UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of heavy-mineral-concentrate and rock samples from the Antelope Wilderness Study Area (NV-060-231/241), Nye County, Nevada

By

Gordon W. Day, Robert L. Turner,

Paul H. Briggs, and Nancy M. Conklin

Open-File Report 86-377

1986

CONTENTS

ILLUSTRATIONS

TABLES

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 Antelope Wilderness Study Area, Nye County, Nevada.

INTRODUCTION

In May 1984, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Antelope Wilderness Study Area (NV-060-231/241), Nye County, Nevada.

The Antelope Wilderness Study Area comprises 87,400 acres, about 137 mi^2 (355 km^2) in the northern part of Nye County, Nevada, of which the U.S. Geological Survey was asked to study 83,100 acres, about 130 mi^2 (337 km^2). Throughout this report, "Wilderness Study Area" and "study area" refer to the 83,100-acre area studied by the U.S. Geological Survey.

The Antelope Wilderness Study Area is about 50 mi (80 km) south-southwest of Eureka, Nevada (fig. 1). The study area can be reached by dirt and graveled roads branching from Nevada State Highway 20, which connects with U.S. Highway 50. Dirt roads border the east, west, and south edges of the study area and furnish good access to the study area by four-wheel drive vehicles. The study area is composed of volcanic tuffs of Tertiary age. The topographic relief in the study area is about 2,900 ft (884 m). The ground surface is rugged mountainous terrain rising steeply from a flat valley at 6,500 ft (1,981 m) to a high point of about 9,400 ft (2,865 m). The streams are intermittent and their gradients are generally steep with the exception of Long Canyon, which is 5 mi long. There are conifers at the higher elevations and sagebrush along the lower flanks of the mountains. The climate is arid to semiarid.

METHODS OF STUDY

Sample Media

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

Samples were collected at 122 sites (plate 1). Where suitable outcrop was available, rock samples were collected. The average sampling density is

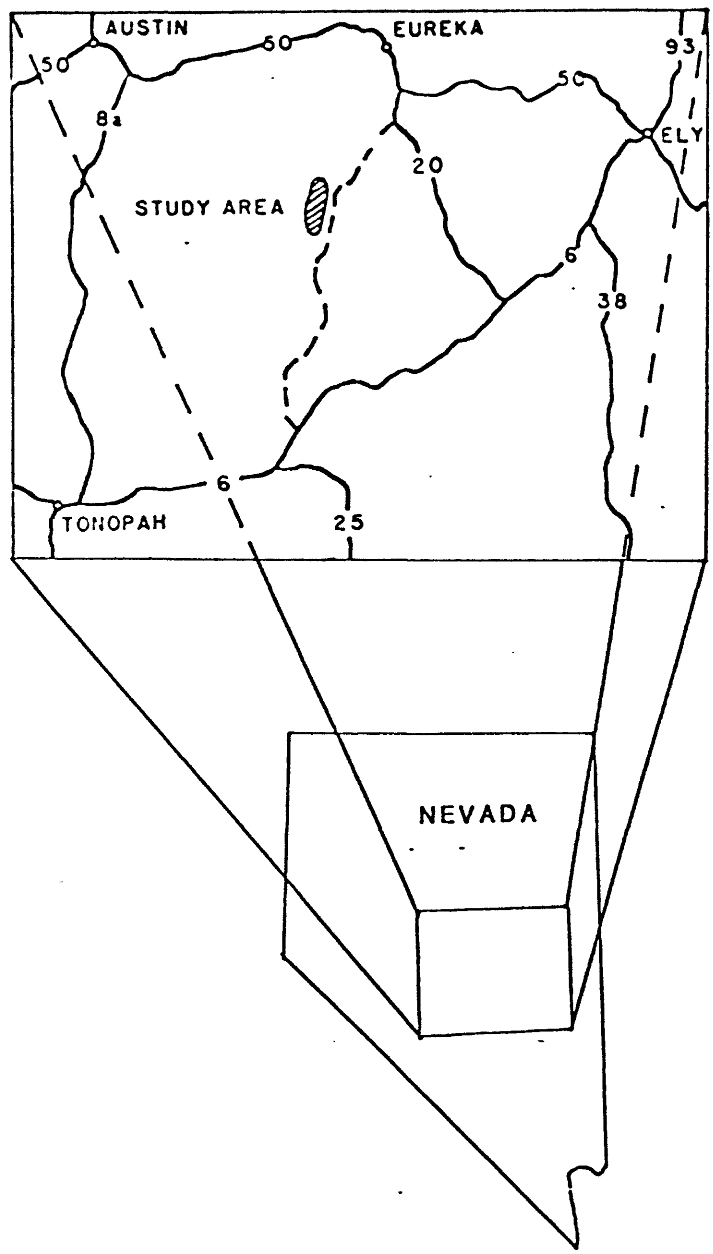

Figure 1. Location of the Antelope Wilderness Study Area (NV-060-231/241), Nye County, Nevada.

about one sample site per 1 mi^2 for the heavy-mineral concentrates, and about one sample site per 11 mi^2 for the rocks. The area of the drainage basins sampled ranged from 0.3 mi^2 to 1.5 mi^2.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from active alluvium primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps (scale = 1:24,000). Each sample was composited from several localities within an area that may extend as much as 100 ft from the site plotted on the map. Each bulk sample was sieved with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Rock samples

Rock samples were collected from outcrops or exposures in the vicinity of the plotted site location. Samples were collected from unaltered, altered and mineralized rocks (table 5).

Sample Preparation

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 sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, was not analyzed. The second fraction, largely ferromagnesian silicates and iron oxides, was saved for analysis/archival storage. The third fraction (the least magnetic 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 0.1 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.

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

Sample Analysis

Spectrographic method

The heavy-mineral-concentrate samples were analyzed by the Branch of Exploration Geochemistry for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The rock samples were analyzed by the Branch of Analytical Chemistry for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Myers and others, 1961). The elements analyzed and their lower limits of determination are listed in table 1. For arsenic (As), gold (Au), cadmium (Cd), and thorium (Th), the lower limit of determination by the two branches varies. 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 for the rock samples 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 the Antelope Wilderness Study Area are listed in tables 3 and 4.

Chemical methods

Other methods of analysis used on samples from the Antelope Wilderness Study Area are summarized in table 2 (Crock and others, 1983; O'Leary and Viets, 1986).

Analytical results for rock samples are listed in table 4.

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 and 4 list the results of analyses for the heavy-mineral concentrate and rock samples, respectively. For the two 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 (plate 1). Columns in which the element headings show the letter "s" below the element symbol are emission spectrographic analyses; "icp" indicates inductively coupled plasma. A letter "N" in table 3 indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in table 1. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in table 3 in front of the lower limit of determination. For table 4, the letter N is not used and a "less than" symbol (<) indicates that an element, observed or not observed, is below the detection limit in table 1. 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. 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, 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.

REFERENCES CITED

Crock, J. G., Lichte, F. E., and Briggs, P. H., 1983, Determination of elements in National Bureau of Standards' Geological Reference Materials SRM278 Obsidian and SRM668 Basalt by Inductively Coupled Argon Plasma-Atomic Emission Spectrometry: Geostandards Newsletter, no. 7, p. 335-340.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

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

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

O'Leary, R. M., and Viets, J. G., 1986, Determination of antimony, arsenic, bismuth, cadmium, copper, lead, molybdenum, silver, and zinc in geological materials by atomic-absorption spectrometry using a hydrochloric acid-hydrogen peroxide digestion: Atomic Spectroscopy, v. 7, p. 4-8.

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

TABLE 1.--Limits of determination for the spectrographic analysis of rocks based on a 10-mg sample

[The values shown are the lower limits of determination assigned by the Grimes and Marranzino method, except for those values in parentheses, which are the lower values assigned by the Myers and others method. The spectrographic limits of determination for heavy-mineral-concentrate samples (Grimes and Marranzino) are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks and stream sediments. Analysts: Nancy M. Conklin (rocks); Gordon W. Day (heavy-mineral concentrates)]

Elements	Lower determination limit		Upper determination limit
	Percent		
Iron (Fe)	0.05		20
Magnesium (Mg)	.02		10
Calcium (Ca)	.05		20
Titanium (Ti)	.002		1
	Parts per million		
Manganese (Mn)	10		5,000
Silver (Ag)	0.5		5,000
Arsenic (As)	200	(700)	10,000
Gold (Au)	10	(15)	500
Boron (B)	10		2,000
Barium (Ba)	20		5,000
Beryllium (Be)	1		1,000
Bismuth (Bi)	10		1,000
Cadmium (Cd)	20	(30)	500
Cobalt (Co)	5		2,000
Chromium (Cr)	10		5,000
Copper (Cu)	5		20,000
Lanthanum (La)	20	(30)	1,000
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
Vanadium (V)	10		10,000
Tungsten (W)	50		10,000
Yttrium (Y)	10		2,000
Zinc (Zn)	200		10,000
Zirconium (Zr)	10		1,000
Thorium (Th)	100	(200)	2,000

TABLE 2.--Commonly used chemical methods

[ICP = inductively coupled plasma]

Element or constituent determined	Sample Type	Method	Determination limit (micrograms/ gram or ppm)	Analyst	Reference
Arsenic (As)	rock	ICP	5	Paul H. Briggs	Crock and others, 1983; Modification of O'Leary and Viets, 1986.
Bismuth (Bi)	rock	ICP	2		
Cadmium (Cd)	rock	ICP	0.1		
Antimony (Sb)	rock	ICP	2		
Zinc (Zn)	rock	ICP	2		

TABLE 3. ANALYSES OF THE NONMAGNETIC FRACTION OF HEAVY-MINERAL-CONCENTRATE SAMPLES FROM THE ANTELOPE WILDERNESS STUDY AREA, NYE COUNTY, NEVADA.

[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
AR001H	38 43 36	116 19 41	.20	.05	5.0	.200	100	N	N	N	20	5,000
AR002H	38 44 4	116 21 1	.15	.20	.2	.020	50	N	N	N	20	>10,000
AR003H	38 44 33	116 22 9	.30	.05	5.0	.070	150	N	N	N	20	>10,000
AR004H	38 45 11	116 19 57	.20	<.05	1.0	.070	50	N	N	N	20	2,000
AR005H	38 45 53	116 21 9	.20	<.05	1.0	.050	50	N	N	N	20	700
AR006H	38 45 45	116 20 26	.20	<.05	1.0	.100	50	N	N	N	20	700
AR007H	38 52 59	116 21 25	.50	.20	5.0	.700	150	N	N	N	20	500
AR008H	38 53 36	116 21 51	.20	.10	2.0	.700	150	N	N	N	20	700
AR009H	38 54 29	116 19 54	.50	.20	20.0	.500	200	N	N	N	20	10,000
AR011H	38 54 43	116 19 42	.20	.05	5.0	.070	70	N	N	N	20	700
AR012H	38 55 40	116 19 16	.20	.10	1.0	.200	70	N	N	N	<20	500
AR013H	38 55 45	116 19 15	.20	.10	2.0	.200	70	N	N	N	<20	700
AR014H	38 57 54	116 17 7	.20	.05	2.0	.050	50	N	N	N	20	700
AR015H	38 59 26	116 17 20	.20	.05	2.0	.050	70	N	N	N	<20	1,000
AR016H	39 1 4	116 16 53	.20	.05	2.0	.070	70	N	N	N	<20	700
AR017H	39 0 22	116 16 47	.20	.05	1.0	.100	70	N	N	N	<20	700
AR018H	38 58 40	116 18 2	.50	.10	2.0	.100	100	N	N	N	<20	1,000
AR019H	39 2 24	116 13 56	.50	.10	5.0	.050	100	N	N	N	50	>10,000
AR020H	39 1 12	116 12 50	.20	.10	5.0	.500	150	N	N	N	<20	2,000
AR023H	38 58 2	116 14 6	.20	.05	2.0	.050	50	N	N	N	<20	1,000
AR024H	38 58 27	116 12 35	.20	.05	2.0	.050	50	N	N	N	<20	1,000
AR041H	38 43 57	116 20 36	.20	.10	2.0	.700	70	N	N	N	<20	>10,000
AR042H	38 44 8	116 21 29	.15	5.00	10.0	.050	100	N	N	N	<20	>10,000
AR043H	38 46 30	116 20 9	.20	.05	2.0	.050	50	N	N	N	<20	1,500
AR044H	38 46 33	116 20 8	.20	.05	2.0	.050	50	N	N	N	<20	1,000
AR045H	38 46 57	116 20 43	.20	.05	1.0	.200	50	N	N	N	<20	700
AR046H	38 46 45	116 20 46	.20	.05	2.0	.020	50	N	N	N	<20	1,500
AR047H	38 49 6	116 20 2	.20	.05	2.0	.050	50	N	N	N	<20	1,000
AR048H	39 49 6	116 20 0	.10	.05	.7	.050	30	N	N	N	<20	500
AR049H	38 48 45	116 20 23	.10	.05	1.0	.020	20	N	N	N	<20	300
AR050H	38 51 5	116 20 4	.10	.05	.2	.070	20	N	N	N	<20	200
AR051H	38 50 37	116 20 15	.10	.05	.5	.200	20	N	N	N	50	300
AR052H	38 50 31	116 20 23	.10	.05	1.0	.100	20	N	N	N	<20	500
AR053H	38 50 5	116 21 23	.20	.05	2.0	.050	70	N	N	N	<20	700
AR054H	38 47 35	116 19 49	.10	.05	.5	.020	50	N	N	N	<20	700
AR055H	38 47 59	116 16 2	.10	.05	1.0	.050	50	N	N	N	<20	700
AR056H	38 49 2	116 15 57	.10	.05	1.0	.010	20	N	N	N	<20	700
AR057H	38 49 14	116 15 57	.10	.05	1.0	.010	50	N	N	N	<20	700
AR058H	38 54 53	116 14 13	.10	.05	.5	.020	100	N	N	N	<20	700
AR059H	38 54 54	116 14 9	.10	.05	1.0	.050	50	N	N	N	<20	700
AR060H	38 55 11	116 12 15	.10	.05	2.0	.020	100	N	N	N	<20	700
AR081H	38 43 51	116 17 46	.30	.20	2.0	.500	150	N	N	N	20	>10,000
AR082H	38 44 49	116 18 48	.30	.10	2.0	.100	70	N	N	N	<20	1,500
AR083H	38 45 14	116 17 41	.30	.10	2.0	.020	50	N	N	N	<20	1,500
AR084H	38 45 14	116 17 41	.20	.05	2.0	.100	70	N	N	N	<20	7,000

TABLE 3. 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
AR001H	N	N	N	N	150	<10	100	N	N	30	N
AR002H	N	N	N	N	N	<10	100	N	N	N	N
AR003H	N	N	N	N	N	10	50	N	N	N	N
AR004H	2	N	N	N	N	<10	50	N	N	N	N
AR005H	2	N	N	N	N	<10	50	N	N	N	N
AR006H	2	N	N	N	N	<10	50	N	N	N	N
AR007H	2	N	N	N	N	<10	100	N	N	N	N
AR008H	5	N	N	N	N	<10	100	N	N	N	N
AR009H	N	N	N	N	N	10	100	N	N	N	20
AR011H	2	N	N	N	N	<10	70	N	N	N	N
AR012H	2	70	N	N	N	<10	50	N	N	N	N
AR013H	2	N	N	N	N	<10	50	N	N	N	N
AR014H	2	N	N	N	N	<10	<50	N	N	N	N
AR015H	2	N	N	N	N	<10	50	N	N	N	N
AR016H	2	N	N	N	N	10	50	N	N	N	N
AR017H	5	N	N	N	N	<10	70	N	N	N	N
AR018H	N	N	N	N	N	<10	50	N	N	N	<20
AR019H	N	20	N	N	N	10	70	N	N	N	<20
AR020H	5	N	N	N	N	<10	100	N	N	N	N
AR023H	N	30	N	N	N	<10	50	N	N	N	N
AR024H	2	30	N	N	N	<10	50	N	N	N	N
AR041H	2	N	N	N	N	<10	100	N	N	N	N
AR042H	N	N	N	N	N	<10	50	N	N	N	N
AR043H	2	N	N	N	N	<10	50	N	N	N	N
AR044H	2	N	N	N	N	<10	50	N	N	N	N
AR045H	2	N	N	N	N	<10	70	N	N	N	N
AR046H	2	N	N	N	N	<10	50	N	N	N	N
AR047H	2	N	N	N	N	<10	50	N	N	N	N
AR048H	5	N	N	N	N	<10	50	N	N	N	N
AR049H	5	N	N	N	N	<10	50	N	N	N	N
AR050H	5	N	N	N	50	<10	50	N	N	N	N
AR051H	5	N	N	N	N	10	50	N	N	N	N
AR052H	5	30	N	N	N	<10	50	N	N	N	N
AR053H	2	N	N	N	N	N	<50	N	N	N	N
AR054H	2	N	N	N	N	N	<50	N	N	N	N
AR055H	5	N	N	N	N	N	<50	N	N	N	N
AR056H	2	N	N	N	N	N	<50	N	N	N	N
AR057H	5	N	N	N	N	N	<50	N	N	N	N
AR058H	5	N	N	N	N	N	<50	N	N	N	N
AR059H	5	1,500	N	N	N	N	<50	N	N	N	N
AR060H	5	20	N	N	N	N	<50	N	N	N	N
AR081H	N	<20	N	N	50	10	<50	N	N	N	20
AR082H	2	<20	N	N	N	N	<50	N	N	N	N
AR083H	2	<20	N	N	N	N	<50	N	N	N	N
AR084H	2	N	N	N	N	N	<50	N	N	N	N

TABLE 3. Continued

Sample	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
AR001H	N	20	N	200	20	N	200	N	>2,000	N
AR002H	N	N	N	1,000	50	N	20	N	500	N
AR003H	N	30	N	1,000	20	N	200	N	>2,000	N
AR004H	N	30	N	200	20	N	150	N	>2,000	N
AR005H	N	50	N	200	20	N	150	N	>2,000	N
AR006H	N	50	N	200	20	N	150	N	>2,000	N
AR007H	N	50	N	N	20	N	200	N	>2,000	N
AR008H	N	100	30	N	20	N	500	N	>2,000	N
AR009H	N	N	N	700	20	N	150	N	>2,000	N
AR011H	N	70	N	200	<20	N	300	N	>2,000	N
AR012H	N	70	N	200	<20	N	300	N	>2,000	N
AR013H	N	70	N	200	20	N	300	N	>2,000	N
AR014H	N	N	N	500	20	N	100	N	>2,000	N
AR015H	N	N	150	500	20	N	150	N	>2,000	N
AR016H	N	N	N	500	20	N	150	N	>2,000	N
AR017H	N	30	N	200	<20	N	300	N	>2,000	N
AR018H	N	N	N	700	20	N	70	N	>2,000	N
AR019H	N	N	N	1,500	20	N	100	N	>2,000	N
AR020H	N	70	N	200	20	N	500	N	>2,000	N
AR023H	N	N	N	500	20	N	100	N	>2,000	N
AR024H	N	20	N	500	20	N	150	N	>2,000	N
AR041H	N	70	N	1,000	20	N	500	N	>2,000	N
AR042H	N	N	N	700	20	N	100	N	>2,000	N
AR043H	N	50	N	700	20	N	200	N	>2,000	N
AR044H	N	50	N	1,000	20	N	200	N	>2,000	N
AR045H	N	70	150	200	20	N	500	N	>2,000	N
AR046H	N	20	150	500	20	N	150	N	>2,000	N
AR047H	N	20	N	700	20	N	150	N	>2,000	N
AR048H	N	70	200	200	20	N	300	N	>2,000	N
AR049H	N	50	200	200	20	N	200	N	>2,000	N
AR050H	N	70	N	N	20	N	500	N	>2,000	N
AR051H	N	100	20	N	20	N	500	N	>2,000	N
AR052H	N	70	30	200	20	N	300	N	>2,000	N
AR053H	N	30	N	700	20	N	200	N	>2,000	N
AR054H	N	50	N	200	20	N	200	N	>2,000	N
AR055H	N	50	100	200	20	N	200	N	>2,000	N
AR056H	N	30	N	500	20	N	150	N	>2,000	N
AR057H	N	50	N	200	20	N	200	N	>2,000	N
AR058H	N	100	70	200	20	N	200	N	>2,000	N
AR059H	N	100	100	200	150	N	200	N	>2,000	N
AR060H	N	100	N	200	20	N	200	N	>2,000	N
AR081H	N	20	N	>10,000	20	N	100	N	>2,000	N
AR082H	N	20	N	1,000	20	N	100	N	>2,000	N
AR083H	N	50	N	700	20	N	200	N	>2,000	N
AR084H	N	50	50	700	20	N	200	N	>2,000	N

TABLE 3. 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
AR085H	38 45 46	116 16 49	.20	2.00	2.0	.100	70	N	N	N	<20	5,000
AR086H	38 46 14	116 15 12	.10	5.00	5.0	.010	70	N	N	N	<20	3,000
AR087H	38 45 19	116 15 6	.10	5.00	5.0	.010	100	N	N	N	20	>10,000
AR088H	38 48 24	116 17 19	.10	.05	1.0	.050	20	N	N	N	<20	3,000
AR089H	38 48 21	116 16 51	.20	.05	1.0	.300	100	N	N	N	<20	700
AR090H	38 47 44	116 17 11	.20	.05	1.0	.700	70	N	N	N	20	10,000
AR091H	38 54 30	116 16 51	.50	.05	.5	.150	70	N	N	N	<20	500
AR092H	38 53 57	116 16 8	.20	.05	.5	.150	70	N	N	N	20	500
AR093H	38 53 12	116 15 13	.20	.10	.7	.200	50	N	N	N	20	500
AR094H	38 46 59	116 14 12	.20	.10	2.0	.150	70	N	N	N	<20	1,000
AR095H	38 52 35	116 15 19	.15	.05	1.0	.050	50	N	N	N	<20	500
AR097H	38 51 18	116 15 33	.20	.10	2.0	.100	50	N	N	N	20	700
AR098H	38 50 47	116 16 8	.20	.10	2.0	.050	50	N	N	N	<20	700
AR099H	27 40 44	116 16 8	.20	.05	2.0	.100	50	N	N	N	<20	700
AR100H	38 50 44	116 15 33	.20	.05	1.5	.100	50	N	N	N	50	700
AR101H	38 50 57	116 15 33	.10	.05	.5	.100	20	N	N	N	<20	200
AR102H	38 54 2	116 14 45	.10	.05	2.0	.100	50	N	N	N	<20	500
AR103H	38 54 5	116 14 34	.10	.05	1.5	.100	70	N	N	N	<20	700
AR121H	38 44 52	116 18 46	.50	.20	2.0	.500	100	N	N	N	20	700
AR122H	38 44 48	116 16 15	.20	10.00	10.0	.500	70	N	N	N	20	>10,000
AR123H	38 45 37	116 15 25	.20	.10	2.0	.050	50	N	N	N	<20	>10,000
AR124H	38 45 12	116 17 36	.50	.05	2.0	.200	100	N	N	N	20	700
AR125H	38 46 22	116 17 45	.50	.20	5.0	.200	150	N	N	N	20	>10,000
AR126H	38 46 39	116 16 58	.20	.10	5.0	1.000	150	N	N	N	20	2,000
AR127H	38 46 46	116 16 23	.50	.10	5.0	.500	150	N	N	N	20	5,000
AR128H	38 48 20	116 17 21	.10	.05	.5	.100	50	N	N	N	20	1,000
AR129H	38 47 40	116 17 8	.20	.05	2.0	.500	100	N	N	N	<20	700
AR130H	38 47 24	116 16 17	.20	.10	2.0	.200	150	N	N	N	<20	700
AR131H	38 54 1	116 16 47	.20	.10	.5	.050	100	N	N	N	20	300
AR132H	38 54 12	116 16 42	.10	.05	.2	.150	70	N	N	N	<20	300
AR133H	38 54 3	116 15 56	.15	.05	.5	.020	70	N	N	N	<20	200
AR134H	38 53 1	116 15 5	.20	.05	.5	.100	70	N	N	N	<20	300
AR135H	38 52 13	116 15 30	.20	.05	.2	.150	70	N	N	N	<20	150
AR136H	38 51 54	116 16 11	.10	<.05	.2	.100	50	N	N	N	<20	300
AR137H	38 51 46	116 15 27	.20	.05	1.0	.020	70	N	N	N	<20	700
AR138H	38 53 55	116 14 8	.20	<.05	.5	.500	70	N	N	N	<20	200
AR139H	38 53 46	116 16 57	.30	.05	1.0	.500	70	N	N	N	20	500
AT161H	38 45 17	116 17 37	.20	<.05	1.0	.020	50	N	N	N	<20	2,000
AR162H	38 46 26	116 17 45	.50	.50	2.0	.100	100	N	N	N	<20	>10,000
AR163H	38 46 35	116 16 17	.30	2.00	5.0	.100	100	N	N	N	<20	10,000
AR164H	39 48 30	116 20 22	.50	.20	2.0	.100	100	N	N	N	20	1,500
AR165H	38 48 31	116 20 21	.50	.10	2.0	.100	150	N	N	N	<20	1,000
AR166H	38 48 57	116 21 10	.20	.10	2.0	.100	70	N	N	N	<20	1,500
AR167H	38 50 49	116 19 11	.10	.05	.2	.100	20	N	N	N	<20	500
AR168H	38 50 44	116 19 8	.30	.05	.2	.150	50	N	N	N	<20	2,000

TABLE 3. 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
AR085H	5	<20	N	N	N	N	<50	N	N	N	N
AR086H	2	N	N	N	50	N	<50	N	N	N	N
AR087H	N	<20	N	N	N	N	<50	N	N	N	N
AR088H	N	N	N	N	N	N	<50	N	N	N	N
AR089H	N	N	N	N	N	N	<50	N	N	N	20
AR090H	2	N	N	N	N	<10	100	N	N	N	N
AR091H	2	N	N	N	N	<10	50	N	N	N	N
AR092H	5	N	N	N	70	200	50	N	N	N	N
AR093H	5	150	N	N	N	<10	50	N	N	N	N
AR094H	2	N	N	N	N	<10	50	N	N	N	N
AR095H	5	N	N	N	N	<10	50	N	N	N	N
AR097H	2	50	N	N	N	<10	50	N	N	N	N
AR098H	2	N	N	N	N	<10	50	N	N	N	N
AR099H	2	N	N	N	N	<10	50	N	N	N	N
AR100H	5	N	N	N	N	<10	50	N	N	N	N
AR101H	5	N	N	N	N	<10	50	N	N	N	N
AR102H	5	<20	N	N	N	<10	50	N	N	N	N
AR103H	5	N	N	N	N	<10	50	N	N	N	N
AR121H	2	N	N	N	N	<10	50	N	N	N	20
AR122H	2	N	N	N	N	<10	50	N	N	N	N
AR123H	2	<20	N	N	N	<10	<50	N	N	N	N
AR124H	2	N	N	N	N	<10	50	N	N	N	N
AR125H	2	N	N	N	N	<10	70	N	N	N	N
AR126H	2	N	N	N	N	<10	100	N	N	N	N
AR127H	N	N	N	N	N	<10	50	N	N	N	N
AR128H	2	N	N	N	N	15	50	N	N	N	N
AR129H	2	N	N	N	N	<10	50	N	N	N	N
AR130H	2	N	N	N	N	<10	50	N	N	N	N
AR131H	2	N	N	N	100	<10	50	N	N	N	N
AR132H	5	N	N	N	N	<10	50	N	N	N	N
AR133H	10	70	N	N	N	<10	50	N	N	N	N
AR134H	7	100	N	N	N	<10	50	N	N	N	N
AR135H	7	N	N	N	N	<10	50	N	N	N	N
AR136H	5	N	N	N	N	<10	50	N	N	N	N
AR137H	2	N	N	N	N	<10	<50	N	N	N	N
AR138H	10	N	N	N	N	<10	50	N	N	N	N
AR139H	2	N	N	N	N	<10	50	N	N	N	N
AT161H	2	N	N	N	N	<10	<50	N	N	N	N
AR162H	N	<20	N	N	50	<10	100	N	N	N	N
AR163H	2	N	N	N	N	<10	50	N	N	N	N
AR164H	2	N	N	N	N	<10	50	N	N	N	N
AR165H	2	N	N	N	N	<10	70	N	N	N	N
AR166H	2	N	N	N	N	<10	70	N	N	N	N
AR167H	5	N	N	N	N	<10	50	N	N	N	N
AR168H	5	N	N	N	50	<10	50	N	N	N	N

TABLE 3. Continued

Sample	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
AR085H	N	100	N	200	20	N	500	N	>2,000	N
AR086H	N	50	N	200	20	N	200	N	>2,000	N
AR087H	N	20	N	1,500	20	N	100	N	>2,000	N
AR088H	N	50	N	500	20	N	300	N	>2,000	N
AR089H	N	30	1,000	200	20	N	200	N	>2,000	N
AR090H	N	50	200	200	20	N	200	N	>2,000	N
AR091H	N	50	N	200	20	N	300	N	>2,000	N
AR092H	N	70	N	200	20	N	300	N	>2,000	N
AR093H	N	70	N	200	100	N	300	N	>2,000	N
AR094H	N	20	N	700	20	N	100	N	>2,000	N
AR095H	N	50	200	200	20	N	200	N	>2,000	N
AR097H	N	50	20	500	20	N	200	N	>2,000	N
AR098H	N	20	N	700	20	N	150	N	>2,000	N
AR099H	N	50	N	500	20	N	150	N	>2,000	N
AR100H	N	50	N	700	20	N	200	N	>2,000	N
AR101H	N	70	N	200	20	N	500	N	>2,000	N
AR102H	N	50	N	200	20	N	200	N	>2,000	N
AR103H	N	70	N	200	20	N	300	N	>2,000	N
AR121H	N	30	N	500	20	N	150	N	>2,000	N
AR122H	N	50	N	1,500	20	N	200	N	>2,000	N
AR123H	N	20	N	700	20	N	100	N	>2,000	N
AR124H	N	20	N	500	<20	N	150	N	>2,000	N
AR125H	N	20	N	500	<20	N	150	N	>2,000	N
AR126H	N	70	N	200	20	N	300	N	>2,000	N
AR127H	N	20	N	700	20	N	100	N	>2,000	N
AR128H	N	30	N	200	<20	N	200	N	>2,000	N
AR129H	N	70	150	200	20	N	300	N	>2,000	N
AR130H	N	70	N	200	20	N	300	N	>2,000	N
AR131H	N	50	N	200	<20	N	200	N	>2,000	N
AR132H	N	70	N	200	20	N	300	N	>2,000	N
AR133H	N	70	N	200	20	N	300	N	>2,000	N
AR134H	N	70	20	200	20	N	300	N	>2,000	N
AR135H	N	70	N	200	<20	N	300	N	>2,000	N
AR136H	N	50	N	200	<20	N	200	N	>2,000	N
AR137H	N	20	N	700	<20	N	100	N	>2,000	N
AR138H	N	150	N	N	20	N	700	N	>2,000	N
AR139H	N	70	<20	200	<20	N	300	N	>2,000	N
AT161H	N	20	N	500	<20	N	150	N	>2,000	N
AR162H	N	20	N	1,500	20	N	50	N	>2,000	N
AR163H	N	50	20	500	20	N	200	N	>2,000	N
AR164H	N	30	700	700	20	N	200	N	>2,000	N
AR165H	N	70	300	700	<20	N	300	N	>2,000	N
AR166H	N	70	N	700	<20	N	200	N	>2,000	N
AR167H	N	70	N	200	20	N	300	N	>2,000	N
AR168H	N	100	N	200	20	N	300	N	>2,000	N

TABLE 3. 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
AR169H	38 47 33	116 19 48	.30	.10	.5	.500	50	N	N	N	<20	1,000
AR170H	38 47 35	116 20 27	.20	.05	1.0	.070	50	N	N	N	<20	700
AR171H	38 47 25	116 20 54	.50	.15	2.0	.500	150	N	N	N	20	700
AR172H	38 50 0	116 15 26	.50	.10	2.0	.100	100	N	N	N	20	5,000
AR173H	38 49 26	116 17 29	.20	.05	2.0	.050	50	N	N	N	<20	1,000
AR174H	38 56 49	116 12 35	.15	.05	1.0	.200	50	N	N	N	<20	700
AR175H	38 56 56	116 12 33	.50	.10	1.0	.150	70	N	N	N	20	5,000
AR176H	38 56 36	116 13 31	.20	.05	1.0	.200	70	N	N	N	<20	1,000
AR181H	38 45 7	116 20 0	.20	.10	2.0	.200	70	N	N	N	20	7,000
AR182H	38 45 58	116 20 27	.20	.05	2.0	.200	70	N	N	N	<20	700
AR183H	38 45 41	116 21 14	.20	.05	2.0	.150	50	N	N	N	<20	700
AR184H	38 53 5	116 21 17	.20	.05	2.0	.200	50	N	N	N	<20	700
AR185H	38 53 21	116 21 10	.20	.05	2.0	.200	50	N	N	N	<20	500
AR186H	38 54 13	116 20 33	.20	.05	1.0	.200	50	N	N	N	<20	500
AR187H	38 54 59	116 18 39	.50	.15	5.0	.100	70	N	N	N	<20	1,000
AR188H	38 56 49	116 19 0	.50	.15	5.0	.100	70	N	N	N	<20	1,000
AR189H	38 56 53	116 18 58	.50	.10	2.0	.200	50	N	N	N	<20	700
AR190H	38 57 57	116 17 5	.50	.10	2.0	.100	50	N	N	N	<20	1,000
AR191H	38 57 32	116 17 50	.30	.05	5.0	.100	50	N	N	N	<20	2,000
AR192H	38 59 13	116 17 21	.50	.10	5.0	.100	50	N	N	N	<20	1,000
AR193H	39 1 9	116 16 55	.30	.05	2.0	.070	50	N	N	N	<20	7,000
AR194H	39 0 5	116 17 53	.30	.05	2.0	.100	70	N	N	N	<20	2,000
AR195H	38 52 35	116 15 17	.30	.05	2.0	.100	50	N	N	N	<20	1,000
AR196H	39 1 7	116 12 47	.30	.20	5.0	.100	70	N	N	N	<20	>10,000
AR197H	39 1 7	116 12 56	.30	.05	5.0	.300	150	N	N	N	<20	200
AR198H	38 59 14	116 14 34	.20	.05	2.0	.100	30	N	N	N	<20	500
AR199H	39 0 20	116 10 56	.20	.20	5.0	.150	50	N	N	N	<20	7,000
AR200H	38 57 19	116 13 25	.30	.05	2.0	.070	50	N	N	N	<20	700
AR201H	38 58 2	116 14 20	.50	.50	2.0	.200	100	N	N	N	<20	500
AR202H	38 59 0	116 12 9	.20	.05	1.0	.020	50	N	N	N	<20	500
AR021H	38 59 37	116 13 26	.20	.05	.5	.015	20	N	N	N	<20	>10,000
AR022H	38 57 15	116 13 24	.50	.05	2.0	.100	70	N	N	N	<20	700

TABLE 3. 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
AR169H	5	N	N	N	N	<10	50	N	N	N	N
AR170H	2	N	N	N	50	10	50	N	N	N	N
AR171H	5	N	N	N	50	<10	150	30	N	N	N
AR172H	5	N	N	N	20	<10	50	N	N	N	20
AR173H	2	70	N	N	N	<10	50	N	N	N	N
AR174H	5	20	N	N	20	<10	50	N	N	N	N
AR175H	2	20	N	N	20	<10	50	N	N	N	N
AR176H	2	50	N	N	20	<10	50	N	N	N	N
AR181H	2	N	N	N	20	<10	50	N	N	N	20
AR182H	5	N	N	N	20	<10	70	N	N	N	N
AR183H	2	N	N	N	N	<10	50	20	N	N	N
AR184H	5	N	N	N	N	<10	50	N	N	N	N
AR185H	2	N	N	N	N	<10	50	N	N	N	N
AR186H	2	N	N	N	N	<10	50	N	N	N	N
AR187H	2	N	N	N	N	<10	50	N	N	N	N
AR188H	2	N	N	N	20	<10	50	N	N	N	20
AR189H	2	N	N	N	50	<10	50	N	N	N	N
AR190H	N	N	N	N	20	<10	50	N	N	N	N
AR191H	2	N	N	N	N	10	50	N	N	N	100
AR192H	2	N	N	N	N	<10	50	N	N	N	N
AR193H	2	N	N	N	20	<10	50	N	N	N	N
AR194H	2	N	N	N	N	<10	50	N	N	N	N
AR195H	2	N	N	N	N	<10	50	N	N	N	N
AR196H	2	N	N	N	50	<10	100	N	N	N	N
AR197H	2	N	N	N	N	15	100	N	N	N	N
AR198H	2	N	N	N	N	<10	50	N	N	N	N
AR199H	2	20	N	N	20	<10	50	N	N	N	N
AR200H	20	N	N	N	N	<10	<50	N	N	N	N
AR201H	2	700	N	N	20	<10	<50	N	N	N	70
AR202H	5	N	N	N	N	<10	<50	N	N	N	N
AR021H	2	N	N	N	N	<10	<50	N	N	N	N
AR022H	2	N	N	N	N	<10	<50	N	N	N	N

TABLE 3. Continued

Sample	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
AR159H	N	70	<20	200	20	N	300	N	>2,000	N
AR170H	N	50	150	200	20	N	200	N	>2,000	N
AR171H	N	70	N	200	20	N	300	N	>2,000	N
AR172H	N	30	N	700	20	N	150	N	>2,000	N
AR173H	N	30	70	500	20	N	150	N	>2,000	N
AR174H	N	70	20	200	20	N	500	N	>2,000	N
AR175H	N	30	N	500	20	N	150	N	>2,000	N
AR176H	N	70	100	500	20	N	300	N	>2,000	N
AR181H	N	30	N	700	20	N	150	N	>2,000	N
AR182H	N	70	30	200	20	N	500	N	>2,000	N
AR183H	N	20	N	500	<20	N	150	N	>2,000	N
AR184H	N	70	N	200	<20	N	200	N	>2,000	N
AR185H	N	70	N	200	<20	N	200	N	>2,000	N
AR186H	N	70	70	200	<20	N	200	N	>2,000	N
AR187H	N	10	N	700	<20	N	100	N	>2,000	N
AR188H	N	10	N	700	<20	N	70	N	>2,000	N
AR189H	N	20	20	500	<20	N	200	N	>2,000	N
AR190H	N	20	N	500	<20	N	70	N	>2,000	N
AR191H	N	20	N	1,000	<20	N	30	N	>2,000	N
AR192H	N	10	N	700	<20	N	70	N	>2,000	N
AR193H	N	20	N	500	<20	N	150	N	>2,000	N
AR194H	N	50	N	500	<20	N	200	N	>2,000	N
AR195H	N	10	70	500	<20	N	100	N	>2,000	N
AR196H	N	100	N	700	<20	N	200	N	>2,000	N
AR197H	N	100	N	200	<20	N	300	N	>2,000	N
AR198H	N	50	50	200	<20	N	150	N	>2,000	N
AR199H	N	50	N	300	20	N	200	N	>2,000	N
AR200H	N	10	N	500	<20	N	70	N	>2,000	N
AR201H	N	10	N	200	70	N	100	N	>2,000	N
AR202H	N	10	N	700	<20	N	150	N	>2,000	N
AR021H	N	10	N	500	<20	N	100	N	>2,000	N
AR022H	N	10	N	700	<20	N	70	N	>2,000	N

TABLE 4. ANALYSES OF THE ROCK SAMPLES FROM ANTELOPE STUDY AREA, NYE COUNTY, NEVADA.

[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	Be-ppm s
AR001R	38 43 36	116 19 39	.5	.10	.70	.070	70	<.5	<700	<15	70	1,500	<1.0
AR014R	38 57 54	116 17 8	7.0	1.00	3.00	.500	300	<.5	<700	<15	<10	1,500	1.5
AR019R	39 2 26	116 13 57	1.5	1.00	20.00	.150	300	.5	<700	<15	15	150	<1.0
AR025R	39 2 37	116 13 55	2.0	<.02	.15	.015	1,500	<.5	<700	<15	10	300	<1.0
AR042R	38 44 8	116 21 28	.3	.70	2.00	<.002	150	<.5	<700	<15	<10	500	<1.0
AR122R	38 44 48	116 16 15	3.0	3.00	3.00	.030	150	.5	<700	<15	30	200	1.5
AR123R	38 45 37	116 15 26	1.5	.15	.15	.070	30	<.5	<700	<15	70	300	<1.0
AR124R	38 45 13	116 17 37	3.0	.70	1.50	.300	200	<.5	<700	<15	15	1,500	2.0
AR135R	38 52 13	116 15 31	3.0	.50	1.50	.150	300	<.5	<700	<15	20	1,500	3.0
AR136R	38 51 53	116 16 12	3.0	.30	1.50	.150	700	<.5	<700	<15	20	1,000	2.0
AR137R	38 51 17	116 15 22	3.0	.30	1.50	.150	1,500	<.5	<700	<15	15	1,000	3.0
AR151R	38 45 17	116 17 38	3.0	.70	1.50	.150	300	<.5	<700	<15	15	1,500	1.5

TABLE 4. ANALYSES OF THE ROCK SAMPLES FROM ANTELOPE STUDY AREA, NYE COUNTY, NEVADA.--Continued

Sample	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	Sn-ppm s
AR001R	<10	<30	<5	70	15.0	30	<5	<20	10	<10	<100	<5	<10
AR014R	<10	<30	15	20	5.0	70	<5	20	<5	15	<100	15	<10
AR019R	<10	<30	<5	20	7.0	<30	<5	<20	20	<10	<100	5	<10
AR025R	<10	<30	<5	<10	2.0	<30	<5	<20	7	<10	<100	<5	<10
AR042R	<10	<30	<5	<10	7.0	<30	<5	<20	<5	<10	<100	<5	<10
AR122R	<10	<30	<5	15	30.0	<30	30	<20	30	70	<100	<5	<10
AR123R	<10	<30	<5	30	70.0	<30	<5	<20	7	<10	<100	<5	<10
AR124R	<10	<30	5	<10	7.0	70	<5	<20	<5	15	<100	7	<10
AR135R	<10	<30	<5	<10	2.0	70	<5	<20	<5	20	<100	7	<10
AR136R	<10	<30	<5	<10	1.5	70	<5	<20	<5	30	<100	<5	<10
AR137R	<10	<30	5	<10	3.0	50	<5	<20	<5	30	<100	<5	<10
AR161R	<10	<30	5	<10	7.0	70	<5	<20	<5	20	<100	7	<10

TABLE 4. ANALYSES OF THE ROCK SAMPLES FROM ANTELOPE STUDY AREA, NYE COUNTY, NEVADA.--Continued

Sample	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	As-ppm icp	Zn-ppm icp	Cd-ppm icp	Bi-ppm icp	Sb-ppm icp
AR001R	<100	15	<50	30	<200	50	<200	6	24	.2	7	8
AR014R	1,500	150	<50	30	<200	300	<200	<5	31	.1	4	12
AR019R	300	30	<50	30	<200	150	<200	21	101	10.3	3	11
AR025R	<100	<10	<50	<10	300	30	<200	121	84	.8	<2	10
AR042R	<100	<10	<50	<10	<200	<10	<200	8	9	.2	<2	7
AR122R	150	150	<50	20	700	30	<200	173	282	.9	<2	31
AR123R	<100	70	<50	10	<200	30	<200	28	30	.3	<2	11
AR124R	700	70	<50	15	<200	150	<200	5	28	.1	<2	8
AR135R	700	30	<50	15	<200	300	<200	<5	25	<.1	<2	7
AR136R	700	30	<50	20	<200	150	<200	5	21	.1	<2	7
AR137R	700	30	<50	15	<200	100	<200	7	30	<.1	<2	6
AR161R	700	30	<50	15	<200	150	<200	<5	27	<.1	<2	6

TABLE 5.--Description of rocks from Antelope Wilderness Study Area, Nye County, Nevada

Sample number	Description
AR001R	Chert
14R	Basalt
19R	Iron-stained sandstone
25R	Breccia
42R	Limestone
122R	Limestone
123R	Limestone
124R	Limestone
135R	Limestone
136R	Rhyolite
137R	Rhyolite
161R	Volcanic