

Mount Isa Mines: Exploration from a Mining Perspective

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In an aging operation, when the life of mine draws near, exploration around known orebodies is imperative not only for extending operational life, but also sustaining a township. The Mount Isa deposit lies in far northwest Queensland, adjacent to the Mount Isa Township, within the Urquhart Shale—a unit of the mid-Proterozoic Mount Isa Group sediments within the Mount Isa inlier. Copper mineralization within the Mount Isa deposit is spatially associated yet asynchronous with lead-zinc-silver mineralization and is extracted from two distinct mines: the shallower and laterally extensive X41 mine, which comprises the now depleted, lower-grade 1100 and 1900 orebodies, and the smaller, deeper Enterprise mine, consisting of the higher-grade 3000 and 3500 orebodies. These orebodies emanate from the Paroo fault, which has juxtaposed basement Eastern Creek Volcanics (1710 ± 25 Ma) against the Mount Isa Group sediments (cf. 1655 ± 4 Ma). With current mining depths in the Enterprise mine approaching 1.75 km, several constraints dictate near-mine exploration strategies, which include but are not limited to social/cultural pressures, aging infrastructure, logistical and scheduling constraints, fault structures, principal stresses, and an increasing geothermal gradient.

As the current life of mine slowly approaches, the geology team at the Mount Isa Copper Operation is focused on near-mine target generation, testing for economic extensions along strike and up- or down-dip of the current known orebodies. Although extensive research has been completed on the Mount Isa deposit, structural controls on mineralization, aside from the Paroo fault, are not well understood. Current and future works such as structural reviews, geomechanical modeling, reviews on applicable geophysical methods, and geochemical vectoring aim to delineate controls on ore formation and determine how to best target for economic mineralization. This will indefinitely lead to further exploration at depth, which presents its own challenges that need to be reconsidered when designing further drill programs. As an established 90-year mining operation, aged infrastructure is beginning to reach its limits, for example, limits with ventilation shafts that were never designed to work effectively at certain depths in the first place. Discovery of a new, deeper, high-grade orebody along strike to the north of the 3500 orebody would have increased mining costs, as it would require new ground support standards and infrastructure—for example, ventilation, as virgin ground temperatures peak at about 65°C.

With these constraints in mind, preliminary exploration drill holes would need moderate intersections over several meters of roughly 1% to 2% Cu for X41 and upward of 2% to 3% for the 3000 and 3500 orebodies to justify further drilling. In order to effectively target economic copper mineralization, a holistic understanding of the Mount Isa deposit is required so that potential offsets to ore can be properly targeted and mine planning can be completed effectively. With developing technologies, near-mine, low-grade “halo” targets will become viable, offering the opportunity to develop low-grade exploration intersections into extensions to the mine and the mine life. Technical excellence and ingenuity when dealing with such challenges will increase the chances for economic viability and longevity of the Mount Isa deposit.