UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

A GEOCHEMICAL INVESTIGATION OF A KNOWN MOLYBDENUM-TIN ANOMALY IN SOUTHWESTERN UTAH

By

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CONTENTS

	Page
Abstract	1
Acknowledgments	1
Introduction	2
Geologic setting	5
Sample collection	10
Analytical methods	11
Generation of contour maps	11
Results	11
Objective rock sample data	12
Subjective rock sample data	27
Discussion	35
Conclusions	50
References cited	51
Appendix 1	57

FIGURES

Figure 1.--Index map of the survey area, southern Wah Wah Mountains, Utah	3
Figure 2.--Generalized geologic map of the study area	6
Figure 3.--Graphical representation of the sampling design	12
Figure 4.--Sample site locations of both object and subjective samples	13
Figure 5.--Objective rock data contour map for Sn	19

FIGURES--Continued

Page

Figure 6.--Objective rock data contour map for Bi------------------------ 20

Figure 7.--Objective rock data contour map for Mo ----------------------- 21

Figure 8.--Objective rock data contour map for Be ----------------------- 22

Figure 9.--Objective rock data contour map for Y ------------------------ 23

Figure 10.--Objective rock data contour map for Nb ---------------------- 24

Figure 11.--Objective rock data contour map for Li ---------------------- 25

Figure 12.--Objective rock data contour map for F ----------------------- 26

Figure 13.--Objective rock data contour map for Ce ---------------------- 28

Figure 14.--Objective rock data contour map for La ---------------------- 29

Figure 15.--Objective rock data contour map for Fe ---------------------- 30

Figure 16.--Objective rock data contour map for Al ---------------------- 31

Figure 17.--Objective rock data contour map for Si ---------------------- 32

Figure 18.--Subjective rock data point plots for Mo, Bi, and Sn ---------- 34

Figure 19.--Subjective rock data point plot for Be ---------------------- 36

Figure 20.--Subjective rock data point plot for Y ----------------------- 37

Figure 21.--Subjective rock data point plot for Nb ---------------------- 38

Figure 22.--Subjective rock data point plot for Li ---------------------- 39

Figure 23.--Subjective rock data point plot for F ----------------------- 40

Figure 24.--Subjective rock data point plot for Ce ---------------------- 41

Figure 25.--Subjective rock data point plot for La ---------------------- 42

Figure 26.--Subjective rock data point plot for Fe ---------------------- 43

Figure 27.--Subjective rock data point plot for Al ---------------------- 44

Figure 28.--Subjective rock data point plot for Si ---------------------- 45

Figure 29.--Subjective rock data point plot for Ba ---------------------- 46

Figure 30.--Subjective rock data point plot for Sr ---------------------- 47

TABLES

Page

Table 1.--Summary of analytical results for the objective samples ------- 15

Table 2.--Summary of analytical results for the subjective samples ------ 16

Table 3.--Matrix of correlation of the 210 objective samples ------------ 17

Table 4.--Matrix of correlation of the 80 subjective samples ------------ 33

ABSTRACT

A detailed geochemical survey utilizing bedrock samples was conducted over an area containing a known molybdenum-tin drainage sediment anomaly in the southern Wah Wah Mountains in southwestern Utah. The geochemical patterns found in this survey are similar to those around known porphyry-type molybdenum deposits. The elements associated with the anomaly are Mo, Sn, Bi, Be, F, Li, Nb, and Y; and the depleted elements are Al, Ce, Fe, La, and Si. The geochemical distribution of these elements associated with an area of leucocratic rhyolite suggests this anomaly is probably located above a felsic body at depth with possible porphyry-type molybdenum mineralization.

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INTRODUCTION

During the summer of 1978, a regional geochemical survey utilizing stream-sediment samples was conducted in the Richfield 1° x 2° quadrangle in southwestern Utah, as part of the U.S. Geological Survey's Conterminous U.S. Mineral Appraisal Program (CUSMAP) (Figure 1). Several areas of anomalously high metal content were identified by this regional survey (Motooka and others, 1979; Miller and others, 1980). One area in the southern Wah Wah Mountains in the southwest corner of the Richfield 1° x 2° quadrangle was anomalously high in molybdenum, tin, and other trace elements characteristic of fluids from a crystallizing felsic body. Although no altered rocks or mineral deposits have been recognized, a porphyry-type molybdenum deposit may exist in association with a hidden intrusive body at depth (Lindsey and Osmorson, 1978; Miller and others, 1980).

To assess the potential for mineralized rock more completely, a detailed geochemical survey consisting of rock and drainage sediments was conducted over the regional Mo-Sn anomaly in the Southern Wah Wah Mountains during the summer of 1979. The area covered approximately 66 square miles (160 square kilometers). The survey area is located in the Bible Spring, Mountain Spring Peak, Observation Knoll, and the Tetons 7 1/2-minute quadrangles. The survey area was extended beyond the regional Mo-Sn anomaly so as to reflect background values in the area.

A rock geochemical survey was utilized because the geochemical properties of rocks can be examined directly. Slight elemental changes associated with mineralization and halo formation can be detected. These often subtle changes in elemental concentrations can often be overlooked in petrological studies (Bailey and McCormick, 1974).

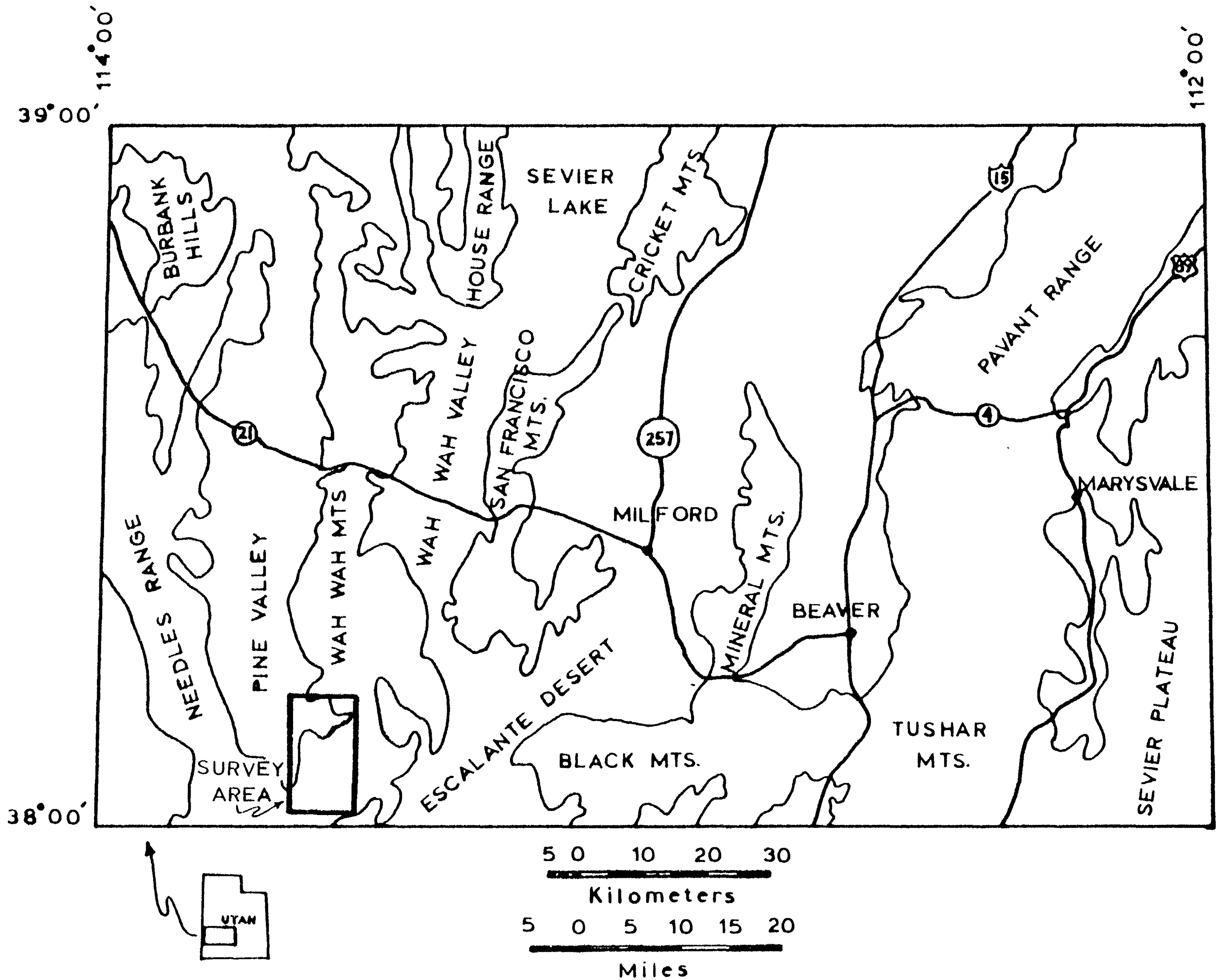

Figure 1.--Index map of the survey area, southern Wah Wah Mountains, from the Richfield 1° by 2° quadrangle, Utah.

There are two geochemical suites defined by the data: those elements that are associated with the regional anomaly and those elements whose concentrations are depleted in the area of the regional anomaly. The elements associated with the regional anomaly are Mn, Cr, F, Y, Na, Be, Nb, Rb, Le, Mo, Bi, and Pb. Those depleted elements are Si, K, Ca, La, Ce, Zn, Fe, Al, W, Mg, Sr, V, Ba, and Ti. This report will discuss the elements Mo, Sn, Bi, Be, F, Nb, Y, and Li with respect to enrichments and the elements Al, Si, Fe, Ce, and La with respect to depletions in conjunction with the regional anomaly.

GEOLOGIC SETTING

The study area is within the Pioche-Marysvale mineral belt in the Basin and Range province, southwestern Utah. The area is on trend with the east-west Blue Ribbon lineament, which is considered to be a deep crustal feature (Rowley and others, 1978). The area also contains regional elemental trends of Sn (Sainsbury and others, 1969), W (Kerr, 1946), Be (Shawe, 1966), and F (Shawe, 1976). In addition, the anomaly is underlain by a broadscale magnetic low (Mabey and Virgin, 1980).

Mining in the Pioche-Marysvale mineral belt has been mainly for Au, Ag, Cu, F, Mn, Pb, U, W, Zn, and alunite. These deposits are associated mainly with upper Tertiary alkali rhyolite centers, which in the southern Wah Wah Mountain area, are commonly localized in areas of intensive hydrothermal alteration (Rowley and others, 1978).

Figure 2 is a generalized geologic map of the study area. The major rock types in the area are upper Tertiary alkalic rhyolite flows, flow domes, and ash-flow tuffs, which overlie Paleozoic sedimentary rocks that are predominately limestone (Best, 1979; Best and Jeffrey, 1979; Rowley and others, 1978).

Several areas of altered rocks have been mapped in the study area (Best and Jeffrey, 1979; Best, 1979), and although extensively prospected, no major mining activity has occurred within the study area. A porphyry-type molybdenum deposit has recently been discovered at Pine Grove approximately 18 miles (29 kilometers) north of the survey area.

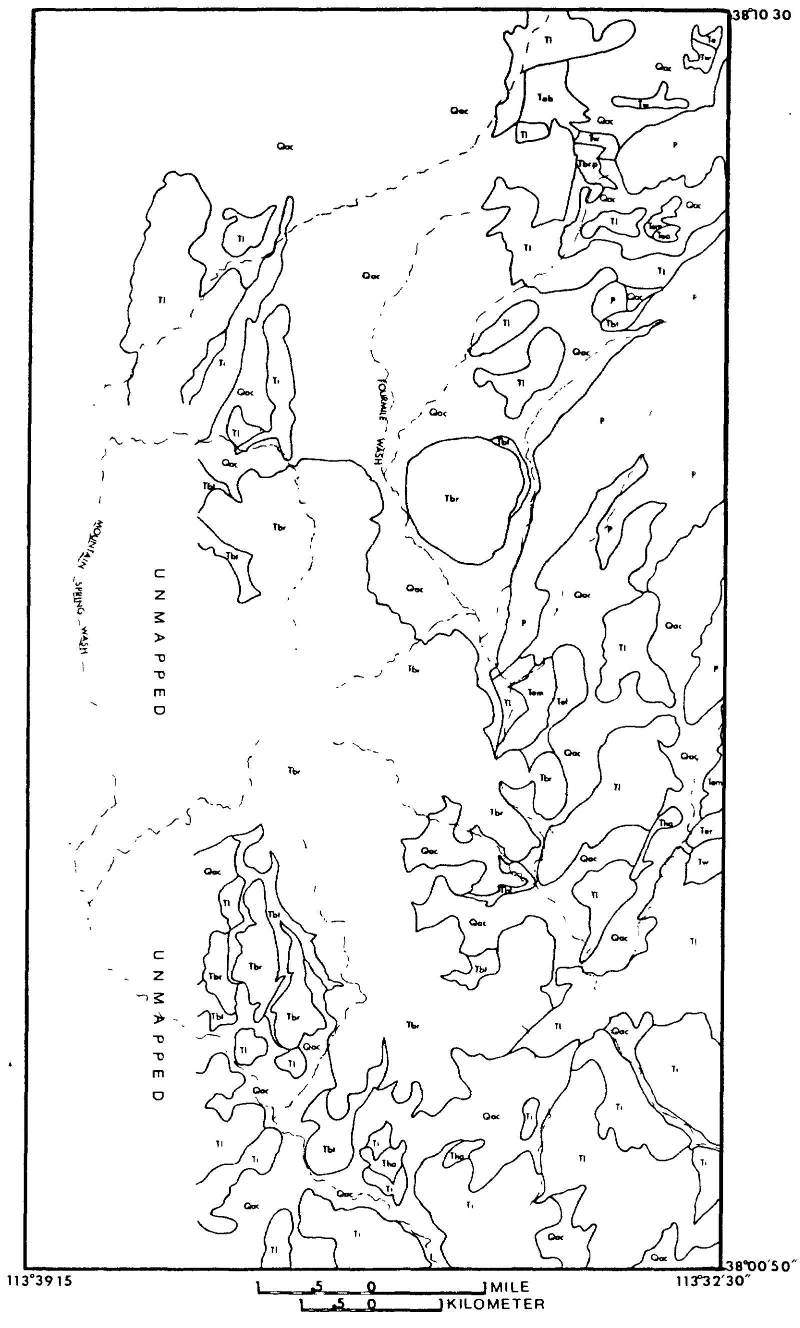

Figure 2.--Generalized geologic map of the study area. After Best, 1979, and Best and Jeffrey, 1979.

DESCRIPTION OF MAP UNITS ON FIGURE 2

Qac ALLUVIUM AND COLLUVIUM (QUATERNARY)--Unconsolidated, poorly sorted stream, fan and slope-wash deposits of gravel, sand, and silt.

FORMATION OF BLAWN WASH(MIOCENE)

Tbr Rhyolite member of Broken Ridge--A sequence of gray, red brown, and lavender felsitic lava flows with locally autobrecciated margins and vitrophyric bases; strongly flow layered and commonly show spherulitic, vuggy, and lithophysal fabrics. One exceptionally porphyritic rhyolite with abundant phenocrysts of smokey quartz, sanidine, playioclase, and minor biotite occurs at the base of the sequence at the north end of Broken Ridge; other rhyolite flows are weakly porphyritic and even aphyric in places, and the sparse phenocrysts, generally less than 1-2 mm across, consist of smokey quartz, alkali feldspar, and playioclase. Topaz and rare fluorite have been noted in vugs. Individual flows may be only a few tens of meters thick, whereas the entire sequence may be as much as 200-300 meters thick. An age of 20. m.y. is reported on a similar topaz rhyolite flow in the Teton quadrangle to the north of Broken Ridge.

Tbrp Rhyolite member of Pink Knolls--Flows and shallow intrusive plugs and dikes of gray to brown strongly porphyritic rhyolite; locally vitrophyric. Phenocrysts of quartz, sanidine, plagioclase, and lesser biotite comprise as much as one-third of the rock. Phenocrysts range widely in size, and within individual outcrops, sanidine and quartz range from small crystals to prominent phenocrysts as much as 3 cm and 1 cm across, respectively.

Tbt Tuff member--A sequence of light-colored, generally loosely consolidated, vitric-lithic ash-flow and minor air-fall tuffs with intervening beds of stratified water-lain tuffs, volcanic sandstones, and conglomerates. The topaz rhyolite at the Tetons is underlain by a strongly welded ash-flow tuff with collapsed pumice lenses of black or brown glass. Tuffs in the unit contain less than 10 percent phenocrysts of quartz, plagioclase, sanidine, and biotite and have abundant pumice lapilli. Fragments of the Lund Tuff Member, as much as 25 cm across, are typically present and are especially common in the epiclastic beds. Scattered fragments of Lund are commonly the only indication of the unit beneath poorly exposed slopes. The unit appears to be comprised of locally-derived material, in part representing the precursory explosive facies of younger rhyolite flows and intrusions.

Tha HORNBLENDE ANDESITE (MIOCENE)--Platy, gray rock with abundant acicular black hornblende and lesser green augite phenocrysts in a very fine grained trachytic matrix rich in plagioclase; locally phenocryst-poor or even aphyric.

Ti ISOM FORMATION (MIOCENE OR OLIGOCENE)--Densely welded, vuggy, eutaxitic red-brown to lavender ash-flow tuff with less than 20 percent phenocrysts of plagioclase and minor amounts of minute black pyroxene; weathers into grus. At least two cooling units occur.

NEEDLES RANGE FORMATION (OLIGOCENE)--Purple-gray to red-brown, firmly welded, crystal-rich ash-flow tuffs in which phenocrysts of plagioclase, biotite, hornblende, and quartz constitute nearly half of the rock; compressed pumice lapilli are locally conspicuous. Age--29 m.y. (Fleck and others, 1975). Individually mapped.

Tl Lund Tuff Member--Crystal-rich ash-flow tuff characterized by about 10 percent quartz, 10 percent biotite, and lesser amounts of hornblende phenocrysts, together with about 25 percent plagioclase. Black vitrophyre, a few meters thick, lies at the base in the eastern part of the quadrangle where the unit is 400 m or more thick.

Tw Wah Wah Springs Tuff Member--Crystal-rich ash-flow tuff characterized by abundant plagioclase, hornblende, and biotite phenocrysts and less than 2 percent quartz phenocrysts. A black vitrophyre occurs at the base of the unit where the total thickness exceeds 230 m.

Te ESCALANTE DESERT FORMATION, UNDIVIDED (OLIGOCENE)--A sequence of crystal-poor, lithic, rhyolitic to quartz-latitic ash-flow tuffs, andesitic and rhyolitic lava flows, and volcanic sandstone described by Grant (1978) and Campbell (1978). "The type section for the formation is the northeast flank of hill 6535 (Lund Quadrangle), sec. 6, T. 32 S., R. 14 W. It includes all lithologies from the first ash-flow above the volcanic conglomerate to the base of the Wah Wah Springs Member of the Needles Range Formation" (Grant, 1978, p. 27). The name is taken from the large flat desert valley which extends into the southeast half of the Lund Quadrangle at the southern end of the Wah Wah Mountains.

Teb Beers Spring Member--Green-brown, well-sorted volcanic sandstone. Exposed thickness ranges from 0 to as much as 400 m south of Jockey Road where a local lense of pyroxene-plagioclase-phyric andesite and a firmly welded ash-flow tuff are included.

Tef Quartz latite flow member--Lavender-gray, somewhat platy, with less than 10 percent phenocrysts (highly altered) of plagioclase, biotite, and hornblende.

Ter Rhyolite member--Variegated lavender, brown, red to pink, platy, flow-layered, felsitic rhyolite with phenocrysts of chalky plagioclase (often weathered out, leaving pits) and inconspicuous biotite; hornblende appears in some thin sections.

Tea Andesite member--Black, massive, generally nonvesicular, with phenocrysts of plagioclase and augite; weathers into brown blocks. Maximum thickness is 360 m.

Tem Tuff member of Marsden Spring--White, orange, pale-green or gray crystal-poor and locally lithic-rich ash-flow tuff; phenocrysts of quartz, feldspar, and biotite are less than 1 mm across and comprise only a few percent of the rock; lithic fragments include pink and gray felsite and, near the base of the tuff, pink quartzite. Unit includes a tuff containing abundant plagioclase and biotite phenocrysts in exposures two miles southwest of Herd Pass. Thickness is 0-300 m.

P PALEOZOIC SEDIMENTARY ROCKS, UNDIVIDED

Chiefly limestones

After Best, 1979 and Best and Jeffrey, 1979.

SAMPLE COLLECTION

Two sets of rock samples were collected within the survey area; objective samples were collected from randomly selected outcrops at a density of one sample per 0.25 square miles (0.64 square kilometers), and subjective samples were collected from obviously altered and mineralized rock. Sample numbers within the 1000 and 2000 series are subjective samples, all other sample numbers are of objective samples.

The 7 1/2-minute quadrangle maps of the survey area were divided into cells using a 0.50-mile grid length. Each cell was then divided into

4 squares, defined as subcells. One subcell was randomly selected from each cell for field collection (Figure 3). The sample site was an area of approximately three feet across (1 square meter). Weathering surfaces were removed and one to three pounds (400g to 1000g) of fresh rock chips were placed in cotton sacks. Duplicate samples were collected from 12 outcrops from sites located 30 to 100 feet (10 to 30 meters) from the original site. If the designated subcell did not contain an outcrop, an alternate subcell from the same cell was sampled. A total of 210 objective samples and 80 subjective samples were collected from the survey area (Figure 4).

ANALYTICAL METHODS

The rock samples were pulverized and subjected to a total digestion with HNO_3 - $HClO_4$ - HF and analyzed with the inductively coupled plasma atomic emission spectrometer (ICP) for the elements Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cu, Fe, Ge, La, Mg, Mn, Nb, Ni, P, Pb, Sb, Sn, Sr, Ti, V, W, Y, and Zn. Ag, As, Au, B, Ge, and Sb were either below the detection limit of the ICP or were lost in the decomposition procedures. Li, Na, and Rb were analyzed by atomic absorption. Ca, K, and Si were analyzed by X-ray fluorescence, and F was analyzed by ion-specific electrode after digestion with Na_2CO_3-K_2CO_3-KNO_3 flux. (Delezal, Povondra and Sulcek, 1966; Grimes and Marranzino, 1968; Hopkins, 1977; Meier, 1980; Motooka and Grimes, 1976).

GENERATION OF CONTOUR MAPS

Computer-generated contour maps for each element were prepared using the U.S. Geological Survey's STPMAP program written by J. Kork and modified by G. Van Trump. The program calculates an average value within a square cell and uses the average to generate the maps. Therefore, cell values are contoured and not individual sample values. Some spatial displacement of

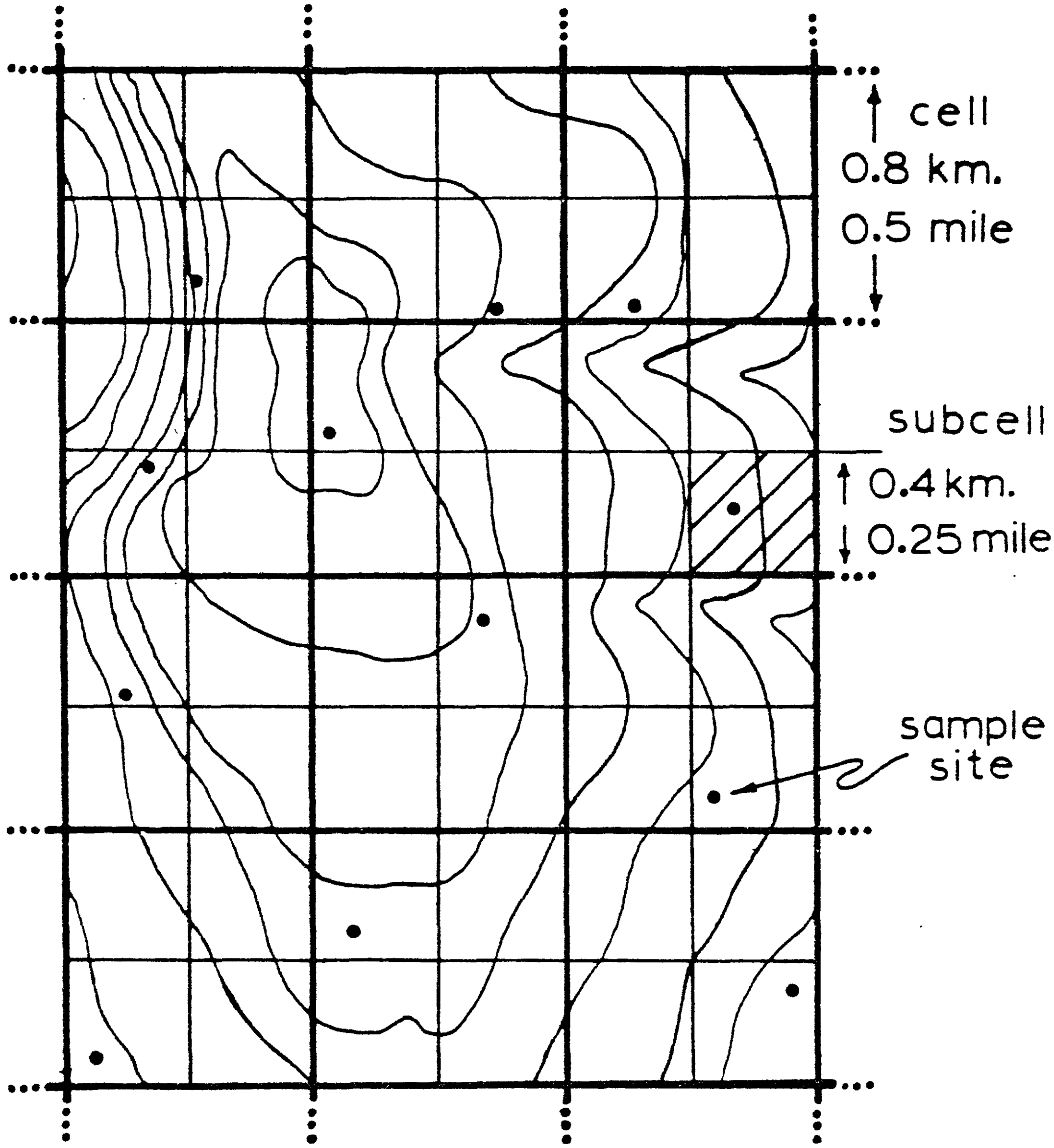

Figure 3.--Graphical representation of the sampling design.

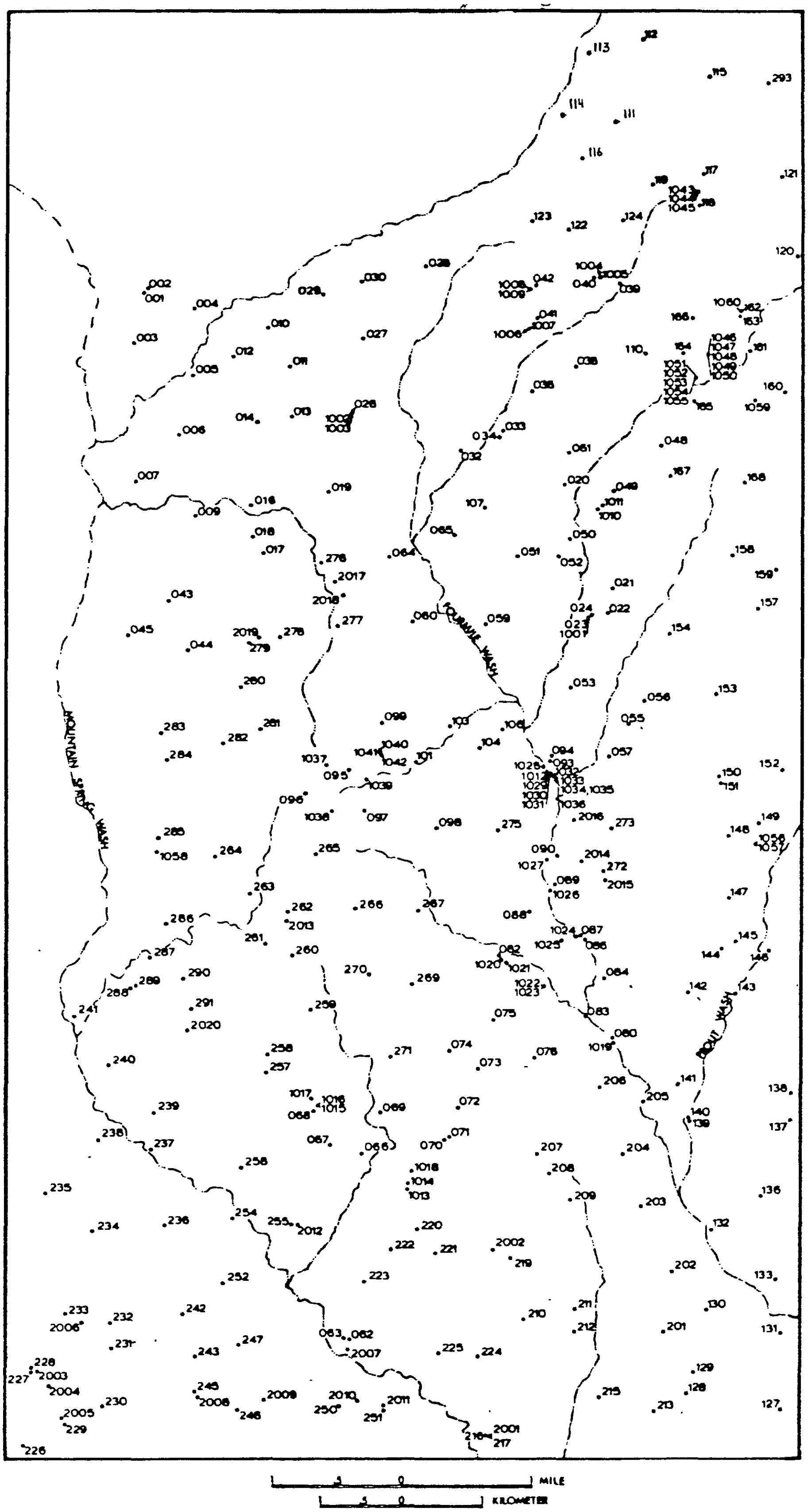

Figure 4.--Sample site locations of both objective and subjective samples. Subjective samples are designated by 1000 or 2000 numbers.

actual anomalies is possible using this method. The survey area was divided into 30 contouring cells along the X-axis and included an area slightly larger than the survey area, which minimized contour edge exaggerations.

RESULTS

The analytical results for the rocks are given in Appendix 1. The elements Al, Ba, Be, Bi, Ce, Cr, Fe, La, Mg, Mn, Mo, Nb, Pb, Sn, Sr, V, W, Y, Zn, Li, Na, Rb, Ca, K, Si, F, and Ti were used in data interpretation. All of these elements show concentration variations that are associated with the regional geochemical anomaly. The elements Mo, Sn, Bi, Be, F, Li, Nb, and Y are generally enriched in the regional anomaly while the elements Al, Ce, Fe, La, and Si are generally depleted in the regional anomaly. A summary of the analytical results for the objective and subjective samples are given in Table 1 and Table 2 respectively. Analysis of the elements Ag, As, Au, B, Ge, and Sb was not possible due to element loss in the decomposition procedures or because too few values were reported. Calcium values from the X-ray fluorescence analysis were used instead of those from the ICP. No clear geochemical trends were exhibited by Cd, Co, P, or Ni and these elements were not used in data interpretation.

OBJECTIVE ROCK SAMPLE SURVEY RESULTS

The correlation matrix for the logarithmetic rally transformed objective rock data is given in Table 3. Fluoride has significant correlation coefficients with respect to K, Si, Be, Li, Mn, Nb, Rb, and Y at the 0.05 significance level. Cerium has significant correlations with Al, Fe, K, Na, Ti, Ba, La, P, Sr, and Zn at the 0.05 significance level. Tin has significant correlations with Na, Be, Bi, Zn, and Mo at the 0.05 significance level. These geochemical suites suggest an emplacement of a highly differentiated

Table 1.--Summary of analytical results for the objective samples

Element	Minimum	Maximum	Mean	Geometric mean	Standard deviation	Geometric deviation	Valid *
Al%	0.06	13.	7.1	5.3	2.6	3.2	210
Ca%	0.01	40.	4.0	1.4	8.0	3.9	210
Fe%	0.02	5.2	1.5	0.90	1.2	3.2	210
K%	0.01	3.2	1.7	1.1	0.72	4.7	203
Mg%	0.01	16.	1.3	0.22	3.3	6.2	210
Na%	0.10	3.9	2.3	1.5	1.1	3.7	188
Si%	0.01	47.	29.	22	9.9	3.9	210
Ti%	0.0002	0.86	0.20	0.08	0.10	5.1	208
Ba ppm	0.15	2600	500	110	560	11.	203
Be ppm	0.04	94.	5.5	2.4	7.9	5.4	192
Bi ppm	50.	69.	36.	36	4.2	1.1	8
Ce ppm	9.0	200	84.	63	49.	2.6	185
Cu ppm	2.0	48.	4.7	2.9	6.4	2.4	105
F ppm	74.	5300	1100	700	1000	2.6	210
La ppm	1.6	95.	39.	30.	22.	2.6	199
Li ppm	2.0	140	33.	22.	28.	2.8	210
Mn ppm	13.	1900	440	330	260	2.6	210
Mo ppm	3.8	17.	2.8	2.8	1.1	1.2	11
Nb ppm	3.0	130	41.	23.	37.	3.3	189
Ni ppm	4.0	250	7.6	4.4	22.	2.1	85
P ppm	14.	2100	440	130	470	6.8	160
Pb ppm	15.	67.	21.	17.	14.	1.9	83
Rb ppm	0.10	900	300	130	250	8.5	199
Sn ppm	20.	40.	20.	14.	1.9	1.1	210
Sr ppm	2.2	1600	230	70.	260	6.6	210
V ppm	1.8	140	21.	6.1	27.	5.3	116
W ppm	26.	44.	19.	19.	4.0	1.2	21
Y ppm	0.40	110	32.	15.	31.	4.7	194
Zn ppm	0.50	110	43	31.	21.	3.2	201

* Number of samples above the detection limit.

Table 2.--Summary of analytical results for the subjective samples

Element	Minimum	Maximum	Mean	Geometric mean	Standard deviation	Geometric deviation	Valid *
Al%	0.02	17.	5.3	2.5	3.6	5.8	80
Ca%	0.001	40.	4.2	0.82	8.8	6.2	80
Fe%	0.01	19.	1.4	0.42	2.8	5.8	80
K%	0.01	3.2	1.3	0.52	0.95	7.6	76
Mg%	0.0004	16.	1.3	0.15	3.6	7.7	80
Na%	0.01	3.9	1.3	0.55	1.3	4.9	61
Si%	0.01	47.	29.	16.	13.	7.4	79
Ti%	0.0002	0.56	0.11	0.04	0.14	5.3	79
Ba ppm	0.15	3100	390	69.	620	12.	76
Be ppm	0.04	50.	5.5	2.2	7.3	5.4	75
Bi ppm	50.	96.	36.	36.	8.4	1.2	3
Ce ppm	9.0	970	75.	37.	120	3.7	56
Cu ppm	2.0	180	5.3	2.1	21.	1.5	23
F ppm	50.	4200	840	480	920	3.0	80
La ppm	1.6	310	29.	14.	38.	4.3	65
Li ppm	2.0	100	25.	14.	25.	2.9	80
Mn ppm	1.0	1300	280	120	270	5.0	80
Mo ppm	3.8	180	6.8	3.3	22.	2.1	10
Nb ppm	3.0	120	34.	17.	32.	3.9	62
Ni ppm	4.0	31.	3.7	3.2	3.8	1.5	13
P ppm	14.	2900	270	57.	470	6.6	44
Pb ppm	15.	89.	24.	19.	18.	2.0	40
Rb ppm	0.10	800	220	75.	220	8.7	76
Sn ppm	20.	21.	--	--	--	--	1
Sr ppm	2.4	2200	230	63.	410	5.7	80
V ppm	1.8	330	22.	4.9	54.	5.2	39
W ppm	26.	130	22.	20.	16.	1.4	6
Y ppm	0.40	95.	23.	6.8	26.	7.3	63
Zn ppm	1.0	250	35.	36.	18.	4.2	76

* Number of samples above the detection limit.

Table 3. Matrix of correlation coefficients of the 210 objective samples.
The number of valid pairs are shown below the diagonal.

	Al	Ca	Fe	K	Mg	Na	Si	Ti	Ba	Be	Bi	Ce	Cu	F	La	Li	Mn	Mo	Nb	Ni	P	Pb	Rb	Sn	Sr	V	W	Y	Zn
Al	1.00	-0.75	0.59	0.46	-0.72	-0.21	0.60	0.56	0.53	-0.27	0.16	0.26	0.15	0.13	0.49	0.07	0.20	-0.69	-0.62	-0.61	0.57	-0.02	-0.10	0.74	0.43	0.51	-0.24	-0.30	0.36
Ca	210	1.00	-0.21	-0.67	0.68	-0.07	-0.91	-0.17	-0.11	-0.22	-0.05	0.13	0.19	-0.32	-0.17	-0.38	-0.33	0.97	-0.38	0.60	0.20	-0.07	-0.35	-0.26	-0.05	0.09	0.53	-0.27	-0.15
Fe	210	210	1.00	-0.13	-0.20	-0.09	0.06	0.81	0.71	-0.43	0.02	0.21	0.69	-0.27	0.50	-0.36	0.05	-0.33	-0.69	-0.11	0.89	0.09	-0.57	-0.06	0.76	0.80	0.86	-0.63	0.51
K	202	202	202	1.00	-0.56	0.42	0.63	0.06	0.08	0.25	-0.28	0.41	-0.41	0.17	0.32	0.30	0.21	-0.69	0.23	-0.31	-0.22	0.04	0.47	0.10	-0.23	-0.41	-0.19	0.35	0.05
Mg	210	210	210	202	1.00	-0.14	-0.77	-0.18	-0.10	-0.21	0.70	-0.02	0.60	-0.29	-0.18	-0.34	-0.32	0.97	-0.59	0.79	0.22	-0.22	-0.34	-0.15	-0.12	0.11	0.35	-0.72	-0.18
Na	187	187	187	187	187	1.00	0.28	-0.12	-0.07	0.25	-0.19	0.15	-0.29	0.11	0.02	0.48	0.48	0.28	0.36	-0.12	-0.05	0.43	0.57	0.77	-0.24	-0.22	0.11	0.48	0.26
Si	210	210	210	202	210	187	1.00	-0.01	-0.08	0.33	-0.03	-0.25	-0.28	0.35	0.01	0.48	0.39	-0.20	0.54	-0.50	-0.44	0.16	0.49	-0.49	-0.06	-0.35	-0.16	0.48	0.07
Ti	207	207	207	201	207	187	207	1.00	0.86	-0.47	-0.59	0.62	0.41	-0.38	0.79	-0.52	-0.14	-0.32	-0.71	-0.08	0.86	-0.27	-0.60	0.37	0.66	0.61	0.64	-0.57	0.35
Ba	202	202	202	098	202	187	202	202	1.00	-0.49	-0.30	0.64	0.11	-0.44	0.82	-0.61	-0.16	-0.00	-0.75	-0.14	0.75	-0.31	-0.62	0.27	0.65	0.40	-0.09	-0.62	0.29
Be	191	191	191	191	191	187	191	191	190	1.00	-0.11	-0.19	-0.36	0.43	-0.34	0.54	0.27	-0.55	0.56	-0.13	-0.67	0.01	0.59	0.78	-0.38	-0.62	-0.73	0.57	0.11
Bi	8	8	8	8	8	8	8	8	8	8	1.00	-0.56	0.94	0.14	-0.42	0.54	0.13	-0.74	0.46	--	0.51	0.55	0.20	0.91	-0.03	--	--	0.40	0.17
Ce	184	184	184	184	184	182	184	184	184	184	8	1.00	-0.17	-0.26	0.91	-0.41	-0.21	-0.22	-0.34	-0.01	0.35	-0.13	-0.24	0.28	0.15	-0.12	0.16	-0.27	0.17
Cu	104	104	104	104	104	103	104	104	104	104	5	103	1.00	-0.21	-05	-0.20	0.12	0.73	-0.36	0.63	0.50	0.49	-0.43	0.53	0.47	0.49	0.74	-0.36	0.32
F	210	210	210	202	210	187	210	207	202	191	8	184	104	1.00	-0.28	0.66	0.33	-0.51	0.62	-0.17	-0.38	0.14	0.55	-0.89	-0.20	-0.25	0.32	0.69	0.17
La	198	198	198	194	198	183	198	198	195	186	8	184	103	198	1.00	-0.48	-0.21	-0.29	-0.58	-0.73	0.57	-0.36	-0.42	-0.25	0.42	0.23	0.21	-0.43	[illegible]
Li	210	210	210	202	210	187	210	207	202	191	8	184	104	210	198	1.00	0.50	-0.51	0.86	-0.20	-0.57	0.50	0.88	-0.31	-0.46	-0.47	0.03	0.85	0.13
Mn	210	210	210	202	210	187	210	207	202	191	8	184	104	210	198	210	1.00	0.10	0.47	-0.10	-0.03	0.55	0.53	0.69	-0.06	-0.25	0.03	0.51	0.49
Mo	11	11	11	11	11	9	11	11	11	11	3	10	6	11	10	11	11	1.00	0.03	-0.63	0.30	0.45	-0.60	1.00	0.33	0.94	--	-0.53	-0.48
Nb	188	188	188	188	188	187	188	188	188	188	8	183	103	188	184	188	188	9	1.00	-0.11	-0.69	0.59	0.80	-0.40	-0.64	-0.53	0.17	0.82	-0.01
Ni	84	84	84	83	84	80	84	84	83	81	1	79	67	84	82	84	84	4	80	1.00	0.42	-0.39	-0.20	--	-0.15	-0.11	0.55	-0.11	0.08
P	159	159	159	158	159	154	159	159	159	157	5	154	95	159	157	159	159	7	155	71	1.00	-0.04	-0.67	0.81	0.70	0.63	0.65	-0.65	0.60
Pb	83	83	83	83	83	83	83	83	83	83	8	80	19	83	80	83	83	9	83	17	52	1.00	0.49	-0.59	-0.22	0.10	--	0.50	0.32
Rb	198	198	198	195	198	187	198	197	195	191	8	184	104	198	191	198	198	11	183	82	158	83	1.00	-0.19	-0.60	-0.60	-0.47	0.93	0.04
Sn	5	5	5	5	5	5	5	5	5	5	4	5	4	5	5	5	5	2	5	1	4	5	5	1.00	0.30	--	--	-0.84	0.83
Sr	210	210	210	202	210	187	210	207	202	191	8	184	104	210	198	210	210	11	188	84	159	83	198	5	1.00	0.52	0.59	-0.62	0.41
V	115	115	115	113	115	110	115	115	114	112	1	110	76	115	114	115	115	4	110	70	101	31	113	0	115	1.00	0.24	-0.64	0.32
W	21	21	21	21	21	21	21	21	21	21	0	21	20	21	21	21	21	0	21	21	21	0	21	0	21	20	1.00	0.16	0.45
Y	193	193	193	191	193	186	193	193	193	189	8	184	104	193	189	193	193	11	187	81	159	82	191	5	193	113	21	1.00	0.34
Zn	200	200	200	195	200	186	200	198	196	190	8	183	103	200	191	200	200	11	187	83	157	83	195	5	200	112	21	189	1.00

leucocratic ore element-rich body at depth. The elements Mo, Sn, F, and Be are commonly closely associated with each other in economic or potentially economic primary Sn and Mo deposits (Groves and Taylor, 1973; Haapala, 1977; Lamarre and Hodder, 1978; Rub, 1972; Sainsbury, 1969; Turneaure, 1971, and Wallace and others, 1978; Mulligan, 1971; Vlasov, 1966). In the survey area anomalous Sn and Bi show spatial distribution over the regional anomaly (Figures 5 and 6). The highest values for Mo occur in the northeast part of the survey area in a highly altered area near an old mercury mine (Figure 7).

The elements Be, Y, Nb, Li, and F show two major concentration anomalies (Figures 8-12). One anomaly designated the northern anomaly, is located in the northern portion of the survey area within the regional anomaly. No altered or mineralized rocks have been mapped in this area (Best, 1979). The other anomaly designated the southern anomaly, is located in the southern portion of the survey area within an area of highly altered rocks. Both anomalous areas have high concentrations of the enriched elements, but the northern anomaly contains higher concentrations and larger spatial distribution of F, Li, Mo, Sn, and Bi.

The southern anomaly is located within both ash-flow tuffs and rhyolite flows, whereas the northern anomaly is restricted to rhyolitic flows and domes (Figure 3). The rocks exposed between the two anomalies is the same rhyolite as is exposed in the regional anomaly. Most of the rocks in the southern anomaly have been bleached and undergone feldspar-destructive alteration with the development of silicious capping. The northern anomaly contains no obvious alteration but the rocks underlying the area may be propylitically altered, similar to the rocks observed along Four-Mile Wash to the east of the regional anomaly.

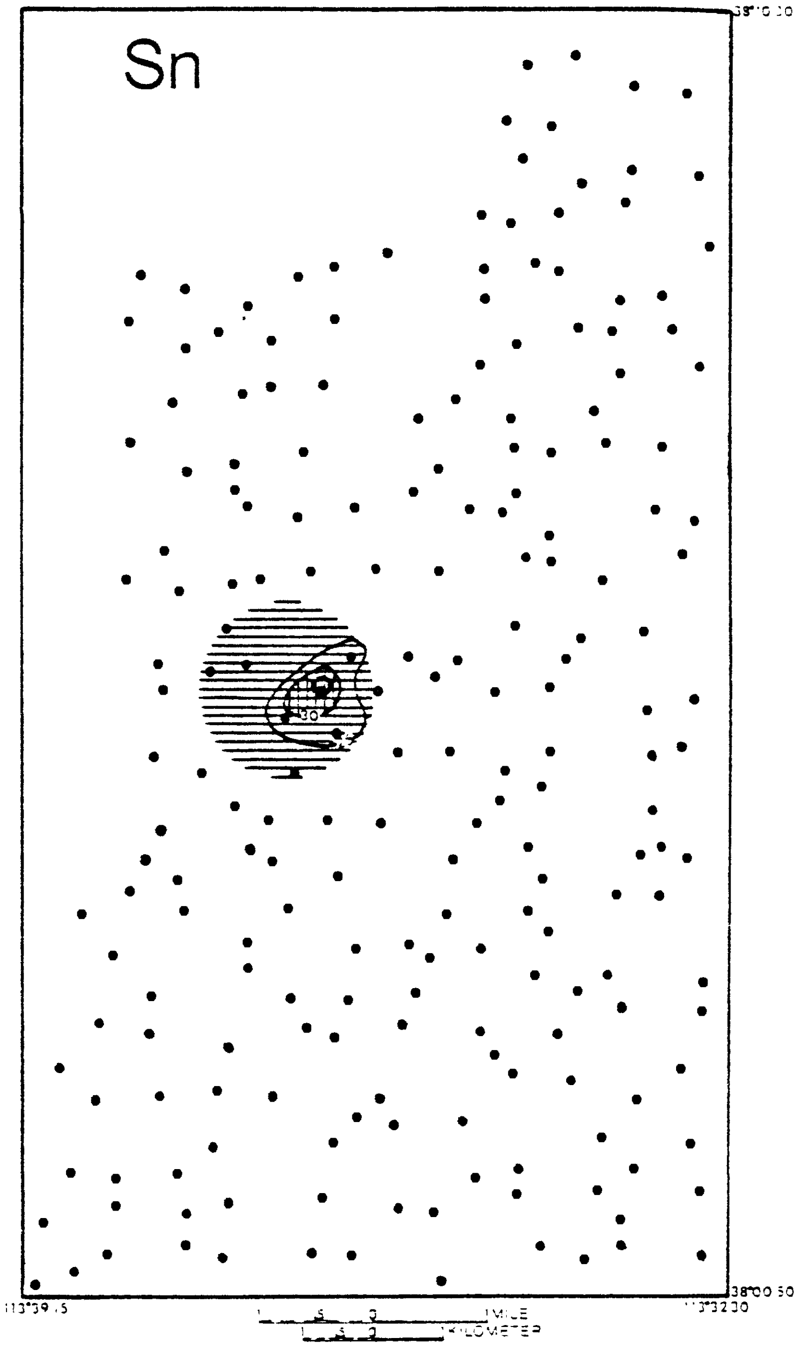

Figure 5.-- Contoured objective rock data for Sn. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 25,30,40 ppm.

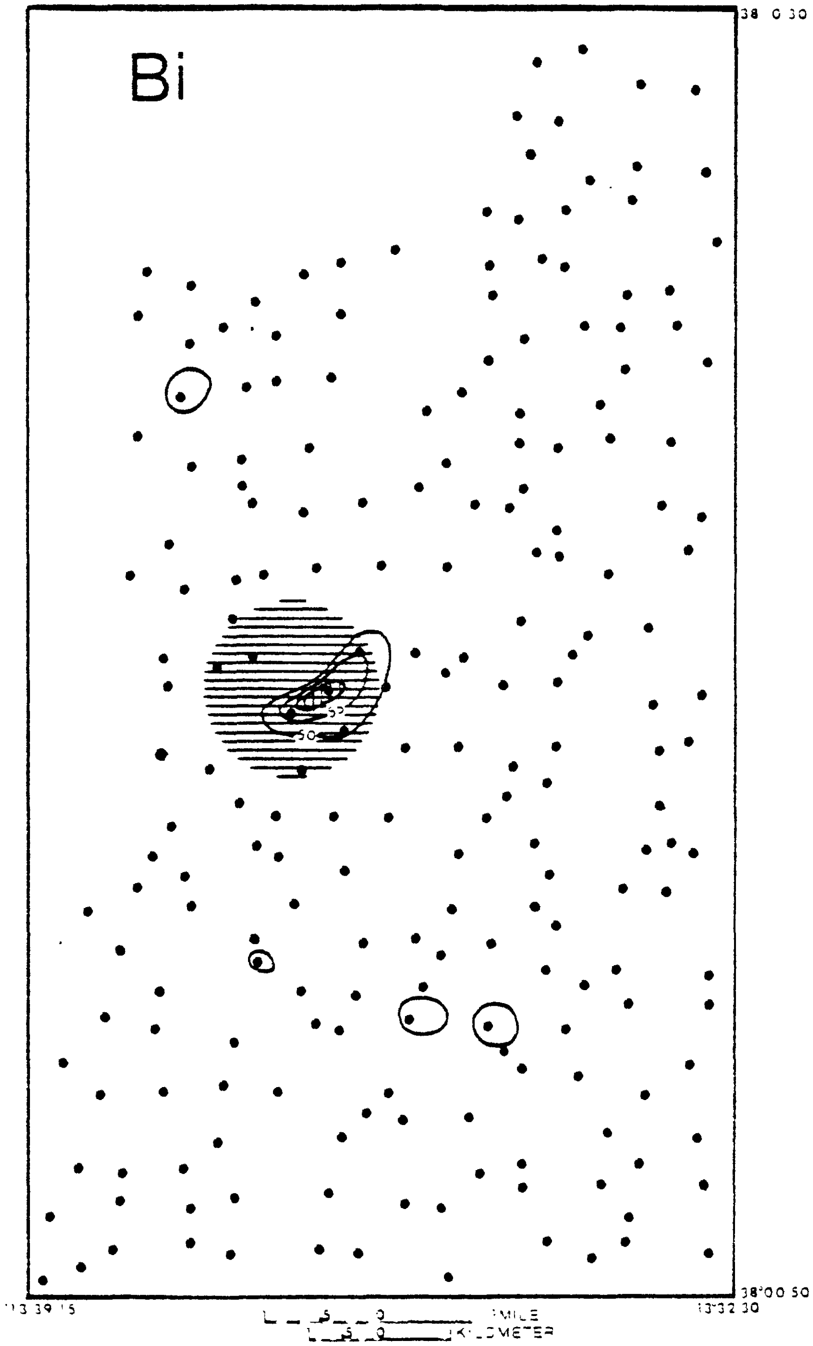

Figure 6.-- Contoured objective rock data for Bi. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 50, 55, 60 ppm.

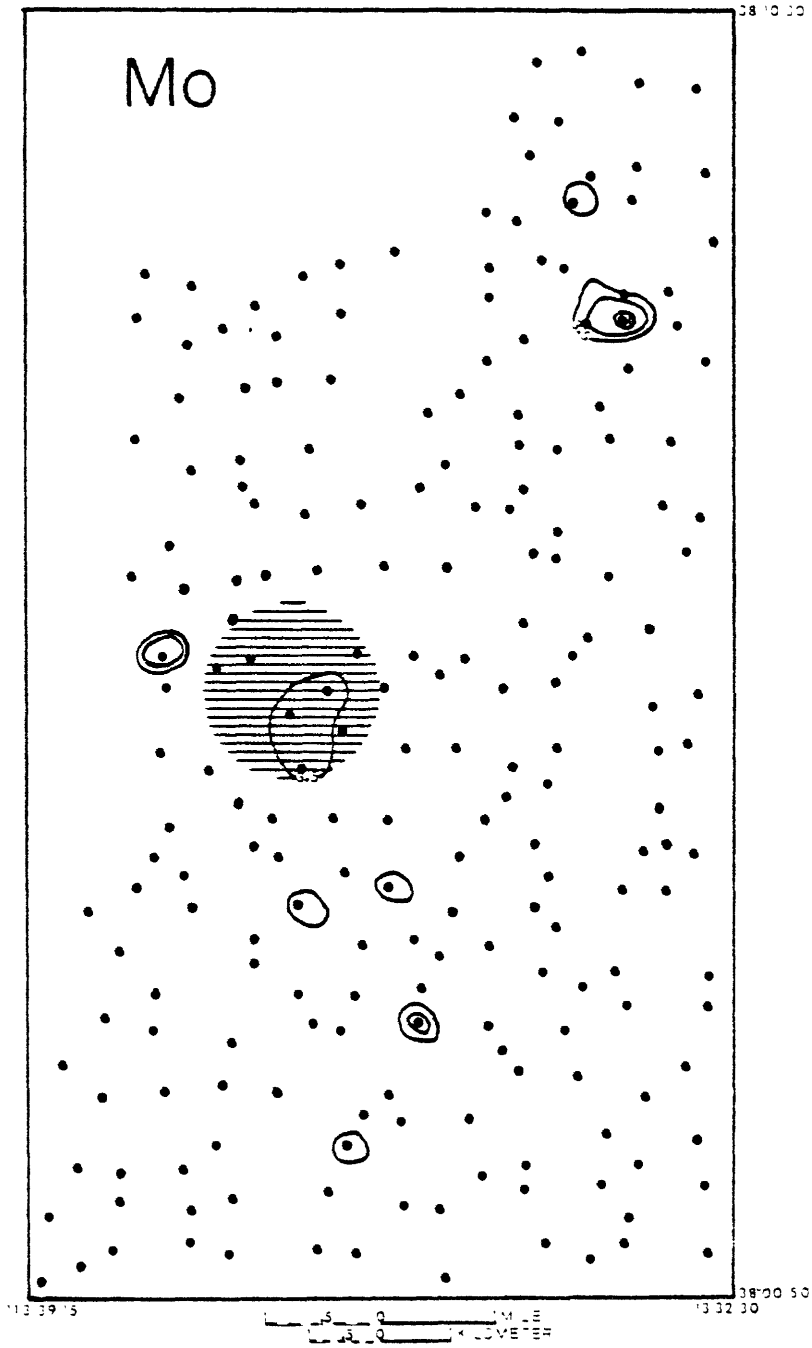

Figure 7.-- Contoured objective rock data for Mo. Horizontal lines show the approximate location of the original anomaly. The dots are sample site locations. Contour intervals are 3.5, 5.0, and 10.0 ppm.

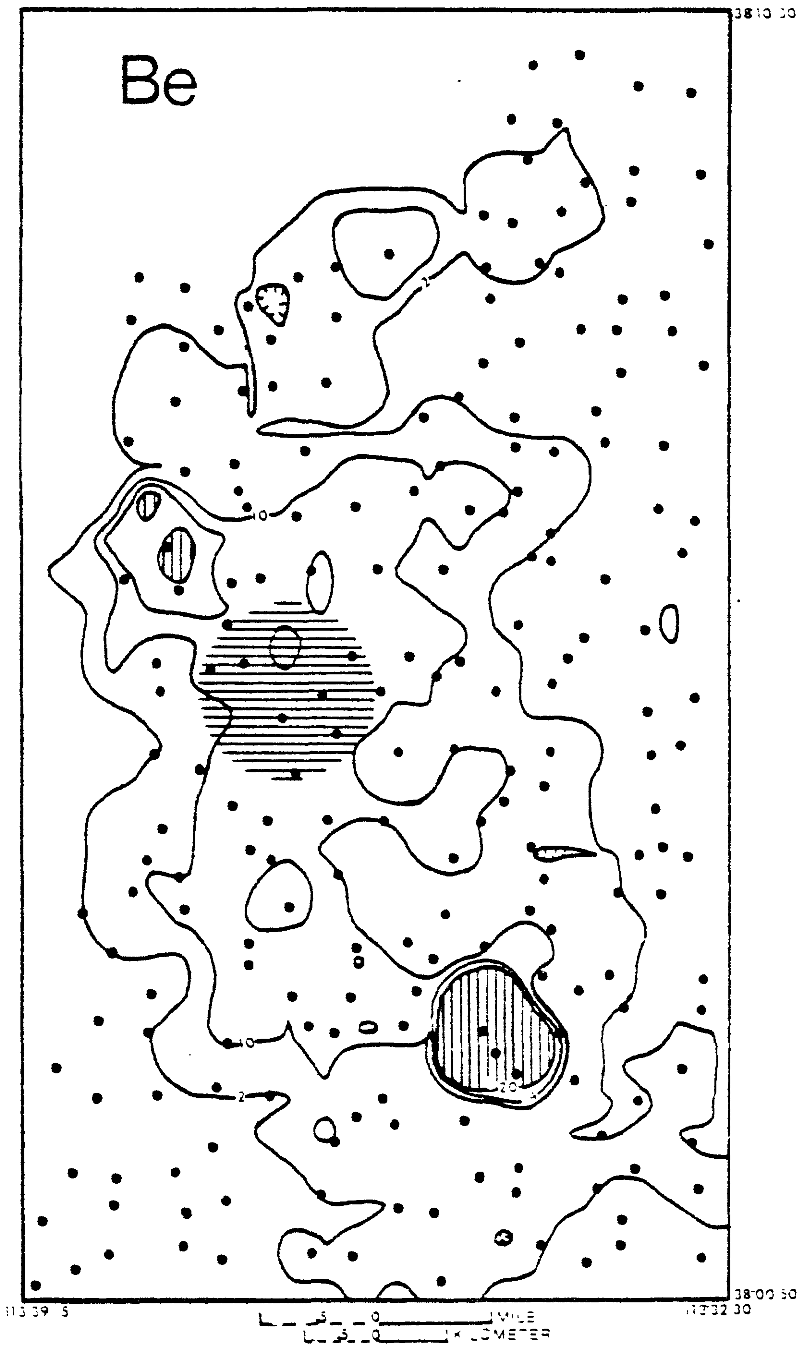

Figure 8.-- Contoured objective rock data for Be. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 2, 10, 14, 20 ppm.

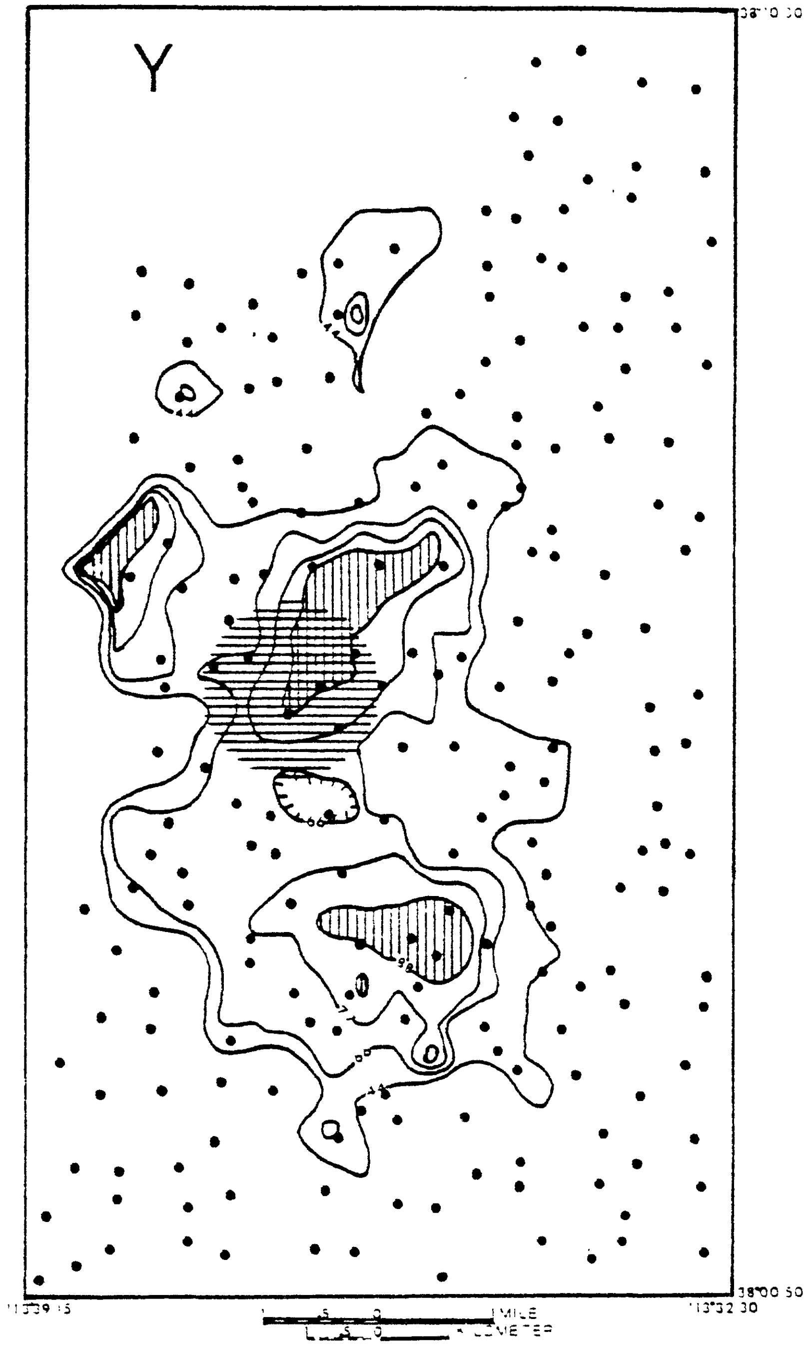

Figure 9.--Contoured objective rock data for Y. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 44, 66, 77, 88 ppm.

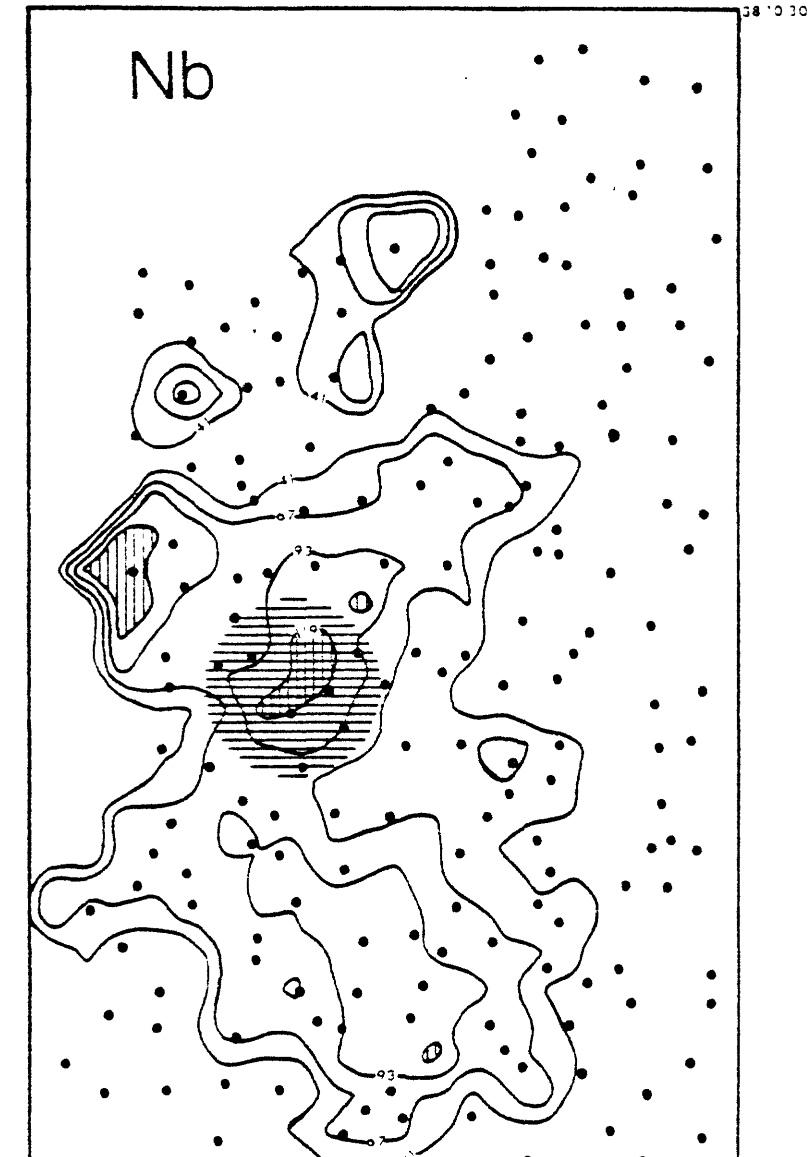

Figure 10-- Contoured objective rock data for Nb. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 41, 67, 93, 119 ppm.

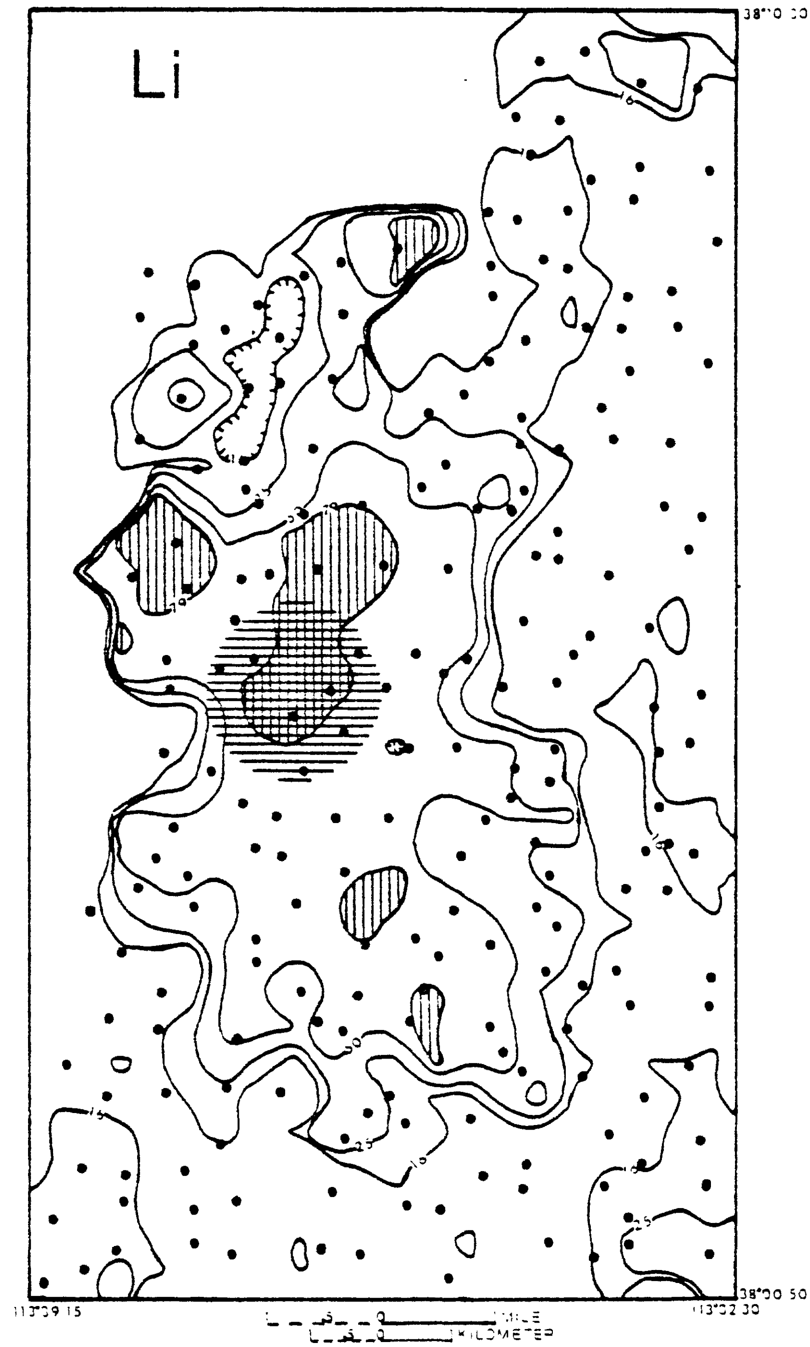

Figure 11-- Contoured objective rock data for Li. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 16, 25, 50, 79 ppm.

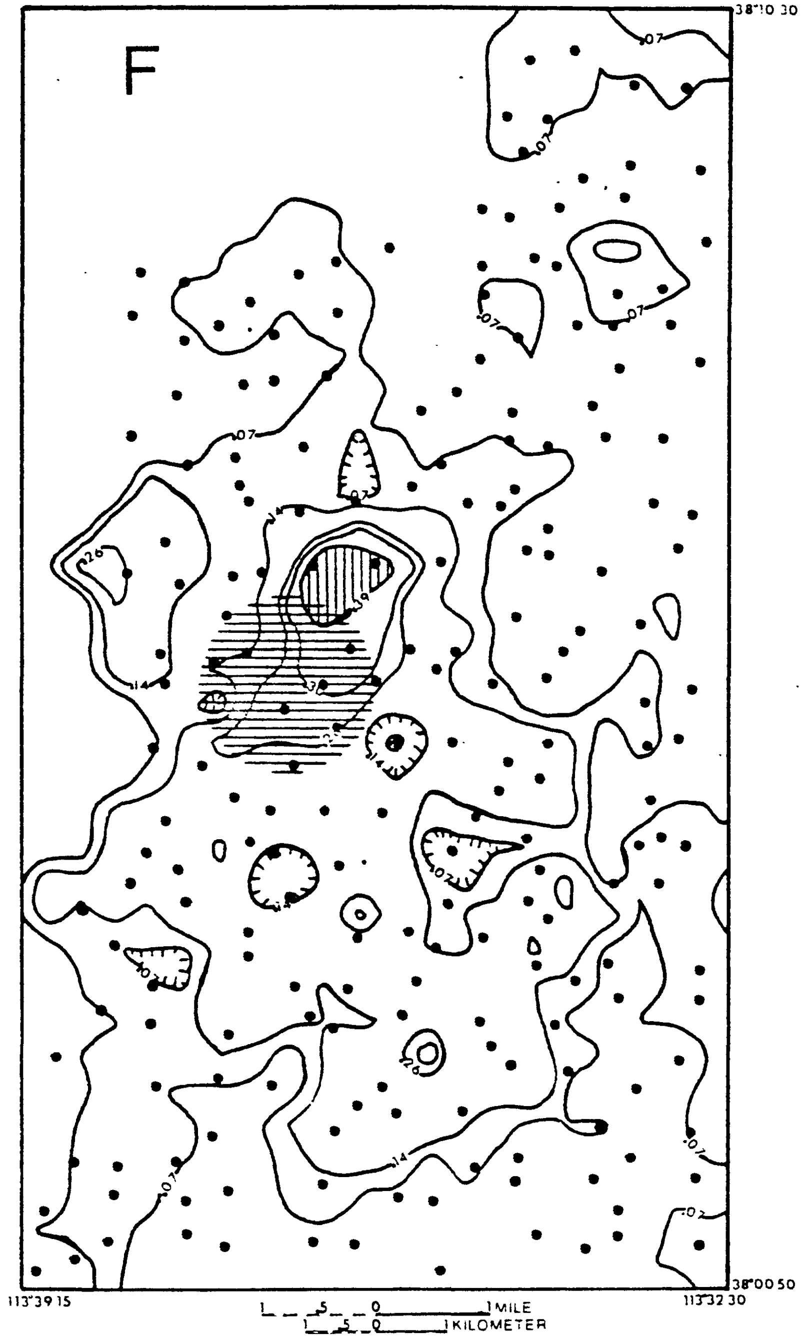

Figure 12-- Contoured objective rock data for F. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals .07, .14, .26, .30, .39 percent.

The depleted elements have even lower concentrations over both the northern and southern anomalies (Figures 13-17). Cerium and La depletions outline the two anomalies best (Figures 13 and 14), whereas Fe and Al show broad areas of depletion around the anomalies (Figures 15 and 16). Silica shows a depletion within and slightly north of the northern anomaly (Figure 17).

The objective data contour maps show the expected geochemical trends for elements associated with the emplacement of a highly differentiated, leucocratic, potentially ore-element-rich body. The northern anomaly has the highest concentrations of F, Li, Mo,Sn, and Bi. Both the southern and northern anomalies have low concentrations of the depleted elements but the northern anomaly contains the lowest Si concentration.

SUBJECTIVE ROCK SAMPLE DATA

Point plots were made of the subjective samples, as the number of samples was not great enough to contour. The correlation matrix for logarithmically transformed data is given in Table 4. Fluoride has significant correlation coeffieants with respect to Al, Be, Li, Mn, Nb, Ni, Pb, Rb, Sr, Y, and Zn at the 0.05 significance level. Cerium has significant correlation coefficants with respect to Al, Cu, La, Ni, P, Sr, V, and Zn at the 0.05 significance level.

The ore elements, Mo, Sn, and Bi have high concentrations in the regional anomaly (Figure 18) as well as a few other areas outside the anomaly. The highest Bi value (sample 1024) and anomalous F concentrations occur north of the regional anomaly. The sample was taken from a small bleached and silicified outcrop in contact with an ash-flow tuff. Two areas containing anomalous concentrations of Mo and Bi north of the regional anomaly are found in hydrothermally altered rocks, as evidenced by samples 1049, 1051, and 1054. The highest Mo value is from the northern part of the area (samples 1045 and 1043)

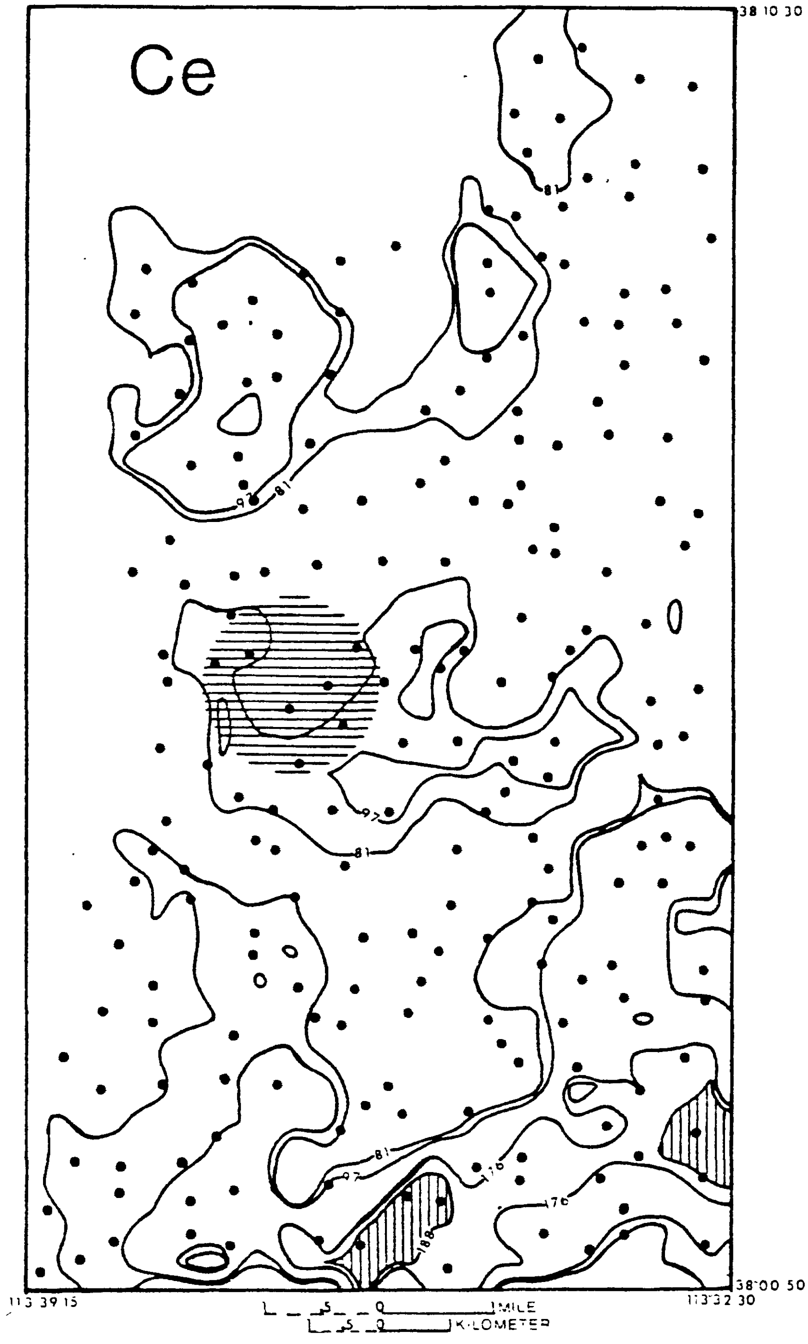

Figure 13-- Contoured objective rock data for Ce. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 81, 97, 176, 188 ppm.

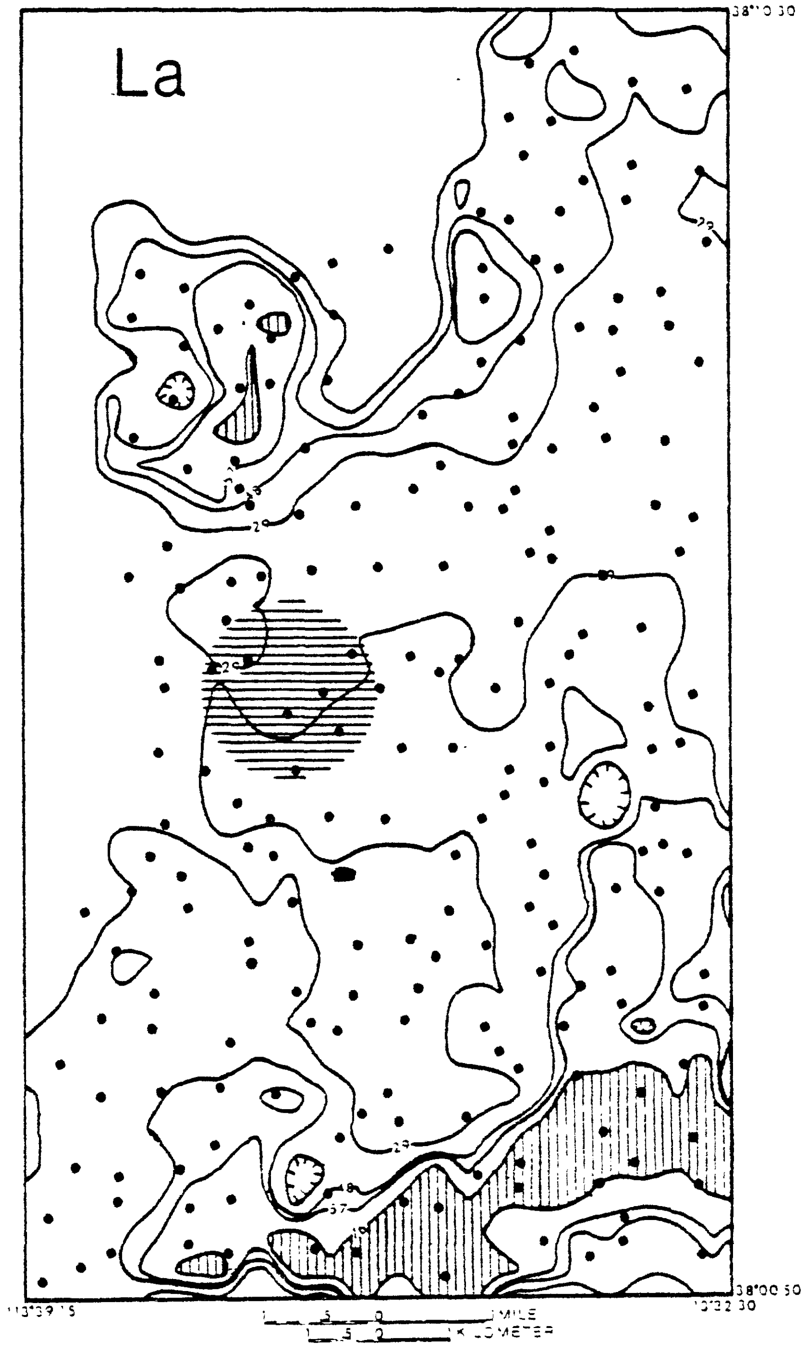

Figure 14.-- Contoured objective rock data for La. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 29, 48, 57, 76 ppm.

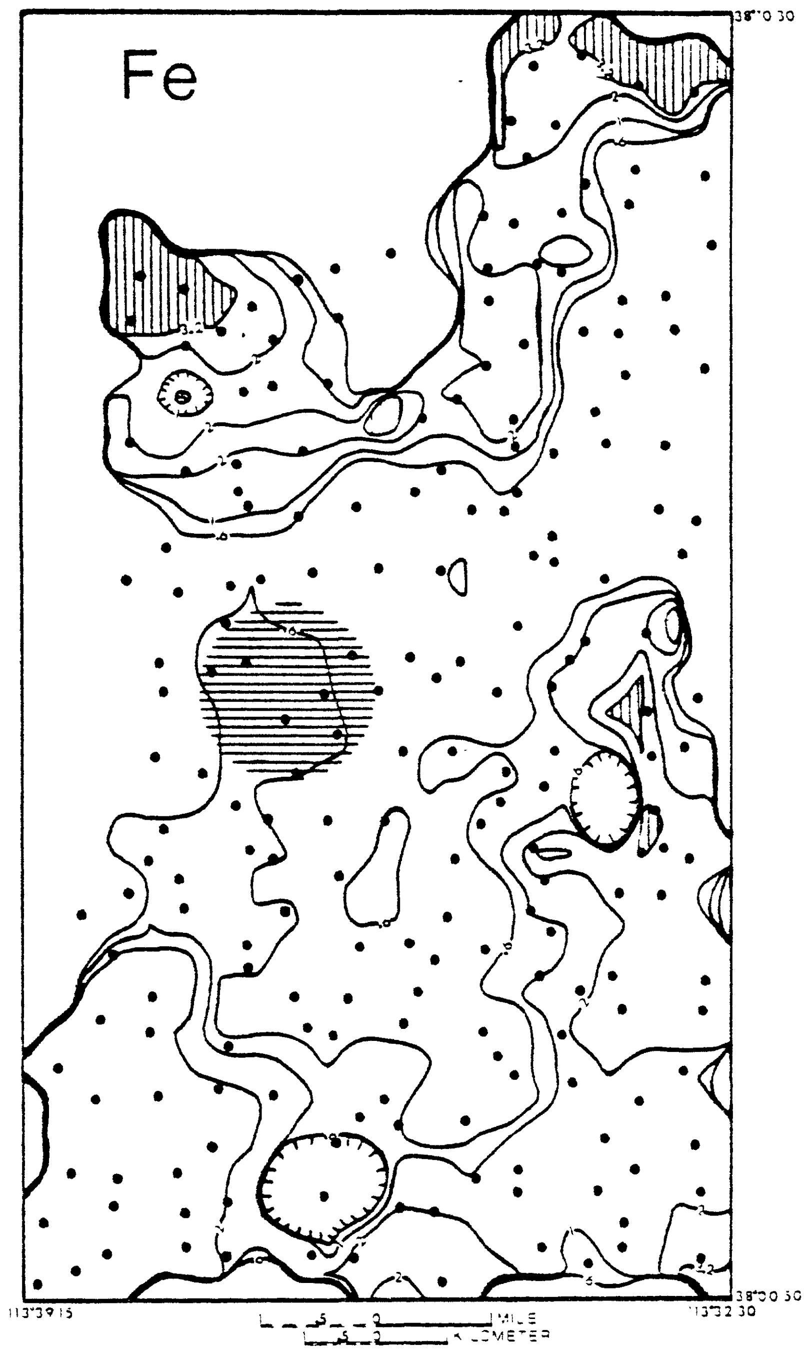

Figure 15.-- Contoured objective rock data for Fe. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals .6, 1.0, 2.0, 3.2 percent.

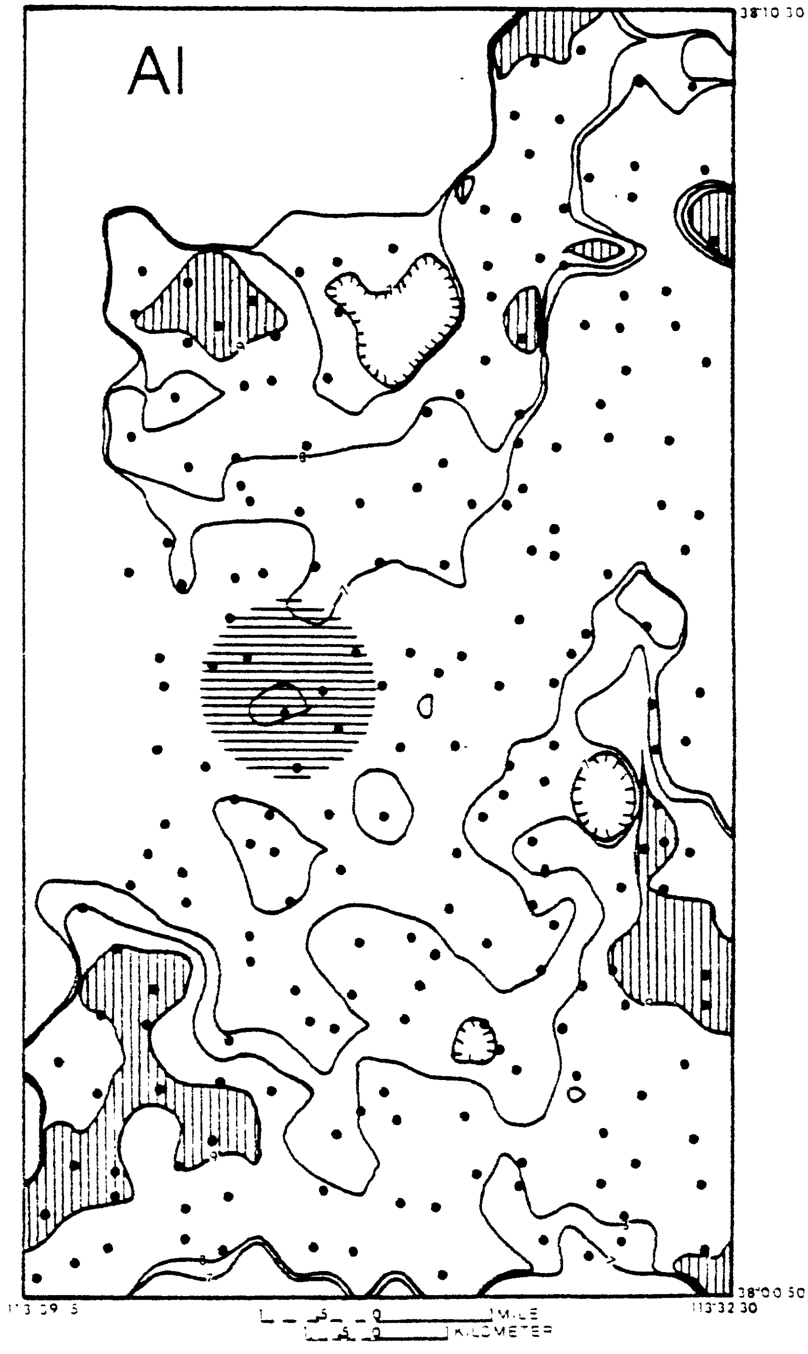

Figure 16.-- Contoured objective rock data for Al. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 7, 8, 9 percent.

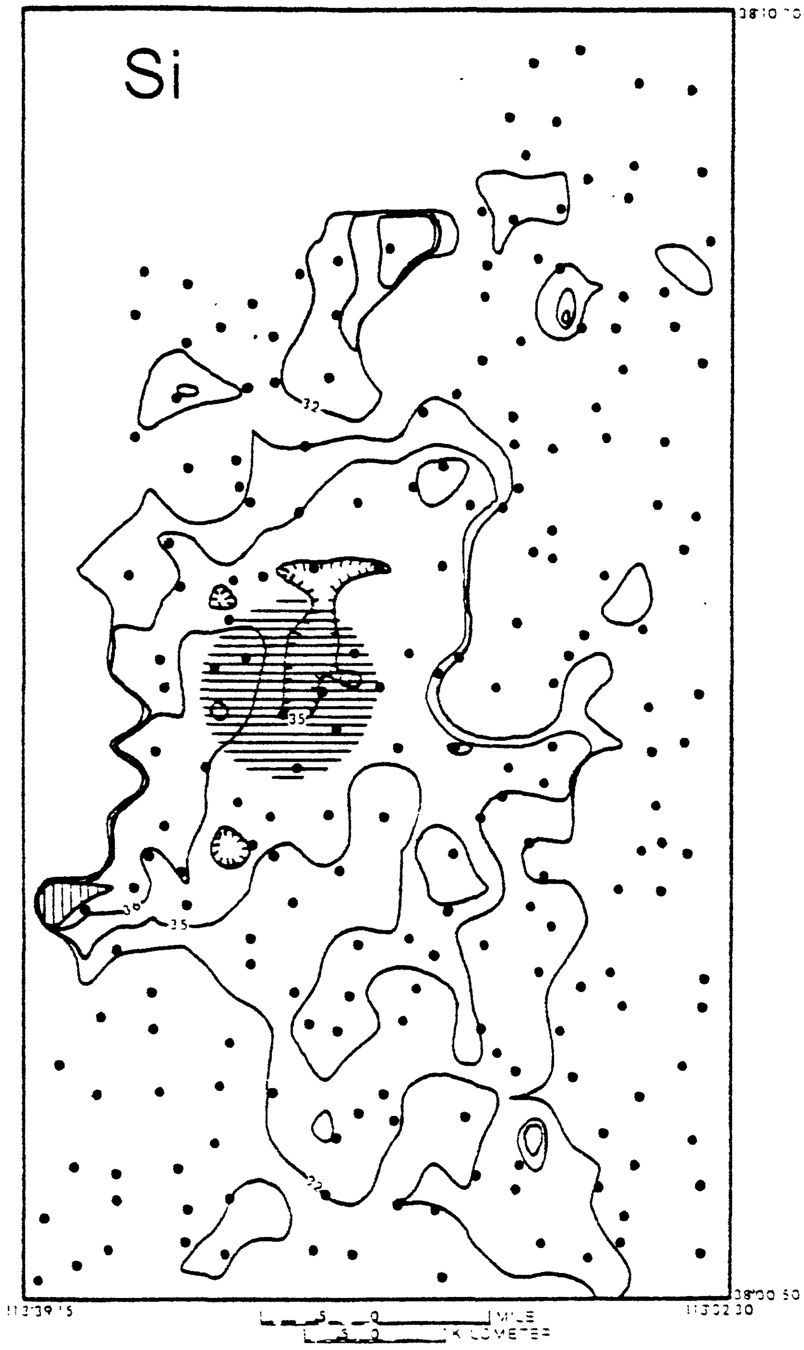

Figure 17.-- Contoured objective rock data for Si. Horizontal lines show the approximate location of the original anomaly, while vertical lines show the area of highest concentration. The dots are sample site locations. Contour intervals 32, 35, 36, 38 percent.

Table 4. Matrix of correlation coefficients of the 80 subjective samples. The number of valid pairs are shown below the diagonal.

	Al	Ca	Fe	K	Mg	Na	Si	Ti	Ba	Be	Bi	Ce	Cu	F	La	Li	Mn	Mo	Nb	Ni	P	Pb	Rb	Sn	Sr	V	W	Y	Zn
Al	1.00	-0.53	0.04	0.70	-0.41	0.26	0.19	0.41	0.33	0.21	0.10	0.62	0.73	0.42	0.56	0.33	0.29	-0.17	-0.14	0.75	0.36	0.03	0.37	--	0.34	0.29	-0.77	0.12	0.53
Ca	80	1.00	-0.07	-0.48	0.71	-0.07	-0.83	-0.25	-0.17	-0.19	0.78	-0.04	0.02	-0.24	-0.03	-0.30	-0.07	0.15	-0.12	0.23	0.39	-0.27	-0.38	--	-0.07	0.00	0.55	-0.11	-0.08
Fe	80	80	1.00	0.06	-0.14	-0.16	-0.20	0.15	0.09	-0.17	0.08	0.21	0.58	-0.08	0.06	-0.13	-0.11	0.56	-0.41	0.77	0.62	-0.34	-0.17	--	0.33	0.47	0.99	-0.22	-0.00
K	76	76	76	1.00	-0.44	0.51	0.19	0.32	0.27	0.19	-0.90	-0.09	-0.24	0.21	-0.06	0.17	0.21	-0.42	0.13	0.34	0.05	0.23	0.65	--	-0.00	-0.23	0.45	0.18	0.15
Mg	80	80	80	75	1.00	-0.02	-0.60	-0.20	-0.11	-0.20	0.99	0.25	0.37	-0.17	-0.04	-0.22	-0.15	-0.07	-0.17	0.67	0.36	-0.33	-0.32	--	-0.00	0.19	-0.87	-0.11	-0.16
Na	61	61	61	61	61	1.00	.14	.26	0.17	0.11	-0.95	0.06	-0.11	0.14	0.11	0.17	0.35	-0.76	0.31	-0.09	0.13	0.13	0.55	--	-0.25	-0.12	-0.60	0.33	0.26
Si	79	79	79	76	79	61	1.00	.16	0.10	0.16	-0.22	-0.51	-0.75	0.14	-0.17	0.30	0.12	-0.23	0.28	-0.77	-0.65	-0.02	0.36	--	-0.15	-0.32	-0.57	0.38	-0.06
Ti	79	79	79	75	79	61	78	1.00	0.67	-0.28	0.42	0.16	-0.03	-0.12	0.32	-0.21	-0.05	-0.00	-0.51	0.17	0.28	-0.49	-0.14	--	0.11	0.66	-0.52	-0.41	0.06
Ba	76	76	76	73	76	61	75	75	1.00	-0.25	0.91	0.15	-0.11	-0.07	0.25	-0.19	-0.03	0.03	-0.49	-0.23	0.23	-0.41	-0.17	--	0.25	-0.08	-0.74	-0.34	0.07
Be	75	75	75	73	75	60	75	74	72	1.00	0.96	0.08	0.24	0.32	0.06	0.63	0.57	-0.59	0.53	0.45	-0.07	0.31	0.46	--	0.29	-0.06	-0.52	0.63	0.44
Bi	3	3	3	3	3	3	3	3	3	3	1.00	0.17	--	0.32	0.17	-0.27	-0.34	--	-0.11	--	1.00	-0.74	-0.95	--	0.95	-1.00	--	-0.02	0.14
Ce	56	56	56	56	56	53	55	56	56	56	3	1.00	0.95	0.19	0.99	0.20	0.06	0.10	-0.19	0.80	0.81	-0.15	-0.17	--	0.49	0.70	-0.47	0.04	0.73
Cu	23	23	23	23	23	23	23	23	23	23	1	22	1.00	0.33	0.94	0.35	0.07	1.00	-0.22	0.87	0.89	-0.13	-0.24	--	0.69	0.97	1.00	0.15	0.82
F	80	80	80	76	80	61	79	79	76	75	3	56	23	1.00	0.19	0.75	0.50	-0.43	0.56	0.57	0.05	0.34	0.47	--	0.47	0.05	-0.57	0.73	0.51
La	65	65	65	63	65	58	65	65	64	64	3	55	22	65	1.00	0.20	0.09	-0.19	-0.24	0.79	0.69	-0.21	-0.17	--	0.48	0.54	-0.43	0.00	0.73
Li	80	80	80	76	80	61	79	79	76	75	3	56	23	80	65	1.00	0.53	-0.42	0.59	0.54	0.13	0.27	0.58	--	0.34	0.07	-0.45	0.61	0.53
Mn	80	80	80	76	80	61	79	79	76	75	3	56	23	80	65	80	1.00	-0.64	0.60	0.43	0.04	0.42	0.49	--	0.27	-0.04	-0.66	0.67	0.58
Mo	10	10	10	10	10	9	10	10	10	9	1	8	2	10	9	10	10	1.00	-0.59	1.00	0.02	-0.43	-0.52	--	0.12	0.10	-0.11	-0.21	-0.3[illegible]
Nb	62	62	62	62	62	58	62	62	62	62	3	59	21	62	58	62	62	9	1.00	-0.18	-0.43	0.16	0.76	--	-0.07	-0.33	-0.83	0.46	0.17
Ni	13	13	13	13	13	13	13	13	13	13	1	12	10	13	12	13	13	2	12	1.00	0.92	-0.09	-0.30	--	0.82	0.92	1.00	0.35	0.31
P	44	44	44	44	44	40	44	44	44	43	2	37	21	44	41	44	44	6	40	13	1.00	-0.28	-0.20	--	0.51	0.71	-0.01	-0.06	0.5[illegible]
Pb	40	40	40	40	40	38	40	40	40	40	3	37	10	40	38	40	40	7	40	4	20	1.00	0.38	--	-0.08	-0.14	--	0.43	[illegible]
Rb	75	76	76	74	75	61	76	75	73	72	3	56	23	76	63	76	76	10	62	13	43	40	1.00	--	-0.17	-0.21	-0.90	0.71	0.28
Sn	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	0	1	1	1	1.00	--	--	--	--	--
Sr	80	80	80	75	80	61	79	79	76	75	3	55	23	80	65	80	80	10	62	13	44	40	76	1	1.00	0.29	0.07	0.13	0.52
V	39	39	39	39	39	35	39	39	39	37	2	31	19	39	36	39	39	4	33	11	34	15	38	1	39	1.00	-0.44	[illegible]	0.41
W	6	6	6	6	6	5	6	6	6	5	1	3	2	6	6	6	6	4	4	2	6	1	5	0	6	6	1.00	1.00	-0.39
Y	63	63	63	63	63	58	63	63	63	63	3	55	23	63	58	63	63	7	60	13	40	40	63	1	63	33	2	1.00	0.47
Zn	76	76	76	73	76	61	75	75	72	72	3	56	23	76	63	76	76	10	62	13	44	40	72	1	76	38	6	62	1.00

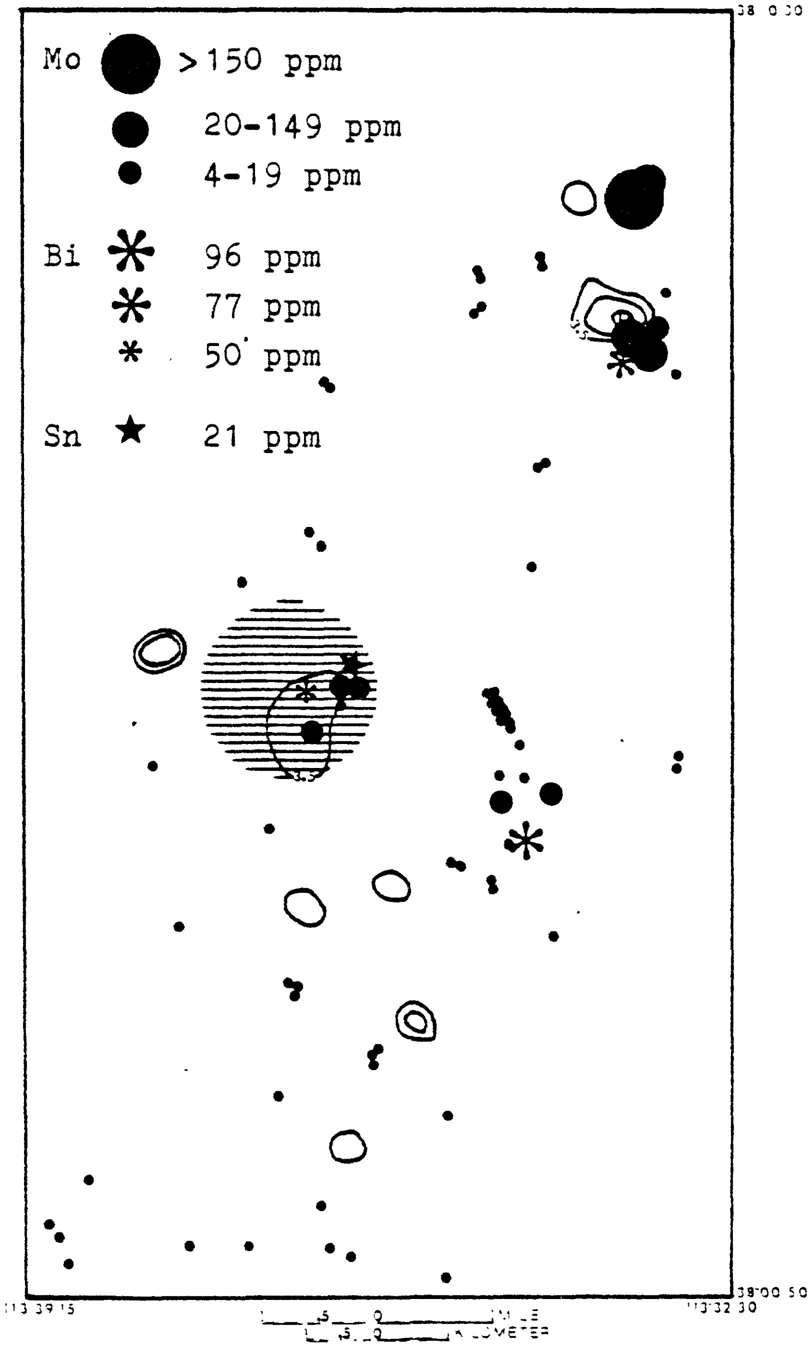

Figure 18.-- Comparison of subjective rock data for Mo, Bi and Sn to the contoured objective rock data for Mo. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are 3.5, 5.0, 10.0 ppm. The small dots are sample site locations.

where samples of extensively iron-stained and silicified rocks were taken, possibly along a fault zone.

The enriched elements Be, Y, Nb, Li, and F all have high values over both the northern and southern anomalies (Figures 19-23). The highest Be value (sample 1040) occurs in highly altered breccia, cemented by purplish-grey jasperoid in the northern anomaly. Other samples containing high values of the enriched elements are from flow-banded, vuggy, and sometimes brecciated rhyolite and from bleached and silicified rocks in highly fractured areas, possibly fault zones.

The behavior of the depleted elements in the subjective samples is similar to that shown by the objective sample contour maps. The highest concentration of depleted elements is usually in areas away from the highest concentration of enriched elements (Figures 24-28). One low value of Si occurs in the northern anomaly. This sample (1039) is from an area of jasperoid within the rhyolite near the center of the northern anomaly. The elements Ba and Sr are concentrated away from the enriched elemental anomalies (Figures 29 and 30).

The two anomalies outlined by the objective rock data are also outlined by the subjective rock data showing the enriched and depleted elemental trends. The anomalous samples outside the northern and southern anomalies represent altered and mineralized rocks along possible faults and fractures.

DISCUSSION

The geochemistry and geology of the study area are very similar to those around known Mo and Sn deposits (Lamarre and Hodder, 1978; Sainsbury, 1969). Most of these deposits are found in leucocratic, alkali granites or hypabyssal rhyolites (Barakso and Gower, 1973; Hosking, 1965a; Sharp, 1978; and Wallace and others, 1978) that commonly are the youngest phase of a larger

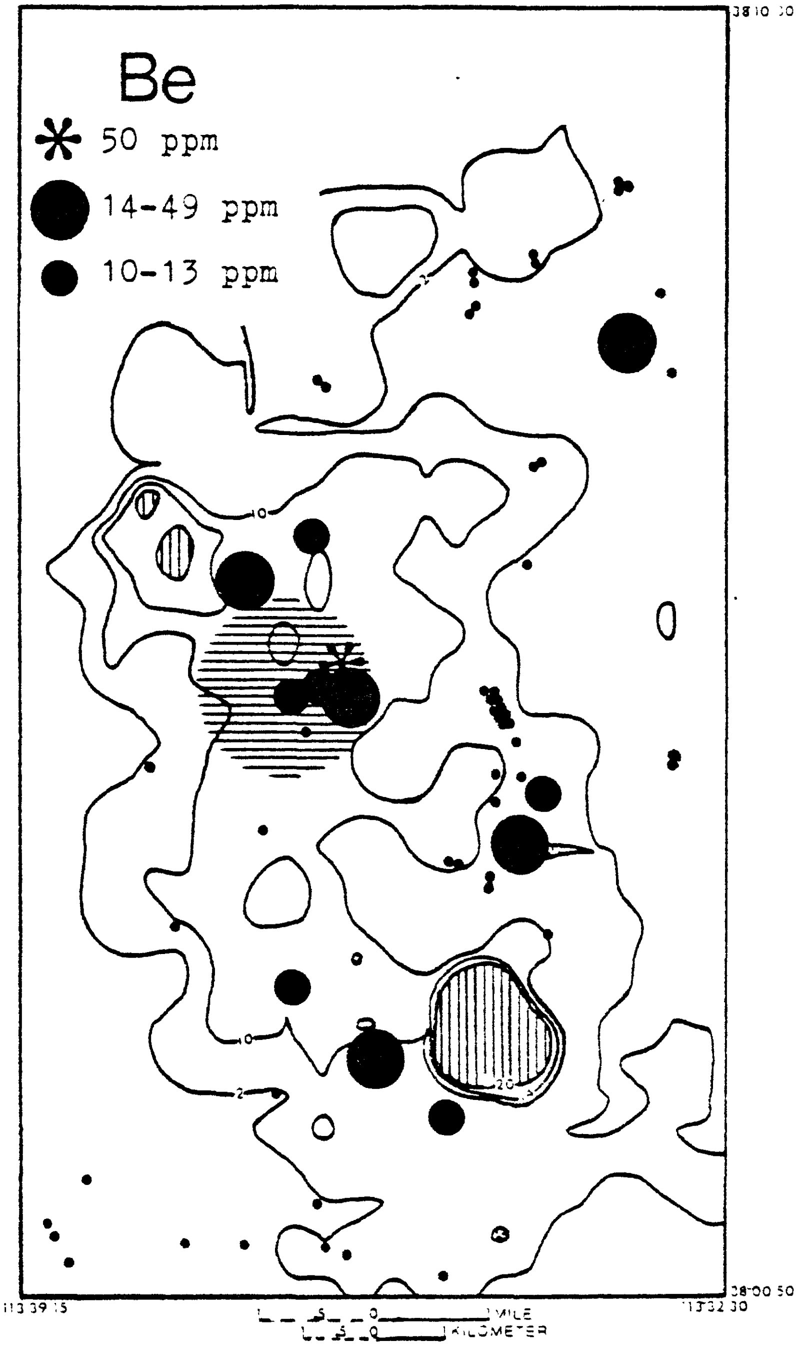

Figure 19.-- Comparison of subjective rock data to contoured objective rock data for Be. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 2, 10, 14, 20 ppm. The small dots are sample site locations.

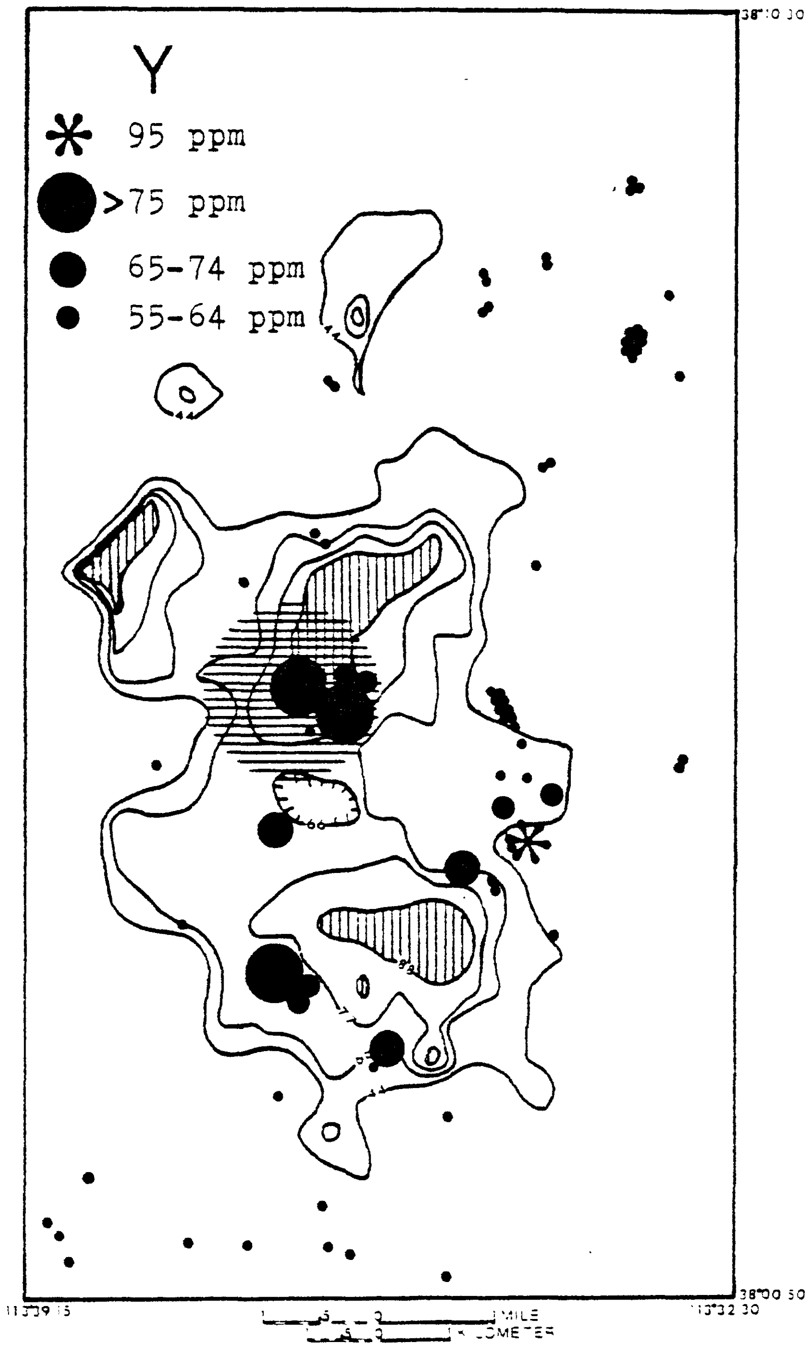

Figure 20-- Comparison of subjective rock data to contoured objective rock data for Y. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 44, 66, 77, 88 ppm. The small dots are sample site locations.

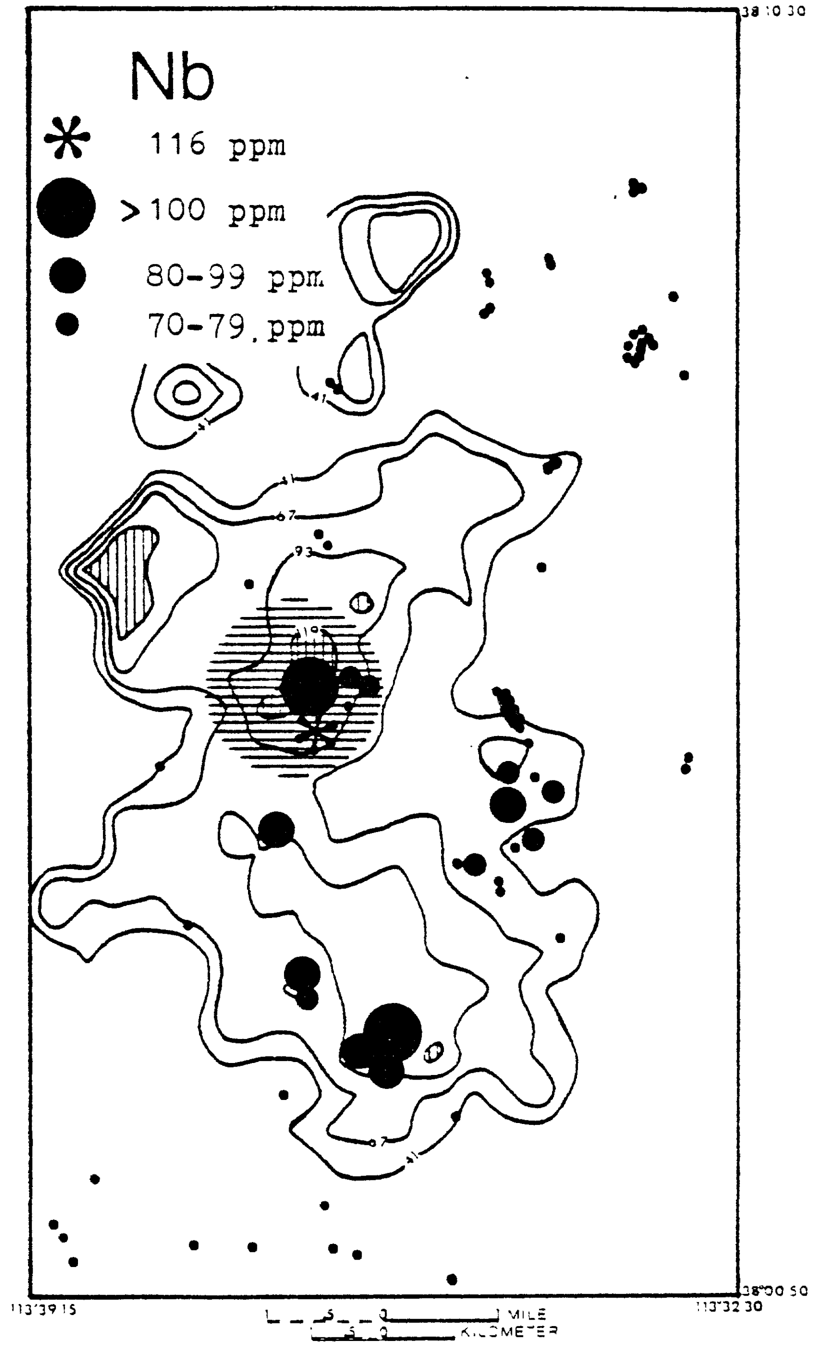

Figure 21.-- Comparison of subjective rock data to contoured objective rock data for Nb. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 41, 67, 93, 119 ppm. The small dots are sample site locations.

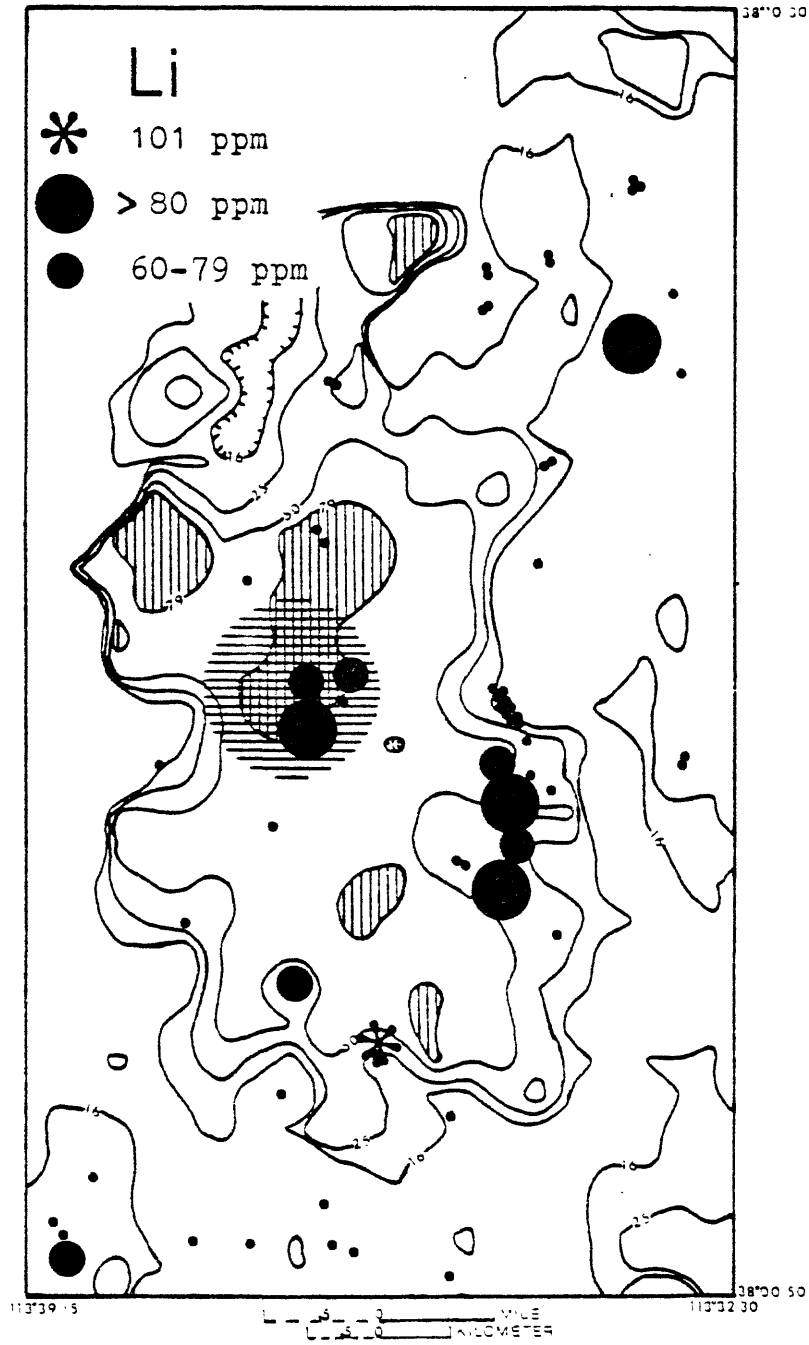

Figure 22.-- Comparison of subjective rock data to contoured objective rock data for Li. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are 16, 25, 50, 79 ppm. The small dots are sample site locations.

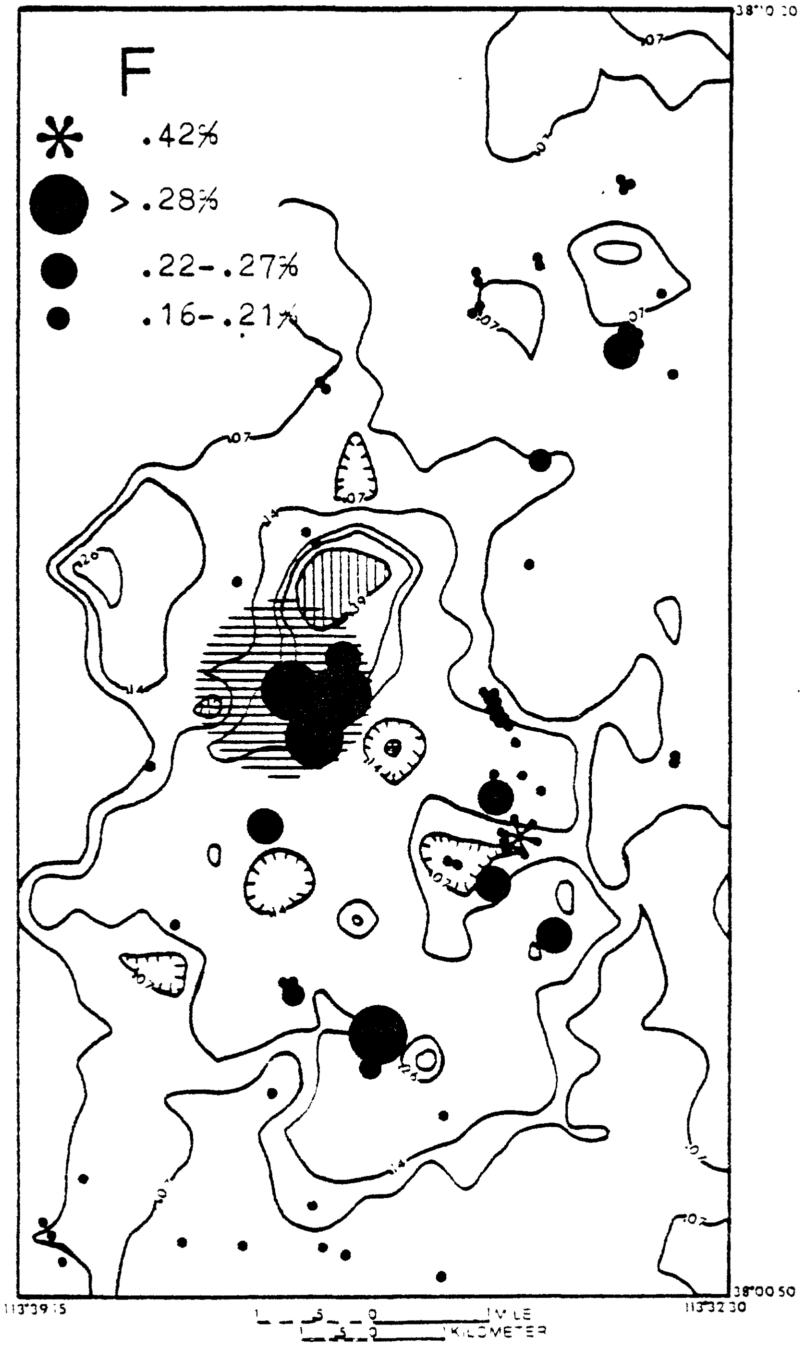

Figure 23.-- Comparison of subjective rock data to contoured objective rock data for F. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are .07, .14, .26, .30, .39 percent. The small dots are sample site locations.

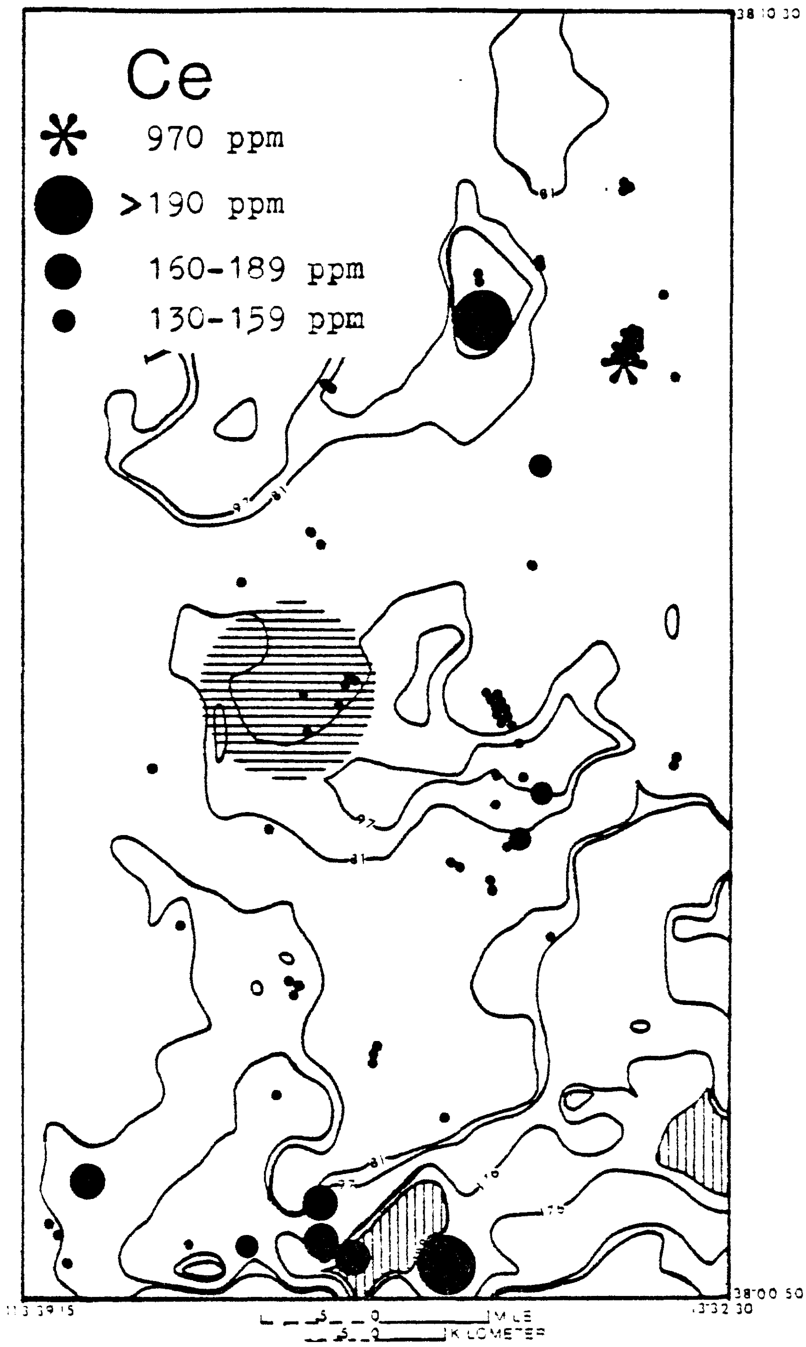

Figure 24.-- Comparison of subjective rock data to contoured objective rock data for Ce. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are 81, 97, 176, 188 ppm. The small dots are sample site locations.

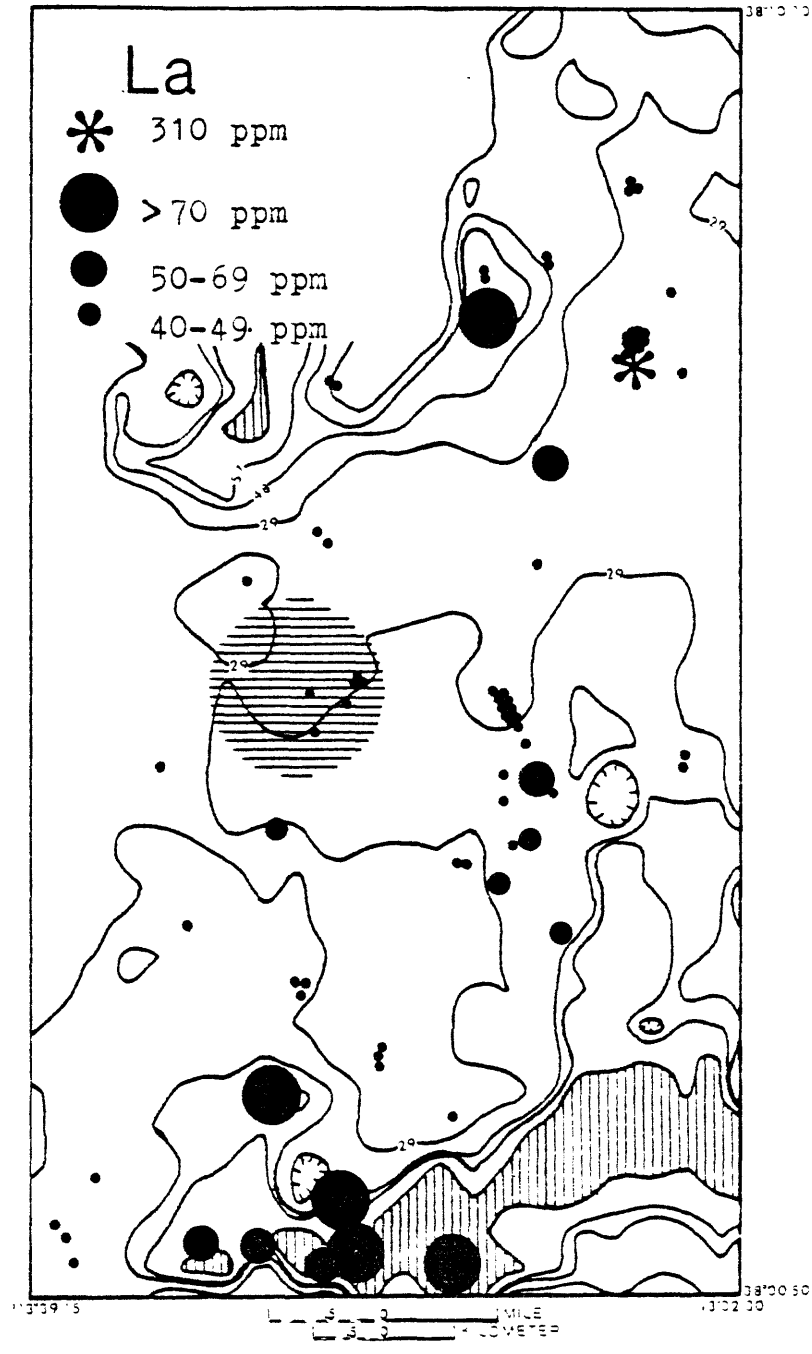

Figure 25.-- Comparison of subjective rock data to contoured objective rock data for La. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are 29, 48, 57, 76 ppm. The small dots are sample site locations.

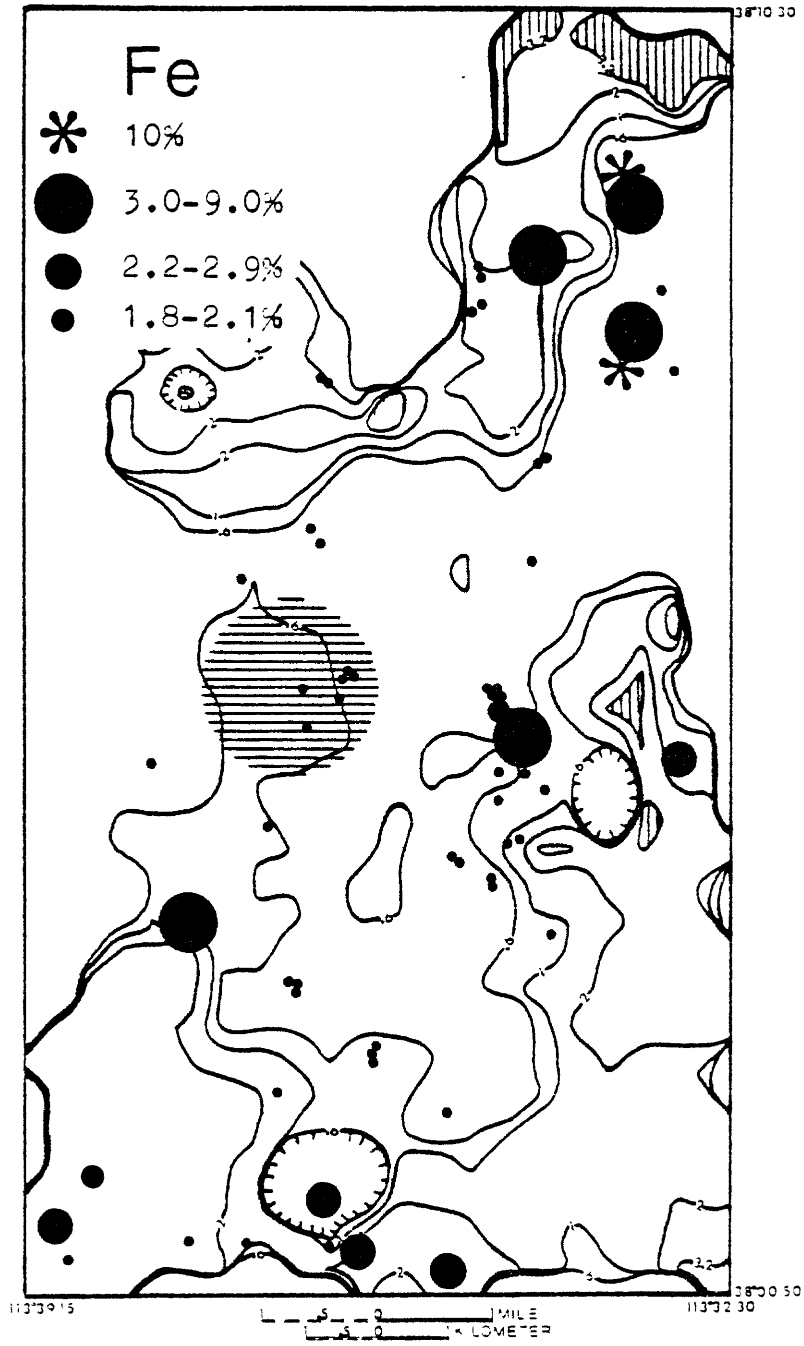

Figure 26.-- Comparison of subjective rock data to contoured objective rock data for Fe. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are .6, 1.0, 2.0, 3.2 percent. The small dots are sample site locations.

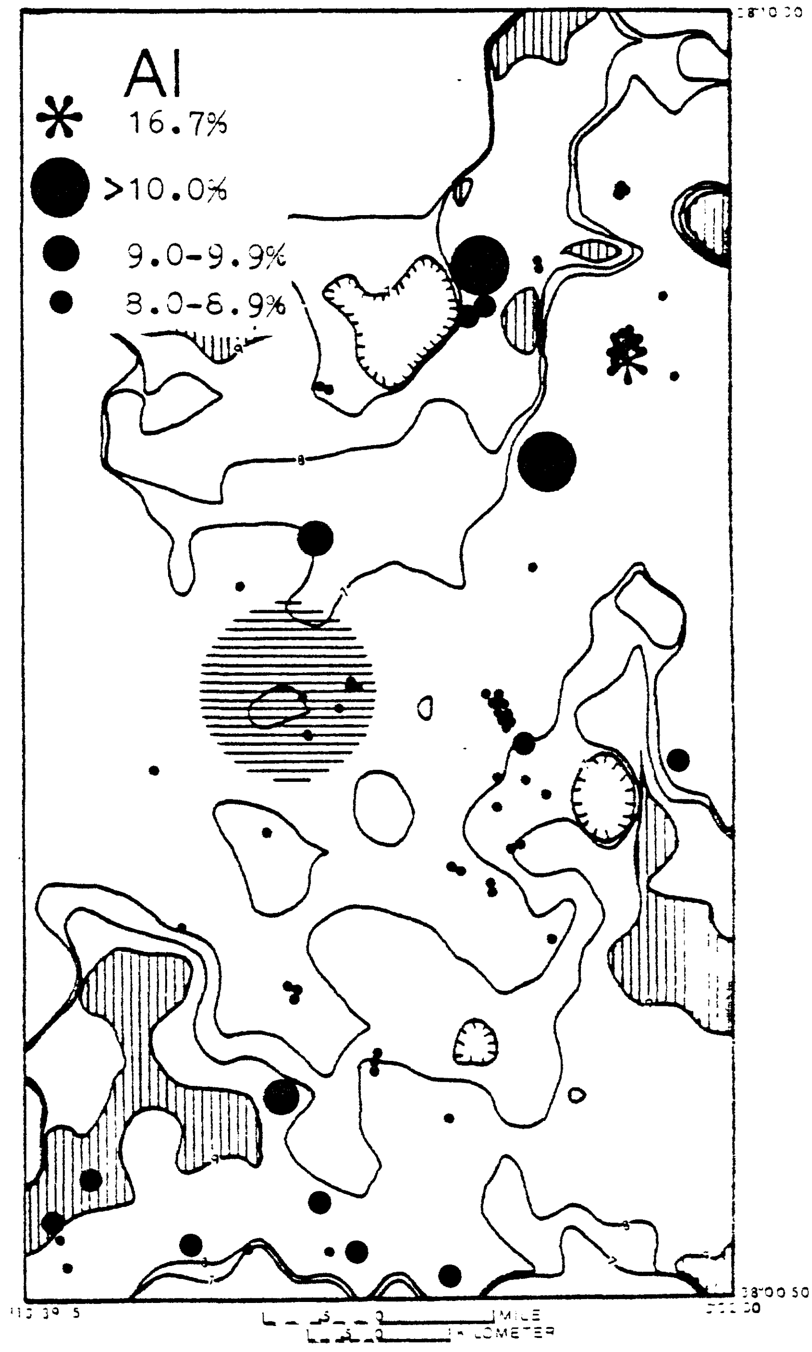

Figure 27.-- Comparison of subjective rock data to contoured objective rock data for Al. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 7, 8, 9 percent. The small dots are sample site locations.

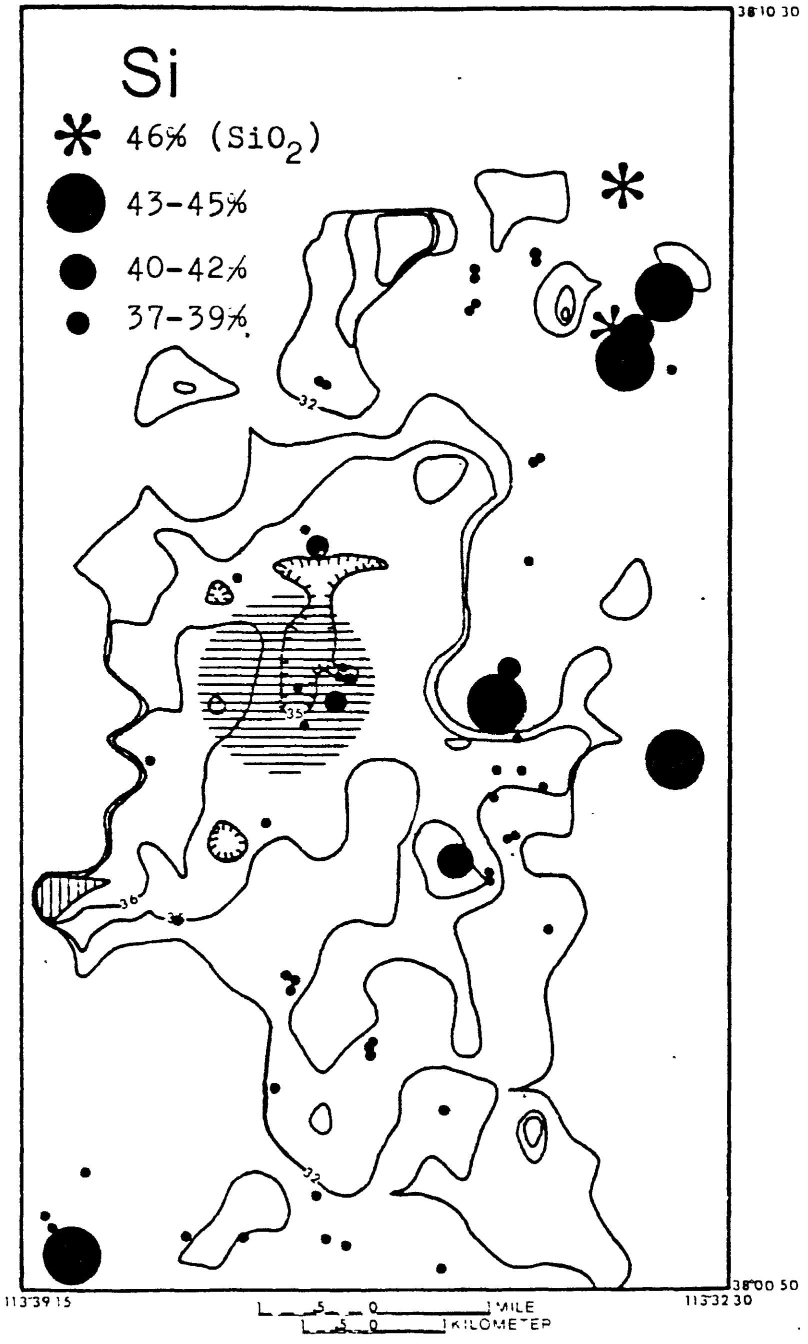

Figure 28.-- Comparison of subjective rock data to contoured objective rock data for Si. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective data. Contour intervals are 32, 35, 36, 38 percent. The small dots are sample site locations.

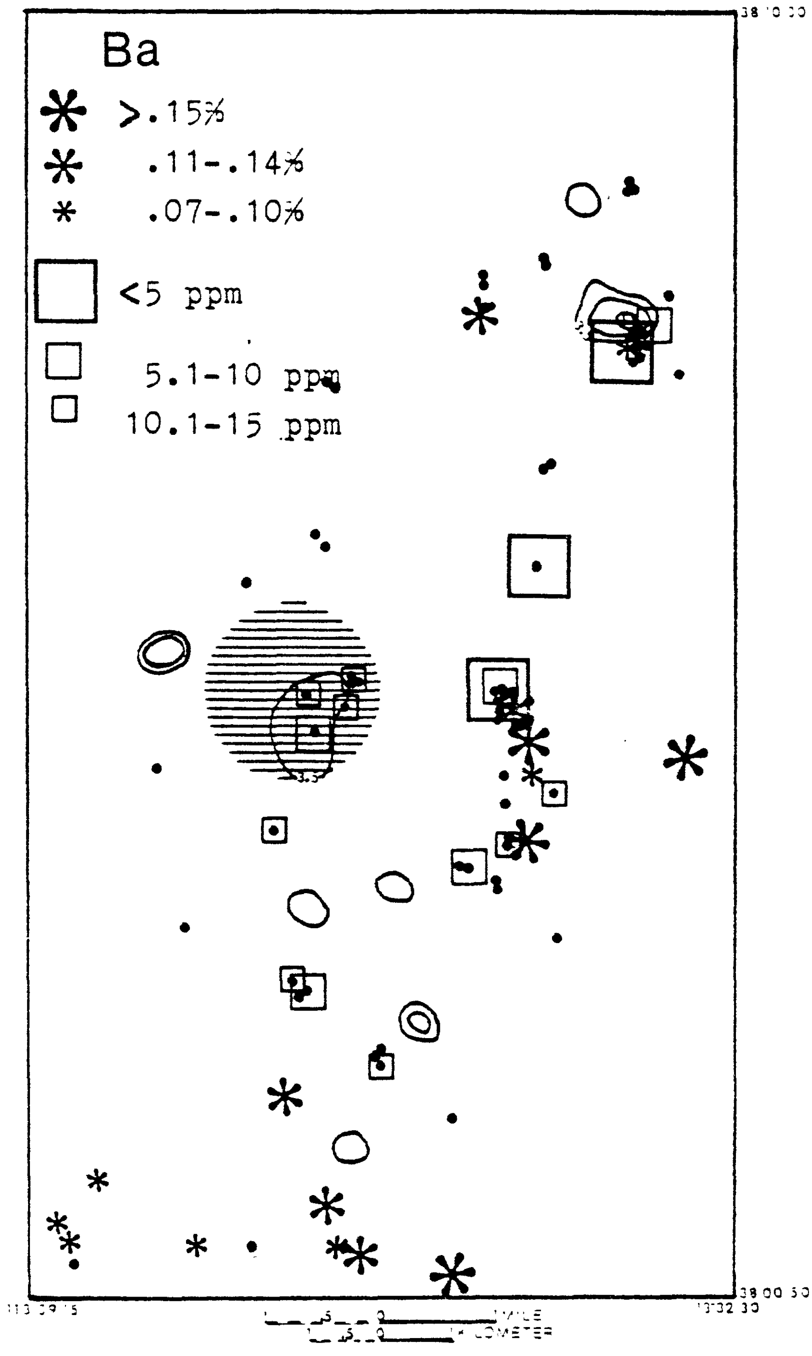

Figure 29.--Comparison of subjective rock data point plots for Ba to contoured objective rock data for Mo. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 3.5, 5.0, 10.0 ppm. The small dots are sample site locations.

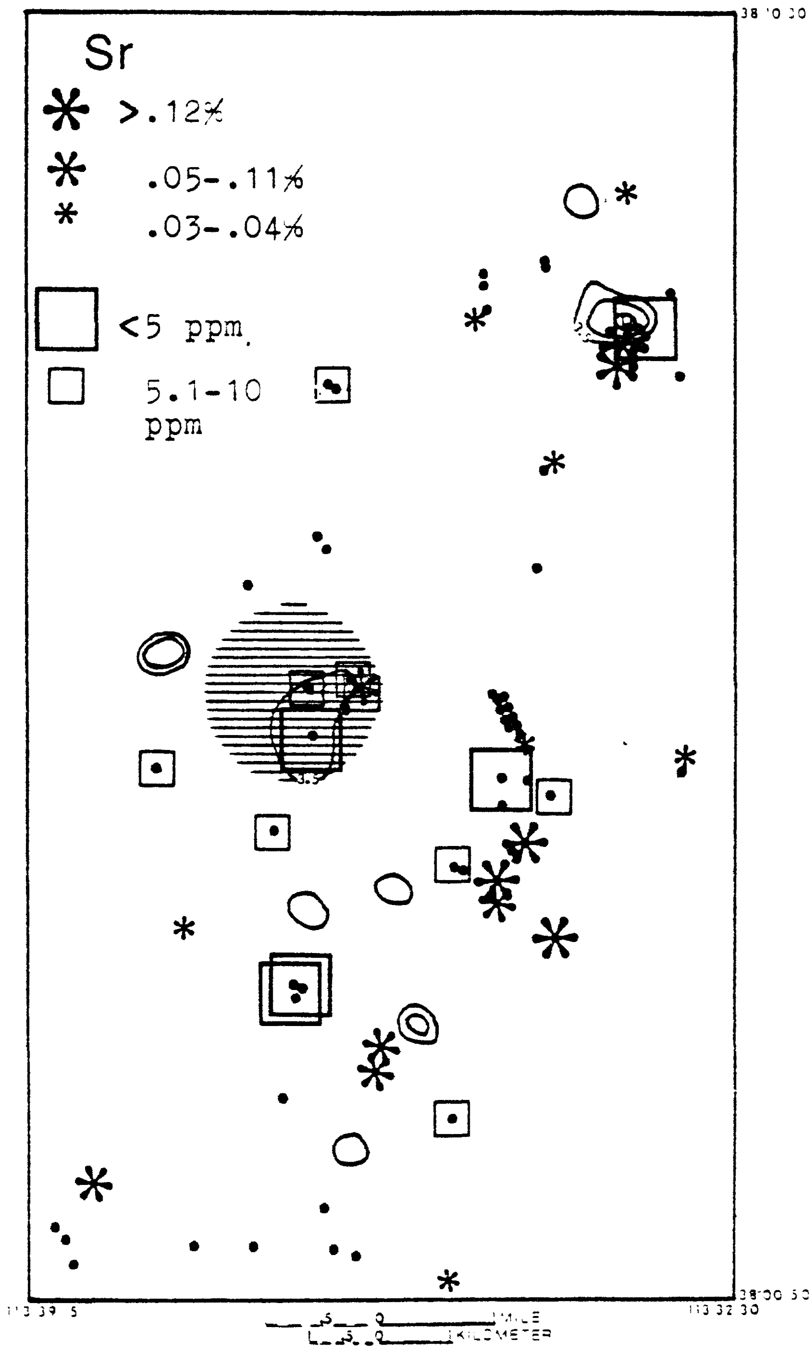

Figure 30.-- Comparison of subjective rock data point plots for Sr to contoured objective rock data for Mo. Horizontal lines show the approximate location of the regional anomaly, while vertical lines show the areas of highest concentration of objective rock data. Contour intervals are 3.5, 5.0, 10.0 ppm. The small dots are sample site locations.

differentiated granitic body. The mineralized rocks tend to form cusps in apical portions of roof zones (Coats and others, 1962; Dagger, 1972; Rattigan, 1963; Stemprok and Sulcek, 1969). Most residual fluids from magmatic differentiation tend to collect in these cusps, greatly concentrating the trace elements (Groves and Taylor, 1973; Groves and McCarthy, 1978; and Sheraton and Black, 1973). The degree of differentiation in the larger parent body determines the Mo, Sn, and other trace element content in the residual fluids (Hosking, 1965b). The presence of mafic mineral phases, especially hornblende and to some degree biotite, greatly affects the concentration of certain elements in the residual fluids (Hesp and Rigby, 1972, and Olade, 1980), because these elements tend to enter the crystal structures of the mafic minerals and become widely dispersed throughout the igneous body with no subsequent concentration of the ore elements (Hosking, 1965a and Haapala, 1977).

The residual fluids found with felsic bodies are generally high in elements such as F, Li, Be, Rb, Nb, Y, Pb, Cu, Zn, Ag, Ge, Mo, Mn, W, and Bi. These same fluids tend to have low concentrations of certain elements such as Fe, Ti, Ba, Sr, Mg, Ce, La, Al, and Zr (Boyle, 1974; Hosking, 1965a; Sainsbury, 1969; VanAlstine, 1976). These residual fluids can be dispersed and imprinted in the wall rocks and existing mineralogy through resurgent boiling and autobrecciation (Phillips, 1973; and Groves and Taylor, 1973). These imprinted elements form halos away from the cusps along thermal gradients (Dagger, 1972; Hosking, 1965a; Olade, 1980). The slower the cooling process, the greater the migration from the cusp (Wallace and others, 1978). Generalized schematics of such halos around Mo and Sn deposits can be found in Dagger (1972). Dunlop and Meyer (1978), Sharp (1978), Sheraton and Black, (1973), Sillitoe and others, (1975), Tischendorf (1973), Wallace and others

(1968). The halos described form an innerhalo of Mo, Sn, W, and Bi with outer halos of base metals, U, Hg, and other trace elements. The inner ore halo shows a general succession of Mo, W, Sn, and Bi halos outward from the cusp. Other elements such as Ga, Y, and Nb generally have broader halos farther from the cusp.

The host rock in the survey area is a leucocratic alkali rhyolite similar to the rocks associated with known Mo and Sn deposits (Best, 1979, and Rowley and others, 1978). The trace element geochemistry in both objective and subjective rock types is seen to show a small Mo, Sn, and Bi anomaly with larger Be, Y, Nb, Li, and F halos, especially in the northern anomaly. The depleted elements such as Ce, La, Fe, and Al have low concentrations over both anomalies. The behavior of W seems aberrant in the study area in that it tends to be concentrated away from high concentrations of the enriched element anomalies. Further study is necessary to understand nonconformity of W to the general trends.

Molybdenum and Sn ores in most major deposits formed shortly after emplacement of the related granitic body (Hesp and Rigby, 1972). The trace element halos in the study area are related to many postvolcanic events. The greatest trace element overprinting and alteration in both objective and subjective rock samples is found in brecciated rhyolite dikes, which cut the main rhyolite flows and other areas of silification and jasperoid formation. The silicified rocks and jasperoid probably reprersent deposition of silica from areas of major rock-forming mineral destruction, as in argillic alteration (Lindsey and Osmonson, 1978). The presence of stubby rhyolite flows and flow domes formed from viscous lavas, commonly believed to have been erupted from high-level magma chambers, is a good indication of apical granitic bodies. Where these rhyolites contain enrichments in certain elements such as

F, Y, Be, Mo, Sn, and Bi and depletions in certain elements such as Fe, Ca, Mg, and Ce, it is possible that the fluids emerged from a highly differentiated source. The large occurrence of lithophysae and vugs indicates high volatile content. The lack of mafic minerals such as biotite and hornblende suggests the proper mineralogy in the postulated parent body is present and that concentration of the ore elements may have occurred. These factors all indicate the conditions were favorable for the formation of a porphyry-type molybdenum deposit at depth.

CONCLUSIONS

Two areas with anomalously high concentrations of certain elements, such as Fe, Be, Bi, Nb, Mo, and Sn and low concentrations of elements such as Fe, Mg, Ca, Ti, Ce, and La were found in the detailed geochemical survey of a regional Mo-Sn anomaly in the southern Wah Wah Mountains. One of these anomalous areas is associated with the regional Mo-Sn anomaly; The other anomalous area is located to the south of the regional anomaly. The geochemistry and geology of these two areas are similar to many known porphyry-type molybdenum and tin deposits.

The unaltered rock type of the northern anomaly is a leucocratic alkali rhyolite, which is postulated to be related to a high-level felsic body. The high concentration of the elements Nb, Be, Mo, Sn, Bi, Li, and F; the low concentrations of the elements Fe, Mg, La, Ce, Ti, and Al; the presence of postvolcanic brecciated rhyolite dikes and other brecciated areas; and the absence of certain mafic minerals such as biotite and hornblende in the rhyolite, all indicate the late-stage, highly differentiated residual fluids may have been emplaced near the northern anomaly. The southern anomaly is related to both rhyolites and rhyolitic ash-flow tuffs. The geochemical halos are similar to the northern anomaly except for lower concentrations in Mo, Sn, Bi, and F. Much of the southern anomaly has been extensively bleached which could be related directly to the postulated residual fluids and circulating meteoric hydrothermal fluids around the cooling felsic body.

The use of the geochemical suites of elements have shown to be very useful in evaluating the degree of differentiation that may have occurred in a magmatic body at depth. A high degree of differentiation within a felsic body is essential to the formation of porphyry-type molybdenum deposits. Geochemical and geologic evidence suggest that the anomalies may be associated with the emplacement of a highly differentiated magma that may contain economic porphyry-type molybdenum deposits.

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Appendix 1--Rock data

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
0001	38 8 39	113 38 8	8.4621	3.440	3.7269	1.40	.7098	2.7	29.01	.4281	926.000
0002	38 8 40	113 38 6	9.2089	3.440	3.4548	1.37	.8678	2.3	28.72	.4207	940.900
0003	38 8 13	113 38 6	8.7208	4.590	5.1697	1.33	1.5672	2.1	28.16	.5657	654.400
0004	38 8 31	113 37 42	9.1856	3.560	2.9316	1.41	.5591	2.7	30.89	.3071	937.000
0005	38 8 5	113 37 36	9.5818	3.170	2.5612	1.40	.8075	2.7	29.58	.2098	934.500
0006	38 7 40	113 37 44	7.2780	.700	.5527	1.96	.0344	3.4	35.80	.0242	35.650
0007	38 7 22	113 38 8	8.6017	3.210	3.0695	1.34	.7065	2.2	28.42	.3355	903.900
0009	38 7 8	113 37 37	8.6403	1.440	2.3588	2.38	.2344	2.8	14.79	.4821	1,312.000
0010	38 8 24	113 37 0	9.1219	2.470	3.3341	1.80	.4145	2.8	28.23	.6562	2,612.000
0011	38 8 3	113 36 49	9.0292	1.450	2.3727	2.30	.1966	3.0	31.50	.5155	1,371.000
0012	38 8 13	113 37 19	9.1489	3.220	3.6921	1.67	.8578	3.2	25.89	.8570	1,538.000
0013	38 7 48	113 36 48	8.9475	.740	1.0050	2.53	.2259	2.1	29.12	.4579	1,214.000
0014	38 7 46	113 37 5	8.4662	1.310	1.9509	2.44	.2045	3.0	32.08	.5114	1,387.000
0016	38 7 12	113 37 9	8.8780	1.710	2.4580	2.26	.2731	2.9	31.23	.5652	1,339.000
0017	38 6 53	113 37 2	6.9094	.640	.5365	1.93	.0654	2.9	35.21	.0513	34.180
0018	38 7 0	113 37 7	7.8440	3.690	4.5512	1.57	1.0810	1.8	29.31	.7118	937.800
0019	38 7 18	113 36 28	8.8081	2.970	3.0645	1.52	.8059	2.7	30.45	.3393	987.700
0020	38 7 20	113 34 30	8.9948	3.490	2.8767	1.42	.7414	2.6	29.59	.3516	890.200
0021	38 6 39	113 34 5	.6333	37.270	.0831	.42	.2426	<.1	3.42	.0269	79.530
0022	38 6 29	113 34 7	.1691	35.770	.0765	.02	4.4955	<.1	1.18	.0054	10.210
0023	38 6 27	113 34 17	.1988	37.890	.0743	.10	2.5667	<.1	.93	.0083	6.400
0024	38 6 23	113 34 15	.1867	37.810	.0713	.04	2.5205	<.1	.24	.0051	3.140
0026	38 7 50	113 36 17	7.0554	.900	.5933	1.83	.3586	3.3	34.96	.0238	17.800
0027	38 8 20	113 36 11	6.9261	1.320	.4996	1.87	.0301	3.5	36.15	.0195	21.640
0028	38 8 48	113 35 40	7.3919	.440	.5280	1.93	.0461	3.5	36.42	.0311	30.120
0029	38 8 37	113 36 51	7.1853	.550	.6198	1.80	.0170	.1	26.79	.0962	468.800
0030	38 8 42	113 36 12	6.9186	1.180	.5399	1.86	.0963	3.2	34.40	.0281	29.330
0032	38 7 35	113 35 23	8.5117	3.520	3.4388	1.42	1.2617	2.6	30.10	.4064	1,088.000
0033	38 7 42	113 35 1	7.7533	.800	.9682	2.44	.3187	2.1	32.08	.1894	1,040.000
0034	38 7 40	113 35 2	7.9790	.860	1.0630	2.41	.2975	2.6	32.83	.2086	1,208.000
0036	38 7 58	113 34 46	8.3509	2.960	3.4629	1.49	.6896	2.6	28.32	.4374	928.100
0038	38 8 3	113 34 24	9.4847	2.880	2.9765	1.40	.8895	2.4	30.77	.3844	975.700
0039	38 8 42	113 34 2	9.0853	3.440	3.0751	1.42	1.0698	2.4	28.75	.3479	858.900
0040	38 8 44	113 34 14	9.1115	2.880	2.9336	1.38	.9170	2.5	30.43	.3717	835.000
0041	38 8 27	113 34 43	8.8963	1.490	1.6628	2.29	.3227	2.8	31.52	.2475	1,359.000
0042	38 8 40	113 34 44	8.3186	2.890	2.6545	1.46	.6014	2.1	29.23	.3069	925.200
0043	38 6 34	113 37 51	7.1284	.730	.5617	1.99	.0197	3.6	35.69	.0245	32.860
0044	38 6 15	113 37 41	7.1254	1.910	.5473	1.86	.0476	3.6	34.77	.0245	34.870
0045	38 6 21	113 38 12	6.1400	.540	.6300	1.89	.0354	3.6	34.72	.0276	49.060
0048	38 7 37	113 33 41	.1757	24.290	.1954	.01	12.8099	<.1	.72	.0036	<.150
0049	38 7 18	113 34 5	.2095	23.470	.1669	.01	13.5252	<.1	.62	.0058	<.150
0050	38 6 58	113 34 27	7.1844	.510	.6495	1.95	.0578	3.3	34.62	.0410	23.880
0051	38 6 52	113 34 53	7.2004	.310	.4803	2.01	.0448	3.1	36.57	.0357	11.220
0052	38 6 51	113 34 33	7.0354	.490	.6492	2.01	.0147	3.6	34.66	.0416	15.060
0053	38 5 59	113 34 26	.2401	24.580	.1088	.02	12.7092	<.1	.42	.0066	5.230

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
0001	1.7400	<50.00	84.70	4.63	5.96	584	47.60	13	441.5	<3.80	14.92
0002	1.8100	<50.00	88.30	11.06	9.48	638	51.16	15	511.3	<3.80	14.76
0003	1.4200	<50.00	92.06	47.40	47.10	640	48.18	12	479.0	<3.80	16.51
0004	1.7900	<50.00	78.54	12.38	9.37	558	49.05	17	334.3	<3.80	10.28
0005	1.8400	<50.00	84.01	9.47	11.90	556	50.37	12	253.4	<3.80	6.87
0006	9.2700	54.81	68.97	<1.50	<2.00	546	17.62	78	761.4	<3.80	111.30
0007	1.7600	<50.00	87.25	13.78	11.58	548	49.68	17	315.6	<3.80	13.50
0009	2.4300	<50.00	183.70	<1.50	23.72	516	70.54	14	490.8	<3.80	23.37
0010	1.9900	<50.00	175.70	10.87	10.97	748	76.31	16	1,860.0	<3.80	22.12
0011	3.0300	<50.00	180.60	1.55	3.36	604	86.08	13	336.9	<3.80	23.54
0012	2.0300	<50.00	143.10	<1.50	<2.00	898	61.64	25	583.7	<3.80	34.87
0013	1.6300	<50.00	155.30	7.02	4.74	476	79.78	9	120.2	<3.80	18.82
0014	2.3600	<50.00	193.60	6.40	<2.00	498	80.33	13	320.5	<3.80	25.32
0016	2.4300	<50.00	184.50	<1.50	<2.00	630	88.32	12	261.3	<3.80	22.64
0017	13.5300	<50.00	52.49	<1.50	<2.00	1,230	21.38	34	531.0	<3.80	64.76
0018	2.4100	<50.00	105.70	75.30	32.97	802	57.59	14	699.6	<3.80	18.65
0019	1.7900	<50.00	93.65	12.03	9.36	664	52.28	38	407.9	<3.80	14.69
0020	1.6800	<50.00	72.09	<1.50	8.94	590	46.25	25	583.4	<3.80	10.81
0021	<.0400	<50.00	<9.00	<1.50	<2.00	74	22.64	3	83.5	<3.80	<3.00
0022	<.0400	<50.00	<9.00	<1.50	<2.00	130	28.33	3	101.6	<3.80	<3.00
0023	<.0400	<50.00	<9.00	<1.50	<2.00	98	23.73	3	77.9	<3.80	<3.00
0024	<.0400	<50.00	<9.00	<1.50	<2.00	104	28.68	3	26.7	<3.80	<3.00
0026	7.1500	<50.00	63.48	6.18	<2.00	696	7.33	61	764.9	<3.80	85.67
0027	6.6600	<50.00	70.81	6.40	<2.00	1,082	24.29	39	631.5	<3.80	59.25
0028	12.2900	<50.00	47.88	5.60	2.37	306	16.83	80	559.8	<3.80	98.92
0029	.6700	<50.00	57.88	2.55	<2.00	1,138	26.20	11	23.3	<3.80	3.36
0030	12.8200	<50.00	50.30	9.36	<2.00	502	13.99	59	434.1	<3.80	82.43
0032	1.7300	<50.00	84.60	<1.50	8.03	646	48.99	21	625.1	<3.80	14.85
0033	1.8200	<50.00	99.16	<1.50	2.38	256	52.10	13	294.7	<3.80	12.69
0034	1.9900	<50.00	99.82	7.69	6.50	436	45.88	14	851.9	<3.80	14.25
0036	1.6600	<50.00	84.48	<1.50	9.70	602	44.87	18	302.4	<3.80	15.94
0038	1.9700	<50.00	79.07	6.99	8.58	802	47.90	20	492.3	<3.80	13.55
0039	1.7100	<50.00	77.94	<1.50	8.31	608	46.45	20	448.3	<3.80	11.40
0040	1.7900	<50.00	72.10	<1.50	8.56	628	45.19	16	352.0	<3.80	12.56
0041	2.2100	<50.00	175.90	3.60	3.34	630	89.53	9	201.5	<3.80	7.54
0042	1.7600	<50.00	86.23	<1.50	6.60	610	45.77	16	282.2	<3.80	14.05
0043	23.7200	<50.00	61.82	<1.50	<2.00	2,280	22.65	119	912.9	<3.80	114.00
0044	20.4700	<50.00	49.98	3.74	<2.00	2,000	25.19	108	870.0	<3.80	111.00
0045	9.1800	<50.00	43.93	6.01	2.59	2,780	18.41	67	858.9	<3.80	126.60
0048	.4000	<50.00	<9.00	<1.50	<2.00	182	16.92	5	143.7	<3.80	<3.00
0049	<.0400	<50.00	<9.00	<1.50	<2.00	168	<1.60	4	92.5	<3.80	<3.00
0050	12.0800	<50.00	84.32	8.55	2.69	1,384	23.23	64	752.7	<3.80	93.04
0051	12.4400	<50.00	77.50	2.33	<2.00	1,004	23.66	69	602.9	<3.80	65.06
0052	9.0700	<50.00	77.64	8.66	2.03	642	25.07	52	728.5	<3.80	77.03
0053	<.0400	<50.00	<9.00	<1.50	<2.00	356	18.27	8	60.6	<3.80	<3.00

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
0001	7.34	976.50	<15.00	90.0	<20.00	567.40	68.27	<26.00	6.53	58.45
0002	8.20	1,076.00	<15.00	110.0	<20.00	598.30	65.30	<26.00	8.90	68.61
0003	26.28	1,127.00	<15.00	100.0	<20.00	457.20	136.60	36.37	10.04	71.48
0004	4.80	879.70	<15.00	130.0	<20.00	562.00	57.70	<26.00	8.58	58.87
0005	5.95	1,013.00	<15.00	130.0	<20.00	588.10	60.83	<26.00	8.92	53.85
0006	<4.00	121.90	40.76	780.0	<20.00	11.22	15.92	<26.00	70.39	39.79
0007	8.28	1,012.00	<15.00	110.0	<20.00	521.30	61.79	<26.00	7.00	63.39
0009	5.23	904.80	<15.00	240.0	<20.00	363.20	<1.80	<26.00	19.58	45.14
0010	9.25	1,762.00	<15.00	160.0	<20.00	602.90	19.74	26.23	16.25	105.70
0011	<4.00	1,095.00	<15.00	240.0	<20.00	388.40	6.60	<26.00	21.17	64.90
0012	8.21	1,952.00	<15.00	100.0	<20.00	610.80	<1.80	33.98	18.39	85.48
0013	<4.00	543.50	<15.00	270.0	<20.00	324.40	<1.80	<26.00	9.88	24.49
0014	5.57	684.40	<15.00	250.0	<20.00	344.00	<1.80	<26.00	20.92	74.78
0016	<4.00	1,213.00	<15.00	210.0	<20.00	430.40	<1.80	<26.00	19.55	60.98
0017	<4.00	41.73	34.35	410.0	<20.00	101.80	<1.80	<26.00	38.79	35.30
0018	118.20	2,105.00	<15.00	80.0	<20.00	598.60	20.10	38.43	13.74	103.90
0019	7.76	992.50	<15.00	140.0	<20.00	521.10	58.33	<26.00	10.01	65.12
0020	5.60	882.00	<15.00	130.0	<20.00	499.90	51.00	<26.00	9.42	39.07
0021	<4.00	<14.00	<15.00	<.1	<20.00	265.20	<1.80	<26.00	4.87	<1.00
0022	<4.00	<14.00	<15.00	<.1	<20.00	170.40	<1.80	<26.00	<.40	<1.00
0023	<4.00	<14.00	<15.00	<.1	<20.00	204.80	<1.80	<26.00	<.40	<1.00
0024	<4.00	<14.00	<15.00	20.0	<20.00	211.50	<1.80	<26.00	<.40	<1.00
0026	6.33	<14.00	29.29	700.0	<20.00	7.64	14.88	<26.00	45.13	25.62
0027	<4.00	64.43	47.74	780.0	<20.00	23.47	24.95	<26.00	80.03	18.96
0028	<4.00	122.60	31.83	610.0	<20.00	10.63	12.25	<26.00	49.32	21.11
0029	<4.00	457.60	<15.00	20.0	<20.00	202.20	35.28	<26.00	5.97	1.37
0030	7.39	16.11	33.51	580.0	<20.00	16.04	23.29	<26.00	46.49	42.45
0032	7.97	1,030.00	<15.00	100.0	<20.00	583.40	58.34	26.48	8.35	58.16
0033	<4.00	104.60	<15.00	200.0	<20.00	160.30	6.95	<26.00	13.22	30.54
0034	6.58	330.90	<15.00	210.0	<20.00	199.00	4.30	<26.00	15.89	42.63
0036	8.08	1,012.00	<15.00	110.0	<20.00	507.90	70.83	32.89	8.17	49.54
0038	4.67	989.60	<15.00	110.0	<20.00	570.00	48.56	<26.00	8.65	63.69
0039	7.07	1,024.00	<15.00	130.0	<20.00	525.10	66.56	<26.00	9.10	42.16
0040	6.83	921.00	<15.00	130.0	<20.00	511.00	57.45	<26.00	8.40	39.80
0041	<4.00	862.00	<15.00	260.0	<20.00	430.50	12.11	<26.00	16.16	34.56
0042	5.94	837.60	<15.00	100.0	<20.00	494.30	44.00	<26.00	8.26	45.73
0043	<4.00	<14.00	39.39	780.0	<20.00	8.31	<1.80	<26.00	88.83	60.58
0044	<4.00	34.78	44.54	750.0	<20.00	42.47	1.94	<26.00	54.65	40.64
0045	6.10	<14.00	45.58	770.0	<20.00	10.05	2.54	<26.00	90.30	60.02
0048	<4.00	<14.00	<15.00	10.0	<20.00	43.33	<1.80	<26.00	<.40	23.09
0049	<4.00	<14.00	<15.00	<.1	<20.00	23.71	<1.80	<26.00	<.40	<1.00
0050	6.33	<14.00	36.61	600.0	<20.00	5.37	<1.80	<26.00	54.56	72.43
0051	<4.00	125.60	32.39	450.0	<20.00	4.56	<1.80	<26.00	45.33	45.25
0052	5.66	14.96	34.74	590.0	<20.00	8.09	2.83	<26.00	55.84	55.23
0053	<4.00	<14.00	<15.00	<.1	<20.00	68.15	<1.80	<26.00	<.40	33.83

Appendix 1--Rock data--continued

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
0055	38 5 45	113 34 2	7.5485	1.010	1.8890	1.49	.3920	3.9	33.09	.2293	1,972.000
0056	38 5 53	113 33 48	6.9114	4.480	.8119	1.50	.2616	2.2	30.72	.0873	824.500
0057	38 5 31	113 34 7	7.4463	.710	1.5017	1.98	.4307	2.0	33.98	.1862	1,872.000
0059	38 6 25	113 35 9	7.1073	.450	.6657	2.00	.1340	3.4	35.25	.0333	10.210
0060	38 6 26	113 35 46	6.9589	.780	.5188	1.91	.0740	3.3	35.22	.0235	28.980
0061	38 7 33	113 34 27	8.8912	3.770	3.3616	1.36	.9019	2.5	29.14	.4178	872.800
0062	38 1 38	113 36 19	8.2195	.240	.0369	1.60	.0126	.2	31.35	.1691	304.200
0063	38 1 39	113 36 21	11.4591	.090	.1033	2.09	.0049	.2	23.73	.0210	74.840
0064	38 6 51	113 35 58	7.2915	.950	.4258	1.98	.0359	3.1	35.80	.0348	41.010
0065	38 7 1	113 35 24	7.2152	.530	.6251	1.95	.0412	3.2	34.81	.0396	31.830
0066	38 2 52	113 36 12	7.2175	.460	.6054	1.95	.0861	3.2	34.63	.0268	11.330
0067	38 2 56	113 36 28	5.9653	.240	.6173	2.35	.0266	1.9	36.67	.0403	14.710
0068	38 3 10	113 36 36	6.8601	.710	.5338	2.03	.0564	3.0	34.39	.0386	10.280
0069	38 3 9	113 36 2	7.5041	.690	.5405	2.00	.0351	3.7	35.99	.0261	26.020
0070	38 2 58	113 35 30	7.1064	.410	.6359	1.95	.0211	3.3	32.84	.0280	11.230
0071	38 2 59	113 35 28	6.7665	.610	.6841	1.93	.0543	3.3	36.36	.0256	22.770
0072	38 3 11	113 35 24	7.3564	.230	.4954	2.19	.0502	2.9	35.23	.0254	11.680
0073	38 3 27	113 35 13	7.2848	.470	.6269	1.88	.0230	3.6	35.87	.0265	10.610
0074	38 3 34	113 35 27	6.8806	.450	.6206	1.94	.0451	3.3	35.23	.0231	21.580
0075	38 3 46	113 35 5	6.8084	.550	.2673	2.60	.0574	3.6	36.72	.0116	9.290
0076	38 3 31	113 34 45	6.9210	.250	.6686	2.10	.0303	3.1	32.79	.0495	8.820
0080	38 3 39	113 34 5	6.0026	2.230	.7004	.66	.6669	.9	32.94	.0638	351.600
0082	38 4 12	113 35 3	6.6456	.250	.5661	2.72	.0386	1.8	37.11	.0479	25.080
0083	38 3 47	113 34 18	6.0661	1.860	.6926	1.08	.4197	.8	33.48	.0667	201.800
0084	38 4 3	113 34 10	9.0722	3.120	3.5351	1.33	1.1232	2.5	28.74	.3583	864.500
0086	38 4 18	113 34 19	8.8327	.560	3.0726	1.46	.8150	.3	32.07	.2307	769.800
0087	38 4 19	113 34 22	8.4401	2.330	3.3279	1.48	.7001	.2	29.37	.2762	730.100
0088	38 4 30	113 34 46	7.0728	.240	.5316	2.10	.0981	3.1	35.28	.0361	32.060
0089	38 4 40	113 34 34	7.2515	.400	.6846	1.99	.0322	3.1	34.96	.0511	15.810
0090	38 4 52	113 34 32	6.7090	.320	.5136	2.22	.0516	2.4	35.50	.0496	17.210
0093	38 5 30	113 34 37	.2768	23.620	.1617	.01	15.5201	<.1	.84	.0112	3.460
0094	38 5 32	113 34 36	.2951	23.880	.1492	.01	14.0240	<.1	.60	.0120	6.490
0095	38 5 27	113 36 18	7.0090	.850	.6413	1.95	.1470	2.9	34.01	.0234	34.470
0096	38 5 17	113 36 40	7.0979	.460	.6935	1.96	.0522	3.0	36.00	.0269	24.240
0097	38 5 10	113 36 10	6.7699	.430	.6820	2.03	.0858	2.8	35.83	.0468	9.750
0098	38 5 3	113 35 34	6.8925	.640	.5525	2.03	.0185	3.2	35.57	.0379	23.370
0099	38 5 45	113 36 1	6.7404	.820	.6134	1.84	.0497	3.1	35.64	.0259	17.290
0101	38 5 29	113 35 45	6.8864	.370	.4581	2.11	.0105	3.0	35.92	.0359	14.100
0103	38 5 43	113 35 27	6.3401	.400	.5472	2.09	.0380	2.9	36.72	.0261	12.700
0104	38 5 35	113 35 12	7.7880	.440	.5191	2.30	.0292	3.2	35.08	.0348	21.700
0106	38 5 42	113 35 1	6.6880	.240	.5701	2.17	.0242	2.9	36.14	.0436	19.880
0107	38 7 11	113 35 9	6.8025	.170	.6348	2.03	.0127	2.9	37.64	.0422	24.070
0110	38 8 14	113 33 48	.2767	.290	.0837	.03	.0266	<.1	46.55	.0422	33.390
0111	38 9 47	113 34 3	8.4209	1.940	1.6175	1.64	.4950	2.5	29.65	.3280	1,025.000
0112	38 10 20	113 33 49	9.1927	2.590	2.9911	1.32	1.3226	2.6	30.12	.3137	925.400

Appendix 1--Rock data--continued

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
0055	1.0700	<50.00	107.60	15.16	<2.00	248	56.41	12	400.9	<3.80	17.27
0056	1.5900	<50.00	54.24	7.87	<2.00	282	31.39	5	684.9	<3.80	5.26
0057	1.3000	<50.00	96.59	12.99	<2.00	262	48.99	13	497.4	<3.80	15.10
0059	8.2400	<50.00	77.74	2.01	<2.00	1,056	20.54	59	632.0	<3.80	65.48
0060	9.7000	<50.00	64.39	6.41	<2.00	3,920	23.87	78	723.2	<3.80	96.25
0061	1.8600	<50.00	86.56	10.11	9.03	592	42.20	24	536.6	<3.80	16.20
0062	1.2000	<50.00	37.03	17.50	<2.00	944	21.08	2	13.6	<3.80	11.77
0063	2.2800	<50.00	<9.00	4.80	<2.00	1,470	18.49	2	24.6	<3.80	89.46
0064	13.0800	<50.00	37.87	6.96	<2.00	590	18.27	75	515.1	<3.80	60.03
0065	10.2300	<50.00	79.99	6.52	<2.00	868	22.65	38	658.2	<3.80	89.53
0066	8.4600	<50.00	60.18	5.36	<2.00	2,800	22.68	85	536.3	<3.80	115.40
0067	12.8800	<50.00	83.58	6.80	<2.00	272	26.17	29	256.6	<3.80	63.53
0068	7.0900	<50.00	102.00	5.32	<2.00	1,964	34.50	46	413.3	<3.80	52.47
0069	20.1400	<50.00	73.92	5.93	2.27	394	24.34	72	1,392.0	<3.80	122.00
0070	9.8500	53.48	64.63	9.98	2.18	3,360	23.80	88	477.7	5.05	123.60
0071	8.4800	<50.00	85.55	<1.50	<2.00	3,120	34.77	82	456.7	<3.80	108.40
0072	9.3800	<50.00	69.84	5.88	<2.00	1,332	29.58	75	501.0	<3.80	106.40
0073	11.3000	<50.00	64.23	5.73	<2.00	3,100	25.73	83	648.5	<3.80	122.40
0074	9.3100	<50.00	63.94	8.91	2.22	612	19.82	56	799.8	<3.80	93.97
0075	5.7700	<50.00	63.86	6.85	<2.00	398	25.83	59	472.0	<3.80	33.43
0076	10.8800	<50.00	84.35	9.28	<2.00	1,390	22.52	55	391.0	<3.80	83.03
0080	13.1100	<50.00	73.18	4.83	<2.00	4,760	29.81	34	468.5	<3.80	59.82
0082	10.3300	<50.00	49.54	7.25	<2.00	230	28.94	32	389.4	<3.80	69.37
0083	10.6800	<50.00	79.05	7.40	<2.00	2,980	42.48	33	406.9	<3.80	61.48
0084	1.8900	<50.00	84.58	8.16	9.44	658	42.02	10	288.7	<3.80	14.60
0086	1.6700	<50.00	64.11	10.47	22.14	752	34.67	43	517.3	<3.80	4.87
0087	1.6300	<50.00	64.00	14.14	14.15	688	36.51	39	630.1	<3.80	48.56
0088	11.9900	<50.00	90.82	7.13	<2.00	570	27.49	49	649.3	<3.80	38.63
0089	9.4800	<50.00	96.18	7.08	<2.00	3,020	32.40	63	394.0	<3.80	78.78
0090	9.5600	<50.00	106.20	<1.50	<2.00	2,300	51.77	49	337.4	<3.80	80.42
0093	<.0400	<50.00	<9.00	<1.50	<2.00	162	<1.60	3	89.0	<3.80	<3.00
0094	<.0400	<50.00	<9.00	<1.50	<2.00	174	<1.60	5	103.2	<3.80	<3.00
0095	11.2300	69.38	63.07	7.00	2.76	3,080	22.83	85	713.7	3.97	116.00
0096	11.5000	59.62	65.38	6.97	2.32	2,960	23.63	111	643.0	3.87	122.90
0097	10.5200	51.89	97.73	7.45	2.09	2,640	40.70	55	562.7	<3.80	81.93
0098	8.4800	<50.00	93.42	5.62	<2.00	514	41.49	49	470.2	<3.80	58.59
0099	9.8500	54.30	63.98	9.52	<2.00	3,920	20.94	80	677.2	<3.80	127.40
0101	10.3800	<50.00	99.76	8.93	2.12	2,760	37.65	61	534.3	<3.80	46.27
0103	11.3400	<50.00	100.60	9.34	<2.00	2,200	30.75	63	638.7	<3.80	45.74
0104	9.2100	<50.00	104.10	<1.50	<2.00	2,000	45.06	65	481.2	<3.80	37.05
0106	9.8000	<50.00	93.11	8.60	<2.00	974	29.18	78	518.8	<3.80	71.33
0107	8.1200	<50.00	71.51	<1.50	<2.00	374	25.86	35	517.4	<3.80	85.26
0110	.2800	<50.00	25.53	4.79	<2.00	102	8.52	45	50.8	5.36	<3.00
0111	1.9900	<50.00	95.03	<1.50	<2.00	628	52.91	12	443.4	<3.80	13.79
0112	1.7300	<50.00	75.06	5.76	8.67	664	44.40	15	379.7	<3.80	9.84

Appendix 1--Rock data--continued

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
0055	<4.00	618.40	<15.00	80.0	<20.00	525.10	30.20	<26.00	8.05	43.75
0056	<4.00	254.70	<15.00	140.0	<20.00	242.30	9.51	<26.00	10.66	22.26
0057	<4.00	497.50	<15.00	150.0	<20.00	335.30	21.96	<26.00	6.47	50.14
0059	<4.00	51.72	37.76	630.0	<20.00	2.20	3.19	<26.00	75.60	32.68
0060	<4.00	39.77	41.70	750.0	<20.00	6.70	3.27	<26.00	102.30	34.12
0061	13.39	843.40	<15.00	130.0	<20.00	511.70	57.31	30.47	8.49	74.67
0062	<4.00	152.40	<15.00	40.0	<20.00	210.10	15.53	<26.00	10.80	2.69
0063	<4.00	96.94	22.52	40.0	<20.00	162.30	11.97	<26.00	13.49	3.18
0064	<4.00	47.64	18.38	560.0	<20.00	25.31	<1.80	<26.00	36.61	31.30
0065	6.20	40.73	40.23	540.0	<20.00	7.13	9.58	<26.00	66.12	58.35
0066	<4.00	<14.00	35.08	750.0	<20.00	5.62	<1.80	<26.00	96.18	30.55
0067	<4.00	45.79	37.52	470.0	<20.00	6.95	<1.80	<26.00	59.44	30.86
0068	<4.00	31.98	27.97	530.0	<20.00	10.04	<1.80	<26.00	75.09	24.57
0069	<4.00	<14.00	48.64	900.0	<20.00	34.19	<1.80	<26.00	74.77	59.28
0070	5.25	<14.00	39.89	780.0	<20.00	2.73	<1.80	<26.00	95.23	80.58
0071	<4.00	<14.00	37.43	660.0	<20.00	5.85	<1.80	<26.00	96.76	58.97
0072	<4.00	18.34	34.94	830.0	<20.00	5.59	5.30	<26.00	58.70	37.59
0073	<4.00	<14.00	37.84	780.0	<20.00	4.34	<1.80	<26.00	107.60	42.27
0074	5.54	<14.00	41.41	790.0	<20.00	7.65	19.23	<26.00	95.55	52.13
0075	<4.00	61.62	32.23	800.0	<20.00	17.88	<1.80	<26.00	105.20	20.61
0076	5.75	<14.00	37.92	560.0	<20.00	4.07	<1.80	<26.00	47.73	59.01
0080	6.18	47.46	20.98	200.0	<20.00	1,621.00	6.00	<26.00	50.74	67.32
0082	<4.00	288.50	22.90	520.0	<20.00	5.66	<1.80	<26.00	49.28	43.15
0083	<4.00	30.10	18.44	390.0	<20.00	924.00	3.44	<26.00	44.15	60.24
0084	13.81	866.40	<15.00	120.0	<20.00	569.00	66.26	31.60	7.34	71.40
0086	10.51	727.60	<15.00	160.0	<20.00	58.08	64.18	<26.00	7.50	43.87
0087	10.18	747.70	<15.00	130.0	<20.00	83.85	59.07	<26.00	8.40	50.65
0088	8.77	<14.00	23.51	600.0	<20.00	4.28	2.54	<26.00	60.66	54.85
0089	<4.00	<14.00	25.61	530.0	<20.00	4.43	<1.80	<26.00	69.76	45.04
0090	<4.00	<14.00	34.60	560.0	<20.00	6.63	<1.80	<26.00	48.63	54.68
0093	<4.00	<14.00	<15.00	<.1	<20.00	26.58	<1.80	<26.00	<.40	10.66
0094	<4.00	<14.00	<15.00	<.1	<20.00	32.76	<1.80	<26.00	<.40	10.85
0095	<4.00	190.20	49.23	660.0	40.26	11.70	<1.80	<26.00	90.31	62.60
0096	<4.00	191.50	44.94	740.0	35.35	6.82	<1.80	<26.00	86.47	42.22
0097	<4.00	164.40	37.73	510.0	29.90	4.15	<1.80	<26.00	72.82	38.31
0098	<4.00	28.57	28.10	570.0	<20.00	9.07	11.31	<26.00	58.00	23.22
0099	<4.00	21.34	53.32	680.0	26.30	9.18	<1.80	<26.00	96.12	47.23
0101	<4.00	138.80	37.20	570.0	<20.00	3.30	<1.80	<26.00	74.98	30.50
0103	<4.00	81.06	46.93	580.0	<20.00	5.00	3.68	<26.00	64.75	50.33
0104	<4.00	<14.00	<15.00	540.0	<20.00	6.01	3.65	<26.00	73.32	38.33
0106	<4.00	66.46	47.48	570.0	<20.00	4.86	3.07	<26.00	59.09	57.07
0107	<4.00	44.59	41.42	510.0	<20.00	3.84	17.98	<26.00	56.78	27.90
0110	<4.00	100.10	<15.00	10.0	<20.00	33.33	5.58	<26.00	2.40	.50
0111	<4.00	592.00	<15.00	100.0	<20.00	379.40	3.14	<26.00	18.35	54.12
0112	6.50	1,070.00	<15.00	100.0	<20.00	567.40	48.13	<26.00	10.55	60.92

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
0113	38 10 14	113 34 17	9.1176	3.190	3.2475	1.38	1.5102	2.4	28.10	.3794	915.900
0114	38 9 49	113 34 30	8.9990	3.530	3.4414	1.34	1.1723	2.4	28.31	.3038	855.400
0115	38 10 5	113 33 16	6.9834	3.400	4.7408	.19	2.9852	2.9	25.50	.3945	211.800
0116	38 9 32	113 34 20	8.2424	3.740	3.2854	1.34	1.0734	2.5	28.40	.4014	847.500
0117	38 9 25	113 33 19	.1385	24.520	.2891	.02	13.5585	<.1	.01	.0035	<.150
0118	38 9 13	113 33 21	.2414	23.080	.2439	.02	12.8250	<.1	2.40	.0060	2.220
0119	38 9 21	113 33 45	9.8832	.290	2.8615	.32	.0373	.2	30.75	.3363	369.900
0120	38 8 52	113 32 32	13.2280	.110	.1231	2.46	.0066	.2	18.95	.3939	206.600
0121	38 9 24	113 32 39	.3304	22.830	.2756	<.01	12.8002	<.1	1.68	.0098	4.000
0122	38 9 3	113 34 28	7.2850	.720	.4295	2.05	.0765	3.1	35.69	.0654	50.590
0123	38 9 6	113 34 46	9.3272	2.900	2.9450	1.44	.8730	2.6	30.51	.2563	936.900
0124	38 9 8	113 34 0	6.9912	.610	.6836	2.26	.0720	2.9	32.96	.1278	124.400
0127	38 1 10	113 32 39	9.1015	1.170	3.2456	.78	.8813	2.5	12.83	.3188	873.800
0128	38 1 17	113 33 28	8.0497	3.090	2.3618	1.61	.9854	2.5	30.04	.1960	788.000
0129	38 1 25	113 33 24	9.2820	2.240	2.5563	1.52	.4722	2.6	29.16	.2141	1,026.000
0130	38 1 50	113 33 18	8.5292	.970	1.6764	2.50	.3274	2.8	30.46	.4057	1,391.000
0131	38 1 40	113 32 40	8.5626	1.190	1.8401	2.37	.2919	2.9	30.85	.4603	1,396.000
0132	38 2 22	113 33 15	8.6230	.810	1.7448	2.57	.4096	2.3	30.44	.4367	1,411.000
0133	38 2 2	113 32 42	8.7525	24.450	1.8925	.02	.5512	2.3	.01	.4357	1,111.000
0136	38 2 36	113 32 51	8.6058	1.130	1.7655	2.36	.2802	2.8	31.87	.4571	1,204.000
0137	38 3 7	113 32 35	9.0392	2.730	3.2426	1.47	.5089	2.6	31.00	.3922	900.900
0138	38 3 17	113 32 35	9.5959	2.680	2.1086	1.40	.5162	2.6	30.94	.1962	957.200
0139	38 3 6	113 33 27	8.7419	3.210	2.4568	1.46	.5065	2.5	28.54	.2236	877.900
0140	38 3 7	113 33 27	9.0883	2.920	2.3808	1.48	.5378	2.4	29.69	.2525	894.800
0141	38 3 21	113 33 32	9.5483	1.420	2.1679	2.21	.2648	3.1	30.08	.5421	1,568.000
0142	38 3 58	113 33 27	8.7641	1.930	2.5012	2.11	.3095	3.0	29.59	.5983	1,287.000
0143	38 3 57	113 33 2	9.1933	3.240	3.1394	1.41	.5175	2.6	29.56	.3852	898.600
0144	38 4 15	113 33 9	9.1049	3.520	2.6188	1.47	.4445	2.4	29.15	.2692	978.200
0145	38 4 18	113 33 2	9.1388	4.440	5.1071	1.12	1.0046	2.9	27.95	.7255	1,158.000
0146	38 4 14	113 32 46	8.1906	2.920	1.9717	2.14	.6305	.3	28.54	.3323	600.700
0147	38 4 35	113 33 6	9.3403	2.840	2.8246	1.50	.9103	2.8	30.38	.2847	946.500
0148	38 5 0	113 33 6	9.0117	3.130	3.0418	1.43	1.0602	2.6	28.54	.2556	953.800
0149	38 5 5	113 32 50	.8828	30.840	.5513	<.01	1.0757	<.1	9.46	.0344	24.250
0150	38 5 23	113 33 11	8.9535	2.970	3.3945	1.40	1.0277	2.3	28.29	.3633	926.800
0151	38 5 21	113 33 10	8.4742	2.710	3.3284	1.45	1.0521	2.3	29.71	.3513	888.900
0152	38 5 26	113 32 39	.1570	24.610	.0703	<.01	14.7296	<.1	.79	.0016	<.150
0153	38 5 56	113 33 12	8.6206	2.090	3.2533	1.46	.5511	2.4	29.27	.3733	884.400
0154	38 6 21	113 33 36	8.0579	.290	.5468	1.99	.3865	1.4	35.94	.0649	1,309.000
0157	38 6 31	113 32 51	.1369	39.990	.1294	<.01	.4802	<.1	2.26	.0046	4.370
0158	38 6 52	113 33 4	.0640	25.020	.0436	<.01	13.2787	<.1	.26	<.0002	<.150
0159	38 6 47	113 32 43	.3118	34.790	.1775	.19	3.6669	<.1	1.97	.0109	19.310
0160	38 7 58	113 32 38	.1186	24.490	.0344	<.01	13.7858	<.1	.21	.0011	<.150
0161	38 8 14	113 32 55	.1490	.440	.1692	2.09	13.7344	<.1	34.75	.0032	2.810
0162	38 8 30	113 33 0	4.0307	1.320	.0231	.77	.0682	.1	35.85	.0152	192.700
0163	38 8 28	113 33 0	9.5910	.110	.0259	1.91	.0604	.3	25.57	.0111	65.410

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
0113	1.7700	<50.00	86.70	13.59	10.88	776	49.26	22	442.6	<3.80	13.61
0114	1.6900	<50.00	78.09	<1.50	11.37	870	37.73	16	401.5	<3.80	11.66
0115	.9600	<50.00	46.36	186.10	47.78	674	32.57	50	980.9	<3.80	10.56
0116	1.6025	<50.00	84.53	<1.50	9.70	756	45.46	15	636.0	<3.80	15.01
0117	<.0400	<50.00	<9.00	432.80	<2.00	122	18.29	3	249.4	<3.80	<3.00
0118	<.0400	<50.00	<9.00	<1.50	<2.00	210	22.01	3	618.2	<3.80	<3.00
0119	1.4700	<50.00	69.23	38.58	4.88	306	28.45	17	23.3	<3.80	12.67
0120	.2600	<50.00	37.41	14.39	<2.00	612	33.52	2	12.6	<3.80	17.62
0121	<.0400	<50.00	<9.00	<1.50	<2.00	208	25.64	4	162.1	<3.80	<3.00
0122	7.8200	<50.00	65.65	6.91	<2.00	218	38.86	34	374.3	<3.80	32.13
0123	1.8300	<50.00	83.45	6.54	4.77	536	49.60	12	254.5	<3.80	9.85
0124	5.9300	<50.00	94.73	8.74	<2.00	276	42.84	26	355.8	4.94	39.48
0127	1.8500	<50.00	86.21	7.00	8.35	802	42.06	49	215.4	<3.80	13.57
0128	1.5900	<50.00	79.03	<1.50	22.70	656	37.50	27	693.3	<3.80	8.06
0129	1.8700	<50.00	89.77	4.77	9.39	674	42.55	36	295.9	<3.80	5.61
0130	2.4800	<50.00	195.10	2.08	2.67	592	78.57	16	375.6	<3.80	24.43
0131	2.4600	<50.00	137.50	1.98	2.47	578	75.76	18	373.2	<3.80	24.67
0132	2.1500	<50.00	183.90	3.02	4.21	518	75.33	15	271.6	<3.80	23.68
0133	2.1500	<50.00	192.60	2.92	2.69	744	79.33	22	391.6	<3.80	24.42
0136	2.6400	<50.00	185.80	2.32	2.65	662	76.26	17	332.8	<3.80	24.02
0137	1.9900	<50.00	85.65	10.48	9.16	688	41.59	13	188.4	<3.80	15.89
0138	1.9600	<50.00	82.74	4.05	10.00	702	50.49	12	409.1	<3.80	6.71
0139	1.8000	<50.00	85.92	2.79	9.05	656	40.58	11	352.6	<3.80	9.45
0140	1.7600	<50.00	82.06	5.87	8.52	654	48.68	12	338.4	<3.80	8.15
0141	2.6700	<50.00	200.30	<1.50	<2.00	548	94.89	15	309.6	<3.80	21.42
0142	2.4100	<50.00	170.70	4.76	3.21	606	69.12	13	304.4	<3.80	24.05
0143	1.8700	<50.00	79.81	<1.50	7.69	750	48.05	15	533.0	<3.80	11.61
0144	1.7900	<50.00	86.31	6.16	9.15	720	49.25	13	630.8	<3.80	9.11
0145	1.3000	<50.00	116.70	9.40	31.38	786	52.88	17	529.1	<3.80	14.97
0146	2.2600	<50.00	152.30	4.39	<2.00	990	61.90	22	369.7	<3.80	21.83
0147	1.8000	<50.00	83.16	5.59	9.20	294	49.40	19	474.7	<3.80	10.37
0148	1.7500	<50.00	80.51	1.97	10.09	744	40.20	15	275.4	<3.80	11.19
0149	<.0400	<50.00	<9.00	<1.50	<2.00	360	21.20	8	396.2	<3.80	<3.00
0150	1.8200	<50.00	73.50	13.38	11.57	850	47.00	22	233.7	<3.80	18.00
0151	1.7800	<50.00	79.99	14.35	9.39	822	39.14	20	251.7	<3.80	14.99
0152	<.0400	<50.00	<9.00	<1.50	<2.00	162	<1.60	3	191.4	<3.80	<3.00
0153	2.2800	<50.00	81.44	12.95	7.86	692	39.40	23	222.5	<3.80	15.62
0154	2.0200	<50.00	69.39	8.95	<2.00	560	27.39	5	649.8	<3.80	10.62
0157	<.0400	<50.00	<9.00	<1.50	<2.00	128	22.94	3	231.7	<3.80	<3.00
0158	<.0400	<50.00	<9.00	<1.50	<2.00	78	<1.60	2	29.4	<3.80	<3.00
0159	<.0400	<50.00	<9.00	<1.50	<2.00	124	19.03	2	96.9	<3.80	<3.00
0160	<.0400	<50.00	<9.00	<1.50	<2.00	88	<1.60	3	15.9	<3.80	<3.00
0161	<.0400	<50.00	<9.00	76.58	<2.00	144	19.94	3	95.4	<3.80	<3.00
0162	1.6900	<50.00	<9.00	9.67	<2.00	276	3.91	3	19.6	<3.80	28.64
0163	1.8200	<50.00	<9.00	12.16	<2.00	594	6.80	3	32.2	<3.80	22.50

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
0113	9.76	1,157.00	<15.00	100.0	<20.00	601.10	55.16	<26.00	8.62	76.30
0114	9.72	858.40	<15.00	110.0	<20.00	526.90	54.70	<26.00	5.36	52.53
0115	55.56	869.20	<15.00	20.0	<20.00	381.10	88.20	34.93	4.36	61.43
0116	8.15	930.80	<15.00	100.0	<20.00	493.50	57.87	31.03	9.06	47.29
0117	254.70	<14.00	<15.00	<.1	<20.00	20.62	20.37	<26.00	<.40	<1.00
0118	<4.00	366.60	<15.00	10.0	<20.00	47.86	<1.80	<26.00	5.25	<1.00
0119	16.74	754.00	<15.00	40.0	<20.00	109.70	93.20	27.32	2.87	28.70
0120	<4.00	608.30	<15.00	20.0	<20.00	425.90	50.24	<26.00	4.80	.50
0121	42.86	<14.00	<15.00	<.1	<20.00	67.48	23.29	<26.00	<.40	28.45
0122	<4.00	73.80	<15.00	360.0	<20.00	16.78	8.64	<26.00	13.80	22.64
0123	5.48	932.90	<15.00	130.0	<20.00	566.10	63.78	<26.00	7.91	55.89
0124	6.20	43.93	15.83	290.0	<20.00	31.12	<1.80	<26.00	19.88	48.90
0127	9.47	848.10	<15.00	170.0	<20.00	521.90	59.97	30.04	7.60	56.54
0128	7.33	755.70	<15.00	150.0	<20.00	494.10	39.63	<26.00	8.92	45.41
0129	6.48	813.10	<15.00	150.0	<20.00	513.50	55.42	<26.00	7.33	33.42
0130	<4.00	515.20	<15.00	280.0	<20.00	285.30	<1.80	<26.00	17.61	47.21
0131	<4.00	623.80	<15.00	260.0	<20.00	357.50	<1.80	<26.00	16.79	48.43
0132	<4.00	524.60	<15.00	270.0	<20.00	177.90	<1.80	<26.00	14.92	61.26
0133	<4.00	645.70	<15.00	280.0	<20.00	262.40	<1.80	<26.00	14.73	45.13
0136	<4.00	603.50	<15.00	280.0	<20.00	322.00	<1.80	<26.00	16.36	47.92
0137	8.28	816.90	<15.00	120.0	<20.00	508.40	70.35	26.71	7.34	45.20
0138	4.24	950.00	<15.00	130.0	<20.00	536.30	48.08	<26.00	8.63	36.40
0139	7.89	794.10	<15.00	130.0	<20.00	521.20	49.84	<26.00	9.62	42.02
0140	4.74	931.20	<15.00	130.0	<20.00	542.90	47.70	<26.00	8.14	36.56
0141	<4.00	990.10	<15.00	230.0	<20.00	408.10	<1.80	<26.00	21.19	48.45
0142	<4.00	1,084.00	<15.00	200.0	<20.00	439.90	<1.80	<26.00	16.14	55.83
0143	5.87	987.70	<15.00	130.0	<20.00	542.10	64.33	<26.00	5.67	48.64
0144	5.12	901.40	<15.00	140.0	<20.00	488.40	51.34	<26.00	10.51	43.74
0145	28.20	2,017.00	<15.00	70.0	<20.00	1,167.00	78.02	44.09	8.60	79.21
0146	4.86	501.70	<15.00	190.0	<20.00	98.98	6.36	<26.00	20.20	47.38
0147	6.12	923.80	<15.00	140.0	<20.00	510.70	64.35	<26.00	8.02	47.26
0148	9.30	880.40	<15.00	130.0	<20.00	554.30	70.08	26.87	7.29	56.83
0149	<4.00	442.60	<15.00	<.1	<20.00	101.40	<1.80	<26.00	11.98	32.00
0150	9.98	1,220.00	<15.00	110.0	<20.00	534.60	70.35	<26.00	12.12	67.96
0151	12.09	1,019.00	<15.00	110.0	<20.00	519.50	62.31	<26.00	6.14	67.32
0152	<4.00	<14.00	<15.00	20.0	<20.00	32.75	<1.80	<26.00	<.40	24.98
0153	8.69	925.10	<15.00	120.0	<20.00	455.30	47.30	<26.00	4.93	61.10
0154	<4.00	53.36	<15.00	160.0	<20.00	165.40	2.63	<26.00	7.19	38.15
0157	<4.00	<14.00	<15.00	20.0	<20.00	140.20	20.10	<26.00	4.61	<1.00
0158	<4.00	<14.00	<15.00	<.1	<20.00	29.55	<1.80	<26.00	<.40	<1.00
0159	<4.00	<14.00	<15.00	20.0	<20.00	129.30	<1.80	<26.00	<.40	23.17
0160	<4.00	<14.00	<15.00	<.1	<20.00	19.16	<1.80	<26.00	<.40	<1.00
0161	149.30	<14.00	<15.00	20.0	<20.00	19.12	<1.80	<26.00	<.40	28.32
0162	<4.00	52.37	<15.00	20.0	<20.00	126.00	4.09	<26.00	2.40	1.27
0163	<4.00	96.13	<15.00	70.0	<20.00	191.00	7.52	<26.00	1.12	2.43

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
0164	38 8 13	113 33 30	.3086	7.680	.4297	.01	2.9657	<.1	32.71	.0062	28.820
0165	38 7 54	113 33 25	.1112	23.510	.2834	<.01	13.2086	<.1	.43	.0017	9.600
0166	38 8 28	113 33 25	11.6020	.480	.9929	1.60	.0259	.6	18.88	.0876	370.600
0167	38 7 24	113 33 36	.0765	24.700	.0517	.01	12.9890	<.1	.07	<.0002	<.150
0168	38 7 21	113 32 58	.0808	24.830	.0430	<.01	13.2224	<.1	.05	<.0002	<.150
0201	38 1 41	113 33 40	8.4785	1.090	1.5609	2.84	.3658	3.2	32.62	.3519	1,251.000
0202	38 2 5	113 33 35	8.1216	2.740	1.5897	2.49	.1664	3.4	30.10	.3947	1,310.000
0203	38 2 32	113 33 50	9.1860	.890	1.6409	2.50	.2785	2.8	30.74	.4136	1,367.000
0204	38 2 53	113 34 0	8.4696	3.120	2.9863	1.42	.4047	2.3	29.33	.3355	946.700
0205	38 3 14	113 33 50	8.7109	1.270	2.2272	2.32	.1745	3.0	27.98	.4920	1,342.000
0206	38 3 20	113 34 11	6.5695	1.300	.6295	2.20	.0456	2.9	34.75	.0467	11.390
0207	38 2 53	113 34 43	7.0796	.630	.6771	2.25	.0758	2.7	35.20	.0490	19.960
0208	38 2 45	113 34 38	6.8378	.300	.1710	3.05	.0203	1.8	36.10	.0472	10.850
0209	38 2 34	113 34 27	7.1461	.390	.6068	2.10	.0557	2.9	31.41	.0495	17.210
0210	38 1 46	113 34 51	7.4351	1.440	1.7417	2.30	.3665	2.8	33.02	.4075	857.100
0211	38 1 50	113 34 25	8.2510	.430	1.6220	2.88	.2899	3.3	37.51	.4358	1,383.000
0212	38 1 41	113 34 25	8.0098	.500	1.6824	2.33	.1933	2.9	33.13	.4403	1,386.000
0213	38 1 9	113 33 44	5.1715	2.990	.3420	3.17	.0770	<.1	34.76	.0577	312.300
0215	38 1 15	113 34 12	7.8837	.400	1.8219	2.33	.0807	3.4	32.97	.4859	1,416.000
0216	38 1 0	113 35 8	8.8149	1.790	2.1726	2.44	.2352	2.8	31.49	.4530	1,393.000
0217	38 1 0	113 35 6	7.7953	1.440	2.0447	2.37	.2864	2.6	31.91	.4362	1,302.000
0219	0 0 0	113 34 56	8.9087	.090	.1838	1.86	.0076	.2	27.68	.0302	23.390
0220	38 2 22	113 35 43	8.8661	.100	.9952	.34	.0086	.1	34.74	.0655	92.760
0221	38 2 13	113 35 35	9.0804	.090	.6240	2.00	.0114	.1	25.83	.0332	14.710
0222	38 2 14	113 35 57	7.3565	.590	.6383	2.07	.0469	3.4	36.04	.0321	23.080
0223	38 2 1	113 36 11	6.7596	.450	.6411	2.05	.0440	3.1	35.55	.0490	14.930
0224	38 1 32	113 35 14	8.6757	1.450	2.0409	2.32	.3584	2.7	31.46	.5845	1,325.000
0225	38 1 32	113 35 33	8.0428	.590	1.9246	2.37	.2507	2.7	31.85	.4644	1,538.000
0226	38 0 55	113 39 5	8.6057	2.980	3.0518	1.55	.6225	2.6	28.94	.3447	895.200
0227	38 1 24	113 39 1	9.2521	2.420	2.8321	1.54	.9540	2.6	31.06	.2699	925.700
0228	38 1 26	113 39 0	9.1699	2.180	2.4598	1.56	1.0151	2.6	29.70	.1908	897.600
0229	38 1 4	113 38 44	8.7619	2.120	3.2223	1.75	1.0845	2.7	31.78	.4129	881.600
0230	38 1 11	113 38 24	8.1694	2.500	2.9855	1.50	.9293	2.5	29.18	.3206	898.200
0231	38 1 34	113 38 20	8.9848	2.480	3.0150	1.52	.5057	2.5	31.28	.2866	939.000
0232	38 1 44	113 38 21	9.1151	2.370	3.1308	1.51	.7427	2.5	30.25	.3782	909.100
0233	38 1 48	113 38 44	9.0252	2.720	3.0915	1.49	1.1736	2.3	29.01	.3081	875.400
0234	38 2 21	113 38 30	8.9641	2.910	2.9900	1.43	1.3626	2.3	30.09	.3350	908.700
0235	38 2 36	113 38 54	8.4854	2.980	2.9997	1.47	.6813	1.9	29.01	.3439	979.200
0236	38 2 23	113 37 53	9.1786	3.390	2.8390	1.39	.8932	2.6	29.27	.2756	911.200
0237	38 2 54	113 38 0	9.0419	2.220	3.4008	1.51	.6998	2.1	30.05	.4377	913.400
0238	38 2 58	113 38 26	8.8898	2.760	2.8829	1.58	.5365	2.3	29.42	.3079	977.000
0239	38 3 9	113 37 58	9.0802	3.340	2.6906	1.59	.5697	2.2	30.16	.3159	998.500
0240	38 3 28	113 38 22	9.3773	2.830	2.5479	1.42	1.2574	2.6	31.35	.2987	951.700
0241	38 3 48	113 38 39	7.4609	.090	.0426	.03	.0147	.1	39.68	.0471	17.790
0242	38 1 48	113 37 44	8.3907	2.270	2.9043	1.44	.7170	2.3	29.01	.3428	959.200

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
0164	.5900	<50.00	<9.00	<1.50	3.01	150	<1.60	23	637.2	16.63	<3.00
0165	<.0400	<50.00	<9.00	<1.50	<2.00	98	20.09	3	157.4	<3.80	<3.00
0166	1.2100	<50.00	30.84	15.93	2.04	2,620	21.91	6	24.4	<3.80	8.77
0167	<.0400	<50.00	<9.00	<1.50	<2.00	124	<1.60	3	38.5	<3.80	<3.00
0168	<.0400	<50.00	<9.00	<1.50	<2.00	76	<1.60	3	40.3	<3.80	<3.00
0201	2.2800	<50.00	187.00	.50	3.47	574	89.38	20	237.2	<3.80	20.00
0202	2.2400	<50.00	167.20	2.59	3.43	668	83.17	12	344.5	<3.80	20.68
0203	2.3900	<50.00	199.50	4.59	4.63	488	94.13	13	134.6	<3.80	20.93
0204	1.8700	<50.00	86.56	2.34	8.84	676	49.10	11	319.8	<3.80	13.16
0205	2.8800	<50.00	182.20	6.89	3.35	468	77.29	10	621.7	<3.80	27.06
0206	11.1100	<50.00	99.83	9.18	<2.00	2,060	38.14	54	523.3	<3.80	67.68
0207	94.3900	54.15	99.65	10.94	<2.00	3,260	35.22	53	417.9	<3.80	79.93
0208	19.0100	<50.00	59.23	<1.50	<2.00	110	29.44	50	45.8	<3.80	72.08
0209	10.5900	<50.00	72.32	<1.50	<2.00	2,460	36.16	66	600.7	<3.80	84.18
0210	2.2300	<50.00	175.40	2.05	12.85	404	69.85	7	85.5	<3.80	24.12
0211	2.3800	<50.00	191.30	2.41	2.57	360	86.98	12	51.7	<3.80	23.97
0212	2.8000	<50.00	171.50	<1.50	<2.00	410	79.64	15	73.2	<3.80	22.81
0213	1.3400	<50.00	51.80	<1.50	<2.00	104	27.70	19	762.1	<3.80	10.32
0215	2.1800	<50.00	171.70	1.92	<2.00	244	65.12	7	39.2	<3.80	23.61
0216	2.0900	<50.00	181.90	1.66	2.96	566	84.80	15	528.4	<3.80	22.67
0217	2.2700	<50.00	180.20	<1.50	6.75	832	80.39	17	415.5	<3.80	23.33
0219	3.6300	<50.00	<9.00	8.63	<2.00	2,440	<1.60	14	50.8	<3.80	36.33
0220	.5700	<50.00	12.29	7.18	<2.00	1,598	15.93	7	49.1	<3.80	97.29
0221	3.0100	<50.00	<9.00	6.29	<2.00	2,480	<1.60	28	205.6	<3.80	57.29
0222	11.6900	<50.00	96.95	6.02	<2.00	2,040	38.64	60	853.7	<3.80	62.48
0223	10.4000	<50.00	100.90	<1.50	<2.00	2,820	39.90	57	538.1	4.42	80.53
0224	2.4600	<50.00	193.90	<1.50	3.72	556	85.17	19	537.0	<3.80	25.96
0225	2.3900	<50.00	189.10	<1.50	4.03	376	83.03	11	231.4	<3.80	25.88
0226	1.8400	<50.00	83.18	8.30	9.60	550	41.10	15	441.4	<3.80	14.84
0227	1.8500	<50.00	79.05	9.86	8.10	642	48.79	21	514.0	<3.80	9.89
0228	1.8300	<50.00	87.69	8.35	11.38	532	50.32	22	372.6	<3.80	6.66
0229	1.9000	<50.00	78.73	7.36	3.11	688	38.63	28	309.4	<3.80	16.37
0230	1.7900	<50.00	91.95	3.31	8.55	692	50.42	30	419.0	<3.80	14.25
0231	1.8800	<50.00	85.66	8.01	8.00	738	42.09	12	317.7	<3.80	12.36
0232	1.8500	<50.00	84.66	8.40	6.00	774	41.07	17	440.1	<3.80	15.13
0233	1.8300	<50.00	83.81	6.79	10.96	578	40.50	24	408.0	<3.80	13.33
0234	1.7000	<50.00	76.27	4.76	9.27	766	46.73	16	415.4	<3.80	11.44
0235	1.7400	<50.00	72.36	5.89	9.48	514	44.30	12	454.9	<3.80	12.12
0236	1.7500	<50.00	79.37	7.09	8.14	644	47.72	13	393.1	<3.80	8.70
0237	1.7500	<50.00	82.00	8.42	9.71	662	47.24	16	382.8	<3.80	13.70
0238	1.7700	<50.00	78.30	4.58	8.63	688	46.94	17	376.2	<3.80	10.84
0239	1.7300	<50.00	76.10	5.84	7.85	630	46.41	10	369.0	<3.80	11.12
0240	1.9100	<50.00	80.62	12.58	11.82	660	49.54	14	506.3	<3.80	9.05
0241	1.6600	<50.00	<9.00	8.24	<2.00	1,774	<1.60	11	22.1	<3.80	84.00
0242	1.9600	<50.00	92.60	4.80	10.02	792	49.96	15	344.3	<3.80	14.31

Appendix 1--Rock data--continued

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
0164	4.97	169.30	<15.00	10.0	<20.00	23.47	13.47	<26.00	2.34	2.70
0165	<4.00	<14.00	<15.00	10.0	<20.00	21.05	<1.80	<26.00	<.40	22.00
0166	<4.00	396.40	<15.00	140.0	<20.00	170.20	110.80	<26.00	1.98	<1.00
0167	<4.00	<14.00	<15.00	10.0	<20.00	17.06	<1.80	<26.00	<.40	23.84
0168	<4.00	<14.00	<15.00	<.1	<20.00	63.31	<1.80	<26.00	<.40	34.98
0201	<4.00	685.40	<15.00	260.0	<20.00	252.20	<1.80	<26.00	14.64	46.34
0202	<4.00	753.30	<15.00	260.0	<20.00	208.80	<1.80	<26.00	14.66	41.54
0203	<4.00	603.80	<15.00	260.0	<20.00	386.80	4.54	<26.00	16.02	23.82
0204	6.83	884.20	<15.00	100.0	<20.00	558.00	44.53	<26.00	7.25	46.67
0205	7.25	899.40	<15.00	260.0	<20.00	334.00	<1.80	<26.00	18.11	66.58
0206	5.40	37.75	31.74	600.0	<20.00	17.64	<1.80	<26.00	64.65	48.05
0207	<4.00	<14.00	27.94	660.0	<20.00	8.42	<1.80	<26.00	78.39	63.78
0208	<4.00	81.91	20.73	580.0	<20.00	5.57	<1.80	<26.00	16.68	6.92
0209	<4.00	<14.00	34.39	540.0	<20.00	6.97	<1.80	<26.00	59.30	56.36
0210	<4.00	884.50	<15.00	210.0	<20.00	183.80	35.45	<26.00	10.74	24.90
0211	<4.00	708.70	<15.00	220.0	<20.00	156.90	<1.80	<26.00	15.63	34.72
0212	<4.00	673.10	<15.00	230.0	<20.00	293.50	<1.80	<26.00	12.81	64.82
0213	<4.00	56.74	<15.00	190.0	<20.00	59.60	<1.80	<26.00	8.80	17.88
0215	5.18	538.30	<15.00	200.0	<20.00	279.70	<1.80	<26.00	14.84	30.14
0216	<4.00	892.40	<15.00	240.0	<20.00	316.20	<1.80	<26.00	19.09	51.77
0217	<4.00	858.00	<15.00	200.0	<20.00	262.90	<1.80	<26.00	18.19	44.31
0219	6.51	<14.00	38.45	60.0	<20.00	40.30	<1.80	<26.00	5.64	18.64
0220	<4.00	21.56	27.65	30.0	<20.00	33.72	5.78	<26.00	29.34	7.69
0221	<4.00	<14.00	15.22	70.0	<20.00	39.12	<1.80	<26.00	<.40	24.76
0222	<4.00	<14.00	27.50	600.0	<20.00	7.72	2.12	<26.00	74.97	75.72
0223	<4.00	44.98	35.12	480.0	<20.00	4.60	<1.80	<26.00	70.47	38.74
0224	<4.00	1,392.00	<15.00	220.0	<20.00	303.50	<1.80	<26.00	21.10	67.87
0225	<4.00	840.90	<15.00	190.0	<20.00	173.70	8.64	<26.00	20.10	42.04
0226	12.17	765.10	<15.00	140.0	<20.00	464.60	48.55	27.48	7.55	64.21
0227	5.61	1,053.00	<15.00	130.0	<20.00	507.30	54.19	<26.00	6.83	66.31
0228	5.84	978.20	<15.00	150.0	<20.00	471.80	60.28	<26.00	8.14	49.35
0229	13.21	830.00	<15.00	160.0	<20.00	459.10	56.48	28.39	7.01	65.09
0230	7.78	988.40	<15.00	100.0	<20.00	467.80	56.20	27.15	8.66	54.29
0231	7.77	804.60	<15.00	150.0	<20.00	501.50	58.03	<26.00	6.87	44.94
0232	9.53	828.10	<15.00	150.0	<20.00	516.30	56.39	28.44	7.02	59.71
0233	9.11	788.60	<15.00	160.0	<20.00	475.00	61.88	28.28	9.23	57.21
0234	5.64	1,022.00	<15.00	120.0	<20.00	550.40	61.66	<26.00	8.77	59.07
0235	4.81	891.10	<15.00	120.0	<20.00	443.50	63.09	<26.00	6.37	50.97
0236	7.42	1,000.00	<15.00	150.0	<20.00	528.10	66.57	<26.00	6.08	48.75
0237	4.93	1,026.00	<15.00	120.0	<20.00	434.70	60.16	<26.00	4.52	61.19
0238	4.47	944.40	<15.00	140.0	<20.00	501.50	54.83	<26.00	6.41	52.38
0239	<4.00	918.00	<15.00	110.0	<20.00	492.30	52.35	<26.00	7.04	51.77
0240	7.10	1,069.00	<15.00	120.0	<20.00	625.30	52.69	<26.00	10.21	58.03
0241	<4.00	<14.00	<15.00	30.0	<20.00	8.20	<1.80	<26.00	17.21	7.14
0242	7.26	967.50	<15.00	120.0	<20.00	486.30	37.66	<26.00	7.17	58.67

Appendix 1--Rock data--continued

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
0243	38 1 30	113 37 37	9.2764	2.570	2.9139	1.56	.7725	2.4	30.72	.3114	949.000
0245	38 1 17	113 37 37	7.7518	1.240	2.1154	2.58	.2266	2.8	31.88	.4576	1,212.000
0247	38 1 35	113 37 15	8.4526	.160	1.0812	2.40	.0667	3.8	33.39	.3818	1,133.000
0250	38 1 12	113 36 23	8.8367	.950	1.7769	2.41	.3148	2.7	31.23	.4639	1,334.000
0251	38 1 10	113 36 1	8.3904	.740	2.4075	2.39	.3849	2.4	30.63	.4627	1,276.000
0252	38 2 1	113 37 24	9.5493	2.320	2.8527	1.45	1.0812	2.5	28.13	.2803	1,023.000
0254	38 2 27	113 37 18	9.2029	2.960	3.0810	1.37	1.1524	2.3	29.25	.3174	929.200
0255	38 2 25	113 36 47	8.6429	.460	1.3748	2.38	.0674	3.8	32.88	.3962	884.100
0256	38 2 47	113 37 14	6.8516	1.040	.5773	2.50	.0478	2.8	28.34	.0480	11.350
0257	38 3 25	113 37 1	6.9881	1.330	.6563	2.09	.0594	3.1	33.48	.0490	236.500
0258	38 3 32	113 36 59	6.5788	.630	.6387	2.26	.0977	2.9	34.61	.0483	36.050
0259	38 3 50	113 36 38	6.9857	.530	.6185	1.86	.0759	3.6	34.65	.0261	9.560
0260	38 4 12	113 36 47	7.4249	.560	.6376	2.17	.0580	3.4	35.60	.0445	12.310
0261	38 4 17	113 37 2	7.3204	.270	.6248	1.97	.0456	3.4	34.93	.0263	16.080
0262	38 4 29	113 36 50	6.8315	.460	.6418	2.00	.0364	2.9	35.27	.0478	27.260
0263	38 4 37	113 37 9	6.9000	.560	.6404	1.93	.0359	3.0	35.21	.0472	25.360
0264	38 4 52	113 37 27	6.9404	.450	.6313	2.08	.0378	3.0	36.16	.0481	20.410
0265	38 4 52	113 36 35	6.3391	.340	.6132	2.02	.0384	3.0	35.72	.0437	14.400
0266	38 4 30	113 36 15	6.9256	.590	.5587	1.99	.0307	3.0	35.88	.0277	25.440
0267	38 4 30	113 35 43	7.1199	.460	.6494	2.06	.0740	2.8	34.21	.0382	23.420
0269	38 4 1	113 35 46	7.1123	.370	.6702	1.90	.0450	3.3	34.88	.0276	21.170
0270	38 4 5	113 36 8	6.6613	.490	.6160	1.93	.0524	3.1	35.01	.0170	27.090
0271	38 3 31	113 35 58	7.0940	.750	.5955	2.15	.0366	3.5	35.39	.0248	19.830
0272	38 4 45	113 34 10	6.9467	.730	.6159	2.07	.0490	3.3	36.76	.0530	14.350
0273	38 5 3	113 34 6	8.1942	.370	1.0180	2.25	.2528	2.2	34.85	.2316	1,250.000
0275	38 5 2	113 35 3	6.6567	.310	.7383	2.03	.0658	3.0	36.34	.0334	18.900
0276	38 6 49	113 36 33	6.6805	.660	.4999	2.00	.0433	3.1	36.51	.0368	50.750
0277	38 6 24	113 36 24	7.1517	.760	.5563	1.98	.0619	3.5	35.06	.0240	22.660
0278	38 6 20	113 36 54	6.9103	1.010	.5750	1.96	.0459	3.4	36.11	.0228	39.690
0279	38 6 18	113 37 10	6.3005	1.590	.6423	1.82	.2561	2.0	33.99	.0245	11.260
0280	38 6 0	113 37 14	6.7666	.290	.6666	2.03	.0338	3.3	36.41	.0517	10.930
0281	38 5 42	113 37 4	6.8275	.390	.6741	1.89	.0170	3.4	35.12	.0270	11.310
0282	38 5 37	113 37 23	6.3862	.440	.6557	2.04	.0519	2.6	38.07	.0513	21.930
0283	38 5 41	113 37 55	6.7346	.420	.6007	1.91	.0225	3.2	35.55	.0251	29.270
0284	38 5 30	113 37 52	6.2663	.690	.5621	1.98	.1739	2.7	35.10	.0380	21.650
0285	38 4 59	113 37 56	4.2081	.100	.0182	.83	.0121	.1	37.09	.5009	369.500
0286	38 4 24	113 37 52	6.7108	.470	.6963	1.98	.0664	3.0	37.09	.0275	49.740
0287	38 4 11	113 38 0	6.4889	.450	.7134	2.02	.0254	3.2	36.09	.0366	12.980
0288	38 3 59	113 38 10	6.8186	.910	.5565	2.18	.0650	3.0	36.51	.0411	14.790
0289	38 4 0	113 38 8	6.5424	.790	.7090	1.98	.0575	3.0	35.90	.0426	15.880
0290	38 4 3	113 37 43	6.4096	1.880	.6736	1.93	.0342	3.1	34.70	.0423	23.880
0291	38 3 50	113 37 39	5.6540	.610	.7120	2.10	.0447	1.9	37.25	.0409	9.810
0293	38 10 2	113 32 45	8.4758	3.720	3.6523	1.44	1.1993	2.6	28.86	.3912	655.200
1001	38 6 28	113 34 17	.0800	39.990	.4170	<.01	.5548	<.1	.19	.0008	2.050
1002	38 7 50	113 36 16	6.3028	.360	.5666	1.92	.0275	2.6	34.83	.0524	33.420

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
0243	1.8500	<50.00	80.00	5.64	5.80	602	50.36	12	400.2	<3.80	10.23
0245	2.2300	<50.00	193.70	<1.50	6.89	380	82.23	10	457.7	<3.80	24.42
0247	1.4700	<50.00	155.40	5.57	4.23	148	71.35	4	36.3	<3.80	19.84
0250	2.5100	<50.00	155.50	<1.50	2.73	476	39.09	16	445.5	<3.80	23.20
0251	2.8000	<50.00	192.30	<1.50	5.12	510	83.06	14	423.5	<3.80	24.33
0252	1.9700	<50.00	91.08	10.71	7.51	594	51.45	17	471.5	<3.80	10.04
0254	1.8100	<50.00	94.51	9.24	8.55	590	52.47	21	569.4	<3.80	12.86
0255	2.1900	<50.00	114.00	4.56	3.42	240	61.28	6	28.2	<3.80	18.56
0256	11.7000	<50.00	81.77	<1.50	<2.00	2,220	36.08	63	501.5	<3.80	77.55
0257	10.3900	50.28	95.16	9.00	2.24	2,380	32.57	51	835.8	<3.80	77.77
0258	12.1000	<50.00	95.06	<1.50	2.33	1,366	38.85	57	478.6	<3.80	82.17
0259	19.0200	<50.00	66.66	<1.50	<2.00	770	23.58	76	880.5	4.92	113.40
0260	12.3100	<50.00	87.89	4.62	<2.00	1,506	37.29	49	559.6	<3.80	84.85
0261	9.6100	<50.00	57.70	5.60	<2.00	1,152	17.65	88	720.1	<3.80	113.30
0262	11.4500	<50.00	86.78	6.74	<2.00	2,120	26.61	66	613.8	<3.80	80.76
0263	13.7800	<50.00	89.02	8.76	2.49	1,466	37.22	52	779.4	<3.80	86.04
0264	10.0400	<50.00	99.26	3.45	<2.00	2,920	39.35	55	490.7	<3.80	82.78
0265	10.3800	<50.00	99.99	<1.50	<2.00	2,380	37.03	54	414.2	4.42	72.58
0266	9.3800	<50.00	93.71	7.96	<2.00	2,060	32.86	65	561.8	<3.80	46.70
0267	9.9500	<50.00	103.70	8.44	<2.00	2,060	36.86	60	517.0	<3.80	64.15
0269	9.9900	<50.00	68.83	9.25	2.24	2,480	21.07	95	677.4	4.04	123.90
0270	6.3500	<50.00	71.40	1.99	<2.00	2,180	22.94	74	904.5	<3.80	73.31
0271	7.6900	<50.00	57.73	3.11	<2.00	3,780	23.74	77	617.7	<3.80	111.10
0272	9.4900	<50.00	88.13	5.18	<2.00	2,860	41.86	60	503.6	<3.80	72.26
0273	2.0800	<50.00	117.70	1.92	<2.00	368	54.64	8	123.8	<3.80	15.78
0275	9.6900	<50.00	95.15	<1.50	<2.00	2,300	33.72	63	602.3	<3.80	64.61
0276	11.6700	<50.00	41.43	<1.50	<2.00	814	18.54	77	515.4	<3.80	58.12
0277	14.3700	<50.00	61.39	5.00	2.28	5,280	24.69	137	648.7	<3.80	103.30
0278	7.7200	<50.00	68.18	3.55	2.50	1,286	28.95	73	797.1	<3.80	95.07
0279	14.8300	<50.00	59.00	<1.50	<2.00	440	22.23	61	914.1	<3.80	101.40
0280	8.6500	<50.00	114.50	<1.50	<2.00	312	46.32	48	494.2	<3.80	45.64
0281	16.0900	<50.00	65.18	8.08	<2.00	2,860	17.93	102	883.4	<3.80	121.10
0282	8.1600	<50.00	101.40	7.41	<2.00	124	36.69	52	595.6	<3.80	62.54
0283	11.6900	<50.00	68.34	9.16	2.69	1,820	18.42	98	901.1	6.82	120.50
0284	6.7200	<50.00	81.09	7.79	2.27	1,570	25.64	30	556.4	<3.80	61.19
0285	.3300	<50.00	<9.00	11.12	<2.00	330	<1.60	5	29.4	<3.80	16.92
0286	8.6700	<50.00	72.73	<1.50	<2.00	1,602	24.71	55	628.0	<3.80	77.31
0287	8.4900	<50.00	82.97	<1.50	<2.00	1,786	29.51	60	513.0	<3.80	73.65
0288	10.1100	<50.00	88.32	4.50	<2.00	2,180	39.76	48	715.7	<3.80	77.59
0289	11.4700	<50.00	82.85	<1.50	<2.00	2,680	38.35	64	662.7	<3.80	79.57
0290	10.5800	<50.00	81.80	<1.50	<2.00	4,460	35.24	64	663.8	<3.80	76.86
0291	9.6900	<50.00	76.27	<1.50	<2.00	434	33.49	35	354.2	<3.80	68.60
0293	1.5300	<50.00	68.57	3.12	13.25	708	40.39	16	724.8	<3.80	14.75
1001	<.0400	<50.00	<9.00	<1.50	<2.00	88	<1.60	2	755.7	<3.80	<3.00
1002	7.3300	<50.00	103.50	12.45	<2.00	472	36.71	33	442.9	<3.80	48.44

Appendix 1--Rock data--continued

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
0243	5.29	911.60	<15.00	150.0	<20.00	485.00	52.70	<26.00	8.07	45.09
0245	<4.00	929.10	<15.00	230.0	<20.00	245.00	<1.80	<26.00	20.56	47.09
0247	<4.00	264.30	<15.00	230.0	<20.00	63.43	27.76	<26.00	8.49	7.23
0250	<4.00	780.60	<15.00	220.0	<20.00	319.10	<1.80	<26.00	15.73	48.91
0251	<4.00	957.20	<15.00	200.0	<20.00	203.90	3.79	<26.00	18.37	60.54
0252	4.97	943.90	<15.00	130.0	<20.00	525.50	53.17	<26.00	8.64	65.99
0254	7.59	1,043.00	<15.00	110.0	<20.00	467.90	57.11	<26.00	8.30	63.83
0255	<4.00	529.80	<15.00	250.0	<20.00	91.90	<1.80	<26.00	6.36	4.15
0256	<4.00	16.23	31.84	500.0	<20.00	5.14	<1.80	<26.00	65.81	80.06
0257	<4.00	<14.00	32.11	600.0	<20.00	21.04	<1.80	<26.00	73.43	47.18
0258	<4.00	136.60	41.71	470.0	<20.00	9.00	<1.80	<26.00	76.47	36.26
0259	<4.00	<14.00	54.50	590.0	<20.00	12.45	<1.80	<26.00	84.65	108.40
0260	<4.00	<14.00	48.47	580.0	<20.00	7.70	<1.80	<26.00	71.30	49.92
0261	<4.00	<14.00	43.59	860.0	<20.00	6.67	4.74	<26.00	64.07	36.87
0262	<4.00	<14.00	42.15	460.0	<20.00	13.99	<1.80	<26.00	60.95	70.96
0263	7.46	<14.00	32.76	530.0	<20.00	8.20	<1.80	<26.00	80.75	69.46
0264	<4.00	16.74	41.09	550.0	<20.00	5.15	<1.80	<26.00	71.46	45.24
0265	<4.00	31.33	39.58	500.0	<20.00	5.10	<1.80	<26.00	64.23	50.39
0266	<4.00	356.10	30.83	550.0	<20.00	10.09	<1.80	<26.00	67.49	42.30
0267	5.91	39.38	35.41	570.0	<20.00	11.89	<1.80	<26.00	65.08	59.47
0269	5.50	<14.00	38.18	760.0	<20.00	8.28	7.66	<26.00	85.01	53.80
0270	<4.00	26.17	47.01	720.0	<20.00	7.30	<1.80	<26.00	78.25	45.54
0271	<4.00	14.19	45.42	750.0	<20.00	12.72	<1.80	<26.00	97.20	22.98
0272	<4.00	33.15	27.91	480.0	<20.00	14.00	<1.80	<26.00	69.63	29.78
0273	<4.00	286.90	<15.00	160.0	<20.00	192.90	<1.80	<26.00	14.94	21.73
0275	<4.00	<14.00	27.13	490.0	<20.00	4.51	<1.80	<26.00	66.77	33.82
0276	<4.00	33.87	31.45	540.0	<20.00	14.19	3.56	<26.00	34.76	24.93
0277	<4.00	45.55	40.26	720.0	<20.00	10.50	<1.80	<26.00	96.47	39.62
0278	<4.00	33.17	43.21	770.0	<20.00	10.34	4.15	<26.00	71.17	31.01
0279	<4.00	55.92	41.93	470.0	<20.00	777.90	3.16	<26.00	57.43	63.15
0280	<4.00	162.20	22.40	420.0	<20.00	4.48	<1.80	<26.00	46.57	38.59
0281	<4.00	<14.00	65.76	700.0	<20.00	4.84	<1.80	<26.00	88.64	69.88
0282	<4.00	225.40	41.65	380.0	<20.00	10.21	<1.80	<26.00	52.00	48.93
0283	<4.00	<14.00	67.13	700.0	<20.00	3.96	7.75	<26.00	81.18	67.54
0284	<4.00	100.00	41.80	480.0	<20.00	10.90	12.34	<26.00	57.57	32.28
0285	<4.00	85.08	25.04	20.0	<20.00	30.20	<1.80	<26.00	3.65	1.43
0286	<4.00	<14.00	32.59	600.0	<20.00	7.65	4.96	<26.00	71.86	35.25
0287	<4.00	<14.00	40.88	500.0	<20.00	4.28	3.50	<26.00	61.36	32.10
0288	<4.00	155.30	34.64	540.0	<20.00	8.62	<1.80	<26.00	87.73	40.73
0289	<4.00	<14.00	31.49	520.0	<20.00	11.68	1.93	<26.00	151.80	111.30
0290	<4.00	<14.00	30.68	500.0	<20.00	32.07	<1.80	<26.00	74.18	47.39
0291	<4.00	109.90	26.27	450.0	<20.00	15.11	<1.80	<26.00	66.75	37.01
0293	22.23	718.50	<15.00	110.0	<20.00	479.10	75.10	26.08	11.22	46.54
1001	<4.00	<14.00	<15.00	20.0	<20.00	27.23	43.90	<26.00	<.40	<1.00
1002	<4.00	<14.00	38.15	340.0	<20.00	7.57	<1.80	<26.00	49.58	40.78

Appendix 1--Rock data--continued

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
1003	38 7 50	113 36 16	6.2033	1.110	.6290	1.71	.2304	3.1	34.96	.0233	34.980
1004	38 8 46	113 34 11	5.9457	.160	.0279	1.13	.0240	.1	31.79	.0289	90.830
1005	38 8 44	113 34 11	3.5028	.640	8.5004	1.76	.0247	<.1	22.06	.0463	179.200
1006	38 8 22	113 34 49	8.8457	1.810	2.1328	2.29	.5165	2.9	31.44	.4462	1,344.000
1007	38 8 23	113 34 48	8.1778	.410	.0238	1.83	.0391	.1	23.27	.0052	92.170
1008	38 8 40	113 34 46	11.3253	.210	.0197	2.52	.0100	.1	19.15	.0209	45.770
1009	38 8 39	113 34 46	6.3038	.160	.0509	1.47	.0064	.1	32.20	.0122	73.980
1010	38 7 11	113 34 13	7.1529	.140	1.6048	.73	.0136	.1	32.29	.0877	419.200
1011	38 7 12	113 34 11	13.5260	.410	.1484	2.65	.0405	.2	16.91	.2893	323.700
1012	38 5 24	113 34 37	.1207	23.860	.0295	.01	14.7244	<.1	.05	.0018	<.150
1013	38 2 39	113 35 50	7.0812	.500	.1632	2.25	.0863	2.2	35.68	.0490	13.860
1014	38 2 40	113 35 49	6.8886	1.040	.5036	.89	.5187	1.0	34.09	.0508	97.000
1015	38 3 12	113 36 35	6.3123	.390	.6421	2.20	.0251	2.9	36.06	.0420	23.650
1016	38 3 11	113 36 34	6.7741	.490	.4874	2.17	.0216	3.3	35.23	.0341	8.280
1017	38 3 14	113 36 37	7.1516	.520	.6186	2.04	.0345	2.7	33.91	.0486	12.800
1018	38 2 45	113 35 47	7.0605	1.490	.7618	1.83	.2854	1.6	32.82	.0571	126.300
1019	38 3 38	113 34 5	7.6741	2.020	1.4890	.91	.6276	2.2	30.94	.1819	505.100
1020	38 4 11	113 35 2	3.6509	.120	.4392	1.56	.0218	1.1	41.65	.0285	31.334
1021	38 4 9	113 34 59	7.1029	1.480	.5965	1.83	.2534	1.7	34.12	.0487	9.800
1022	38 4 0	113 34 40	6.5782	2.830	.6761	.85	.7554	.4	30.69	.0495	354.700
1023	38 4 0	113 34 39	7.1327	2.700	1.7279	1.23	.9213	.9	30.88	.2326	507.200
1024	38 4 20	113 34 23	6.7070	1.860	.5598	.63	1.2274	.8	32.88	.0456	1,787.000
1025	38 4 18	113 34 30	7.2169	.150	.3800	2.22	.0377	1.9	36.92	.0352	10.640
1026	38 4 38	113 34 36	6.8563	.350	.6937	1.99	.0352	2.9	34.86	.0470	15.840
1027	38 4 50	113 34 37	6.9190	.110	.4313	2.15	.0340	2.8	36.20	.0473	23.530
1028	38 5 26	113 34 40	.1841	23.360	.0506	.01	16.3781	<.1	.47	.0065	3.910
1029	38 5 24	113 34 37	.1399	23.860	.0585	.01	11.8839	<.1	.19	.0037	<.150
1030	38 5 24	113 34 37	.1265	1.160	.0322	.04	.7491	<.1	44.30	.0037	16.620
1031	38 5 24	113 34 36	.0663	31.300	.0396	<.01	.5947	<.1	11.48	.0011	<.150
1032	38 5 24	113 34 35	.0845	4.430	.0170	.02	.2881	<.1	39.69	<.0002	9.990
1033	38 5 23	113 34 34	.1313	29.200	.0679	<.01	8.2472	<.1	4.07	.0040	22.120
1034	38 5 22	113 34 34	7.5704	.990	1.7536	3.18	.4000	.2	34.23	.2049	2,431.000
1035	38 5 22	113 34 33	7.4421	1.140	1.7091	1.88	.5786	2.2	32.66	.2102	1,512.000
1036	38 5 14	113 34 33	6.7973	2.870	1.9187	1.28	.5681	1.9	31.24	.2036	664.200
1037	38 5 28	113 36 29	6.6767	.720	.6288	1.97	.0734	3.2	35.92	.0225	11.750
1038	38 5 10	113 36 26	6.7283	.320	.6076	1.91	.0360	2.7	36.08	.0262	9.770
1039	38 5 22	113 36 9	4.9224	.350	.4354	1.49	.0203	1.9	38.51	.0332	14.740
1040	38 5 34	113 36 2	4.9603	1.340	.4617	1.34	.2308	1.0	36.48	.0359	58.580
1041	38 5 33	113 36 2	5.9094	.490	.5766	2.04	.0304	2.5	35.23	.0475	11.060
1042	38 5 32	113 36 3	6.6164	.590	.6887	2.02	.1017	2.7	32.34	.0555	34.390
1043	38 9 18	113 33 22	3.7987	.390	12.1611	.66	.0363	.1	29.22	.0790	127.800
1044	38 9 18	113 33 22	.4023	.090	.1958	.04	.0716	<.1	46.82	.0033	25.210
1045	38 9 18	113 33 21	4.9060	.310	8.6601	.61	.0571	.2	29.59	.1001	163.400
1046	38 8 13	113 33 16	.2990	.390	.0255	.05	.0952	.1	42.73	.0393	79.910
1047	38 8 13	113 33 16	.0172	.001	.0047	<.01	.0017	<.1	<.01	.0020	.660

Appendix 1--Rock data--continued

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
1003	9.7000	<50.00	59.32	6.57	2.05	638	7.94	43	707.1	<3.80	85.87
1004	3.9800	<50.00	27.56	20.24	<2.00	358	18.99	14	29.7	<3.80	30.67
1005	.2900	<50.00	<9.00	<1.50	<2.00	416	12.98	2	5.3	<3.80	<3.00
1006	2.9100	<50.00	208.90	6.99	23.09	604	75.87	16	594.2	<3.80	24.59
1007	1.7600	<50.00	<9.00	11.61	<2.00	362	3.02	6	10.7	<3.80	20.84
1008	1.9600	<50.00	17.57	17.82	<2.00	638	8.95	5	14.2	<3.80	24.62
1009	3.7100	<50.00	<9.00	24.30	<2.00	276	2.16	4	117.7	<3.80	35.33
1010	1.2500	<50.00	153.00	7.94	2.25	876	55.79	14	18.9	<3.80	4.38
1011	.3400	<50.00	86.95	14.13	<2.00	2,040	33.00	5	4.5	<3.80	6.90
1012	.4400	<50.00	<9.00	<1.50	<2.00	294	<1.60	7	36.7	<3.80	<3.00
1013	8.9600	<50.00	21.30	8.39	<2.00	268	9.97	38	113.5	<3.80	78.21
1014	4.8900	<50.00	56.46	9.09	2.21	1,686	18.48	27	398.6	<3.80	89.00
1015	9.2500	<50.00	86.10	7.96	<2.00	1,926	30.14	60	309.4	<3.80	71.98
1016	9.2600	<50.00	104.10	11.15	<2.00	400	28.93	28	479.1	<3.80	59.63
1017	13.5200	<50.00	103.40	11.19	<2.00	1,526	30.15	15	673.8	<3.80	86.75
1018	28.7500	<50.00	81.05	10.72	2.17	2,820	27.03	101	1,258.0	<3.80	100.40
1019	7.6900	<50.00	88.34	18.03	2.03	2,780	47.31	58	423.8	<3.80	30.28
1020	5.7600	<50.00	48.87	6.49	<2.00	92	13.33	52	348.7	<3.80	42.65
1021	11.3100	<50.00	85.75	11.33	<2.00	120	31.01	8	493.2	<3.80	78.77
1022	9.5800	<50.00	94.14	<1.50	<2.00	436	37.93	33	632.5	<3.80	51.06
1023	7.0900	<50.00	74.88	13.00	3.78	2,200	44.37	81	414.7	<3.80	40.57
1024	15.1800	96.45	132.30	3.08	<2.00	4,180	44.89	61	644.6	<3.80	78.04
1025	9.1100	<50.00	46.91	9.94	<2.00	1,050	14.88	43	83.7	<3.80	46.55
1026	9.6500	<50.00	94.36	10.02	<2.00	2,780	32.08	88	443.7	4.54	81.92
1027	9.4900	<50.00	83.86	8.74	<2.00	930	24.85	62	287.3	<3.80	79.46
1028	.5100	<50.00	<9.00	<1.50	<2.00	166	18.88	3	69.3	<3.80	<3.00
1029	.6400	<50.00	<9.00	<1.50	<2.00	478	<1.60	8	37.0	<3.80	<3.00
1030	2.1700	<50.00	<9.00	<1.50	<2.00	276	<1.60	35	19.3	<3.80	<3.00
1031	2.7700	<50.00	<9.00	<1.50	<2.00	236	26.17	5	79.3	<3.80	<3.00
1032	3.3300	<50.00	<9.00	<1.50	<2.00	148	<1.60	14	43.5	<3.80	<3.00
1033	1.6200	<50.00	<9.00	<1.50	<2.00	254	23.85	5	261.3	<3.80	<3.00
1034	2.6000	<50.00	75.47	20.56	<2.00	424	34.15	13	163.9	<3.80	10.47
1035	1.7500	<50.00	60.51	17.36	2.53	304	26.98	19	200.7	<3.80	11.40
1036	1.7500	<50.00	70.68	11.89	3.21	406	34.50	12	481.2	<3.80	12.87
1037	10.6500	50.25	65.87	9.28	<2.00	3,140	21.75	71	707.3	<3.80	110.70
1038	9.3600	<50.00	64.63	10.23	<2.00	2,940	19.09	86	637.2	5.37	115.90
1039	7.2100	<50.00	70.56	9.76	<2.00	1,560	23.88	23	414.7	<3.80	50.14
1040	50.2100	<50.00	78.75	8.32	<2.00	2,960	29.52	71	451.2	<3.80	61.30
1041	12.1200	<50.00	93.93	10.41	<2.00	1,994	32.19	25	580.7	6.00	76.51
1042	14.4800	<50.00	109.70	9.85	2.56	1,460	37.22	39	603.1	5.43	79.62
1043	.2500	<50.00	25.31	<1.50	<2.00	538	17.35	6	18.1	61.53	6.63
1044	.2900	<50.00	<9.00	9.44	<2.00	88	<1.60	11	37.2	<3.80	<3.00
1045	.4300	<50.00	<9.00	<1.50	<2.00	696	6.32	6	8.8	182.30	10.66
1046	.4800	<50.00	<9.00	8.60	<2.00	350	<1.60	6	23.9	<3.80	62.13
1047	<.0400	<50.00	<9.00	5.15	<2.00	50	<1.60	2	1.0	<3.80	<3.00

Appendix 1--Rock data--continued

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
1003	<4.00	<14.00	50.30	660.0	<20.00	13.44	18.95	<26.00	48.84	31.85
1004	<4.00	236.50	74.42	20.0	<20.00	282.20	30.96	<26.00	3.91	2.38
1005	<4.00	553.20	<15.00	<.1	<20.00	139.20	24.89	57.84	<.40	2.46
1006	<4.00	1,133.00	16.26	210.0	<20.00	369.00	<1.80	<26.00	23.51	51.91
1007	<4.00	73.52	<15.00	50.0	<20.00	141.80	5.86	<26.00	1.24	1.44
1008	<4.00	147.50	37.47	70.0	<20.00	119.80	21.91	<26.00	2.24	3.00
1009	<4.00	93.82	62.93	40.0	<20.00	104.80	31.97	<26.00	3.61	5.43
1010	<4.00	322.10	<15.00	10.0	<20.00	153.40	28.17	<26.00	8.32	3.44
1011	<4.00	383.80	<15.00	30.0	<20.00	446.30	32.81	<26.00	13.70	2.09
1012	<4.00	<14.00	<15.00	20.0	<20.00	46.15	<1.80	<26.00	<.40	17.07
1013	<4.00	<14.00	41.40	550.0	<20.00	19.67	<1.80	<26.00	12.52	19.11
1014	<4.00	19.90	31.79	220.0	<20.00	613.70	8.23	<26.00	54.01	111.10
1015	<4.00	<14.00	42.80	530.0	<20.00	4.33	<1.80	<26.00	59.71	39.60
1016	<4.00	<14.00	51.69	510.0	<20.00	3.52	<1.80	<26.00	63.15	33.52
1017	<4.00	<14.00	53.54	560.0	<20.00	20.53	<1.80	<26.00	77.00	69.31
1018	<4.00	<14.00	89.26	500.0	<20.00	931.80	10.32	<26.00	70.28	116.70
1019	<4.00	349.10	<15.00	150.0	<20.00	1,301.00	15.74	<26.00	24.21	51.22
1020	<4.00	<14.00	20.41	320.0	<20.00	5.55	<1.80	<26.00	37.01	29.64
1021	<4.00	22.30	36.91	410.0	<20.00	128.70	<1.80	<26.00	66.10	62.15
1022	<4.00	22.17	30.63	280.0	<20.00	1,303.00	<1.80	<26.00	36.40	58.59
1023	7.04	276.30	15.68	260.0	<20.00	830.90	11.34	<26.00	30.37	54.67
1024	<4.00	<14.00	38.49	160.0	<20.00	2,183.00	4.27	<26.00	94.70	61.08
1025	<4.00	<14.00	30.81	530.0	<20.00	8.74	<1.80	<26.00	25.44	23.02
1026	<4.00	<14.00	45.27	510.0	<20.00	13.26	<1.80	<26.00	58.24	52.63
1027	<4.00	<14.00	35.39	500.0	<20.00	3.51	<1.80	<26.00	42.29	30.61
1028	<4.00	<14.00	<15.00	10.0	<20.00	23.51	<1.80	<26.00	<.40	<1.00
1029	<4.00	<14.00	<15.00	20.0	<20.00	29.28	<1.80	<26.00	<.40	20.93
1030	<4.00	<14.00	<15.00	<.1	<20.00	15.27	<1.80	<26.00	<.40	1.25
1031	<4.00	<14.00	<15.00	<.1	<20.00	206.40	<1.80	<26.00	<.40	40.75
1032	<4.00	<14.00	<15.00	10.0	<20.00	15.61	<1.80	<26.00	<.40	36.20
1033	<4.00	<14.00	<15.00	20.0	<20.00	81.96	<1.80	<26.00	<.40	21.84
1034	5.50	578.70	<15.00	400.0	<20.00	170.80	31.10	<26.00	6.57	47.97
1035	5.30	575.10	16.50	170.0	<20.00	238.50	31.81	<26.00	6.41	43.21
1036	<4.00	546.20	16.12	110.0	<20.00	278.00	21.07	<26.00	5.66	64.74
1037	<4.00	43.33	63.67	800.0	<20.00	8.75	<1.80	<26.00	89.57	52.49
1038	<4.00	<14.00	61.70	750.0	<20.00	4.13	<1.80	<26.00	82.22	57.16
1039	<4.00	<14.00	33.32	380.0	<20.00	11.49	<1.80	<26.00	49.26	31.70
1040	<4.00	64.81	35.21	180.0	21.37	515.40	1.89	<26.00	52.52	53.39
1041	<4.00	<14.00	60.05	520.0	<20.00	5.41	<1.80	<26.00	61.23	75.03
1042	4.20	60.43	48.42	420.0	<20.00	8.92	<1.80	<26.00	58.55	64.59
1043	<4.00	985.70	<15.00	60.0	<20.00	312.70	230.70	83.82	<.40	3.35
1044	<4.00	<14.00	<15.00	10.0	<20.00	13.04	9.38	<26.00	<.40	1.74
1045	<4.00	801.00	<15.00	60.0	<20.00	222.20	268.40	56.49	<.40	3.14
1046	<4.00	22.42	17.37	20.0	<20.00	5.64	<1.80	<26.00	4.93	5.00
1047	<4.00	<14.00	<15.00	<.1	<20.00	2.43	<1.80	<26.00	<.40	2.22

sample	Latitude	Longitud	Al%	Ca%	Fe%	K%	Mg%	Na%	Si%	Ti%	Ba ppm
1043	38 8 13	113 33 16	.1441	.110	.0284	.02	.1175	.6	44.73	.3479	336.100
1049	38 8 13	113 33 16	.1272	.060	.0320	.04	.0168	<.1	46.14	.3283	547.500
1050	38 8 13	113 33 16	.6755	22.460	.2227	.03	13.5361	<.1	3.49	.0315	6.070
1051	38 8 4	113 33 23	16.6924	.640	4.0979	.58	.8690	1.1	12.67	.0921	370.500
1052	38 8 4	113 33 22	.2573	23.950	.1007	.01	13.0678	<.1	.01	.0047	6.020
1053	38 8 4	113 33 23	.2353	.100	.0145	.05	.0153	<.1	46.36	.1339	1,088.000
1054	38 8 4	113 33 23	.2172	10.040	19.2426	1.63	.0201	.5	.01	.0523	83.710
1055	38 8 4	113 33 22	.0217	19.420	.0140	.01	.0004	<.1	1.84	.0181	4.810
1056	38 4 56	113 32 52	8.8670	.380	2.2703	1.96	.4247	3.1	32.58	.2344	3,053.000
1057	38 4.56	113 32 51	.8293	.120	.3418	.12	.0632	.3	44.19	.0112	379.900
1058	38 4 54	113 37 57	6.6196	.130	.3255	2.03	.0166	1.6	36.85	.0349	141.100
1059	38 7 54	113 32 53	.1753	28.240	.0773	.01	9.8588	<.1	.31	.0028	<.150
1060	38 8 30	113 33 0	.9645	.490	.9274	.16	.1594	<.1	43.18	.0789	395.400
2001	38 1 0	113 35 6	8.5575	1.130	2.3445	2.15	.1898	3.0	29.92	.5191	2,126.000
2002	38 2 13	113 35 6	7.3294	.210	.6435	2.16	.0577	3.1	35.99	.0356	16.490
2003	38 1 25	113 38 57	8.1211	.970	2.7886	2.30	.5023	1.6	27.86	.2574	812.600
2004	38 1 19	113 38 52	6.4578	.170	1.6995	3.14	.1756	.4	35.28	.2232	803.000
2005	38 1 6	113 38 46	1.4045	.160	.3951	.59	.0553	.1	43.95	.0407	187.200
2006	38 1 45	113 38 35	8.0194	5.520	1.8234	1.44	.6057	2.0	26.87	.3194	843.000
2007	38 1 34	113 36 19	8.7942	.320	2.2196	3.00	.1030	3.9	30.18	.4390	1,184.000
2008	38 1 15	113 37 36	8.5821	.340	1.5040	2.42	.1075	3.5	33.31	.3789	1,077.000
2009	38 1 13	113 37 2	7.2106	1.270	1.5395	.08	.0735	.1	34.59	.1261	358.700
2010	38 1 13	113 36 14	7.4667	.310	1.7127	2.40	.1404	3.5	32.51	.3298	1,022.000
2011	38 1 11	113 36 1	8.4941	.460	2.2551	2.27	.2453	3.9	31.68	.4445	1,450.000
2012	38 2 24	113 36 45	9.0429	.510	.8691	2.62	.2284	1.3	32.09	.5328	1,425.000
2013	38 4 26	113 36 50	6.9231	.350	.3797	2.36	.0631	2.2	34.70	.0469	13.700
2014	38 4 50	113 34 20	6.6068	.300	.8186	1.26	.2182	<.1	36.90	.0850	549.000
2015	38 4 43	113 34 9	6.5336	.360	.6323	1.98	.0518	2.8	33.34	.0470	13.160
2016	38 5 5	113 34 24	8.4564	2.690	3.1667	1.65	.6728	2.3	28.53	.1690	991.100
2017	38 6 42	113 36 26	6.9940	.960	.4941	1.93	.0680	3.1	35.92	.0370	60.570
2018	38 6 36	113 36 22	3.3975	.490	.2521	1.00	.0833	1.1	39.44	.0227	79.110
2019	38 6 19	113 37 4	6.8366	1.990	.4489	1.53	.4186	.8	26.68	.0432	23.900
2020	38 3 42	113 37 42	9.3992	6.070	5.0738	1.03	1.6443	2.2	25.72	.5587	680.700

sample	Be ppm	Bi ppm	Ce ppm	Cr ppm	Cu ppm	F ppm	La ppm	Li ppm	Mn ppm	Mo ppm	Nb ppm
1048	.2800	<50.00	<9.00	10.31	<2.00	74	<1.60	5	15.5	<3.80	31.28
1049	.2800	<50.00	12.03	11.25	<2.00	70	<1.60	4	24.6	5.00	30.90
1050	1.0400	<50.00	<9.00	<1.50	<2.00	374	19.38	7	153.0	<3.80	<3.00
1051	14.4300	77.39	968.60	74.99	181.30	2,480	313.10	88	460.4	22.33	10.61
1052	1.1600	<50.00	<9.00	<1.50	<2.00	184	<1.60	5	236.5	<3.80	<3.00
1053	.2700	<50.00	<9.00	4.61	<2.00	230	<1.60	6	5.2	<3.80	17.89
1054	<.0400	<50.00	<9.00	<1.50	<2.00	118	15.25	5	3.8	58.08	<3.00
1055	<.0400	<50.00	<9.00	<1.50	<2.00	52	<1.60	2	6.6	<3.80	<3.00
1056	2.1300	<50.00	72.71	17.79	2.50	386	29.19	11	534.3	<3.80	10.95
1057	2.1900	<50.00	<9.00	11.82	3.77	186	<1.60	17	736.2	<3.80	<3.00
1058	6.7400	<50.00	<9.00	10.74	<2.00	766	2.01	37	56.6	<3.80	33.36
1059	<.0400	<50.00	<9.00	.0	<2.00	280	<1.60	3	91.0	<3.80	<3.00
1060	.5400	<50.00	66.62	21.40	<2.00	130	20.78	7	44.1	<3.80	13.62
2001	2.9700	<50.00	194.90	7.66	5.79	550	73.81	14	235.4	<3.80	27.37
2002	11.6100	<50.00	97.33	7.25	<2.00	1,046	30.37	58	602.6	<3.80	67.20
2003	1.4800	<50.00	69.20	9.40	7.69	562	31.78	16	96.7	<3.80	10.76
2004	1.4700	<50.00	59.82	20.32	7.32	252	27.56	22	122.4	<3.80	8.92
2005	4.2700	<50.00	15.20	23.99	5.29	124	3.38	61	56.8	<3.80	<3.00
2006	1.1100	<50.00	67.15	13.72	12.14	608	32.04	12	55.1	<3.80	12.51
2007	2.3300	<50.00	167.50	4.28	25.04	170	71.62	3	22.5	<3.80	23.96
2008	1.6200	<50.00	171.60	6.51	6.85	276	64.27	3	78.3	<3.80	21.91
2009	1.6300	<50.00	146.80	19.85	<2.00	168	56.88	24	94.8	<3.80	17.29
2010	2.0000	<50.00	164.10	7.51	2.99	390	67.46	10	153.5	<3.80	18.80
2011	2.3300	<50.00	177.50	3.35	5.15	358	70.30	8	155.2	<3.80	23.74
2012	2.0600	<50.00	194.30	7.92	<2.00	716	71.44	8	103.8	<3.80	24.06
2013	9.7200	<50.00	118.30	9.59	<2.00	2,540	42.62	43	215.3	<3.80	83.87
2014	1.4100	<50.00	149.00	6.52	<2.00	370	61.68	5	101.1	<3.80	7.24
2015	10.8100	<50.00	105.90	5.24	<2.00	1,302	31.24	16	578.3	4.85	75.80
2016	1.4100	<50.00	58.41	7.04	<2.00	464	28.77	15	385.8	<3.80	6.89
2017	12.5600	<50.00	50.93	10.34	<2.00	1,532	16.39	48	482.4	<3.80	51.52
2018	8.3600	<50.00	23.44	10.24	<2.00	552	8.30	19	266.2	<3.80	33.38
2019	14.5000	<50.00	41.33	6.69	<2.00	418	16.48	12	470.2	<3.80	64.50
2020	1.4500	<50.00	93.42	38.83	34.23	596	38.93	13	943.9	<3.80	18.05

Appendix 1--Rock data--continued

sample	Ni ppm	P ppm	Pb ppm	Rb ppm	Sn ppm	Sr ppm	V ppm	W ppm	Y ppm	Zn ppm
1048	<4.00	<14.00	<15.00	10.0	<20.00	18.00	<1.80	<26.00	5.86	2.66
1049	<4.00	34.11	20.39	10.0	<20.00	18.65	<1.80	<26.00	5.24	3.45
1050	<4.00	<14.00	<15.00	20.0	<20.00	47.92	<1.80	<26.00	6.31	<1.00
1051	30.70	2,938.00	26.55	60.0	<20.00	1,944.00	325.20	34.25	39.79	254.50
1052	<4.00	<14.00	<15.00	10.0	<20.00	22.81	<1.80	<26.00	<.40	<1.00
1053	<4.00	<14.00	<15.00	10.0	<20.00	44.95	<1.80	<26.00	2.81	1.81
1054	<4.00	1,916.00	<15.00	10.0	<20.00	1,280.00	37.54	133.00	<.40	13.35
1055	<4.00	<14.00	<15.00	20.0	<20.00	86.07	<1.80	<26.00	<.40	22.75
1056	5.70	674.30	<15.00	110.0	<20.00	358.80	43.42	<26.00	7.64	39.85
1057	4.38	20.70	<15.00	10.0	<20.00	97.92	9.81	<26.00	2.17	7.59
1058	<4.00	<14.00	24.82	520.0	<20.00	8.87	<1.80	<26.00	7.02	21.10
1059	<4.00	<14.00	<15.00	20.0	<20.00	73.13	<1.80	<26.00	<.40	17.51
1060	<4.00	176.80	45.39	20.0	<20.00	58.62	8.63	<26.00	3.37	15.27
2001	<4.00	972.50	17.38	230.0	<20.00	357.70	<1.80	<26.00	20.00	44.11
2002	<4.00	<14.00	35.99	600.0	<20.00	7.27	<1.80	<26.00	52.68	67.81
2003	6.78	632.20	<15.00	250.0	<20.00	229.80	58.17	<26.00	5.76	51.50
2004	<4.00	346.40	<15.00	490.0	<20.00	127.70	38.52	<26.00	4.50	10.50
2005	<4.00	378.60	<15.00	70.0	<20.00	38.36	19.11	<26.00	1.75	18.08
2006	4.37	465.40	<15.00	120.0	<20.00	516.10	40.04	<26.00	1.88	21.15
2007	4.23	428.00	<15.00	230.0	<20.00	68.85	<1.80	<26.00	5.37	30.89
2008	<4.00	624.70	<15.00	200.0	<20.00	49.60	13.43	<26.00	13.25	31.99
2009	4.33	168.50	<15.00	10.0	<20.00	74.17	40.38	<26.00	8.36	20.32
2010	<4.00	565.50	<15.00	220.0	<20.00	83.45	18.68	<26.00	8.11	42.72
2011	<4.00	930.30	<15.00	190.0	<20.00	121.60	7.87	<26.00	15.80	54.15
2012	<4.00	274.40	<15.00	240.0	<20.00	255.40	<1.80	<26.00	17.83	29.27
2013	<4.00	<14.00	37.76	630.0	<20.00	8.81	<1.80	<26.00	71.74	71.10
2014	<4.00	140.50	<15.00	100.0	<20.00	32.89	1.88	<26.00	5.78	32.63
2015	<4.00	<14.00	43.70	520.0	<20.00	9.93	<1.80	<26.00	61.06	69.24
2016	4.68	603.90	<15.00	110.0	<20.00	363.20	67.21	<26.00	4.65	60.99
2017	<4.00	52.72	37.69	490.0	<20.00	21.69	3.61	<26.00	40.62	23.32
2018	<4.00	57.16	22.51	170.0	<20.00	93.52	1.93	<26.00	25.79	15.79
2019	<4.00	<14.00	29.01	430.0	<20.00	88.94	<1.80	<26.00	41.67	33.32
2020	22.28	1,188.00	<15.00	90.0	<20.00	486.30	120.80	28.42	12.08	65.53