# Improving road runoff quality through research

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# Outline

- What's the problem ?
- How is research helping ?
  - Influence of traffic behaviour on runoff quality
  - Influence of road surface type on runoff quality
  - Effectiveness of stormwater treatment
  - Sustainable reuse of contaminated road sediments

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# What's the Problem ?

- Road runoff conveys contaminants such as copper, zinc and hydrocarbons to the road edge and beyond
- These can accumulate in the environment, for instance in estuary sediments
- At elevated concentrations these contaminants are toxic to aquatic life
- Need guidance on:
  - Where are high contaminant loads generated ?
  - What can be done to manage these contaminants ?


# Influence of traffic behaviour on runoff quality

# Why is traffic behaviour important ?

- Sources of contaminants:
- Copper from brake linings
- Zinc from tyre wear
- Higher emissions where greater wear
- Intersections, congested roads, on/off ramps, hills, bends, roundabouts

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# NZTA Research Report 395

- Characterised runoff quality at 4 road sites
- Focus was different traffic characteristics


**Arterial road, urban fringe (36,000 vpd)**
**Congestion = 1.38**


**Urban motorway (>100,000 vpd)**
**Congestion = 0.81**


**Rural highway (13,900 vpd)**
**Congestion = 0.52**


**Rural motorway (41,500 vpd)**
**Congestion = 0.4**

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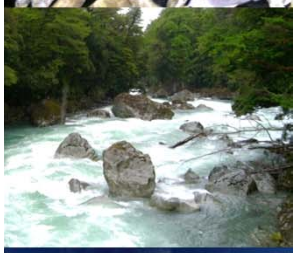

# Research Methods

- Flow measurement for 6-12 months
- Automatic water sample collection during range of storm events
- Samples analysed for TSS, Cu and Zn

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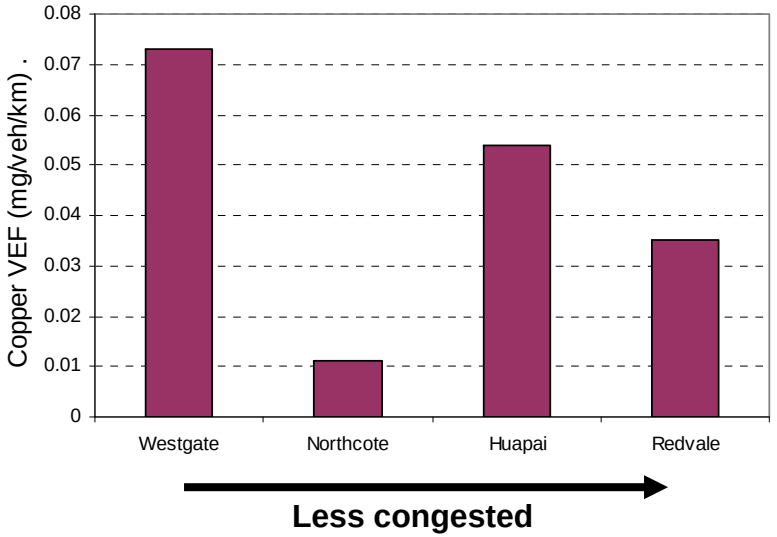
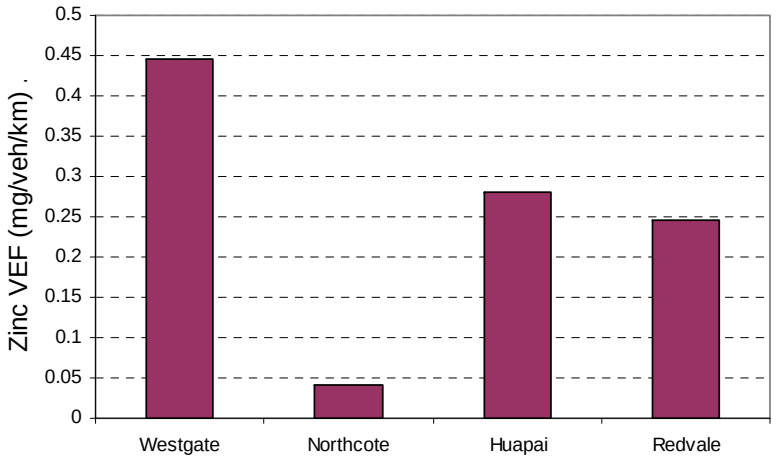
# Results

- ‘Vehicle Emission Factors’ - allow comparison of metal load per vehicle per km
- Ranking of VEFs consistent with congestion at 3 of 4 sites
- Guideline VEFs developed….
- …BUT
- VEF estimates for Northcote site (N motorway) very low

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# Influence of road surface type on highway runoff quality

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- Focus was different traffic characteristics…
- …but road surface type and age also varied


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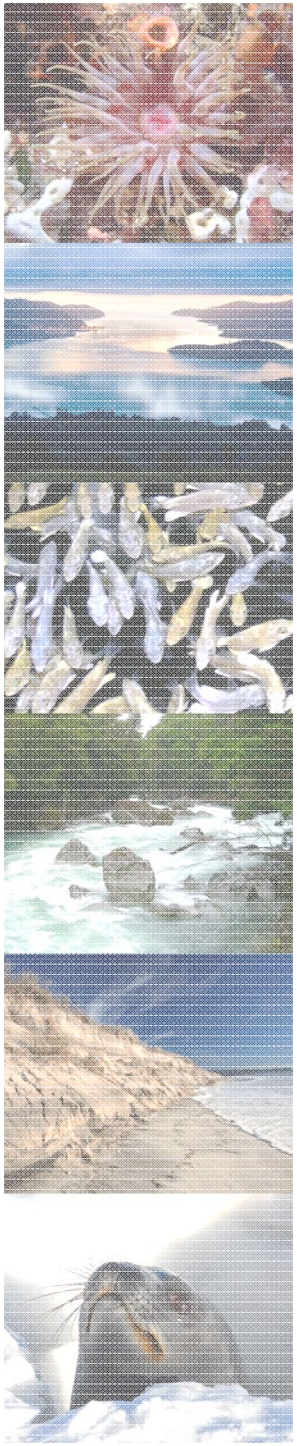
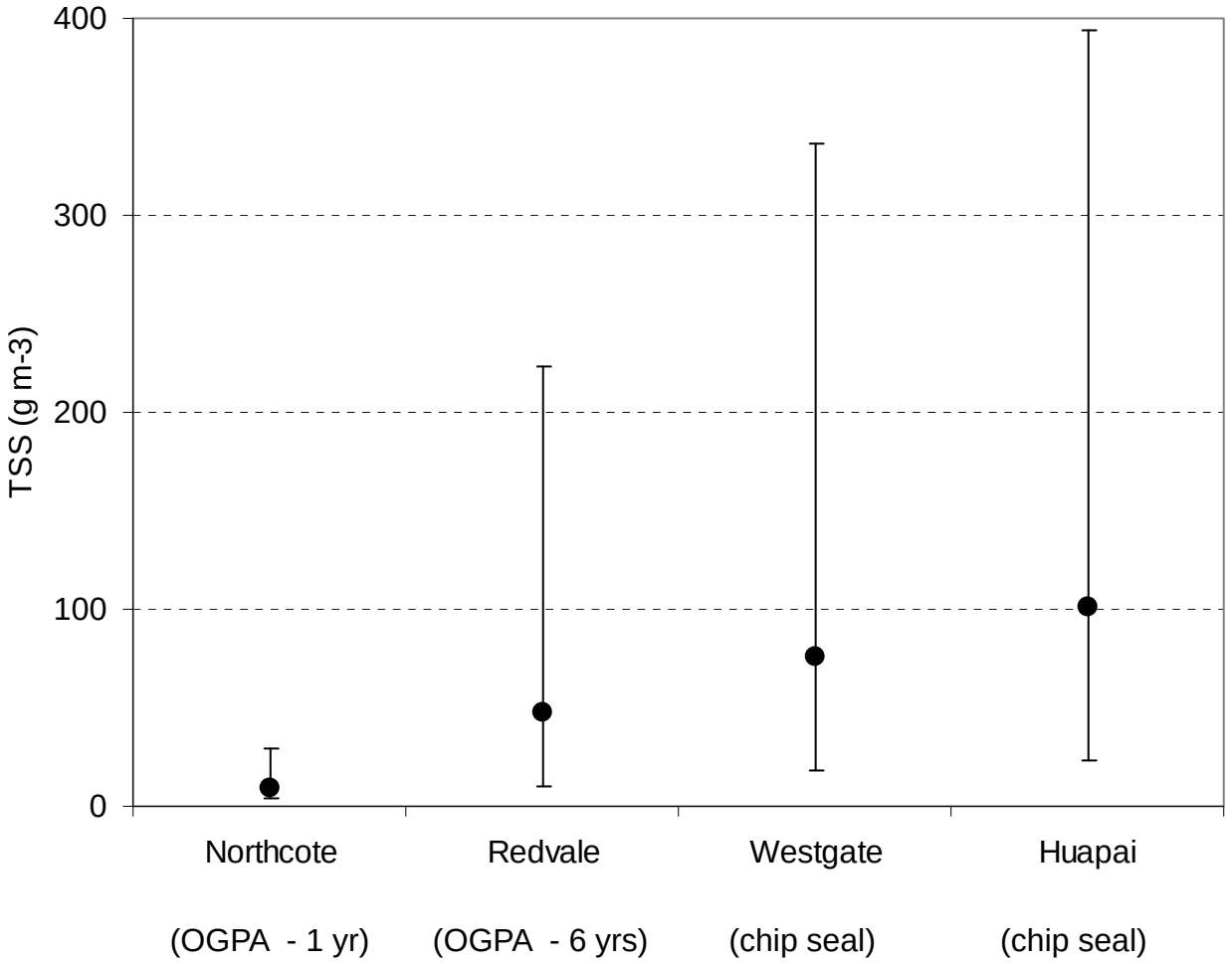


# Suspended solids

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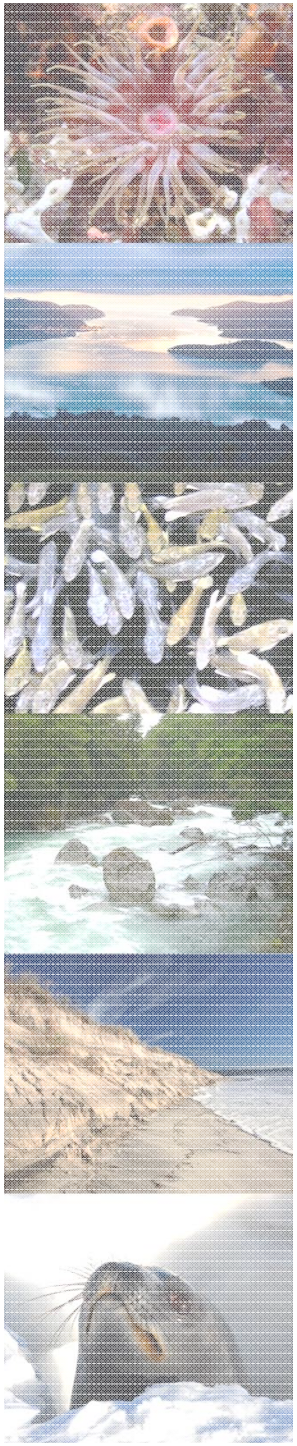
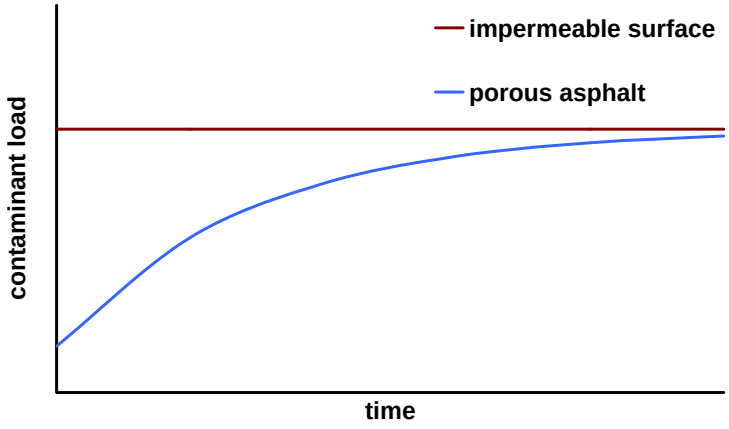
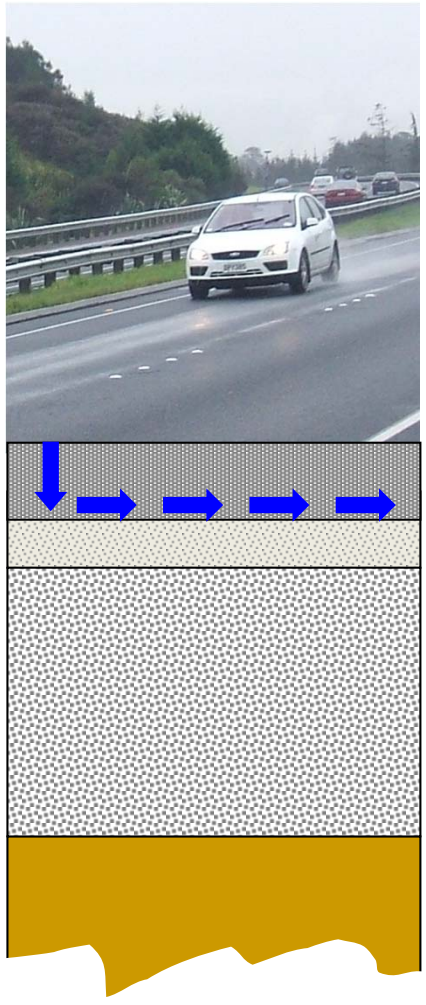


# Influence of OGPA

- Highways sealed with porous asphalt ‘friction courses’ for decades
- Designed for safety and noise-reduction
- Permeability appears to have runoff quality benefits as a by-product
- Benefits reduce over time – infiltration tests suggest within the first 3 years[1]
- But possibly a markedly lower contaminant load over the life of the surface



1. Lane, R (2008) OGPA cleaning trial. International Conference on Surface Friction, Christchurch, 1–4 May 2005. www.nzta.govt.nz/resources/surface-friction-conference-2005/8/docs/lane-ogpa-cleaning-trail.pdf.

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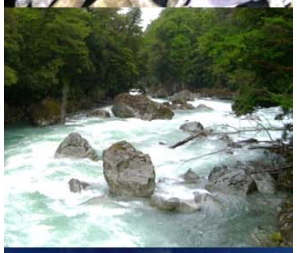
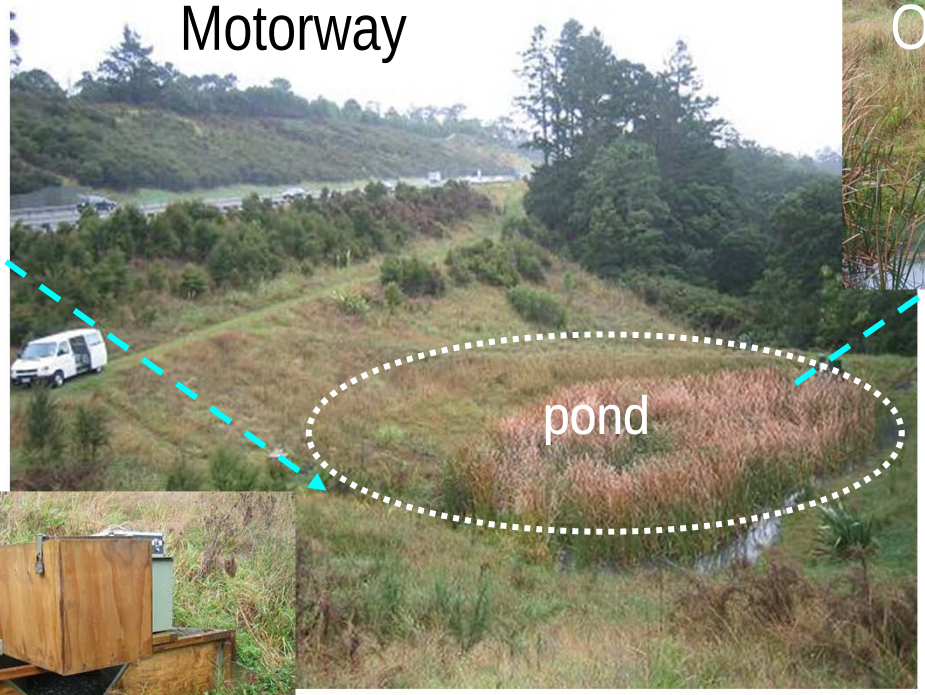
# Effectiveness of control measures – stormwater treatment



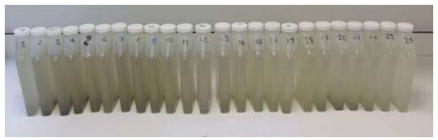



# Methods

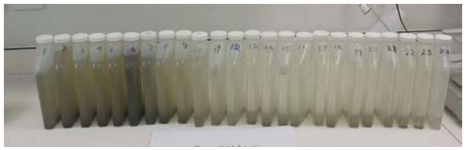




**Samples of treated runoff**




Samples of untreated runoff



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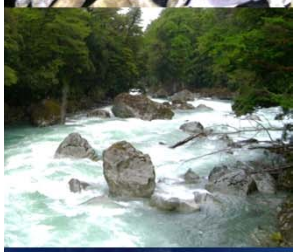

# Performance – load reduction



| Treatment type | | Load-reduction factor | | |
|---|---|---|---|---|
| | | TSS | Total copper | Total zinc |
| Stormwater ponds | More vegetation ↕ Less vegetation | | | |
| Vegetated swales | | | | |

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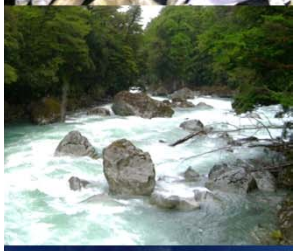


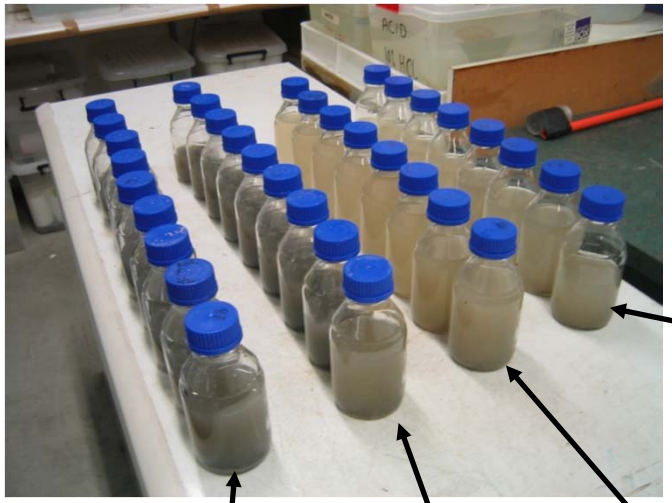


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# Performance – load reduction

| Treatment type | | Load reduction | | |
|---|---|---|---|---|
| | | TSS | Total copper | Total zinc |
| Stormwater ponds | More vegetation ↕ Less vegetation | 0.7 ↕ 0.5 | 0.5 | 0.65 ↕ 0.55 |
| Vegetated swales | | 0.6 | 0.8 | 0.8 |

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# Performance of media filters

- NZTA-funded study to assess performance of proprietary media filtration devices
- Emphasis on improving knowledge of device performance in the field
- Monitoring of 3 devices: SW360 Stormfilter, Hynds UpFlow, Humes Filternator
- Recently extended with Auckland Council co-funding
- Monitoring of 9 events at each site completed – target is total of 15

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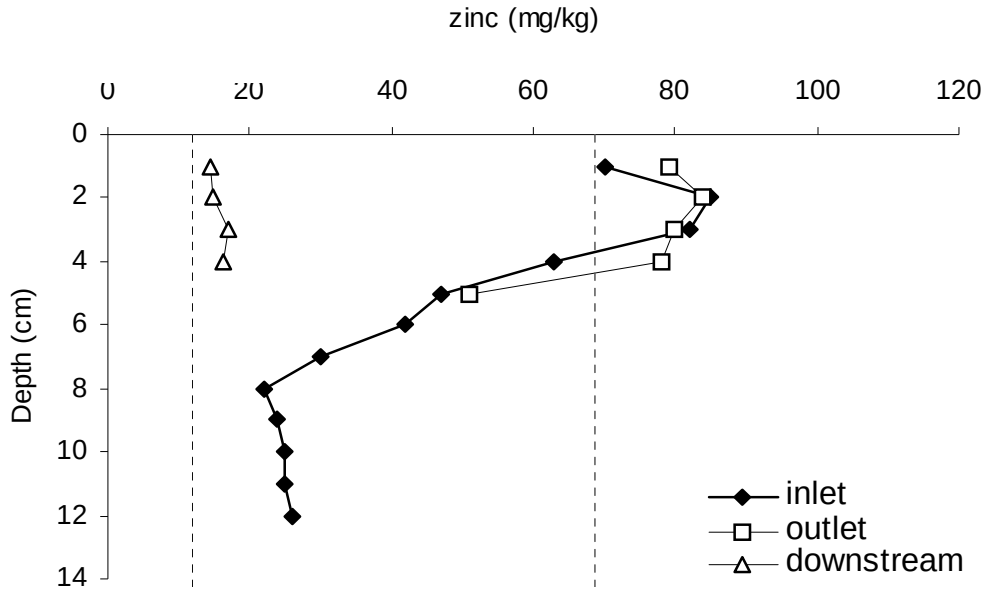
# Sustainable re-use of contaminated road-derived sediments

# Road-derived sediment

- Large volumes of street sweeping and other road-derived sediment (RDS):
  - Expensive to dispose of
  - Contaminated




- Are there:
  - Ways to reduce disposal costs ?
  - Environmentally responsible alternatives to disposal ?

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# Sustainable re-use

- feasibility of conversion to compost and mulch-type products
  - types and levels of contaminants
  - leaching rates
  - toxicity experiments
  - identification of stabilisers (eg lime)

- industry-led trial to determine the feasibility of using composts and mulches formed from RDS and greenwaste on a large scale

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# Summary

- Road runoff conveys contaminants such as copper, zinc and hydrocarbons to the road edge and beyond
- At elevated levels these are toxic to aquatic life
- Research has, and continues to be, committed to being focused on end-user needs
- Current research is helping by investigating:
  - how and why levels of these contaminants vary
  - The effectiveness of measures to manage runoff quality
  - Innovative ways of contributing to the sustainability of the roading sector

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Research on sustainable reuse of RDS led by

- Craig Depree, NIWA Hamilton

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