# **Neutralisation effectiveness of an alkaline brine treatment for a copper heap leach facility**

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Heap leach residues from copper processing pose challenges for remediation due to their inherent acidity and long-term potential to produce acid, saline, and metalliferous drainage (AMD). As an alternative to a conventional cover system design, liquid neutralants can be employed to reduce the dissolution of pH-dependent major and trace metals/metalloids and improve seepage water quality. Produced as a waste product from coal seam gas extraction, sodium carbonate alkaline brine is potentially beneficial for neutralising acidic materials due to the availability of high concentrations of CO32- and HCO3- anions.

A field-scale heap leach facility containing spent residues was constructed under controlled conditions and monitored over 16 months as alkaline brine was added. Despite challenges with permeability, clogging, and weather conditions, neutralisation of the acidic heap leach residues was eventually achieved. The pH behaviour of seepage water was strongly influenced by the slow release of retained acidity from jarosite. Neutralisation of the combined actual and retained acidity, from both sulfide and sulfate minerals, was required to achieve circumneutral seepage quality pH conditions.

The mobility of major and minor trace metals/metalloids was dependent on the pH of the heap leach residues. The initial pH 4 conditions produced elevated arsenic, copper, nickel, and zinc, which diminished to low or negligible concentrations at pH 8. Conversely, concentrations of sodium and chloride reached a high plateau as the heap leach residues became saturated with brine. Saline drainage is an expected consequence of this neutralisation technique.

This study presents the benefits, challenges, and limitations of re-using alkaline brine waste to achieve improved seepage water quality from copper heap leach materials.

****Keywords:**** Heap leach, brine, neutralisation, acidity