Abstract

This thesis investigates water use within the Australian and New Zealand gold mining sectors. Process and non-process water audit strategies were conducted to study site water use efficiencies and explore how different water management techniques influence extraction rates, water through-put and re-use cycles. Water audit findings were verified by simulating the data in WaterMiner, a coal mine based software modeling program. This provided the basis for recommendations towards water management planning at four case study mine sites (Kalgoorlie, Jundee, Tanami and Waihi) and an indication that WaterMiner water flow alternatives result in an average of 17.5% increased water efficiency.

At the Kalgoorlie Consolidated Gold Mine the incorporation of simulated flows into its current water management could reduce extraction from three of its main water sources by 1,479 ML/year, equating to a reduction in water abstraction of 31.2%. At Newmont's Jundee Gold Mine implementing suggested alternate flows in the operation could reduce its annual water usage by the lowest margin of all the case study sites, resulting in water savings of 8% or 175 ML/year. For Newmont's Tanami Granites Gold Mine and the Waihi Gold Mine in NZ indicative water savings were 329 ML/year or 17.2% of site water demand, and 1,031 ML/year or 14.6%, respectively.

The ultrasonic techniques and methodologies described in this thesis present replicable water auditing processes for water managers in other mine sites to consider. The water auditing results and approaches developed and verified by the WaterMiner program, provide a sound basis for water use efficiencies and management planning in the gold mining industry.