UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the Eagle Mountains Wilderness Study Area (CDCA-334), Riverside County, California

by

Gordon W. Day, Betty M. Adrian, Charles L. Whittington,

and Mary L. Tompkins

Open-File Report 85-372

1985

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 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 mineral survey of the Eagle Mountains Wilderness Study Area (CDCA-334), California Desert Conservation Area, Riverside County, California.

INTRODUCTION

In March 1982, the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Eagle Mountains Wilderness Study Area, Riverside County, California.

The Eagle Mountains Wilderness Study Area lies about 150 miles (241 km) east of Los Angeles and comprises about 78 mi^2 (202 km^2) in the southeastern and east-central parts of the Eagle Mountains (see fig. 1). The western boundary of the area abuts Joshua Tree National Monument, the northern boundary skirts the Eagle Mountains mining district, and parts of the southern and eastern boundaries follow the Colorado River Aqueduct. The southern boundary lies about 2 to 3 miles north of Interstate Highway 10, and parts of the northern boundary lie less than a mile south of Black Eagle mine road. Access to the interior of the area is provided mainly by jeep trails in Big Wash and in an unnamed north-draining wash in the western part.

Much of the study area is ruggedly mountainous, but spacious areas of subdued relief exist in parts of the interior. Elevations vary from about 1,400 feet (427 m) in Big Wash at the eastern boundary to 3,994 feet (1,217 m) on a peak about one mile east of the western boundary. The climate is arid, and vegetation is quite sparse.

Most of the bedrock in the study area consists of metaigneous and metasedimentary rocks of Precambrian and(or) Paleozoic age and batholithic rocks of Mesozoic age. Cutting the metamorphic and batholithic rocks are numerous felsic to mafic dikes of Mesozoic and (or) Cenozoic age. Extensive alluvial deposits are present in parts of the area. The geology is described by Powell (1981) and summarized in Powell and others (1984).

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, many of which may be ore-related, permits determination of some elements that are not easily detected in stream-sediment samples.

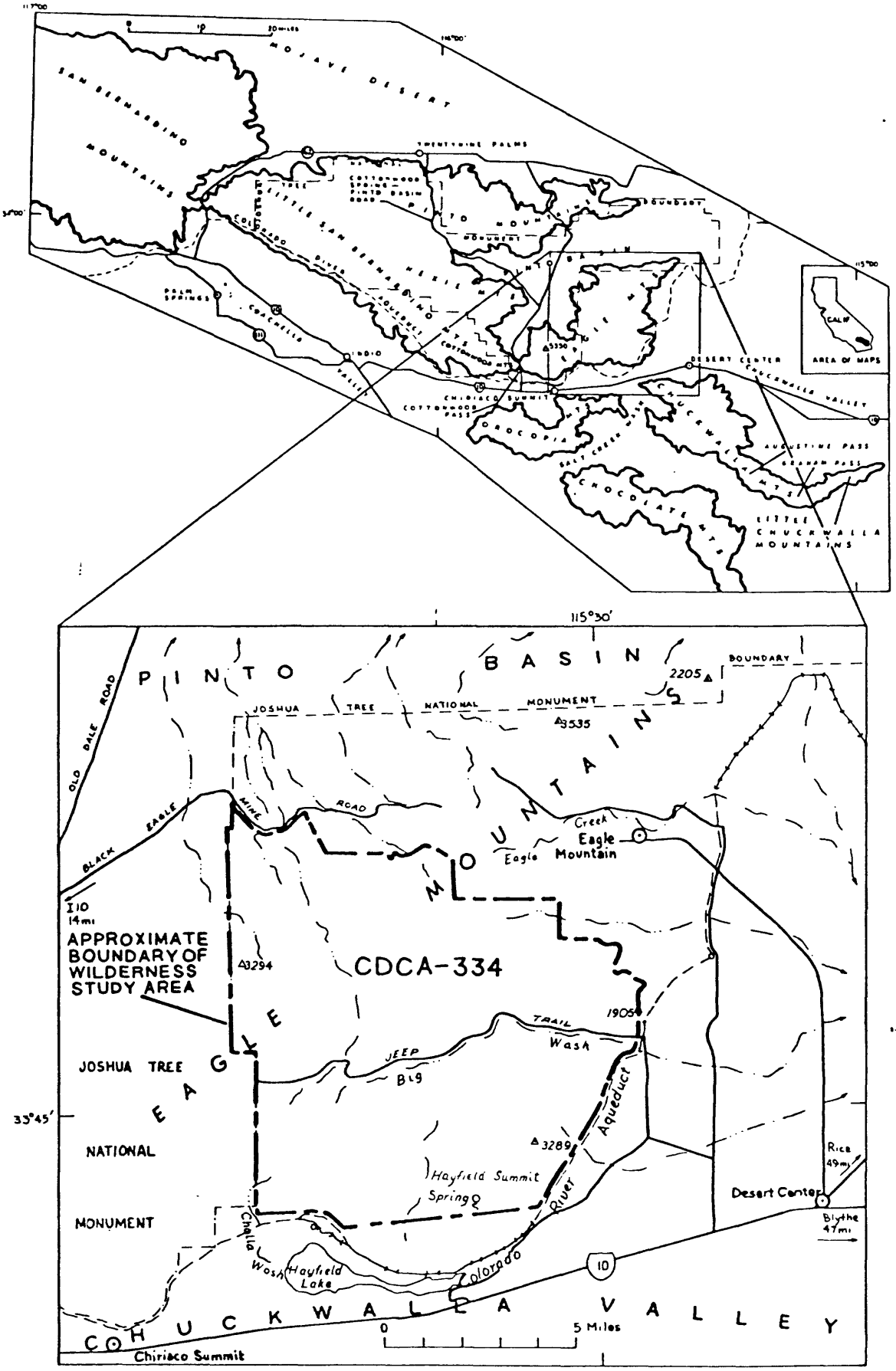

Figure 1.--Index maps showing location of the Eagle Mountains Wilderness Study Area (CDCA-334), California Desert Conservation Area, Riverside County, California.

Sample Collection

Samples were collected at 78 sites (plate 1). Sufficient material was collected at each site to subsequently prepare both a sieved sediment sample and a heavy-mineral-concentrate sample. Sampling density was about one sample per 1 mi^2 for the stream sediments and heavy-mineral concentrates.

Stream-sediment samples

The stream-sediment samples consisted of alluvium collected from dry stream beds. The sampled material at each site was composited from several localities in an area 2 to 15 meters wide that extended across what appeared to be the most recently active stream channel.

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same alluvium as the stream-sediment samples. Bulk samples that did not contain enough coarse material to be screened were panned until most of the quartz, feldspar, organic matter, and clay-sized material were removed.

Sample Preparation

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

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 including 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.

Sample Analysis

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, 7, 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 (Fe, Mg, Ca, and Ti) are given in weight percent; all others are given in parts per million (micrograms/gram). Analytical data for samples from the Eagle Mountains Wilderness Study Area are listed in tables 2 and 3.

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, 1976).

DESCRIPTION OF DATA TABLES

Tables 2 and 3 list the analyses for the samples of stream sediment and heavy-mineral concentrate, 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. 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. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. 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 2 and 3, some of the elements listed in these tables (Fe, Mg, Ca, and 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.

The spectrographic determinations for Ag, As, Au, Bi, Cd, Mo, Sb, and W in stream-sediment samples, and for As, Au, Cd, Sb, Sc, Zn, and Zr in heavy-mineral-concentrate samples were all below the lower limits of determinations shown in table 1; consequently, the columns for these elements have been deleted from tables 2 and 3, respectively. There are only three stream-sediment samples (EM001, EM052, and EM077) in which Zn was observed, but in each the Zn was below the lowest reporting value of 200 ppm. These samples are shown in the data table with an asterisk before the sample number and a footnote stating that Zn was observed at <200 ppm.

REFERENCES CITED

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.

Powell, R. E., 1981, Geology of the crystalline basement complex, Eastern Transverse Ranges, southern California--Constraints on regional tectonic interpretation: California Institute of Technology, Pasadena, Ph.D. thesis, 441 p.

Powell, R. E., Whittington, C. L., Granch, V. J. S., and McColly, R. A., 1984, Mineral resource potential map of the Eagle Mountains Wilderness Study Area (CDCA-334), Riverside County, California: U.S. Geological Survey Open-File Report 84-631, scale 1:62,500.

VanTrump, George, Jr., and Miesch, A. T., 1976, 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 stream sediments, based on a 10-mg sample

[The spectrographic limits of determination for heavy-mineral-concentrate samples are two reporting units higher than the limits given for rocks and stream sediments]

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	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	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	2,000

TABLE 2.--Analyses of stream-sediment samples from the Eagle Mountains Study Area, Riverside County, California
[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	P-ppm s	Ba-ppm s	Be-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s
*EM001	33 47 25	115 30 15	10	2.0	2.0	.5	1,000	10	300	1	50	200	15
EM002	33 47 15	115 31 30	5	1.0	1.0	.5	1,000	<10	300	1	15	50	15
EM003	33 46 40	115 32 10	10	1.0	1.0	.5	1,000	10	300	1	15	50	15
EM004	33 48 10	115 32 40	5	2.0	1.0	.5	700	<10	300	1	20	100	15
EM005	33 47 30	115 32 55	5	2.0	1.0	.5	700	<10	300	1	20	100	15
EM006	33 47 30	115 33 0	5	2.0	1.0	.5	700	10	300	1	30	100	20
EM007	33 46 50	115 33 5	5	1.0	1.0	.5	1,000	10	300	1	15	50	15
EM008	33 46 10	115 32 45	10	1.0	1.0	.5	1,000	20	200	1	15	50	15
EM009	33 46 25	115 34 55	5	1.0	1.0	.3	500	10	300	2	10	50	20
EM011	33 45 40	115 36 50	5	.5	1.0	.3	700	10	300	5	15	30	15
EM012	33 46 0	115 38 40	3	1.0	1.0	.3	700	20	500	2	15	50	15
EM013	33 48 25	115 37 10	5	1.0	.5	.3	500	10	200	1	15	100	15
EM014	33 46 45	115 36 55	5	1.0	.5	.3	500	10	500	2	15	50	15
EM015	33 51 10	115 40 0	5	2.0	.7	.3	500	<10	500	1	15	70	15
EM016	33 51 5	115 39 10	5	1.0	1.0	.3	500	10	200	1	15	70	15
EM018	33 50 45	115 37 35	5	1.0	1.0	.3	500	10	500	2	10	70	15
EM020	33 50 50	115 34 50	10	2.0	2.0	.5	700	20	300	1	50	150	20
EM021	33 50 15	115 34 25	10	2.0	2.0	.5	500	20	300	1	50	150	20
EM022	33 50 20	115 35 30	5	1.0	1.0	.3	500	10	300	1	30	100	15
EM023	33 50 35	115 35 30	5	1.0	.7	.3	500	20	300	1	30	70	15
EM024	33 49 55	115 36 10	5	1.0	.7	.5	500	10	300	1	20	100	15
EM025	33 50 25	115 36 15	5	1.0	.7	.5	500	10	300	1	20	150	15
EM026	33 49 45	115 37 35	2	1.0	.7	.2	500	10	300	5	15	70	10
EM027	33 48 0	115 33 40	5	2.0	1.0	.3	500	10	300	2	70	200	20
EM028	33 47 55	115 33 45	5	2.0	1.0	.5	500	10	500	2	70	150	20
EM029	33 48 30	115 35 0	3	1.0	1.0	.5	500	20	500	2	15	100	15
EM030	33 48 25	115 38 0	3	1.0	1.0	.3	500	15	300	2	15	70	15
EM031	33 49 15	115 37 45	5	2.0	1.0	.5	1,000	15	500	1	20	100	15
EM032	33 49 0	115 38 30	5	1.0	1.0	.5	700	10	500	1	15	100	15
EM033	33 49 0	115 39 25	10	1.0	1.0	.5	500	20	500	1	15	150	20
EM034	33 48 5	115 39 50	10	1.0	.7	.5	1,000	30	500	N	20	200	20
EM035	33 46 35	115 39 40	5	1.0	1.0	.5	700	10	300	2	20	100	15
EM036	33 46 25	115 39 25	3	1.0	.7	.2	500	<10	300	1	15	100	10
EM037	33 45 0	115 38 45	3	1.0	.7	.5	500	15	300	2	15	50	15
EM038	33 45 35	115 33 30	3	1.0	.7	.5	1,000	<10	300	2	15	50	15
EM039	33 48 5	115 29 10	10	1.0	1.0	.3	700	10	300	2	20	50	20
EM040	33 48 15	115 30 5	3	2.0	1.0	.2	500	<10	300	2	15	100	15
EM041	33 48 55	115 30 15	3	1.0	1.0	.3	500	10	300	2	15	100	15
EM042	33 48 45	115 31 45	3	1.0	1.0	.3	500	10	100	1	50	200	20
EM043	33 48 40	115 31 35	1	.1	.3	.2	200	<10	500	1	10	10	<5
EM044	33 49 20	115 30 45	3	1.0	1.0	.5	200	10	500	1	20	100	20
EM045	33 49 25	115 32 55	3	1.0	1.0	.3	200	10	500	2	20	100	15
EM046	33 49 25	115 32 45	3	1.0	1.0	.3	500	<10	500	2	20	70	15
EM048	33 50 40	115 39 25	3	1.0	1.0	.2	200	<10	500	2	15	70	15
EM049	33 50 0	115 38 30	3	1.0	1.0	.2	200	20	500	2	20	70	15
EM050	33 49 35	115 38 0	3	1.0	.7	.3	100	10	300	2	15	70	15
EM051	33 48 50	115 37 50	5	2.0	2.0	.5	1,000	30	500	2	15	100	15
*EM052	33 49 20	115 39 30	10	1.0	1.0	.5	1,000	20	500	2	15	100	15
EM053	33 48 20	115 38 25	10	1.0	1.0	.5	1,000	10	500	2	15	100	15
EM054	33 47 50	115 38 10	5	1.0	1.0	.5	1,000	10	500	3	10	50	15

*Zn was observed at <200 ppm.

TABLE 2.--Analyses of stream-sediment samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	La-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zr-ppm s	Th-ppm s
EM001	200	<20	50	20	20	N	200	200	70	1,000	N
EM002	100	<20	20	100	15	N	200	50	70	1,000	N
EM003	100	<20	20	50	15	N	200	100	70	1,000	N
EM004	50	20	50	30	15	N	200	70	70	1,000	N
EM005	100	<20	50	20	15	N	200	100	70	1,000	N
EM006	50	<20	70	20	15	N	200	100	30	200	N
EM007	100	<20	20	20	15	N	200	70	30	500	N
EM008	100	20	20	50	15	N	200	200	100	700	N
EM009	200	<20	20	100	15	15	200	70	100	300	100
EM011	150	<20	15	100	15	N	200	70	200	500	150
EM012	100	<20	20	50	15	N	200	70	70	500	N
EM013	100	<20	30	50	15	N	200	100	70	200	N
EM014	100	20	20	50	15	N	200	70	200	1,000	N
EM015	100	<20	30	50	15	N	200	100	100	200	N
EM016	50	<20	20	50	15	N	200	100	20	200	N
EM018	100	N	20	50	15	N	200	100	100	200	N
EM020	200	N	30	10	20	N	300	300	70	200	N
EM021	100	N	50	20	20	N	300	200	50	500	N
EM022	200	N	30	30	20	N	200	150	200	300	N
EM023	100	N	30	20	15	N	200	200	30	300	N
EM024	500	<20	30	50	20	N	200	150	100	150	N
EM025	100	<20	30	30	15	N	200	150	30	150	N
EM026	100	<20	20	50	15	N	200	70	100	200	N
EM027	100	<20	50	10	20	100	100	100	50	500	N
EM028	50	<20	50	10	20	N	150	100	30	200	N
EM029	50	N	50	10	15	N	200	70	50	200	N
EM030	50	<20	70	15	20	N	100	70	50	200	N
EM031	300	<20	200	10	15	N	100	200	100	700	N
EM032	100	<20	200	10	15	N	150	100	150	700	N
EM033	100	<20	200	10	20	N	150	200	50	500	N
EM034	200	<20	200	10	20	N	100	200	100	500	N
EM035	100	<20	100	20	10	N	200	100	50	200	N
EM036	50	N	50	30	15	N	100	70	50	200	N
EM037	50	<20	50	30	15	N	100	70	50	500	N
EM038	100	30	50	30	15	N	200	50	50	500	N
EM039	50	<20	200	10	15	N	200	200	30	500	N
EM040	20	<20	50	10	15	N	200	50	20	200	N
EM041	50	N	100	20	20	N	200	70	70	200	N
EM042	150	<20	100	10	20	N	200	100	70	300	N
EM043	50	N	10	N	5	N	100	10	20	150	N
EM044	70	<20	100	10	15	N	200	100	70	500	N
EM045	70	<20	100	15	15	N	200	70	70	500	N
EM046	70	N	100	20	15	N	300	100	50	200	N
EM048	50	<20	100	50	15	N	200	70	70	100	N
EM049	100	<20	100	50	15	N	200	50	70	300	N
EM050	100	<20	200	10	15	N	200	100	50	300	N
EM051	50	<20	30	20	10	N	300	100	50	300	N
EM052	200	<20	20	20	10	N	200	200	200	700	N
EM053	200	<20	20	20	15	N	300	200	50	500	N
EM054	70	20	20	20	10	N	200	50	100	500	N

TABLE 2.--Analyses of stream-sediment samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	Latitude	Longitude	Fe-pct. S	Mg-pct. S	Ca-pct. S	Ti-pct. S	Mn-ppm S	B-ppm S	Ba-ppm S	Be-ppm S	Co-ppm S	Cr-ppm S	Cu-ppm S
EM055	33 47 55	115 37 40	5	1.0	1.0	.3	1,000	20	500	2	15	50	15
EM056	33 47 20	115 37 0	5	1.0	1.0	.3	500	10	500	2	10	50	10
EM057	33 46 55	115 36 0	5	1.0	1.0	.5	700	10	500	5	15	50	15
EM058	33 47 55	115 35 0	5	1.0	1.0	.5	700	30	500	2	15	100	15
EM059	33 45 10	115 38 25	3	1.0	1.0	.3	500	20	500	2	15	70	15
EM060	33 45 20	115 38 55	5	1.0	.5	.3	700	10	500	2	10	70	15
EM061	33 45 35	115 36 0	5	1.0	1.0	.5	1,000	20	500	3	10	70	15
EM062	33 47 40	115 28 30	10	2.0	1.0	.5	700	30	500	1	50	100	15
EM063	33 47 0	115 30 20	5	1.0	1.0	.5	2,000	10	500	1	10	100	15
EM064	33 46 30	115 31 0	5	2.0	1.0	.5	1,000	10	500	1	20	100	20
EM065	33 45 0	115 34 20	2	1.0	1.0	.3	700	<10	300	2	10	50	5
EM066	33 44 0	115 36 15	5	2.0	1.0	.5	700	10	500	2	20	70	15
EM067	33 44 15	115 35 55	10	1.0	1.0	1.0	1,000	20	500	2	20	70	15
EM068	33 44 20	115 36 10	10	1.0	.5	1.0	1,000	20	500	1	20	70	15
EM069	33 43 45	115 37 0	7	2.0	1.0	.5	700	10	500	1	20	70	15
EM070	33 43 40	115 37 0	10	2.0	1.0	.5	700	10	300	1	50	150	20
EM071	33 42 45	115 37 5	5	2.0	1.0	.3	700	10	500	1	15	100	15
EM072	33 43 20	115 35 40	10	1.0	1.0	.5	1,000	20	500	1	20	70	15
EM073	33 43 5	115 35 55	7	2.0	1.0	.5	1,000	20	500	1	50	100	15
EM074	33 43 50	115 34 45	5	1.0	1.0	.3	1,000	10	500	2	20	70	15
EM075	33 43 15	115 34 10	5	.5	1.0	.2	1,000	<10	300	2	10	50	5
EM076	33 43 0	115 33 5	5	1.0	1.0	.3	1,000	10	300	2	10	50	10
*EM077	33 42 55	115 31 40	10	.5	.7	.3	2,000	20	300	2	15	70	15
EM078	33 43 15	115 31 5	2	1.0	1.0	.3	500	10	500	2	10	50	10
EM079	33 44 5	115 31 0	10	.5	.7	.5	1,000	10	300	2	15	50	10
EM080	33 44 25	115 30 45	5	1.0	.5	.3	1,000	<10	300	2	10	50	10
EM081	33 45 35	115 29 45	10	.5	1.0	.5	700	<10	300	2	15	30	15
EM082	33 45 40	115 29 40	10	1.0	1.0	.5	700	<10	300	1	15	30	15

*Zn was observed at <200 ppm.

TABLE 2.--Analyses of stream-sediment samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	La-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	Y-ppm s	Zr-ppm s	Th-ppm s
EM055	100	<20	30	50	15	N	200	50	70	500	N
EM056	100	<20	20	50	15	N	200	50	100	500	N
EM057	500	<20	30	50	15	15	300	100	300	500	100
EM058	100	N	30	20	10	N	200	100	70	500	N
EM059	50	N	30	50	10	N	100	70	50	200	N
EM060	200	<20	20	50	10	15	N	70	300	500	150
EM061	100	<20	20	10	10	N	200	100	70	500	N
EM062	200	N	30	20	20	N	200	200	50	500	N
EM063	100	20	15	20	20	N	200	50	70	1,000	N
EM064	100	20	20	20	20	N	200	100	100	1,000	N
EM065	50	<20	20	30	10	N	200	70	50	200	N
EM066	100	<20	20	50	10	N	200	100	100	200	N
EM067	200	20	10	20	15	N	200	200	200	1,000	N
EM068	200	<20	10	50	15	N	200	200	100	500	200
EM069	100	<20	30	20	20	N	200	200	70	500	N
EM070	100	<20	50	20	15	N	200	100	70	200	N
EM071	50	<20	30	20	15	N	200	200	50	300	N
EM072	200	20	10	50	15	N	200	200	100	1,000	N
EM073	200	<20	50	20	20	N	200	200	70	500	N
EM074	100	50	20	30	10	N	200	100	100	500	N
EM075	50	20	10	20	10	N	200	100	50	200	N
EM076	20	20	20	20	10	N	200	100	50	200	N
EM077	100	30	10	20	10	N	200	200	100	500	N
EM078	50	20	15	50	10	N	200	50	50	200	N
EM079	200	20	15	20	10	N	200	200	100	1,000	100
EM080	100	<20	20	20	10	N	200	100	70	500	N
EM081	100	<20	20	20	10	N	200	100	50	500	N
EM082	200	<20	20	20	10	N	200	100	70	700	N

TABLE 1.--Analyses of heavy-mineral-concentrate samples from the Eagle Mountains Study Area, Riverside County, California

[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	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Co-ppm s
EM001C3	33 47 25	115 30 15	.3	.15	2	>2.0	150	N	30	700	N	N	N
EM002C3	33 47 15	115 31 30	.5	.07	1	1.5	150	N	20	500	N	N	N
EM003C3	33 46 40	115 32 10	.7	.20	3	2.0	300	N	30	3,000	<2	N	N
EM004C3	33 48 10	115 32 40	.3	.15	1	2.0	150	N	30	700	N	N	N
EM005C3	33 47 30	115 32 55	.5	.20	3	>2.0	200	N	20	700	<2	N	N
EM006C3	33 47 30	115 33 0	.5	.30	5	>2.0	300	N	50	1,000	20	N	10
EM007C3	33 46 50	115 33 5	.7	.20	5	2.0	500	N	50	700	5	N	N
EM008C3	33 46 10	115 32 45	.3	.15	5	1.5	200	N	50	2,000	<2	N	10
EM009C3	33 46 25	115 34 55	1.0	.30	10	2.0	500	N	70	500	3	N	N
EM011C3	33 45 40	115 36 50	.5	.15	20	>2.0	300	N	<20	300	30	N	N
EM012C3	33 46 0	115 38 40	.3	.07	3	1.0	150	N	30	700	<2	N	N
EM013C3	33 48 25	115 37 10	.5	.20	10	>2.0	300	N	100	300	20	1,000	N
EM014C3	33 46 45	115 36 55	.2	.10	7	2.0	200	N	20	500	<2	N	N
EM015C3	33 51 10	115 40 0	.7	.15	10	>2.0	300	N	50	500	<2	<20	N
EM016C3	33 51 5	115 39 10	.5	.20	10	>2.0	300	N	70	700	<2	N	N
EM018C3	33 50 45	115 37 35	.5	.15	15	>2.0	200	10	50	700	5	2,000	N
EM020C3	33 50 50	115 34 50	.5	.20	10	>2.0	300	N	50	500	N	N	15
EM021C3	33 50 15	115 34 25	.5	.30	5	>2.0	200	N	50	700	<2	N	N
EM022C3	33 50 20	115 35 30	.3	.20	10	>2.0	200	5	30	1,000	5	20	<10
EM023C3	33 50 35	115 35 30	.5	.15	7	>2.0	500	N	70	700	<2	N	10
EM024C3	33 49 55	115 36 10	.3	.20	10	>2.0	300	N	30	500	<2	50	N
EM025C3	33 50 25	115 36 15	.7	.50	10	>2.0	700	N	50	500	3	N	<10
EM026C3	33 49 45	115 37 35	.7	.50	15	>2.0	300	N	70	300	2	70	N
EM027C3	33 48 0	115 33 40	.7	.50	7	>2.0	300	N	50	2,000	<2	N	<10
EM028C3	33 47 55	115 33 45	1.0	.30	10	>2.0	500	N	70	700	15	N	N
EM029C3	33 48 30	115 35 0	.7	.15	3	>2.0	200	N	50	700	20	<20	N
EM030C3	33 48 25	115 38 0	.7	.50	15	>2.0	500	N	50	700	15	N	<10
EM031C3	33 49 15	115 37 45	.2	.10	10	2.0	200	N	20	700	<2	N	N
EM032C3	33 49 0	115 38 30	.3	.15	10	>2.0	300	N	20	3,000	N	N	N
EM033C3	33 49 0	115 39 25	.5	.15	7	2.0	200	N	50	1,500	<2	N	<10
EM034C3	33 48 5	115 39 50	.7	.15	5	2.0	200	N	50	1,000	<2	<20	N
EM035C3	33 46 35	115 39 40	1.0	.20	7	2.0	500	N	30	700	<2	50	N
EM036C3	33 46 25	115 39 25	.7	.20	7	2.0	300	N	30	2,000	N	N	N
EM037C3	33 45 0	115 38 45	.5	.10	15	.7	150	N	20	700	5	300	N
EM038C3	33 45 35	115 33 30	.3	.20	7	>2.0	500	N	100	1,500	<2	70	<10
EM039C3	33 48 5	115 29 10	.5	.20	10	>2.0	500	N	50	700	<2	N	15
EM040C3	33 48 15	115 30 5	1.5	1.00	10	>2.0	500	N	70	1,500	3	N	15
EM041C3	33 48 55	115 30 15	.7	.30	10	>2.0	700	N	20	7,000	N	N	15
EM042C3	33 48 45	115 31 45	1.0	.50	10	>2.0	500	N	50	700	3	N	<10
EM043C3	33 48 40	115 31 35	1.5	.15	3	>2.0	2,000	N	30	2,000	20	N	15
EM044C3	33 49 20	115 30 45	.7	.70	10	>2.0	500	N	50	2,000	<2	N	15
EM045C3	33 49 25	115 32 55	.7	.70	10	>2.0	500	N	30	700	<2	N	15
EM046C3	33 49 25	115 32 45	.5	.50	7	>2.0	300	N	50	700	<2	N	10
EM048C3	33 50 40	115 39 25	.5	.20	20	>2.0	200	3	<20	2,000	2	700	N
EM049C3	33 50 0	115 38 30	.2	.15	20	2.0	200	N	<20	700	N	N	N
EM050C3	33 49 35	115 38 0	.5	.50	15	>2.0	500	N	20	1,000	N	N	N
EM051C3	33 48 50	115 37 50	.7	.70	15	>2.0	500	N	20	7,000	N	N	N
EM052C3	33 49 20	115 39 30	.3	.10	7	>2.0	300	N	20	2,000	<2	70	N
EM053C3	33 48 20	115 38 25	.5	.20	10	>2.0	1,000	N	20	700	N	N	<10
EM054C3	33 47 50	115 38 10	.5	.20	10	>2.0	500	N	20	700	N	N	N

TABLE 3.--Analyses of heavy-mineral-concentrate samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Th-ppm s
EM001C3	<20	<10	200	N	N	N	50	N	N	70	N	700	<200
EM002C3	<20	N	150	N	N	N	20	N	N	50	N	700	N
EM003C3	<20	<10	300	N	50	N	70	N	<200	50	N	700	1,000
EM004C3	<20	N	150	N	<50	N	30	N	N	70	N	1,000	N
EM005C3	<20	<10	200	N	<50	N	70	N	<200	150	N	1,000	<200
EM006C3	50	<10	300	N	70	N	50	<20	<200	200	N	500	<200
EM007C3	30	<10	300	N	<50	N	20	N	<200	50	N	700	N
EM008C3	N	<10	500	N	50	N	150	N	N	100	N	700	1,500
EM009C3	20	<10	>2,000	N	150	N	70	300	N	70	150	5,000	500
EM011C3	N	N	1,000	N	150	N	100	50	N	70	150	>5,000	300
EM012C3	N	N	150	N	N	N	150	N	N	30	150	1,500	<200
EM013C3	20	N	1,500	10	200	N	70	100	N	100	500	5,000	500
EM014C3	N	<10	100	50	50	N	500	<20	N	50	200	2,000	N
EM015C3	30	<10	500	30	100	N	1,500	2,000	N	200	2,000	3,000	200
EM016C3	30	N	500	<10	50	N	200	<20	N	150	150	2,000	300
EM018C3	<20	<10	500	10	150	N	150	70	N	50	500	5,000	N
EM020C3	<20	10	500	10	150	N	50	50	<200	200	N	700	1,500
EM021C3	20	<10	200	N	70	N	300	N	300	150	100	500	300
EM022C3	<20	100	300	100	70	N	10,000	150	N	300	300	1,000	300
EM023C3	<20	10	500	10	150	N	200	70	<200	150	100	700	1,000
EM024C3	20	<10	500	<10	100	N	300	100	N	150	200	3,000	N
EM025C3	30	N	700	<10	200	N	100	100	<200	200	N	2,000	<200
EM026C3	20	<10	>2,000	10	200	N	200	200	N	100	200	>5,000	700
EM027C3	150	<10	200	N	70	N	20	30	300	100	<100	700	<200
EM028C3	70	<10	200	N	100	N	30	20	300	150	N	300	N
EM029C3	20	<10	100	30	100	N	500	30	<200	100	700	200	<200
EM030C3	30	N	1,500	N	150	N	200	100	N	200	700	5,000	<200
EM031C3	<20	N	300	N	50	N	150	N	N	100	<100	2,000	500
EM032C3	<20	<10	500	N	100	N	100	50	N	150	200	2,000	500
EM033C3	<20	<10	300	<10	70	N	200	<20	300	100	<100	500	700
EM034C3	<20	<10	1,000	N	50	N	70	N	<200	50	<100	500	<200
EM035C3	100	<10	200	N	<50	N	100	N	N	70	200	1,500	N
EM036C3	100	<10	100	N	50	N	150	N	N	50	100	1,500	N
EM037C3	<20	N	200	<10	<50	N	200	1,500	N	50	1,000	2,000	<200
EM038C3	<20	<10	1,000	N	70	N	150	N	N	150	200	2,000	1,500
EM039C3	<20	<10	1,500	50	200	N	100	70	N	300	500	1,000	1,500
EM040C3	150	10	1,000	N	150	<10	70	50	300	150	N	1,000	<200
EM041C3	<20	<10	>2,000	<10	200	N	150	70	N	200	N	1,500	5,000
EM042C3	100	15	300	N	100	N	100	50	<200	200	N	1,000	N
EM043C3	100	N	500	N	150	N	50	200	<200	70	N	700	200
EM044C3	50	100	700	<10	200	N	700	150	<200	300	<100	2,000	300
EM045C3	50	<10	700	N	150	N	50	150	N	200	150	3,000	300
EM046C3	50	N	500	N	150	N	200	50	<200	300	100	1,000	1,000
EM048C3	30	20	1,000	50	100	N	300	30	N	150	3,000	>5,000	1,000
EM049C3	<20	N	150	N	70	N	700	<20	N	100	200	5,000	<200
EM050C3	30	10	700	1,000	100	N	30,000	50	N	3,000	700	3,000	<200
EM051C3	50	N	700	<10	100	N	500	30	N	150	300	>5,000	200
EM052C3	<20	N	200	N	50	N	200	<20	N	100	<100	2,000	500
EM053C3	30	N	1,000	20	150	N	100	70	N	300	200	2,000	1,000
EM054C3	20	N	200	N	100	N	300	70	N	70	<100	5,000	N

TABLE 3.--Analyses of heavy-mineral-concentrate samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	Latitude	Longitude	Fe-pct. S	Mg-pct. S	Ca-pct. S	Ti-pct. S	Mn-ppm S	Ag-ppm S	B-ppm S	Ba-ppm S	Be-ppm S	Bi-ppm S	Co-ppm S
EM055C3	33 47 55	115 37 40	.3	.07	10	1.0	150	N	<20	1,500	N	N	N
EM056C3	33 47 20	115 37 0	.2	.10	10	2.0	200	N	20	500	N	N	N
EM057C3	33 46 55	115 36 0	.5	.10	20	1.5	300	2	<20	300	3	2,000	N
EM058C3	33 47 55	115 35 0	1.5	.20	7	2.0	700	N	70	700	5	200	15
EM059C3	33 45 10	115 38 25	.7	.20	15	2.0	500	N	20	300	5	N	<10
EM060C3	33 45 20	115 38 55	1.5	.30	10	1.5	1,000	N	20	700	7	200	20
EM061C3	33 45 35	115 36 0	.5	.15	5	>2.0	300	N	30	700	<2	N	15
EM062C3	33 47 40	115 28 30	.5	.20	5	>2.0	200	N	50	700	<2	N	300
EM063C3	33 47 0	115 30 20	.5	.07	2	.1	100	N	20	700	N	N	N
EM064C3	33 46 30	115 31 0	.3	.10	5	>2.0	200	N	20	500	N	N	N
EM065C3	33 45 0	115 34 20	5.0	2.00	3	2.0	5,000	N	20	700	3	N	30
EM066C3	33 44 0	115 36 15	1.0	.70	7	>2.0	1,000	N	20	500	<2	N	15
EM067C3	33 44 15	115 35 55	.5	.20	5	2.0	200	N	50	700	<2	N	N
EM068C3	33 44 20	115 36 10	.5	.20	3	2.0	200	N	50	700	<2	N	10
EM069C3	33 43 45	115 37 0	.7	.15	10	>2.0	500	N	<20	1,000	<2	N	10
EM070C3	33 43 40	115 37 0	.7	.20	10	>2.0	300	N	50	500	<2	N	<10
EM071C3	33 42 45	115 37 5	.7	.20	7	>2.0	300	N	70	700	<2	N	15
EM072C3	33 43 20	115 35 40	.3	.10	7	2.0	300	N	50	700	<2	N	15
EM073C3	33 43 5	115 35 55	.7	.30	5	2.0	200	N	50	500	<2	N	10
EM074C3	33 43 50	115 34 45	.5	.20	10	>2.0	1,500	N	30	700	<2	N	15
EM075C3	33 43 15	115 34 10	.3	.15	20	2.0	2,000	N	20	300	N	N	<10
EM076C3	33 43 0	115 33 5	1.5	.70	15	2.0	3,000	N	100	700	N	N	10
EM077C3	33 42 55	115 31 40	.3	.15	10	2.0	700	N	50	500	2	N	<10
EM078C3	33 43 15	115 31 5	.5	.15	15	2.0	3,000	N	20	300	N	N	N
EM079C3	33 44 5	115 31 0	.5	.15	7	2.0	1,000	N	50	700	2	N	N
EM080C3	33 44 25	115 30 45	.3	.15	10	>2.0	500	N	20	500	<2	N	15
EM081C3	33 45 35	115 29 45	.3	.07	1	>2.0	150	N	20	500	<2	N	N
EM082C3	33 45 40	115 29 40	.5	.10	5	>2.0	500	N	20	300	N	N	10

TABLE 3.--Analyses of heavy-mineral-concentrate samples from the Eagle Mountains Study Area, Riverside County, California--Continued

Sample	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Th-ppm s
EM055C3	<20	<10	200	100	50	N	1,000	2,000	N	50	1,500	3,000	N
EM056C3	<20	N	200	N	50	N	150	30	N	50	150	2,000	<200
EM057C3	<20	<10	1,500	100	100	N	500	300	N	70	5,000	>5,000	300
EM058C3	30	<10	1,000	N	150	N	50	100	<200	100	300	1,000	<200
EM059C3	<20	<10	1,500	10	100	N	150	30	N	100	700	>5,000	1,500
EM060C3	20	10	>2,000	N	70	20	500	1,000	N	100	300	>5,000	5,000
EM061C3	<20	<10	1,000	N	200	N	100	70	N	150	200	1,500	3,000
EM062C3	<20	10	500	20	150	N	200	30	<200	150	200	200	2,000
EM063C3	N	N	200	N	N	N	100	N	N	30	N	300	200
EM064C3	N	N	500	N	50	N	30	N	N	100	N	1,000	200
EM065C3	100	10	1,000	N	300	30	150	30	300	150	N	700	200
EM066C3	N	<10	2,000	<10	200	N	100	100	N	300	N	2,000	2,000
EM067C3	<20	<10	300	N	<50	N	70	N	N	70	N	700	2,000
EM068C3	N	<10	500	N	50	N	100	<20	N	150	N	1,000	3,000
EM069C3	<20	<10	1,500	N	150	N	100	70	N	150	150	1,500	1,500
EM070C3	20	10	1,000	N	100	N	20	30	300	150	<100	700	700
EM071C3	<20	<10	1,000	N	300	N	200	50	<200	150	<100	700	2,000
EM072C3	<20	10	500	N	50	N	150	<20	N	150	N	1,000	>5,000
EM073C3	<20	<10	500	N	150	N	100	<20	300	100	150	500	2,000
EM074C3	<20	10	2,000	N	150	N	500	70	N	150	N	2,000	3,000
EM075C3	<20	<10	700	N	300	N	50	70	N	150	N	2,000	1,000
EM076C3	<20	<10	700	N	200	N	100	70	<200	100	N	1,500	700
EM077C3	<20	<10	200	N	300	N	100	50	300	150	N	300	1,500
EM078C3	<20	<10	200	N	150	N	1,000	N	<200	70	N	3,000	1,000
EM079C3	<20	<10	200	N	100	N	100	N	<200	70	<100	1,000	2,000
EM080C3	<20	<10	200	N	50	N	150	N	N	150	N	2,000	3,000
EM081C3	N	<10	100	N	<50	N	50	N	N	100	N	1,500	700
EM082C3	<20	<10	1,500	<10	50	N	20	30	N	200	N	1,000	300