UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map for heavy-mineral-concentrate samples from the La Madre Mountains Wilderness Study Area (NV-050-412), Clark County, Nevada

By

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

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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 La Madre Mountains Wilderness Study Area, Clark County, Nevada.

INTRODUCTION

In May and June of 1984, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the La Madre Mountains Wilderness Study Area (NV-050-412), Clark County, Nevada.

The La Madre Mountains Wilderness Study Area comprises about 53 mi^2 (138 km^2) in the central area of Clark County, Nevada, and lies about 12 mi (19 km) west of Las Vegas, Nevada (see fig. 1). Access to the study area is provided on the north by dirt roads branching from State Highway 157, on the southeast by road and jeep trails from State Highway 159, on the south by the Red Rock jeep trail, and on the west by the Lovell Canyon road which branches from State Highway 160.

The study area is located northeast of the Spring Mountains and is bounded on the west side by Lovell Canyon (fig. 1). The area is underlain by a sequence of marine limestone and dolomite of Cambrian to Permian age, and mostly subaerial sandstones and siltstone deposits of Triassic and Jurassic age. Northeast-trending high-angle faults and large-scale thrust faults and associated folds have greatly disrupted these strata, placing Cambrian dolomite on Jurassic age sandstone in some places.

The topographic relief in the study area is about 3,500 ft (1,067 m), with a maximum elevation of 8,154 ft (2,485 m) at La Madre Mountain. The ground surface in the south and east is rugged with cliffs and steep canyons that grade into less rugged terrain in the higher, northwest part of the study area.

METHODS OF STUDY

Sample Medium

Heavy-mineral-concentrate samples provide information about the chemistry of certain minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, many of which may be ore-related, permits determination of some elements that are not easily detected in stream-sediment samples.

Sample Collection

Samples were collected at 26 sites within the wilderness study area, and at 28 sites in the surrounding area adjacent to the study area (plate 1). At

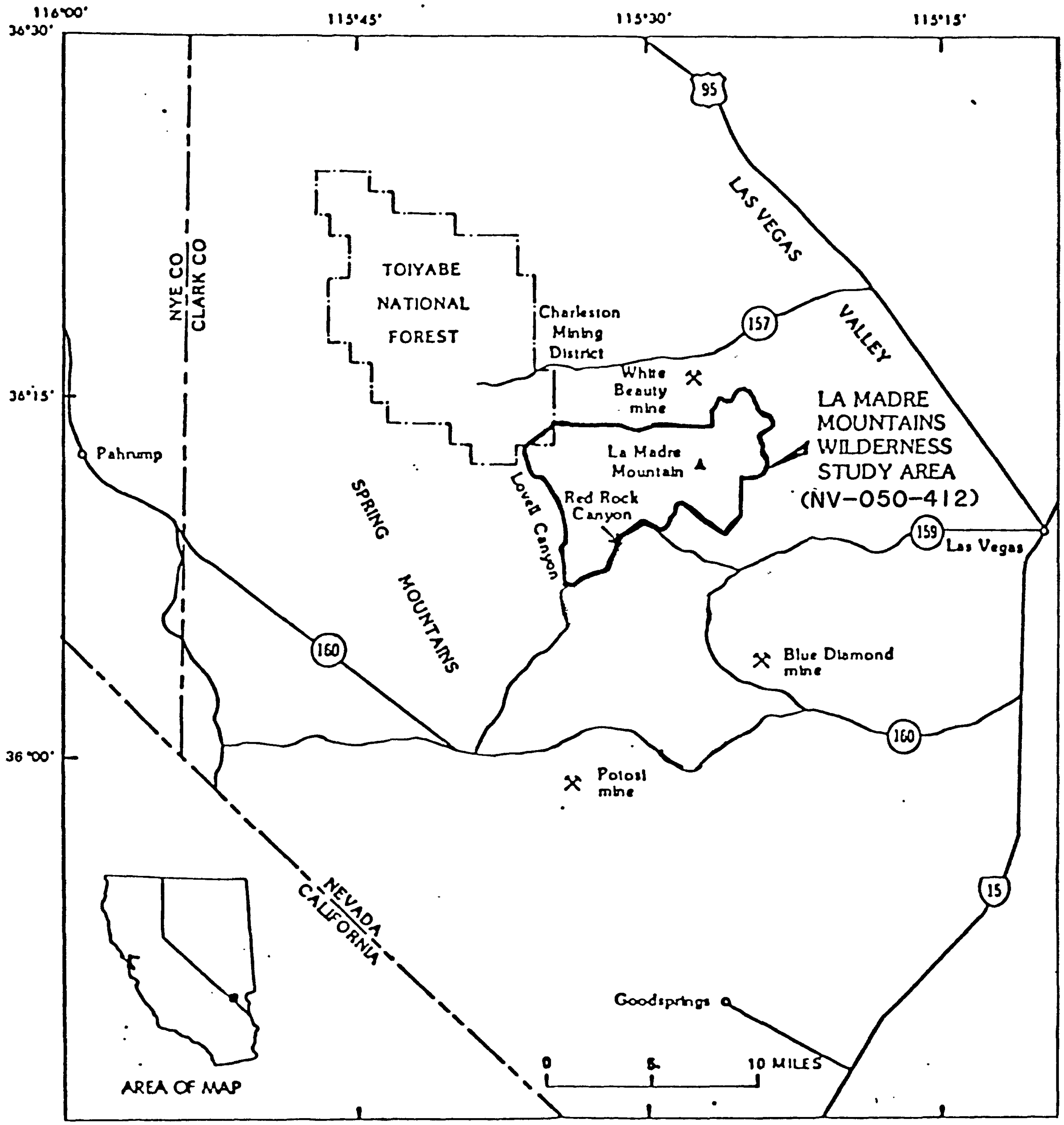

Figure 1. Location of the La Madre Mountains Wilderness Study Area (NV-050-412), Clark County, Nevada

four of these sites, a duplicate sample was also collected as part of a general study to determine analytical and sampling variation. The duplicate samples are shown by a slashed line (/) between the sample numbers on plate 1. Sampling density was about 1 sample site per 2 mi^2. The area of the drainage basins sampled ranged from 0.3 mi^2 to 1.5 mi^2.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from active alluvium primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps (scale = 1:62,500). 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. 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.

Sample Preparation

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 which may include 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.

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate 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. 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 La Madre Mountains study area are listed in table 2.

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

Table 2 lists the analyses of the heavy-mineral concentrate samples. 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 map (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. Because of the formatting used in the computer program that produced the table, some of the elements listed in the table (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.

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.

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.

TABLE 1.--Limits of determination for the spectrographic analysis of heavy-mineral concentrates, based on a 5-mg sample

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.1	50
Magnesium (Mg)	.05	20
Calcium (Ca)	.1	50
Titanium (Ti)	.005	2
	Parts per million	
Manganese (Mn)	20	10,000
Silver (Ag)	1	10,000
Arsenic (As)	500	20,000
Gold (Au)	20	1,000
Boron (B)	20	5,000
Barium (Ba)	50	10,000
Beryllium (Be)	2	2,000
Bismuth (Bi)	20	2,000
Cadmium (Cd)	50	1,000
Cobalt (Co)	10	5,000
Chromium (Cr)	20	10,000
Copper (Cu)	10	50,000
Lanthanum (La)	50	2,000
Molybdenum (Mo)	10	5,000
Niobium (Nb)	50	5,000
Nickel (Ni)	10	10,000
Lead (Pb)	20	50,000
Antimony (Sb)	200	20,000
Scandium (Sc)	10	200
Tin (Sn)	20	2,000
Strontium (Sr)	200	10,000
Vanadium (V)	20	20,000
Tungsten (W)	100	20,000
Yttrium (Y)	20	5,000
Zinc (Zn)	500	20,000
Zirconium (Zr)	20	2,000
Thorium (Th)	200	5,000

TABLE 2.--Spectrographic analyses of heavy-mineral-concentrate samples from the La Madre Mountains Wilderness Study Area, Clark County, Nevada

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

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
LA001H	36 13 49	115 33 58	.5	.5	1.0	2.00	100	N	N	N	50	500	2
LA002H	36 14 7	115 29 10	.3	5.0	10.0	1.00	100	N	N	N	20	N	N
LA003H	36 12 50	115 30 42	1.0	2.0	5.0	2.00	200	N	N	N	70	700	N
LA004H	36 15 7	115 26 37	.5	2.0	20.0	.50	70	N	N	N	50	500	N
LA005H	36 12 56	115 25 13	.5	10.0	10.0	.20	100	N	N	N	20	N	N
LA006H	36 12 56	115 24 21	.5	10.0	10.0	.50	100	N	N	N	20	2,000	N
LA007H	36 9 37	115 24 36	.2	2.0	5.0	1.50	70	N	N	N	50	>10,000	N
LA008H	36 9 52	115 27 0	.5	5.0	10.0	1.00	100	N	N	N	20	N	N
LA009H	36 10 31	115 28 44	.3	10.0	20.0	.50	70	N	N	N	50	N	N
LA010H	36 10 26	115 28 35	1.5	10.0	10.0	.50	100	N	N	N	20	N	N
LH001H	36 14 59	115 25 51	.5	2.0	10.0	1.00	70	N	N	N	50	N	N
LH002H	36 14 39	115 26 12	1.0	2.0	20.0	1.00	100	3	N	N	50	500	N
LH004H	36 14 16	115 22 57	.3	10.0	20.0	.50	100	5	N	N	20	5,000	N
LH005H	36 13 23	115 32 19	1.0	2.0	2.0	1.50	150	N	N	N	50	500	N
LH006H	36 13 53	115 30 55	.5	1.0	2.0	2.00	100	N	N	N	50	500	N
LJ001H	36 12 22	115 40 32	.7	.5	10.0	.10	50	5	N	N	20	N	N
LJ002H	36 12 4	115 39 59	1.0	.5	10.0	.15	70	10	N	N	50	200	N
LJ003H	36 10 1	115 39 32	.5	2.0	10.0	2.00	70	N	N	N	30	500	N
LJ004H	36 9 52	115 37 21	.5	1.0	5.0	2.00	150	N	N	N	20	2,000	N
LJ005H	36 10 27	115 34 8	.3	2.0	5.0	1.50	70	N	N	N	50	7,000	N
LJ006H	36 12 19	115 36 13	1.0	.5	10.0	1.00	100	3	N	N	50	500	N
LJ007H	36 11 39	115 36 33	.5	2.0	5.0	2.00	150	N	N	N	20	2,000	N
LJ008H	36 9 7	115 33 39	.5	1.0	20.0	.50	70	N	N	N	50	N	N
LJ009H	36 9 7	115 33 39	.5	.5	10.0	.50	70	N	N	N	20	N	N
LJ010H	36 9 14	115 33 57	.5	2.0	5.0	2.00	150	N	N	N	20	N	N
LJ011H	36 8 34	115 34 0	.5	.5	20.0	1.00	100	N	N	N	50	200	N
LJ012H	36 7 20	115 33 7	.5	5.0	10.0	.70	100	N	N	N	20	N	N
LJ014H	36 10 46	115 30 7	.3	5.0	5.0	.50	70	N	N	N	20	>10,000	N
LJ015H	36 10 34	115 31 1	1.0	10.0	20.0	.70	150	N	N	N	20	1,000	N
LJ016H	36 10 26	115 31 7	.5	5.0	10.0	.70	100	N	N	N	20	>10,000	N
LJ017H	36 10 26	115 31 7	.5	7.0	10.0	.50	150	N	N	N	20	>10,000	N
LJ018H	36 14 47	115 24 12	.3	10.0	10.0	.50	100	N	N	N	20	N	N
LK001H	36 13 26	115 34 37	.5	2.0	2.0	2.00	150	N	N	N	20	700	N
LK002H	36 13 33	115 34 42	1.0	2.0	5.0	2.00	150	N	N	N	20	N	N
LK003H	36 12 43	115 30 35	.5	2.0	5.0	2.00	200	N	N	N	20	N	N
LK004H	36 13 5	115 30 24	.2	2.0	10.0	1.50	150	N	N	N	50	N	N
LK005H	36 15 3	115 26 23	.5	1.0	10.0	.50	50	N	N	N	50	N	N
LK006H	36 13 52	115 21 17	.3	5.0	20.0	.50	200	N	N	N	20	1,500	N
LK007H	36 12 48	115 25 18	.2	10.0	10.0	.50	100	N	N	N	20	700	N
LK008H	36 11 10	115 26 7	.5	7.0	10.0	.50	100	N	N	N	20	200	N
LK009H	36 11 10	115 26 7	.5	10.0	7.0	1.00	100	N	N	N	20	N	N
LK010H	36 9 32	115 25 50	.5	.5	.1	2.00	50	N	N	N	200	>10,000	N
LK011H	36 10 26	115 28 20	.3	5.0	5.0	1.50	50	N	N	N	50	10,000	N
LK012H	36 9 55	115 29 6	.3	5.0	5.0	1.50	70	N	N	N	200	10,000	N
LT001H	36 12 27	115 40 40	.5	1.0	20.0	2.00	50	N	N	N	20	1,500	N

TABLE 2.--Continued

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s
LA001H	N	N	N	100	10	50	N	N	N	70	N	50	N	N
LA002H	N	N	N	70	<10	70	N	N	N	20	N	20	N	200
LA003H	N	N	N	100	10	150	N	50	N	20	N	70	<20	N
LA004H	N	N	N	100	<10	150	N	N	N	20	N	15	N	700
LA005H	N	N	N	20	15	<50	N	N	N	2,000	N	10	N	N
LA006H	N	N	N	20	20	<50	N	N	N	2,000	<200	10	N	N
LA007H	N	N	N	20	<10	50	N	N	N	300	N	50	<20	700
LA008H	N	N	N	70	<10	<50	N	N	N	50	N	30	N	N
LA009H	N	N	N	N	<10	<50	N	N	N	100	N	10	N	N
LA010H	N	N	N	50	<10	50	N	N	N	200	N	10	N	N
LH001H	N	N	N	70	<10	100	N	N	N	<20	N	30	N	200
LH002H	N	N	N	100	15	150	N	N	30	300	N	10	N	500
LH004H	100	N	N	N	700	50	N	N	N	50,000	2,000	10	100	N
LH005H	N	N	N	100	10	50	N	N	N	N	N	20	N	2,000
LH006H	N	N	N	70	10	50	N	N	N	<20	N	70	N	N
LJ001H	N	N	10	150	15	100	N	N	150	<20	N	N	N	700
LJ002H	N	N	10	300	15	150	N	N	150	50	<200	10	N	1,000
LJ003H	N	N	N	70	<10	50	N	50	N	N	N	20	N	700
LJ004H	N	N	N	70	10	100	N	N	N	<20	N	50	N	200
LJ005H	N	N	N	70	10	50	N	N	N	<20	N	50	N	500
LJ006H	N	N	N	100	15	100	N	N	50	N	N	10	N	500
LJ007H	N	N	N	100	10	70	N	70	N	N	N	50	N	200
LJ008H	N	N	N	150	<10	100	N	N	N	20	N	15	N	700
LJ009H	N	N	N	200	10	100	N	N	30	N	N	10	N	700
LJ010H	N	N	N	70	10	50	N	50	N	N	N	30	N	N
LJ011H	N	N	N	150	<10	150	N	N	30	N	N	20	N	700
LJ012H	N	N	N	50	<10	<50	N	N	N	20	N	10	N	N
LJ014H	N	N	N	50	10	70	N	N	N	1,000	N	10	N	1,000
LJ015H	N	N	N	20	<10	50	N	N	N	100	N	10	N	N
LJ016H	N	N	N	N	<10	50	N	N	N	20	N	20	N	1,000
LJ017H	N	N	N	N	<10	<50	N	N	N	20	N	20	N	1,000
LJ018H	N	N	N	N	<10	<50	N	N	N	N	N	10	N	N
LK001H	N	N	N	70	<10	70	N	70	N	N	N	50	N	N
LK002H	N	N	N	70	15	100	N	50	N	N	N	50	N	200
LK003H	N	N	N	150	10	70	N	50	N	20	N	50	N	N
LK004H	N	N	N	70	<10	50	N	50	N	50	N	30	N	N
LK005H	N	N	N	150	15	100	N	N	30	N	N	10	N	700
LK006H	N	N	10	20	<10	<50	N	N	N	150	N	20	N	200
LK007H	N	N	N	N	<10	<50	N	N	N	20	N	15	N	N
LK008H	N	N	N	N	<10	<50	N	N	N	150	N	10	N	N
LK009H	N	N	N	N	<10	<50	N	N	N	500	N	10	N	N
LK010H	N	N	N	100	<10	50	N	N	N	<20	N	70	N	700
LK011H	N	N	N	70	<10	<50	N	N	N	<20	N	50	N	N
LK012H	N	N	N	70	10	<50	N	N	N	100	N	50	N	200
LT001H	N	N	N	70	<10	150	N	N	N	70	N	30	N	700

TABLE 2.--Continued

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
LT002H	70	N	200	N	>2,000	N
LT003H	50	N	300	N	>2,000	N
LT004H	70	N	500	500	>2,000	N
LT005H	100	N	300	N	>2,000	N
LT006H	100	N	300	N	>2,000	N
LT007H	50	N	300	N	>2,000	N
LT008H	100	N	200	500	>2,000	N
LT009H	70	N	300	700	>2,000	N
LT010H	50	N	200	700	>2,000	N
LT011H	100	N	300	N	>2,000	N
LT012H	50	N	150	N	>2,000	N
LT013H	50	N	100	N	>2,000	N
LT014H	50	N	100	N	>2,000	N

TABLE 2.--Continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s	Be-ppm s
LT002H	36 11 55	115 39 58	.5	1.0	20.0	.70	100	N	N	N	20	N	N
LT003H	36 11 10	115 40 35	.5	1.0	10.0	1.50	100	N	N	N	50	N	N
LT004H	36 9 47	115 38 47	1.0	2.0	5.0	2.00	100	N	N	N	20	200	N
LT005H	36 10 34	115 34 23	1.0	1.0	5.0	2.00	150	N	N	N	50	1,500	N
LT006H	36 12 32	115 36 18	1.0	1.0	5.0	1.50	100	N	N	N	50	700	N
LT007H	36 11 44	115 36 32	1.0	1.0	5.0	1.50	100	N	N	N	50	10,000	N
LT008H	36 11 42	115 35 40	.5	1.0	2.0	1.50	100	N	N	N	20	2,000	N
LT009H	36 11 42	115 35 40	.5	1.0	2.0	1.50	200	N	N	N	20	700	N
LT010H	36 9 42	115 33 48	.3	2.0	7.0	1.50	100	N	N	N	20	5,000	N
LT011H	36 9 37	115 33 39	1.0	1.0	5.0	2.00	150	N	N	N	50	N	N
LT012H	36 7 55	115 34 7	.3	5.0	10.0	1.00	100	N	N	N	20	200	N
LT013H	36 7 15	115 33 12	.3	5.0	5.0	.70	100	N	N	N	<20	N	N
LT014H	36 9 32	115 30 58	.5	10.0	20.0	.70	100	N	N	N	50	2,000	N

TABLE 2.--Continued

Sample	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s
LT002H	N	N	N	150	15	150	N	N	30	200	N	10	N	1,000
LT003H	N	N	N	70	<10	100	N	N	N	<20	N	20	N	500
LT004H	N	N	N	70	10	50	N	<50	N	20	N	50	N	N
LT005H	N	N	N	50	10	100	N	N	N	150	N	30	20	N
LT006H	N	N	N	70	10	100	N	N	N	<20	N	50	N	500
LT007H	N	N	N	70	<10	50	N	N	N	100	N	30	N	200
LT008H	N	N	N	70	10	50	N	50	N	N	N	50	N	N
LT009H	N	N	N	70	10	100	N	50	N	N	N	30	N	200
LT010H	N	N	N	70	10	100	N	N	N	N	N	20	N	500
LT011H	N	N	N	70	10	100	N	50	N	N	N	50	N	N
LT012H	N	N	N	70	15	50	N	N	N	200	N	10	N	200
LT013H	N	N	N	50	10	50	N	N	N	500	N	10	N	N
LT014H	N	N	N	N	<10	50	N	N	N	300	N	10	N	N

TABLE 2.--Continued

Sample	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
LT002H	70	N	200	N	>2,000	N
LT003H	50	N	300	N	>2,000	N
LT004H	70	N	500	500	>2,000	N
LT005H	100	N	300	N	>2,000	N
LT006H	100	N	300	N	>2,000	N
LT007H	50	N	300	N	>2,000	N
LT008H	100	N	200	500	>2,000	N
LT009H	70	N	300	700	>2,000	N
LT010H	50	N	200	700	>2,000	N
LT011H	100	N	300	N	>2,000	N
LT012H	50	N	150	N	>2,000	N
LT013H	50	N	100	N	>2,000	N
LT014H	50	N	100	N	>2,000	N