

APPLICATION OF COMPUTER TECHNIQUES
TO SEEPAGE-SALINITY SURVEYS
IN KANSAS

By

Robert B. Leonard
Charles O. Morgan

Special Distribution Publication 47

State Geological Survey
The University of Kansas
Lawrence, Kansas

1970

STATE GEOLOGICAL SURVEY OF KANSAS

Frank C. Foley, Director



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Resources of the Kansas State Board of Agriculture.

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APPLICATION OF COMPUTER TECHNIQUES TO
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By

Robert B. Leonard¹ and Charles O. Morgan¹

ABSTRACT

Calculation and tabulation of potentially significant parameters by computer techniques promote more efficient analysis and presentation of a large amount of data from seepage-salinity surveys than would be practical using manual methods. Output from computer programs written in FORTRAN IV and GMAP languages is readily adaptable to the objectives of individual investigations.

INTRODUCTION

From 1959 to 1968 personnel of the U.S. Geological Survey and cooperating State agencies² made 33 seepage-salinity surveys of parts of 7 streams in Kansas to evaluate the effects of oilfield brine, irrigation return flow, and other natural and manmade factors on the quantity and chemical quality of low streamflow and of seepage into the streams. More than 33,000 units of basic data, in the form of discharge measurements of low streamflow and chemical analyses of corresponding samples, were obtained. The principal objectives of most of the surveys were achieved, but the time required for manual calculation and tabulation of potentially significant parameters generally precluded comprehensive analysis of a large part of the data. The purpose of this report is to describe the parameters that were generally useful and to present the computer programs that were designed to calculate and tabulate those parameters efficiently.

¹U.S. Geological Survey

²Cooperating agencies include the Kansas State Department of Health, Kansas Water Resources Board, and Kansas State Board of Agriculture.

The computer programs³ described herein were developed specifically to facilitate the presentation, analysis, and interpretation of a large amount of data collected during a continuing series of seepage-salinity surveys of one particular area--the Smoky Hill River adjacent to the newly established Cedar Bluff Irrigation District in west-central Kansas. Use of the programs is illustrated by data from nine surveys made between April 1964 and October 1968, but the programs would be equally applicable to surveys made in other areas.

Low streamflow was measured and samples were collected during each survey at 30 stations in the main stem and near the mouths of tributaries. Successive surveys of the reach were made to reveal progressive changes in the quantity and quality of inflow to the reach that could be attributed to irrigation return flow. The discharge measurements and results of chemical analyses comprise about 5,100 units of basic data. About 37,000 individual calculations, and tabulation of the results in a form that simplifies analysis, were made in about 3 minutes of computer time at a cost of about \$50.00.⁴

DESCRIPTION OF PARAMETERS

Streamflow in each reach of the main stem consists principally of streamflow entering the upstream end of the reach, tributary inflow, and seepage into or out of the channel. Variations in the quantity and chemical quality of each component, or combination of components, can be evaluated in terms of the measured or calculated parameters that are listed as output in table 1. The significance of each parameter depends largely on the purpose for which the survey was made; therefore, each parameter listed in table 1 is described to assist in the selection and analysis of parameters that are most significant to a particular investigation. For example, the parameters describing net seepage (M through R, table 1) were useful for evaluating the effect of effluent ground water on the magnitude of oilfield brine pollution of the Walnut River (Leonard, 1964a, 1964b), whereas net gains (G through L, table 1) were far more useful than net seepage for evaluating the effect of irrigation return flow on streamflow of the Smoky Hill River (Leonard, 1969).

³Developed as part of the cooperative program with the State Geological Survey of Kansas and the Environmental Health Services of the Kansas State Department of Health.

⁴The programs were tested on the GE 625 computer at The University of Kansas Computation Center, Paul J. Wolfe, Director.

Table 1.--Tabular output available from computer programs.

-
- A. Concentrations, in mg/l, at each station.
 - B. Concentrations, in me/l, at each station.
 - C. Chemical discharge, in ke/day, at each station.
 - D. Chemical discharge, in tons/day, at each station.
 - E. Water and chemical discharge at each station as percentage of that at reference station.
 - F. Percentage composition at each station.
 - G. Net gains or losses, in ke/day, in each reach.
 - H. Concentrations, in me/l, in net gains or losses in each reach.
 - I. Percentage composition of net gains or losses in each reach.
 - J. Net gains or losses, in tons/day, in each reach.
 - K. Net gains or losses as percentage of water and chemical discharge at reference station.
 - L. Concentrations, in me/l, in net gains or losses in each reach.
 - M. Net seepage, in ke/day, in each reach.
 - N. Percentage composition of net seepage in each reach.
 - O. Concentrations, in me/l, in net seepage in each reach.
 - P. Concentrations, in mg/l, in net seepage in each reach.
 - Q. Net seepage, in tons/day, in each reach.
 - R. Net seepage in each reach as percentage of water and chemical discharge at reference station.
 - S. Cumulative net seepage, in ke/day.
 - T. Cumulative net seepage, in tons/day.
 - U. Percentage composition of cumulative net seepage.
 - V. Concentrations, in me/l, in cumulative net seepage.
 - W. Concentrations, in mg/l, in cumulative net seepage.
 - X. Cumulative net seepage as percentage of water and chemical discharge at reference station.
-

Basic data, arranged as shown in table 2, are indexed according to the date of the survey and the location of the station in river miles upstream from the mouth of the main stem. Stations on the main stem and tributaries are identified by the suffixes R and T, respectively. Examples of potentially significant parameters are shown in table 3 for stations on a tributary (341.5T) and on the river (342.0R).

Water quality at data-collection stations

Concentration

Basic data for each station consists of the measured water discharge in cubic feet per second (cfs) and the corresponding concentrations of the ions in milligrams per liter (mg/l).

Table 2.--Arrangement of data in programs.

Parameter (*Basic input data for Kansas)	Word position on tape for output from program TBSPSL	
	Table 1 on tape	Tables 2-24 on tape
Table number on tape	1	1
*Station number	2	2
Tributary (T) or main reach (R) code	3	3
*Month	4	4
*Day	5	5
*Year	6	6
*Discharge	7	25
*SiO ₂	8	7
Al	9	8
Fe	10	9
Mn	11	10
*Ca	12	11
*Mg	13	12
Sr	14	13
*Na	15	14
*K	16	15
Li	17	16
*HCO ₃	18	17
*CO ₃	19	18
*SO ₄	20	19
*Cl	21	20
*F	22	21
*NO ₃	23	22
*PO ₄	24	23
*B	25	24
*Dissolved solids	26	
Tons per acre-foot	27	
Tons per day	28	
Total hardness	29	
Non-carbonate hardness	30	
Acidity	31	
SAR	32	
*Conductance	33	
*pH	34	
Color	35	
Oxygen	36	
BOD	37	
Phenol	38	
ABS	39	
Temperature (°C)	40	
Sum cations	41	
Sum anions	42	
Inflow to reach	43	
Cumulative inflow	44	
Seepage into reach	45	
Cumulative seepage	46	

Table 3.--Example of tabular output from programs.

A. CONCENTRATIONS, IN MG/L, AT EACH STATION																		
DATE	DISCHARGE (CFS)	SID2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B	D.S. (1)	SAR (2)	SP.C. (3)	PH (4)
STATION		341.5T																
9 1 65	0.14	24.0	69.0	9.7	27.0	8.5	222.	-1. ⁽⁵⁾	48.0	34.0	0.3	0.6	0.10	0.13	340.	0.8	550.	8.2
11 16 65	0.18	24.0	77.0	16.0	27.0	8.6	254.	-1.	56.0	39.0	0.3	0.8-1.00	0.13		378.	0.7	620.	8.0
3 22 66	1.20	14.0	91.0	12.0	36.0	7.2	229.	-1.	96.0	52.0	0.3	2.7	0.10	0.18	436.	0.9	680.	7.8
11 16 66	0.54	20.0	102.0	17.0	38.0	7.6	266.	-1.	114.0	58.0	0.3	2.7	0.20	0.21	501.	0.9	780.	8.1
3 30 67	0.39	16.0	99.0	10.0	42.0	7.8	181.	-1.	131.0	67.0	0.3	1.8-1.00	0.13		485.	1.1	760.	7.6
11 21 67	1.42	18.0	122.0	14.0	51.0	7.8	254.	-1.	155.0	72.0	0.3	6.6	0.10	0.21	588.	1.2	-1.-1.0	
10 30 68	0.62	22.0	121.0	17.0	53.0	8.4	234.	0.	177.0	81.0	0.4	1.7	0.11	0.16	627.	1.2	950.	8.0

STATION 342.0R																		
4 30 64	7.61	12.0	116.0	27.0	38.0	12.0	212.	-1.	270.0	30.0	0.6	0.5	0.20	0.13	634.	0.8	880.	8.1
10 21 64	9.28	13.0	122.0	20.0	37.0	13.0	198.	-1.	264.0	28.0	0.6	-1.0	0.10	0.19	615.	0.8	880.	7.7
9 1 65	11.88	18.0	117.0	26.0	39.0	12.0	220.	-1.	254.0	33.0	0.6	0.7	0.10	0.19	630.	0.8	910.	7.9
11 16 65	8.67	16.0	128.0	20.0	43.0	10.0	229.	-1.	250.0	41.0	0.5	1.2	0.10	0.18	626.	0.9	880.	8.2
3 22 66	12.08	14.0	126.0	20.0	40.0	10.0	212.	-1.	256.0	38.0	0.6	1.2-1.00	0.18		641.	0.9	900.	8.1
11 16 66	10.10	12.0	128.0	22.0	42.0	11.0	212.	-1.	256.0	48.0	0.6	1.3	0.20	0.23	642.	0.9	960.	8.1
3 30 67	7.26	17.0	126.0	27.0	48.0	10.0	200.	-1.	280.0	57.0	0.6	0.9-1.00	0.19		680.	1.0	1000.	7.5
11 21 67	9.73	13.0	134.0	25.0	54.0	9.8	234.	-1.	272.0	61.0	0.5	2.2	0.10	0.24	695.	1.1	-1.-1.0	
10 30 68	11.65	15.0	136.0	26.0	53.0	11.0	217.	0.	302.0	55.0	0.6	2.7	0.05	0.24	732.	1.1	1050.	7.7

B. CONCENTRATIONS, IN ME/L, AT EACH STATION													
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3		
STATION 341.5T													
9 1 65	0.14	3.44	0.80	1.17	0.22	3.64	0.	1.00	0.96	0.02	0.01		
11 16 65	0.18	3.84	1.32	1.17	0.22	4.16	0.	1.17	1.10	0.02	0.01		
3 22 66	1.20	4.54	0.99	1.57	0.18	3.75	0.	2.00	1.47	0.02	0.04		
11 16 66	0.54	5.09	1.40	1.65	0.19	4.36	0.	2.37	1.64	0.02	0.04		
3 30 67	0.39	4.94	0.82	1.83	0.20	2.97	0.	2.73	1.89	0.02	0.03		
11 21 67	1.42	6.09	1.15	2.22	0.20	4.16	0.	3.23	2.03	0.02	0.11		
10 30 68	0.62	6.04	1.40	2.31	0.21	3.84	0.	3.69	2.28	0.02	0.03		

STATION 342.0R													
4 30 64	7.61	5.79	2.22	1.65	0.31	3.47	0.	5.62	0.85	0.03	0.01		
10 21 64	9.28	6.09	1.64	1.61	0.33	3.25	0.	5.50	0.79	0.03	0.		
9 1 65	11.88	5.84	2.14	1.70	0.31	3.61	0.	5.29	0.93	0.03	0.01		
11 16 65	8.67	6.39	1.64	1.87	0.26	3.75	0.	5.70	1.16	0.03	0.02		
3 22 66	12.08	6.29	1.64	1.74	0.26	3.47	0.	5.33	1.07	0.03	0.02		
11 16 66	10.10	6.39	1.81	1.83	0.28	3.47	0.	5.33	1.35	0.03	0.02		
3 30 67	7.26	6.29	2.22	2.09	0.26	3.28	0.	5.83	1.61	0.03	0.01		
11 21 67	9.73	6.69	2.06	2.35	0.25	3.84	0.	5.66	1.72	0.03	0.04		
10 30 68	11.65	6.79	2.14	2.31	0.28	3.56	0.	6.29	1.55	0.03	0.04		

C. CHEMICAL DISCHARGE, IN KE/DAY, AT EACH STATION													
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3		
STATION 341.5T													
9 1 65	0.14	1.18	0.27	0.40	0.07	1.25	0.	0.34	0.33	0.01	0.00		
11 16 65	0.18	1.69	0.58	0.52	0.10	1.83	0.	0.51	0.48	0.01	0.01		
3 22 66	1.20	13.32	2.90	4.59	0.54	11.01	0.	5.86	4.30	0.05	0.13		
11 16 66	0.54	6.72	1.85	2.18	0.26	5.76	0.	3.13	2.16	0.02	0.06		
3 30 67	0.39	4.71	0.78	1.74	0.19	2.83	0.	2.60	1.80	0.02	0.03		
11 21 67	1.42	21.14	4.00	7.70	0.69	14.45	0.	11.20	7.05	0.05	0.37		
10 30 68	0.62	9.15	2.12	3.49	0.33	5.81	0.	5.59	3.46	0.03	0.04		

STATION 342.0R													
4 30 64	7.61	107.70	41.32	30.76	5.71	64.65	0.	104.59	15.74	0.59	0.15		
10 21 64	9.28	138.13	37.32	36.52	7.55	73.63	0.	124.71	17.92	0.72	0.		
9 1 65	11.88	169.58	62.11	49.28	8.92	104.74	0.	153.61	27.03	0.92	0.33		
11 16 65	8.67	135.40	34.87	39.65	5.42	79.56	0.	110.34	24.51	0.56	0.41		
3 22 66	12.08	185.70	48.58	51.39	7.56	102.63	0.	157.42	31.65	0.93	0.57		
11 16 66	10.10	157.73	44.68	45.12	6.95	85.81	0.	131.62	33.43	0.78	0.52		
3 30 67	7.26	111.61	39.42	37.06	4.54	58.19	0.	103.48	28.53	0.56	0.26		
11 21 67	9.73	159.07	48.91	55.88	5.96	91.24	0.	134.72	40.92	0.63	0.84		
10 30 68	11.65	193.31	60.91	65.67	8.01	101.31	0.	179.10	44.18	0.90	1.24		

Table 3.--Example of tabular output from programs--*continued.*

D. CHEMICAL DISCHARGE, IN TONS/DAY, AT EACH STATION															
DATE	DISCHARGE (CFS)	SiO2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B	
STATION 341.5T															
9 1 65	0.14	0.01	0.03	0.00	0.01	0.00	0.08	0.	0.02	0.01	0.00	0.00	0.00	0.00	
11 16 65	0.18	0.01	0.04	0.01	0.01	0.00	0.12	0.	0.03	0.02	0.00	0.00	0.	0.00	
3 22 66	1.20	0.05	0.29	0.04	0.12	0.02	0.74	0.	0.31	0.17	0.00	0.01	0.00	0.00	
11 16 66	0.54	0.03	0.15	0.02	0.06	0.01	0.39	0.	0.17	0.08	0.00	0.00	0.00	0.00	
3 30 67	0.39	0.02	0.10	0.01	0.04	0.01	0.19	0.	0.14	0.07	0.00	0.00	0.	0.00	
11 21 67	1.42	0.07	0.47	0.05	0.20	0.03	0.97	0.	0.59	0.28	0.00	0.03	0.00	0.00	
10 30 68	0.62	0.04	0.20	0.03	0.09	0.01	0.39	0.	0.30	0.14	0.00	0.00	0.00	0.00	

STATION 342.0R																
4	30	64	7.61	0.25	2.38	0.55	0.78	0.25	4.36	0.	5.55	0.62	0.01	0.01	0.00	0.00
10	21	64	9.28	0.33	3.06	0.50	0.93	0.33	4.96	0.	6.61	0.70	0.02	0.	0.00	0.00
9	1	65	11.88	0.58	3.75	0.83	1.25	0.38	7.06	0.	8.15	1.06	0.02	0.02	0.00	0.01
11	16	65	8.67	0.37	3.00	0.47	1.01	0.23	5.36	0.	5.85	0.96	0.01	0.03	0.00	0.00
3	22	66	12.08	0.46	4.11	0.65	1.30	0.33	6.91	0.	8.35	1.24	0.02	0.04	0.	0.01
11	16	66	10.10	0.33	3.49	0.60	1.15	0.30	5.78	0.	6.98	1.31	0.02	0.04	0.01	0.01
3	30	67	7.26	0.33	2.47	0.53	0.94	0.20	3.92	0.	5.49	1.12	0.01	0.02	0.	0.00
11	21	67	9.73	0.34	3.52	0.66	1.42	0.26	6.15	0.	7.15	1.60	0.01	0.06	0.00	0.01
10	30	68	11.65	0.47	4.28	0.82	1.67	0.35	6.83	0.	9.50	1.73	0.02	0.08	0.00	0.01

E. WATER AND CHEMICAL DISCHARGE AT EACH STATION AS PERCENTAGE OF THAT AT REFERENCE STATION

DATE	WATER	SIO2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION 341.5T														
9 1 65	0.64	1.28	0.41	0.31	0.51	0.39	0.80	0.	0.13	0.70	0.32	1.92	0.	0.35
11 16 65	1.50	2.57	1.00	1.26	1.01	1.36	1.77	0.	0.38	1.39	0.90	0.63	0.	1.22
3 22 66	7.58	7.58	5.39	4.55	7.00	5.46	8.00	0.	2.89	9.85	4.55	22.74	0.	8.53
11 16 66	4.04	6.73	3.58	3.43	3.74	3.07	6.39	0.	1.86	4.69	2.42	6.06	4.04	4.04
3 30 67	3.79	4.66	2.80	2.10	3.38	2.95	3.19	0.	1.97	4.70	2.27	5.24	0.	3.08
11 21 67	11.34	17.01	10.33	7.22	11.12	8.85	12.05	0.	7.09	12.96	8.51	27.72	11.34	9.92
10 30 68	3.73	5.14	3.18	2.76	3.53	2.85	3.90	0.	2.23	4.88	2.99	2.89	3.73	2.60

STATION 342.0R																
4	30	64	84.65	84.65	79.19	120.29	73.11	86.82	85.05	0.	84.65	66.83	84.65	70.54	56.43	84.65
10	21	64	97.79	105.94	96.99	88.90	95.21	97.79	93.54	0.	97.79	88.32	97.79	0.	97.79	77.41
9	1	65	54.42	81.63	59.51	70.75	62.42	46.65	67.26	0.	56.42	57.93	54.42	190.47	0.	43.08
11	16	65	72.25	82.57	80.42	76.05	77.67	76.05	76.95	0.	81.73	70.53	72.25	45.63	0.	81.28
3	22	66	76.31	76.31	75.12	76.31	78.27	76.31	74.55	0.	77.52	72.50	91.57	101.75	0.	85.85
11	16	66	75.54	75.54	84.08	83.10	77.38	83.10	95.33	0.	77.98	72.52	90.65	54.56	75.54	82.74
3	30	67	70.49	92.17	66.28	105.73	71.99	70.49	65.57	0.	78.32	74.40	84.58	48.80	0.	83.70
11	21	67	77.72	84.19	77.72	88.31	80.70	76.16	76.09	0.	85.24	75.25	97.14	63.32	77.72	77.72
10	30	68	70.18	65.79	67.22	79.33	66.42	70.18	67.99	0.	71.60	62.26	84.22	86.13	31.90	73.23

F. PERCENTAGE COMPOSITION AT EACH STATION

DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3
STATION 341.5T											
9 1 65	0.14	61.13	14.16	20.85	3.86	64.72	0.	17.78	17.05	0.28	0.17
11 16 65	0.18	58.64	20.08	17.92	3.36	64.47	0.	18.06	17.03	0.24	0.20
3 22 66	1.20	62.39	13.56	21.52	2.53	51.57	0.	27.46	20.15	0.22	0.60
11 16 66	0.54	61.06	16.77	19.83	2.33	51.73	0.	28.16	19.41	0.19	0.52
3 30 67	0.39	63.42	10.56	23.46	2.56	38.89	0.	35.75	24.77	0.21	0.38
11 21 67	1.42	63.04	11.92	22.97	2.07	43.63	0.	33.82	21.28	0.17	1.12
10 30 68	0.62	60.64	14.04	23.16	2.16	38.92	0.	37.40	23.18	0.21	0.28

STATION 342.0R											
4 30 64	7.61	58.06	22.27	16.58	3.08	34.81	0.	56.32	8.48	0.32	0.08
10 21 64	9.28	62.93	17.00	16.64	3.44	33.94	0.	57.48	8.26	0.33	0.
9 1 65	11.88	58.50	21.43	17.00	3.08	36.54	0.	53.59	9.43	0.32	0.11
11 16 65	8.67	62.88	16.19	18.41	2.52	36.94	0.	51.23	11.38	0.26	0.19
3 22 66	12.08	63.33	16.57	17.53	2.58	35.00	0.	53.69	10.79	0.32	0.19
11 16 66	10.10	61.98	17.56	17.73	2.73	34.03	0.	52.20	13.26	0.31	0.21
3 30 67	7.26	57.94	20.46	19.24	2.36	30.46	0.	54.17	14.94	0.29	0.13
11 21 67	9.73	58.95	18.13	20.71	2.21	34.00	0.	50.20	15.25	0.23	0.31
10 30 68	11.65	58.95	18.57	20.03	2.44	31.01	0.	54.82	13.52	0.28	0.38

Table 3.--Example of tabular output from programs--*continued.*

G. NET GAINS OR LOSSES, IN KE/DAY, IN EACH REACH											
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3
STATION	342.0R										
4 30 64	-0.47	-15.52	8.82	-2.76	-0.35	-2.37	0.	-7.28	1.81	-0.04	-0.10
10 21 64	0.81	7.92	4.96	2.29	0.66	1.68	0.	8.30	2.73	0.06	0.
9 1 65	1.28	6.63	19.48	10.95	0.96	20.63	0.	10.08	8.03	0.10	0.08
11 16 65	1.17	27.42	7.72	1.36	0.73	19.45	0.	9.16	7.96	0.08	0.32
3 22 66	1.59	14.20	12.72	5.65	0.34	7.20	0.	13.24	10.68	0.12	0.36
11 16 66	2.17	36.79	19.17	9.69	1.49	27.02	0.	22.63	12.65	0.17	0.24
3 30 67	0.70	9.16	6.44	5.67	0.03	4.30	0.	3.30	8.63	0.05	0.26
11 21 67	2.79	45.61	12.63	19.71	1.62	26.16	0.	33.68	16.52	0.09	0.73
10 30 68	2.65	28.60	24.71	15.90	1.82	19.44	0.	33.41	15.63	0.09	0.60

H. CONCENTRATIONS, IN ME/L, IN NET GAINS OR LOSSES IN EACH REACH											
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3
STATION	342.0R										
4 30 64	-0.47	13.51	-7.68	2.40	0.31	2.07	0.	6.34	-1.58	0.03	0.09
10 21 64	0.81	4.00	2.50	1.15	0.33	0.85	0.	4.19	1.38	0.03	0.
9 1 65	1.28	2.12	6.22	3.50	0.31	6.59	0.	3.22	2.57	0.03	0.02
11 16 65	1.17	9.59	2.70	0.48	0.26	6.80	0.	3.20	2.78	0.03	0.11
3 22 66	1.59	3.65	3.27	1.45	0.09	1.85	0.	3.41	2.75	0.03	0.09
11 16 66	2.17	6.93	3.61	1.83	0.28	5.09	0.	4.26	2.38	0.03	0.04
3 30 67	0.70	5.35	3.76	3.31	0.02	2.51	0.	1.93	5.04	0.03	0.15
11 21 67	2.79	6.69	1.85	2.89	0.24	3.84	0.	4.94	2.42	0.01	0.11
10 30 68	2.65	4.41	3.81	2.45	0.28	3.00	0.	5.16	2.41	0.01	0.09

I. PERCENTAGE COMPOSITION OF NET GAINS OR LOSSES IN EACH REACH											
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3
STATION	342.0R										
4 30 64	-0.47	158.18	-89.88	28.11	3.59	29.73	0.	91.21	-22.71	0.45	1.31
10 21 64	0.81	50.05	31.34	14.45	4.16	13.12	0.	65.00	21.40	0.49	0.
9 1 65	1.28	17.44	51.24	28.79	2.53	53.02	0.	25.89	20.63	0.25	0.20
11 16 65	1.17	73.64	20.74	3.66	1.97	52.61	0.	24.78	21.53	0.20	0.87
3 22 66	1.59	43.16	38.65	17.16	1.03	22.79	0.	41.90	33.77	0.39	1.15
11 16 66	2.17	54.79	28.55	14.44	2.22	43.09	0.	36.09	20.18	0.27	0.38
3 30 67	0.70	43.02	30.24	26.61	0.13	25.98	0.	19.95	52.19	0.33	1.56
11 21 67	2.79	57.32	15.87	24.77	2.04	33.89	0.	43.64	21.40	0.12	0.95
10 30 68	2.65	40.26	34.79	22.38	2.57	28.10	0.	48.30	22.60	0.13	0.87

J. NET GAINS OR LOSSES, IN TONS/DAY, IN EACH REACH														
DATE	DISCHARGE (CFS)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	-0.47	-0.15	-0.34	0.12	-0.07	-0.02	-0.16	0.	-0.39	0.07	-0.00	-0.01	-0.00	-0.00
10 21 64	0.81	0.01	0.18	0.07	0.06	0.03	0.11	0.	0.44	0.11	0.00	0.	0.00	-0.00
9 1 65	1.28	0.06	0.15	0.26	0.28	0.04	1.39	0.	0.53	0.31	0.00	0.01	0.00	0.00
11 16 65	1.17	0.05	0.61	0.10	0.03	0.03	1.31	0.	0.49	0.31	0.00	0.02	0.00	0.00
3 22 66	1.59	0.06	0.31	0.17	0.14	0.01	0.49	0.	0.70	0.42	0.00	0.02	0.	0.00
11 16 66	2.17	0.07	0.81	0.26	0.25	0.06	1.82	0.	1.20	0.50	0.00	0.02	0.00	0.00
3 30 67	0.70	0.03	0.20	0.09	0.14	0.00	0.29	0.	0.17	0.34	0.00	0.02	0.	0.00
11 21 67	2.79	0.12	1.01	0.17	0.50	0.07	1.76	0.	1.79	0.65	0.00	0.05	0.00	0.00
10 30 68	2.65	0.08	0.63	0.33	0.40	0.08	1.31	0.	1.77	0.61	0.00	0.04	-0.00	0.00

K. NET GAINS OR LOSSES AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION														
DATE	WATER	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	-5.23	-50.17	-11.41	25.68	-6.56	-5.36	-3.12	0.	-5.89	7.70	-5.23	-49.30	-3.49	-19.06
10 21 64	8.54	1.81	5.56	11.82	5.96	8.54	2.13	0.	6.51	13.47	8.54	0.	8.54	-0.68
9 1 65	5.86	8.80	2.33	22.19	13.87	5.03	13.25	0.	3.70	17.21	5.86	44.80	0.	6.67
11 16 65	9.75	11.14	16.29	16.84	2.67	10.26	18.82	0.	6.79	22.91	9.75	35.76	0.	7.06
3 22 66	10.04	10.04	5.75	19.98	8.60	3.42	5.23	0.	6.52	24.45	12.05	64.93	0.	7.16
11 16 66	16.23	16.23	19.61	35.65	16.63	17.85	30.01	0.	13.41	27.44	19.48	24.90	16.23	14.95
3 30 67	6.80	8.89	5.44	17.27	11.01	0.43	4.84	0.	2.50	22.51	8.16	48.80	0.	12.05
11 21 67	22.28	28.76	22.28	22.80	28.47	20.73	21.82	0.	21.31	30.38	14.00	55.11	22.28	17.67
10 30 68	15.96	11.58	9.94	32.19	16.08	15.96	13.04	0.	13.36	22.03	8.31	41.77	-2.60	2.51

Table 3.--Example of tabular output from programs--continued.

L. CONCENTRATIONS, IN MG/L, IN NET GAINS OR LOSSES IN EACH REACH														
DATE	DISCHARGE (CFS)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION		342.0R												
4 30 64	-0.47	115.15	270.72	-93.34	55.19	12.00	126.04	0.	304.38	-55.96	0.60	5.66	0.20	0.47
10 21 64	0.81	2.54	80.17	30.46	26.54	13.00	51.60	0.	201.26	48.91	0.60	0.	0.10	-0.02
9 1 65	1.28	18.00	42.47	75.69	80.41	12.00	402.19	0.	154.63	90.97	0.60	1.53	0.10	0.27
11 16 65	1.17	16.00	192.10	32.82	10.95	10.00	414.90	0.	153.85	98.69	0.50	6.97	0.10	0.12
3 22 66	1.59	14.00	73.22	39.79	33.40	3.40	113.04	0.	163.64	97.38	0.60	5.82	0.	0.11
11 16 66	2.17	12.00	138.96	43.93	42.00	11.00	310.67	0.	204.84	84.54	0.60	2.76	0.20	0.19
3 30 67	0.70	17.00	107.26	45.74	76.11	0.63	153.14	0.	92.57	178.83	0.60	9.33	0.	0.28
11 21 67	2.79	15.49	134.00	22.51	66.44	9.30	234.00	0.	237.18	85.87	0.25	6.68	0.10	0.19
10 30 68	2.65	11.60	88.45	46.38	56.40	11.00	183.04	0.	247.66	85.57	0.26	5.76	-0.02	0.04
M. NET SEEPAGE, IN KE/DAY, IN EACH REACH														
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3			
STATION		342.0R												
4 30 64	-0.47	-15.52	8.82	-2.76	-0.35	-2.37	0.	-7.28	1.81	-0.04	-0.10			
10 21 64	0.71	6.97	4.82	2.05	0.63	0.81	0.	8.03	2.56	0.06	-0.07			
9 1 65	0.82	2.25	18.31	9.39	0.76	16.60	0.	8.06	6.71	0.08	0.04			
11 16 65	-0.06	10.33	4.83	-4.24	0.19	6.68	0.	1.05	3.10	0.04	-0.18			
3 22 66	-0.90	-16.72	4.60	-5.17	-0.69	-16.03	0.	-3.22	0.57	0.02	-0.15			
11 16 66	0.88	19.10	13.68	2.15	0.86	15.49	0.	9.27	6.13	0.12	-0.03			
3 30 67	-1.26	-16.80	0.79	-3.80	-0.72	-11.06	0.	-12.80	-0.50	-0.02	-0.20			
11 21 67	-0.98	-14.77	0.16	-3.72	-0.18	-13.55	0.	-3.41	-2.58	-0.04	-0.66			
10 30 68	-0.28	-21.85	13.39	-4.47	0.38	-10.45	0.	-2.46	-0.26	-0.03	-0.39			
N. PERCENTAGE COMPOSITION OF NET SEEPAGE IN EACH REACH														
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3			
STATION		342.0R												
4 30 64	-0.47	158.18	-89.88	28.11	3.59	29.73	0.	91.21	-22.71	0.45	1.31			
10 21 64	0.71	48.19	33.29	14.19	4.33	7.08	0.	70.57	22.48	0.53	-0.66			
9 1 65	0.82	7.33	59.62	30.57	2.48	52.74	0.	25.59	21.31	0.24	0.12			
11 16 65	-0.06	93.00	43.49	-38.22	1.72	62.48	0.	9.87	28.96	0.39	-1.69			
3 22 66	-0.90	93.03	-25.61	28.75	3.82	85.23	0.	17.13	-3.04	-0.09	0.77			
11 16 66	0.88	53.38	38.22	6.00	2.40	50.02	0.	29.92	19.78	0.38	-0.10			
3 30 67	-1.26	81.85	-3.84	18.50	3.49	45.03	0.	52.08	2.01	0.07	0.80			
11 21 67	-0.98	79.79	-0.86	20.11	0.96	66.96	0.	16.84	12.74	0.20	3.26			
10 30 68	-0.28	174.11	-106.74	35.65	-3.02	76.90	0.	18.08	1.93	0.19	2.90			
O. CONCENTRATIONS, IN ME/L, IN NET SEEPAGE IN EACH REACH														
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3			
STATION		342.0R												
4 30 64	-0.47	-13.51	-7.68	-2.40	-0.31	-2.07	0.	-6.34	-1.58	-0.03	-0.09			
10 21 64	0.71	4.02	2.77	1.18	0.36	0.46	0.	4.63	1.47	0.03	-0.04			
9 1 65	0.82	1.12	9.13	4.68	0.38	8.28	0.	4.02	3.35	0.04	0.02			
11 16 65	-0.06	-70.40	-32.92	-28.93	-1.30	-45.53	0.	-7.19	-21.10	-0.28	-1.23			
3 22 66	-0.90	-7.60	-2.09	-2.35	-0.31	-7.28	0.	-1.46	-0.26	-0.01	-0.07			
11 16 66	0.88	8.93	6.39	1.00	0.40	7.24	0.	4.33	2.86	0.05	-0.01			
3 30 67	-1.26	-5.45	-0.26	-1.23	-0.23	-3.59	0.	-4.15	-0.16	-0.01	-0.06			
11 21 67	-0.98	-6.16	-0.07	-1.55	-0.07	-5.66	0.	-1.42	-1.08	-0.02	-0.28			
10 30 68	-0.28	-31.91	-19.56	-6.53	-0.55	-15.26	0.	-3.59	-0.38	-0.04	-0.58			
P. CONCENTRATIONS, IN MG/L, IN NET SEEPAGE IN EACH REACH														
DATE	DISCHARGE (CFS)	SI02	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION		342.0R												
4 30 64	-0.47	-115.15	-270.72	-93.34	-55.19	-12.00	-126.04	0.	-304.38	-55.96	-0.60	-5.66	-0.20	-0.47
10 21 64	0.71	0.37	80.48	33.73	27.18	14.10	28.31	0.	222.28	52.28	0.66	-2.68	0.10	-0.04
9 1 65	0.82	16.98	22.51	111.03	107.63	14.82	505.22	0.	192.98	118.63	0.73	1.19	0.10	0.31
11 16 65	-0.06	-75.83	-1410.83	-400.33	-665.00	-50.78	-2777.66	0.	-345.33	-748.33	-5.35	-76.50	-0.20	-0.93
3 22 66	-0.90	-17.07	-152.28	-25.43	-53.99	-12.20	-444.37	0.	-70.31	-9.20	-0.15	-4.10	-0.13	-0.30
11 16 66	0.88	5.28	178.91	77.73	23.06	15.69	441.79	0.	208.06	101.55	1.04	-0.91	0.20	0.15
3 30 67	-1.26	-16.39	-109.29	-3.11	-28.34	-9.10	-219.11	0.	-199.52	-5.70	-0.11	-3.97	-0.05	-0.06
11 21 67	-0.98	-14.85	-123.53	-0.81	-35.72	-2.89	-345.07	0.	-68.31	-38.15	-0.32	-17.08	-0.10	-0.37
10 30 68	-0.28	-82.07	-639.46	-237.86	-150.18	-21.64	-930.96	0.	-172.29	-13.57	-0.73	-35.65	-1.26	-1.70

Table 3.--Example of tabular output from programs--*continued.*

Q. NET SEEPAGE, IN TONS/DAY, IN EACH REACH														
DATE	DISCHARGE (CFS)	SIO2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	-0.47	0.15	0.34	0.12	0.07	0.02	0.16	0.	0.39	0.07	0.00	0.01	0.00	0.00
10 21 64	0.71	0.00	0.15	0.06	0.05	0.03	0.05	0.	0.43	0.10	0.00	-0.01	0.00	-0.00
9 1 65	0.82	0.04	0.05	0.25	0.24	0.03	1.12	0.	0.43	0.26	0.00	0.00	0.00	0.00
11 16 65	-0.06	0.01	0.23	0.06	0.11	0.01	0.45	0.	0.06	0.12	0.00	0.01	0.00	0.00
3 22 66	-0.90	0.04	0.37	0.06	0.13	0.03	1.08	0.	0.17	0.02	0.00	0.01	0.00	0.00
11 16 66	0.88	0.01	0.42	0.18	0.05	0.04	1.04	0.	0.49	0.24	0.00	-0.00	0.00	0.00
3 30 67	-1.26	0.06	0.37	0.01	0.10	0.03	0.75	0.	0.68	0.02	0.00	0.01	0.00	0.00
11 21 67	-0.98	0.04	0.33	0.00	0.09	0.01	0.91	0.	0.18	0.10	0.00	0.05	0.00	0.00
10 30 68	-0.28	0.06	0.48	0.18	0.11	0.02	0.70	0.	0.13	0.01	0.00	0.03	0.00	0.00

R. NET SEEPAGE IN EACH REACH AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION														
DATE	WATER	SIO2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	-5.23	50.17	11.41	25.68	6.56	5.36	3.12	0.	5.89	7.70	5.23	49.30	3.49	19.06
10 21 64	7.48	0.23	4.90	11.47	5.35	8.11	1.02	0.	6.30	12.62	8.18	0.	7.48	-1.38
9 1 65	3.76	5.31	0.79	20.85	11.89	3.98	10.66	0.	2.96	14.38	4.57	22.35	0.	4.91
11 16 65	-0.50	2.71	6.13	10.54	8.31	2.67	6.46	0.	0.78	8.91	5.35	20.13	0.	2.91
3 22 66	-5.69	6.93	6.76	7.23	7.87	6.94	11.64	0.	1.59	1.31	1.74	25.89	0.	10.70
11 16 66	6.54	2.88	10.18	25.43	3.68	10.27	17.21	0.	5.49	13.29	13.65	-3.31	6.54	4.72
3 30 67	-12.23	15.42	9.98	2.11	7.38	11.13	12.47	0.	9.69	1.29	2.74	37.33	0.	4.59
11 21 67	-7.83	9.68	7.22	0.29	5.38	2.26	11.30	0.	2.16	4.74	6.25	49.51	7.83	12.07
10 30 68	-1.69	8.65	7.60	17.44	4.52	3.32	7.01	0.	0.98	0.37	2.46	27.34	19.36	12.47

S. CUMULATIVE NET SEEPAGE, IN KE/DAY												
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	
STATION	342.0R											
4 30 64	2.06	33.46	18.92	10.68	1.13	22.69	0.	33.03	8.40	0.21	0.06	
10 21 64	0.88	24.32	4.21	6.37	0.03	14.68	0.	14.00	5.72	0.05	-0.10	
9 1 65	6.40	86.84	42.06	28.41	4.23	53.22	0.	81.95	18.65	0.47	0.14	
11 16 65	4.47	71.73	19.95	20.98	2.75	39.89	0.	60.76	14.57	0.36	-0.18	
3 22 66	5.94	96.41	26.48	23.66	4.29	45.34	0.	92.78	13.37	0.59	-0.11	
11 16 66	4.76	81.38	23.71	18.73	2.89	46.22	0.	58.93	17.86	0.41	-0.02	
3 30 67	0.86	22.01	13.14	8.96	0.37	11.37	0.	21.24	11.26	0.15	-0.36	
11 21 67	1.96	32.79	19.56	10.63	1.62	11.88	0.	41.25	12.03	0.27	-0.75	
10 30 68	4.66	73.52	30.40	21.15	3.56	37.57	0.	74.12	15.84	0.47	0.05	

T. CUMULATIVE NET SEEPAGE, IN TONS/DAY														
DATE	DISCHARGE (CFS)	SIO2	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	2.06	0.40	1.43	0.25	0.41	0.08	1.85	0.	2.52	0.33	0.01	0.02	0.00	0.00
10 21 64	0.88	0.04	0.78	0.20	0.24	0.12	1.41	0.	1.94	0.37	0.01	-0.00	0.01	0.00
9 1 65	6.40	0.40	1.96	0.64	0.72	0.27	4.26	0.	5.65	0.73	0.01	0.01	0.00	0.00
11 16 65	4.47	0.19	1.59	0.27	0.75	0.12	2.69	0.	3.22	0.57	0.01	0.01	0.00	0.00
3 22 66	5.94	0.33	3.03	0.36	0.91	0.25	5.41	0.	5.26	0.52	0.01	0.02	0.00	0.00
11 16 66	4.76	0.17	1.80	0.32	0.52	0.13	3.11	0.	3.17	0.71	0.01	-0.00	0.00	0.00
3 30 67	0.86	0.54	3.22	0.61	1.07	0.24	5.47	0.	6.99	0.83	0.01	0.02	0.00	0.00
11 21 67	1.96	0.19	1.57	0.33	0.48	0.11	3.08	0.	2.89	0.71	0.01	0.04	0.00	0.00
10 30 68	4.66	0.31	2.59	0.41	0.76	0.15	3.94	0.	4.19	0.64	0.01	0.06	0.00	0.01

U. PERCENTAGE COMPOSITION OF CUMULATIVE NET SEEPAGE												
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HCO3	CO3	SO4	CL	F	NO3	
STATION	342.0R											
4 30 64	2.06	52.13	29.47	16.64	1.75	35.24	0.	51.29	13.05	0.33	0.10	
10 21 64	0.88	69.64	12.05	18.23	0.08	42.74	0.	40.75	16.64	0.15	-0.28	
9 1 65	6.40	53.76	26.04	17.59	2.62	38.45	0.	49.84	11.34	0.29	0.08	
11 16 65	4.47	62.15	17.29	18.18	2.38	34.57	0.	52.65	12.63	0.31	-0.15	
3 22 66	5.94	63.92	17.55	15.69	2.84	29.84	0.	61.05	8.79	0.39	-0.07	
11 16 66	4.76	64.22	18.71	14.78	2.78	37.46	0.	47.76	14.48	0.33	-0.02	
3 30 67	0.86	49.48	29.54	20.14	0.84	26.04	0.	48.66	25.78	0.34	-0.83	
11 21 67	1.96	50.76	30.28	16.45	2.51	18.37	0.	63.77	18.60	0.42	-1.16	
10 30 68	4.66	57.16	23.63	16.44	2.76	29.34	0.	57.88	12.37	0.36	0.04	

Table 3.--Example of tabular output from programs--*concluded.*

V. CONCENTRATIONS, IN ME/L, IN CUMULATIVE NET SEEPAGE														
DATE	DISCHARGE (CFS)	CA	MG	NA	K	HC03	CO3	SO4	CL	F	NO3			
STATION	342.0R													
4 30 64	2.06	6.64	3.76	2.12	0.22	4.51	0.	6.56	1.67	0.04	0.01			
10 21 64	0.88	11.30	1.96	2.96	0.01	6.82	0.	6.50	2.66	0.02	-0.05			
9 1 65	6.40	5.55	2.69	1.82	0.27	4.04	0.	5.24	1.19	0.03	0.01			
11 16 65	4.47	6.56	1.83	1.92	0.25	3.65	0.	5.56	1.33	0.03	-0.02			
3 22 66	5.94	6.64	1.82	1.63	0.30	3.12	0.	6.39	0.92	0.04	-0.01			
11 16 66	4.76	7.00	2.04	1.61	0.25	3.97	0.	5.07	1.54	0.04	-0.00			
3 30 67	0.86	10.48	6.26	4.27	0.18	5.41	0.	10.11	5.36	0.07	-0.17			
11 21 67	1.96	6.84	4.08	2.22	0.34	2.48	0.	8.60	2.51	0.06	-0.16			
10 30 68	4.66	6.45	2.67	1.86	0.31	3.30	0.	6.50	1.39	0.04	0.00			
W. CONCENTRATIONS, IN MG/L, IN CUMULATIVE NET SEEPAGE														
DATE	DISCHARGE (CFS)	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	2.06	18.87	133.14	45.67	48.76	8.74	274.87	0.	314.95	59.16	0.79	0.76	0.	0.12
10 21 64	0.88	14.72	226.50	23.78	68.02	0.51	416.27	0.	312.43	94.20	0.45	0.	0.61	0.
9 1 65	6.40	21.41	111.21	32.68	41.73	10.57	246.49	0.	251.56	42.27	0.57	0.54	0.12	0.17
11 16 65	4.47	13.63	131.55	22.20	44.14	9.83	222.73	0.	267.08	47.29	0.62	0.	0.07	0.19
3 22 66	5.94	12.72	133.04	22.17	37.45	11.54	190.48	0.	306.82	32.63	0.77	0.	0.	0.19
11 16 66	4.76	12.61	140.24	24.79	37.03	9.71	242.51	0.	243.39	54.47	0.67	0.	0.17	0.26
3 30 67	0.86	38.28	210.05	76.09	98.06	6.96	330.24	0.	485.73	190.04	1.36	0.	0.	0.32
11 21 67	1.96	1.74	137.04	49.61	50.95	13.24	151.18	0.	413.27	89.00	1.07	0.	0.	0.19
10 30 68	4.66	14.98	129.31	32.44	42.67	12.20	201.17	0.	312.44	49.30	0.78	0.28	0.	0.27
X. CUMULATIVE NET SEEPAGE AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION														
DATE	WATER	SI02	CA	MG	NA	K	HC03	CO3	SO4	CL	F	NO3	PO4	B
STATION	342.0R													
4 30 64	22.91	136.37	47.43	55.08	38.51	27.84	36.10	0.	38.52	35.67	40.75	127.68	6.90	60.08
10 21 64	9.27	14.57	24.83	35.62	24.66	34.67	26.62	0.	28.61	46.22	41.71	0.	231.51	24.58
9 1 65	29.32	55.89	31.00	54.60	35.99	32.92	40.60	0.	39.15	39.97	28.03	99.70	0.	21.07
11 16 65	37.24	41.68	42.60	43.52	57.73	38.52	38.58	0.	45.01	41.93	46.27	20.57	0.	51.06
3 22 66	37.52	55.25	55.47	41.59	54.58	59.25	58.29	0.	48.86	30.69	58.13	60.63	0.	67.32
11 16 66	35.57	38.42	43.38	44.10	35.16	35.71	51.35	0.	35.43	39.28	48.92	-2.04	31.39	48.50
3 30 67	8.34	148.65	86.36	122.12	82.21	85.50	91.44	0.	99.75	55.06	97.05	64.68	0.	106.13
11 21 67	15.66	46.89	34.71	44.77	27.33	33.10	38.07	0.	34.50	33.19	64.25	43.74	143.54	43.80
10 30 68	28.07	43.59	40.76	39.59	30.44	31.13	39.23	0.	31.59	23.06	48.64	58.21	29.86	57.61

(1) RESIDUE AT 180°C

(3) MICROMHOS AT 25°C

(5) -1 INDICATES NO DATA.

$$(2) \text{ SAR} = \frac{\text{NA}^+}{\sqrt{\frac{\text{CA}^{++} + \text{MG}^{++}}{2}}}$$

(4) AT TIME OF ANALYSIS

The data are listed chronologically and in upstream order in table 3A. The concentrations of the ions, excluding silica, phosphate, and boron, are converted to milliequivalents per liter (me/l) according to the equation:

$$\text{Concentration (me/l)} = \frac{\text{Concentration (mg/l)}}{\text{Equivalent weight (grams/equivalent)}}$$

(see table 3B) to facilitate evaluation of the chemical analyses. The sum of the concentrations of the major cations (positive ions) and anions (negative ions), in milliequivalents per liter, should be equal or nearly equal in a valid analysis. Equality of the sums is assumed as a basis for computation of the percentage composition of the dissolved solids.

The concentrations of the ions at a station normally vary inversely with the rate of streamflow as a result of dilution by rainfall. Dilution by rainfall does not alter significantly the relative proportions of the ionic components; therefore, variations and fluctuations in the concentrations of the ions, expressed as percentages of total anions and cations (table 3F), are useful for revealing significant changes in ionic concentration caused by other factors.

Chemical discharge

The chemical discharge (or load, $\underline{L}$) of an ionic constituent is defined by the equation:

$$\underline{L} = \underline{K} \times \underline{Q} \times \underline{C}$$

where $\underline{K}$ is a units-conversion constant, $\underline{Q}$ is the water discharge, and $\underline{C}$ is the concentration of the ionic constituent. The chemical discharge is expressed in tons per day (tons/day) when $\underline{Q}$ is in cubic feet per second, $\underline{C}$ is in milligrams per liter, and $\underline{K}$ equals 0.0027. It can also be expressed in thousands of equivalent weights (kiloequivalents) per day (ke/day) when $\underline{C}$ is in milliequivalents per liter and $\underline{K}$ equals 2.446. The latter form is useful because the anionic load in kiloequivalents per day should be equal or nearly equal to the cationic load, and the relative proportions of the ions that determine water type are apparent by inspection. The chemical discharge at each station is expressed in kiloequivalents per day and tons per day in table 3, parts C and D, respectively.

The water and chemical discharge at each station during successive surveys is converted to a percentage of the discharge at a reference station for comparing the relative effect of each source of inflow on the chemical quality of water in the main stem during successive

surveys. Station 334.4R, the downstream end of the surveyed reach, is the reference station for the examples shown in table 3, parts E, K, R, and X.

Net gains or losses

The increase (or decrease) in water discharge or chemical discharge in each reach during a single survey is called the net gain (or loss) in that reach. Each reach is identified by the location of the station at the downstream end. The algebraic difference between the discharge at the ends of the reach is calculated in kiloequivalents per day (table 3G), tons per day (table 3J), and percentages of the discharge of water or similar ions at the reference station (table 3K). Net gains and losses in water discharge, in cubic feet per second, are included in all three tables. Negative values represent losses from the channel, changing stage, or erroneous measurements of water discharge or concentration. Concomitant gains and losses of water and of different ionic constituents in a reach generally indicate interchange of ground and surface water that might be undetectable from water-discharge measurements alone. Differences greater than about 8 percent between the anionic load and the cationic load in net gains (or losses), in kiloequivalents per day, normally indicate erroneous measurements.

Concentrations of the ions in net gains or losses are calculated in milliequivalents per liter (table 3H) and milligrams per liter (table 3L) from corresponding values of water discharge and chemical discharge. The percentage composition of net gains or losses is shown in table 3I. Large apparent anomalies in the percentages can be caused by simultaneous gains and losses in a reach, or by minor errors in measurement or analysis when net gains or losses are small.

Net seepage gains or losses

Net seepage gain in a reach is net gain minus tributary inflow to the reach. Net seepage gains (positive values in the tables) represent unmeasured inflow, normally effluent ground water, directly to the main stem. Net seepage losses (negative values in the tables) represent unmeasured losses or withdrawals. Net seepage gains and losses are calculated in tons per day (table 3Q), in kiloequivalents per day (table 3M), and as percentages of the

discharge at the reference station (table 3R). The percentage composition of the dissolved-solids load and the concentrations of the ions in net seepage are shown in table 3, parts N through P.

Net seepage gain or loss in a single reach is probably significant only when the magnitude exceeds about 6 percent of the measured discharge at the terminus of the reach. The effect of small errors in measurement and analysis at a single station is minimized when seepage gains and losses are accumulated in a downstream direction. Cumulative net seepage gains along the main stem upstream from a given station are shown in table 3, parts S and T. The percentages and concentrations of the ions in cumulative net seepage are shown in table 3, parts U through W. Cumulative net seepage, expressed as a percentage of the discharge at the reference station, is shown in table 3X.

DESCRIPTION OF COMPUTER PROGRAMS

The programs are written in FORTRAN IV and GMAP languages.

Input

Input to program SPSL (app. I) consists of U.S. Geological Survey Water Resources Division water-quality cards 1 and 2 for surface-water data. (See app. II.) Equivalent data can be read from tape by changing the variable L5 number in the program (Card No. SPS2010, app. I) to match the number of the input tape. Stations are arranged in downstream order; data from each station are arranged in time sequence. Preceding the data deck for each station is a control card containing the station number in river miles upstream from the mouth of the main stem, the station name, and a code I or R. (See comments in program listing, app. I, for arrangement of control cards numbered SPS860-1040.)

The data cards for the first (upstream) station are used to compile the list of consecutive surveys; therefore, the card deck for that station must include cards representing all surveys. Data from all surveys need not be included on cards for the other stations. Data representing each survey must have been collected within 5 days of the date shown for that survey on the card for the first station, or the program instructions will consider that data as belonging to another survey. An example of arrangement of the data on the cards is shown in appendix II.

Output

Output from the program SPSL (app. I) is written on magnetic tape. A sort routine (program SORT, app. III) is required to arrange the data by station in the desired chronological order shown in table 3. Data from each station during a single survey are represented by 46 words of information, one record of output on the tape. The records are first sorted into groups corresponding to the parameters (Word No. 1) shown in table 2. Then records in each group are re-sorted by station (Word No. 2), year (Word No. 6), month (Word No. 4), and day (Word No. 5), respectively. Program SORT is written in GMAP language for the GE 625 computer.

The sorted information is the input tape used by the tabling program (TBSPSL, app. IV) for a printed output of 24 tables of information, each corresponding to a parameter in table 2. Instructions for retrieving any or all the computer tables (listed in table 2) are found in appendix IV, cards numbered TBS1270 through TBS1400. For an example of input control data to TBSPSL, see appendix V. If there are no more than 12 records per station, data from three stations are printed on each page. If more or less than three stations per page are desired, the format can be changed by adjusting card numbered TAB170.

Output is readily adaptable to the objectives of each investigation. Irrelevant output can be discarded after examination for significance, or it can be deleted by use of the control card (app. V). Conversely, part of the output can be used as data for additional computations pertinent to a specific problem. For example, ratios of the concentration of major ionic constituents to the concentration of chloride were used to determine the percentage of the dissolved-solids load that oil-field brine contributed to the Walnut River, Kansas (Leonard, 1964a). Other ionic ratios calculated from the concentrations of individual ions in net gains were particularly useful for relating changes in the chemical quality of streamflow to irrigation return flow from the Cedar Bluff Irrigation District (Leonard, 1969).

CONCLUSIONS

Use of the digital computer programs described herein facilitates the presentation, analysis, and interpretation of voluminous data collected during seepage-salinity surveys of low streamflow. More useful information can be derived from the data at a much lower cost by use of the computer than by time-consuming manual calculation and tabulation. The data and

information are printed out in a form that simplifies analysis and that is suitable for publication. Output is readily adaptable to the objectives of individual investigations.

SELECTED REFERENCES

- Leonard, R. B., 1964a, A method for evaluating oil-field brine pollution of the Walnut River in Kansas: U.S. Geol. Survey Prof. Paper 501B, p. B173-B176.
- _____ 1964b, Results of four chemical-quality surveys of the Walnut River basin, Kansas: Kansas State Dept. of Health Bull. No. 1-3, 38 p.
- _____ 1969, Effect of irrigation on the chemical quality of low streamflow adjacent to Cedar Bluff Irrigation District, Kansas: Kansas State Dept. of Health Bull. No. 1-10, 17 p.

APPENDIXES

Appendix I.--Listing of program SPSL.

CPSL0000	PROGRAM TO PREPARE FOR INTERPRETATION OF WATER-QUALITY	SPS	10
C	DATA FROM SEEPAGE-SALINITY SURVEYS. DATA ARE STORED	SPS	20
C	ONTO TAPE FOR FURTHER PROCESSING.	SPS	30
C	*****	SPS	40
C	ANALYTICAL METHODS DEVELOPED BY ROBERT B. LEONARD	SPS	50
C	PROGRAMMED BY CHARLES O. MORGAN	SPS	60
C	KANSAS DISTRICT, WRD, USGS, LAWRENCE, KANSAS	SPS	70
C	DATE COMPLETED--JULY 1968	SPS	80
C	LANGUAGE FORTRAN IV, H LEVEL	SPS	90
C	*****	SPS	100
C	TWO ADDITIONAL PROGRAMS ARE REQUIRED TO PRODUCE FINAL TABLES	SPS	130
C	PROGRAM SPSL REQUIRES 5 SUBROUTINES, MEL, DECM, DET, ERAS, HOLD.	SPS	110
C	*****NOTE*****	SPS	120
C	-----THE FIRST, A GMAP ROUTINE, SORTS THE DATA BY TABLE NUMBER,	SPS	140
C	STATION NUMBER, AND DATE.	SPS	150
C	-----THE SECOND, A FORTRAN IV PROGRAM, CALLED TBSPSL, SETS UP	SPS	160
C	TABLE HEADINGS AND WRITES THE TABLE IN FINAL FORM.	SPS	170
C	*****	SPS	180
C	INPUT DATA ARE WRD 1, 2 CARDS FOR STREAM WATER-QUALITY DATA	SPS	190
C	ARRANGED BY STATIONS IN DOWNSTREAM ORDER, AND EACH STATION	SPS	200
C	ARRANGED SEQUENTIALLY BY DATE AND PRECEDED BY A STATION	SPS	210
C	IDENTIFICATION CARD.	SPS	220
C	*****	SPS	230
C	*****	SPS	240
C	EXPLANATION OF OUTPUT	SPS	250
C	DATA ARE OUTPUT ONTO UNIT L2. INFORMATION IS ARRANGED BY	SPS	260
C	TABLE 2 THROUGH N, FOLLOWED BY TABLE 1. WITHIN EACH TABLE THE	SPS	270
C	DATA ARE GROUPED BY DATE, WITH STATIONS SEQUENCED IN A DOWN-	SPS	280
C	STREAM ORDER.	SPS	290
C	***THE SORT ROUTINE GROUPS EACH STATION (BY TABLE CATAGORY)	SPS	300
C	INTO SEQUENTIAL DATES.	SPS	310
C	THE FOLLOWING DATA ARE OUTPUT ONTO UNIT L2*****	SPS	320
C	-----	SPS	330
C	CONCENTRATIONS, IN MG/L, AT EACH STATION	SPS	340
C	-----	SPS	350
C	CONCENTRATIONS, IN ME/L, AT EACH STATION	SPS	360
C	-----	SPS	370
C	CHEMICAL DISCHARGE, IN KE/DAY, AT EACH STATION	SPS	380
C	-----	SPS	390
C	CHEMICAL DISCHARGE, IN TONS/DAY, AT EACH STATION	SPS	400
C	-----	SPS	410
C	WATER AND CHEMICAL DISCHARGE AT EACH STATION AS PERCENTAGE OF THAT	SPS	420
C	AT REFERENCE STATION	SPS	430
C	-----	SPS	440
C	PERCENTAGE COMPOSITION AT EACH STATION	SPS	450
C	-----	SPS	460
C	NET GAINS OR LOSSES, IN KE/DAY, IN EACH REACH	SPS	470
C	-----	SPS	480
C	CONCENTRATIONS, IN ME/L, IN NET GAINS OR LOSSES IN EACH REACH	SPS	490
C	-----	SPS	500
C	PERCENTAGE COMPOSITION OF NET GAINS OR LOSSES IN EACH REACH	SPS	510
C	-----	SPS	520
C	NET GAINS OR LOSSES, IN TONS/DAY, IN EACH REACH	SPS	530
C	-----	SPS	540
C	NET GAINS OR LOSSES AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE	SPS	550
C	AT REFERENCE STATION	SPS	551
C	-----	SPS	560
C	CONCENTRATIONS, IN MG/L, IN NET GAINS OR LOSSES IN EACH REACH	SPS	570
C	-----	SPS	580

C	NET SEEPAGE, IN KE/DAY, IN EACH REACH	SPS 590
C	-----	SPS 600
C	PERCENTAGE COMPOSITION OF NET SEEPAGE IN EACH REACH	SPS 610
C	-----	SPS 620
C	CONCENTRATIONS, IN ME/L, IN NET SEEPAGE IN EACH REACH	SPS 630
C	-----	SPS 640
C	CONCENTRATIONS, IN MG/L, IN NET SEEPAGE IN EACH REACH	SPS 650
C	-----	SPS 660
C	NET SEEPAGE, IN TONS/DAY, IN EACH REACH	SPS 670
C	-----	SPS 680
C	NET SEEPAGE IN EACH REACH AS PERCENTAGE OF WATER AND CHEMICAL	SPS 690
C	DISCHARGE AT REFERENCE STATION	SPS 700
C	-----	SPS 710
C	CUMULATIVE NET SEEPAGE, IN KE/DAY	SPS 720
C	-----	SPS 730
C	CUMULATIVE NET SEEPAGE, IN TONS/DAY	SPS 740
C	-----	SPS 750
C	PERCENTAGE COMPOSITION OF CUMULATIVE NET SEEPAGE	SPS 760
C	-----	SPS 770
C	CONCENTRATIONS, IN ME/L, IN CUMULATIVE NET SEEPAGE	SPS 780
C	-----	SPS 790
C	CONCENTRATIONS, IN MG/L, IN CUMULATIVE NET SEEPAGE	SPS 800
C	-----	SPS 810
C	CUMULATIVE NET SEEPAGE AS PERCENTAGE OF WATER AND CHEMICAL	SPS 820
C	DISCHARGE AT REFERENCE STATION	SPS 830
C	*****	SPS 840
C	*****	SPS 850
C	EXPLANATION OF INPUT CONTROL CARDS	SPS 860
C	*****	SPS 870
C	ONE CARD IS NEEDED BEFORE THE DATA---CARD CONTAINS IDENTIFICA-	SPS 880
C	TION OF AREA OF STUDY (FIELDS 1 THROUGH 36)	SPS 890
C	*****	SPS 900
C	*****	SPS 910
C	DATA---CARDS REQUIRED, STATION IDENTIFICATION AND WRD 1, 2 QW	SPS 920
C	ANALYSES CARDS FOR STREAM DATA. ONE STATION IDENTIFICATION	SPS 930
C	CARD PRECEDES EACH GROUP OF 1, 2 CARDS FOR A STATION.	SPS 940
C	THESE GROUPS OF STATION CARDS ARE ARRANGED IN DOWNSTREAM	SPS 950
C	ORDER. THE STATION IDENTIFICATION CARD MUST BE IN THE	SPS 960
C	FOLLOWING FORMAT-----STATION NUMBER RIGHT JUSTIFIED IN	SPS 970
C	FIELDS 1-7, STATION NAME LEFT JUSTIFIED IN FIELDS 9-41,	SPS 980
C	AND THE TRIBUTARY (T) OR MAIN STREAM (R) DESIGNATION IN	SPS 990
C	FIELD 72.	SPS1000
C	*****	SPS1010
C	FOLLOWING THE DATA CARDS ARE TWO CARDS	SPS1020
C	CARD 1 HAS A Z PUNCHED IN COLUMN 1	SPS1030
C	CARD 2 HAS A X PUNCHED IN COLUMN 1	SPS1040
C	*****	SPS1050
C	*****DTA AND BTA VALUES---POSITIONS IN ARRAYS*****	SPS1060
C	FIELD(DTA) FIELD(BTA) PARAMETER	SPS1070
C	1 STATION NUMBER	SPS1080
C	2 MONTH	SPS1090
C	3 DAY	SPS1100
C	4 YEAR	SPS1110
C	5 19 DISCHARGE	SPS1120
C	6 1 SID2	SPS1130
C	7 2 AL	SPS1140
C	8 3 FE	SPS1150
C	9 4 MN	SPS1160
C	10 5 CA	SPS1170
C	11 6 MG	SPS1180

C	12	7	SR	SPS1190
C	13	8	NA	SPS1200
C	14	9	K	SPS1210
C	15	10	LI	SPS1220
C	16	11	HCO3	SPS1230
C	17	12	CO3	SPS1240
C	18	13	SO4	SPS1250
C	19	14	CL	SPS1260
C	20	15	F	SPS1270
C	21	16	NO3	SPS1280
C	22	17	PO4	SPS1290
C	23	18	B	SPS1300
C	24		DS	SPS1310
C	25		TONS/ACRE-FOOT	SPS1320
C	26		TONS/DAY	SPS1330
C	27		T. HARDNESS	SPS1340
C	28		N.C. HARDNESS	SPS1350
C	29		ACIDITY	SPS1360
C	30		SAR	SPS1370
C	31		K*10**6	SPS1380
C	32		PH	SPS1390
C	33		COLOR	SPS1400
C	34		OXYGEN	SPS1410
C	35		BOD	SPS1420
C	36		PHENOL	SPS1430
C	37		ABS	SPS1440
C	38		TEMP.	SPS1450
C	39		SUM CATIONS	SPS1460
C	40		SUM ANIONS	SPS1470
C	41		INFLOW TO REACH	SPS1480
C	42		CUMULATIVE INFLOW	SPS1490
C	43		SEEPAGE INTO REACH	SPS1500
C	44		CUMULATIVE SEEPAGE	SPS1510
C	*****			SPS1520
C	*****DIMENSIONED ARRAYS*****			SPS1530
C				SPS1540
C	ICD(50)--COUNT OF ANALYSES BY STATION (IN READ IN ORDER)			SPS1550
C	LOC(6)--ALPHA IDENTIFICATION OF STATION			SPS1560
C	TITLE(7)--IDENTIFICATION OF PROJECT AREA--READ FROM CONTROL CARD 1			SPS1570
C	STAT(50)--STATION NUMBERS			SPS1580
C	SV(19)--USED IN CALCULATIONS WHERE VALUES ARE SAVED OR ACCUMULATED			SPS1590
C	M(12)--CUMULATIVE DAYS AT THE BEGINNING OF EACH MONTH			SPS1600
C	N(80)--INTERMEDIATE STORAGE OF DATA			SPS1610
C	ND(9)--ARRAY POSITIONS OF PRINCIPAL CATIONS AND ANIONS IN BTA			SPS1620
C	IPT(2)--ALPHA CHARACTERS T AND R FOR CHECKING DATA FOR ORIGIN			SPS1630
C	FROM TRIBUTARY (T) AND MAIN REACH (R) STREAMS			SPS1640
C	KEY(50)--IDENTIFICATION OF STATION AS TRIBUTARY (1) OR MAIN			SPS1650
C	REACH STATIONS (0)			SPS1660
C	BTA(400,19)--STORAGE OF CALCULATED VALUES FOR FUTURE REFERENCE IN			SPS1670
C	OTHER CALCULATIONS			SPS1680
C	B(9)--STORES CATION AND ANION VALUES FOR ACCUMULATING AND			SPS1690
C	CALCULATION			SPS1700
C	DTA(50,44)--STORAGE OF STATION ANALYSES WITH CONSTITUENTS IN ME/L			SPS1710
C	C(18)--CONVERSION FACTORS (MG/L TO ME/L)			SPS1720
C	DIMENSION ICD(50), LOC(6), TITLE(7), STAT(50), SV(19), M(12), N(80)			SPS1730
C	1), ND(9), IPT(2)			SPS1740
C	*****LABELED COMMON*****			SPS1750
C	TB--MAINLINE AND SUBROUTINE HOLD			SPS1760
C	CTA--MAINLINE AND SUBROUTINES ERAS, HOLD			SPS1770
C	DA--MAINLINE AND SUBROUTINES DECM, HOLD			SPS1790

C	CAR--MAINLINE AND SUBROUTINE DET	SPS1780
C	ML--MAINLINE AND SUBROUTINE MEL	SPS1800
C	IUN--MAINLINE AND SUBROUTINE HOLD	SPS1810
	COMMON /TB/ KEY(50)	SPS1820
	COMMON /CTA/ BTA(400,19)	SPS1830
	COMMON /CAR/ B(9)	SPS1840
	COMMON /DA/ DTA(50,44)	SPS1850
	COMMON /ML/ C(18)	SPS1860
	COMMON /IUN/ L2	SPS1870
C	*****DATA STATEMENT VARIABLES*****	SPS1880
C	NX--EQUAL TO X (FOR CHECKING TERMINATION OF PROGRAM RUN)	SPS1890
C	NZ--EQUAL TO Z (FOR CHECKING END OF DATA GROUP)	SPS1900
C	IBK--EQUAL TO A BLANK	SPS1910
	DATA NX,NZ,IBK,IPT(1),IPT(2)/LHX,1HZ,1H,1HT,1HR/	SPS1920
	DATA ND,M/5,6,8,9,11,13,14,15,16,0,31,59,90,120,151,181,212,243,27	SPS1930
	13,304,344/,KSTOR/6HSTORET/	SPS1940
C	*****INPUT-OUTPUT UNITS*****	SPS1950
C	L1--SCRATCH TAPE	SPS1960
C	L2--OUTPUT TAPE	SPS1970
C	L5--CARD INPUT	SPS1980
	L1=1	SPS1990
	L2=2	SPS2000
	L5=5	SPS2010
C	NRANGE--RANGE OF DAYS BELOW OR ABOVE STATION 1 WHICH ARE SORTED	SPS2020
C	FOR CALCULATION PURPOSES	SPS2030
	NRANGE=6	SPS2040
	REWIND L2	SPS2050
	CALL MEL	SPS2060
	READ(L5,1)(TITLE(I),I=1,7),ISTOR	SPS2070
1	FORMAT (A1,A5,5A6,4X,A6)	SPS2080
	IF (TITLE(1).EQ.FLOAT(NX)) GO TO 83	SPS2090
C	KON--STATION COUNT	SPS2100
2	KON=0	SPS2110
C	K--COUNT OF ANALYSES CARDS FOR A STATION (COUNT STORED IN ICD)	SPS2120
	K=0	SPS2130
	REWIND L1	SPS2140
C	READ AND COUNT ANALYSES AT EACH STATION, WRITE ON TAPE L1	SPS2150
	IF(ISTOR .EQ. KSTOR) GO TO 101	SPS2160
3	READ (L5,4) (N(I),I=1,80)	SPS2170
4	FORMAT (80A1)	SPS2180
	IF (N(1).EQ.NZ) GO TO 8	SPS2190
	IF (N(1).EQ.NX) GO TO 83	SPS2200
	IF (N(80).EQ.IBK) GO TO 5	SPS2210
	GO TO 6	SPS2220
5	KON=KON+1	SPS2230
	IF (KON.GT.1) ICD(KON-1)=K	SPS2240
	K=0	SPS2250
	GO TO 7	SPS2260
6	K=K+1	SPS2270
7	WRITE (L1,4) (N(I),I=1,80)	SPS2280
	GO TO 3	SPS2281
101	CALL STORRD(ICOUNT)	SPS2282
	REWIND L1	SPS2283
	DO 102 I = 1,ICOUNT	SPS2284
	READ (L1) STAY	SPS2285
	IF(I.EQ. 1) STAX = STAY	SPS2286
	IF(STAX .EQ. STAY) GO TO 103	SPS2287
	KON = KON + 1	SPS2288
	ICD(KON) = K	SPS2289
	K = 1	

	STAX = STAY	SPS2290
	GO TO 102	SPS2291
103	K = K + 1	SPS2292
102	CONTINUE	SPS2293
	KON = KON + 1	SPS2294
8	ICD(KON)=K	SPS2295
C	IDT--IDATE VALUE FOR STATION 1	SPS2300
	IDT=0	SPS2310
C	KK--NUMBER OF ANALYSES FOR STATION 1 (ICD(1)/2)	SPS2320
	KK=ICD(1)/2	SPS2330
	IF(ISTOR .EQ. KSTOR) KK = ICD(1)	SPS2331
	DO 82 KKK=1, KK	SPS2340
	IF (KKK.GT.1) IDT=IDTX	SPS2350
	DO 10 I=1,400	SPS2360
	DO 9 J=1,19	SPS2370
	BTA(I,J)=0.0	SPS2380
9	CONTINUE	SPS2390
10	CONTINUE	SPS2400
	DO 12 I=1,50	SPS2410
	DO 11 J=1,44	SPS2420
	DTA(I,J)=0.0	SPS2430
11	CONTINUE	SPS2440
12	CONTINUE	SPS2450
	I=0	SPS2460
	REWIND L1	SPS2470
	DO 22 ITRY=1,KON	SPS2480
	I=I+1	SPS2490
C	KCK--KICKER FOR DENOTING THAT ANALYSIS FOR A PARTICULAR DATE HAS	SPS2500
C	BEEN FOUND AND THE REMAINDER OF ANALYSES FOR THE STATION ARE	SPS2510
C	TO BE DUMPED	SPS2520
	KCK=0	SPS2530
C	ITP--IDENTIFICATION FOR TRIBUTARY (T) OR MAIN REACH (R)	SPS2540
	IF(ISTOR .EQ. KSTOR) GO TO 140	SPS2541
	READ (L1,13) STAT(I),(LOC(J),J=1,6),ITP	SPS2550
13	FORMAT (F8.0,5A6,A3,30X,A1,8X)	SPS2560
	GO TO 150	SPS2561
140	READ(L1) STAT(I),LOC,ITP	SPS2570
	CALL REREAD(L1)	SPS2571
150	KEY(I) = 0	SPS2572
	IF (ITP.EQ. IPT(1)) KEY(I)=1	SPS2580
C	IJ--NUMBER OF ANALYSES FOR STATION (ICD(I)/2)	SPS2590
	IJ=ICD(ITRY)/2	SPS2600
	IF(ISTOR .EQ. KSTOR) IJ = ICD(ITRY)	SPS2601
	DO 19 IX=1,IJ	SPS2610
	IF (KCK.GT.0) GO TO 16	SPS2620
C	ICD1--CARD NUMBER (1)	SPS2630
C	ICD2--CARD NUMBER (2)	SPS2640
	IF (ISTOR .EQ. KSTOR) GO TO 120	SPS2641
	READ (L1,14) (DTA(I,JK),JK=1,20),ICD1,(DTA(I,JL),JL=21,38),ICD2	SPS2650
14	FORMAT (F8.0,3F2.0,F7.0,2F3.0,F4.0,F3.0,3F4.0,F5.0,2F3.0,F4.0,F2.0	SPS2660
	1,F5.0,F6.0,F3.0,2X,I1/14X,3F3.0,F6.0,F4.0,F8.0,2F4.0,F2.0,F3.0,F5.	SPS2670
	20,F2.0,5F3.0,F2.0,1X,I1)	SPS2680
	GO TO 130	SPS2681
120	READ (L1) DTA(I,1), (LOC(J),J=1,6), ITP,(DTA(I,JK),JK=2,38)	SPS2682
C	IMN--MONTH OF ANALYSIS (ALSO DTA(I,2))	SPS2690
130	IMN = DTA(I,2)	SPS2700
C	IDY--DAY OF ANALYSIS (ALSO DTA(I,3))	SPS2710
	IDY=DTA(I,3)	SPS2720
C	IYR--YEAR OF ANALYSIS (ALSO DTA(I,4))	SPS2730
	IYR=DTA(I,4)	SPS2740

	IF (I.GT.1) GO TO 15	SPS2750
C	IDATE--IMN, IDY, AND IYR CONVERTED TO NUMBER OF DAYS FOR SORTING	SPS2760
C	PURPOSES (STATION 1)	SPS2770
	IDATE=(IYR*365)+M(IMN)+IDY	SPS2780
	IF (IDATE.GT.IDT) GO TO 18	SPS2790
	GO TO 19	SPS2800
C	KDATE--IMN, IDY, AND IYR CONVERTED TO NUMBER OF DAYS FOR SORTING	SPS2810
C	PURPOSES (STATIONS 2 TO N)	SPS2820
15	KDATE=(IYR*365)+M(IMN)+IDY	SPS2830
C	DATES AGREEING WITHIN + OR - NRANGE DAYS ARE KEPT	SPS2840
	IF (IDATE.GE.(KDATE-NRANGE).AND.IDATE.LE.(KDATE+NRANGE)) GO TO 18	SPS2850
	IF (IX.EQ.IJ) GO TO 21	SPS2860
	GO TO 19	SPS2870
C	IFK--DUMMY VARIABLE FOR DUMPING ANALYSES NOT NEEDED	SPS2880
16	IF(ISTOR .EQ. KSTOR) GO TO 160	SPS2890
	READ(L1,17)IFK	SPS2891
17	FORMAT (I1,79X/80X)	SPS2900
	GO TO 18	SPS2901
160	READ(L1) IFK	SPS2902
18	KCK=1	SPS2910
19	CONTINUE	SPS2920
	IF(ISTOR .EQ. KSTOR) DTA(I,1) = DTA(I,1) /100.	SPS2921
	PRINT 6000, DTA(I,1),LOC,ITP,(DTA(I,JK),JK=2,38)	SPS2922
6000	FORMAT(F12.2,5A6,A3,A1,6F12.2/4(10F12.2/))	SPS2923
	IF(ISTOR .EQ. KSTOR) GO TO 180	SPS2924
	IF (DTA(I,21).LT.0.)DTA(I,21)=ABS(DTA(I,21))*100.	SPS2925
	IF (DTA(I,22).LT.0.)DTA(I,22)=ABS(DTA(I,22))*100.	SPS2926
	CALL DECM (I)	SPS2930
180	IF(I.EQ. 1) IDT = IDATE	SPS2940
C	CONCENTRATIONS, IN ME/L, AT EACH STATION	SPS2950
	DO 20 IY=6,23	SPS2960
	IF(DTA(I,IY)) 280,280,270	SPS2961
270	BTA(I,IY-5)=DTA(I,IY)*C(IY-5)	SPS2970
	GO TO 20	SPS2971
280	BTA(I,IY-5) = 0.	SPS2972
20	CONTINUE	SPS2980
	BTA(I,19)=DTA(I,5)	SPS2990
	GO TO 22	SPS3000
21	I=I-1	SPS3010
22	CONTINUE	SPS3020
C	KOUNT--NUMBER OF STATIONS FOR A SORTED DATE	SPS3030
	KOUNT=I	SPS3040
	IDTX = IDT	SPS3045
	DO 24 I=1,KOUNT	SPS3050
C	DTA(I,39) = SUMMATION CATIONS	SPS3060
	DTA(I,39)=BTA(I,5)+BTA(I,6)+BTA(I,8)+BTA(I,9)	SPS3070
C	DTA(I,40) = SUMMATION ANIONS	SPS3080
	DTA(I,40)=BTA(I,11)+BTA(I,13)+BTA(I,14)+BTA(I,15)+BTA(I,16)	SPS3090
C	CALCULATE SAR	SPS3100
	IF (DTA(I,30).GT..01) GO TO 24	SPS3110
	IF (BTA(I,8).LT..0001.OR.BTA(I,5).LT..0001.OR.BTA(I,6).LT..0001) G	SPS3120
10	TO 23	SPS3130
	DTA(I,30)=BTA(I,8)/(SQRT((BTA(I,5)+BTA(I,6))/2.))	SPS3140
	GO TO 24	SPS3150
23	DTA(I,30)=0.0	SPS3160
24	CONTINUE	SPS3170
C	KP--FIRST POSITION OF STORAGE OF CALCULATED DATA IN BTA ARRAY	SPS3180
C	(DESIGNATED IN MAIN PROGRAM, USED IN SUBROUTINE HOLD)	SPS3190
	KP=1	SPS3200
C	ITAB--TABLE NUMBER, WRITTEN ONTO OUTPUT UNIT L2 WITH CALCULATED	SPS3210

C	OUTPUT FOR SORTING PURPOSES	SPS3220
	ITAB=2	SPS3230
	CALL HOLD (KP,KOUNT,ITAB)	SPS3240
	DO 26 I=1,KOUNT	SPS3250
	BTA(I+50,19)=DTA(I,5)	SPS3260
	BTA(I+100,19)=DTA(I,5)	SPS3270
	DO 25 L=1,18	SPS3280
C	CHEMICAL DISCHARGE, IN KE/DAY, AT EACH STATION	SPS3290
	BTA(I+50,L)=DTA(I,5)*BTA(I,L)*2.445	SPS3300
C	CHEMICAL DISCHARGE, IN TONS/DAY, AT EACH STATION	SPS3310
	BTA(I+100,L)=DTA(I,5)*DTA(I,L+5)*.0027	SPS3320
	IF (DTA(I,L+5) .LT. 0.) BTA(I+100,L) = 0.	SPS3321
25	CONTINUE	SPS3330
26	CONTINUE	SPS3340
	KP=51	SPS3350
	ITAB=ITAB+1	SPS3360
	CALL HOLD (KP,KOUNT,ITAB)	SPS3370
	KP=101	SPS3380
	ITAB=ITAB+1	SPS3390
	CALL HOLD (KP,KOUNT,ITAB)	SPS3400
C	WATER AND CHEMICAL DISCHARGE AT EACH STATION AS PERCENTAGE OF THAT	SPS3410
C	AT REFERENCE STATION	SPS3420
	DO 28 I=1,KOUNT	SPS3430
	DO 27 L=1,19	SPS3440
	IF (BTA(I+100,L).LT..00001) GO TO 27	SPS3450
	IF (BTA(KOUNT+100,L).LT..00001) GO TO 27	SPS3460
	BTA(I+150,L)=(BTA(I+100,L)/BTA(KOUNT+100,L))*100.	SPS3470
27	CONTINUE	SPS3480
28	CONTINUE	SPS3490
	KP=151	SPS3500
	ITAB=ITAB+1	SPS3510
	CALL HOLD (KP,KOUNT,ITAB)	SPS3520
	CALL ERAS (KP)	SPS3530
C	PERCENTAGE COMPOSITION AT EACH STATION	SPS3540
	DO 30 I=1,KOUNT	SPS3550
	K=I+150	SPS3560
C	A1--SUMMATION OF CATIONS, EQUAL TO DTA(I,39)	SPS3570
	A1=DTA(I,39)	SPS3580
C	A2--SUMMATION OF ANIONS, EQUAL TO DTA(I,40)	SPS3590
	A2=DTA(I,40)	SPS3600
C	AION--EQUAL TO A1 OR A2 IN CALCULATIONS USING SUM OF ANIONS AND	SPS3610
C	CATIONS	SPS3620
	AION=A1	SPS3630
	BTA(K,19)=DTA(I,5)	SPS3640
	DO 29 L=1,18	SPS3650
	IF (L.GT.10) AION=A2	SPS3660
	IF (BTA(I,L).LT..00001) GO TO 29	SPS3670
	BTA(K,L)=(BTA(I,L)/AION)*100.	SPS3680
29	CONTINUE	SPS3690
30	CONTINUE	SPS3700
	KP=151	SPS3710
	ITAB=ITAB+1	SPS3720
	CALL HOLD (KP,KOUNT,ITAB)	SPS3730
	CALL ERAS (KP)	SPS3740
C	CALCULATE INFLOW TO REACH (DTA(I,41), I = 1,KOUNT)	SPS3750
	DTA(I,41)=0.0	SPS3760
C	DIS1--DISCHARGE OF UPSTREAM STATION	SPS3770
	DIS1=DTA(1,5)	SPS3780
	DO 31 I=2,KOUNT	SPS3790
	IF (KEY(I).EQ.1) GO TO 31	SPS3800

C	DIS2--DISCHARGE OF DOWNSTREAM STATION	SPS3810
	DIS2=DTA(I,5)	SPS3820
	DTA(I,41)=DIS2-DIS1	SPS3830
	DIS1=DIS2	SPS3840
31	CONTINUE	SPS3850
C	NET GAINS OR LOSSES, IN KE/DAY, IN EACH REACH	SPS3860
	DO 32 LL=1,19	SPS3870
	SV(LL)=BTA(51,LL)	SPS3880
32	CONTINUE	SPS3890
	DO 34 I=2,KOUNT	SPS3900
	IF (KEY(I).EQ.1) GO TO 34	SPS3910
C	N1, N2, N3, N4, K--ARRAY POSITIONS, USED IN VARIOUS CALCULATIONS	SPS3920
	N2=I+50	SPS3930
	N3=I+150	SPS3940
	N4=I+200	SPS3950
	BTA(N3,19)=DTA(I,41)	SPS3960
	DO 33 L=1,19	SPS3970
C	BON--SAVED VALUE	SPS3980
	BON=BTA(N2,L)	SPS3990
	BTA(N3,L)=BON-SV(L)	SPS4000
	SV(L)=BON	SPS4010
	IF (BTA(N3,L).EQ..0 .OR. DTA(I,41).EQ..0) GO TO 33	SPS4020
C	CONCENTRATIONS, IN ME/L, IN NET GAINS OR LOSSES IN EACH REACH	SPS4030
	BTA(N4,L)=BTA(N3,L)/(DTA(I,41)*2.445)	SPS4040
	IF (L.EQ.19) BTA(N4,L)=BTA(N3,L)	SPS4050
33	CONTINUE	SPS4060
34	CONTINUE	SPS4070
	KP=151	SPS4080
	ITAB=ITAB+1	SPS4090
	CALL HOLD (KP,KOUNT,ITAB)	SPS4100
	KP=201	SPS4110
	ITAB=ITAB+1	SPS4120
	CALL HOLD (KP,KOUNT,ITAB)	SPS4130
C	PERCENTAGE COMPOSITION OF NET GAINS OR LOSSES IN EACH REACH	SPS4140
	DO 37 I=2,KOUNT	SPS4150
	IF (KEY(I).EQ.1) GO TO 37	SPS4160
	K=I+150	SPS4170
	N2=I+250	SPS4180
	DO 35 IP=1,9	SPS4190
C	KD--ARRAY POSITION, EQUAL TO ND(I)	SPS4200
	KD=ND(IP)	SPS4210
	B(IP)=BTA(K,KD)	SPS4220
35	CONTINUE	SPS4230
	CALL DET (A1,A2)	SPS4240
	AION=A1	SPS4250
	DO 36 L=1,19	SPS4260
	IF (L.GT.10) AION=A2	SPS4270
	IF (BTA(K,L).EQ..0) GO TO 36	SPS4280
	IF (AION.EQ.0.) GO TO 36	SPS4290
	BTA(N2,L)=(BTA(K,L)/AION)*100.	SPS4300
	IF (L.EQ.19) BTA(N2,L)=BTA(K,L)	SPS4310
36	CONTINUE	SPS4320
37	CONTINUE	SPS4330
	KP=251	SPS4340
	ITAB=ITAB+1	SPS4350
	CALL HOLD (KP,KOUNT,ITAB)	SPS4360
	CALL ERAS (KP)	SPS4370
C	NET GAINS OR LOSSES, IN TONS/DAY, IN EACH REACH	SPS4380
	DO 38 L=1,19	SPS4390
	SV(L)=BTA(101,L)	SPS4400

38	CONTINUE	SPS4410
	DO 40 I=2,KOUNT	SPS4420
	IF (KEY(I).EQ.1) GO TO 40	SPS4430
	N2=I+250	SPS4440
	DO 39 L=1,19	SPS4450
	BTA(N2,L)=BTA(I+100,L)-SV(L)	SPS4460
	SV(L)=BTA(I+100,L)	SPS4470
39	CONTINUE	SPS4480
40	CONTINUE	SPS4490
C	NET GAINS OR LOSSES AS PERCENTAGE OF WATER AND CHEMICAL	SPS4500
C	DISCHARGE AT REFERENCE STATION	SPS4501
	DO 42 I=2,KOUNT	SPS4510
	IF (KEY(I).EQ.1) GO TO 42	SPS4520
	DO 41 L=1,19	SPS4530
	IF (BTA(I+250,L).EQ.0..OR.BTA(KOUNT+100,L).EQ.0.) GO TO 41	SPS4540
	BTA(I+300,L)=(BTA(I+250,L)/BTA(KOUNT+100,L))*100.	SPS4550
41	CONTINUE	SPS4560
42	CONTINUE	SPS4570
	KP=251	SPS4580
	ITAB=ITAB+1	SPS4590
	CALL HOLD (KP,KOUNT,ITAB)	SPS4600
	CALL ERAS (KP)	SPS4610
	KP=301	SPS4620
	ITAB=ITAB+1	SPS4630
	CALL HOLD (KP,KOUNT,ITAB)	SPS4640
	CALL ERAS (KP)	SPS4650
C	CONCENTRATIONS, IN MG/L, IN NET GAINS OR LOSSES IN EACH REACH	SPS4660
	DO 45 I=1,KOUNT	SPS4670
	K=I+200	SPS4680
	N2=I+250	SPS4690
	DO 44 L=1,19	SPS4700
	IF (BTA(K,L).EQ..0) GO TO 44	SPS4710
	IF (L.EQ.19) GO TO 43	SPS4720
	BTA(N2,L)=BTA(K,L)/C(L)	SPS4730
	GO TO 44	SPS4740
43	BTA(N2,L)=BTA(K,L)	SPS4750
44	CONTINUE	SPS4760
45	CONTINUE	SPS4770
	KP=251	SPS4780
	ITAB=ITAB+1	SPS4790
	CALL HOLD (KP,KOUNT,ITAB)	SPS4800
	CALL ERAS (KP)	SPS4810
	KP=201	SPS4820
	CALL ERAS (KP)	SPS4830
C	CUMULATIVE INFLOW	SPS4840
	CUM=0.0	SPS4850
	DO 46 I=2,KOUNT	SPS4860
	IF (KEY(I).EQ.1) GO TO 46	SPS4870
C	CUM--USED TO DETERMINE CUMULATIVE INFLOW	SPS4880
	CUM=CUM+DTA(I,41)	SPS4890
	DTA(I,42)=CUM	SPS4900
46	CONTINUE	SPS4910
C	SEEPAGE INTO REACH(WATER)	SPS4920
	CM=0.	SPS4930
	DO 48 I=2,KOUNT	SPS4940
	IF (KEY(I).EQ.1) GO TO 47	SPS4950
	DTA(I,43)=DTA(I,41)-CM	SPS4960
	CM=0.	SPS4970
	GO TO 48	SPS4980
C	CM--USED TO DETERMINE SEEPAGE INTO REACH	SPS4990

47	CM=CM+DTA(I,5)	SPS5000
48	CONTINUE	SPS5010
C	NET SEEPAGE, IN KE/DAY, IN EACH REACH	SPS5020
	DO 49 IX=1,18	SPS5030
49	SV(IX)=0.0	SPS5040
	DO 52 I=2,KOUNT	SPS5050
	K=I+150	SPS5060
	N2=I+200	SPS5070
	BTA(N2,19)=DTA(I,43)	SPS5080
	DO 51 L=1,18	SPS5090
	IF (KEY(I).EQ.1) GO TO 50	SPS5100
	BTA(N2,L)=BTA(K,L)-SV(L)	SPS5110
	SV(L)=0.0	SPS5120
	GO TO 51	SPS5130
50	SV(L)=SV(L)+BTA(I+50,L)	SPS5140
51	CONTINUE	SPS5150
52	CONTINUE	SPS5160
	KP=201	SPS5170
	ITAB=ITAB+1	SPS5180
	CALL HOLD (KP,KOUNT,ITAB)	SPS5190
	KP=151	SPS5200
	CALL ERAS (KP)	SPS5210
C	PERCENTAGE COMPOSITION OF NET SEEPAGE IN EACH REACH	SPS5220
	DO 55 I=2,KOUNT	SPS5230
	IF (KEY(I).EQ.1) GO TO 55	SPS5240
	K=I+200	SPS5250
	N2=I+150	SPS5260
	DO 53 IP=1,9	SPS5270
	KD=ND(IP)	SPS5280
	B(IP)=BTA(K,KD)	SPS5290
53	CONTINUE	SPS5300
	CALL DET (A1,A2)	SPS5310
	AION=A1	SPS5320
	DO 54 L=1,19	SPS5330
	IF (L.GT.10) AION=A2	SPS5340
	IF (BTA(K,L).EQ.0..OR.AION.EQ.0.) GO TO 54	SPS5350
	BTA(N2,L)=(BTA(K,L)/AION)*100.	SPS5360
	IF (L.EQ.19) BTA(N2,L)=BTA(K,L)	SPS5370
54	CONTINUE	SPS5380
55	CONTINUE	SPS5390
	KP=151	SPS5400
	ITAB=ITAB+1	SPS5410
	CALL HOLD (KP,KOUNT,ITAB)	SPS5420
	CALL ERAS (KP)	SPS5430
C	CONCENTRATIONS, IN ME/L, IN NET SEEPAGE IN EACH REACH	SPS5440
	DO 57 I=2,KOUNT	SPS5450
	K=I+200	SPS5460
	N2=I+150	SPS5470
	IF (KEY(I).EQ.1) GO TO 57	SPS5480
	BTA(N2,19)=DTA(I,43)	SPS5490
	DO 56 L=1,18	SPS5500
	IF (BTA(K,L).EQ. .0 .OR. DTA(I,43).EQ. .0) GO TO 56	SPS5510
	BTA(N2,L)=BTA(K,L)/(DTA(I,43)*2.445)	SPS5520
	IF (BTA(K,L).LT.0..AND.DTA(I,43).LT.0.) BTA(N2,L)=BTA(N2,L)*(-1.)	SPS5530
56	CONTINUE	SPS5540
57	CONTINUE	SPS5550
	KP=151	SPS5560
	ITAB=ITAB+1	SPS5570
	CALL HOLD (KP,KOUNT,ITAB)	SPS5580
	KP=251	SPS5590

	CALL ERAS (KP)	SPS5600
C	CONCENTRATIONS, IN MG/L, IN NET SEEPAGE IN EACH REACH	SPS5610
	DO 59 I=2,KOUNT	SPS5620
	K=I+150	SPS5630
	N2=I+250	SPS5640
	BTA(N2,L)=DTA(I,43)	SPS5650
	DO 58 L=1,18	SPS5660
	IF (BTA(K,L).EQ..0) GO TO 58	SPS5670
	BTA(N2,L)=BTA(K,L)/C(L)	SPS5680
58	CONTINUE	SPS5690
59	CONTINUE	SPS5700
	KP=251	SPS5710
	ITAB=ITAB+1	SPS5720
	CALL HOLD (KP,KOUNT,ITAB)	SPS5730
	KP=151	SPS5740
	CALL ERAS (KP)	SPS5750
	DO 61 I=2,KOUNT	SPS5760
	K=I+250	SPS5770
	N2=I+300	SPS5780
	IF (KEY(I).EQ.1) GO TO 61	SPS5790
	BTA(N2,L)=DTA(I,43)	SPS5800
	DO 60 L=1,18	SPS5810
C	NET SEEPAGE, IN TONS/DAY, IN EACH REACH	SPS5820
	BTA(N2,L)=DTA(I,43)*BTA(K,L)*.0027	SPS5830
60	CONTINUE	SPS5840
61	CONTINUE	SPS5850
	KP=301	SPS5860
	ITAB=ITAB+1	SPS5870
	CALL HOLD (KP,KOUNT,ITAB)	SPS5880
	KP=251	SPS5890
	CALL ERAS (KP)	SPS5900
C	NET SEEPAGE IN EACH REACH AS PERCENTAGE OF WATER AND CHEMICAL	SPS5910
C	DISCHARGE AT REFERENCE STATION	SPS5920
	DO 63 I=2,KOUNT	SPS5930
	K=I+300	SPS5940
	N2=I+350	SPS5950
	IF (KEY(I).EQ.1) GO TO 63	SPS5960
	DO 62 L=1,19	SPS5970
	IF (BTA(K,L).EQ.0..OR.BTA(KOUNT+100,L).EQ.0.) GO TO 62	SPS5980
	BTA(N2,L)=(BTA(K,L)/BTA(KOUNT+100,L))*100.	SPS5990
62	CONTINUE	SPS6000
63	CONTINUE	SPS6010
	KP=351	SPS6020
	ITAB=ITAB+1	SPS6030
	CALL HOLD (KP,KOUNT,ITAB)	SPS6040
	KP=151	SPS6050
	CALL ERAS (KP)	SPS6060
C	CUMULATIVE SEEPAGE	SPS6070
	CUM=0.0	SPS6080
	DO 64 I=2,KOUNT	SPS6090
	IF (KEY(I).EQ.1) GO TO 64	SPS6100
	CUM=DTA(I,43)+CUM	SPS6110
	DTA(I,44)=CUM	SPS6120
64	CONTINUE	SPS6130
C	CUMULATIVE NET SEEPAGE, IN KE/DAY	SPS6140
	DO 65 IY=1,18	SPS6150
	SV(IY)=0.0	SPS6160
65	CONTINUE	SPS6170
	DO 67 I=2,KOUNT	SPS6180
	K=I+200	SPS6190

	N2=I+150	SPS6200
	IF (KEY(I).EQ.1) GO TO 67	SPS6210
	BTA(N2,19)=DTA(I,44)	SPS6220
	DO 66 L=1,18	SPS6230
	SV(L)=SV(L)+BTA(K,L)	SPS6240
	BTA(N2,L)=SV(L)	SPS6250
66	CONTINUE	SPS6260
67	CONTINUE	SPS6270
	KP=151	SPS6280
	ITAB=ITAB+1	SPS6290
	CALL HOLD (KP,KOUNT,ITAB)	SPS6300
	KP=201	SPS6310
	CALL ERAS (KP)	SPS6320
C	CUMULATIVE NET SEEPAGE, IN TONS/DAY	SPS6330
	DO 68 IY=1,18	SPS6340
	SV(IY)=0.0	SPS6350
68	CONTINUE	SPS6360
	DO 70 I=2,KOUNT	SPS6370
	N2=I+250	SPS6380
	IF (KEY(I).EQ.1) GO TO 70	SPS6390
	BTA(N2,19)=BTA(I+150,19)	SPS6400
	DO 69 L=1,18	SPS6410
	SV(L)=SV(L)+BTA(I+300,L)	SPS6420
	BTA(N2,L)=SV(L)	SPS6430
69	CONTINUE	SPS6440
70	CONTINUE	SPS6450
	KP=251	SPS6460
	ITAB=ITAB+1	SPS6470
	CALL HOLD (KP,KOUNT,ITAB)	SPS6480
	KP=301	SPS6490
	CALL ERAS (KP)	SPS6500
C	PERCENTAGE COMPOSITION OF CUMULATIVE NET SEEPAGE	SPS6510
	DO 73 I=2,KOUNT	SPS6520
	K=I+150	SPS6530
	N2=I+200	SPS6540
	IF (KEY(I).EQ.1) GO TO 73	SPS6550
	BTA(N2,19)=DTA(I,44)	SPS6560
	DO 71 IP=1,9	SPS6570
	KD=ND(IP)	SPS6580
71	B(IP)=BTA(K,KD)	SPS6590
	CALL DET (A1,A2)	SPS6600
	AION=A1	SPS6610
	DO 72 L=1,18	SPS6620
	IF (L.GT.10) AION=A2	SPS6630
	IF (BTA(K,L).EQ.0..OR.AION.EQ.0.) GO TO 72	SPS6640
	BTA(N2,L)=(BTA(K,L)/AION)*100.	SPS6650
72	CONTINUE	SPS6660
73	CONTINUE	SPS6670
	KP=201	SPS6680
	ITAB=ITAB+1	SPS6690
	CALL HOLD (KP,KOUNT,ITAB)	SPS6700
	CALL ERAS (KP)	SPS6710
C	CONCENTRATIONS, IN ME/L, IN CUMULATIVE NET SEEPAGE	SPS6720
	DO 75 I=2,KOUNT	SPS6730
	K=I+150	SPS6740
	N2=I+200	SPS6750
	IF (KEY(I).EQ.1) GO TO 75	SPS6760
	BTA(N2,19)=DTA(I,44)	SPS6770
	DO 74 L=1,18	SPS6780
	IF (BTA(K,L) .EQ. .0 .OR. DTA(I,44) .EQ. 0.) GO TO 74	SPS6790

	BTA(N2,L)=BTA(K,L)/(DTA(I,44)*2.445)	SPS6800
74	CONTINUE	SPS6810
75	CONTINUE	SPS6820
	KP=201	SPS6830
	ITAB=ITAB+1	SPS6840
	CALL HOLD (KP,KOUNT,ITAB)	SPS6850
	KP=151	SPS6860
	CALL ERAS (KP)	SPS6870
C	CONCENTRATIONS, IN MG/L, IN CUMULATIVE NET SEEPAGE	SPS6880
	DO 77 I=2,KOUNT	SPS6890
	K=I+200	SPS6900
	N2=I+150	SPS6910
	IF (KEY(I).EQ.1) GO TO 77	SPS6920
	BTA(N2,19)=DTA(I,44)	SPS6930
	DO 76 L=1,18	SPS6940
	IF (BTA(K,L).LT..00001) GO TO 76	SPS6950
	BTA(N2,L)=BTA(K,L)/C(L)	SPS6960
76	CONTINUE	SPS6970
77	CONTINUE	SPS6980
	KP=151	SPS6990
	ITAB=ITAB+1	SPS7000
	CALL HOLD (KP,KOUNT,ITAB)	SPS7010
	KP=251	SPS7020
	CALL ERAS (KP)	SPS7030
C	CUMULATIVE NET SEEPAGE AS PERCENTAGE OF WATER AND CHEMICAL	SPS7040
C	DISCHARGE AT REFERENCE STATION	SPS7050
	DO 78 IY=1,19	SPS7060
	SV(IY)=0.0	SPS7070
78	CONTINUE	SPS7080
	DO 80 I=2,KOUNT	SPS7090
	IF (KEY(I).EQ.1) GO TO 80	SPS7100
	DO 79 L=1,19	SPS7110
	SV(L)=SV(L)+BTA(I+350,L)	SPS7120
	BTA(I+300,L)=SV(L)	SPS7130
79	CONTINUE	SPS7140
80	CONTINUE	SPS7150
	KP=301	SPS7160
	ITAB=ITAB+1	SPS7170
	CALL HOLD (KP,KOUNT,ITAB)	SPS7180
	CALL ERAS (KP)	SPS7190
	ITAB=1	SPS7200
	DO 81 I=1,KOUNT	SPS7210
C	ISTAT--STATION NUMBER	SPS7220
	ISTAT=((DTA(I,1)*10.+.01)	SPS7230
	MON=DTA(I,2)	SPS7240
	IDAY=DTA(I,3)	SPS7250
	IYR=DTA(I,4)	SPS7260
C	CONCENTRATIONS, IN MG/L, AT EACH STATION	SPS7270
	WRITE (L2) ITAB,ISTAT,KEY(I),MON,IDAY,IYR,(DTA(I,L),L=5,44)	SPS7280
81	CONTINUE	SPS7290
82	CONTINUE	SPS7300
	GO TO 2	SPS7310
83	REWIND L2	SPS7320
	CALL EXIT	SPS7330
	END	SPS7340-

CSTORRD00		SUBROUTINE TO READ STORETTE FORMAT CARDS		STR	10
SUBROUTINE STORRD (KK)				STR	20
EXIT ARRAY	CARD	PARAMETER		STR	30
POSITION	CODE			STR	40
				STR	50
				STR	60
				STR	70
1	71825	ACIDITY(MG/L AS H+)		STR	80
2	00410	ALKALINITY, TOTAL(MG/L AS CaCO3)		STR	90
3	01105	ALUMINUM, TOTAL (MG/L AS AL)		STR	100
4	01106	ALUMINUM, DISSOLVED(MG/L AS AL)		STR	110
5	71845	AMMONIA(MG/L AS NH4)		STR	120
6	01000	ARSENIC (MG/L AS AS)		STR	130
7	01005	BARIUM (MG/L AS BA)		STR	140
87	00054	BASIN CONTENT IN ACRE- FEET		STR	145
8	00440	BICARBONATE ION (MG/L AS HCO3)		STR	150
9	00310	BIOCHEMICAL OXYGEN DEMAND(MG/L,5 DAY-20 *C)		STR	160
10	01020	BORON (MG/L AS B)		STR	170
11	71870	BROMIDE (MG/L AS BR)		STR	180
12	01025	CADMIUM (MG/L AS CD)		STR	190
13	00915	CALCIUM (MG/L AS CA)		STR	200
14	00405	CARBON DIOXIDE (MG/L AS CO2)		STR	210
15	00445	CARBONATE ION (MG/L AS CO3)		STR	220
16	00335	CHEMICAL OXYGEN DEMAND, .025 N K2CR07 (MG/L)		STR	230
17	00340	CHEMICAL OXYGEN DEMAND, .25 N K2CR07 (MG/L)		STR	240
18	00940	CHLORIDE (MG/L AS CL)		STR	250
19	01032	CHROMIUM, HEXAVALENT (MG/L AS CR)		STR	260
20	01030	CHROMIUM, TOTAL (MG/L AS CR)		STR	270
21	01035	COBALT (MG/L AS CO)		STR	280
90	31501	COLIFORM, MEMBRANE FILTER, FIELD MEASUREMENT		STR	281
22	31503	COLIFORM, MEMBRANE FILTER, DELAYED M-ENDO		STR	290
		MEDIUM (COLONIES /100ML),LABORATORY		STR	300
23	31507	COLIFORM, MPN		STR	310
24	00080	COLOR (PLATINUM - COBALT UNITS)		STR	320
25	00095	CONDUCTIVITY (MICROMHOS AT 25 *C)		STR	330
26	01040	COPPER (MG/L AS CU)		STR	340
27	00001	CROSS-SECTION LOCATION, HORIZONTAL (FEET		STR	350
		FROM RIGH2BANKS LOOKING UPSTREAM)		STR	360
28	00003	CROSS-SECTION LOCATION, VERTICAL (FEET		STR	370
		FROM SURFACE)		STR	380
29	00004	STREAM WIDTH (FEET)		STR	390
30	00005	CROSS-SECTION LOCATION, VERTICAL (PERCENT		STR	400
		OF TOTAL DEPTH)		STR	410
31	00008	NUMBER USED IN SAMPLE ACCOUNTING PROCEDURE		STR	420
32	00720	CYANIDE (MG/L AS CN)		STR	430
33	71820	DENSITY (GM/ML AT 20 *C)		STR	440
34	00060	DISCHARGE (CUBIC FEET PER SECOND)		STR	450
35	00300	DISSOLVED OXYGEN (MG/L)		STR	460
36	00301	DISSOLVED OXYGEN (PERCENT OF SATURATION)		STR	470
37	70300	DISSOLVED SOLIDS (RESIDUE ON EVAPORATION		STR	480
		AT 180 *C)		STR	490
38	70301	DISSOLVED SOLIDS (SUM OF CONSTITUENTS)		STR	500
39	70303	DISSOLVED SOLIDS (TONS PER ACRE-FOOT)		STR	510
40	70302	DISSOLVED SOLIDS (TONS PER DAY)		STR	520
41	00950	FLUORIDE (MG/L AS F)		STR	530
42	00902	HARDNESS, NON-CARBONATE (MG/L AS CaCO3)		STR	540
43	00900	HARDNESS, TOTAL (MG/L AS CaCO3)		STR	550
44	71830	HYDROXIDE ION (MG/L AS OH)		STR	560
45	71865	IODIDE (MG/L AS I)		STR	570

C	46	01046	IRON, DISSOLVED (MG/L)	STR 580
C	47	01047	IRON, FERROUS (MG/L)	STR 590
C	48	01045	IRON, TOTAL (MG/L AS FE)	STR 600
C	49	01049	LEAD (MG/L AS PB)	STR 610
C	50	01130	LITHIUM (MG/L AS LI)	STR 620
C	51	00925	MAGNESIUM (MG/L AS MG)	STR 630
C	52	01055	MANGANESE, TOAL (MG/L AS MN)	STR 640
C	53	01056	MANGANESE, DISSOLVED (MG/L AS MN)	STR 650
C	54	38260	METHYLENE BLUE ACTIVE SUBSTANCE (MBAS)	STR 660
C	55	01065	NICKEL (MG/L AS NI)	STR 670
C	56	71850	NITRATE (MG/L AS NO3), FILTERED	STR 680
C	88	00620	NITRATE (MG/L AS NO3), UNFILTERED	STR 685
C	57	71855	NITRITE (MG/L AS NO2)	STR 690
C	58	00605	NITROGEN, ORGANIC (MG/L AS N)	STR 700
C	59	00600	NITROGEN, TOTAL (MG/L AS N)	STR 710
C	60	00625	NITROGEN, TOTAL KJELDOHL (MG/L AS N)	STR 720
C	61	00085	ODOR (THRESHOLD NUMBER)	STR 730
C	62	00090	OXIDATION REDUCTION POTENTIAL (MILLIVOLTS)	STR 740
C	63	71835	OXYGEN CONSUMED-FILTERED (MG/L)	STR 750
C	64	71840	OXYGEN CONSUMED-UNFILTERED (MG/L)	STR 760
C	65	00400	PH (STANDARD UNITS)	STR 770
C	66	32730	PHENOLS (MG/L)	STR 780
C	67	00660	PHOSPHATE, ORTHO (MG/L AS PO4)	STR 790
C	68	00650	PHOSPHATE, TOTAL (MG/L AS PO4)	STR 800
C	69	00935	POTASSIUM (MG/L AS K)	STR 810
C	70	00505	RESIDUE, TOTAL VOLATILE (MG/L) (LOSS ON IGNITION)	STR 820 STR 830
C	71	00510	RESIDUE, TOTAL FIXED (MG/L) (LOSS ON IGNITION ASH)	STR 840 STR 850
C	72	71860	RESIDUAL SODIUM CARBONATE	STR 860
C	73	01145	SELENIUM (MG/L AS SE)	STR 870
C	74	00955	SILICA (MG/L AS SIO2)	STR 880
C	75	00931	SODIUM ADSORPTION RATIO	STR 890
C	76	00933	SODIUM PLUS POTASSIUM (MG/L)	STR 900
C	77	00930	SODIUM (MG/L AS NA)	STR 910
C	78	00932	SODIUM, PERCENT	STR 920
C	79	01080	STRONTIUM (MG/L AS SR)	STR 930
C	80	00945	SULFATE (MG/L AS SO4)	STR 940
C	81	00746	SULFIDE, DISSOLVED (MG/L AS S)	STR 950
C	82	00745	SULFIDE, TOTAL (MG/L AS S)	STR 960
C	83	00010	TEMPERATURE, WATER (DEGREES CELCIUS)	STR 970
C	89	00020	TEMPERATURE, AIR (DEGREES FAHRENHEIT)	STR 971
C	84	00075	TURBIDITY, HELLIGE (MG/L AS SILICON DIOXIDE)	STR 980
C	85	00070	TURBIDITY, JACKSON CANDLE UNITS	STR 990
C	86	01090	ZINC(MG/L AS ZN)	STR1000

ARRAYS AND THEIR CONTENTS WITHIN THE PROGRAM ARE -

NAME	CONTENTS	
		STR1010
		STR1020
		STR1030
		STR1040
		STR1050
		STR1060
ANICAT	CONTAINS ANION-CATION PERCENT BEFORE BEING WRITTEN ON INTERMEDIATE STORAGE	STR1070 STR1080
CODE	CONTAINS THE VALID PARAMETER CODES WHICH MAY APPEAR ON STORRETTE CARDS	STR1090 STR1100
EQUIV	CONTAINS ME/L VALUES BEFORE BEING WRITTEN ON INTERMEDIATE STORAGE	STR1110 STR1120
EXIT	CONTAINS MG/L VALUES BEFORE BEING WRITTEN ON INTERMEDIATE STORAGE	STR1130 STR1140
EXP	CONTAINS EXPONENT VALUE READ FROM STORRETTE CARDS	STR1150

C	IDENT	CONTAINS STATION ID NUMBER IN I8	STR1160
C	INDICA	SAME AS IN MAINLINE	STR1170
C	ISTNO	CONTAINS 1ST 25 COLUMNS FROM THE 1ST CARD OF AN	STR1180
C		ANALYSIS AND IS COMPARED AGAINST ALL SUBSEQUENT CARDS	STR1190
C		READ TO DETERMINE WHERE A NEW ANALYSIS BEGINS	STR1200
C	KDENT	SAME AS IDENT BUT COMPARED WITH IDENT TO CHECK	STR1210
C		STATION NUMBER TO BE SURE WE STILL ARE READING SAME	STR1220
C		STATION	STR1230
C	KODE	CONTAINS PARAMETER CODE AS READ FROM STORRETTE CARDS	STR1240
C	PARAM	CONTAINS PARAMETER VALUE AS READ FROM STORRETTE CARDS	STR1250
C			STR1260
	DIMENSION PARAM(100), EXP(100), CODE(90), IDENT(12), KDENT(12), KO		STR1270
	IDE(100), ISTNO(4), IHDCD(79), LOC(6), DUMMY(34)		STR1271
	COMMON /VALUE/ EXIT(100), EQUIV(100), ANICAT(100)		STR1290
	COMMON /HEAD/ INDICA(83)		STR1300
	INTEGER CODE, EXP		STR1310
	DATA CODE/5H71825,5H00410,5H01105,5H01106,5H71845,5H01000,5H01005,STR1340		
	15H00440,5H00310,5H01020,5H71870,5H01025,5H00915,5H00405,5H00445,5HSTR1350		
	200335,5H00340,5H00940,5H01032,5H01030,5H01035,5H31503,5H31507,5H00STR1360		
	3080,5H00095,5H01040,5H00001,5H00003,5H00004,5H00005,5H00008,5H0072STR1370		
	40,5H71820,5H00060,5H00300,5H00301,5H70300,5H70301,5H70303,5H70302,STR1380		
	55H00950,5H00902,5H00900,5H71830,5H71865,5H01046,5H01047,5H01045,5HSTR1390		
	601049,5H01130,5H00925,5H01055,5H01056,5H38260,5H01065,5H71850,5H71STR1400		
	7855,5H00605,5H00600,5H00625,5H00085,5H00090,5H71835,5H71840,5H0040STR1410		
	80,5H32730,5H00660,5H00650,5H00935,5H00505,5H00510,5H71860,5H01145,STR1420		
	95H00955,5H00931,5H00933,5H00930,5H00932,5H01080,5H00945,5H00746,5HSTR1430		
	\$00745,5H00010,5H00075,5H00070,5H01090,5H00054,5H00620,5H00020,STR1440		
	\$5H31501/		STR1450
	DATA BLANK, IBLANK, DOT, I1, I2, I3, I4, IZ/1H , 1H , 1H., 1H1, 1H2, 1H3, 1H4,STR1451		
	1 1HZ/		STR1452
	DO1102 I = 1,34		STR1453
1102	DUMMY(I) = -1.		STR1454
	REWIND 1		STR1460
C			STR1461
C	ICDSUB = CURRENT NUMBER OF VALID PARAMETER CODES TO CHECK FOR.		STR1462
C	USED IN LOOP CONTROLS.		STR1463
C			STR1464
	ICDSUB = 90		STR1465
	KK=0		STR1470
C			STR1480
C	READ STATION IDENTIFICATION COLUMNS 1-25		STR1490
C			STR1500
	DO 1 I = 1,83		STR1510
	1 INDICA(I)=-1		STR1520
	2 READ (5,3) ITYPE, IHDCD		STR1530
	3 FORMAT (80A1)		STR1540
	IF (ITYPE.EQ.IZ) GO TO 23		STR1550
	CALL REREAD(5)		STR1560
	IF (ITYPE .EQ. I1) READ(5,100) STAT, LOC, ITP		STR1561
100	FORMAT(1X,F7.0,5A6,A3,30X,A1)		STR1562
	READ (5,4) IDENT		STR1570
	4 FORMAT (A1,4I2,6A2,A4)		STR1580
	CALL REREAD(5)		STR1581
	READ(5,103) DATE3, DATE1, DATE2		STR1582
103	FORMAT(9X,3F2.0)		STR1583
C			STR1590
C	SET UP ARRAY ISTNO		STR1600
C			STR1610
	DO 5 J=1,4		STR1620
	K=J+1		STR1630

5	ISTNO(J)=IDENT(K)	STR1640
	NUMBER=0	STR1650
	DO 6 I=2,5	STR1660
6	NUMBER=NUMBER*100+IDENT(I)	STR1670
	CALL REREAD (5)	STR1680
	L=1	STR1690
	K=L+4	STR1700
C		STR1710
C	CHECK FOR END OF DATA GROUP (A CARD WITH A Z IN COLUMN 1) IF NOT	STR1720
C	THE END READ STORRETTE CARDS UNTIL ANALYSIS OR STATION CHANGES.	STR1730
C		STR1740
7	READ (5,3) ICHNG	STR1750
	IF (ICHNG.EQ.IZ.OR.ICHNG.EQ.I1) GO TO 11	STR1760
	CALL REREAD (5)	STR1770
	READ (5,8) KIDENT,(KODE(I),PARAM(I),EXP(I),I=L,K)	STR1780
8	FORMAT (A1,4I2,6A2,A4,5(A5,F4.4,I2))	STR1790
	IF (KIDENT(1).EQ.IZ) GO TO 11	STR1800
	IF (KIDENT(2).EQ.ISTNO(1).AND.KIDENT(3).EQ.ISTNO(2).AND.KIDENT(4).EQ.	STR1810
1	ISTNO(3).AND.KIDENT(5).EQ.ISTNO(4)) GO TO 9	STR1820
	GO TO 11	STR1830
9	DO 10 I=1,12	STR1840
	IF (KIDENT(I).NE.IDENT(I)) GO TO 11	STR1850
10	CONTINUE	STR1860
	L=K+1	STR1870
	K=L+4	STR1880
	GO TO 7	STR1890
C		STR1900
C	PROCESS AN ANALYSIS AND WRITE VALUES ON INTERMEDIATE STORAGE	STR1910
C		STR1920
11	CALL REREAD (5)	STR1930
	ICOUNT=K-5	STR1940
	LDENT6=IDENT(6)	STR1950
	LDENT7=IDENT(7)	STR1960
	LDENT8=IDENT(8)	STR1970
	IF(KODE(1).EQ. IBLANK) GO TO 101	STR1971
	DO 12 I=1,ICOUNT	STR1980
	IF (KODE(I).EQ.IBLANK.OR.I.EQ.ICOUNT) GO TO 13	STR1990
12	CONTINUE	STR2000
13	IF (KODE(I).EQ. IBLANK) ICOUNT = I - 1	STR2010
	DO 14 I=1,ICOUNT	STR2020
14	PARAM(I)=PARAM(I)*10.**EXP(I)	STR2030
	DO 15 I=1,100	STR2040
15	EXIT(I)=-1	STR2050
	DO 19 I=1,ICOUNT	STR2060
	DO 16 J=1,ICDSUB	STR2070
	IF (KODE(I).EQ.CODE(J)) GO TO 18	STR2080
16	CONTINUE	STR2090
	WRITE (6,17) IDENT,I	STR2100
17	FORMAT (1X,54H*** WARNING - PARAMETER CODE INVALID IN THIS DATA SE	STR2110
	IT ,A1,4I2,6A2,A4,16HDATA SET SKIPPED,2X,9HICOUNT = ,I6)	STR2120
	GO TO 2	STR2130
18	EXIT(J)=PARAM(I)	STR2140
19	CONTINUE	STR2150
	WRITE(1) STAT,LOC,ITP,DATE1,DATE2,DATE3,	STR2160
	1 EXIT(34),EXIT(74),EXIT(3),EXIT(48),EXIT(52),	STR2170
	1 EXIT(13),EXIT(51),EXIT(79),EXIT(77),EXIT(69),EXIT(50),EXIT(8),	STR2171
	2 EXIT(15),EXIT(80),EXIT(18),EXIT(41),EXIT(56),EXIT(68),EXIT(10),	STR2172
	3 EXIT(37),DUMMY(1),DUMMY(2),EXIT(43),EXIT(42),DUMMY(4),DUMMY(5),	STR2173
	4 EXIT(25),EXIT(65),(DUMMY(I),I =1,5), EXIT(83)	STR2174
	GO TO 102	STR2175

101	WRITE(1) STAT,LOC,ITP,DATE1,DATE2,DATE3,DUMMY	STR2176
C		STR2180
C	SET FLAG IN ARRAY INDICA FOR CONSTITUENTS FOUND TO BE PRESENT	STR2190
C	IN THE CURRENT ANALYSIS	STR2200
C		STR2210
102	DO 20 I=1,26	STR2220
	IF (EXIT(I).LT.0.) GO TO 20	STR2230
	INDICA(I)=1	STR2240
20	CONTINUE	STR2250
	L=26	STR2260
	DO 21 I=32,69	STR2270
	L=L+1	STR2280
	IF (EXIT(I).LT.0.) GO TO 21	STR2290
	INDICA(L)=1	STR2300
21	CONTINUE	STR2310
	L=64	STR2320
	DO 22 I=72,ICDSUB	STR2330
	L=L+1	STR2340
	IF (EXIT(I).LT.0.) GO TO 22	STR2350
	INDICA(L)=1	STR2360
22	CONTINUE	STR2370
	KK=KK+1	STR2500
	GO TO 2	STR2510
23	RETURN	STR2520
	END	STR2530-

CMELOO0000		MEL 10
	SUBROUTINE MEL	MEL 20
C	SUBROUTINE DESIGNATING CONVERSION FACTORS FROM MG/L TO ME/L	MEL 30
	COMMON /ML/ C(18)	MEL 40
	DO 1 I=1,18	MEL 50
	C(I)=1.0	MEL 60
1	CONTINUE	MEL 70
C	AL++	MEL 80
	C(2)=.11119	MEL 90
C	FE++	MEL 100
	C(3)=.03581	MEL 110
C	MN++	MEL 120
	C(4)=.03640	MEL 130
C	CA++	MEL 140
	C(5)=.04990	MEL 150
C	MG++	MEL 160
	C(6)=.08224	MEL 170
C	NA++	MEL 180
	C(8)=.04350	MEL 190
C	K+	MEL 200
	C(9)=.02558	MEL 210
C	HCO3-	MEL 220
	C(11)=.01639	MEL 230
C	CO3--	MEL 240
	C(12)=.03333	MEL 250
C	SO4--	MEL 260
	C(13)=.02082	MEL 270
C	CL-	MEL 280
	C(14)=.02820	MEL 290

C	F-	MEL 300
	C(15)=.05263	MEL 310
C	NO3-	MEL 320
	C(16)=.01613	MEL 330
C	PO4---	MEL 340
	C(17)=.03159	MEL 350
	RETURN	MEL 360
	END	MEL 370-

CDECM0000		DEC 10
	SUBROUTINE DECM (K)	DEC 20
C	SUBROUTINE TO PLACE DECIMALS INTO DTA VALUES	DEC 30
	COMMON /DA/ DTA(50,44)	DEC 40
	DO 3 I=1,38	DEC 50
	GO TO (2,3,3,3,3,1,1,2,2,1,1,2,1,1,1,3,3,1,1,1,1,2,2,3,2,2,3,3,1,1,	DEC 60
	1,3,1,3,1,1,2,2,3), I	DEC 70
1	DTA(K,I)=DTA(K,I)*0.1	DEC 80
	GO TO 3	DEC 90
2	DTA(K,I)=DTA(K,I)*0.01	DEC 100
3	CONTINUE	DEC 110
	RETURN	DEC 120
	END	DEC 130-

CDET00000		DET 10
	SUBROUTINE DET (A1,A2)	DET 20
C	SUBROUTINE TO ACCUMULATE TOTAL CATION (A1) AND ANION (A2) VALUES	DET 30
	COMMON /CAR/ B(9)	DET 40
	A1=0.	DET 50
	A2=0.	DET 60
	DO 1 I=1,4	DET 70
	A1=A1+B(I)	DET 80
1	CONTINUE	DET 90
	DO 2 I=5,9	DET 100
	A2=A2+B(I)	DET 110
2	CONTINUE	DET 120
	RETURN	DET 130
	END	DET 140-

CERAS0000		ERA	10
	SUBROUTINE ERAS (K)	ERA	20
C	SUBROUTINE TO ERASE CALCULATED VALUES THAT HAVE BEEN STORED UNTO	ERA	30
C	TAPE. THE SPACE IS THEN READY FOR NEW VALUES.	ERA	40
	COMMON /CTA/ BTA(400,19)	ERA	50
	KJ=K+49	ERA	60
	DO 2 I=K,KJ	ERA	70
	DO 1 J=1,19	ERA	80
	BTA(I,J)=0.	ERA	90
1	CONTINUE	ERA	100
2	CONTINUE	ERA	110
	RETURN	ERA	120
	END	ERA	130-

CHOLD0000		HOL	10
	SUBROUTINE HOLD (K,KOUNT,ITAB)	HOL	20
C	SUBROUTINE TO STORE CALCULATED DATA ONTO TAPE	HOL	30
	COMMON /DA/ DTA(50,44)	HOL	40
	COMMON /TB/ KEY(50)	HOL	50
	COMMON /CTA/ BTA(400,19)	HOL	60
	COMMON /IUN/ L2	HOL	70
C	B(21)--DUMMY ARRAY USED TO FILL BTA ARRAY TO SAME LENGTH AS DTA	HOL	80
C	SEE MAINLINE FOR EXPLANATION OF OTHER VARIABLES	HOL	90
	DIMENSION B(21)	HOL	100
	DO 1 M=1,21	HOL	110
	B(M)=0.	HOL	120
1	CONTINUE	HOL	130
	KJ=K+(KOUNT-1)	HOL	140
	DO 2 I=K,KJ	HOL	150
	IX=I-(K-1)	HOL	160
	ISTAT=((DTA(IX,1)*10.+.01)	HOL	170
	MON=DTA(IX,2)	HOL	180
	IDAY=DTA(IX,3)	HOL	190
	IYR=DTA(IX,4)	HOL	200
	WRITE (L2) ITAB,ISTAT,KEY(IX),MON,IDAY,IYR,(BTA(I,L),L=1,19),(B(M)	HOL	210
	1,M=1,21)	HOL	220
2	CONTINUE	HOL	230
	RETURN	HOL	240
	END	HOL	250-

Appendix II.--Input to program SPSL.

3415 SMOKY HILL T5										T	
3415 090165	0.1424		69	97	27	85	222	48	34	3 M1	
3415 090165	6 1 13	340			212	30	55082			76M2	
3415 111665	0.1824		77	16	27	86	254	56	39	3 M1	
3415 111665	8 13	378			258	50	62080			52M2	
3415 32266	1.2014		91	12	36	72	229	96	52	3 M1	
3415 32266	27 1 18	436			276	88	68078			50M2	
3415 111666	0.5420		102	17	38	76	266	114	58	3 M1	
3415 111666	27 2 21	501			324	106	78081			53M2	
34150 33067	.3916		99	10	42	78	181	131	67	3 M1	
34150 33067	18 13	485			288	140	76076			66M2	
3415 112167	1.4218		122	14	51	78	254	155	72	3 M1	
3415 112167	66 1 21	588	572		362	154	89078			M2	
3415 103068	0.6222		121	17	53	84	234	0 177	81	04 M1	
3415 103068	17011016	627			372	180	95080			54M2	
34205SMOKY HILL R8										R	
34205043064	7.6112		116	27	38	12	212	270	30	6 M1	
34205043064	5 2 13	634			400	226	88081			66M2	
34205102164	9.2813		122	20	37	13	198	264	28	6 M1	
34205102164	1 19	615			386	224	88077			M2	
34205090165	11.8818		117	26	39	12	220	254	33	6 M1	
34205090165	7 1 19	630			399	219	91079			75M2	
34205111665	8.6716		128	20	43	10	229	250	41	5 M1	
34205111665	12 1 18	626			402	214	88082			50M2	
34205 32266	12.0814		126	20	40	10	212	256	38	6 M1	
34205 32266	12 18	641			396	222	90081			48M2	
34205111666	10.1012		128	22	42	11	212	256	48	6 M1	
34205111666	13 2 23	642			410	236	96081			51M2	
34205 33067	7.2617		126	27	48	10	200	280	57	6 M1	
34205 33067	9 19	680			426	262	100075			66M2	
34205112167	9.7313		134	25	54	98	234	272	61	5 M1	
34205112167	22 1 24	695	687		438	246	101077			M2	
34205103068	11.6515		136	26	53	11	217	0 302	55	06 M1	
34205103068	27005024	732			446	268	105077			M2	

Appendix III.--Listing of program SORT.

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600SM
SORT      INFILE,OUTFIL,46
FIELD     (W2,W1,W1,W1,W1)
SEQ       (A1,A5,A3,A4)
FILCB     INFILE,**,2,,,,,,,,,,,,,,,,,TAPE2
FILCB     OUTFIL,**,2,,,,,,,,,,,,,,,,,TAPE1
END
```

Appendix IV.--Listing of program TBSPSL.

CTBSPSL00	PROGRAM TO READ FROM TAPE L2 AND WRITE IN TABLE FORM	TBS	10
C	DATA CALCULATED IN PROGRAM SPSL AND SORTED BY GMAP SORT	TBS	20
C	*****	TBS	30
C	PROGRAMMED BY CHARLES O. MORGAN	TBS	40
C	KANSAS DISTRICT, WRD, USGS, LAWRENCE, KANSAS	TBS	50
C	DATE COMPLETED, JULY 1968	TBS	60
C	LANGUAGE FORTRAN IV, H LEVEL	TBS	70
C	*****	TBS	80
C	PROGRM TBSPSL REQUIRES 1 SUBROUTINE, CALLED TAB	TBS	90
C	*****NOTE*****	TBS	100
C	TWO PROGRAMS PRECEDE TBSPSL	TBS	110
C	-----THE FIRST, A FORTRAN PROGRAM, CALLED SPSL, MAKES THE	TBS	120
C	CALCULATIONS AND OUTPUTS THE RESULTS ON UNIT L2.	TBS	130
C	-----THE SECOND, A GMAP ROUTINE, SORTS THE DATA BY TABLE	TBS	140
C	NUMBER, STATION NUMBER, AND DATE.	TBS	150
C	*****	TBS	160
C	INPUT DATA ARE ON UNIT L2 AND IN THE FOLLOWING FORMAT	TBS	170
C	TABLE 1 TABLES 2 PARAMETER	TBS	180
C	(FIELD) TO N	TBS	190
C	(FIELD)	TBS	200
C	1 1 TABLE NUMBER (I FORMAT)--ITAB	TBS	210
C	2 2 STATION NUMBER (I FORMAT)--ISTAT	TBS	220
C	3 3 TRIB. (1) OR MAIN (0) (I FORMAT)--KEYX	TBS	230
C	4 4 MONTH (I FORMAT)--MON	TBS	240
C	5 5 DAY (I FORMAT)--IDAY	TBS	250
C	6 6 YEAR (I FORMAT)--IYR	TBS	260
C	7 25 DISCHARGE--B(1)	TBS	270
C	8 7 SIO2--B(2)	TBS	280
C	9 8 AL--B(3)	TBS	290
C	10 9 FE--B(4)	TBS	300
C	11 10 MN--B(5)	TBS	310
C	12 11 CA--B(6)	TBS	320
C	13 12 MG--B(7)	TBS	330
C	14 13 SR--B(8)	TBS	340
C	15 14 NA--B(9)	TBS	350
C	16 15 K--B(10)	TBS	360
C	17 16 LI--B(11)	TBS	370
C	18 17 HCO3--B(12)	TBS	380
C	19 18 CO3--B(13)	TBS	390
C	20 19 SO4--B(14)	TBS	400
C	21 20 CL--B(15)	TBS	410
C	22 21 F--B(16)	TBS	420
C	23 22 NO3--B(17)	TBS	430
C	24 23 PO4--B(18)	TBS	440
C	25 24 B--B(19)	TBS	450
C	26 DS--B(20)	TBS	460
C	27 TONS/ACRE-FOOT--B(21)	TBS	470
C	28 TONS/DAY--B(22)	TBS	480
C	29 T.HARDNESS--B(23)	TBS	490
C	30 N.C.HARDNESS--B(24)	TBS	500
C	31 ACIDITY--B(25)	TBS	510
C	32 SAR--B(26)	TBS	520
C	33 K*10**6--B(27)	TBS	530
C	34 PH--B(28)	TBS	540
C	35 COLOR--B(29)	TBS	550
C	36 OXYGEN--B(30)	TBS	560
C	37 BOD--B(31)	TBS	570
C	38 PHENOL--B(32)	TBS	580
C	39 ABS--B(33)	TBS	590

C	40	TEMPERATURE--B(34)	TBS 600
C	41	SUM CATIONS--B(35)	TBS 610
C	42	SUM ANIONS--B(36)	TBS 620
C	43	INFLOW TO REACH--B(37)	TBS 630
C	44	CUMULATIVE INFLOW--B(38)	TBS 640
C	45	SEEPAGE INTO REACH--B(39)	TBS 650
C	46	CUMULATIVE SEEPAGE--B(40)	TBS 660
C	*****	*****	TBS 670
C	*****	*****	TBS 680
C	EXPLANATION OF OUTPUT		TBS 690
C	DATA ARE OUTPUT ON UNIT L6, THE LINE PRINTER, ARRANGED		TBS 700
C	IN ORDER FROM TABLE 1 TO N, BY STATION IN AN UPSTREAM ORDER.		TBS 710
C	EACH STATION IS ARRANGED SEQUENTIALLY BY DATE.		TBS 720
C	THE FOLLOWING TABLES ARE OUTPUT		TBS 730
C	-----		TBS 740
C	CONCENTRATIONS, IN MG/L, AT EACH STATION--1		TBS 750
C	-----		TBS 760
C	CONCENTRATIONS, IN ME/L, AT EACH STATION--2		TBS 770
C	-----		TBS 780
C	CHEMICAL DISCHARGE, IN KE/DAY, AT EACH STATION--3		TBS 790
C	-----		TBS 800
C	CHEMICAL DISCHARGE, IN TONS/DAY, AT EACH STATION--4		TBS 810
C	-----		TBS 820
C	WATER AND CHEMICAL DISCHARGE AT EACH STATION AS PERCENTAGE OF		TBS 830
C	THAT AT REFERENCE STATION--5		TBS 840
C	-----		TBS 850
C	PERCENTAGE COMPOSITION AT EACH STATION--6		TBS 860
C	-----		TBS 870
C	NET GAINS OR LOSSES, IN KE/DAY, IN EACH REACH--7		TBS 880
C	-----		TBS 890
C	CONCENTRATIONS, IN ME/L, IN NET GAINS OR LOSSES IN EACH REACH--8		TBS 900
C	-----		TBS 910
C	PERCENTAGE COMPOSITION OF NET GAINS OR LOSSES IN EACH REACH--9		TBS 920
C	-----		TBS 930
C	NET GAINS OR LOSSES, IN TONS/DAY, IN EACH REACH--10		TBS 940
C	-----		TBS 950
C	NET GAINS OR LOSSES AS PERCENTAGE OF WATER AND CHEMICAL		TBS 960
C	DISCHARGE AT REFERENCE STATION--11		TBS 961
C	-----		TBS 970
C	CONCENTRATIONS, IN MG/L, IN NET GAINS OR LOSSES IN EACH REACH--12		TBS 980
C	-----		TBS 990
C	NET SEEPAGE, IN KE/DAY, IN EACH REACH--13		TBS1000
C	-----		TBS1010
C	PERCENTAGE COMPOSITION OF NET SEEPAGE IN EACH REACH--14		TBS1020
C	-----		TBS1030
C	CONCENTRATIONS, IN ME/L, IN NET SEEPAGE IN EACH REACH--15		TBS1040
C	-----		TBS1050
C	CONCENTRATIONS, IN MG/L, IN NET SEEPAGE IN EACH REACH--16		TBS1060
C	-----		TBS1070
C	NET SEEPAGE, IN TONS/DAY, IN EACH REACH--17		TBS1080
C	-----		TBS1090
C	NET SEEPAGE IN EACH REACH AS PERCENTAGE OF WATER AND CHEMICAL		TBS1100
C	DISCHARGE AT REFERENCE STATION--18		TBS1110
C	-----		TBS1120
C	CUMULATIVE NET SEEPAGE, IN KE/DAY--19		TBS1130
C	-----		TBS1140
C	CUMULATIVE NET SEEPAGE, IN TONS/DAY--20		TBS1150
C	-----		TBS1160
C	PERCENTAGE COMPOSITION OF CUMULATIVE NET SEEPAGE--21		TBS1170
C	-----		TBS1180

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C      CONCENTRATIONS, IN ME/L, IN CUMULATIVE NET SEEPAGE--22      TBS1190
C      -----TBS1200
C      CONCENTRATIONS, IN MG/L, IN CUMULATIVE NET SEEPAGE--23      TBS1210
C      -----TBS1220
C      CUMULATIVE NET SEEPAGE AS PERCENTAGE OF WATER AND CHEMICAL    TBS1230
C      DISCHARGE AT REFERENCE STATION--24      TBS1240
C      *****TBS1250
C      *****TBS1260
C      EXPLANATION OF INPUT CONTROL DATA      TBS1270
C      *****TBS1280
C      ONE CARD IS NEEDED AS CONTROL FOR OUTPUT--CARD      TBS1290
C      CONTAINS IDENTIFICATION OF STUDY AREA, PUNCHED LEFT-HAND    TBS1300
C      JUSTIFIED IN FIELDS 1 THROUGH 36, AND CONTROL FOR TABLES TO TBS1310
C      BE RETRIEVED FROM TAPE UNIT L2.      TBS1320
C      ***** THE PRESENT PROGRAM (JULY 1968) ALLOWS FOR RETRIEVING TBS1330
C      24 TABLES. THE KEY FOR RETRIEVING ANY OR ALL OF THE TABLES TBS1340
C      CONSISTS OF PUNCHING A 1 IN THE PROPER FIELD OR FIELDS ON    TBS1350
C      THE CONTROL CARD. FIELDS 41 THROUGH 64 ARE RESERVED FOR      TBS1360
C      THIS KEY. BY SUBTRACTING 40 FROM THE CARD FIELD NUMBER, THE TBS1370
C      TABLE TO BE RETRIEVED (SEE TABLE LIST ABOVE) IS IDENTIFIED TBS1380
C      (FOR EXAMPLE, 41-40 = TABLE 1--PUNCH A 1 IN FIELD 41 OR 55-40 TBS1390
C      = TABLE 15--PUNCH A 1 IN FIELD 55).      TBS1400
C      *****TBS1410
C      **NOTE-----THE PROGRAM IS TERMINATED BY SYSTEMS ROUTINE CALLED TBS1420
C      FLGEOF.      TBS1430
C      *****TBS1440
C      *****TBS1450
C      *****DIMENSIONED ARRAYS*****TBS1460
C      B(44)--ARRAY OF DATA READ FROM UNIT L2 AND WRITTEN OUT ON UNIT TBS1470
C      L6 (LINE PRINTER), ONE LINE AT A TIME      TBS1480
C      ITABLE(40)--READ-IN ARRAY FOR CONTROLLING WHICH TABLES ARE TO BE TBS1490
C      PRINTED      TBS1500
C      MQQ(24)--ARRAY (SEE DATA STATEMENT) SIGNIFYING WHETHER TABLE IS TBS1510
C      MG/L OR ME/L--FOR CONTROLLING TABLE HEADINGS      TBS1520
C      TITLE(9)--READ-IN IDENTIFICATION OF AREA      TBS1530
C      MEQ(24)--SAME AS MQQ(24)--TO CARRY VALUES ACROSS IN LABELED TBS1540
C      COMMON STATEMENT      TBS1550
C      DIMENSION B(44), ITABLE(40), MQQ(24)      TBS1560
C      COMMON /TITL/ TITLE(9),MEQ(24),L6      TBS1570
C      DATA (MQQ(I),I=1,24)/0,1,1,0,0,1,1,1,1,0,0,0,1,1,1,0,0,0,1,0,1,1,0 TBS1580
C      1,0/      TBS1590
C      INPUT-OUTPUT UNITS      TBS1600
C      L2--TAPE CREATED BY SPSL, SORTED BY GMAP SORT      TBS1610
C      L5--CARD READ-IN      TBS1620
C      L6--PRINTER OUTPUT      TBS1630
C      L2=2      TBS1640
C      L5=5      TBS1650
C      L6=6      TBS1660
C      DO 1 I=1,24      TBS1670
C      MEQ(I)=MQQ(I)      TBS1680
C      1 CONTINUE      TBS1690
C      REWIND L2      TBS1700
C      SKIP A PAGE      TBS1710
C      WRITE (L6,2)      TBS1720
C      2 FORMAT (1H1)      TBS1730
C      READ CONTROL CARD      TBS1740
C      READ (L5,3) (TITLE(I),I=1,9),(ITABLE(I),I=1,24)      TBS1750
C      3 FORMAT (9A4,4X,24I1)      TBS1760
C      END OF FILE ROUTINE FROM SYSTEMS LIBRARY      TBS1770
C      CALL FLGEOF (L2,NX)      TBS1780

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C	NTAB--COUNTER FOR LIMITING PAGE SIZE TO 3 STATIONS	TBS1790
	NTAB=0	TBS1800
C	MTAB--PREVIOUS TABLE NUMBER-COMPARED WITH ITAB TO CONTROL PAGE	TBS1810
C	SKIP AND TABLE HEADING	TBS1820
	MTAB=0	TBS1830
C	KSTAT--PREVIOUS STATION NUMBER--COMPARED WITH ISTAT READ FROM	TBS1840
C	UNIT L2 TO CONTROL PAGE SKIP AND HEADING STATEMENTS	TBS1850
	KSTAT=0	TBS1860
C	READ DATA	TBS1870
C	ITAB--TABLE NUMBER--READ FROM UNIT L2	TBS1880
C	ISTAT--STATION NUMBER--READ FROM UNIT L2	TBS1890
C	KEYX--INDICATOR FOR TRIBUTARY (1) OR MAIN REACH (0) STATION	TBS1900
C	MON--MONTH OF ANALYSIS	TBS1910
C	IDAY--DAY OF ANALYSIS	TBS1920
C	IYR--YEAR OF ANALYSIS	TBS1930
4	READ (L2) ITAB,ISTAT,KEYX,MON,IDAY,IYR,(B(K),K=1,40)	TBS1940
	IF (NX.NE.0) GO TO 11	TBS1950
C	SORT FOR REQUESTED TABLE	TBS1960
	IF (ITAB.ITAB).LT.1) GO TO 4	TBS1970
C	TABLES 7-N DO NOT NEED TRIBUTARIES (ITAB GREATER THAN 6)	TBS1980
	IF (ITAB.GT.6) GO TO 10	TBS1990
C	IF NEW STATION--CALL TAB TO SKIP PAGE AND WRITE HEADINGS	TBS2000
	IF (KSTAT.NE.ISTAT) CALL TAB (ITAB,ISTAT,KEYX,NTAB,MTAB)	TBS2010
C	IF ITAB IS EQUAL TO 1 WRITE MG/L TABLE	TBS2020
	IF (ITAB.GT.1) GO TO 6	TBS2030
	WRITE (L6,5) MON,IDAY,IYR,B(1),B(2),B(6),B(7),B(9),B(10),(B(I),I=1	TBS2040
	12,20),B(26),B(27),B(28)	TBS2050
5	FORMAT (3I3,F10.2,F6.1,2F6.1,F7.1,F5.1,F6.0,F4.0,F7.1,F8.1,2F5.1,2	TBS2060
	1F5.2,F8.0,F5.1,F6.0,F4.1,/))	TBS2070
C	ASSIGN KSTAT THE ISTAT VALUE (STATION NUMBER) OF DATA JUST PRINTED	TBS2080
	KSTAT=ISTAT	TBS2090
	GO TO 4	TBS2100
C	IF MEQ(ITAB) EQUAL TO 1, WRITE ME/L TYPE FORMAT, IF ME(ITAB)	TBS2110
C	EQUAL TO 0, WRITE MG/L TYPE FORMAT	TBS2120
6	IF (MEQ(ITAB).EQ.1) GO TO 8	TBS2130
	WRITE (L6,7) MON,IDAY,IYR,B(19),B(1),B(5),B(6),B(8),B(9),(B(I),I=1	TBS2140
	11,18)	TBS2150
7	FORMAT (3I3,F10.2,F7.2,2F8.2,F9.2,F7.2,F9.2,F9.2,F9.2,F10.2,2F7.2,	TBS2160
	12F6.2,/))	TBS2170
	KSTAT=ISTAT	TBS2180
	GO TO 4	TBS2190
8	WRITE (L6,9) MON,IDAY,IYR,B(19),B(5),B(6),B(8),B(9),(B(I),I=11,16)	TBS2200
9	FORMAT (3I3,F10.2,2F8.2,F9.2,F7.2,3F9.2,F10.2,2F7.2/))	TBS2210
	KSTAT=ISTAT	TBS2220
	GO TO 4	TBS2230
C	SORT OUT TRIBUTARIES (WHEN KEYX = 1)	TBS2240
10	IF (KEYX.GT.0) GO TO 4	TBS2250
	IF (KSTAT.NE.ISTAT) CALL TAB (ITAB,ISTAT,KEYX,NTAB,MTAB)	TBS2260
	IF (MEQ(ITAB).EQ.1) GO TO 8	TBS2270
	WRITE (L6,7) MON,IDAY,IYR,B(19),B(1),B(5),B(6),B(8),B(9),(B(I),I=1	TBS2280
	11,18)	TBS2290
	KSTAT=ISTAT	TBS2300
	GO TO 4	TBS2310
11	WRITE (L6,2)	TBS2320
	REWIND L2	TBS2330
	CALL EXIT	TBS2340
	END	TBS2350-

CTAB00000	SUBROUTINE TO WRITE TABLE HEADINGS	TAB 10
C	SEE MAIN PROGRAM FOR VARIABLES NOT IDENTIFIED	TAB 20
	SUBROUTINE TAB (ITAB,ISTAT,KEYX,NTAB,MTAB)	TAB 30
	COMMON /TITL/ TITLE(9),MEQ(24),L6	TAB 40
C	K1--ALPHA IDENTIFICATION FOR TRIBUTARY STATIONS (KEYX = 0)	TAB 50
C	K2--ALPHA IDENTIFICATION FOR MAIN REACH STATIONS (KEYX = 1)	TAB 60
	DATA K1,K2/1HT,1HR/	TAB 70
C	STAT--STATION NUMBER	TAB 80
	STAT=ISTAT	TAB 90
	STAT=STAT*0.1	TAB 100
C	K3--IF KEYX = 0, K3 IS SET TO K1, IF KEYX = 1, K3 IS SET TO K2--	TAB 110
C	K3 IS OUTPUT WITH STATION NUMBER	TAB 120
	K3=K1	TAB 130
	IF (KEYX.LT.1) K3=K2	TAB 140
	NTAB=NTAB+1	TAB 150
	IF (MTAB.NE.ITAB) GO TO 1	TAB 160
	IF (NTAB.LT.4) GO TO 3	TAB 170
1	NTAB=1	TAB 180
C	SKIP PAGE	TAB 190
	WRITE (L6,2)	TAB 200
2	FORMAT (1H1)	TAB 210
	GO TO 5	TAB 220
3	WRITE (L6,4)	TAB 230
4	FORMAT (4(1H /))	TAB 240
C	WRITE STATION NUMBER AND TYPE OF STATION IDENTIFICATION	TAB 250
5	WRITE (L6,6) STAT,K3	TAB 260
6	FORMAT (9H STATION ,F8.1,A1,///)	TAB 270
C	WRITE TABLE IDENTIFICATION AT TOP OF PAGE IF NTAB EQUAL TO 1	TAB 280
C	(PROPER HEADING CONTROLLED BY VALUE OF ITAB)	TAB 290
	IF (NTAB.GT.1) GO TO 55	TAB 300
	GO TO (7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53), ITAB	TAB 310
7	WRITE (L6,8)	TAB 320
8	FORMAT (46X,40HCONCENTRATIONS, IN MG/L, AT EACH STATION //)	TAB 330
	GO TO 55	TAB 340
9	WRITE (L6,10)	TAB 350
10	FORMAT (46X,40HCONCENTRATIONS, IN ME/L, AT EACH STATION //)	TAB 360
	GO TO 55	TAB 370
11	WRITE (L6,12)	TAB 380
12	FORMAT (44X,46HCHEMICAL DISCHARGE, IN KE/DAY, AT EACH STATION //)	TAB 390
	GO TO 55	TAB 400
13	WRITE (L6,14)	TAB 410
14	FORMAT (43X,48HCHEMICAL DISCHARGE, IN TONS/DAY, AT EACH STATION//)	TAB 420
	GO TO 55	TAB 430
15	WRITE (L6,16)	TAB 440
16	FORMAT (24X,87HWATER AND CHEMICAL DISCHARGE AT EACH STATION AS PER	TAB 450
	CENTAGE OF THAT AT REFERENCE STATION //)	TAB 460
	GO TO 55	TAB 470
17	WRITE (L6,18)	TAB 480
18	FORMAT (48X,38HPERCENTAGE COMPOSITION AT EACH STATION //)	TAB 490
	GO TO 55	TAB 500
19	WRITE (L6,20)	TAB 510
20	FORMAT (45X,45HNET GAINS OR LOSSES, IN KE/DAY, IN EACH REACH //)	TAB 520
	GO TO 55	TAB 530
21	WRITE (L6,22)	TAB 540
22	FORMAT (38X,61HCONCENTRATIONS, IN ME/L, IN NET GAINS OR LOSSES IN	TAB 550
	LEACH REACH //)	TAB 560
	GO TO 55	TAB 561
23	WRITE (L6,24)	TAB 570
		TAB 580

24	FORMAT (39X,59H)PERCENTAGE COMPOSITION OF NET GAINS OR LOSSES IN EACH REACH //	590
	GO TO 55	TAB 591
25	WRITE (L6,26)	TAB 600
26	FORMAT (44X,47H)NET GAINS OR LOSSES, IN TONS/DAY, IN EACH REACH //	610
	GO TO 55	TAB 620
27	WRITE (L6,28)	TAB 630
28	FORMAT (24X,87H)NET GAINS OR LOSSES AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION //	TAB 640
	GO TO 55	TAB 650
29	WRITE (L6,30)	TAB 660
30	FORMAT (38X,61H)CONCENTRATIONS, IN MG/L, IN NET GAINS OR LOSSES IN EACH REACH //	TAB 670
	GO TO 55	TAB 680
31	WRITE (L6,32)	TAB 690
32	FORMAT (48X,37H)NET SEEPAGE, IN KE/DAY, IN EACH REACH //	TAB 700
	GO TO 55	TAB 710
33	WRITE (L6,34)	TAB 720
34	FORMAT (41X,51H)PERCENTAGE COMPOSITION OF NET SEEPAGE IN EACH REACH //	TAB 730
	GO TO 55	TAB 740
35	WRITE (L6,36)	TAB 750
36	FORMAT (40X,53H)CONCENTRATIONS, IN ME/L, IN NET SEEPAGE IN EACH REACH //	TAB 760
	GO TO 55	TAB 770
37	WRITE (L6,38)	TAB 780
38	FORMAT (41X,53H)CONCENTRATIONS, IN MG/L, IN NET SEEPAGE IN EACH REACH //	TAB 790
	GO TO 55	TAB 800
39	WRITE (L6,40)	TAB 810
40	FORMAT (47X,39H)NET SEEPAGE, IN TONS/DAY, IN EACH REACH //	TAB 820
41	WRITE (L6,42)	TAB 830
42	FORMAT (20X,93H)NET SEEPAGE IN EACH REACH AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION //	TAB 840
	GO TO 55	TAB 850
43	WRITE (L6,44)	TAB 860
44	FORMAT (50X,33H)CUMULATIVE NET SEEPAGE, IN KE/DAY //	TAB 870
	GO TO 55	TAB 880
45	WRITE (L6,46)	TAB 890
46	FORMAT (49X,35H)CUMULATIVE NET SEEPAGE, IN TONS/DAY //	TAB 900
	GO TO 55	TAB 910
47	WRITE (L6,48)	TAB 920
48	FORMAT (43X,48H)PERCENTAGE COMPOSITION OF CUMULATIVE NET SEEPAGE IN EACH REACH //	TAB 930
	GO TO 55	TAB 940
49	WRITE (L6,50)	TAB 950
50	FORMAT (43X,50H)CONCENTRATIONS, IN ME/L, IN CUMULATIVE NET SEEPAGE IN EACH REACH //	TAB 960
	GO TO 55	TAB 970
51	WRITE (L6,52)	TAB 980
52	FORMAT (43X,50H)CONCENTRATIONS, IN MG/L, IN CUMULATIVE NET SEEPAGE IN EACH REACH //	TAB 990
	GO TO 55	TAB 1000
53	WRITE (L6,54)	TAB 1010
54	FORMAT (23X,89H)CUMULATIVE NET SEEPAGE AS PERCENTAGE OF WATER AND CHEMICAL DISCHARGE AT REFERENCE STATION //	TAB 1020
C	WRITE TABLE COLUMN HEADING AT TOP OF EACH SEPARATE STATION	TAB 1030
C	DATA GROUP	TAB 1040
55	IF (ITAB.EQ.1) GO TO 57	TAB 1050
	IF (NTAB.GT.1) GO TO 61	TAB 1060
		TAB 1070

Appendix V.--Input to program TBSPSL.

SEEPAGE-SALINITY SURVEYS

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Appendix VI.--Program abstract.

KANSAS GEOLOGICAL SURVEY COMPUTER PROGRAM
THE UNIVERSITY OF KANSAS, LAWRENCE

PROGRAM ABSTRACT

Title (If subroutine state in title):

Application of Computer Techniques to Seepage-Salinity Surveys in Kansas

Date: December 1969

Author, organization: Robert B. Leonard and Charles O. Morgan

U.S. Geological Survey, Water Resources Division

Direct inquiries to: U.S. Geological Survey

Name: Robert B. Leonard or Charles O. Morgan Address: Box 768

Lawrence, Kansas 66044

Purpose/description: Manipulation of large quantities of water quality data collected
during seepage-salinity surveys and to present these data in a form for analysis and
interpretation.

Mathematical method: See table 1 for listing of various mathematical methods.

Restrictions, range: Maximum of 50 data-collection stations; first station must have
analyses (or dummy analyses) for all dates of seepage-salinity surveys. There is no
restriction on the number of surveys for a station.

Computer manufacturer: GE Model: 635

Programming language: FORTRAN IV, GMAP

Memory required: Maximum 39 K Approximate running time: 3 minutes for 9 surveys from 30
stations

Special peripheral equipment required: Tapes

Remarks (special compilers or operating systems, required word lengths, number of successful runs, other machine versions, additional information useful for operation or modification of program)

The sort routine is written in GMAP language.



