A Comparison of Analytical Methods Testing Soils for Gold Exploration in Pembrokeshire, West Wales

Maxwell L. Porter[1], Iain McDonald[1], Tristan English[2]
1. Cardiff University, Cardiff, United Kingdom, 2. Sarn Helen Gold, Cardiff, United Kingdom

West Wales has experienced a resurgence in gold exploration, with Sarn Helen Gold (SHG) seeking to find new gold resources across the historical mining region located near Dolaucothi Gold Mines. The Plumstone Mountain locality within Pembrokeshire has been an area of focus from prior exploration efforts by the British Geological Survey (BGS), revealing several prospective features through regional-scale geochemical and geophysical surveys. From July to October 2021, the author collaborated with SHG to complete a soil sampling, rock chip sampling, and gold panning programme to follow up on these initial findings by the BGS. The synthesis of completed data analysis addresses a series of aims: (1) assess the prospective nature of the Plumstone Mountain study area; and (2) evaluate the effectiveness of pXRF, fire assay, multi-element, and ionic leach analytical techniques.

An approach that integrates geochemistry and conceptual thinking is required to explore the mineral potential of Plumstone Mountain due to the lack of surface exposure. The pXRF has the ability to provide quick and more cost-effective data over alternative commercial lab techniques. These advantages are critical during an early-stage exploration programme despite the higher limits of detection provided (LOD), with continued pXRF use recommended for future exploration work undertaken within the region.

Plumstone Mountain contains intensely altered portions of the Roch Rhyolite Group, a rock package that has previously been revealed to contain enriched concentrations of base metals and trace gold mineralisation. A geochemical soil anomaly is present in the north of the study area, corresponding with high concentrations of pathfinder elements (As, Ba, Cu, Fe, Pb, Zn), alongside an Au anomaly identified using ionic leach data. When assessed and compared to other known deposits, the analysis indicates bimodal-felsic volcanogenic massive sulphide mineralisation and is supported by previous discoveries of Au associated with pyrite in quartz veins.