UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

QUALITY OF WATER IN TIBBEE CREEK AND TRIBUTARIES NEAR WEST POINT, MISSISSIPPI

Open-File Report 81-406

Prepared in cooperation with the

Mississippi Department of Natural Resources
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Jackson, Mississippi
1981

UNITED STATES DEPARTMENT OF THE INTERIOR
JAMES G. WATT, Secretary
GEOLOGICAL SURVEY
Doyle G. Frederick, Acting Director

For additional information write to:

U.S. Geological Survey
Water Resources Division
100 West Capitol Street, Suite 710
Jackson, MS 39201

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

Factors for converting inch-pound units to metric units are shown below to four significant figures. In the text, metric equivalents are shown only to the number of significant figures consistent with the accuracy of analytical determinations or measurement.

Multiply	By	To obtain
inch (in)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)

Throughout this report water temperatures are reported in degrees Celsius. These temperatures may be converted to the Farenheit equivalent with the following formula:

$$°F=9/5\ (°C)+32$$

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level". NGVD of 1929 is referred to as sea level in this report.

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ABSTRACT

An intensive water-quality study was conducted on Tibbee Creek and two of its tributaries, Town Creek and Catalpa Creek, on June 19-22, 1979. The data were collected during a period of low discharge and high air temperatures. The water in Tibbee Creek and Catalpa Creek was of much better quality than water in Town Creek.

Large quantities of nitrogen, phosphorus, and dissolved solids and high densities of fecal coliform were present in Town Creek. The five-day biochemical oxygen demand values averaged 14 mg/L, and the mean total nitrogen concentration was 56 mg/L. The mean concentrations of ammonia, nitrate plus nitrite nitrogen, and organic nitrogen were 1.8 mg/L, 50 mg/L, and 3.7 mg/L, respectively.

A total phosphorus load of more than 400 pounds per day, more than 91 percent of the total phosphorus load leaving the study area, was carried by Town Creek into Tibbee Creek. Total phosphorus concentrations averaged 14 mg/L in Town Creek and 0.11 and 0.12 mg/L in Tibbee and Catalpa Creeks respectively.

Bacterial densities were higher at site 2 in Town Creek than at sites 1 and 3 in Tibbee and Catalpa Creeks respectively. The median fecal coliform bacterial density was 25,000 col/100 mL (colonies per 100 milliliters) in Town Creek and less than 200 col/100 mL in Tibbee and Catalpa Creeks. Median fecal streptococcal densities were 1,000 col/100 mL in Town Creek, 210 col/100 mL in Tibbee Creek, and 800 col/100 mL in Catalpa Creek.

Fecal coliform to fecal streptococcal ratios were greater than 4.0 in Town Creek, indicating wastes of human origin were probably present during the study. Ratios were less than 0.7 in Tibbee and Catalpa Creeks, indicating human wastes were probably absent during the study.

INTRODUCTION

Freshwater is one of the major resources of the State of Mississippi. There is a need for a comprehensive management plan for efficient utilization and conservation of this resource. The Mississippi Department of Natural Resources, Bureau of Pollution Control, has been designated the responsibility for developing a statewide waste-treatment management program.

The U.S. Geological Survey, in cooperation with the Bureau of Pollution Control, is providing hydrologic data necessary for determining the waste-assimilation capacity of various freshwater and tidal streams in the state. The hydrologic data presented in this report is intended for use in developing a comprehensive long-range plan for effective management of water resources.

DESCRIPTION OF STUDY AREA

General Location

The water quality study on Tibbee Creek and tributaries was conducted in the vicinity of West Point, Mississippi. West Point is located in southern Clay County in the northeastern section of the state. A sampling site was located on Tibbee Creek at the U.S. Geological Survey gaging station, approximately 0.75 mile north of Tibbee, and on the two tributaries--Town Creek, 1.5 miles south of West Point, and Catalpa Creek, approximately 4.0 miles east of Tibbee. The location of the study area and the sampling sites are shown in figure 1.

Cultural Features

West Point, Starkville, and Columbus make up the golden triangle area of Mississippi; one of the larger trade and population centers in the northeastern part of the state. The Chamber of Commerce estimated the 1979 population of West Point to be 10,000 people, an increase of 13 percent from 1970. A moderate increase in population occurred between 1960 and 1970 following an increase of 24 percent from 1950 to 1960. The population of Clay County has fluctuated through the years with a slight decline taking place from 1960 (18,933) to 1970 (18,840).

Manufacturing jobs make up a large portion of the total employment in West Point. A variety of products such as clothing, steel products, aluminum cans and boats, and meat products are produced. The area also supports a large agricultural industry concentrated in the upland areas.

Topography and Geography

The study area lies within the Black Prairie physiographic district developed on Upper Cretaceous chalks. Underlying geologic materials are mainly marl, sandstone, sand, clay, and limestone. Pleistocene terraces, composed of sand and clay, form low hills and ridges north of Tibbee Creek. A wide alluviated bottomland has formed along Tibbee Creek.

The topography of the Black Prairie district in the study area is generally flat or gently rolling. In areas of flat land, prairies have developed and are now used mainly for agricultural purposes. A forest of water oak, willow oak, cherrybark oak, several species of hickory, sweetgum, cypress, and river birch cover the broad bottomlands.

The altitude of the study area above sea level ranges from 160 to 180 feet in the bottomlands to approximately 250 feet along the bordering hills and ridges.

Climate

The climate of the study area is temperate to subtropic, influenced by the Gulf of Mexico to the south and the continental land mass to the north. Occasional heavy general rains caused by tropical disturbances or hurricanes fall in the Tibbee Creek basin. However, the heaviest

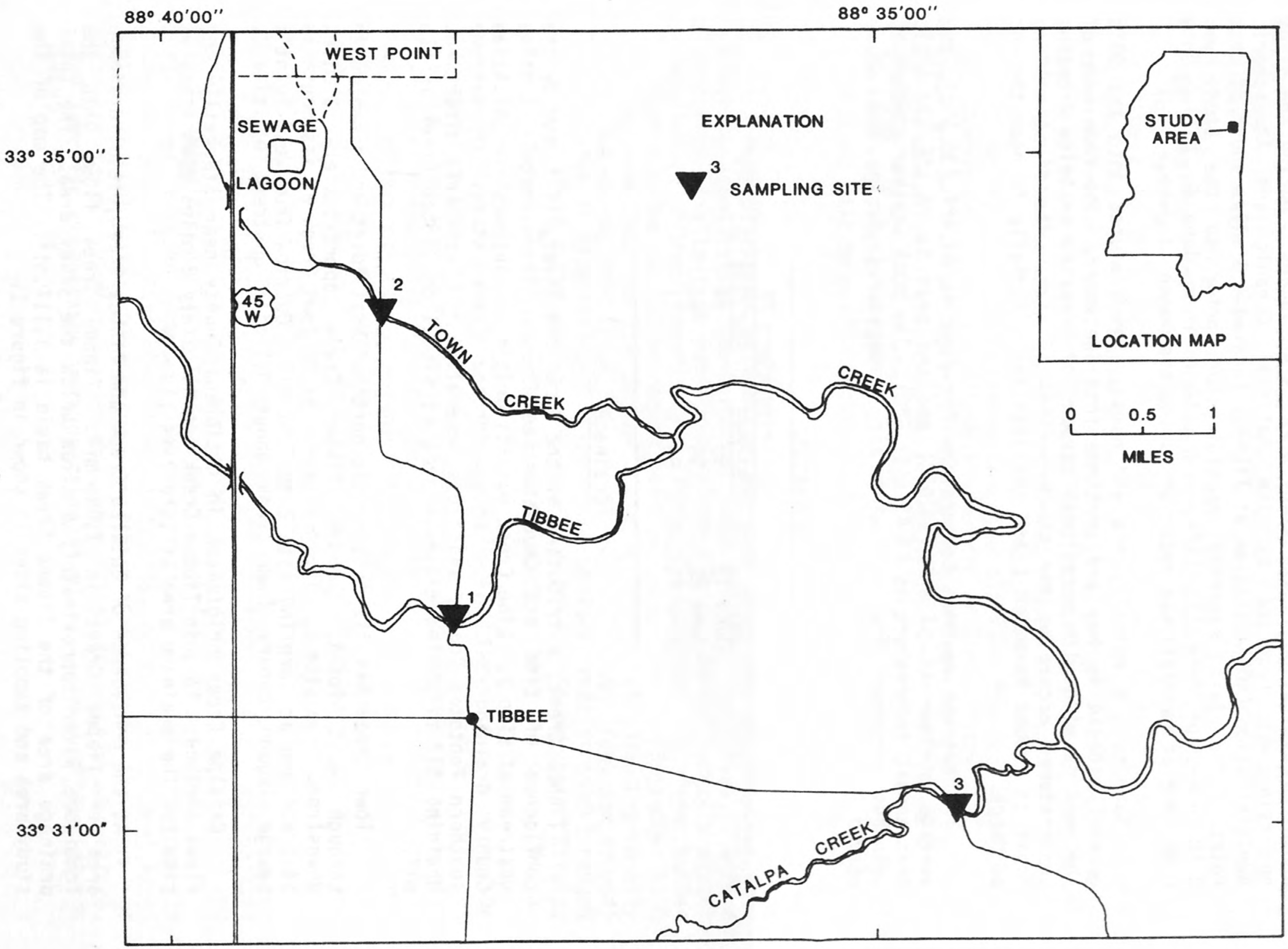

FIGURE 1.--STUDY AREA, WATER-QUALITY SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-22, 1979.

rainfall, in terms of intensity, comes from local summer thunderstorms. October normally is the driest month and March the wettest. The average annual precipitation in the study area is 48 inches. During the study no rain was recorded by the National Oceanic and Atmospheric Administration (NOAA) station at Tibbee, located 4.5 miles south of West Point. The last recorded precipitation prior to the study was 0.10 inches on June 11, 1979, and 0.18 inch on June 6, 1979. Only 0.98 inch of rainfall was recorded during the month of June.

Summers are normally hot and humid. Temperatures into the 90's generally begin in May and continue into September. The remainder of the year is mild with occasional periods of freezing or below freezing temperatures occurring for short periods of time. The first killing frost is around November 1 and the last frost normally is near the end of March.

The average maximum temperature for June is 87.4°F (30.5°C), the average minimum is 64.8°F (18.0°C) and the mean is 76.1°F (24.5°C). Mean annual temperature is 63.4°F (17.5°C). The NOAA weather station at Columbus recorded the following air temperatures during the study period.

Date	Temperature °F	
	Maximum	Minimum
June 19	93	64
June 20	94	66
June 21	93	71

Drainage

Tibbee Creek, a tributary of the Tombigbee River, is formed by the confluence of Line and Chuquatonchee Creeks, approximately 6 miles upstream of site 1. Line Creek has its origin in southwestern Chickasaw County draining 387 mi². Chuquantonchee Creek starts in extreme southern Pontotoc County and flows generally in a southerly direction, draining 517 mi². The drainage area at site 1 on Tibbee Creek is 925 mi².

Town Creek has its origin just north of West Point and flows south through West Point, joining Tibbee Creek approximately 2 miles downstream from site 1. The drainage area of Town Creek at its mouth is 14.1 mi² and at sampling site 2 is 7.52 mi². Outflow from West Point's sewage lagoon enters Town Creek about 0.5 mile upstream of site 2.

Catalpa Creek originates in Oktibbeha County near Starkville and flows northeast to join Tibbee Creek approximately 8 miles downstream of site 1. The drainage area at site 3 is 118 mi².

At the confluence of Catalpa Creek and Tibbee Creek, total drainage area of Tibbee Creek is 1,088 mi². Tibbee Creek flows into the Tombigbee River approximately 6 miles below the study area. The total drainage area of the Tibbee Creek basin is 1,117 mi². The map of the study area and sampling sites is shown in figure 1.

The stream channels at all three sites have a similar form. The channel of Tibbee Creek at site 1 is approximately 35 to 45 feet wide with high, steep banks covered with heavy vegetation. The bottom of the channel is firm, made up of hard chalky material and covered with rubble. A similar type channel was found on Catalpa Creek. However, the banks were not as high as the banks on Tibbee Creek. The channel at site 3 was approximately 40 feet wide with a steep left (north) bank and a right bank which had a more gradual slope. The channel of Town Creek at site 2 was 10 to 15 feet in width with steep banks 3 to 5 feet in height. The stream bottom was smooth and sandy. The water depth at the time of the study was approximately 0.5 feet in Town and Catalpa Creeks and less than 1.5 feet in Tibbee Creek. Cross sections of the stream channel at the sampling sites are shown in figure 2.

A reservoir will be formed when the gates of the lock and dam on the Tombigbee River at Columbus are closed in January 1981. The reservoir will extend up the Tibbee Creek basin through the study area. At the normal pool elevation (163 ft above sea level) the water will be 6.5 feet higher than during the study at site 1 on Tibbee Creek. The reservoir will also affect stages at site 3 on Catalpa Creek. Site 2 on Town Creek will be unaffected.

STREAMFLOW

Stream discharge at each of the sampling sites was computed from discharge and stage measurements made during the study. Stream discharge at site 1 is published in the U.S. Geological Survey's annual reports as Tibbee Creek near Tibbee, Mississippi (station number 02441000). The period of record is from August 1928 to September 1930 and October 1939 to the present. The discharge at site 1 gradually decreased during the study from 74 to 57 ft^3/s (cubic feet per second) with a mean of 67.6 ft^3/s. The discharge of Town Creek at site 2 ranged from 4.6 to 6.0 ft^3/s with a mean of 5.6 ft^3/s. Discharge of Catalpa Creek at site 3 averaged 3.6 ft^3/s and ranged from 3.0 to 3.7 ft^3/s.

The estimated 7-day Q_2 and Q_{10} (minimum 7day average flow with 2 or 10 year recurrence interval) is 0.06 and 0.0 ft^3/s, respectively, at site 1 (Tharpe, 1975, p. 26). Discharge data are not available for determining the 7-day Q_{10} at site 2 and 3, but it is estimated that it would be zero at both sites unless maintained artificially. Town Creek receives sewage and industrial wastewater inflows, and during the drier months the flow will be determined by the quantity of this inflow.

WATER-QUALITY DATA COLLECTION AND ANALYSIS

The descriptions of water quality in Tibbee, Town, and Catalpa Creeks in this report are based on chemical, physical, and bacteriological analysis of samples collected at 6-hour intervals and field measurements made at 3-hour intervals at each site from June 19 through June 21. Estimates of water quality, based on water quality at the sampling sites, were made for Tibbee Creek below the mouth of Catalpa Creek. Continuous monitors for dissolved-oxygen, temperature, and specific conductance were operated at sites 1 and 3 throughout the study.

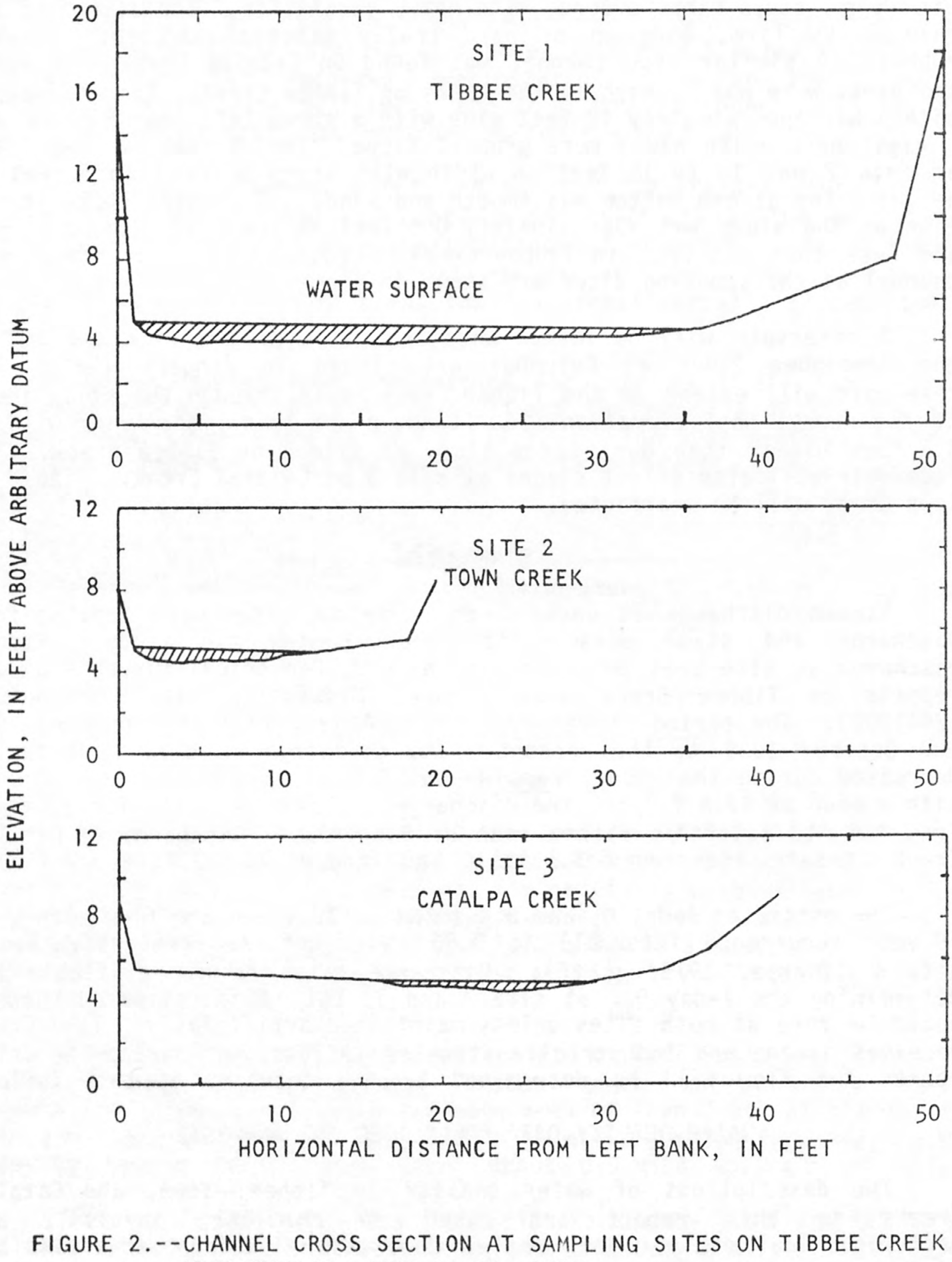

FIGURE 2.--CHANNEL CROSS SECTION AT SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-20, 1979.

The 5-day biochemical oxygen demand (BOD_5) and fecal bacteria count were determined in the U.S. Geological Survey Mobile Laboratory temporarily located in West Point. Samples for the other water-quality parameters were analyzed by the U.S. Geological Survey National Water Quality Laboratory in Atlanta, Georgia. Results of all measurements and analysis are given in tables 1-3.

WATER-QUALITY CHARACTERISTICS

General Composition

The overall quality of the water of Tibbee and Catalpa Creeks is acceptable for most uses. The water is moderately hard to hard and low in color. Analysis of samples from Town Creek indicate that water in this stream is not of suitable quality for most uses. Town Creek had high concentrations of all nitrogen species, phosphorus, dissolved solids, and fecal coliform bacteria during the study.

The concentration of iron in Tibbee Creek was at the Environmental Protection Agency (1976, p. 78) recommended limit (0.3 mg/L) for public water supplies. However, this concentration is not considered toxic to fish and wildlife. The concentrations of insecticides, herbicides, trace elements, and PCB (polychlorinated biphenols) in samples collected from Tibbee and Catalpa Creeks were low or below detectable limits.

Specific Conductance

Specific conductance is a measure of the ability of water to conduct an electrical current and is reported in micromhos per centimeter (umhos/cm) at 25°C. This property is a function of the amount and kind of mineral matter in solution and can be used to estimate the dissolved-solids concentration of the water.

Ratios of dissolved-solids concentration to specific conductance of water samples collected during this investigation suggest that dissolved-solids concentrations may be estimated by multiplying the specific conductance by 0.60 at sites 1 and 3 and by 0.65 at site 2. Specific conductance of samples ranged from 260 micromhos at site 1 on Tibbee Creek to 1,600 micromhos at site 2 on Town Creek. Hence dissolved-solids concentrations ranged from about 156 mg/L in Tibbee Creek to about 1,040 mg/L in Town Creek.

The specific conductance remained fairly constant at sites 1 and 3 ranging from 260 to 285 umhos at site 1 and from 440 to 500 umhos/cm at site 3. At site 2 the specific conductance ranged from 1,380 to 1,600 umhos/cm. The mean specific conductance was 273 umhos/cm at site 1, 482 umhos/cm at site 3 and 1,489 umhos/cm at site 2. Specific conductance varied at site 2 between 100 and 200 umhos/cm each day reaching a maximum value at 1500 to 2400 hours. During this period of time, a similar variation in discharge also took place. A graph of discharge and specific conductance for site 2 and specific conductance for all sampling sites in shown in figure 3.

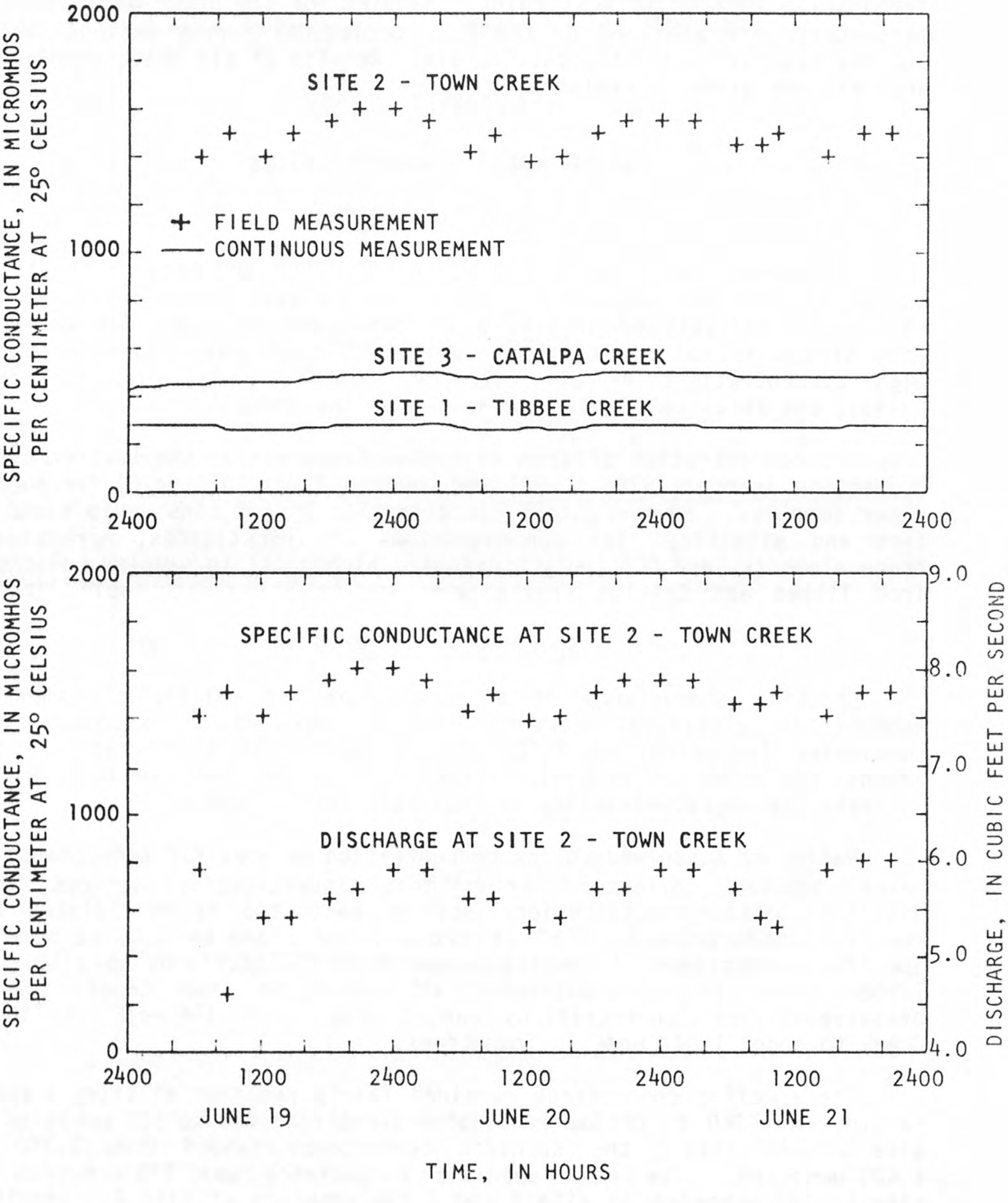

FIGURE 3.--SPECIFIC CONDUCTANCE AT SAMPLING SITES AND DISCHARGE AT SITE 2 ON TOWN CREEK, JUNE 19-21, 1979.

Based on the specific conductance measurements, the average dissolved-solids load in Tibbee Creek entering the study area was estimated to be 30.6 tons/d (tons per day) during the study period. Town Creek contributed an estimated average dissolved solids load of 14.6 tons/d to Tibbee Creek. Approximately 2.8 tons/d of dissolved solids were contributed by Catalpa Creek, making the average dissolved-solids load in Tibbee Creek immediately below the junction with Catalpa Creek 48 tons/d. Thus, Town Creek contributed approximately 30 percent of the total dissolved solids while only contributing 8 percent of the discharge in Tibbee Creek. Catalpa Creek contributed 6 percent of the total dissolved solids and 4 percent of the discharge.

Water Temperature

The stream temperature at site 1 on Tibbee Creek averaged 27.5°C and ranged from 25.0°C to 28.5°C. The stream temperature at site 2 ranged from 23.0°C to 34.5°C with a mean of 27.0°C. At site 3 the temperature ragned from 23.0°C to 28.0°C and averaged 26.5°C. Stream temperatures at all these sites reached a maximum in the afternoon and a minimum in the early morning. Daily changes in temperatures on Town Creek, however, were larger and more rapid than those on Catalpa and Tibbee Creeks. The maximum stream temperature at site 2 were higher than at sites 1 and 3. A graph showing stream temperatures at the sampling sites is shown in figure 4.

pH - Hydrogen Ion Activity

The pH of water is a measure of the hydrogen ion activity of that water. Pure water at 25°C has a pH of 7.0. Water with pH values less than 7.0 are acidic. Water with a pH greater than 7.0 is basic. The pH of most streams in Mississippi that are not influenced by pollution generally is between 6.5 and 8.5.

The pH of water in Tibbee Creek at site 1 remained fairly uniform, ranging from 7.4 to 7.8 (table 1). The pH at site 3 on Catalpa Creek ranged from 8.1 to 8.3. The pH at site 2 on Town Creek changed slightly during the day and reached a maximum in the afternoon. The minimum pH occurred between 0300 and 0600 hours. The range of pH at site 2 was 7.4 to 8.2. The median pH was 7.6 units at both sites 1 and 2, with a median pH of 8.1 at site 3.

Dissolved Oxygen

Dissolved oxygen is an essential element in many of the chemical and biological processes in a stream. Oxygen is required to support most types of organisms present in the aquatic environment. Streams with large loads of organic materials may have oxygen-consuming organic or inorganic reactions that reduce the level of dissolved oxygen to levels that are unfavorable for most aquatic organisms. Large populations of algae may cause an increase in dissolved-oxygen concentration during the day. Thus, dissolved-oxygen content is an indication of the status of the water with respect to the balance between oxygen consuming and oxygen producing processes at the moment of sampling (Hem, 1970).

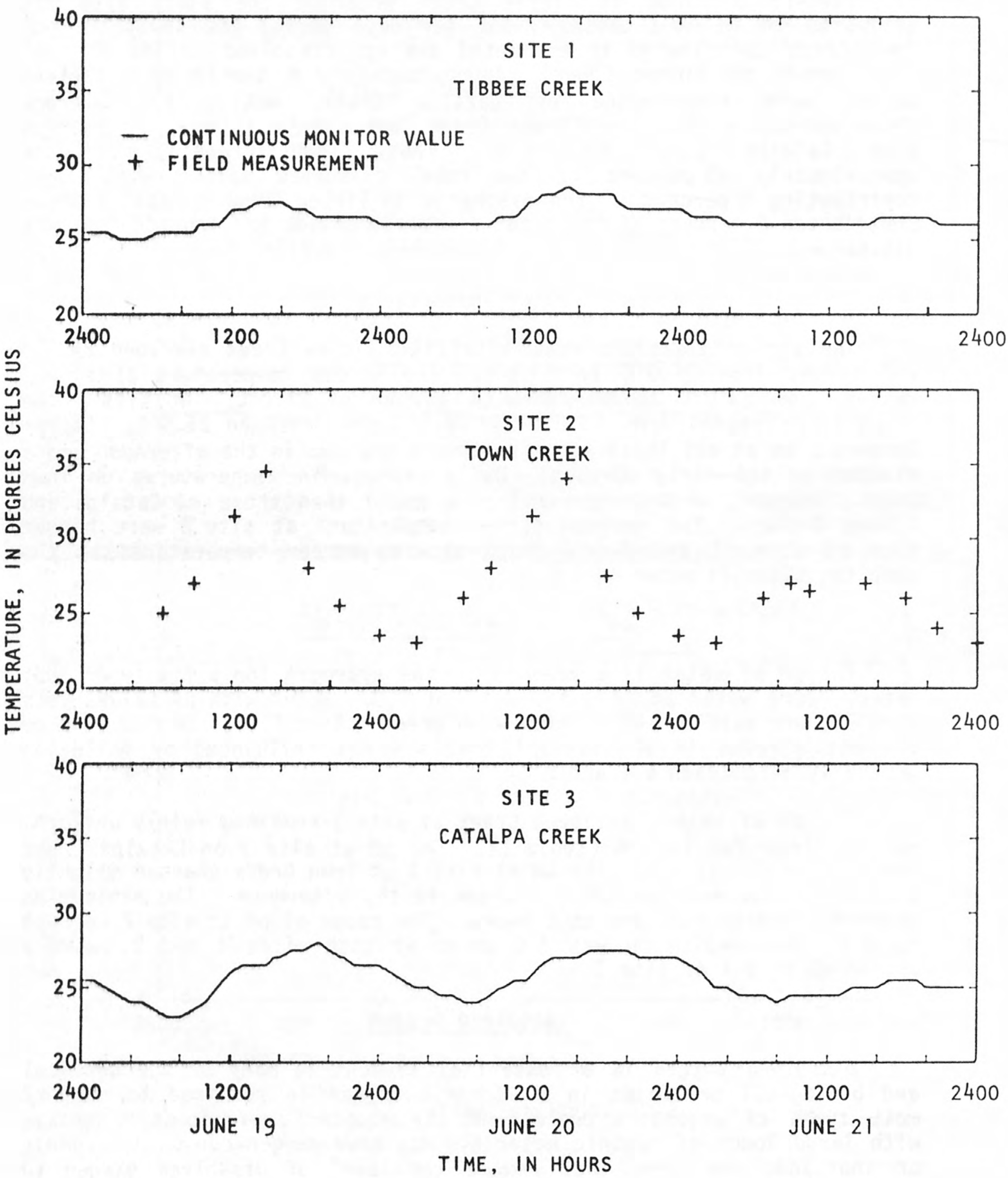

FIGURE 4.--STREAM TEMPERATURE AT SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-21, 1979.

The concentration of dissolved oxygen varied in a diurnal pattern at all sites throughout the study (fig. 5). Dissolved oxygen increased to a maximum in the afternoon at approximately 1500 hours and decreased to the minimum concentration during the night. The decrease in dissolved-oxygen concentration at night was probably due to decomposition processes at a time when oxygen was not being produced by algae.

The concentration of dissolved oxygen in Tibbee Creek at site 1 ranged from 5.8 mg/L to 7.6 mg/L with a mean of 6.9 mg/L. Catalpa Creek at site 3 had dissolved-oxygen concentrations in somewhat of a larger range of 6.1 to 8.8 mg/L. The mean was 7.4 mg/L. Town Creek at site 2 exhibited comparatively large changes in dissolved oxygen with a range of 4.3 mg/L to 9.9 mg/L and a mean of 6.4 mg/L. The wide range in dissolved oxygen at site 2 was probably due to the large population of algae. The water at site 2 was observed to be green in color and to have a high level of suspended solids. During the night, dissolved-oxygen concentrations dropped below the recommended minimum daily average of 5 mg/L (Mississippi Department of Natural Resources, 1977).

Biochemical Oxygen Demand

Biochemical oxygen demand (BOD_5) is the amount of oxygen used by biological activity at 20°C for a period of five days. The BOD_5 is commonly used to estimate the organic load of the stream. Natural, unpolluted streams carry a residual organic load of 0.5 to 1.0 mg/L of BOD_5. During high runoff this amount may increase to 1.0 to 2.0 mg/L or higher (Velz, 1970). Industrial and municipal effluents may also increase the BOD_5 load.

The oxygen demand was fairly low and did not exceed 1.9 mg/L at sites 1 and 3. However, the BOD_5 at site 2 was consistently higher throughout the study period. The mean BOD_5 value at site 2 was 14 mg/L, with a range from 12 to 16 mg/L. Site 1 on Tibbee Creek had a mean BOD_5 value of 1.5 mg/L and a range of 1.2 to 1.9 mg/L. A slightly lower mean of 1.0 mg/L was observed at site 3 on Catalpa Creek. The range at site 3 was 0.6 to 1.7 mg/L. The maximum, mean, and minimum BOD_5 concentrations are given in figure 6.

Inflow from Town Creek contributes a BOD_5 load of 424.0 lbs/d (pounds per day) to Tibbee Creek. This compares to a BOD_5 load of 545.8 lbs/d entering the study area at site 1. Catalpa Creek added a BOD_5 load of 19.0 lbs/d during the study period. Thus, Town Creek which receives wastewater effluent contributes 43 percent of the total BOD_5 load.

Nitrogen Compounds

Nitrogen is one of the major nutrients which affects the quality of freshwater. Total nitrogen is reported as the sum of three species of nitrogen: ammonia nitrogen, nitrite plus nitrate nitrogen, and organic nitrogen. The total nitrogen concentrations at site 1 on Tibbee Creek

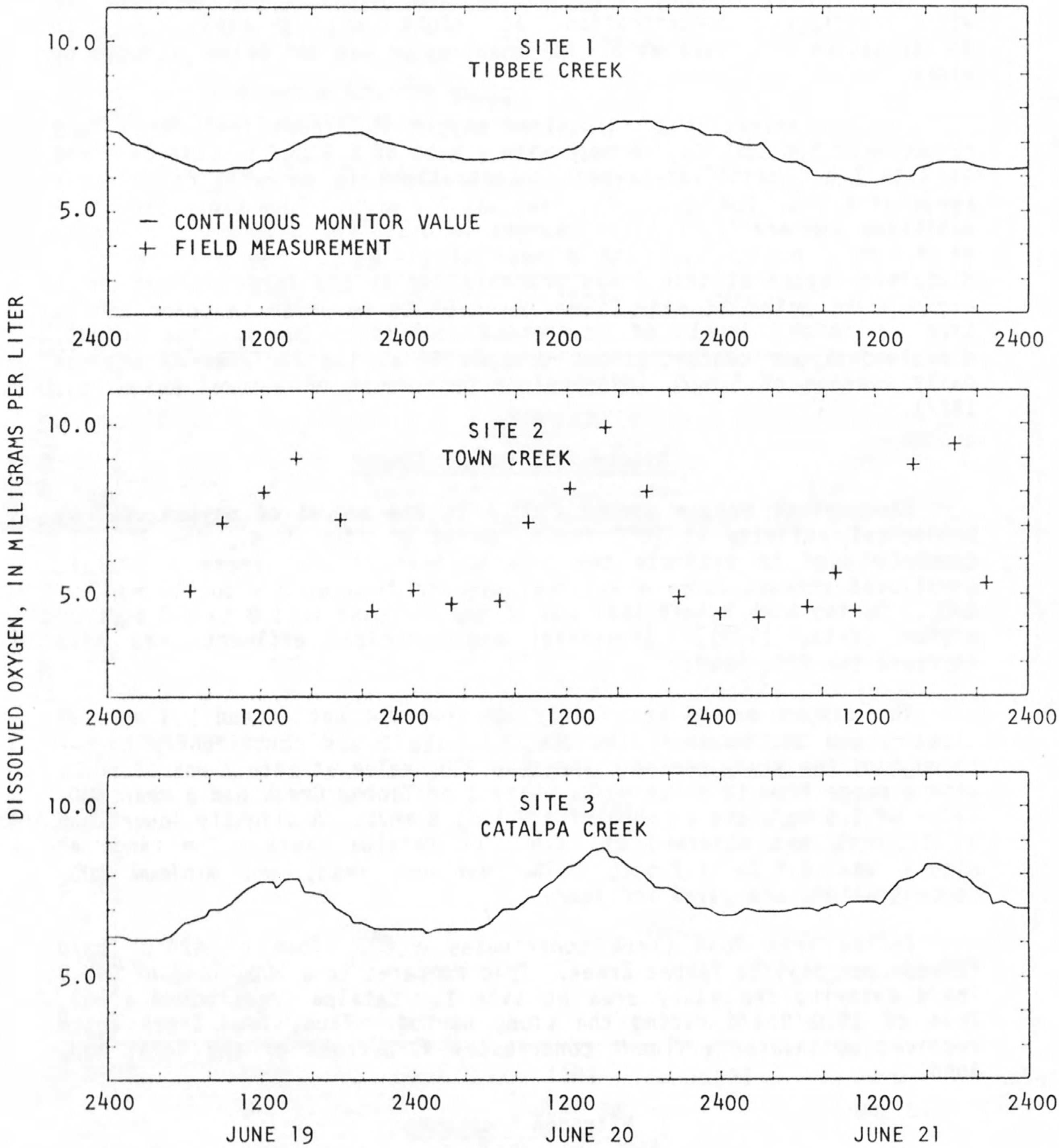

FIGURE 5.--DISSOLVED-OXYGEN CONCENTRATION AT SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-21, 1979.

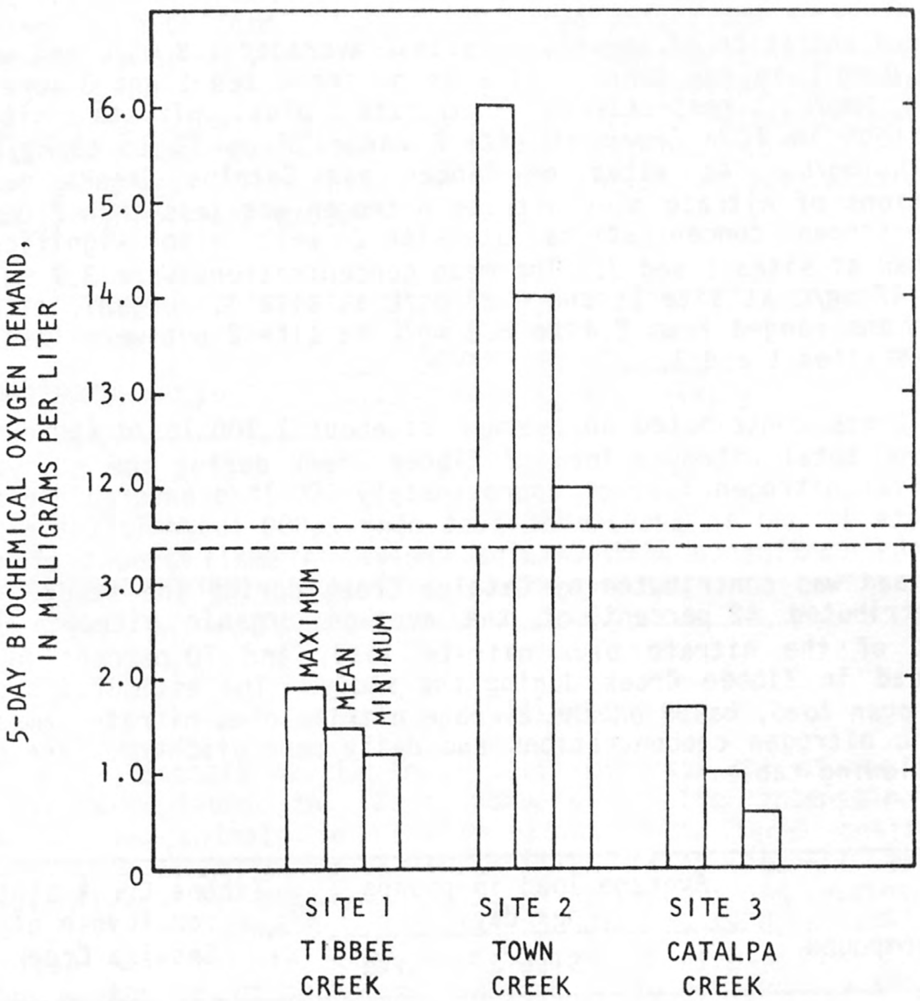

FIGURE 6.--BOD_5 AT SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-22, 1979.

and at site 3 on Catalpa Creek were less than 2.3 mg/L. However, the total nitrogen concentration at site 2 was much higher than at sites 1 and 3 averaging 56.0 mg/L. The minimum total nitrogen concentration at site 2 was 34 mg/L and the maximum concentration was 63 mg/L. The mean total nitrogen concentrations at Tibbee and Catalpa Creeks were 0.79 mg/L and 0.50 mg/L respectively.

The concentration of ammonia at site 2 averaged 1.8 mg/L and was as high as 6.0 mg/L in one sample. The means for sites 1 and 3 were 0.06 and 0.04 mg/L, respectively. Nitrate plus nitrite nitrogen concentrations in Town Creek at site 2 ranged from 30 to 59 mg/L and averaged 50 mg/L. At sites on Tibbee and Catalpa Creeks maximum concentrations of nitrate plus nitrite nitrogen was less than 2.0 mg/L. Organic nitrogen concentrations at site 2 were also significantly greater than at sites 1 and 3. The mean concentrations were 3.7 mg/L at site 2; 0.42 mg/L at site 1; and 0.38 mg/L at site 3. Organic nitrogen concentrations ranged from 2.4 to 8.3 mg/L at site 2 but were less than 0.7 mg/L at sites 1 and 3.

Town Creek contributed an average of about 1,700 lbs/d (pounds per day) to the total nitrogen load of Tibbee Creek during the study. An average total nitrogen load of approximately 300 lb/d entered the study area at site 1, and an average of just over 2,000 lbs/d left the study area at the confluence with Catalpa Creek. A small amount of total nitrogen load was contributed by Catalpa Creek during the study. Town Creek contributed 42 percent of the average organic nitrogen load, 92 percent of the nitrate plus nitrite load, and 70 percent of the ammonia load in Tibbee Creek during the study. The estimated average total nitrogen load, based on the average nitrite plus nitrate, ammonia, and organic nitrogen concentrations and daily mean discharge, are given in the following table:

Nitrogen compound	Average load in pounds per day			Tibbee Creek at the confluence of Catalpa Creek
	Site 1	Site 2	Site 3	
Organic nitrogen	160	120	8	288
Nitrite plus nitrate nitrogen	120	1,520	2	1,642
Ammonia nitrogen	22	54	1	77
Total nitrogen	302	1,694	11	2,007

Phosphorus

Phosphorus is the least abundant of the major nutrients required for biological productivity. Phosphorus is usually reported as total and orthophosphate. Total phosphorus concentrations at site 1 on Tibbee Creek and site 3 on Catalpa Creek were less than 0.15 mg/L and were within the range of concentrations observed in other natural streams in the state. The concentration of total phosphorus at site 2 on Town Creek was much greater than at sites 1 and 3. The mean total phosphorus concentration was 14 mg/L, almost 100 times the mean concentrations at sites 1 and 3. The orthophosphate averaged 11 mg/L and ranged from 5.0 to 14 mg/L. The total phosphorus concentrations at site 2 ranged from 12 to 19 mg/L.

Tibbee Creek carried an average total phosphorus load of 40 lbs/d at site 1. About 50 percent of this load (20 lbs/d) was in the orthophosphate form. Town Creek added an average of 423 lbs/d of total phosphorus or 91 percent of the total phosphorus load leaving the study area. About 78 percent of the phosphorus leaving the study area was in the orthophosphate form and most of that originated from Town Creek. Less than one percent of the total phosphorus load was contributed by Catalpa Creek. The following table shows the estimated average total and orthophosphate phosphorus loads.

Phosphorus compound	Average load in pounds per day			Tibbee Creek at the confluence with Catalpa Creek
	Site 1	Site 2	Site 3	
Orthophosphate phosphorus	29	332	2	363
Total phosphorous	40	423	2	465

Bacteria

The bacteria of the fecal coliform group and of the streptococcus group are found in large numbers in the intenstinal tracts of warmblooded animals in varying ratios. The fecal coliform to fecal streptococcal ratio for various animals are as follows: man, 4.4; duck, 0.6; pig, 0.4; and cows, 0.1. Food processing wastes have ratios generally less than 0.7 (Bordner and Winter, 1978, p. 145). Therefore, a fecal coliform to fecal streptoccal ratio less than 0.7 is evidence that wastes are of nonhuman origin; a ratio between 2.0 and 4.0 suggests a predominance of human wastes: and a ratio greater than 4.0 may be considered as strong evidence that wastes are of human origin (Geldreich and Kenner, 1969).

Bacteria densities generally were less than 1,200 col/100 mL (colonies per 100 milliliters) in Catalpa Creek and in Tibbee Creek upstream of the mouth of Town Creek. Median densities of fecal coliform bacteria at sites 1 and 3 were less than 140 col/100 mL. Median fecal streptococcus densities were 210 col/100 mL at site 1 and 800 col/mL at site 3 . However, bacteria densities in Town Creek at site 2 were much greater than at sites 1 and 3. The median fecal coliform bacteria density at site 2 was 25,000 col/100 mL. Fecal coliform densities at this site ranged from 5,200 to 60,000 col/100 mL. Fecal streptococcal densities at site 2 ranged from 460 to 7,000 col/100 mL. The median fecal streptococcal density at this site was 1,000 col/100 mL. Maximum, minimum, and median values of fecal coliform and fecal streptococcal bacteria densities are shown in figure 7.

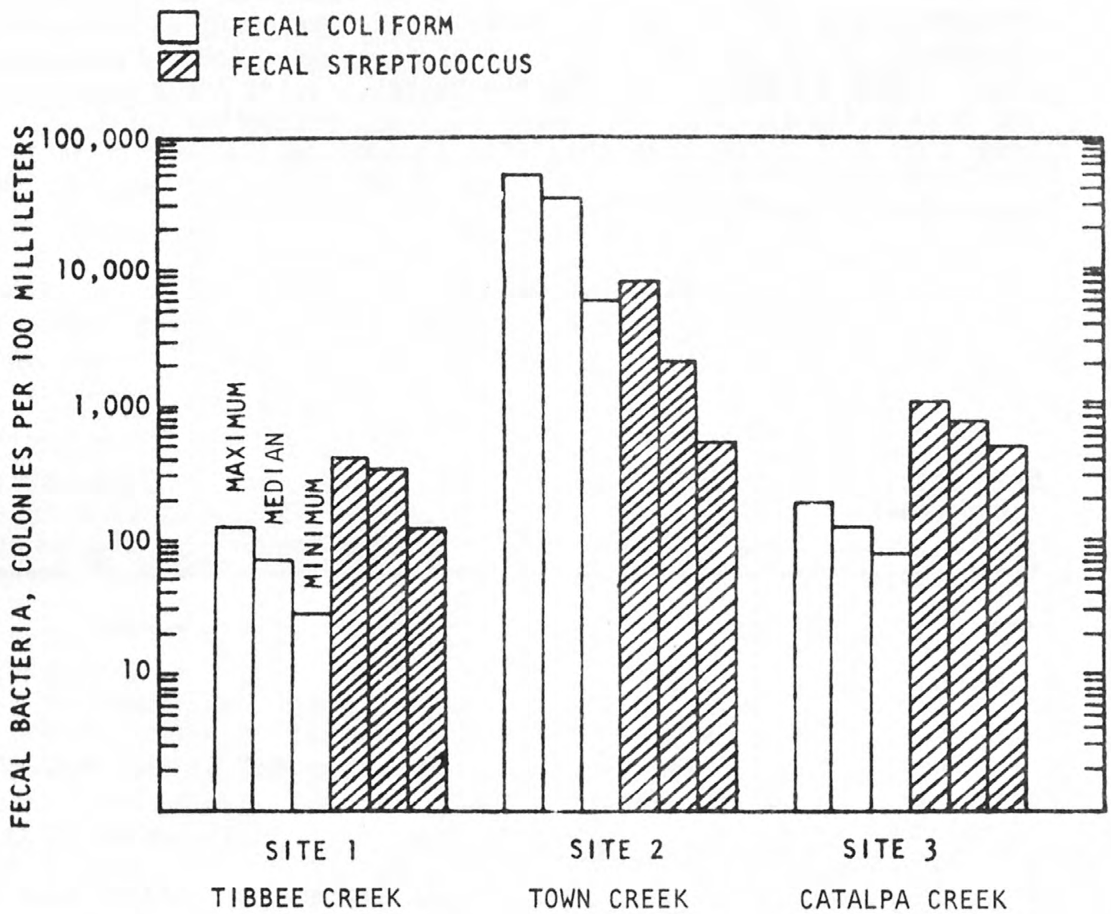

FIGURE 7.-- MAXIMUM, MEDIAN, AND MINIMUM DENSITIES OF FECAL COLIFORM AND FECAL STREPTOCOCCAL BACTERIA AT SAMPLING SITES ON TIBBEE CREEK AND TRIBUTARIES, JUNE 19-22, 1979.

The fecal coliform to fecal streptococcal ratio was less than 0.7 for all samples collected at sites 1 and 3. All the bacteria samples collected at site 2 on Town Creek had ratios exceeding 4.0, and may be considered strong evidence that wastes of human origin were present in Town Creek during the study. The low ratios at sites 1 (mean = 0.2) and 3 (mean = 0.5) indicate that human wastes probably were not present at these sites during the study period.

SUMMARY

An intensive quality-of-water study was conducted on June 19-22, 1979, on Tibbee Creek and two of its tributaries, Town Creek and Catalpa Creek during the low flow.

The water in Tibbee Creek upstream of Town Creek and Catalpa Creek is of such a quality that the water can be used for many purposes. Analysis of samples collected from Town Creek indicate that the water has been degraded by industrial and treated sewage wastewater and Town Creek is having a detrimental effect on the water quality of Tibbee Creek. Large concentrations of nitrogen, phosphorus, dissolved solids, and high densities of fecal coliform were being transported into Tibbee Creek by Town Creek.

Specific conductance of the water at site 1 (Tibbee Creek) remained fairly constant with a mean value of 273 umhos/cm. At site 3 (Catalpa Creek) the specific conductance was higher, with a mean value of 482 umhos/cm. Specific conductance at site 2 on Town Creek was much greater averaging 1,489 umhos/cm. An average of 48.0 tons per day of dissolved solids was transported out of the study area by Tibbee Creek. Of this, 30 percent (14.6 tons per day) was contributed by Town Creek.

Concentrations of nitrogen species were much higher at site 2 on Town Creek than at sites 1 and 3. Ammonia concentrations were well above recommended limits of 0.5 mg/L for public water supplies at site 2. The mean ammonia concentration in Town Creek (site 2) was 1.8 mg/L, whereas mean concentrations at sites 1 and 3 were 0.06 and 0.04 mg/L, respectively. Nitrite plus nitrate concentrations at site 2 ranged from 30 to 59 mg/L, with a mean of 50 mg/L. Organic nitrogen concentrations were also much greater at site 2 than at sites 1 and 3, with mean concentration at site 2 of 3.7 mg/L as compared to mean concentrations of 0.42 mg/L at site 1 and 0.38 mg/L at site 3. Most of the nitrogen load being transported out of the study area by Tibbee Creek originated in Town Creek. About 42 percent of the organic nitrogen, 92 percent of nitrite plus nitrate, and 70 percent of the ammonia leaving the study area was contributed by Town Creek.

A large part (91 percent) of the total and orthophosphate phosphorus load leaving the study area also originated from Town Creek. Seventy-eight percent of the total phosphorus load was in the orthophosphate form.

Bacteria densities at site 2 were generally much higher than the densities at sites 1 and 3. The median fecal coliform density at site 2 was 25,000 col/100 mL compared to median densities of 60 and 130 col/100 mL at sites 1 and 3, respectively. The median fecal streptococcus densities were 210 col/100 mL at site 1, 1,000 col/100 mL at site 2, and 800 col/100 mL at site 3. The fecal coliform to fecal streptococcus ratios of samples collected at sites 1 and 3 indicate that the fecal bacteria probably were of nonhuman origin. The fecal bacteria ratios of samples collected at site 2 strongly suggests that wastes of human origin were present during the study.

The concentrations of dissolved oxygen changed in a diurnal pattern at all sites. Dissolved-oxygen concentrations increased to a maximum in the afternoon at about 1500 hours and then decreased to the minimum values at night. Dissolved-oxygen concentrations remained fairly high at sites 1 and 3. However, dissolved-oxygen concentrations at site 2 dropped below 5 mg/L during the night.

Mean BOD_5 values were 1.5 and 1.0 mg/L at sites 1 and 3 respectively. The BOD_5 values for samples taken at site 2 averaged 14 mg/L and were consistently high throughout the study. The BOD_5 at site 2 ranged from 12 to 16 mg/L.

The pH ranged from 7.4 to 7.8 at site 1; 8.1 to 8.3 at site 3; and 7.4 to 8.2 at site 2.

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HYDROLOGIC DATA

TABLE 1.--RESULTS OF LABORATORY ANALYSIS, FIELD DETERMINATIONS, HOURLY DISCHARGE, AND CONTINUOUS MONITOR VALUES, TIBBEE CREEK, JUNE 19-22, 1979

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17, LONG 88°38'00"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
19...	0100	74	280	--	25.5	7.3
19...	0200	74	280	--	25.5	7.0
19...	0300	74	280	--	25.0	6.9
19...	0400	73	280	--	25.0	6.7
19...	0500	73	280	--	25.0	6.6
19...	0600	73	280	--	25.5	6.4
19...	0700	73	280	--	25.5	6.3
19...	0715	73	280	7.7	25.5	6.2
19...	0800	73	280	--	25.5	6.2
19...	0900	73	260	--	25.5	6.2
19...	0920	73	260	7.7	26.0	6.2
19...	1000	73	260	--	26.0	6.3
19...	1100	72	260	--	26.5	6.3
19...	1200	71	260	--	27.0	6.5
19...	1245	70	260	7.7	27.0	6.5
19...	1300	70	260	--	27.0	6.7
19...	1400	70	260	--	27.5	6.8
19...	1500	70	260	7.6	27.5	7.0
19...	1600	70	270	--	27.5	7.2
19...	1700	70	270	--	27.0	7.2
19...	1800	70	270	--	27.0	7.3
19...	1845	70	280	7.6	26.5	7.3
19...	1900	70	280	--	26.5	7.3
19...	2000	69	280	--	26.5	7.3
19...	2100	69	280	7.6	26.5	7.1
19...	2200	69	280	--	26.5	7.0
19...	2300	69	280	--	26.5	6.9
19...	2400	69	280	--	26.0	6.8
20...	0020	69	280	7.5	26.0	6.8
20...	0100	69	280	--	26.0	6.7
20...	0200	69	280	--	26.0	6.6
20...	0300	68	285	--	26.0	6.6
20...	0315	68	285	7.5	26.0	6.6
20...	0400	68	285	--	26.0	6.5
20...	0500	68	280	--	26.0	6.5
20...	0600	67	270	--	26.0	6.5
20...	0700	67	260	--	26.0	6.6
20...	0715	67	260	7.5	26.0	6.5
20...	0800	67	260	--	26.0	6.6

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
20...	0900	66	260	--	26.0	6.5
20...	0930	66	260	7.6	26.5	6.5
20...	1000	66	260	--	26.5	6.5
20...	1100	66	260	--	26.5	6.6
20...	1200	65	270	--	27.5	6.8
20...	1235	65	270	7.8	27.5	6.8
20...	1300	65	270	--	28.0	6.9
20...	1400	65	260	--	28.0	7.4
20...	1500	65	260	--	28.5	7.4
20...	1515	65	260	7.8	28.5	7.5
20...	1600	65	260	--	28.0	7.6
20...	1700	65	270	--	28.0	7.6
20...	1800	65	280	--	28.0	7.6
20...	1845	65	280	7.6	28.0	7.6
20...	1900	65	280	--	27.5	7.5
20...	2000	65	280	--	27.0	7.4
20...	2100	65	280	7.6	27.0	7.5
20...	2200	64	280	--	27.0	7.4
20...	2300	64	280	--	27.0	7.2
20...	2400	63	280	--	27.0	7.2
21...	0020	63	280	7.5	27.0	7.2
21...	0100	63	280	--	26.5	7.0
21...	0200	62	280	--	26.5	6.9
21...	0300	61	280	--	26.5	6.9
21...	0315	61	280	7.5	26.5	7.0
21...	0400	61	270	--	26.0	6.6
21...	0500	61	270	--	26.0	6.4
21...	0600	60	270	--	26.0	6.4
21...	0700	60	270	--	26.0	6.2
21...	0715	60	270	7.4	26.0	6.0
21...	0800	60	270	--	26.0	6.0
21...	0900	59	270	--	26.0	6.0
21...	0915	58	270	7.5	26.0	6.0
21...	1000	58	270	--	26.0	5.9
21...	1100	58	270	--	26.0	5.9
21...	1130	58	270	7.6	26.0	5.8
21...	1200	58	270	--	26.0	5.8
21...	1300	58	270	--	26.0	5.9
21...	1400	58	270	--	26.0	6.0

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
21...	1500	58	270	--	26.0	6.0
21...	1520	58	270	7.5	26.0	6.2
21...	1600	58	270	--	26.5	6.3
21...	1700	58	280	--	26.5	6.4
21...	1800	59	280	--	26.5	6.4
21...	1845	59	280	7.6	26.5	6.4
21...	1900	59	280	--	26.5	6.4
21...	2000	59	280	--	26.5	6.3
21...	2100	59	280	7.6	26.0	6.2
21...	2200	58	280	--	26.0	6.2
21...	2300	58	280	--	26.0	6.2
21...	2400	57	280	--	26.0	6.1
22...	0020	57	280	7.6	26.0	6.3

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	TIME	OXYGEN DEMAND, CHEM- ICAL (HIGH LEVEL) (MG/L)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)
JUN								
19...	0715	18	1.2	140	210	.10	.03	.13
19...	1245	17	1.8	K62	130	.20	.02	.22
19...	1845	20	1.9	K27	120	1.7	.03	1.7
20...	0020	22	1.4	K58	180	.23	.02	.25
20...	0715	14	1.3	130	300	.22	.02	.24
20...	1235	19	1.4	K46	160	.12	.02	.14
20...	1845	21	1.6	K31	160	.17	.02	.19
21...	0020	28	1.3	K42	220	.17	.02	.19
21...	0715	17	1.4	100	340	.17	.02	.19
21...	1130	22	1.5	K38	320	.09	.02	.11
21...	1845	13	1.9	K100	380	.16	.01	.17
22...	0020	12	1.2	K77	250	.14	.01	.15

K - NONIDEAL COLONY COUNT

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN							
19...	.07	.39	.46	.59	2.6	.110	.08
19...	.06	.41	.47	.69	3.1	.110	.08
19...	.08	.51	.59	2.3	10	.120	.08
20...	.05	.53	.58	.83	3.7	.110	.09
20...	.06	.39	.45	.69	3.1	.120	.09
20...	.06	.34	.40	.54	2.4	.140	.06
20...	.05	.36	.41	.60	2.7	.120	.09
21...	.05	.35	.40	.59	2.6	.100	.10
21...	.06	.53	.59	.78	3.5	.100	.08
21...	.07	.47	.54	.65	2.9	.100	.04
21...	.06	.29	.35	.52	2.3	.120	.06
22...	.04	.49	.53	.68	3.0	.090	.05

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	TIME	COLOR (PLATINUM COBALT UNITS)	TURBIDITY (NTU)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN								
21...	1130	15	35	120	18	43	2.1	5.1

DATE	SODIUM ADSORPTION RATIO	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	ALKALINITY (MG/L AS CACO3)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)
JUN								
21...	.2	120	0	98	4.8	13	6.2	.1

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	ARSENIC TOTAL (UG/L AS AS)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)
JUN								
21...	6.6	154	135	.21	24.1	3	0	4

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	CADMIUM RECOV. FM BOT-TOM MA-TERIAL (UG/G AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	CHRO-MIUM, RECOV. FM BOT-TOM MA-TERIAL (UG/G)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO)	COBALT, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS CO)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	COPPER, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)
JUN 21...	<10	20	<10	0	<10	6	<10	1600

DATE	IRON, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	LEAD, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS PB)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, RECOV. FM BOT-TOM MA-TERIAL (UG/G)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	MERCURY RECOV. FM BOT-TOM MA-TERIAL (UG/G AS HG)	NICKEL, TOTAL RECOV-ERABLE (UG/L AS NI)
JUN 21...	2600	5	<10	100	150	<.5	.09	22

DATE	NICKEL, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS NI)	SELE-NIUM, TOTAL (UG/L AS SE)	SELE-NIUM, TOTAL IN BOT-TOM MA-TERIAL (UG/G)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	ZINC, RECOV. FM BOT-TOM MA-TERIAL (UG/G AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	PHENOLS (UG/L)	OIL AND GREASE, TOTAL RECOV. GRAVI-METRIC (MG/L)
JUN 21...	<10	0	0	20	10	5.1	0	0

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	PCB, TOTAL (UG/L)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	NAPHTHALENES, POLYCHLOR. TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL (UG/L)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN 21...	.0	0	.00	.00	.0	.0	0	.00	.0

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)	DIAZINON, TOTAL (UG/L)	DIAZINON, TOTAL IN BOTTOM MATERIAL (UG/KG)	DIELDRIN TOTAL (UG/L)	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN 21...	.00	.7	.00	.0	.01	.0	.00	.0

DATE	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)
JUN 21...	.00	.00	.0	.00	.0	.00	.0	.00	.0

TABLE 1--CONTINUED

02441000 - TIBBEE CREEK AT SITE 1 - LAT 33°32'17", LONG 88°38'00"

DATE	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	MALATHION, TOTAL (UG/L)	MALATHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	METHOXYCHLOR, TOTAL (UG/L)	METHOXYCHLOR, TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARATHION, TOTAL (UG/L)	METHYL PARATHION, TOT. IN BOTTOM MATL. (UG/KG)
JUN								
21...	.00	.0	.00	.0	.00	.0	.00	.0

DATE	METHYL TRITHION, TOTAL (UG/L)	METHYL TRITHION, TOT. IN BOTTOM MATL. (UG/KG)	MIREX, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	PARATHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	PERTHANE TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN								
21...	.00	.0	.00	.00	.0	.00	0	0

DATE	TOTAL TRITHION (UG/L)	TRITHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL (UG/L)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN								
21...	.00	.0	.00	0	.00	0	.00	.0

TABLE 2.--RESULTS OF LABORATORY ANALYSIS, FIELD DETERMINATIONS, AND HOURLY DISCHARGE, TOWN CREEK, JUNE 19-22, 1979

02441025 - TOWN CREEK AT SITE 2 - LAT 33°34'07", LONG 88°38'31"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
19...	0630	5.9	1400	7.6	25.0	5.1
19...	0905	5.1	1500	7.7	27.0	7.1
19...	1215	5.4	1400	7.9	31.5	8.0
19...	1445	5.4	1500	8.2	34.5	9.0
19...	1820	5.6	1550	7.7	28.0	7.2
19...	2045	5.7	1600	7.5	25.5	4.5
20...	0005	5.9	1600	7.4	23.5	5.1
20...	0300	5.9	1550	7.4	23.0	4.7
20...	0645	5.6	1420	7.5	26.0	4.8
20...	0900	5.6	1490	7.6	28.0	7.1
20...	1215	5.0	1380	7.9	31.5	8.1
20...	1500	5.4	1400	7.9	34.0	9.9
20...	1815	5.7	1500	7.8	27.5	8.0
20...	2045	5.7	1550	7.5	25.0	4.9
21...	0005	5.9	1550	7.4	23.5	4.4
21...	0300	5.9	1550	7.4	23.0	4.3
21...	0650	5.7	1450	7.4	26.0	4.6
21...	0900	5.4	1450	7.5	27.0	5.6
21...	1030	5.3	1500	7.6	26.5	4.5
21...	1500	5.9	1400	7.6	27.0	8.8
21...	1815	6.0	1500	7.6	26.0	9.4
21...	2045	6.0	1500	7.4	24.0	5.3
22...	0005	6.0	1500	7.4	23.0	4.6

TABLE 2.--CONTINUED

02441025 - TOWN CREEK AT SITE 2 - LAT 33°34'07", LONG 88°38'31"

DATE	TIME	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)
JUN								
19...	0630	65	16	52000	7000	50	4.0	54
19...	1215	70	16	25000	910	49	4.1	53
19...	1820	68	14	K15000	700	53	3.1	56
20...	0005	70	13	K15000	1200	57	2.0	59
20...	0645	61	13	25000	4200	30	.22	30
20...	1215	68	15	30000	510	45	.68	46
20...	1815	73	12	5200	460	53	1.3	54
21...	0650	58	12	27000	2200	44	3.9	48
21...	1030	65	15	30000	1000	49	2.4	51
21...	1815	67	14	20000	820	49	1.8	51
22...	0005	59	14	60000	4100	42	4.7	47

K - NONIDEAL COLONY COUNT

TABLE 2.--CONTINUED

02441025 - TOWN CREEK AT SITE 2 - LAT 33°34'07", LONG 88°38'31"

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN							
19...	.62	8.3	8.9	63	280	13.0	13
19...	2.2	2.9	5.1	58	260	19.0	5.6
19...	1.1	2.7	3.8	60	260	13.0	5.0
20...	1.0	2.9	3.9	63	280	14.0	13
20...	.41	3.2	3.6	34	150	13.0	13
20...	.48	4.4	4.9	51	230	12.0	12
20...	.98	2.7	3.7	58	260	13.0	5.3
21...	6.5	2.0	8.5	55	250	14.0	14
21...	2.5	5.2	7.7	59	260	13.0	13
21...	2.5	2.4	4.9	56	250	14.0	13
22...	6.0	2.6	8.6	56	250	13.0	12

TABLE 3.--RESULTS OF LABORATORY ANALYSIS, FIELD DETERMINATIONS, HOURLY DISCHARGE, AND CONTINUOUS MONITOR VALUES, CATALPA CREEK, JUNE 19-22, 1979

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
19...	0100	3.4	440	--	25.5	6.2
19...	0200	3.5	440	--	25.0	6.1
19...	0300	3.5	450	--	24.5	6.1
19...	0400	3.5	450	--	24.0	6.1
19...	0500	3.6	450	--	24.0	6.2
19...	0600	3.6	450	--	23.5	6.6
19...	0700	3.6	450	--	23.0	6.7
19...	0745	3.6	460	8.3	23.0	6.8
19...	0800	3.6	460	--	23.0	7.0
19...	0900	3.7	460	--	23.5	7.0
19...	0945	3.7	460	8.2	23.5	7.2
19...	1000	3.6	460	--	24.0	7.3
19...	1100	3.5	460	--	25.0	7.6
19...	1200	3.4	460	--	26.0	7.8
19...	1300	3.4	460	--	26.5	7.8
19...	1315	3.3	460	8.2	26.5	7.6
19...	1400	3.3	460	--	26.5	7.9
19...	1500	3.3	460	--	26.5	7.9
19...	1530	3.3	470	8.2	27.0	7.5
19...	1600	3.3	470	--	27.0	7.5
19...	1700	3.3	480	--	27.5	7.4
19...	1800	3.2	480	--	27.5	7.0
19...	1900	3.2	480	--	28.0	6.8
19...	1915	3.2	490	8.1	28.0	6.6
19...	2000	3.2	490	--	27.5	6.6
19...	2100	3.1	490	--	27.0	6.4
19...	2115	3.1	490	8.1	27.0	6.4
19...	2200	3.1	490	--	26.5	6.4
19...	2300	3.2	490	--	26.5	6.4
19...	2400	3.3	500	--	26.5	6.4
20...	0040	3.4	500	8.1	26.0	6.4
20...	0100	3.4	500	--	26.0	6.3
20...	0200	3.5	500	--	25.5	6.4
20...	0300	3.7	500	--	25.0	6.4
20...	0330	3.7	500	8.1	25.5	6.4
20...	0400	3.7	500	--	25.0	6.4
20...	0500	3.7	490	--	24.5	6.4
20...	0600	3.6	480	--	24.5	6.6
20...	0700	3.6	480	--	24.0	7.0

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
20...	0745	3.6	470	8.3	24.0	7.0
20...	0800	3.6	470	--	24.0	7.0
20...	0900	3.5	480	--	24.5	7.3
20...	0950	3.4	480	8.3	25.0	7.4
20...	1000	3.4	480	--	25.0	7.6
20...	1100	3.3	480	--	25.5	7.8
20...	1200	3.2	480	--	25.5	8.2
20...	1255	3.2	470	8.3	26.5	8.3
20...	1300	3.2	470	--	26.5	8.4
20...	1400	3.1	480	--	27.0	8.7
20...	1500	3.1	480	--	27.0	8.8
20...	1530	3.1	480	8.2	27.0	8.5
20...	1600	3.1	480	--	27.0	8.5
20...	1700	3.1	490	--	27.5	8.2
20...	1800	3.1	490	--	27.5	8.0
20...	1900	3.1	500	--	27.5	7.6
20...	1915	3.1	500	8.1	27.5	7.6
20...	2000	3.1	500	--	27.5	7.6
20...	2100	3.1	500	--	27.0	7.4
20...	2115	3.1	500	8.1	27.0	7.3
20...	2200	3.1	500	--	27.0	7.0
20...	2300	3.1	500	--	27.0	7.0
20...	2400	3.2	500	--	27.0	6.8
21...	0040	3.2	500	8.1	26.5	6.8
21...	0100	3.2	500	--	26.5	6.8
21...	0200	3.3	500	--	26.0	7.0
21...	0300	3.4	500	--	25.0	6.9
21...	0330	3.6	500	8.1	25.0	6.9
21...	0400	3.6	500	--	25.0	6.9
21...	0500	3.5	500	--	24.5	6.9
21...	0600	3.4	500	--	24.5	7.0
21...	0700	3.4	480	--	24.5	7.0
21...	0745	3.3	480	8.1	24.0	6.9
21...	0800	3.3	480	--	24.0	7.0
21...	0900	3.2	480	--	24.5	7.1
21...	0930	3.2	480	8.1	24.5	7.0
21...	1000	3.2	480	--	24.5	7.2
21...	1100	3.2	480	--	24.5	7.2
21...	1200	3.2	480	--	24.5	7.2

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	OXYGEN, DIS-SOLVED (MG/L)
JUN						
21...	1230	3.2	480	8.1	24.5	7.1
21...	1300	3.2	480	--	24.5	7.4
21...	1400	3.2	480	--	25.0	7.8
21...	1500	3.2	480	--	25.0	7.9
21...	1545	3.2	480	8.3	25.0	8.1
21...	1600	3.2	480	--	25.0	8.3
21...	1700	3.2	480	--	25.5	8.3
21...	1800	3.2	480	--	25.5	8.1
21...	1900	3.1	480	--	25.5	7.9
21...	1915	3.1	500	8.2	25.5	7.9
21...	2000	3.1	500	--	25.0	7.6
21...	2100	3.0	500	--	25.0	7.4
21...	2115	3.0	500	8.1	25.0	7.1
21...	2200	3.0	500	--	25.0	7.2
21...	2300	3.0	500	--	25.0	7.0
21...	2400	3.0	500	--	24.5	7.0
22...	0040	3.0	500	8.1	24.0	6.8

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	TIME	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)
JUN								
19...	0745	14	1.0	200	840	.12	.01	.13
19...	1315	19	1.4	130	410	.06	.02	.08
19...	1915	30	1.4	K81	520	.03	.00	.03
20...	0040	17	.9	200	1200	.04	.01	.05
20...	0745	13	1.0	120	1100	.06	.01	.07
20...	1255	15	1.1	130	470	.05	.01	.06
20...	1915	17	.8	170	680	.11	.00	.11
21...	0040	15	.9	160	1100	.04	.01	.05
21...	0745	16	1.0	110	740	.09	.01	.10
21...	1230	16	1.7	K85	920	.09	.01	.10
21...	1915	11	.6	200	600	.06	.00	.06
22...	0040	12	.8	130	1000	.09	.00	.09

K - NONIDEAL COLONY COUNT

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN							
19...	.04	.40	.44	.57	2.5	.120	.11
19...	.05	.39	.44	.52	2.3	.120	.08
19...	.03	.35	.38	.41	1.8	.120	.08
20...	.04	.38	.42	.47	2.1	.110	.11
20...	.04	.31	.35	.42	1.9	.120	.07
20...	.04	.36	.40	.46	2.0	.110	.11
20...	.10	.35	.45	.56	2.5	.120	.09
21...	.04	.38	.42	.47	2.1	.110	.11
21...	.04	.40	.44	.54	2.4	.120	.11
21...	.04	.34	.38	.48	2.1	.120	.08
21...	.03	.33	.36	.42	1.9	.120	.09
22...	.04	.61	.65	.74	3.3	.110	.11

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	TIME	COLOR (PLATINUM COBALT UNITS)	TURBIDITY (NTU)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)
JUN								
21...	1230	5	4.0	190	4	74	1.8	25

DATE	SODIUM ADSORPTION RATIO	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	ALKALINITY (MG/L AS CACO3)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)
JUN								
21...	.8	230	0	190	2.9	28	20	.2

DATE	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	SOLIDS, DISSOLVED (TONS PER AC-FT)	SOLIDS, DISSOLVED (TONS PER DAY)	ARSENIC TOTAL (UG/L AS AS)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)
JUN								
21...	4.1	283	266	.38	2.45	5	0	1

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)
JUN								
21...	<10	30	<10	0	10	5	<10	300

DATE	IRON, RECOV. FM BOTTOM MATERIAL (UG/G AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, RECOV. FM BOTTOM MATERIAL (UG/G)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/G AS HG)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)
JUN								
21...	7600	4	10	20	720	<.5	.18	21

DATE	NICKEL, RECOV. FM BOTTOM MATERIAL (UG/G AS NI)	SELENIUM, TOTAL (UG/L AS SE)	SELENIUM, TOTAL IN BOTTOM MATERIAL (UG/G)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	PHENOLS (UG/L)	OIL AND GREASE, TOTAL RECOV. GRAVIMETRIC (MG/L)
JUN								
21...	10	0	0	20	20	11	0	1

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	PCB, TOTAL (UG/L)	PCB, TOTAL IN BOTTOM MATERIAL (UG/KG)	NAPHTHALENES, POLYCHLOR, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	CHLORDANE, TOTAL (UG/L)	CHLORDANE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN									
21...	.0	0	.00	.00	.0	.0	0	.00	.0

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOTTOM MATERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOTTOM MATERIAL (UG/KG)	DIAZINON, TOTAL (UG/L)	DIAZINON, TOTAL IN BOTTOM MATERIAL (UG/KG)	DIELDRIN TOTAL (UG/L)	DIELDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN								
21...	.00	.0	.00	.0	.01	.5	.00	.0

DATE	ENDOSULFAN, TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOTTOM MATERIAL (UG/KG)	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR, TOTAL (UG/L)	HEPTACHLOR, TOTAL IN BOTTOM MATERIAL (UG/KG)	HEPTACHLOR EPOXIDE TOTAL (UG/L)	HEPTACHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)
JUN									
21...	.00	.00	.0	.00	.0	.00	.0	.00	.0

TABLE 3 --CONTINUED

02441320 - CATALPA CREEK AT SITE 3 - LAT 33°31'11", LONG 88°34'25"

DATE	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOTTOM MATERIAL (UG/KG)	MALATHION, TOTAL (UG/L)	MALATHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	METHOXYCHLOR, TOTAL (UG/L)	METHOXYCHLOR, TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARATHION, TOTAL (UG/L)	METHYL PARATHION, TOT. IN BOTTOM MATL. (UG/KG)
JUN								
21...	.00	.0	.00	.0	.00	.0	.00	.0

DATE	METHYL TRITHION, TOTAL (UG/L)	METHYL TRITHION, TOT. IN BOTTOM MATL. (UG/KG)	MIREX, TOTAL (UG/L)	PARATHION, TOTAL (UG/L)	PARATHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	PERTHANE TOTAL (UG/L)	TOXAPHENE, TOTAL (UG/L)	TOXAPHENE, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN								
21...	.00	.0	.00	.00	.0	.00	0	0

DATE	TOTAL TRITHION (UG/L)	TRITHION, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4-D, TOTAL IN BOTTOM MATERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOTTOM MATERIAL (UG/KG)	SILVEX, TOTAL (UG/L)	SILVEX, TOTAL IN BOTTOM MATERIAL (UG/KG)
JUN								
21...	.00	.0	.00	0	.00	0	.00	.0