UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

GEOCHEMICAL ANALYSES OF STREAM SEDIMENTS AND HEAVY-MINERAL CONCENTRATES COLLECTED NEAR A STRATABOUND CU-AG OCCURRENCE IN THE CABINET MOUNTAINS WILDERNESS, MONTANA

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INTRODUCTION

Purpose of Study

The Wilderness Act (Public Law 88-577, Sept. 3, 1964) and related Acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the Administration and the Congress. This report presents the results of a geochemical study in the Cabinet Mountains Wilderness, Montana.

This study was designed to investigate several geochemical techniques that may be applied to a low sample density (one site/13 km^2) geochemical reconnaissance for stratabound Cu-Ag occurrences in the Wallace 1° x 2° quadrangle in Idaho and Montana. The geochemical reconnaissance in the Wallace 1° x 2° quadrangle is part of the U.S. Geological Survey CUSMAP Project (Conterminous United States Mineral Appraisal Program). The specific objectives of this study were (1) to determine the geochemical dispersion patterns of Cu, Ag, and associated elements from a known stratabound Cu-Ag occurrence; (2) to evaluate the relative effectiveness of samples of stream sediment and heavy-mineral concentrate for detecting the presence of a stratabound Cu-Ag occurrence; and (3) to evaluate several possible modes of transport of Cu and Ag in the stream sediments.

This report includes a map showing the locations of sites sampled in this study (pl. 1) and a tabulation of chemical analyses of the samples of stream sediment and heavy-mineral concentrate. The purpose of the report is to make the data available to the public in a timely manner.

LOCATION OF STUDY AREA

The study area is located in the southwestern part of the Cabinet Mountains Wilderness in the Kootenai National Forest, Sanders County Montana (fig. 1). Two stream catchment areas that contain significant exposures of stratabound Cu-Ag mineralization in the Revett Formation, shown in figure 1, were sampled in detail.

GEOLOGY

The Cabinet Mountains Wilderness is underlain by rocks of the Belt Supergroup of Proterozoic Y age (fig. 2). The Belt Supergroup in the area is at least 8,200 m thick and consist primarily of argillites, siltites, and quartzites which have been metamorphosed to the greenschist facies (Lindsey and others, 1978). The St. Regis and Revett Formations are exposed in both stream catchment areas studied; Burke Formation is exposed only in the Rock Creek catchment area. The Revett Formation contains the stratabound Cu-Ag minerals. The Revett Formation consists of three quartzite units separated by two argillite and siltite layers. The thickness of the Revett in the study area is approximately 550 m (Russell Smith, oral commun., 1980).

Stratabound Cu-Ag Occurrence

Anomalous concentrations of copper (100 ppm or greater) have been reported in all the formations of the Belt Supergroup except the Prichard Formation, Pilcher and Bonner Quartzites and their equivalents (Harrison, 1972, p. 1232). The Revett Formation contains the only presently economic stratabound Cu-Ag deposit in the Belt basin. The deposit is located at Spar Lake, Montana, approximately 3 km west of the Cabinet Mountains Wilderness The mineralized zone in the Revett Formation in the study area is not the same stratigraphic zone as the mineralization at the Spar Lake deposit (John Balla, personal commun., 1981).

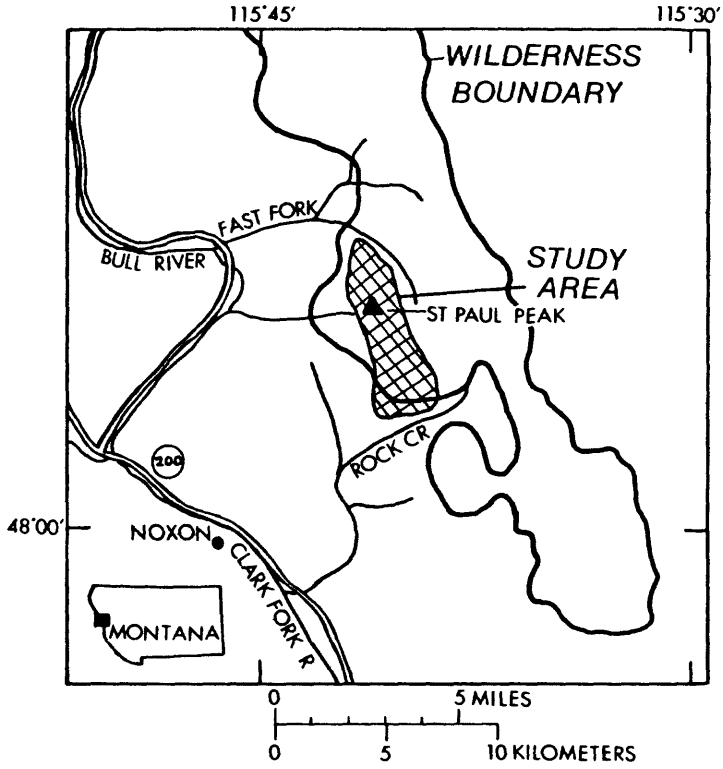

Figure 1. Location of study area

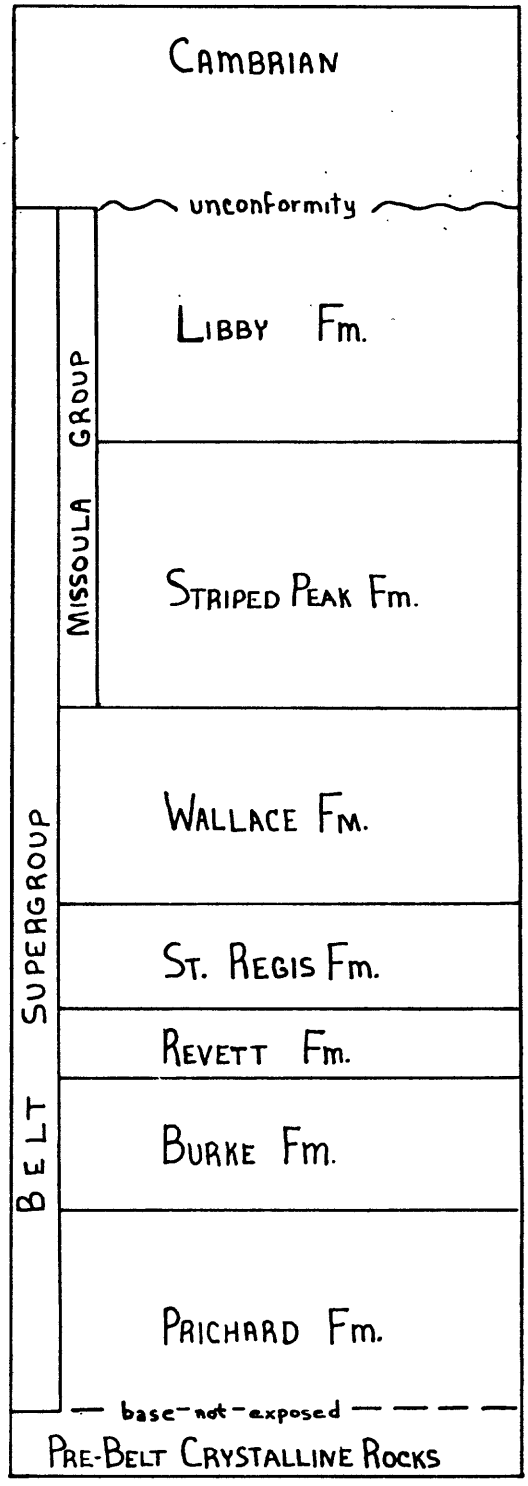

Figure 2. Generalized statigraphic column for the Cabinet Mountains Wilderness

The stratabound Cu-Ag deposit in the study area occurs in the upper part of the lower quartzite unit of the Revett Formation. The approximate location of the mineralized zone is shown in plate 1. This zone also contains anomalous Pb concentrations. The most abundant sulfides in the mineralized zone are, in decreasing abundance, bornite, chalcopyrite, and galena. The mineralogy of the silver has not been reported. The sulfides are disseminated through the quartzite or may occur along bedding planes or veinlets. The grain size of the sulfides range from 10 to 100 μm with the bulk of the grains at about 30 μm (Jack Harrison, oral commun., 1981).

SAMPLE COLLECTION AND PREPARATION

Sample Collection

Samples of composited stream-sediments and panned heavy-mineral concentrates were collected at 69 sites in the two stream catchment areas that drain the stratabound Cu-Ag deposit. The sites were located approximately 200-400 m apart. Each sample of stream sediment was a composite of five grab samples taken at 2 m intervals. Panned heavy-mineral concentrates were obtained from composited samples of stream sediment at each site using a standard gold pan.

Sample Preparation

The samples of stream sediment were air-dried and splits were sieved to minus-80-mesh (<180 μm). Splits of 21 samples were sieved to four particle-size ranges to provide information on the distribution of metal concentrations over several ranges of particle size.

The samples of panned heavy-minerals were air-dried, and the highly magnetic material removed by a magnet. Remaining light-weight material remaining was then separated by allowing the heavier fraction to settle

through bromoform (specific gravity 2.82). The resulting heavy-mineral fraction was then separated into a magnetic and nonmagnetic fraction using a Frantz Isodynamic Separator at a setting of 0.6 ampere, with 15° side and 15° forward settings.

ANALYTICAL PROCEDURES

Semiquantitative spectrographic analysis

The samples of stream sediment and nonmagnetic heavy-mineral concentrate were analyzed semiquantitatively for 31 elements using an optical emission spectrograph, according to the method outlined by Grimes and Marranzino (1968). The semiquantitative spectrographic values are reported as the approximate geometric midpoints: 1.0, 0.7, 0.5, 0.3, 0.2, 0.15 (or appropriate powers of ten) of ranges whose respective boundaries are: 1.2, 0.83, 0.56, 0.38, 0.22, 0.18, 0.12 or appropriate multiples).

The precision of the results of the semiquantitative spectrographic analyses varies from rock type to rock type and from element to element within the various sample media. In general, the precision of the method is plus or minus one reporting value of the actual value given approximately 83 percent of the time, or within two reporting intervals 96 percent of the time (Motooka and Grimes, 1976).

It has been the experience of the laboratory that analyses performed by one analyst over a relatively short period of time exhibit a degree of precision which is greater than that quoted. Reference samples were used to insure the quality of the analyses, and a general estimate of accuracy of the reported values may be obtained from Harrison and Grimes (1970).

The lower limits of determination for the 31 elements determined in stream sediments, and heavy-mineral concentrates are given in table 1.

Table 1.--Lower limits of detection for semiquantitative spectrographic analyses

Element	Percent	ppm	Element	Percent	ppm
Calcium	0.05	--	Magnesium	0.02	--
Iron	0.05	--	Titanium	0.002	--
Antimony	--	100	Molybdenum	--	5
Arsenic	--	200	Nickel	--	5
Barium	--	20	Niobium	--	20
Beryllium	--	1	Scandium	--	5
Bismuth	--	10	Silver	--	0.5
Boron	--	10	Strontium	--	100
Cadmium	--	20	Thorium	--	100
Chromium	--	10	Tin	--	10
Cobalt	--	5	Tungsten	--	50
Copper	--	5	Vanadium	--	10
Gold	--	10	Yttrium	--	10
Lanthanum	--	20	Zinc	--	200
Lead	--	10	Zirconium	--	10
Manganese	--	10			

Partial extraction of selected elements from samples of stream-sediments

Eighty-four samples of stream sediments, representing the 21 samples split for the particle-size study, were leached with a 3.6N hydrochloric-acid solution containing 20 percent ascorbic acid and 10 percent potassium iodide. This method, similar to that developed by Viets and others (1979), will dissolve the loosely bound metals associated with clays and surface coatings of Fe-Mn oxides. The leach also dissolves the majority of secondary minerals stable under oxidizing conditions such as sulfates, carbonates, and oxides but will not significantly dissolve most sulfide minerals. The leach solution allows determination of Ag, Cd, Cu, and Zn to the 0.05 ppm level, and Bi, Pb, and Sb to the 1.0 ppm level by atomic absorption spectrometry.

DESCRIPTION OF TABLES 3 AND 4

For tables 3 and 4, the data are arranged so that column 1 contains the assigned field number that is shown on plate 1. An R immediately following the field number indicates the sample is a replicate sample collected 25 m downstream from the sample with the identical preceding digits. An A, B, C, or D following the assigned field number for samples of stream sediments indicates the particle-size range (table 2) of the stream sediment analyzed. Stream-sediments' field numbers without particle-size codes were analyzed using the minus 80 mesh (<180 μm) fraction. Latitude and longitude (in degrees, minutes, and seconds) are given in columns 2 and 3. The remaining columns contain the concentrations of the elements reported. Columns in which the element headings are preceded by an S are emission spectrographic data. Columns in which the element heading are preceded by AA are atomic-absorption data from the partial leach extraction. The suffix P in the element heading

Table 2.--Coding for particle size of stream sediments analyzed

PARTICLE-SIZE CODE	MESH	PARTICLE SIZE µm	DESCRIPTION
A	+ 35	between 500 and 2000	Coarse sand and greater
B	-35+ 80	between 180 and 500	Medium to fine sand
C	-80+230	between 63 and 180	Fine sand to very fine sand
D	-230	less than 63	Silt and Clay

for the four elements analyzed by atomic-absorption spectrometry is a bookkeeping entry that refers to the partial extraction method used. All element concentrations are in parts per million (ppm), except for Fe, Mg, Ca, and Ti, which are given in percent.

If a given element was looked for but not detected in a sample, then the letter "N" is entered in place of an analytical value. The lower limit of detection of each element for which one or more "N" values have been reported is given in Table 1. Leaders (--) placed in the data columns indicates that the analysis were not performed.

ACKNOWLEDGMENTS

We wish to thank the following persons who contributed to this study: John Balla and Russel Smith of ASARCO provided helpful information on the geology of the study area; Jack Harrison gave insight on the geology of the stratabond Cu-Ag occurrences in the Belt rocks; John Viets helpfully discussed the partial extraction techniques for stream sediments; Kenneth Pudlick and Mary Dahl assisted in the field work; John Bush and Chen Wai provided helpful discussion on the geology and chemical analyses; Chris McDougal and Steve McDanal lent computer support. The interest of these persons is gratefully acknowledged.

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Table 3--Data for stream-sediment samples.

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO
0003	48 4 10	115 40 48	1.5	.7	.30	.30	300	N	70	500	1.5	7
0004	48 4 11	115 40 40	1.5	1.5	.30	.20	1,000	N	70	700	2.0	10
0004A	48 4 11	115 40 40	1.5	1.5	.07	.30	1,000	N	70	700	2.0	15
0004B	48 4 11	115 40 40	2.0	1.5	.15	.30	1,500	N	70	700	3.0	15
0004C	48 4 11	115 40 40	2.0	1.5	.30	.30	1,500	N	70	700	2.0	15
0004D	48 4 11	115 40 40	1.5	1.5	.50	.30	1,500	N	70	700	2.0	15
0005	48 4 6	115 40 39	2.0	.7	.30	.30	1,500	N	70	300	2.0	10
0005A	48 4 6	115 40 39	1.5	1.0	.05	.30	500	N	70	700	2.0	10
0005B	48 4 6	115 40 39	2.0	1.0	.15	.30	1,500	N	70	700	3.0	15
0005C	48 4 6	115 40 39	1.5	.7	.20	.30	1,500	N	50	500	2.0	15
0005D	48 4 6	115 40 39	3.0	1.0	.30	.50	1,500	N	70	700	2.0	15
0006	48 4 2	115 40 34	1.5	1.0	.30	.20	500	3.0	70	700	3.0	7
0006A	48 4 2	115 40 34	1.5	.5	.10	.20	700	1.5	70	700	2.0	7
0006B	48 4 2	115 40 34	1.5	.7	.30	.30	700	3.0	70	700	3.0	5
0006C	48 4 2	115 40 34	2.0	1.0	.30	.20	700	3.0	70	700	3.0	10
0006D	48 4 2	115 40 34	2.0	1.5	.50	.30	500	3.0	70	700	2.0	10
0007	48 3 50	115 40 36	2.0	.7	.30	.20	700	2.0	70	500	1.5	10
0007A	48 3 50	115 40 36	1.0	.5	<.05	.15	500	N	70	700	1.5	7
0007B	48 3 50	115 40 36	1.5	.5	.07	.20	700	1.5	70	700	2.0	15
0007C	48 3 50	115 40 36	1.5	.5	.30	.20	700	1.5	100	500	2.0	15
0007D	48 3 50	115 40 36	3.0	1.0	.20	.30	1,000	2.0	70	700	2.0	15
0008	48 3 43	115 40 35	1.5	.7	.15	.15	1,000	2.0	70	500	1.5	7
0008A	48 3 43	115 40 35	1.5	.7	<.05	.30	1,000	N	70	700	2.0	10
0008B	48 3 43	115 40 35	2.0	.5	.10	.20	1,000	.5	70	700	2.0	10
0008C	48 3 43	115 40 35	1.5	.5	.20	.20	700	.5	200	700	1.5	7
0008D	48 3 43	115 40 35	2.0	1.5	.20	.30	1,000	1.5	70	700	1.5	15
0009	48 2 7	115 41 1	2.0	.5	.10	.30	300	N	70	300	1.0	5
0010	48 6 35	115 41 45	2.0	1.0	.15	.20	300	<.5	100	500	1.5	5
0011	48 6 42	115 41 41	1.5	1.0	.20	.20	500	N	100	500	1.5	5
0012	48 6 58	115 41 34	2.0	1.0	.20	.20	300	N	70	500	1.5	7
0013	48 4 3	115 40 55	3.0	.7	.30	.30	1,000	.7	100	500	2.0	10
0014	48 3 55	115 40 47	2.0	.5	.20	.20	1,500	1.0	100	500	2.0	7
0016	48 3 25	115 39 58	2.0	.7	.15	.30	1,000	2.0	70	500	2.0	10
0018	48 3 31	115 39 56	3.0	.7	.15	.30	1,000	N	100	700	1.5	15
0021	48 3 27	115 40 10	3.0	.7	.20	.30	1,500	<.5	100	500	2.0	10
0023	48 3 24	115 40 5	2.0	.5	.10	.20	700	<.5	70	300	1.5	7
0024	48 3 22	115 40 15	2.0	.5	.20	.20	700	1.0	100	500	2.0	7
0026	48 3 28	115 40 30	1.5	.7	.30	.20	1,000	1.5	70	500	2.0	10
0026A	48 3 28	115 40 30	1.5	.5	.05	.20	700	N	70	700	2.0	7
0026B	48 3 28	115 40 30	1.5	.7	.15	.30	1,000	N	70	700	1.5	7
0026C	48 3 28	115 40 30	1.5	.5	.30	.20	1,000	.7	70	500	1.5	7
0026D	48 3 28	115 40 30	1.5	1.5	.20	.30	1,500	1.5	150	500	2.0	10
0028	48 4 4	115 40 41	3.0	.7	.50	.30	2,000	N	100	700	1.5	10
0028A	48 4 4	115 40 41	1.5	.7	.15	.30	2,000	N	70	700	3.0	10
0028B	48 4 4	115 40 41	1.5	.7	.50	.50	5,000	N	70	1,000	3.0	15

Table 3--Data for stream-sediment samples.--continued

Sample	S-CR	S-CU	S-LA	S-MO	S-NI	S-PB	S-SC	S-SN	S-SR	S-V	S-W	S-Y
0003	50	20	30	N	15	70	7	N	150	100	N	30
0004	50	30	50	N	50	70	7	N	<100	70	N	30
0004A	70	7	50	N	50	50	10	N	N	100	N	70
0004B	100	20	50	<5	70	70	15	N	N	100	N	50
0004C	50	20	70	N	30	100	10	N	<100	70	N	50
0004D	50	50	50	N	30	100	10	10	<100	70	N	30
0005	20	20	30	N	15	70	7	N	100	70	N	20
0005A	50	10	50	N	20	50	15	N	N	70	N	50
0005B	30	15	50	N	20	70	15	N	N	70	N	70
0005C	20	20	30	N	20	100	10	N	<100	70	N	30
0005D	50	30	50	<5	20	100	15	N	<100	100	N	30
0006	20	500	50	N	15	200	7	N	100	70	N	30
0006A	30	300	50	N	15	300	7	N	N	70	N	50
0006B	20	1,000	50	N	10	300	10	N	N	70	N	50
0006C	20	1,000	70	N	20	200	7	N	<100	70	N	50
0006D	30	700	50	N	20	200	15	N	100	100	N	30
0007	30	300	30	N	15	200	7	N	<100	70	N	30
0007A	20	100	30	7	10	100	5	N	N	70	N	30
0007B	30	150	30	N	10	300	7	N	N	70	N	50
0007C	20	200	20	N	15	200	7	N	N	70	N	30
0007D	30	500	50	N	15	300	10	15	N	100	N	70
0008	30	150	30	N	15	150	5	N	N	50	N	30
0008A	50	70	30	N	10	150	10	N	N	70	N	30
0008B	30	100	70	N	15	150	7	N	N	70	N	50
0008C	30	100	50	<5	15	100	7	N	N	70	N	30
0008D	30	300	50	N	20	200	10	10	N	70	N	30
0009	15	20	30	N	15	30	N	N	N	30	N	20
0010	20	20	70	N	15	50	7	N	N	50	N	30
0011	15	15	50	N	15	50	7	N	N	50	N	30
0012	15	15	70	N	15	30	7	<10	N	50	N	50
0013	20	50	50	<5	20	700	10	N	100	100	N	30
0014	15	150	30	N	10	500	5	N	N	50	N	50
0016	20	150	70	N	15	1,000	7	N	N	50	N	50
0018	30	100	50	N	15	700	10	N	N	100	N	50
0021	50	70	30	N	15	500	7	15	N	100	N	50
0023	20	70	30	N	10	300	5	N	N	30	N	30
0024	30	100	50	N	10	300	5	N	100	50	N	30
0026	30	150	30	N	10	200	5	15	100	70	N	30
0026A	30	70	20	N	10	100	7	N	N	70	N	30
0026B	30	200	30	N	10	300	7	N	N	70	N	30
0026C	20	200	30	N	10	200	5	15	N	70	N	30
0026D	20	300	30	N	15	300	7	<10	<100	70	N	30
0028	30	70	30	N	15	200	7	N	150	100	N	50
0028A	20	15	30	N	15	100	10	N	N	70	N	30
0028B	15	70	30	N	20	150	15	N	<100	70	N	30

Table 3--Data for stream-sediment samples.--continued

Sample	S-ZN	S-ZR	AA-CU-P	AA-PB-P	AA-ZN-P	AA-AG-P	AA-CD-P	AA-BI-P	AA-SB-P
0003	N	300	--	--	--	--	--	--	--
0004	N	200	--	--	--	--	--	--	--
0004A	N	300	6	25	30	.10	.65	1	8
0004B	N	300	16	53	44	.15	.20	1	2
0004C	N	200	24	69	35	.20	1.5	1	N
0004D	N	200	9	14	19	.05	.40	N	N
0005	N	200	--	--	--	--	--	--	--
0005A	N	300	4	19	12	N	.40	N	N
0005B	N	300	14	66	30	.25	.80	1	1
0005C	N	200	17	75	37	.20	.80	1	1
0005D	N	300	7	20	18	.05	.35	N	N
0006	N	200	--	--	--	--	--	--	--
0006A	N	300	380	160	17	.80	.40	N	2
0006B	N	150	1,800	300	10	.90	.60	N	N
0006C	N	200	970	210	16	.15	.55	N	1
0006D	N	300	660	130	29	1.7	.40	N	N
0007	N	300	--	--	--	--	--	--	--
0007A	N	200	85	97	8	.15	.30	N	N
0007B	N	300	180	180	15	1.1	.50	N	N
0007C	N	200	200	140	19	.80	.55	N	N
0007D	N	500	190	89	22	.70	.40	N	N
0008	N	300	--	--	--	--	--	--	--
0008A	N	300	52	81	11	<.05	.65	N	N
0008B	N	300	110	130	15	.10	1.0	N	N
0008C	N	300	120	110	14	.20	.90	N	N
0008D	N	300	280	150	36	.95	1.2	N	2
0009	N	500	--	--	--	--	--	--	--
0010	N	300	--	--	--	--	--	--	--
0011	N	300	--	--	--	--	--	--	--
0012	N	300	--	--	--	--	--	--	--
0013	N	200	--	--	--	--	--	--	--
0014	N	300	--	--	--	--	--	--	--
0016	N	300	--	--	--	--	--	--	--
0018	N	500	--	--	--	--	--	--	--
0021	N	500	--	--	--	--	--	--	--
0023	N	300	--	--	--	--	--	--	--
0024	N	300	--	--	--	--	--	--	--
0026	N	300	--	--	--	--	--	--	--
0026A	N	200	49	62	11	.05	.60	N	N
0026B	N	200	180	130	24	.35	1.1	N	1
0026C	N	300	270	160	28	.80	1.5	N	1
0026D	N	300	57	32	10	.15	.45	N	N
0028	<200	500	--	--	--	--	--	--	--
0028A	N	500	30	60	110	<.05	1.2	N	N
0028B	<200	500	70	140	210	<.05	.90	1	1

Table 3--Data for stream-sediment samples.--continued

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO
0028C	48 4 4	115 40 41	1.5	.5	.50	.30	5,000	N	70	700	2.0	15
0028D	48 4 4	115 40 41	2.0	1.0	.70	.50	5,000	N	70	1,000	2.0	15
0029	48 3 15	115 40 53	2.0	.7	.30	.30	1,500	15.0	70	500	3.0	10
0029A	48 3 15	115 40 53	1.5	.7	.07	.30	1,000	5.0	70	700	2.0	10
0029B	48 3 15	115 40 53	1.5	.7	.15	.30	3,000	15.0	70	700	3.0	15
0029C	48 3 15	115 40 53	1.5	.7	.20	.30	3,000	15.0	70	700	3.0	15
0029D	48 3 15	115 40 53	1.5	.7	.50	.30	2,000	15.0	70	700	3.0	15
0029R	48 3 15	115 40 53	1.5	.5	.30	.20	2,000	10.0	70	300	3.0	7
0029RA	48 3 15	115 40 53	1.5	.7	.07	.30	1,500	3.0	70	700	2.0	15
0029RB	48 3 15	115 40 53	1.5	.7	.15	.30	3,000	15.0	70	700	3.0	15
0029RC	48 3 15	115 40 53	1.5	.7	.20	.30	2,000	15.0	70	700	3.0	15
0029RD	48 3 15	115 40 53	2.0	.7	.50	.30	1,500	20.0	70	700	3.0	15
0030	48 2 58	115 40 36	1.5	.3	.30	.20	2,000	<.5	70	500	2.0	7
0030A	48 2 58	115 40 36	1.5	.5	.30	.30	3,000	N	70	1,000	2.0	15
0030B	48 2 58	115 40 36	1.0	.2	.50	.20	5,000	<.5	70	1,000	3.0	10
0030C	48 2 58	115 40 36	1.0	.2	.30	.20	3,000	N	70	700	3.0	7
0030D	48 2 58	115 40 36	2.0	1.0	.70	.30	5,000	.5	70	1,500	2.0	15
0033	48 5 39	115 40 37	1.0	.5	.30	.15	1,500	<.5	150	300	3.0	7
0034	48 5 39	115 40 42	2.0	1.0	.30	.20	1,000	<.5	100	500	2.0	7
0035	48 5 47	115 40 41	1.5	.7	.20	.20	700	1.5	100	300	2.0	7
0039	48 5 26	115 40 36	1.0	.7	.30	.15	700	<.5	100	500	3.0	5
0039R	48 5 26	115 40 36	1.5	.7	.30	.15	700	<.5	100	500	2.0	7
0040	48 5 45	115 40 32	1.0	.5	.20	.20	700	.7	150	300	3.0	5
0041	48 6 23	115 40 32	1.0	.7	.20	.15	1,000	1.0	150	500	3.0	7
0042	48 6 35	115 40 33	1.5	.7	.20	.20	500	<.5	100	500	1.5	7
0043	48 6 8	115 41 0	1.0	.5	.30	.15	1,000	.5	100	300	3.0	5
0044	48 6 25	115 41 22	1.0	.5	.30	.20	700	N	70	500	2.0	5
0049	48 6 45	115 41 17	1.5	.3	.50	.15	700	<.5	70	300	2.0	5
0050	48 6 52	115 41 10	2.0	.5	.30	.15	700	.7	100	300	2.0	7
0051	48 2 30	115 40 34	1.5	.5	.15	.15	500	.7	70	300	2.0	7
0051A	48 2 30	115 40 34	1.5	.5	.05	.20	300	N	70	700	1.5	5
0051B	48 2 30	115 40 34	1.5	.7	.07	.30	700	N	70	700	1.5	15
0051C	48 2 30	115 40 34	1.0	.5	.10	.20	500	<.5	70	500	1.5	7
0051D	48 2 30	115 40 34	1.5	1.0	.20	.30	700	.7	100	500	1.5	10
0052	48 2 42	115 40 32	1.5	.3	.10	.15	500	.7	70	300	1.5	7
0052A	48 2 42	115 40 32	1.0	.5	<.05	.30	300	N	70	700	1.5	7
0052B	48 2 42	115 40 32	1.5	.5	.05	.30	500	<.5	70	700	1.5	7
0052C	48 2 42	115 40 32	1.5	.5	.10	.30	700	.5	70	500	1.0	5
0052D	48 2 42	115 40 32	2.0	1.5	.20	.50	1,000	1.5	100	700	1.5	10
0053	48 2 51	115 40 31	2.0	.7	.20	.15	700	1.0	70	500	2.0	7
0053A	48 2 51	115 40 31	1.5	.7	.07	.30	1,000	N	70	1,000	2.0	10
0053B	48 2 51	115 40 31	1.5	1.0	.10	.30	1,500	N	100	1,000	2.0	10
0053C	48 2 51	115 40 31	1.5	.5	.20	.20	1,000	.7	100	700	2.0	7
0053D	48 2 51	115 40 31	1.5	1.5	.50	.30	1,500	1.5	200	700	2.0	15
0054	48 3 5	115 40 27	2.0	.7	.30	.20	700	.7	70	300	2.0	10

Table 3--Data for stream-sediment samples.--continued

Sample	S-CR	S-CU	S-LA	S-MO	S-NI	S-PB	S-SC	S-SN	S-SR	S-V	S-W	S-Y
00280	15	70	30	N	15	150	7	N	<100	70	N	30
00286	15	100	50	N	20	200	10	N	100	100	N	50
0029	30	3,000	70	N	15	700	10	N	150	70	N	50
0029A	20	1,000	50	N	15	500	10	N	N	70	N	70
0029B	20	1,500	70	N	15	700	10	N	N	70	N	50
0029C	20	2,000	70	N	15	1,000	10	N	N	70	N	30
0029D	20	1,500	50	N	20	700	10	N	100	100	N	50
0029R	20	2,000	70	N	7	300	7	N	100	50	N	30
0029RA	20	1,500	70	N	15	500	10	N	N	70	N	50
0029RB	20	3,000	70	N	15	1,500	10	N	N	70	N	70
0029RC	15	3,000	70	N	20	1,000	15	N	N	70	N	70
0029RD	20	2,000	50	N	20	700	10	N	100	100	N	50
0030	20	100	30	N	7	100	7	N	150	30	N	30
0030A	20	150	50	N	10	100	7	N	N	70	N	50
0030B	N	100	30	N	10	100	7	N	N	50	N	30
0030C	N	100	50	N	7	100	5	N	N	30	N	30
0030D	30	150	30	N	20	200	15	N	150	100	N	30
0033	20	100	30	N	10	100	7	N	100	30	N	30
0034	20	70	50	N	10	70	5	N	100	50	N	30
0035	<10	150	30	N	10	70	5	N	<100	50	N	30
0039	20	100	30	N	7	200	7	N	<100	30	N	30
0039R	20	150	30	N	7	200	7	N	N	50	N	30
0040	N	70	30	N	7	150	7	N	N	30	N	30
0041	10	100	70	N	10	100	7	N	N	30	N	30
0042	20	50	50	N	10	50	7	N	N	50	N	30
0043	10	100	30	N	10	70	7	N	100	30	N	20
0044	20	20	20	N	10	70	7	N	100	30	N	30
0049	N	20	50	N	7	70	5	N	100	30	N	30
0050	10	20	50	N	10	30	7	N	100	30	N	30
0051	15	70	30	N	7	100	5	N	N	30	N	30
0051A	30	30	50	N	10	70	7	N	N	70	N	70
0051B	30	70	30	N	15	100	7	N	N	70	N	50
0051C	20	70	50	N	10	70	5	N	N	30	N	30
0051D	10	150	30	N	15	100	7	10	N	70	N	70
0052	15	70	30	N	10	70	5	N	N	30	N	30
0052A	20	30	30	N	10	70	7	N	N	70	N	30
0052B	20	70	30	N	10	70	7	N	N	70	N	50
0052C	20	70	50	N	15	100	5	N	N	50	N	30
0052D	50	300	70	N	30	300	7	15	N	70	N	70
0053	20	150	30	N	10	150	7	N	100	50	N	30
0053A	20	70	50	N	20	100	7	<10	N	70	N	50
0053B	20	150	50	N	20	200	7	N	N	70	N	50
0053C	10	150	70	N	15	100	7	N	N	50	N	30
0053D	30	500	100	N	30	300	10	15	<100	100	N	50
0054	20	150	30	N	20	150	7	N	100	30	N	30

Table 3--Data for stream-sediment samples.--continued

Sample	S-ZN	S-ZR	AA-CU-P	AA-PB-P	AA-ZN-P	AA-AG-P	AA-CD-P	AA-BI-P	AA-SB-P
00286	<200	300	77	160	230	<.05	.55	N	N
00286	300	500	95	150	220	<.05	.75	N	N
0029	N	300	--	--	--	--	--	--	--
0029A	N	300	410	140	14	1.2	.60	N	N
0029B	N	300	2,200	570	30	3.8	1.2	N	N
0029C	N	200	2,300	560	30	8.7	1.3	N	N
0029D	N	300	2,200	480	38	9.9	1.4	1	1
0029R	N	300	--	--	--	--	--	--	--
0029RA	N	300	810	370	29	1.9	1.3	1	N
0029RB	N	300	2,900	860	32	6.7	1.8	1	1
0029RC	N	300	3,900	820	36	10	1.8	1	N
0029RD	N	500	3,800	610	39	14	1.8	1	N
0030	<200	300	--	--	--	--	--	--	--
00304	N	300	71	69	120	.25	2.2	N	N
00308	<200	200	150	170	260	.65	4.2	1	1
0030C	N	300	180	180	250	.80	5.0	1	1
0030D	200	500	160	150	210	.70	4.3	1	1
0033	N	200	--	--	--	--	--	--	--
0034	N	300	--	--	--	--	--	--	--
0035	N	300	--	--	--	--	--	--	--
0039	N	200	--	--	--	--	--	--	--
0039R	N	200	--	--	--	--	--	--	--
0040	N	200	--	--	--	--	--	--	--
0041	N	200	--	--	--	--	--	--	--
0042	N	300	--	--	--	--	--	--	--
0043	N	200	--	--	--	--	--	--	--
0044	N	200	--	--	--	--	--	--	--
0049	N	200	--	--	--	--	--	--	--
0050	N	200	--	--	--	--	--	--	--
0051	N	300	--	--	--	--	--	--	--
0051A	N	300	22	35	9	<.05	.70	N	N
0051B	N	300	33	40	8	.10	.75	N	N
0051C	N	300	68	44	10	.30	.90	N	N
0051D	N	1,000	160	92	26	.70	1.3	N	N
0052	N	300	--	--	--	--	--	--	--
0052A	N	300	22	30	5	<.05	.70	N	N
0052B	N	300	44	49	49	.20	.80	N	N
0052C	N	500	51	40	28	.25	.80	N	N
0052D	N	>1,000	170	91	50	.90	1.2	N	N
0053	N	300	--	--	--	--	--	--	--
0053A	N	500	34	47	12	<.05	.40	N	N
0053B	N	500	105	80	20	.30	.80	1	1
0053C	N	300	220	120	28	.85	1.5	N	N
0053D	N	700	130	55	21	.60	.75	N	N
0054	N	300	--	--	--	--	--	--	--

Table 3--Data for stream-sediment samples.--continued

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO
0054A	48 3 5	115 40 27	1.5	1.0	.10	.30	1,500	N	70	1,000	2.0	15
0054B	48 3 5	115 40 27	2.0	1.5	.15	.30	1,500	<.5	100	1,000	3.0	15
0054C	48 3 5	115 40 27	1.5	1.5	.50	.30	1,500	.7	100	1,000	2.0	15
0054D	48 3 5	115 40 27	1.5	1.5	.50	.30	1,500	1.0	200	700	3.0	10
0055	48 3 17	115 40 29	2.0	.7	.10	.15	700	<.5	70	300	2.0	7
0055A	48 3 17	115 40 29	1.5	.7	.05	.30	1,000	N	70	700	2.0	7
0055B	48 3 17	115 40 29	1.5	.7	.10	.30	1,000	N	150	1,000	3.0	7
0055C	48 3 17	115 40 29	1.5	.7	.20	.20	1,000	N	100	1,000	1.5	5
0055D	48 3 17	115 40 29	2.0	1.5	.30	.30	1,000	.7	200	700	2.0	10
0056	48 6 29	115 41 16	2.0	.3	.10	.20	500	N	70	300	2.0	7
0057	48 6 24	115 41 4	2.0	.3	.15	.20	300	.5	100	300	1.5	7
0057A	48 6 24	115 41 4	2.0	1.5	.10	.30	700	N	100	1,000	2.0	10
0057B	48 6 24	115 41 4	2.0	1.0	.20	.30	700	N	100	700	2.0	15
0057C	48 6 24	115 41 4	1.5	.7	.20	.20	700	N	70	700	2.0	10
0057D	48 6 24	115 41 4	1.5	1.5	.20	.50	700	.5	100	700	1.0	10
0058	48 6 29	115 40 56	2.0	.3	.20	.20	300	.5	100	300	1.5	7
0058A	48 6 29	115 40 56	2.0	1.5	.10	.30	1,000	N	100	1,000	2.0	10
0058B	48 6 29	115 40 56	1.5	1.0	.15	.30	700	N	100	700	2.0	10
0058C	48 6 29	115 40 56	1.5	.7	.20	.20	700	N	100	700	2.0	7
0058D	48 6 29	115 40 56	1.5	1.0	.20	.30	700	.5	150	700	2.0	10
0059	48 6 37	115 41 11	1.5	.5	.15	.20	700	N	70	500	2.0	7
0060	48 6 49	115 41 3	3.0	1.0	.70	.30	500	N	100	300	1.5	7
0061	48 4 2	115 40 52	2.0	.7	.30	.30	1,000	N	70	300	2.0	10
0062	48 3 56	115 40 43	2.0	.7	.30	.20	700	1.0	100	500	3.0	7
0062R	48 3 56	115 40 43	2.0	.7	.30	.20	500	1.0	100	300	2.0	7
0063	48 3 16	115 39 50	1.5	.5	.15	.20	1,500	1.5	70	500	3.0	7
0065	48 3 11	115 40 5	1.5	.5	.30	.20	2,000	<.5	70	500	1.5	5
0066	48 3 5	115 40 20	2.0	.5	.30	.30	1,000	N	70	500	2.0	7
0067	48 3 0	115 40 28	1.5	.7	.20	.15	1,000	1.5	70	300	2.0	7
0067A	48 3 0	115 40 28	1.5	.7	.05	.30	700	N	100	700	1.5	7
0067B	48 3 0	115 40 28	2.0	1.0	.07	.30	1,000	N	70	1,000	3.0	10
0067C	48 3 0	115 40 28	1.5	1.0	.20	.30	1,000	.7	150	500	2.0	15
0067D	48 3 0	115 40 28	2.0	1.5	.30	.50	1,500	2.0	150	700	3.0	15
0069	48 3 37	115 40 0	3.0	.7	.15	.30	700	.5	70	700	2.0	10
0070	48 3 30	115 40 12	2.0	.5	.15	.20	700	1.5	100	500	2.0	7
0071	48 3 28	115 40 16	2.0	.5	.15	.20	500	.5	70	300	2.0	7
0073	48 5 51	115 40 59	2.0	1.0	.30	.30	300	N	100	500	2.0	7
0074	48 5 28	115 40 45	1.0	.5	.15	.15	300	N	70	300	1.5	5
0075	48 5 51	115 40 48	1.5	.7	.20	.20	500	1.0	100	300	3.0	7
0076	48 6 4	115 40 29	1.0	.5	.20	.15	700	.7	150	300	2.0	7
0077	48 6 14	115 40 26	1.5	.7	.15	.15	500	.5	100	300	2.0	7
0082	48 6 22	115 41 48	1.5	1.5	.15	.15	500	N	100	500	2.0	7
0083	48 6 12	115 41 47	2.0	1.0	.20	.15	500	N	100	500	2.0	7
0087	48 6 1	115 41 41	3.0	1.0	.50	.20	1,500	N	100	300	2.0	10
0095	48 2 50	115 41 6	2.0	.5	.30	.15	700	.7	70	700	2.0	5

Table 3--Data for stream-sediment samples.--continued

Sample	S-CR	S-CU	S-LA	S-MO	S-NI	S-PB	S-SC	S-SN	S-SR	S-V	S-W	S-Y
0054A	70	100	50	N	20	200	15	N	N	70	N	50
0054B	200	200	70	N	50	300	15	N	N	100	N	70
0054C	100	200	70	<5	70	300	15	N	<100	70	N	70
0054D	70	300	70	N	50	300	15	N	100	70	N	50
0055	20	100	30	N	15	150	7	N	N	50	N	50
0055A	20	70	50	N	20	200	10	<10	N	70	N	50
0055B	20	150	50	N	20	200	10	10	N	70	N	50
0055C	20	100	50	N	15	200	7	30	N	50	N	30
0055D	30	200	50	N	30	300	7	50	N	70	N	70
0056	10	20	50	N	15	70	7	N	N	30	N	30
0057	15	30	50	N	10	50	7	N	N	50	N	50
0057A	30	10	70	N	15	70	15	N	N	100	N	50
0057B	30	30	100	N	20	70	15	N	N	100	N	70
0057C	10	20	70	N	7	30	7	N	N	50	N	30
0057D	30	70	70	5	20	70	10	N	N	150	<50	50
0058	15	50	50	N	10	50	7	N	<100	50	N	30
0058A	30	7	70	<5	15	70	10	N	N	100	N	50
0058B	15	20	70	N	15	50	15	N	N	70	N	70
0058C	10	50	70	N	10	50	7	N	N	70	N	50
0058D	20	100	50	N	20	70	10	N	N	70	N	30
0059	15	20	70	N	10	50	7	N	N	30	N	30
0060	15	20	70	N	15	30	7	N	<100	70	N	30
0061	20	50	30	N	20	150	10	N	150	70	N	30
0062	20	200	50	N	15	200	10	N	150	50	N	30
0062R	15	200	30	N	15	150	7	N	100	50	N	30
0063	20	300	70	N	15	500	7	N	100	30	N	30
0065	10	50	30	N	15	100	7	N	150	50	N	30
0066	15	70	30	N	15	150	7	N	150	70	N	30
0067	15	150	50	N	15	200	7	N	<100	50	N	30
0067A	30	70	30	N	15	100	10	N	N	70	<50	70
0067B	50	150	50	N	15	200	7	N	N	70	N	50
0067C	50	200	50	N	20	300	5	N	N	70	N	30
0067D	30	500	70	N	30	300	15	<10	<100	100	N	50
0069	20	70	70	N	20	150	7	N	N	50	N	50
0070	15	200	50	N	20	700	5	N	N	50	N	30
0071	15	100	30	N	15	300	5	N	N	30	N	30
0073	15	20	70	N	20	70	7	N	100	70	N	50
0074	15	10	30	N	10	70	5	N	N	30	N	30
0075	15	70	70	N	15	100	7	N	100	30	N	50
0076	15	70	50	N	10	70	7	N	N	30	N	30
0077	15	50	50	N	15	50	7	N	N	50	N	30
0082	20	15	70	N	15	50	10	N	N	50	N	30
0083	15	15	70	N	15	30	7	N	100	50	N	50
0087	15	30	30	N	15	150	7	N	N	30	N	30
0095	15	50	50	N	10	70	7	N	100	30	N	30

Table 3--Data for stream-sediment samples.--continued

Sample	S-ZN	S-ZR	AA-CU-P	AA-PB-P	AA-ZN-P	AA-AG-P	AA-CD-P	AA-BI-P	AA-SB-P
0054A	N	500	54	68	15	<.05	.60	N	N
0054B	N	300	180	140	30	.30	1.1	N	N
0054C	N	300	290	170	33	.70	1.6	N	1
0054D	N	500	62	29	12	.15	.50	N	N
0055	N	300	--	--	--	--	--	--	--
0055A	N	300	71	79	15	<.05	.65	N	N
0055B	N	300	220	150	32	.35	1.3	N	1
0055C	N	300	290	170	34	.70	1.6	N	1
0055D	N	1,000	150	64	22	.40	.80	N	3
0056	N	300	--	--	--	--	--	--	--
0057	N	300	--	--	--	--	--	--	--
0057A	N	300	--	--	--	--	--	--	--
0057B	N	300	--	--	--	--	--	--	--
0057C	N	300	--	--	--	--	--	--	--
0057D	N	500	--	--	--	--	--	--	--
0058	N	200	--	--	--	--	--	--	--
0058A	N	300	11	13	5	<.05	.60	N	N
0058B	N	300	28	16	6	.25	.70	N	N
0058C	N	300	43	19	7	.25	.75	N	N
0058D	N	500	59	24	11	.35	.80	N	N
0059	N	300	--	--	--	--	--	--	--
0060	N	300	--	--	--	--	--	--	--
0061	N	200	--	--	--	--	--	--	--
0062	N	200	--	--	--	--	--	--	--
0062R	N	200	--	--	--	--	--	--	--
0063	N	300	--	--	--	--	--	--	--
0065	N	200	--	--	--	--	--	--	--
0066	N	300	--	--	--	--	--	--	--
0067	N	300	--	--	--	--	--	--	--
0067A	N	500	38	52	12	<.05	.40	N	N
0067B	N	500	82	75	17	.15	.55	N	N
0067C	N	500	170	110	22	.55	.80	N	N
0067D	N	500	87	33	15	.35	.40	N	N
0069	N	500	--	--	--	--	--	--	--
0070	N	300	--	--	--	--	--	--	--
0071	N	300	--	--	--	--	--	--	--
0073	N	300	--	--	--	--	--	--	--
0074	N	300	--	--	--	--	--	--	--
0075	N	300	--	--	--	--	--	--	--
0076	N	200	--	--	--	--	--	--	--
0077	N	300	--	--	--	--	--	--	--
0082	N	200	--	--	--	--	--	--	--
0083	N	200	--	--	--	--	--	--	--
0087	<200	200	--	--	--	--	--	--	--
0095	N	200	--	--	--	--	--	--	--

Table 3--Data for stream-sediment samples.--continued

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO
0095P	48 2 50	115 41 6	2.0	.5	.30	.15	700	.5	70	300	1.5	5
0097	48 2 40	115 40 54	2.0	.5	.70	.20	1,500	<.5	70	500	2.0	7
0099	48 2 33	115 40 46	2.0	.5	.20	.20	500	1.5	70	500	2.0	7
0100	48 6 34	115 40 48	2.0	.3	.20	.20	1,000	<.5	100	300	2.0	7
0100A	48 6 34	115 40 48	3.0	1.0	.20	.50	1,500	N	150	1,000	3.0	10
0100B	48 6 34	115 40 48	2.0	1.0	.30	.50	1,500	N	100	700	3.0	10
0100C	48 6 34	115 40 48	2.0	1.0	.30	.50	1,500	N	150	700	2.0	10
0100D	48 6 34	115 40 48	1.5	.7	.20	.30	1,500	N	100	700	3.0	7
0100P	48 6 34	115 40 48	2.0	.5	.20	.30	1,000	.5	70	300	2.0	7
0100RA	48 6 34	115 40 48	2.0	1.0	.20	.50	1,500	N	150	700	3.0	10
0100RB	48 6 34	115 40 48	2.0	1.0	.30	.50	1,500	N	100	700	3.0	10
0100RC	48 6 34	115 40 48	2.0	1.0	.30	.50	1,500	N	100	700	3.0	10
0100RD	48 6 34	115 40 48	3.0	1.0	.30	.50	1,500	N	100	700	2.0	10
0102	48 6 39	115 40 45	3.0	.7	.30	.15	700	<.5	100	300	1.5	7
0102A	48 6 39	115 40 45	1.5	1.0	.15	.30	1,000	N	100	700	2.0	15
0102B	48 6 39	115 40 45	2.0	1.0	.20	.30	1,000	N	100	700	3.0	15
0102C	48 6 39	115 40 45	2.0	.7	.30	.30	700	N	100	500	1.5	10
0102D	48 6 39	115 40 45	2.0	1.5	.20	.30	700	N	150	700	2.0	10

Table 3--Data for stream-sediment samples.--continued

Sample	S-CR	S-CU	S-LA	S-MO	S-NI	S-PB	S-SC	S-SN	S-SR	S-V	S-W	S-Y
0095B	10	30	30	N	7	70	5	N	N	30	N	30
0097	20	70	30	N	15	70	7	N	150	50	N	30
0099	15	300	50	N	15	50	5	N	100	30	N	30
0100	15	20	30	N	7	50	7	N	100	50	N	30
0100A	20	30	70	N	20	70	15	N	N	100	N	50
0100B	15	50	50	N	15	70	10	N	N	100	N	30
0100C	15	50	30	N	15	70	10	N	N	100	N	30
0100D	10	20	50	N	10	50	10	N	N	70	N	30
0100P	15	20	30	N	10	50	7	N	100	70	N	30
0100RA	10	30	70	N	20	70	15	N	N	100	N	50
0100RB	10	30	70	5	15	70	10	N	N	100	<50	50
0100RC	15	50	70	7	20	70	15	N	N	150	<50	50
0100RD	15	50	50	N	15	70	10	N	<100	100	N	50
0102	<10	70	50	N	7	30	5	N	N	30	N	30
0102A	15	15	50	5	20	50	7	N	N	70	<50	30
0102B	15	50	70	N	15	70	7	N	N	70	N	30
0102C	15	30	70	N	15	30	7	N	N	70	N	30
0102D	15	70	70	N	20	70	10	N	N	100	N	50

Table 3--Data for stream-sediment samples.--continued

Sample	S-ZN	S-ZR	AA-CU-P	AA-PB-P	AA-ZN-P	AA-AG-P	AA-CD-P	AA-BI-P	AA-SB-P
0095F	N	200	--	--	--	--	--	--	--
0097	N	200	--	--	--	--	--	--	--
0099	N	300	--	--	--	--	--	--	--
0100	N	300	--	--	--	--	--	--	--
0100A	N	300	15	24	27	.15	1.0	N	N
0100B	N	300	24	32	36	.25	1.1	N	N
0100C	N	300	24	30	31	.25	1.1	N	N
0100D	N	300	12	11	15	.15	.85	N	N
0100E	N	300	--	--	--	--	--	--	--
0100EA	N	300	17	25	30	.15	1.1	N	N
0100EB	N	300	24	37	45	.20	1.3	N	N
0100EC	N	300	23	32	36	.25	1.2	N	N
0100ED	N	300	25	26	34	.30	1.1	N	N
0102	N	300	--	--	--	--	--	--	--
0102A	N	200	14	13	6	<.05	.70	N	N
0102B	N	200	34	17	10	.10	.80	N	N
0102C	N	200	30	12	9	.10	.80	N	N
0102D	N	300	56	18	16	.45	.85	N	N

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AU	S-B
0002	48 4 14	115 40 59	2.0	.7	.30	>2.0	300	N	N	200
0003	48 4 10	115 40 48	2.0	.7	.15	>2.0	500	N	N	150
0004	48 4 11	115 40 40	3.0	.7	2.00	2.0	700	N	N	500
0006	48 4 2	115 40 34	3.0	.7	.70	2.0	700	N	N	300
0007	48 3 0	115 40 28	1.5	.7	.50	>2.0	1,000	N	N	300
0008	48 3 43	115 40 35	3.0	1.5	.20	1.5	700	<1	N	300
0009	48 2 7	115 41 1	3.0	1.0	.50	>2.0	1,000	N	N	500
0010	48 6 35	115 41 45	3.0	1.5	2.00	2.0	700	N	N	300
0011	48 6 42	115 41 41	3.0	1.5	2.00	2.0	700	N	N	300
0012	48 6 58	115 41 34	2.0	1.0	5.00	>2.0	700	N	N	300
0013	48 4 3	115 40 55	3.0	1.0	2.00	>2.0	1,000	N	N	300
0014	48 3 55	115 40 47	3.0	1.0	.20	2.0	1,000	N	N	500
0016	48 3 25	115 39 58	3.0	1.0	.50	>2.0	2,000	N	N	300
0018	48 3 31	115 39 56	2.0	.5	.20	>2.0	700	N	N	300
0021	48 3 27	115 40 10	3.0	1.0	.30	>2.0	2,000	N	N	300
0023	48 3 24	115 40 5	3.0	.5	.30	>2.0	1,500	N	N	500
0026	48 3 58	115 40 51	3.0	1.0	.30	>2.0	1,000	N	N	700
0028	48 4 4	115 40 41	3.0	.7	<.10	>2.0	2,000	N	N	300
0029	48 3 15	115 40 53	2.0	.5	.50	>2.0	2,000	N	N	300
0030	48 2 53	115 40 36	2.0	2.0	1.00	>2.0	1,500	N	N	300
0033	48 5 39	115 40 37	5.0	1.0	.50	1.0	700	N	N	700
0035	48 5 47	115 40 41	2.0	1.0	.70	>2.0	700	15	N	500
0039	48 5 26	115 40 36	2.0	.7	1.00	1.5	700	N	N	500
0040	48 5 45	115 40 32	2.0	.7	.70	2.0	700	N	N	700
0041	48 6 23	115 40 32	2.0	.5	.70	1.5	700	N	N	300
0042	48 6 35	115 40 32	1.5	1.5	3.00	>2.0	700	N	N	300
0043	48 6 8	115 41 0	2.0	1.0	.30	>2.0	700	N	N	500
0046	48 6 29	115 41 27	1.5	.5	.10	.7	700	N	N	200
0049	48 6 45	115 41 17	2.0	.7	3.00	>2.0	700	N	N	200
0052	48 2 42	115 40 32	3.0	.7	.10	>2.0	700	N	N	500
0053	48 2 51	115 40 31	5.0	1.0	.15	1.5	1,000	N	N	300
0054	48 3 5	115 40 27	3.0	1.0	.20	>2.0	700	N	N	700
0055	48 3 17	115 40 29	2.0	1.0	.10	>2.0	1,000	N	N	300
0056	48 6 29	115 41 16	2.0	1.0	1.00	2.0	1,500	N	N	300
0057	48 6 24	115 41 4	3.0	.7	2.00	1.0	1,000	N	N	300
0058	48 6 29	115 40 56	3.0	.7	5.00	2.0	700	N	N	200
0059	48 6 37	115 41 11	3.0	1.0	2.00	2.0	700	7	N	200
0060	48 6 49	115 41 3	2.0	1.5	7.00	>2.0	700	N	N	100
0061	48 4 2	115 40 52	5.0	1.0	.50	1.0	700	N	N	200
0062	48 3 56	115 40 43	2.0	.7	.20	2.0	700	N	N	500
0063	48 3 16	115 39 50	2.0	.5	.70	>2.0	1,000	N	N	300
0065	48 3 11	115 40 5	1.5	.5	.30	>2.0	1,000	N	N	200
0066	48 3 5	115 40 20	1.5	.5	.70	>2.0	700	N	N	200
0069	48 3 37	115 40 0	1.5	.7	.15	>2.0	500	N	N	500
0070	48 3 30	115 40 12	2.0	1.0	.15	>2.0	1,500	N	N	700

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.

Sample	S-BA	S-BE	S-BI	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI
0002	700	5	N	10	150	10	200	N	50	N
0003	1,500	5	N	10	100	15	200	N	50	20
0004	1,500	5	500	70	100	50	1,000	N	70	30
0006	700	3	N	50	150	150	700	N	50	N
0007	700	5	N	30	100	150	700	N	70	N
0008	1,500	5	N	15	50	100	300	N	<50	N
0009	1,000	5	<20	15	150	100	300	N	100	20
0010	1,000	5	100	10	50	50	1,000	N	50	20
0011	700	5	1,000	10	50	20	700	N	70	20
0012	500	2	100	10	70	100	1,000	N	70	15
0013	1,000	5	N	20	50	70	700	N	N	20
0014	1,000	7	N	10	50	70	150	N	<50	N
0016	1,000	5	N	20	100	100	500	N	50	N
0018	1,000	5	N	10	100	30	500	N	<50	N
0021	700	3	N	100	150	100	700	N	70	15
0023	1,000	5	N	50	100	150	500	N	<50	N
0025	1,500	5	N	30	200	150	700	N	70	N
0028	1,000	5	N	N	200	70	200	N	<50	N
0029	700	7	N	N	150	500	300	N	N	N
0030	1,000	5	N	<10	100	100	150	N	<50	N
0033	1,000	3	N	N	70	20	1,500	N	N	30
0035	1,000	5	N	10	150	150	700	N	50	N
0039	1,000	3	N	<10	150	70	2,000	N	50	10
0040	1,000	5	N	10	100	30	1,500	N	<50	N
0041	1,000	3	N	N	100	30	1,500	N	<50	N
0042	700	2	50	10	100	150	1,000	N	50	N
0043	1,500	5	N	10	150	100	500	N	50	N
0046	700	5	<20	N	20	20	100	N	N	N
0049	500	2	N	70	50	20	1,000	N	100	10
0052	1,000	5	N	<10	200	150	300	N	50	N
0053	1,000	7	N	<10	100	200	150	20	<50	N
0054	1,500	7	N	10	200	150	500	N	50	N
0055	1,000	5	N	15	500	150	200	N	50	N
0056	1,000	5	N	<10	100	100	500	N	70	N
0057	700	3	N	N	70	15	700	N	50	N
0058	700	3	N	N	100	15	700	N	70	N
0059	1,000	5	N	10	100	20	700	N	50	N
0060	300	N	100	10	70	15	700	20	100	N
0061	1,500	5	N	15	70	50	200	N	70	20
0062	1,000	5	N	10	70	100	200	N	50	N
0063	1,500	5	N	10	100	150	500	150	50	N
0065	700	5	N	N	70	30	300	N	<50	N
0066	700	7	N	15	50	100	500	N	N	N
0069	1,000	5	N	10	70	100	300	N	50	N
0070	1,000	3	N	15	100	150	300	N	50	N

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.

Sample	S-PB	S-SC	S-SN	S-SR	S-V	S-Y	S-ZN	S-ZR	S-TH
0002	100	15	N	N	150	500	N	>2,000	N
0003	100	10	N	N	200	200	N	>2,000	N
0004	200	10	N	200	150	700	N	>2,000	N
0006	300	10	N	N	200	500	N	>2,000	N
0007	700	10	N	N	200	1,500	N	>2,000	N
0008	200	10	N	N	200	500	N	>2,000	N
0009	500	10	<20	N	200	700	N	>2,000	N
0010	100	10	20	200	150	500	N	>2,000	<200
0011	200	10	<20	N	150	700	N	>2,000	<200
0012	100	10	20	N	200	2,000	N	>2,000	N
0013	1,500	10	N	N	150	2,000	N	>2,000	N
0014	200	10	N	N	150	500	N	>2,000	N
0016	1,000	10	N	N	200	1,000	N	>2,000	N
0018	700	10	N	N	200	1,500	N	>2,000	N
0021	700	10	N	N	200	1,000	N	>2,000	<200
0023	500	10	<20	N	150	1,000	N	>2,000	N
0025	700	10	<20	N	150	700	N	>2,000	N
0028	500	10	N	N	200	500	N	>2,000	<200
0029	1,500	10	<20	N	200	1,000	N	>2,000	N
0030	700	10	<20	N	150	500	N	>2,000	N
0033	70	10	N	N	150	3,000	N	>2,000	N
0035	150	10	N	N	200	700	N	>2,000	N
0039	150	20	N	N	100	2,000	N	>2,000	N
0040	100	20	N	N	100	700	N	>2,000	N
0041	100	15	N	N	70	1,500	N	>2,000	<200
0042	100	20	<20	<200	150	500	N	>2,000	N
0043	150	20	500	N	150	500	N	>2,000	N
0046	70	10	N	N	50	150	1,500	>2,000	N
0049	200	20	<20	N	200	2,000	N	>2,000	<200
0052	300	15	<20	N	150	1,500	N	>2,000	<200
0053	300	10	N	N	150	500	N	>2,000	<200
0054	150	15	N	N	200	1,000	N	>2,000	200
0055	200	15	N	N	200	500	N	>2,000	<200
0056	200	15	N	N	100	1,500	N	>2,000	N
0057	150	15	N	300	70	500	N	>2,000	<200
0058	150	15	N	300	200	700	N	>2,000	N
0059	200	15	N	200	200	700	N	>2,000	N
0060	50	15	N	300	500	200	N	1,000	N
0061	150	15	N	N	150	500	N	>2,000	N
0062	200	15	N	N	150	500	N	>2,000	<200
0063	2,000	15	N	N	200	1,000	N	>2,000	N
0065	200	15	N	N	200	1,000	N	>2,000	N
0066	1,500	15	<20	N	200	1,500	N	>2,000	N
0069	100	15	N	N	150	700	N	>2,000	N
0070	700	15	N	N	200	1,000	N	>2,000	N

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.--continued

Sample	LATITUDE	LONGITUD	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AU	S-B
0071	48 3 28	115 40 16	2.0	1.0	.10	1.5	500	N	N	300
0073	48 5 51	115 40 59	2.0	.7	2.00	2.0	500	N	N	300
0074	48 5 28	115 40 45	2.0	.5	1.00	1.5	500	5	150	500
0075	48 5 51	115 40 48	3.0	1.0	2.00	1.5	1,000	N	N	300
0076	48 6 4	115 40 29	2.0	1.0	1.00	2.0	700	N	N	300
0077	48 6 14	115 40 26	1.5	1.0	2.00	2.0	700	N	N	200
0082	48 6 22	115 41 48	3.0	1.0	2.00	1.0	500	N	N	300
0083	48 6 12	115 41 47	1.5	1.0	5.00	1.0	700	N	N	300
0087	48 6 1	115 41 41	5.0	1.0	5.00	1.0	1,000	N	N	150
0095	48 2 50	115 41 6	15.0	.5	.15	.7	5,000	N	N	100
0099	48 2 33	115 40 46	2.0	.3	.50	>2.0	500	N	N	300
0100	48 6 34	115 40 48	2.0	.5	3.00	2.0	700	N	N	200
0100R	48 6 34	115 40 48	2.0	.5	5.00	>2.0	1,000	N	N	200
0095R	48 2 50	115 41 6	2.0	.3	.15	1.0	500	N	N	150

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.--continued

Sample	S-BA	S-BE	S-BI	S-CO	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI
0071	1,000	5	N	10	50	100	200	N	50	N
0073	700	3	N	N	30	30	1,500	N	<50	N
0074	700	3	N	10	30	20	500	N	N	10
0075	1,000	3	N	10	30	100	700	N	70	20
0076	700	3	N	N	30	50	700	N	50	10
0077	500	2	N	10	50	30	700	N	70	N
0082	700	2	N	15	30	30	1,000	10	30	30
0083	500	2	100	N	20	10	700	N	50	N
0087	1,000	<2	150	15	30	15	1,000	N	50	N
0095	1,500	3	N	70	30	200	150	<10	<50	30
0099	700	5	<20	15	50	200	300	N	<50	N
0100	700	2	N	N	30	20	500	N	70	N
0100R	300	2	N	N	30	20	700	N	50	N
0095R	500	3	N	N	20	20	100	N	<50	N

Table 4--Data for heavy-mineral, non-magnetic concentrate samples.--continued

Sample	S-PB	S-SC	S-SN	S-SR	S-V	S-Y	S-ZN	S-ZR	S-TH
0071	200	15	N	N	150	500	N	>2,000	N
0073	150	15	N	300	100	700	N	>2,000	<200
0074	200	15	N	N	100	2,000	N	>2,000	N
0075	300	15	N	<200	100	1,500	N	>2,000	N
0076	150	15	N	N	150	700	N	>2,000	N
0077	100	15	N	200	150	500	N	>2,000	N
0082	100	15	N	N	100	1,000	N	2,000	<200
0083	70	15	<20	200	100	500	N	>2,000	N
0087	150	15	20	300	100	500	N	2,000	200
0095	150	15	N	N	100	700	700	>2,000	N
0099	150	15	N	N	150	700	N	>2,000	N
0100	300	15	N	200	70	700	N	>2,000	N
0100R	150	15	N	300	100	500	N	>2,000	<200
0095R	50	15	N	N	50	700	N	>2,000	N