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Remediation of dam by-wash with rock chute in central Queensland

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The Reef Protection Regulations in Queensland require graziers to document property areas of low land condition and make a plan for their future management (DES 2021). The Grazing Resilience and Sustainable Solutions (GRASS) program, funded by the Department of Environment and Science (DES), assists graziers in Great Barrier Reef catchments develop Action Plans for Land Management (APLM) for these areas and offers specialist support for issues such as erosion control. A grazier in the Fitzroy region identified significant erosion on a dam by-wash (Fig. 1a) and engaged the Department of Agriculture and Fisheries (DAF) extension staff to assist with development of an APLM and a detailed plan for restoration of the eroded area. The aim of this project was to work with the landholder to reduce sediment loss from a gully created by the dam by-wash.

DAF staff engaged a soil conservation consultant to design an erosion mitigation strategy for the landholder. The site was located on a beef cattle property at Thangool, central Queensland, with Brigalow softwood land types consisting of alluvial, self-mulching topsoil and dispersive clay subsoil. The potential volume of water passing through the erosion site from rainfall events of different durations and intensities was determined by catchment size, elevation, vegetation, and infiltration rates using the Empirical version of the Rational method as described by Day and Shepherd (2019). Initial calculations using the Ramwade flow calculator tool (Carey *et al.* 2015) showed that the 190-ha catchment had a 1% slope at the gully erosion site. A rock chute structure was designed to handle a peak water flow of 20 m³/s expected from a 1 in 50-year rainfall event in the catchment.

The rock chute design specifications included a 35 m chute crest around the top of the gully, a batter of 3:1 through the gully head, a 6-m chute batter and an apron length of 2 m and depth of 0.3 m to dissipate the water turbulence. Earth moving at the site began with shaping the level crest and batter, then excavation of 0.6 m deep cut off trenches around the chute crest and at the end of the apron. Excess soil from the shaping and battering of the chute was used to construct a diversion wing bank to direct water over the rock chute. Geofabric was laid across the top cut off trench and the top of chute batter. The geofabric was keyed in underneath a layer of compacted gravel and 600 mm quarry rock. A wire netting fence was erected at the bottom of the rock chute to hold rock in place and catch debris to further stabilise the site.

The rock chute was completed on 21 July 2021 and 402 mm of rainfall was received at the site from completion to 28 February 2022. Visual site assessments indicated very limited sediment movement at the apron of the rock chute (Fig. 1b).



Fig. 1. Erosion at the dam by-wash prior to rock chute construction (a) and the completed rock chute (b).

Calculations of sediment saving based on the rate of erosion at the site estimated that approximately 150 tonnes of sediment would be prevented from running off into the Fitzroy River catchment annually. Over time, more pasture growth around the rock chute site will help to further strengthen the structure and increase its ability to handle extreme rainfall events. In conclusion, the construction of the rock chute has reduced the risk of sediment runoff from a heavily eroding dam by-wash. The project has allowed the land holders to engage with extension staff and consultants through participation in the GRASS project and successfully demonstrate the proactive measures undertaken to be compliant under reef regulations.

References

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