Using Automated pXRF Data Collection to Model Gold Deportment and Litho-Geochemistry through Regolith in the Yilgarn Craton, Western Australia

Aidan Kitchener[1], Simon Griffiths[1], Harry Brookes[1]
[1]Third Planet Exploration Services Ltd., Bristol, United Kingdom

The systematic deployment of portable X-ray fluorescence (pXRF) at mineral exploration projects provides robust multi-element geochemical data comparable with laboratory analytical methods. Recent innovative technologies such as detectORE™ and RokBot™ from Portable PPB facilitate rapid, on-site data collection of low-level gold (down to ~5ppb) and multi-element analyses using pXRF. Obtaining these data within days of sample collection enables shorter reaction times in mineral exploration, fast tracking discoveries, saving time and money.

At Mulgabbie, an orogenic Au deposit in the Yilgarn Craton, Western Australia, we used pXRF data from air core, diamond and reverse circulation drilling collected by detectORE™ and RokBot™ technology to outline gold deportment and generate a project specific litho-geochemistry model through regolith.

We validated detectORE™ gold determinations by comparing the values statistically and spatially with laboratory fire assay data. The base of regolith was defined using mobile element ratios. Assessing immobile elements, we developed a litho-geochemical classification that maps metavolcanic rock types through the regolith and into bedrock. This classification, in addition to gold analyses, interpreted sulphide mineralogy and pathfinder element distribution were then projected in cross-sections to provide a spatially coherent, 3D geochemical model.

Step by step analysis of the geochemical model resulted in identification of a clearly more favourable host rock for mineralisation at Mulgabbie, with gold, pyrite and pathfinders constrained to a dolerite unit. The model also highlights gold, arsenic and remnant sulphide distribution in the regolith overlying mineralisation, providing insight into dispersion in the weathered environment. A direct comparison of detectORE™ gold with fire assay gold shows a strong positive correlation.

Our work demonstrates that incorporation of new technologies in active exploration projects can rapidly improve decision making in near real time. In addition, demonstrating the potential to optimize the probability of discovery and reduce the time to discover and develop mineral deposits.