UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality maps of heavy-mineral-concentrate and rock samples from the Big Hatchet Mountains Wilderness Study Area (NM-030-035), Hidalgo County, New Mexico

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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 geochemical survey of the Big Hatchet Mountains Wilderness Study Area (NM-030-035), Hidalgo County, New Mexico.

INTRODUCTION

In April, 1985, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Big Hatchet Mountains Wilderness Study Area (NM-030-035) in Hidalgo County, New Mexico.

The Big Hatchet Mountains Wilderness Study Area comprises about 77 mi^2 (49,151 acres) in southeastern Hidalgo County and lies about 20 mi south of Hatchita (fig. 1). Unimproved dirt roads provide access from State Highway 81 on the north and west sides. The east side is reached by a system of dirt roads south from the Everhart Ranch.

Marine sediments were deposited in the area throughout most of the Paleozoic. The early and middle Mesozoic were characterized by nondeposition and erosion due to regional uplifting. Another series of marine sediments were deposited in the early Cretaceous period. Folding, high-angle faulting, and thrust faulting began in the late Cretaceous; following another erosional episode, volcanism became widespread. High-angle faulting and tilting caused the uplift of the Big Hatchet Mountain block.

Approximately 10,000 ft of Paleozoic rocks, mostly limestones and dolomites, occur in the area. Another 5,000 ft of shallow-water marine sediments accumulated during the Cretaceous period. The geology of the area is described by Zeller (1975).

The Big Hatchet Mountains are a rugged, northwest-trending, isolated desert range, rising abruptly from the broad valleys to the east and west. The terrain is rugged with deep canyons and near-vertical cliffs. Elevations range from 4,400 ft to 8,336 ft on Big Hatchet Peak. Scattered pinyon and juniper trees grow at higher elevations while cottonwood, palo verde, mesquite, and tamerask are found in the canyons. All streams are ephemeral.

METHODS OF STUDY

Sample Media

Analyses of 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 may be ore related, permits determination of some elements that are not easily detected in stream-sediment samples.

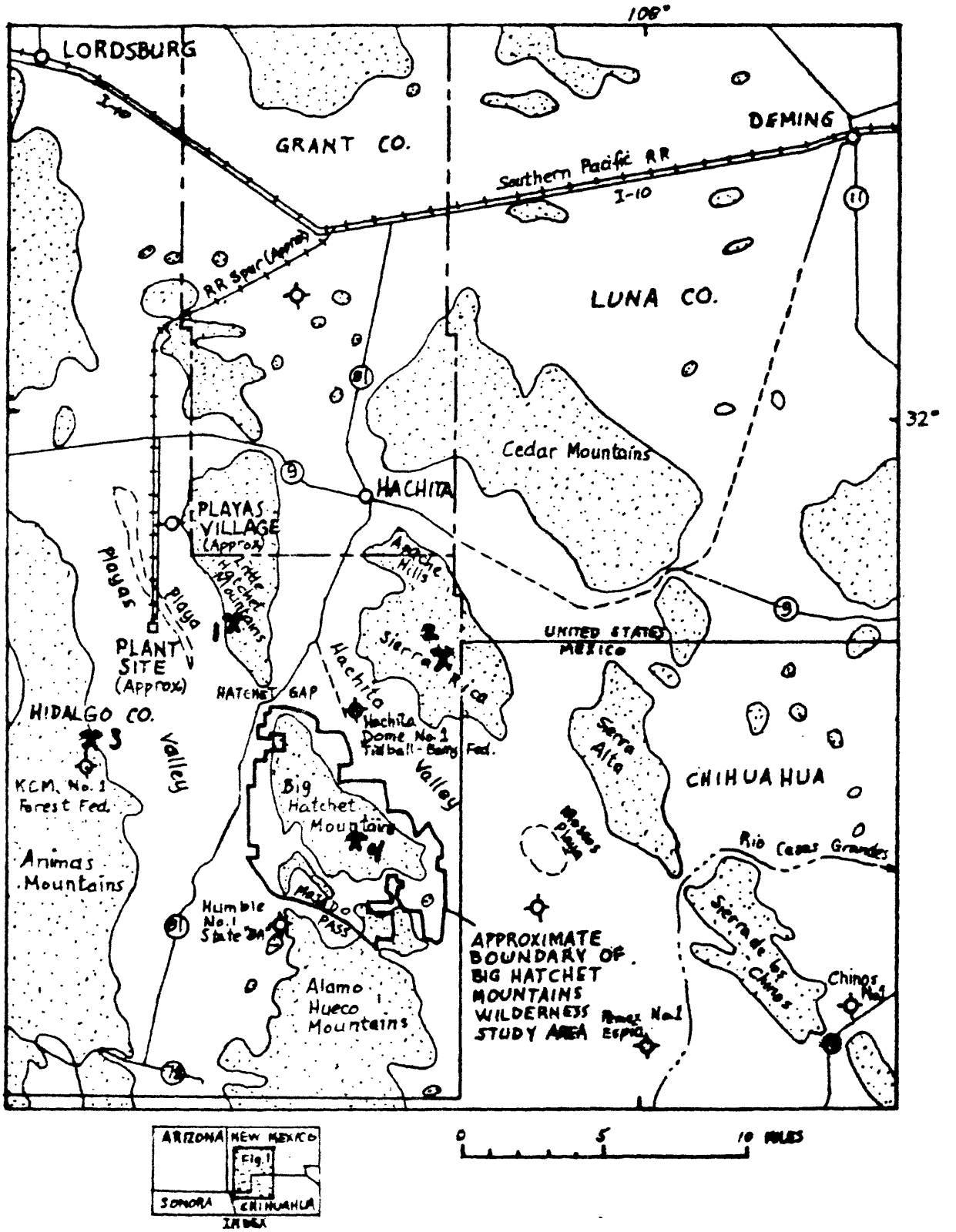

Figure 1.--Index map showing location of Big Hatchet Mountains Wilderness Study Area, southwestern New Mexico. Mountain areas are shaded.

Analyses of unaltered or unmineralized rock samples provide background geochemical data for individual rock units. 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 82 sites within or on drainages originating within the Big Hatchet Wilderness Study Area (plate 1). At all sites both a stream-sediment sample and a heavy-mineral-concentrate sample were collected. At five of these sites rock samples were also collected. Sampling density was about one sample site per 0.9 mi^2. The area of the drainage basins sampled ranged from 0.2 to 2.0 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 = 1:24,000). Each sample was composited from several localities within an area that may extend as much as 50 ft from the site plotted on the map. Stream-sediment samples were saved for archival storage and not analyzed.

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.

Sample Preparation

The stream-sediment samples were only saved for archival storage and not analyzed. The heavy-mineral-concentrate sample was air dried and seived through an 80-mesh stainless-steel screen. 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). These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15 degrees and a tilt of 10 degrees 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. The most magnetic material, primarily magnetite, was not analyzed. The third fraction (the least magnetic material which may include the nonmagnetic ore minerals and zircon, sphene, etc.) contained sufficient sample for spectrographic analysis (5 mg) for only 14 of the 82

sites. The second fraction, largely ferromagnesium silicates and iron oxides, which had been saved for archival storage, was therefore analyzed.

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

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate samples and rock samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method. The analyses for heavy-mineral-concentrate samples were performed by analysts in the Branch of Exploration Geochemistry using the method of Grimes and Marranzino (1968); analyses for rock samples were performed by analysts in the Branch of Analytical Chemistry using the method of Myers and others (1961). 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 intervals 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 are listed in table 2 for the C-2 fraction of the heavy-mineral-concentrate sample (magnetic at 1.0 ampere), in table 3 for the C-3 fraction of the heavy-mineral-concentrate sample (nonmagnetic at 1.0 ampere), and in table 4 for the rock samples.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered ino 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 (Van Trump and Miesch, 1977).

DESCRIPTION OF DATA TABLES

Tables 2, 3, and 4 list the analyses for heavy-mineral-concentrate C-2 and C-3 fractions and rock 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). 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 the tables in place of the analytical value. Because of the formatting used in the computer program that produced the data tables, 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.

No detectable amounts of Au, Bi, Cd and Th in the C-2 fraction nor As, Au, Bi, Nb, Ni, Sb, Th, W, Zr in the C-3 fraction concentrate samples were found. Consequently, the columns for these elements have been deleted from tables 2 and 3, respectively.

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.

Motooka, J.M., and Grimes, D.J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geological Survey Circular 738, 25 p.

Myers, A.T., Havens, R.G., and Dunton, P.J., 1961, A spectrochemical method for the semiquantitative analyses of rocks, minerals, and ores: U.S. Geological Survey Bulletin 1084-I, p. 1207-1229.

VanTrump, George, Jr., and Miesch, A.T., 1977, The U.S. Geological Survey RASS-STATPAC system for management and statistical reduction of geochemical data: Computers and Geosciences, v. 3, p. 475-488.

Zeller, R.A., Jr.,1975, Structural geology of Big Hatchet Peak Quadrangle, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Circular 146, 23 p.

TABLE 1.--Limits of determination for the spectrographic analysis of rocks and rock and heavy-mineral-concentrate samples

Elements	Rock		Heavy-mineral concentrate	
	Lower determination limit	Upper determination limit	Lower determination limit	Upper determination limit
	Percent			
Iron (Fe)	0.05	20	0.1	50
Magnesium (Mg)	.02	10	.05	20
Calcium (Ca)	.05	20	.1	50
Titanium (Ti)	.002	1	.005	2
	Parts per million			
Manganese (Mn)	10	5,000	20	10,000
Silver (Ag)	0.5	5,000	1	10,000
Arsenic (As)	700	10,000	500	20,000
Gold (Au)	15	500	20	1,000
Boron (B)	10	2,000	20	5,000
Barium (Ba)	20	5,000	50	10,000
Beryllium (Be)	1	1,000	2	2,000
Bismuth (Bi)	10	1,000	20	2,000
Cadmium (Cd)	30	500	50	1,000
Cobalt (Co)	5	2,000	10	5,000
Chromium (Cr)	10	5,000	20	10,000
Copper (Cu)	5	20,000	10	50,000
Lanthanum (La)	30	1,000	50	2,000
Molybdenum (Mo)	5	2,000	10	5,000
Niobium (Nb)	20	2,000	50	5,000
Nickel (Ni)	5	5,000	10	10,000
Lead (Pb)	10	20,000	20	50,000
Antimony (Sb)	100	10,000	200	20,000
Scandium (Sc)	5	100	10	200
Tin (Sn)	10	1,000	20	2,000
Strontium (Sr)	100	5,000	200	10,000
Vanadium (V)	10	10,000	20	20,000
Tungsten (W)	50	10,000	100	20,000
Yttrium (Y)	10	2,000	20	5,000
Zinc (Zn)	200	10,000	500	20,000
Zirconium (Zr)	10	1,000	20	2,000
Thorium (Th)	200	2,000	200	5,000

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO

[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	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s
BA001H	31 42 18	108 24 45	20	.3	.3	.7	2,000	N	N	50	2,000	20	150
BA002H	31 40 45	108 24 30	20	.5	1.0	.5	3,000	N	<500	30	1,500	15	150
BA003H	31 39 34	108 24 47	30	.2	.1	>2.0	1,000	N	N	<20	100	20	N
BA004H	31 38 56	108 24 27	50	.5	1.0	1.0	3,000	N	1,000	<20	1,500	15	100
BA005H	31 37 32	108 24 57	20	.7	1.0	.5	10,000	N	700	20	5,000	15	100
BA006H	31 36 10	108 24 48	30	.7	1.0	.5	1,000	N	500	50	200	10	150
BA007H	31 35 45	108 23 38	20	.7	2.0	.7	2,000	N	N	50	1,000	10	100
BA008H	31 35 37	108 22 26	30	.5	1.0	.3	1,000	N	N	<20	2,000	7	150
BA009H	31 34 25	108 22 19	30	.7	1.0	1.0	1,500	N	N	<20	3,000	15	70
BA010H	31 32 57	108 20 6	20	.5	1.0	1.0	1,000	N	500	70	700	10	50
BA011H	31 32 39	108 18 46	20	.7	3.0	1.0	3,000	N	500	50	2,000	15	150
BA012H	31 32 38	108 16 13	50	.3	.5	1.0	5,000	N	2,000	50	2,000	20	150
BH001H	31 37 22	108 21 47	30	.5	.7	.3	1,000	N	N	50	300	15	100
BH002H	31 37 42	108 21 27	30	.7	.7	.7	2,000	N	<500	50	2,000	15	150
BH003H	31 41 27	108 25 1	20	.7	2.0	1.0	7,000	N	N	30	3,000	20	150
BH004H	31 40 0	108 24 40	50	.5	1.0	.7	700	N	<500	N	200	10	70
BH005H	31 39 8	108 24 23	30	.5	.7	.7	1,500	N	700	50	500	10	150
BH006H	31 38 17	108 25 28	30	.3	.5	.7	5,000	N	1,000	50	2,000	15	100
BH007H	31 36 57	108 24 58	30	.5	.7	1.0	2,000	N	1,500	50	500	15	150
BH008H	31 35 53	108 24 14	30	.7	1.0	.7	2,000	N	700	50	2,000	20	150
BH009H	31 36 24	108 22 42	20	.7	1.5	.7	2,000	N	N	30	10,000	5	150
BH010H	31 34 41	108 22 18	20	.7	1.5	1.5	2,000	N	N	70	200	7	70
BH011H	31 33 15	108 20 53	20	.5	.7	1.0	2,000	N	1,500	50	700	10	100
BH012H	31 33 7	108 19 20	30	.7	2.0	1.5	1,000	N	N	70	500	2	100
BH013H	31 33 13	108 17 10	30	.7	1.0	1.0	3,000	N	500	100	1,500	20	150
BH015H	31 41 30	108 23 43	20	.7	1.5	.2	2,000	N	N	30	700	20	150
BH016H	31 40 30	108 23 2	50	.7	1.0	.7	3,000	N	N	N	1,000	20	70
BH017H	31 40 23	108 22 57	15	.5	.7	1.5	2,000	N	N	30	500	15	20
BH018H	31 39 55	108 22 48	50	.7	3.0	.5	1,500	N	500	N	300	15	150
BH019H	31 39 17	108 22 40	20	1.5	3.0	.5	2,000	N	N	20	700	7	150
BH020H	31 39 15	108 22 35	20	.7	2.0	.7	1,500	N	N	20	1,500	15	70
BH021H	31 38 47	108 21 47	20	.7	.7	.5	2,000	N	700	30	700	20	150
BH022H	31 38 43	108 22 9	50	.7	1.0	1.0	2,000	N	<500	N	700	15	150
BH023H	31 37 37	108 20 52	50	.7	1.0	.7	2,000	N	1,000	20	700	15	150
BH024H	31 37 11	108 21 32	30	.5	1.0	.7	1,500	N	<500	70	500	15	150
BH025H	31 37 38	108 22 26	30	.5	.7	.5	1,000	N	500	50	150	15	150
BH026H	31 37 25	108 22 27	30	1.0	1.0	.5	1,500	N	500	20	300	10	150
BH027H	31 37 5	108 19 35	30	.5	1.0	.7	1,000	N	1,000	100	150	20	100
BH028H	31 36 17	108 18 35	20	.3	1.0	1.0	2,000	N	700	70	700	20	100
BH029H	31 36 5	108 18 40	20	.3	.7	.7	2,000	N	700	100	500	20	70
BH030H	31 35 56	108 18 48	20	.5	3.0	1.0	3,000	N	700	50	2,000	20	150
BH031H	31 36 8	108 19 13	50	.5	.7	1.0	1,500	N	1,500	30	500	20	100
BH032H	31 35 57	108 19 15	30	.3	.5	1.0	3,000	N	1,000	70	1,000	20	150
BH033H	31 36 0	108 19 35	20	.5	1.0	.7	2,000	N	700	70	700	20	150
BH034H	31 36 20	108 20 0	50	.5	1.0	.7	1,500	N	1,000	50	300	20	150

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	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	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s
BA001H	150	700	70	50	<50	500	500	N	10	N	N	200	N	100	1,500
BA002H	1,500	150	50	70	N	300	300	N	<10	N	N	300	N	50	1,500
BA003H	20	50	700	N	300	70	100	N	50	200	N	50	N	2,000	N
BA004H	150	300	100	200	<50	500	200	N	15	N	N	500	N	300	1,500
BA005H	70	300	N	200	<50	300	300	N	<10	N	7,000	200	N	50	1,500
BA006H	50	300	<50	150	N	500	300	N	<10	N	<200	300	N	50	1,000
BA007H	70	300	100	100	<50	300	300	N	15	N	N	300	N	150	700
BA008H	300	200	<50	70	N	300	500	N	10	N	N	150	N	30	1,500
BA009H	200	150	200	70	<50	300	150	N	15	N	N	300	N	70	700
BA010H	300	500	70	100	50	300	150	N	10	N	N	700	N	100	<500
BA011H	300	200	200	70	<50	300	100	N	15	N	N	300	N	200	500
BA012H	100	300	70	200	<50	700	300	N	15	N	N	300	N	150	1,500
BH001H	100	200	<50	150	N	500	200	N	10	N	N	300	N	50	1,500
BH002H	100	300	50	200	<50	500	200	N	10	N	N	500	N	70	1,500
BH003H	70	200	50	100	<50	500	300	N	10	N	<200	300	N	150	1,500
BH004H	200	200	50	100	N	500	500	N	10	N	N	300	N	150	2,000
BH005H	500	500	N	300	<50	500	200	N	10	N	N	200	N	50	1,500
BH006H	150	100	50	100	<50	500	200	N	15	N	300	300	N	150	1,500
BH007H	70	300	70	200	<50	500	200	N	10	N	N	300	N	100	1,500
BH008H	70	1,000	<50	300	N	500	300	N	10	N	N	200	N	50	2,000
BH009H	70	700	50	70	<50	300	300	N	<10	N	2,000	300	N	70	700
BH010H	150	200	300	70	50	500	200	N	15	<20	300	300	N	200	1,000
BH011H	100	200	100	70	50	300	150	N	10	N	N	500	N	70	700
BH012H	700	70	N	15	<50	200	70	N	10	N	N	700	N	50	700
BH013H	100	200	50	50	<50	500	200	N	10	N	N	300	<100	100	1,000
BH015H	700	100	70	100	<50	200	200	N	<10	N	N	200	N	50	1,000
BH016H	1,000	150	<50	100	<50	500	200	N	10	N	N	300	N	200	1,000
BH017H	500	70	150	30	70	200	150	N	15	20	N	150	N	1,000	500
BH018H	1,500	150	50	100	N	500	150	500	15	N	N	300	N	150	2,000
BH019H	5,000	150	50	200	<50	300	150	N	15	N	N	500	N	70	1,000
BH020H	1,000	100	70	50	<50	500	150	N	15	N	N	500	N	200	1,500
BH021H	50	200	N	150	N	500	500	N	<10	N	N	300	N	30	2,000
BH022H	200	500	70	300	<50	700	200	N	15	N	N	300	N	100	2,000
BH023H	150	1,000	N	200	N	700	200	<200	15	N	N	500	<100	30	1,000
BH024H	150	500	50	100	<50	700	500	N	10	N	N	300	N	50	1,000
BH025H	70	1,000	N	200	<50	500	200	N	10	N	N	300	N	30	1,000
BH026H	100	300	N	300	<50	500	200	N	10	N	N	300	N	50	1,500
BH027H	1,000	150	50	100	<50	500	150	N	15	N	N	300	100	70	1,500
BH028H	200	100	70	50	<50	500	200	<200	10	N	N	300	<100	150	1,500
BH029H	100	100	50	70	<50	500	200	300	10	<20	N	300	<100	70	1,500
BH030H	300	150	150	70	50	700	150	200	10	N	N	300	150	200	1,000
BH031H	1,000	200	70	70	<50	700	200	500	15	N	N	500	100	50	1,500
BH032H	500	200	100	100	50	500	200	<200	20	N	N	500	150	200	1,500
BH033H	150	300	50	70	<50	500	200	<200	10	N	N	500	<100	70	1,000
BH034H	100	300	70	100	<50	500	200	500	15	N	N	300	150	70	1,500

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	Zr-ppm s
BA001H	1,000
BA002H	1,000
BA003H	>2,000
BA004H	1,500
BA005H	1,500
BA006H	1,000
BA007H	2,000
BA008H	300
BA009H	1,000
BA010H	2,000
BA011H	1,500
BA012H	2,000
BH001H	300
BH002H	1,500
BH003H	2,000
BH004H	2,000
BH005H	1,500
BH006H	1,500
BH007H	2,000
BH008H	1,500
BH009H	1,500
BH010H	>2,000
BH011H	1,500
BH012H	1,000
BH013H	1,500
BH015H	300
BH016H	>2,000
BH017H	>2,000
BH018H	1,500
BH019H	300
BH020H	2,000
BH021H	100
BH022H	2,000
BH023H	1,500
BH024H	700
BH025H	100
BH026H	1,500
BH027H	1,500
BH028H	2,000
BH029H	1,500
BH030H	>2,000
BH031H	1,500
BH032H	500
BH033H	1,500
BH034H	500

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--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	B-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s
BH035H	31 36 18	108 20 8	30	.5	.7	.7	1,500	N	1,000	70	300	15	150
BH036H	31 36 23	108 20 30	30	.5	.7	.3	1,500	N	500	20	1,500	10	150
BH037H	31 36 23	108 20 42	30	.5	.5	.7	1,500	N	500	50	1,000	20	150
BH038H	31 33 47	108 16 13	20	.5	.5	1.0	7,000	N	1,000	50	5,000	15	200
BH039H	31 33 57	108 16 13	20	.7	2.0	.3	3,000	N	700	100	1,000	20	150
BH040H	31 34 15	108 16 6	15	1.5	1.5	.7	2,000	N	700	70	500	15	100
BH041H	31 34 49	108 16 45	20	2.0	3.0	1.5	2,000	N	<500	50	500	10	100
BH042H	31 34 52	108 17 12	20	.7	2.0	.7	1,500	N	700	100	500	20	100
BH043H	31 34 22	108 17 50	30	.3	.3	.7	2,000	N	500	70	500	15	150
BH044H	31 34 31	108 18 15	30	.5	1.0	.7	2,000	N	700	100	700	20	150
BH045H	31 34 47	108 18 14	50	.3	.7	.5	3,000	N	1,000	30	1,500	20	150
BH046H	31 34 45	108 18 18	50	.5	1.0	1.0	3,000	N	1,000	50	1,500	20	150
BH047H	31 35 27	108 17 17	30	.5	.7	.7	2,000	N	1,500	100	500	20	150
BH048H	31 35 57	108 17 37	20	.7	1.5	1.0	2,000	N	500	70	1,000	15	150
BH049H	31 35 43	108 17 59	30	.3	1.0	.7	3,000	N	1,000	100	1,000	20	150
BH050H	31 35 51	108 20 51	20	.7	.5	.7	2,000	N	700	20	1,000	15	150
BH051H	31 35 48	108 20 54	20	.5	.5	.5	1,500	N	1,000	N	1,500	10	150
BH052H	31 35 45	108 20 52	50	.5	1.0	1.0	1,500	N	1,000	N	1,000	10	100
BH053H	31 35 10	108 21 0	30	.7	1.5	1.5	1,500	N	N	50	300	10	100
BH054H	31 35 9	108 20 50	50	.5	1.5	1.0	2,000	N	N	20	700	10	100
BH056H	31 34 5	108 19 45	50	.5	1.0	.7	1,500	3	500	N	1,500	10	100
BH057H	31 34 2	108 20 12	20	.7	1.0	.7	2,000	N	1,500	70	3,000	15	200
BH058H	31 34 11	108 21 13	20	1.0	2.0	.7	2,000	N	1,000	50	700	15	150
BH059H	31 33 55	108 19 6	20	.5	2.0	1.0	2,000	N	500	50	700	10	150
BH060H	31 33 22	108 18 28	30	.7	1.5	1.0	1,500	N	<500	70	500	10	100
BR001H	31 37 19	108 22 34	50	.7	1.0	.7	2,000	N	N	30	2,000	5	150
BR003H	31 40 39	108 25 6	30	.5	1.0	1.0	3,000	N	N	70	1,500	10	150
BR004H	31 39 17	108 24 41	30	.3	.7	1.0	2,000	N	700	N	700	20	150
BR005H	31 38 52	108 25 33	30	.7	.7	1.0	3,000	N	500	20	2,000	15	100
BR006H	31 37 17	108 25 7	20	.7	1.0	.5	5,000	N	700	20	2,000	10	150
BR007H	31 36 7	108 24 25	20	1.0	1.0	1.0	2,000	N	700	30	300	7	200
BR008H	31 35 51	108 22 55	20	.7	.7	.5	2,000	N	500	50	2,000	10	200
BR009H	31 34 36	108 22 52	20	1.0	1.0	1.0	1,000	N	N	50	500	15	50
BR010H	31 33 43	108 22 5	30	.5	.7	2.0	1,500	N	N	70	10,000	10	70
BR011H	31 33 7	108 19 33	20	1.5	1.0	1.5	2,000	N	N	50	500	3	70
BR012H	31 32 32	108 18 23	50	.7	1.0	2.0	2,000	N	2,000	30	500	15	50
BR013H	31 33 7	108 15 36	20	.5	.5	1.5	3,000	N	1,000	50	5,000	15	100

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	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	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s
BH035H	200	200	N	300	<50	500	300	200	10	N	N	500	<100	30	1,500
BH036H	70	700	N	200	N	500	300	N	<10	N	N	500	N	30	1,500
BH037H	100	500	70	300	<50	700	300	N	<10	N	N	500	N	50	2,000
BH038H	2,000	200	70	150	<50	500	200	N	10	N	N	300	100	100	1,500
BH039H	500	150	N	30	N	300	100	N	15	N	N	300	<100	30	700
BH040H	1,000	150	N	20	N	300	100	N	15	N	N	300	N	50	700
BH041H	2,000	70	70	30	<50	300	100	N	20	N	N	200	N	150	700
BH042H	1,000	150	50	30	<50	500	150	N	10	N	N	300	<100	70	700
BH043H	70	150	50	50	<50	500	150	<200	10	N	N	300	<100	70	1,000
BH044H	70	200	70	50	<50	500	200	<200	10	N	N	300	<100	100	1,500
BH045H	200	300	N	70	N	500	150	200	15	N	N	500	100	30	1,000
BH046H	200	300	70	70	<50	500	200	300	10	N	N	300	100	100	1,500
BH047H	150	100	N	50	<50	300	150	<200	10	N	N	300	<100	50	700
BH048H	2,000	100	50	50	<50	300	200	N	15	N	N	300	<100	70	1,000
BH049H	500	100	70	70	<50	500	200	N	15	N	N	300	150	70	1,500
BH050H	100	1,000	N	200	N	500	300	N	10	N	N	500	N	50	1,500
BH051H	70	150	N	150	N	500	200	N	<10	N	N	500	N	30	2,000
BH052H	150	300	100	300	50	700	300	N	15	N	N	500	N	70	2,000
BH053H	100	150	200	150	<50	700	200	N	10	N	N	500	N	200	1,500
BH054H	150	200	50	150	<50	500	300	N	15	N	N	500	N	70	2,000
BH056H	150	500	N	300	<50	500	2,000	N	10	N	N	500	N	100	10,000
BH057H	70	200	70	150	<50	300	300	N	10	N	<200	500	N	70	1,000
BH058H	100	500	70	150	<50	300	200	N	10	N	5,000	300	N	100	700
BH059H	200	200	70	100	50	300	200	N	15	N	N	500	N	150	700
BH060H	500	100	50	200	<50	300	150	N	10	N	N	300	N	70	700
BR001H	70	300	70	100	N	300	200	N	10	N	N	300	N	100	700
BR003H	100	150	150	50	<50	500	1,000	N	15	N	N	500	N	200	1,500
BR004H	100	500	100	150	150	700	300	N	10	N	N	200	N	300	2,000
BR005H	100	70	200	30	N	300	200	N	15	N	200	500	N	200	1,500
BR006H	100	300	N	200	<50	300	200	N	10	N	N	150	N	50	2,000
BR007H	100	500	70	300	50	500	300	N	10	N	N	200	N	100	1,500
BR008H	70	500	<50	150	N	300	500	N	<10	N	<200	200	N	50	1,500
BR009H	100	200	100	150	50	700	150	N	10	N	N	300	N	150	<500
BR010H	200	150	200	70	100	300	200	N	10	N	N	500	N	150	700
BR011H	300	200	70	20	50	200	100	N	15	N	N	500	N	70	500
BR012H	300	200	200	100	50	500	150	N	15	N	N	500	N	200	700
BR013H	150	100	200	70	50	500	200	<200	15	N	<200	500	<100	200	1,000

TABLE 2.--SPECTROGRAPHIC ANALYSIS OF THE C-2 FRACTION (MAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	Zr-ppm s
BH035H	500
BH036H	300
BH037H	1,000
BH038H	2,000
BH039H	300
BH040H	1,000
BH041H	2,000
BH042H	1,500
BH043H	1,500
BH044H	1,500
BH045H	300
BH046H	1,500
BH047H	700
BH048H	1,500
BH049H	1,500
BH050H	1,500
BH051H	500
BH052H	2,000
BH053H	>2,000
BH054H	1,500
BH056H	700
BH057H	1,000
BH058H	1,000
BH059H	1,000
BH060H	700
BR001H	2,000
BR003H	2,000
BR004H	2,000
BR005H	1,000
BR006H	700
BR007H	1,500
BR008H	1,000
BR009H	2,000
BR010H	>2,000
BR011H	1,000
BR012H	>2,000
BR013H	>2,000

TABLE 3.--SPECTROGRAPHIC ANALYSIS OF THE C-3 FRACTION (NONMAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO

[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	B-ppm s	Ba-ppm s	Be-ppm s	Cl-ppm s	Co-ppm s
BA001H	31 42 18	108 24 45	.20	.5	2	.02	30	N	<20	>10,000	<2	N	N
BA009H	31 34 25	108 22 19	1.00	2.0	10	.50	100	1.5	<20	>10,000	2	50	20
BH011H	31 33 15	108 20 53	.20	1.5	10	.10	50	N	20	>10,000	2	N	N
BH019H	31 39 17	108 22 40	.50	2.0	20	.02	100	N	<20	10,000	<2	N	N
BH021H	31 38 47	108 21 47	.20	5.0	10	.05	100	7.0	<20	10,000	2	50	N
BH032H	31 35 57	108 19 15	.50	5.0	10	.20	100	N	<20	>10,000	5	N	N
BH034H	31 36 20	108 20 0	.50	5.0	10	.20	100	N	<20	300	2	N	N
BH037H	31 36 23	108 20 42	.15	2.0	5	.01	50	7.0	<20	>10,000	2	50	N
BH050H	31 35 51	108 20 51	.50	5.0	10	.05	100	N	<20	>10,000	2	N	N
BH051H	31 35 48	108 20 54	1.00	5.0	5	.10	100	N	<20	>10,000	N	N	N
BH055H	31 34 2	108 19 33	.10	.2	1	.01	30	150.0	20	2,000	N	200	N
BH059H	31 33 55	108 19 6	.20	1.0	20	.10	30	N	20	10,000	<2	N	N
BH060H	31 33 22	108 18 28	.50	.5	20	.05	50	N	20	1,000	<2	N	N
BR007H	31 36 7	108 24 25	1.00	5.0	10	.02	200	N	<20	10,000	<2	N	N

TABLE 3.--SPECTROGRAPHIC ANALYSIS OF THE C-3 FRACTION (NONMAGNETIC AT 1.0 AMPERE) OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Pb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zn-ppm s
BA001H	N	<10	N	N	700	10	N	>10,000	100	30	N
BA009H	70	10	N	N	10,000	20	N	5,000	50	300	3,000
BH011H	100	<10	150	N	<20	10	N	1,000	50	150	N
BH019H	N	<10	150	N	30	10	N	700	20	200	N
BH021H	N	100	N	N	10,000	10	N	300	20	200	3,000
BH032H	50	<10	150	N	20	30	70	300	30	500	N
BH034H	N	<10	N	N	70	10	N	N	20	200	N
BH037H	N	20	N	N	15,000	10	N	10,000	20	100	3,000
BH050H	N	<10	N	N	150	10	N	500	20	150	N
BH051H	N	<10	N	N	70	10	N	10,000	20	50	700
BH055H	N	150	N	70	>50,000	<10	N	200	50	30	>20,000
BH059H	200	<10	150	N	20	10	N	500	70	200	N
BH060H	500	<10	150	N	N	10	N	300	100	200	N
BR007H	N	30	N	N	<20	10	N	300	20	100	700

Table 4.-- SPECTROGRAPHIC ANALYSIS OF ROCK SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO

[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
BH039R	31 33 57	108 16 13	.7	.07	7.00	.002	70	N	N	N
BH050R	31 35 51	108 20 51	>20.0	<.02	.15	<.002	<10	N	N	N
BR001R	31 37 19	108 22 34	20.0	.20	.15	.030	50	N	1,500	N
BR005R	31 38 52	108 25 33	.7	.02	1.50	.005	150	<.5	N	N
BR013R	31 33 7	108 15 36	7.0	.07	3.00	.010	70	1.0	2,000	N

Table 4.-- SPECTROGRAPHIC ANALYSIS OF ROCK SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
BH[illegible]39R	<1[illegible]	150	N	N	N	N	15	5	N	N	N
BH[illegible]50R	N	>5,[illegible]00	N	N	N	N	15	70	N	N	<20
BR001R	15	30	1.5	N	N	15	30	2,000	N	7[illegible]	N
BR[illegible]05R	10	5[illegible]0	3.0	N	N	N	<10	20	N	N	<20
PR[illegible]13R	<1[illegible]	3,[illegible]00	5.[illegible]	N	N	7	15	30	N	15	<20

Table 4.-- SPECTROGRAPHIC ANALYSIS OF ROCK SAMPLES FROM THE BIG HATCHET MOUNTAINS WILDERNESS STUDY AREA, HIDALGO COUNTY, NEW MEXICO--Continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
BH039R	7	N	N	N	N	<100	15	N	N	N	<1	N
BH050R	15	150	N	N	N	3,000	30	N	N	1,000	<10	N
PR001R	300	150	N	<5	N	<100	150	N	<10	1,500	30	N
PR005R	7	N	N	N	N	<100	<10	N	N	N	15	N
PR013R	70	300	N	N	N	150	50	N	N	1,000	15	N