STATE OF ALASKA

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Geology and Geochemistry at Kontrashibuna Lake, Lake Clark Region, Southwestern Alaska

By

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ILLUSTRATIONS

GEOLOGY AND GEOCHEMISTRY AT KONTRASHIBUNA LAKE,

LAKE CLARK REGION, SOUTHWESTERN ALASKA

By

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A B S T R A C T

Mineralized areas are known in the Lake Clark region, but almost no production has resulted, partly because of difficult access and partly because of a lack of geologic information. A brief geologic and geochemical investigation was conducted around the perimeter of Kontrashibuna Lake by the writer during the 1969 field season. A reconnaissance geologic map was made and 230 geochemical stream sediment and soil samples were collected. Several copper, lead, and zinc anomalies were found, four of which suggest more detailed work. Stream sediment and soil sampling along the drainage below the Kasna Creek copper deposit was conducted as a test of geochemical sampling procedures.

I N T R O D U C T I O N

PURPOSE

The presence of the Kasna Creek copper deposit and other prospects in the region prompted a short geological and geochemical investigation around Kontrashibuna Lake to help determine if a long-term program would be warranted. Detailed geological studies of the Lake Clark quadrangle have not been made. Stream sediment samples were collected from the active stream bed and from the banks of Kasna Creek where there is a known copper deposit to test sampling methods.

LOCATION AND ACCESS

Kontrashibuna Lake is in the Lake Clark A-3 and A-4 quadrangles about 160 miles southwest of Anchorage (*fig 1*) and 3 miles east of Port Alsworth on Lake Clark (*fig 2*). The lake is ½ to 1 mile wide and occupies a west-trending glaciated valley 14 miles long at an elevation of 560 feet in the Chigmit Mountains of the southwestern part of the Alaska Range. It is in the headwaters of the Tanalian River, which flows into the south side of Lake Clark near Port Alsworth.

Access to the area is primarily by air and foot, although boats can be used on Kontrashibuna Lake. Wien Consolidated Airlines has scheduled flights to Iliamna village, 35 miles southwest of Port Alsworth. Light planes may be chartered there for transport directly to the lake or to a landing strip at Port Alsworth. A footpath follows the Tanalian River from Port Alsworth 3½ miles to the lower (western) end of the Kontrashibuna Lake. Game trails may be followed around the lake, but steep slopes and thick brush make other travel on foot very difficult. A 2-mile trail leads from the mouth of Kasna Creek to a copper prospect near the head of the creek. St. Eugene Mining Company has begun work on a road to replace this trail, but the road had not been completed by 1969.

SURFICIAL FEATURES AND CLIMATE

Rugged topography near Kontrashibuna Lake (cover photo) is characteristic of the southern part of the Alaska Range. The lake is at an elevation of 560 feet, but summits of the surrounding mountains rise abruptly to 3000 to 5000 feet. Approximately 25 miles west of the lake, Iliamna volcano reaches an altitude of 10,016 feet. Glaciers and ice fields still exist near the crest of the range north and east of Kontrashibuna Lake, and glacial silt is abundant in large streams that enter the lake. Waterfalls and U-shape valleys are common. Below 2000 feet, spruce, birch, cottonwood, and alders are abundant, but higher terrain is barren. Annual precipitation is about 30 inches, and the mean temperature in a 4-year period at Port Alsworth was 31.6° F. (Warfield and Rutledge, 1951, p 3).

PREVIOUS WORK

Exploration near Kontrashibuna Lake and Lake Clark has included prospecting, sampling, and diamond drilling. Mineralized ground was first staked there in 1906. Since 1943, the St. Eugene Mining Corporation, Ltd., Vancouver, B.C., has been interested in the property and has done diamond drilling. They have also done regional geochemical sampling. Bulk sampling and a little geochemical sampling were done at Kasna Creek by the U. S. Bureau of Mines in 1948 (Warfield and Rutledge, 1951).

Published reports concerning the Kontrashibuna Lake area and the Lake Clark region have been primarily of a reconnaissance nature. Reconnaissance mapping was done by Martin and Katz (1912). Tentative ages were assigned to the rocks based on their investigations covering an area between the southern end of Iliamna Lake to the upper end of Lake Clark and from Cook Inlet west to Lake Clark. They dated the schists, quartzites, and crystalline limestone along the lower half of Kontrashibuna Lake as Paleozoic. The limestone beds at Kasna Creek were correlated with limestone exposed at Iliamna Lake and Lake Clark, determined by fossils to be Triassic in age. Structural relationships indicated the granitic rocks of the Chigmit Mountains to be upper Jurassic. Volcanic rocks were found to be mostly Jurassic and Tertiary in ages. Smith (1917) discussed the Kontrashibuna Lake area briefly in his report on the Lake Clark-Central Kuskokwim region.

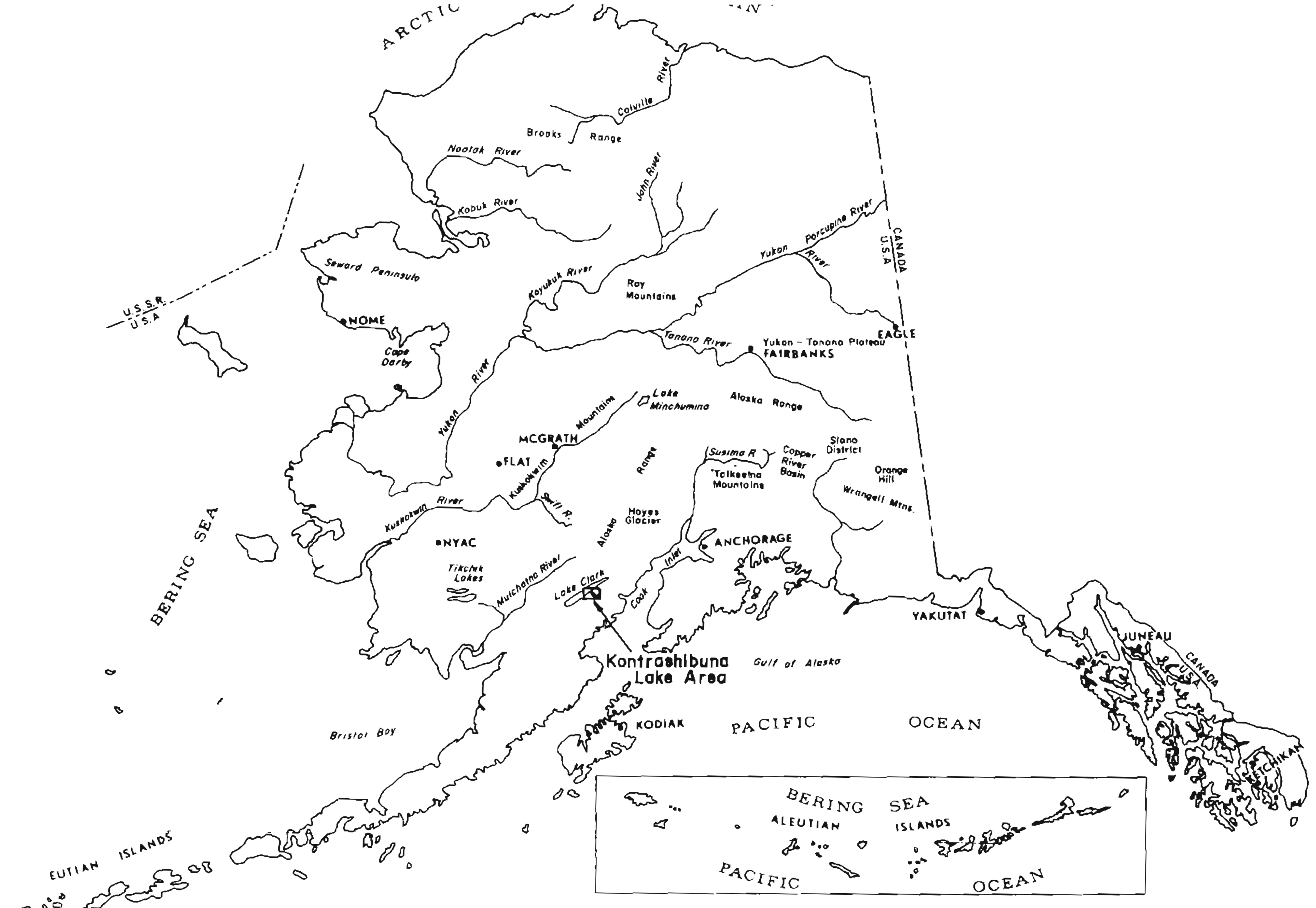


Figure 1

Location Map - Kontrashibuna Lake Area, Alaska

Capps (1935) included the Kontrashibuna Lake area in his reconnaissance mapping of the southern Alaska Range but did not alter the geology as mapped by Martin and Katz (1912).

Detterman and Reed (1964, 1968) mapped the Iliamna quadrangle south of Lake Clark at scale 1:250,000 (1 inch = 4 miles). Detterman and Reed (1965) and Reed (1967) undertook geochemical investigations in that quadrangle. Reed included geochemical sampling along Kasna Creek. Radiometric dating of plutons in the region was done by Detterman and Reed (1965) and Reed and Lanphere (1969). A major fault underlying Lake Clark was discussed by St. Amand (1957) and Ivanhoe (1962). Reconnaissance for radioactive minerals was undertaken by Moxham and Nelson (1952), who examined the principal prospects in the Lake Clark region.

ACKNOWLEDGEMENTS

The St. Eugene Mining Corporation, Ltd., an affiliate of Falconbridge Nickel Mines, Ltd., permitted the Divison of Mines and Geology to examine the Kasna Creek property and provided information for which the writer is grateful.

REGIONAL SETTING

Kontrashibuna Lake is on the northwest side of the Talkeetna geanticline, one of the principal geologic structures of the Alaska Range. The geanticline has undergone intermittent uplift and erosion since Early Jurassic time (Payne, 1955; Reed and Lanphere, 1969). Bedrock in this part of the range consists of highly deformed metasedimentary and metavolcanic rocks of Paleozoic to Early Mesozoic age, which have been intruded by a northeast-trending batholith composed mainly of diorite and quartz diorite of Jurassic to Tertiary age. The rocks have also been intruded by plutons of quartz porphyry, granodiorite, and quartz monzonite, which are peripheral to the main batholith. At this latitude, the Alaska Range is bounded by two major northeast-trending faults characterized by large displacements. The Bruin Bay fault 40 miles east of the map area, separates batholithic rocks from sedimentary strata of the Cook Inlet province. The Lake Clark fault, which underlies Lake Clark immediately west of the map area, is characterized by a right lateral displacement of approximately 8 miles (Ivanhoe, 1962).

M I N E R A L   D E P O S I T S

Mineralization and hydrothermal alteration in the region are associated mainly with small bodies of quartz porphyry, granodiorite, and quartz monzonite of Cretaceous and Tertiary age (Reed, 1967; Reed and Lanphere, 1969). At the Thompson claims on the Kijik River 7 miles north of Lake Clark, silver, galena, sphalerite, chalcopyrite, and pyrite have been found in a shear zone in granitic rock. Near the north end of Iliamna Lake, about 30 to 50 miles south of the map area magnetite, copper, silver, lead, and zinc have been found in limestone and greenstone near intrusive rocks. Placer gold has been found on tributaries of the Kijik River, and a small amount has been recovered from Portage Creek on the west side of Lake Clark (Capps, 1935). South of Kontrashibuna Lake there is a contact metamorphic copper-iron deposit in carbonate rocks near an intrusive of granodiorite.

G E O L O G Y   N E A R   K O N T R A S H I B U N A   L A K E

GENERAL GEOLOGY

Stratigraphy and structure in the Kontrashibuna Lake area are open to controversy because of a lack of detailed mapping. The present reconnaissance geologic map (*fig 2*) shows relatively large units of predominantly metasedimentary and volcanic rocks, smaller units of fragmental volcanic rocks and carbonate strata, and large masses of intrusive granitic to granodioritic rock. In the layered and bedded rocks, north-northeast strikes and steep west-northwest dips predominate, but top positions are unknown. If the rocks are uncomplicated by folding and faulting, the easternmost strata should be the oldest. West-dipping fossiliferous carbonate strata exposed near Kasna Creek have been considered younger than metasedimentary rocks exposed farther west. If this is so, the field relations suggest that the strata either are overturned or have been complexly faulted. Close examination of the limestone-volcanic rock contact and the positions of the brachiopod valves in the carbonate beds at Kasna Creek might reveal the tops of these beds. No attempt is made here to solve this problem, but future prospectors and mappers should be aware of it.

METASEDIMENTARY ROCKS

Metamorphosed nonfossiliferous sedimentary rocks exposed at the west end of Kontrashibuna Lake (*fig 2*) are part of a formation mapped as gneisses and quartzitic schists by Martin and Katz (1912). This formation is well exposed at Tanalian Mountain and apparently underlies at least 9 miles of the northern lake shore and 4 miles of the southern one. Fine-grained quartzitic and pelitic schists are characteristic, but the formation also contains subordinate crystalline limestone and dolomite, minor basalt sills or flows, and fragmental volcanic rocks. Agglomerate exposed west of Tanalian Mountain on Lake Clark appears to be interbedded with rocks of this formation, but the stratigraphic position of other agglomerate shown on the map is less certain. The strata also are cut by dikes of mafic to felsic composition. Estimates of the age of this formation range from pre-Triassic (Martin and Katz, 1912, p 32) to Permian or younger (Burke, 1965, p 13).

VOLCANIC ROCKS

Rocks of volcanic origin are exposed intermittently for at least 8 miles along the southern shore of Kontrashibuna Lake and at its eastern end. These rocks are part of a generalized formation mapped as porphyries and tuffs by Martin and Katz (1912). On the present geologic map, the formation also is generalized. The volcanic rocks are basalt, andesite, felsite, agglomerate, and tuff, but there is minor diorite and gabbro. The age of the volcanic rocks has been reported as Triassic or Jurassic (Martin and Katz, 1912, p 58), but the relationship of the volcanic rocks to the metasedimentary strata described above is not clear.

CARBONATE ROCKS AT KASNA CREEK

Carbonate rocks underlie approximately ¼ square mile near the head of Kasna Creek. Martin and Katz (1912) reportedly traced the carbonate rocks northward along the east edge of the quartzitic schist unit to the north end of Lake Clark, but more recent work by mining company geologists suggests that the carbonate rocks are discontinuous. At Kasna Creek typical lithologies include fine-grained fossiliferous, gray limestone and dolomite, which are brown on weathered surfaces. The carbonate strata are approximately 1500 feet thick and crop out for about 4000 feet along strike. They form prominent outcrops on the east side of Kasna Creek at an altitude of 2000-3000 feet (*fig 3*). On the west, these strata are in contact with mafic volcanic rocks close to the present bed of the creek. On the east, they are in contact with felsitic volcanic rocks. To the south, the carbonate rocks appear to be cut off by intrusive granodiorite (Reed, 1967, p 13). Downstream to the north, volcanic rocks predominate. Thus the carbonate rocks appear to form a thick lenticular mass within a sequence of volcanic rocks, but the possibility of faulting should not be overlooked.

PLUTONIC ROCKS

Plutonic rocks in the area range in composition from granite to granodiorite. Light colored, medium-grained granite is exposed on a bold mountain northeast of the lake and in at least one small area on the southern shore. Light-gray to pink, fine-grained granite is exposed in low bluffs along the shore of Lake Clark and the Tanalian River. Granodiorite described by Reed (1967), south of Kasna Creek, was not studied in the field by the present writer.

MINERALIZED ROCK AT KASNA CREEK

A metasomatic mineralized zone in carbonate rock extends for about 2400 feet parallel to Kasna Creek at an average elevation of 2500 feet. This zone contains irregular lenses and pods of specular hematite, chalcopyrite, amphibole, chlorite, calcite, and quartz, which have replaced limestone and dolomite. The lenses and pods are parallel to bedding in the limestone. Extensive sampling of hand-dug trenches by the U. S. Bureau of Mines revealed an average of approximately 1% copper. Two main mineralized areas within this zone are separated by a steep draw (*fig 5*). Mineralized ground on the Gilt Edge claim on the north is about 1100 feet long and 250 feet wide. It is about 200-300 feet above the stream bed. Mineralized rock on the King claim to the south is 1300 feet long and 50 feet wide. It forms the east bank of the present channel of Kasna Creek.

Figure 3 -- Steeply dipping carbonate beds, east side of Kasna Creek. These beds are the host rock for a metasomatic copper-iron deposit. Head of Kasna Creek is in background.

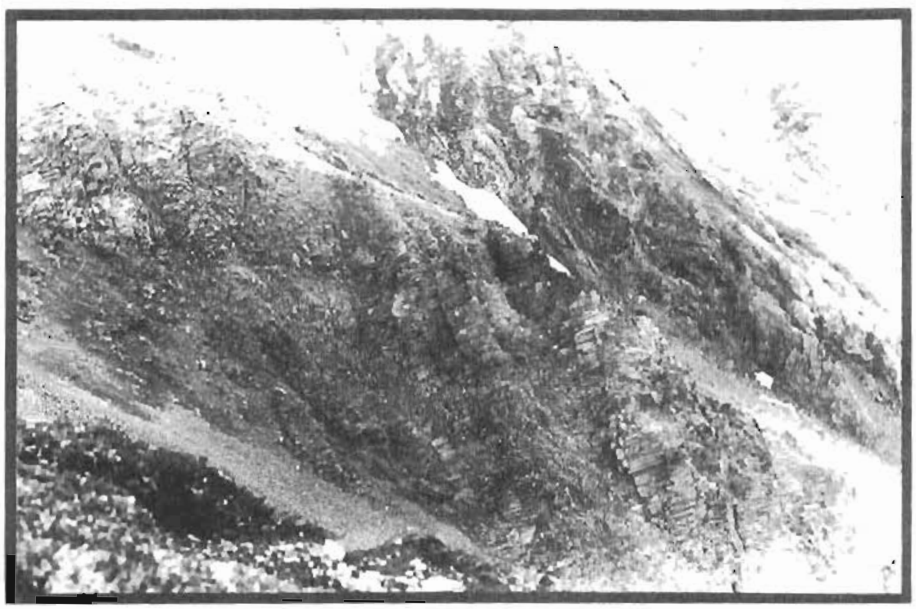
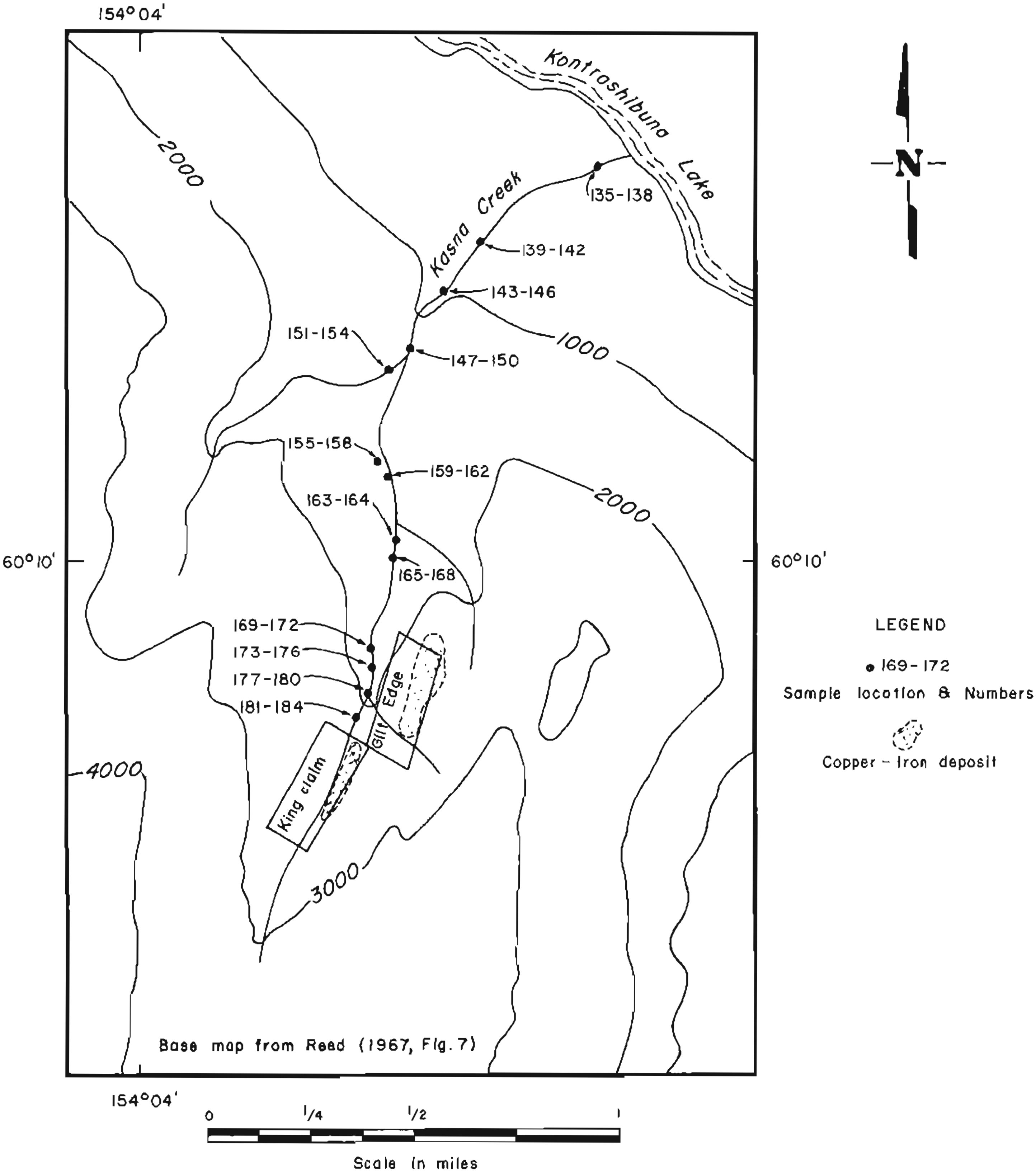


Figure 4-- Columnar jointing in steeply inclined volcanic beds (foreground) underlying carbonate beds (top center), east side Kasna Creek.



KASNA CREEK
Stream Sediment Sample
&
Copper - Iron Deposit Locations

Figure 5

GEOCHEMICAL INVESTIGATIONS

SAMPLING PROCEDURE

Fine silt from beneath flowing stream waters was collected for trace element analyses. Occasionally, where fines could not be obtained under water, silt from the adjacent part of the channel or stream bank was used. To increase the validity of the samples, two were generally collected from each location. Between one-half and one cup of material was gathered and placed in a cloth sample bag. The use of cloth bags rather than plastic permitted the excess water to be squeezed out so the sample could at least partly dry in the field. Field tests for heavy metals were made using the method described by Hawkes (1963).

SAMPLE ANALYSES

Generally field tests requiring over 5 ml of dye to reach an end point were considered anomalous. After the field tests were made, the remaining portions of the samples were returned to the Division of Mines and Geology laboratory at College, where they were analyzed for copper, lead, and zinc by atomic absorption (*Appendix I*). The sample material was later submitted to the Mineral Industry Research Laboratory at the University of Alaska for spectroscopic analyses (*Appendices III & IV*).

The anomalous values for copper, lead, and zinc derived from atomic absorption analyses and frequency distribution graphs (*figs 6, 7, & 8*) are:

	Mode	Anomalous Values
Copper	20-30	90
Lead	10-20	50
Zinc	40-50	110

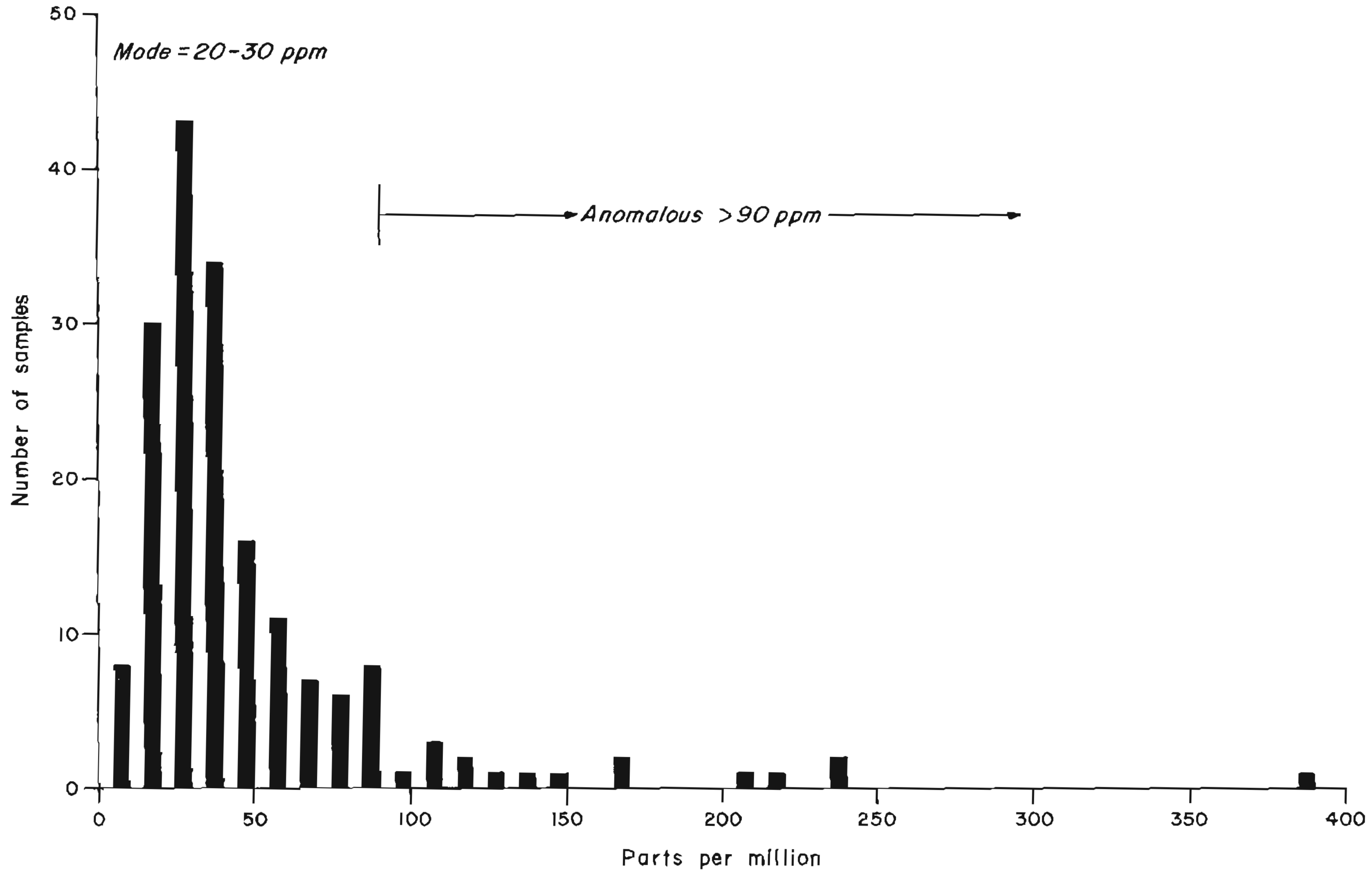
SAMPLING RESULTS

Sample locations and numbers are shown on figure 9. Localities having geochemical anomalies are also indicated, and each of these is discussed in the following paragraphs.

Kasna Creek

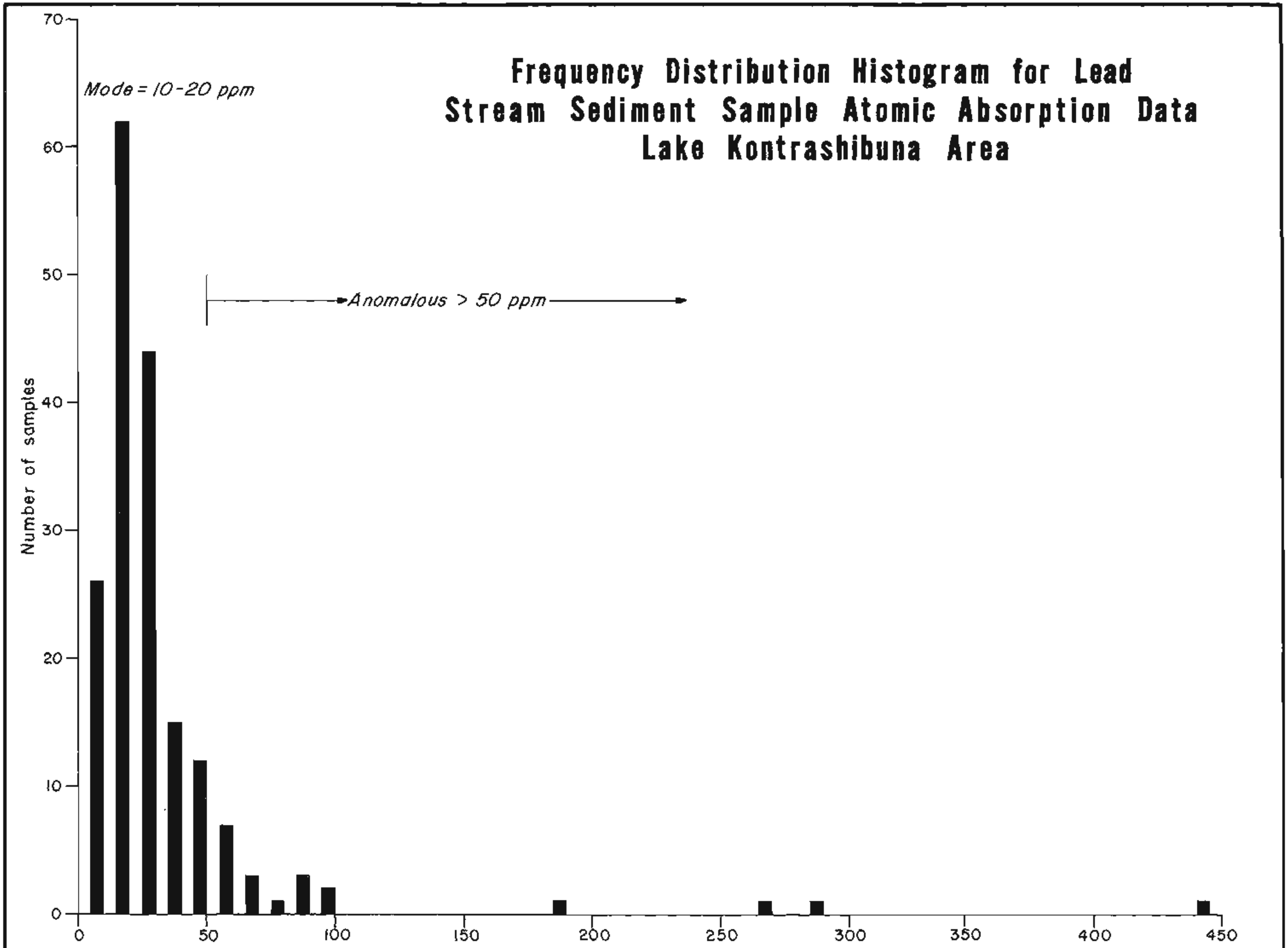
Outcrops of the copper-iron deposit on Kasna Creek have contributed much mineralized material to the stream. As a result, high copper concentrations are found in the sediments along the drainage course, which extends 1.7 miles from the deposit to the lake.

Two sets of two samples each were taken at each location on Kasna Creek. This was done partly to compare duplicate samples at each location and partly to compare samples taken from the stream banks with those collected from beneath flowing water. Each of the four samples was given a separate number, as shown in figure 5.



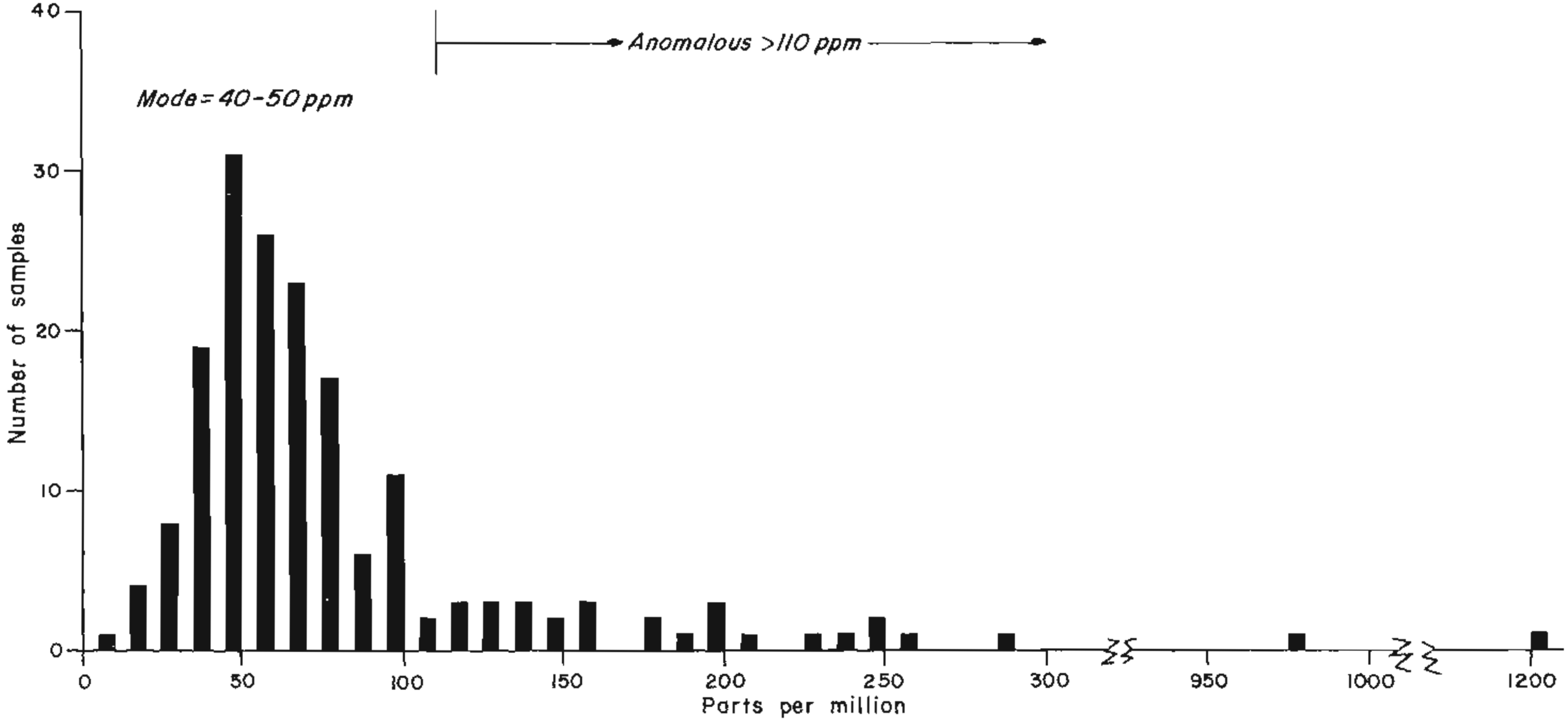
Frequency Distribution Histogram for Copper Stream Sediment Sample Atomic Absorption Data Lake Kontrashibuna Area

Figure 6



Frequency Distribution Histogram for Lead
Stream Sediment Sample Atomic Absorption Data
Lake Kontrashibuna Area
Mode = 10-20 ppm
Anomalous > 50 ppm
Number of samples
0
10
20
30
40
50
60
70
0
50
100
150
200
250
300
350
400
450
Parts per million

Figure 7



Frequency Distribution Histogram for Zinc
Stream Sediment Sample Atomic Absorption Data
Lake Kontrashibuna Area

Figure 8

Atomic absorption analyses show that nearly all of the samples collected along Kasna Creek are anomalous in copper. Samples numbered 155 through 158 were obtained from a tributary on the west side of Kasna Creek. High copper values there a short distance above the main channel of Kasna Creek indicate that the material probably was derived from the Kasna Creek deposit at a time when the stream was above its present level. It seems unlikely that a separate mineralized body is present upslope from samples 155-158. High-level gravel containing an abundance of the Kasna Creek mineralized material was seen about 200 feet above the present channel on the canyon slope near an elevation of 1800 feet. This bed is about 20 feet thick, well cemented, and forms a dark, coarse conglomerate containing an estimated 25% mineralized material.

Profiles of Kasna Creek (*figs 10 & 11*) show copper, lead, and zinc values in samples taken from below water and in those taken from the stream bank. The graphs represent the averages of duplicate samples.

The copper curves show good agreement between the stream sediment and the bank samples. In this case, the bank samples were higher along the lower half of the drainage. There is considerable variation in the interval of extremely high values, but values level off in the lower part of the drainage. Sags in the curves between the two intervals may reflect high stream velocity, which could cause lower concentration of metals.

Zinc is present as fine grains of sphalerite included in chalcopyrite. Analyses of composite samples by the U. S. Bureau of Mines show the zinc content for most samples to be less than 0.05% and a maximum assay of 0.25%. The 46 geochemical analyses for zinc are all above the background level for the region. Only two are below 200 ppm, and the highest is 1200 ppm. The plots of both stream and stream bank samples show (1) the same pattern as the copper assays; (2) erratic values in the zone of very high concentrations; (3) fairly consistent values in the lower part of the drainage, and (4) a slight sag in between. Dirt from the stream banks had slightly higher metal contents than stream sediments.

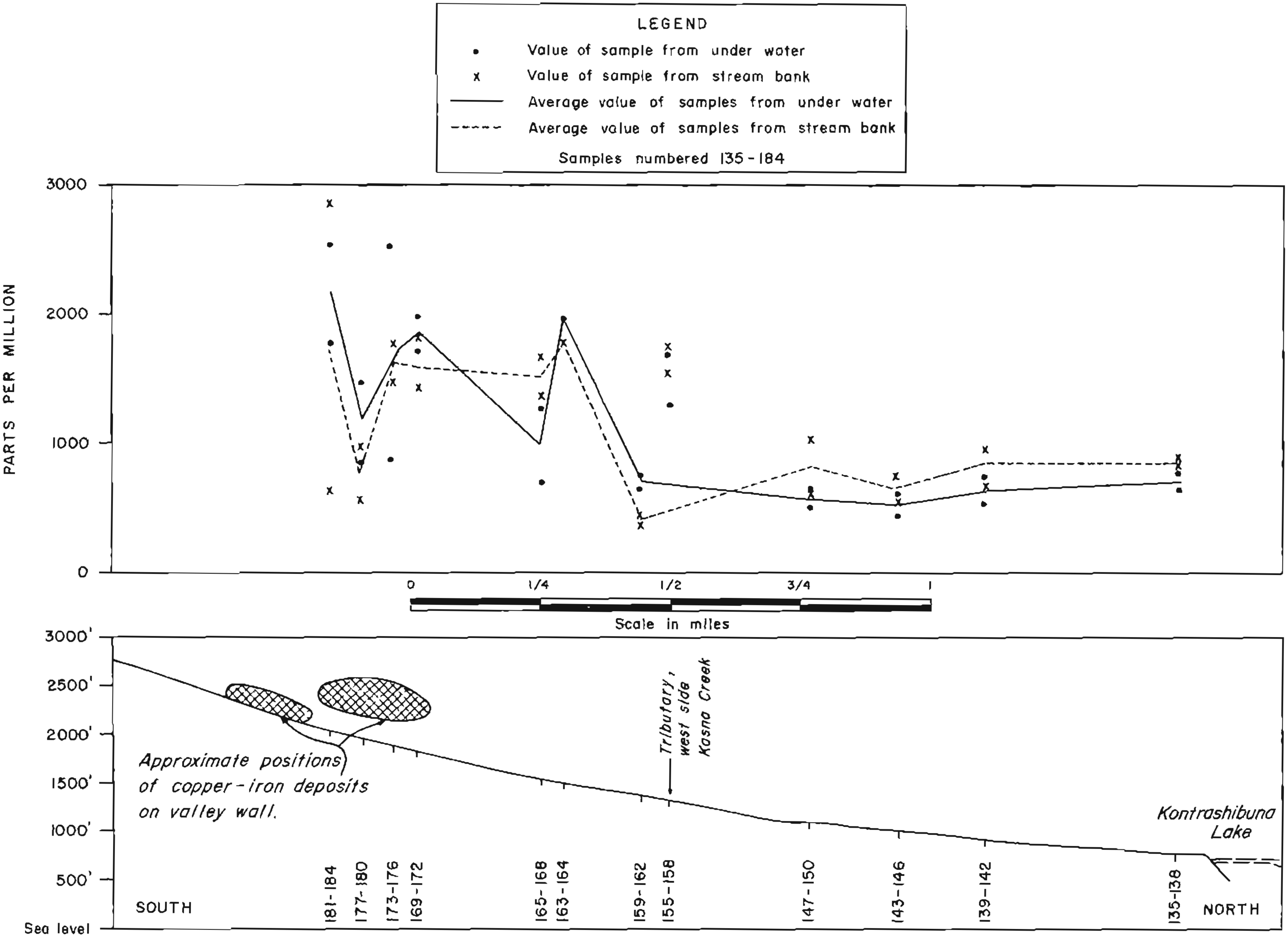
Lead is a minor constituent of the deposit. The U. S. Bureau of Mines reported less than 0.1% lead for all the samples analyzed. Eleven stream sediment samples yielded anomalous values, ranging from 50 to 150 ppm. The overall pattern is nevertheless the same as for copper and zinc, and the bank samples are generally greater in lead content than the stream samples.

Other Areas

Streams in 11 other areas along the shore of Kontrashibuna Lake produced anomalies. They are indicated by the letters A through K on the geochemical map (*fig 9*).

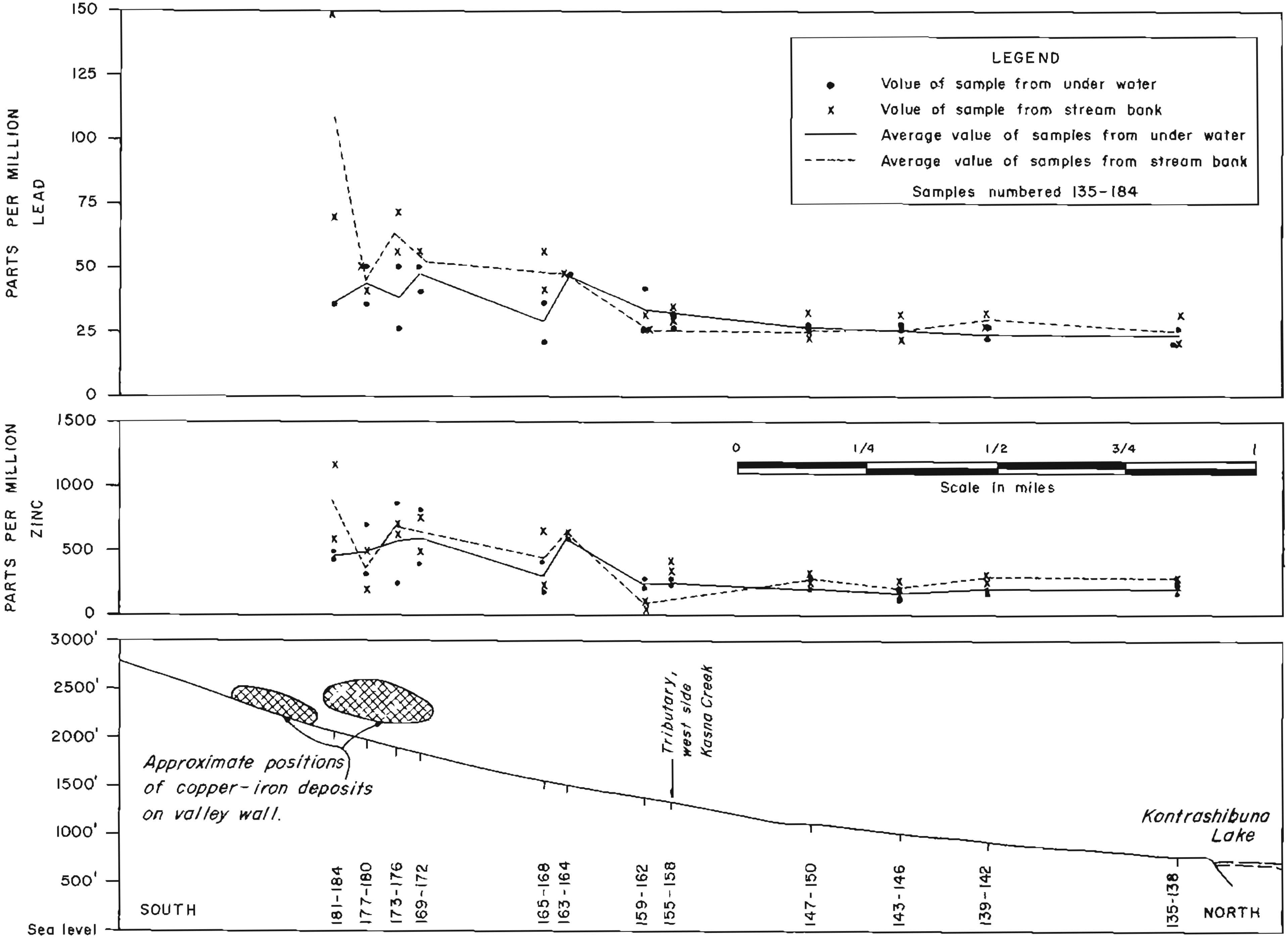
Area A

North shore of lake near west end. The presence here of disseminated pyrite and scattered quartz stringers in felsite prompted the collection of stream sediment samples numbered 5 through 24A. Eleven of these gave anomalous values: 10 for zinc (115 to 225 ppm); 6 for copper (90 to 390 ppm); and 11 for lead (50 to 270 ppm). The bedrock is predominantly pelitic and quartzitic schist with much intruded felsite containing considerable pyrite. Above 2000 feet elevation, felsite is dominant. While no well-defined structures or mineralized zones were observed, this area may warrant further investigation.



Kasna Creek Profile - Copper Values

Figure 10



Kasna Creek Profile - Lead & Zinc Values

Figure 11

Area B

North shore of lake near midpoint. On the west fork of a large stream about 2½ miles from its mouth, samples 28, 29, and 30 gave zinc anomalies of 115 ppm, 270 ppm, and 290 ppm, respectively. Sample 32 on the east fork was weakly anomalous in copper, 90 ppm, and samples 29, 30, and 33 contained 50 to 70 ppm lead. Samples 29 and 30 are from the main stream, and 28 is from a small tributary. The sampler reported the stream float to be predominantly igneous rock. High zinc values may justify follow-up sampling in the area.

Area C

North shore of lake near midpoint. On a large stream 2 miles from its mouth, sample 37 gave a slight copper anomaly (105 ppm). Sampling upstream failed to produce other anomalous values.

Area D

North shore of lake near east end. On three closely-spaced streams, samples 83 through 95 except number 91 produced anomalous zinc values (150 to 255 ppm). Seven were anomalous in lead (50 to 95 ppm). Copper is below 50 ppm. Bedrock is mostly basalt. The writer concluded that the anomalous zinc in this area is due to lithology and not to mineralization.

Area E

South shore of lake at east end. At two localities on a small tributary of the main river entering the east end of the lake, samples 105 through 107 had slightly anomalous zinc contents (115 to 125 ppm). Copper and lead are low. The zinc anomaly is probably similar to that at location D.

Area F

South shore of lake near east end. About ½ mile from the mouth of a large stream. Samples 108 and 109 produced slight anomalies for zinc (135 and 155 ppm) and lead (50 and 60 ppm). About 3/4 miles from the mouth samples showed no anomalies. Bedrock is mostly basalt. The zinc values do not seem to indicate mineralization.

Area G

South shore of lake near east end, on two short streams. Sample 121 produced 50 ppm molybdenum by spectrographic analysis and sample 126 had 100 ppm zinc.

Area H

South shore of lake 2 miles east of Kasna Creek. A small stream heads in a possible fault zone 1 mile south of the lake and cuts a variety of igneous rocks. At an elevation of 1100 feet, one piece of granite float found in the stream contained scattered flakes of molybdenite. Iron oxide staining is also present near the same location. At 900 feet sample 129 was anomalous in lead (290 ppm) and zinc (980 ppm). Sample 130 was anomalous in copper (240 ppm). At 1100 feet, sample 131 also contained 240 ppm of copper, and sample 132 had 210 ppm of copper. Samples 130 and 131 also yielded anomalous molybdenum (50 ppm) by spectrographic analysis. These assays may reflect a small amount of mineralization along small faults. More detailed study and sampling of the general area are needed to determine the significance of the showings.

Area I

South shore of lake 1½ miles east of Kasna Creek. A tributary enters a large stream at an elevation of 1075 feet. This tributary occupies a deep draw on the east side of the ridge that separates this stream from the stream at location G. Bedrock is mostly light-colored felsite with an abundance of pyrite and iron staining. Mineralization here may be structurally related to that at area H. Sample 133 produced 90 ppm copper, 440 ppm lead, and 1210 ppm zinc. Sample 134 at approximately the same location, produced 170 ppm copper and 50 ppm molybdenum. A study of this area should be included with that of area H.

Area J

South shore of lake 2½ miles west of Kasna Creek. Sample 185 from a small stream near the lake shore produced 130 ppm copper. Lead and zinc were not anomalous. Bedrock is andesite. Field observations and other samples failed to indicate mineralization.

Area K

South shore of lake near west end. At three locations along a large stream sampling showed low copper anomalies. Sample 194-197 from near the head of the drainage course has between 100 and 170 ppm copper. One pair of samples from midway in the drainage had 115 and 140 ppm of copper. Two moderate lead anomalies of 55 ppm were present. While zinc values were above average, they were not anomalous. The sampler reported the bedrock to be predominantly argillite and metamorphosed sediments with minor felsite. Evidence for a mineralized zone is not strong.

SUGGESTIONS TO PROSPECTORS

Geochemical anomalies and a rather high background for copper, lead, and zinc obtained by stream sediment sampling suggest that a wide area may contain minerals of economic interest. Further geologic mapping and sampling would be justified. Comparison of the analytical results obtained from samples collected from beneath stream water with those from stream banks suggest that they are equally reliable. Attention should be focused on carbonate rocks and greenstones near small plutons of granitic to granodioritic composition.

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Appendix I

Stream sediment and soil sample analyses for copper, lead, and zinc by atomic absorption and field tests. Results in parts per million and milliliters of dye. Anomalous values underlined.

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
1	E 10	C	0	20	50	100
2	E 9	C	0	30	50	75
3	E 8	C	0	35	65	100
4	E 7A	C	0	25	60	85
5	9P 30	C	0	120	35	175
6	9P 30D	C	0	55	40	100
7	9P 29	C	0	70	45	60
8	9P 28	C	0	60	50	105
9	9P 28D	C	12	45	35	200
10	9P 27	C	0	90	85	125
11	9P 27D	C	0	95	100	130
12	9P 26	C	8	35	45	185
13	9P 26D	C	8	25	35	150
14	9P 19	C	6	70	30	140
15	9P 19D	C	0	80	50	90
16	9P 1	C	20	LOST	SAMPLE	
17	9P 20	C	16	220	190	135
18	9P 20D	C	20	390	270	225
19	9P 21	C	0	40	5	15
20	9P 21D	C	0	10	10	35
21	9P 22	C	0	110	55	115
22	9P 22D	C	0	70	45	65

C = Stream-sediment sample from beneath running water
D = Soil sample from stream bank

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
23	9P 23	C	0	30	15	40
24A	9P 23D	C	0	30	20	40
24B	9P 119	C	0	35	20	75
24C	9P 120	C	1	35	20	75
24D	9P 121	C	0	35	25	70
24E	9P 122	C	2	35	25	75
25	9P 149	C	0	35	25	65
26	9P 150	C	0	25	15	50
27	9P 151	C	0	25	15	40
28	9P 152	C	0	45	30	<u>115</u>
29	9P 153	C	6	60	<u>70</u>	<u>270</u>
30	9P 154	C	8	60	<u>75</u>	<u>290</u>
31	9P 155	C	0	55	35	55
32	9P 156	C	0	<u>90</u>	45	90
33	9P 157	C	0	75	<u>50</u>	100
34	9P 158	C	0	55	35	75
35	9P 159	C	1	15	10	30
36	9P 160	C	0	35	25	95
37	69P 123	C	4	<u>105</u>	20	50
38	69P 124	C	0	70	15	35
39	69P 125	C	0	75	15	60
40	69P 126	C	0	60	15	65
41	69P 133	C	0	50	25	55
42	69P 127	C	0	35	20	50
43	69P 128	C	0	30	15	45
44	69P 129	C	0	30	20	50
45	69P 130	C	0	30	15	40
46	69P 131	C	0	40	25	55

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
47A	69P 132	C	0	45	30	60
47B	E 16A	C	0	25	15	50
47C	E 16B	C	0	20	15	40
48	69P 178	C	0	40	25	55
49	69P 179	C	0	30	20	50
50	69P 176	C	0	30	15	50
51	69P 177	C	0	35	20	50
52	69P 174	C	0	35	30	80
53	69P 175	C	0	35	25	75
54	69P 172	C	0	20	10	55
55	69P 173	C	1	35	10	65
56	69P 170	C	0	35	30	85
57	69P 171	C	0	30	30	80
58	69P 168	C	0	30	30	80
59	69P 169	C	0	25	25	80
60	69P 166	C	0	30	30	90
61	69P 167	C	0	30	30	90
62	69P 134	C	0	65	5	20
63	69P 135	C	0	80	10	15
64	69P 136	C	0	35	10	40
65	69P 137	C	0	30	10	40
66	69P 138	C	0	25	10	30
67	69P 139	C	0	25	10	35
68	69P 140	C	0	35	10	50
69	69P 141	C	0	40	10	50
70	69P 148	C	0	45	20	55
71	69P 146	C	0	65	15	45
72	69P 147	C	4	55	15	60

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
73	69P 144	C	0	20	15	45
74	69P 145	C	0	20	15	40
75	69P 142	C	0	25	10	45
76	69P 143	C	0	25	15	40
77	69P 117	C	0	25	25	65
78	69P 118	C	0	25	20	75
79	69P 113	C	1	15	10	75
80	69P 114	C	2	15	10	65
81	69P 115	C	1	15	10	70
82	69P 116	C	2	20	10	80
83	69P 109	C	2	20	50	200
84	69P 110	C	3	25	55	255
85	69P 111	C	2	15	45	200
86	69P 112	C	4	15	55	240
87	69P 105	C	8	30	85	250
88	69P 106	C	8	30	95	255
89	69P 107	C	2	25	65	205
90	69P 108	C	4	35	85	245
91	E9 17	C	1	15	15	60
92	69P 101	C	0	45	25	160
93	69P 102	C	0	45	30	150
94	69P 103	C	0	50	40	155
95	69P 104	C	0	50	30	175
96	69P 100	C	0	15	5	25
97A	69P 180	C	0	35	20	50
97B	E9 18	C	0	60	15	50
98	E9 19	C	–	25	10	25
99	69P 183	C	0	30	10	25

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
100	69P 182	C	0	30	10	20
101	69P 181	C	4	35	15	100
102	E9 20	C	-	15	10	10
103	69P 189	C	0	55	30	65
104	69P 184	C	0	25	20	100
105	69P 185	C	0	25	25	120
106	69P 186	C	0	35	25	125
107	69P 187	C	0	35	25	115
108	69P 87	C	3	65	50	135
109	69P 88	C	1	85	60	155
110	69P 81	C	0	25	40	60
111	69P 82	C	0	20	30	55
112	E9 11A	C	0	20	25	45
113	E9 11B	C	0	15	25	50
114	69P 83	C	0	15	20	60
115	69P 84	C	1	20	20	50
116	69P 89	C	0	20	15	40
117	69P 90	C	0	15	15	35
118	69P 91	C	0	20	15	40
119	69P 85	C	0	20	25	30
120A	69P 86	C	0	20	20	30
120B	69P 92	C	0	15	20	50
120C	69P 93	C	0	20	20	55
120D	69P 94	C	0	30	25	65
120E	69P 95	C	0	20	15	45
121	69P 96	C	0	10	35	50
122	69P 97	C	1	5	20	45
123	69P 98	C	0	15	30	50

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
124	69P 99	C	0	10	35	55
125	69P 161	C	0	10	25	60
126	69P 162	C	0	10	20	100
127	69P 163	C	0	10	10	60
128	69P 164	C	0	10	10	60
129	9E 13A	C	2	85	290	980
130	9E 13B	C	1	240	30	70
131	9E 12A	C	0	240	25	70
132	9E 12B	C	0	210	35	80
133	9E 14A	C	25	90	440	1210
134	9E 14B	C	20	170	15	60

KASNA CREEK AREA, Nos. 135-184

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
135	69P 77	C	20	750	25	250
136	69P 78	C	6	600	20	215
137	69P 79	D	6	830	25	260
138	69P 80	D	20	800	30	300
139	69P 73	C	10	500	25	230
140	69P 74	C	4	700	20	240
141	69P 75	D	20	675	30	300
142	69P 76	D	20	920	25	320
143	69P 69	C	6	400	25	155
144	69P 70	C	25	575	25	260
145	69P 71	D	8	525	20	220
146	69P 72	D	10	725	30	275
147	69P 65	C	25	620	25	250
148	69P 66	C	8	480	25	240
149	69P 67	D	8	580	20	255

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
150	69P 68	D	12	1000	30	300
151	69P 61	C	0	140	20	100
152	69P 62	C	0	110	15	95
153	69P 63	D	0	140	20	100
154	69P 64	D	2	150	20	100
155	69P 57	C	25	1650	25	300
156	69P 58	C	25	1275	30	275
157	69P 59	D	25	1705	35	465
158	69P 60	D	25	1500	35	375
159	69P 53	C	2	730	40	260
160	69P 54	C	16	620	25	275
161	69P 55	D	11	400	30	110
162	69P 56	D	5	350	25	135
163	69P 51	C	25	1940	45	620
164	69P 52	D	25	1750	45	680
165	69P 47	C	25	1250	35	430
166	69P 48	C	25	670	20	210
167	69P 49	D	25	1350	40	260
168	69P 50	D	25	1650	55	700
169	69P 43	C	20	1700	40	420
170	69P 44	D	16	1400	55	550
171	69P 45	C	20	1950	55	850
172	69P 46	D	25	1700	50	830
173	69P 39	C	25	2500	50	900
174	69P 40	C	25	850	25	290
175	69P 41	D	25	1450	70	680
176	69P 42	D	25	1750	55	750
177	69P 35	C	25	825	35	375

Map No.	Field No.	Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
178	69P 36	C	25	1450	50	730
179	69P 37	D	14	650	50	250
180	69P 38	D	25	950	40	550
181	69P 31	C	25	2500	35	470
182	69P 32	C	25	1750	35	500
183	69P 33	D	25	605	70	1200
184	69P 34	D	25	2810	150	620
185	9E 4	C	10	130	25	50
186	9E 5	C	6	80	15	50
187	9E 6	C	6	85	20	65
188	69P 18	C	8	60	10	45
189	69P 17	C	2	25	15	30
190	69P 16	C	4	115	15	55
191	69P 16D	C	8	140	15	60
192	69P 15	C	2	75	25	55
193	69P 15D	C	4	85	15	50
194	69P 14	C	-	100	55	70
195	69P 14D	C	2	120	35	70
196	69P 13	C	8	150	25	95
197	69P 13D	C	2	170	55	100
198	69P 12	C	3	40	20	45
199	69P 11	C	2	35	20	55
200	69P 10	C	2	50	25	65
201	69P 9	C	2	35	15	65
202	69P 9D	C	3	35	15	65
203	69P 2	C	0	30	15	50
204	69P 2D	C	0	25	15	40

Map No.	Field No.		Sample Type	Field Tests ml dye	Copper ppm	Lead ppm	Zinc ppm
205	69P	8	C	4	45	30	60
206	69P	8D	C	3	45	30	65
207	9E	3	C	0	30	30	80
208	9E	2A	C	0	35	15	65
209	9E	2B	C	0	30	20	70
210	69P	3	C	4	35	20	35
211	69P	3D	C	4	30	15	35
212	69P	4	C	4	30	15	35
213	69P	7	C	4	45	20	75
214	69P	7D	C	4	35	20	50
215	69P	5	C	4	35	25	60
216	69P	5D	C	6	40	35	65
217	69P	6	C	4	45	30	65
218	9E	1A	C	0	45	40	90
219	9E	1B	C	0	50	35	90

Appendix II

INTERVALS OF ESTIMATION AND DETECTION LIMITS

SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSES

Copper ppm*	Lead ppm	Zinc ppm	Molybdenum ppm	Silver ppm	Cobalt ppm	Chromium ppm	Nickel ppm	Manganese ppm	Titanium ppm	Iron (%)	Magnesium (%)	Calcium (%)	Barium ppm	Strontium ppm
20,000	20,000	10,000	2,000	5,000	2,000	5,000	5,000	5,000	10,000	20	10	20	5,000	5,000
10,000	10,000	5,000	1,000	2,000	1,000	2,000	2,000	2,000	5,000	10	5	10	2,000	2,000
5,000	5,000	2,000	500	1,000	500	1,000	1,000	1,000	2,000	5	2	5	1,000	1,000
2,000	2,000	1,000	200	500	200	500	500	500	1,000	2	1	2	500	500
1,000	1,000	500	100	200	100	200	100	200	500	1	0.5	1	200	200
500	500	200	50	100	50	100	50	100	200	0.5	0.2	0.5	100	100
200	200	100	20	50	20	50	20	50	100	0.2	0.1	0.2	50	50
100	100	L	10	20	10	20	10	20	50	0.1	0.05	0.1	20	L
50	50		5	10	L	10	5	L	L	L	L	0.05	L	
20	20		L	5		5	L					L		
10	10			2		L								
5	L			1										
2				L										
L**														

Boron ppm	Beryllium ppm	Tin ppm	Tungsten ppm	Zirconium ppm	Lanthanum ppm	Niobium ppm	Scandium ppm	Yttrium ppm	Vanadium ppm	Gold ppm	Bismuth ppm	Cadmium ppm	Antimony ppm	Arsenic ppm
2,000	1,000	1,000	10,000	1,000	1,000	2,000	100	200	10,000	500	1,000	500	10,000	10,000
1,000	500	500	5,000	500	500	1,000	50	100	5,000	200	500	200	5,000	5,000
500	200	200	2,000	200	200	500	20	50	1,000	100	200	100	2,000	2,000
200	100	100	1,000	100	100	200	10	20	500	50	100	L	1,000	1,000
100	50	50	500	50	50	100	5	10	200	20	50		500	500
50	20	20	200	20	20	50	L	L	100	10	20		200	L
20	10	10	100	L	L	20			50	L	10		100	
10	5	L	50			10			20		5		50	
L	2		L			L			10		L		L	
	1								L					
	L													

*ppm indicates parts per million
**L = Lowest limit of detection

Atomic Absorption and Semi-Quantitative Emission Spectrograph Analytical Data-Stream Sediment Samples
Lake Kontrashibuna, Southwestern Alaska
(1) Atomic Absorption - all values in parts per million unless indicated otherwise

Map Number	Sample Number	Copper (1)	Lead (1)	Zinc (1)	Copper	Lead	Zinc	Molybdenum	Silver	Cobalt	Chromium	Nickel	Manganese	Titanium	Iron	Magnesium	Calcium	Barium	Strontium	Boron	Beryllium	Zirconium	Lanthanum	Niobium	Scandium	Yttrium	Vanadium	Antimony	Map Number
1	69E10	20	50	100	20	20	100	5	ND	20	50	10	1000	1.0	[illegible]	1	1	500	200	10	ND	100	20	20	20	20	200	ND	1
2	69E9	30	50	75	10	10	100	ND	ND	10	50	10	1000	5000	2	1	1	500	200	10	1	100	50	20	10	20	100	ND	2
3	69E8	35	65	100	20	50	100	5	ND	20	50	10	2000	5000	5	2	2	500	200	10	1	200	50	20	20	20	100	ND	3
4	69E7A	25	60	85	20	50	100	5	ND	20	200	20	1000	5000	5	2	2	200	200	10	ND	100	50	20	20	20	100	50	4
5	69P30	120	35	175	100	10	100	5	NA	20	100	20	2000	2000	2	1	2	200	200	10	1	100	50	20	10	20	100	ND	5
6	69P30D	55	40	100	100	50	100	5	ND	50	200	50	5000	5000	5	1	2	200	200	10	ND	100	20	20	20	10	100	50	6
7	69P29	70	45	60	50	10	200	ND	ND	10	100	10	2000	2000	1	0.5	2	500	100	ND	1	100	50	10	10	20	50	ND	7
8	69P28	60	50	105	50	50	100	5	ND	10	100	10	1000	2000	2	1	2	200	200	ND	2	100	50	10	10	20	100	ND	8
9	69P28D	45	35	200	20	ND	100	ND	ND	10	100	10	1000	2000	1	0.2	2	200	200	ND	1	50	50	10	10	10	50	ND	9
10	69P27	90	85	125	50	50	200	5	ND	20	100	20	2000	5000	2	0.5	2	200	200	ND	1	100	50	10	10	20	100	ND	10
11	69P27D	95	100*	130	100	50	100	10	ND	50*	100	20	5000	5000	2	0.5	2	200	200	10	1	100	50	10	10	20	100	ND	11
12	69P26	35	45	185	10	ND	200	ND	ND	ND	50	10	1000	2000	1	0.2	2	200	100	10	1	50	50	10	10	10	50	ND	12
13	69P26D	25	35	150	5	ND	200	ND	ND	10	20	10	1000	1000	0.5	0.1	2	100	100	ND	1	50	50	10	ND	10	20	ND	13
14	69P19	70	30	140	50	20	100	5	ND	20	50	20	1000	5000	2	1	2	200	200	10	1	100	50	10	10	20	100	ND	14
15	69P19D	80	50	90	100	20	100	5	ND	20	100	20	2000	5000	2	0.5	2	200	200	10	1	100	50	20	10	20	50	ND	15
17	69P20	220*	190*	135	200	100	100	5	ND	20	100	20	1000	5000	2	1	1	200	100	20	1	200	100*	20	20	50	100	ND	17
18	69P20D	390*	270*	220	200	200	100	5	ND	20	100	20	1000	5000	5	2	1	500	200	50	ND	100	100*	10	20	50	100	ND	18
19	69P21	40	5	15	20	ND	100	ND	ND	ND	20	5	1000	1000	0.2	0.1	2	100	100	10	ND	20	50	10	ND	10	20	ND	19
20	69P21D	10	10	35	50	20	100	10	ND	20	500	100*	2000	5000	5	2	2	500	200	10	ND	200	ND	20	20	10	100	ND	20
21	69P22	110	55	35	100	50	100	5	ND	20	100	20	2000	5000	5	2	1	500	200	10	1	200	50	20	20	10	100	ND	21
22	69P22D	70	45	65	100	50	100	5	ND	20	100	20	1000	5000	2	1	2	200	200	10	2	100	50	10	10	20	100	ND	22
23	69P23	30	15	40	10	ND	100	ND	ND	10	50	20	500	2000	1	0.5	1	200	100	ND	1	100	50	10	10	10	50	ND	23
24A	69P23D	30	20	40	10	10	100	ND	ND	10	100	10	1000	2000	2	0.5	1	200	200	ND	1	50	50	10	10	10	50	ND	24A
24B	69P119	35	20	75	20	20	100	10	ND	20	200	20	2000	1.0	5	2	2	500	200	10	ND	200	20	20	20	20	100	ND	24B
24C	69P120	35	20	75	50	20	100	10	ND	50*	500	50	1000	1.0	5	5	2	500	200	20	ND	200	20	20	20	20	100	50	24C
24D	69P121	35	25	70	50	20	100	10	ND	20	500	100*	2000	5000	10	2	2	500	200	20	ND	100	20	20	20	20	200	50	24D
24E	69P122	35	25	75	50	50	100	10	ND	20	200	50	1000	1.0	5	2	2	500	200	10	1	200	20	20	20	20	100	ND	24E
25	69P149	35	25	65	20	10	100	10	ND	10	100	20	500	2000	5	1	1	200	100	10	1	100	50	20	10	20	100	ND	25
26	69P150	25	15	50	20	10	100	5	ND	10	100	20	1000	5000	2	1	2	500	200	10	ND	100	50	10	10	20	100	ND	26
27	69P151	25	15	40	10	10	100	ND	ND	ND	10	5	1000	2000	1	0.2	2	200	200	ND	1	100	50	10	10	20	50	ND	27
28	69P152	45	30	115	50	20	100	20	ND	20	500	50	2000	5000	5	5	5	500	500	10	ND	100	ND	20	20	20	100	50	28
29	69P153	60	70	270	100	50	200	20	ND	50*	200	50	2000	5000	5	2	2	200	200	ND	ND	100	20	20	20	20	100	ND	29
30	69P154	60	75	290	50	50	200	10	ND	20	100	20	2000	5000	2	1	2	200	200	ND	ND	100	50	10	20	20	100	ND	30
31	69P155	55	35	55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31
32	69P156	90	45	90	100	50	100	20	ND	50	500	50	2000	1.0	5	2	2	200	200	ND	ND	100	ND	20	50	50	100	ND	32
33	69P157	75	50	100	20	10	100	5	ND	10	100	10	1000	5000	2	1	1	200	100	ND	ND	100	50	10	10	20	100	ND	33
34	69P158	55	35	75	100	50	100	10	ND	20	200	20	1000	5000	5	1	2	200	200	ND	ND	100	20	20	20	20	100	ND	34
35	69P159	15	10	30	50	20	100	10	ND	20	200	50	1000	5000	5	2	2	500	200	ND	ND	100	20	20	20	20	100	50	35
36	69P160	35	25	95	20	10	100	10	ND	20	200	20	1000	5000	5	1	2	500	200	ND	ND	200	ND	20	20	20	100	ND	36
37	69P123	105	20	50	100	10	100	10	ND	20	200	20	1000	2000	2	0.5	2	500	200	ND	2	100	50	10	10	50	100	ND	37
38	69P124	70	15	35	50	ND	100	10	ND	10	200	20	500	2000	2	0.5	1	200	200	ND	1	100	50	10	10	20	50	ND	38
39	69P125	75	15	60	50	10	100	20	ND	20	200	20	1000	2000	2	0.5	2	500	200	ND	1	100	50	10	10	20	100	ND	39
40	69P126	60	15	65	50	10	100	20	ND	10	200	20	1000	2000	5	0.5	2	500	200	ND	1	100	50	10	10	20	100	ND	40
41	69P133	50	25	55	50	20	100	10	ND	20	200	20	2000	5000	5	2	2	500	200	10	ND	200	20	20	20	50	100	ND	41
42	69P127	35	20	50	50	20	100	10	ND	20	200	20	2000	5000	5	2	2	500	200	ND	ND	200	20	20	20	20	100	ND	42
43	69P128	30	15	45	50	20	100	20	ND	20	500	20	2000	5000	5	2	2	500	200	ND	1	200	20	20	20	50	100	50	43
44	69P129	30	20	50	50	20	100	20	ND	20	200	20	1000	5000	5	2	2	500	200	ND	ND	200	20	20	20	20	100	ND	44
45	69P130	30	15	40	50	20	100	10	ND	20	50	10	1000	5000	5	2	2	1000	200	ND	ND	200	20	20	20	20	100	ND	45
46	69P131	40	25	55	50	20	100	10	ND	20	200	20	1000	5000	5	2	2	500	200	ND	ND	200	20	20	20	20	100	50	46
47A	69P132	45	30	60	50	20	100	5	ND	20	100	20	2000	5000	5	1	2	500	200	ND	ND	200	20	20	20	20	100	ND	47A
47B	69E16A	25	15	50	20	10	100	20	ND	10	100	20	1000	2000	2	0.5	2	500	200	ND	ND	100	50	10	10	20	50	ND	47B
47C	69E16B	20	15	40	10	10	100	20	ND	10	200	20	1000	2000	2	1	1	500	200	10	1	100	50	10	10	20	50	ND	47C
48	69P178	40	25	55	50	20	100	20	ND	20	500	100*	1000	5000	5	1	2	500	200	ND	ND	200	50	20	20	50	100	50	48
49	69P179	30	20	50	50	20	100	10	ND	10	200	20	1000	5000	2	1	2	500	200	ND	ND	100	20	10	20	20	100	ND	49
50	69P176	30	15	50	50	20	100	20	ND	20	500	20	1000	5000	5	2	2	500	200	ND	1	200	20	20	20	50	100	ND	50
51	69P177	35	20	50	20	20	ND	10	ND	20	100	20	1000	5000	2	1	1	500	200	10	ND	200	20	20	20	20	100	ND	51
52	69P174	35	30	80	50	50	100	5	ND	20	50	10	2000	5000	5	1	1	500	200	ND	ND	200	20	20	20	50	200	ND	52
53	69P175	35	25	75	20	20	100	5	ND	20	100	20	1000	5000	5	1	2	500	200	ND	ND	200	20	20	20	20	100	ND	53
54	69P172	20	10	55	20	20	100	20	ND	20	500	50	2000	5000	5	2	2	500	200	ND	ND	200	20	20	20	20	100	50	54
55	69P173	35	10	65	20	ND	100	10	ND	10	200	50	1000	2000	1	0.5	2	200	200	ND	1	100	50	10	10	20	50	50	55
56	69P170	35	30	85	20	50	100	10	ND	20	200	20	1000	1.0	10	1	2	1000	200	ND	1	200	50	20	20	50	100	50	56
57	69P171	30	30	80	20	50	100	10	ND	20	100	10	2000	1.0	5	1	2	500	200	ND	1	200	20	20	20	50	100	ND	57

Map Number	Sample Number	Copper (1)	Lead (1)	Zinc (1)	Copper	Lead	Zinc	Molybdenum	Silver	Cobalt	Chromium	Nickel	Manganese	Titanium	Iron	Magnesium	Calcium	Barium	Strontium	Boron	Beryllium	Zirconium	Lanthanum	Niobium	Scandium	Yttrium	Vanadium	Antimony	Map Number
58	69P168	30	30	80	20	50	100	10	ND	20	100	20	2000	5000	5	1	1	500	200	ND	ND	200	ND	20	20	20	100	ND	58
59	69P169	25	25	80	20	50	100	10	ND	20	200	20	1000	5000	5	1	2	1000	200	ND	ND	200	20	20	20	50	100	ND	59
60	69P166	30-	30	90	50	20	100	10	ND	20	200	20	2000	5000	5	1	1	1000	100	ND	ND	200	20	20	20	20	100	ND	60
61	69P167	30	30	90	20	50	100	10	ND	10	200	20	1000	5000	5	1	2	500	200	ND	1	200	20	20	20	20	50	ND	61
62	69P134	65	5	20	100	10	100	10	ND	20	200	50	1000	5000	2	2	2	200	200	ND	1	200	50	20	20	50	50	ND	62
63	69P135	80	10	15	50	10	100	10	ND	10	500	50	500	2000	2	0.5	1	200	100	ND	1	100	50	10	10	50	50	ND	63
64	69P136	35	10	40	20	10	100	10	ND	10	500	50	500	2000	2	0.5	2	500	200	ND	1	100	50	10	10	20	50	ND	64
65	69P137	30	10	40	20	ND	100	5	ND	10	200	20	500	2000	1	0.5	1	200	100	ND	1	100	50	10	10	20	50	ND	65
66	69P138	25	10	30	20	10	100	10	ND	20	500	20	500	5000	2	0.5	2	200	200	ND	ND	100	50	10	10	20	100	ND	66
67	69P139	25	10	35	20	10	100	10	ND	20	500	50	1000	2000	2	1	2	200	200	ND	ND	100	50	10	20	20	100	ND	67
68	69P140	35	10	50	20	10	100	10	ND	20	200	20	1000	5000	2	1	2	200	200	ND	ND	100	50	10	20	20	100	ND	68
69	69P141	40	10	50	20	10	100	10	ND	10	100	20	2000	2000	2	1	1	200	100	ND	1	100	50	10	10	20	50	ND	69
70	69P148	45	20	55	50	20	100	10	ND	50	200	20	1000	5000	5	2	1	500	100	10	ND	200	20	20	20	50	100	ND	70
71	69P146	65	15	45	20	10	100	5	ND	10	200	20	500	2000	2	0.5	2	200	100	ND	1	100	50	10	10	20	50	ND	71
72	69P147	55	15	60	20	ND	100	5	ND	10	200	20	500	2000	2	0.5	1	200	100	ND	ND	100	50	10	10	20	100	ND	72
73	69P144	20	15	45	20	20	100	10	ND	20	500	50	1000	5000	5	1	2	500	200	ND	1	500	20	20	20	20	100	ND	73
74	69P145	20	15	40	20	10	100	10	ND	20	200	20	1000	5000	2	1	2	500	200	ND	ND	200	20	10	10	20	100	ND	74
75	69P142	25	10	45	20	20	100	20	ND	20	500	50	1000	5000	5	1	2	500	200	ND	ND	200	20	20	20	20	100	50	75
76	69P143	25	15	40	20	ND	100	5	ND	ND	100	20	500	2000	2	0.5	2	200	100	ND	1	200	50	10	10	10	50	ND	76
77	69P117	25	25	65	20	50	100	10	ND	20	200	20	2000	1.0	5	2	2	500	500*	10	ND	200	20	20	20	20	100	ND	77
78	69P118	25	20	75	20	20	100	5	ND	20	200	20	2000	5000	5	2	5	500	500*	ND	ND	200	20	20	20	20	200	ND	78
79	69P113	15	10	75	20	20	ND	5	ND	10	100	10	2000	5000	5	1	1	500	200	ND	1	200	20	20	20	20	100	ND	79
80	69P114	15	10	65	10	20	100	5	ND	10	200	10	2000	5000	2	0.5	1	500	200	ND	1	200	20	20	20	20	100	ND	80
81	69P115	15	10	70	10	20	100	5	ND	10	100	10	1000	5000	2	0.5	1	500	200	ND	1	200	50	20	20	20	50	ND	81
82	69P116	20	10	80	20	20	100	5	ND	10	200	20	1000	5000	5	1	1	500	200	ND	1	200	50	20	20	20	50	ND	82
83	69P109	20	50	200	20	50	200	10	ND	10	100	20	2000	5000	5	1	2	1000	200	10	1	200	50	20	20	50	100	ND	83
84	69P110	25	55	255	20	50	200	20	ND	10	500	50	2000	5000	5	0.5	1	500	100	ND	1	200	20	20	20	50	50	ND	84
85	69P111	15	45	200	20	50	200	20	ND	10	500	50	2000	2000	2	1	1	1000	200	ND	1	200	20	20	10	20	50	50	85
86	69P112	15	55	240	20	50	200	20	ND	20	500	50	2000	5000	5	1	1	1000	100	ND	1	200	20	20	20	50	50	50	86
87	69P105	30	85	250	20	100	200	20	ND	20	200	20	2000	5000	5	1	2	1000	200	10	1	200	20	20	20	50	100	ND	87
88	69P106	30	55	255	50	100	200	20	ND	20	200	20	2000	5000	5	2	2	500	200	10	1	200	50	20	20	50	100	ND	88
89	69P107	25	65	205	20	100	200	10	ND	20	500	50	2000	2000	5	1	1	500	100	ND	ND	200	20	20	20	20	100	ND	89
90	69P108	35	85	245	50	100	200	10	ND	20	200	20	2000	5000	5	2	2	1000	200	10	1	200	20	20	20	50	100	50	90
91	69E17	15	15	60	10	10	ND	5	ND	10	100	10	1000	5000	2	0.5	1	500	200	ND	1	200	20	10	10	20	50	ND	91
92	69P101	45	25	160	20	10	100	10	ND	20	500	50	1000	2000	2	0.5	1	200	100	ND	1	200	50	10	10	20	100	50	92
93	69P102	45	30	150	20	20	200	10	ND	20	100	20	1000	5000	5	0.5	1	500	200	ND	1	200	50	20	10	20	100	ND	93
94	69P103	50	40	155	50	20	100	10	ND	20	100	10	1000	5000	2	0.5	1	500	200	ND	1	100	50	20	10	20	100	ND	94
95	69P104	50	30	175	50	10	200	10	ND	20	100	20	1000	2000	2	0.5	1	200	100	ND	2	100	50	10	10	20	50	ND	95
96	69P100	15	5	25	10	20	100	5	ND	20	100	10	1000	2000	5	1	5	1000	500*	ND	1	100	20	20	10	20	50	ND	96
97A	69P180	35	20	50	20	10	100	10	ND	10	100	20	1000	2000	2	0.5	1	200	200	ND	ND	100	20	10	10	10	50	ND	97A
97B	69E18	60	15	50	20	ND	100	ND	ND	20	100	20	500	1000	1	0.2	1	200	200	ND	1	50	50	10	10	20	50	ND	97B
98	69E19	25	10	25	500*	20	100	10	ND	20	200	20	1000	5000	5	2	2	500	500*	10	ND	100	ND	20	20	10	200	ND	98
99	69P183	30	10	25	20	20	100	10	ND	20	200	20	1000	5000	10*	2	2	500	200	10	2	500	20	20	20	50	200	ND	99
100	69P182	30	10	20	20	20	100	5	ND	20	200	10	1000	5000	10*	1	2	500	500*	ND	2	500	20	20	20	20	200	ND	100
101	69P181	35	15	100	50	20	100	10	ND	50	200	50	2000	5000	5	2	2	500	500*	ND	ND	100	20	20	20	20	100	ND	101
102	69E20	15	10	10	10	ND	100	5	ND	10	100	20	500	2000	1	0.5	1	200	200	ND	1	100	50	10	10	10	50	ND	102
103	69P189	55	30	65	20	ND	100	10	ND	ND	100	10	500	2000	2	0.2	0.5	200	100	ND	1	100	50	10	10	20	50	ND	103
104	69P184	25	20	100	20	20	100	5	ND	20	100	20	1000	5000	5	1	1	500	200	10	1	200	20	20	20	20	100	ND	104
105	69P185	25	25	120	20	20	100	10	ND	20	200	20	1000	5000	5	1	1	500	200	10	1	200	20	20	20	20	100	ND	105
106	69P186	35	25	185	50	20	200	10	ND	50*	200	20	2000	1.0	5	2	2	500	200	10	2	200	20	20	20	50	100	ND	106
107	69P187	35	25	115	20	20	100	10	ND	20	100	20	2000	5000	5	1	1	500	200	10	ND	200	20	20	20	20	100	ND	107
108	69P87	65	50	135	100	50	100	20	ND	50*	500	20	1000	5000	5	2	2	500	200	ND	ND	200	20	20	20	50	100	ND	108
109	69P88	85	60	155	50	50	100	20	ND	50*	200	20	1000	5000	5	1	2	500	200	ND	1	200	50	20	20	50	100	ND	109
110	69P81	25	40	60	20	10	100	5	ND	20	50	10	1000	5000	2	1	1	200	200	10	ND	100	20	20	10	20	100	ND	110
111	69P82	20	30	55	20	10	100	5	ND	10	100	10	1000	5000	2	1	1	200	200	ND	ND	100	50	20	10	20	100	ND	111
112	69E11A	20	25	45	10	10	100	5	ND	10	200	20	500	5000	2	1	1	500	200	ND	ND	100	50	20	10	20	100	ND	112
113	69E11B	15	25	50	20	20	100	20	ND	20	500	50	1000	5000	5	1	2	~~500~~	~~200~~	~~ND~~	~~ND~~	~~100~~	~~20~~	~~20~~	~~20~~	~~20~~	~~100~~	50	113
114	69P83	15	20	60	20	10	100	5	ND	10	100	10	1000	5000	2	1	1	200	200	ND	ND	100	20	10	10	20	100	ND	114
115	69P84	20	20	50	20	20	100	10	ND	20	200	20	2000	5000	5	2	2	500	200	ND	ND	100	ND	20	20	10	100	ND	115
116	69P89	20	15	40	20	10	100	20	ND	10	500	50	1000	5000	5	1	2	200	200	ND	ND	100	50	20	20	20	100	50	116
117	69P90	15	15	35	20	10	100	20	ND	20	200	20	1000	2000	5	2	2	200	200	ND	ND	100	50	20	20	20	100	ND	117
118	69P91	20	15	40	10	ND	100	5	ND	10	200	20	1000	2000	2	0.5	1	200	200	ND	1	100	50	10	10	20	100	ND	118
119	69P85	20	25	30	20	20	100	10	ND	20	500	50	1000	5000	5	2	2	500	200	ND	ND	200	20	10	20	10	100	ND	119
120A	69P86	20	20	30	10	10	100	5	ND	10	100	10	1000	2000	2	1	2	200	200	ND	ND	100	50	10	10	10	100	ND	120A

Appendix III Cont

Map Number	Sample Number	Copper (1)	Lead (1)	Zinc (1)	Copper	Lead	Zinc	Molybdenum	Silver	Cobalt	Chromium	Nickel	Manganese	Titanium	Iron	Magnesium	Calcium	Barium	Strontium	Boron	Beryllium	Zirconium	Lanthanum	Niobium	Scandium	Yttrium	Vanadium	Antimony	Map Number
120D	69P94	30	25	65	20	50	100	10	ND	20	200	20	2000	5000	5	1	2	1000	200	ND	1	100	20	20	20	20	100	ND	120D
120E	69P95	20	15	45	20	10	100	5	ND	10	200	20	1000	2000	2	0.5	1	500	100	ND	1	100	50	10	10	20	50	ND	120E
121	69P96	10	35	50	20	50	100	50	ND	10	1000	100	1000	2000	2	0.5	1	1000	100	ND	1	200	50	10	10	50	50	50	121
122	69P97	5	20	45	5	20	100	10	ND	10	100	20	1000	2000	2	0.5	1	1000	100	ND	1	200	50	10	10	50	50	ND	122
123	69P98	15	30	50	10	50	100	20	ND	10	500	50	1000	2000	2	0.5	1	1000	100	ND	1	100	20	20	10	50	50	50	123
124	69P99	10	35	55	10	50	ND	20	ND	10	500	50	1000	2000	2	0.5	1	1000	100	ND	1	100	50	10	10	50	50	50	124
125	69P161	10	25	60	10	50	100	10	ND	10	200	20	2000	5000	5	1	1	1000	100	ND	1	200	20	20	20	50	50	ND	125
126	69P162	10	20	100	20	20	100	10	ND	10	200	20	2000	5000	5	1	1	1000	200	ND	ND	200	20	20	10	50	50	ND	126
127	69P163	10	10	60	10	20	100	10	ND	10	500	50	2000	5000	5	1	2	500	200	ND	ND	200	20	20	10	20	50	50	127
128	69P164	10	10	60	10	10	100	5	ND	10	100	20	1000	5000	5	1	2	500	200	ND	1	100	50	10	10	20	50	ND	128
129	69E13A	210*	20	65	200	20	100	20	ND	20	200	20	1000	5000	5	2	2	500	200	ND	1	100	20	20	20	20	100	ND	129
130	69E13B	240*	30	70	500*	20	100	50*	ND	50*	100	20	2000	5000	5	2	2	1000	200	ND	ND	100	ND	20	20	20	100	ND	130
131	69E12A	240*	25	70	200	20	100	20	ND	50*	100	20	1000	1.0	10*	2	2	500	200	ND	ND	200	20	20	20	20	200	ND	131
132	69E12B	210*	35	80	200	20	100	50*	ND	20	200	20	1000	5000	10*	2	2	500	200	ND	ND	200	20	20	20	20	100	ND	132
133	69E14A	90	440*	1210*	100	200	2000*	20	5*	20	200	20	2000	5000	5	2	1	500	200	20	ND	200	50	20	20	50	100	50	133
134	69E14B	170*	15	60	200	20	100	50*	ND	50*	200	20	1000	5000	10	2	2	500	200	ND	ND	200	20	20	20	20	100	ND	134
151	69P61	140*	20	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	151
152	69P62	110*	15	95	100	10	100	10	ND	50	500	50	1000	5000	5	2	2	200	100	20	ND	100	ND	20	20	20	100	ND	152
153	69P63	140*	20	100	200	20	100	10	ND	20	500	20	1000	5000	5	2	2	200	100	20	ND	100	ND	20	20	20	200	ND	153
154	69P64	150*	20	100	200	20	100	10	ND	50	500	100*	2000	5000	5	2	1	500	100	20	ND	200	20	20	50	20	200	100	154
185	69E4	130*	25	50	200	20	100	10	ND	20	200	20	1000	5000	5	2	2	200	200	10	ND	100	ND	10	20	20	100	ND	185
186	69E5	80	15	50	100	20	100	10	ND	20	500	50	1000	5000	5	2	2	200	200	ND	ND	100	20	20	20	20	100	50	186
187	69E6	85	20	65	50	10	100	5	ND	20	200	20	1000	5000	5	2	2	400	200	ND	ND	100	20	20	20	10	100	ND	187
188	69P18	60	10	45	50	10	100	5	ND	20	200	20	1000	5000	2	1	2	500	200	ND	ND	100	50	20	10	20	100	ND	188
189	69P17	25	15	30	20	10	100	ND	ND	10	200	20	1000	2000	2	1	2	100	200	ND	ND	100	50	10	10	10	50	ND	189
190	69P16	115*	15	55	100	10	100	5	ND	20	200	20	2000	5000	5	1	2	500	200	10	ND	100	20	10	20	20	100	ND	190
191	69P160	140*	15	60	100	ND	100	ND	ND	10	200	50	2000	2000	5	1	2	200	100	ND	ND	50	50	10	10	20	100	ND	191
192	69P15	75	25	55	100	20	200	5	ND	50*	500	50	2000	5000	10*	5	2	500	200	20	ND	100	ND	20	50	20	200	ND	192
193	69P15D	85	15	50	50	10	100	5	ND	10	200	20	2000	5000	5	2	2	200	100	10	ND	100	50	20	20	20	100	50	193
194	69P14	100*	55	70	100	20	100	5	ND	20	100	20	2000	5000	5	2	2	500	200	10	ND	100	20	20	20	20	100	ND	194
195	69P140	120*	35	70	200	20	100	5	ND	20	200	20	1000	5000	5	2	2	500	200	10	ND	100	50	20	20	20	100	ND	195
196	69P13	150*	25	95	100	50	100	10	ND	50*	200	20	1000	5000	5	2	2	1000	200	10	ND	100	50	20	20	20	200	ND	196
197	69P130	170*	55	100	200	50	100	10	ND	50*	500	50	1000	5000	5	5	2	1000	200	10	ND	100	20	20	20	20	100	50	197
198	69P12	40	20	45	20	10	100	5	ND	10	200	20	500	2000	2	1	2	500	200	10	ND	100	50	10	10	20	100	ND	198
199	69P11	35	20	55	50	20	100	10	ND	20	500	50	1000	5000	5	5	2	500	200	10	ND	200	20	20	20	20	100	50	199
200	69P10	50	25	65	100	20	100	5	ND	20	500	50	1000	5000	5	2	2	500	200	10	1	200	20	20	20	20	100	50	200
201	69P9	35	15	65	50	20	100	5	ND	20	200	50	1000	5000	5	2	2	500	200	10	ND	200	20	20	20	20	100	ND	201
202	69P90	35	15	65	50	20	100	10	ND	20	500	50	1000	1.0	5	2	2	500	200	10	ND	100	20	20	20	20	100	ND	202
203	69P2	30	15	50	20	20	100	10	ND	20	500	50	1000	5000	5	2	2	500	200	10	ND	200	20	20	20	20	100	50	203
204	69P2D	25	15	40	20	20	100	10	ND	50*	200	20	1000	1.0	5	2	2	500	200	10	ND	200	20	20	20	20	100	50	204
205	69P8	45	30	60	20	10	200	5	ND	10	100	20	1000	2000	2	1	2	200	200	ND	1	100	50	10	10	10	100	ND	205
206	69P8D	45	30	65	20	10	100	ND	ND	10	100	20	500	5000	2	0.5	2	200	200	ND	2	100	50	10	10	20	100	ND	206
207	69E3	30	30	80	50	20	100	5	ND	20	200	50	2000	5000	5	2	2	200	200	10	ND	100	20	20	20	20	100	ND	207
208	69E2A	35	15	65	20	10	100	5	ND	20	200	20	1000	5000	5	2	2	200	200	ND	ND	100	50	20	20	20	100	ND	208
209	69E2B	30	20	70	20	10	100	5	ND	20	200	20	1000	5000	5	2	2	200	200	ND	ND	100	20	20	20	20	100	ND	209
210	69P3	35	20	35	20	10	100	5	ND	20	200	20	1000	5000	5	1	2	500	200	10	ND	100	50	10	20	20	100	ND	210
211	69P3D	30	15	35	20	10	100	5	ND	20	200	20	1000	5000	5	2	2	500	200	10	ND	100	20	20	20	20	100	50	211
212	69P4	30	15	35	20	10	100	5	ND	10	500	50	1000	5000	5	2	2	500	200	10	ND	100	50	20	10	20	50	50	212
213	69P7	45	20	75	20	10	100	5	ND	20	200	20	1000	5000	2	1	2	200	200	10	ND	100	50	20	10	20	100	ND	213
214	69P7D	35	20	50	20	ND	100	ND	ND	10	100	10	1000	5000	2	1	2	100	200	ND	ND	100	50	10	10	10	50	ND	214
215	69P5	35	25	60	20	10	100	5	ND	20	200	20	1000	5000	2	1	2	200	200	ND	ND	100	20	10	20	20	100	ND	215
216	69P5D	40	35	65	20	20	100	5	ND	10	100	20	1000	5000	2	0.5	2	200	200	ND	1	100	50	20	10	20	50	ND	216
217	69P6	45	30	65	10	10	200	ND	ND	ND	100	10	500	2000	1	0.2	2	200	100	ND	1	50	50	10	10	10	50	ND	217
218	69E1A	45	40	90	50	50	200	10	ND	50	500	50	2000	5000	10	5	5	500	200	20	1	100	20	20	20	20	200	50	218
219	69E1B	50	35	90	50	20	100	10	ND	20	500	50	2000	1.0	5	2	2	200	200	10	ND	200	20	20	20	20	100	50	219

*denotes anomalous value

Appendix IV

Atomic Absorption and Semi-Quantitative Emission Spectrograph Analytical Data-Stream Sediment Samples
Kasna Creek, Southwestern Alaska
(1) Atomic Absorption - all values in parts per million unless indicated otherwise

Map Number	Sample Number	Copper (1)	Lead (1)	Zinc (1)	Copper	Lead	Zinc	Molybdenum	Silver	Cobalt	Chromium	Nickel	Manganese	Titanium	Iron	Magnesium	Calcium	Barium	Strontium	Boron	Beryllium	Zirconium	Lanthanum	Niobium	Scandium	Yttrium	Vanadium	Arsenic	Antimony	Bismuth	Map Number
135	69P77	750	25	250	1000	20	200	10	ND	20	200	20	2000	5000	10	5	2	500	200	10	1	100	ND	20	20	20	100	ND	ND	ND	135
136	69P78	600	20	215	1000	20	200	20	1	20	500	50	2000	5000	10	2	2	500	200	20	ND	200	ND	20	20	20	100	ND	50	ND	136
137	69P79	830	25	260	1000	20	200	20	1	20	200	20	2000	5000	10	2	2	500	200	20	ND	100	ND	20	20	20	100	ND	ND	ND	137
138	69P80	800	30	300	1000	20	200	10	1	20	200	20	1000	2000	5	2	2	500	200	20	ND	100	20	20	20	20	100	ND	100	ND	138
139	69P73	500	25	230	1000	20	200	20	1	50	500	20	2000	5000	5	2	2	500	200	20	ND	200	ND	20	20	20	100	ND	50	ND	139
140	69P74	700	20	240	1000	20	500	20	1	50	200	20	2000	5000	5	2	2	500	200	20	ND	100	ND	20	20	20	100	ND	ND	ND	140
141	69P75	675	30	300	500	20	200	20	ND	20	200	20	2000	5000	5	2	2	500	200	10	1	200	20	20	20	20	100	ND	ND	5	141
142	69P76	920	25	320	1000	20	200	20	1	20	500	50	2000	5000	5	2	2	500	200	20	ND	200	20	20	20	50	100	ND	50	ND	142
143	69P69	400	25	155	500	10	100	5	ND	20	200	20	2000	2000	2	1	2	500	100	10	ND	100	50	10	10	20	100	ND	ND	ND	143
144	69P70	575	25	260	500	20	200	20	ND	20	500	20	2000	5000	5	2	2	500	200	20	ND	100	ND	20	20	20	100	ND	50	ND	144
145	69P71	525	20	220	500	20	200	20	ND	50	500	50	2000	5000	5	2	2	500	200	20	ND	200	ND	20	20	20	100	ND	ND	ND	145
146	69P72	725	30	275	1000	20	200	20	1	50	500	20	2000	5000	10	2	2	500	100	20	ND	200	20	20	20	20	100	ND	50	ND	146
147	69P65	620	25	250	1000	20	200	20	ND	20	200	20	2000	5000	5	2	2	500	200	10	ND	100	ND	20	20	50	100	ND	ND	ND	147
148	69P66	480	25	240	500	20	200	10	ND	20	200	20	2000	5000	5	2	2	500	200	20	ND	200	ND	20	20	20	100	ND	ND	ND	148
149	69P67	580	20	255	500	20	100	10	1	20	500	20	2000	5000	5	2	2	500	200	20	ND	200	ND	20	20	20	100	ND	50	ND	149
150	69P68	1000	30	300	1000	20	500	20	1	50	200	20	2000	5000	10	2	2	500	200	20	ND	200	ND	20	20	20	200	ND	ND	ND	150
155	69P57	1650	25	300	2000	50	500	50	2	50	500	20	5000	5000	10	2	5	500	200	20	ND	100	ND	20	20	50	100	ND	ND	5	155
156	69P58	1275	30	275	1000	20	200	20	1	20	500	50	2000	5000	5	2	2	500	200	20	1	100	ND	20	10	20	100	ND	50	ND	156
157	69P59	1705	35	460	2000	50	500	20	2	50	200	20	5000	2000	10	2	5	500	200	20	ND	100	ND	20	20	50	100	ND	ND	ND	157
158	69P60	1500	35	375	2000	50	500	20	2	50	500	50	2000	5000	10	5	5	500	200	20	ND	100	ND	20	20	50	100	ND	50	ND	158
159	69P53	730	40	260	1000	20	200	20	ND	50	500	50	2000	5000	5	2	2	500	200	10	ND	200	20	20	20	20	100	ND	50	ND	159
160	69P54	620	25	275	1000	50	500	20	1	20	200	20	2000	5000	10	2	2	500	200	20	ND	200	ND	20	20	50	100	ND	ND	ND	160
161	69P55	400	30	110	500	20	100	10	ND	20	200	20	2000	5000	5	2	2	500	200	10	ND	200	20	20	20	50	100	ND	ND	ND	161
162	69P56	350	25	135	500	20	100	10	ND	20	200	20	2000	1.0	5	2	2	500	200	10	ND	200	ND	20	20	20	100	ND	ND	ND	162
163	69P51	1940	45	620	5000	50	1000	50	ND	100	500	50	5000	5000	10	5	5	500	200	20	ND	100	ND	20	20	50	100	ND	ND	5	163
164	69P52	1750	45	680	1000	50	1000	20	2	50	200	20	5000	5000	10	5	2	500	200	20	ND	100	ND	20	20	50	100	ND	ND	ND	164
165	69P47	1250	35	430	5000	50	1000	20	ND	100	200	20	5000	5000	10	5	5	1000	200	20	ND	100	ND	20	20	50	100	ND	ND	5	165
166	69P48	670	20	210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	166
167	69P49	1350	40	260	2000	50	500	20	2	50	200	20	5000	2000	10	5	10	500	200	10	ND	50	ND	20	20	20	100	ND	ND	ND	167
168	69P50	1650	55	700	1000	50	1000	50	2	50	500	50	5000	5000	10	2	2	500	200	20	ND	100	20	20	20	50	100	ND	ND	5	168
169	69P43	1700	40	420	2000	50	500	50	2	50	500	50	5000	5000	5	2	2	500	200	20	ND	100	ND	20	20	50	100	ND	50	5	169
170	69P44	1400	55	550	2000	50	500	50	2	50	500	50	2000	5000	10	2	2	500	200	50	ND	100	20	20	20	50	100	ND	ND	5	170
171	69P45	1950	55	850	2000	50	1000	50	5	50	200	20	5000	5000	10	2	2	500	200	20	ND	100	ND	20	20	20	100	ND	ND	ND	171
172	69P46	1700	50	830	2000	50	1000	20	2	50	200	20	5000	5000	10	5	2	500	200	20	ND	100	ND	20	20	50	100	ND	ND	ND	172
173	69P39	2500	50	900	2000	50	1000	50	5	50	200	20	5000	5000	10	5	2	500	200	20	ND	100	20	20	20	50	100	ND	ND	ND	173
174	69P40	850	25	290	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	174
175	69P41	1450	70	680	2000	100	1000	20	2	50	200	20	5000	5000	10	5	2	500	200	20	ND	100	20	20	20	50	100	ND	ND	ND	175
176	69P42	1750	55	750	2000	50	1000	20	2	50	500	50	2000	5000	10	2	5	500	100	20	ND	100	ND	20	20	50	100	ND	ND	ND	176
177	69P35	825	35	375	1000	50	500	50	1	50	500	50	2000	5000	5	2	2	500	200	20	ND	100	ND	20	50	50	100	ND	50	ND	177
178	69P36	1450	50	730	1000	50	1000	50	2	50	200	20	5000	5000	10	2	2	500	200	20	ND	100	20	20	20	50	100	ND	ND	ND	178
179	69P37	650	50	250	1000	50	200	50	1	50	200	50	2000	2000	5	2	5	500	100	20	ND	100	20	20	20	50	100	ND	ND	ND	179
180	69P38	950	40	550	1000	50	500	20	1	50	200	20	2000	5000	10	5	5	500	200	20	ND	100	ND	20	20	50	100	ND	50	ND	180
181	69P31	2500	35	470	2000	50	500	50	2	100	200	20	5000	2000	10	5	2	500	200	50	ND	100	ND	20	20	50	100	ND	ND	5	181
182	69P32	1750	35	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	182
183	69P33	605	70	1200	500	100	1000	20	1	50	200	50	2000	5000	10	2	5	500	200	50	ND	100	ND	20	50	50	200	500	50	5	183
184	69P34	2810	150	620	2000	100	1000	50	5	100	500	20	5000	5000	10	5	5	500	200	20	ND	200	ND	20	20	50	100	ND	50	ND	184