Getting the Most from Lab and pXRF Multi-element Geochemistry with Examples from the Red Lake Gold Complex, Ontario, Canada

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Emphasis is often placed on innovative technologies to improve both productivity and probability of discovery in mineral exploration. However, some of the highest impact improvements can be realised simply through better application and integration of existing techniques and technologies, often utilising datasets that have already been collected but not used.

A good example comes from a pre-existing, very large multi-element geochemical dataset from the Red Lake gold complex, Ontario, Canada, has been used for more accurate identification of lithological units and geological modelling in resource estimation and near-mine exploration targeting. Despite limitations due to significant analytical issues and a diversity of analytical techniques and elemental suites, the most stratigraphically important rock units can be discriminated using this dataset, including different geochemical suites of visually similar basalts and of felsic igneous rocks. This is allowing better geological modelling of complicated ore zones for improved resource estimation. The improved stratigraphic resolution also enables better reconstruction of mineralisation-related litho-structural architecture and better prediction of trap sites for improved near-mine targeting. Additionally, most stratigraphically important rock units at Red Lake can be more effectively discriminated with fit-for-purpose standards using pXRF analysis of drill core during logging, avoiding long turnaround times for traditional assay laboratory analysis.

While useful information can be gained from most historic geochemical datasets, this example shows that use of laboratories with sub-optimal analytical practices or misguided selection of analytical method, usually in pursuit of marginal cost savings, often undermines or destroys the potential value of historic and current geochemical analysis regimes.