Geophysical Research Abstracts
Vol. 14, EGU2012-14048, 2012
EGU General Assembly 2012

3D reflection seismic imaging in the Kevitsa Ni-Cu-PGE deposits, northern Finland

A. Malehmir (1), C. Juhlin (1), and C. Wijns (2)

(1) Uppsala University, Department of Earth Sciences, SE 75236 Uppsala-Sweden, (2) First Quantum Minerals Ltd, Perth, Australia

Better mining technology, coupled with the realization that outcropping or shallow deposits are becoming rarer has led the exploration industry to look ever deeper in the search for economic mineralization. Conventional geochemical and geophysical methods are less effective in these cases. The majority of geophysical methods that can penetrate to sufficient depth lack the necessary resolution to effectively complement drilling. Seismic surveys are one of the few methods that do have sufficient resolution at depth to constrain geological models of an ore deposit at the drilling scale. Although eventually drilling is required, reflection seismic methods can be used to partly reduce the drilling cost by focusing the drilling in key or strategically important areas. In this work, we present 3D reflection seismic data acquired in the Kevitsa Ni-Cu-PGE (platinum group elements) deposits, northern Finland.

The 3D reflection seismic survey was conducted over an area of about 9 km2, where open-pit mining will start in mid-2012. The principal objective of the survey was to image major fault and fracture zones at depth that may have an impact on the mine stability and safety. Mine planning would then take into account the geometry of these zones at Kevitsa. Processing results show both gently dipping and steeply dipping reflections from depths of about 2 km to as shallow as 150-200 m. Many of the reflections are interpreted to originate from either fault systems or internal magmatic layering within the Kevitsa main intrusion. Further correlation between the surface seismic data and VSP data suggests that numerous faults are present in the imaged volume based upon time shifts or phase changes along horizontal to gently dipping reflections. Some of these faults cross the planned open-pit mine at depths of about 300-500 m, and are therefore critical for geotechnical planning.

In terms of in-pit and near-mine exploration, the magmatic layering internal to the intrusion controls the distribution of the bulk of economic mineralization. The ability to image this magmatic layering can therefore guide future drilling, particularly by constraining the presumed lateral extents of the resource area. Exploration will also target discrete reflectors that may represent higher-grade sulphide mineralization.

Acknowledgment: Kevitsa Mining Oy/First Quantum Minerals Ltd