Enhancing Road Resilience by Mitigating the Disruption from Earthquake-impaired Underground Pipelines?

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Outline of Presentation

- Issues incurred from the Canterbury earthquakes in 2010-2011
- Roading system resilience
- Proposed solutions
- Conclusion
Canterbury Earthquake Sequence 2010-2011

- 4 September 2010 ($M_w$ 7.1) — Darfield Earthquake;
- 22 February 2011 ($M_w$ 6.2) — Christchurch Earthquake;
- 13 June 2011 ($M_w$ 5.3 and $M_w$ 6.0);
- 23 December 2011 ($M_w$ 5.8 and $M_w$ 5.9).
Issues
What is Infrastructure Resilience?

“Infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events.”

Holistic Assessment Considering

- Performance
- Frangibility
- Functionality
- Adaptability
- Consequence
- Cost

US National Infrastructure Advisory
Cost for Improving Infrastructure Resilience

- Biggest steps in resilience for small cost early in project cycle – design philosophy.
- Early consideration of resilience can facilitate cost saving through optimisation.
- Detailed design and construction phases – small potential steps in resilience improvement for high cost.
Proposed solutions (1)

Fragility curves of sewer pipelines in different liquefaction zones

- Estimate the damage to pipes
- Predict the potential effects on roads
- Mitigate disruption for roads
Proposed solutions (2)

- Roading engineers, Geotechnical engineers, and Civil engineers
Proposed solutions (3)

Strategically and systematically manage three waters and roads restoration
Questions?