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Chemical and physical characteristics of alluvium from drill core near the Rabbit Creek Gold Deposit, Getchell Mining District, Humboldt County, Nevada

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INTRODUCTION

A method is needed to identify mineral deposits buried by hundreds of feet of transported overburden. Drill core of the alluvium covering the Rabbit Creek gold deposits provides an opportunity to study the processes of secondary geochemical dispersion in the overburden. With this insight, additional experiments will improve the potential for understanding and refining current geochemical exploration techniques and for developing new techniques.

During the fall of 1988 the Branch of Geochemistry, U.S. Geological Survey received drill core from Santa Fe Pacific Minerals, Inc., Reno, Nevada. The samples of core were obtained during the drilling of a hole through 460 ft (140 m) of alluvium to the southeast of the sedimentary rock-hosted Rabbit Creek Gold Deposit, but within the proposed pit design (fig. 1.). The post-mineralization alluvial core was obtained to characterize the distribution of elements in the overburden using a variety of analytical techniques. The 21 3-in-diameter core samples varied from 3 to 9 in in length and were taken, approximately, at 20-ft intervals. The first sample was taken at a depth of 15 ft and the last at 449 ft.

The core samples were prepared for shipment in such a way the moisture loss and degradation to the integrity of the core was minimized. Upon arrival at the USGS laboratory facility in Denver, Colorado the samples were unpacked, described, and the samples were then physically prepared for analysis.

Sample preparation

The 21 core samples were air dried and weighed (table 1). The samples were then disaggregated in a soil machine consisting of a rotating ceramic auger and bowl. The sample is placed in the ceramic bowl and the auger is lowered gently to break-up aggregate grains. Large clasts were removed as they were freed in order to reduce the amount of chipping and breaking of the coarser fragments and allow the rotatory action to break up smaller aggregate grains. After disaggregation the samples were weighed again (table 1). The samples were then sieved into seven fractions using a Rototap Sieve Shaker with a running time of 20 minutes per sample, sieve fraction weights were recorded (table 1). The nested sieves produced sieve fractions of: +4 mesh, -4/+8 mesh, -8/+20 mesh, -20/+60 mesh, -60/+100 mesh, -100/+250 mesh, and -250 mesh.

Splits of the -20/+60 and -60/+100 mesh fractions were processed further in a vertical pulverizer using ceramic plates where the splits were ground to approximately -100 mesh, these splits were used for chemical analysis.

Two of the sieve fractions, -20/+60 and -100/+250, were processed to produce three heavy-mineral-concentrate fractions based on the specific gravity and magnetic susceptibility of the individual mineral grains. Twenty grams of sample were placed in separatory funnels filled with bromoform, a liquid with a specific gravity of 2.89. Lighter minerals, such as quartz and feldspar with specific gravities less than 2.8, will float in bromoform while heavier minerals will sink and can be easily removed. The heavy-mineral-concentrate samples were washed with acetone and air dried.

The heavy-mineral concentrate resulting from the bromoform separation, was subjected to magnetic separations using a modified Frantz Isodynamic Separator to provide three magnetic splits of the sample: (C1) strongly magnetic minerals, primarily magnetite, ilmenite, and mixed grains containing magnetite; (C2) weakly magnetic minerals, including most of the iron and

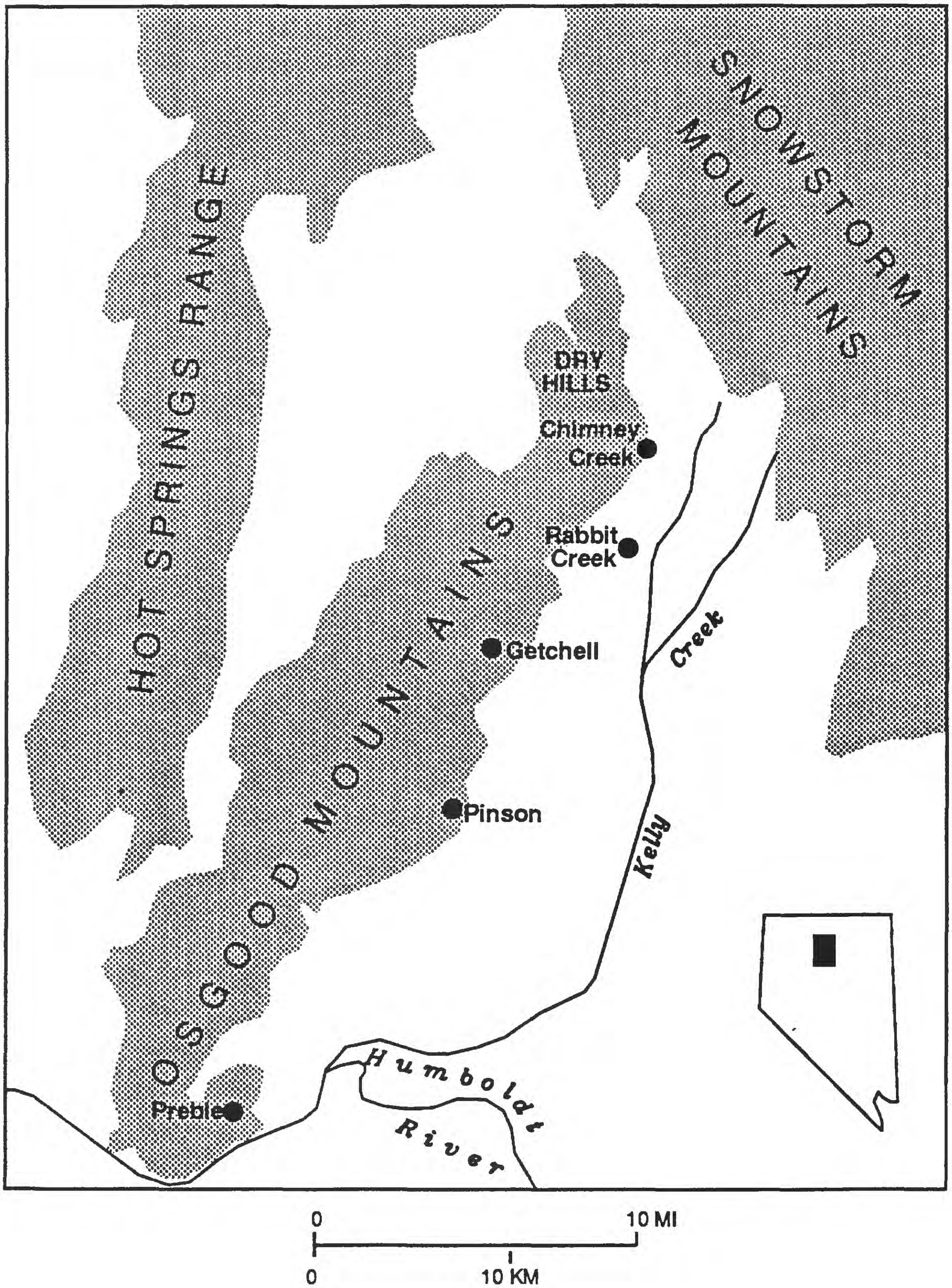

Figure 1.--Rabbit Creek gold deposit location map.

Table 1.--Weights of Rototap Sieve Shaker size fractions from the Rabbit Creek core samples

Sample number	Core-sample description	Sample weight (g)	Weight (g) after disaggregation	Sample loss during disaggregation (g)	Sieve fraction weights (g) +4 mesh +4.75 mm	-4/+8 mesh +2.36 mm	-8/+20 mesh +0.85 mm	-20/+60 mesh +0.25 mm	-60/+100 mesh +0.149 mm	-100/+250 mesh +0.063 mm	-250 mesh -0.063 mm	Total sample wt. after sieving	Loss during sieving
1	9" at 15'	1161	1157	4	425.8	138.1	175.2	166.2	52.6	104.9	91.4	1154.2	2.8
2	8" at 38'	952	949	3	397.4	105.0	137.9	130.1	34.9	62.1	80.5	947.9	1.1
3	9" at 59.5'	1230	1228	2	376.2	201.9	238.8	175.8	44.4	88.3	100.3	1225.7	2.3
4	7" at 83.2'	1044	1041	3	333.9	218.2	179.1	100.1	35.3	80.7	91.3	1038.6	2.4
5	9" at 107'	1188	1184	4	642.4	121.8	137.7	103.9	35.6	70.2	70.0	1181.6	2.4
6	7" at 124'	990	987	3	375.2	114.1	121.7	101.0	50.2	118.4	102.8	983.4	3.6
7	7" at 149'	784	781	3	331.5	81.9	117.1	88.8	29.1	58.1	73.2	779.7	1.3
8	8" at 176'	1252	1249	3	532.2	168.6	174.8	137.2	42.1	87.7	104.5	1247.1	1.9
9	6" at 201.8'	771	764	7	338.2	98.7	97.3	80.4	27.5	53.1	66.2	761.4	2.6
10	6" at 224'	491	490	1	63.0	85.7	133.0	85.4	24.7	44.8	52.4	489.0	1.0
11	9" at 249'	1075	1068	7	317.4	158.0	207.3	158.8	42.3	75.4	106.0	1065.2	2.8
12	7" at 275'	1062	1058	4	359.8	113.0	165.9	164.6	57.0	95.3	99.8	1055.4	2.6
13	6" at 299'	549	534	--	240.7	70.5	78.2	56.5	16.3	28.0	41.4	531.6	2.4
14	6" at 323'	754	752	2	197.2	120.4	158.0	134.5	37.5	54.0	48.8	750.4	1.6
15	8" at 342'	1080	1075	5	250.2	235.3	239.5	139.0	44.0	73.8	89.8	1071.6	3.4
16	7" at 361'	939	936	3	393.8	137.0	152.5	123.9	32.4	44.4	50.0	934.0	2.0
17	9" at 380'	879	849	--	337.9	136.5	149.8	115.1	28.5	38.9	39.2	845.9	3.1
18	8" at 402'	1264	1262	2	431.1	263.9	245.4	141.2	38.8	66.2	72.4	1259.0	3.0
19	8" at 421'	628	627	1	114.2	145.8	143.6	103.1	30.0	42.9	40.8	620.4	6.6
20	3" at 422'	339	337	2	6.1	40.3	80.1	57.6	21.7	47.3	82.6	335.7	1.3
21	6" at 449'	805	803	2	409.1	114.3	102.3	68.4	20.9	37.8	48.9	801.7	1.3
Estimated weighing error........		+/-1	+/-1	+/-2	+/-.1	+/-.1	+/-.1	+/-.1	+/-.1	+/-.1	+/-.7	±/-1.7	

manganese oxides and the ferromagnesian silicates; and (C3) very weakly to nonmagnetic minerals, primarily zircon, apatite, barite, and sphene but also including many ore-related sulfides and oxides. These magnetic separations are the same separations 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 0.2 ampere to remove the magnetite and ilmenite (C1), and a current of 0.6 ampere to split the remainder of the sample into weakly magnetic (C2) and "nonmagnetic" (C3) fractions. Each of the fractions was weighed and the results are compiled in tables 2 and 3.

Clast samples were picked from the plus 4 mesh sieve fraction. Individual clasts were picked from samples for specific characteristics. These clasts were treated as a separate sample medium where a variety of descriptive and analytical techniques were employed to characterize them.

Explanation of Data

The data are presented by laboratory methodology or analytical treatment of the sample. There are 14 data sections including: core description, mineralogy, X-ray diffraction, sequential digestions, cold-vapor atomic absorption spectrophotometry, visible-absorption spectrophotometry, ion specific electrode, flame atomic-absorption spectroscopy, arsenic determinations, gold determinations, gas chromatography, and emission spectrography total and oxalic partial. In each section, data generated by a specific laboratory treatment are presented for all samples tested. An explanation describing the technique used and the format of the data presentation is provided for each of the 14 sections.

Core Description

We received 21 samples of alluvial core, each sample 3-9 in long, from core hole 313A at the site of the Rabbit Creek gold deposit. The samples were wet and wrapped in aluminum foil when received. They were allowed to dry for several days, before being examined.

The visual examination was done with a hand lens and a binocular microscope. It consisted of a brief description of the content, shape, and proportions of the clasts, as well as the degree of induration, nature of matrix, presence of cementing medium, and color of the core. The color was described by using a standard soil color chart (see table 4).

Following the visual examination, pieces of core were acidified by placing the sample in a beaker of 1:4 HCl and the nature of the reaction was described. After acidification of each sample, the finer grained material was decanted during several successive washings and the presence of quartz and other minerals of the sand-size fraction was briefly noted.

Two pieces of each sample were submitted to make thin sections. Some of the thin sections were very hard to make, because of the varying degrees of induration of the core samples, some of which were very weakly indurated. The descriptions of thin sections are shown in table 5. Questionable minerals that were not identified in thin section were identified by X-ray diffraction. The remainder of the core samples was disaggregated and sieved in preparation for studies of grain-size distribution, mineralogy, and geochemistry of the various sieve fractions.

TABLE 2--HEAVY MINERAL CONCENTRATE WEIGHTS
-100/+250 FRACTION

SAMPLE #	TOTAL WT. (g)	C1 (g)	C2 (g)	C3 (g)	CONC. WT. (g)	PERCENT HEAVIES
1	20.00	0.083	0.378	0.010	0.471	2.35
2	20.00	0.020	0.135	0.008	0.163	0.82
3	20.00	0.080	0.413	0.021	0.514	2.57
4	20.00	0.119	0.336	0.047	0.502	2.51
5	20.00	0.184	0.567	0.016	0.767	3.83
6	20.00	0.118	0.331	0.011	0.460	2.30
7	20.00	0.112	0.116	0.035	0.263	1.31
8	20.00	0.182	0.234	0.012	0.428	2.14
9	20.00	0.185	0.290	0.015	0.490	2.45
10	15.00	0.140	0.213	0.010	0.363	2.42
11	20.00	0.099	0.091	0.011	0.201	1.00
12	20.00	0.067	0.063	0.010	0.140	0.70
13	-	-	-	-	-	-
14	20.00	0.060	0.219	0.100	0.379	1.90
15	20.00	0.112	0.078	0.012	0.202	1.01
16	15.00	0.043	0.178	0.009	0.230	1.53
17	10.00	0.101	0.045	0.008	0.154	1.54
18	20.00	0.033	0.121	0.040	0.194	0.97
19	15.00	0.086	0.139	0.018	0.243	1.62
20	15.00	0.021	0.020	0.008	0.049	0.33
21	8.00	0.032	0.044	0.005	0.081	1.01

TABLE 3--HEAVY MINERAL CONCENTRATE WEIGHTS
-20/+60 FRACTION

SAMPLE #	TOTAL WT. (g)	C1 (g)	C2 (g)	C3 (g)	CONC. WT. (g)	PERCENT HEAVIES
1	20.00	0.004	0.511	0.008	0.523	2.61
2	20.00	0.001	0.171	0.002	0.174	0.87
3	20.00	0.009	0.343	0.013	0.365	1.83
4	20.00	0.010	0.098	0.014	0.122	0.61
5	20.00	0.038	0.272	0.005	0.315	1.57
6	20.00	0.010	0.133	0.006	0.149	0.75
7	20.00	0.010	0.245	0.023	0.278	1.39
8	20.00	0.001	0.295	0.007	0.303	1.52
9	20.00	0.025	0.264	0.006	0.295	1.48
10	20.00	0.002	0.533	0.010	0.545	2.73
11	20.00	0.031	0.241	0.010	0.282	1.41
12	20.00	0.012	0.157	0.003	0.172	0.86
13	10.00	0.009	0.104	0.011	0.124	1.24
14	20.00	0.088	0.569	0.120	0.777	3.88
15	20.00	0.024	0.212	0.021	0.257	1.29
16	20.00	0.005	0.332	0.008	0.345	1.73
17	20.00	0.040	0.147	0.004	0.191	0.95
18	20.00	0.006	0.391	0.031	0.428	2.14
19	20.00	0.003	0.468	0.020	0.491	2.46
20	10.00	0.007	0.039	0.001	0.047	0.47
21	15.00	0.006	0.065	0.002	0.073	0.49

Grain-size analysis was done by constructing cumulative curves from data points produced by sieving with the Rototap Sieve Shaker. Additional size fractions were generated by further hand sieving of the coarsest material (+4 mesh, +4.75 mm), which represented more than 40 percent of the weight of many samples. The additional size fractions are as follows: +50 mm, +45 mm, +31.5 mm, +25 mm, +19.1 mm, +12.7 mm, and +9.52 mm. The hand-generated sieve data are shown in table 6. The additional data points were used to construct the coarse end of the cumulative curves and to better determine graphic percentiles by inspection of the curves. Linear combinations of the percentiles were used to calculate graphic statistical parameters of grain size. From three to five percentiles were used in each calculation, because generally the accuracy of the statistical values is determined by the number of percentiles used. The parameters that were calculated by the graphic method are graphic mean grain size, graphic standard deviation, inclusive graphic skewness, and graphic kurtosis (Folk, 1980). The selected percentiles and calculated parameters are listed in table 7.

We studied the +4-mesh pebbles and cobbles separately. We sorted them by lithology with the aid of binocular and petrographic microscopes and X-ray diffraction of selected clasts. The various clast types then were weighed to determine the percentage by weight of each clast type in each sample.

Table 4.--Descriptions of hand samples of alluvium from core at the Rabbit Creek gold deposit

__Sample Number__: 1. __Size and Depth of Core Sample__: 9 in at 15 ft. __Name__: Sandy conglomerate with calcite cement, probably greater than 10%. __Color__: Light tan/grey Hue 10 YR 8/3. __General Description__: Very poorly sorted. Matrix is largely sand sized material, not much in the way of fine silt or clay sized material. The interior of the segment contains voids that are clustered around the pebbles. Maximum dimension of spaces about 4 mm. Well indurated, but still friable. __Clast Characteristics__: Clasts are subangular and subrounded with a maximum size of about 5 cm. There are numerous small, white, rounded, and subrounded clasts - tuff, with biotite crystals and small rock fragments, or perhaps clasts of caliche with black, volcanic glass. Perhaps 5% by volume, with a maximum size of about 1 cm. Clasts defined by size greater than 2 mm. __Character of Matrix__: Sand size material mostly, 2 mm to about 1/20 mm. Matrix has a carbonate cement. After acidification, matrix is porous. __Reaction with HCl (1:4)__: Strong. __Description of sand and silt-size matrix mineralogy__: Dominantly quartz, rock fragments, iron oxides, some muscovite, feldspar, biotite, and hornblende(?). __Other__: Very strong diesel odor - probably from water-soluble oil used in drilling fluid. All of the core samples have this smell.

__Sample Number__: 2. __Size and Depth of Core Sample:__ 8 in at 38 ft. __Name__: Sandy conglomerate with calcite cement greater than 10%. __Color__: Light tan/grey HUE 10 YR 8/2. __General Description__: Very poorly sorted and strongly indurated. Segment contains voids throughout. The voids are up to 5 mm in longest dimension. Estimate about 10% porosity due to these voids. Induration due to cementation by calcite. __Clast Characteristics__: Clasts angular to subrounded, with maximum size up to 6 cm. These are matrix supported and estimated to make up about 20% to 25% by volume (+2 mm size). Just a few tuff (or caliche?) clasts as seen in sample number 1. __Character of Matrix__: Sand size mostly, to coarse silt. Range is about 2 mm to about 1/50 mm. A very fine grained, granular calcite cement is present in the matrix. __Reaction with HCl (1:4)__: Very strong. __Description of sand- and silt-size matrix mineralogy__: Dominantly quartz, rock fragments, and iron oxides with some biotite flakes and sphene(?). Quartz approximately equivalent to rock fragments. Quartz grains strongly iron-oxide coated. __Other__: Induration is so hard that some clasts break when rock is hit with a hammer, rather than disaggregate from the matrix.

__Sample Number__: 3. __Size and Depth of Core Sample:__ 9 in at 59.5 ft. __Name__: Sandy conglomerate with calcite cement greater than 10%. __Color__: Light tan/grey Hue 10 YR 8/3. __General Description__: Very friable, disaggregated while sitting around. Poorly sorted. __Clast Characteristics__: Clasts are subangular and subrounded with +2 mm making up about 30% to 40% by volume, possibly 50%. Matrix supported where more cohesive, but cannot be certain about the naturally disaggregated parts of sample. Clasts are up to 3 cm maximum size. __Character of Matrix__: Mostly sand size, 2 mm to 1/50 mm. There are some white clots of calcite cement up to 3 or 4 mm across. Limonitic clots up to about 1 cm across are also present. __Reaction with HCl (1:4)__: Very strong, in spite of the poor induration. __Description of sand- and silt-size matrix mineralogy__: Dominantly quartz, with iron oxides, biotite, rock fragments, and some muscovite.

Sample Number: 4. **Size and Depth of Core Sample:** 7 in at 83.2 ft. **Name:** Sandy (tuffaceous) conglomerate, with calcite cement greater than 10%. **Color:** Light grey/tan Hue 2.5 YR 8/1. **General Description:** Poorly sorted, indurated but moderately friable. There are irregular open spaces or voids with maximum dimension about 1 cm. There are tuffaceous (or caliche?) clasts and layers, subparallel to the core diameter, which partially wrap around clasts. **Clast Characteristics:** Clasts subangular and subrounded, majority are subrounded. Maximum size to about 2 cm, makeup about 25% to 30% by volume - matrix supported. Tuffaceous clasts present. **Character of Matrix:** Mostly sand with abundant calcite cement, but the friability (hence cementation) vary. There are some very "rock like", far more indurated parts of this sample, which suggests irregular distribution of the calcite cement. Disaggregation was not complete with acid, which probably means some other cementation medium, such as silica or sulfates, is present. **Reaction with HCl (1:4):** Very strong, but again, as above, disaggregation was not complete. **Description of sand- and silt-size matrix mineralogy:** Sand-sized material is mostly quartz, with iron oxide grains, feldspars, some muscovite, biotite, epidote(?), garnet, and hornblende. **Other:** Tuffaceous matrix (white) is more common this segment than in the higher samples, but it also has an abundance of calcite. It is not crumbly caliche, but tuffaceous material as it includes a lot of biotite and quartz crystals in it - similar to the smaller tuff (or caliche?) clasts. Perhaps it represents smeared-out larger tuff (or caliche?) clasts.

Sample Number: 5. **Size and Depth of Core Sample:** 9 in at 107 ft. **Name:** Sandy breccia with calcite cement greater than 10%. **Color:** Light grey/tan Hue 2.5 YR 8/1. **General Description:** Very poorly sorted, large clasts, very hard, and well indurated (almost a rock). There is considerable vug or pore space between grains in spite of dense cementation. **Clast Characteristics:** Clasts angular and subangular up to 7 cm, maximum dimension. Due to angularity, this is more of a breccia. Some well indurated tuffaceous (or caliche?) clasts to 1 cm, which contain biotite and quartz crystals up to 1 mm size. Numerous large clasts in this segment. Clast proportion about 50%, matrix supported. **Character of Matrix:** Sandy to tuffaceous, probably some calcium carbonate. Abundant granular carbonate cement gives matrix a vitreous lustre. Small white clots appear to be caliche patches - irregular, very fine grained. **Reaction with HCl (1:4):** Very strong, but disaggregation incomplete, so may be some silica or sulfate cement as well. **Description of sand- and silt-size matrix mineralogy:** Quartz, with iron-oxide aggregates and grains, rock fragments, epidote(?), hornblende(?), possibly some fluorite. **Other:** Sample would be very hard to disaggregate.

Sample Number: 6. **Size and Depth of Core Sample:** 7 in at 124 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light grey/tan Hue 2.5 YR 8/2. **General Description:** Very poorly sorted, hard, well indurated, but disaggregates easier than previous sample. **Clast Characteristics:** Angular and subangular clasts make up about 20 to 30% by volume, with maximum size to about 5 cm. Matrix supported. Some clasts are tuffaceous (or caliche?) up to about 2 cm in size. Some carbonate clasts have caliche rims up to 3 mm thick, which are banded. **Character of Matrix:** Sandy mostly, with a abundant calcite cement. **Reaction with HCl (1:4):** Strong, but disaggregation not complete, so may contain silica or sulfate as well as calcite. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz, with rock fragments, iron oxides as aggregates and single grains, hornblende, minor biotite.

Sample Number: 7. **Size and Depth of Core Sample:** 7 in at 149 ft. **Name:** Sandy conglomerate with calcite cement greater than 10 percent. **Color:** Light tan Hue 2.5 Y 8/1. **General Description:** Very poorly sorted, well indurated. A clot of organic(?) material about 1-2 cm wide, 1-2cm thick, parallel with core diameter, having a resinous luster, containing sand grains, forms part of the matrix. Matrix also has smaller clots of similar character. The segment contains voids, in spite of being well cemented. **Clast Characteristics:** Angular and subangular up to 6 cm, most considerably smaller makeup 20 to 30% by volume, matrix supported. Some tuffaceous (or caliche?) clasts with biotite and quartz phenocrysts up to 3 cm across. **Character of Matrix:** Sand, mostly with carbonate cement. Caliche and hyalite (secondary, clear silica) also present. **Reaction with HCl (1:4):** Strong. **Description of sand- and silt-size matrix mineralogy:** Mostly quartz, followed by rock fragments and iron oxide aggregates and grains, feldspar, minor epidote(?). Organic clots of sand size with smaller grains. **Other:** The resinous, organic(?) clot is brownish. Fractures in large clasts and matrix boundaries with clasts contain caliche and hyalite. This was the only noted occurrence of silica in matrix/fractures seen in the core segments.

Sample Number: 8. **Size and Depth of Core Sample:** 8 in at 176 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light tan/yellow Hue 10 YR 8/3. **General Description:** Very poorly sorted, well indurated, and clast rich (almost a rock). The segment looks porous, but does not have large voids seen previously. **Clast Characteristics:** Clasts subangular and subrounded, estimate 30 to 40% by volume, greater than 2 mm, in sandy matrix. Maximum size to 6 cm. Tuff (or caliche?) clasts with quartz, biotite and garnet crystals are present, up to about 1 cm size. **Character of Matrix:** Sandy, mostly with a calcite cement. **Reaction with HCl (1:4):** Strong. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz and iron oxides - euhedral magnetite crystals present. Some possible tourmaline, epidote(?) and hornblende(?).

Sample Number: 9. **Size and Depth of Core Sample:** 6 in at 201.8 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light tan/grey/brown Hue 7.5 YR 8/3. **General Description:** Poorly sorted - moderately and variably indurated. **Clast Characteristics:** Clasts subangular and subrounded, maximum size up to 6 to 7 cm, most much smaller. A few tuffaceous (or caliche?) clasts, generally less than 1 cm in size, some smaller elongate clots of this material. **Character of Matrix:** Sandy matrix, carbonate cement visible as fine-grained vitreous interstitial material. **Reaction with HCl (1:4):** Strong. Disaggregation not complete with acid, indicates silica and/or sulfates present as well as calcite in the cement. **Description of sand- and silt-size matrix mineralogy:** Quartz with abundant feldspars; hornblende, epidote(?), biotite, and feldspars more common than in previous samples. Iron oxides.

Sample Number: 10. **Size and Depth of Core Sample:** 6 in at 224 ft. **Name:** Sandy conglomerate with cement greater than 10%. **Color:** Tan/yellow Hue 10 YR 8/4 more of a limonite color than previous. **General Description:** Poorly sorted, very pebbly; contains large amounts of tuff (or caliche?) clasts and the smaller clasts are distinctly rounded. Relatively friable in comparison with higher samples. **Clast Characteristics:** Clasts subangular and rounded up to 3.5 cm. Most of the smaller ones distinctly round. The clasts are 40 to 50% by volume. Tuff (or caliche?) clasts are common, and relatively rounded in comparison with other clast types. They contain biotite (or black volcanic glass?) and lithic fragments - of variable composition. Carbonate clasts which are present have no caliche overgrowths. **Character of Matrix:** Sandy, but with more fines than previously seen. Size ranges from 2 mm to 1/100 mm. **Reaction with HCl (1:4):** Strong, and produced cloud of fines, more so than previously seen in higher samples. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz, iron oxides, and rock fragments. Iron oxides include magnetite. Rock fragments and feldspars common. Some hornblende. **Other:** Although the matrix is dominantly sandy, there appear to be more clays within it than previously described.

Sample Number: 11. **Size and Depth of Core Sample:** 9 in at 249 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light tan/grey Hue 10 YR 8/2. **General Description:** Poorly sorted, well indurated. **Clast Characteristics:** Clasts subangular and subrounded up to 5 cm size, matrix supported, make up about 40% by volume of the rock. Numerous tuff (or caliche?) clasts present, to about 1 cm in maximum dimension. **Character of Matrix:** Sandy; vitreous carbonate cement in matrix. Common, clear, equant, striated grains about 1 mm in size occur in matrix. These are probably calcite, as they disappear on acidification. Matrix size 2 mm to 1/50 to 1/100 mm; fines present but not much below silt (as usual). **Reaction with HCl (1:4):** Strong. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz with minor iron oxide aggregates and single grains. Magnetite present. Some quartz grains are very well rounded. Some rock fragments. **Other:** The striated crystals, tentatively identified as calcite, might be salt (NaCl) as they appear to have a very salty taste. However, the taste could be from material in the matrix. The crystals are soft and dissolved on acidification. In this particular specimen they also appeared to disappear when water was poured on the sample. This was not the case for some lower samples.

Sample Number: 12. **Size and Depth of Core Sample:** 7 in at 275 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light tan/grey Hue 10 YR 8/1, but variable to 8/4; areas of carbonate cement are lighter. **General Description:** Indurated but relatively friable. The sandy matrix contains some irregular voids, which are 2 to 3 mm in maximum dimension. Some Mn-oxides present on what appears to be internal fractures in the segment. **Clast Characteristics:** Clasts are subangular and subrounded up to about 5 cm size and makeup about 30% by volume. Matrix supported. One large limonite clast brokeup, about 2.5 cm; may represent oxidized organic material? **Character of Matrix:** Sandy, mostly, but down to about 1/50 mm, some even smaller. Calcite cement is present, smooth looking, interstitial; however, not evenly distributed. **Reaction with HCl (1:4):** Very strong. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz and feldspar, and iron oxides. Common euhedral magnetite. **Other:** Induration is variable as the calcite cement is not uniform throughout the segment. The calcite rich zones are the hardest.

Sample Number: 13. **Size and Depth of Core Sample:** 6 in at 299 ft. **Name:** Sandy conglomerate with calcite cement greater than 10%. **Color:** Light tan/yellow/grey Hue 10 YR 8/3. **General Description:** Variably indurated, poorly sorted. Evidently the calcite cement is again variable in the segment. Lots of internal porosity, particularly open spaces around the pebbles up to 1 cm maximum dimension. Some equant voids 3 mm across. **Clast**

Characteristics: Clasts subangular and subrounded up to 5 cm across makeup 30 to 40% by volume. Matrix supported. Tuff (or caliche?) clasts present up to about 1 cm across. These contain biotite (or black volcanic glass?). **Character of Matrix:** Sandy, with interstitial carbonate cement which gives a resinous lustre. Again, glassy crystals present in matrix in clusters which disappear when wet and have a weak salty taste. Could these be halite, or calcite? **Reaction with HCl (1:4):** Very strong. Disaggregation not complete on acid; probably some silica and or sulfate in cement. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz, quartz-aggregates and rock fragments. A few very rounded quartz grains, magnetite, and other iron-oxide grains. Lots of iron-oxide stain on quartz and aggregate quartz grains.

Sample Number: 14. **Size and Depth of Core Sample:** 6 in at 323 ft. **Name:** Sandy conglomerate. **Color:** Tan/yellow Hue 10 YR 8/6, but with limonitic splotches up to about a cm in size. **General Description:** Poorly sorted, coherent, but generally friable. Matrix has large amount of limonite and hematite stained spots. **Clast Characteristics:** Clasts subangular or subrounded, up to about 3 cm; matrix supported. These makeup about 30% to 40% by volume of the sample. Tuff (or caliche?) clasts present, but sparse. Probably contained biotite, now FeOx spots. **Character of Matrix:** Sandy, but with lots of limonite and hematite stain. Very fine grained silty and clay-rich aggregates, limonitic and hematitic zones occur in it. **Reaction with HCl (1:4):** None. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz with feldspar, rock fragments, and iron oxides, including magnetite grains. **Other:** First sample with no carbonate matrix.

Sample Number: 15. **Size and Depth of Core Sample:** 8 in at 342 ft. **Name:** Sandy, silty(?), conglomerate. **Color:** Mottled, tan/brown/yellow Hue 10 YR 8/4 to 10 YR 6/8, very variable. **General Description:** Poorly sorted, fairly friable. Has lots of limonitic and hematitic mottling. Some hematitic material probably oxidized clasts. **Clast Characteristics:** Clast subangular and rounded, many rotten and friable, up to 3 cm and make up 30% to 40% by volume. Matrix supported. Some small tuff (or caliche?) clasts, fairly common. Some of these clasts are smeared out and bent around adjacent pebbles of harder material. **Character of Matrix:** Sandy but appears to have more fines than previously noted. Hematitic and limonitic zones as noted above. **Reaction with HCl (1:4):** None, however, the sample disaggregated to produce a large cloud of fine material and a coarser residue. The cloud of fine material was floated off. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz, feldspar, and iron oxide grains with large of magnetite fraction. Aggregate limonite and hematite and rock fragments (these may be same thing).

Sample Number: 16. **Size and Depth of Core Sample:** 7 in at 361 ft. **Name:** Sandy, silty conglomerate with calcite matrix greater than 10%. **Color:** Upper 7.5 YR 8/2 light tan/grey, lower 10 YR 8/3 light tan/yellow/grey. **General Description:** Poorly sorted and variably indurated. Top 2/3 is rock like, bottom 1/3 is friable due to differences in cementation. Clasts also larger and sparser at top. **Clast Characteristics:** Upper clasts subangular and subrounded to 5 cm size, larger and sparser than the subrounded lower ones. Overall about 30% of rock is clasts, matrix supported. Tuff (or caliche?) clasts present, to about 1 cm in size. **Character of Matrix:** Upper part sandy to tuffaceous with carbonate cement, lower is sandy. Clay clots occur in the sand fraction. Limonitic and hematitic splotches occur in the matrix of the lower part, as described for other samples above this zone. **Reaction with HCl (1:4):** Variable. Stronger for upper part but still had reaction for lower as well. Acidification produced a cloud of fine material, which was decanted, and a coarser residue. **Description of sand- and silt-size matrix mineralogy:** Dominantly quartz with iron oxides and rock fragments. Some magnetite in the iron oxide fraction. **Other:** This segment shows variation in just 7 in, with very different induration characteristics due to differing amounts of carbonate cementation. Some variations in degree of cementation have been noted in samples from higher in the section as well.

Sample Number: 17. **Size and Depth of Core Sample:** 9 in at 380 ft. **Name:** Sandy conglomerate with calcite cement, less than 10% (?). **Color:** Variable; Tan/yellow/grey 10 YR 8/4 to 7/4. **General Description:** Well indurated, but variably so. Poorly sorted. Flatter clasts show an imbrication, parallel to the core diameter. Color is mottled again due to limonitic rich clots and zones. **Clast Characteristics:** Subangular and subrounded clasts up to 6 cm size make up 30% to 40% of the segment and are matrix supported. A few tuff (or caliche?) clasts are present. **Character of Matrix:** Mostly sandy, but with mottled, hard limonitic zones or clots. No distinctly obvious carbonate cement. **Reaction with HCl (1:4):** Variable, moderately strong in places. **Description of sand- and silt-size matrix mineralogy:** Sand fraction dominantly quartz with rock fragments and iron oxides, a good deal of which is magnetite grains. Some aggregate iron oxides which may be oxidized rock fragments. Lots of clear feldspar and some muscovite, noted also sphene, epidote(?) or pyroxene(?).

Sample Number: 18. **Size and Depth of Core Sample:** 8 in at 402 ft. **Name:** Sandy, silty conglomerate with greater than 10% calcite cement. **Color:** Mottled, light brown to reddish brown due to hematitic splotches and clasts, Hue 10 R 4/8 (red splotches), 10 YR 8/4 to 8/8 other areas. **General Description:** Poorly sorted, well indurated but still relatively friable. Lots of hematitic splotches and clasts. Voids are abundant, particulary along boundaries of clasts and matrix. Voids have maximum dimension of 1 cm. **Clast Characteristics:** Clasts subangular and subrounded, maximum size to 6 cm, matrix supported, makeup 40% of segment. Some of the hematitic zones are actually clasts, up to about 4 mm size. Some tuff clasts, up to about 1 cm size, that contain magnetite. Estimate hematite zones to be about 10-15%. **Character of Matrix:** Sandy mainly but particle size down to 1/50 to 1/100 mm. Some hematitic areas in matrix are clayey. Estimated 10 to 15% hematitic zones. This segment has a lot of iron. **Reaction with HCl (1:4):** Very strong (and unexpected, as matrix was not obviously carbonate cemented). Dissolution gave a lot of fines which were decanted. **Description of sand- and silt-size matrix mineralogy:** Mostly quartz and quartz-aggregate rock fragments, iron oxide grains, with some magnetite. Some quartz very rounded. **Other:** Voids around some of the clasts are filled with clear, striated crystals. Possibly halite again, as they taste a bit salty. This material was included in the thin section blank. It did fizz on acidification, which suggests that the material is really calcite or that there is calcite around these crystals that is producing the fizz. The crystals did not completely disappear when acidified. Another possibility is that these crystals are gypsum.

Sample Number: 19. **Size and Depth of Core Sample:** 8 in at 421 ft. **Name:** Sandy conglomerate with calcite matrix greater than 10% (?). **Color:** Tan to reddish yellow. Hue 10 YR 7/4 to 10 R 4/8. **General Description:** Poorly sorted, indurated, but relatively friable. Matrix again has hematitic zones, but not as many as previously. Distinctly full of voids, with open spaces around the pebbles and more equant than previous sample. Again, lined with clear striated crystals, which could be either halite, gypsum, or calcite. **Clast Characteristics:** Very clast rich; subangular and rounded, about 40% by volume perhaps as high as 50; matrix supported. Maximum clast size 5 cm. Hematitic clasts probably less than 5%. Tuff (or caliche?) clasts present, largest to 1 cm, most are smaller. **Character of Matrix:** Sandy, same approximate size distribution as before. **Reaction with HCl (1:4):** Moderately strong. Acidification produced a heavy cloud of fine material, although not as much as in some of the higher samples, and also a coarser residue. The finer material was decanted. **Description of sand- and silt-size matrix mineralogy:** Mostly quartz, with feldspar, quartz aggregate rock fragments, iron oxides, with a lot of magnetite which is generally pretty fine grained. Some large clear quartz crystals.

Sample Number: 20. **Size and Depth of Core Sample:** 3 in at 422 ft. **Name:** Moderately poorly sorted, epiclastic, medium-fine grained sand. **Color:** Tan/yellow/brown, Hue 10 YR 8/3 to 8/4. **General Description:** A sandy zone, continuous with the last segment. Moderately poorly sorted, well indurated sand. **Character of Matrix:** Grain size of sand approximately 0.5 mm to 1/50 to 1/100 mm. Some 1 mm tuffaceous (or caliche?) clasts, rounded, some rock fragments in coarser fraction as well. Magnetite rich. **Reaction with HCl (1:4):** None, but lots of fines were produced by solution which were decanted. **Description of sand- and silt-size matrix mineralogy:** Sand is mostly quartz or quartz-feldspar aggregates, stained with iron oxide, and containing fine magnetite. Just a few discrete quartz crystals and sand-sized rock fragments, largely quartz aggregate or quartzite. Some magnetite crystals. This may be a reworked tuff with some fine material present. **Other:** In thin section, check for shards. The aggregate texture of the grains and their fine dusting of magnetite suggests tuff.

Sample Number: 21. **Size and Depth of Core Sample:** 6 in at 449 ft. **Name:** Tuffaceous conglomeratic sand, fine to medium grained. **Color:** Light brown/yellow 10 YR 8/6. **General Description:** Poorly indurated, relatively friable, sandy conglomerate. **Clast Characteristics:** Clasts are angular and subrounded, up to about 6 cm, forming 20% by volume, matrix supported. One large clast is a fine grained, well indurated tuff (or caliche?) fragment. About 5% to 10% hematitic clasts and clots. Few clasts are below 5 mm in size; which differs from previous samples. **Character of Matrix:** Sandy, much like the sand of the previous sample. Size range about 0.5 mm to 1/50 to 1/100mm. Much iron oxide dusting (mgt. ?). **Reaction with HCl (1:4):** Very slight. Lots of fines produced by fluid which were decanted. **Description of sand- and silt-size matrix mineralogy:** Mostly quartz aggregate probably quartz-feldspar aggregate, some individual quartz crystals, lots of magnetite. Again, this resembles tuffaceous material and should be checked for shards.

Table 5.--Descriptions of thin sections and polished sections.

Sample 1 (Depth, 15 ft)

Deformed, quartz-rich rock containing small clasts (< 0.5mm) of chert?, silicified rocks veined with quartz, metamorphic rocks that are mica rich, and basalt. Most clasts lack distinct boundaries. The rock contains veins of cockscomb-textured quartz with vague boundaries.

Sample 2 (Depth, 38 ft)

Slide 1 Matrix- and cement-supported conglomerate containing rock fragments (many are +1 cm) and mineral grains floating in a matrix of very fine grained calcium carbonate, quartz, and feldspar. The composition of the matrix was confirmed by x-ray diffraction analysis. Rock fragments include limestone, metamorphic rocks (0.5 mm), and basalt (0.3 mm); mineral grains include angular quartz (0.2 mm), angular plagioclase (60μm), biotite, white mica, and opaque minerals.

Clasts of limestone consist of fossil crinoid columnals with rim cement (40-50% of the rock), pelloids, endothyrid forams, scraps of Bryozoa, silt-sized quartz, and possibly fragments of chert, all cemented with sparry calcite. The constituents listed above suggest that this limestone was deposited in shallow water. Evidence for solution compaction can be seen along some calcite grain boundaries, where the rim cement surrounding crinoid stems has been dissolved and grains have compacted together.

Slide 2 Cement- and matrix-supported conglomerate with rock fragments and mineral grains floating in sand- to clay-size matrix of very fine grained calcium carbonate, quartz, and feldspar. The rock fragments include detrital caliche (>1 mm), metasedimentary rocks (>1 mm), siltstone, silicified rocks with faint foliation, some intensely foliated metasedimentary rocks, and altered basalt (0.5 mm); mineral grains include quartz (100μm), plagioclase (including An_{50}), hornblende, calcite, and clinopyroxene.

Sample 3 (Depth, 60 ft)

Clast- and matrix-supported conglomerate containing rock fragments (+1-cm size) floating in sand- to clay-size matrix and calcium carbonate. The rock fragments include metamorphic rocks (>1 mm), basalt with plagioclase microlites, detrital caliche, calcareous siltstone containing fine-sand-sized angular quartz (200μm) and pelloids, limestone with detrital quartz (50μm), recrystallized quartzite, limestone with coating of caliche, and silicified limestone. Mineral grains include rounded (reworked) quartz (300μm), strained quartz, plagioclase, and opaque minerals. Interstitial material between the +1-cm rock fragments is very fine grained calcium carbonate cement.

A clast of silicified rock contains a cross section of a silicified crinoid columnal, proving that the rock is a silicic alteration of limestone rather than a true chert.

Sample 4 (Depth, 83 ft)

Mixture of local clast-supported (clasts +1 cm) and local matrix- and cement-supported conglomerate containing rock fragments of basalt with fresh plagioclase microlites, recrystallized quartzite, igneous rock containing epidote, detrital caliche, micaceous metasedimentary rock, and limestone. Mineral grains include quartz, plagioclase, hornblende, and epidote. Clasts of detrital caliche are soft and have been deformed around harder clasts of limestone. The cement is very fine grained calcium carbonate (caliche).

Sample 5 (Depth, 107 ft)

Slide 1 Clast-supported conglomerate contains rock fragments (+0.5 cm) of caliche-coated limestone (with detrital quartz grains that are 300μm), detrital caliche, basalt with microlites of calcic plagioclase(composition of An_{63-73}), foliated metasedimentary rocks, recrystallized quartzite, serpentinite?, and silicified rocks. Mineral grains include quartz, clinopyroxene, hornblende, plagioclase, calcite, mica, and opaque minerals. Interstitial caliche, fine-grained rock fragments, and mineral grains are matrix and cement. The coatings (0.5mm) of caliche on various larger rock clasts are distributed asymmetrically, such that the coating is thicker on one side of a clast than on the other side.

Slide 2 Clast-supported conglomerate contains rock fragments of limestone, basalt, metasedimentary rocks, silicified and quartz-veined rocks, and ultramafic rocks containing clinopyroxene, orthopyroxene, and serpentine. Mineral grains include quartz, plagioclase, orthopyroxene, hornblende, white mical, and glass shards. Interstitial calcium carbonate is probably the cement.

Sample 6 (Depth, 124 ft)

Mixture of local clast-supported (clasts +4 cm) and matrix- and cement-supported conglomerate in fine sand matrix of mineral grains and fine-grained rock fragments. Conglomerate contains caliche-coated rock fragments of limestone, calcareous siltstone, metasedimentary rocks, basalt, detrital caliche, and silicified rocks. Mineral grains include quartz, plagioclase, and hornblende. Cement is probably a secondary calcium carbonate.

Some limestone clasts contain fossils, including crinoids that are surrounded by rim cement, endothyrid forams, fusulinids, and echinoid spines. Locally, crinoids contain the mud-filled borings of endolithic algae, which indicates that deposition occurred in the photic zone. The above constituents suggest shallow-water deposition of the original limestone unit.

Sample 7 (Depth, 149 ft)

Slide 1 Unusually well consolidated rock, which contains an abundance of silicic rock fragments. Clast-supported conglomerate contains fragments of recrystallized quartzite, siltstone/mudstone, foliated metasedimentary rocks, and silicified rocks. Mineral grains include more angular quartz, rounded (reworked) quartz (350μm), and goethite as a replacement of euhedral pyrite. The boundaries between clasts and cements are vague, so that the clasts are difficult to distinguish from cement in thin section. The cement is a coarse secondary calcium carbonate. The rock contains a vein of calcite and clusters of goethite pseudomorphs of euhedral, pyritohedral pyrite.

Slide 2 Clast-supported conglomerate containing clasts of quartzite and siltstone/mudstone (300-1200μm). Mineral grains include quartz, and cement is probably a secondary calcium carbonate. Rock is veined by calcium carbonate and contains clusters of goethite.

Polished section Goethite replacement of euhedral, pyritohedral pyrite (<0.1 mm). If the original euhedral pyrite was detrital, then it did not travel far, because the crystals show no effects of abrasion. Fresh and finely disseminated, relict pyrite (<4μm) occurs, some of which is pyritohedral in form.

Sample 8 (Depth, 176 ft)

Slide 1 Clast-supported conglomerate containing rock fragments (+0.5 cm) of limestone, basalt, foliated metasedimentary rocks, detrital caliche, coarse-grained siltstone with quartz 125μm, limestone with detrital quartz silt (40μm), and silicified rock veined with quartz. Limestone clasts contain tangential sections of fusulinids and cross section of a spine (200μm) that is well preserved. Mineral grains include quartz, calcite, plagioclase, and hornblende. Matrix and cement are the very fine grained clays and calcium carbonate that occur interstitially.

Slide 2 This sample is dominated by a large clast of what is a siltstone to fine-grained sandstone, which contains quartz grains 40-70μm. The largest clast is surrounded by a thick (1200μm) coating of caliche. Within the caliche coating there are well-preserved glass shards. The other clasts in the slide are smaller fragments of limestone, basalt with plagioclase microlites, very fine grained sandstone with quartz grains that are up to 50μm, angular glass shards (200μm), red chert, plagioclase (+240μm), quartz, and hornblende.

Sample 9 (Depth, 202 ft)

Slide 1 Clast-supported conglomerate containing rock fragments (+0.5 cm) of basalt, detrital caliche, igneous rock altered to chlorite, very fine grained sandstone with quartz grains 200μm, silty limestone (+2 mm) with quartz grains 40μm, serpentinite?, metasedimentary rocks with quartz grains 600μm, and quartz-veined siltstone. Interstitial material is more abundant than in sample 8, and consists of mineral grains of quartz, plagioclase, hornblende, and unidentified opaque minerals, and fine-grained rock fragments. The cement is caliche.

Slide 2 Clast-supported conglomerate containing clasts of basalt with local clinopyroxene preserved, limestone, siltstone, metasedimentary rocks, silty limestone, silicified rocks, and detrital caliche. Mineral grains include quartz, plagioclase, hornblende, and opaque minerals, which are packed together in the caliche cement with tiny rock fragments. The cement is secondary calcium carbonate (caliche).

<u>Sample 10 (Depth, 224 ft)</u>

<u>Slide 1</u> Clast-supported, tightly packed conglomerate that contains clasts with very sharp boundaries, which are easily distinguishable in thin section. Clasts include limestone, siltstone with 60-μm quartz, metasedimentary rocks, some intensely foliated metamorphic rocks, detrital caliche, silicified rocks that are veined with quartz and calcium carbonate, and basalt. Mineral grains include very coarse, strained quartz, hornblende, and plucked-out material of unknown composition. The cement is calcium carbonate.

A clast of very altered mafic volcanic/hypabyssal rock (>1 mm) contains a variolitic texture. Another clast of mafic volcanic/hypabyssal rock contains calcic plagioclase with a composition of An_{70}.

<u>Slide 2</u> Clast-supported conglomerate with easily distinguishable clasts, as above. Clasts consist of fine-grained quartz-rich sandstone with rounded, second-generation, grains of quartz, partly silicified limestone, basalt, limestone, metasedimentary rocks, detrital caliche, completely silicified rocks, and siltstone. Mineral grains include quartz and plagioclase. Cement consists of equant grains of calcium carbonate.

<u>Sample 11 (Depth, 249 ft)</u>

<u>Slide 1</u> Clast-supported, tightly packed conglomerate containing clasts (+0.3 cm) of limestone, siltstone, metamorphic rocks, chert, basalt, silicified rocks, and detrital caliche. Locally cement-supported conglomerate. Locally, secondary calcium carbonate pushed apart rock fragments and/or filled open spaces. Mineral grains include quartz, fresh biotite, and hornblende. The cement is calcium carbonate. No halite was noted in thin section, although it was tentatively identified in hand sample.

<u>Slide 2</u> Clast-supported conglomerate containing clasts of calcite-veined siltstone, altered basalt, siltstone, detrital caliche, calcareous siltstone, limestone, silicified rocks veined with quartz, quartzite?, and metamorphic rocks. The rock appears to be clast supported and to lack obvious matrix or cement. Interstitial material may not have survived diagenesis or grinding and polishing of the thin section.

<u>Sample 12 (Depth, 275 ft)</u>

<u>Slide 1</u> Cement- and matrix-supported conglomerate that contains clasts (+4 cm) of metamorphic rocks, veined and silicified rocks, chert, igneous rock consisting of plagioclase (800μm) and clay minerals, limestone (or caliche), and siltstone. Matrix contains sand-sized rocks and minerals, and caliche cement, which appears as calcite in the x-ray pattern. The slide is dominated by a large clast of siltstone. Clasts of the other lithologies occur adjacent to the siltstone clast.

Slide 2 Cement- and matrix-supported rock. The clasts include quartzite (or quartz siltstone), jasperoid, glass shards, limestone, altered bassalt or diabase, metamorphic rocks, and quartz in a cement of secondary calcium carbonate.

Sample 13 (Depth, 299 ft)

Clast-supported rock containing clasts (0.5-3.0 cm) of metasedimentary rocks, calcareous siltstone, quartzite with rounded grains of quartz that are up to 300μm, jasperoid or silicified rock, siltstone, altered mafic igneous rock (basalt?), and quartz-veined siltstone in cement of secondary calcium carbonate. Some clasts are coated with caliche, which is probably part of the detrital clast. Matrix consists of minerals and fine-grained rock fragments. No halite was noted in thin section.

Sample 14 (Depth, 323 ft)

Clast-supported, tightly packed conglomerate containing clasts of metamorphic rocks, rounded (reworked) clasts of basalt that consists of radial aggregates of acicular and fibrous minerals, coarser grained igneous rock with plagioclase that is 275μm, serpentinite?, siltstone, chert or jasperoid that is veined with quartz, quartzite (coarse), quartz, plagioclase, fresh brown biotite, and opaque minerals that are up to 1200 μm. The matrix is a green material that consists of clay (montmorillonite?) and quartz, as indicated by X-ray diffraction patterns. There is no obvious calcium-carbonate cement.

Polished section Goethite occurs as a replacement of pyrite?, but there is no relict pyrite in the sample. The pyrite? replaced by goethite is not euhedral, as it is in sample 7. Instead, it is corroded or abraded.

Sample 15 (Depth, 342 ft)

Clast-supported, very tightly packed rock containing clasts (0.5-2.0 cm) of metamorphic rocks, siltstone, quartzite, basalt with microlites of calcic plagioclase (An_{74}), jasperoid, only one limestone clast, quartz, plagioclase, and clay minerals?. There is no calcium-carbonate cement in this rock. X-ray diffraction analyses indicate that the interstitial material consists of clay minerals and quartz. The clay may be matrix material, or deformed and crushed fragments of an altered, labile rock.

Sample 16 (Depth, 361 ft)

Slide 1 Clast-supported conglomerate with interstitial fine-grained rocks and mineral fragments. Contains clasts of limestone, quartzite, siltstone, metamorphic rocks, jasperoid, quartz, plagioclase, biotite, and white mica in a cement of secondary calcium carbonate.

Slide 2 Clast- and cement-supported rock containing clasts of limestone, siltstone, metamorphic rocks, micaceous quartzite, silicified rocks or chert, mildly foliated metamorphic rocks, altered volcanic rocks (basalt?), quartz, white mica, and calcite in a cement of secondary calcium carbonate.

Sample 17 (Depth, 380 ft)

Clast-supported, tightly packed conglomerate with clasts (0.5-+3 cm) of siltstone, limestone, recrystallized quartzite or quartz- vein material, altered mafic igneous (basalt?) rocks, chert?, calcareous siltstone, metamorphic rocks, jasperoid?, quartz, plagioclase, and mica. Matrix consists of fine-grained rocks and mineral grains, in cement of secondary calcium carbonate. The basalt? contains the radial aggregates of acicular and fibrous minerals that are seen in other samples.

Sample 18 (Depth, 402 ft)

Clast-supported rock containing clasts (0.5-2+ cm) of limestone, altered basalt, siltstone, metamorphic rocks, chert?, and recrystallized quartzite or quartz-vein material. The interstitial material consists of quartz, calcium carbonate, and clay, according to x-ray diffraction analyses, and minor plagioclase appears in the thin section. Clasts of altered igneous rocks (basalt?) are particularly abundant in this sample. Siltstone clasts may be more abundant than metamorphic clasts. No halite was noted in thin section.

Sample 19 (Depth, 421 ft)

Clast-supported, very tightly packed rock containing clasts (<0.5-+1 cm) of metamorphic rocks, siltstone, silicified rocks or chert?, quartz-vein material, altered basalt?, minor limestone, quartzite, quartz, and biotite that shows only a pale pleochroism. Metamorphic rocks and siltstone are particularly abundant. There is no obvious matrix or cement. Neither halite nor gypsum were noted in thin section.

Sample 20 (Depth, 422 ft)

Matrix material, nearly opaque, Matrix contains tiny grains of quartz, silicified rocks (chert?), metamorphic rocks (125 μm), mica, and siltstone. No limestone observed. X-ray diffraction analysis indicates that the matrix material consists of quartz, impure calcite, and clay (montmorillonite?). Glass shards were not observed.

Sample 21 (Depth, 449 ft)

Clast-supported rock containing clasts (<0.5-+3 cm) of moderately foliated metasiltstone, altered basalt, metamorphic rocks, minor limestone or detrital caliche, slightly calcareous siltstone, jasperoid, volcanic glass?, and silicified rocks that may be recrystallized quartzite or quartz-vein material, clay, silt-sized quartz, and biotite. Siltstone and metamorphic rocks predominate in this sample. There is no calcium-carbonate cement in this sample. X-ray diffraction analysis indicates that the interstitial material consists of quartz and clay (montmorillonite?). The clay looks similar to that in sample 15. Glass shards were not observed in thin section.

Table 6. Weights of size fractions that were sieved by hand from the Rabbit Creek core samples
[(--) denotes no data]

Sample number	Core-sample description	Additional coarse sieve-fraction weights (g)								
		+2" mesh +50 mm	+1 3/4" mesh +45 mm	. +1 1/4" mesh +31.5 mm	+1" mesh +25.0 mm	-1"/+3/4" mesh +19.1 mm	+3/4" mesh +19.1 mm	+1/2" mesh +12.7 mm	+3/8" mesh +9.52 mm	-3/8"/+4 mesh +4.75 mm
1	9" at 15'	--	-- --	--	--	--	--	--	--	
2	8" at 38'	--	-- --	--	--	--	--	--	--	
3	9" at 59.5'	--	-- --	--	--	--	--	--	--	
4	7" at 83.2'	--	-- --	--	--	--	--	--	--	
5	9" at 107'	--	-- --	--	--	395.45	101.38	34.09	111.48	
6	7" at 124'	--	28.64 0	23.77	134.33	--	49.1	60.44	78.93	
7	7" at 149'	31.99	0 0	17.65	130.26	--	47.55	30.57	73.42	
8	8" at 176'	--	--30.16	17.14	176.55	--	115.01	36.42	156.92	
9	6" at 201.8'	--	29.0727.81	19.99	122.72	--	20.56	26.38	91.64	
10	6" at 224'	--	-- --	--	--	--	15.67	9.93	37.40	
11	9" at 249'	--	--27.65	19.16	51.11	--	72.45	33.53	113.51	
12	7" at 275'	--	--31.25	19.23	169.44	--	43.19	11.22	85.45	
13	6" at 299'	--	-- --	20.00	69.40	--	40.88	31.47	78.95	
14	6" at 323'	--	--21.63	17.73	30.35	--	44.97	20.04	62.54	
15	8" at 342'	--	-- --	--	--	--	26.86	42.70	180.64	
16	7" at 361'	--	-- --	28.94	152.32	--	103.41	43.81	65.36	
17	9" at 380'	--	--19.51	0	33.45	--	79.93	47.38	157.64	
18	8" at 402'	--	-- --	22.92	58.2	--	60.92	68.32	220.76	
19	8" at 421'	--	-- --	--	--	---	3.15	17.67	93.38	
20	3" at 422'	--	-- --	--	--	---	---	---	---	
21	6" at 449'	--	-- --	30.43	149.35	--	48.95	45.3	135.1	
Estimated weighing error...		±0.01	±0.01±0.01	±0.01	±0.01	±0.01	±0.01	±0.01	+/-.1	

Table 7. Selected percentiles and statistical parameters of grain size, Rabbit Creek core samples

Sample number	Core-sample length and depth	Percentiles (ø)								Statistical parameters[1]					
										Mean (ø)		Standard deviation (ø)		Skewness	Kurtosis
		1%	5%	16%	25%	50% (median)	75%	84%	95%	Graphic	Moment	Graphic	Moment	Graphic	Graphic
1	9" at 15'	-6.58	-6.10	-4.77	-3.68	-1.13	1.58	2.88	5.10	-1.00	-0.93	3.6	3.3	0.08	0.87
2	8" at 38'	-6.59	-6.17	-5.00	-4.05	-1.51	1.19	2.55	5.23	-1.32	1.21	3.6	3.3	.13	.89
3	9" at 59.5'	-6.55	-5.97	-4.38	-3.07	-1.02	1.26	2.62	5.16	-0.93	-0.82	3.4	3.1	.08	1.05
4	7" at 83.2'	-6.56	-6.01	-4.48	-3.24	-1.39	1.08	2.84	5.29	-1.01	-0.96	3.5	3.2	.17	1.07
5	9" at 107'	-6.63	-6.33	-5.53	-4.87	-2.71	0.07	1.77	4.46	-2.16	-2.08	3.5	3.4	.28	.90
6	7" at 124'	-5.59	-4.69	-4.34	-3.60	-1.21	2.38	3.42	5.56	-0.71	-0.57	3.5	3.4	.26	.70
7	7" at 149'	-6.44	-4.85	-4.42	-4.07	-1.53	1.31	2.89	5.40	-1.02	-1.02	3.4	3.3	.28	.78
8	8" at 176'	-5.28	-4.61	-4.31	-3.81	-1.70	1.00	2.62	5.20	-1.13	-1.04	3.2	3.1	.33	.84
9	6" at 201.8'	-5.60	-5.33	-4.50	-4.28	-1.81	1.04	2.68	5.27	-1.21	-1.18	3.4	3.2	.29	.82
10	6" at 224'	-4.07	-3.30	-2.07	-1.55	-0.81	1.99	3.27	5.59	0.34	0.36	2.7	2.6	.30	1.03
11	9" at 249'	-5.29	-4.59	-3.67	-2.70	-0.83	1.53	2.93	5.49	-0.52	-0.42	3.2	3.0	.20	.98
12	7" at 275'	-5.32	-4.64	-4.37	-3.64	-0.75	1.87	3.09	5.41	-0.68	-0.52	3.4	3.2	.13	.75
13	6" at 299'	-4.89	-4.61	-4.28	-3.63	-1.89	0.53	2.03	5.07	-1.38	-1.19	3.0	3.0	.34	.95
14	6" at 323'	-5.31	-4.68	-3.55	-2.40	-0.70	1.38	2.40	4.68	-0.62	-0.47	2.9	2.8	.01	1.02
15	8" at 342'	-4.02	-3.41	-2.69	-2.17	-0.93	1.23	2.61	5.20	-0.33	-0.26	2.6	2.6	.38	1.04
16	7" at 361'	-4.87	-4.60	-4.34	-3.96	-1.71	0.48	1.68	4.19	-1.46	-1.32	2.8	2.8	.23	.81
17	9" at 380'	-5.27	-4.38	-3.65	-3.05	-1.62	0.39	1.56	3.89	-1.24	-1.11	2.6	2.6	.28	.98
18	8" at 402'	-4.79	-4.38	-3.31	-2.78	-1.49	0.28	1.70	4.38	-1.03	-0.93	2.6	2.6	.31	1.17
19	8" at 421'	-3.59	-3.14	-2.41	-1.96	-0.72	1.29	2.36	4.71	-0.26	-0.16	2.4	2.4	.34	.99
20	3" at 422	-2.70	-1.98	-1.10	-0.55	1.50	3.95	5.04	6.39	1.81	1.79	2.8	2.6	.16	.76
21	6" at 449'	-4.89	-4.62	-4.39	-4.01	-2.31	-0.12	1.47	4.53	-1.74	-1.57	2.9	2.9	.39	.97

[1]The statistical parameters were determined from graphic measures (percentiles read from cumulative curves). In addition, the means and standard deviations were determined by moment measures, directly from sieve data (a computational rather than graphic measure). Where data were sufficient, the graphic parameters were based on three to five percentiles according to the method of Folk and Ward (1957) and Folk (1980). Where data were insufficient, the graphic parameters were determined from fewer percentiles according to the method of Inman (1952).

TABLE: 8 MINERALOGY OF THE -100/+250 FRACTION HEAVY MINERAL CONCENTRATE

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
1	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	94%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	5%
			RED FRAGMENTS	FeOx	1%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	60%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	20%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			PALE GREEN VITREOUS	PUMPELLYITE	10%
			BROWN MICA	BIOTITE	RARE
	C3	WHITE TO SANDY	CLEAR HEXAGONAL PRISMS	APATITE	80%
			DK. BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	20%
			CLEAR TETRAGONAL PRISM	ZIRCON	1 GRAIN
			BRASSY METALLIC CUBE	PYRITE	RARE
2	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
	C2	TAN W/ WHITE COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	50%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	20%
			BROWN, RED, AND EUHEDRAL BLACK MICA	BIOTITE	10%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			PALE GREEN VITREOUS	PUMPELLYITE	10%
			CUBE	FeOx/PYRITE	RARE
	C3	WHITE TO SANDY W/ SCATTERED BLACK	MILKY TO CLEAR PLATES	BARITE	45%
			CLEAR HEXAGONAL PRISMS AND ROUNDED GRAINS	APATITE	30%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	5%
			BRASSY METALLIC CUBE	PYRITE	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE
			BROWN MICA	BIOTITE	RARE
3	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	89%
			RED FRAGMENTS	FeOx	10%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	1%
	C2	TAN W/ MINOR WHITE COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	40%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	35%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	15%
			PALE GREEN WAXY TO VITREOUS	PUMPELLYITE	5%
			BLACK MICA	BIOTITE	5%
			CUBE	FeOx/PYRITE	RARE
			PINK TETRAGONAL PRISM	ZIRCON	RARE
	C3	WHITE TO SANDY W/ SCATTERED BLACK	SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	69%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	15%
			MILKY TO CLEAR PLATES	BARITE	10%
			VERY PALE GREEN GRAINS	PUMPELLYITE	10%
			RED FRAGMENTS	FeOx	5%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	1%
4	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ COATINGS	MAGNETITE	89%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			RED FRAGMENTS	FeOx	1%
	C2	TAN TO LT. GREEN W/ WHITE COATINGS	EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	55%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	20%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	15%
			DK. BROWN TO BLACK MICA	BIOTITE	5%
			PALE GREEN WAXY TO VITREOUS	PUMPELLYITE	5%
	C3	WHITE	MILKY TO CLEAR PLATES	BARITE	94%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	5%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	1%
			BRASSY METALLIC CUBE	PYRITE	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE
			BROWN MICA	BIOTITE	RARE
			MALLEABLE SILVER METALLIC BALLS & SLIVERS	CONTAMINATION - Zn	11 GRAINS

TABLE: 8 MINERALOGY OF THE -100/+250 FRACTION (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
5	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	89%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN - TAN W/ THICK WHITE COATINGS	EUHEDRAL GREEN "PRISMS" AND FRAGS	PYROXENE - ENSTATITE	59%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	30%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	10%
			PALE GREEN WAXY TO VITREOUS	PUMPELLYITE	1%
			CUBE	FeOx/PYRITE	RARE
			BLACK MICA	BIOTITE	RARE
	C3	WHITE TO SANDY	MILKY TO CLEAR PLATES	BARITE	54%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	30%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	5%
			RED FRAGMENTS	FeOx	1%
			YELLOW VITREOUS WEDGE	SPHENE	RARE
			MALLEABLE SILVER METALLIC SLIVER	CONTAMINATION - Zn	1 GRAIN
6	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	89%
			EUHEDRAL PALE GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN TO TAN W/ ALMOST NO COATINGS	EUHEDRAL PALE GREEN "PRISMS" AND FRAGS	PYROXENE - ENSTATITE	59%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	25%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	15%
			PALE GREEN WAXY TO VITREOUS	PUMPELLYITE	1%
			BLACK, THICK EUHEDRAL MICA BOOK	BIOTITE	RARE
	C3	WHITE	SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	50%
			MILKY TO CLEAR PLATES	BARITE	30%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
			YELLOW VITREOUS WEDGE	SPHENE	RARE
7	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	89%
			EUHEDRAL PALE GREEN "PRISMS"	PYROXENE - ENSTATITE	10%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN W/ MINOR COATINGS	EUHEDRAL PALE GREEN "PRISMS" AND FRAGS	PYROXENE - ENSTATITE	40%
			BLACK, VITREOUS CLEAVAGE FRAGMENTS	AMPHIBOLE	40%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	20%
			BROWN MICA	BIOTITE	RARE
	C3	WHITE	MILKY TO CLEAR PLATES	BARITE	98%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	1%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	1%
			YELLOW VITREOUS WEDGE	SPHENE	RARE
			BRASSY METALLIC CUBE	PYRITE	RARE
8	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	DK. BROWN W/ ALMOST NO COATINGS	DK. GREEN TO BLACK CLEAVAGE FRAGMENTS	AMPHIBOLE	60%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	30%
			EUHEDRAL PALE GREEN "PRISMS" AND FRAGS	PYROXENE - ENSTATITE	10%
	C3	WHITE W/ SCATTERED BLACK	BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	50%
			MILKY TO CLEAR PLATES	BARITE	30%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
			YELLOW VITREOUS WEDGE	SPHENE	RARE
9	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
			EUHEDRAL PALE GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
	C2	DK. BROWN W/ MINOR COATINGS	DK. GREEN TO BLACK CLEAVAGE FRAGMENTS	AMPHIBOLE	55%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	39%
			PALE GREEN WAXY TO VITREOUS	PUMPELLYITE	5%
			BROWN MICA	BIOTITE	1%
			CUBE	FeOx/PYRITE	RARE
			EUHEDRAL PALE GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
			MILKY PLATES AND FRAGMENTS - COATS	BARITE	RARE
	C3	WHITE	MILKY TO CLEAR PLATES	BARITE	50%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	30%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	5%
			MALLEABLE SILVER METALLIC SLIVER	CONTAMINATION - Zn	5%
			BLACK MICA	BIOTITE	RARE

TABLE: 8 MINERALOGY OF THE -100/+250 FRACTION (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
10	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	89%
			DK. GREEN TO BLACK CLEAVAGE FRAGMENTS	AMPHIBOLE	10%
			BROWN TO EUHEDRAL BLACK MICA	BIOTITE	1%
	C3	WHITE TO SANDY	MILKY TO CLEAR PLATES	BARITE	40%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	30%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	15%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
			RED FRAGMENTS	FeOx	5%
			MALLEABLE SILVER METALLIC SLIVER	CONTAMINATION - Zn	RARE
			TARNISHED SULFIDE	PYRITE	RARE
			SOFT METALLIC MICACEOUS FLAKE * ID BY XRD	MOLYBDENITE	1 GRAIN
11	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	65%
			DK. GREEN TO BLACK CLEAVAGE FRAGMENTS	AMPHIBOLE	20%
			PALE YELLOW TO GREEN * ID BY XRD	PUMPELLYITE	10%
			YELLOW VITREOUS WEDGE	SPHENE	5%
	C3	SANDY	MILKY TO CLEAR PLATES	BARITE	60%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	20%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	10%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	10%
			RED FRAGMENTS	FeOx	RARE
			BROWN MICA	BIOTITE	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE
			BRASSY METALLIC CUBE	PYRITE	RARE
12	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN W/ WHITE COATINGS	RED, BROWN, AND YELLOW FRAGMENTS W/ COATINGS	FeOx	64%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	30%
			DK. GREEN FIBROUS CLEAVAGE FRAGMENTS	AMPHIBOLE	5%
			PALE YELLOW TO GREEN	PUMPELLYITE	1%
			GOLD TO BROWN MICA	BIOTITE	RARE
			CUBE	FeOx/PYRITE	RARE
			PINK TETRAGONAL PRISM	ZIRCON	RARE
	C3	SANDY TO WHITE	MILKY TO CLEAR PLATES	BARITE	74%
			BROWN TO BLACK GRANULAR FRAGMENTS	APATITE - PHOSPHATE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	5%
			RED AND YELLOW FRAGMENTS	FeOx	1%
			BLACK MICA	BIOTITE	RARE
			MALLEABLE SILVER METALLIC SLIVER	CONTAMINATION - Zn	RARE
13		INSUFFICIENT SAMPLE			
14	C1	RUSTY BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	50%
			RED FRAGMENTS	FeOx	50%
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	85%
			PALE YELLOW TO GREEN	PUMPELLYITE	5%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	5%
			MILKY TO CLEAR PLATES	BARITE	5%
	C3	WHITE W/ SCATTERED BLACK	MILKY TO CLEAR PLATES	BARITE	67%
			ORANGE TO BLACK FRAGMENTS	APATITE - PHOSPHATE	30%
			RED AND YELLOW FRAGMENTS	FeOx	2%
			STUBBY HEXAGONAL PRISMS	APATITE	1%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	RARE
			GOLD MICA	BIOTITE	RARE

TABLE: 8 MINERALOGY OF THE -100/+250 FRACTION (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
15	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	95%
			RED FRAGMENTS	FeOx	5%
	C2	BROWN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	58%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	30%
			PALE YELLOW TO GREEN	PUMPELLYITE	10%
			BLACK EUHEDRAL MICA	BIOTITE	1%
			YELLOW VITREOUS WEDGE	SPHENE	1%
			CUBE	FeOx/PYRITE	RARE
	C3	BLACK	BROWN/BLACK BOTRYOIDAL GRAINS * ID BY XRD	APATITE - PHOSPHATE	50%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	25%
			SMALL MILKY PLATES	BARITE	15%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	10%
16	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	80%
			PALE YELLOW TO GREEN	PUMPELLYITE	10%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	10%
			BLACK MICA	BIOTITE	RARE
			CUBE	FeOx/PYRITE	RARE
			STUBBY HEXAGONAL PRISM	APATITE	RARE
	C3	SANDY TO WHITE	MILKY TO CLEAR PLATES	BARITE	73%
			BLACK FRAGMENTS	APATITE - PHOSPHATE	10%
			YELLOW TO ORANGE FRAGMENTS	APATITE - PHOSPHATE	10%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	5%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	1%
			CONTAMINATION - WHITE CHIPS	PORCELAIN CHIPS	1%
			SCARLET VITREOUS GRAINS * ID BY XRD	CINNABAR	4 GRAINS
17	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	99%
			RED FRAGMENTS	FeOx	1%
	C2	BROWN W/ ALMOST NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	49%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	45%
			PALE YELLOW TO GREEN	PUMPELLYITE	5%
			RED MICA	BIOTITE	1%
			BLACK MICA	BIOTITE	RARE
			PINK TETRAGONAL PRISM	ZIRCON	RARE
	C3	SANDY	MILKY TO CLEAR PLATES	BARITE	65%
			YELLOW TO ORANGE FRAGMENTS	APATITE - PHOSPHATE	20%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	5%
			BLACK MICA	BIOTITE	RARE
			BLACK FRAGMENTS	APATITE - PHOSPHATE	RARE
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE
18	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	90%
			RED FRAGMENTS	FeOx	10%
	C2	BROWN W/ NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	85%
			PALE YELLOW TO GREEN	PUMPELLYITE	10%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	5%
			BLACK EUHEDRAL MICA	BIOTITE	RARE
			STUBBY HEXAGONAL PRISM	APATITE	RARE
	C3	WHITE TO SANDY	NICE LARGE MILKY TO CLEAR PLATES	BARITE	69%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	20%
			YELLOW TO ORANGE FRAGMENTS	APATITE - PHOSPHATE	10%
			BROWN TO BLACK FRAGMENTS	APATITE - PHOSPHATE	1%
			PINK TETRAGONAL PRISM	ZIRCON	RARE
			RED FRAGMENTS	FeOx	RARE
			BADLY ETCHED TINY BRASSY CUBE	PYRITE	RARE

TABLE: 8 MINERALOGY OF THE -100/+250 FRACTION (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
19	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	97%
			RED FRAGMENTS	FeOx	3%
	C2	BROWN W/ NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	79%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	15%
			PALE YELLOW TO GREEN	PUMPELLYITE	5%
			RED, WEATHERED MICA	BIOTITE	1%
			WHITE MICA	MUSCOVITE	RARE
			STUBBY HEXAGONAL PRISM	APATITE	RARE
			DK. GREEN FIBROUS CLEAVAGE FRAGMENTS	AMPHIBOLE	RARE
			PINK TETRAGONAL PRISM	ZIRCON	RARE
	C3	SANDY	MILKY TO CLEAR PLATES	BARITE	59%
			CRUDDY PALE YELLOW TO ORANGE FRAGMENTS	APATITE - PHOSPHATE	20%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	15%
			GRAY TO BLACK FRAGMENTS	APATITE - PHOSPHATE	5%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	1%
			BLACK EUHEDRAL MICA	BIOTITE	RARE
			RED FRAGMENTS	FeOx	RARE
			MALLEABLE SILVER METALLIC BALL	CONTAMINATION - Zn	RARE
20	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ COATINGS	MAGNETITE	90%
			RED FRAGMENTS	FeOx	10%
	C2	DK. BROWN W/ NO COATINGS	RED, BROWN, AND YELLOW FRAGMENTS	FeOx	50%
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	20%
			BLACK, SUBMETALLIC EUHEDRAL MICA	BIOTITE	20%
			MILKY TO CLEAR PLATES	BARITE	10%
			PINK TETRAGONAL PRISM	ZIRCON	RARE
			PALE YELLOW TO GREEN	PUMPELLYITE	RARE
			CUBE	FeOx/PYRITE	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE
	C3	WHITE	MILKY TO CLEAR PLATES	BARITE	90%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	5%
			RED FRAGMENTS	FeOx	5%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	RARE
			EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	RARE
21	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK W/ THICK COATINGS	MAGNETITE	100%
			RED FRAGMENTS	FeOx	RARE
	C2	BROWN W/ NO COATINGS	EUHEDRAL, METALLIC PLATES	SPEC. HEMATITE	59%
			RED, BROWN, AND YELLOW FRAGMENTS	FeOx	40%
			PALE YELLOW TO GREEN	PUMPELLYITE	1%
			BLACK MICA	BIOTITE	RARE
			PINK TETRAGONAL PRISM	ZIRCON	RARE
	C3	SANDY	CRUDDY PALE YELLOW TO ORANGE FRAGMENTS	APATITE - PHOSPHATE	55%
			SILKY TO CLEAR HEXAGONAL PRISMS	APATITE	20%
			MILKY TO CLEAR PLATES	BARITE	10%
			GRAY TO BLACK FRAGMENTS	APATITE - PHOSPHATE	10%
			CLEAR AND PINK TETRAGONAL PRISMS	ZIRCON	5%
			BLACK EUHEDRAL MICA	BIOTITE	RARE
			RED FRAGMENTS	FeOx	RARE
			YELLOW VITREOUS WEDGE	SPHENE	RARE

TABLE: 9 MINERALOGY OF THE -20/+60 FRACTION HEAVY MINERAL CONCENTRATE

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
1	C1	BLACK W/ WHITE COATINGS	EUHEDRAL W/ CLAY, CALCITE, BARITE COATINGS	MAGNETITE	100%
	C2	GRAY TO TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
	C3	WHITE AND BLACK GRAINS	BLACK GRAINS WITH WHITE COATINGS	APATITE-PHOSPHATE	80%
			PLATES AND ROSETTES - AUTHIGENIC	BARITE	20%
			STUBBY PRISMS	APATITE	RARE
			SINGLE TETRAGONAL PRISM	ZIRCON	RARE
2	C1	BLACK W/ WHITE COATINGS - 10 GRAINS	SOME EUHEDRAL W/ CLAY, CALCITE COATINGS	MAGNETITE	100%
	C2	GRAY TO TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	89%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			PLATES - AUTHIGENIC	BARITE	1%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
			TARNISHED SUBMETALLIC GRAIN - * ID BY XRD	FAYALITE	RARE
			GOLD WEATHERED MICA	BIOTITE	RARE
			METAL SLIVER	ALUMINUM	1 GRAIN
	C3	BLACK AND WHITE - ~30 GRAINS	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	80%
			PLATES - AUTHIGENIC	BARITE	20%
3	C1	BLACK & RED W/ MINOR WHITE COATINGS	RED FRAGMENTS	MIXED FeOx	90%
			EUHEDRAL	MAGNETITE	10%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			YELLOW TO GREEN WAXY GRAINS - * ID BY XRD	PUMPELLYITE	5%
			CUBES	FeOx/PYRITE	RARE
	C3	BLACK W/ WHITE COATINGS	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	90%
			PLATY - AUTHIGENIC	BARITE	5%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	5%
			CONTAMINATION	PORCELAIN CHIP	RARE
4	C1	BLACK & RED W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	70%
			EUHEDRAL, BLACK, METALLIC	MAGNETITE	20%
			EUHEDRAL GREEN "PRISMS" W/ MAG. INCL.	PYROXENE - ENSTATITE	10%
	C2	GRAY TO TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	50%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	50%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
			ROSETTE - AUTHIGENIC	BARITE	RARE
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
	C3	WHITE	PLATES & ROSETTES - AUTHIGENIC	BARITE	100%
			BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	RARE
5	C1	BLACK TO DK. GREEN W/ WHITE COATINGS	EUHEDRAL GREEN "PRISMS" W/ MAG. INCL.	PYROXENE - ENSTATITE	70%
			EUHEDRAL WITH BARITE, CALCITE COATING	MAGNETITE	25%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	MIXED FeOx	5%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	89%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			EUHEDRAL GREEN "PRISMS" - * ID BY XRD	PYROXENE - ENSTATITE	1%
			CUBES	FeOx/PYRITE	RARE
			BLACK CLEAVAGE FRAGMENT	AMPHIBOLE	RARE
	C3	BLACK AND WHITE	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	60%
			PLATES - AUTHIGENIC	BARITE	30%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	10%
6	C1	BLACK & RED W/ MINOR WHITE COATINGS	RED FRAGMENTS	FeOx	93%
			EUHEDRAL + RED OXIDIZED GRAINS	MAGNETITE	5%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	1%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	1%
	C2	GRAY TO TAN W/ MINOR WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
	C3	WHITE	BLOCKY TRANSLUCENT MILKY GRAINS	BARITE	60%
			BLACK TO BROWN GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	30%
			PLATY - AUTHIGENIC	BARITE	10%
			CONTAMINATION	PORCELAIN CHIP	1 GRAIN

TABLE: 9 MINERALOGY OF THE -20/+60 FRACTION ... (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
7	C1	BLACK W/ WHITE COATINGS	EUHEDRAL W/ CALCITE, BARITE COATING	MAGNETITE	100%
			METALLIC SLIVER - CONTAMINATION	STEEL	RARE
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			CUBE	FeOx/PYRITE	RARE
			EUHEDRAL GREEN "PRISMS"	EPIDOTE	RARE
	C3	BLACK	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	90%
			PLATES - AUTHIGENIC	BARITE	10%
8	C1	BLACK W/ WHITE COATINGS	EUHEDRAL W/ CALCITE, BARITE COATING	MAGNETITE	100%
			EUHEDRAL GREEN "PRISMS" W/ MAG. INCL.	PYROXENE - ENSTATITE	RARE
	C2	GRAY TO TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	10%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
			CUBES	FeOx/PYRITE	RARE
			PLATES - AUTHIGENIC	BARITE	RARE
	C3	WHITE	PLATES & ROSETTES - AUTHIGENIC	BARITE	70%
			GRAY TO BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	30%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	1 GRAIN
9	C1	TAN W/ MINOR WHITE COATINGS	RED FRAGMENTAL GRAINS	MIXED FeOx	80%
			EUHEDRAL, BLACK	MAGNETITE	20%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
	C2	TAN W/ MINOR WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	5%
			EUHEDRAL GREEN "PRISMS"	PYROXENE - ENSTATITE	RARE
			CUBES	FeOx/PYRITE	RARE
	C3	BLACK	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	100%
			WAXY PLATE	BARITE	RARE
10	C1	BLACK W/ WHITE COATINGS - 26 GRAINS	EUHEDRAL W/ MATRIX COATING	MAGNETITE	100%
	C2	GRAY TO TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	5%
			CUBES	FeOx/PYRITE	RARE
	C3	GRAY	GRAY TO BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	80%
			PLATES - AUTHIGENIC	BARITE	10%
			RED FRAGMENTAL GRAINS	FeOx	10%
			GOLD MICA	WEATHERED BIOTITE	RARE
11	C1	BLACK W/ MINOR WHITE COATINGS	EUHEDRAL W/ BARITE, CALCITE COATING	MAGNETITE	100%
			RED FRAGMENTAL GRAINS	MIXED FeOx	RARE
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	85%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	15%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
			YELLOW - ORANGE VITREOUS	SPHENE	RARE
			BLACK BOTRYIODAL OXIDE	MnOx or HEMATITE	RARE
			STUBBY HEXAGONAL PRISM	APATITE	RARE
	C3	GRAY	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	85%
			PLATES - AUTHIGENIC	BARITE	10%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	5%
12	C1	BLACK W/ WHITE COATINGS	EUHEDRAL BLACK W/ BARITE, CALCITE COATINGS	MAGNETITE	60%
			RED FRAGMENTAL GRAINS	MIXED FeOx	40%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW GRAINS - THICK COATINGS	FeOx	100%
			YELLOW TO GREEN WAXY GRAINS	PUMPELLYITE	RARE
			WHITE MICACEOUS FRAGMENT	SERICITE	RARE
			PLATE - AUTHIGENIC	BARITE	RARE
	C3	BLACK AND WHITE - 25 GRAINS	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	50%
			BLACK AND RED FRAGMENTAL GRAINS	FeOx + MnOx	25%
			PLATES & ROSETTES - AUTHIGENIC	BARITE	25%
			CONTAMINATION	PORCELAIN CHIP	RARE

TABLE: 9 MINERALOGY OF THE -20/+60 FRACTION ... (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
13	C1	GRAY TO WHITE W/ THICK COATINGS	MIXED GRAINS W/ CALCITE, BARITE, SERICITE COATS	FeOx	70%
			EUHEDRAL GRAINS W/ WHITE COATINGS	MAGNETITE	30%
	C2	TAN W/ MINOR COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			DK. GREEN TO YELLOW VITREOUS/WAXY * ID BY XRD	PUMPELLYITE	5%
			CUBES AND PYRITOHEDRON	FeOx/PYRITE	RARE
			BLACK VITREOUS - SUBMETALLIC BOTRYOIDAL	MnOx	RARE
	C3	BLACK	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	95%
			PLATES - AUTHIGENIC	BARITE	5%
			LT. YELLOW TRANSLUCENT GRAINS (1 DIMPLED)	PHOSPHATE FOSSIL	RARE
14	C1	TAN W/ V. MINOR WHITE COATINGS	RED FRAGMENTAL GRAINS	MIXED FeOx	80%
			EUHEDRAL, BLACK METALLIC	MAGNETITE	20%
			PLATES & ROSETTES - AUTHIGENIC	BARITE	RARE
			METALLIC CONTAMINATION	STEEL SLIVER	RARE
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	5%
			CUBES	FeOx/PYRITE	RARE
			PLATES - AUTHIGENIC	BARITE	RARE
	C3	WHITE AND BLACK	PLATES & ROSETTES - AUTHIGENIC	BARITE	60%
			BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	30%
			LT. BROWN-OFF WHITE TRANSLUCENT	APATITE	10%
			RED GRAINS	FeOx	RARE
15	C1	BLACK W/ MINOR WHITE COATINGS	EUHEDRAL, BLACK METALLIC	MAGNETITE	79%
			RED, BROWN FRAGMENTAL GRAINS	FeOx	20%
			PLATES - AUTHIGENIC W/ MAG. INCL.	BARITE	1%
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			RED MICA	WEATHERED BIOTITE	5%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	5%
			BLACK BOTRYOIDAL VITREOUS GRAINS	MnOx	RARE
			EUHEDRAL BLACK MICA	BIOTITE	RARE
			CUBES	FeOx/PYRITE	RARE
	C3	BLACK	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	74%
			BLACK BOTRYOIDAL VITREOUS GRAINS	MnOx	20%
			PLATES - AUTHIGENIC	BARITE	5%
			STUBBY HEXAGONAL PRISMATIC GRAINS	APATITE	1%
			RED FRAGMENTAL GRAINS	FeOx	RARE
16	C1	BLACK & TAN W/ WHITE COATINGS	EUHEDRAL, BLACK W/ SOME THICK COATS	MAGNETITE	60%
			RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	40%
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	97%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	3%
			CLUSTER OF PLATES W/ MATRIX	BARITE	RARE
			CUBES AND PYRITOHEDRONS	FeOx/PYRITE	RARE
			BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	RARE
			RED MICA BOOKS	WEATHERED BIOTITE	RARE
	C3	GRAY TO TAN	BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	40%
			GRAY TO BROWN TRANSLUCENT	PHOSPHATES	40%
			BLACK BOTRYIODAL	MnOx	10%
			PLATES - AUTHIGENIC	BARITE	10%
17	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, SOME W/ THICK CALCITE, BARITE COATS	MAGNETITE	90%
			RED GRAINS - OXIDIZED MAGNETITE	FeOx	10%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	90%
			RED, BROWN MICA	WEATHERED BIOTITE	10%
			BLACK MICA	BIOTITE	RARE
			CUBE	FeOx/PYRITE	RARE
	C3	WHITE - ABOUT 25 GRAINS	PLATES - AUTHIGENIC	BARITE	50%
			STUBBY HEXAGONAL PRISMATIC GRAINS	APATITE	25%
			WAXY GRAY TO BROWN	PHOSPHATE	20%
			BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	5%

TABLE: 9 MINERALOGY OF THE -20/+60 FRACTION ... (CONTINUED)

SAMPLE #	HMC FRACTION	SAMPLE DESCRIPTION	COMMENTS	MINERAL IDENTIFICATION	ESTIMATED ABUNDANCE
18	C1	BLACK - RED W/ MINOR WHITE COATINGS	EUHEDRAL, BLACK METALLIC	MAGNETITE	70%
			RED FRAGMENTAL GRAINS	FeOx	30%
			GOLD COLORED MICA	BIOTITE	RARE
			SPLENDENT ETCHED METALLIC PLATE	SPEC. HEMATITE	RARE
			METALLIC CONTAMINATION	STEEL SLIVER	RARE
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	99%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	1%
			CUBES AND PYRITOHEDRONS	FeOx/PYRITE	RARE
			GOLD WEATHERED MICA	BIOTITE	RARE
	C3	WHITE	PLATES - AUTHIGENIC	BARITE	70%
			BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	20%
			CLEAR - OFF WHITE STUBBY PRISMS	APATITE	10%
19	C1	BLACK W/ WHITE COATINGS	EUHEDRAL, BLACK METALLIC - 30 GRAINS	MAGNETITE	85%
			RED GRAINS	FeOx	10%
			PLATES - AUTHIGENIC W/ MAG. INCL.	BARITE	5%
	C2	TAN W/ ALMOST NO COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	99%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	1%
			CUBE	FeOx/PYRITE	RARE
			RED MICA BOOK	BIOTITE	RARE
			WHITE MICA	MUSCOVITE	RARE
	C3	GRAY - YELLOW	GRAY TO BLACK GRAINY VITREOUS FRAGMENTS	APATITE - PHOSPHATE	50%
			YELLOW-ORANGE TRANSLUCENT WAXY - * ID BY XRD	APATITE	40%
			PLATES - AUTHIGENIC	BARITE	5%
			STUBBY HEXAGONAL PRISMATIC GRAINS	APATITE	5%
20	C1	RED W/ WHITE COATINGS	RED GRAINS	FeOx	90%
			EUHEDRAL, BLACK METALLIC	MAGNETITE	8%
			CUBES	FeOx/PYRITE	2%
	C2	TAN W/ WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			PLATES - AUTHIGENIC	BARITE	5%
			EUHEDRAL BLACK MICA - 1 GRAIN	BIOTITE	RARE
			CUBES AND PYRITOHEDRONS	FeOx/PYRITE	RARE
			WHITE MICA - 1 GRAIN	MUSCOVITE	RARE
	C3	WHITE - 10 GRAINS	PLATES - AUTHIGENIC	BARITE	80%
			RED GRAINS	FeOx	20%
21	C1	BLACK W/ WHITE COATINGS	EUHEDRAL SOME W/ THICK BARITE, CALCITE COATS	MAGNETITE	99%
			RED FRAGMENTAL GRAINS	FeOx	1%
	C2	TAN W/ MINOR WHITE COATINGS	RED, BROWN, YELLOW FRAGMENTAL GRAINS	FeOx	95%
			BLACK BOTRYOIDAL GRAINS	MnOx	5%
			YELLOW GREEN WAXY GRAINS	PUMPELLYITE	RARE
			CUBE	FeOx/PYRITE	RARE
			BLACK EUHEDRAL MICA	BIOTITE	RARE
	C3	DARK GRAY - 35 GRAINS	DARK GRAY MICROCRYSTALLINE FRAGMENTS	APATITE - PHOSPHATE	90%
			STUBBY HEXAGONAL PRISMATIC GRAINS	APATITE	10%
			CONTAMINATION	PORCELAIN CHIP	RARE

MINERALOGY OF HEAVY-MINERAL CONCENTRATES

Minerals in each magnetic split of the heavy-mineral concentrates were identified by examination with a binocular microscope. X-ray diffraction (XRD) was used to confirm identifications. Each sample was also examined under short-wave ultraviolet (UV) light for the presence of scheelite [$CaWO_4$] and other fluorescing minerals. No scheelite or powellite [$Ca(Mo,W)O_4$] was observed in any of the samples. The percent abundance for each mineral present in each fraction was estimated.

Tables 8 and 9 list the description, identification, and estimated abundance for each mineral. Several abbreviations are used in the tables and their intended meanings are as follows:

C1	-Strongly magnetic split of the heavy-mineral concentrate
C2	-weakly magnetic split of the heavy-mineral concentrate
C3	-"Non-magnetic" split of the heavy-mineral concentrate
DK.	-Dark
FeOx	-Undifferentiated secondary iron oxide minerals
FeOx/PYRITE	-Iron oxide pseudomorph after pyrite
HMC	-Heavy-mineral concentrate
ID BY XRD	-Identification confirmed by X-ray Diffraction
INCL.	-Inclusion(s)
LT.	-Light
MAG.	-Magnetite
MnOx	-Undifferentiated manganese oxides
SPEC. HEMATITE	-Specularite, variety of hematite
V.	-Very
W/	-With

X-ray Diffraction Analysis

X-ray diffraction analyses were made of various size fractions prepared by Steven Smith (U.S.G.S) to determine major minerals and variations in mineralogy with grain size and with depth of sample.

Size fractions used were -20/+60 mesh, -60/+100 mesh, -100/+250 mesh, and -250 mesh. A small split of each size fraction was prepared as a smear on glass; XRD patterns were run with copper radiation at goniometer speed of 2° 2θ per minute, and chart speed of 2° per minute.

Peak heights were measured (in arbitrary units) above background at 9° 2θ (mica), 12.5° (kaolinite) 20.9° quartz, 28° feldspar, and 43.2° calcite. The area of the peak at 6° was used as measure of the amount of montmorillonite. Peaks were selected to be as free from interference as possible and to be on scale for all samples.

The measurements show in a semiquantitative manner the change in amounts of various minerals with depth. Small differences in peak heights for the same mineral in different samples are not significant; large differences indicate differences in the amount of the mineral present in the samples.

No attempt was made to determine the amount of the various minerals present in the samples. Quartz, feldspar, and calcite are the dominate mineral. Variations in the amount of quartz and feldspar are probably due to variations in sedimentation and erosion in the formation of the alluvium. Calcite is present in part as caliche and in part as limestone pebbles. Clay minerals are present in no more than small amounts in most samples.

Table 10.--Peak heights from XRD patterns of -20/+60 mesh material from Rabbit Creek drill hole, Humboldt County, Nevada

[Degrees 2θ are approximate location of XRD peak used; Mont, montmorillonite, group minerals, area of peak in arbitrary units; mica, mica of various types; K, kaolinite group minerals; Q, quartz; F, feldspar group minerals; calcite, calcite peak at 43.2° 2θ selected since it did not go off scale in any of these patterns; --, no peak measureable]

Sample No.	Mont 6°	Mica 9°	K 12.5°	Q 21°	F 28°	Calcite 43.2°
1	--	2	--	56	24	14
2	--	1	--	32	11	27
3	--	1	--	33	10	22
4	--	1	--	29	9	31
5	--	1	--	27	23	27
6	--	1	--	33	16	28
7	--	1	--	27	15	33
8	--	1	--	38	10	24
9	--	1	--	33	8	27
10	--	--	--	25	12	26
11	--	1	--	45	10	20
12	5	1	--	28	7	34
13	--	2	--	46	4	27
14	7	2	--	65	20	--
15	15	3	1	74	13	--
16	4	1	--	28	9	21
17	10	1	--	52	24	12
18	3	1	--	39	10	7
19	5	1	--	51	9	9
20	50	--	--	15	--	--
21	14	3	--	76	8	6

Table 11.--Peak heights from XRD patterns of -60/+100 mesh material from Rabbit Creek drill hole, Humboldt County, Nevada

[Degrees 2Θ are approximate location of XRD peak used; Mont, montmorillonite, group minerals, area of peak in arbitrary units; mica, mica of various types; K, kaolinite group minerals; Q, quartz; F, feldspar group minerals; calcite, calcite peak at 43.2° 2Θ selected since it did not go off scale in any of these patterns; --, no peak measureable]

Sample No.	Mont 6°	Mica 9°	K 12.5°	Q 21°	F 28°	Calcite 43.2°
1	--	1	--	44	15	13
2	--	(1)	--	32	12	21
3	--	2	1	45	31	25
4	--	2	--	35	18	31
5	--	1	--	28	29	26
6	--	1	--	30	28	15
7	2	1	1	34	19	27
8	3	1	--	35	15	25
9	7	1	1	28	17	28
10	--	--	1	33	16	33
11	4	1	--	43	12	25
12	8	1	--	32	5	33
13	3	2	--	48	5	21
14	20	4	--	80	17	--
15	36	3	1	74	25	--
16	29	2	--	52	22	--
17	10	2	--	42	8	19
18	14	2	--	56	7	15
19	6	2	--	50	6	21
20	82	2	1	16	14	--
21	8	2	1	62	8	6

Table 12.--Peak heights from XRD patterns of -100/+250 mesh material from Rabbit Creek drill hole, Humboldt County, Nevada

[Degrees 2Θ are approximate location of XRD peak used; Mont, montmorillonite, group minerals, area of peak in arbitrary units; mica, mica of various types; K, kaolinite group minerals; Q, quartz; F, feldspar group minerals; calcite, calcite peak at 43.2° 20 selected since it did not go off scale in any of these patterns; --, no peak measureable]

Sample No.	Mont 6°	Mica 9°	K 12.5°	Q 21°	F 28°	Calcite 43.2°
1	9	3	2	21	46	14
2	6	2	1	53	25	30
3	--	1	--	37	20	25
4	5	1	--	34	31	30
5	2	--	--	33	36	21
6	--	--	--	25	42	10
7	3	1	--	23	23	30
8	5	1	--	27	27	25
9	8	1	1	29	38	25
10	8	1	1	33	20	14
11	1	2	--	44	10	24
12	7	1	--	36	35	38
13	No sample					
14	8	1	--	91	14	--
15	40	1	1	61	20	--
16	17	--	--	34	12	--
17	41	2	--	56	20	8
18	18	2	--	42	8	18
19	12	2	1	64	8	10
20	43	--	--	29	--	--
21	18	2	--	64	--	2

Table 13.--Peak heights from XRD patterns of -250 mesh material from Rabbit Creek drill hole, Humboldt County, Nevada

[Degrees 2Θ are approximate location of XRD peak used; Mont, montmorillonite, group minerals, area of peak in arbitrary units; mica, mica of various types; K, kaolinite group minerals; Q, quartz; F, feldspar group minerals; calcite, calcite peak at 43.2° 2Θ selected since it did not go off scale in any of these patterns; --, no peak measureable]

Sample No.	Mont 6°	Mica 9°	Quartz 20.8°	Feldspar 28°	Calcite 43.2°
1	2	2	17	21	25
2	4	2	25	20	38
3	7	2	22	24	32
4	14	1	13	15	42
5	11	1	13	23	35
6	5	3	11	27	35
7	6	2	12	25	42
8	12	2	15	19	25
9	22	2	17	21	25
10	55	3	18	11	25
11	9	2	25	12	25
12	17	--	11	3	54
13	2	1	26	17	32
14	34	2	44	9	--
15	58	3	38	8	--
16	18	2	19	10	29
17	70	1	22	3	10
18	32	3	34	4	14
19	19	2	31	8	16
20	82	--	15	6	--
21	55	4	42	--	3

SEQUENTIAL EXTRACTIONS OF THE -250 MESH FRACTION FOR THE DETERMINATION OF 18 ELEMENTS

The sequential extraction scheme used on the minus-250-mesh fraction of selected Rabbit Creek core samples was modeled after procedures described by Chao (1984). This scheme was designed to solubilize and separate chemical phases of the alluvial material in the following order: (1) carbonates and exchangeable metals; (2) Mn oxides and amorphous Fe oxides; (3) crystalline Fe oxides; (4) sulfides; and (5) the residue ("silicate fraction").

Extraction Method and Analysis

1. Carbonate and exchangeable metals: In a polypropylene centrifuge tube, 25 ml of 1 M acetic acid was added to a 1 g split of minus 250 mesh sample. The capped tubes were agitated on a horizontal shaker for 2 hours. The samples were then centrifuged and decanted with the leachate saved for analysis.

2. Mn oxides and amorphous Fe oxides: Twenty-five milliliters of 0.25 M hydroxylamine hydrochloride in 0.25 M hydrochloric acid was added to the residual material from extraction 1. The tubes were placed in a water bath at 50°C for 30 minutes. The samples were then centrifuged and decanted with the leachate saved for analysis.

3. Crystalline Fe oxides: Twenty-five milliliters of 4 N hydrochloric acid was added to the residual material from extraction 2. The tubes were placed in a water bath at 95°C for 30 minutes. The samples were then centrifuged and decanted with the leachate saved for analysis.

4. Sulfides: Two grams of potassium chlorate and 10 ml of concentrated hydrochloric acid was added to the residual material from extraction 3. The samples were left to stand at room temperature for 45 minutes. The samples were diluted with 15 ml of water, centrifuged, and decanted with the leachate saved for analysis.

5. Residue ("silicate fraction"): Ten milliliters of concentrated nitric acid was added to 50 ml teflon beakers containing the residual material from extraction 4 and the resultant solutions were heated on a hot plate at 110°C for 10 minutes. Ten milliliters of perchloric acid and 10 ml of 48 percent hydrofluoric acid were added and the samples placed on a hot plate at 220°C until a moist bead was obtained. Twenty-five milliliters of 4 N hydrochloric acid was added and the samples heated at 100°C for 30 minutes. The solutions were transferred to centrifuge tubes, centrifuged, and decanted with the liquid saved for analysis.

A separate total digestion was performed on each sample with a fresh 1 g split using the same procedure as in "5".

Each solution was analyzed for 18 elements using induction coupled plasma-atomic emission spectrometry (tables 14 and 15).

Table 14.--Lower limits of determination for elements analyzed for by ICP-AES after extraction

Element	Lower Limit of Determination
	percent
Iron (Fe)	0.001
Calcium (Ca)	0.0001
Aluminum (Al)	0.0003
	parts per million
Arsenic (As)	3
Barium (Ba)	0.06
Cobalt (Co)	1
Chromium (Cr)	1
Copper (Cu)	0.3
Lead (Pb)	5
Manganese (Mn)	10
Nickel (Ni)	2
Phosphorus (P)	15
Sodium (Na)	3
Strontium (Sr)	0.03
Titanium (Ti)	0.3
Tungsten (W)	8
Zinc (Zn)	0.5
Zirconium (Zr)	0.8

Table 15.-- Determination of 18 elements after sequential extraction of -250 mesh fraction of Rabbit Creek drill core.

Inductively Coupled Plasma Emission Spectrographic Analyses of Extracted "Fractions" and Total Digestions
("0" = not detected at lower limit of determination)

Sample Number	Element	Carbonate -- Exchangeable Metals	Mn-Oxides -- Amorph. Fe-Oxides	Crystalline Fe-Oxides	Sulfides	Residue	Total Digestion
2		0.003	0.05	1.5	0.22	0.84	2.4
7		0	0.06	1.6	0.26	0.66	2.1
12		0	0.02	1.2	0.26	0.83	1.9
13		0	0.04	1.5	0.23	0.73	2.3
14	Fe(%)	0	0.07	3.1	0.42	1.3	5.1
15		0	0.04	1.9	0.37	2.1	5.7
16		0.001	0.06	2.3	0.31	1.2	3.9
18		0	0.04	2.6	0.35	1.4	4.5
19		0	0.04	2.9	0.36	1.5	4.9
21		0	0.05	1.9	0.27	1.6	4.4
2		16	1.6	0.16	0.03	0.52	16
7		19	2.2	0.22	0.03	0.49	16
12		21	2.6	0.31	0.02	0.07	17
13		12	1.4	0.17	0.03	0.31	14
14	Ca(%)	0.41	0.74	0.22	0.03	0.12	1.8
15		0.34	0.68	0.18	0.02	0.11	1.8
16		13	1.9	0.28	0.04	0.27	14
18		7.0	1.6	0.25	0.02	0.08	9.7
19		6.2	1.8	0.26	0.02	0.08	9.5
21		1.4	0.96	0.22	0.02	0.04	3.6
2		0.02	0.11	0.67	0.19	3.6	5.7
7		0.01	0.13	0.82	0.28	2.7	4.5
12		0.01	0.08	0.66	0.34	3.1	4.6
13		0.01	0.09	0.55	0.20	3.5	5.9
14	Al(%)	0.02	0.09	0.75	0.22	4.9	8.8
15		0.01	0.11	0.87	0.29	6.0	12
16		0.01	0.10	0.61	0.18	4.2	6.5
18		0.02	0.08	0.60	0.15	4.7	7.9
19		0.02	0.09	0.73	0.17	5.2	8.7
21		0.02	0.09	0.76	0.24	6.6	11
2		0	0	20	0	4.7	26
7		0	0	17	0	5	17
12		0	4.6	23	0	4.4	31
13		0	6.1	55	4.3	6.2	66
14	As(ppm)	15	14	190	17	20	230
15		10	10	79	8	20	120
16		5	23	190	15	15	240
18		8	29	320	26	22	390
19		12	45	380	28	32	460
21		18	55	320	25	49	460

Table 15.-- continued

Sample Number	Element	Carbonate -- Exchangeable Metals	Mn-Oxides -- Amorph. Fe-Oxides	Crystalline Fe-Oxides	Sulfides	Residue	Total Digestion
2		54	150	230	29	340	800
7		78	220	420	62	270	990
12		56	32	22	4.8	190	290
13		34	75	150	71	1100	1400
14	Ba(ppm)	12	350	1000	72	690	2100
15		7.6	98	41	8.7	260	520
16		36	160	110	41	630	990
18		37	240	380	53	260	1000
19		41	420	99	12	250	790
21		42	780	140	11	190	1200
2		0	3.4	3.3	0	1.3	8.0
7		0	4.9	3.1	0	1.6	7.0
12		0	3.6	2.6	0	0	5.2
13		0	3.8	2.3	0	1.1	5.5
14	Co(ppm)	0	14	6.9	0	0	19
15		0	7.7	3.7	0	0	11
16		0	10	5.7	0	0	14
18		0	15	8.4	1.1	1.0	22
19		0	15	8.0	1.0	0	19
21		0	22	8.3	1.2	1.3	29
2		0	1.4	19	2.9	44	65
7		0	0	18	2.4	30	63
12		0	0	12	2.7	23	22
13		0	2.1	22	2.4	62	65
14	Cr(ppm)	0	1.4	39	5.4	56	89
15		0	0	15	2.7	57	77
16		0	3.0	35	3.9	37	57
18		0	0	29	4.3	80	89
19		0	0	33	4.7	76	90
21		0	0	25	3.2	100	130
2		1.0	1.3	14	2.4	8.2	33
7		1.0	1.9	17	3.8	5.1	29
12		0.7	0	9.6	2.4	9.7	24
13		0.3	0	14	1.7	5.3	23
14	Cu(ppm)	0	0.7	20	2.3	9.4	33
15		0	1.3	14	2.8	17	43
16		0	0.7	18	2.5	13	35
18		0	2.4	20	2.9	17	44
19		0	1.7	23	2.8	15	44
21		0	3.0	22	3.5	25	59

Table 15.-- continued

Sample Number	Element	Carbonate -- Exchangeable Metals	Mn-Oxides -- Amorph. Fe-Oxides	Crystalline Fe-Oxides	Sulfides	Residue	Total Digestion
2		0	6.4	9.8	0	15	20
7		0	0	7.7	0	12	15
12		0	0	7.1	0	13	17
13		0	0	8.6	0	15	19
14	Pb(ppm)	0	0	8.8	0	16	20
15		0	10	12	0	18	23
16		0	0	6.9	0	16	18
18		0	8.9	11	0	15	26
19		0	16	16	0	16	32
21		0	19	17	0	16	38
2		0	230	140	22	86	370
7		0	230	160	25	72	340
12		0	200	120	31	57	270
13		0	240	95	21	57	320
14	Mn(ppm)	0	920	320	38	71	1200
15		0	760	230	38	91	1100
16		0	600	210	37	85	810
18		0	600	240	37	80	820
19		0	2000	400	47	82	2300
21		17	4400	810	72	140	5400
2		0	5.0	25	3.3	6.4	38
7		0	4.9	24	3.0	4.3	33
12		0	3.0	19	3.6	7.0	25
13		0	6.0	32	3.8	8.3	42
14	Ni(ppm)	0	14	46	5.8	9.4	66
15		0	9.2	29	4.4	12	55
16		0	8.1	42	4.7	11	54
18		0	4.0	43	5.2	18	55
19		0	5.8	42	4.9	12	55
21		0	16	52	6.3	19	86
2		60	690	33	0	0	720
7		51	560	0	0	0	560
12		24	510	58	0	0	530
13		76	660	36	0	0	740
14	P(ppm)	1200	930	24	0	0	1800
15		1000	270	0	0	0	1100
16		51	850	45	0	0	900
18		62	880	36	0	0	900
19		120	990	33	0	0	1000
21		220	520	65	0	0	700

Table 15.-- continued

Sample Number	Element	Carbonate -- Exchangeable Metals	Mn-Oxides -- Amorph. Fe-Oxides	Crystalline Fe-Oxides	Sulfides	Residue	Total Digestion
2		240	34	130	71	6400	7800
7		560	74	210	97	4900	6400
12		190	34	28	16	1700	2100
13		150	99	300	55	1600	2700
14	Na(ppm)	390	72	51	17	4000	5400
15		220	56	33	3.2	3700	5700
16		120	59	150	33	3000	4000
18		150	38	30	9.7	3500	4900
19		140	39	36	12	3500	4400
21		210	44	31	5.7	2200	2800
2		120	17	16	4.0	110	260
7		310	36	18	5.0	98	410
12		210	25	7.0	1.0	23	240
13		94	25	38	20	200	390
14	Sr(ppm)	33	41	18	3.0	52	150
15		29	42	15	3.0	52	170
16		72	20	25	10	130	260
18		65	15	7.0	1.0	39	120
19		62	18	14	2.0	42	140
21		48	30	24	4.0	36	150
2		0	4.6	280	76	2900	3100
7		0	8.4	450	160	2200	2700
12		0	0	120	50	2200	2200
13		0	0.9	150	45	2600	2700
14	Ti(ppm)	0	0.5	200	54	4600	4900
15		0	0.5	110	32	4400	5300
16		0	1.0	160	47	4300	4300
18		0	0	150	34	4700	4500
19		0	2.5	140	41	5400	5600
21		0	5.2	98	24	4600	5000
2		0	0	0	0	0	0
7		0	0	0	0	0	0
12		0	0	0	0	0	0
13		0	0	0	0	0	0
14	W(ppm)	0	0	0	0	24	12
15		0	0	0	0	18	0
16		0	0	0	0	14	8
18		0	0	15	12	32	40
19		0	9.2	30	17	54	92
21		0	16	65	20	69	170

Table 15.-- continued

Sample Number	Element	Carbonate -- Exchangeable Metals	Mn-Oxides -- Amorph. Fe-Oxides	Crystalline Fe-Oxides	Sulfides	Residue	Total Digestion
2		4.3	11	58	8.9	28	100
7		0.7	6.6	46	7.7	16	68
12		0.7	3.9	36	8.1	27	68
13		8.2	12	59	8.8	27	110
14	Zn(ppm)	1.4	8.7	71	8.3	27	110
15		0	6.3	86	15	87	220
16		1.2	4.5	60	6.6	20	89
18		2.4	6.0	87	11	32	140
19		4.2	9.5	87	10	36	140
21		1.0	11	120	17	80	230
2		0	0	5.7	7.8	58	66
7		0	0	23	18	40	75
12		0	0	9.2	16	60	76
13		0	0	11	10	82	100
14	Zr(ppm)	0	0	3.0	8.1	90	110
15		0	0.90	6.1	12	200	260
16		0	0	5.5	7.6	74	83
18		0	0	3.0	5.2	94	100
19		0	0	3.0	6.1	110	120
21		0	0	7.9	11	160	190

Cold vapor-atomic absorption spectrophotometry (CV-AAS) for the analysis of mercury

The minus 100/+250 mesh fraction and the pulverized minus 20/+60 mesh fraction were analyzed for mercury by a continuous flow-cold vapor-atomic absorption spectrophotometric method (Kennedy and Crock, 1987). To determine mercury in geologic materials, samples are digested with nitric acid and sodium dichromate in a closed Teflon vessel. After bringing to a constant weight, the digest is mixed with air and a sodium chloride-hydroxylamine hydrochloride-sulfuric acid solution and then Hg (II) is reduced to Hg° with stannous chloride in a continuous flow manifold. The mercury vapor is separated and measured using cold vapor atomic absorption spectrophotometry (CV-AAS).

Table 16.--Analytical results for mercury shown in ppm

Sample number	Size fraction	
	-100/+250 mesh	-20/+60 mesh (pulverized)
1	0.20	0.26
2	0.22	0.34
3	0.14	0.20
4	0.16	0.18
5	0.20	0.26
6	0.30	0.42
7	0.22	0.22
8	0.20	0.26
9	0.22	0.26
10	0.24	0.38
11	0.14	0.16
12	0.86	0.86
13	2.10	2.10
14	7.0	7.1
15	9.2	9.4
16	1.5	1.6
17	2.4	2.5
18	1.4	1.5
19	1.1	1.2
20	12	12
21	0.98	1.0

Visible-absorption-spectrophotometry for the analysis of tungsten

The minus 100/+250 mesh fraction and the pulverized minus 20/+60 mesh fraction were analyzed for tungsten by visible absorption spectrophotometry (Welsch, 1983). The sample is decomposed by nitric and hydrofluoric acids and the residue is dissolved in 80% hydrochloric acid. A clear aliquot of the solution is treated with stannous chloride to inhibit interferences, particularly from molybdenum. The blue tungsten dithiol complex is developed at 95 °C within a half-hour period. The complex is extracted into 4 mL heptane and the concentration is determined by measuring the absorption at 630 nm with a visible wavelength-range absorption spectrophotometer.

Table 17.--Analytical results for tungsten shown in ppm

Sample number	Size fraction -100/+250 mesh	Size fraction -20/+60 mesh (pulverized)
1	12	12
2	6.0	5.0
3	4.5	4.0
4	4.0	5.0
5	4.5	7.0
6	3.0	4.5
7	3.5	5.5
8	5.0	6.0
9	21	8.0
10	14	12
11	7.5	5.5
12	12	11
13	15	9
14	31	29
15	25	26
16	18	27
17	13	18
18	29	48
19	46	53
20	6	14
21	75	70

Ion specific electrode (ISE) analysis for fluoride

The minus 100/+250 mesh fraction and the pulvarized minus 20/+60 mesh fraction were analyzed for fluoride by a ion-specific electrode (ISE) method (Hopkins, 1977; O'Leary and Meier, 1986). Samples are fused with a sodium carbonate-potassium carbonate-potassium nitrate flux and the fused sample is dissolved with citric acid. Sodium citrathe buffer, which also serves as an ionic strength adjuster, is then added to this solution prior to determining the fluorine concentration by standard-addition technique using ISE.

Table 18.--Analytical results for fluoride shown in ppm

Sample number	Size fraction -100/+250 mesh	-20/+60 mesh (pulverized)
1	500	1300
2	500	700
3	500	600
4	700	700
5	600	600
6	400	600
7	700	600
8	600	600
9	600	500
10	600	600
11	600	600
12	1200	1000
13	700	500
14	1100	1000
15	1600	1200
16	1000	900
17	1600	1100
18	1000	900
19	1000	800
20	3600	4300
21	1700	1300

Method: Flame atomic-absorption spectroscopy (FAA) for the determination of Sb, As, Bi Cd, and Zn

The minus 100/+250 mesh fraction and the pulverized minus 20/+60 mesh fraction were analyzed for antimony, arsenic, bismush, cadmium, and zinc by flame atomic absorption spectroscopy (O'Leary and Viets, 1986). A chlorine-liberating solution of hychochloric acid and hydrogen peroxide is used to solubilize most nonsilicate bound metals found in geologic materials. The five metals of interest are selectively extracted into a 10 percent aliquat 336-MIBK organic phase in the presence of ascorbic acid and potassium iodide in 6 N HCl. The metals are then determined by flame atomic absorption spectroscopy (O'Leary and Viets, 1986).

Table 19.--Analytical results for antimony, arsenic, bismuth, cadnium, and zinc, shown in ppm.

	Size fraction									
	-100/+250 mesh					-20/+60 mesh (pulverized)				
Sample number	Sb	As	Bi	Cd	Zn	Sb	As	Bi	Cd	Zn
1	4	30	N(1)	0.4	90	10	70	N(1)	0.4	140
2	4	30	N(1)	0.5	75	6	40	N(1)	0.5	85
3	4	40	N(1)	0.5	95	8	60	N(1)	0.5	95
4	4	20	N(1)	0.4	110	6	40	N(1)	0.5	95
5	4	20	N(1)	0.4	70	6	50	N(1)	0.5	75
6	2	10	N(1)	0.2	55	4	30	N(1)	0.4	70
7	4	20	N(1)	0.4	60	6	40	N(1)	0.5	65
8	4	30	N(1)	0.5	80	8	50	N(1)	0.6	90
9	4	40	N(1)	0.5	150	6	50	N(1)	0.6	90
10	4	50	N(1)	0.5	90	8	70	N(1)	0.5	85
11	4	40	N(1)	0.7	85	8	50	N(1)	0.6	100
12	6	40	N(1)	0.5	55	8	50	N(1)	0.6	55
13	8	70	N(1)	0.6	75	8	70	N(1)	0.6	70
14	14	190	N(1)	0.3	70	20	300	N(1)	0.3	90
15	16	90	N(1)	0.8	90	20	160	N(1)	0.7	100
16	14	200	N(1)	0.5	70	16	300	N(1)	0.6	75
17	14	120	N(1)	0.3	100	20	200	N(1)	0.4	100
18	20	400	N(1)	0.7	90	30	600	N(1)	0.6	100
19	26	500	N(1)	0.7	90	34	600	N(1)	0.6	100
20	8	110	N(1)	0.2	55	8	140	N(1)	0.5	50
21	18	500	N(1)	0.3	120	18	500	N(1)	0.3	120

Arsenic Species Analysis

A moderately strong acid solution (4.0 N HCl) extracts arsenic from solid samples. The arsenic that is extracted is associated with amorphous and crystalline iron and manganese oxyhydroxides (Chao and Zhou, 1983). The extracted arsenic may occur in two oxidation states which are not altered by the acid extraction. The concentration of arsenic in each oxidation state can be determined using the ion exchange technique for water developed by Ficklin (1983) and adapted to solid phase extractions by Ficklin and Callender (1987). Cherry and others (1979) suggest that dissolved arsenic assumes the proper ratio of As(III) (arsenite) to As(V) (arsenate) to reflect the oxidation-reduction potential of a given ground water system. Ficklin and Callender (1987) observed that solid phase arsenic species were an indication of redox conditions in lacustrine sediments. In oxidized sediments they found exclusively As(V) while in reduced sediments they found both As(III) and As(V).

The results for extraction and speciation of arsenic in the Rabbit Creek core samples are listed in table 20. Almost all of the extracted arsenic in the samples occurred as As(V) with only minor occurrences of As(III). A bar graph of the arsenic concentrations vs depth for the -250 fraction is presented in figure 1. Results in table 20 marked with a star are concentrations determined from samples that appeared to be different material than the other samples in this set. (Some of the arsenic may have oxidized during sample preparation)

Some clasts were separated from the bulk material of the core samples. After preparation, arsenic was extracted and speciated as described above. Results are listed in table 21. The arsenic in the clasts also occurred mainly as As(V) with only some minor occurrences of As(III).

Table 20.--Analytical results for extractable As species in seived Rabbit Creek core samples

[AsIII was run on the -100/+250 fraction and it was not detected in any of the samples, therefore it does not appear in the table]

Sample	-250 As III mg/kg	-250 As V mg/kg	-100/+250 As V mg/kg	-20/+60 As III mg/kg	-20/+60 As V mg/kg
1	0.1	30	16	<0.5	9
2	0.1	22	8.9	<0.5	5.6
3	0.1	26	17	<0.5	11
4	0.1	13	9.3	<0.5	6.3
5	0.1	14	6.4	<0.5	5.6
6	0.1	6.3	6.6	<0.5	6.5
7	0.1	11	4.2	<0.5	6.3
8	0.1	12	7.3	<0.5	12
9	0.1	19	15	<0.5	10
10	0.1	29	17	<0.5	18
11	0.1	23	14	<0.5	9.9
12	0.1	23	27	<0.5	16
13	0.1	54	30	149	1700*
14	0.1	150	70	<0.5	37
15	0.1	67	38	<0.5	29
16	0.1	149	101	<0.5	41
17	0.1	52	53	<0.5	46
18	24	194	134	40	360
19	12	150	114	29	380
20	7.3	51	114	209*	2870*
21	0.1	168	no data	1432*	5334*

Table 21.--Analytical results for extractable As species in selected clasts from Rabbit Creek core samples

Sample	Lithology	AsIII(mg/kg)	As(V) mg/kg
1d	gossan angular siltstone	<2	16
4a	gossan	45	330
14c	gossan	29	1760
16c	hard siltstone	<2	780
16d	partly silicified or metamorphic foliation	89	400
18a	silicified and/or chert	<2	210
18d	iron stained orange siltstone	47	630
19b	dark gray silicified	<2	72
21c	silicified, maybe quartz vein	15	235

Gold Analysis

Three sieve fractions of the prepared drill core were analyzed for gold. The three fractions were the ground -20/+60 mesh split, -100/+250 split, and -250 split. In addition, 43 ground clast samples collected from the +4 mesh fraction were analyzed for gold.

A 10-gram sample is roasted for 1 hour at 700 °C, gold is then extracted with hydrobromic acid - 0.5 percent bromine solution and MIBK (methyl isobutyl ketone). An electrothermal atomic absorption spectrometer with background corrector was used to determine gold to 1 ppb detection limit (O'Leary and Meier, 1986).

Table 22 shows the gold values for the samples in ppb. In some of the clast samples there was not enough sample to give a 1 ppb detection limit, therefore, resulting in a higher detection limit for these samples.

Table 22.--Gold in alluvium from sieved core from Rabbit Creek drill hole

[N, not detected; <,detected but below the limit of determination shown; --, no data; values reported in parts per billion (ppb)]

Sample	-20/+60	-100/+250	-250
1	3	4	8
2	3	5	13
3	4	5	9
4	5	6	12
5	4	4	16
6	1	1	4
7	4	5	20
8	1	2	8
9	2	3	6
10	5	6	13
11	3	7	15
12	5	5	14
13	4	2	6
14	3	4	11
15	25	31	45
16	2	2	5
17	4	3	9
18	5	4	7
19	6	4	9
20	<1	1	2

Table 23.--Gold in selected clasts from core from Rabbit Creek drill hole

[N, not detected; <, detected but below the limit of determination shown; --, no data; values reported in parts per billion (ppb)]

	1B	1C	1D	3B	3C	4D	4EE	5C	7B	8B	9B	9C
Au, ppb	<3	3	<5	5	2	13	3	15	3	2	5	3

	11B	11C	12A	12C	13A	13B	13C	14A	14B	14C	15A	15B
Au, ppb	<1	2	<1	4	<5	<5	1	6	11	4	30	3

	15C	15D	15E	16A	16C	16D	17A	17AA	18A	18B	18D	19A
Au, ppb	10	5	7	2	5	3	13	<1	3	7	5	6

	19B	19BB	19C	21A	21B	21C	21D
Au, ppb	<2	<1	<2	123	6	3	17

Gas chromatography

Cored alluvium samples were analyzed by methods used by Hinkle and Dilbert (1984), Hinkle and Botinelly, (1988), and Hinkle (1986, 1988): 10 grams of -20/+60 mesh sample were placed in 10 ml size evacuated blood sampling vials. The vials were stoppered with air-tight rubber stoppers, and placed in an incubator at 47 °C. Two sets of samples were placed in the incubator and heated for different times, one set was heated for 20-26 hours, and the other set was heated for 5 days. Headspace gas in the vials was removed by injecting 5 ml of air and withdrawing 5 ml of mixed air and headspace gas. The gas samples were analyzed for CO_2, O_2, SO_2, and CS_2 by gas chromatography, using two gas chromatographs with connected sample loops; operating conditions for the gas chromatographs are shown in table 24.

Concentrations of volatiles of interest in the headspace gases were calculated by comparison to standard curves; concentrations of these volatiles in the added atmospheric air were subtracted from the values determined. Results of the two sets of analyses were very close and the averages are shown in table 25; results for CO_2 are reported in percent (volume/volume), results for SO_2 and CS_2 are reported as relative peak areas because the concentrations were near the lower limit of determination. Results for O_2 are not reported because all samples were determined to be the same composition of atmospheric air.

Table 24.--Gas chromatograph operating conditions

	Chromatograph 1	Chromatograph 2
Gases analyzed	CO_2, O_2	H_2S, COS, CS_2, SO_2, CH_3SH
Detector	thermistor detector	Hall electrolytic conductivity detector, operated in the sulfur mode
Lower limit of detection	0.03% CO2, 1% O2 (vol/vol)	500 ppb of any sulfur compound (vol/vol)
Column	concentric stainless steel outer column: 72 in x 1/4 in molecular sieve. Inner column 72 in x 1/8 in Porapak mixture (Alltech Assoc. Deerfield, Ill.)	30 in x 1/8 in Teflon packed with 18 in of acetone-washed 80/100 mesh Porapak QS (Supelpak-S) (Supelco, Inc., Bellefonte, Pa.)
Carrier gas	helium at 90 mL/min	ultra-high purity He at 60 mL/min Hall detector: Methanol flow rate = 0.5 mL/min. Ultra high air flow rate= 35 mL/min.
Temperature	column: 70 °C detector: low mode	both columns in same oven: 50 °C, programmed to 150 °C for 7 min.

Table 25.--Analysis of core samples for CO_2, O_2, SO_2, and CS_2

[O_2 reported in % was found to be the same as atmospheric air in all samples and has not been included in the table]

Sample	SO_2 ppb	CS_2 ppb	CO_2 (%)
1	1.6	0.9	<.01
2	1.6	1.1	<.01
3	1.2	1.3	<.01
4	1.3	0.7	<.01
5	1.2	0.9	<.01
6	1.0	0.7	<.01
7	1.1	0.8	<.01
8	1.1	0.9	<.01
9	1.1	0.8	<.01
10	0.8	0.9	.03
11	0.9	0.4	<.01
12	1.1	0.5	<.01
13	1.2	1.4	<.01
14	0.9	0.5	<.01
15	1.1	0.9	<.01
16	1.0	0.8	.03
17	0.4	0.5	<.01
18	1.1	1.6	<.01
19	1.1	1.1	.03
20	0.9	0.5	<.01
21	0.8	0.4	.03

Total atomic emission spectrography for the determination of 35 elements

Three of the seived fractions and the whole clasts were analyzed by dc-arc emission spectrography (Grimes and Marranzino, 1968). Ten milligrams (mg) of prepared sample is mixed with 20 mg of spectrographically pure powdered graphite and placed in a performed 6.35-mm-diameter cupped electroded where it is packed and vented. The electrode containing the sample is placed opposite a counter electrode in the arc stand where it is arced at 13 ampere for 2.25 min. The resulting spectra from the volatization of the sample is recorded on film. The developed film is then visually compared to a standard film and element concentrations are determined. Concentrations are reported as the approximate midpoints of geometric brackets whose boundaries are 0.825, 1.211, 1.77, 2.61, 3.83, 5.62, 8.52, or any order of magnitude therein of the dynamic working range of a particular element. The 35 elements analyzed for and the upper and lower limits of determination used are presented in table 26. The results from the analysis of the three sieve fraction (-20/+60, -100/+250, and -250) and whole clasts are presented in tables 27-30. Of the 35 elements reported Au, Bi, Cd, Sn, and Th do not appear in the table 27-30. These elements were looked for but were not detected at their respective lower limits of determination in any of the samples.

Table 26.--Limits of determination for the spectrographic analysis of geologic materials based on a 10-mg sample

[The spectrographic limits of determination for heavy-mineral-concentrate samples and oxalic acid leachates are based on a 5-mg sample, and are therefore two reporting intervals 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 27.--Emission spectrographic results from the analysis of the -20/+60 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
1	3	5	1.5	.7	N	.2	.7	N	N	100	700	N	N	N	20	150	20	15	N
2	15	3	1.5	1	N	.3	.5	N	N	100	700	N	N	N	20	150	15	15	N
3	15	2	1.5	1	N	.3	.5	N	N	100	500	N	N	N	20	150	20	15	N
4	20	1.5	1.5	.7	N	.2	L	N	N	100	1000	N	N	N	10	70	10	10	N
5	15	1.5	2	1	N	.2	N	N	N	70	700	N	N	N	20	70	15	15	N
6	5	1	1	1.5	N	.15	N	N	N	50	500	L	N	N	10	50	7	20	N
7	15	2	2	1.5	N	.3	L	N	N	50	700	N	N	N	20	150	20	50	N
8	10	1.5	1.5	1	N	.2	.5	N	N	50	1000	N	N	N	20	150	15	30	N
9	15	2	1.5	.7	N	.2	L	N	N	100	1500	L	N	N	15	100	15	20	N
10	15	5	3	1	N	.5	L	N	N	100	700	L	N	N	30	200	30	30	N
11	10	2	1.5	.7	N	.3	.5	N	N	100	700	N	N	N	10	100	10	20	N
12	15	1.5	1.5	.7	N	.15	N	N	N	70	300	N	N	N	10	70	15	30	N
13	10	1.5	.7	.3	N	.15	.5	N	N	150	1000	L	N	N	10	70	15	20	N
14	.5	5	1	1	N	.3	.7	N	N	100	3000	N	N	N	20	100	20	20	N
15	.5	3	.7	.5	N	.2	.7	N	N	150	500	L	N	N	15	100	20	20	N
16	7	2	1	.7	N	.2	N	N	N	100	500	N	N	N	20	100	15	15	N
17	3	2	.7	.5	N	.2	L	N	N	150	700	L	N	N	L	70	15	20	N
18	2	2	1	.5	N	.3	L	L	N	100	1000	L	N	N	20	150	20	20	N
19	3	3	.7	.5	N	.5	.5	200	N	150	500	1	N	N	15	100	30	15	N
20	.5	1	1.5	L	N	.15	N	N	N	100	100	2	N	N	10	30	7	10	N
21	1	2	.7	L	N	.3	.5	L	N	200	300	1.5	N	N	20	200	20	15	N

Table 27.--Emission spectrographic results from the analysis of the -20/+60 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(05) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
1	L	1000	L	N	50	L	N	15	N	N	N	100	L	20	N	100
2	L	500	N	N	50	L	N	15	N	L	N	100	N	30	N	100
3	L	700	N	N	50	L	N	10	N	L	N	150	N	20	N	100
4	L	300	N	N	20	L	N	7	N	200	N	50	N	15	N	70
5	N	500	N	N	30	L	N	10	N	L	N	70	N	15	N	70
6	N	200	N	N	20	10	N	5	N	N	N	70	N	10	N	70
7	N	500	N	N	50	L	N	10	N	150	N	100	N	15	N	50
8	N	500	N	N	50	10	N	10	N	L	N	100	N	20	N	70
9	N	500	N	N	50	N	N	10	N	L	N	70	N	20	N	70
10	N	700	N	N	70	N	N	20	N	L	N	100	N	30	L	100
11	N	300	N	N	50	N	N	10	N	L	N	100	N	20	N	100
12	N	200	N	N	20	10	N	5	N	N	N	70	N	15	N	70
13	N	300	N	N	30	L	N	5	N	L	N	70	N	20	N	70
14	N	500	N	L	50	N	N	15	N	N	N	150	30	15	N	70
15	L	700	N	L	50	L	N	10	N	N	N	100	20	15	L	150
16	N	500	N	N	50	N	N	15	N	N	N	150	L	20	N	100
17	L	500	N	L	30	L	N	10	N	N	N	70	20	20	N	200
18	N	200	N	N	50	N	N	15	N	N	N	70	30	15	L	100
19	N	300	N	L	50	N	N	15	N	N	N	100	50	20	L	150
20	N	300	N	N	10	15	N	5	N	N	N	50	N	10	N	70
21	N	1000	L	L	50	N	N	10	N	N	N	70	70	20	L	200

Table 28.--Emission spectrographic results from the analysis of the -100/+250 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
1	5	5	1.5	1	N	.5	N	N	N	150	1000	L	N	N	15	70	20	10	N
2	10	3	1	1	N	.3	L	N	N	150	1500	L	N	N	15	70	15	10	N
3	5	2	1.5	1	N	.2	.5	N	N	70	1000	N	N	N	15	100	15	15	N
4	15	2	2	.7	N	.2	L	N	N	100	2000	N	N	N	10	70	10	7	N
5	7	5	2	1	N	.3	L	N	N	70	1500	N	N	N	15	100	10	10	N
6	2	5	1.5	1.5	N	.3	.5	N	N	70	2000	1	N	N	10	30	7	20	N
7	20	3	5	1	N	.3	N	N	N	100	2000	L	N	N	15	70	15	10	N
8	10	5	1.5	1	N	.5	L	N	N	100	3000	L	N	N	15	100	15	10	N
9	10	3	3	1	N	.3	L	N	N	70	5000	L	N	N	10	100	15	7	N
10	3	5	2	1	N	.3	N	N	N	50	700	N	N	N	15	100	20	5	N
11	7	2	1.5	.3	N	.2	N	N	N	150	1500	N	N	N	15	100	15	20	N
12	10	2	2	.5	N	.2	N	N	N	30	700	L	N	N	10	70	10	10	N
13	10	3	1	.3	N	.2	.5	N	N	200	1500	L	N	N	15	100	10	7	N
14	.5	5	.7	.5	N	.3	.5	L	N	150	5000	N	N	N	20	50	15	30	N
15	.2	3	.7	.7	N	.2	L	N	N	100	300	N	N	N	L	50	15	10	N
16	5	5	1	.5	N	.3	N	L	N	150	1000	N	N	N	20	100	20	50	N
17	2	7	1.5	.5	N	.5	L	N	N	200	700	1	N	N	10	70	20	20	N
18	5	5	1	.3	N	.3	.5	200	N	200	1500	L	N	N	20	100	30	15	N
19	5	5	.7	.3	N	.3	.5	L	N	150	700	L	N	N	10	150	20	7	N
20	.7	7	3	.3	N	.5	.5	N	N	100	2000	3	N	N	20	30	20	30	N
21	1	7	1	L	N	.5	.7	L	N	200	1500	2	N	N	50	150	30	20	N

Table 28.--Emission spectrographic results from the analysis of the -100/+250 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(05) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
1	L	700	L	L	30	N	N	15	N	100	N	100	N	20	N	150
2	L	500	N	N	30	L	N	10	N	100	N	70	N	20	N	200
3	N	500	N	N	20	L	N	10	N	L	N	70	N	15	N	100
4	N	300	N	N	20	N	N	10	N	200	N	50	N	15	N	70
5	N	500	L	N	20	L	N	15	N	150	N	70	N	20	N	100
6	N	500	L	L	15	10	N	10	N	L	N	50	N	30	N	200
7	N	500	N	N	50	L	N	15	N	500	N	70	N	20	N	100
8	N	700	N	N	30	L	N	15	N	200	N	100	N	20	N	100
9	N	500	N	N	20	L	N	10	N	100	N	50	N	15	N	100
10	N	500	N	N	30	N	N	10	N	L	N	70	N	10	N	70
11	N	200	N	N	50	N	N	10	N	150	N	70	N	30	N	100
12	N	300	N	N	30	L	N	7	N	L	N	50	N	15	N	70
13	50	500	N	L	50	L	N	10	N	L	N	70	L	50	N	200
14	N	500	N	L	50	N	N	15	N	N	N	100	20	15	N	100
15	N	200	N	N	20	L	N	10	N	N	N	50	20	10	N	150
16	N	1000	N	N	50	N	N	15	N	N	N	100	L	20	N	100
17	L	1000	L	L	30	10	N	15	N	N	N	50	L	20	N	300
18	L	500	N	N	50	10	N	20	N	N	N	100	20	30	N	150
19	N	1500	N	N	50	N	N	15	N	N	N	70	30	20	N	200
20	L	500	N	L	15	15	N	15	N	N	N	100	N	30	N	200
21	L	5000	5	L	100	20	N	15	N	N	N	70	150	30	N	500

Table 29.--Emission spectrographic results from the analysis of the -250 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
1	7	3	1.5	1.5	N	.7	N	N	N	70	700	1.5	N	N	15	70	30	30	N
2	10	2	1	2	N	.2	N	N	N	30	700	N	N	N	L	150	10	20	N
3	10	2	1.5	1.5	N	.3	L	N	N	50	500	L	N	N	10	100	20	20	N
4	15	2	2	1.5	N	.5	N	N	N	30	1000	N	N	N	L	100	30	20	N
5	10	2	2	1	N	.2	N	N	N	30	700	L	N	N	L	50	20	15	N
6	7	1.5	1	2	N	.15	N	N	N	30	700	1	N	N	N	20	7	15	N
7	20	3	3	1.5	N	.3	N	N	N	30	1500	L	N	N	15	100	20	20	N
8	20	3	2	1	N	.5	N	N	N	70	5000	1	N	N	15	100	20	30	N
9	10	2	1.5	1.5	N	.2	N	N	N	20	3000	N	N	N	L	30	15	20	N
10	15	3	2	1.5	N	.5	N	N	N	50	500	L	N	N	15	30	30	30	N
11	10	2	1.5	.7	N	.3	N	N	N	30	2000	N	N	N	L	100	10	20	N
12	20	1	1.5	.5	N	.15	N	N	N	20	300	1.5	N	N	N	20	7	15	N
13	7	2	1	.7	N	.2	N	N	N	70	1500	N	N	N	L	150	10	20	N
14	.7	5	1.5	.7	N	.5	N	L	N	70	2000	N	N	N	30	150	30	20	N
15	.5	5	1.5	.5	N	.5	N	N	N	100	500	1.5	N	N	15	70	50	30	L
16	10	3	1	.5	N	.3	N	L	N	70	1000	L	N	N	20	70	20	10	N
17	3	3	1.5	.5	N	.3	N	N	N	50	200	1	N	N	10	50	15	30	L
18	7	5	2	.7	N	.5	L	200	N	150	1500	2	N	N	50	200	50	50	N
19	5	3	1	.7	N	.3	N	300	N	100	700	1	N	N	20	70	30	10	N
20	1	3	2	.5	N	.5	N	N	N	70	300	2	N	N	15	15	20	30	L
21	.7	3	1.5	.3	N	.3	N	N	N	50	500	L	N	N	20	150	30	20	N

Table 29.--Emission spectrographic results from the analysis of the -250 sieve fraction of Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(50) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
1	L	500	N	N	30	L	N	5	N	L	N	150	N	15	N	100
2	N	150	N	N	20	L	N	L	N	N	N	50	N	10	N	70
3	N	300	N	N	20	15	N	L	N	150	N	100	N	10	N	100
4	N	150	L	N	20	L	N	L	N	200	N	70	N	10	N	100
5	N	200	N	N	20	L	N	L	N	100	N	50	N	L	N	50
6	N	150	N	N	10	15	N	N	N	N	N	30	N	L	N	50
7	N	300	N	N	30	L	N	5	N	200	N	70	N	15	N	70
8	N	500	N	N	50	L	N	7	N	500	N	100	N	15	N	100
9	N	300	N	N	20	L	N	L	N	100	N	70	N	L	L	50
10	N	300	N	N	50	L	N	7	N	100	N	50	N	15	N	70
11	N	150	N	N	30	10	N	L	N	200	N	70	N	10	N	70
12	N	200	N	N	10	L	N	L	N	100	N	30	N	10	N	50
13	L	150	N	N	50	10	N	L	N	L	N	70	N	10	N	70
14	N	1000	L	N	70	N	N	10	N	N	N	200	30	15	N	100
15	L	500	N	L	50	10	N	7	N	N	N	70	30	10	L	300
16	N	500	N	N	50	N	N	7	N	100	N	150	L	10	N	50
17	N	300	N	N	30	15	N	5	N	N	N	50	N	L	N	100
18	L	700	N	L	100	15	N	15	N	N	N	150	50	20	N	150
19	N	1500	N	L	50	10	N	10	N	N	N	100	50	15	N	100
20	50	200	N	20	15	20	N	7	N	N	N	100	N	20	N	150
21	N	1500	5	N	70	20	N	5	N	N	N	50	70	L	N	70

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
14A	.07	.3	.15	N	N	.07	1.5	N	N	15	500	N	N	N	N	L	10	N	N
14B	.3	.3	.2	N	L	.1	3	N	N	20	200	N	N	N	N	30	7	5	N
14C	7	3	.3	N	1.5	.5	.7	200	N	15	500	N	N	N	10	30	30	150	N
15A	.3	7	.5	N	.2	.5	5	N	N	100	700	1	N	N	10	300	30	10	N
15C	.2	.5	.15	N	N	.2	1.5	N	N	70	200	N	N	N	N	20	10	N	1
15D	.2	1	.15	N	N	.3	.7	N	N	10	5000	N	N	N	N	20	15	N	N
15E	.2	1	.3	N	N	.3	1.5	N	N	150	200	N	N	N	N	100	20	10	10
16A	1.5	.7	.3	L	L	.1	15	N	N	20	300	N	N	N	N	100	50	5	N
16B	.15	15	.7	N	N	.3	N	300	N	50	1500	L	N	N	30	70	150	15	N
16C	.7	20	.5	N	N	G1	N	200	N	15	200	N	N	N	30	100	70	15	N
16D	7	10	5	3	L	1	N	L	N	10	300	N	N	N	20	300	50	30	N
17A	.7	.5	.15	N	N	.15	20	N	N	50	200	L	N	N	N	20	15	5	N
18A	1	2	.3	N	N	.15	1	200	N	20	700	L	N	N	10	10	20	5	N
18B	.2	2	.5	.3	N	.2	.7	N	N	20	300	N	N	N	10	50	30	15	N
18C	7	10	3	G5	N	1	N	N	N	15	1000	N	N	N	50	300	100	30	L
18D	3	15	5	G5	N	1	N	200	N	10	1500	N	N	N	70	300	70	30	15
19A	.1	.7	.15	L	N	.2	3	N	N	30	1000	N	N	N	N	30	30	10	N
19B	5	10	3	.3	N	1	N	300	N	20	200	L	N	N	50	200	100	50	20
19C	.2	.3	.07	N	N	.15	.5	N	N	30	500	N	N	N	N	30	7	N	N
21A	.15	.5	.15	N	N	.15	5	N	N	20	700	L	N	N	N	30	10	N	N
21B	.2	.2	.15	N	N	.07	1	N	N	10	200	N	N	N	N	15	10	N	N
21C	.15	2	.1	N	N	.5	.5	300	N	150	500	1	N	N	L	20	20	50	N
21D	1.5	.5	.15	N	.3	.2	2	N	N	20	300	L	N	N	N	20	10	N	N

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(50) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
14A	N	200	N	N	5	N	N	N	N	N	N	150	N	L	N	30
14B	N	20	N	N	5	N	N	N		N	N	70	N	10	N	100
14C	150	700	N	N	30	30	N	7	N	200	N	100	G10000	100	N	50
15A	L	300	10	L	200	10	N	10	N	100	N	200	N	20	300	500
15C	L	10	N	N	10	N	N	N	N	N	N	20	N	10	N	300
15D	100	30	N	L	7	L	N	L	N	200	N	100	20	15	N	150
15E	N	15	N	N	20	10	N	5	N	N	N	70	N	15	N	200
16A	N	100	N	N	30	N	N	5	N	N	N	3000	N	10	N	70
16B	50	G5000	N	N	100	70	N	7	N	L	N	500	20	15	N	200
16C	N	500	N	N	150	N	N	20	N	100	N	700	N	20	N	70
16D	N	700	N	N	200	N	N	30	N	150	N	200	N	30	N	70
17A	N	200	N	N	7	L	N	N	N	N	N	50	N	15	N	100
18A	N	700	N	N	10	N	N	7	N	N	N	70	L	15	N	70
18B	N	300	N	N	15	10	N	7	N	N	N	50	N	30	N	70
18C	N	1000	N	N	200	N	N	20	N	300	N	300	N	30	N	100
18D	N	700	N	N	200	15	N	20	N	500	N	200	N	50	L	100
19A	N	100	N	N	10	N	N	5	N	100	N	300	N	15	N	200
19B	N	700	N	N	150	15	N	15	N	100	N	200	30	20	N	100
19C	N	50	N	N	10	N	N	N	N	N	N	15	N	L	N	100
21A	N	150	N	N	15	N	N	N	N	L	N	30	L	10	N	150
21B	N	20	N	N	N	N	N	N	N	N	N	50	N	10	N	70
21C	50	500	N	L	10	10	N	5	N	N	N	100	30	20	N	200
21D	70	150	N	N	10	N	N	N	N	100	N	20	L	50	N	300

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
5B	2	15	1	L	.2	G1	2	N	N	70	1000	L	N	N	15	500	200	30	N
5C	2	5	.5	L	N	.1	1.5	N	N	15	500	N	N	N	N	30	100	N	N
7A	7	10	3	.2	N	.5	N	N	N	50	3000	L	N	N	L	50	150	30	N
8A	5	20	7	G5	N	G1	N	N	N	20	500	N	N	N	70	500	100	100	N
9A	20	10	5	G5	N	G1	N	N	N	10	1500	N	N	N	20	500	50	30	N
9C	1	.7	.3	L	.3	.3	1.5	N	N	100	1000	N	N	N	N	70	10	N	N
9D	7	.5	1	L	L	.15	L	N	N	20	500	N	N	N	N	30	7	N	N
10A	7	5	.5	.2	.2	.1	1.5	L	N	70	300	1	N	N	10	20	150	10	N
10B	10	1.5	.7	.2	N	.2	N	N	N	30	500	L	N	N	N	30	30	N	N
11A	1	7	.5	L	N	.05	1.5	N	N	15	500	L	N	N	30	10	50	N	N
11B	5	2	5	N	L	1	7	N	N	150	300	L	N	N	L	300	20	20	N
11C	.3	1.5	.07	L	N	.015	.5	N	N	L	200	L	N	N	10	L	30	N	N
12A	1.5	.5	.5	L	N	.2	.7	N	N	30	1500	L	N	N	N	30	10	5	N
12B	.7	2	.5	L	N	.15	N	N	N	20	700	N	N	N	N	15	20	N	N
12C	7	2	.7	L	L	.3	1	N	N	30	1000	L	N	N	15	30	50	10	N
13A	.3	3	.5	N	L	.3	1.5	N	N	50	700	1	N	N	N	30	50	5	N
13B	20	.7	.5	L	L	.1	.5	N	N	50	300	N	N	N	N	70	10	5	N
13C	.5	1	.5	.3	N	.3	.7	N	N	30	G5000	L	N	N	N	30	30	10	N
15B	.1	.5	.2	L	L	.15	3	N	N	30	2000	L	N	N	N	30	150	N	N
17B	7	10	.7	L	N	.7	L	700	N	100	2000	1	N	N	20	70	50	50	N

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(50) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
5B	50	300	20	50	100	30	N	10	N	100	N	500	N	30	200	200
5C	N	L	15	N	L	10	N	5	N	100	N	1000	N	10	N	50
7A	50	1000	N	N	20	15	N	10	N	200	N	200	N	20	L	100
8A	N	1000	N	N	200	10	N	30	N	200	N	500	N	30	N	150
9A	N	5000	N	N	150	20	N	15	N	150	N	200	N	15	N	70
9C	N	20	N	N	20	N	N	L	N	150	N	70	N	20	N	150
9D	N	150	N	N	L	N	N	N	N	100	N	70	N	10	N	150
10A	50	5000	15	N	150	30	N	10	N	100	N	500	N	10	L	50
10B	N	500	N	N	7	10	N	5	N	200	N	100	N	10	N	70
11A	N	5000	N	N	70	15	N	L	N	100	N	70	N	L	N	70
11B	N	1000	N	L	100	30	N	7	N	100	N	150	N	20	N	1000
11C	N	1000	N	N	20	10	N	N	N	N	N	70	N	L	N	15
12A	N	70	N	N	L	N	N	L	N	100	N	150	N	L	N	70
12B	N	500	N	N	15	N	N	N	N	N	N	50	N	10	N	70
12C	N	1500	N	N	20	20	N	5	N	100	N	200	N	15	N	70
13A	L	70	N	N	10	N	N	15	N	N	N	100	N	15	N	300
13B	N	200	N	N	15	N	N	7	N	700	N	70	N	20	N	30
13C	N	30	N	N	30	N	N	7	N	N	N	100	N	10	N	100
15B	N	50	N	N	7	N	N	L	N	L	N	70	N	15	N	100
17B	N	G5000	N	N	50	150	L	15	N	100	N	200	N	30	N	50

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.05) Ca%	(.05) Fe%	(.02) Mg%	(.2) Na%	(.2) P%	(.002) Ti%	(.5) Ag	(200) As	(10) Au	(10) B	(20) Ba	(1) Be	(10) Bi	(20) Cd	(10) Co	(10) Cr	(5) Cu	(5) Ga	(10) Ge
1A	.2	.2	.03	N	N	.05	N	N	N	10	200	N	N	N	N	L	L	N	N
1B	1.5	1.5	.2	N	.7	.1	2	N	N	30	1000	N	N	N	N	150	15	N	N
1C	.07	.7	.15	L	N	.3	1	N	N	15	700	N	N	N	N	10	30	N	N
1D	.7	15	.2	L	N	.3	L	L	N	15	2000	L	N	N	20	70	200	10	N
2A	7	.2	.15	L	N	.07	N	N	N	10	150	N	N	N	N	15	5	N	N
3A	10	3	2	1	N	.5	N	N	N	100	5000	L	N	N	10	100	30	50	N
3B	1.5	.5	.15	L	N	.2	.5	N	N	15	300	N	N	N	N	20	10	N	N
3C	1	.15	.05	N	N	.03	3	N	N	10	200	N	N	N	N	10	N	N	N
3D	7	.5	.2	L	L	.07	N	N	N	15	1500	N	N	N	N	20	10	N	N
4A	2	20	.2	N	.5	.15	N	300	N	70	500	1	N	N	10	50	50	N	N
4B	.5	1	.3	N	L	.3	L	N	N	100	200	N	N	N	10	30	15	N	N
4C	1	.3	.2	N	L	.1	N	N	N	30	500	N	N	N	L	15	7	N	N
4D	5	.3	.5	L	.7	.1	3	N	N	30	1000	N	N	N	N	100	15	10	N
5A	1.5	2	.5	L	.2	.15	L	N	N	50	700	L	N	N	L	20	30	N	N
5D	1	.7	.15	L	L	.07	N	N	N	20	5000	N	N	N	L	10	10	N	N
6A	7	10	2	G5	.2	1	N	N	N	10	2000	L	N	N	20	70	20	50	N
7B	5	.7	1	.3	.7	.1	5	N	N	30	300	N	N	N	N	150	20	5	5
8B	1	.2	.1	N	N	.07	1	N	N	15	1000	N	N	N	N	L	7	N	N
9B	1	.7	.5	L	N	.1	1.5	N	N	15	300	N	N	N	N	10	50	N	N

Table 30.--Emission spectrographic results from the analysis of the whole clasts from Rabbit Creek core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(50) La	(10) Mn	(5) Mo	(20) Nb	(5) Ni	(10) Pb	(100) Sb	(5) Sc	(10) Sn	(100) Sr	(100) Th	(10) V	(20) W	(10) Y	(200) Zn	(10) Zr
1A	N	30	N	N	L	N	N	N	N	N	N	10	L	N	N	100
1B	L	200	N	N	50	N	N	L	N	100	N	70	N	20	N	30
1C	N	15	7	N	L	N	N	L	N	L	N	200	N	L	N	70
1D	N	1500	N	N	150	N	N	10	N	L	N	200	300	20	N	50
2A	N	30	N	N	L	N	N	N	N	100	N	L	N	N	N	15
3A	N	300	N	N	30	N	N	10	N	200	N	70	N	10	N	50
3B	N	20	N	N	L	N	N	N	N	L	N	50	N	L	N	300
3C	N	50	N	N	L	N	N	N	N	N	N	L	N	N	N	30
3D	N	100	N	N	L	N	N	N	N	150	N	30	N	10	N	50
4A	50	1000	N	N	50	10	150	L	N	300	N	200	N	30	N	100
4B	N	500	N	N	100	10	N	L	N	N	N	50	N	15	N	200
4C	N	200	N	N	30	N	N	N	N	L	N	15	N	L	N	150
4D	50	20	N	N	10	N	N	L	N	200	N	50	N	30	N	50
5A	N	1000	5	N	100	N	N	L	N	100	N	50	N	30	200	300
5D	N	300	N	N	20	N	N	N	N	100	N	10	N	20	N	150
6A	70	1000	N	L	30	30	N	10	N	700	N	150	N	30	N	200
7B	70	50	N	N	50	L	N	L	N	200	N	150	N	70	N	100
8B	N	50	N	N	N	N	N	N	N	N	N	50	N	L	N	70
9B	N	300	N	N	15	N	N	N	N	N	N	100	N	L	N	50

Atomic emission spectrography for the determination of 35 elements in oxalic acid leachates

An oxalic acid leach was used in conjunction with dc-arc emission spectrography to analyze four of the core fractions (-20/+60 ground, -20/+60 unground, -100/+250, and -250) for metals tied up in secondary amorphous Fe and Mn oxide coatings (tables 31-34). Fifty ml of 5 percent oxalic acid solution was added to 5 gm of sample the solution was then placed on a heating plate and brought to a boil for 5 minutes. The solution was filtered and the filtrate was taken to dryness. The resulting solid was placed in a muffle furnace and heated to 450 °C for 4 hrs., during this step the crystalline oxalic acid is driven off as oxalate. The prepared sample was then pulverized and a 5 mg sample was analyzed spectrographically for 35 elements. (Grimes and Marranzino, table 26). Tables 31-34 contain the results from the analysis of the oxalic acid leachates, Au, Bi, Cd, Th, and Y were analyzed; however, these elements do not appear in the table because they were not detected at the respective lower limits of determination in any of the samples.

Atomic emission spectrography for the determination of 35 elements in heavy-mineral concentrates from drill core

The C2 and C3 fractions of the prepared heavy-mineral concentrates (-20/+60 and -100/+250) were analyzed spectrographically. The method used is similar to the one described by Grimes and Marranzino (table 26) except that a 5 mg sample charge is used and the sample charge is buffered with 25 mg of 4:1 graphite-quartz mixture. The results from the analysis of the heavy-mineral concentrates are presented in tables 35-38 of the 35 elements reported Au, Bi, Cd, Sn, and Th do not appear in the tables, these elements were looked for but were not detected at their respective lower limits of determination in any of the samples.

Explanation of emission spectrographic data tables

All the emission spectrographic data tables are presented such that the first columns contains the sample number and the balance of the columns the concentration of that element which appears at the head of each column. Elements reported in percent include Ca, Fe, Mg, Na, P, and Ti, all other elements are reported in parts per million (ppm). Sometimes a qualifier (N, L, G) is used in place of a real value, N indicates an element was looked for but was not detected at the lower limit of determination, L indicates that the element was present at a concentration below the lower limit of determination, and G indicates that the element was detected at a concentration greater than the upper limit of determination.

Table 31.--Emission spectrographic results from the analysis of the -20/+60 ground sieve fraction oxalic acid leachate

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	1	20	10	.7	1.5	.05	N	N	N	200	3000	10	N	N	150	200	300	70	N
2	1	7	10	2	1	L	L	N	N	2000	1500	3	N	N	100	200	150	10	N
3	1.5	30	10	.5	1	.05	N	L	N	300	3000	10	N	N	200	300	200	70	N
4	.5	5	10	3	.7	L	L	N	N	1000	1000	L	N	N	50	100	100	L	N
5	1	20	15	2	2	.03	1	N	N	700	5000	15	N	N	150	150	150	100	N
6	.3	10	10	1.5	.7	.05	N	N	N	300	3000	10	N	N	70	50	70	10	N
7	.5	20	15	1.5	1	.05	N	N	N	1000	3000	10	N	N	150	200	200	30	N
8	.7	20	10	.7	1.5	.02	N	N	N	200	5000	10	N	N	100	150	200	50	N
9	1	30	15	.5	1.5	.05	N	L	N	500	10000	10	N	N	150	200	200	100	N
10	1	20	15	.7	1	.01	N	N	N	300	1500	5	N	N	100	300	150	70	N
11	.7	30	10	.5	2	.1	N	L	N	1000	2000	15	N	N	150	300	30	50	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	1	30	10	1.5	.5	.1	N	3000	N	500	3000	15	N	N	200	200	500	100	L
14	1.5	30	10	.5	1.5	.2	N	1500	N	100	5000	7	N	N	150	300	200	70	20
15	2	50	10	.5	2	.15	N	5000	N	300	2000	20	N	N	200	300	300	150	30
16	1	30	10	L	3	.05	N	7000	N	300	2000	7	N	N	150	300	200	50	L
17	1	30	7	.5	1	.07	N	5000	N	200	1500	15	N	N	70	200	300	70	20
18	1	30	7	L	1	.1	N	10000	N	100	2000	10	N	N	100	300	300	70	30
19	1	50	5	L	1.5	.15	N	15000	N	100	1500	15	N	N	100	200	300	70	50
20	2	20	5	.5	.7	.03	1.5	3000	N	100	1000	50	N	N	50	30	100	30	30
21	1.5	20	5	.5	2	.15	N	15000	N	200	7000	50	N	N	300	150	500	100	70

Table 31.--Emission spectrographic results from the analysis of the -20/+60 ground sieve fraction oxalic acid leachate--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr	(5) Pd	(20) Pt
1	N	10000	20	L	300	L	N	N	N	L	N	700	70	N	500	L	N	N
2	N	7000	L	N	150	N	N	N	N	N	N	1000	N	L	N	N	N	N
3	N	7000	20	L	500	N	N	N	N	L	N	700	50	L	700	N	N	N
4	N	1000	N	N	70	N	N	N	N	N	N	500	N	N	N	N	N	N
5	N	7000	10	L	200	N	N	N	N	200	N	500	L	N	L	N	N	N
6	N	3000	L	L	100	N	N	N	N	N	N	200	N	N	N	N	N	N
7	N	3000	10	L	150	N	N	N	N	L	N	500	L	N	N	N	N	N
8	N	5000	10	L	200	N	N	N	N	L	N	300	L	N	L	N	N	N
9	N	7000	10	L	200	N	N	N	N	200	N	500	50	N	500	N	N	N
10	N	5000	L	N	200	N	N	N	N	N	N	500	L	N	N	N	N	N
11	N	5000	15	L	500	N	N	N	N	L	N	300	L	N	500	N	N	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	N	7000	20	50	300	N	200	N	N	200	N	700	150	N	700	N	N	N
14	N	10000	L	N	300	20	L	10	N	L	N	500	150	N	L	70	N	N
15	N	G(10000)	20	50	500	30	500	20	N	200	N	500	500	N	500	700	N	N
16	N	10000	L	N	200	N	L	N	N	N	N	500	200	N	L	N	N	N
17	N	5000	20	50	200	L	1000	N	N	L	N	300	300	N	500	150	N	N
18	N	3000	L	L	500	N	200	N	N	N	N	300	500	N	500	50	N	N
19	N	5000	10	L	300	N	700	N	N	L	N	300	700	N	500	50	N	N
20	N	1500	L	L	100	50	N	L	N	200	N	500	50	N	N	1000	N	N
21	N	G(10000)	30	70	500	20	300	L	N	L	N	500	2000	N	500	300	N	N

Table 32.--Emission spectrographic results from the analysis of the -20/+60 unground sieve fraction oxalic acid leachate

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	1.5	30	15	2	3	.2	N	N	N	1500	7000	20	N	N	300	200	300	70	N
2	1	20	15	1.5	2	.15	N	N	N	2000	7000	20	N	N	200	150	150	30	N
3	1	30	15	1	1.5	.15	N	N	N	1000	5000	15	N	N	200	200	200	30	N
4	1	20	15	1.5	1	.15	N	N	N	3000	10000	20	N	N	100	100	150	15	N
5	.5	15	15	2	1	.1	N	N	N	1500	7000	15	N	N	150	100	150	70	N
6	1.5	20	20	3	1	.2	3	N	N	1500	10000	30	N	N	200	150	150	150	N
7	.5	15	15	1.5	1	.15	N	N	N	1000	5000	15	N	N	100	150	150	20	N
8	1	20	10	.7	2	.15	N	500	N	1000	10000	10	N	N	150	150	150	50	N
9	.7	15	10	.5	1.5	.15	N	N	N	700	10000	15	N	N	100	150	100	30	N
10	.7	20	10	.5	1	.1	N	N	N	300	2000	10	N	N	200	300	150	70	N
11	1	30	15	.5	2	.2	N	N	N	500	3000	15	N	N	150	500	300	100	N
12	.7	10	10	.7	1.5	.03	N	L	N	1000	1000	30	N	N	150	100	70	20	N
13	2	20	10	2	3	.2	N	1000	N	2000	5000	20	N	N	200	200	300	100	L
14	1.5	15	10	.5	1	.15	N	300	N	200	3000	10	N	N	200	300	70	50	L
15	3	20	10	.5	3	.15	N	2000	N	300	5000	50	N	N	200	200	200	100	30
16	1.5	30	15	.5	3	.2	N	2000	N	200	5000	15	N	N	200	500	200	150	30
17	1.5	20	7	L	2	.15	N	5000	N	500	2000	50	N	N	100	150	150	70	30
18	2	30	10	N	1.5	.2	N	7000	N	300	2000	50	N	N	150	700	500	150	50
19	.7	30	10	1	1.5	.2	N	10000	N	300	2000	30	N	N	150	500	500	300	50
20	1	15	7	.7	1	.05	2	2000	N	500	1500	70	N	N	70	70	100	70	20
21	1.5	20	7	.5	2	.15	N	7000	N	700	10000	70	N	N	300	200	500	50	70

Table 32.--Emission spectrographic results from the analysis of the -20/+60 unground sieve fraction oxalic acid leachate--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr	(5) Pd	(20) Pt
1	N	G(10000)	20	50	300	20	N	10	N	200	N	700	150	N	500	150	N	N
2	N	10000	20	L	150	N	N	N	N	L	N	300	150	N	L	L	N	N
3	N	10000	20	L	200	N	N	N	N	L	N	300	70	N	L	50	N	N
4	N	7000	20	N	150	20	N	N	N	200	N	150	70	N	L	20	N	N
5	N	10000	10	N	150	N	N	N	N	L	N	100	L	N	N	20	N	N
6	N	G(10000)	15	50	200	L	N	L	N	300	N	200	50	N	N	150	N	N
7	N	5000	10	N	150	N	N	N	N	L	N	100	L	N	L	20	N	N
8	N	10000	20	N	200	N	N	N	N	L	N	150	50	N	L	30	N	N
9	N	7000	15	N	150	150	N	N	N	L	N	150	70	N	L	20	N	N
10	N	10000	20	N	300	N	N	N	N	L	N	200	L	N	L	L	N	N
11	N	7000	20	L	500	L	N	N	N	200	N	150	50	N	1000	20	N	N
12	N	5000	10	L	100	N	N	N	N	N	N	200	150	N	N	N	N	N
13	N	G(10000)	15	70	500	20	500	L	N	300	N	200	200	N	500	150	N	N
14	N	10000	L	N	300	20	N	20	N	L	N	300	200	N	N	100	N	N
15	N	G(10000)	10	70	500	50	700	30	N	300	N	200	500	N	700	1000	N	N
16	N	G(10000)	L	N	300	N	N	N	N	L	N	300	200	N	500	50	N	N
17	N	10000	10	50	200	L	500	10	N	L	N	200	200	N	500	700	N	N
18	N	5000	L	L	700	N	500	15	N	L	N	300	500	N	1000	150	N	N
19	N	7000	10	L	500	N	1000	10	N	L	N	150	1000	N	700	100	N	N
20	N	2000	L	N	100	20	N	L	N	200	N	300	50	N	N	1500	N	N
21	N	G(10000)	50	70	700	20	300	15	N	200	N	200	3000	N	L	500	N	N

Table 33.--Emission spectrographic results from the analysis of the -100/+250 sieve fraction oxalic acid leachate

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	1.5	30	15	2	1	.1	N	N	N	700	5000	15	N	N	150	150	500	100	N
2	1	20	15	1.5	.7	.01	N	N	N	500	3000	10	N	N	100	200	200	20	N
3	1.5	30	15	1.5	.7	.1	N	N	N	300	3000	10	N	N	150	300	300	100	N
4	1	20	15	2	.7	.1	N	N	N	1000	5000	15	N	N	100	200	200	30	N
5	.7	20	15	2	.5	.15	N	N	N	300	7000	10	N	N	100	200	200	50	N
6	2	30	15	3	.5	.3	N	N	N	500	10000	20	N	N	100	150	200	70	N
7	.5	15	15	1	.5	.03	N	N	N	500	3000	10	N	N	70	100	150	15	N
8	.5	20	10	.7	.7	.15	N	N	N	200	7000	10	N	N	100	70	150	30	N
9	1	30	15	.5	1.5	.15	N	N	N	200	10000	15	N	N	150	200	300	70	N
10	2	50	15	.5	1	.07	N	L	N	200	2000	10	N	N	200	500	300	100	N
11	1.5	30	10	.7	2	.1	N	L	N	500	5000	15	N	N	150	300	300	70	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	1	30	10	1.5	.7	.1	L	500	N	200	5000	10	N	N	150	300	500	150	L
14	2	50	10	.7	1.5	.15	N	2000	N	150	7000	7	N	N	200	300	200	100	20
15	2	50	10	.5	1.5	.1	N	1500	N	200	2000	20	N	N	150	200	300	100	20
16	1	20	10	1	1	.03	N	5000	N	150	3000	5	N	N	200	300	200	150	L
17	1.5	30	7	.5	1	.1	N	3000	N	150	2000	20	N	N	150	100	200	150	30
18	2	50	7	.5	1.5	.1	N	1500	N	200	5000	15	N	N	200	500	300	100	50
19	1.5	30	5	L	1	.1	N	1000	N	100	2000	10	N	N	100	300	200	30	30
20	3	20	5	L	1	.05	1	500	N	200	1500	50	N	N	70	70	100	20	L
21	1.5	30	3	L	1.5	.1	N	1500	N	100	7000	30	N	N	500	100	500	20	50

Table 33.--Emission spectrographic results from the analysis of the -100/+250 sieve fraction oxalic acid leachate--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr	(5) Pd	(20) Pt
1	N	10000	10	L	200	N	N	N	N	200	N	1000	50	N	700	50	N	N
2	N	7000	10	N	150	N	N	N	N	N	N	700	N	N	L	N	N	N
3	N	7000	20	L	300	N	N	N	N	L	N	500	L	N	500	N	N	N
4	N	5000	15	50	150	20	N	N	N	500	N	500	L	N	500	N	N	N
5	N	5000	15	L	150	N	N	N	N	L	N	300	N	N	L	L	N	N
6	N	7000	10	50	150	L	N	N	N	300	N	500	N	N	L	300	N	N
7	N	5000	10	N	100	N	N	N	N	N	N	300	N	N	L	N	N	N
8	N	5000	10	L	150	N	N	N	N	L	N	500	L	N	L	N	N	N
9	N	7000	15	N	200	N	N	N	N	200	N	700	50	N	1000	N	N	N
10	N	10000	15	N	300	N	N	N	N	L	N	700	50	N	700	N	N	N
11	N	7000	20	L	300	N	N	N	N	L	N	500	L	N	700	N	N	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	N	7000	20	L	300	N	L	N	20	L	N	500	70	N	1000	L	N	N
14	N	10000	10	L	500	20	N	20	N	L	N	700	200	N	500	150	N	N
15	N	10000	15	L	500	30	300	15	N	200	N	500	150	N	700	700	N	N
16	N	10000	L	N	200	N	L	N	N	N	N	500	100	N	L	N	N	N
17	N	10000	10	50	200	N	300	N	N	L	N	500	70	N	700	200	N	N
18	N	10000	L	L	300	N	500	N	N	N	N	500	500	N	700	20	N	N
19	N	10000	15	L	200	N	300	N	N	N	N	300	700	N	500	L	N	N
20	N	3000	L	L	100	30	N	L	N	200	N	700	L	N	L	1500	N	N
21	N	G(10000)	50	50	500	20	200	10	N	L	N	500	2000	N	500	300	N	N

Table 34.--Emission spectrographic results from the analysis of the -250 sieve fraction oxalic acid leachate

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	1	20	7	3	.5	.1	N	N	N	150	3000	10	N	N	100	100	500	100	N
2	.7	10	7	2	L	.02	N	N	N	100	2000	5	N	N	50	150	150	50	N
3	1.5	20	10	1.5	.5	.2	N	N	N	200	2000	10	N	N	150	150	200	70	N
4	.5	7	10	5	N	.007	N	N	N	500	2000	3	N	N	50	150	100	20	N
5	.7	10	7	5	N	.1	N	N	N	50	5000	5	N	N	50	100	100	70	N
6	1	10	10	3	L	.3	N	N	N	300	10000	10	N	N	50	70	150	50	N
7	.5	10	15	3	.5	.05	N	N	N	500	3000	10	N	N	100	200	200	30	N
8	.7	20	10	1.5	L	.2	L	N	N	150	G(10000)	7	N	N	100	100	200	100	N
9	.5	15	7	1	N	.07	N	N	N	30	G(10000)	2	N	N	30	100	150	70	N
10	.5	10	7	.7	N	.02	N	N	N	30	700	3	N	N	50	300	150	50	N
11	.7	20	10	1	L	.2	N	N	N	200	2000	10	N	N	70	500	300	100	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	1	15	7	3	.7	.07	N	1000	N	100	2000	7	N	N	50	70	200	70	N
14	2	30	7	1.5	.7	.3	N	1500	N	100	7000	5	N	N	300	500	200	100	L
15	2	20	5	.7	.5	.15	N	500	N	100	1000	15	N	N	150	100	200	70	L
16	1	20	5	1.5	L	.05	N	2000	N	70	1500	3	N	N	150	300	200	70	N
17	.5	15	3	1	N	.07	N	500	N	50	700	5	N	N	70	50	150	50	N
18	1.5	20	7	.5	.5	.1	N	15000	N	100	5000	7	N	N	200	300	300	100	30
19	1.5	30	5	L	L	.5	N	20000	N	30	5000	10	N	N	300	500	500	100	30
20	3	20	7	.5	.5	.1	5	3000	N	100	2000	50	N	N	30	30	100	70	20
21	1.5	20	7	L	L	.07	10	20000	N	50	7000	20	N	N	500	150	300	50	30

Table 34.--Emission spectrographic results from the analysis of the -250 sieve fraction oxalic acid leachate--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr	(5) Pd	(20) Pt
1	N	7000	10	L	100	N	N	N	N	L	N	1000	100	N	L	L	N	N
2	N	1000	10	N	50	N	N	N	N	N	N	300	50	N	N	N	N	N
3	N	3000	20	L	150	N	N	N	N	L	N	500	50	N	L	N	N	N
4	N	700	L	N	50	N	N	N	N	N	N	300	N	N	N	N	N	N
5	N	700	10	N	50	N	N	N	N	N	N	200	N	N	N	N	N	N
6	N	2000	L	L	70	N	N	N	N	L	N	200	N	N	L	70	N	N
7	N	1500	L	N	70	N	N	N	N	N	N	300	L	N	N	N	N	N
8	N	2000	15	N	200	N	N	N	N	L	N	500	50	N	500	N	N	N
9	N	1000	10	N	70	N	N	N	N	N	N	200	50	N	1000	N	N	N
10	N	700	10	N	100	N	N	N	N	N	N	150	L	N	N	N	N	N
11	N	1000	20	N	300	N	N	N	N	L	N	500	50	N	500	N	N	N
12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	N	2000	L	N	150	N	L	N	N	L	N	300	70	N	1000	N	N	N
14	N	7000	20	N	500	L	N	N	N	L	N	1000	300	N	L	150	N	N
15	N	7000	30	L	300	20	200	N	N	L	N	500	200	N	L	700	N	N
16	N	5000	10	N	200	N	N	N	N	N	N	300	150	N	N	N	N	N
17	N	1500	15	N	100	N	N	N	N	N	N	200	100	N	N	70	N	N
18	N	7000	L	N	150	N	500	N	N	N	N	300	300	N	700	L	N	N
19	N	10000	50	L	300	N	500	N	N	N	N	1000	1000	N	700	30	N	N
20	N	700	L	N	70	30	N	N	20	200	N	700	50	N	N	1500	N	N
21	N	G(10000)	50	L	300	L	700	N	N	N	N	500	1000	N	1000	200	N	N

Table 35.--Spectrographic results from the analysis of the -20/+60 fraction C-2 heavy-mineral concentrate from drill core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	2	20	.7	L	N	.7	N	L	N	20	2000	L	N	N	100	100	150	N	N
2	3	15	1	.7	L	1	N	N	N	20	G10000	L	N	N	50	100	150	N	N
3	5	20	2	.7	L	1.5	1.5	L	N	20	3000	L	N	N	150	150	150	N	N
4	5	15	1.5	.7	N	1	N	L	N	L	10000	L	N	N	100	150	150	N	N
5	3	20	1	L	N	1	N	N	N	20	5000	L	N	N	150	100	160	N	N
6	2	15	1	L	N	.7	N	N	N	L	3000	L	N	N	100	100	100	N	N
7	3	20	1	L	L	1.5	N	L	N	L	2000	L	N	N	150	100	200	N	N
8	3	30	1	L	N	.7	N	N	N	N	5000	L	N	N	100	100	150	N	N
9	3	15	1	N	N	.7	N	N	N	L	1000	L	N	N	70	70	70	N	N
10	5	30	1.5	.7	N	2	N	N	N	20	2000	L	N	N	100	200	150	N	N
11	3	20	1.5	.7	N	1	N	N	N	L	2000	L	N	N	100	50	100	N	N
12	3	30	1	N	N	1.5	N	L	N	20	1500	2	N	N	100	200	200	N	N
13	3	20	.7	L	L	.7	N	500	N	30	5000	2	N	N	50	100	200	N	N
14	2	30	.7	N	N	1	N	1000	N	50	7000	2	N	N	100	150	150	N	N
15	3	30	1	N	.5	1.5	N	700	N	30	2000	2	N	N	100	150	200	N	N
16	3	50	1	N	L	1.5	N	1000	N	20	2000	L	N	N	100	150	200	N	N
17	1.5	50	.7	N	N	1.5	N	1500	N	20	7000	2	N	N	50	200	200	N	N
18	2	50	1	L	N	1	N	1500	N	20	700	2	N	N	50	150	150	N	N
19	1.5	30	.7	L	N	1	N	1500	N	20	500	2	N	N	30	150	200	N	N
20	1	30	.5	N	L	1.5	N	2000	N	50	7000	2	N	N	20	50	70	N	N
21	1.5	15	.7	N	N	1.5	N	1500	N	20	5000	2	N	N	200	150	100	N	N

Table 35.--Spectrographic results from the analysis of the -20/+60 fraction C-2 heavy-mineral concentrate from drill core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr	(5) Pd	(20) Pt
1	L	7000	10	N	300	100	N	20	N	200	N	500	N	50	500	150	--	--
2	N	5000	10	N	150	100	N	20	N	500	N	500	N	50	L	150	--	--
3	N	10000	15	N	200	70	N	30	N	300	N	500	N	50	L	150	--	--
4	N	7000	L	N	200	150	N	20	N	200	N	300	N	30	L	200	--	--
5	N	10000	10	N	200	70	N	30	N	300	N	500	N	30	N	150	--	--
6	N	G10000	10	N	200	70	N	15	N	200	N	300	N	30	N	100	--	--
7	L	10000	10	N	300	100	N	20	N	200	N	500	N	70	500	150	--	--
8	L	3000	N	N	300	50	N	20	N	200	N	500	N	30	L	100	--	--
9	N	5000	N	N	200	50	N	20	N	200	N	300	N	30	N	100	--	--
10	N	5000	N	N	300	50	N	30	N	300	N	500	N	30	N	100	--	--
11	N	5000	N	N	300	70	N	20	N	200	N	300	N	30	L	100	--	--
12	N	5000	15	N	300	100	N	20	N	200	N	700	L	50	500	150	--	--
13	150	G10000	N	N	200	150	N	15	N	200	N	500	N	70	L	150	--	--
14	100	5000	N	N	200	50	N	30	N	200	N	700	L	50	L	200	--	--
15	100	10000	N	N	300	70	150	30	N	200	N	500	L	100	500	200	--	--
16	150	10000	N	N	200	50	100	20	N	L	N	500	L	30	L	150	--	--
17	100	G10000	N	N	200	200	L	20	N	L	N	500	50	100	L	700	--	--
18	L	1500	N	N	200	70	700	20	N	N	N	500	L	30	L	150	--	--
19	100	1500	N	N	150	50	500	20	N	200	N	300	70	30	N	150	--	--
20	200	500	N	L	70	200	L	15	N	N	N	700	50	150	N	500	--	--
21	100	G10000	30	N	500	200	N	20	N	300	N	300	300	50	N	500	--	--

Table 36.--Spectrographic results from the analysis of the -20/+60 fraction C-3 heavy-mineral concentrate from drill core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	20	.5	.2	L	5	.05	L	N	N	30	500	N	N	N	N	70	20	N	N
2	20	.7	.5	N	3	.15	N	N	N	20	G100000	L	N	N	N	70	15	N	N
3	50	1	.7	L	5	.2	1	N	N	20	1500	L	N	N	N	150	30	N	N
4	15	.7	.3	N	.5	.15	N	N	N	20	G10000	N	N	N	N	70	20	N	N
5	30	.7	.7	L	7	.15	N	N	N	30	700	N	N	N	N	70	700	N	N
6	30	1	.7	L	5	1.5	N	N	N	30	7000	N	N	N	20	300	30	N	N
7	50	.7	.3	N	7	.15	5	N	N	50	1000	L	N	N	N	150	20	N	N
8	20	5	1	N	1.5	.1	N	N	N	20	G10000	N	N	N	30	20	30	N	N
9	30	.5	.5	N	5	.07	L	N	N	20	700	N	N	N	N	50	15	N	N
10	20	.5	.5	N	3	G2	N	N	N	30	700	N	N	N	L	70	10	N	N
11	50	1	.7	L	7	.2	3	N	N	50	700	N	N	N	N	150	70	N	N
12	15	.7	.2	N	3	.5	N	N	N	L	300	N	N	N	N	50	10	N	N
13	30	.5	.3	L	5	.1	2	N	N	20	1000	L	N	N	N	70	10	10	N
14	10	.7	.2	N	1.5	.15	N	N	N	20	G10000	N	N	N	N	70	L	N	N
15	50	1	.5	N	7	.1	N	N	N	20	500	N	N	N	N	100	20	N	N
16	30	2	.5	N	7	2	2	L	N	100	1000	L	N	N	L	100	30	L	N
17	15	.5	1	L	2	.1	1	N	N	20	3000	N	N	N	N	70	15	N	N
18	30	.5	.2	N	2	.07	2	N	N	L	G10000	N	N	N	N	50	10	N	N
19	50	1	.7	N	5	.7	7	N	N	30	700	N	N	N	N	70	70	N	N
20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	20	.3	.15	N	2	.07	3	N	N	20	300	L	N	N	N	70	L	N	N

Table 36.--Spectrographic results from the analysis of the -20/+60 fraction C-3 heavy-mineral concentrate from drill core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr
1	300	50	N	N	15	N	N	N	N	1000	N	100	N	500	N	100
2	300	150	N	N	15	N	N	15	N	1500	N	150	N	500	N	50
3	500	150	N	N	20	N	N	20	N	2000	N	150	N	1000	N	100
4	L	70	N	N	10	N	N	N	N	10000	N	70	N	100	N	50
5	300	30	N	N	20	N	N	10	N	1500	N	1000	N	500	N	70
6	300	1000	N	N	50	L	N	15	N	1500	N	200	N	700	N	200
7	700	70	N	N	20	L	N	30	N	2000	N	200	N	1000	N	150
8	150	300	N	N	100	N	N	15	N	5000	N	100	N	150	N	30
9	300	20	N	N	15	N	N	10	N	1500	N	200	N	700	N	30
10	150	200	N	N	20	N	N	30	N	1500	N	2000	N	300	N	70
11	500	50	N	N	50	N	N	10	N	200	N	200	N	1000	N	150
12	100	N	N	N	L	N	N	N	N	1000	N	150	N	100	N	30
13	300	50	N	N	10	N	N	10	N	1500	N	20	N	500	N	70
14	L	70	N	N	10	N	N	10	N	7000	N	70	N	100	N	50
15	500	1500	10	N	10	N	N	L	N	1000	N	150	N	700	N	50
16	500	500	N	L	20	N	N	30	N	700	N	300	L	700	N	200
17	300	100	N	N	L	N	7000	N	N	700	N	70	N	500	N	70
18	100	200	N	N	10	N	N	20	N	1500	N	30	N	100	N	30
19	300	300	L	N	15	L	N	30	N	1000	N	700	N	700	N	70
20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	300	150	N	N	10	N	N	L	N	1000	N	30	N	500	N	50

Table 37.--Spectrographic results from the analysis of the -100/+250 fraction C-2 heavy-mineral concentrate from drill core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	5	20	7	.5	N	G2	N	N	N	20	1000	L	N	N	70	1000	100	N	N
2	5	20	3	L	N	2	N	N	N	L	5000	L	N	N	70	300	150	N	N
3	7	20	7	.5	L	2	N	N	N	L	3000	L	N	N	100	300	50	N	N
4	7	20	.7	L	N	G2	N	N	N	L	5000	L	N	N	70	300	70	N	N
5	7	20	10	.5	N	2	N	N	N	L	1000	N	N	N	70	150	100	N	N
6	5	20	5	L	N	G2	N	N	N	L	700	L	N	N	50	200	70	N	N
7	5	30	5	.5	N	G2	N	N	N	L	10000	L	N	N	70	100	100	N	N
8	5	20	5	.5	N	G2	N	N	N	20	2000	L	N	N	100	100	150	N	N
9	5	30	7	.7	L	G2	N	N	N	20	2000	L	N	N	150	200	200	N	N
10	3	30	1.5	.5	N	G2	N	N	N	20	2000	L	N	N	100	150	200	N	N
11	5	30	2	L	1	2	N	N	N	20	2000	L	N	N	100	300	300	N	N
12	3	50	1.5	N	N	G2	N	N	N	L	1000	L	N	N	100	500	200	N	N
13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	2	30	.7	N	N	G2	N	1000	N	30	G10000	L	N	N	100	200	200	N	N
15	3	30	1	N	.5	G2	N	L	N	L	3000	L	N	N	100	150	150	N	N
16	3	50	1	N	L	2	N	1500	N	30	5000	L	N	N	200	150	300	N	N
17	1	50	1	N	L	G2	N	L	N	L	2000	L	N	N	100	150	100	N	N
18	2	50	.7	N	N	2	N	2000	N	L	2000	2	N	N	100	100	200	N	N
19	1.5	30	.7	N	N	G2	N	1000	N	L	100	L	N	N	70	200	150	N	N
20	.7	30	1	N	L	G2	N	1000	N	L	G10000	L	N	N	70	100	70	N	N
21	1	20	.7	N	L	G2	N	1500	N	L	10000	2	N	N	1000	150	300	N	L

Table 37.--Spectrographic results from the analysis of the -100/+250 fraction C-2 heavy-mineral concentrate from drill core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr
1	150	7000	10	50	100	70	N	70	N	200	N	700	N	100	L	2000
2	100	10000	10	L	150	100	N	50	N	200	N	700	N	70	L	1000
3	150	G10000	N	N	200	100	N	50	N	200	N	1000	N	70	L	500
4	200	7000	N	L	70	50	N	70	N	200	N	500	N	70	N	G2000
5	N	7000	N	L	70	30	N	70	N	200	N	500	N	70	N	700
6	200	7000	N	50	50	30	N	50	N	200	N	500	N	100	N	G2000
7	L	5000	N	L	100	50	N	50	N	200	N	500	N	70	N	1500
8	200	G10000	N	L	100	70	N	50	N	200	N	700	N	100	L	2000
9	150	G10000	N	L	200	70	N	50	N	200	N	700	N	150	L	700
10	200	7000	N	L	200	70	N	30	N	200	N	700	N	70	N	1000
11	100	G10000	N	L	300	150	N	30	N	L	N	700	N	70	L	1000
12	150	7000	N	50	200	100	N	30	N	N	N	700	N	70	L	2000
13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	150	7000	N	50	200	70	L	20	N	200	N	1000	N	50	N	700
15	150	G10000	N	50	300	100	300	30	N	200	N	500	200	100	500	G2000
16	L	G10000	N	L	300	100	200	20	N	200	N	700	L	50	N	300
17	L	G10000	N	50	70	200	200	50	N	N	N	300	N	100	N	G2000
18	L	5000	N	L	150	100	3000	20	N	N	N	500	100	30	N	500
19	L	5000	N	50	100	70	700	20	N	N	N	500	150	50	N	1500
20	300	5000	N	50	50	200	300	30	N	L	N	500	N	150	N	2000
21	N	G10000	50	L	1500	1500	L	20	N	300	N	200	700	50	L	2000

Table 38.--Spectrographic results from the analysis of the -100/+250 fraction C-3 heavy-mineral concentrate from drill core

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(.1) Ca %	(.1) Fe %	(.05) Mg %	(.5) Na %	(.5) P %	(.005) Ti %	(1) Ag	(500) As	(20) Au	(20) B	(50) Ba	(2) Be	(20) Bi	(50) Cd	(20) Co	(20) Cr	(10) Cu	(10) Ga	(20) Ge
1	5	.3	.3	N	1.5	.7	N	N	N	20	2000	L	N	N	N	20	300	N	N
2	5	.7	.3	N	1.5	.5	50	N	N	30	G10000	L	N	N	N	30	100	N	N
3	15	3	1.5	N	2	1	N	N	N	50	10000	L	N	N	20	100	150	L	N
4	3	.2	.3	N	L	.5	N	N	N	L	G10000	N	N	N	N	30	70	N	N
5	15	.5	1	N	1	1	N	N	N	20	10000	N	N	N	N	50	50	N	N
6	10	.7	1	N	1	1	N	N	N	20	1500	L	N	N	N	30	L	N	N
7	2	.3	.5	N	L	.15	N	N	N	L	G10000	N	N	N	N	20	70	N	N
8	20	.5	1.5	N	2	.7	N	N	N	30	1500	L	N	N	L	50	15	N	N
9	15	.5	1	N	1	.7	N	N	N	20	G10000	L	N	N	N	30	100	N	N
10	3	.5	.7	N	.5	.7	N	N	N	20	G10000	L	N	N	N	20	15	N	N
11	10	.7	1	N	1	1	N	N	N	30	1500	L	N	N	N	50	L	N	N
12	15	.5	1	N	.7	2	N	N	N	30	3000	L	N	N	N	30	L	N	N
14	3	.5	.07	N	.7	.7	N	N	N	20	G10000	N	N	N	N	30	20	N	N
15	20	.5	.07	N	2	.5	N	N	N	20	3000	L	N	N	N	20	10	N	N
16	20	1	.5	N	1.5	G2	N	N	N	50	3000	L	N	N	L	70	20	10	N
17	10	1	.5	N	1	1	N	N	N	30	2000	N	N	N	L	70	15	L	N
18	10	.7	.2	N	.7	.7	N	N	N	20	G1000	N	N	N	N	30	70	N	N
19	20	1	.5	N	1.5	1.5	N	N	N	30	G1000	L	N	N	L	70	10	10	N
20	.7	.5	.1	N	N	.7	N	N	N	L	G1000	N	N	N	N	L	L	N	N
21	2	1.5	.15	N	L	1	N	N	N	30	3000	L	N	N	30	50	20	N	N

Table 38.--Spectrographic results from the analysis of the -100/+250 fraction C-3 heavy-mineral concentrate from drill core--Continued

[Ca, Fe, Mg, Na, P, and Ti reported in percent, all other elements reported in ppm; N, not detected; L, detected at a level below the limit of determination; G, detected at a level greater than the upper limit of determination; -- no data]

Field No.	(100) La	(20) Mn	(10) Mo	(50) Nb	(10) Ni	(20) Pb	(200) Sb	(10) Sc	(20) Sn	(200) Sr	(200) Th	(20) V	(50) W	(20) Y	(500) Zn	(20) Zr
1	100	200	N	L	L	N	N	15	N	1000	N	100	N	200	L	G2000
2	100	200	N	L	L	1500	N	10	N	200	N	100	100	150	700	G2000
3	200	1000	N	L	30	L	N	30	N	1000	N	200	N	300	N	G2000
4	L	100	N	N	N	L	N	N	N	3000	N	30	N	70	1000	G2000
5	150	500	N	N	L	N	300	15	N	500	N	150	N	200	500	G2000
6	100	500	N	N	L	N	N	15	N	300	N	150	N	500	N	G2000
7	N	50	N	N	N	N	1	N	N	7000	N	20	N	50	N	G2000
8	300	300	N	N	L	L	L	20	N	1000	N	150	N	700	N	G2000
9	200	500	N	N	L	500	200	10	N	1500	N	150	N	300	G2000	G2000
10	N	70	N	N	N	N	N	10	N	500	N	100	N	100	N	G2000
11	150	200	N	N	L	N	N	15	N	500	N	100	N	500	700	G2000
12	100	200	N	N	L	N	300	20	N	300	N	150	N	500	L	G2000
14	L	150	N	N	N	N	N	L	N	5000	N	100	N	70	N	G2000
15	300	500	10	N	L	N	N	L	N	700	N	30	70	700	N	G2000
16	300	700	N	N	L	L	N	20	N	1000	N	200	N	500	500	G2000
17	100	1500	N	N	L	30	N	15	N	500	N	100	N	500	1500	G2000
18	100	200	N	N	10	N	300	15	N	2000	N	70	50	100	500	G2000
19	200	1500	N	N	10	N	N	30	N	500	N	150	N	700	700	G2000
20	L	50	N	N	N	N	1	N	N	1500	N	30	N	50	N	G2000
21	L	G10000	N	N	50	50	N	L	N	200	N	150	150	100	L	G2000

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