Kaikoura/Hurunui Earthquake: **Environmental Challenges and Opportunities**

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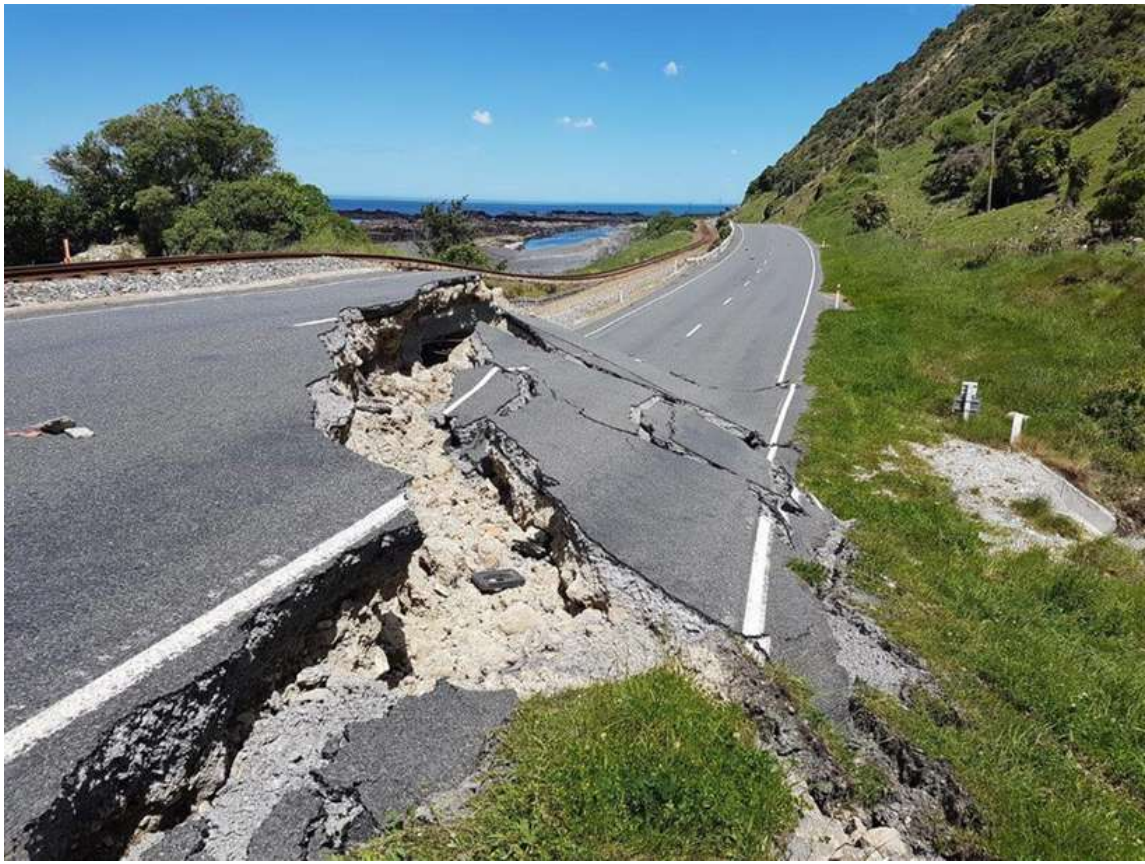
NCTIR RECONNECTING COMMUNITIES

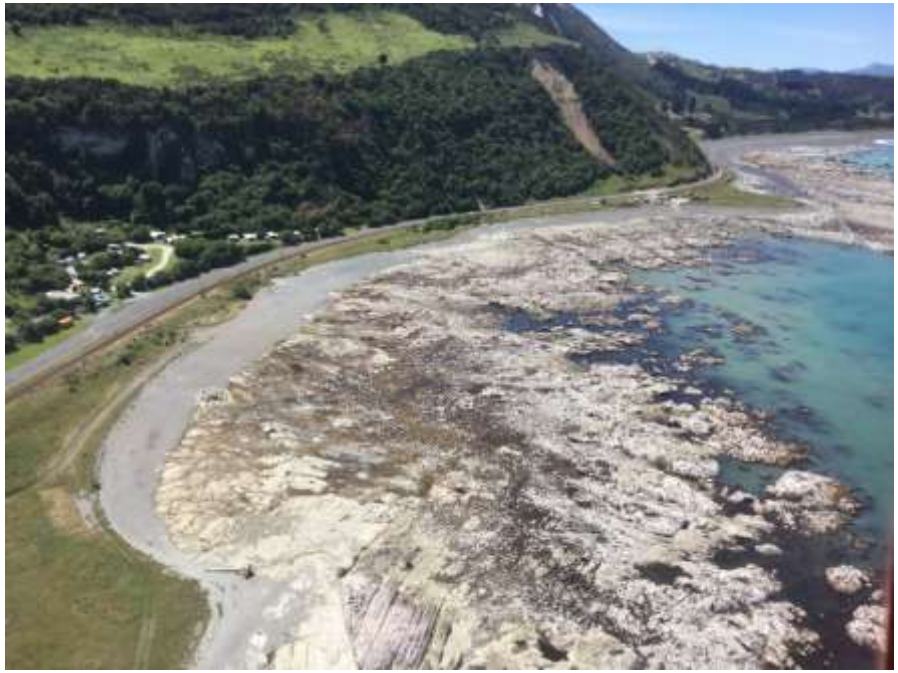
Overview

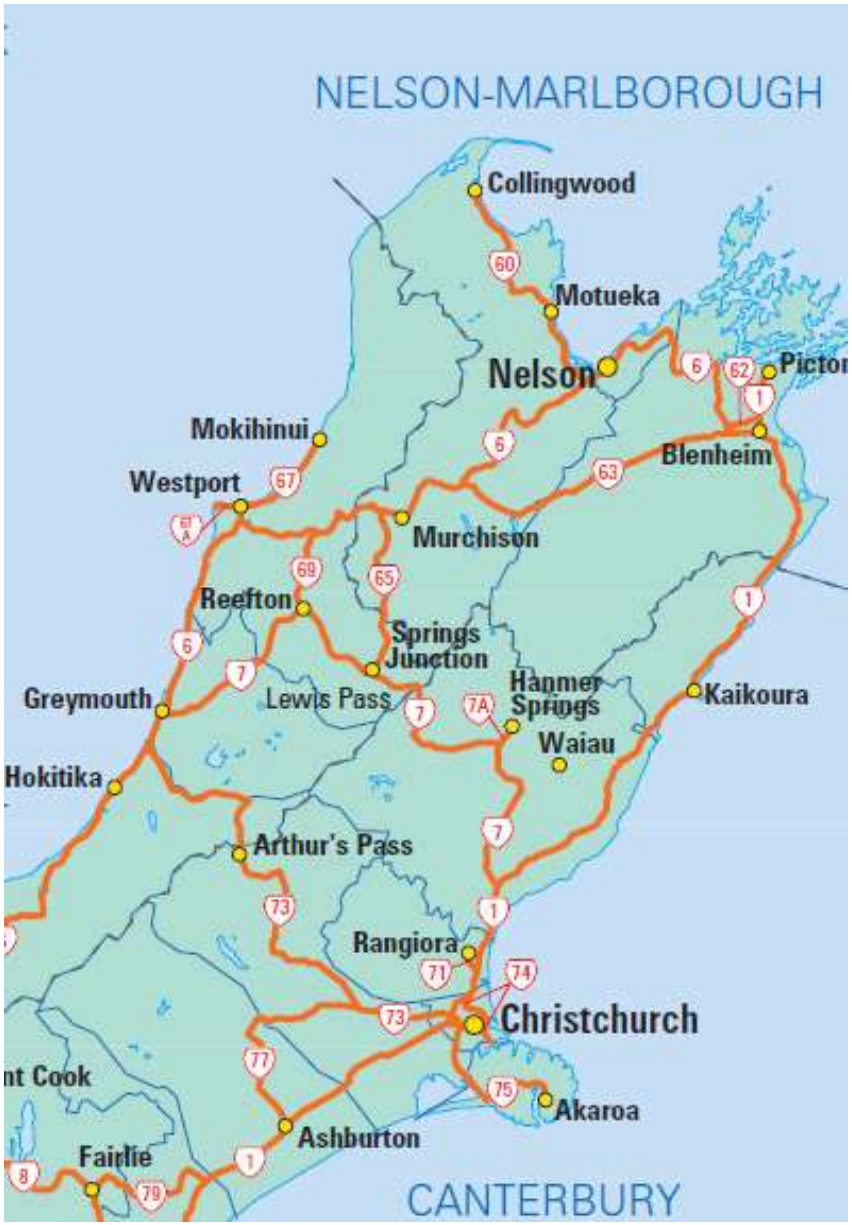
1. Setting the scene
   - Location
   - Damage
2. Emergency legislation
3. Case study – Ohau Point



Kaikoura

- SH1 1 (road) & MNL (rail) between Picton & Christchurch.
- Major tourist destination - whale & dolphin encounters





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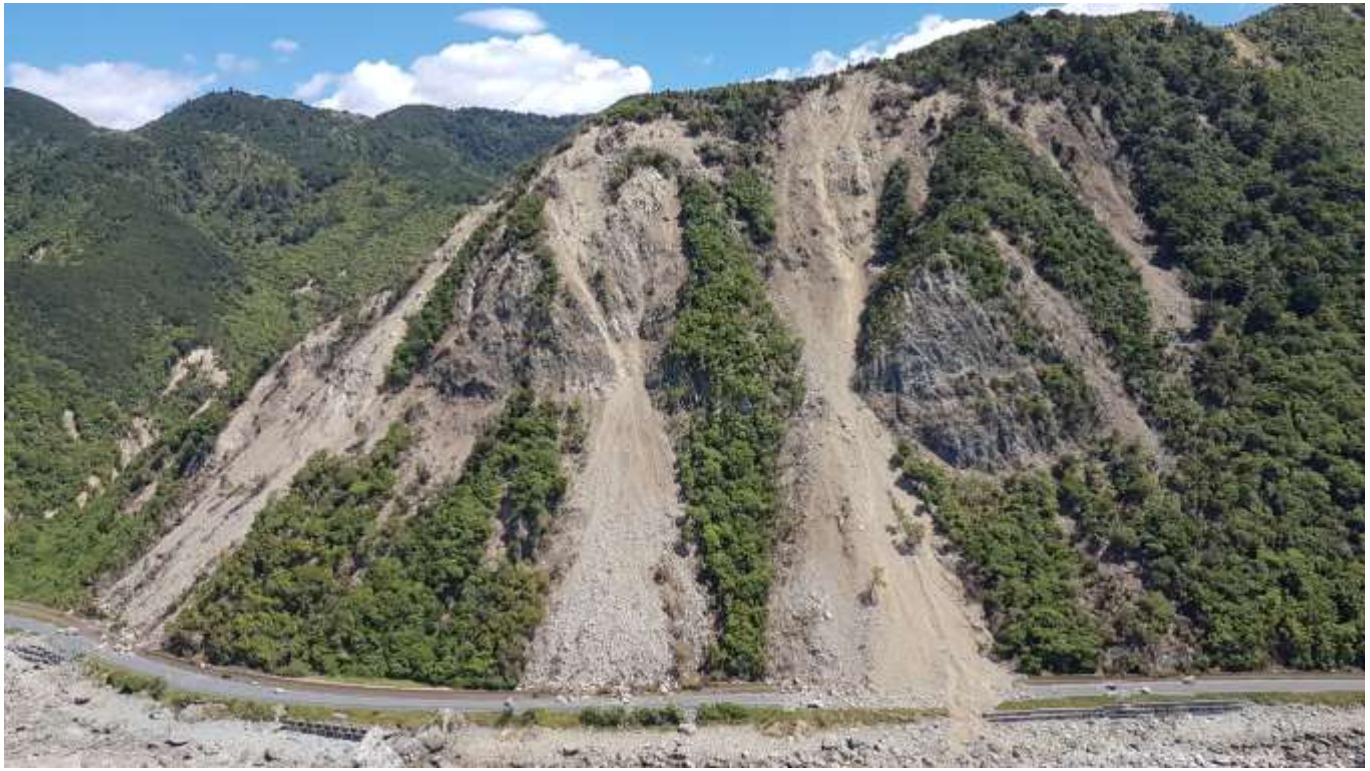
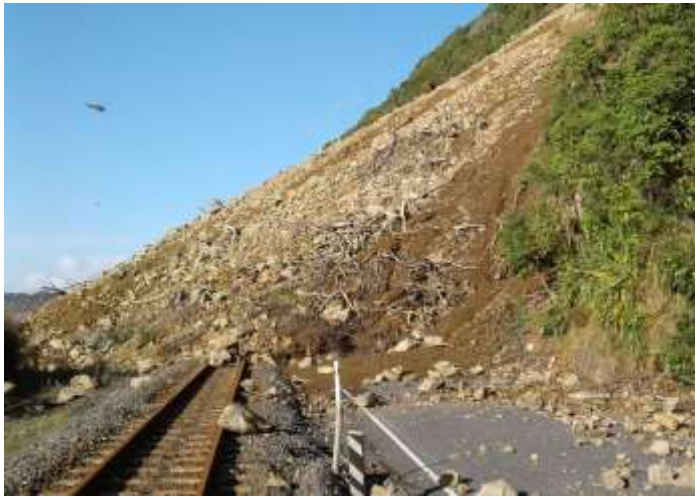
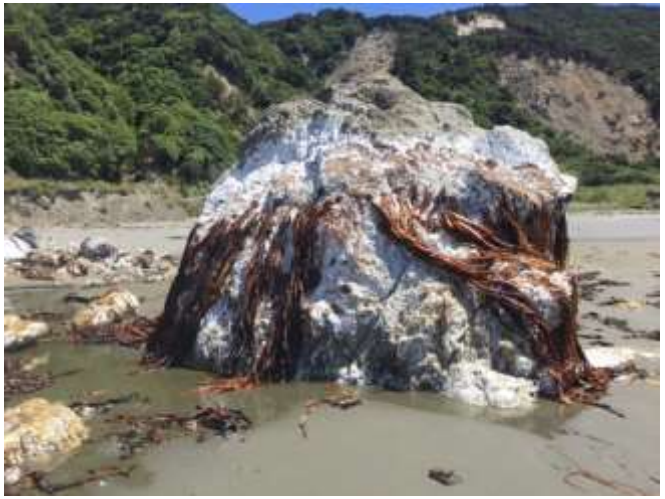






THE EARTHQUAKE

7.8 MAGNITUDE
KAIKOURA EARTHQUAKE

THE SOUTH ISLAND MOVED
6M CLOSER
TO THE
NORTH ISLAND

RUPTURES OCCURRED ON
21 FAULT LINES, ACROSS 170KM
IN A COMPLEX SEQUENCE THAT LASTED FOR ABOUT 2 MINUTES

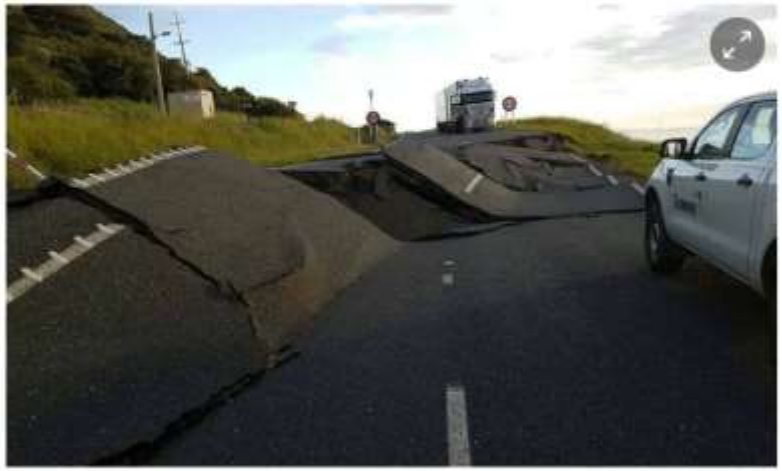
THE EARTHQUAKE GENERATED A
TSUNAMI OF NEARLY
7 METRES IN PLACES

Geographic context

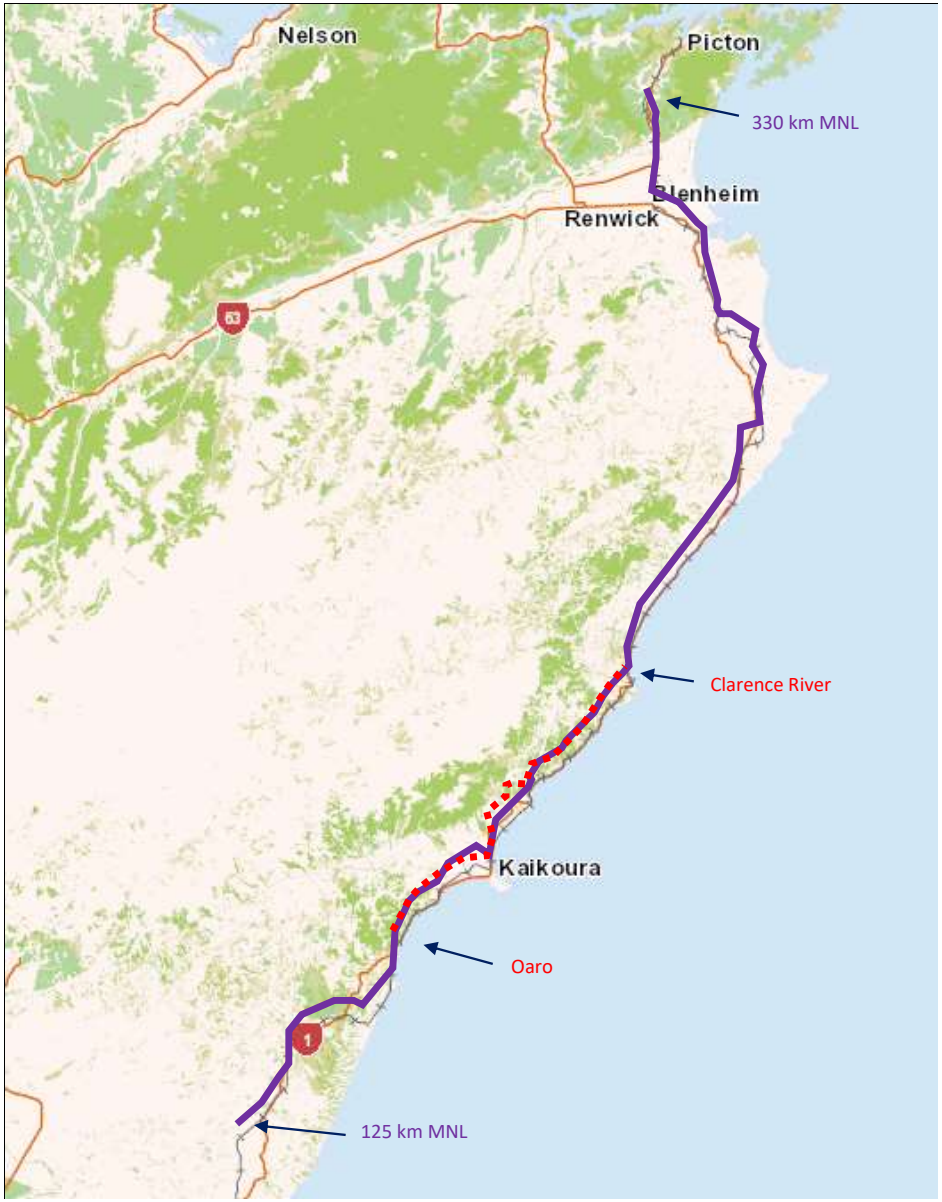
Kaikoura: state of emergency declared in town cut off by New Zealand earthquake

Strong aftershocks and looming severe weather hamper efforts to reach communities stranded by disaster

New Zealand earthquake - read the latest updates



Damaged road near Oaro on State Highway 1, caused by Monday's earthquake in New Zealand. Photograph: NZ Transport Agency



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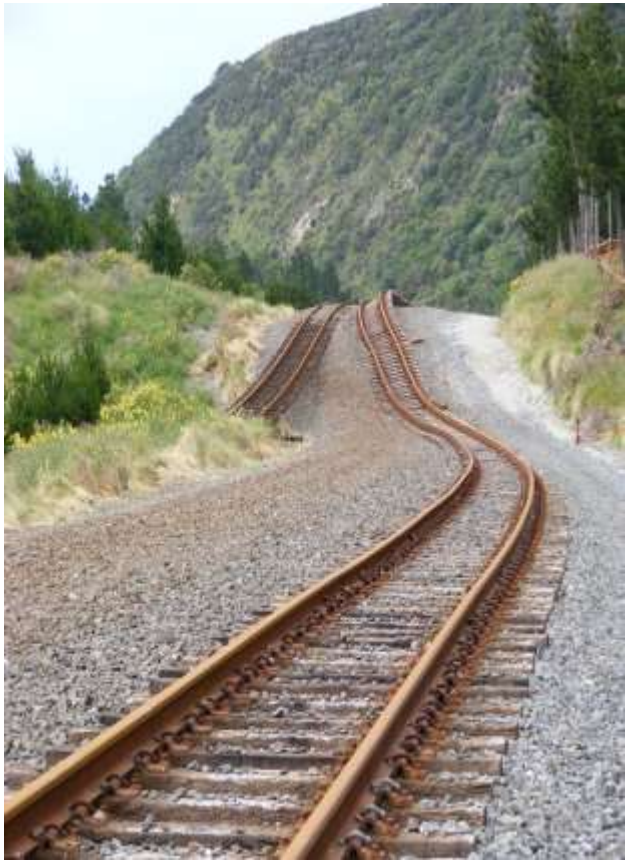
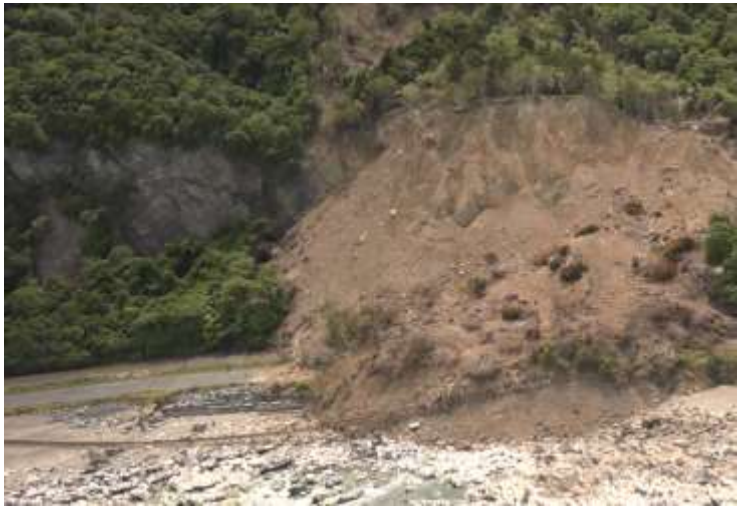
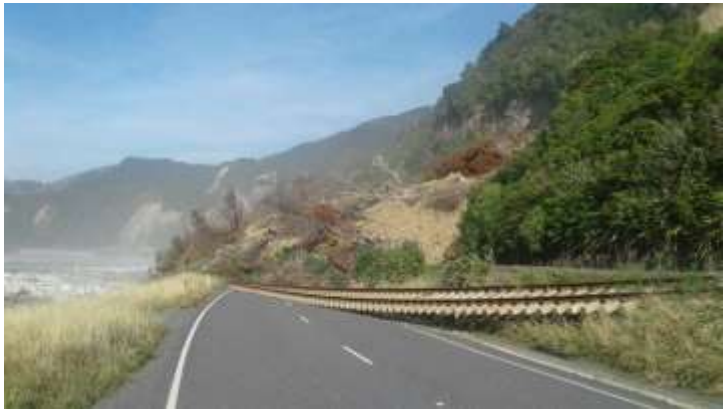
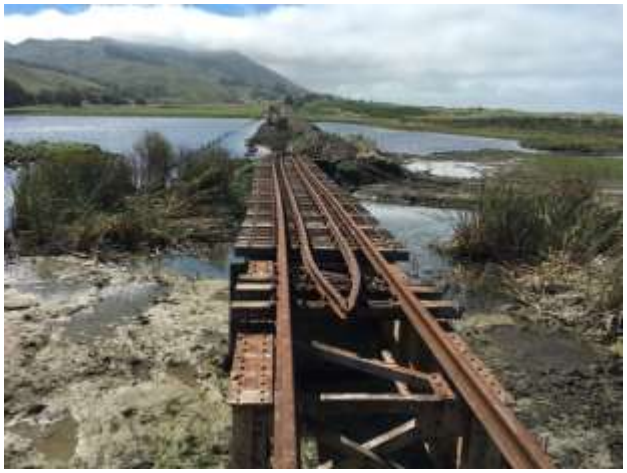








RAIL

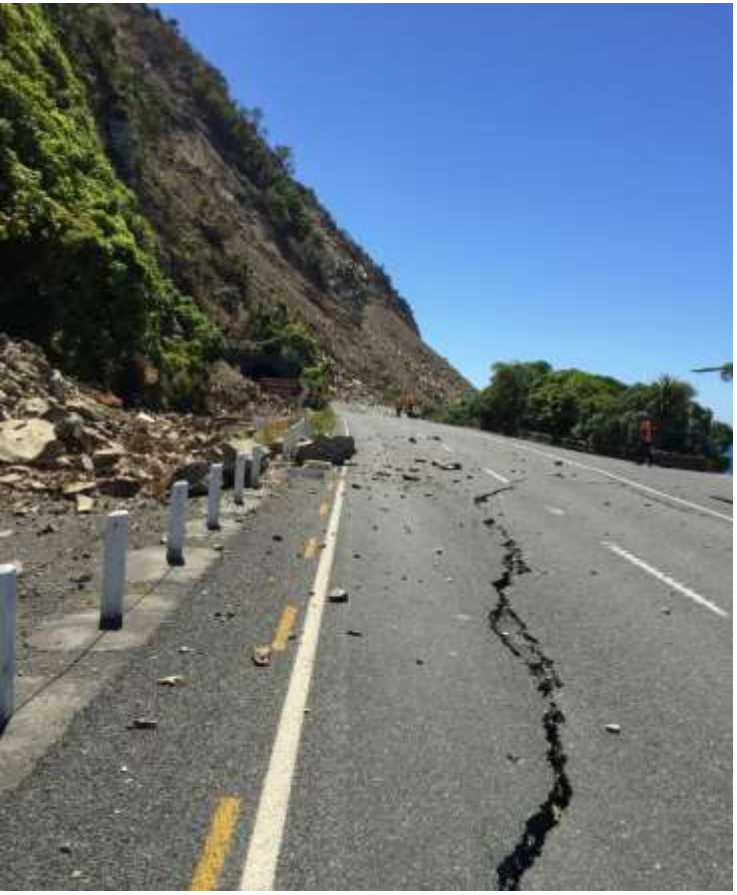
100% OF THE TRACK IMPACTED BY NOVEMBER'S EARTHQUAKE WAS REPAIRED BY **AUGUST 2017**

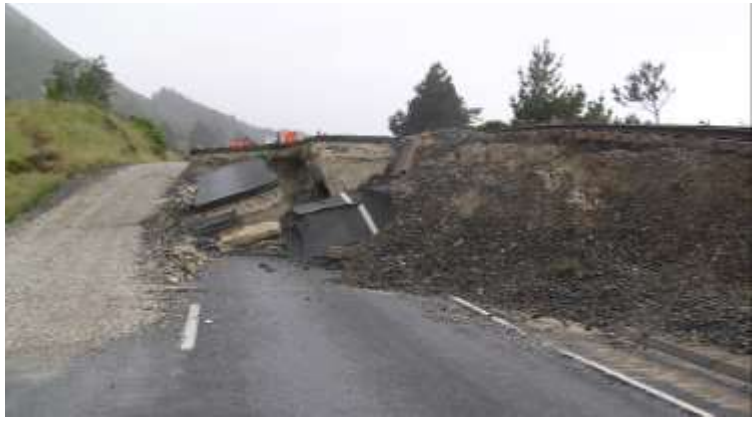
220 WORK SITES ALONG **190KM OF RAIL LINE**

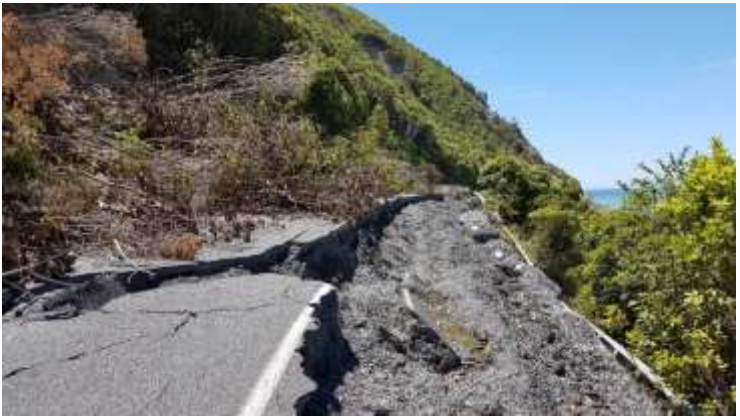
20 RAIL TUNNELS SUSTAINED MAJOR DAMAGE

PRIOR TO THE EARTHQUAKE

1 MILLION TONNES OF FREIGHT CARRIED YEARLY







ROAD

BETWEEN CHEVIOT AND CLARENCE THERE ARE:

1,500+ DAMAGED SITES

200+ WITH MAJOR ISSUES

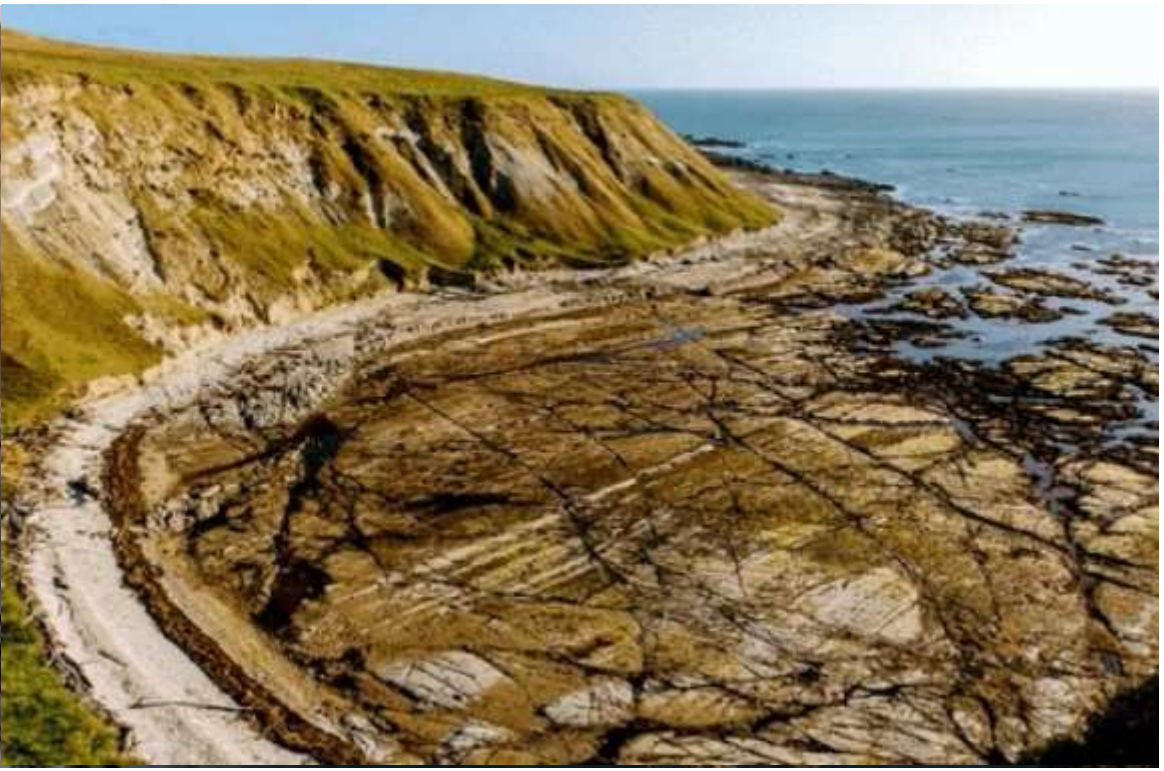
100+ DAMAGED **STRUCTURES**

9 SIGNIFICANT DAMAGE

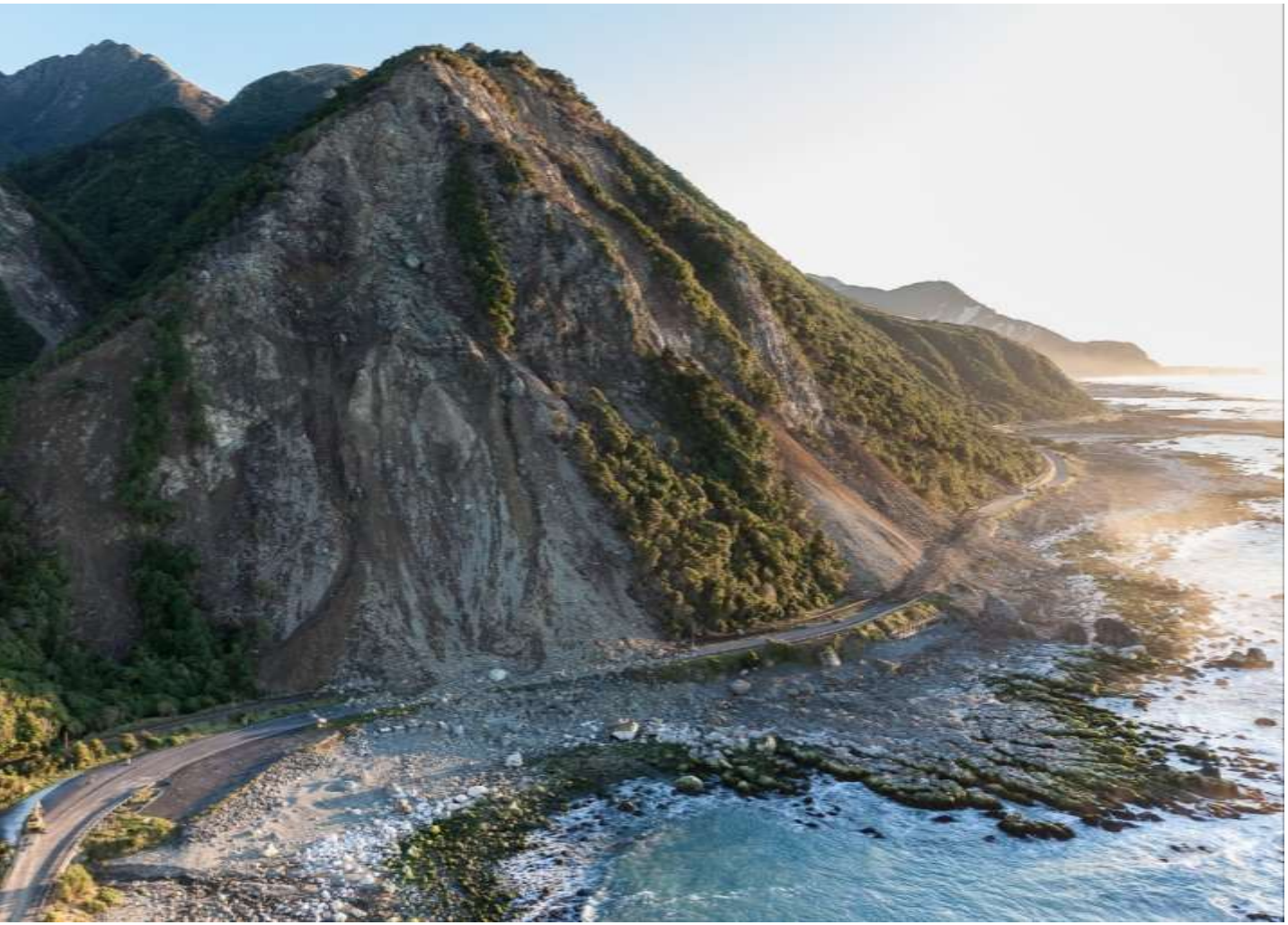
85 LANDSLIDES

194KM OF ROAD AFFECTED BETWEEN WAIPARA AND PICTON

Coastal uplift



Landslides



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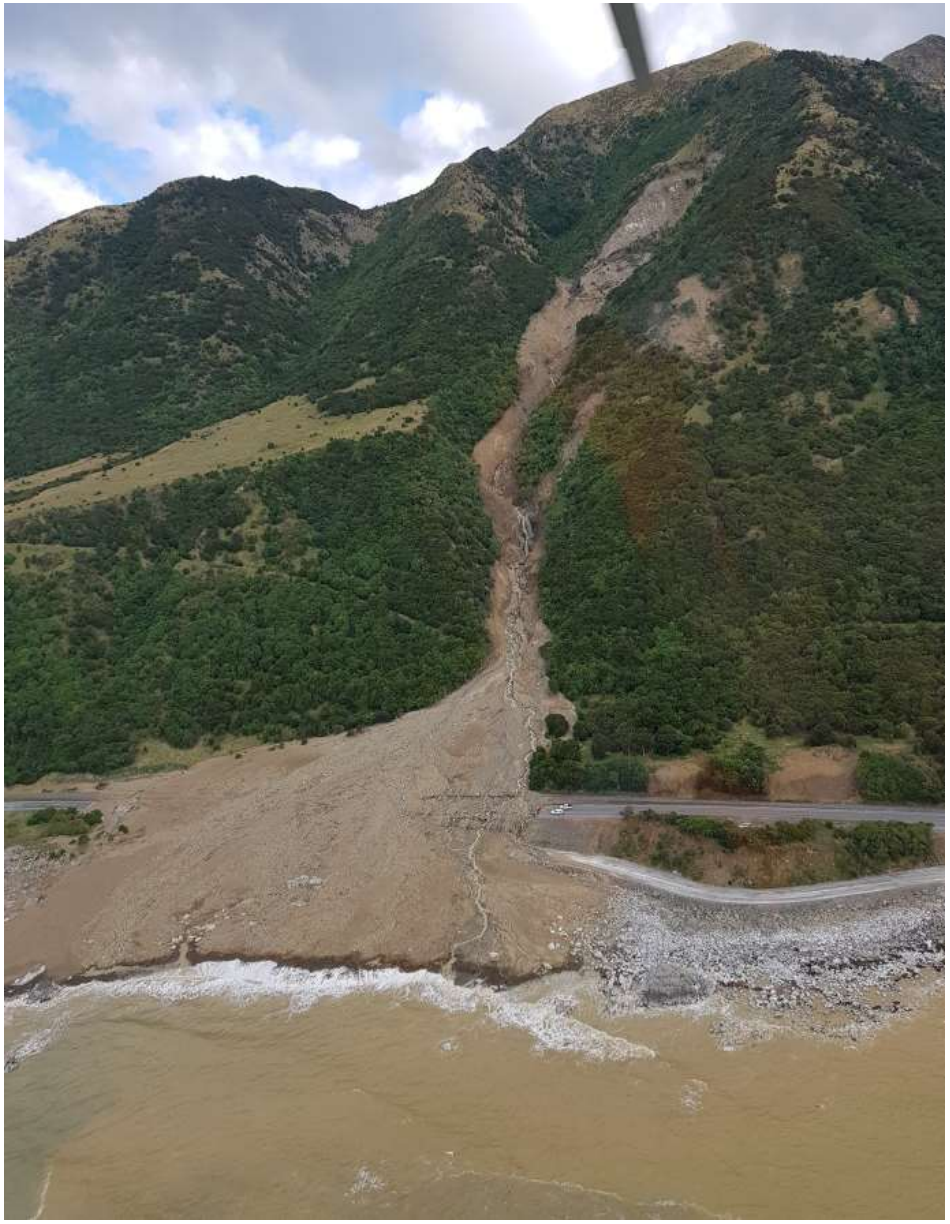
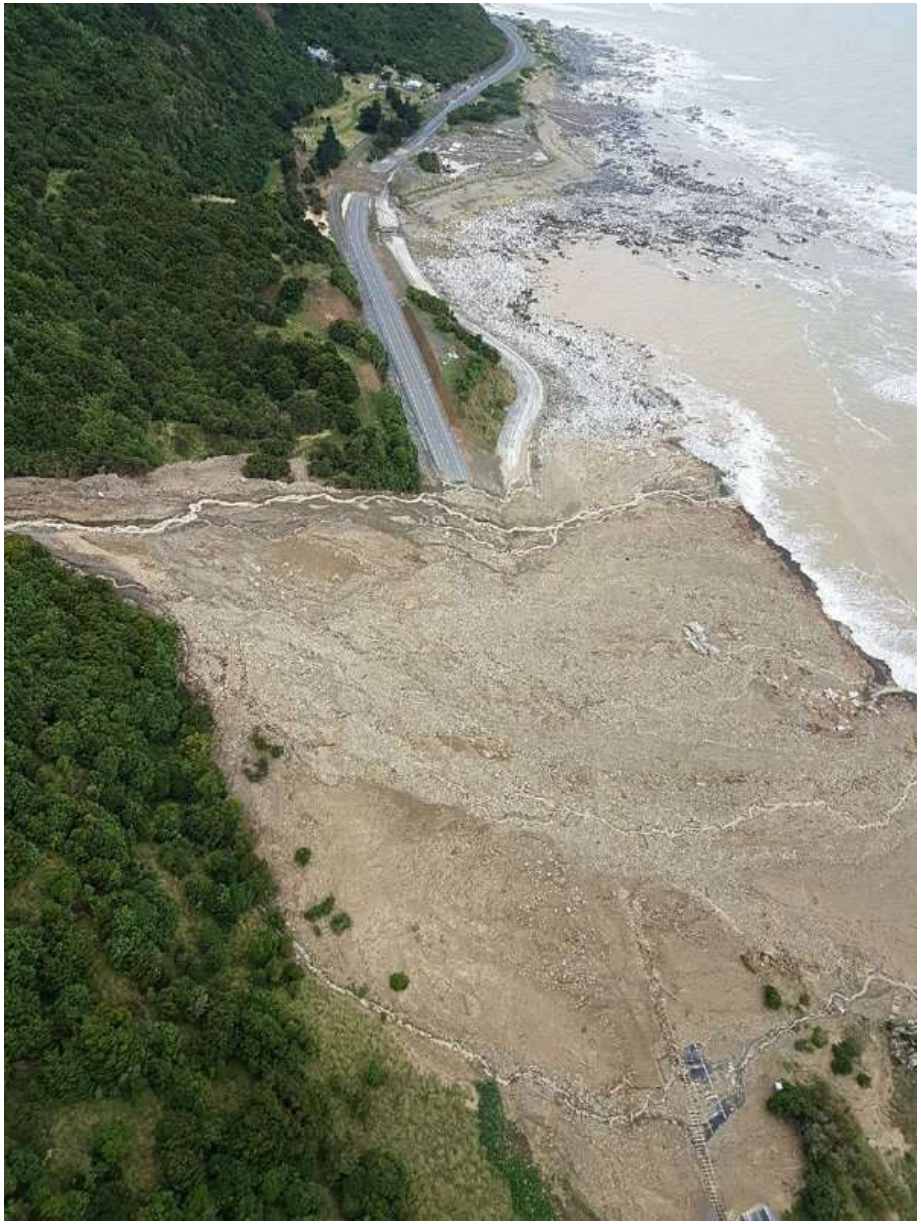
NCTIR RECONNECTING COMMUNITIES





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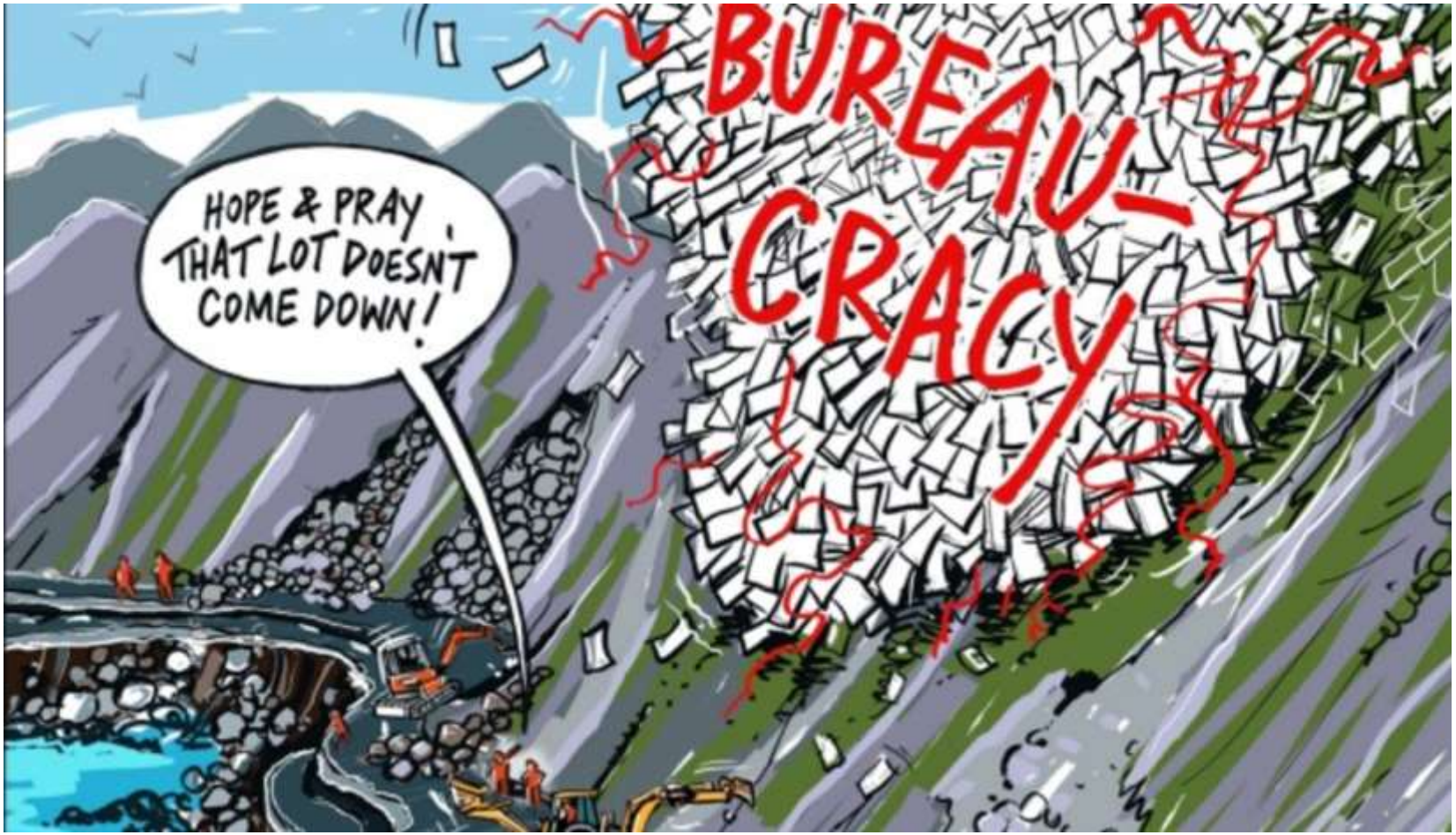
RECONNECTING COMMUNITIES

Hurunui/Kaikoura Earthquake Recovery Act 2016



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NCTIR RECONNECTING COMMUNITIES

ECOLOGICAL PRINCIPLES

These principles guide our project design, construction and environmental outcomes.

They are a requirement under the emergency legislation which enabled the reinstatement of the transport corridor – and fundamental to the NCTIR program underpinning good decision making.

The 10 NCTIR ecological principles are:

1. Avoid as far as practicable, or minimise permanent habitat loss (including coastal, terrestrial and freshwater habitats).
2. Avoid as far as practicable, or minimise loss of rare ecosystem types and habitats for Threatened, At Risk, taonga and marine mammal species.
3. Avoid as far as practicable, or minimise habitat fragmentation/barriers (including coastal, terrestrial and freshwater habitats).
4. Avoid as far as practicable, or minimise impacts on habitat connectivity (including coastal, terrestrial and freshwater habitats).
5. Avoid as far as practicable, or minimise impacts on Threatened, At Risk, taonga and marine mammal species.
6. Create safe habitats, especially for Threatened, At Risk, taonga and marine mammal species. For example, where possible build in habitat creation/improvement opportunities for species such as seals, penguins and significant plants.
7. Avoid as far as practicable, or minimise effects on water quality and sediment – including kai moana and mauri.
8. Avoid as far as practicable, or minimise alteration of natural hydrology patterns to the extent practicable.
9. Avoid as far as practicable, or minimise the potential for the spread and/or establishment of pest plants or animals (including coastal, terrestrial and freshwater habitats).
10. Avoid as far as practicable, or minimise impacts on habitats that play an important role in the life cycle and ecology of native species. For example, seal breeding colonies, shag roosts/nesting sites, gull breeding colonies.

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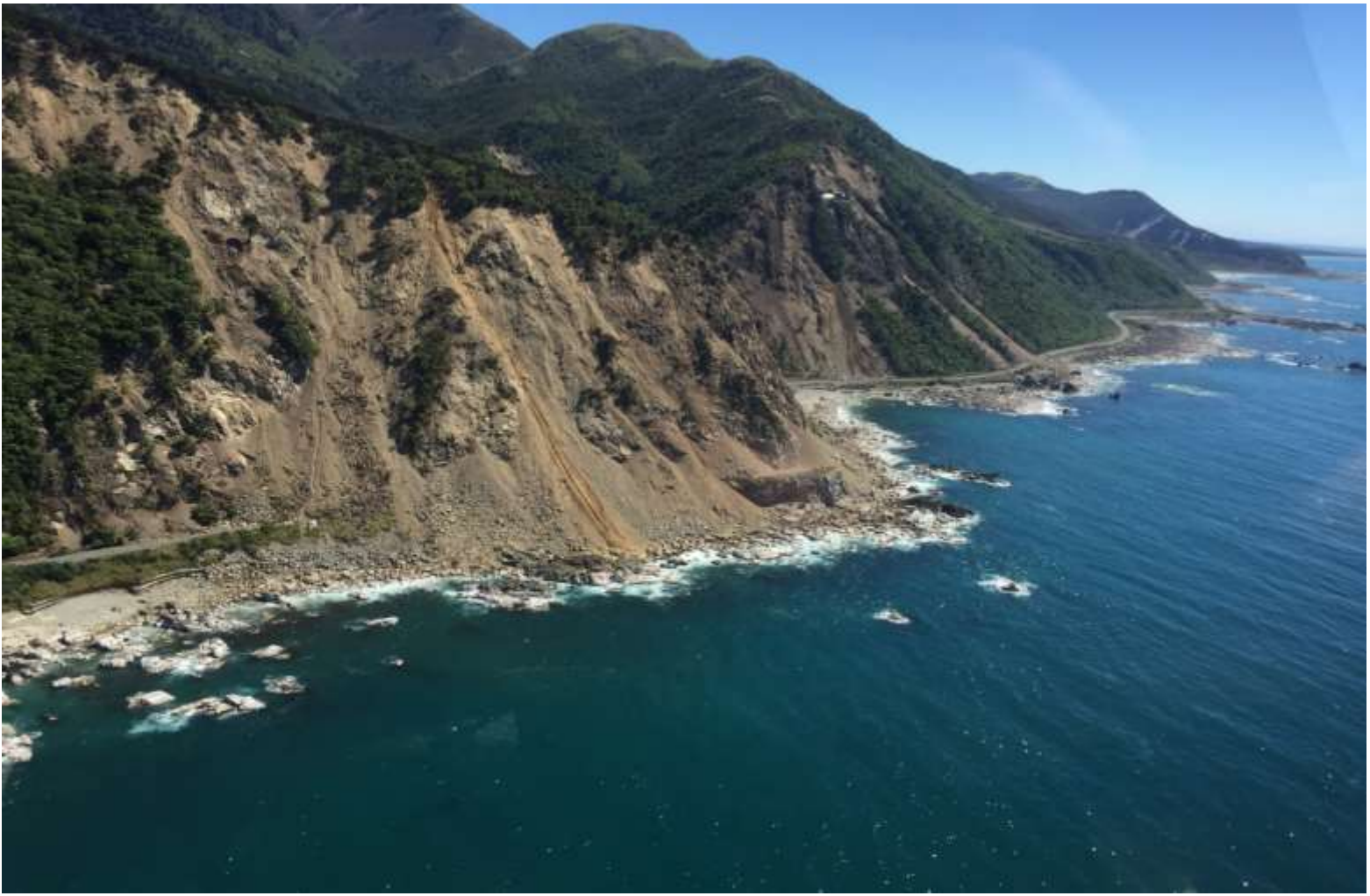
NCTIR RECONNECTING COMMUNITIES

Case Study - Ohau Point



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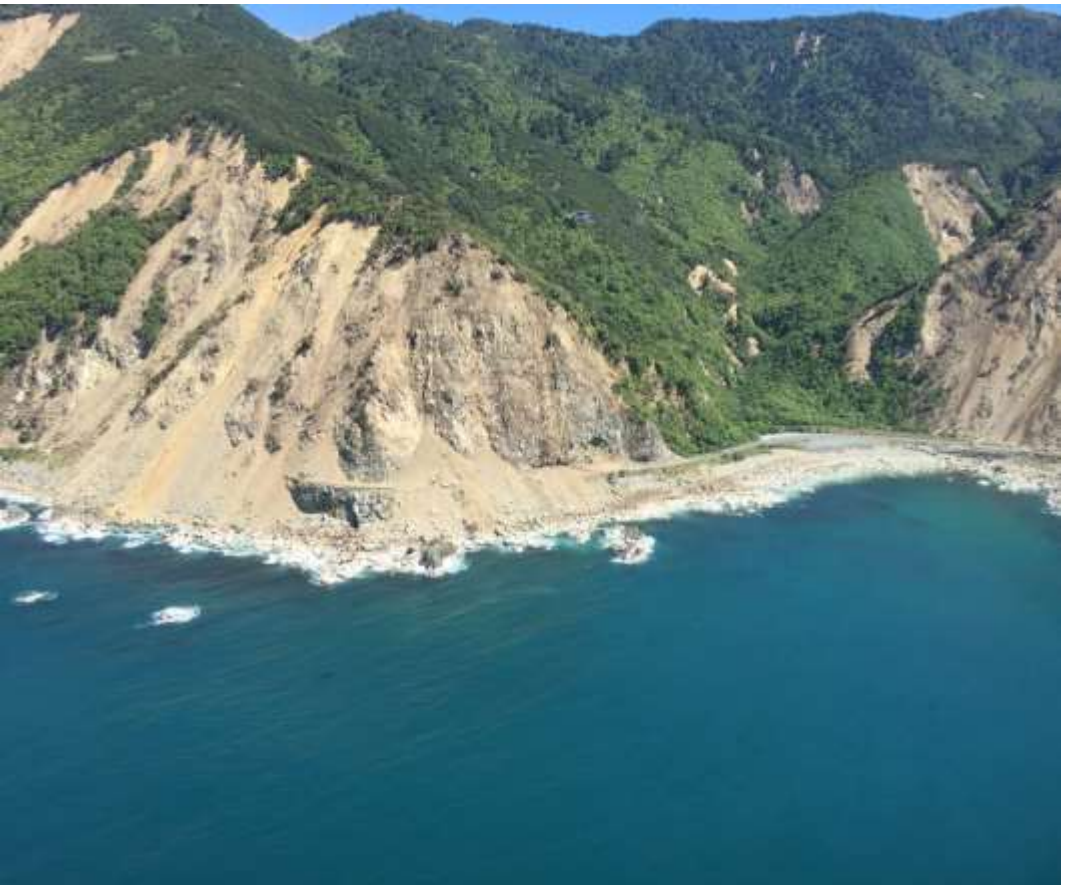
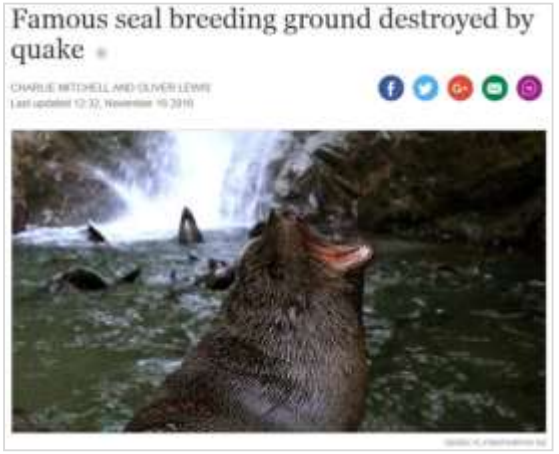
Ohau Point Fur Seal Sanctuary



- Largest breeding colony on the east coast of the South Island, with some 4,000 seals.
- Buried under **150,000m³** of slip material.
- Ohau Stream waterfall pool destroyed.



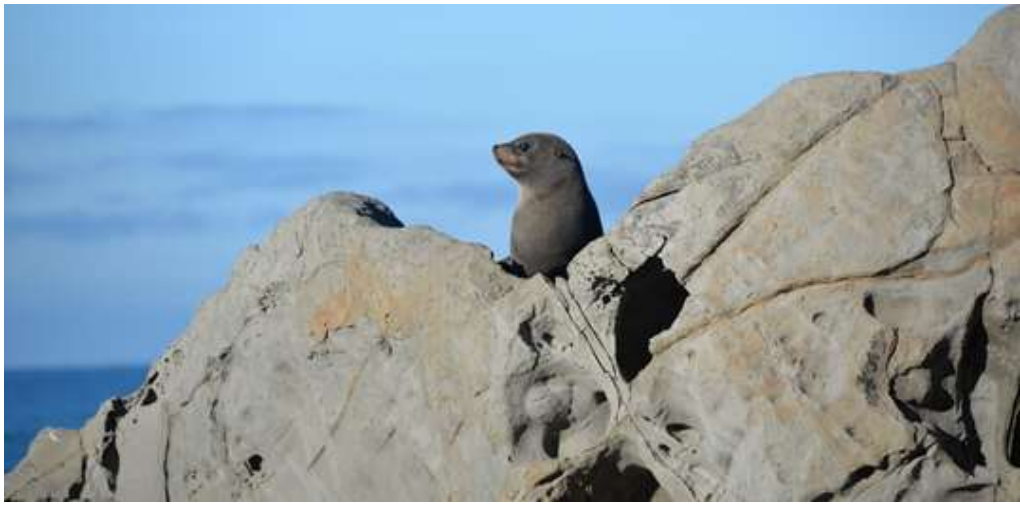
Famous seal breeding ground destroyed by quake

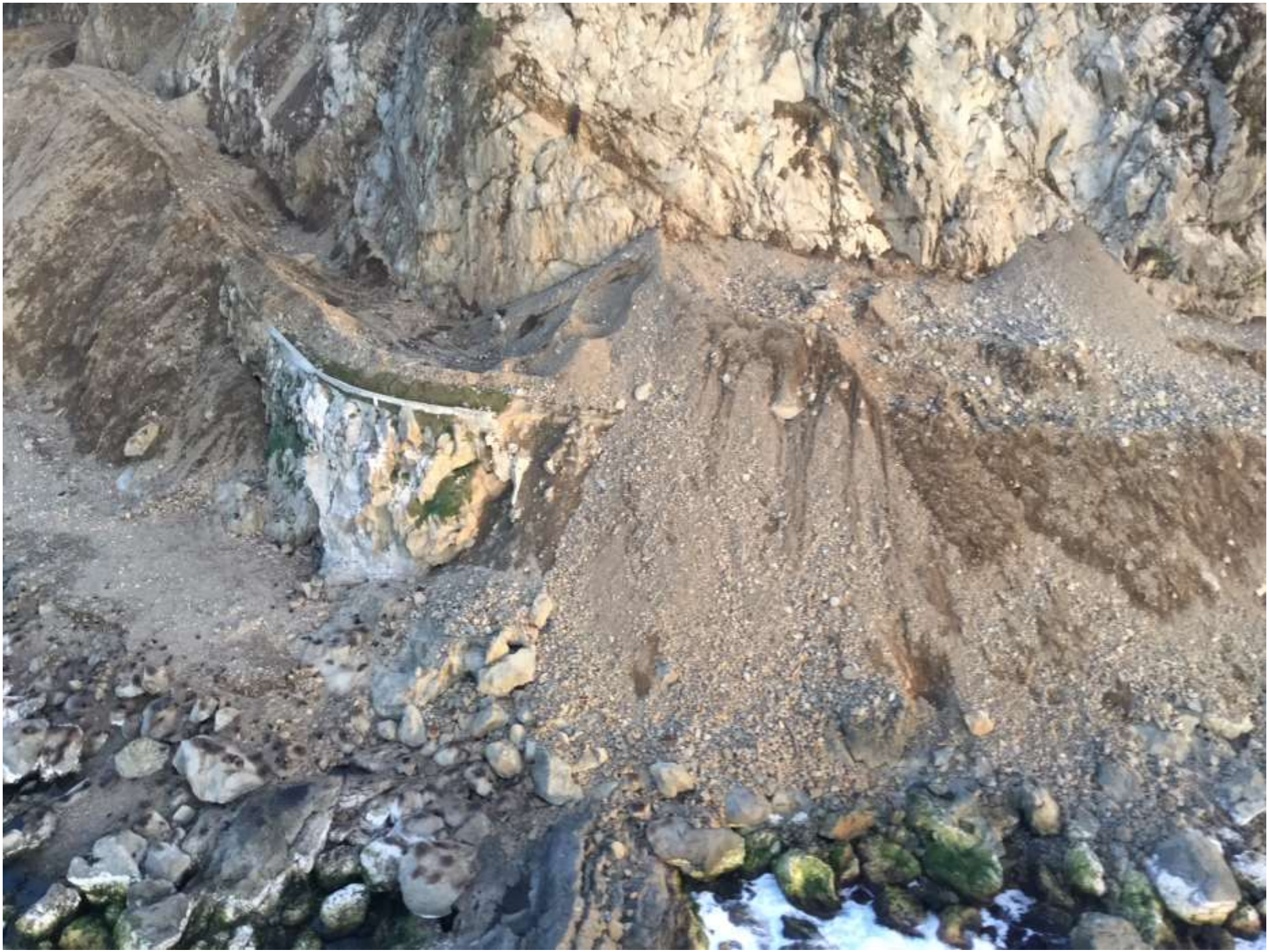
CHARLIE MITCHELL AND OLIVER LEWIS

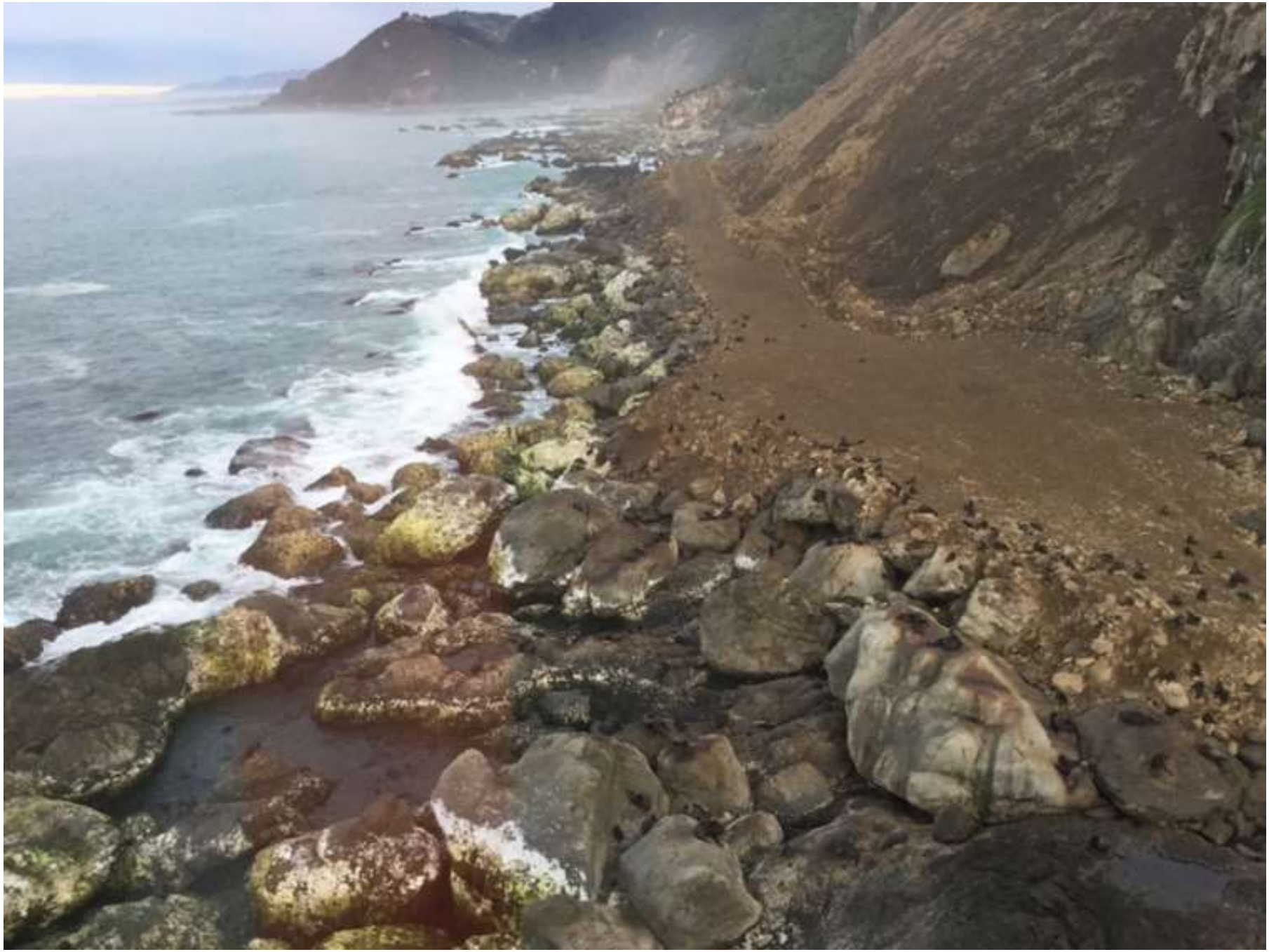
Ohau Point Road Rebuild

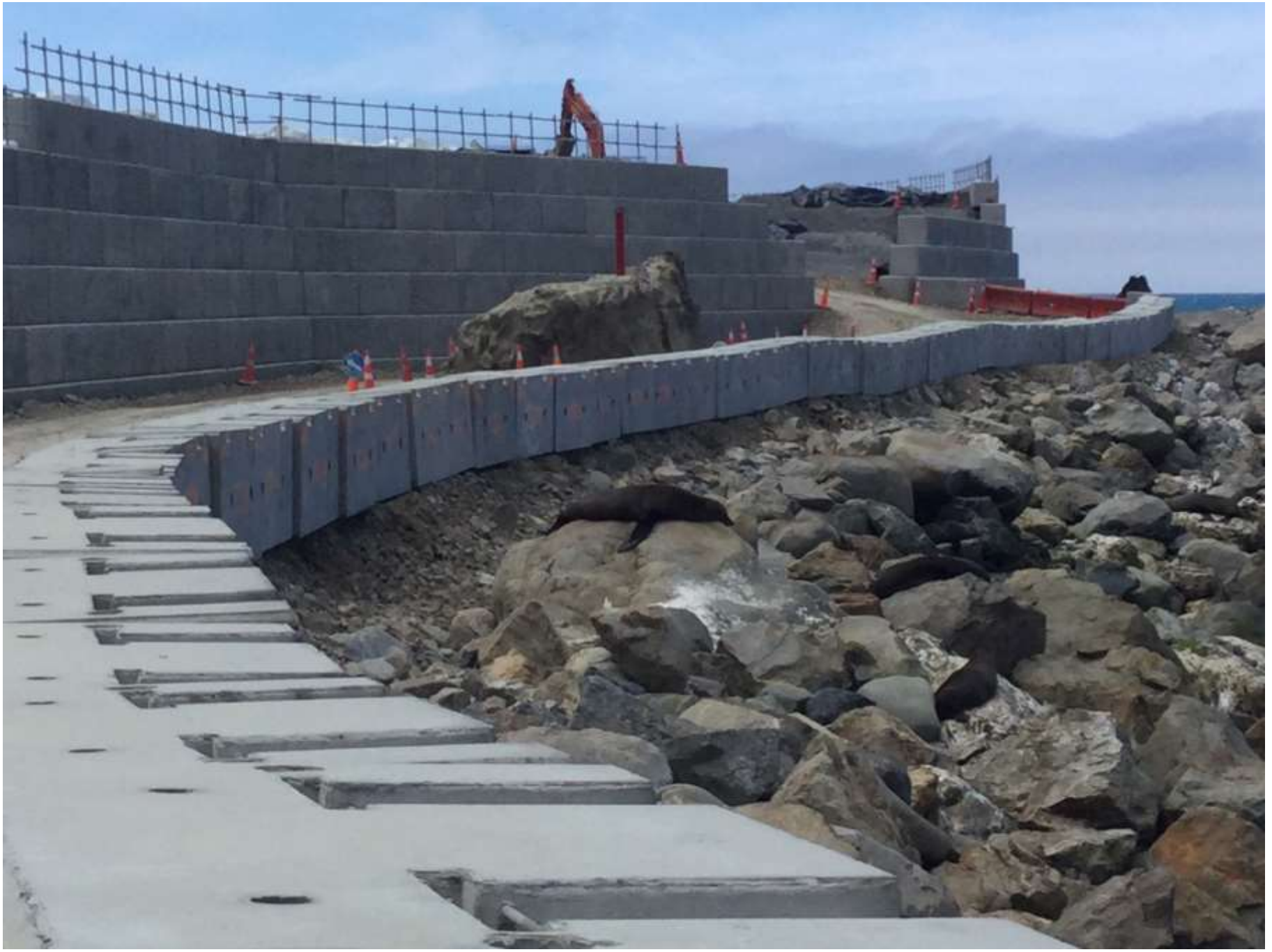
- Heli-sluicing
- Scaling
- Blasting
- Remove slip material
- Geotechnical
- Build seawall – out into the seal sanctuary.

- NZ fur seal breeding colony – 4,000 individuals.



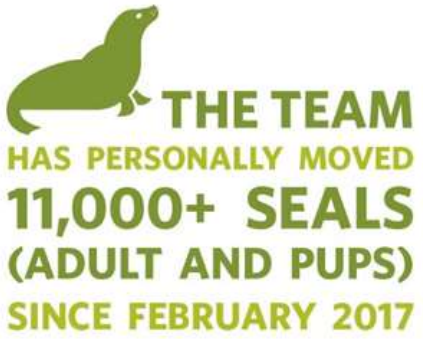






NZ fur seals

- Worked closely with Department of Conservation.
- Full time seal handlers (2-6 people), day and night team.
- Seal phone and business cards.
- Handling and retrieval protocols.
- Management methods:
  - fencing;
  - high-pressure hose;
  - hand moving – herding and capturing; and…



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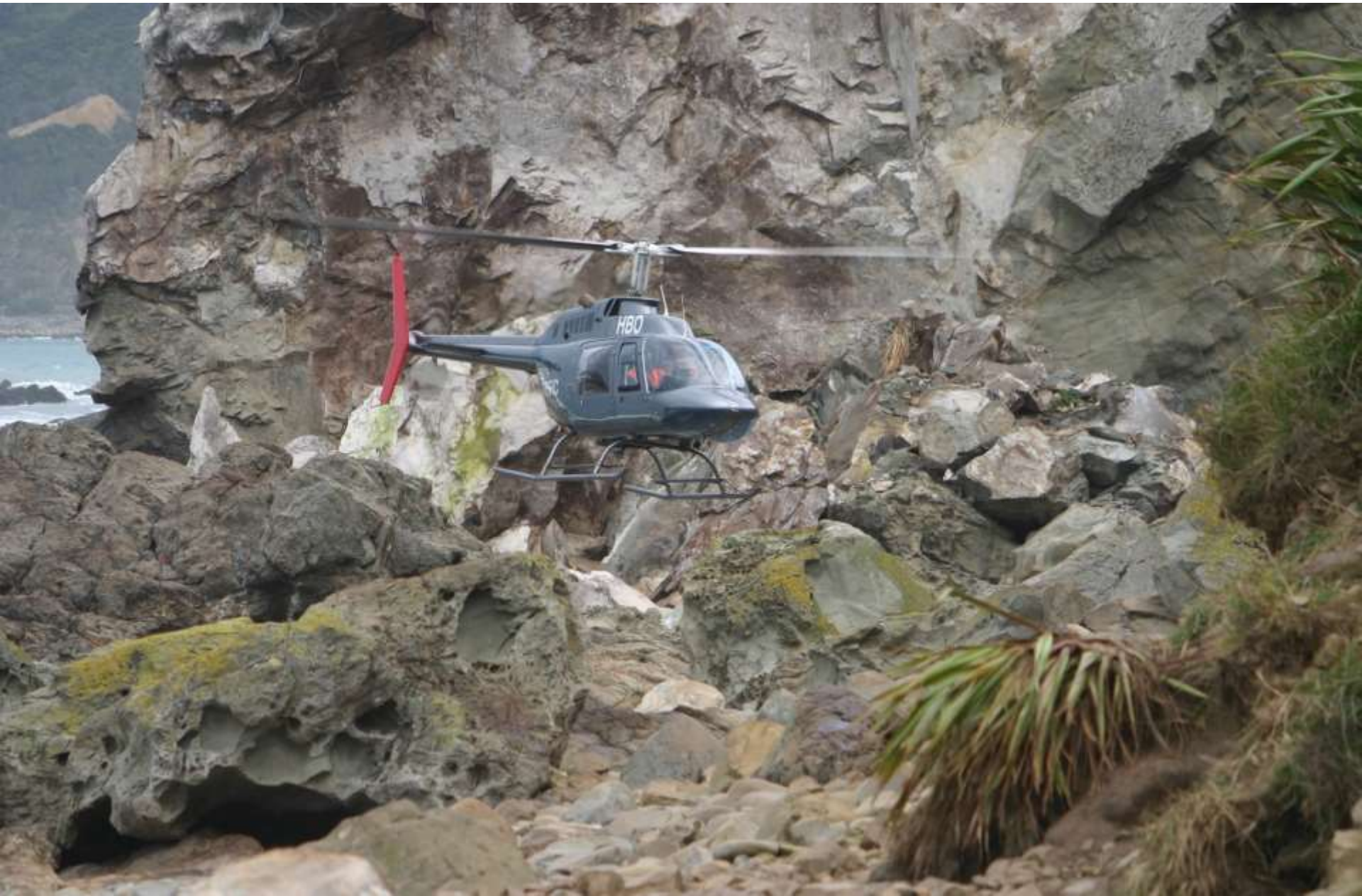
Heli-herding



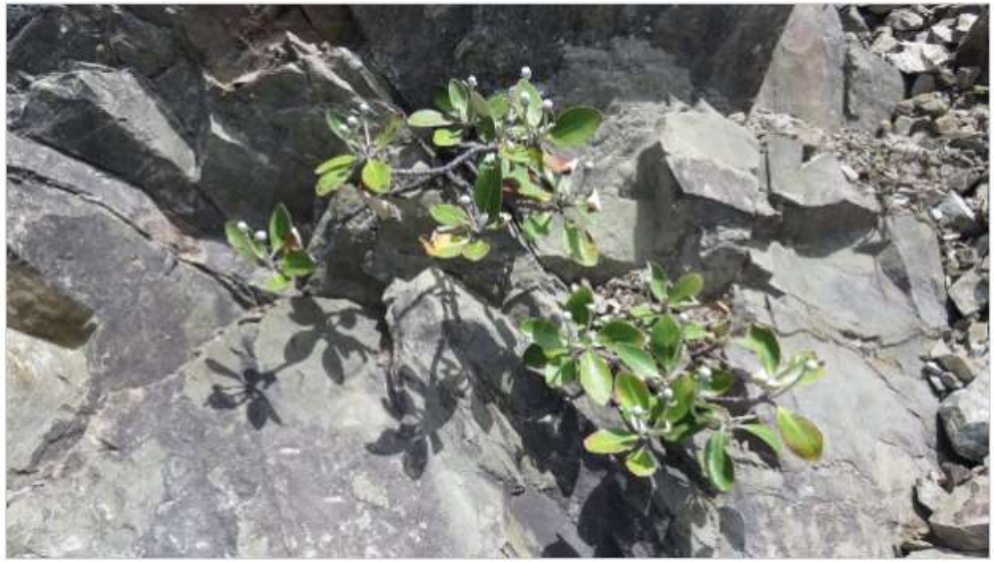
Ohau Rock Daisy

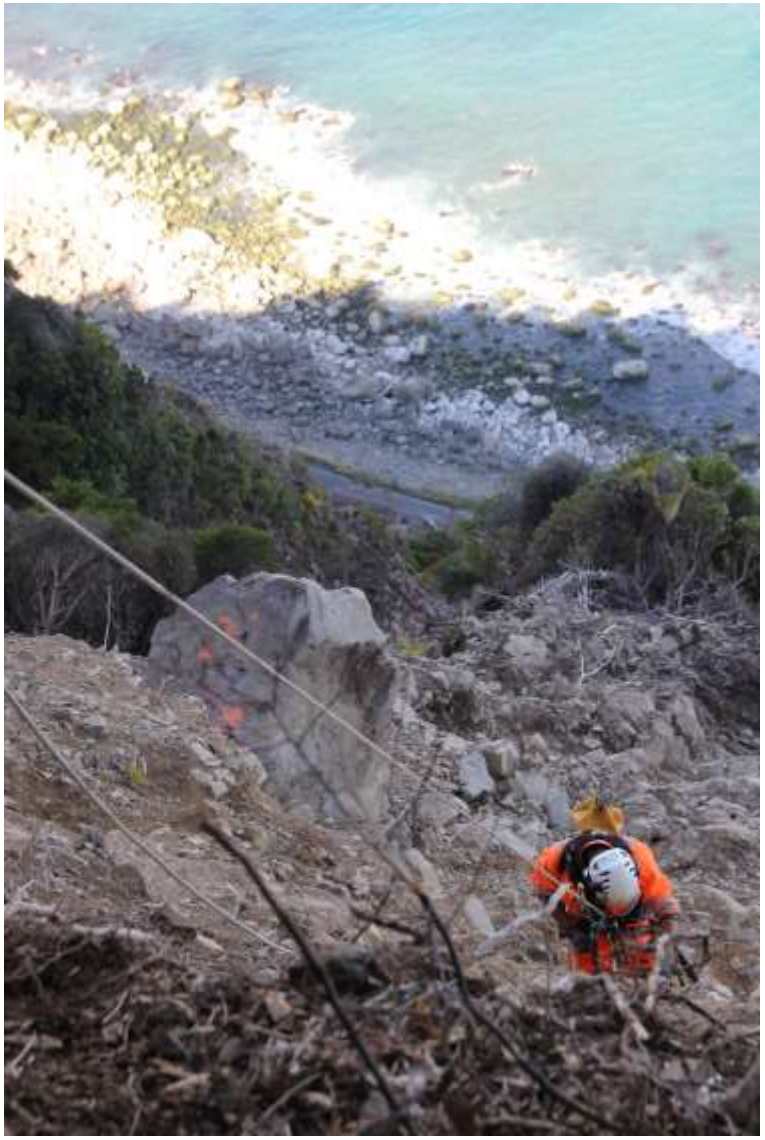
- Variety of rock daisy found only on the bluffs of Ohau Point.
- **95%** of the Ohau rock daisy population was lost as a result of the earthquake.

Ohau Rock Daisy

Rare Marlborough rock daisy being brought back to life following Kaikoura quake

JONATHAN CARSON
Last updated 17:58, June 13 2017





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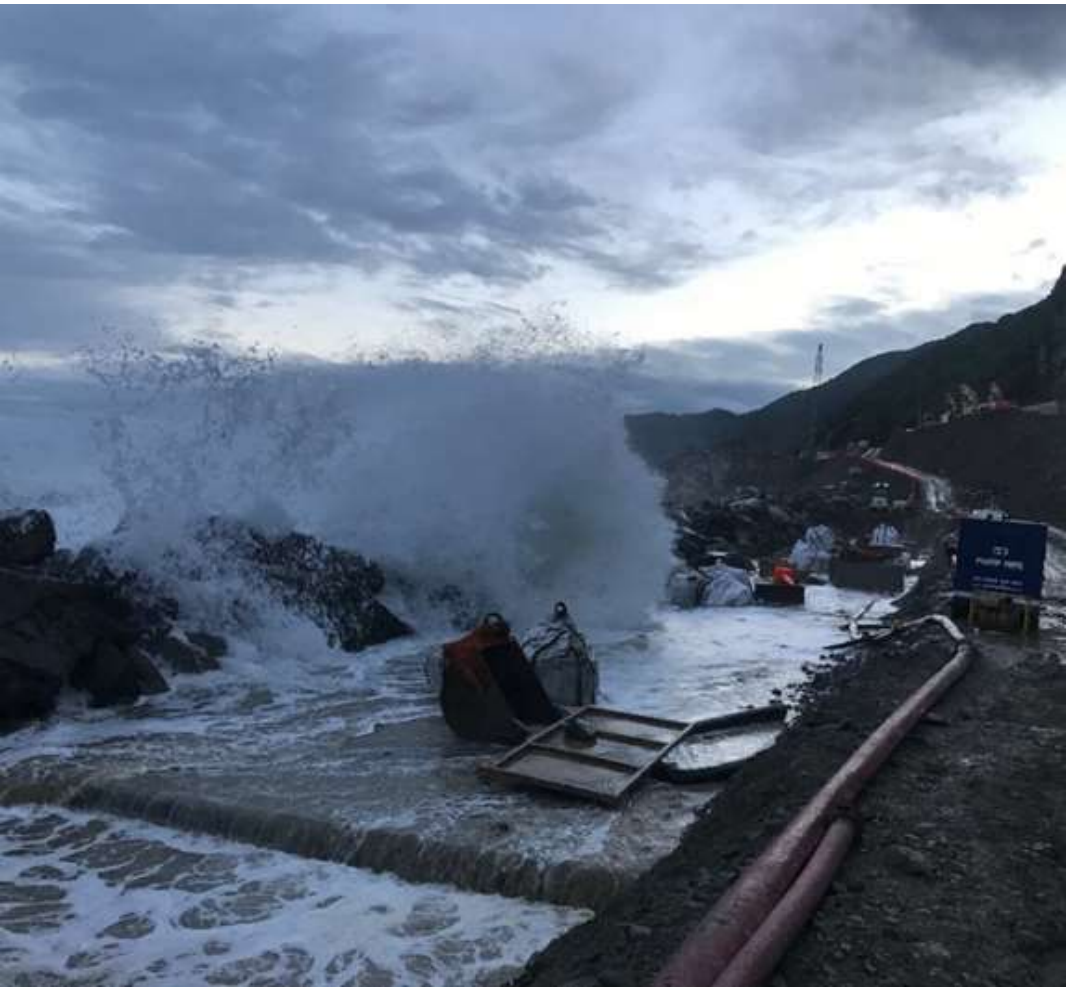
Challenges and Opportunities



- Limited physical space
- Harsh environment
- High ecological values
- Emergency legislation
- Adaptive management & innovation

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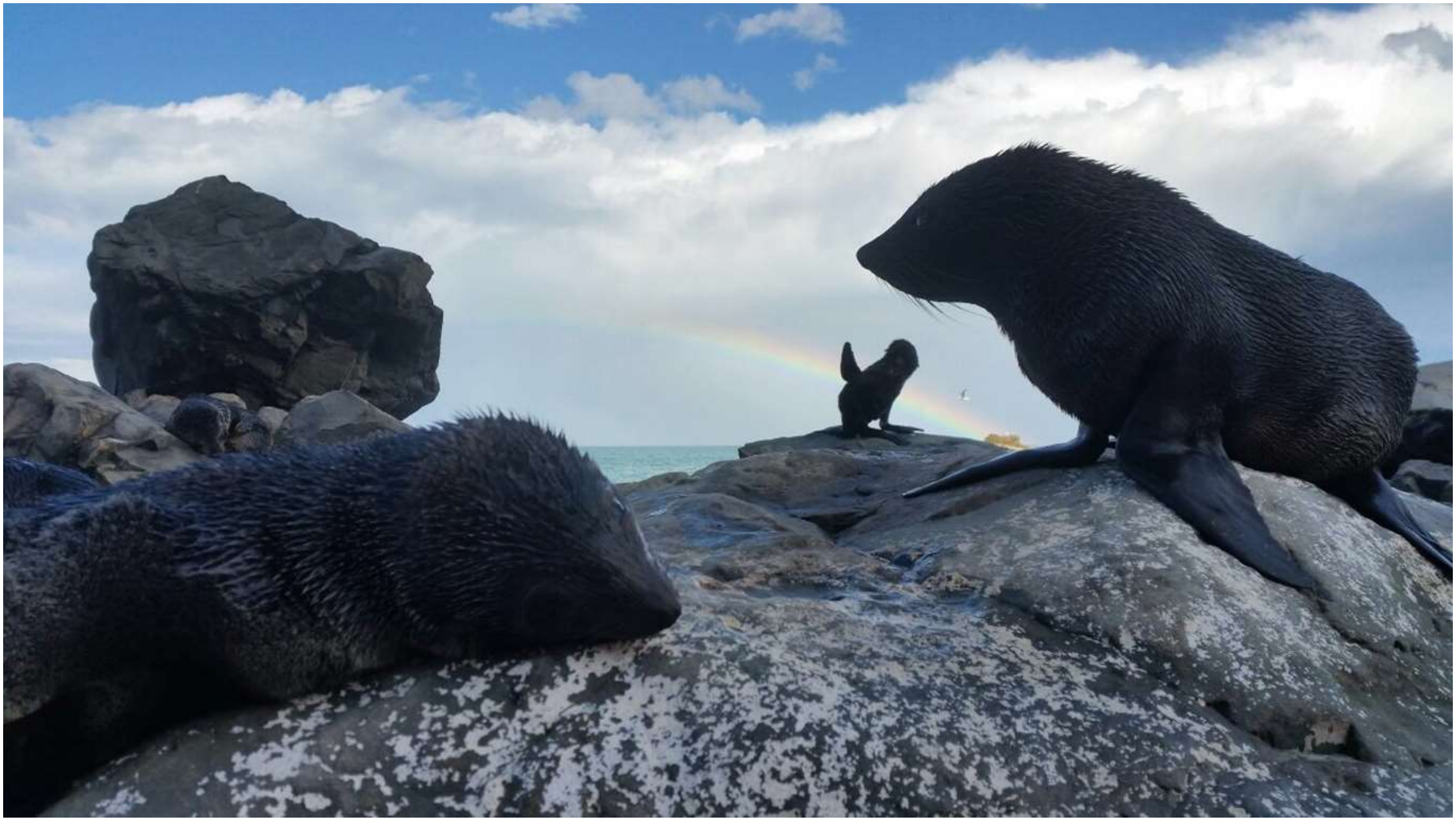
Thank you – Questions?



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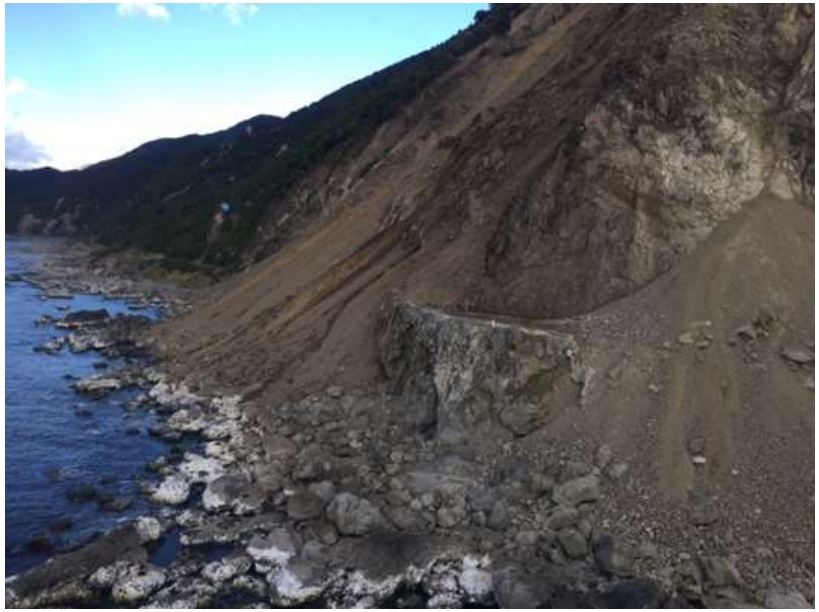
Key conditions

- Requirement for Restoration Liaison Group
- Ecological scoping surveys
- Development of project ecological principles
- Construction Environmental Management Plan
- Erosion and Sediment Control Plan
- Iwi Adviser required supported by cultural monitors



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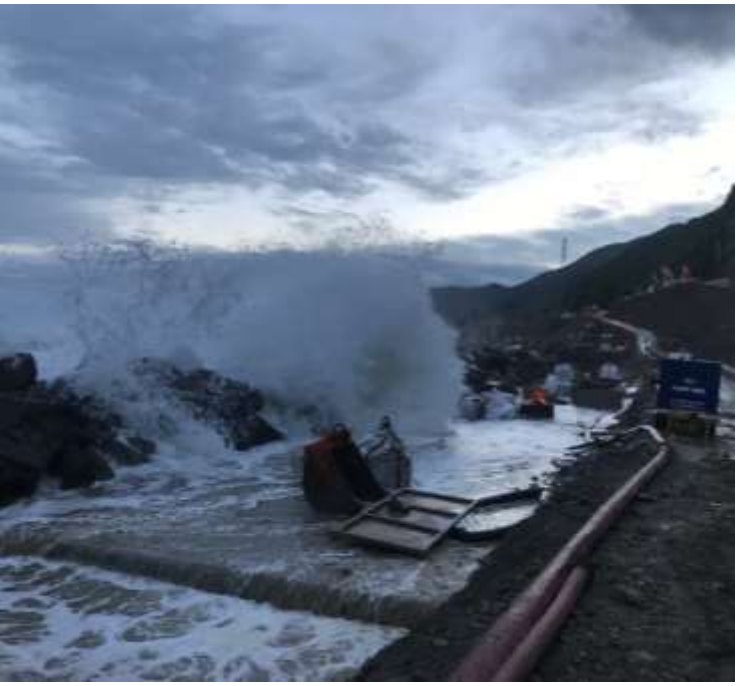
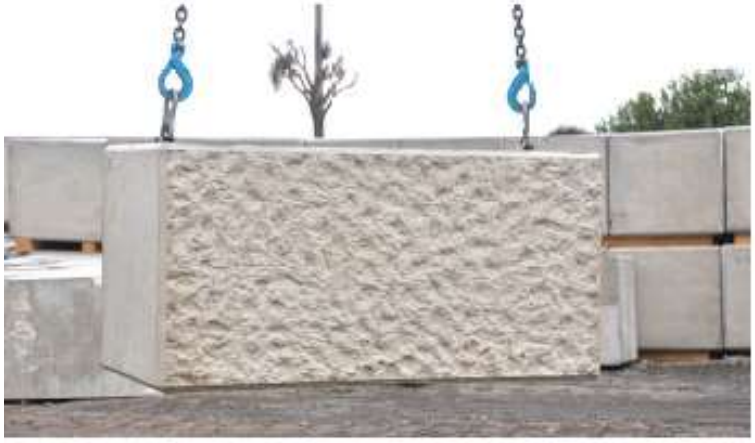




RETAINING WALLS AND SEA WALLS

302 RETAINING WALLS HAVE BEEN IDENTIFIED AS DAMAGED

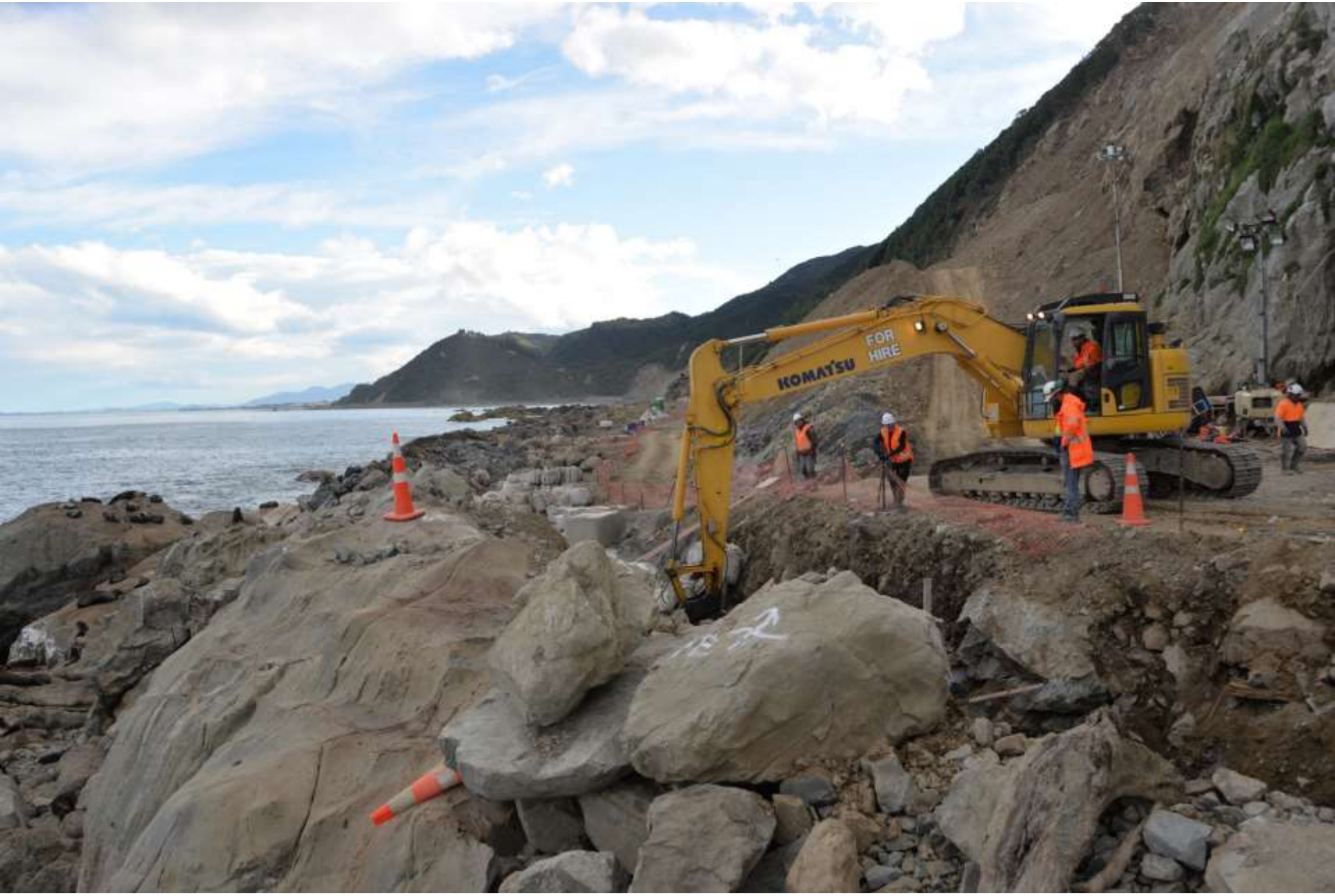
97 ARE ALONG THE COASTLINE

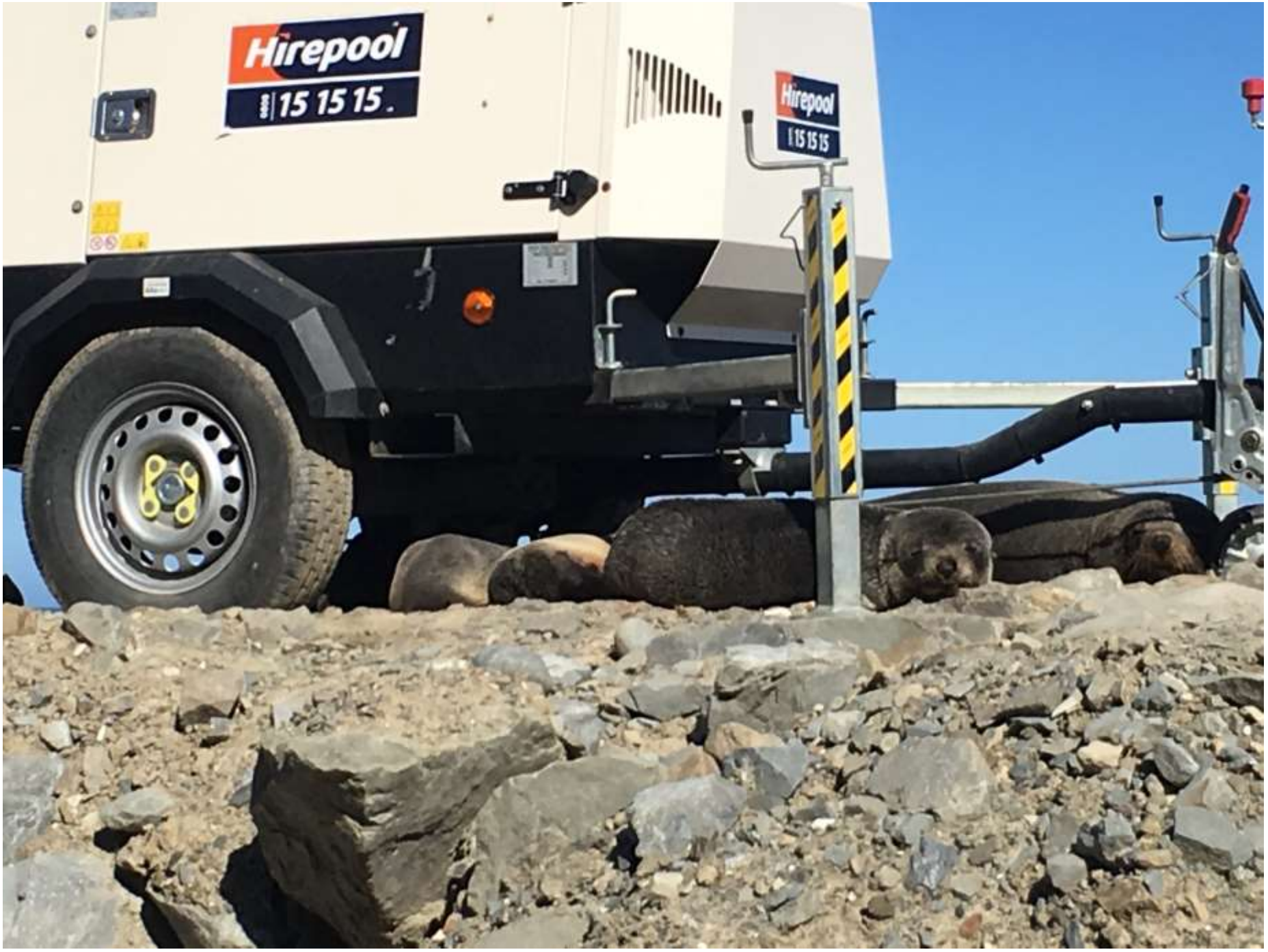
2.8KM OF SEAWALL BEING CONSTRUCTED

7,000+ BLOCKS WILL BE NEEDED TO BUILD THE SEAWALLS NORTH OF KAIKOURA

EACH SEAWALL BLOCK WEIGHS **5 TONNE**

35% OF THE WORK TO BUILD SEAWALLS IS PREPARING THE FOUNDATIONS


KOMATSU
FOR HIRE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