

## Using Rainfall Simulators to Design and Assess the Post-Mining Erosional Stability

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**Abstract :** Changes to the mining environmental approvals process in Queensland have been rolled out under the MERFP Act (2018). This includes requirements for a Progressive Rehabilitation and Closure Plan (PRC Plan). Key considerations of the landform design report within the PRC Plan must include: (i) identification of materials available for landform rehabilitation, including their ability to achieve the required landform design outcomes, (ii) erosion assessments to determine landform heights, gradients, profiles, and material placement, (iii) slope profile design considering the interactions between soil erodibility, rainfall erosivity, landform height, gradient, and vegetation cover to identify acceptable erosion rates over a long-term average, (iv) an analysis of future stability based on the factors described above e.g., erosion and /or landform evolution modelling. ACARP funded an extensive and thorough erosion assessment program using rainfall simulators from 1998 to 2010. The ACARP program included laboratory assessment of 35 soil and spoil samples from 16 coal mines and samples from a gold mine in Queensland using 3 x 0.8 m laboratory rainfall simulator. The reliability of the laboratory rainfall simulator was verified through field measurements using larger flumes 20 x 5 meters and catchment scale measurements at three sites (3 different catchments, average area of 2.5 ha each). Soil cover systems are a primary component of a constructed mine landform. The primary functions of a soil cover system are to sustain vegetation and limit the infiltration of water and oxygen into underlying reactive mine waste. If the external surface of the landform erodes, the functions of the cover system cannot be maintained, and the cover system will most likely fail. Assessing a constructed landform's potential 'long-term' erosion stability requires defensible erosion rate thresholds below which rehabilitation landform designs are considered acceptably erosion-resistant or 'stable'. The process used to quantify erosion rates using rainfall simulators (flumes) to measure rill and inter-rill erosion on bulk samples under laboratory conditions or on in-situ material under field conditions will be explained.

**Keywords :** open-cut, mining, erosion, rainfall simulator

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