Overview of the KSM porphyry gold-copper cluster, northwestern British Columbia

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The Kerr-Sulphurets-Mitchell (KSM) porphyry Cu-Au-Mo-Ag cluster, located in northwestern British Columbia, hosts one of the world's largest undeveloped reserves of gold and copper. Seabridge Gold's KSM holdings contain proven and probable reserves totalling 2.2 Bt at 0.55 g/t Au and 0.21 wt.% Cu within four distinct ore bodies: Kerr, Sulphurets, Mitchell, and Iron Cap. These deposits are contemporaneous, featuring predominantly hypogene mineralization centered on Early Jurassic intrusions. Nonetheless, each of the four deposits displays a unique combination of important attributes, including the nature of the syn-mineral intrusions, overall Cu/Au ratio, deposit morphology, and proportion of mineralization hosted within wallrock. We will present a brief overview of the exploration history and regional geology of the KSM deposits, as well as a summary of the geology, hydrothermal alteration, and mineralization within the deposits themselves.

The KSM cluster contains a co-magmatic suite of syn-mineral intrusions ranging in composition from diorite to granodiorite to quartz monzonite. Early, medium-grained, plagioclase-hornblende phyric, diorite intrusions are ubiquitous throughout the district, followed temporally by syn-mineral to post-mineral plagioclase-hornblende-K-feldspar; quartz-phyric porphyry dykes with K-feldspar megacrysts. The Kerr, Mitchell, and Iron Cap deposits display hydrothermal alteration zonation patterns typical of calc-alkaline porphyry Au-Cu deposits. Early, central potassic alteration with abundant quartz veining, associated with the bulk of mineralization, extends laterally into poorly mineralized propylitic alteration. Potassic alteration zones are partially overprinted by areas of pyrite-rich phyllic alteration, concentrated within the shallowest parts of the deposits. Additionally, the Kerr and Mitchell deposits feature discrete advanced argillic roots zones, with intermediate to high sulfidation mineralization. The nature of the fault-dismembered and possibly truncated Sulphurets deposit, primarily hosted by sedimentary wallrock, is somewhat more cryptic.

Structurally, the KSM deposits feature many complexities. Cretaceous east-vergent thrust faults, dipping shallowly to the west, cut across the district, while several of the deposits are also segmented by normal faults. Furthermore, the Kerr and Mitchell deposits feature zones of ductile deformation, with tightly folded quartz veins and pervasive foliation. Alteration-dependant differential strain partitioning, whereby the relatively low competency zones with strong phyllic alteration were preferentially deformed, also affects these deposits. While the giant KSM porphyry cluster is clearly deformed by virtue of its age and location in a long active convergent setting, many of the classic features from younger porphyry systems can still be distinguished.