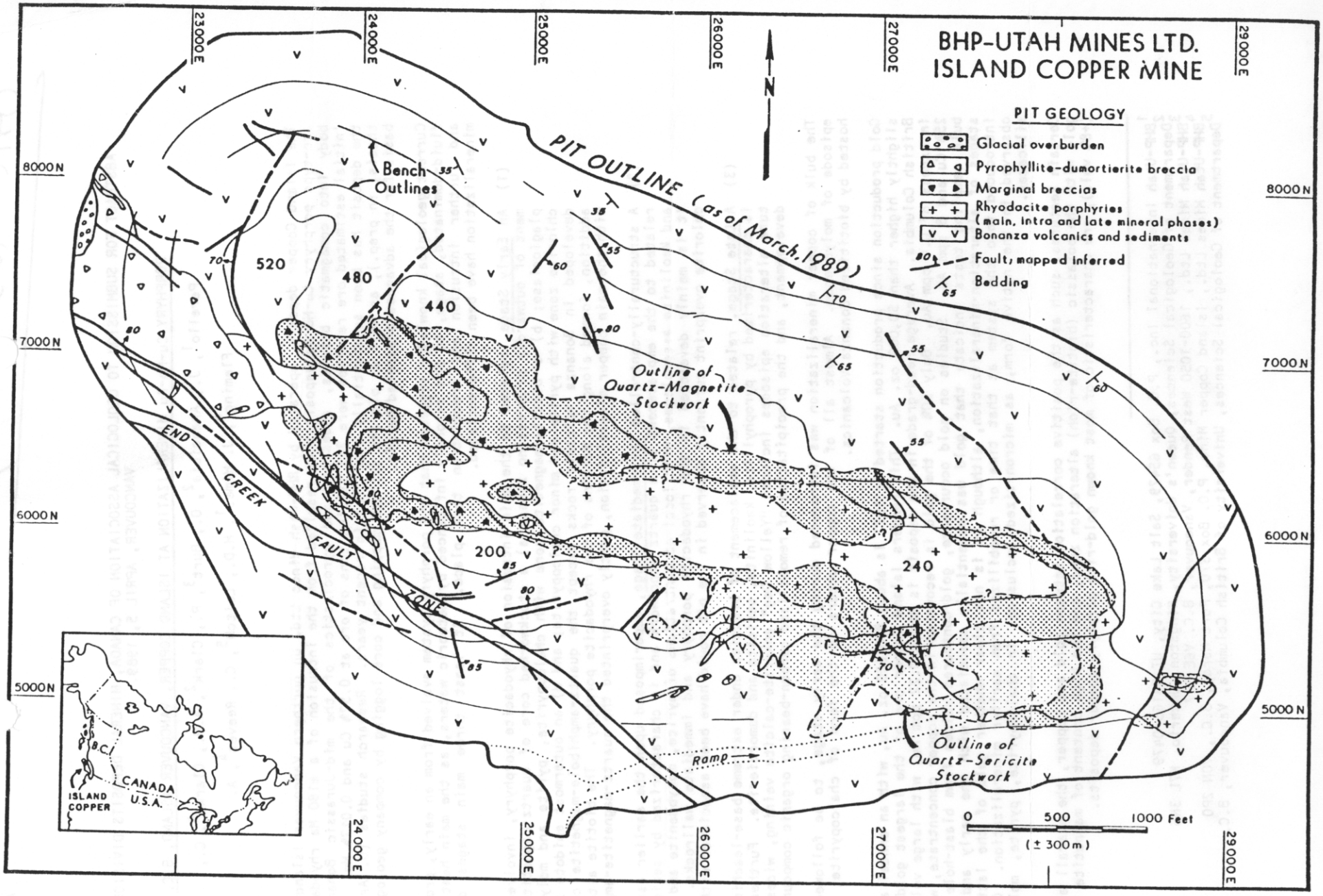
BHP-UTAH MINES LTD.
ISLAND COPPER MINE
PIT GEOLOGY
Glacial overburden
Pyrophyllite-dumortierite breccia
Marginal breccias
Rhyodacite porphyries
(main, intra and late mineral phases)
Bonanza volcanics and sediments
Fault; mapped inferred
Bedding
PIT OUTLINE (as of March, 1989)
Bench Outlines
Outline of Quartz-Magnetite Stockwork
Outline of Quartz-Sericite Stockwork
Ramp
END CREEK FAULT ZONE
520
480
440
200
240
23000 E
24000 E
25000 E
26000 E
27000 E
29000 E
8000 N
7000 N
6000 N
5000 N
0 500 1000 Feet
(± 300 m)
B.C.
CANADA
U.S.A.
ISLAND COPPER

884327

GAC-MDD Field Trip

TOS → ISLAND COPPER

Apr. 27/92

ABSTRACT FOR SUBMISSION TO GEOLOGICAL ASSOCIATION OF CANADA, MINERAL DEPOSITS DIVISION, WORKSHOP, VANCOUVER, APRIL 5, 1989.

# PORPHYRY Cu-Mo-Au MINERALIZATION AT ISLAND COPPER, VANCOUVER ISLAND, B.C.

Perello[1], J., Arancibia[2], O., Burt[3], P., Clark[2], A.H., Clarke[4], C., Fleming[4], J. Himes[1], M.D., Leitch[5], C., Reeves[4], A.

The Island Copper deposit, operated by BHP-Utah Mines Ltd. on northern Vancouver Island, is an island arc-type porphyry Cu-Mo-Au deposit that resulted from the intrusion of a ±180 Ma rhyodacite dike-like body into comagmatic basalts, andesites and pyroclastics of the mid-Jurassic Bonanza Volcanics. Initial estimated ore reserves were 283 million tons of ore at 0.52% Cu and 0.017% Mo. The geology of the deposit has been substantially clarified in recent years. Research studies (O. Arancibia, Ph.D. thesis, in prep.), as well as pit and surface mapping and core logging by company geologists, form the basis for the advances presented herein.

Current geological knowledge suggests that the porphyry system evolved from an early, probably juvenile fluid-dominated, stage, to one strongly influenced by meteoric waters, as the main heat source cooled and further intrusion and brecciation took place. At least three main stages of alteration-mineralization have been differentiated.

(1) An Early Stage, related to the main intrusion of rhyodacite porphyry, involved the development of outwardly progressing zones: a) a stockworked core of quartz-magnetite-amphibole-Na plagioclase; b) a biotite-magnetite zone with chalcopyrite, pyrite and molybdenite; c) a chlorite zone with pyrite and minor chalcopyrite; and d) an outermost epidote zone. All are developed in Bonanza Volcanic rocks except the quartz-amphibole-magnetite core which, in addition, formed along the margins of the rhyodacite porphyry. The biotite alteration, along with the main copper mineralization, partly overprinted the quartz-magnetite-amphibole core.

(2) A structurally-controlled Intermediate Stage, superimposed upon the earlier assemblages, was related to the emplacement of a quartz stockwork and is characterized by sericite, chlorite and kaolinite assemblages, with local concentrations of pyrite, molybdenite and chalcopyrite. It is mainly developed in the rhyodacite porphyry and immediate wallrocks. Much of the chlorite overprint currently observed in the pit could have been associated with this stage.

(3) A Late Stage, related to the emplacement of breccias under extreme base-leaching conditions, is characterized by pyrophyllite, kaolinite, sericite and dumortierite. Further low temperature alteration episodes included "Yellow Dog" ankerite-calcite veining, widespread zeolite development, and the precipitation of remobilized carbon-bearing organic compounds.

The bulk of copper mineralization was introduced during the early stage, to be followed by the main episode of molybdenum. Almost all of the copper occurs in the form of chalcopyrite, predominantly hosted by biotitized Bonanza Volcanics.

Gold production since production started in 1971 is about 880,000 oz. Au, with an annual average output slightly higher than 50,000 oz. Au. This renders Island Copper one of the largest gold producers in British Columbia. Average head-grade in the deposit is about 0.22 ppm Au, with large volumes assaying in excess of 0.4 ppm Au. Only 50% of the gold is recovered in the copper concentrate, which averages 25% Cu and 8 ppm Au. Studies on gold occurrence, gold-contoured values from blast-hole samples, and bulk sampling tests indicate that gold was essentially associated with the early and intermediate stages of alteration-mineralization, although it is not clear whether gold of the latter stage was introduced into the system at that time or remobilized from earlier mineralization. Gold has been observed in the native form, as micron-sized inclusions in chalcopyrite, pyrite, molybdenite and silicates.

Certain features, such as the positive correlation between gold and copper, the overall association of gold with the potassic (biotite-rich) alteration zone, and the high content of magnetite in the system (+8% vol.), are characteristic of most known gold-rich porphyry copper deposits.

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