UNITED STATES DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Cougar Canyon, Tunnel Spring Wilderness Study Area, (UT-040-123/NV-050-166), Lincoln County, Nevada, and Washington County, Utah.

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. 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 Cougar Canyon/Tunnel Spring Wilderness Study Area, Lincoln County Nevada, and Washington County, Utah.

INTRODUCTION

In May 1988, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Cougar Canyon/Tunnel Spring Wilderness Study Area, (UT-040-123/NV-050-166), Lincoln County, Nevada, and Washington County, Utah.

The Cougar Canyon/Tunnel Spring Wilderness Study Area comprises about 10 mi^2 (26km^2) in the western part of Washington County, Utah and the eastern part of Lincoln County, Nevada and lies about 25 mi (40km) east of Caliente, Nevada and about 50 mi (80 km) southwest of Cedar City Utah. (see fig. 1). Access to the study area is provided on the west by an improved light duty road leading east from Caliente and U.S. Highway 93 to Acoma, Nevada, and from there to Beaver Dam State Park via a dirt road. The area is also accessable on the east by a dirt road leading from Utah Highway 120 to Pine Park Canyon.

The study area is situated on a broad, elevated, and deeply dissected volcanic plateau and is underlain by a thick section of dacitic to rhyolitic ash-flow and air-fall tuff of Miocene age, which is derived from the nearby Caliente caldera complex. Rock formations exposed in the study area are described in Conrad and others (1990).

Elevations range from about 5000 ft (1,524 m) at the bottom of Beaver Dam Wash, on the west side of the study area, up to about 6,200 ft (1,890 m) on the plateau, giving a topographic relief of about 1,200 ft (366 m). The highest point is about 7,000 ft (2,134 m) on Big Mountain at the southeast end of the study area. The climate is semiarid.

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

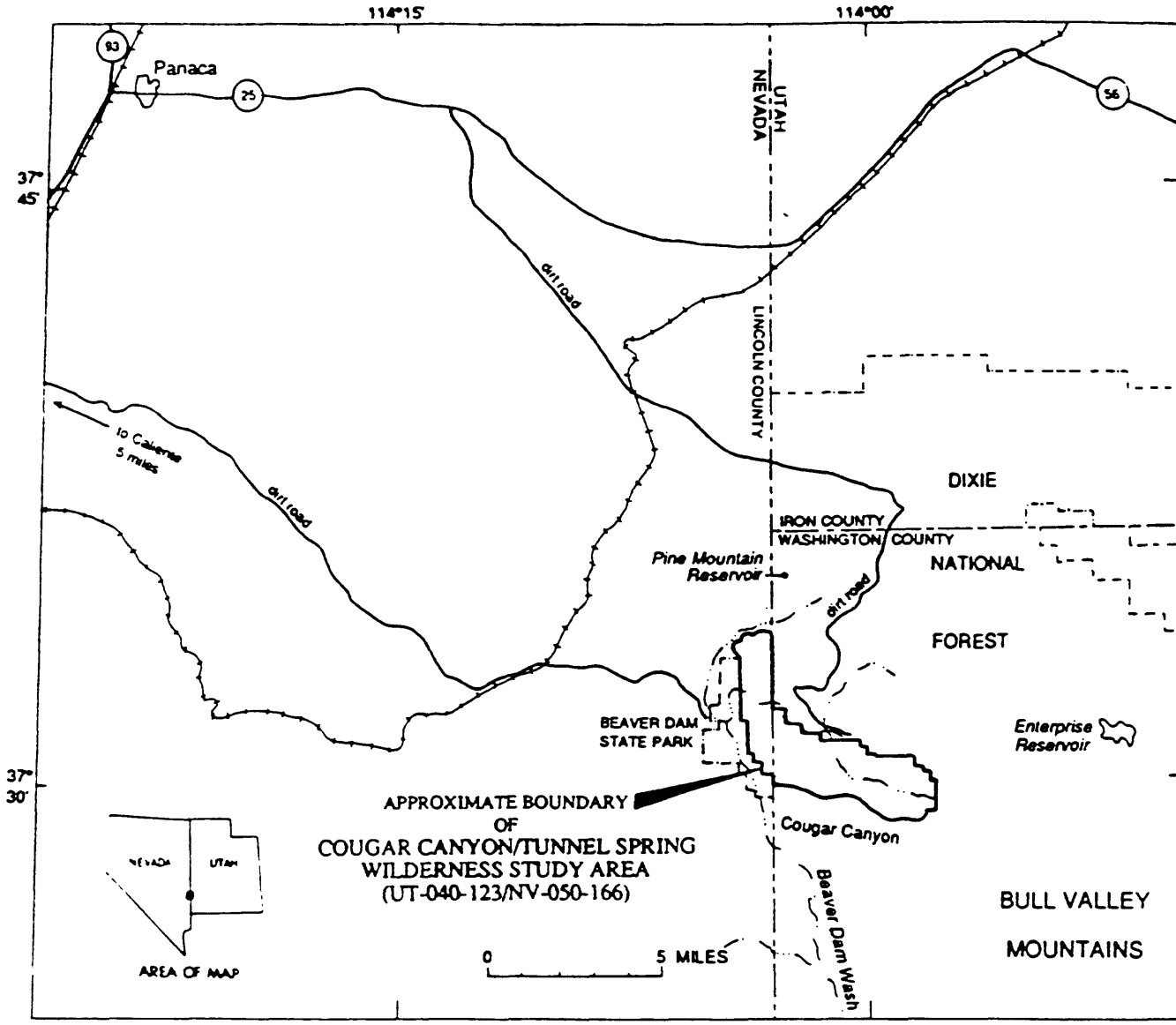

Figure 1. Index map of the Cougar Canyon/Tunnel Spring Wilderness Study Area, Lincoln County, Nevada, and Washington County, Utah.

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 34 sites and heavy-mineral-concentrate samples were collected at 32 sites (fig 2). Rock samples were collected at 26 sites.
Sampling density was about one sample site per 0.7 mi^2 for the stream sediments and heavy-mineral concentrates, and about one sample site per 1.0 mi^2 for the rocks. The area of the drainage basins sampled ranged from about 0.3 mi^2 to 4.00 mi^2.

Stream-sediment samples

The stream-sediment samples consisted of active alluvium collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps. Each sample was a composite derived from several localities within an area that may extend as much as 50 ft from the center of the symbol 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 was 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.Samples that had been panned in the field were 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 sample was separated into three fractions using a large electromagnet (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

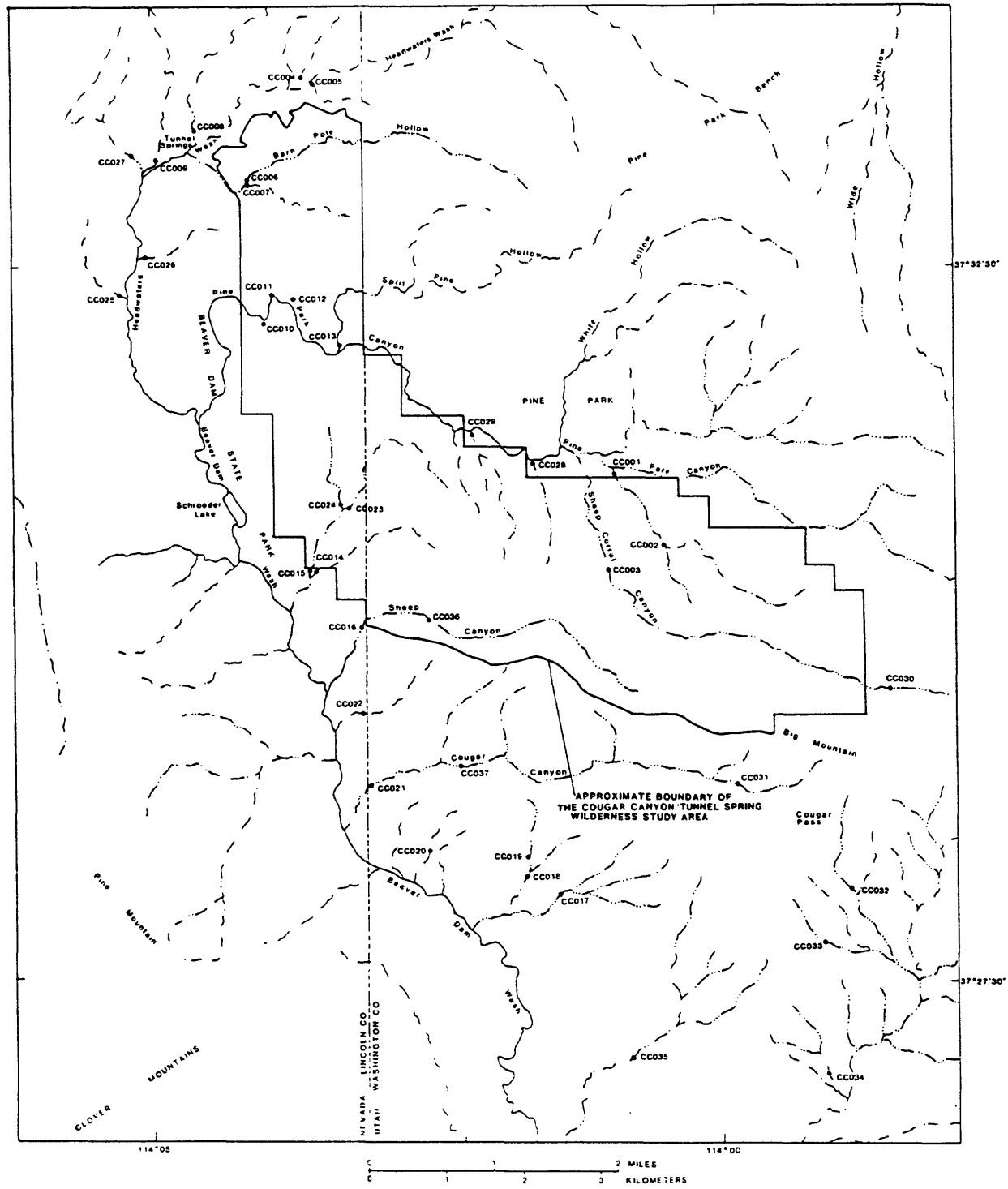

Figure 2. Localities of heavy-mineral-concentrate, stream-sediment, and rock samples from the Cougar Canyon/Tunnel Spring Wilderness Study Area, Lincoln County, Nevada, and Washington County, Utah.

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 and rock samples were analyzed for 35 elements and the heavy-mineral-concentrate samples were analyzed for 37 elements using a semiquantitative, direct-current arc emission spectrographic method (modification of Grimes and Marranzino, 1968). Heavy-mineral-concentrate samples were analyzed for the same elements plus platinum and palladium. The elements analyzed and their lower limits of determination are listed in table 1. Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (iron, magnesium, calcium, sodium, phosphorus, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data are listed in tables 3, 4, and 5 for stream-sediment, heavy-mineral-concentrate, and rock samples, respectively.

Chemical methods

Samples from this study area were also analyzed by other analytical methods. Rocks and stream sediments were analyzed by inductively coupled plasma emission spectroscopy (ICP), and atomic absorption spectroscopy (AA). Arsenic (As), bismuth (Bi), cadmium (Cd), antimony (Sb), and zinc (Zn) were analyzed by ICP, gold (Au) was analyzed by flame AA, and mercury (Hg) by cold vapor AA. See table 2 for limits of determination and references.

Analytical results using these methods are listed in tables 3 and 5.

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 samples 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 (fig. 2). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses, "cvaa" indicates cold vapor atomic absorption analysis; and "icp" indicates inductively coupled plasma-atomic emission spectroscopy; 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. 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 place of an analytical value. Because of the formatting used in the computer program that produced tables 3-5, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) may 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

The authors wish to thank Steve McDanal for assistance with sample collection, and M.S. Erickson and Bruce Roushey for their assistance in the analysis of these samples.

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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, except as noted]

Elements	Lower determination limit	Upper determination limit
	Percent	
Calcium (Ca)	.05	20
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Sodium (Na)	0.2	5
Phosphorus (P)	0.2	10
Titanium (Ti)	.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.

TABLE 2.--Chemical methods used

[AA = atomic absorption; ICP = inductively coupled plasma spectroscopy]

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Reference
Gold (Au)	rock	AA	.1	Modification of Thompson and others, 1968.
Mercury (Hg)	rock	CVAA	0.02	Koirtyohann and Khalil, 1976.
Arsenic (As)	rock	ICP	5	Crock and others, 1987.
Antimony (Sb)	rock	ICP	2	
Zinc (Zn)	rock	ICP	2	
Bismuth (Bi)	rock	ICP	2	
Cadmium (Cd)	rock	ICP	0.1	

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE COUGAR CANYON AND TUNNEL SPRING WILDERNESS STUDY AREAS, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.

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

Sample	Latitude	Longitude	Ca-pct. s	Fe-pct. s	Mg-pct. s	Na-pct. s	P-pct. s	Ti-pct. s	Ag-ppm s	As-ppm s
CC 001 S	37 31 2	114 0 55	1.0	10.0	1.0	1.0	<.2	1.0	N	N
CC 002 S	37 30 33	114 0 29	1.0	3.0	.7	1.0	<.2	.3	N	N
CC 003 S	37 30 21	114 0 58	2.0	15.0	1.0	1.0	<.2	>1.0	N	N
CC 004 S	37 33 48	114 3 40	1.0	2.0	1.0	1.0	<.2	.3	N	N
CC 005 S	37 33 45	114 3 23	1.5	1.5	.7	.7	<.2	.3	N	N
CC 006 S	37 33 36	114 4 9	.7	1.5	.5	1.0	<.2	.2	N	N
CC 007 S	37 33 34	114 4 8	.3	1.0	.5	2.0	<.2	.3	N	N
CC 008 S	37 33 27	114 4 37	.5	2.0	.5	2.0	<.2	.3	N	N
CC 009 S	37 33 15	114 4 56	.3	1.5	5.0	2.0	<.2	.2	N	N
CC 013 S	37 31 56	114 3 21	.5	2.0	.5	1.0	<.2	.3	N	N
CC 014 S	37 30 21	114 3 34	.5	10.0	.7	1.5	<.2	1.0	N	N
CC 015 S	37 30 21	114 3 33	1.0	5.0	1.0	1.5	<.2	.5	N	N
CC 016 S	37 29 57	114 3 10	2.0	10.0	1.5	1.0	<.2	1.0	N	N
CC 017 S	37 28 6	114 1 26	1.5	10.0	2.0	1.0	<.2	1.0	N	N
CC 018 S	37 28 13	114 1 43	2.0	15.0	2.0	1.0	<.2	1.0	N	N
CC 019 S	37 28 21	114 1 42	5.0	10.0	2.0	.7	<.2	.7	N	N
CC 020 S	37 28 24	114 2 33	1.5	15.0	3.0	1.0	<.2	1.0	N	N
CC 021 S	37 28 53	114 3 5	2.0	10.0	2.0	1.0	<.2	1.0	N	N
CC 022 S	37 29 21	114 3 8	2.0	15.0	2.0	1.0	<.2	1.0	N	N
CC 023 S	37 39 47	114 3 16	1.0	5.0	1.0	1.0	<.2	.3	N	N
CC 024 S	37 30 49	114 3 20	.7	3.0	.7	2.0	<.2	.7	N	N
CC 025 S	37 32 17	114 5 17	1.0	3.0	.7	.7	<.2	.7	N	N
CC 026 S	37 32 33	114 5 3	1.0	3.0	.7	.7	<.2	.7	N	N
CC 027 S	37 33 16	114 5 10	.7	1.0	.5	1.5	<.2	.2	N	N
CC 028 S	37 31 6	114 1 38	1.0	10.0	1.0	1.0	<.2	1.0	N	N
CC 029 S	37 31 18	114 2 10	1.0	5.0	1.5	1.0	<.2	.3	N	N
CC 030 S	37 29 33	113 58 30	2.0	10.0	1.5	1.0	<.2	>1.0	N	N
CC 031 S	37 28 52	113 59 51	2.0	7.0	1.5	.5	<.2	.7	N	N
CC 032 S	37 28 10	113 58 52	1.5	20.0	1.5	1.0	<.2	1.0	N	N
CC 033 S	37 27 45	113 59 5	1.0	5.0	1.0	.3	<.2	.5	N	N
CC 034 S	37 26 50	113 59 5	1.0	10.0	1.0	1.5	<.2	.7	N	N
CC 035 S	37 26 57	114 0 48	2.0	7.0	2.0	1.0	<.2	.7	N	N
CC 036 S	37 30 1	114 2 34	.5	5.0	.7	1.5	<.2	.3	N	N
CC 037 S	37 29 0	114 2 18	1.0	3.0	1.0	2.0	<.2	.2	N	N

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE COUGAR CANYON AND TUNNEL SPRING WILDERNESS STUDY AREAS, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--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	Ga-ppm s	Ge-ppm s
CC 001 S	N	15	500	2.0	N	N	20	70	20	50	N
CC 002 S	N	20	500	2.0	N	N	10	20	20	30	N
CC 003 S	N	10	1,000	1.5	N	N	50	200	70	50	N
CC 004 S	N	50	500	2.0	N	N	<10	15	50	30	N
CC 005 S	N	30	700	2.0	N	N	<10	20	15	20	N
CC 006 S	N	20	300	2.0	N	N	<10	10	5	30	N
CC 007 S	N	15	100	2.0	N	N	<10	10	<5	50	N
CC 008 S	N	20	500	3.0	N	N	<10	10	15	50	N
CC 009 S	N	20	200	3.0	N	N	<10	10	10	50	N
CC 013 S	N	20	200	2.0	N	N	<10	10	15	50	N
CC 014 S	N	10	1,000	1.0	N	N	15	20	20	70	N
CC 015 S	N	20	1,000	3.0	N	N	<10	20	15	30	N
CC 016 S	N	20	1,000	1.5	N	N	20	100	30	50	N
CC 017 S	N	<10	1,000	<1.0	N	N	50	150	100	30	N
CC 018 S	N	10	1,000	1.0	N	N	70	200	100	50	N
CC 019 S	N	20	1,000	1.0	N	N	30	200	70	30	N
CC 020 S	N	10	1,000	<1.0	N	N	70	200	100	50	N
CC 021 S	N	15	1,000	1.0	N	N	50	150	50	50	N
CC 022 S	N	15	1,000	1.5	N	N	50	200	70	50	N
CC 023 S	N	10	500	2.0	N	N	<10	<10	10	30	N
CC 024 S	N	10	700	2.0	N	N	<10	10	7	50	N
CC 025 S	N	20	700	2.0	N	N	10	15	20	30	N
CC 026 S	N	15	300	1.5	N	N	<10	10	15	20	N
CC 027 S	N	15	200	5.0	N	N	<10	<10	5	50	N
CC 028 S	N	10	1,000	1.5	N	N	20	10	7	30	N
CC 029 S	N	10	200	3.0	N	N	<10	<10	5	50	N
CC 030 S	N	15	1,000	1.0	N	N	30	150	70	30	N
CC 031 S	N	10	1,000	1.0	N	N	20	150	50	15	N
CC 032 S	N	15	1,000	1.0	N	N	50	150	70	30	N
CC 033 S	N	<10	1,000	1.0	N	N	15	70	30	10	N
CC 034 S	N	10	1,000	1.0	N	N	50	50	50	30	N
CC 035 S	N	10	1,500	1.5	N	N	30	50	50	50	N
CC 036 S	N	<10	300	<1.0	N	N	20	50	30	50	N
CC 037 S	N	<10	300	1.0	N	N	30	70	20	30	N

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE COUGAR CANYON AND TUNNEL SPRING WILDERNESS STUDY AREAS, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	La-ppm s	Mn-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	Th-ppm s	V-ppm s
CC 001 S	300	2,000	N	30	20	30	N	15	N	200	N	200
CC 002 S	50	1,000	N	20	15	50	N	7	N	300	N	50
CC 003 S	200	1,500	N	20	70	30	N	20	N	500	N	300
CC 004 S	N	1,000	<5	<20	10	20	N	7	N	100	N	50
CC 005 S	<50	700	<5	<20	20	20	N	7	N	100	N	30
CC 006 S	<50	1,000	<5	<20	5	30	N	5	N	100	N	20
CC 007 S	50	1,000	5	<20	<5	50	N	<5	N	<100	N	15
CC 008 S	50	1,500	<5	20	5	50	N	5	N	100	N	50
CC 009 S	<50	1,500	5	<20	5	30	N	5	N	100	N	20
CC 013 S	70	1,000	<5	20	7	50	N	7	N	150	N	30
CC 014 S	150	1,500	<5	20	15	20	N	15	N	200	N	100
CC 015 S	70	1,500	<5	20	10	20	N	10	N	500	N	50
CC 016 S	150	1,500	<5	20	50	30	N	15	N	500	N	200
CC 017 S	100	2,000	<5	N	100	20	N	20	N	1,000	N	300
CC 018 S	50	2,000	<5	N	100	20	N	30	N	1,000	N	300
CC 019 S	50	1,500	<5	N	50	20	N	15	N	500	N	300
CC 020 S	<50	1,500	N	N	70	20	N	20	N	700	N	300
CC 021 S	50	1,000	N	N	50	30	N	20	N	700	N	200
CC 022 S	100	1,500	N	<20	50	30	N	20	N	700	N	200
CC 023 S	150	1,500	N	<20	7	20	N	7	N	300	N	30
CC 024 S	70	1,000	N	20	5	50	N	7	N	200	N	20
CC 025 S	70	1,000	N	<20	10	30	N	7	N	200	N	50
CC 026 S	70	1,500	N	20	10	20	N	7	N	150	N	50
CC 027 S	70	700	5	20	5	50	N	5	N	100	N	20
CC 028 S	70	2,000	N	20	5	30	N	15	N	200	N	70
CC 029 S	100	1,500	N	30	<5	50	N	5	N	150	N	50
CC 030 S	50	2,000	N	<20	100	30	N	20	N	300	N	300
CC 031 S	100	1,500	N	N	50	15	N	20	N	300	N	200
CC 032 S	<50	2,000	N	<20	70	30	N	30	N	500	N	300
CC 033 S	100	1,000	N	N	20	10	N	30	N	200	N	150
CC 034 S	<50	1,500	N	<20	30	20	N	30	N	500	N	200
CC 035 S	50	1,500	N	N	30	50	N	30	N	700	N	150
CC 036 S	100	200	N	20	50	30	N	7	N	200	N	70
CC 037 S	50	300	N	N	20	20	N	10	N	300	N	100

TABLE 3--ANALYTICAL RESULTS OF STREAM-SEDIMENT SAMPLES FROM THE COUGAR CANYON AND TUNNEL SPRING WILDERNESS STUDY AREAS, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Au-ppm aa	Hg-ppm cvaa	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
CC 001 S	<20	70	<200	1,000	N	.04	<5	<2	.5	<2	88
CC 002 S	<20	30	N	200	N	.04	<5	<2	.3	<2	51
CC 003 S	N	50	<200	200	N	.02	<5	<2	1.1	<2	110
CC 004 S	<20	20	N	300	N	.02	<5	<2	.3	<2	41
CC 005 S	<20	20	N	500	N	.02	<5	<2	.3	<2	36
CC 006 S	<20	15	N	200	N	<.02	<5	<2	.2	<2	28
CC 007 S	<20	15	N	300	N	<.02	<5	<2	.2	<2	28
CC 008 S	<20	30	N	300	N	<.02	<5	<2	.2	<2	38
CC 009 S	<20	30	N	200	N	.02	<5	<2	.2	<2	23
CC 013 S	<20	30	N	200	N	.02	<5	<2	.2	<2	45
CC 014 S	<20	50	<200	>1,000	N	.02	<5	<2	.7	<2	140
CC 015 S	<20	30	N	500	N	<.02	<5	<2	.3	<2	59
CC 016 S	N	50	<200	1,000	N	.06	<5	<2	.8	<2	94
CC 017 S	N	20	N	200	N	.08	<5	<2	.7	<2	81
CC 018 S	N	30	200	150	N	.06	<5	<2	.6	<2	67
CC 019 S	<20	20	<200	200	N	.06	<5	<2	.7	<2	58
CC 020 S	N	20	<200	200	N	.08	<5	<2	.9	<2	72
CC 021 S	N	30	<200	200	N	.04	<5	<2	.5	<2	63
CC 022 S	N	50	200	300	N	.04	<5	<2	.7	<2	95
CC 023 S	N	30	N	300	N	.02	<5	<2	.3	<2	66
CC 024 S	N	50	N	300	N	.02	<5	<2	.2	<2	64
CC 025 S	N	30	N	300	N	.04	<5	<2	.3	<2	51
CC 026 S	N	20	<200	500	N	.04	<5	<2	.4	<2	66
CC 027 S	<20	30	<200	200	N	<.02	<5	<2	<.1	<2	19
CC 028 S	N	50	<200	1,000	N	.02	<5	<2	.5	<2	110
CC 029 S	N	50	N	500	N	.02	<5	<2	.3	<2	71
CC 030 S	N	30	N	500	N	.04	<5	<2	.5	<2	63
CC 031 S	N	50	N	300	N	.16	<5	<2	.6	<2	77
CC 032 S	N	50	200	>1,000	N	.10	<5	<2	.9	<2	98
CC 033 S	N	15	<200	200	N	.10	<5	<2	.7	<2	76
CC 034 S	N	20	<200	300	N	.02	<5	<2	.8	<2	74
CC 035 S	N	20	N	200	N	.04	<5	<2	.7	<2	57
CC 036 S	N	30	N	300	N	.14	16	<2	.4	<2	83
CC 037 S	N	20	N	100	N	.12	9	<2	.5	<2	71

TABLE 4--ANALYTICAL RESULTS OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.

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

Sample	Latitude	Longitude	Ca-pct. s	Fe-pct. s	Mg-pct. s	Na-pct. s	P-pct. s	Ti-pct. s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s
CC 001 S	37 31 2	114 0 55	3.0	.3	.10	1.0	3.0	>2.00	N	N	N	N
CC 002 S	37 30 33	114 0 29	3.0	.5	.15	.5	5.0	>2.00	N	N	N	<20
CC 003 S	37 30 21	114 0 58	3.0	.5	.15	.5	5.0	2.00	N	N	N	<20
CC 004 S	37 33 48	114 3 40	2.0	.7	.20	N	.5	>2.00	N	N	N	50
CC 005 S	37 33 45	114 3 23	1.0	.5	.15	N	.7	>2.00	N	N	N	150
CC 006 S	37 33 36	114 4 9	2.0	.7	.20	<.5	.7	>2.00	N	N	N	70
CC 007 S	37 33 34	114 4 8	3.0	1.0	.30	.5	2.0	>2.00	N	N	N	<20
CC 008 S	37 33 27	114 4 37	3.0	.5	.10	.5	2.0	>2.00	N	N	N	20
CC 009 S	37 33 15	114 4 56	2.0	2.0	.70	1.5	<1.0	3.00	N	N	N	100
CC 013 S	37 31 56	114 3 21	1.0	.5	.20	.7	1.0	2.00	N	N	N	30
CC 014 S	37 30 21	114 3 34	1.5	.3	.07	1.0	1.5	2.00	N	N	N	<20
CC 015 S	37 30 21	114 3 33	2.0	1.0	1.00	.5	1.0	>2.00	N	N	N	20
CC 016 S	37 29 57	114 3 10	3.0	.3	.20	.5	3.0	>2.00	N	N	N	<20
CC 017 S	37 28 6	114 1 26	5.0	.5	.70	.5	3.0	1.50	N	N	N	<20
CC 018 S	37 28 13	114 1 43	2.0	1.0	.30	.5	1.5	.50	N	N	N	<20
CC 020 S	37 28 24	114 2 33	3.0	.5	.50	1.0	2.0	.15	N	N	N	<20
CC 021 S	37 28 53	114 3 5	2.0	.5	.20	1.0	2.0	.20	N	N	N	<20
CC 022 S	37 29 21	114 3 8	3.0	.5	.30	1.0	3.0	>2.00	N	N	N	<20
CC 023 S	37 39 47	114 3 16	2.0	.5	.15	.5	3.0	>2.00	N	N	N	20
CC 024 S	37 30 49	114 3 20	.5	.5	.10	<.5	1.0	1.50	N	N	N	<20
CC 025 S	37 32 17	114 5 17	2.0	.7	.20	<.5	1.5	>2.00	N	N	N	100
CC 026 S	37 32 33	114 5 3	.7	.3	.10	.7	<.5	2.00	N	N	N	30
CC 027 S	37 33 16	114 5 10	3.0	.5	.15	<.5	2.0	>2.00	N	N	N	20
CC 028 S	37 31 6	114 1 38	.5	.5	.10	N	1.5	2.00	N	N	N	<20
CC 029 S	37 31 18	114 2 10	1.0	.7	.20	.7	1.0	1.50	N	N	N	20
CC 030 S	37 29 33	113 58 30	3.0	.3	.15	.7	5.0	1.50	N	N	N	<20
CC 031 S	37 28 52	113 59 51	2.0	.5	.20	1.0	2.0	.50	N	N	N	<20
CC 032 S	37 28 10	113 58 52	7.0	.3	.15	.5	7.0	>2.00	N	N	N	<20
CC 034 S	37 26 50	113 59 5	2.0	.7	.50	1.0	5.0	.50	N	N	N	<20
CC 035 S	37 26 57	114 0 48	3.0	.7	.20	.5	5.0	.50	N	N	N	<20
CC 036 S	37 30 1	114 2 34	1.5	.5	.30	1.0	1.0	>2.00	N	N	N	<20
CC 037 S	37 29 0	114 2 18	2.0	.7	.50	1.0	1.5	.70	N	N	N	<20

TABLE 4--ANALYTICAL RESULTS OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	Ba-ppm s	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	Nb-ppm s
CC 001 S	500	<2	N	N	N	20	N	15	N	700	500	N	100
CC 002 S	300	2	N	N	N	30	N	<10	N	1,000	700	N	70
CC 003 S	500	2	N	N	N	<20	N	10	N	700	500	N	50
CC 004 S	200	3	N	N	N	50	1,500	<10	N	700	1,000	N	50
CC 005 S	200	3	N	N	N	70	N	<10	N	700	300	N	50
CC 006 S	500	2	N	N	N	50	<10	<10	N	1,000	700	N	70
CC 007 S	200	2	N	N	N	<20	<10	10	N	1,500	1,500	N	100
CC 008 S	500	2	N	N	N	N	N	<10	N	1,000	700	N	70
CC 009 S	500	5	N	N	<50	50	N	30	N	1,000	2,000	N	150
CC 013 S	300	3	N	N	N	<20	<10	<10	N	700	500	N	50
CC 014 S	700	5	N	N	N	N	N	15	N	300	200	N	<50
CC 015 S	500	5	N	N	N	300	N	<10	N	700	1,000	N	50
CC 016 S	500	3	N	N	N	50	N	<10	N	1,000	700	N	50
CC 017 S	>10,000	<2	N	N	<20	200	<10	10	N	500	1,000	N	70
CC 018 S	>10,000	N	N	N	<20	100	50	15	N	150	500	N	<50
CC 020 S	>10,000	<2	N	N	N	50	10	20	N	200	1,000	N	N
CC 021 S	5,000	<2	N	N	N	<20	<10	20	N	100	500	N	N
CC 022 S	>10,000	<2	N	N	N	50	<10	20	N	700	700	N	100
CC 023 S	300	7	N	N	N	<20	N	<10	N	700	500	N	50
CC 024 S	500	10	N	N	N	N	N	15	N	150	500	N	N
CC 025 S	300	3	N	N	N	50	N	15	N	1,000	500	N	50
CC 026 S	500	3	N	N	N	20	N	20	N	300	200	N	N
CC 027 S	500	2	N	N	N	20	N	15	N	1,500	700	N	70
CC 028 S	300	10	N	N	N	N	N	15	N	200	500	N	N
CC 029 S	300	7	N	N	N	N	N	15	N	300	500	N	N
CC 030 S	500	2	N	N	N	20	<10	15	N	700	700	N	70
CC 031 S	700	<2	N	N	N	50	<10	30	N	200	200	N	<50
CC 032 S	500	<2	N	N	N	20	N	15	N	1,000	1,000	N	70
CC 034 S	>10,000	<2	N	N	<20	20	10	20	N	300	500	N	N
CC 035 S	>10,000	<2	N	N	N	<20	<10	10	N	500	500	N	<50
CC 036 S	300	2	N	N	<20	50	<10	<10	N	300	200	N	100
CC 037 S	10,000	N	N	N	<20	30	<10	<10	N	150	200	N	70

TABLE 4--ANALYTICAL RESULTS OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	Ni-ppm s	Pb-ppm s	Pd-ppm s	Pt-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	Zr-ppm s
CC 001 S	<10	<20	N	N	N	N	150	500	N	50	N	500	N	>2,000
CC 002 S	<10	N	N	N	N	20	50	<200	200	100	N	1,000	N	>2,000
CC 003 S	<10	N	N	N	N	10	20	500	200	50	N	700	N	>2,000
CC 004 S	<10	N	N	N	300	70	2,000	<200	N	100	N	1,000	N	>2,000
CC 005 S	20	20	N	N	N	100	100	<200	<200	150	N	1,000	N	>2,000
CC 006 S	10	20	N	N	N	70	300	<200	<200	150	N	1,000	N	>2,000
CC 007 S	<10	<20	N	N	N	50	1,000	<200	N	150	N	1,000	N	>2,000
CC 008 S	N	N	N	N	N	50	300	<200	N	100	N	1,000	N	>2,000
CC 009 S	<20	20	N	N	N	5	N	N	N	100	N	500	N	>5,000
CC 013 S	15	<20	N	N	N	20	300	<200	<200	70	N	700	N	>2,000
CC 014 S	10	N	N	N	N	10	<20	300	N	50	N	500	N	>2,000
CC 015 S	20	N	N	N	N	50	20	<200	N	100	N	700	N	>2,000
CC 016 S	10	N	N	N	N	20	30	200	N	70	N	1,000	N	>2,000
CC 017 S	30	10	N	N	N	<10	<20	2,000	N	50	N	200	N	>2,000
CC 018 S	15	10	N	N	N	N	<20	3,000	N	70	N	100	N	>2,000
CC 020 S	<10	N	N	N	N	N	N	2,000	N	20	N	70	N	>2,000
CC 021 S	<10	N	N	N	N	N	N	1,000	N	20	N	100	N	>2,000
CC 022 S	<10	20	N	N	N	<10	50	1,000	N	100	N	700	N	>2,000
CC 023 S	10	N	N	N	N	20	70	N	<200	100	N	700	N	>2,000
CC 024 S	20	N	N	N	N	50	N	N	N	50	N	1,000	N	>2,000
CC 025 S	10	20	N	N	N	50	20	N	<200	150	N	1,000	N	>2,000
CC 026 S	<10	N	N	N	N	30	1,000	N	N	50	N	500	N	>2,000
CC 027 S	<10	N	N	N	N	50	100	N	N	150	N	700	N	>2,000
CC 028 S	20	N	N	N	N	70	20	N	<200	70	N	700	N	>2,000
CC 029 S	<10	N	N	N	N	50	300	N	N	50	N	700	N	>2,000
CC 030 S	<10	N	N	N	N	10	<20	500	200	70	N	300	N	>2,000
CC 031 S	<10	N	N	N	N	<10	N	1,500	<200	20	N	100	N	>2,000
CC 032 S	<10	N	N	N	N	10	<20	500	200	100	N	500	N	>2,000
CC 034 S	10	50	N	N	N	<10	N	1,000	N	50	N	150	N	>2,000
CC 035 S	10	20	N	N	N	<10	N	1,000	<200	30	N	200	N	>2,000
CC 036 S	10	<20	N	N	N	15	30	<200	<200	50	N	500	N	>2,000
CC 037 S	10	<20	N	N	N	10	20	500	N	50	N	150	N	>2,000

TABLE 5--ANALYTICAL RESULTS OF ROCK SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.

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

Sample	Latitude	Longitude	Ca-pct. s	Fe-pct. s	Mg-pct. s	Na-pct. s	P-pct. s	Ti-pct. s	Ag-ppm s	As-ppm s
CC001R	37 31 2	114 0 55	.30	.5	.15	1.0	N	.030	N	N
CC002R	37 30 33	114 0 29	.30	.5	.15	.7	N	.030	N	N
CC003R	37 30 21	114 0 58	.20	1.5	.20	3.0	<.2	.150	N	N
CC006R1	37 33 36	114 4 9	.30	.5	.15	1.0	N	.050	N	N
CC006R2	37 33 36	114 4 9	.05	.5	.03	2.0	N	.050	N	N
CC009R	37 33 15	114 4 56	.05	.3	.02	1.0	N	.020	N	N
CC010R	37 32 5	114 4 1	.70	3.0	.50	3.0	.2	.700	N	N
CC011R1	37 32 17	114 3 57	.70	2.0	.50	2.0	.2	.500	N	N
CC011R2	37 32 17	114 3 57	.70	3.0	.70	2.0	.2	.500	<.5	N
CC012R	37 32 15	114 3 45	.20	.5	.15	1.0	N	.020	N	N
CC013R	37 31 56	114 3 21	.70	3.0	.50	2.0	.2	.700	N	N
CC016R1	37 29 57	114 3 10	.20	1.0	.20	2.0	<.2	.100	N	N
CC016R2	37 29 57	114 3 10	.50	1.5	.30	2.0	<.2	.200	N	N
CC018R2	37 28 13	114 1 43	<.05	2.0	<.02	<.2	.2	.200	N	N
CC020R1	37 28 24	114 2 33	<.05	.2	<.02	.2	.2	.150	N	N
CC020R2	37 28 24	114 2 33	1.50	3.0	1.50	2.0	.2	.500	.5	N
CC020R3	37 28 24	114 2 33	1.00	2.0	1.50	2.0	<.2	.200	N	N
CC021R	37 28 53	114 3 5	1.00	2.0	1.00	2.0	<.2	.300	N	N
CC024R	37 30 49	114 3 20	.20	.7	.30	2.0	<.2	.100	N	N
CC025R	37 32 17	114 5 17	.20	.5	.10	2.0	N	.020	N	N
CC030R1	37 29 33	113 58 30	1.00	3.0	1.00	1.5	<.2	.300	N	N
CC030R2	37 29 33	113 58 30	1.00	3.0	1.00	2.0	<.2	.500	N	N
CC030R3	37 29 33	113 58 30	1.00	2.0	.70	2.0	<.2	.500	N	N
CC031R	37 28 52	113 59 51	.07	.2	.10	<.2	<.2	.015	N	N
CC035R1	37 26 57	114 0 48	.70	2.0	.50	2.0	<.2	.200	1.0	N
CC035R2	37 26 57	114 0 48	.15	1.5	.70	1.5	<.2	.200	<.5	N

TABLE 5--ANALYTICAL RESULTS OF ROCK SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--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	Ga-ppm s	Ge-ppm s
CC001R	N	10	50	2.0	N	N	N	N	<5	20	N
CC002R	N	<10	30	1.5	N	N	N	N	<5	15	N
CC003R	N	15	300	1.0	N	N	<10	N	<5	30	N
CC006R1	N	<10	70	2.0	N	N	N	N	<5	20	N
CC006R2	N	10	20	<1.0	N	N	N	N	N	20	N
CC009R	N	10	<20	1.5	N	N	N	N	N	15	N
CC010R	N	<10	500	<1.0	N	N	15	N	<5	30	N
CC011R1	N	<10	700	<1.0	N	N	10	N	<5	30	N
CC011R2	N	<10	700	<1.0	N	N	10	N	<5	50	N
CC012R	N	<10	20	2.0	N	N	<10	N	N	20	N
CC013R	N	<10	500	<1.0	N	N	10	N	<5	30	N
CC016R1	N	15	200	1.0	N	N	<10	<10	5	30	N
CC016R2	N	20	300	<1.0	N	N	10	10	15	30	N
CC018R2	N	15	150	N	N	N	N	70	30	15	N
CC020R1	N	15	100	N	N	N	N	50	5	20	<10
CC020R2	N	10	700	<1.0	N	N	20	50	20	20	N
CC020R3	N	10	300	<1.0	N	N	20	30	15	30	N
CC021R	N	10	300	N	N	N	20	30	30	30	N
CC024R	N	20	150	1.0	N	N	N	N	<5	30	N
CC025R	N	10	20	2.0	N	N	N	N	N	30	N
CC030R1	N	10	500	<1.0	N	N	20	20	15	30	N
CC030R2	N	10	500	N	N	N	20	20	20	30	N
CC030R3	N	<10	500	<1.0	N	N	20	20	20	30	N
CC031R	N	15	100	N	N	N	N	N	20	N	N
CC035R1	N	<10	300	N	N	N	15	<10	20	20	N
CC035R2	N	<10	500	<1.0	N	N	15	15	20	30	N

TABLE 5--ANALYTICAL RESULTS OF ROCK SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	La-ppm s	Mn-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	Th-ppm s	V-ppm s
CC001R	100	200	N	<20	<5	20	N	N	N	100	N	10
CC002R	<50	100	N	<20	<5	15	N	N	N	150	N	10
CC003R	150	200	N	20	<5	20	N	<5	N	<100	N	10
CC006R1	<50	100	N	<20	<5	20	N	<5	N	100	N	10
CC006R2	100	100	N	20	<5	20	N	<5	N	N	N	10
CC009R	<50	150	N	<20	<5	15	N	N	N	N	N	<10
CC010R	150	150	N	<20	<5	15	N	10	N	300	N	30
CC011R1	150	200	N	<20	<5	20	N	7	N	300	N	30
CC011R2	150	200	N	<20	<5	20	N	10	N	500	N	50
CC012R	<50	100	N	<20	<5	20	N	N	N	150	N	<10
CC013R	150	300	N	<20	<5	15	N	10	N	300	N	50
CC016R1	100	150	N	<20	10	50	N	<5	N	150	N	30
CC016R2	100	70	N	<20	20	30	N	7	N	200	N	30
CC018R2	100	<10	N	N	<5	20	N	15	N	700	N	100
CC020R1	<50	<10	N	N	<5	15	N	5	N	500	N	70
CC020R2	150	500	N	<20	50	20	N	20	N	700	N	150
CC020R3	100	200	N	N	50	15	N	15	N	500	N	70
CC021R	100	200	N	N	50	20	N	15	N	300	N	70
CC024R	100	200	N	<20	<5	30	N	<5	N	<100	N	15
CC025R	100	200	N	20	<5	30	N	N	N	100	N	<10
CC030R1	150	200	N	<20	50	30	N	10	N	700	N	70
CC030R2	150	200	N	<20	70	20	N	15	N	500	N	70
CC030R3	150	200	N	<20	50	15	N	10	N	700	N	50
CC031R	N	100	N	N	<5	<10	N	N	N	N	N	<10
CC035R1	100	150	N	<20	15	20	N	7	N	300	N	50
CC035R2	<50	200	N	<20	20	20	N	7	N	200	N	70

TABLE 5--ANALYTICAL RESULTS OF ROCK SAMPLES FROM THE COUGAR CANYON/TUNNEL SPRING WILDERNESS STUDY AREA, LINCOLN COUNTY, NEVADA, AND WASHINGTON COUNTY, UTAH.--Continued

Sample	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Au-ppm aa	Hg-ppm cvaa	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
CC001R	N	30	N	70	N	.02	10	<2	.1	<2	57
CC002R	N	15	N	70	N	N	7	<2	.1	<2	58
CC003R	N	30	N	200	N	N	<5	<2	.2	<2	54
CC006R1	N	15	N	50	N	N	5	<2	<.1	<2	30
CC006R2	N	15	N	70	N	N	<5	<2	<.1	<2	22
CC009R	N	10	N	50	N	N	<5	<2	<.1	<2	28
CC010R	N	20	N	100	N	.12	<5	<2	.4	<2	100
CC011R1	N	20	N	100	N	N	<5	<2	.4	<2	76
CC011R2	N	20	N	100	N	.04	<5	<2	.3	<2	62
CC012R	N	20	N	70	N	N	<5	<2	<.1	<2	38
CC013R	N	20	N	100	N	N	<5	<2	.4	<2	95
CC016R1	N	10	N	70	N	.02	6	<2	<.1	<2	41
CC016R2	N	10	N	70	N	.02	<5	<2	.2	<2	36
CC018R2	N	<10	N	70	N	.10	<5	<2	.2	<2	7
CC020R1	N	N	N	50	N	.68	<5	<2	<.1	<2	<2
CC020R2	N	20	N	100	N	N	9	<2	.3	<2	23
CC020R3	N	15	N	70	N	N	<5	<2	<.1	<2	28
CC021R	N	15	N	70	N	.04	<5	<2	.3	<2	56
CC024R	N	15	N	70	N	.06	<5	<2	.2	<2	38
CC025R	N	20	N	100	N	.02	<5	<2	.2	<2	60
CC030R1	N	15	N	100	N	.08	<5	<2	.3	<2	46
CC030R2	N	20	N	100	N	.02	<5	<2	.4	<2	66
CC030R3	N	15	N	100	N	.06	<5	<2	.4	<2	57
CC031R	N	N	N	N	N	N	<5	<2	<.1	<2	10
CC035R1	N	15	N	50	N	N	<5	<2	.4	<2	32
CC035R2	N	10	N	100	N	.02	<5	<2	.3	<2	53

Table 6. Description of rock samples

SAMPLE	DESCRIPTION
CC 001R	Welded tuff
CC 002	Welded tuff
CC 003	Welded tuff
CC 006R1	Welded tuff
CC 006R2	Welded tuff
CC 009	Welded tuff
CC 010	Welded tuff
CC 011R1	Welded tuff
CC 011R2	Welded tuff
CC 012	Welded tuff
CC 013	Welded tuff
CC 016R1	Welded tuff
CC 016R2	Welded tuff
CC 018R2	Altered rock, white, limonite on weathered surfaces.
CC 020R1	Altered rock, white.
CC 020R2	Welded tuff, grayish red.
CC 020R3	Welded tuff
CC 021	Welded tuff
CC 024	Welded tuff
CC 025	Welded tuff
CC 030R1	Welded tuff
CC 030R2	Welded tuff
CC 030R3	Welded tuff
CC 031	Welded tuff
CC 035R1	Welded tuff
CC 035R2	Welded tuff