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MINERALOGY

Information on mineralogy was included in Section 8 of the 1998/2000 feasibility studies.

Russell M. Honea did two studies.

The first study was done on a sample of low-grade pyroclastics and one speck of electrum was seen. This was pale yellow indicating appreciable silver content. Gangue material was primarily quartz, sanidine and clay.

A second study was done on two samples of rhyolite and one sample of pyroclastics. Gold was found to be present as electrum ranging in size from 36 micron to 98 micron (400 mesh to 150 mesh). Silver was present mainly as acanthite (Ag_2S) with some native silver, pyrargyrite ($3Ag_2S{\cdot}Sb_2S_3$) and polybasite ($9Ag_2S{\cdot}Sb_2S_3$).

Multi-element x-ray fluorescence analyses of four samples were done on the different ore types and these showed only trace quantities of mercury.

A mineralogical study was done by Pittsburgh Mineral & Environmental Technology, Inc. as part of the Barmac VSI bulk crushing-screening test done in 1997. The following are the conclusions and recommendations from the report, which was dated June 20, 1997.

"The following mineralogical features are considered to be pertinent to ore processing and precious metals recovery at the Soledad Mountain Project:

- The ore types investigated contain both coarse as well as ultra finegrained native gold, which is characterized by high silver concentrations. The coarse gold particles could become a reason for recovery losses since 80 to 150 micron gold particles may not be completely solubilized in standard heap leach cycles. It is recommended that Golden Queen evaluate if a gravity scavenging circuit for the removal of coarse gold (and coarse gold/silver-bearing pyrite) would be a technically and economically viable tool for recovery of coarse precious metals particles prior to leaching. Such a preconcentration would be particularly attractive for the vein ore.

- The bimodal size distribution of the gold as well as the gold/silver association with very coarse-grained pyrite and iron oxides could result in nugget effects during sampling, sample preparation, assay work and metallurgical testing. In order to minimize these mineralogical detriments it is imperative that rigorous blending, splitting and pulverization practices are observed during assay pulp preparation. The amounts of +200 mesh material in the assay pulps should be kept at a minimum.

Specifically for the vein ore, triplicate assays and duplicate assays of screen size fractions are suggested in order to reduce or reconcile analytical problems.

- All of the Soledad ore types contain trace amounts of ultra fine pyrite, which may contribute to some refractoriness and to low(er) recoveries. Additional mine geology work is suggested on the quartz latite and the pyroclastics, which contain distinctly elevated accounts of ultra fine sulfides. Samples from this work should be subjected to detailed bottle roll testing in order to assess the extent and impact (if any) of the sulfides on gold/silver recovery.

- Most of the sulfide-associated native gold and the sulfide-encapsulated silver sulfides are likely to be refractory to direct cyanidation unless sulfide fracturing and oxidation is achieved.

- The presence of considerable amounts of swelling clay (i.e. montmorillonite) in the quartz latite ore should be monitored during follow-up metallurgical work. This material could contribute to reduced permeability, solution sorption and solution clarification problems.

- It is recommended that Golden Queen Mining perform exploratory comminution tests with the high pressure grinding roll. The metallurgical beneficial effects of microfracturing and more liberation in the –65 mesh range could potentially increase gold and silver recoveries by several percent. Another beneficial effect inherent in HPGR comminution (which would replace the tertiary crushers) is its acceleration of the leach kinetics."