# Determination of Optimum Mining Elevations in Nickel Laterite Deposits with Geostatistical Simulation and Optimization

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Nickel laterite deposits are tropically weathered mafic-ultramafic complexes. The resulting nickel concentration is found within soil horizons and is mineable with regular dozer units. Closely spaced drillholes are used to establish the locally varying optimal depth for mining. We define and explain the concept of a selective mining unit size in the context of laterite deposits, where mining will proceed by dozing the ore for loading and hauling to the plant. The mining equipment and anticipated operational conditions dictate the size of the representative dozer regions (RDRs). A conditional simulation approach is used to calculate "optimum" RDR mining elevations. Multiple realizations of the ore base surface are simulated. For a single bottom surface realization, dilution and lost ore costs are calculated over the extent of each RDR. The optimum mining elevation is the elevation that minimizes the cost of accepting dilution and wasting lost ore. The optimization of RDR elevation accounts for uncertainty in the base surface. Sensitivity studies on alternative RDR sizes (equipment choices) and grade control drilling are possible in the proposed framework. Geostatistical simulation fairly represents the variability of the ore/waste contact; conventional smooth mapping methods would overestimate recovery and underestimate dilution. These concepts are developed with a synthetic case study.

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