How preparation and assaying methods steal ounces from resource estimates

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All resource models depend on assays and an assumption that representative subsamples were assayed. Resource estimation, for gold projects in particular, requires an understanding of routine sample preparation and assay methods.

Achieving a representative sample for assay is a significant challenge for some gold projects. Part of the challenge is balancing the cost of sample preparation and maximizing the probability of achieving sample representivity. There are a large number of options that need to be considered such as particle size reduction, sample weights, splitting techniques and control of sample cross-contamination. Optimizing sample preparation is an often overlooked opportunity to acquire better quality data.

Gold is mined at very low concentrations so that analytical methods are challenged at important grade ranges like the lower mine cut-off; precision is over 100% within 20 times the detection limit but improves asymptotically as concentrations increase. The fire assay method is prone to underestimation of gold concentrations because there are numerous steps and at each step there is a risk of incomplete gold recovery. Methods that depend on leaching (by cyanide or aqua regia) run the risk of systematic underestimation but are sometimes selected on the basis of cost or the assumption that a larger sample is more representative and therefore preferred.

Other common industry practices can introduce selection bias which invariably lowers resource estimates. Selection bias can be introduced when the rules for treatment of multiple results for the same sample assumes that one fire assay method is “better” than another. Problems are exacerbated when high grade samples are re-sampled and re-assayed with a “better” method; the second assay then replaces the previous assay. To understand if a gold assay method should be preferred over another, it is necessary to separate sampling errors from potential analytical bias.

Practical steps to assess the risk of underestimation include “assay-to-extinction” experiments, assessment of existing duplicate assay data sets and optimizing work flow to avoid selection bias. An awareness of the issues will prevent avoidable “losses” and improve resource estimation.