Some Chemical Characteristics of Mine Drainage in Illinois

By L. G. TOLER

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FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM (SI) UNITS

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI):

Multiply inch-pound unit	*By*	*To obtain SI unit*
acre	0.4047	square hectometer (hm^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
ton (short)	0.9072	megagram (Mg)
tons per day (ton/d)	0.9072	megagrams per day (Mg/d)
tons per square mile (ton/mi^2)	0.3503	megagrams per square kilometer (Mg/km^2)

SOME CHEMICAL CHARACTERISTICS OF MINE DRAINAGE IN ILLINOIS

By L. G. TOLER

ABSTRACT

Surface mining for coal in Illinois has affected runoff from the mined areas and altered water quality in the streams. Average annual sulfate loads in streams are 3,000–4,000 tons per square mile of mined land in the Big Muddy and Saline River basins in southern Illinois. Relatively high concentrations of dissolved aluminum, arsenic, chromium, copper, iron, manganese, and zinc are commonly associated with concentrations of sulfate greater than about 2,000 milligrams per liter.

INTRODUCTION

Illinois is one of the major coal producing States in the United States. In 1976, Illinois ranked fourth among the States, with a production of approximately 58 million tons. It has the largest reserves of bituminous coal and in 1974 was the State with the second highest total reserves (Smith and Stall, 1975, p. 12).

The coal areas in Illinois are part of the Eastern Interior Coal Field (fig. 1), which includes most of Illinois and parts of Indiana and Kentucky. The coal beds are included in a large structural basin, and in Illinois, their maximum depth is about 1,200 feet near the center of the basin (Smith and Stall, 1975). Near the periphery of the basin, coal is at or near the surface and is amenable to surface mining. About 47 percent of the 1976 production was by surface mining.

As of 1974, approximately 181,000 acres of land in Illinois had been surface mined for coal (Haynes and Klimstra, 1975, p. 2). Figure 2 shows the acreage of surface-mined land in Illinois by county.

Surface mining involves stripping the overburden from the coal, removing the coal, and filing the newly mined pit with overburden from adjacent areas. Surface-mining methods are commonly used to recover coal from depths of up to about 100 feet. Enormous amounts of earth materials are thus disturbed and made more vulnerable to weathering.

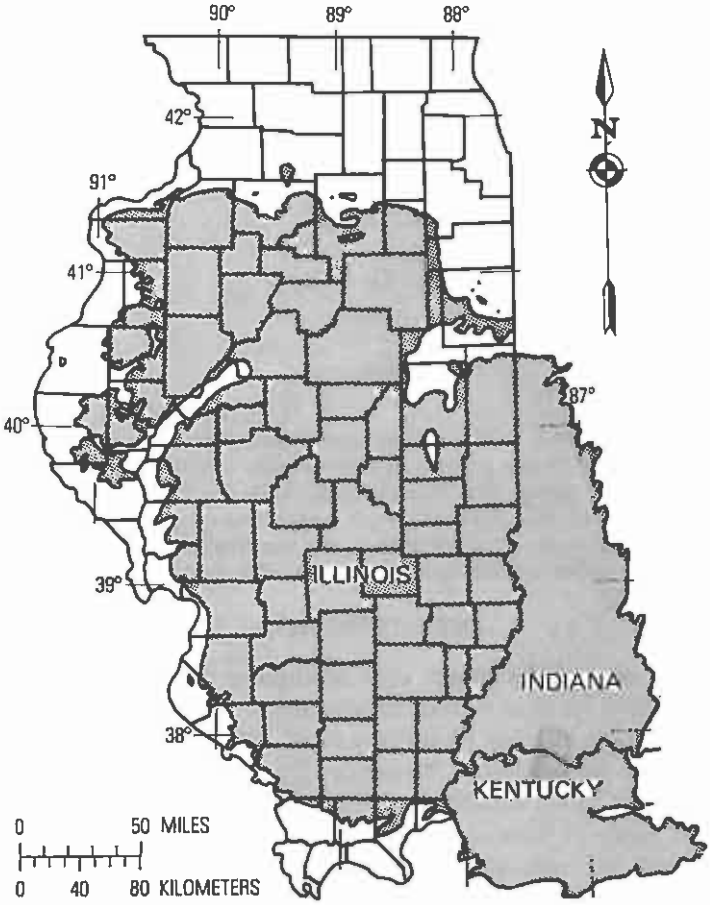

FIGURE 1.—Location of Eastern Interior Coal Field (shaded area).

An apparent increasing demand on our own energy sources has created a high priority for assessments of the effects of surface mining on water quality. In 1974, the U.S. Geological Survey began a program of sampling and evaluating the water quality of streams in the strip-mined areas in Illinois. The U.S. Environmental Protection Agency (EPA) provided funds for the project.

APPROACH

The first phase of the sampling program was to provide broad geographical coverage of much of the surface-mined area in Illinois. Fifty sites were selected and sampled twice in 1975.

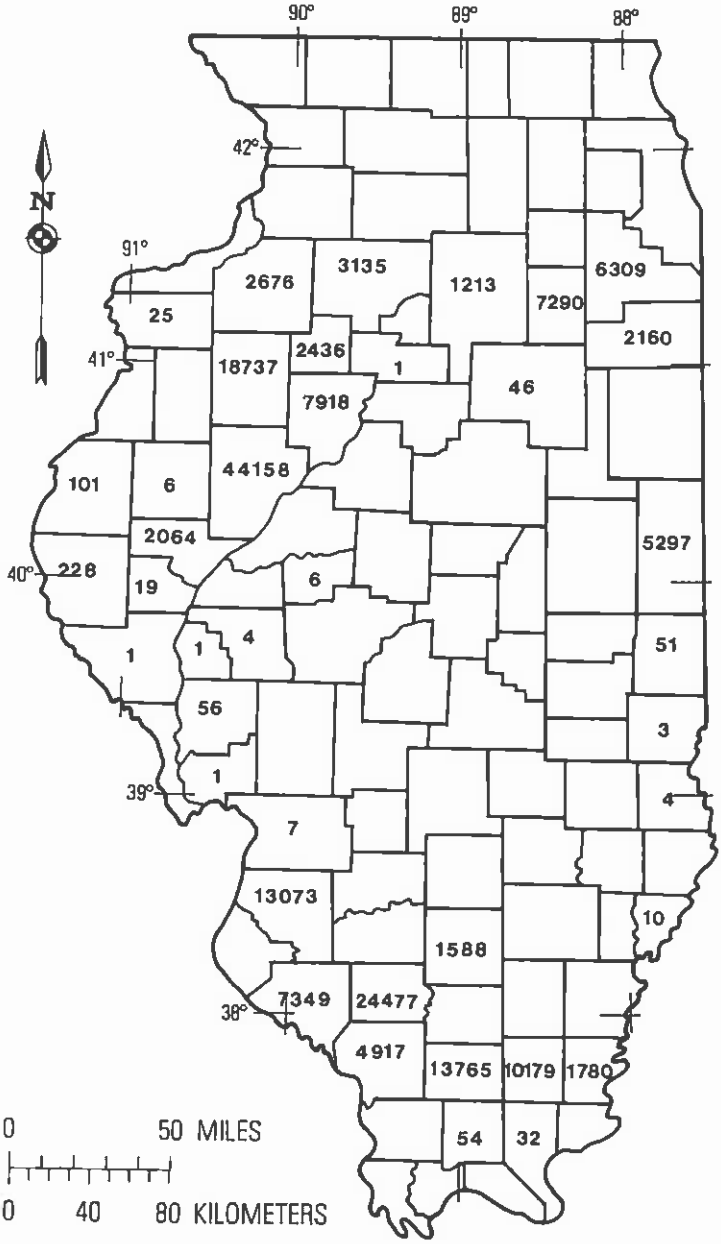

FIGURE 2.—Acreage distribution of strip-mined land in Illinois, by county, as of June 1974.

The results of the reconnaissance sampling were then used to design the second phase of the sampling program. This phase included a wider range of hydrologic conditions. The discharge and constituent concentrations obtained during the more intensive sampling were analyzed by regression techniques and extrapolated by use of flow duration curves of discharge to estimate the average quantities of material dissolved in surface-mine drainage. The loads carried by the streams were then related to the mined area within each basin.

RECONNAISSANCE

The 50 sites selected for the reconnaissance phase are shown in figure 3. These sites were sampled twice, once in May and once in June 1975. All samples were collected during periods of average to low flow, at about the 30 percent flow duration in May and at the 30–65 percent flow duration in June.

Discharge, water temperature, specific conductance, dissolved oxygen, and pH were measured in the field. Water samples were collected for laboratory analyses of alkalinity, total organic carbon, chloride, phenols, sulfate, sulfide, and the metals aluminum, arsenic, chromium, copper, iron, manganese, mercury, and zinc. The data were then scrutinized for consistency between the two sampling dates and for constituent characteristics common to all or part of the State. Field and laboratory data collected during the reconnaissance sampling are included in table 4.

Sulfate was a major constituent in samples from all sites. Sulfate concentrations ranged from 25 to 4,100 mg/L (milligrams per liter). On the basis of comparisons with streams having little or no upstream mining activity, it is probable that concentrations of sulfate of more than about 100 mg/L in base flow are attributable to drainage from mined areas.

The acidic waters contained significant concentrations of aluminum, arsenic, chromium, copper, mercury, and zinc and high concentrations of the more common metals, iron and manganese.

MONITORING PROGRAM

The heavily mined area that extends west to east across the Big Muddy and Saline River basins in southern Illinois was selected for more intensive sampling because the reconnaissance samples in these basins had the highest concentrations of sulfate and many of the metals and because of concurrent studies in that area by the Greater Egypt Regional Planning and Development Commission (GERPDC) and the Southeastern Illinois Regional Planning and Development Commission (SIRPDC).

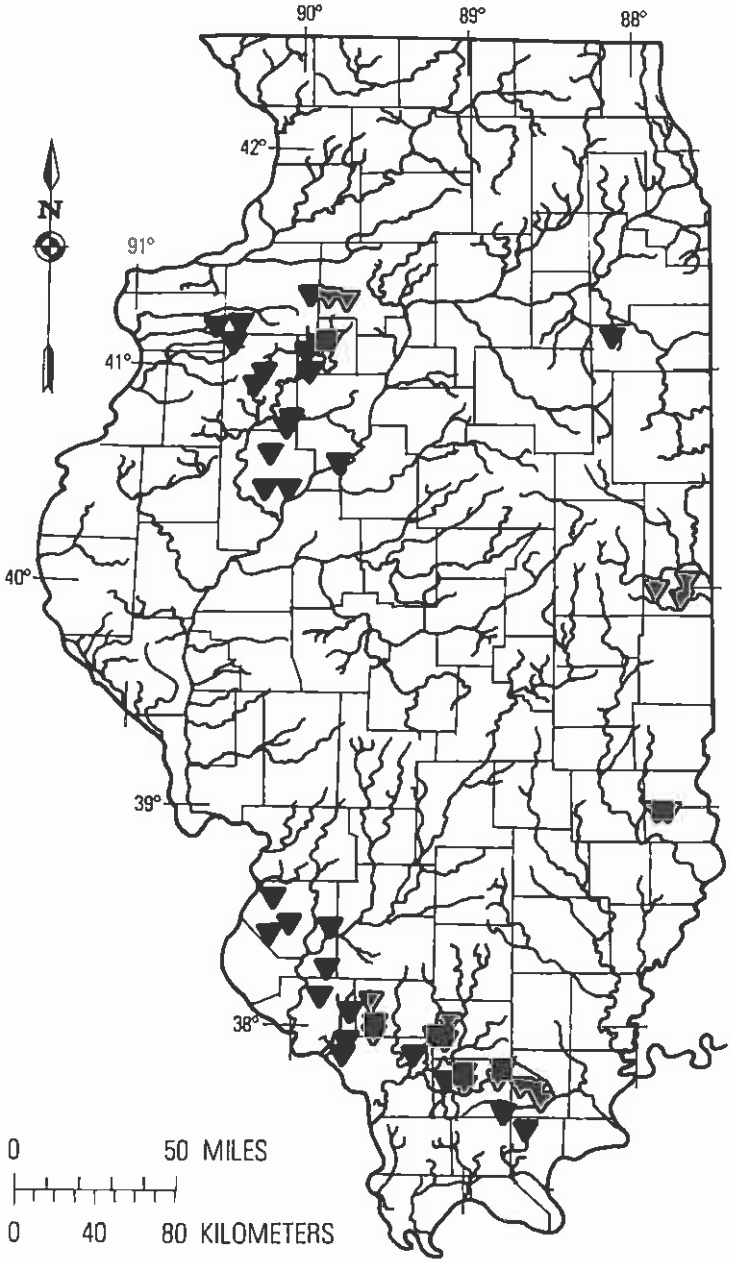

FIGURE 3.—Location of reconnaissance sampling sites in Illinois.

The selection of 20 sites (fig. 4) was coordinated with the above agencies and the Illinois Environmental Protection Agency (IEPA). Survey personnel collected water-quality samples and made concurrent discharge measurements at these sites about three to four times per year. Where feasible, reference points were located from which water-surface elevations were determined concurrently with discharge measurements and rating curves were prepared from which estimates of discharge could be made. IEPA personnel also collected and analyzed samples and measured water-surface elevation at selected sites about twice per month from March to September 1976. All available analyses are reported in table 5.

The laboratory analyses of reconnaissance samples did not always show the carbonate-ion and bicarbonate-ion distribution expected from the field pH. Often no carbonate was reported, even though the field pH was above 8.3, a condition under which it should occur (Brown, Skougstad, and Fishman, 1970, p. 42). The absence of carbonate indicated that the pH was changing between the time of sampling and the time of analysis. Because the determination of the carbonate-ion and bicarbonate-ion distribution is a part of the determination of alkalinity, the alkalinity values reported by the laboratory were also suspected of being erroneous. Therefore, alkalinity was determined both in the field and in the laboratory.

The relationship shown in figure 5 dispelled any suspicion of erroneous laboratory alkalinity values even though the pH changed enroute to the laboratory. However, the exercise indicated that the carbonate-ion and bicarbonate-ion distribution as it existed in the stream must be determined in the field for all samples having the carbonate-ion in solution (pH greater than 8.3). This was done in addition to the other field analyses for all samples collected by the Survey in the 1976 and 1977 water years.

Drainage areas for all sites, including the reconnaissance sites, were outlined and planimetered on Survey topographic maps. Boundaries of strip-mined areas for the 20 sites sampled during the 1976 and 1977 water years were transferred from GERPDC and SIRPDC (1977) maps to topographic maps, and the area of strip-mined land above the sampling site was planimetered for each of the 20 basins.

RESULTS

SULFATE AS AN INDICATOR

The formation of acidic mine water has been documented many times, and an extensive bibliography on the subject is available (Office of Water Resources Research, 1975). Generally, surface mining exposes many earth materials to weathering, and the physical-chemical breakdown of some materials are thereby accelerated. All

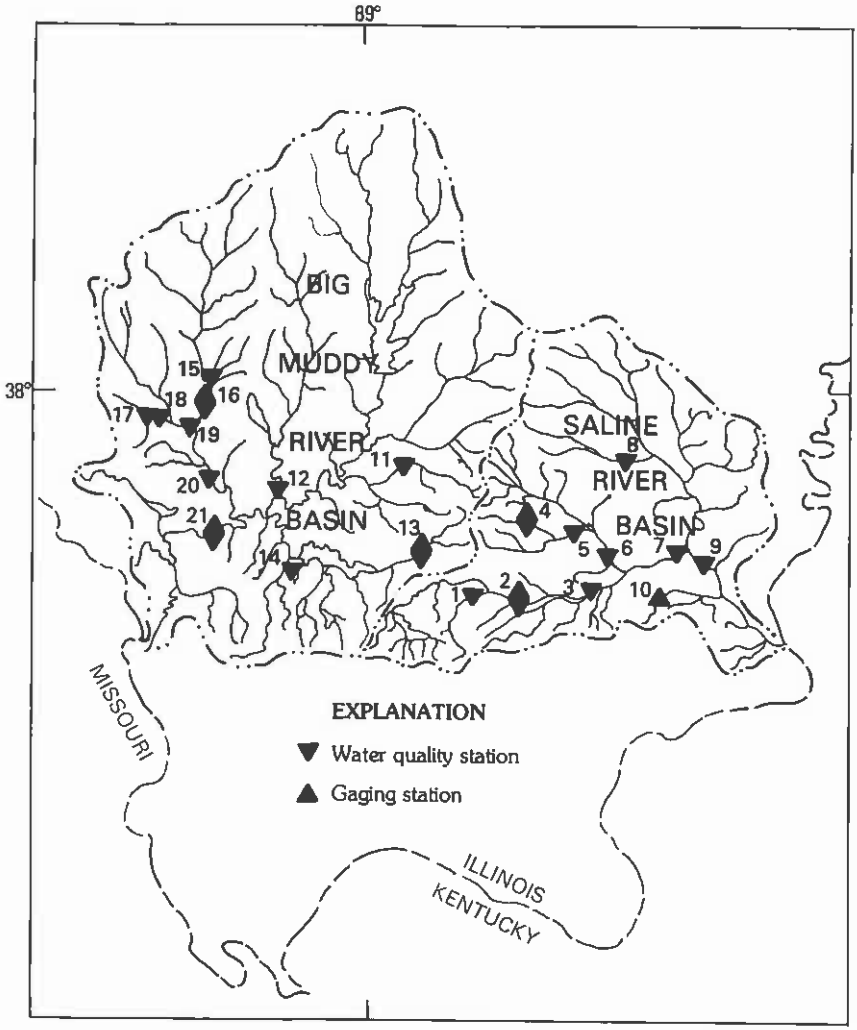

FIGURE 4.—Location of and number identifying sampling sites in Big Muddy and Saline River basins, Illinois.

the reactions are not fully understood (Doyle, 1976, p. 142), but it is generally accepted that water and oxygen act upon iron sulfide to produce ferrous sulfate and sulfuric acid in solution. The ferrous sulfate may react further to produce ferric sulfate and more sulfuric acid. The result is acidic water with high concentrations of sulfate.

Secondary reactions of the acidic water bring many other constituents into solution. These include many metals, such as aluminum, iron, manganese, arsenic, cadmium, mercury, and zinc. These metals are then subject to other reactions such as the formation of precipitates or sorption on sediments.

If the natural water is sufficiently alkaline, the acidic water may persist only for a short time before neutralization. However, neutralization does not change the concentration of sulfate, and sulfate persists as an indicator of mine drainage. Metals are usually not a reliable indicator of the amount of acidic mine drainage because they may not remain in solution.

The concentration of sulfate in streams depends on the amount produced at some source and the subsequent dilution in the streams. Dilution depends on the discharge of a stream, which varies with several factors such as the amount of precipitation and the drainage area. Concentrations cannot always be compared from stream to stream as an index of mining effect because of these variables. However, the amount of sulfate in acidic mine drainage and the resultant sulfate load in the stream would be expected to vary with the area of the mined land. This assumption was tested with data from the intensive sampling sites.

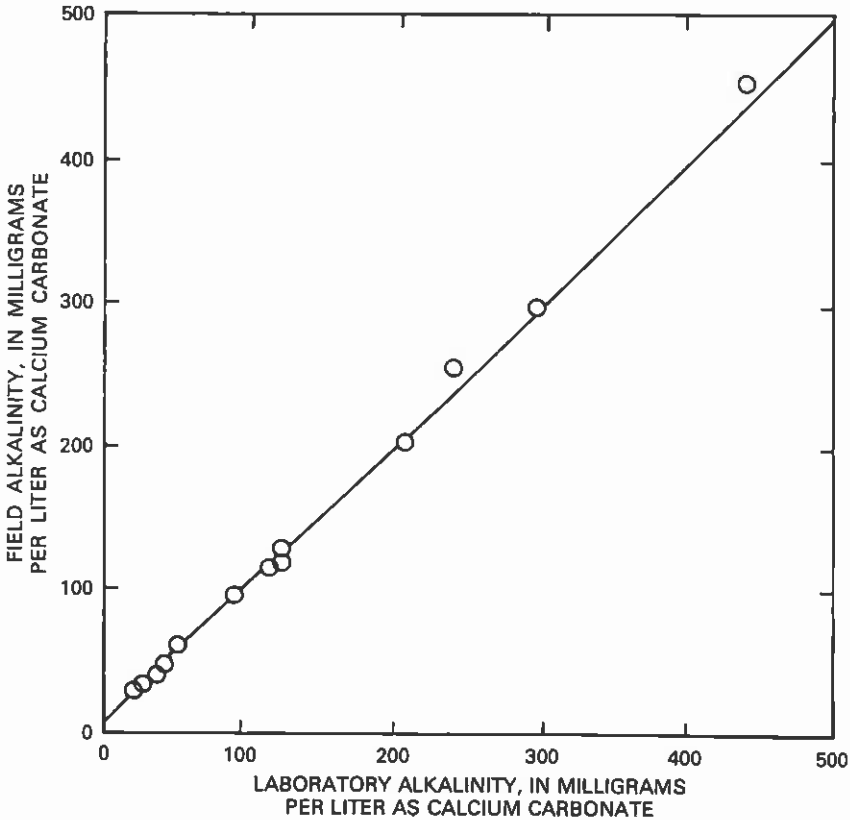

FIGURE 5.—Field and laboratory alkalinity measurements.

SULFATE LOADS

Continuous records of both sulfate concentration and stream discharge are needed to compute sulfate loads for any period. Continuous records of both were not available for any sampling site; however, enough data were available for some sampling sites to use the duration curve technique (Searcy, 1959, p. 29) to estimate annual sulfate loads. This technique depends on the correlation of either sulfate concentration or load with stream discharge and the availability of flow duration curves.

Sufficient data to regress sulfate concentrations on concurrent discharge measurements were available for 14 of the 20 sites sampled during the 1976 and 1977 water years. Computerized regression programs were used to relate log-instantaneous discharge to log-sulfate concentration and to log-instantaneous sulfate load. The discharge per square mile was used in the regressions for sulfate load to facilitate the use of the relationships in the duration curve technique for computing average annual sulfate loads. The standards errors (table 1), given in logarithmic deviations and in average percent deviations from the regression line, apply to both equations.

TABLE 1.—*Station data for sulfate-concentration and sulfate-load computations*
[Q = discharge in cubic foot per second; A = drainage area in square miles; CC = Correlation coefficient]

Map number	Station number	Sulfate concentration		Sulfate load		Standard error		Number of measurements
		Equation	CC	Equation	CC	Log	Percent	
1	03382090	$1{,}400Q^{-0.543}$	−0.86	$19.2(Q/A)^{0.457}$	0.81	0.203	48	21
2	03382100	$2{,}180Q^{-0.419}$	−0.86	$107(Q/A)^{0.581}$	0.92	0.195	46	25
3	03382130	$1{,}810Q^{-0.339}$	−0.73	$187(Q/A)^{0.661}$	0.90	0.234	56	20
4	03382170	$162Q^{0.020}$	0.11	$6.11(Q/A)^{1.02}$	0.99	0.157	37	6
5	03382185	$1{,}640Q^{-0.133}$	−0.60	$194(Q/A)^{0.866}$	0.98	0.133	27	20
8	03382320	$196Q^{-0.056}$	−0.28	$31.6(Q/A)^{0.944}$	0.98	0.200	48	19
11	05597040	$176Q^{-0.137}$	−0.49	$9.72(Q/A)^{0.863}$	0.96	0.269	68	8
12	05597300	$665Q^{-0.272}$	−0.88	$109(Q/A)^{0.728}$	0.98	0.156	37	8
13	05597500	$456Q^{-0.162}$	−0.49	$22.3(Q/A)^{0.838}$	0.95	0.252	81	17
15	05598700	$3{,}040Q^{-0.332}$	−0.80					8
16	05599000	$3{,}620Q^{-0.505}$	−0.81	$162(Q/A)^{0.495}$	0.80	0.247	60	16
18	05599080	$1{,}330Q^{-0.130}$	−0.94	$65.7(Q/A)^{0.760}$	0.99	0.127	30	8
19	05599100	$3{,}290A^{-0.423}$	−0.81	$167(Q/A)^{0.577}$	0.88	0.229	55	16
21	05599500	$1{,}350Q^{-0.287}$	−0.75	$869(Q/A)^{0.713}$	0.94	0.146	34	49

Sites 6, 9, and 20 had five or fewer measurements and were considered unsuitable for regression analyses. The measurements covered a wide range of discharge and sulfate concentration; therefore, visually estimated lines of relationship were used for these three sites. Sites 7, 14, and 17 were omitted from the load computations because no relationships between discharge and concentration of sulfate load were apparent.

Continuous discharge records were available for sites 2, 4, 10, 13, 16, and 21 (fig. 4). All gaged sites except site 10 were also sampling sites. Flow-duration curves were prepared from gaging station records for five gaged sites. These six gaging stations were also used to estimate flow-duration curves for the other sampling sites. Two general curves were prepared, one for sites with drainage areas less than 100 mi^2 (fig. 6) and one for sites with drainage areas greater than 100 mi^2 (fig. 7). The flow duration curves were adjusted to discharge per square mile of drainage area to facilitate use of the curves with different drainage areas. The generalized flow duration curves in figures 6 and 7 were visually placed in an intermediate position relative to those for the gaged sites.

The five flow-duration curves prepared from station records and the general curves from figures 6 and 7 were used with sulfate load-discharge relationships for the appropriate gaged and ungaged sites to estimate annual sulfate loads.

The procedure for estimating annual sulfate loads was to first select percent times and corresponding discharges from the duration curves to prepare a flow-duration table. A sulfate-load-duration table was then prepared by determining the sulfate load associated with each discharge value in the flow-duration table. The sulfate loads were determined from the relationships to discharge in table 1 or from the graphical relationships for those sites where regression equations were not available. The product of each time interval and the average sulfate load for the time interval was then summed to obtain the estimated daily sulfate load. Table 2 gives an example of the procedure and the values obtained for one sampling site.

The sulfate loads calculated for 16 sites were regressed against the area of mined land (table 3) upstream from the sampling site. The drainage area and the mined area upstream from site 15 (fig. 4) would require extensive fieldwork to be defined because of modification of the basin divide during mining. This site and the three sites where relationships between discharge and concentration of sulfate were indeterminate were not used.

The relationships of annual sulfate loads to the area of surface-mined land (fig. 8) and the average annual sulfate load per square mile to the percent of surface-mined land (fig. 9) both show that sulfate loads are strongly dependent on the amount of land disturbed by surface mining. The regression coefficients indicate that 3,000–4,000 tons of sulfate annually enter the streams per square mile of mined land.

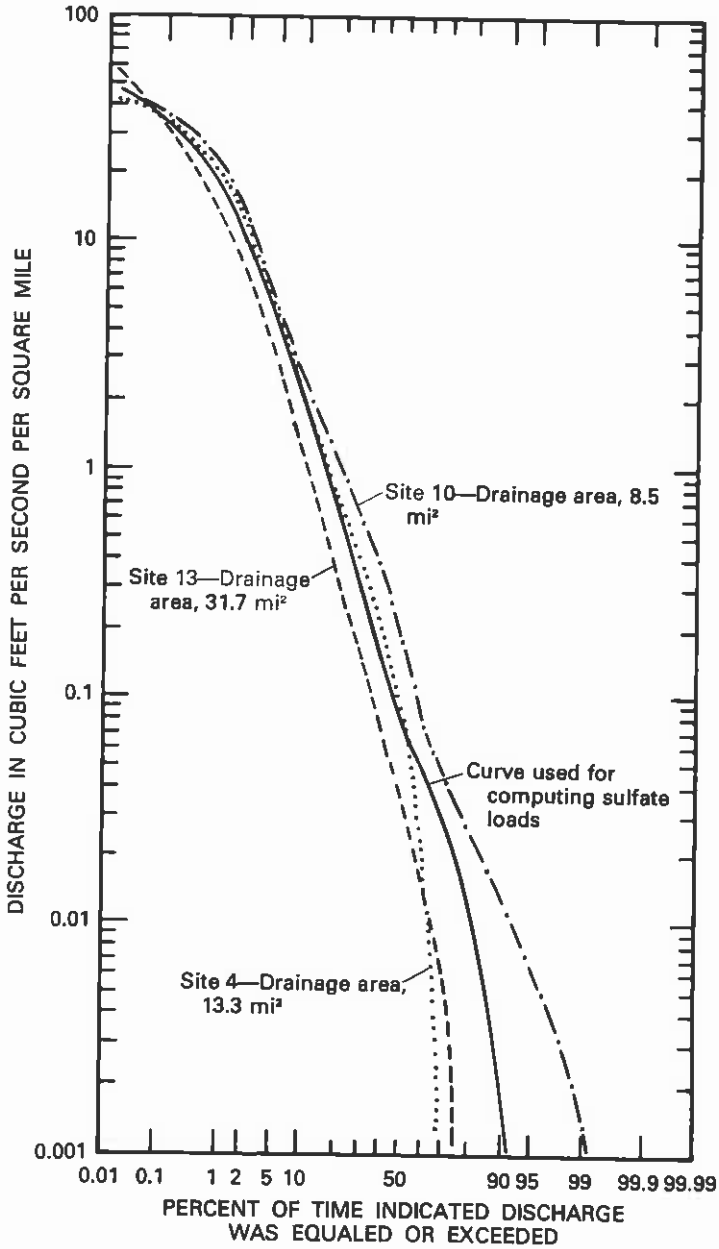

FIGURE 6.—Generalized flow-duration curve for sites less than 100 mi² in the Big Muddy and Saline River basins, Illinois. Location of sites shown in figure 4.

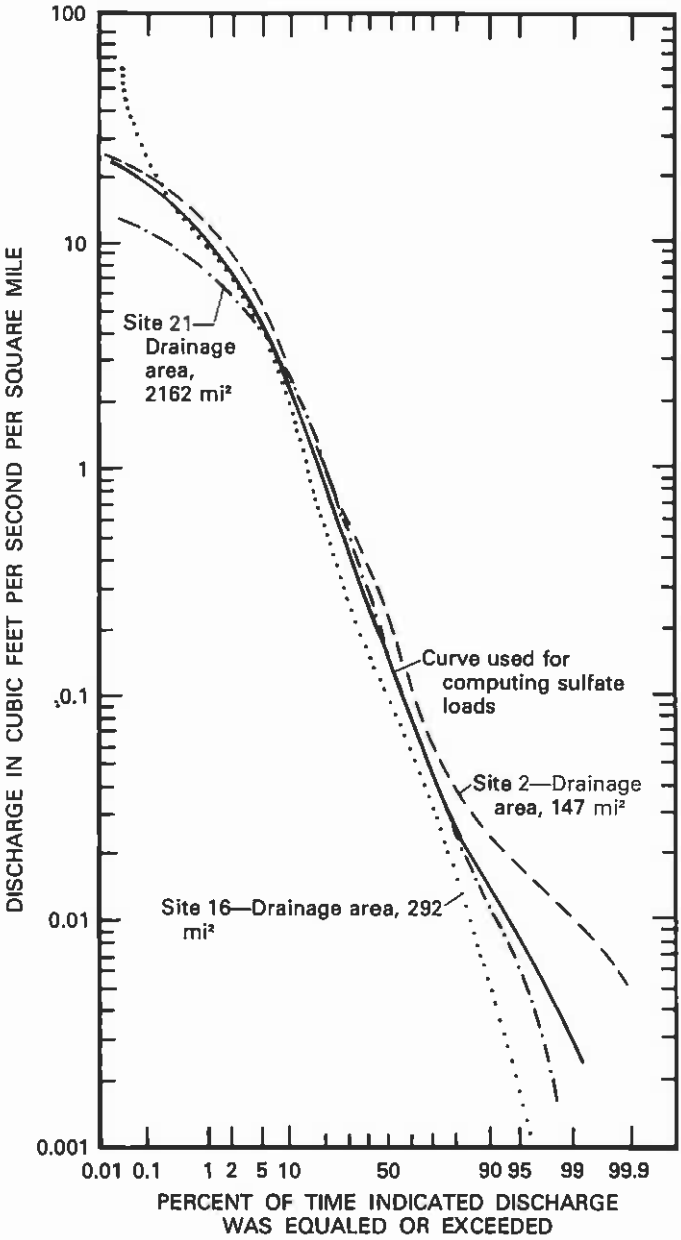

FIGURE 7.—Generalized flow-duration curve for sites greater than 100 mi² in the Big Muddy and Saline River basins, Illinois. Location of sites shown in figure 4.

TABLE 2.—*Tabulation of average annual sulfate load for site 21 by use of the flow-duration curve technique*

Percent time	Discharge ((ft³/s)/mi²)	Sulfate load (tons per day)	Time interval (percent)	Average sulfate load for time interval (tons per day)	Column 4 × Column 5 × 0.01
0	15	6,200			
.1	12	5,200	0.1	5,700	5.70
.2	11	4,900	.1	5,050	5.05
.5	8.7	4,200	.3	4,550	13.65
1.0	7.2	3,600	.5	3,900	19.50
2.0	6.0	3,200	1.0	3,400	34.00
3.0	5.0	2,750	1.0	2,975	29.75
5.0	4.0	2,350	2.0	2,550	51.00
7.0	3.3	2,100	2.0	2,225	44.50
10	2.5	1,700	3.0	1,900	57.00
15	1.5	1,200	5.0	1,450	72.50
20	1.2	1,000	5.0	1,100	55.00
30	.6	620	10	810	81.00
40	.3	380	10	500	50.00
50	.15	230	10	305	30.50
60	.084	150	10	190	19.00
70	.048	100	10	125	12.50
80	.025	64	10	82	8.20
90	.013	40	10	52	5.20
95	.0065	25	5.0	32.5	1.63
100	.0	0	5.0	12.5	.63
Total					596.31

Average tons per day (596.31) times 365 days/yr equals 217,653 tons/yr. Tons per year (217,653) divided by drainage area (2,162 mi²) equals 101 tons/yr/mi².

TABLE 3.—*Drainage areas, mined areas, and sulfate loads*

Map number	Station number	Drainage area (square miles)	Mined area		Annual average sulfate load	
			Square miles	Percent	Tons	Tons per square mile
11	05597040	33.1	0.0	0.0	2,970	90
8	03382320	76.4	.0	.0	10,800	141
4	[1]03382170	13.3	.1	.8	2,410	181
21	[1]05599500	2,162	51.6	2.4	218,000	101
12	05597300	283	6.7	2.4	27,200	96
1	03382090	35.4	1.1	3.1	4,200	119
9	[2]03382450	1,022	31.3	3.1	119,000	116
13	[1]05597500	31.7	1.2	3.8	4,640	146
3	03382130	248	12.1	4.9	45,400	183
20	[1]05599300	516	25.5	4.9	96,500	187
2	[1]03382100	147	9.8	6.7	29,000	197
6	[2]03382205	233	15.8	6.8	52,800	226
19	05599100	162	12.1	7.5	39,800	246
16	[1]05599000	292	24.1	8.3	33,600	115
18	05599080	46.1	5.5	11.9	16,400	356
5	03382185	77.9	14.8	19.0	58,940	757

[1] Gaging station.

[2] Insufficient data for regression analysis; eye-fit line used for load calculation.

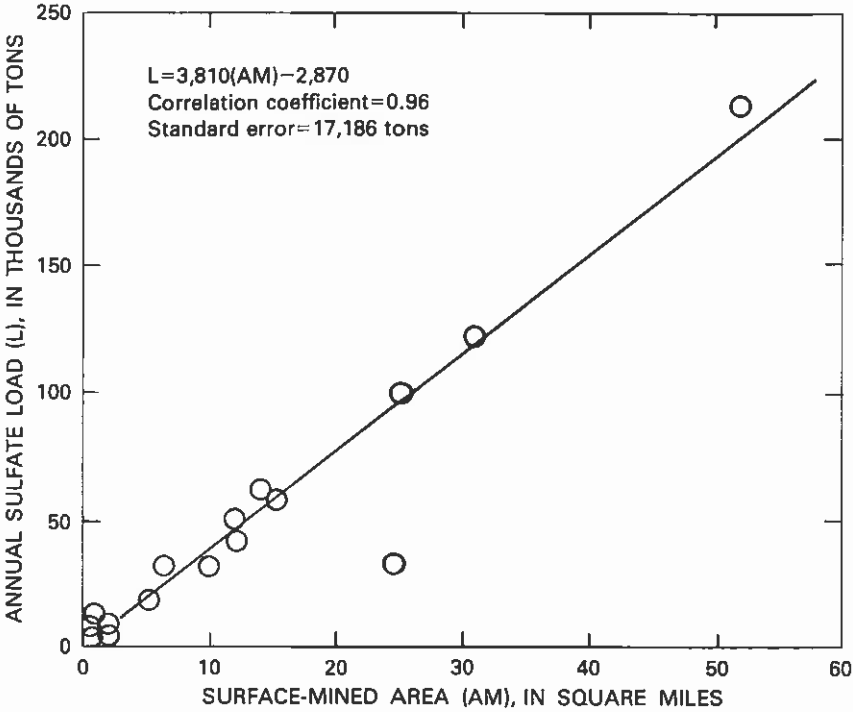

FIGURE 8.—Relationship of annual sulfate load to area of surface-mined land.

DATA NEEDS

The data collected from 1975 to 1977 provide considerable information on chemical characteristics of streams in surface-mined areas in Illinois and suggest that additional data are needed to define better the hydrology.

The concentrations of dissolved solids, sulfate, and many metals are relatively high near the mine sites, where the water is commonly acidic. In larger streams, acidic water from mine drainage is readily neutralized, and concentration of the above constituents are lower. The inverse correlation of discharge to sulfate concentration (table 1) suggests that dilution is the principal cause of attenuation of sulfate.

The dissolved concentrations of most of the major constituents are directly related to each other and to specific conductance. Figure 10 shows two relationships for one station and indicates that measurements of specific conductance could be used to estimate accurately concentrations of some constituents. As specific conductance is readily measurable, these relationships could be used with recorded flow data to calculate, with a fair degree of accuracy, the dissolved loads of certain constituents contributed by mined areas.

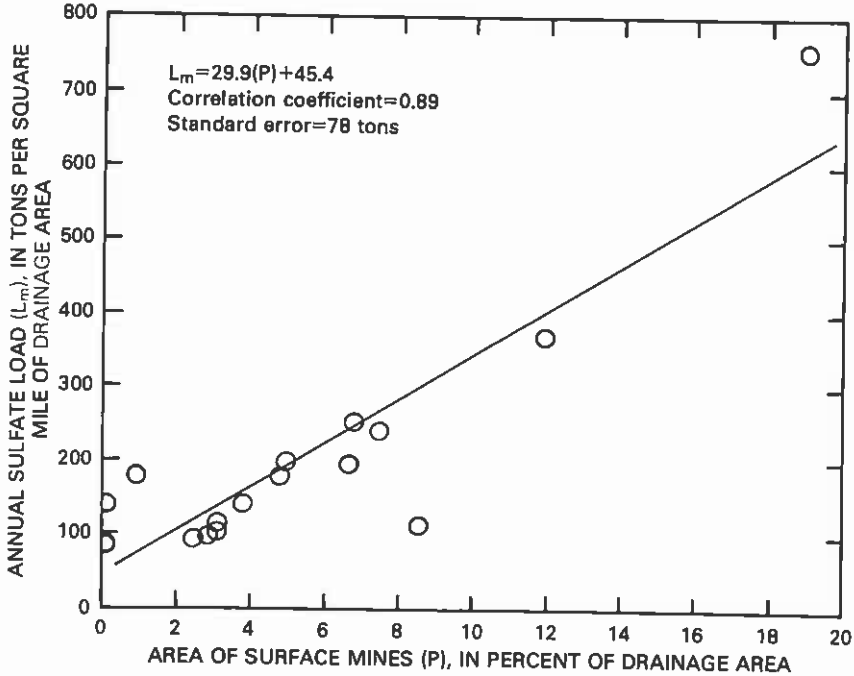

FIGURE 9.—Relationship of annual sulfate load per square mile of drainage area to percentage of surface-mined land.

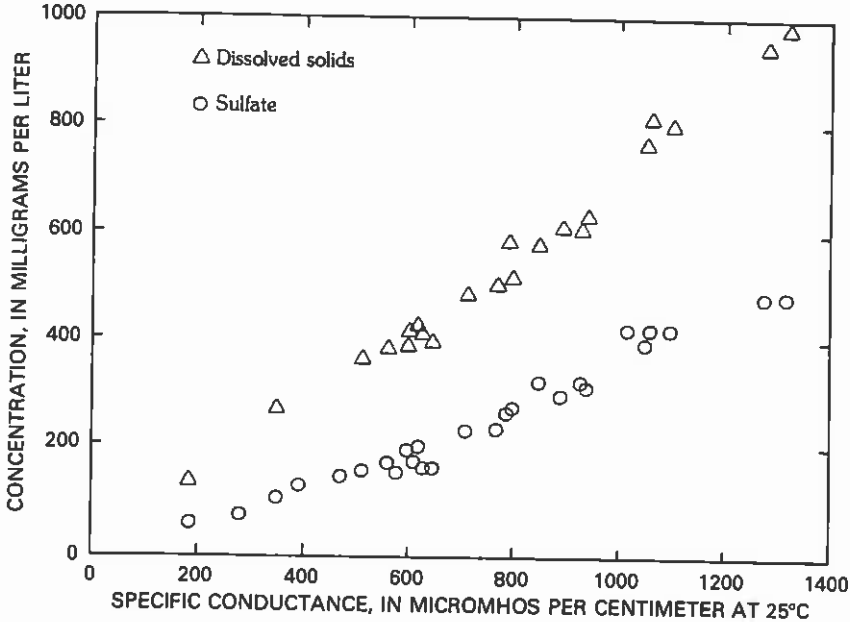

FIGURE 10.—Relationship of specific conductance to dissolved solids and sulfate concentrations for Big Muddy River at Murphysboro, Illinois.

Although many of the major constituents are inversely related to discharge, which suggests that attenuation is largely by dilution, no well-defined relationships were observed for the minor constituents. Metals, in particular, are considered susceptible to adsorption and precipitation, but data are not available to evaluate whether any constituents are being concentrated in bottom materials or how metals absorbed on sediments are transported.

Data are also needed to evaluate the changes in runoff caused by surface mining in Illinois. Corbett (1966) concluded that floodflows in one watershed in southern Indiana were materially reduced by "cast overburden". Comparison studies of runoff from mined areas with that from nearby unmined areas would provide the information needed for this evaluation.

SUMMARY

Bituminous coal reserves in Illinois make up a large part of the Eastern Interior Coal Field. On the periphery of a structural basin in Illinois, the coal is amenable to removal by surface mining. As of June 1974, 181,000 acres had been affected by surface mining.

The water quality in streams has been altered by runoff from the mined areas. Analyses of stream water made from 1975 to 1977 show that acidic water is formed in many mined areas but is usually neutralized before it reaches the larger streams. Sulfate loadings in streams in southern Illinois are directly related to the area of mined land in the basin. Annually, 3,000–4,000 tons of sulfate per square mile of mined land enter the streams.

High sulfate concentrations are associated with high concentrations of dissolved solids. Concentrations of aluminum, arsenic, chromium, copper, iron, manganese, and zinc are significant in the acidic waters.

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TABLES 4, 5

Table 4.--Chemical analyses of samples collected at reconnaissance sites

DATE	DRAINAGE AREA (SQUARE MILES) (81024)	INSTAN-TANEOUS DIS-CHARGE (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS) (00095)	PH (UNITS) (00400)	TEMPER-ATURE (DEG C) (00010)	DIS-SOLVED OXYGEN (MG/L) (00300)	TOTAL ACIDITY AS H+ (MG/L) (71825)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICAR-BONATE (HCO3) (MG/L) (00440)	ALKA-LINITY AS CACO3 (MG/L) (00410)	CARBON DIOXIDE (CO2) (MG/L) (00405)	TOTAL SUL-FIDE (S) (MG/L) (00745)
03338090 - JORDAN CREEK AT FAIRMOUNT, IL (LAT 40 03 26 LONG 087 50 11)												
MAY , 1975												
12...	17.8	14	643	7.9	14.0	11.2	.0	.0	260	213	5.2	.0
JUN												
19...	17.8	13	660	7.4	22.5	7.7	.0	.0	278	228	18	1.4
03339040 - GRAPE CREEK AT TILTON, IL (LAT 40 05 42 LONG 087 38 08)												
MAY , 1975												
12...	11.8	7.3	818	7.3	12.0	9.2	.0	.0	244	200	20	.0
JUN												
19...	11.8	11	776	6.8	20.0	8.2	.0	.0	246	202	42	.0
03339142 - FAYETTE DRAIN NEAR INDIANOLA, IL (LAT 39 57 05 LONG 087 42 30)												
MAY , 1975												
12...	10.3	12	666	7.9	13.0	11.5	.0	.0	276	226	5.6	.0
JUN												
19...	10.3	11	752	7.3	20.5	9.4	.0	.0	293	240	23	.5
03346150 - BIG CREEK NEAR OBLONG, IL (LAT 39 00 12 LONG 087 56 28)												
MAY , 1975												
13...	35.0	6.7	615	7.4	15.0	8.6	.0	.0	106	87	6.8	.0
JUN												
16...	35.0	1.2	840	7.3	20.0	7.2	.0	.0	217	178	17	.6
03346180 - DOGWOOD CREEK AT OBLONG, IL (LAT 39 00 07 LONG 087 53 38)												
MAY , 1975												
13...	11.7	.80	984	7.8	15.0	6.6	.0	.0	164	135	4.2	.4
JUN												
16...	11.7	.60	1080	7.3	21.0	6.2	.0	.0	245	201	20	1.0
03382090 - SUGAR CREEK NEAR STONEFORT, IL (LAT 37 39 19 LONG 088 45 48)												
MAY , 1975												
14...	35.4	5.0	760	3.6	16.5	7.7	5.5	273	0	0	.0	.5
JUN												
17...	35.4	E4.1	2420	3.3	23.0	.3	44	2180	0	0	.0	1.0
03382120 - LITTLE SALINE RIVER NEAR STONEFORT, IL (LAT 37 35 04 LONG 088 40 09)												
MAY , 1975												
14...	19.5	13	120	6.9	15.0	8.8	.0	.0	23	19	4.6	.0
JUN												
17...	19.5	.50	167	6.9	21.0	5.5	.0	.0	68	56	14	1.4
03382155 - PRAIRIE CREEK NEAR CORINTH, IL (LAT 37 49 37 LONG 088 42 36)												
MAY , 1975												
14...	5.43	1.5	570	7.1	19.0	10.0	.0	.0	92	75	12	.0
JUN												
17...	5.43	.06	758	7.0	24.0	9.2	.0	.0	152	125	24	.1
03382175 - BRUSHY CREEK TRIB NEAR MARCO, IL (LAT 37 46 33 LONG 088 37 09)												
MAY , 1975												
13...	4.04	1.0	2050	3.0	20.0	7.0	16	794	0	0	.0	.0
JUN												
16...	4.04	.04	5890	2.7	27.0	4.2	--	--	--	--	--	.0

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	PHENOLS (UG/L) (32730)
03338040 - JORDAN CREEK AT FAIRMOUNT, IL (LAT 40 03 26 LONG 087 58 11)												
MAY - 1975												
12...	76	13	30	0	0	0	10	20	<.5	10	6.2	1
JUN												
19...	69	12	20	0	<10	0	40	20	<.5	10	3.0	5
03339040 - GRAPE CREEK AT TILTON, IL (LAT 40 05 42 LONG 087 38 08)												
MAY - 1975												
12...	120	26	70	1	0	0	30	290	.6	1100	5.7	0
JUN												
19...	110	22	60	0	0	0	20	260	<.5	690	19	0
03339142 - FAYETTE DRAIN NEAR INDIANOLA, IL (LAT 39 57 05 LONG 087 42 30)												
MAY - 1975												
12...	66	15	30	2	<10	0	30	20	<.5	10	12	16
JUN												
19...	74	16	20	0	0	0	50	30	<.5	10	4.5	0
03346150 - BIG CREEK NEAR OBLONG, IL (LAT 39 00 12 LONG 087 58 28)												
MAY - 1975												
13...	33	89	180	1	10	10	260	120	.8	390	15	4
JUN												
16...	25	90	20	1	<10	0	60	490	1.3	0	9.6	2
03346180 - DOGWOOD CREEK AT OBLONG, IL (LAT 39 00 07 LONG 087 53 38)												
MAY - 1975												
13...	50	180	110	2	20	20	180	500	.7	60	13	0
JUN												
16...	63	200	40	5	10	10	70	1000	.6	10	18	2
03382090 - SUGAR CREEK NEAR STONEFORT, IL (LAT 37 39 19 LONG 088 45 48)												
MAY - 1975												
14...	320	2.1	20000	0	70	40	3700	5200	1.7	520	14	27
JUN												
17...	2200	6.0	220000	1	680	250	250000	39000	<.5	3700	5.8	0
03382120 - LITTLE SALINE RIVER NEAR STONEFORT, IL (LAT 37 35 04 LONG 088 40 09)												
MAY - 1975												
14...	30	2.4	60	0	<10	0	170	150	.8	20	4.6	8
JUN												
17...	30	4.2	20	1	10	0	340	560	<.5	10	5.9	6
03382155 - PRAIRIE CREEK NEAR CORINTH, IL (LAT 37 49 37 LONG 088 42 36)												
MAY - 1975												
14...	160	16	210	0	0	10	260	60	1.1	20	4.0	3
JUN												
17...	180	68	220	1	20	18	110	90	.7	0	5.2	7
03382175 - BRUSHY CREEK TRIB NEAR MARCO, IL (LAT 37 46 33 LONG 088 37 09)												
MAY - 1975												
13...	1000	22	45000	2	230	190	180000	7000	2.2	5900	7.0	6
JUN												
16...	4100	40	21000	520	640	270	340000	26000	1.1	2000	12	1

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DRAINAGE AREA (SQUARE MILES) (81024)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	PH (UNITS) (00400)	TEMPERATURE (DEG C) (00010)	DISSOLVED OXYGEN (MG/L) (00300)	TOTAL ACIDITY AS H+ (MG/L) (71825)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	ALKALINITY AS CACO3 (MG/L) (00410)	CARBON DIOXIDE (CO2) (MG/L) (00405)	TOTAL SULFIDE (S) (MG/L) (00745)
03382180 - BANKSTON FORK AT DORRIS HEIGHTS, IL (LAT 37 45 34 LONG 088 34 18)												
MAY , 1975												
13...	73.3	58	2000	7.2	20.0	8.7	.0	.0	124	102	13	.4
JUN												
16...	73.3	6.2	2900	6.7	24.5	8.3	.0	.0	209	171	67	.9
03382210 - BRIER CREEK NEAR HARRISBURG, IL (LAT 37 41 40 LONG 088 32 10)												
MAY , 1975												
14...	3.22	.40	586	7.3	15.5	8.1	.0	.0	138	113	11	.0
05447370 - MUD CREEK AT ANNAWAN, IL (LAT 41 24 04 LONG 089 55 13)												
MAY , 1975												
15...	80.5	50	679	8.3	18.0	11.1	.0	.0	323	265	2.6	.0
JUN												
18...	80.5	68	683	7.4	24.0	8.1	.0	.0	292	240	19	.9
05447390 - COAL CREEK AT SHEFFIELD, IL (LAT 41 21 48 LONG 089 44 43)												
MAY , 1975												
15...	25.3	16	738	8.7	16.5	15.0	.0	.0	281	230	.9	.0
JUN												
18...	25.3	43	718	7.5	23.0	9.1	.0	.0	278	228	14	.0
05447400 - KING CREEK AT MINERAL, IL (LAT 41 23 08 LONG 089 58 34)												
MAY , 1975												
15...	17.6	14	785	8.4	17.0	11.1	.0	.0	282	231	1.8	.0
JUN												
18...	17.6	17	897	7.7	24.0	8.9	.0	.0	273	224	8.7	1.8
05466010 - MUD CREEK AT OPHIEM, IL (LAT 41 15 03 LONG 090 22 40)												
MAY , 1975												
14...	17.2	9.6	636	8.4	22.0	8.6	.0	.0	268	220	1.7	.0
JUN												
17...	17.2	36	350	7.5	21.0	7.1	.0	.0	147	121	7.4	--
05466080 - POPE CREEK NEAR ALPHA, IL (LAT 41 08 45 LONG 090 22 47)												
MAY , 1975												
14...	41.1	37	708	7.7	16.0	18.0	.0	.0	274	225	8.7	.0
JUN												
17...	41.1	78	585	7.7	20.0	9.0	.0	.0	193	158	4.2	.1
05466630 - NORTH POPE CREEK AT NEW WINDSOR, IL (LAT 41 11 30 LONG 090 26 47)												
MAY , 1975												
14...	6.30	4.1	670	8.7	20.5	15.1	.0	.0	250	205	.8	.0
JUN												
17...	6.30	5.5	620	7.8	21.0	8.8	.0	.0	228	187	5.0	.8
05527002 - HORSE CREEK NEAR ESSEX, IL (LAT 41 18 38 LONG 088 09 00)												
MAY , 1975												
12...	107	46	690	8.3	16.5	14.3	.0	.0	211	173	1.7	.0
JUN												
19...	107	186	703	7.2	25.5	8.5	.0	.0	233	191	24	3.8

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	PHENOLS (UG/L) (32730)
03302180 - BANKSTON FORK AT DORRIS HEIGHTS, IL (LAT 37 45 34 LONG 088 34 10)												
MAY , 1975												
13...	1100	16	28	1	10	10	20	510	.6	0	4.5	6
JUN												
16...	1900	23	110	0	20	20	30	640	<.5	40	16	1
03382210 - MAIER CREEK NEAR HARRISBURG, IL (LAT 37 41 40 LONG 088 32 18)												
MAY , 1975												
14...	140	9.2	80	1	10	10	150	210	.7	320	9.3	0
05447370 - MUD CREEK AT ANNAWAN, IL (LAT 41 24 04 LONG 089 55 13)												
MAY , 1975												
15...	79	18	30	1	<10	10	50	90	.6	10	4.9	0
JUN												
18...	62	17	40	1	10	0	50	40	<.5	0	13	1
05447390 - COAL CREEK AT SHEFFIELD, IL (LAT 41 21 40 LONG 089 44 43)												
MAY , 1975												
15...	100	15	20	0	20	10	40	80	.5	10	21	--
JUN												
18...	71	13	60	0	10	0	30	30	<.5	0	7.4	0
05447480 - KING CREEK AT MINERAL, IL (LAT 41 23 00 LONG 089 50 34)												
MAY , 1975												
15...	220	8.6	10	1	<10	10	20	70	.5	0	1.8	4
JUN												
18...	230	11	50	1	0	0	50	50	<.5	10	11	3
05466010 - MUD CREEK AT OPHIEM, IL (LAT 41 15 03 LONG 090 22 40)												
MAY , 1975												
14...	48	13	20	0	0	0	20	20	<.5	0	3.7	0
JUN												
17...	27	14	190	1	0	0	140	140	<.5	20	71	1
05466480 - POPE CREEK NEAR ALPHA, IL (LAT 41 08 45 LONG 090 22 47)												
MAY , 1975												
14...	47	18	20	0	0	0	30	120	<.5	0	3.0	0
JUN												
17...	33	13	80	1	0	0	50	130	<.5	0	31	0
05466630 - NORTH POPE CREEK AT NEW WINDSOR, IL (LAT 41 11 38 LONG 090 26 47)												
MAY , 1975												
14...	58	21	20	0	10	0	30	60	<.5	30	--	12
JUN												
17...	44	18	70	1	0	0	30	70	<.5	0	23	0
05527002 - HORSE CREEK NEAR ESSEX, IL (LAT 41 18 38 LONG 088 09 00)												
MAY , 1975												
12...	86	25	50	0	<10	0	20	10	<.5	10	5.8	8
JUN												
19...	60	22	20	1	<10	0	60	18	<.5	50	14	3

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DRAINAGE AREA (SQUARE MILES) (01024)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	PH (UNITS) (00400)	TEMPERATURE (DEG C) (00010)	DISSOLVED OXYGEN (MG/L) (00300)	TOTAL ACIDITY AS H+ (MG/L) (71825)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	ALKALINITY AS CACO3 (MG/L) (00410)	CARBON DIOXIDE (CO2) (MG/L) (00405)	TOTAL SULFIDE (S) (MG/L) (00745)
05568450 - LITTLE LAMARSH CREEK AT MAPLETON, IL (LAT 40 33 40 LONG 089 44 36)												
MAY , 1975												
13...	8.06	4.6	940	8.0	16.5	10.1	.0	.0	370	303	5.9	.0
JUN												
16...	8.06	3.4	935	8.0	19.0	9.0	.0	.0	345	283	5.5	.2
05568770 - SPOON RIVER AT MODENA, IL (LAT 41 08 08 LONG 089 45 38)												
MAY , 1975												
15...	154	113	732	8.2	16.0	10.2	.0	.0	279	229	2.8	.0
JUN												
19...	154	248	752	7.8	21.0	8.4	.0	.0	273	224	6.9	2.6
05568772 - JACK CREEK AT MODENA, IL (LAT 41 08 05 LONG 089 46 40)												
MAY , 1975												
15...	15.7	12	640	8.3	15.0	12.8	.0	.0	302	248	2.4	.0
JUN												
19...	15.7	18	696	7.9	18.0	9.2	.0	.0	297	244	6.8	.0
05568795 - INDIAN CREEK AT TOULON, IL (LAT 41 05 55 LONG 089 53 06)												
MAY , 1975												
15...	39.6	42	768	7.9	13.0	11.2	.0	.0	284	233	5.7	.0
JUN												
18...	39.6	61	648	7.8	21.5	9.1	.0	.0	254	208	6.4	.0
05568860 - WALNUT CREEK NEAR WEST JERSEY, IL (LAT 41 01 05 LONG 089 57 43)												
MAY , 1975												
15...	161	159	730	7.9	14.0	9.6	.0	.0	243	216	5.3	.0
JUN												
18...	161	176	530	7.8	23.0	7.9	.0	.0	208	171	5.3	.0
05568895 - SNAKEDEN HOLLOW NEAR DAMINDA, IL (LAT 40 57 34 LONG 090 04 15)												
MAY , 1975												
14...	9.82	5.5	1300	8.3	18.0	11.5	.0	.0	250	205	2.0	.0
JUN												
18...	9.82	17	957	7.8	23.0	8.5	.0	.0	285	168	5.2	.3
05568910 - SUGAR CREEK AT DAMINDA, IL (LAT 40 55 48 LONG 090 07 00)												
MAY , 1975												
14...	21.6	15	706	8.4	19.0	9.7	.0	.0	209	171	1.3	.1
JUN												
18...	21.6	30	742	8.1	22.0	8.2	.0	.0	195	160	2.5	.3
05568940 - HICKORY CREEK NEAR MAQUON, IL (LAT 40 46 43 LONG 090 08 07)												
MAY , 1975												
14...	8.99	5.8	1460	8.1	15.5	9.1	.0	.0	324	266	4.1	.0
JUN												
17...	8.99	10	928	7.9	18.0	8.3	.0	.0	201	165	4.0	.0
05569450 - LITTLERS CREEK NEAR RAPATEE, IL (LAT 40 44 53 LONG 090 09 28)												
MAY , 1975												
14...	33.3	14	1080	8.4	16.0	8.0	.0	.0	308	253	2.0	.3
JUN												
17...	33.3	26	1110	7.9	19.0	8.4	.0	.0	258	212	5.2	.0

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	PHENOLS (UG/L) (32730)
05568450 - LITTLE LAMARSH CREEK AT MAPLETON, IL (LAT 40 33 48 LONG 089 44 36)												
MAY , 1975												
13...	190	11	20	1	0	0	20	120	<.5	10	2.5	4
JUN												
16...	190	11	20	0	0	0	60	110	<.5	10	2.3	0
05568770 - SPOON RIVER AT MODENA, IL (LAT 41 08 08 LONG 089 45 38)												
MAY , 1975												
15...	64	31	20	1	<10	0	20	100	.5	10	--	4
JUN												
19...	55	26	30	1	0	0	30	60	<.5	10	8.6	0
05568772 - JACK CREEK AT MODENA, IL (LAT 41 08 05 LONG 089 46 40)												
MAY , 1975												
15...	56	15	20	0	10	10	50	50	.5	10	7.5	0
JUN												
19...	47	14	40	1	0	0	10	40	<.5	0	9.8	5
05568795 - INDIAN CREEK AT TOULON, IL (LAT 41 05 55 LONG 089 53 06)												
MAY , 1975												
15...	51	18	30	0	<10	20	50	60	.9	10	3.2	0
JUN												
18...	43	16	30	0	<10	0	80	40	<.5	10	10	4
05568860 - WALNUT CREEK NEAR WEST JERSEY, IL (LAT 41 01 05 LONG 089 57 43)												
MAY , 1975												
15...	54	13	20	1	0	0	10	40	<.5	10	4.2	4
JUN												
18...	47	12	130	0	0	0	50	0	<.5	10	34	1
05568895 - SNAKEDEN HOLLOW NEAR DAHINDA, IL (LAT 40 57 34 LONG 090 04 15)												
MAY , 1975												
14...	520	9.7	20	1	0	0	30	160	<.5	10	2.5	4
JUN												
18...	340	10	40	0	<10	0	40	90	<.5	10	4.3	0
05568910 - SUGAR CREEK AT DAHINDA, IL (LAT 40 55 40 LONG 090 07 00)												
MAY , 1975												
14...	180	9.5	10	2	0	10	40	100	<.5	10	6.0	0
JUN												
18...	190	8.0	20	6	0	0	30	60	<.5	0	8.2	0
05568940 - HICKORY CREEK NEAR MAQUON, IL (LAT 40 46 43 LONG 090 08 07)												
MAY , 1975												
14...	580	6.0	20	1	0	10	30	420	<.5	10	5.6	0
JUN												
17...	280	9.5	80	1	0	0	80	190	<.5	10	38	0
05569450 - LITTLERS CREEK NEAR RAPATEE, IL (LAT 40 44 53 LONG 090 09 28)												
MAY , 1975												
14...	430	25	30	0	<10	10	30	830	<.5	10	5.0	4
JUN												
17...	320	23	30	1	<10	0	10	320	<.5	0	6.4	0

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DRAINAGE AREA (SQUARE MILES) (81024)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	PH (UNITS) (00400)	TEMPERATURE (DEG C) (00010)	DISSOLVED OXYGEN (MG/L) (00300)	TOTAL ACIDITY AS H+ (MG/L) (71825)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	ALKALINITY AS CACO3 (MG/L) (00410)	CARBON DIOXIDE (CO2) (MG/L) (00405)	TOTAL SULFIDE (S) (MG/L) (00745)
05569920 - COAL CREEK NEAR FAIRVIEW, IL (LAT 40 39 33 LONG 090 14 08)												
MAY , 1975												
13...	28.2	13	1250	8.2	21.0	9.9	.0	.0	287	235	2.9	.0
JUN												
14...	28.2	17	1080	8.1	21.0	9.2	.0	.0	257	211	3.3	.0
05569960 - PUT CREEK NEAR CUBA, IL (LAT 40 31 27 LONG 090 11 55)												
MAY , 1975												
13...	24.3	15	1200	7.9	21.0	9.4	.0	.0	225	185	4.5	.0
JUN												
16...	24.3	12	1190	8.2	23.5	9.4	.0	.0	212	174	2.1	.0
05569970 - TURKEY CREEK NEAR ALYTON, IL (LAT 40 33 26 LONG 090 15 40)												
MAY , 1975												
13...	35.6	14	612	8.2	23.0	10.0	.0	.0	280	230	2.8	.2
JUN												
16...	35.6	13	704	8.2	24.0	8.7	.0	.0	279	229	2.0	--
05589735 - PRAIRIE DU PONT CREEK NEAR CENTREVILLE, IL (LAT 38 31 28 LONG 090 06 16)												
MAY , 1975												
13...	20.4	16	974	8.4	18.0	8.7	.0	.0	291	239	1.9	1.0
JUN												
17...	20.4	5.1	1230	8.2	24.0	8.6	.0	.0	298	244	3.0	.0
05594795 - HEBERERS BRANCH NEAR FREEBURG, IL (LAT 38 26 20 LONG 089 50 29)												
MAY , 1975												
15...	2.55	.89	1790	7.9	17.0	8.7	.0	.0	138	113	2.6	.1
JUN												
17...	2.55	1.4	2730	7.9	22.0	8.3	.0	.0	137	112	2.0	.0
05595185 - DOUGLAS CREEK NEAR SMITHTON, IL (LAT 38 25 28 LONG 089 59 14)												
MAY , 1975												
13...	16.9	7.4	1090	8.4	18.0	8.8	.0	.0	185	152	1.2	.5
JUN												
17...	16.9	.99	1110	8.1	26.0	11.2	.0	.0	148	121	1.9	.0
05595190 - WEST FORK RICHLAND CREEK AT FLORAVILLE, IL (LAT 38 22 54 LONG 090 02 43)												
MAY , 1975												
13...	15.5	4.1	780	8.6	21.5	10.1	.0	.0	235	193	.9	.1
JUN												
17...	15.5	.21	800	8.1	25.0	9.8	.0	.0	197	162	2.5	.5
05595230 - DOZA CREEK NEAR NEW ATHENS, IL (LAT 38 15 13 LONG 089 51 41)												
MAY , 1975												
13...	37.6	10	1550	9.0	24.0	10.9	.0	.0	131	107	.2	.1
JUN												
17...	37.6	4.1	1420	8.0	25.0	8.1	.0	.0	121	99	1.9	1.4
05595295 - LITTLE PLUM CREEK NEAR WALSH, IL (LAT 38 07 13 LONG 089 50 50)												
MAY , 1975												
14...	17.0	3.5	1140	8.3	16.0	9.1	.0	.0	237	194	1.9	2.7
JUN												
18...	17.0	.76	1060	8.0	22.0	7.0	.0	.0	222	182	3.6	.3

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	PHENOLS (UG/L) (32730)
05569920 - COAL CREEK NEAR FAIRVIEW, IL (LAT 40 39 33 LONG 090 14 00)												
MAY , 1975												
13...	440	9.2	10	1	<10	10	20	370	<.5	10	3.1	0
JUN												
16...	99	12	20	0	<10	0	10	120	<.5	0	5.6	0
05569960 - PUT CREEK NEAR CUBA, IL (LAT 40 31 27 LONG 090 11 55)												
MAY , 1975												
13...	500	12	40	1	0	0	20	180	<.5	10	3.3	4
JUN												
16...	460	12	40	1	10	0	30	140	<.5	20	5.0	0
05569970 - TURKEY CREEK NEAR BLYTON, IL (LAT 40 33 26 LONG 090 15 40)												
MAY , 1975												
13...	120	14	20	2	10	10	30	100	<.5	10	6.7	34
JUN												
16...	82	16	20	1	0	0	50	40	<.5	10	4.4	7
05589735 - PRAIRIE DU PONT CREEK NEAR CENTREVILLE, IL (LAT 38 31 28 LONG 090 06 16)												
MAY , 1975												
13...	270	19	40	2	<10	10	20	530	.9	10	7.3	2
JUN												
17...	410	32	40	4	20	10	50	640	<.5	0	9.1	2
05594795 - HEBERERS BRANCH NEAR FREEBURG, IL (LAT 38 26 20 LONG 089 58 29)												
MAY , 1975												
15...	740	50	20	2	<10	20	30	2800	.6	10	16	0
JUN												
17...	1300	78	20	1	<10	10	20	860	<.5	10	5.2	0
05595185 - DOUGLAS CREEK NEAR SMITHTON, IL (LAT 38 25 28 LONG 089 59 14)												
MAY , 1975												
13...	400	17	50	2	10	0	40	210	.9	10	8.2	17
JUN												
17...	500	29	30	1	<10	0	30	280	<.5	10	18	0
05595190 - WEST FORK RICHLAND CREEK AT FLORAVILLE, IL (LAT 38 27 54 LONG 090 02 43)												
MAY , 1975												
13...	190	15	30	0	10	10	20	100	<.5	10	5.6	0
JUN												
17...	220	18	10	0	<10	0	50	200	<.5	10	9.2	7
05595230 - DOZA CREEK NEAR NEW ATHENS, IL (LAT 38 15 13 LONG 089 51 41)												
MAY , 1975												
13...	710	17	40	1	10	10	30	220	.7	10	8.0	0
JUN												
17...	620	32	40	1	20	20	40	240	<.5	10	14	0
05595295 - LITTLE PLUM CREEK NEAR WALSH, IL (LAT 38 07 13 LONG 089 58 50)												
MAY , 1975												
14...	430	13	10	0	<10	20	40	210	.6	10	8.1	0
JUN												
18...	380	12	10	1	0	0	20	280	<.5	0	5.2	0

Table 4.--Chemical analyses of samples collected at miscellaneous sites--Continued

DATE	DRAINAGE AREA (SQUARE MILES) (81024)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	PH (UNITS) (00400)	TEMPERATURE (DEG C) (00010)	DISSOLVED OXYGEN (MG/L) (00300)	TOTAL ACIDITY AS H+ (MG/L) (71325)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	ALKALINITY AS CACO3 (MG/L) (00410)	CARBON DIOXIDE (CO2) (MG/L) (00405)	TOTAL SULFIDE (S) (MG/L) (00745)
05597255 - REESE CREEK NEAR OLD DU QUOIN, IL (LAT 37 58 33 LONG 089 18 02)												
MAY , 1975												
15...	37.3	E26	680	7.3	18.5	4.5	.0	.0	121	99	9.7	.3
05597265 - SIMMILE CREEK AT DOWELL, IL (LAT 37 56 08 LONG 089 13 09)												
MAY , 1975												
15...	12.7	3.4	1730	7.2	19.0	7.6	.0	.0	158	130	16	.2
JUN												
18...	12.7	.60	2750	7.3	23.0	7.3	.0	.0	284	233	23	.1
05597490 - LITTLE CRAB ORCHARD CREEK NEAR MARION, IL (LAT 37 44 22 LONG 088 51 21)												
MAY , 1975												
14...	8.50	2.2	1120	5.0	19.0	8.2	.7	35	0	0	.0	.0
05599020 - GALUM CREEK NEAR LOST PRAIRIE, IL (LAT 38 05 13 LONG 089 33 14)												
MAY , 1975												
14...	21.4	1.7	910	8.1	20.0	11.6	.0	.0	184	151	E.3	.2
JUN												
18...	21.4	.05	940	8.7	27.0	14.4	.0	.0	223	183	.7	.3
05599055 - PIPESTONE CREEK NEAR DENMARK, IL (LAT 37 57 58 LONG 089 29 03)												
MAY , 1975												
15...	18.7	8.0	6710	8.4	28.0	8.2	.0	.0	619	508	3.9	.4
JUN												
18...	18.7	7.8	6720	8.4	27.0	9.4	.0	.0	633	519	4.0	.0
05599060 - BRUSHY FORK NEAR DENMARK, IL (LAT 37 57 52 LONG 089 29 03)												
MAY , 1975												
15...	11.9	3.4	1010	8.1	20.5	9.5	.0	.0	136	112	1.7	1.6
JUN												
18...	11.9	.03	2580	8.3	27.5	7.6	.0	.0	203	167	1.6	.3

E Estimated value

Table 4.--Chemical analyses of samples collected at reconnaissance sites--Continued

DATE	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)	PHENOLS (UG/L) (32730)
05597255 - REESE CREEK NEAR OLD DU QUOIN, IL (LAT 37 58 33 LONG 089 18 02)												
MAY , 1975												
15...	170	21	40	2	<10	0	40	1300	.9	20	28	37
05597265 - SIXMILE CREEK AT DOWELL, IL (LAT 37 56 08 LONG 089 13 09)												
MAY , 1975												
15...	810	17	90	1	10	10	20	2400	.8	140	5.7	4
JUN												
18...	1000	19	120	0	20	10	40	900	<.5	0	3.0	8
05597400 - LITTLE CRAB ORCHARD CREEK NEAR MARION, IL (LAT 37 44 22 LONG 088 51 21)												
MAY , 1975												
14...	540	10	4000	2	20	20	1800	3000	.5	320	18	0
05599020 - GALUM CREEK NEAR LOST PRAIRIE, IL (LAT 38 05 13 LONG 089 33 14)												
MAY , 1975												
14...	250	18	20	1	<10	18	60	510	<.5	50	7.7	8
JUN												
18...	250	22	20	1	0	0	40	1300	<.5	10	8.1	5
05599055 - PIPESTONE CREEK NEAR DENMARK, IL (LAT 37 57 58 LONG 089 29 03)												
MAY , 1975												
15...	3000	41	20	1	10	10	50	680	.6	18	6.9	0
JUN												
18...	3500	45	30	0	20	20	40	140	<.5	10	18	--
05599060 - BRUSHY FORK NEAR DENMARK, IL (LAT 37 57 52 LONG 089 29 03)												
MAY , 1975												
15...	360	11	30	1	10	0	0	130	.7	10	9.4	0
JUN												
19...	1300	14	20	0	10	20	60	240	<.5	10	4.8	--

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	TIME	TEMPERATURE (DEG C) (00010)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	DISSOLVED OXYGEN (MG/L) (00300)	PH (UNITS) (00400)	ALKALINITY AS CACO3 (MG/L) (00410)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	CARBONATE (CO3) (MG/L) (00445)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)
(12) 05597300 - LITTLE MUDDY RIVER NEAR DE SOTO, IL (LAT 37 49 53 LONG 089 11 12)--Continued											
06-15-76*	1500	26.0	--	1270	6.7	7.7	105	0	--	--	--
08-17-76*	1400	24.5	--	1070	11.5	7.4	100	0	--	[illegible]	--
08-30-76	1545	24.0	2.4	1570	8.5	7.7	138	0	168	0	--
04-06-77	1445	14.0	982	260	5.0	6.6	36	--	44	0	12
07-05-77	1430	29.5	24	565	5.9	7.3	70	--	85	0	7.9
08-26-77	1415	26.0	14	750	11.4	8.4	77	--	94	0	7.1
(13) 05597500 - CRAB ORCHARD CREEK NEAR MARION, IL (LAT 37 43 52 LONG 088 53 21)											
12-09-75	0945	4.0	12	910	10.8	7.1	26	10	32	0	6.4
02-19-76	1400	10.0	69	520	10.2	6.3	16	15	20	0	9.5
03-02-76*	1300	15.5	7.0	1330	8.9	7.6	44	0	--	--	--
03-17-76*	0800	5.0	5.0	1380	11.4	7.5	65	0	--	--	--
03-25-76	1230	13.0	6.7	1220	9.4	7.3	67	20	82	0	9.1
04-02-76*	0800	10.0	8.0	1020	7.6	7.3	50	0	--	--	--
04-21-76*	0800	16.5	28	1050	7.7	6.2	0	7.0	--	--	--
05-06-76*	0800	16.0	--	1450	7.2	7.3	80	0	--	--	--
05-06-76	1600	16.0	2.6	1420	7.0	7.3	79	10	96	0	13
05-20-76*	0800	15.5	4.2	1130	8.2	7.3	45	0	--	--	--
06-03-76*	0800	18.5	18	733	5.8	7.0	60	0	--	--	--
06-16-76*	0800	20.5	5.0	1080	5.8	7.1	65	0	--	--	--
07-06-76*	0800	21.0	17	767	8.0	6.7	18	0	--	--	--
07-15-76*	0800	24.5	.90	1450	5.7	7.2	65	0	--	--	--
08-23-76	1245	24.0	.34	880	6.5	6.9	59	0	72	0	18
03-29-77	1650	18.5	307	342	6.4	6.1	23	-	28	0	8.6
06-30-77	1500	24.5	.63	1180	6.2	5.0	3	-	4	0	6.1
08-24-77	1145	23.5	.10	1140	9.3	7.3	25	--	31	0	6.9
(14) 05598210 SYCAMORE CREEK NEAR CARBONDALE, IL (LAT 37 42 30 LONG 089 10 20)											
12-24-75	1030	.0	12	380	13.8	7.6	95	5.0	116	0	2.9
02-27-76	1645	13.0	3.3	1500	11.7	6.1	0	65	0	0	8.4
03-31-76	0845	11.5	7.3	1100	10.6	6.6	4	35	5	0	6.2
05-04-76	0830	9.0	1.1	1600	11.0	4.2	0	149	0	0	5.6
08-30-76	1130	19.0	.02	3070	7.8	3.3	0	94	0	0	--
04-07-77	1600	17.0	4.7	1480	8.2	3.8	0	240	0	0	3.1
07-01-77	1440	26.0	2.6	1160	8.4	3.5	0	150	0	0	6.5
08-29-77	1430	23.0	6.3	570	9.8	4.9	0	--	0	0	7.2
(15) 05598700 - PANTHER CREEK NEAR PYATTS, IL (LAT 38 00 10 LONG 089 20 07)											
12-22-75	1645	2.0	6.9	3000	15.0	8.6	256	20	273	22	3.2
02-26-76	0900	9.0	14	3000	11.6	7.9	195	15	238	0	12
03-30-76	1030	15.0	26	1700	9.0	7.7	126	30	154	0	14
05-03-76	1100	11.5	3.5	5000	9.0	8.0	240	40	293	0	--
08-26-76	1100	26.0	2.2	4050	7.2	7.7	208	10	254	0	9.0
04-07-77	1000	12.5	10	2630	9.5	7.6	200	-	240	0	3.5
07-07-77	1110	28.5	4.6	2880	10.4	8.0	62	--	76	0	4.9
08-26-77	1045	24.0	4.0	5100	9.1	8.1	180	--	230	0	7.4

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO MIUM (CR) (UG/L) (01030)	DIS SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	PHENOLS (UG/L) (32730)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)
(12) 05597300 - LITTLE MUDDY RIVER NEAR DE SOTO, IL (LAT 37 49 53 LONG 089 11 12)--Continued											
06-15-76*	--	540	--	--	-	3600	--	--	--	--	--
08-17-76*	--	390	--	--	-	3100	--	--	--	--	--
08-30-76	20	780	0	<10	10	50	13000	0	20	--	<.5
04-06-77	8.5	80	1	<10	0	260	180	30	110	--	<.5
07-05-77	19	170	2	1	0	100	820	0	220	--	.0
08-26-77	25	230	0	6	6	510	550	0	190	--	.0
(13) 05597500 - CRAB ORCHARD CREEK NEAR MARION, IL (LAT 37 43 52 LONG 088 53 23)											
12-09-75	18	430	0	0	0	1600	2300	110	80	--	<.5
02-19-76	11	210	0	<10	0	850	1200	80	140	--	<.5
03-02-76*	38	480	0	70	50	900	2600	0	--	--	.0
03-17-76*	20	500	0	10	50	900	2600	200	--	--	.0
03-25-76	19	530	0	<10	0	90	2600	30	40	--	<.5
04-02-76*	--	400	-	--	-	1400	2000	200	--	--	.0
04-21-76*	--	552	--	--	--	5400	3000	400	--	--	.2
05-06-76*	--	752	--	--	--	1400	2100	100	--	--	.0
05-06-76	16	79	0	10	0	70	2500	30	30	--	<.5
05-20-76*	--	475	--	--	--	1100	1720	100	--	--	.0
06-03-76*	10	200	0	0	30	1300	1950	0	--	20	.0
06-16-76*	18	425	0	0	50	2200	1180	0	--	15	.0
07-06-76*	--	150	--	--	--	1500	--	--	--	--	--
07-15-76*	--	750	--	--	--	700	--	--	--	--	--
08-23-76	7.6	360	0	<10	10	70	580	10	220	--	<.5
03-29-77	5.5	120	0	<10	10	540	400	40	220	--	<.5
06-30-77	13	630	2	3	7	340	2800	230	820	--	.2
08-24-77	8.4	580	1	1	4	30	1500	10	20	--	.0
(14) 05598210 SYCAMORE CREEK NEAR CARBONDALE, IL (LAT 37 42 30 LONG 089 10 20)											
12-24-75	11	60	0	0	0	50	660	0	20	--	<.5
02-27-76	10	780	1	<10	10	23000	16000	390	200	--	<.5
03-31-76	8.2	520	0	<10	10	12000	10000	200	10	--	<.5
05-04-76	8.6	850	0	10	20	17000	20000	480	7800	--	<.5
08-30-76	5.7	1900	0	10	50	9000	72000	1300	49000	--	<.5
04-07-77	6.7	770	0	<10	50	26000	16000	520	22000	--	<.5
07-01-77	5.2	660	2	9	26	25000	15000	400	2400	--	.2
08-29-77	4.8	260	1	6	6	1200	6500	110	500	--	.0
(15) 05598700 - PANTHER CREEK NEAR FYATTS, IL (LAT 38 00 10 LONG 089 20 07)											
12-22-75	18	1500	0	<10	10	50	850	20	20	--	<.5
02-26-76	17	1200	1	10	10	40	820	10	30	--	<.5
03-30-76	15	760	0	<10	10	80	750	20	30	--	<.5
05-03-76	20	1900	0	10	10	40	520	10	20	--	<.5
08-26-76	16	2440	0	10	20	40	200	10	20	--	<.5
04-07-77	14	1700	1	10	10	80	1100	20	50	--	<.5
07-07-77	15	1600	1	0	0	10	200	0	130	--	.0
08-26-77	17	1800	0	1	2	30	160	10	50	--	.0

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	TIME	TEMPERATURE (DEG C) (00010)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	DISSOLVED OXYGEN (MG/L) (00300)	PH (UNITS) (00400)	ALKALINITY AS CACO3 (MG/L) (00410)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	CARBONATE (CO3) (MG/L) (00445)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)
(16) 05599000 - BEAUCOUP CREEK NEAR MATTHEWS, IL (LAT 37 58 00 LONG 089 21 00)											
12-23-75	--	.0	49	1450	13.6	8.0	118	--	144	0	8.3
02-26-76	--	10.0	97	1040	11.2	7.6	98	--	120	0	11
03-11-76*	0900	9.0	83	1120	9.6	7.7	230	0	--	-	--
03-29-76*	1400	10.5	112	1280	8.8	7.5	120	0	--	-	--
03-30-76	--	15.0	557	860	8.0	7.5	81	--	99	0	24
04-15-76*	1300	17.0	18	1670	9.8	8.0	170	0	-	--	--
05-03-76	--	14.5	18	2000	11.6	8.3	203	--	248	0	12
05-28-76*	0800	19.0	11	--	8.0	7.7	210	0	--	--	--
06-10-76*	0800	22.0	41	1320	6.2	7.6	120	0	--	--	--
06-23-76*	1500	22.0	10	--	8.5	7.8	180	0	--	--	--
07-15-76*	0800	28.0	4.2	2250	5.3	7.7	170	0	--	--	--
07-29-76*	0900	23.5	193	533	6.9	7.7	16	0	--	-	--
08-26-76	--	26.0	4.3	2720	7.6	7.8	185	--	225	0	14
04-07-77	1300	13.0	120	1020	8.4	7.6	90	--	110	0	8.7
07-07-77	1330	29.0	10	2400	5.7	7.8	7	--	8	0	6.3
08-26-77	1200	23.5	10	1550	7.1	7.8	110	--	140	0	7.2
(17) 05599055 - PIPESTONE CREEK NEAR DENMARK, IL (LAT 37 57 58 LONG 089 29 03)											
05-15-75	1530	20.0	8.0	6710	8.2	8.4	508	0	619	0	6.9
06-18-75	1730	27.0	7.8	6720	9.4	8.4	519	0	633	0	18
12-23-75	1600	.0	6.0	4680	13.2	8.6	456	25	517	19	4.1
02-27-76	0930	9.0	6.0	5700	12.0	8.3	331	20	404	0	17
03-30-76	1600	16.0	54	840	9.0	7.7	100	15	122	0	--
05-03-76	1630	14.0	3.5	3980	12.2	8.7	406	30	437	29	8.7
04-06-77	1215	11.0	8.2	2370	11.8	8.2	190	--	230	0	6.6
07-06-77	1330	35.0	1.2	2880	12.8	8.6	200	--	230	7	5.7
08-25-77	1500	27.0	4.8	5600	13.6	8.7	300	-	370	0	7.5
(18) 05599080 - PIPESTONE CREEK NEAR AVA, IL (LAT 37 57 33 LONG 089 26 34)											
12-23-75	1430	.0	14	2900	14.4	8.5	300	15	346	10	4.0
02-26-76	1545	13.0	13	1900	12.4	8.2	207	10	252	0	12
03-30-76	1700	15.5	25	1300	8.4	7.8	127	20	155	0	18
05-03-76	1715	16.5	.07	4360	13.0	8.6	468	30	517	26	9.8
08-27-76	1500	29.0	.05	6050	15.0	8.6	348	20	390	17	--
04-06-77	1120	9.2	17	1380	11.3	8.0	140	-	170	0	3.6
07-06-77	1500	23.5	1.0	4550	12.4	8.6	230	-	260	10	6.0
08-25-77	1315	23.5	4.7	5300	13.0	8.7	300	-	360	0	6.9
(19) 05599100 - GALUM CREEK NEAR PYATTS, IL (LAT 37 56 42 LONG 089 22 45)											
12-23-75	1100	.0	22	2020	13.4	8.3	207	15	252	0	6.4
02-26-76	1030	10.0	46	1300	10.4	7.8	130	10	158	0	12
03-03-76*	1000	16.5	142	--	8.6	8.1	155	0	--	--	--
03-18-76*	0300	9.0	34	--	13.0	8.2	190	0	--	--	--
03-30-76	1345	15.0	556	770	7.4	7.5	80	20	98	0	25
04-01-76*	1000	14.0	94	1020	9.3	7.3	90	0	--	--	--
04-20-76*	0800	19.0	27	--	6.1	7.8	240	0	--	--	--
05-03-76	1330	13.0	11	4000	10.0	8.4	320	15	390	0	7.1
05-05-76*	1000	13.5	8.6	--	10.2	8.1	290	0	--	--	--
05-19-76*	0800	14.5	4.6	--	6.8	8.0	280	0	--	--	--
06-02-76*	1000	19.5	640	467	6.3	7.0	150	0	--	-	--
06-15-76*	0800	23.5	6.0	2830	4.1	7.7	230	0	--	--	--

Table 5 --Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	PHENOLS (UG/L) (32730)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)
(16) 05599000 - BEAUCOUP CREEK NEAR MATTHEWS, IL (LAT 37 58 00 LONG 089 21 00)											
12-23-75	36	530	0	0	10	40	500	10	40	--	<.5
02-26-76	31	400	1	<10	0	120	450	0	70	--	<.5
03-11-76*	--	400	-	--	--	2500	650	0	--	--	.7
03-29-76*	--	460	--	-	--	1400	800	0	--	--	.0
03-30-76	42	270	0	20	10	60	510	0	80	--	<.5
04-15-76*	80	940	0	0	30	1200	1100	0	--	-	.1
05-03-76	89	850	0	10	0	30	1000	20	10	--	<.5
05-20-76*	--	1130	--	--	--	1200	1400	0	--	--	.0
06-10-76*	--	1000	--	--	--	2400	950	0	--	--	.0
06-23-76*	--	1250	--	--	--	1100	1250	--	--	--	.1
07-15-76*	38	1400	0	20	70	1200	1650	0	--	--	.0
07-29-76*	25	50	1	40	50	6500	510	0	--	--	.0
08-26-76	21	1500	1	<10	10	10	780	10	0	--	<.5
04-07-77	22	420	1	<10	10	150	490	10	60	--	<.5
07-07-77	16	1300	2	0	0	10	910	0	130	--	.0
08-26-77	19	700	0	0	5	80	330	0	50	--	.0
(17) 05599055 - PIPESTONE CREEK NEAR DENMARK, IL (LAT 37 57 58 LONG 089 29 03)											
05-15-75	41	3000	1	10	10	50	680	10	20	0	.6
06-18-75	45	3500	0	20	20	60	140	10	30	--	<.5
12-23-75	44	2300	0	10	10	50	900	10	40	--	.6
02-27-76	35	1700	1	<10	10	60	1200	10	70	--	<.5
03-30-76	12	280	0	<10	10	230	200	0	90	--	<.5
05-03-76	28	2000	0	10	10	10	340	0	10	--	<.5
04-06-77	31	920	1	<10	0	60	430	20	80	--	<.5
07-06-77	70	2200	0	0	2	10	110	10	200	--	.0
08-25-77	54	2700	0	0	5	40	1100	0	60	--	.0
(18) 05599080 - PIPESTONE CREEK NEAR AVA, IL (LAT 37 57 33 LONG 089 26 34)											
12-23-75	30	1100	0	<10	10	50	600	20	30	--	<.5
02-26-76	19	710	1	<10	10	60	470	10	40	--	<.5
03-30-76	14	470	0	<10	10	220	350	10	110	--	<.5
05-03-76	32	2900	1	10	10	40	20	10	10	--	<.5
08-27-76	45	2300	1	<10	10	30	910	10	20	--	<.5
04-06-77	18	580	0	<10	0	80	250	10	50	--	<.5
07-06-77	66	2200	0	0	0	20	190	0	130	--	.0
08-25-77	51	2500	0	0	2	50	150	10	40	--	.0
(19) 05599100 - GALUM CREEK NEAR PYATTS, IL (LAT 37 56 42 LONG 089 22 45)											
12-23-75	26	850	0	10	0	50	520	10	50	--	<.5
02-26-76	21	500	2	<10	0	80	440	0	40	--	<.5
03-03-76*	--	920	-	-	--	1500	800	100	--	--	.1
03-16-76*	--	75	--	-	--	800	620	100	--	--	.0
03-30-76	12	290	0	<10	10	170	340	0	140	-	<.5
04-01-76*	30	260	0	0	50	740	530	100	--	15	.0
04-20-76*	40	1000	1	0	50	2300	1550	300	--	10	.3
05-03-76	33	1400	0	10	10	30	750	10	10	--	<.5
05-05-76*	--	1450	--	-	-	800	700	100	--	--	.4
05-19-76*	--	3500	--	-	-	1000	1500	100	-	--	.0
06-02-76*	--	145	-	--	-	750	700	0	--	--	.0
06-15-76*	--	1000	-	--	--	2000	--	--	--	--	-

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	TIME	TEMPERATURE (DEG C) (00010)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	DISSOLVED OXYGEN (MG/L) (00300)	PH (UNITS) (00400)	ALKALINITY AS CACO3 (MG/L) (00410)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	CARBONATE (CO3) (MG/L) (00445)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)
(19) 05598100 - GALUM CREEK NEAR PYATTS, IL (LAT 37 56 42 LONG 089 22 45)--Continued											
07-02-76*	1000	21.5	1.8	3070	5.6	7.8	260	0	--	-	--
08-17-76*	0800	22.0	9.5	4350	8.6	8.0	280	0	--	--	--
08-27-76	1200	25.0	3.1	5050	8.3	8.1	308	238	376	0	--
09-14-76*	0800	18.0	6.0	1120	6.2	7.6	65	0	--	--	--
(20) 05599300 - BEAUCOUP CREEK NEAR ORAVILLE, IL (LAT 37 51 43 LONG 089 19 57)											
12-22-75	1430	1.0	91	1060	12.8	8.0	118	20	144	0	7.2
02-27-76	1215	11.0	172	1040	8.0	7.6	113	10	138	--	12
03-31-76	1045	14.5	1230	760	7.8	7.3	77	10	94	0	24
04-07-77	1400	13.0	403	780	7.2	7.4	74	--	90	0	8.4
07-05-77	1300	28.0	24	1380	4.7	7.5	150	--	180	0	6.3
08-25-77	1045	23.0	41	2260	8.2	8.3	160	--	190	0	7.5
(21) **05598500 - BIG MUDDY RIVER AT MURPHYSBORO, IL (LAT 37 44 55 LONG 089 20 45)											
11-11-74	1530	12.0	3290	330	--	7.1	40	--	49	0	--
12-10-74	1400	3.5	1730	697	--	6.4	77	--	94	0	10
01-06-75	1330	4.0	3510	751	--	7.3	48	--	58	0	--
02-10-75	1345	3.0	4450	448	--	7.0	46	--	56	0	--
03-11-75	1330	5.0	2850	597	--	7.2	54	--	66	0	8.3
04-14-75	1100	11.5	1500	500	--	7.3	59	--	72	0	--
05-06-75	1130	19.5	7000	360	--	6.8	43	--	53	0	--
06-09-75	1200	23.0	872	655	--	7.2	68	--	83	0	--
07-07-75	1400	25.0	1800	680	--	6.6	54	--	66	0	7.7
08-18-75	1600	26.0	1040	630	5.3	7.4	68	--	83	0	--
09-15-75	1530	20.0	312	805	6.5	7.3	109	--	133	--	--
10-15-75	1300	20.0	89	1050	9.7	7.7	121	--	147	0	--
11-10-75	1415	15.0	218	1060	6.2	7.8	128	--	156	0	--
12-15-75	1630	7.0	1120	355	10.0	7.5	56	--	68	0	15
12-22-75	1100	1.0	1560	580	12.2	7.4	51	10	62	0	9.4
01-19-76	1500	.0	683	800	13.8	7.3	84	--	102	0	--
02-09-76	1400	1.0	446	930	12.3	7.3	102	--	124	0	--
02-27-76	0800	9.0	2500	470	9.0	7.1	48	10	59	0	10
03-03-76*	1400	15.5	684	733	8.7	7.6	65	0	--	--	--
03-15-76	1330	11.5	702	690	9.6	7.4	88	--	107	0	13
03-16-76*	1100	10.0	630	700	10.6	7.7	75	0	--	--	--
04-01-76*	1500	14.5	2420	583	8.0	7.2	50	0	--	--	--
04-06-76	1515	16.0	1060	610	7.6	7.3	62	5.0	76	0	15
04-12-76	1345	16.0	390	770	9.0	7.5	89	--	108	0	--
04-20-76*	1100	21.0	318	850	7.2	7.6	100	0	--	--	--
05-05-76*	1400	16.5	450	717	11.3	7.8	68	0	--	--	--
05-17-76	1400	19.0	220	880	5.6	7.4	110	--	134	0	15
05-19-76*	1100	19.0	410	950	7.5	7.7	110	0	--	--	--
06-02-76*	1400	20.0	2310	633	6.2	7.3	90	0	--	--	--
06-07-76	1400	21.5	1860	535	5.7	7.1	52	--	63	0	--
06-15-76*	1000	26.0	288	800	5.8	7.5	80	0	--	--	--
07-02-76*	1400	24.0	514	600	6.2	7.3	64	0	--	--	--
07-12-76	1700	28.0	609	600	5.5	7.2	73	--	89	0	--
07-15-76*	1100	30.5	487	567	8.3	7.3	60	0	--	--	--
08-09-76	1530	24.5	220	710	6.0	7.7	83	--	101	0	8.7

** Discharge values for this station are mean daily discharges

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	PHENOLS (UG/L) (32730)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)
(19) 05599100 - GALUM CREEK NEAR PYATTS, IL (LAT 37 56 42 LONG 089 22 45)--Continued											
07-02-76*	40	1500	1	0	50	2500	1000	100	--	5	.0
08-17-76*	--	2000	--	--	--	2100	--	--	--	--	--
08-27-76	52	2400	1	<10	10	70	580	10	0	--	<.5
09-14-76*	--	500	--	--	--	1500	--	--	--	--	--
(20) 05599300 - BEAUCOUP CREEK NEAR ORAVILLE, IL (LAT 37 51 43 LONG 089 19 57)											
12-22-75	32	440	0	0	0	50	570	10	60	--	<.5
02-27-76	33	430	1	<10	10	100	510	10	50	--	<.5
03-31-76	39	220	0	<10	10	210	200	10	120	--	<.5
04-07-77	19	310	1	<10	10	200	550	30	60	--	<.5
07-05-77	16	1300	2	0	0	10	910	0	130	--	0
08-25-77	29	1200	1	2	5	40	660	10	50	--	.0
(21) 05599500 - BIG MUDDY RIVER AT MURPHYSBORO, IL (LAT 37 44 55 LONG 089 20 45)											
11-11-74	16	100	--	--	--	--	--	--	--	--	--
12-10-74	48	300	0	0	0	190	400	10	--	--	<.5
01-06-75	16	140	--	--	--	--	--	--	--	--	--
02-10-75	20	150	--	--	--	--	--	--	--	--	--
03-11-75	25	170	0	0	0	40	240	20	--	--	<.5
04-14-75	24	200	--	--	--	--	--	--	--	--	--
05-06-75	14	85	--	--	--	--	--	--	--	--	--
06-09-75	24	190	--	--	--	--	--	--	--	--	--
07-07-75	16	330	1	<10	10	40	1200	10	--	--	<.5
08-18-75	14	250	--	--	--	--	--	--	--	--	--
09-15-75	16	270	--	--	--	--	--	--	--	--	--
10-15-75	31	390	--	--	--	--	--	--	--	--	--
11-10-75	35	420	--	--	--	--	--	--	--	--	--
12-15-75	16	120	2	<10	10	500	390	50	--	--	<.5
12-22-75	20	150	0	<10	0	190	400	20	100	--	<.5
01-19-76	32	270	--	--	--	--	--	--	--	--	--
02-09-76	34	320	--	--	--	--	--	--	--	--	--
02-27-76	21	160	1	<10	10	340	250	10	110	--	<.5
03-03-76*	--	240	--	--	--	1900	1000	1200	--	--	.4
03-15-76	30	260	0	0	0	40	970	10	--	--	<.5
03-16-76*	--	260	--	--	--	1200	1000	300	--	--	.3
04-01-76*	25	180	0	0	70	4900	680	200	--	10	.0
04-06-76	22	170	0	0	10	190	590	0	90	--	<.5
04-12-76	32	230	--	--	--	--	--	--	--	--	--
04-20-76*	45	240	2	0	50	1800	1050	200	--	--	.1
05-05-76*	--	260	--	--	--	700	550	0	--	--	.0
05-17-76	36	290	0	<10	0	30	1800	10	--	--	<.5
05-19-76*	--	300	--	--	--	1600	1800	100	--	--	.0
06-02-76*	--	300	--	--	--	8300	700	100	--	--	.0
06-07-76	19	150	--	--	--	--	--	--	--	--	--
06-15-76*	--	350	--	--	--	1700	--	--	--	--	--
07-02-76*	25	175	0	0	50	3500	850	100	--	0	.0
07-12-76	17	190	--	--	--	--	--	--	--	--	--
07-15-76*	20	175	1	20	20	3500	700	300	--	10	.1
08-09-76	21	230	1	<10	10	30	1400	20	--	--	<.5

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	TIME	TEMPERATURE (DEG C) (00010)	INSTANTANEOUS DISCHARGE (CFS) (00061)	SPECIFIC CONDUCTANCE (MICROMHOS) (00095)	DISSOLVED OXYGEN (MG/L) (00300)	PH (UNITS) (00400)	ALKALINITY AS CACO3 (MG/L) (00410)	TOTAL ACIDITY AS CACO3 (MG/L) (00435)	BICARBONATE (HCO3) (MG/L) (00440)	CARBONATE (CO3) (MG/L) (00445)	TOTAL ORGANIC CARBON (C) (MG/L) (00680)
(21) **05598500 - BIG MUDDY RIVER AT MURPHYSBORO, IL (LAT 37 44 55 LONG 089 20 45)--Continued											
08-30-76	1330	26.0	57	1020	8.5	7.5	135	0	164	0	--
09-13-76	1530	20.5	365	620	4.1	7.3	67	--	82	0	--
10-18-76	1540	13.0	63	1100	12.2	8.2	130	--	160	0	--
11-15-76	1300	5.0	65	940	9.0	7.3	120	--	140	0	11
12-13-76	1530	1.0	126	1150	15.2	7.5	--	--	--	--	--
01-17-77	1100	.0	75	1280	6.0	7.2	160	--	190	0	--
02-08-77	1130	.0	100	1320	6.5	7.5	170	--	210	0	8.7
03-22-77	1400	11.5	1420	560	8.4	7.2	58	--	71	0	--
04-01-77	1400	15.2	17500	185	5.1	7.2	30	--	36	0	7.6
05-02-77	1400	18.0	808	600	8.0	8.0	66	--	80	0	8.9
06-01-77	1000	25.8	285	625	6.3	7.6	80	--	97	0	--
07-11-77	1545	28.5	413	645	6.3	7.5	210	--	250	0	5.3
08-16-77	1400	26.0	937	395	4.4	7.1	36	--	44	0	8.5
08-29-77	1200	24.0	977	280	7.5	7.3	41	--	50	0	11
09-12-77	1200	23.0	190	850	8.0	7.5	71	--	86	0	--

** Discharge values for this station are mean daily discharges.

Table 5.--Chemical analyses of samples from Saline and Big Muddy River basins--Continued

DATE	DIS-SOLVED CHLO-RIDE (CL) (MG/L) (00940)	DIS-SOLVED SULFATE (SO4) (MG/L) (00945)	DIS-SOLVED ARSENIC (AS) (UG/L) (01000)	DIS-SOLVED CHRO-MIUM (CR) (UG/L) (01030)	DIS-SOLVED COPPER (CU) (UG/L) (01040)	DIS-SOLVED IRON (FE) (UG/L) (01046)	DIS-SOLVED MAN-GANESE (MN) (UG/L) (01056)	DIS-SOLVED ZINC (ZN) (UG/L) (01090)	DIS-SOLVED ALUM-INUM (AL) (UG/L) (01106)	PHENOLS (UG/L) (32730)	DIS-SOLVED MERCURY (HG) (UG/L) (71890)
(21) 05599500 - BIG MUDDY RIVER AT MURPHYSBORO, IL (LAT 37 44 55 LONG 089 20 45)--Continued											
08-30-76	35	420	1	<10	0	10	1600	10	110	--	<.5
09-13-76	26	200	--	--	--	--	--	--	--	--	--
10-18-76	43	420	--	--	--	--	--	--	--	--	--
11-15-76	48	310	1	<10	10	70	690	20	--	--	<.5
12-13-76	--	--	--	--	--	--	--	--	--	--	--
01-17-77	57	480	--	--	--	--	--	--	--	--	--
02-08-77	59	480	1	<10	10	120	1100	20	--	--	<.5
03-22-77	27	170	--	--	--	--	--	--	--	--	--
04-01-77	8.6	53	1	<10	10	290	80	10	360	--	<.5
05-02-77	33	180	1	7	2	10	20	0	--	--	.0
06-01-77	35	160	--	--	--	--	--	--	--	--	--
07-11-77	32	160	0	1	4	50	380	0	180	--	.0
08-16-77	24	130	0	0	0	100	490	20	--	--	.0
08-29-77	12	69	2	3	11	520	320	10	360	--	.0
09-12-77	27	320	--	--	--	--	--	--	--	--	--

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