



El Abra Porphyry Copper Deposit, Northern Chile - Update

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The El Abra property is located about 40 km north of the Chuquicamata mine in the Antofagasta region of northern Chile, at an elevation of 3,900 to 4,100 m asl. The discovery of El Abra occurred in pre-hispanic times when Incas mined turquoise and chrysocolla. The British Compañía Minera de Calama mined several vein deposits of the area in the early 20th century. Anaconda explored the area intermittently from 1945 to 1969, ultimately drilling 6 holes, which were the first indication of a large, low-grade deposit in the area. The Chilean Government took control of the property in 1971, with exploration by the Chuquicamata Geological Division of Codelco beginning in 1972. This program of mapping and core drilling outlined a significant copper-oxide resource by 1975. In 1993, Codelco sought a partner to develop the property, resulting in the purchase of 51% of the deposit by Cyprus Amax Mining Company in 1994. The new partnership, named Sociedad Contractual Minera El Abra (SCM El Abra), began mining in 1995, with the first cathode production in August 1996. Phelps Dodge Mining Company acquired Cyprus Amax Minerals Company in November 1999 therefore earning a 51% interest in SCM El Abra. The historical production for El Abra was 300 Mt at 0.65%TCu. The remaining reserves as of January 1st, 2003 are 536 Mt at 0.41%TCu. The designed mine capacity is 277,000 metric tons of material moved per day and the SX-EW capacity is 225,000 metric tons of copper cathode production per year.

El Abra is a porphyry copper-type deposit, which occurs in a narrow (30- to 50-km wide), north-south trending mineral belt, which also contains the Chuquicamata and Radomiro Tomic porphyry copper deposits. The deposit lies about 3 km east of the West Fissure (Domeyko Fault), and is associated with a north-west trending fault zone that might be an off-shoot of the main West Fissure. At the mine property area, outcrops of Paleozoic-Triassic age sedimentary and volcanic rocks are intruded by Tertiary age intrusive bodies with associated mineralization. Remnants of Tertiary ignimbrites and rhyolite flows overly the mentioned older rocks. The El Abra deposit is hosted mainly by 38 Ma dioritic to granodioritic intrusions. These rocks are intruded by the 34 Ma Clara granodiorite batholith and later by a north-northeast trending swarm of El Abra quartz monzonite porphyry dikes and irregular plugs with associated breccias. The Clara and El Abra porphyry have similar composition and are believed to be closely associated in age.

Alteration grades outwards from a large potassic zone represented by the formation of biotite and/or potassium feldspar and is most closely associated with the copper mineralization. Phyllic (quartz-sericite-clay) alteration overprints the potassic zone and occurs related to hydrothermal breccias and in zones associated with the northwest-trending fault structures. Propylitic alteration, characterized by the mineral association chlorite-epidote-pyrite-hematite, is developed near the margin of the deposit.

Copper oxide mineralization at El Abra crops out in an area of about 1,700 m by 1,000 m. Mineralization consists of an upper oxide zone, which extends from the surface down to a depth of 90 to 300 meters. Chrysocolla, pseudomalachite, copper clay, and tenorite are the principal oxide ore minerals in association with potassic and phyllic alteration. Libethenite, brochantite, copper wad, and turquoise are locally important. The mixed zone represents a transition between the oxide and sulfide zone. It is typically 10 to 20 meters thick and accounts for less than 5% of the copper mineralization. In addition to the oxide minerals mentioned above, this zone may also contain cuprite, native copper, secondary chalcocite, bornite and chalcopyrite. The sulfide zone extends to more than 700 meters below the bottom of the oxide zone. Bornite, chalcopyrite, chalcocite, and pyrite are the principal sulfide ore minerals in association with potassic alteration and to a lesser extent quartz-sericite alteration. The margins of El Abra porphyry dikes typically contain higher-grade mineralization in breccias, while interior to the dike the grades are lower. Locally there are quartz-sericite breccias with abundant pyrite and less chalcopyrite. Molybdenite is common as veinlets in the El Abra porphyry dikes. Secondary chalcocite occurs erratically as veins and in quartz-sericite breccias.