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GEOCHEMICAL REPORT NO. 1

Geochemical Investigations of Selected Areas in Southeastern Alaska, 1964

By

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GEOCHEMICAL INVESTIGATIONS OF SELECTED AREAS IN SOUTHEASTERN ALASKA, 1964

By

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SUMMARY

Southeastern Alaska, comprising some 40,000 square miles, contains about 7 per cent of the total area of the State, but its past mine production of metals is equal to 17 per cent of the total production from the entire State. In percentages of Alaskan production, Southeastern Alaska has produced 22 per cent of the gold, 15 per cent of the silver, 100 per cent of the palladium, 3 per cent of the copper, 95 per cent of the lead and 100 per cent of the uranium. Total value of Southeastern Alaska's metal production, at present prices, is about $250 million.

Although the area is widely mineralized, very many parts of it have had little or no prospecting. Exposures along the beaches and streambeds, and on cliffs and ridges have been examined, but the major portion of the land area, which is usually covered with dense forest growth, has received only scanty attention. It is believed that geochemical testing of stream sediments in the covered areas will serve, along with geological information in available publications, to direct prospectors to specific localities that have better-than-average chances of containing valuable ore bodies.

In this report on geochemical investigations in Southeastern Alaska we recommend that prospectors investigate the following areas:

(1) The Hollis area on Prince of Wales Island. All of this area has abnormal amounts of metals (copper, lead, or zinc), and there have been small, producing gold mines. Four places within the Hollis area appear to offer attractive opportunities for prospectors.

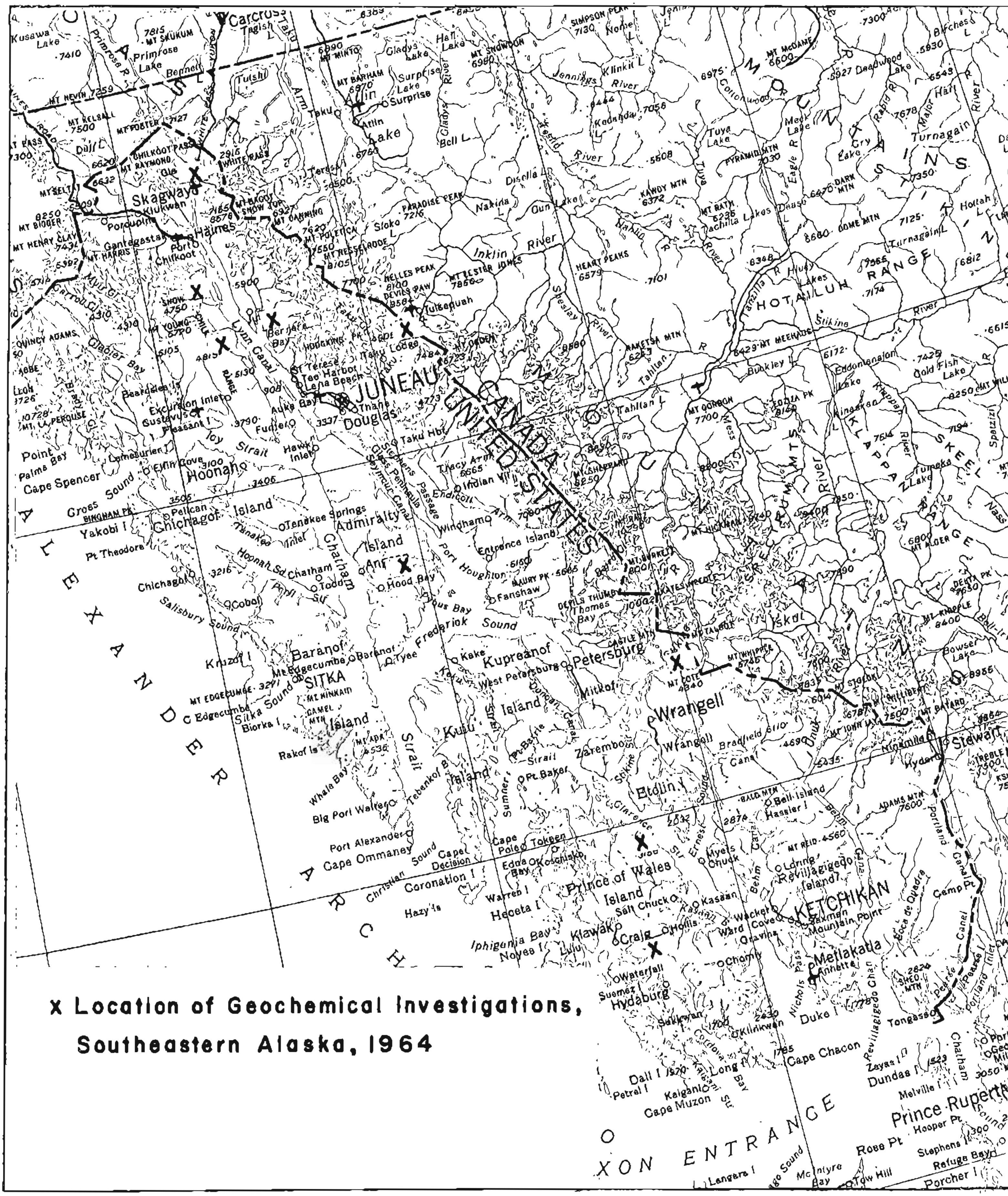
(2) William Henry Bay, on the west side of Lynn Canal. Very little sampling work was done, but the single anomaly found there should be easy to trace to its source.

(3) In Gambier Bay, on Admiralty Island. There are several anomalies that appear to merit attention. One of these

is on a copper-bearing structure that has been known for some time but has had practically no development.

(4) Near Skagway. Geochemical sampling suggests that an old, well known molybdenum prospect warrants careful attention.

Anomalous amounts of metals were found in places other than those listed above, and it is certain that the 1964 investigations were not complete in any area. Furthermore, the interpretation of stream sediment anomalies is not well understood and other investigators may draw differing conclusions from the reported work.



x Location of Geochemical Investigations, Southeastern Alaska, 1964

INTRODUCTION

General

In 1964 a modest beginning at preparing a geochemical map of the more accessible drainage systems of Southeastern Alaska was initiated by the Division of Mines and Minerals of the State Department of Natural Resources. Areas were selected for investigation because of one or more of the following factors:

Known prospects or mines in the vicinity.

Favorable geology indicated on maps by the U.S. Geological Survey.

Areas recently made accessible because of new logging roads.

In addition, some geochemical work, such as that on the Stikine and Taku Rivers, was done incidentally during an investigation for a different purpose.

Sampling and Analyses

Stream sediments were collected from gravel or silt under running water at points in a stream above tidal influence. At the sample site, the character of bedrock (if exposed) and gravel were noted and magnetometer readings were usually taken.

A dithizone test for total cold-extractable heavy metal (abbreviated as Cx) was made at the site, using the University of Alaska method with unleaded gasoline or carbon tetrachloride as the dithizone solvent and sodium chloride as the extractor. Usually, pH was not adjusted.

Samples were sent to a laboratory for analysis of the total content of copper, lead, zinc and molybdenum in the -80 mesh fraction. As a check on laboratory work, duplicate samples (with different numbers) were prepared and splits were sent to various laboratories. Work was done by the Division's laboratories at Ketchikan and Fairbanks, by the U. S. Bureau of Mines at Douglas, by the U. S. Geological Survey at Denver and by the Rocky Mountain Geochemical Laboratory at Missoula, Montana. In the earlier investigations all samples from an investigation were checked by three laboratories.

Generally, copper results from the various laboratories were close but it was some time before some of the work in lead and zinc was acceptable. Also, there was continuing trouble in checking molybdenum, especially when the molybdenum content was low. It is believed that the results reported here can be duplicated within a range of about 20 per cent for any group of samples.

The laboratory work did not satisfactorily check the field Cx tests. There is a broad correlation and a suggestion that Cx tests show a wider spread of anomalies than the laboratory tests. However, there are many discrepancies, some of which may have been caused by metals such as antimony or arsenic for which laboratory determinations were not made. Others may be due to vegetation. Water tests, made in the field, were erratic, but in particular drainage systems they may have considerable value.

Interpretation of Results

Graphs were prepared for each area by plotting the number of samples with a similar metal content on the vertical scale and showing on the horizontal scale the metal content in parts per million (one part per million is equal to 0.0001%). Unless a very large number of samples are plotted on a graph prepared in this manner, the curve must be "smoothed", so it is less accurate than a plot of cumulative values. Further, the assumption of normal distribution of metal values in stream sediments may not be correct. However, graphs prepared in the manner shown are easy to understand and they do indicate the lower limit of metal values that may be anomalous.

Undoubtedly some anomalous values are simply erratic departures from a normal (or log-normal) distribution. Further checking of a stream will correct anomalies of that type. It also seems certain that some anomalies may be caused by the presence of rock strata that have a widely disseminated, higher-than-normal metal content, but no ore bodies. The moderate molybdenum anomaly in Gambier Bay may be caused by molybdenum in a carbonaceous schist since there is scant evidence of rock associations normally connected with molybdenum ore deposits. On the other hand the group of lead-zinc anomalies in Gambier Bay appears to be associated with rock types and structure favorable to lead-zinc or lead-zinc-silver ore bodies. Similarly, high copper-zinc values in the Hollis and Twelvemile Arm areas may represent widely disseminated mineralization, but those geochemical tests which show metal values in excess of the high local background may indicate valuable concentrations of metals in favorable geological structures.

Prospecting

Since Southeastern Alaska has a heavy rainfall and the streams have relatively confined drainage systems, geochemical testing of stream sediments should be effective in distinguishing those streams which head in mineralized areas. The method is particularly valuable in locating metallization in the vast, practically unprospected terrain between the beaches and timberline, and in the zones of structural weakness, which tend to be covered by vegetation and which are often favorable for ore deposition.

Of course, stream sediment sampling is only a preliminary step in prospecting. Drainage systems with anomalous metal content must be studied in relation to known geology and structure, known prospects, and field observations of topography as a guide to structure, rock exposures, types of rocks in gravel, staining, changes in vegetation, etc.

Fortunately, most of the hillsides and mountain slopes in Southeastern Alaska have a thin soil cover over a mantle of colluvium (a soil-rubble mixture), so soil sampling for geochemical tests is not difficult. However, hillside creep and soil flows are common and must be taken into account in the interpretation of soil testing results.

There are scattered glacial deposits and rather extensive bogs at all elevations. These will be difficult to sample by soil testing, but the usually thin forest cover in such areas should expedite ground geophysical surveys.

Although the 1964 investigations were limited to testing for four base metals, any of the apparently mineralized areas may be valuable for precious metals, or other base metals.

SKAGWAY

Skagway is located at the north end of Lynn Canal approximately 90 miles north of Juneau. It is the southern terminus of the White Pass and Yukon Railroad, which runs north to Whitehorse, Yukon Territory, Canada.

Mineral production from the immediate vicinity of Skagway has been very limited. The Inspiration Mine produced a few tons of ore which had values in silver, lead, zinc, and copper. Some prospecting was done on a molybdenum occurrence near Clifton, a station on the railroad, about 8 miles north of Skagway.

Geology

Skagway is located in an area of granitic rocks that form the Coast Range batholith at this particular location. Metamorphosed sediments are found within the granitic rocks just west of town. The western limit of the batholith appears to lie between Skagway and Haines and its eastern edge is apparently near the Alaska-Canada border. Reconnaissance geology of the area is described in U. S. Geological Survey Bulletins 926-C, Occurrences of Molybdenum Minerals in Alaska and 800, Geology and Mineral Deposits of Southeastern Alaska.

A copy of a thesis by Fred Barker, "Coast Range Batholith Between Haines and Lake Bennett, B.C.," was made available by Mr. Emil Maki of Skagway. The bedrock classifications shown on the attached map of the area are those of Mr. Barker.

Previous Work

Many years ago a shallow shaft was sunk on a molybdenite-bearing aplite dike northeast of Clifton and a short tunnel was driven on a molybdenite discovery west of map location 2 and below the railroad grade. There has been superficial searches for molybdenum on the steep, well exposed slopes in the vicinity of Clifton, but there is no evidence of other underground work nor of surface trenching in the covered areas, although scattered grains of molybdenite may be found over a large area.

Over ten years ago a zone of high radioactivity close to Skagway caused considerable excitement and there have been several discoveries of short, thin lenses of argentiferous galena in the tight batholithic rocks.

Geochemical Investigation

The Skagway area is much drier than the rest of Southeastern Alaska and the batholithic rocks have few watercourses. Consequently, there were few streams available for stream sampling.

Map locations #1 to 5 indicate a molybdenum anomaly associated with a north 60° east fracture zone that probably continues southwesterly through map locations #9 to 13, where anomalous zinc values are found.

In the Taiya River valley at map locations 15 to 17 a stream is flowing from a spring in glacial gravels and is depositing a large amount of iron oxide. Although stream sediment samples were not anomalous, the water tests show very high values with a thick red precipate that is considered to indicate the presence of considerable lead. A similar Cx reaction with stream sediments was noted at map location 18 on the West Branch, but, at map location 19, also on the West Branch, no anomaly was apparent. Zircon was found in the gravel at map locations 18 to 22.

Prospecting

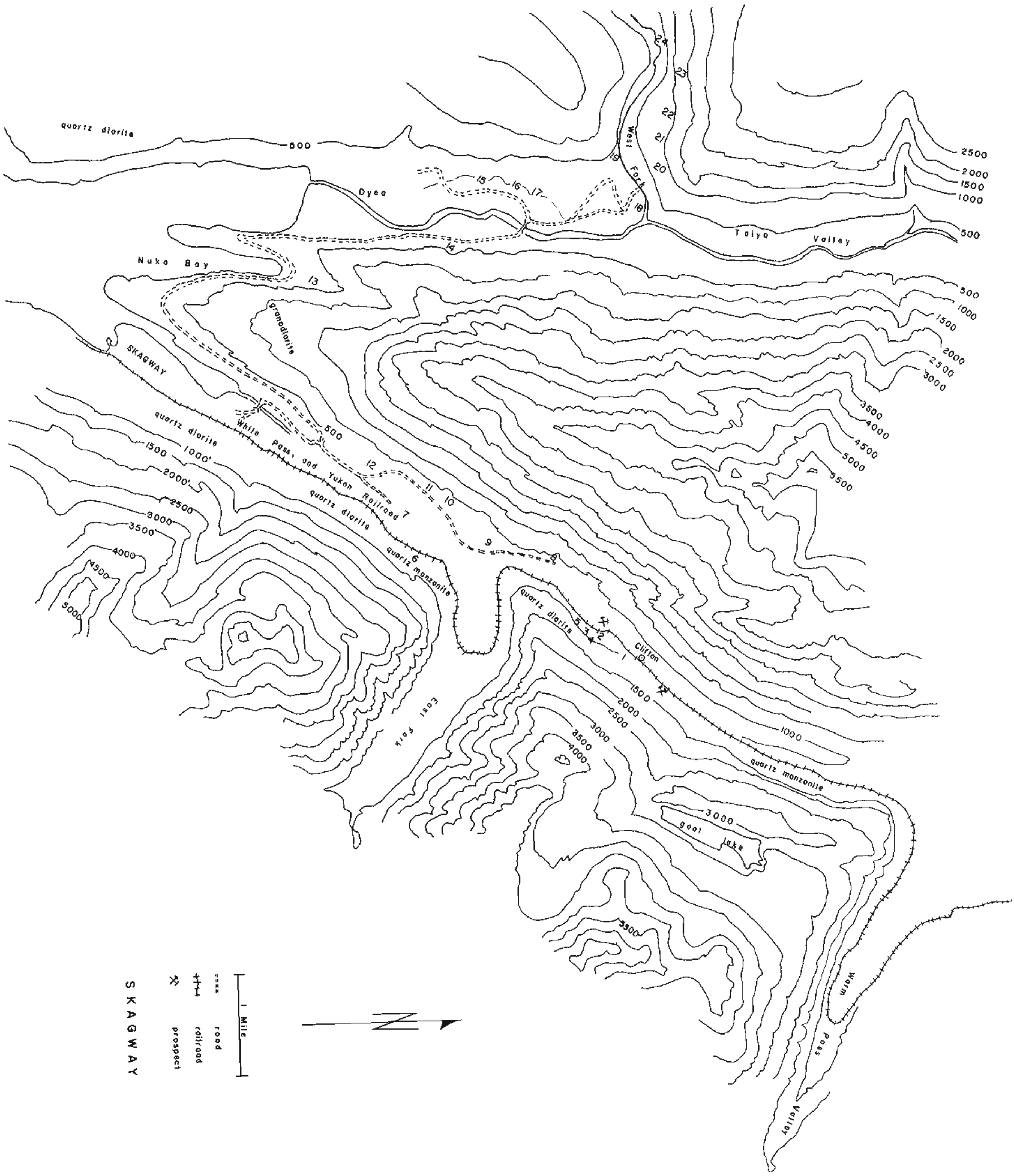
In view of the high molybdenum content of stream sediments from streams that drain the covered shear zone extending from the hill above Clifton down into the Skagway River it would appear that an area about one mile long and five hundred feet wide should be prospected by soil sampling, followed by trenching of any anomalous areas indicated by such work. There is room in this shattered zone, indicated by high water content and vegetation, for a molybdenite ore body, most likely in or along the contact of the coarser grained quartz-feldspar rocks.

It is doubtful if a zinc ore body exists near the zinc anomalies on the southwesterly extension of the shear zone. The metamorphic rocks in this area are intruded by large dikes and fingers of quartz-diorite, but there is little evidence of concentrated metallization.

SKAGWAY
August 1964

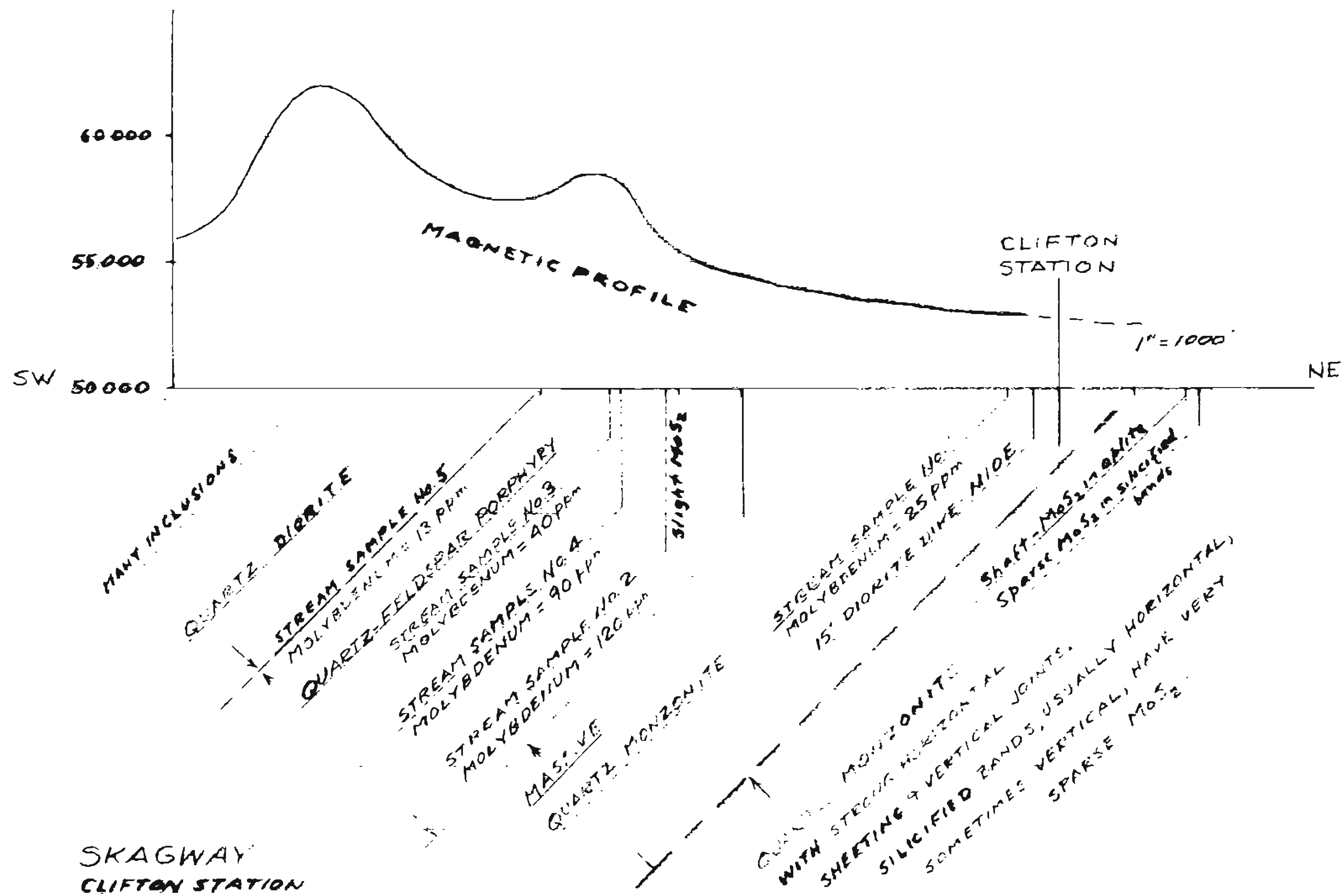
Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream Sediments
1	1	3	10	20	25	-	blank	52.9	qtz-biotite granite	qtz-biotite granite
2	2	5	30	25	120	10	pink-brn	55.5	covered	qtz monzonite
3	3	5	10	60	40	3	brn	58.5	covered	coarse grained qtz-feldspar
4	4	5	20	110	90	-	blank	58.5	covered	coarse grained qtz-feldspar
5	5	2	5	40	13	4	brn	57.5	covered	qtz-diorite
6	6	7	25	170	12	12	brn	54.5	covered	qtz-diorite
7	7 & 8	5	10	20	0	+ 20	pink-violet	56.4	pyritized qtzite	river wash
7	7R	0	tr	tr	0	tr	Ni.		qtzite	
7	7AR	0	tr	0	0	tr	Ni.		rusty qtzite	adjoining 7R
7	7BR	0	0	0	0	tr	Ni.		rusty granitic	adjoining 7AR
8	9	10	5	65	0	14	pink-gray	53.4	granite	granite
9	10	7	0	85	8	6	brn-gray	53.4	granite	granite
10	11	40	5	115	3	4	gray	53.6	granitic & schist	granite with some qtz
11	12	30	5	140	2	5	pink-gray	54.2	granitic & schist	granite with some qtz
12	13	45	0	160	2	4	gray	54.2	schist	schist
13	26	10	5	110	6			54.0	light igneous	light igneous

14	25	5	15	40	0	10		51.8	light igneous	light igneous
15	16	10	10	55	9	2	brn	56.5	no bedrock	rusty gravel water test+20 pink
16	17-18	no sample - water test +40 pink with red ppt.								
17	19	2	15	15	0		water 20 pink	55.6	no bedrock	rusty sand & gravel
18	14	5	20	20	0	+20	pink-gray	54.6	no bedrock	light & dark igneous
19	15	25	10	15	0	2	gray	54.6	no bedrock	light & dark igneous
20	20	3	10	75	0			56.0	no bedrock	light igneous
21	21	3	10	50	9			56.0	no bedrock	light igneous & some schist
22	22	5	10	85	5			55.6	no bedrock	light igneous & some schist
23	23	7	5	65	3			55.2	no bedrock	light igneous & some schist
24	24	2	15	10	0			55.2	no bedrock	light igneous & some schist

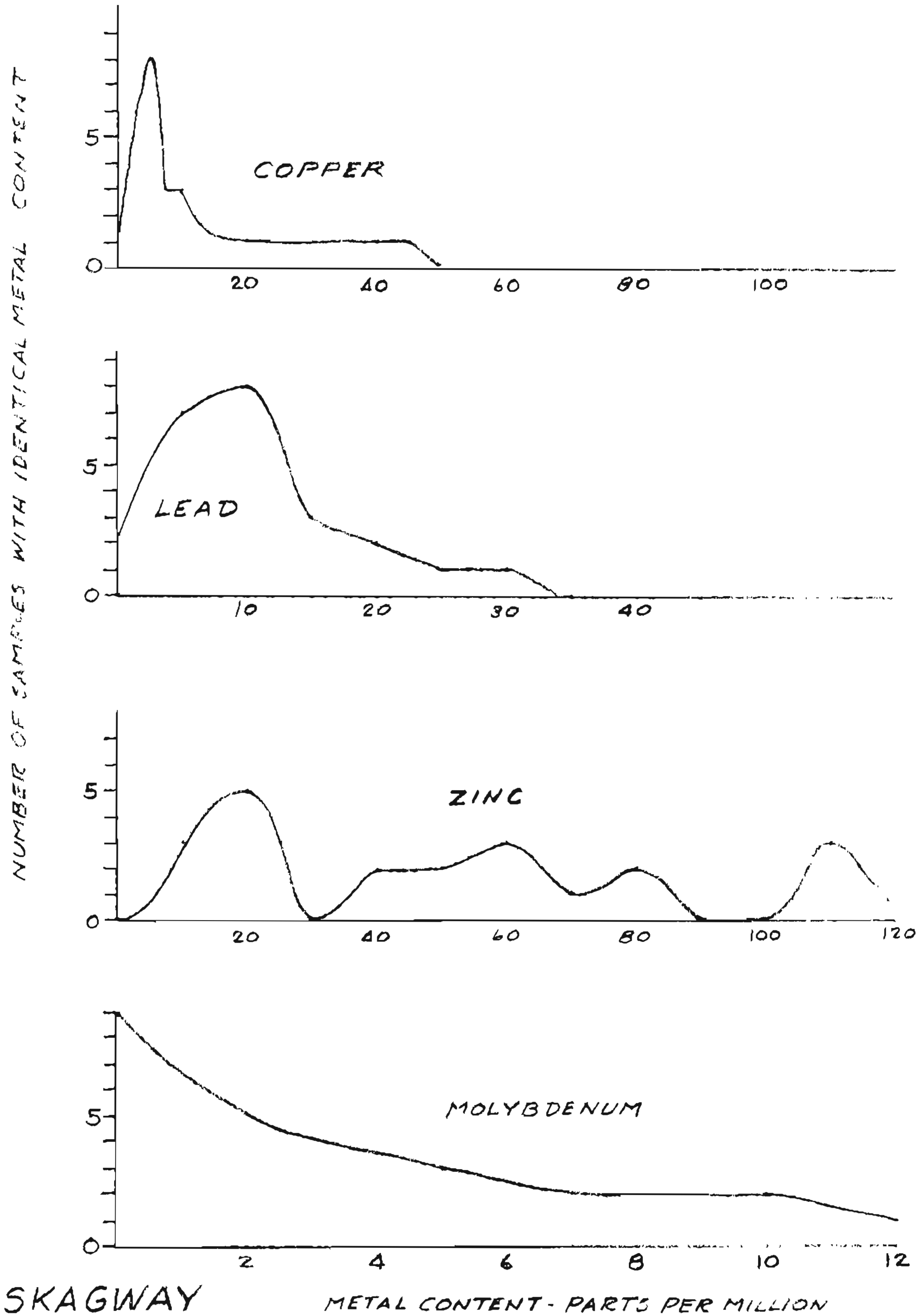


quartz diorite
Dyea
West Fork
Taiya Valley
Nuka Bay
Granodiorite
SKAGWAY
White Pass and Yukon Railroad
quartz diorite
quartz manzonite
East Fork
Clifton
goat lake
Warm Pass Valley
1 Mile
road
railroad
prospect
SKAGWAY


Clifton



SKAGWAY
CLIFTON STATION


NUMBER OF SAMPLES WITH IDENTICAL METAL CONTENT
COPPER
LEAD
ZINC
MOLYBDENUM
0
5
20
40
60
80
100
10
30
120
2
4
6
8
12
SKAGWAY
METAL CONTENT - PARTS PER MILLION

GLACIER POINT

Glacier Point, located on the west side of Lynn Canal about sixty miles north of Juneau and fifteen miles south of Haines, is a delta built up by the outwash from Davidson Glacier, which, like other glaciers in the area, is now receding and providing new rock exposures along the valley walls. There are no old prospects or mines in the area other than a recent copper-iron discovery by Mr. Howard Hayes, a local logging operator, and a copper prospect located north of the Hayes prospect several years ago.

The Hayes discovery was made by Dale Henkins, a geology student in Mr. Hayes' employ.

Geology

The geology of the area has not been mapped but during the investigation it was noted that the general geology and structure shown on the north end of USGS Map I-303 continues through Glacier Point. The rocks are metasediments, including marblized limestone and gneiss, with a northwesterly strike and some east-west faulting. The south end of the Chilkat Peninsula (opposite Glacier Point) is tuff and lava. The mainland and the Chilkat Peninsula are separated by the major fault zone that extends for 250 miles or more down Lynn Canal and Chatham Strait.

Geochemical Investigation

Twenty stream sediment samples were taken, including samples taken in the vicinity of the Howard Hayes prospect. A moderate anomaly was found below the Hayes prospect (map locations 8 and 9), but a more interesting anomaly was found to the south of that prospect at map locations 11 to 13.

The variation between the Cx tests and the laboratory tests is remarkable. Note that the high Cx tests in no case were confirmed by laboratory work and that high laboratory results were not compatible with Cx testing. The discrepancy was especially notable at map locations 18 and 19 where the Cx tests gave a strong color that persisted at the end of the testing range; nevertheless, laboratory results were not anomalous. Since the streams at map locations 18 and 19 are small and are close to a dioritic intrusion into schist it is possible that these anomalies indicate arsenic or antimony, which may be associated with precious metals.

Howard Hayes Prospect

This newly discovered prospect is located on a steep cliff at the head of a talus slope that contains float of magnetite in marble, and chalcopyrite with hematite, in an impure, schistose limestone partially altered to skarn. The magnetite outcrop was examined in some detail but the schistose limestone was largely inaccessible.

The deposit is interpreted as consisting of low grade mineralization in metamorphic rocks close to east-west faulting, which has formed slices of varying composition.

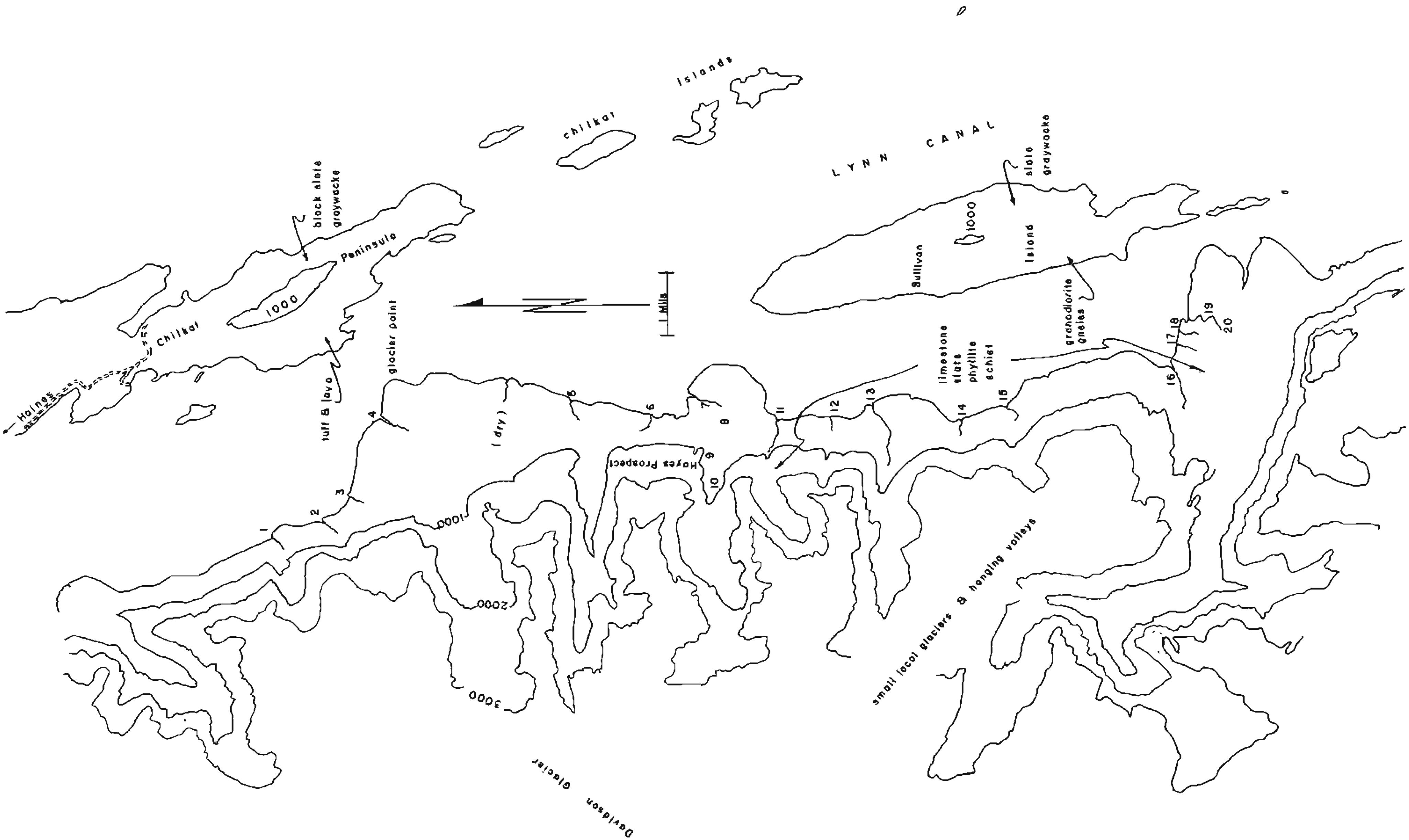
Prospecting

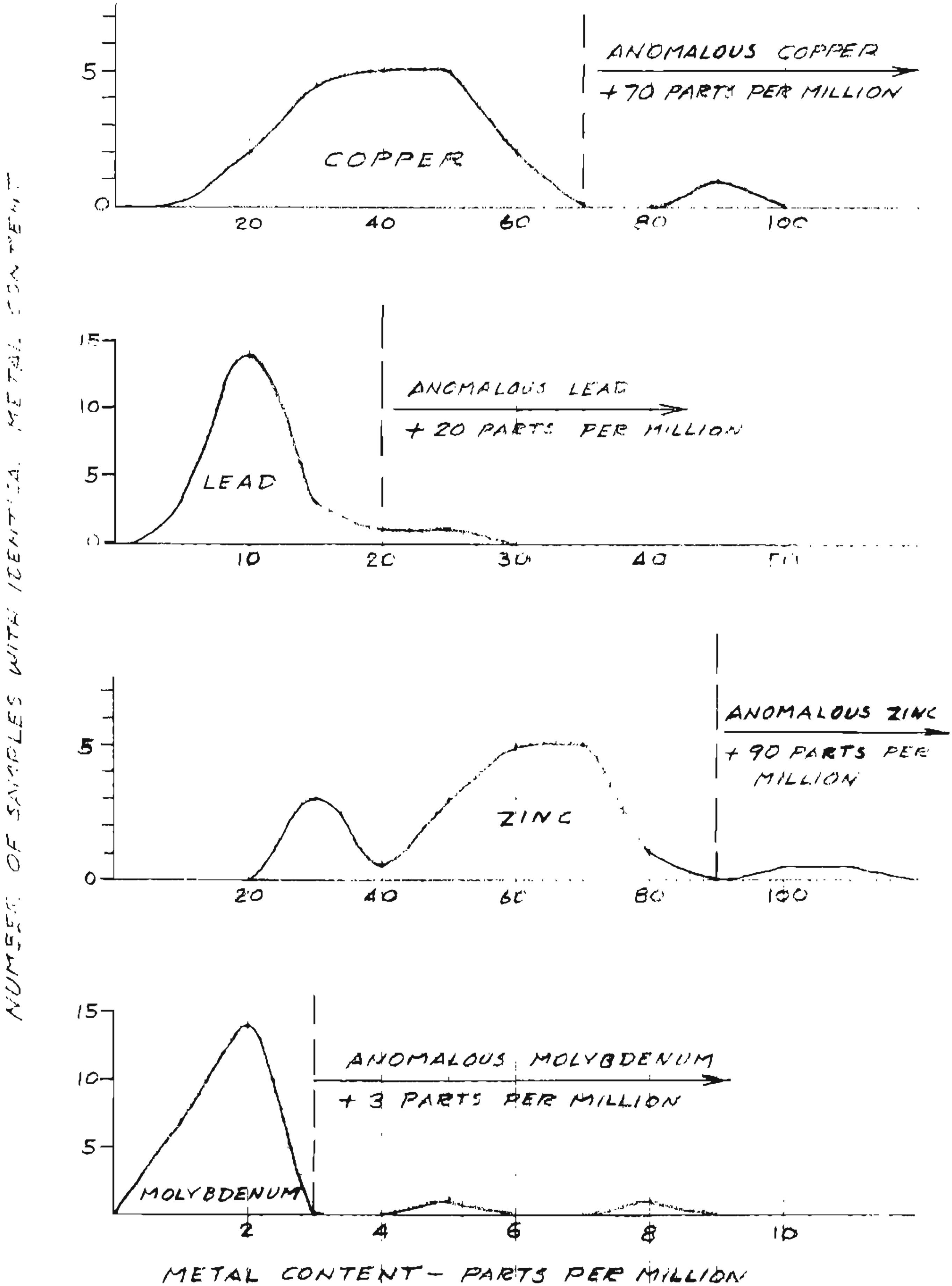
The anomalies at map locations 11 to 13 may be derived from a northwesterly zone of structural weakness that is more or less in line with the Hayes prospect and the older prospect to the north of it. Since the creeks cut this zone on a steep mountain side it should be possible to locate the metal source by geochemical sampling of the streams and a search for float in the stream wash.

GLACIER POINT
August 1964

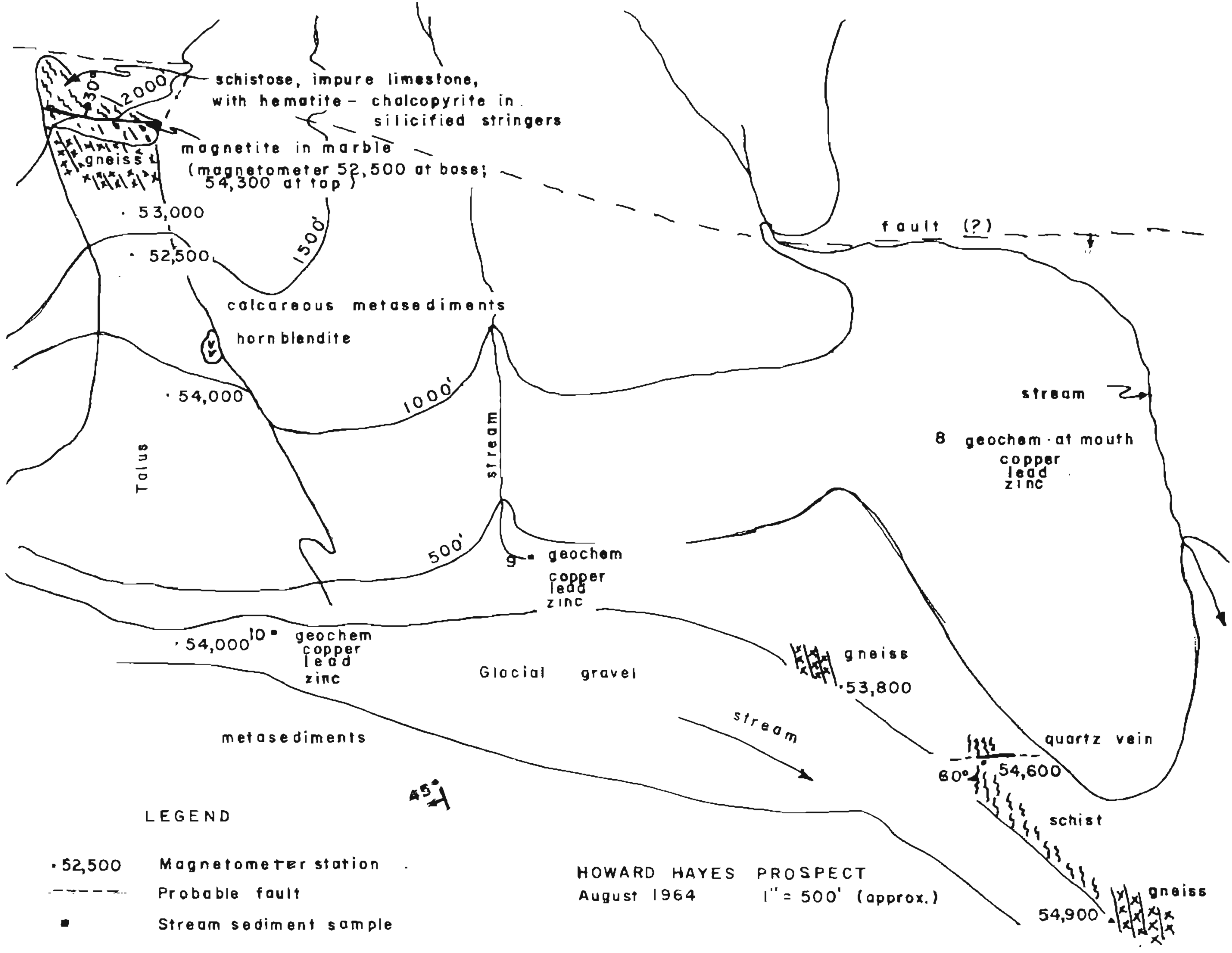
Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream Sediments
1	1	45	5	50	1	2	brn	54.8	no bedrock	gneiss & green schist
2	2	40	10	65	1	8	tan	55.0	schist	mainly schist with some quartz
3	3	15	10	45	2	10	brn	54.6	no bedrock	mixed gravel, brown coated
4	4	40	10	75	2	20	brn	54.6	no bedrock	schist, gneiss with some granite
5	5	35	10	35	1	-	blank	54.9	no bedrock	schist, gneiss with some granite
6	6	30	10	50	2	-	blank	53.6	schist & gneiss	schist, gneiss with some granite
7	7	25	5	35	2	7	tan	54.6	no bedrock	igneous & some marble
8	8	55	15	105	2	5	brn	54.4	limestone	mostly granitic
9	9	90	10	75	2	2	brn	54.5	schist & gneiss	schist, gneiss & some granite
10	10	30	5	30	2	10	brn	54.0	schist & gneiss	schist, gneiss & some granite
11	16	130	10	85	2	4	brn	53.7	no bedrock	schist with quartz
12	19	120	10	110	2	5	tan	53.6	schist	schist
13	18	125	10	60	2	-	blank	53.9	no bedrock	graywacke & rusty schist
14	20	65	15	60	1	-	blank	54.0	no bedrock	metasediments
15	21	60	10	60	2	-	blank	53.6	schist	mostly schist
16	11	35	25	60	1	-	blank	54.4	no bedrock	metasediments with some Ig.

17	15	15	10	50	1	5	violet	53.6	schist	metasediments
18	14	30	10	75	2	+20	violet	54.8	schist	schist
19	12	35	20	75	2	+20	violet	53.6	no bedrock	schist & some granitic
20	13	50	10	75	1	12	violet	53.4	no bedrock	schist


Haines
Chilkat
Peninsula
1000
black slate
graywacke
tuff & lava
glacier point
chilkat
Islands
LYNN CANAL
slate
graywacke
Sullivan
Island
1000
1 Mile
granodiorite
gneiss
limestone
slate
phyllite
schist
(dry)
Hayes Prospect
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1000
2000
3000
small local glaciers & hanging valleys
Davidson Glacier



PART OF WEST SIDE OF LYNN CANAL



HOWARD HAYES PROSPECT
August 1964 1" = 500' (approx.)

WILLIAM HENRY BAY

William Henry Bay is on the west side of Lynn Canal, south of Glacier Point, about forty miles north of Juneau. Prior to 1919 over a thousand feet of drifts and tunnel had been driven in a copper mine south of the head of the bay. Shipments from the mine returned $1,020 in gold and silver, but there is no report on the value of copper recovered.

Geology

William Henry Bay is within an area where a major, northwesterly thrust fault and northwesterly folds are cut by a wide zone of east-west faulting. Sediments and volcanics of Paleozoic age have been subjected to folding, faulting and low grade metamorphism. The geology is described and illustrated in the following publications by the U. S. Geological Survey: Bulletin 714, Mineral Resources of Alaska, 1919; Bulletin 963-A, Some Mineral Investigations in Southeastern Alaska; Map I-303, Progress Map of the Geology of the Juneau Quadrangle.

Geochemical Investigation

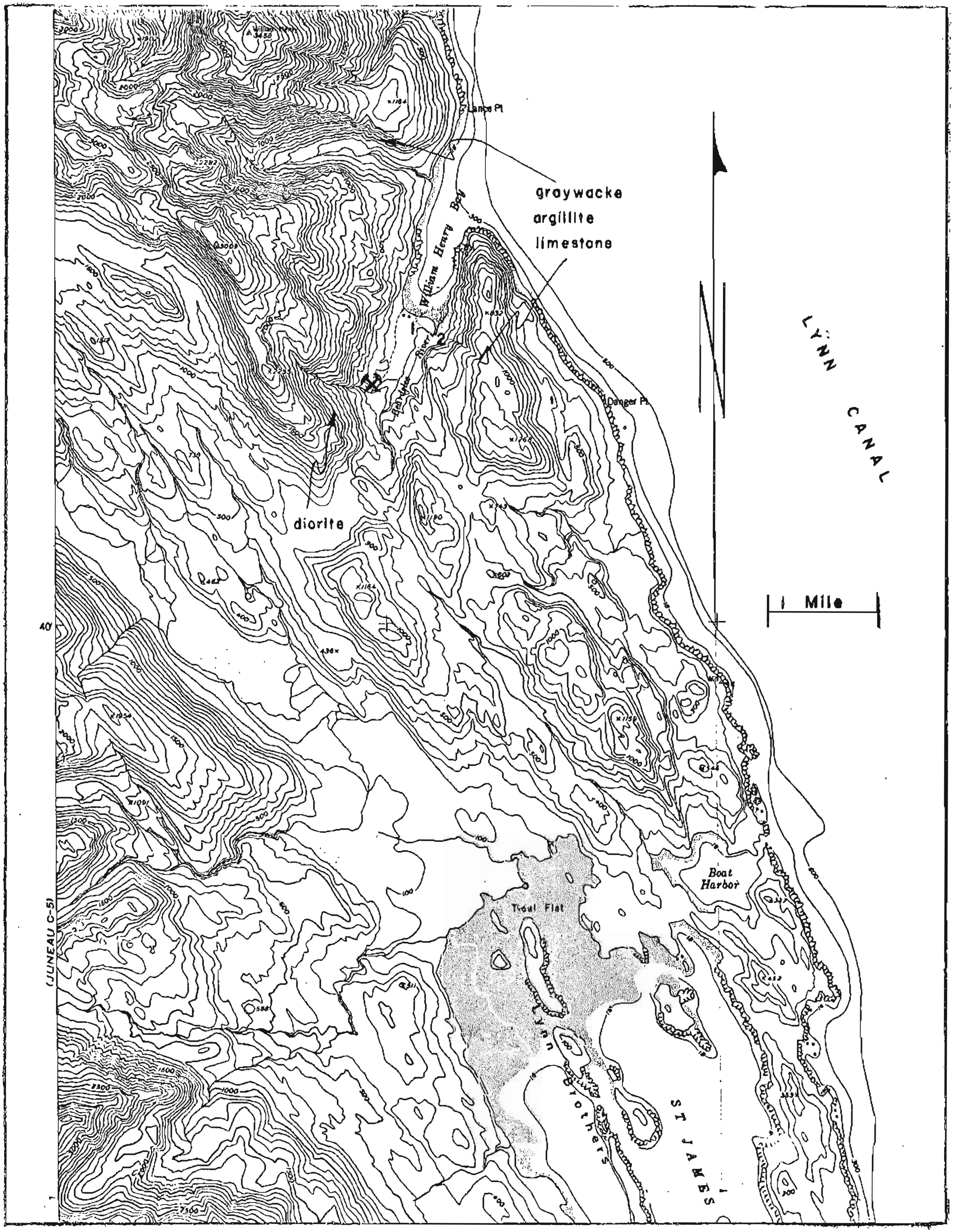
A very limited investigation was made during a stop forced by bad weather. Two samples were taken. One of these was on the main stream that drains the area in which the old copper mine is located; the other was taken from a short stream near the mouth of the larger one. The second sample showed a high lead-zinc anomaly.

Prospecting

In the stream at map location 2, and for some distance down the main stream below the confluence of the two streams, the gravel is iron-stained and partially cemented. In view of the high anomaly and the large amount of iron oxide it would seem that the area is worth prospecting within a half mile of the southeastern end of William Henry Bay, in spite of the fact that the scope of the present investigation has been very limited.

WILLIAM HENRY BAY
August 1964

Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream sediments
1	1	45	15	135	5	-	blank		limestone	small round mix
2	2	55	125	2000	8	10	brn		limestone w/gneiss	small round mix only rusty


graywacke
argillite
limestone
diorite
LYNN CANAL
1 Mile
William Henry Bay
Lance Pt
Danger Pt
Boat Harbor
Tidal Flat
Lynn Brothers
ST JAMES
(JUNEAU C-5)
40'

BERNERS BAY

Berners Bay is situated on the east side of Lynn Canal approximately forty-five miles northwest of Juneau. Gold lode deposits were first discovered in 1886 or 1887 on Sherman Creek. Between 1890 and 1900, five stamp mills were erected and production exceeded 68,000 ounces of gold before the mines closed a few years later. Copper has been reported in the area, but very little prospecting in recent years has taken place.

Geology

The geology of Berners Bay is described in the following U.S. Geological Survey Bulletins: Bulletin 446, The Berners Bay Region, Alaska; Bulletin 800, Geology and Mineral Deposits of Southeastern Alaska.

These bulletins indicate that the coast range diorite commences at the mouth of the Antler River, but the eastern limit is not defined. The Canadian Department of Mines and Resources, Geological Survey Memoir 248, Taku River Map-Area, British Columbia, indicates that bedrock at the border is tuff, graywacke, argillite, conglomerate, breccia, limestone and andesites with minor intrusions. This leads to the conclusion that the coast range diorite does not occupy a large part of the area so it should be favorable for prospecting.

Geochemical Investigation

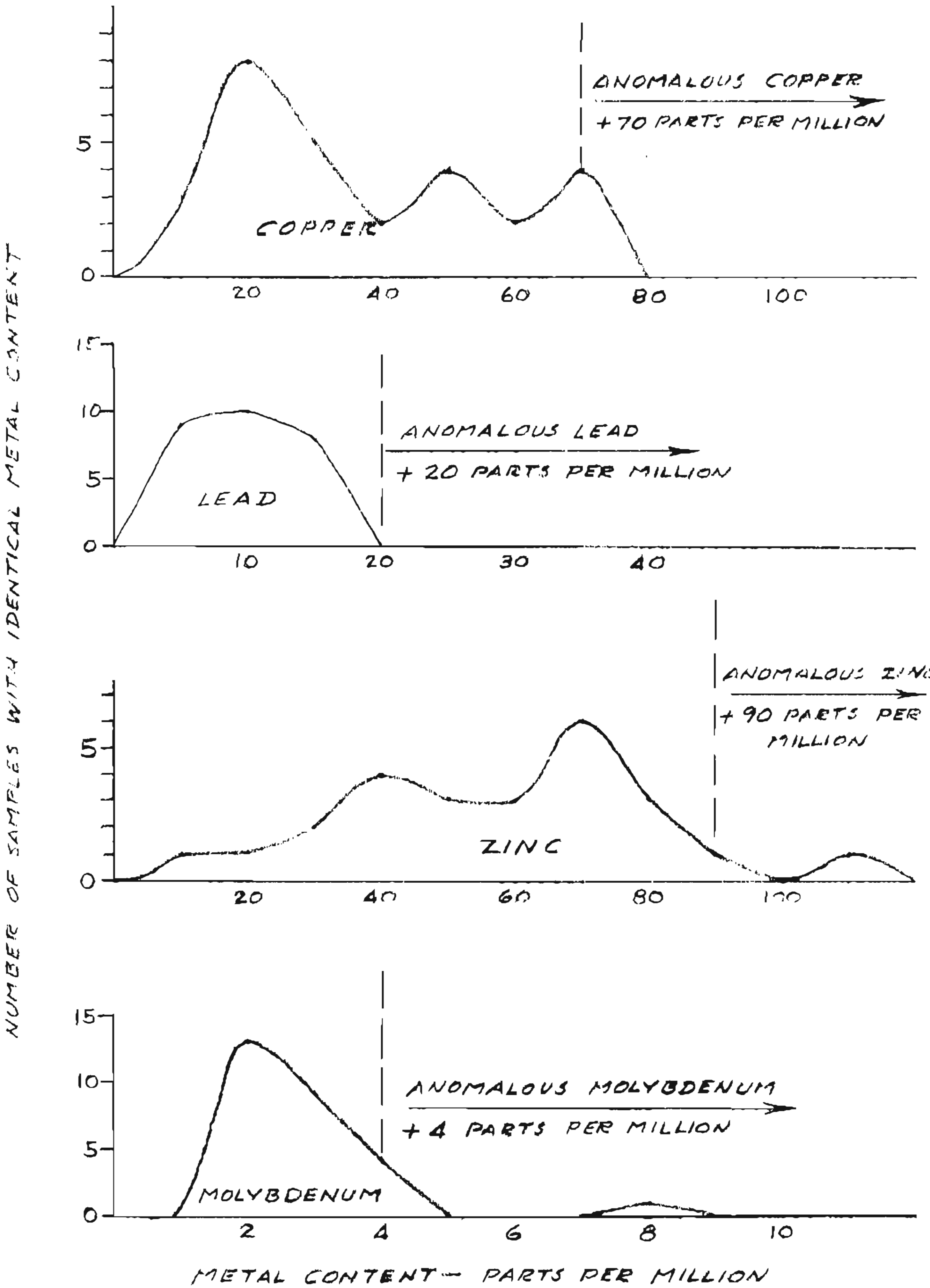
A total of 28 stream sediment samples were taken as well as two rock samples that contained sulfides. What are considered anomalous amounts of zinc and molybdenum were found at location 6. The highest anomaly was found between 11 and 16, where samples indicate a concentration of zinc and molybdenum. The one indication of copper in anomalous amounts was at location 22.

BERNERS BAY
August 1964

Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream sediments
1	19	15	5	55	2	8	violet-brn	54.0	graywacke	black slate & graywacke strike 310° - dip vert.
2	20	15	10	60	2	5	pink-brn	54.0	graywacke & B.S.	black slate & graywacke
3	21	15	5	45	2	-	blank	54.2	graywacke	graywacke & glacial fill
4	22	20	15	75	2	2	brn		graywacke	graywacke & glacial fill
5	23	10	10	25	2	6	brn		argillite w/pyrite	graywacke & glacial fill water test plus 15 brn/ redcap
6	24	55	15	135	4	6	pink-brn	54.5	no bedrock	graywacke & some igneous
7	25	5	5	10	2	3	brn	53.5	graywacke & B.S.	graywacke & some grando-diorite
8	26	20	10	75	2	17	pink-brn		graywacke & B.S.	graywacke & some grando-diorite
9	11	45	10	60	3	4	brn	54.5	gneiss & argillite	graywacke & some grando-diorite
9R	108	0	0	0	0	Assay	gneiss with pyrite & chalcopyrite?			
10	12	10	5	40	2	+20	brn	54.5	qtz diorite &granodio-rite	mostly granodiorite
11	13	35	15	90	2	6	brn	53	graywacke	micaseous schist
12	14	65	10	85	4	6	brn		no bedrock	graywacke with granodiorite
13	18	30	10	75	4	5	brn		black slate w/pyrite	black slate
14	17	65	15	245	8	4	violet-gray	54.5	black slate	black slate w/qtz

15	16	15	5	35	2	6	brn	54	graywacke	graywacke. b.r. to the east schistosegreenstone
16	10	20	10	110	3	10	pink-brn	53.5	graywacke	graywacke
17	8	30	5	50	3	6	pink-brn		no bedrock	graywacke
18	9	20	10	35	2	15	pink-brn	53.5	no bedrock	graywacke
19R	107R	0	0	0	0		Assay		chlorite schist & limestone outcrop 75'wide with pyrite & Cu?	
20	6	45	5	75	2	6	violet		black slate	metosediments & some igneous
21	5	55	15	85	3	-	no test		no bedrock	granite boulders & B.S.
22	4	70	15	75	3	6	brn		no bedrock	granite boulders & B.S.
23	3	30	10	80	3	4	gray		no bedrock	black slate
24	2	25	5	50	3	6	gray		no bedrock	black slate
25	1	30	15	65	3	+20	pink-violet		no bedrock	metoseds. & some igneous
26	15	35	10	40	2	6	pink-violet	55.0	no bedrock	metoseds. & some igneous
27	B.C.1	45	15	75	4	8	brn	55.2	no bedrock	glacial mix
28	B.C.2	50	5	40	3	10	pink-brn	55.0	graywacke	glacial mix water test +15 pink-brn


copper reported
quartz diorite
schistose greenstone
copper reported
graywacke
limestone
slate
greenstone volcanics
Mud
Mud
BERNERS BAY
BERNERS BAY
BERNERS
Cove Point
Pt St Mary
Point Bridget
Mab Island
1 Mile



ANOMALOUS COPPER
+70 PARTS PER MILLION
COPPER
ANOMALOUS LEAD
+20 PARTS PER MILLION
LEAD
ANOMALOUS ZINC
+90 PARTS PER MILLION
ZINC
ANOMALOUS MOLYBDENUM
+4 PARTS PER MILLION
MOLYBDENUM
NUMBER OF SAMPLES WITH IDENTICAL METAL CONTENT
METAL CONTENT — PARTS PER MILLION

BERNERS BAY

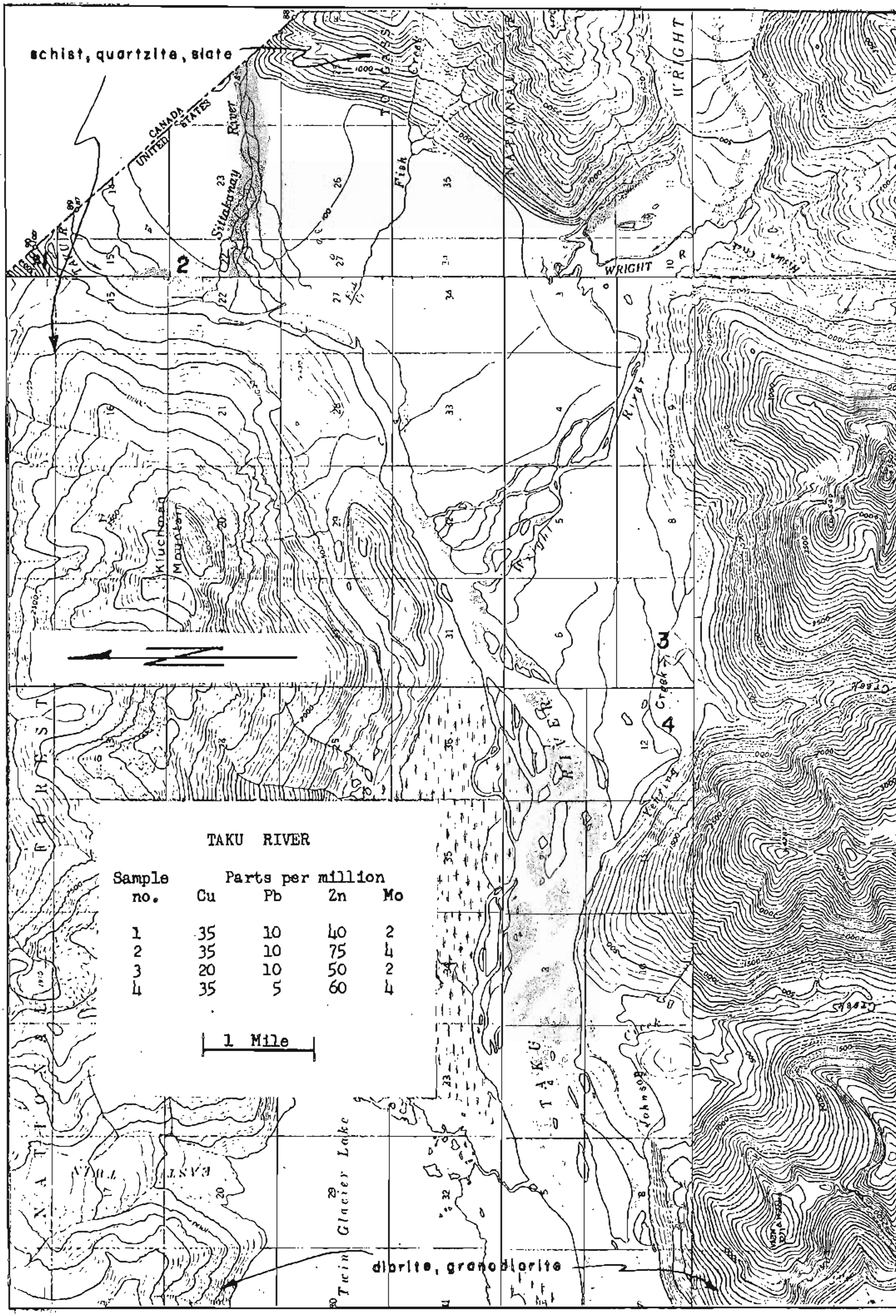
TAKU RIVER

Four stream sediment samples were taken during the month of September in the vicinity of the Taku River, thirty miles northeast of Juneau.

Several lead, zinc, copper, silver and gold prospects occur a few miles east of the border on the Canadian side.

Early U. S. Geological Survey maps show this particular area as being part of the Coast Range batholith because the geology has not been investigated. The Canadian Department of Mines and Resources Geological Survey Memoir 248 indicates that bedrock at the border in the vicinity of the Sittakanay River and Wright Glacier is palaeozoic schist, quartzite, argillite and slate with minor intrusions. The intrusive in this area is quartz monzonite. The eastern limit of the Coast Range batholith is probably near the western part of the accompanying map.

The four stream sediment samples did not indicate anomalous amounts of metal. Samples 1 and 2 were taken from sloughs and should be indicators for two large areas. Samples 3 and 4 were taken on Yhering Creek and should reveal the metal content of a small area.



TAKU RIVER

Sample no.	Parts per million Cu	Pb	Zn	Mo
1	35	10	40	2
2	35	10	75	4
3	20	10	50	2
4	35	5	60	4

GAMBIER BAY, ADMIRALTY ISLAND

Copper and nickel occur in Gambier Bay, but there is no recorded production of either metal. The geology is interesting in that there is a zone of strong east-west folding that interrupts the prevailing northwesterly structure. Imposed on these is a system of northerly and northeasterly faults.

Between May 5 and May 13, 1964 the writers obtained stream sediment samples in parts of Gambier Bay. Three areas with higher than normal metal content were noted: a copper area near a dolomite breccia; a lead-zinc area near a strong cross-fold; a zinc-molybdenum area near a fault zone.

Although outcrops are scarce, prospecting by geochemical and geophysical methods is not unduly difficult. The area is accessible.

Previous Work

As early as 1904 the U.S.G.S. reported on the Brown copper prospect on the north slope of Cave Mountain at the head of Gambier Bay and on the Cook copper prospect on Gambier Mountain (not covered in this investigation). See U.S.G.S. Bulletins 259 and 287.

Herman Kloss, a well known prospector, reports that he dug a single trench across a shear zone that is 150 to 200 feet wide and up to a mile or more in length, along the north shore of Gambier Bay. Mineralization was confined to small amounts of copper and nickel oxides. He also reports copper mineralization along a parallel zone to the east. These localities were not visited.

A hunter reports having found high grade copper float in a canyon south of Gambier Bay. An isolated copper anomaly at location 85 may be associated with this reported discovery. Copper prospects are also reported on the ridge south of locations 29 to 43 but the investigation showed lead-zinc, rather than copper, anomalies in the streams which drain that ridge.

No prospecting activity was reported in the area during 1964.

Geochemical Investigation

The portion of Gambier Bay in which stream sediment samples were taken shows a higher-than-average metal content for copper, lead, and zinc and three areas of anomalous values in these metals.

At map locations 5 and 10 to 13, on the hill between the two westernmost arms of Gambier Bay locally known as Cave Mountain, there is a silicified dolomite breccia mineralized with pyrite and chalcopyrite. The rock consists of angular, dark fragments of dolomite with silicified borders cemented by crystalline quartz. It contains calcite veinlets and a little magnetite. A picked specimen assayed 1.7 per cent copper.

The dolomite breccia weathers to a mass of porous iron oxide which can be traced west-northwest for two thousand feet or more. At the sea cliff the apparent width is about 100 feet but rock exposures and stream rubble on the mountain suggest that this rock is part of a larger, nonmineralized limestone breccia. Massive barite has been found at one place on the southerly edge of the dolomite.

Anomalous lead-zinc values extend for a mile and a half from map location 29 to 41, but the best spot is between locations 34 and 37. These are close to the apex of a strong east-west fold and a major east-west fault zone. Since the creeks are short, a proximate source of metal seems probable.

Zinc-molybdenum anomalies occur between locations 44 to 54. Since the graphitic schist at location 53 has an anomalous molybdenum content and since the stream gravels do not show a large amount of the acidic igneous rocks usually associated with molybdenite ores, it is possible that the molybdenum anomaly in the stream sediments is caused by the graphitic schist. The fact that the ratio of zinc to lead in this area is greater than in the area from location 29 to 41 may indicate that the metal source is more distant, as the higher mobility of zinc is well known.

Location 85 tends to confirm the report of copper upstream from where the sample was taken.

Prospecting

None of the anomalous areas are particularly difficult to prospect. The dolomite breccia can be followed by the dark red soil formed over it and possibly by a magnetic survey. Trenching or test pitting by hand should be relatively easy because of thin soil cover. Geochemical soil testing may have some value, but the soft iron oxide cover is apt to give negative results.

A similar soil over massive sulfide ore bodies has at times been found to be worthless for geochemical testing and Cx tests of this material during this investigation were blank.

The lead-zinc (locations 29 to 41) is marked by a steep, rugged ascent from the beach but gentler, covered slopes are found a short distance inland. Geochemical testing of the soils should be feasible.

Prospecting of the zinc-molybdenum area (locations 44 to 54) will require further stream sediment testing to find the nearest source of metal. The more likely source is on the northeasterly trending ridge about a mile south of map location 53.

GAMBIER BAY
May 1964

Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream Sediments
1	81	30	10	105	3				schist	schist, limestone acid porphyry
2	82	35	10	120	1				cal. schist	schist, limestone, acid porphyry
3	83	30	10	195	1				cal. schist	schist, limest., acid porphyry
4	84	35	10	330	4				cal. schist	schist, limest., acid porphyry
5	85	70	10	195	1				no bedrock	schist, limestone
6	16	35	20	50	0	10	brn	54.0	garnet schist	schist, alt. diabase (?)
	16R	35	10	100	0				altered basic dike	
7	19	35	35	120	0				schist	schist
	19AR	140	40	100	0				100' alt. dike	
	19BR	80	40	55	0				hornfels -	next to dike
8	17	30	30	150	0	+20	brn	53.8	cal. sed.	impure limestone
9	18	35	40	45	0	6	brn		cal. sed.	impure limestone
10	20	135	20	70	1	18	violet	55.2	schist	schist
	20R	1.7%	60	270	0				dolomite brec.	
11	21	500	20	285	1	17	violet-brn	53.5	no bedrock	intermittent stream
12	22	320	15	105	1	17	drk brn	53.5	dolomite brec.	intermittent stream
13	23	400	20	100	3	17	violet-brn	54.6	dolomite brec.	intermittent stream
14	24	10	20	110	2	0		54.7	no bedrock	limestone breccia

15	25	50	10	90	3	20	violet-brn	54.4	no bedrock	limestone breccia
16	80	40	20	95	0				limestone	l.s., schist, acid intrusive
17	79	40	10	330	2				limestone	l.s., schist, acid intrusive
	79R	20	10	10	0				limestone with pyrite	
18	78	50	10	220	3				schist	schist, l.s., qtz diorite
19	77	40	10	25	1				schist	schist, l.s., qtz diorite
20	76	40	15	110	2				schist	schist, limestone
21	75	50	110	90	0				schist	schist, limestone
22	74	55	25	70	1				schist	schist, limestone
23	73	25	10	100	2				schist	schist, qtz, greenstone
24	72	80	35	100	1				schist	sericite schist
25	71	70	15	80	1				no bedrock	schist
26	70	45	15	125	1				no bedrock	schist
27	69	35	15	100	2				no bedrock	schist
28	68	45	10	135	2				green chert	various - large stream
29	12	45	50	180	0	11	brn	52.0	sandy limestone	limestone
30	13	35	35	85	0	6	brn	53.8	sandy l.s.	limestone
31	14	70	70	125	0	7	brn	53.9	sandy l.s.	limestone w/pyrite
32	15	55	35	150	0	10	brn	53.6	sandy l.s.	limestone
33	11	50	65	160	0	10	brn	53.4	faultzone?	limestone
34	10	50	65	220	0	0		54.0	limestone	limestone
35	9	55	60	370	1	1	brn	53.8	limestone	limestone
36	8	55	80	475	2	0		53.8	limestone	limestone

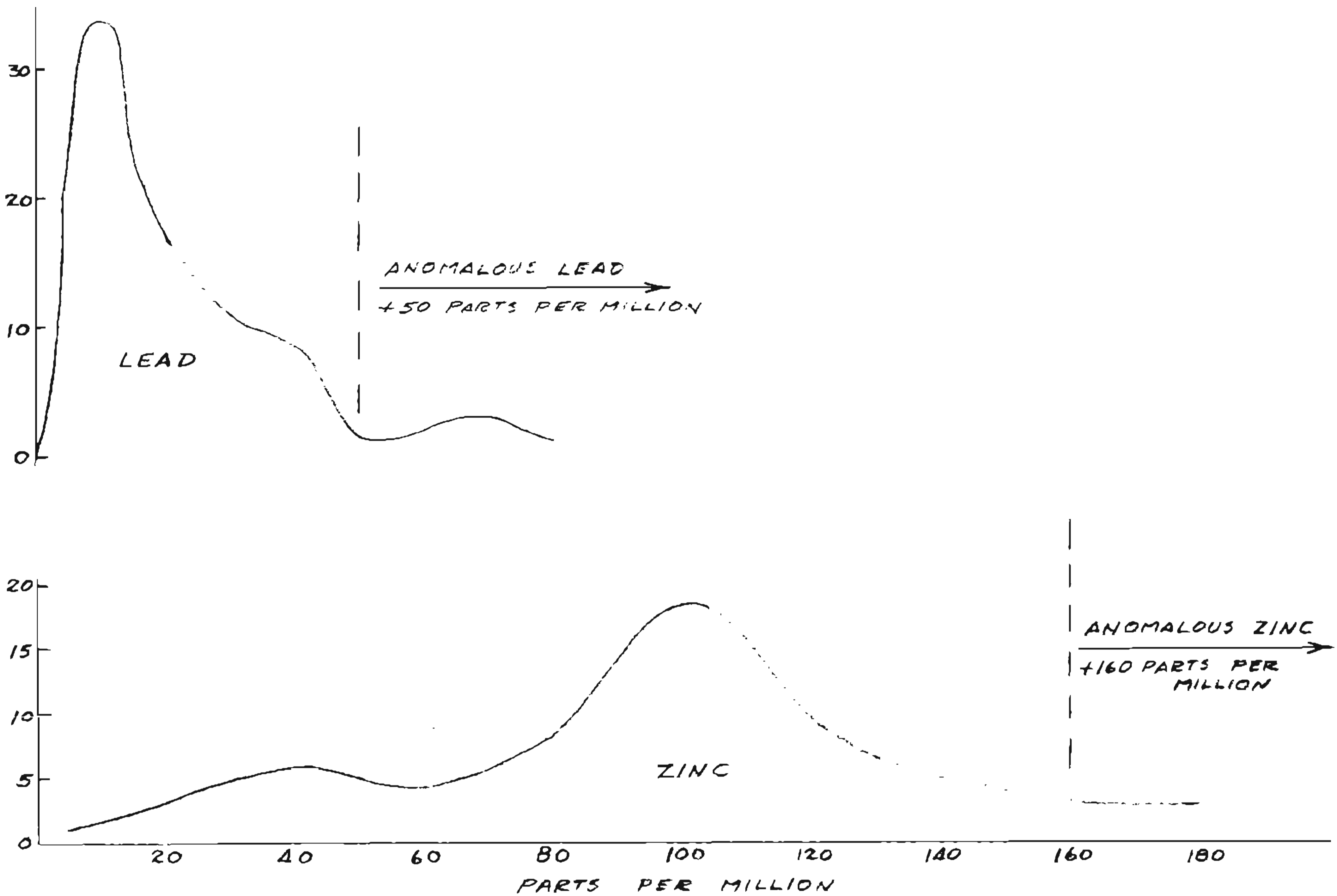
37	7	45	55	400	1	2	brn	53.0	cal. schist andesite sill w/pyrite	
38	6	45	30	125	0	0			impure limestone	limestone
39	5	45	40	185	3	0			impure limestone	limestone
40	4	50	40	100	2	3	brn	54.1	schistose l.s.	limestone
41	3	45	35	185	3	0			limestone	limestone
42	2	30	25	135	1	0			greenstone	limestone, greenstone
43	1			Missing						
44	65	40	10	80	1	0		53.6	no bedrock	river wash
			Water only ----15				pink			
45	64	45	10	240	8	7	violet	53.8	no bedrock	schist
46	63	15	10	100	1	5	brn	53.4	no bedrock	very short creek
47	62	30	10	170	3	11	violet-brn		no bedrock	glacial
48	61	25	10	200	6	22	violet-brn	53.7	schist	glacial
49	60	15	40	75	7	2	tan	53.3	schist	schist, qtz., igneous
50	59	20	15	80	2	10	brn		black marble	schist, marble
51	58	55	10	195	9	4	brn	53.5	black marble	schist, marble
52	57	55	10	190	10	18	violet-brn	54.0	qtz mica schist	
53	56R	20	10	25	12				graphite schist	specimen
54	56	60	10	210	7	21	violet-gray	53.8	schist	schist, marble, diorite(?)
55	55	50	10	95	4	14	brn	53.6	schist	qtz schist, marble
56	54R	35	20	?	0				altered basic dike	N6E; 33E
57	54	20	20	95	1	18	yellow	53.6	black marble	glacial

58	53	50	15	?	4	5	violet	54.5	l.s. w/epidote	glacial
59	52	35	10	135	3	18	violet-brn	54.1	schistose	on fault zone (?)
60	51	30	10	60	3	4	brn	53.1	volc. breccia	volcanics, chert
61	50	40	10	100	4	11	brn	53.5	chert	volcanics, chert
62	49	25	10	90	4	7	brn		chert	volcanics, chert
63	48	40	10	290	11	8	brn	54.9	volcanics	volcanic
64						0				very short creek
65	47	25	10	90	2	15	violet-brn	53.9		gray volcanic
66	46	35	30	85	4	6	brn	53.8		
67	45	10	15	25	0	4	brn	53.9		
68	44	25	10	?	5	6	violet	54.1	volc. conglom.	
69	43	55	10	?	0	2	brn	54.6	no bedrock	argillite
70	42	50	10	?	8	0		54.2	no bedrock	argillite
71	41	5	10	?	0	4	brn	54.2	no bedrock	volc. congl. qtz
72	40	5	20	30	0	0		55.0	no bedrock	glacial
73	39	5	10	25	1	0		54.6	no bedrock	volcanics, acid intrusive
74	66	15	10	10	2	4	violet		no bedrock	volcanics
75	67	10	10	5	0	0			no bedrock	glacial
76	26	25	15	100	0	0		54.3	argillite	argillite, congl., acid intrusive
77	27	5	20	30	0	0		54.0	no bedrock	argillite
78	28	5	25	40	2	5	violet-brn	54.2	no bedrock	argillite, chert, acid intru.
79	29	15	25	55	0	4	colorless	54.8	no bedrock	argillite, chert, acid intru.
80	30	45	25	120	2	0		54.8	black chert	argillite, chert

81	31	30	180	125	1	7	light brn	54.2	greenstone	argillite, greenstone
82	32	30	25	165	0	3	yellow	54.4	no bedrock	chert, argillite, little l.s.
83	33	35	10	105	1	2	pale green	54.3	argillite	argillite, chert, schist
84	34	30	25	140	1	5	brn	53.0	no bedrock	chert, schist, biotite granite
85	35	75	10	125	0	0			argillite	chert, argillite, volcanics
86	36	50	20	130	0	3	tan	54.0	no bedrock	chert, argillite
87	37	25	20	95	1	2	tan	54.2	no bedrock	qtz feldspar intru., volcanic breccia
88	38	25	25	180	0	7	brn		no bedrock	qtz feldspar intru., volcanic breccia

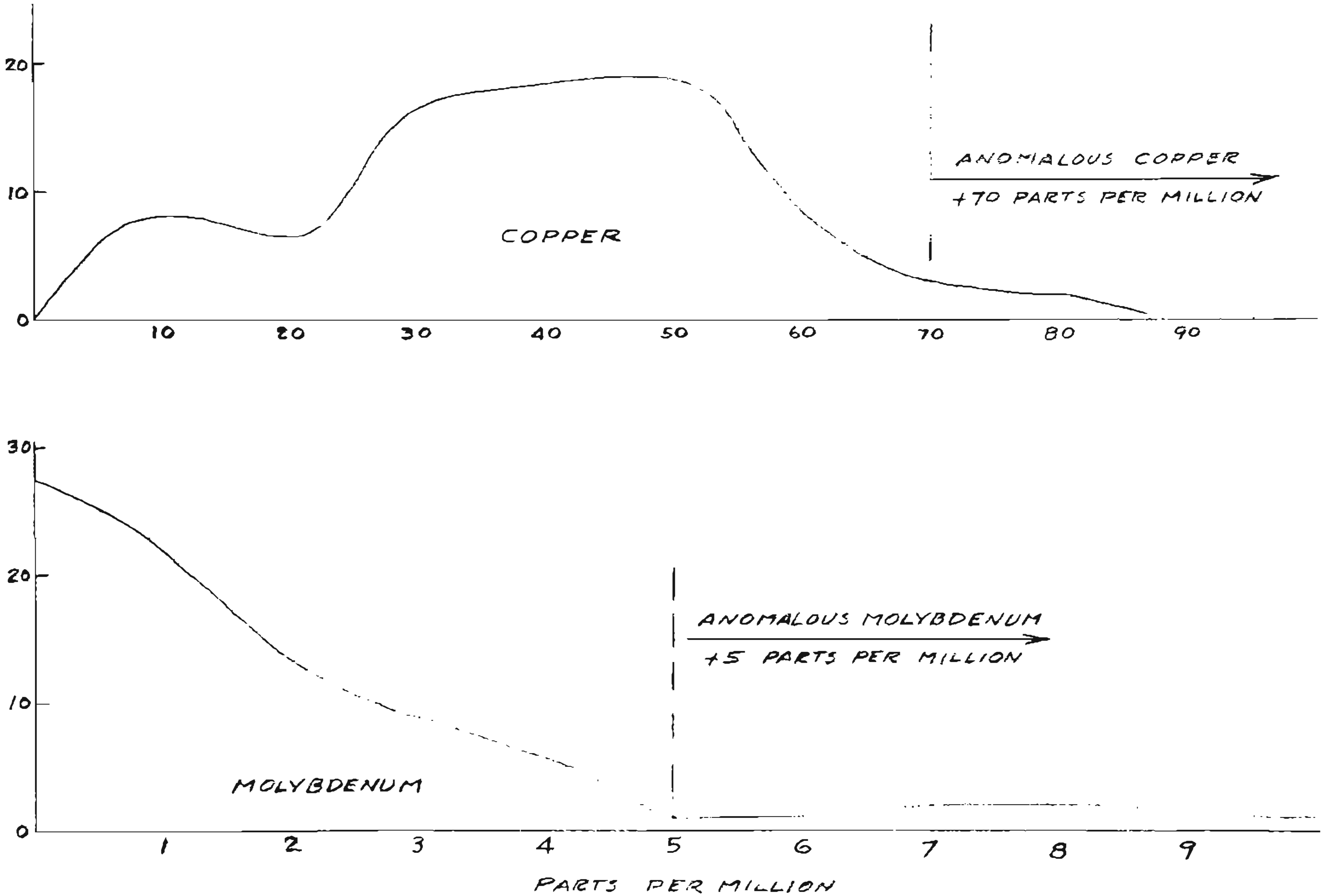

GAMBIER BAY
1 Silurian or Devonian — schist, marble, phyllite, graywacke, argillite
3 Permian and Permian (?) — fine to medium grained limestone with fragments of chert
3B Permian (?) — dark gray chert, volcanic pebble conglomerate, graywacke, siliceous argillite, dark limestone
5 Triassic — volcanic rocks, chert breccia, pillow lavas
6 Jurassic and Cretaceous — argillite, graywacke, conglomerate
from U.S. Geological Survey, Map I-323
U.S. Forest Service, topographical maps
Herbert & Race May 1964
1 mile
copper reported
copper prospect
calcareous schist
limestone breccia with chalcopyrite
copper & barite reported
limestone & schist
greenstone with quartz veins
schist & greenstone
green meta. chert - quartzite
calcareous graywacke with pyrite
dolomite
andesite
calcareous schist - quartz & calcite veins
copper - nickel
150-200' wide
volcanic conglomerate
marble & schist
graphite schist
black marble
basic dike
limestone - calcite & epidote
green volcanic breccia
chert
argillite
graywacke
qtz-mica schist


GAMBIER BAY
1 mile
30°
500' Contours



GAMBIER BAY

CHART 1



GAMBIER BAY

CHART 2

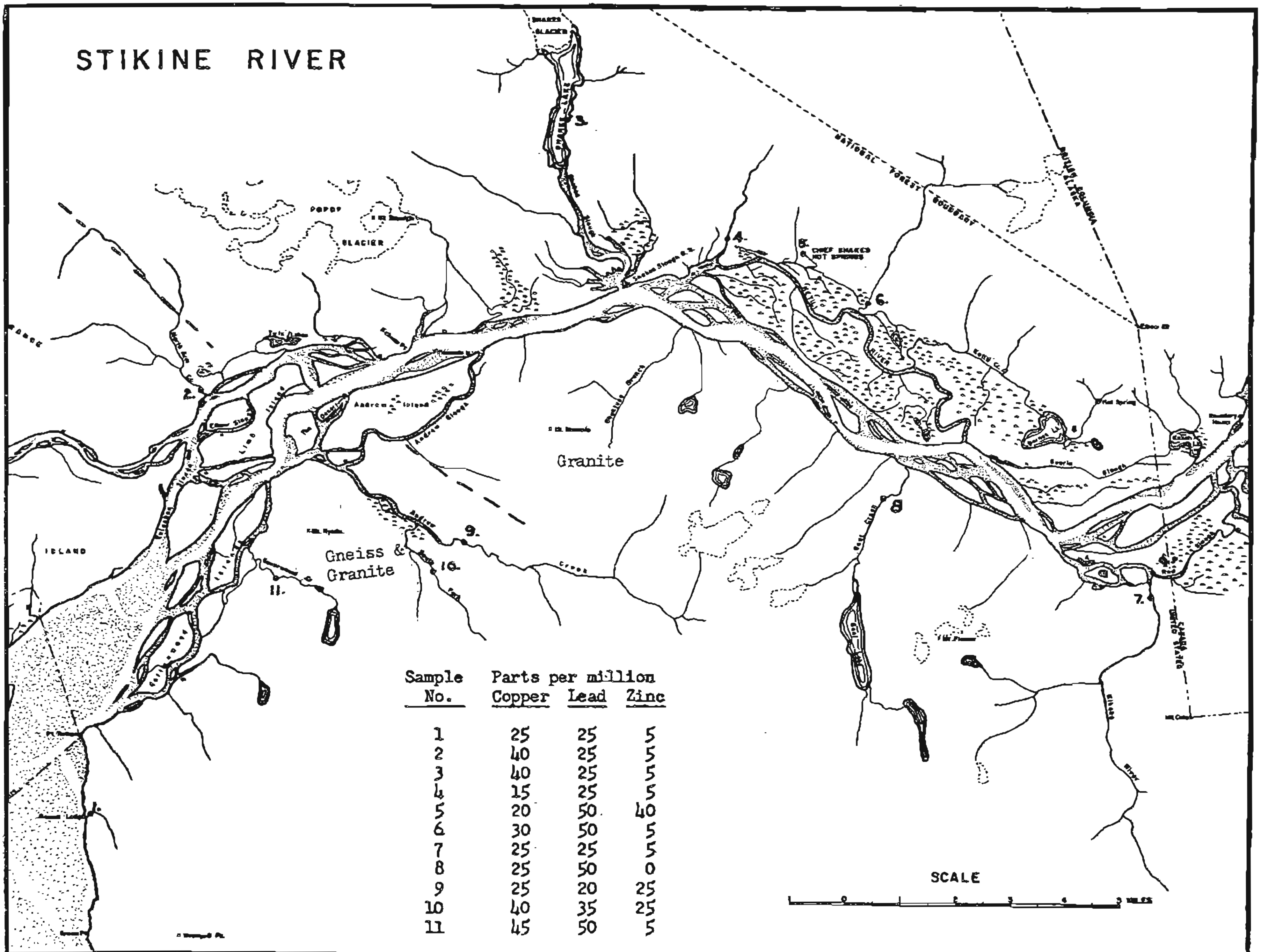
STIKINE RIVER

Eleven stream sediment samples were taken on June 18 and 19, 1964 between the Canadian border and the mouth of the Stikine River, northwest of Wrangell. The area covered includes part of the Coast Range batholith and the bordering metamorphic rocks on its west side.

There are no known prospects in this area although the garnetiferous schist near Garnet Ledge has been investigated as a possible source of industrial garnets.

None of the stream sediment samples showed what would be considered an anomalously high metal content

STIKINE RIVER



Sample No.	Parts per million Copper	Lead	Zinc
1	25	25	5
2	40	25	5
3	40	25	5
4	15	25	5
5	20	50	40
6	30	50	5
7	25	25	5
8	25	50	0
9	25	20	25
10	40	35	25
11	45	50	5

RATZ HARBOR

Ratz Harbor is located on the east side of Prince of Wales Island at W longitude 132°36' and N latitude 55°53'. It is approximately 50 miles northwest of Ketchikan.

Geology

The geology of Prince of Wales Island and in particular the Kasaan Peninsula has been described in the following U. S. Geological Survey Bulletins: Bulletin 347, The Ketchikan and Wrangell Mining Districts, Alaska; Bulletin 800, Geology and Mineral Deposits of Southeastern Alaska; Bulletin 1058-H, Geology of Part of the Craig C-2 Quadrangle and Adjoining Areas, Prince of Wales Island, Southeast Alaska; Bulletin 1090, Iron and Copper Deposits of Kasaan Peninsula, Prince of Wales Island, Southeastern Alaska; Bulletin 1108-B, Geology of the Craig Quadrangle, Alaska.

Bulletin 1108-B shows the inland area of Ratz Harbor to be diorite, while the points on either side of the harbor entrance are mapped as graywacke, slate, and andesitic volcanic rocks. The area to the west of the diorite is mapped as undifferentiated intrusive rocks, determined by photo interpretation. The undifferentiated intrusive rocks may include complexes of the metamorphic rocks.

Observations of the road construction exposures made during the course of this investigation agreed with the USGS mapping. Unfortunately the road system did not penetrate to the west far enough to enter the area of possible metamorphism. The igneous rock did, however, grade into granodiorite, and in one exposure was found to be a coarse-grained granite. The hill directly east of Big Lake (Ratz) contained several diorite dikes. Sparse pyritization was found in the area of Big Lake. The volcanics at the entrance of the harbor also contained pyrite. Gabbro containing magnetite was found near the contact of the diorite with the volcanics between Ratz and Little Ratz Harbor.

Very little quartz was observed. However, a 3-inch quartz vein containing pyrite was found in a quarry between Big Lake and Trumpeter Lake.

A sample of granodiorite containing pyrite assayed 0.03 per cent Cu. This sample was taken from an exposure east of Big Lake and shown on the map as RHR-1. Table 1 indicates the results of x-ray spectrographic analysis of rock samples shown on the map as 1 to 11R.

Geochemical Investigation

A total of 35 stream sediment samples were tested in the field for Cx metal and 10 samples representing larger watersheds or anomalous field results were bagged for laboratory analysis.

Laboratory results shown on Table II indicate that the streams flowing into Big Lake from the west (2) and south (4) carry anomalous amounts of copper and/or zinc. The table also indicates anomalous amounts of copper (8) and zinc (7) to the north of Little Lake. Both of these areas were covered with snow at the time of the field trip.

TABLE I. X-ray Spectrographic Analyses of Rock Samples

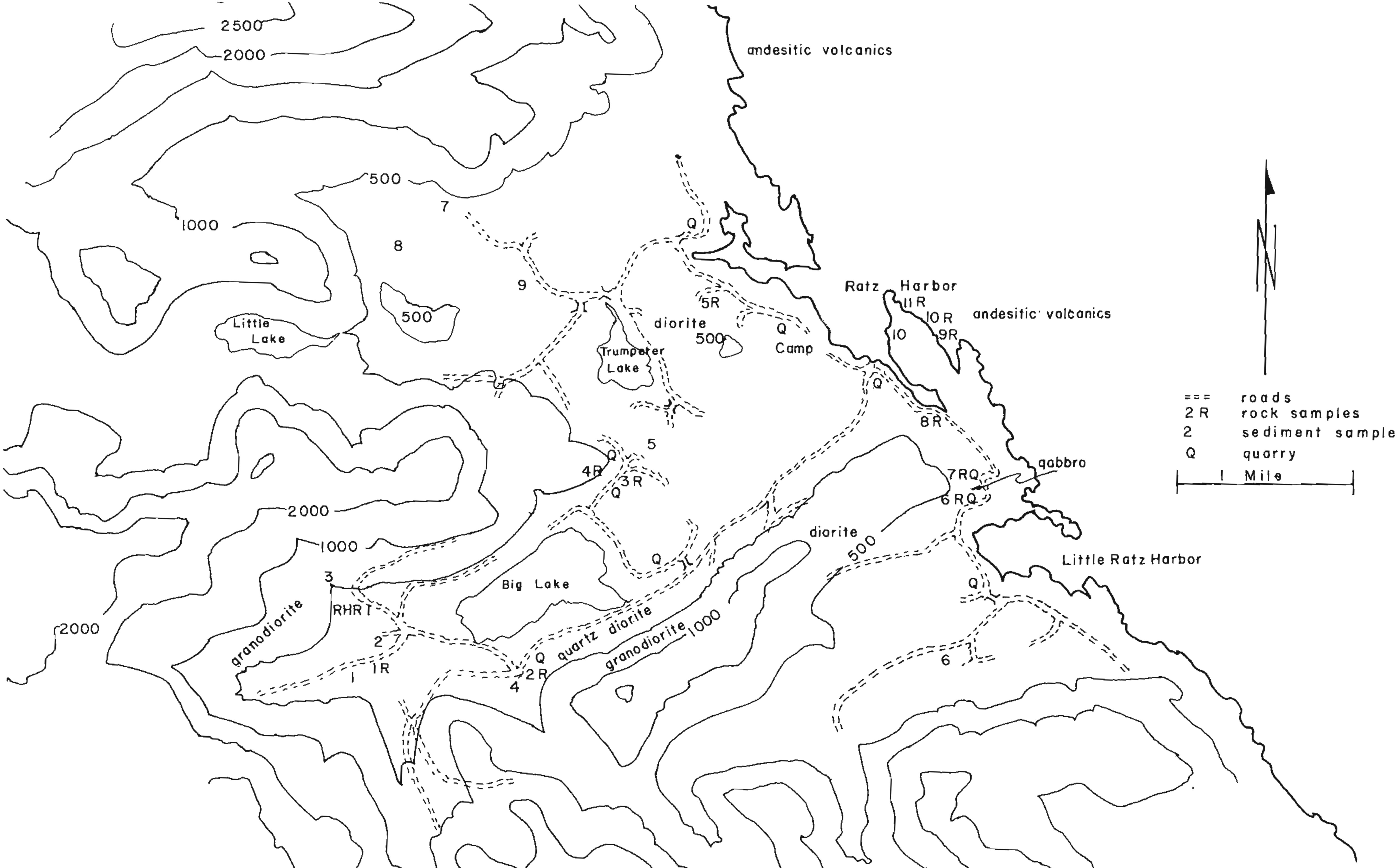
Sample No.	Major Elements	Minor Elements	Trace Elements
1R	Silicon Iron	Calcium Aluminum	Potassium, Titanium, Manganese (est. 0.1%), Strontium, Nickel, Zirconium (?)
2R	Silicon Iron	Calcium Aluminum Potassium Strontium	Titanium, Manganese (0.05%) Rubidium
3R	Silicon Iron	Calcium Aluminum	Potassium, Titanium, Strontium, Manganese (0.15%), Rubidium, Nickel, Copper, Zinc
4R	Silicon Iron	Calcium Aluminum	Strontium, Potassium, Titanium, Manganese (0.1%), Nickel
5R	Silicon Iron	Calcium Aluminum	Potassium, Manganese (0.15%), Nickel, Copper, Zinc, Rubidium, Strontium
6R	Silicon Iron	Calcium Aluminum Titanium	Potassium, Manganese (0.15%), Nickel, Zinc
7R	Silicon Iron	Calcium Aluminum Potassium	Nickel, Manganese (0.1%), Zinc, Copper, Lead, Strontium, Rubidium, Titanium
8R	Silicon Iron	Calcium Aluminum	Potassium, Titanium, Nickel, Chromium, Manganese (0.05%), Rubidium, Strontium
9R	Silicon Iron	Calcium Titanium Aluminum	Potassium, Manganese (0.1%), Nickel, Zinc, Strontium

TABLE I. Continued........

Sample No.	Major Elements	Minor Elements	Trace Elements
10R	Silicon Iron	Calcium Titanium Aluminum	Potassium, Manganese (0.1%), Nickel, Copper, Strontium, Zinc
11R	Silicon Iron	Calcium Titanium Aluminum	Potassium, Manganese (0.1%), Zinc, Strontium

TABLE II. Geochemical Sample Analyses in PPM

Sample No.	Copper	Lead	Zinc
1	37	10	40
2	72	4	160
3	38	21	40
4	180	4	180
5	31	23	55
7	23	<2	90
8	138	54	65
9	46	<2	60
10	14	31	85



2500
2000
500
1000
7
8
9
500
Little Lake
andesitic volcanics
Q
5R
diorite
500
Q
Camp
Trumpeter Lake
Ratz Harbor
11R
10R
9R
10
andesitic volcanics
Q
8R
5
Q
4R
3R
Q
7RQ
6RQ
gabbro
2000
1000
3
RHR1
granodiorite
2
1
1R
Q
Big Lake
Q
2R
4
quartz diorite
granodiorite
1000
diorite
500
Little Ratz Harbor
Q
6
2000
=== roads
2R rock samples
2 sediment samples
Q quarry
1 Mile
N

HOLLIS

Hollis is located on Twelvemile Arm on the east side of Prince of Wales Island at latitude 55°29'N, and longitude 132°45'W, approximately 43 miles WNW of Ketchikan.

The Hollis area has been an active small gold mining area. Several small mines were producing gold at the time U.S. Geological Survey Professional Paper No. 1 was published in 1901. Gold, associated with pyrite and galena, occurred in quartz veins from a few inches to a few feet in width, usually within shear zones. Aerial photography reveals that at least five of the mines were on the same shear zone.

A copper smelter was placed in operation at Copper Harbor in 1905, 20 miles to the south. In the same year another copper smelter was placed in operation at Hadley, 16 miles to the east. The now inactive Rush and Brown Mine and the Salt Chuck Mine are about 12 miles to the north. Besides copper, the Salt Chuck Mine produced palladium.

There are now more than 40 miles of logging roads in the vicinity of Hollis. The area has been logged and is in at least its fifth year of regrowth. The U. S. Forest Service is carrying on an experiemental reforesting project in part of the Maybeso valley.

Geology

The geology of the Hollis area is described in part by several U. S. Geological Survey publications. The most descriptive are: Professional Paper No. 1, Preliminary Report on the Ketchikan Mining District; Bulletin 347, The Ketchikan and Wrangell Mining Districts; Bulletin 714, Mineral Resources of Alaska, 1919; Bulletin 800, Geology and Mineral Deposits, Southeastern Alaska; and Bulletin 1108-B, Geology of the Craig Quadrangle, Alaska.

The accompanying part of Plate 1 from Bulletin 1108-B indicates the regional geology of the Hollis area. Detailed geology in the vicinity of the old mines can be found in other USGS Bulletins and in the files of the Division of Mines and Minerals.

In an unpublished report, dated June 2, 1938, J.C. Roehm, Territorial Mining Engineer, stated that "the mountain ridge between Harris and Maybeso Creeks has a diorite core."

Geochemical Investigation

One hundred and twenty-seven samples of stream sediment were taken in the vicinity of Hollis, as well as several samples of bedrock and metal bearing rock. The background level of metal contained in the stream sediments was found to be higher than in other areas investigated during 1964. Widespread mineralization was indicated on both the Harris River and Maybeso Creek. Samples taken at locations 19 to 32 indicate an exceptionally well mineralized watershed containing anomalous amounts of copper, lead and zinc. High amounts of zinc, copper and molybdenum were found between locations 8 to 12. Zinc and copper were high at locations 14 to 15 and 39 to 43. Anomalous amounts of zinc were found between locations 45 to 54.

The head of the Harris Valley is apparently well mineralized since anomalous amounts of copper, lead, zinc and molybdenum were found in samples taken at locations in that area. The entire north side of the Harris River from location 81 to 111 showed a high zinc content as well as high lead and copper values at locations 86,87, 92, 94 and 108.

Readings taken with an Arvela magnetometer indicated a higher magnetic intensity at locations 76, 77, 79, 83, and 85. Bedrock was poorly exposed in this area of the Harris Valley

Prospecting

Mineralization in the Hollis area is so widely disseminated that a large portion of the district seems to offer better-than-average prospecting opportunities, if geochemistry should be the only guide. However, it is suggested that four places should be selected for initial efforts.

On the north side of Maybeso Creek between map locations 19 to 32 is geochemical evidence of mineralization, most likely connected with the contact between the metamorphic rocks and the diorite of Granite Mountain. Particularly interesting is the group of anomalies from 25 to 29 which are close to a re-entrant into the dioritic intrusion and indicate, by high lead content, that the source of metal is not distant.

At the head of the Harris River, anomalies 68 to 71 occur in a re-entry into a crystalline intrusive body.

On the west side of the pass between Maybeso Creek and the Harris River anomalies 61 to 65 and 67 suggest a greater exent of mineralization along a large east-west, south dipping fault than has been shown at the Lucky Nell gold prospect in the pass. At the Lucky Nell prospect pyrite, galena, sphalerite and chalcopyrite occur in quartz lenses in an approximate sulfide-to-quartz ratio of 4 to 1. The gold is in the sulfides.

It is probable that anomalies 8 to 16 should be followed southerly into an area with anomalous topography and vegetation. This area may contain a fault zone parallel to the fault in Maybeso Creek, and a small intrusive to the east is suspected. Harris Peak is reported to contain diorite, and that rock was found in the gravel of many of the streams on the north side of the Harris River. The high molybdenum at map locations 8, 9 and 12, in connection with copper and zinc anomalies, suggests the possibility of a porphyry-type deposit.

HOLLIS
June 1964

Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	Ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream sediments
1	11	50	5	80	1	6	brn-violet		no bedrock	greenstone, light igneous. Some porphry water test 3 ml brn
2	12	45	5	95	1	7	brn-violet		no bedrock	greenstone & metasedi-ments
3	13	no lab sample				6	brn-violet	55.3	black slate	greenstone & greenstone porphry
4	14	no lab sample				10	brn-violet		no bedrock	little sand & gravel some black slate & greenstone
5	15	100	25	120	1	5	brn-violet		no bedrock	little sand & gravel some light igneous
6	16	50	5	50	1	4	brn-violet		no bedrock	glacial till
7	17	115	25	270	1	16	brn-violet		no bedrock	graywacke talus
	17R	tr	0	tr	-	w/trace Ni. & Barium				in Quarry~~-graywacke~~, argillite & congl.w/ pyrite
	17AR	0	10	tr	0	w/trace Ni.				same Quarry~~-diorite~~ dike w/pyrite
8	28	70	8	150	14	10	brn		no bedrock	little sand & gravel mostly mud
MSR	27	tr	10	tr			tr. Ni.		graywacke with pyrite	
9	27	150	8	450	16	+ 20	violet		graywacke	graywacke talus
10	26	70	8	145	1	12	brn	55.2	graywacke	graywacke talus water test 10 m/pink-brn

11	25	135	40	230	1	20	brn-violet	55.2	graywacke w/pyrite	graywacke
MSR	25		35	tr			tr Ni.		graywacke w/pyrite	
12	29	95	15	315	10	20	violet-brn		graywacke	graywacke w/ <5% igneous
13	30	20	4	26	2	10	brn		graywacke	graywacke talus
14	31	125	30	325	1	20	violet	53.4	graywacke	graywacke talus
15	32	190	4	325	1	20	violet-brn		no bedrock	mud
16	33	80	5	290	2	2		55.6	no bedrock	glacial till-large fast stream
17	34	90	10	530	4	+20	brn		no bedrock	mostly sand & mud
18	35	55	5	195	1	6	brn		no bedrock	Maybeso River-small angular & round light colored sand & gravel
19	18	140	45	285	1	12	brn-violet	53.5	black slate argillite	black slate & light igneous
20	19	100	50	550	2	+20	brn-violet		black slate argillite	black slate & 10% light igneous
21	20	190	40	220	2	10	brn		brn finegrained conglomerate	glacial till
	20R		25	Tr			brn		argillite	with pyrite
22	21	200	8	590	1	+20	violet-brn		argillite	argillite
23	22	180	40	975	1	+20	violet		no bedrock	glacial till - water 5 ml brn
24	23	85	8	450	1	+20	violet		black slate argillite	glacial till
25	24	420	50	2500	4	4	brn		black slate argillite	black slate 95%

26	1	75	40	610	3	+20	violet		no bedrock	talus and glacial boulders
26R			<0.1%	tr		tr	Au, 0.3 oz Ag		calcareous graywacke in argillite w/ pyrite	
27	2	195	105	1270	1	+20		55.3	no bedrock	talus & glacial Bld.
28	3	135	75	170	1	15	brn		no bedrock	talus & glacial Bld.
	R3									pyritized graywacke & argillite assay tr Ni & Zn
29	4	150	45	200	1	18	brn	55.4	graywacke w/pyrite	glacial slide
29R		tr	tr				tr Ni		diorite dike w/pyrite	
30	5	120	30	105	1	5	tr Ni		no bedrock	glacial till
31	6	130	25	220	1	14	tr Ni		black shale	glacial slide
32	7	100	30	145	1	7	tr Ni		no bedrock	moss and mud
33	8	80	30	95	1	2	tr Ni		no bedrock	glacial till
	33R		10	tr			tr Ag, 0.3 Ag		3 mi quarry, road 100, argillite w/pyrite & 2 acidic dikes w/pyrite sampled'	
34	9	80	20	65	1	4	brn		no bedrock	med size glacial morain stream much blue-gray clay
35	10	95	5	80	1	4	brn		no bedrock	med size glacial morain stream much blue-gray clay
36	36	85	8	80	1	2	brn		no bedrock	med size glacial morain stream much blue-gray clay with some graywacke & argillite

37	37	90	18	95	1	2	brn	55.6	fine grain conglomerate	med size glacial morain stream much blue-gray clay w/some graywacke & argillite
38	38	90	8	95	8	2	brn		no bedrock	mostly mud
39	39	95	15	310	1	17	brn		no bedrock	glacial till
40	42	110	12	150	1	+20	violet		no bedrock	glacial till w/some green metasediments
41	41	150	25	110	1	6	brn		no bedrock	glacial till w/some green metasediments
42	40	75	8	130	1	5	brn		no bedrock	glacial till w/some green metasediments
43	43	120	18	120	1	5	brn		no bedrock	glacial till
44	44	no sample				2	brn	56.3	no bedrock	50% graywacke, 50% glacial mix
45	45	60	13	110	1	6	brn		green porphry w/pyrite	50% graywacke, 50% glacial mix
46	46	60	10	145	1	7	violet-brn		green porphry	mostly large angular & round green metasediments
47	47	70	4	200	3	3	brn		fine-grain dio-rite or meta-graywacke	cr in fault striking N.
48	48	80	4	130		2	brn		no bedrock	green metasediments & some dark basic boulders
49	54	90	5	430	1	12	pink-brn	56.8	no bedrock	green metasediments & some dark basic boulders w/graywacke
50	53	105	20	365	1	10	pink-brn		no bedrock	green metasediments & some dark basic boulders w/ some granite & aplite
51	52	75	20	170	1	8	pink-brn		no bedrock	graywacke, granitics, aplite schist

52	51	35	4	130	1	4	brn		no bedrock	schist & granitics
53	50	40	20	85	2	7	brn		greenstone	greenstone
53R				tr		tr. Ni			green schist near quartz diorite	
54	49	70	20	270	1	7	violet brn	56.1	quartz diorite	granitic
54R				tr		tr Ni	quartz diorite w/pyrite			
55	55	40	20	100	1	+20	violet		graywacke	light colored metasedi-ments
56	56	40	20	115	1	+20	violet		no bedrock	glacial till
57	57	60	20	220	1	20	brn-violet	55.0	graywacke (green porphry)	graywacke
57	57R			tr			tr Ni, tr Au 0.2 Ag		greenstone	greenstone w/pyrite
58	58	125	40	790	1	+20	brn-violet		greenstone	mostly greenstone & graywacke
59	59	90	8	270	1	10	brn-violet		greenstone	greenstone
60	60	70	25	300	1	+20	brn-violet	54.0	no bedrock	small stream above tide water small rounded-rusty gravel
61	61	370	20	330	1	+20	brn-pink	52.4	no bedrock	mostly igneous
62	62	260	10	320	1	20	brn-pink	55.5	no bedrock	mostly igneous (some diorite)
63	63	no sample				6	brn		blue conglomer-ate	talus
64	64	100	55	180	1	13	brn		green conglom & diorite?	mineralized quartz in canyon bottom 4' wide
	64R		150	tr						quartz
65	65	185	715	550	5	+20	violet-brn	56.9	diorite ?	blue fine grained w/ pyrite near Luck Nell

66	66	no sample				9	brn		diorite	little gravel- on divide between A.R. & Maybeso
66R			40				Nil Au Ag			wide qtz in gully on trail from Lucky Nell to Hollis
67	67	90	60	410	1	+20	pink	54.1	no bedrock	glacial till
68	68	240	50	1010	1	+20	pink	54.6	no bedrock	slide rock, float on road w/pyrite, chalcopyrite & Zn ?
69	69	240	20	235	4	16	brn		no bedrock	glacial till & slide water sample-2 ml brn
70	70	310	4	120	13	6	brn		no bedrock	glacial till, float w/pyr.
71	71	210	30	260	2	15	brn		no bedrock	glacial till, float w/pyr.
72	72	80	12	205	8	6	brn		no bedrock	glacial till, float w/ pyr.
73	73	90	20	135	2	8	brn		no bedrock	glacial till, float w/pyr.
74	74	180	25	142	1	2	brn		no bedrock	glacial till, float w/pyr.
75	75	60	15	95	1	5	brn	57.5	diorite	mag @ quarry 60.1
76	76	165	20	150	1	4	brn	58.5	diorite	glacial till
77	77	100	20	135	4	2	brn	60.2	no bedrock	glacial till
78	78	50	10	70	1	3	brn	54.5	no bedrock	glacial till
79	79	140	11	100	1	0		59.7	no bedrock	glacial till w/much diorite
80	80	45	9	110	1	4	brn	53.5	no bedrock	glacial till w/much dior.
81	81	75	14	175	1	0		57.0	no bedrock	glacial till w/much dior.
82	82	40	12	170	1	5	brn	53.6	no bedrock	talus, diorite, graywacke, conglom.
83	83	75	10	200	1	5	brn	?	no bedrock	talus, diorite, graywacke, conglom. magnetometer erratic

84	84	95	20	665	1	13	violet-brn	?	no bedrock	talus, diorite, graywacke, conglom. magnetometer irractic
85	85	85	32	270	1	+20	brn	61.5	no bedrock	diorite, graywacke & argillite
86	86	55	30	160	1	+20	brn	53.5	no bedrock	diorite, graywacke & argillite
87	87	135	60	515	1	15	brn	54.5	no bedrock	diorite, graywacke & argillite water 1 ml brn.
88	88	60	25	365	1	+20	pink	56.0	no bedrock	mostly glacial clay w/ water 2 ml brn
89	89	55	40	450	1	13	brn	55.0	no bedrock	more black shale & argillit
90	90	85	40	705	1	+20	pink		no bedrock	glacial mix of local rocks
91	91	80	40	765	1	+20	violet-brn		conglom.	black slate & conglom.
92	92	125	25	885	1	+20	brn-pink	56.0	green banded metased.	black slate & conglom.
93	93	30	35	280	1	15	brn-pink		green banded metased.	black slate & conglom.
94	94	180	40	1025	1	+15	brn-pink	55.8	green banded metased.	black slate 7 conglom.
95	95	50	15	170	1	+15	violet-brn	59.0	graywacke	graywacke
96	96	80	15	200	1	8	brn	57.2	green metased.	graywacke
97	97	70	10	160	1	15	gray	55	no bedrock	greenstone, green metasediments
98	98	90	30	360	1	+15	brn-violet		no bedrock	greetnstone, green meta-sed. w/diorite
99	99	40	25	95	1	10	brn	53.2	no bedrock	blue shale, graywacke
100	100	60	20	265	1	4	brn		black shale (argillite)	graywacke & black shale

101	101	no sample				+15	brn	55.0	no bedrock	graywacke
102	102	40	15	220	1	5	brn		greenstone	greenstone
103	103	65	25	100	1	5	brn	55.2	green metased.	green metased. & graywacke diorite dike @ 5 mi. post
103R	103R	tr		tr			tr Ni		sample of diorite dike @ 5 mi post	
104	104	75	10	320	1	15	violet	55.0	no bedrock	green metased.
105	105	85	10	270	1				greenstone	greenstone
106	106	65	10	170	1	10	brn		greenstone & argillite	graywacke, argillite & green metasediments.
107	107	75	20	430	1	+15	brn	54.0	green schist w/pyrite	schist, argillite, graywacke
107R	107R	tr		tr					schist w/pyrite	
108	108	150	25	675	2	+20	violet		green metased w/quartz & pyrite	graywacke, argillite & schist
108R		<0.1%	1.4%	0.5%		tr. Ni	quartz from argillite & graphitic schist in quarry below Dawson Mine			
109	109	45	25	815	2	+20	pink-violet	55.5	argillite w/ quartz&pyrite	rusty graywacke many small qtz veins nearby
109R			10	tr		trace Ni	graphitic schist w/ quartz & pyrite			
110	110	50	45	310	1	10	pink-brn		no bedrock	rusty graywacke
111	111	50	10	195	1	15	brn	54.6	no bedrock	glacial mix
112	112	60	20	90	1	+22	pink		argillite w/ pyrite	90% argillite 10% greenstone
113	113	60	15	65	1	10	pink	Magnetometer in error	quartz diorite & argillite	igneous argillite & graywacke
114	114	30	10	55	1	15	brn		quartz diorite	igneous argillite & graywacke

114R		tr	0	tr		tr Ni			diorite w/ pyrite & chalcopyrite ?	
115	115	60	15	50	1	15	gray-brn	Magnetometer in error	graywacke	argillite, shale & graywacke
116	116	30	25	40	1	15	brn		no bedrock	green conglom. (part of the graywacke series)
117	117	35	20	30	1	16	brn		no bedrock	green conglom. (part of the graywacke series)
118	118	140	10	155	1	20	brn		green conglom	green conglom (part of the graywacke series)
119	119	40	25	110	1	+20	brn-violet		no bedrock	graywacke & med. igneous
120	120	40	15	55	1	+20	tan w/pink cap		no bedrock	tan clay - no sand
121	121	30	10	130	1	+20	pink		graywacke	graywacke & med. igneous
122	122	60	20	475	1	+20	brn-pink		no bedrock	graywacke & med igneous
123	123	30	10	65	4	+20	pink-brn		argillite	argillite & graywacke
124	124	20	10	110	1	10	brn		argillite	argillite & graywacke
125	125	40	15	60	1	20	brn		no bedrock	graywacke
126	126	65	25	260	1	+20	brn-pink		no bedrock	graywacke
127	127	40	25	110	1	20	pink-brn		no bedrock	a mixture of small gravel in Harris River
128	a duplicate sample									

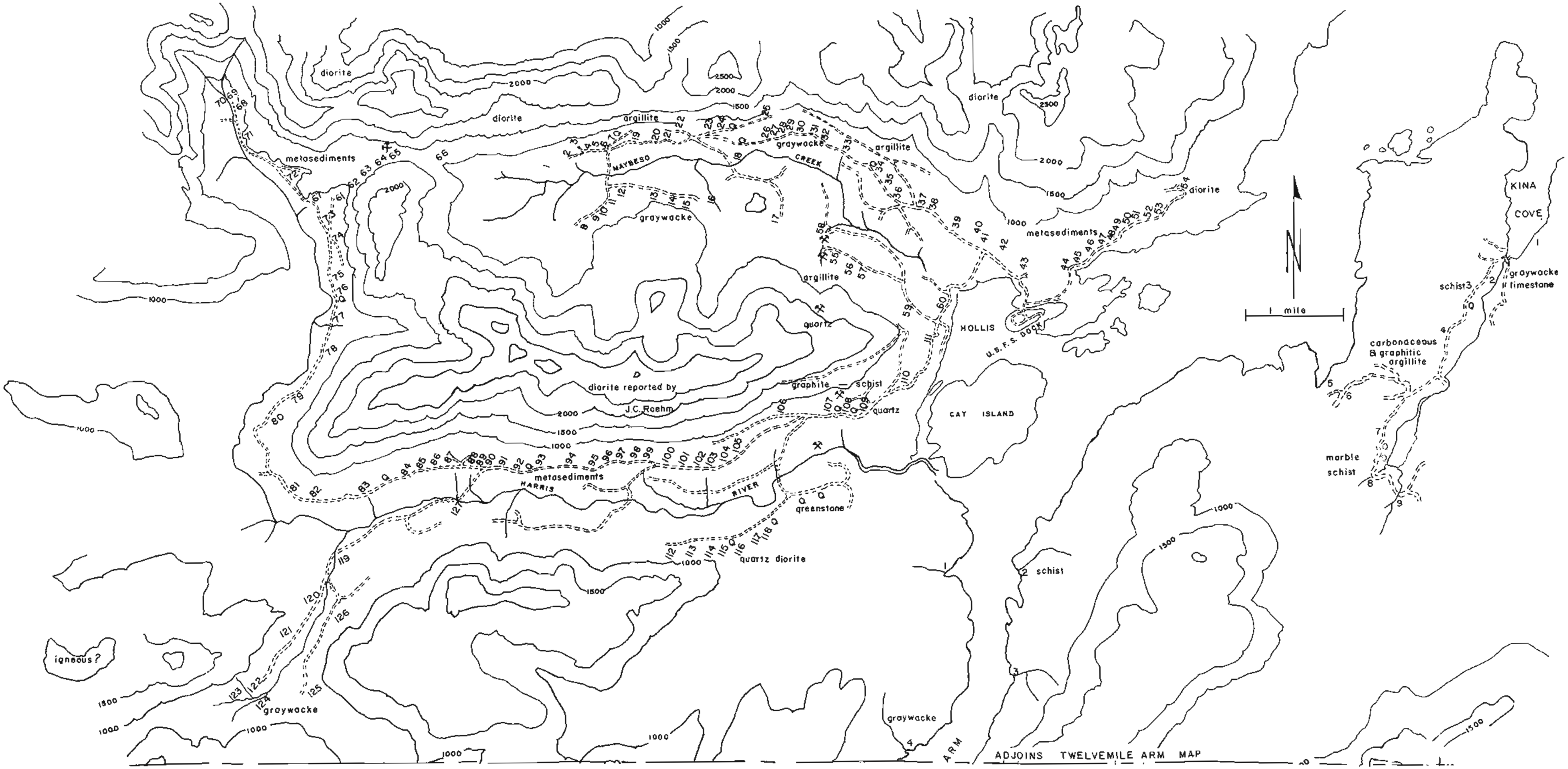
Copy of Part of Plate 1
U.S.G.S. Bulletin 1108-B

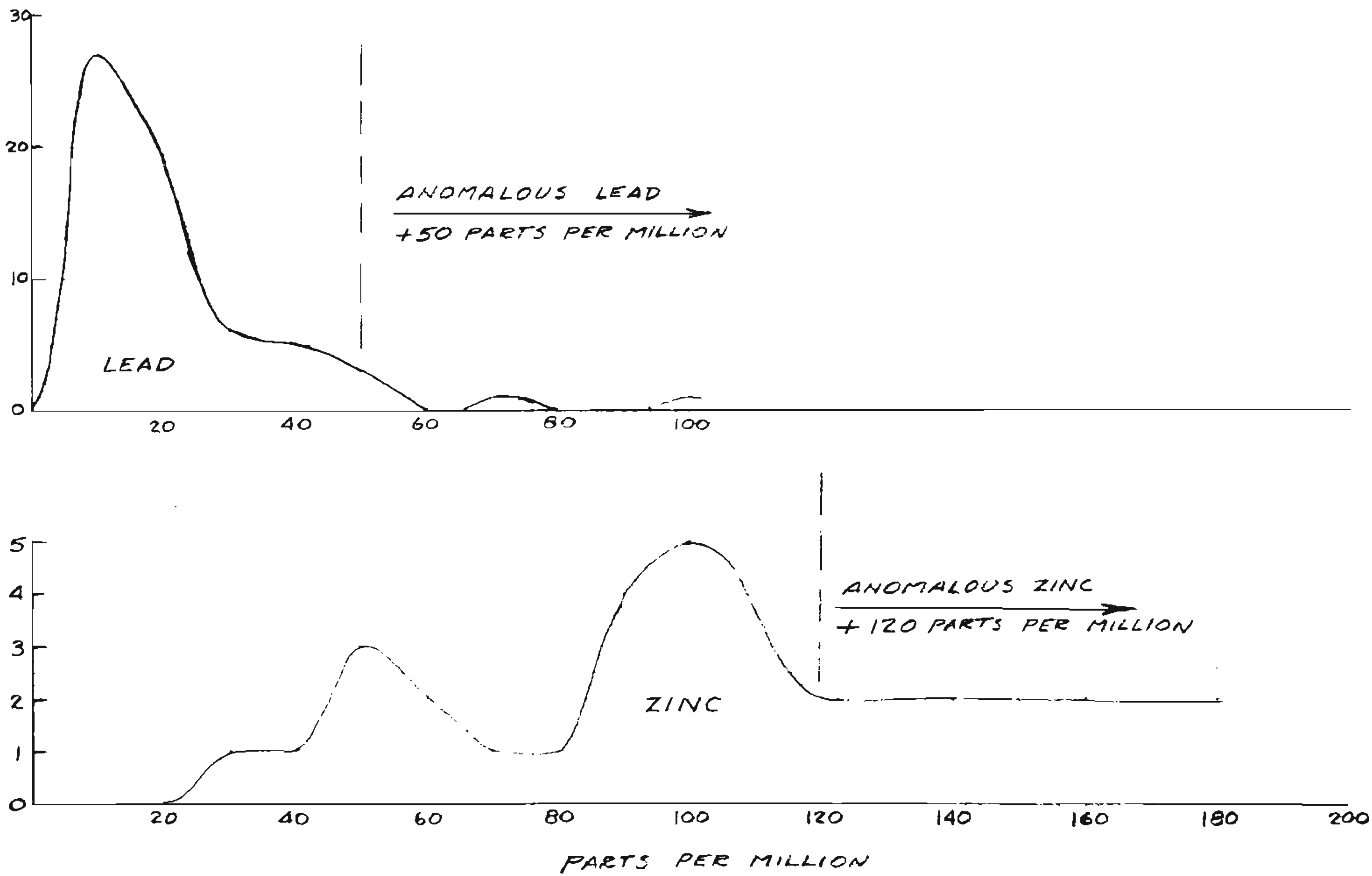
Dsv - Devonian sedimentary and volcanic rocks
Qag - Alluvial & glacial deposits
Da - Devonian andesitic lava, breccia & conglomerate
dt - Diorite
ig - Intrusive undifferentiated
wg - Devonian limestone

Report area

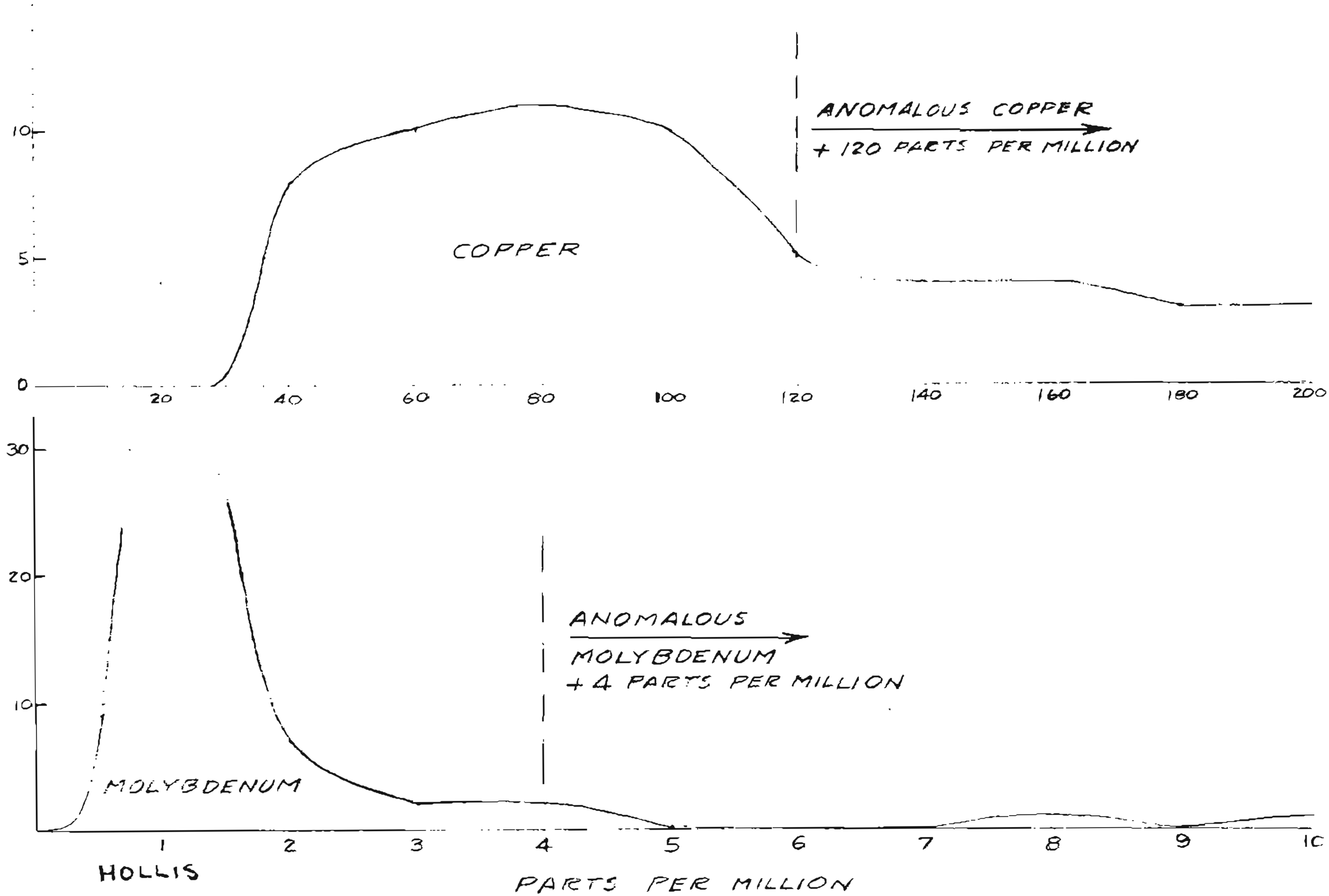
scale 1" = 4 Miles

HOLLIS & KINA COVE




30
20
10
0
LEAD
ANOMALOUS LEAD
+50 PARTS PER MILLION
20
40
60
80
100
5
4
3
2
1
0
ZINC
ANOMALOUS ZINC
+120 PARTS PER MILLION
20
40
60
80
100
120
140
160
180
200
PARTS PER MILLION

HOLL..S


ANOMALOUS COPPER
+ 120 PARTS PER MILLION
COPPER
ANOMALOUS
MOLYBDENUM
+ 4 PARTS PER MILLION
MOLYBDENUM
HOLLIS
PARTS PER MILLION

KINA COVE

Kina Cove is located approximately 5 miles ENE of Hollis. There are about six miles of logging roads south of the head of the bay. The area was logged about four years ago and has since grown to brush and young trees.

No reported prospects or mines exist in the vicinity of the road system.

Geology

The geology of Kina Cove is indicated by U. S. Geological Survey Bulletin 1108-B to have been compiled from Bulletin 800 and "by photogeologic methods only". Bulletin 800, Plate I, shows the geology as consisting of Devonian sediments and lavas.

Bulletin 1058, Geology of Part of the Craig C-2 Quadrangle and Adjoining Areas, Prince of Wales Island, Southeastern Alaska, Plate 33, shows part of Kina Cove as Silurian volcanic graywacke, conglomeratic volcanic graywacke, tuff, agglomerate, limy-matrix conglomerate, and lava flows too small to show on the map. This bulletin also shows the creek flowing through a unit of slate, slaty argillite, and minor fine conglomerate and graywacke, also of Silurian age.

The field work confirmed that the slaty argillite included graywacke and limestone near the beach and extended to the south end of the lake where it became quite schistose and contained a higher percentage of sulphides. The slaty argillite on the hill to the west of the lake showed evidence of crumbling and appears to be more graphitic than similar slaty argillite near the mouth of Kina Creek.

Geochemical Investigation

Nine stream sediment samples were taken along the logging roads. These showed that the high zinc content in the Hollis area to the west persisted into Kina Cove. The high copper-zinc anomaly found at map location 4 is interesting as is the molybdenum anomaly at map location 8, which is apparently near an area with an unusually large amount of quartz.

KINA COVE
July 1964

Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	Ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream Sediments
1	6	5	5	125	4	+20	brn		No bedrock	glacial mix
2	7	50	5	110	4	15	brn		argillite & limestone	glacial mix
3	8	65	5	175	1	15	brn		graywacke & schist	schist
4	9	225	25	400	4	+20	brn		argillite	argillite
5	5	25	5	40	4	10	purple-brn		argillite	beach gravel
6	4	35	5	120	0	+20	brn		argillite	argillite w/much qtz
6R		tr	tr	tr	0		tr Ni, No Ag		argillite	argillite w/much qtz & pyrite
7	3	45	10	115	5	15	brn		graywacke schist & limestone	graywacke with much quartz
8	2	20	5	140	20	15	brn		schistose gray-wacke	mostly schist
9	1	35	5	90	1	+20	brn		no bedrock	graywacke, schist & diorite
9R		tr	0	tr	0		tr Ni		schistose metasediment w/pyrite	

TWELVEMILE ARM

The logging camp of Campbell Construction and Logging Company is at the head of Twelvemile Arm and approximately six miles south of Hollis. The Kasaan District Office of the U. S. Forest Service loaned the writer a 14 foot boat equipped with an outboard motor to complete the field examination of Kina Cove and Twelvemile Arm. They also loaned the use of a cabin on Twelvemile Creek about a mile south of the logging camp.

Professional Paper No. 1, Preliminary Report on the Ketchikan Mining District, Alaska, by A. H. Brooks, 1902, mentions the Dolly Varden Claims. The report states: "The Dolly Varden Claim is located about 1½ miles southeast of the head of Twelvemile Arm. We were unable to visit this claim, but learned that the country rock is a white limestone, and that the ore is copper pyrite and malachite, carrying some gold values". Bulletin 347, 1908, also mentions the same claims and says, "The marble occurs as a member of the greenstone slate formation exposed along the shores of Twelvemile Arm."

The deposit evidently was never mined since no further mention of it is made in later publications.

Geology

In addition to the two publications mentioned above, Bulletin 800 and Bulletin 1108-B show the general geology of the area traversed. Bulletin 1108-B, Plate I shows marble intersecting Twelvemile Creek, but field examination places the marble area a mile or so to the south. The creek flows for the most part over black slaty argillite and locally metamorphosed graywacke. The graywacke series varies in color from green to blue and includes a great variety of textures. The black slaty argillite varies from a carbonaceous shale to a graphitic schist.

In contrast to the gentle dips observed at Hollis, the sediments south of the head of Twelvemile Arm are nearly vertical and strike WNW, parallel to a major zone folding, faulting and intrusion that extends from Cholmondeley Sound on the east coast of Prince of Wales Island to Trocadero Bay on the west.

Geochemical Investigation

Seven stream sediment samples were taken and bedrock observations were made enroute from Hollis to the Twelvemile Arm logging camp. The locations of the first four of these are shown on the Hollis map, which adjoins the Twelvemile Arm map on the north.

Thirty samples were taken along the logging roads south of the head of Twelvemile Arm. Pyrite and chalcopyrite were found in limestone quarries at two places (map locations 29 and 30).

The average content of copper and zinc in stream sediments was found to be high, even though no very high anomalies were found. On the other hand, the lead content was well under that discovered in the Hollis area.

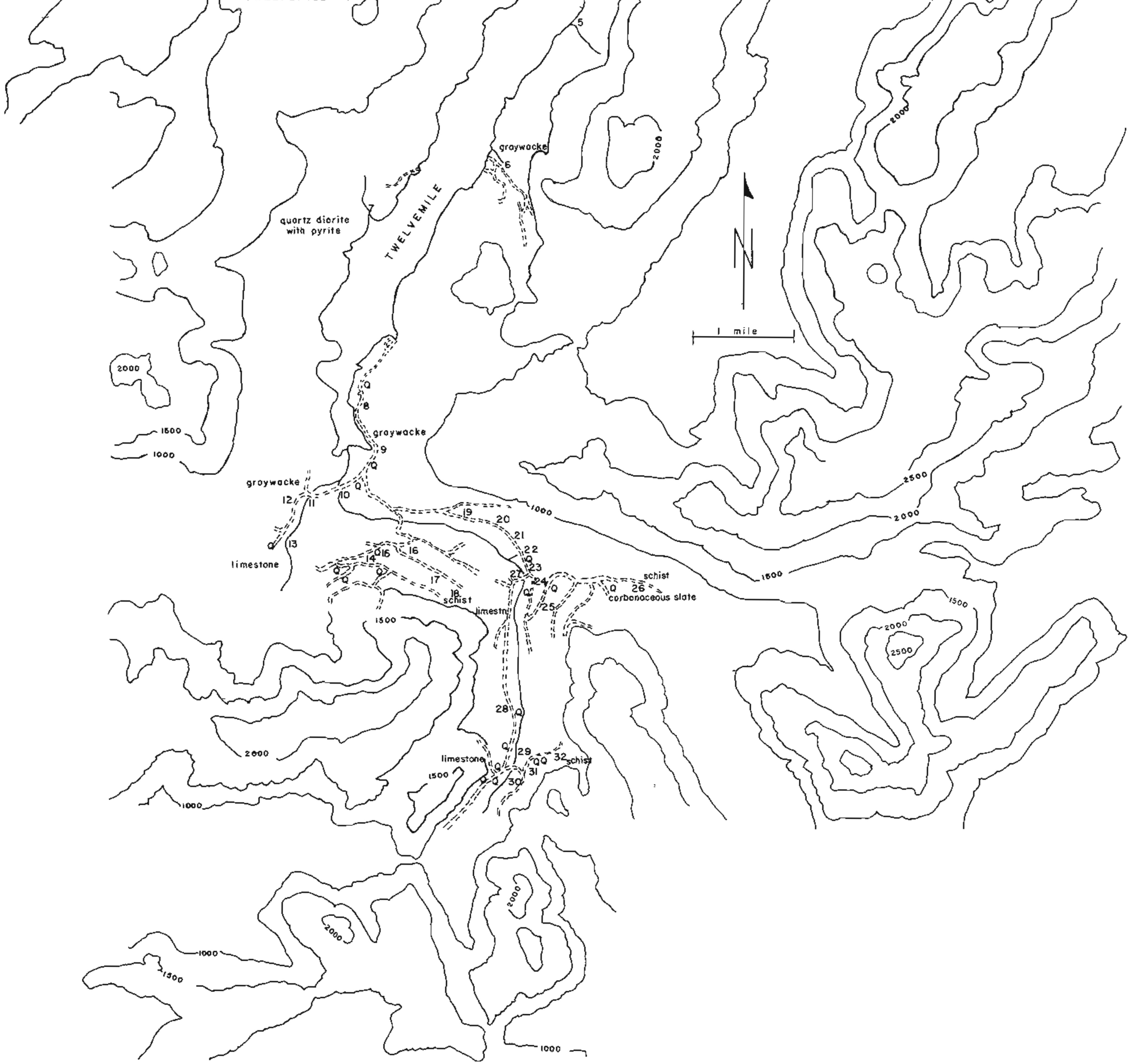
Attention is directed to copper-zinc anomalies at map locations 2 and 3; zinc (and possibly lead) from 10 to 13; and copper-zinc at 30 and 31 (near visible chalcopyrite).

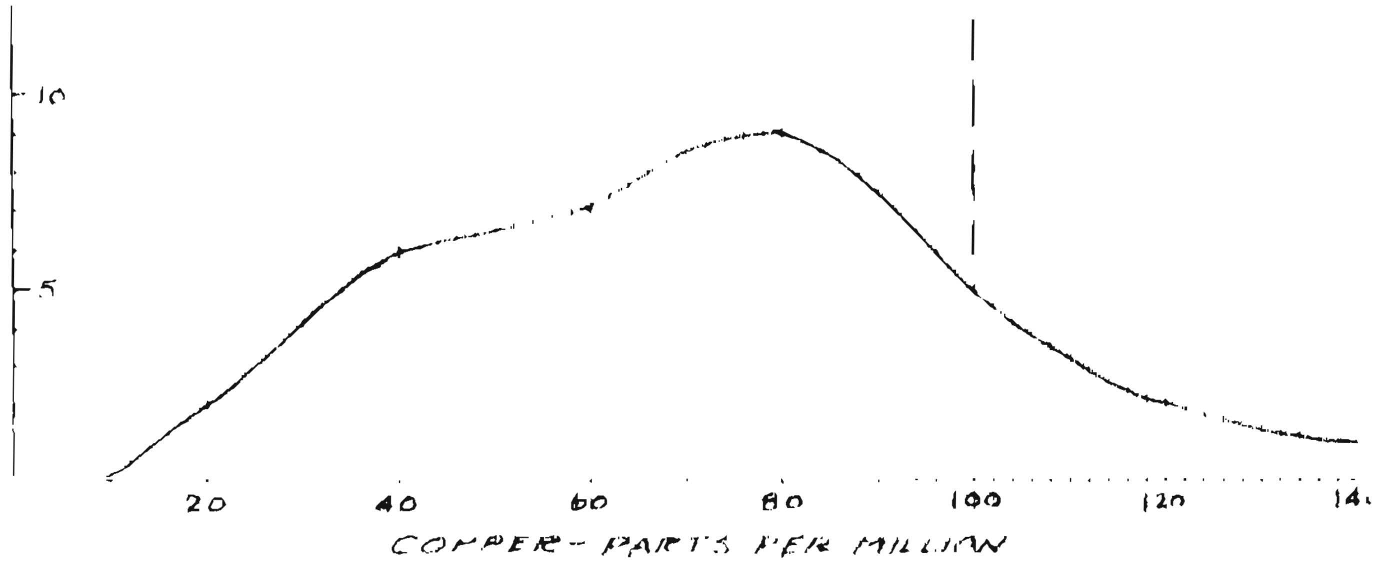
TWELVE MILE ARM
July 1964

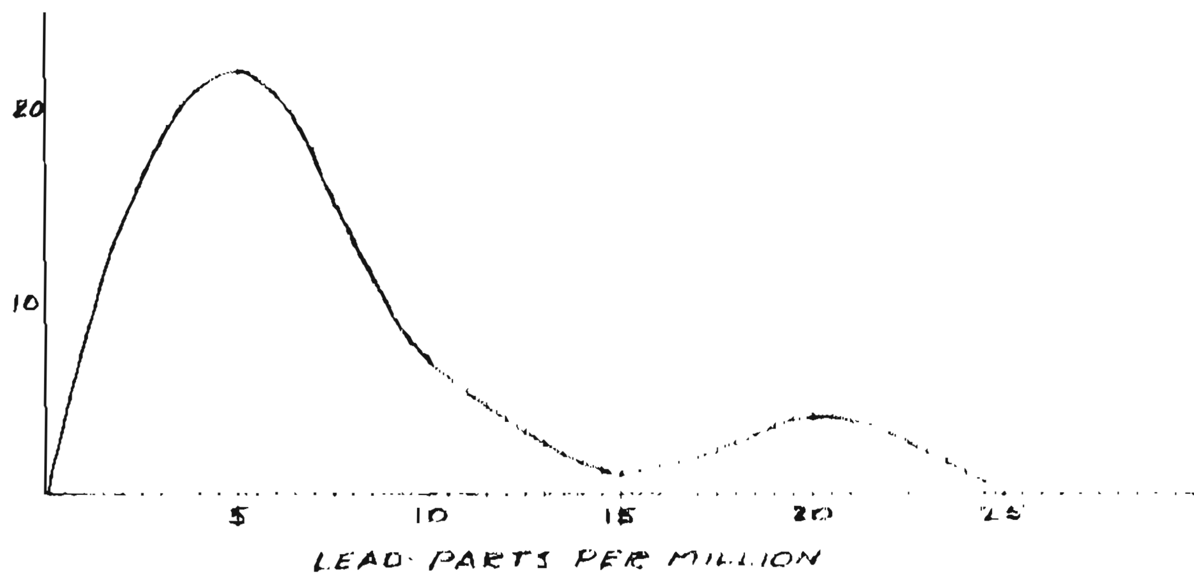
Map No.	Sample No.	Ppm Cu	Pb	Zn	Mo	ml dye Cx	Color Reaction	Mag reading x 1000	Bedrock	Stream sediments
1	1	60	5	140	4	15	violet-brn		volcanic breccia	mostly medium igneous
2	2	100	5	240	4	15	pink-brn		gray schist	glacial mix
3	3 & 4	140	10	165	1	15	brn		no bedrock	graywacke
4	5	20	10	90	1	6	brn		graywacke	graywacke
5	6	75	0	85	1	17	brn		no bedrock	graywacke (green conglom.)
6	7	80	0	90	1	17	brn		graywacke	graywacke (green conglom.)
7	8	65	5	130	4	12	brn		diorite w/qtz qtz diorite	light igneous-some graywacke
7R		0	0	0	0		fine grained diorite w/much disseminated pyrite			
8	34	40	0	115	4	4	brn		graywacke	graywacke
9	33	45	0	100	0	6	brn		graphitic schist	2" qtz vein in stream bottom
10	32	30	0	140	6	+ 20	orange-pink		no bedrock	graywacke
11	31	50	20	190	4	8	brn		graywacke	graywacke & meta-sediments
12	30	40	20	325	0	13	pink-brn		graywacke	graywacke & meta-sediments
13	29 28	45	5	145	5	6	brn		graywacke limestone, argillite	stream x-cuts strike of bedrock-sedi, some b.r.
14	27	45	0	90	0	9	brn		green metased.	graywacke
15	26	65	10	130	0	6	lav-gray		green metased.	graywacke

16	25	35	0	90	0	9	brn		green metased.	graywacke no igneous
17	24	100	20	145	0	10	brn		graywacke & schist	graywacke
18	23	90	5	140	4	+-20	brn		schist	graywacke marble @ end of road strikes 200° dip vert.
19	22	120	0	115	0	6	brn		no bedrock	glacial mix w/clay
20	21	60	0	120	0	4	brn		no bedrock	glacial mix
21	20	25	0	85	4	7	brn		metasediments	metasediments
22	19	20	5	60	0	10	pink-brn		metasediments	metasediments
23	18	50	10	150	4	10	brn		green metasediments	metasediments
24	15	70	10	120	0	6	brn		marble	marble & some schist
25	16	90	5	145	5	3	brn		no bedrock	metasediments
26	17	80	5	100	0		no field test		metasediments	metasediments - more schistose
27	14	25	0	130	0	10	brn		marble	metasediments
28	13	70	5	125	7	10	brn		limestone	metasediments - some gneiss
29	12	75	20	150	0	18	pink		graywacke	graywacke & some greenstone
29R		<0.1%	0	tr	0	18	limestone in Quarry East of location 29 w/pyrite & chalcopyrite			
30	11	70	10	275	0	25	limestone		schist	graywacke, schist
30R		0.3%	0	tr	tr		limestone in Quarry East of location 30 w/pyrite & chalcopyrite			
31	10	110	15	225	4	20	brn		no bedrock	graywacke & schist
32	9	95	0	130	4	17	violet-brn		graphitic schist	graywacke w/limestone
32R		0	0	0	0		fine grained gray metamorphosed rock w/much disseminated pyrite			

HOLLIS — KINA COVE MAP
TWELVEMILE ARM




10
5
20
40
60
80
100
120
COPPER- PARTS PER MILLION


20
10
5
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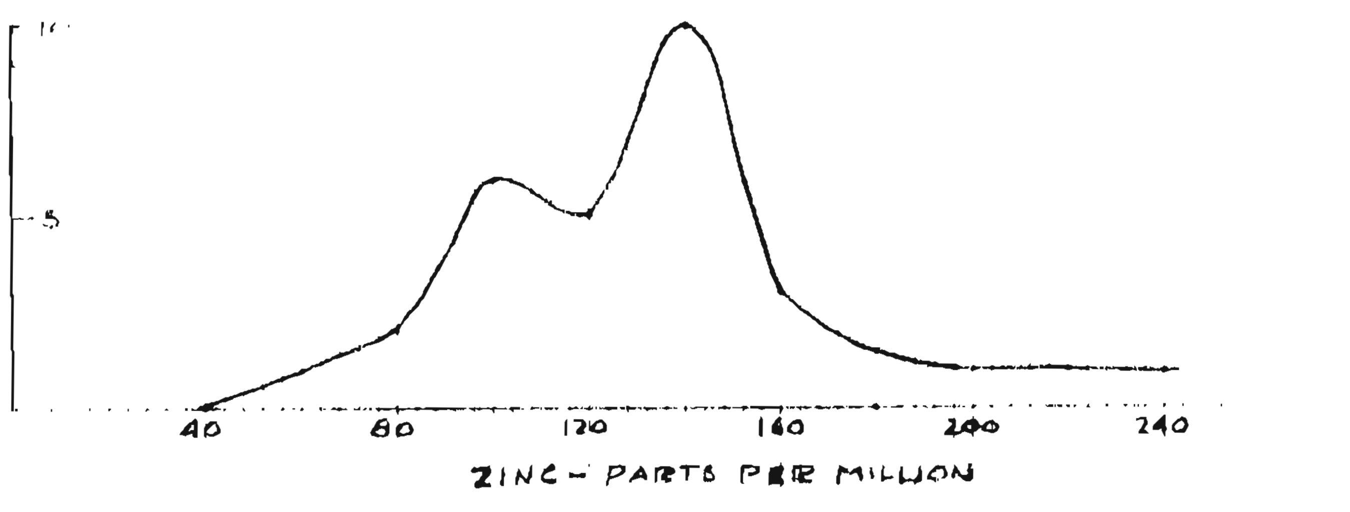
15
20
LEAD- PARTS PER MILLION


5
40
80
120
160
200
240
ZINC - PARTS PER MILLION

12 MILE ARM