

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY**

WORKING PAPER SERIES



REPORT
ON
TUTTLE CREEK RESERVOIR
MARSHALL, POTTAWATOMIE, AND
RILEY COUNTIES
KANSAS
EPA REGION VII
WORKING PAPER No. 524

**CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA**

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MARSHALL, POTTAWATOMIE, AND
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KANSAS
EPA REGION VII
WORKING PAPER No. 524

WITH THE COOPERATION OF THE
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
AND THE
KANSAS NATIONAL GUARD
APRIL, 1977

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F O R E W O R D

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Kansas State Department of Health and Environment for professional involvement, to the Kansas National Guard for conducting the tributary sampling phase of the Survey, and to those Kansas wastewater treatment plant operators who voluntarily provided effluent samples and flow data.

The staff of the Kansas Division of Environmental Health provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

Major General Edward R. Fry, the Adjutant General of Kansas, and Project Officer Colonel Albin L. Lundquist, who directed the volunteer efforts of the Kansas National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

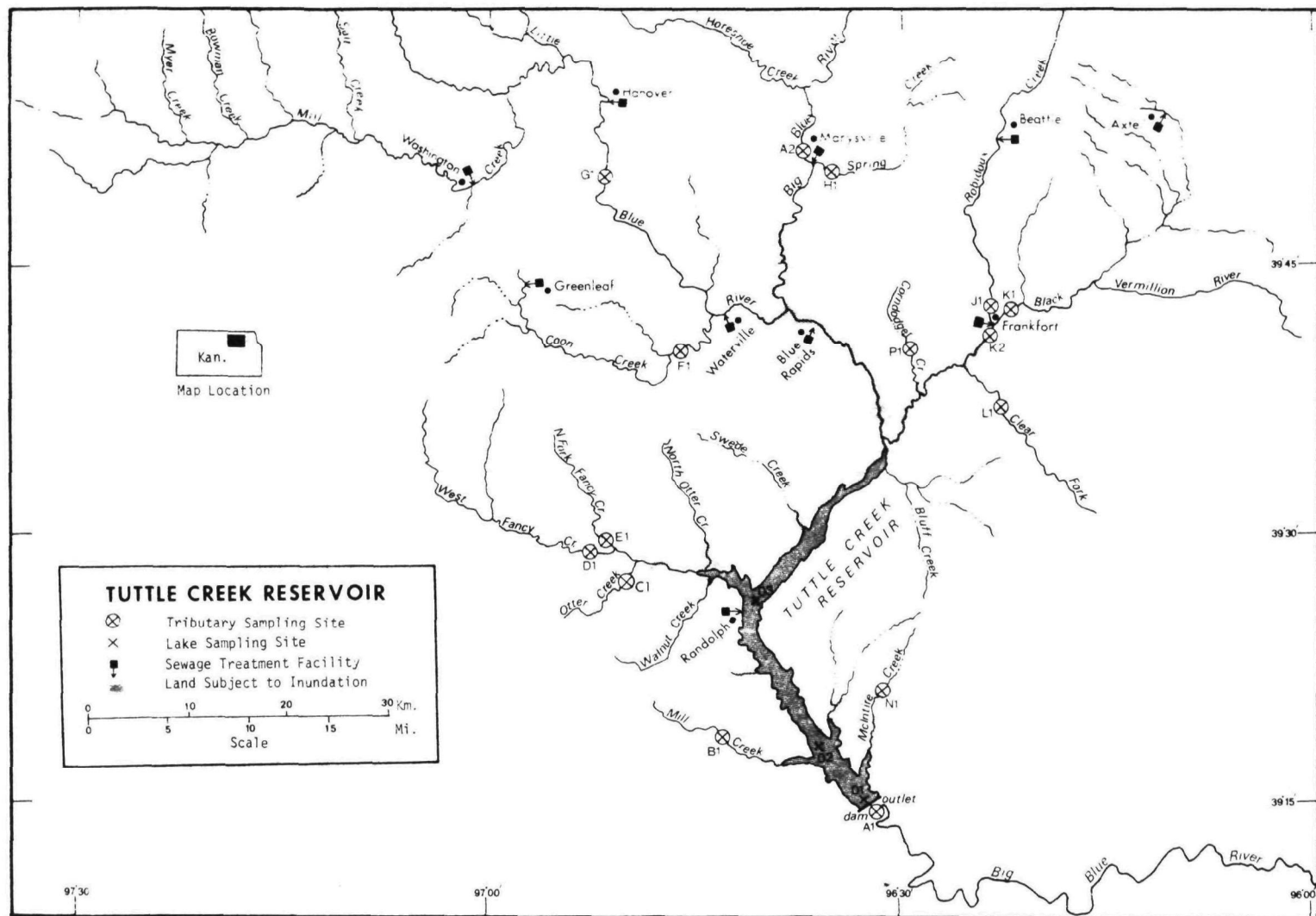
STUDY RESERVOIRS

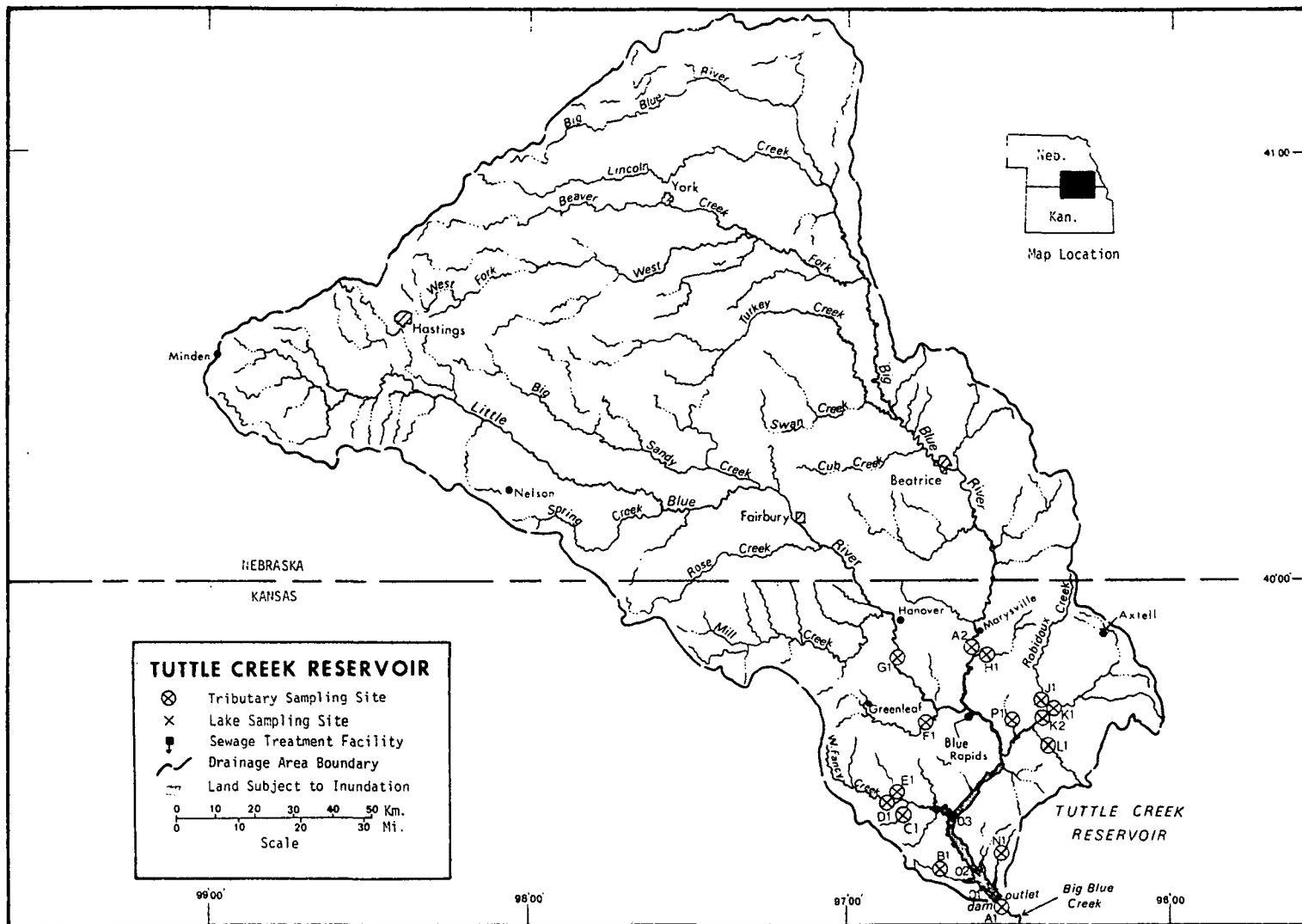
STATE OF KANSASNAME

Cedar Bluff
Council Grove
Elk City
Fall River
John Redmond
Kanopolis
Marion
Melvern
Milford
Norton
Perry
Pomona
Toronto
Tuttle Creek
Wilson

COUNTY

Trego
Morris
Montgomery
Greenwood
Coffey, Lyon
Ellsworth
Marion
Osage
Clay, Geary
Norton
Jefferson
Osage
Greenwood, Woodson
Marshall, Pottawatomie, Riley
Russell





TUTTLE CREEK RESERVOIR

STORET NO. 2014

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate Tuttle Creek Reservoir is potentially eutrophic. However, the reservoir becomes quite turbid during periods of runoff, and primary productivity is intermittently light-limited (Kring, 1977).

This water body ranked last in overall trophic quality among the 15 Kansas reservoirs sampled when compared using a combination of six water quality parameters*. All of the other reservoirs had less median total phosphorus and dissolved orthophosphorus, 11 had less and one had the same median inorganic nitrogen, nine had less mean chlorophyll a, and four had greater mean Secchi disc transparency. Marked depression of hypolimnetic dissolved oxygen occurred at sampling station 1 in June.

Survey limnologists did not observe concentrations of algae or macrophytes during sampling visits.

The low Secchi disc transparencies and numbers of phytoplankton indicate that at times primary productivity in the reservoir is light-limited as noted above. In several reports it is stated that Tuttle Creek Reservoir is eutrophic, has high nutrient levels, but has only low to moderate productivity due to lack of light penetration. This is generally attributed

* See Appendix A.

to the morphology of the basin and to winds which tend to maintain turbid conditions and also limit the time available for photosynthesis because of vertical mixing (Klaasen and Marzolf, 1971; Marzolf and Osborne, 1972; Osborne and Marzolf, 1972).

B. Rate-Limiting Nutrient:

Due to significant nutrient changes in the samples during shipment, the results of the algal assays are not considered representative of conditions in the reservoir at the times the samples were taken. Nutrient-wise, the reservoir data indicate nitrogen limitation in April and phosphorus limitation at two of the three sampling stations in October.

C. Nutrient Controllability:

1. Point sources--During the sampling year, point sources contributed only 0.7% of the total phosphorus load to Tuttle Creek Reservoir. The wastewater treatment plants at Marysville and Blue Rapids contributed 0.3% and 0.2% of the total load, respectively. Eight other facilities collectively contributed 0.2%.

The present total phosphorus loading of $22.28 \text{ g/m}^2/\text{year}$ is nearly 26 times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 15). Removal of phosphorus at the point sources probably would not improve the trophic condition of the reservoir since primary productivity is light-limited part of the time.

It should be noted that if soil-conservation practices are initiated to reduce erosion in the watershed and resulting turbidity in the reservoir, the existing nutrient load is likely to cause a marked increase in primary productivity. However, it appears that a significant reduction of the phosphorus loading can only be accomplished by control of all sources impacting the Big Blue and Little Blue rivers (see discussion below).

2. Non-point sources--Non-point sources contributed 99.3% of the total phosphorus load during the sampling year. The Big Blue River contributed 60.5%, the Little Blue River contributed 33.9%, and seven other gauged tributaries collectively contributed 2.7%. The ungauged tributaries contributed an estimated 2.1% of the total load.

The phosphorus export rates of the Big Blue and Little Blue rivers ($70 \text{ kg/km}^2/\text{year}$ and $56 \text{ kg/km}^2/\text{year}$) were substantially higher than the rates of the other gaged tributaries in the drainage basin (see page 14). This may be due to other point sources beyond the 40-kilometer limit of the Survey* (e.g., Hastings and Fairbury, Nebraska) or to land-use practices in the drainage basin. In a recent report, it is noted that much of the drainage is cropland, pasture, and range (Anonymous, 1975).

* See Working Paper No. 175; "...Survey Methods, 1973-1976".

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS[†]

A. Morphometry^{††}:

1. Surface area: 63.94 kilometers².
2. Mean depth: 8.25 meters.
3. Maximum depth: 20.0 meters.
4. Volume: 524.608×10^6 m³.
5. Eleven-year median hydraulic retention time: 139 days.

B. Tributary and Outlet: (See Appendix C for flow data)

1. Tributaries -

<u>Name</u>	<u>Drainage area (km²)*</u>	<u>Mean flow (m³/sec)*</u>
Big Blue River	12,372.4	23.270
Otter Creek	57.0	0.188
West Fancy Creek	271.9	0.800
N. Fork Fancy Creek	93.0	0.280
Coon Creek	255.4	0.810
Little Blue River	8,609.2	18.580
Robidoux Creek	303.0	0.960
Black Vermillion River K-1	735.6	2.510
Clear Fork	115.5	0.370
Minor tributaries & immediate drainage -	<u>2,090.7</u>	<u>6.980</u>
Totals	24,903.7	54.748

2. Outlet -

Big Blue River	24,967.6**	52.860
----------------	------------	--------

C. Precipitation***:

1. Year of sampling: 75.4 centimeters.
2. Mean annual: 85.1 centimeters.

[†] Table of metric conversions--Appendix B.

^{††} Kring, 1977.

* For limits of accuracy, see Working Paper No. 175.

** Includes area of reservoir.

*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Tuttle Creek Reservoir was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at three stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 18.3 meters at station 1, 10.7 meters at station 2, and 7.6 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table (the June nutrient samples were not properly preserved and were not analyzed).

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR TUTTLE CREEK RESERVOIR
STORET CODE 2014

1ST SAMPLING (4/11/74)

2ND SAMPLING (6/25/74)

3RD SAMPLING (10/ 2/74)

3 SITES

3 SITES

3 SITES

PARAMETER	RANGE		MEAN	MEDIAN	RANGE		MEAN	MEDIAN	RANGE		MEAN	MEDIAN
TEMP (C)	9.2	- 11.4	10.0	9.4	21.4	- 25.4	23.5	23.7	15.1	- 17.4	16.4	16.2
DISS OXY (MG/L)	9.4	- 10.6	10.0	10.2	1.4	- 9.2	5.7	6.0	7.6	- 8.6	8.1	8.1
CNDCTVY (MCROMO)	393.	- 518.	432.	395.	507.	- 792.	564.	533.	473.	- 487.	479.	477.
PH (STAND UNITS)	8.1	- 8.3	8.2	8.1	8.0	- 8.6	8.3	8.4	8.0	- 8.2	8.1	8.1
TOT ALK (MG/L)	195.	- 264.	217.	199.	*****	-*****			190.	- 202.	195.	194.
TOT P (MG/L)	0.170	- 0.249	0.202	0.190	*****	-*****			0.083	- 0.162	0.117	0.111
ORTHO P (MG/L)	0.083	- 0.155	0.131	0.149	*****	-*****			0.056	- 0.067	0.060	0.058
NO2+NO3 (MG/L)	0.660	- 1.880	1.440	1.690	*****	-*****			0.700	- 0.960	0.850	0.845
AMMONIA (MG/L)	0.110	- 0.160	0.145	0.150	*****	-*****			0.030	- 0.070	0.046	0.045
KJEL N (MG/L)	0.300	- 0.800	0.485	0.400	*****	-*****			0.400	- 1.000	0.607	0.550
INORG N (MG/L)	0.770	- 2.040	1.585	1.840	*****	-*****			0.760	- 1.010	0.896	0.880
TOTAL N (MG/L)	1.160	- 2.480	1.925	2.090	*****	-*****			1.300	- 1.740	1.457	1.440
CHLRPYL A (UG/L)	5.1	- 34.5	15.3	6.3	2.8	- 14.4	7.5	5.4	7.5	- 15.8	11.0	9.7
SECCHI (METERS)	0.4	- 0.7	0.6	0.6	0.3	- 2.3	1.3	1.4	0.2	- 0.6	0.3	0.2

B. Biological characteristics:

1. Phytoplankton -

<u>Sampling Date</u>	<u>Dominant Genera</u>	<u>Algal Units per ml</u>
04/11/74	1. <u>Stephanodiscus</u> <u>sp.</u>	10,947
	2. <u>Chroomonas</u> <u>sp.</u>	2,238
	3. <u>Cryptomonas</u> <u>sp.</u>	241
	4. <u>Ankistrodesmus</u> <u>sp.</u>	181
	5. <u>Nitzschia</u> <u>sp.</u>	60
	Other genera	<u>62</u>
	Total	13,729
06/25/74	1. <u>Stephanodiscus</u> <u>sp.</u>	1,703
	2. <u>Chroomonas</u> <u>sp.</u>	183
	3. <u>Melosira</u> <u>sp.</u>	61
	4. <u>Cryptomonas</u> <u>sp.</u>	30
	5. <u>Euglena</u> <u>sp.</u>	30
	Other genera	<u>76</u>
	Total	2,083
10/02/74	1. <u>Nitzschia</u> <u>sp.</u>	1,641
	2. <u>Stephanodiscus</u> <u>sp.</u>	1,452
	3. <u>Flagellates</u>	284
	4. <u>Skeletonema</u> <u>sp.</u>	189
	5. <u>Chroomonas</u> <u>sp.</u>	158
	Other genera	<u>95</u>
	Total	3,819

2. Chlorophyll a -

<u>Sampling Date</u>	<u>Station Number</u>	<u>Chlorophyll <u>a</u> ($\mu\text{g/l}$)</u>
04/11/74	1	5.1
	2	6.3
	3	34.5
06/25/74	1	2.8
	2	14.4
	3	5.4
10/02/74	1	7.5
	2	9.7
	3	15.8

C. Limiting Nutrient Study:

The algal assay results are not considered representative of conditions in the reservoir at the times the samples were taken (04/11/74 and 10/02/74) due to significant changes in nitrogen and phosphorus during shipment from the field to the laboratory.

The reservoir data indicate a combination of limiting nutrients, although it will be noted that station 3 nearest the point sources tended toward nitrogen limitation while the two stations further away tended more toward phosphorus limitation.

Following is a tabulation of the mean inorganic nitrogen/orthophosphorus ratios for each of the sampling stations and

times with the indicated limiting nutrient in parentheses (however, note that primary productivity is intermittently light-limited; Kring, 1977).

<u>Station</u>	<u>04/11/74</u>	<u>10/02/74</u>
1	13/1 (N?)	17/1 (P)
2	13/1 (N?)	15/1 (P)
3	10/1 (N)	12/1 (N)

IV. NUTRIENT LOADINGS (See Appendix E for data)

For the determination of nutrient loadings, the Kansas National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the maps (pages v and vi), except for the months of May, June, and July when two samples were collected at a number of the sites. Sampling was begun in October, 1974, and was completed in September, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Kansas District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $\text{kg}/\text{km}^2/\text{year}$, at stations C-1, D-1, E-1, and L-1 and multiplying the means by the ZZ area in km^2 .

The operators of the Beattie, Blue Rapids, Frankfort, Marysville, Randolph, and Watersville wastewater treatment plants provided monthly effluent samples and corresponding flow data. The operators of the

* See Working Paper No. 175.

wastewater treatment plants at Axtell, Greenleaf, Hanover, and Washington also provided monthly samples, but corresponding flow data were not available. Nutrient loads from these sources were estimated at 1.134 kg P and 3.401 kg N/capita/year, and flows were estimated at 0.3785 m³/capita/day.

A. Waste Sources:

1. Known municipal* -

<u>Name</u>	<u>Pop. Served</u>	<u>Treatment</u>	<u>Mean Flow (m³/d)</u>	<u>Receiving Water</u>
Axtell	514	tr. filter	194.5	Vermillion River
Beattie	296	stab. pond	106.0	Trib. of Robi- doux Creek
Blue Rapids	1,298	prim. clari- fier	649.2	Big Blue River
Frankfort	1,060	stab. pond	772.5	Black Ver- million River
Greenleaf	485	tr. filter	183.6	Coon Creek
Hanover	838	prim. clari- fier	317.2	Little Blue River
Marysville	3,740	prim. clari- fier	1,309.8	Big Blue River
Randolph	145	act. sludge	32.6	Peach Creek
Washington	1,700	tr. filter	643.5	Peach Creek
Waterville	750	prim. clari- fier	258.9	Little Blue River

2. Industrial - Unknown

* Treatment plant questionnaires.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg P/ yr</u>	<u>% of total</u>
a. Tributaries (non-point load) -		
Big Blue River	861,300	60.5
Otter Creek	735	<0.1
West Fancy Creek	3,950	0.3
N. Fork Fancy Creek	1,410	0.1
Coon Creek	3,560	0.3
Little Blue River	482,715	33.9
Robidoux Creek	8,655	0.7
Black Vermillion River K-1	16,785	1.2
Clear Fork	1,310	0.1
b. Minor tributaries & immediate drainage (non-point load) -	29,895	2.1
c. Known municipal STP's -		
Axtell	585	<0.1
Beattie	310	<0.1
Blue Rapids	2,555	0.2
Frankfort	1,050	<0.1
Greenleaf	550	<0.1
Hanover	950	0.1
Marysville	3,975	0.3
Randolph	100	<0.1
Washington	1,930	0.1
Waterville	865	<0.1
d. Septic tanks - Unknown	?	-
e. Industrial - Unknown	?	-
f. Direct precipitation* -	<u>1,120</u>	<u>0.1</u>
Total	1,424,305	100.0

2. Outputs -

Lake outlet - Big Blue River 229,125

3. Net annual P accumulation - 1,195,180 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

<u>Source</u>	<u>kg N/ yr</u>	<u>% of total</u>
a. Tributaries (non-point load) -		
Big Blue River	4,282,460	55.3
Otter Creek	10,355	0.1
West Fancy Creek	72,290	1.0
N. Fork Fancy Creek	23,170	0.3
Coon Creek	223,550	2.9
Little Blue River	2,159,265	28.0
Robidoux Creek	121,720	1.6
Black Vermillion River K-1	212,200	2.8
Clear Fork	23,580	0.3
b. Minor tributaries & immediate drainage (non-point load) -	485,670	6.3
c. Known municipal STP's -		
Axtell	1,750	<0.1
Beattie	920	<0.1
Blue Rapids	9,065	0.1
Frankfort	3,525	<0.1
Greenleaf	1,650	<0.1
Hanover	2,850	<0.1
Marysville	13,450	0.2
Randolph	370	<0.1
Washington	5,780	0.1
Waterville	3,860	0.1
d. Septic tanks - Unknown	?	-
e. Industrial - Unknown	?	-
f. Direct precipitation* -	<u>69,030</u>	<u>0.9</u>
Total	7,726,510	100.0

2. Outputs -

Lake outlet - Big Blue River 4,192,595

3. Net annual N accumulation - 3,533,915 kg.

* See Working Paper No. 175.

D. Non-point Nutrient Export by Subdrainage Area:

<u>Tributary</u>	<u>kg P/km²/yr</u>	<u>kg N/km²/yr</u>
Big Blue River	70	346
Otter Creek	13	182
West Fancy Creek	15	266
N. Fork Fancy Creek	15	249
Coon Creek	14	875
Little Blue River	56	251
Robidoux Creek	29	402
Black Vermillion River	23	288
Clear Fork	11	204

E. Mean Nutrient Concentrations in Ungaged Streams:

<u>Tributary</u>	<u>Mean Total P Conc. (mg/l)</u>	<u>Mean Total N Conc. (mg/l)</u>
McIntire Creek	0.075	2.548
Corndodger Creek	0.067	1.883
Cedar Creek	0.040	0.868

F. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m ² /yr	22.28	18.70	120.8	55.3

Vollenweider phosphorus loadings
(g/m²/yr) based on mean depth and 11-year median
hydraulic retention time of Tuttle Creek Reservoir:

"Dangerous" (eutrophic loading)	0.86
"Permissible" (oligotrophic loading)	0.43

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
2001	CEDAR BLUFF RESERVOIR	0.017	0.055	431.667	4.217	10.800	0.004
2002	COUNCIL GROVE	0.069	0.830	485.889	9.789	10.400	0.028
2003	ELK CITY	0.030	0.590	490.400	3.212	14.000	0.003
2004	FALL RIVER RESERVOIR	0.053	0.470	488.667	7.683	9.200	0.016
2005	JOHN REDMOND RESERVOIR	0.118	1.250	492.667	9.467	8.200	0.066
2006	KANOPOLIS RESERVOIR	0.056	0.640	487.000	16.033	10.200	0.011
2007	MARION RESERVOIR	0.052	0.430	483.667	12.400	9.000	0.010
2008	MELVERN RESERVOIR	0.034	0.265	459.111	30.400	14.400	0.007
2009	MILFORD RESERVOIR	0.079	0.710	466.333	18.883	12.800	0.036
2010	NORTON RESERVOIR	0.122	0.110	476.750	21.360	8.000	0.036
2011	PERRY RESERVOIR	0.055	0.970	478.571	5.614	13.400	0.017
2012	POMONA RESERVOIR	0.040	1.240	481.333	8.312	13.000	0.021
2013	TORONTO RESERVOIR	0.067	0.425	488.500	6.583	13.000	0.011
2014	TUTTLE CREEK RESERVOIR	0.162	0.970	470.667	11.278	13.600	0.067
2015	WILSON RESERVOIR	0.023	0.265	445.222	8.867	13.400	0.004

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	2001	CEDAR BLUFF RESERVOIR	539
2	2015	WILSON RESERVOIR	439
3	2007	MARION RESERVOIR	357
4	2003	ELK CITY	350
5	2004	FALL RIVER RESERVOIR	328
6	2008	MELVERN RESERVOIR	326
7	2013	TORONTO RESERVOIR	303
8	2010	NORTON RESERVOIR	292
9	2011	PERRY RESERVOIR	279
10	2006	KANOPOLIS RESERVOIR	271
11	2012	POMONA RESERVOIR	267
12	2002	COUNCIL GROVE	230
13	2009	MILFORD RESERVOIR	214
14	2005	JOHN REDMOND RESERVOIR	164
15	2014	TUTTLE CREEK RESERVOIR	139

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P	INDEX NO
2001	CEDAR BLUFF RESERVOIR	100 (14)	100 (14)	100 (14)	93 (13)	57 (8)	89 (12)	539
2002	COUNCIL GROVE	29 (4)	29 (4)	36 (5)	43 (6)	64 (9)	29 (4)	230
2003	ELK CITY	86 (12)	50 (7)	7 (1)	100 (14)	7 (1)	100 (14)	350
2004	FALL RIVER RESERVOIR	57 (8)	57 (8)	14 (2)	71 (10)	79 (11)	50 (7)	328
2005	JOHN REDMOND RESERVOIR	14 (2)	0 (0)	0 (0)	50 (7)	93 (13)	7 (1)	164
2006	KANOPOLIS RESERVOIR	43 (6)	43 (6)	29 (4)	21 (3)	71 (10)	64 (9)	271
2007	MARION RESERVOIR	64 (9)	64 (9)	43 (6)	29 (4)	86 (12)	71 (10)	357
2008	MELVERN RESERVOIR	79 (11)	82 (11)	86 (12)	0 (0)	0 (0)	79 (11)	326
2009	MILFORD RESERVOIR	21 (3)	36 (5)	79 (11)	14 (2)	50 (7)	14 (2)	214
2010	NORTON RESERVOIR	7 (1)	93 (13)	64 (9)	7 (1)	100 (14)	21 (3)	292
2011	PERRY RESERVOIR	50 (7)	18 (2)	57 (8)	86 (12)	25 (3)	43 (6)	279
2012	POMONA RESERVOIR	71 (10)	7 (1)	50 (7)	64 (9)	39 (5)	36 (5)	267
2013	TORONTO RESERVOIR	36 (5)	71 (10)	21 (3)	79 (11)	39 (5)	57 (8)	303
2014	TUTTLE CREEK RESERVOIR	0 (0)	18 (2)	71 (10)	36 (5)	14 (2)	0 (0)	139
2015	WILSON RESERVOIR	93 (13)	82 (11)	93 (13)	57 (8)	25 (3)	89 (12)	439

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR KANSAS

05/03/76

LAKE CODE 2014 TUTTLE CREEK

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 24936.5

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS)												MEAN
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
2014A1	24967.6	20.39	42.48	84.95	62.30	82.12	96.28	70.79	36.81	39.64	39.64	33.98	24.64	52.86
2014A2	12372.4	8.78	18.41	36.81	22.09	31.15	65.13	31.15	20.10	20.95	12.18	7.08	5.66	23.27
2014C1	57.0	0.082	0.108	0.272	0.227	0.340	0.311	0.368	0.105	0.119	0.156	0.071	0.085	0.188
2014D1	271.9	0.34	0.45	0.96	0.99	1.42	1.56	1.47	0.51	0.59	0.65	0.31	0.31	0.80
2014E1	93.0	0.12	0.16	0.37	0.34	0.51	0.48	0.54	0.16	0.18	0.23	0.10	0.12	0.28
2014F1	255.4	0.34	0.45	1.02	1.02	1.44	1.56	1.47	0.51	0.59	0.65	0.34	0.34	0.81
2014G1	8609.2	10.19	16.14	27.47	15.86	31.15	31.15	18.12	11.33	22.09	24.07	9.06	6.23	18.58
2014J1	303.0	0.40	0.54	1.19	1.22	1.70	1.84	1.73	0.62	0.71	0.79	0.40	0.40	0.96
2014K1	735.6	1.02	1.44	2.80	3.40	4.25	5.10	4.25	1.67	2.01	1.98	1.13	0.96	2.51
2014K2	1061.9	1.90	4.25	5.10	3.11	6.80	7.93	4.25	1.67	4.81	4.53	1.50	1.19	3.91
2014L1	115.5	0.16	0.21	0.51	0.45	0.68	0.65	0.71	0.22	0.25	0.31	0.15	0.16	0.37
2014ZZ	1797.2	2.66	3.68	6.51	8.50	11.89	14.72	11.33	5.95	6.80	5.66	3.40	2.58	6.98

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 24936.5
SUM OF SUB-DRAINAGE AREAS = 25672.1

TOTAL FLOW IN = 703.91
TOTAL FLOW OUT = 634.01

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2014A1	10	74	13.904	12	8.438				
	11	74	32.423	9	27.354				
	12	74	12.063	14	14.300				
	1	75	5.918	11	1.388				
	2	75	0.620	11	0.453				
	3	75	1.863	8	0.249				
	4	75	108.737	15	234.180				
	5	75	33.244	5	54.935	24	2.322		
	6	75	178.113	14	145.265	28	152.345		
	7	75	142.972	17	64.562	22	14.442		
	8	75	28.883	10	20.785				
	9	75	7.391	13	5.663				
2014A2	10	74	6.371	13	2.775				
	11	74	5.267	10	2.832				
	12	74	4.248	15	3.313				
	1	75	7.164	12	5.210				
	2	75	6.315	9	3.625				
	3	75	27.156	9	15.065				
	4	75	12.459	13	10.874				
	5	75	25.315	24	5.663				
	6	75	75.889	14	48.139	28	110.436		
	7	75	17.755	11	9.911	13	3.341		
	8	75	6.400	10	3.766				
	9	75	4.304	14	3.228				

TRIBUTARY FLOW INFORMATION FOR KANSAS

05/03/76

LAKE CODE 2014 TUTTLE CREEK

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2014C1	10	74	0.034	12	0.004				
	11	74	0.037	9	0.017				
	12	74	0.042	14	0.003				
	1	75	0.054	10	0.003				
	2	75	0.076	8	0.025				
	3	75	0.283	8	0.034				
	4	75	0.278	5	0.878				
	5	75	0.232	5	0.071	27	3.964		
	6	75	0.793	14	0.187	28	0.176		
	7	75	0.113	17	0.105	22	0.059		
	8	75	0.027	10	0.059				
	9	75	0.008	13	0.014				
2014D1	10	74	0.142	12	0.212				
	11	74	0.161	9	0.283				
	12	74	0.153	14	0.184				
	1	75	0.224	10	0.0				
	2	75	0.340	8	0.275				
	3	75	0.991	8	0.255				
	4	75	1.218	5	0.566				
	5	75	0.963	5	0.425	27	2.549		
	6	75	3.964	14	0.510	28	0.595		
	7	75	0.453	17	0.142	22	0.170		
	8	75	0.130	10	0.142				
	9	75	0.040	12	0.164				
2014E1	10	74	0.051	12	0.119				
	11	74	0.054	9	0.170				
	12	74	0.059	14	0.099				
	1	75	0.079	11	0.091				
	2	75	0.113	8	0.127				
	3	75	0.396	8	0.119				
	4	75	0.425	5	0.232				
	5	75	0.340	5	0.142	27	0.708		
	6	75	1.218	14	0.266	28	0.241		
	7	75	0.164	17	0.142	22	0.142		
	8	75	0.042	10	0.071				
	9	75	0.012	13	0.099				
2014F1	10	74	0.142	13	0.241				
	11	74	0.178	10	0.311				
	12	74	0.167	15	0.269				
	1	75	0.224						
	2	75	0.340	9	0.311				
	3	75	1.048	9	0.311				
	4	75	1.246	13	0.340				
	5	75	0.991	18	0.198				
	6	75	3.964	14	0.453	29	0.425		
	7	75	0.453	13	0.255	27	0.425		
	8	75	0.130	10	0.311				
	9	75	0.040	14	0.198				

TRIBUTARY FLOW INFORMATION FOR KANSAS

05/03/76

LAKE CODE 2014 TUTTLE CREEK

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2014G1	10	74	3.625	13	3.596				
	11	74	4.955	10	5.295				
	12	74	4.786	15	5.295				
	1	75	5.352	12	4.531				
	2	75	5.663	9	4.248				
	3	75	30.016	9	14.951				
	4	75	12.290	13	10.534				
	5	75	13.989	18	6.853				
	6	75	76.172	14	30.299	29	36.812		
	7	75	39.927	13	12.544	27	59.749		
	8	75	12.176	10	11.242				
	9	75	4.474	14	3.823				
2014J1	10	74	0.173	13	0.071				
	11	74	0.207	10	0.170				
	12	74	0.195	15	0.142				
	1	75	0.261	12	0.057				
	2	75	0.396	9	0.283				
	3	75	1.246	9	0.481				
	4	75	1.501	13	0.396				
	5	75	1.161	18	0.255				
	6	75	4.531	14	1.104	29	1.331		
	7	75	0.538	12	0.311	29	0.127		
	8	75	0.159	9	0.085				
	9	75	0.045	14	0.113				
2014K1	10	74	0.425	13	0.085				
	11	74	0.595	10	1.416				
	12	74	0.481	15	0.283				
	1	75	0.680	12	0.283				
	2	75	1.048	9	0.991				
	3	75	2.832	9	1.133				
	4	75	4.248	13	1.133				
	5	75	2.832	18	0.368				
	6	75	12.743	14	1.756	29	1.982		
	7	75	1.303	12	1.274	29	0.765		
	8	75	0.425	9	0.144				
	9	75	0.130	14	0.538				
2014K2	10	74	0.968	13	0.142				
	11	74	0.779	10	2.718				
	12	74	0.578	15	0.623				
	1	75	1.237	12	0.510				
	2	75	3.143	9	1.557				
	3	75	5.324	9	1.982				
	4	75	3.766	13	1.359				
	5	75	4.559	18	0.708				
	6	75	20.105	14	3.936	29	2.945		
	7	75	1.294	12	1.104	29	0.453		
	8	75	0.425	9	0.269				
	9	75	0.314	14	0.249				

TRIBUTARY FLOW INFORMATION FOR KANSAS

05/03/76

LAKE CODE 2014 TUTTLE CREEK

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2014L1	10	74	0.068	13	0.283				
	11	74	0.076	10	0.170				
	12	74	0.079	15	0.076				
	1	75	0.105	12	0.085				
	2	75	0.153	9	0.241				
	3	75	0.538	9	0.227				
	4	75	0.566	13	0.269				
	5	75	0.453	18	0.057				
	6	75	1.642	14	0.651	29	1.359		
	7	75	0.218	12	0.311	29	1.982		
	8	75	0.057	9	0.057				
	9	75	0.016	14	0.425				
2014ZZ	10	74	1.189						
	11	74	1.784						
	12	74	1.274						
	1	75	1.756						
	2	75	2.662						
	3	75	6.796						
	4	75	10.477						
	5	75	8.212						
	6	75	36.812						
	7	75	3.398						
	8	75	1.501						
	9	75	0.425						

APPENDIX D

PHYSICAL and CHEMICAL DATA

201401
39 15 19.0 096 36 11.0 3
TUTTLE CREEK RESERVOIR
20161 KANSAS

091191

11EPALES 2111202
0065 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/11	12 15	0000	9.4		28	395	8.20	200	0.160	0.600	1.880	0.154
	12 15	0005	9.3	9.8		394	8.10	199	0.150	0.400	1.580	0.152
	12 15	0015	9.3	10.4		393	8.10	197	0.160	0.400	1.630	0.149
	12 15	0030	9.2	10.2		394	8.10	196	0.150	0.400	1.750	0.148
	12 15	0060	9.2	10.2		404	8.10	198	0.150	0.400	1.870	0.139
74/06/25	14 00	0000	25.4	8.0	90	557	8.60					
	14 00	0005	24.8	7.6		544	8.40					
	14 00	0015	23.4	7.0		531	8.30					
	14 00	0030	22.9	5.2		534	8.40					
	14 00	0040	22.4	3.8		532	8.40					
	14 00	0050	21.7	2.6		531	8.10					
	14 00	0060	21.4	1.4		534	8.10					
74/10/02	15 35	0000	17.4	8.0	24	475	8.07	196	0.050	0.500	0.960	0.059
	15 35	0005	17.3	8.0		475	8.13	190	0.030	0.500	0.940	0.058
	15 35	0015	17.4	7.6		475	8.13	190	0.030	0.500	0.940	0.059
	15 35	0030	17.3	8.0		475	8.13	192	0.040	0.400	0.950	0.058
	15 35	0045	17.3	7.6		477	8.09	190	0.050	0.500	0.960	0.058
	15 35	0060	17.3	7.8		479	8.05	191	0.050	0.500	0.960	0.056

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/11	12 15	0000	0.190	5.1	
	12 15	0005	0.182		
	12 15	0015	0.181		
	12 15	0030	0.181		
	12 15	0060	0.170		
74/06/25	14 00	0000		2.8	
74/10/02	15 35	0000	0.083	7.5	
	15 35	0005	0.086		1.0
	15 35	0015	0.085		
	15 35	0030	0.084		
	15 35	0045	0.085		
	15 35	0060	0.095		

STORET RETRIEVAL DATE 76/05/03

201402
39 18 41.0 096 39 06.0 3
TUTTLE CREEK RESERVOIR
20149 KANSAS

091191

11EPALES 2111202
0035 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/11	12 45	0000	9.5		25	394	8.15	201	0.150	0.600	1.840	0.153
	12 45	0005	9.5	10.6		394	8.15	195	0.150	0.400	1.690	0.154
	12 45	0015	9.4	10.2		394	8.15	195	0.160	0.300	1.830	0.155
	12 45	0030	9.4	10.4		396	8.20	198	0.150	0.300	1.840	0.151
74/06/25	14 30	0000	24.9	9.2	54	537	8.40					
	14 30	0005	24.1	8.4		524	8.40					
	14 30	0015	23.5	6.6		523	8.60					
	14 30	0025	22.7	5.2		526	8.40					
	14 30	0035	22.1	3.2		526	8.00					
74/10/02	15 00	0000	16.2	8.4	9	473	8.15	191	0.030	0.500	0.850	0.059
	15 00	0005	16.2	8.4		477	8.19	194	0.030	0.600	0.820	0.057
	15 00	0015	16.1	8.4		477	8.19	194	0.040	0.600	0.840	0.057
	15 00	0028	16.0	8.2		475	8.11	196	0.040	0.900	0.820	0.058

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/11	12 45	0000	0.197	6.3	
	12 45	0005	0.190		
	12 45	0015	0.189		
	12 45	0030	0.191		
74/06/25	14 30	0000		14.4	
74/10/02	15 00	0000	0.110	9.7	
	15 00	0003			1.0
	15 00	0005	0.113		
	15 00	0015	0.121		
	15 00	0028	0.146		

STORET RETRIEVAL DATE 76/05/03

201403
39 26 00.0 096 42 50.0 3
TUTTLE CREEK RESERVOIR
20161 KANSAS

091191

11EPALES 2111202
0027 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/11	13 10	0000	11.3		15	513	8.30	264	0.130	0.800	0.720	0.083
	13 10	0005	11.3	9.8		511	8.25	252	0.150	0.600	0.770	0.087
	13 10	0015	11.4	9.4		516	8.25	264	0.110	0.600	0.660	0.086
	13 10	0022	11.4	9.4		518	8.25	264	0.120	0.500	0.660	0.089
74/06/25	15 05	0000	24.7	6.2	12	507	8.20					
	15 05	0005	24.1	6.0		637	8.40					
	15 05	0015	24.0	6.0		696	8.20					
	15 05	0025	23.9	5.6		792	8.10					
74/10/02	14 30	0000	15.5	8.6	7	487	8.17	202	0.070	1.000	0.740	0.067
	14 30	0005	15.3	8.4		485	8.17	202	0.060	0.700	0.720	0.063
	14 30	0015	15.1	8.2		485	8.17	202	0.060	0.700	0.700	0.064
	14 30	0021	15.1	8.0		487	8.13	202	0.060	0.600	0.700	0.062

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/11	13 10	0000	0.246	34.5	
	13 10	0005	0.229		
	13 10	0015	0.235		
	13 10	0022	0.249		
74/06/25	15 05	0000		5.4	
74/10/02	14 30	0000	0.155	15.8	
	14 30	0002			1.0
	14 30	0005	0.159		
	14 30	0015	0.162		
	14 30	0021	0.161		

APPENDIX E
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/05/04

2014A1
39 15 09.0 096 36 01.0 4
BIG BLUE RIVER
20 7.5 TUTTLE CR DM
O/TUTTLE CREEK RESERVOIR 091191
BANK SAMP AT SE BASE OF TUTTLE CREEK DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/12	09 25		0.860	1.300	0.032	0.060	0.095
74/11/09	09 55		0.780	1.000	0.050	0.050	0.080
74/12/14	09 50		0.704	0.700	0.025	0.050	0.070
75/01/11	10 00		0.480	2.300	0.088	0.020	0.060
75/04/15	11 00		0.575	1.700	0.139	0.030	0.080
75/05/05	10 05		0.870	1.300	0.145	0.060	0.120
75/05/24	10 45		0.910	1.400	0.240	0.075	0.140
75/06/14	09 55		1.600	0.700	0.025	0.100	0.160
75/06/28	10 00		1.720	0.850	0.015	0.120	0.190
75/07/17	12 50		1.650	0.900	0.010	0.130	0.210
75/07/22	09 50		1.650	0.700	0.005	0.145	0.230
75/08/10	15 15		1.800	1.050	0.020	0.150	0.230
	17 05		0.090	1.400	0.025	0.070	0.150
75/09/13	10 45		1.570	1.000	0.030	0.160	0.200

STORET RETRIEVAL DATE 76/05/04

2014A2
39 50 32.0 096 39 40.0 4
BIG BLUE RIVER
20 7.5 MARYSVILLE
T/TUTTLE CREEK RESERVOIR 091191
US HWY 36 BRDG AT W EDGE OF MARYSVILLE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630	00625	00610	00671	00665
FROM	OF		NO2&NO3	TOT KJEL	NH3-N	PHOS-DIS	PHOS-TOT
TO	DAY	FEET	N-TOTAL	N	TOTAL	ORTHO	
			MG/L	MG/L	MG/L	MG/L P	MG/L P
74/10/13	08	50	0.016	1.200	0.060	0.310	0.500
74/11/10	09	30	1.120	2.300	0.260	0.370	0.460
74/12/15	13	10	1.760	0.800	0.090	0.380	0.460
75/01/12	14	10	1.680	3.300	0.336	0.300	0.400
75/02/09	13	40	2.000	2.300	0.304	0.384	0.500
75/03/09	13	15	1.780	2.100	0.472	0.440	0.630
75/04/13	13	40	2.100	1.800	0.360		
75/05/24	10	50	1.800	1.700	0.035	0.375	0.540
75/06/14	10	50	2.900	5.600	0.095	0.315	1.900
75/06/28	13	55	1.650	4.200	0.045	0.345	1.750
75/07/11	13	10	2.800	2.200	0.103	0.425	0.805
75/07/13	13	35	1.450	1.100	0.015	0.430	0.560
75/08/10	15	55	2.200	2.500	0.030	0.460	0.600
75/09/14	14	00	1.650	1.200	0.015	0.400	0.600

STORET RETRIEVAL DATE 76/05/04

2014B1
39 19 30.0 096 45 00.0 4
MILL CREEK
20 RILEY CO HWY MAP
T/TUTTLE CREEK RESERVOIR 091191
HWY 77 BRDG 7 MI S OF RANDOLPH
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/12	12 48		0.224	2.700	0.060	0.020	0.090
74/11/09	09 40		0.690	2.500	0.085	0.230	0.290
74/12/14	09 35		0.504	1.250	0.090	0.015	0.035
75/01/11	09 45		0.760	2.000	0.352	0.060	0.160
75/02/08	09 45		1.350	1.900	0.432	0.152	0.220
75/03/08	15 45		1.035	1.500	0.040	0.044	0.070
75/04/05	09 43		0.175	0.550	0.030	0.020	0.090
75/05/05	10 10		0.525	1.550	0.170	0.070	0.140
75/05/27	14 00		0.500	0.900	0.085	0.110	0.170
75/06/14	10 00		1.900	0.800	0.050	0.120	0.205
75/06/28	09 35		1.880	0.700	0.030	0.030	0.130
75/07/17	12 20		0.945	0.600	0.040	0.035	0.060
75/07/22	09 35		0.770	0.700	0.060	0.010	0.060
75/08/10	15 10		0.420	0.500	0.035	0.020	0.070
75/09/13	09 35		0.670	0.500	0.030	0.050	0.100

STORET RETRIEVAL DATE 76/05/04

2014C1
 39 27 55.0 096 51 15.0 4
 OTTER CREEK
 20 7.5 RANDOLPH
 T/TUTTLE CREEK RESERVOIR 091191
 SEC RD BRDG 4.3 MI ESE OF MAY DAY
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/12	12 20		0.024	1.200	0.025	0.020	0.080
74/11/09	10 15		0.232	1.000	0.045	0.040	0.040
74/12/14	10 05		0.152	1.100	0.020	0.025	0.040
75/03/08	09 40		0.815	1.400	0.044	0.048	0.100
75/04/05	10 20		0.185	1.550	0.030	0.035	0.100
75/05/05	10 40		0.145	1.750	0.100	0.045	0.090
75/05/27	14 35		0.170	1.200	0.055	0.025	0.190
75/06/14	10 30		1.000	1.250	0.060	0.100	0.250
75/06/28	10 10		1.000	0.400	0.025	0.015	0.100
75/07/17	12 45		0.740	0.300	0.020	0.035	0.050
75/07/22	10 00		0.830	1.400	0.045	0.005	0.160
75/08/10	15 30		0.735	0.600	0.070	0.030	0.090
75/09/13	10 00		0.890	1.300	0.060	0.050	0.090

201401
39 29 05.0 096 54 47.0 4
WEST FANCY CREEK
20 7.5 LASITA
T/TUTTLE CREEK RESERVOIR 091191
SEC RD BRDG .6 MI S OF MAY DAY
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/12	12 02		0.504	3.130	0.360	0.010	0.130
74/11/09	10 45		1.200	1.700	0.085	0.080	0.110
74/12/14	10 25		1.440	0.900	0.025	0.015	0.040
75/02/08	10 40		1.600	2.500	0.480	0.120	0.260
75/03/08	09 30		1.935	2.900	0.464	0.128	0.185
75/04/05	10 30		1.570	2.400	0.145	0.210	0.230
75/05/05	11 07		0.575	1.200	0.030	0.050	0.120
75/05/27	15 00		0.450	0.950	0.035	0.025	0.150
75/06/14	11 00		1.900	2.200	0.100	0.115	0.325
75/06/28	10 30		1.570	0.850	0.045	0.050	0.190
75/07/17	13 00		0.200	1.100	0.045	0.020	0.120
75/07/22	16 25		0.145	1.350	0.020	0.015	0.130
75/08/10	15 45		0.360	1.000	0.030	0.020	0.140
75/09/12	10 15		0.840	1.500	0.120	0.075	0.160

STORET RETRIEVAL DATE 76/05/04

2014E1
 39 29 29.0 096 53 05.0 4
 N FORK FANCY CREEK
 20 7.5 LASITA
 T/TUTTLE CREEK RESERVOIR 091191
 UNIMPROVED RD BRDG 1.8 MI E OF MAY DAY
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/12	12 05		0.240	1.900	0.050	0.035	0.102
74/11/09	10 30		1.000	1.300	0.140	0.130	0.160
74/12/14	10 15		1.080	0.600	0.015	0.040	0.050
75/01/11	10 45		0.960	1.500	0.040	0.025	0.040
75/02/08	10 30		1.720	2.250	0.464	0.232	0.315
75/03/08	09 20		1.935	1.350	0.104	0.144	0.190
75/04/05	10 30		1.350	1.900	0.050	0.100	0.240
75/05/05	10 55		0.710	1.450	0.135	0.070	0.150
75/05/27	15 15		0.840	0.850	0.100	0.060	0.190
75/06/14	10 45		2.500	1.600	0.120	0.180	0.310
75/06/28	10 21		2.300	0.600	0.020	0.125	0.190
75/07/17	12 55		1.350	0.550	0.020	0.045	0.110
75/07/22	10 20		1.050	0.800	0.095	0.015	0.090
75/08/10	13 37		0.570	0.575	0.040	0.030	0.070
75/09/13	10 10		1.500	1.900	0.090	0.180	0.290

STORET RETRIEVAL DATE 76/05/04

2014F1
 39 39 44.0 096 48 22.0 4
 COON CREEK
 20 7.5 BARNES
 T/TUTTLE CREEK RESERVOIR 091191
 SEC RD BRDG 3.5 MI SW OF WATERVILLE
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	09 55		0.240	3.200	0.055	0.015	0.135
74/11/10	11 15		0.704	1.500	0.095	0.035	0.110
74/12/15	14 50		0.940	0.500	0.020	0.005	
75/02/09	14 40		1.650	2.300	0.432	0.160	0.330
75/03/09	14 40		1.780	1.100	0.220	0.073	0.110
75/04/13	14 55		0.960	1.800	0.230	0.100	0.210
75/05/18	12 10		0.430	1.500	0.025	0.030	0.185
75/06/14	12 05		1.570	7.300	1.950	0.490	0.750
75/06/29	14 50		1.500	1.050	0.030	0.125	0.210
75/07/13	14 30		0.390	0.600	0.015	0.020	0.110
75/07/27	14 15		0.330	2.500	0.200	0.040	0.130
75/08/10	15 35		0.230	1.700	0.025	0.020	0.130
75/09/14	14 50		1.150	0.900	0.020	0.105	0.210

STORET RETRIEVAL DATE 75/05/04

2014G1
39 46 33.0 096 51 29.0 4
LITTLE BLUE RIVER
20 7.5 HANOVER SE
T/TUTTLE CREEK RESERVOIR 091191
KS HWY 15E BRDG 5 MI N OF BARNES
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	09 24		0.780	1.700			
74/11/10	10 20		1.010	1.200	0.045	0.280	0.375
74/12/15	14 00		1.160	1.200	0.390	0.250	0.330
75/02/09	14 10		1.500	0.400	0.082	0.205	0.260
75/03/09	13 50		1.355	1.675	0.208	0.208	0.395
75/04/13	14 15		0.830	2.100	0.306	0.288	0.580
75/05/18	11 30		0.015	1.550	0.080	0.230	0.320
75/06/14	11 40		1.050	1.500	0.015	0.180	0.400
75/06/29	14 23		1.050	2.600	0.065	0.270	1.100
75/07/13	14 00		0.010	2.800	0.025	0.270	1.050
75/07/27	13 45		2.700	1.750	0.040	0.260	0.540
75/08/10	16 15		0.250	5.200	0.065	0.260	1.850
75/09/14	14 30		0.015	3.150	0.015	0.310	0.580
				1.600	0.010	0.200	0.480

STORET RETRIEVAL DATE 76/05/04

2014H1
 39 49 53.0 096 38 43.0 4
 SPRING CREEK
 20 7.5 MARYSVILLE
 T/TUTTLE CREEK RESERVOIR 091191
 US HWY 77 BRDG .5 MI S OF MARYSVILLE
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	10	38	0.072	1.900	0.035	0.085	0.165
74/11/10	11	45	0.368	1.300	0.470	0.105	0.150
74/12/15	15	30	0.640	1.400	0.020	0.025	0.110
75/01/12	16	00	0.880	0.600	0.016	0.035	0.060
75/02/09	15	15	2.100	2.500	0.232	0.168	0.480
75/03/08	15	15	1.935	1.450	0.224	0.140	0.200
75/04/13	15	25	1.250	1.425	0.145	0.115	0.202
75/05/18	13	00	0.230	1.250	0.025	0.055	0.160
75/06/14	12	40	1.900	4.050	0.092	0.135	0.280
75/06/29	15	30	1.300	0.900	0.015	0.120	0.200
75/07/13	15	10	0.030	0.950	0.030	0.040	0.170
75/07/27	14	40	0.010	1.150	0.020	0.040	0.150
75/09/14	15	30	0.095	1.300	0.010	0.082	0.190

STORET RETRIEVAL DATE 76/05/04

2014J1
39 42 40.0 096 26 30.0 4
MOBIDOUX CREEK
20 7.5 FRANKFORT
T/TUTTLE CREEK RESERVOIR 091191
AT UNIMPROVED CO RD BRDG
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	14 45		0.128	1.500	0.310	0.195	0.330
74/11/10	14 25		0.650	1.600	0.170	0.240	0.350
74/12/15	14 26		0.528	1.100	0.020	0.115	0.170
75/02/09	15 00		1.570	2.000	0.200	0.168	0.360
75/03/09	14 50		1.510	2.400	0.314	0.204	0.380
75/04/13	15 05		1.450	1.700	0.085	0.155	0.310
75/05/18	09 52		0.810	1.300	0.090	0.080	0.280
75/06/14	12 27		2.100	5.100	0.085	0.170	0.350
75/06/29	14 07		0.270	1.600	0.050	0.050	0.290
75/07/12	14 50		0.440	1.200	0.020	0.092	0.225
75/07/29	19 55		0.115	1.650	0.027	0.115	0.310
75/08/09	10 40		0.060	1.400	0.050	0.115	0.320
75/09/14	16 00		0.370	1.600	0.020	0.165	0.285

STORET RETRIEVAL DATE 75/05/04

2014K1
39 41 50.0 096 25 07.0 4
BLACK VERMILLION RIVER
20 7.5 FRANKFORT
T/TUTTLE CREEK RESERVOIR 091191
AT HWY. 99 BRDG DUE S OF FRANKFORT
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	13 35		0.040	2.150	0.775	0.115	0.240
74/11/10	14 15		1.240	2.600	0.110	0.130	0.400
74/12/15	13 40		0.600	0.900	0.025	0.060	0.100
75/02/09	14 40		2.300	2.100	0.432	0.128	0.270
75/03/09	14 30		1.690	2.000	0.304	0.104	0.230
75/04/13	14 55		0.760	1.950	0.120	0.080	0.170
75/05/18	09 40		0.560	1.200	0.040	0.085	0.210
75/06/14	12 19		1.900	4.200	0.075	0.130	0.380
75/06/29	16 55		0.950	1.100	0.030	0.145	0.300
75/07/12	14 10		0.340	1.100	0.045	0.080	0.180
75/07/29	20 20		0.080	0.850	0.020	0.075	0.180
75/08/09	09 50		0.050	0.950	0.025	0.085	0.170
75/09/14	15 25		0.315	1.100	0.035	0.090	0.230

STORET RETRIEVAL DATE 76/05704

2014K2
 39 40 55.0 096 26 30.0 4
 BLACK VERMILLION RIVER
 20 7.5 FRANKFORT
 T/TUTTLE CREEK RESERVOIR 091191
 AT COUNTY ROAD BRIDGE
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	13 20		0.072	2.500	0.420	0.185	0.420
74/11/10	13 40		0.960	2.800	0.150	0.135	0.440
74/12/15	13 50		0.600	1.000	0.040	0.090	0.140
75/02/09	13 45		2.200	2.200	0.360	0.160	0.310
75/03/09	13 45		1.585	1.700	0.336	0.140	0.320
75/04/13	14 15		1.000	2.100	0.075	0.115	0.230
75/05/18	09 07		0.700	1.550	0.060	0.115	0.300
75/06/14	11 51		2.000	3.700	0.240	0.145	0.460
75/06/29	14 40		1.200	1.400	0.025	0.160	0.370
75/07/12	14 00		0.400	1.100	0.025	0.095	0.290
75/07/29	20 10		0.550	1.100		0.095	0.270
75/08/09	09 30		0.100	2.200	0.065	0.140	0.340
75/09/14	15 15		0.345	1.900	0.090	0.140	0.310

STORET RETRIEVAL DATE 76/05/04

2014L1
 39 36 35.0 096 26 10.0 4
 CLEAR FORK
 20 7.5 FRANKFORT SW
 T/TUTTLE CREEK RESERVOIR 091191
 SEC RD BRDG 6.5 MI S OF FRANKFORT
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	14 15		0.040	1.700	0.600	0.025	0.100
74/11/10	14 00		0.672	1.200	0.125	0.085	0.150
74/12/15	14 05		0.336	1.000	0.015	0.010	0.030
75/02/09	14 15		1.400	1.800	0.100	0.096	0.210
75/03/09	14 05		0.955	1.500	0.136	0.048	0.080
75/04/13	14 35		0.470	1.200	0.055	0.035	0.120
75/05/18	09 22		0.430	1.350	0.025	0.030	0.130
75/06/14	12 05		0.920	4.400	0.075	0.055	0.120
75/06/29	15 10		0.770	0.650	0.015	0.030	0.060
75/07/12	14 26		0.570	0.700	0.040	0.005	0.100
75/07/29	20 40		0.300	0.700	0.020	0.010	0.080
75/08/09	10 10		0.220	0.750	0.045	0.025	0.100
75/09/14	15 40		0.850	1.000	0.020	0.090	0.190

STORET RETRIEVAL DATE 76/05/04

2014M1
39 16 29.0 096 33 31.0 4
CEDAR CREEK
20 7.5 TUTTLE CR DM
T/TUTTLE CREEK RESERVOIR 091191
KS HWY 13 1.5 MI NE OF TUTTLE CREEK DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
FROM	OF						
TO	DAY	FEET					
75/07/17	13	00			0.020	0.005K	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2014N1
 39 31 25.0 096 34 35.0 4
 MCINTIRE CREEK
 20 7.5 TUTTLE CR DM
 T/TUTTLE CREEK RESERVOIR 091191
 SEC RD BRDG 3.5 MI W OF JCT KS HWY 13
 11EPALES 2111204
 0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
FROM	OF						
TO	DAY	FEET					
74/10/12	10	55	1.200	2.400	0.040	0.015	0.050
74/11/09	10	30	1.400	1.100	0.045	0.135	0.160
74/12/14	10	15	1.640	0.300	0.015	0.035	0.040
75/02/08	10	20	2.700	0.500	0.030	0.096	0.096
75/03/08	09	30	1.335	1.400	0.028	0.032	0.032
75/04/05	10	30	0.840	0.850	0.075	0.045	0.090
75/05/05	10	35	0.850	0.850	0.045	0.030	0.040
75/05/24	11	20	1.050	0.500	0.035	0.050	0.075
75/06/14	10	27	1.880	0.900	0.060	0.070	0.080
75/06/29	10	32	1.880	0.250	0.015	0.055	0.070
75/07/17	13	20	2.000	0.250	0.025	0.065	0.080
75/07/22	10	26	2.000	1.600	0.030	0.055	0.065
75/08/10	15	50	1.900	0.750	0.090	0.035	0.100
75/09/13	10	00	2.400	0.950	0.030	0.055	0.070

STORET RETRIEVAL DATE 75/05/04

2014P1
39 39 55.0 096 32 20.0 4
CORNDODGER CREEK
20 7.5 BLUE RAPIDS
T/TUTTLE CREEK RESERVOIR 091191
SEC RD BRUG 1.2 MI S OF JCT KS HWY 9
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/13	12 55		0.032	2.400	0.075	0.015	0.110
74/11/10	13 30		0.810	1.200	0.060	0.022	0.110
74/12/15	13 15		0.528	1.000	0.030	0.005	0.020
75/02/09	13 50		2.200	1.600	0.110	0.056	0.120
75/03/09	13 30		1.585	0.800	0.112	0.016	0.050
75/04/13	14 00		0.310	1.300	0.020	0.007	0.040
75/05/18	08 31		0.400	0.850	0.080	0.005K	0.070
75/06/29	14 25		1.100	0.600		0.025	0.060
75/07/12	14 50		0.770	0.750	0.045	0.005K	0.040
75/07/29	19 30		0.165	0.650	0.020	0.005K	0.040
75/08/09	09 14		0.095	2.200	0.050	0.015	0.060
75/09/13	15 00		0.450	0.800	0.035	0.035	0.090

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2014AA PR2014AA P003740
39 50 00.0 096 38 00.0 4
MARYSVILLE
20 7.5 MARYSVILLE
T/TUTTLE CREEK 091191
BLUE RIVER
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE	TIME	DEPTH	00630 NO2&NO3	00625 TOT KJEL	00610 NH3-N	00671 PHOS-DIS	00665 PHOS-TOT	50051 FLOW	50053 CONDUIT
FROM	OF		N-TOTAL	N	TOTAL	ORTHO		RATE	FLOW-MGD
TO	DAY	FEET	MG/L	MG/L	MG/L	MG/L P	MG/L P	INST MGD	MONTHLY
75/10/23	11	00							
CP(T)-			0.050	30.000	9.200	3.600	8.100	0.346	0.346
75/10/23	16	00							

STORET RETRIEVAL DATE 76/05/04

2014AB PR2014AB P001298
 39 41 30.0 096 39 00.0 4
 BLUE RAPIDS
 20 7.5 BLUE RAPIDS
 T/TUTTLE CREEK 091191
 BLUE RIVER
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/03/03	13 45		0.240	43.000	24.000	2.800	14.500	0.166	0.162
75/04/29	07 45		0.100	40.000	28.000	2.300	16.000	0.168	0.175
75/05/13	15 20		0.050	45.000	23.000	4.600	8.100	0.167	0.170
75/06/02	08 00		0.050	30.000	23.000	3.270	4.900	0.162	0.161
75/06/19	10 30		0.150	26.000	15.000	1.850	8.500	0.176	0.187
75/06/30	11 15		0.150	34.000	20.000	0.650	9.400	0.192	0.181
75/07/17	09 30		0.025	31.000	20.000	3.000	9.100	0.158	0.162
75/08/25	14 10		0.100	30.000	22.000	9.200	10.000	0.169	0.171
75/09/22	09 05		0.050	38.500	25.000	3.200	11.500	0.158	0.165
75/10/24	08 25		0.050	44.000	26.000	4.700	12.000	0.184	0.174
75/12/03	10 10		0.025	48.000	30.000	4.100	13.500	0.177	0.175
75/12/22	11 35		0.050	47.000	30.000	3.300	11.500	0.183	0.175

STORET RETRIEVAL DATE 76/05/04

2014GA PR2014GA P000750
 39 42 00.0 096 44 30.0 4
 WATERVILLE
 20 7.5 BARNES
 T/TUTTLE CREEK 091191
 LITTLE BLUE RIVER
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/12	09 10		1.760	23.000	21.000	5.500	6.000	0.067	0.067
75/03/11	09 25		2.640	45.000	17.000	3.300	7.300	0.060	0.060
75/04/16	10 00		1.750	45.000	18.800	2.950	8.200	0.075	0.068
75/04/30	10 30		0.700	46.000	24.000	3.100	13.500	0.083	0.067
75/05/22	08 30		1.100	48.000	22.000	2.100	8.000	0.060	0.004
75/06/12	15 00		0.050	42.500	17.300	6.800	13.000	0.068	0.067
75/07/02	09 00		0.125	39.000	22.000	1.100	6.800	0.067	0.090
75/07/24	13 30		0.100	31.000	20.000	2.200	6.500	0.067	0.075
75/08/13	10 35		0.100	39.000	21.000	1.400	6.500	0.052	0.090
75/09/03	15 50		0.025	40.000	30.000	3.300	9.900		0.090
75/09/23	15 30		0.025	44.000	18.500	2.900	11.500	0.075	0.067
75/10/14	16 00		0.075	36.000	19.500	2.100	12.000	0.060	0.075
75/11/05	08 45		0.150	42.000	21.000	2.500	7.600	0.071	0.067

STORET RETRIEVAL DATE 76/05/04

2014GB PR2014GB P000838
 39 53 05.0 096 53 00.0 4
 HANOVER
 20 7.5 HANOVER WEST
 T/TUTTLE CREEK 091191
 LITTLE BLUE RIVER
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/26	13 30		1.520	61.000	24.000	8.900	18.500		
75/04/03	15 00		0.664	51.000	27.600	9.200	18.500		0.001
75/04/30	14 30		1.450	52.500	22.000	7.900	22.000		
75/06/11	09 30		1.000	33.000	14.000	4.900	7.050		
75/07/08	11 30		0.150	53.000	32.000	8.000	8.800		
75/07/23	15 00		0.075	35.000	21.000	8.800	10.500		
75/08/20	14 00		0.100	44.000	23.000	9.000	23.000		
75/09/03	15 30		0.150	50.000	35.000	8.200	17.500	0.067	
75/09/19	09 00		0.075	58.000	38.000	12.000	15.500		
75/10/15	14 00		0.075	66.000	36.000	12.600	21.000		
75/10/24	15 00		0.200	50.000	31.000	12.000	23.500		
75/12/09	14 00		0.100	74.500	36.000	7.800	22.500		
75/12/22	13 30		0.150	63.000	34.000	10.000	26.000		

STORET RETRIEVAL DATE 76/05/04

2014KA PD2014KA P000296
 39 51 35.0 096 25 40.0 4
 BEATTIE
 20 7.5 AXTELL NW
 T/TUTTLE CREEK RES 091191
 WOLF CREEK
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/22			0.080	29.000		3.900	10.000	0.025	0.028
75/02/28			2.000	52.000	25.000	5.750	7.200	0.028	0.028
75/03/18	10 00		1.440	18.000	11.600	4.100	29.000	0.028	0.028
75/06/25	11 45		1.300	45.000	24.000	1.400	7.600	0.028	0.028
75/07/09	08 30		0.075	27.000	12.000	2.400	5.300	0.028	0.028
75/07/30	09 00		0.025	20.000	0.120	3.700	4.700	0.028	0.028
75/09/04	09 00		0.025	11.500	0.089	2.800	4.200	0.028	0.028
75/09/17	13 00		0.150	10.300	0.280	4.500	5.250	0.028	0.028
75/10/08	13 00		0.075	6.200	0.160	3.050	3.500	0.028	0.028
75/11/12	09 00		0.500	8.500	0.075	2.880	3.600	0.028	0.028
75/12/11	15 00		1.500	12.000	0.055	3.500	4.700	0.028	0.028
76/01/15	14 30		0.850	39.000	12.600	2.800	11.000	0.028	0.028
76/02/17	09 00			16.000				0.028	0.028

STORET RETRIEVAL DATE 75/05/04

2014KB PD2014KB P001060
 39 42 00.0 096 26 00.0 4
 FRANKFORT
 20 7.5 FRANKFORT
 T/TUTTLE CREEK 091191
 BLACK VERMILLION RIVER
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/14	15 00		0.080	2.600	0.271	5.100	5.700	0.108	0.116
75/03/14	11 45		0.160	17.000	0.160	4.300		0.132	0.143
75/04/15	16 00		0.560	4.200	0.080K	0.180	1.600	0.120	0.325
75/05/09	09 00		0.650	11.500	0.160	1.300	2.500	0.120	0.220
75/05/27	14 30		1.150	9.200	0.061	2.900	3.400	0.018	0.200
75/06/16	14 00		0.050	4.300	0.050K	0.860	1.100	0.180	0.300
75/07/08	09 30		0.100	12.500	0.025	2.700	4.100	0.144	0.207
75/07/29	10 00		0.100	14.000	0.025K	1.900	3.000	0.108	0.104
75/08/13	11 30		0.275	13.500	0.110	3.600	4.400	0.120	0.160
75/09/04	09 00		0.175	18.000	0.025K	2.750	4.100	0.144	0.327
75/09/24	08 00		0.875	31.000	0.025	3.500	5.800	0.084	0.155
75/10/15	08 00		1.100	16.000	0.025K	3.850	5.300	0.096	0.205
75/11/10	09 00		1.250	12.500	0.025	4.800	6.100	0.096	0.130

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2014WA TF2014WA P001700
 39 49 30.0 097 02 30.0 4
 WASHINGTON
 20 7.5 WASHINGTON
 T/TUTTLE CREEK 091191
 PEACH CREEK
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/20	11 00		13.800	20.000	5.940	10.000	10.500		
75/03/20	11 00		18.400	2.600	1.500	12.000	12.500		
75/04/22	10 30		25.000	7.450	0.530	13.000	14.000		
75/05/06	09 00		40.000	10.500	0.640	17.300			
75/06/05	09 00		27.000	5.550	0.750	9.000	9.400		
75/10/01	10 30		18.900	2.800	0.056	9.000	9.400		
75/10/16	11 00		19.000	11.000	0.240	10.500	12.000		
75/11/12	10 30		21.000	8.700	0.075	10.000	12.000		
75/11/19	09 30		27.000	5.000	0.510	12.600	13.500		
75/12/03	09 00		22.000	7.600	0.440	11.000	13.000		
75/12/09	13 30		17.600	14.000	1.650	10.000	13.000	0.002	
75/12/23			16.000	15.000	3.600		12.500		

STORET RETRIEVAL DATE 76/05/04

2014XA TF2014XA P000514
 39 52 00.0 096 15 00.0 4
 AXTELL
 20 7.5 AXTELL
 T/TUTTLE CREEK 091191
 VERMILLION
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/04/14	13 00		3.750	28.000	11.000	6.000	11.000		
75/05/14	08 30		28.000	5.800	0.050K	3.750	9.900		
75/06/13	08 30		4.200	19.000	5.500	3.700	6.100		
75/07/09	09 15		22.000	9.200	0.025K	7.500	12.000		
75/09/17	09 00		22.000	17.500	2.100	11.000	12.000		
75/10/15	10 30		28.000	15.000	0.830	9.500	12.500		
75/11/19	11 05		0.150	50.000	28.000	3.500	11.000		
75/12/03	10 30		0.350	45.000	21.000	2.200	10.500		
76/01/20	15 10		2.630	43.000		3.450	14.000		

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2014YA AS2014YA 2-000145
 39 26 00.0 096 45 00.0 4
 RANDOLPH
 20 7.5 RANDOLPH
 T/TUTTLE CREEK 091191
 PEACH CREEK
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/04/15	11 00								
CP(T)-			0.400	8.800			5.000		
75/04/15	16 00								
75/05/20	08 00								
CP(T)-			0.050	13.500	0.570	1.550	8.000		
75/05/20	16 00								
75/06/18	08 00								
CP(T)-			4.000	5.400	0.050K	3.800	5.200		
75/06/18	17 00								
75/07/20	08 00								
CP(T)-			0.025	3.200	0.030	2.400	7.700		
75/07/20	17 00								
75/08/19	08 00								
CP(T)-			0.050	26.000	8.200	1.200	8.000	0.012	0.010
75/08/19	16 00								
75/09/17	08 30								
CP(T)-			0.025	23.500	7.300	1.150	7.200	0.013	0.015
75/09/17	19 30								
75/10/26	08 30								
CP(T)-			3.000	31.000	6.000	2.200	10.500	0.012	0.013
75/10/26	15 00								
75/11/23	09 00								
CP(T)-			9.200	11.000	0.380	5.400	7.800	0.001	
75/11/23	15 00								
75/12/24	08 00								
76/01/18	08 00								
CP(T)-				17.000		1.800	7.650	0.005	0.006
76/01/18	15 00								
76/02/13	08 00								
CP(T)-				19.000			8.600	0.005	0.005
76/02/13	15 00								
76/03/21	08 00								
CP(T)-				23.000			9.800	0.010	0.009
76/03/21	17 00								

K VALUE KNOWN TO BE
 LESS THAN INDICATED

STORET RETRIEVAL DATE 76/05/04

2014ZA TF2014ZA P000485
 39 43 00.0 096 59 00.0 4
 GREENLEAF
 20 7.5 GREENLEAF
 T/TUTTLE CREEK 091191
 UNNAMED STREAM
 11EPALES 2141204
 0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/02/24	15 00		7.360	22.000	5.125	3.700	9.000		
75/04/07	14 00		11.050	26.000	4.400	2.240	10.500		
75/05/19	13 00		11.000	31.000	9.100	5.600	12.500		
75/06/10	13 30		4.300	27.500	10.000	4.000	10.500		
75/06/25	13 45		10.000	24.000	1.200	2.600	11.500		
75/08/05	10 00		0.675	24.000	6.200	4.900	7.900		
75/09/16	13 00		20.000	4.700		7.500	8.000		
75/10/08	13 30		23.000	9.700		8.400	8.700		
75/10/24	13 00		3.400	37.000	18.000	8.500	12.500		
75/11/06	13 30		27.000	25.000		7.800	5.300		
75/12/05	13 30		14.700	23.000	7.050	8.950	13.000		
75/12/09	13 30		24.000	16.000	3.000	10.000	11.500		