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Geochemical Data for the Guadalupe Escarpment Wilderness Study Area, Eddy County, New Mexico

by

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CONTENTS

	Page
Introduction	1
Geologic setting	1
Methods	
Sampling and sample preparation methods	1
Analytical methods	3
Analytical data	3
References	18

TABLES

Table 1.--Determination limits for elements analyzed by semiquantitative emission spectography	4
2.--Analytical data for sieved sediment samples	5
3.--Analytical data for panned concentrate samples	8
4.--Analytical data for rock samples	11
5.--Analytical data for insoluble residues of rock samples	14
6.--Descriptive data for rock samples	17

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Guadalupe Escarpment Wilderness Study Area in the Lincoln National Forest, Eddy County, New Mexico. The Guadalupe Escarpment Wilderness Study Area was classified as a proposed wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION

During 1982, the U.S. Geological Survey and the U.S. Bureau of Mines conducted field investigations to evaluate the mineral resource potential of the Guadalupe Escarpment Wilderness Study Area. Field studies included geologic mapping, geochemical sampling, and a survey of known mines, prospects, and mineralized zones. This report presents a brief description of the procedure used in collecting and analyzing the geochemical samples and a list of the analytical results.

The Guadalupe Escarpment Wilderness Study Area encompasses approximately 21,000 acres along the Guadalupe Ridge in the southern end of the Guadalupe Mountains about 35 miles southwest of Carlsbad, New Mexico (fig. 1). The area trends northeasterly, is bounded on the south by the Texas state line, and adjoins the northern boundary of the Guadalupe Mountains National Park, Culberson County, Texas. The study area is bounded on the northeast by Carlsbad Caverns National Park, Eddy County, New Mexico. The area comprises several narrow, gently sloping mesas bounded by deeply incised canyons. Elevations range from 7413 ft on Camp Wilderness Ridge to approximately 4875 ft at Franks Spring.

GEOLOGIC SETTING

The Guadalupe Escarpment Wilderness Study Area lies northwest of the structurally low Delaware Basin and along the southern end of the Guadalupe Mountains uplift. Guadalupe Ridge, which defines the northwest boundary of the study area, is the crest of a gently-folded northeast trending anticline. The area is underlain entirely by rocks of the Permian Guadalupian Series which consists of limestones and dolomites with thin lenses of interbedded siltstone and sandstone. The individual formations have been described in detail by Hayes (1964).

METHODS

Sampling and sample-preparation methods

Geochemical rock and stream-sediment sampling was carried out by the U.S. Geological Survey during the spring of 1982. Access to the area was achieved by 4-wheel drive vehicle and foot traverses.

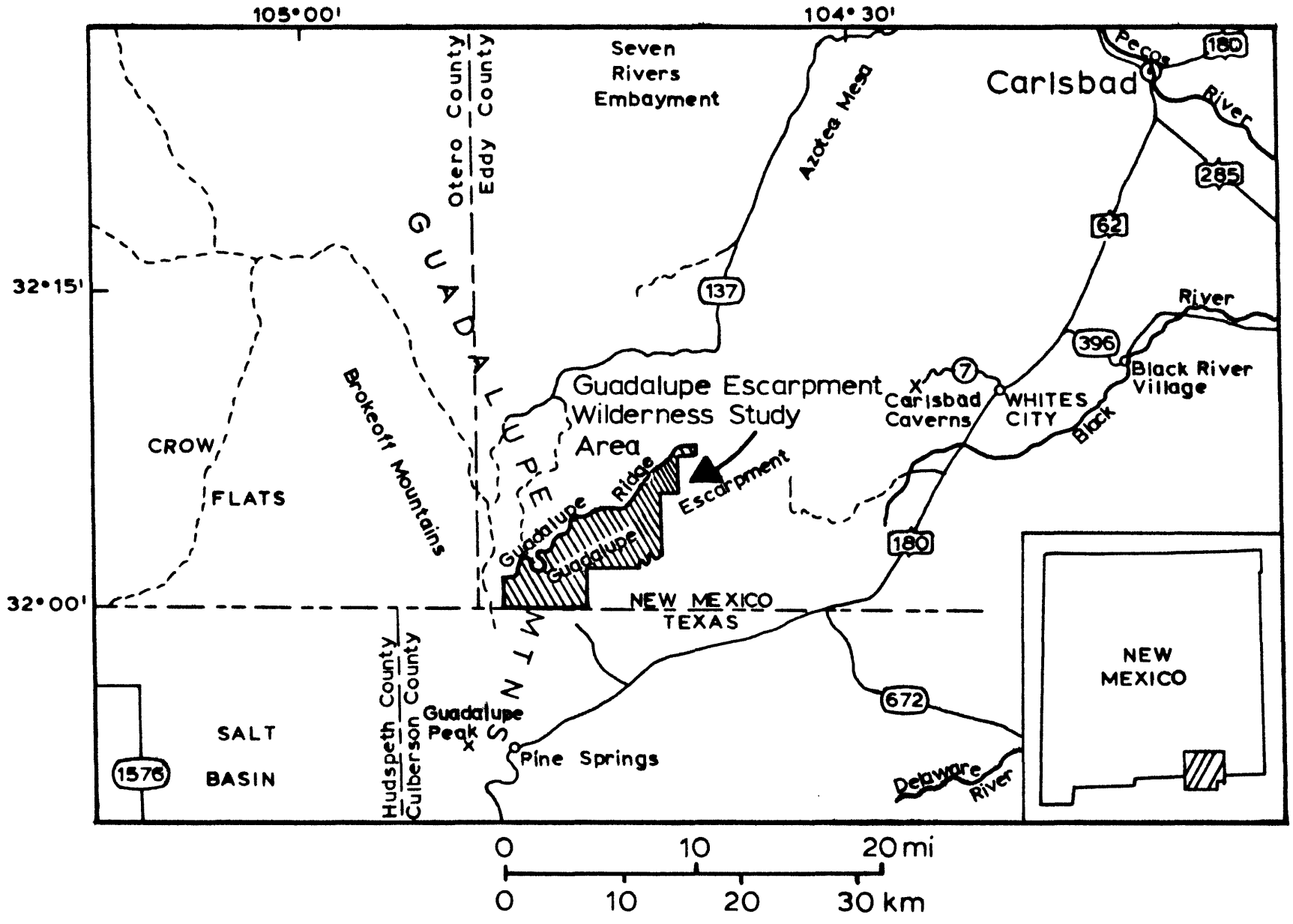

Figure 1.--Index map showing location of the Guadalupe Escarpment Wilderness Study Area, New Mexico

Rock samples

Rock samples were collected at approximately one-mile intervals along Guadalupe Ridge, the northwestern boundary of the area, and along the northwest trending mesas throughout the area. Rock samples were also collected from outcrops near most of the stream-sediment sample sites. A total of 40 rock samples was collected from 38 sites throughout the study area. A brief description of the rock samples is listed in Table 6. All rock samples were taken from outcrops, and no evidence of hydrothermal alteration was observed in any of the samples. All rock samples were crushed and pulverized to <150-mesh (0.10 mm) before being analyzed.

Stream-sediment samples

Stream-sediment samples were collected from the active portion of intermittent drainages at 18 sites. Two types of sediment samples were collected. A composite sample was collected across the active portion of each drainage course at 17 of the sites, then sieved to <30 mesh (0.59 mm), and pulverized to <150 mesh (0.10 mm). The second stream-sediment sample consisted of a bulk sample to be panned for a heavy-mineral concentrate. The panned sample was further concentrated by liquid separation in bromoform (specific gravity 2.85). The magnetic fraction of the heavy-mineral concentrate was removed by magnetic separation on a Frantz Isodynamic Separator[1].

Analytical Methods

All rock samples and both the sieved stream-sediment samples and the nonmagnetic fraction of the heavy-mineral concentrates were analyzed for 31 elements by a six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in Table 1. Rock samples were also analyzed for zinc, cadmium, bismuth, antimony, and arsenic by atomic absorption spectrophotometry. Splits of the limestone and dolomite rock samples were dissolved in dilute HCl. The insoluble residue was washed with distilled water, then analyzed by semiquantitative emission spectrography.

ANALYTICAL DATA

Analytical data for samples from the Guadalupe Escarpment Wilderness Study Area were entered into the USGS Rock Analysis Storage System (RASS). These data for sieved sediments, nonmagnetic heavy-mineral concentrates, rocks, and insoluble residues of rocks are listed in Tables 2-5. Abbreviations used on the element columns are as follows:

[1]The use of trade names in this report is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

pct - percent
ppm - parts per million
s - semiquantitative emission spectrographic analyses
aa - atomic absorption analyses
N - not detected
-- - no data available
< - detected but below lower limit of determination
> - greater than upper limit of detection

Table 1.--Determination limits for elements analyzed by semiquantitative emission spectrography.

Element	Lower Limits of Determination	
	rocks and sediments	concentrates
Fe	0.05%	0.1%
Mg	0.02	0.05
Ca	0.05	0.1
Ti	0.002	0.005
Mn	10 ppm	20 ppm
Ag	0.5	1
As	200	500
Au	10	20
B	10	20
Ba	20	50
Be	1	2
Bi	10	20
Cd	20	50
Co	5	10
Cr	10	20
Cu	5	10
La	20	50
Mo	5	10
Nb	20	50
Ni	5	10
Pb	10	20
Sb	100	200
Sc	5	10
Sn	10	20
Sr	100	200
Th	100	200
V	10	20
W	50	100
Y	10	20
Zn	200	500
Zr	10	20

Table 2.--Analytical Data for sieved Sediment Samples

Sample	Latitude	Longitude	Fe-pct.	Mg-pct.	Ca-pct.	Ti-pct.	Mn-ppm	Ag-ppm	As-ppm	Au-ppm	B-ppm	Ba-ppm
			s	s	s	s	s	s	s	s	s	s
GE5	32 2 8	104 48 24	1.5	1.0	1	.30	500	N	N	N	100	200
GE6	32 2 5	104 48 24	1.5	1.0	2	.50	500	N	N	N	100	300
GE25	32 1 58	104 44 56	.5	2.0	10	.07	150	N	N	N	50	100
GE26	32 1 53	104 44 58	.5	3.0	15	.05	150	N	N	N	30	70
GE27	32 1 24	104 44 54	.5	3.0	20	.05	150	N	N	N	30	150
GE28	32 2 59	104 43 9	.5	1.5	5	.10	200	N	N	N	50	100
GE29	32 2 58	104 43 13	.5	5.0	15	.05	150	N	N	N	50	100
GE31	32 2 35	104 43 35	.5	2.0	3	.10	150	N	N	N	50	100
GE32	32 2 40	104 42 58	.3	5.0	5	.07	150	N	N	N	50	70
GE33	32 2 44	104 42 55	.3	5.0	15	.07	100	N	N	N	30	70
GE34	32 2 35	104 41 46	.5	3.0	20	.05	100	N	N	N	30	70
GE35	32 0 6	104 47 37	.3	3.0	10	.05	100	N	N	N	30	150
GE36	32 0 3	104 47 41	.5	5.0	10	.07	100	N	N	N	20	100
GE37	32 2 43	104 41 23	.7	3.0	15	.05	100	N	N	N	30	70
GE38	32 5 10	104 41 2	.5	3.0	15	.07	150	N	N	N	50	100
GE39	32 5 37	104 40 45	.5	2.0	10	.07	150	N	N	N	50	200
GE40	32 5 39	104 40 40	.5	1.5	7	.10	150	N	N	N	70	200

Table 2.-- Analytical Data for sieved Sediment Samples (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
GE5	1.5	N	N	7	70	15	30	N	N	30	30	N	10
GE6	2.0	N	N	7	70	20	30	N	N	30	50	N	7
GE25	1.0	N	N	N	30	7	N	N	N	7	15	N	<5
GE26	<1.0	N	N	N	30	7	N	N	N	10	20	N	N
GE27	<1.0	N	N	N	50	5	N	N	N	7	15	N	<5
GE28	1.5	N	N	N	50	10	20	<5	N	10	20	N	5
GE29	<1.0	N	N	N	30	7	N	5	N	7	15	N	<5
GE31	1.5	N	N	N	50	10	N	N	N	7	20	N	5
GE32	1.0	N	N	N	30	10	20	N	N	7	15	N	<5
GE33	N	N	N	N	30	5	N	7	N	10	15	N	N
GE34	<1.0	N	N	N	30	7	N	5	N	10	15	N	N
GE35	1.0	N	N	N	30	7	N	<5	N	7	30	N	<5
GE36	1.0	N	N	N	50	7	N	N	N	5	15	N	<5
GE37	1.0	N	N	5	30	7	N	<5	N	10	15	N	5
GE38	N	N	N	<5	100	7	N	<5	N	10	15	N	5
GE39	1.0	N	N	N	30	7	N	N	N	7	20	N	5
GE40	1.5	N	N	5	30	10	N	N	N	10	20	N	7

Table 2.--Analytical Data for sieved Sediment Samples (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	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
GE5	N	200	70	N	20	N	200	N	--	--	--	--	--
GE6	N	300	50	N	30	N	300	N	--	--	--	--	--
GE25	N	<100	20	N	20	N	100	N	--	--	--	--	--
GE26	N	100	15	N	<10	N	50	N	--	--	--	--	--
GE27	N	150	15	N	<10	N	30	N	--	--	--	--	--
GE28	N	100	30	N	<10	N	100	N	--	--	--	--	--
GE29	N	100	20	N	<10	N	20	N	--	--	--	--	--
GE31	N	100	30	N	10	N	200	N	--	--	--	--	--
GE32	N	N	20	N	10	N	150	N	--	--	--	--	--
GE33	N	100	15	N	<10	N	100	N	--	--	--	--	--
GE34	N	100	20	N	10	N	20	N	--	--	--	--	--
GE35	N	N	15	N	<10	N	100	N	--	--	--	--	--
GE36	N	N	20	N	<10	N	100	N	--	--	--	--	--
GE37	N	100	20	N	10	N	70	N	--	--	--	--	--
GE38	N	150	20	N	15	N	100	N	--	--	--	--	--
GE39	N	100	15	N	<10	N	70	N	--	--	--	--	--
GE40	N	100	20	N	15	N	200	N	--	--	--	--	--

Table 3.-- Analytical data for Panned Concentrate Samples

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
GE5C	32 2 8	104 48 24	.7	.5	1.5	>2.0	150	N	N	N	100	1,500
GE6C	32 2 5	104 48 24	.5	.7	1.5	>2.0	100	N	N	N	70	5,000
GE25C	32 1 58	104 44 56	.5	3.0	.5	.7	100	N	N	N	30	>10,000
GE26C	32 1 53	104 44 58	.7	5.0	.5	.5	100	N	N	N	30	>10,000
GE27C	32 1 24	104 44 54	.5	3.0	.3	.7	100	N	N	N	30	>10,000
GE28C	32 2 59	104 43 9	.7	2.0	1.0	>2.0	100	N	N	N	50	>10,000
GE29C	32 2 58	104 43 13	.5	3.0	.7	2.0	100	N	N	N	50	>10,000
GE30C	32 2 43	104 43 33	.3	1.0	1.5	>2.0	100	N	N	N	70	7,000
GE31C	32 2 35	104 43 35	.2	1.5	1.0	>2.0	70	N	N	N	50	1,500
GE32C	32 2 40	104 42 58	.2	1.0	1.5	>2.0	200	N	N	N	150	1,000
GE33C	32 2 44	104 42 55	.5	2.0	.5	1.0	50	N	N	N	20	>10,000
GE34C	32 2 35	104 41 46	.7	1.0	.5	1.5	50	N	N	N	30	>10,000
GE35C	32 0 6	104 47 37	.2	5.0	.2	1.0	50	N	N	N	50	>10,000
GE36C	32 0 3	104 47 41	.7	2.0	.2	1.5	150	N	N	N	70	>10,000
GE37C	32 2 43	104 41 23	1.0	3.0	.5	>2.0	150	N	N	N	200	>10,000
GE38C	32 5 10	104 41 2	.5	3.0	.3	2.0	70	N	N	N	50	>10,000
GE39C	32 5 37	104 40 45	.5	3.0	.3	1.0	50	N	N	N	20	>10,000
GE40C	32 5 39	104 40 40	.3	2.0	.5	2.0	100	N	N	N	50	>10,000

Table 3.--Analytical data for Panned Concentrate Samples (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
GE5C	N	N	200	N	200	10	N	N	70	N	100	N	15
GE6C	<2	N	200	N	300	20	N	10	70	N	1,500	N	15
GE25C	2	N	70	N	30	<10	N	N	N	N	70	N	15
GE26C	N	N	50	N	50	<10	N	N	N	10	70	N	15
GE27C	<2	N	50	N	30	N	N	<10	N	10	30	N	15
GE28C	2	N	150	N	100	50	N	N	<50	15	700	N	15
GE29C	2	N	100	N	70	N	N	N	50	N	50	N	15
GE30C	2	N	200	N	200	15	N	N	N	N	30	N	15
GE31C	2	N	300	N	200	N	N	N	<50	N	200	N	15
GE32C	2	N	200	N	500	10	N	N	50	N	70	N	15
GE33C	2	N	50	N	50	N	N	N	N	N	20	N	15
GE34C	2	N	100	N	100	N	N	200	50	10	700	N	15
GE35C	2	N	50	N	50	10	N	N	N	N	100	N	15
GE36C	2	N	100	N	70	10	N	N	<50	<10	150	N	15
GE37C	2	N	150	10	150	100	N	70	50	N	700	N	15
GE38C	2	N	100	N	70	N	N	10	N	N	300	N	15
GE39C	2	N	50	N	30	N	N	N	N	N	30	N	15
GE40C	2	N	100	N	100	N	N	N	N	N	50	N	15

Table 3.--Analytical data for Panned Concentrate Samples (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	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
GE5C	N	N	150	N	500	20,000	>2,000	N	--	--	--	--	--
GE6C	N	N	100	N	500	>20,000	>2,000	N	--	--	--	--	--
GE25C	N	5,000	30	N	300	5,000	>2,000	N	--	--	--	--	--
GE26C	N	2,000	30	N	200	3,000	>2,000	N	--	--	--	--	--
GE27C	N	3,000	20	N	200	3,000	>2,000	N	--	--	--	--	--
GE28C	N	5,000	200	N	500	20,000	>2,000	N	--	--	--	--	--
GE29C	N	3,000	30	N	500	10,000	>2,000	N	--	--	--	--	--
GE30C	N	1,500	150	N	700	20,000	>2,000	N	--	--	--	--	--
GE31C	<20	3,000	70	N	700	20,000	>2,000	N	--	--	--	--	--
GE32C	<20	3,000	200	N	700	20,000	>2,000	N	--	--	--	--	--
GE33C	20	3,000	50	N	300	5,000	>2,000	N	--	--	--	--	--
GE34C	N	5,000	50	N	300	15,000	>2,000	N	--	--	--	--	--
GE35C	N	3,000	30	N	300	7,000	>2,000	N	--	--	--	--	--
GE36C	N	3,000	70	N	500	10,000	>2,000	N	--	--	--	--	--
GE37C	N	1,000	70	N	500	15,000	>2,000	N	--	--	--	--	--
GE38C	N	3,000	150	N	500	3,000	>2,000	N	--	--	--	--	--
GE39C	20	5,000	30	N	200	5,000	>2,000	N	--	--	--	--	--
GE40C	N	5,000	30	N	500	10,000	>2,000	N	--	--	--	--	--

Table 4.--Analytical Data for Rock Samples

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
GE1R1	32 4 42	104 45 1	>20.00	<.02	<.05	.100	10	N	N	N	20	200
GE1R2	32 4 42	104 45 1	.70	1.00	2.00	.300	50	N	N	N	70	100
GE3R	32 0 39	104 47 16	1.00	10.00	15.00	.050	70	N	N	N	50	700
GE4R	32 1 5	104 47 31	.50	.10	.30	.500	200	N	N	N	50	100
GE5R	32 2 8	104 48 24	.20	10.00	15.00	.015	100	N	N	N	50	20
GE6R	32 2 5	104 48 24	.30	7.00	10.00	.010	150	N	N	N	20	<20
GE7R	32 1 41	104 48 55	.05	10.00	10.00	<.002	30	N	N	N	10	N
GE8R	32 2 0	104 47 24	.50	2.00	5.00	.200	100	N	N	N	70	500
GE9R	32 1 43	104 46 10	.20	7.00	15.00	.020	100	N	N	N	50	20
GE10R	32 2 46	104 47 2	.07	7.00	10.00	<.002	100	N	N	N	20	N
GE11R	32 3 31	104 46 18	.20	>10.00	20.00	.030	100	N	N	N	70	30
GE12R	32 4 20	104 46 7	.10	10.00	20.00	.010	70	N	N	N	30	N
GE13R	32 4 22	104 45 20	.05	10.00	15.00	<.002	50	N	N	N	20	N
GE14R	32 2 33	104 44 42	<.05	10.00	10.00	<.002	30	N	N	N	50	N
GE15R1	32 2 40	104 44 54	>20.00	<.02	<.05	.070	20	N	N	N	30	50
GE15R2	32 2 40	104 44 54	1.00	<.02	<.05	.200	50	.5	N	N	30	20
GE16R	32 4 41	104 44 12	.70	.05	.05	.300	150	N	N	N	70	150
GE17R	32 4 22	104 43 39	1.00	10.00	20.00	.020	150	N	N	N	50	30
GE18R	32 3 40	104 41 20	.07	7.00	15.00	<.002	15	N	N	N	100	N
GE19R	32 4 1	104 42 7	.20	7.00	20.00	.020	100	N	N	N	100	20
GE20R	32 4 42	104 42 30	.10	5.00	10.00	.020	100	N	N	N	100	20
GE21R	32 5 30	104 42 17	.30	.20	.07	.500	100	N	N	N	50	150
GE22R	32 6 8	104 41 45	.10	7.00	10.00	.015	150	N	N	N	50	150
GE23R	32 6 18	104 40 54	.10	7.00	15.00	.007	200	N	N	N	50	<20
GE24R	32 7 4	104 40 27	.15	7.00	15.00	.010	200	N	N	N	30	<20
GE25R	32 1 58	104 44 56	<.05	3.00	10.00	N	70	N	N	N	20	N
GE26R	32 1 53	104 44 58	N	5.00	10.00	N	30	N	N	N	10	N
GE27R	32 1 24	104 44 54	.10	7.00	15.00	.050	50	N	N	N	50	20
GE28R	32 2 59	104 43 9	<.05	5.00	10.00	.002	70	N	N	N	20	N
GE29R	32 2 58	104 43 13	<.05	7.00	15.00	.002	70	N	N	N	30	<20
GE30R	32 2 43	104 43 33	<.05	3.00	20.00	<.002	70	N	N	N	15	N
GE31R	32 2 35	104 43 35	N	7.00	20.00	<.002	70	N	N	N	10	N
GE32R	32 2 40	104 42 58	<.05	3.00	20.00	N	50	N	N	N	20	N
GE33R	32 2 44	104 42 55	N	2.00	15.00	<.002	30	N	N	N	10	N
GE34R	32 2 35	104 41 46	<.05	5.00	10.00	<.002	20	N	N	N	15	N
GE35R	32 0 6	104 47 37	<.05	5.00	10.00	.005	20	N	N	N	20	<20
GE36R	32 0 3	104 47 41	N	1.50	15.00	N	50	N	N	N	15	N
GE38R	32 5 10	104 41 2	N	10.00	10.00	<.002	50	N	N	N	20	N
GE39R	32 5 37	104 40 45	N	.50	20.00	<.002	70	N	N	N	15	N
GE40R	32 5 39	104 40 40	N	.70	20.00	<.002	50	N	N	N	15	N

Table 4.-- Analytical Data for Rock Samples (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
GE1R1	N	N	30	N	50	7	N	20	N	7	30	N	<5
GE1R2	N	N	<20	7	70	10	N	10	N	20	<10	N	7
GE3R	N	N	N	7	20	10	N	N	N	50	15	N	<5
GE4R	1.5	N	N	N	150	<5	20	N	N	5	<10	N	5
GE5R	N	N	N	N	30	<5	N	N	N	5	N	N	N
GE6R	N	N	N	5	10	<5	N	N	N	5	N	N	N
GE7R	N	N	N	N	20	<5	N	N	N	<5	N	N	N
GE8R	1.0	N	N	N	70	5	20	N	N	7	10	N	7
GE9R	N	N	N	<5	20	<5	N	N	N	<5	N	N	N
GE10R	N	N	N	<5	10	<5	N	N	N	<5	N	N	N
GE11R	N	N	N	<5	20	5	N	N	N	7	<10	N	N
GE12R	N	N	N	N	30	5	N	N	N	<5	N	N	N
GE13R	N	N	N	N	50	<5	N	N	N	5	N	N	N
GE14R	N	N	N	N	N	N	N	N	N	N	N	N	N
GE15R1	N	N	150	N	100	30	N	20	N	20	30	N	N
GE15R2	N	N	N	N	10	<5	N	10	N	<5	100	N	N
GE16R	1.0	N	N	7	100	7	30	N	N	15	N	N	7
GE17R	N	N	N	N	30	N	N	7	N	10	N	N	N
GE18R	N	N	N	N	10	N	N	N	N	N	N	N	<5
GE19R	N	N	N	N	20	N	N	N	N	5	N	N	<5
GE20R	N	N	N	N	15	<5	N	N	N	5	N	N	N
GE21R	1.0	N	N	<5	100	5	N	N	20	10	<10	N	5
GE22R	N	N	N	N	20	5	N	N	N	7	10	N	N
GE23R	N	N	N	N	50	<5	N	N	N	N	<10	N	N
GE24R	N	N	N	N	10	N	N	N	N	N	N	N	N
GE25R	N	N	N	N	N	<5	20	N	N	N	N	N	N
GE26R	N	N	N	N	<10	N	N	N	N	N	N	N	N
GE27R	N	N	N	N	30	<5	N	N	N	<5	N	N	N
GE28R	N	N	N	N	N	<5	N	N	N	N	N	N	N
GE29R	N	N	N	N	<10	N	N	N	N	N	N	N	N
GE30R	<1.0	N	N	N	N	N	N	N	N	<5	N	N	N
GE31R	N	N	N	N	N	N	N	N	N	N	N	N	N
GE32R	N	N	N	N	N	N	N	N	N	<5	N	N	N
GE33R	N	N	N	N	N	N	N	N	N	N	N	N	N
GE34R	1.0	N	N	N	N	N	N	N	N	N	N	N	N
GE35R	1.5	N	N	N	10	<5	N	N	N	<5	N	N	N
GE36R	N	N	N	N	N	N	N	N	N	<5	N	N	N
GE38R	1.0	N	N	N	10	N	N	N	N	N	N	N	N
GE39R	N	N	N	N	10	N	N	N	N	N	N	N	N
GE40R	<1.0	N	N	N	15	N	N	N	N	N	N	N	N

Table 4.--Analytical Data for Rock Samples (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	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
GE1R1	N	300	70	N	N	2,000	150	N	30	450	20.0	N	3
GE1R2	N	300	50	N	<10	<200	300	N	15	240	.2	N	5
GE3R	N	150	20	N	10	N	20	N	10	20	.5	N	2
GE4R	N	200	20	N	20	N	1,000	N	<5	15	.2	N	N
GE5R	N	100	15	N	N	N	<10	N	5	10	.3	N	1
GE6R	N	N	20	N	N	N	<10	N	N	5	.2	N	1
GE7R	N	N	10	N	N	N	<10	N	<5	15	.4	N	2
GE8R	N	300	20	N	20	N	300	N	5	15	.2	N	2
GE9R	N	150	15	N	N	N	15	N	10	55	.2	N	N
GE10R	N	N	N	N	N	N	N	N	<5	25	.1	N	N
GE11R	N	100	20	N	<10	N	20	N	5	20	.2	N	1
GE12R	N	N	15	N	N	N	10	N	5	30	.1	N	2
GE13R	N	N	<10	N	N	N	N	N	5	5	.1	N	2
GE14R	N	N	<10	N	N	N	N	N	5	5	.2	N	2
GE15R1	N	300	50	N	<10	5,000	30	N	210	2,200	52.0	N	3
GE15R2	N	300	15	N	<10	200	1,000	N	40	230	2.7	N	5
GE16R	N	500	20	N	30	N	1,000	N	5	20	.2	N	1
GE17R	N	150	10	N	15	N	20	N	<5	10	.1	N	1
GE18R	N	N	N	N	N	N	N	N	N	5	.1	N	2
GE19R	N	<100	15	N	10	N	30	N	<5	15	.2	N	1
GE20R	N	N	10	N	<10	N	20	N	<5	20	.3	N	N
GE21R	N	300	30	N	30	N	1,000	N	5	15	.3	N	1
GE22R	N	<100	15	N	<10	N	<10	N	N	35	.4	N	N
GE23R	N	<100	15	N	<10	N	N	N	N	15	.2	N	N
GE24R	N	<100	10	N	10	N	<10	N	N	15	.2	N	N
GE25R	N	N	N	N	<10	N	N	N	N	25	.2	N	N
GE26R	N	N	N	N	N	N	N	N	N	10	.1	N	N
GE27R	N	N	20	N	10	N	70	N	5	25	N	N	N
GE28R	N	N	N	N	<10	N	<10	N	N	5	N	N	N
GE29R	N	150	N	N	<10	N	<10	N	5	5	.1	N	N
GE30R	N	200	<10	N	10	N	N	N	5	10	.3	N	2
GE31R	N	100	N	N	N	N	N	N	<5	5	.4	N	1
GE32R	N	100	<10	N	N	N	N	N	5	240	.4	N	2
GE33R	N	100	<10	N	<10	N	N	N	<5	20	.3	N	3
GE34R	N	N	N	N	<10	N	N	N	5	20	.1	N	1
GE35R	N	N	<10	N	N	N	N	N	5	10	.2	N	2
GE36R	N	100	N	N	N	N	N	N	5	5	.2	N	2
GE38R	N	N	N	N	N	N	N	N	5	10	.1	N	N
GE39R	N	100	10	N	10	N	N	N	<5	10	.2	N	N
GE40R	N	150	10	N	<10	N	N	N	5	5	.1	N	1

Table 5.--Analytical Data for Insoluble Residues of Rock Samples

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
GE1R1IR	32 4 42	104 45 1	20.0	.05	<.05	.15	20	N	N	N	20	300
GE1R2IR	32 4 42	104 45 1	1.5	.10	<.05	.30	15	N	N	N	150	30
GE3RIR	32 0 39	104 47 16	15.0	.30	<.05	.50	50	N	N	N	200	>5,000
GE5RIR	32 2 8	104 48 24	1.0	.20	<.05	.70	70	N	N	N	300	300
GE6RIR	32 2 5	104 48 24	10.0	1.00	<.05	.50	150	.5	N	N	300	300
GE7RIR	32 1 41	104 48 55	2.0	1.00	.30	.20	100	.5	N	N	200	500
GE9RIR	32 1 43	104 46 10	7.0	1.00	.05	1.00	70	N	300	N	500	300
GE10RIR	32 2 46	104 47 2	5.0	.30	.20	.15	50	N	N	N	100	50
GE11RIR	32 3 31	104 46 18	5.0	1.00	.07	1.00	100	N	N	N	500	500
GE12RIR	32 4 20	104 46 7	10.0	.70	<.05	.70	70	N	N	N	300	200
GE17RIR	32 4 22	104 43 39	15.0	.70	<.05	.30	200	N	N	N	200	300
GE19RIR	32 4 1	104 42 7	7.0	1.00	<.05	.70	100	N	N	N	500	300
GE20RIR	32 4 42	104 42 30	7.0	2.00	.10	1.00	100	N	N	N	1,000	1,500
GE22RIR	32 6 8	104 41 45	15.0	.70	<.05	.70	70	N	N	N	300	5,000
GE23RIR	32 6 18	104 40 54	.5	.20	<.05	.10	10	N	N	N	150	50
GE24RIR	32 7 4	104 40 27	.5	.20	.30	.07	10	N	N	N	100	20
GE27RIR	32 1 24	104 44 54	1.5	.20	.10	.70	20	N	N	N	200	100
GE35RIR	32 0 6	104 47 37	1.0	10.00	10.00	1.00	50	<.5	N	N	200	200
GE40RIR	32 5 39	104 40 40	2.0	.20	.15	.07	70	N	N	N	70	100

Table 5.--Analytical Data for Insoluble Residues of Rock Samples (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
GE1R1IR	N	N	<20	N	30	7	N	50	N	5	200	N	N
GE1R2IR	<1.0	N	N	N	50	<5	N	7	<20	7	15	N	<5
GE3RIR	1.5	N	N	30	100	100	N	N	N	500	200	N	10
GE5RIR	<1.0	N	N	<5	150	<5	N	N	<20	7	15	N	N
GE6RIR	2.0	N	N	7	150	20	<20	20	<20	70	30	N	10
GE7RIR	<1.0	N	N	30	150	3,000	N	50	N	100	70	N	5
GE9RIR	2.0	N	N	10	150	150	<20	70	20	70	100	N	20
GE10RIR	1.0	N	N	7	<10	300	N	N	N	200	70	N	N
GE11RIR	1.0	N	N	20	150	50	50	<5	20	50	70	N	20
GE12RIR	1.0	N	N	15	150	100	<20	<5	<20	100	150	N	15
GE17RIR	1.0	N	N	10	50	<5	N	10	<20	15	10	N	<5
GE19RIR	1.0	N	N	10	150	20	70	15	20	30	20	N	20
GE20RIR	2.0	N	N	7	200	70	50	20	20	100	30	N	20
GE22RIR	2.0	N	N	50	150	100	70	30	<20	300	500	N	15
GE23RIR	<1.0	N	N	N	50	<5	N	N	N	<5	N	N	5
GE24RIR	<1.0	N	N	N	<10	<5	N	N	N	<5	N	N	N
GE27RIR	<1.0	N	N	5	70	10	<20	N	20	15	20	N	5
GE35RIR	<1.0	N	N	5	150	30	70	N	<20	15	100	N	7
GE40RIR	1.0	N	N	5	<10	20	N	<5	N	15	50	N	N

Table 5.--Analytical Data for Insoluble Residues of Rock Samples (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	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
GE1R1IR	N	300	100	N	N	1,500	100	N	--	--	--	--	--
GE1R2IR	N	300	50	N	10	200	700	N	--	--	--	--	--
GE3RIR	N	500	100	N	20	N	100	N	--	--	--	--	--
GE5RIR	N	150	50	N	30	N	1,000	N	--	--	--	--	--
GE6RIR	N	150	300	N	30	200	500	N	--	--	--	--	--
GE7RIR	15	200	50	N	10	1,000	200	N	--	--	--	--	--
GE9RIR	N	1,000	100	N	20	700	300	N	--	--	--	--	--
GE10RIR	N	<100	30	N	10	1,000	150	N	--	--	--	--	--
GE11RIR	N	500	100	N	50	N	300	N	--	--	--	--	--
GE12RIR	10	300	200	N	20	500	300	N	--	--	--	--	--
GE17RIR	N	300	70	N	20	N	300	N	--	--	--	--	--
GE19RIR	N	200	100	N	30	N	500	N	--	--	--	--	--
GE20RIR	<10	700	150	N	20	N	500	N	--	--	--	--	--
GE22RIR	10	500	100	N	30	500	200	N	--	--	--	--	--
GE23RIR	N	150	30	N	10	N	50	N	--	--	--	--	--
GE24RIR	N	200	15	N	<10	N	50	N	--	--	--	--	--
GE27RIR	N	<100	50	N	20	N	1,000	N	--	--	--	--	--
GE35RIR	N	<100	30	N	50	N	>1,000	N	--	--	--	--	--
GE40RIR	N	200	30	N	10	<200	100	N	--	--	--	--	--

Table 6.--Descriptive data for rock samples

Sample Number	Rock Type	Formation	Color	Grain Size	Remarks
GE 1R1	Sandstone	Seven Rivers	Dark Brown	Fine	Hematite with limonitic staining
GE 1R2	Sandstone	Seven Rivers	Light Brown	Fine	
GE 3R	Dolomite	Yates	Light Brown	Aphanitic	Minor limonitic staining
GE 4R	Sandstone	Yates	Light Brown	Fine	Minor limonitic staining
GE 5R	Dolomite	Seven Rivers	Light Gray	Aphanitic	
GE 6R	Limestone	Seven Rivers	Light Brown	Aphanitic	
GE 7R	Limestone	Seven Rivers	Light Pink	Aphanitic	
GE 8R	Sandstone	Yates	Brown	Fine	Minor limonitic staining
GE 9R	Limestone	Yates	Light Brown	Aphanitic	Minor limonitic staining
GE 10R	Dolomite	Yates	White	Aphanitic	
GE 11R	Dolomite	Yates	Light Brown	Aphanitic	
GE 12R	Dolomite	Seven Rivers	White	Aphanitic	
GE 13R	Dolomite	Yates	Light Gray	Aphanitic	
GE 14R	Dolomite	Yates	Light Gray	Aphanitic	Oolitic
GE 15R1	Sandstone	Seven Rivers	Dark Brown	Fine	Hematite concretion
GE 15R2	Sandstone	Seven Rivers	Light Brown	Fine	Abundant hematite with limonitic staining
GE 16R	Sandstone	Yates	Brown	Fine	Minor limonitic staining
GE 17R	Dolomite	Yates	Light Gray	Medium	
GE 18R	Limestone	Tensill	Light Gray	Fine	
GE 19R	Limestone	Yates	Brown	Aphanitic	Minor limonitic staining
GE 20R	Limestone	Yates	Light Brown	Aphanitic	
GE 21R	Sandstone	Yates	Light Brown	Fine	
GE 22R	Limestone	Yates	Light Gray	Aphanitic	
GE 23R	Limestone	Yates	Gray	Aphanitic	
GE 24R	Limestone	Yates	Light Gray	Aphanitic	
GE 25R	Limestone	Breccia member, Capitan Limestone	White	Aphanitic	
GE 26R	Limestone	Breccia member, Capitan Limestone	Light Gray	Medium	
GE 27R	Limestone	Breccia member, Capitan Limestone	Light Gray	Aphanitic	
GE 28R	Limestone	Massive member, Capitan Limestone	Light Gray	Aphanitic	
GE 29R	Limestone	Massive member, Capitan Limestone	White	Aphanitic	
GE 30R	Limestone	Massive member, Capitan Limestone	Light Gray	Aphanitic	
GE 31R	Limestone	Massive member, Capitan Limestone	White	Aphanitic	
GE 32R	Limestone	Breccia member, Capitan Limestone	Light Gray	Aphanitic	
GE 33R	Limestone	Breccia member, Capitan Limestone	White	Aphanitic	
GE 34R	Limestone	Breccia member, Capitan Limestone	Light Gray	Aphanitic	
GE 35R	Limestone	Goat Seep Dolomite	Light Gray	Aphanitic	
GE 36R	Limestone	Goat Seep Dolomite	Light Gray	Aphanitic	
GE 38R	Dolomite	Massive member, Capitan Limestone	Light Gray	Aphanitic	
GE 39R	Limestone	Massive member, Capitan Limestone	Light Gray	Aphanitic	
GE 40R	Limestone	Massive member, Capitan Limestone	Light Gray	Aphanitic	

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