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Spectrographic and chemical analyses  
of whole-rock and insoluble-residue samples,  
Rolla 1° x 2° quadrangle, Missouri:  
Drill holes no. 23 and 24

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open entry



by

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## Introduction

Geochemical studies of the Rolla, Mo., 1° x 2° quadrangle were begun in 1977 as part of a joint multidisciplinary study of the quadrangle by the U.S. Geological Survey and the Division of Geology and Land Survey, Missouri Department of Natural Resources. The study is to assess the mineral resource potential of the area by integrated geologic, geochemical, and geophysical studies.

The geochemical work to date has been directed at the characterization of the sedimentary and igneous rocks in the quadrangle through spectrographic and chemical analyses of whole-rock samples and dilute-hydrochloric-acid insoluble-residue samples of whole rock from widely spaced drill holes. Sixty-two drill holes have been selected for study from the sample library of the Missouri Division of Geology and Land Survey. None of the holes are company-confidential, none intersect economically significant mineralized ground, and only a few are located in known ore-bearing trends.

The analytical results for drill hole no. 23, Missouri log numbers 21239 and 23878, and for drill hole no. 24, Missouri log number 12320, are given in this report. Drill hole no. 23 is located in sec. 8, T. 28 N., R. 6 E., in Wayne County, and drill hole no. 24 is located in sec. 9, T. 35 N., R. 2 W., in Crawford County.

Data of the whole-rock samples for drill hole no. 23 are listed in table 1, and data for the insoluble-residue samples for drill hole no. 23 are listed in table 2. Data of the insoluble-residue samples for drill hole no. 24 are listed in table 3. Missouri log number, county, and location allow correlation with the stratigraphic logs on file at the Missouri Division of Geology and Land Survey in Rolla, Mo.

## Preparation and analysis of samples

The samples were pulverized to minus-140-mesh (0.105 mm) in a vertical grinder with ceramic plates. Some insoluble-residue samples contained only a few milligrams of material, and these were hand-ground in an agate mortar and pestle. A hand magnet was passed over the insoluble residue samples before grinding to remove filings or chips of drill bit that might be present.

Each sample was analyzed semiquantitatively for 31 elements using a six-step, D.C.-arc, optical-emission spectrographic method (Grimes and Marranzino, 1968). In addition, where sufficient sample was available, each sample was analyzed for zinc by an atomic-absorption technique using deuterium background correction (Ward and others, 1969, p. 33).

The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, 0.15, and multiples of 10 of these numbers) and are approximate geometric midpoints of the concentration ranges. The precision is shown to be within one adjoining reporting interval on each side of the reported values 83 percent of the time and within two adjoining intervals on each side of the reported value 96 percent of the time (Motooka and Grimes, 1976).

The visual lower limits of determination for the 31 elements that were determined spectrographically and are included in this report are as follows:

For those given in percent:

Calcium	0.05
Iron	0.05
Magnesium	0.02
Titanium	0.002

For those given in ppm:

Antimony	100	Molybdenum	5
Arsenic	200	Nickel	5
Barium	20	Niobium	20
Beryllium	1	Scandium	5
Bismuth	10	Silver	0.5
Boron	10	Strontium	100
Cadmium	20	Thorium	100
Chromium	10	Tin	10
Cobalt	5	Tungsten	50
Copper	5	Vanadium	10
Gold	10	Yttrium	10
Lanthanum	20	Zinc	200
Lead	10	Zirconium	10
Manganese	10		

## Description of samples

Each sample is identified by an eight-character code. The first three numbers signify the USGS hole number (for example, 001=hole 1, 002=hole 2, and so forth). These three numbers are followed by a capital letter (W, U, or I), which indicates washed (W) or unwashed (U) whole rock in table 1 and insoluble residue (I) in table 2. The last four digits identify the depth of the sample from the drill-hole collar. Each sample is a composite of 10 feet of drill core from above the depth indicated.

The stratigraphic unit of the sample is identified by a coded number in the first column (tables 1 and 2) following the sample number. The code and formation names are as follows:

<u>code</u>	<u>formation</u>
1	Precambrian rocks
2	Lamotte Sandstone
3	Bonneterre Formation
4	Davis Formation
5	Derby-Doe Run* Formation
6	Potosi Dolomite
7	Eminence Dolomite
8	Gunter Sandstone Member of Gasconade Dolomite
9	Gasconade Dolomite (part)
10	Roubidoux Formation
11	Residuum
13	Basal conglomerate
14	Derby-Doe Run and Davis Formations, undifferentiated
16	Van Buren Formation

\*As used by McCracken, 1961.

## Explanation of data

The columns in tables 1 and 2 have headings of sample, formation, and elements. Columns in which the element heading is preceded by an S contain the emission-spectrographic data. The prefix AA in the zinc column heading indicates that the results were determined by atomic absorption.

Iron, magnesium, calcium, and titanium are reported in percent (%); all other elements are in parts per million. Other symbols shown on the tables are:

N = Not detected at the level of detection;

-- = Not determined;

< = Detected, but below the lowest limit of detection, which is value shown; and

> = Greater than value shown.

Elements that were not detected in any of the samples of a sample set (whole rock or insoluble residue) are not reported in the tables.

## References cited

- Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analyses of geologic materials: U.S. Geological Survey Circular 591, 6 p.
- McCracken, M. H., comp., and others, 1961, Geologic map of Missouri: Missouri Division of Geological Survey and Water Resources, scale 1:500,000.
- Motooka, J. M., and Grimes, D. J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analyses: U.S. Geological Survey Circular 738, 25 p.
- Ward, F. N., Nakagawa, H. M., Harms, T. F., and Van Sickle, G. H., 1969, Atomic absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO	S-CR
023W0660	6	.15	10.0	20.00	.010	150	N	10	20	<1.0	N	10
023W0670	6	.10	10.0	10.00	.010	70	N	<10	<20	<1.0	N	10
023W0680	6	.20	10.0	15.00	.010	150	N	<10	<20	<1.0	N	10
023W0690	6	.20	10.0	15.00	.010	150	N	<10	<20	<1.0	N	10
023W0700	6	.30	>10.0	15.00	.007	150	N	<10	<20	<1.0	N	<10
023W0710	6	.15	10.0	10.00	.007	100	N	<10	N	<1.0	N	<10
023W0720	6	.20	>10.0	15.00	.010	150	N	<10	<20	<1.0	N	<10
023W0730	6	.70	10.0	15.00	.010	150	N	10	<20	<1.0	N	<10
023W0740	6	.20	10.0	15.00	.010	100	N	<10	N	<1.0	N	15
023W0750	6	.10	>10.0	15.00	.010	100	N	<10	N	<1.0	N	N
023W0760	6	.50	10.0	15.00	.007	200	N	<10	<20	<1.0	N	<10
023W0770	6	.10	10.0	10.00	.007	70	N	<10	N	<1.0	N	N
023W0780	6	.10	10.0	10.00	.005	100	N	<10	N	<1.0	N	N
023W0790	6	.30	>10.0	15.00	.005	150	N	<10	<20	<1.0	N	N
023W0800	6	.15	10.0	20.00	.005	100	N	<10	N	<1.0	N	<10
023W0810	6	.30	>10.0	20.00	.015	150	1.0	10	<20	<1.0	N	<10
023W0820	6	.15	10.0	20.00	.015	100	N	<10	<20	<1.0	N	<10
023W0830	6	.10	>10.0	20.00	.010	100	N	<10	N	<1.0	N	<10
023W0840	5	.15	>10.0	20.00	.015	100	N	15	<20	<1.0	N	N
023W0850	5	.15	10.0	20.00	.003	150	N	<10	<20	<1.0	N	<10
023W0860	5	.70	10.0	20.00	.030	200	N	30	50	<1.0	N	20
023W0870	5	.15	>10.0	20.00	.020	150	N	20	<20	<1.0	N	10
023W0880	5	.70	10.0	15.00	.020	200	N	10	N	<1.0	N	10
023W0890	5	.20	10.0	15.00	.020	150	N	15	<20	<1.0	N	15
023W0900	5	.30	10.0	20.00	.050	150	N	20	20	<1.0	N	20
023W0910	5	.20	10.0	15.00	.030	150	N	20	20	<1.0	N	15
023W0920	5	.20	7.0	20.00	.010	150	N	<10	N	<1.0	N	N
023W0930	5	.10	7.0	10.00	<.002	100	N	N	N	<1.0	N	N
023W0940	5	.30	>10.0	>.05	.030	150	N	10	<20	<1.0	N	N
023W0950	5	.20	10.0	15.00	.015	100	N	<10	<20	<1.0	N	15
023W0960	4	.20	10.0	15.00	.010	150	N	<10	<20	<1.0	N	N
023W0970	4	.20	10.0	20.00	.015	150	N	<10	<20	<1.0	N	N
023W0980	4	.20	10.0	15.00	.015	150	N	10	<20	<1.0	N	N
023W0990	4	.50	10.0	20.00	.050	200	N	15	50	<1.0	N	N
023W1000	4	.20	10.0	20.00	.020	150	N	10	20	<1.0	N	20
023W1010	4	.20	10.0	10.00	.010	150	N	<10	<20	<1.0	N	10
023W1020	4	.20	10.0	15.00	.020	150	N	<10	20	<1.0	N	<10
023W1030	4	.20	10.0	15.00	.020	150	N	10	<20	<1.0	N	<10
023W1040	4	.30	10.0	15.00	.020	150	N	15	<20	<1.0	N	10
023W1050	4	.30	10.0	15.00	.020	200	N	10	<20	<1.0	N	10
023W1060	4	.20	10.0	15.00	.030	150	N	10	N	<1.0	N	10
023W1070	4	.30	10.0	15.00	.020	150	N	15	N	<1.0	N	10
023W1080	4	.50	10.0	15.00	.020	200	N	20	N	<1.0	N	<10
023W1090	4	.50	10.0	15.00	.020	200	N	15	N	<1.0	N	15
023W1100	4	.50	>10.0	>20.00	.010	300	N	15	N	<1.0	N	10

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-Cu	S-LA	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-Zn
023W0660	<5	<20	N	N	<10	N	100	15	<10	N	N
023W0670	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0680	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0690	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0700	5	<20	N	N	<10	N	N	10	<10	<10	N
023W0710	5	<20	N	N	<10	N	N	15	<10	<10	N
023W0720	<5	<20	N	N	<10	N	100	10	<10	<10	N
023W0730	5	<20	N	N	<10	N	<100	20	<10	10	<5
023W0740	<5	<20	N	N	<10	N	<100	10	<10	<10	N
023W0750	<5	<20	N	N	<10	N	<100	10	<10	<10	N
023W0760	<5	<20	N	N	<10	N	N	10	<10	<10	<5
023W0770	<5	<20	N	N	<10	N	N	20	<10	<10	N
023W0780	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0790	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0800	<5	<20	N	N	<10	N	N	10	<10	<10	N
023W0810	<5	<20	N	N	<10	N	150	10	<10	<10	N
023W0820	<5	<20	N	N	<10	N	100	15	N	<10	N
023W0830	<5	<20	N	N	<10	5	100	15	N	N	N
023W0840	<5	<20	N	N	<10	5	100	15	<10	<10	N
023W0850	<5	<20	N	N	<10	<5	100	10	N	<10	N
023W0860	7	<20	N	7	15	<5	150	10	N	15	N
023W0870	<5	<20	N	N	<10	<5	100	15	N	<10	N
023W0880	<5	N	N	<5	<10	5	150	10	N	10	N
023W0890	<5	N	N	N	<10	5	150	10	N	10	N
023W0900	5	N	N	5	<10	5	150	15	N	10	N
023W0910	<5	N	N	N	<10	5	150	20	N	15	N
023W0920	<5	N	N	N	<10	5	150	15	N	10	N
023W0930	N	N	N	N	N	<5	N	10	N	10	N
023W0940	<5	N	N	N	<10	<5	150	10	N	10	N
023W0950	<5	N	N	N	<10	<5	100	10	N	10	N
023W0960	N	N	N	N	<10	N	150	15	N	10	N
023W0970	<5	N	N	N	<10	5	150	10	N	15	<5
023W0980	<5	N	N	N	<10	5	150	15	N	10	N
023W0990	<5	N	N	N	<10	5	150	15	10	20	N
023W1000	<5	N	N	N	<10	<5	150	15	N	15	<5
023W1010	5	N	N	N	<10	N	<100	10	<10	70	N
023W1020	<5	N	N	N	<10	<5	150	15	N	15	N
023W1030	<5	N	N	N	<10	5	150	15	N	10	N
023W1040	<5	N	N	N	<10	<5	150	15	N	20	<5
023W1050	<5	N	N	N	<10	<5	150	10	N	20	<5
023W1060	N	N	N	N	<10	N	100	15	10	15	N
023W1070	5	N	N	N	<10	<5	100	10	N	15	N
023W1080	<5	N	N	N	<10	<5	100	10	<10	15	N
023W1090	<5	N	N	N	<10	N	100	15	<10	15	N
023W1100	<5	N	N	N	10	N	100	N	N	10	N

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-D	S-BA	S-BE	S-CO	S-CR
023W1110	4	.70	>10.0	20.00	.030	300	N	20	<20	<1.0	N	15
023W1120	4	1.00	10.0	20.00	.050	500	N	10	30	N	N	10
023W1130	4	1.00	10.0	20.00	.070	700	N	10	50	N	N	15
023W1140	4	1.00	10.0	20.00	.050	500	N	10	50	N	N	20
023W1150	4	.70	10.0	20.00	.070	500	N	15	50	<1.0	N	20
023W1160	3	1.00	>10.0	20.00	.070	500	N	15	50	<1.0	N	30
023W1170	3	1.00	10.0	20.00	.050	500	N	30	30	<1.0	N	20
023W1180	3	.70	10.0	15.00	.070	500	N	20	70	<1.0	N	20
023W1190	3	.50	>10.0	20.00	.020	500	N	15	20	N	N	10
023W1200	3	1.50	10.0	15.00	.100	500	N	30	100	<1.0	7	50
023W1210	3	1.00	10.0	20.00	.015	500	N	20	20	N	N	10
023W1220	3	.70	10.0	20.00	.020	500	N	30	20	N	N	20
023W1230	3	1.50	10.0	15.00	.150	300	N	50	150	1.0	5	30
023W1240	3	1.50	10.0	20.00	.100	500	N	30	100	<1.0	10	50
023W1250	3	1.50	10.0	15.00	.150	300	N	70	150	1.5	7	50
023W1260	3	1.00	10.0	20.00	.070	500	N	30	70	<1.0	N	20
023W1270	3	1.00	10.0	20.00	.070	500	N	50	70	<1.0	5	30
023W1280	3	1.00	10.0	20.00	.050	500	N	30	20	<1.0	N	20
023W1290	3	1.50	10.0	20.00	.070	500	N	50	30	<1.0	5	30
023W1300	3	1.00	10.0	20.00	.030	300	N	30	50	<1.0	N	20
023W1310	3	.50	10.0	20.00	.020	500	N	15	20	<1.0	N	10
023W1320	3	.50	10.0	20.00	.020	300	N	15	<20	<1.0	N	10
023W1330	3	.30	10.0	20.00	.010	300	N	10	N	N	N	N
023W1340	3	.70	10.0	20.00	.070	300	N	30	50	1.0	5	20
023W1350	3	.50	10.0	20.00	.020	300	N	20	<20	<1.0	N	10
023W1360	3	1.00	10.0	20.00	.070	500	N	30	30	<1.0	5	15
023W1370	3	1.00	10.0	20.00	.100	500	N	50	100	<1.0	5	20
023W1380	3	1.00	10.0	20.00	.100	500	N	30	100	<1.0	5	20
023W1390	3	.70	10.0	15.00	.070	500	N	20	30	<1.0	N	10
023W1400	3	1.50	7.0	15.00	.070	300	N	20	100	<1.0	7	15
023W1410	3	.70	10.0	20.00	.030	500	N	15	30	N	N	10
023W1420	3	.70	10.0	20.00	.070	500	N	30	70	<1.0	N	15
023W1430	3	1.00	10.0	20.00	.070	700	N	30	70	<1.0	5	20
023W1440	3	.70	10.0	20.00	.050	1,000	N	30	50	<1.0	N	10
023W1450	3	2.00	7.0	15.00	.100	700	N	70	150	1.0	10	20
023W1460	3	1.50	7.0	15.00	.100	2,000	N	50	200	1.0	7	20
023W1470	3	1.50	10.0	20.00	.150	2,000	N	50	150	1.0	5	15
023W1480	3	1.50	7.0	20.00	.150	1,000	N	100	150	1.0	5	30
023W1490	3	3.00	10.0	15.00	.200	3,000	N	100	200	1.0	7	30
023W1500	3	3.00	7.0	20.00	.200	2,000	N	100	100	1.0	5	20
023W1510	3	3.00	3.0	20.00	.200	700	N	150	200	1.5	5	30
023W1520	3	2.00	3.0	15.00	.200	700	N	70	300	1.0	5	15
023W1530	3	3.00	5.0	15.00	.200	1,000	N	70	300	1.0	7	15
023W1540	3	3.00	5.0	10.00	.150	5,000	N	70	200	3.0	7	15
023W1550	1	5.00	1.0	.50	.300	150	N	70	700	1.5	5	15

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-CU	S-LA	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN
023W1110	<5	N	N	N	15	N	100	N	N	10	N
023W1120	<5	N	N	5	15	N	100	N	N	15	N
023W1130	5	N	N	5	10	N	100	N	N	30	<5
023W1140	7	N	N	7	30	N	100	N	N	20	N
023W1150	5	N	N	5	15	N	100	10	N	30	<5
023W1160	5	N	N	7	20	N	100	10	N	30	N
023W1170	5	N	N	7	15	N	100	10	N	20	<5
023W1180	<5	N	N	5	30	N	150	10	N	30	N
023W1190	<5	N	N	N	10	N	100	10	N	10	<5
023W1200	30	N	N	20	70	N	100	20	10	50	N
023W1210	5	N	N	N	15	N	100	N	N	15	N
023W1220	7	N	N	N	20	N	100	N	N	20	N
023W1230	7	20	N	10	30	5	100	30	15	100	N
023W1240	100	20	N	15	70	5	100	50	20	100	N
023W1250	10	20	N	15	30	7	100	50	20	150	15
023W1260	10	N	N	7	20	5	100	15	10	50	N
023W1270	7	N	N	7	30	N	100	15	N	50	<5
023W1280	5	N	N	5	50	N	100	10	N	20	N
023W1290	10	N	N	7	100	N	100	15	10	20	<5
023W1300	5	N	N	N	70	N	N	N	N	30	N
023W1310	5	N	N	N	30	N	100	N	N	10	N
023W1320	<5	N	N	N	30	N	100	N	N	10	N
023W1330	<5	N	N	N	20	N	100	N	N	10	5
023W1340	7	N	N	10	50	5	100	30	10	20	N
023W1350	<5	N	N	N	30	N	100	N	N	20	<5
023W1360	5	N	N	7	50	N	100	15	10	20	<5
023W1370	7	N	N	10	70	5	100	15	15	30	N
023W1380	5	N	N	7	50	N	100	10	15	50	N
023W1390	5	N	N	N	30	N	100	10	10	15	N
023W1400	10	N	N	10	50	N	100	10	15	30	N
023W1410	5	N	N	5	20	N	100	N	15	10	N
023W1420	5	N	N	5	30	N	N	10	10	15	<5
023W1430	7	N	N	10	50	N	N	15	15	30	N
023W1440	<5	N	N	5	20	N	100	N	10	15	N
023W1450	20	30	N	15	100	7	100	50	20	100	<5
023W1460	5	50	N	10	20	7	100	30	20	100	<5
023W1470	5	30	N	7	20	5	100	15	20	70	5
023W1480	5	50	N	10	10	7	150	30	30	150	5
023W1490	7	50	N	10	15	7	100	30	50	150	10
023W1500	N	20	N	10	10	7	100	20	50	150	10
023W1510	N	50	N	15	15	10	200	30	50	100	20
023W1520	N	50	N	15	10	7	150	20	50	150	20
023W1530	N	50	N	15	15	7	150	20	30	150	20
023W1540	N	30	N	15	10	7	100	20	30	100	30
023W1550	<5	70	<20	10	N	10	N	30	50	300	100

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23,  
 Rolla 1° x 2° quadrangle, Missouri--continued

sample	FORM	S-FEX	S-MG%	S-CA%	S-TIX	S-MN	S-AG	S-B	S-BA	S-BE	S-CO	S-CR
023W1560	1	5.00	1.0	.50	.200	700	N	30	500	1.5	7	10
023W1565	1	5.00	.7	.30	.300	200	N	30	700	2.0	7	10

TABLE 1.--Spectrographic and atomic-absorption analyses of whole-rock samples from drill hole No. 23,  
 Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-CU	S-LA	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN
023W1560	N	50	<20	10	50	10	N	30	50	300	90
023W1565	N	70	<20	10	10	10	N	50	30	200	80

TABLE 2.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-H	S-BA	S-BE	S-CO	S-CR	S-CU
02310660	6	.10	.15	.30	.015	30	N	30	30	N	N	N	N
02310670	6	1.50	.70	.70	.100	300	N	20	300	1.0	N	10	30
02310690	6	1.50	.30	.50	.070	300	N	30	100	3.0	5	10	5
02310700	6	.15	.20	.70	.050	50	N	30	70	N	N	N	<5
02310710	6	5.00	2.00	.50	.500	100	N	200	150	5.0	10	150	150
02310720	6	.20	.50	1.00	.070	100	N	20	100	N	N	50	5
02310730	6	5.00	1.50	.20	.300	1,000	N	200	100	5.0	15	150	300
02310770	6	7.00	3.00	.70	.100	300	N	300	150	15.0	5	70	30
02310780	6	.50	.50	.70	.030	50	N	30	70	<1.0	N	N	20
02310790	6	1.50	1.00	.30	.030	150	N	100	70	7.0	N	10	10
02310830	6	1.50	2.00	.70	.300	70	N	100	70	3.0	5	70	10
02310840	5	2.00	2.00	.70	.500	100	N	300	100	3.0	7	100	30
02310850	5	.20	.20	.30	.070	15	N	30	100	N	N	N	30
02310855	5	3.00	2.00	2.00	.300	100	N	100	200	3.0	15	70	30
02310860	5	3.00	3.00	.50	.500	70	N	200	100	5.0	20	150	150
02310870	5	2.00	2.00	.30	.500	70	N	200	100	3.0	7	70	20
02310880	5	5.00	3.00	.30	.700	100	N	200	150	3.0	30	150	50
02310890	5	2.00	3.00	.50	.700	70	N	150	150	3.0	7	150	15
02310900	5	3.00	2.00	.20	.700	50	N	150	150	3.0	15	150	30
02310910	5	2.00	2.00	.70	.500	50	N	150	150	3.0	5	100	10
02310920	5	7.00	3.00	.50	.700	700	N	150	200	5.0	7	150	15
02310930	5	1.00	1.50	.70	.200	50	N	100	100	3.0	N	50	20
02310940	5	1.50	1.50	.70	.300	300	N	100	150	1.0	5	150	300
02310950	5	.70	1.00	.70	.150	30	N	70	100	<1.0	N	20	30
02310960	4	.50	.70	.70	.300	30	N	50	500	1.0	N	20	10
02310970	4	.50	.50	.70	.150	50	N	50	200	1.0	N	20	100
02310990	4	.50	.70	.70	.200	30	N	30	150	<1.0	N	15	<5
02311000	4	.50	.50	1.00	.200	10	N	50	150	1.0	N	20	5
02311005	4	3.00	5.00	5.00	.500	100	2.0	150	700	7.0	10	50	200
02311010	4	.30	.50	.30	.150	30	N	50	150	<1.0	N	15	20
02311020	4	.20	.30	.30	.100	15	N	30	200	<1.0	N	15	10
02311030	4	.70	.70	.20	.200	20	N	50	150	1.0	5	30	15
02311040	4	2.00	2.00	.20	.700	30	N	100	150	2.0	5	150	5
02311050	4	1.00	1.00	.30	.300	20	N	70	150	1.5	5	70	15
02311060	4	2.00	2.00	.70	.500	30	N	150	150	3.0	5	100	5
02311065	4	.50	1.00	1.00	.150	20	N	50	200	1.0	N	20	7
02311070	4	7.00	1.50	.70	.300	50	N	150	100	1.5	10	100	30
02311080	4	5.00	2.00	.50	.700	70	N	200	170	2.0	15	150	50
02311090	4	3.00	2.00	1.00	.500	70	N	200	100	2.0	15	100	50
02311100	4	3.00	1.50	.20	.500	70	N	150	150	2.0	10	100	30
02311110	4	7.00	2.00	.50	1.000	70	N	200	150	1.5	20	150	100
02311120	4	2.00	1.50	1.50	.500	50	N	100	300	1.5	10	50	30
02311130	4	1.00	1.50	1.50	.300	50	N	50	200	<1.0	5	20	20
02311140	4	10.00	1.50	1.00	.700	70	N	100	300	1.0	20	70	150
02311150	4	5.00	1.50	1.00	.500	50	N	70	200	1.5	20	50	70

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TABLE 2.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-LA	S-MO	S-NB	S-NI	S-PB	S-SC	S-SN	S-V	S-Y	S-ZN	S-ZR	AA-ZN
02310660	N	N	N	5	N	N	N	N	N	N	N	<5
02310670	N	N	N	5	20	5	N	15	10	V	100	--
02310690	N	N	N	15	N	N	N	20	N	V	200	--
02310700	N	N	N	5	N	N	N	N	N	V	10	N
02310710	N	N	<20	30	15	7	N	100	10	V	200	--
02310720	N	N	N	5	150	N	N	10	N	V	15	<25
02310730	N	N	N	50	70	5	N	200	10	V	150	--
02310770	N	N	N	20	150	N	N	100	N	V	20	N
02310780	N	N	N	5	N	N	N	10	N	V	N	--
02310790	N	N	N	7	50	N	N	30	N	V	10	--
02310830	N	N	<20	20	10	5	N	70	N	N	100	--
02310840	N	N	<20	20	20	7	N	70	10	V	150	<50
02310850	N	N	N	7	N	N	N	10	N	V	70	N
02310855	N	5	N	50	70	5	N	70	N	V	100	<50
02310860	N	N	<20	50	15	7	N	100	10	V	100	--
02310870	N	N	<20	30	10	7	N	100	10	V	100	N
02310880	30	N	<20	150	50	10	N	100	15	V	150	N
02310890	20	N	<20	20	10	10	N	70	15	V	150	N
02310900	N	N	<20	30	15	7	N	100	15	V	100	N
02310910	N	N	N	20	15	5	N	100	10	V	100	N
02310920	N	N	<20	30	10	10	N	100	15	V	100	--
02310930	N	N	N	15	10	5	N	70	10	V	70	N
02310940	N	N	N	20	150	N	N	30	N	200	70	--
02310950	N	N	N	7	N	N	N	30	N	V	50	N
02310960	N	N	N	5	N	N	N	70	10	V	700	--
02310970	N	N	N	7	20	N	N	20	N	V	200	--
02310990	N	N	N	5	N	N	N	15	N	V	70	N
02311000	N	N	N	5	10	N	N	30	N	V	100	N
02311005	N	N	N	70	70	N	N	150	N	V	150	--
02311010	N	N	N	7	10	N	N	10	N	V	100	N
02311020	N	N	N	5	N	N	N	10	N	V	150	N
02311030	N	N	N	15	15	N	N	20	N	V	70	N
02311040	N	N	20	20	20	N	N	100	20	V	500	N
02311050	N	N	N	10	10	N	N	50	15	N	500	N
02311060	N	N	N	20	20	5	N	70	10	V	300	N
02311065	N	N	N	10	N	N	N	20	N	V	100	--
02311070	N	N	N	50	100	7	N	50	10	V	200	N
02311080	20	N	20	50	100	10	N	70	15	V	200	5
02311090	20	N	<20	50	100	7	N	70	10	V	150	<10
02311100	20	N	<20	30	200	5	N	50	10	V	150	<25
02311110	30	N	20	100	300	15	N	70	20	V	200	<10
02311120	N	N	N	20	150	5	N	30	15	V	150	<10
02311130	N	N	N	15	15	N	N	20	N	V	150	<10
02311140	N	N	N	50	300	5	N	30	15	V	200	N
02311150	N	N	<20	50	150	<5	N	50	<10	V	150	N

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TABLE 2.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-B	S-BA	S-BE	S-CO	S-CR	S-CU
02311160	3	3.00	2.00	1.50	1.000	50	N	70	200	1.5	15	100	50
02311170	3	5.00	2.00	.70	.700	70	N	150	150	2.0	15	70	50
02311180	3	5.00	2.00	2.00	1.000	100	.5	100	200	1.5	30	150	50
02311190	3	5.00	1.50	.30	.500	50	N	150	150	2.0	15	50	30
02311200	3	7.00	2.00	1.50	.500	70	.5	100	200	1.5	30	70	200
02311210	3	3.00	1.00	.20	.300	30	N	100	100	1.5	15	50	30
02311220	3	5.00	2.00	.50	1.000	100	.5	200	100	3.0	20	100	100
02311230	3	2.00	1.00	.30	.300	50	.5	70	300	2.0	10	50	30
02311240	3	5.00	1.00	.15	.700	50	.7	50	500	2.0	20	70	500
02311250	3	3.00	1.50	.50	.500	70	.7	70	300	3.0	15	70	30
02311260	3	3.00	1.50	1.00	.500	70	N	100	300	2.0	20	70	70
02311270	3	5.00	1.50	.30	.700	70	N	150	300	2.0	20	100	50
02311280	3	7.00	3.00	.30	1.000	100	N	300	200	2.0	30	150	70
02311290	3	10.00	1.50	.20	.700	70	1.0	200	200	3.0	20	70	100
02311300	3	7.00	1.50	.30	.700	70	.5	150	200	2.0	20	100	30
02311310	3	5.00	1.00	.15	.500	50	.5	150	200	2.0	15	70	30
02311320	3	7.00	1.50	.70	.700	70	N	150	300	2.0	30	100	50
02311330	3	7.00	1.50	.20	.500	50	.5	150	150	2.0	15	100	50
02311340	3	3.00	1.50	.70	.700	70	N	150	150	2.0	15	100	50
02311350	3	5.00	2.00	.30	.700	70	N	200	200	2.0	20	150	30
02311360	3	5.00	1.50	.30	.700	50	N	150	300	2.0	15	100	50
02311370	3	7.00	2.00	.70	1.000	100	.5	200	200	2.0	20	150	150
02311380	3	3.00	1.50	.70	.700	50	N	70	300	1.5	10	70	30
02311390	3	3.00	1.50	.20	.500	50	N	150	200	1.5	15	100	50
02311400	3	2.00	1.00	.20	.500	50	N	70	700	1.0	15	70	50
02311410	3	3.00	1.00	.20	.500	50	N	70	500	1.5	15	70	50
02311420	3	5.00	1.50	.30	.500	50	.5	100	300	1.0	20	70	50
02311430	3	5.00	1.00	.20	.700	50	.5	100	300	1.5	20	100	50
02311440	3	3.00	1.00	.50	.500	50	N	100	500	1.0	15	70	30
02311450	3	7.00	1.00	.50	.500	70	.7	100	300	1.0	30	70	100
02311460	3	3.00	.70	.30	.700	50	N	100	700	1.0	15	70	30
02311470	3	1.50	1.00	.50	.500	100	N	70	700	<1.0	10	50	30
02311480	3	3.00	1.00	.70	1.000	70	N	150	700	1.0	15	70	500
02311490	3	2.00	1.00	.70	.500	150	N	100	700	1.0	10	70	20
02311500	3	3.00	1.00	.50	.500	150	N	100	500	1.0	10	100	<5
02311510	3	10.00	1.50	.50	.500	200	N	150	300	1.5	15	70	<5
02311520	3	5.00	1.00	.70	.700	150	N	150	700	1.0	10	70	<5
02311530	3	5.00	.70	.50	.700	150	N	100	1,000	<1.0	10	50	<5
02311540	3	7.00	1.00	.20	.500	150	N	100	500	1.5	10	70	<5
02311550	1	7.00	.70	.05	.500	200	N	70	1,000	1.0	10	20	<5
02311560	1	5.00	.50	.07	.500	500	N	30	1,000	1.5	10	20	<5
02311565	1	5.00	.70	.07	.300	500	N	30	700	1.5	7	10	<5

TABLE 2.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 23, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-LA	S-MO	S-NB	S-MI	S-PB	S-SC	S-SN	S-V	S-Y	S-ZN	S-ZR	AA-ZN
02311160	N	N	20	70	100	7	N	100	15	V	300	5
02311170	N	N	20	50	100	10	N	100	10	V	200	<5
02311180	20	N	20	100	200	10	N	150	20	V	300	5
02311190	N	N	<20	50	150	5	N	100	10	V	200	<10
02311200	N	N	<20	150	500	7	N	70	10	V	200	5
02311210	N	N	N	30	30	5	N	50	<10	V	150	N
02311220	30	N	20	100	200	15	N	100	20	V	500	5
02311230	20	N	20	30	70	<5	N	70	15	V	300	N
02311240	20	N	20	30	100	5	N	150	15	V	300	N
02311250	30	N	20	30	50	10	N	100	30	V	300	5
02311260	50	N	<20	50	100	10	N	100	20	V	300	5
02311270	50	N	20	30	150	15	10	150	20	V	300	<5
02311280	70	N	30	70	500	20	15	200	30	V	500	5
02311290	50	7	20	50	1,500	10	N	150	20	V	300	15
02311300	50	N	20	50	300	10	N	150	20	V	500	<5
02311310	30	N	20	30	500	5	30	100	15	V	150	<25
02311320	50	N	20	70	500	20	10	200	20	V	300	10
02311330	50	N	20	50	500	7	N	200	20	V	200	10
02311340	70	N	20	50	200	15	N	300	20	V	200	5
02311350	50	N	20	50	500	15	N	200	20	V	150	10
02311360	70	5	20	50	300	15	N	200	20	V	200	5
02311370	50	5	20	70	500	15	N	200	30	V	300	10
02311380	50	N	20	30	150	10	N	150	20	V	200	<5
02311390	30	5	<20	30	200	10	N	200	15	V	150	<5
02311400	50	N	20	30	150	7	N	150	20	V	200	<5
02311410	50	N	20	30	200	5	N	150	20	V	300	10
02311420	50	N	20	30	300	5	N	150	20	V	150	<5
02311430	50	N	20	50	500	15	N	200	20	V	200	<5
02311440	50	N	20	30	300	5	N	150	20	V	200	<5
02311450	50	N	20	50	500	10	N	200	30	V	150	<5
02311460	50	N	20	30	50	10	N	200	30	V	200	<5
02311470	30	N	30	15	100	5	N	100	20	V	500	<5
02311480	100	N	30	20	20	15	N	200	50	V	300	300
02311490	70	N	20	20	20	10	N	150	30	V	300	100
02311500	70	N	20	20	10	10	N	150	20	V	300	200
02311510	70	N	30	30	20	15	N	150	50	V	300	300
02311520	70	N	30	20	15	7	N	100	50	V	300	200
02311530	70	N	20	15	15	7	N	70	50	V	500	200
02311540	70	N	20	15	15	10	N	150	50	V	300	250
02311550	70	N	20	10	20	20	N	100	100	V	500	500
02311560	50	N	20	7	20	15	N	70	70	V	200	400
02311565	50	N	20	5	20	10	N	50	30	V	200	400

TABLE 3.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 24, Rolla 1° x 2° quadrangle, Missouri

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-B	S-BA	S-BE	S-CO	S-CR
02410030	6	.30	.50	1.50	.030	30	N	N	50	100	N	N	N
02410040	6	.30	.20	.50	.020	20	N	N	50	100	N	N	N
02410050	6	.20	.10	.20	.010	20	N	N	50	100	N	N	N
02410060	6	.70	.05	.10	.050	10	N	N	50	100	N	N	N
02410070	6	.07	.15	.30	.010	10	N	N	50	100	N	N	N
02410080	6	.15	.10	.30	.010	10	N	N	50	100	N	N	N
02410090	6	.20	.07	.20	.007	10	N	N	50	100	N	N	N
02410100	6	1.50	.05	.10	.007	10	N	N	50	70	N	N	N
02410110	6	.10	.07	.07	.010	<10	N	N	50	50	N	N	N
02410120	6	.20	.07	.07	.020	10	N	N	50	50	N	N	N
02410130	6	.15	.05	.05	.005	10	N	N	50	70	N	N	N
02410140	6	.05	.05	.10	.005	<10	N	N	50	70	N	N	N
02410150	6	.05	.05	.07	.003	10	N	N	50	70	N	N	N
02410160	6	.15	.03	.05	.002	10	N	N	50	50	N	N	N
02410170	6	.07	.03	.07	.003	<10	N	N	50	70	N	N	N
02410180	6	.15	.03	.05	.003	<10	N	N	50	50	N	N	N
02410190	6	.10	.05	.15	.005	10	N	N	50	100	N	N	N
02410200	6	.10	.07	.10	.007	10	N	N	50	50	N	N	N
02410210	6	.07	.20	.50	.030	<10	N	N	30	100	N	N	N
02410220	6	<.05	.07	.20	.005	10	N	N	30	50	N	N	N
02410230	6	.05	.20	.70	.015	10	N	N	30	70	N	N	N
02410240	5	<.05	.07	.10	.010	<10	N	N	50	50	N	N	N
02410250	6	.05	.10	.20	.010	N	N	N	30	50	N	N	N
02410260	6	.50	.50	.70	.150	10	N	N	70	100	N	N	15
02410270	6	<.05	.50	1.00	.007	10	N	N	70	70	N	N	N
02410280	6	<.05	.05	.05	.005	N	N	N	50	50	N	N	N
02410290	6	<.05	.15	.50	.010	10	N	N	50	50	N	N	N
02410300	5	.15	.15	.30	.050	20	N	N	50	150	N	N	10
02410310	5	.70	.20	.15	.100	N	N	N	50	150	1.5	N	15
02410320	5	1.50	.50	.30	.300	20	N	N	70	700	2.0	7	70
02410330	5	1.00	.30	.15	.150	10	N	N	50	200	1.0	5	20
02410340	5	.50	.50	.20	.500	20	N	N	50	700	<1.0	N	100
02410350	5	.50	.50	.10	.300	15	N	N	50	700	1.5	N	50
02410360	5	1.00	1.00	.20	.700	20	N	N	70	1,000	1.5	10	100
02410370	5	2.00	.70	.15	.500	20	N	N	70	700	3.0	15	70
02410380	4	1.50	.70	.20	.300	20	N	N	70	700	2.0	10	100
02410390	4	1.50	.70	.20	.300	20	N	N	50	1,000	2.0	10	100
02410400	4	1.00	.70	.20	.300	20	N	N	50	700	1.5	10	100
02410410	4	3.00	1.50	.15	.700	50	N	N	100	1,000	1.5	30	200
02410420	4	3.00	1.50	.15	.700	50	N	N	150	500	1.0	15	150
02410430	4	3.00	1.00	.10	.500	50	N	N	150	700	1.0	15	150
02410440	4	3.00	1.00	.15	.300	30	N	N	100	700	1.0	20	100
02410450	4	2.00	.50	.15	.200	30	N	N	70	700	1.0	10	70
02410460	4	1.00	.50	.10	.200	20	N	N	70	700	<1.0	7	70
02410470	4	1.50	.50	.20	.300	30	N	N	70	200	<1.0	10	70

TABLE 3.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 24, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-CU	S-LA	S-MO	S-ND	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN
02410030	5	N	N	N	N	N	N	N	N	N	15	<5
02410040	<5	N	N	N	N	N	N	N	N	N	10	<5
02410050	<5	N	N	N	N	N	N	N	N	N	N	<5
02410060	5	N	N	N	N	N	N	N	N	N	N	<5
02410070	<5	N	N	N	N	N	N	N	N	N	N	N
02410080	<5	N	N	N	N	N	N	N	N	N	N	N
02410090	<5	N	N	N	N	N	N	N	N	N	N	N
02410100	<5	N	N	N	N	N	N	N	N	N	N	5
02410110	<5	N	N	N	N	N	N	N	N	N	N	N
02410120	7	N	N	N	5	N	N	N	N	N	10	<5
02410130	<5	N	N	N	N	N	N	N	N	N	N	<5
02410140	<5	N	N	N	N	N	N	N	N	N	N	N
02410150	<5	N	N	N	N	N	N	N	N	N	N	N
02410160	<5	N	N	N	N	N	N	N	N	N	N	N
02410170	<5	N	N	N	N	N	N	N	N	N	N	<5
02410180	<5	N	N	N	N	N	N	N	N	N	N	N
02410190	<5	N	N	N	N	N	N	N	N	N	15	<5
02410200	<5	N	N	N	N	N	N	N	N	N	N	<5
02410210	<5	N	N	N	N	N	N	N	N	N	10	<5
02410220	<5	N	N	N	N	N	N	N	N	N	N	<10
02410230	<5	N	N	N	N	N	N	N	N	N	N	N
02410240	<5	N	N	N	N	N	N	N	N	N	N	N
02410250	<5	N	N	N	N	N	N	N	N	N	N	<10
02410260	<5	N	N	N	5	50	N	N	20	N	30	<5
02410270	<5	N	N	N	N	N	N	N	N	N	N	N
02410280	<5	N	N	N	N	N	N	N	N	N	N	N
02410290	<5	N	N	N	N	N	N	N	N	N	N	N
02410300	7	N	N	N	N	N	N	N	20	N	50	N
02410310	50	N	N	N	5	20	N	N	20	N	150	N
02410320	<5	N	N	N	10	20	N	N	50	10	500	N
02410330	15	N	N	N	7	10	N	N	20	N	150	<25
02410340	<5	N	N	N	5	20	N	100	70	20	500	<5
02410350	<5	N	N	N	5	20	N	N	30	10	200	N
02410360	<5	N	N	N	15	15	N	N	100	15	300	N
02410370	100	N	N	N	30	70	N	N	70	10	200	N
02410380	5	N	N	N	20	15	N	N	100	N	200	N
02410390	<5	N	N	N	15	15	N	N	100	10	200	N
02410400	<5	N	N	N	15	10	5	N	100	<10	150	N
02410410	15	50	N	N	50	100	15	100	200	<10	150	N
02410420	20	30	N	N	50	20	10	100	200	10	150	N
02410430	5	20	N	N	30	10	10	100	200	10	200	<5
02410440	10	20	N	N	30	10	5	N	150	N	150	N
02410450	7	20	N	N	20	15	N	100	70	<10	150	N
02410460	10	N	N	N	15	10	N	100	100	<10	200	N
02410470	10	N	N	N	15	15	N	N	70	10	200	N

TABLE 3.--Spectrographic and atomic-absorption analysis of insoluble-residue samples from drill hole No. 24, Rolla 1° x 2° quadrangle, Missouri--continued

sample	FORM	S-FEM	S-HG%	S-C4%	S-TIZ	S-MN	S-AG	S-AS	S-B	S-BA	S-BE	S-CO	S-CR
02410480	4	1.00	.30	.10	.300	20	N	N	70	300	<1.0	7	70
02410490	4	1.50	.50	.20	.200	30	N	N	50	300	1.0	10	70
02410500	4	2.00	1.50	.50	.700	50	N	N	150	300	1.0	50	150
02410510	4	2.00	1.00	.30	.300	50	N	N	100	200	1.5	10	70
02410520	4	2.00	.70	.30	.300	50	N	N	100	150	1.0	10	100
02410530	4	1.50	.50	.20	.300	30	N	N	100	150	1.0	10	70
02410540	4	1.50	.50	.15	.300	30	N	N	100	200	1.0	10	70
02410550	4	1.50	1.00	.10	.300	50	1.0	N	200	150	1.5	10	100
02410560	3	10.00	1.00	.50	.500	70	.5	N	200	150	2.0	30	150
02410570	3	10.00	.70	.10	.300	70	1.0	N	200	150	1.5	20	70
02410580	3	5.00	.50	.10	.200	50	1.0	N	70	300	2.0	20	30
02410590	3	7.00	1.50	2.00	.300	150	.7	N	70	200	1.0	20	100
02410600	3	5.00	1.50	1.00	.500	100	.5	N	70	300	1.5	20	100
02410610	3	7.00	1.00	1.00	.300	100	.7	N	70	300	1.5	15	50
02410620	3	20.00	.50	.50	.200	70	2.0	700	100	300	1.5	30	50
02410630	3	10.00	1.00	1.50	.300	100	.7	N	70	300	1.5	20	50
02410640	3	10.00	.70	.20	.300	70	1.0	N	70	500	2.0	15	50
02410650	3	7.00	1.00	.50	.500	70	.7	N	100	500	3.0	10	50
02410660	3	3.00	1.00	.50	.300	50	.5	N	150	500	3.0	7	20
02410670	3	5.00	1.50	.50	.700	70	N	N	150	700	3.0	10	50
02410680	3	10.00	1.50	.50	1.000	70	.7	N	200	700	3.0	15	70
02410690	3	5.00	1.50	.70	.500	100	.7	N	300	700	5.0	10	50
02410700	3	7.00	1.50	.70	.700	70	N	N	100	700	3.0	10	70
02410710	3	3.00	2.00	1.50	.700	100	N	N	300	700	5.0	7	70
02410720	3	7.00	1.50	.50	1.000	100	.5	N	300	700	5.0	10	150
02410725	3	5.00	1.50	.50	.700	100	.5	N	200	700	5.0	10	100
02410740	3	5.00	1.50	.70	.700	100	.5	N	300	700	5.0	10	100
02410750	3	3.00	1.50	.50	.700	70	N	N	300	700	5.0	10	100
02410760	3	5.00	1.00	.30	1.000	70	.5	N	300	1,000	5.0	15	100
02410770	3	20.00	2.00	.20	.150	30	N	N	500	200	50.0	15	50
02410780	3	20.00	1.00	1.00	.700	100	.7	N	300	500	5.0	15	100
02410790	3	3.00	.70	.20	.500	50	.5	N	200	300	5.0	10	70
02410800	3	7.00	1.00	.50	.700	100	.5	N	300	700	5.0	10	100
02410810	3	10.00	1.00	.15	.300	50	1.5	N	300	500	10.0	20	50
02410820	3	10.00	1.50	.15	.500	50	1.5	N	300	500	10.0	20	70
02410830	3	7.00	1.00	.03	.700	100	1.0	N	200	700	5.0	30	100
02410840	3	7.00	1.00	.50	.300	100	.5	N	200	700	2.0	15	100
02410850	3	2.00	.50	.15	.200	70	.5	N	100	700	3.0	10	20
02410860	3	5.00	.20	.10	.200	70	2.0	N	100	500	2.0	50	20
02410870	2	.20	.03	.05	.020	10	N	N	10	70	N	N	N
02410880	2	.15	.05	<.05	.030	10	N	N	10	30	N	5	N
02410890	2	1.50	.10	.05	.100	10	N	N	50	70	<1.0	30	10
02410900	2	.50	.15	<.05	.100	10	N	N	70	100	<1.0	5	N
02410910	2	1.50	.15	<.05	.150	10	N	N	50	50	1.0	N	20
02410920	2	.50	.10	<.05	.150	10	N	N	30	30	1.0	N	15

TABLE 3.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 24, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-CU	S-LA	S-MO	S-ND	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN
02410480	7	20	N	N	15	10	N	100	100	10	300	N
02410490	10	N	N	N	15	10	N	100	50	<10	150	N
02410500	30	50	N	N	50	20	10	100	200	15	150	N
02410510	20	20	N	N	20	20	5	N	100	10	150	N
02410520	20	20	N	N	20	15	5	N	100	10	150	N
02410530	15	N	N	N	20	10	N	N	50	<10	100	N
02410540	20	20	N	N	15	10	<5	N	70	10	150	N
02410550	30	20	N	N	20	10	7	N	100	10	100	10
02410560	100	20	7	N	50	150	10	N	150	10	100	10
02410570	150	N	5	N	30	500	7	N	100	15	100	N
02410580	100	N	N	N	50	200	N	N	50	15	100	N
02410590	100	20	5	N	50	150	5	N	100	15	100	N
02410600	100	30	5	N	50	100	5	N	150	15	150	10
02410610	100	N	7	N	50	150	<5	N	70	20	200	25
02410620	100	N	N	N	70	200	N	N	50	20	300	20
02410630	100	N	7	N	50	200	N	N	50	15	100	<10
02410640	100	N	7	N	30	150	N	N	50	20	200	20
02410650	50	30	7	20	30	100	N	N	50	20	200	10
02410660	30	50	N	20	20	150	N	N	30	20	150	5
02410670	30	70	5	20	20	70	5	100	100	30	200	5
02410680	50	100	7	20	30	100	7	100	100	30	300	5
02410690	50	70	7	<20	50	200	5	100	70	20	200	30
02410700	30	70	7	N	30	100	5	100	100	30	150	5
02410710	30	70	5	N	20	100	7	100	100	20	150	5
02410720	70	100	15	30	50	150	10	100	200	50	300	5
02410725	150	100	7	<20	50	100	7	100	150	30	200	--
02410740	50	100	7	20	30	100	10	100	150	30	200	30
02410750	50	100	5	20	30	70	7	100	150	30	200	5
02410760	50	150	10	20	50	150	10	100	150	50	200	<10
02410770	15	N	N	N	30	20	5	N	100	10	70	--
02410780	70	70	10	N	70	200	7	100	100	30	150	10
02410790	30	50	5	<20	50	150	5	N	70	20	200	N
02410800	30	100	5	20	50	150	7	100	150	30	200	N
02410810	70	30	5	<20	70	200	N	N	70	30	200	5
02410820	70	30	7	<20	70	200	5	N	100	20	200	<5
02410830	100	70	7	20	100	150	7	N	150	50	300	5
02410840	50	30	N	N	30	70	5	100	70	20	100	N
02410850	50	20	N	N	20	70	5	N	30	20	150	N
02410860	500	N	5	N	70	100	5	N	20	15	150	<5
02410870	10	N	N	N	5	N	N	N	N	N	50	N
02410880	10	N	N	N	7	N	N	N	N	N	200	N
02410890	150	N	N	N	50	N	N	N	10	10	300	N
02410900	5	N	N	N	5	N	N	N	15	15	500	N
02410910	10	N	N	N	5	N	N	N	15	15	500	N
02410920	5	N	N	N	N	10	N	N	10	30	1,000	N

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TABLE 3.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No 24,  
Rolla 1° x 2° quadrangle, Missouri--continued

sample	FORM	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-B	S-BA	S-BE	S-CO	S-CR
02410930	2	1.00	.10	<.05	.150	10	N	N	30	30	1.5	5	15
02410940	2	.70	.15	.05	.150	20	N	N	50	700	1.0	5	N
02410950	1	10.00	1.50	.07	1.000	200	N	N	500	100	2.0	30	70
02410960	1	5.00	1.00	.10	1.000	150	N	N	500	200	1.5	20	100
02410970	1	3.00	1.00	.20	.700	150	N	N	300	100	2.0	50	30

TABLE 3.--Spectrographic and atomic-absorption analyses of insoluble-residue samples from drill hole No. 24, Rolla 1° x 2° quadrangle, Missouri--continued

sample	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SC	S-SR	S-V	S-Y	S-ZR	AA-ZN
02410930	30	N	N	N	15	10	5	N	10	50	300	N
02410940	15	100	N	N	30	15	5	N	10	70	300	N
02410950	20	N	N	N	100	N	30	N	200	15	70	<5
02410960	5	N	N	N	30	N	10	N	300	N	50	N
02410970	15	N	N	N	50	30	10	N	200	30	100	5

