La Fortuna Cu-Au Porphyry Deposit, Atacama Region, Northern Chile

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The La Fortuna copper-gold porphyry deposit is located in the Province of Huasco, approximately 140km east of Vallenar, at an elevation of about 4,100m, in the Atacama region of northern Chile. La Fortuna is part of the El Morro Project, which is currently 100%-owned by Metallica Resources Inc. and operated through a joint venture agreement with Noranda Chile Ltda. Noranda is earning in a 70% interest in the project through exploration. Small-scale mining activity on scattered Cu-Au vein showings in the La Fortuna district has occurred intermittently since the early 1900’s. Modern exploration began in 1993 when a cluster of gold-bearing Oligocene porphyry systems was recognized by BHP. Since then, several companies performed drilling, airborne and ground geophysics, soil geochemistry, surface sampling and geologic mapping, but it was not until January 2001 that diamond hole DDHF-18, drilled by Noranda, fully intersected the productive La Fortuna porphyry for the first time. Discovery was the result of a combination of sound geological interpretation and timely negotiation with the mining property owners. The deposit was outlined between 2000 and 2002 with a total of 19,009 m of diamond drilling in 41 holes, on a 200 x 200m drill hole grid. This drilling provided the basis for an inferred resource estimate of 465 Mt grading 0.61% Cu and 0.50g/t Au, at a 0.40% Cu cut-off.

The La Fortuna district is located within a 15 by 30km north-trending structural depression within Paleozoic to Permo-Triassic basement rocks. The western edge of the depression is fault bounded and may correspond to the southern extension of the Domeykofault system, the main controlling feature for the northern Chile Late Eocene–Early Oligocene copper porphyry belt. Within the depression, basement rocks are principally covered by Mesozoic and Cenozoic stratified sedimentary and volcanic rocks. These sequences are intruded by a series of granodioritic to dioritic porphyry stocks and dikes, dated between 42Ma and 32Ma (Eocene–Early Oligocene), some of which are related to the porphyry mineralization. At La Fortuna, multiple pulses of quartz monzonitic to dioritic intrusions of calc-alkalic affinity were emplaced in the eastward-dipping volcanosedimentary stratigraphy, between about 35 and 32 Ma. The dominant host rocks are volcanic breccias and dacitic to andesitic tuffs. Main-phase porphyry intrusion is a subvertical stock, measuring about 400 x 800m that was subsequently intruded by smaller, late- to post-mineral dykes. All of the intrusions show strong NNE- and NW-trending structural control. Locally, hydrothermal breccias formed at the margins of the porphyry bodies.

Hydrothermal alteration is characterized by an early, biotite- and magnetite-rich potassic phase, overprinted by intermediate argillic (illite-smectite-chlorite), phyllic (sericite-pyrite-tourmaline), and advanced argillic (dickite-pyrophyllite-alunite-quartz) alteration assemblages. The latter is characteristic of the gold-bearing, siliceous structures at Cantarito, located 700m SE from the La Fortuna porphyry. Age dates for alteration products reported by BHP, have yielded 35Ma for phyllic-intermediate argillic alteration and 32 Ma for the advanced argillic event. Supergene alteration and mineralization has produced a zoned vertical profile with an upper leached horizon varying from 20 to 300m in thickness, followed by a secondary enrichment zone up to 100m thick, and a primary zone recognized to a depth of 970m from the surface. No copper oxide zone of importance has been encountered. Leaching and enrichment process is thought to have occurred between the onset of porphyry mineralization, at approximately 35 Ma, and the sealing of the deposit at 22 Ma with the deposition of a sequence of piedmont gravels, possibly correlated with the widespread Atacama gravels.

Principal sulfides associations are chalocite/digenite-pyrite in the secondary enrichment blanket and chalcopyrite-pyrite with subordinate bornite in the primary zone. Copper–gold mineralization occurs principally in the porphyry units, in multi-stage stockworks and disseminations, in an almost 1:1 relation (%:g/t).

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