

Project: MacKays to Peka Peka Expressway Interim
Date: September 2015
Client: NZTA
Location: Kapiti Coast North Island



Tensor RE Geogrids

The MacKays to Peka Peka expressway is part of the RONS Programme (Roads of National Significance) and will comprise of 18km of 4 lane highway passing through Paraparaumu and Waikanae. With 18 new bridges it is the first of the Northern Corridor Wellington projects (there will be 8 in total from Levin to Wellington Airport). This section of road along the existing SH1 is part of the major bottle necks resulting in frequent traffic jams, and will separate local and highway traffic to create a safer and shorter route. The total cost will be \$635 million, and is required to create a safe, efficient and reliable route in and out of Wellington (NZ's capital and 3rd largest city), allowing for future residential and business growth in the Wellington region.

Consents took 2 years and in November 2013 it was decided the road would go ahead. Consents are still ongoing which are approved by Kapiti Coast District Council and Greater Wellington Regional Council. The designs by Beca have had to consider a major earthquake in a liquefaction prone area.

Construction for the project will take 4 years, with completion planned for mid-2017. MacKays to Peka Peka (also called M2PP) Alliance includes NZTA, Fletchers Construction, Higgins, Kapiti Coast District Council, and Beca with the office set up in Paraparaumu.

Geofabrics New Zealand Ltd technical support has been provided to Beca on products and design assistance, these include products such as **Tensor RE** geogrids (for Bridge abutment foundations), **Tensor TriAx**[®] geogrids for crane foundation works, **bidim**[®] geotextiles for separation and drainage layers, **gabions & Green Terramesh** for MSE (Mass Stabilised Earth) embankments and reinforced soil structures, **Megaflor**[®] for subsoil drainage, and geosynthetic clay liner for containment in the new wetland areas.



Tensor RE wrap around construction between H Piles



Poplar Ave – Tensor RE stand-alone RE abutment construction



Poplar Ave – Abutment prior to Beam placement

The project has been split into 3 zones (Northern, Central, and Southern), 12 of the new bridges will be constructed with MSE slopes. Reinforcement lengths are determined by the backfill grading, loading, and seismic safety factor, no bodkin joints were used to minimise wastage, left over short lengths were recycled.

Bridge abutments are created using MSE construction methods with the **Tensar RE** geogrids, 0.5m layers of sand with 5% cement stabilisation created within formwork. Bidim geotextile were used between the **Tensar RE** geogrid and cement stabilised fill to minimise loss of finer particles. Since the Christchurch earthquake, new design solutions for bridge abutments are required that can take movement without compromising the integrity of the structure. **Tensar RE** geogrids have very low creep rates but very high strength. The designs take into account a major earthquake on Kapiti Coast's liquefaction prone ground.

Each abutment can have up to 90 H Steel piles driven into the soil up to 20m in length, the layers are then created between the H Piles. Large cranes (situated on top of **Tensar TriAx**® geogrids) bore the pile holes on each side along with siting of the piers, these form the foundations for the bridge beams. Super T concrete bridge beams up to 85 tonnes are manufactured in a plant set up in the Otaihanga/ Mazengarb area, the cross head beams made in Otaki at 170 tonnes are the largest single cast units ever manufactured in NZ to date.

The biggest single structure will be the Waikanae River Bridge, which boasts NZ's largest bored piles (3m in diameter).

Besides technical support, quality assurance and certification, local storage, and just in time deliveries of product on site were beneficial in keeping stock on site to a minimum. Monthly meetings ensure stock lead times are met, and any issues addressed, minimising any disruptions to the construction programme.

A lot of this construction is in culturally sensitive land, particularly the Northern zone between the Waikanae River and Te Moana Road (called waahi-tapu, sacred Maori land), work is monitored very closely by the Wellington Regional Council following strict guidelines.

MacKays to Peka Peka project involves a lot of new thinking and techniques following the Christchurch Earthquake in particular.

How Tensar RE500 Uniaxial Geogrid Works:

Tensar RE500 uniaxial geogrids have been given accreditation for use in retaining walls and bridge abutments as well as in soil slopes by a number of independent government and other certifying agencies around the world. They are made from high density polyethylene and are characterised by long, slim apertures that have been orientated in one direction during manufacture to produce high strength in the direction of roll length. The long term (creep) load characteristics for Tensar RE500 geogrid are supported by extensive test data and along with comprehensive durability testing confirm a design life of 120 years.



Poplar Ave – as at Sept 2015

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