Sedimentation rates in three billabongs downstream of the Ranger mine, Northern Territory, Australia.

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# ABSTRACT

Rehabilitation of the Ranger uranium mine in northern Australia involves the construction of a landform across the ~800 ha mine site footprint. As part of the Commonwealth’s Environmental Requirements, erosion characteristics of the constructed landform should not vary significantly from those of comparable landforms in surrounding undisturbed areas and therefore should not increase the sedimentation in billabongs, downstream of the mine, above the natural rate. This latter requirement will also contribute to maintenance of the ecological values of the billabongs. To assess whether the requirements are met after rehabilitation, natural sedimentation rates in the billabongs had to be determined. A pilot study was undertaken to determine the best method(s) and chronometers for this purpose.

Three left-bank tributaries of Magela Creek drain from the rehabilitated Ranger mine site and each tributary has a billabong (Coonjimba, Georgetown and Gulungul) at its junction with Magela Creek. These billabongs are termed backflow billabongs with one billabong, Coonjimba, orientated almost perpendicular to Magela Creek. The catchment of Coonjimba Creek and billabong does not contain any upstream sources of sand.

Three cores from each of three billabongs were collected. Sand similar to that in the bed of Magela Creek was found at depth (below about 0.5 m) in all of the billabongs (Coonjimba, Georgetown and Gulungul). Material from these sands enabled dating by optically stimulated luminescence (OSL). One or two cores per billabong were analyzed for other stratigraphically contextualized chronometers, i.e., 226Ra(excess), 210Pb(excess), 137Cs, and changes to major element concentrations related to catchment conditions. Apart from OSL dating, the other methods applied in the present study were adjudged as unreliable, a consequence mainly of the confounding influence of bioturbation over time, especially at shallow sediment depths. While there were probably variations of sedimentation rate in the billabongs, the best estimate for the long-term mean natural rate of inorganic sedimentation from this pilot study is between 0.003 and 0.012 cm year-1, based on OSL. The sediment trap efficiency of the billabongs and the management implications of the results of this study will be explored during the presentation.

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