Spatial Distribution of Geohazards in Western Australia and Imposed Risks to Tailings Storage Facility Inventory

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ABSTRACT

The Western Australia Department of Mines, Industry Regulation and Safety (DMIRS) maintains a database of mining disturbance (MINDEX) which includes identification of tailings storage facilities (TSFs) within Western Australia. The MINDEX database includes approximately 3,500 items listed as a tailings storage facility. Verification of the database by use of public-domain satellite imagery has identified approximately 750 TSFs within operating mining leases and approximately 600 TSFs within abandoned mining leases. The approximately 1,350 known facilities are located throughout Western Australia and present a potentially significant legacy risk profile.

Statistical analysis of dam failure modes by ICOLD (Bulletin 121) has identified geohazards including extreme rainfall events and earthquakes to be some of the leading causes of tailings dam failure. Western Australia is susceptible to a range of geohazards from cyclonic activity in the state’s north to seismic hot spots in the Goldfields. Leading-practice for design of a TSF is to explicitly address the risks presented by geohazards including extreme rainfall events and earthquakes by defining an appropriate return period in-line with the consequence classification.

In addition to common geohazards, excess water in the decant pond is often a contributing factor to dam failure and environmental issues such as seepage. Public datasets can also be used to identify facilities where a positive water balance (rainfall greater than evaporation) is likely to persist and thereby may present an elevated risk profile.

This paper aims to present a snapshot of the legacy risk profile for tailings storage facilities within Western Australia by comparing the spatial distribution of known facilities against common geohazards such as cyclonic activity, climate, and peak ground accelerations from earthquakes. The analysis also includes an assessment of proximity to populations at risk including towns and sensitive receptors including significant river systems and wetlands.