**Groundwater Modelling Support for Closure Approvals at Ranger Uranium Mine**

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**ABSTRACT**

Mine-derived solutes from Energy Resources of Australia’s (ERA’s) Ranger uranium mine have been closely monitored for decades. Ranger is surrounded by the Northern Territory’s Kakadu National Park and is upstream of Ramsar convention wetlands. Modelling of groundwater flow and solute egress from mine wastes to surface waters has helped ERA successfully assess closure options and secure intermediate regulatory approvals during the site closure process. Potential environmental impacts were assessed using groundwater modelling in support of three recent ERA applications involving disposal of tailings-derived mine waste. Model results are an important part of the basis for obtaining regulatory approval of the three applications.

ERA wanted to understand potential Mg loading from uniform and segregated tailings deposition scenarios for Pit 3 in 2017. INTERA developed 2D models that showed excess tailings pore pressures would not cause outflow and solute egress from the pit during deposition. INTERA’s 3D models demonstrated that post-closure magnesium (Mg) loading to creeks for both tailings scenarios differed marginally and would be a small fraction of natural creek Mg loads. The modelling results helped avoid delays in tailings deposition from environmental concerns.

In support of ERA’s 2019 request for approval to change the tailings deposition method and final tailings level, INTERA’s model results for the permitted and proposed methods revealed minimal differences in post-closure Mg loading. The model results helped ERA obtain the needed approval for water and tailings levels in Pit 3.

INTERA is currently modelling comparative impacts from leaving tailings contaminated material in the footprint of the tailings storage facility (TSF) or placing it in Pit 3. These modelling results will support a TSF contaminated material application important for ERA to stay on schedule and minimise both closure costs and environmental impacts.