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Continuing pollution from the Rum Jungle U–Cu project: A critical evaluation of environmental monitoring and rehabilitation

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The Rum Jungle U–Cu project underwent extensive rehabilitation in the 1980's, however, it remains a major cause of pollution to the Finniss River.

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ABSTRACT

The former Rum Jungle uranium–copper project, Australia, is an internationally important case study on environmental pollution from and rehabilitation of mining. The Rum Jungle mining project is briefly reviewed, followed by a critical evaluation of monitoring data and pollution loads prior to and after rehabilitation – leading to the conclusion that rehabilitation has clearly failed the test of time after just two decades. The most critical findings are the need to understand pollution cycles holistically, and designing monitoring regimes to match, explicit inclusion of radiological criteria (lacking in original planning), and finally the need to set targets based on environmental criteria. Two examples include polluted groundwater which was excluded from rehabilitation and the poor design, construction and/or performance of engineered soil covers – both leading to increasing acid drainage impacts on the Finniss River. The critical review therefore presents a valuable case study of the environmental performance of uranium mine site rehabilitation.

1. Introduction

In the Australian mining industry, the former Rum Jungle uranium–copper project holds a special place for many reasons. It was the first project to commercially mine and export uranium for nuclear weapons in the 1950's, it was a major part of the post-war Northern Territory economy, it caused widespread ongoing environmental pollution which reached many kilometres downstream, it was among the first generation of polluting former mine sites to be rehabilitated in the 1980's and this was followed by a decade-long post-rehabilitation monitoring program. It is therefore possible to assess the pollution loads leaving the site prior to and following rehabilitation, providing a unique and important case study for such projects, especially the long-term effectiveness of rehabilitating former uranium mines. Although there are numerous papers on specific aspects of Rum Jungle, this paper seeks to synthesize all key data and information and analyse it holistically from an environmental perspective. The paper briefly reviews the Rum Jungle project, followed by a detailed compilation and critical evaluation of the available environmental monitoring data, giving a unique case study of the environmental performance of uranium mine site rehabilitation.

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2. The Rum Jungle U–Cu project – a brief history

The Rum Jungle uranium–copper project (U–Cu) has been an important mining project in Australia, for many reasons as noted previously. This section is a brief history to understand the project, its subsequent rehabilitation and environmental monitoring.

The mineral potential of the 'Rum Jungle' region, just south of Darwin, had been noted since the original surveys by Goyder's team in 1869, primarily for Cu and gold (but nothing of economic interest was found) (Barlow, 1962). The name is believed to be derived from a bullock wagon of rum which was bogged in a swamp in 1871 on its way to the Pine Creek gold field, with the bullocky's then drinking the entire cargo – and the name of Rum Jungle has been used ever since (Barrie, 1982). Between 1906 and 1913 the area was evaluated for copper, but nothing of economic interest was discovered (Crohn, 1968). The region is located in the tropical wet-dry climate of northern Australia, shown in Fig. 1.

Following the advent of the nuclear weapons race from August 1945, the Australian Government vigorously promoted uranium (U) prospecting. In 1949, local pastoral owner and amateur prospector Jack White, reading the government pamphlet on U minerals, realised that the unusual green minerals from the bed of the Finniss River were most likely torbenite (they were clearly not Cu) (Annabell, 1971; Barrie, 1982; Raggatt, 1968). The potential significance was quickly realised, with the Australian government taking

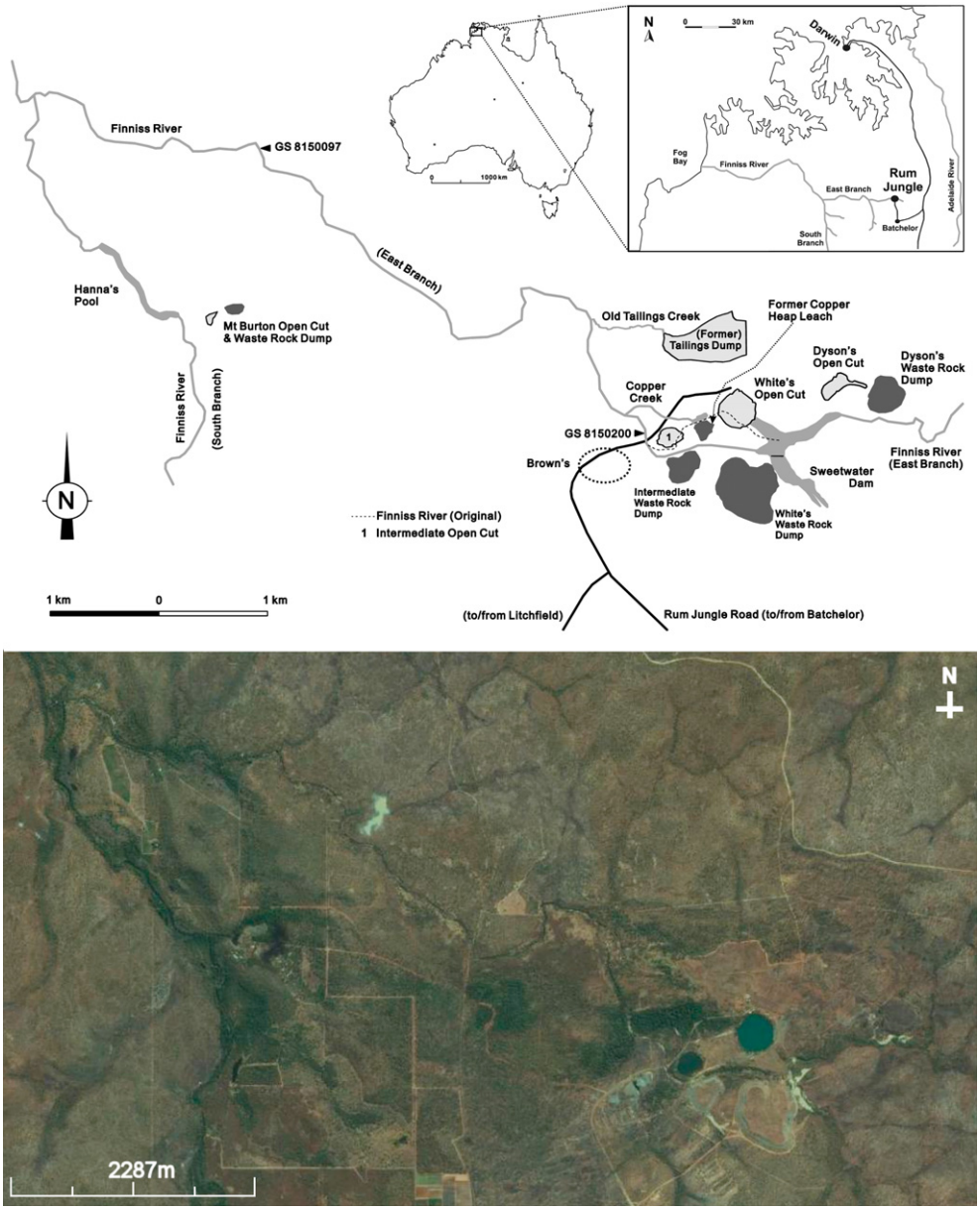

Fig. 1. Location and site map of the Rum Jungle U–Cu project, Northern Territory (top) (adapted from Pidsley, 2002); corresponding Google Earth image – date 7 June 2005 (bottom) (adapted from GE, 2009).

over in the 'national interest' (Lichaz and Myers, 1977). By late 1951 two modest U deposits were proven at White's (U–Cu) and Dyson's (U). In August 1952 U export arrangements were agreed to with the UK/USA, being for nuclear weapons, and the final contract was signed on 6 January 1953 (Gowing, 1974). The project was owned by the Australian Government, operated under contract by Consolidated Zinc (ConZinc, later to become CRA Ltd, now Rio Tinto Ltd) and was financed by the US–UK Combined Development Agency (CDA) (Griffiths, 1998). The project was considered a military project and was therefore regulated as a project of national security – not based on normal mining law and regulations (DNT, 1978; Rafferty, 1982).

After a difficult construction period, including switching from underground to open cut mining which necessitated a 1 km diversion of the Finniss River, the project was officially opened in September 1954 and produced its first uranium oxide (U_3O_8) (Cawte, 1992). The White's and Dyson's open cuts were completed by late 1958, with the mill processing stockpiled U and U–Cu ore as well as a small amount of purchased U ore. In 1959, exploration discovered the Rum Jungle Creek South (RJCS) U deposit, and this proved larger than White's and Dyson's combined (Berkman, 1968). The RJCS site was mined over 1961–63, and allowed processing to continue at Rum Jungle until 1971 with all U from RJCS stockpiled by the Australian Government.

The Intermediate Cu deposit adjacent to White's was mined by ConZinc over 1964–65 separate to the CDA contract and toll processed through the mill, plus an experimental Cu heap leach project (Fraser, 1979). The Brown's Pb–Cu–Ni–Co–Ag prospect was studied but abandoned as uneconomic due to low grades and difficult processing (the Brown's 'oxide' project was developed in 2008, mining oxide ore only, but went bankrupt in early 2009 due to the collapse of commodity prices; a major sulfide project could still be developed in the future). A compilation of relevant mining data is given in Table 1.