

Project: Look Out Point Green Terramesh Structure
Date: March 2015
Client: NZ Transport Agency
Designer: Opus Dunedin & Wellington
Contractor: Downer Dunedin
Location: Lookout Point Caversham Dunedin



Green Terramesh

The Caversham Highway Improvement is a NZ Transport Agency highway upgrading project to improve safety and ease traffic congestion along State Highway 1 between Anderson Bay Road and Lookout Point. This 3km section of State highway forms part of the southern arterial route into Dunedin. The construction of a new bridge over the highway to directly link Mornington Road, Riselaw Road and South Road formed part of Stage 2 of this project. This bridge was necessary because Riselaw Road had to be lifted which removed the existing access from South Road to State Highway 1.

The original bridge design incorporated approach embankments with 1V:2H side slopes. However due to the unfavourable foundation conditions, relating to (a) global stability of the sloping natural ground at the site and the large predicted settlements and (b) the rock mass defects including faults and cavities at the bridge site, it was considered necessary to reduce the foundation load by adopting a narrower embankment base using the 70 degree **Green Terramesh** reinforced soil solution for the bridge approach abutments and ramps.

Green Terramesh is a permanent soil reinforcement system incorporating pre-fabricated Galmac® and PVC coated double twist wire mesh facing elements and **Tensar RE500** series uniaxial geogrid. The **Green Terramesh** unit with its set face angle and fixed vertical spacing provides a permanent formwork for ease of construction and long term face stability. Both vegetated and rock fill can be incorporated into the face with local rock from Blackhead quarry selected for this project which visually resulted in an impressive structure. **Tensar RE500** geogrid is a robust HDPE uniaxial geogrid with a long history of use in soil reinforcement applications. It is ideally suited for connecting into the **Green Terramesh** facing unit and has a high resistance to installation damage which was an important consideration for the AP65 crushed quarry aggregate.

The design of the **Green Terramesh** slopes had to take into account the traffic loads from Riselaw Road and the expected seismicity for this site. The use of the **Green Terramesh** units allowed the design to be optimised in terms of the reinforcement lengths and grades of Tensar geogrid.



Modified support brackets for vertical face



Safety barriers attached to Green Terramesh facing units



View of near vertical Green Terramesh face

The construction was straightforward with this system. Downer, the contractor for these works quickly picked up on the methodology for construction. This was helped through regular visits by Geofabrics staff especially at the initial stage of construction. **Green Terramesh** is a flexible and adaptable system which was critical for this site where the slope that directly faces the bridge abutment had to be near vertical. The contractor was able to achieve this change by having vertical brackets manufactured which were then attached to the **Green Terramesh** units along this section of the embankment.

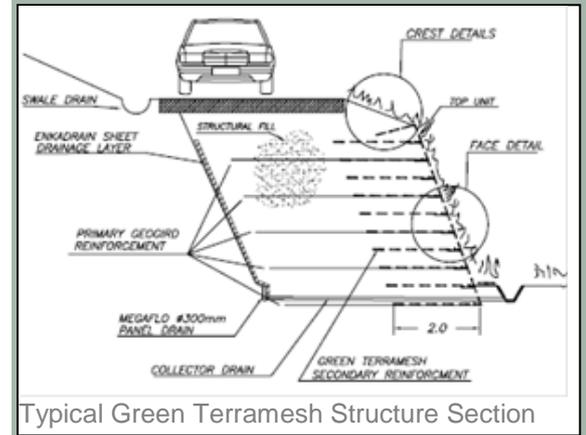
Tensar RE500 series uniaxial geogrid reinforcement was laid in between the **Green Terramesh** units with all units and geogrid fully connected using a pneumatic lacing tools for fixing stainless steel rings to the mesh and geogrid to form a monolithic structural facing. The geogrid reinforcement inclusion within the fill creates a stable composite mass. The rock face finish reduces maintenance requirements and was achieved by placing **bidim**[®] geotextile separator at the interface between the rock and AP65 backfill.

This project presented some unique challenges especially when soft soils were uncovered over non-active fault and a cavity discovered in the underlying sandstone layer close to where the foundations for the new Lookout Point Bridge were to be built.

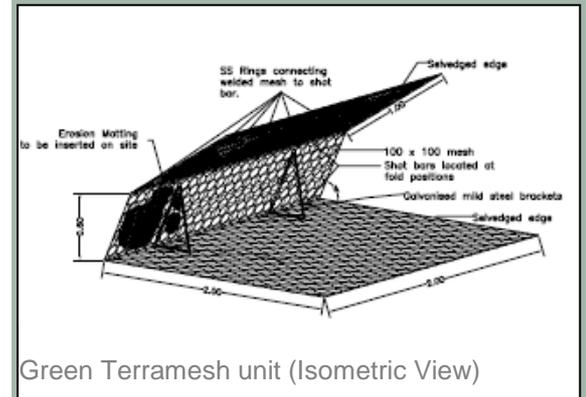
A combination of ground improvement methods was employed which included jet-grouting fill for the cavity and laying of high strength **Mirafi PET** woven geotextiles across the embankment width to bridge over any areas of uncertainty that could lead to collapse. The ductile and flexible nature of the **Green Terramesh** reinforced soil structures means that they are versatile to minor ground movements without impairment to their structural integrity.



View of completed Green Terramesh Embankments



Typical Green Terramesh Structure Section



Green Terramesh unit (Isometric View)

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