UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Owyhee Breaks (OR-003-059) and the Blue Canyon (OR-003-073) Wilderness Study Areas, Malheur County, Oregon

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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 Owyhee Breaks (OR-003-059) and the Blue Canyon (OR-003-073) Wilderness Study Areas, Malheur County, Oregon.

INTRODUCTION

In September 1988, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Owyhee Breaks (OR-003-059) and the Blue Canyon (OR-003-073) Wilderness Study Areas (WSAs), Malheur County, Oregon. In this report the two WSAs are collectively referred to as the study area. The Owyhee Breaks WSA comprises about 20.5 mi^2 (53 km^2) (13,100 acres) and the Blue Canyon WSA covers 19.8 mi^2 (51 km^2) (12,700 acres). The two contiguous areas are located in Malheur County, Oregon, about 30 mi (48 km) northwest of the town of Jordan Valley (fig. 1). The study area can be accessed by gravel and dirt roads from Crowley, which is about 14 mi (22.4 km) to the west, or from Sheaville, located near the Idaho border on U.S. Highway 95, 10 mi (16 km) north of Jordan Valley and about 20 mi (32 km) to the east of the WSAs. Dirt roads and jeep trails are numerous in and around the study areas.

The topographic relief of the study areas is about 2,200 ft (670 m), ranging from about 2,670 ft (814 m) along the Owyhee River to 4,872 ft (1,485 m) at the southeast end of the Owyhee Breaks WSA. The WSAs are located in a semiarid region with sparce vegetation and few trees except along water courses. The geology of the study area is covered by Vander Meulen and others (in press). The WSAs are underlain by a thick sequence of middle Miocene rhyolite flows, ash-flow tuffs and middle Miocene to Pliocene sedimentary rocks and basalt flows. The oldest rocks, rhyolite flows in the southeasten part of the study area, erupted from a precaldera silicic magma chamber beneath Mahogany Mountain, 7 mi (11.2 km) east of the study area (Rytuba and others, 1985; Vander Meulen, 1989). Continued silicic volcanism during the middle Miocene resulted in the eruption of ash-flow and air-fall tuffs and the formation of the Mahogany Mountain and Three Fingers calderas, (Vander Meulen and others, 1989) located to the east and northeast of the WSAs, and a proposed caldera located to the west of the study area. The rhyolite tuffs probably underlie the entire study area at depth.

The region has undergone extensional tectonism (Rytuba, 1989) resulting in basin-and-range topography and a north-plunging lacustrine basin of regional extent that is cut by north and northwest-trending faults. During Miocene and Pliocene time, lacustrine and fluvial volcaniclastic sedimentation within the basin was accompanied by intermittent episodes of basaltic and adesitic volcanism. Rocks that were deposited during this time are exposed in the northern and western parts of the study area. Plateau-forming basalts cap these volcanic and sedimentary rocks and are the youngest rocks in the study area. The west margin of the Mahogany Mountain caldera cuts the central part of the Blue Canyon study area. During the time of lacustrine sedimentation, hydrothermal activity 3 mi (4.8 km) north-northeast of the Blue Canyon WSA at Red Butte altered, silicified, and mineralized sediment on the southeast side

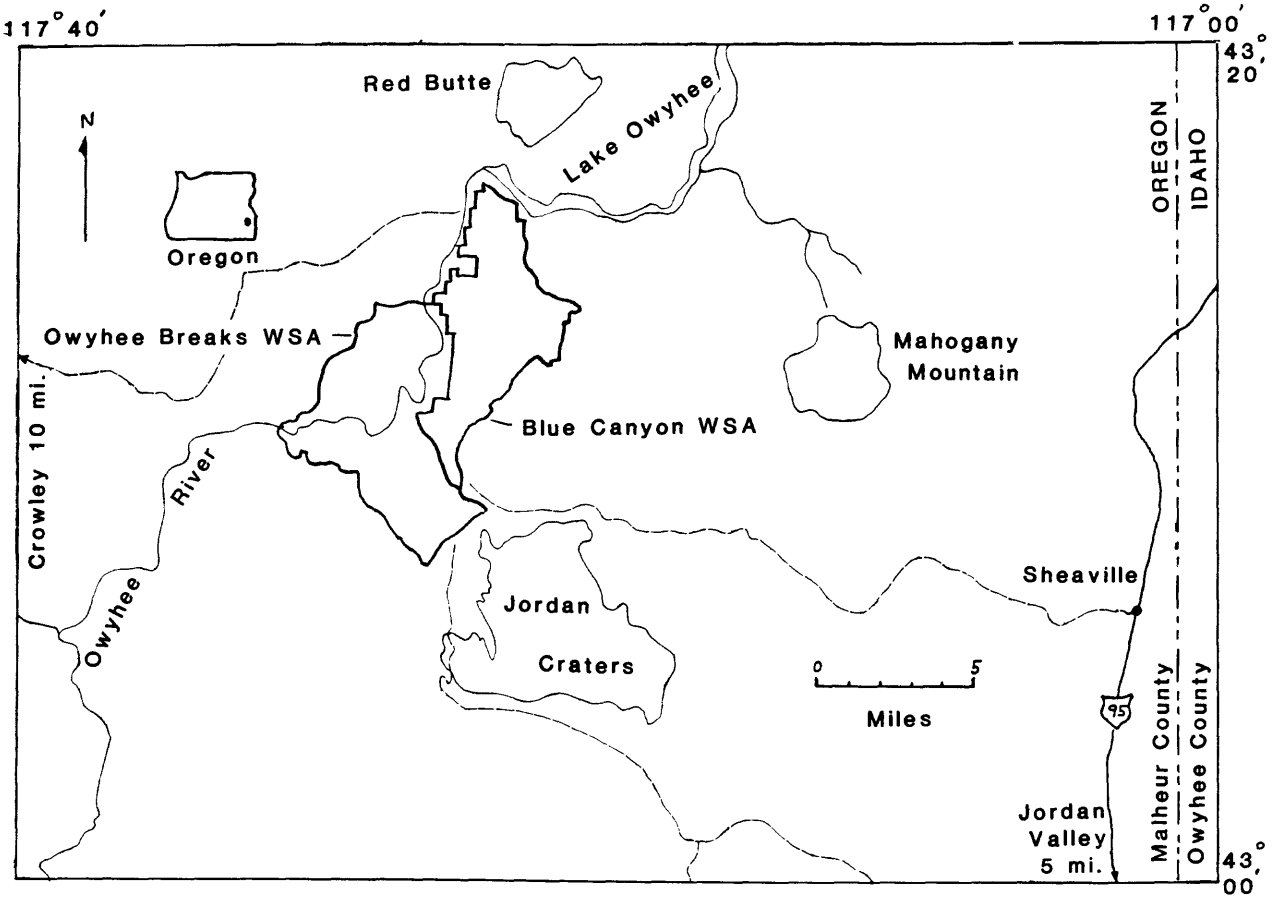

Figure 1. Location map of the Owyhee Breaks (OR-003-059) and the Blue Canyon (OR-003-073) Wilderness Study Areas, Malheur County, Oregon.

of the butte (Evans and Cummings, 1986). Modification of the area by erosion, mass wasting, and deposition during the Quaternary has led to the present-day geology of the area. Hot springs occur along the Owyhee River in the Owyhee Breaks WSA and downstream from the Blue Canyon WSA.

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 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.

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

Stream sediment samples were collected at 47 sites and heavy-mineral-concentrate samples at 46 sites (plate 1). Eighty-two samples were collected at 44 sites. Multiple samples per each site are indicated by a letter suffix in table 6. Sampling density was about one sample site per 1 mi^2 for the stream sediments and heavy-mineral-concentrates. The area of the drainage basins sampled ranged from 0.25 mi^2 to 2 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 plate 1. Some samples were composited from several localities within an area that may extend as much as 20 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 various types of occurrences in the vicinity of the plotted site location. Descriptions of rock samples are in table 6.

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.

Concentrate samples were panned in the laboratory, air dried, and sieved to minus-35 mesh; bromoform (specific gravity 2.85) was used to remove the remaining quartz and feldspar. The resultant heavy-mineral-concentrate sample was separated into three fractions using a large electromagnet by placing the sample in contact with the face of the magnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material (removed at a setting of 0.25 ampere), primarily magnetite, was not analyzed. The second fraction (removed at a setting of 1.75 ampere), largely ferromagnesian silicates and iron oxides, was saved for archival storage. The third fraction (the nonmagnetic 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 0.2 ampere to remove the magnetite and ilmenite, and a current of 0.6 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 35 elements using a semiquantitative, direct-current arc emission spectrographic method. In addition, heavy-mineral-concentrate samples were also scanned for platinum (Pt) and palladium (Pd). The analyses were performed using a modification of the methods of Grimes and Marranzino (1968), and of Myers and others (1961). 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, titanium, sodium, and phosphorus, are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Owyhee Breaks and Blue Canyon Wilderness Study Areas are listed in tables 3, 4, and 5.

Chemical Methods

Other methods of analyses were used on samples from the wilderness study areas. Stream sediments and rocks were analyzed for mercury (Hg) using atomic absorption spectroscopy, for gold (Au) using flameless atomic absorption, and for silver (Ag), arsenic (As), gold (Au), bismuth (Bi), cadmium (Cd), copper (Cu),

molybdenum (Mo), lead (Pb), antimony (Sb), and zinc (Zn), using inductively coupled plasma-atomic emission spectroscopy. Selected stream sediments, heavy-mineral concentrates and rocks were also analyzed for uranium (U), using fluorometry, and/or for fluorine using the ion-selective electrode method. See table 2 for a more detailed summary of these chemical methods.

Analytical results for stream sediment, heavy-mineral concentrate, and rock samples are listed in tables 3, 4, and 5, respectively.

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, 1977).

DESCRIPTION OF DATA TABLES

Tables 3-5 list the results of analyses for the samples of stream sediment, heavy-mineral concentrate, and rock, 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 map (plate 1). Columns in which the element headings show the letter "s" beside the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses; "icp" indicates inductively coupled plasma-atomic emission spectroscopy; "faa" indicates flameless atomic absorption analysis; "f" indicates fluorometric analyses; and "si" refers to the ion-selective electrode method. 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. For emission spectrographic analyses, a "less than" symbol (<) entered in the tables in front of the lower limit of determination indicates that an element was observed but was below the lowest reporting value. For AA and ICP analyses, a "less than" symbol (<) entered in the tables in front of the lower limit of determination indicates that an element was below the lowest reporting value. 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 3-5 in place of an analytical value. Because of the formatting used in the computer program that produced table 5, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Na, 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.

ACKNOWLEDGMENTS

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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	
Calcium (Ca)	0.05	20
Iron (Fe)	0.05	20
Magnesium (Mg)	0.02	10
Sodium (Na)	0.2	5
Phosphorus (P)	0.2	10
Titanium (Ti)	0.002	1
	Parts per million	
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)	10	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Gallium (Ga)	5	500
Germanium (Ge)	10	100
Lanthanum (La)	50	1,000
Manganese (Mn)	10	5,000
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
Thorium (Th)	100	2,000
Vanadium (V)	10	10,000
Tungsten (W)	20	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Palladium (Pd)*	5	1,000
Platinum (Pt)*	20	1,000

*Determined in heavy-mineral-concentrate samples only. Limits are for heavy-mineral-concentrate samples. Reported only if detected.

TABLE 2.--Chemical methods used

[AA = atomic absorption; ICP = inductively coupled plasma-atomic emission spectroscopy; FAA = flameless atomic absorption; F = fluorometry; SI = ion-selective electrode method]

Element or constituent determined	Sample type	Method	Determination limits micrograms/ gram or ppm)	Analyst	Reference
Gold (Au)	rock and stream sediment	FAA	0.002	R. Hill J. Frisken	Meier, 1980.
Mercury (Hg)	"	AA	0.02	P. Hageman T. Floyd	Kennedy and Crock, 1987.
Silver (Ag)	"	ICP	0.05	J. Motooka	Motooka, 1988
Arsenic (As)	"	ICP	1		
Gold (Au)	"	ICP	0.25		
Bismuth (Bi)	"	ICP	1		
Cadmium (Cd)	"	ICP	0.05		
Copper (Cu)	"	ICP	0.05		
Molybdemum (Mo)	"	ICP	0.10		
Lead (Pb)	"	ICP	1		
Antimony (Sb)	"	ICP	1		
Zinc (Zn)	"	ICP	0.05		
Uranium (U)	stream sediment	F	0.05	T. Roemer	Modification of Centanni and others, 1956
Fluorine (F)	rock, stream sediment, and concentrates	SI	0.01%	L. Bradley J. Sharkey	Hopkins, 1977

Table 3. Results of analyses of stream-sediment samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas Malheur County, Oregon.

Sample	Latitude	Longitude	Ca %-s	Fe %-s	Mg %-s	Na %-s	P %-s	Ti %-s	Ag ppm-s	As ppm-s	Au ppm-s	B ppm-s	Ba ppm-s
OB 01S	43 12 14	117 35 9	2.0	7	3.0	1.5	<.2	>1.0	N	N	N	<10	1,000
OB 02S	43 12 27	117 33 57	3.0	7	2.0	1.5	<.2	>1.0	N	N	N	<10	1,500
OB 03S	43 12 22	117 33 35	3.0	7	3.0	1.5	.2	>1.0	N	N	N	<10	1,500
OB 04S	43 12 33	117 33 19	3.0	7	3.0	2.0	.2	.7	N	N	N	N	1,000
OB 05S	43 12 35	117 32 37	1.5	3	.7	3.0	N	.3	N	N	N	<10	1,500
OB 06S	43 12 32	117 32 4	.7	5	1.0	1.5	<.2	.5	N	N	N	<10	1,000
OB 07S	43 11 55	117 31 43	2.0	5	1.0	2.0	N	.5	N	N	N	20	700
OB 08S	43 12 7	117 31 28	1.5	7	1.5	1.5	N	.7	N	N	N	20	700
OB 09S	43 12 3	117 31 2	2.0	5	2.0	1.5	N	.5	N	N	N	N	700
OB 10S	43 13 3	117 30 53	2.0	5	1.5	2.0	N	.7	N	N	N	N	1,500
OB 11S	43 13 22	117 30 48	2.0	5	1.5	2.0	<.2	.5	N	N	N	N	1,500
OB 12S	43 14 5	117 30 15	2.0	7	2.0	1.5	<.2	.7	N	N	N	N	1,500
OB 13S	43 13 30	117 29 32	2.0	5	1.5	2.0	<.2	.5	N	N	N	N	1,000
OB 14S	43 12 57	117 29 38	3.0	5	2.0	1.5	<.2	.5	N	N	N	N	700
OB 15S	43 12 44	117 30 15	3.0	7	3.0	2.0	<.2	.7	N	N	N	N	500
OB 16S	43 12 49	117 30 10	5.0	7	3.0	2.0	<.2	.5	N	N	N	N	700
OB 17S	43 12 8	117 29 57	2.0	7	3.0	1.5	<.2	.7	N	N	N	<10	700
OB 18S	43 12 1	117 29 43	2.0	5	1.5	1.5	<.2	.5	N	N	N	N	1,500
OB 19S	43 11 32	117 29 40	2.0	3	1.0	1.5	<.2	.5	N	N	N	<10	700
OB 20S	43 11 28	117 29 34	3.0	7	3.0	1.5	<.2	1.0	N	N	N	N	700
OB 21S	43 10 23	117 29 55	2.0	5	1.0	1.5	N	1.0	N	N	N	15	700
OB 22S	43 10 46	117 31 9	2.0	7	1.0	2.0	N	1.0	N	N	N	15	700
OB 23S	43 9 9	117 28 42	1.5	7	1.0	2.0	N	1.0	N	N	N	10	700
OB 24S	43 15 9	117 26 40	2.0	7	2.0	2.0	<.2	.7	N	N	N	<10	1,000
OB 25S	43 15 6	117 26 34	1.5	5	.7	2.0	<.2	.7	N	N	N	10	1,500
OB 26S	43 15 8	117 26 30	1.5	3	.7	2.0	<.2	.5	N	N	N	10	1,500
OB 27S	43 13 42	117 32 43	1.5	2	.5	3.0	N	.3	N	N	N	<10	2,000
OB 28S	43 13 22	117 29 0	3.0	7	2.0	2.0	<.2	.7	N	N	N	<10	700
OB 29S	43 13 40	117 28 12	1.5	5	1.0	2.0	<.2	.7	N	N	N	10	1,000
OB 30S	43 13 43	117 28 7	3.0	7	3.0	1.5	<.2	1.0	N	N	N	<10	700
OB 31S	43 14 22	117 28 58	3.0	7	3.0	3.0	<.2	.7	N	N	N	N	700
OB 32S	43 14 8	117 29 25	3.0	7	3.0	3.0	N	.5	N	N	N	N	700
OB 33S	43 14 35	117 29 37	3.0	7	3.0	2.0	N	.7	N	N	N	<10	700
OB 34S	43 15 10	117 29 12	3.0	7	3.0	2.0	<.2	.7	N	N	N	N	700
OB 35S	43 15 16	117 29 50	2.0	7	2.0	2.0	N	.7	N	N	N	10	1,000
OB 36S	43 16 14	117 28 44	3.0	7	3.0	2.0	N	.5	N	N	N	<10	1,000
OB 37S	48 17 54	117 28 0	5.0	10	3.0	3.0	.2	>1.0	N	N	N	N	700
OB 38S	43 21 12	117 25 28	1.5	5	2.0	1.5	N	.5	N	N	N	15	1,500
OB 39S	43 20 32	117 24 52	3.0	3	2.0	3.0	<.2	.5	N	N	N	N	1,500
OB 40S	43 18 0	117 23 9	3.0	3	1.5	3.0	N	.7	N	N	N	<10	1,500
OB 41S	43 17 37	117 26 28	7.0	10	3.0	1.5	.2	1.0	N	N	N	N	500
OB 43S	43 17 2	117 26 6	5.0	10	2.0	1.5	.2	>1.0	N	N	N	N	1,000
OB 44S	43 16 18	117 26 2	1.5	2	.3	3.0	N	.3	N	N	N	10	2,000
OB 45S	43 15 42	117 24 52	1.5	5	1.0	2.0	N	.7	N	N	N	20	1,000
OB 46S	43 14 45	117 27 0	7.0	10	3.0	2.0	N	.7	N	N	N	N	700

Table 3. Results of analyses of stream-sediment samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas Malheur County, Oregon.--Continued

Sample	Be ppm-s	Bi ppm-s	Cd ppm-s	Co ppm-s	Cr ppm-s	Cu ppm-s	Ga ppm-s	Ge ppm-s	La ppm-s	Mn ppm-s	Mo ppm-s
OB 01S	1.5	N	N	50	300	30	15	N	50	1,000	N
OB 02S	1.5	N	N	30	300	30	20	N	50	1,000	N
OB 03S	1.5	N	N	30	200	20	20	N	50	1,500	N
OB 04S	1.5	N	N	30	100	20	20	N	50	1,500	N
OB 05S	2.0	N	N	15	50	15	20	N	70	700	N
OB 06S	3.0	N	N	15	50	30	30	N	70	1,000	7
OB 07S	1.5	N	N	20	100	30	20	N	50	1,000	N
OB 08S	2.0	N	N	20	100	30	20	N	50	1,000	N
OB 09S	3.0	N	N	20	100	20	20	N	50	1,000	N
OB 10S	2.0	N	N	20	100	20	20	N	50	1,500	N
OB 11S	2.0	N	N	20	70	20	20	N	50	1,500	N
OB 12S	1.5	N	N	30	70	30	15	N	70	1,000	5
OB 13S	1.5	N	N	20	70	20	15	N	<50	1,500	N
OB 14S	1.5	N	N	30	100	30	20	N	<50	1,000	N
OB 15S	1.5	N	N	50	100	50	20	N	N	1,000	N
OB 16S	1.5	N	N	30	150	30	20	N	N	1,000	N
OB 17S	2.0	N	N	30	150	50	20	N	<50	1,000	N
OB 18S	2.0	N	N	20	70	20	15	N	50	1,000	N
OB 19S	5.0	N	N	15	70	20	20	N	50	700	N
OB 20S	1.5	N	N	50	300	30	20	N	50	1,500	N
OB 21S	2.0	N	N	15	150	30	20	N	50	700	N
OB 22S	2.0	N	N	30	150	30	20	N	50	1,000	N
OB 23S	1.5	N	N	30	200	50	20	N	50	1,000	N
OB 24S	2.0	N	N	30	150	30	30	N	50	1,000	N
OB 25S	3.0	N	N	15	70	20	30	N	70	1,000	5
OB 26S	2.0	N	N	15	50	15	20	N	50	700	N
OB 27S	2.0	N	N	15	70	7	20	N	50	700	N
OB 28S	1.5	N	N	20	70	30	20	N	N	1,000	N
OB 29S	2.0	N	N	20	150	30	30	N	<50	1,000	N
OB 30S	1.5	N	N	50	300	30	20	N	50	1,000	N
OB 31S	1.5	N	N	30	300	30	20	N	N	1,000	N
OB 32S	<1.0	N	N	50	200	50	15	N	N	1,500	N
OB 33S	1.5	N	N	30	200	50	20	N	50	1,500	N
OB 34S	1.5	N	N	50	150	30	20	N	N	1,000	7
OB 35S	2.0	N	N	30	100	30	30	N	70	1,000	N
OB 36S	1.5	N	N	30	300	30	20	N	70	1,000	N
OB 37S	1.5	N	N	70	300	30	30	N	50	2,000	N
OB 38S	3.0	N	N	15	70	20	50	N	70	1,000	N
OB 39S	1.5	N	N	20	100	20	20	N	70	1,000	N
OB 40S	3.0	N	N	15	150	15	20	N	<50	700	N
OB 41S	1.5	N	N	50	150	70	20	N	N	1,500	N
OB 43S	2.0	N	N	50	150	30	20	N	70	1,500	N
OB 44S	2.0	N	N	15	30	15	20	N	50	1,000	<5
OB 45S	2.0	N	N	15	70	30	20	N	<50	700	N
OB 46S	1.5	N	N	50	200	70	20	N	N	1,500	N

Table 3. Results of analyses of stream-sediment samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas Malheur County, Oregon.--Continued

Sample	Nb ppm-s	Ni ppm-s	Pb ppm-s	Sb ppm-s	Sc ppm-s	Sn ppm-s	Sr ppm-s	Th ppm-s	V ppm-s	W ppm-s	Y ppm-s	Zn ppm-s
OB 01S	<20	70	10	N	30	N	700	N	300	N	30	N
OB 02S	<20	50	10	N	30	N	1,000	N	500	N	30	N
OB 03S	<20	30	15	N	30	N	1,000	N	300	N	30	N
OB 04S	<20	50	10	N	20	N	700	N	300	N	20	N
OB 05S	<20	20	20	N	7	N	1,000	N	150	N	20	N
OB 06S	20	20	30	N	15	N	150	N	150	N	50	N
OB 07S	<20	50	15	N	15	N	300	N	150	N	50	N
OB 08S	<20	30	20	N	15	N	500	N	150	N	50	N
OB 09S	<20	30	20	N	15	N	300	N	150	N	50	N
OB 10S	<20	30	20	N	15	N	700	N	200	N	30	N
OB 11S	<20	30	20	N	15	N	700	N	150	N	30	N
OB 12S	<20	50	15	N	15	N	700	N	200	N	30	N
OB 13S	<20	30	15	N	15	N	500	N	150	N	30	N
OB 14S	<20	30	15	N	15	N	500	N	200	N	30	N
OB 15S	<20	50	10	N	20	N	500	N	300	N	30	N
OB 16S	<20	50	15	N	20	N	700	N	200	N	20	N
OB 17S	<20	70	15	N	15	N	300	N	200	N	30	N
OB 18S	<20	30	15	N	15	N	700	N	150	N	50	N
OB 19S	30	20	20	N	7	N	300	N	100	N	70	N
OB 20S	<20	70	15	N	20	N	700	N	300	N	50	N
OB 21S	<20	30	20	N	15	N	700	N	150	N	50	N
OB 22S	<20	30	15	N	15	N	700	N	150	N	50	N
OB 23S	<20	50	15	N	15	N	700	N	150	N	50	N
OB 24S	<20	70	15	N	15	N	500	N	150	N	50	N
OB 25S	20	20	20	N	7	N	1,000	N	150	N	50	N
OB 26S	<20	15	20	N	7	N	1,000	N	70	N	20	N
OB 27S	<20	15	20	N	7	N	1,000	N	70	N	20	N
OB 28S	<20	50	15	N	15	N	300	N	150	N	30	N
OB 29S	<20	30	20	N	15	N	700	N	150	N	30	N
OB 30S	<20	70	15	N	30	N	500	N	500	N	50	N
OB 31S	<20	70	15	N	30	N	700	N	300	N	30	N
OB 32S	<20	70	N	N	30	N	500	N	300	N	30	N
OB 33S	<20	70	15	N	20	N	500	N	300	N	30	N
OB 34S	<20	70	15	N	20	N	700	N	300	N	30	N
OB 35S	<20	50	20	N	20	N	700	N	200	N	50	N
OB 36S	<20	70	15	N	30	N	500	N	300	N	30	N
OB 37S	<20	70	15	N	30	N	700	N	700	N	30	N
OB 38S	<20	20	20	N	15	N	700	N	150	N	50	N
OB 39S	<20	30	15	N	15	N	700	N	150	N	20	N
OB 40S	<20	30	15	N	15	N	700	N	150	N	20	N
OB 41S	<20	50	<10	N	30	N	700	N	300	N	30	N
OB 43S	20	30	20	N	30	N	700	N	500	N	50	N
OB 44S	<20	15	30	N	5	N	1,000	N	70	N	20	N
OB 45S	<20	20	20	N	15	N	300	N	100	N	30	N
OB 46S	<20	100	15	N	20	N	500	N	200	N	30	N

Table 3. Results of analyses of stream-sediment samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas Malheur County, Oregon.--Continued

Sample	Zr ppm-s	Hg-ppm aa	Au-ppm faa	Ag-ppm icp	As-ppm icp	Au-ppm icp	Bi-ppm icp	Cd-ppm icp	Cu-ppm icp	Mo-ppm icp	Pb-ppm icp	Sb-ppm icp	Zn-ppm icp	U-ppm f	F-% si
OB 01S	300	N	N	N	N	N	N	.130	26.0	1.10	5.9	N	83	8.70	.05
OB 02S	200	N	N	N	1.7	N	N	.110	26.0	1.30	5.6	N	76	.60	.06
OB 03S	700	.04	N	.063	7.8	N	N	.130	18.0	2.10	7.2	N	94	1.20	.04
OB 04S	150	.02	N	N	5.7	N	N	.140	24.0	.94	5.9	N	69	.80	.09
OB 05S	150	N	N	N	4.5	N	N	.140	10.0	1.60	7.3	N	38	.75	.04
OB 06S	500	.10	.004	.096	27.0	N	N	.330	23.0	6.00	18.0	2.1	120	1.10	.09
OB 07S	300	.04	N	.080	1.8	N	N	.610	34.0	.62	11.0	N	86	1.10	.04
OB 08S	500	.04	N	.089	5.6	N	N	.310	33.0	1.00	13.0	N	90	.50	.05
OB 09S	500	.16	N	.068	14.0	N	N	.500	29.0	.92	16.0	1.1	110	1.00	.03
OB 10S	700	.04	N	N	11.0	N	N	.190	18.0	1.50	10.0	N	72	.60	.05
OB 11S	300	.04	N	N	10.0	N	N	.190	24.0	1.80	10.0	N	70	.70	.07
OB 12S	300	.04	N	N	12.0	N	N	.180	32.0	2.60	9.3	N	74	1.10	.09
OB 13S	150	.02	N	N	6.8	N	N	.150	26.0	.56	8.2	N	81	.75	.05
OB 14S	200	.02	N	N	8.4	N	N	.190	34.0	.87	10.0	N	85	1.10	.06
OB 15S	100	N	N	N	5.6	N	N	.160	54.0	.55	5.9	N	93	.85	.09
OB 16S	100	N	N	N	7.5	N	N	.140	44.0	.50	8.8	N	81	.40	.04
OB 17S	150	.04	N	.054	6.9	N	N	.220	56.0	.50	11.0	N	93	.70	.07
OB 18S	300	.04	N	.053	10.0	N	N	.200	20.0	.88	14.0	N	77	1.20	.05
OB 19S	500	.04	N	.086	6.7	N	N	.360	24.0	.80	23.0	N	130	2.10	.07
OB 20S	300	.04	N	N	7.3	N	N	.160	28.0	1.10	8.4	N	81	1.50	.04
OB 21S	300	N	N	N	3.0	N	N	.140	31.0	.50	10.0	N	41	1.60	.01
OB 22S	300	N	N	N	2.9	N	N	.200	34.0	.53	11.0	N	50	1.10	.01
OB 23S	300	N	N	.066	3.3	N	N	.200	41.0	.55	9.3	N	55	1.20	.01
OB 24S	300	.02	N	N	7.1	N	N	.250	29.0	1.00	9.8	N	85	1.60	.02
OB 25S	700	N	N	N	12.0	N	N	.190	15.0	2.20	9.4	N	57	3.10	.04
OB 26S	300	N	N	N	3.2	N	N	.160	12.0	.87	8.2	N	38	2.40	.02
OB 27S	300	N	N	N	6.6	N	N	.140	6.3	1.90	7.1	N	25	1.10	.05
OB 28S	200	N	N	N	6.5	N	N	.190	34.0	.33	8.7	N	84	.75	.03
OB 29S	200	.04	N	N	5.1	N	N	.310	26.0	.77	13.0	N	79	1.00	.05
OB 30S	200	N	N	N	4.4	N	N	.220	42.0	.51	11.0	N	98	1.20	.02
OB 31S	200	.04	N	.061	8.9	N	N	.250	44.0	1.10	9.7	N	91	.85	.03
OB 32S	70	N	N	.052	6.9	N	N	.130	57.0	.40	3.4	N	71	.25	.03
OB 33S	200	.04	N	.051	6.8	N	N	.230	45.0	1.10	8.6	N	80	.65	.09
OB 34S	200	.02	N	.051	12.0	N	N	.150	43.0	4.10	7.9	N	77	.55	.11
OB 35S	300	.02	N	N	11.0	N	N	.190	27.0	1.60	12.0	N	76	.90	.09
OB 36S	200	.04	N	N	9.0	N	N	.180	36.0	1.40	9.0	N	68	.75	.04
OB 37S	200	N	.002	N	7.2	N	N	.170	34.0	.96	7.1	N	120	.55	.04
OB 38S	300	.12	N	N	30.0	N	N	.270	19.0	2.40	13.0	3.1	71	--	.32
OB 39S	200	.04	N	.051	8.1	N	N	.140	21.0	1.30	8.8	N	60	1.20	.03
OB 40S	300	.18	.007	N	2.4	N	N	.092	12.0	.66	6.5	N	41	1.10	.05
OB 41S	100	<.02	N	N	2.4	N	N	.190	27.0	1.40	12.0	N	99	.25	.04
OB 43S	500	<.02	N	.055	4.2	N	N	.160	11.0	1.90	15.0	N	24	.70	.07
OB 44S	200	<.02	N	N	1.6	N	N	.160	24.0	.92	12.0	N	57	.85	.02
OB 45S	500	<.02	N	N	1.3	N	N	.230	62.0	.64	7.3	N	81	.95	.08
OB 46S	200	.02	N	.060	1.6	N	N	.170	14.0	1.40	12.0	N	48	.30	.05

Table 3. Results of analyses of stream-sediment samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas Malheur County, Oregon.--Continued

Sample	Latitude	Longitude	Ca %-s	Fe %-s	Mg %-s	Na %-s	P %-s	Ti %-s	Ag ppm-s	As ppm-s	Au ppm-s	B ppm-s	Ba ppm-s
OB 47S	43 14 7	117 27 11	1.5	3	.7	2.0	N	.5	N	N	N	10	1,500
OB 48S	43 14 7	117 27 16	2.0	7	1.5	1.5	N	1.0	N	N	N	<10	1,000

Sample	Be ppm-s	Bi ppm-s	Cd ppm-s	Co ppm-s	Cr ppm-s	Cu ppm-s	Ga ppm-s	Ge ppm-s	La ppm-s	Mn ppm-s	Mo ppm-s
OB 47S	2.0	N	N	15	70	15	20	N	50	500	N
OB 48S	2.0	N	N	20	150	30	20	N	<50	1,500	N

Sample	Nb ppm-s	Ni ppm-s	Pb ppm-s	Sb ppm-s	Sc ppm-s	Sn ppm-s	Sr ppm-s	Th ppm-s	V ppm-s	W ppm-s	Y ppm-s	Zn ppm-s
OB 47S	<20	20	20	N	7	N	700	N	70	N	30	N
OB 48S	<20	30	15	N	15	N	300	N	150	N	50	N

Sample	Zr ppm-s	Hg-ppm aa	Au-ppm faa	Ag-ppm icp	As-ppm icp	Au-ppm icp	Bi-ppm icp	Cd-ppm icp	Cu-ppm icp	Mo-ppm icp	Pb-ppm icp	Sb-ppm icp	Zn-ppm icp	U-ppm f	F-% si
OB 47S	300	<.02	N	N	1.6	N	N	.260	25.0	.85	14.0	N	100	1.10	.07
OB 48S	300	<.02	N	N	N	N	N	.089	58.0	.45	3.0	N	85	.45	.02

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.

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

Sample	Latitude	Longitude	Ca %-s	Fe %-s	Mg %-s	Na %-s	P %-s	Ti %-s	Ag ppm-s	As ppm-s
OB 01H	43 12 14	117 35 9	3	.5	.10	N	3.0	>2.0	N	N
OB 02H	43 12 27	117 33 57	10	.5	.07	<.5	7.0	>2.0	N	N
OB 03H	43 12 22	117 33 35	5	2.0	.15	<.5	3.0	2.0	N	N
OB 04H	43 12 33	117 33 19	10	2.0	.30	.5	5.0	>2.0	N	N
OB 05H	43 12 35	117 32 37	10	.5	.07	<.5	5.0	>2.0	N	N
OB 06H	43 12 32	117 32 4	3	1.0	.10	<.5	2.0	>2.0	N	N
OB 07H	43 11 55	117 31 43	3	1.0	.70	.5	2.0	>2.0	N	N
OB 08H	43 12 7	117 31 28	3	.5	.15	<.5	3.0	>2.0	1.5	N
OB 09H	43 12 3	117 31 2	2	2.0	.50	.5	1.0	1.5	N	N
OB 10H	43 13 3	117 30 53	7	.7	.07	<.5	5.0	>2.0	N	N
OB 11H	43 13 22	117 30 48	10	.7	.15	<.5	5.0	>2.0	N	N
OB 12H	43 14 5	117 30 15	2	.3	.05	<.5	1.0	1.5	N	N
OB 13H	43 13 30	117 29 32	15	5.0	3.00	.7	2.0	1.5	N	N
OB 14H	43 12 57	117 29 38	10	2.0	.70	.7	2.0	2.0	N	N
OB 15H	43 12 44	117 30 15	15	3.0	1.50	.7	3.0	>2.0	N	N
OB 16H	43 12 49	117 30 10	15	5.0	3.00	.7	2.0	>2.0	N	N
OB 17H	43 12 8	117 29 57	5	1.5	.70	.7	1.5	>2.0	N	N
OB 18H	43 12 1	117 29 43	3	1.0	.50	.5	2.0	>2.0	N	N
OB 19H	43 11 32	117 29 40	10	1.5	.50	.5	5.0	>2.0	N	N
OB 20H	43 11 28	117 29 34	10	1.5	.70	1.0	2.0	>2.0	N	N
OB 21H	43 10 23	117 29 55	3	.7	.15	<.5	.7	>2.0	N	N
OB 22H	43 10 46	117 31 9	3	.7	.30	.5	1.5	>2.0	N	N
OB 23H	43 9 9	117 28 42	3	1.0	.30	.5	.7	>2.0	5.0	N
OB 24H	43 15 9	117 26 40	10	.7	.15	.5	3.0	>2.0	N	N
OB 25H	43 15 6	117 26 34	7	.5	.07	<.5	5.0	>2.0	N	N
OB 26H	43 15 8	117 26 30	15	.5	.05	<.5	7.0	>2.0	N	N
OB 27H	43 13 42	117 32 43	15	.5	.05	<.5	5.0	>2.0	N	N
OB 28H	43 13 22	117 29 0	20	2.0	1.00	.7	5.0	>2.0	N	N
OB 29H	43 13 40	117 28 12	5	1.0	.30	1.5	1.5	1.5	N	N
OB 30H	43 13 43	117 28 7	7	1.0	.50	1.0	1.5	>2.0	N	N
OB 31H	43 14 22	117 28 58	15	1.0	.50	.5	1.5	1.5	N	N
OB 32H	43 14 8	117 29 25	15	2.0	.70	1.0	.7	.3	N	N
OB 33H	43 14 35	117 29 37	7	.7	.30	.7	3.0	>2.0	N	N
OB 34H	43 15 10	117 29 12	10	.7	.30	.5	3.0	1.5	N	N
OB 35H	43 15 16	117 29 50	7	.5	.05	<.5	3.0	>2.0	N	N
OB 36H	43 16 14	117 28 44	10	.5	.07	<.5	1.0	1.5	70.0	N
OB 37H	43 17 54	117 28 0	10	.7	.15	1.0	1.5	2.0	N	N
OB 38H	43 21 12	117 25 28	>50	.7	.15	<.5	1.0	.7	N	N
OB 39H	43 20 32	117 24 52	7	.5	.05	<.5	3.0	>2.0	N	N
OB 41H	43 17 37	117 26 28	5	2.0	.70	2.0	<.5	.5	N	N
OB 43H	43 17 2	117 26 6	5	1.0	.70	1.5	1.5	2.0	N	N
OB 44H	43 16 18	117 26 2	5	1.0	.30	<.5	2.0	>2.0	N	N
OB 45H	43 15 42	117 24 52	5	1.0	.30	1.5	1.5	>2.0	N	N
OB 46H	43 14 45	117 27 0	10	1.5	.70	3.0	1.5	1.5	N	N
OB 47H	43 14 7	117 27 11	10	1.5	.30	.5	7.0	>2.0	N	N
OB 48H	43 14 7	117 27 16	5	2.0	1.00	2.0	<.5	1.5	N	N

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Au ppm-s	B ppm-s	Ba ppm-s	Be ppm-s	Bi ppm-s	Cd ppm-s	Co ppm-s	Cr ppm-s	Cu ppm-s
OB 01H	N	N	>10,000	N	N	N	N	30	<10
OB 02H	N	N	>10,000	N	N	N	N	50	<10
OB 03H	N	N	7,000	N	N	N	<20	50	<10
OB 04H	N	<20	>10,000	N	N	N	<20	200	<10
OB 05H	N	N	>10,000	N	N	N	N	50	<10
OB 06H	N	N	>10,000	3	N	N	N	70	10
OB 07H	N	<20	2,000	3	N	N	N	150	10
OB 08H	30	<20	700	5	N	N	N	30	<10
OB 09H	N	<20	2,000	3	N	N	N	30	10
OB 10H	N	<20	>10,000	2	N	N	N	30	<10
OB 11H	N	N	>10,000	N	N	N	N	70	<10
OB 12H	N	N	>10,000	N	N	N	N	<20	<10
OB 13H	N	N	>10,000	<2	N	N	20	700	10
OB 14H	N	N	1,000	3	N	N	<20	150	10
OB 15H	N	N	5,000	3	N	N	<20	300	10
OB 16H	N	<20	10,000	2	N	N	20	700	150
OB 17H	N	20	500	3	N	N	N	150	10
OB 18H	N	N	700	3	N	N	N	70	15
OB 19H	N	N	500	5	N	N	N	70	10
OB 20H	N	N	700	3	N	N	<20	150	<10
OB 21H	N	N	300	5	N	N	N	70	10
OB 22H	N	N	700	3	N	N	N	70	10
OB 23H	N	<20	700	5	N	N	N	100	10
OB 24H	N	N	>10,000	N	N	N	N	100	<10
OB 25H	N	N	>10,000	N	N	N	N	70	<10
OB 26H	N	N	1,500	N	N	N	N	70	<10
OB 27H	N	N	>10,000	N	N	N	N	50	<10
OB 28H	N	N	>10,000	3	N	N	<20	200	10
OB 29H	N	<20	3,000	3	N	N	N	50	<10
OB 30H	N	N	700	3	N	N	N	70	<10
OB 31H	N	N	5,000	3	N	N	N	100	<10
OB 32H	N	N	>10,000	N	N	N	<20	200	10
OB 33H	N	N	2,000	3	N	N	N	70	<10
OB 34H	N	N	>10,000	N	N	N	N	70	<10
OB 35H	N	N	>10,000	N	N	N	N	20	<10
OB 36H	700	N	3,000	3	N	N	N	<20	<10
OB 37H	N	N	5,000	3	N	N	N	20	<10
OB 38H	N	N	2,000	3	N	N	N	<20	<10
OB 39H	N	N	>10,000	N	N	N	N	20	<10
OB 41H	N	N	5,000	N	N	N	<20	50	10
OB 43H	N	N	>10,000	N	N	N	<20	100	<10
OB 44H	N	<20	>10,000	N	N	N	<20	70	<10
OB 45H	N	N	3,000	3	N	N	N	70	<10
OB 46H	N	N	>10,000	N	N	N	N	20	15
OB 47H	N	50	>10,000	N	N	N	<20	150	<10
OB 48H	N	<20	2,000	2	N	N	<20	150	10

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Ga ppm-s	Ge ppm-s	La ppm-s	Mn ppm-s	Mo ppm-s	Nb ppm-s	Ni ppm-s	Pb ppm-s	Sb ppm-s
OB 01H	<10	N	300	300	N	50	<10	70	N
OB 02H	<10	N	300	500	N	100	<10	N	N
OB 03H	<10	N	200	500	N	<50	<10	N	N
OB 04H	<10	N	500	500	N	100	10	<20	N
OB 05H	<10	N	300	300	N	200	<10	<20	N
OB 06H	<10	N	300	300	15	70	<10	150	N
OB 07H	<10	N	300	500	N	50	10	N	N
OB 08H	<10	N	300	300	N	<50	<10	N	N
OB 09H	<10	N	150	500	N	<50	<10	N	N
OB 10H	<10	N	500	300	N	100	<10	<20	N
OB 11H	<10	N	300	300	N	150	<10	20	N
OB 12H	N	N	150	100	N	70	<10	N	N
OB 13H	<10	N	300	1,500	N	<50	30	2,000	N
OB 14H	<10	N	200	500	N	<50	10	20	N
OB 15H	<10	N	300	1,500	N	<50	20	15,000	500
OB 16H	10	N	300	1,500	N	70	30	700	<200
OB 17H	<10	N	200	500	N	50	10	200	N
OB 18H	<10	N	200	500	N	50	10	<20	N
OB 19H	<10	N	1,000	1,000	N	50	10	30	N
OB 20H	10	N	300	700	N	50	10	200	N
OB 21H	<10	N	300	300	N	50	<10	N	N
OB 22H	<10	N	300	500	N	50	10	N	N
OB 23H	<10	N	300	300	N	50	<10	N	N
OB 24H	<10	N	200	300	N	150	<10	<20	N
OB 25H	<10	N	300	300	N	100	<10	N	N
OB 26H	<10	N	300	500	N	70	<10	N	N
OB 27H	<10	N	300	300	N	150	<10	<20	N
OB 28H	<10	N	500	700	N	<50	15	N	N
OB 29H	15	N	<100	300	N	<50	10	N	N
OB 30H	<10	N	150	300	N	50	<10	N	N
OB 31H	<10	N	300	500	N	<50	<10	100	N
OB 32H	<10	N	<100	500	N	<50	20	30	N
OB 33H	<10	N	150	300	N	70	<10	N	N
OB 34H	<10	N	150	300	N	50	<10	N	N
OB 35H	N	N	200	300	N	100	<10	150	N
OB 36H	<10	N	200	200	N	<50	<10	N	N
OB 37H	<10	N	200	300	N	50	<10	N	N
OB 38H	<10	N	150	500	N	<50	<10	N	N
OB 39H	<10	N	150	300	N	100	<10	N	N
OB 41H	15	N	N	200	N	<50	<10	N	N
OB 43H	15	N	150	500	N	50	<10	N	N
OB 44H	N	N	700	1,000	N	150	<10	N	N
OB 45H	15	N	200	300	N	70	<10	N	N
OB 46H	30	N	N	300	N	50	10	N	N
OB 47H	<10	N	700	1,500	N	200	10	20	N
OB 48H	20	N	100	500	N	50	15	N	N

Table 4. Results of analyses of heavy-mineral-concentrate samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Sc ppm-s	Sn ppm-s	Sr ppm-s	Th ppm-s	V ppm-s	W ppm-s	Y ppm-s	Zn ppm-s	Zr ppm-s	F-% si
OB 01H	70	30	<200	N	100	N	700	N	>2,000	--
OB 02H	30	30	500	N	150	N	500	N	>2,000	--
OB 03H	50	70	<200	N	150	N	700	N	>2,000	--
OB 04H	30	30	300	N	150	N	500	N	>2,000	--
OB 05H	15	150	500	N	150	N	500	N	>2,000	--
OB 06H	30	20	1,500	N	150	N	700	N	>2,000	--
OB 07H	50	30	<200	N	150	N	700	N	>2,000	--
OB 08H	50	100	<200	N	150	N	700	N	>2,000	--
OB 09H	20	N	<200	N	70	N	1,000	N	>2,000	--
OB 10H	30	20	700	N	150	N	500	N	>2,000	3.18
OB 11H	20	20	1,000	N	150	N	500	N	>2,000	--
OB 12H	<10	N	1,500	N	20	N	200	N	>2,000	.54
OB 13H	70	50	200	N	150	N	700	N	>2,000	1.19
OB 14H	50	70	<200	N	150	N	700	N	>2,000	--
OB 15H	70	70	200	N	150	N	700	N	>2,000	--
OB 16H	70	500	300	N	200	N	700	N	>2,000	--
OB 17H	30	50	<200	N	150	N	500	N	>2,000	--
OB 18H	70	150	<200	N	150	N	700	N	>2,000	--
OB 19H	50	50	<200	N	150	N	1,000	N	>2,000	--
OB 20H	30	30	200	N	150	N	700	N	>2,000	--
OB 21H	70	200	<200	N	150	N	700	N	>2,000	.10
OB 22H	30	150	<200	N	150	N	500	N	>2,000	--
OB 23H	50	70	<200	N	150	N	700	N	>2,000	--
OB 24H	20	30	200	N	150	N	500	N	>2,000	--
OB 25H	30	30	<200	N	150	N	700	N	>2,000	--
OB 26H	30	30	200	N	150	N	700	N	>2,000	--
OB 27H	20	30	1,000	N	150	N	500	N	>2,000	--
OB 28H	50	30	200	N	150	N	700	N	>2,000	.52
OB 29H	20	30	300	N	70	N	300	N	>2,000	--
OB 30H	30	30	<200	N	100	N	500	N	>2,000	--
OB 31H	30	20	<200	N	70	N	1,000	N	>2,000	1.12
OB 32H	20	N	7,000	N	70	N	200	N	>2,000	.41
OB 33H	30	700	<200	N	150	N	500	N	>2,000	.35
OB 34H	20	N	1,500	N	50	N	500	N	>2,000	4.92
OB 35H	15	500	1,000	N	100	N	500	N	>2,000	.31
OB 36H	30	2,000	<200	N	50	N	700	N	>2,000	6.00
OB 37H	30	150	<200	N	70	N	500	N	>2,000	2.64
OB 38H	15	N	300	N	20	N	300	N	>2,000	38.00
OB 39H	15	20	1,500	N	70	N	300	N	>2,000	--
OB 41H	10	N	700	N	30	N	70	N	>2,000	--
OB 43H	30	30	700	N	70	N	300	N	>2,000	--
OB 44H	15	20	1,000	N	150	N	300	N	>2,000	--
OB 45H	20	30	200	N	100	N	300	N	>2,000	--
OB 46H	<10	N	700	N	30	N	150	N	>2,000	--
OB 47H	30	30	700	N	150	N	500	N	>2,000	--
OB 48H	15	N	300	N	100	N	150	N	>2,000	--

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.

Sample	Latitude	Longitude	Ca %-s	Fe %-s	Mg %-s	Na %-s	P %-s	Ti %-s	Ag ppm-s	As ppm-s
OB 001A	43 12 14	117 35 9	.70	1.00	.30	1.5	N	.070	N	N
OB 001B	43 12 14	117 35 9	.05	.10	.02	<.2	N	.005	N	N
OB 002	43 12 27	117 33 57	.50	.70	.15	.3	N	.070	N	N
OB 003A	43 12 22	117 33 35	.07	.20	.02	.2	N	.050	N	N
OB 003B	43 12 22	117 33 35	<.05	3.00	.02	<.2	N	.007	<.5	N
OB 003D	43 12 22	117 33 35	.70	.70	.20	1.0	N	.070	N	N
OB 004A	43 12 33	117 33 19	.30	.70	.10	<.2	N	.030	N	N
OB 004B	43 12 33	117 33 19	>20.00	1.00	.50	1.5	N	.100	N	N
OB 005A	43 12 35	117 32 37	3.00	7.00	1.50	2.0	N	>1.000	N	N
OB 005B	43 12 35	117 32 37	.70	3.00	.30	.7	N	.150	<.5	N
OB 006A	43 12 32	117 32 4	.10	3.00	.05	1.5	N	.100	2.0	N
OB 006B	43 12 32	117 32 4	.05	3.00	.10	.5	N	.150	.7	N
OB 006D	43 12 32	117 32 4	.50	3.00	.20	1.0	N	.300	<.5	N
OB 010A	43 13 3	117 30 53	.50	7.00	.10	1.5	N	.070	N	N
OB 010B	43 13 3	117 30 53	.15	1.50	.10	.7	N	.070	N	N
OB 011A	43 13 22	117 30 48	.05	1.50	.02	1.5	N	.100	N	<200
OB 011B	43 13 22	117 30 48	2.00	1.50	.30	3.0	N	.200	N	N
OB 011D	43 13 22	117 30 48	<.05	1.00	.07	.7	N	.070	N	N
OB 012	43 14 5	117 30 15	.30	.70	.10	1.0	N	.200	N	N
OB 014A	43 12 57	117 29 38	.70	2.00	.30	3.0	N	.200	N	N
OB 014B	43 12 57	117 29 38	1.50	2.00	.50	3.0	N	.200	N	N
OB 014D	43 12 57	117 29 38	3.00	1.50	.70	2.0	N	.150	N	N
OB 014E	43 12 57	117 29 38	.10	1.50	.10	.5	N	.070	.5	N
OB 015	43 12 44	117 30 15	.05	1.50	.02	1.0	N	.070	N	<200
OB 017	43 12 8	117 29 57	.07	1.50	.07	1.0	N	.070	N	N
OB 018A	43 12 1	117 29 43	1.50	3.00	.50	1.5	<.2	.200	N	N
OB 018B	43 12 1	117 29 43	1.00	1.50	.50	2.0	N	.150	N	N
OB 020	43 11 28	117 29 34	<.05	3.00	.02	3.0	N	.100	<.5	N
OB 023	43 9 9	117 28 42	.20	1.50	.15	3.0	N	.070	N	N
OB 024A	43 15 9	117 26 40	.10	3.00	.07	1.5	N	.150	N	N
OB 024B	43 15 9	117 26 40	.07	3.00	.07	1.5	N	.150	<.5	N
OB 024D	43 15 9	117 26 40	.10	3.00	.07	2.0	N	.070	<.5	N
OB 025A	43 15 6	117 26 34	.10	.30	.03	<.2	N	.020	N	N
OB 025B	43 15 6	117 26 34	<.05	.05	.02	<.2	N	.010	N	N
OB 025D	43 15 6	117 26 34	20.00	.30	.07	<.2	N	.030	N	N
OB 027	43 13 42	117 32 43	.20	3.00	.15	.3	<.2	.070	N	N
OB 028A	43 13 22	117 29 0	.10	.70	.10	<.2	N	.030	N	N
OB 028B	43 13 22	117 29 0	.50	1.50	.20	1.5	N	.070	N	N
OB 028D	43 13 22	117 29 0	.70	3.00	.30	2.0	N	.200	N	N
OB 028E	43 13 22	117 29 0	.70	2.00	.30	3.0	N	.150	N	N
OB 028F	43 13 22	117 29 0	.20	1.50	.15	1.0	N	.070	N	N
OB 029	43 13 40	117 28 12	1.50	3.00	.30	3.0	N	.300	N	N
OB 030A	43 13 43	117 28 7	.30	1.50	.15	1.5	N	.070	N	N
OB 030B	43 13 43	117 28 7	.20	3.00	.10	1.5	N	.300	N	N
OB 031A	43 14 22	117 28 58	.07	1.50	.05	1.0	N	.150	.7	N

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Au ppm-s	B ppm-s	Ba ppm-s	Be ppm-s	Bi ppm-s	Cd ppm-s	Co ppm-s	Cr ppm-s	Cu ppm-s
OB 001A	N	10	300	3.0	N	N	<10	10	7
OB 001B	N	10	30	N	N	N	N	<10	5
OB 002	N	15	200	N	N	N	N	<10	7
OB 003A	N	<10	50	N	N	N	N	<10	5
OB 003B	N	<10	70	N	N	N	N	<10	10
OB 003D	N	10	150	N	N	N	N	10	7
OB 004A	N	10	150	N	N	N	N	<10	5
OB 004B	N	N	300	N	N	N	<10	10	<5
OB 005A	N	15	1,500	2.0	N	N	15	100	20
OB 005B	N	N	500	1.5	N	N	<10	<10	10
OB 006A	N	N	700	5.0	N	N	N	<10	7
OB 006B	N	N	1,500	1.5	N	N	<10	<10	10
OB 006D	N	N	3,000	3.0	N	N	15	30	15
OB 010A	N	N	700	7.0	N	N	N	<10	15
OB 010B	N	<10	700	3.0	N	N	N	<10	<5
OB 011A	N	N	700	5.0	N	N	N	<10	<5
OB 011B	N	N	1,500	3.0	N	N	<10	<10	20
OB 011D	N	N	150	5.0	N	N	N	<10	5
OB 012	N	<10	100	1.5	N	N	<10	<10	10
OB 014A	N	N	1,000	1.5	N	N	<10	<10	10
OB 014B	N	N	1,500	5.0	N	N	<10	30	15
OB 014D	N	N	1,500	3.0	N	N	<10	<10	10
OB 014E	N	<10	300	3.0	N	N	<10	<10	10
OB 015	N	<10	1,000	3.0	N	N	N	<10	5
OB 017	N	<10	200	5.0	N	N	N	<10	5
OB 018A	N	N	1,000	3.0	N	N	<10	<10	15
OB 018B	N	N	700	3.0	N	N	<10	<10	15
OB 020	N	<10	70	3.0	N	N	N	<10	7
OB 023	N	20	200	3.0	N	N	N	<10	5
OB 024A	N	N	1,000	3.0	N	N	N	<10	7
OB 024B	N	N	1,000	3.0	N	N	N	<10	7
OB 024D	N	N	700	3.0	N	N	N	<10	5
OB 025A	N	30	70	N	N	N	N	<10	<5
OB 025B	N	30	30	N	N	N	N	<10	<5
OB 025D	N	20	50	2.0	N	N	N	<10	<5
OB 027	N	<10	150	1.5	N	N	N	<10	15
OB 028A	N	<10	150	1.5	N	N	N	<10	15
OB 028B	N	<10	500	1.5	N	N	N	<10	15
OB 028D	N	N	1,000	1.5	N	N	<10	<10	15
OB 028E	N	N	1,500	1.5	N	N	<10	<10	10
OB 028F	N	<10	500	3.0	N	N	N	<10	7
OB 029	N	N	2,000	2.0	N	N	<10	<10	7
OB 030A	N	N	500	3.0	N	N	N	<10	<5
OB 030B	N	N	1,000	3.0	N	N	N	<10	7
OB 031A	N	N	500	3.0	N	N	N	<10	7

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Ga ppm-s	Ge ppm-s	La ppm-s	Mn ppm-s	Mo ppm-s	Nb ppm-s	Ni ppm-s	Pb ppm-s	Sb ppm-s
OB 001A	15	N	N	150	N	20	5	10	N
OB 001B	N	100	N	50	N	<20	<5	N	N
OB 002	<5	10	N	150	5	<20	<5	N	N
OB 003A	N	N	N	70	N	<20	<5	N	N
OB 003B	N	N	N	200	N	<20	7	N	N
OB 003D	5	N	N	70	N	<20	<5	N	N
OB 004A	N	<10	N	150	N	<20	<5	N	N
OB 004B	<5	N	N	1,500	N	<20	5	N	N
OB 005A	50	N	50	700	<5	20	20	20	N
OB 005B	5	N	N	700	<5	<20	5	10	N
OB 006A	15	N	N	100	15	20	<5	15	N
OB 006B	<5	N	N	150	<5	<20	5	N	N
OB 006D	20	N	N	1,000	7	<20	10	15	N
OB 010A	10	N	<50	200	N	20	<5	20	N
OB 010B	30	N	50	200	N	20	<5	15	N
OB 011A	20	N	50	200	5	30	<5	20	N
OB 011B	15	N	N	200	N	<20	<5	15	N
OB 011D	15	N	N	200	N	30	<5	20	N
OB 012	15	N	N	150	N	<20	<5	10	N
OB 014A	20	N	N	500	<5	<20	<5	15	N
OB 014B	20	N	<50	150	N	<20	5	15	N
OB 014D	15	N	N	300	N	<20	<5	15	N
OB 014E	10	N	N	150	5	<20	5	<10	N
OB 015	15	N	<50	70	N	20	<5	15	N
OB 017	10	N	<50	200	N	30	<5	15	N
OB 018A	15	N	N	150	5	<20	5	15	N
OB 018B	20	N	<50	300	N	<20	<5	15	N
OB 020	30	N	70	150	5	30	<5	50	N
OB 023	30	N	70	150	N	20	<5	15	N
OB 024A	15	N	<50	500	<5	<20	<5	10	N
OB 024B	15	N	<50	200	<5	<20	<5	70	N
OB 024D	15	N	<50	150	<5	20	<5	20	N
OB 025A	N	20	N	15	15	<20	<5	N	N
OB 025B	N	N	N	20	N	<20	<5	N	N
OB 025D	N	N	N	50	7	<20	<5	N	N
OB 027	<5	30	N	30	15	<20	5	N	N
OB 028A	<5	N	N	150	N	<20	<5	N	N
OB 028B	7	N	N	100	N	<20	<5	N	N
OB 028D	15	N	N	500	N	<20	<5	10	N
OB 028E	15	N	N	700	N	<20	5	15	N
OB 028F	5	N	N	150	N	<20	<5	N	N
OB 029	50	N	50	700	N	<20	5	20	N
OB 030A	20	N	<50	150	N	<20	5	10	N
OB 030B	20	N	50	150	5	<20	5	15	N
OB 031A	15	N	50	70	20	20	<5	10	N

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Sc ppm-s	Sn ppm-s	Sr ppm-s	Th ppm-s	V ppm-s	W ppm-s	Y ppm-s	Zn ppm-s	Zr ppm-s	Hg-ppm aa
OB 001A	<5	N	100	N	15	N	30	N	100	<.02
OB 001B	N	N	N	N	N	N	N	N	20	<.02
OB 002	N	N	N	N	10	N	10	N	70	<.02
OB 003A	N	N	N	N	<10	N	N	N	50	<.02
OB 003B	N	N	N	N	70	N	N	N	10	<.02
OB 003D	N	N	N	N	70	N	<10	N	100	<.02
OB 004A	N	N	N	N	<10	N	N	N	20	.04
OB 004B	7	N	700	N	50	N	<10	N	20	<.02
OB 005A	15	N	500	N	150	N	30	N	500	.12
OB 005B	5	N	<100	N	30	N	20	N	150	<.02
OB 006A	N	N	<100	N	<10	N	50	N	700	.10
OB 006B	<5	N	<100	N	10	N	15	N	70	.22
OB 006D	7	N	100	N	70	N	50	N	300	.32
OB 010A	5	N	<100	N	70	N	70	<200	500	.18
OB 010B	N	N	N	N	N	N	50	N	700	<.02
OB 011A	N	N	N	N	N	N	70	N	1,000	<.02
OB 011B	<5	N	300	N	20	N	15	N	150	<.02
OB 011D	N	N	N	N	N	N	70	<200	700	.04
OB 012	5	N	N	N	15	N	15	N	150	.02
OB 014A	<5	N	200	N	30	N	15	N	200	<.02
OB 014B	5	N	1,000	N	30	N	30	N	300	.04
OB 014D	5	N	1,000	N	20	N	20	N	150	<.02
OB 014E	<5	N	N	N	30	N	50	N	100	.28
OB 015	N	N	N	N	15	N	70	N	700	<.02
OB 017	N	N	N	N	10	N	100	200	1,000	.20
OB 018A	7	N	700	N	70	N	20	N	200	.24
OB 018B	<5	N	300	N	20	N	30	N	300	<.02
OB 020	N	N	N	N	100	N	150	<200	700	.02
OB 023	N	N	N	N	20	N	70	N	700	<.02
OB 024A	<5	N	<100	N	<10	N	50	N	500	.02
OB 024B	<5	N	<100	N	<10	N	50	N	500	.02
OB 024D	N	N	N	N	<10	N	70	N	700	<.02
OB 025A	N	N	N	N	<10	N	10	N	20	<.02
OB 025B	N	N	N	N	N	N	<10	N	15	<.02
OB 025D	N	N	<100	N	<10	N	150	N	30	<.02
OB 027	N	N	N	N	50	N	<10	N	50	.16
OB 028A	N	N	N	N	N	N	<10	N	30	<.02
OB 028B	<5	N	<100	N	<10	N	15	N	100	<.02
OB 028D	<5	N	150	N	20	N	15	N	150	<.02
OB 028E	<5	N	150	N	20	N	15	N	150	<.02
OB 028F	N	N	<100	N	15	N	15	N	70	.02
OB 029	7	N	700	N	70	N	30	N	300	<.02
OB 030A	N	N	<100	N	15	N	30	N	300	<.02
OB 030B	7	N	200	N	50	N	50	N	500	.24
OB 031A	<5	N	<100	N	30	N	70	N	500	.08

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Au-ppm faa	Ag-ppm icp	As-ppm icp	Au-ppm icp	Bi-ppm icp	Cd-ppm icp	Cu-ppm icp	Mo-ppm icp	Pb-ppm icp	Sb-ppm icp	Zn-ppm icp	F-% si
OB 001A	N	N	N	N	N	N	4.70	.31	3.6	N	40.00	--
OB 001B	N	N	N	N	N	N	5.80	N	N	N	N	--
OB 002	N	N	1.2	N	N	N	5.40	2.40	N	N	6.60	--
OB 003A	N	N	N	N	N	N	2.70	.96	N	N	N	--
OB 003B	N	N	3.5	N	N	N	7.60	1.10	N	N	1.00	--
OB 003D	N	N	N	N	N	N	6.60	.45	1.8	N	7.90	--
OB 004A	N	N	7.8	N	N	N	4.00	.56	N	2.4	1.90	--
OB 004B	N	N	N	N	N	N	3.10	.21	N	N	8.00	--
OB 005A	N	N	4.0	N	N	.120	13.00	1.90	6.1	N	49.00	.08
OB 005B	N	N	55.0	N	N	.056	11.00	2.70	5.7	4.1	39.00	--
OB 006A	.024	.860	53.0	N	N	N	5.40	11.00	8.1	2.6	23.00	--
OB 006B	.002	.190	34.0	N	N	.066	6.40	3.00	2.0	3.5	14.00	--
OB 006D	.006	.089	110.0	N	N	.140	13.00	4.00	7.9	6.9	75.00	--
OB 010A	.002	N	120.0	N	N	.200	15.00	1.90	19.0	4.9	140.00	--
OB 010B	N	N	5.6	N	N	.086	2.10	.39	12.0	N	87.00	--
OB 011A	.002	N	250.0	N	N	.053	2.00	4.20	15.0	3.1	30.00	--
OB 011B	N	N	2.0	N	N	N	4.90	N	8.8	N	29.00	--
OB 011D	.002	N	3.8	N	N	.230	4.00	.43	15.0	N	120.00	--
OB 012	N	N	1.9	N	N	.084	7.80	.51	5.5	N	15.00	--
OB 014A	N	N	4.4	N	N	N	13.00	1.70	2.7	N	38.00	--
OB 014B	N	N	1.5	N	N	N	17.00	.19	7.1	N	24.00	--
OB 014D	N	N	N	N	N	N	9.50	.33	7.8	N	34.00	--
OB 014E	N	N	12.0	N	N	.130	7.40	4.20	3.3	N	40.00	--
OB 015	N	N	180.0	N	N	N	4.40	1.60	11.0	3.0	9.20	--
OB 017	N	.070	65.0	N	N	.280	5.70	.34	19.0	2.2	110.00	--
OB 018A	N	N	110.0	N	N	.056	15.00	4.50	12.0	1.7	29.00	--
OB 018B	N	N	N	N	N	N	11.00	N	5.9	N	12.00	--
OB 020	N	N	16.0	N	N	.280	5.80	4.00	26.0	3.7	88.00	--
OB 023	N	N	N	N	N	.073	4.20	.69	9.4	N	54.00	--
OB 024A	.002	N	22.0	N	N	.067	3.90	2.90	7.4	N	46.00	--
OB 024B	.004	.059	41.0	N	N	.074	5.30	2.80	66.0	1.8	49.00	--
OB 024D	N	N	190.0	N	N	.240	3.60	2.80	16.0	2.3	71.00	--
OB 025A	N	N	35.0	N	N	N	2.90	13.00	1.6	2.0	N	--
OB 025B	N	N	N	N	N	N	.93	.61	1.0	N	N	--
OB 025D	N	N	N	N	N	N	2.80	7.80	1.2	N	N	8.98
OB 027	N	N	97.0	N	N	.078	7.70	18.00	3.9	1.8	15.00	--
OB 028A	N	N	N	N	N	N	5.20	.21	N	N	6.90	--
OB 028B	N	N	N	N	N	N	5.20	.25	N	N	19.00	--
OB 028D	N	N	N	N	N	N	7.10	.39	1.3	N	37.00	--
OB 028E	N	N	2.1	N	N	.076	10.00	.50	2.2	N	29.00	--
OB 028F	N	N	10.0	N	N	N	N	.95	1.2	N	N	--
OB 029	N	N	3.0	N	N	.080	N	.35	1.7	N	10.00	--
OB 030A	N	N	N	N	N	N	N	2.70	5.0	N	2.00	--
OB 030B	N	N	80.0	N	N	.090	N	30.00	10.0	1.9	30.00	--
OB 031A	N	.140	45.0	N	N	.170	N	30.00	6.4	2.5	3.70	--

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Latitude	Longitude	Ca %-s	Fe %-s	Mg %-s	Na %-s	P %-s	Ti %-s	Ag ppm-s	As ppm-s
OB 031B	43 14 22	117 28 58	.15	2.00	.05	1.5	N	.100	N	N
OB 031D	43 14 22	117 28 58	.50	10.00	.05	2.0	N	.150	N	N
OB 032A	43 14 8	117 29 25	10.00	15.00	5.00	2.0	.3	>1.000	N	N
OB 032B	43 14 8	117 29 25	.30	1.50	.20	.7	N	.100	N	N
OB 032D	43 14 8	117 29 25	>20.00	.50	.20	.7	N	.030	N	N
OB 035	43 15 16	117 29 50	.15	2.00	.05	<.2	N	.050	N	<200
OB 036	43 16 14	117 28 44	1.50	1.50	.30	.5	N	.070	.5	N
OB 037A	43 17 54	117 28 0	.10	1.50	.05	.7	N	.070	<.5	N
OB 037B	43 17 54	117 28 0	.70	.70	.10	.7	N	.020	N	N
OB 037D	43 17 54	117 28 0	.50	.70	.15	.7	N	.100	N	N
OB 037E	43 17 54	117 28 0	.05	.20	.02	<.2	N	.020	N	N
OB 038A	43 21 12	117 25 28	.50	.70	.70	.5	N	.070	<.5	N
OB 038B	43 21 12	117 25 28	7.00	.20	.10	.2	N	.002	N	N
OB 038D	43 21 12	117 25 28	.50	.50	.30	.2	N	.030	N	N
OB 038E	43 21 12	117 25 28	10.00	.10	.15	.2	N	<.002	N	N
OB 038F	43 21 12	117 25 28	.15	1.00	.70	.7	N	.070	<.5	N
OB 038G	43 21 12	117 25 28	.05	7.00	.02	.3	N	.050	3.0	N
OB 038H	43 21 12	117 25 28	.50	1.50	.30	1.5	N	.200	<.5	N
OB 038I	43 21 12	117 25 28	>20.00	.10	.07	<.2	N	<.002	N	N
OB 042	43 17 28	117 26 31	.15	2.00	.15	3.0	<.2	.150	N	N
OB 046	43 14 45	117 27 0	3.00	5.00	.15	5.0	<.2	.300	N	N
OB 048	43 14 7	117 27 16	.07	3.00	.07	1.5	N	.070	N	N
VM-4-88	43 17 0	117 26 0	.10	.70	.07	1.5	N	.070	3.0	N
VM-5-88	43 17 0	117 26 0	.15	2.00	.07	3.0	N	.150	.5	N
VM-5A-88	43 17 0	117 26 0	.10	2.00	.03	1.5	N	.150	N	N
VM-7-88	43 17 0	117 26 0	.07	1.00	.15	<.2	N	.030	N	N
VM-8-88	43 17 0	117 26 0	5.00	15.00	2.00	3.0	.5	>1.000	N	N
VM-9-88	43 17 0	117 26 0	15.00	1.50	.30	.5	N	.030	N	N
VM-22-88	43 14 0	117 28 0	.70	2.00	.15	3.0	<.2	.150	N	N
VM-23-88	43 14 0	117 28 0	7.00	3.00	.20	3.0	N	.150	N	N
VM-24-88	43 14 0	117 28 0	1.00	2.00	.30	3.0	N	.150	N	N
VB-02-88	43 18 0	117 23 0	.70	1.00	.10	1.0	N	.070	N	N
VB-03-88	43 18 0	117 23 0	.30	5.00	.03	3.0	N	.200	N	N
88-GM-5	43 13 0	117 28 0	<.05	1.00	.02	.2	N	.070	N	N
88-GM-7	43 12 0	117 28 0	.70	1.50	.10	1.5	N	.070	N	N
88-GM-8	43 12 0	117 29 0	.05	.70	<.02	.7	N	.050	N	N
88-GM-11	43 14 0	117 30 0	1.00	3.00	.70	3.0	N	.200	.5	N

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Au ppm-s	B ppm-s	Ba ppm-s	Be ppm-s	Bi ppm-s	Cd ppm-s	Co ppm-s	Cr ppm-s	Cu ppm-s
OB 031B	N	N	700	3.0	N	N	N	<10	<5
OB 031D	N	<10	1,000	5.0	N	N	N	<10	5
OB 032A	N	N	500	1.0	N	N	70	100	50
OB 032B	N	N	150	N	N	N	N	10	15
OB 032D	N	N	<20	N	N	N	N	15	<5
OB 035	N	N	150	N	N	N	N	<10	30
OB 036	N	N	500	2.0	N	N	N	<10	15
OB 037A	N	N	200	3.0	N	N	N	<10	7
OB 037B	N	15	150	2.0	N	N	N	<10	7
OB 037D	N	N	300	2.0	N	N	<10	<10	7
OB 037E	N	70	100	N	N	N	N	<10	<5
OB 038A	N	15	200	1.5	N	N	N	<10	5
OB 038B	N	10	30	3.0	N	N	N	<10	<5
OB 038D	N	15	150	1.5	N	N	N	<10	<5
OB 038E	N	50	30	2.0	N	N	N	<10	<5
OB 038F	N	20	300	2.0	N	N	<10	<10	7
OB 038G	N	N	150	1.5	N	N	<10	<10	10
OB 038H	N	10	1,000	1.5	N	N	<10	10	5
OB 038I	N	N	30	3.0	N	N	N	<10	<5
OB 042	N	N	1,000	1.5	N	N	N	<10	10
OB 046	N	N	2,000	3.0	N	N	N	<10	<5
OB 048	N	10	700	3.0	N	N	N	<10	<5
VM-4-88	N	<10	700	1.5	N	N	N	<10	15
VM-5-88	N	<10	1,500	1.5	N	N	N	<10	7
VM-5A-88	N	<10	1,500	2.0	N	N	N	<10	7
VM-7-88	N	<10	70	N	N	N	<10	<10	20
VM-8-88	N	N	700	2.0	N	N	30	<10	100
VM-9-88	N	N	30	1.0	N	N	<10	<10	30
VM-22-88	N	<10	1,500	3.0	N	N	<10	<10	15
VM-23-88	N	<10	1,500	2.0	N	N	<10	<10	10
VM-24-88	N	10	1,500	3.0	N	N	<10	10	10
VB-02-88	N	<10	700	3.0	N	N	N	<10	<5
VB-03-88	N	<10	1,500	3.0	N	N	N	<10	<5
88-GM-5	N	<10	300	1.5	N	N	N	<10	7
88-GM-7	N	<10	500	3.0	N	N	<10	<10	<5
88-GM-8	N	10	100	3.0	N	N	N	<10	5
88-GM-11	N	10	1,500	3.0	N	N	N	<10	30

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Ga ppm-s	Ge ppm-s	La ppm-s	Mn ppm-s	Mo ppm-s	Nb ppm-s	Ni ppm-s	Pb ppm-s	Sb ppm-s
OB 031B	20	N	70	70	50	20	<5	15	N
OB 031D	50	N	150	100	15	20	<5	15	N
OB 032A	30	N	N	2,000	N	<20	70	N	N
OB 032B	<5	N	N	500	N	<20	5	N	N
OB 032D	N	N	N	1,500	N	N	5	N	N
OB 035	N	N	N	50	100	<20	7	N	N
OB 036	10	N	N	100	5	<20	5	10	N
OB 037A	20	N	<50	150	5	30	<5	20	N
OB 037B	5	N	N	100	N	<20	<5	<10	N
OB 037D	<5	N	N	500	N	<20	5	N	N
OB 037E	N	N	N	50	N	<20	<5	N	N
OB 038A	30	<10	N	200	N	<20	<5	N	N
OB 038B	7	N	N	200	N	<20	<5	N	N
OB 038D	20	<10	N	300	N	<20	<5	N	N
OB 038E	20	20	N	150	N	<20	<5	N	N
OB 038F	15	N	N	200	N	<20	<5	<10	N
OB 038G	10	N	N	150	20	<20	5	<10	<100
OB 038H	15	N	N	700	N	<20	5	15	N
OB 038I	5	N	N	300	N	N	<5	N	N
OB 042	20	N	N	300	10	20	<5	20	N
OB 046	50	N	70	1,500	5	20	<5	20	N
OB 048	15	<10	50	150	7	20	<5	15	N
VM-4-88	7	N	N	100	7	<20	<5	15	N
VM-5-88	10	N	N	100	20	20	<5	15	N
VM-5A-88	10	N	<50	150	150	20	<5	15	N
VM-7-88	<5	N	N	500	N	<20	<5	N	N
VM-8-88	50	N	50	2,000	N	<20	<5	10	N
VM-9-88	<5	N	N	3,000	N	<20	<5	N	N
VM-22-88	15	N	N	500	7	<20	5	15	N
VM-23-88	15	N	N	1,000	10	<20	5	15	N
VM-24-88	15	N	N	300	<5	<20	<5	15	N
VB-02-88	20	N	<50	100	<5	<20	<5	15	N
VB-03-88	50	N	70	50	15	30	<5	20	N
88-GM-5	<5	N	N	150	15	<20	<5	N	N
88-GM-7	15	N	<50	70	N	20	5	10	N
88-GM-8	10	N	N	50	N	30	<5	20	N
88-GM-11	20	N	N	700	N	<20	5	15	N

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Sc ppm-s	Sn ppm-s	Sr ppm-s	Th ppm-s	V ppm-s	W ppm-s	Y ppm-s	Zn ppm-s	Zr ppm-s	Hg-ppm aa
OB 031B	N	N	<100	N	10	N	70	N	700	<.02
OB 031D	N	N	N	N	70	N	100	<200	700	.06
OB 032A	30	N	1,500	N	500	N	30	200	100	<.02
OB 032B	<5	N	N	N	70	N	15	N	70	.04
OB 032D	N	N	100	N	20	N	10	N	15	<.02
OB 035	N	N	N	N	20	N	<10	N	20	.44
OB 036	N	N	N	N	15	N	30	N	300	<.02
OB 037A	N	N	N	N	10	N	100	N	700	.02
OB 037B	N	N	<100	N	15	N	20	N	150	<.02
OB 037D	<5	N	<100	N	15	N	15	N	70	<.02
OB 037E	N	N	N	N	N	N	<10	N	30	<.02
OB 038A	N	N	N	N	<10	N	<10	N	70	.08
OB 038B	N	N	<100	N	N	N	N	N	N	<.02
OB 038D	N	N	N	N	<10	N	<10	N	30	.06
OB 038E	N	N	150	N	<10	N	N	N	N	<.02
OB 038F	<5	N	<100	N	15	N	10	N	70	.10
OB 038G	<5	N	200	N	10	N	15	N	50	2.20
OB 038H	5	N	100	N	30	N	15	N	300	.04
OB 038I	N	N	300	N	N	N	N	N	N	<.02
OB 042	N	N	N	N	15	N	50	N	700	<.02
OB 046	7	N	700	N	N	N	70	N	700	<.02
OB 048	N	N	N	N	<10	N	70	N	700	<.02
VM-4-88	N	N	<100	N	<10	N	30	N	500	<.02
VM-5-88	N	20	<100	N	<10	N	30	N	700	.32
VM-5A-88	N	N	<100	N	15	N	50	N	700	<.02
VM-7-88	N	N	N	N	15	N	N	N	20	<.02
VM-8-88	30	N	700	N	150	N	70	N	200	.12
VM-9-88	N	N	<100	N	70	N	10	N	20	<.02
VM-22-88	<5	N	200	N	15	N	15	N	150	.12
VM-23-88	<5	N	150	N	30	N	15	N	150	.22
VM-24-88	<5	N	150	N	20	N	15	N	200	.72
VB-02-88	N	N	100	N	10	N	30	N	500	.16
VB-03-88	N	N	100	N	<10	N	100	<200	700	.06
88-GM-5	N	N	N	N	<10	N	15	N	70	.06
88-GM-7	N	N	<100	N	<10	N	100	N	500	.14
88-GM-8	N	N	N	N	N	N	70	N	700	.08
88-GM-11	5	N	300	N	30	N	30	N	150	.08

Table 5. Results of analyses of rock samples from the Owyhee Breaks and the Blue Canyon Wilderness Study Areas, Malheur County, Oregon.--Continued

Sample	Au-ppm faa	Ag-ppm icp	As-ppm icp	Au-ppm icp	Bi-ppm icp	Cd-ppm icp	Cu-ppm icp	Mo-ppm icp	Pb-ppm icp	Sb-ppm icp	Zn-ppm icp	F-% si
OB 031B	N	N	70.0	N	N	.120	N	8.20	10.0	1.5	4.20	--
OB 031D	N	N	190.0	N	N	.450	N	.62	10.0	3.3	120.00	--
OB 032A	N	N	N	N	N	N	N	3.00	1.4	N	40.00	--
OB 032B	N	N	50.0	N	N	N	N	.15	2.0	N	20.00	--
OB 032D	N	N	N	N	N	N	N	60.00	N	N	2.50	--
OB 035	N	N	210.0	N	N	N	N	4.10	N	2.4	2.50	--
OB 036	.002	.100	60.0	N	N	.110	N	4.20	10.0	2.0	30.00	--
OB 037A	N	N	4.0	N	N	N	N	1.30	20.0	N	100.00	--
OB 037B	N	N	20.0	N	N	N	4.50	1.30	6.0	N	10.00	--
OB 037D	N	N	1.7	N	N	N	8.30	2.30	1.1	N	20.00	--
OB 037E	N	N	N	N	N	N	1.10	.20	N	N	2.00	--
OB 038A	N	N	1.6	N	N	N	4.00	.10	2.1	N	10.00	--
OB 038B	.002	N	N	N	N	N	2.20	.34	N	N	.88	--
OB 038D	.010	N	1.7	N	N	N	4.00	.41	2.2	N	8.40	--
OB 038E	.006	N	20.0	N	N	N	1.00	.23	N	N	.55	--
OB 038F	.002	N	4.8	N	N	.080	5.80	2.40	5.4	N	20.00	--
OB 038G	.040	2.300	310.0	N	N	N	5.20	20.00	2.6	10.0	.27	--
OB 038H	.004	N	10.0	N	N	.240	4.30	.17	8.7	N	40.00	--
OB 038I	N	N	N	N	N	N	1.00	N	N	N	.10	--
OB 042	N	N	20.0	N	N	N	7.30	6.00	9.2	N	50.00	--
OB 046	N	N	N	N	N	.110	1.30	.56	10.0	N	110.00	--
OB 048	N	N	20.0	N	N	.130	3.50	4.70	10.0	1.1	40.00	--
VM-4-88	N	.120	30.0	N	N	.056	20.00	5.60	3.3	1.4	10.00	--
VM-5-88	.002	.240	30.0	N	N	N	5.60	10.00	3.8	1.4	40.00	--
VM-5A-88	N	N	40.0	N	N	N	5.80	100.00	8.3	2.5	50.00	--
VM-7-88	N	N	N	N	N	.068	20.00	1.70	1.1	N	7.80	--
VM-8-88	N	N	N	N	N	.265	100.00	1.70	6.3	1.1	130.00	--
VM-9-88	N	N	N	N	N	.372	20.00	.29	N	N	9.10	--
VM-22-88	.002	N	40.0	N	N	.102	10.00	4.60	2.6	1.4	30.00	--
VM-23-88	N	N	50.0	N	N	.151	10.00	6.00	2.6	1.2	20.00	--
VM-24-88	N	N	10.0	N	N	N	8.40	1.70	1.6	N	30.00	--
VB-02-88	N	N	20.0	N	N	N	1.60	4.00	7.8	2.8	9.40	--
VB-03-88	N	N	150.0	N	N	.195	3.00	8.50	20.0	5.5	150.00	--
88-GM-5	N	.140	20.0	N	N	.101	4.30	10.00	3.2	N	20.00	--
88-GM-7	N	N	N	N	N	.428	1.20	.15	4.1	N	60.00	--
88-GM-8	N	N	30.0	N	N	.127	3.00	1.44	10.0	N	40.00	--
88-GM-11	N	.160	4.7	N	N	N	30.00	.95	3.0	1.3	30.00	--

Table 6. Description of rock samples

OB001A	Green sandstone
1B	Petrified wood
2	Silicified tuff and opal
3A	Silicified tuff
3B	Red and black jasper
3D	White tuff
4A	Silicified rock
4B	Calcite vein
5A	Hot springs mud
5B	Silicified breccia
6A	Silicified tuff
6B	Black chert with pyrite
6D	Silicified conglomerate with pyrite
10A	Red silicified tuff
10B	Green silicified tuff
11A	White silicified tuff
11B	Opalized dacite
11D	Black chert
12	Silicified tuff
14A	Tuff breccia
14B	Jasper in glassy volcanic rock
14D	Black chert in glassy volcanic rock
14E	Silicified tuff
15	Silicified tuff
17	Green-black jasper in tuff breccia with pyrite
18A	Limonitic, silicified tuff breccia
18B	Jasper in dacite
20	Rhyolite
23	Rhyolite
24A	Silicified tuff
24B	Silicified breccia with pyrite
24D	Tuff
25A	White banded chalcedony
25B	Opal
25D	Obsidian
27	Tuff--red and buff
28A	Red silicified tuff
28B	Buff silicified tuff
28D	Tuff breccia (picture rock)
28E	Silicified tuff breccia
28F	Green and red jasper in tuff
29	Crystal tuff
30A	Silicified tuff
30B	Tuff breccia
31A	Silicified tuff breccia
31B	Tuff breccia
31D	Tuff
32A	Basalt
32B	Tuff breccia
32D	Calcite vein
35	Silicified tuff

Table 6--continued

36	Silicified tuff
37A	Silicified tuff breccia
37B	Silicified tuff with jasper
37D	Black jasper
37E	Chalcedony
38A	Silicified tuff breccia--Red Butte
38B	Chert and calcite--Red Butte
38D	Vein quartz--Red Butte
38E	Banded chalcedony--Red Butte
38F	Red and green jasper--Red Butte
38G	Silicified breccia--Red Butte
38H	Silicified sandstone--Red Butte
38I	Calcite Vein--Red butte
42	Silicifed tuff
46	Obsidian
48	Silicified tuff breccia
VM-4-88	Lithic lapilli tuff--limonitic breccia
-5-	Lithic lapilli tuff--limonitic breccia, silicified
-5A-	Lithic lapilli tuff--limonitic breccia, silicified
-7-	Ash tuff--silica replacement
-8-	Pyroxine andesite--altered, with pyrite
-9-	Ash tuff--silicified and calcite
-22-	Brecciated dike--silicified, with sulfides
-23-	Brecciated dike--silicified with sulfides
-24-	Brecciated dike--silicified with sulfides
VB-02-88s	Fault breccia--open spaces
VB-03-88s	Fault breccia--argillic alteration
88-GM-5	Birch Creek tuff--silicified
-7	Birch Creek tuff--silicified
-8	Leslie Gulch tuff--silicified, with sulfides
-11	Ash tuff--silicified