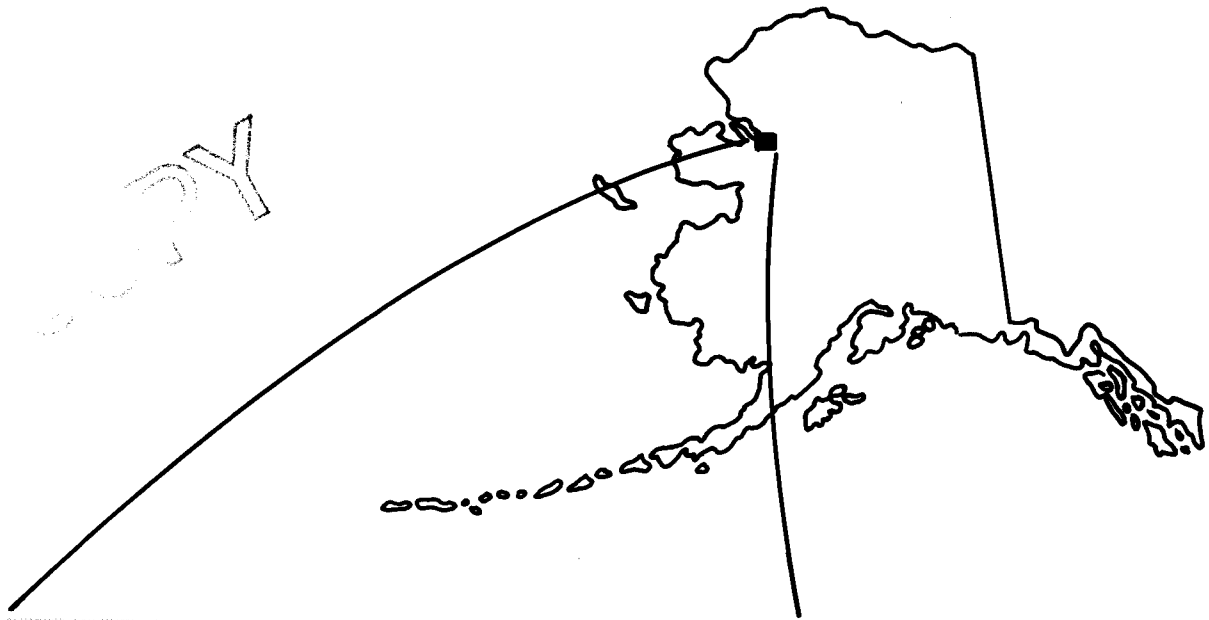
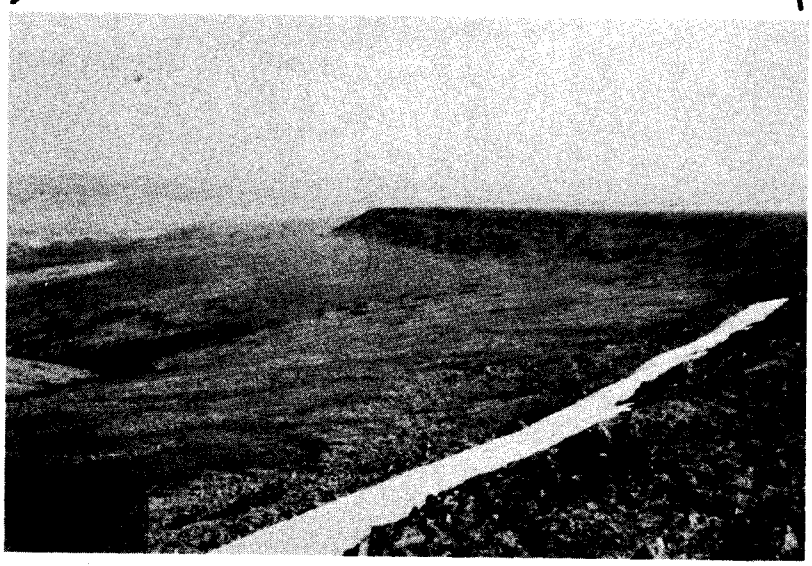
Sampling and Analytical Results of a Reconnaissance in the Selawik Hills Area, Northwestern Alaska

By: James C. Barker





UNITED STATES DEPARTMENT OF THE INTERIOR
Donald P. Hodel, Secretary

OF MINES
Horton, Director

OFR 43-85

CONTENTS

CONTENTS--Continued

UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

cm	centimeter
cps	count per second
ft	foot
ft^3	cubic foot
g	gram
in	inch
pct	percent
ppm	parts per million

LIST OF DEFINITIONS

Abundant	=10 to 50 pct
Subordinate	= 2 to 10 pct
Minor	= 0.5 to 2 pct
Few/accessory	= 0.2 to 0.5 pct
Trace	less than 0.1 pct

SAMPLING AND ANALYTICAL RESULTS OF A MINERAL RECONNAISSANCE IN THE SELAWIK HILLS AREA, NORTHWESTERN ALASKA

By James C. Barker[1]

ABSTRACT

In 1980, the Bureau of Mines (BOM) and the Bureau of Land Management (BLM) made a mineral reconnaissance in the Selawik Hills area of northwestern Alaska. The Selawik Hills are partially underlain by three Cretaceous alkaline complexes that have given rise to uranium and thorium mineral occurrences locally associated with columbium (niobium), fluorite, and rare earth elements. Anomalous uranium occurs in: altered zones in syenite (0.02 to 0.08 pct U_3O_8) that contain xenotime, zircon, fluorite, thorianite, and an unidentified niobium-uranium-titanium mineral found by microprobe examination; quartz vein systems associated with altered tectonic lineaments; and slightly uraniferous lamprophyre dikes. A low-grade occurrence of uranium (0.02 pct U_3O_8) in carbonaceous sandstone also was found within Tertiary coal-bearing sediments. Multiple thin seams of lignitic coal exposed in two outcroppings indicate that the sedimentary basin north of the Selawik Hills contains coal deposits of unknown extent. The uranium and thorium occurrences in igneous rock, and the uranium at the adjacent sedimentary series, both warrant further investigation. Detailed sampling mapping and geophysics followed by core drilling, would be needed to estimate the economic significance of these occurrences.

INTRODUCTION

The Bureau of Mines (BOM) and the Bureau of Land Management (BLM) made

[1]Supervisory physical scientist, Alaska Field Operations Center, Bureau of Mines, Fairbanks, AK.

a reconnaissance of mineral occurrences in the Selawik Hills area, northwestern Alaska (fig. 1), as part of an ongoing interagency effort to develop data on the resources of the federal lands in Alaska. This area was investigated because of its known favorability for mineralization coupled with a lack of substantiating data. The field work was done in 1980 and geologists and engineers from both agencies participated. The BLM provided logistical and helicopter support for 14 days of field work while the Bureau provided all analytical data and compiled the report. Budgetary limitations prevented planned follow-up examinations during the subsequent years. Therefore, this report presents the analytical data for rock, stream sediment, and pan concentrates, but only provides brief descriptions of mineral occurrences. Several previously unreported mineral occurrences are described.

Although all mineral resources, including coal, were considered, this investigation focuses on (1) the distribution of uranium and the suite of metals commonly associated with felsic and alkaline intrusions or in associated placers (tin, tungsten, tantalum, niobium (columbium), beryllium, fluorine, and rare earth minerals), and (2) minerals associated with sedimentary basins (coal and uranium).

ACKNOWLEDGMENTS

Bureau of Land Management (BLM) geologists, C. M. Murry, D. D. Keill, J. L. Kato and J. W. Deininger assisted in the field work. Data presented on figures 2 and 7 were compiled by J. W. Deininger. J. Y. Foley, a Bureau of Mines geologist, was most helpful with the field mapping and provided all of the petrographic examinations. J. J. Sjoberg, of the Bureau's Reno (NV) Research Center, performed the microprobe examinations.

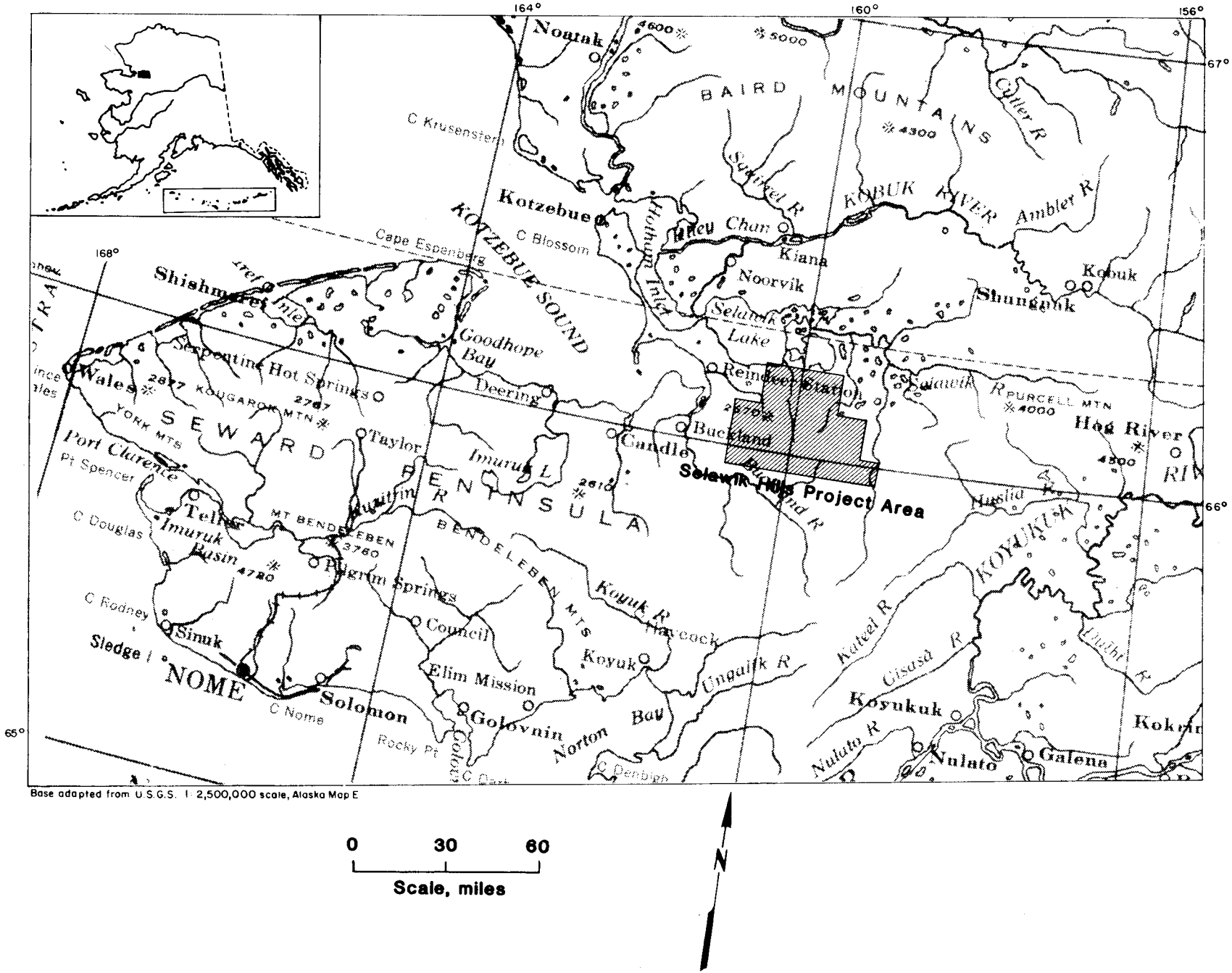


Figure 1. Project area.

LOCATION AND ACCESS

The study area includes that portion of the Selawik Hills and vicinity that remains under the administrative authority of the BLM (Section 17-D-1, Alaska Native Claims Settlement Act, 1971, PL92-203). It also includes a limited area to the north which is presently under other federal administrative authorities (fig. 2). This northern area of the investigation was included to provide a more complete picture of the Selawik Hills igneous complex and the mineral potential that exists in the vicinity. The study area is within the Selawik and Candle, U.S. Geological Survey (USGS) 1:250,000 scale topographic quadrangles.

There is no established overland access to the project area, however, tracked vehicles can freely operate on snow throughout most of the region in the winter. The coastal waters are generally ice-free and suitable for barge transport by late June or early July and relatively open-water sea conditions persist through November. Inland freshwater lakes are ice-free from late June through September and offer access by float planes. Beginning in early June and extending to mid-September, the area is normally accessible for surface geologic work.

HISTORY

Several mineral exploration firms have examined the Selawik Hills during the past decade. Although nothing has been published on this activity, mining claims were located for uranium and later drilled. Drill sites and prospect pits are noted in the description of mineral occurrences which follow later in this report. Locations and historic record of mining claims are on file with the Alaska Division of Geological and Geophysical Surveys[2]. Claims staked for uranium in the 1970's are

[2]Alaska Division of Geological and Geophysical Surveys, 794 University

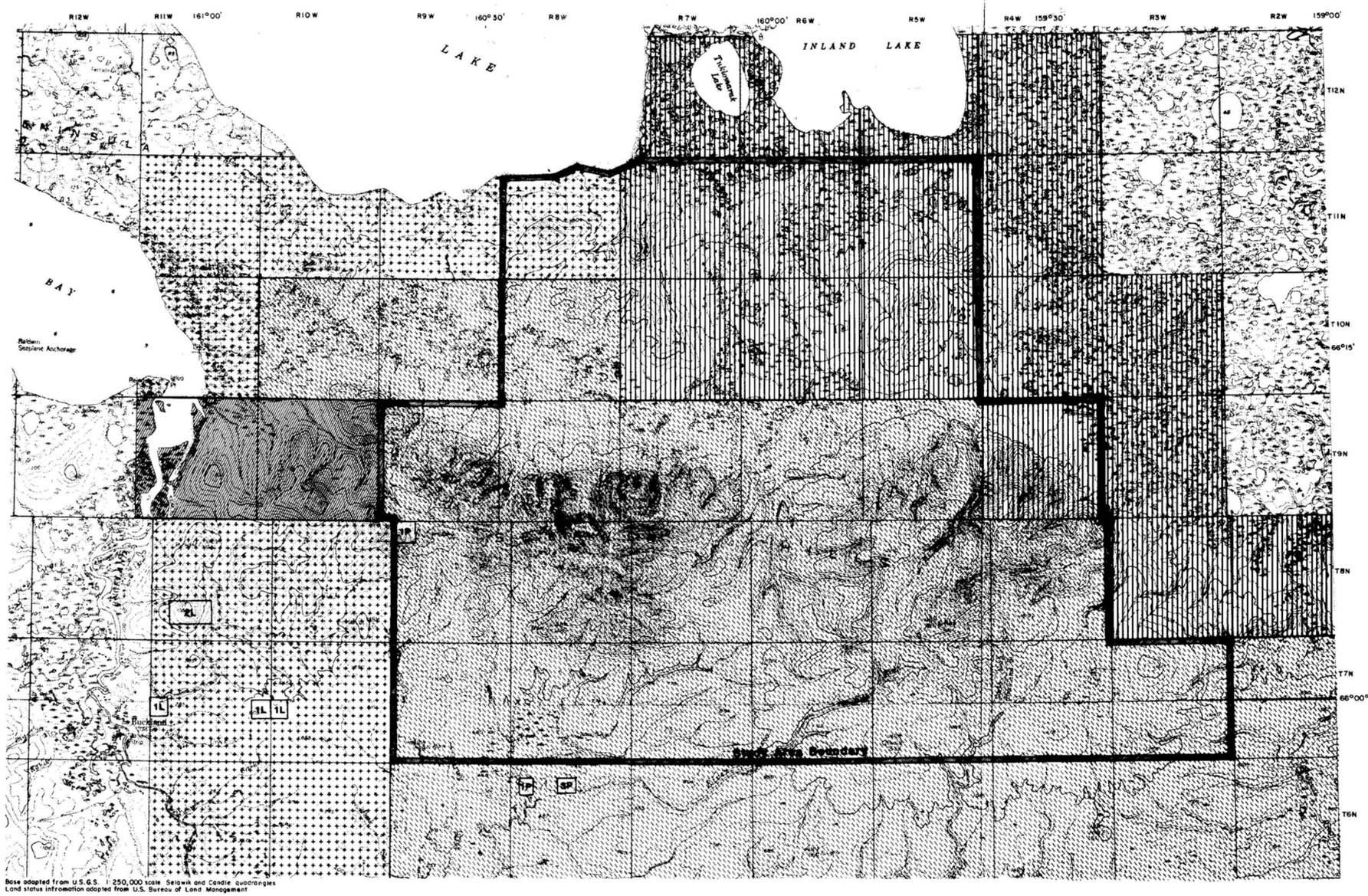


Figure 2: Land status and mining claim locations

Avenue, Basement, Fairbanks, AK.

now deemed abandoned and void by the BLM.[3] Within the project area, only a single placer claim was active as of November, 1983.

[3]BLM, Fairbanks District Office, P.O. Box 1150, Fairbanks, AK.

Reconnaissance geologic mapping at 1:250,000 scale has been compiled by Patton and Miller (1)[4] for the Selawik Quadrangle, and by Patton (2) for the Candle Quadrangle. Petrographic studies of the plutonic complexes near the Selawik Hills were reported by Miller (3).

[4]Underlined numbers in parentheses refer to items in the list of references preceding the appendixes at the end of this report.

The most detailed work pertaining to the resource potential of the Selawik Mountains area was a U.S. Department of Energy (DOE) contract study of radioactive minerals by C. C. Hawley and Associates in 1978 (4). Work included 1:63,360 scale geologic mapping, airborne and ground radiometric surveys, and geochemical sampling. Although no new mineral occurrences were found during that investigation, five discrete areas were delineated as anomalous for radioactive minerals.

Reports describing other geologic and mineral reconnaissance investigations of western Alaska are listed in the bibliography at the end of this report.

PHYSIOGRAPHY AND CLIMATE

The Selawik Hills are rolling, tundra-covered uplands and low mountains, surrounded by coastal and inland wetlands which are the results of a cold maritime climate. Elevations range from sea level to 3,307 ft at VABM View, however, most of the terrain is well below 1,000 ft. Climatic conditions are strongly influenced by proximity to the Bering and Chukchi Seas. Inclement weather can persist for extended periods

during the summer field season.

GEOLOGY

The Selawik Hills area is underlain by alkaline plutonic complexes that have intruded Cretaceous pelitic schist and andesite (fig. 3). Tertiary to Pleistocene sedimentary and volcanic rocks border the hills (1-2). The intrusions in the Selawik Hills area are part of an east-trending group of Mid-Cretaceous granite and syenitic intrusions referred to by Miller as the Hogatza plutonic belt (5).

Intrusive Rocks

The Selawik Hills complex is the largest of three exposed alkaline complexes in the study area. It is a zoned syenite intrusion that comprises syenite, monzonite, and quartz monzonite, as well as malignite and subordinate ijolite, shonkinite, and pyroxenite (1). The syenitic rocks are composed of alkali feldspar, hornblende, pyroxene, and biotite with accessory fluorite, sphene, zircon, apatite, magnetite, and olivine. Locally some phases include quartz or nepheline. These rocks commonly exhibit gneissic and trachytoid textures and are cut, along with the hosting metasedimentary rock, by dikes of aplite, alaskite, lamprophyre, and leucocratic syenite. A K-Ar age determination on biotite in nepheline syenite yielded 107 $\pm$ 2.8 m.y. (1). Small felsic stocks of unknown relationship with the alkaline complexes have intruded the Cretaceous andesite north of the Selawik Hills.

Two smaller alkaline plutons outcrop north of the Selawik Hills complex and comprise the Selawik Lake complex to the west, and the Inland Lake complex to the east. They are composed primarily of nepheline syenite and lesser syenite, malignite, and monzonite. Melanite garnet and fluorite are locally abundant, and the plutons are commonly cut by lamprophyre

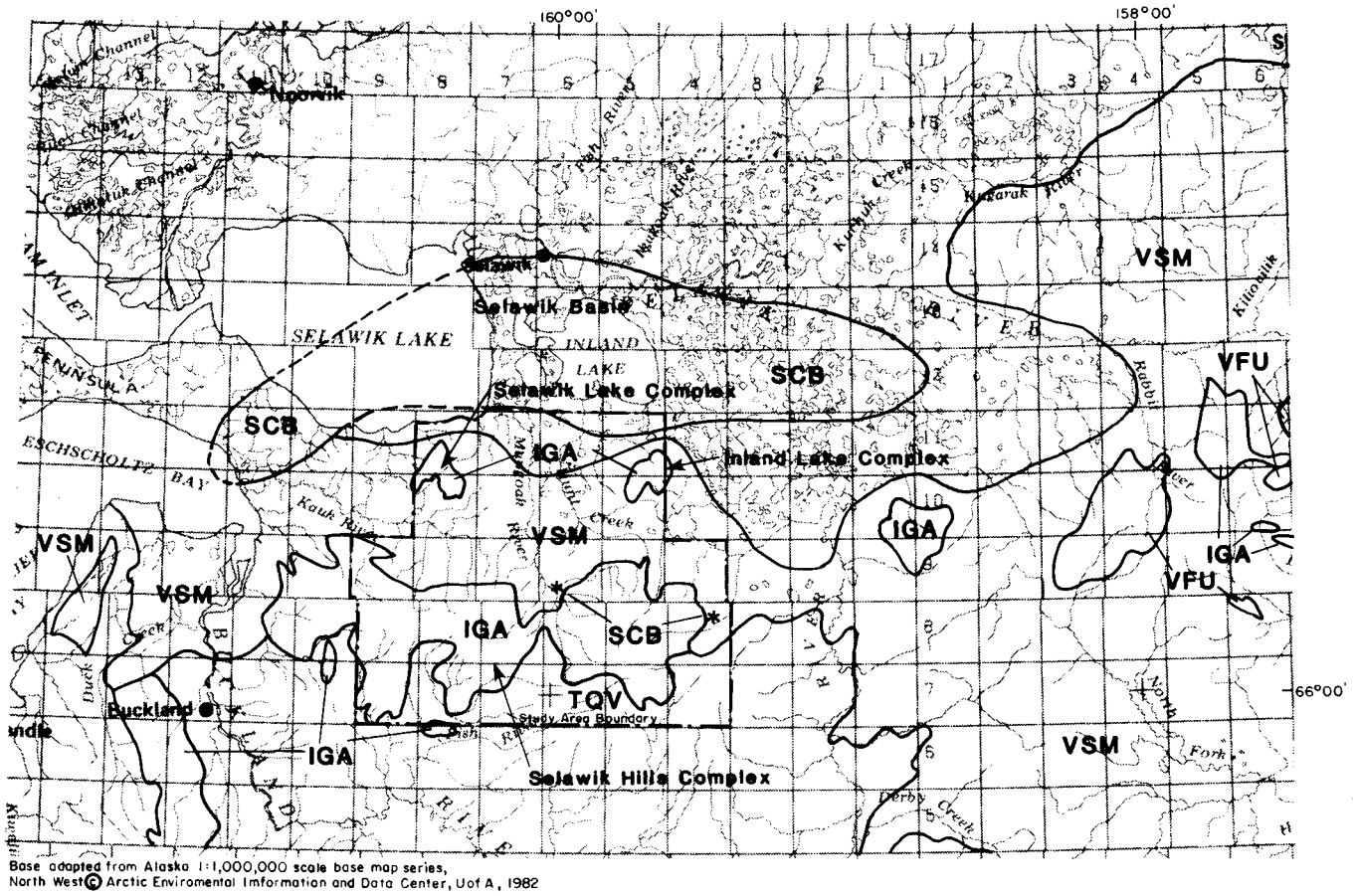


Figure 3. Regional geology.

dikes. Aeromagnetic data indicates the plutons are considerably larger than exposed in outcrop (4, 6). Miller suggested that below surficial cover, the Inland Lake complex is continuous with the northern Selawik Hills complex (3).

Miller described the petrography of the alkaline rocks of the Selawik area and compared them with other alkaline intrusions in the Hogatza plutonic belt (3). These plutons are typified by an enrichment of barium, fluorine, lead, uranium, thorium, zirconium, and light rare earth elements (eg. lanthanum, cesium, neodymium).

Volcanic and Metasedimentary Rocks

Tertiary to Pleistocene subaerial, vesicular olivine basalt, up to 500 ft thick, overlies the southern margin of the Selawik Hills complex and caps the lower ridges to the north (fig. 4). Volcanic vents have been mapped on the south side of the complex (2).

The low-lying area between the Selawik Hills, Inland Lake, and Selawik Lake complexes (fig. 3) may be underlain by Tertiary sediments. An outcropping of tilted Tertiary sediments east of the Mangoak River contains granitic detritus, peat, and lignite (1). A similar outcropping and rubble was found at a second site to the east during this investigation.

Limited data indicates that an east-trending gravity low underlies Selawik Lake and vicinity, parallel to, but north of a fault which forms the northern boundary of the Selawik Hills (7). Barnes interpreted the data to imply the presence of a Tertiary sedimentary basin. Although Tertiary rocks do not outcrop in the Selawik Lake vicinity, the presence of Tertiary sediments to the south near the Mangoak River suggests that the Selawik basin contains continental coal-bearing sediments (4)

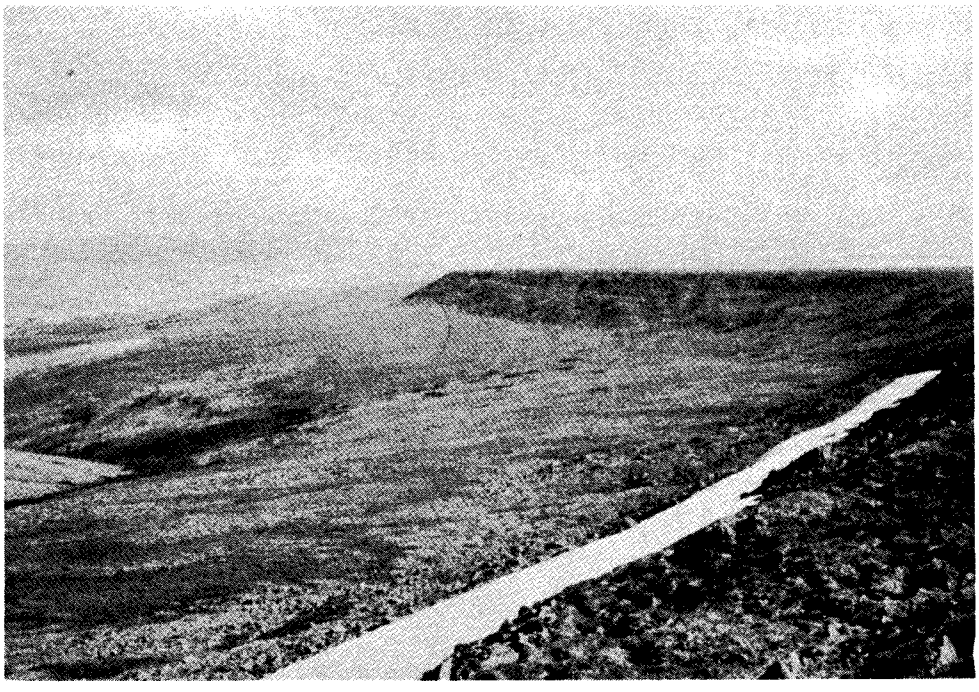


FIGURE 4. - Looking north from the Selawik Hills. Syenite intrusive rocks capped by Tertiary-Quaternary basalts. Inland Lake complex in far background.

derived, at least in part, from detritus shed by the alkaline complexes.

The intrusive complexes in the Selawik Hills area are hosted by metasedimentary and andesitic volcanic rocks. Metasedimentary rocks were derived from Cretaceous (1) calcareous and pelitic units and include calc-silicate hornfels, silty marble, conglomeratic marble, and metapelite. Biotite from the metapelite has yielded a K-Ar age date of 110 ± 3 m.y. (1) which probably represents thermal alteration during the intrusion of the Selawik pluton. The metasedimentary rocks are only exposed on the north side of the Selawik Hills. Elsewhere, Cretaceous (1) andesitic volcanic and metavolcanic rocks host the plutonic complexes. The metavolcanic rocks exhibit hornfels textures near the intrusive contact.

PROCEDURE

Stream sediment and panned concentrate samples were obtained with a steel shovel from silty gravels taken from either the center of the active channel of smaller creeks or from the leading edge of gravel bars on larger streams. For stream sediment samples, approximately 0.5 lb of finer grain sediment was placed directly into water-resistant paper bags, air-dried, and screened at minus 80-mesh. The minus 80-mesh fraction was then pulverized prior to standard atomic absorption and fluorometric analyses (table 1). Panned concentrates were collected with a 14-in (35.6-cm) pan which was heap-filled, then carefully panned until nearly all quartz, feldspar, and mafic minerals were removed. The concentrated heavy mineral fraction was air-dried in the laboratory, weighed, and pulverized for analyses by semi-quantitative, X-ray fluorescence spectrographic techniques. Sample sites for stream sediments and panned concentrates are shown in figs. 5&6. Analytical results are listed in

TABLE 1. - Lower detection limits of analytical procedures

Element	Lower limit of detection (ppm)
Atomic absorption[1] - Stream sediments and rock samples:	
Ag	0.1
Cu	1
Mo	2
Pb	5
W	5
Zn	4
Fluorometric (U_3O_8),[1] X-ray fluorescence (Nb Th),[2] and colorimetric (W)[1] - Stream sediments and rock samples:	
Nb	20
Th	20
U_3O_8	1
W	5
Optical emission spectrography[1] - Rock and stream sediment samples:	
Ag	10
Al_2O_3	10
As	1,000
Au	20
B	20
Ba	700
BeO	10
Bi	40
CaO	200
Cb_2O_5	70
Cd	400
Co	20
Cr	10
Cu	10
Fe	20
Ga	20
Hf	80
La_2O_3	1,000

Element	Lower limit of detection (ppm)
Optical emission spectrography[1] - Rock and stream sediment samples--Con.	
La_2O_3	100
Li_2O	1,000
MgO	4
Mn	10
Mo	10
Na_2O	4,000
Ni	20
P	2,000
Pb	100
Pt	50
Re	50
Sb	400
Sc	50
SiO_2	3
Sn	20
Sr	600
Ta_2O_5	80
Te	8,000
Ti	10
Tl	2,000
V	30
Y_2O_3	10
Zn	1,000
ZrO_2	40
X-ray fluorescent spectrography[3] - Panned concentrates:	
Nb	50 to 200
Sn	50
Ta	500 to 1,000
Th	100 to 500
U	100 to 1,000
W	500 to 1,000

[1]Analyses performed by Technical Service Laboratories (TSL), Spokane, WA.
[2]X-ray fluorescence analyses for niobium and thorium by Bondar-Clegg, Inc., Lakewood, CO.
[3]Analyses performed by J. Drake, geologist, Bureau of Mines, Juneau, AK.

tables 2 and 3.

Rock samples consist of random chips generally collected within a few feet of the sample station, unless otherwise noted. Rocks were pulverized and analyzed by procedures similar to those used for stream sediments (table 1). Descriptions of samples listed in table 4 are taken from field notes, supplemented as required by thin section examination. Locations of rock samples are shown in figure 7.

In addition to the quantitative analytical data reported in the tables, optical semi-quantitative, emission-spectrographic analyses for 42 elements were performed on most rock and stream sediment samples (appendix A).

Uranium content of rock and stream sediment samples collected during this project is reported as uranium oxide (U_3O_8). The U_3O_8 content multiplied by 0.85 provides actual elemental uranium content.

Previous DOE investigators (4, p. 58) estimated the anomalous threshold values of uranium and thorium to be 60 ppm U and 400 ppm Th in rock, and 15 ppm U and 200 ppm Th in stream sediment and soil samples. The estimates were based on a regional geochemical survey of the southern Selawik Quadrangle area. The anomalous values were the upper 2.5 pct of analytical values as shown on cumulative frequency diagrams. These anomalous threshold values are adopted for this investigation because the sampling by the Bureau of Mines focused on suspected or known mineralized areas and true background values could not be determined on the basis of this intentionally biased data base.

Elements sought in pan concentrate samples were generally below detection limits and therefore it was not possible to define anomalous levels. For comparison, a study of 1,069 heavy mineral concentrates

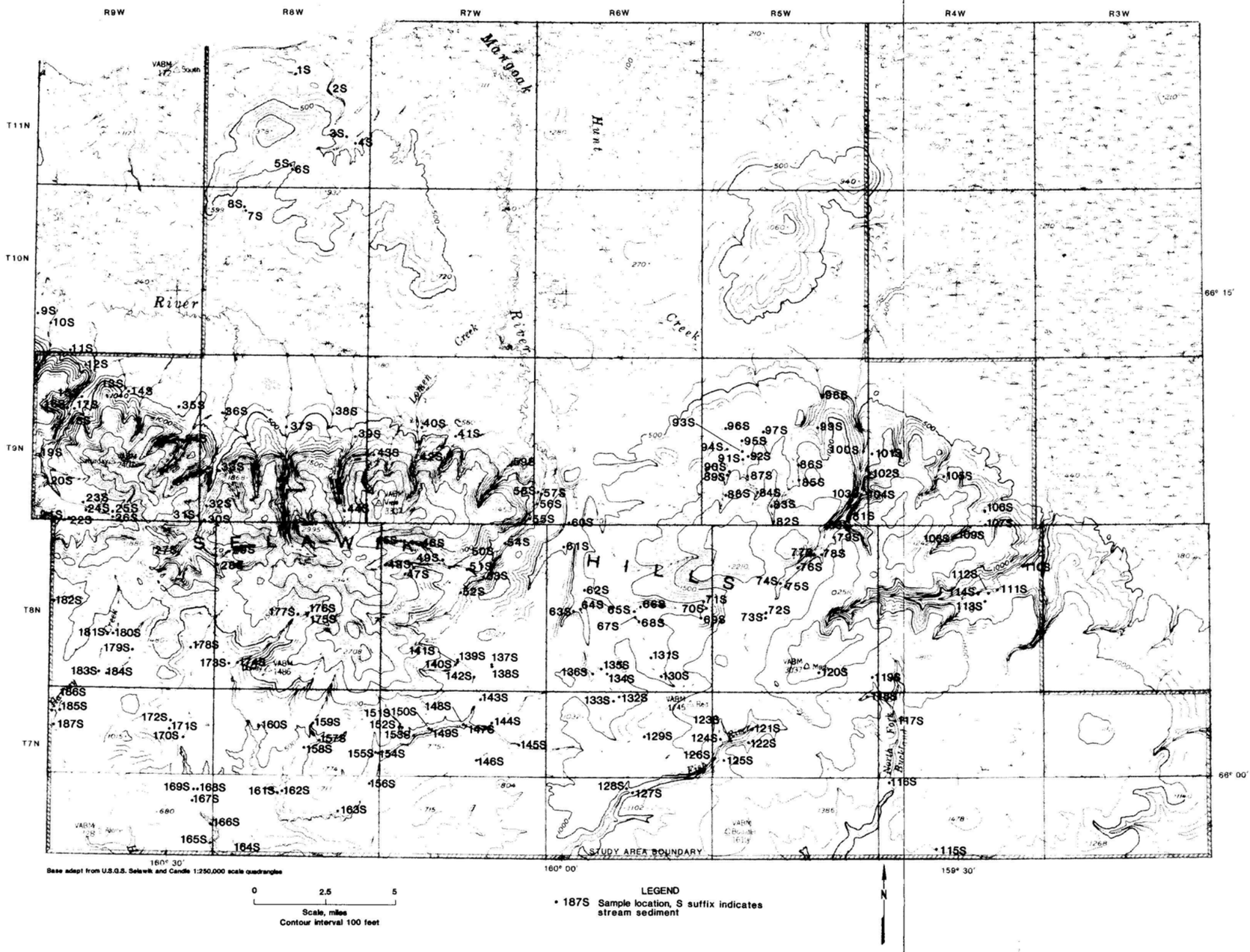
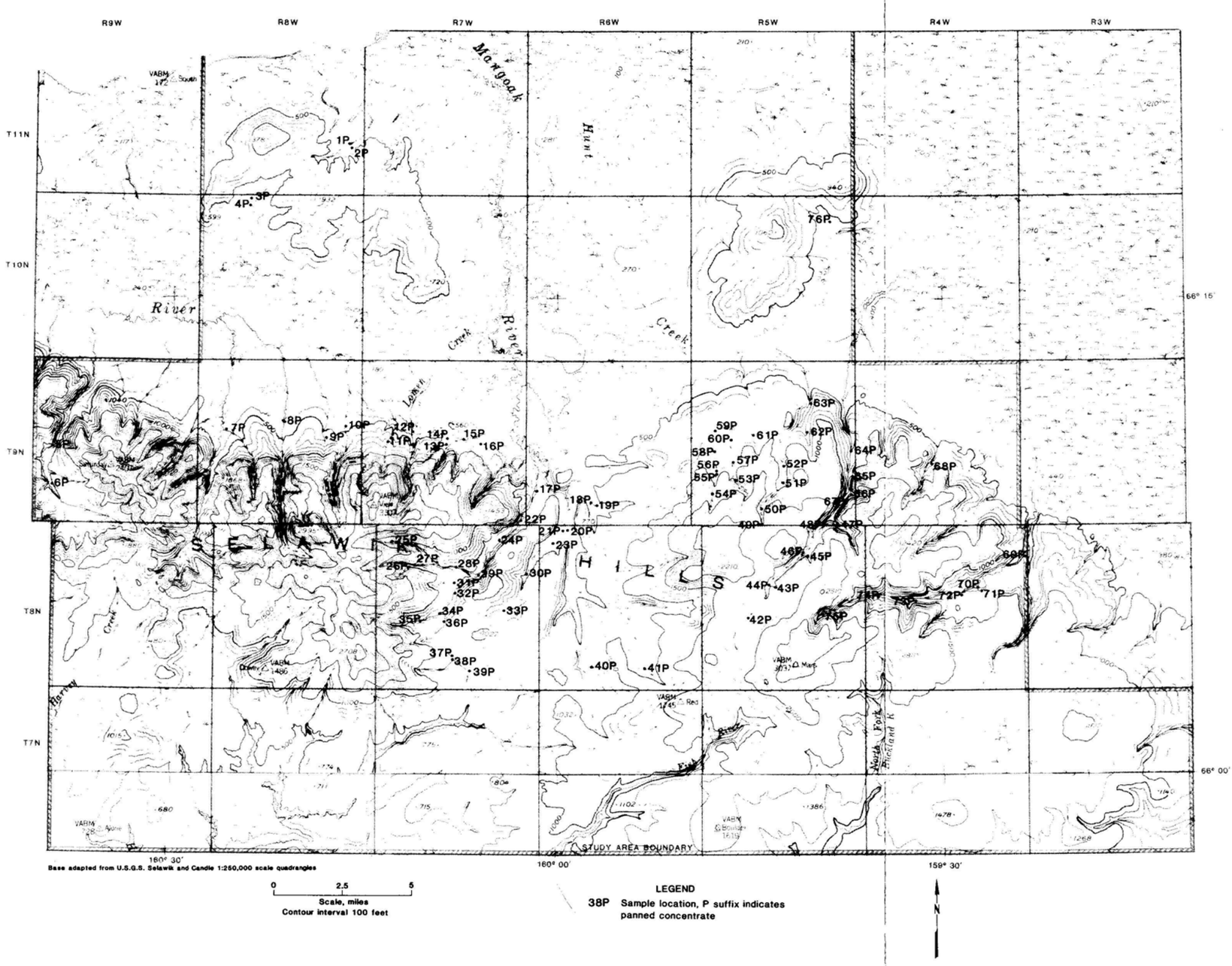


Figure 5: Stream sediment sample locations in the Selawik Hills Study Area, Alaska



Base adapted from U.S.G.S. Selawik and Candle 1:250,000 scale quadrangles

0 2.5 5
Scale, miles
Contour interval 100 feet

LEGEND

38P Sample location, P suffix indicates panned concentrate

Figure 6: Panned concentrate sample locations in the Selawik Hills Study Area, Alaska

TABLE 2. - Stream sediment sample analytical results

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Zn, ppm	U_3O_8, ppm
1S..	0.2	10	3	14	36	1
2S..	0.4	10	3	10	31	1
3S..	1.0	15	2	20	68	<1
4S..	0.9	15	<2	20	56	1
5S..	0.3	18	5	15	140	12
6S..	0.4	13	4	22	92	1
7S..	0.4	16	5	13	52	2
8S..	0.4	10	5	10	41	2
9S..	0.4	14	7	16	55	13
10S..	0.2	24	<2	26	69	9
11S..	0.4	17	5	18	58	10
12S..	0.4	19	4	12	47	13
13S..	0.3	8	5	9	51	4
14S..	0.4	13	4	12	60	4
15S..	0.3	7	6	14	55	6
16S..	0.4	44	<2	30	89	9
17S..	0.8	33	6	25	82	16
18S..	0.5	16	2	31	65	20
19S..	0.4	11	12	27	99	43
20S..	1.5	14	5	33	90	8
21S..	ins	26	6	60	66	45
22S..	0.3	25	2	55	96	30
23S..	0.5	33	7	42	110	1
24S..	0.6	16	5	59	145	47
25S..	0.5	18	3	34	88	80
26S..	ins	24	2	70	110	14
27S..	1.2	11	2	27	68	7
28S..	0.5	62	2	36	120	11
29S..	0.5	39	4	21	61	19
30S..	0.2	16	2	12	39	1
31S..	0.3	18	4	20	54	2
32S..	<0.1	10	2	12	29	2
33S..	0.4	22	3	12	105	3
34S..	0.5	19	4	28	78	3
35S..	0.2	16	5	20	69	15
36S..	0.5	11	6	8	58	3
37S..	0.2	21	4	18	44	43
38S..	0.4	15	2	15	59	9
39S..	0.4	29	<2	12	81	2
40S..	0.1	22	3	21	61	3
41S..	0.5	16	4	24	82	6
42S..	0.4	27	5	37	83	4
43S..	0.4	23	5	26	78	7
44S..	ins	36	10	18	58	120
45S..	0.8	45	2	25	66	7
46S..	0.6	42	ins	24	70	ins
47S..	0.5	20	5	18	44	5
48S..	0.4	20	ins	14	50	ins
49S..	0.5	30	ins	20	52	ins
50S..	0.5	30	3	20	59	5
51S..	0.2	21	8	19	39	4
52S..	0.5	19	3	16	45	6
53S..	0.5	14	4	13	39	8
54S..	0.6	15	5	20	38	9
55S..	0.4	10	4	11	30	10
56S..	0.2	8	5	14	59	7
57S..	0.4	10	4	10	25	7
58S..	0.2	5	<2	12	38	5
59S..	0.1	21	2	12	67	4
60S..	1.0	31	5	13	70	2
61S..	0.5	19	5	24	70	1
62S..	0.2	4	3	11	42	6
63S..	0.4	19	5	17	97	2
64S..	0.3	13	5	15	62	1
65S..	0.3	4	3	15	48	11
66S..	0.2	6	<2	14	38	4
67S..	ins	10	ins	10	76	ins
68S..	0.3	1	<2	14	25	4
69S..	0.3	10	2	14	45	21
70S..	0.2	3	<2	16	39	12
71S..	0.5	6	2	22	67	14
72S..	0.1	4	2	6	55	9
73S..	ins	10	6	14	80	7
74S..	1.5	13	3	14	66	12
75S..	0.1	9	3	10	32	5
76S..	0.3	4	3	11	52	6
77S..	0.5	5	2	11	45	9
78S..	0.5	15	4	22	56	16
79S..	0.5	30	5	34	66	5
80S..	0.4	18	5	21	48	5
81S..	0.5	30	2	24	89	19
82S..	0.6	16	3	19	105	5
83S..	0.5	16	4	17	40	3
84S..	0.4	14	3	20	55	3
85S..	10.5	26	5	25	56	5
86S..	0.5	29	5	31	83	8
87S..	0.5	21	5	66	125	5
88S..	0.3	16	2	20	49	5
89S..	0.5	20	4	70	84	8
90S..	0.5	20	6	28	50	9
91S..	0.4	16	ins	40	55	ins
92S..	0.8	15	4	115	150	9
93S..	0.5	15	ins	45	75	ins
94S..	0.5	16	5	30	56	5
95S..	0.8	15	5	49	72	4
96S..	1.0	16	5	25	52	6
97S..	0.9	20	3	115	210	7
98S..	0.1	10	ins	14	20	ins
99S..	0.6	44	5	29	86	2
100S..	1.4	100	3	90	95	2

ins Insufficient sample for analysis.

Stream sediment sample analytical results - Continued

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Zn, ppm	U_3O_8, ppm
101S..	1.0	30	3	24	67	6
102S..	0.5	20	4	26	77	9
103S..	0.2	22	ins	28	44	ins
104S..	0.5	25	3	26	81	10
105S..	<0.1	10	3	19	59	19
106S..	0.5	24	5	22	71	9
107S..	0.5	21	4	15	32	7
108S..	0.3	21	4	21	54	10
109S..	0.5	22	3	20	64	11
110S..	0.4	25	4	15	46	11
111S..	0.5	22	4	18	50	5
112S..	1.2	36	4	16	70	3
113S..	ins	ins	ins	ins	ins	ins
114S..	0.4	20	ins	13	44	ins
115S..	0.5	12	3	27	80	1
116S..	ins	26	ins	14	76	ins
117S..	0.3	10	2	20	80	7
118S..	0.3	21	6	25	87	18
119S..	1.0	20	<2	21	62	6
120S..	0.3	25	3	36	88	24
121S..	ins	9	4	12	53	12
122S..	<0.1	4	3	11	47	11
123S..	0.1	6	3	12	50	7
124S..	0.4	15	3	18	69	8
125S..	0.4	24	2	15	105	<1
126S..	ins	10	ins	10	94	ins
127S..	0.5	15	<2	16	82	8
128S..	0.5	20	5	19	105	1
129S..	0.5	8	5	11	49	2
130S..	0.2	8	4	7	58	13
131S..	0.3	6	2	14	65	8
132S..	ins	10	ins	16	64	ins
133S..	0.2	12	4	12	66	3
134S..	0.5	14	5	24	83	6
135S..	0.1	16	4	19	82	2
136S..	0.5	13	5	14	94	4
137S..	0.3	9	6	21	52	1
138S..	1.0	13	4	20	89	<1
139S..	0.5	11	6	36	49	1
140S..	0.5	10	4	10	49	9
141S..	0.5	18	<2	12	60	7
142S..	0.6	15	6	15	54	2
143S..	0.1	13	3	13	51	2
144S..	1.0	13	5	19	85	4
145S..	0.4	12	3	19	74	2
146S..	0.8	20	5	15	92	1
147S..	0.4	15	5	12	79	2
148S..	ins	22	4	14	70	3
149S..	0.4	13	5	11	62	3
150S..	0.1	16	4	9	40	3
151S..	0.5	19	4	11	40	6
152S..	0.4	9	4	9	33	6
153S..	0.2	16	5	15	55	3
154S..	<0.1	12	5	9	51	4
155S..	0.2	11	8	14	53	2
156S..	ins	12	4	7	50	5
157S..	0.6	7	5	7	40	9
158S..	0.4	15	9	17	64	15
159S..	0.2	14	2	14	51	4
160S..	0.6	20	5	16	39	9
161S..	ins	12	4	20	76	3
162S..	0.2	6	3	11	40	14
163S..	0.4	17	2	11	67	3
164S..	ins	11	5	12	48	11
165S..	0.3	22	4	18	48	6
166S..	0.4	13	<2	17	74	4
167S..	0.3	16	4	16	73	10
168S..	0.4	9	<2	17	68	3
169S..	0.4	14	5	19	100	5
170S..	0.4	12	4	21	93	5
171S..	0.2	10	4	18	73	3
172S..	0.3	9	3	16	68	22
173S..	0.5	14	5	17	67	5
174S..	0.4	16	5	20	59	5
175S..	0.3	12	2	13	49	7
176S..	0.2	26	6	17	67	7
177S..	0.5	42	4	20	80	10
178S..	0.6	16	4	23	60	9
179S..	ins	10	ins	48	98	ins
180S..	ins	11	5	24	67	18
181S..	0.2	7	<2	19	56	21
182S..	0.1	11	5	27	82	22
183S..	<0.1	9	5	16	48	7
184S..	0.2	20	4	17	40	5
185S..	0.2	15	4	19	41	5
186S..	0.5	14	7	26	130	7
187S..	0.1	14	4	20	93	4

ins Insufficient sample for analysis.

TABLE 3. - Panned concentrate sample analytical results[1]

Sample	Weight of concentrate, minus 14-mesh, in g[2]	Nb, ppm	Sn, ppm	Ta, ppm	Th, ppm	U, ppm	W, ppm	Zr, ppm
1P....	5.4	TR	ND	ND	NA	ND	ND	NA
2P....	5.7	TR	ND	ND	NA	ND	ND	NA
3P....	6.7	100	ND	ND	D	ND	ND	NA
4P....	14.2	200	ND	ND	400	ND	ND	NA
5P....	58.5	200	ND	ND	NA	ND	ND	NA
6P....	23.4	200	ND	ND	D	ND	ND	NA
7P....	15.0	TR	ND	ND	100	ND	ND	NA
8P....	17.0	TR	ND	ND	D	ND	ND	NA
9P....	15.2	TR	ND	ND	NA	ND	ND	NA
10P....	4.8	TR	ND	ND	NA	ND	ND	NA
11P....	11.8	TR	ND	ND	NA	ND	ND	NA
12P....	8.7	100	ND	ND	D	ND	ND	NA
13P....	21.9	TR	ND	ND	NA	ND	ND	NA
14P....	11.8	TR	ND	ND	NA	ND	ND	NA
15P....	9.3	200	ND	ND	TR	ND	ND	NA
16P....	8.2	100	ND	ND	NA	ND	ND	NA
17P....	8.8	TR	ND	ND	NA	ND	ND	NA
18P....	4.4	200	ND	ND	NA	ND	ND	NA
19P....	10.5	200	ND	ND	NA	ND	ND	NA
20P....	38.1	200	ND	ND	NA	ND	ND	NA
21P....	28.9	200	ND	ND	NA	ND	ND	NA
22P....	19.1	TR	ND	ND	NA	ND	ND	NA
23P....	6.2	TR	ND	ND	NA	ND	ND	NA
24P....	16.5	TR	ND	ND	NA	ND	ND	NA
25P....	17.4	ND	TR	ND	NA	ND	ND	NA
26P....	7.8	60	ND	ND	NA	ND	ND	NA
27P....	13.7	TR	ND	ND	NA	ND	ND	NA
28P....	12.0	60	ND	ND	NA	ND	ND	NA
29P....	19.2	TR	ND	ND	TR	ND	ND	NA
30P....	7.2	200	ND	ND	NA	ND	ND	NA
31P....	25.7	100	ND	ND	D	ND	ND	NA
32P....	52.7	TR	ND	ND	D	ND	ND	NA
33P....	4.3	200	ND	ND	300	ND	ND	NA
34P....	32.2	80	ND	ND	NA	ND	ND	NA
35P....	19.4	200	ND	ND	D	ND	ND	7000
36P....	68.5	TR	ND	ND	NA	ND	ND	NA
37P....	12.4	TR	ND	ND	NA	ND	ND	NA
38P....	11.1	TR	ND	ND	NA	ND	ND	NA
39P....	6.2	TR	ND	ND	NA	ND	ND	NA
40P....	3.2	300	ND	ND	NA	ND	ND	NA
41P....	9.1	200	ND	ND	NA	ND	ND	NA
42P....	8.5	200	ND	ND	NA	ND	ND	NA
43P....	8.6	ND	ND	ND	NA	ND	ND	NA
44P....	8.0	TR	ND	ND	NA	ND	ND	NA
45P....	14.1	90	ND	ND	NA	ND	ND	NA
46P....	13.6	200	ND	ND	NA	ND	ND	NA
47P....	21.9	200	ND	ND	200	ND	ND	NA
48P....	5.9	100	ND	ND	NA	ND	ND	NA

See explanatory notes at end of table.

Panned concentrate sample analytical results[1] - Continued

Sample	Weight of concentrate, minus 14-mesh, in g[2]	Nb, ppm	Sn, ppm	Ta, ppm	Th, ppm	U, ppm	W, ppm	Zr, ppm
49P....	13.8	100	ND	ND	NA	ND	ND	NA
50P....	7.8	TR	ND	ND	NA	ND	ND	NA
51P....	9.4	TR	ND	ND	NA	ND	ND	NA
52P....	7.7	TR	ND	ND	NA	ND	ND	NA
53P....	2.4	ND	ND	ND	NA	ND	ND	NA
54P....	11.3	ND	ND	ND	NA	ND	ND	NA
55P....	9.0	ND	ND	ND	NA	ND	ND	NA
56P....	10.3	TR	ND	ND	NA	ND	ND	NA
57P....	11.2	TR	ND	ND	NA	ND	ND	NA
58P....	14.7	TR	ND	ND	NA	ND	ND	NA
59P....	9.9	TR	ND	ND	NA	ND	ND	NA
60P....	9.3	ND	ND	ND	NA	ND	ND	NA
61P....	5.8	TR	ND	ND	NA	ND	ND	NA
62P....	5.4	ND	ND	ND	NA	ND	ND	NA
63P....	13.2	ND	ND	ND	NA	ND	ND	NA
64P....	28.3	TR	ND	ND	NA	ND	ND	NA
65P....	17.2	400	ND	ND	100	ND	ND	NA
66P....	18.5	400	ND	ND	300	ND	ND	NA
67P....	11.8	100	ND	ND	NA	ND	ND	NA
68P....	10.8	ND	ND	ND	NA	ND	ND	NA
69P....	18.3	TR	ND	ND	NA	ND	ND	NA
70P....	31.5	100	ND	ND	NA	ND	ND	NA
71P....	11.2	TR	ND	ND	NA	ND	ND	NA
72P....	12.3	TR	ND	ND	NA	ND	ND	NA
73P....	5.4	70	ND	ND	D	ND	ND	NA
74P....	29.0	TR	ND	ND	NA	ND	ND	NA
75P....	23.2	TR	ND	ND	NA	ND	ND	NA
76P....	11.9	ND	ND	ND	NA	ND	ND	NA

D Detected.
NA Not analyzed.
ND Not detected.
TR Trace.

[1]Analyses performed by J. Drake, geologist, in laboratory section of the Alaska Field Operations Center, Bureau of Mines, Juneau, AK.

[2]Original sample size was 0.17 ft^3 of unscreened alluvial sand and gravel. Weights listed in the table represent only the heavy mineral fraction which was analyzed.

TABLE 4. - Rock and soil sample analytical results[1] and descriptions

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Th, ppm	U_3O_8, ppm	W, ppm	Zn, ppm	Field and petrographic descriptions
1R..	0.5	16	5	28	NA	9	NA	50	Gray clay soil in tundra area with 2x radiometric background.
2R..	.5	18	4	19	NA	20	NA	45	Tundra soil with 2x radiometric background.
3R..	.2	16	4	5	23	7	4	34	Fine-grained nepheline syenite with weakly developed gneissic texture.
4R..	NA	NA	NA	NA	380	123	NA	NA	Radioactive phase or zone of syenite with abundant red waxy mineral.
5R..	.2	30	6	22	91	36	15	39	Fine-grained nepheline syenite with tourmaline.
6R..	NA	50	NA	400	442	183	NA	NA	A 4-ft-wide lamprophyre dike with leached carbonate.
7R..	NA	50	NA	400	313	218	NA	NA	Lamprophyre dike with secondary carbonate and unidentified opaques in thin section.
8R..	.2	17	8	23	19	56	3	27	Fresh, frost-fractured syenite with biotite and pyroxene.
9R..	.3	17	9	31	NA	98	NA	43	Silty soil in area of of 3x radiometric background.
10R..	.41	8	ND	40	NA	120	NA	14	Radioactive hematitic vein quartz with limonite boxworks in rubble along fault.
11R..	3.5	6	ND	16	NA	16	NA	15	Syenite with disseminated hematite and cut by thin, fine-grained dikes.
12R..	.4	20	3	15	NA	2	NA	55	Micaceous silty soil and clay.
13R..	.4	30	3	20	NA	1	NA	65	Soil from area of high level alluvial gravels.
14R..	.6	32	4	21	NA	1	NA	64	Do.
15R..	.2	7	2	21	167	14	4	18	Typical pyroxene biotite syenite.
16R..	.2	35	4	7	NA	4	NA	45	Pegmatite dike.
17R..	.2	3	4	30	NA	5	31	NA	Brecciated syenite altering to clay; fluorite present.
18R..	.5	37	4	39	NA	7	NA	85	Soil sample.
19R..	.2	10	1	29	36	6	NA	71	Brecciated and silicified hornblende syenite, slightly radioactive.
20R..	.3	5	ND	69	NA	53	NA	80	Hornblende syenite with veinlets of purple fluorite. Some clay alteration present.
21R..	.2	5	1	10	NA	4	NA	38	Syenite intrusion breccia fragments in crystalline felsic matrix. Clay alteration is common.
22R..	.2	2	2	18	NA	7	NA	8	Alkali granite with accessory zircon, sphene, clay, and chlorite.
23R..	.17	10	10	60	875	734	NA	54	Altered biotite syenite with clay and limonite. Accessory xenotime, zircon, and up to 10 pct of rock is a red waxy mineral.
24R..	.21	32	5	20	420	81	NA	19	Fractured syenite with clay and limonite.
25R..	.25	29	3	100	4,957	770	NA	98	Hornblende syenite with interstitial fluorite, and biotite.

See explanatory notes at end of table.

Rock and soil sample analytical results[1] and descriptions - Continued

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Th, ppm	U_3O_8 ppm	W, ppm	Zn, ppm	Field and petrographic descriptions
26R..	0.22	5	4	75	NA	21	NA	40	Propylitically-altered hornblende syenite with carbonate veinlets and accessory fluorite.
27R..	.26	45	5	50	79	12	NA	44	Propylitically- and clay-altered syenite, with chlorite after biotite and hornblende veinlets of epidote, fluorite, and carbonate.
28R..	.68	105	3	15	51	13	NA	50	Hornblende syenite with minor sphene and trace xenotime. Accessory zircon and opaques present.
29R..	.8	22	5	195	NA	293	NA	130	Dark brown soil near location of diamond drill hole. Float rock is coarse-grained, hornblende syenite.
30R..	.2	13	3	298	292	48	NA	74	Hornblende syenite with minor fluorite associated with hornblende phenocrysts, and late biotite.
31R..	.2	14	3	140	277	36	NA	82	Clay-altered, foliated, hornblende syenite.
32R..	.2	22	4	70	48	8	NA	48	Aegirine syenite with secondary biotite and minor clay and iron oxide alteration.
33R..	.5	26	5	38	NA	90	NA	100	Light brown soil in area of 4x radiometric background.
34R..	.2	2	4	30	ND	6	NA	20	Fractured alaskite altered to clay, chlorite, iron oxide, and sphene. Accessory fluorite and zircon.
35R..	.2	11	3	45	529	92	NA	81	Weakly developed gneissic texture in hornblende syenite with xenotime, fluorite, and cut by chlorite- and epidote-quartz veinlets.
36R..	.2	84	1	26	535	21	NA	51	Aegirine syenite altered to clay and limonite Thin section examination identified secondary biotite and abundant fluorite, epidote, zircon, and a red waxy mineral.
37R..	.4	58	2	172	ND	18	NA	143	Hornblende-rich syenite.
38R..	1.4	115	2	13	NA	10	NA	10	Fine-grained granitic rock.
39R..	.85	4	ND	81	NA	59	NA	110	Nepheline syenite with zircon, sphene, clay, and secondary fluorite.
40R..	.2	4	3	13	NA	6	NA	12	Medium-grained granitic rock.
41R..	.3	18	NA	NA	NA	NA	NA	NA	From brown soil area on ridge of hornblende syenite.
42R..	NA	NA	NA	NA	NA	NA	NA	NA	Do.
43R..	NA	10	NA	NA	NA	NA	NA	NA	Feldspar veins with garnet cutting dark crystalline rock.
44R..	NA	NA	NA	NA	NA	NA	NA	NA	Quartz-pebble conglomerate.
45R..	NA	NA	NA	NA	NA	NA	NA	NA	Quartz biotite gneiss.
46R..	NA	NA	NA	NA	NA	NA	NA	NA	Micaceous metasedimentary rock.
47R..	NA	NA	NA	NA	NA	NA	NA	NA	Red-weathering gneissic monzonite.
48R..	NA	NA	NA	NA	NA	NA	NA	NA	Fine-grained, light colored, volcaniclastic texture.
49R..	NA	20	NA	100	205	100	NA	NA	Radioactive, fine-grained, nepheline biotite syenite.

See explanatory notes at end of table.

Rock and soil sample analytical results[1] and descriptions - Continued

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Th, ppm	U_3O_8, ppm	W, ppm	Zn, ppm	Field and petrographic descriptions
50R..	NA	NA	NA	100	69	21	NA	NA	Syenite with porphyritic pyroxene phenocrysts and gneissic texture.
51R..	1.8	25	ND	37	81	25	ND	45	Silicified breccia zone with pyrite, sericite, hematite, and boxwork. Collected from prospect pit.
52R..	.2	28	2	45	47	25	3	59	Wallrock to sample 53R; slight chloritic and sericitic alteration.
53R..	.72	29	4	35	65	14	ND	58	Silicified breccia zone with pyrite, sericite, and hematite.
54R..	NA	10	NA	200	226	150	NA	NA	Radioactive, gneissic syenite with feldspar alteration.
55R..	.2	32	3	42	66	13	3	52	Altered syenite with secondary silicification.
56R..	.2	1	1	ND	40	0.9	4	14	Gneiss.
57R..	.2	60	2	ND	3	.2	4	31	Foliated, quartz monzonite.
58R..	.2	50	4	31	35	11	3	51	Coarse-grained, foliated pyroxene shonkinite.
59R..	.2	7	ND	42	36	220	5	19	Grab sample from shear zone in chloritized, foliated syenite with quartz veins $\leq$ 0.5 in thick, and biotitization. Accessory xenotime and zircon noted in thin section.
60R..	.44	75	2	9	ND	1	NA	20	Green silicious rubble along fault escarpment.
61R..	.60	15	ND	6	NA	ND	NA	18	Pyritic quartz veins hosted by silicified and epidotized volcanics.
62R..	.61	10	ND	10	NA	ND	NA	45	Pyritic volcanic rock.
63R..	.48	5	5	8	ND	ND	ND	15	Quartz vein containing magnetite and sulfides and hosted by mafic volcanic rock. Grab sample.
64R..	.76	55	5	10	ND	ND	ND	5	Syenite with quartz veins containing magnetite, specular hematite, and limonite boxwork.
65R..	1.2	20	3	10	ND	ND	ND	23	Quartz and calcite vein rubble with sulfides, hosted by banded volcanic rock.
66R..	.2	45	1	3	ND	ND	3	29	Greenstone (dike?)
67R..	.2	8	2	ND	2	ND	3	25	Biotite pyroxene, and epidote with sericite and quartz stockworks.
68R..	NA	20	NA	NA	NA	NA	NA	NA	Tactite with pyrite. Grab sample.
69R..	.2	15	3	81	7	0.7	4	31	Coarse-grained shonkinite.
70R..	NA	NA	NA	100	ND	5	NA	NA	Coarse-grained shonkinite.
71R..	3.1	15	2	15	58	17	ND	13	Porphyritic potassium feldspar syenite.
72R..	.56	35	5	20	33	5	NA	30	Quartz veins with biotite and pyrite.
73R..	1.5	165	ND	10	NA	6	NA	18	Banded quartz and biotite with limonite and trace sulfides.
74R..	.33	5	4	5	NA	2	NA	7	Iron-stained quartz biotite granitic rock with a trace of pyrite.
75R..	.2	14	3	3	5	ND	4	12	Pyroxene syenite with feldspar stockworks.
76R..	.2	21	5	6	8	ND	4	13	Hornfels andesitic volcanic rock.
77R..	NA	10	NA	NA	NA	NA	NA	NA	Biotite syenite.
78R..	.2	8	2	5	34	8	3	38	Aplite dike with a trace of pyrite. High grade grab sample.
79R..	.2	13	1	3	6	2	4	27	Hornfels andesitic volcanic rock.

See explanatory notes at end of table.

Rock and soil sample analytical results[1] and descriptions - Continued

Sample	Ag, ppm	Cu, ppm	Mo, ppm	Pb, ppm	Th, ppm	U_3O_8, ppm	W, ppm	Zn, ppm	Field and petrographic description
80R..	NA	8	NA	NA	NA	NA	NA	NA	Aplite dike with disseminated tourmaline(?).
81R..	0.2	12	1	5	41	4	3	19	Fine-grained, quartz monzonite, which is seritized, silicified, and contains sericite and bands and wisps of biotite.
82R..	.45	3	5	15	NA	12	NA	31	Silicified granitic rock.
83R..	.30	4	6	10	NA	11	NA	30	Gossan rubble.
84R..	1	3	4	9	NA	10	NA	20	Gossan rubble.
85R..	.57	30	ND	15	NA	1	NA	50	Vesicular basalt.
86R..	.90	18	ND	39	NA	14	NA	35	Monzonite.
87R..	NA	10	NA	NA	40	16	NA	NA	Coarse-grained monzonite.
88R..	.3	41	6	22	NA	4	NA	105	Gneissic hornblende syenite porphyry with potassium feldspar up to 3 in long.
89R..	.2	55	5	75	26	213	10	117	Black, carbonaceous, fine-grained sandstone and siltstone with leaf fossils.
90R..	.2	79	2	11	16	2	5	77	Monzonite.
91R..	.2	13	3	3	9	5	5	129	Syenite dike cutting greenstone.
92R..	.2	5	ND	3	2	2	3	6	Quartz monzonite with quartz veinlets.
93R..	.2	28	2	4	ND	0.5	5	59	Vesicular basalt.
94R..	.2	1	ND	13	24	9	3	16	Fine-grained quartz monzonite.
95R..	.2	44	1	10	20	2	4	8	Altered granitic rock with albite, hematite, and hematitic quartz stockworks.
96R..	.61	130	5	160	ND	4	NA	165	Ferricreted granitic rock rubble.
97R..	NA	100	NA	100	NA	NA	NA	NA	Altered and brecciated syenite with goethite.
98R..	.55	49	2	20	162	9	NA	15	Nepheline syenite.
99R..	.2	9	4	12	78	16	4	124	Shonkinite.
100R..	.2	13	2	33	22	6	4	28	Coarse-grained shonkinite.
101R..	.2	8	ND	18	72	9	3	25	Nepheline syenite.
102R..	NA	NA	NA	NA	21	8	NA	NA	Granitic rock with magnetite in thin quartz veinlets.
103R..	.82	100	2	65	28	22	NA	68	Silicified volcanic rock with limonite boxwork and a trace of sulfides.
104R..	.5	110	3	93	ND	7	NA	70	Silicified volcanic rock with limonite boxworks and trace sulfides.
105R..	NA	800	NA	NA	NA	NA	NA	NA	Iron-stained greenstone with calcite, epidote, and sulfides. High grade grab sample.
106R..	NA	1,000	NA	NA	NA	NA	NA	NA	Do.
107R..	NA	10	NA	NA	NA	NA	NA	NA	Do.
108R..	NA	60	NA	NA	NA	NA	NA	NA	Do.
109R..	NA	40	NA	NA	NA	NA	NA	NA	Metasedimentary rock with sulfide veinlets.
110R..	NA	500	NA	NA	NA	NA	NA	NA	Tactite (?) with sulfides and malachite.

NA Not analyzed.
ND Not detected.
[1]Semi-quantitative emission spectrographic results are in appendix A.

from Alaska, by Thomas and Sainsbury (8), in 1973, cited the threshold values to be 336 ppm for Nb, 500 ppm for Sn, 1,000 ppm for W, any detected value for uranium, and 400 ppm for Th. Of the concentrates collected in the Selawik Hills area, only one thorium value and two niobium values barely exceeded these threshold levels.

Gamma-ray radiometric background over alkaline rocks of the Selawik Hills area typically ranged between 250 and 500 cps when the counter was held at hip level. Background levels were determined by recording measurements over an area of flat, unaltered bedrock or rubble. Recorded measurements at specific locations are the average of three or four readings. Since gamma-ray readings will vary depending on weather, time of season, etc., the values cited in the text are given only as a qualitative ratio compared to nearby background levels. Thus a 4X background anomaly implies the readings over a specific location are four times the average reading over nearby areas. References to radiometric measurements are only intended to infer the relative levels of radiation intensity. All gamma-ray radiation measurements were recorded with hand-held, total-count scintillometers[5] with an upper detection limit of 20,000 cps.

[5]Mt. Sopris, Model Sc-132, Portable Scintillation Counter, Delta, CO.

MINERAL OCCURRENCES IN THE SELAWIK HILLS AREA

Radioactive Minerals

The Selawik Hills alkaline complex is part of the Mid-Cretaceous Hogatza plutonic belt (5). This belt traverses west-central Alaska and has long been considered one of the most favorable areas in Alaska for the occurrence of radioactive minerals. Throughout the Hogatza plutonic belt, the concentration of uranium and thorium is at least several times the average abundances in similar rocks elsewhere (4).

Five areas containing anomalous uranium and thorium values were deline-

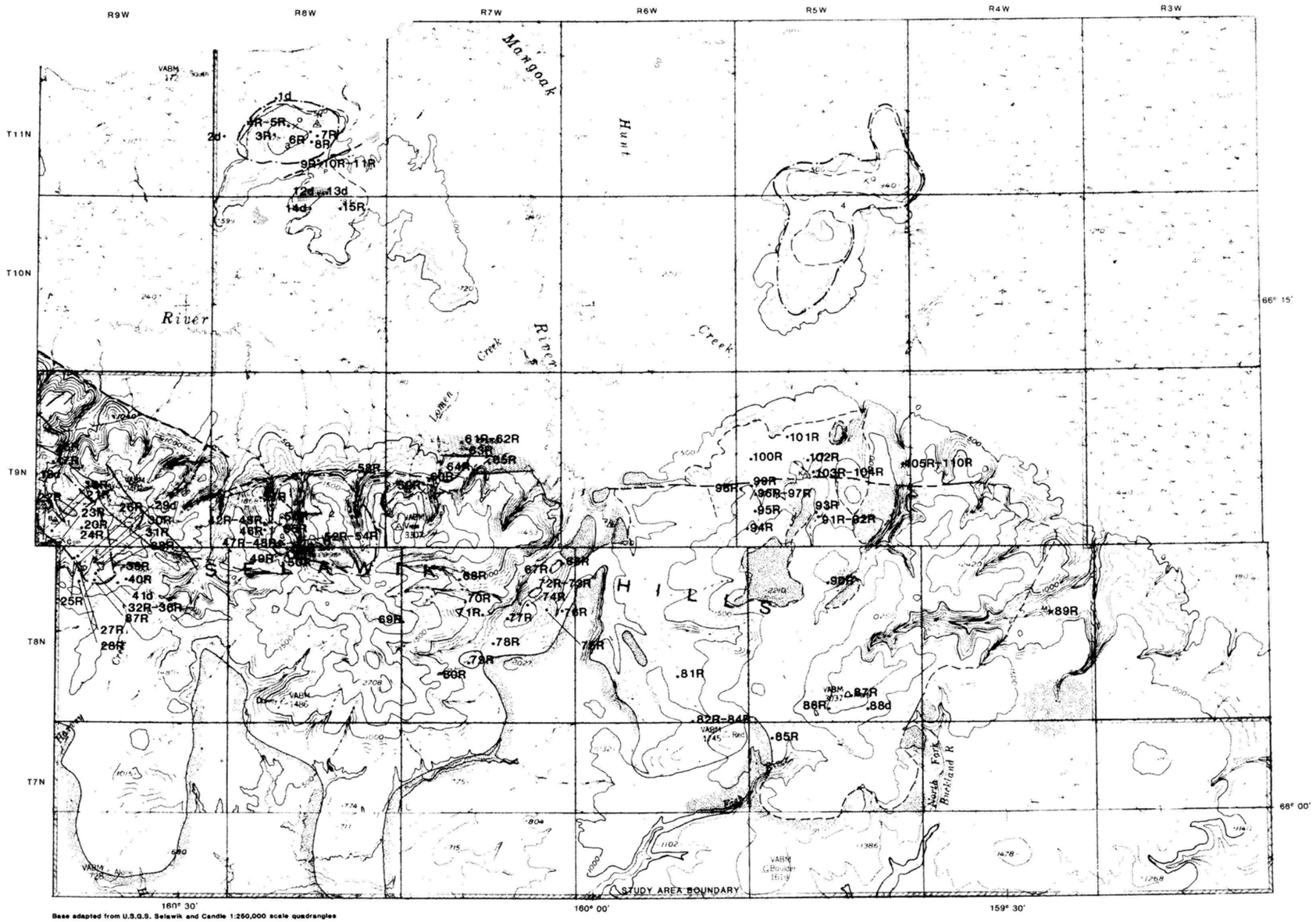
ated in the most recent published report on the Selawik Hills area (4). Four of these areas are located on figure 7 (shown as areas 1 through 4), the fifth, which is not shown, consists of scattered radioactive highs in the eastern portion of the Selawik Hills pluton. Within the five areas, three occurrences of low-grade uranium enrichment were cited (4). The first, shown as location B in area 1 on figure 7, consisted of a sample of mafic syenite which contained 70 ppm U and 1,300 ppm Th. A felsic dike from the second occurrence, location A, also in area 1, was reported to contain 139 ppm U (9). Lamprophyre dikes at the third occurrence, location N, area 3, in the northern Selawik Lake complex, contained up to 160 ppm U and 310 ppm Th. Additional occurrences of radioactive minerals were located and described during this study.

Selawik Hills Complex

Anomalous Area 1

Altered radioactive zones occur in syenite southwest of VABM Saturday (fig. 8). This is the general vicinity of anomalous area 1 (4) and includes mineral locations A through F (fig. 7). Shallow prospect pits and at least two diamond drill holes (locations C and E) are evidence of earlier exploration. The exploration apparently took place in the mid-1970's, and may have been more extensive than is evident. No information is available on this evaluation.

Medium-grained syenite with biotite and hornblende is the dominant rock type in the area. Locally, a preferred orientation of phenocrysts occurs, but generally no foliation was visible in the rocks. In thin section, the typical hornblende syenite exhibits microgranophyric texture. Areas of coarse-grained and porphyritic hornblende syenite occur with the medium-grained syenite (fig. 8). These later rocks are distin-



Base adapted from U.S.G.S. Selawik and Candle 1:250,000 scale quadrangles

LEGEND

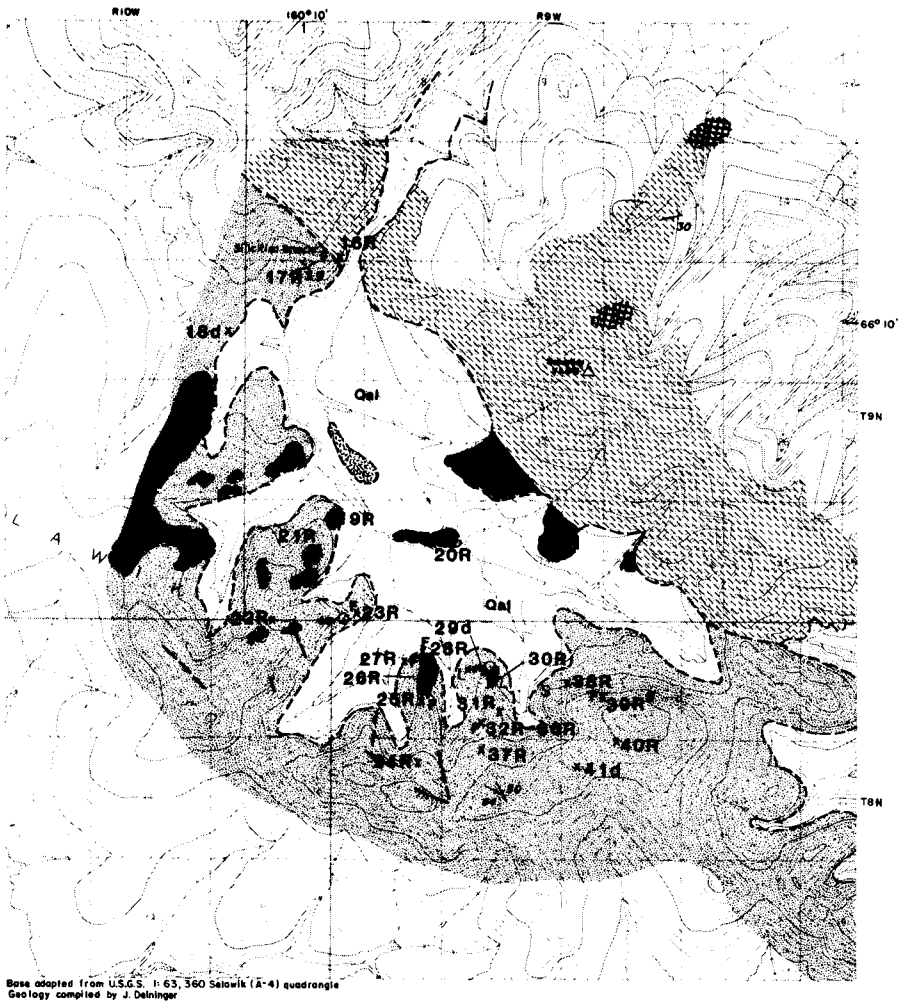
- Gravels– Glacial till or possibly weathering tertiary conglomerate. Unit consist of vein quartz, shist, phyllite, and graphitic schist
- Visicular olivine basalt
- Tertiary continental sedimentary rocks with coal seams
- Syenite, nepheline syenite, monzonite, and quartz monzonite
- Metasedimentary rocks including pelitic schist and marble
- Andesitic volcanics
- Fault, dashed where inferred
- Contact of lithologic unit, dashed where inferred. Contact of the Selawik Hills intrusive complex is adapted from Hawley, 1977,(4), and modified by field observations in 1980 by USBM
- ×Q Mineral occurrence discussed in this report
- △N Reported mineral prospect/occurrence (number applys to reference cited in report)
- 3 Radioactive mineral anomalous area (after C.C. Hawley, 1977)
- ·110R Sample location, R suffix indicates rock sample, d suffix indicates soil sample

N

0 2.5 5

Scale, miles
Contour interval 100 feet

Figure 7: Outcrop geology, mineral occurrences, and rock sample locations in the Selawik Hills Study Area, Alaska



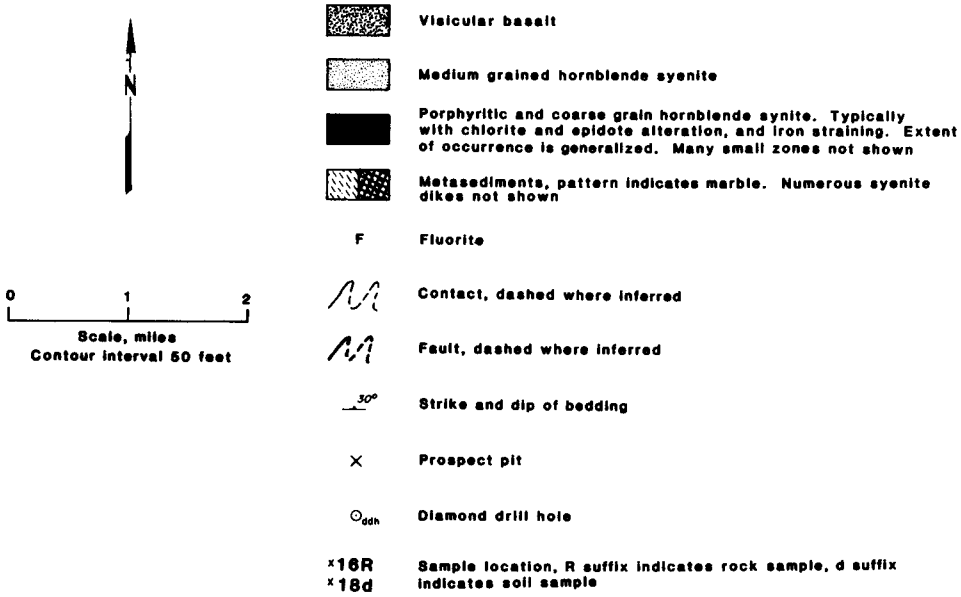


Figure 8. Geology and mineral occurrences of the VABM Saturday area.

guished by slight- to moderate-red iron-staining and about a 1.5X increase in radiometric background. Chlorite and epidote alteration products are common in the coarse-grained rocks.

Zones of more highly altered coarse-grained and porphyritic hornblende syenite with higher radiometric counts (2 to 6X background) were found in ridge top and hillside rubble. Lack of outcrop precluded determination of the size of these occurrences. Radiometric readings, however, indicate the zones to be tens of feet in width and traceable along strike for 100 to 250 ft across the ridge crests. Typically, these zones contain accessory to minor amounts of zircon, fluorite, xenotime, sphene, and an unidentified red, waxy mineral which is frequently altered to goethite and limonite. Other opaques present include thorianite (ThO_2) and an unidentified niobium-uranium-titanium mineral found during microprobe examination of sample 23R. Alteration minerals include quartz, clay after plagioclase, fluorite (secondary) on fracture planes, chlorite after mafics, goethite, epidote, and secondary biotite. Chlorite veinlets and narrow pegmatite dikes are common.

Stream sediment samples collected from creeks draining locations A through F (fig. 7) contained anomalous concentrations of uranium (>15 ppm). A sample containing 80 ppm U_3O_5, (sample 25S), came from a small gulch where no uranium minerals have been found.

At location E, (sample 36R), a coarse-grained, red waxy mineral occurs within a N 20° east-trending zone of mafic aegirine syenite rubble and comprises up to 10 pct of some boulders. Fluorite and zircon occur as accessory minerals. Alteration products include interstitial clay, biotite, and epidote. Chlorite, quartz, and epidote veinlets cut the zone. The U_3O_8 content in sample 36R was only 21 ppm, however, thorium

content was 535 ppm and niobium was 218 ppm. A nearby sample of similarly altered syenite with epidote and chlorite veinlets from the same structure contained 92 ppm U_3O_8 and 529 ppm Th.

A 4X background radiometric anomaly was recorded near sample site 32R. Similar, but less radioactive zones occur along the same north-trending ridge at sample sites 30R and 31R which contained 48 and 36 ppm U_3O_8, respectively. A diamond drill-hole location is just north of sample site 31R.

Approximately one mile east of location E is a rubble field (location F) of pegmatitic syenite. The syenite contains fluorite and accessory zircon, sphene, and a red waxy mineral. Feldspars are altered to clay and some fluorite occurs in cross-cutting veinlets. Sample 39R was marginally anomalous with 59 ppm U_3O_8.

At location D, a second north-trending ridge of hornblende syenite hosts zones of clay, chlorite, epidote, and carbonate alteration. Fluorite is commonly present as discrete grains and secondary fillings. At sample site 25R a rubble zone of this composition yielded radiometric levels of about 3X background. Five to ten percent of the rock consisted of the red waxy mineral. Sample 25R contained 770 ppm U_3O_8, however, no identifiable uranium minerals were discerned. Thorium content was 4,957 ppm.

Further to the west, at location C, sample 23R from another similar zone contained 734 ppm U_3O_8, 875 ppm Th, and 535 ppm Nb. Xenotime was also identified in thin section from this sample. Relatively uranium-free thorianite and a thorium-free niobium-uranium-titanium mineral were found by microprobe examination. Emission spectrographic analysis of a second split of sample 23R (table A-1) indicate 0.01 pct La, 0.1 pct Nb, 0.005 pct Y, and 1 pct Zr. A diamond drill hole that possibly

intersected the zone at depth was located to the southwest.

Anomalous Area 2

Several uranium occurrences (locations G through I) were found within anomalous area 2 (fig. 7). Unlike area 1 near VABM Saturday, however, these occurrences are hosted by hornblende syenite with a gneissic texture. Except for silica replacement and the near lack of fluorite, mineralogy and alteration features at locations G and H of area 2 are similar to the occurrences west of VABM Saturday. There is no indication that the gneissic foliation is related to uranium mineralization.

At location H, several caved-in and abandoned prospect pits and at least one diamond drill hole have explored a narrow (less than 2 ft), silicified breccia zone(s) in gneissic syenite. Radiometric readings over the pits were 2X background. The zone(s) contains quartz, hematite, pyrite, chlorite, minor sericite, limonite, boxworks, and accessory xenotime, zircon, and the unidentified red waxy mineral. Uranium content of chip sample 51R was less than anomalous at 25 ppm U_3O_8 and 81 ppm Th. A similar zone also occurs nearby at sample site 53R.

At location G, poorly exposed gneissic syenite with silica replacement and propylitic alteration emitted 2 to 3X background radiation. Values of U_3O_8 (150 ppm) and thorium (226 ppm) were detected in sample 54R.

At location I, quartz veins associated with lineaments tentatively identified as shear zones, cut foliated syenite and monzonite. The syenite and monzonite have been partially replaced by silica and chlorite. The margins of the shear zone are more intensely altered and are host to quartz veinlets up to 0.5 in thick. Accessory xenotime was observed in a thin section of this rock. Locally biotization is present and grab sample 59R of this alteration phase contained 220 ppm U_3O_8

and 36 ppm Th. Radiometric readings over the shear zones were 1.5 to 2X background.

Stream sediment sample 44S, collected mid-way between locations H and I, contained 120 ppm U_3O_8, and was the highest stream sediment value found in the Selawik Hills area. The drainage area upslope of this sample site contains no identified uranium occurrences.

Inland Lake and Selawik Lake Complexes

Anomalous areas 3 and 4 (4) comprise the Selawik Lake and Inland Lake syenite, and nepheline syenite complexes, situated north of the Selawik Hills. Miller (5) reported relatively high background concentrations of arsenic, lead, strontium, lanthanum, and light rare earth elements, as well as unusual amounts of fluorine (up to 0.57 pct) and zirconium (up to 0.20 pct ZrO_6) in these areas.

Anomalous Area 3

In the Selawik Lake complex, three types of radioactive occurrences were found: quartz veins associated with a fault zone; lamprophyre dikes; and radioactive (zones)? within nepheline syenite.

Radioactive, hematitic vein quartz was observed along a tundra-covered northeast-trending fault (?) escarpment at location P. Radiometric readings over the cobble-size vein quartz were 2 to 3X background, and boxworks were present. Sample 10R of chips taken at random from the leached rubble contained 120 ppm U_3O_8, and sample 9R collected nearby from silty soil along the escarpment, contained 115 ppm U_3O_8.

At location O, boulders of medium-grained syenite were noticeably radioactive (up to 4X backgound). Chip sample 4R from one boulder contained 123 ppm U_3O_8 and 380 ppm Th. Uranium may be associated with zircon since pronounced metamict halos surrounded zircon grains that oc-

cur in primary biotite. This feature was not seen in specimens from other locations in the Selawik Hills area. A fine-grained syenite, intermixed with rubble at this location contained 36 ppm U_3O_8 and 91 ppm Th (sample site 5R).

At location N, a 4-ft-wide, east-striking lamprophyre dike yielded radiometric readings 3 to 5X background. Chip sample 6R contained 183 ppm U_3O_8, 442 ppm Th, and 400 ppm Pb. Similar lamprophyre rubble at sample site 7R contained 218 ppm U_3O_8 and 313 ppm Th. Emission spectrographic analyses of both samples (table A-1) also show elevated levels for barium, lead, niobium, yttrium, and zirconium.

Anomalous Area 4

The Inland Lake complex was briefly investigated. No radioactive minerals or alteration zones were identified, however, locally abundant purple fluorite was observed as matrix and breccia filling in syenite rubble on a small hill one mile west of Hill 940, (location Q, fig. 7). The fluorite is similar to that associated with the radioactive zones near VABM Saturday.

Selawik Basin

Tertiary-age sedimentary basins, located near uraniferous source rocks and containing coal-bearing continental sediments, are normally considered favorable hosts for uranium deposits. The Selawik basin and the lowlands immediately north of the Selawik Hills were, at least in part, filled by alluvium shed during uplift of the uranium-enriched plutonic rocks of the Selawik Hills area. Therefore, the opportunity has existed for uranium ions to be leached from these source rocks and be reconcentrated during or after sedimentation. Although much of the Selawik Basin has been more recently filled with unconsolidated quaternary allu-

vium, remnant uplifted Tertiary sedimentary sections either outcrop or lie close to the surface along the northern front of the hills. Therefore, this area of Tertiary rocks which is not too deeply buried for economic consideration, is interpreted as particularly favorable for uranium deposits.

A Tertiary outcropping has been mapped by Patton and Miller at location J, east of the Mangoak River (1) and similar sediments are also exposed at location M. Lignitic coal and other carbonaceous material occur in the Tertiary rocks at both locations. Sample 89R, a carbonaceous sandstone with 213 ppm U_3O_8 and 26 ppm Th, indicates that at least low-grade uranium mineralization has taken place. Due to limited outcrop the extent of the occurrence could not be defined.

Lowlands surrounding the Selawik Hills are covered by water-saturated tundra and water bodies that in turn overlie permanently frozen sediment. Such conditions prevented further assessment of uranium potential during this investigation. Geophysical techniques and drilling would be necessary for further evaluation.

Other Mineral Commodities

The absence of detectable tin and tungsten values in the panned concentrates indicates deposits of these elements do not occur in the Selawik Hills area. Typically, regional anomalies of these metals will be persistently found in alluvial panned concentrate sampling surveys, even if only subeconomic deposits exist nearby.

The altered syenite zones near VABM Saturday contain niobium values as high as 0.1 pct (sample 23R, table A-1) and detection of lanthanum and yttrium suggest rare earth minerals also are present. Some rare earth elements presumably occur in the thorianite and xenotime also identified

in sample 23R. In addition to the analyses presented in table 4, a random selection of five samples (23R, 24R, 25R, 30R, 36R) from several altered syenite zones were analyzed quantitatively for niobium. Values of 535, 155, 32, 202, and 218 ppm respectively have a mean value of 228 ppm.

The panned concentrate samples that had low values of niobium were generally from areas located along the upper west fork of the Mangoak River and in the east-central area of the Selawik Hills. Time constraints prevented pan sampling in the VABM Saturday area where niobium was detected in rock samples listed above. Source(s) of niobium values in the pan concentrate samples is unknown.

Fluorite is associated with the uranium occurrences southwest of VABM Saturday and is present at the Inland Lake complex. Fluorite locally constitutes 5 to 10 pct of some alteration zones in syenite. Fluorite, in addition to niobium and rare earth minerals, may represent byproduct commodities should uranium extraction ever take place.

At location K (fig. 7), Elliot and Miller (10, p. 6) noted disseminated galena, sphalerite, and pyrite in quartz-calcite veins cutting syenite. Their grab samples reportedly contained up to 2 pct Pb and 1 pct Zn, and a stream sediment sample collected one mile downstream was anomalous in silver, copper, lead, and zinc. Extent of the mineralization was not determined.

Occurrence K was not relocated during the present investigation. Stream sediment samples 92S and 97S were collected from the drainages north and west of the reported location. Both samples contained anomalous concentrations of lead (both contained 115 ppm) and had the highest lead values detected in stream sediment samples in 1980. Quartz stockworks

in granitic and volcanic rocks were also noted in the vicinity.

Minor copper mineralization occurs at location L (fig. 7). Malachite and minor chalcopyrite associated with calcite, chlorite, and epidote veins are hosted by chlorite-altered basalt (greenstone) and fine-grained banded metasediments. Mineralization is confined to thin veinlets and pods. Some sulfide banding within the greenstone was also observed but consisted predominantly of pyrite. Copper values in high-graded grab samples did not exceed 1,000 ppm. Copper values in excess of 100 ppm were detected in a nearby stream sediment sample (100S) collected from a creek which drains the site.

Low-rank coal (lignite) rubble up to 10 in thick occurs at location M and is reported (1) to outcrop east of the Mangoak River at location J. Location M consists of poorly exposed alternating 4-in-thick beds of lignitic coal and black mudstone. The bedding strikes N 50° E and dips 40° SE. Coal rubble nearby indicates seams in excess of 10 in thick also occur. Owing to a general lack of Tertiary outcrop, no further assessment of coal is possible.

CONCLUSIONS

Uranium occurs in association with the Mid-Cretaceous alkaline complexes of the Selawik Hills and vicinity. Although only subeconomic mineralization was found, the area is favorable for the existence of uranium deposits. Known uranium occurrences are of at least four types:

(1) Altered zones in syenite (locations B, C, D, E, F, G, H and O). Samples contained up to 0.08 pct U_3O_8 and up to 0.5 pct of associated thorium. A microprobe examination of one specimen indicated that thorium occurs as uranium-free thorianite, whereas uranium was found to occur as a

niobium-uranium-titanium mineral. Further mineralogical studies are necessary to determine the extent (if any) of uranium contained in refractory minerals. This will indicate the economic potential of recoverable (leachable) U_3O_8. Niobium (up to 0.1 pct Nb), fluorite, and possibly rare earth minerals are associated with the uranium occurrences. Additional evaluation of these occurrences is recommended.

(2) Quartz vein systems associated with hydrothermally altered shear zones, faults, or other structural lineaments (locations I and P). Samples of leached vein quartz contained about 0.02 pct U_3O_8. Values of uranium predominate over thorium in these occurrences. Further evaluation is justified.

(3) Lamprophyre dikes (location N). These contain anomalous uranium (0.02 pct U_2O_8), but appear to have little economic potential.

(4) Tertiary coal-bearing sedimentary formations [locations J(?) and M]. A sample of carbonaceous sandstone from location M contained 0.02 pct U_3O_8 suggesting that at least some low-grade uranium mineralization has occurred.

Lignitic coal has been found at two locations. Seams at least 10 in or more thick are indicated. Based on the extent of low, covered terrain, coal deposits could be extensive.

Base metals occur in veins along the northwest edge of the Selawik Hills complex in both granitic and silicified volcanic rock. The tonnage

potential seems to be low. Unless deposits with high precious metal contents can be located, the economic value is likely to be insignificant.

Other mineral commodities were not found.

REFERENCES

1. Patton, W. W., Jr., and T. P. Miller. Regional Geologic Map of the Selawik and Southeastern Baird Mountains Quadrangles, Alaska. U.S. Geol. Surv. Misc. Geol. Investigation Map I-530, 1968.

2. Patton, W. W., Jr. Regional Geologic Map of the Candle Quadrangle, Alaska. U.S. Geol. Surv. Misc. Geol. Inv. Map I-492, 1967.

3. Miller, T. P. Potassium-Rich Alkaline Intrusive Rocks of Western Alaska. Geol. Soc, Am. Bull. v. 83, 1972, p. 2111-2128.

4. Hawley, C. C., and Assoc. Uranium Evaluation of the Seward-Selawik Area, Alaska. A NURE report prepared for Dept. Energy under contract GJBX-105(78), 1978, 155 pp.

5. Miller, T. P. Petrology of the Plutonic Rocks of West-Central Alaska. Ph.D. Thesis, Stanford Univ., Stanford, CA, 1970, 132 pp.

6. Texas Instruments, Inc. Airborne Geophysical Survey of Copper River and Seward-Selawik Area, Alaska. Prepared for U.S. Energy Res. Devel. Admin., Grand Junction, CO. Report GJO-1653, 1975.

7. Barnes, D. F. Bouguer Gravity Map of Alaska. U.S. Geol. Surv. OFR 76-70, 1976, 1:250,000 scale, 1 sheet.

8. Thomas, B. I. and C. L. Sainsbury. Location of Anomalous Concentrations of Metals in Alaskan Placer Concentrate Samples. BuMines OFR 56-76, 1975.

9. Eakins, G. R. Investigations of Alaska's Uranium Potential, Part I - Reconnaissance Program, West-Central Alaska and Copper River Basin. AK Dep. Nat. Resour., DGGS report for U.S. Energy Res. Devel. Admin. under contract AT(05-1)-1639, 1977.

10. Elliott, R. L., and T. P. Miller. Results of Stream Sediment Sampling in the West Candle and Southern Selawik Quadrangles. U. S. Geol. Surv. OFR 69-89, 1969, 61 pp.

BIBLIOGRAPHY

Arctic Environmental Information and Data Center, Univ. AK, 707 A Street, Anchorage, AK. Mineral Terranes of Alaska. 1982, 6 plates.

Eakins, G. R., and R. B. Forbes. Investigation of Alaska's Uranium Potential Part I. AK Dept. Nat. Resour., DGGS Special Report 12, prepared for U.S. Energy Res. Devel. Admin. under Contract No. AT(05-1)-1627, 1976, 331 pp.

Forbes, R. B. Investigation of Alaska's Uranium Potential Part II. AK Dept. Nat. Resourc., DGGS report prepared for U.S. Energy Res. Devel. Admin. under Contract No. GJO-1627, 1975, 44 pp.

Jones, B. K. Uranium and Thorium in Granitic and Alkaline Rocks in Western Alaska. M.S. Thesis, Univ. AK, Fairbanks, AK, 1976, 123 pp.

Jones, B. K., and R. B. Forbes. Investigations of Alaska's Uranium Potential, Part II. Uranium and Thorium in Granitic and Alkaline Rocks in Western Alaska. AK Dept. Nat. Resourc., DGGS report prepared for U.S. Energy Res. Devel. Admin. under Contract No At(05-1)-1969, 1977.

Mendenhall, W. C. A Reconnaissance in the Norton Bay Region, Alaska (in Reconnaissance in the Cape Nome and Norton Bay Regions, Alaska). U.S. Geol. Surv. Spec. Publ., 1901, 222 pp.

Miller, T. P. Characteristics of the Western Alaska Uranium Province. Geol. Assoc. of Canada, Ann. Mtg., Program with Abstracts, v. 2, 1977, p. 36.

Miller, T. P. Geologic Interpretation of a Radioactivity Anomaly near the West Fork of the Buckland River, Western Alaska. U.S. Geol. Surv. OFR 77-372, 1977, 10 pp.

Miller, T. P. Hardrock Uranium Potential of Alaska. U.S. Geol. Surv. OFR 76-246, 1976, 7 pp.

Miller, T. P., and L. A. Anderson. Airborne Radioactivity and Total Intensity Magnetic Survey of the Southern Kobuk-Selawik Lowland, Western Alaska. U.S. Geol. Surv. OFR 69-170, 1969, 6 pp.

Miller, T. P., and C. M. Bunker. A Reconnaissance Study of the U and Th Contents of Plutonic Rocks of the Southeastern Seward Peninsula, Alaska. U.S. Geol. Surv. OFR 75-217, 1975, 33 pp.

Miller, T. P., and C. M. Bunker. Uranium, Thorium and Potassium Analyses of Selected Plutonic Rocks from West-Central Alaska. U.S. Geol. Surv. OFR 75-216, 1975, 5 pp.

Patton, W. W., Jr. Mesozoic Tectonics and Correlations in Yukon-Koyukuk Province, West-Central Alaska (abs.): Am. Assoc. Petroleum Geol. Bull., v. 54, No. 12, 1970, p. 2500.

Patton, W. W., Jr. Reconnaissance geology of the northern Yukon-Koyukuk Province, Alaska. U.S. Geol. Surv. Prof. Paper 774-A, 1973.

Rich, R. A., H. D. Holland, and U. Petersen. Hydrothermal Uranium Deposits. Elsevier, 1977, 264 pp.

Sainsbury, G. L. Geology, Ore Deposits and Mineral Potential of the Seward Peninsula, Alaska. BuMines OFR 73-75, 1975, 122 pp.

Sharp, R. R., and D. E. Hill. Uranium Concentrations in Stream Waters and Sediments from Selected Sites in the Eastern Seward Peninsula, Koyukuk and Charley River Areas, and Across South Central Alaska. (U.S. DOE contract No. GJBX-79(78), Bendix Field Engineering Corp.).

Smith, P. S., and H. M. Eakin. A Geologic Reconnaissance in South-Eastern Seward Peninsula and the Norton Bay-Nulato Region, Alaska. U.S. Geol. Surv. Bull. 449, 1911, 146 pp.

U.S. Bureau of Mines. Mineral Appraisal of the Proposed Selawik National Wildlife Refuge, Alaska: A Preliminary Comment. BuMines OFR 22-79, 1979, 7 pp.

. Uranium Hydrogeochemical and Stream Sediment Reconnaissance Data from the Area of the Teller, Bendeleben, Candle, and Kateel River Quadrangles, Alaska (U.S. DOE contract No. GJBX-85(78) Bendix Field Engineering Corp.), May 1978.

Wedow, H., R. G. White, and R. M. Moxham. Interim report on an appraisal of the uranium possibilities of Alaska, U.S. Geol. Surv. OFR 52-165, 1951, 124 pp.

West, W. S. Reconnaissance for Radioactive Deposits in the Darby Mountains, Seward Peninsula, Alaska, 1948. U.S. Geol. Surv. Circ. 300, 1953, 7 pp.

West, W. S., and J. J. Matzko. Reconnaissance for radioactive deposits in the Buckland-Kiwalik district, Candle quadrangle, Seward Peninsula, AK. U.S. Geol. Surv. Trace Elements Inves. Rep. 49, 1953.

White, M. G., and others. Preliminary summary of reconnaissance for uranium in Alaska, 1951. U.S. Geol. Surv. Circ. 196, 1952, 17 pp.

APPENDIX A.--SEMI-QUANTITATIVE EMISSION SPECTROGRAPHIC ANALYSES

TABLE A-1. - Rock and soil samples

(All values in percent)

Sample	1R	3R	4R	6R	7R	9R	10R	11R	12R	13R
Al_2O_3	6	7	8	12	10	8	8	8	8	8
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	0.07	–	0.1	1	0.7	–	0.1	0.3	–	–
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.005	0.005	–	0.002	0.002	0.002	0.005	–	0.01	0.01
CaO	0.5	0.2	3	0.02	3	8	0.8	2	1	1.5
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.007	0.007	–	–	–	0.01	–	–	0.01	0.02
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	0.01	0.01	0.01	–	–	–	–
Cu	–	–	–	0.005	0.005	–	–	–	–	0.002
Ga	0.002	0.002	0.002	0.003	0.002	0.002	–	–	0.002	0.002
Fe	2	2	2	5	2	8	0.5	3	3	10
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	0.04	0.04	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.02	0.02	0.08	0.1	0.1	0.06	0.08	0.1	0.01	0.02
MgO	0.6	0.4	0.8	2	2	3	0.6	2	0.6	1
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.003	0.003	–	0.002	–	0.004	–	–	0.	0.01
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1.5	1	1.5	–	4	2	>4	>4	1	1
Sr	–	–	0.08	–	0.2	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.4	0.8	1	0.6	0.8	0.04	0.6	0.6	0.4
V	0.007	0.005	–	0.02	0.01	0.007	–	–	0.007	0.01
Y_2O_3	–	–	0.01	0.03	0.01	0.01	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.007	0.005	0.05	0.5	0.1	0.3	0.1	0.2	0.02	0.02
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	17R	18R	20R	23R	24R	25R	26R	27R	28R	29R
Al_2O_3	8	10	10	12	8	12	12	10	10	8
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	0.2	0.3	0.5	0.07	0.07	0.8	0.2	0.5	–
BeO	–	–	–	–	–	–	0.001	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.007	0.005	0.002	–	–	0.002	0.002	–	–	0.004
CaO	0.7	1	7	0.5	2	1	3	3	5	3
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.01	0.003	–	–	–	–	–	–	–	–
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	0.1	0.02	0.02	–	–	–	–
Cu	0.001	0.005	–	–	0.002	0.001	–	0.005	0.01	0.004
Ga	–	0.002	0.002	–	0.002	0.002	0.002	0.002	0.002	0.004
Fe	4	6	3	1	1	4	1.5	3	7	10
La_2O_3	–	–	–	0.01	0.01	–	–	–	–	–
Pb	–	–	0.02	0.04	0.01	0.06	0.04	0.01	–	0.06
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.01	0.04	0.2	0.1	0.03	0.03	0.1	0.08	0.08	0.08
MgO	0.6	2	3	0.2	0.3	0.4	0.3	2	2	2
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.004	0.003	0.003	0.002	–	–	–	0.002	0.002	0.002
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1	2	4	4	2	2	4	2	2	2
Sr	–	–	0.2	0.5	0.06	0.06	0.7	0.08	0.08	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.4	0.8	0.6	0.3	0.2	0.2	0.1	0.4	0.6	0.8
V	0.007	0.02	–	–	0.003	–	–	0.005	0.03	0.01
Y_2O_3	–	–	–	0.005	–	0.005	–	–	0.005	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.01	0.02	0.02	1	0.1	0.3	–	0.007	0.01	0.3
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

– Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	33R	39R	41R	42R	43R	44R	45R	46R	47R	48R
Al_2O_3	10%	10	12	4	6	8	3	6	8	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	0.4	1	-	-	-	-	0.1	-	0.2	0.1
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.004	0.005	0.004	-	-	-	-	-	-	-
CaO	2	3	0.8	10	8	>10	3	4	8	5
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.001	-	0.001	-	0.01	-	-	-	-	-
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	0.002	-	-	-	0.001	-	-	-	0.002	-
Ga	0.002	0.002	0.002	-	-	-	-	-	-	0.002
Fe	8	4	3	1.5	8	0.5	1.5	1.5	5	2
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	0.02	-	-	-	--	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.06	0.2	0.08	0.02	0.08	0.02	0.1	0.08	0.08	0.08
MgO	2	3	3	>4	>4	2	0.8	2	4	3
Mo	-	-	-	-	-	-	-	-	-	-
Ni	-	0.002	0.002	0.002	0.004	-	0.002	-	0.003	0.002
P	-	-	-	-	-	-	-	-	- -	-
Ag	-	-	-	-	-	-	-	-	-	--
SiO_2	>20	>20	>20	20	>20	15	>20	>20	>20	>20
NaO_2	1.5	4	2	0.4	1.5	1	4	2	4	>4
Sr	-	0.7	-	-	-	0.06	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.8	0.6	0.8	0.2	0.4	0.1	0.6	0.6	0.8	0.8
V	0.01	0.005	0.008	-	0.01	-	-	-	0.006	0.003
Y_2O_3	-	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.1	0.05	0.005	-	-	-	0.01	-	0.02	0.02
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	--	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	--	-	-

- Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	49R	50R	51R	53R	54R	60R	61R	62R	63R	64R
Al_2O_3	8	8	8	6	8	6	6	8	8	2
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	0.2	0.2	0.1	0.2	0.2	0.07	-	-	-	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.003	0.003	0.002	0.02	0.005	-	-	0.002	-	-
CaO	8	5	2	8	6	1	8	8	5	0.3
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.005	0.001	0.001	0.007	0.002	-	0.001	0.004	-	-
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	0.002	-	0.001	0.003	0.001	0.004	0.003	-	-	0.005
Ga	0.002	0.002	-	-	0.002	-	-	-	-	-
Fe	5	5	2	6	5	1	5	5	5	1
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	0.01	0.01	0.01	-	0.02	0.01	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.08	0.08	0.06	0.08	0.08	0.03	0.08	0.06	0.04	0.08
MgO	>4	4	2	3	4	0.08	0.08	4	3	0.02
Mo	-	-	-	-	-	-	-	0.004	-	-
Ni	0.003	0.002	0.002	0.003	0.003	-	0.002	-	0.002	0.002
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	2	2	1.5	2	2	-	-	2	-
Sr	0.06	0.06	-	-	0.06	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.6	0.8	0.3	0.6	0.8	0.04	0.6	0.6	0.6	0.001
V	0.006	0.008	0.005	0.01	0.006	-	0.01	0.02	0.005	-
Y_2O_3	-	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.03	0.02	0.02	0.02	0.07	-	-	-	-	-
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	65R	68R	70R	71R	72R	74R	77R	80R	82R	83R
Al_2O_3	6	8	8	8	10	8	8	8	8	4
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	0.2	0.2	0.07	0.4	0.3	0.07	-	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-
CaO	3	>10	3	3	10	2	2	1	-	0.03
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.001	0.001	0.001	0.001	0.008	0.002	-	-	-	-
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	0.002	0.002	-	-	-	-	-	-	-	-
Ga	-	-	-	-	0.002	-	0.001	-	0.002	-
Fe	1.5	8	2	2	2	1.5	0.5	0.5	0.5	0.5
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	0.01	0.01	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.06	0.06	0.06	0.06	0.04	0.08	0.03	0.04	0.04	0.04
MgO	2	4	3	3	3	2	2	0.02	0.08	0.06
Mo	-	-	-	-	-	-	-	-	-0	-
Ni	0.002	0.006	0.002	0.002	0.003	-	-	0.002	-	-
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1.5	4	2	2	2	2	1.5	1.5	-	-
Sr	-	-	0.06	-	-	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.5	0.8	0.6	0.4	0.5	0.2	0.3	0.05	0.1	0.06
V	0.005	0.008	0.007	0.005	0.01	-	-	-	-	-
Y_2O_3	-	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	-	-	0.02	0.005	-	-	-	0.01	-	-
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	84R	85R	86R	87R	88R	96R	97R	98R	102R	103R
Al_2O_3	6	10	12	8	8	3	3	6	8	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	0.5	0.1	-	0.1	-	-	0.1	0.07
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	-	0.002	-	0.002	0.005	-	-	-	-	-
CaO	0.02	8	2	2	1	5	6	0.3	0.5	0.1
Cd	-	-	-	-	-	-	-	-	-	-
Cr	-	0.02	-	-	0.002	0.01	0.01	-	-	0.001
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	0.01		-	-	-	-	-	-
Cu		0.007	0.001	0.001	0.001	0.02	0.01	0.003	-	0.01
Ga	-	-	0.002	-	-	-	-	0.002	-	0.002
Fe	1	10	3	2	2	8	6	1.5	1	1.5
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	0.02	-	-	0.03	0.01	-	-	0.02
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.08	0.06	0.08	0.04	0.04	0.08	0.06	0.03	0.04	0.08
MgO	0.08	>4	2	2	2	3	3	0.06	0.8	0.4
Mo	-	-	-	-	-	-	-	-	-	-
Ni	-	0.04	0.003	0.002	0.002	0.005	0.003	0.002	-	0.002
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	-	3	2	2	1.5	-	-	4	2	1.5
Sr	-	0.1	0.2	0.06	-	-	-	-	0.06	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.08	1	0.6	0.4	0.6	0.6	0.6	0.3	0.4	0.3
V	-	0.02	0.007	0.01	0.005	0.005	0.006	-	0.005	-
Y_2O_3	-	-	0.005	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr		0.005	0.3	0.02	0.005	0.004	-	0.04	0.03	0.005
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Rock and soil samples - Continued

(All values in percent)

Sample	104R	105R	106R	107R	108R	109R	110R
Al_2O_3	8	8	4	8	6	8	8
Sb	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-
Ba	0.1	-	-	-	-	-	-
BeO	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-
B	-	-	0.002	-	0.002	0.002	0.002
CaO	0.5	5	8	10	5	1.5	1
Cd	-	-	-	-	-	-	-
Cr	0.001	-	-	-	-	-	-
Co	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-
Cu	0.02	0.08	0.1	0.001	0.006	0.004	0.05
Ga	0.002	-	-	0.003	-	-	-
Fe	1.5	8	6	6	1.5	10	4
La_2O_3	-	-	-	-	-	-	-
Pb	0.03	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-
Mn	0.08	0.08	0.08	0.08	0.08	0.08	0.0 6
MgO	0.6	4	3	2	2	1	2
Mo	-	-	-	-	-	-	-
Ni	0.002	-	0.002	0.002	0.002	0.002	0.002
P	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20
NaO_2	1	2	-	-	-	-	-
Sr	-	-	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-
Ti	0.3	0.4	0.6	0.6	0.2	0.8	0.8
V	-	0.01	0.02	0.02	0.003	0.01	0.01
Y_2O_3	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-
Zr	0.005	-	-	-	-	-	-
Au	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-

- Denotes not detected.

TABLE A-2. - Stream sediment samples

(All values in percent)

Sample	1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S	12S
Al_2O_3	6	1	3	3	4	6	8	6	10	8	10	8
Sb	–	–	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–	–	–
Ba	–	–	–	–	–	–	–	–	0.1	0.1	0.8	0.2
BeO	–	–	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–	–	–
B	0.005	0.002	0.01	0.005	0.002	0.005	0.005	0.003	0.004	0.005	0.002	–
CaO	0.5	0.2	0.5	0.7	0.5	0.5	0.7	0.5	8	>10	>10	>10
Cd	–	–	–	–	–	–	–	–	–	–	–	–
Cr	0.005	–	0.01	0.005	0.005	0.005	0.005	0.002	0.002	–	0.001	0.002
Cb	–	–	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–	–	–
Cu	–	–	–	–	–	–	–	–	0.001	0.006	0.002	0.004
Ga	0.002	–	–	–	–	–	–	–	0.003	–	0.002	–
Fe	1.5	1	5	3	1	2	3	1	6	8	5	>10
La_2O_3	–	–	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–	–	–
Mn	0.02	0.003	0.02	0.01	0.02	0.02	0.03	0.02	0.06	0.2	0.06	0.08
MgO	0.6	0.2	0.6	0.6	0.4	0.6	1	0.6	4	4	3	>4
Mo	–	–	0.002	–	–	–	–	–	–	–	–	–
Ni	0.002	–	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.003	0.003	0.002
P	–	–	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–	–	–
SiO_7	>20	10	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	0.4	1	1	1	1	1	0.6	2	3	2	1.5
Sr	–	–	–	–	–	–	–	–	–	0.06	0.06	0.1
Ta_2O	–	–	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.06	0.2	0.3	0.3	0.4	0.4	0.3	0.8	1	0.8	>1
V	0.005	–	0.005	0.005	0.005	0.01	0.005	–	0.01	0.02	0.01	0.05
Y_2O_3	–	–	–	–	–	–	–	–	–	0.004	–	0.02
Zn	–	–	–	–	–	–	–	–	–	–	–	–
Zr	0.005	–	–	0.005	–	–	0.02	0.01	0.005	0.02	0.02	0.02
Au	–	–	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–	–	–
Ju	–	–	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	13S	14S	15S	16S	17S	18S	19S	20S	21S	22S
Al_2O_3	10	12	10	6	8	8	10	8	8	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	0.07	-	0.1	0.1	-	0.07	-	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	-	-	0.002	0.003	0.002	0.002	0.005	0.005	0.003	0.005
CaO	1.5	3	4	8	8	5	10	2	2	1.5
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.001	-	0.001	-	-	0.005	0.003	0.005	-	-
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	0.004	0.004	-	-	-	-	-
Ga	0.002	0.002	0.002	-	-	0.002	0.003	0.002	-	-
Fe	2	4	3	4	5	5	10	4	4	4
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	0.01	0.01	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.06	0.06	0.06	0.08	0.06	0.06	0.03	0.1	0.1	0.1
MgO	1	3	3	3	2	2	>4	2	2	2
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	4	2	4	1	1.5	2	2	3	3	3
Sr	-	-	-	-	-	0.06	-	-	-	-
Ta_2O	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.6	0.8	0.8	0.8	1	0.8	1	0.8	0.8	0.8
V	0.003	0.006	0.004	0.01	0.01	0.007	0.02	0.007	0.008	0.008
Y_2O_3	0.001	-	0.001	-	-	0.005	0.003	0.01	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.01	-	0.05	0.005	0.05	0.1	0.2	0.5	0.2	0.1
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	23S	24S	27S	28S	29S	30S	31S	32S	33S	34S
Al_2O_3	8	10	8	4	8	6	6	6	10	10
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	-	-	-	-	-	-	-	-
BeO	-	0.07	0.07	0.3	0.07	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-
CaO	0.004	0.002	-	0.005	0.002	0.002	-	-	0.002	0.004
Cd	2	4	1.5	3	10	0.8	0.6	0.6	1.5	0.4
Cr	-	-	-	-	-	-	-	-	-	-
Co	-	-	-	0.001	0.01	0.001	0.001	0.002	0.001	0.001
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	-	-	-	-	-	-	-
Ga	0.002	0.001	-	0.004	0.004	-	-	-	-	-
Fe	-	-	-	-	0.002	-	-	-	0.01	-
La_2O_3	1.5	2	2	2	10	1.5	1.5	1.5	3	4
Pb	-	-	-	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	-	-	-	-	-	-	-	-	-	-
MgO	0.08	0.06	0.06	0.04	0.08	0.03	0.03	0.03	0.04	0.04
Mo	2	1	1	1	3	0.6	0.6	0.4	2	1
Ni	-	-	-	-	-	-	-	-	-	-
P	-	0.002	0.002	0.002	0.006	0.002	0.002	-	-	0.002
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	-	-	-	-	-	-	-	-	-	-
NaO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
Sr	0.8	1.5	3	1.5	1.5	2	1.5	2	1	1.5
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	-	-	-	-	-	-	-	-	-	-
V	0.6	0.6	0.6	0.6	0.8	0.3	0.2	0.2	0.6	0.6
Y_2O_3	0.004	0.006	0.007	0.008	0.02	0.003	0.005	0.003	0.004	0.008
Zn	-	-	-	-	0.001	-	-	-	0.001	-
Zr	-	-	-	-	-	-	-	-	-	-
Au	-	0.02	0.01	0.005	0.01	0.005	-	-	0.2	0.02
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	35S	36S	37S	38S	39S	40S	41S	42S	43S	44S
Al_2O_3	8	10	8	8	8	10	10	10	10	8
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	–	0.07	0.2	–	0.1	–	0.1	0.2	0.1
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.002	–	0.005	0.005	–	–	0.002	0.002	0.004	0.003
CaO	1.5	2	>10	>10	1.5	3	2	2	8	>10
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.005	–	0.02	0.01	–	0.001	0.01	0.005	0.01	0.006
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	0.001	–	0.001	–	0.001	–	0.001	0.004	0.003
Ga	0.002	–	–	–	–	–	0.003	–	–	–
Fe	3	2	10	10	2	4	8	4	>10	8
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.04	0.06	0.1	0.08	0.1	0.08	0.08	0.06	0.08	0.1
MgO	1	1	>4	>4	3	4	3	2	>4	>4
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.003	0.002	0.06	0.003	–	0.002	0.004	0.003	0.006	0.008
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	1.5	2	1.5	1.5	4	3	2	3	3
Sr	–	–	–	0.06	–	0.06	–	–	0.08	0.08
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.6	0.8	>1	0.6	0.8	0.8	0.6	0.8	0.8
V	0.005	0.004	0.02	0.02	0.003	0.01	0.01	0.007	0.02	0.01
Y_2O_3	–	–	–	0.001	–	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.02	0.005	0.02	–	–	0.005	0.4	–	–	0.01
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

– Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	45S	46S	47S	48S	49S	50S	51S	52S	53S	54S
Al_2O_3	8	8	8	10	10	6	3	8	8	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	0.1	0.2	0.3	0.1	0.1	0.1	-	0.07	0.07	0.07
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.003	0.003	0.002	0.002	-	0.002	0.002	0.002	0.002	-
CaO	2	3	5	7	5	2	2	2	7	2
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.01	0.01	0.003	0.01	0.01	0.007	0.002	0.01	0.01	0.005
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	0.001	-	-	0.001	-	-	-	-	-	-
Ga	0.002	0.002	-	0.002	0.002	-	-	0.002	0.003	0.002
Fe	5	5	4	8	5	3	2	6	8	5
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.04	0.04	0.1	0.04	0.04	0.03	0.02	0.04	0.04	0.04
MgO	2	2	4	3	2	1	1	2	3	2
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.004	0.003	0.003	0.005	0.005	0.3	0.002	0.003	0.005	0.003
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	2	1.5	3	2	1	1.5	3	2	2
Sr	0.06	0.06	-	0.1	0.06	-	-	-	0.06	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.6	0.6	>1	0.8	0.8	0.6	0.3	0.6	1	0.6
V	0.02	0.01	0.001	0.02	0.01	0.005	0.005	0.01	0.02	0.01
Y_2O_3	-	-	-	0.01	0.01	-	-	-	0.01	0.005
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.01	0.01	0.01	0.05	0.1	0.02	-	0.005	0.2	0.1
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	55S	56S	57S	58S	59S	60S	61S	62S	63S	64S
Al_2O_3	8	8	8	10	8	8	4	8	8	10
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	0.1	0.1	0.07	–	–	–	–	0.07	–	–
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	–	0.003	–	0.002	0.003	0.003	0.003	–	0.002	0.002
CaO	5	8	3	10	4	2	1	2	1	1.5
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.005	0.01	0.005	0.01	0.003	0.003	0.01	–	0.01	0.007
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	–	–	–	–	–	–	–	–	–
Ga	0.002	–	–	–	–	0.004	–	–	–	–
Fe	4	4	5	>10	4	3	2	2	0.002	0.002
La_2O_3	–	–	–	–	–	–	–	–	2	2
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.06	0.08	0.04	0.08	0.1	0.08	0.01	0.1	0.06	0.04
MgO	3	4	2	>4	4	3	0.6	0.6	1	1
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.003	0.003	0.003	0.006	0.003	0.004	0.003	–	0.003	0.003
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	3	4	1.5	2	4	1	1.5	>4	2	4
Sr	–	–	–	–	–	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.8	0.6	>1	0.8	0.8	0.3	0.5	0.6	0.6
V	0.01	0.008	0.01	0.03	0.005	0.006	0.007	–	0.005	0.007
Y_2O_3	0.01	–	0.01	0.01	–	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.05	–	0.1	0.3	0.003	–	0.005	–	–	0.005
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	65S	66S	67S	68S	69S	70S	71S	72S	73S	74S
Al_2O_3	8	8	10	10	8	12	10	8	12	10
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	–	0.1	–	0.07	0.07	–	–	0.2	0.07
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.002	–	–	–	–	–	–	–	–	0.002
CaO	0.8	1	2	2	0.6	1.5	1	1	1.5	0.8
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.006	–	–	–	0.002	–	0.002	0.001	–	0.006
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	–	–	–	–	–	–	–	–	–
Ga	–	–	–	–	–	–	–	–	–	–
Fe	0.002	–	0.002	–	0.002	–	0.002	–	0.002	0.002
La_2O_3	1	1	1	0.8	1	1	2	1	1.5	1.5
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	–	–	–	–	–	–	–	–	–	–
MgO	0.03	0.02	0.06	0.03	0.02	0.06	0.06	0.03	0.04	0.02
Mo	0.4	0.3	0.2	0.4	0.2	0.6	1	0.2	0.4	0.8
Ni	–	–	–	–	–	–	–	–	–	–
P	0.004	–	–	–	0.002	–	0.002	0.002	0.002	0.003
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	–	–	–	–	–	–	–	–	–	–
NaO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
Sr	4	2	>4	3	1.5	4	4	4	>4	3
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	–	–	–	–	–	–	–	–	–	–
V	0.2	0.2	0.5	0.2	0.2	0.3	0.3	0.6	0.2	0.2
Y_2O_3	–	–	–	–	0.006	–	–	–	–	0.005
Zn	–	–	–	–	–	–	–	–	–	–
Zr	–	–	–	–	–	–	–	–	–	–
Au	0.007	–	–	–	0.03	–	–	–	–	–
Hf	–	–	–	–	–	–	–	0.03	0.005	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	75S	76S	77S	78S	79S	80S	81S	82S	83S	84S
Al_2O_3	12	8	10	10	6	8	8	8	10	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	0.1	0.07	0.1	0.1	-	0.07	0.07	-	0.07	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.002	0.002	-	0.003	0.002	0.002	0.005	0.005	0.002	0.005
CaO	2	1.5	1.5	4	2	3	3	1	1	0.5
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.006	0.001	0.003	0.002	-	-	0.008	0.01	0.007	0.01
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	0.004	0.002	-	0.004	-	-	-
Ga	0.002	-	0.002	0.002	-	-	0.002	-	0.002	0.003
Fe	2	1	2	8	2	3	5	3	3	3
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.03	0.03	0.04	0.08	0.1	0.08	0.08	0.04	0.03	0.03
MgO	2	0.6	1	3	3	3	3	0.8	1	0.4
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.003	-	0.002	0.002	0.003	0.003	0.006	0.01	0.003	0.003
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	2	3	2	3	2	2	2	3	2
Sr	-	-	-	-	-	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.3	0.2	0.5	1	0.8	0.8	0.6	0.4	0.4	0.2
V	0.008	-	0.005	0.01	0.006	0.008	0.01	0.007	0.005	0.007
Y_2O_3	-	-	-	-	-	-	0.001	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.005	-	0.005	0.01	-	-	0.3	-	0.005	0.005
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	85S	86S	87S	88S	89S	90S	91S	92S	93S	94S
Al_2O_3	8	6	8	8	6	8	6	8	6	10
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	0.07	-	0.07	0.07	-	0.07	0.07	-	0.07	0.07
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
CaO	2	1	0.7	1	0.5	1.5	1	1	0.5	1
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.01	0.005	0.007	0.007	0.005	0.007	0.007	0.01	0.002	0.007
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	0.01	-	-
Cu	0.01	0.001	-	-	-	-	-	-	-	-
Ga	0.002	0.002	-	0.002	0.003	-	0.002	0.002	-	0.002
Fe	5	3	3	3	2	4	4	3	2	4
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	0.01	-	-	0.06	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.04
MgO	2	1	0.6	1	0.4	2	0.6	1	0.4	1
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.004	0.003	0.004	0.003	0.002	0.004	0.003	0.003	0.003	0.003
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	2	1	3	1.5	2	1.5	3	1.5	2
Sr	-	-	-	-	-	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.8	0.6	0.4	0.4	0.1	0.6	0.3	0.8	0.2	0.6
V	0.01	0.007	0.007	0.005	0.005	0.007	0.007	0.01	q0.005	0.007
Y_2O_3	0.005	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.005	-	-	-	0.1	0.005	0.005	0.5	0.005	0.007
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	95S	96S	97S	99S	100S	101S	102S	103S	104S	105S
Al_2O_3	6	8	8	10	10	8	8	10	10	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	0.07	0.1	-	-	-	-	0.1	-	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.003	0.002	-	0.002	0.003	0.003	0.002	-	0.005	0.002
CaO	0.5	1	1.5	1.5	1	1	1	5	2	1.5
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.005	0.005	0.007	-	0.002	-	-	0.001	0.001	0.001
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	0.01	0.02	0.002	-	-	0.1	-
Ga	0.002	0.002	0.002	-	-	-	-	-	-	-
Fe	3	3	3	8	8	2	3	8	4	3
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	0.02	-	0.04	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.04	0.04	0.04	0.1	0.1	0.1	0.1	0.1	0.1	0.04
MgO	0.4	0.8	1	3	2	2	2	4	3	2
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.003	0.003	0.003	0.006	0.004	0.003	0.003	0.006	0.003	0.002
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1.5	2	4	2	1.5	1.5	1.5	3	3	2
Sr	-	-	-	-	-	-	-	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.2	0.6	0.6	0.8	0.4	0.3	0.4	0.8	0.8	0.8
V	0.007	0.005	0.007	0.008	0.02	0.005	0.005	0.008	0.008	0.004
Y_2O_3	-	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.005	0.007	0.1	-	0.005	0.01	0.05	0.03	0.005	0.2
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	106S	107S	108S	109S	110S	111S	112S	113S	114S	115S	116S
Al_2O_3	8	10	6	6	8	8	6	10	8	6	8
Sb	-	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-	-
Ba	-	-	-	-	0.07	-	-	0.07	0.07	-	-
BeO	-	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-	-
B	0.003	0.002	0.002	0.003	0.005	0.002	0.005	0.002	0.005	0.005	-
CaO	1.5	2	1	0.8	3	1.5	1	3	2	0.8	2
Cd	-	-	-	-	-	-	-	-	-	-	-
Cr	0.004	0.02	0.006	0.004	0.007	0.005	0.005	0.01	0.01	0.003	0.003
Co	-	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-	-
Cu	0.001	-	-	-	0.001	-	0.005	0.001	0.001	-	0.002
Ga	0.002	-	-	-	0.002	-	0.002	0.002	0.003	-	-
Fe	2	8	1.5	1	8	5	3	8	5	4	4
La_2O_3	-	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	0.01	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-	-
Mn	0.08	0.06	0.03	0.02	0.04	0.03	0.04	0.04	0.03	0.03	0.04
MgO	1	2	0.6	0.6	2	1	1	2	2	0.8	2
Mo	-	-	-	-	-	-	-	-	-	-	-
Ni	0.003	0.004	0.002	0.003	0.004	0.002	0.003	0.004	0.005	0.003	0.008
P	-	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	2	1.5	3	1.5	1.5	1.5	2	2	-	1.5
Sr	-	-	-	-	-	-	-	0.06	-	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-	-
Ti	0.5	0.8	0.5	0.3	0.8	0.6	0.2	0.8	0.6	0.6	0.8
V	0.008	0.01	0.006	-	0.02	0.01	0.007	0.02	0.02	0.004	0.008
Y_2O_3	-	-	-	-	0.01	-	-	-	0.005	-	-
Zn	-	-	-	-	-	-	-	-	-	-	-
Zr	0.005	0.3	0.08	0.02	0.3	0.1	0.005	0.05	0.3	-	0.02
Au	-	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-	-
Pr	-	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	117S	118S	119S	120S	121S	123S	124S	125S	126S	127S
Al_2O_3	6	8	8	10	8	12	6	6	15	8
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	0.07	-	0.07	0.07	-	-	0.1	-
BeO	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	0.004	0.005	0.004	0.005	-	-	0.002	0.004	-	0.002
CaO	0.8	1	1.5	1	1	2	1.5	1.5	2	4
Cd	-	-	-	-	-	-	-	-	-	-
Cr	0.001	0.005	0.006	0.002	0.002	-	0.01	0.004	0.002	0.01
Co	-	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	0.002	-	-	-	0.002	-	-
Ga	-	-	-	0.002	0.002	-	-	-	0.002	-
Fe	4	3	4	4	2	1	2	3	1.5	4
La_2O_3	-	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	0.04	0.08	0.03	0.06	0.04	0.1	0.1	0.08	0.08	0.1
MgO	0.8	2	2	2	0.4	1	2	2	1	3
Mo	-	-	-	-	-	-	-	-	-	-
Ni	0.002	0.003	0.004	0.003	0.002	0.002	0.004	0.002	0.003	0.006
P	-	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1	2	1.5	3	3	>4	1.5	0.4	>4	3
Sr	-	-	-	-	-	0.06	-	0.06	-	-
Ta_2O_3	-	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	0.3	0.6	0.5	0.6	0.4	0.6	0.8	0.8	0.6	0.8
V	0.004	0.005	0.006	0.007	-	-	0.005	0.005	-	0.008
Y_2O_3	-	-	-	-	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	0.2	-	-	0.02	0.2	-	-	-	0.005	-
Au	-	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	128S	129S	130S	131S	132S	133S	134S	135S	136S	137S
Al_2O_3	10	10	8	12	12	8	6	10	8	10
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	–	–	–	0.1	–	–	–	–	0.07
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.004	0.002	–	0.002	–	0.002	0.002	0.005	0.005	0.005
CaO	1.5	2	1	1	2	1.5	0.7	1	1.5	1
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.01	0.01	0.005	–	–	0.006	0.007	0.01	0.01	0.01
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	0.001	–	–	–	–	–	–	–	–	–
Ga	–	0.002	0.002	0.002	0.003	–	–	–	0.002	0.002
Fe	4	2	1	1.5	4	1.5	4	3	6	3
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.1	0.04	0.03	0.06	0.08	0.06	0.04	0.04	0.06	0.03
MgO	2	1	0.4	0.8	0.8	1	0.6	2	2	0.8
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.006	0.004	0.002	–	0.002	0.004	0.003	0.003	0.003	0.002
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	3	4	>4	>4	2	2	2	2	2
Sr	–	–	–	–	–	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.8	0.8	0.3	0.3	0.5	0.8	0.4	0.6	0.6	0.8
V	0.008	0.005	–	0.003	0.003	0.005	0.005	0.007	0.007	0.01
Y_2O_3	–	–	–	–	–	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.02	0.005	0.005	–	0.004	–	0.005	0.01	0.005	0.01
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	138S	139S	140S	141S	142S	143S	144S	145S	146S	147S
Al_2O_3	10	8	8	8	6	8	6	10	8	10
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	–	–	–	–	–	–	–	–	–
BeO	–	–	–	–	–	–	0.07	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.005	0.002	0.002	0.002	0.005	0.003	0.005	0.005	0.002	0.002
CaO	0.7	2	2	2	1.5	1.5	1.5	1.5	2	1.5
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.01	0.005	0.005	0.005	0.01	0.007	0.007	0.01	0.02	0.01
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	–	0.007	0.001	–	–	–	–	0.001	–
Ga	–	–	–	0.002	0.002	–	–	–	–	0.002
Fe	8	10	5	6	6	2	>10	4	>10	5
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.03	0.1	0.04	0.06	0.06	0.04	0.06	0.1	0.03	0.08
MgO	2	3	2	4	1	2	1	3	2	3
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.004	0.003	0.005	0.004	0.003	0.003	0.003	0.008	0.01	0.003
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	20	>20	>20	>20
NaO_2	1.5	2	1.5	3	2	1.5	2	1.5	1.5	4
Sr	–	–	–	–	–	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.6	0.4	0.6	0.4	0.6	0.4	1	0.8	0.8
V	0.01	0.01	0.007	0.01	0.005	0.005	0.005	0.008	0.01	0.007
Y_2O_3	–	–	–	–	–	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.005	–	0.01	0.005	–	–	0.005	0.005	–	0.005
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	148S	149S	150S	151S	152S	153S	154S	155S	156S	157S
Al_2O_3	10	10	8	6	8	6	8	8	8	6
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Be	–	–	–	–	–	–	–	–	0.07	–
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002
CaO	1.5	2	2	5	7	1.5	2	1.5	2	2
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.005	0.01	0.01	0.005	0.01	0.01	0.007	0.005	0.01	0.01
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	–	–	–	–	–	–	–	–	–
Ga	–	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Fe	4	4	3	8	10	5	7	3	7	6
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.06	0.04	0.03	0.1	0.1	0.06	0.04	0.04	0.04	0.04
MgO	2	3	3	3	4	3	3	2	3	2
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.002	0.004	0.003	0.003	0.004	0.003	0.004	0.003	0.005	0.004
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	2	1.5	1	2	2	1.5	2	2	2	2
Sr	–	–	–	–	–	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.6	0.4	0.6	1	0.6	0.8	0.6	0.6	0.8
V	0.005	0.01	0.01	0.007	0.02	0.007	0.01	0.007	0.01	0.01
Y_2O_3	–	–	–	0.01	0.01	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.005	0.1	–	0.02	1	0.02	0.005	–	–	0.4
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	158S	159S	160S	161S	162S	163S	164S	165S	166S	167S
Al_2O_3	4	6	4	8	6	8	6	8	8	8
Sb	–	–	–	–	–	–	–	–	–	–
As	–	–	–	–	–	–	–	–	–	–
Ba	–	–	–	0.1	0.07	–	0.07	–	–	–
BeO	–	–	–	–	–	–	–	–	–	–
Bi	–	–	–	–	–	–	–	–	–	–
B	0.003	0.003	0.002	0.005	0.003	0.003	0.002	0.005	0.003	0.003
CaO	2	5	0.3	7	8	2	2	1.5	1.5	1.5
Cd	–	–	–	–	–	–	–	–	–	–
Cr	0.007	–	0.002	0.002	0.001	0.005	0.01	0.006	0.002	0.005
Co	–	–	–	–	–	–	–	–	–	–
Cb_2O_3	–	–	–	–	–	–	–	–	–	–
Cu	–	–	–	–	–	–	–	0.001	–	–
Ga	–	–	–	0.002	–	0.002	0.002	–	0.002	0.002
Fe	7	3	1	6	8	5	6	4	5	4
La_2O_3	–	–	–	–	–	–	–	–	–	–
Pb	–	–	–	–	–	–	–	–	–	–
Li_2O	–	–	–	–	–	–	–	–	–	–
Mn	0.04	0.08	0.01	0.1	0.08	0.06	0.04	0.03	0.08	0.04
MgO	3	3	0.6	4	4	2	2	0.8	2	2
Mo	–	–	–	–	–	–	–	–	–	–
Ni	0.003	0.003	0.002	0.004	0.004	0.004	0.004	0.03	0.003	0.004
P	–	–	–	–	–	–	–	–	–	–
Ag	–	–	–	–	–	–	–	–	–	–
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	1.5	2	1	2	2	2	2	2	3	2
Sr	–	–	–	0.06	–	–	–	–	–	–
Ta_2O_3	–	–	–	–	–	–	–	–	–	–
Sn	–	–	–	–	–	–	–	–	–	–
Ti	0.6	0.6	0.2	0.8	0.8	0.6	0.6	0.6	0.6	0.6
V	0.01	0.007	0.005	0.01	0.01	0.007	0.01	0.008	0.007	0.01
Y_2O_3	–	–	–	–	0.002	–	–	–	–	–
Zn	–	–	–	–	–	–	–	–	–	–
Zr	0.05	–	0.005	0.02	0.005	0.01	0.01	0.02	0.02	0.2
Au	–	–	–	–	–	–	–	–	–	–
Hf	–	–	–	–	–	–	–	–	–	–
In	–	–	–	–	–	–	–	–	–	–
Pt	–	–	–	–	–	–	–	–	–	–
Re	–	–	–	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–	–	–	–
Tl	–	–	–	–	–	–	–	–	–	–
Sc	–	–	–	–	–	–	–	–	–	–

– Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	168S	169S	170S	171S	172S	173S	174S	175S	176S	178S
Al_2O_3	8	6	8	8	4	4	8	6	6	4
Sb	-	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-	-
Ba	-	-	-	-	-	-	-	-	-	-
BeO	-	-	-	-	-	-	0.07	0.1	0.1	-
Bi	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-
CaO	0.005	0.002	0.002	0.005	0.002	0.005	0.005	0.003	0.005	0.002
Cd	1.5	1.5	1.5	1	1.5	5	7	5	7	0.8
Cr	-	-	-	-	-	-	-	-	-	-
Co	0.002	0.005	0.007	-	0.001	-	-	0.001	0.002	0.001
Cb_2O_3	-	-	-	-	-	-	-	-	-	-
Cu	-	-	-	-	-	-	-	-	-	-
Ga	-	-	-	-	-	-	-	-	-	-
Fe	0.002	0.002	0.002	-	-	-	0.001	0.001	0.001	-
La_2O_3	4	5	5	2	3	4	0.002	-	-	-
Pb	-	-	-	-	-	-	8	4	6	8
Li_2O	-	-	-	-	-	-	-	-	-	-
Mn	-	-	-	-	-	-	-	-	-	-
MgO	0.06	0.04	0.04	0.03	0.04	0.08	0.08	0.06	0.08	0.08
Mo	2	2	1	2	1	2	4	4	4	0.4
Ni	-	-	-	-	-	-	-	-	-	-
P	0.003	0.003	0.003	0.002	-	0.002	0.003	0.003	0.003	0.002
Ag	-	-	-	-	-	-	-	-	-	-
SiO_2	-	-	-	-	-	-	-	-	-	-
NaO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20	>20
Sr	2	2	2	2	1.5	1	3	2	2	1
Ta_2O_3	-	-	-	-	-	-	0.06	-	0.06	-
Sn	-	-	-	-	-	-	-	-	-	-
Ti	-	-	-	-	-	-	-	-	-	-
V	0.8	0.6	0.4	0.6	0.6	0.6	0.8	0.8	0.8	0.2
Y_2O_3	0.007	0.007	0.001	0.007	0.008	0.005	0.02	0.01	0.01	-
Zn	-	-	-	-	-	-	-	-	-	-
Zr	-	-	-	-	-	-	-	-	-	-
Au	0.005	0.05	0.01	0.005	0.02	0.005	0.01	0.005	0.01	0.005
Hf	-	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-	-

- Denotes not detected.

Stream sediment samples - Continued

(All values in percent)

Sample	179S	180S	181S	182S	183S	184S	185S	186S	187S
Al_2O_3	8	8	8	8	8	6	6	6	8
Sb	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-
Ba	0.1	0.07	0.07	0.07	0.07	-	-	-	-
BeO	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-
B	-	0.002	0.004	0.005	0.003	0.003	0.005	0.005	0.005
CaO	1.5	0.7	0.8	1	0.5	0.4	0.4	1	0.7
Cd	-	-	-	-	-	-	-	-	-
Cr	-	-	0.002	0.005	0.005	0.003	0.004	0.005	0.007
Co	-	-	-	-	-	-	-	-	-
Cb_2O_3	-	-	-	-	-	-	-	-	-
Cu	-	-	-	-	-	-	0.002	-	-
Ga	0.002	-	-	0.002	0.002	-	-	-	0.002
Fe	5	2	2	2	2	1	1.5	7	4
La_2O_3	-	-	-	-	-	-	-	-	-
Pb	-	-	-	-	-	-	-	-	-
Li_2O	-	-	-	-	-	-	-	-	-
Mn	0.1	0.08	0.03	0.03	0.03	0.01	0.03	0.06	0.03
MgO	0.8	0.6	0.6	2	1	0.6	0.3	0.6	1
Mo	-	-	-	-	-	-	-	-	-
Ni	0.003	0.002	0.002	0.003	0.003	0.002	0.002	0.003	0.003
P	-	-	-	-	-	-	-	-	-
Ag	-	-	-	-	-	-	-	-	-
SiO_2	>20	>20	>20	>20	>20	>20	>20	>20	>20
NaO_2	3	3	4	2	3	1.5	1.5	1	2
Sr	-	-	-	-	-	-	-	-	-
Ta_2O_5	-	-	-	-	-	-	-	-	-
Sn	-	-	-	-	-	-	-	-	-
Ti	0.4	0.6	0.8	0.4	0.4	0.2	0.3	0.6	0.3
V	0.005	0.003	0.005	0.007	0.005	0.007	0.006	0.005	0.007
Y_2O_3	-	-	0.001	-	-	-	-	-	-
Zn	-	-	-	-	-	-	-	-	-
Zr	0.01	0.005	0.3	0.05	0.02	0.01	0.01	-	0.005
Au	-	-	-	-	-	-	-	-	-
Hf	-	-	-	-	-	-	-	-	-
In	-	-	-	-	-	-	-	-	-
Pt	-	-	-	-	-	-	-	-	-
Re	-	-	-	-	-	-	-	-	-
Te	-	-	-	-	-	-	-	-	-
Tl	-	-	-	-	-	-	-	-	-
Sc	-	-	-	-	-	-	-	-	-

- Denotes not detected.

APPENDIX B. - CROSS-REFERENCE OF SAMPLE AND FIELD NUMBERS

Sample[1]	Field Number	Sample[1]	Field Number	Sample[1]	Field Number	Sample[1]	Field Number
1P..	SS16382	51P..	SS16316	26R..	SS18438	76R..	SS10516
2P..	SS16380	52P..	SS16318	27R..	SS18437	77R..	SS10518
3P..	SS16389	53P..	SS16852	28R..	SS18436	78R..	SS10519
4P..	SS16387	54P..	SS16320	29R..	SS18426	79R..	SS10520
5P..	SS18314	55P..	SS16854	30R..	SS18425	80R..	SS10521
6P..	SS18428	56P..	SS16322	31R..	SS18424	81R..	SS10512
7P..	SS16421	57P..	SS16856	32R..	SS18423	82R..	SS16377
8P..	SS16448	58P..	SS16324	33R..	SS18422	83R..	SS16378A
9P..	SS16447	59P..	SS16326	34R..	SS18421	84R..	SS16378B
10P..	SS16446	60P..	SS16859	35R..	SS18420	85R..	SS18198
11P..	SS16445	61P..	SS16275	36R..	SS18419	86R..	SS18197
12P..	SS16435	62P..	SS10530	37R..	SS18418	87R..	SS16278
13P..	SS16429	63P..	SS17336	38R..	SS18059	88R..	SS18321
14P..	SS16431	64P..	SS16255	39R..	SS18290	89R..	SS16292
15P..	SS16430	65P..	SS16253	40R..	SS18202	90R..	SS10499
16P..	SS16436	66P..	SS10599	41R..	SS18416	91R..	SS16313
17P..	SS16406	67P..	SS10597	42R..	SS16416	92R..	SS16314
18P..	SS16268	68P..	SS18286	43R..	SS16417	93R..	SS16310
19P..	SS16266	69P..	SS16289	44R..	SS16418	94R..	SS17337
20P..	SS10535	70P..	SS16587	45R..	SS16419	95R..	SS17338
21P..	SS10533	71P..	SS16586	46R..	SS16415	96R..	SS10575
22P..	SS16404	72P..	SS16589	47R..	SS16413	97R..	SS10576
23P..	SS16371	73P..	SS16337	48R..	SS16414	98R..	SS10577
24P..	SS16402	74P..	SS16334	49R..	SS10538	99R..	SS10578
25P..	SS16302	75P..	SS16330	50R..	SS10537	100R..	SS10579
26P..	SS16356	1R..	SS16424	51R..	SS10540	101R..	SS10580
27P..	SS16306	2R..	SS16425	52R..	SS10541	102R..	SS16277
28P..	SS16358	3R..	SS10546	53R..	SS10542	103R..	SS10581
29P..	SS16427	4R..	SS10547	54R..	SS10543	104R..	SS10582
30P..	SS16441	5R..	SS10548	55R..	SS10544	105R..	SS16257
31P..	SS16270	6R..	SS10549	56R..	SS10545	106R..	SS16258
32P..	SS16272	7R..	SS10550	57R..	SS16420	107R..	SS16259
33P..	SS16444	8R..	SS16461	58R..	SS16449	108R..	SS16260
34P..	SS16362	9R..	SS16464	59R..	SS16451	109R..	SS16261
35P..	SS16364	10R..	SS16462	60R..	SS16450	110R..	SS16262
36P..	SS16368	11R..	SS16463	61R..	SS16458	1S..	SS16423
37P..	SS16410	12R..	SS16385	62R..	SS16457	2S..	SS16422
38P..	SS16408	13R..	SS16383	63R..	SS16433	3S..	SS16381
39P..	SS16412	14R..	SS16384	64R..	SS16432	4S..	SS16379
40P..	SS16375	15R..	SS16467	65R..	SS16434	5S..	SS16465
41P..	SS16373	16R..	SS18312	66R..	SS10534	6S..	SS16466
42P..	SS16282	17R..	SS18313	67R..	SS10536	7S..	SS16386
43P..	SS16285	18R..	SS18311	68R..	SS16308	8S..	SS16388
44P..	SS16287	19R..	SS18415	69R..	SS10584	9S..	SS18395
45P..	SS10588	20R..	SS18427	70R..	SS10583	10S..	SS18406
46P..	SS10590	21R..	SS18414	71R..	SS10531	11S..	SS18301
47P..	SS10595	22R..	SS18413	72R..	SS16359	12S..	SS18405
48P..	SS10593	23R..	SS18441	73R..	SS16360	13S..	SS18394
49P..	SS16328	24R..	SS18439	74R..	SS16438	14S..	SS18393
50P..	SS16312	25R..	SS18440	75R..	SS10517	15S..	SS18396

See footnote at end of table.

APPENDIX B. - CROSS-REFERENCE OF SAMPLE AND FIELD NUMBERS-CONTINUED

Sample[1]	Field Number
16S..	SS18407
17S..	SS18302
18S..	SS18303
19S..	SS18397
20S..	SS18304
21S..	SS18409
22S..	SS18410
23S..	SS18399
24S..	SS18305
25S..	SS18212
26S..	SS18235
27S..	SS18236
28S..	SS18369
29S..	SS18367
30S..	SS18370
31S..	SS18401
32S..	SS18402
33S..	SS18391
34S..	SS18414
35S..	SS18300
36S..	SS18299
37S..	SS18389
38S..	SS18366
39S..	SS18404
40S..	SS18387
41S..	SS18291
42S..	SS18294
43S..	SS18365
44S..	SS18388
45S..	SS16303
46S..	SS16304
47S..	SS10585
48S..	SS16355
49S..	SS16305
50S..	SS16307
51S..	SS16357
52S..	SS16271
53S..	SS16426
54S..	SS16401
55S..	SS16403
56S..	SS18364
57S..	SS16405
58S..	SS18363
59S..	SS18386
60S..	SS10532
61S..	SS16370
62S..	SS18374
63S..	SS18230
64S..	SS18280
65S..	SS18373

Sample[1]	Field Number
66S..	SS18349
67S..	SS18372
68S..	SS18350
69S..	SS18348
70S..	SS18347
71S..	SS18346
72S..	SS16281
73S..	SS16283
74S..	SS16288
75S..	SS16286
76S..	SS10500
77S..	SS10589
78S..	SS10587
79S..	SS10591
80S..	SS10592
81S..	SS10594
82S..	SS16327
83S..	SS16311
84S..	SS16849
85S..	SS16315
86S..	SS16317
87S..	SS16851
88S..	SS16319
89S..	SS16853
90S..	SS16321
91S..	SS16855
92S..	SS16276
93S..	SS16857
94S..	SS16323
95S..	SS16858
96S..	SS16325
97S..	SS16274
98S..	SS17335
99S..	SS10529
100S..	SS16256
101S..	SS16254
102S..	SS16252
103S..	SS10596
104S..	SS10598
105S..	SS18283
106S..	SS18359
107S..	SS18358
108S..	SS18357
109S..	SS18356
110S..	SS16584
111S..	SS16585
112S..	SS16588
113S..	SS16296
114S..	SS16590
115S..	SS18287

Sample[1]	Field Number
116S..	SS18362
117S..	SS18288
118S..	SS18324
119S..	SS18322
120S..	SS18320
121S..	SS18199
122S..	SS18282
123S..	SS18354
124S..	SS18355
125S..	SS18379
126S..	SS18378
127S..	SS18353
128S..	SS18352
129S..	SS18281
130S..	SS16372
131S..	SS18371
132S..	SS18376
133S..	SS18377
134S..	SS16374
135S..	SS18227
136S..	SS18226
137S..	SS18232
138S..	SS18233
139S..	SS18344
140S..	SS16407
141S..	SS18345
142S..	SS16411
143S..	SS18225
144S..	SS18234
145S..	SS18375
146S..	SS18351
147S..	SS18229
148S..	SS18228
149S..	SS18224
150S..	SS18223
151S..	SS18343
152S..	SS18342
153S..	SS18231
154S..	SS18222
155S..	SS18221
156S..	SS18211
157S..	SS18209
158S..	SS18217
159S..	SS18336
160S..	SS18208
161S..	SS18338
162S..	SS18337
163S..	SS18341
164S..	SS18210
165S..	SS18220

Sample[1]	Field Number
166S..	SS18340
167S..	SS18219
168S..	SS18339
169S..	SS18218
170S..	SS18206
171S..	SS18329
172S..	SS18330
173S..	SS18332
174S..	SS18331
175S..	SS18335
176S..	SS18334
177S..	SS18215
178S..	SS18214
179S..	SS18204
180S..	SS18325
181S..	SS18326
182S..	SS18200
183S..	SS18201
184S..	SS18213
185S..	SS18328
186S..	SS18327
187S..	SS18205

[1]Suffix key: P-panned concentrate sample; R-rock samples; S-stream sediment samples.