Innovating Discovery: Field Sensors and Breakthrough Technology at the Sinclair Cesium Mine, Western Australia.

Nigel Brand[1,2], David Crook[3]
[1]Geochemical Services Pty Ltd, West Perth, Australia, [2]CET, University of Western Australia, Crawley, Australia, [3]Ore Source Pty Ltd, West Perth, Australia

Field-portable sensors were instrumental in both the discovery and development of the Sinclair Cesium Deposit in Western Australia—Australia's first commercially extracted Cesium mine and only the third pollucite deposit mined globally.

The deposit was discovered and delineated through the innovative application of field-portable X-ray fluorescence (pXRF) to an extremely fractionated lithium–Cesium–tantalum (LCT) pegmatite system. A key adaptation was the development of a Lithium Index algorithm integrated into pXRF software, enabling rapid identification of coherent soil anomalies suggestive of fertile pegmatites within the Pioneer Dome. One such anomaly ("Anomaly 8") led directly to the first drill intersection of Cesium-rich mineralization in August 2016.
A robust workflow integrating real-time field data, laboratory confirmation, and QA/QC protocols enabled precise Cesium quantification during exploration, drill-and-blast, stockpiling, and shipping. The turnaround speed of in-field analysis proved critical to the success of the tightly constrained three-month mining operation, far outpacing the responsiveness of commercial laboratories.

To support ore-block definition and mineral identification, an extensive spectral reference library of LCT pegmatite minerals was compiled, validated, and deployed using portable Raman spectroscopy. This facilitated rapid in-situ mineral confirmation and strengthened confidence in grade control and extraction planning.

Following Sinclair, continued regional exploration using these portable technologies led directly to the discovery of spodumene mineralization at Dome North. The Sinclair project proved that field-adapted technologies can transform mineral discovery from slow, laboratory-dependent processes into fast, precise, real-time decision-making— bridging the gap between geoscience innovation and operational impact in the field.