

CASE STUDY

Double Twist Mesh

Project: Reid Line Spillway Sloped Weir
Date: March 2008
Client: Horizons Regional Council
Location: Manawatu



Gabions

During the month of February 2004 an extreme weather system produced two-day rainfalls of up to 300mm resulting in flooding of low lying areas of the lower North Island including the Manawatu. Following on from this the Horizons Regional Council identified an urgent need for further improvement works to the Lower Manawatu Scheme including a major upgrade of the Reid Line Spillway to form part of the 100 year flood protection of Feilding. The proposal also included minor stopbank improvements in Feilding and stopbanking of two overflows from the Kiwitea Stream into the Makino Stream.

The upgrade of the Reid Line Spillway had to be carried out as without it the existing channel capacity was estimated to be sufficient to only provide Feilding protection from a 25-year flood event.

Geofabrics were contacted by Horizons Regional Council to put forward a solution for a **gabion** and **Reno mattress** spillway. The spillway would be designed to carry flows about once every 10 years, with flows lasting about 1-3 days as floodwaters recede. Peak flows would typically last for 3-8 hours.

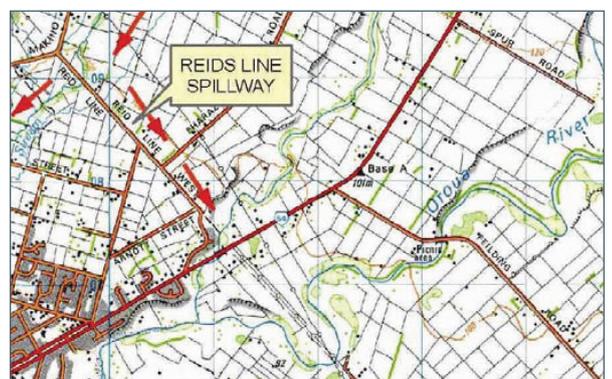
The spillway had to withstand the 100 year event with little or no damage, and the overdesign flood with only minor repairs required. It is likely that climate change in the next 50 years will result in future upgrade of the spillway being required, with increase in the design capacity likely to approach 150 cumecs. Although a concrete structure would satisfy the technical requirements it was considered too expensive whereas a **gabion** and **Reno mattresses** spillways offered both the hydraulic attributes demanded for this location as well as the cost effectiveness required by Horizons Regional Council. In addition Geofabrics could demonstrate historical performance of these structures through various International projects.



Reid Line Spillway flood (Image courtesy of Manawatu District Council)



Site prior to construction



Site Location (Image courtesy of Horizons Regional Council)

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Maccaferri New Zealand provided extensive technical support throughout the design process which included assistance from the Technical Department of Maccaferri in Italy. The Macra software, specifically developed by Maccaferri, was used to conduct hydraulic and static analysis of weirs for this site.

Both stepped and slopes weirs were considered with the final choice going to the more cost effective sloped weir due to the more intermittent design flows associated with this site. The final weir layout incorporated a 500mm thick Reno mattress extending over a flow width of 40m and a 300mm thick Reno mattress over a flow width of 35m providing a total design flow width of 75m. The crest is level for 25m and slopes up 0.5m over the remaining 50m to follow the rising ground levels. The gabion sidewalls were designed at 1.5m high on the right bank and 1m on the left bank to accommodate the design freeboard. At the 100 year design flow of 60 cumecs, the maximum depth of water at the crest was calculated at 0.79m. Some minor damage is expected for the 100 year design flow with a greater degree of damage likely should projected climate change design flows increase to 150 cumecs.

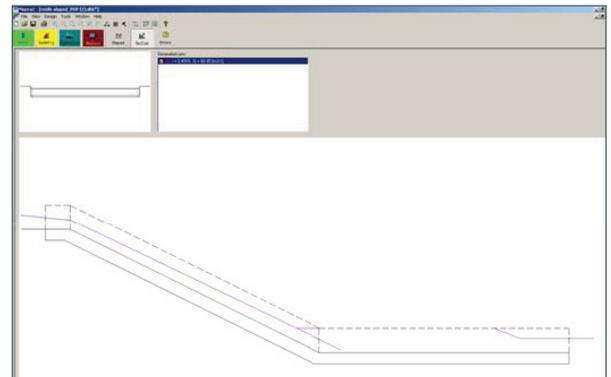
The 500mm thick Reno mattress was specially brought in for this project to satisfy the high water velocities on the face during the peak design flood events. Bidim A29 geotextile was incorporated under the Reno mattresses to limit erosion to the base soil from any residual flows during peak flows.

Hydraulic structures require a higher level of workmanship to ensure rock movement within the Reno mattress is limited during peak design flow events. To assist the contractor in this regard, Maccaferri provided installation guidelines and on site training.

Rock selection and placement were important to limit the voids within the mattresses that could result in internal movement of the rock within the Reno mattresses. Additional ties were included to hold down the lid.

The use of the pneumatic lacing tool resulted in a consistent spacing of stainless steel rings at not more than 150mm apart for holding down the lids. This also has the advantage of speeding up the installation process over traditional hand lacing techniques.

In addition to providing support during the design and construction phases of the project, Maccaferri have also provided advice to the Horizons Regional Council on durability of the Galmac/PVC coated wire used in the manufacture of gabions and Reno mattresses used in the construction as well as what levels of maintenance are likely for this type of structure.



Macra Analysis



Reno mattress installation



Completed structure