

## PROJECT DESCRIPTION

Boliden  
Petkula, Finland

The Kevitsa open pit mine has been in operation since 2012 and was acquired by Boliden in 2016. A new strategic plan is currently being developed to investigate an increase in production. In conjunction with this, the geotechnical slope design parameters for the final pit depth, including a possibly deeper pit, need to be analyzed.

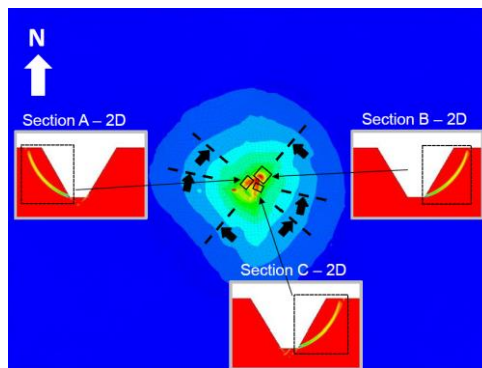


## ITASCA'S ROLE

Itasca's role in the project was to: (i) evaluate large-scale slope stability including dewatering requirements, (ii) review the bench slope design, and (iii) make recommendations on data collection and pit monitoring. Compilation and interpretation of existing data was undertaken to create an updated geomechanical and hydrogeological model. This served as an input into the 2D numerical model (in *FLAC*), with which the stability of interramp and overall slopes were analyzed. 3D numerical modelling was conducted in *FLAC3D* for selected cases to further verify the 2D results. Additionally, structural fabric data was interpreted and kinematic analysis of bench slope stability conducted. These results were then validated through a back-analysis of the as-built slope geometry. This work was done in cooperation with Itasca S.A. (Chile).

## PROJECT RESULTS

The project results showed that the rock mass quality at Kevitsa is generally good and joint orientations are rather favorable, with some exceptions. Based on the existing data, the overall slope angles for Kevitsa final pit can be fairly steep even for greater depths and depressurization is not judged to be necessary from the stability point of view. Steep interramp slopes are also possible with no or little structural control. Nevertheless, in areas where jointing controls stability, interramp angles should be limited. Neither kinematics, nor numerical modeling provided constraint regarding maximum interramp slope height, but a maximum height was suggested for the best engineering practice. Bench face angles should be locally reduced to limit the spill volume in the areas where structural fabric creates a potential for planar failure. Furthermore a monitoring plan and additional data gathering were suggested for a future study at a feasibility level.



*Plan view of Kevitsa final pit showing calculated shear strain increments, along with the corresponding 2D simulation results for strength properties producing overall slope failure*