Rapid Structural Modelling from Core Photography at the Zafranal project, Peru

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ABSTRACT

The Zafranal porphyry copper project is situated approximately 100km north of Arequipa in southern Peru. It is owned by Teck Resources (80%) and Mitsubishi Minerals Corporation (20%) and is currently in the advanced stages of a feasibility study. A need was identified to develop a structural model as quickly as possible to feed into geotechnical studies for pit design, with an emphasis on brittle faults and their interaction with pit walls. The previous structural model was limited to a few major faults cutting the central part of the pit.

The challenge was to make best use of the available datasets within a very limited timeframe. Available data included surface mapping, both legacy and recent, with structural data; a limited number of geotechnical drillholes with oriented core and 113,500m of infill drilling which was not oriented but had reasonably complete photography of the uncut core.

It was decided to re-log all the available core from the photographs, assigning intervals into texture categories ranging from continuous core to intensely fractured and finally to fault gouge. This process took five geologists two weeks to accomplish. In the resulting dataset, intervals of gouge surrounded by fractured rock were grouped together and attributed by thickness, enabling the biggest structures to be filtered out. The data were loaded into Leapfrog software along with the surface mapping.

By considering the wider gouge intercepts first and aligning potential families of intercepts with the surface orientations, the structural style and the major faults were defined. The remaining gouge intercepts were systematically coded into subsidiary faults and splays of the larger structures.

The model was successful in defining potential pit slope failure mechanisms in certain sectors, but also has potential application to geometallurgy (domaining of comminution behaviour) and understanding controls on the Zafranal mineralization.