



Gully Dam (Before Remediation).

# GULLY REMEDIATION

## Geoff and Maureen McCarthy

### BACKGROUND

The Burnett catchment was subject to extreme rainfall and flood events in 2010/11 and again in 2013. These events exacerbated existing, and created new, erosion issues throughout the catchment, putting pressure on farm infrastructure and landscapes across the region.

Geoff and Maureen McCarthy purchased a grazing property at Apple Tree Creek in 2015. They inherited some erosion problems on the property, including a severely eroded dam by-wash. Geoff believed that the dam wall would be compromised over coming wet seasons and sought remediation assistance.

### THE ISSUE

The damage to the by-wash was due to its width being inadequate to accommodate expected flows. The water collected by the by-wash also returned to the stream too close to the back of the dam wall, creating a risk of 'gullying' into the dam.

Part of the by-wash was cut away by a 4.5m long gully which eroded the by-wash down to bedrock. The bedrock was scoured to a depth of 1.5m - 3.0m and full of holes and cracks. The eddying and turbulence effects created by these holes resulted in erosion of adjacent banks. The peak concentration of the water and the eddying effects became significant threat to the integrity of the dam wall.

## THE SOLUTION

Geoff and Maureen sought assistance from the Burnett Mary Regional Group (BMRG) who were able to provide expert advice and funding support through the 'Better Beef for the Reef' project. The final solution was based on best practice design principles (ref.1). A local contractor was able to work with existing infrastructure (e.g. bywash) and source rock from the property to reduce costs. Stock were excluded from the by-wash paddock for most of the year to ensure that the immediate vicinity of the dam developed good ground cover.

The existing lip of the by-wash was deliberately left intact to improve the structural integrity. Topsoil was removed to increase the width of the by-wash and spread back over the site to facilitate revegetation. Re-establishing ground cover is vital as above ground plant components help to slow water moving across the landscape. Below the surface, fibrous root systems help to hold the soil together, reducing erosion risk.

A rocky extrusion on the McCarthy's' property supplied rock for battering exposed and vulnerable sections of earthworks. Larger rocks were broken into smaller angular material, which packs together better for armouring. A gravel / rock mix of 100mm - 500mm diameter was used to counter an expected flow of 10m<sup>3</sup>/sec.

## DESIGN PRINCIPLES

Design principles (ref 1) suggested that the by-wash width should be expanded to 13m to accommodate all expected flows as determined by the rule of thumb:

$$\begin{aligned} \text{by wash width} &= 2 \times \sqrt{\text{catchment (ha)}} \\ \text{by wash width} &= 2 \times \sqrt{42.25} \\ \text{by wash width} &= 13\text{m} \end{aligned}$$

However, this width was impractical due to a hill that bordered the by-wash. To avoid the cost of additional, extensive earthworks, a 10m by-wash was constructed. This width is still wide enough to accommodate most expected flows.

The by-wash was constructed with a 200mm fall along its 10m width to take the fastest flow away from the wall. The by-wash was then levelled out after several metres to prevent undue channelling of water. To further protect the integrity of the dam wall, a diversion bank was built along the side of the wall out to where there was a more suitable return slope. The diversion bank was armoured with rock to prevent erosion and consequential threats to the wall's integrity.

The end of the dam wall was also armoured with rock and built up to 1m above the by-wash, allowing enough freeboard to prevent overtopping of the wall. Given that the dam wall end on the by-wash is most at risk, a log was embedded into the rock armouring to give further protection and channel water away from the wall.

A rock chute was also constructed to slow water returning from the by-wash to the stream.

## REVEGETATION

After the earthworks were completed, Geoff and Maureen hand planted the site with Pangola grass (*Digitaria eriantha*). Pangola's ability to shoot out runners enables it to spread quickly and hold strongly to the soil. Unlike other 3P (productive, palatable and perennial) grasses, which mostly form tussocks, the runners grow roots at each node, making the plant well anchored with a large 'footprint' over the soil. In comparison tussock grasses can result in 'pedestalling', a type of erosion where water swirls around the tussock taking soil away from the base of the plant.

## RESULTS

This project was developed and completed successfully due to a combination of soil conservation expertise, skills of the contractor and the unwavering dedication of Geoff and Maureen.

This combination has resulted in a functional, economical dam by-wash. Geoff and Maureen are committed to monitoring and maintaining these structures to ensure that the project continues to yield long-term benefits.



Gully Dam (After Remediation).



Gully Dam (After Revegetation).

Reference 1: This project was designed and constructed in accordance with principles outlined in *"Gully Erosion – Options for Prevention and Rehabilitation – Experiences from the Burnett and Mary River Catchments, Queensland"* - John Day and Bob (RN) Shepherd, 2019

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**Special thanks to Geoff and Maureen McCarthy for their commitment to this project.**



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