

## **ORE CONTROL IN ANTAMINA, A SKARN WITH HIGH COMPLEXITY**

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### **ABSTRACT**

Nine years producing copper, zinc, molybdenum, bornite and lead-bismuth concentrates has proven that Antamina solved the puzzle of its style of mineralization. To achieve this goal a unique methodology for ore control was tested, developed and implemented.

The highly complex mineralization style includes a series of metals that may increase or decrease the value of the concentrate product. Up to 12 elements are assayed and 8 variables are calculated to determine the ore type and the value of each in situ 5x5x15 m block. In addition, 11 geological features are mapped to assist and validate the assay results.

To determine the value of a block a customized program of interpolation is used. The estimation methodology uses LAK (Local Anisotropy Kriging) which has to reproduce the local variations of grade contents for all the metals. Basically, the technique searches the optimum anisotropy for each block and interpolate the value using samples within such optimum anisotropy. Thirteen geological units are used to interpolate grades and the relationships may vary for each metal.

Blocks are then characterized as one of the nine ore types and valued according to their ore process and metal content. Ore process is flotation for all ore types but recoveries, mill throughput and type of contaminants varies between the 9 ore types. Seventeen equations predicting recoveries and concentrate quality are introduced to calculate the value of the in situ ore. These equations consider assay values, ratios between metals and grade ranges.

Dilution and Ore Loss is controlled during the operation using blast movement monitors (BMM), continuous training of loading equipment operators and field supervision. Reconciliation between ore control and the Concentrator Plant is monthly estimated and reported. Grade variation is usually between 5 to 7 % difference which is considered acceptable for this type of deposit.