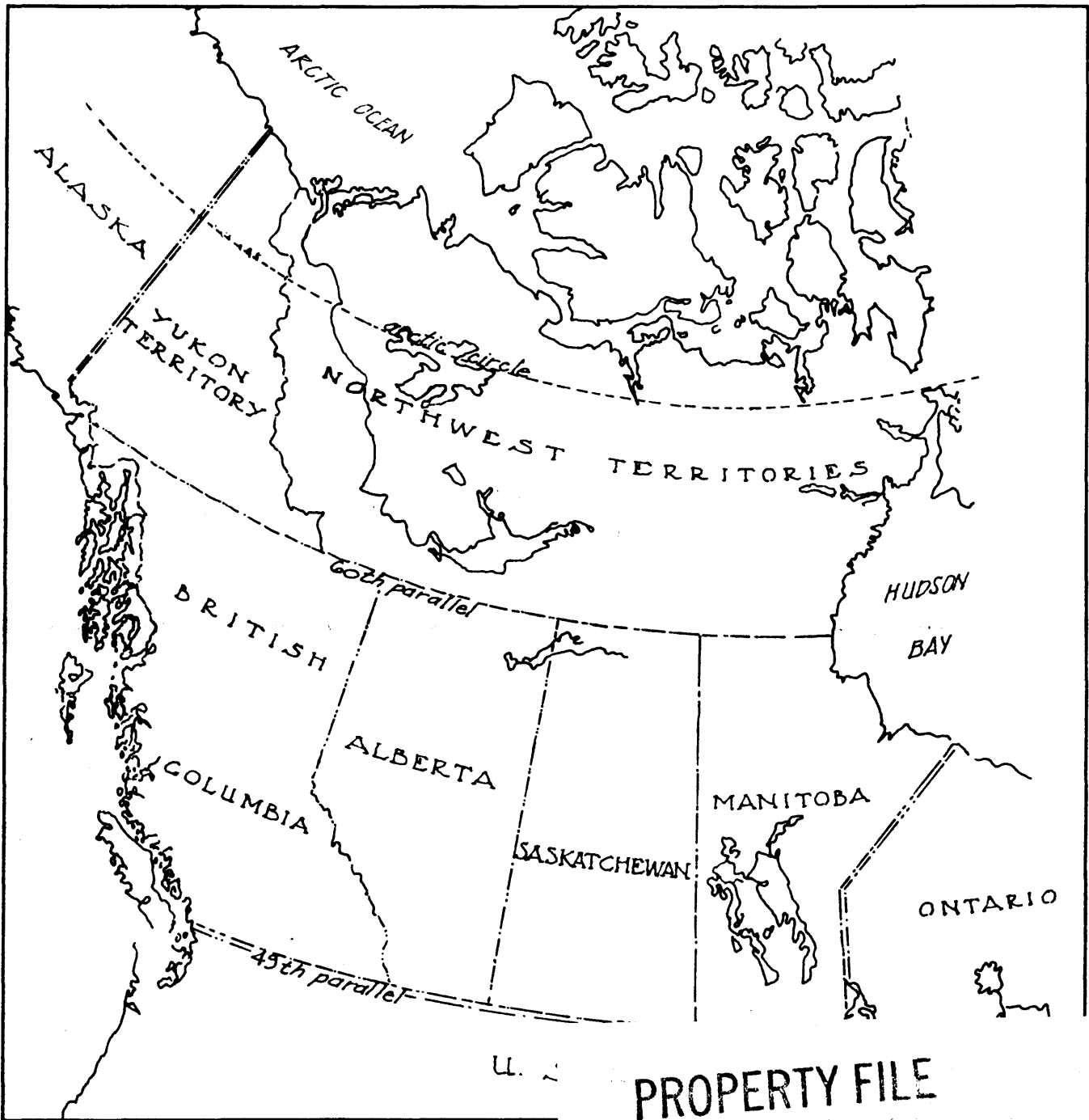


MINERAL INDUSTRIES IN WESTERN CANADA

THE TENTH COMMONWEALTH MINING AND METALLURGICAL CONGRESS – SEPTEMBER 2-28, 1974



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UTAH MINES LTD.ISLAND COPPER MINETHE COMPANY

The Island Copper Mine is owned by Utah Mines Ltd. Utah is an investor owned corporation with its Head Office in San Francisco. At present, Utah derives more than 80% of its income from mining interests. It has mines or interests in mining operations in Arizona, New Mexico, Utah in the United States, in Peru, Australia and of course Canada.

Utah has been operating in Canada since the mid-1950's. Its Canadian operations currently are centred in Port Hardy, British Columbia, location of the Island Copper Mine and Vancouver, where exploration and certain administrative offices are maintained.

Utah's previous Canadian experience included construction of Vancouver's Burrard Building and construction of a large potash mining operation at Esterhazy, Saskatchewan.

EXPLORATION

The original claims were staked by G. Milbourne, a B.C. prospector. In January 1966, Utah entered into an option agreement with Mr. Milbourne. During the rest of 1966 up to May 1969, diamond drilling and other exploratory work was carried out to evaluate the ore body. In July 1969, a little over two years after the first diamond drill hole was collared, the company gave the go ahead and committed themselves to an investment in excess of \$70,000,000 for development of the mine.

MINE GEOLOGY

The Island Copper orebody is estimated to contain 280,000,000 tons of ore, averaging 0.52% copper and 0.027% molybdenite. The main ore minerals are - chalcopyrite and molybdenite. The size of the orebody is approximately 5,000 feet long by a maximum width of 1,200 feet. Copper concentrate, containing gold and silver is shipped directly to Japan. Molybdenum concentrate, containing rhenium goes to the U.S. and Germany.

The pit axis trends west-northwest, reflecting the trend of the orebody and the dyke-like body of quartz feldspar porphyry, both of which dip northward. The ore zone is adjacent to the porphyry. Over 75% of the ore is in altered fragmental and bedded tuff of andesitic composition and the remainder in porphyry. The ore minerals, almost entirely chalcopyrite and molybdenite, are largely confined to a dense fine network of intersecting fracture surfaces.

The orebody seems to plunge gently at either end, reaching maximum dimensions within the designed pit limit, of 5000 feet long and 1200 feet wide. Although it will be mined to 1000 feet deep, mineralization continues below that level.

Near the west end of the present pit, the porphyry dyke is brecciated and replaced by a large mass of pyrophyllite and quartz, containing the rare blue mineral, dumortierite.

The attached plan (Figure 1) shows the main geological elements in the pit, while Table 1 indicates the relation between alteration and ore mineralization.

Host rocks for ore are upper Triassic - lower Jurassic age, being part of the Bonanza sub-group. The Bonanza itself is the upper of 3 main members of the Vancouver Group of basic volcanic flows, breccias and minor sediments, this being the dominant formation on Vancouver Island.

THE MINE

The Island Copper Mine is worked in forty foot benches and will ultimately be 7,500 feet long, 3,500 feet wide and 1,000 feet deep. The lowest bench is presently the 960 level which is forty feet below sea level.

Drilling is performed by three Bucyrus Erie 9 7/8 inch drills; two 60R electrics and one 45R diesel and electric. Holes in rock are drilled eight feet below grade and holes in glacial till are drilled to grade.

The blasting agent is ammonium nitrate with fuel oil in bulk and packaged form provided by Canadian Industries Limited. Wet holes are pumped where possible and where not possible packaged AN/PO is used. Very minor amounts of packaged slurry are used in difficult situations.

Blasting times are at noon on Monday, Wednesday and Fridays, to minimize the effects on production operations.

Loading is done by five 15 cubic yard P & H 2100 electric shovels. One of these is the 2100 BL with the lower propel system and the others are the 2100B. Also one L700 Letourneau 15 yard front end loader is used.

For the hauling operation, 25 Unit Rig M120, 120 ton haul trucks with electric wheel drive carry the load.

Auxiliary equipment include five D-3 dozers, five D-9 dozers, one 824B rubber tired dozer, one Michigan 280 rubber tired dozer, two Cat 14E graders, one Cat 16E grader, one Cat 980 loader, two Mack 35 ton dump units and 2 H.D. 41 dozers.

The mine is operated 24 hours a day, seven days a week with four rotating crews. Average production is presently in excess of 106,000 tons per day.

PRIMARY CRUSHER

One Allis Chalmers superior gyratory, size 54" by 74" is used for primary crushing having a capacity to crush 3,000 tons per hour to minus 9". The product is screened into +4" and -4" fractions and stockpiled. Three draw points per mill draw a blended feed for optimum grinding in the mill.

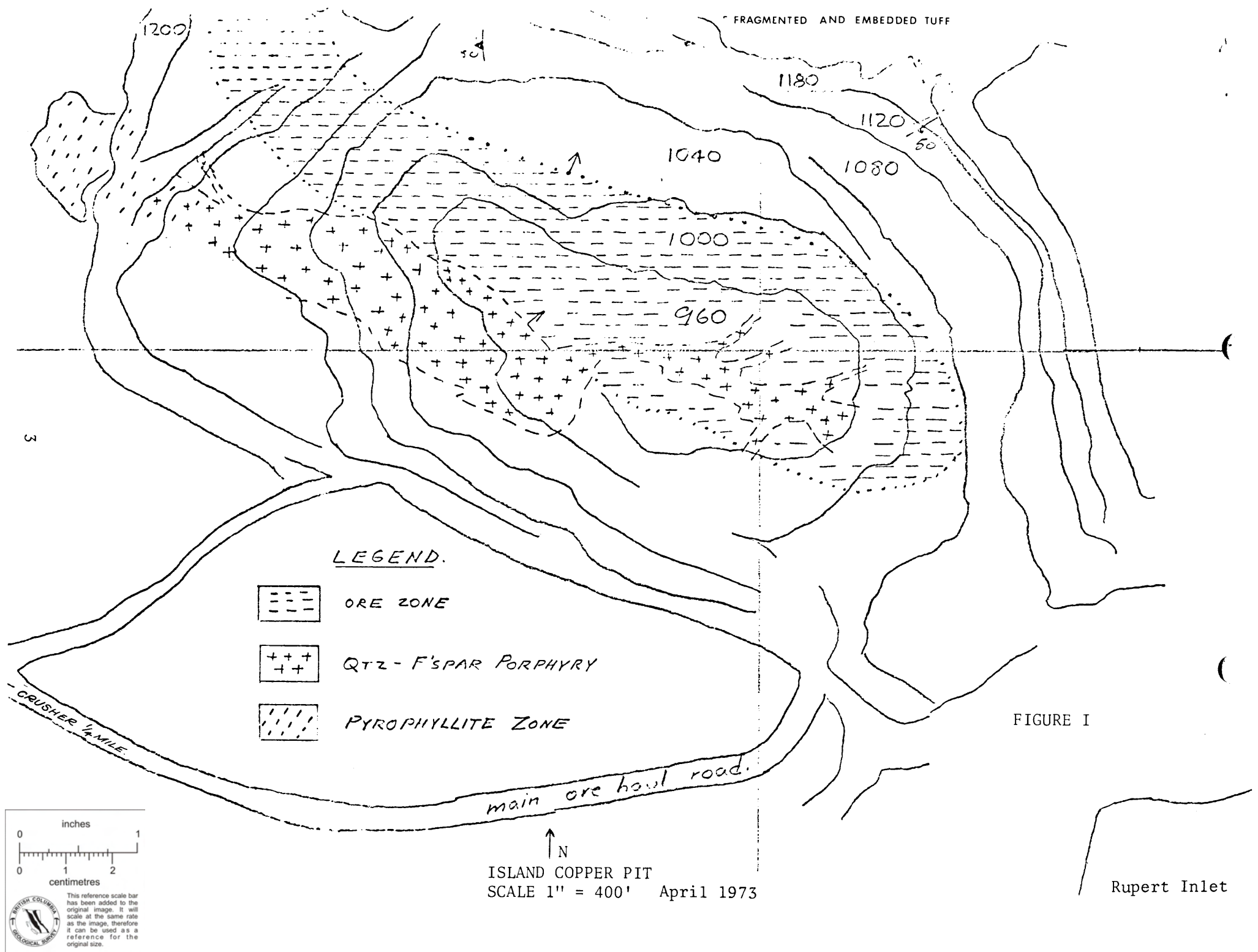


FIGURE I

RELATIONS BETWEEN ALTERATION MINERALS AND SULPHIDE (ORE) MINERALS
IN THE HANGING-WALL (NORTH-EAST SIDE) OF THE QFP DYKE

Table 1

	QFP DYKE	MARGINAL BRECCIA	BIOTITE ZONE	CHLORITE ZONE	EPIDOTE ZONE
<u>STAGE ONE</u>					
Quartz		----	----	----	
Biotite		----	----	----	
Hydrobiotite/ Vermiculite		----	----	----	
Chlorite		----	----	----	----
Epidote		----	----	----	----
Albite		----	----	----	----
Sericite		----	----	----	----
Smectite(1)		----	----	----	----
Magnetite		----	----	----	----
Actinolite		----	----	----	----
<u>STAGE TWO</u>					
Quartz		----	----	----	
Chalcopyrite (2)		----	----	----	----
Molybdenite		----	----	----	----
Pyrite		----	----	----	----
<u>STAGE THREE</u>					
Quartz	-	----	----	----	----
Sericite	-	----	----	----	----
Kaolinite	-	----	----	----	----
Pyrophyllite		----	----	----	----
Molybdenite		----	----	----	----
Chalcopyrite		----	----	----	----
Pyrite		----	----	----	----
<u>STAGE FOUR (3)</u>					
Quartz		----	----	----	----
Molybdenite(2)		----	----	----	----
Chalcopyrite		----	----	----	----
Pyrite		----	----	----	----
<u>STAGE FIVE</u>					
Carbonate	----	----	----	----	----
Zeolite	----	----	----	----	----
Hydrocarbon	-	----	----	----	----
Sphalerite	-	----	----	----	----
Chalcopyrite	-	----	----	----	----
Hematite	-	----	----	----	----
Pyrite	-	----	----	----	----
		← ORE ZONE →			

SYMBOLS

----- Always Present
 - - - Often Present
 - - Occasionally Present

NOTES

- This is probably a saponite (Mg- Montmorillite)
- This stage of sulphide mineralization is the major contribution to the ore.
- The exact age relations between the barren quartz veins and the sulphides on slip surfaces have not been established.
- The pyrophyllite-dumortierite breccia is tentatively placed in Stage Three.

D.G.C.

CONCENTRATOR

Designed capacity is 33,000 T.P.D. of ore. Copper concentrate production is approximately 650 T.P.D. A molybdenite concentrate is also produced. See simplified flow sheet (Fig. 2).

Autogenous Mills - Primary Grind

Six Hardinge 32' diameter by 14' long mills. They are operated at 11.0 R.P.M. which is approximately 72% of critical speed. The load is controlled by the power consumed by the two 3,000 H.P. drive motors. Lifters are changed approximately every two weeks.

Secondary Grinding

Three Allis Chalmers 16' x 23' ball mills are being installed for secondary grinding. Expected completion date is mid-August. Each mill is powered by 3,000 H.P. drive motors.

Copper Rougher Flotation

140 Wemco 300 cubic foot cells are used giving 20 minute flotation retention time.

Other Copper Flotation

50 Galigher 100 cubic foot cleaner cells
16 Galigher 50 cubic foot recleaner cells
28 Wemco 300 cubic foot scavenger

Moly Feed & Copper Conc. Thickeners

One each - 100 ft diameter

Tailings Thickeners

2 x 375 ft. diameter

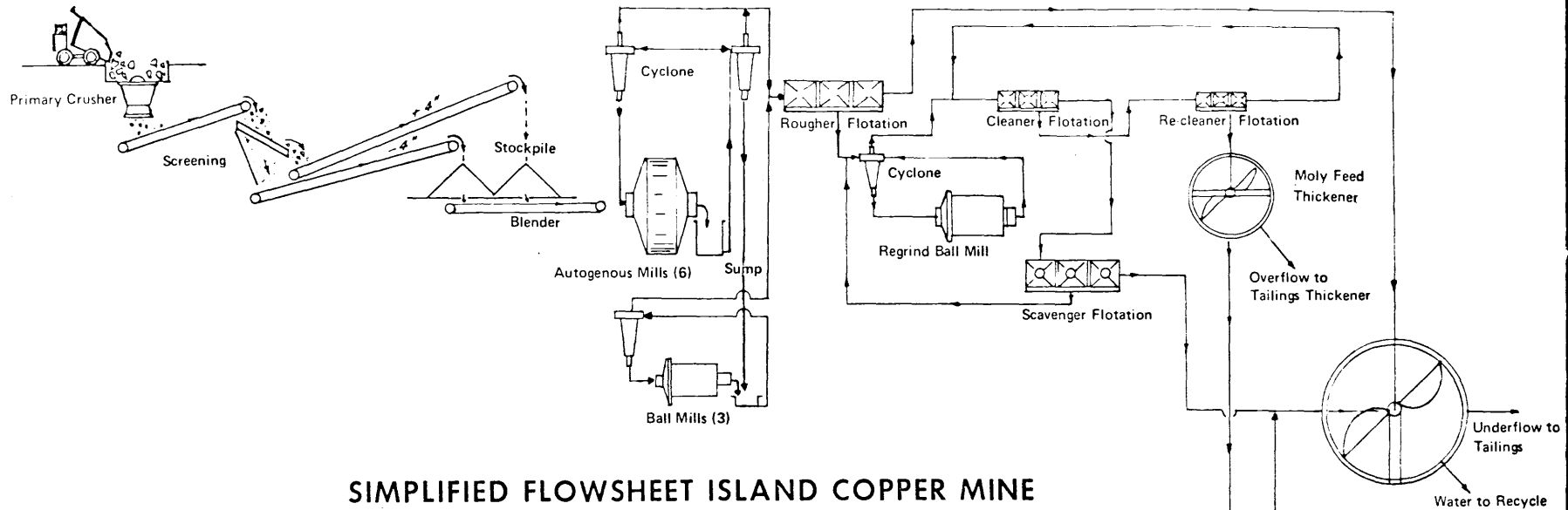
Final Copper Conc. Processing

From thickener to 2 disc filters and from there to driers, capacity up to 1,000 T.P.D. Moisture reduced to 5%, concentrate then stored in "Teepee" building which has a capacity of 37,000 tons.

Molybdenite Circuit

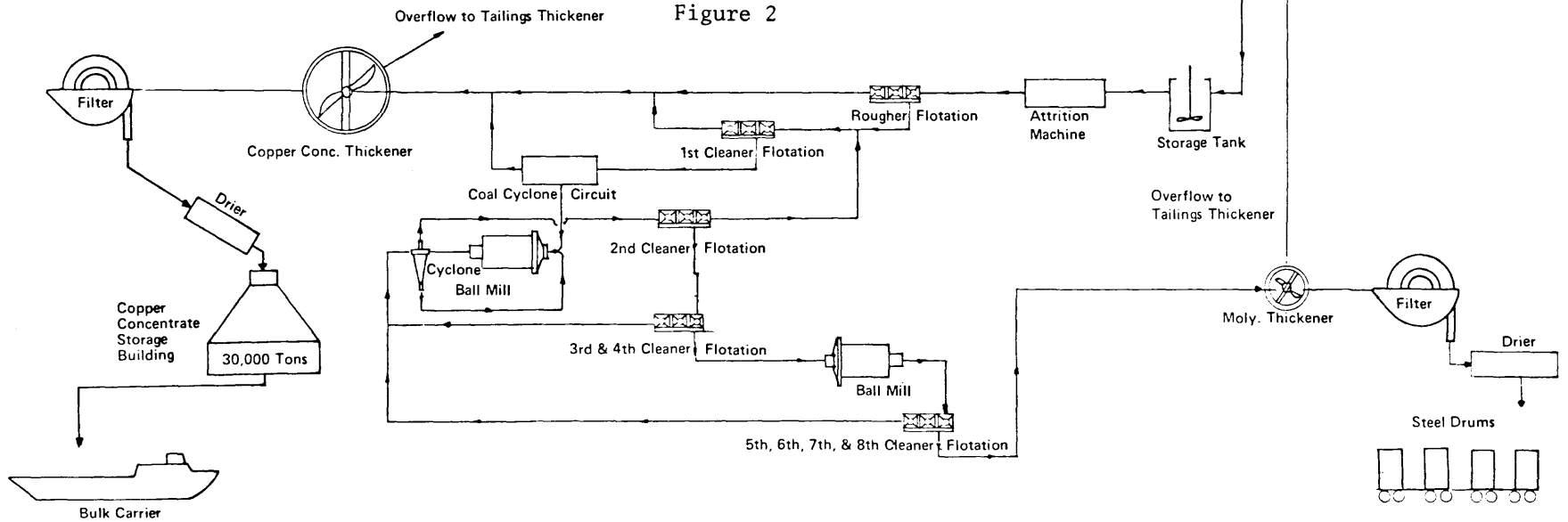
Similar to copper. Copper concentrate is processed by depressing copper and floating off molybdenite. Coal, or rather specifically, hydrocarbons, are removed also. Molybdenite concentrates are loaded into steel drums for shipment.

ORE FROM MINE



SIMPLIFIED FLOWSHEET ISLAND COPPER MINE

Figure 2



Disposal of Tailings

Tailings are placed at the bottom of Rupert Inlet which is over 500' in depth.

Laboratory

Modern apparatus such as Atomic Absorption Spectrophotometers are employed to Assay mine and mill samples on a 24 hour, 7 day a week basis. Also, an environmental program is carried out by this department.

ENVIRONMENTAL MONITORING PROGRAM

Utah Mines initiated an environmental water sampling program in late 1969 before any construction started at the site. A biological consulting firm was retained to do a chemical and biological assessment of Rupert Inlet and adjacent waters. The first surveys were conducted in early 1970.

In January 1971 a permit was issued to Utah by the Provincial Pollution Control Branch permitting discharge of the tailings from the copper - molybdenum concentrator into Rupert Inlet via a submerged outfall system. The effluent is diluted 1:1 with seawater before discharge in a pipe located 800 feet offshore at a depth of 150 feet below the surface of the water.

One of the conditions of the permit required Utah to carry out an extensive programme of monitoring the receiving waters (Rupert & Holberg Inlets and Quatsino Sound) and the streams flowing into Rupert Inlet. The permit also required that Utah retain an independent agency to assist in setting up of the program, establishing procedures for sampling and analytical work, and preparation of annual reports on the results of the program acceptable to the Pollution Control Board.

Utah selected a team of scientists from the Universities of British Columbia and Victoria to carry out the functions of the independent agency. This team, which is directed by J.B. Evans, head of the U.B.C. Department of Mineral Engineering, consists of oceanographers, marine biologists, ecologists, chemists, geologists, metallurgists, and mining engineers. The independent agency revised the existing monitoring program to include a wider scope in an attempt to cover all parameters which could be affected by the mill effluent.

The revised program was developed and monitoring commenced in March of 1971. Information gathered since that time in conjunction with surveys which had been carried out by Utah prior to the issuance of the Permit, have provided the baseline information against which to compare present and future conditions of the receiving waters.

Monitoring of the inlet waters is carried out on a periodic basis and includes measurements of the following major parameters:

Physical characteristics of the inlet bottom including seismic profiles, bottom photography, dredging and coring of the bottom for sediment analysis.

Physical characteristics of the receiving waters including temperature, turbidity, and colour.

Meteorological characteristics - state of surface water and weather

Chemical characteristics of receiving waters including measurement of dissolved oxygen, salinity, alkalinity, and heavy metal content.

Biological characteristics including measurement of the organisms on the bottom in the deep part of the inlet, marine life on the bottom in the shallow intertidal areas, collection and measurement of plankton, and collection of crabs and fish for measurement of numbers, size and heavy metal content.

Many of these same parameters are also periodically measured in a number of the fresh water streams flowing into Rupert Inlet.

The effluent is monitored daily for heavy metals, pH, solids and volumes. Bi-weekly bio-assays are conducted on the final effluent.

Utah has chemists and marine biologists who carry out a major portion of the data collection and analytical work relating to the physical, chemical, and biological parameters measured. The various parameters measured are overseen by the scientists from the independent agency. A biological consultant has been retained to assist Utah when necessary.

RECLAMATION

The open pit eventually could be a new recreational asset. When mining operations are completed, it is planned to allow the pit to fill with water, creating a 380 acre lake. A few benches will remain above the surface of the lake and these could be utilized as campsites. The former haulage ramps will provide access at various points around the lake.

That portion of the pit remaining above the lake level, comprising in all some 110 acres, will be planted with suitable grasses and other ground cover. Once this ground cover becomes established, it should create a soil that will be receptive to natural reforestation. Climatic conditions are favourable and there is abundant rainfall.

No reclamation will be possible within the pit area during the mining operation. The pit will constantly be expanding and it will be necessary to maintain haul roads around the perimeter.

Future recreational uses are also possible on the major disposal area for waste rock.

The rock is to be disposed of in a low-level fill built out from the mine site into Rupert Inlet. Over a 25 year period this will create approximately 700 acres of new shoreline along the Inlet.

The area will be progressively seeded with grasses as it is created. Some planting of seedlings also may be necessary as it will be located some distance from natural forest. Utah Mines Ltd. will undertake this as required. The final result will be a large, level, forested area suitable for campsites.

When mining operations are completed, the company will construct ramps from the crest of the new shoreline to the water's edge, providing ready access to the Inlet for recreational activities.

The company's application to carry out open pit mining was approved by provincial cabinet Order-in-Council on January 20th, 1970.

A \$110,000 bond has been posted with the Minister of Mines as a guarantee that the company will carry out the reclamation plans it has proposed for the area both during and after mining operations.

SEQUENCE OF EVENTS

January 1966	Utah entered an option agreement with prospector G. Milbourne
June 1969	Utah gave go ahead and committed an investment of over \$70 million to develop the mine.
April 1971	First mine stripping operation began.
October 1971	First mill turnover, 28 months after construction was initiated.
December 1971	First concentrate shipment - M.S. "Grimland:."
January 1972	All six autogenous mills operating.
Employment -	120 staff 520 hourly employees 640 total.



Island Copper Mines (Utah Mines) at the northern end of Vancouver Island, B.C.