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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

Area VIII - Alaska

EXAMINATION REPORT

MITCHELL COPPER PROSPECT

by

A. L. Kimball

Area VIII Mineral Resource Office
Juneau, Alaska

Report No. 1592 April 1966

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MITCHELL COPPER PROSPECT[1/]

by

A. L. Kimball[2/]

ABSTRACT

The Mitchell copper property lies above timberline on an open ridge near the headwaters of Kechumstuk Creek, 33 miles west of Chicken, Alaska, the nearest year-round settlement.

Exposures in a hand trench consist of veins or lenses of copper sulfide mineralization, dominantly bornite, in a garnetiferous skarn zone within a small roof pendant not far from a contact with dioritic rocks.

Further copper mineralization in decomposed skarn was noted in dozer trenches more than 200 feet apart along strike. Copper-bearing skarn float was noted for 900 feet along strike and skarn for 4,000 feet or more in roughly the same alignment.

Weighted assays indicated 2.73 percent copper in a 4.4-foot width in the hand trench. Silver analyses of two of the six segments of the 4.4-foot width indicate a rough silver-copper ratio of nearly 1/2 ounce silver per ton for each percent of copper.

No significant anomalies were found by rapid magnetometer reconnaissance.

INTRODUCTION

The Mitchell copper property was examined by Bureau of Mines engineers in September 1963 as part of an investigation of the mineral resources that might be affected by the proposed Rampart hydroelectric project.

Light snow fell on the second day of the two-day examination, possibly obscuring pertinent information.

A visit to the property was made on foot in 1961 by George Moerlein, Bear Creek Mining Co., and Robert H. Saunders, State Division of Mines and Minerals. A report has been published by the State Division of Mines and Minerals in its annual report for 1962.

1/ Work on manuscript completed April 1965.

2/ Mine examination and exploration engineer, Area VIII Mineral Resource Office, Bureau of Mines, Juneau, Alaska.

HISTORY AND OWNERSHIP

Three or more lode claims (the exact number not determined), recorded in June 1954, were located along the structural strike of the deposit. The claims were located by John Hajdukovich of Big Delta, Alaska.

A dozen trenches or cuts had been excavated by crawler tractor during the mid-1950's and were predated by an earlier hand trench and small prospect pits.

A man by the name of Mitchell carried on earlier prospecting in the area and had a cabin, now in disrepair, 1,000 feet below the prospect on a small pup to the east. The dates of his activity are uncertain.

LOCATION AND ACCESSIBILITY

The Mitchell copper prospect is at an altitude of approximately 4,400 feet, above timberline on an open ridge which slopes toward the northeast. The property is in the headwater drainage of Kechumstuk Creek, 33 miles west of Chicken and 52 miles north of Tok. It is in the southeast corner of the Eagle (A-5) quadrangle at approximately 64°05' N latitude and 143°02' W longitude (fig. 1).

A winter tractor-trail follows the Mosquito Fork of the Fortymile River from Chicken, the nearest inhabited settlement, to Kechumstuk, now abandoned, thence up Kechumstuk Creek to the prospect. The country is largely underlain by permafrost, and much of it is covered by muskeg and rock rubble. Walking is difficult, and cross-country tractor travel usually must be limited to the winter months.

It is unlikely that fixed-wing bush aircraft could be landed within miles of the prospect during the summer.

Access was gained by helicopter at the time of the Bureau of Mines examination.

CLIMATE

Several weather stations are within 50 to 80 miles of the prospect and, though in the same division of Alaskan climate, all lie in the valleys of either the Yukon or Tanana Rivers, whereas the prospect is situated on an open ridge 3,000 feet higher. Weather records at these stations are probably not entirely representative of conditions at the prospect.

The closest station is at Tanacross where average January and July temperatures are -13.3° F and 58.6° F, respectively, and rainfall averages approximately 10 inches per year. Temperature extremes of 90° F above, and 70° F below zero have been recorded.

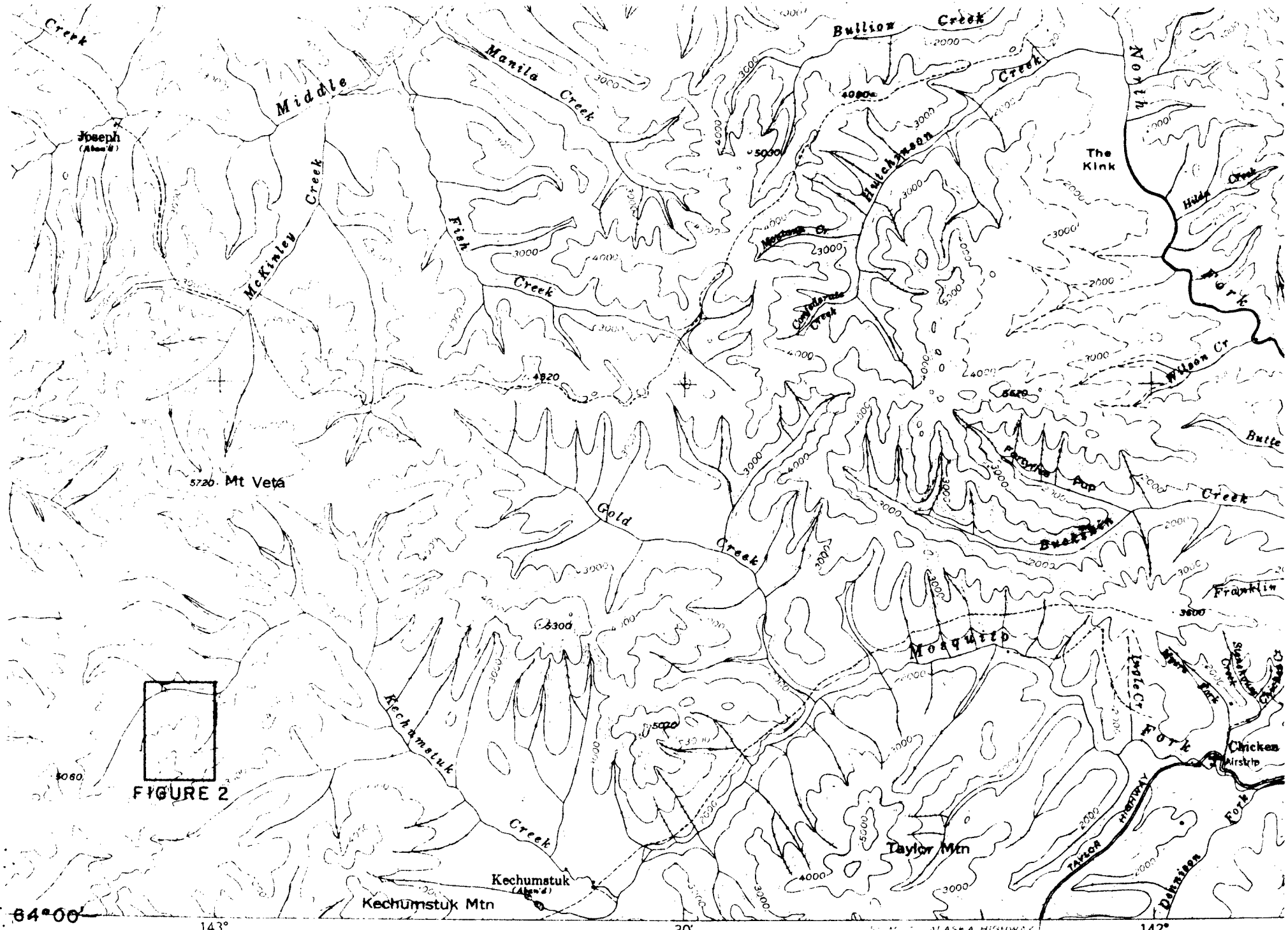

FIGURE 1.- Index Map, Mitchell Copper Prospect.

Scale: 1 in = 4 mi

PHYSICAL FEATURES AND GENERAL GEOLOGY

The country near the prospect is drained by Kechumstuk Creek, tributary to the Mosquito Fork of the Fortymile River which enters the Yukon River 15 miles east of the International Boundary.

The claims are on an open ridge slope that is largely covered with tufted grassy tundra and a profusion of blocks and rock rubble. Timberline is very irregular, partly because gullies and pups support more vegetation than the open ridges. A tongue of sparse spruce trees and brush reaches within 500 feet vertically of the prospect, though elsewhere for the most part timberline is considerably lower.

The ridges rise nearly 1,000 feet above the prospect to the south, while the Kechumstuk Creek valley immediately to the north is approximately 1,500 feet below it.

The divide area between Kechumstuk Creek on the east and the North Fork of the Fortymile River on the west is above timberline, moderately rugged, and roughly defines a broad band of intrusive rocks regionally mapped by Mertie[3/] as diorite to granodiorite, tentatively Mesozoic in age. Cambrian to pre-Cambrian Birch Creek schist and associated metamorphics are mapped to the east and west of this igneous band. The prospect is approximately 2 miles west of the easterly contact of this intrusive mass with the metamorphics as mapped, and lies in metasedimentary rocks that appear to comprise a roof pendant or remnant of metasediments within the larger mass of intrusive rocks.

THE PROSPECT AND WORK BY THE BUREAU OF MINES

Mineralization consists of copper sulfides (dominantly bornite with subordinate chalcocite and chalcopyrite with traces of malachite) closely associated with a highly garnetiferous skarn zone in siliceous-carbonaceous metasediments at or near a contact with dioritic rocks. The metasediments probably comprise a small roof pendant in a much larger mass of intrusive rocks.

A series of shallow dozer trenches, an earlier hand trench, and several small pits were the extent of work seen, all of which was done 10 or more years ago.

A 38-foot-long hand trench exposed bornite and minor amounts of other copper sulfides as lenses, pods, or irregular parallel veins. A 4.4-foot stratigraphic width of the mineralized exposure was channel sampled in six segments, labeled samples 2A-2F. The three highest assays[4/] indicated

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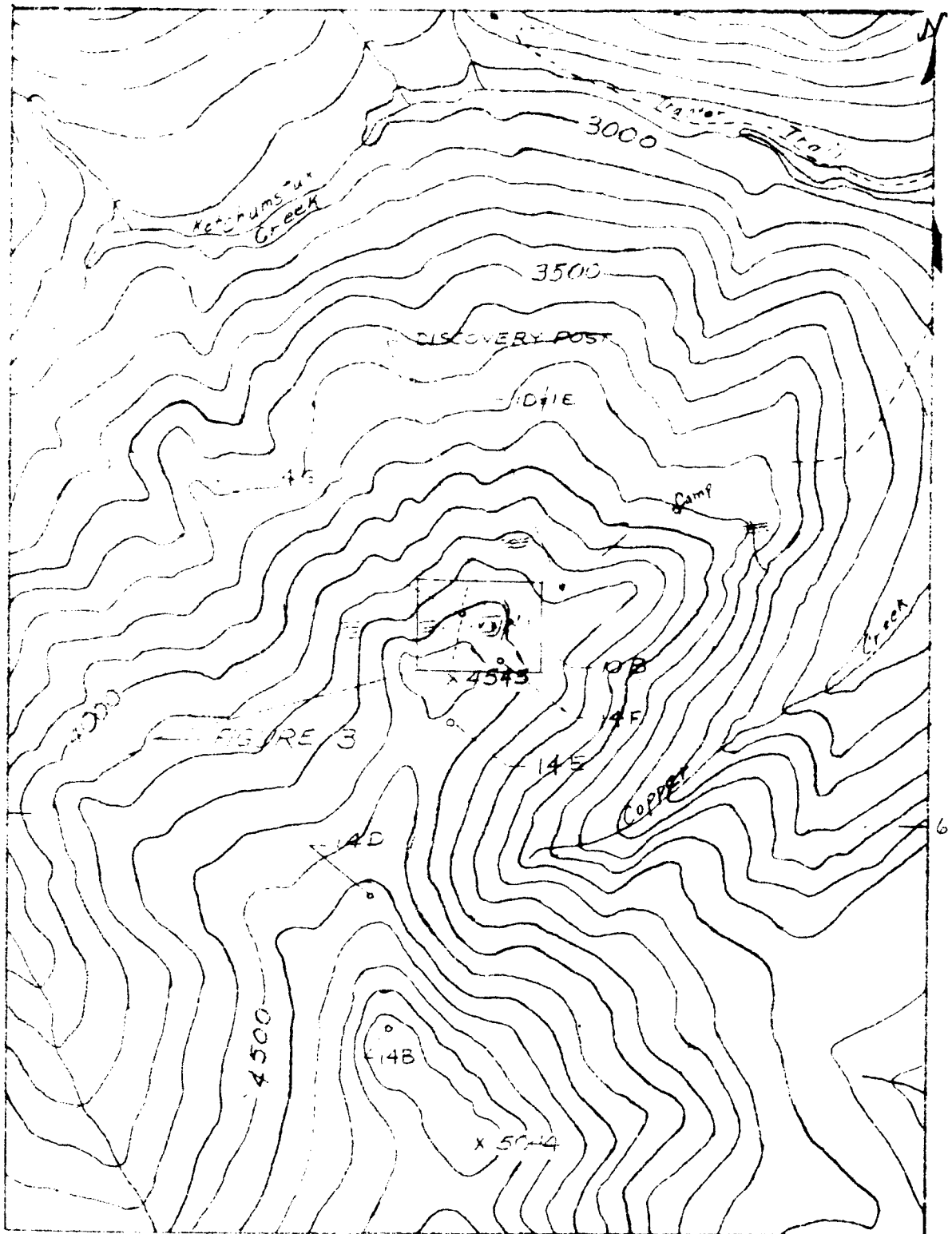
3/ Mertie, J. B., Jr. The Yukon-Tanana Region, Alaska. U.S. Geol. Survey Bull. 872, 1937, plate 1.

4/ See tables 1 through 6 for assay and petrographic results and figures 2 and 3 for sample locations.

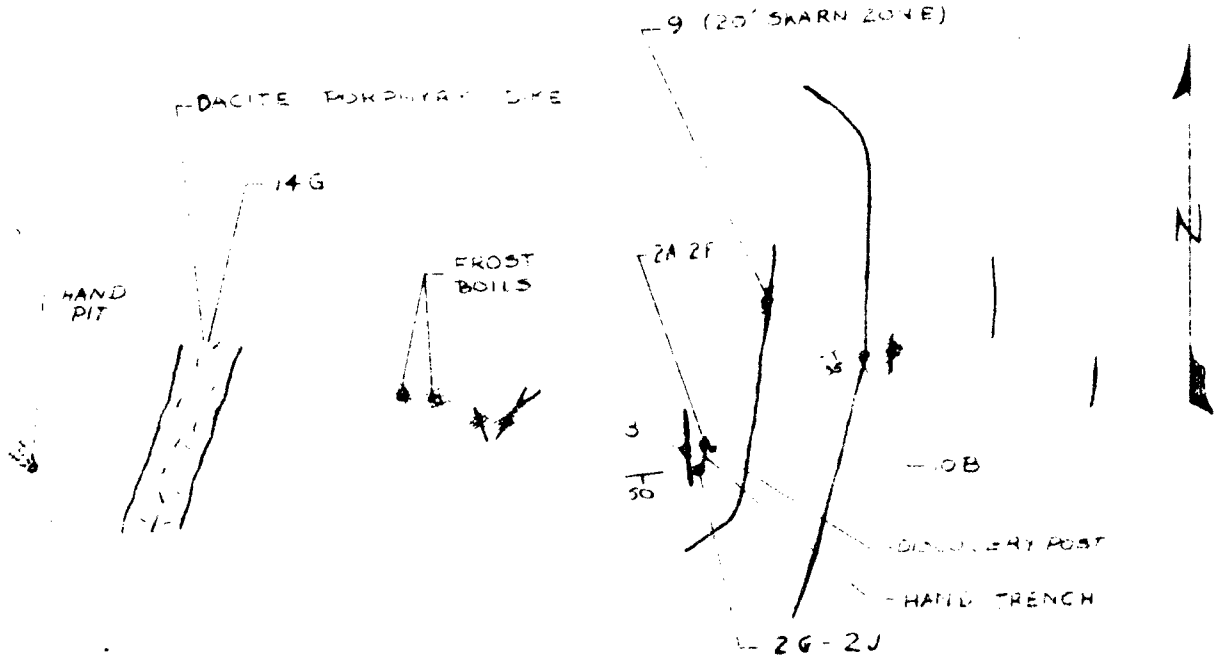


Scale 1" = 2,000'

PETROGRAPHIC SAMPLE LOCATIONS

MITCHELL COPPER

Figure 2



LEGEND

3 • SAMPLE LOCATION

—— BULLDOZER CUT

✱ FLOAT SKARN WITH COPPER MINERALS

MITCHELL COPPER

SAMPLE LOCATIONS

SCALE: 1" = 200'

FIGURE 3

10.91 percent copper and 5.28 ounces silver across 0.25 feet, 9.93 percent copper and 4.15 ounces silver across 0.50 feet, and 4.78 percent copper across 0.80 feet. Two tenths of a percent bismuth was also found in each of the first two. Weighted average copper content for all six segments was 2.73 percent copper for the 4.4-foot width. The sample width was composed of alternate bands of quartzite, skarn, and altered limestone and was largely copper-bearing, but with the predominance of copper in the skarn. The skarn was largely grossularite garnet, diopside, and bornite and contained minor chalcocite and digenite with traces of calcite, malachite, sphalerite, and covellite.

The hand trench was shallow except for 5 feet of its length that penetrated to a depth of nearly 5 feet below the top of the bedrock and though this was the only locality in which more than traces of bornite or other copper minerals were seen in place, it also was the only locality where prospecting exposed material significantly below the top of the bedrock.

Earthy greenish decomposed skarn zones were seen in a shallow bulldozer trench 200 feet easterly and 20 feet to the west. A grab sample (No. 3) of the latter assayed 0.68 percent copper and was composed of garnet, quartz, diopside, and minor bornite. The greenish cast may have been due to the diopside, vegetation, or malachite though malachite was not reported.

Channel-chip samples (2G-2J) of the southernmost portion of the 38-foot hand trench, 20 feet south of the 4.4-foot stratigraphic section, assayed 0.56 percent copper over a 5.2-foot width. An included 0.90-foot segment, as a separate sample, assayed 3.73 percent copper.

A grab sample (No. 9) from a gossan-skarn zone 20 feet wide exposed in a dozer cut 150 feet northwest of the hand trench assayed 1.72 ounces silver and no gold. The composition was dominantly limonite and quartz with lesser garnet and amphibole. Traces of copper were detected spectroscopically but were also detected in most of the other rocks of the area. Limonitic skarn was exposed at this point only.

The immediate area of the prospect was largely covered by rock rubble or extensive areas of muskeg and tufted grass containing frost boils. None of the rocks seen in place were at critical points.

The copper mineralization was almost invariably found associated with skarn though the converse was frequently not true, for though copper minerals largely as float were found in a crude east trending alignment for more than 900 feet, barren skarn fragments were found sparsely scattered in similar alignment for more than 4,000 feet.

An unmineralized porphyritic dacite dike 50 to 75 feet thick cuts the structure 500 feet west of the hand trench. Its definition was determined only with difficulty from a band of float and rubble appearing similar to other local rocks on weathered surfaces. Its attitude in rough approximation is N 20° E with steep easterly dip.

Local float and rubble are igneous with some metamorphics and consist of quartz-monzonite, gneissic diorite, quartzite, skarn, limestone, and gossan near the prospect with granite and quartz diorite a mile or more to the south.

Some of the gneissic diorite may be in place 100 feet or more south of the main copper showing in the metasediments.

Magnetometer reconnaissance in the general area revealed no significantly anomalous values, and no magnetic minerals were identified petrographically other than normal small amounts in the igneous rocks.

CONCLUSIONS AND RECOMMENDATIONS

The zone of bornite veins in the skarn does not appear exceptionally large from exposures seen in place but does have good values in copper over several feet of width and contains some silver. Since most of the area is covered by soil and rock rubble containing intermittent residual mineralized float for some distance in either direction along a generalized strike, it is probable that the mineralization extends considerably beyond that seen in place.

A geochemical survey along the skarn line combined with an appropriate electrical geophysical method might disclose anomalies that would strengthen the justification for as well as indicate the location of additional work. Such additional work should initially take the form of packsack diamond drilling on a small scale because such equipment could be moved in by helicopter and because local water supply from swampy areas near the prospect would at best be adequate for only a relatively small packsack drilling program. A larger drill would require pumping from possibly a 1,000-foot lower elevation and involve far more preparation because of the water supply problem and transportation.

It does not appear that dozer trenching would be an adequate tool for further exploration of this property.

TABLE 1. - Assay samples and results

Sample No.	Assay Results Cu percent	Bi percent	Au oz/ton	Ag oz/ton	Sample type	Stratigraphic thickness, feet	Remarks
2A	10.91	0.20	0.02	5.28	Channel	0.25	Skarn and bornite.
2B	1.22	-	-	-	do....	.15	Quartzite and skarn.
2C	9.93	.20	.04	4.15	do....	.5	Skarn and bornite.
2D	.41	-	-	-	do....	.65	Do.
2E	.04	-	<.01	<.01	do....	2.05	Skarn.
2F	4.78	.07	-	-	do....	.8	Skarn and bornite.
2G	.56	-	-	-	Chip...	5.2	Skarn.
2H	1.25	-	-	-	Channel	1.2	Skarn and malachite.
2I	.08	-	-	-	do....	.35	Banded quartzite.
2J) 2K)	3.73	-	-	-	do....	.9	Skarn and bornite.
3	.68	-	-	-	Grab...	-	Skarn.
9	-	-	<.01	1.72	do....	-	Limonitic skarn.

TABLE 2. - Petrographic samples

Sample No.	Figure	Description
1D	2	Float, quartz monzonite.
1E	2	Float, skarn.
2A	3	Channel sample, bornite and skarn.
2C	3	Do.
2E	3	Channel sample, skarn.
2G	3	Chip sample, skarn.
2K (2J)	2	Channel sample, bornite and skarn.
3	3	Decomposed skarn with minor copper minerals.
9	3	Grab, limonitic skarn zone 20 feet wide.
10B	3	Similar to sample No. 3, less decomposition.
14B	3	Blocky quartz diorite rubble.
14D	3	Granite float.
14E	3	Tactite float.
14F	3	Metadiorite gneiss in place south of mineralized zone.
14G	3	Porphyritic dacite dike 50 to 75 feet wide.
15A-G	-	Suite of rocks from locations of samples No. 2A-2K.

TABLE 3. - Petrographic analyses

Sample No.	1D	1E	2A	2C	2E	2G	2K	3	9	10B
Element:										
Al	X	-	T	T	X	X	-	-	T	X
Ca	X	X	T	T	X	X	X	X	T	X
Mg	X	X	-	-	X	X	X	X	N	X
Na	X	T	-	-	-	-	-	-	T	-
Ba	T	T	-	-	T	T	N	T	-	T
Cr	T	N	N	N	T	T	T	T	N	T
Cu	T	T	X	X	T	X	X	X	T	T
Li	T	T	-	-	-	T	N	T	-	T
K	X	N	-	-	-	N	-	-	-	N
Mn	T	X	T	T	T	-	X	X	T	X
Sr	T	-	-	-	T	-	T	T	-	T
Ti	T	T	T	N	T	T	T	T	-	T
V	T	N	N	N	N	T	N	-	N	N
Ag	N	N	T	T	N	N	T	N	N	N
Be	N	N	-	-	N	N	N	N	-	N
Bi	N	N	N	X	N	N	L	N	N	N
Mo	N	N	N	N	N	N	N	N	N	T
Ni	N	-	N	N	N	N	N	N	N	-
Pb	N	N	N	T	N	N	N	N	N	N
Rb	N	N	-	-	-	-	-	-	-	N
Zn	N	T	T	T	T	T	L	X	T	T
Fe	-	X	X	X	X	X	X	T	X	X
Ga	-	N	N	T	N	N	N	N	N	N
Cd	-	-	-	-	-	-	-	T	-	-
Cb, In, Sn, Y, Zr	N	N	N	N	N	N	N	N	N	N

Legend:
P - Predominant more than 50 percent
A - Abundant 10 - 50 percent
S - Subordinate 2 - 10 percent
M - Minor 0.5 - 2 percent
F - Few 0.1 - 0.5 percent
T - Trace less than 0.1 percent
X - Detected in sample
N - Sought but not detected
L - Notable amounts less than 0.1 percent.

TABLE 4. - Petrographic analyses

Sample No.	1D	1E	2A	2D	2E	2G	2K	3	9	10B
Rock classification:										
Quartz monzonite	C	-	-	-	-	-	-	-	-	-
Skarn	-	C	-	C	C	C	C	C	C	C
Minerals:										
Actinolite	-	A	-	-	-	-	-	-	-	-
Actinolite+tremolite	-	-	-	-	-	-	-	-	M	P
Andesine	A	-	-	-	-	-	-	-	-	-
Biotite	S	-	-	-	-	-	-	-	-	-
Bornite	-	-	A	A	N	F	A	F	-	T
Calcite	F	A	T	F	-	F	S	S	-	M
Chalcocite	-	-	M?	S?	-	-	-	-	-	T
Chalcopyrite	-	-	N	N	N	-	F	N	-	-
Chlovite	-	-	-	-	-	F	F	-	-	-
Chrysocolla	-	-	-	-	-	T	T	-	-	-
Covellite	-	-	-	T	-	-	T	T	-	-
Cubanite	-	-	N	N	N	-	-	-	-	-
Cuprite-tenorite	-	-	-	-	-	-	-	-	-	N
Diopside	T	M	A	A	A	A	-	S	-	-
Digenite	-	-	-	S	-	-	F	N	-	T
Garnet (Ca,Fe or Ca,Al)	-	P	P	P	-	S	A	S	S	M
Limonite	-	T	-	-	-	T	F	-	A	-
Magnetite	N	N	-	-	-	-	-	-	-	-
Malachite	-	-	T	T	-	-	-	-	-	-
Manganese dioxide	-	-	-	-	-	-	-	-	-	T
K-feldspar	A	-	-	-	-	-	-	-	-	-
Powellite stain f	-	-	-	-	-	-	-	-	-	T
Pyrite	-	-	N	N	N	-	N	N	-	-
Pyrrhotite	-	-	N	N	N	-	N	N	-	-
Quartz	A	S	-	N	A	A	A	A	P	-
Sphalerite	-	-	-	T	N	-	T	N	-	-
Tremolite	-	-	-	-	A	-	A	-	-	-
Fluorescence	N	N	-	N	N	-	N	N	N	X
Radioactivity	N	-	-	-	-	-	-	-	N	-
Copper oxide, green	-	-	-	-	-	-	-	-	-	X

Legend:
P - Predominant more than 50 percent
A - Abundant 10 - 50 percent
S - Subordinate 2 - 10 percent
M - Minor 0.5 - 2 percent
F - Few 0.1 - 0.5 percent
T - Trace less than 0.1 percent
C - Rock classification
X - Detected in sample
f - Fluorescent
N - Sought but not detected

TABLE 5. - Petrographic analyses

Sample No.	14B	14D	14E	14F	14G
Spectroscopic:					
Ag Bi In Pb Sn Zn	-	-	N	N	N
Al Ca Fe K Mg Na Ti	-	-	X	X	X
Ba Cr Cu Ga Li Mn Sr V	-	-	T	T	T
Be Cb Mo Ni Rb Y	-	-	N	N	N
Zr	-	-	N	-	N
Rock classification:					
Granite	-	C	-	-	-
Metadiorite gneiss	-	-	-	C	-
Porphyritic dacite	-	-	-	-	C
Quartz diorite	C	-	-	-	-
Tactite	-	-	C	-	-
Minerals:					
Albite oligoclase	F	M	T	-	P
Andesine	A	A	P	P	-
Apatite	-	-	T	T	-
Biotite	M	M	-	-	-
Chlorite	S	M	S	S	-
Diopside	-	-	F	T	-
Epidote	-	T	S	M	-
Goethite	-	-	-	-	F
Hornblende	S	S	S	S	-
Hydromuscovite	-	-	M	-	-
K-feldspar	A	A	T	S	M
Magnetite	F	T	T	M	N
Muscovite	-	-	-	-	M
Quartz	A	A	A	S	S
Sphene	T	T	F	M	-
Tourmaline	-	T	-	-	-
Zircon f	-	-	-	T	-
Fluorescence	N	N	N	T	N
Radioactivity	N	N	N	N	N

Legend:
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- M - Minor 0.5 - 2 percent
- F - Few 0.1 - 0.5 percent
- T - Trace less than 0.1 percent
- C - Rock classification
- X - Detected in sample
- f - Fluorescent
- N - Sought but not detected

TABLE 6. - Petrographic analyses

Sample No.	15A	15B	15C	15D	15E	15F	15G
Spectroscopic:							
Bi Cu	X	-	-	-	-	-	-
Ag Ga Pb Zn	T	-	-	-	-	-	-
In Mo Sn	N	-	-	-	-	-	-
Rock classification:							
Gossan	-	C	-	-	-	-	-
Limestone	-	-	-	C	C	-	-
Quartzite	-	-	C	-	-	-	-
Skarn	C	-	-	-	-	C	C
Minerals:							
Biotite	-	-	-	-	-	S	-
Bornite	M	-	-	-	-	N	-
Calcite	S	-	F	P	P	-	-
Chalcocite	M	N	-	-	-	N	-
Chalcopyrite	N	N	-	-	-	N	-
Chlorite	-	-	S	-	-	M	-
Covellite	T	N	-	-	-	N	-
Diopside	S	-	-	M	-	A	A
Epidote	-	-	-	-	-	-	S
Garnet	P	-	-	-	-	-	-
Goethite-limonite	-	P	-	-	-	T	-
Graphite	-	-	-	T?	-	-	-
Labradorite	-	-	-	-	-	P	-
Actinolite	-	-	-	-	A	A	-
Pyrite	-	N	-	-	-	T	-
Pyrrhotite	-	N	-	-	-	M	-
Quartz	M	N	P	N	-	-	-
Wollastonite	-	-	-	-	-	-	P
Not identified	T	-	-	-	-	-	-
Fluorescence	N	N	N	N	T	N	N
Radioactivity	N	N	N	N	N	N	N

Legend:
P - Predominant more than 50 percent
A - Abundant 10 - 50 percent
S - Subordinate 2 - 10 percent
M - Minor 0.5 - 2 percent
F - Few 0.1 - 0.5 percent
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