

MOLODZWI DAM

LEVUBU, LIMPOPO PROVINCE, SOUTH AFRICA

HYDRAULIC & EROSION CONTROL / WEIRS & GROYNES

Product: Gabions, Reno[®] Mattresses

Problem

The 560-mega litre Molodzwi Dam is located on Sapekoe's Maclands Estate near Thohoyandou. During February 2000, a 1:200 year flood occurred, with recorded rainfall up to 1250mm for the Soutpansberg region.

The original spillway of the dam consisted of red brown alluvial deposits and weathered gneiss. During the intense rainfalls, the spillway gradually started eroding from the downstream end due to the lack of suitable rock bedding. Whilst the heavy rainfalls continued, another dam upstream of Molodzwi Dam broke, creating a wave of water, which carried off two cars on a national road as it travelled downstream.

The earth spillway at Molodzwi flowed at a depth of 2,5m for a prolonged period. As the headward erosion advanced upstream, finally eroding past the centerline of the embankment, the spillway failed completely.

Solution

The original proposal for the reinstatement of the eroded spillway entailed the construction of a concrete masonry weir.

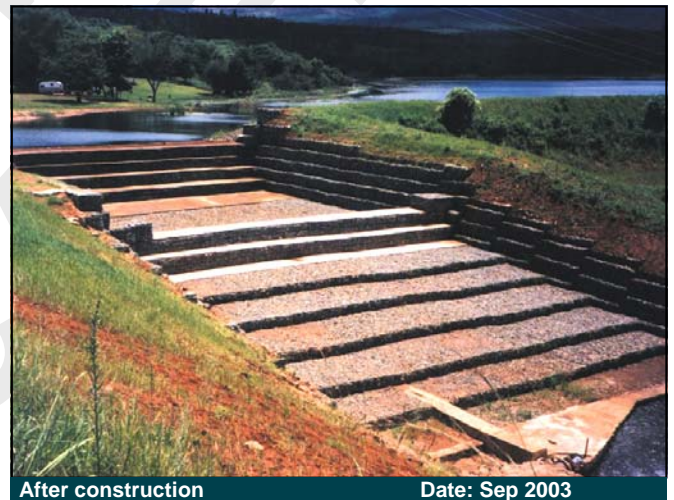
Maccaferri was approached by Munyayi Malaka Engineers to assist with the preliminary design of an alternative gabion spillway structure. Due to its social and economic benefits, this alternative solution was proposed.

Utilizing the Maccaferri Macra 2TM software (a software developed to provide engineers with a rapid and efficient tool to conduct hydraulic and static analysis of gabion weirs), Maccaferri was able to carry out the initial analysis for the structure.

The 4m high gabion weir was designed for a maximum flow of 200m³/s. The new weir has a crest width of 22m, a stilling basin width of 26m and a total length of 57,5m.



Before construction



After construction

Date: Sep 2003



After construction

Date: Sep 2003

Client:

SAPEKOE ESTATES

Main contractor:

AJP CIVIL CONTRACTORS

Designer:

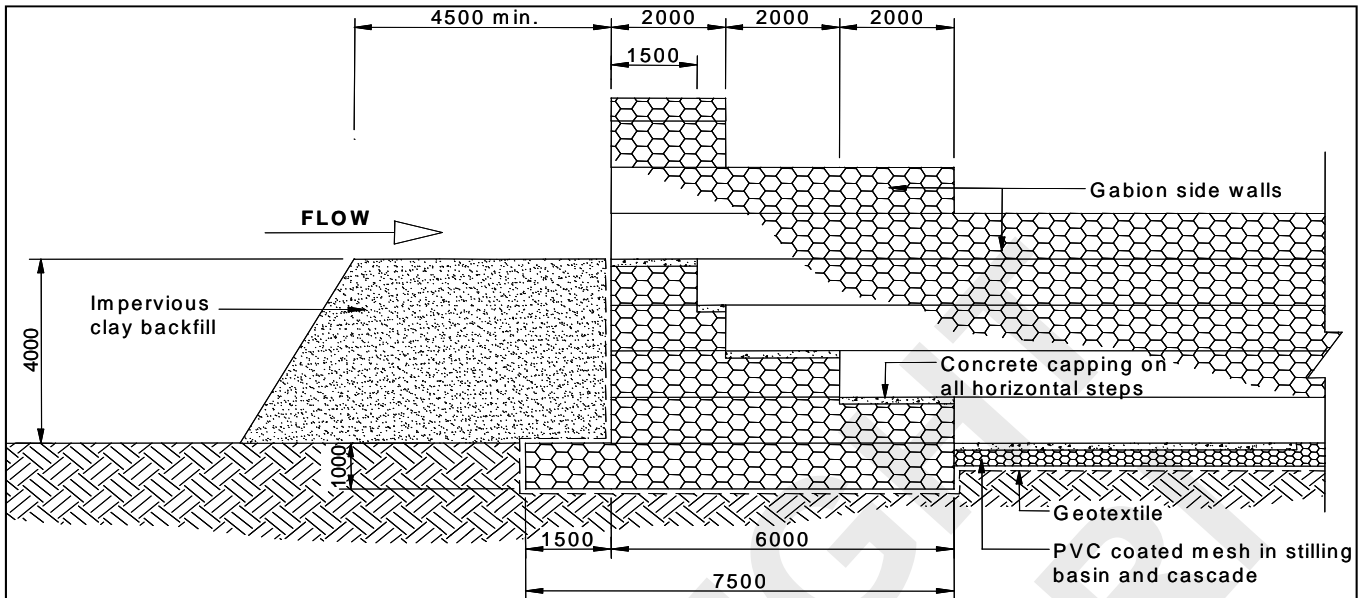
MUNYAYI MALAKA ENGINEERS

Products used:

4500m³ GABIONS & RENO MATTRESSES

Date of construction

FEBRUARY 2001-SEPTEMBER 2001



Typical section

Date: Feb 2001

The weir steps along with the first 8 metres of the stilling basin were concrete capped to protect the mesh from dynamic force damage and super-critical flow conditions.

A gabion counter weir was constructed downstream with a height of 2m. Gabion side walls were necessary along the banks of the weir to contain the flow within the channel and to protect the banks against further erosion. A gabion cascade was built downstream of the counter weir.

Approximately 4500m³ of PVC coated gabions and Reno mattresses were used to construct the weir, stilling basin, counter weir, cascade and side walls. All gabions were manufactured from 80x100 mesh and all Reno mattresses were manufactured from 60x80 mesh.

Benefits

- **FLEXIBILITY:** Double twist hexagonal mesh gabions are flexible and will permit differential settlement without fracture.
- **PERMEABILITY:** Gabions are permeable. Uplift forces downstream are minimised.
- **ECONOMICAL:** Gabions proved by far to be the most cost effective solution.

- **DURABILITY:** All products used were manufactured using double twist hexagonal woven mesh. The wire is Class A zinc-galvanised with an additional 0,5mm PVC coated layer. The PVC coating provided complete protection to the zinc-galvanising to cater for abrasive sediment carried in suspension in the water.
- **REDUCED WASTAGE:** The smaller mesh aperture used for the Reno mattresses (60x80), provided greater security of confinement for the broad spectrum of gabion rock reducing wastage. A cost saving was realised by reduced wastage.
- **TECHNICAL SUPPORT:** Technical support was provided to Consulting Engineers Munyayi Malaka, in the form of design assistance, AutoCAD drawings and site assistance.
- **SOCIAL BENEFIT:** The use of gabions allowed for local unskilled labour to be used for packing operations. Certified Maccaferri trainers were provided throughout the project to impart the correct skills and methods for good quality gabion construction.

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