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OPTIMIZATION OF DRILLING GRIDS FOR THE CALCULATION OF RESOURCES

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DETAILS

The optimization of drilling grids is both an economic and scientific issue. At the base, the key is to determine the critical distance for establishing an adequate spatial correlation of economic mineral concentrations. At a more detail level, the issue is complex and relies in part on the understanding of the nature of the deposit, therefore the form and the variability of mineral concentrations and, on the other hand, to the multiple methods of statistical processing.

Drilling campaigns allow for sampling of the mineralized zones. These samples are then used to:

- Spatially delimit the deposit and document the spatial variation of values for the substances of interest. This is to permit spatial interpolation of these substances and resource calculation.
- Document the spatial distribution and the local content for substances of interest, for planning blasting operations (calculations of reserves, etc.).

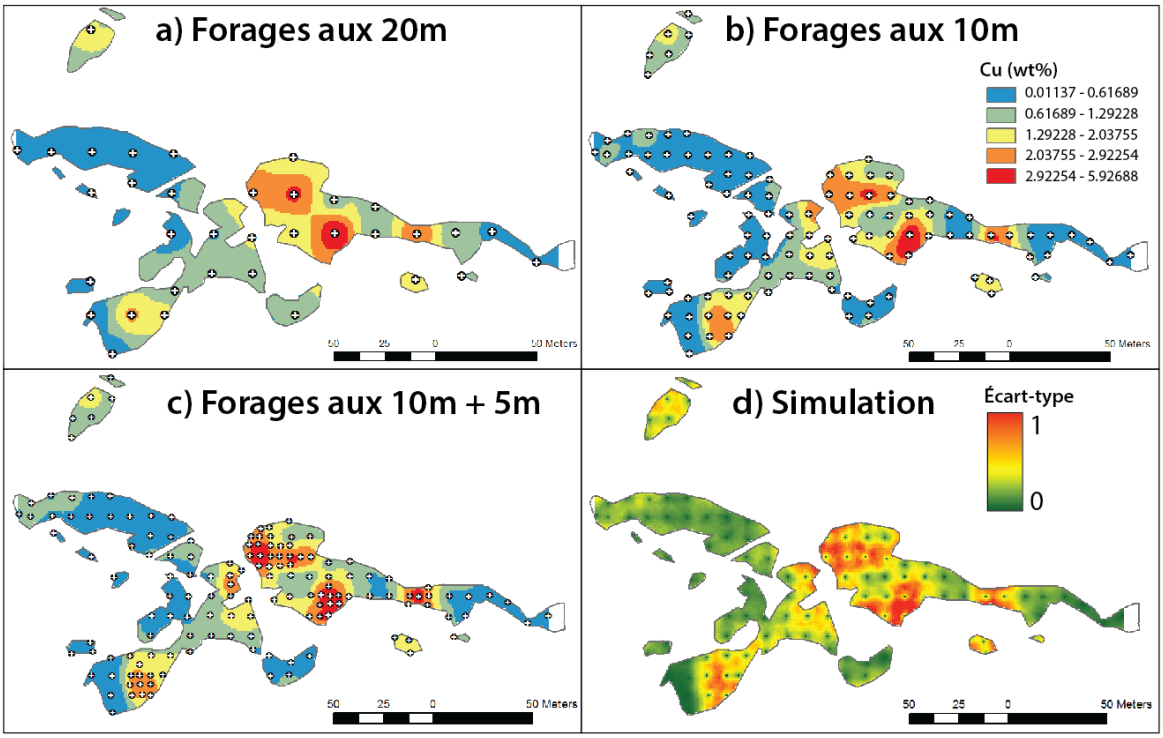
This project is mainly interested in the minimum amount of sample required for resource calculation (i.e., samples that best approximate overall (or average) values for a substance within a given area. Optimal spacing between the drill sites required for the estimation of this average value has been addressed in this project.

This project also applied 1) commonly used spatial interpolation tools (IDW and kriging), 2) tools that allow assessment of interpolation quality (e.g., conditional simulations and other tools), and 3) tools able to classify the resources.

The first phase of evaluation tested the behaviour of certain substances such as phosphate and metals Ag, Au, Cu, Zn, and Pb from the block models of three CONSOREM partners (Arianne-Phosphate, GLENCORE, and Agnico-Eagle). These models allowed for the simulation of multiple drilling campaigns (**attached figure**) (i.e., sampling of block models). The collected samples were used in the calculation of the means and variograms, for example.

From this study, it is evident that for the phosphate deposit of the Paul Zone, a drilling grid of 200 m allows to reproduce the known results in a satisfactory manner. In the same sense, a grid spacing of 20–30 m for the massive sulphide deposit of Bracemac is considered satisfactory, even being 40 m for the large-sized lenses. For the massive sulphide gold deposit of La Ronde, a drilling resolution of 30–40 m is satisfactory given the margin of error that is considered to be acceptable.

The results and procedures carried out in this project will be extended to other deposits and address various problems (in particular, calculating reserves) that have not been dealt with in this project.



Tests performed on a 2D example from on the Glencore model blocks; a) IDW-type interpolation from simulated drilling distances of 20 m; b–c) Simple kriging interpolation from (b) simulated drilling distances of 10 m and (c) at 10 m and 5 m in certain areas; For maps a–c, the white cross on a black background represent the simulated boreholes; (d) Results from 100 conditional simulations from boreholes at 10 m spacing (see map b). The map presents the standard deviation. Areas in red are the more difficult to interpolate and deserve to be drilled at a closer spacing - see map c).

SUMMARY SHEET

Objectives	• Identify the main parameters that have a significant influence on results from a resource calculation. • Learn from known deposits, for which block models, reconciled or not, are available. • Define the optimal spacing between the boreholes allowing a precise and accurate estimate of values.
Results & innovations	• Documentation of the process for performing a resource calculation. • Establishment of a protocol (Python code) to exploit the block models of CONSOREM partners. • Quantification of the error associated with estimates of values according to the various distances between drill sites. • Propositions for optimal spacing between drilling sites primarily for, primarily, volcanogenic massive sulphide (VMS) type deposits.