UNITED STATES DEPARTMENT OF THE INTERIOR

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Spectrographic analyses of insoluble-residue samples, Joplin 1° x 2° quadrangle, Kansas and Missouri: Drill hole nos. 75, 76, 77, 78, and 79

By

John H. Bullock, Jr.* and Helen W. Folger*

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*U.S. Geological Survey, DFC, Box 25046, MS 973, Denver, CO 80225

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INTRODUCTION

Geochemical studies of the Joplin 1° x 2° quadrangle, Missouri and Kansas, were begun in 1983 as part of a multidisciplinary study of the quadrangle by the U.S. Geological Survey, the Missouri Division of Geology and Land Survey, and the Kansas Geological Survey. The purpose of the study was to assess the mineral resource potential of the area by integrated geologic, geochemical, and geophysical studies.

The geochemical work has been directed at the characterization of the sedimentary rocks in the quadrangle through spectrographic analyses of dilute-hydrochloric-acid insoluble-residue samples of whole rock from widely-spaced drill holes. Drill holes have been selected for study from the sample libraries of the Missouri Division of Geology and Land Survey and the Kansas Geological Survey (KGS). None of the holes are company confidential and none intersect economically significant mineralized ground.

The analytical results for drill hole no. 75 (#1 Nelson - KGS), drill hole no. 76 (#1 J. Hess - KGS), drill hole no. 77 (#1 Galloway - Walker - KGS), drill hole no. 78 (#23-8 Plummer - KGS), and drill hole no. 79 (#5 Bruenger - KGS) are given in this report. Drill hole no. 75 is located in sec. 11, T. 24 S., R. 22 E. in Bourbon County, Kansas; drill hole no. 76 is located in sec. 31, T. 25 S., R. 20 E. in Allen County, Kansas; drill hole no. 77 is located in sec. 4, T. 35 S., R. 19 E. in Montgomery County, Kansas; drill hole no. 78 is located in sec. 8, T. 31 S., R. 17 E. in Montgomery County, Kansas; drill hole no. 79 is located in sec. 7, T. 26 S., R. 19 E. in Allen County, Kansas (fig. 1). Data for the insoluble-residue samples from drill holes 75, 76, 77, 78, and 79 are listed in tables 1, 2, 3, 4, and 5 respectively. Well name, well number, township, range, and county allow for identification and location of files at the Kansas Geological Survey.

PREPARATION AND ANALYSIS OF SAMPLES

Insoluble residues were prepared by dissolving approximately 80 grams of crushed carbonate rock in repeated applications of 1:5 hydrochloric acid until the carbonate was removed. The samples were then filtered and dried overnight at 50 °C.

The samples were pulverized to minus 140 mesh (0.105 mm) in a vertical grinder equipped with ceramic plates. Some insoluble-residue samples contained only a few milligrams of material, and these were hand ground with 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 have been present.

Each sample was analyzed semiquantitatively for 31 elements using a six-step D.C.-arc optical-emission spectrographic method (Grimes and Marranzino, 1968).

The semiquantitative spectrographic values are reported as six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, and 0.15) 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 value 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).

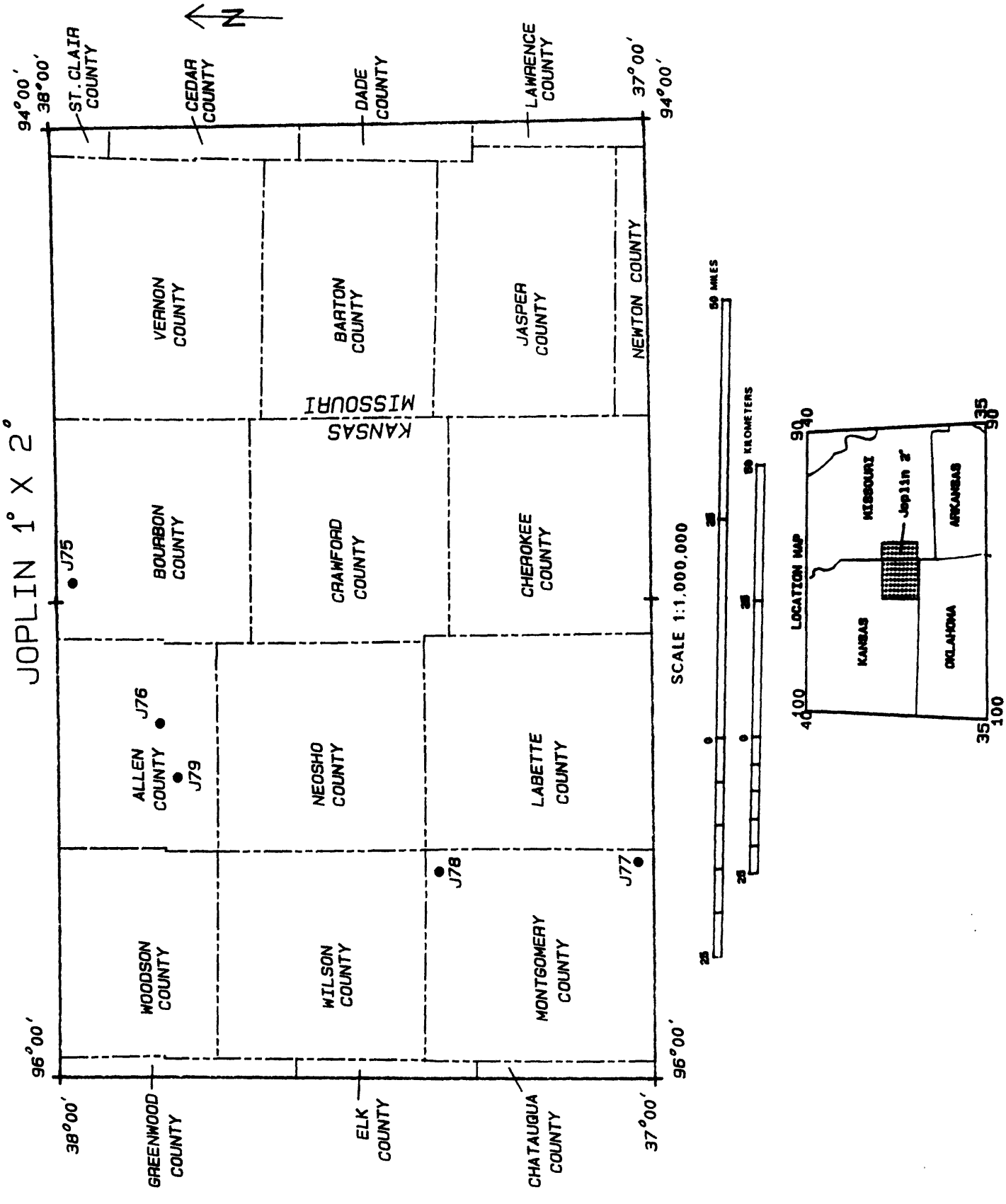

Figure 1. Locations of drill holes 75, 76, 77, 78, and 79, Joplin 1° x 2° quadrangle, Missouri and Kansas.

The visual lower limits of determination for the 31 elements that were determined spectrographically for 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 DATA TABLES

Each sample is identified by an eight-character code beginning with the letter J, signifying Joplin. The next number signifies the USGS drill-hole number. The letter R appears after the drill hole number and signifies insoluble residue. The next four digits identify the depth of the sample from the drill-hole collar. Most samples are composites of approximate 10-foot intervals, dependent upon the original sample intervals and upon the amount of sample material available for analysis.

The stratigraphic unit of the sample is identified by a coded number in the last column of tables 1 through 5. The code and formation names are as follows:

Code	Formation
20	Pennsylvanian Undifferentiated
31	Chattanooga Shale
40	Mississippian Undifferentiated
60	Ordovician Undifferentiated
78	Cambro - Ordovician Undifferentiated

EXPLANATION OF DATA

The columns in tables 1 through 5 have headings of sample, elements, and formation. The letter S over the columns signifies emission-spectrographic data.

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

N = Not detected at the limit of determination;
< = Detected, but below the limit of determination shown; and
> = Greater than the limit of determination shown.

Because of the formatting used in the computer program that produced tables 1-5, some of the elements listed in these tables (Fe, Mg, Ca, Ti, Ag, and Be) may carry one or more nonsignificant zeros to the right of the significant digits. The analyst did not determine these elements to the accuracy suggested by the extra zeros.

RASS

Upon completion of all analytical work, the information from the samples is entered into a computer-based file called RASS (Rock Analysis Storage System). This RASS file contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and placed in a standard form (STATPAC) for computerized statistical manipulation or publication (VanTrump and Miesch, 1977).

ACKNOWLEDGMENTS

The authors wish to thank the Kansas Geological Survey, Dr. Lee C. Gerhart, State Geologist, and his staff, for making these drill-hole samples available from their sample library.

REFERENCES

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

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

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

TABLE 1--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 75, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J75R0910	37 58 11	94 47 42	2	.1	.1	.2	50	N	N	N
J75R0930	37 58 11	94 47 42	.5	.05	.05	.07	15	N	N	N
J75R0950	37 58 11	94 47 42	1	.05	.07	.07	20	N	N	N
J75R0970	37 58 11	94 47 42	2	.1	.1	.1	50	N	N	N
J75R0990	37 58 11	94 47 42	3	.3	.15	.3	100	N	N	N
J75R1010	37 58 11	94 47 42	1.5	.05	.1	.1	20	N	N	N
J75R1030	37 58 11	94 47 42	3	.3	.05	.5	50	N	N	N
J75R1060	37 58 11	94 47 42	2	.2	.07	.2	50	N	N	N
J75R1080	37 58 11	94 47 42	1	.15	.05	.15	30	N	N	N
J75R1100	37 58 11	94 47 42	2	.2	.07	.2	50	N	N	N
J75R1120	37 58 11	94 47 42	3	.7	<.05	.3	70	N	N	N
J75R1135	37 58 11	94 47 42	2	.3	.05	.2	50	N	N	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J75R0910	70	200	N	N	<20	7	10	50	N	N	N	30
J75R0930	50	50	N	N	N	N	N	<5	N	N	N	5
J75R0950	50	50	N	N	N	N	N	10	N	<5	N	10
J75R0970	70	70	N	N	N	N	10	200	N	N	N	15
J75R0990	100	150	N	N	N	10	50	100	20	<5	N	30
J75R1010	50	300	N	N	N	5	10	10	N	N	N	15
J75R1030	100	150	1.5	N	N	10	70	50	N	N	N	30
J75R1060	70	70	1	N	N	7	50	30	N	N	N	50
J75R1080	50	50	N	N	N	<5	30	10	N	N	N	15
J75R1100	70	70	1	N	N	5	50	15	N	N	N	20
J75R1120	100	100	2	N	N	10	70	20	N	15	N	50
J75R1135	100	100	1.5	N	N	5	30	20	N	10	N	20

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Format
J75R0910	N	N	<5	N	100	30	N	N	1,000	50	N	40
J75R0930	N	N	N	N	N	10	N	N	N	15	N	40
J75R0950	N	N	N	N	N	10	N	N	700	15	N	40
J75R0970	N	N	N	N	N	20	N	N	700	50	N	40
J75R0990	10	N	7	N	N	100	N	15	<200	100	N	40
J75R1010	N	N	N	N	N	15	N	N	300	30	N	40
J75R1030	10	N	7	N	N	100	N	20	N	200	N	40
J75R1060	10	N	5	N	N	70	N	10	<200	100	N	40
J75R1080	N	N	N	N	N	30	N	N	N	50	N	40
J75R1100	N	N	5	N	N	50	N	10	<200	70	N	40
J75R1120	15	N	10	N	N	150	N	15	N	100	N	31
J75R1135	N	N	5	N	N	70	N	10	N	100	N	60

TABLE 2--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 76, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J76R0540	37 49 39	95 15 16	2	.5	.07	1	50	N	N	N
J76R0600	37 49 39	95 15 16	2	.5	.1	.7	150	N	N	N
J76R0720	37 49 39	95 15 16	2	.5	.07	.5	70	N	N	N
J76R0850	37 49 39	95 15 16	2	.5	.05	.7	50	N	N	N
J76R1100	37 49 39	95 15 16	1.5	.2	<.05	.5	50	N	N	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J76R0540	100	200	2	N	N	5	100	20	30	N	<20	10
J76R0600	100	200	2	N	N	7	100	20	30	N	<20	15
J76R0720	100	200	2	N	N	5	100	20	30	N	<20	15
J76R0850	100	200	2	N	N	5	150	15	50	N	<20	15
J76R1100	100	150	2	N	N	7	100	15	30	N	N	20

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form#
J76R0540	N	N	15	N	100	200	N	20	N	300	N	20
J76R0600	<10	N	15	N	100	150	N	15	N	200	N	20
J76R0720	10	N	15	N	100	100	N	20	N	200	N	20
J76R0850	10	N	15	N	150	100	N	30	N	300	N	20
J76R1100	10	N	10	N	N	100	N	15	N	200	N	20

TABLE 3--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 77, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J77R0655	37 1 34	95 32 54	3	.15	.15	.15	50	N	N	N
J77R1190	37 1 34	95 32 54	5	.7	.1	1	70	N	N	N
J77R1229	37 1 34	95 32 54	5	1	.05	1	70	N	N	N
J77R1248	37 1 34	95 32 54	5	.5	.05	.3	70	N	N	N
J77R1255	37 1 34	95 32 54	2	.1	.07	.15	50	N	N	N
J77R1282	37 1 34	95 32 54	1.5	.07	.05	.05	10	N	N	N
J77R1300	37 1 34	95 32 54	1	.03	.05	.02	<10	N	N	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J77R0655	50	200	1	N	N	7	10	20	N	15	N	20
J77R1190	200	200	3	N	N	10	150	15	30	N	<20	30
J77R1229	200	300	3	N	N	15	100	20	50	N	<20	20
J77R1248	150	200	3	N	N	15	20	30	N	50	N	30
J77R1255	100	100	N	N	N	5	10	15	N	10	N	15
J77R1282	70	70	N	N	N	N	N	15	N	7	N	5
J77R1300	70	50	N	N	N	N	N	10	N	5	N	5

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form#
J77R0655	10	N	N	N	N	50	N	N	N	50	N	20
J77R1190	10	N	15	N	N	200	N	30	N	300	N	40
J77R1229	10	N	20	N	N	300	N	20	N	200	N	40
J77R1248	15	N	7	N	N	200	N	10	N	150	N	78
J77R1255	N	N	N	N	N	20	N	N	N	50	N	78
J77R1282	N	N	N	N	N	10	N	N	N	10	N	78
J77R1300	N	N	N	N	N	N	N	N	N	20	N	78

TABLE 4--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 78, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J78R0540	37 21 44	95 34 2	1.5	.3	.05	.5	100	N	N	N
J78R0580	37 21 44	95 34 2	2	.5	.05	.5	100	N	N	N
J78R0630	37 21 44	95 34 2	5	1	.07	.5	200	1	N	N
J78R0680	37 21 44	95 34 2	5	1	.05	1	200	N	N	N
J78R0710	37 21 44	95 34 2	3	.7	.1	.5	200	.7	N	N
J78R0770	37 21 44	95 34 2	5	1	.07	.7	200	.5	N	N
J78R0820	37 21 44	95 34 2	5	.7	.05	.5	150	N	N	N
J78R0860	37 21 44	95 34 2	3	.7	<.05	.7	150	N	N	N
J78R0920	37 21 44	95 34 2	3	.7	.05	.5	150	N	N	N
J78R0960	37 21 44	95 34 2	3	.7	<.05	1	150	N	N	N
J78R1000	37 21 44	95 34 2	3	.5	<.05	.5	100	N	N	N
J78R1040	37 21 44	95 34 2	3	.5	<.05	.5	100	N	N	N
J78R1100	37 21 44	95 34 2	3	.7	<.05	1	150	N	N	N
J78R1140	37 21 44	95 34 2	5	.7	<.05	.7	200	N	N	N
J78R1180	37 21 44	95 34 2	2	.15	.05	.2	50	N	N	N
J78R1220	37 21 44	95 34 2	1.5	.1	.1	.15	30	N	N	N
J78R1260	37 21 44	95 34 2	.5	.05	.05	.1	20	N	N	N
J78R1300	37 21 44	95 34 2	.3	.03	.07	.07	15	N	N	N
J78R1340	37 21 44	95 34 2	.2	.05	.07	.05	20	N	N	N
J78R1380	37 21 44	95 34 2	.5	.1	.2	.1	30	N	N	N
J78R1410	37 21 44	95 34 2	5	1.5	.1	1	100	N	N	N
J78R1511	37 21 44	95 34 2	1.5	.5	.3	.15	20	N	N	N

TABLE 4--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 78, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.--Continued

Sample	B-ppm	Ba-ppm	Be-ppm	Bi-ppm	Cd-ppm	Co-ppm	Cr-ppm	Cu-ppm	La-ppm	Mo-ppm	Nb-ppm	Ni-ppm
	s	s	s	s	s	s	s	s	s	s	s	s
J78R0540	50	70	1	N	N	5	50	5	30	N	N	10
J78R0580	50	100	1.5	N	N	7	20	15	20	N	N	15
J78R0630	100	150	3	N	N	20	200	100	N	15	<20	150
J78R0680	100	200	2	N	N	20	50	20	20	5	<20	50
J78R0710	150	100	2	N	N	20	150	100	N	15	<20	100
J78R0770	150	300	3	N	N	30	100	70	50	10	<20	100
J78R0820	100	200	3	N	N	20	100	50	30	10	<20	70
J78R0860	100	200	2	N	N	20	100	15	50	N	<20	50
J78R0920	100	200	2	N	N	20	100	50	50	<5	<20	70
J78R0960	150	200	2	N	N	15	100	15	50	N	<20	30
J78R1000	100	150	2	N	N	10	50	10	30	N	<20	20
J78R1040	100	200	2	N	<20	30	30	15	50	N	<20	20
J78R1100	150	200	3	N	N	20	150	20	70	N	<20	30
J78R1140	150	200	2	N	N	30	100	30	50	N	<20	100
J78R1180	100	70	1	N	N	10	20	10	20	N	N	30
J78R1220	100	50	1	N	N	5	20	10	20	N	N	15
J78R1260	100	30	N	N	N	N	N	<5	N	N	N	N
J78R1300	100	50	N	N	N	N	N	<5	N	N	N	5
J78R1340	100	50	N	N	N	N	N	<5	N	N	N	5
J78R1380	100	70	N	N	N	N	N	20	N	N	N	5
J78R1410	200	200	3	N	N	30	150	30	30	N	<20	70
J78R1511	100	150	N	N	N	5	10	20	N	5	N	15

TABLE 4--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 78, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.--Continued

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form#
J78R0540	N	N	5	N	100	70	N	15	N	300	N	20
J78R0580	N	N	5	N	100	70	N	10	N	500	N	20
J78R0630	50	N	15	N	100	200	N	15	N	100	N	20
J78R0680	N	N	10	N	100	150	N	20	N	200	N	20
J78R0710	20	N	10	N	N	300	N	N	N	100	N	20
J78R0770	20	N	15	N	150	200	N	20	N	200	N	20
J78R0820	20	N	15	N	100	200	N	20	N	200	N	20
J78R0860	10	N	15	N	150	150	N	50	N	300	N	20
J78R0920	20	N	15	N	100	200	N	20	N	100	N	20
J78R0960	10	N	15	N	100	200	N	30	N	500	N	20
J78R1000	N	N	7	N	100	150	N	20	N	200	N	20
J78R1040	N	N	7	N	150	100	N	15	1,000	150	N	20
J78R1100	20	N	15	N	150	200	N	20	N	300	N	20
J78R1140	20	N	15	N	N	200	N	30	N	200	N	20
J78R1180	N	N	<5	N	N	50	N	20	200	100	N	40
J78R1220	N	N	N	N	N	50	N	N	N	50	N	40
J78R1260	N	N	N	N	N	15	N	N	N	150	N	40
J78R1300	N	N	N	N	N	10	N	N	N	10	N	40
J78R1340	N	N	N	N	N	10	N	N	N	15	N	40
J78R1380	N	N	N	N	N	15	N	N	N	30	N	40
J78R1410	15	N	20	N	100	200	N	20	N	200	N	31
J78R1511	N	N	N	N	N	50	N	N	N	70	N	78

TABLE 5--SPECTROGRAPHIC ANALYSES OF INSOLUBLE-RESIDUE SAMPLES FROM DRILL HOLE NO. 79, JOPLIN 1 x 2 QUADRANGLE, MISSOURI AND KANSAS.

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown.]

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s
J79R0630	37 47 50	95 22 16	5	1	.15	.5	200	.5	N	N
J79R0710	37 47 50	95 22 16	5	1	.1	.5	200	N	N	N
J79R0780	37 47 50	95 22 16	3	.7	.05	.5	100	N	N	N
J79R0845	37 47 50	95 22 16	3	.5	.05	.5	150	N	N	N
J79R1015	37 47 50	95 22 16	3	.5	.05	.7	100	N	N	N

Sample	B-ppm s	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s
J79R0630	100	200	2	N	N	20	150	50	30	10	<20	100
J79R0710	100	300	3	N	N	20	150	20	70	N	<20	50
J79R0780	100	300	2	N	N	10	100	15	70	N	<20	30
J79R0845	100	200	2	N	N	15	100	20	30	<5	<20	50
J79R1015	100	200	2	N	N	10	100	20	50	N	<20	30

Sample	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s	Form#
J79R0630	10	N	15	N	N	200	N	20	200	150	N	20
J79R0710	10	N	20	N	150	300	N	30	N	150	N	20
J79R0780	15	N	15	N	150	200	N	30	N	200	N	20
J79R0845	10	N	15	N	100	300	N	20	N	200	N	20
J79R1015	15	N	20	N	100	200	N	30	N	200	N	20