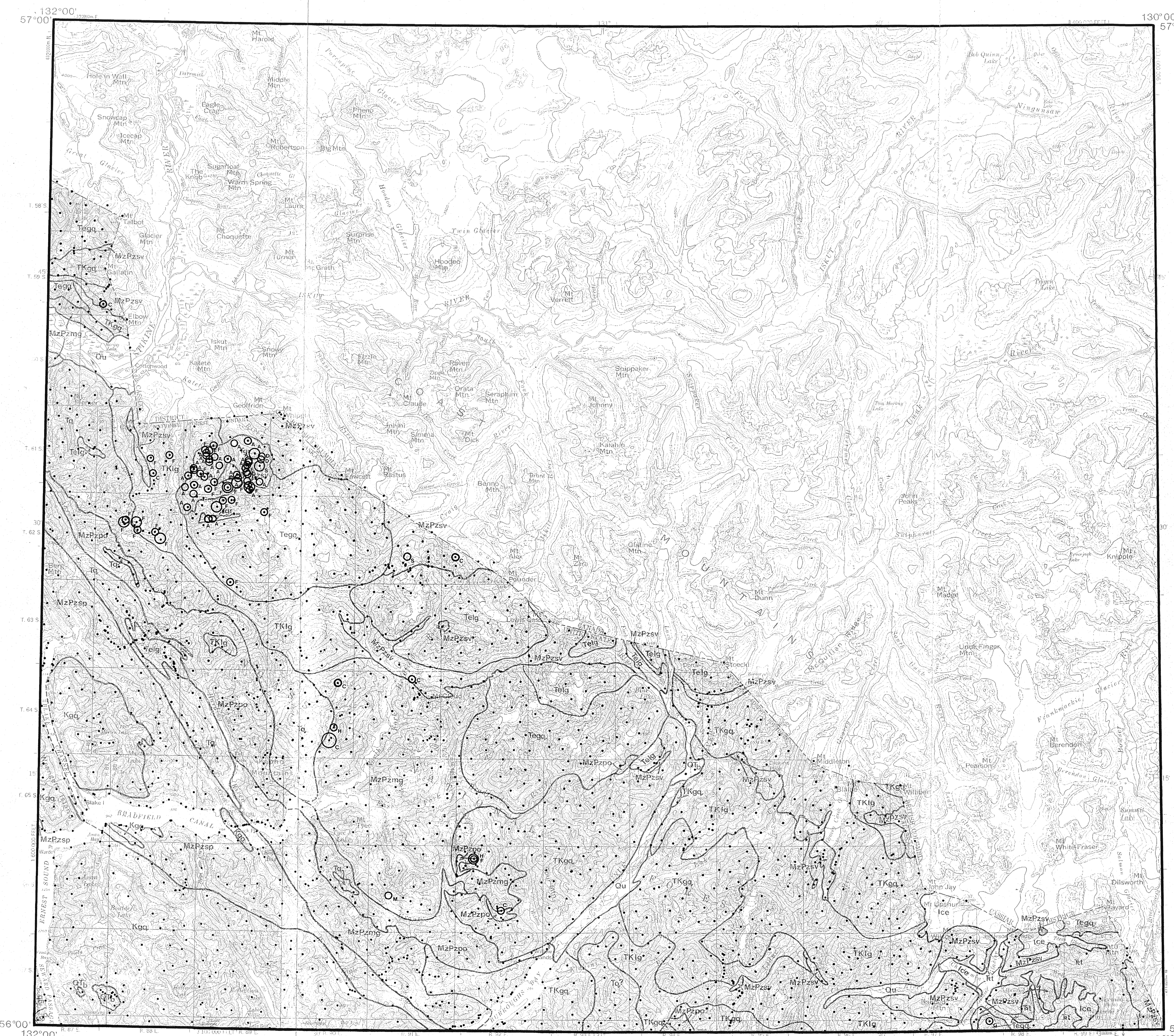
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TIN IN ROCK SAMPLES
(spectrographic determinations)

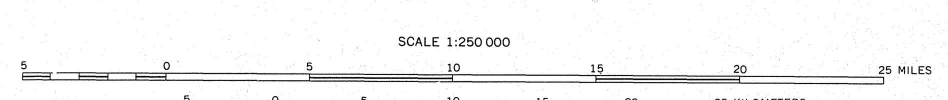
OPEN-FILE REPORT
81-728 H
sheet 1 of 2
FOLIO OF THE BRADFIELD CANAL QUADRANGLE, ALASKA



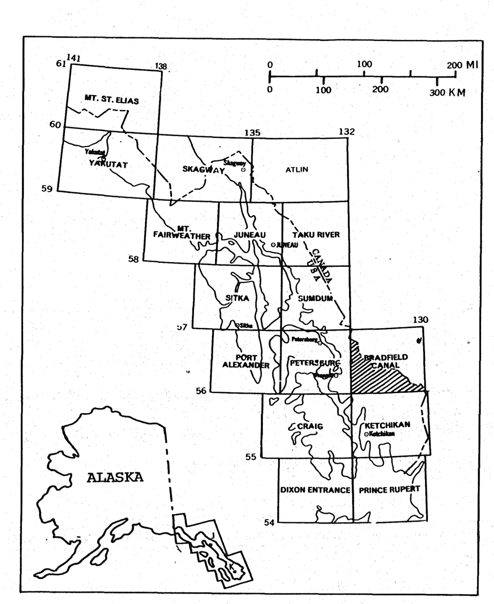
Base from USGS 1:250,000 topo series:
Bradfield Canal, 1955, ALASKA-CANADA.

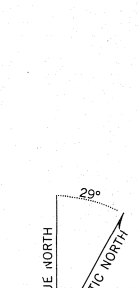
ROCK SAMPLES

Geology by H. C. Berg, D. A. Brew, A. L. Clark, W. H. Condon, J. E. Decker, M. F. Diggles, G. C. Dunne, R. L. Elliott, J. O. Gallinatti, M. H. Herdrick, S. M. Karl, R. D. Koch, M. L. Miller-Hoare, R. P. Morrell, J. G. Smith, and R. A. Sonnevil, 1968-1979.

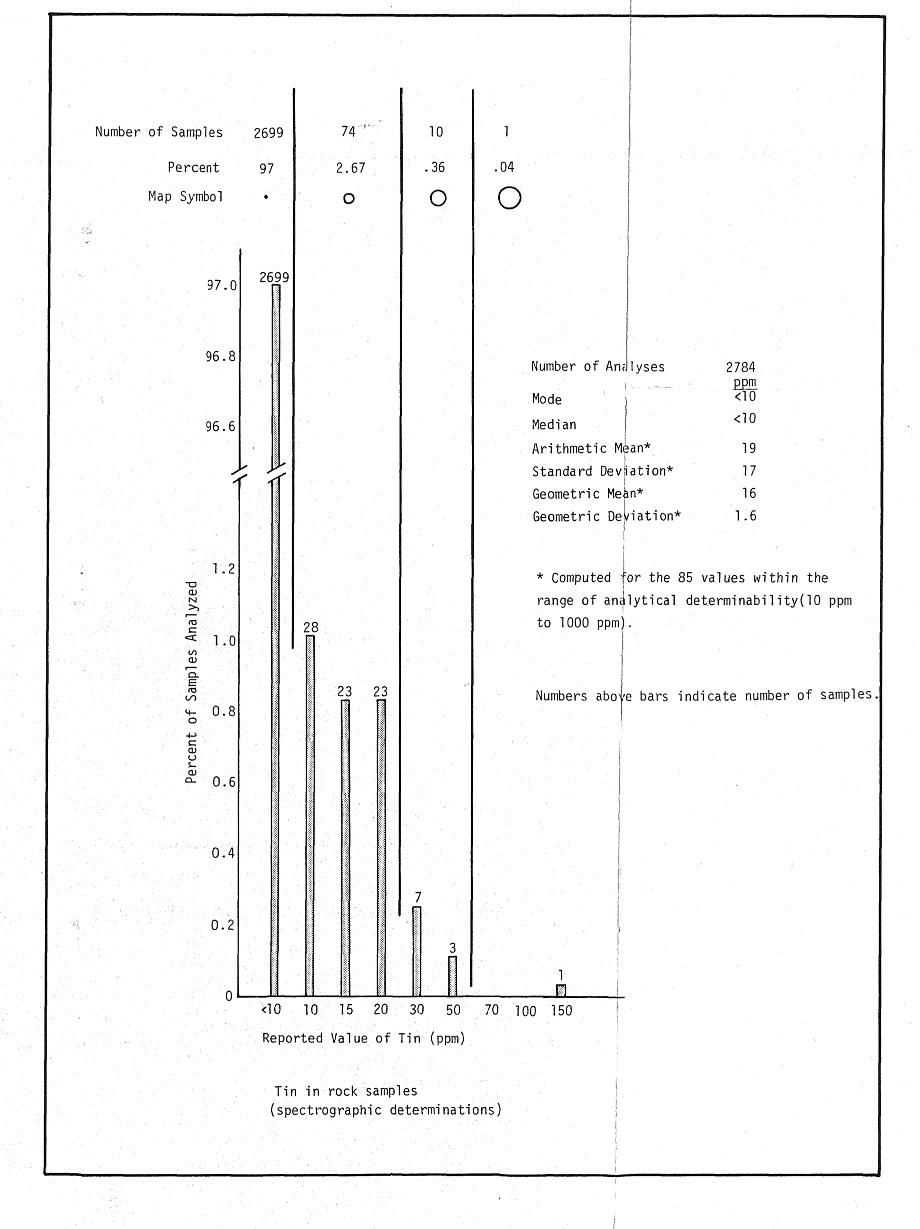


CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL





APPROXIMATE MEAN DECLINATION, 1955



Tin in rock samples
(spectrographic determinations)

Average abundance[1/] of tin (in ppm) in the Earth's crust and in various crustal components

		Ultramafic	Basalt	Intermediate igneous rocks	Silicic igneous rocks	Alkalic igneous rocks	Greisens	Shale, clay	Limestone	Soil
Average[2/]	-	0.6	1.1	1.4	3.5	-	-	6	0.2?	8?
Usual Range[2/]	-	0.1-1.3	0-8	0-10	<1-15	8-39	780-7800	1-20	-	0-10
	Earth's crust	Ultramafic	Basalt	Granodiorite	Granite			Shale	Limestone	Soil
Average[3/]	2	0.5	1	2	3	-	-	4	4	10

1/ Note: Because the analyses on which these averages are based may not be directly compatible with the analyses used for this report, these figures serve only as a general guide.

2/ From Sainsbury and Reed (1973)

3/ From Levinson (1974)

KEY TO LITHOLOGY GROUP SYMBOLS

A - ALKALI-FELDSPAR GRANITE - includes related dikes

B - BASALT and ANDESITE - includes dikes and flows, and lamprophyre dikes

C - CALCSILICATE and SKARN

D - DIORITE and GABBRO - includes minor metadiorite, hornblendite, and ultramafic rocks

F - FELSITE - some quartz-porphyritic. Includes dikes, flows(?), and breccias

G - GRANITIC ROCKS - mainly massive and foliated quartz monzonite, granodiorite, and quartz diorite, with lesser alaskite, aplite, and pegmatite

H - HORNBLENDE-RICH SCHIST and GNEISS - includes amphibolite, greenschist, and other mafic metamorphic rocks

M - MIGMATITE and ORTHOGNEISS - includes granitic gneiss (eg: granodiorite gneiss, quartz diorite gneiss, etc.)

S - SCHIST and GNEISS - mainly pelitic and quartzofeldspathic schist and gneiss, and lesser non-schistose metasedimentary rocks

V - VEINS

Unit Descriptions

Qu UNCONSOLIDATED DEPOSITS, UNDIVIDED (Quaternary)

QTb BASALT (Quaternary and Tertiary?)

Tgr ALKALI-FELDSPAR GRANITE WITH ASSOCIATED QUARTZ-PORPHYRITIC RHYOLITE DIKES AND FLOWS(?) (Miocene?)

Tgb BIOTITE-PYROXENE GABBRO, LOCALLY CONTAINS HORNBLENDE AND/OR OLIVINE (Miocene)

Telg LEUCOCRATIC QUARTZ MONZONITE AND GRANODIORITE (Eocene)

Tegq GRANODIORITE AND QUARTZ DIORITE (Eocene)

Tq QUARTZ DIORITE (Eocene or Paleocene)

TKlg LEUCOCRATIC QUARTZ MONZONITE AND GRANODIORITE (Tertiary and/or Cretaceous)

TKgq GRANODIORITE AND QUARTZ DIORITE (Tertiary and/or Cretaceous)

Kgq BIOTITE-HORNBLENDE QUARTZ DIORITE, PLAGIOCLASE-PORPHYRITIC BIOTITE GRANODIORITE/QUARTZ DIORITE, BOTH LOCALLY CONTAIN GARNET AND/OR EPIDOTE (Cretaceous)

Ŧrt TEXAS CREEK GRANODIORITE (Triassic)

MzPzmg MIGMATITE AND ORTHOGNEISS, WITH LESSER PARAGNEISS (Mesozoic and/or Paleozoic)

MzPzpo PARAGNEISS AND ORTHOGNEISS, WITH LESSER AMPHIBOLITE AND MARBLE (Mesozoic and/or Paleozoic)

MzPzsp SCHIST AND PARAGNEISS, WITH LESSER AMPHIBOLITE AND MARBLE (Mesozoic and/or Paleozoic)

MzPzsv METASEDIMENTARY AND LESSER METAVOLCANIC ROCKS, WITH LOCAL MARBLE (Mesozoic and/or Paleozoic)

Discussion

During U.S. Geological Survey investigations in the Bradfield Canal quadrangle between 1968 and 1979, 2784 rock geochemical samples, 1295 stream-sediment samples, and 219 stream-sediment heavy-mineral concentrate samples were collected. The samples were analyzed for up to 31 elements by a 6-step, semi-quantitative emission spectrographic method (Grimes and Marranzino, 1968) and for up to 5 elements by atomic-absorption techniques (Ward and others, 1969). Complete analytical data for all samples, plus location maps, station coordinates, and a discussion of sampling and analytical procedures are available in 3 reports (Koch and others, 1980a,b,c). These data are also available on magnetic computer tape (Koch, O'Leary, and Risoli, 1980).

Maps on this and the accompanying sheet show the amounts of tin (Sn) detected in all geochemical samples collected in the Bradfield Canal quadrangle. All tin analyses were by the 6-step spectrographic method. The spectrographic analytical values are reported as the approximate midpoints of geometrically-spaced class intervals, with values in the series 1, 1.5, 2, 3, 5, 7, 10, 15, ...(see Koch and others, 1980, a, b, c).

Average geochemical abundances vary for different lithologies and in different areas. The degree of chemical weathering also affects the elemental abundances, although probably with minor effect in this recently glaciated terrain. Mechanical release of cassiterite is probably responsible for the Sn detected in stream-sediment (Bruce L. Reed, personal communication, 1981). Analytical variance and variations in sampling practice limit the repeatability of these results. Complex interactions between these sources of variation make it impossible to select a single threshold value which will discriminate between areas which are barren and areas with potentially valuable mineral concentrations.

In order to estimate which analytical values are sufficiently above general background levels to warrant further interest, the following procedure was followed for each sample type. Histograms of the data were examined for apparent breaks (discontinuities or abrupt changes in level) in the distribution. A cutoff value was selected at an arbitrarily chosen level near the 95th percentile or at a break close to that level when one was present. The geographic distribution of the samples above the cutoff level was examined for clumping and scatter. The cutoff level was adjusted up or down to minimize apparent geographic scatter ("noise").

Samples in which the Sn content was at or above the cutoff level are marked by one of three sizes of circles. Each circle size represents a range of values, with larger circles indicating higher values. Samples in which the Sn content was below the cutoff level are indicated on the map by dots. The range, number, and percentage of values associated with each map symbol are indicated on the corresponding histogram. Higher values may indicate a greater likelihood of bedrock mineralization but confidence levels are low for values near analytical limits of determinability, for single-element anomalies, and for results not supported by high values in nearby samples.

Each rock sample was assigned to one of ten broad lithologic groups of similar rock types on the basis of the rock name given to the sample at the time that it was collected. The types of rocks included in each of the groups are summarized in the table labelled "Key to Lithology Group Symbols". On the map, circles representing rock samples with Sn content above the cutoff value are labeled with the letter indicating the lithology group for that sample.

Based on sampling in the Bradfield Canal quadrangle, and in the Ketchikan and Prince Rupert quadrangles to the south (Koch and Elliott, 1978a,b,c), detectable levels of Sn in rock or normal stream-sediment samples are very unusual. Of 1712 rock samples from the Ketchikan and Prince Rupert quadrangles, only 14 had reported Sn values. These samples came from a variety of geologic units but were all processed in the same analytical batch and the Sn values probably resulted from contamination. Only eight of the 2591 stream-sediment samples collected in the Ketchikan and Prince Rupert quadrangles had reported Sn and reanalysis of three of those failed to confirm detectable Sn.

Tin was detected in three percent (85 samples) of the 2784 rock samples collected in the Bradfield Canal quadrangle. All rock samples with detectable Sn are marked on the map with circles. Most of these samples came from the alkali-feldspar granite at Cone Mountain, southwest of boundary peak Mount Whipple, or from felsite, mostly dikes, in and near the granite and probably related to it. The remaining samples come from sites scattered across the quadrangle in metamorphic units and roof pendants. Half of these are skarn samples. The two samples within the Cone Mountain granite unit which are labelled 'D' are biotite-pyroxene diabase, which is cut by the granite. The Sn values in these samples are probably related to the granite. The number of samples from the main lithology groups having detectable Sn are listed below.

Lithology	Samples	Percent	Geometric Mean	Range
Felsite - mainly dikes	36	42	16 ppm	10- 50 ppm
Alkali-feldspar granite	33	39	16	10- 50
Calcsilicate/skarn	7	8	19	10-150
Metamorphic rocks	3	4	25	10- 50
Diabase	2	2	12	10- 15
Other	4	5	5	10- 20

Tin was detected in 2.6 percent (33 samples) of the 1294 normal stream-sediment samples from the Bradfield Canal quadrangle which were analyzed for Sn. All of the samples with detectable Sn are indicated on the map by circles. Most of them cluster in and near the Cone Mountain granite; and include all but 3 of the samples collected within the area of that unit. The only other "cluster" of Sn values consists of two sites near Berg Mountain. Both primary and replicate samples at these sites contained detectable Sn, though there are no reported Sn values from rock samples in the area.

Tin is effectively concentrated in stream-sediment heavy-mineral concentrate samples and was detected (at or above 20 ppm) in 48 percent (104 samples) of the 219 samples collected. Because detectable Sn is rare in the other two sample media, the cutoff value was lowered one class interval (to 70 ppm) below the normal level of about the 95th percentile. This provides a view of a larger fraction of the total population. The upper 12 percent of concentrate samples are marked with circles on the map. The additional values (the 70 ppm level) scatter across the quadrangle and appear to represent the high end of normal background levels. Concentrations of 100 ppm and above are more likely significant. Two clusters of these values occur; one north of Cone Mountain, and one on and near the potassium-feldspar-porphyritic leucocratic quartz monzonite near boundary peak Mt. Stoeckl.

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MAPS SHOWING DISTRIBUTION AND ABUNDANCE OF TIN IN GEOCHEMICAL SAMPLES FROM THE BRADFIELD CANAL QUADRANGLE, SOUTHEASTERN ALASKA

by

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1981