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Chesapeake Bay Citizen Monitoring Program Report Conestoga River (October 1986 - June 1990)

Chesapeake Bay Program

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Cynthia A. Dunn and Gayla Campbell, Alliance for the Chesapeake Bay, have made significant contributions to the success of this project. Ms. Dunn recruited most of the original volunteers and helped to plan and implement the quality control sessions. Ms. Campbell helped with general management of the project in 1989-90 and helped put together the site descriptions. Linda Clews, Alliance Intern in 1986-87 contributed to the original implementation of the project.

Mr. Samuel C. Wenger, Manheim Central High School, provided invaluable historical perspectives and copies of the reports of the data collected by Lancaster County students in the mid- 1970's. Mr. Stephen J. Cummings, President of the Conestoga Valley Association was particularly helpful during the planning and recruiting phase of the project. Volunteer Monitors, Donna Bucher, Bill Ebel, and Marylin Ebel have given many hours of project coordinating time in addition to their diligent sampling. Ms. Ebel currently serves as the Volunteer Project Coordinator.

U.S. Geological Survey, Harrisburg, PA personnel have donated time and much needed advice on all aspects of this project. We wish to thank Jerry Hollowell, Susquehanna River Basin Commission for his support and for the use of their nitrate data. USEPA Central Regional Laboratory personnel through their interest, advice and time, made a unique contribution to the credibility of this data. The assistance of the Potomac Edison Electric Company's Chalk Point Monitoring Laboratory and staff in determining the comparability of turbidity results is appreciated.

ENDORSEMENT

The Chesapeake Bay Program Monitoring Subcommittee has reviewed the assumptions and methods of data analysis used in this report and finds them appropriate for analysis conducted. The findings of this report are consistent with and supported by the analytical techniques employed.

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SUMMARY

The Alliance for the Chesapeake Bay, Inc. (ACB) began a pilot water quality testing project using volunteers in July 1985 as one of the activities funded under its Chesapeake Bay Program public participation grant from USEPA. This initial project was carried out in the tidal portions of the James River in Virginia and the Patuxent River in Maryland. Volunteers were recruited and trained to test water quality in the Conestoga River in Pennsylvania in October 1986.

The major objective of the Conestoga River Citizen Monitoring Project is to track concentration of nitrate in the ambient waters of the Conestoga River with the intent of answering the questions: 1) Has the level of nitrate in the river changed over time? and 2) Is there a downward trend in observed nitrate?

Four water quality parameters are measured weekly at seven sites located on the banks of the Conestoga River between Brownstown and Safe Harbor: water and air temperature, dissolved oxygen, nitrate + nitrite (NO23), and turbidity. Monitors report weekly accumulated rainfall if they have a sufficiently clear space to install a rain gage near the site. In addition, monitors record weather and general ecological observations about the site. Data Collection Forms are sent to the Coordinator and the data are stored on-line at the Chesapeake Bay Computer Center in Annapolis, MD.

This report summarizes the water quality data collected by the Conestoga River volunteer monitors with particular emphasis on the concentration of nitrate. Although nitrate values appear to be somewhat higher in the winter, there is not a consistent seasonal pattern in the nitrate data for all stations or all years.

The nitrate concentrations measured by the Susquehanna River Basin Commission (SRBC) during high flow periods at a site near Conestoga, Pennsylvania were compared with results obtained by volunteers at nearby sites during the same period. The citizen's data and the SRBC guage data were averaged by week and then matched in pairs. There were 37 weeks of data for the SRBC station and citizen station 10; 19 weeks of data for SRBC and station 11; and 21 weeks that the SRBC station and citizen stations 10 and 11 both had data. While the nitrate levels for sites 10 and 11 were highly correlated, there was a relatively small correlation between either site 10 or site 11 and the SRBC guage.

Lastly we compared seasonal means of nitrate concentrations in the river measured by high school students in 1975-76 with those measured by the Chesapeake Bay Citizen Monitoring Program (CBCMP) in 1987-90. No change in nitrate mean concentration for the fall sampling period is apparent. However, the nitrate concentrations in the spring appear to have increased since 1976. This would be

expected since animal numbers in Lancaster County have increased during this period of time, while crop land acreage on which to apply manure has decreased.

There appears to be a slight relationship between rainfall and nitrate for the citizen monitoring data. The relationship was not a strong one but it was consistent. There seems to a be a positive relationship between turbidity and rainfall. Although it varied by site, an increase in daily rainfall was associated with increased turbidity values and vice versa.

Low dissolved oxygen (DO) was not observed at any of the citizen monitoring sites. The DO remained at or above 5 milligrams per liter (mg/l) at nearly all times.

The following recommendations are offered concerning the direction and continuation of this project:

1. Discontinue the weekly determination of dissolved oxygen.

2. Emphasize the importance of consistency in data collection so that fewer gaps in the data record occur. This will greatly enhance the statistical power of the data to determine trends.

3. Place more emphasis on carrying out the quality assurance of the testing procedures paying particular attention to the nitrate and turbidity kit reagents.

4. Obtain funding to document the field observations with analyses by certified laboratories.

INTRODUCTION

The Alliance for the Chesapeake Bay, Inc. (ACB) began a pilot water quality testing project using volunteers in July 1985 as one of the activities funded under its Chesapeake Bay Program public participation grant from USEPA. This initial project was carried out in the tidal portions of the James River in Virginia and the Patuxent River Maryland. Volunteers were recruited and trained to test water quality in the Conestoga River in Pennsylvania in October 1986. The Chesapeake Bay Citizen Monitoring Program (CBCMP) currently has volunteers monitoring in 14 watersheds in the Chesapeake Bay drainage basin.

The establishment of such a program was suggested in "Volunteer Monitoring Program, Chesapeake Bay: A Framework for Action, Appendix F, Attachment 5" (USEPA 1983). In response to a request from the Chesapeake Bay Program Monitoring Subcommittee, ACB established an ad hoc committee to analyze and report on the desirability and feasibility of citizen monitoring efforts and to provide specific recommendations. The committee's proposal was presented to and accepted by the Chesapeake Bay Program Implementation Committee in February 1985 (CPB 1987a). A report on the Chesapeake Bay Citizen Monitoring Program and analysis of data collected on the James and Patuxent Rivers, July 1985 to October 1988 was published in 1989 (Ellett, et al. 1989).

Data collected by volunteers augments information gathered in the Chesapeake Bay Monitoring Program begun in 1984. This program collects data at over 165 stations Bay-wide. The Monitoring Program's major objectives are to determine long-term trends and the driving forces behind them, and to establish the link between water quality and the health of the Bay's living resources. The monitoring program should help to distinguish the effects on the Bay from natural events (e.g., flows and salinities) and from man-induced pollutants (such as excessive nutrients)(CBP 1987b). It is well documented that several years are necessary to separate trends from natural variability in complex ecological systems like the Chesapeake Bay. This program is making monitoring information widely available so that it can be used to help managers make decisions about the Bay's future.

Volunteer monitoring that delivers data of known quality can augment the Baywide program and help to determine seasonal and temporal changes in Bay waters and to evaluate the water quality status of selected tributaries. Specifically, volunteers can contribute by:

o providing long-term water quality data in areas which are not routinely monitored (e.g. nearshore habitats, small tidal creeks);

- o providing more frequent sampling to yield time-series data with the large number of points required to establish response and lag times in changes;

- o capturing data on short-lived phenomena of interest (e.g. storms);

- o providing observational information on weather, living resources, and site conditions, and

- o answering short-term research questions.

A well-coordinated, long-term volunteer monitoring program can also promote active stewardship of natural resources by local residents; provide an early warning of problems in stormwater management, sediment control, and sewage contamination; and further educate the general public and concerned public officials regarding the Bay.

USEPA believes citizen monitoring programs can help fill data gaps and has promoted and supported this concept by:

- o sponsoring two national workshops on volunteer monitoring; (USEPA 1988 and USEPA 1990b)

- o publishing a directory of volunteer monitoring organizations (USEPA 1990a);

- o sponsoring the publication of a national volunteer monitoring newsletter;

- o producing a volunteer water quality monitoring guide for state managers (USEPA 1990c); and

- o conducting on-site training for volunteers participating in new monitoring programs in near coastal waters.

PURPOSE OF PROGRAM AND REPORT

The main objective of the Conestoga River Citizen Monitoring Project is to track concentration of nitrate nitrogen in the Conestoga River. We hope to answer questions such as:

- o Has the level of nitrate in the river changed over the sampling period?

- o Is there a downward trend in observed nitrate?

- o Is there any relationship between the recorded rainfall and nitrate values?

This report summarizes the water quality data collected by the Conestoga River volunteer monitors with particular emphasis on the concentration of nitrate. We also compared nitrate concentrations measured by the Susquehanna River Basin Commission during high flow periods at a site near Conestoga, Pennsylvania (about 2.6 miles upstream from the mouth of the river) with results obtained by volunteers at nearby sites during the same period. Lastly, we have compared seasonal means of nitrate-N concentrations in the river measured by high school students in 1975-76 with those measured by CBCMP in 1987-90.

BACKGROUND ON CONESTOGA WATERSHED

The Conestoga River drains 477 square miles of Lancaster, Lebanon, and Berks counties from its source near Elverson, Pa., to its confluence with the Susquehanna River 60 miles west. In colonial times, the Conestoga River was a clear, pristine river abounding with a variety of organisms such as sponges, mollusks, insect larvae, amphibians, reptiles, and fish of different species. It was relatively pure and clear with minimal erodible material in its waters even during occasional heavy rains. By the mid-1970's, however, the Conestoga was plagued by pollutants from municipal sewage treatment effluent, industrial waste, feed lot seepage, and agricultural runoff (CVA 1976).

It was the apparent degraded condition of the Conestoga River that prompted the organization of the Conestoga Valley Association in 1956. The purpose of this organization was to improve the environment and water quality of the Conestoga River basin by eliminating stream pollution and reducing soil erosion. Recognizing that the completion of such a task cannot be accomplished without substantial data, observations and other information, the Association took action in 1973 to engage junior and senior high school faculty of Lancaster County schools in an educational program for students concerning possible solutions to water quality problems in the waters of the Conestoga River and its feeder streams.

Actual monitoring of water samples began during the fall of the 1973-74 school year with five schools participating. A report of data collected on the Conestoga mainstem by students during October through December in 1975 and March through April in 1976 was published by the Conestoga Valley Association in 1976 (CVA 1976).

Most of the Conestoga River watershed is in Lancaster County which has seen an increase in population of 50% since 1950. Approximately two-thirds of the County is classified as agricultural land with only 15 percent urban , residential, or commercial. Farmers have grown corn, tobacco, and other crops here since the early 1700's. In recent times, dairy and poultry farms have become a common feature. Between 1970 and 1980, the number of livestock in Lancaster County increased by 260,000. By 1984, livestock and poultry accounted for nearly two-thirds of all agricultural production. In fact, Lancaster County now has more dairy cows per acre than any other locale in the United States (Alliance 1987; PA DER 1980; PA DER 1989).

Nitrogen is essential for plant growth, but the presence of excessive amounts in water supplies presents a major pollution problem. Nitrogen compounds may enter as nitrates or be converted to nitrates from agricultural fertilizers, sewage, industrial and packing house wastes, drainage from livestock feeding areas, farm manures and legumes. Nitrates in large amounts can cause "blue babies syndrome" (methemoglobinemia) in infants less than six months of age (Fishel and Leitman 1986). It is an important factor to be considered in livestock production, where, in addition to causing methemoglobinemia, it is responsible for many other symptoms arising from the presence of high levels of nitrates in water supplies. Nitrates in conjunction with phosphate stimulate the growth of algae with all of the related difficulties associated with excessive algae. (LaMotte)

In 1981, The U.S. Geological Survey and the Pennsylvania Department of Environmental Resources began evaluating stream and ground water quality in the headwaters of the Conestoga. This study is part of the nationwide Rural Clean Water Program designed to promote and monitor the effects of agricultural management practices on water quality. Data collected early in this project indicate that high concentrations and large nonpoint source discharges of nitrate occur in the Conestoga (Gerhart 1986 and Fishel & Lietman 1986).

Comprehensive monitoring tests in the headwaters region have also shown that more than 40 percent of private well water supplies tested in 1986 have levels of nitrate in excess of the EPA standard of 10 milligrams per liter (mg/l). These high concentrations are closely associated with agricultural practices and geology. Transport of nitrate through ground water in areas underlain by carbonate rocks is rapid; therefore, proper management of soluble nutrients is especially important in these areas (Gerhart 1986).

It is important to continue monitoring to determine the effectiveness of these practices. Such information will help in making proper management decisions that will protect agricultural land, local water supplies, the Conestoga River, Susquehanna River, and ultimately the Chesapeake Bay (Fishel & Lietman 1986; Gerhart 1986; USDA 1987).

PROJECT ORGANIZATION AND IMPLEMENTATION

Administration

Representatives of several Pennsylvania agencies formed a consensus planning group that provided guidance to the Alliance while organizing the Conestoga Citizen Monitoring Project. Individuals from the Susquehanna River Basin Commission, US Geological Survey, PA Department of Environmental Resources Bureaus of Water Quality Management, Soil and Water Conservation and State Parks, PA Chesapeake Bay Education Office, and Pennsylvania State University were present at the planning meeting that was held in June of 1986.

The Conestoga Valley Association and the Chesapeake Bay Foundation were helpful in locating individuals interested in becoming volunteer monitors. A newspaper article and word-of-mouth helped recruit enough people for ten sites between Hinkeltown and Safe Harbor. The recruits were asked to commit to taking weekly samples for at least one year and possibly longer. Sufficient data to be included in this report has been collected from seven of the ten sites. Six sites are currently being monitored.

Only one of the sites is monitored by volunteers who live along the waterway, with the rest having to drive or walk to the site each week. Monitoring sites were selected based on convenience for the available volunteers as long as sites were spaced out along the length of the river.

Previous experience with volunteer monitoring programs has established that a successful program needs to have clearly established data quality objectives (DQO's) identified at the outset of the data collection effort. A Quality Assurance Project Plan (QAPjP) was prepared and accepted by the Chesapeake Bay Program Quality Assurance Officer (QAO) (USEPA 1986). The initial testing of methods for use in the CBCMP was conducted at the EPA Central Regional Laboratory, Annapolis, MD under the supervision of the CBP QAO and various other chemists and technicians. Instruments and methods used were chosen based on simplicity of use, cost, and accuracy. Every possible effort has been made to use methods that are comparable to those employed by the CBP Monitoring Program. Where methods are necessarily different, methods comparison tests have been performed and degree of comparability has been determined. The units reported are the same as those in the CBP Monitoring Program.

The standard deviations (SD) for the values are reported in Table 1. The precision reported in Table 1 is the range of values expected from the volunteers versus a value determined by the coordinator on the same sample. Accuracy is the range of values expected from the field analysis versus a value determined

TABLE 1. PRECISION AND ACCURACY OBJECTIVES

Parameter	Method/Range	Units	Sensitivity*	Precision	Accuracy	Calibration
Temperature	Thermometer -5.0^{o} to $+45^{o}$	^{o}C	$0.5^{o}C$	$\pm$ 1.0	$\pm$ 0.5	with NBS Certified Thermometers
Dissolved Oxygen	Micro Winkler Titration	mg/l	0.1 mg/l	$\pm$ 0.9	$\pm$ 0.3**	Standard Winkler & Y.S.I. DO Meter
Nitrate + Nitrite (NO23)	Color Comparator 0.25 to 10.0+	mg/l	1.0 mg/l	$\pm$ 1.0	$\pm$ 0.8**	Auto Analyzer
Turbidity	Visual Comparison 5-200	JTU	5.0 JTU	$\pm$ 10.0	$\pm$ 30.0**	Monitek Turbidimeter

* Determined by the increments measurable with the stated method reflecting estimation where allowed.

** The standard deviation of the mean difference between paired determinations.

PRECISION is the range of values expected from the volunteers versus a value determined by the coordinator on the same sample.

ACCURACY is the range of values expected from the field analysis versus a value determined by a qualified water quality laboratory using a standard analytical method.

by a qualified water-quality laboratory using a standard analytical method.

The volunteers initially attend a 3-hour training session. These sessions include the viewing of an introductory slide show followed by a demonstration and carrying out of the test procedures. Volunteers unable to attend a session are trained by the coordinator individually. Each volunteer undergoes a quality control check each year during which all volunteers test the same water with their equipment in the way they do it at home and results are compared to those of the coordinator. Their results then provide a measure of how well they perform as a group or how precisely they measure the characteristics and constituents required.

Volunteer monitors are asked to collect data and samples once a week year round---a potential of 52 observations per site per year. However, it is assumed that some weeks will be missed for vacations, illness, and severe weather (i.e. wind, flooding, ice). Therefore, 48 observations per year are considered to constitute a complete data set for a given site.

Four water quality parameters are measured weekly at each site: water (and air) temperature, dissolved oxygen (DO), nitrate + nitrite (NO23), and turbidity. Monitors report weekly accumulated rainfall if they have a sufficiently clear space to install a rain gage near the site. Rain gages are not installed at sites that are not on private property because they might be vandalized or tampered with.

The thermometers, DO titration, turbidity, and NO3-N kits are manufactured by LaMotte Chemical Products, Inc., Chestertown, MD. Each volunteer monitor is supplied with a Citizen Monitoring Manual which was prepared specially for this program (ACB 1986). The Manual gives step by step instructions for all sampling and analysis procedures as well as brief background material on what the test results mean.

In addition, information on weather and general observations about the site (live or dead organisms, debris, oil slicks, ice, odor, water color, anything unusual) is recorded on a Data Collection Form (see Figure 1) and sent to the project coordinator. Data are entered into a computer file stored in the Chesapeake Bay Program Computer Data Base. SAS software is used to generate plots and graphics of the various parameters versus time.

Surface water samples were obtained in a bucket from the water's edge. Armored thermometers reading from -5.0° to +45.0° C were used to determine air and water temperature. They were calibrated with precision thermometers which had been calibrated with NBS certified thermometers.

The test for dissolved oxygen is made using a water analysis kit which employs a modified Winkler method. We have determined the bias in DO values to be -\+ 0.3 mg/l. Monitors titrate two samples at each sampling time. If the difference between the first two is greater than 0.6 mg/l, they do a third titration. The average of the two closer values is recorded. If values differing by more than 0.9 mg/l are reported with no third test done, the results are not entered in the file. Less than 25 (of over 4000 observations) DO measurements have been determined to be above the upper control limit of 0.9 mg/l difference.

The LaMotte nitrate + nitrite testing kit uses powdered cadmium to reduce nitrate to nitrite. The nitrite that is originally present plus reduced nitrate is determined by diazotizing sulfanilamide and coupling with N-(naphthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye which is measured colorimetrically using a color comparator. The range of 0.25 to 10.0 ppm can be extended by dilution with de-ionized water. Protocol requires that a diluted sample be run whenever the first sample shows a concentration of 10.0 ppm.

In the winter of 1988-89 unusually low concentrations of nitrate led a volunteer to question the test procedure. The volunteer was issued new chemical reagents and a comparison with results using old reagents indicated that the old reagents produced significantly lower values. LaMotte subsequently determined that the cadmium reducing reagent is very sensitive to humidity. This reagent is now packaged in a bottle with a desiccant and the monitors are cautioned to store the reagent in a dry place and to avoid getting moisture in the container. All volunteers were issued new reagents shortly thereafter with instructions to begin using them. Nitrate concentrations lower than expected were reported at Eden, Rockhill Dam, and Grofftown Road between October 1988 and March 1989. Concentrations at Safe Harbor drop in October 1988 and remain low until September 1989. The results are, therefore, compromised making it difficult to draw strong conclusions about the possible changes in nitrate concentrations in the river.

Turbidity was estimated by a visual method in Jackson Turbidity Units. The LaMotte turbidity kit uses a drop count of standardized turbidity solution (Fuller's earth) over two ranges; 5-100 JTU in 5 JTU increments, 10-200 JTU in 10 JTU increments. LaMotte calibrates the reagent with a Jackson Candle Turbidimeter. Measured drops of the reagent are added to tap water in a test tube with a black dot at the bottom until the appearance of the dot matches that of a tube containing a sample of the river water to be tested.

We attempted to install river height gages in order to estimate flow and volume of water in the river at the time of sampling. US Geological Survey donated staff gaging materials and personnel to install staff gages at the sites. USGS personnel then trained Alliance staff and volunteers in measuring river profiles at the monitoring sites. A subsequent flood washed out most of the gages. River stage was recorded at the sites with gages for several months. USGS personnel used this data to determine discharge at time of sampling by the volunteer.

The error in estimating discharge at the sites without having stream profiles at varying river stages, as well as more accurately determined profiles, was approximately 20%. This level of precision could probably be attained by developing an estimated constant factor for flow and volume at a volunteer site for any given time based on a proration of watershed area above the volunteer site with the watershed area above either of two USGS gaging stations in operation on the Conestoga. This may be done in the future if the quality of the nitrate concentration data is deemed sufficiently high to allow loading estimates to be determined.

RESULTS

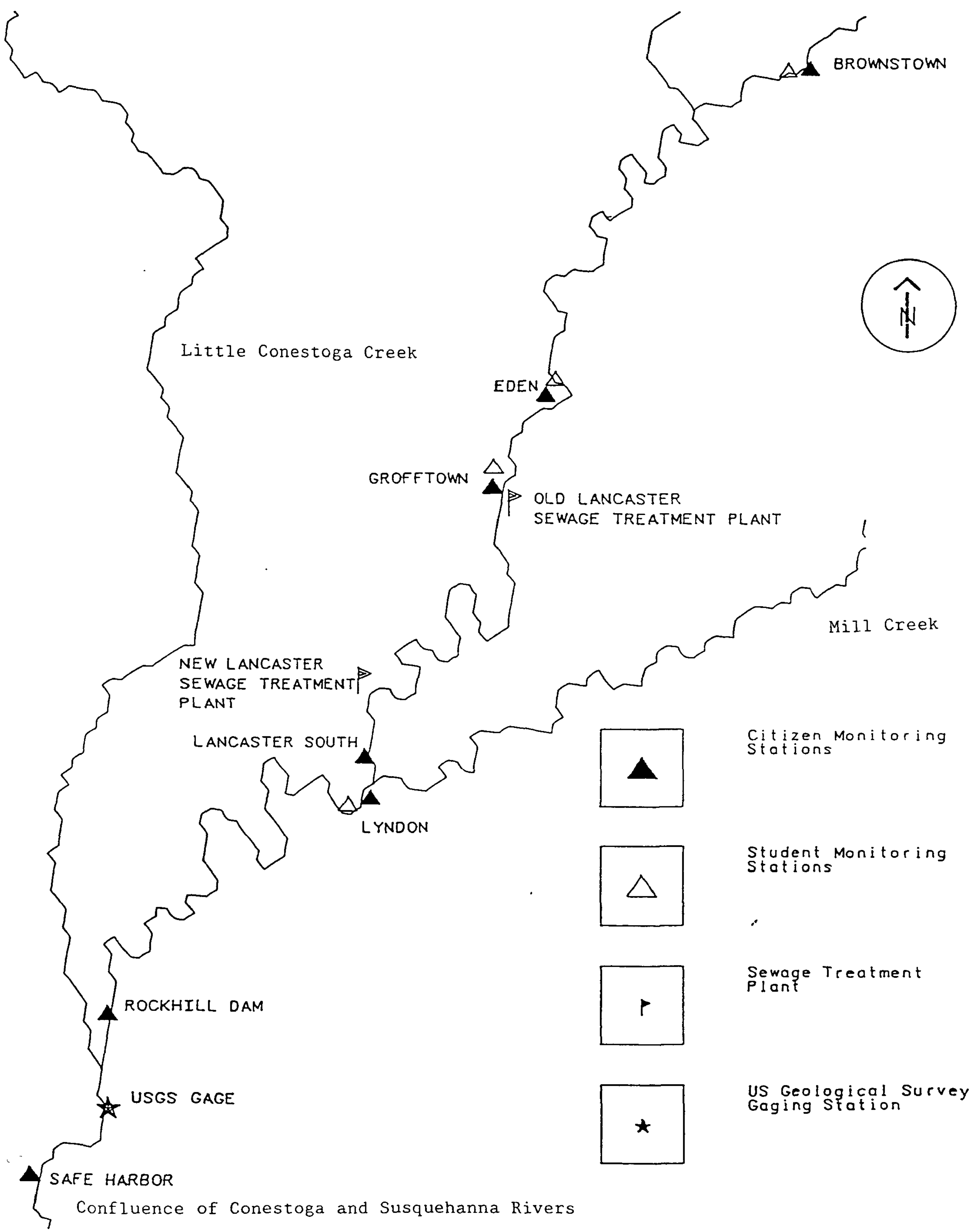
The major objective of this project is to track the concentration of nitrate in the ambient waters of the Conestoga River with the intent of answering the questions, "Has the level of nitrate in the river changed over time? and Is there a downward trend in observed nitrate?"

Figure 1 shows the location of the citizen monitoring sites, Lancaster Co. School sites, the location of the US Geological Survey and Susquehanna River Basin Commission (SRBC) gaging and sampling station, and the location of two sewage treatment plants (STP). The upper plant was closed in 1988 and waste water from Lancaster is now treated at the South Lancaster STP which opened in May 1988 and has the capability of removing nutrients from the effluent.

Nutrient monitoring of the Conestoga River by SRBC has indicated no change in the nitrogen loading for the period 1985-1989, but shows a slight decrease in the phosphorus load for 1988 and a significant decrease for 1989. This decrease is attributed largely to the decreased phosphorus concentration in the Lancaster STP effluent. The STP effluent monitoring data show a significant decrease in ammonia concentration but the nitrate-nitrogen concentration has concurrently increased. This is most likely due to the oxidation of ammonia to nitrate nitrogen (Ott, 1990).

Although nitrate values reported by the Conestoga volunteer monitors appear to be somewhat higher in the winter, there is not a consistent seasonal pattern in the nitrate data for all stations or all years. Visual inspection of the monthly average nitrate data indicated that some stations might exhibit a downward trend in

Figure 1. **CONESTOGA RIVER WATER QUALITY MONITORING STATIONS**



nitrate over the period of record. A Seasonal Kendall nonparametric test for trend was applied to each site and, in fact, the observed trend at stations 8 and 10 was statistically significant ($p<.05$). It must be emphasized that the period of record is still too short and uneven to place much confidence in our ability to measure trends. Since accurate flow measurements were not available at each site, it was not possible to apply a flow-adjusted Seasonal Kendall test. In addition, the measurement problems in the nitrate data which were discussed earlier preclude making inferences about these numbers. In future years when adequate data are available, we should be able to determine if nitrate levels are in fact decreasing. With the additional data, a time series analysis which accounts for the serial correlation should be applied.

There does appear to be a slight relationship between rainfall and nitrate for the citizen monitoring data. Since these are weekly time series data, some serial correlation is expected. Therefore, an accurate significance test for the correlation coefficient cannot be readily obtained. However, for all sites, an increase in daily rainfall was associated with lowered nitrate values and vice versa. The relationship was not a strong one (Spearman rank order correlation approximately -0.20) but it was consistent. We cannot conclude that increases in rainfall cause reduction in nitrate concentrations without a more sophisticated analysis, since other factors could be influencing this apparent association. However, this correlation demonstrates the importance of also examining rainfall patterns when testing for trends in nitrate. It should be noted that even though nitrate concentrations appear to be decreasing with increased rainfall, , the nitrate load may actually be increasing due to the increase in streamflow.

Rainfall and turbidity values were also examined simultaniously. As one would expect, there does seem to be a positive relationship between turbidity and rainfall. Although it varied by site, an increase in daily rainfall was associated with increased turbidity values and vice versa. Across all sites the Spearman rank order correlation was approximately .39 indicating a moderate relationship.

The nitrate concentrations measured by the Susquehanna River Basin Commission during high flow periods were compared to the concentrations reported by the volunteers. The citizen's data and the SRBC gauge data were averaged by week and then matched. There were 37 weeks of data for the SRBC and station 10, and 19 weeks of data for SRBC and station 11, and 21 weeks that station 10 and 11 both had data. While the nitrate levels for sites 10 and 11 were highly correlated (Spearman rank order correlation, $r=.75$) there was a relatively small correlation between either site 10 or site 11 and the SRBC gauge ($r = .18$ and $r = .20$ respectively).

FIGURE 2. COMPARISON OF SEASONAL MEANS OF NO23 CONCENTRATION

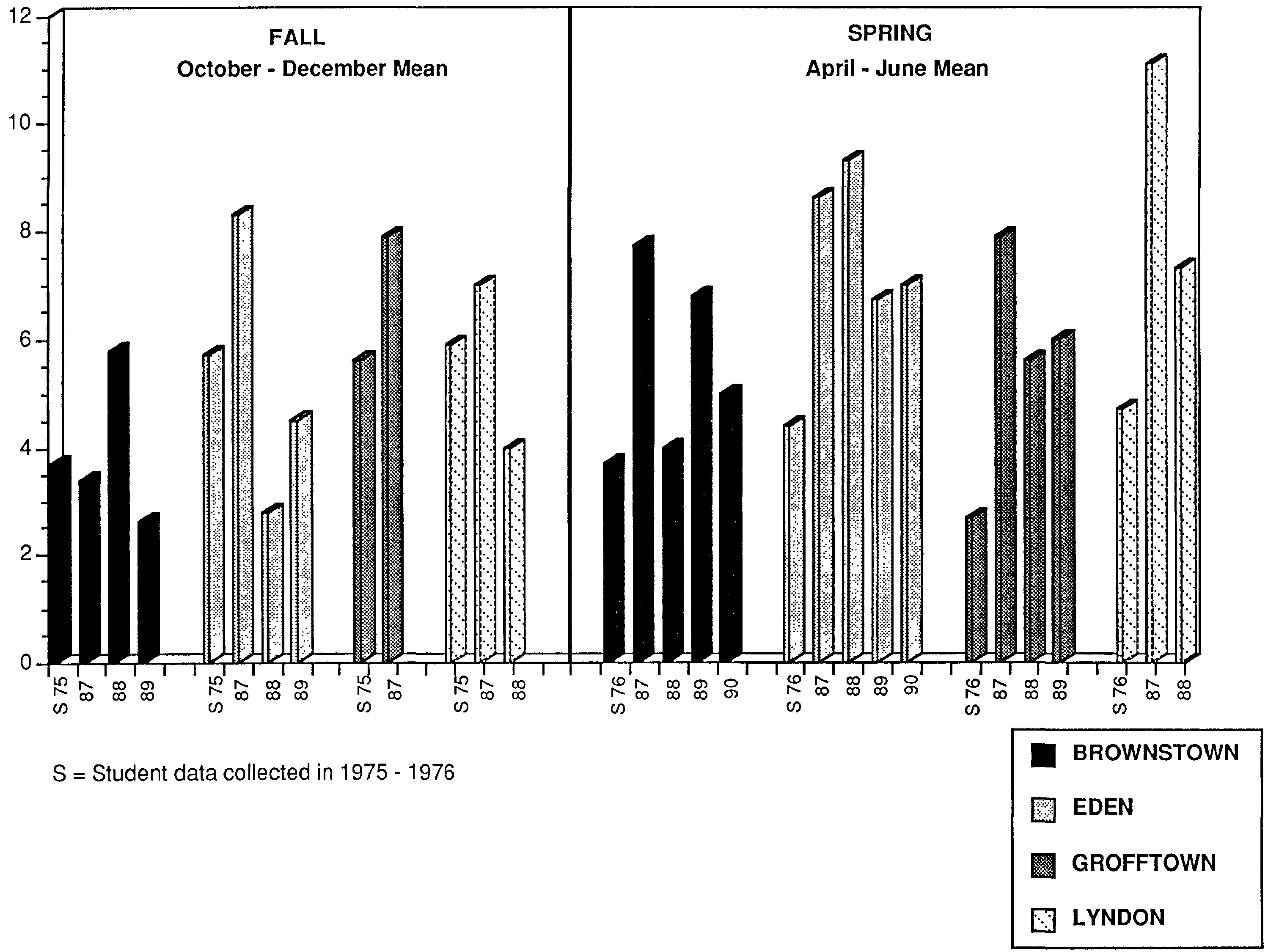


Figure 2 shows the comparison of seasonal means between nitrite + nitrate concentrations measured by students involved in the Conestoga Valley Association's Conestoga River Monitoring Program and those measured by CBCMP volunteers. The student data are from October-December 1975 and March-May 1976 (CVA 1976). Hach colorimeters were used to measure nitrate. The CBCMP data were averaged by year for October through December 1987-89 and April through June 1987 through 1990. For the comparison, four student sites were chosen that were fairly close to CBCMP sites (see Fig. 1). Although the measurements were taken by different methods, one would not expect systematic differences to be observed.

No change in nitrate mean concentration for the fall sampling period is apparent from the graph. However, the nitrate concentrations in the spring appear to have increased since 1976. This would be expected since animal numbers in Lancaster County have increased dramatically during this period of time, while crop land acreage on which to apply manure has decreased. Between 1960 and 1985, the number of dairy cows almost doubled, the number of broilers increased almost six times, layers almost three times and hogs over six times. In the same period of time, the number of farms shrank from 7,210 to 5,210 (USDA 1985).

CONCLUSIONS

It is unclear whether the data collected by this project will provide documentation of a significant change in the concentration of nitrate-N in the surface waters of the Conestoga River. Because of the relative insensitivity of the nitrate kit, the change in concentration will have to be rather dramatic to show a down-trend.

If the group of citizens currently participating in the volunteer monitoring project are able to continue sampling for several more years and if many more nutrient management programs are put in place on adjacent lands, one could hope to detect a decrease in nitrate concentration in the river waters barring any increases in contributions from STP's or the atmosphere. Unfortunately, the increase in nutrient management programs may not necessarily bring about a decrease in NO23 concentration in the river waters. The quality control procedures must be rigidly adhered to and the collection of samples must be highly consistent, with no lengthy data gaps, in order to detect a downward trend in nitrate.

The problems encountered in measuring turbidity are similar to those in measuring nitrate--the sensitivity of the method requires dramatic changes in order to document a significant trend. Again, quality control of the reagent has caused some doubt about the validity of the quantities reported.

Low dissolved oxygen (DO) was not observed at any of the citizen monitoring sites. The DO remained at or above 5 milligrams per liter (mg/l) at nearly all times. Only one site, Lancaster South, reported DO below 5 on two occasions and then it was only slightly lower.

In light of the above conclusions, the following recommendations should be considered concerning the direction and continuation of this project:

1. Discontinue the weekly determination of dissolved oxygen.

2. Emphasize the importance of consistency in data collection so that fewer gaps in the data record occur. This will greatly enhance the statistical power of the data to determine trends.

3. Place more emphasis on carrying out the quality assurance of the testing procedures paying particular attention to the nitrate and turbidity kit reagents.

4. Obtain funding to document the field observations with analyses by certified laboratories.

The majority of the volunteers have done a very credible job of sampling and providing data on the state of their river's water quality. They have and are providing the only water quality data along the Conestoga River's course. The data being collected by this group of dedicated citizens will be a very valuable record of the efficacy of the efforts undertaken by the Commonwealth of Pennsylvania and its citizens to restore and protect the waters of the Conestoga and Susquehanna Rivers as well as the Chesapeake Bay.

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DATA SUMMARY AND LISTING

The following section presents a site by site data summary of all verified data on the Conestoga river in the Citizen Monitoring Program Data File through June 1990. The sites are in order progressing down the river. They are identified by name and number followed by the location and a description of the site as well as the dates that data were collected at the site. This information is followed by plots of each parameter value versus date of collection.

The last section presents a site by site listing of all verified data in order site by site. The date, time of sampling (24 hour clock) and site name is followed by the measured values for the following parameters:

Air temperature - in degrees centigrade

Water temperature - in degrees centigrade

Turbidity - in Jackson Candle Units (JTU)

Dissolved oxygen - in milligrams per liter (mg/l)

Rain - weekly accumulation in millimeters (mm)

Nitrate nitrogen - in milligrams per liter (mg/l)

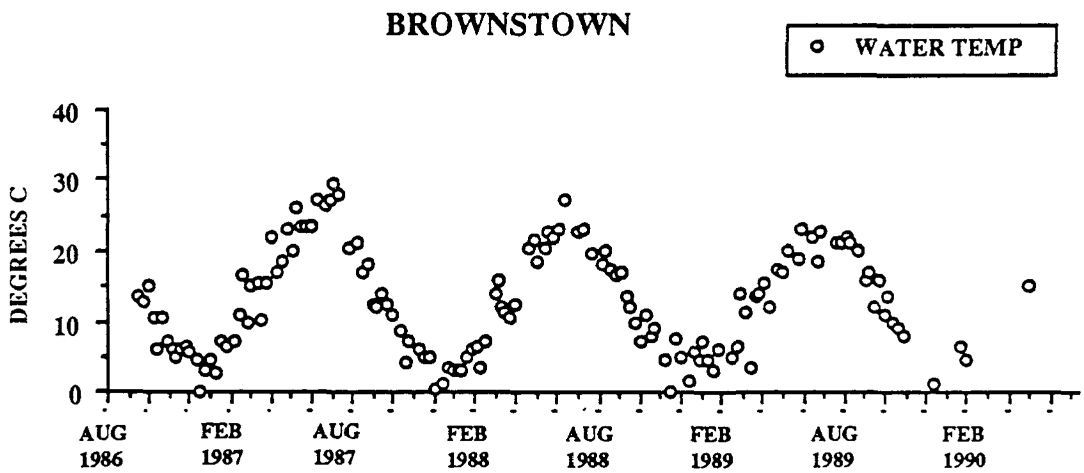
BROWNSTOWN #3

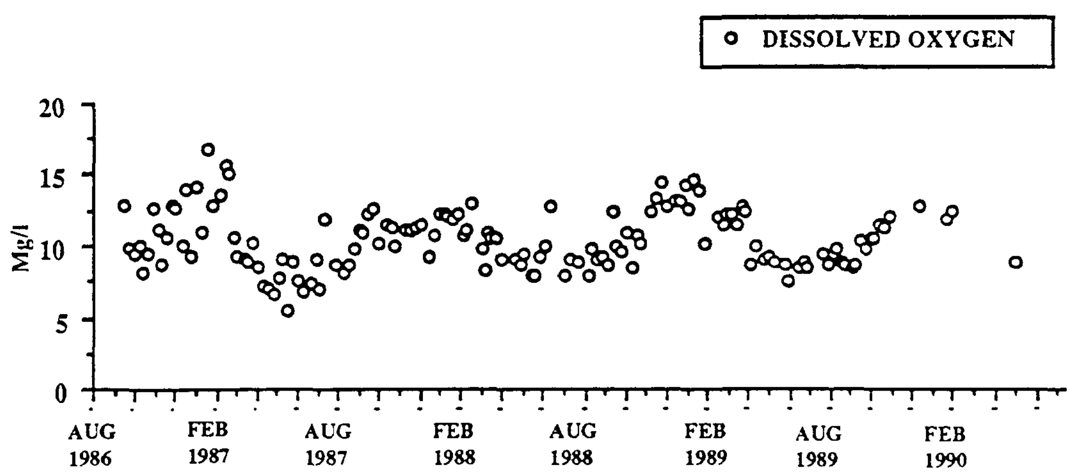
Monitor: Donna Bucher

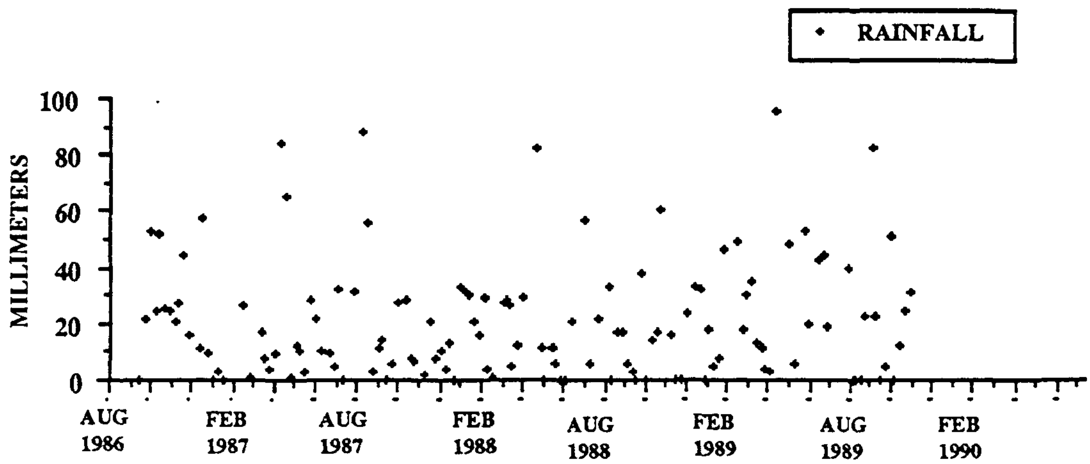
Location: 40 07 14 76 12 50 Brownstown is located 48.00 km from the mouth of the Conestoga River.

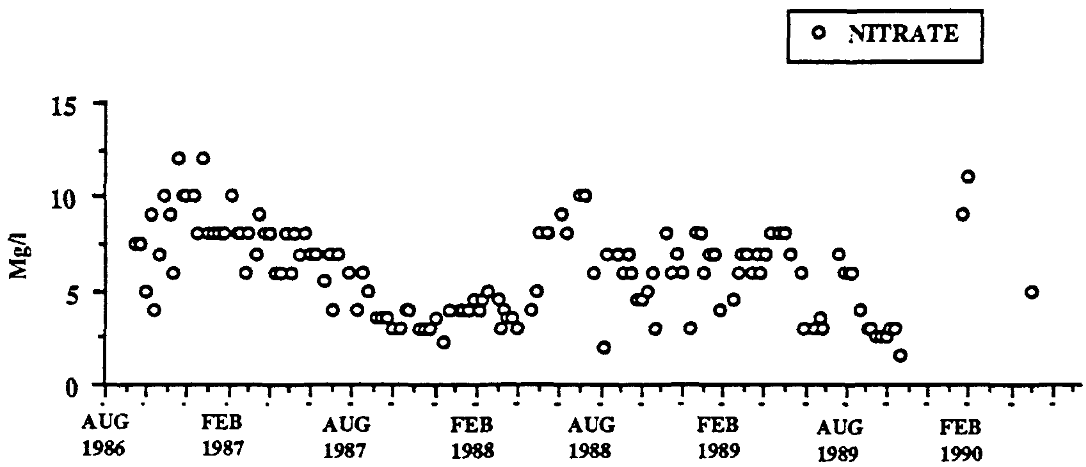
Sampling Site: Grab sample taken from the east riverbank in West Earl Community Park 200 yards upstream of road crossing.

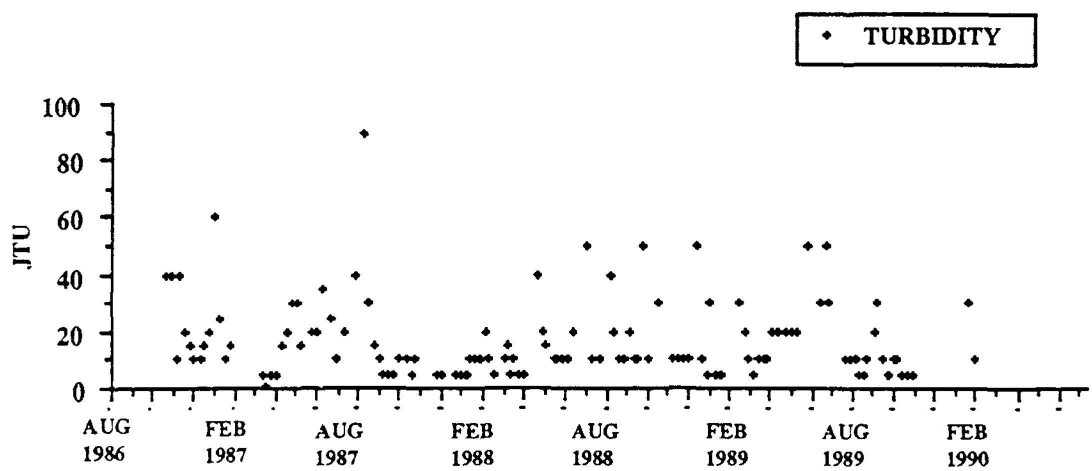
Data Collection Dates: October 1986 to November 1989, January 1990 to February 1990, May 1990.






RAINFALL
100
80
60
40
20
0
MILLIMETERS
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990


NITRATE
15
10
5
0
Mg/l
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990


TURBIDITY
100
80
60
40
20
0
JTU
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990

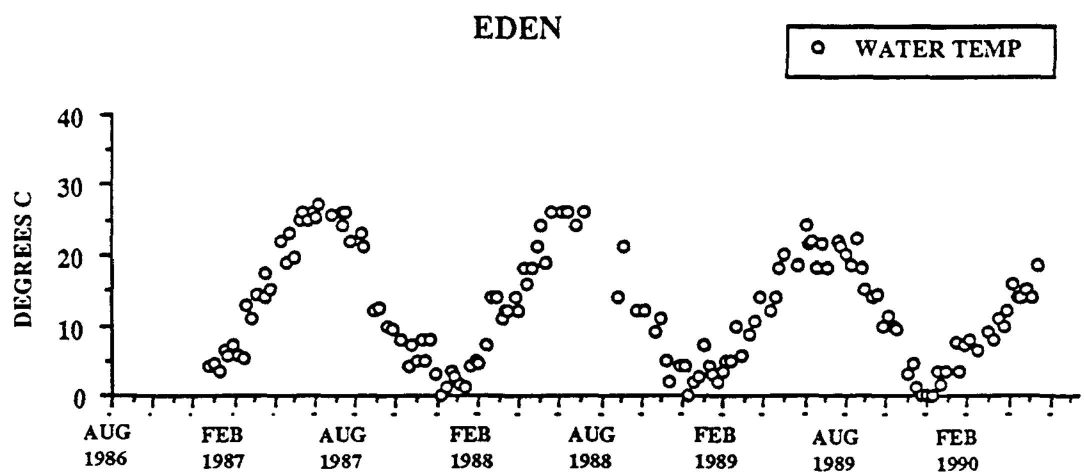
EDEN #4

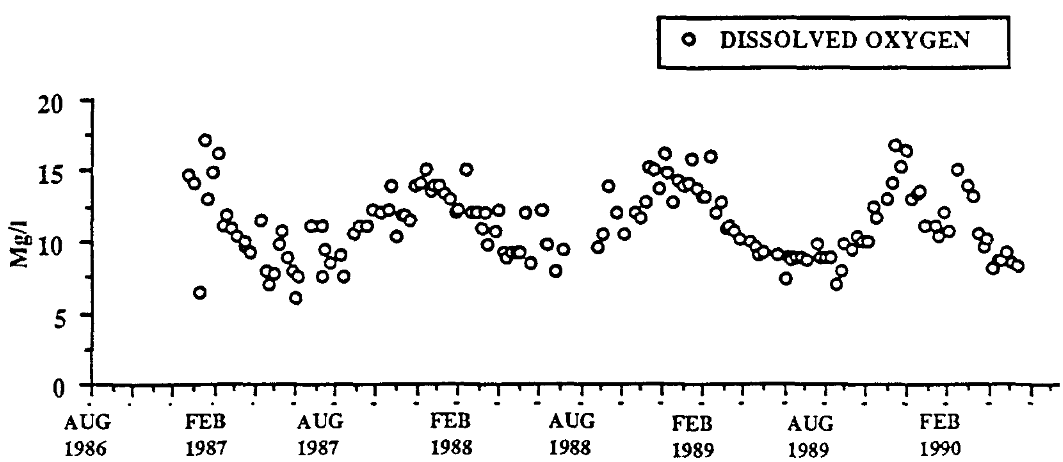
Monitors: Marilyn and Bill Ebel

Location: 40 04 12 76 15 45 Eden is located 35.036 km from the mouth of the Conestoga River.

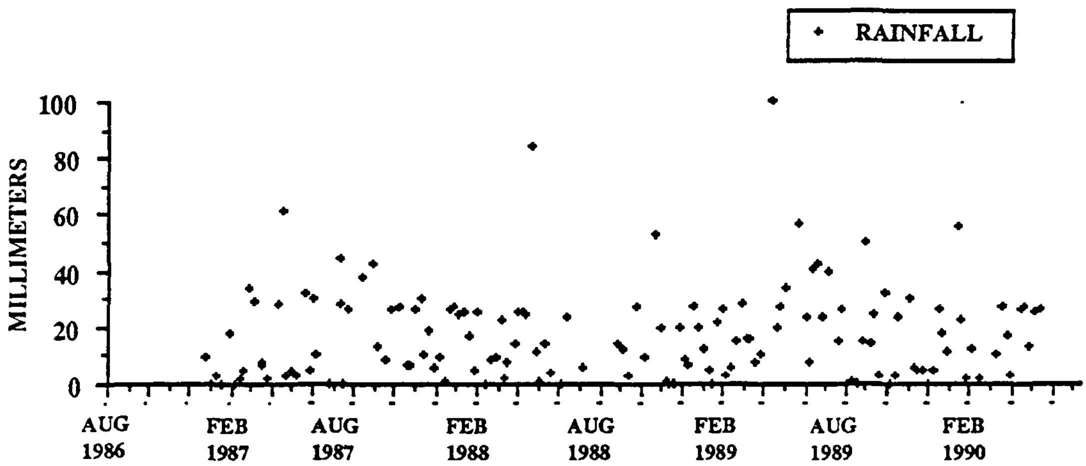
Sampling Site: Grab sample taken form the west riverbank on the Ebel's waterfront property 100 yards downstream of road crossing.

Data Collection Dates: February 1987 to August 1988, October 1988 to June 1990.

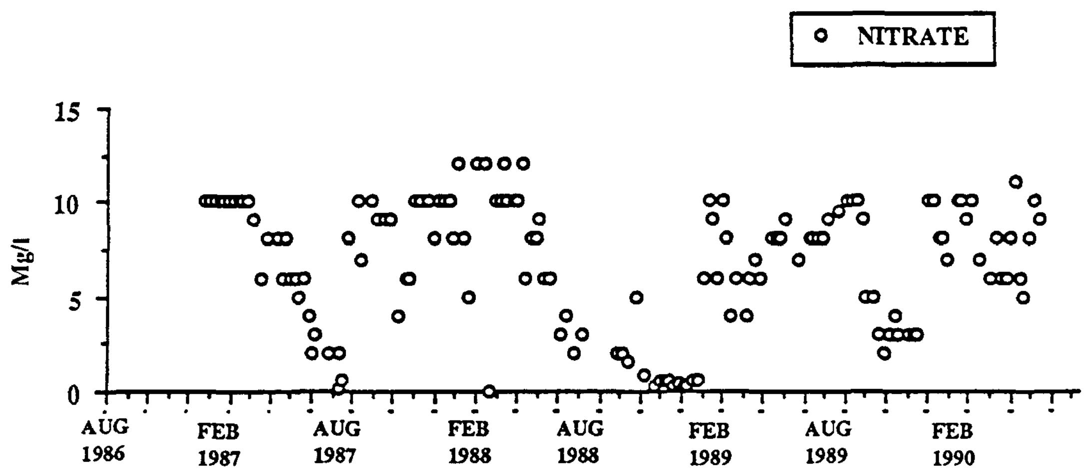




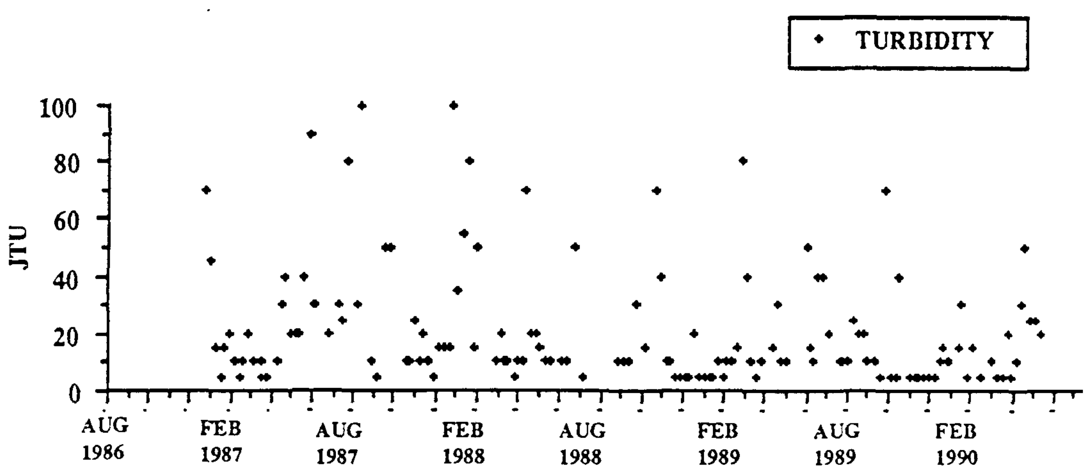
EDEN



RAINFALL
MILLIMETERS
100
80
60
40
20
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990



NITRATE
Mg/l
15
10
5
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990



TURBIDITY
JTU
100
80
60
40
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0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990

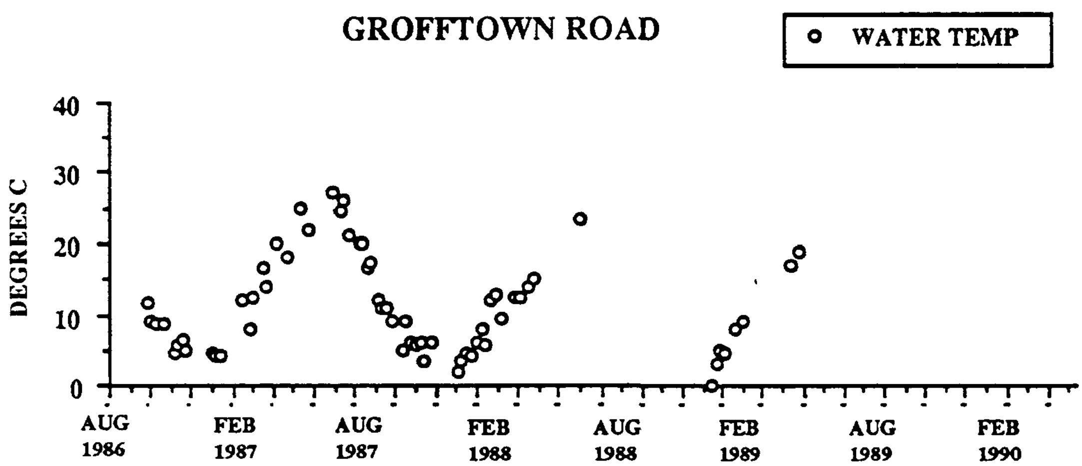
GROFFTOWN ROAD #5

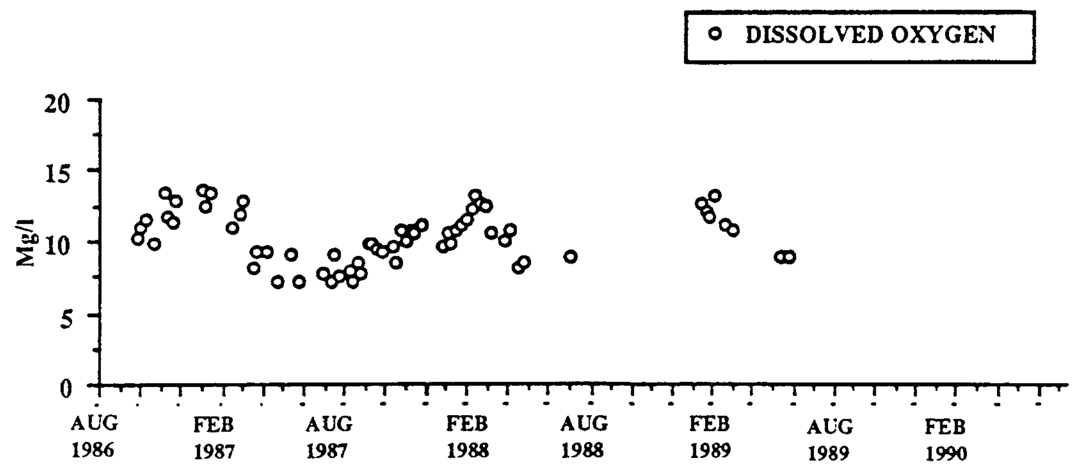
Monitor: Jeff Musser

Location: 40 02 54 76 16 40 Grofftown Road is located 31.447 km from the mouth of the Conestoga River.

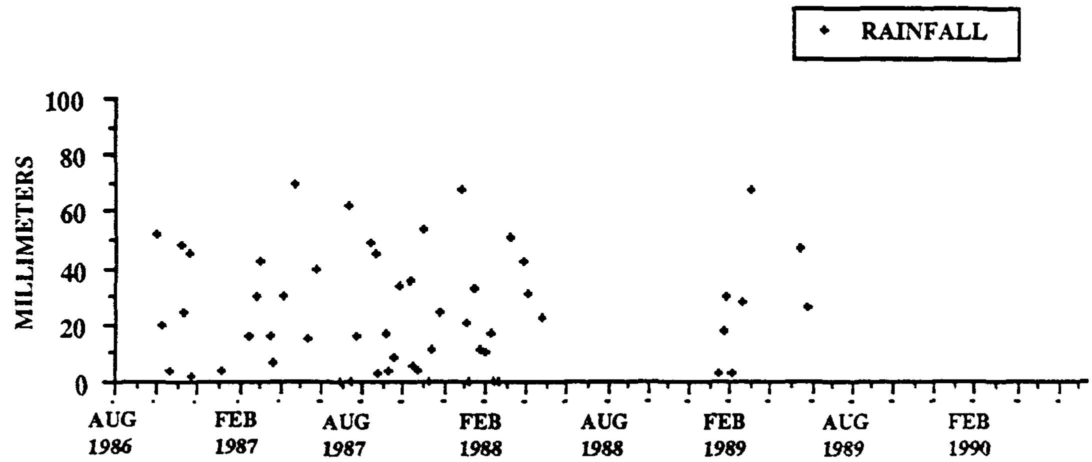
Sampling Site: Grab sample taken from the west riverbank just below a U.S. Geological Survey gaging station and approximately 100 yards upstream from a sewage treatment plant effluent discharge. The site is in a highly urbanized area. The sewage treatment plant was closed shortly before the end of the sampling period.

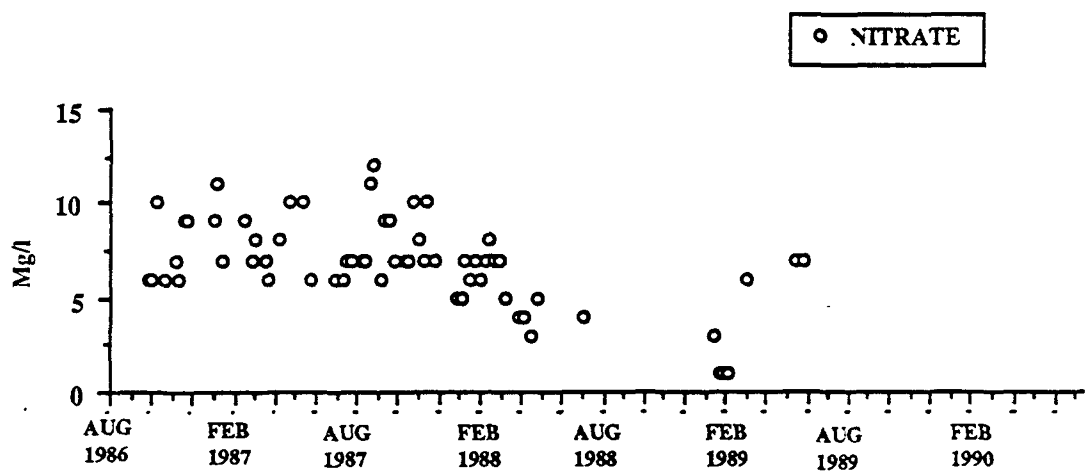
Data Collection Dates: November 1986 to May 1988, August 1988, February 1989 to March 1989, June 1989.

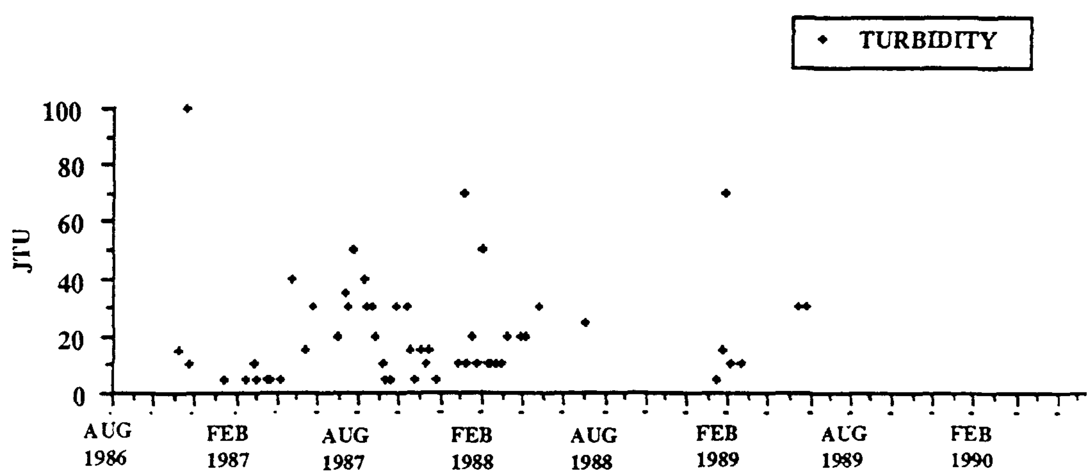




GROFFTOWN ROAD







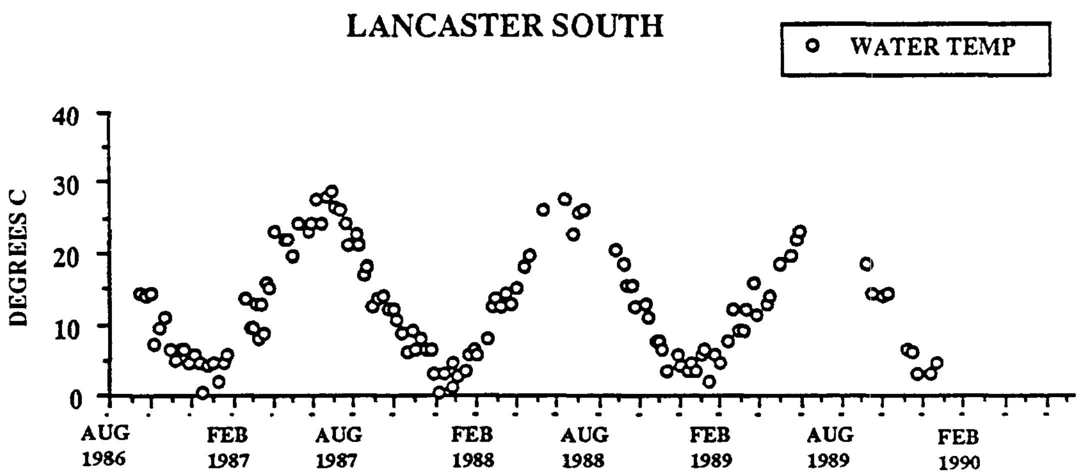
LANCASTER SOUTH #7

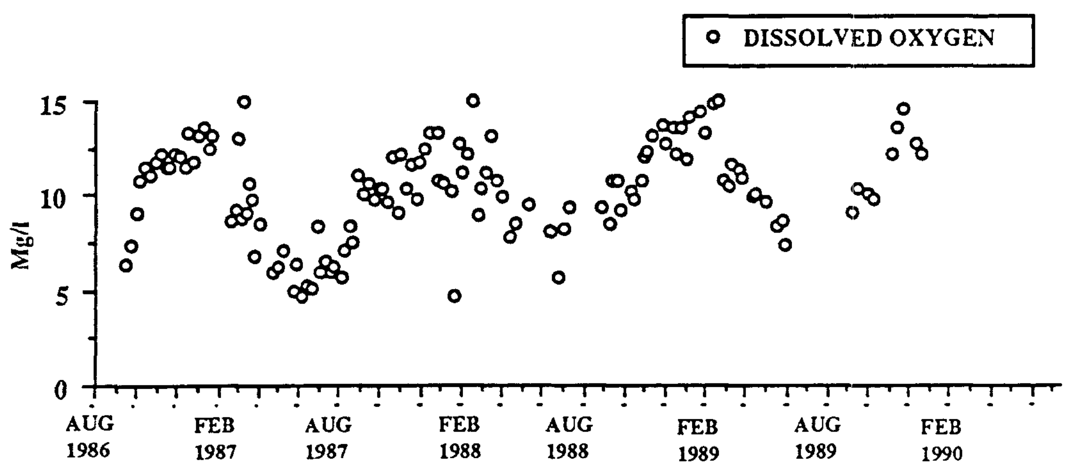
Monitors: John Hanna and Judd Simonson

Location: 40 00 24 76 18 10 Lancaster South is located 20.632 km from the mouth of the Conestoga River.

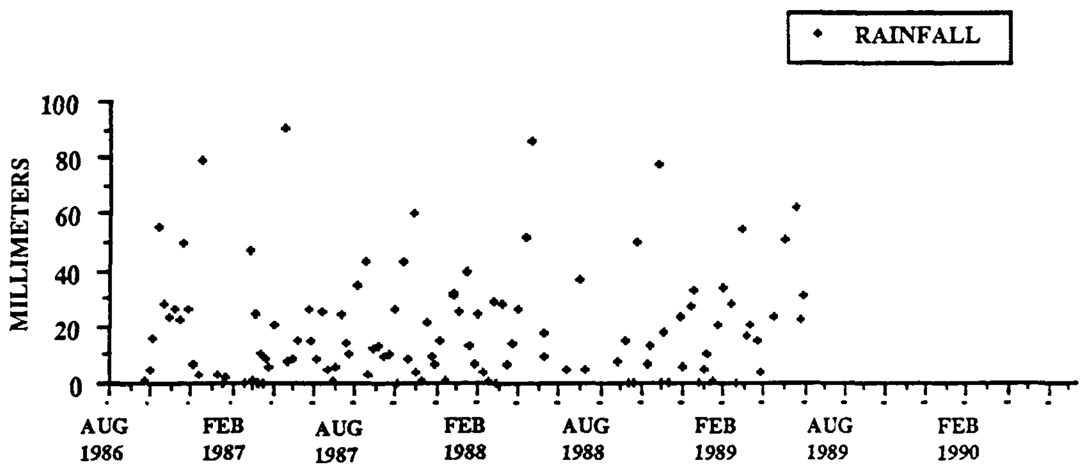
Sampling Site: Grab sample taken from the west riverbank of privately owned (Meadow Hills Resturant and Knights of Columbus Hall) waterfront property. It is approximately .5 mile upstream of Route 324 road crossing; approximately .5 mile downstream of Lancaster sewage treatment plant.

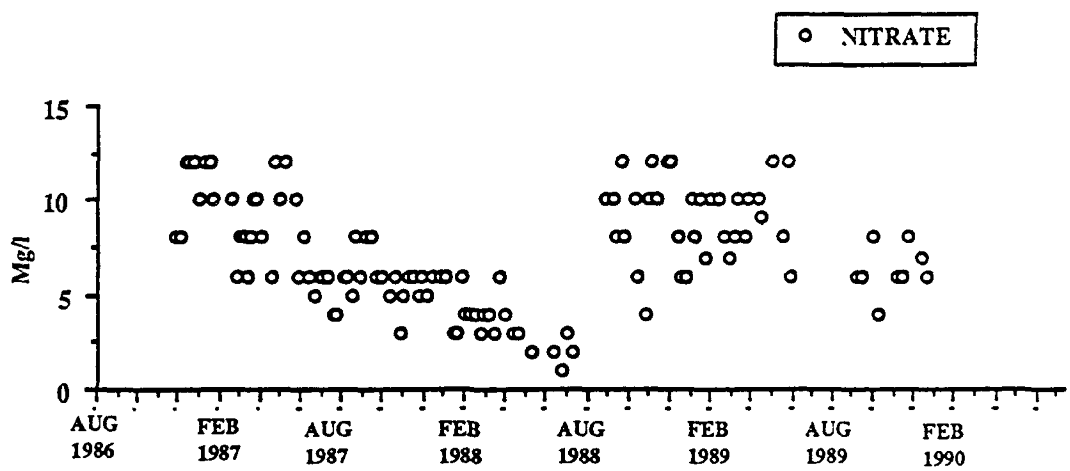
Data Collection Dates: October 1986 to August 1988, October 1988 to June 1989, October 1989 to January 1990.

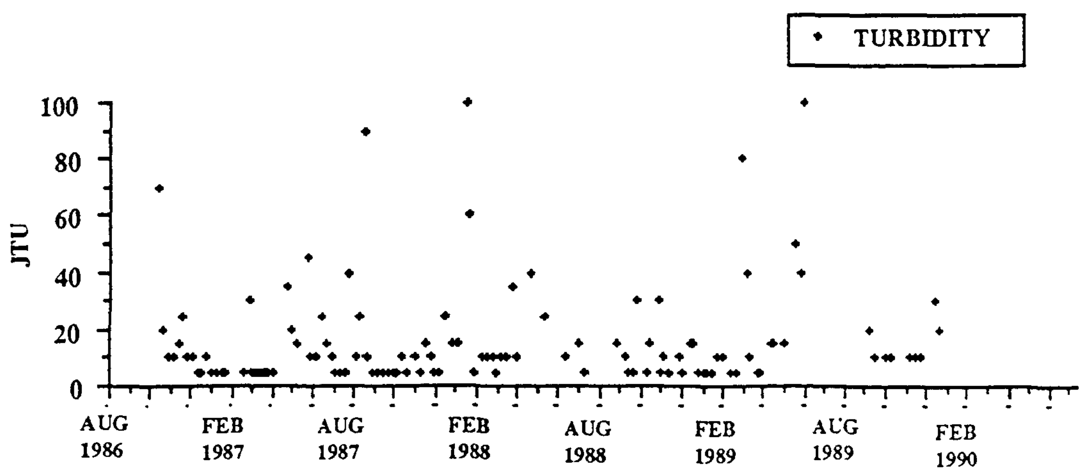




LANCASTER SOUTH







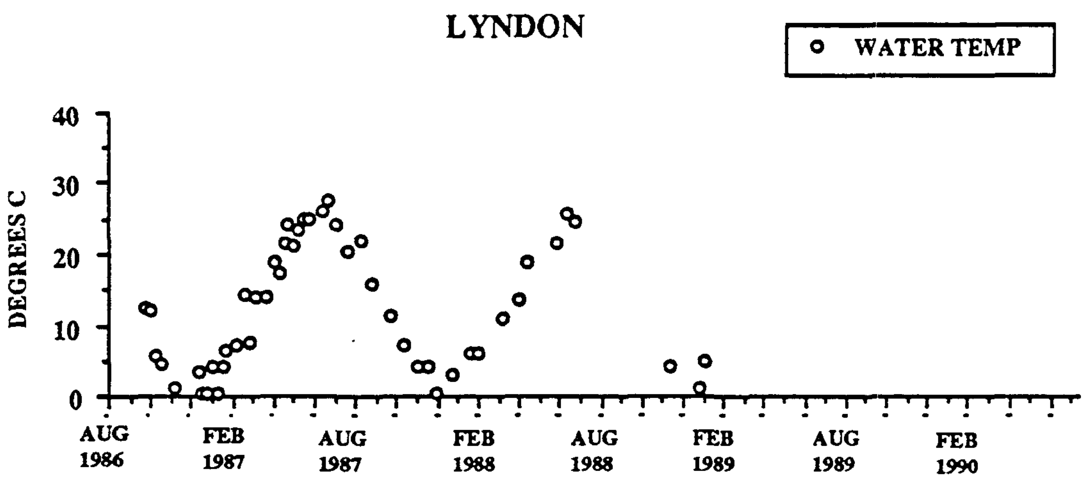
LYNDON #8

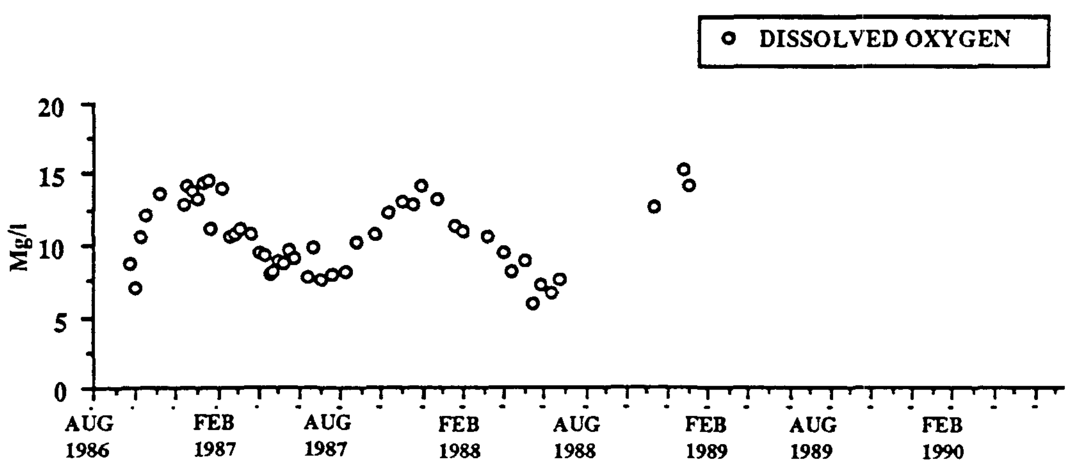
Monitor: Hans Wenger

Location: 39 59 59 76 18 21 Lyndon is located 19.824 km from the mouth of the Conestoga River.

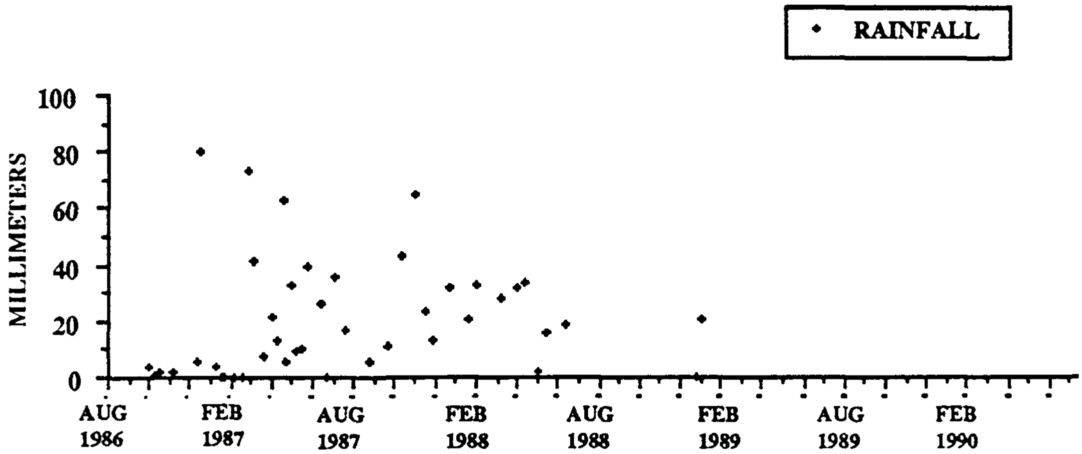
Sampling Site: Grab sample taken from the east riverbank of undeveloped shoreline in a suburban area. It was approximately 300 yards downstream from the confluence of Mill Creek.

Data Collection Dates: November 1986 to July 1988, December 1988, January 1989.





LYNDON


RAINFALL
MILLIMETERS
100
80
60
40
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0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
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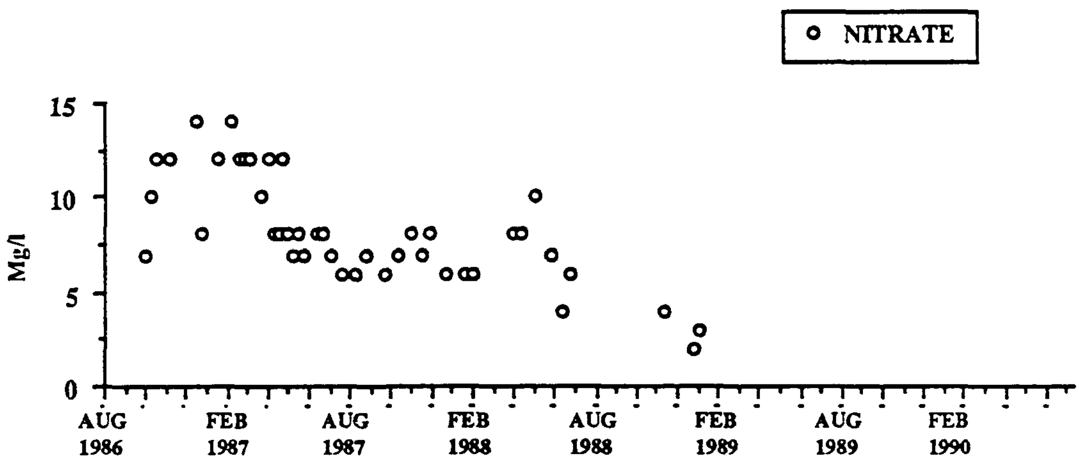
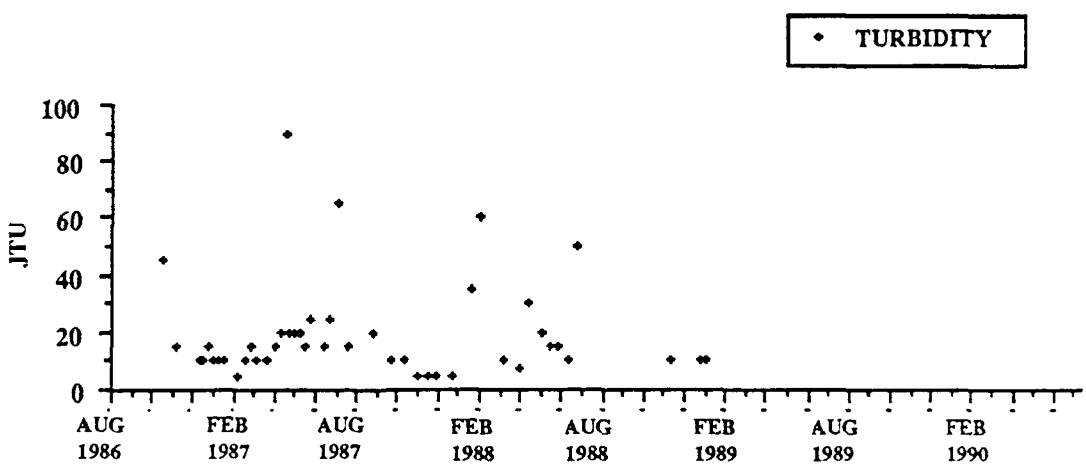
FEB 1989
AUG 1989
FEB 1990


NITRATE
Mg/l
15
10
5
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990


TURBIDITY
JTU
100
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40
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0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990

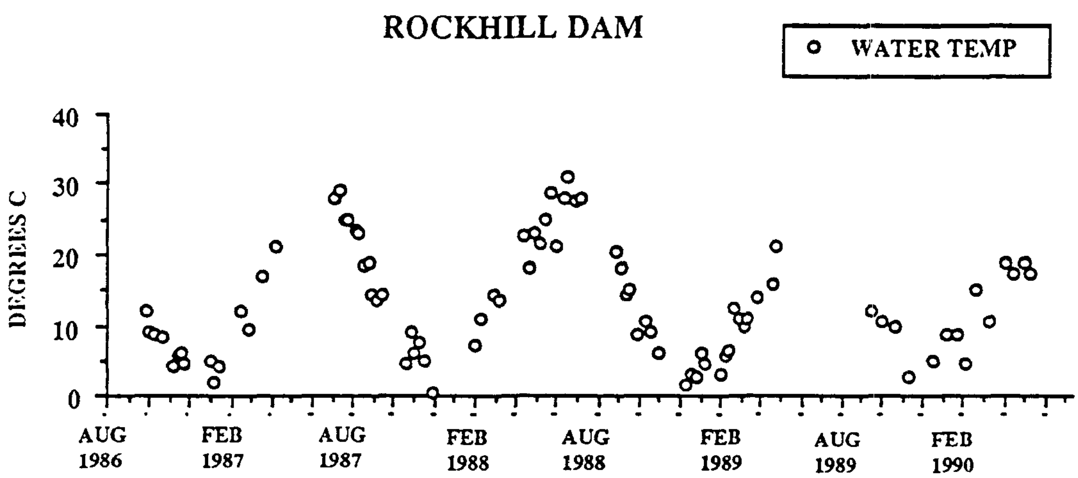
ROCKHILL DAM #10

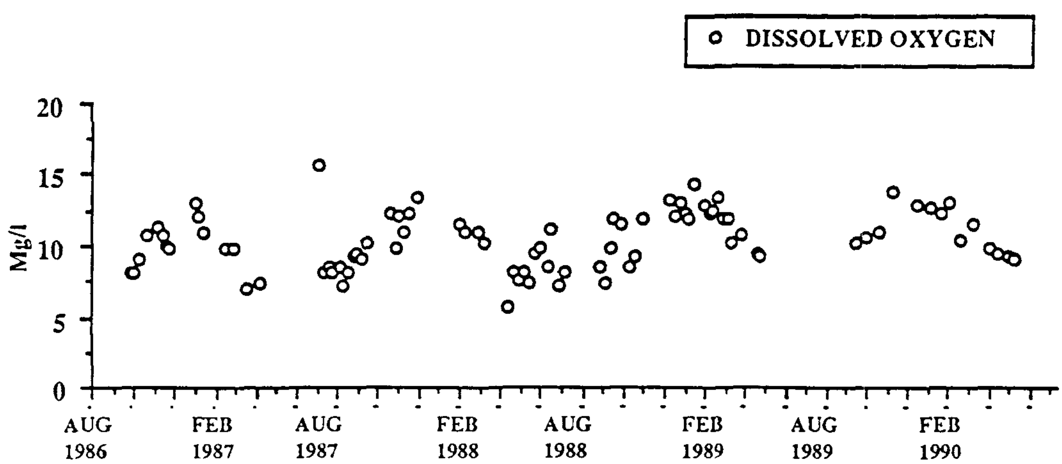
Monitors: Jeff Musser, Dave Dussinger and Naomi Levine, Jim and Barbara Ann Wiser, and Harris Malkin

Location: 39 57 46 76 21 55 Rockhill Dam is located 4.574 km from the mouth of the Conestoga River and 1/2 to 3/4 of a mile upstream from the Little Conestoga Confluence.

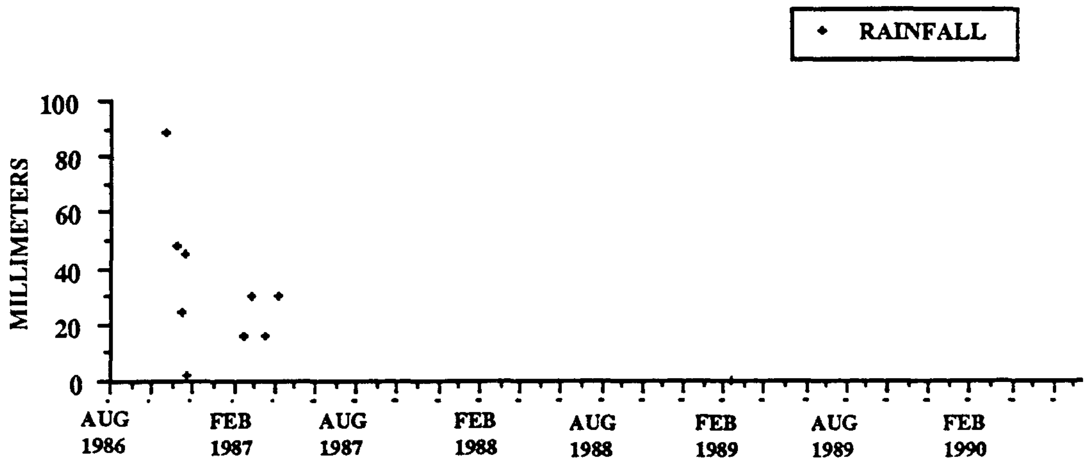
Sampling Site: Grab sample taken from slackwater just above and below an abandoned dam on the west riverbank.

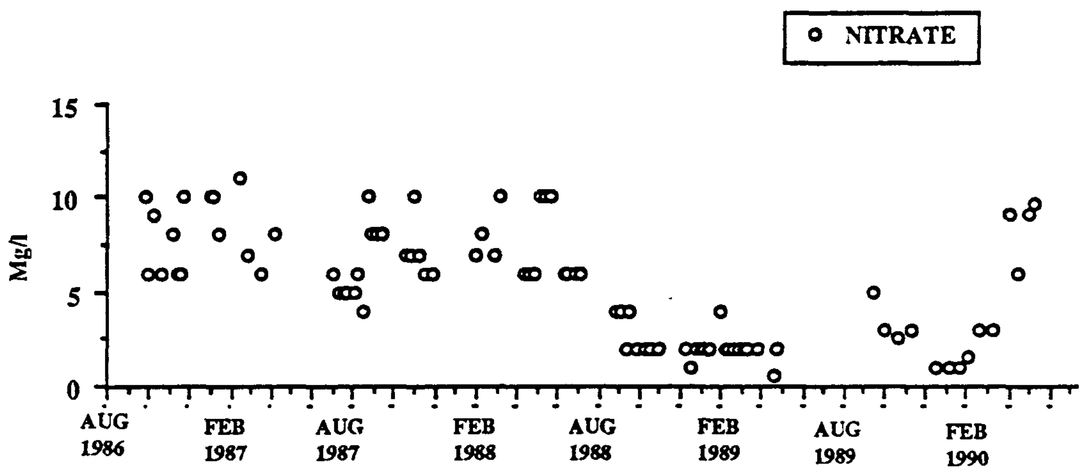
Data Collection Dates: November 1986 to May 1987, August 1987 to January 1988, March 1988 to November 1988, January 1989 to May 1989, October 1989 to June 1990.

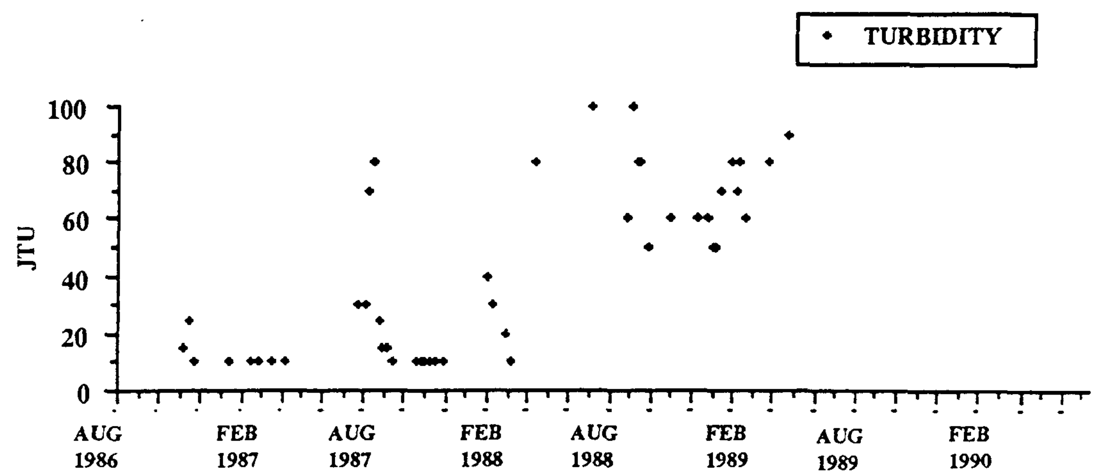




ROCKHILL DAM







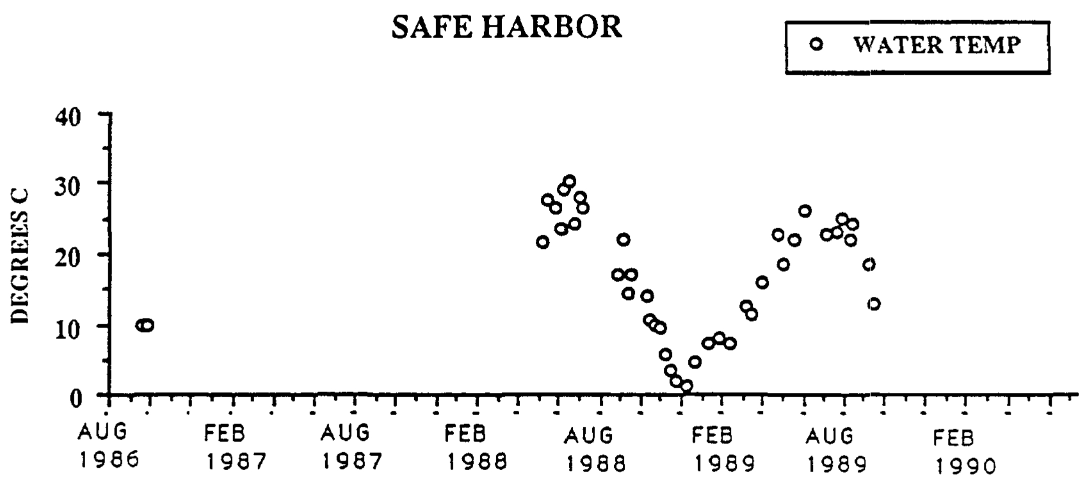
SAFE HARBOR #11

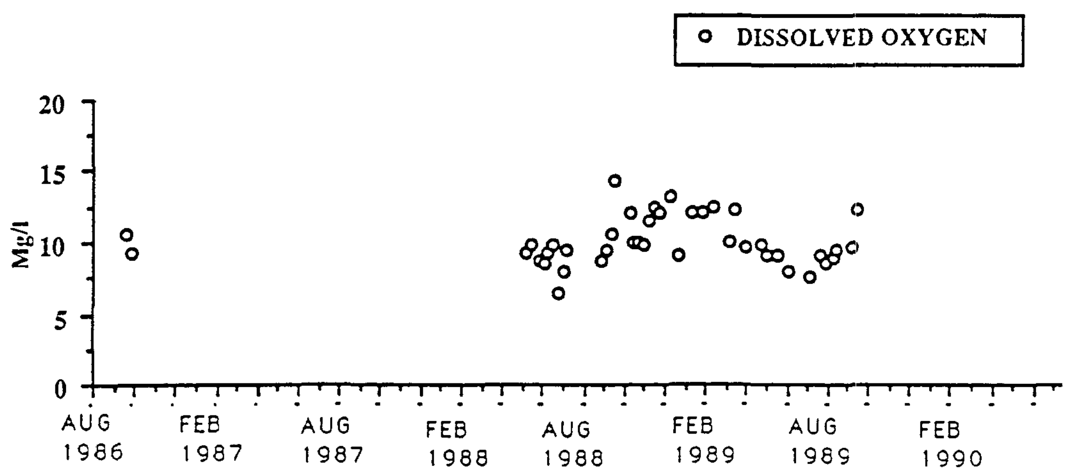
Monitor: Garry Kilgore

Location: 39 56 19 76 23 16 Safe Harbor is located 2.311 km from the mouth of the Conestoga River and Safe Harbor Dam.

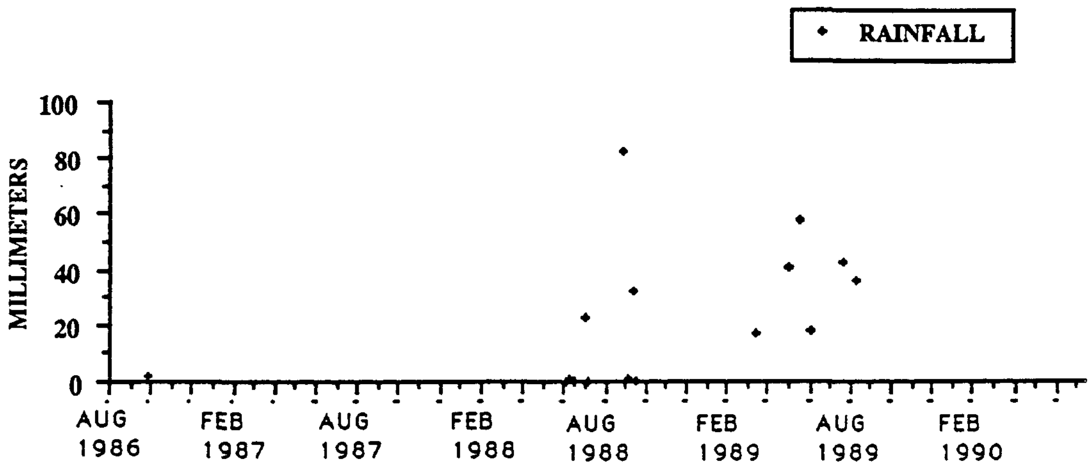
Sampling Site: Grab sample was taken from the west bank in Safe Harbor Park approximately 550 feet below the bridge and 190 feet below the confluence with Witmer Run.

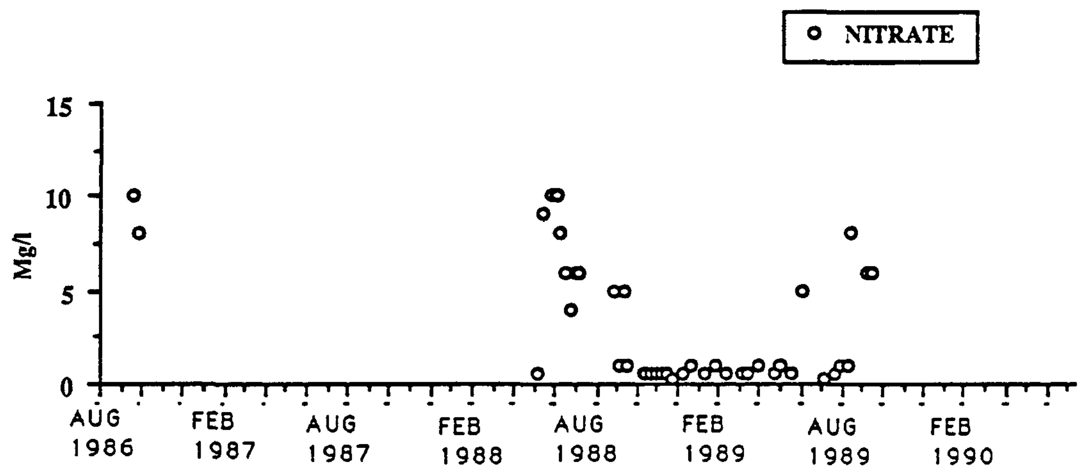
Data Collection Dates: June 1988 to October 1989.

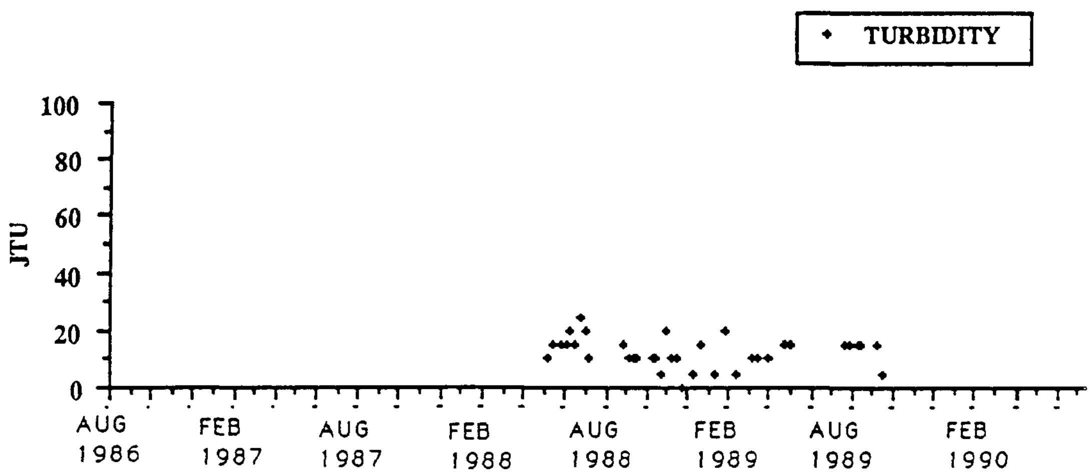




SAFE HARBOR


RAINFALL
MILLIMETERS
100
80
60
40
20
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990


NITRATE
Mg/l
15
10
5
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990


TURBIDITY
JTU
100
80
60
40
20
0
AUG 1986
FEB 1987
AUG 1987
FEB 1988
AUG 1988
FEB 1989
AUG 1989
FEB 1990

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
25OCT86	1430	BROWNSTOWN	15.0	13.5	.	12.80	0.0	7.5
01NOV86	940	BROWNSTOWN	15.0	13.0	.	9.80	21.8	7.5
09NOV86	1130	BROWNSTOWN	22.0	15.0	.	9.40	52.6	5.0
16NOV86	1200	BROWNSTOWN	17.5	10.5	.	10.00	24.4	9.0
21NOV86	1100	BROWNSTOWN	8.0	6.0	.	8.20	51.8	4.0
28NOV86	1400	BROWNSTOWN	14.5	10.5	140	9.50	25.4	7.0
06DEC86	1430	BROWNSTOWN	15.0	7.0	40	12.60	24.9	10.0
13DEC86	1000	BROWNSTOWN	11.0	6.0	10	11.10	20.6	9.0
20DEC86	840	BROWNSTOWN	5.5	5.0	40	8.70	27.0	6.0
28DEC86	1430	BROWNSTOWN	6.0	6.0	20	10.60	44.0	12.0
03JAN87	1330	BROWNSTOWN	12.0	6.5	15	12.90	16.0	10.0
09JAN87	1330	BROWNSTOWN	4.5	5.5	10	12.60	.	10.0
18JAN87	1330	BROWNSTOWN	1.0	4.5	10	10.00	11.0	10.0
25JAN87	1630	BROWNSTOWN	-5.0	0.0	15	13.90	58.0	8.0
31JAN87	1630	BROWNSTOWN	1.5	3.0	20	9.15	9.0	12.0
08FEB87	1400	BROWNSTOWN	4.0	4.5	60	14.20	0.0	8.0
15FEB87	1400	BROWNSTOWN	5.0	2.5	25	11.00	3.0	8.0
22FEB87	1230	BROWNSTOWN	9.5	7.0	10	16.80	0.0	8.0
02MAR87	1430	BROWNSTOWN	8.0	6.5	15	12.80	.	8.0
15MAR87	900	BROWNSTOWN	5.0	7.0	.	13.50	.	10.0
22MAR87	1250	BROWNSTOWN	15.5	11.0	.	15.60	26.0	8.0
29MAR87	1330	BROWNSTOWN	25.0	16.5	.	15.10	.	8.0
05APR87	1330	BROWNSTOWN	6.0	10.0	.	10.60	0.8	6.0
10APR87	1340	BROWNSTOWN	23.0	15.0	.	9.20	.	8.0
20APR87	1000	BROWNSTOWN	16.5	15.5	5	9.00	17.0	7.0
25APR87	1000	BROWNSTOWN	10.0	10.3	1	8.75	8.0	9.0
03MAY87	1500	BROWNSTOWN	16.0	15.5	5	10.20	4.0	8.0
11MAY87	1600	BROWNSTOWN	31.0	22.0	5	8.50	9.0	8.0
16MAY87	1015	BROWNSTOWN	14.5	17.0	15	7.05	84.0	6.0
25MAY87	1000	BROWNSTOWN	16.5	18.5	200	7.00	65.0	6.0
02JUN87	830	BROWNSTOWN	23.0	23.0	30	6.60	1.0	8.0
10JUN87	930	BROWNSTOWN	17.0	20.0	30	7.65	12.0	6.0
15JUN87	1330	BROWNSTOWN	33.0	26.0	15	9.12	10.0	8.0
21JUN87	1230	BROWNSTOWN	25.0	23.5	.	5.35	3.0	7.0
29JUN87	1345	BROWNSTOWN	29.0	23.5	20	8.92	28.0	8.0
07JUL87	1115	BROWNSTOWN	23.5	23.5	20	7.50	22.0	7.0
14JUL87	1115	BROWNSTOWN	29.5	27.0	35	6.70	10.0	7.0
27JUL87	1620	BROWNSTOWN	32.0	26.5	25	7.40	9.0	5.5
04AUG87	1945	BROWNSTOWN	28.5	27.0	10	8.95	5.0	7.0
10AUG87	1300	BROWNSTOWN	28.5	29.5	.	6.85	32.0	4.0
17AUG87	1515	BROWNSTOWN	34.5	28.0	20	11.90	0.0	7.0
01SEP87	1230	BROWNSTOWN	21.5	20.5	40	8.55	31.0	6.0
14SEP87	1300	BROWNSTOWN	27.0	21.0	90	8.05	88.0	4.0
21SEP87	1310	BROWNSTOWN	22.0	17.0	30	8.60	56.0	6.0
28SEP87	1445	BROWNSTOWN	28.0	18.0	15	9.85	3.0	5.0
05OCT87	1245	BROWNSTOWN	18.5	12.5	10	11.10	11.0	.
11OCT87	1745	BROWNSTOWN	14.5	12.0	5	10.90	14.0	3.5
19OCT87	1345	BROWNSTOWN	20.5	14.0	5	12.30	0.0	3.5
25OCT87	1415	BROWNSTOWN	14.5	12.5	5	12.70	6.0	3.5
02NOV87	845	BROWNSTOWN	13.5	11.0	10	10.10	27.0	3.0
15NOV87	1300	BROWNSTOWN	14.0	8.5	10	11.50	28.0	3.0
23NOV87	1230	BROWNSTOWN	8.5	4.0	5	11.40	8.0	4.0
28NOV87	915	BROWNSTOWN	3.5	7.0	10	10.00	7.0	4.0
14DEC87	845	BROWNSTOWN	3.5	6.0	.	11.10	2.0	3.0
21DEC87	850	BROWNSTOWN	4.0	5.0	.	11.20	21.0	3.0

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
28DEC87	1500	BROWNSTOWN	1.0	5.00	5	11.30	8	3.00
05JAN88	930	BROWNSTOWN	0.0	0.50	5	11.50	10	3.50
12JAN88	1600	BROWNSTOWN	0.0	.	.	.	4	.
19JAN88	900	BROWNSTOWN	1.5	1.00	.	9.30	13	2.25
25JAN88	815	BROWNSTOWN	1.0	3.50	5	10.80	0	4.00
01FEB88	830	BROWNSTOWN	3.0	3.00	5	12.30	33	.
09FEB88	1425	BROWNSTOWN	2.5	3.00	5	12.30	31	4.00
15FEB88	1330	BROWNSTOWN	6.5	3.00	10	12.00	30	4.00
23FEB88	1430	BROWNSTOWN	4.5	5.00	10	11.90	21	4.00
01MAR88	1030	BROWNSTOWN	4.0	6.00	10	12.20	16	4.50
07MAR88	900	BROWNSTOWN	5.0	6.50	20	10.70	29	4.00
14MAR88	1445	BROWNSTOWN	2.0	3.50	10	11.10	4	4.50
21MAR88	1230	BROWNSTOWN	1.0	7.00	5	13.10	1	5.00
05APR88	930	BROWNSTOWN	16.5	14.00	10	9.90	27	4.50
10APR88	1000	BROWNSTOWN	14.0	16.00	15	8.30	28	3.00
12APR88	1030	BROWNSTOWN	9.0	12.00	5	10.90	26	4.00
18APR88	1015	BROWNSTOWN	13.0	11.50	10	10.50	5	3.50
25APR88	900	BROWNSTOWN	9.0	10.50	5	10.50	12	3.50
02MAY88	800	BROWNSTOWN	10.0	12.50	5	9.05	29	3.00
23MAY88	1400	BROWNSTOWN	29.0	20.50	40	9.00	82	4.00
31MAY88	1000	BROWNSTOWN	27.0	21.50	20	8.55	11	5.00
05JUN88	1100	BROWNSTOWN	23.5	18.50	15	9.50	0	8.00
14JUN88	800	BROWNSTOWN	20.0	20.50	10	8.00	11	8.00
20JUN88	830	BROWNSTOWN	24.0	22.50	10	7.90	6	10.00
27JUN88	1130	BROWNSTOWN	23.0	22.00	10	9.20	0	9.00
05JUL88	930	BROWNSTOWN	25.5	23.00	10	10.00	0	9.00
11JUL88	1500	BROWNSTOWN	34.5	27.00	20	12.90	21	8.00
01AUG88	900	BROWNSTOWN	27.0	22.50	50	7.85	57	10.00
08AUG88	1000	BROWNSTOWN	25.0	23.00	10	9.00	6	10.00
22AUG88	1100	BROWNSTOWN	20.0	19.50	10	8.80	22	6.00
06SEP88	950	BROWNSTOWN	15.0	18.00	40	8.00	33	2.00
11SEP88	1345	BROWNSTOWN	23.5	20.00	20	9.85	0	7.00
19SEP88	1030	BROWNSTOWN	20.0	17.50	10	9.05	17	8.00
26SEP88	1030	BROWNSTOWN	17.5	16.50	10	9.20	17	7.00
03OCT88	915	BROWNSTOWN	16.0	17.00	20	8.60	6	6.00
10OCT88	1315	BROWNSTOWN	18.5	13.50	10	12.40	3	7.00
17OCT88	930	BROWNSTOWN	15.0	12.00	10	9.95	0	6.00
24OCT88	915	BROWNSTOWN	10.5	10.00	50	9.60	38	4.50
31OCT88	830	BROWNSTOWN	3.0	7.00	10	10.90	0	4.50
07NOV88	830	BROWNSTOWN	7.5	11.00	.	8.40	14	5.00
14NOV88	915	BROWNSTOWN	6.5	8.00	30	10.80	17	6.00
21NOV88	845	BROWNSTOWN	9.5	9.00	.	10.10	60	3.00
05DEC88	1045	BROWNSTOWN	4.0	4.50	10	12.50	16	8.00
12DEC88	930	BROWNSTOWN	-4.0	0.05	10	13.40	0	6.00
20DEC88	1045	BROWNSTOWN	8.5	7.50	10	14.50	0	7.00
28DEC88	1200	BROWNSTOWN	12.5	5.00	10	12.90	24	6.00
09JAN89	1200	BROWNSTOWN	3.0	1.50	50	13.30	33	3.00
18JAN89	1415	BROWNSTOWN	12.0	5.50	10	13.30	32	8.00
24JAN89	1300	BROWNSTOWN	14.0	4.50	5	14.40	0	8.00
31JAN89	1330	BROWNSTOWN	11.5	7.00	30	12.60	18	6.00
06FEB89	1330	BROWNSTOWN	4.0	4.50	5	14.70	5	7.00
14FEB89	1000	BROWNSTOWN	7.0	3.00	5	13.90	8	7.00
22FEB89	1300	BROWNSTOWN	4.5	6.00	.	10.10	46	4.00
13MAR89	915	BROWNSTOWN	-0.5	5.00	30	12.10	49	4.50
21MAR89	945	BROWNSTOWN	7.0	6.50	20	11.60	18	6.00

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
27MAR89	1600	BROWNSTOWN	20.0	14.0	10	12.20	30.0	7.0
03APR89	1615	BROWNSTOWN	17.5	11.5	5	12.20	35.0	7.0
11APR89	930	BROWNSTOWN	4.5	3.5	10	11.60	13.0	6.0
17APR89	1445	BROWNSTOWN	21.5	13.5	10	12.80	11.0	7.0
24APR89	1330	BROWNSTOWN	15.0	14.0	10	12.50	4.0	6.0
01MAY89	930	BROWNSTOWN	17.5	15.5	20	8.65	3.0	7.0
08MAY89	1630	BROWNSTOWN	15.0	12.0	20	10.00	95.0	8.0
22MAY89	930	BROWNSTOWN	18.5	17.5	20	9.05	.	8.0
30MAY89	930	BROWNSTOWN	19.0	17.0	20	9.30	48.0	8.0
05JUN89	1000	BROWNSTOWN	22.5	20.0	20	8.80	6.0	7.0
19JUN89	845	BROWNSTOWN	19.5	19.0	50	8.65	53.0	6.0
26JUN89	1200	BROWNSTOWN	28.5	23.0	.	7.60	20.0	3.0
10JUL89	930	BROWNSTOWN	26.5	22.0	30	8.40	42.0	3.0
17JUL89	1015	BROWNSTOWN	22.0	18.5	50	8.85	44.0	3.5
24JUL89	1200	BROWNSTOWN	30.5	22.5	30	8.50	19.0	3.0
14AUG89	1030	BROWNSTOWN	27.0	21.0	10	9.40	.	7.0
22AUG89	915	BROWNSTOWN	23.5	21.0	10	8.65	39.4	6.0
29AUG89	1500	BROWNSTOWN	27.5	22.0	10	9.50	0.0	6.0
04SEP89	1600	BROWNSTOWN	24.5	21.0	5	9.90	0.0	6.0
12SEP89	1300	BROWNSTOWN	.	.	5	8.75	0.0	6.0
17SEP89	1700	BROWNSTOWN	25.0	20.0	10	8.65	22.6	4.0
26SEP89	1000	BROWNSTOWN	16.0	16.0	20	8.50	82.5	3.0
03OCT89	945	BROWNSTOWN	20.0	17.0	30	8.70	22.9	3.0
09OCT89	1000	BROWNSTOWN	9.5	12.0	10	10.40	0.0	2.5
16OCT89	1035	BROWNSTOWN	18.5	16.0	5	9.80	5.1	2.5
23OCT89	1200	BROWNSTOWN	17.5	11.0	10	10.60	51.1	2.5
30OCT89	1015	BROWNSTOWN	17.0	13.5	10	10.60	0.0	3.0
06NOV89	1100	BROWNSTOWN	14.5	10.0	5	11.50	12.0	3.0
13NOV89	1015	BROWNSTOWN	10.0	9.0	5	11.40	24.6	1.5
20NOV89	1445	BROWNSTOWN	17.0	8.0	5	12.10	31.0	.
03JAN90	1030	BROWNSTOWN	4.0	1.0	.	12.80	.	.
12FEB90	1200	BROWNSTOWN	6.0	6.5	30	11.80	.	9.0
20FEB90	900	BROWNSTOWN	-0.5	4.5	10	12.40	.	11.0
22MAY90	900	BROWNSTOWN	12.0	15.0	.	8.75	.	5.0
01FEB87	1430	EDEN	1.0	4.0	70	14.70	9.0	10.0
07FEB87	1135	EDEN	4.0	4.5	45	14.20	0.0	10.0
14FEB87	1800	EDEN	1.5	3.5	15	6.50	2.6	10.0
22FEB87	1500	EDEN	9.5	6.5	5	17.10	0.0	10.0
28FEB87	1045	EDEN	4.0	5.5	15	13.10	.	10.0
07MAR87	1300	EDEN	19.0	7.0	20	14.90	18.0	10.0
14MAR87	1430	EDEN	6.5	5.5	10	16.20	0.0	10.0
23MAR87	815	EDEN	15.2	5.3	5	11.10	2.2	10.0
28MAR87	1100	EDEN	16.0	13.0	10	11.90	4.5	10.0
04APR87	1830	EDEN	9.0	11.0	20	11.00	33.7	10.0
12APR87	730	EDEN	12.0	14.5	10	10.40	29.2	9.0
22APR87	1000	EDEN	21.5	17.5	5	9.60	7.0	.
25APR87	1200	EDEN	14.0	14.0	10	10.00	7.2	6.0
02MAY87	1245	EDEN	12.5	15.0	5	9.20	2.2	8.0
17MAY87	1700	EDEN	26.0	22.0	10	11.60	28.0	8.0
24MAY87	1320	EDEN	25.0	19.0	30	8.00	61.0	6.0
31MAY87	815	EDEN	26.0	23.0	40	6.90	3.0	8.0
08JUN87	700	EDEN	18.5	19.5	20	7.70	4.4	6.0
15JUN87	1100	EDEN	27.0	25.0	20	9.90	2.6	6.0
20JUN87	1230	EDEN	28.0	26.0	20	10.70	.	5.0
27JUN87	1700	EDEN	26.0	25.0	40	8.80	32.0	6.0

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
04JUL87	1630	EDEN	29.50	26.0	90	7.9	4.8	4.00
08JUL87	1300	EDEN	26.50	25.2	.	6.0	30.0	2.00
12JUL87	1130	EDEN	20.00	27.0	30	7.6	10.4	3.00
02AUG87	1500	EDEN	27.00	25.5	20	11.1	0.1	2.00
15AUG87	1630	EDEN	27.50	26.0	30	11.1	28.0	0.20
17AUG87	1930	EDEN	24.00	24.0	30	7.6	44.3	2.00
21AUG87	1615	EDEN	36.00	26.0	25	9.4	0.0	0.50
30AUG87	1700	EDEN	22.50	22.0	80	8.5	26.0	8.00
11SEP87	1500	EDEN	24.00	23.0	30	9.1	144.0	10.00
18SEP87	1430	EDEN	22.00	21.0	100	7.5	37.3	7.00
04OCT87	900	EDEN	6.00	12.0	10	10.5	42.0	10.00
11OCT87	1300	EDEN	15.00	12.5	5	11.2	13.5	9.00
24OCT87	1200	EDEN	12.00	10.0	50	11.1	8.2	9.00
01NOV87	1100	EDEN	11.00	9.5	50	12.3	26.0	9.00
12NOV87	1900	EDEN	4.00	8.0	400	12.1	27.2	4.00
22NOV87	1530	EDEN	2.00	4.0	10	12.2	6.2	6.00
28NOV87	1630	EDEN	6.00	7.0	10	13.9	6.4	6.00
06DEC87	1400	EDEN	5.50	5.0	25	10.4	26.4	10.00
12DEC87	1500	EDEN	11.00	8.0	10	11.9	30.0	10.00
15DEC87	900	EDEN	2.00	5.0	20	11.8	10.2	.
26DEC87	1000	EDEN	5.00	8.0	10	11.5	18.6	10.00
02JAN88	900	EDEN	-5.00	3.0	5	13.9	5.9	8.00
10JAN88	1700	EDEN	-5.00	0.0	15	14.2	9.2	10.00
16JAN88	1300	EDEN	-1.00	1.0	15	15.1	0.8	10.00
23JAN88	1330	EDEN	2.00	3.5	15	13.6	26.0	10.00
30JAN88	1630	EDEN	1.50	2.5	100	14.0	27.0	8.00
07FEB88	1530	EDEN	-3.00	1.5	35	14.0	25.0	12.00
13FEB88	1400	EDEN	-3.50	1.0	55	13.4	25.2	8.00
21FEB88	1130	EDEN	-4.00	4.0	80	13.0	17.4	5.00
29FEB88	800	EDEN	-0.06	5.0	15	12.1	5.0	.
06MAR88	900	EDEN	3.00	4.5	50	12.3	25.4	12.00
18MAR88	1200	EDEN	0.40	7.0	.	15.0	0.2	12.00
25MAR88	1200	EDEN	0.12	14.0	.	2.1	8.8	0.00
02APR88	1130	EDEN	0.13	14.0	10	12.1	9.3	10.00
08APR88	1435	EDEN	0.70	11.0	20	11.0	22.3	10.00
12APR88	1100	EDEN	0.90	12.0	10	12.0	2.2	12.00
18APR88	900	EDEN	0.13	12.0	10	9.8	8.0	10.00
27APR88	1000	EDEN	13.00	14.0	5	10.8	14.4	10.00
01MAY88	1600	EDEN	13.00	12.0	10	12.2	25.6	10.00
11MAY88	930	EDEN	12.00	18.0	10	9.2	25.4	12.00
15MAY88	800	EDEN	13.00	16.0	70	8.9	25.0	6.00
22MAY88	915	EDEN	20.00	18.0	20	9.2	84.0	8.00
29MAY88	1330	EDEN	27.00	21.0	20	9.3	11.4	8.00
02JUN88	1830	EDEN	17.00	24.0	15	9.2	0.8	9.00
11JUN88	1345	EDEN	21.00	19.0	10	12.1	14.2	6.00
20JUN88	1000	EDEN	25.00	26.0	10	8.5	3.6	6.00
05JUL88	1430	EDEN	31.00	26.0	10	12.2	0.0	3.00
11JUL88	1900	EDEN	23.00	26.0	10	9.9	23.2	4.00
23JUL88	1500	EDEN	23.00	24.0	50	7.9	136.0	2.00
07AUG88	1700	EDEN	29.00	26.0	5	9.5	5.6	3.00
26SEP88	800	EDEN	10.00	14.0	10	9.6	13.8	2.00
02OCT88	1830	EDEN	19.00	21.0	10	10.5	12.6	2.00
13OCT88	1400	EDEN	13.00	.	10	14.0	2.6	1.50
22OCT88	1100	EDEN	8.00	12.0	30	12.1	27.0	5.00
05NOV88	900	EDEN	16.00	12.0	15	10.6	9.6	0.75

DATE	TIME	SITE NAME	AIR TEMP	WATER TEMP	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
20NOV88	1530	EDEN	12.0	9.0	70	12.10	53.0	0.25
28NOV88	900	EDEN	7.0	11.0	40	11.70	20.0	0.50
04DEC88	800	EDEN	3.0	5.0	10	12.90	0.5	0.50
11DEC88	1200	EDEN	-4.0	2.0	10	15.30	0.0	0.50
18DEC88	1030	EDEN	-3.0	-0.5	5	15.10	0.0	0.25
24DEC88	1600	EDEN	7.0	4.0	5	13.70	20.0	0.35
02JAN89	1630	EDEN	4.0	4.0	5	16.30	8.6	0.25
07JAN89	1400	EDEN	-0.5	0.0	5	14.90	7.0	0.25
14JAN89	1200	EDEN	0.0	2.0	20	12.90	27.0	0.50
21JAN89	1730	EDEN	-2.0	2.5	5	14.30	20.0	0.50
30JAN89	1730	EDEN	8.0	7.0	5	13.90	12.0	6.00
05FEB89	1830	EDEN	-1.0	4.0	5	14.10	4.5	10.00
12FEB89	1900	EDEN	0.0	3.0	5	15.80	0.4	9.00
18FEB89	1000	EDEN	-2.0	2.0	10	13.70	21.6	6.00
26FEB89	1630	EDEN	1.5	3.5	5	13.20	26.2	10.00
04MAR89	1200	EDEN	3.5	5.0	10	13.20	2.6	8.00
10MAR89	1630	EDEN	4.0	5.0	10	16.10	5.4	4.00
18MAR89	1700	EDEN	12.5	10.0	15	12.10	15.4	6.00
25MAR89	1200	EDEN	10.0	5.5	80	12.90	28.2	.
01APR89	1145	EDEN	12.0	.	40	11.00	16.3	4.00
08APR89	1000	EDEN	9.0	8.5	10	11.20	16.4	6.00
15APR89	1300	EDEN	10.0	10.5	5	10.70	7.4	7.00
21APR89	1200	EDEN	15.0	14.0	10	10.10	10.3	6.00
09MAY89	1800	EDEN	14.0	12.0	15	10.00	99.8	8.00
15MAY89	1700	EDEN	15.0	14.0	30	9.60	20.0	8.00
20MAY89	1900	EDEN	21.0	18.0	10	9.10	27.6	8.00
30MAY89	1730	EDEN	24.0	20.0	10	9.20	34.0	9.00
17JUN89	1800	EDEN	21.5	18.5	200	9.00	57.0	7.00
27JUN89	1415	EDEN	30.0	24.0	50	7.30	23.2	.
02JUL89	1300	EDEN	24.5	21.5	15	8.90	8.0	8.00
08JUL89	2000	EDEN	21.0	22.0	10	8.70	40.4	8.00
16JUL89	1900	EDEN	17.5	18.0	40	8.80	42.2	8.00
23JUL89	1430	EDEN	30.5	21.5	40	8.80	23.4	8.00
31JUL89	2000	EDEN	18.0	18.0	20	8.60	39.4	9.00
13AUG89	1530	EDEN	26.0	22.0	10	9.90	15.0	9.50
20AUG89	1800	EDEN	24.5	21.0	10	8.75	26.0	.
27AUG89	1200	EDEN	23.5	20.0	10	8.85	0.0	10.00
04SEP89	1100	EDEN	19.0	18.5	25	8.90	1.2	10.00
11SEP89	910	EDEN	22.0	22.1	20	7.00	0.0	10.00
18SEP89	1145	EDEN	19.0	18.2	20	7.90	15.4	9.00
25SEP89	1600	EDEN	15.0	15.0	10	9.80	50.4	5.00
30SEP89	.	EDEN	.	.	.	.	14.2	.
07OCT89	1100	EDEN	15.0	14.0	10	9.50	24.8	5.00
15OCT89	1300	EDEN	23.0	14.5	5	10.30	3.3	3.00
21OCT89	1200	EDEN	7.0	10.0	70	10.00	31.8	2.00
28OCT89	1200	EDEN	14.0	11.5	5	10.00	0.0	3.00
05NOV89	1700	EDEN	13.0	10.0	5	12.40	2.8	4.00
11NOV89	1630	EDEN	9.5	9.5	40	11.70	23.3	3.00
24NOV89	1100	EDEN	0.5	3.0	5	13.00	30.2	3.00
02DEC89	1630	EDEN	5.5	4.5	5	14.10	5.8	3.00
09DEC89	1600	EDEN	-7.0	1.0	5	16.80	5.0	3.00
16DEC89	1530	EDEN	-4.5	0.0	5	15.30	4.4	.
24DEC89	1400	EDEN	-7.0	0.0	5	16.40	0.1	10.00
31DEC89	1030	EDEN	0.0	0.0	5	13.10	5.0	10.00
06JAN90	1600	EDEN	4.0	3.5	10	13.40	26.0	8.00

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
13JAN90	1700	EDEN	-2.0	1.5	15	13.60	18.00	8.0
20JAN90	1000	EDEN	1.5	3.5	10	11.10	11.60	7.0
03FEB90	1200	EDEN	4.5	7.5	15	11.10	56.00	10.0
10FEB90	1800	EDEN	2.0	3.5	30	10.40	22.60	10.0
17FEB90	1700	EDEN	3.0	7.0	5	12.10	2.20	9.0
24FEB90	1200	EDEN	.	8.0	15	10.70	12.60	10.0
09MAR90	1800	EDEN	8.5	6.5	5	15.10	2.20	7.0
25MAR90	1700	EDEN	7.0	9.0	10	14.00	.	6.0
01APR90	1900	EDEN	7.5	8.0	5	13.30	10.60	8.0
09APR90	1800	EDEN	14.0	11.0	5	10.50	27.00	6.0
16APR90	900	EDEN	8.0	10.0	20	9.70	16.80	6.0
21APR90	1000	EDEN	13.0	12.0	5	10.10	2.80	8.0
28APR90	1100	EDEN	20.5	16.0	10	8.10	.	11.0
07MAY90	735	EDEN	8.0	14.0	30	8.70	26.80	6.0
12MAY90	1120	EDEN	13.0	14.0	50	8.60	27.20	5.0
19MAY90	900	EDEN	17.5	15.0	25	9.30	13.20	8.0
26MAY90	1730	EDEN	16.0	14.0	25	8.50	25.60	10.0
03JUN90	1000	EDEN	24.0	18.5	20	8.25	26.60	9.0
04NOV86	1720	GROFFTOWN ROAD	12.4	11.6	.	10.20	.	6.0
11NOV86	1720	GROFFTOWN ROAD	6.5	9.0	.	11.00	52.00	6.0
18NOV86	1535	GROFFTOWN ROAD	8.5	8.5	.	11.60	20.00	10.0
27NOV86	1505	GROFFTOWN ROAD	11.9	8.5	.	9.80	3.54	6.0
13DEC86	1315	GROFFTOWN ROAD	0.0	4.5	15	13.40	48.00	6.9
19DEC86	1430	GROFFTOWN ROAD	8.5	5.5	140	11.70	25.00	6.0
26DEC86	1215	GROFFTOWN ROAD	6.0	6.5	100	11.40	45.00	9.0
01JAN87	1330	GROFFTOWN ROAD	2.5	5.0	10	12.80	1.50	9.0
06FEB87	1500	GROFFTOWN ROAD	9.0	4.5	.	13.50	.	9.0
12FEB87	1500	GROFFTOWN ROAD	2.0	4.0	.	12.40	3.50	11.0
19FEB87	1440	GROFFTOWN ROAD	4.0	4.0	5	13.40	.	7.0
25MAR87	1050	GROFFTOWN ROAD	19.0	12.0	5	11.00	15.70	9.0
03APR87	1345	GROFFTOWN ROAD	5.5	8.0	10	11.90	30.00	7.0
10APR87	1450	GROFFTOWN ROAD	22.0	12.5	5	12.90	42.70	8.0
23APR87	1500	GROFFTOWN ROAD	14.0	16.5	5	8.05	16.00	7.0
29APR87	1425	GROFFTOWN ROAD	16.0	14.0	5	9.30	6.25	6.0
12MAY87	1425	GROFFTOWN ROAD	24.0	20.0	5	9.30	30.50	8.0
29MAY87	815	GROFFTOWN ROAD	23.0	18.0	40	7.10	69.50	10.0
19JUN87	1500	GROFFTOWN ROAD	32.0	25.0	15	9.10	15.00	10.0
29JUN87	1455	GROFFTOWN ROAD	31.0	22.0	30	7.20	39.50	6.0
05AUG87	1400	GROFFTOWN ROAD	25.0	27.0	20	7.80	0.00	6.0
17AUG87	1455	GROFFTOWN ROAD	27.0	24.5	35	7.15	62.50	6.0
21AUG87	1405	GROFFTOWN ROAD	30.0	26.0	30	8.95	0.00	7.0
28AUG87	1405	GROFFTOWN ROAD	23.0	21.0	50	7.60	16.00	7.0
11SEP87	1500	GROFFTOWN ROAD	27.0	20.0	40	8.00	185.00	7.0
17SEP87	910	GROFFTOWN ROAD	21.0	20.0	30	7.10	49.50	7.0
25SEP87	1455	GROFFTOWN ROAD	19.0	16.5	30	8.35	45.20	11.0
30SEP87	1310	GROFFTOWN ROAD	23.0	17.5	20	7.75	2.75	12.0
09OCT87	1015	GROFFTOWN ROAD	11.5	12.0	10	9.80	17.20	6.0
14OCT87	.	GROFFTOWN ROAD	19.0	11.0	5	9.75	3.75	9.0
23OCT87	1235	GROFFTOWN ROAD	12.0	11.0	5	9.40	8.75	9.0
30OCT87	1120	GROFFTOWN ROAD	11.5	9.0	30	9.25	34.20	7.0
13NOV87	1520	GROFFTOWN ROAD	13.0	5.0	30	9.70	36.20	7.0
20NOV87	1445	GROFFTOWN ROAD	8.0	9.0	15	8.40	5.25	7.0
27NOV87	940	GROFFTOWN ROAD	3.5	6.0	5	10.80	3.75	10.0
03DEC87	1410	GROFFTOWN ROAD	6.0	5.5	15	10.00	54.00	8.0
11DEC87	935	GROFFTOWN ROAD	7.0	6.0	10	10.70	0.25	7.0

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE
17DEC87	1500	GROFFTOWN ROAD	3.5	3.5	15	10.50	11.20	10
29DEC87	1030	GROFFTOWN ROAD	-5.0	6.0	5	11.20	24.70	7
29JAN88	900	GROFFTOWN ROAD	-8.0	-0.5	10	9.70	67.70	5
05FEB88	1410	GROFFTOWN ROAD	-1.0	2.0	70	10.50	21.00	5
11FEB88	1500	GROFFTOWN ROAD	4.5	3.5	10	9.80	0.00	7
19FEB88	1455	GROFFTOWN ROAD	4.0	4.5	20	10.80	33.20	6
25FEB88	1430	GROFFTOWN ROAD	1.5	4.0	10	11.10	11.70	7
04MAR88	1505	GROFFTOWN ROAD	3.5	6.0	50	11.60	10.20	6
11MAR88	1410	GROFFTOWN ROAD	13.0	8.0	10	12.30	17.20	7
18MAR88	1430	GROFFTOWN ROAD	4.5	5.5	10	13.30	0.00	8
25MAR88	1330	GROFFTOWN ROAD	23.0	12.0	10	12.70	0.00	7
31MAR88	1500	GROFFTOWN ROAD	16.5	13.0	10	12.40	.	7
08APR88	1515	GROFFTOWN ROAD	7.5	9.5	20	10.50	51.00	5
29APR88	1500	GROFFTOWN ROAD	11.0	12.5	20	10.00	42.70	4
06MAY88	1510	GROFFTOWN ROAD	12.5	12.5	20	10.70	31.00	4
19MAY88	1510	GROFFTOWN ROAD	16.0	14.0	.	8.15	101.00	3
27MAY88	1015	GROFFTOWN ROAD	21.0	15.0	30	8.50	22.20	5
02AUG88	1350	GROFFTOWN ROAD	33.5	23.5	25	8.90	.	4
10FEB89	945	GROFFTOWN ROAD	-2.0	0.0	5	12.60	3.25	3
17FEB89	945	GROFFTOWN ROAD	-5.0	3.0	15	12.00	18.00	1
23FEB89	1215	GROFFTOWN ROAD	4.5	5.0	70	11.70	30.20	1
02MAR89	1515	GROFFTOWN ROAD	7.0	4.5	10	13.20	2.75	1
17MAR89	845	GROFFTOWN ROAD	11.0	8.0	10	11.10	28.20	6
31MAR89	1450	GROFFTOWN ROAD	10.0	9.0	.	10.70	68.20	6
09JUN89	1405	GROFFTOWN ROAD	21.0	17.0	30	8.90	46.70	7
20JUN89	1145	GROFFTOWN ROAD	27.0	19.0	30	8.80	26.00	7
26OCT86	1545	LANCASTER SOUTH	15.0	14.5	.	6.25	.	10
02NOV86	915	LANCASTER SOUTH	16.0	14.0	.	7.30	1.00	10
09NOV86	1200	LANCASTER SOUTH	18.5	14.5	.	9.00	5.00	9
15NOV86	1335	LANCASTER SOUTH	14.0	7.0	.	10.80	16.00	12
22NOV86	1630	LANCASTER SOUTH	5.5	9.5	70	11.40	56.00	8
30NOV86	1200	LANCASTER SOUTH	10.0	11.0	20	11.00	28.00	12
06DEC86	1845	LANCASTER SOUTH	4.0	6.5	10	11.70	24.00	10
13DEC86	1415	LANCASTER SOUTH	-0.5	5.0	10	12.20	26.00	12
21DEC86	1430	LANCASTER SOUTH	5.0	6.5	15	11.40	23.00	10
27DEC86	1415	LANCASTER SOUTH	4.5	6.5	25	11.40	50.00	12
04JAN87	1315	LANCASTER SOUTH	4.0	4.5	10	12.10	26.00	8
10JAN87	1515	LANCASTER SOUTH	3.5	5.5	10	12.00	7.00	8
18JAN87	930	LANCASTER SOUTH	-0.5	4.5	5	11.50	3.00	12
25JAN87	1130	LANCASTER SOUTH	4.0	0.5	5	13.30	79.00	12
31JAN87	1605	LANCASTER SOUTH	1.0	4.0	10	11.70	.	12
08FEB87	1115	LANCASTER SOUTH	5.0	4.5	5	13.20	.	10
15FEB87	935	LANCASTER SOUTH	-0.5	2.0	5	13.60	3.00	12
22FEB87	930	LANCASTER SOUTH	5.0	4.5	5	12.50	0.00	12
28FEB87	1030	LANCASTER SOUTH	4.5	5.5	5	13.20	2.00	10
29MAR87	920	LANCASTER SOUTH	16.0	13.5	5	8.70	0.20	10
05APR87	930	LANCASTER SOUTH	4.5	9.5	30	9.20	47.50	6
07APR87	1215	LANCASTER SOUTH	23.0	9.5	5	13.00	0.73	8
12APR87	920	LANCASTER SOUTH	9.5	13.0	5	8.80	24.30	8
14APR87	1345	LANCASTER SOUTH	8.5	8.0	5	15.00	0.00	8
19APR87	.	LANCASTER SOUTH	17.0	13.0	5	9.10	10.10	6
22APR87	845	LANCASTER SOUTH	8.0	8.5	5	10.60	0.13	8
26APR87	500	LANCASTER SOUTH	18.0	16.0	5	9.75	8.38	10
03MAY87	900	LANCASTER SOUTH	16.0	15.0	5	6.80	5.33	10
11MAY87	1545	LANCASTER SOUTH	30.0	23.0	5	8.45	20.30	8

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
24MAY87	915	LANCASTER SOUTH	24.5	22.0	200	.	90.40	6
30MAY87	900	LANCASTER SOUTH	27.0	22.0	35	5.85	7.11	12
07JUN87	930	LANCASTER SOUTH	16.5	19.5	20	6.20	8.89	10
14JUN87	1345	LANCASTER SOUTH	32.0	24.0	15	7.10	14.90	12
28JUN87	915	LANCASTER SOUTH	23.0	23.0	45	4.85	26.60	10
04JUL87	900	LANCASTER SOUTH	27.0	24.0	10	6.40	14.70	6
12JUL87	1000	LANCASTER SOUTH	29.5	27.5	10	4.65	8.13	8
19JUL87	830	LANCASTER SOUTH	23.0	24.0	25	5.30	25.40	6
26JUL87	930	LANCASTER SOUTH	30.0	28.0	15	5.10	5.08	5
03AUG87	1630	LANCASTER SOUTH	33.0	28.5	10	8.25	0.76	6
09AUG87	1223	LANCASTER SOUTH	28.0	26.5	5	6.00	6.10	6
15AUG87	1915	LANCASTER SOUTH	28.0	26.0	5	6.45	24.60	6
23AUG87	1600	LANCASTER SOUTH	24.0	24.0	5	6.00	13.90	4
29AUG87	1100	LANCASTER SOUTH	23.0	21.0	40	6.20	10.40	4
07SEP87	1400	LANCASTER SOUTH	26.5	22.5	10	5.70	35.30	6
13SEP87	1130	LANCASTER SOUTH	24.0	21.0	25	7.05	140.00	6
20SEP87	.	LANCASTER SOUTH	17.5	17.0	90	8.25	43.10	5
26SEP87	1400	LANCASTER SOUTH	23.5	18.0	10	7.45	2.54	8
04OCT87	1000	LANCASTER SOUTH	18.0	12.5	5	11.00	11.90	6
11OCT87	1230	LANCASTER SOUTH	11.0	13.5	5	9.95	13.40	8
17OCT87	1430	LANCASTER SOUTH	20.0	14.0	5	10.60	9.65	8
25OCT87	1000	LANCASTER SOUTH	11.0	12.0	5	9.70	10.40	6
02NOV87	1630	LANCASTER SOUTH	13.5	12.0	5	10.30	26.40	6
08NOV87	1230	LANCASTER SOUTH	19.5	10.5	5	10.40	0.00	.
15NOV87	1300	LANCASTER SOUTH	17.0	8.5	10	9.60	43.60	5
22NOV87	1500	LANCASTER SOUTH	3.0	6.0	5	12.00	8.38	6
30NOV87	1700	LANCASTER SOUTH	6.0	9.0	160	9.00	60.40	3
06DEC87	1500	LANCASTER SOUTH	6.0	6.5	10	12.20	3.81	5
12DEC87	930	LANCASTER SOUTH	11.0	8.0	5	10.30	1.27	6
20DEC87	1500	LANCASTER SOUTH	14.5	6.5	15	11.60	22.10	6
28DEC87	1700	LANCASTER SOUTH	0.5	6.5	10	9.70	9.91	5
01JAN88	1400	LANCASTER SOUTH	5.0	3.0	5	11.70	6.60	6
08JAN88	630	LANCASTER SOUTH	-5.0	0.5	5	12.50	14.70	5
17JAN88	1400	LANCASTER SOUTH	5.0	3.0	25	13.30	1.27	6
27JAN88	1100	LANCASTER SOUTH	-3.0	1.0	15	13.30	31.50	6
30JAN88	1330	LANCASTER SOUTH	14.5	4.5	15	10.70	32.50	6
06FEB88	1600	LANCASTER SOUTH	-5.0	2.5	15	10.60	25.10	6
16FEB88	1530	LANCASTER SOUTH	6.0	3.5	100	10.20	39.30	3
21FEB88	1530	LANCASTER SOUTH	2.5	5.5	60	4.55	13.40	3
01MAR88	1700	LANCASTER SOUTH	6.5	6.5	5	12.70	6.85	6
05MAR88	1530	LANCASTER SOUTH	8.0	5.5	110	11.20	24.60	4
13MAR88	1330	LANCASTER SOUTH	11.5	.	10	12.10	3.81	4
22MAR88	1430	LANCASTER SOUTH	6.5	8.0	10	15.00	1.27	4
27MAR88	930	LANCASTER SOUTH	12.0	12.5	10	8.90	29.20	3
02APR88	1330	LANCASTER SOUTH	13.0	13.5	5	10.40	0.25	4
09APR88	1430	LANCASTER SOUTH	15.0	12.5	10	11.20	28.40	4
17APR88	1600	LANCASTER SOUTH	20.0	14.5	10	13.10	6.86	3
24APR88	1630	LANCASTER SOUTH	12.5	13.0	35	10.70	14.20	6
02MAY88	1700	LANCASTER SOUTH	15.0	15.0	10	9.90	26.80	4
13MAY88	930	LANCASTER SOUTH	23.0	18.0	120	7.80	51.50	3
22MAY88	1600	LANCASTER SOUTH	28.5	19.5	40	8.45	85.60	3
10JUN88	1130	LANCASTER SOUTH	35.0	26.0	25	9.50	9.40	2
11JUN88	.	LANCASTER SOUTH	.	.	.	.	17.70	.
14JUL88	1400	LANCASTER SOUTH	32.5	27.5	10	8.05	5.08	2
24JUL88	1030	LANCASTER SOUTH	28.0	22.5	140	5.65	175.00	1

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
01AUG88	1700	LANCASTER SOUTH	32.5	25.5	15	8.20	36.80	3
08AUG88	1700	LANCASTER SOUTH	31.0	26.0	5	9.30	5.08	2
26SEP88	1700	LANCASTER SOUTH	23.5	20.5	15	9.40	7.88	10
06OCT88	1130	LANCASTER SOUTH	16.5	18.5	10	8.50	14.70	10
10OCT88	1700	LANCASTER SOUTH	18.0	15.5	5	10.80	0.00	8
20OCT88	1700	LANCASTER SOUTH	18.5	15.5	5	10.70	0.00	12
24OCT88	1700	LANCASTER SOUTH	13.0	12.5	30	9.20	50.00	8
08NOV88	1330	LANCASTER SOUTH	17.0	13.0	5	10.20	6.61	10
10NOV88	1700	LANCASTER SOUTH	13.5	11.0	15	9.80	13.20	6
22NOV88	930	LANCASTER SOUTH	5.0	7.5	30	10.70	76.90	4
26NOV88	1100	LANCASTER SOUTH	10.0	7.5	5	12.00	0.00	10
02DEC88	1700	LANCASTER SOUTH	2.5	6.5	10	12.30	17.70	12
11DEC88	1230	LANCASTER SOUTH	-2.0	3.5	5	13.10	0.00	10
26DEC88	1330	LANCASTER SOUTH	4.5	5.5	10	13.70	23.60	12
30DEC88	1600	LANCASTER SOUTH	1.5	4.0	5	12.80	5.85	12
09JAN89	1700	LANCASTER SOUTH	2.0	3.5	15	13.60	27.60	8
15JAN89	2000	LANCASTER SOUTH	8.5	4.5	15	12.20	32.70	6
22JAN89	1130	LANCASTER SOUTH	10.5	3.5	5	13.60	0.25	6
29JAN89	930	LANCASTER SOUTH	8.5	5.5	5	11.90	4.57	10
04FEB89	1530	LANCASTER SOUTH	2.5	6.5	5	14.20	10.60	8
11FEB89	1330	LANCASTER SOUTH	7.0	2.0	5	15.30	0.76	10
17FEB89	1600	LANCASTER SOUTH	-0.5	5.5	10	14.40	20.50	7
26FEB89	1230	LANCASTER SOUTH	6.0	4.5	10	13.30	33.70	10
11MAR89	1400	LANCASTER SOUTH	9.0	7.5	5	14.90	28.40	10
17MAR89	1600	LANCASTER SOUTH	20.0	12.0	5	15.00	0.00	8
25MAR89	1500	LANCASTER SOUTH	17.0	9.0	80	10.80	54.80	7
01APR89	1630	LANCASTER SOUTH	8.0	9.0	40	10.50	17.20	8
08APR89	1500	LANCASTER SOUTH	16.5	12.0	10	11.60	20.30	10
18APR89	1430	LANCASTER SOUTH	23.0	16.0	5	11.30	14.90	8
23APR89	1030	LANCASTER SOUTH	10.0	11.5	5	10.90	3.81	10
09MAY89	1700	LANCASTER SOUTH	18.0	13.0	15	9.85	119.00	10
14MAY89	2000	LANCASTER SOUTH	16.0	14.0	15	10.10	23.30	9
28MAY89	1430	LANCASTER SOUTH	24.0	18.5	15	9.55	50.60	12
11JUN89	1130	LANCASTER SOUTH	23.5	19.5	50	8.30	61.90	8
19JUN89	1630	LANCASTER SOUTH	30.0	22.0	40	8.55	22.70	12
24JUN89	1830	LANCASTER SOUTH	29.5	23.0	100	7.30	30.70	6
03OCT89	1135	LANCASTER SOUTH	21.0	18.5	20	8.95	.	6
10OCT89	1215	LANCASTER SOUTH	16.0	14.5	10	10.40	.	6
25OCT89	1152	LANCASTER SOUTH	22.0	14.0	10	10.10	.	8
01NOV89	1248	LANCASTER SOUTH	14.0	14.5	10	9.80	.	4
01DEC89	1300	LANCASTER SOUTH	5.5	6.5	10	12.10	.	6
06DEC89	1600	LANCASTER SOUTH	6.5	6.0	10	13.60	.	6
16DEC89	1600	LANCASTER SOUTH	-5.5	3.0	10	14.60	.	8
03JAN90	1230	LANCASTER SOUTH	8.0	3.0	30	12.70	.	7
11JAN90	1330	LANCASTER SOUTH	5.5	4.5	20	12.10	.	6
02NOV86	1648	LYNDON	12.0	12.5	.	8.70	.	.
09NOV86	1600	LYNDON	15.0	12.0	.	6.90	3.64	7
16NOV86	1600	LYNDON	8.5	5.5	.	10.50	1.35	10
23NOV86	1630	LYNDON	9.0	4.5	45	12.00	2.20	12
14DEC86	1600	LYNDON	-1.0	1.0	15	13.50	2.11	12
18JAN87	1700	LYNDON	0.5	3.5	10	12.90	6.00	18
25JAN87	1700	LYNDON	-7.0	0.5	10	14.10	80.00	14
01FEB87	.	LYNDON	-1.0	0.5	15	13.80	147.00	8
08FEB87	1600	LYNDON	6.0	4.0	10	13.20	.	.
15FEB87	1700	LYNDON	-7.0	0.5	10	14.40	4.00	18

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
22FEB87	1700	LYNDON	6.5	4.0	10.0	14.60	0.00	12
01MAR87	1630	LYNDON	16.0	6.5	.	11.20	0.00	.
15MAR87	1700	LYNDON	7.0	7.0	5.0	13.90	0.14	14
27MAR87	1700	LYNDON	17.0	14.5	10.0	10.60	0.23	12
05APR87	1700	LYNDON	5.0	7.5	15.0	10.80	73.40	12
12APR87	1700	LYNDON	15.5	14.0	10.0	11.10	41.60	12
26APR87	1700	LYNDON	19.0	14.0	10.0	10.80	7.87	10
10MAY87	1700	LYNDON	28.5	19.0	15.0	9.50	21.80	12
16MAY87	730	LYNDON	17.0	17.5	20.0	9.25	12.90	8
24MAY87	1700	LYNDON	22.5	21.5	90.0	8.00	62.90	8
31MAY87	1800	LYNDON	27.0	24.0	20.0	8.10	5.59	12
07JUN87	1800	LYNDON	25.0	21.0	20.0	8.90	33.10	8
14JUN87	700	LYNDON	26.5	23.5	20.0	8.60	9.90	7
22JUN87	1800	LYNDON	27.0	25.0	15.0	9.60	10.20	8
28JUN87	2000	LYNDON	22.5	25.0	25.0	9.00	40.00	7
19JUL87	2000	LYNDON	25.0	26.0	15.0	7.80	26.40	8
26JUL87	1800	LYNDON	26.5	27.5	25.0	9.90	0.00	8
10AUG87	2000	LYNDON	22.0	24.0	65.0	7.45	35.50	7
24AUG87	800	LYNDON	17.0	20.5	15.0	7.95	16.80	6
14SEP87	1900	LYNDON	21.5	22.0	.	8.10	210.00	6
27SEP87	1900	LYNDON	18.0	16.0	20.0	10.20	5.20	7
25OCT87	1700	LYNDON	10.0	11.5	10.0	10.80	10.90	6
15NOV87	1700	LYNDON	6.0	7.0	10.0	12.30	43.20	7
06DEC87	1630	LYNDON	7.0	4.0	5.0	13.10	64.80	8
20DEC87	1700	LYNDON	8.0	4.0	5.0	12.90	23.40	7
03JAN88	1700	LYNDON	0.0	0.5	5.0	14.10	13.50	8
24JAN88	1700	LYNDON	9.0	3.0	5.0	13.20	32.30	6
20FEB88	1800	LYNDON	8.0	6.0	35.0	11.30	20.80	6
06MAR88	1800	LYNDON	11.0	6.0	60.0	11.00	33.10	6
10APR88	1900	LYNDON	13.5	11.0	10.0	10.50	28.20	.
01MAY88	1900	LYNDON	16.0	13.5	7.5	9.50	32.50	8
15MAY88	1900	LYNDON	22.0	19.0	30.0	8.20	33.80	10
05JUN88	2000	LYNDON	.	.	20.0	8.85	1.50	10
13JUN88	2030	LYNDON	.	.	15.0	5.90	15.80	8
13JUN88	2030	LYNDON	.	.	15.0	5.90	15.80	8
27JUN88	1930	LYNDON	24.5	21.5	15.0	7.20	.	7
12JUL88	1930	LYNDON	27.0	25.5	10.0	6.60	19.00	4
25JUL88	2030	LYNDON	27.0	24.5	50.0	7.45	154.00	6
11DEC88	1700	LYNDON	6.0	4.0	10.0	12.70	.	4
22JAN89	1500	LYNDON	10.0	1.0	10.0	15.30	0.00	2
29JAN89	1630	LYNDON	12.0	5.0	10.0	14.10	21.00	3
04NOV86	1610	ROCKHILL DAM	12.6	12.0	.	8.05	.	10
11NOV86	1615	ROCKHILL DAM	6.1	9.2	.	8.15	.	6
18NOV86	1630	ROCKHILL DAM	10.1	8.5	.	9.10	.	9
27NOV86	1300	ROCKHILL DAM	12.7	8.2	.	10.80	88.50	6
13DEC86	820	ROCKHILL DAM	-3.0	4.0	15.0	11.40	48.00	8
21DEC86	1645	ROCKHILL DAM	3.0	5.5	25.0	10.70	25.00	6
26DEC86	830	ROCKHILL DAM	4.5	6.0	.	10.00	45.00	6
01JAN87	1130	ROCKHILL DAM	2.0	4.5	10.0	9.80	1.50	10
06FEB87	1615	ROCKHILL DAM	6.0	5.0	.	13.00	.	10
12FEB87	1640	ROCKHILL DAM	3.0	2.0	.	12.00	.	10
19FEB87	1600	ROCKHILL DAM	5.0	4.0	10.0	10.90	.	8
25MAR87	1150	ROCKHILL DAM	19.5	12.0	10.0	9.90	15.70	11
03APR87	1450	ROCKHILL DAM	8.0	9.5	10.0	9.80	30.00	7
23APR87	1600	ROCKHILL DAM	14.5	17.0	10.0	6.90	16.00	6

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
12MAY87	1245	ROCKHILL DAM	23.0	21.0	10	7.40	30.5	8
09AUG87	1326	ROCKHILL DAM	28.5	28.0	.	15.70	.	6
16AUG87	1500	ROCKHILL DAM	30.5	29.0	.	8.20	.	5
23AUG87	1506	ROCKHILL DAM	27.0	25.0	.	8.45	.	5
30AUG87	1710	ROCKHILL DAM	26.5	25.0	30	8.10	.	5
07SEP87	1320	ROCKHILL DAM	26.5	23.5	30	8.50	.	5
14SEP87	1800	ROCKHILL DAM	26.0	23.0	70	7.05	.	6
20SEP87	1815	ROCKHILL DAM	20.0	18.5	80	8.05	.	4
27SEP87	1540	ROCKHILL DAM	26.5	19.0	25	9.20	.	10
04OCT87	1635	ROCKHILL DAM	20.0	14.5	15	9.50	.	8
11OCT87	1725	ROCKHILL DAM	12.0	13.5	15	9.00	.	8
19OCT87	1715	ROCKHILL DAM	21.0	14.5	10	10.20	.	8
22NOV87	1525	ROCKHILL DAM	9.0	4.5	10	12.20	.	7
29NOV87	1645	ROCKHILL DAM	16.0	9.0	10	9.80	.	7
06DEC87	1600	ROCKHILL DAM	7.0	6.0	10	12.10	.	8
13DEC87	1515	ROCKHILL DAM	7.0	7.5	10	11.00	.	7
20DEC87	1545	ROCKHILL DAM	9.5	5.0	10	12.30	.	6
03JAN88	1030	ROCKHILL DAM	-4.5	0.5	10	13.40	.	6
10JAN88	1000	ROCKHILL DAM	-12.0	.	.	.	.	.
17JAN88	930	ROCKHILL DAM	1.0	.	.	.	.	.
06MAR88	1600	ROCKHILL DAM	12.0	7.0	40	11.60	.	7
12MAR88	1512	ROCKHILL DAM	19.0	11.0	30	10.90	.	8
02APR88	1400	ROCKHILL DAM	14.0	14.5	20	10.90	.	7
10APR88	1730	ROCKHILL DAM	17.0	13.5	10	10.20	.	8
14MAY88	1445	ROCKHILL DAM	23.0	22.5	80	5.55	.	6
21MAY88	1908	ROCKHILL DAM	21.0	18.0	.	8.10	.	6
30MAY88	1540	ROCKHILL DAM	28.5	23.0	150	7.60	.	6
06JUN88	1907	ROCKHILL DAM	28.5	21.5	140	8.20	.	10
13JUN88	1300	ROCKHILL DAM	29.0	25.0	130	7.30	.	8
21JUN88	2030	ROCKHILL DAM	26.0	28.5	170	9.40	.	10
02JUL88	1027	ROCKHILL DAM	22.5	21.0	180	9.90	.	.
12JUL88	1924	ROCKHILL DAM	26.0	28.0	130	8.45	.	6
16JUL88	1253	ROCKHILL DAM	35.0	31.0	110	11.20	.	6
30JUL88	1602	ROCKHILL DAM	35.0	27.5	170	7.05	.	6
06AUG88	1633	ROCKHILL DAM	26.5	28.0	100	8.20	.	6
24SEP88	920	ROCKHILL DAM	15.0	20.5	60	8.40	.	4
04OCT88	1804	ROCKHILL DAM	13.5	18.0	100	7.40	.	4
11OCT88	1740	ROCKHILL DAM	12.5	14.5	80	9.75	.	2
17OCT88	1745	ROCKHILL DAM	18.5	15.0	80	11.80	.	4
29OCT88	1043	ROCKHILL DAM	8.5	8.5	50	11.50	.	2
07NOV88	1730	ROCKHILL DAM	6.0	10.5	140	8.50	.	2
15NOV88	1230	ROCKHILL DAM	14.0	9.0	180	9.20	.	2
26NOV88	1620	ROCKHILL DAM	9.0	6.0	60	11.90	.	2
08JAN89	1352	ROCKHILL DAM	5.5	1.5	60	13.30	.	2
14JAN89	1613	ROCKHILL DAM	1.0	3.0	180	12.00	.	1
22JAN89	1426	ROCKHILL DAM	9.0	2.5	60	13.00	.	2
29JAN89	1313	ROCKHILL DAM	8.5	6.0	50	12.30	.	2
04FEB89	1545	ROCKHILL DAM	-1.5	4.5	50	11.90	.	2
11FEB89	1530	ROCKHILL DAM	10.0	.	70	14.40	.	2
26FEB89	1445	ROCKHILL DAM	1.0	3.0	80	12.80	.	4
05MAR89	1555	ROCKHILL DAM	5.0	5.5	70	12.20	.	2
12MAR89	1532	ROCKHILL DAM	6.0	6.5	80	12.40	0.0	2
18MAR89	1808	ROCKHILL DAM	12.0	12.5	60	13.40	.	2
25MAR89	1557	ROCKHILL DAM	19.0	11.0	170	11.80	.	2
02APR89	1635	ROCKHILL DAM	9.0	10.0	130	11.90	.	2

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE
07APR89	1845	ROCKHILL DAM	6.0	11.0	190	10.10	.	2.00
23APR89	1627	ROCKHILL DAM	15.5	14.0	80	10.80	.	2.00
17MAY89	1440	ROCKHILL DAM	19.5	16.0	.	9.35	.	0.50
21MAY89	1555	ROCKHILL DAM	24.5	21.0	90	9.20	.	2.00
09OCT89	1200	ROCKHILL DAM	15.5	12.0	.	10.20	.	5.00
23OCT89	1145	ROCKHILL DAM	12.5	10.5	.	10.50	.	3.00
13NOV89	1235	ROCKHILL DAM	13.0	10.0	.	11.00	.	2.50
05DEC89	1130	ROCKHILL DAM	1.5	2.5	.	13.70	.	3.00
08JAN90	1210	ROCKHILL DAM	3.1	5.0	.	12.80	.	1.00
29JAN90	1130	ROCKHILL DAM	10.5	8.5	.	12.70	.	1.00
12FEB90	1515	ROCKHILL DAM	9.5	8.5	.	12.30	.	1.00
26FEB90	1130	ROCKHILL DAM	3.0	4.5	.	13.10	.	1.50
12MAR90	1145	ROCKHILL DAM	29.0	15.0	.	10.40	.	3.00
02APR90	1145	ROCKHILL DAM	12.0	10.5	.	11.50	.	3.00
24APR90	1115	ROCKHILL DAM	24.0	19.0	.	9.90	.	9.00
07MAY90	1120	ROCKHILL DAM	19.0	17.5	.	9.50	.	6.00
22MAY90	1000	ROCKHILL DAM	15.5	19.0	.	9.25	.	9.00
28MAY90	1145	ROCKHILL DAM	24.0	17.5	.	9.10	.	9.60
29OCT86	1650	SAFE HARBOR	16.5	10.0	.	10.50	.	10.00
06NOV86	1645	SAFE HARBOR	10.0	10.0	.	9.20	1.45	8.00
06JUN88	2000	SAFE HARBOR	20.0	21.5	10	9.20	.	0.60
16JUN88	1710	SAFE HARBOR	21.0	27.5	15	9.90	.	9.00
26JUN88	1040	SAFE HARBOR	25.5	26.5	15	8.70	.	10.00
04JUL88	1020	SAFE HARBOR	25.5	23.5	15	8.40	0.00	10.00
10JUL88	1200	SAFE HARBOR	32.0	29.0	20	9.20	0.52	8.00
17JUL88	1240	SAFE HARBOR	31.5	30.0	15	9.90	0.24	6.00
24JUL88	1040	SAFE HARBOR	29.5	24.0	25	6.40	140.00	4.00
31JUL88	1240	SAFE HARBOR	32.0	28.0	20	7.90	22.50	6.00
07AUG88	1030	SAFE HARBOR	29.0	26.5	10	9.50	0.16	6.00
27SEP88	859	SAFE HARBOR	13.5	17.0	15	8.60	82.00	5.00
02OCT88	1340	SAFE HARBOR	28.0	22.0	10	9.50	1.00	1.00
11OCT88	1740	SAFE HARBOR	11.5	14.5	10	10.50	32.00	5.00
17OCT88	1540	SAFE HARBOR	20.0	17.0	10	14.40	0.00	1.00
06NOV88	1245	SAFE HARBOR	15.0	14.0	10	12.10	.	0.50
13NOV88	1635	SAFE HARBOR	9.5	10.5	10	10.00	.	0.50
20NOV88	1700	SAFE HARBOR	13.5	10.0	5	10.00	.	0.50
28NOV88	1220	SAFE HARBOR	6.0	9.5	20	9.80	.	0.50
04DEC88	1640	SAFE HARBOR	1.0	5.5	10	11.60	.	0.50
13DEC88	1610	SAFE HARBOR	-3.0	3.5	10	12.50	.	0.50
20DEC88	1100	SAFE HARBOR	9.0	2.0	0	12.10	.	0.25
05JAN89	1255	SAFE HARBOR	-4.0	1.0	5	13.20	.	0.50
16JAN89	1000	SAFE HARBOR	4.5	4.5	15	9.00	.	1.00
06FEB89	1800	SAFE HARBOR	1.0	7.0	5	12.10	.	0.50
21FEB89	1710	SAFE HARBOR	10.0	8.0	20	12.00	.	1.00
12MAR89	1240	SAFE HARBOR	4.5	7.0	5	12.40	.	0.50
03APR89	1430	SAFE HARBOR	17.0	12.5	10	10.00	.	0.50
11APR89	1839	SAFE HARBOR	.	11.5	10	12.30	17.00	0.50
25APR89	1029	SAFE HARBOR	18.0	16.0	10	9.60	.	1.00
21MAY89	1832	SAFE HARBOR	23.0	22.5	15	9.80	.	0.50
28MAY89	947	SAFE HARBOR	23.0	18.5	15	9.00	41.00	1.00
11JUN89	1600	SAFE HARBOR	22.0	22.0	.	9.00	58.00	0.50
27JUN89	1950	SAFE HARBOR	27.0	26.0	.	8.00	17.50	5.00
30JUL89	1535	SAFE HARBOR	20.5	22.5	.	7.60	122.00	0.25
13AUG89	1430	SAFE HARBOR	24.0	23.0	15	9.10	42.00	0.50
21AUG89	1940	SAFE HARBOR	24.0	25.0	15	8.50	.	1.00

DATE	TIME	SITE NAME	AIR TEMP.	WATER TEMP.	TURBIDITY	DISSOLVED OXYGEN	RAIN	NITRATE N
04SEP89	930	SAFE HARBOR	25.5	22.0	15	8.9	36	1
08SEP89	1200	SAFE HARBOR	29.0	24.0	15	9.5	.	8
02OCT89	1047	SAFE HARBOR	21.0	18.5	15	9.6	113	6
09OCT89	1230	SAFE HARBOR	9.5	13.0	5	12.3	.	6