Ketchikan

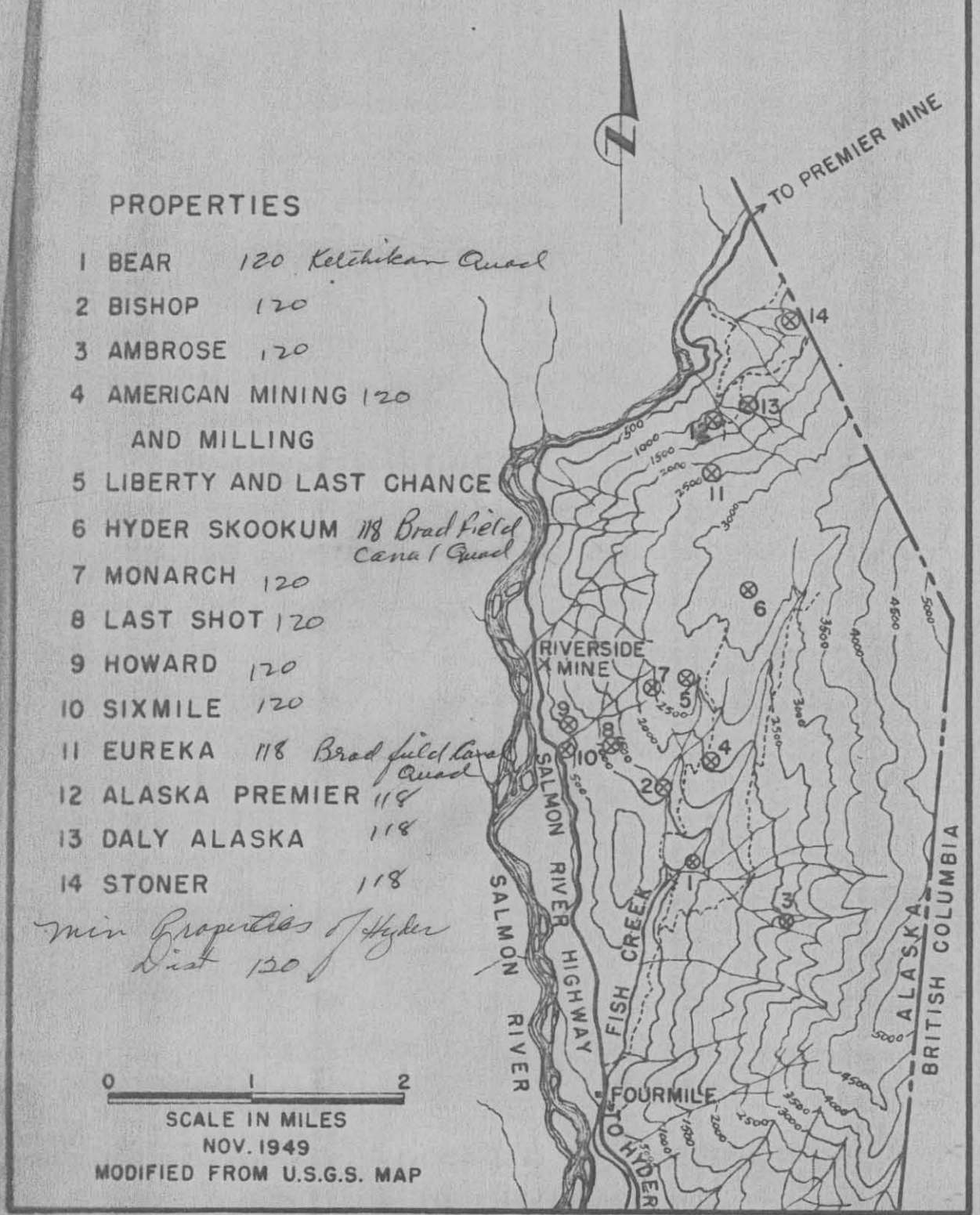

FIG. 2 PROPERTY LOCATION MAP

Ketchikan Quad
120
Annette Island File 91

Property: Annette Island "Homestake Group" "Ben Bolt"

Owners: Al Kreidler (Creidler) and associates (Dodge, Goff,)

Location: Crab Bay, S. E. Alaska. Annette Island.

Transportation:

Geology:

Ore Body:

Assays: 10 Assays

Homestake	Au.	nil to .41
	ag.	nil
Ben Bolt	Au.	.41
	ag.	5.68

Development:

Information: 9/2/22 8/21/22 LHM.9/22/22
J.A.W. report 6/15/22

file #20

Conclusion: Assays too low.

Ketchikan Quad
120

Property: Bradley Property (6 claims)

Owners: English Company

Location: Smuggler's Cove, Cleveland Peninsula, S. E. Alaska

Transportation:

Geology:

Ore Body:

Assays:

Development: 1500 ft. tunnel

Information: sketch maps and assays file #20
8/1/24 6/9/24 6/1/24
LHM report 9/22/22

canneries, Whitney-Fidalgo and P.F.I., shared trucking and loading facilities at the airport to expedite the operation. More airlifts may be needed in the future to handle the Kotzebue overload. Most of the surplus salmon had been flown to Anchorage, and some to Seattle.

Trailership Tested In Atlantic Ocean

THE SS "GREAT LAND," DESTINED FOR SEATTLE TO ANCHORAGE SERVICE has completed a successful two-day trial run in the Atlantic, according to Totem Ocean Trailer Express, Inc. (TOTE) President, William B. Maling. The 790-foot roll-on/roll-off is expected to be delivered to Seattle in late August for service to Anchorage. The inaugural run for the new trailership line is scheduled for September 1.

Deferred Compensation Plans Sought

THE CITY AND BOROUGH OF JUNEAU INTENDS TO ESTABLISH a deferred compensation plan for its employees similar to those used by the state and other municipalities. City Manager Mar Winegar is accepting proposals from companies interested in being the carrier of the deferred compensation plan to be funded with variable annuity products. Proposals will be accepted through 10 am, August 29, 1975.

Transportation Bill Goes to President

AN APPROPRIATIONS BILL APPROVED BY THE SENATE, with amendments added by Alaska's congressional delegation, would include $5 million for the Valdez Vessel Traffic Control System, $2.5 million for the Sitka Coast Guard Air Station, $10 million to the Coast Guard to fund oil spill cleanups, $10.2 million for capital improvements for the Alaska Railroad, and a $150 million binding authority for the railroad. The bill will go to President Fort for his signature.

Kenai Natives Receive Grant

THE KENAI NATIVE ASSOCIATION HAS BEEN AWARDED A $100,000 GRANT to assist in planning the development of its Wildwood headquarters. One-third of the grant constituted in-kind planning services provided by the State Department of Commerce and Economic Development. The remainder was awarded in funds by the federal Economic Development Administration.

Statewide Unemployment Decline Continues

UNEMPLOYMENT IN ALASKA WAS DOWN TO 8.2 PERCENT IN MAY, and is expected to drop even further for July-October, according to the State Department of Labor. The surge of employment is attributed to pipeline construction work. Labor officials estimate unemployment figures could reach 14.9 percent in 1977, but level off at the end of the decade to about 11 percent. Unemployment averaged 10 percent in 1974.

900 New Mine Claims Filed

OVER 900 NEW MINING CLAIMS WERE FILED during May and June in Alaska. Ambler River quadrangle led the field of new claims, with 550 filed, the next highest being the Talkeetna quadrangle with 119, followed by the Ketchikan quadrangle with 74. The 903 claims were received from the 36 recorders' offices in the state.

Robert Walp Named Director of Telecommunications

ROBERT WALP, SATELLITE SPECIALIST FOR HUGHES AIRCRAFT CO., has been appointed to direct the Alaska State Office of Telecommunications. Walp replaces Marvin Weatherly who is moving to the Alaska Public Utilities Commission. The new director has responsibility for the development of the new small earth station satellite communications network in rural Alaska.

Good Deer Season Expected in Southeast

DEER SEASON IS NOW OPEN IN MOST OF SOUTHEASTERN ALASKA, and the Department of Fish & Game predicts the deer will be in plentiful supply. Bob Burnett stated that Fish & Game surveys indicate that deer herds have regained some of their past strength over the past few mild winters, and in fact are "overbrowsing" vegetation at lower elevations in some areas. According to Burnett, the higher elevations on Admiralty, Baranof and Chicagof Islands will be likely spots for bucks during the early part of the season, as the timberline offers good feed and relief from insects.

March Lease Sale Planned for Beaufort Sea

ALASKA GOVERNOR JAY HAMMOND SAID THE STATE OF ALASKA WOULD HOLD OIL AND GAS LEASE SALE in the Beaufort Island area "possibly as early as March 1976." While making the announcement, the governor

P00000

000008

Ketchikan Quad 120 -

Kx #	Mas #	Kx #	Mas #	Kx #	Mas #	Kx #	Mas #	Kx #	Mas #	Kx #	Mas #
1	3	26	9	51	105	76	88	101	143	126	78
2	102	27	10	52	26	77	76	102	99	127	56
3	107	28	126	53	28	78	74	103	144	128	90
4	118	29	11	54	28	79	57	104	69	129	108
5	100	30	14	55	31	80	64	105	113	130	121
6	24	31	12	56	26	81	124	106	129	131	95
7	93	32	13	57	29	82	15	107	127	132	95
8	64	33	15	58	30	83	15	108	117	133	95
9	94	34	15	59	59	84	15	109	116	134	95
10	68	35	15	60	61	85	26	110	128	135	80
11	96	36	15	61	48	86	26	111	139	136	77 76 112 142 Dock & Bldg site
12	58	37	15	62	42	87	64	112	146	137	
13	32	38	15	63	64	88	2	113	75	138	103
14	93	39	18	64	62	89	138	114	98	139	85
15	122	40	19	65	62	90	58	115	91	140	97
16	8	41	20	66	62	91	craig 2	116	91	141	79
17	107	42	16	67	63	92	137	117	132	142	84
18	114	43	17	68	63	93	5 craig 2	118	120	143	104
19	3	44	17	69	66	94		119	115	144	81
20	134	45	21	70	101	95	craig 2	120	110	145	106
21	133	46	23	71	15	96	140	121	130	146	73
22	136	47	22	72	27	97	15	122	141	147	87
23	7	48	25	73	123	99	145	123	111	148	131
24	135	49	83	74	15	99	125	124	101	149	119
25	6	50	82	75	86	100	26	125	89	150	8

(over)

800000

000009

Kx #	mas #	Kx #
151	109	
152	112	
153	70	
154	711	
155	72	
156	92	
157	67	Jan 1976
158		
159		
160		
161		
162		
163		
164		

(120)

Ketchikan Mas numbers with no karder listings

mas #	mas #	mas #	mas #
0001			
0033			
0034			
0035			
0036			
0037			
0038			
0039			
0040			
0041			
0043			
0044			
0045			
0046			
0047			
0049			
0050			
0051			
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0055			
0060			
0065			

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...Ellen Zach wa...
...oung people here. He remain...
(Cont. On P. 10)

Southeast Exclusion Eyed By Seiberling

KETCHIKAN, Alaska (AP) — A major mineral deposit 45 miles east of here should be excluded from a proposed Alaskan wilderness area, Rep. John Seiberling, D-Ohio, said Saturday.

Seiberling, whose committee has conducted a series of hearings on Alaska d-2 lands, also says Congress should consider excluding all of Southeast Alaska from consideration in several wilderness bills now under study by his House subcommittee on general oversight and Alaska lands.

The subcommittee is examining how much of Alaska's lands should be set aside for inclusion in wilderness areas, national parks, wildlife refuges and other protected areas.

Legislation under consideration by the subcommittee would set aside about a third of Alaska under terms of the Alaska Native Land Claims Settlement Act.

Approximately 114 acres are involved.

Seiberling said a mineral find by U.S. Borax and Chemical Corp. convinces him the area surrounding the deposit should be left open for development. He said this is one of the few points on which he has reached agreement with critics of the Udall bill — a proposal by Rep. Morris Udall, D-Ariz.

Seiberling's subcommittee heard about 180 person during a 12-hour hearing here on Saturday. On Friday, he visited the U.S. Borax molybdenum deposit, a find which may be the largest of its kind in the world.

Company officials say it may be worth $5 billion.

The area lies within the proposed Misty Fjords Wilderness Area and near two major salmon-producing rivers.

The Saturday hearing wrapped up a week's work in Southeastern Alaska for the subcommittee.

SE AK EMPIRE
JUNEAU, AK 7/11/77

Mine Looms In The Future For Ketchikan

3/22/76 SE Empire

U.S. Borax Corp.'s potential mining operation near Ketchikan will, if followed through by the giant corporation, provide a substantial economic shot in the arm for the Gateway City.

Company officials said in announcing their molybdenum deposit last week that construction of an open pit mine and related facilities would cost more than $250 million. From 700 to 1,000 workers would be employed during the construction phase, with about 500 employed full time during the production.

The city of Ketchikan would be the major supply and staging center during construction and production, company officials said.

The Los Angeles-based firm said it discovered the one square mile deposit in the fall of 1974 after more than three years of exploration in Southeast Alaska.

The molybdenum deposit is located 45 miles east of Ketchikan, five miles from tidewater at an elevation of 2,000 feet, the firm said. Officials said drilling data so far indicates an ore body of more than 100 million tons, grading from .2 per cent to .35 per cent molybdenum disulfide.

The deposit is at or near the surface, allowing use of open pit mining.

"Prospects for future mining of the ore body appear to be promising," a company statement said. "However, because of the extent of the mineralized area, considerable further exploration drilling and evaluation will be necessary before a decision can be reached to bring the property into production."

The company plans more exploration and environmental work this year, officials said. The site is on national forest land; 235 mining claims have been filed in the area, the company said.

Exploration has already cost the firm more than $1 million, officials said.

Molybdenum is an alloy agent used to give hardness to steel, case iron and non-ferrous metals. It is under study for use in automobile emmission control equipments, coal gasification and as an alloy for aircraft anf gas turbine engines.

U.S. Borax has mined in the southwestern United States for the past 100 years. It operates a borax mine and refinery at Boron, Calif. and holds 40 per cent interest in Allan Potash Mines in Allan, Saskatchewan.

State officials said Borax has been working with the Department of Economic Development and other agencies for nine months on the project.

Commissioner of Economic Development Tony Motley said the long-term operation fits closely with Gov. Jay Hammond's efforts to diversify Alaska's economy.

Ketchikan's economy has been hard-hit recently by logging and fishing industry cutbacks.

Motley said the Borax proposal is "the most significant new operation in the state."

Construction of the mining facility—if the company follows through with its plans—won't begin for about five years, company officials said.

S New Alaskan - June 1977 (Newspaper)

TONGASS ISLAND at the southernmost entrance to Southeast Alaska hosted a military fort and a large indian village a century ago. Only short stubbs of decayed totem poles hidden by brush mark it today (the totem shown was removed in a restoration program a couple of years ago). Note the tree growing from the top of the totem.

Dave
Here is print
of article
Pictures filed
in folders in
Quadrangles (MPF)

Q 120

Ref:

How best to describe Southeast Alaska?

TOUGH ENVIRONMENT ... FRAGILE ECONOMY!

ONE YEAR AGO NEW ALASKAN PUBLISHED THE FOLLOWING STORY. NEXT MONTH CONGRESS WILL HOLD HEARINGS TO CONSIDER THE GOVERNMENT'S BIGGEST LAND GRAB WHICH COULD CLASSIFY ALMOST HALF OR OUR COOL JUNGLE AS "INSTANT" WILDERNESS.

Publisher Bob Pickrell doubts man's ability to have perma-

Publisher Bob Pickrell doubts man's ability to have permanent impact on the panhandle's 15 million plus acres of wilderness. To prove it he reports on the evidence -- hectic activity during the early 20th century -- and what remains of that development in our "cool jungle".

We predict that by this time next year (or before) the southern panhandle will be embroiled in a feverish emotional and legal battle involving the preservationists (Sierra Club, Conservation Societys) versus U.S. Borax and the SOC committee of Ketchikan. The issue will be the establishment of a molybdium mine by U.S. Borax in the Boca De Quadra -- Wilson Arm area of Southeast Alaska. Preservationists wil cry "destruction of the environment." Ketchikan Community groups and U.S. Borax will cite as advantages the economic and social growth Alaska will experience with the establishment of the industry.

In order to negotiate a possible compromise the U.S. Forest Service will spend thousands of man hours and hundred thousands of tax payer dollars compiling environmental impact studies concerning the project.

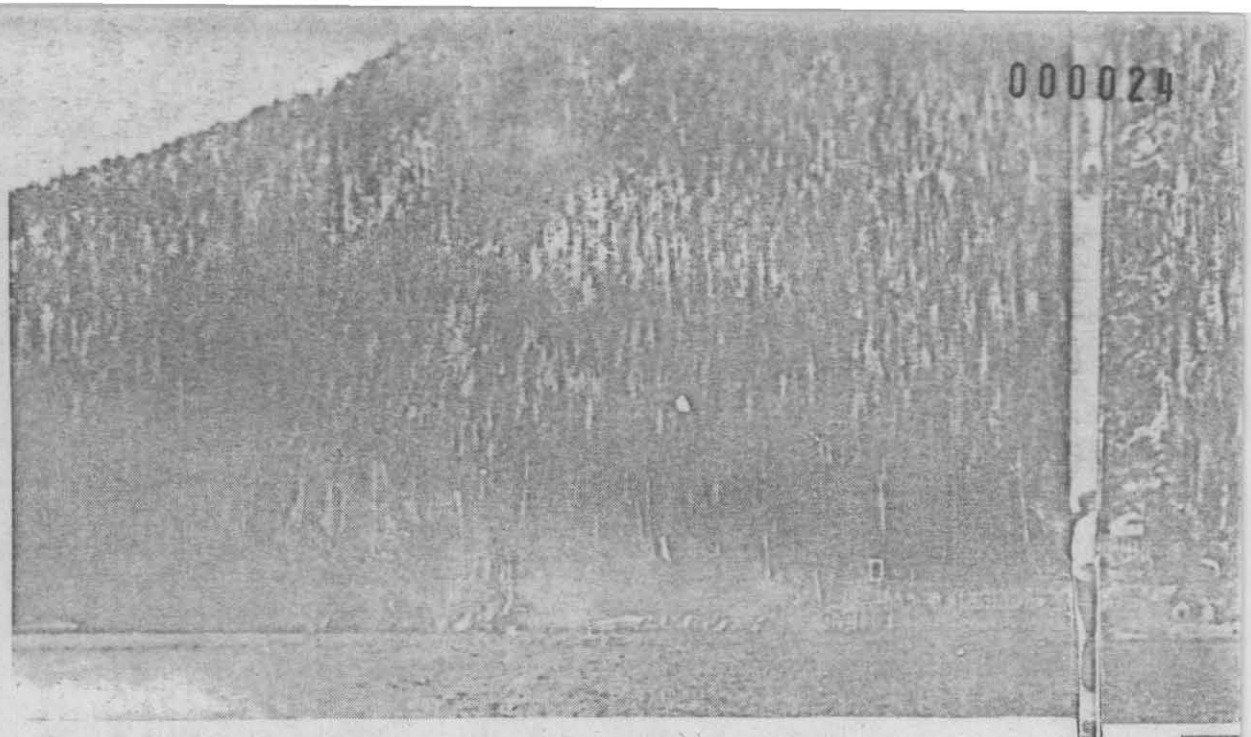
All of this effort will be expended on the premise that future economic expansion may exploit and harm Southeast Alaska's "fragile" environment.

We speak to that premise only in this issue of NEW ALASKAN ... not by anticipating the future impact of such activities but rather by looking at the impact similiar activities had on our "fragile" panhandle wilderness in the past.

Literally thousands of tough Alaska pioneers hewed, dug, cleared and, by today's standards, "mutilated" thousands of square miles of our "fragile" landscape seventy - five years ago. Their goal was selfishly economic and their methods primitive. No consideration was given to environmental impact. There was no supervision by governmental agencies. And when the ore body petered out or economics forced closure of the canneries they simply packed their bags and left leaving behind buildings, machinery, tailings, garbage dumps and all

(continued on next page)

BOILERS used to produce power for the tram line at the Mt. Andrew mine on Kasaan Bay stand in a tangle of undergrowth. They are disappearing under a cover of rust and moss. Built stoutly to withstand extreme pressure — they will soon be subdued by Southeast's tenacious environment.



TOUGH ENVIRONMENT...FRAGILE ECONOMY

(continued from page 5)

the trivia associated with human habitation. They were the worst of the land spoilers according to our standards today.

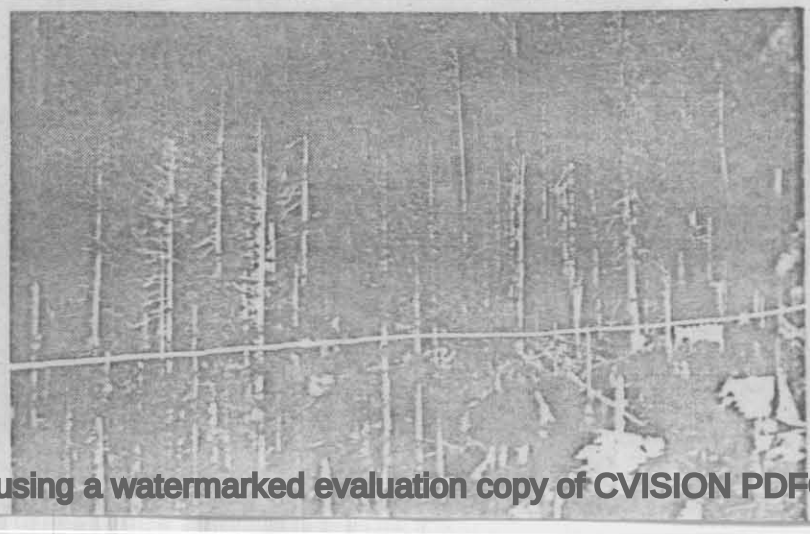
But they did prove something that we totally overlook in this age of environmental concern. "No man can build permanence in Southeast Alaska".

Our "fragile" Southeast environment is a fast recouping rain forest jungle. It eats with relish any unattended residue of human habitation. Wood rots, metal rusts, mansonry crumbles and our voracious flora and fauna coverts it to rich fertilizer in just a couple of decades. This isn't a theory to be speculated on as we prepare environmental reports. IT IS A FACT supported by evidence of the past.

The few remains of mining towns and canneries that existed just within this century -- a short seventy to eighty years ago -- are now treasured archeological sites. Native settlements that were photographed one hundred years ago have totally disappeared beneath a forest canopy. Fifty year old canneries, once thriving settlements, are now identified by a few barnacle studded pilings on the beach. Nature

(Continued on page 8)

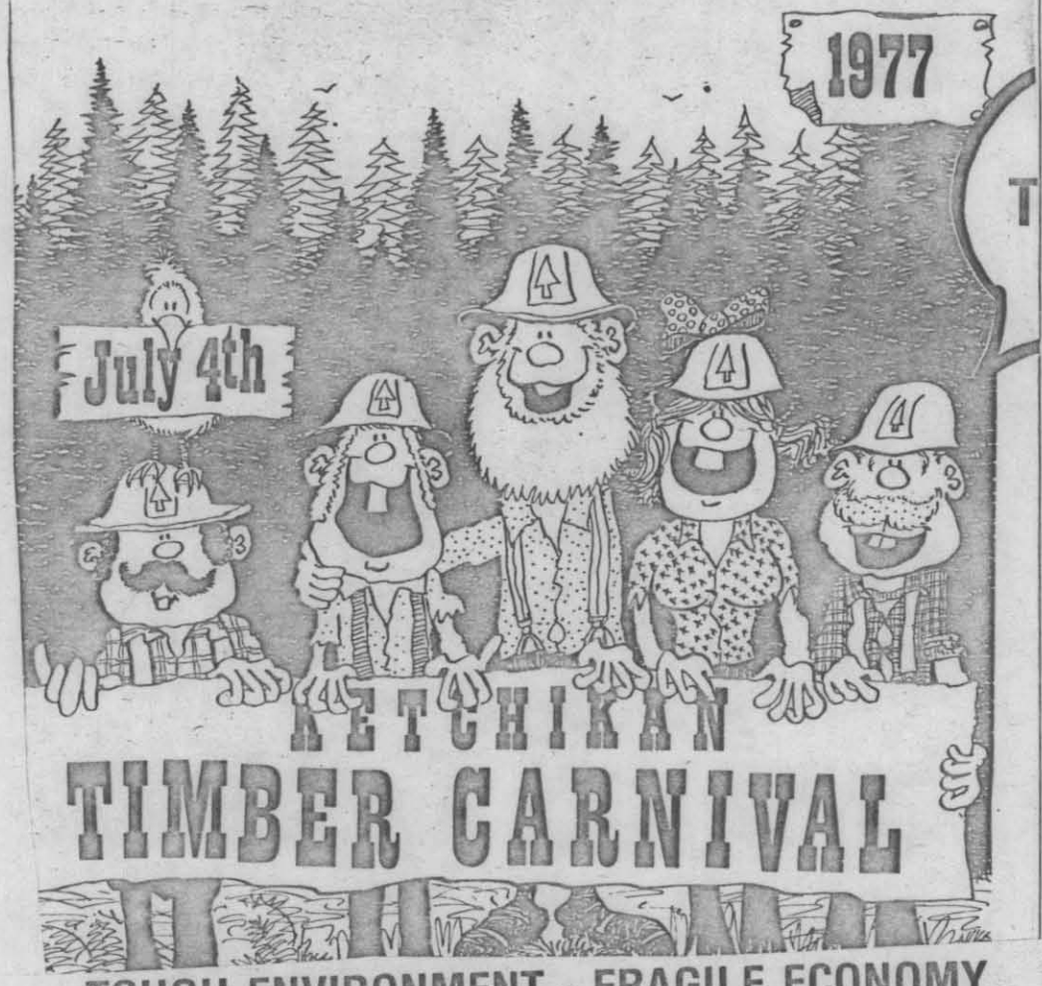
June 1977 - Nora Klenstan



YESTERDAY
Dolomi Mine on Prince of Wales Island was extensively mined throughout the first half of this century. This picture was probably taken between 1915 and 1920.

...acing. There will even be rolling pin tosses, nail driving and a Pa
...nd Ma bucking contests, in which the women can become involved.
...Prizes in the main events run about $200 for first place, paying down
...o $20 for fourth. All placing in the top positions carry home bright
...ew trophies.

(continued on next page)

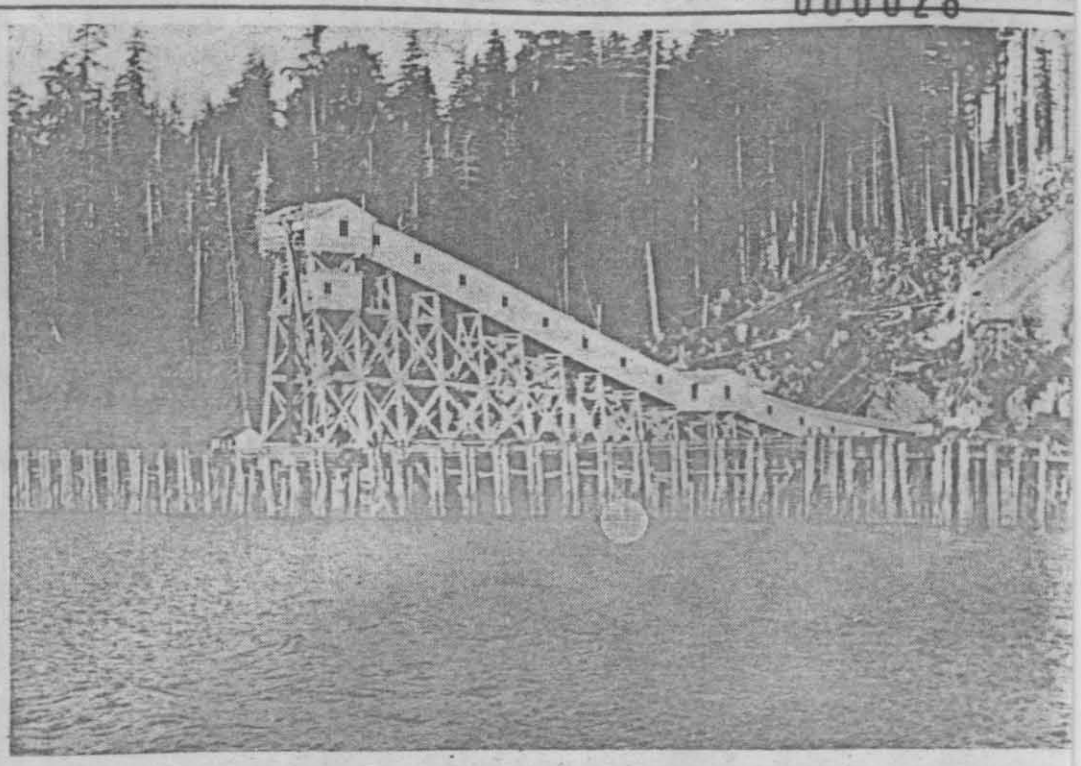


TOUGH ENVIRONMENT - FRAGILE ECONOMY

(continued from page 6)

must chuckle at the supreme egotism of Southeast Alaska man as he debates his potential 21st century impact on the panhandle landscape. If he builds a road and leaves it she'll make it a ribbon of alder in 10 years. If he constructs a totem pole and leaves it she'll convert it to a living tree within two generations. If he clears a piece of land and leaves it she'll cover it with Salmonberry and seedling hemlock and spruce within two years. If he builds a home or factory and leaves it

(continued on next page)



TOUGH ENVIRONMENT - FRAGILE ECONOMY

(continued from page 9)

she'll make it an apartment for shrews, mice, ants, birds and bats within a year ... rot it in 5 years .. crush it in ten years and reduce it to fertilizer fodder in 30 years. Tailings become a lump of green. Glory holes a blue pool of water.

This is a tough country. A country that was scraped bare by glaciers just a few thousand years ago. Our trees exist because they were able to establish a foothold in solid rock drenched with a few feet of rain.

Amazingly, all the activity that occured early in the 19th century had virtually no impact on the fauna of Southeast Alaska. The salmon multiplied in adjacent streams, the deer and bear populations suffered no ill effects despite the fact that no one filed an environmental impact study. Which leads us to believe that the concept of "harvesting" all of our natural resources, both non - renewable and renewable, is more important than preservation of an unfragile wilderness.

We should be concerned about stocking our salmon streams through hatchery and aqua - culture programs. We should be concerned about properly managing the hunting of wild game. Man can co - exist with fish and game without depleting this resource. This too has been proven in Southeast Alaska.

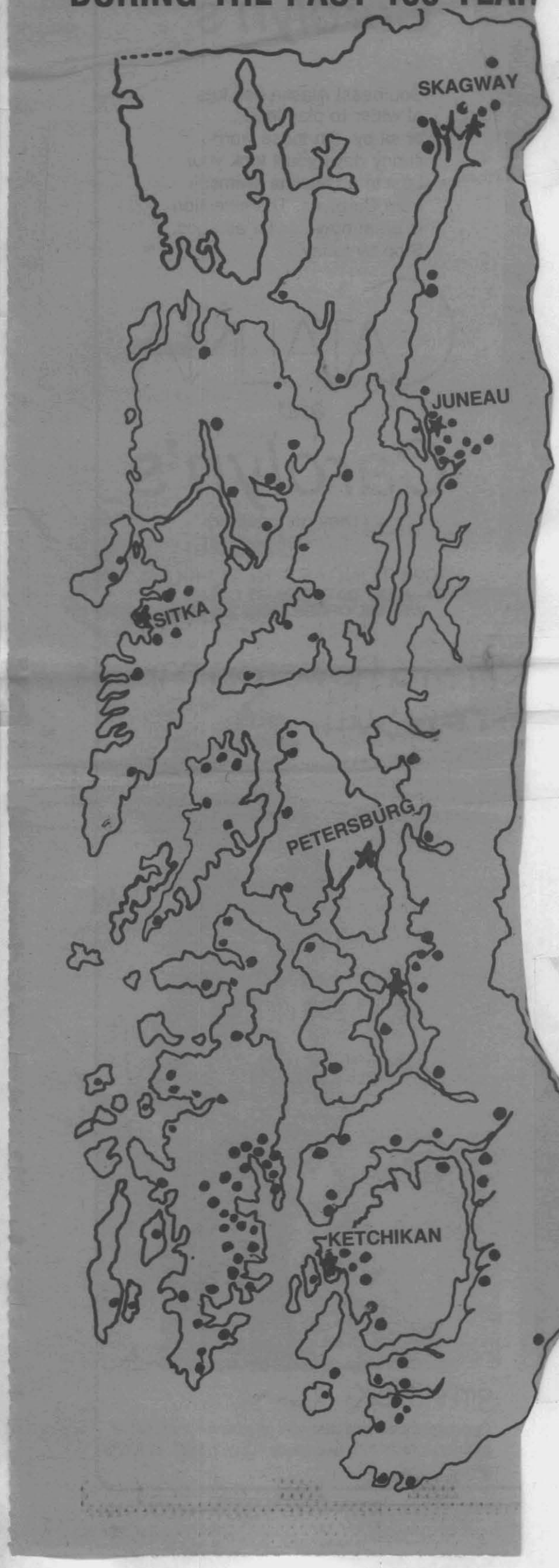
So we suggest that we look to the past in preparation for the future. Let's not try to identify and compare Southeast Alaska with the Midwest, New Mexico, Los Angeles, or even Washington State as we study the impact of an industry that will occupy an area that is a pin point in the panhandle's sixteen million acres. A pin point that will disappear TOTALLY a few decades after the pin is pulled.

Let's look to the past as we anticipate the future. Just think, if all those mining companies, cannery operations, and native settlements that dotted S.E. Alaska during the past 100 years had been compelled to emboil themselves in today's environmental control processes in order to become established they probably never would have existed. Yet they did exist. And where are they today?

Our wonderfully recuperative rain forest jungle has absorbed them. They are now a part of the wilderness!

WILDERNESS

TAKEOVER OF MINES, CANNERIES AND VILLAGES THAT EXISTED DURING THE PAST 100 YEARS



Too numerous to list by name, this map locates some of the mines, canneries and villages that existed in Southeast Alaska from 1880 to 1952. Virtually nothing exists in most of these locations to identify man's past activities. Each dot represents a habitation that would have required, under today's requirements, an environmental impact study. Probably few would have qualified or stringent requirements would have made the projects economically unfeasible. Their impact on the environment was negligible. Indeed some today are designated as historical sites. All are places of interest to bush snoopers, if they can find them!

THE QUARTZ HILL DISCOVERY 000031
U.S. BORAX - MO AUGUST 11, 1977
Quad 120

Mr. Sheldon P. Wimpfen
U.S. Department of the Interior
Bureau of Mines
2401 E. Street, NW.
Washington, D.C. 20241

Dear Sheldon;

Thank you for the warm letter you sent. It makes one feel good, when one of your esteem takes an interest in what we are doing in the field.

The story you wrote is close to what actually happened, but I will correct it slightly. First, I'm sorry if I gave you an impression that I alone found Quartz Hill, it took the L.A. managerial staff and the Spokane exploration office to find it.

Bob Munro, our manager of exploration, was able to get us our budget for that first year of reconnaissance work. Jackie E. Stephens, the manager of the Pacific Northwest Exploration Office (my immediate boss) organized and proposed the recon. project of 1974. I was the project geologist and kept the

project going and also did ½ of all the sampling. That first year we lived on a 55-foot house boat with a flat top, which we could land a one-passenger Hughes-300 helicopter on top of. I had a pilot & a skipper on the boat besides two-two man traversing teams. Each team consisted of a lead geologist and a field assistant. I was the project leader, plus one of the crew leaders. Each day we would be taken off of the boat by the helicopter dropped of in a drainage or ridge top & traverse downstream, trying to get back to tide water. Sampling by stream-sediment or rock chip conventional methods. Our density was approximately 3 samples per mile and sampling all side drainages coming into the major drainage we were on. Then the helicopter would pick us up each night & take us back to the boat for the night. We would sample one area for 1-2 weeks, then move the boat to the next cove or bay & start the project over again. We did this all summer until we all had to go back to school.

After I left S.E. Alaska the results

around the Wilson Arm area came back to Jackie E. Stephens in late Sept. of 1974. [All results had been sent to & analyzed by our Research Center in Anaheim, California].

Jackie & his immediate boss, Mr. Bob Kistler flew back up to the Wilson Arm area with all the data we had compiled and they landed at Discovery Outcrop (where I took you) & located the mineral prospect for the first time. [I had indicated to Jackie, that the Wilson Arm area was extremely interesting & a very likely environment for a porphyry-type mineralized area.

Jackie & Bob Kistler immediately returned to L.A. & reported their findings. Jackie then organized a barge camp at the head of Wilson Arm & returned to the area in the fall of 1974 and located mining claims over the Quartz Hill area, they also built the old cook cabin at the old camp site that fall.

Jackie returned with a shallow-drilling company (Salisbury, Prescott, & Dietz) in the winter and drilled one hole into the mineralized rock & thus proving what we had found.

I then returned to U.S. Borax and put together the first year of "Winkie" drilling at Quartz Hill in the summer of 1975. The Next year (1976) we did more "Winkie" drilling to prove out the perimeter of our deposit plus putting down several 600-foot Diamond Drill Holes. Last year and this year we constructed the new Quartz Hill camp and started the deep-hole drilling at Quartz Hill, with a few "Winkie" holes yet to drill.

That just about concludes the finding at Quartz Hill and the exploratory drilling to date.

Hope this fills you in on what you wanted, Sheldon.

Have a good summer and fall—

Sincerely—

Lance

LANCE E. SENTER
PROJECT GEOLOGIST—U.S. BORAX

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANALYSES OF ROCK SAMPLES FROM THE KETCHIKAN QUADRANGLE, SOUTHEASTERN ALASKA

By R. D. Koch and R. L. Elliott

OPEN-FILE REPORT 78-156-A

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature

Menlo Park, California

1978

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANALYSES OF ROCK AND STREAM-SEDIMENT SAMPLES FROM THE PRINCE RUPERT QUADRANGLE, SOUTHEASTERN ALASKA

By R. D. Koch and R. L. Elliott

OPEN-FILE REPORT 78-156-B

Menlo Park, California

1978

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANALYSES OF STREAM-SEDIMENT SAMPLES FROM THE KETCHIKAN QUADRANGLE, SOUTHEASTERN ALASKA

OPEN-FILE REPORT 78-156-C

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature

Menlo Park, California

1978

from Atlas of the Ketchikan Region
Region by Alaska Div. of Reg. Planning, 1979

Mining

Mining has played a part in the economy of Ketchikan since 1867 when the first copper prospect was located on Prince of Wales Island. Gold was discovered on both sides of Tongass Narrows in about 1900, and some mining continued until 1913. Most mining on Revillagigedo Island was near the head of Thorne Arm where the Sea Level Mine was involved in gold and silver beginning in 1902. In 1948 the Mahoney Mine produced the only zinc concentrates commercially exported from Alaska. The Kasaan and Cleveland Peninsula were the zones of most intense prospecting and mining in the area in the early days. The Dall Head area of Gravina Island is also an area of many claims. More than 40 mines have operated in the Ketchikan mining district. A few have lasted more than 40 years, but most were short-lived enterprises. Copper, gold, silver, palladium, lead, zinc, and uranium have been produced commercially. Deposits of iron, antimony, molybdenum, beryllium, rare-earth metals, thorium, and chromite have been investigated. Nickel, cobalt, bismuth, and tungsten occurrences are known. Conservative minimum production figures below are from Berg and Cobb (1967).

Copper	28,000,000 lbs.
Gold	45,000 oz.
Silver	200,000 oz.
Palladium (plus some platinum)	11,000 oz.
Zinc	74,819 lbs.
Lead	42,000 lbs.
Uranium	14,000 tons ore (0.8% U_3O_8)

Tongass Historical Society

The size and style of the new Hadley Hotel, built about 1903 represented the optimism that investors had in the copper mining potential in the area. When mining shut down at Hadley the hotel was barged to Ketchikan where it became the Harris and later the Ayson Hotel.

With the worldwide rise in the demand for metals and corresponding rise in price, interest in prospecting has increased substantially in the Ketchikan area. Several large firms and many individuals are prospecting at the present time. Of this recent mining the U.S. Borax discovery of molybdenum at Quartz Hill is potentially of greatest economic and environmental impact within the Ketchikan region. The claim area, shown in the Landsat photograph below, is approximately 43 miles east of Ketchikan on the mainland between the Keta and Wilson-Blossom drainage basins. Presently, bulk sampling and continued exploration is being done at the site and, if results prove favorable, full mine development could occur in the 1980's. The economic impact of such development on the Ketchikan area could be considerable, with the potential development of a new townsite for 1,500 workers and their families. However, careful location and design of all necessary facilities must be undertaken to reduce adverse impacts on the significant salmon resources found within the Keta and Blossom-Wilson river systems and toxic and other wastes associated with mining activity and concentrations of people must be controlled. Additionally, the impact of such development on the recreation and aesthetic values of the relatively pristine East Behm Canal environment must also be considered.

Q 120 - ?

RESTRICTED

Portion of WMR 108 - Molybdenum
Not sent to W. A. Hawkins - Ketchikan

SUMMARY

The molybdenite ore in the Shakan deposit occurs in a fissure vein that has been exposed and sampled in 14 open cuts and one tunnel. Uncertainty as to the extent of the vein and incomplete development preclude accurate estimation of positive ore, but the probable ore amounts to nearly 14,000 tons of milling grade (1.31 percent molybdenite). Old maps show details of development, sampling, and assay results. No ore has been milled or shipped from the property. The Bureau plans to delineate the ore body by driving about 600 feet of winzes and drifts on the vein. No equipment is on the property, and initial work would require the construction of a small camp and the installation of a portable compressor and air drills.

If exploration were to develop enough ore, mine and mill equipment to exploit the deposit would cost $160,000, to which should be added $40,000 for working capital. Possible suspension of work because of unfavorable weather might extend the estimated 13-month development period.

1

The Bureau of Mines made concentration tests at Rolla, Mo., on a representative sample of ore taken from the wall of an adit driven through the deposit. Ninety-three percent of the molybdenite was recovered by flotation in a concentrate assaying 94.71 percent molybdenum sulfide, 0.04 percent copper, 0.29 percent iron, and 1.3 percent insoluble matter.

ORE RESERVES

No positive ore has been developed by the work done in the mine to date. Probable ore is ore exposed and sampled on two sides, as represented by the exposures in the surface cuts and in the adit. Possible ore is ore exposed on one side. Computations are based on the assumption that the ore extends to a depth equal to one-half the exposed length. The following tonnages are computed from ore exposed in the 11 crosscuts and 1 adit:

Probable ore - 13,700 tons of 1.31-percent molybdenite.

Possible ore - 4,100 tons of 2.08-percent molybdenite.

These estimates, which are regarded as reliable, are based on 200 samples taken and assayed by the Alaska Treadwell Gold Mining Co. In September 1918, when the samples were taken, engineers of that company estimated the reserves of ore above the adit at 36,000 tons of 1.58-percent molybdenite. After that estimate was made, mine headings reached the end of the ore shoot or lost the vein. It appears, therefore, that the original estimate was too optimistic. Bureau of Mines engineers, using the Treadwell assays but assuming a different zone of influence for the samples, have reduced the calculated ore reserves and grade.

PROPOSED EXPLORATION BY BUREAU OF MINES

Local topography makes exploration by core drilling difficult. The best method of exploring the deposit would be by a winze and tunnels on the vein. Mining and sampling facilities and a camp would have to be provided, as none are available.

The Bureau of Mines plans to explore and develop the deposit at an estimated expenditure of $30,000. About 6 months will be required to complete the work.

DISPOSITION OF THE PRODUCT

Laboratory tests showed that the ore may be concentrated by flotation. Milling might be done at the mine, or the ore might be transported by barge 200 miles to Juneau, where a section of the mill of the Alaska Juneau Gold Mining Co. could be remodeled to handle the ore. The latter plan appears the more feasible in view of possible difficulty of acquiring new milling equipment at present. Another possibility would be to transport the ore by barge 150 miles to Kasaan Bay, where the old Salt Chuck mill could be remodeled to handle it. Further study is needed to determine which plan is best.

APPROXIMATE CAPITAL EXPENDITURES (FOR PRODUCTION IF EXPLORATION PROVES SUCCESSFUL)

Mine equipment	$60,000
100-ton flotation plant	100,000
Working capital	40,000
	200,000

It would be necessary to reserve $100,000 for mill construction even though the Juneau plant or some other were to mill the ore. Another $100,000 would be required to pay for remodeling equipment, hiring barges, and constructing loading facilities. Three months would be required for exploration and sampling, 6 months for development and preparation of the mine, and 4 months for completion of the milling plant, a total of 13 months.

Supplies must be delivered by boat, which means that allowance must be made for delays in sailing dates and limited cargo space. The estimate of time required included expected delays due to inclement weather.

At the completion of the development program, the mine should supply 100 tons of milling-grade ore each 24 hours.

CONCLUSIONS

Two hundred feet of winze will be sunk on the vein at a point most advantageous for developing ore. The ore body will be delineated further by about 400 feet of drifting. This exploration program should stimulate production of a substantial quantity of an essential war mineral.

It is estimated that the work will cost $30,000. Within 6 months after operations are begun, enough information as to assured reserves, character and grade of ore should be available to permit definite plans to be made for processing the ore.

Metallurgical tests indicate that a high-grade concentrate can be produced by flotation and that operation of the Shakan molybdenum deposits is possible if the extent of the ore reserves and grade are proven to be favorable.

oOo

Form Keta River mine study group

A joint governmental committee has been formed to examine environmental study plans for the proposed U. S. Borax Quartz Hill mine site in the Keta River area of Southeastern Alaska.

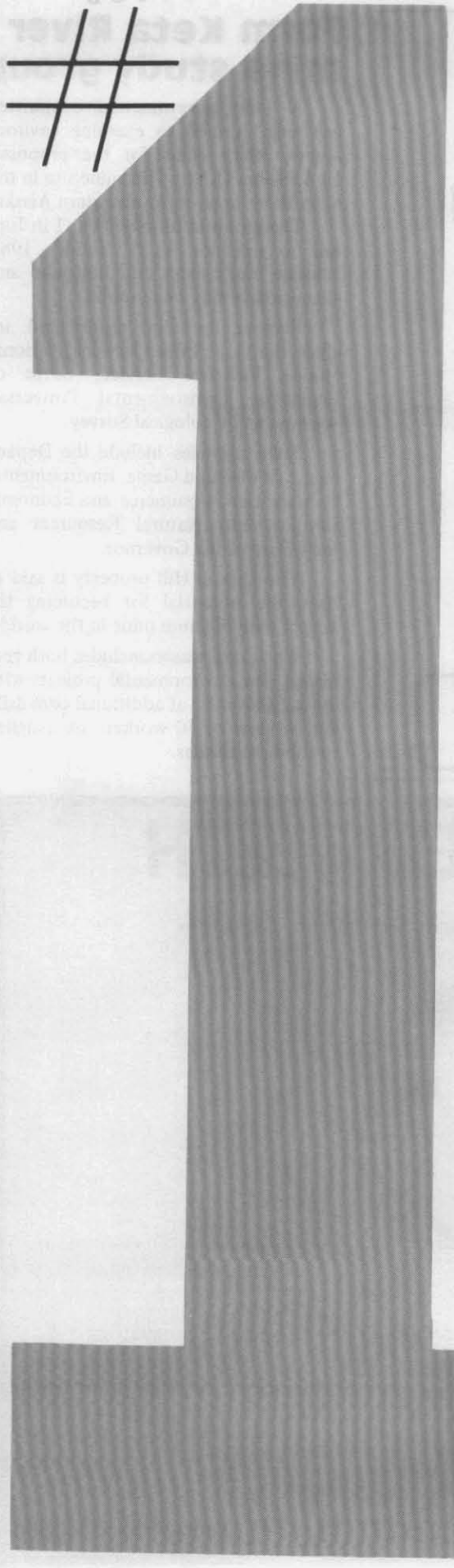
The group is to meet Oct. 1 in Juneau to examine U. S. Borax's 1981 baseline study plan and designate any changes that may be required.

Federal agencies represented include the U. S. Forest Service, National Marine Fisheries Service, Corps of Engineers, Environmental Protection Agency, and Geological Survey.

State agencies include the Departments of Fish and Game, Environmental Conservation, Commerce and Economic Development, Natural Resources and the Office of the Governor.

The Quartz Hill property is said to have the potential for becoming the largest molybdenum mine in the world.

Work this season includes both geological and environmental projects with up to 30,000 ft. of additional core drilling. A crew of 50 workers are assigned to the field studies.



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SOUTHEAST ALASKA EMPIRE

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Business Manager

Mining

We congratulate our Southeast Alaska sister city of Ketchikan on its good fortune regarding U.S. Borax Corporation's plans for a large-scale mining operation.

If all goes as planned, the molybdenum mine and related facilities will provide full-time jobs for 500 workers, with as many as 1,000 working during the construction phase. Ketchikan, just 45 miles from the Borax mineral find, will serve as a central supply base and staging area for the operation.

For a city plagued by sharp decreases in fishing and logging activity, the news was certainly welcome. If Borax is able to follow through with its plans, the mine will provide a stable, long-term economic shot in the arm for Ketchikan.

But, as we in Juneau have learned all too well recently, the "if" involved in natural resource development on federal land is quite a hurdle to overcome.

It wouldn't surprise us a bit if Borax's proposal for Ketchikan goes the way of Champion International's plan for a large timber operation and pulp mill near Juneau.

Just as Champion's plan included clearcutting—that call to arms for lawsuit-happy preservationists—Borax's plan calls for an open pit mine. And as sure as night follows day, the Sierra Club and its cohorts will hear that dirty word "open pit mine" and flock to Alaska armed to the teeth with lawyers and lawsuits.

Some will scoff and reply that mining—open pit or no—is allowed under the regulations of the National Forest Service. Let Borax follow all the required environmental laws and requirements, and the mine will be permitted.

Those sunny types need only remember that clearcutting was allowed—in fact required—when Champion began its long and fruitless effort toward the Berner's Bay mill. Champion followed all the rules, but was nonetheless caught in the web of Sierra Club suits and endless delays. The result, of course, was no logging, no mill and no jobs for Juneauites.

We hope Ketchikan is luckier.

ALASKA CLIPPING SERVICE

Ketchikan Daily News Ketchikan, Alaska

JUL 12 1972

Hearing Being Held on Hyder Mill Site

A hearing began today into the validity of a mill site claim held by Carol Ann Wikstrom, daughter of Carl Wikstrom, about seven miles north of Hyder.

The forest service claims the New W placer claim, lode claim and mill site had lost its validity because no minerals had been found and because the mill had not been used or operated.

Wikstrom, who appeared with his attorney Richard Whittaker, relinquished claim to the placer and lode sites, but maintains the mill site is still vaild.

The hearing is being carried out in the jury room in the Federal Building before L.K. Luoma, hearing examiner from the office of hearings and appeals of the department of interior from Salt Lake City, Utah. The forest service is represented by Albert Wall, office of general counsel, Portland.

Wikstrom has held a placer and a lode claim and has a mill set up on Salmon River, near Hyder.

The forest service complaint, filed in 1969, charges minerals have not been found "in sufficient quantities to constitute a valid discovery."

The complaint also says the millsite "is not being used or occupied for mining or milling purpose" and therefore is invalid. valid.

Wikstrom today agreed to relinquish claim to the placer and lode sites. The only remaining issue therefore, Luoma said, is whether the 3.5 acre mill site is used for mining or milling purposed.

The hearing is expected to last through today and possibly into Thursday.

The forest service brought witnesses to testify this morning.

Wikstrom and FS Compromise on Site

The forest service and Carl Wikstrom will try to agree on a compromise solution to a dispute over operation of Wikstrom's New W mill site near Hyder.

This was the order of L. K. Luoma, a department of interior hearing examiner from Salt Lake City, following a six-hour hearing here Wednesday into the Wikstrom mining claim on Salmon River, seven miles north of Hyder. Luoma indicated he wanted the parties to reach a compromise rather than write out an official ruling.

"All we want is that the mill site be used for mining purposes and that it be kept in a reasonable degree of neatness and orderliness," said Richard Wilson, supervisor of the South Tongass National Forest, who attended the hearing in the federal building jury room.

The forest service had contended that the 3.5 acre mill site was not being used for either mining or milling purposes and was therefore invalid.

The agency also challenged the validity of a placer claim and a lode claim for New W at the same location, but Wikstrom agreed during the hearing to relinquish claim to those sites.

Luoma did not rule on the validity of the mill site, and asked Wikstrom and the forest service to talk it over, Wilson said.

The hearing record will remain open for 90 days. The New W claims are in the name of Wikstrom's daughter Carol Ann.

Smith & others

)THERS - MAP SHOWING GENERAL GEOLOGY AND ANALYZED SAMPLES, KETCHIKAN,
BRADFIELD CANAL, AND PRINCE RUPERT QUADRANGLES, SOUTHEASTERN ALASKA

1:250,000 MAP MF-825
(2 SHEETS)

MAP LOCATION

021

USGS 1977

000063

Copy rec'd from Wes. Moulton, U.S.F.S., 12-18-80

TOM PITTMAN

000065

REPORT OF MINERAL EXAMINATION

FOR

MINING CLAIMS

OF THE

PACIFIC COAST MOLYBDENUM COMPANY

UNITED STATES BORAX AND CHEMICAL CORPORATION

QUARTZ HILL PROJECT

TONGASS NATIONAL FOREST

KETCHIKAN AREA

SOUTHEAST ALASKA

BY

Wesley G. Moulton
Mining Engineer

and

Don E. Williams
Mining Engineer

INDEX

REPORT OF MINERAL EXAMINATION

Claimant:	Pacific Coast Molybdenum Company with U.S. Borax and Chemical Corp. as operator; 3075 Wilshire Boulevard, Los Angeles, California 90010.
Reason for Examination:	Determination of rights that existed prior to the Presidential Proclamation of December 1, 1978, that withdrew the Misty Fiords area from entry under the mining laws, and the Secretary of the Interior withdrawal of December 5, 1978, under Section 204(b) of the Federal Land Policy and Management Act of October 21, 1976.
Lands Involved:	JES claims 14 thru 17, 33 thru 41, 54 thru 63, 75 thru 84, 97 thru 104, 119 thru 124, 141, and 142. (Exhibit B).
Land Status:	National Forest lands open to entry under the mining laws as of the date of location, but withdrawn from entry on December 1, 1978, under the Antiquities Act of 1906, and on December 5, 1978, under the Federal Land Policy and Management Act of 1976.
Location Data:	The above listed claims were located in October 1974, and recorded in the Ketchikan recording district.
Mining District:	Ketchikan
Mining Engineers:	Wesley G. Moulton, Juneau, Alaska Don E. Williams, Washington, D.C. (See Exhibits A-1 and A-2 for qualifications).

SUMMARY

Molybdenum mineralization was first discovered about 10 years ago in the Boca de Quadra area of the Peabody Mountains in southeast Alaska approximately 45 miles east of Ketchikan. Extensive prospecting using geochemical and geophysical methods led the U.S. Borax Company to locate 235 mining claims in the Quartz Hill area. Shortly after the 1974 claim locations, a shallow-hole drilling program was started at the area of the highest molybdenum anomaly.

Results obtained from the shallow drilling (300 feet or less) indicated that further drilling for deeper penetration would be necessary for delineation of a suspect molybdenum ore body. The deeper drilling started in 1977 with depths up to 2,000 feet being attained. The information gained from all drilling up through the 1978 field operating season provided data for the U.S. Borax and Chemical Corporation (hereinafter, U.S. Borax) to estimate proven reserves of 700,000,000 tons of ore at an average grade of 0.15 percent Molybdenum Disulfide (MoS_2).

The company then started planning for access routes, additional mining claims, bulk sampling programs, continued exploration, mine and mill design; millsite, waste disposal, economic planning, and environmental concerns.

On December 1, 1978, a Presidential Proclamation withdrew the Misty Fiords area (including Quartz Hill) from entry under the mining laws. The same area was included in a December 5, 1978, Secretary of the Interior withdrawal under Section 204(b) of the Federal Land Policy and Management Act of October 21, 1976. Both withdrawals were subject to valid existing rights which had been acquired in accordance with the 1872 mining laws, 30 U.S.C. 22, et seq. To establish such valid existing rights, all criteria for valid mining claims, including discovery of sufficient mineralization must have been met by December 1, 1978.

The withdrawals prevented any further exploration for additional quantities of minerals on unpatented claims or the location of new claims, but development work and testing of previously located mineral zones could be continued on those claims which met the validity criteria.

In order to obtain preliminary information for determining which of the claims could meet the test of having a valid discovery, the authors of this report visited the Los Angeles and Spokane offices of U.S. Borax from January 9 thru 12, 1979. At that time the company provided claim maps and drill site maps plus access to their records on drilling, sampling, and other work.

Wes Moulton personally examined the Quartz Hill claims in 1975, and reexamined them in July 1979. During the 1979 trip, he checked the pre-December 1978 drill cores and also took randomly selected samples of such cores.

Based on field examinations, spot sampling, and review of pertinent records of exploration, the authors have determined that 49 of the U.S. Borax Quartz Hill lode mining claims meet the test of having a valuable valid mineral discovery.

PHYSICAL FEATURES

The Quartz Hill claims are located in sections 26, 34, and 35 of T 74 S, R 88 E and sections 2 and 3, T 75 S, R 88 E of southeast Alaska. They are within the Misty Fiords area, bounded on the southeast by Boca de Quadra and the Keta River and on the northwest by Smeaton Bay and the Blossom River.

Access to the claims from Ketchikan is by float plane or boat to Smeaton Bay and then by foot or helicopter to the drilling sites.

Within the boundaries of the block of 49 claims the elevation differences above mean sea level range from 1,340 feet to 3,000 feet. Except for a few months during the summer, the area is usually covered by heavy snowfall.

GEOLOGY

The Misty Fiords area lies within the Coast Range batholithic complex and consists of a rugged terrain of plutonic and metamorphic rocks.

The Quartz Hill molybdenum (Mo) deposit is in the form of a large quartz monzonite igneous body which intrudes a cap rock of gneiss. At Quartz Hill the gneiss cap has been removed by erosion exposing the molybdenum mineralization in the quartz monzonite substructure.

A generalized cross section is attached as Exhibit C.

U.S. BORAX DEVELOPMENT

In addition to extensive geological, geophysical, and geochemical surveys, U.S. Borax has conducted an intensive drilling program to delineate the outer limits as well as depth of the molybdenum deposit. The work has not been completed despite the fact that 280 holes have been drilled, as near as possible, on 500-foot centers. The preliminary drilling in 1975 was by light, easily portable

drills that were capable of drilling to 300 feet. Although it was believed that large quantities of molybdenum occurred at deeper levels, the 300 foot drilling depth was generally sufficient to penetrate the thin edges of the gneiss cap around the central exposure of quartz monzonite and establish the existence of the underlying molybdenum bearing rock.

After 1976, drilling up to 2,000 feet in depth was started in order to determine whether ore-grade molybdenum mineralization existed under the earlier shallow drilling. It is significant that all drill holes that reached the molybdenum zone, both shallow and deep, were stopped with mineralization still showing at the bottom. However, the maximum effort of the company in 1976, during the short exploration time available in the summer months, was directed toward a lateral extension of the mineralized body rather than a depth determination for ore reserve calculations.

By 1978, U.S. Borax had located in excess of 1000 claims in the Quartz Hill area. Their ongoing exploratory drilling program for lateral development beyond their original mineral findings was terminated by the December 1 and December 5, 1978 withdrawals.

All JES claims which had drilling on them were included in the initial examination, but if drilling logs did not show sufficient MoS_2 mineralization, or if the drilling did not penetrate the gneiss cap, those claims were eliminated from further evaluation. Drilling had been done on less than 100 claims.

EXAMINATION

The 49 lode mining claims that are the subject of this report contained many drill holes predating the December 1978 withdrawal. After preliminary checks of the recorded logs of all drilling, the information obtained from 106 separate drill holes was used for the tonnage calculations. All of these holes were within the boundaries of the 49 claims. Three of the 49 claims did not contain drill holes, but outcrop exposures of molybdenum mineralization in conjunction with drilling on adjacent claims confirmed existence of a valuable mineral deposit.

As previously stated, the company made all records concerning exploration available to Moulton and Williams for use in this mineral report. The records included geologic maps, drilling maps, drill hole logs, mineral assays, and tonnage estimates.

During Moulton's 1979 field visit to Quartz Hill, all of the 49 claims were examined to corroborate the evidence of onsite drilling. All of the rock cores from all of the drill holes were made available to him for inspection. The cores were examined for visual indications of molybdenum mineralization at the measured depth and intervals as shown by the company in its records.

To further corroborate the U.S. Borax records, Moulton randomly selected 4 drill holes for check assays. The company was not notified which 4 of the drill holes were to be sampled and assayed. Moulton took the samples as a representative split of the ore zone interval cores. The samples were bagged, labeled, and removed from Quartz Hill for assay, with all normal procedures used to prevent sample contamination. An additional sample was taken from a rock outcrop near drill hole 79-61, with all samples being sent to Metallurgical Laboratories in San Francisco for analysis. The results of the assays indicated comparable or better values to the U.S. Borax records of the same drill holes and intercepts.

The assay results of the samples are as follows:

Sample No.	Intercept Thickness in feet	Assay Value (Mo)
77-11 (Drill Hole)	1660	0.15%
77-15 (Drill Hole)	900	0.37%
77-20 (Drill Hole)	545	0.15%
79-68 (Drill Hole)	45	0.24%
79-61 (Rock at outcrop)		1.02%

Based on the comparability of the company drilling records and the Forest Service check assays plus visual inspection of the drill core, the U.S. Borax drill logs for the 46 subject claims with drilling are accepted for ore quality, and are used in making quantity calculations. The remaining three claims were visually examined, but not drilled or sampled.

TONNAGE DETERMINATIONS

In order for each claim to exhibit a discovery of a valuable deposit, the claim must contain either sufficient ore to sustain a mineral project alone or be able to provide, in conjunction with other claims, a supporting and participating block of ore for a mine or mill complex.

The grid pattern of the company drill hole layout on the approximate 500-foot centers was set up for the maximum determination of mineralization within the ore body. It was not designed for the proving of mineral discoveries on the individual mining claims. Although many of the drill holes are not spaced exactly on 500-foot centers, this discrepancy can be attributed to extremely steep slopes, timber growth, and other natural obstructions.

Discovery criteria on the 49 claims is based on the amount and grade of molybdenum mineralization as exhibited by the ore zones of those drill holes, within and adjacent to the claim boundaries, which could influence that particular claim. The criteria was also based on mineralized outcrops of ore grade rock.

Each drill hole represented a certain amount of tonnage based on the depth of penetration of the ore zone, the grade of the ore encountered, and the zone of mineralization as determined in a specified horizontal direction from the hole. The radius distance of the zone of influence was based on facts such as geology of the area, knowledge of molybdenum mineralization parameters, information gained from adjacent holes, and from practical experience with determination of ore-in-place probability.

The determination of depth of mineralization can be quite confusing when a drill hole is bottomed in a probable ore zone, but for purposes of this report, the only mineralization which has been considered is that which is definitely measurable.

The U.S. Borax Company has estimated that the 49 claims have proven reserves of ore containing 0.15% MoS_2 in the amount of 700,000,000 tons.

To corroborate quantity of the company estimated reserves, the drill holes were plotted on a claims map and an independent evaluation was made of the ore tonnage by Moulton and Williams. The tonnage evaluation was based on the drill hole horizontal zone of influence (300 feet radius), the ore zone thickness as drilled, and the percent of the particular drill hole influence for an individual claim. Many drill holes could influence more than one claim and many claims had more than one drill hole. Variations in ore zone thicknesses as penetrated by the different holes was resolved in the overlap of the drill hole influence zones by allowing the stronger showing to eliminate the weaker or thinner portions.

The final Moulton-Williams estimates amount to 776,830,000 tons of proven reserves of ore (0.15% MoS_2) within the boundaries of the 49 mining claims.

A claim map showing drill hole locations and zones of influence is included as exhibit D. Calculations of the ore reserves are shown in exhibit F.

VALUATION

Although the Moulton and Williams' calculations indicate approximately 776,830,000 tons of ore for purposes of this report, we have used the more conservative figure of 700,000,000 tons as estimated by U.S. Borax.

It is expected that the mining method would be by open pit. The ore body is more amenable to this type of mining because of its massive size and shape with minimum overburden.

Based on this information, a complex is projected which will mine and process 14,600,000 tons of ore per year over a life span of 50 years. It is estimated that preproduction costs of development and construction will amount to 400 million dollars.

The determination of preproduction costs is based on the long-held custom of estimating those costs through planned daily tonnages of mined and milled ores. The rule-of-thumb is for a cost of $10,000 to be applied to each ton of ore handled on a daily basis. In this case the 14,600,000 tons of ore per year equals 40,000 tons per day. At a daily rate of 40,000 tons multiplied by $10,000/ton this equals $400,000,000 total preproduction costs. The operating costs, at December 1978 rates, amount to approximately $2.97 per ton of ore mined and milled. This cost includes transportation, overburden removal, rehabilitation and miscellaneous, such as housing. Calculations for operating costs are shown in exhibit F.

By using the known facts and the best available estimates, we are able to arrive at a per-ton value of the ore and a projected net value for the total proven ore body.

Reserves: 700,000,000 tons of rock containing an average grade of 0.15% molybdenum disulfide.

Mining Method: Open pit.

Annual Mining and Milling Rate: 14,600,000 tons/year

Life of the Operation: ± 50 years

Concentrate Recovery: 85%

Molybdenum Disulfide Value: 60% Molybdenum (Mo) and 40% Sulfur (S)

Therefore:

14,600,000 tons/year x 2000 pounds/ton x 0.15% MoS_2 x 85% recovery=

37,230,000 lbs. MoS_2 produced/year

At 60% Mo of the 37,230,000 lbs. MoS_2, the total molybdenum recovered annually would be:

22,338,000 lbs. Mo

The cost of producing the Mo can be shown as follows:

Amortization of Preproduction and Development Costs:	= $400,000,000 for 700,000,000 tons = $0.57/ton	
Operating Costs		
Mining and Concentration:	$2.13/ton	
Transportation:	$0.06/ton	
Overburden Removal:	$0.28/ton	(Includes snow removal operations)
Housing, Miscellaneous, Etc.	$0.50/ton	
Rehabilitation	$0.045/ton	
Total cost per ton	= $3.585	

Annual production cost: $3.585 x 14,600,000 tons/yr.
= $52,341,000/yr.

The Engineering and Mining Journal for December 1978 quoted the average price for MoS_2 concentrate $5.86 per pound of contained molybdenum. This price was quoted as F.O.B. Climax, Colorado.

Since December 1978, the market price for MoS_2 has continued to rise. Cost figures have also risen since 1978, but have not reduced the profit/cost ratio by an appreciable amount.

For ore averaging 0.15% MoS_2 and at 85% recovery from mill feed, one ton of ore would produce 2.55 pounds of molybdenum disulfide. Since the MoS_2 contains 60% molybdenum and 40% sulfur, the 2.55 pounds of MoS_2 per ton of ore will yield 1.53 pounds of Mo.

$1.53 lbs. Mo/ton @ $5.86/lb. Mo
= $8.97 gross/ton of ore

$8.97 gross/ton of ore less $3.59 cost/ton
= $5.38 net/ton of ore

At an annual rate of 14,600,000 tons, the possible gross returns are:

$130,962,000/year

The net returns annually are:

$78,548,000

For the total mining and milling operation the projected net value of the 700,000,000 tons of ore at the December 1978 rate amounts to:

$3,766,000,000.00

CONCLUSIONS

After a thorough study of the geologic and mineral evidence provided by drill cores, geologic mapping, and geochemical tests, we find that a massive quartz monzonite body containing large quantities of molybdenum exists beneath the subject lode mining claims. The purpose of the Forest Service examination was to determine which, if any, of the U.S. Borax claims could actually show a mineral discovery, as of December 1, 1978, within the individual claim boundaries. In addition, the discovery must be such that the individual claim could provide a sufficient amount of ore of an economic grade to support an effective and producing mine.

The mining claims disclosed proven reserves, through outcrop exposures or pre-December 1978 drilling, as follows:

Claim Number (J.E.S. Claims)	Discovery Point (DH-Drill Hole)	Proven Reserves (In million Tons)
15	DH 181	0.37
33	DH 84	0.335
34	DH 86	1.234
35	DH 71	7.50
36	DH 78-55	19.755
37	DH 78-57	24.37
38	DH 78-58	22.723
39	DH 47	5.63
40	DH 105	1.325
41	DH 78-60	2.64
54	DH 91	0.65
55	DH 75	6.458
56	DH 78-59	26.687
57	DH 78-53	40.431
58	DH 77-12	54.245
59	DH 77-27	13.65
60	DH 42	9.606
61	DH 78-34	2.273
62	DH 37	2.70
63	DH 110	3.60
75	DH 87	0.55
76	DH 77	7.124

77	DH 78-42	50.557
78	DH 77-33	60.466
79	DH 77-16	53.725
80	DH 77-20	25.017
81	DH 77-19	64.45
82	DH 2	9.853
83	DH 17	2.593
84	DH 154	1.709
97	DH 142	2.17
98	DH 78-38A	28.26
99	DH 78-37	52.61
100	DH 77-32	53.525
101	DH 77-25	52.546
102	DH 77-22	22.446
103	DH 34	12.32
104	DH 97	0.63
119	DH 78-40	3.55
120	DH 149	7.467
121	DH 118	5.26
122	DH 120	3.986
123	DH 121	4.16
124	DH 119	0.80
141	DH 104	0.90
142	DH 102	0.684

14	Molybdenum mineralized porphyritic quartz latite outcrop (190 ft. west and 450 ft. north of the southeast corner of the claim.	No Estimate
16	Molybdenum bearing quartz monzonite and quartz latite outcrops scattered throughout the south half of the claim.	No Estimate
17	Molybdenum bearing quartz monzonite and quartz latite outcrops scattered throughout the south one-third of the claim.	No Estimate

The 49 listed lode mining claims contain a proven reserve of 776,830,000 tons of 0.15% MoS_2.

Although there were no drill holes on claims 14, 16, and 17, the molybdenum bearing outcrops indicate that mineralization in the underlying rock substructure is a continuation of the known deposits under claims 15, 35, 36, 37, and 38. The drill holes on those claims adjacent to 14, 16, and 17 show a proven reserve of approximately 74 million tons of ore within their collective claim limits and are

evidence of the extension of the underlying orebody shown to be within the boundaries of adjacent claims 15, 35, 36, 37, and 38. The calculation for probable ore reserves within claims 14, 16, and 17 is impossible without measurable exploration data. Even so, it is our opinion that these claims probably contain minable quantities of MoS_2.

We find that the estimated costs of recovering the molybdenum from the mineralized ore body and preparing it for market are such that a prudent person would be justified in expending time and money with a reasonable expectation of having a profitable mining operation.

It is our opinion that each of the previously listed 49 lode mining claims of the U.S. Borax and Chemical Corporation contain a valuable mineral deposit within its boundaries.

Wesley G. Moulton
WESLEY G. MOULTON
Mining Engineering
Nov 28 1980
Date

Don E. Williams
DON E. WILLIAMS
Mining Engineer
Nov. 24, 1980
Date

EXHIBIT A-1

Resume of Mining and Mineral Experience of Wesley G. Moulton

1938	Graduated from Colorado School of Mines with Engineer of Mines degree.
1938	Miner-shaftman; United Gold Mines Corporation, Cripple Creek, Colorado.
1939-1941	Engineer-surveyor; Cresson Consolidated Gold Mines and United Gold Mines.
1941-1942	Shift foreman; Cresson Consolidated Gold Mines.
1942-1946	U.S. Army.
1946-1951	Mine Superintendent; Cresson Consolidated Gold Mines, Cripple Creek, Colorado.
1951-1953	Self-employed mining lead, zinc, copper, gold, silver, and uranium.
1953-1956	Mine Superintendent; Consolidated Uranium Corporation; uranium mining at Temple Mountain, Utah; and tungsten at Austen, Nevada.
1956-1958	Exploration Manager; Minerales Jeanette de Cuba, Santiago de Cuba (manganese).
1958-1960	Mine Superintendent; Kerr McGee Corporation, Grants, New Mexico.
1960-1963	Mine Superintendent; Phillips Petroleum Company, Grants, New Mexico.
1963-Present	USDA Forest Service; Mineral Examiner, Regions 5 and 10.

EXHIBIT A-2

Resume of Mining and Mineral Experience of Don E. Williams

May 1956	BS degree in Mining Engineering and Geology at the Missouri School of Mines, University of Missouri at Rolla.
1956-1961	Field mining engineer and geologist; Baroid Division, National Lead Company, Magnet Cove, Arkansas.
1961-1962	Mining Engineer; U.S. Geological Survey, Conservation Division, Mining Branch, in Montana, and Washington, D.C.
1962-1963	Mining Superintendent for Dierks' Forests, Inc., in Howard County, Arkansas.
1963-1967	Zone Geologist; U.S. Department of Agriculture, Forest Service, Hot Springs, Arkansas.
1967-1976	Project Engineer; Forest Service in northern Arkansas.
1976-1978	Regional Geologist; Forest Service in Atlanta, Georgia.
1978-Present	Mineral Leader and Mining Claims Specialist; Minerals and Geology Management Staff, USDA Forest Service, Washington, D.C.

Professional Organizations:

Member of American Institute of Mining, Metallurgical and Petroleum Engineers since 1954. Past chairman, state director, and state delegate for the Arkansas section; and past chairman of the Southeastern Regional Council of Section Delegates.

Member of the American Institute of Professional Geologists (Certified Professional Geologist #1320) from 1965 to present.

Registered Professional Geologist, State of Georgia (#318); 1977 to present.

000095

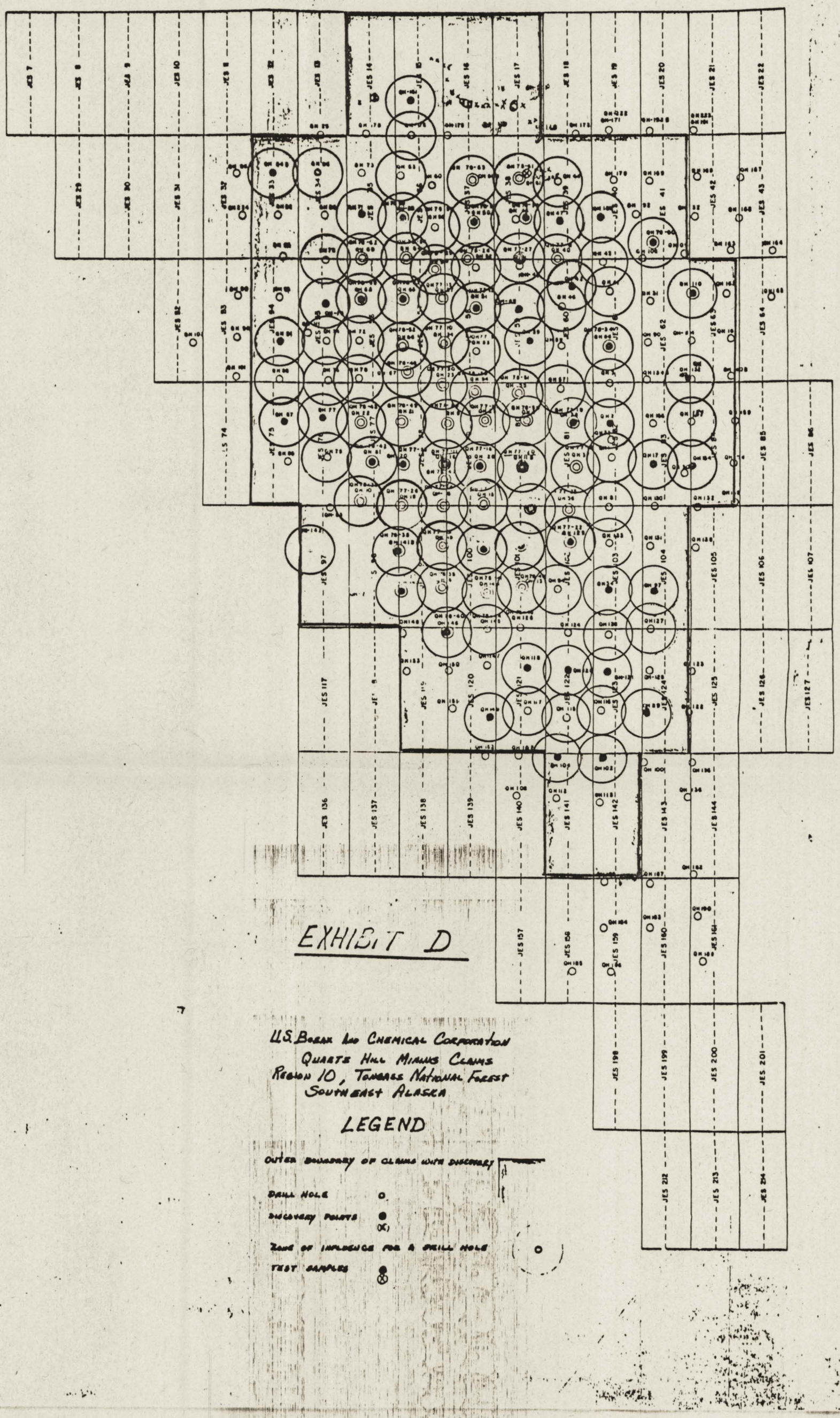

EXHIBIT D

U.S. Borax and Chemical Corporation
Quartz Hill Mining Claims
Region 10, Tongass National Forest
Southeast Alaska

LEGEND

Outer boundary of claims with discovery

Drill hole ○

Discovery points ● (X)

Zone of influence for a drill hole ○

Test samples ⊗

EXHIBIT D

Generalized Geologic Cross-Section Indicating Rock Substructure And Outcrops At Quartz Hill.

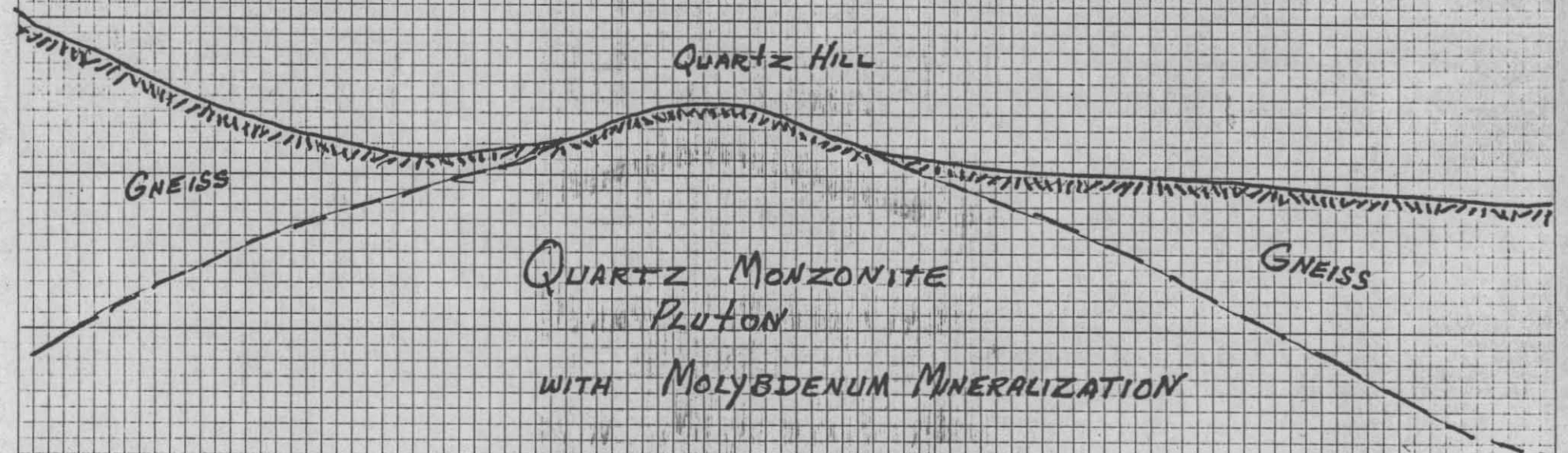

Exhibit C

000098

BLOSSOM

CLAIMS
COVERED BY
REPORT

KETT

T-74S
T-75S

BORAX
EXPLORATION

PACIFIC COAST MOLYBDENUM CO
WILLARD HILL PROJECT
JES CLAIM GROUP
EXHIBIT B
CLAIM MAP

JES Claim No.	Drill Hole No. *	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
14						Outcrops
15	181 176	15 20	.3 .4	70 40	.37	Drill Hole #181
16						Outcrops
17						Outcrops

EXHIBIT E (1 OF 12)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
33	84	15	.3	100		
	86	35	.7	5	.335	Drill Hole #84
34	86	35	.7	90		
	71	20	.4	25		
	78-62	210	4.2	10		
	78	10	.2	42	1.234	Drill Hole # 86
35	176	20	.4	10		
	63	30	.6	45		
	71	20	.4	70		
	78-55	640	12.8	35		
	78-62	210	4.2	40		
	78-54 A	375	7.5	10	7.50	Drill Hole # 71
36	176	20	.4	40		
	63	30	.6	40		
	78-55	640	12.8	60		
	78-56	775	15.5	45		
	78-54 A	375	7.5	20		
	77-29	800	16.0	20	19.755	Drill Hole # 78-55

EXHIBIT E (2 of 12)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
37	78-63	275	5.5	70		
	78-56	775	15.5	50		
	78-57	595	11.9	60		
	77-28	805	16.1	30		
	77-29	800	16.0	5	24.37	Drill Hole # 78-57
38	78-63	275	5.5	22		
	78-61	250	5.0	83		
	44	10	.2	1		
	78-57	595	11.9	1		
	78-58	590	11.8	100		
	77-27	480	9.6	35		
	47	45	.9	10		
	77-8	830	16.6	12	22.723	Drill Hole # 78-58
39	44	10	.2	50		
	47	45	.9	70		
	105	15	.3	30		
	77-8	650	13.0	30		
	43	40	.8	20		
	78-61	250	5.0	15	5.63	Drill Hole # 47
40	105	15	.3	55		
	43	40	.8	25		
	78-60	240	4.8	20	1.325	Drill Hole

EXHIBIT E (3 OF 12)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
41	78-60	240	4.8	55	2.64	Drill Hole #78-60
54	91	25	.5	90		
	89	25	.5	40	.65	Drill Hole #91
55	78	10	.2	40		
	78-62	210	4.2	10		
	75	60	1.2	65		
	78-59	705	14.1	25		
	74	60	1.2	75		
	72	25	.5	2		
	91	25	.5	2		
	89	25	.5	3		
	76	55	1.1	38		
	70	100	2.0	15	6.458	Drill Hole #75
56	78-62	210	4.2	32		
	78-54 A	510	10.2	20		
	78-59	705	14.1	60		
	78-53	895	17.9	45		
	72	25	.5	60		
	78-52	645	12.9	44		
	70	100	2.0	37		
	78-48	20	.4	18		
					26.687	Drill Hole #78-59

CLAIM NO.	DRILL HOLE No.	VERTICAL DRILLED THICKNESS OF ORE ZONE (IN FEET)	DRILL HOLE INFLUENCE ZONE ORE TONNAGE (IN MILLIONS)	% OF DRILL HOLE INFLUENCE ON CLAIM	TONS OF ORE IN CLAIM LIMITS (IN MILLIONS	DISCOVERY POINT
57	78-54 A	510	10.2	15		
	77-29	800	16.0	40		
	78-53	895	17.9	55		
	77-13	850	17.0	50		
	78-52	645	12.9	40		
	77-10	665	13.3	50		
	78-48	20	.4	20		
	77-30	515	10.3	22	40.431	DRILL HOLE # 78-53
58	77-28	805	16.1	50		
	77-29	800	16.0	15		
	77-27	480	9.6	0		
	77-12	1375	27.5	90		
	77-13	850	17.0	25		
	77-9	450	9.0	75		
	77-10	665	13.3	45		
	77-30	515	10.3	20	54.245	DRILL HOLE 77-12
59	77-27	480	9.6	48		
	77-8	830	16.6	15		
	77-12	1375	27.5	10		
	QH-49	45	.9	60		
	46	95	1.9	15		
	QH-39	65	1.3	75		
	77-9	450	9.0	5		
	78-51	170	3.4	40	13.65	DRILL HOLE QH-39

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in Millions	Discovery Point
60	77-8	830	16.6	35		
	43	55	1.1	8		
	42	150	3.0	60		
	41	50	1.0	5		
	46	95	1.9	45		
	78-34	55	1.1	25		
	QH-39	65	1.3	10		
	57	20	.4	42		
	3	45	.9	10		
	78-51	170	3.4	10	9.606	Drill Hole #42
61	43	55	1.1	28		
	78-60	240	4.8	5		
	41	50	1.0	55		
	78-34	55	1.1	70		
	3	45	.9	45		
	57	20	.4	0	2.273	Drill Hole 78-34
62	78-60	240	4.8	20		
	QH-110	240	4.8	35		
	137	10	.2	30	2.70	Drill Hole #137
63	QH-110	240	4.8	65		
	137	10	.2	24	3.60	Drill Hole QH-110
75	89	25	.5	50		
	87	20	.4	75	.55	Drill Hole #87

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
76	89	25	.5	3		
	76	55	1.1	35		
	QH-70	100	2.0	10		
	87	20	.4	8		
	77	20	.4	70		
	78-43	640	12.8	20		
	79	15	.3	78		
	78-42	905	18.1	10		
	78-39	1005	20.1	8	7.124	Drill Hole #77
77	76	55	1.1	0		
	QH-70	100	2.0	35		
	78-48	20	.4	15		
	78-43	640	12.8	60		
	78-49	745	14.9	40		
	78-42	905	18.1	75		
	77-33	1265	25.3	40		
	78-39	1005	20.1	38		
	77-26	1340	26.8	18	50.557	Drill Hole 78-42
78	78-48	515	10.3	25		
	77-30	515	10.3	20		
	78-49	745	14.9	55		
	77-24	960	19.2	38		
	77-33	1265	25.3	50		
	77-11	1660	33.2	50		
	77-26	1340	26.8	35		
	77-14	475	9.5	18	60.466	Drill Hole 77-33

Exhibit E
(7 of 12)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
79	77-30	515	10.3	20		
	77-24	960	19.2	55		
	77-21	550	11.0	55		
	77-11	1660	33.2	50		
	77-16	895	17.9	50		
	77-14	475	9.5	15		Drill Hole 77-16
	77-17	1010	20.2	40	53.725	
80	78-51	170	3.4	40		
	77-21	550	11.0	25		
	77-20	545	10.9	85		
	77-16	895	17.9	20		
	77-17	1010	20.2	10		Drill Hole 77-20
	77-15	795	15.9	38	25.017	
81	78-51	170	3.4	10		
	57	20	.4	40		
	3	45	.9	0		
	77-19	845	16.9	95		
	2	190	3.8	0		
	77-20	545	10.9	3		
	77-18	535	10.7	70		
	1	130	2.6	1		
	77-15	795	15.9	3		
	77-23	735	14.7	50		
	8	100	2.0	0		Drill Hole 77-19
					64.45	

000113

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
82	3	45	.9	30		
	57	20	.4	0		
	2	190	3.8	80		
	77-19	845	16.9	5		
	1	130	2.6	75		
	77-18	535	10.7	12		Drill Hole
	8	100	2.0	35		#2
	77-23	735	14.7	12	9.853	
83	137	10	.2	24		
	157	90	1.8	50		
	154	85	1.7	45		Drill Hole
	17	80	1.6	55	2.593	#17
84	137	10	.2	22		
	157	90	1.8	50		Drill Hole
	154	85	1.7	45	1.709	# 154
97	142	10	.2	80		Drill Hole
	78-39	1005	20.1	10	2.17	#142
98	78-39	1005	20.1	35		
	77-26	1340	26.8	20		
	78-38 A	1525	30.5	50		Drill Hole
	78-37	205	4.1	15	28.26	78-38 A
99	77-26	1340	26.8	35		
	77-14	475	9.5	16		
	77-31	980	19.6	45		
	78-38 A	1525	30.5	50		
	78-37	205	4.1	50		
	78-35	1275	25.5	50		Drill Hole
	78-40	710	14.2	20	52.61	78-37

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
100	77-14	475	9.5	15		
	77-17	1010	20.2	25		
	77-31	980	19.6	35		
	77-32	1105	22.1	50		
	78-35	1275	25.5	50		
	78-41	1020	20.4	50		Drill Hole
	78-40	710	14.2	20		77-32
	78-44	670	13.4	25	53.525	
101	77-17	1010	20.2	15		
	77-15	795	15.9	45		
	77-32	1105	22.1	33		
	77-25	1075	21.5	65		
	78-41	1020	20.4	32		
	78-46	795	15.9	70		
	94	40	.8	0		
	78-44	670	13.4	15		Drill Hole
	78-45	95	1.9	75	52.546	77-25
102	77-23	735	14.7	38		
	77-15	795	15.9	6		
	8	100	2.0	0		
	133	100	2.0	1		
	77-22	875	17.5	65		
	77-25	1075	21.5	10		
	78-46	795	15.9	10		
	94	40	.8	65		
	34	130	2.6	6		
	78-45	95	1.9	2		
	128	95	1.9	3		Drill Hole
					22.446	77-22

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
103	77-23	735	14.7	5		
	8	100	2.0	30		
	133	100	2.0	65		
	77-22	875	17.5	38		
	34	130	2.6	80		
	97	30	.6	10		Drill Hole #34
	127	25	.5	8		
	128	95	1.9	45	12.32	
104	97	30	.6	80		Drill Hole #97
	127	25	.5	30	0.63	
119	78-40	710	14.2	25	3.55	Drill Hole 78-40
120	78-40	710	14.2	25		
	78-44	670	13.4	28		Drill Hole #149
	149	15	.3	55	7.467	
121	78-44	670	13.4	18		
	78-45	95	1.9	40		
	118	70	1.4	70		
	117	65	1.3	70		
	149	15	.3	30		Drill Hole #118
	104	90	1.8	6	5.26	
122	120	60	1.2	100		
	118	70	1.4	1		
	121	80	1.6	3		
	115	85	1.7	65		
	117	65	1.3	3		
	116	85	1.7	4		
	104	90	1.8	40		Drill Hole
	120	60	1.2			

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in Millions	Discovery Point
123	128	95	1.9	45		
	127	25	.5	6		
	121	80	1.6	85		
	116	85	1.7	55		Drill Hole
	119	50	1.0	35		#121
	102	90	1.8	35	4.16	
124	127	25	.5	40		Drill Hole
	119	50	1.0	60	0.8	#119
141	104	90	1.8	40		Drill Hole
	102	90	1.8	10	0.9	#104
142	102	90	1.8	38	0.684	Drill Hole #102

Total Tonnage 776,830,000 tons

000121

EXHIBIT F

CALCULATED COSTS--MINE DEPARTMENT

Drill Production

Assumptions:

1. Hole diameter = 9"
2. Hole depth = 50'
3. Penetration rate = 1'/minute = 50.0 min./hole
4. Pulling-moving time = 2.5 min.
5. Level time = 2.5 min.
   Drill cycle = 60.0 minutes /hole
6. Available drilling time = 7 hours

Shot Pattern: 15 x 15
Ton Hole: 1125
Ton per foot drilled: 22.5
Bench Height: 50'
Tons drilled per year: 14.6 MM

Drilling hours/day: 7 ÷ Drill cycle $\frac{60}{60}$ = 7 holes/drill/shift

Tons/shift: 28,000 ÷ tons/hole 1125 = 24.89 = 25 holes/shift

25 ÷ 7 = 4 drills/shift/day

Drill Supplies

	Cost	Life Feet	Dollars/ Foot	Dollars/ Ton	Dollars/ Year	Quantity
Bit	$ 300	2,000	$0.15	$0.01	$ 97,500	325
Sub	400	25,000	0.02	0.0007	10,400	26
Pipe	2,000	50,000	0.04	0.002	26,000	13
			TOTAL	$0.0127	$133,900	

Drill Costs
(4 drills, 2 shifts/day)

	Quantity	Dollar Cost/Unit	Dollar/ Foot	Dollar/ Ton	Dollar/ Year
Diesel	1120 gal.	$ 1.00	$0.40	$.018	$262,800
Lubricants	100 gal.	2.00	0.08	.003	43,800
Filters, $40	4	40.00	0.06	.003	43,800
Hydraulic Oil	100 gal.	1.00	0.04	.002	29,200
Repair Supplies		500.00	0.18	.01	146,000
				$0.36	$525,600

Total Supply Costs/Ton = $0.0127
0.036
$0.0487

Cost per year = .0487 x 14,600,000 = $711,000

Blasting

Loading density 26.14 lb. ANFO/foot of hole
50 hole/blast x 50 ft. per hole loaded x 26.19 = 65,475 explosive
65,475 x $0.12 = $7,857 per blast
$7,858 - 56,000 = $0.14 per ton
14,600,000 lb. x $0.14 = $2,044,000 per year

ANFO Truck

		Dollar Cost/Unit	Dollar Cost/Hour
Fuel (Gas)	10 gal/hr/truck	$1.00	$20.00
Oil	1 gal/hr/truck	2.00	2.00
Tires		1.00	2.00
Repairs			10.00
			$34.00/hr.

7 x 34 - 28,000 = $0.01 per ton
14,600,000 x 0.01 = $146,000

Cost per year: $2,044,000
146,000
$2,190,000

Production Analysis

100+ ton trucks heaped capacity = 75 yds. x fill factor .9 = 67.5 cu. yd/load; cu. yd/load 67.5 - swell factor 1.5 = 45 back cu. yd/load

45 x 2.5 = 112.50 tons/load

28,000 - 112.50 = 250 loads/shift

Truck Hour/shift	8	Shovel Bucket Size	15 yds
Start-up time	.25 hrs	Cycle time	0.5 min.
Lunch	.50	Cycles/truck	8.0
Shutdown	.25	Load time/truck	4.0
Moving time	.50	Cleanup	.5
Max. work time	6.50	Total load time	4.5

6.5 x 50 min. ÷ 4.5 = 72 loads/shift/shovel
loads/shift/shovel 72 x shovel available .9 = 65 loads/shift/shovel
loads/shift 250 ÷ loads/shift/shovel 65 = 4 shovels/shift
truck/cycle time 8 ÷ 4.5 = 2 + 1 truck/shovel (spare)
truck/shovel 3 x shovels/shift 4 = 12 trucks/shift

Shovel	Hourly
Power 1200 KWH	$ 24.00
Lubricants	8.00
Teeth and adapters	4.00
Maintenance and repair	120.00
	$156.00 per hour

$$\frac{7 \times 4 \times 156}{28,000} = 0.16$$

14,600,000 x .16 = $2,336,000

Hauling	Hourly
Fuel at 15 gal/hr at $1/gal	$15.00
Lubricating oils	2.00
Tires	5.00
Maintenance	6.00
	$28.00

$\frac{28 \times 7 \times 12}{28,000}$ = 0.08 per ton

14,600,000 x 0.08 = $1,168,000 per year

Cleanup: 2, D-8's	$30.00
Diesel fuel: 15 gal/hr @ $1	2.00
Oil	5.00
Maintenance and Parts	$37.00

$\frac{37 \times 7 \times 2}{28,000}$ = $0.018 per ton

Labor Costs
(Operating Costs)

The following assumtion has been made to derive labor and operating costs:

Each day's-pay employee will work 1,936 hours per year straight time and receive pay for 2,080 hours (holidays plus 10 days vacation).

Arizona has many open pit mines and the pay scales were based on these plus approximately 30 percent for higher Alaska rates.

A shift differential of $0.14 for afternoon shift is averaged at $0.07. This will add $136 per year to base pay.

Mine (Labor)

Drilling:

1. Operators
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Helpers
   8 x (2,080 x 10.57 + 136) = 176,973

Blasting:

1. Leadmen
   2 x (2,080 x 11.07 + 136) = 46,323

2. Powdermen
   2 x (2,080 x 10.77 + 136) = 45,075

3. Helpers
   2 x (2,080 x 10.57 + 136) = 44,243

Loading:

1. Shovel Operators
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Shovel Helpers
   8 x (2,080 x 10.77 + 136) = 180,301

Hauling:

1. Truck Operators
   24 x (2,080 x 11.07 + 136) = 555,878

Cleanup:

1. Dozer Operators
   4 x (2,080 x 11.07 + 136) = 92,646

2. Laborers:
   10 x (2,080 x 10.57 + 136) = 221,216

Total Labor Cost $1,733,247

Concentration

Crushing:

1. Crusher Operators (2 shifts)
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Helpers
   8 x (2,080 x 10.57 +136) = 176,973

Grinding:

1. Operators
   12 x (2,080 x 11.07 + 136) = 277,939

2. Helpers
   12 x (2,080 x 10.57 + 136) = 265,459

Subtotal $ 905,667

Flotation:
(3 shifts, add $234)

1. Operators
   30 x (2,080 x 10.97 + 234) = $ 691,548

2. Helpers
   30 x (2,080 x 10.57 + 234) = 666,588

3. Mill Hands 30 x (2,080 x 10.57 + 234) =	$ 666,588
4. Laborers/baggers 20 x (2,080 x 10.57 + 234) =	444,392
5. Tailings 18 x (2,080 x 10.97 + 234) =	444,929
Total Concentration	$3,819,712

Operating costs

Includes balls, liners, reagents, lime, etc., at $0.50 per ton	$7,300,000

SUPPORT FUNCTIONS

Maintenance and Repair

1. Electricians 9 x (2,080 x 11.07 + 234) =	$ 210,146
2. Welders, mechanic machinists 18 x (2,080 x 11.07 + 234) =	420,292
3. Service mechanics 15 x (2,080 x 10.77 + 234) =	339,534
4. Tire mechanics 4 x (2,080 x 10.77 + 234) =	88,712
5. Helpers 12 x (2,080 x 10.57 + 234) =	266,640
Subtotal	$1,325,324

Power Plant

1. Operators 6 x (2,080 x 10.77 + 234) =	$ 135,934

Warehouse and Dock

1. Clerk 6 x (2,080 x 10.57 + 234) =	133,378

Warehouse and Dock Con't.

2. Equipment operators 6 x (2,080 x 10.77 + 234) =	$ 135,814
3. Laborers 12 x (2,080 x 10.27 + 234) =	259,147
Subtotal	$ 664,273

Communication and Transportation

1. Boat Crew 8 x (2,080 x 10.27 + 234) =	$ 172,765
2. Assaying Help 3 x (2,080 x 10.27 + 234) =	64,787
Total	$ 237,552

Operating Costs (Support)

1. Maintenance and Repairs	
a. .08 x (1,733,245 + 408,800) =	$ 171,364
b. Concentrator 8% of labor and Operating .08 x (3,819,712 + 7,300,000) =	889,577
c. Support 10% labor .10 x (1,325,324) =	132,253
Total	$1,193,194
2. Power: Assume 1,500,000 KWH used per week at $0.027: 1,500,000 x 0.027 x 52 =	$2,106,000
3. Warehouse and Dock	150,000
4. Communication and Transportation	400,000
5. Compressed Air	50,000
6. Assaying	45,000
Total (#3-6)	$ 645,000

Support Summary

Labor:

Maintenance and Repair	$1,325,324
Power Plant	135,934
Warehouse and Dock	528,339
Communication and Transportation	172,765
Assaying Help	64,787
Total	$2,227,149

Operating:

Maintenance and Repair	$1,193,194
Power	2,106,000
Warehouse and Dock	150,000
Communication and Transportation	400,000
Compressed Air	50,000
Assaying	45,000
Total	$3,944,194

Overhead:

Staff and Supervision:

1. General Manager, 1 each	$ 45,000
2. Mine Superintendent, 1 each	36,000
3. Plant Superintendent, 1 each	36,000
4. Maintenance Supt., 1 each	36,000
5. Chief Engineer	33,000
6. General Mine Foreman	29,000
7. General Plant Foreman	29,000
8. Chief Electrician	27,000
9. Mine Shift Bosses, 4 at $24,000	96,000
10. Mill Shift Bosses, 6 at $24,000	144,000
11. Maintenance Shift Bosses, 6 at $24,000	144,000
12. Surface and Warehouse Foreman	24,000
13. Metallurgist	27,000
14. Chemist	27,000
15. Mine Engineer/Geologist	27,000
16. Chief Clerk	20,000
17. Engineer/Geologist Helper	20,000
18. Pilot	24,000
19. Boat Captain	24,000
20. Timekeeper	19,000
21. Secretary, 2 at $14,000	28,000
22. Safety Engineer	27,000
23. Nurses, 6 at $22,000	132,000
Total	$1,054,000

Fringe Benefits:

Days-Pay Labor Mine	$1,733,247
Concentration and Crushing	3,819,712
Maintenance and Repair	1,325,324
Power and Warehouse	664,273
Communication and Transportation	172,765
Assay	64,787
Total	$7,780,108
Fringe benefits at 45% of direct labor cost assumed for days-pay (.45 x $7,780,108)	$3,501,049.
Fringe benefits at 40% of direct labor cost for supervisory (.40 x $1,054,000)	$ 421,600
Total Fringe Benefits	$3,922,649

Total Costs

Labor	
Day	$7,780,108
Salary	1,054,000
Fringe Benefits	3,922,649
Total Labor	$12,756,757
Operating	
Mine	
Drill	$ 711,000
Blast	2,190,000
Load	2,336,000
Haul	1,668,000
Cleanup	292,000
Total	$7,197,500
Concentration	$ 7,300,000
Support and Power	$ 3,944,194
Total	$18,441,694

Labor	$ 7,780,108
Fringe	3,501,049
Supervisory	1,054,000
Fringe Benefits	421,600
Operating Costs	18,441,694
Total Direct Cost Per Year	$31,198,451

Total direct cost per year, mine and mill:

31,198,450 ÷ 14,600,000 = $2.13 per ton

It is estimated that the final cost of development and construction will be 400 million dollars which adds an additional $0.57 to the cost of mining and milling.

Transportation

Molybdenum sulfide is sold F.O.B. plant. As water haulage is cheaper than rail, it appears that the market for concentrates from Quartz Hill would come mainly from foreign sources.

According to the U.S. Bureau of Mines, the average water haul is $0.03 per ton-mile; for the 700 miles from Ketchikan the cost would be approximately $21 per ton. Haulage of the concentrate to Seattle would add an additional $0.03 per ton. If the return trip hauled an additional 18,442 tons of supplies the cost goes up to $0.06 per ton. Calculations are as follows:

Tons mined per year: 14,600,000
Average grade MoS_2: 0.15%
Concentrate recovery: 85

14,600,000 x 2,000 x .0015 x 85 = 37,230,000 lbs. MoS_2 per year or 18,615 tons of MoS_2.

Concentrates contain 95% MoS_2: $\frac{95}{100} = \frac{18,615}{x}$

x = 19,595 tons of concentrate

19,595 x 21 ÷ 14,600,000 = tons mined

It is assumed an equal tonnage in supplies to the mine would double the cost per ton mined.

Environmental Concerns

U.S. Borax is presently collecting environmental data to develop a representative picture of environmental conditions that exist at Quartz

Hill prior to any operation. This program is composed of the following elements:

Meteorology, air quality and noise
Surface and ground water hydrology, water quality and snow
Oceanography
Geology and soils
Vegetation, wildlife, and aquatic biology
Coastal and marine biology

It is anticipated that selected environmental parameters would continue to be monitored during the life of the operation.

Both Federal and State governments have strict laws concerning air and water pollution, and it is mandatory to operate within the limits imposed.

Costs of normal environmental protection measures are included in development and operational costs. Due to the environmental problems unique to the Quartz Hill area, $0.045 per ton was allowed to cover additional protection, mitigation, and rehabilitation measures.

United States Department of the Interior

BUREAU OF MINES

O'Neill Building
University of Alaska
Room 205
Fairbanks, Alaska 99701

December 16, 1980

To: Dave Carnes, Supervisory Physical Scientist, AFOC, Juneau

From: James Barker, Mining Engineer, AFOC, Fairbanks

Subject: Mining Activity.

It was announced at the Whitehorse Geoscience Forum that the Apollo Mine on Unga Island (Aleutian Islands), is being reactivated as an underground operation. The mine, which has reportedly produced over 800,000 oz. of gold, still has 2 1/2 million tons of ore reserves grading 0.4 oz. gold. Work is being done by Catalina Resources and is restricted to the formerly patented ground. An exploration drilling program is continuing through the winter of 1980.

Resource Associates is actively exploring for additional gold deposits in the area. Recently they have announced the discovery of 20 new gold prospects along the Alaska peninsula and Aleutian Islands. Their work is being done on prospecting leases obtained from the Bristol Bay Native Corporation.

cc Tom Pittman

mb

REPORT OF MINERAL EXAMINATION

FOR

MINING CLAIMS

OF THE

PACIFIC COAST MOLYBDENUM COMPANY

UNITED STATES BORAX AND CHEMICAL CORPORATION

QUARTZ HILL PROJECT

TONGASS NATIONAL FOREST

KETCHIKAN AREA

SOUTHEAST ALASKA

BY

Wesley G. Moulton
Mining Engineer

and

Don E. Williams
Mining Engineer

INDEX

REPORT OF MINERAL EXAMINATION

Claimant:	Pacific Coast Molybdenum Company with U.S. Borax and Chemical Corp. as operator; 3075 Wilshire Boulevard, Los Angeles, California 90010.
Reason for Examination:	Determination of rights that existed prior to the Presidential Proclamation of December 1, 1978, that withdrew the Misty Fiords area from entry under the mining laws, and the Secretary of the Interior withdrawal of December 5, 1978, under Section 204(b) of the Federal Land Policy and Management Act of October 21, 1976.
Lands Involved:	JES claims 14 thru 17, 33 thru 41, 54 thru 63, 75 thru 84, 97 thru 104, 119 thru 124, 141, and 142. (Exhibit B).
Land Status:	National Forest lands open to entry under the mining laws as of the date of location, but withdrawn from entry on December 1, 1978, under the Antiquities Act of 1906, and on December 5, 1978, under the Federal Land Policy and Management Act of 1976.
Location Data:	The above listed claims were located in October 1974, and recorded in the Ketchikan recording district.
Mining District:	Ketchikan
Mining Engineers:	Wesley G. Moulton, Juneau, Alaska Don E. Williams, Washington, D.C. (See Exhibits A-1 and A-2 for qualifications).

SUMMARY

Molybdenum mineralization was first discovered about 10 years ago in the Boca de Quadra area of the Peabody Mountains in southeast Alaska approximately 45 miles east of Ketchikan. Extensive prospecting using geochemical and geophysical methods led the U.S. Borax Company to locate 235 mining claims in the Quartz Hill area. Shortly after the 1974 claim locations, a shallow-hole drilling program was started at the area of the highest molybdenum anomaly.

Results obtained from the shallow drilling (300 feet or less) indicated that further drilling for deeper penetration would be necessary for delineation of a suspect molybdenum ore body. The deeper drilling started in 1977 with depths up to 2,000 feet being attained. The information gained from all drilling up through the 1978 field operating season provided data for the U.S. Borax and Chemical Corporation (hereinafter, U.S. Borax) to estimate proven reserves of 700,000,000 tons of ore at an average grade of 0.15 percent Molybdenum Disulfide (MoS_2).

The company then started planning for access routes, additional mining claims, bulk sampling programs, continued exploration, mine and mill design; millsite, waste disposal, economic planning, and environmental concerns.

On December 1, 1978, a Presidential Proclamation withdrew the Misty Fiords area (including Quartz Hill) from entry under the mining laws. The same area was included in a December 5, 1978, Secretary of the Interior withdrawal under Section 204(b) of the Federal Land Policy and Management Act of October 21, 1976. Both withdrawals were subject to valid existing rights which had been acquired in accordance with the 1872 mining laws, 30 U.S.C. 22, et seq. To establish such valid existing rights, all criteria for valid mining claims, including discovery of sufficient mineralization must have been met by December 1, 1978.

The withdrawals prevented any further exploration for additional quantities of minerals on unpatented claims or the location of new claims, but development work and testing of previously located mineral zones could be continued on those claims which met the validity criteria.

In order to obtain preliminary information for determining which of the claims could meet the test of having a valid discovery, the authors of this report visited the Los Angeles and Spokane offices of U.S. Borax from January 9 thru 12, 1979. At that time the company provided claim maps and drill site maps plus access to their records on drilling, sampling, and other work.

Wes Moulton personally examined the Quartz Hill claims in 1975, and reexamined them in July 1979. During the 1979 trip, he checked the pre-December 1978 drill cores and also took randomly selected samples of such cores.

Based on field examinations, spot sampling, and review of pertinent records of exploration, the authors have determined that 49 of the U.S. Borax Quartz Hill lode mining claims meet the test of having a valuable valid mineral discovery.

PHYSICAL FEATURES

The Quartz Hill claims are located in sections 26, 34, and 35 of T 74 S, R 88 E and sections 2 and 3, T 75 S, R 88 E of southeast Alaska. They are within the Misty Fiords area, bounded on the southeast by Boca de Quadra and the Keta River and on the northwest by Smeaton Bay and the Blossom River.

Access to the claims from Ketchikan is by float plane or boat to Smeaton Bay and then by foot or helicopter to the drilling sites.

Within the boundaries of the block of 49 claims the elevation differences above mean sea level range from 1,340 feet to 3,000 feet. Except for a few months during the summer, the area is usually covered by heavy snowfall.

GEOLOGY

The Misty Fiords area lies within the Coast Range batholithic complex and consists of a rugged terrain of plutonic and metamorphic rocks.

The Quartz Hill molybdenum (Mo) deposit is in the form of a large quartz monzonite igneous body which intrudes a cap rock of gneiss. At Quartz Hill the gneiss cap has been removed by erosion exposing the molybdenum mineralization in the quartz monzonite substructure.

A generalized cross section is attached as Exhibit C.

U.S. BORAX DEVELOPMENT

In addition to extensive geological, geophysical, and geochemical surveys, U.S. Borax has conducted an intensive drilling program to delineate the outer limits as well as depth of the molybdenum deposit. The work has not been completed despite the fact that 280 holes have been drilled, as near as possible, on 500-foot centers. The preliminary drilling in 1975 was by light, easily portable

drills that were capable of drilling to 300 feet. Although it was believed that large quantities of molybdenum occurred at deeper levels, the 300 foot drilling depth was generally sufficient to penetrate the thin edges of the gneiss cap around the central exposure of quartz monzonite and establish the existence of the underlying molybdenum bearing rock.

After 1976, drilling up to 2,000 feet in depth was started in order to determine whether ore-grade molybdenum mineralization existed under the earlier shallow drilling. It is significant that all drill holes that reached the molybdenum zone, both shallow and deep, were stopped with mineralization still showing at the bottom. However, the maximum effort of the company in 1976, during the short exploration time available in the summer months, was directed toward a lateral extension of the mineralized body rather than a depth determination for ore reserve calculations.

By 1978, U.S. Borax had located in excess of 1000 claims in the Quartz Hill area. Their ongoing exploratory drilling program for lateral development beyond their original mineral findings was terminated by the December 1 and December 5, 1978 withdrawals.

All JES claims which had drilling on them were included in the initial examination, but if drilling logs did not show sufficient MoS_2 mineralization, or if the drilling did not penetrate the gneiss cap, those claims were eliminated from further evaluation. Drilling had been done on less than 100 claims.

EXAMINATION

The 49 lode mining claims that are the subject of this report contained many drill holes predating the December 1978 withdrawal. After preliminary checks of the recorded logs of all drilling, the information obtained from 106 separate drill holes was used for the tonnage calculations. All of these holes were within the boundaries of the 49 claims. Three of the 49 claims did not contain drill holes, but outcrop exposures of molybdenum mineralization in conjunction with drilling on adjacent claims confirmed existence of a valuable mineral deposit.

As previously stated, the company made all records concerning exploration available to Moulton and Williams for use in this mineral report. The records included geologic maps, drilling maps, drill hole logs, mineral assays, and tonnage estimates.

During Moulton's 1979 field visit to Quartz Hill, all of the 49 claims were examined to corroborate the evidence of onsite drilling. All of the rock cores from all of the drill holes were made available to him for inspection. The cores were examined for visual indications of molybdenum mineralization at the measured depth and intervals as shown by the company in its records.

To further corroborate the U.S. Borax records, Moulton randomly selected 4 drill holes for check assays. The company was not notified which 4 of the drill holes were to be sampled and assayed. Moulton took the samples as a representative split of the ore zone interval cores. The samples were bagged, labeled, and removed from Quartz Hill for assay, with all normal procedures used to prevent sample contamination. An additional sample was taken from a rock outcrop near drill hole 79-61, with all samples being sent to Metallurgical Laboratories in San Francisco for analysis. The results of the assays indicated comparable or better values to the U.S. Borax records of the same drill holes and intercepts.

The assay results of the samples are as follows:

Sample No.	Intercept Thickness in feet	Assay Value (Mo)
77-11 (Drill Hole)	1660	0.15%
77-15 (Drill Hole)	900	0.37%
77-20 (Drill Hole)	545	0.15%
79-68 (Drill Hole)	45	0.24%
79-61 (Rock at outcrop)		1.02%

Based on the comparability of the company drilling records and the Forest Service check assays plus visual inspection of the drill core, the U.S. Borax drill logs for the 46 subject claims with drilling are accepted for ore quality, and are used in making quantity calculations. The remaining three claims were visually examined, but not drilled or sampled.

TONNAGE DETERMINATIONS

In order for each claim to exhibit a discovery of a valuable deposit, the claim must contain either sufficient ore to sustain a mineral project alone or be able to provide, in conjunction with other claims, a supporting and participating block of ore for a mine or mill complex.

The grid pattern of the company drill hole layout on the approximate 500-foot centers was set up for the maximum determination of mineralization within the ore body. It was not designed for the proving of mineral discoveries on the individual mining claims. Although many of the drill holes are not spaced exactly on 500-foot centers, this discrepancy can be attributed to extremely steep slopes, timber growth, and other natural obstructions.

Discovery criteria on the 49 claims is based on the amount and grade of molybdenum mineralization as exhibited by the ore zones of those drill holes, within and adjacent to the claim boundaries, which could influence that particular claim. The criteria was also based on mineralized outcrops of ore grade rock.

Each drill hole represented a certain amount of tonnage based on the depth of penetration of the ore zone, the grade of the ore encountered, and the zone of mineralization as determined in a specified horizontal direction from the hole. The radius distance of the zone of influence was based on facts such as geology of the area, knowledge of molybdenum mineralization parameters, information gained from adjacent holes, and from practical experience with determination of ore-in-place probability.

The determination of depth of mineralization can be quite confusing when a drill hole is bottomed in a probable ore zone, but for purposes of this report, the only mineralization which has been considered is that which is definitely measurable.

The U.S. Borax Company has estimated that the 49 claims have proven reserves of ore containing 0.15% MoS_2 in the amount of 700,000,000 tons.

To corroborate quantity of the company estimated reserves, the drill holes were plotted on a claims map and an independent evaluation was made of the ore tonnage by Moulton and Williams. The tonnage evaluation was based on the drill hole horizontal zone of influence (300 feet radius), the ore zone thickness as drilled, and the percent of the particular drill hole influence for an individual claim. Many drill holes could influence more than one claim and many claims had more than one drill hole. Variations in ore zone thicknesses as penetrated by the different holes was resolved in the overlap of the drill hole influence zones by allowing the stronger showing to eliminate the weaker or thinner portions.

The final Moulton-Williams estimates amount to 776,830,000 tons of proven reserves of ore (0.15% MoS_2) within the boundaries of the 49 mining claims.

A claim map showing drill hole locations and zones of influence is included as exhibit D. Calculations of the ore reserves are shown in exhibit F.

VALUATION

Although the Moulton and Williams' calculations indicate approximately 776,830,000 tons of ore for purposes of this report, we have used the more conservative figure of 700,000,000 tons as estimated by U.S. Borax.

It is expected that the mining method would be by open pit. The ore body is more amenable to this type of mining because of its massive size and shape with minimum overburden.

Based on this information, a complex is projected which will mine and process 14,600,000 tons of ore per year over a life span of 50 years. It is estimated that preproduction costs of development and construction will amount to 400 million dollars.

The determination of preproduction costs is based on the long-held custom of estimating those costs through planned daily tonnages of mined and milled ores. The rule-of-thumb is for a cost of $10,000 to be applied to each ton of ore handled on a daily basis. In this case the 14,600,000 tons of ore per year equals 40,000 tons per day. At a daily rate of 40,000 tons multiplied by $10,000/ton this equals $400,000,000 total preproduction costs. The operating costs, at December 1978 rates, amount to approximately $2.97 per ton of ore mined and milled. This cost includes transportation, overburden removal, rehabilitation and miscellaneous, such as housing. Calculations for operating costs are shown in exhibit F.

By using the known facts and the best available estimates, we are able to arrive at a per-ton value of the ore and a projected net value for the total proven ore body.

Reserves: 700,000,000 tons of rock containing an average grade of 0.15% molybdenum disulfide.

Mining Method: Open pit.

Annual Mining and Milling Rate: 14,600,000 tons/year

Life of the Operation: ± 50 years

Concentrate Recovery: 85%

Molybdenum Disulfide Value: 60% Molybdenum (Mo) and 40% Sulfur (S)

Therefore:

14,600,000 tons/year x 2000 pounds/ton x 0.15% MoS_2 x 85% recovery=

37,230,000 lbs. MoS_2 produced/year

At 60% Mo of the 37,230,000 lbs. MoS_2, the total molybdenum recovered annually would be:

22,338,000 lbs. Mo

The cost of producing the Mo can be shown as follows:

Amortization of Preproduction and Development Costs: $400,000,000 for 700,000,000 tons
= $0.57/ton

Operating Costs

Mining and Concentration:	$2.13/ton	
Transportation:	$0.06/ton	
Overburden Removal:	$0.28/ton	(Includes snow removal operations)
Housing, Miscellaneous, Etc.	$0.50/ton	
Rehabilitation	$0.045/ton	
Total cost per ton	= $3.585	

Annual production cost: $3.585 x 14,600,000 tons/yr.
= $52,341,000/yr.

The Engineering and Mining Journal for December 1978 quoted the average price for MoS_2 concentrate $5.86 per pound of contained molybdenum. This price was quoted as F.O.B. Climax, Colorado.

Since December 1978, the market price for MoS_2 has continued to rise. Cost figures have also risen since 1978, but have not reduced the profit/cost ratio by an appreciable amount.

For ore averaging 0.15% MoS_2 and at 85% recovery from mill feed, one ton of ore would produce 2.55 pounds of molybdenum disulfide. Since the MoS_2 contains 60% molybdenum and 40% sulfur, the 2.55 pounds of MoS_2 per ton of ore will yield 1.53 pounds of Mo.

$1.53 lbs. Mo/ton @ $5.86/lb. Mo
= $8.97 gross/ton of ore

$8.97 gross/ton of ore less $3.59 cost/ton
= $5.38 net/ton of ore

At an annual rate of 14,600,000 tons, the possible gross returns are:

$130,962,000/year

The net returns annually are:

$78,548,000

For the total mining and milling operation the projected net value of the 700,000,000 tons of ore at the December 1978 rate amounts to:

$3,766,000,000.00

CONCLUSIONS

After a thorough study of the geologic and mineral evidence provided by drill cores, geologic mapping, and geochemical tests, we find that a massive quartz monzonite body containing large quantities of molybdenum exists beneath the subject lode mining claims. The purpose of the Forest Service examination was to determine which, if any, of the U.S. Borax claims could actually show a mineral discovery, as of December 1, 1978, within the individual claim boundaries. In addition, the discovery must be such that the individual claim could provide a sufficient amount of ore of an economic grade to support an effective and producing mine.

The mining claims disclosed proven reserves, through outcrop exposures or pre-December 1978 drilling, as follows:

Claim Number (J.E.S. Claims)	Discovery Point (DH-Drill Hole)	Proven Reserves (In million Tons)
15	DH 181	0.37
33	DH 84	0.335
34	DH 86	1.234
35	DH 71	7.50
36	DH 78-55	19.755
37	DH 78-57	24.37
38	DH 78-58	22.723
39	DH 47	5.63
40	DH 105	1.325
41	DH 78-60	2.64
54	DH 91	0.65
55	DH 75	6.458
56	DH 78-59	26.687
57	DH 78-53	40.431
58	DH 77-12	54.245
59	DH 77-27	13.65
60	DH 42	9.606
61	DH 78-34	2.273
62	DH 37	2.70
63	DH 110	3.60
75	DH 87	0.55
76	DH 77	7.124

77	DH 78-42	50.557
78	DH 77-33	60.466
79	DH 77-16	53.725
80	DH 77-20	25.017
81	DH 77-19	64.45
82	DH 2	9.853
83	DH 17	2.593
84	DH 154	1.709
97	DH 142	2.17
98	DH 78-38A	28.26
99	DH 78-37	52.61
100	DH 77-32	53.525
101	DH 77-25	52.546
102	DH 77-22	22.446
103	DH 34	12.32
104	DH 97	0.63
119	DH 78-40	3.55
120	DH 149	7.467
121	DH 118	5.26
122	DH 120	3.986
123	DH 121	4.16
124	DH 119	0.80
141	DH 104	0.90
142	DH 102	0.684

14	Molybdenum mineralized porphyritic quartz latite outcrop (190 ft. west and 450 ft. north of the southeast corner of the claim.	No Estimate
16	Molybdenum bearing quartz monzonite and quartz latite outcrops scattered throughout the south half of the claim.	No Estimate
17	Molybdenum bearing quartz monzonite and quartz latite outcrops scattered throughout the south one-third of the claim.	No Estimate

The 49 listed lode mining claims contain a proven reserve of 776,830,000 tons of 0.15% MoS_2.

Although there were no drill holes on claims 14, 16, and 17, the molybdenum bearing outcrops indicate that mineralization in the underlying rock substructure is a continuation of the known deposits under claims 15, 35, 36, 37, and 38. The drill holes on those claims adjacent to 14, 16, and 17 show a proven reserve of approximately 74 million tons of ore within their collective claim limits and are

evidence of the extension of the underlying orebody shown to be within the boundaries of adjacent claims 15, 35, 36, 37, and 38. The calculation for probable ore reserves within claims 14, 16, and 17 is impossible without measurable exploration data. Even so, it is our opinion that these claims probably contain minable quantities of MoS_2.

We find that the estimated costs of recovering the molybdenum from the mineralized ore body and preparing it for market are such that a prudent person would be justified in expending time and money with a reasonable expectation of having a profitable mining operation.

It is our opinion that each of the previously listed 49 lode mining claims of the U.S. Borax and Chemical Corporation contain a valuable mineral deposit within its boundaries.

Wesley G. Moulton
WESLEY G. MOULTON
Mining Engineering
Nov 28 1980
Date

Don E. Williams
DON E. WILLIAMS
Mining Engineer
Nov. 24, 1980
Date

EXHIBIT A-1

Resume of Mining and Mineral Experience of Wesley G. Moulton

1938	Graduated from Colorado School of Mines with Engineer of Mines degree.
1938	Miner-shaftman; United Gold Mines Corporation, Cripple Creek, Colorado.
1939-1941	Engineer-surveyor; Cresson Consolidated Gold Mines and United Gold Mines.
1941-1942	Shift foreman; Cresson Consolidated Gold Mines.
1942-1946	U.S. Army.
1946-1951	Mine Superintendent; Cresson Consolidated Gold Mines, Cripple Creek, Colorado.
1951-1953	Self-employed mining lead, zinc, copper, gold, silver, and uranium.
1953-1956	Mine Superintendent; Consolidated Uranium Corporation; uranium mining at Temple Mountain, Utah; and tungsten at Austen, Nevada.
1956-1958	Exploration Manager; Minerales Jeanette de Cuba, Santiago de Cuba (manganese).
1958-1960	Mine Superintendent; Kerr McGee Corporation, Grants, New Mexico.
1960-1963	Mine Superintendent; Phillips Petroleum Company, Grants, New Mexico.
1963-Present	USDA Forest Service; Mineral Examiner, Regions 5 and 10.

EXHIBIT A-2

Resume of Mining and Mineral Experience of Don E. Williams

May 1956	BS degree in Mining Engineering and Geology at the Missouri School of Mines, University of Missouri at Rolla.
1956-1961	Field mining engineer and geologist; Baroid Division, National Lead Company, Magnet Cove, Arkansas.
1961-1962	Mining Engineer; U.S. Geological Survey, Conservation Division, Mining Branch, in Montana, and Washington, D.C.
1962-1963	Mining Superintendent for Dierks' Forests, Inc., in Howard County, Arkansas.
1963-1967	Zone Geologist; U.S. Department of Agriculture, Forest Service, Hot Springs, Arkansas.
1967-1976	Project Engineer; Forest Service in northern Arkansas.
1976-1978	Regional Geologist; Forest Service in Atlanta, Georgia.
1978-Present	Mineral Leader and Mining Claims Specialist; Minerals and Geology Management Staff, USDA Forest Service, Washington, D.C.

Professional Organizations:

Member of American Institute of Mining, Metallurgical and Petroleum Engineers since 1954. Past chairman, state director, and state delegate for the Arkansas section; and past chairman of the Southeastern Regional Council of Section Delegates.

Member of the American Institute of Professional Geologists (Certified Professional Geologist #1320) from 1965 to present.

Registered Professional Geologist, State of Georgia (#318); 1977 to present.

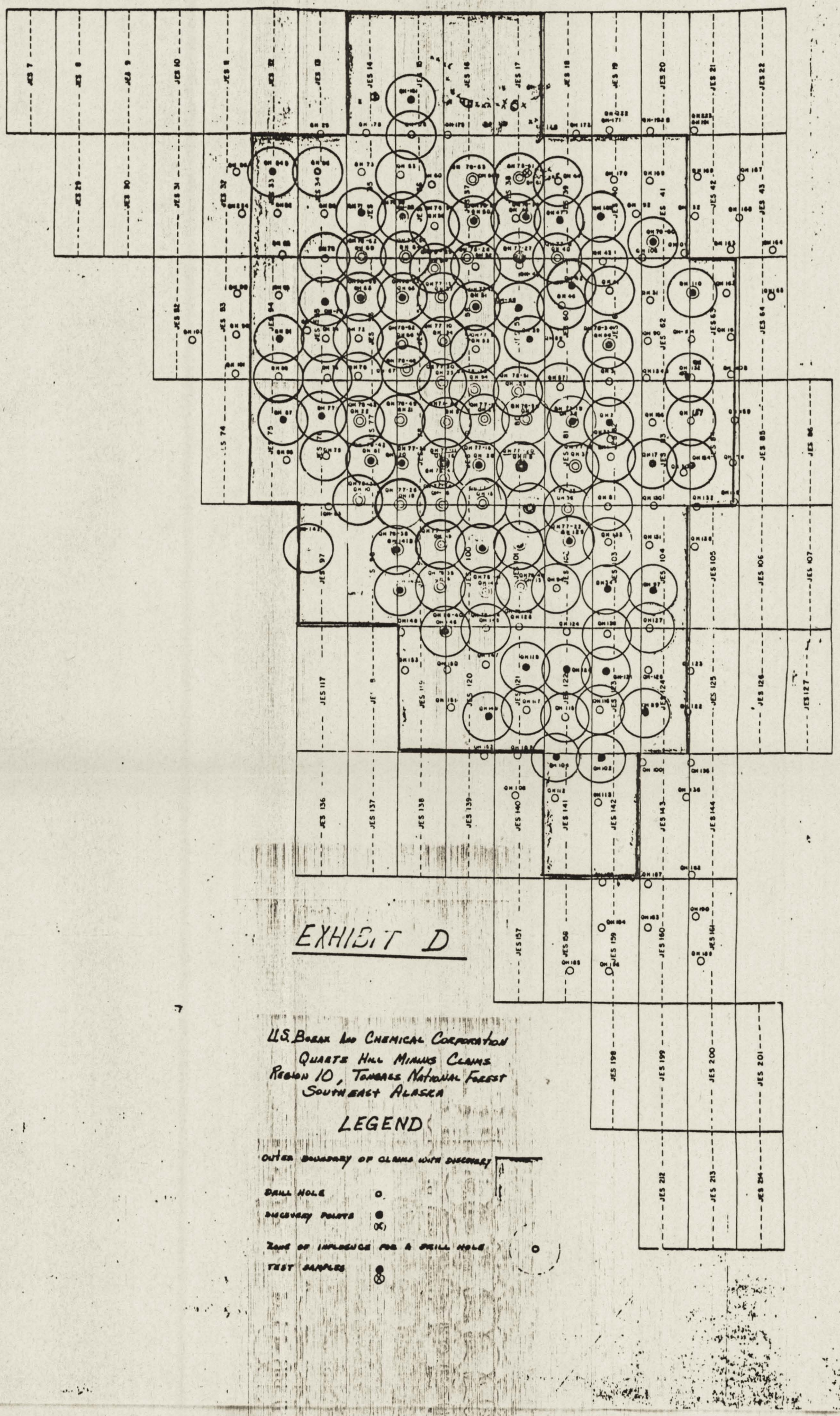

EXHIBIT D

U.S. Borax and Chemical Corporation
Quartz Hill Mining Claims
Region 10, Tongass National Forest
Southeast Alaska

LEGEND

Outer boundary of claims with discovery

Drill hole ○

Discovery points ● (X)

Zone of influence for a drill hole ○

Test samples ⊗

EXHIBIT D

Generalized Geologic Cross-Section Indicating Rock Substructure And Outcrops At Quartz Hill.

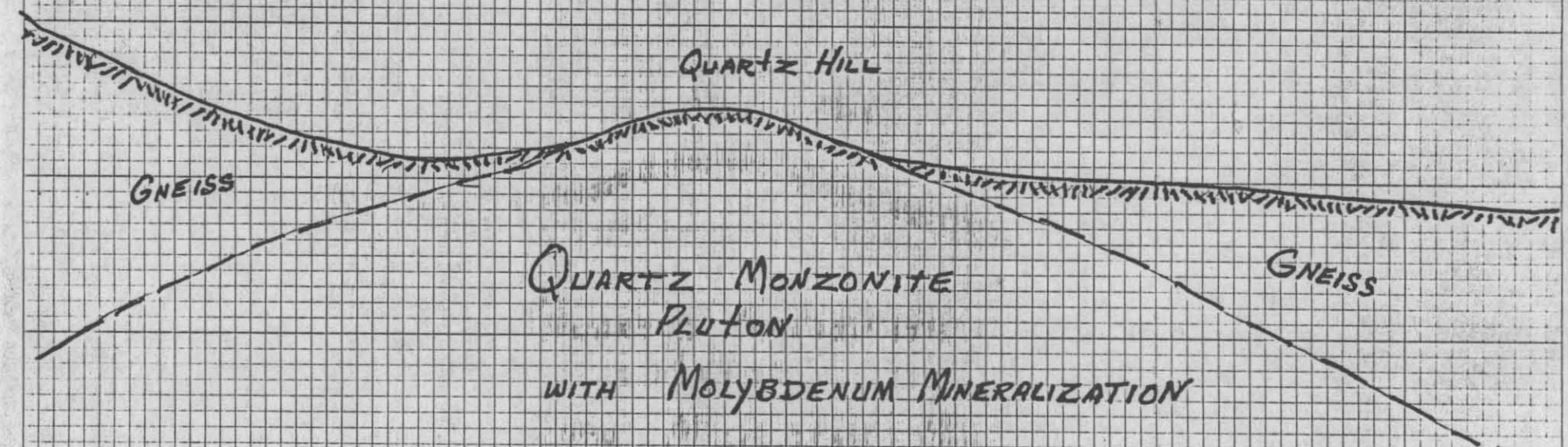

Exhibit C

000180

BLOSSOM

CLAIMS
COVERED BY
REPORT

T-74S
T-75S

KERN

BORAX
EXPLORATION

PACIFIC COAST MOLYBDENUM CO
QUARTZ HILL PROJECT
JES CLAIM GROUP

EXHIBIT B

JES Claim No.	Drill Hole No. *	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
14						Outcrops
15	181 176	15 20	.3 .4	70 40	.37	Drill Hole #181
16						Outcrops
17						Outcrops

EXHIBIT E (1 OF 12)

181000

* Drill Hole Numbers without the year prefix

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in millions	Discovery Point
33	84	15	.3	100		
	86	35	.7	5	.335	Drill Hole #84
34	86	35	.7	90		
	71	20	.4	25		
	78-62	210	4.2	10		
	78	10	.2	42	1.234	Drill Hole # 86
35	176	20	.4	10		
	63	30	.6	45		
	71	20	.4	70		
	78-55	640	12.8	35		
	78-62	210	4.2	40		
	78-54 A	375	7.5	10	7.50	Drill Hole # 71
36	176	20	.4	40		
	63	30	.6	40		
	78-55	640	12.8	60		
	78-56	775	15.5	45		
	78-54 A	375	7.5	20		
	77-29	800	16.0	20	19.755	Drill Hole # 78-55

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in Millions	Discovery Point
37	78-63	275	5.5	70		
	78-56	775	15.5	50		
	78-57	595	11.9	60		
	77-28	805	16.1	30		
	77-29	800	16.0	5	24.37	Drill Hole # 78-57
38	78-63	275	5.5	22		
	78-61	250	5.0	83		
	44	10	.2	1		
	78-57	595	11.9	1		
	78-58	590	11.8	100		
	77-27	480	9.6	35		
	47	45	.9	10		
	77-8	830	16.6	12	22.723	Drill Hole # 78-58
39	44	10	.2	50		
	47	45	.9	70		
	105	15	.3	30		
	77-8	650	13.0	30		
	43	40	.8	20		
	78-61	250	5.0	15	5.63	Drill Hole # 47
40	105	15	.3	55		
	43	40	.8	25		
	78-60	240	4.8	20		

581000

EXHIBIT E (3 OF 12)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
41	78-60	240	4.8	55	2.64	Drill Hole #78-60
54	91	25	.5	90		
	89	25	.5	40	.65	Drill Hole #91
55	78	10	.2	40		
	78-62	210	4.2	10		
	75	60	1.2	65		
	78-59	705	14.1	25		
	74	60	1.2	75		
	72	25	.5	2		
	91	25	.5	2		
	89	25	.5	3		
	76	55	1.1	38		
	70	100	2.0	15	6.458	Drill Hole #75
56	78-62	210	4.2	32		
	78-54 A	510	10.2	20		
	78-59	705	14.1	60		
	78-53	895	17.9	45		
	72	25	.5	60		
	78-52	645	12.9	44		
	70	100	2.0	37		
	78-48	20	.4	18		
					26.687	Drill Hole #78-59

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions)	Discovery Point
57	78-54 A	510	10.2	15		
	77-29	800	16.0	40		
	78-53	895	17.9	55		
	77-13	850	17.0	50		
	78-52	645	12.9	40		
	77-10	665	13.3	50		
	78-48	20	.4	20		
	77-30	515	10.3	22	40.431	Drill Hole # 78-53
58	77-28	805	16.1	50		
	77-29	800	16.0	15		
	77-27	480	9.6	0		
	77-12	1375	27.5	90		
	77-13	850	17.0	25		
	77-9	450	9.0	75		
	77-10	665	13.3	45		
	77-30	515	10.3	20	54.245	Drill Hole 77-12
59	77-27	480	9.6	48		
	77-8	830	16.6	15		
	77-12	1375	27.5	10		
	QH-49	45	.9	60		
	46	95	1.9	15		
	QH-39	65	1.3	75		
	77-9	450	9.0	5		
	78-51	170	3.4	40	13.65	Drill Hole QH-39

Exhibit E (5 of 17)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (In Feet)	Drill Hole Influence Zone Ore Tonnage (In Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (In Millions	Discovery Point
60	77-8	830	16.6	35		
	43	55	1.1	8		
	42	150	3.0	60		
	41	50	1.0	5		
	46	95	1.9	45		
	78-34	55	1.1	25		
	QH-39	65	1.3	10		
	57	20	.4	42		
	3	45	.9	10		
	78-51	170	3.4	10	9.606	Drill Hole #42
61	43	55	1.1	28		
	78-60	240	4.8	5		
	41	50	1.0	55		
	78-34	55	1.1	70		
	3	45	.9	45		
	57	20	.4	0	2.273	Drill Hole 78-34
62	78-60	240	4.8	20		
	QH-110	240	4.8	35		
	137	10	.2	30	2.70	Drill Hole #137
63	QH-110	240	4.8	65		
	137	10	.2	24	3.60	Drill Hole QH-110
75	89	25	.5	50		
	87	20	.4	75	.55	Drill Hole #87

Exhibit E (6 of 7)

CLAIM NO.	DRILL HOLE No.	VERTICAL DRILLED THICKNESS OF ORE ZONE (IN FEET)	DRILL HOLE INFLUENCE ZONE ORE TONNAGE (IN MILLIONS)	% OF DRILL HOLE INFLUENCE ON CLAIM	TONS OF ORE IN CLAIM LIMITS (IN MILLIONS	DISCOVERY POINT
76	89	25	.5	3		
	76	55	1.1	35		
	QH-70	100	2.0	10		
	87	20	.4	8		
	77	20	.4	70		
	78-43	640	12.8	20		
	79	15	.3	78		
	78-42	905	18.1	10		
	78-39	1005	20.1	8	7.124	DRILL HOLE #77
77	76	55	1.1	0		
	QH-70	100	2.0	35		
	78-48	20	.4	15		
	78-43	640	12.8	60		
	78-49	745	14.9	40		
	78-42	905	18.1	75		
	77-33	1265	25.3	40		
	78-39	1005	20.1	38		
	77-26	1340	26.8	18	50.557	DRILL HOLE 78-42
78	78-48	515	10.3	25		
	77-30	515	10.3	20		
	78-49	745	14.9	55		
	77-24	960	19.2	38		
	77-33	1265	25.3	50		
	77-11	1660	33.2	50		
	77-26	1340	26.8	35		
	77-14	475	9.5	18	60.466	DRILL HOLE 77-33

EXHIBIT E (7 OF 12)

000193

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in millions	Discovery Point
79	77-30	515	10.3	20		
	77-24	960	19.2	55		
	77-21	550	11.0	55		
	77-11	1660	33.2	50		
	77-16	895	17.9	50		
	77-14	475	9.5	15		Drill Hole 77-16
	77-17	1010	20.2	40	53.725	
80	78-51	170	3.4	40		
	77-21	550	11.0	25		
	77-20	545	10.9	85		
	77-16	895	17.9	20		
	77-17	1010	20.2	10		Drill Hole 77-20
	77-15	795	15.9	38	25.017	
81	78-51	170	3.4	10		
	57	20	.4	40		
	3	45	.9	0		
	77-19	845	16.9	95		
	2	190	3.8	0		
	77-20	545	10.9	3		
	77-18	535	10.7	70		
	1	130	2.6	1		
	77-15	795	15.9	3		
	77-23	735	14.7	50		
	8	100	2.0	0		Drill Hole 77-19
					64.45	

EXHIBIT F (6)

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in millions	Discovery Point
82	3	45	.9	30		
	57	20	.4	0		
	2	190	3.8	80		
	77-19	845	16.9	5		
	1	130	2.6	75		
	77-18	535	10.7	12		Drill Hole
	8	100	2.0	35		#2
	77-23	735	14.7	12	9.853	
83	137	10	.2	24		
	157	90	1.8	50		
	154	85	1.7	45		Drill Hole
	17	80	1.6	55	2.593	#17
84	137	10	.2	22		
	157	90	1.8	50		Drill Hole
	154	85	1.7	45	1.709	# 154
97	142	10	.2	80		Drill Hole
	78-39	1005	20.1	10	2.17	#142
98	78-39	1005	20.1	35		
	77-26	1340	26.8	20		
	78-38 A	1525	30.5	50		Drill Hole
	78-37	205	4.1	15	28.26	78-38 A
99	77-26	1340	26.8	35		
	77-14	475	9.5	16		
	77-31	980	19.6	45		
	78-38 A	1525	30.5	50		
	78-37	205	4.1	50		
	78-35	1275	25.5	50		Drill Hole
	78-40	710	14.2	20	52.61	78-37

Claim No.	Drill Hole No.	Vertical Drilled Thickness of ore zone (in feet)	Drill Hole Influence Zone ore tonnage (in millions)	% of Drill Hole Influence on Claim	Tons of ore in Claim Limits (in millions	Discovery Point
100	77-14	475	9.5	15		
	77-17	1010	20.2	25		
	77-31	980	19.6	35		
	77-32	1105	22.1	50		
	78-35	1275	25.5	50		
	78-41	1020	20.4	50		Drill Hole 77-32
	78-40	710	14.2	20		
	78-44	670	13.4	25	53.525	
101	77-17	1010	20.2	15		
	77-15	795	15.9	45		
	77-32	1105	22.1	33		
	77-25	1075	21.5	65		
	78-41	1020	20.4	32		
	78-46	795	15.9	70		
	94	40	.8	0		
	78-44	670	13.4	15		Drill Hole 77-25
	78-45	95	1.9	75	52.546	
102	77-23	735	14.7	38		
	77-15	795	15.9	6		
	8	100	2.0	0		
	133	100	2.0	1		
	77-22	875	17.5	65		
	77-25	1075	21.5	10		
	78-46	795	15.9	10		
	94	40	.8	66		
	34	130	2.6	6		
	78-45	95	1.9	2		
	128	95	1.9	3		Drill Hole 77-22
					22.446	

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
103	77-23	735	14.7	5		
	8	100	2.0	30		
	133	100	2.0	65		
	77-22	875	17.5	38		
	34	130	2.6	80		
	97	30	.6	10		Drill Hole
	127	25	.5	8		#34
	128	95	1.9	45	12.32	
104	97	30	.6	80		Drill Hole
	127	25	.5	30	0.63	#97
119	78-40	710	14.2	25	3.55	Drill Hole 78-40
120	78-40	710	14.2	25		
	78-44	670	13.4	28		Drill Hole
	149	15	.3	55	7.467	#149
121	78-44	670	13.4	18		
	78-45	95	1.9	40		
	118	70	1.4	70		
	117	65	1.3	70		
	149	15	.3	30		Drill Hole
	104	90	1.8	6	5.26	#118
122	120	60	1.2	100		
	118	70	1.4	1		
	121	80	1.6	3		
	115	85	1.7	65		
	117	65	1.3	3		
	116	85	1.7	4		
	104	90	1.8	40		Drill Hole
	102	90	1.8			

102000

Claim No.	Drill Hole No.	Vertical Drilled Thickness of Ore Zone (in Feet)	Drill Hole Influence Zone Ore Tonnage (in Millions)	% of Drill Hole Influence on Claim	Tons of Ore in Claim Limits (in Millions	Discovery Point
123	128	95	1.9	45		
	127	25	.5	6		
	121	80	1.6	85		
	116	85	1.7	55		Drill Hole
	119	50	1.0	35		#121
	102	90	1.8	35	4.16	
124	127	25	.5	40		Drill Hole
	119	50	1.0	60	0.8	#119
141	104	90	1.8	40		Drill Hole
	102	90	1.8	10	0.9	#104
142	102	90	1.8	38	0.684	Drill Hole #102

Total Tonnage 776,830,000 tons

000203

EXHIBIT F

CALCULATED COSTS--MINE DEPARTMENT

Drill Production

Assumptions:

1. Hole diameter = 9"
2. Hole depth = 50'
3. Penetration rate = 1'/minute = 50.0 min./hole
4. Pulling-moving time = 2.5 min.
5. Level time = 2.5 min.
   Drill cycle = 60.0 minutes /hole
6. Available drilling time = 7 hours

Shot Pattern: 15 x 15
Ton Hole: 1125
Ton per foot drilled: 22.5
Bench Height: 50'
Tons drilled per year: 14.6 MM

Drilling hours/day: 7 ÷ Drill cycle $\frac{60}{60}$ = 7 holes/drill/shift

Tons/shift: 28,000 ÷ tons/hole 1125 = 24.89 = 25 holes/shift

25 ÷ 7 = 4 drills/shift/day

Drill Supplies

	Cost	Life Feet	Dollars/ Foot	Dollars/ Ton	Dollars/ Year	Quantity
Bit	$ 300	2,000	$0.15	$0.01	$ 97,500	325
Sub	400	25,000	0.02	0.0007	10,400	26
Pipe	2,000	50,000	0.04	0.002	26,000	13
			TOTAL	$0.0127	$133,900	

Drill Costs
(4 drills, 2 shifts/day)

	Quantity	Dollar Cost/Unit	Dollar/ Foot	Dollar/ Ton	Dollar/ Year
Diesel	1120 gal.	$ 1.00	$0.40	$.018	$262,800
Lubricants	100 gal.	2.00	0.08	.003	43,800
Filters, $40	4	40.00	0.06	.003	43,800
Hydraulic Oil	100 gal.	1.00	0.04	.002	29,200
Repair Supplies		500.00	0.18	.01	146,000
				$0.36	$525,600

Total Supply Costs/Ton = $0.0127
0.036
$0.0487

Cost per year = .0487 x 14,600,000 = $711,000

Blasting

Loading density 26.14 lb. ANFO/foot of hole
50 hole/blast x 50 ft. per hole loaded x 26.19 = 65,475 explosive
65,475 x $0.12 = $7,857 per blast
$7,858 - 56,000 = $0.14 per ton
14,600,000 lb. x $0.14 = $2,044,000 per year

ANFO Truck

		Dollar Cost/Unit	Dollar Cost/Hour
Fuel (Gas)	10 gal/hr/truck	$1.00	$20.00
Oil	1 gal/hr/truck	2.00	2.00
Tires		1.00	2.00
Repairs			10.00
			$34.00/hr.

7 x 34 - 28,000 = $0.01 per ton
14,600,000 x 0.01 = $146,000

Cost per year: $2,044,000
146,000
$2,190,000

Production Analysis

100+ ton trucks heaped capacity = 75 yds. x fill factor .9 = 67.5 cu. yd/load; cu. yd/load 67.5 - swell factor 1.5 = 45 back cu. yd/load

45 x 2.5 = 112.50 tons/load

28,000 - 112.50 = 250 loads/shift

Truck Hour/shift	8	Shovel Bucket Size	15 yds
Start-up time	.25 hrs	Cycle time	0.5 min.
Lunch	.50	Cycles/truck	8.0
Shutdown	.25	Load time/truck	4.0
Moving time	.50	Cleanup	.5
Max. work time	6.50	Total load time	4.5

6.5 x 50 min. ÷ 4.5 = 72 loads/shift/shovel
loads/shift/shovel 72 x shovel available .9 = 65 loads/shift/shovel
loads/shift 250 ÷ loads/shift/shovel 65 = 4 shovels/shift
truck/cycle time 8 ÷ 4.5 = 2 + 1 truck/shovel (spare)
truck/shovel 3 x shovels/shift 4 = 12 trucks/shift

Shovel	Hourly
Power 1200 KWH	$ 24.00
Lubricants	8.00
Teeth and adapters	4.00
Maintenance and repair	120.00
	$156.00 per hour

$$\frac{7 \times 4 \times 156}{28{,}000} = 0.16$$

14,600,000 x .16 = $2,336,000

Hauling	Hourly
Fuel at 15 gal/hr at $1/gal	$15.00
Lubricating oils	2.00
Tires	5.00
Maintenance	6.00
	$28.00

$\frac{28 \times 7 \times 12}{28,000}$ = 0.08 per ton

14,600,000 x 0.08 = $1,168,000 per year

Cleanup: 2, D-8's	$30.00
Diesel fuel: 15 gal/hr @ $1	2.00
Oil	5.00
Maintenance and Parts	$37.00

$\frac{37 \times 7 \times 2}{28,000}$ = $0.018 per ton

Labor Costs
(Operating Costs)

The following assumtion has been made to derive labor and operating costs:

Each day's-pay employee will work 1,936 hours per year straight time and receive pay for 2,080 hours (holidays plus 10 days vacation).

Arizona has many open pit mines and the pay scales were based on these plus approximately 30 percent for higher Alaska rates.

A shift differential of $0.14 for afternoon shift is averaged at $0.07. This will add $136 per year to base pay.

Mine (Labor)

Drilling:

1. Operators
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Helpers
   8 x (2,080 x 10.57 + 136) = 176,973

Blasting:

1. Leadmen
   2 x (2,080 x 11.07 + 136) = 46,323

2. Powdermen
   2 x (2,080 x 10.77 + 136) = 45,075

3. Helpers
   2 x (2,080 x 10.57 + 136) = 44,243

Loading:

1. Shovel Operators
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Shovel Helpers
   8 x (2,080 x 10.77 + 136) = 180,301

Hauling:

1. Truck Operators
   24 x (2,080 x 11.07 + 136) = 555,878

Cleanup:

1. Dozer Operators
   4 x (2,080 x 11.07 + 136) = 92,646

2. Laborers:
   10 x (2,080 x 10.57 + 136) = 221,216

Total Labor Cost $1,733,247

Concentration

Crushing:

1. Crusher Operators (2 shifts)
   8 x (2,080 x 11.07 + 136) = $ 185,296

2. Helpers
   8 x (2,080 x 10.57 +136) = 176,973

Grinding:

1. Operators
   12 x (2,080 x 11.07 + 136) = 277,939

2. Helpers
   12 x (2,080 x 10.57 + 136) = 265,459

Subtotal $ 905,667

Flotation:
(3 shifts, add $234)

1. Operators
   30 x (2,080 x 10.97 + 234) = $ 691,548

2. Helpers
   30 x (2,080 x 10.57 + 234) = 666,588

3. Mill Hands
   30 x (2,080 x 10.57 + 234) = $ 666,588

4. Laborers/baggers
   20 x (2,080 x 10.57 + 234) = 444,392

5. Tailings
   18 x (2,080 x 10.97 + 234) = 444,929

Total Concentration $3,819,712

Operating costs

Includes balls, liners, reagents, lime, etc., at $0.50 per ton $7,300,000

SUPPORT FUNCTIONS

Maintenance and Repair

1. Electricians
   9 x (2,080 x 11.07 + 234) = $ 210,146

2. Welders, mechanic machinists
   18 x (2,080 x 11.07 + 234) = 420,292

3. Service mechanics
   15 x (2,080 x 10.77 + 234) = 339,534

4. Tire mechanics
   4 x (2,080 x 10.77 + 234) = 88,712

5. Helpers
   12 x (2,080 x 10.57 + 234) = 266,640

Subtotal $1,325,324

Power Plant

1. Operators
   6 x (2,080 x 10.77 + 234) = $ 135,934

Warehouse and Dock

1. Clerk
   6 x (2,080 x 10.57 + 234) = 133,378

Warehouse and Dock Con't.

2. Equipment operators
   6 x (2,080 x 10.77 + 234) = $ 135,814

3. Laborers
   12 x (2,080 x 10.27 + 234) = 259,147

Subtotal $ 664,273

Communication and Transportation

1. Boat Crew
   8 x (2,080 x 10.27 + 234) = $ 172,765

2. Assaying Help
   3 x (2,080 x 10.27 + 234) = 64,787

Total $ 237,552

Operating Costs (Support)

1. Maintenance and Repairs

   a. .08 x (1,733,245 + 408,800) = $ 171,364

   b. Concentrator 8% of labor and Operating
      .08 x (3,819,712 + 7,300,000) = 889,577

   c. Support 10% labor
      .10 x (1,325,324) = 132,253

   Total $1,193,194

2. Power: Assume 1,500,000 KWH used per week
   at $0.027: 1,500,000 x 0.027 x 52 = $2,106,000

3. Warehouse and Dock 150,000

4. Communication and Transportation 400,000

5. Compressed Air 50,000

6. Assaying 45,000

Total (#3-6) $ 645,000

Support Summary

Labor:

Maintenance and Repair	$1,325,324
Power Plant	135,934
Warehouse and Dock	528,339
Communication and Transportation	172,765
Assaying Help	64,787
Total	$2,227,149

Operating:

Maintenance and Repair	$1,193,194
Power	2,106,000
Warehouse and Dock	150,000
Communication and Transportation	400,000
Compressed Air	50,000
Assaying	45,000
Total	$3,944,194

Overhead:

Staff and Supervision:

1. General Manager, 1 each	$ 45,000
2. Mine Superintendent, 1 each	36,000
3. Plant Superintendent, 1 each	36,000
4. Maintenance Supt., 1 each	36,000
5. Chief Engineer	33,000
6. General Mine Foreman	29,000
7. General Plant Foreman	29,000
8. Chief Electrician	27,000
9. Mine Shift Bosses, 4 at $24,000	96,000
10. Mill Shift Bosses, 6 at $24,000	144,000
11. Maintenance Shift Bosses, 6 at $24,000	144,000
12. Surface and Warehouse Foreman	24,000
13. Metallurgist	27,000
14. Chemist	27,000
15. Mine Engineer/Geologist	27,000
16. Chief Clerk	20,000
17. Engineer/Geologist Helper	20,000
18. Pilot	24,000
19. Boat Captain	24,000
20. Timekeeper	19,000
21. Secretary, 2 at $14,000	28,000
22. Safety Engineer	27,000
23. Nurses, 6 at $22,000	132,000
Total	$1,054,000

Fringe Benefits:

Days-Pay Labor Mine	$1,733,247
Concentration and Crushing	3,819,712
Maintenance and Repair	1,325,324
Power and Warehouse	664,273
Communication and Transportation	172,765
Assay	64,787
Total	$7,780,108
Fringe benefits at 45% of direct labor cost assumed for days-pay (.45 x $7,780,108)	$3,501,049.
Fringe benefits at 40% of direct labor cost for supervisory (.40 x $1,054,000)	$ 421,600
Total Fringe Benefits	$3,922,649

Total Costs

Labor	
Day	$7,780,108
Salary	1,054,000
Fringe Benefits	3,922,649
Total Labor	$12,756,757
Operating	
Mine	
Drill	$ 711,000
Blast	2,190,000
Load	2,336,000
Haul	1,668,000
Cleanup	292,000
Total	$7,197,500
Concentration	$ 7,300,000
Support and Power	$ 3,944,194
Total	$18,441,694

Labor	$ 7,780,108
Fringe	3,501,049
Supervisory	1,054,000
Fringe Benefits	421,600
Operating Costs	18,441,694
Total Direct Cost Per Year	$31,198,451

Total direct cost per year, mine and mill:

31,198,450 ÷ 14,600,000 = $2.13 per ton

It is estimated that the final cost of development and construction will be 400 million dollars which adds an additional $0.57 to the cost of mining and milling.

Transportation

Molybdenum sulfide is sold F.O.B. plant. As water haulage is cheaper than rail, it appears that the market for concentrates from Quartz Hill would come mainly from foreign sources.

According to the U.S. Bureau of Mines, the average water haul is $0.03 per ton-mile; for the 700 miles from Ketchikan the cost would be approximately $21 per ton. Haulage of the concentrate to Seattle would add an additional $0.03 per ton. If the return trip hauled an additional 18,442 tons of supplies the cost goes up to $0.06 per ton. Calculations are as follows:

Tons mined per year: 14,600,000
Average grade MoS_2: 0.15%
Concentrate recovery: 85

14,600,000 x 2,000 x .0015 x 85 = 37,230,000 lbs. MoS_2 per year or 18,615 tons of MoS_2.

Concentrates contain 95% MoS_2: $\frac{95}{100} = \frac{18,615}{x}$

x = 19,595 tons of concentrate

19,595 x 21 ÷ 14,600,000 = tons mined

It is assumed an equal tonnage in supplies to the mine would double the cost per ton mined.

Environmental Concerns

U.S. Borax is presently collecting environmental data to develop a representative picture of environmental conditions that exist at Quartz

Hill prior to any operation. This program is composed of the following elements:

Meteorology, air quality and noise
Surface and ground water hydrology, water quality and snow
Oceanography
Geology and soils
Vegetation, wildlife, and aquatic biology
Coastal and marine biology

It is anticipated that selected environmental parameters would continue to be monitored during the life of the operation.

Both Federal and State governments have strict laws concerning air and water pollution, and it is mandatory to operate within the limits imposed.

Costs of normal environmental protection measures are included in development and operational costs. Due to the environmental problems unique to the Quartz Hill area, $0.045 per ton was allowed to cover additional protection, mitigation, and rehabilitation measures.

MINERALS ALERT

April 7, 1981

Major Molybdenum Mine To Be Developed In Alaska. - U.S. Borax & Chemical Corp. has announced that it intends to bring the Quartz Hill molybdenum deposit into production by late 1987 at a cost of $870 million. The deposit is located 45 miles east of Ketchikan in southeastern Alaska. The ore body, containing 1.5 billion tons of ore, is believed to be one of the world's largest. The mine is expected to produce annually 40 million pounds of molybdenum in concentrate for approximately 70 years. This compares with an estimated U.S. mine production of 147 million pounds in 1980. The company estimates that half of the output will be exported to the Pacific Basin and Europe. Molybdenum supply should exceed demand through the mid-1980's, but company supply-demand studies indicate that by the late 1980's the market can absorb the added output.

John T. Kummer, 634-1020

New Titanium Sponge Plant Announced. - International Titanium Corp., owned by Japanese and American investors, announced it will build a $25 million titanium sponge plant at Moses Lake in central Washington. The new plant will have an initial annual capacity of 4,000 tons, will be completed in early 1982, and will employ 125 people.

Langtry E. Lynd, 634-1073

Secondary Aluminum Antidumping Investigation Initiated. - On March 24, petitions were filed with the Department of Commerce and International Trade commission by the Aluminum Recycling Associaton, Inc., alleging that secondary aluminum alloy in unwrought form from the United Kingdom is being sold in the U.S. at less than fair market value and that an industry in the U.S. is being materially injured or threatened with material injury by reason of such imports. Accordingly, the Commission is instituting a preliminary antidumping investigation to determine whether a reasonable indication of such injury exists.

Horace F. Kurtz, 634-1080

Branch of Domestic Data
Ken Hanks, 653-7740

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MINERALS ALERT

April 7, 1981

French Minerals Study Issued. - An exhaustive statistical study of world mine production of the 51 principal fuel and non-fuel minerals has been published by the Bureau de Documentation Miniere in the Annales des Mines, Paris, for November-December, 1980. The study, which appears every 5 years, calculates the value of non-fuel mineral production (excluding quarry production) in 1978 as $62.0 billion, compared with $53.9 billion in 1973, both expressed in 1978 dollars. Value of fuels, substantially larger, was $416.9 billion in 1978. The Soviet Union retained first place with a value of non-fuels minerals production of $12.9 billion, and the United States was second with $8.8 billion. Values used were those reported by the producers, or calculated from world prices where necessary.

William Keyes, 632-5047

Important Molybdenite Deposit Discovered in Republic of Korea. A significant molybdenite deposit was found recently by the Korea Mining Promotion Corp. in Yongwol county of Kwangwon Province. The deposit is in the Sangdong mining area, about 81 miles southeast of Seoul, and was reported to have about 80 million metric tons of ore with 0.41% Ma. A tungsten deposit of about 1.4 million tons grading 0.5 percent tungsten was also discovered near the molybdenite find.

John Wu, 634-1272

Alcoa Alumina Expansion in Jamaica. - Alcoa and three Norwegian companies (Elkem, Norsk Hydro, and Ardal Og Sunndal Verk) ended several months of negotiations and signed an agreement for an expansion which will double capacity of Alcoa's 550,000-ton-per-year alumina refinery in central Jamaica. Alcoa will hold a 51% interest in the expanded plant, the Norwegian companies 29%, and the Jamaican Government 20%. Sharing of the estimated $350 million construction cost and engineering details remain to be decided.

Doris Hyde, 632-9352

Persian Gulf States to Set Up Aluminum Rolling Mill. - Six Persian Gulf States signed a joint-venture agreement in February of 1981 to establish the Gulf Aluminum Rolling Mill Company (GARMC), at a cost of around $100 million. The plant, to be located in Bahrain, will be integrated with Aluminum Bahrain's (ALBA) primary smelter, which will complete expansion from 126,000 tons to 160,000 tons per year by the end of 1981. The planned capacity of the rolling mill is 40,000 tons per year of semi-fabricated aluminum products. Production is scheduled to begin at the end of 1983. Equity holders in the venture are Saudi Arabia, Bahrain, Kuwait and Iraq 20% each, Oman and Qatar 10% each.

Peter J. Clarke, 632-5065

Zimbabwe Mineral Value Up 1/3. - The value of production of both fuel and non-fuel mineral commodities in Zimbabwe increased to $614.2 million from $466 million in 1979. Production of 367,000 troy ounces of gold was valued at $214.6 million, or 35% of the total. The value of asbestos production was $103.6 million followed by the value of nickel output at $96.2 million. The first year of mineral industry activity following 16 years of economic sanctions also experienced sharply higher wage and benefit costs due to the imposition of minimum wage scales in late 1980. A decline of metal prices may impact future mineral production even though the industry has had rapid growth despite the period of civil war and restricted markets.

George Morgan, 632-5065

Branch of Foreign Data
Arylene Butler, 634-1279

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