UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from the Deep Creek, La Verkin Creek, North Fork Virgin River, Orderville Canyon, and Parunuweap Canyon Wilderness Study Areas, Kane and Washington Counties, 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 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 Deep Creek, La Verkin Creek, North Fork Virgin River, Orderville Canyon, and Parunuweap Canyon Wilderness Study Areas, Kane and Washington Counties, Utah.

INTRODUCTION

In June and July, 1986, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Deep Creek, La Verkin Creek, North Fork Virgin River, Orderville Canyon, and Parunuweap Canyon Wilderness Study Areas in Kane and Washington Counties, Utah.

All of the above wilderness study areas are on the periphery of Zion National Park (fig. 1). Deep Creek Wilderness Study Area (UT-040-146) comprises about 3,320 acres (5 mi^2) in northeast Washington County along the northern boundary of Zion National Park. La Verkin Creek Wilderness Study Area (UT-040-153) comprises about 440 acres (0.7 mi^2) along the northern boundary of Zion National Park in northern Washington County. North Fork Virgin River Wilderness Study Area (UT-040-150) comprises about 1,040 acres (1.6 mi^2) in southwest Kane County along the northern boundary of Zion National Park. Orderville Canyon Wilderness Study Area (UT-040-145) comprises about 1,750 acres (2.7 mi^2) in southwest Kane County along the eastern boundary of Zion National Park. Parunuweap Canyon Wilderness Study Area (UT-040-230) comprises about 14,100 acres (22 mi^2) in southwest Kane County along the eastern boundary of Zion National Park.

Zion National Park is located in southwest Utah near the center of an equilateral triangle formed by Cedar City, Kanab, and St. George, an approximately 25-mi straight line distance from each. Access to near the boundaries of the study areas is provided by dirt roads branching off State Highways 9 and 14.

The wilderness study areas are in the western part of the Colorado Plateau, a tectonically stable province that was uplifted during the Cenozoic Era. Uplift was accompanied here by faulting, basalt volcanism, and deep erosion. The oldest and most widely distributed formation in the area is the Navajo Sandstone of early Jurassic age. This is overlain successively by the Temple Cap Sandstone, the Carmel Formation, Entrada Sandstone, the Summerville Formation, and Morrison Formation, succeded by upper Cretaceous Dakota Sandstone and Tropic Shale. A description of these units can be found in Gregory (1950).

The study area is a high plateau dissected by streams into deep, steep walled canyons. Natural arches, pinnacles, and large areas of "slickrock" are common. Local relief averages about 800 ft. Altitude ranges from a low of 3,800 ft at the confluence of the East and North Forks of the Virgin River to in excess of 7,000 ft on the Upper Kolob Plateau. Douglas fir trees grow along the river canyons and tributary creeks. The uplands support a mixed woodland of pinyon, juniper and scrub oak interspersed with open patches of sagebrush. The area has an arid type of climate and the tributary streams are

mostly ephemeral. Each wilderness study area borders Zion National Park and contains the canyon of a tributary to the Virgin River.

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 a limited number of minerals in rock material eroded from the drainage basin upstream from each sample site. The selective concentration of minerals, some of which may be ore related, permits determination of some elements that are not easily detected in stream-sediment samples.

Sample Collection

Samples were collected at eight sites in Deep Creek WSA, seven sites in La Verkin Creek WSA, two sites in North Fork Virgin River WSA, seven sites in Orderville Canyon WSA, and thirty sites in Parunuweap Canyon WSA (figs. 2-6, respectively). At all sites, both a stream-sediment sample and a heavy-mineral-concentrate sample were collected. Sampling density was about one sample site per 0.6 mi^2. The area of the drainage basins sampled ranged from 0.2 mi^2 to 2.0 mi^2. Sufficient heavy-mineral-concentrate for spectrographic analysis (5 mg) was recovered from all but one sample site. In general, every available tributary drainage to the main canyon of the WSA was sampled.

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) stream as shown on USGS topographic maps (scale = 1:24,000). Each sample was composited from several localities within an area that may extend as much as 50 ft from the site plotted on the map.

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.

Sample Preparation

The stream-sediment samples were air dried, then sieved using an 80-mesh (0.17-mm) stainless-steel sieve. The portion of the sediment passing through the sieve was saved for analysis.

After air drying, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy-mineral concentrate sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily

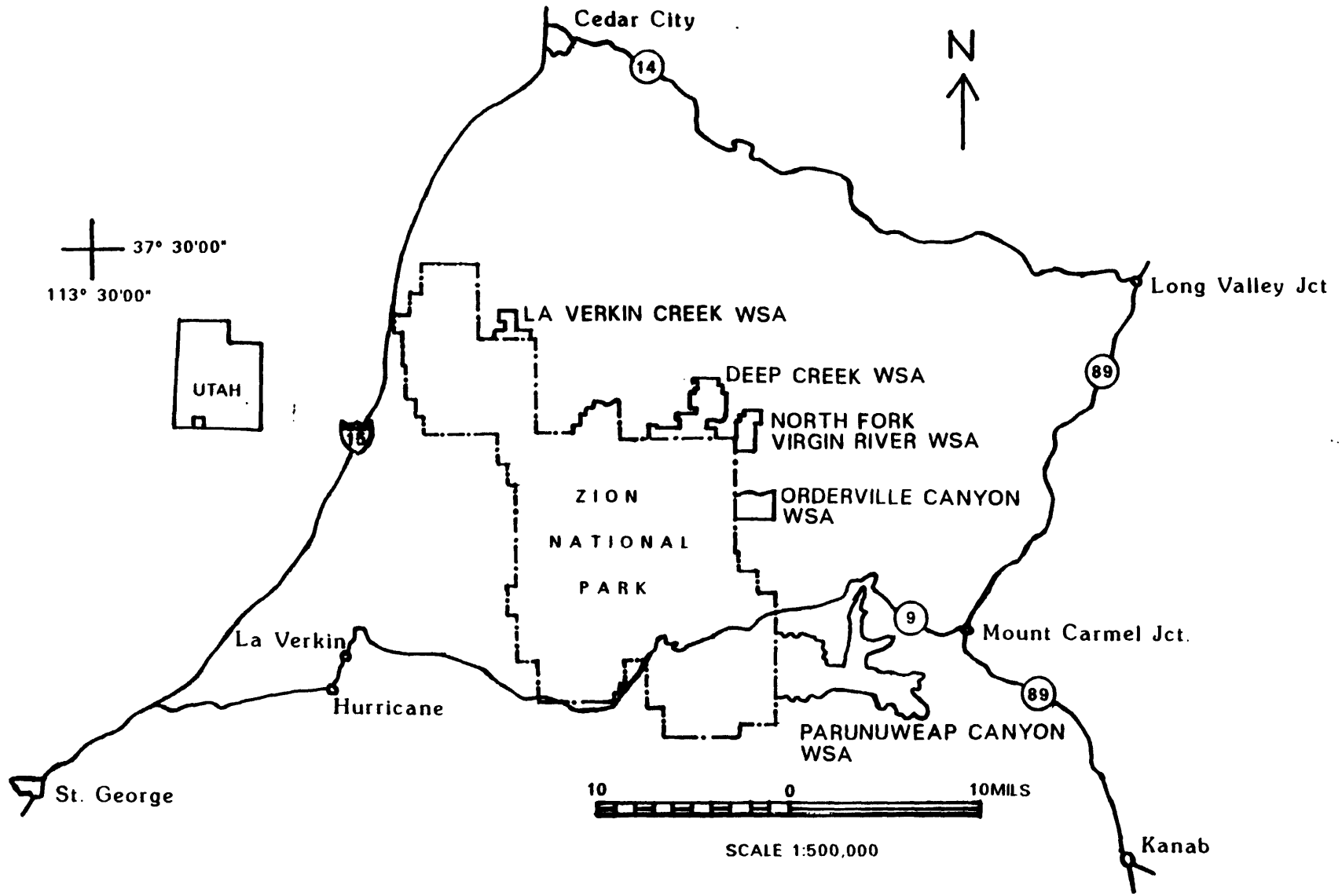

Figure 1. Index map showing location of the Deep Creek, La Verkin Creek, North Fork Virgin River, Orderville Canyon, and Parunuweap Canyon Wilderness Study Areas, Kane and Washington Counties, Utah.

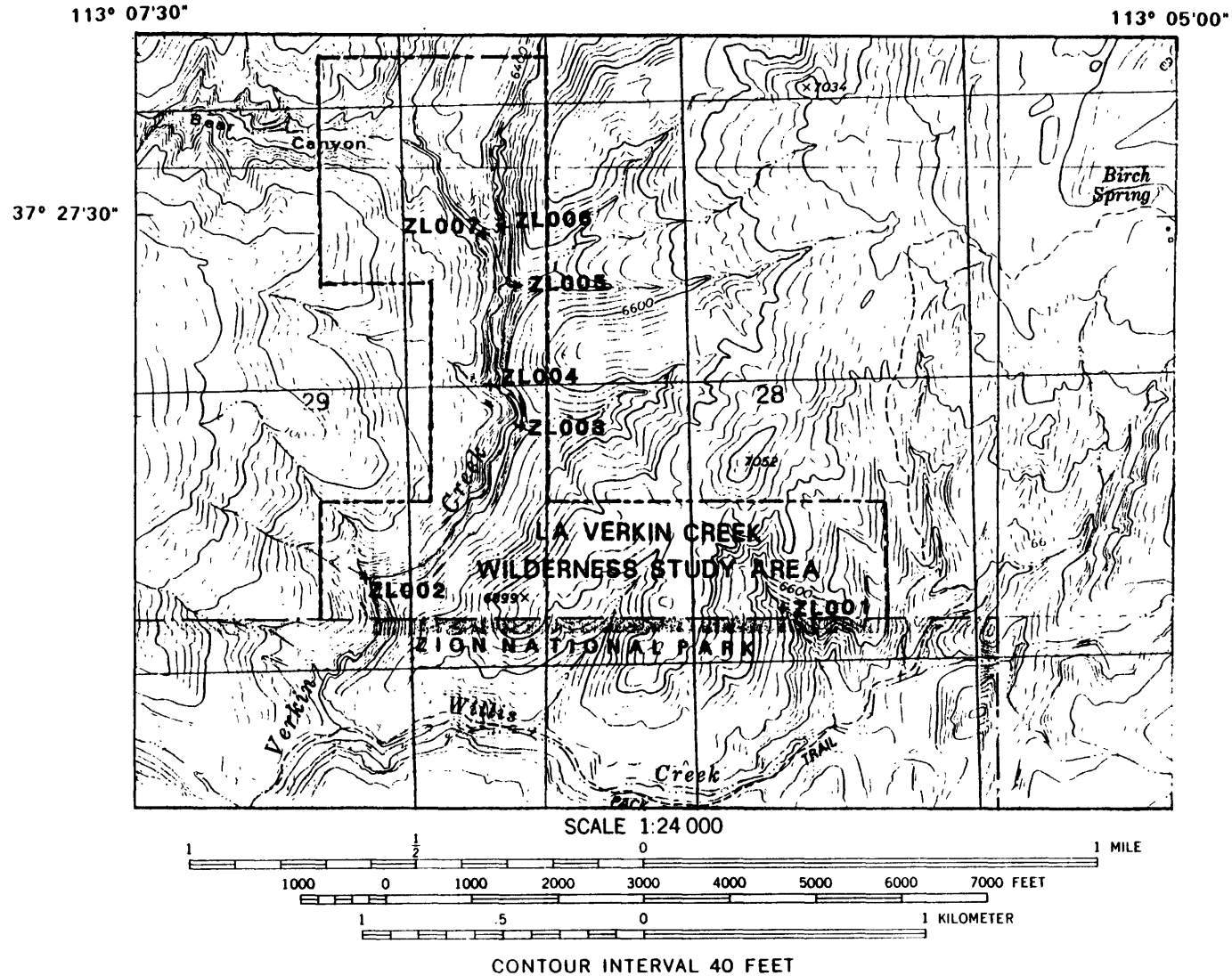

Figure 2. Localities of sample sites, La Verkin Creek Wilderness Study Area (UT-040-153), Washington County, Utah.

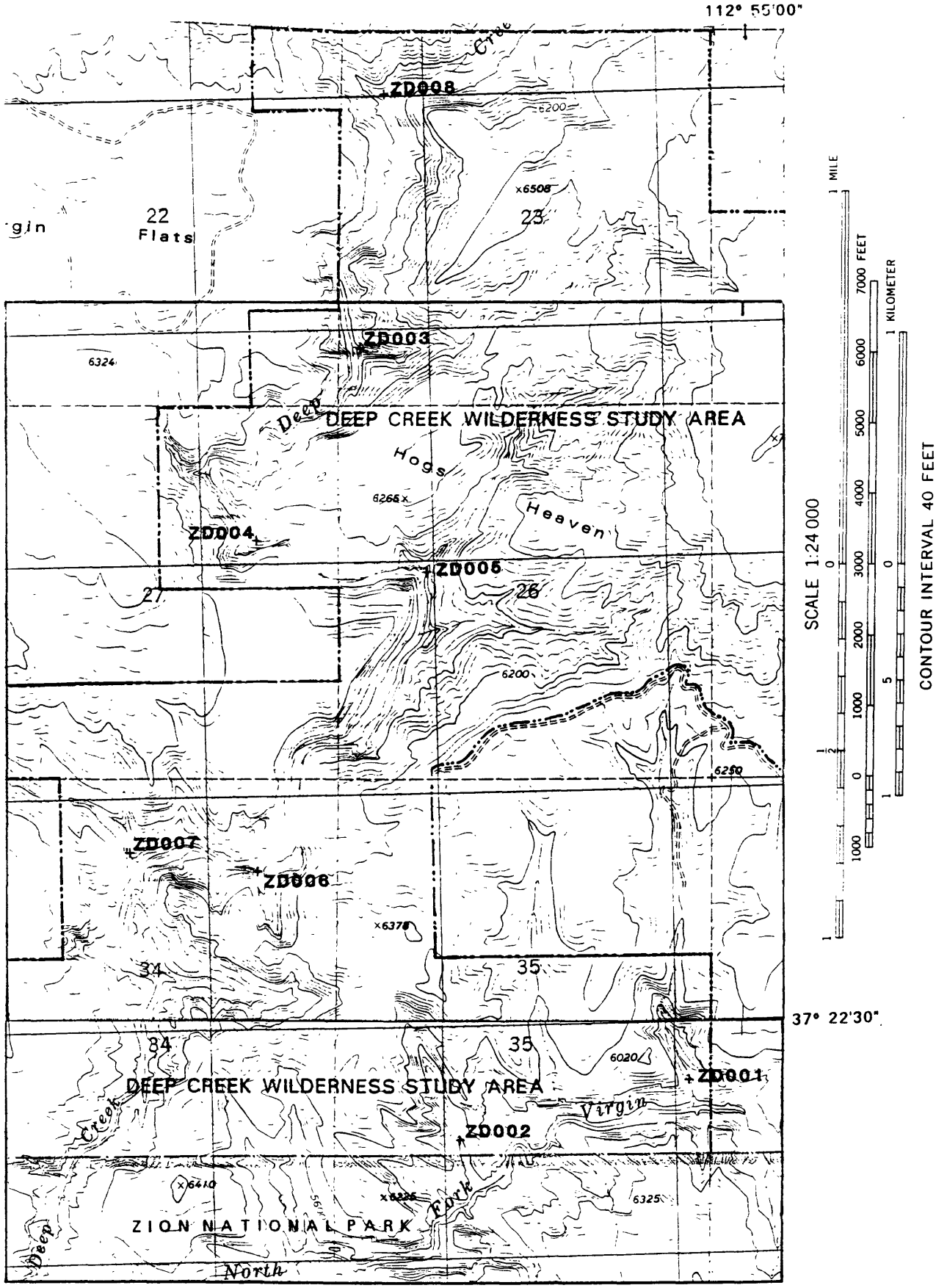

Figure 3. Localities of sample sites, Deep Creek Wilderness Study Area (UT-040-146), Washington County, Utah.

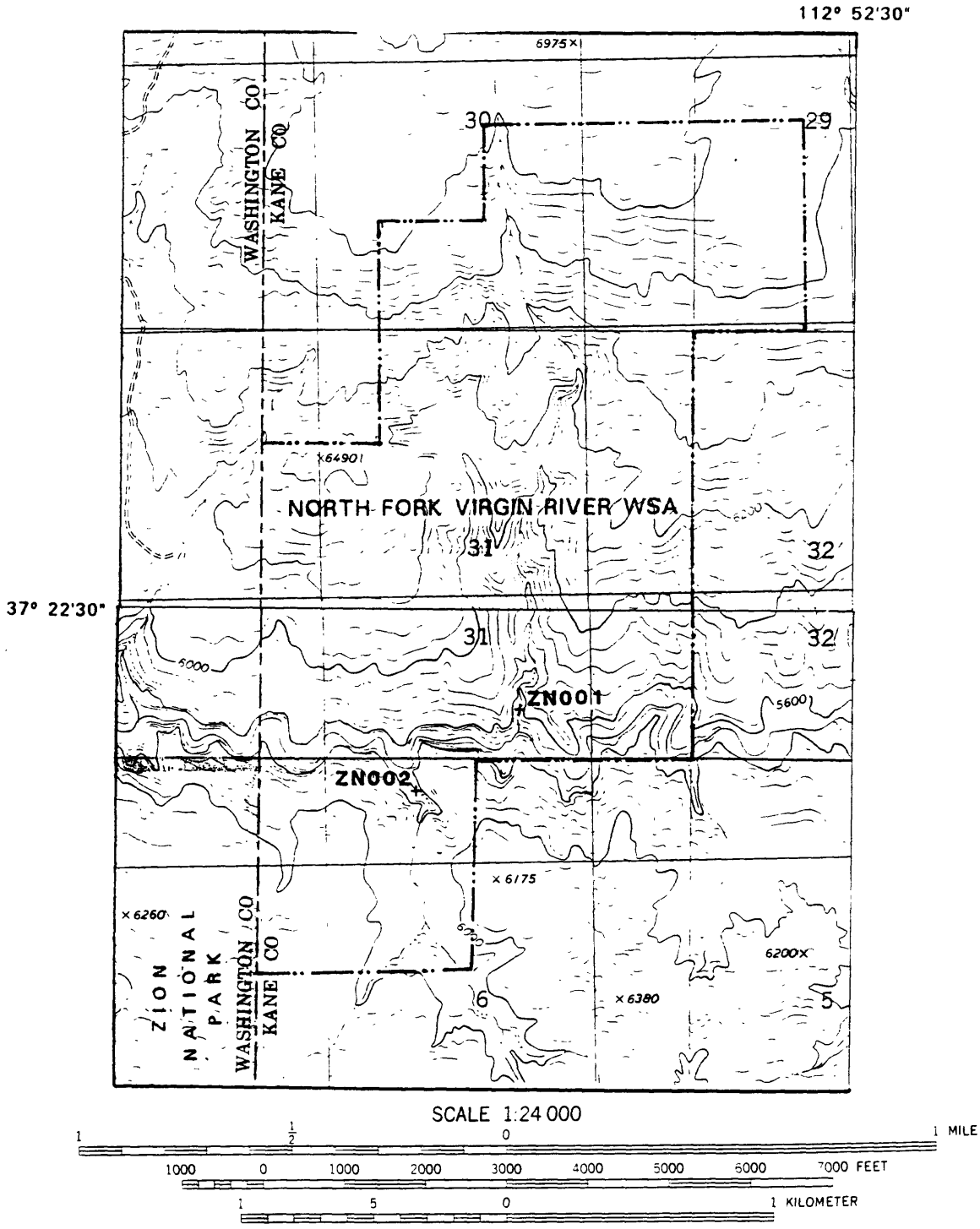

Figure 4. Localities of sample sites, North Fork Virgin River Wilderness Study Area (UT-040-150), Kane County, Utah.

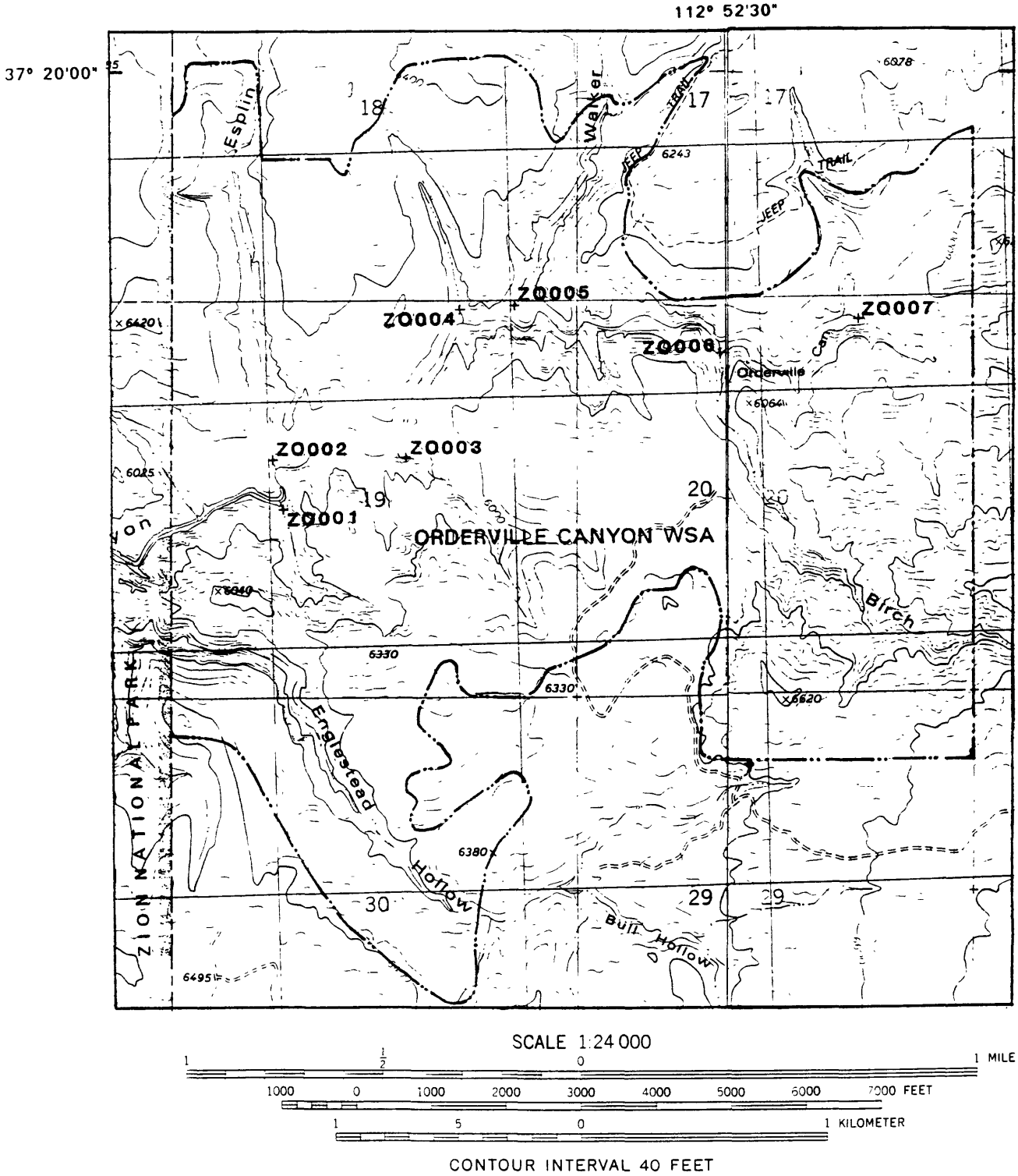

Figure 5. Localities of sample sites, Orderville Canyon Wilderness Study Area (UT-040-145), Kane County, Utah.

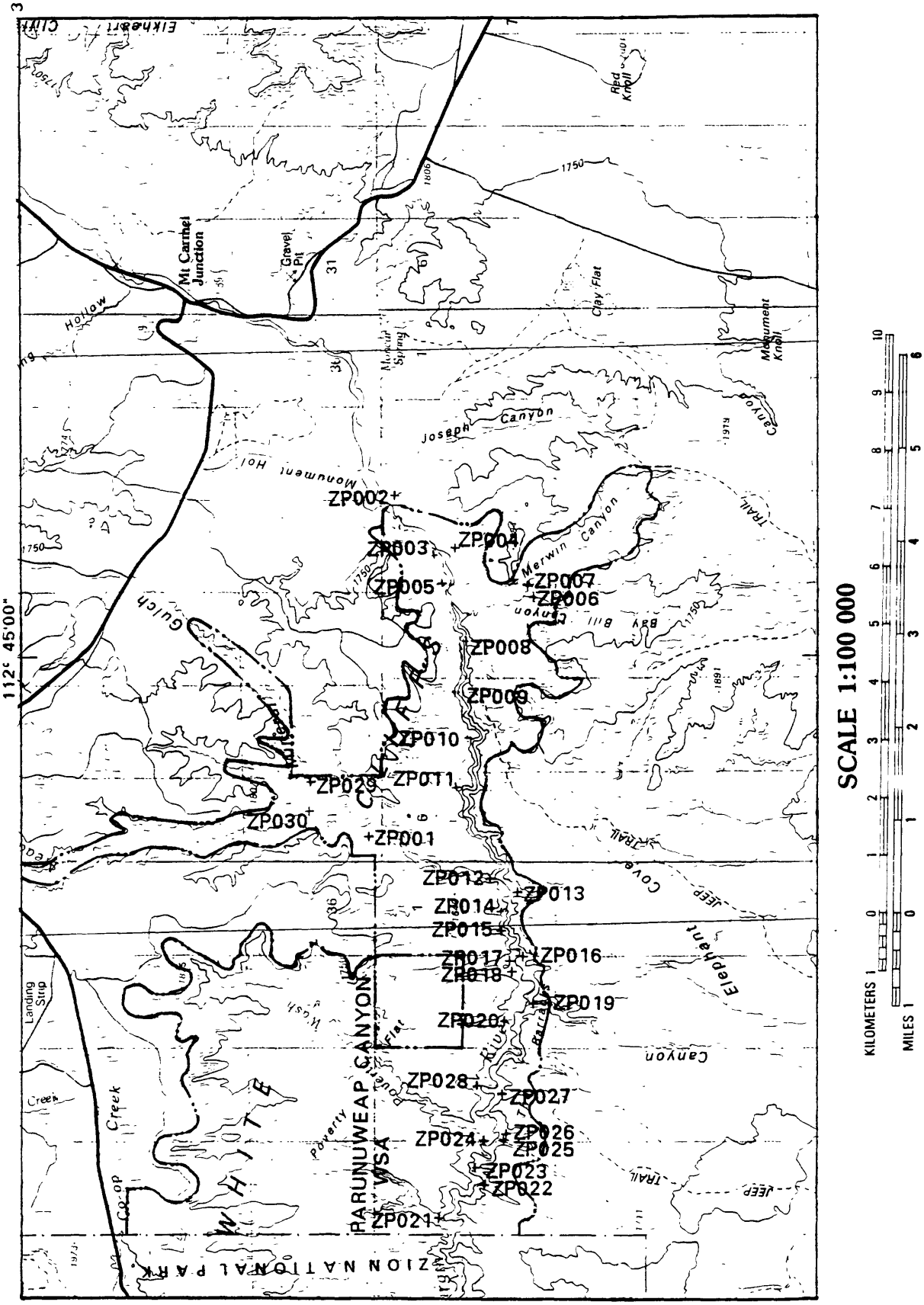

Figure 6. Localities of sample sites, Parunuweap Canyon Wilderness Study Area (UT-040-230), Kane County, Utah.

magnetite, was not analyzed. The second fraction, largely ferromagnesium silicates and iron oxides, was saved for archival storage. The third fraction (the least magnetic material which may include the nonmagnetic ore minerals and 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 degrees and a tilt of 10 degrees with a current of 0.1 ampere to remove the magnetite and ilmenite, and a current of 1.0 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

Sample Analysis

Spectrographic method

The stream-sediment and heavy-mineral-concentrate samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in table 1. Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. 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, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from all WSA's (Deep Creek, La Verkin Creek, North Fork Virgin River, Orderville Canyon, Parunuweap Canyon) are listed in tables 3 and 4 for stream-sediment and heavy-mineral-concentrate samples respectively.

Chemical methods

Stream-sediment samples from the five study areas were also analyzed by inductively coupled plasma atomic emission spectroscopy (ICP) and atomic absorption spectroscopy (AA). Samples were analyzed for arsenic (As), antimony (Sb), bismuth (Bi), cadmium (Cd), and zinc (Zn) using ICP and for gold (Au) using AA. Limits of determination and references are listed in table 2.

Analytical results using these methods for stream-sediment samples are listed in table 3.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered ino a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (Van Trump and Miesch, 1977).

DESCRIPTION OF DATA TABLES

Tables 3 and 4 list the analyses for stream-sediment and heavy-mineral-concentrate samples for each of the five areas, respectively. For the 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 maps (figs. 2-6). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "aa" indicates atomic absorption analyses; "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 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 the tables in place of the analytical value. Because of the formatting used in the computer program that produced tables 3 and 4, some of the elements listed in these tables (Fe, Mg, Ca, Ti) 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 stream sediments and heavy-mineral-concentrate samples

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

TABLE 2.--Chemical methods used

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

Element or constituent determined	Sample type	Method	Determination limit (micrograms/ gram or ppm)	Analyst	Reference
Gold (Au)	sediments	AA	0.1	Kay Kennedy	Modification of Thompson and others, 1968.
Arsenic (As)	sediments	ICP	5	David Fey	Crock and others, 1987.
Antimony (Sb)	sediments	ICP	2		
Zinc (Zn)	sediments	ICP	2		
Bismuth (Bi)	sediments	ICP	2		
Cadmium (Cd)	sediments	ICP	0.1		

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.
[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
ZD001S	37 22 22	112 55 9	.50	.50	1.50	.050	30	N	N	N	70	300
ZD002S	37 22 15	112 55 50	.70	2.00	5.00	.150	100	N	N	N	70	200
ZD003S	37 24 3	112 56 5	1.00	1.00	7.00	.100	100	N	N	N	30	150
ZD004S	37 23 38	112 56 25	.70	.20	1.00	.100	70	N	N	N	50	200
ZD005S	37 23 33	112 55 55	.70	.20	.20	.070	70	N	N	N	50	150
ZD006S	37 22 50	112 56 25	.05	.07	.30	.020	<10	N	N	N	70	150
ZD007S	37 22 54	112 56 47	.70	1.00	5.00	.070	70	N	N	N	70	700
ZD008S	37 24 39	112 56 2	1.00	2.00	7.00	.100	200	N	N	N	50	200
ZL001S	37 26 45	113 5 57	1.50	2.00	7.00	.150	150	N	N	N	50	200
ZL002S	37 26 48	113 6 57	.30	.50	1.50	.030	20	N	N	N	50	200
ZL003S	37 27 6	113 6 35	1.00	.70	5.00	.100	150	N	N	N	70	200
ZL004S	37 27 10	113 6 39	1.00	1.00	7.00	.100	100	N	N	N	30	200
ZL005S	37 27 22	113 6 34	1.00	.70	5.00	.100	150	N	N	N	50	150
ZL006S	37 27 29	113 6 37	1.00	.70	2.00	.150	100	N	N	N	50	70
ZL007S	37 27 28	113 6 41	2.00	.50	2.00	.200	100	N	N	N	50	150
ZN001S	37 22 17	112 53 20	1.00	.70	2.00	.100	70	N	N	N	30	200
ZN002S	37 22 8	112 56 36	1.00	1.00	5.00	.150	150	N	N	N	50	200
ZO001S	37 19 2	112 53 43	.50	.50	1.50	.050	30	N	N	N	50	200
ZO002S	37 19 9	112 53 45	.70	.10	.50	.070	30	N	N	N	30	150
ZO003S	37 19 9	112 53 22	1.00	1.00	10.00	.100	200	N	N	N	50	300
ZO004S	37 19 28	112 53 14	.70	.70	1.50	.070	50	N	N	N	50	300
ZO005S	37 19 29	112 53 5	1.00	1.00	7.00	.100	100	N	N	N	70	200
ZO006S	37 19 22	112 52 31	.50	.15	.70	.020	50	N	N	N	20	100
ZO007S	37 19 27	112 52 8	1.00	.50	.70	.100	50	N	N	N	30	70
ZP001S	37 11 41	112 47 3	1.00	1.00	7.00	.200	100	N	N	N	50	200
ZP002S	37 11 30	112 43 8	.50	.70	3.00	.100	50	N	N	N	50	200
ZP003S	37 11 7	112 43 50	.30	.70	3.00	.030	30	N	N	N	50	200
ZP004S	37 10 54	112 43 44	.10	.05	.20	.050	15	N	N	N	50	70
ZP005S	37 11 0	112 44 10	.20	.05	.20	.030	<10	N	N	N	20	100
ZP006S	37 10 9	112 44 18	.20	.30	1.00	.070	30	N	N	N	70	150
ZP007S	37 10 13	112 44 13	.30	.50	.70	.050	20	N	N	N	30	200
ZP008S	37 10 46	112 44 49	.15	.02	.05	.030	N	N	N	N	30	150
ZP009S	37 10 56	112 45 24	.15	.07	.20	.030	<10	N	N	N	50	150
ZP010S	37 10 47	112 45 58	.20	.30	1.00	.050	20	N	N	N	30	150
ZP011S	37 10 52	112 46 34	.20	.20	.50	.050	20	N	N	N	30	150
ZP012S	37 10 34	112 47 37	.70	.30	1.00	.050	50	N	N	N	20	150
ZP013S	37 10 20	112 47 46	.10	.03	.10	.030	30	N	N	N	50	150
ZP014S	37 10 30	112 47 58	.30	.07	.05	.070	20	N	N	N	50	150
ZP015S	37 10 28	112 48 12	.20	<.02	<.05	.015	<10	N	N	N	20	50
ZP016S	37 10 14	112 48 30	.10	<.02	<.05	.050	<10	N	N	N	70	50
ZP017S	37 10 23	112 48 34	.50	.15	.70	.100	20	N	N	N	30	200
ZP018S	37 10 20	112 48 40	.10	.05	.07	.030	10	N	N	N	70	200
ZP019S	37 10 12	112 49 5	1.00	.03	.07	.200	200	N	N	N	150	100
ZP020S	37 10 25	112 49 15	.20	.05	<.05	.050	20	N	N	N	70	150
ZP021S	37 11 2	112 51 36	.10	.05	.15	.030	<10	N	N	N	100	70

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.--Continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s
ZD001S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZD002S	N	N	N	<5	N	5	N	N	N	<5	10	N	N
ZD003S	N	N	N	<5	N	5	N	N	N	<5	<10	N	N
ZD004S	N	N	N	N	N	<5	N	N	N	<5	N	N	<5
ZD005S	N	N	N	N	50	5	N	N	N	<5	10	N	N
ZD006S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZD007S	N	N	N	N	N	7	N	N	N	N	N	N	N
ZD008S	N	N	N	<5	N	5	N	N	N	5	<10	N	<5
ZL001S	N	N	N	<5	N	5	N	N	N	<5	10	N	N
ZL002S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZL003S	N	N	N	<5	<10	5	N	N	N	<5	10	N	N
ZL004S	N	N	N	<5	N	5	N	N	N	5	<10	N	N
ZL005S	N	N	N	N	N	5	N	N	N	<5	<10	N	N
ZL006S	<1	N	N	5	<10	7	N	N	N	5	10	N	N
ZL007S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZN001S	N	N	N	<5	N	<5	N	N	N	N	N	N	N
ZN002S	N	N	N	<5	N	<5	N	N	N	<5	10	N	<5
ZO001S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZO002S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZO003S	N	N	N	N	N	5	N	N	N	<5	15	N	N
ZO004S	N	N	N	N	N	5	N	N	N	<5	10	N	N
ZO005S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZO006S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZO007S	N	N	N	<5	N	5	N	N	N	<5	N	N	<5
ZP001S	<1	N	N	<5	<10	5	N	N	N	<5	20	N	N
ZP002S	N	N	N	N	<10	<5	N	N	N	N	<10	N	N
ZP003S	N	N	N	N	<10	<5	N	N	N	N	<10	N	N
ZP004S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP005S	N	N	N	N	50	<5	N	N	N	N	N	N	N
ZP006S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZP007S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZP008S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP009S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP010S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP011S	N	N	N	N	<10	N	N	N	N	N	N	N	N
ZP012S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP013S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP014S	N	N	N	N	N	N	N	N	N	<5	N	N	N
ZP015S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP016S	N	N	N	N	10	N	N	N	N	N	N	N	N
ZP017S	N	N	N	N	100	N	N	N	N	N	N	N	N
ZP018S	N	N	N	N	70	N	N	N	N	N	N	N	N
ZP019S	N	N	N	N	200	N	N	N	N	N	N	N	N
ZP020S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP021S	N	N	N	N	<10	N	N	N	N	N	N	N	N

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
ZD001S	N	N	<10	N	N	N	200	N	<.1	<5	<2	<.1	<2	5
ZD002S	N	<100	10	N	N	N	150	N	<.1	<5	<2	.1	2	57
ZD003S	N	<100	15	N	N	N	70	N	<.1	<5	<2	<.1	<2	10
ZD004S	N	N	10	N	N	N	300	N	<.1	<5	<2	<.1	<2	9
ZD005S	N	N	10	N	N	N	150	N	<.1	<5	<2	<.1	<2	16
ZD006S	N	N	<10	N	N	N	20	N	<.1	<5	<2	<.1	<2	2
ZD007S	N	100	<10	N	N	N	1,000	N	<.1	<5	<2	<.1	<2	7
ZD008S	N	200	15	N	N	N	70	N	<.1	<5	<2	<.1	<2	23
ZL001S	N	<100	15	N	N	N	70	N	<.1	<5	<2	.2	<2	16
ZL002S	N	N	<10	N	N	N	10	N	<.1	<5	<2	<.1	<2	17
ZL003S	N	<100	15	N	N	N	300	N	<.1	<5	<2	<.1	<2	12
ZL004S	N	300	15	N	N	N	300	N	<.1	<5	<2	.1	<2	12
ZL005S	N	N	15	N	N	N	300	N	<.1	<5	<2	.1	<2	12
ZL006S	N	N	15	N	N	N	150	N	<.1	<5	<2	<.1	<2	33
ZL007S	N	N	20	N	N	N	300	N	<.1	<5	<2	<.1	<2	90
ZN001S	N	<100	15	N	N	N	300	N	<.1	<5	<2	<.1	<2	9
ZN002S	N	<100	15	N	N	N	150	N	<.1	<5	<2	<.1	<2	20
ZO001S	N	<100	10	N	N	N	300	N	<.1	<5	<2	<.1	<2	10
ZO002S	N	N	10	N	N	N	200	N	<.1	<5	<2	<.1	<2	10
ZO003S	N	200	20	N	N	N	200	N	<.1	<5	<2	<.1	<2	15
ZO004S	N	<100	10	N	N	N	150	N	<.1	5	<2	<.1	<2	3
ZO005S	N	100	15	N	N	N	100	N	<.1	<5	<2	<.1	<2	13
ZO006S	N	N	<10	N	N	N	20	N	<.1	<5	<2	<.1	<2	8
ZO007S	N	N	10	N	N	N	200	N	<.1	<5	<2	.1	<2	21
ZP001S	N	100	15	N	N	N	150	N	<.1	<5	<2	<.1	<2	20
ZP002S	N	<100	10	N	N	N	500	N	<.1	<5	<2	<.1	<2	9
ZP003S	N	N	10	N	N	N	200	N	<.1	<5	<2	<.1	<2	10
ZP004S	N	N	N	N	N	N	1,000	N	<.1	<5	<2	<.1	<2	8
ZP005S	N	N	<10	N	N	N	500	N	<.1	<5	<2	<.1	<2	4
ZP006S	N	N	<10	N	N	N	200	N	<.1	<5	<2	<.1	<2	9
ZP007S	N	N	10	N	N	N	20	N	<.1	<5	<2	<.1	<2	12
ZP008S	N	N	<10	N	N	N	500	N	<.1	<5	<2	<.1	<2	4
ZP009S	N	N	<10	N	N	N	50	N	<.1	<5	<2	<.1	<2	8
ZP010S	N	<100	<10	N	N	N	200	N	<.1	<5	<2	<.1	<2	5
ZP011S	N	N	<10	N	N	N	700	N	<.1	<5	<2	<.1	<2	5
ZP012S	N	N	10	N	N	N	500	N	<.1	<5	<2	.1	<2	10
ZP013S	N	N	<10	N	N	N	200	N	<.1	<5	<2	<.1	<2	7
ZP014S	N	N	<10	N	<10	N	700	N	<.1	<5	<2	<.1	<2	4
ZP015S	N	N	N	N	N	N	200	N	<.1	<5	<2	<.1	<2	7
ZP016S	N	N	<10	N	N	N	>1,000	N	<.1	<5	<2	<.1	<2	4
ZP017S	N	N	<10	N	N	N	300	N	<.1	<5	<2	<.1	<2	9
ZP018S	N	N	<10	N	N	N	700	N	<.1	<5	<2	<.1	<2	25
ZP019S	N	N	15	N	30	N	>1,000	N	<.1	<5	<2	<.1	<2	11
ZP020S	N	N	<10	N	N	N	500	N	<.1	<5	<2	<.1	<2	3
ZP021S	N	N	N	N	N	N	200	N	<.1	<5	<2	<.1	<2	3

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.--Continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
ZP022S	37 10 38	112 51 10	.30	.15	.30	.030	70	N	N	N	20	150
ZP023S	37 10 45	112 50 58	.15	.02	<.05	.070	<10	N	N	N	50	150
ZP024S	37 10 39	112 50 39	.20	.20	1.00	.050	20	N	N	N	100	200
ZP025S	37 10 29	112 50 39	.20	.02	<.05	.070	10	N	N	N	70	100
ZP026S	37 10 27	112 50 34	.20	.15	.50	.070	70	N	N	N	50	200
ZP027S	37 10 30	112 50 7	.50	.15	.50	.100	10	N	N	N	70	150
ZP028S	37 10 41	112 50 1	.10	.02	.07	.050	<10	N	N	N	30	150
ZP029S	37 12 11	112 46 31	.50	.20	.70	.100	50	N	N	N	30	150
ZP030S	37 12 14	112 46 37	.30	.20	.70	.020	10	N	N	N	20	100

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.--Continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s
ZP022S	N	N	N	N	<10	N	N	N	N	N	N	N	N
ZP023S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP024S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP025S	N	N	N	N	50	N	N	N	N	N	N	N	5
ZP026S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP027S	N	N	N	N	N	N	N	N	N	N	N	N	N
ZP028S	N	N	N	N	10	N	N	N	N	N	N	N	N
ZP029S	N	N	N	N	N	<5	N	N	N	N	N	N	N
ZP030S	N	N	N	N	N	<5	N	N	N	N	N	N	N

TABLE 3. SPECTROGRAPHIC, AA, & ICP ANALYSES OF STREAM-SEDIMENT SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE & WASHINGTON COUNTIES, UTAH.--Continued

Sample	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Au-ppm aa	As-ppm icp	Bi-ppm icp	Cd-ppm icp	Sb-ppm icp	Zn-ppm icp
ZP022S	N	N	<10	N	15	N	700	N	<.1	<5	<2	<.1	<2	12
ZP023S	N	N	<10	N	N	N	70	N	<.1	<5	<2	<.1	<2	20
ZP024S	N	N	<10	N	N	N	300	N	<.1	<5	<2	<.1	<2	3
ZP025S	N	N	<10	N	N	N	>1,000	N	<.1	<5	<2	<.1	<2	4
ZP026S	N	N	N	N	N	N	500	N	<.1	<5	<2	<.1	<2	18
ZP027S	N	N	10	N	N	N	>1,000	N	<.1	<5	<2	<.1	<2	5
ZP028S	N	N	N	N	N	N	150	N	<.1	<5	<2	<.1	<2	2
ZP029S	N	<100	10	N	N	N	100	N	<.1	<5	<2	<.1	<2	14
ZP030S	N	N	<10	N	N	N	100	N	<.1	<5	<2	<.1	<2	7

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.
[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
ZD001H	37 22 22	112 55 9	.50	<.05	.10	.7	50	N	N	N
ZD002H	37 22 15	112 55 50	3.00	<.05	<.10	.7	100	N	N	N
ZD003H	37 24 3	112 56 5	1.00	.20	1.00	>2.0	100	N	N	N
ZD004H	37 23 38	112 56 25	.30	.07	.10	1.0	<20	N	N	N
ZD005H	37 23 33	112 55 55	.70	.07	<.10	>2.0	50	N	N	N
ZD006H	37 22 50	112 56 25	.70	.05	.10	1.0	20	N	N	N
ZD007H	37 22 54	112 56 47	.20	<.05	<.10	1.5	20	N	N	N
ZD008H	37 24 39	112 56 2	2.00	.50	1.50	1.0	150	N	N	N
ZL001H	37 26 45	113 5 57	1.50	.15	1.00	.7	100	N	N	N
ZL002H	37 26 48	113 6 57	.70	<.05	.10	2.0	20	N	N	N
ZL003H	37 27 6	113 6 35	.30	.05	.20	.7	20	N	N	N
ZL004H	37 27 10	113 6 39	.70	.10	.50	2.0	50	N	N	N
ZL005H	37 27 22	113 6 34	1.50	.05	.50	1.0	100	N	N	N
ZL006H	37 27 29	113 6 37	1.00	.20	1.00	>2.0	100	N	N	N
ZL007H	37 27 28	113 6 41	1.00	<.05	.20	.7	30	N	N	N
ZN001H	37 22 17	112 53 20	.70	.07	.50	1.0	50	N	N	N
ZN002H	37 22 8	112 56 36	2.00	.10	.70	1.0	70	N	N	N
ZO001H	37 19 2	112 53 13	.50	<.05	.10	>2.0	<20	N	N	N
ZO002H	37 19 9	112 53 45	.70	<.05	.15	1.0	150	N	N	N
ZO003H	37 19 9	112 53 22	1.00	.07	.20	1.0	70	N	N	N
ZO004H	37 19 28	112 53 14	1.00	<.05	.10	2.0	50	N	N	N
ZO005H	37 19 29	112 53 5	1.50	.05	.20	.7	100	N	N	N
ZO006H	37 19 22	112 52 31	1.50	.15	.50	1.5	100	N	N	N
ZP001H	37 11 41	112 47 3	.20	.05	.30	.7	<20	N	N	N
ZP002H	37 11 30	112 43 8	.50	<.05	.10	1.0	70	N	N	N
ZP003H	37 11 7	112 43 50	.30	<.05	.10	1.0	20	N	N	N
ZP004H	37 10 54	112 43 44	.15	<.05	<.10	1.0	20	N	N	N
ZP005H	37 11 0	112 44 10	.20	<.05	<.10	2.0	20	N	N	N
ZP006H	37 10 9	112 44 18	.10	<.05	<.10	1.0	70	N	N	N
ZP007H	37 10 13	112 44 13	.50	<.05	<.10	.7	30	N	N	N
ZP008H	37 10 46	112 44 49	<.10	<.05	.10	.7	<20	N	N	N
ZP009H	37 10 56	112 45 24	1.00	<.05	<.10	2.0	200	N	N	N
ZP010H	37 10 47	112 45 58	.20	<.05	<.10	>2.0	<20	N	N	N
ZP011H	37 10 52	112 46 34	.10	<.05	<.10	1.5	<20	N	N	N
ZP012H	37 10 34	112 47 37	.15	.05	.70	.7	<20	N	N	N
ZP013H	37 10 20	112 47 46	.10	<.05	<.10	1.5	20	N	N	N
ZP014H	37 10 30	112 47 58	.20	<.05	<.10	2.0	<20	N	N	N
ZP015H	37 10 28	112 48 12	.10	<.05	<.10	.5	<20	N	N	N
ZP016H	37 10 14	112 48 30	<.10	<.05	N	.7	<20	N	N	N
ZP017H	37 10 23	112 48 34	.30	.05	.15	>2.0	<20	N	N	N
ZP018H	37 10 20	112 48 40	.30	<.05	<.10	>2.0	20	N	<500	N
ZP019H	37 10 12	112 49 5	.50	<.05	<.10	1.5	100	N	N	N
ZP020H	37 41 2	112 49 15	.20	<.05	<.10	2.0	20	N	N	N
ZP021H	37 11 2	112 51 36	.20	<.05	<.10	2.0	<20	N	N	N
ZP022H	37 10 38	112 51 10	.30	<.05	<.10	2.0	20	N	N	N

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.--Continued

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
ZD001H	20	>10,000	N	N	N	N	20	N	N	N	N
ZD002H	50	>10,000	N	N	N	<10	20	10	N	N	N
ZD003H	100	>10,000	N	N	N	N	100	<10	50	N	N
ZD004H	200	>10,000	N	N	N	N	200	N	70	N	N
ZD005H	70	>10,000	N	N	N	N	100	<10	N	N	N
ZD006H	300	>10,000	N	N	N	N	500	10	N	N	N
ZD007H	50	>10,000	N	N	N	N	<20	N	N	N	N
ZD008H	150	>10,000	N	N	N	<10	20	10	70	N	N
ZL001H	50	10,000	N	N	N	N	50	N	N	N	N
ZL002H	200	>10,000	N	N	N	N	300	<10	N	N	N
ZL003H	50	10,000	N	N	N	N	70	N	N	N	N
ZL004H	70	>10,000	N	N	N	N	50	<10	N	N	N
ZL005H	200	10,000	N	N	N	N	20	<10	N	N	<50
ZL006H	100	>10,000	N	N	N	N	150	<10	N	N	N
ZL007H	70	>10,000	N	N	N	N	N	10	N	N	N
ZN001H	70	>10,000	N	N	N	N	20	<10	N	N	N
ZN002H	100	>10,000	N	N	N	N	20	<10	50	N	N
ZO001H	100	>10,000	N	N	N	N	20	N	N	N	<50
ZO002H	100	>10,000	N	N	N	N	N	<10	N	N	N
ZO003H	100	10,000	N	N	N	N	70	N	N	N	N
ZO004H	150	>10,000	N	N	N	N	200	<10	N	N	N
ZO005H	100	>10,000	N	N	N	N	150	<10	N	N	N
ZO006H	70	>10,000	N	N	N	N	200	<10	N	N	N
ZP001H	70	5,000	N	N	N	N	N	N	N	N	N
ZP002H	200	>10,000	2	N	N	N	500	N	N	N	N
ZP003H	100	>10,000	N	N	N	N	200	N	N	N	N
ZP004H	100	>10,000	<2	N	N	N	150	N	N	N	N
ZP005H	150	5,000	N	N	N	N	200	N	N	N	N
ZP006H	150	>10,000	N	N	N	N	100	N	N	N	N
ZP007H	100	>10,000	N	N	N	N	70	N	N	N	N
ZP008H	70	>10,000	<2	N	N	N	20	N	N	N	N
ZP009H	1,000	>10,000	N	N	N	N	1,000	N	N	N	N
ZP010H	200	>10,000	N	N	N	N	150	N	N	N	N
ZP011H	100	>10,000	N	N	N	N	50	N	N	N	N
ZP012H	20	>10,000	<2	N	N	N	N	N	N	N	N
ZP013H	70	10,000	<2	N	N	N	70	N	N	N	N
ZP014H	100	3,000	N	N	N	N	30	N	N	N	N
ZP015H	100	2,000	<2	N	N	N	20	N	N	N	N
ZP016H	70	1,000	<2	N	N	N	<20	N	N	N	N
ZP017H	70	>10,000	<2	N	N	N	50	N	70	N	N
ZP018H	100	10,000	N	N	N	N	200	N	N	N	N
ZP019H	150	5,000	<2	N	N	N	700	N	300	N	N
ZP020H	200	3,000	<2	N	N	N	200	N	N	N	N
ZP021H	100	10,000	<2	N	N	N	100	N	N	N	N
ZP022H	100	10,000	<2	N	N	N	150	N	300	N	N

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.--Continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
ZP001H	N	<20	N	N	N	1,500	20	N	500	N	>2,000	N
ZP002H	10	20	N	N	N	2,000	20	N	500	N	>2,000	N
ZP003H	<10	<20	N	N	N	1,500	30	N	300	N	>2,000	N
ZP004H	N	N	N	N	N	700	20	N	200	N	>2,000	N
ZP005H	<10	<20	N	N	N	700	20	N	300	N	>2,000	N
ZP006H	N	N	N	N	N	700	20	N	500	N	>2,000	N
ZP007H	N	<20	N	N	N	700	20	N	1,000	N	>2,000	N
ZP008H	15	20	N	N	N	>10,000	30	N	200	N	>2,000	N
ZL001H	N	<20	N	N	N	>10,000	20	N	150	N	>2,000	N
ZL002H	N	<20	N	N	N	500	30	N	700	N	>2,000	N
ZL003H	N	N	N	N	N	200	<20	N	150	N	>2,000	N
ZL004H	<10	N	N	N	N	3,000	20	N	200	N	>2,000	N
ZL005H	N	<20	N	N	N	1,500	30	N	200	N	>2,000	N
ZL006H	<10	<20	N	N	N	1,500	30	N	700	N	>2,000	N
ZL007H	N	<20	N	N	N	3,000	<20	N	300	N	>2,000	N
ZN001H	N	<20	N	N	N	>10,000	20	N	200	N	>2,000	N
ZN002H	<10	150	N	N	N	>10,000	30	N	300	N	>2,000	N
ZO001H	N	<20	N	N	N	1,000	30	N	500	N	>2,000	N
ZO002H	N	<20	N	N	N	700	20	N	500	N	>2,000	N
ZO003H	N	<20	N	N	N	500	30	N	700	N	>2,000	N
ZO004H	N	<20	N	N	N	700	30	N	700	N	>2,000	N
ZO005H	N	30	N	N	N	>10,000	30	N	200	N	>2,000	N
ZO006H	<10	N	N	N	N	5,000	<20	N	150	N	>2,000	N
ZP001H	N	N	N	N	N	200	<20	N	150	N	>2,000	N
ZP002H	<10	<20	N	N	N	2,000	20	N	1,000	N	>2,000	N
ZP003H	N	<20	N	N	N	200	20	N	700	N	>2,000	N
ZP004H	N	<20	N	N	N	1,000	20	N	1,000	N	>2,000	N
ZP005H	N	<20	N	N	N	N	30	N	1,000	N	>2,000	N
ZP006H	N	<20	N	N	N	200	<20	N	700	N	>2,000	N
ZP007H	N	<20	N	N	N	500	20	N	300	N	>2,000	N
ZP008H	N	<20	N	N	N	200	<20	N	700	N	>2,000	N
ZP009H	<10	<20	N	N	N	200	30	N	1,000	N	>2,000	N
ZP010H	N	<20	N	N	N	2,000	30	N	1,000	N	>2,000	N
ZP011H	N	<20	N	N	N	N	20	N	500	N	>2,000	N
ZP012H	N	<20	N	N	N	3,000	20	N	700	N	>2,000	N
ZP013H	N	20	N	N	N	N	20	N	700	N	>2,000	N
ZP014H	N	<20	N	N	N	N	20	N	1,000	N	>2,000	N
ZP015H	N	<20	N	N	N	N	20	N	1,000	N	>2,000	N
ZP016H	N	<20	N	N	N	N	<20	N	700	N	>2,000	N
ZP017H	N	<20	N	N	30	700	20	N	1,000	N	>2,000	N
ZP018H	N	<20	N	N	N	N	30	N	1,500	N	>2,000	N
ZP019H	N	20	N	N	N	N	30	N	1,500	N	>2,000	N
ZP020H	N	<20	N	N	N	N	20	N	1,000	N	>2,000	N
ZP021H	N	<20	N	N	N	N	30	N	700	N	>2,000	N
ZP022H	N	<20	N	N	N	N	30	N	1,500	N	>2,000	N

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.--Continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
ZP023H	37 10 45	112 50 58	1.00	<.05	<.10	2.0	20	N	N	N
ZP024H	37 10 39	112 50 39	<.10	N	N	.7	<20	N	N	N
ZP025H	37 10 29	112 50 39	.10	N	<.10	>2.0	<20	N	N	N
ZP026H	37 10 27	112 50 34	1.00	.05	.10	>2.0	100	N	N	N
ZP027H	37 10 30	112 50 7	.20	<.05	.10	>2.0	<20	N	N	N
ZP028H	37 10 41	112 50 1	3.00	<.05	<.10	>2.0	150	N	<500	N
ZP029H	37 12 11	112 46 31	2.00	.30	.70	2.0	100	N	N	N
ZP030H	37 12 14	112 46 37	1.50	.30	1.50	1.0	20	N	N	N

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.--Continued

Sample	P-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
ZP023H	500	2,000	N	N	N	N	300	N	N	N	N
ZP024H	100	10,000	<2	N	N	N	70	N	N	N	N
ZP025H	150	10,000	<2	N	N	N	100	N	N	N	N
ZP026H	100	10,000	N	N	N	N	70	N	100	N	N
ZP027H	150	3,000	<2	N	N	N	300	N	300	N	N
ZP028H	500	7,000	N	N	N	<10	500	<10	N	N	N
ZP029H	200	>10,000	<2	N	N	N	200	<10	150	N	N
ZP030H	50	>10,000	70	N	N	N	N	10	N	N	50

TABLE 4. SPECTROSCOPIC ANALYSES OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM DEEP CREEK, LA VERKIN CREEK, NORTH FORK VIRGIN RIVER, ORDERVILLE CANYON, AND PARUNUWEAP CANYON WILDERNESS STUDY AREAS, KANE AND WASHINGTON COUNTIES, UTAH.--Continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
ZP023H	<10	<20	N	N	N	200	20	N	700	N	>2,000	N
ZP024H	N	<20	N	N	N	N	20	N	1,000	N	>2,000	N
ZP025H	N	<20	N	N	N	200	30	N	1,500	N	>2,000	N
ZP026H	N	<20	N	N	N	500	20	N	700	N	>2,000	N
ZP027H	N	<20	N	N	N	N	20	N	1,000	N	>2,000	N
ZP028H	N	<20	N	N	N	N	100	N	1,000	N	>2,000	N
ZP029H	<10	<20	N	N	N	1,500	30	N	1,000	N	>2,000	N
ZP030H	<10	20	N	N	N	7,000	20	N	150	N	>2,000	N