

The Tatna Copper Project, Lesser Caucasus, Southern Armenia: An Example of a Rapid, Geology-Focused, Exploration Assessment

Paul Stenhouse^{1,*} and Jean Francois Milian²

¹SRK Consulting (UK) Ltd, Cardiff, United Kingdom

²RAK Minerals and Metals Investments, Ras al Khaimah, United Arab Emirates

*Corresponding author: e-mail, pstenhouse@srk.co.uk

Tatna is a copper prospect located in the Zangezur ore district of southern Armenia. There are a number of copper, gold, and molybdenum occurrences close to Tatna, including the historical Dastakert Cu-Mo mine.

The oldest rocks at Tatna comprise a sequence of andesitic volcanic and volcanoclastic rocks, possibly with minor calcareous layers. Cutting this sequence is a number of intrusive stocks and dikes including granodiorite, quartz-feldspar porphyry, and diorite.

Initial Soviet-era exploration from the 1950s to the 1970s focused on narrow (≤ 1 m), clay-rich faults on the north side of the valley. RAK Minerals and Metals Investments Armenia (RMMIA) conducted further exploration from 2011 to 2014 that identified an additional zone of mineralization on the south side of the valley, immediately adjacent to an unmineralized diorite dike.

Detailed mapping indicated that this southern zone of mineralization was part of an approximately 0.5 km^2 zone of skarn/skarnoid, comprising fine-grained diopside, grossular >> andradite, and minor epidote. Variations in the grain size and composition of the skarn minerals are controlled by stratigraphy, which is folded by a tight, steeply plunging, project-scale antiform.

The limited volume potential of the copper-bearing faults on the north side of the valley and low average copper grades on the south side of the valley (0.4–0.5%) meant that the only real potential for economic copper mineralization was if the skarn-related mineralization continued parallel to bedding at depth. This concept was tested with a drill program, which broadly confirmed the geological model of sulfides occurring within stratigraphically controlled skarn/skarnoid and immediately adjacent andesite. However, copper mineralization was low grade (0.1–0.2%), narrow (1–2 m), and associated with significantly increased Ag-Zn-Pb relative to the previous drilling intercepts.

The pattern of decreasing Cu and increasing Ag-Zn-Pb is a common zonation pattern in copper skarns, indicating increasing distance along the flow path. However, at Tatna this transition occurred over a lateral distance of <100 m. The homogeneity of the skarn mineralogy in outcrop and lack of mineralization to the southeast infer that the dominant synmineralization flow direction was upward. Therefore, the rapid lateral decrease in Cu grades and increase in Ag-Zn-Pb content are interpreted to be the result of a permeability anisotropy at the intersection between the diorite dike and reactive layers within the andesitic sequence. This anisotropy may have been amplified by reaction-infiltration feedbacks to produce a channel of copper mineralization, with stacked lateral flow fronts.

On this basis, it was decided that the potential for significant near-surface copper mineralization was limited and exploration was terminated. Although not an economic success, this case study illustrates how a geology-focused exploration program enabled RMMIA to assess the possibility of Tatna hosting economic quantities of near-surface copper mineralization in a single field season and thus prevent wasted expenditure.