UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results, mineralogical data, and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Areas (UT-050-238,242), Wayne and Garfield Counties, Utah

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral values, if any. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Areas (UT-050-238,242), Wayne and Garfield Counties, Utah.

INTRODUCTION

In April 1982 the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Areas, Wayne and Garfield Counties, Utah.

The Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Areas comprise about 266 mi^2 (692 km^2) in Wayne and Garfield Counties, Utah. Access to the study areas is provided by unimproved dirt roads and jeep trails.

The study areas occupy the northern part of the Henry Mountains from Utah State Highway 24 on the north to the southern flank of Mount Ellen. Mount Ellen is a diorite porphyry laccolith of Eocene age and is radially surrounded by bysmaliths, ductaliths, and other satellite intrusives also composed of diorite porphyry. These plutonic bodies intrude the 8,000 ft (2500 m) thick Henry Basin sediments which range in age from Permian to Holocene. Only Upper Triassic and younger rocks are exposed in the area. The individual formations have been described in detail by Patterson and others, 1984.

The topographic relief in the study areas is about 7,000 ft (2100 m) with a maximum elevation of 11,522 ft (3513 m). The lower elevations consist of gently sloping plateaus and are cut by intermittent streams. The higher elevations exhibit substantial relief and are cut by intermittent and permanent streams. The climate ranges from arid in the low lying plateaus to semi-arid alpine in the higher mountains.

METHODS OF STUDY

Sample Media

Analyses of the stream-sediment samples represent the chemistry of the rock material eroded from the drainage basin upstream from each sample site. Such information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits. Heavy-mineral-concentrate samples provide information about the chemistry of a limited number of minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, many of which are ore-related, permits determination of some elements that are not easily detected in stream-sediment samples.

Analyses of unaltered or unmineralized rock samples provide background geochemical data for individual rock units. On the other hand, analyses of

altered or mineralized rocks, where present, may provide useful geochemical information about the major- and trace-element assemblages associated with a mineralizing system.

Sample Collection

Samples were collected at 126 sites (plate 1). At nearly all of those sites, both a stream-sediment sample and a heavy-mineral-concentrate sample were collected. Where suitable outcrop was available, rock samples were collected. Sampling density was about 1 sample site per 2 mi^2 for the stream sediment, heavy-mineral concentrate, and rock samples. The area of the drainage basins sampled ranged from 5 mi^2 to 25 mi^2.

Stream-sediment samples

The stream-sediment samples consisted of active alluvium collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps (scale = 1:50,000). Each sample was composited from several localities within an area that may extend as much as 100 ft from the site plotted on the map.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same active alluvium as the stream-sediment samples. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected from outcrops or exposures in the vicinity of the plotted site location. Samples were collected from unaltered, altered, or mineralized rock outcrops.

Sample Preparation

The stream sediment samples were air dried, then sieved using 80 mesh (0.17 mm) stainless steel sieves. The portion of the sediment passing through the sieve was saved for analysis.

After air drying, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy mineral sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, was not analyzed. The second fraction, largely ferromagnesian silicates and iron oxides, was saved for analysis/archival storage. The third fraction (the least magnetic material including the nonmagnetic ore minerals, zircon, sphene, etc.) was split using a Jones splitter. One split was hand-ground for spectrographic analysis; the other split was saved for mineralogical analysis. These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15° and a tilt of 10° with a current of 0.1 ampere to remove the magnetite and

ilmenite, and a current of 1.0 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

Rock samples were crushed and then pulverized to minus 0.15 mm with ceramic plates.

Sample Analysis

Spectrographic method

The stream-sediment, heavy-mineral-concentrate, and rock samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in Table 1. Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (iron, magnesium, calcium, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Area are listed in Tables 2-4.

In addition to the spectrographic analysis, all heavy-mineral-concentrate samples were mineralogically analyzed. Minerals reported include zircon (round and euhedral) , sphene, rutile, anatase, barite, apatite, scheelite, epidote, pyrite, pyroxene, arsenopyrite, amphibole, and rock fragments. The relative abundance of these minerals was visually determined using a binocular microscope.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (VanTrump and Miesch, 1976).

DESCRIPTION OF DATA TABLES

Tables 2-4 list the analyses for the samples of rock, stream sediment, and heavy-mineral concentrate, respectively. For the three tables, the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers correspond to the numbers shown on the site location maps (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses. A letter "N" in the tables indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in table 1. If an element

was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in the tables in front of the upper limit of determination. If an element was not looked for in a sample, two dashes (--) are entered in tables 2-4 in place of an analytical value. Because of the formatting used in the computer program that produced tables 2-4, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) carry one or more nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros.

Table 5 contains the mineralogical data for Bull Mountain and Blue Hills-Mount Ellen Wilderness Study Area. In the table, the data are arranged so that column 1 contains the USGS-assigned sample numbers. These numbers again correspond to the numbers shown on the site location map (plate 1). Columns headed with mineral names show the relative amount of that specific mineral found in a sample. Relative abundance is indicated by two dashes (--) (meaning that the mineral was not observed), or a number from 1-6, where: 1 = trace present, <9%; 2 = present, >2%; 3 = common, >5%; 4 = major, >20%; 5 = dominant, >50%; 6 = ubiquitous, >85%.

REFERENCES CITED

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

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VanTrump, George, Jr., and Miesch, A. T., 1976, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

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TABLE 1.--Limits of determination for the spectrographic analysis of rocks and stream sediments, based on a 10-mg sample

[The spectrographic limits of determination for heavy-mineral-concentrate samples are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks and stream sediments]

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Calcium (Ca)	.05	20
Titanium (Ti)	.002	1
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

TABLE 2.--Spectrographic analysis of rock samples from Bull Mt. and Blue Hills-Mt. Ellen Wilderness Study Area, Utah
[N, Not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown]

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
001	38 6 51	110 44 33	1.00	.50	2.00	.200	200	1.0	N	N	20	500	1.0	N	N	10
005	38 7 47	110 44 12	<.05	1.00	>20.00	.003	15	N	N	N	N	50	N	N	N	N
007	38 7 4	110 48 49	5.00	1.00	2.00	.200	1,500	N	N	N	15	700	1.5	N	N	10
008	38 5 54	110 46 38	>20.00	.70	3.00	.100	2,000	N	N	N	150	1,000	1.0	N	N	20
010	38 3 25	110 47 20	5.00	1.00	2.00	.300	1,000	N	N	N	15	1,500	<1.0	N	N	5
011	38 7 19	110 43 43	2.00	1.00	2.00	.200	500	N	N	N	20	700	1.0	N	N	5
016	38 6 3	110 46 32	5.00	1.00	>20.00	.200	300	N	N	N	1,500	50	<1.0	N	N	15
021	38 7 53	110 46 10	5.00	.50	2.00	.150	1,000	N	N	N	15	700	1.0	N	N	5
024	38 4 58	110 48 7	<.05	.05	.07	.020	100	N	N	N	20	200	1.0	N	N	N
027	38 8 35	110 44 32	5.00	1.00	3.00	.300	1,500	N	N	N	15	1,500	1.0	N	N	10
032	38 6 5	110 42 48	7.00	1.50	5.00	.500	1,500	N	N	N	20	1,000	1.0	N	N	15
036	38 7 21	110 46 16	3.00	.70	2.00	.200	1,000	N	N	N	15	1,000	1.0	N	N	10
037	38 3 43	110 47 58	7.00	1.00	3.00	.500	1,000	N	N	N	20	700	1.0	N	N	15
038	38 7 59	110 47 19	3.00	.70	2.00	.150	700	N	N	N	10	1,000	1.0	N	N	10
044	38 5 54	110 46 38	7.00	1.00	10.00	.200	2,000	N	N	N	10	1,000	1.0	N	N	15
049	38 7 31	110 51 39	7.00	1.00	2.00	.200	1,000	N	N	N	10	1,000	1.0	N	N	15
053	38 5 35	110 44 6	3.00	1.00	2.00	.200	1,000	N	N	N	<10	700	1.0	N	N	15
056	38 9 0	110 44 54	.70	.30	1.00	.200	300	N	N	N	30	5,000	1.0	N	N	<5
059	38 5 49	110 45 41	7.00	1.00	5.00	.300	1,500	N	N	N	10	700	1.0	N	N	7
060	38 3 45	110 47 32	2.00	.50	1.00	.150	300	2.0	N	N	<10	500	1.5	N	N	N
061	38 8 1	110 43 52	3.00	.70	3.00	.200	1,000	N	N	N	10	1,000	1.5	N	N	7
065	38 3 22	110 47 48	3.00	.30	1.00	.200	100	N	N	N	20	1,000	1.5	N	N	N
067	38 7 53	110 46 10	5.00	.50	2.00	.150	700	N	N	N	20	700	1.0	N	N	<5
068	38 3 32	110 47 7	10.00	.30	.07	.200	100	5.0	N	N	50	700	1.0	50	N	20
069	38 5 44	110 46 28	5.00	1.00	5.00	.150	1,500	N	N	N	10	700	1.0	N	N	15
074	38 6 27	110 46 18	.20	10.00	>20.00	.007	700	N	N	N	30	50	N	N	N	N
075	38 6 13	110 46 29	5.00	1.50	2.00	.500	1,000	N	N	N	<10	700	1.0	N	N	10
076	38 8 35	110 44 32	2.00	.50	1.50	.200	1,000	N	N	N	<10	1,000	1.5	N	N	N
078	38 3 47	110 47 9	3.00	1.00	1.50	.200	700	N	N	N	20	1,000	1.0	N	N	<5
084	38 3 42	110 47 32	3.00	.70	1.50	.200	500	.5	N	N	15	1,000	<1.0	N	N	<5
086	38 6 10	110 50 46	2.00	.70	1.50	.200	1,000	N	N	N	20	1,000	<1.0	N	N	7
087	38 8 6	110 46 52	3.00	.70	2.00	.150	1,000	N	N	N	20	700	1.0	N	N	5
092	38 5 9	110 45 26	2.00	.70	2.00	.150	700	N	N	N	10	500	<1.0	N	N	5
093	38 10 26	110 50 56	2.00	.70	2.00	.200	1,000	N	N	N	10	700	1.0	N	N	5
094	38 7 18	110 44 25	2.00	.70	2.00	.150	1,000	N	N	N	15	1,000	1.0	N	N	<5
096	38 7 33	110 44 6	3.00	.30	3.00	.200	1,000	N	N	N	15	1,000	1.0	N	N	15
100	38 7 27	110 50 3	3.00	1.00	5.00	.300	1,000	N	N	N	15	700	1.5	N	N	N
103	38 7 56	110 46 38	5.00	.70	3.00	.300	1,000	N	N	N	10	1,000	1.0	N	N	7
104	38 7 19	110 43 27	5.00	.70	2.00	.200	700	N	N	N	50	1,000	1.0	N	N	7
106	38 7 53	110 46 24	5.00	1.00	2.00	.200	1,500	N	N	N	10	1,500	1.0	N	N	5
107	38 5 54	110 46 38	>20.00	.70	15.00	.100	2,000	N	N	N	100	1,000	1.0	N	N	30
109	38 6 29	110 46 11	5.00	1.00	2.00	.200	1,500	N	N	N	15	1,000	1.0	N	N	7
113	38 7 33	110 49 54	7.00	1.00	3.00	.300	2,000	N	N	N	30	1,000	1.0	N	N	15
121	38 6 29	110 46 11	7.00	1.00	3.00	.200	1,500	N	N	N	20	1,000	1.5	N	N	20
122	38 5 9	110 46 12	7.00	1.00	2.00	.300	1,500	N	N	N	20	1,000	1.5	N	N	15

TABLE 2.--Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
001	50	200	30	7	N	10	70	N	5	N	200	50	N	20	N	500	N
005	15	10	N	N	N	N	N	N	N	N	700	N	N	N	N	N	N
007	10	20	20	N	N	10	30	N	10	N	1,000	100	N	20	N	100	N
008	20	7	N	N	N	20	N	N	7	15	<100	50	N	20	N	50	N
010	20	20	N	N	N	15	15	N	15	N	1,000	100	N	20	N	150	N
011	50	5	N	N	N	10	20	N	5	N	200	50	N	20	N	1,000	N
016	70	15	50	15	<20	20	50	N	15	N	500	100	70	30	N	150	N
021	<10	10	20	N	N	15	50	N	7	N	1,000	50	N	15	N	100	N
024	<10	<5	N	N	N	10	<10	N	N	N	N	10	N	N	N	100	N
027	<10	7	50	N	N	7	50	N	7	N	1,000	70	N	20	N	100	N
032	<10	30	30	N	N	10	50	N	15	N	1,000	100	N	20	N	100	N
036	<10	15	20	N	N	10	20	N	5	N	700	70	N	15	N	50	N
037	30	30	20	N	N	10	30	N	15	N	700	150	N	20	N	100	N
038	30	20	N	N	N	7	20	N	7	N	500	70	N	<10	N	50	N
044	70	150	50	N	N	50	30	N	10	N	1,000	100	N	30	N	150	N
049	<10	20	50	N	N	10	70	N	10	N	1,000	100	N	20	N	100	N
053	50	30	N	N	N	20	50	N	10	N	1,000	100	N	10	N	100	N
056	15	5	N	<5	N	5	<10	N	N	N	200	70	N	15	N	700	N
059	20	50	30	N	N	10	50	N	10	N	1,000	100	N	30	N	100	N
060	<10	10,000	50	N	N	5	20	N	5	N	700	50	N	10	N	70	N
061	<10	150	20	N	N	10	50	N	7	N	1,000	100	N	20	N	100	N
065	15	10	N	N	N	7	50	N	5	N	1,000	100	N	N	N	50	N
067	10	10	N	N	N	7	50	N	<5	N	1,000	70	N	<10	N	100	N
068	<10	500	N	20	N	5	100	N	5	N	500	70	150	N	N	100	N
069	<10	20	50	N	N	10	30	N	10	N	1,000	100	N	20	N	100	N
074	<10	15	N	N	N	N	N	N	N	N	200	15	N	15	N	N	N
075	10	15	30	N	N	10	100	N	7	N	1,000	100	N	20	N	100	N
076	<10	5	30	N	N	5	30	N	5	N	1,000	50	N	15	N	150	N
078	<10	50	N	N	N	10	30	N	10	N	1,000	50	N	20	N	100	N
084	10	300	50	N	N	10	70	N	10	N	1,000	70	N	20	N	70	N
086	10	15	20	N	N	10	50	N	10	N	1,000	70	N	15	N	100	N
087	10	10	N	N	N	7	30	N	5	N	700	50	N	15	N	100	N
092	10	10	50	N	N	10	30	N	7	N	700	70	N	15	N	100	N
093	<10	5	30	N	N	10	20	N	10	N	1,000	70	N	20	N	150	N
094	<10	10	50	N	N	10	50	N	5	N	1,000	70	N	20	N	100	N
096	20	20	N	N	N	10	50	N	10	N	1,000	100	N	20	N	100	N
100	10	20	20	N	N	10	50	N	7	N	1,000	70	N	20	N	150	N
103	10	15	20	N	N	10	20	N	7	N	1,000	70	N	15	N	100	N
104	10	20	20	N	N	10	20	N	5	N	700	50	N	15	N	150	N
106	10	10	30	N	N	7	30	N	7	N	1,000	50	N	15	N	100	N
107	70	<5	N	N	N	20	<10	N	10	20	200	70	N	50	N	100	N
109	15	15	50	N	N	10	30	N	10	N	1,000	50	N	20	N	100	N
113	10	30	50	N	N	10	30	N	10	N	100	70	N	30	N	150	N
121	20	15	30	N	N	20	50	N	10	N	1,000	100	N	30	N	150	N
122	<10	20	30	N	N	10	50	N	15	N	1,000	100	N	20	N	150	N

TABLE 2.--Continued

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
124	38 3 14	110 47 11	10.00	1.50	5.00	.300	2,000	N	N	N	20	1,000	1.0	N	N	30
127	38 7 15	110 50 54	7.00	1.00	5.00	.500	1,500	N	N	N	10	500	1.0	N	N	10
134	38 3 24	110 47 24	5.00	1.00	5.00	.200	700	N	N	N	20	1,000	1.0	N	N	N
136	38 8 0	110 46 45	5.00	1.00	5.00	.200	1,000	N	N	N	20	1,500	1.0	N	N	5
139	38 5 53	110 46 34	7.00	1.50	7.00	.300	700	N	N	N	20	1,000	<1.0	N	N	10
143	38 9 11	110 40 34	3.00	1.00	20.00	.050	1,000	N	N	N	300	50	1.0	<10	N	10
145	38 7 51	110 43 11	5.00	1.00	5.00	.200	1,500	N	N	N	20	700	1.0	N	N	10
146	38 9 0	110 44 54	1.50	1.00	5.00	.300	500	N	N	N	30	>5,000	<1.0	N	N	5
149	38 6 25	110 48 49	7.00	1.00	5.00	.500	1,000	N	N	N	20	700	1.0	N	N	<5
153	38 3 59	110 47 49	2.00	1.00	3.00	.200	3,000	N	N	N	15	1,000	1.0	N	N	5
158	38 3 20	110 47 30	3.00	.70	5.00	.200	2,000	N	N	N	30	2,000	1.5	N	N	10
160	38 7 47	110 44 12	2.00	1.00	10.00	.300	1,000	N	N	N	30	1,000	2.0	N	N	10
161	38 8 0	110 46 45	2.00	.70	3.00	.200	1,000	N	N	N	15	1,000	1.5	N	N	10
162	38 9 38	110 49 39	2.00	1.00	5.00	.200	1,000	N	N	N	10	1,000	1.5	N	N	10
163	38 7 39	110 49 16	3.00	1.00	5.00	.300	1,500	N	N	N	15	1,000	1.0	N	N	15
168	38 3 57	110 47 54	5.00	1.50	7.00	.500	1,500	N	N	N	20	1,000	<1.0	N	N	20
173	38 8 13	110 47 1	2.00	.70	2.00	.300	1,000	N	N	N	20	1,000	1.5	N	N	5
176	38 6 21	110 48 46	3.00	1.00	2.00	.300	1,000	N	N	N	<10	700	1.0	N	N	15
178	38 9 31	110 49 26	1.00	1.00	3.00	.500	1,000	N	N	N	<10	700	1.0	N	N	5
184	38 7 33	110 43 46	5.00	.05	7.00	.030	300	N	N	N	30	200	<1.0	N	N	N
185	38 6 4	110 45 39	15.00	1.00	5.00	.300	1,500	N	N	N	15	1,000	1.0	N	N	7
187	38 9 23	110 50 23	3.00	1.00	2.00	.200	1,000	N	N	N	10	1,000	1.0	N	N	5
188	38 8 49	110 42 58	7.00	.20	2.00	.200	70	N	N	N	20	1,000	1.5	N	N	N
189	38 7 27	110 50 1	5.00	1.00	5.00	.200	1,500	N	N	N	20	700	1.0	N	N	15
192	38 7 43	110 44 14	5.00	.10	2.00	.200	1,500	N	N	N	15	1,000	1.0	N	N	7
193	38 6 50	110 44 33	3.00	.70	2.00	.200	700	N	N	N	30	1,000	1.0	N	N	5
194	38 7 44	110 44 8	5.00	1.00	>20.00	.150	500	N	300	N	2,000	70	1.0	30	N	10
196	38 8 4	110 47 9	7.00	.70	2.00	.100	1,000	N	N	N	<10	1,000	1.0	N	N	5
197	38 5 54	110 46 38	5.00	1.00	2.00	.300	1,000	N	N	N	N	1,000	1.0	N	N	7
199	38 3 32	110 47 56	5.00	1.00	.70	.200	500	.7	200	N	>2,000	500	2.0	N	N	5
204	38 5 53	110 46 34	5.00	2.00	20.00	.200	1,000	N	N	N	20	1,000	1.0	N	N	10
205	38 7 19	110 43 30	3.00	1.50	1.00	.200	500	N	N	N	50	200	1.0	N	N	N
207	38 6 51	110 48 49	7.00	1.00	1.50	.300	1,000	N	N	N	20	1,000	1.5	N	N	15
208	38 8 38	110 44 29	10.00	1.00	3.00	.200	1,500	N	N	N	10	1,000	1.0	N	N	20
214	38 3 20	110 47 34	5.00	1.00	1.50	.200	1,000	N	N	N	30	1,000	1.0	N	N	5
217	38 9 48	110 42 50	.50	.50	2.00	.150	1,000	N	N	N	50	500	1.0	N	N	<5
223	38 8 9	110 49 10	5.00	1.00	2.00	.200	1,000	N	N	N	10	1,000	1.0	N	N	10
226	38 7 53	110 46 32	5.00	.70	5.00	.200	1,000	N	N	N	10	1,000	1.0	N	N	7
238	38 8 52	110 43 0	.20	.20	1.00	.100	70	N	N	N	30	500	1.0	N	N	N
243	38 6 21	110 48 46	7.00	1.00	3.00	.200	1,000	N	N	N	10	1,000	1.0	N	N	20
244	38 3 46	110 47 12	10.00	.50	2.00	.200	500	20.0	N	N	15	1,500	1.0	N	N	1,000
246	38 9 23	110 50 24	7.00	1.00	2.00	.300	1,500	N	N	N	10	1,000	1.0	N	N	10
247	38 7 15	110 50 55	7.00	1.00	3.00	.300	1,500	N	N	N	10	1,000	1.0	N	N	5
249	38 7 44	110 44 8	.70	.70	15.00	.150	700	N	N	N	10	500	<1.0	N	N	N
250	38 8 11	110 46 57	7.00	1.00	5.00	.300	1,500	N	N	N	15	700	1.0	N	N	5

TABLE 2.--Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
124	50	20	30	N	N	20	50	N	15	N	1,000	150	N	20	N	70	N
127	<10	70	30	N	N	10	20	N	10	N	N	100	N	10	N	150	N
134	10	300	20	N	N	15	50	N	10	N	1,500	100	70	20	N	100	N
136	<10	20	N	N	N	10	50	N	5	N	1,000	70	70	20	N	100	N
139	<10	15	30	N	N	10	15	N	N	N	300	100	70	15	N	50	N
143	20	15	30	N	N	10	10	N	15	15	1,500	30	70	15	3,000	30	N
145	<10	15	50	N	N	10	70	N	<5	N	1,000	100	70	30	N	100	N
146	20	15	N	N	N	10	50	N	<5	N	1,000	70	70	30	N	200	N
149	<10	15	30	N	N	7	30	N	15	N	1,000	70	70	30	N	100	N
153	10	<5	30	N	N	7	50	N	7	N	1,000	100	N	30	N	100	N
158	<10	5	30	N	N	10	70	N	7	N	1,000	100	N	20	N	100	N
160	70	15	50	N	N	20	50	N	10	N	700	100	N	20	N	150	N
161	<10	10	20	N	N	10	50	N	7	N	1,000	50	N	15	N	100	N
162	N	15	20	N	N	10	30	N	7	N	1,000	50	N	15	N	100	N
163	N	20	30	N	N	15	70	N	10	N	1,000	100	N	30	N	150	N
168	50	20	N	N	N	20	50	N	15	N	1,000	150	N	20	N	150	N
173	<10	15	30	N	N	7	50	N	7	N	1,000	70	N	15	N	150	N
176	50	20	N	N	N	20	30	N	10	N	1,000	100	N	10	N	70	N
178	<10	15	50	N	N	7	20	N	10	N	1,000	100	N	20	N	100	N
184	<10	<5	N	N	N	7	<10	N	N	N	200	20	N	N	N	200	N
185	<10	10	50	N	N	5	30	N	7	N	1,000	50	N	20	N	70	N
187	N	10	30	N	N	5	50	N	5	N	700	50	N	20	N	70	N
188	<10	15	N	N	N	7	50	N	5	N	700	70	N	10	N	100	N
189	<10	15	50	N	N	10	30	N	10	N	700	100	N	20	N	100	N
192	<10	15	20	N	N	7	50	N	7	N	1,000	50	N	20	N	100	N
193	<10	50	30	N	N	15	70	N	10	N	700	70	N	20	N	100	N
194	70	<5	50	N	N	30	30	N	15	N	300	100	N	20	N	70	N
196	<10	5	N	N	N	5	20	N	5	N	1,000	50	N	15	N	50	N
197	10	30	50	N	N	10	50	N	10	N	700	70	N	20	N	150	N
199	50	15	70	5	N	10	70	N	10	N	300	70	N	20	N	100	N
204	70	10	50	N	<20	30	30	N	15	N	1,000	200	N	50	N	200	N
205	50	30	30	N	N	10	10	N	5	N	<100	50	N	20	N	300	N
207	<10	50	30	N	N	7	30	N	15	N	1,000	150	N	30	N	150	N
208	<10	10	50	N	N	10	70	N	10	N	1,500	150	N	30	N	150	N
214	10	5	30	N	N	7	50	N	7	N	1,500	100	N	20	N	100	N
217	15	7	N	N	N	5	15	N	N	N	200	30	N	<10	N	300	N
223	<10	10	20	N	N	10	30	N	10	N	1,000	100	N	20	N	100	N
226	10	15	30	N	N	7	50	N	7	N	1,500	100	N	20	N	70	N
238	15	5	N	N	N	10	<10	N	N	N	500	30	N	15	N	50	N
243	20	20	N	N	N	15	50	N	10	N	1,000	100	N	10	N	100	N
244	<10	7,000	100	20	N	50	100	N	5	N	700	70	100	30	300	100	N
246	<10	50	30	N	N	7	50	N	10	N	1,000	70	N	20	N	70	N
247	<10	10	20	N	N	7	30	N	7	N	1,000	70	N	20	N	100	N
249	15	7	N	N	N	5	20	N	N	N	200	30	N	20	N	300	N
250	<10	20	30	N	N	7	50	N	7	N	1,000	70	N	15	N	100	N

TABLE 2.--Continued

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
251	38 6 30	110 51 42	5.00	1.00	2.00	.300	1,500	N	N	N	<10	1,000	1.0	N	N	10
252	38 8 35	110 44 32	5.00	1.00	3.00	.300	2,000	N	N	N	10	1,000	1.0	N	N	10
255	38 5 9	110 46 12	5.00	1.50	7.00	.300	500	N	N	N	50	500	1.5	N	N	10
258	38 7 27	110 50 2	7.00	1.00	5.00	.020	2,000	N	N	N	<10	1,000	1.0	N	N	10
261	38 4 58	110 48 7	5.00	1.00	1.50	.500	1,500	N	N	N	20	700	1.0	N	N	5
263	38 5 54	110 46 37	7.00	1.00	10.00	.070	3,000	N	N	N	<10	1,500	1.0	N	N	15
268	38 6 46	110 44 38	2.00	2.00	5.00	.500	700	N	N	N	50	700	1.0	N	N	5
272	38 6 12	110 46 29	5.00	2.00	5.00	.200	2,000	N	N	N	15	150	1.0	N	N	5
273	38 3 33	110 47 51	5.00	.50	.50	.200	300	20.0	N	N	50	200	1.0	N	N	20
276	38 7 27	110 49 45	7.00	1.00	5.00	.500	2,000	N	N	N	20	1,000	1.0	N	N	15
279	38 3 45	110 47 8	3.00	1.00	3.00	.200	1,000	.5	N	N	10	1,500	<1.0	N	N	<5
281	38 7 6	110 48 49	7.00	1.50	5.00	.300	2,000	N	N	N	15	1,000	1.0	N	N	20
285	38 7 26	110 51 17	5.00	1.00	5.00	.300	1,500	N	N	N	15	1,000	1.0	N	N	20
286	38 4 1	110 47 47	2.00	.50	1.00	.100	300	N	N	N	30	1,500	1.0	N	N	<5
287	38 6 40	110 44 40	7.00	1.00	5.00	.300	2,000	N	N	N	15	1,000	1.0	N	N	15
290	38 3 45	110 47 8	5.00	.70	2.00	.200	1,000	N	N	N	10	700	1.0	N	N	5
291	38 6 5	110 46 34	5.00	1.50	15.00	.200	1,000	N	N	N	30	500	1.0	N	N	10
293	38 6 29	110 44 44	5.00	.70	3.00	.200	1,500	N	N	N	10	700	1.0	N	N	7
297	38 6 54	110 48 49	2.00	1.00	.70	.200	500	N	N	N	10	700	1.0	N	N	5
HM906A	38 4 3	110 47 33	>20.00	.15	.10	.010	100	N	N	N	N	50	N	150	N	N
HM906B	38 4 3	110 47 33	2.00	.30	1.50	.300	300	N	N	N	N	700	N	N	N	10
HM906C	38 4 3	110 47 33	1.50	.50	1.00	.300	500	7.0	N	N	<10	150	<1.0	N	N	30
HM906D	38 4 3	110 47 33	.70	.30	1.00	.200	150	5.0	N	N	N	700	<1.0	N	N	<5
HM906E	38 4 3	110 47 33	5.00	.70	3.00	.300	500	N	N	N	N	700	N	N	N	5
HM906F	38 4 3	110 47 33	.70	.20	.70	.300	150	50.0	N	N	N	700	<1.0	N	N	7
HM906G	38 4 3	110 47 33	2.00	.30	2.00	.300	1,000	N	N	N	N	500	<1.0	N	N	5
HM912A	38 19 3	110 55 48	2.00	1.50	5.00	.300	300	N	N	N	100	150	1.5	N	N	7
HM912B	38 19 3	110 55 48	1.50	1.50	5.00	.300	200	N	N	N	100	150	1.5	N	N	7
HM912C	38 19 3	110 55 18	2.00	1.50	5.00	.300	300	N	N	N	100	150	1.5	N	N	7
HM913A	38 17 21	110 55 15	2.00	1.50	5.00	.300	300	N	N	N	100	150	1.5	N	N	7
HM913B	38 17 21	110 55 15	1.50	1.50	5.00	.300	200	N	N	N	70	150	1.0	N	N	7
HM913C	38 17 21	110 55 15	1.50	1.50	3.00	.300	200	N	N	N	100	150	1.5	N	N	7
HM914A	38 15 35	110 54 19	1.00	1.50	5.00	.300	300	N	N	N	100	150	1.5	N	N	7
HM914B	38 15 35	110 54 19	1.50	1.50	5.00	.300	300	N	N	N	100	150	1.5	N	N	7
HM914C	38 15 35	110 54 19	2.00	2.00	5.00	.500	300	N	N	N	100	200	1.0	N	N	7
HM915A	38 10 40	110 53 10	1.00	1.50	7.00	.300	200	N	N	N	100	150	1.0	N	N	7
HM915B	38 10 40	110 53 10	.70	1.50	5.00	.200	200	N	N	N	100	150	1.0	N	N	5
HM915C	38 10 40	110 53 10	2.00	1.50	10.00	.300	300	N	N	N	100	150	<1.0	N	N	7

TABLE 2.--Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
251	20	70	N	N	N	10	30	N	7	N	1,500	150	N	10	N	100	N
252	<10	10	50	N	N	10	70	N	7	N	1,500	150	N	20	N	150	N
255	70	50	70	N	N	50	30	N	10	N	500	100	N	20	N	200	N
258	10	20	30	N	N	5	30	N	10	N	1,000	100	N	20	N	100	N
261	<10	15	30	N	N	7	50	N	7	N	1,000	100	N	20	N	100	N
263	20	15	30	5	N	10	50	N	10	N	1,500	100	N	30	N	150	N
268	30	20	50	N	N	15	50	N	5	N	200	50	N	15	N	150	N
272	<10	<5	100	N	N	10	200	N	5	N	700	50	N	20	500	100	N
273	10	1,500	20	N	N	7	300	N	7	N	700	100	N	15	N	100	N
276	10	20	30	7	N	10	30	N	10	N	1,000	100	N	20	<200	150	N
279	10	500	50	15	N	7	50	N	7	N	1,000	70	N	20	N	100	N
281	10	30	30	N	N	7	50	N	15	N	1,000	100	N	30	N	150	N
285	15	20	50	N	N	10	50	N	15	N	1,000	100	N	20	N	150	N
286	10	5	N	N	N	10	30	N	N	N	1,000	50	N	N	N	50	N
287	<10	10	20	N	N	7	30	N	10	N	1,000	150	N	20	N	200	N
290	10	15	N	N	N	10	50	N	7	N	1,000	100	N	15	N	100	N
291	100	20	70	5	N	50	200	N	15	N	1,000	150	N	30	N	150	N
293	<10	10	20	N	N	10	50	N	10	N	1,000	100	N	20	N	150	N
297	70	7	50	N	N	20	30	N	5	N	150	50	N	20	N	300	N
HM906A	<10	500	<20	N	N	7	30	N	<5	30	N	70	300	10	N	N	N
HM906B	N	700	30	N	N	5	50	N	5	N	700	70	N	20	N	50	N
HM906C	N	20,000	30	N	N	15	30	N	<5	N	700	70	N	15	N	70	N
HM906D	N	1,500	30	N	N	5	50	N	5	N	1,000	50	<50	<10	N	70	N
HM906E	N	700	30	N	N	5	100	N	<5	N	700	100	N	20	N	100	N
HM906F	<10	15,000	30	10	N	5	50	N	5	N	700	50	50	15	N	70	N
HM906G	N	70	20	N	N	<5	50	N	5	N	1,000	100	N	20	N	150	N
HM912A	70	30	20	7	N	30	30	N	7	10	300	150	N	20	N	50	N
HM912B	70	20	20	7	<20	30	30	N	7	10	300	150	N	20	N	70	N
HM912C	70	20	20	7	<20	30	30	N	7	10	300	150	N	20	N	70	N
HM913A	70	20	20	7	<20	30	30	N	7	<10	500	200	N	20	N	100	N
HM913B	70	20	20	7	N	30	50	N	7	<10	200	150	N	20	N	100	N
HM913C	70	20	20	7	<20	30	30	N	7	N	300	150	N	20	N	70	N
HM914A	70	20	20	7	<20	30	30	N	7	10	200	150	N	20	N	70	N
HM914B	70	20	20	7	<20	30	50	N	7	<10	300	150	N	20	N	70	N
HM914C	70	30	20	7	N	30	30	N	7	<10	200	150	N	20	N	100	N
HM915A	70	20	20	10	N	30	50	N	7	<10	300	200	N	20	N	70	N
HM915B	50	20	20	<5	<20	30	50	N	7	<10	150	150	N	20	N	70	N
HM915C	100	20	20	10	<20	50	50	N	7	<10	300	200	N	30	N	70	N

TABLE 3.--Spectrographic analysis of stream-sediment samples from Bull Mt. and Blue Hills-Mt. Ellen Wilderness Study Area, Uta

[N, not detected; <, detected but below the limit of determination shown; >, determinined to be greater than the value shown

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM010	38 10 20	110 40 50	.5	.3	2.0	.10	200	N	N	N	20	700	1.0	N	N	N	50
HM011	38 9 58	110 41 0	.3	.2	1.5	.07	150	N	N	N	10	150	1.0	N	N	N	N
HM012	38 9 56	110 40 50	.5	.5	1.5	.15	200	N	N	N	30	200	1.0	N	N	5	50
HM013	38 10 29	110 48 43	1.0	.5	3.0	.20	500	N	N	N	30	1,000	1.5	N	N	7	20
HM014	38 11 42	110 45 14	2.0	.5	2.0	.30	500	.7	N	N	30	200	1.0	N	N	7	20
HM015	38 11 45	110 45 27	1.0	.5	1.5	.20	500	N	N	N	20	300	1.5	N	N	5	10
HM016	38 11 37	110 46 18	1.0	.7	2.0	.30	500	N	N	N	50	500	1.5	N	N	5	30
HM017	38 12 0	110 46 0	1.5	.7	2.0	.50	700	N	N	N	50	300	1.5	N	N	7	20
HM018	38 14 42	110 45 29	2.0	1.0	7.0	.30	200	<.5	N	N	100	300	1.5	N	N	5	50
HM019	38 14 41	110 45 21	1.5	.7	7.0	.15	300	N	N	N	70	700	1.0	N	N	5	50
HM033	38 5 6	110 59 3	1.0	1.5	2.0	.30	300	N	N	N	20	1,500	1.0	N	N	5	50
HM035	38 7 4	110 54 43	2.0	1.0	3.0	.20	200	N	N	N	20	1,000	1.0	N	N	5	30
HM036	38 6 56	110 54 37	1.0	1.0	1.5	.30	200	N	N	N	30	700	1.0	N	N	5	150
HM037	38 7 59	110 53 15	3.0	1.0	1.0	.50	700	N	N	N	30	500	1.0	N	N	5	50
HM038	38 5 35	110 52 34	2.0	1.0	7.0	.50	200	N	N	N	70	300	1.0	N	N	5	50
HM039	38 6 12	110 54 47	2.0	1.0	1.5	.30	500	N	N	N	100	500	1.5	N	N	7	70
HM040	38 4 37	110 54 7	1.5	1.0	2.0	.30	200	N	N	N	50	300	1.0	N	N	7	50
HM041	38 3 30	110 57 45	1.0	1.5	5.0	.20	300	N	N	N	50	1,000	1.0	N	N	5	20
HM042	38 3 28	110 57 59	1.0	1.5	3.0	.30	500	N	N	N	50	1,000	1.0	N	N	5	30
HM051	38 11 10	110 51 35	1.5	1.0	2.0	.30	200	N	N	N	30	300	1.5	N	N	7	20
HM052	38 11 20	110 51 46	2.0	1.0	3.0	.50	200	N	N	N	50	500	1.5	N	N	7	50
HM150	38 6 34	110 52 35	1.5	.5	2.0	.20	100	N	N	N	30	500	N	N	N	5	20
HM151	38 6 40	110 52 35	2.0	1.5	5.0	.30	500	N	N	N	70	700	1.5	N	N	10	50
HM152	38 7 12	110 53 15	1.0	.7	2.0	.20	500	N	N	N	30	500	1.0	N	N	5	20
HM153	38 7 18	110 51 35	2.0	.7	1.0	.50	700	N	N	N	50	300	1.0	N	N	5	20
HM154	38 7 22	110 51 33	1.5	1.0	1.0	.20	300	N	N	N	30	300	1.0	N	N	5	10
HM155	38 9 53	110 48 33	1.0	.5	7.0	.20	150	N	N	N	30	300	1.0	N	N	N	15
HM156	38 9 52	110 48 40	2.0	.7	.7	.50	500	N	N	N	30	300	1.5	N	N	5	20
HM157	38 9 53	110 47 40	1.5	.5	1.0	.20	100	<.5	N	N	50	200	1.5	N	N	5	20
HM158	38 9 50	110 47 35	1.0	.5	.7	.20	500	N	N	N	30	300	1.0	N	N	N	10
HM159	38 10 38	110 49 22	1.5	.5	1.0	.30	150	<.5	N	N	50	300	1.5	N	N	5	20
HM160	38 10 59	110 50 10	1.0	.7	1.5	.30	300	N	N	N	50	200	1.0	N	N	7	50
HM161	38 11 58	110 52 58	1.5	1.0	5.0	.20	100	<.5	N	N	70	150	1.0	N	N	7	70
HM162	38 11 58	110 53 2	2.0	1.5	7.0	.50	200	<.5	N	N	100	200	1.5	N	N	7	100
HM163	38 10 38	110 53 30	2.0	1.0	7.0	.30	150	N	N	N	100	300	1.0	N	N	5	70
HM164	38 10 40	110 53 24	2.0	1.5	7.0	.30	200	<.5	N	N	100	200	1.5	N	N	5	70
HM178	38 11 14	110 50 47	1.5	1.0	2.0	.30	200	N	N	N	50	500	1.5	N	N	10	30
HM179	38 9 25	110 54 25	2.0	1.0	3.0	.30	200	N	N	N	50	500	1.0	N	N	7	70
HM180	38 9 27	110 54 18	2.0	.7	2.0	.50	150	N	N	N	50	500	1.0	N	N	5	50
HM181	38 10 33	110 54 32	1.5	2.0	5.0	.50	100	<.5	N	N	50	200	1.0	N	N	7	100
HM182	38 10 35	110 54 32	1.5	1.0	5.0	.20	200	N	N	N	50	300	1.0	N	N	5	50
HM183	38 14 46	110 54 31	2.0	1.5	10.0	.30	200	N	N	N	150	200	1.5	N	N	5	100
HM184	38 14 47	110 54 31	1.5	1.0	5.0	.20	200	N	N	N	70	700	1.0	N	N	5	50
HM185	38 14 20	110 54 45	1.5	1.5	7.0	.30	150	N	N	N	100	200	1.5	N	N	7	100
HM186	38 14 30	110 55 45	1.5	1.0	7.0	.20	200	N	N	N	150	1,000	1.5	N	N	5	70

TABLE 3.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM010	5	20	N	N	5	10	N	--	N	100	30	N	10	N	--	N
HM011	7	20	N	N	5	<10	N	--	N	150	15	N	10	N	--	N
HM012	5	N	N	N	5	10	N	--	N	100	20	N	10	N	--	N
HM013	10	30	N	<20	10	15	N	--	N	200	50	N	20	N	--	N
HM014	10	20	N	N	7	15	N	--	N	100	70	N	15	N	--	N
HM015	7	20	N	N	7	15	N	--	N	200	50	N	15	N	--	N
HM016	10	20	N	N	10	20	N	--	N	150	50	N	15	N	--	N
HM017	10	30	N	<20	10	15	N	--	N	200	70	N	15	N	--	N
HM018	10	30	N	<20	15	20	N	--	N	300	150	N	20	N	--	N
HM019	7	20	<5	N	20	10	N	--	N	500	100	N	20	N	--	N
HM033	10	50	N	N	10	10	N	--	N	100	50	N	20	N	--	N
HM035	10	20	N	N	7	10	N	--	N	150	100	N	20	N	--	N
HM036	7	70	N	N	7	20	N	--	N	N	50	N	20	N	--	N
HM037	15	20	N	N	10	15	N	--	N	200	70	N	30	N	--	N
HM038	15	50	N	N	20	20	N	--	N	300	100	N	20	N	--	N
HM039	20	20	N	N	15	30	N	--	N	150	70	N	20	N	--	N
HM040	15	20	N	N	10	20	N	--	N	100	100	N	20	N	--	N
HM041	15	30	<5	N	10	20	N	--	N	200	50	N	20	N	--	N
HM042	10	20	N	N	10	15	N	--	N	100	50	N	15	N	--	N
HM051	10	20	N	N	10	20	N	--	N	150	50	N	20	N	--	N
HM052	15	20	7	N	20	20	N	--	N	300	100	N	20	N	--	N
HM150	7	20	N	N	5	10	N	--	N	100	30	N	10	N	--	N
HM151	15	30	N	N	15	15	N	--	N	150	70	N	20	N	--	N
HM152	10	20	N	N	7	10	N	--	N	100	30	N	10	N	--	N
HM153	10	50	N	N	7	15	N	--	N	200	50	N	20	N	--	N
HM154	10	50	N	N	N	30	N	--	N	200	30	N	10	N	--	N
HM155	7	N	N	N	5	15	N	--	N	200	30	N	10	N	--	N
HM156	10	20	N	<20	10	20	N	--	N	100	50	N	15	N	--	N
HM157	10	N	N	N	10	20	N	--	N	100	70	N	15	N	--	N
HM158	10	20	N	N	5	30	N	--	N	200	30	N	10	N	--	N
HM159	10	50	N	N	10	15	N	--	N	100	50	N	20	N	--	N
HM160	7	20	N	N	7	20	N	--	N	100	30	N	10	N	--	N
HM161	15	20	20	N	30	20	N	--	N	200	100	N	20	N	--	N
HM162	20	50	15	N	30	20	N	--	N	200	150	N	30	N	--	N
HM163	15	50	5	N	15	20	N	--	N	300	100	N	20	N	--	N
HM164	20	50	10	N	20	30	N	--	N	200	150	N	20	N	--	N
HM178	10	20	N	<20	15	15	N	--	N	150	70	N	20	N	--	N
HM179	15	50	10	N	20	20	N	--	N	200	100	N	20	N	--	N
HM180	10	30	<5	N	15	15	N	--	N	150	70	N	30	N	--	N
HM181	20	20	10	N	20	20	N	--	N	200	100	N	30	N	--	N
HM182	20	20	10	N	15	20	N	--	N	200	150	N	20	N	--	N
HM183	30	30	15	N	30	20	N	--	N	300	200	N	30	N	--	N
HM184	15	50	7	N	20	20	N	--	N	200	100	N	20	N	--	N
HM185	20	20	7	N	20	20	N	--	N	150	100	N	30	N	--	N
HM186	20	50	10	N	20	20	N	--	N	700	100	N	30	N	--	N

TABLE 3.--Continued

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM187	38 14 30	110 56 0	1.0	1.0	3.0	.20	150	N	N	N	50	300	1.0	N	N	5	50
HM188	38 13 9	110 56 15	2.0	1.5	7.0	.20	150	<.5	N	N	100	300	1.0	N	N	5	70
HM189	38 13 15	110 56 25	1.0	1.0	3.0	.20	200	N	N	N	70	500	1.0	N	N	5	70
HM190	38 11 25	110 57 10	1.5	1.0	2.0	.30	200	N	N	N	50	300	1.0	N	N	5	50
HM191	38 11 25	110 57 0	1.5	1.0	3.0	.20	150	N	N	N	30	300	1.0	N	N	5	50
HM192	38 10 35	110 56 0	1.5	1.0	5.0	.30	200	N	N	N	50	500	1.0	N	N	5	50
HM193	38 10 35	110 55 10	2.0	1.0	3.0	.50	300	N	N	N	50	700	1.5	N	N	5	50
HM194	38 12 54	110 58 24	1.5	1.5	2.0	.30	200	N	N	N	50	500	1.0	N	N	10	50
HM195	38 12 54	110 58 16	1.0	1.0	2.0	.20	150	N	N	N	30	1,500	1.0	N	N	5	50
HM196	38 13 2	110 57 57	1.0	1.0	2.0	.20	200	N	N	N	30	200	1.0	N	N	5	50
HM197	38 14 22	110 57 30	1.5	1.0	5.0	.30	100	N	N	N	70	150	1.5	N	N	5	70
HM198	38 14 20	110 57 41	1.0	.7	2.0	.15	200	<.5	N	N	10	1,000	1.0	N	N	5	10
HM199	38 14 51	110 57 44	1.5	1.0	5.0	.20	200	<.5	N	N	100	500	1.0	N	N	5	70
HM200	38 14 20	110 58 38	2.0	1.5	3.0	.30	200	N	N	N	100	1,000	1.5	N	N	5	100
HM201	38 14 25	110 56 43	2.0	1.0	5.0	.20	200	N	N	N	150	500	1.5	N	N	7	100
HM202	38 15 34	110 59 39	2.0	1.5	5.0	.30	200	N	N	N	100	300	1.0	N	N	5	100
HM203	38 15 28	110 59 35	2.0	1.0	5.0	.20	200	N	N	N	100	300	1.5	N	N	5	70
HM204	38 15 33	110 59 5	2.0	1.5	5.0	.30	150	N	N	N	150	500	1.5	N	N	5	70
HM205	38 16 36	110 56 50	1.5	1.0	7.0	.20	150	N	N	N	70	200	1.5	N	N	5	70
HM206	38 16 45	110 56 49	1.0	1.0	2.0	.15	200	N	N	N	30	500	1.0	N	N	5	15
HM207	38 16 17	110 55 57	1.5	1.0	5.0	.20	150	N	N	N	70	300	1.0	N	N	5	70
HM208	38 16 17	110 56 1	1.5	1.0	5.0	.20	150	N	N	N	70	200	1.0	N	N	5	50
HM209	38 17 5	110 55 58	2.0	1.5	7.0	.30	150	N	N	N	100	200	1.0	N	N	5	100
HM210	38 20 55	110 56 4	1.5	1.5	5.0	.20	150	N	N	N	70	200	1.5	N	N	5	100
HM211	38 21 2	110 54 17	2.0	1.0	5.0	.20	100	N	N	N	70	500	1.0	N	N	5	70
HM212	38 19 5	110 54 29	1.5	1.0	5.0	.20	150	N	N	N	50	300	1.0	N	N	5	70
HM213	38 18 43	110 54 22	2.0	1.0	7.0	.30	150	N	N	N	50	700	1.0	N	N	5	100
HM214	38 18 52	110 56 13	2.0	1.5	5.0	.20	150	N	N	N	50	150	1.0	N	N	5	100
HM215	38 18 47	110 56 12	2.0	1.5	7.0	.30	150	N	N	N	100	300	1.0	N	N	5	70
HM216	38 18 20	110 55 44	1.5	1.0	5.0	.20	100	N	N	N	150	200	1.5	N	N	5	50
HM217	38 18 15	110 55 43	1.0	1.5	7.0	.20	100	<.5	N	N	70	700	1.0	N	N	7	50
HM218	38 17 58	110 55 17	1.0	1.5	5.0	.30	150	N	N	N	150	200	1.0	N	N	5	70
HM219	38 16 47	110 53 59	1.5	1.0	7.0	.30	200	N	N	N	100	300	1.5	N	N	7	100
HM220	38 16 8	110 53 27	1.0	1.5	7.0	.20	200	<.5	N	N	150	200	1.5	N	N	5	50
HM221	38 16 8	110 53 40	1.5	1.5	7.0	.30	200	N	N	N	70	200	1.0	N	N	5	70
HM222	38 9 45	110 53 17	1.5	1.0	5.0	.30	150	N	N	N	100	300	1.5	N	N	5	50
HM223	38 9 43	110 53 19	2.0	1.0	7.0	.30	150	N	N	N	70	200	1.5	N	N	5	50
HM255	38 7 40	110 44 51	1.5	1.0	5.0	.50	500	N	N	N	100	1,500	1.0	N	N	5	100
HM256	38 7 34	110 43 18	2.0	.5	2.0	.20	300	N	N	N	50	1,000	1.0	N	N	5	10
HM257	38 8 13	110 43 29	1.0	.7	3.0	.30	200	N	N	N	70	500	1.0	N	N	N	20
HM258	38 8 59	110 43 38	1.5	1.5	3.0	.50	700	N	N	N	100	1,000	1.0	N	N	5	20
HM259	38 8 52	110 43 35	1.0	1.0	2.0	.20	200	N	N	N	50	500	1.0	N	N	5	15
HM260	38 10 4	110 43 29	1.0	.7	5.0	.30	500	<.5	N	N	50	1,500	1.0	N	N	5	20
HM261	38 10 34	110 43 17	2.0	1.0	3.0	.50	500	N	N	N	50	700	2.0	N	N	5	30
HM262	38 10 41	110 43 15	2.0	1.5	7.0	.50	300	<.5	N	N	70	700	2.0	N	N	5	30

TABLE 3.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM187	10	20	<5	N	15	15	N	--	N	100	70	N	15	N	--	N
HM188	20	30	15	<20	20	20	N	--	N	200	100	N	20	N	--	N
HM189	10	20	N	N	10	15	N	--	N	100	50	N	20	N	--	N
HM190	15	20	N	<20	10	15	N	--	N	100	70	N	20	N	--	N
HM191	10	20	N	N	15	20	N	--	N	100	50	N	20	N	--	N
HM192	15	20	N	N	15	15	N	--	N	200	70	N	20	N	--	N
HM193	15	20	N	<20	20	15	N	--	N	150	70	N	30	N	--	N
HM194	10	20	N	N	10	20	N	--	N	100	50	N	20	N	--	N
HM195	5	30	N	N	7	15	N	--	N	100	30	N	20	N	--	N
HM196	15	20	N	N	15	20	N	--	N	100	50	N	15	N	--	N
HM197	20	30	15	N	30	20	N	--	N	200	150	N	30	N	--	N
HM198	<5	20	N	N	7	15	N	--	N	100	20	N	20	N	--	N
HM199	15	20	5	N	15	10	N	--	N	300	100	N	30	N	--	N
HM200	10	30	<5	N	15	20	N	--	N	200	150	N	20	N	--	N
HM201	20	30	7	N	20	20	N	--	N	100	100	N	30	N	--	N
HM202	20	30	7	N	20	15	N	--	N	150	100	N	20	N	--	N
HM203	15	20	5	N	15	15	N	--	N	100	100	N	20	N	--	N
HM204	15	50	5	N	20	20	N	--	N	100	100	N	30	N	--	N
HM205	10	20	7	N	15	15	N	--	N	200	100	N	15	N	--	N
HM206	7	20	N	N	5	10	N	--	N	100	50	N	10	N	--	N
HM207	15	20	7	N	15	20	N	--	N	200	100	N	20	N	--	N
HM208	15	20	7	N	10	15	N	--	N	150	70	N	15	N	--	N
HM209	20	30	10	N	15	20	N	--	N	300	100	N	30	N	--	N
HM210	15	30	10	N	20	20	N	--	N	500	150	N	30	N	--	N
HM211	10	20	10	N	20	15	N	--	N	200	100	N	20	N	--	N
HM212	10	20	10	N	20	10	N	--	N	150	100	N	20	N	--	N
HM213	15	50	10	N	30	15	N	--	N	500	100	N	30	N	--	N
HM214	20	20	10	N	30	20	N	--	N	200	150	N	20	N	--	N
HM215	15	20	7	N	20	15	N	--	N	200	150	N	20	N	--	N
HM216	15	20	5	N	20	20	N	--	N	200	70	N	20	N	--	N
HM217	20	20	10	N	20	15	N	--	N	200	100	N	20	N	--	N
HM218	20	30	7	N	20	20	N	--	N	200	100	N	20	N	--	N
HM219	20	30	10	N	30	20	N	--	N	200	150	N	30	N	--	N
HM220	15	20	10	N	30	15	N	--	N	300	100	N	20	N	--	N
HM221	20	20	15	N	30	20	N	--	N	500	100	N	20	N	--	N
HM222	10	50	N	<20	15	20	N	--	N	300	70	N	20	N	--	N
HM223	15	20	N	N	15	20	N	--	N	200	100	N	20	N	--	N
HM255	15	20	N	N	10	20	N	--	N	150	70	N	15	N	--	N
HM256	10	N	N	N	N	15	N	--	N	150	100	N	10	N	--	N
HM257	10	20	N	N	5	15	N	--	N	100	50	N	10	N	--	N
HM258	15	50	N	<20	10	20	N	--	N	200	70	N	20	N	--	N
HM259	10	20	N	N	5	20	N	--	N	100	50	N	20	N	--	N
HM260	10	20	N	N	7	20	N	--	N	100	50	N	10	N	--	N
HM261	20	70	N	N	7	20	N	--	N	300	70	N	50	N	--	N
HM262	10	70	<5	N	10	20	N	--	N	500	70	N	50	N	--	N

TABLE 3.--Spectrographic analysis of stream-sediment samples from Bull Mt. and Blue Hills-Mt. Ellen Wilderness Study Area, Utah (continued)

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM263	38 9 17	110 44 12	2.0	1.0	1.5	.50	1,000	N	N	N	30	1,000	1.5	N	N	10	50
HM264	38 8 15	110 44 27	2.0	1.0	5.0	.50	500	N	N	N	50	500	1.0	N	N	7	70
HM265	38 4 26	110 45 43	5.0	1.5	1.0	.70	700	N	N	N	70	700	2.0	N	N	15	70
HM266	38 5 4	110 44 47	1.5	1.0	3.0	.30	500	<.5	N	N	30	700	1.5	N	N	5	30
HM267	38 5 15	110 46 45	5.0	1.0	1.0	.70	1,000	N	N	N	50	700	1.5	N	N	10	50
HM268	38 5 35	110 45 47	2.0	1.0	.5	.70	300	N	N	N	100	700	1.5	N	N	5	100
HM269	38 6 18	110 45 23	15.0	2.0	5.0	1.00	2,000	N	N	N	30	700	1.0	N	N	15	15
HM270	38 7 2	110 43 30	1.5	.7	2.0	.30	300	N	N	N	50	500	1.0	N	N	5	20
HM271	38 7 6	110 43 33	2.0	1.0	2.0	.50	500	N	N	N	70	700	1.5	N	N	5	20
HM272	38 7 47	110 41 16	2.0	.5	3.0	.30	700	N	N	N	70	3,000	1.0	N	N	5	20
HM273	38 11 56	110 42 46	1.0	.7	5.0	.30	200	<.5	N	N	50	2,000	1.0	N	N	5	30
HM332	38 5 51	110 47 0	.3	.2	.2	.20	100	N	N	N	100	300	<1.0	N	N	N	100
HM333	38 5 55	110 37 1	.2	.3	.7	.10	150	N	N	N	30	200	<1.0	N	N	N	N
HM704	38 5 35	110 48 0	.5	.7	.5	.30	200	N	N	N	50	200	1.5	N	N	5	50
HM705	38 5 30	110 48 27	2.0	1.0	1.0	.50	700	N	N	N	70	300	1.0	N	N	7	50
HM706	38 5 23	110 46 26	1.5	1.0	1.0	.50	150	N	N	N	30	200	2.0	N	N	7	50
HM707	38 5 42	110 50 31	1.0	1.0	1.5	.20	300	N	N	N	30	300	1.5	N	N	5	30
HM708	38 5 28	110 50 31	.7	1.0	3.0	.30	200	N	N	N	50	200	1.5	N	N	5	30
HM711	38 9 18	110 49 55	1.0	1.5	7.0	.50	200	N	N	N	50	150	1.5	N	N	5	50
HM712	38 8 43	110 51 3	1.0	.7	.7	.20	300	N	N	N	70	300	2.0	N	N	5	20
HM713	38 8 28	110 51 27	1.0	1.0	10.0	.20	200	N	N	N	30	1,000	1.0	N	N	5	30
HM714	38 10 0	110 52 7	.7	.7	2.0	.15	100	N	N	N	30	200	1.5	N	N	5	15
HM715	38 9 57	110 52 12	1.0	1.0	2.0	.20	100	N	N	N	50	300	1.5	N	N	5	30
HM716	38 9 1	110 53 33	2.0	1.5	3.0	.30	150	N	N	N	30	200	1.5	N	N	5	50
HM717	38 8 33	110 53 2	1.0	.7	1.0	.30	200	N	N	N	30	500	1.5	N	N	5	30
HM719	38 11 37	110 53 37	.5	1.0	5.0	.15	100	N	N	N	50	300	1.5	N	N	5	30
HM720	38 11 37	110 53 53	.5	1.0	2.0	.15	70	N	N	N	30	700	1.0	N	N	5	20
HM858	38 11 30	110 46 12	1.5	.5	1.5	.30	200	N	N	N	50	700	2.0	N	N	7	20
HM859	38 9 57	110 46 8	.5	.3	1.5	.10	200	N	N	N	50	2,000	1.5	N	N	N	<10
HM860	38 9 55	110 46 3	.7	.3	2.0	.10	150	N	N	N	30	300	1.0	N	N	5	<10
HM861	38 10 28	110 46 10	1.5	.5	2.0	.20	200	<.5	N	N	30	200	1.5	N	N	5	10
HM862	38 10 37	110 45 5	.5	.2	1.5	.10	100	N	N	N	20	300	1.0	N	N	N	N
HM863	38 8 37	110 45 7	1.5	.5	5.0	.30	500	3.0	N	N	50	700	1.5	N	N	10	30
HM864	38 7 23	110 45 50	1.5	.7	1.0	.50	300	N	N	N	50	300	1.0	N	N	10	150
HM865	38 6 59	110 46 58	5.0	.7	2.0	.70	1,000	N	N	N	50	300	1.0	N	N	10	70
HM866	38 6 55	110 46 58	2.0	.5	1.0	.50	700	<.5	N	N	30	500	1.0	N	N	7	50

TABLE 3.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM263	15	20	N	N	10	30	N	--	N	500	100	N	30	N	--	N
HM264	10	50	N	N	10	20	N	--	N	300	70	N	30	N	--	N
HM265	50	50	5	N	15	20	N	--	N	300	150	N	20	<200	--	N
HM266	15	20	N	N	10	15	N	--	N	200	50	N	20	N	--	N
HM267	20	30	N	<20	10	20	N	--	N	500	100	N	20	N	--	N
HM268	15	50	<5	<20	15	20	N	--	N	150	100	N	30	N	--	N
HM269	15	50	N	N	7	15	N	--	N	1,000	200	N	30	N	--	N
HM270	10	N	N	N	5	15	N	--	N	200	50	N	15	N	--	N
HM271	10	50	N	N	5	20	N	--	N	300	70	N	20	N	--	N
HM272	10	20	N	N	7	20	N	--	N	200	70	N	20	N	--	N
HM273	10	50	N	N	10	20	N	--	N	200	50	N	30	N	--	N
HM332	5	N	N	N	5	15	N	--	N	N	15	N	30	N	--	N
HM333	<5	N	N	N	5	10	N	--	N	N	10	N	N	N	--	N
HM704	10	30	N	<20	10	20	N	--	N	100	70	N	20	N	--	N
HM705	15	20	N	<20	7	20	N	--	N	200	100	N	20	N	--	N
HM706	10	50	7	<20	15	30	N	--	N	100	100	N	30	N	--	N
HM707	10	20	N	N	7	30	N	--	N	200	50	N	15	N	--	N
HM708	10	50	N	<20	10	30	N	--	N	200	70	N	20	N	--	N
HM711	15	30	15	N	20	20	N	--	N	150	150	N	30	N	--	N
HM712	15	30	N	N	7	50	N	--	N	100	70	N	20	N	--	N
HM713	10	30	N	N	10	20	N	--	N	300	70	N	20	N	--	N
HM714	7	30	N	N	7	15	N	--	N	100	50	N	50	N	--	N
HM715	10	50	N	N	10	30	N	--	N	150	70	N	20	N	--	N
HM716	15	20	5	N	15	30	N	--	N	150	100	N	20	N	--	N
HM717	10	30	N	N	7	20	N	--	N	100	70	N	20	N	--	N
HM719	10	20	<5	N	10	15	N	--	N	300	100	N	20	N	--	N
HM720	10	N	5	N	10	15	N	--	N	150	70	N	20	N	--	N
HM858	10	30	N	N	10	15	N	--	N	200	100	N	20	N	--	N
HM859	7	20	N	N	5	10	N	--	N	200	50	N	10	N	--	N
HM860	7	N	N	N	5	10	N	--	N	150	50	N	15	N	--	N
HM861	7	20	N	N	7	15	N	--	N	200	70	N	20	N	--	N
HM862	5	20	N	N	5	10	N	--	N	100	30	N	10	N	--	N
HM863	20	50	<5	<20	15	30	N	--	N	500	50	N	30	N	--	N
HM864	15	20	N	<20	15	20	N	--	N	150	70	N	20	N	--	N
HM865	20	50	N	<20	20	20	N	--	N	200	150	N	30	N	--	N
HM866	20	20	N	<20	15	30	N	--	N	200	100	N	20	N	--	N

TABLE 4.--Spectrographic analysis of heavy-mineral-concentrate samples from Bull Mountain and Blue Hills-Mt. Ellen Wilderness Study Areas, Utah

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown]

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM010C	38 10 20	110 40 50	.50	<.05	1.5	2.00	150	N	N	N	100	>10,000	<2	N	N	N	150
HM011C	38 9 58	110 41 0	.50	.07	3.0	2.00	200	N	N	N	70	>10,000	<2	N	N	N	50
HM012C	38 9 56	110 40 50	.15	.05	1.0	.50	100	N	N	N	70	>10,000	<2	N	N	N	20
HM013C	38 10 29	110 48 43	1.50	.10	1.0	>2.00	500	N	N	N	300	>10,000	2	N	N	N	70
HM014C	38 11 42	110 45 14	1.50	.30	10.0	2.00	500	N	N	N	100	>10,000	<2	N	N	N	50
HM015C	38 11 45	110 45 27	1.50	.20	10.0	>2.00	700	N	N	N	200	>10,000	2	N	N	N	100
HM016C	38 11 37	110 46 18	1.50	.20	10.0	>2.00	700	N	N	N	200	>10,000	<2	N	N	N	100
HM017C	38 12 0	110 46 0	1.00	.20	10.0	>2.00	500	N	N	N	100	>10,000	2	N	N	N	50
HM018C	38 14 42	110 45 29	3.00	.10	10.0	1.50	200	N	N	N	70	>10,000	2	N	N	N	<20
HM019C	38 14 41	110 45 21	2.00	.15	7.0	1.00	300	N	N	N	100	>10,000	<2	N	N	N	20
HM033C	38 5 6	110 59 3	1.00	.15	.5	.70	70	N	N	N	100	>10,000	<2	N	N	N	100
HM035C	38 7 4	110 54 43	1.00	<.05	1.0	.30	70	N	N	N	50	>10,000	N	N	N	N	20
HM036C	38 6 56	110 54 37	.50	.05	2.0	>2.00	150	N	N	N	100	>10,000	3	N	N	N	70
HM037C	38 7 59	110 53 15	1.50	.20	10.0	>2.00	700	N	N	N	200	>10,000	2	N	N	N	100
HM038C	38 5 35	110 52 34	2.00	.20	7.0	>2.00	300	N	N	N	100	>10,000	2	N	N	N	30
HM040C	38 4 37	110 54 7	.70	.70	5.0	2.00	100	N	N	N	50	>10,000	<2	N	N	N	50
HM041C	38 3 30	110 57 45	.70	.20	1.5	.50	70	N	N	N	20	>10,000	<2	N	N	N	<20
HM042C	38 3 28	110 57 59	.70	.10	1.0	>2.00	70	N	N	N	150	>10,000	2	N	N	N	100
HM051C	38 11 10	110 51 35	.50	.15	7.0	>2.00	500	N	N	N	20	>10,000	2	N	N	N	50
HM052C	38 11 20	110 51 46	.70	.15	5.0	2.00	300	N	N	N	70	>10,000	2	N	N	N	50
HM150C	38 6 34	110 52 35	.30	.07	2.0	2.00	200	N	N	N	50	>10,000	<2	N	N	N	50
HM151C	38 6 40	110 52 35	.70	.10	2.0	1.50	150	N	N	N	50	>10,000	<2	N	N	N	20
HM152C	38 7 12	110 53 15	2.00	.20	2.0	>2.00	200	N	N	N	50	>10,000	<2	N	N	N	70
HM153C	38 7 18	110 51 35	.50	.07	7.0	>2.00	200	N	N	N	30	>10,000	2	N	N	N	50
HM154C	38 7 22	110 51 33	2.00	.50	20.0	>2.00	1,000	N	N	N	100	>10,000	<2	N	N	N	50
HM155C	38 9 53	110 48 33	.15	<.05	10.0	2.00	500	N	N	N	50	3,000	N	N	N	N	30
HM156C	38 9 52	110 48 40	.50	.07	2.0	>2.00	300	N	N	N	70	5,000	2	N	N	N	20
HM157C	38 9 53	110 47 40	2.00	.20	2.0	>2.00	300	N	N	N	100	10,000	3	N	N	N	100
HM158C	38 9 50	110 47 35	3.00	1.00	20.0	1.50	1,500	N	N	N	70	3,000	N	N	N	N	70
HM159C	38 10 38	110 49 22	5.00	.50	7.0	>2.00	700	N	N	N	500	>10,000	3	N	N	N	150
HM160C	38 10 59	110 50 10	2.00	.50	5.0	>2.00	500	N	N	N	200	>10,000	2	N	N	N	30
HM161C	38 11 58	110 52 58	3.00	.70	15.0	2.00	1,000	N	N	N	100	>10,000	N	N	N	N	30
HM162C	38 11 58	110 53 2	2.00	.20	5.0	1.00	200	N	N	N	100	>10,000	N	N	N	N	30
HM163C	38 10 38	110 53 30	3.00	.20	3.0	.70	200	N	N	N	50	>10,000	N	N	N	N	20
HM164C	38 10 40	110 53 24	2.00	.50	5.0	.50	200	N	N	N	50	>10,000	N	N	N	N	20
HM178C	38 11 14	110 50 47	1.00	.20	5.0	>2.00	200	N	N	N	50	>10,000	3	N	N	N	100
HM179C	38 9 25	110 54 25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM180C	38 9 27	110 54 18	7.00	.50	5.0	>2.00	500	N	N	N	100	>10,000	5	N	N	N	150
HM181C	38 10 33	110 54 32	.70	.20	1.0	.15	50	N	N	N	20	>10,000	<2	N	N	N	20
HM182C	38 10 35	110 54 32	2.00	.10	2.0	>2.00	200	N	N	N	50	>10,000	<2	N	N	N	30
HM183C	38 14 46	110 54 31	.70	.10	1.5	.10	30	N	N	N	20	>10,000	N	N	N	N	<20
HM184C	38 14 47	110 54 31	2.00	.10	1.5	1.50	100	N	N	N	70	>10,000	<2	N	N	N	<20
HM185C	38 14 20	110 54 45	2.00	1.00	5.0	.20	100	N	N	N	70	>10,000	N	N	N	N	<20
HM186C	38 14 30	110 55 45	2.00	.70	2.0	.15	50	N	N	N	<20	>10,000	N	N	N	N	<20
HM187C	38 14 30	110 56 0	1.50	.30	2.0	.70	150	N	N	N	50	>10,000	N	N	N	N	20

TABLE 4.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM010C	N	100	N	N	<10	<20	N	100	N	5,000	30	N	300	N	>2,000	N
HM011C	<10	150	N	N	<10	N	N	50	N	>10,000	30	N	300	N	>2,000	N
HM012C	<10	70	N	N	<10	N	N	30	N	>10,000	<20	N	100	N	>2,000	N
HM013C	20	300	N	<50	<10	200	N	100	N	5,000	100	N	500	N	>2,000	N
HM014C	10	300	N	<50	<10	50	N	50	N	3,000	50	N	500	N	>2,000	N
HM015C	<10	500	N	50	<10	30	N	100	N	2,000	70	N	500	N	>2,000	N
HM016C	<10	300	N	50	<10	30	N	150	N	1,000	70	N	700	N	>2,000	N
HM017C	<10	300	N	50	<10	30	N	100	N	2,000	70	N	500	N	>2,000	N
HM018C	20	300	N	N	<10	30	N	15	N	>10,000	<20	N	300	N	>2,000	N
HM019C	15	200	N	<50	<10	20	N	20	N	5,000	30	N	200	N	>2,000	N
HM033C	<10	70	N	<50	<10	<20	N	20	N	10,000	<20	N	70	N	>2,000	N
HM035C	10	N	N	N	<10	<20	N	15	N	10,000	<20	N	30	N	>2,000	N
HM036C	<10	500	N	70	<10	30	N	>200	70	1,500	100	<100	700	N	>2,000	200
HM037C	<10	300	N	50	<10	30	N	200	30	1,000	100	N	500	N	>2,000	N
HM038C	10	200	N	50	<10	50	N	100	N	2,000	70	N	500	N	>2,000	N
HM040C	<10	100	N	<50	<10	20	N	30	N	10,000	30	N	150	N	>2,000	N
HM041C	<10	50	N	N	<10	20	N	10	N	10,000	<20	N	50	N	>2,000	N
HM042C	<10	150	N	50	<10	20	N	150	N	2,000	50	<100	300	N	>2,000	<200
HM051C	<10	150	N	50	<10	20	N	200	N	2,000	70	N	500	N	>2,000	N
HM052C	<10	100	N	<50	<10	20	N	100	150	>10,000	70	N	500	N	>2,000	N
HM150C	30	70	N	50	<10	<20	N	100	N	>10,000	20	N	150	N	>2,000	N
HM151C	<10	50	N	<50	<10	<20	N	100	N	5,000	20	N	100	N	>2,000	N
HM152C	10	N	N	<50	<10	200	N	>200	N	10,000	50	N	700	N	>2,000	N
HM153C	<10	100	N	50	<10	N	N	200	N	2,000	70	N	700	N	>2,000	N
HM154C	<10	300	N	<50	<10	30	N	200	N	1,000	70	N	500	N	>2,000	N
HM155C	<10	100	N	N	<10	<20	N	100	N	300	50	N	300	N	>2,000	N
HM156C	<10	100	N	<50	<10	<20	N	200	N	300	50	N	700	N	>2,000	N
HM157C	10	500	N	N	<10	50	N	>200	30	1,000	100	<100	1,500	N	>2,000	N
HM158C	20	150	N	<50	<10	30	N	50	N	1,000	50	N	500	N	>2,000	N
HM159C	10	2,000	N	<50	<10	50	N	>200	N	2,000	150	N	1,000	N	>2,000	N
HM160C	<10	70	N	N	<10	50	N	70	N	500	100	N	700	N	>2,000	N
HM161C	10	100	N	<50	<10	20	N	20	N	3,000	100	N	500	N	>2,000	N
HM162C	10	100	N	N	<10	<20	N	15	N	>10,000	50	N	200	N	>2,000	N
HM163C	10	70	N	N	<10	<20	N	20	N	>10,000	<20	N	300	N	>2,000	N
HM164C	10	50	N	N	<10	<20	N	15	N	>10,000	20	N	100	N	>2,000	N
HM178C	<10	300	N	50	<10	50	N	200	N	7,000	150	N	700	N	>2,000	N
HM179C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM180C	30	300	N	50	<10	100	N	>200	100	>10,000	100	N	1,500	N	>2,000	N
HM181C	<10	N	N	N	<10	N	N	<10	N	>10,000	20	N	100	N	>2,000	N
HM182C	10	150	N	<50	<10	30	N	30	N	>10,000	50	N	500	N	>2,000	N
HM183C	N	N	N	N	<10	N	N	N	N	>10,000	<20	N	20	N	2,000	N
HM184C	<10	50	N	N	<10	<20	N	20	N	10,000	30	N	200	N	>2,000	N
HM185C	<10	50	N	N	<10	N	N	N	N	>10,000	20	N	70	N	500	N
HM186C	<10	N	N	N	<10	N	N	N	N	>10,000	<20	N	<20	N	2,000	N
HM187C	N	100	N	N	<10	N	N	10	N	>10,000	20	N	100	N	>2,000	N

TABLE 4.--Continued

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM188C	38 13 9	110 56 15	3.00	.50	5.0	.70	200	N	N	N	100	>10,000	<2	N	N	N	50
HM189C	38 13 15	110 56 25	7.00	1.00	5.0	1.00	700	N	N	N	100	>10,000	<2	N	N	N	20
HM190C	38 11 25	110 57 10	2.00	.20	1.5	.70	100	N	N	N	50	>10,000	N	N	N	N	30
HM191C	38 11 25	110 57 0	3.00	1.00	2.0	1.00	200	N	N	N	100	>10,000	N	N	N	N	50
HM192C	38 10 35	110 56 0	.70	.50	2.0	1.00	150	N	N	N	50	>10,000	<2	N	N	N	20
HM193C	38 10 35	110 55 10	3.00	1.00	3.0	1.50	300	N	N	N	100	>10,000	<2	N	N	N	50
HM194C	38 12 54	110 58 24	2.00	.70	2.0	2.00	100	N	N	N	100	>10,000	2	N	N	N	70
HM195C	38 12 54	110 58 16	1.00	.20	2.0	>2.00	200	N	N	N	100	>10,000	3	N	N	N	100
HM196C	38 13 2	110 57 57	1.00	.30	2.0	2.00	150	N	N	N	100	>10,000	<2	N	N	N	70
HM197C	38 14 22	110 57 30	2.00	.30	5.0	2.00	200	N	N	N	150	>10,000	2	N	N	N	150
HM198C	38 14 20	110 57 41	1.00	.30	2.0	>2.00	200	N	N	N	100	>10,000	2	N	N	N	50
HM199C	38 14 51	110 57 44	3.00	.50	3.0	>2.00	500	N	N	N	200	>10,000	2	N	N	N	300
HM200C	38 14 20	110 58 38	2.00	.30	1.5	2.00	500	N	N	N	100	>10,000	2	N	N	N	200
HM201C	38 14 25	110 58 43	1.00	.20	1.0	.50	200	N	N	N	70	>10,000	N	N	N	N	150
HM202C	38 15 34	110 59 39	2.00	.50	3.0	2.00	300	N	N	N	200	>10,000	2	N	N	N	200
HM203C	38 15 28	110 59 35	3.00	.50	2.0	2.00	500	N	N	N	150	>10,000	2	N	N	N	300
HM204C	38 15 33	110 59 5	1.00	.50	2.0	.50	100	N	N	N	70	>10,000	<2	N	N	N	20
HM205C	38 16 36	110 56 50	1.00	.10	2.0	.20	50	N	N	N	20	>10,000	<2	N	N	N	<20
HM206C	38 16 45	110 56 49	1.50	.70	2.0	>2.00	200	N	N	N	150	>10,000	2	N	N	N	70
HM207C	38 16 17	110 55 57	3.00	.50	2.0	1.00	100	N	N	N	50	>10,000	N	N	N	N	<20
HM208C	38 16 17	110 56 1	2.00	.50	2.0	.70	150	N	N	N	50	>10,000	N	N	N	N	<20
HM209C	38 17 5	110 55 58	2.00	.50	3.0	1.00	100	N	N	N	70	>10,000	N	N	N	N	30
HM210C	38 20 55	110 56 4	1.00	.20	2.0	.20	100	N	N	N	50	>10,000	N	N	N	N	20
HM211C	38 21 2	110 54 17	3.00	.50	2.0	.70	150	N	N	N	50	>10,000	N	N	N	N	30
HM212C	38 19 5	110 54 29	2.00	.30	2.0	1.00	100	N	N	N	100	>10,000	N	N	N	N	30
HM213C	38 18 43	110 54 22	1.00	.10	2.0	2.00	100	N	N	N	70	>10,000	2	N	N	N	20
HM216C	38 18 20	110 55 44	.20	.10	1.5	.10	70	N	N	N	30	>10,000	N	N	N	N	<20
HM217C	38 18 15	110 55 43	.20	.15	1.0	.30	20	N	N	N	30	>10,000	N	N	N	N	<20
HM218C	38 17 58	110 55 17	.30	.15	1.5	.20	70	N	N	N	30	>10,000	<2	N	N	N	20
HM219C	38 16 47	110 53 59	.70	.20	2.0	.10	70	N	N	N	30	>10,000	N	N	N	N	20
HM220C	38 16 8	110 53 27	.50	.15	5.0	.30	100	N	N	N	50	>10,000	2	N	N	N	20
HM221C	38 16 8	110 53 40	.70	.15	7.0	.70	200	N	N	N	50	>10,000	<2	N	N	N	20
HM222C	38 9 45	110 53 17	5.00	.15	2.0	.70	150	N	N	N	30	>10,000	2	N	N	N	30
HM224C	38 11 35	110 55 50	.30	<.05	.2	>2.00	100	N	N	N	50	>10,000	2	N	N	N	50
HM255C	38 7 40	110 44 51	.20	<.05	10.0	1.00	200	N	N	N	50	>10,000	<2	N	N	N	50
HM256C	38 7 34	110 43 18	.30	.05	10.0	>2.00	300	N	N	N	50	>10,000	<2	N	N	N	30
HM257C	38 8 13	110 43 29	.20	<.05	1.5	2.00	100	N	N	N	50	>10,000	N	N	N	N	20
HM258C	38 8 59	110 43 38	.20	<.05	5.0	.50	200	N	N	N	30	>10,000	N	N	N	N	20
HM259C	38 8 52	110 43 35	.20	.05	1.0	1.00	70	N	N	N	50	>10,000	N	N	N	N	30
HM260C	38 10 4	110 43 29	.10	<.05	.5	.70	20	N	N	N	50	>10,000	N	N	N	N	20
HM261C	38 10 34	110 43 17	.20	<.05	7.0	.70	300	N	N	N	50	>10,000	N	N	N	N	20
HM262C	38 10 41	110 43 15	.50	<.05	5.0	.20	200	N	N	N	20	>10,000	N	N	N	N	20
HM263C	38 9 17	110 44 12	.15	<.05	10.0	.70	700	N	N	N	50	10,000	N	N	N	N	30
HM264C	38 8 15	110 44 27	.50	<.05	20.0	1.00	1,000	N	N	N	N	10,000	N	N	N	N	30
HM265C	38 4 26	110 45 43	.50	<.05	10.0	>2.00	500	70	N	500	30	10,000	2	N	N	N	70

TABLE 4.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM188C	30	200	N	N	<10	20	N	30	N	>10,000	30	N	300	N	>2,000	N
HM189C	20	150	N	N	<10	20	N	15	20	>10,000	50	N	150	N	>2,000	N
HM190C	<10	70	N	N	<10	<20	N	20	N	>10,000	20	N	70	N	>2,000	N
HM191C	10	100	N	N	<10	<20	N	15	N	>10,000	50	N	150	N	>2,000	N
HM192C	N	70	N	N	<10	N	N	15	N	>10,000	20	N	100	N	>2,000	N
HM193C	30	100	N	N	<10	20	N	20	N	>10,000	50	N	150	N	>2,000	N
HM194C	<10	100	N	<50	<10	20	N	30	N	>10,000	50	N	200	N	>2,000	N
HM195C	10	300	N	<50	<10	30	N	>200	N	7,000	70	N	1,500	N	>2,000	N
HM196C	<10	70	N	N	<10	N	N	20	30	>10,000	50	N	200	N	>2,000	N
HM197C	20	300	N	N	<10	30	N	100	N	>10,000	50	N	500	N	>2,000	N
HM198C	<10	150	N	<50	<10	50	N	>200	200	10,000	70	N	1,000	N	>2,000	N
HM199C	20	200	N	N	<10	30	N	150	N	>10,000	70	N	700	N	>2,000	N
HM200C	<10	200	N	N	<10	20	N	100	20	>10,000	50	N	500	N	>2,000	N
HM201C	<10	50	N	N	<10	N	N	15	N	>10,000	<20	N	70	N	>2,000	N
HM202C	10	200	N	50	<10	30	N	150	N	>10,000	50	N	500	N	>2,000	<200
HM203C	50	150	N	50	<10	30	N	70	N	>10,000	50	N	300	1,000	>2,000	<200
HM204C	10	70	N	N	<10	<20	N	15	N	>10,000	<20	N	100	<500	>2,000	N
HM205C	<10	N	N	N	<10	N	N	N	N	>10,000	<20	N	70	N	2,000	N
HM206C	10	300	N	50	<10	50	N	200	20	10,000	70	N	1,500	N	>2,000	N
HM207C	10	70	N	N	<10	<20	N	10	N	>10,000	<20	N	70	N	>2,000	N
HM208C	<10	100	N	N	<10	<20	N	<10	N	>10,000	<20	N	100	N	2,000	N
HM209C	<10	50	N	N	<10	N	N	20	N	>10,000	20	N	300	N	>2,000	N
HM210C	<10	N	N	N	<10	<20	N	10	N	>10,000	20	N	70	N	>2,000	N
HM211C	15	50	10	N	<10	50	N	15	N	>10,000	30	N	100	N	>2,000	N
HM212C	10	50	<10	N	<10	20	N	30	N	>10,000	30	N	200	N	>2,000	N
HM213C	<10	70	N	<50	<10	50	N	20	N	>10,000	50	N	150	N	>2,000	N
HM216C	<10	N	N	N	<10	N	N	N	N	>10,000	<20	N	<20	N	>2,000	N
HM217C	N	N	N	N	<10	N	N	10	N	>10,000	<20	N	20	N	>2,000	N
HM218C	<10	N	N	N	<10	N	N	15	N	>10,000	<20	N	50	N	2,000	N
HM219C	<10	N	N	N	<10	N	N	N	N	>10,000	20	N	30	N	>2,000	N
HM220C	<10	70	N	N	<10	N	N	15	N	>10,000	20	N	150	N	>2,000	N
HM221C	10	50	N	<50	<10	20	N	20	N	>10,000	20	N	100	N	>2,000	N
HM222C	30	70	<10	N	<10	20	N	30	N	>10,000	20	N	150	N	>2,000	N
HM224C	<10	N	N	N	<10	30	N	>200	N	2,000	70	N	2,000	N	>2,000	N
HM255C	<10	70	N	N	<10	20	N	50	N	7,000	20	N	200	N	>2,000	N
HM256C	<10	100	N	<50	<10	50	N	100	N	5,000	50	N	500	N	>2,000	N
HM257C	<10	N	N	<50	<10	<20	N	100	N	7,000	30	N	300	N	>2,000	N
HM258C	<10	N	N	N	<10	20	N	50	N	5,000	<20	N	150	N	>2,000	N
HM259C	<10	N	N	N	<10	<20	N	70	N	7,000	20	N	200	N	>2,000	N
HM260C	<10	N	N	N	<10	<20	N	70	N	3,000	20	N	200	N	>2,000	N
HM261C	<10	70	N	N	<10	70	N	15	N	5,000	20	N	150	N	>2,000	N
HM262C	<10	N	N	N	<10	N	N	30	N	5,000	<20	N	100	N	>2,000	N
HM263C	<10	70	N	N	<10	N	N	30	N	500	20	N	200	N	>2,000	N
HM264C	<10	100	N	N	<10	<20	N	20	N	1,000	20	N	200	N	>2,000	N
HM265C	50	100	N	70	<10	7,000	N	100	N	700	100	100	500	5,000	>2,000	N

TABLE 4.--Continued

SAMPLE	LATITUDE	LONGITUDE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO	S-CR
HM266C	38 5 4	110 44 47	.20	<.05	10.0	2.00	300	N	N	N	30	>10,000	N	N	N	N	50
HM267C	38 5 15	110 46 45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM268C	38 5 35	110 45 47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM269C	38 6 18	110 45 23	1.50	.50	10.0	>2.00	700	N	N	N	70	>10,000	N	N	N	N	<20
HM270C	38 7 2	110 43 30	.20	.10	1.5	2.00	200	N	N	N	50	>10,000	N	N	N	N	20
HM271C	38 7 6	110 43 33	.20	<.05	10.0	2.00	700	N	N	N	70	>10,000	N	N	N	N	20
HM272C	38 7 47	110 41 16	.10	<.05	.5	.30	70	N	N	N	20	>10,000	N	N	N	N	<20
HM273C	38 11 56	110 42 46	.20	<.05	.2	.10	<20	N	N	N	50	>10,000	N	N	N	N	<20
HM332C	38 5 51	110 47 0	.30	.07	20.0	>2.00	700	N	N	N	70	2,000	N	N	N	N	30
HM333C	38 5 55	110 37 1	1.00	.07	1.5	>2.00	500	N	N	N	30	>10,000	3	N	N	N	70
HM704C	38 5 35	110 48 0	1.50	.10	15.0	2.00	500	N	N	N	30	>10,000	<2	N	N	N	50
HM705C	38 5 30	110 48 27	1.00	.20	20.0	1.00	1,000	N	N	N	20	10,000	<2	N	N	N	50
HM706C	38 5 23	110 48 26	1.00	.15	10.0	2.00	500	<1	N	N	700	>10,000	2	N	N	N	30
HM707C	38 5 42	110 50 31	1.50	.15	15.0	>2.00	700	N	N	N	100	10,000	<2	N	N	N	50
HM708C	38 5 28	110 50 31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM711C	38 9 18	110 49 55	.50	.10	2.0	.70	150	N	N	N	50	>10,000	2	N	N	N	30
HM712C	38 8 43	110 51 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM713C	38 8 28	110 51 27	1.00	.10	3.0	1.00	200	N	N	N	30	>10,000	N	N	N	N	20
HM714C	38 10 0	110 52 7	1.50	.10	3.0	.30	150	N	N	N	30	>10,000	N	N	N	N	<20
HM715C	38 9 57	110 52 12	.70	.10	2.0	.20	150	N	N	N	30	>10,000	2	N	N	N	<20
HM716C	38 9 1	110 53 33	.50	.10	10.0	1.50	500	N	N	N	20	>10,000	2	N	N	N	20
HM717C	38 8 33	110 53 2	2.00	<.05	2.0	2.00	150	N	N	N	20	>10,000	3	N	N	N	20
HM718C	38 14 27	110 45 30	2.00	.10	1.5	2.00	150	N	N	N	30	>10,000	2	N	N	N	20
HM719C	38 11 37	110 53 37	.70	.05	1.0	.20	50	N	N	N	20	>10,000	N	N	N	N	<20
HM720C	38 11 37	110 53 53	1.00	.07	2.0	1.50	100	N	N	N	30	>10,000	<2	N	N	N	<20
HM858C	38 11 30	110 46 12	.15	.05	1.5	1.00	70	N	N	N	20	>10,000	<2	N	N	N	<20
HM859C	38 9 57	110 46 8	.10	<.05	1.0	.70	50	N	N	N	20	>10,000	<2	N	N	N	<20
HM860C	38 9 55	110 46 3	.20	<.05	1.0	.70	50	N	N	N	50	>10,000	N	N	N	N	<20
HM861C	38 10 28	110 46 10	.70	.05	5.0	.70	300	N	N	N	20	>10,000	N	N	N	N	20
HM862C	38 10 37	110 45 5	.30	.05	1.0	1.50	100	N	N	N	100	>10,000	2	N	N	N	50
HM863C	38 8 37	110 45 7	1.50	.10	20.0	1.50	1,500	N	N	N	30	>10,000	N	N	N	N	30
HM864C	38 7 23	110 45 50	.50	.07	15.0	>2.00	500	N	N	N	50	>10,000	<2	N	N	N	70
HM865C	38 6 59	110 46 58	.20	.05	15.0	>2.00	300	N	N	N	20	5,000	<2	N	N	N	<20
HM866C	38 6 55	110 46 58	.50	.10	10.0	>2.00	500	N	N	N	70	1,500	<2	N	N	N	30

TABLE 4.--Continued

SAMPLE	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR	S-TH
HM266C	<10	70	N	50	<10	700	N	100	N	2,000	30	N	300	N	>2,000	N
HM267C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM268C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM269C	N	200	N	70	<10	70	N	15	N	500	50	N	200	N	>2,000	N
HM270C	<10	70	N	<50	<10	50	N	100	N	3,000	30	N	300	N	>2,000	N
HM271C	<10	70	N	<50	<10	50	N	100	N	3,000	50	N	500	N	>2,000	N
HM272C	<10	N	N	N	<10	N	N	50	N	5,000	<20	N	150	N	>2,000	N
HM273C	<10	N	N	N	<10	N	N	N	N	5,000	<20	N	20	N	>2,000	N
HM332C	N	300	N	<50	N	50	N	20	N	1,000	100	N	500	N	>2,000	N
HM333C	N	300	N	<50	N	70	N	30	50	1,500	100	N	500	N	>2,000	N
HM704C	10	100	N	<50	<10	20	N	150	N	1,000	70	N	300	N	>2,000	N
HM705C	10	200	N	N	<10	20	N	100	N	1,000	30	N	500	N	>2,000	N
HM706C	10	200	N	50	<10	500	N	150	N	1,000	50	N	500	N	>2,000	N
HM707C	10	200	N	<50	<10	150	N	150	N	1,000	70	N	500	N	>2,000	N
HM708C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM711C	<10	70	N	N	<10	30	N	50	N	>10,000	30	N	150	N	>2,000	N
HM712C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM713C	10	100	N	N	<10	30	N	50	N	2,000	30	N	200	N	>2,000	N
HM714C	20	200	N	N	<10	20	N	10	N	>10,000	<20	N	200	N	>2,000	N
HM715C	10	100	N	N	<10	20	N	10	N	>10,000	<20	N	300	N	>2,000	N
HM716C	<10	100	N	50	<10	20	N	50	N	5,000	50	N	200	N	>2,000	N
HM717C	<10	200	N	<50	<10	50	N	70	50	5,000	70	N	700	N	>2,000	N
HM718C	10	100	N	50	<10	30	N	200	N	>10,000	50	N	700	N	>2,000	N
HM719C	<10	150	N	N	<10	N	N	15	N	>10,000	<20	N	100	N	>2,000	N
HM720C	10	100	N	<50	<10	30	N	30	N	>10,000	50	N	150	N	>2,000	N
HM858C	N	50	N	N	<10	<20	N	50	N	10,000	<20	N	100	N	>2,000	N
HM859C	N	50	N	N	<10	<20	N	20	N	3,000	<20	N	50	N	>2,000	N
HM860C	N	N	N	N	<10	N	N	30	N	7,000	<20	N	70	N	>2,000	N
HM861C	<10	70	N	N	<10	N	N	50	N	3,000	<20	N	150	N	>2,000	N
HM862C	<10	50	N	N	<10	N	N	50	N	5,000	30	N	200	N	>2,000	N
HM863C	10	100	N	N	<10	<20	N	50	N	5,000	20	N	700	N	>2,000	N
HM864C	<10	100	N	50	<10	<20	N	150	N	700	70	N	700	N	>2,000	N
HM865C	<10	50	N	N	<10	N	N	50	N	300	50	N	200	N	>2,000	N
HM866C	<10	70	N	50	<10	<20	N	150	N	500	70	N	500	N	>2,000	N

TABLE 5.--Mineralogical analysis of heavy-mineral-concentrate samples from Bull Mountain and Blue Hills-Mt. Ellen Wilderness Study Areas, Utah

[Abundance of minerals tentatively identified in the non-magnetic heavy mineral fraction: -- = none observed; 1 = trace present, <1%; 2 = present, >2%; 3 = common, >5%; 4 = major, >20%; 5 = dominant, >50%; 6 = ubiquitous, >85%. Observed crystal shape of zircon is denoted in column header by an R or E indicating round and euhedral, respectively.]

SAMPLE	LATITUDE	LONGITUD	ZIRCON-R	ZIRCON-E	SPHENE	RUTILE	ANATASE	BARITE	APATITE	SCHEELIT	EPIDOTE	PYRITE
HM051C	38 11 10	110 51 35	2	3	3	2	1	--	4	--	--	--
HM052C	38 11 20	110 51 46	3	2	3	3	2	3	3	--	1	1
HM150C	38 6 34	110 52 35	3	2	3	3	--	4	3	--	1	2
HM151C	38 6 40	110 52 35	3	3	2	--	--	5	3	--	1	3
HM152C	38 7 12	110 53 15	5	2	2	2	--	4	3	--	1	2
HM153C	38 7 18	110 51 35	3	3	2	2	--	4	4	--	--	2
HM154C	38 7 22	110 51 33	3	3	2	2	--	--	4	--	1	2
HM155C	38 9 53	110 48 33	--	--	--	--	--	--	--	--	--	--
HM156C	38 9 52	110 48 40	4	3	2	2	--	--	4	--	--	2
HM157C	38 9 53	110 47 40	4	3	2	2	--	--	3	--	2	3
HM158C	38 9 50	110 47 35	2	3	2	--	--	4	4	--	2	--
HM159C	38 10 38	110 49 22	4	3	2	--	2	3	3	--	--	2
HM160C	38 10 59	110 50 10	4	2	3	2	--	1	4	--	--	2
HM161C	38 11 58	110 52 58	2	2	3	--	--	4	4	--	2	2
HM162C	38 11 58	110 53 2	2	1	1	2	--	4	1	--	2	--
HM163C	38 10 38	110 53 30	2	1	--	1	--	5	1	--	--	2
HM164C	38 10 40	110 53 24	1	1	1	2	--	5	--	--	--	--
HM178C	38 11 14	110 50 47	4	2	2	3	--	4	3	--	--	--
HM179C	38 9 25	110 54 25	4	2	3	3	--	4	4	--	--	2
HM180C	38 9 27	110 54 18	4	2	1	3	--	4	3	--	--	2
HM181C	38 10 33	110 54 32	1	1	--	1	--	6	--	--	--	2
HM182C	38 10 35	110 54 32	3	1	2	3	--	5	--	--	--	2
HM183C	38 14 46	110 54 31	1	1	--	1	--	6	--	--	--	2
HM184C	38 14 47	110 54 31	1	1	1	2	--	5	--	--	--	1
HM185C	38 14 20	110 54 45	1	1	--	1	--	5	--	--	--	2
HM186C	38 14 30	110 55 45	1	1	1	2	--	6	--	--	--	--
HM187C	38 14 30	110 56 0	1	1	2	2	--	6	--	--	--	2
HM188C	38 13 9	110 56 15	1	1	--	1	--	5	--	--	--	2
HM189C	38 13 15	110 56 25	1	1	--	2	--	5	--	--	2	2
HM190C	38 11 25	110 57 10	2	1	--	1	--	5	3	--	--	3
HM191C	38 11 25	110 57 0	1	2	2	2	--	5	3	--	2	2
HM192C	38 10 35	110 56 0	3	3	3	2	--	5	3	--	--	1
HM193C	38 10 35	110 55 10	1	--	--	2	--	5	1	--	--	--
HM194C	38 12 54	110 58 24	2	1	--	2	--	5	--	--	--	1
HM195C	38 12 54	110 58 16	5	2	2	2	--	3	4	--	--	2
HM196C	38 13 2	110 57 57	2	2	2	2	--	5	2	--	--	1
HM197C	38 14 22	110 57 30	3	3	--	2	--	4	3	--	--	3
HM198C	38 14 20	110 57 41	5	3	2	3	--	3	3	--	--	--
HM199C	38 14 51	110 57 44	3	1	--	2	--	5	--	--	--	3
HM200C	38 14 20	110 58 38	2	2	--	1	--	4	--	--	--	2
HM201C	38 14 25	110 58 43	1	1	--	3	--	5	--	--	--	2
HM202C	38 15 34	110 59 39	2	2	--	3	--	4	--	--	--	2
HM203C	38 15 28	110 59 35	2	2	--	2	--	4	--	--	--	2
HM204C	38 15 33	110 59 5	1	1	--	1	--	5	--	--	--	2
HM205C	38 16 36	110 56 50	1	1	--	1	--	5	2	--	--	1

TABLE 5.--Continued

SAMPLE	PYROXENE	ARSENOPY	AMPHIBOL	ROCK FRA
HM051C	--	--	1	2
HM052C	--	--	2	2
HM150C	--	--	2	2
HM151C	--	--	--	2
HM152C	--	--	2	2
HM153C	--	--	--	2
HM154C	--	--	2	2
HM155C	--	--	--	--
HM156C	--	--	2	2
HM157C	1	--	2	2
HM158C	--	--	4	3
HM159C	--	--	3	5
HM160C	--	--	3	4
HM161C	--	--	3	4
HM162C	--	--	2	5
HM163C	--	--	2	4
HM164C	--	--	2	4
HM178C	--	--	2	2
HM179C	--	--	2	2
HM180C	--	--	1	2
HM181C	--	--	--	3
HM182C	--	--	--	3
HM183C	--	--	--	3
HM184C	--	--	2	3
HM185C	--	--	--	4
HM186C	--	--	--	2
HM187C	--	--	2	2
HM188C	--	--	2	4
HM189C	--	--	3	4
HM190C	--	--	2	3
HM191C	--	--	3	2
HM192C	--	--	2	2
HM193C	--	--	2	4
HM194C	--	--	3	3
HM195C	--	--	--	1
HM196C	--	--	1	3
HM197C	--	--	2	5
HM198C	--	--	3	--
HM199C	--	--	3	4
HM200C	--	--	2	5
HM201C	--	--	--	4
HM202C	--	--	2	5
HM203C	--	--	2	5
HM204C	--	--	2	4
HM205C	--	--	2	4

TABLE 5.--Continued

SAMPLE	LATITUDE	LONGITUD	ZIRCON-R	ZIRCON-E	SPHENE	RUTILE	ANATASE	BARITE	APATITE	SCHEELIT	EPIDOTE	PYRITE
HM206C	38 16 45	110 56 49	4	3	2	1	--	2	4	--	--	1
HM207C	38 16 17	110 55 57	1	1	1	2	--	5	3	--	--	1
HM208C	38 16 17	110 56 1	1	1	2	2	--	5	2	--	--	1
HM209C	38 17 5	110 55 58	1	1	--	1	--	5	2	--	--	2
HM210C	38 20 55	110 56 4	1	1	--	1	--	6	1	--	--	2
HM211C	38 21 2	110 54 17	1	--	1	1	--	5	1	--	--	3
HM212C	38 19 5	110 54 29	1	2	2	2	1	5	2	--	1	3
HM213C	38 18 43	110 54 22	2	2	2	3	1	5	1	--	1	2
HM216C	38 18 20	110 55 44	1	1	--	2	1	6	1	--	1	1
HM217C	38 18 15	110 55 43	2	2	2	2	--	5	2	--	--	2
HM218C	38 17 58	110 55 17	1	1	--	1	--	6	--	--	--	1
HM219C	38 16 47	110 53 59	1	1	--	1	--	6	--	--	--	1
HM220C	38 16 8	110 53 27	1	1	2	2	--	5	--	--	--	1
HM221C	38 16 8	110 53 40	1	2	2	2	--	4	3	--	--	2
HM222C	38 9 45	110 53 17	3	2	1	2	--	4	2	--	--	4
HM224C	38 11 35	110 55 50	6	1	--	1	--	1	1	--	--	--
HM255C	38 7 40	110 44 51	2	3	1	1	--	4	5	--	--	2
HM256C	38 7 34	110 43 18	2	3	3	2	--	2	6	--	1	2
HM257C	38 8 13	110 43 29	2	4	1	2	--	3	5	--	--	2
HM258C	38 8 59	110 43 38	4	3	3	2	--	4	5	--	--	1
HM259C	38 8 52	110 43 35	4	3	2	2	--	4	3	--	--	2
HM260C	38 10 4	110 43 29	5	2	--	2	--	4	3	--	--	2
HM261C	38 10 34	110 43 17	3	2	4	2	1	3	5	--	--	1
HM262C	38 10 41	110 43 15	2	3	3	--	--	4	4	--	--	3
HM263C	38 9 17	110 44 12	5	2	3	2	1	--	5	--	--	--
HM264C	38 8 15	110 44 27	4	2	3	1	--	1	5	--	--	2
HM265C	38 4 26	110 45 43	3	2	2	3	--	2	3	--	--	2
HM266C	38 5 4	110 44 47	3	2	2	2	--	4	4	--	--	--
HM267C	38 5 15	110 46 45	--	--	--	--	--	--	--	--	--	--
HM268C	38 5 35	110 45 47	--	--	--	--	--	--	--	--	--	--
HM269C	38 6 18	110 45 23	4	2	2	2	--	3	4	--	2	2
HM270C	38 7 2	110 43 30	4	2	1	2	--	4	4	--	1	2
HM271C	38 7 6	110 43 33	2	3	3	2	--	2	5	--	1	1
HM272C	38 7 47	110 41 16	4	2	1	2	--	5	2	--	1	1
HM273C	38 11 56	110 42 46	3	2	1	2	--	6	1	--	1	3
HM332C	38 5 51	110 47 0	2	2	4	1	1	1	4	--	1	--
HM333C	38 5 55	110 37 1	4	2	3	2	2	1	3	--	1	2
HM704C	38 5 35	110 48 0	--	--	--	--	--	--	--	--	--	--
HM705C	38 5 30	110 48 27	2	2	2	--	--	--	6	--	--	--
HM706C	38 5 23	110 48 26	--	--	--	--	--	--	--	--	--	--
HM707C	38 5 42	110 50 31	1	2	2	1	--	--	6	--	--	3
HM708C	38 5 28	110 50 31	--	3	2	1	1	--	5	--	--	2
HM711C	38 9 18	110 49 55	1	2	1	3	1	5	3	--	--	--
HM712C	38 8 43	110 51 3	--	--	--	--	--	--	--	--	--	--
HM713C	38 8 28	110 51 27	--	2	2	--	--	4	4	--	--	--

TABLE 5.--Continued

SAMPLE	PYROXENE	ARSENOPY	AMPHIBOL	ROCK FRA
HM206C	--	--	3	2
HM207C	--	--	2	4
HM208C	--	--	2	4
HM209C	--	--	3	4
HM210C	--	--	2	3
HM211C	--	--	--	3
HM212C	2	--	2	3
HM213C	1	--	2	3
HM216C	--	--	1	2
HM217C	--	--	2	3
HM218C	--	--	1	2
HM219C	--	--	1	2
HM220C	--	--	2	2
HM221C	--	--	1	3
HM222C	--	--	1	3
HM224C	--	--	1	--
HM255C	--	--	--	1
HM256C	--	--	--	2
HM257C	--	--	1	3
HM258C	--	--	--	2
HM259C	--	--	--	3
HM260C	--	--	--	3
HM261C	--	--	--	2
HM262C	--	--	--	3
HM263C	--	--	1	1
HM264C	--	--	1	1
HM265C	--	--	--	4
HM266C	--	--	--	3
HM267C	--	--	--	--
HM268C	--	--	--	--
HM269C	1	--	3	1
HM270C	1	--	--	2
HM271C	1	--	2	1
HM272C	--	--	1	2
HM273C	--	--	--	2
HM332C	--	--	1	--
HM333C	--	--	2	3
HM704C	--	--	--	--
HM705C	--	--	--	--
HM706C	--	--	--	--
HM707C	--	--	--	2
HM708C	--	--	--	2
HM711C	--	--	1	1
HM712C	--	--	--	--
HM713C	3	--	--	2

TABLE 5.--Continued

SAMPLE	LATITUDE	LONGITUD	ZIRCON-R	ZIRCON-E	SPHENE	RUTILE	ANATASE	BARITE	APATITE	SCHEELIT	EPIDOTE	PYRITE
HM714C	38 10 0	110 52 7	1	2	--	2	--	6	2	--	--	2
HM715C	38 9 57	110 52 12	1	1	--	2	--	6	--	--	--	3
HM716C	38 9 1	110 53 33	4	4	--	2	--	3	4	--	--	3
HM717C	38 8 33	110 53 2	3	3	2	4	--	5	2	--	1	3
HM718C	38 14 27	110 45 30	1	2	--	2	2	6	--	--	--	--
HM719C	38 11 37	110 53 37	1	--	--	2	2	6	2	--	--	3
HM720C	38 11 37	110 53 53	1	--	2	2	2	6	2	--	--	--
HM858C	38 11 30	110 46 12	2	1	3	2	2	5	2	--	--	--
HM859C	38 9 57	110 46 8	2	2	2	2	2	6	2	--	1	2
HM860C	38 9 55	110 46 3	2	2	--	1	1	6	2	--	--	2
HM861C	38 10 28	110 46 10	2	2	--	--	--	5	4	--	2	2
HM862C	38 10 37	110 45 5	4	1	--	2	--	5	2	--	2	1
HM863C	38 8 37	110 45 7	2	3	--	1	--	3	5	--	1	3
HM864C	38 7 23	110 45 50	3	2	3	2	1	2	5	--	--	2
HM865C	38 6 59	110 46 58	4	3	3	1	--	--	4	--	--	2
HM866C	38 6 55	110 46 58	4	2	2	--	--	--	4	--	--	--

TABLE 5.--Continued

SAMPLE	PYROXENE	ARSENOPY	AMPHIBOL	ROCK FRA
HM714C	--	--	--	3
HM715C	--	--	--	3
HM716C	--	--	--	2
HM717C	--	--	--	--
HM718C	--	--	--	2
HM719C	--	--	1	3
HM720C	--	--	--	3
HM858C	--	--	2	2
HM859C	--	--	--	--
HM860C	--	--	--	1
HM861C	--	--	1	2
HM862C	--	--	1	2
HM863C	--	--	1	1
HM864C	--	--	--	2
HM865C	--	--	--	1
HM866C	1	--	1	2