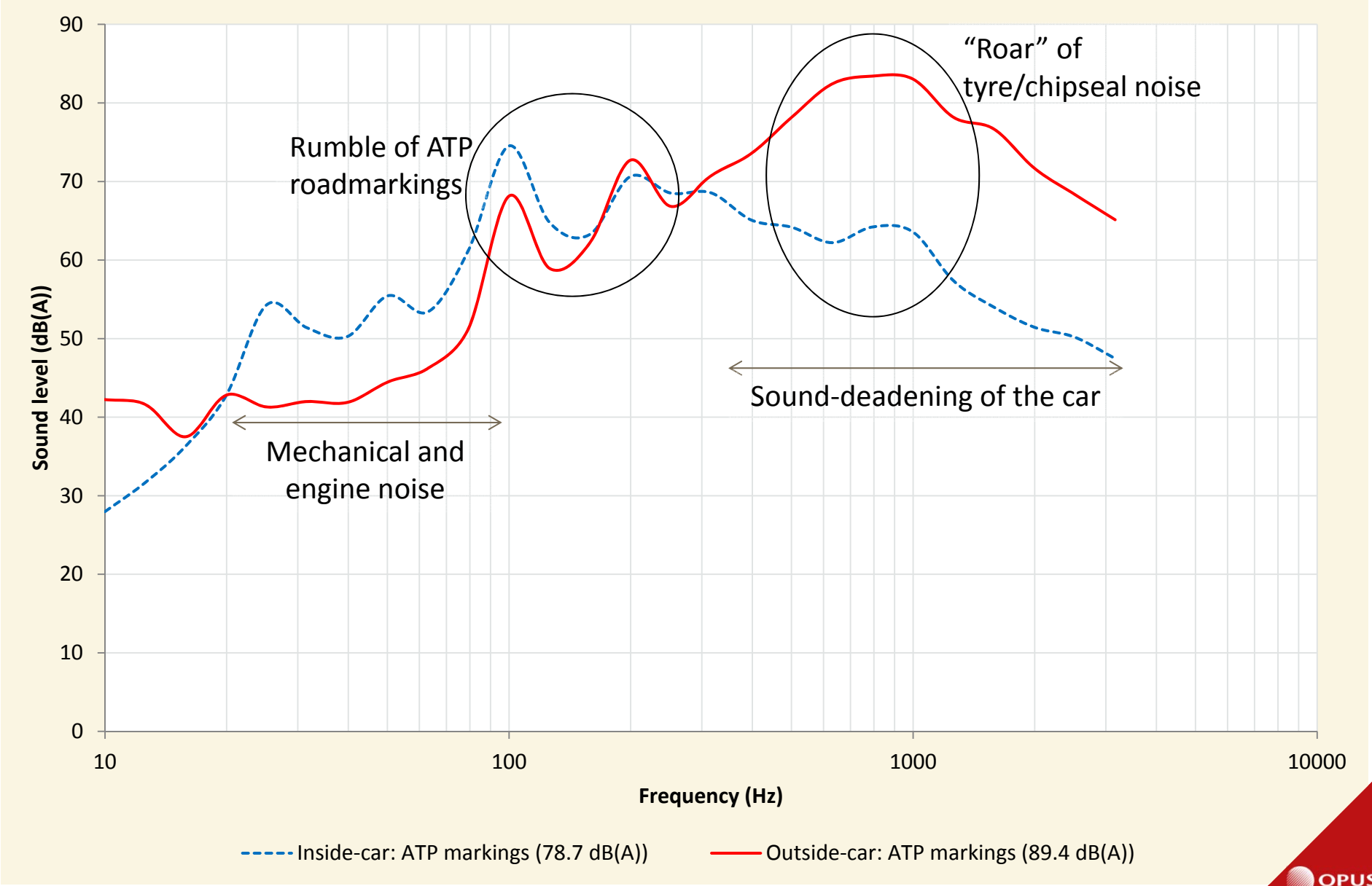
- Slow abrasive wear
  - Cold plastic is very hard
- Profile is pushed down into road surface under heavy traffic
- Break-up under wear
- Profiled elements loose adhesion
- Partial breakage when clearing snow falls

“Pictures” of noise: car on road only and car on ATP roadmarking

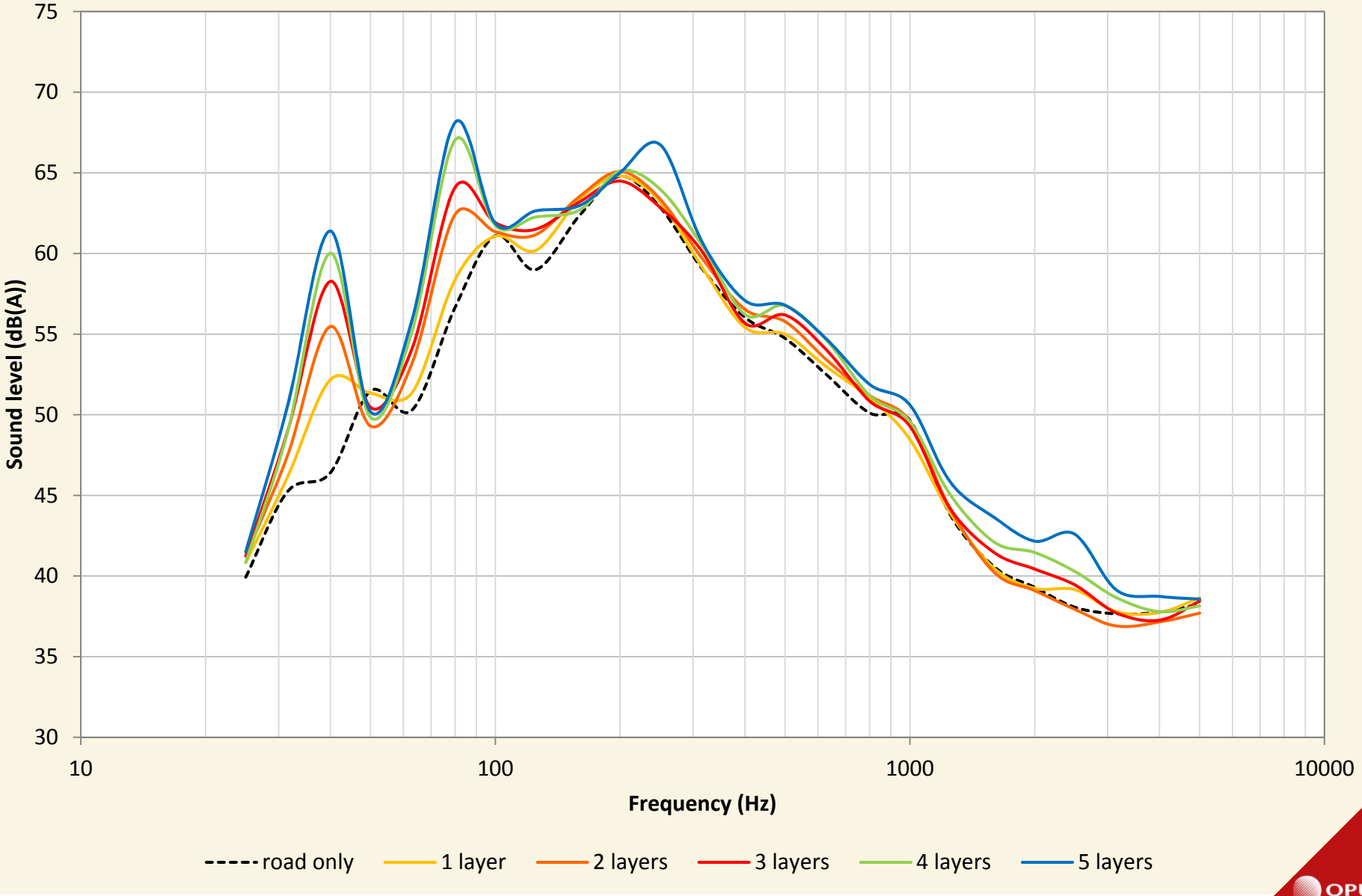


- Road traffic noise is made up of many different components
- Noise spectra show a picture of the noise which help show up these different components of the noise
- ATP roadmarkings work by having a distinct tonal noise

Noise inside-car versus noise outside-car: ATP roadmarkings are distinctive even if not the loudest part



Review of Project 478: Tonal peaks increase with block height



ATP markings: Height of noise “spike” versus block height

	40 Hz	80 Hz	All Hz
	Increase relative to road only	Increase relative to road only	Total noise
Road only			70.6
1 layer block height	5.8	1.7	71.1
2 layers	9.1	5.8	71.8
3 layers	11.9	7.4	72.0
4 layers	13.6	10.4	73.0
5 layers	15.0	11.5	73.9

Review of Project 478 continued (2): Noise pattern into headphones in driving simulator

Road noise

Surface irregularity: seal join, service cover, road patch, pothole

ATP marking

Review of Project 478 continued (3): Playback in Driving Simulator

Headphones
Generating ATP marking noise (plus music)

Television stimuli
Showing Stroop test

Steering wheel
With buttons for participant to respond to Stroop test

Computer with operator
Controlling test

Sub woofer
Generating vibrations under participant's seat

Foot pedal
For participant to press when detecting ATP marking

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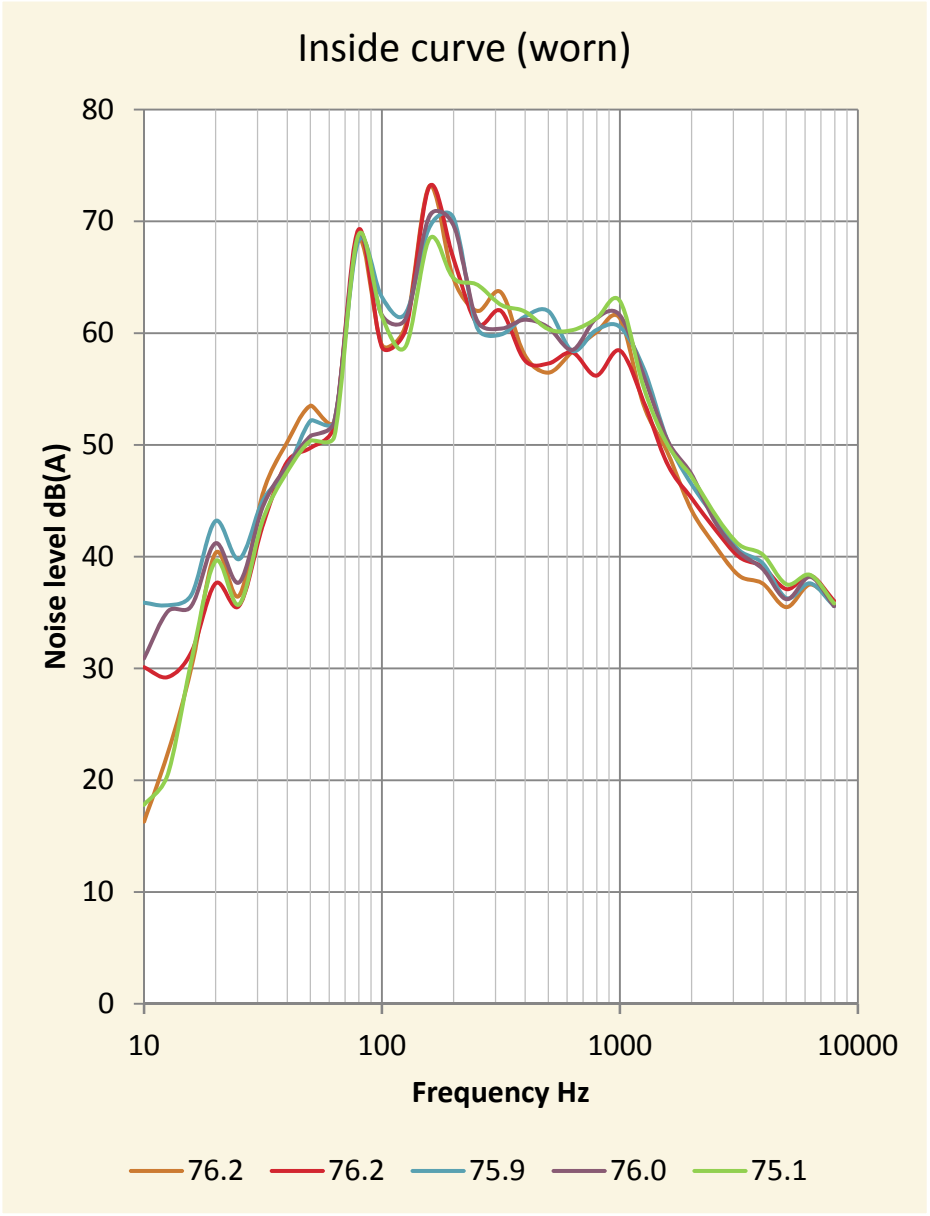
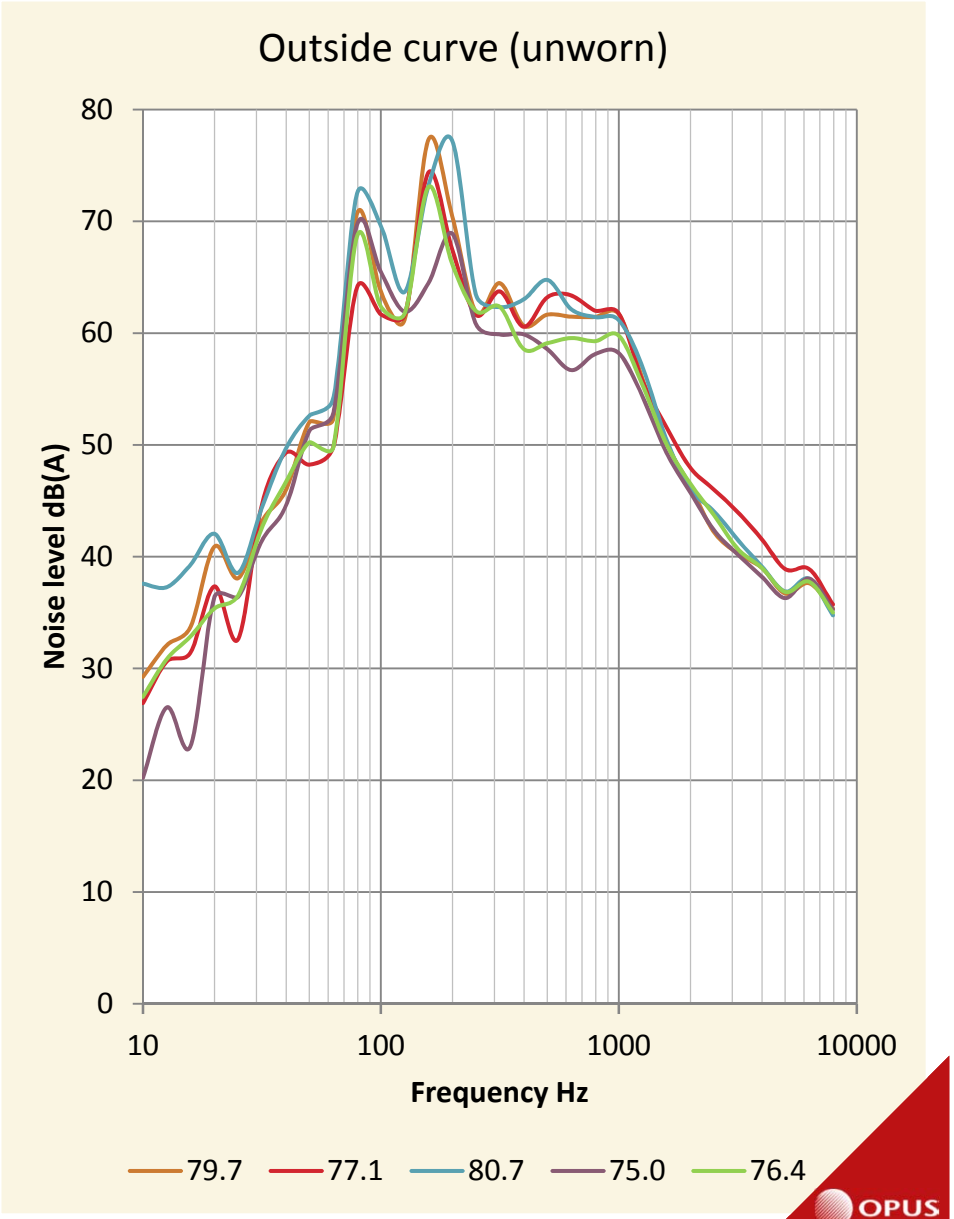
Typical markings in Bay of Plenty (in place 4-6 years)

Reliable measurement of noise from ATP roadmarkings need multiple measurements





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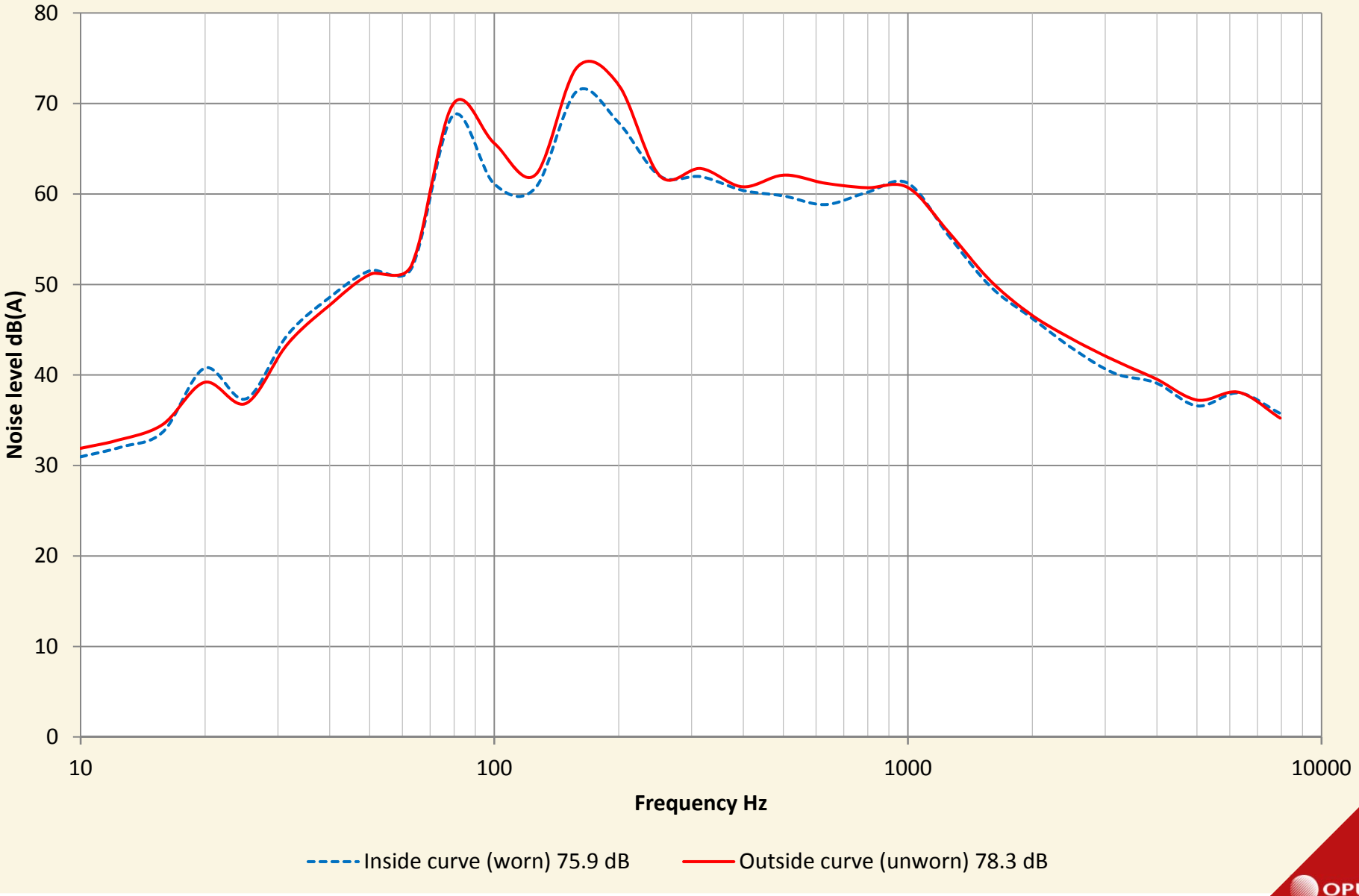
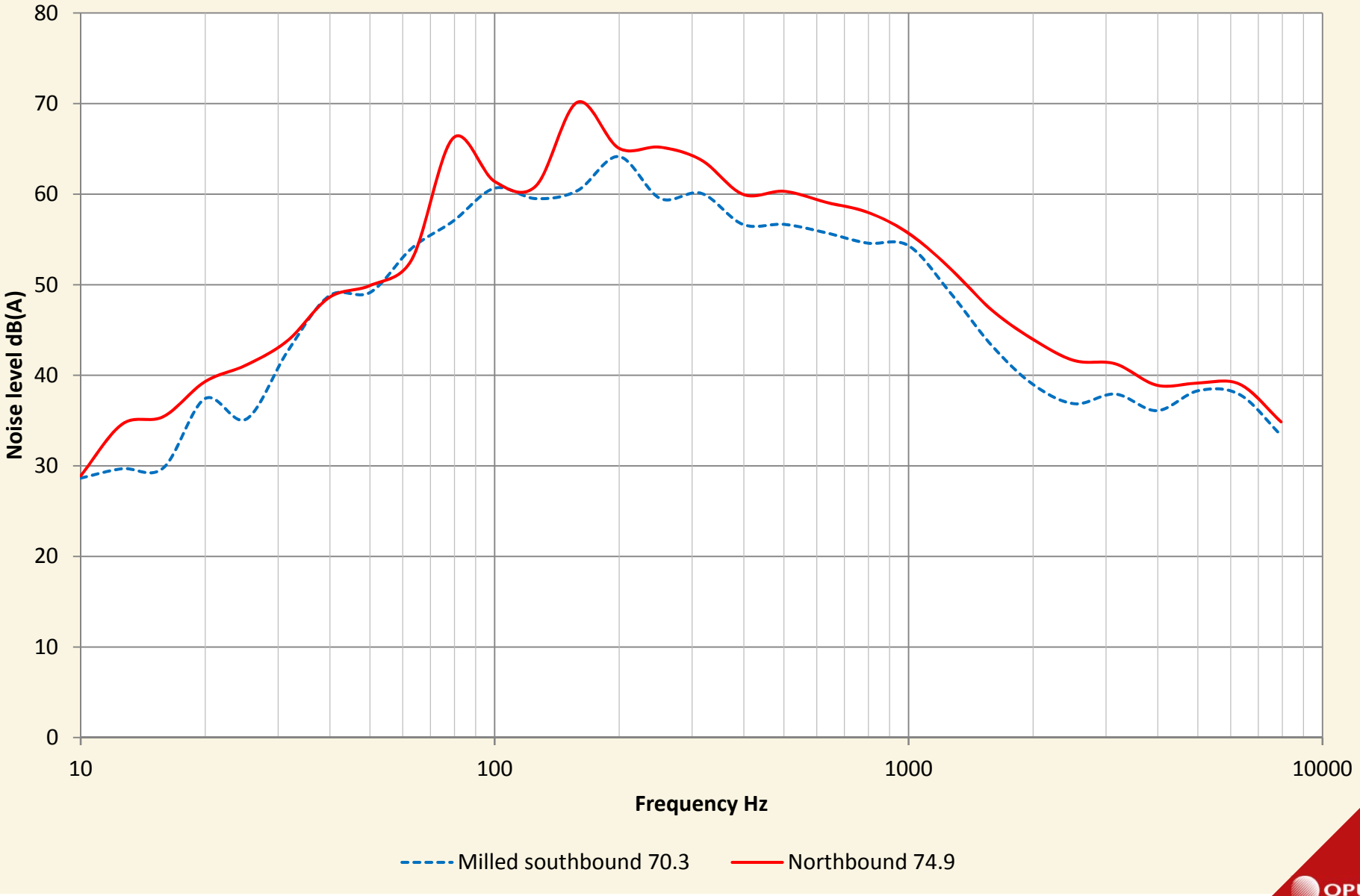
Multiple measurements of noise from ATP roadmarkings are then averaged to show effect.

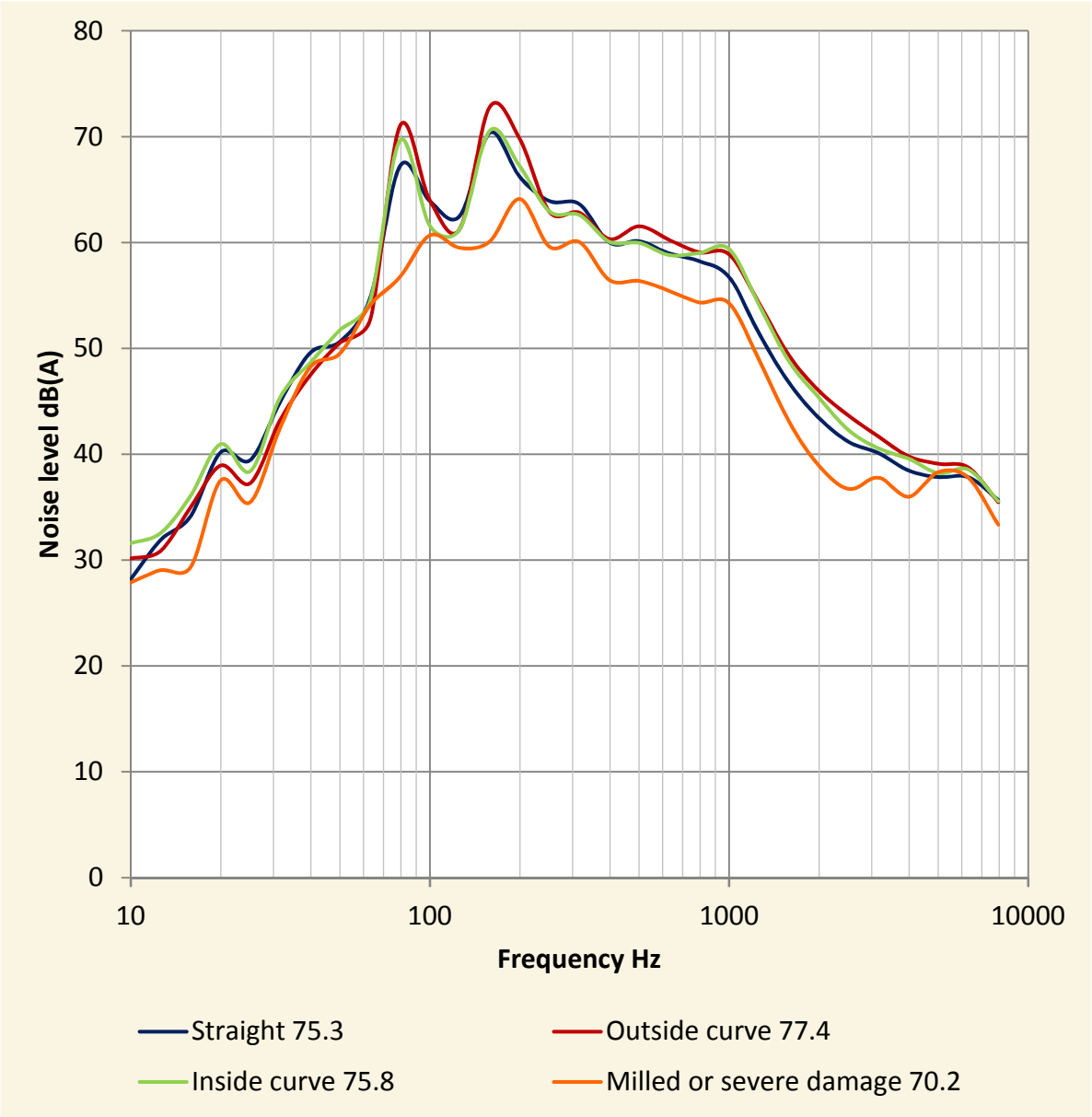


Noise from heavily “worn” roadmarkings

Noise from heavily “worn” roadmarkings



Overall results



	dB
Straight	75.8
	75.3
	74.9
Outside curve	78.3
	76.3
Inside curve	75.9
	75.6
Milled or damaged	69.7
	70.3

Conclusions

- The results are logical - you would expect the outer corner to be less worn than the inside corner
- There is a distinct difference between ATP roadmarkings and one that is heavily worn (milled)
- These ATP roadmarkings at 4-6 years old are still effective and appear to have a significant remaining life (3-4 years?)

What happens next

- How can this remaining life be taken through into next reseal period. Possible solutions which would have to be tested for effectiveness are:
  - Reseal between/abutting the ATP markings
  - Reseal over the markings so that the profile is mirrored through into the new surface, and replicate the visibility properties of the ATP marking with other materials
- Will be investigated in a new NZTA research project