bushfire&natural HAZARDSCRC

# RESEARCH DRIVING CHANGE SHOWCASE 2017

Adelaide

## Towards a safer built environment

**Mark Edwards – Session Chair**
Geoscience Australia, Canberra, ACT

An Australian Government Initiative

CRC AUSTRALIA


26/03/2006


31 JAN 2011


31 JAN 2011


coles

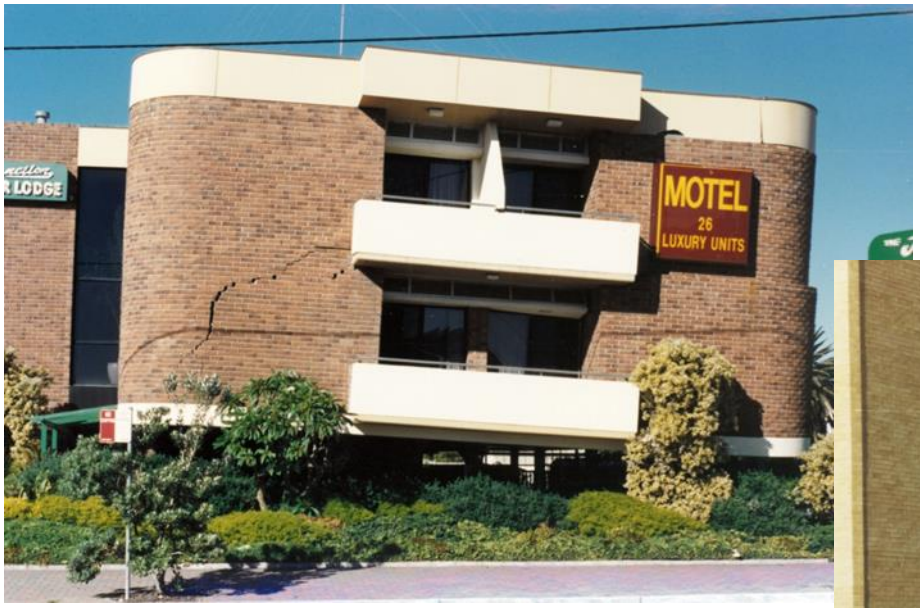

URGICAL AIDS HIRE OR BUY
Aston's
PHARMACY


08/04/2006

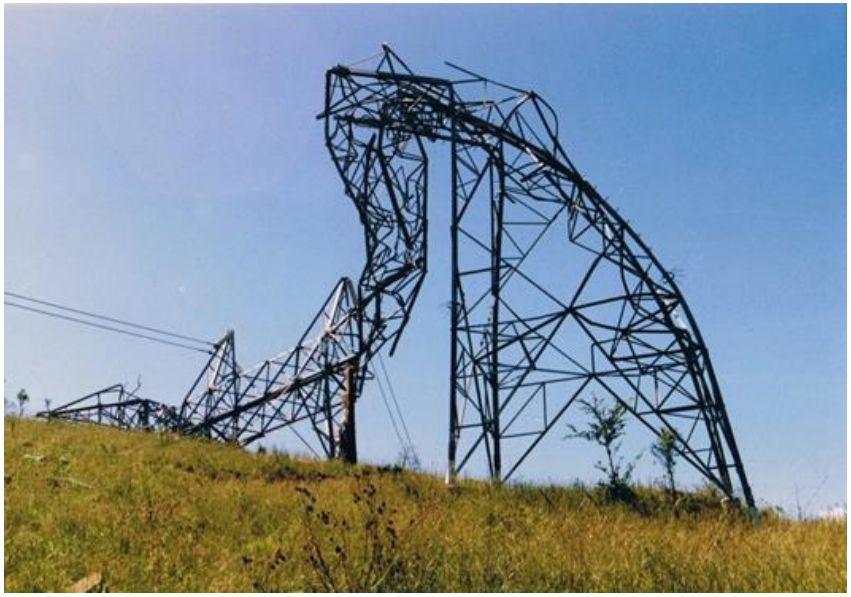

1924
THE KENT


GOODYEAR
SPORTS
27/03/2006


B1B09D
B1B09C
B1B09A
B1B09B


MOTEL
26
LUXURY UNITS


AGER
GREAT

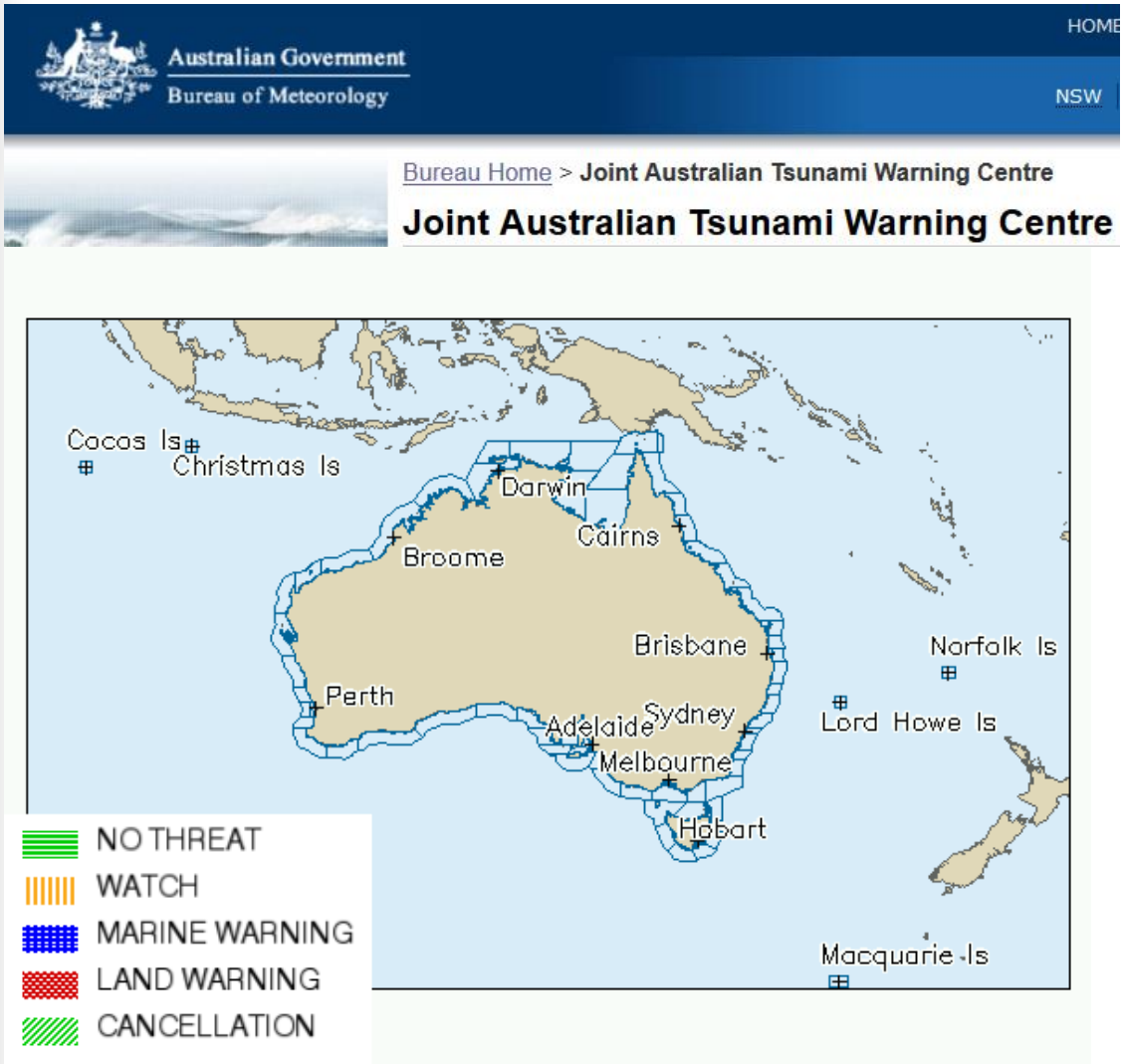



SA-9A
DO-F1/R

# CLUSTER PROJECTS

1) Natural Hazards Exposure Information Framework (GA)
2) Enhancing Resilience Of Critical Road Infrastructures (RMIT)
3) Improving the Resilience of Existing Housing to Severe Wind Events (JCU)
4) Cost-effective Mitigation Strategy Development For Building Related Flood Risk (GA)
5) Cost-effective Mitigation Strategy Development For Building Related Earthquake Risk (University of Adelaide

# ELLIOTT SIMMONS, NSW STATE EMERGENCY SERVICE, END-USER


Australian Government
Bureau of Meteorology
HOME
NSW
Bureau Home > Joint Australian Tsunami Warning Centre
Joint Australian Tsunami Warning Centre
Cocos Is
Christmas Is
Darwin
Cairns
Broome
Brisbane
Norfolk Is
Perth
Adelaide
Sydney
Lord Howe Is
Melbourne
Hobart
Macquarie Is
NO THREAT
WATCH
MARINE WARNING
LAND WARNING
CANCELLATION

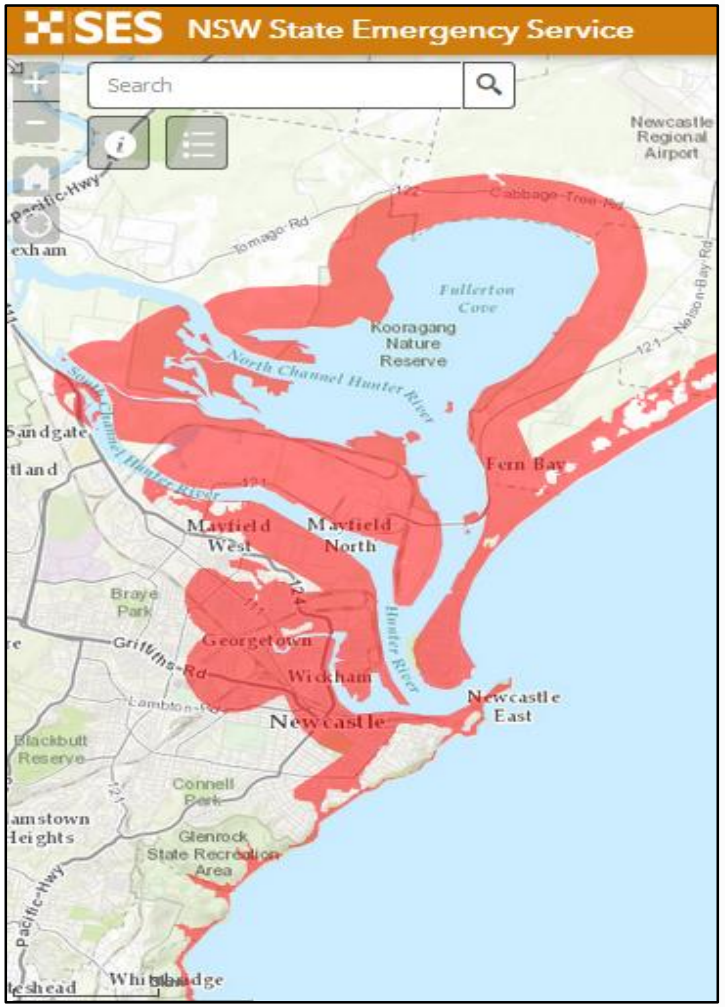

SES NSW State Emergency Service
Search
Newcastle Regional Airport
Kooragang Nature Reserve
Fern Bay
Mayfield West
Mayfield North
Georgetown
Wickham
Newcastle
Newcastle East
Glenrock State Recreation Area

Table 6: Possible Vulnerable Population in NSW (2011 census) within 1km of coast and below the 10m contour height (AHD).

| | Total Population | Dwellings | No Vehicle at Dwelling | Schools / Childcare Centres | School Age Children (Pre to High School) | Public / Private Hospitals | Aged Care / Nursing Homes | Age >= 85 | Caravan Park / Camping Grounds |
|---|---|---|---|---|---|---|---|---|---|
| Northern Rivers | 23649 | 9526 | 675 | 24 | 3565 | 2 | 6 | 570 | 33 |
| Mid North Coast | 29395 | 12436 | 1215 | 17 | 4225 | 0 | 0 | 814 | 60 |
| Hunter | 46818 | 19112 | 2165 | 25 | 6257 | 3 | 6 | 1541 | 48 |
| Lord Howe Island | 360 | 129 | 22 | 0 | 36 | 1 | 0 | 8 | 0 |
| Metropolitan | 104616 | 42796 | 8570 | 84 | 10434 | 1 | 4 | 2284 | 9 |
| Illawarra | 38588 | 15649 | 2132 | 26 | 5402 | 0 | 6 | 1119 | 48 |
| South Coast | 10767 | 4436 | 358 | 10 | 1505 | 0 | 1 | 489 | 47 |
| NSW Total | 254193 | 104084 | 15137 | 186 | 31424 | 7 | 23 | 6825 | 245 |

Note: Figures quoted are approximate. There may be areas impacted that are adjacent to tidal rivers or estuaries further than 1km from the coast.

# Flood Evacuation Order


**North West SES Region Headquarters**

**418 Frome St**

**Moree NSW 2400**

**Telephone: (02) 6757 9250**

**Fax: (02) 67572980**


**Issued Thursday 2 February 2012 at 11:30pm** Email:nwr.ops@ses.nsw.gov.au

**Radio stations are asked to immediately broadcast this message and repeat it.**

Use of the Standard Emergency Warning Signal (SEWS) with this message is authorized.

## Flood Evacuation Order North Moree, Yarraman, Gwydirville and Bendygleet

**Authorised By:** ***James McTavish Incident Controller***

As a result of ongoing heavy rainfall the predicted flood level by the Bureau of Meteorology on the Mehi River at Moree will exceed 9.5 metres around 3pm Thursday afternoon with major flooding, and peak near 10.3 metres around 9am Friday morning. Businesses should also prepare for inundation of the main street.

The State Emergency Service is directing residents within the nominated areas to evacuate to South Moree within the next 6 hours. The Geoffrey Hunter Bridge on Frome Street in Moree is expected to be cut this afternoon (Thursday 2 February).

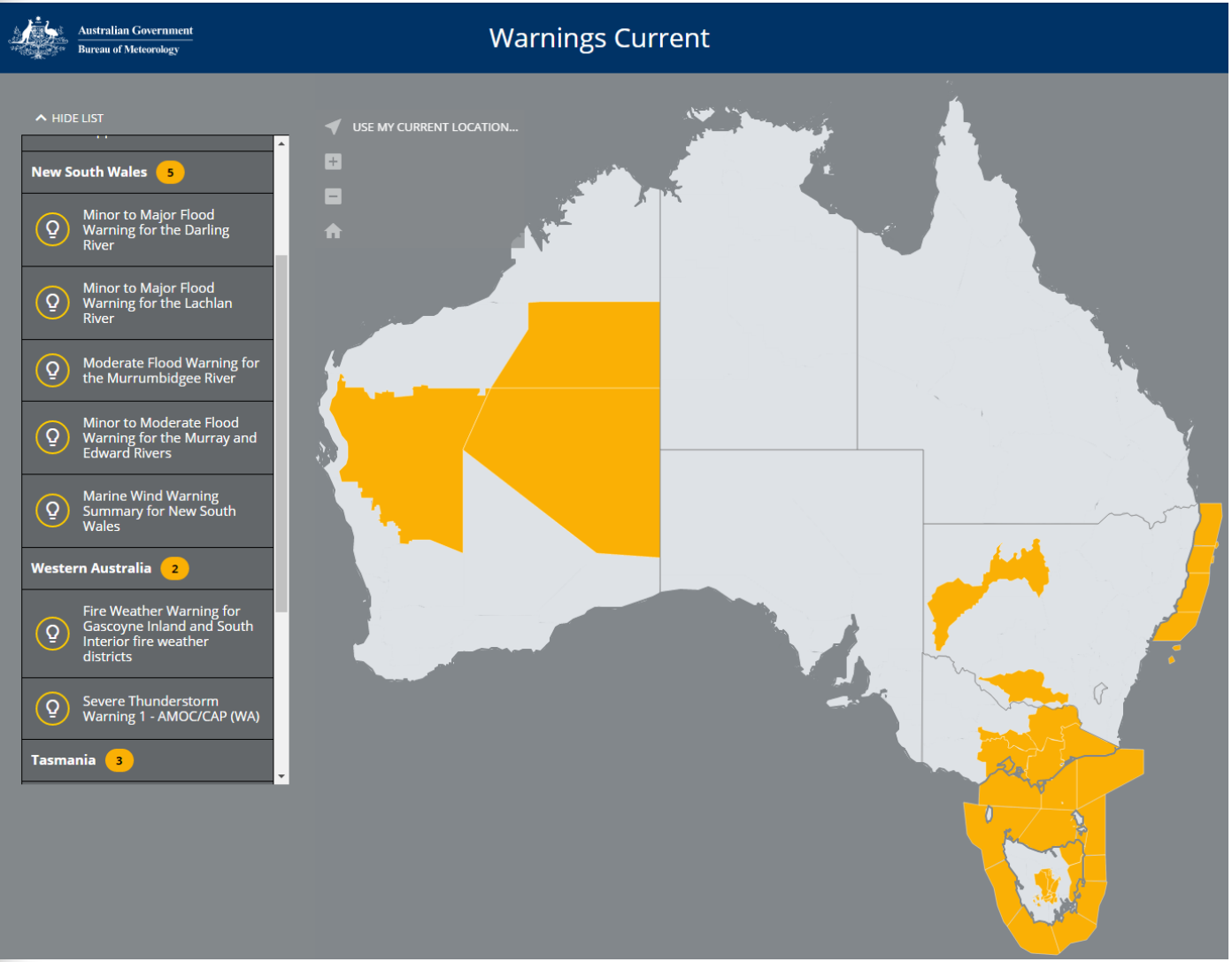
Do not delay your evacuation. Roads will be congested or closed. You could become trapped and need rescue. Remaining in flooded areas is dangerous and may place your life at risk.

In the first instance go to friends or relatives. Alternatively, a registration centre will be established at the Moree Town Hall, Balo Street from where you will be directed to evacuation centre will be established at the PCYC in South Moree, where temporary accommodation and other help will be provided.

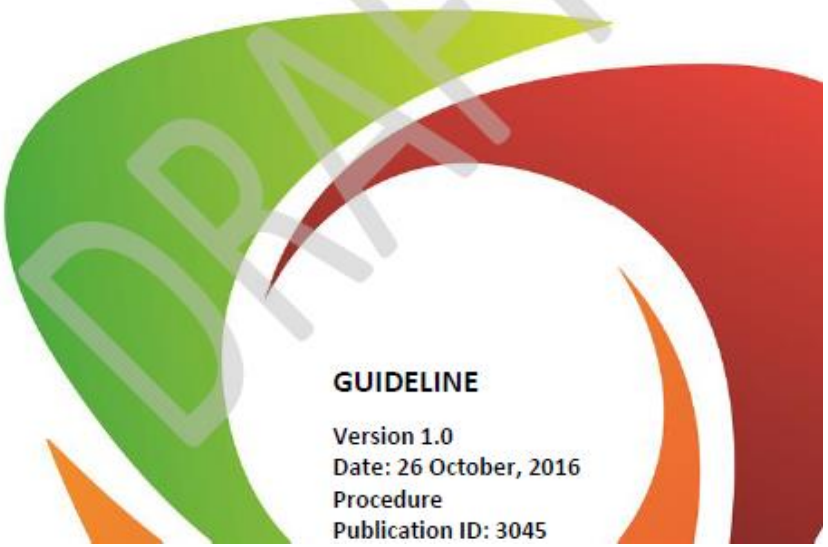
If you don't have a car, buses may operate where possible on normal routes. Special transport may also be provided on request if necessary at the registration point.

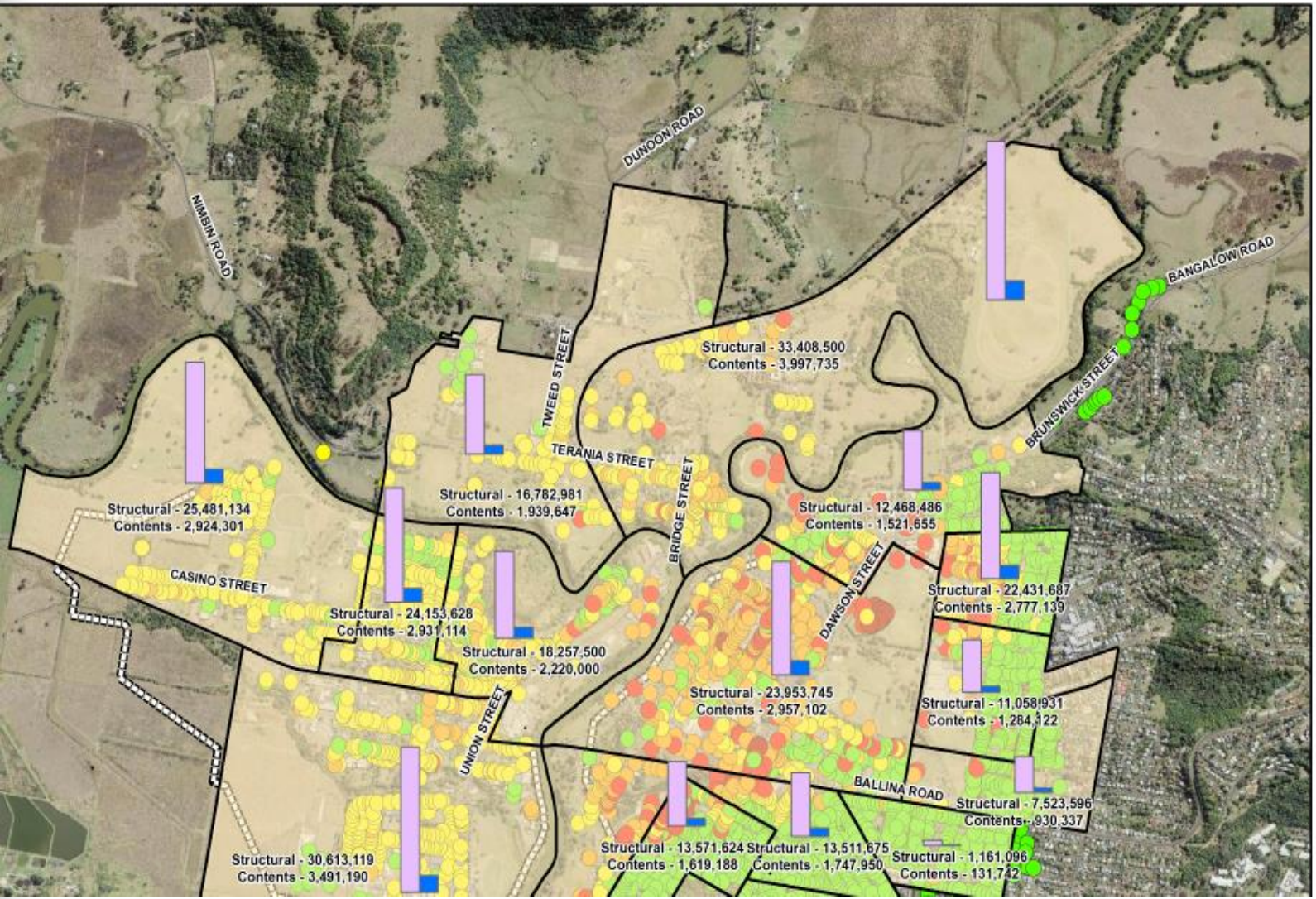
As you evacuate you should:

- Take your important documents, mementos and photos
- Take your spare clothing and medicines
- If possible, check to see if your neighbours need help
- Turn off the electricity and gas
- Don't walk ride or drive through floodwater
- Continue to listen to a local radio station for updates


Australian Government
Bureau of Meteorology
Warnings Current
HIDE LIST
USE MY CURRENT LOCATION...
New South Wales 5
Minor to Major Flood Warning for the Darling River
Minor to Major Flood Warning for the Lachlan River
Moderate Flood Warning for the Murrumbidgee River
Minor to Moderate Flood Warning for the Murray and Edward Rivers
Marine Wind Warning Summary for New South Wales
Western Australia 2
Fire Weather Warning for Gascoyne Inland and South Interior fire weather districts
Severe Thunderstorm Warning 1 - AMOC/CAP (WA)
Tasmania 3


# National Damage Assessment Data Set and Dictionary for Phase 2 Assessments






NSW STATE EMERGENCY SERVICE

# LISMORE

**Impact Assessment (09/04/2017)**

**March 2017**
**Event: 210/1617**

**Estmated Residential Property Damage ($)**
(Excludes commercial and industrial)

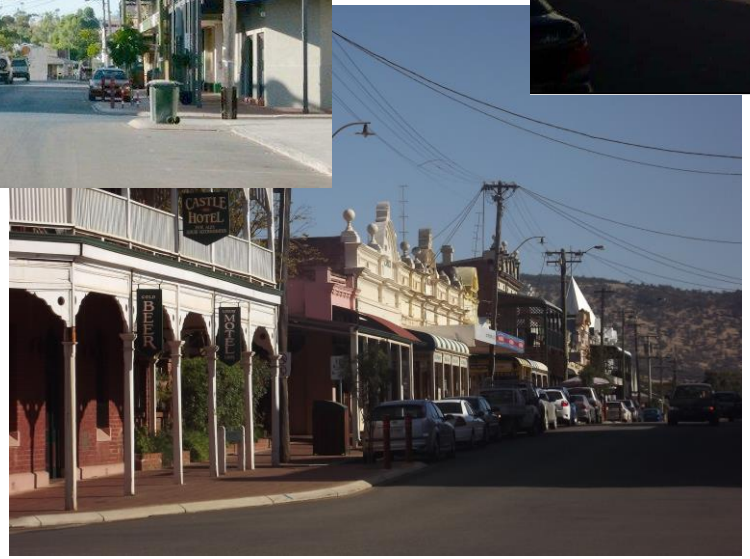
- Statistical Area 1 (SA1)
- Structural
- Contents
- Other
- No damage/unaffected
- Slight damage
- Moderate damage
- Severe damage
- Total damage/destroy
- Levee Alignments

*Damage values derived from the national NEXIS data set.*

# PAUL MARTIN, CEO YORK SHIRE COUNCIL, WA

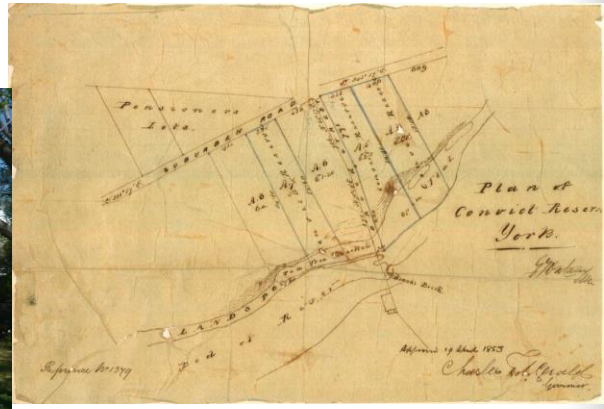
# YORK, WA'S FIRST INLAND TOWN



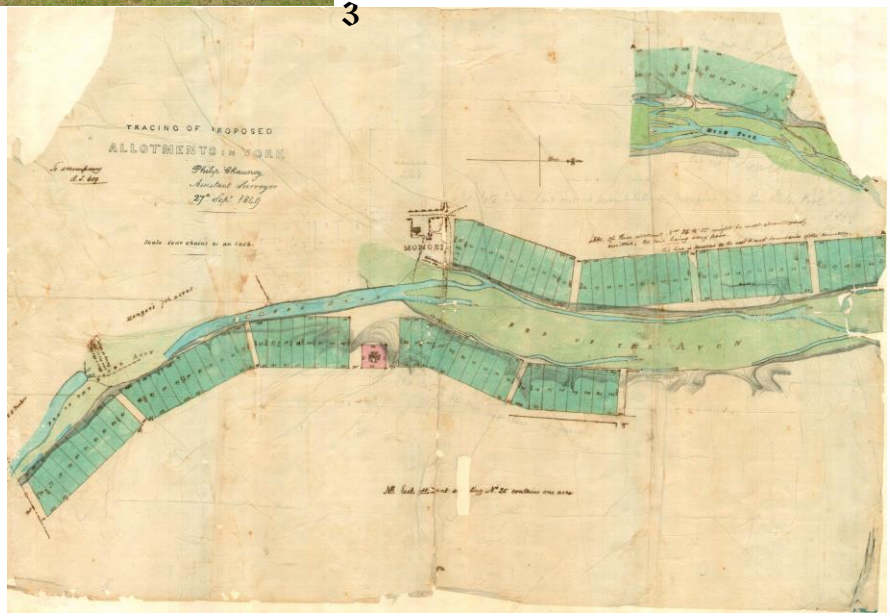




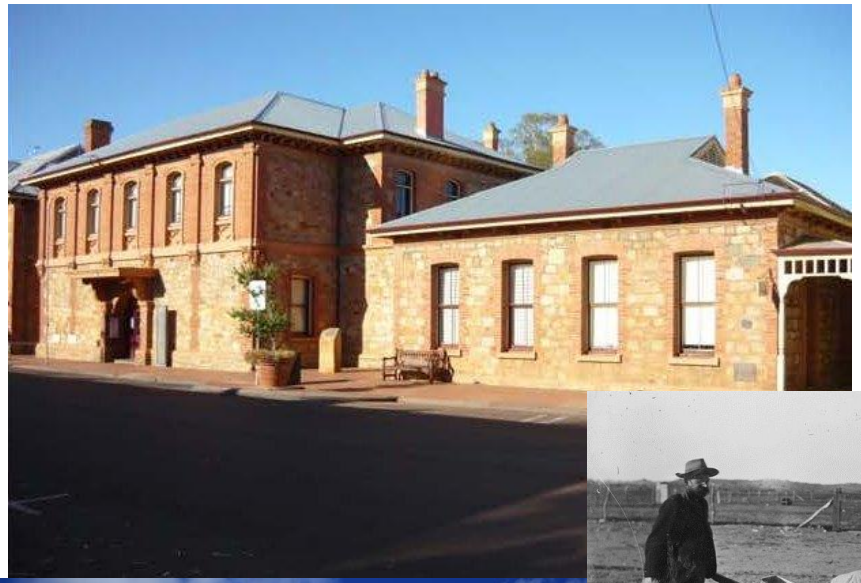
1836


185
3



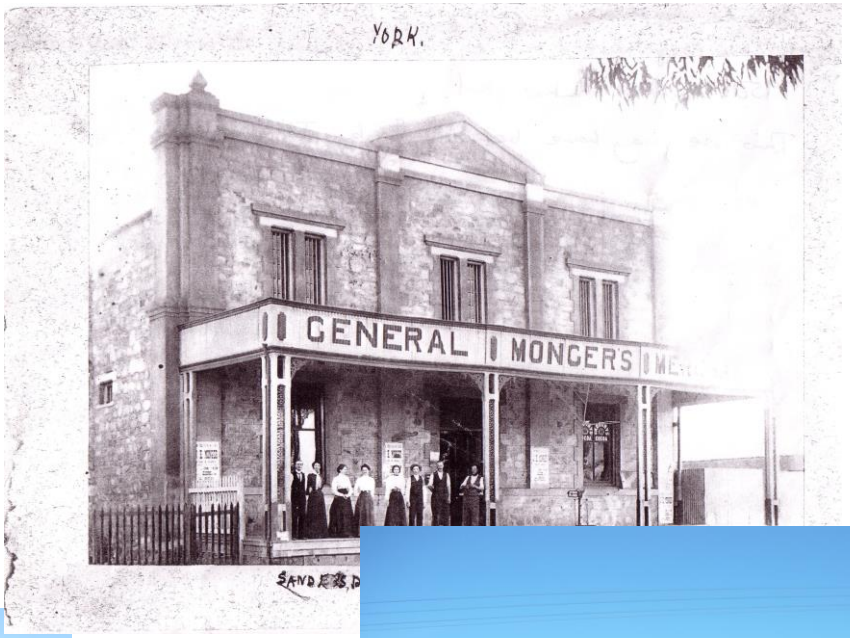

1849




YORK CO-OP


Galileo


TOWN HALL


YORK.
GENERAL

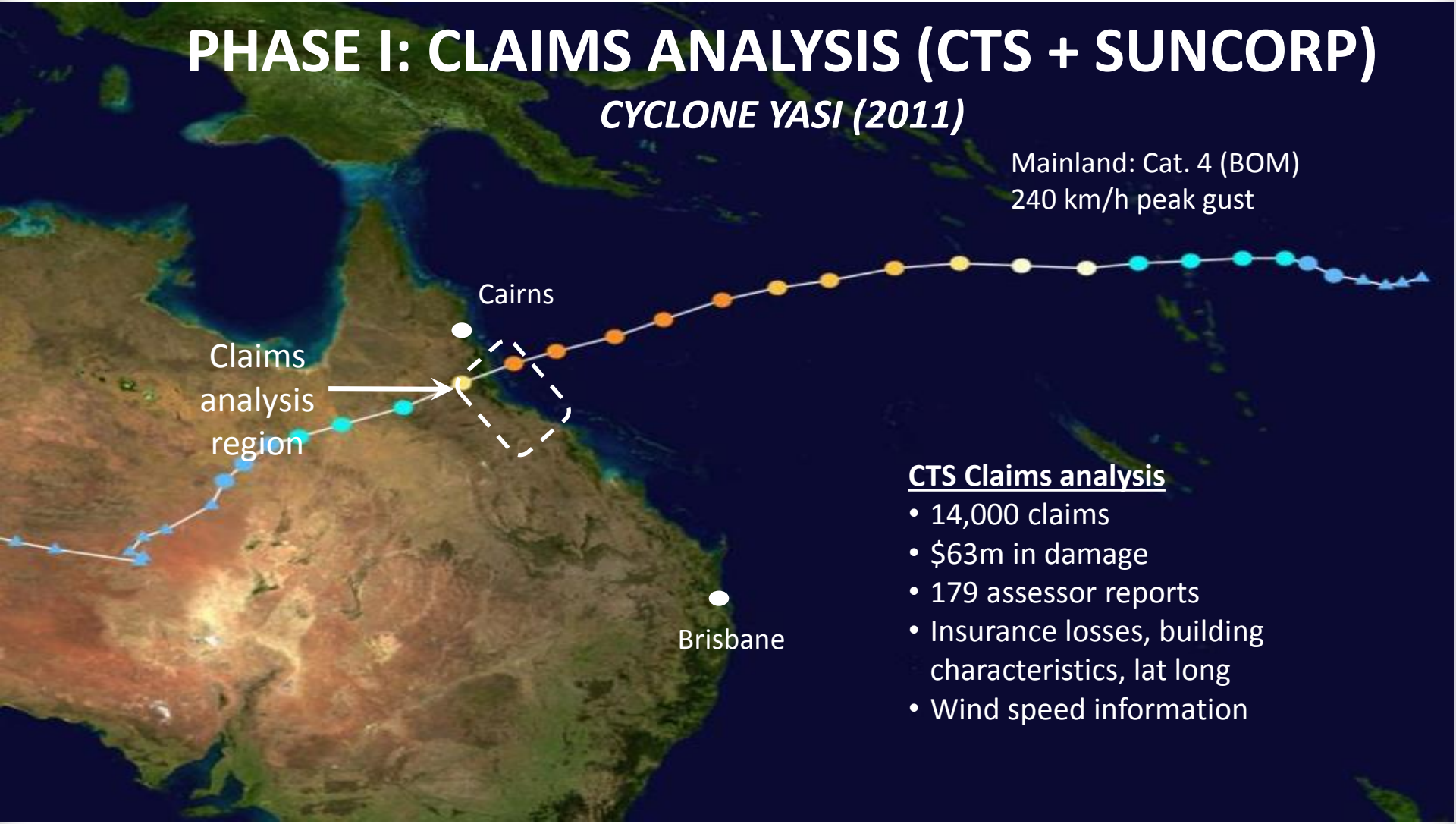

nord stage 2

# Cyclone Resilience through Academic and Industry Partnership


Jon Harwood, Suncorp

# PHASE I: CLAIMS ANALYSIS (CTS + SUNCORP)

## *CYCLONE YASI (2011)*

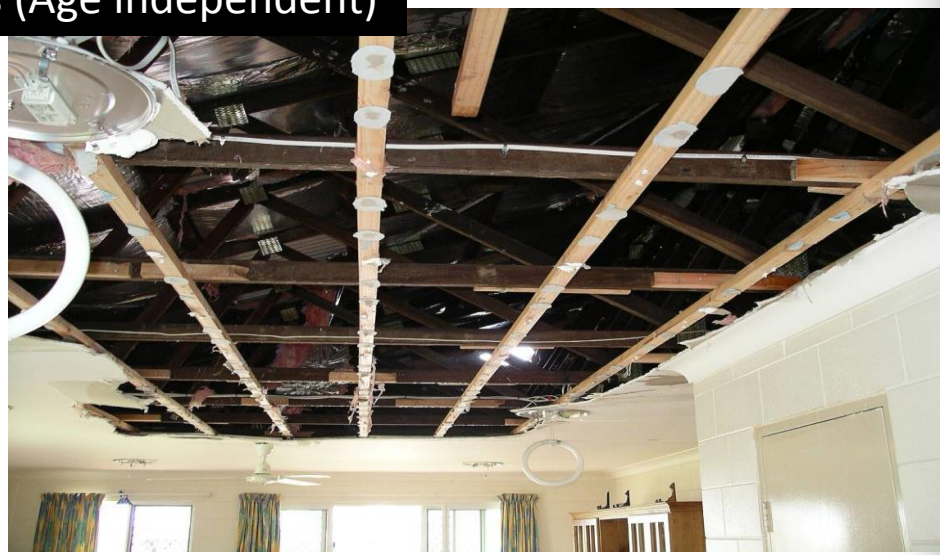



**CTS Claims analysis**

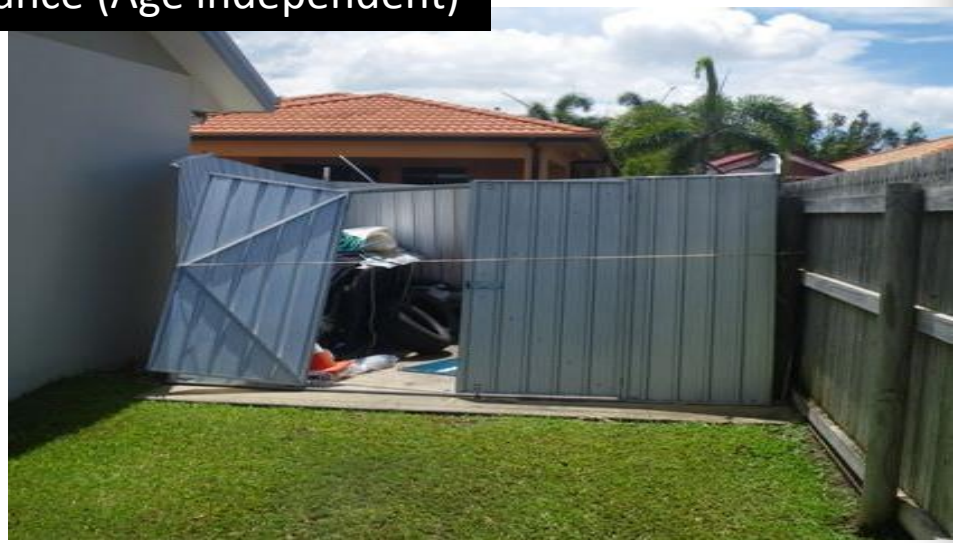
- 14,000 claims
- $63m in damage
- 179 assessor reports
- Insurance losses, building characteristics, lat long
- Wind speed information


Structural Failures (Older housing)

Water Ingress Failures (Age independent)



Auxiliary Items and Maintenance (Age independent)

# Key Findings and Recommendations

- Pre-code housing at relatively > risk of structural damage
- **Modern housing still vulnerable**
- Minor damages independent of housing age (high frequency)

<u>Recommendations for Mitigation (Existing housing)</u>

1. Structural roof upgrading
2. Opening (i.e. windows, doors, etc.) protection upgrading
3. Community education/outreach

# Phase II - Cost Benefit Analysis

- Partnered with CTS and Urbis Consulting
- Simple low cost mitigation can pay for itself after just one cyclone
- This work vital for providing evidence base for policy makers

| MITIGATION OPTION | COST PER HOUSEHOLD | TOTAL BENEFIT PER HOUSEHOLD** | BCR | PAYBACK PERIOD*** |
|---|---|---|---|---|
| Community awareness campaign* | $55 - $136 | $440-$820 | 3.2 – 14.8 | <1- 6 years |
| Opening protection – self installed (Low cost scenario) | $1,660 | $1,990-$6,400 | 1.2 – 3.9 | 4 – 21 years |
| Roofing option – strapping only (Low cost scenario) | $3,000 | $12,900-$38,800 | 4.3 – 12.9 | 2 - 4 years |
| Roofing option – over-batten system (Medium cost scenario) | $12,000 | $13,500-$39,400 | 1.1 – 3.3 | 5 – 37 years |

# CYCLONE RESILIENCE BENEFIT

## Key points of vulnerability as basis for question structure

**Roofs**

**Window and door openings**

**Preparedness**

**Sheds**

## Size of the benefit depends on:

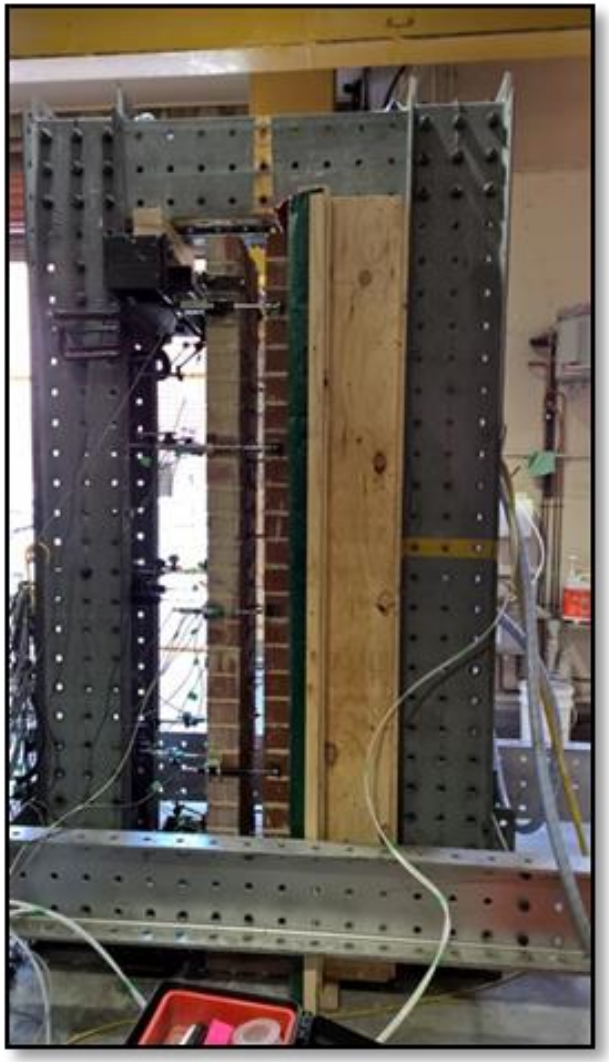
- Roof upgrades – largest driver of benefit as largest structural vulnerability addressed
- Location of home – largest potential benefits go to mitigation in the most cyclone prone areas
- Age of home – work done to pre 1980s properties will see largest benefits

# How do we get homeowners to invest in mitigation?


# UNDERSTANDING BEHAVIOR CHANGE

# MARK EDWARDS, GEOSCIENCE AUSTRALIA

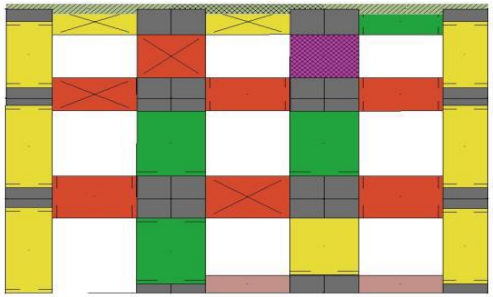

HYUNDAI

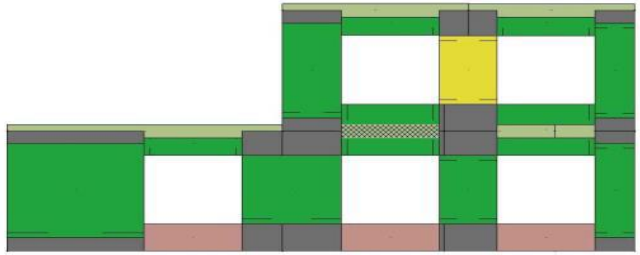


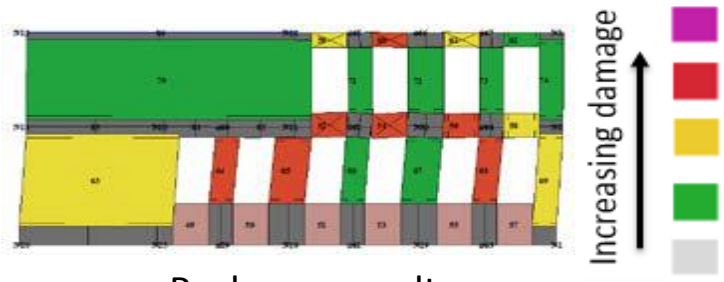

Standard ties

Helifix anchors

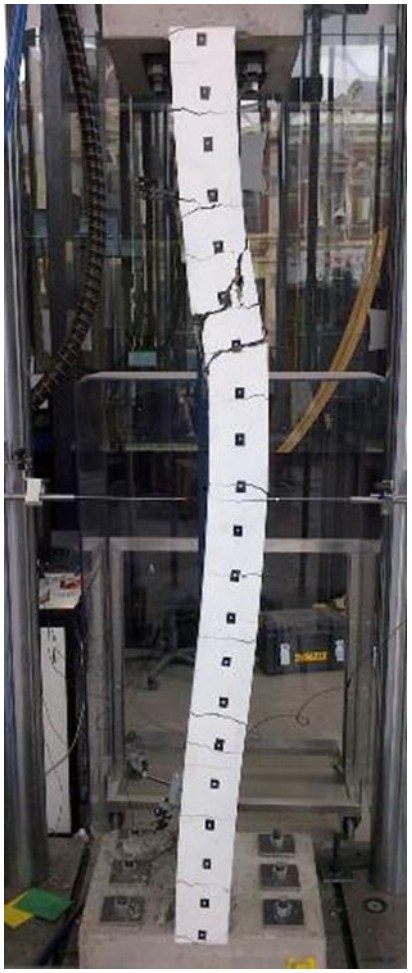
Foam infill/strips

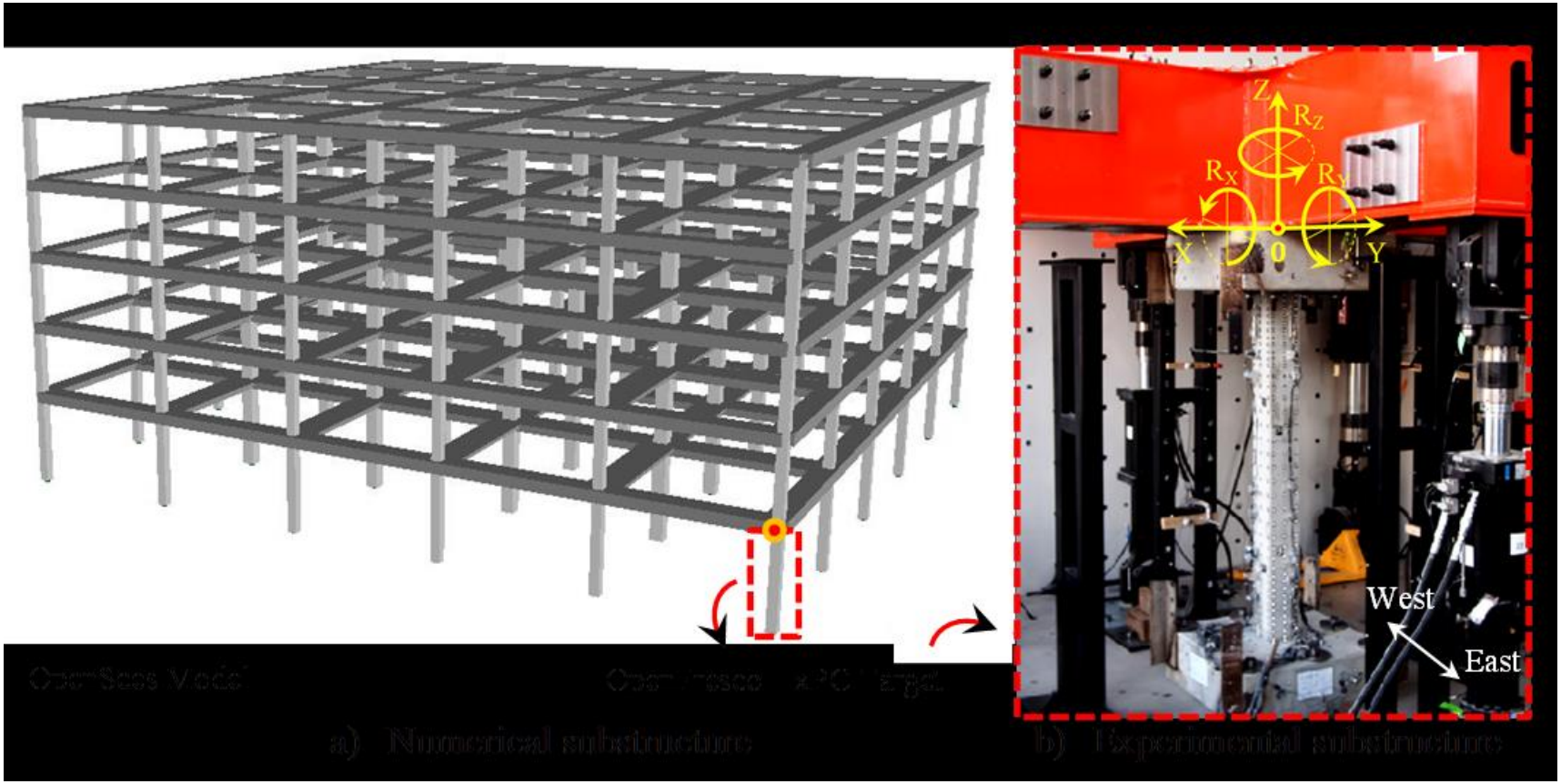





Pushover results






a) Numerical substructure b) Experimental substructure

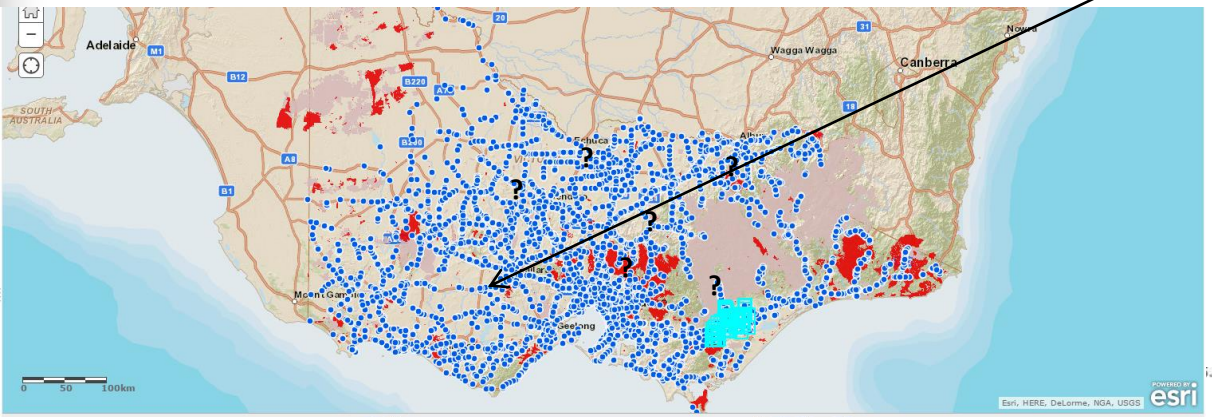
# Mitigation Earthquake



# Mitigation
# Flood

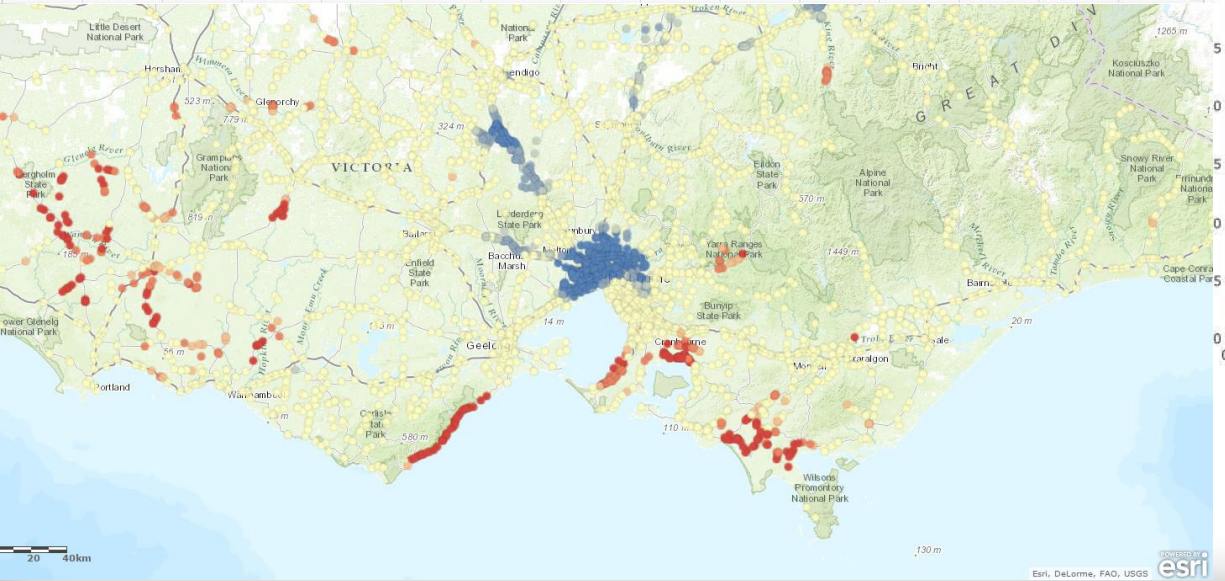
# BRIDGE PRIORITISATION

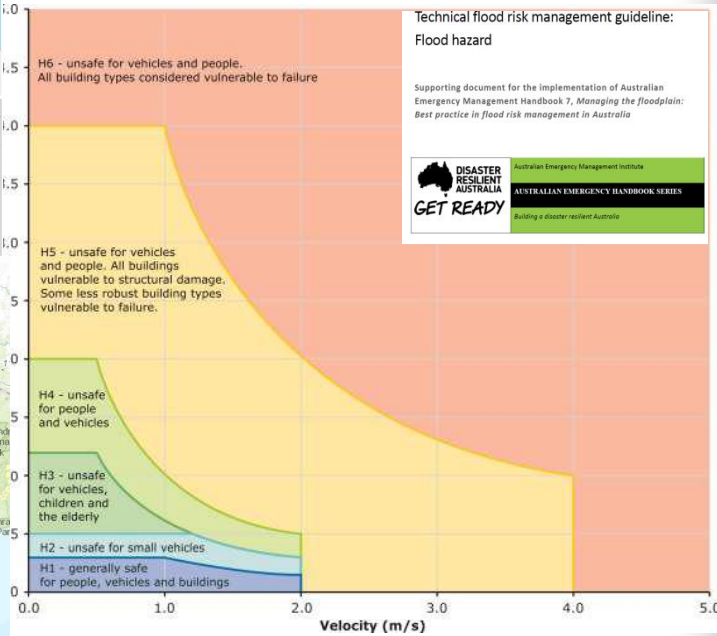
| Damage | Probability ARI ?? | Probability ARI ?? | Probability ARI ?? | ... |
|---|---|---|---|---|
| D1 | 0.01% | ~ | ~ | |
| D2 | 5.6% | ~ | ~ | |
| D3 | 67.2% | ~ | ~ | |
| D4 | 23.2% | ~ | ~ | |
| D5 | 4% | ~ | ~ | |




Bridge Structures (6,112 features, 104 selected) — Table Options

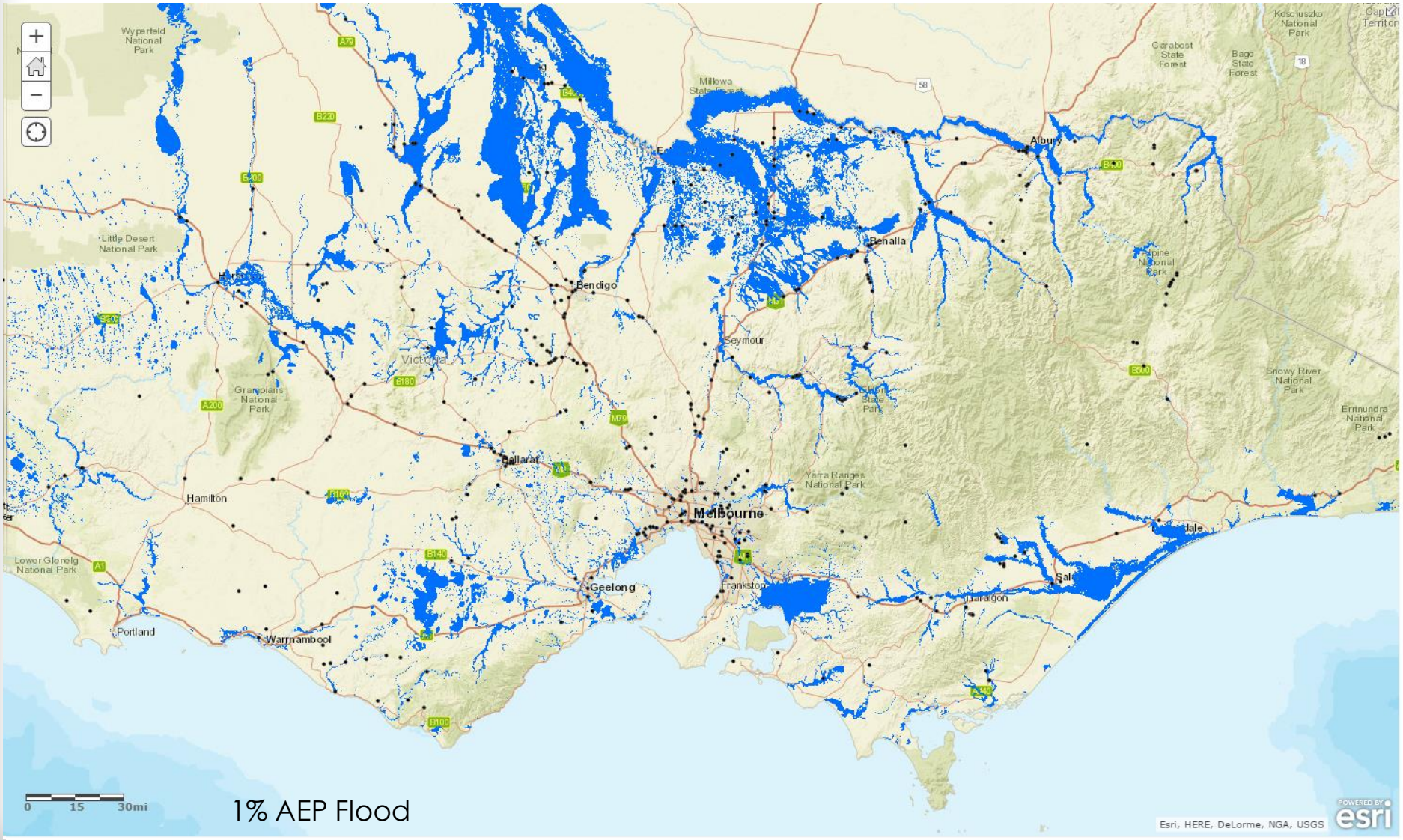
| ID_STRUCTURE | BRIDGE_RATIN | BRIDGE_TYPE | BRIDGE_TYPE | COLLOQUIAL_N | COLLOQUIAL_N | COLLOQUIAL_N | FEATURE_CRO | FEDERAL_CAT | MATERIAL_CD | MIN_CLEARAN | NO_SPANS | OVERALL_LEN | OVERALL_WID | STRUCTURE_ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN1350 | 40.00 | SE | ROAD OVER SEASONAL WATERCOURSE | | | | UN-NAMED WATERCOURSE | | | | 1 | 1.80 | 61.40 | SC |
| SN1353 | 1.00 | SD | ROAD OVER PERENNIAL WATERCOURSE | | | | MUDDY CREEK | | SP | | 2 | 40.80 | 13.00 | SB |
| SN1354 | 8.00 | SE | ROAD OVER | | | | UN-NAMED | | SR | | 4 | 4.80 | 46.50 | SC |



# Mitigation
# Severe Wind

# GIS INTEGRATION FOR CRTICAL BRIDGE VULNERABILITY




1% AEP Flood

# Mitigation
# Earthquake