

# Exploiting Heterogeneity: Improving Head Grade and Project Value

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## ABSTRACT

As for many commodities, gold mining has relied on economies of scale to allow material to be mined and processed more cost effectively. While it is true that mineral deposits of today and tomorrow are inherently lower grade than yesteryear, it is also true that the diluting effects of larger scale mining have also resulted in lower deposit grades. With such diluting effects, if mineral processes are unable to achieve improvements in operating costs and recoveries to commensurately reduce cut-off grades, there can be a net reduction in ore reserves. Conversely, early segregation and rejection of waste in mining-processing can result in enhanced metal recovery.

To address challenges in reduced deposit grades, whether inherent or from mining scale, and to generally improve profitability, one can consider the heterogeneity of mineral deposits. All mineral deposits exhibit heterogeneity – some more than others. Gold deposits often possess a high degree of heterogeneity, which can result in small amounts of high-value gold mineralization remaining economic despite being highly diluted in process feeds. This paper explores the heterogeneity of gold deposits in comparison to other mineral deposits. It introduces the concept of “waste liberation” as a means to gauge when, for a given degree of heterogeneity, the mining scale or lump size is sufficiently small, and mineralization is sufficiently absent, for continued economic processing. Rejecting such liberated waste is key to improving process head grades. And for many deposits with head grade – recovery relationships, improved head grades mean improved metal recoveries.

The paper discusses concepts in waste rejection, including selective mining unit (SMU) sizing, ore screening, and ore sorting (bulk and particle) and their potential impact on gold project economics.