THE SACATON PORPHYRY COPPER DEPOSIT

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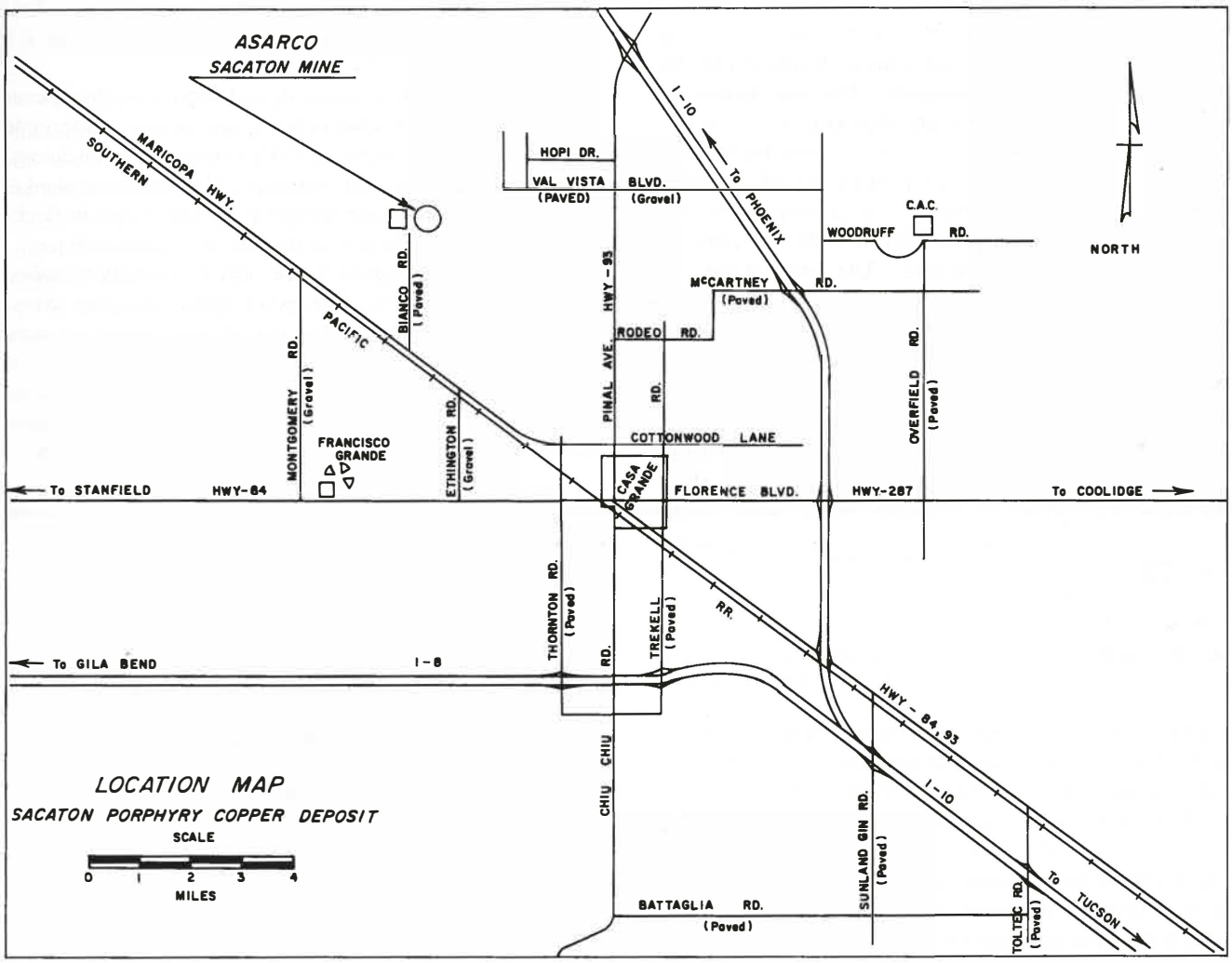
This one-day field trip visits an active open pit copper mine about 35 miles south of Tempe. Boots are recommended; hard hats and safety glasses will be supplied at the mine. Figure 1 is included in place of a road log. The geology of the deposit will be described more completely in an article being prepared for the second porphyry copper volume under the editorship of S. R. Titley (University of Arizona).



The Sacaton copper deposit is located in the west-central portion of Pinal County, Arizona, about 6 miles northwest of Casa Grande and 65 miles northwest of Tucson. The mine is on a gently dipping alluvial plain south of the Sacaton Mountains. Vegetation is sparse and the climate is semiarid. The average altitude in the mine area is 1,450 feet.

Early in 1961 Asarco geologists examined a small outcrop of leached capping south of the Sacaton Mountains. The outcrop forms a low hill, about 300 feet in diameter, which is surrounded by Quaternary alluvium. The closest pre-mineral rocks are found one and one-half miles to the north. The outcrop is composed of granite which is cut by several thin monzonite porphyry dikes. Both rocks contain pervasive phyllic and argillic alteration. The nature of the leached capping suggests the original sulfides were about 2 percent pyrite by volume with traces of chalcocite.

With the altered outcrop as a positive exploration lead a

drilling program was initiated which eventually outlined two zones of ore grade copper mineralization which are separated by a steeply dipping normal fault (the Sacaton Fault). The west ore body, on the up-thrown side of the fault, is presently being mined by open pit methods. Before commencement of mining activities the ore reserves were estimated to be 33.0 million tons at an average grade of 0.76 percent copper with a cutoff of 0.30 percent copper. The east ore body will eventually be mined by block caving methods. Full-scale production in the west ore body started in February, 1974. At the present time the mine is producing approximately 11,000 tons of ore per day.

Outcrops in the vicinity of the Sacaton deposit include Precambrian Pinal Schist and Oracle Granite and the Laramide Three Peaks Monzonite. The ore bodies are completely covered by Quaternary alluvium.

Within the ore bodies Oracle Granite is intruded by monzonite and quartz monzonite porphyries of probable Laramide age. The porphyries occur as mixed breccias, monolithic breccias, large poorly defined dike-like intrusive masses, and thin well-defined dikes. The center of the west ore body is occupied by an irregular pre-mineral breccia in which fragments of granite and the porphyries are intimately mixed.

Pre-mineral rocks occurring in and around the ore bodies exhibit pervasive hydrothermal alteration. The principal alteration minerals include sericite, quartz, undifferentiated clays, biotite, and chlorite. A well-defined zonation of alteration assemblages has not been identified, but the strongest alteration is generally coincident with the most intense sulfide mineralization.

Hypogene sulfide mineralization (as pyrite, chalcopyrite, and molybdenite) occurs in veinlets, disseminations, and breccia cavity fillings. All pre-mineral rock types are mineralized. The total sulfide content varies from 1.5 percent to 4.0 percent by volume. The best hypogene mineralization occurs in an arcuate-shaped zone which underlies ore grade supergene mineralization. Within this zone the copper content averages over 0.40 percent as chalcopyrite and the pyrite to chalcopyrite ratio varies from 1:1 to 3:1.

Supergene sulfides (chalcocite and minor covellite) occur as replacements of chalcopyrite and pyrite. Supergene mineralization in the west ore body is irregular in thickness, configuration, grade, and continuity. The supergene blanket has a gentle to moderate northerly dip and varies in thickness from less than 50 feet on the margins to over 500 feet.

The original supergene blanket was extensively modified and partly destroyed by a period of post-enrichment oxidation and leaching. During this period a significant quantity of chalcocite from the blanket was oxidized. A portion of the oxidized copper was fixed in place as various oxide copper minerals. The remainder was leached and probably flushed out of the mine area.