Kaikoura is a coastal town in the North Canterbury region of the South Island of New Zealand. It is a popular tourist destination known for its abundant wildlife and its year round sperm whale population. The region was badly affected by an earthquake in the November 2016.

The magnitude 7.8(Mw) earthquake caused landslides and rockfalls along the coastal road of State Highway (SH1). SH1 links the Kaikoura town north to Blenheim and south to Christchurch and at the same time serves as a major tourist route with its scenic view along the coast. A rail corridor adjacent to SH1 is used as a major transportation mode to bring goods in from Picton was also affected by the earthquake.

There was an extraordinary effort in response to this extraordinary seismic event: 21 faults had ruptured, generating the strongest ground shaking ever recorded in New Zealand. The South Island itself moved, thousands of landslides came down, land rose and slumped along the eastern coast.

Transport infrastructure was devastated, with coastal and rural communities isolated overnight. The instant disruption to tourism, freight and primary industries was felt nationwide. Almost a million cubic metres of rock and material fell onto SH1 and the Main North Line; while the seabed rose under Kaikoura harbour. Traffic was forced onto narrow mountain roads never designed to carry the load.

Not long after the earthquake, the government established the North Canterbury Transport Infrastructure Recovery Alliance (NCTIR). The NCTIR was set up to restore the network, and keep traffic moving on alternate routes. This partnership between the NZ Transport Agency and KiwiRail was new territory, as was the collaboration of Downer New Zealand, Fulton Hogan, HEB Construction and Higgins on such scale. With work sites spread over a large geographical area stretching from North Canterbury
to Marlborough - some very remote - the recovery effort sought to merge the knowledge of local contractors with resources from all over New Zealand.

A number of rockfall protection solutions and structures of varying energy capacities were considered and installed in several other sections of the road. These include Green Terramesh bunds, high energy rockfall barriers, hybrid barriers and debris flow fences amongst others.

At the P1A site, the first of ten major slips north of Kaikoura, there was sufficient space to install a low maintenance landslide and rockfall protection solution in the form of a rockfilled face Green Terramesh Bund.

Green Terramesh reinforced soil bunds are known for their versatility and high energy absorption capacity against impact; they are also very low maintenance as they can resist multiple rock/debris impact without replacement. The Green Terramesh unit with Galfan (Zn95%/Al5%) + PVC polymer coating wire means that it is durable for a minimum design life of >50 years in an aggressive coastal atmospheric exposure environment like SH1. The availability of space at the toe of a slope at site P1A also made this a feasible solution compared to a fence structure.

Geofabrics’ technical team worked with NCTIR to develop a design suggestion for the site. The solution adopted, a Green Terramesh reinforced soil embankment, is expected to be repeatedly impacted by debris from landslides. A stability analysis was performed to ascertain its stability during debris impact and after accumulation against sliding, global and internal, using MacStars software. In addition, the Green Terramesh bund stability was checked against seismic load during ULS and SLS conditions.

During the initial installation stage Geofabrics’ team assisted the contractor with installation tips and best practice to achieve a neat facing finish for the bund.

Not long after the installation, the bund was impacted by a landslide caused by ex-cyclone Gita in February 2018. The total pile up height was observed to be approximately 1 m high and the bund has not shown any signs of displacement. The road and rail network have been protected from inundation and remained untouched by the new/weather triggered slips.