Bureau of Mines
Report of Investigations 4986

INVESTIGATION OF THE COPPER BULLION CLAIMS, RUA COVE, KNIGHT ISLAND, ALASKA

BY F. A. RUTLEDGE

United States Department of the Interior — June 1953

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UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary
BUREAU OF MINES
J. J. Forbes, Director

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by

F. A. Rutledge[1]/

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ILLUSTRATIONS

1/ Mining engineer, Bureau of Mines, Juneau, Alaska.

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INTRODUCTION

The Bureau of Mines investigated the Copper Bullion claims at Rua Cove on the east coast of Knight Island in Prince William Sound, Alaska, during November-December 1948 and March-April 1949. This project was part of the Bureau of Mines program for developing critical and strategic minerals in Alaska.

Mineralization at the copper deposit on the Copper Bullion group of claims is mainly pyrrhotite and chalcopyrite, confined to a northeast-trending shear zone in the greenstone 2,000 feet northwest of Rua Cove. The property has been partly developed by two adits, by a number of crosscuts from the upper adit, and by several diamond-drill holes.

The deposit at Rua Cove is one of the larger known copper prospects in Prince William Sound. Because of its proximity and similarity to the old Beatson Mine on Latouche Island and the substantial quantity of low-grade ore already developed, this property was selected for additional development by the Bureau of Mines.

ACKNOWLEDGMENTS

The investigation was under the general supervision of G. D. Jermain, chief, Alaska Branch, Mining Division, Bureau of Mines. A preliminary examination of the deposit was made during August 1942 by Stephen P. Holt, mining engineer, Bureau of Mines.

Analytical determinations of samples were made by H. E. Peterson, chemist, Salt Lake City Branch, Metallurgical Division, Salt Lake City, Utah.

The use of the cabins on the property belonging to the lessee, Frank H. Dickey, Bellevue, Wash., facilitated the Bureau of Mines program.

Drill cores resulting from the Bureau of Mines drilling program were examined and logged by W. S. Twenhofel, geologist, Federal Geological Survey, Juneau, Alaska.

Acknowledgment also is made to the Consolidated Mining and Smelting Co. of Canada, Ltd., for the use of their drill logs and for the results of their 1929-30 development program.

LOCATION AND ACCESSIBILITY

The Copper Bullion prospect is 2,000 feet northwest of Rua Cove, a small inlet on the east coast of Knight Island in Prince William Sound, Alaska (figs. 1 and 2). United States Mineral Monument 8 on the Bullion claim 5 is located at latitude 60° 20' 33" N. and longitude 147° 39' 25" W. Knight Island is in the Valdez mining district; the recording office is at Valdez, Alaska.

Rua Cove is on the unprotected easterly side of Knight Island; consequently, it cannot be used for a harbor. At present all equipment and supplies must be landed by small boats during fair weather on an extremely narrow beach at the mouth of the small stream flowing into the sound below the beach cabin (fig. 3). An old corduroy road in the valley provides access from the beach to the mine, a distance of approximately 1/2 mile.

Marsha Bay southwest of the Copper Bullion prospect is a well-protected harbor. The construction of 1-1/2 miles of road would make the mine accessible from this bay. At present all water transportation is either by chartered fishing boats from Cordova, 75 miles east, or by the regular mail boat serving Prince William Sound. Small-boat charter costs approximately $75.00 a day; the mail boat charges $50.00 a stop plus $0.02 a pound for all freight.

PHYSICAL FEATURES AND CLIMATE

The relief on Knight Island is typical of that in Prince William Sound; the altitudes of the mountains range from 1,000 to over 3,000 feet. The entire region of Prince William Sound has been intensely glaciated. Remnants of the old ice sheet that covered the entire area and extended past Kodiak Island are present in many localities as alpine glaciers.

The precipitous mountains rise steeply from the shore of Knight Island; consequently, the beaches are narrow. The eastern slope of Iron Mountain (fig. 3) rises from tide water to over 2,000 feet. The Copper Bullion prospect is on the south slope of Iron Mountain and on the north side of a cirquelike basin that drains into Rua Cove.

This basin and the lower slopes of the mountains are covered with spruce, hemlock, and alder. Enough timber for mining use may be cut locally. Above 1,000 feet the mountains generally are barren.

The climate of the region is fairly mild, although rain and snow are heavy. Latouche, 24 miles southwest on Latouche Island, is the nearest place where weather records have been kept. The mean annual temperature for Latouche is 41.8° F.; the highest and lowest temperatures recorded are 82° and 1° F.; respectively. Average precipitation, including that formed by 162.2 inches of snow, is 176.79 inches. Some snow remains in the high mountains throughout the summer.

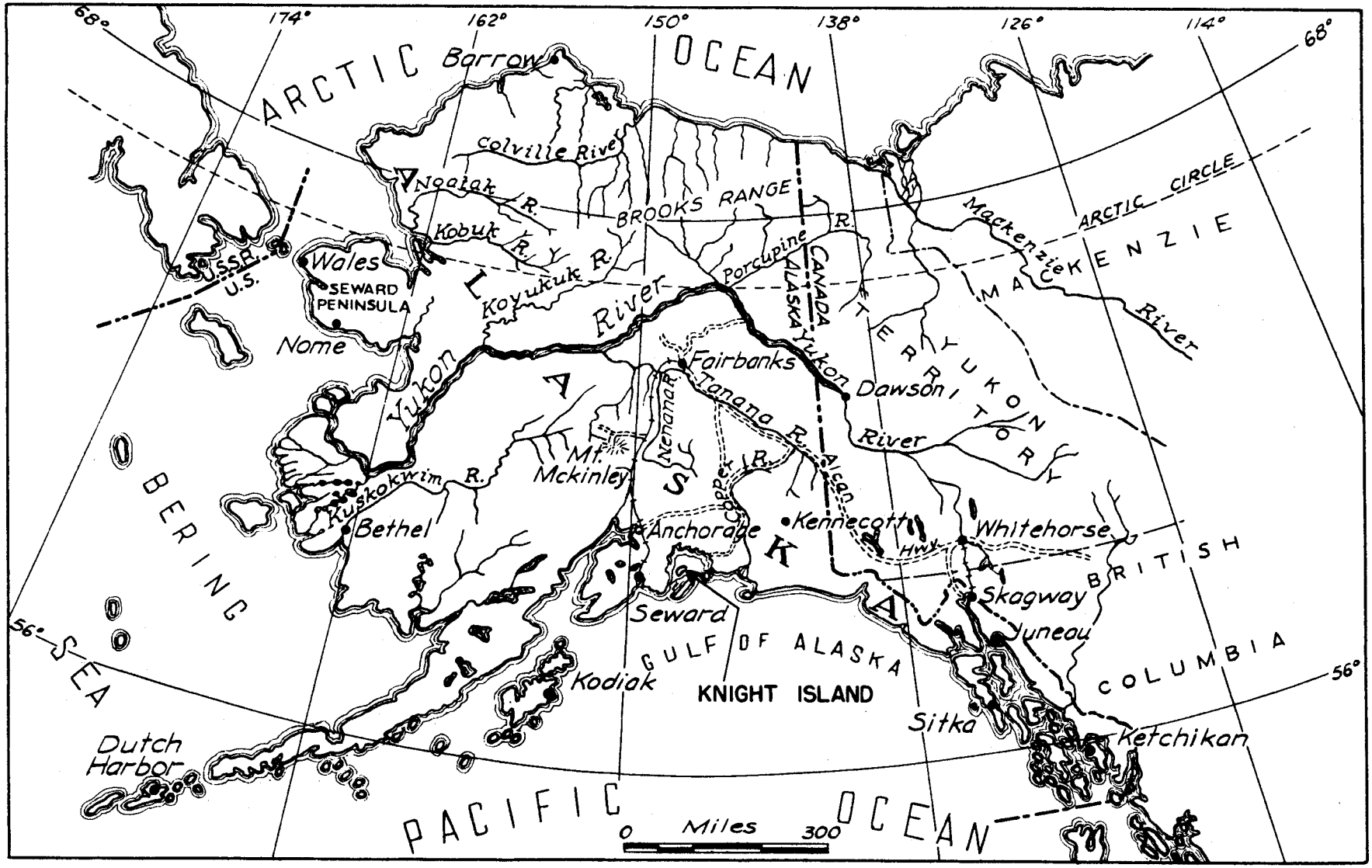

Figure 1. - Index map of Alaska.

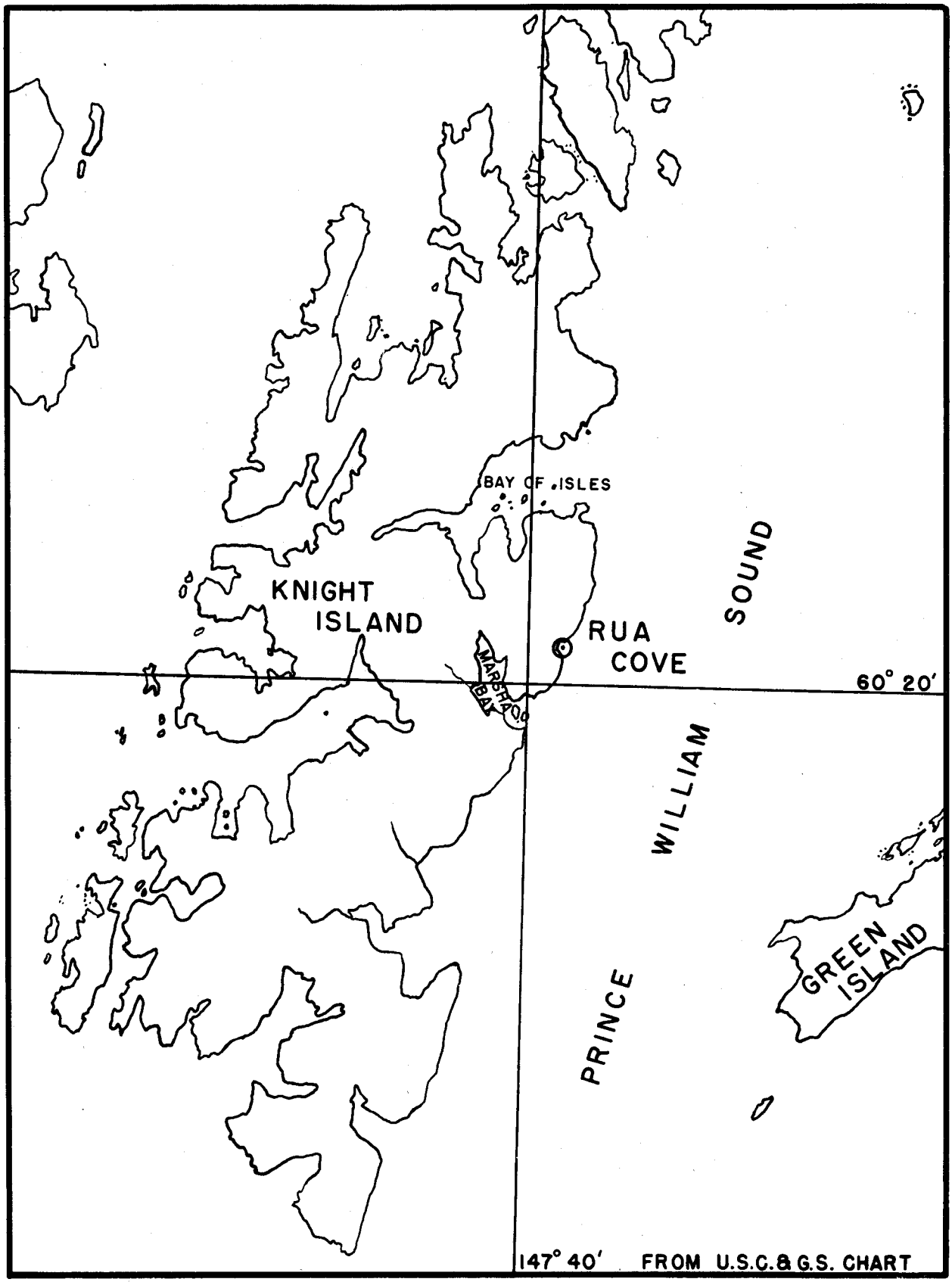

Figure 2. - Index map of Knight Island.

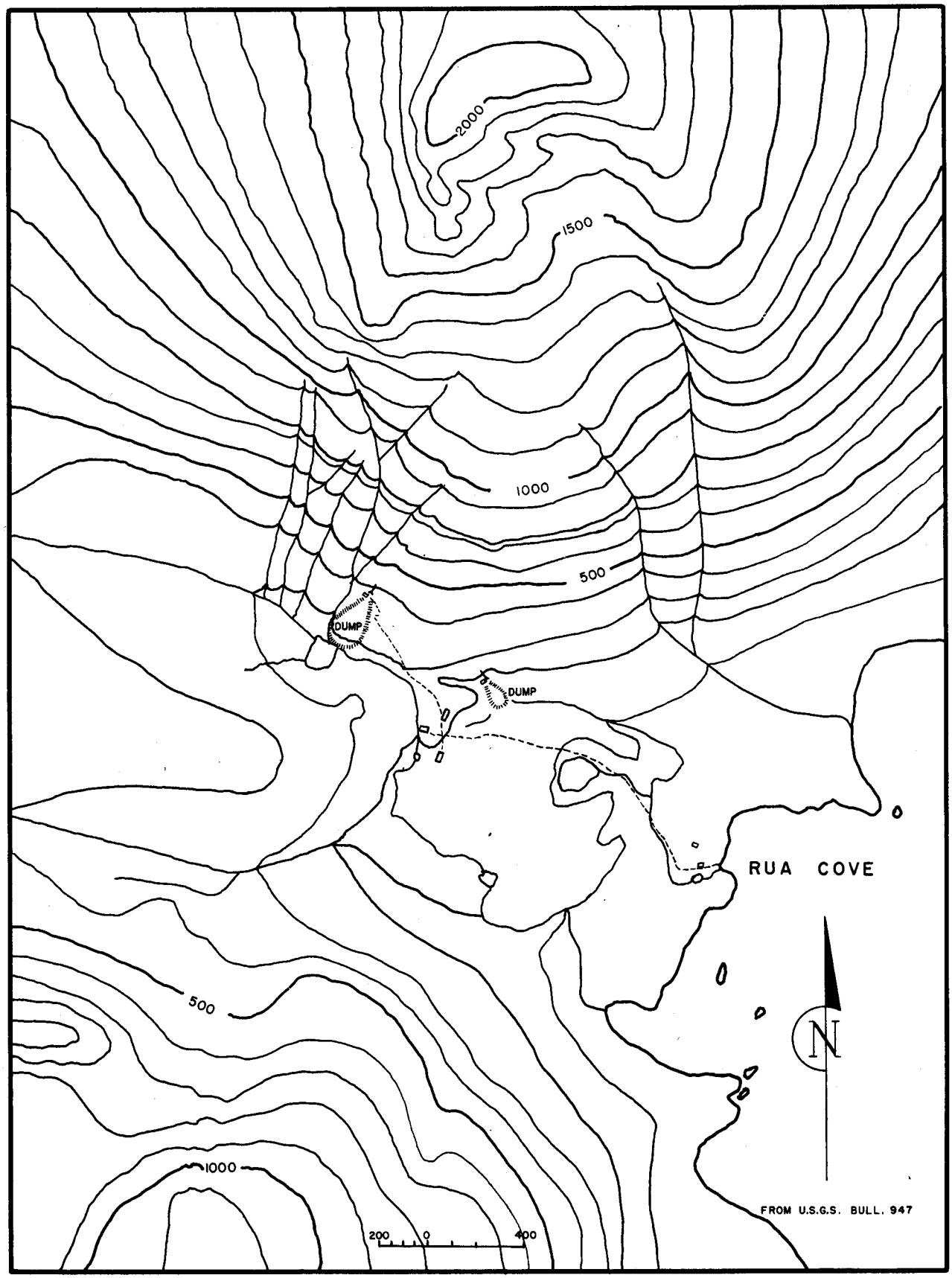

Figure 3. - Topographic map of Copper Bullion deposit and vicinity.

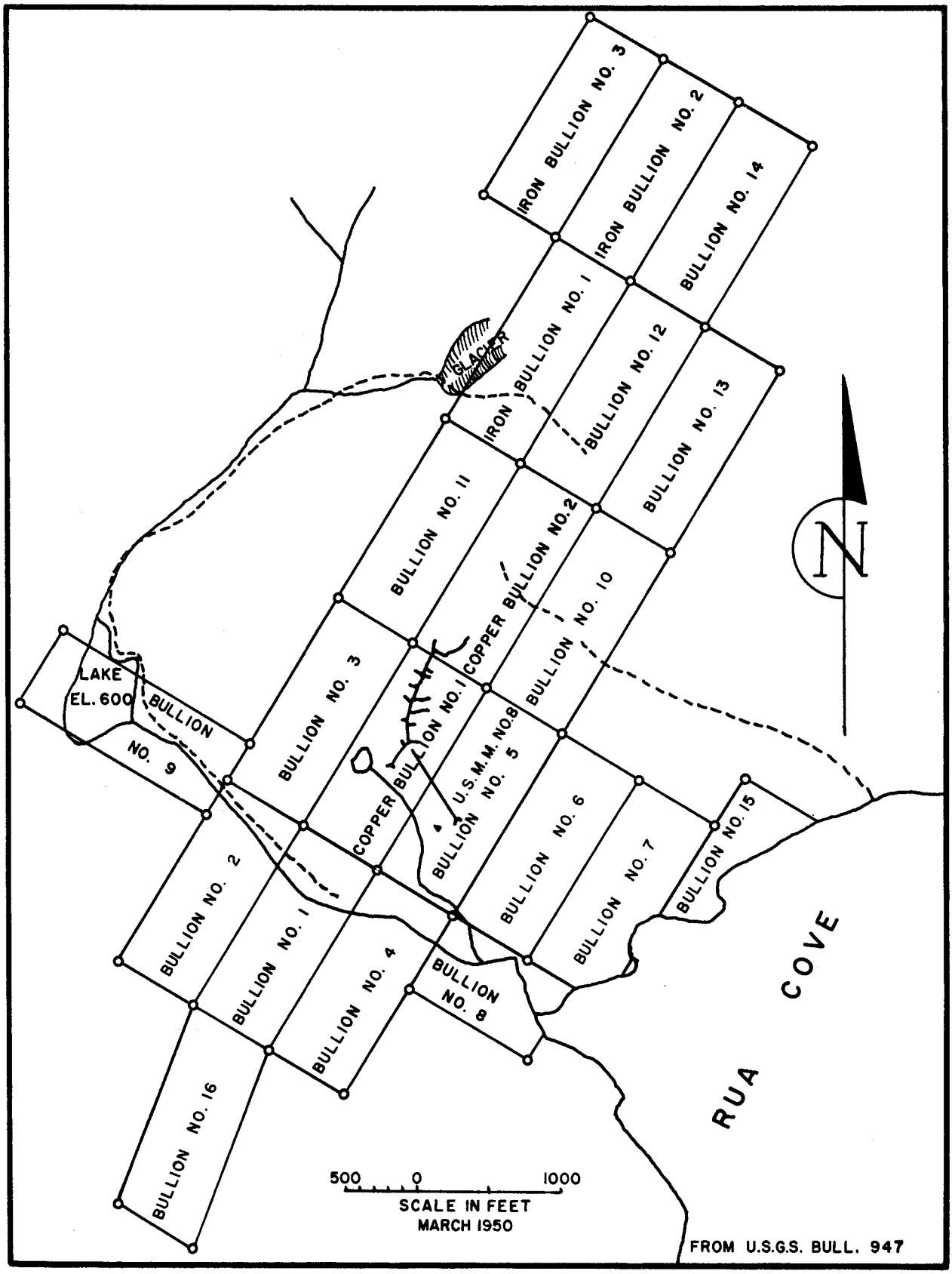

Figure 4. - Claim map of Copper Bullion group, Rua Cove.

A lake at an altitude of 600 feet is near the western edge of the basin; it can furnish enough water for a moderate power development (fig. 4). During the development of the property the stream flowing from this lake was used to run a Pelton wheel driving a 9- by 8-inch single-stage compressor.

HISTORY AND PRODUCTION

The initial location of the copper deposit at Rua Cove was made in 1905 or 1906 by Charles T. Rua, and development began soon after. By 1908, when the property was first examined by the Federal Geological Survey,[2] the main tunnel had been driven to a length of 360 feet. During 1912 the two claims, Copper Bullion 1 and 2, were patented by Fred Liljegren.

On the recommendation of W. A. Dickey, the property was acquired by Fred B. Snyder of Minneapolis, Minn., in 1916. It was then optioned to Dickey and active development was undertaken. At this time the property consisted of 2 patented and 16 unpatented claims. Periodical examinations of the property by the Federal Geological Survey were made by B. L. Johnson[3] in 1916, A. H. Brooks and S. R. Capps[4] in 1922, and Fred H. Moffit[5] in 1923.

The Kennecott Copper Corp. sampled and mapped the deposit in 1926. C. W. Poy was in charge of this sampling program. At this time, Dickey had developed the property with 1,637 feet of drifts and crosscuts in the mineralized shear zone on the 400-foot level.

In 1929 the Solar Development Co., a subsidiary of the Consolidated Mining & Smelting Co. of Canada, Ltd., secured an option from W. A. Dickey and brought the property to its present stage of development. Underground development by the Solar Development Co. consisted of extending the workings on the 400-foot level by 680 feet and of driving a 586-foot drift on the 200-foot level. Twelve diamond-drill holes, whose combined length was 2,073.5 feet, were drilled from the 400-foot level. One hole 251 feet long was driven from the 200-foot level. The option held by the Solar Development Co. was terminated in May 1930.

Upon the death of W. A. Dickey, his option was transferred to his son, Frank H. Dickey, Bellevue, Wash., the present (April 1952) option holder.

The Rua Cove deposit and the related geology was investigated during the summer of 1943 by Stefansson and Moxham[6] of the Federal Geological Survey.

No production of ore from this deposit has been recorded.

2/ Grant, U. S., and Higgins, D. F., Jr., Copper mining and prospecting on Prince William Sound, Alaska: Geol. Survey Bull. 379, p. 92, 1909.

3/ Johnson, B. L., Mining on Prince William Sound, Alaska: Geol. Survey Bull. 662, 1918, pp. 213-214.

4/ Brooks, A. H., and Capps, S. R., The Alaskan mining industry in 1922: Geol. Survey Bull. 755, 1924, pp. 28-29.

5/ Stefansson, Karl, and Moxham, Robert M., Copper Bullion claims, Rua Cove, Knight Island, Alaska: Geol. Survey Bull. 947-E, 1946, p. 87.

6/ Work cited in footnote 5 (p. 5), pp. 85-92.

PROPERTY AND OWNERSHIP

The Rua Cove property consists of the Copper Bullion group of claims. The group comprises 2 patented claims (Copper Bullion 1 and 2, patented, U. S. Survey No. 993, U. S. Patent 16919, Juneau No. 01616) and 16 unpatented claims. The unpatented claims are named as follows: Bullion 1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, and 15 and the Iron Bullion 1, 2, and 3. Figure 4 is a map of the claims at Rua Cove.

The Copper Bullion group of claims is owned by Fred B. Snyder, 1430 Rand Tower, Minneapolis, Minn., and is under option to Frank H. Dickey of Bellevue, Wash.

GENERAL GEOLOGY

The geology at Rua Cove has been described in some detail by Stefansson and Moxham.7/ The mine workings are in greenstone. Three distinct types of greenstone have been recognized and described by the Geological Survey. The most abundant type is fine grained, ranges in color from greenish shades to black, and is in part very schistose. The second type is a blocky, dark-gray porphyritic rock. Most of the lower tunnel is in this second type, but it can be found locally as inclusions on the upper level. The third type of greenstone recognized by the Geological Survey is a medium-grained, gray-green rock with the composition of a quartz diorite. In this report it is referred to as quartz diorite.

Copper mineralization in the Prince William Sound area is usually associated with the greenstone and is concentrated along zones of shearing. Ore bodies are replacements of the sheared greenstone by sulfide minerals, largely pyrrhotite and chalcolyrite. The degree of replacement of the sheared greenstone by the sulfides differs within the ore bodies. Zones or lenses of massive sulfides are associated closely with sheared greenstone containing disseminated sulfides; both may contain remnants of unaltered country rock.

DESCRIPTION OF DEPOSIT

The copper deposit at Rua Cove has been formed within a northeast-trending shear zone in the greenstone. On the 400-foot level, the mineralized zone strikes N. 17° E.; it has been developed throughout a strike length of 540 feet (fig. 5). The width of the main mineralized zone ranges from 90 to 180 feet.

The strike and dip of the many shear planes that comprise the shear zone are not constant. Individual strikes range from N. 30° W. to N. 48° E. The mineralization is terminated at its north end by a fault that strikes S. 85° E. The shear planes and faults dip steeply, but the dip may be in either direction.

Apparently both walls of the principal deposit are delimited by fault planes, which are well exposed near the ends of the various crosscuts. However, several other lenses of sulfide mineralization were penetrated by the

7/ Work cited in footnote 5 (p. 5), pp. 88-89.

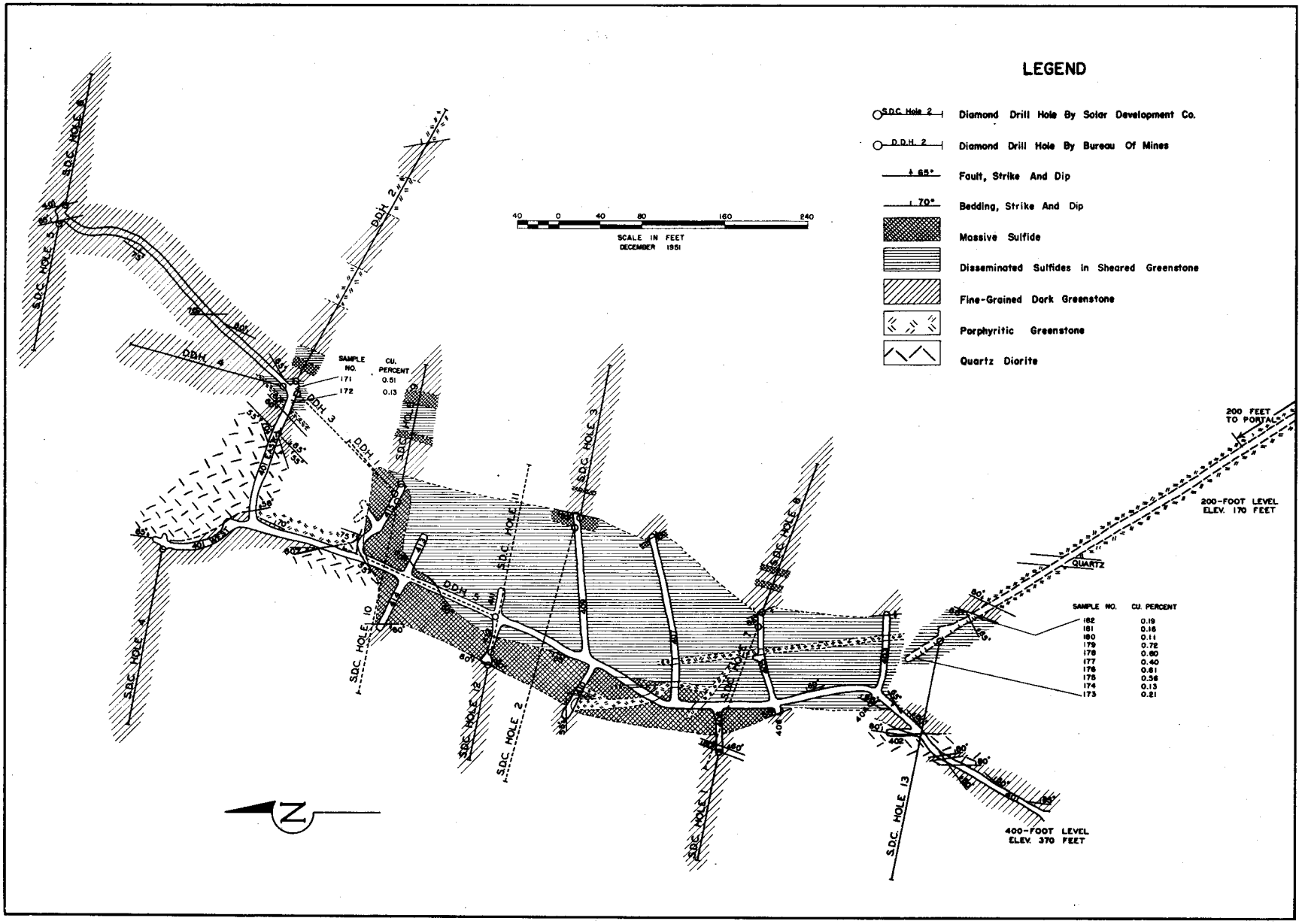

Figure 5. - Geologic map of underground workings, Rua Cove.

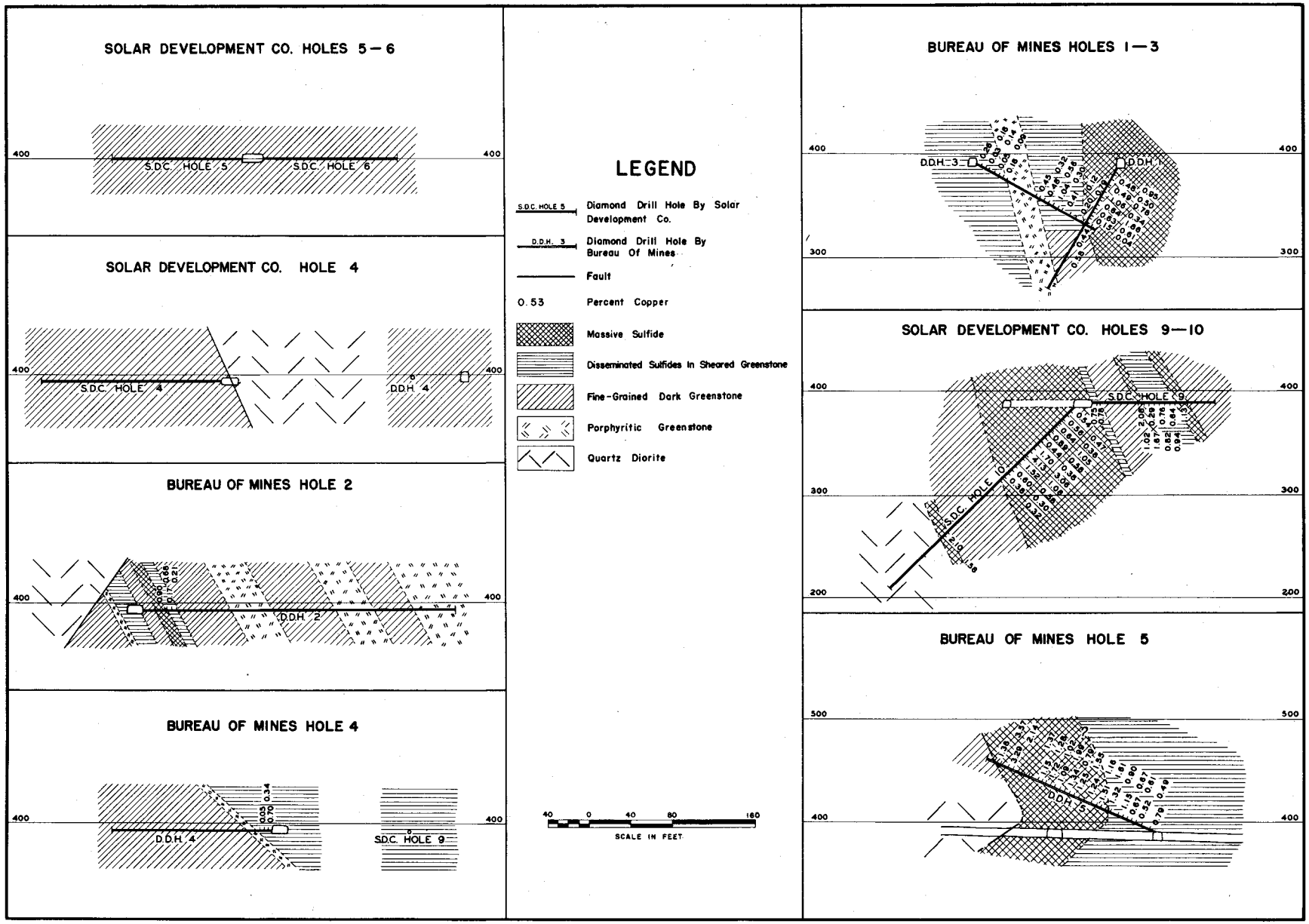

Figure 6. - Diamond-drill section, Copper Bullion, Rua Cove.

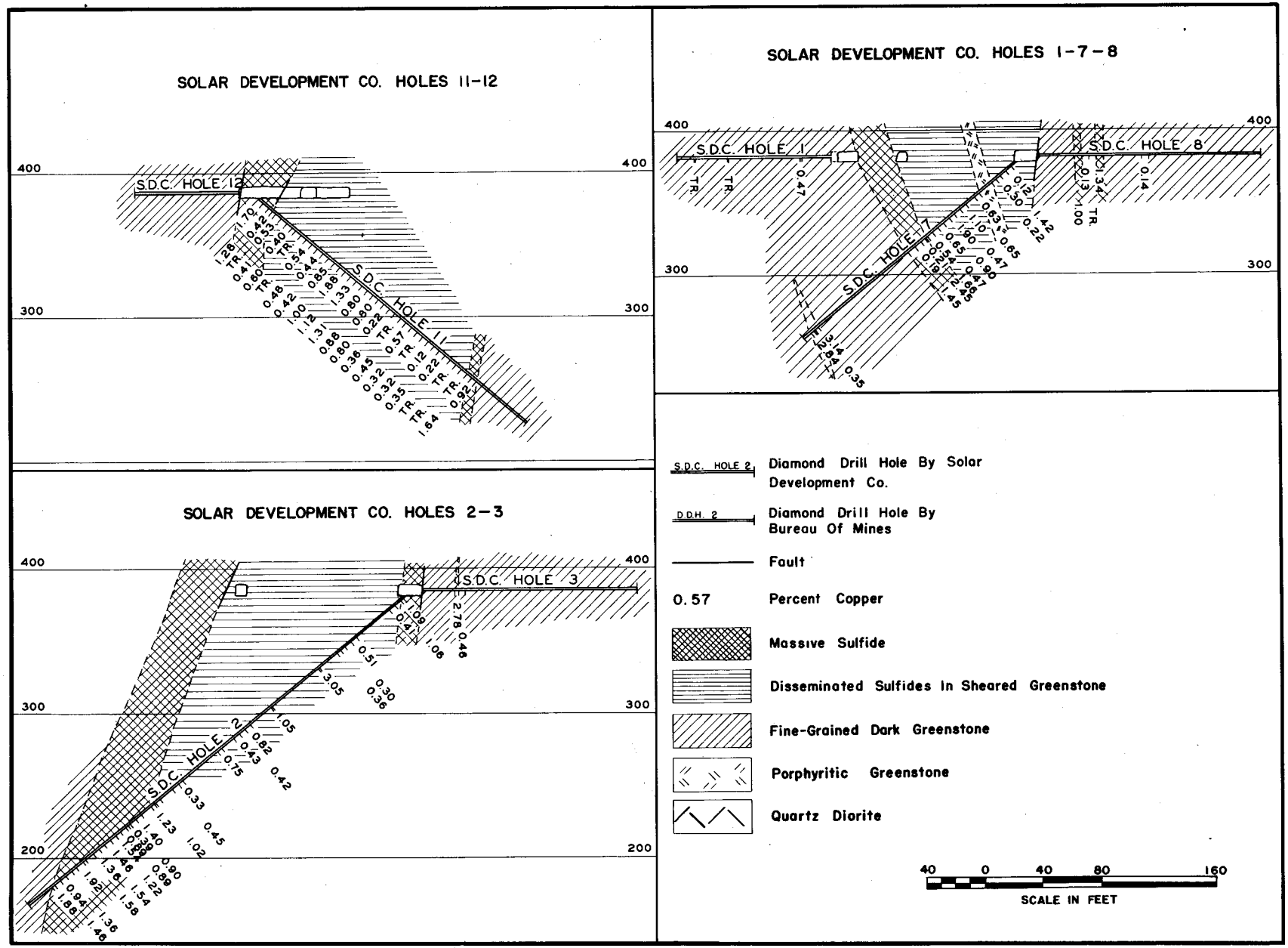

Figure 7. - Diamond-drill section, Copper Bullion, Rua Cove.

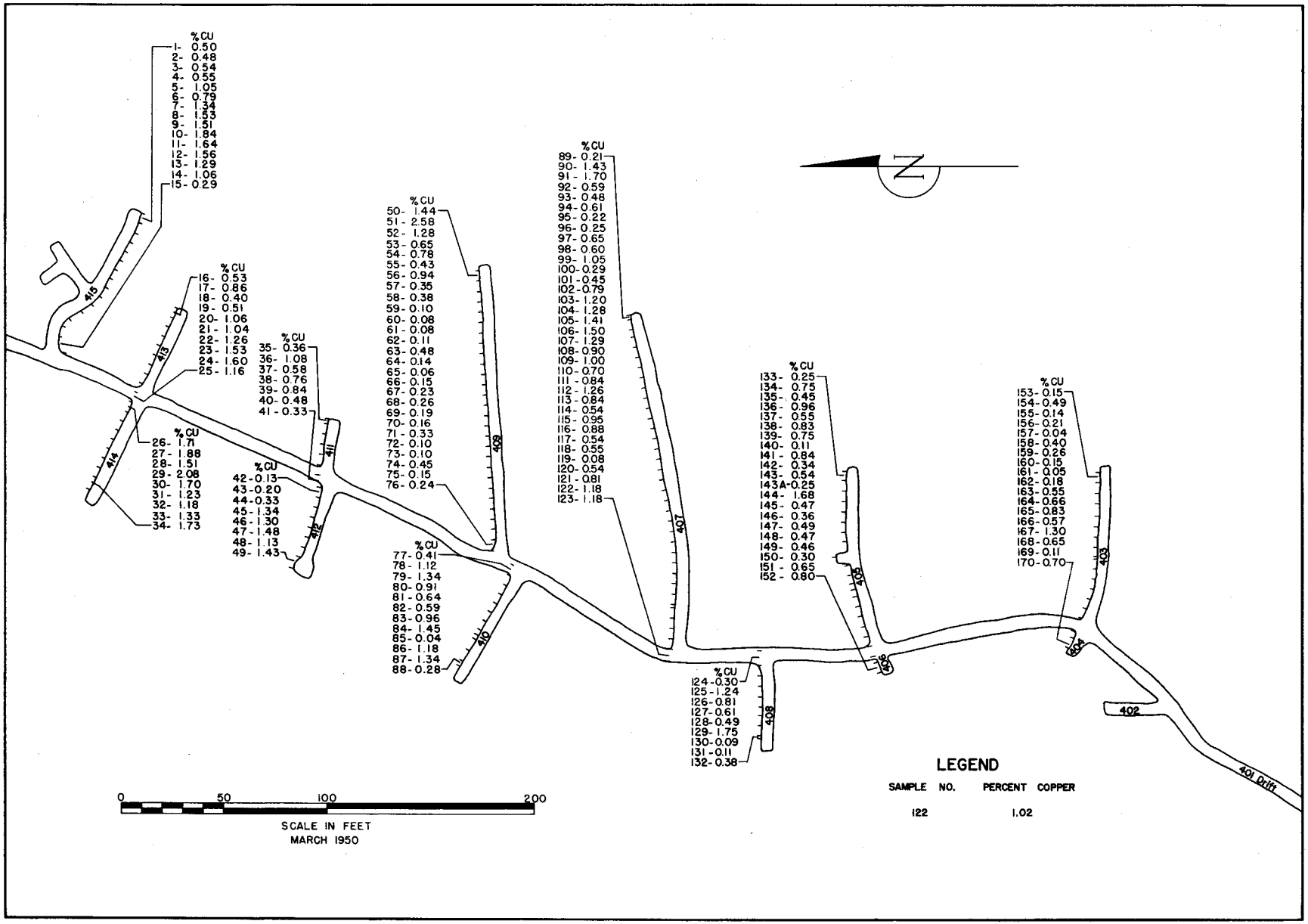

Figure 8. - Channel samples, upper level, Rua Cove, Knight Island.

drill holes; one was penetrated by the 401 east drift outside of the main mineralized zone, as shown on figure 5.

A band of nearly solid sulfides approximately 500 feet long and from 25 to 60 feet wide, extends along the west wall and across the north end of the main mineralized zone. The original sheared greenstone in this section has been almost entirely replaced by pyrrhotite and chalcopyrite. However, several horses of barren porphyritic greenstone have been exposed by the underground workings in this section.

Most of the remainder of the main deposit is sheared greenstone, which contains disseminated sulfides and some quartz; it also contains smaller lenses of nearly massive sulfides and horses of the barren porphyritic greenstone.

The lower adit, 200 feet below the main level, is in barren porphyritic greenstone throughout most of its length. The last 80 feet, however, is in sheared greenstone, which contains a small quantity of disseminated sulfides.

Figures 6 and 7 are idealized sections through the diamond-drill holes. Where no definite contact was known, the contact exposed in the drift or drill hole was projected parallel to the bedding or banding in the greenstone.

Several opencuts have exposed zones of sulfide mineralization on the surface. A fault that is exposed in one opencut at an altitude of 750 feet terminates the surface exposure at the north; it is assumed that an extension of the fault terminates the main ore body on the 400-foot level. If this assumption is correct it would indicate that the main ore zone rakes northward.

WORK BY BUREAU OF MINES

The original Bureau of Mines program proposed concurrent channel sampling of the underground workings and diamond drilling. However, the Bureau of Mines was unable to procure the necessary pipe for transmitting air and water at the scheduled time; consequently the workings were channel sampled during November-December 1948 but the diamond drilling was postponed. The channel-sampling program obtained 182 samples from 917.7 linear feet of crosscuts. The locations of the samples and the percentages of copper are shown on figure 8. Gold and silver analyses on composite samples are given in the table Composite sample analyses.

The property was diamond drilled during March and April 1949. Five holes were drilled; their combined length was 896.6 feet. Four of the drill holes were located in the area north of the fault that terminates the ore body; they were drilled to determine if additional copper mineralization exists in that area, but no sulfide mineralization was found, except near the turn in drift 401 east. Here the sheared greenstone contains a small amount of disseminated sulfides. A lens composed of massive sulfide and disseminated sulfide mineralization, in approximately equal amounts was cut by drill hole 2.

Drill hole 5 was drilled from the main adit to test the upper extension of the fault that terminates the ore body on the north. The results from this hole indicate a roll in the contact as shown on figure 6, Bureau of Mines hole 5.

A plan map of the 400-foot level with computed average analyeis of plus-1-percent ore and of minus-1-percent ore is shown on figure 9. It is noted that the plus-1-percent copper mineralization tends to follow the zones of massive sulfide mineralization.

The massive sulfide zones were considered by the Bureau of Mines as possible sources of sulfur for use in pulp mills proposed for southeastern Alaska. Composites of samples representing cross sections of the main sulfide lens were analyzed for iron and sulfur. The following table gives the analyses of Fe and S for the composite samples and the computed analyses for Cu, Au, and Ag.

Composite sample analyses

	Percent			Ounce per ton	
Samples	Cu	Fe	S	Au	Ag
1-15	1.36	30.0	16.8	0.005	0.1
23-24	1.52	49.3	31.45	.005	.1
45-48	1.28	51.1	31.65	.005	.1
50-51	2.01	34.8	21.35	.005	.1
77-84	.89	44.5	26.9	.005	.1
86-87	1.26	52.1	32.3	.005	.1
126-129	.87	35.3	20.2	.005	.1

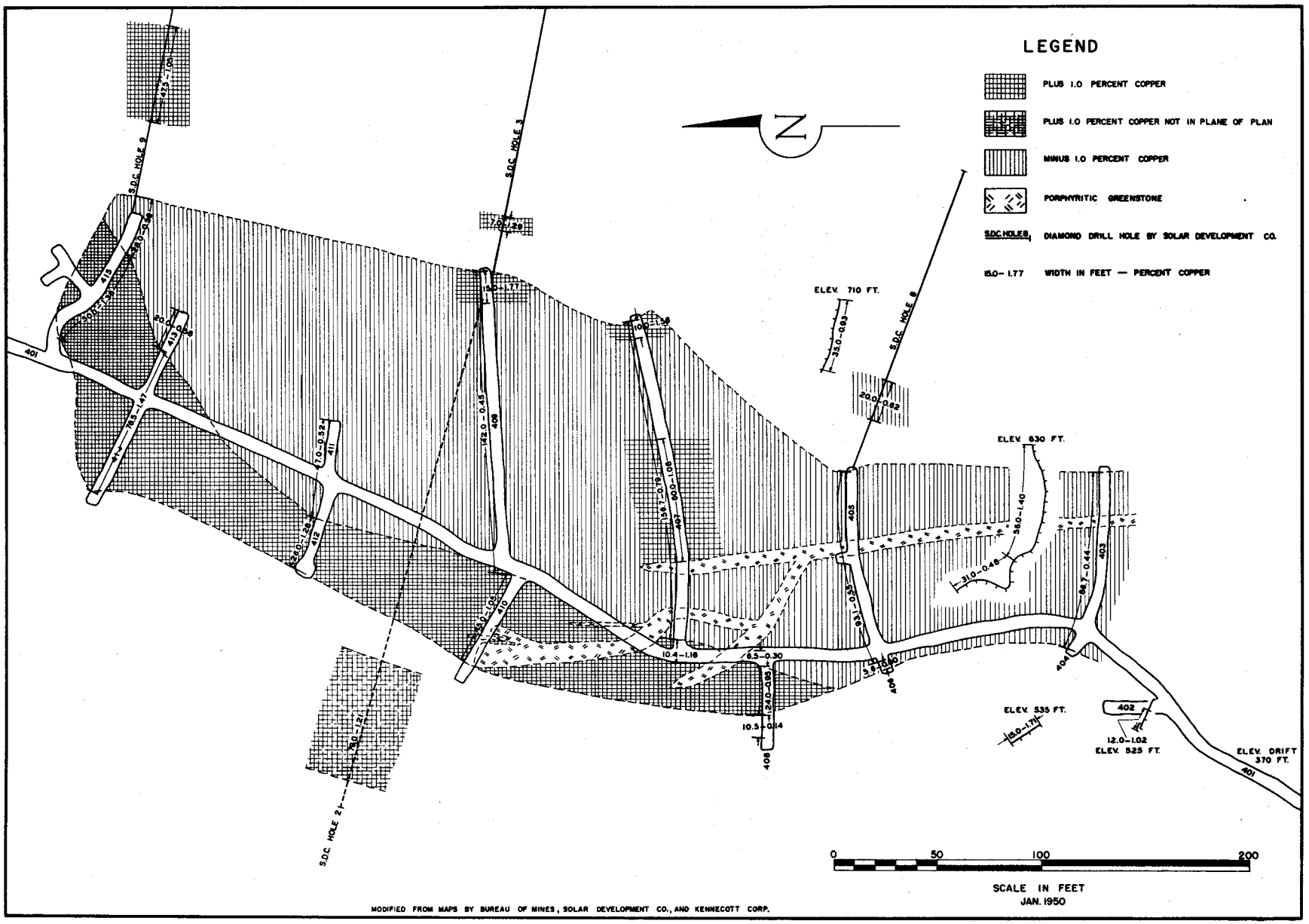

Figure 9. - Estimated grade of outlined area, Upper Level, Rua Cove.