Regolith domain modelling using multivariate cluster analysis at Mt Thirsty Co-Ni Deposit

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REGOLITH DOMAIN MODELLING USING MULTIVARIATE CLUSTER ANALYSIS AT MT THIRSTY CO-NI DEPOSIT

The Mt Thirsty Co-Ni Deposit is located about 16 km northwest of Norseman in the Eastern Goldfields region of Western Australia. Weathering and supergene enrichment processes have produced the deposit enriched in cobalt, nickel and manganese, formed within highly weathered peridotite ultramafic rocks.

Mining production and research on existing Co-Ni oxide deposits has highlighted the importance of modelling the regolith profile for use in mine planning. The highly variable weathering profile has a profound control on the vertical grade distribution within the deposit and is an important control in resource estimation.

Between 1995 and 2010, various owners completed exploration and resource definition drilling at the deposit.

Subtle variations in the regolith profile of the Mt Thirsty Co-Ni deposit were not always evident during visual logging of the drill cuttings beyond the recognition of an upper goethitic zone and a lower nontronitic zone. Inspection of the assay results identified variations in manganese, magnesium and iron contents through the profile, but these zones were not able to be manually interpreted in 3D with sufficient continuity.

This case study demonstrates the application of the multi-element classification method - cluster analysis - to categorise the drill sample data. Cluster analysis classes were assessed to determine the relevant position in the regolith profile and validated by manual geological interpretation of the important upper vs lower saprolite horizon contact. Based on the cluster analysis classification the regolith horizons were modelled in 3D to inform geostatistical analysis and grade estimation.

Geostatistical analysis confirmed that the regolith horizons based on the cluster analysis were effective in sub-domaining the mineralisation, leading to improved grade estimation of the economic metals, contaminants and gangue components. Lateral grade continuity is improved by using the irregular regolith contacts to control unfolding during estimation.

In this study, geological modelling improvements underpinned a 90% increase in the Indicated Mineral Resource estimate. This approach is extremely cost effective for projects with legacy datasets, with only minimal additional drilling required for QAQC, density and metallurgical test work.