Rain-activated Slippery When Wet sign

- For use on high-risk skid sites
- Only activates when the road is wet
- Lowered the speed profile in wet conditions
- Reduced barrier strikes

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Trial partners: hmi technologies, Data Traffic, Spray Marks, Waka Kotahi NZ Transport Agency

The Why

Flushed and/or polished surfaces increase the possibility of losing control of a vehicle when the road is wet.

Over half of crashes on our network occur on bends so bends with low skid resistance are one of our Top 5 identified safety issues for targeted intervention under the NOC KRA Framework.

NZTA's T/10 sets out the skid resistance management requirements and this includes provision for warning signage, including temporary speed limits, on high risk sites that breach Threshold Level.

I wanted to add another layer of warning on sites where the hazard may not be obvious. But I only wanted it visible when I really wanted people to take notice and actually adjust their speed. And, it had to be portable so that we can shift it around the network as often as needed.

Equipment

- Electronic panel with Slippery When Wet graphic and text Slow Down
- Radar to detect vehicle speed. Currently set to 5km/h but can be changed to curve speed when the sign is used in conjunction with static signs.
- Optical Rain sensor monitors rainfall every 20s.
- When the accummulated rain fall exceeds 1mm within 60 minutes, the sign is activated.
- The accummulated rainfall trigger threshold can be changed.
- The sign is deactivated 1hr after the rainfall eases.
- Solar powered
- One sign for each direction
- Survey tubes for each direction, downstream of the sign

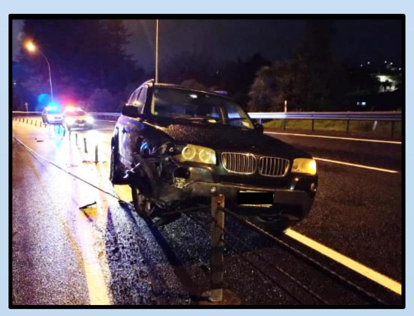
Optical rain sensor supplied by HMI.

Trial site

SH 2: 146/2.5-3.2 Bethlehem, Tauranga
Speed Limit: 80km/h

The first trial candidate was a polished curve with shape issues and three fatal crashes where the vehicles crossed the centreline within metres of each other. However, by the time the equipment arrived, (thanks Covid-induced shipping disruption), this site was up for reseal.

The replacement site has some skid resistance and shape issues and is a frequent flier for barrier strikes



Trial notes

We surveyed the site under three schemes:

- Unsigned
- Static Slippery When Wet Slow Down sign
- Rain-activated Slippery When Wet Slow Down

A nearby camera was used to log the wet times. The survey data was then matched with the wet times. The resultant data was checked to eliminate any non-free flow conditions. The speeds were compared across the three schemes.

The Electronic sign shifted another 3.3% of drivers down into the 71-80km/h bin and another 2% down to the 61-70km/h bin.

The shift doesn't sound like much, but with over 40,000 data points for each sign combination, we are confident that the electronic signs are influencing the fleet to reduce speeds when the sign is activated.

We expect that there has been movement within the bands, particularly within the 81-90km/h band.

Results

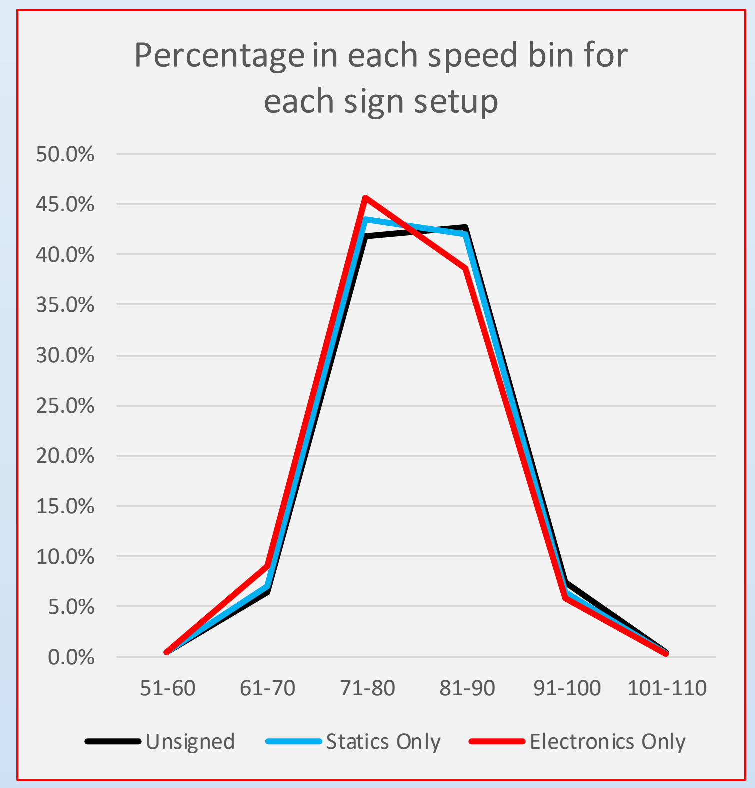
We have reviewed the data for the Decreasing Lanes (heading towards Katikati).

The Electronic sign shifted another 3.3% of drivers down into the 71-80km/h bin and another 2% down to the 61-70km/h bin.

The shift doesn't sound like much, but with over 40,000 data points for each sign combination, we are confident that the electronic signs are influencing the fleet to reduce speeds when the sign is activated.

We expect that there has been movement within the bands, particularly within the 71-80 and 81-90 bands and this will be reviewed once the trial is complete.

Sign scheme	Speed bin (km/h)						Sample size
	51-60	61-70	71-80	81-90	91-100	101-110	
Unsigned	0.5%	6.5%	41.9%	42.8%	7.5%	0.5%	43457
Statics Only	0.5%	7.0%	43.5%	42.0%	6.4%	0.4%	47811
Electronics Only	0.5%	9.0%	45.7%	38.7%	5.8%	0.3%	41938



Conclusions

- Static signs did reduce the speed profile.
- Rain-activated electronic Slippery When Wet, Slow Down sign reduced the speed profile more.
- The signs on this site may be helping to reduce the number of barrier strikes. Not all of the previous crashes were in the wet, so we're not sure if the signs have really been fully responsible for the reduction.

Reflection

The trial was not only a trial for the hardware, but also for our methodology.

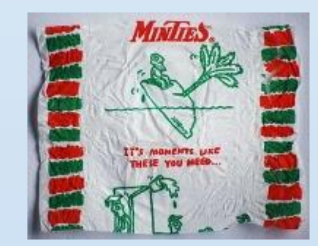
We set the trigger at 1mm accumulated rainfall in an hour and we were happy with that setting.

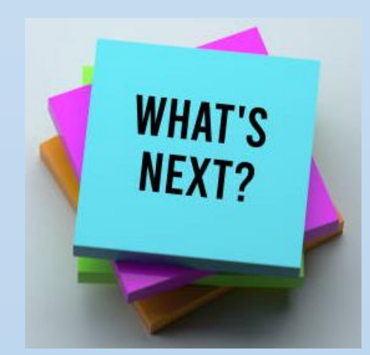
There are a few tweaks we could make to increase the accuracy, but given the sample size, we're confident that our idea is worth pursuing.

The analysis used 10km/h speed bins due to the ease of handling it this way through the software package. The data could be further analysed if there might be value in doing so. However, for now, this coarseness is acceptable as it was sufficient to show us that the idea looks promising and should be used again on another site.

We used traffic camera footage to determine the Wet and Dry/Damp condition to estimate when the sensor would have turned an electronic sign on. We did this because the sensor wasn't available during the control surveys. The method was a bit inconsistent and has likely not matched the sensor condition all the time.

It's important to be really careful when installing the sensor that took months to arrive because if it's dropped, it breaks.





When the 2023 SCRIM data is released, we'll be looking for a new candidate site – preferably a polished site.

Ideally, we'll repeat the surveys to confirm whether the electronic sign has the same positive effect on shifting the speed profile at a different site

At the next site, the wet/dry condition will be determined via the rain sensor for both the control survey (static signs only) and the trial survey (static and electronic sign). This will ensure accurate comparison between the two sign schemes