March 28, 2008

PREPARED FOR:

City of Rock Island
Department of Public Works
City of Moline
Department of Public Works

PREPARED BY:

Symbiont
6737 West Washington Street
Suite 3440
West Allis, Wisconsin 53214

Supplemental Environmental Project for the City of Rock Island and the City of Moline, Illinois

Tina A. Reese
Project Manager

Harris Byers
Project Scientist

Symbiont
Project No. W053466

TABLE OF CONTENTS

Section		Page
1.0	PURPOSE	1
2.0	METHODOLOGY	2
2.1	Sample Timing	2
2.2	Laboratory Sample Collection	2
2.3	Water Quality Laboratory Parameters	3
2.4	Field Water Quality Parameters	3
2.5	Decontamination Procedures	4
2.6	Load Calculations	4
2.7	Data Quality Objectives	5
2.8	Statistical Water Quality Analysis	5
2.8.1	Statistical Definitions	6
3.0	EVALUATION CRITERIA	8
4.0	RESULTS AND DISCUSSION	9
4.1	Illinois Surface Water Quality Standards	9
4.1.1	Mississippi River	9
4.1.2	Rock River	10
4.2	Constituent Loads	10
4.2.1	General Discussion	10
4.2.2	*E. Coli* and Fecal Coliform	13
4.3	Water Quality Variability Downstream of Rock Island and Moline	25
4.4	SEP Quality Assurance/ Quality Control Analysis	26
5.0	SUMMARY AND RECOMMENDATIONS	27
5.1	Summary	27
5.2	Recommendations	28
6.0	REFERENCES	29

TABLES

4.1 Surface Water Quality Analytical Results

4.2 Constituent Loads in Surface Water of the Mississippi and Rock Rivers

4.3 Comparison of Load Variability in Surface Water of the Mississippi River Upstream and Downstream of the Cities

4.4 Comparison of Load Variability in Surface Water of the Rock River Upstream and Downstream of the Cities

FIGURES

2.1 Site Map and Sample Locations

2.2 Rock River Watershed Delineation

4.1 Surface Constituent Loads in Mississippi and Rock River Samples

4.2 *E. Coli* Loads in Mississippi River Surface Water

4.3 Fecal Coliform Loads in Mississippi River Surface Water

4.4 *E. Coli* Loads in Rock River Surface Water

4.5 Fecal Coliform loads in Rock River Surface Water

APPENDICES

A Statistical Output

B Analytical Data

Section 1.0
PURPOSE

The Cities of Rock Island and Moline, Illinois (Cities) are bounded on the north and or east by the Mississippi River and on the south by the Rock River. For both communities, these Rivers are critical environmental resources for their economic and recreational life and define the aesthetic characteristics of the communities. Pool 15 of the Mississippi River is also the water supply for both Cities.

In March 2005, the Cities began a Supplemental Environmental Project (SEP) to benchmark water quality conditions at various locations in the Mississippi and Rock Rivers for 9 months of the year (March – November) during a 2-year period (2005-2006). The SEP was developed to document water quality conditions present in Pool 16 of the Mississippi River and the Rock River adjacent to the Cities of Rock Island and Moline and the subsequent changes in water quality that occur as the rivers flow through these urbanized areas. The goal of this study was to address the following:

1) Does water from the Mississippi and Rock River meet appropriate Illinois State Water Quality Standards?

2) Is water quality on the Illinois side of the Mississippi River significantly different then water quality on the Iowa side of the Mississippi River?

3) Does water quality in the Mississippi and Rock Rivers degrade significantly as the rivers flow through the Cities?

4) Is the variability in constituent loads upstream and downstream of the Cites on the Mississippi and Rock Rivers significantly different?

The results of this SEP will supplement and enhance the findings of the previous studies conducted in this area. The Cities are the largest urbanized area on the Mississippi River between Minneapolis and St. Paul, Minnesota and St. Louis, Missouri. This water quality monitoring program could ultimately serve as the foundation to develop a comprehensive regional water quality-monitoring program.

Section 2.0
METHODOLOGY

During 2005 and 2006, monthly water quality monitoring was conducted upstream and downstream from the Cities of Rock Island and Moline during a 9 month period of the year (March – November). Discrete grab samples were collected at the following locations on the Mississippi River:

- Upstream – Pool 15 (M1, M2, M3), and
- Downstream – Pool 16 (M10, M11, and M12)

Discrete grab samples were also collected at three sampling locations on the Rock River:

- Upstream – R2 and R3, and
- Downstream – R1.

These sampling locations are depicted on Figure 2.1.

All Mississippi and Rock River sample locations were accessed by boat and located using a RTK Leica GPS with sub-centimeter accuracy. Surface samples were collected at each sample location from a downstream position using a dip sampler or the direct method. Mid-depth surface water samples were collected concurrently with the surface samples using a Kemmerer bottle at two Mississippi River locations (M2 and M11) at approximately half the distance from the surface to the riverbed, as determined by a depth finder. The surface and mid-depth grab samples represent conditions at the time of sampling and do not account for temporal variations in water quality.

2.1 SAMPLE TIMING

The Cities and Symbiont in collaboration with the United States Army Corps of Engineers (USACE) in Rock Island established the travel times of river water within the monitored reaches, and sample collection was generally conducted so that downstream samples were collected from the approximate same parcel of water that was sampled at the initial upstream monitoring location.

2.2 LABORATORY SAMPLE COLLECTION

Escherichia coli (E. coli) and fecal coliform samples were collected in sterilized sample bottles and a new pair of disposable gloves was used at each sample location. Once the samples were collected, they were transferred into clean laboratory-supplied sample containers and labeled with an identifying sample number, location, date, sample depth. The initials of sampling personnel were also recorded. The sample bottles were sealed and immediately placed on ice in a cooler and maintained at approximately 4°C from the time of sample collection until receipt by the analytical laboratories. The lead technician of each sampling team coordinated sample delivery to the various laboratories. The samples were delivered under proper chain-of-custody procedures within 24 hours of collection. All samples were properly preserved and analyzed within the appropriate holding time. The laboratory recorded temperature upon arrival at the

laboratory and samples that required thermal preservation were refrigerated after sample acceptance.

2.3 WATER QUALITY LABORATORY PARAMETERS

When received by the laboratory, the samples were logged into a logbook and/or laboratory database. Maximum holding times before analysis were met, as stated in applicable laboratory method standard operating procedures (SOPs). Parameters of particular concern because of short maximum holding times included *E. coli* and fecal coliform analysis (24 hours for samples not being collected for NPDES discharge compliance) and carbonaceous biochemical oxygen demand, nitrate, and nitrite (48 hours).

Laboratory analytical parameters included:

- *E. coli*,
- Fecal coliform,
- Chlorophyll *a*,
- Total Kjeldahl nitrogen (TKN),
- Nitrate as nitrogen (NO_3-N),
- Nitrite as nitrogen (NO_2-N),
- Ammonia as nitrogen (NH_3-N),
- Orthophosphorus,
- Total phosphorous (TP),
- Total suspended solids (TSS),
- Total dissolved solids (TDS),
- Volatile suspended solids (VSS),
- Five-day carbonaceous biochemical oxygen demand ($CBOD_5$), and
- Chloride.

Surface water quality samples were also analyzed for total and dissolved Resource Conservation and Recovery Act (RCRA) metals and total and dissolved, copper, nickel and zinc during the first three sampling events in 2005, but were not analyzed during the 2006 monitoring events. The metals analyses were eliminated from the sampling plan after the September 7, 2005 sampling event because metals were not detected in any sample prior to that time.

2.4 FIELD WATER QUALITY PARAMETERS

An YSI 650 MDS water quality meter was used to measure five instream water quality parameters and included:

- water temperature,
- specific conductivity,
- dissolved oxygen (DO) concentration
- DO percent saturation, and
- pH.

River depth was determined with a depth finder. Water velocity was measured with a velocimeter.

2.5 DECONTAMINATION PROCEDURES

All sampling equipment was decontaminated before collecting the first sample and between successive sampling locations by washing with a trisodium phosphate solution (or equivalent) followed by two distilled water rinses. Equipment blanks were collected to verify the proper level of decontamination.

2.6 LOAD CALCULATIONS

Water is called the "universal solvent," since many common substances are easily dissolved in water. Other substances, such as suspended solids do not dissolve in water, but are often present in water or wastewater discharges (effluent). Pollutants which are either dissolved or suspended in water are often measured or expressed in terms of "concentration," typically milligrams per liter (mg/L) or micrograms per liter (µg/L). Concentrations alone do not accurately describe conditions in the Mississippi and Rock Rivers, because concentrations do not take into account the volume of water that the sample represents and the subsequent mass of pollutant. Constituent of concern loadings in this study were calculated using the following equation:

Daily flow at sampling station (L/day) x Constituent concentration (mg/L) = Constituent load (mg/day)

The methodology used to determine daily flow at each sampling station is presented below.

Mississippi River

The daily flow at each sampling location upstream of the Cities on the Mississippi River (M1, M2, and M3) were estimated by dividing the USACE gauge flow data from Pool 14 by three.

Daily flow at each sample location on the Mississippi River downstream of the Cities (M10, M11, and M12) were estimated by adding together the following flows:

- Flow from Pool 14,
- Estimated Rock River flow at R1,
- Flow from the Duck and Crow Creeks, and
- Daily effluent flow from the Cities to the Mississippi River.

and then dividing by three.

Rock River

Minor differences in concentrations of constituents between R2 and R3 (upstream Rock River sampling locations) were generally not significant (Appendix A.1); therefore, the concentrations were averaged between the stations to calculate upstream daily loads. For the purpose of this report, the averaged loads at R2 and R3 will be referred to as R2R3Avj.

Daily flow rates at the upstream and downstream sample locations on the Rock River were calculated by first determining the flow (cubic feet per second; cfs) per square mile (mi^2) of watershed at the gage station at Joslin, Illinois the day before sampling. The flow was then multiplied by the square miles of watershed contributing to R2R3Avj and R1 (Figure 2.2). The daily effluent discharge flow of the South Moline Wastewater Treatment Plant (WWTP) was added to the flow rate at R1.

2.7 DATA QUALITY OBJECTIVES

Data Quality Objectives are qualitative and quantitative statements, which specify the quality of the data required to support decisions made during the SEP, and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels that address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. The analytical data generated by the collection of surface water samples during the SEP was of DQO Level 1(field parameters) and 3 (laboratory parameters) which are defined below.

- Screening (DQO Level 1): This level provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives. These types of data include photoionization detector readings, surface water dissolved oxygen and temperature, and other data generated with real-time, on-site monitoring equipment.

- Engineering (DQO Level 3): This level provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile laboratory generated data and some analytical laboratory methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation).

2.8 STATISTICAL WATER QUALITY ANALYSIS

Limitations exist when using common parametric statistical methods to analyze environmental datasets. Environmental datasets are generally relatively small and lack replication, although field duplicates were collected at select monitoring locations to fulfill quality assurance/quality control (QA/QC) protocols. Several statistical models have been developed for situations where the collection of replicate samples over long periods of time is impractical, such as the dataset compiled during this study. According to the SAS Institute (1999), "the most cost-beneficial of statistical methods for quality and productivity improvement is statistical design of experiments (DOE)". Full factorial statistical modeling is the most conservative DOE design and has been shown to be effective in modeling surface water quality (Symbiont, 2006 and Koltz et al., 2006).

Step 1 – Analysis of Variance Modeling

When the data for a particular constituent are fit to a DOE model, an analysis of variance (ANOVA) is performed to determine the significance of the model. If the p-value of the ANOVA was less than 0.10 (α= 0.10), it was concluded that there was significant variation in the data. A p-value of 0.10 equates to a 90% confidence level, which was determined to be a proper level of certainty for the project goals. If this p-value condition was met, then each factor and factor-cross in the model was tested by pair-wise multiple comparisons using the a Student T-test or

Tukey-Kramer Honest Significant Difference to determine which factor level contributed to significant variation within the dataset. Factors and factor levels are summarized in the following table:

River and Depth	Factor	Factor Levels
Mississippi River – Surface	Year	2005, 2006
	Month	Mar., Apr., May., June, July, Aug., Sept., Oct., Nov.
	Vertical Transect	Left, Center, Right
	Stream Position	Upstream, Downstream
Mississippi River – Mid-depth	Year	2005, 2006
	Month	Mar., Apr., May., June, July, Aug., Sept., Oct., Nov.
	Stream Position	Upstream, Downstream
Rock River – Surface	Year	2005, 2006
	Month	Mar., Apr., May., June, July, Aug., Sept., Oct., Nov.
	Stream Position	Upstream, Downstream

To analyze data in this study, full factorial DOE models for *E. coli* and fecal coliform were built in JMP Version 6.0 (SAS Institute, Cary, NC) to test the hypothesis that loads of a particular water quality parameter were the same at the sampling locations during each of the sampling events on the Mississippi or Rock Rivers. With this type of statistical model, samples are collected under a stringent orthogonal sampling plan so data can be analyzed at every combination of factor level.

Individual constituent loads on the Mississippi and Rock Rivers were generally not normally distributed; therefore, loads were log-transformed prior to statistical modeling in JMP. A description of each DOE model and factors used in each model are presented in Sections 4.3.1, 4.3.2, and 4.3.3. Details regarding the statistics utilized in this report and leverage plots for each analysis can be found in Appendix A.

2.8.1 Statistical Definitions

Beyond the common descriptive statistics (mean, median, geometric mean, standard deviation, and variance) several other descriptive statistics were calculated and used to describe constituents in the Mississippi and Rock Rivers. One-half of the detection limits was used in the analysis when the constituent concentrations were below the detection limit. Additional descriptive statistics used to describe environmental data includes the following:

Statistics to describe and test distributions

- The Shapiro-Wilk W-test is used to **determine if a dataset is normally distributed**. If the p-value is less than 0.05, the dataset does not follow a normal distribution. This analysis was used multiple times throughout this investigation, first to determine if loads and concentrations were normally distributed and secondly to determine if the DOE models adequately fit their respective datasets.

- Kolmogorov's D is used to **determine if a dataset is log-normally distributed**. If the p-value associated with the test is greater than 0.05, the dataset does not follow a log-normal distribution.

Statistics to describe and compare variance

- The ANOVA regression of the DOE model requires that the standard deviations be equal between factors. Since this is highly unlikely, the model calculates a pooled standard deviation (weighted average) between the factors. This calculation is represented in the ANOVA model as the Root Mean Square Error. The multiple comparisons described above also calculate a pooled standard deviation between factor levels.

- The Levene test (Levene, 1960) was used to determine if variances are homogeneous between factor levels of a given constituent. A corresponding p-value less than 0.05 indicates the variances are unequal at a 95% confidence level.

Statistics to Describe Model Fit

- r^2 is a descriptive statistic often used to explain how well a model fits a dataset. The r^2 value estimates the proportion of the variation in the response around the mean that can be attributed to terms in the model rather than to random error. An r^2 of 1 indicates there is a perfect fit and all the errors are zero. An r^2 of zero indicates that the fit predicts the response not better than the overall response mean.

Statistics Used in Multiple-Comparison Tests

- The Tukey-Kramer Honest Significant Difference (Tukey HSD) test was described by Tukey (1953) and Kramer (1956). The test was used in this study to determine which factor levels are significantly different from each other when the factor consisted of more than two levels such as vertical transect (right, center and left).

- The Student T-test was used in this study to determine if factor levels are significantly different from each other when the factor consisted to two levels such as stream position (upstream, downstream).

Section 3.0
EVALUATION CRITERIA

Water Quality samples from the Mississippi River in this study are subject to four Illinois standards: General Use Water Quality Standard as defined in Title 35 of the Illinois Administrative Code (35 IAC), Sections 302.204 – 302.207 and 302.209; Numeric Standard for Chemical Constituents (Acute) as defined in 35 IAC 302.208 and 35 IAC 302.121; Numeric Standard for Chemical Constituents (Chronic) as defined in 35 IAC 303.208; and Site Specific Water Quality Standards as defined in 35 IAC 303.331. In addition, water quality samples taken upstream of Rock Island (M1, M2, and M3) are subject to Illinois Public and Food Processing Water Supply Standards as defined in 35 IAC 302.301.

Water Quality samples from the Rock River in this study are subject to three Illinois standards: General Use Water Quality Standard as defined in 35 IAC 302.204 – 302.207 and 302.209; Numeric Standard for Chemical Constituents (Acute) as defined in 35 IAC 302.208 and 302.121; and Numeric Standard for Chemical Constituents (Chronic) as defined in 35 IAC 303.331.

Section 4.0
RESULTS AND DISCUSSION

4.1 ILLINOIS SURFACE WATER QUALITY STANDARDS

In Section 4.1 water quality samples collected from the Mississippi and Rock Rivers as part of the SEP are compared to appropriate Illinois State Water Quality Standards to determine if standards have been violated.

4.1.1 Mississippi River

The surface and mid-depth water quality in the Mississippi River upstream of Rock Island and Moline (M1, M2, and M3; Figure 2.1) met the applicable water quality standards during all 18 water quality monitoring events (Table 4.1).

The surface and mid-depth water quality in the Mississippi River downstream of Rock Island and Moline (M10, M11, and M12; Figure 2.1) generally met the applicable water quality standards during the project, with the exception of pH and fecal coliform (Table 4.1) and included the following locations and dates:

- pH
  - M-10 (surface) – July 20, 2005, August 10, 2005, and November 1, 2006
  - M-11 (surface) – August 10, 2005
  - M-11 (mid-depth) – August 10, 2005
- Fecal coliform
  - M-12 (surface) – August 10, 2005, May 10, 2006, July 6, 2006 and August 9, 2006

The general use water quality standard for pH, which is 9.0 standard units (S.U.), was exceeded during 3 of the 18 sampling events at 2 of the 6 sampling locations on the Mississippi River during 2005 and 2006. Both of the locations that exceeded the standard are located just downstream of the Cities.

The general use water quality standard for fecal coliform, which is 400 CFU/100 mL, was exceeded during 4 of the 18 sampling events at one of the six sampling locations on the Mississippi River during 2005 and 2006. Monitoring location M-12 was the site which exceeded the standard and is located downstream of the Rock River on the west (Iowa) side of the Mississippi River. Although there is no water quality standard for *E. coli*, concentrations of this constituent were also elevated during the same sample periods.

In August 2005 the surface concentration was 9,100 CFU/100 mL; however, the surface concentration at M10 and M11, which are located southwest of M12 (Figure 2.1), during the same sampling round was 70 and 30 CFU/100 mL, respectively which is well below the standard. The standard for fecal coliform was again exceeded at M-12 in May, July and August 2006 (400, 9,800 and 12,000 CFU/100 mL, respectively) during which times the concentration of fecal coliform at M10 and M11 was up to 3 log-orders lower and always below the standard.

Previous studies conducted by Symbiont (2006) have indicated the navigational channel (generally the center of river) acts as a barrier to localized horizontal mixing of constituents across the Mississippi River; therefore, the elevated fecal coliform concentration at M12 is likely due to input from the west (Iowa) side of the river, potentially from the Davenport Waste Water Treatment Plant, which does not disinfect their effluent.

4.1.2 Rock River

The water quality in the Rock River upstream (R2 and R3) and downstream (R1) of Rock Island and Moline generally met the applicable water quality standards (Table 4.1) with the exception of the following:

- pH
  - R1 (surface) – July 20, 2005, September 7, 2005, October 5, 2005, November 1, 2005 and November 1, 2006
  - R2 (surface) – September 6, 2005 and November 1, 2002
  - R3 (surface) – November 1, 2005
- Fecal coliform
  - R1 (surface) – March 14, 2006
  - R2 (surface) – March 14, 2006
  - R3 (surface) – March 14, 2006

The general use water quality standard for pH, which is 9.0 standard units (S.U.), was exceeded during 5 of the 18 sampling events during 2005 and 2006 at one to three of the sampling locations on the Rock River. The sampling location just downstream of the Cities, R1, was the location which most commonly exceeded the standard.

The general use water quality standard for fecal coliform, which is 400 CFU/100 mL, was exceeded during 1 of the 18 sampling events during 2005 and 2006 at all three of the sampling locations on the Rock River.

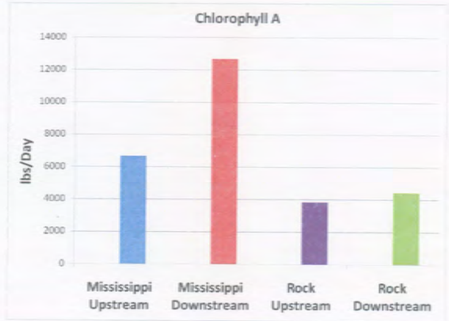
The exceedance occurred in March 2006 and the fecal coliform concentrations upstream of the cities, sampling locations R2 and R3, were 860 and 1500 CFU/100 mL, respectively. The fecal coliform concentration downstream of the city, sampling location R1, was 900 CFU/100 mL during this same time period. This data indicates that the source of the elevated levels of fecal coliform on this date was likely upstream of sampling location R3 and the Cities.

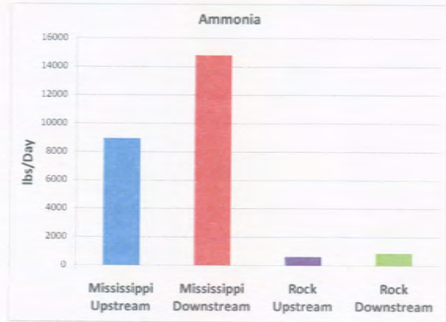
4.2 CONSTITUENT LOADS

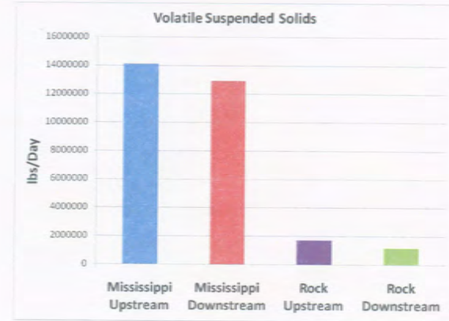
4.2.1 General Discussion

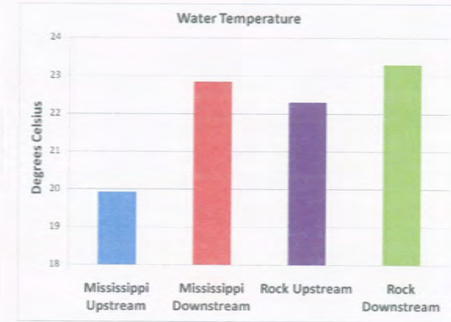
Median surface loads of nutrients and field parameters at sample locations upstream and downstream of the Cities on the Mississippi and Rock Rivers were calculated and are presented in Table 4.2. The calculated loads of 12 laboratory parameters and 5 field parameters are graphically presented below on Figure 4.1. *E. coli* and fecal coliform loads are discussed in detail in section 4.3.2 and thus are excluded from discussion in this section.

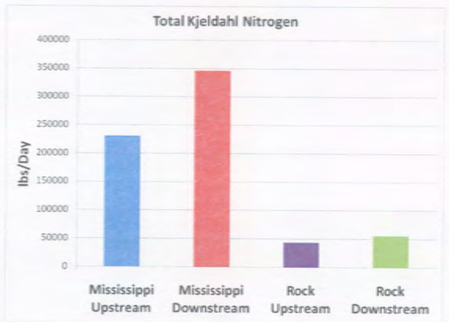
Figure 4.1
Surface Constituent Loads in Mississippi and Rock River Samples

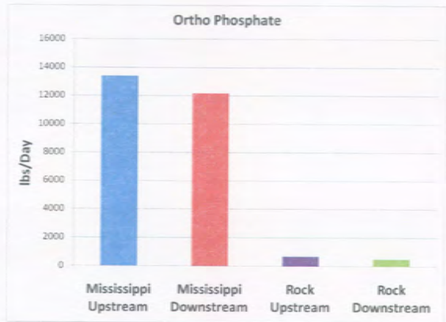


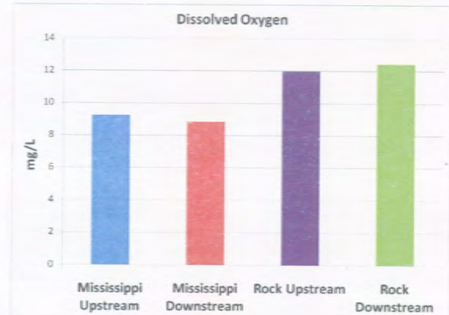


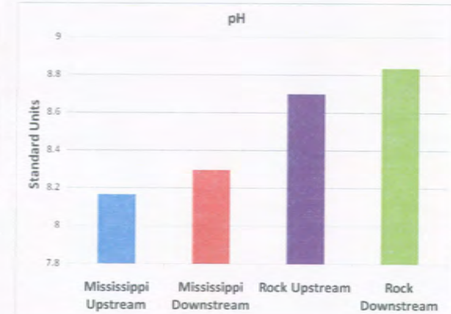


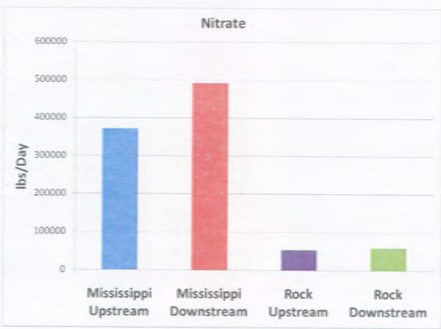


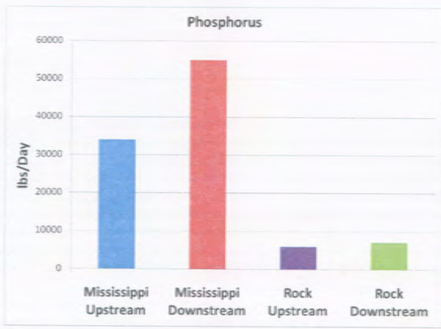


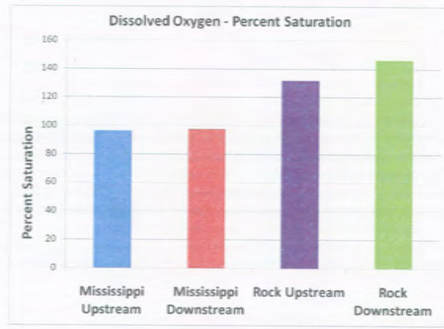


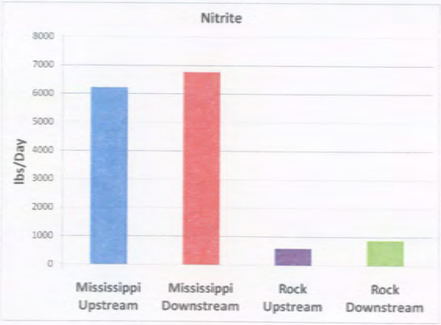


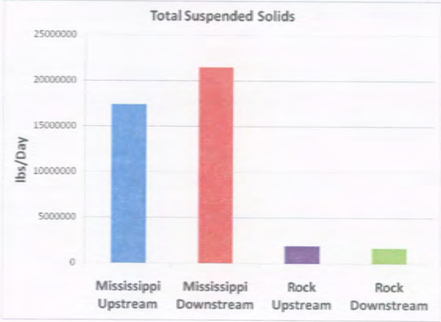


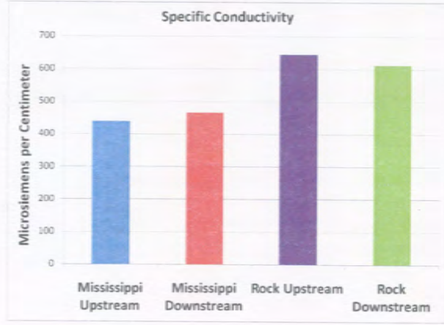












Lbs/Day = Pounds per Day
Mg/L = Milligrams per Liter

The sources of nutrients in surface waters can be broadly divided as *natural* and *anthropogenic*. Natural sources are generally ubiquitous; however, their contribution is usually low because, over the course of time, natural systems have established balances. The major sources of nutrients to streams are anthropogenic sources including commercial fertilizers applied to crops, lawns and gardens; wastewater discharges; leaking septic systems; snowmelt runoff; and animal manure (Stark et al., 2000). Following is a discussion of the trends observed for nutrients and key field parameters measured in the Mississippi and Rock Rivers upstream and downstream of the Cities.

With the exception of DO (percent saturation and mg/L), pH, specific conductivity, and water temperature, concentrations of nutrients and field water quality measurements were greater in the Mississippi River than the Rock River. These observations were expected as the Mississippi River has a much greater flow (volume of water) than the Rock River.

In general, the trends in constituent concentrations (chlorophyll A, the nitrogen series, ortho phosphate, total phosphorus, and TSS) and field water quality measurements (volatile suspended solids, water temperature, and pH) observed for the Mississippi and Rock Rivers were generally consistent, with the notable exception of DO. DO concentrations decreased in the Mississippi River downstream of the Cities, but increased slightly in the Rock River. Water temperature, which was approximately 20 and 23 degrees Celsius upstream and downstream of the Cities on the Mississippi River, respectively, may account for much of the decrease in DO because the solubility of oxygen is greater in colder waters. This is reflected by the percent saturation DO measurement which increases downstream of the Cities on both Rivers. The DO increase in the Rock River could also be due to turbulent flow cascading over a low head dam that is located just east of Vandruff Island.

It appears that increased DO measurements in the Rock River also correlates with an increase in chlorophyll A concentrations indicating that photosynthesis may be playing an important role at the downstream locations. Photosynthesis occurs where algae and plants removed carbon dioxide from the water which increases the DO concentration and pH of the water.

Chlorophyll A, TKN, nitrate, nitrite, ammonia, phosphorus, DO (percent saturation), water temperature and pH increased in both the Mississippi and Rock Rivers downstream of the Cities. Since chlorophyll A in the water strongly reflects algal productivity, this probably reflects higher algal growth rates downstream of the Cities. The increased DO and pH could also be related to algae growth and are a result of increased photosynthesis. The TKN, nitrate, nitrite, ammonia and phosphorus increases are likely due to increases in organic matter in the water column.

Ortho phosphate and VSS decreased in both the Mississippi and Rock Rivers downstream of the Cities. Natural processes produce ortho phosphate, but major anthropogenic sources include: partially treated and untreated sewage, runoff from agricultural sites, and application of some lawn fertilizers. Ortho phosphate is readily available for plant uptake which is likely the cause of the decreases downstream of the Cities. VSS gives an indication as to what fraction of the TSSs are of organic nature and therefore subject to biological breakdown. The decrease in VSS in both Rivers indicates that the percent of organic matter contained in the TSS decreased downstream of the Cities.

The trends in water quality noted above are generally typical of surface water flowing through large urbanized areas.

4.2.2 *E. Coli* and Fecal Coliform

Section 4.2.2 addresses several questions.

1. Is water quality on the Illinois side of the Mississippi River significantly different then water quality on the Iowa side of the Mississippi River?

2. Are *E. coli* and fecal coliform loads significantly different upstream and downstream of the Cities on the Mississippi River.

3. Are *E. coli* and fecal coliform loads significantly different upstream and downstream of the Cities on the Rock River.

These questions were evaluated using full factorial DOE analysis models and are discussed below.

Mississippi River, Surface

Two 2x9x2x2 full factorial analysis DOE models (*E. coli* and fecal coliform) were developed using log-transformed daily loads of the two constituents to determine which factors contribute significantly to the *E. coli* and fecal coliform loads in the Mississippi River in the vicinity of the Cities (Appendix A.2). The data used in the models were log-transformed. The factors and factor levels in each model were:

- Year: 2005, 2006
- Month: March, April, May, June, July, Aug, Sept, Oct, Nov
- Lateral Transect: Left, Center, Right
- Stream Position: Upstream, Downstream

The r^2 of the *E. coli* and fecal coliform models were 0.92 and 0.74, respectively, indicating the statistical models fit their data well. Results from Shapiro-Wilk W-tests performed on the residuals of each model ($p<w = 0.96$ for E. coli and $p<w = 0.18$ for fecal coliform) indicate the normality assumption of the models was satisfied and confirmed that the models properly fit the data. The p-values from model regressions were calculated and indicate that factors in the model are significantly influencing loads of enteric bacteria; therefore Tukey HSD or student's t tests (based on applicable number of factor levels) were performed and the results of significant factor levels are discussed below and are included in Appendix A.2.

E. Coli

Based on the results of a student t-test analysis, it was determined that the *E. coli* loads in Mississippi River surface water for 2006 were greater than in 2005.

LSMeans Differences Student's t α=0.050 Q=2.00172				
Factor Level				Mean Daily Load
2005		B		12.896
2006	A			13.162
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

Based on the results of a Tukey-HSD analysis *E. coli* loads in the fall (September-November) were less than loads in the spring (March-May) or summer (June-August).

LSMeans Differences Tukey HSD α=0.050 Q=3.26851					
Factor Level					Mean Daily Load
March	A				13.442
April	A	B			13.120
May	A	B			13.157
June	A	B	C		13.018
July	A	B			13.202
August	A	B			13.267
September			C	D	12.603
October		B	C	D	12.869
November				D	12.583
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**					

A Tukey HSD analysis was performed to determine if water quality on the Illinois side of the Mississippi River was significantly different than on the Iowa side using right, left, and center as factor levels. The results indicate that *E. coli* loads measured in surface water of the Mississippi River appear to be unequally distributed across the River. The *E. coli* loads on the left (Illinois) side of the Mississippi River were not significantly different from the center (navigational channel), but were significantly less than loads on the right (Iowa) side, which generally supports conclusions from prior investigations (Symbiont, 2006).

LSMeans Differences Tukey HSD α=0.050 Q=2.42949				
Factor Level				**Mean Daily Load**
Right	A			13.346
Left		B		12.931
Center		B		12.810
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

A Student's t test was performed to determine if water quality on the Mississippi River downstream of the Cities was significantly different than upstream. The test indicates the *E. coli* load downstream of the Cities on the Mississippi River was significantly greater than the upstream load. Previous studies have indicated that impacts to the River from the City of Rock Island's WWTP are localized to within a narrow mixing zone, less than 150 feet downstream of the outfall; therefore the significant increase in *E. coli* load downstream of the Cities cannot be wholly attributed to inputs from the WWTP. Other sources of *E. coli* inputs to the Mississippi River in the vicinity of the Cities include the Davenport WWTP and three tributaries.

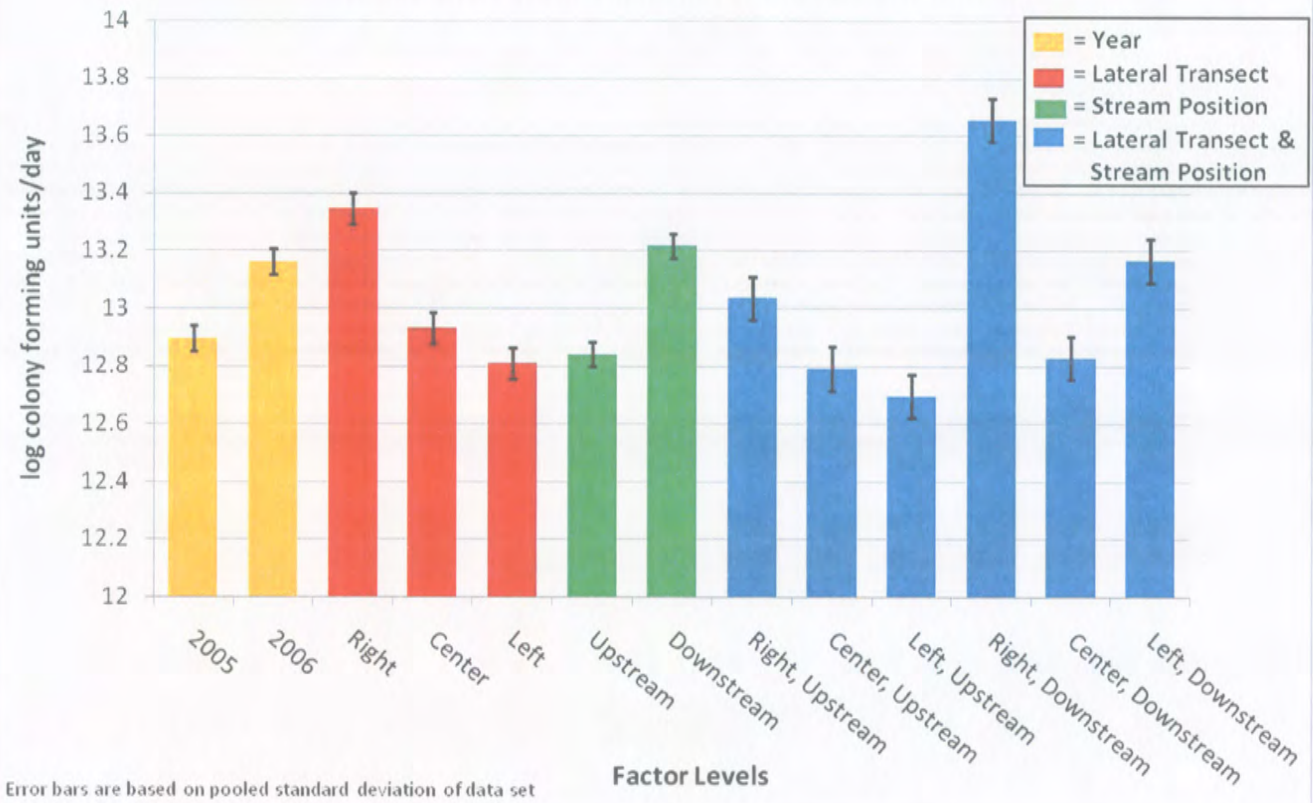
LSMeans Differences Student's t α=0.050 Q=2.00172				
Factor Level				**Mean Daily Load**
Downstream	A			13.217
Upstream		B		12.841
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

The factor cross between Lateral Transect and Stream Position was significant and indicates that in general; homogeneity exists in loads of *E. coli* upstream of the Cities between the left (Illinois) and the center and between the right (Iowa) and the center portions of the River, although the *E. coli* load on the right side of the River is significantly greater than the left. The factor cross also suggests the *E. coli* loads are not significantly different between upstream and downstream samples in the navigational channel (center). Furthermore, the cross between Lateral Transect and Stream Position indicates that the sampling location downstream of the Cities on the Iowa side of the River (M-12) had significantly greater *E. coli* loads than any of the other monitoring location. Previous studies have documented greater concentrations of *E. coli* and fecal coliform downstream of the City of Rock Island on the Iowa side of the Mississippi River compared to the left, which could potentially be due to the discharge of non-disinfected effluent from the Davenport, Iowa WWTP (Symbiont, 2006).

LSMeans Differences Tukey HSD α=0.050 Q=2.98525					
Factor Cross Level					**Mean Daily Load**
Right,Downstream	A				13.656
Left,Downstream		B			13.166
Right,Upstream		B	C		13.036
Center,Downstream			C	D	12.829
Center,Upstream			C	D	12.791
Left,Upstream				D	12.696
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**					

A summary of the trends observed in *E. Coli* loads in Mississippi River surface water are presented in Figure 4.2.

Figure 4.2
***E. Coli* Loads in Mississippi River Surface Water**



Error bars are based on pooled standard deviation of data set

Fecal Coliform

Fecal coliform loads in the Mississippi River surface water tended to follow many of the same trends noted for *E. coli*. Based on the results of a student t-test analysis, it was determined that the fecal coliform loads for 2006 were greater than in 2005.

LSMeans Differences Student's t
α=0.050 Q=2.00172

Factor Level				Mean Daily Load
2005		B		12.998
2006	A			13.298

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

A Tukey HSD analysis was performed to determine if water quality on the Illinois side of the Mississippi River was significantly different than on the Iowa side using right, left, and center as factor levels. Results indicate fecal coliform loads on the right (Iowa) side of the River were significantly greater than the center or left.

LSMeans Differences Tukey HSD
α=0.050 Q=2.40532

Factor Level				Mean Daily Load
Right	A			13.428
Left		B		13.063
Center		B		12.953

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

A Student's t test was performed to determine if water quality on the Mississippi River downstream of the Cities was significantly different than upstream. Results indicate fecal coliform loads downstream were significantly greater than upstream.

LSMeans Differences Student's t α=0.050 Q=2.00172				
Factor Level				**Mean Daily Load**
Downstream	A			13.312
Upstream		B		12.985
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

Fecal coliform loads did not tend to follow a clear seasonal trend, even though month was a significant factor in the model.

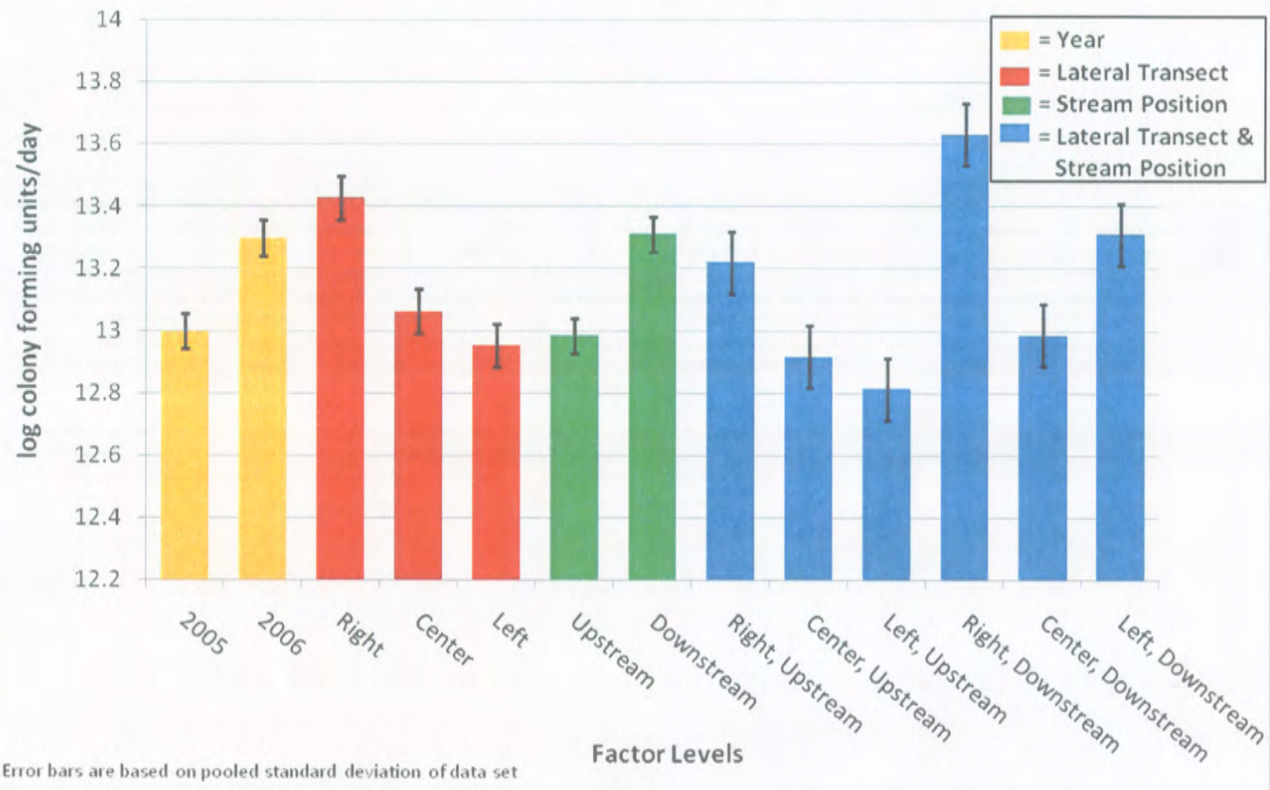
LSMeans Differences Tukey HSD α=0.050 Q=3.22171				
Factor Level				**Mean Daily Load**
March	A			13.478
April	A	B		13.197
May	A	B		13.113
June	A			13.305
July	A	B		13.080
August	A			13.389
September		B		12.602
October	A			13.301
November	A	B		12.869
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

Although the factor cross between Lateral Transect and Stream Position was not significant in the DOE model, the fecal coliform load on the right (Iowa) side of the River was greater than on the left (Illinois), downstream of the Cities.

LSMeans Differences Tukey HSD α=0.050 Q=2.94711				
Factor Cross Level				**Mean Daily Load**
Right,Downstream	A			13.634
Left,Downstream	A	B		13.313
Right,Upstream	A	B	C	13.221
Center,Downstream		B	C	12.988
Center,Upstream		B	C	12.918
Left,Upstream			C	12.814
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

A summary of the trends observed in fecal coliform loads in Mississippi River surface water are presented in Figure 4.3.

Figure 4.3
Fecal Coliform Loads in Mississippi River Surface Water



Error bars are based on pooled standard deviation of data set

Mississippi River, Mid-Depth

Two 2x9x2 full factorial analysis DOE models (*E. coli* and fecal coliform) were developed using log-transformed daily loads of the two constituents to determine which factors contributed significantly to *E. coli* and fecal coliform loads in the Mississippi River in the vicinity of the Cities (Appendix A.3). The factors and factor levels in each model were:

- Year: 2005, 2006
- Month: March, April, May, June, July, Aug, Sept, Oct, Nov
- Stream Position: Upstream, Downstream

The r^2 of the *E. coli* and fecal coliform models were 0.86 and 0.86, respectively, indicating the models fit their data well. Results from Shapiro-Wilk W-tests performed on the residuals of each model ($p<w = 0.054$ for E. coli and $p<w = 0.61$ for fecal coliform) indicate the normality assumption of the models was satisfied and confirms that the models properly fit the data. Results of the models are discussed below and statistical analysis results are contained in Appendix A.3.

The p-values from ANOVA model regressions (p=0.205 [*E. coli]* and p=0.1766 [fecal coliform]) indicate that the identified factors are not significantly influencing loads of enteric bacteria in mid-depth loads on the Mississippi River therefore, it can be concluded that loads of *E. coli* and fecal coliform in the navigational channel at mid-depth in the Mississippi River are not significantly different between upstream and downstream locations. Furthermore, model results indicate that loads of *E. coli* and fecal coliform do not vary by month. Statistical analysis results are contained in Appendix A.3.

Rock River

Two 2x9x2 full factorial analysis DOE models (*E. coli* and fecal coliform) were developed using log-transformed daily loads of the two constituents to determine which factors contributed significantly to *E. coli* and fecal coliform loads in the Rock River (Appendix A.4). The factors and factor levels in each model were:

- Year: 2005, 2006
- Month: March, April, May, June, July, Aug, Sept, Oct, Nov
- Stream Position: Upstream, Downstream

The r^2 value of the *E. coli* and fecal coliform models were 0.91 and 0.94, respectively, indicating the model fits the data well (Appendix A.4). The result from a Shapiro-Wilk W-test performed on the residual of the *E. coli* model ($p<W = 0.17$) indicates the normality assumption of the model was satisfied and confirms that the models properly fit the data. The result from a Shapiro-Wilk W-test performed on the residuals of the fecal coliform model ($p<W = 0.03$) indicate the normality assumption of the models was not satisfied and indicates the model could be further refined.

The p-values from model regressions indicate that factors in the model are significantly influencing loads of enteric bacteria significant (p=0.0624 [*E. coli*] and p=0.0154 [fecal coliform]); therefore Tukey HSD or student's t tests (based on applicable number of factor levels) were

performed and the results of significant factor levels are discussed below. Statistical analysis results are contained in Appendix A.4.

E. Coli

Model results for *E. coli* loads on the Rock River indicate loads in 2006 were greater than 2005; which was the same trend noted on the Mississippi River.

LSMeans Differences Student's t
α=0.050 Q=2.306

Factor Level				Mean Daily Load
2005		B		12.759
2006	A			12.121

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

A Student's t test was performed to determine if E. coli loads on the Rock River downstream of the Cites was significantly different than upstream. Results indicate that daily loads of *E. coli* downstream of the Cities are not significantly different from upstream loads; which supports conclusions from previous investigations (Symbiont, 2006).

LSMeans Differences Student's t
α=0.050 Q=2.306

Factor Level				Mean Daily Load
Downstream	A			12.511
Upstream	A			12.369

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

Although the model indicates loads of *E. coli* varies by month, the Tukey HSD analysis indicates loads are fairly homogeneous from late spring through the fall.

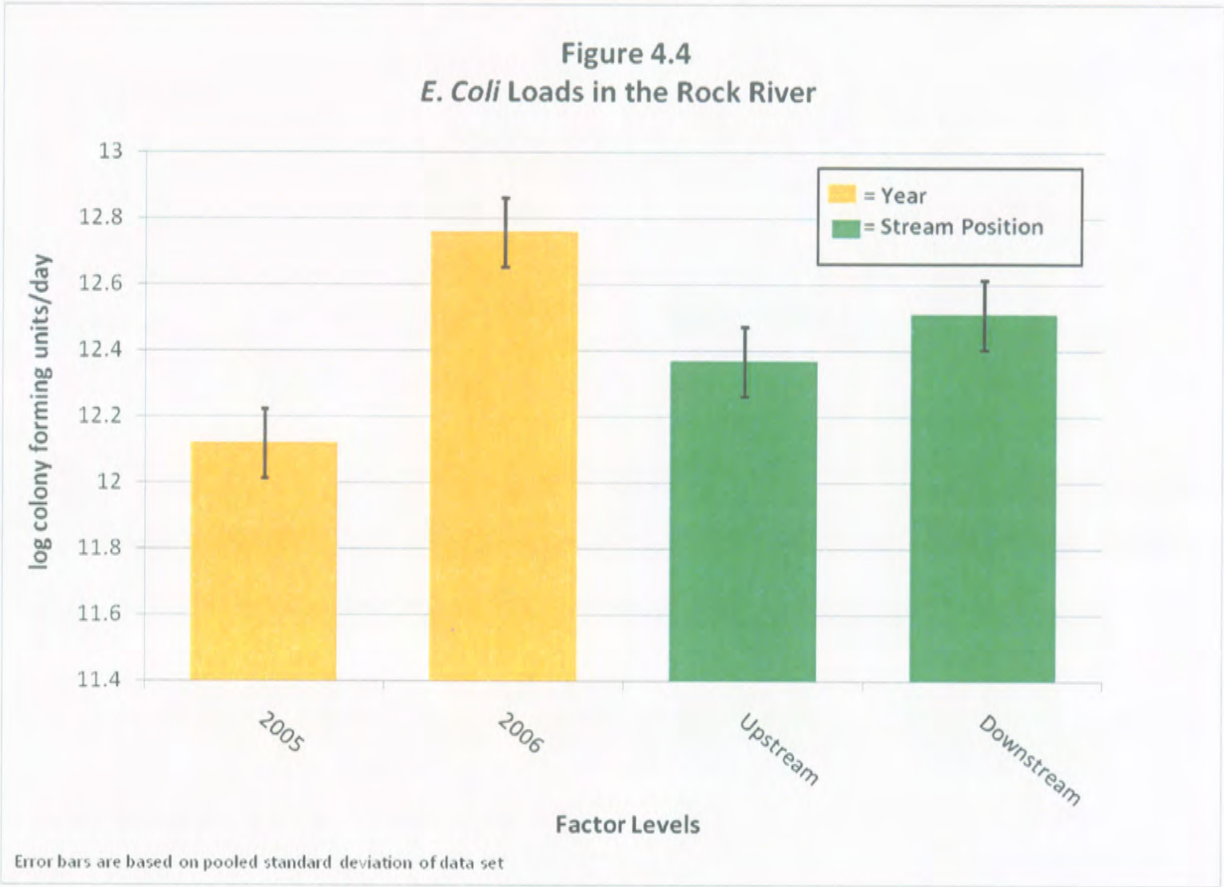
LSMeans Differences Tukey HSD
α=0.050 Q=4.07747

Factor Level				Mean Daily Load
March	A			13.555
April	A	B		12.887
May	A	B		12.344
June		B		12.185
July		B		12.075
August	A	B		12.402
September		B		12.055
October	A	B		12.300
November		B		12.157

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

A summary of the trends observed in *E. Coli* loads in the Rock River are presented in Figure 4.4.



Fecal Coliform

Fecal coliform loads on the Rock River follow the same trends as noted for *E. coli,* as noted in Appendix A.4. Fecal coliform loads in 2006 were greater than 2005.

LSMeans Differences Student's t
α=0.050 Q=2.306

Factor Level				Mean Daily Load
2005		B		12.718
2006	A			12.076

Mean Daily Loads are expressed in Log (Colony forming units per day)

Levels not connected by same letter are significantly different.

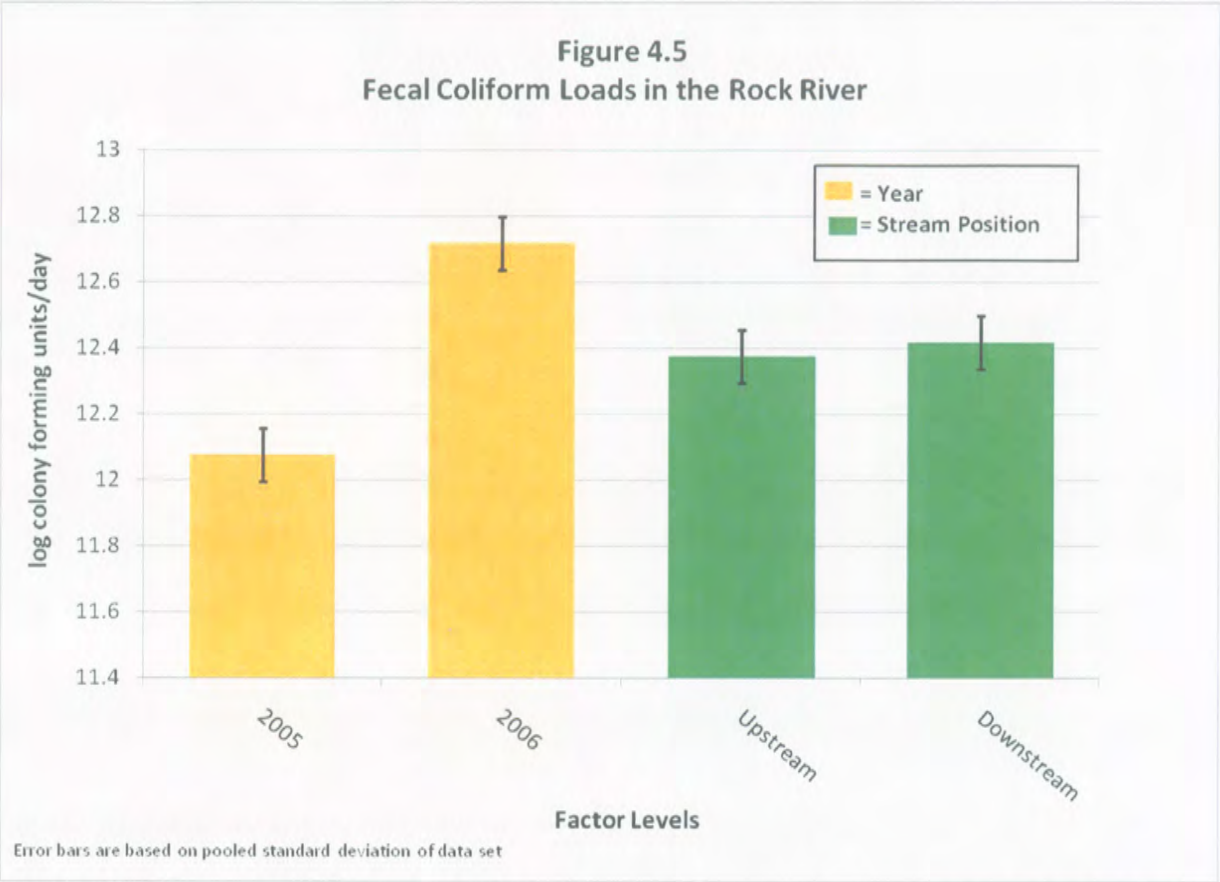
A Student's t test was performed to determine if fecal coliform loads on the Rock River downstream of the Cities was significantly different than upstream. Fecal Coliform loads downstream of the Cities are not significantly different from upstream loads.

LSMeans Differences Student's t α=0.050 Q=2.306				
Factor Level				**Mean Daily Load**
Downstream	A			12.418
Upstream	A			12.376
Mean Daily Loads are expressed in Log (Colony forming units per day **Levels not connected by same letter are significantly different.**				

Fecal Coliform loads are fairly homogenous from late spring through the fall.

LSMeans Differences Tukey HSD α=0.050 Q=4.07747				
Factor Level				**Mean Daily Load**
March	A			13.331
April	A	B		12.397
May	A	B		12.428
June		B		12.293
July		B		12.006
August	A	B		12.431
September		B		12.152
October		B		12.323
November		B		12.209
Mean Daily Loads are expressed in Log (Colony forming units per day) **Levels not connected by same letter are significantly different.**				

A summary of the trends observed in Fecal Coliform loads in the Rock River are presented in Figure 4.5.



4.3 WATER QUALITY VARIABILITY DOWNSTREAM OF ROCK ISLAND AND MOLINE

This section addresses the question regarding variability of constituent loads upstream and downstream of the Cities on both the Mississippi and Rock Rivers.

Variability in constituent loads in the Mississippi and Rock Rivers downstream of the Cities has generally not been well defined in previous studies, thus a major goal of the SEP was to accurately quantify variability in loads between upstream and downstream sampling locations.

As noted in Table 4.3, variation in constituent loads in surface water of the Mississippi River noted downstream of the Cities was generally not significantly different than variation noted upstream of the Cities. However, the variation in Chlorophyll A, Nitrite, and CBOD loads downstream of the Cities was significantly greater than upstream. The variation in TSS and VSS loads upstream of the Cities was significantly greater than variation downstream of the Cities.

As noted in Table 4.4, the variation in constituent loads in the Rock River noted downstream of the Cities is not significantly different than variation noted upstream of the Cities.

Variation in field water quality parameters in the Mississippi and Rock Rivers noted upstream of the Cities is not significantly different than the variation noted downstream of the Cities.

4.4 SEP QUALITY ASSURANCE/ QUALITY CONTROL ANALYSIS

Representativeness expresses the degree to which water quality data collected during the project accurately and precisely represents the water quality in the Mississippi and Rock Rivers. To meet the level of the quality assurance/quality control (QA/QC) effort required for this project, two field duplicate samples were generally collected per monitoring event as noted in Table 4.1. To assess the representativeness of the sample data, concentrations of constituents measured in the field duplicate samples were compared to concentrations measured in the actual samples on a pair wise basis using a paired T-test or a sign rank test (nonparametric alternative to the paired t-test). The field duplicates and corresponding samples for M1 and M10 were segregated into pairs and a Shipro-Wilk normality test was performed to determine which pair-wise comparison would be most appropriate for each constituent at each sample location (Appendix A.5 and A.6). When the concentrations of a constituent in the field duplicates and corresponding samples were normally distributed, a paired-t test was performed. A sign rank test was performed for all constituents, and is most appropriate for constituents that did not follow a normal distribution. Statistical results are documented in Appendix A.5 and A.6.

Equipment blanks often detected constituents at or slightly above the detection limit, though the concentrations were comparatively low with the exception of a few monitoring events (Table 4.1). *E. coli* and fecal coliform were noted in very low concentrations in the equipment blank collected on October 10, 2005. Fecal coliform were noted in the equipment blank sample collected on October 2006; however, the concentration of *E. coli* from the same equipment blank sample was below detection limits. Relatively low concentrations of total P and ORP were noted in equipment blank samples. TSS, VSS, and TDS were noted periodically in the equipment blank samples as well.

Matrix spike and matrix spike duplicate samples generally met the laboratory QA/QC threshold recovery limits.

Section 5.0
SUMMARY AND RECOMMENDATIONS

5.1 SUMMARY

The following conclusions were made from the SEP investigation:

- In general, the water quality samples collected on the Mississippi and Rock Rivers both upstream and downstream of the Cities of Rock Island and Moline during 2005 and 2006 as part of the SEP met the appropriate Illinois state water quality standards with the following exceptions:
  - pH was exceeded during 3 of 18 sampling events on the Mississippi River,
  - Fecal coliform concentrations exceeded water quality standards during 4 of 18 sampling events of the Mississippi River,
  - pH was exceeded during 5 of 18 sampling events on the Rock River and
  - Fecal coliform concentrations exceeded water quality standards during 1 of 18 sampling events on the Rock River.
- Nutrient and field water quality parameters followed trends typical of surface water flowing through large urbanized areas.
- The results suggest that *E. coli* and fecal coliform loads in the Mississippi River surface water appear to be unequally distributed across the River. The *E. coli* loads on the left (Illinois) side of the Mississippi River were not significantly different from the center (navigational channel), but were significantly less than loads on the right (Iowa) side, which generally supports conclusions from prior water quality studies (Symbiont, 2006). The data indicates that water quality on the Illinois side of the Mississippi River is significantly different than the Iowa side.
- Loads of *E. coli* and fecal coliform in surface water in the Mississippi River are significantly greater downstream of the Cities compared to upstream.
- Loads of E. coli and fecal coliform in mid-depth water in the Mississippi River did not increase significantly downstream of the Cites when compared to upstream.
- Loads of *E. coli* and fecal coliform downstream of the Cities in the Rock River did not increase significantly compared to upstream.
- Variation in constituent loads in surface water of the Mississippi River noted downstream of the Cities was not significantly different than variation noted upstream of the Cities with the exception of Chlorophyll A, Nitrite, CBOD, TSS, and VSS.
- Variation in constituent loads in surface water of the Rock River noted downstream of the Cities was not significantly different than variation noted upstream of the Cities.

5.2 RECOMMENDATIONS

Future water quality studies conducted on the Mississippi and Rock Rivers in the vicinity of the Cities should include an assessment of various inputs from different land uses. Load contributions related to storm water should also be evaluated.

In addition, efforts should be made to refine the method used to calculate the daily flow downstream of the Cities. The method used to calculate the flow in this study relies on adding together known and or estimated inputs to the Rivers as they flow through the Cities. However, a more accurate method for determining flow would be to develop and calibrate a rating curve, that could correlate river stage to flow.

Section 6.0
REFERENCES

Hayer, A.J., 1984, A Proof of the Conjecture that the Tukey-Kramer Multiple Comparisons Procedure is Conservative, *Annals of Mathematical Statistics*, 12: 61-75.

Koltz, B.J., T. Reese, H. Byers, W. Gonwa, and D. Howard, 2006, Determining Water Quality Impacts of Combined Sewer Overflow on the Mississippi River using Full Factorial Analysis, WEFTEC 2006, Dallas, TX, October 2006.

Kramer, C.Y., 1956, Extensions of multiple range tests to group means with unequal numbers of replications, *Biometrics*, 12: 309-310.

Levene, H. 1960, Robust test for the equality of variances, In I. Olkin (ed), Contributions to probability and statistics, Stanford Univ. Press.

McClave, J.T., and P. G. Benson, 1988, *Statistics for business and economics*. Dellen Publishing Co., San Francisco, CA.

Moore, P.G, 1958, *Principles of statistical techniques*. 1st ed. Cambridge at the Univ. Press, New York, NY.

Ostle, B, 1954, *Statistics in research basic concepts and techniques for research workers*. 1st ed. Iowa State College Press, Ames, IA.

Sall, J.P., 1990, Leverage Plots for General Linear Hypothesis, *American Statistician*, 44(4): 303-315.

Snedecor, G.W., and W.G. Cochran, 1980, *Statistical methods*. 7th ed. The Iowa State Univ. Press, Ames, IA.

Stark, J.R., Hanson, P.E., Goldstein, R.M., Fallon, J.D., Fong, K.E., Lee, A.L., Kroeing, S.E., and Andrews, W.J., 2000, *Water Quality in the Upper Mississippi River Basin, Minnesota, Wisconsin, South Dakota, Iowa, and North Dakota, 1995-1998*: U.S. Geological Survey Circular 1211, 35p., online at http://pubs.water.usgs.gov/circ1211/.

Symbiont, 2006, *Combined Sewer Overflow Long Term Control Plan for the City of Rock Island, Illinois.*

Triad Engineering Incorporated, 2003, *Existing Water Quality Baseline Technical Memorandum, Pool 16 of the Mississippi River and the Rock River*, September.

Triad Engineering Incorporated, 2005, *Water Quality Monitoring for the Mississippi and Rock Rivers for Cities of Rock Island and Moline, Illinois Quality Assurance and Quality Control Project Plan,* April.

Tukey, J., 1953, A problem of multiple comparisons, Dittoed manuscript of 396 pages, Princeton University.

TABLES

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients														Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Vairable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml		ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
Rock River																									
SEPM-R1(surface)	SEPM-R1-S01	3/15/2005	20	(30)	25	0.97	3.5	<0.50	0.32	0.15	0.28	(25)	(25)	330	(2)	36	45	NA	0.5	15.29	109.3	596	NA	2.23	8.02
	SEPM-R1-S02	4/13/2005	70	(30)	140	1.3	2.3	<0.25	<0.05	<0.02	0.16	(9)	(9)	380	(3.6)	35	NA	13	0.5	NA	NA	NA	NA	NA	NA
	SEPM-R1-S03	5/4/2005	<10	(ND)	110	2	1.8	<0.25	<0.05	0.04	0.16	(40)	(40)	310	(8.6)	42	57	0.5	0.5	16.2	151.2	561	NA	13.3	8.87
	SEPM-R1-S04	6/15/2005	55	73	230	2.7	0.9	0.04	<0.05	<0.02	0.31	(43)	(43)	360	(1.6)	47	80	NA	0.5	10.95	131.6	613	NA	24.09	8.8
	SEPM-R1-S05	7/20/2005	30	<10	92	1.8	<0.1	<0.02	<0.05	0.02	0.3	(51)	(51)	330	(0.3)	56	NA	NA	0.5	13.26	176.9	652	NA	29.58	9.17
	SEPM-R1-S06	8/10/2005	20	40	130	2.2	0.1	0.02	0.05	0.05	0.36	(97)	(97)	350	(8.8)	61	NA	NA	0.5	9.99	140.9	605	NA	28.35	8.99
	SEPM-R1-S07	9/7/2005	<10	<10	31	1.8	0.3	0.02	<0.05	<0.02	0.22	(59)	(59)	310	(5.6)	57	86	NA	NA	17.94	220.1	591	NA	24.87	9.1
	SEPM-R1-S08	10/5/2005	40	50	340	2.2	0.6	<0.02	0.08	<0.02	0.23	(58)	(58)	320	(11.1)	64	86	NA	0.5	17.43	206.6	606	NA	23.69	9.16
	SEPM-R1-S09	11/1/2005	10	<10	570	2.4	1.5	<0.02	<0.05	<0.02	0.25	(38)	(38)	310	(12.8)	64	50	NA	0.5	14.65	157.8	622	NA	11.3	9.16
	SEPM-R1-S10	3/14/2006	520	900	84	2.2	4.1	0.03	0.05	0.03	0.42	(170)	(138)	390	(4.9)	54	40	7	0.5	11.40	NA	NA	NA	NA	NA
	SEPM-R1-S11	4/26/2006	20	<10	83	1.5	5	0.02	<0.05	0.03	0.19	(29)	(9.7)	360	(4.6)	41	63	10	0.5	11.50	116.0	642	NA	16.3	8.73
	SEPM-R1-S12	5/10/2006	10	55	140	1.9	4.9	0.02	<0.05	<0.02	0.17	(93)	(93)	430	(7.9)	44	64	10	0.5	15.89	171.2	662	NA	17.3	8.79
	SEPM-R1-S13	6/7/2006	10	<10	180	2	3.4	0.03	<0.05	<0.02	0.21	(154)	(129)	410	(5.5)	42	84	8	0.5	12.44	155.1	675	NA	25.5	8.79
	SEPM-R1-S14	7/6/2006	<10	<10	160	2.1	3.1	0.03	<0.05	<0.02	0.25	(99.5)	(32.8)	330	(9.6)	44	58	10	0.5	9.23	111.1	612	NA	26.1	8.64
	SEPM-R1-S15	8/9/2006	390	210	240	2	1	0.03	<0.05	<0.02	0.21	(109)	(88)	310	(6)	48	82	5	0.5	14.67	179.5	568	1.6	26.6	8.97
	SEPM-R1-S16	9/7/2006	20	20	260	2.6	1.2	0.03	<0.05	<0.02	0.31	(83)	(76)	300	(10.5)	49	58	12	0.5	9.56	112.2	590	1.6	22.9	8.67
	SEPM-R1-S17	10/4/2006	40	30	84	1.2	2.7	0.02	<0.05	0.04	0.22	(254)	(254)	380	(4.4)	46	80	10	0.5	9.33	104.6	682	1.1	20	8.64
	SEPM-R1-S18	11/1/2006	40	40	66	1.1	3.1	<0.02	<0.05	0.06	0.21	(107)	(107)	410	(3.3)	43	39	6	0.5	11.18	92.2	727	2.0	7	9.45
SEPM-R2(surface)	SEPM-R2-S01	3/9/2005	27	(10)	20	1.3	4.2	<0.25	0.25	0.15	0.26	(204)	(204)	390	(1)	42	21	8	0.5	11.87	89.2	673	2.9	3.5	8.17
	SEPM-R2-S02	4/13/2005	20	(20)	130	1.3	2.4	<0.25	<0.05	<0.02	0.22	(175)	(175)	350	(2.4)	36	40	8	0.5	13.58	132.5	582	2.9	14	8.92
	SEPM-R2-S03	5/4/2005	30	(10)	160	2.5	1.9	<0.05	<0.05	<0.02	0.22	(12)	(12)	350	(10.4)	43	47	6	0.5	14.7	132	572	1.5	10.6	8.7
	SEPM-R2-S04	6/15/2005	<10	36	150	1.8	1.6	0.03	<0.05	0.05	0.36	(97)	(97)	460	(2.9)	45	68	5	0.5	7.82	92	674	1	23.1	8.85
	SEPM-R2-S05	7/20/2005	<10	36	110	1.8	0.4	0.02	<0.05	0.12	0.39	(79)	(79)	350	(1.6)	56	NA	4	0.5	9.48	121	707	1.5	28	8.85
	SEPM-R2-S06	8/9/2005	10	10	86	1.9	0.5	0.02	0.05	0.16	0.35	(52)	(52)	370	(5)	58	NA	4	0.5	12.1	155	634	1	28.1	8.91
	SEPM-R2-S07	9/6/2005	10	40	120	2.1	0.6	0.02	<0.05	<0.02	0.2	(175)	(175)	340	(5.3)	59	78	4	NA	14	162	634	1	23.7	9.08
	SEPM-R2-S08	10/5/2005	<10	20	280	1.6	1.3	<0.02	<0.05	<0.02	0.16	(77)	(77)	330	(7.5)	61	68	4	0.5	13.29	153	658	2	22.4	8.65
	SEPM-R2-S09	11/1/2005	18	18	290	2.5	1.8	<0.02	<0.05	<0.02	0.23	(56)	(56)	330	(8.3)	63	32	4.5	0.5	15.7	139	646	2	10	9.01
	SEPM-R2-S10	3/14/2006	1200	860	92	2.8	4.2	0.04	0.07	0.05	0.83	(466)	(158)	320	(5.3)	51	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S11	4/26/2006	40	<10	90	1.7	5	0.02	<0.05	0.03	0.23	(69)	(12.1)	380	(3.8)	38	36	8	0.5	9.30	93.0	645	2.0	14.7	8.70
	SEPM-R2-S12	5/10/2006	45	64	140	2	4.8	0.02	<0.05	<0.02	0.19	(86)	(86)	340	(5.9)	42	54	6	0.5	13.60	144.0	665	1.5	16.7	8.70
	SEPM-R2-S13	6/7/2006	10	10	150	1.6	3.6	0.03	<0.05	0.02	0.22	(129)	(129)	430	(3)	43	68	6	0.5	9.60	117.0	687	2.0	24.1	8.60
	SEPM-R2-S14	7/5/2006	40	27	210	2.3	3.4	0.03	<0.05	<0.02	0.22	(81.9)	(67.5)	360	(8.9)	21	80	6	0.5	12.80	164.0	641	1.5	26.6	8.70
	SEPM-R2-S15	8/9/2006	30	27	190	2	1.2	0.02	<0.05	0.03	0.24	(72)	(L.A.)	320	(4.8)	47	69	4	0.5	8.97	113.0	582	1.5	26.3	8.50
	SEPM-R2-S16	9/6/2006	36	50	220	2.5	1.4	0.03	<0.05	0.02	0.3	(101)	(101)	370	(11.6)	48	70	6	0.5	11.80	135.0	610	2.0	22.4	8.90
	SEPM-R2-S17	10/3/2006	70	50	72	1.5	2.8	<0.02	<0.05	0.07	0.2	(42)	(42)	380	(3.5)	46	80	6	0.5	10.30	112.0	687	1.5	18.6	8.60
	SEPM-R2-S18	11/1/2006	10	10	53	1	3.2	<0.02	<0.05	0.06	0.17	(59.5)	(40.5)	410	(2)	43	25	7	0.5	8.90	75.0	732	2.0	6.9	8.50

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[5]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Rock River																								
SEPM-R1(surface)	SEPM-R1-S01	3/15/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R1-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S04	6/15/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R1-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S06	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S07	9/7/2005	<0.01	<0.01	0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R1-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S14	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S16	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S17	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R1-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SEPM-R2(surface)	SEPM-R2-S01	3/9/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R2-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R2-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S07	9/6/2005	<0.01	<0.01	0.07	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R2-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R2-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients													Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Valrable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml		ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
SEPM-R3(surface)	SEPM-R3-S01	3/9/2005	36	(10)	21	1.4	4.2	<0.25	0.25	0.14	0.23	(257)	(257)	370	(1)	43	21	6	0.5	12.1	91.5	NA	2.9	3.48	8.21
	SEPM-R3-S02	4/13/2005	45	(30)	120	1.4	2.3	<0.25	<0.05	<0.02	0.24	(392)	(392)	360	(2.5)	36	40	7.5	0.5	13.86	133.6	579	2.9	14	8.81
	SEPM-R3-S03	5/4/2005	<10	(ND)	160	1.7	1.8	<0.05	<0.05	<0.02	0.18	(78)	(78)	280	(9.8)	43	47	4	0.5	14.8	132	567	1.5	10.4	8.9
	SEPM-R3-S04	6/15/2005	<10	<10	160	2	1.9	0.04	<0.05	0.07	0.31	(81)	(81)	470	(3)	46	68	4	0.5	8.09	93	665	1	22.3	8.82
	SEPM-R3-S05	7/20/2005	10	<10	98	1.7	0.1	0.02	<0.05	0.1	0.33	(58)	(58)	350	(3.1)	55	NA	2.5	0.5	9.15	117	698	1.5	28	8.86
	SEPM-R3-S06	8/9/2005	20	30	86	1.6	0.2	0.02	0.05	0.13	0.34	(58)	(58)	360	(5.3)	56	NA	3	0.5	12.2	156	627	1	28	8.9
	SEPM-R3-S07	9/6/2005	20	30	100	2.1	0.4	<0.02	<0.05	<0.02	0.19	(216)	(216)	370	(5.5)	57	78	2	NA	13.4	159	627	1	23.7	8.76
	SEPM-R3-S08	10/5/2005	<10	10	300	1.4	1.1	<0.02	<0.05	<0.02	0.2	(71)	(71)	350	(7.5)	61	68	3	0.5	12.61	145	647	2	22.2	8.66
	SEPM-R3-S09	11/1/2005	10	27	450	2.5	1.7	<0.02	<0.05	<0.02	0.22	(50)	(50)	340	(8.4)	61	32	1.5	0.5	14.9	131	639	2	9.8	9.03
	SEPM-R3-S10	3/14/2006	2600	1500	96	3.4	4.2	0.04	0.07	0.05	0.82	(390)	(250)	300	(6)	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S11	4/26/2006	<10	10	91	1.7	5	0.02	<0.05	0.02	0.22	(66)	(12)	350	(3.5)	38	36	7	0.5	9.30	93.0	643	2.0	14.7	8.60
	SEPM-R3-S12	5/10/2006	30	40	130	1.8	4.7	0.02	<0.05	<0.02	0.18	(85)	(85)	340	(6.4)	42	54	7	0.5	13.50	143.0	661	1.5	16.7	8.70
	SEPM-R3-S13	6/7/2006	<10	<10	130	1.6	3.4	0.03	<0.05	0.02	0.21	(137)	(137)	420	(2.9)	43	68	7	0.5	9.50	116.0	684	2.0	24.1	8.60
	SEPM-R3-S14	7/5/2006	18	40	180	2.4	3.2	0.03	<0.05	<0.02	0.23	(106)	(66.7)	370	(8.8)	44	80	6	0.5	13.70	174.0	635	1.5	26.6	8.70
	SEPM-R3-S15	8/9/2006	<10	<10	190	2	1.1	0.02	<0.05	0.03	0.23	(137)	(137)	310	(4.9)	48	69	4	0.5	8.48	107.0	581	1.5	26.3	8.50
	SEPM-R3-S16	9/6/2006	50	40	230	2.6	1.3	0.03	<0.05	<0.02	0.33	(67)	(67)	350	(12.8)	47	70	6	0.5	11.50	135.0	605	2.0	22.2	8.90
	SEPM-R3-S17	10/3/2006	55	<10	75	1.5	2.7	<0.02	<0.05	0.06	0.18	(63.5)	(63.5)	380	(3.1)	45	80	6	0.5	10.00	109.0	682	1.5	18.4	8.50
	SEPM-R3-S18	11/1/2006	<10	20	52	1	3.1	<0.02	<0.05	0.05	0.18	(92)	(78.2)	410	(2.4)	42	25	7	0.5	9.10	76.0	729	2.0	6.8	8.40
Mississippi River																									
SEPM-M1(surface)	SEPM-M1-S01	3/9/2005	36	(50)	14	0.74	2.4	<0.25	0.12	0.07	0.12	(68)	(68)	260	(ND)	21	21	8	0.5	12.75	96.8	449	2.2	3.77	8.19
	SEPM-M1-S01FD	3/9/2005	60	(40)	14	3	2.3	<0.25	0.11	0.07	0.13	(103)	(103)	260	(ND)	21	21	NA	NA	NA	NA	NA	NA	3.77	NA
	SEPM-M1-S02	4/13/2005	70	(30)	43	1.2	1.3	<0.25	<0.05	0.02	0.25	(211)	(157)	170	(1.5)	16	40	20	0.5	13.73	129.5	314	3.6	12.7	8.06
	SEPM-M1-S02FD	4/13/2005	50	(60)	44	1.2	1.3	<0.25	<0.05	0.02	0.25	(337)	(337)	230	(1.2)	16	40	20	0.5	NA	NA	NA	NA	12.7	NA
	SEPM-M1-S03	5/4/2005	<10	(ND)	62	1.3	2.8	<0.05	<0.05	<0.02	0.17	(49)	(49)	230	(3.4)	16	47	8.5	0.5	13	121	389	1.7	12.1	8.6
	SEPM-M1-S03FD	5/4/2005	10	(ND)	59	1.6	2.8	<0.05	<0.05	<0.02	0.14	(24)	(24)	250	(3.6)	16	47	8.5	NA	NA	121	NA	NA	12.1	NA
	SEPM-M1-S04	6/15/2005	18	55	13	1.3	3	0.08	0.14	0.07	0.22	(118)	(118)	310	(0.9)	18	68	8.5	0.5	6.28	75	479	2	24.7	8.03
	SEPM-M1-S04FD	6/15/2005	20	80	13	1.3	3.1	0.08	0.13	0.08	0.2	(111)	(111)	310	(0.5)	18	68	8.5	0.5	NA	75	NA	NA	24.7	8.03
	SEPM-M1-S05	7/20/2005	<10	27	110	1.4	1.1	0.03	<0.05	0.04	0.18	(35)	(35)	270	(1.9)	16	NA	6	0.5	9.21	120	508	1	29.7	8.78
	SEPM-M1-S05FD	7/20/2005	<10	36	100	1.4	1.1	0.03	<0.05	0.05	0.18	(50)	(50)	280	(2)	15	NA	6	0.5	9.21	120	508	1	29.7	8.78
	SEPM-M1-S06	8/9/2005	36	18	110	1.5	0.1	0.02	0.05	0.06	0.2	(35)	(35)	240	(3.3)	16	NA	7	0.5	10.7	140	403	1	29.2	8.93
	SEPM-M1-S06FD	8/10/2005	10	27	110	1.6	0.1	0.02	0.05	0.06	0.21	(37)	(37)	260	(3.1)	16	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S07	9/6/2005	10	30	61	0.87	0.1	<0.02	<0.05	0.1	0.21	(179)	(113)	230	(1.8)	19	78	7	NA	7.4	90	433	1	25.5	8.54
	SEPM-M1-S07FD	9/6/2005	NA	NA	61	0.99	0.1	<0.02	<0.05	0.09	0.2	(179)	(116)	240	(1.4)	19	78	7	NA	7.4	90	433	NA	25.5	8.54
	SEPM-M1-S08	10/5/2005	70	140	14	1	1.1	0.03	0.16	0.12	0.24	(131)	(131)	270	(1.9)	22	68	8	0.5	7.84	88	454	2	21.22	7.89
	SEPM-M1-S08FD	10/5/2005	90	140	13	0.8	1.2	0.02	0.16	0.12	0.22	(76)	(76)	250	(1.1)	21	NA	NA	NA	7.84	NA	NA	NA	NA	NA
	SEPM-M1-S09	11/1/2005	<10	20	14	0.8	2	0.02	<0.05	0.06	0.14	(30)	(30)	250	(2.4)	16	32	9	0.5	10.3	94	414	2	11.3	7.82
	SEPM-M1-S09FD	11/1/2005	40	45	17	0.9	2	0.02	<0.05	0.06	0.15	(58)	(58)	250	(2)	16	32	NA	NA	NA	NA	NA	NA	11.3	NA
	SEPM-M1-S10	3/14/2006	320	320	35	1.1	3.6	0.02	<0.05	<0.02	0.16	(56)	(56)	260	(2.3)	21	23	9	0.5	9.00	72.0	436	1.5	5	8
	SEPM-M1-S10FD	3/14/2006	280	330	36	1.1	3.6	0.02	<0.05	<0.02	0.16	(57)	(57)	240	(1.9)	21	NA	9	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S11	4/26/2006	20	55	19	1.1	5.3	0.03	<0.05	0.04	0.19	(67)	(8.5)	280	(0.9)	18	36	6	0.5	8.56	86.0	478	2.5	14.5	8.5
	SEPM-M1-S11FD	4/26/2006	40	64	18	0.9	5.4	0.03	<0.05	0.04	0.19	(76)	(8)	260	(0.6)	18	NA	6	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S12	5/10/2006	210	330	11	0.8	4.7	0.03	<0.05	0.04	0.13	(350)	(350)	280	(1.1)	19	54	9	0.5	9.90	104.0	513	2.0	16.2	8.01
	SEPM-M1-S12FD	5/10/2006	240	230	12	0.9	4.7	0.03	<0.05	0.03	0.13	(238)	(238)	160	(1.0)	19	NA	9	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S13	6/7/2006	110	36	6	0.8	2.1	0.07	0.07	0.05	0.13	(327)	(327)	280	(0.25)	17	68	8	0.5	6.10	75.0	461	2.0	25.3	7.7
	SEPM-M1-S13FD	6/7/2006	100	82	6	0.7	2.1	0.07	0.08	0.05	0.12	(250)	(250)	280	(0)	17	NA	8	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S14	7/5/2006	80	110	9	0.7	1.9	0.05	<0.05	0.1	0.13	(20.5)	(20.5)	340	(0.9)	9.7	80	8	0.5	6.50	83.0	475	1.5	27.5	8.1
	SEPM-M1-S15	8/9/2006	10	55	130	1.6	0.2	<0.02	<0.05	0.06	0.25	(87)	(87)	210	(4)	20	69	6	0.5	8.70	114.0	401	1.0	28.6	8.7
	SEPM-M1-S15FD	8/9/2006	27	30	140	1.9	0.2	<0.02	<0.05	0.06	0.31	(75)	(75)	230	(3.6)	20	NA	6	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S16	9/6/2006	40	<10	29	0.8	0.29	<0.02	0.11	0.1	0.2	(40)	(40)	230	(2.8)	20	70	8	0.5	6.10	75.0	407	1.0	24.5	8.2
	SEPM-M1-S16FD	9/6/2006	<10	20	29	0.7	0.29	<0.02	0.11	0.09	0.2	(46)	(46)	230	(2.6)	19	NA	8	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S17	10/3/2006	10	64	44	0.8	0.72	<0.02	<0.05	0.04	0.14	(54.5)	(54.5)	230	(1.9)	21	80	7	0.5	9.50	104.0	425	1.0	18.9	8.4
	SEPM-M1-S17FD	10/3/2006	10	82	40	0.8	0.72	<0.02	<0.05	0.05	0.12	(43)	(43)	230	(1.4)	21	NA	7	0.5	NA	NA	NA	NA	NA	NA
	SEPM-M1-S18	11/1/2006	30	64	86	1.1	0.68	<0.02	<0.05	<0.02	0.12	(76)	(73.7)	240	(2.5)	23	25	7	0.5	10.80	95.0	438	1.5	8.7	8.8
	SEPM-M1-S18FD	11/1/2006	20	50	65	0.8	0.68	<0.02	<0.05	<0.02	0.13	(73)	(69.4)	230	(3.4)	23	NA	7	0.5	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[2]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SEPM-R3(surface)	SEPM-R3-S01	3/9/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R3-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R3-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S07	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-R3-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-R3-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mississippi River																								
SEPM-M1(surface)	SEPM-M1-S01	3/9/2005	<0.01	<0.01	0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S01FD	3/9/2005	<0.01	<0.01	0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S02FD	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S03FD	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S04FD	6/15/2005	<0.01	<0.01	0.08	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S05FD	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S06FD	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S07	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S07FD	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M1-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S08FD	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S09FD	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S10FD	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S11FD	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S12FD	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S13FD	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S15FD	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S16FD	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S17FD	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M1-S18FD	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Total and Dissolved Metals

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients														Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Vairable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
SEPM-M2(surface)	SEPM-M2-S01	3/9/2005	20	(20)	16	0.8	2.1	<0.25	0.12	0.06	0.13	(152)	(152)	260	(0.3)	20	21	17	0.5	14	105.3	480	2.2	3.18	8.19
	SEPM-M2-S02	4/13/2005	10	(ND)	38	1.2	1.2	<0.25	<0.05	0.02	0.22	(173)	(173)	220	(0.9)	15	40	11	0.5	13.97	132	307	3.6	12.7	8.08
	SEPM-M2-S03	5/4/2005	<10	(ND)	56	1.2	2.6	<0.05	<0.05	<0.02	0.13	(12)	(12)	260	(3)	14	47	15	0.5	13.4	126	381	1.7	12.2	8.6
	SEPM-M2-S04	6/15/2005	<10	40	9	0.94	3	0.07	0.11	0.08	0.23	(78)	(78)	370	(0.5)	17	68	17	0.5	6.59	79	479	2	24.6	8.06
	SEPM-M2-S05	7/20/2005	10	<10	110	1.5	1	0.03	<0.05	0.04	0.18	(95)	(95)	280	(2.3)	15	NA	15	0.5	9.78	129	509	1	29.8	8.81
	SEPM-M2-S06	8/9/2005	10	27	100	1.4	0.1	0.02	0.05	0.06	0.2	(23)	(23)	260	(3.8)	15	NA	14	0.5	11.7	148	402	1	29.6	8.97
	SEPM-M2-S07	9/6/2005	10	20	59	1.1	0.1	<0.02	<0.05	0.09	0.22	(138)	(132)	160	(1.8)	19	78	12	NA	7.7	95	433	1	25.8	8.54
	SEPM-M2-S08	10/5/2005	50	30	10	0.6	1.1	0.02	0.16	0.12	0.2	(86)	(172)	250	(1)	22	68	15	0.5	7.96	89	451	2	21	7.92
	SEPM-M2-S09	11/1/2005	<10	36	7	0.8	2	0.02	<0.05	0.07	0.14	(41)	(41)	240	(2.1)	15	32	16	8	10.6	98	411	2	11.1	7.88
	SEPM-M2-S10	3/14/2006	240	300	35	0.9	3.6	0.02	<0.05	<0.02	0.15	(40)	(9)	240	(2.1)	20	23	17	0.5	NA	NA	NA	1.5	5	NA
	SEPM-M2-S11	4/26/2006	<10	<10	19	1.2	4.6	0.03	<0.05	0.04	0.15	(74)	(6.5)	270	(0.9)	16	36	23	0.5	8.32	83.0	482	2.5	14.7	7.9
	SEPM-M2-S12	5/10/2006	100	72	10	0.7	3.4	0.02	<0.05	0.03	0.1	(260)	(260)	290	(0.9)	17	54	18	0.5	9.80	103.0	508	2.0	16.1	8.12
	SEPM-M2-S13	6/7/2006	20	<10	1	0.7	1.9	0.07	0.06	0.04	0.09	(85)	(85)	280	(0.38)	15	68	14	0.5	6.00	74.0	460	2.0	25.1	7.7
	SEPM-M2-S14	7/5/2006	90	55	5	0.7	1.9	0.05	<0.05	0.1	0.13	(21.5)	(21.5)	250	(0.9)	9.2	80	13	0.5	6.50	83.0	475	1.5	27.5	8.2
	SEPM-M2-S15	8/9/2006	30	30	140	1.5	0.2	<0.02	<0.05	0.06	0.27	(86)	(86)	210	(3.9)	19	69	15	0.5	9.20	122.0	400	1.0	28.6	8.7
	SEPM-M2-S16	9/6/2006	10	<10	33	0.9	0.28	<0.02	0.08	0.08	0.16	(80)	(80)	230	(2.8)	19	70	14	0.5	6.60	81.0	406	1.0	24.5	8.2
	SEPM-M2-S17	10/3/2006	<10	100	42	0.8	0.71	<0.02	<0.05	0.03	0.12	(29)	(29)	220	(1.6)	21	80	7	0.5	9.30	102.0	425	1.0	18.8	8.3
	SEPM-M2-S18	11/1/2006	20	60	84	0.9	0.68	<0.02	<0.05	<0.02	0.11	(49.5)	(43.1)	240	(3.3)	24	25	14	0.5	10.90	96.0	446	1.5	8.8	8.8
SEPM-M2(mid-depth)	SEPM-M2-M01	3/9/2005	30	(20)	16	0.92	2	<0.25	0.13	0.06	0.11	(65)	(65)	250	(0.1)	20	21	17	8	13.78	102.6	439	2.2	3.1	8.22
	SEPM-M2-M02	4/13/2005	27	(20)	41	1.3	1.1	<0.25	<0.05	0.02	0.23	(313)	(3131)	260	(1.2)	15	40	11	6	14.02	132	308	3.6	12.7	8.06
	SEPM-M2-M03	5/4/2005	<10	(10)	55	1.5	2.5	<0.05	<0.05	<0.02	0.12	(1422)	(1422)	250	(3.4)	14	47	15	8	12.8	120	381	1.7	12.1	8.6
	SEPM-M2-M04	6/15/2005	30	27	9	1.2	3	0.07	0.11	0.08	0.21	(74)	(74)	310	(0.4)	17	68	17	8	6.64	79	478	2	24.6	8.04
	SEPM-M2-M05	7/20/2005	<10	10	120	1.8	1	0.03	<0.05	0.04	0.22	(101)	(101)	280	(2)	16	NA	15	7	9.8	129	509	1	30	8.82
	SEPM-M2-M06	8/9/2005	10	20	110	1.4	0.1	0.02	0.05	0.06	0.21	(42)	(42)	270	(3.4)	15	NA	14	7	10.7	138	403	1	29.2	8.97
	SEPM-M2-M07	9/6/2005	10	50	68	0.96	0.1	<0.02	<0.05	0.1	0.22	(170)	(170)	230	(1.9)	19	78	12	6	7.1	86	433	1	25.4	8.53
	SEPM-M2-M08	10/5/2005	64	100	10	0.7	1.1	0.02	0.09	0.14	0.2	(107)	(107)	260	(1.1)	21	68	15	7	7.92	89	451	2	21	7.94
	SEPM-M2-M09	11/1/2005	20	10	6	0.7	2	0.02	<0.05	0.07	0.15	(31)	(31)	250	(2.4)	15	32	16	0.5	10.3	94	411	2	11.1	7.89
	SEPM-M2-M10	3/14/2006	200	290	34	1	3.5	0.02	<0.05	<0.02	0.13	(37)	(7)	240	(2)	20	23	17	8	NA	NA	NA	1.5	5	NA
	SEPM-M2-M11	4/26/2006	20	<10	18	1	4.5	0.03	<0.05	0.04	0.16	(104)	(10)	240	(0.9)	16	36	23	11	8.00	80.0	482	2.5	14.7	7.9
	SEPM-M2-M12	5/10/2006	55	100	8	0.9	3.4	0.02	<0.05	0.04	0.13	(370)	(370)	280	(0.8)	17	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M13	6/7/2006	50	55	4	0.7	2	0.06	0.06	0.07	0.13	(87)	(87)	290	(0.5)	16	68	14	7	5.90	75.0	460	2.0	25.1	7.9
	SEPM-M2-M14	7/5/2006	73	100	6	0.7	1.9	0.05	<0.05	0.09	0.13	(22)	(22)	300	(0.8)	9.3	80	13	7	6.40	82.0	475	1.5	27.5	8.2
	SEPM-M2-M15	8/9/2006	10	60	150	1.6	0.2	<0.02	<0.05	0.07	0.24	(140)	(140)	220	(3.5)	19	69	15	7	9.20	122.0	400	1.0	28.7	8.7
	SEPM-M2-M16	9/6/2006	<10	10	33	0.9	0.29	<0.02	0.08	0.09	0.19	(67)	(67)	220	(3)	20	70	14	7	6.50	79.0	406	1.0	24.5	8
	SEPM-M2-M17	10/3/2006	20	120	45	0.8	0.73	<0.02	<0.05	0.04	0.13	(51)	(51)	220	(1.5)	21	80	15	7	8.90	99.0	425	1.0	18.7	8
	SEPM-M2-M18	11/1/2006	20	60	69	0.7	0.68	<0.02	<0.05	<0.02	0.13	(63.5)	(55.9)	240	(3)	23	25	14	7	11.00	98.0	445	1.5	8.8	8.6

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
Total and Dissolved Metals																								
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[5]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SEPM-M2(surface)	SEPM-M2-S01	3/9/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S07	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SEPM-M2(mid-depth)	SEPM-M2-M01	3/9/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-M02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-M05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M07	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M2-M08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M2-M18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients: E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Instream Field Parameters: Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Vairable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
Mississippi River																									
SEPM-M3(surface)	SEPM-M3-S01	3/9/2005	10	(ND)	15	0.83	1.9	<0.25	0.14	0.07	0.11	(22)	(22)	250	(0.5)	19	21	18	0.5	13.79	102.2	422	2.2	2.54	8.21
	SEPM-M3-S02	4/13/2005	10	(10)	40	1.2	1.2	<0.25	0.07	0.03	0.24	(242)	(242)	200	(1.2)	15	40	21	0.5	14.3	135	303	3.6	12.7	8.06
	SEPM-M3-S03	5/4/2005	<10	(ND)	58	1.2	2.4	<0.05	<0.05	<0.02	0.12	(251)	(251)	250	(3.3)	14	47	17	0.5	13.3	121	374	1.7	11.8	8.7
	SEPM-M3-S04	6/15/2005	30	10	6	0.83	3	0.07	0.11	0.08	0.21	(63)	(63)	340	(0)	17	68	11	0.5	6.78	81	478	2	24.2	8.02
	SEPM-M3-S05	7/20/2005	<10	<10	140	1.5	0.9	0.02	<0.05	0.04	0.16	(60)	(60)	270	(2.3)	15	NA	15	0.5	10.12	133	507	1	29.8	8.84
	SEPM-M3-S06	8/9/2005	10	10	97	1.3	0.1	0.02	0.05	0.06	0.22	(17)	(17)	280	(3.3)	15	NA	12	0.5	10.8	140	402	1	29.2	8.97
	SEPM-M3-S07	9/6/2005	20	20	61	0.91	0.1	<0.02	<0.05	0.09	0.19	(82)	(77)	210	(1.8)	18	78	14	NA	7.3	88	433	1	25.4	8.54
	SEPM-M3-S08	10/5/2005	20	50	8	0.7	1	0.02	0.17	0.13	0.17	(114)	(114)	260	(0.9)	21	68	12	0.5	8.22	92	451	2	20.8	7.92
	SEPM-M3-S09	11/1/2005	<10	<10	3	0.7	1.9	0.02	<0.05	0.07	0.12	(49)	(49)	230	(2.1)	14	32	16	0.5	11.9	100	407	2	10.6	7.9
	SEPM-M3-S10	3/14/2006	130	140	35	0.9	3.3	0.02	<0.05	<0.02	0.13	(34)	(5)	230	(1.9)	20	23	12	0.5	NA	NA	NA	1.5	5	NA
	SEPM-M3-S11	4/26/2006	10	10	18	1.1	4.2	0.03	<0.05	0.03	0.14	(53)	(6)	290	(0.6)	16	36	18	0.5	8.52	85.0	475	2.5	14.3	7.9
	SEPM-M3-S12	5/10/2006	<10	20	7	0.8	3.1	0.02	<0.05	0.03	0.1	(441)	(441)	260	(0.9)	16	54	15	0.5	10.30	107.0	506	2.0	15.9	8.07
	SEPM-M3-S13	6/7/2006	80	55	4	0.9	2	0.07	0.06	0.05	0.1	(165)	(165)	280	(0)	16	68	12	0.5	6.20	76.0	460	2.0	24.8	7.8
	SEPM-M3-S14	7/5/2006	10	120	3	0.8	1.9	0.04	<0.05	0.1	0.12	(17.5)	(17.5)	300	(1.3)	9.2	80	13	0.5	6.40	82.0	475	1.5	27.5	8.1
	SEPM-M3-S15	8/9/2006	10	10	140	1.5	0.2	<0.02	<0.05	0.05	0.23	(55)	(55)	220	(3.6)	19	69	10	0.5	9.60	126.0	397	1.0	28.5	8.8
	SEPM-M3-S16	9/6/2006	10	<10	28	0.8	0.29	<0.02	0.08	0.08	0.19	(78)	(78)	220	(2.4)	19	70	12	0.5	6.50	79.0	406	1.0	24.5	8.2
	SEPM-M3-S17	10/3/2006	10	120	40	0.8	0.72	<0.02	<0.05	0.04	0.12	(43)	(43)	210	(1.5)	20	80	13	0.5	9.20	101.0	424	1.0	18.8	8.4
	SEPM-M3-S18	11/1/2006	20	30	77	0.9	0.66	<0.02	<0.05	<0.02	0.12	(68)	(57.1)	250	(3.4)	23	25	13	0.5	10.90	95.0	444	1.5	8.6	8.9
M-10(surface)	M-10-S01	3/15/2005	30	(20)	26	1.6	3.4	<0.50	0.27	0.14	0.3	(9.5)	(9.5)	320	(2)	35	45	NA	0.5	15.7	111.8	588	NA	2.23	8.1
	M-10-S01FD	3/15/2005	36	(80)	27	1.6	3.4	<0.50	0.29	0.16	0.29	(1.5)	(1.5)	330	(2)	36	45	NA	0.5	15.7	111.8	588	NA	2.23	8.1
	M-10-S02	4/13/2005	60	(30)	43	1.2	1.3	<0.25	0.06	0.02	0.23	(87)	(87)	210	(1.3)	16	NA	NA	0.5	NA	NA	NA	NA	NA	NA
	M-10-S02FD	4/13/2005	36	(100)	42	1.2	1.3	<0.25	<0.05	0.02	0.22	(143)	(143)	230	(1.3)	16	NA	NA	0.5	NA	NA	NA	NA	NA	NA
	M-10-S03	5/4/2005	<10	(ND)	62	1.7	2.4	<0.25	<0.05	<0.02	0.14	(34)	(34)	230	(2.9)	15	57	0.5	0.5	12.9	120.7	370	NA	11.8	8.67
	M-10-S03FD	5/4/2005	10	(ND)	58	1.2	2.4	<0.25	<0.05	<0.02	0.13	(81)	(81)	240	(2.1)	15	57	0.5	0.5	NA	NA	NA	NA	NA	NA
	M-10-S04	6/15/2005	10	55	8	1.3	3	0.07	0.1	0.08	0.17	(85)	(85)	300	(0)	20	80	NA	0.5	7.02	83.7	477	NA	24.32	8.05
	M-10-S04FD	6/15/2005	50	160	21	0.81	2.9	0.07	0.12	0.07	0.21	(59)	(59)	310	(0)	18	80	NA	0.5	7.02	83.7	477	NA	24.32	8.05
	M-10-S05	7/20/2005	130	200	100	1.7	0.8	0.02	<0.05	0.04	0.22	(33)	(33)	290	(3.6)	24	NA	NA	0.5	11.63	158.9	538	NA	29.74	9.02
	M-10-S05FD	7/20/2005	180	150	120	1.7	0.8	0.02	<0.05	0.04	0.21	(NA)	(43)	310	(3.9)	24	NA	NA	0.5	11.63	158.9	538	NA	29.74	9.02
	M-10-S06	8/10/2005	45	70	95	1.2	0.1	0.02	0.05	0.06	0.26	(57)	(57)	250	(3.8)	16	NA	NA	0.5	8.99	118.7	402	NA	28.91	9.01
	M-10-S06FD	8/10/2005	18	190	86	1.4	0.1	0.02	0.05	0.06	0.23	(57)	(57)	250	(4)	17	NA		0.5	9.43	118.7	402	NA	28.8	9.01
	M-10-S07	9/7/2005	27	36	60	0.93	0.2	<0.02	<0.05	0.1	0.23	(65)	(65)	250	(1.1)	20	86	NA	NA	7.75	95.9	432	NA	25.96	8.6
	M-10-S07FD	9/7/2005	20	45	60	1	0.1	<0.02	<0.05	0.1	0.24	(73)	(NA)	270	(1)	20	86	NA	NA	7.75	95.9	432	NA	25.96	8.6
	M-10-S08	10/5/2005	40	50	8	0.7	1	0.02	<0.05	0.13	0.23	(20)	(20)	260	(1.1)	22	86	NA	0.5	8.31	93.7	450	NA	21.54	7.97
	M-10-S08FD	10/5/2005	36	100	7	0.8	1	0.02	0.06	0.13	0.22	(30)	(30)	260	(0.9)	21	86		0.5	8.31	93.7	450	NA	21.54	7.97
	M-10-S09	11/1/2005	20	70	4	0.7	2	0.02	<0.05	0.07	0.14	(14)	(14)	210	(1.1)	15	50	NA	0.5	11.38	100.3	406	NA	10.88	8.19
	M-10-S09FD	11/1/2005	<10	40	3	0.7	2	0.02	<0.05	0.06	0.14	(35)	(35)	230	(1.1)	15	50	NA	NA	NA	NA	NA	NA	10.88	NA
	M-10-S10	3/14/2006	340	200	71	1.5	4	0.03	<0.05	0.03	0.31	(213)	(200)	370	(4.3)	41	40	13	0.5	11.00	NA	NA	NA	NA	NA
	M-10-S10FD	3/14/2006	430	800	93	2.7	4	0.03	0.05	0.03	0.64	(247)	(203)	380	(4.9)	48	NA	13	0.5	NA	NA	NA	NA	NA	NA
	M-10-S11	4/26/2006	10	20	29	1.1	4.4	0.03	<0.05	0.04	0.16	(61)	(8.1)	300	(1.9)	20	63	15	0.5	9.09	91.5	505	NA	16.8	8.1
	M-10-S11FD	4/26/2006	60	<10	24	1.3	4.3	0.03	<0.05	0.04	0.16	(62)	(8)	310	(1.5)	21	63	15	0.5	9.09	91.5	505	NA	16.8	8.1
	M-10-S12	5/10/2006	50	18	94	1.6	4.1	0.02	<0.05	<0.02	0.16	(89)	(89)	380	(5.0)	30	64	15	0.5	11.48	126.8	557	NA	16.8	8.43
	M-10-S12FD	5/10/2006	60	55	74	1.6	3.9	0.02	<0.05	<0.02	0.15	(72)	(72)	310	(5.1)	29	64	15	0.5	11.48	126.8	557	NA	16.8	8.43
	M-10-S13FD	6/7/2006	<10	<10	58	1.8	2.3	0.06	<0.05	0.04	0.2	(116)	(79)	310	(1.5)	22	NA	13	0.5	NA	NA	NA	NA	NA	NA
	M-10-S13	6/7/2006	20	50	110	1.8	2.3	0.06	<0.05	0.04	0.22	(148)	(108)	300	(6.1)	23	84	13	0.5	9.65	121.6	553	NA	26.2	8.46
	M-10-S14	7/6/2006	50	50	82	1.3	2.4	0.04	<0.05	0.03	0.21	(189.5)	(189.5)	310	(4.6)	28	58	12	0.5	7.82	98.4	542	NA	26.2	8.48
	M-10-S14FD	7/6/2006	50	40	82	1.2	2.5	0.04	<0.05	0.02	0.22	(247)	(23.71)	320	(4.3)	28	NA	12	0.5	NA	NA	NA	NA	NA	NA
	M-10-S15	8/9/2006	110	220	160	1.5	0.3	<0.02	<0.05	0.07	0.26	(202)	(188)	230	(4.1)	21	82	12	0.5	9.99	131.4	413	1.6	28.2	8.89
	M-10-S15FD	8/9/2006	150	170	170	1.6	0.3	<0.02	<0.05	0.08	0.27	(172)	(157)	230	(4.6)	21	NA	12	0.5	NA	NA	NA	NA	NA	NA
	M-10-S16	9/7/2006	40	45	150	1.9	0.82	0.02	<0.05	0.03	0.26	(71)	(71)	280	(6.5)	34	58	14	0.5	8.35	100.1	501	1.0	23.6	8.55
	M-10-S16FD	9/7/2006	50	50	140	1.8	0.8	<0.02	0.06	0.04	0.25	(62)	(62)	260	(6.9)	32	NA	14	0.5	NA	NA	NA	NA	NA	NA
	M-10-S17	10/4/2006	30	40	75	1.2	2.1	0.03	<0.05	0.06	0.19	(63)	(63)	340	(3.8)	39	80	10	0.5	9.20	103.0	644	1.7	19.8	8.6
	M-10-S17FD	10/4/2006	30	90	75	1.1	2.1	0.03	<0.05	0.06	0.19	(137.5)	(137.5)	330	(4)	39	NA	10	0.5	NA	NA	NA	NA	NA	NA
	M-10-S18	11/1/2006	20	110	61	1.1	3.2	<0.02	<0.05	0.05	0.2	(242)	(24)	400	(2.8)	43	39	12	0.5	10.25	87.3	728	1.3	7	10.74
	M-10-S18FD	11/1/2006	<10	10	65	0.8	3.2	<0.02	<0.05	<0.02	0.27	(154)	(154)	420	(2.8)	42	NA	12	0.5	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
			Total and Dissolved Metals																					
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[5]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Mississippi River																								
SEPM-M3(surface)	SEPM-M3-S01	3/9/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M3-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S04	6/15/2005	<0.01	<0.01	<0.05	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M3-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S06	8/9/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S07	9/6/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	SEPM-M3-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S14	7/5/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S16	9/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S17	10/3/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SEPM-M3-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
M-10(surface)	M-10-S01	3/15/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S01FD	3/15/2005	<0.01	<0.01	0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S02FD	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S03FD	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S04FD	6/15/2005	<0.01	<0.01	0.06	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S05FD	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S06	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S06FD	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S07	9/7/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S07FD	9/7/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-10-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S08FD	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S09FD	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S10FD	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S11FD	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S12FD	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S13FD	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S14	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S14FD	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S15FD	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S16	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S16FD	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S17	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S17FD	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-10-S18FD	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients														Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Vairable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml		ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
M-11(surface)	M-11-S01	3/15/2005	40	(20)	NA	0.9	1.9	<0.50	<0.05	0.04	0.14	(2)	(2)	220	(0.5)	20	45	NA	0.5	16.94	119.1	290	NA	2.34	8.26
	M-11-S02	4/13/2005	<10	(10)	39	1.2	1.2	<0.25	<0.05	<0.02	0.24	(89)	(100)	170	(1.5)	15	NA	21	10	NA	NA	NA	NA	NA	NA
	M-11-S03	5/4/2005	<10	(ND)	58	1.2	NA	NA	0.55	0.5055	0.636	(79)	(79)	240	(2.5)	15	57	0.5	0.5	NA	NA	NA	NA	NA	NA
	M-11-S04	6/15/2005	NA	270	NA	0.91	3.3	0.07	0.09	0.08	0.22	(45)	(45)	290	(0)	17	80	NA	0.5	7.98	88.9	465	NA	24.45	8.06
	M-11-S05	7/20/2005	<10	<10	120	1.2	1	0.02	<0.05	0.03	0.19	(41)	(41)	260	(1.9)	15	NA	NA	0.5	10.36	137.3	504	NA	29.77	8.87
	M-11-S06	8/10/2005	20	30	60	1.1	1	0.02	0.05	0.06	0.19	(72)	(72)	240	(3.9)	15	NA	NA	0.5	8.61	117.4	400	NA	29.06	9.02
	M-11-S07	9/7/2005	<10	10	62	0.76	0.2	<0.02	<0.05	0.1	0.25	(98)	(98)	260	(0.8)	19	86	NA	NA	8.07	99.9	441	NA	25.99	8.6
	M-11-S08	10/5/2005	55	100	10	0.8	1.1	0.02	<0.05	0.13	0.23	(42)	(42)	250	(1.1)	22	86	NA	0.5	8.3	94.2	450	NA	21.51	7.96
	M-11-S09	11/1/2005	20	<10	6	0.8	2	0.02	<0.05	0.07	0.14	(23)	(23)	220	(1.5)	15	50	NA	0.5	10.84	98.1	409	NA	11.15	8.01
	M-11-S10	3/14/2006	91	210	41	1	3.5	0.02	<0.05	<0.02	0.14	(39)	(39)	300	(3)	19	40	15	0.5	12.00	NA	NA	NA	NA	NA
	M-11-S11	4/26/2006	<10	20	18	1.2	4.6	0.03	<0.05	0.04	0.15	(79)	(8.6)	270	(1.5)	16	63	20	0.5	8.54	85.5	479	NA	15.2	8.04
	M-11-S12	5/10/2006	50	30	9	0.8	3.3	0.02	<0.05	<0.02	0.1	(86)	(86)	300	(1.1)	17	64	18	0.5	10.78	114.7	504	NA	16.5	8.19
	M-11-S13	6/7/2006	<10	20	2	0.8	2	0.06	<0.05	0.05	0.1	(39)	(39)	280	(0.9)	16	84	16	0.5	5.87	72.9	460	NA	25.6	7.84
	M-11-S14	7/6/2006	30	10	2	0.6	2	0.04	<0.05	0.05	0.14	(43)	(43)	310	(0.75)	19	58	14	0.5	8.65	80.6	475	NA	26.5	8.27
	M-11-S15	8/9/2006	27	70	160	1.5	0.2	<0.02	<0.05	0.08	0.24	(265)	(265)	220	(3.9)	20	82	15	0.5	8.67	115.8	399	1.6	28.3	8.8
	M-11-S16	9/7/2006	20	10	35	1	0.3	<0.02	0.08	0.09	0.18	(33)	(33)	210	(2.5)	19	58	15	0.5	6.68	79.4	408	1.0	24.3	8.21
	M-11-S17	10/4/2006	30	90	43	0.8	0.71	<0.02	<0.05	0.04	0.13	(51.5)	(51.5)	210	(2.1)	20	80	12	0.5	8.30	91.1	424	1.7	19.2	8.38
	M-11-S18	11/1/2006	30	10	80	0.3	0.66	<0.02	<0.05	0.12	0.17	(93.5)	(93.5)	250	(4)	45	39	14	0.5	11.23	97.9	441	1.3	8.3	8.97
M-11(mid-depth)	M-11-M01	3/15/2005	<10	(10)	26	0.94	1.9	<0.50	<0.05	0.04	0.13	(21)	(21)	220	(1)	20	45	NA	9	15.81	115.7	431	NA	2.38	8.26
	M-11-M02	4/13/2005	10	(10)	39	1.4	1.2	<0.25	<0.05	0.04	0.24	(124)	(124)	190	(2.4)	15	NA	NA	0.5	NA	NA	NA	NA	NA	NA
	M-11-M03	5/4/2005	<10	(10)	56	1.7	2.6	<0.25	<0.05	<0.02	0.13	(70)	(70)	290	(2.6)	15	57	17	8.5	12.5	119.4	376	NA	12.6	8.65
	M-11-M04	6/15/2005	10	110	7	1.1	3.2	0.07	0.09	0.08	0.16	(70)	(70)	290	(0)	17	80	20	10	7.98	88.9	465	NA	24.45	8.06
	M-11-M05	7/20/2005	50	18	120	1.4	1	0.02	<0.05	0.04	0.19	(45)	(45)	280	(2.5)	15	NA	13	6.5	10.36	137.3	504	NA	29.77	8.87
	M-11-M06	8/10/2005	20	18	98	1.1	0.1	0.02	0.05	0.07	0.24	(69)	(69)	250	(4.4)	16	NA	13	6.5	8.61	117.4	400	NA	29.06	9.02
	M-11-M07	9/7/2005	<10	36	64	0.68	0.1	<0.02	<0.05	0.1	0.27	(67)	(67)	280	(0.9)	18	86	NA	12	8.07	99.9	441	NA	25.99	8.6
	M-11-M08	10/5/2005	70	90	10	0.8	1	0.02	0.12	0.13	0.23	(30)	(30)	260	(1.1)	21	86	15	7.5	8.66	96.5	450	NA	21.52	7.99
	M-11-M09	11/1/2005	<10	30	6	0.7	2	0.02	<0.05	0.07	0.15	(30)	(30)	220	(1.5)	15	50	15	7.5	11.39	100.5	408	NA	11.14	8.06
	M-11-M10	3/14/2006	150	180	40	0.9	3.2	<0.02	<0.05	<0.02	0.15	(65)	(65)	280	(2.6)	19	40	15	7.5	6.00	NA	NA	NA	NA	NA
	M-11-M11	4/26/2006	<10	<10	18	1.2	4.5	0.02	<0.05	0.06	0.16	(70)	(8.6)	280	(2.4)	17	63	20	10.0	8.54	85.5	479	NA	15.2	8.04
	M-11-M12	5/10/2006	120	55	9	1.1	3.3	0.02	<0.05	<0.02	0.11	(79)	(79)	350	(2.4)	17	64	18	9	9.19	93.1	505	NA	16.3	8.22
	M-11-M13	6/7/2006	<10	<10	3	0.8	1.9	0.06	<0.05	0.05	0.11	(25)	(25)	290	(0.6)	15	84	16	8.0	5.48	70.3	458	NA	25.8	7.92
	M-11-M14	7/6/2006	<10	30	4	0.8	2	0.04	<0.05	0.05	0.15	(36.3)	(36.5)	300	(1.4)	19	58	14	7.0	8.18	82.7	475	NA	27	6.52
	M-11-M15	8/9/2006	10	55	160	1.6	0.2	<0.02	<0.05	0.07	0.25	(123)	(123)	210	(3.8)	20	82	15	7.5	9.03	120.1	399	1.6	28.4	8.78
	M-11-M16	9/7/2006	<10	30	29	0.9	0.3	<0.02	0.08	0.08	0.18	(32)	(32)	210	(2.6)	19	58	15	7.5	6.73	80.7	407	1.0	24.6	8.03
	M-11-M17	10/4/2006	36	45	48	0.9	0.7	0.02	<0.05	0.04	0.14	(131)	(131)	220	(2.3)	20	80	12	6.0	8.44	93.1	424	1.7	19.2	8.31
	M-11-M18	11/1/2006	40	18	94	0.8	0.64	<0.02	<0.05	<0.02	0.13	(108)	(108)	230	(4)	23	39	14	7.0	11.46	97.8	444	1.3	8.4	8.96

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
			Total and Dissolved Metals																					
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[5]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
M-11(surface)	M-11-S01	3/15/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S04	6/15/2005	<0.01	<0.01	0.06	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S06	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S07	9/7/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S14	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S16	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S17	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
M-11(mid-depth)	M-11-M01	3/15/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-M02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-M05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M06	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M07	9/7/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-11-M08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M14	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M16	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M17	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-11-M18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients														Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Variable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml		ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
M-12(surface)	M-12-S01	3/15/2005	10	(50)	28	0.8	1.9	<0.50	<0.05	0.04	0.12	(3)	(3)	220	(1)	17	45	NA	0.5	10.45	119.7	446	NA	2.83	8.33
	M-12-S02	4/13/2005	45	(20)	43	1.4	1.1	<0.25	<0.05	<0.02	0.24	(144)	(144)	200	(1.7)	15	NA	NA	0.5	NA	NA	NA	NA	NA	NA
	M-12-S03	5/4/2005	18	(ND)	64	1.4	2.9	<0.25	<0.05	0.02	0.13	(118)	(118)	240	(2.3)	16	57	0.5	0.5	11.95	116.5	384	NA	12.4	8.64
	M-12-S04	6/15/2005	27	110	10	1.3	3.3	0.08	0.1	0.08	0.21	(64)	(64)	300	(0)	17	80	NA	0.5	7.44	85.9	479	NA	24.8	8.01
	M-12-S05	7/20/2005	2,900	<10	93	1.7	1.1	0.02	0.2	0.06	0.22	(34)	(34)	260	(2.3)	17	NA	NA	0.5	10.37	143.1	510	NA	29.89	8.89
	M-12-S06	8/10/2005	4,700	9,100	88	2	0.1	0.02	0.52	0.13	0.26	(49)	(49)	260	(4.1)	20	NA	NA	0.5	8.99	119.9	410	NA	28.91	8.97
	M-12-S07	9/7/2005	40	160	63	0.79	0.1	<0.02	<0.05	0.1	0.24	(60)	(60)	250	(1.1)	19	86	NA	NA	8.48	110.2	439	NA	26.09	8.7
	M-12-S08	10/5/2005	36	73	11	0.9	1.1	0.02	0.12	0.13	0.23	(81)	(81)	260	(1.3)	22	86	NA	0.5	9	98.2	452	NA	21.79	7.98
	M-12-S09	11/1/2005	18	20	12	0.8	2	0.02	<0.05	0.06	0.16	(25)	(25)	230	(1.6)	16	50	NA	0.5	11.34	100.8	411	NA	11.34	8.04
	M-12-S10	3/14/2006	190	240	38	1	3.6	0.02	<0.05	<0.02	0.18	(32)	(32)	300	(3)	22	40	10	0.5	11.40	NA	NA	NA	NA	NA
	M-12-S11	4/26/2006	<10	20	15	0.9	5.2	0.03	<0.05	0.04	0.15	(64)	(7.1)	260	(1.4)	17	63	15	0.5	8.25	82.1	477	NA	15.5	7.99
	M-12-S12	5/10/2006	370	400	9	0.9	4	0.02	<0.05	<0.02	0.12	(131)	(131)	280	(1.4)	19	64	15	S	8.87	93.1	510	NA	16.7	8.22
	M-12-S13	6/7/2006	40	20	4	0.8	2.2	0.07	0.05	0.05	0.12	(51)	(51)	280	(6.8)	16	84	12	0.5	5.47	68.9	459	NA	26.2	7.77
	M-12-S14	7/6/2006	6800	9800	2	0.8	1.9	0.05	0.18	0.08	0.18	(28.5)	(28.5)	300	(1)	20	58	11	0.5	5.91	73.2	480	NA	26.7	8.19
	M-12-S15	8/9/2006	72000	12000	150	1.5	0.2	<0.02	<0.05	0.12	0.26	(162)	(136)	220	(4.5)	20	82	10	0.5	9.45	124.1	403	1.6	28.3	8.82
	M-12-S16	9/7/2006	64	55	24	0.9	0.3	<0.02	0.12	0.08	0.18	(24)	(24)	210	(2.8)	20	58	10	0.5	6.30	76.0	469	1.0	24.3	8.03
	M-12-S17	10/4/2006	20	36	45	0.7	0.73	<0.02	<0.05	0.04	0.13	(116)	(116)	220	(2)	20	80	8	0.5	8.38	90.8	425	1.7	18.9	8.78
	M-12-S18	11/1/2006	<10	27	86	0.3	0.66	<0.02	<0.05	<0.02	0.18	(62.5)	(62.5)	230	(4)	23	39	10	0.5	11.87	101.9	445	1.3	8	8.84

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
Illinois General Use Water Quality Standards[1]																			1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Acute)[3]			0.36	0.36	5.0	NE	0.0305	0.0275819	3.98	1.26	0.05	0.04	0.3469392	0.2232898	0.0026	0.0022	0.1942388	0.1938503	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]			0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	0.051552	0.0508302
Illinois Public and Food Processing Water Supply Standards[5]			0.05		1.0		0.01		0.05				0.05						0.01					
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
M-12(surface)	M-12-S01	3/15/2005	<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-12-S02	4/13/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S03	5/4/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S04	6/15/2005	<0.01	<0.01	0.07	0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-12-S05	7/20/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S06	8/10/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S07	9/7/2005	<0.01	<0.01	0.06	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	M-12-S08	10/5/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S09	11/1/2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S10	3/14/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S11	4/26/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S12	5/10/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S13	6/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S14	7/6/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S15	8/9/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S16	9/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S17	10/4/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	M-12-S18	11/1/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Total and Dissolved Metals

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Biological and Nutrients														Instream Field Parameters								
			E. coli	Fecal Coliform	Chlorophyll A	TKN	Nitrate Nitrogen as N	Nitrite Nitrogen as N	Ammonia Nitrogen as N	Ortho Phosphate as P	Total Phosphate as P	Total Suspended Solids	Volatile Suspended Solids	Total Dissolved Solids	CBOD	Chloride	Outdoor Temperature	Channel Depth	Sample Depth	Dissolved Oxygen	Dissolved Oxygen (Saturation)	Specific Conductivity	Velocity	Water Temperature	pH
Illinois General Use Water Quality Standards[1]				400					15					1000		500				5				Variable[2]	6.5 - 9.0
Illinois Numeric Standards for Chemical Constituents (Acute)[3]									Vairable[4]																
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]																									
Illinois Public and Food Processing Water Supply Standards[5]							10							500		250									
			Colonies/per 100ml	ug/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°F	Feet	Feet	mg/L	Percent	µS/CM	fps	°C	S.U.
Other																									
EQUIPMENT BLANK	EQUIP-01	3/9/2005	<10	(ND)	<1	0.14	<1.0	<0.25	<0.05	<0.02	0.02	(ND)	(ND)	<1	(ND)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-02	4/13/2005	<10	(ND)	3.0	0.15	<1.0	<0.25	<0.05	<0.02	0.04	(14)	(14)	20.0	(ND)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-03	5/4/2005	<10	(ND)	<1	<0.10	<0.10	<0.05	<0.05	<0.02	<0.02	(ND)	(ND)	16.0	(1.4)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-04	6/15/2005	<10	<10	<1	0.16	<0.1	<0.02	<0.05	<0.02	<0.02	(0.5)	(0.5)	40.0	(1.2)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-05	7/20/2005	<10	<10	<1	<0.10	<0.1	<0.02	<0.05	0.03	0.08	(13)	(13)	14.0	(3.5)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-06	8/10/2005	10.0	10.0	2.0	0.10	0.10	0.02	0.07	0.02	0.05	(0)	(0)	6.0	(0.1)	1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-07	9/6/2005	<10	<10	<1	<0.10	<0.1	<0.02	<0.05	<0.02	0.03	(0)	(0)	18.0	(0)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-08	10/5/2005	<10	<10	<1	<0.1	<0.1	<0.02	<0.05	0.06	0.15	(NA)	(NA)	<1	(NA)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-09	11/1/2005	<10	<10	<1	<0.1	<0.1	<0.02	<0.05	<0.02	0.03	(0)	(0)	<1	(0.2)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-10	3/14/2006	<10	<10	<1	<0.1	<0.1	<0.02	<0.05	0.05	0.02	NA	NA	<1	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-11	4/26/2006	<10	<10	<1	0.2	<0.1	<0.02	<0.05	<0.02	<0.02	(0)	(0)	<1	(0)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-12	5/10/2006	<10	<10	<1	<0.1	<0.1	<0.02	<0.05	<0.02	<0.02	(5)	(5)	20	(0.3)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-13	6/7/2006	<10	<10	1	<0.1	<0.1	<0.02	<0.05	<0.02	<0.02	(26)	(26)	<1	(0)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-14	7/5/2006	<10	<10	3	<0.1	<0.1	<0.02	<0.05	<0.02	0.04	(7)	(7)	10	(0.3)	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-15	8/9/2006	<10	<10	3	0.1	0.1	<0.02	<0.05	<0.02	<0.02	(0)	(0)	<1	(0.8)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-16	9/6/2006	<10	<10	<1	<0.1	<0.10	<0.02	<0.05	0.02	0.03	(0)	(0)	2	(1)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-17	10/3/2006	<10	300	<1	<0.1	<0.10	<0.02	<0.05	0.02	0.03	(18.5)	(18.5)	<1	(0)	<0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-18	11/1/2006	<10	<10	<1	<0.1	<0.10	<0.02	<0.05	<0.02	0.04	(30.7)	(30.7)	<1	(0.3)	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.1
Surface Water Quality Analytical Results
Supplemental Environmental Project
Rock Island and Moline, Illinois

	Sample Id	Sample Date	Total and Dissolved Metals	Total Arsenic	Dissolved Arsenic	Total Barium	Dissolved Barium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Total Copper	Dissolved Copper	Total Lead	Dissolved Lead	Total Mercury	Dissolved Mercury	Total Nickel	Dissolved Nickel	Total Selenium	Dissolved Selenium	Total Silver	Dissolved Silver	Total Zinc	Dissolved Zinc
Illinois General Use Water Quality Standards[1]																									
Illinois Numeric Standards for Chemical Constituents (Acute)[3]				0.36	0.36	5.0	NE	0.0305	0.0275619	3.98	1.26	0.05	0.04	0.3469392	0.2232698	0.0026	0.0022	0.1942388	0.1936503	1.0		0.0			
Illinois Numeric Standards for Chemical Constituents (Chronic)[3]				0.19	0.19	5.0	NE	0.0025	0.0021754	0.47	0.41	0.03	0.03	0.0727588	0.0468275	0.0013	0.0011	0.0117728	0.0117374	NE	NE	NE	NE	NE	0.2878934	0.2815597
Illinois Public and Food Processing Water Supply Standards[5]				0.05		1.0		0.01		0.05				0.05						0.01					
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Other																									
EQUIPMENT BLANK	EQUIP-01	3/9/2005		<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	EQUIP-02	4/13/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-03	5/4/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-04	6/15/2005		<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	EQUIP-05	7/20/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-06	8/10/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-07	9/6/2005		<0.01	<0.01	<0.05	<0.05	<0.001	<0.001	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
	EQUIP-08	10/5/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-09	11/1/2005		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-10	3/14/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-11	4/26/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-12	5/10/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-13	6/7/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-14	7/5/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-15	8/9/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-16	9/6/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-17	10/3/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	EQUIP-18	11/1/2006		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4.2
Constituent Loads in Surface Water of the Mississippi and Rock Rivers
Supplementary Environmental Project
Rock Island and Moline, Illinois

	Median Constituent Load			
	Mississippi River		Rock River Upstream	
Loads	Mississippi River Upstream	Mississippi River Downstream	Rock River Upstream	Rock River Downstream
Chlorophyll A (lb/D)	6.68E+03	1.27E+04	3.86E+03	4.44E+03
TKN (lb/D)	2.31E+05	3.47E+05	4.38E+04	5.58E+04
Nitrate Nitrogen as N (lb/D)	3.71E+05	4.93E+05	5.34E+04	5.85E+04
Nitrite Nitrogen as N (lb/D)	6.22E+03	6.77E+03	5.87E+02	8.78E+02
Ammonia Nitrogen as N (lb/D)	8.95E+03	1.48E+04	5.92E+02	8.56E+02
Ortho Phosphate as P (lb/D)	1.34E+04	1.22E+04	6.98E+02	4.83E+02
Total Phosphate as P (lb/D)	3.40E+04	5.51E+04	5.88E+03	7.10E+03
Total Suspended Solids (lb/D)	1.74E+07	2.15E+07	1.93E+06	1.71E+06
Volatile Suspended Solids (lb/D)	1.41E+07	1.29E+07	1.72E+06	1.18E+06
Total Dissolved Solids (lb/D)	5.87E+07	7.37E+07	8.15E+06	9.45E+06
CBOD (lb/D)	4.20E+05	6.09E+05	9.33E+04	1.53E+05
Chloride (lb/D)	4.41E+06	6.41E+06	1.04E+06	1.41E+06
Average Dissolved Oxygen (mg/L)	9.25	8.86	11.99	12.44
Average Dissolved Oxygen (% Saturation)	96.33	97.72	132.00	146.05
Average Specific Conductivity (uS)	439.33	466.50	644.00	612.50
Average Water Temperature (oC)	19.92	22.84	22.30	23.30
Average pH	8.17	8.30	8.70	8.84

Units:
CFU/D - Colony Forming Units per Day
lbs/Day - Pounds per Day
mg/L - Milligrams per Liter
µS/cm - Microsiemens per Centimeter

Table 4.3
Comparison of Load Variability in Surface Water of the Mississippi River Upstream and Downstream of the Cities
Supplemental Environmental Project
Rock Island and Moline, Illinois

Constituent of Concern	Factor Level	Count (n)	Standard Deviation	Hypothesis Test	p-Value
Log E. coli Load CFU/D	Downstream	54	0.82	Levene	0.258
	Upstream	54	0.56		
Log FC Load (CFU/D)	Downstream	54	0.75	Levene	0.336
	Upstream	54	0.55		
Chlorophyll A (mg/D)	Downstream	52	1.84E+09	Levene	**0.044**
	Upstream	54	1.44E+09		
TKN (mg/D)	Downstream	54	3.61E+10	Levene	0.150
	Upstream	54	3.02E+10		
Nitrate Nitrogen as N (mg/D)	Downstream	53	1.24E+11	Levene	0.591
	Upstream	54	1.12E+11		
Nitrite Nitrogen as N (mg/D)	Downstream	53	4.08E+09	Levene	**0.027**
	Upstream	54	2.90E+09		
Ammonia Nitrogen as N (mg/D)	Downstream	54	5.65E+09	Levene	0.089
	Upstream	54	2.19E+09		
Ortho Phosphate as P (mg/D)	Downstream	54	4.84E+09	Levene	0.065
	Upstream	54	1.36E+09		
Total Phosphate as P (mg/D)	Downstream	54	7.28E+09	Levene	0.323
	Upstream	54	5.34E+09		
Total Suspended Solids (mg/D)	Downstream	54	3.48E+12	Levene	**0.010**
	Upstream	54	7.00E+12		
Volatile Suspended Solids (mg/D)	Downstream	54	3.40E+12	Levene	**0.004**
	Upstream	54	6.93E+12		
Total Dissolved Solids (mg/D)	Downstream	54	6.93E+12	Levene	0.610
	Upstream	54	6.49E+12		
CBOD (mg/D)	Downstream	54	8.23E+10	Levene	**0.001**
	Upstream	53	4.88E+10		
Chloride (mg/D)	Downstream	54	4.82E+11	Levene	0.254
	Upstream	54	3.92E+11		
Dissolved Oxygen (mg/D)	Downstream	50	2.40E+11	Levene	0.173
	Upstream	52	3.25E+11		
Dissolved Oxygen (Saturation)	Downstream	47	19.64	Levene	0.627
	Upstream	52	20.67		
Specific Conductivity	Downstream	47	72.77	Levene	0.100
	Upstream	52	49.06		
Water Temperature	Downstream	47	8.10	Levene	0.463
	Upstream	54	8.46		
pH	Downstream	47	0.50	Levene	0.366
	Upstream	52	0.38		

Notes:
The Levene Hypothesis test is used to determine if variances are homogeneous between factor levels of a given constituent . A coresponding p-value less than 0.05 indicates the variances are unequal at a 95% confidence level.

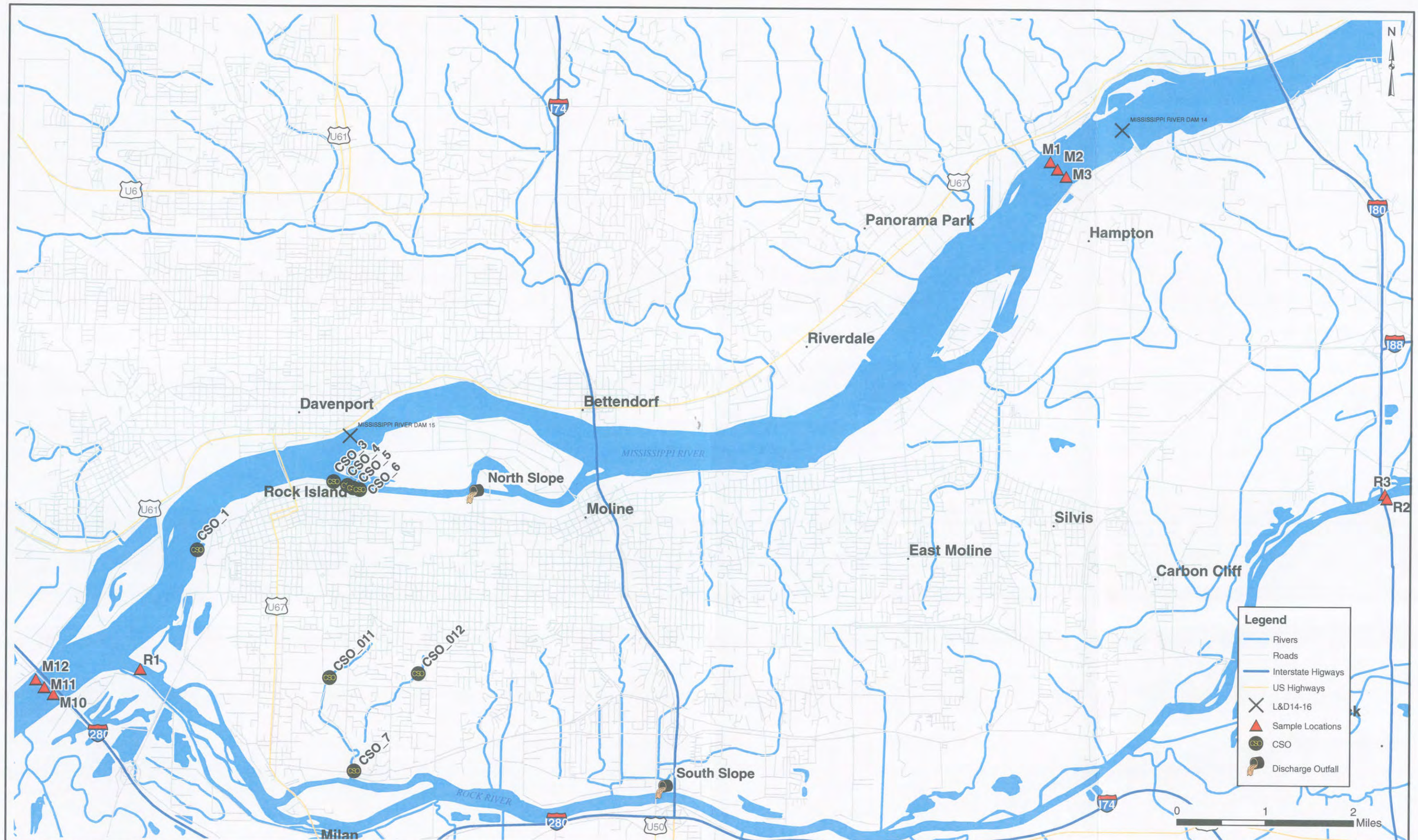
Table 4.4
Comparison of Load Variability in Surface Water of the Rock River Upstream and Downstream of the Cities
Supplemental Environmental Project
Rock Island and Moline, Illinois

Constituent of Concern	Factor Level	Count (n)	Standard Deviation	Hypothesis Test	p-Value
Log E. coli Load CFU/D	Downstream	18	0.66	Levene	0.774
	Upstream	18	0.74		
Log FC Load (CFU/D)	Downstream	18	0.73	Levene	0.297
	Upstream	18	0.59		
Chlorophyll A (mg/D)	Downstream	18	1.16E+09	Levene	0.207
	Upstream	18	8.63E+08		
TKN (mg/D)	Downstream	18	1.32E+10	Levene	0.932
	Upstream	18	1.43E+10		
Nitrate Nitrogen as N (mg/D)	Downstream	18	4.44E+10	Levene	0.531
	Upstream	18	3.87E+10		
Nitrite Nitrogen as N (mg/D)	Downstream	18	1.71E+09	Levene	0.160
	Upstream	18	7.87E+08		
Ammonia Nitrogen as N (mg/D)	Downstream	18	2.09E+09	Levene	0.502
	Upstream	18	1.22E+09		
Ortho Phosphate as P (mg/D)	Downstream	18	9.95E+08	Levene	0.608
	Upstream	18	7.12E+08		
Total Phosphate as P (mg/D)	Downstream	18	2.27E+09	Levene	0.690
	Upstream	18	3.43E+09		
Total Suspended Solids (mg/D)	Downstream	18	1.12E+12	Levene	0.102
	Upstream	18	2.24E+12		
Volatile Suspended Solids (mg/D)	Downstream	18	9.99E+11	Levene	0.137
	Upstream	18	1.69E+12		
Total Dissolved Solids (mg/D)	Downstream	18	3.28E+12	Levene	0.173
	Upstream	18	2.65E+12		
CBOD (mg/D)	Downstream	18	5.10E+10	Levene	0.466
	Upstream	18	4.18E+10		
Chloride (mg/D)	Downstream	18	3.10E+11	Levene	0.398
	Upstream	18	2.63E+11		
Dissolved Oxygen (mg/D)	Downstream	17	1.14E+11	Levene	0.234
	Upstream	17	8.43E+10		
Dissolved Oxygen (Saturation)	Downstream	16	37.92	Levene	0.144
	Upstream	17	26.97		
Specific Conductivity	Downstream	16	44.86	Levene	0.844
	Upstream	17	44.23		
Water Temperature	Downstream	16	8.01	Levene	0.952
	Upstream	17	7.70		
pH	Downstream	16	0.32	Levene	0.721
	Upstream	17	0.33		

Notes:

The Levene Hypothesis test is used to determine if variances are homogeneous between factor levels of a given constituent . A coresponding p-value less than 0.05 indicates the variances are unequal at a 95% confidence level.

FIGURES



6737 West Washington Street
Suite 3440
West Allis, Wisconsin 53214
414.291.8840
FAX 414.291.8841

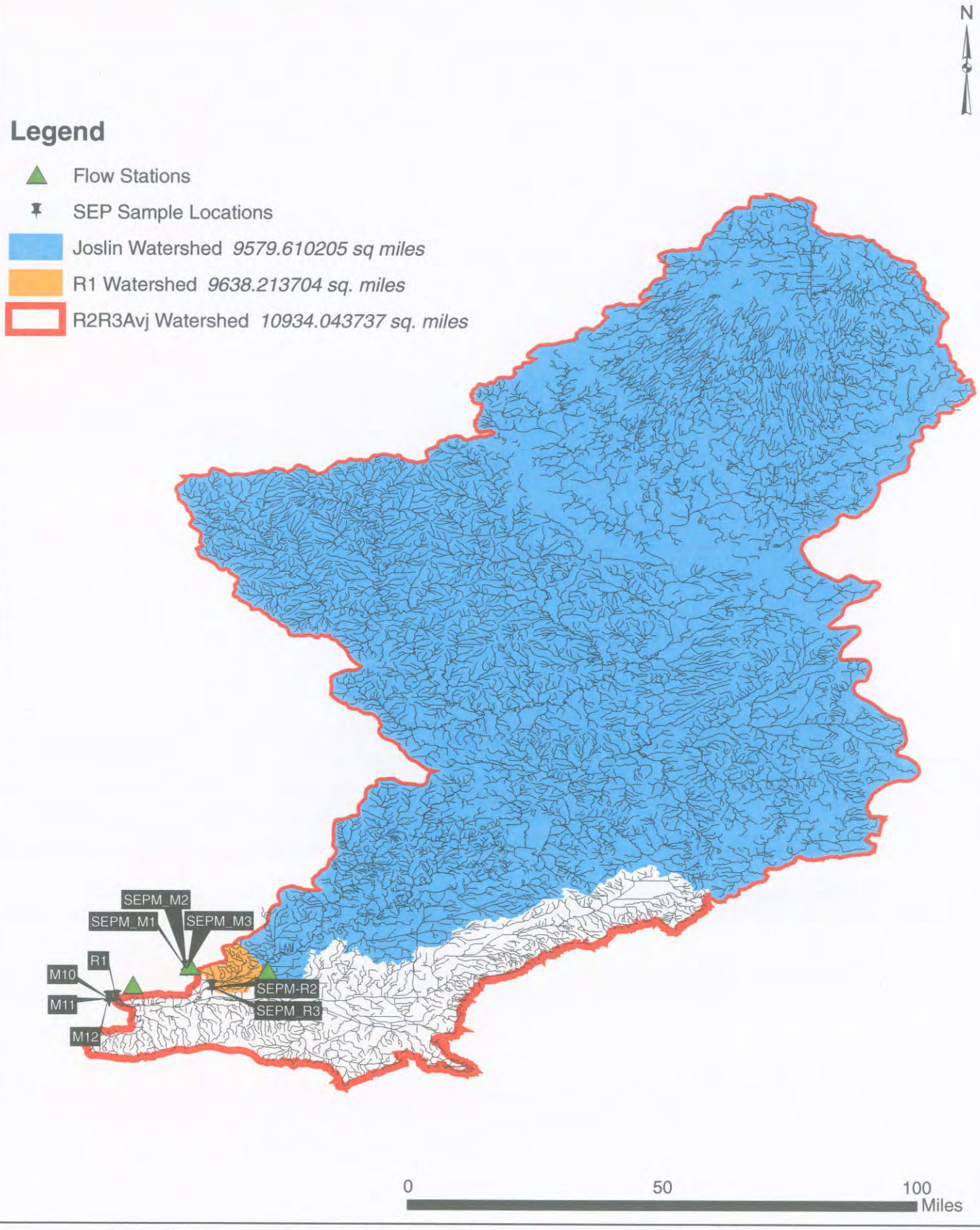
- MUNICIPAL ENGINEERING
- INDUSTRIAL PROCESSES
- REMEDIATION SERVICES
- ENVIRONMENTAL STUDIES
- AIR EMISSIONS ASSISTANCE
- WASTEWATER PRETREATMENT
- ENVIRONMETNAL COMPLIANCE
- CONSTRUCTION MANAGEMENT
- HAZARDOUS MATERIALS MANAGEMENT
- GEOGRAPHIC INFORMATION SYSTEMS

DSGN:	HLB
DR:	MJK
APVD:	RED
PATH:	G:\PROJECTS\QUAD CITY SUPPLEMENTAL SAMPLING\MAP DOCUMENTS\FIGURE1.MXD

SUPPLEMENTAL ENVIRONMENTAL PROJECT
ROCK ISLAND AND MOLINE, ILLINOIS

FIGURE 2.1
SITE MAP AND
SAMPLE LOCATIONS

SCALE	1 INCH EQUALS 1 MILE
DWG	FIGURE 1
DATE	JULY 2006
PROJ NO.	W053466



6737 West Washington Street
Suite 3440
West Allis, Wisconsin 53214
414.291.8840
FAX 414.291.8841

DSGN: HLB	CHK:	
DR: HLB	APVD:	
PATH: G:\Projects\Quad City Supplemental Sampling\Figure 2.2.mxd		

SUPPLEMENTAL ENVIRONMENTAL PROJECT
ROCK ISLAND AND MOLINE, ILLINOIS

FIGURE 2.2
ROCK RIVER
WATERSHED
DELINEATION

SCALE	1:1,600,000
DWG	Figure 2.2
DATE	JAN, 2008
PROJ NO.	W053466

APPENDIX A
STATISTICAL OUTPUT

COMPARISON OF CONCENTRATIONS AT SITES

A.1: R2 and R3

FULL FACTORIAL ANALYSIS RESULTS

A.2: Mississippi River Surface Water
A.3: Mississippi River Mid-Depth
A.4: Rock River

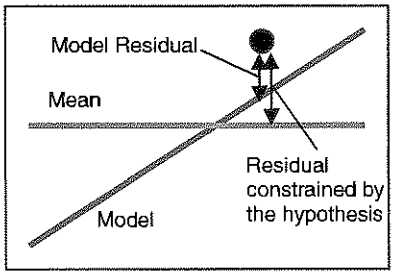
QA/QC CALCULATIONS FOR FIELD DUPLICATES AND CORRESPONDING SAMPLES

A.5: Sample Location M-1
A.6: Sample Location M-10

COMPARISON OF LOAD VARIABILITIES IN SURFACE WATER UPSTREAM AND DOWNSTREAM OF THE CITIES

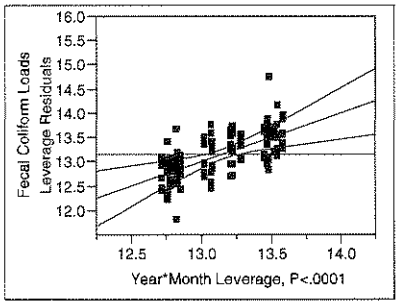
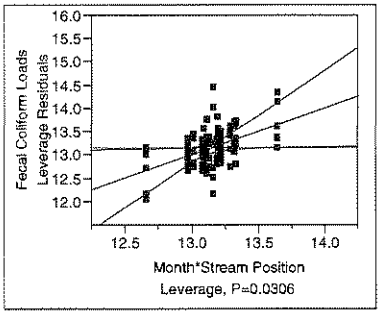
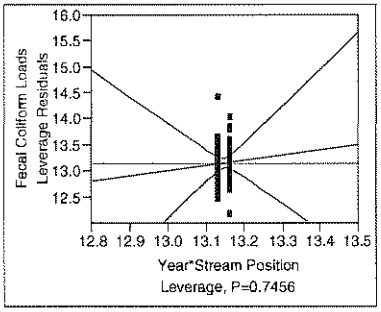
A.7: Mississippi River
A.8: Rock River

Leverage plots can be used to aid in model interpretation by graphically illustrating the significance of the model and factors within the model. Leverage plots were described by Sall (1990) and indicate for each point what the residual would be both with and without the effect in the model. The illustration below shows a general leverage plot.



The distance from the datapoint (black circle) to the model line of fit (red line) shows the actual residual. The distance from the datapoint to the line of the mean (blue line) shows what the residual error would be without the effect in the model. In other words, the mean line in this leverage plot represents the model where the hypothesized value of the effect is constrained to zero.

Leverage plots contained in Appendix A, are shown with 95% confidence curves, which can be used to indicate if the test is significant. The illustration below shows three general leverage plots including confidence intervals of the model line of fit with varying degrees of factor significance. If the confidence interval region between the curves contains the horizontal mean (blue line), then the effect of the factor is not considered to be significant. A p-value is given with each leverage plot to aid in interpretation.

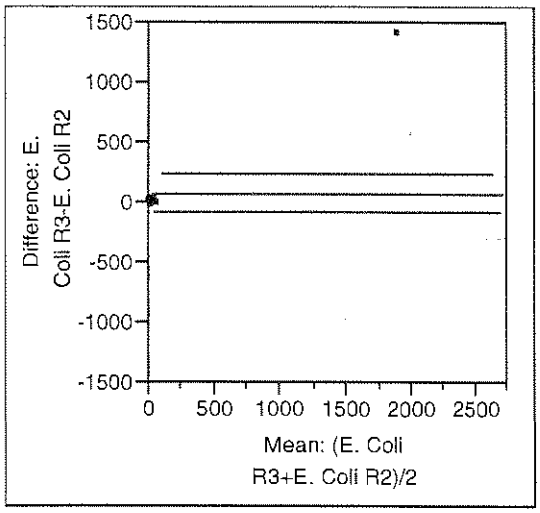
		
Significant effect; confidence curve crosses horizontal mean line.	Borderline significance; confidence curve is asymptotic to horizontal line.	Not significant; confidence curve does not cross horizontal line.

Appendix A-1

Comparison of Concentrations at Sample Sites R2 and R3

Appendix A.1
Comparison of Concentrations at Sample Sites R2 and R3

Matched Pairs
Difference: E. Coli R3-E. Coli R2



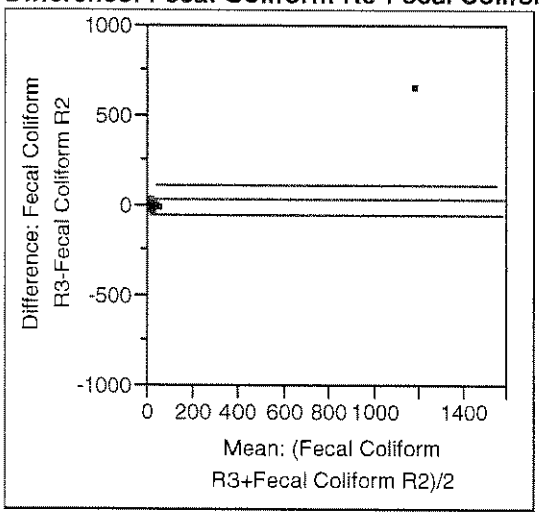
E. Coli R3	162.722	t-Ratio	0.937127
E. Coli R2	89.5	DF	17
Mean Difference	73.2222	Prob > |t|	0.3618
Std Error	78.1348	Prob > t	0.1809
Upper95%	238.072	Prob < t	0.8191
Lower95%	-91.628		
N	18		
Correlation	0.99864		

Wilcoxon Sign-Rank

	E. Coli R3-E. Coli R2
Test Statistic	-11.000
Prob > |z|	0.587
Prob > z	0.706
Prob < z	0.294

Matched Pairs

Difference: Fecal Coliform R3-Fecal Coliform R2

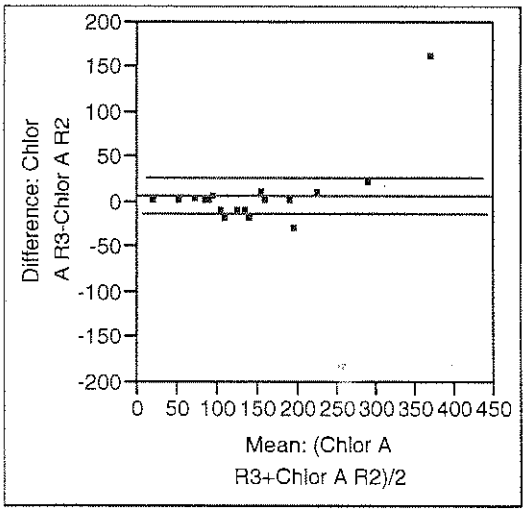


Fecal Coliform R3	106.588	t-Ratio	0.796147
Fecal Coliform R2	76.0588	DF	16
Mean Difference	30.5294	Prob > |t|	0.4376
Std Error	38.3464	Prob > t	0.2188
Upper95%	111.82	Prob < t	0.7812
Lower95%	-50.761		
N	17		
Correlation	0.99676		

Wilcoxon Sign-Rank

	Fecal Coliform R3-Fecal Coliform R2
Test Statistic	-16.500
Prob > |z|	0.408
Prob > z	0.796
Prob < z	0.204

Matched Pairs
Difference: Chlor A R3-Chlor A R2

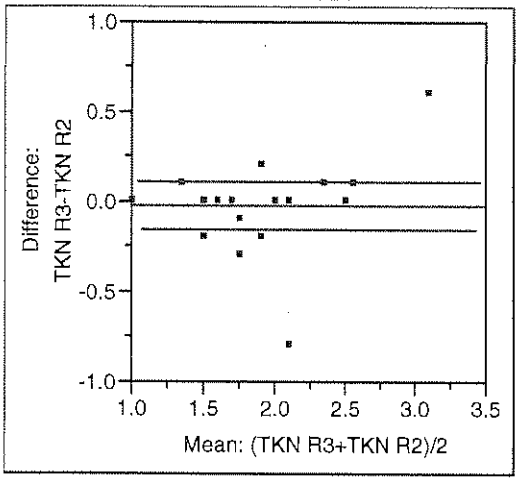


Chlor A R3	148.278	t-Ratio	0.619532
Chlor A R2	142.389	DF	17
Mean Difference	5.88889	Prob > |t|	0.5438
Std Error	9.50538	Prob > t	0.2719
Upper95%	25.9435	Prob < t	0.7281
Lower95%	-14.166		
N	18		
Correlation	0.93785		

Wilcoxon Sign-Rank

	Chlor A R3-Chlor A R2
Test Statistic	-5.000
Prob > |z|	0.792
Prob > z	0.604
Prob < z	0.396

Matched Pairs
Difference: TKN R3-TKN R2

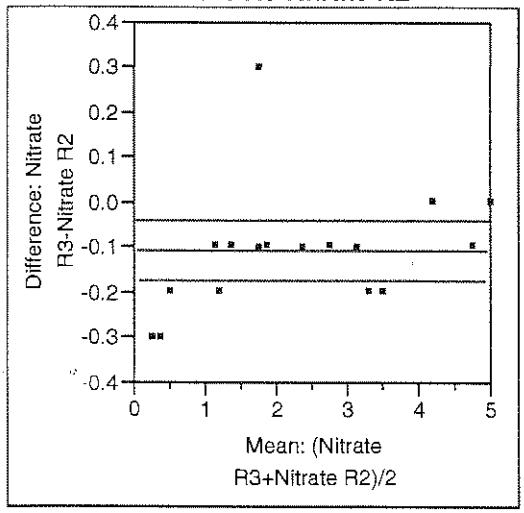


TKN R3	1.87778	t-Ratio	-0.34754
TKN R2	1.9	DF	17
Mean Difference	-0.0222	Prob > |t|	0.7325
Std Error	0.06394	Prob > t	0.6338
Upper95%	0.11268	Prob < t	0.3662
Lower95%	-0.1571		
N	18		
Correlation	0.87742		

Wilcoxon Sign-Rank

	TKN R3-TKN R2
Test Statistic	-4.000
Prob > |z|	0.758
Prob > z	0.621
Prob < z	0.379

Matched Pairs
Difference: Nitrate R3-Nitrate R2

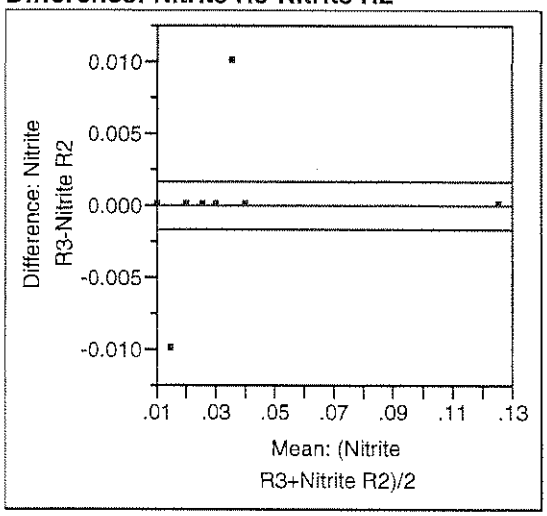


Nitrate R3	2.35556	t-Ratio	-3.31933
Nitrate R2	2.46111	DF	17
Mean Difference	-0.1056	Prob > |t|	0.0041
Std Error	0.0318	Prob > t	0.9980
Upper95%	-0.0385	Prob < t	0.0020
Lower95%	-0.1726		
N	18		
Correlation	0.99661		

Wilcoxon Sign-Rank

	Nitrate R3-Nitrate R2
Test Statistic	-46.000
Prob > |z|	0.006
Prob > z	0.997
Prob < z	0.003

Matched Pairs
Difference: Nitrite R3-Nitrite R2

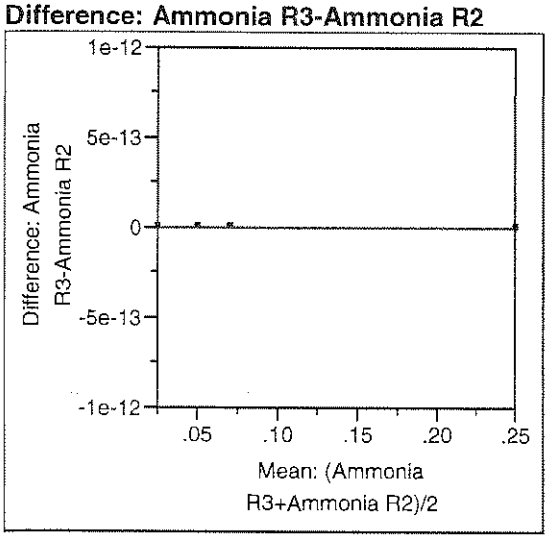


Nitrite R3	0.03306	t-Ratio	1.19e-16
Nitrite R2	0.03306	DF	17
Mean Difference	9.6e-20	Prob > |t|	1.0000
Std Error	0.00081	Prob > t	0.5000
Upper95%	0.00171	Prob < t	0.5000
Lower95%	-0.0017		
N	18		
Correlation	0.99515		

Wilcoxon Sign-Rank

	Nitrite R3-Nitrite R2
Test Statistic	0.500
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Matched Pairs
Difference: Ammonia R3-Ammonia R2

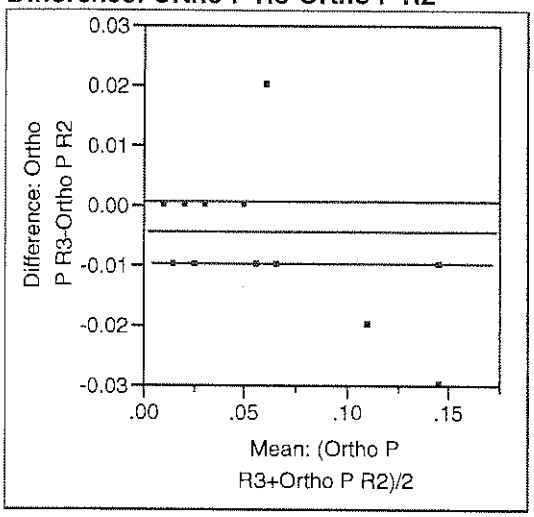


Ammonia R3	0.04139	t-Ratio	.
Ammonia R2	0.04139	DF	17
Mean Difference	0	Prob > |t|	.
Std Error	0	Prob > t	.
Upper95%	0	Prob < t	.
Lower95%	0		
N	18		
Correlation	1		

Wilcoxon Sign-Rank

	Ammonia R3-Ammonia R2
Test Statistic	0.000
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Matched Pairs
Difference: Ortho P R3-Ortho P R2

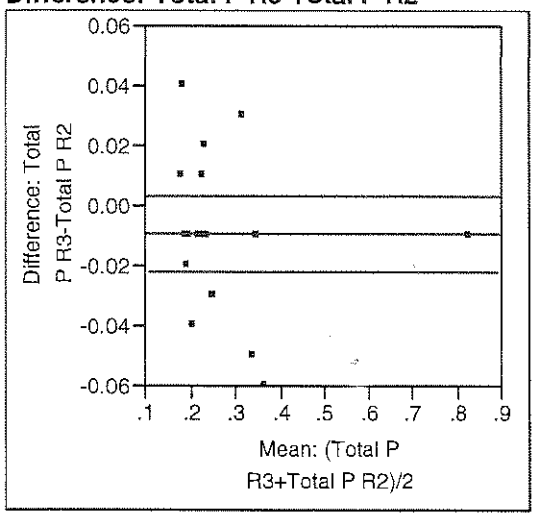


Ortho P R3	0.04167	t-Ratio	-1.81028
Ortho P R2	0.04611	DF	17
Mean Difference	-0.0044	Prob > |t|	0.0880
Std Error	0.00246	Prob > t	0.9560
Upper95%	0.00074	Prob < t	0.0440
Lower95%	-0.0096		
N	18		
Correlation	0.98352		

Wilcoxon Sign-Rank

	Ortho P R3-Ortho P R2
Test Statistic	-11.500
Prob > |z|	0.141
Prob > z	0.930
Prob < z	0.070

Matched Pairs
Difference: Total P R3-Total P R2

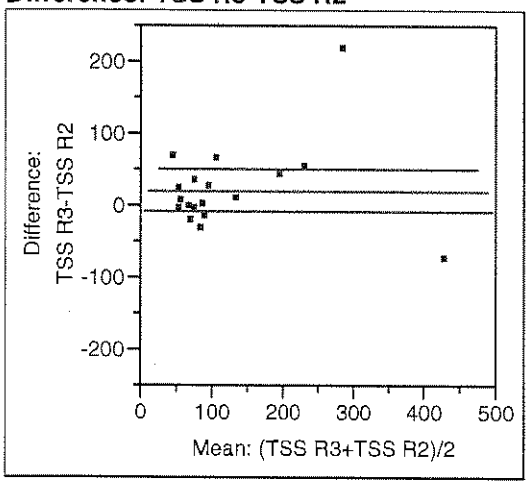


Total P R3	0.26778	t-Ratio	-1.55455
Total P R2	0.27722	DF	17
Mean Difference	-0.0094	Prob > |t|	0.1385
Std Error	0.00608	Prob > t	0.9308
Upper95%	0.00337	Prob < t	0.0692
Lower95%	-0.0223		
N	18		
Correlation	0.98568		

Wilcoxon Sign-Rank

	Total P R3-Total P R2
Test Statistic	-34.000
Prob > |z|	0.139
Prob > z	0.931
Prob < z	0.069

Matched Pairs
Difference: TSS R3-TSS R2

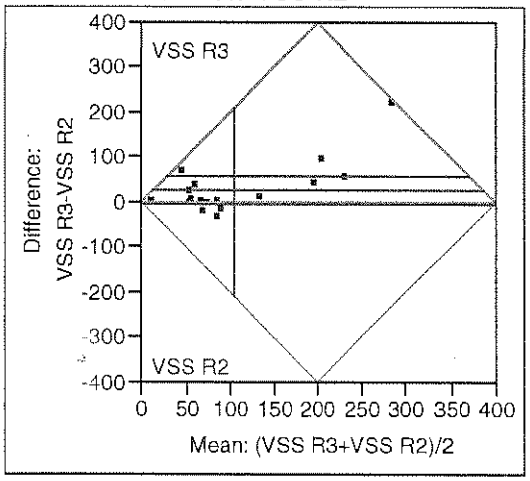


TSS R3	133.611	t-Ratio	1.443248
TSS R2	113	DF	17
Mean Difference	20.6111	Prob > |t|	0.1671
Std Error	14.2811	Prob > t	0.0836
Upper95%	50.7415	Prob < t	0.9164
Lower95%	-9.5193		
N	18		
Correlation	0.83602		

Wilcoxon Sign-Rank

	TSS R3-TSS R2
Test Statistic	30.500
Prob > |z|	0.196
Prob > z	0.098
Prob < z	0.902

Matched Pairs
Difference: VSS R3-VSS R2

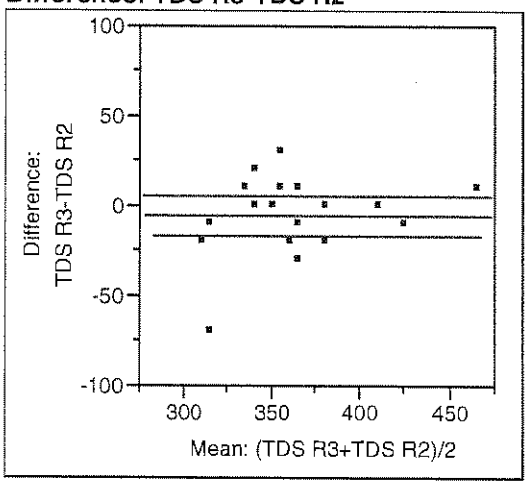


VSS R3	118.847	t-Ratio	1.874616
VSS R2	91.9471	DF	16
Mean Difference	26.9	Prob > |t|	0.0792
Std Error	14.3496	Prob > t	0.0396
Upper95%	57.3198	Prob < t	0.9604
Lower95%	-3.5198		
N	17		
Correlation	0.85224		

Wilcoxon Sign-Rank

	VSS R3-VSS R2
Test Statistic	32.500
Prob > |z|	0.132
Prob > z	0.066
Prob < z	0.934

Matched Pairs
Difference: TDS R3-TDS R2

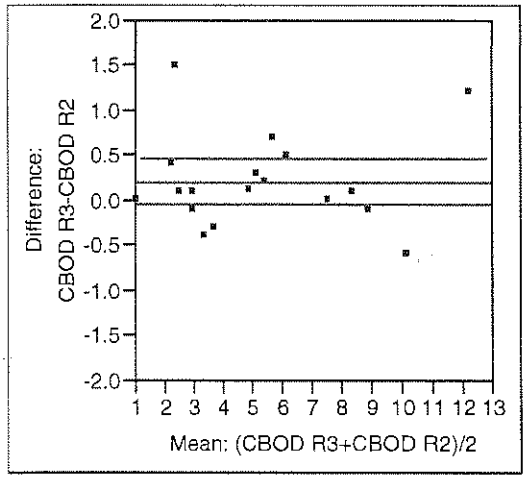


TDS R3	360	t-Ratio	-1.05755
TDS R2	365.556	DF	17
Mean Difference	-5.5556	Prob > |t|	0.3051
Std Error	5.25321	Prob > t	0.8475
Upper95%	5.52775	Prob < t	0.1525
Lower95%	-16.639		
N	18		
Correlation	0.86088		

Wilcoxon Sign-Rank

	TDS R3-TDS R2
Test Statistic	-14.500
Prob > |z|	0.373
Prob > z	0.813
Prob < z	0.187

Matched Pairs
Difference: CBOD R3-CBOD R2

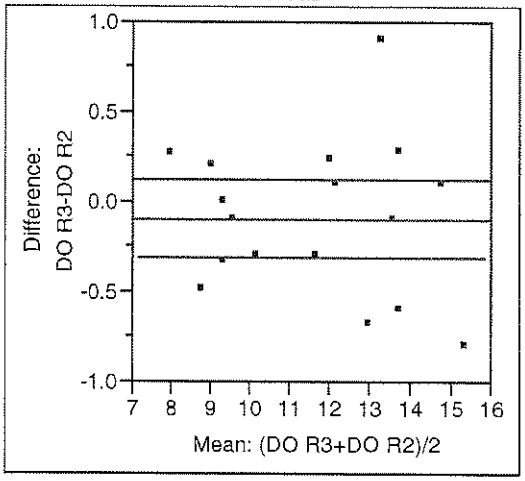


CBOD R3	5.38333	t-Ratio	1.671189
CBOD R2	5.17778	DF	17
Mean Difference	0.20556	Prob > |t|	0.1130
Std Error	0.123	Prob > t	0.0565
Upper95%	0.46506	Prob < t	0.9435
Lower95%	-0.054		
N	18		
Correlation	0.98577		

Wilcoxon Sign-Rank

	CBOD R3-CBOD R2
Test Statistic	29.000
Prob > |z|	0.138
Prob > z	0.069
Prob < z	0.931

Matched Pairs
Difference: DO R3-DO R2

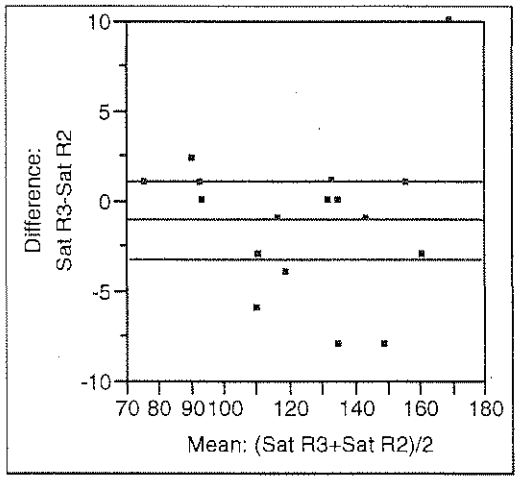


DO R3	11.5406	t-Ratio	-0.91796
DO R2	11.6359	DF	16
Mean Difference	-0.0953	Prob > |t|	0.3723
Std Error	0.10381	Prob > t	0.8139
Upper95%	0.12477	Prob < t	0.1861
Lower95%	-0.3154		
N	17		
Correlation	0.98334		

Wilcoxon Sign-Rank

	DO R3-DO R2
Test Statistic	-21.000
Prob > |z|	0.291
Prob > z	0.855
Prob < z	0.145

Matched Pairs
Difference: Sat R3-Sat R2

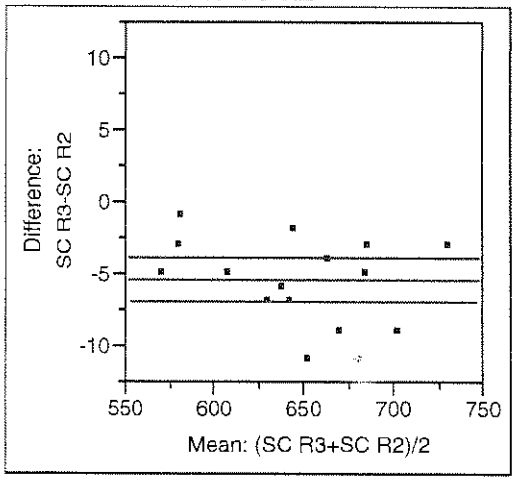


Sat R3	124.182	t-Ratio	-1.00045
Sat R2	125.218	DF	16
Mean Difference	-1.0353	Prob > |t|	0.3320
Std Error	1.03483	Prob > t	0.8340
Upper95%	1.15845	Prob < t	0.1660
Lower95%	-3.229		
N	17		
Correlation	0.98758		

Wilcoxon Sign-Rank

	Sat R3-Sat R2
Test Statistic	-16.500
Prob > |z|	0.318
Prob > z	0.841
Prob < z	0.159

Matched Pairs
Difference: SC R3-SC R2

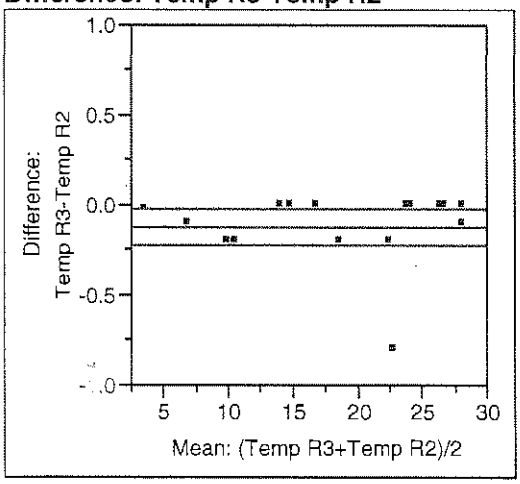


SC R3	641.813	t-Ratio	-7.82335
SC R2	647.25	DF	15
Mean Difference	-5.4375	Prob > |t|	<.0001
Std Error	0.69503	Prob > t	1.0000
Upper95%	-3.9561	Prob < t	<.0001
Lower95%	-6.9189		
N	16		
Correlation	0.9982		

Wilcoxon Sign-Rank

	SC R3-SC R2
Test Statistic	-68.000
Prob > |z|	0.000
Prob > z	1.000
Prob < z	0.000

Matched Pairs
Difference: Temp R3-Temp R2

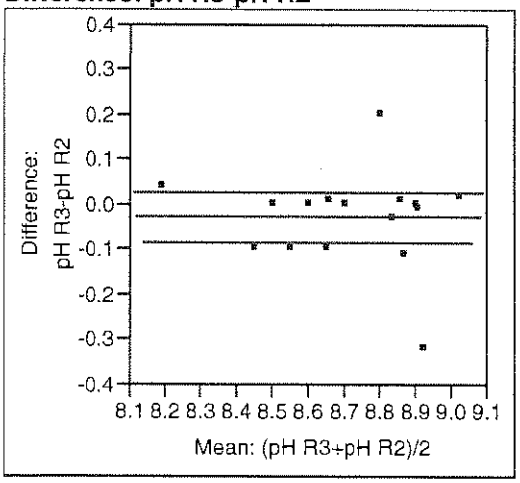


Temp R3	18.6871	t-Ratio	-2.48805
Temp R2	18.8059	DF	16
Mean Difference	-0.1188	Prob > |t|	0.0242
Std Error	0.04776	Prob > t	0.9879
Upper95%	-0.0176	Prob < t	0.0121
Lower95%	-0.2201		
N	17		
Correlation	0.99967		

Wilcoxon Sign-Rank

	Temp R3-Temp R2
Test Statistic	-22.500
Prob > |z|	0.004
Prob > z	0.998
Prob < z	0.002

Matched Pairs
Difference: pH R3-pH R2

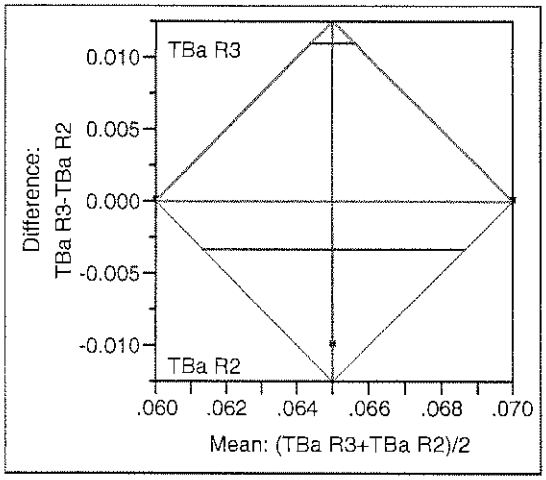


pH R3	8.69706	t-Ratio	-1.141
pH R2	8.72588	DF	16
Mean Difference	-0.0288	Prob > |t|	0.2707
Std Error	0.02526	Prob > t	0.8647
Upper95%	0.02473	Prob < t	0.1353
Lower95%	-0.0824		
N	17		
Correlation	0.88582		

Wilcoxon Sign-Rank

	pH R3-pH R2
Test Statistic	-14.000
Prob > |z|	0.300
Prob > z	0.850
Prob < z	0.150

Matched Pairs
Difference: TBa R3-TBa R2



TBa R3	0.06333	t-Ratio	-1
TBa R2	0.06667	DF	2
Mean Difference	-0.0033	Prob > |t|	0.4226
Std Error	0.00333	Prob > t	0.7887
Upper95%	0.01101	Prob < t	0.2113
Lower95%	-0.0177		
N	3		
Correlation	0.5		

Wilcoxon Sign-Rank

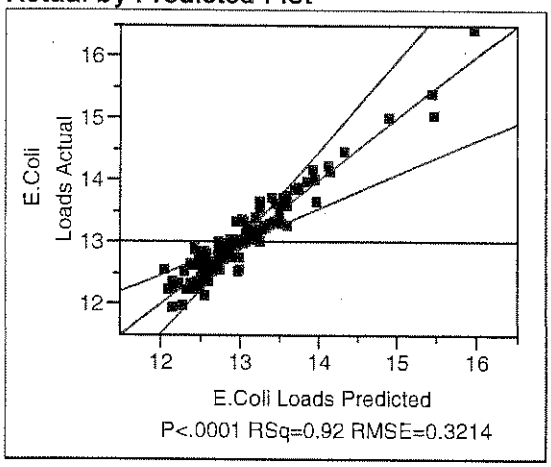
	TBa R3-TBa R2
Test Statistic	-0.500
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Appendix A-2

Full Factorial Analysis Results
Surface Loads of *E. Coli* and Fecal Coliform
on the Mississippi River

Appendix A.2
Full Factorial Analysis Results
Surface Loads of E. Coli and Fecal Coliform on the Mississippi River

Least Squares Fit
Response E.Coli Loads
Whole Model
Actual by Predicted Plot



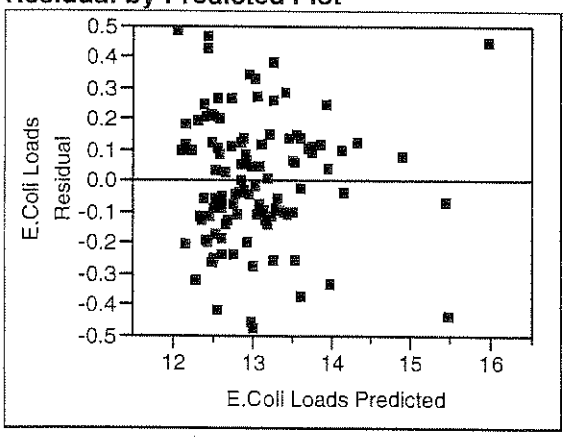
Summary of Fit

RSquare	0.922543
RSquare Adj	0.80267
Root Mean Square Error	0.321424
Mean of Response	13.02903
Observations (or Sum Wgts)	108

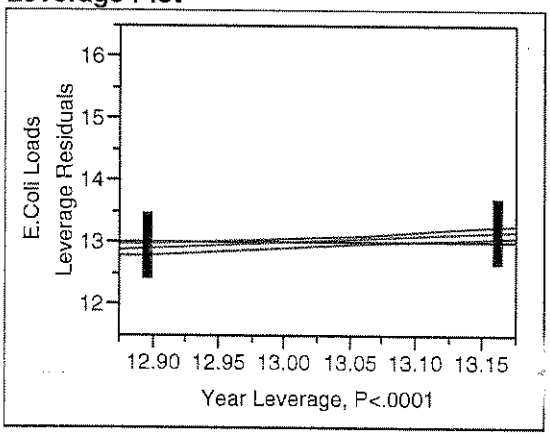
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	65	51.681476	0.795100	7.6960
Error	42	4.339171	0.103314	Prob > F
C. Total	107	56.020646		<.0001

Residual by Predicted Plot



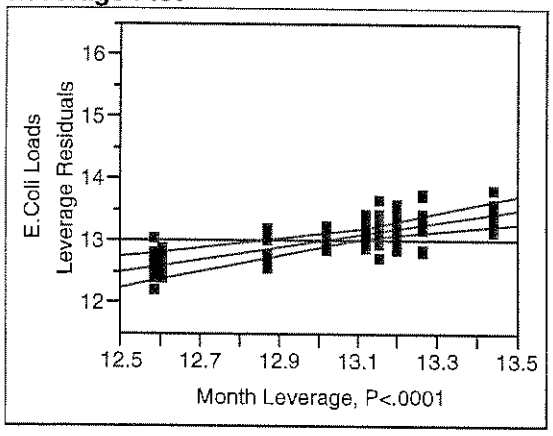
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.895951	0.04374031	12.8960
2006	13.162101	0.04374031	13.1621

Month
Leverage Plot



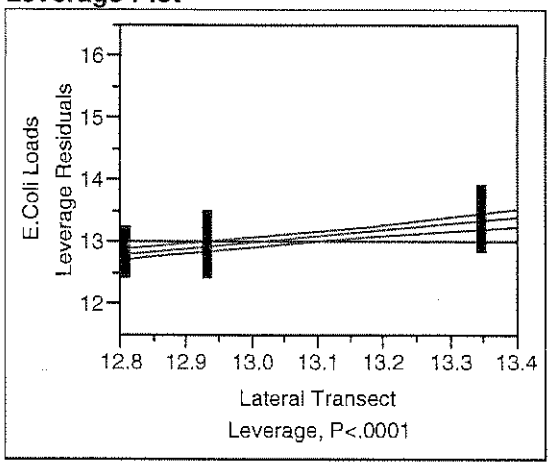
LSMeans Differences Tukey HSD

α=0.050 Q=3.26851

Level					Least Sq Mean
March	A				13.442470
August	A	B			13.266757
July	A	B			13.201928
May	A	B			13.157248
April	A	B			13.119583
June	A	B	C		13.017670
October		B	C	D	12.868623
September			C	D	12.603479
November				D	12.583476

Levels not connected by same letter are significantly different.

Lateral Transect
Leverage Plot



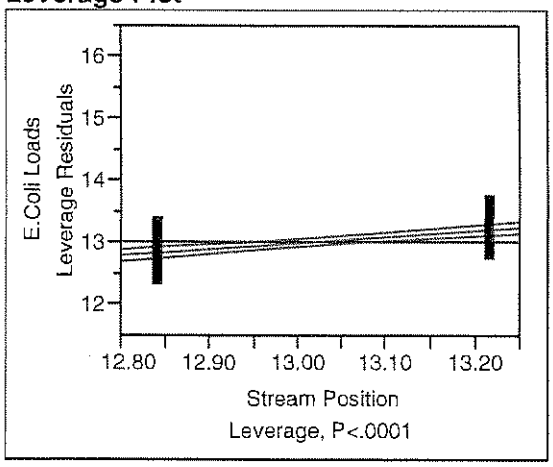
LSMeans Differences Tukey HSD

α=0.050 Q=2.42949

Level			Least Sq Mean
Right	A		13.345781
Left		B	12.930836
Center		B	12.810461

Levels not connected by same letter are significantly different.

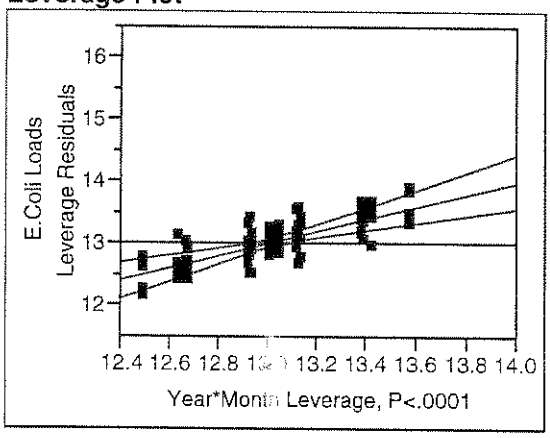
Stream Position
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	12.841159	0.04374031	12.8412
Downstream	13.216893	0.04374031	13.2169

Year*Month
Leverage Plot



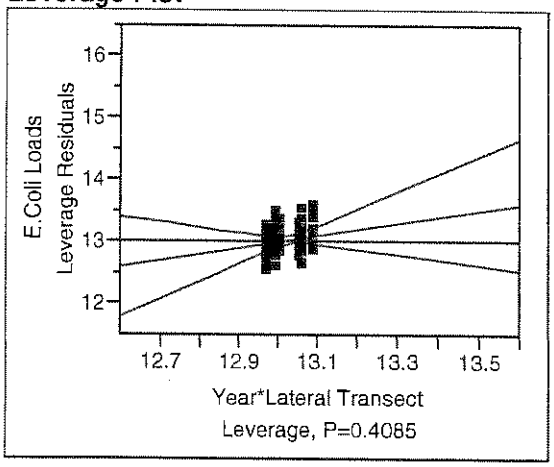
LSMeans Differences Tukey HSD

α=0.050 Q=3.71241

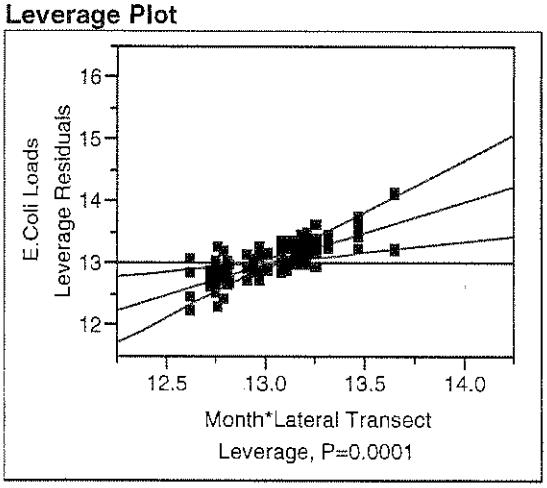
Level								Least Sq Mean
2006,March	A							13.940501
2006,May	A	B						13.686725
2006,August	A	B	C					13.499477
2006,July	A	B	C					13.445495
2005,April	A	B	C	D				13.345370
2005,October	A	B	C	D	E			13.280302
2006,June		B	C	D	E	F		13.157290
2005,August		B	C	D	E	F	G	13.034037
2005,July			C	D	E	F	G	12.958361
2005,March			C	D	E	F	G	12.944438
2006,April			C	D	E	F	G	12.893796
2005,June			C	D	E	F	G	12.878049
2006,September				D	E	F	G	12.755257
2005,May					E	F	G	12.627771
2006,November					E	F	G	12.623423
2005,November						F	G	12.543529
2006,October							G	12.456944
2005,September							G	12.451701

Levels not connected by same letter are significantly different.

Year*Lateral Transect
Leverage Plot



Month*Lateral Transect
Leverage Plot



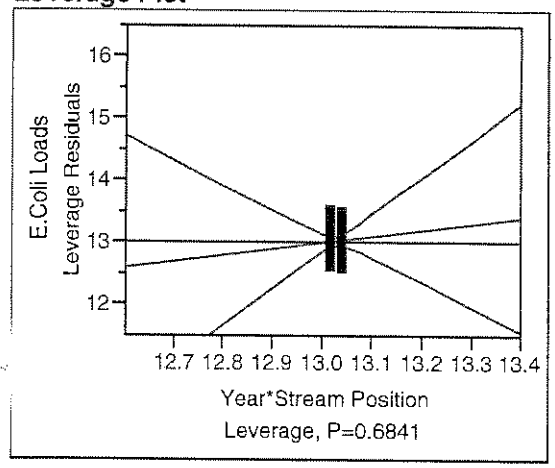
LSMeans Differences Tukey HSD

α=0.050 Q=3.95521

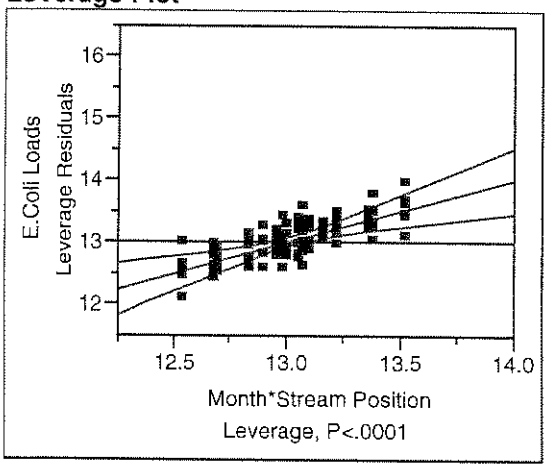
Level							Least Sq Mean
August,Right	A						14.205703
July,Right	A	B					13.964571
May,Right	A	B	C				13.556959
March,Right	A	B	C	D			13.468763
March,Center	A	B	C	D			13.444298
March,Left	A	B	C	D			13.414348
April,Right	A	B	C	D	E		13.379713
June,Right	A	B	C	D	E		13.316086
April,Left		B	C	D	E	F	13.199673
June,Left		B	C	D	E	F	13.153874
May,Center		B	C	D	E	F	13.120021
October,Right			C	D	E	F	12.902725
October,Center			C	D	E	F	12.880974
July,Left			C	D	E	F	12.868300
August,Left			C	D	E	F	12.857921
September,Right			C	D	E	F	12.827324
October,Left			C	D	E	F	12.822170
May,Left			C	D	E	F	12.794763
April,Center			C	D	E	F	12.779362
July,Center			C	D	E	F	12.772913
August,Center			C	D	E	F	12.736648
September,Left			C	D	E	F	12.658363
November,Center				D	E	F	12.652135
November,Left				D	E	F	12.608112
June,Center				D	E	F	12.583049
November,Right					E	F	12.490180
September,Center						F	12.324749

Levels not connected by same letter are significantly different.

Year*Stream Position
Leverage Plot



Month*Stream Position
Leverage Plot

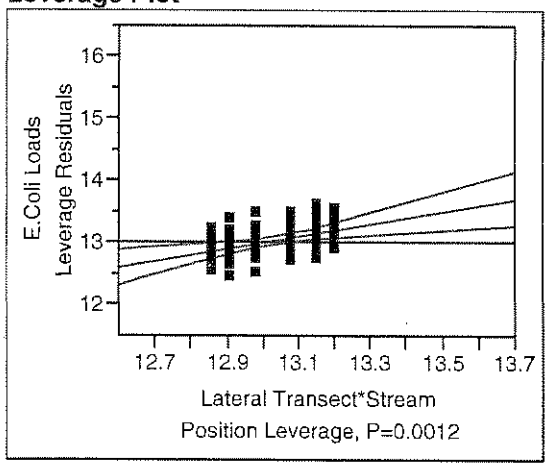


LSMeans Differences Tukey HSD
α=0.050 Q=3.71241

Level								Least Sq Mean
August,Downstream	A							13.945921
July,Downstream	A	B						13.741619
March,Downstream	A	B	C					13.495907
March,Upstream	A	B	C	D				13.389032
May,Downstream	A	B	C	D	E			13.301075
June,Upstream		B	C	D	E	F		13.158616
April,Upstream		B	C	D	E	F		13.127279
April,Downstream		B	C	D	E	F	G	13.111887
October,Downstream			C	D	E	F	G	13.030709
May,Upstream			C	D	E	F	G	13.013420
June,Downstream			C	D	E	F	G	12.876723
November,Downstream				D	E	F	G	12.730710
September,Downstream				D	E	F	G	12.717484
October,Upstream				D	E	F	G	12.706537
July,Upstream					E	F	G	12.662237
August,Upstream						F	G	12.587593
September,Upstream						F	G	12.489473
November,Upstream							G	12.436241

Levels not connected by same letter are significantly different.

Lateral Transect*Stream Position Leverage Plot



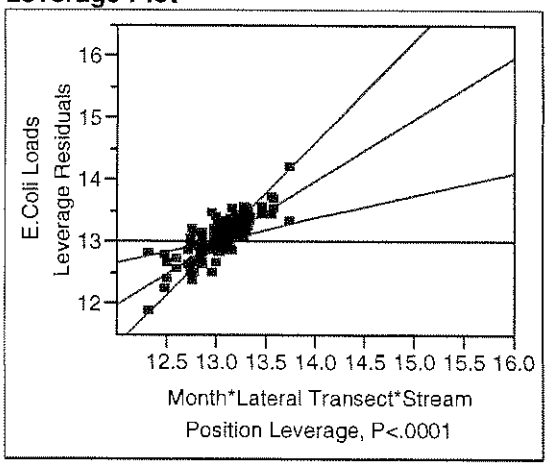
LSMeans Differences Tukey HSD

α=0.050 Q=2.98525

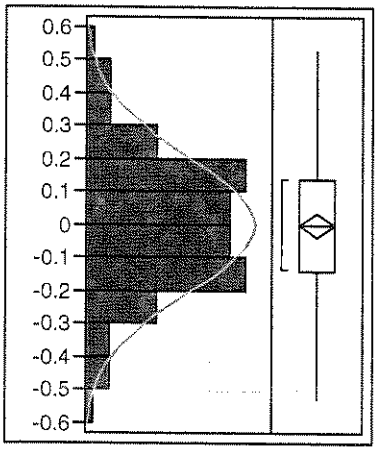
Level					Least Sq Mean
Right,Downstream	A				13.655727
Left,Downstream		B			13.165500
Right,Upstream		B	C		13.035834
Center,Downstream			C	D	12.829452
Center,Upstream			C	D	12.791470
Left,Upstream				D	12.696172

Levels not connected by same letter are significantly different.

Month*Lateral Transect*Stream Position Leverage Plot



Residual E.Coli Loads



Normal(4.6e-15,0.20611)

Quantiles

100.0%	maximum	0.5243
99.5%		0.5243
97.5%		0.4513
90.0%		0.2625
75.0%	quartile	0.1402
50.0%	median	1.8e-15
25.0%	quartile	-0.1402
10.0%		-0.2625
2.5%		-0.4513
0.5%		-0.5243
0.0%	minimum	-0.5243

Moments

Mean	4.589e-15
Std Dev	0.2061104
Std Err Mean	0.019833
upper 95% Mean	0.0393166
lower 95% Mean	-0.039317
N	108

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	4.589e-15	-0.039317	0.0393166
Dispersion	σ	0.2061104	0.1818085	0.237971

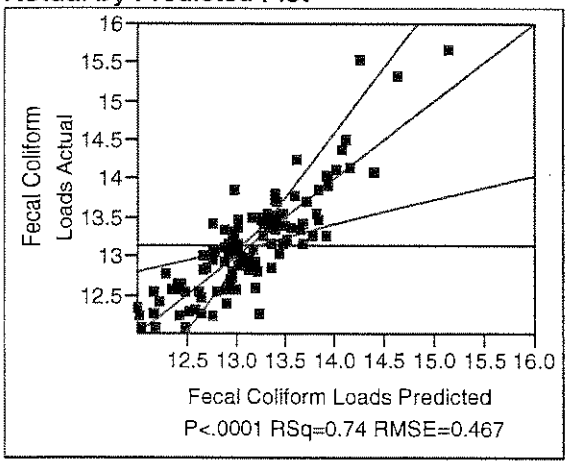
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.994958	0.9648

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Response Fecal Coliform Loads
Whole Model
Actual by Predicted Plot



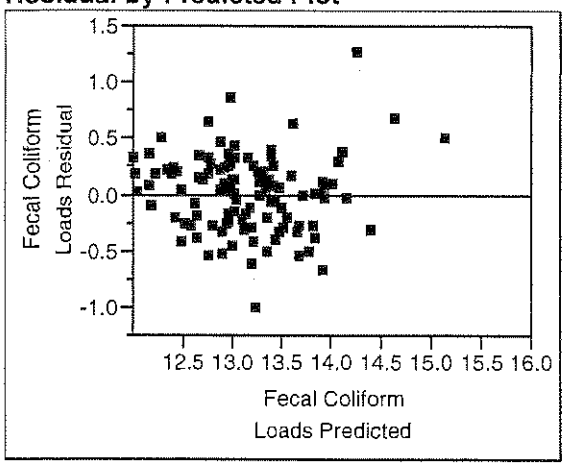
Summary of Fit

RSquare	0.739295
RSquare Adj	0.519045
Root Mean Square Error	0.467028
Mean of Response	13.14808
Observations (or Sum Wgts)	108

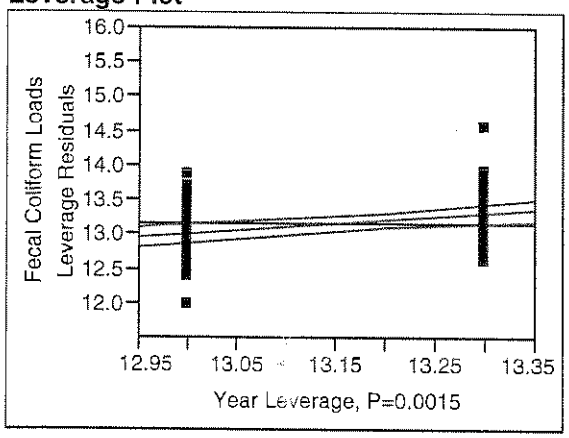
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	49	35.874219	0.732127	3.3566
Error	58	12.650658	0.218115	Prob > F
C. Total	107	48.524877		<.0001

Residual by Predicted Plot



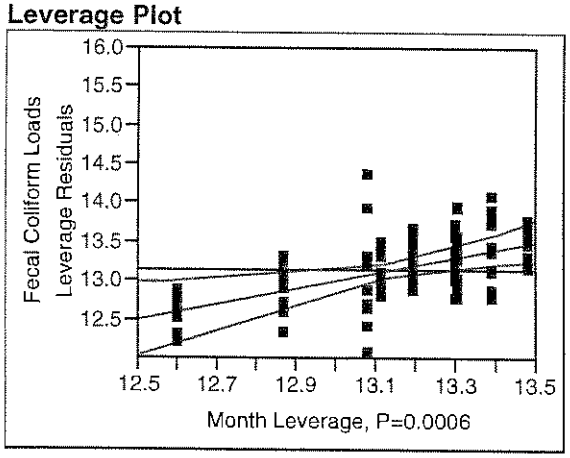
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.998065	0.06355441	12.9981
2006	13.298097	0.06355441	13.2981

Month
Leverage Plot



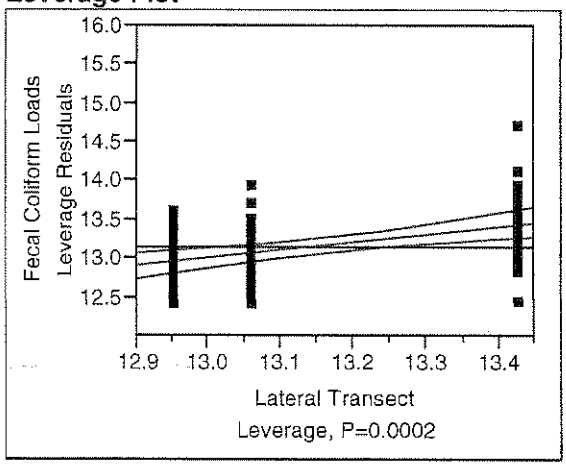
LSMeans Differences Tukey HSD

α=0.050 Q=3.22171

Level			Least Sq Mean
March	A		13.478034
August	A		13.388610
June	A		13.304581
October	A		13.300657
April	A	B	13.196524
May	A	B	13.112889
July	A	B	13.080280
November	A	B	12.868898
September		B	12.602257

Levels not connected by same letter are significantly different.

Lateral Transect
Leverage Plot



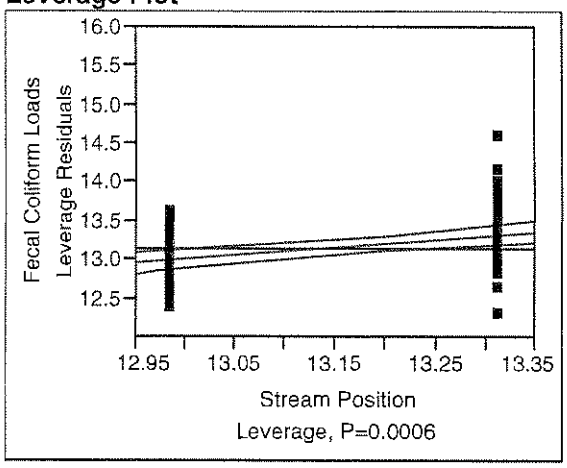
LSMeans Differences Tukey HSD

α=0.050 Q=2.40532

Level			Least Sq Mean
Right	A		13.427734
Left		B	13.063480
Center		B	12.953029

Levels not connected by same letter are significantly different.

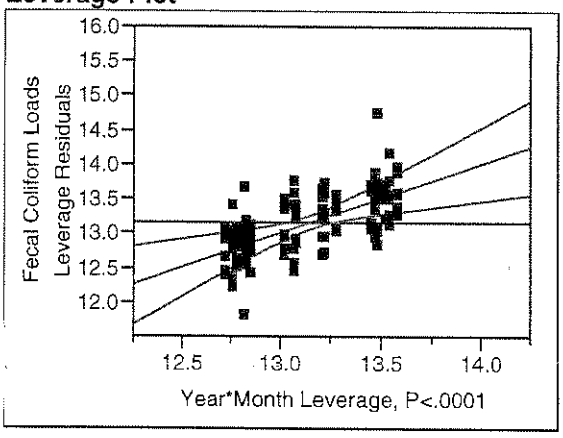
Stream Position
Leverage Plot



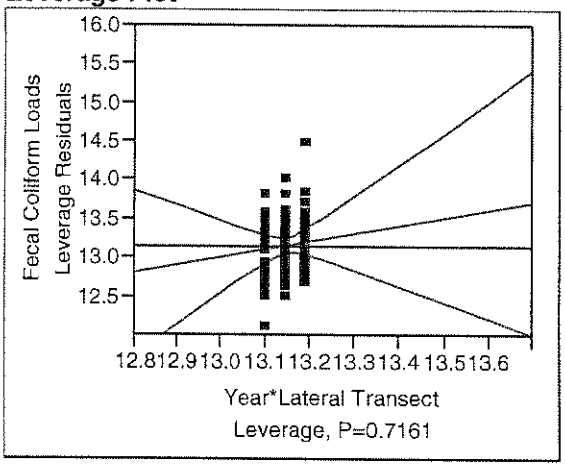
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	12.984525	0.06355441	12.9845
Downstream	13.311637	0.06355441	13.3116

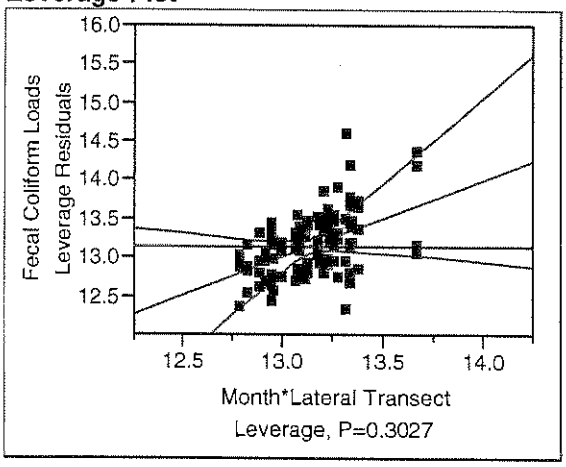
Year*Month
Leverage Plot



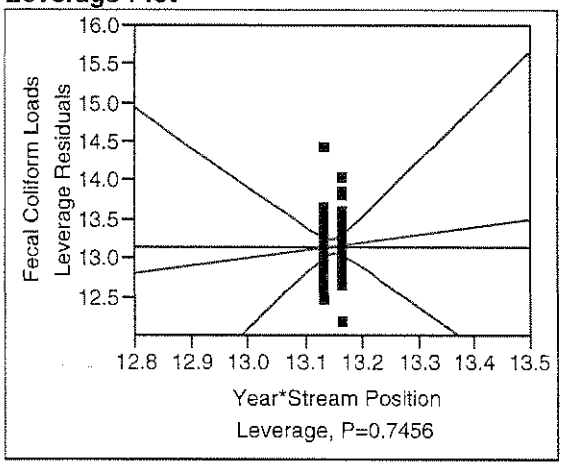
Year*Lateral Transect
Leverage Plot



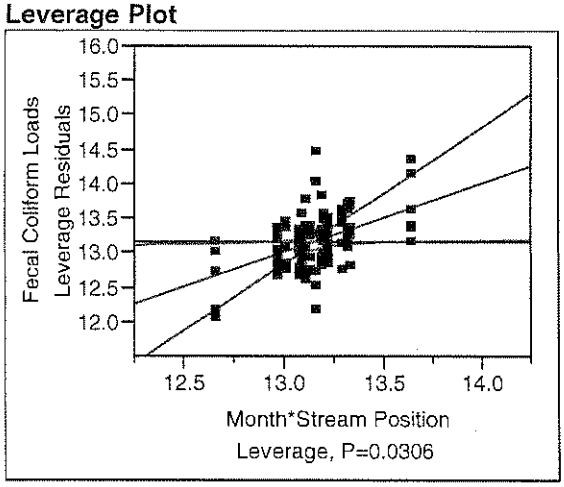
Month*Lateral Transect
Leverage Plot



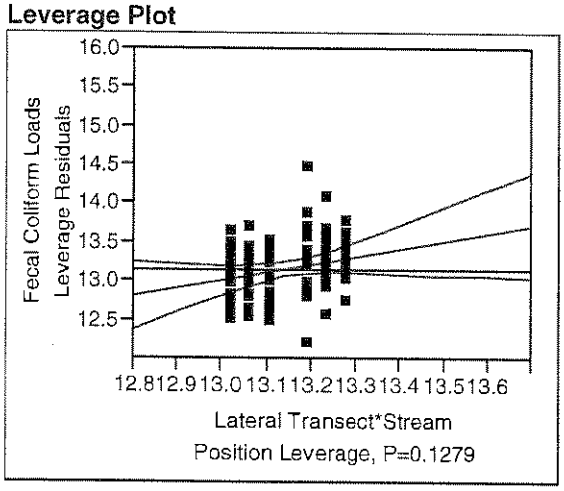
Year*Stream Position
Leverage Plot



Month*Stream Position
Leverage Plot



Lateral Transect*Stream Position Leverage Plot



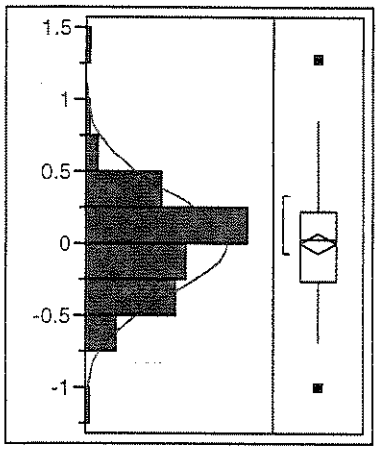
LSMeans Differences Tukey HSD

α=0.050 Q=2.94711

Level				Least Sq Mean
Right,Downstream	A			13.634484
Left,Downstream	A	B		13.312747
Right,Upstream	A	B	C	13.220985
Center,Downstream		B	C	12.987681
Center,Upstream		B	C	12.918377
Left,Upstream			C	12.814213

Levels not connected by same letter are significantly different.

Distributions
Residual Fecal Coliform Loads



Normal(3.1e-15,0.34385)

Quantiles

100.0%	maximum	1.259
99.5%		1.259
97.5%		0.720
90.0%		0.366
75.0%	quartile	0.218
50.0%	median	0.024
25.0%	quartile	-0.268
10.0%		-0.434
2.5%		-0.648
0.5%		-1.019
0.0%	minimum	-1.019

Moments

Mean	3.092e-15
Std Dev	0.3438465
Std Err Mean	0.0330866
upper 95% Mean	0.0655904
lower 95% Mean	-0.06559
N	108

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3.092e-15	-0.06559	0.0655904
Dispersion	σ	0.3438465	0.3033045	0.3969983

Goodness-of-Fit Test
Shapiro-Wilk W Test

W	Prob<W
0.982985	0.1839

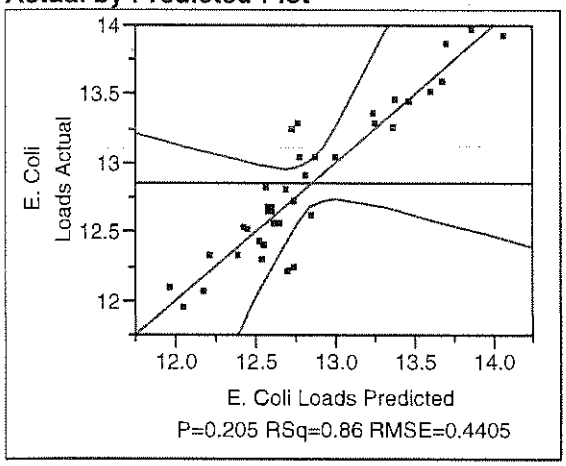
Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Appendix A-3

Full Factorial Analysis Results
Mid-Depth Loads of *E. Coli* and Fecal Coliform
on the Mississippi River

Appendix A.3
Full Factorial Analysis Results
Mid-Depth Loads of E. Coli and Fecal Coliform on the Mississippi River

Least Squares Fit
Response E. Coli Loads
Whole Model
Actual by Predicted Plot



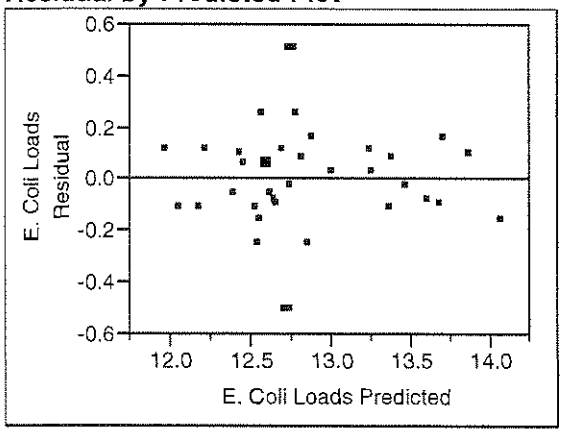
Summary of Fit

RSquare	0.856094
RSquare Adj	0.370413
Root Mean Square Error	0.44045
Mean of Response	12.84878
Observations (or Sum Wgts)	36

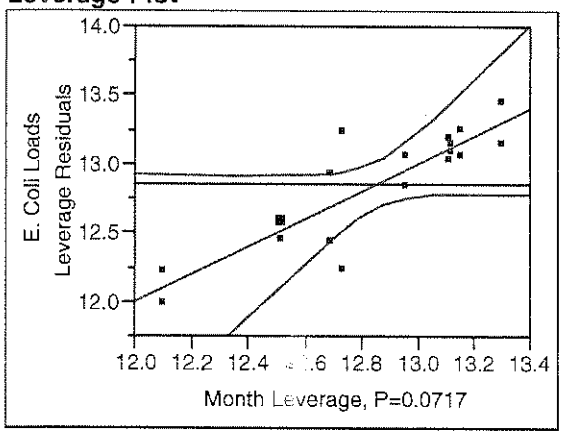
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	27	9.232684	0.341951	1.7627
Error	8	1.551972	0.193997	Prob > F
C. Total	35	10.784656		0.2050

Residual by Predicted Plot



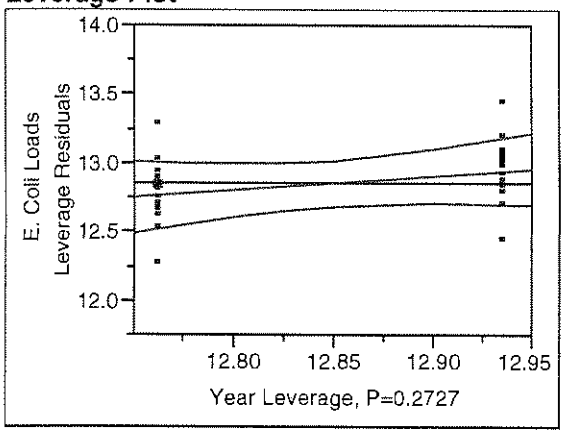
Month
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
April	13.112976	0.22022518	13.1130
August	12.509527	0.22022518	12.5095
July	12.730388	0.22022518	12.7304
June	12.952329	0.22022518	12.9523
March	13.297015	0.22022518	13.2970
May	13.150164	0.22022518	13.1502
November	12.683369	0.22022518	12.6834
October	13.104270	0.22022518	13.1043
September	12.098977	0.22022518	12.0990

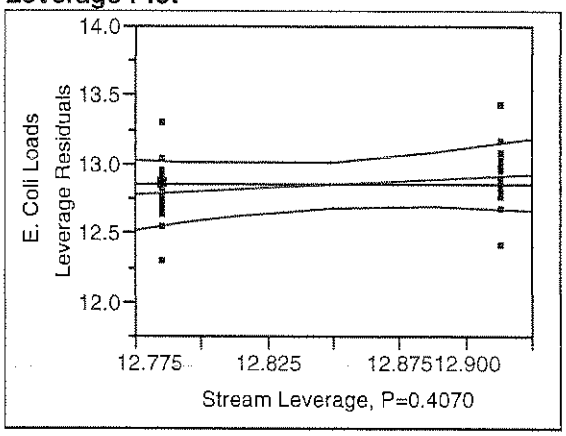
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.762322	0.10381515	12.7623
2006	12.935237	0.10381515	12.9352

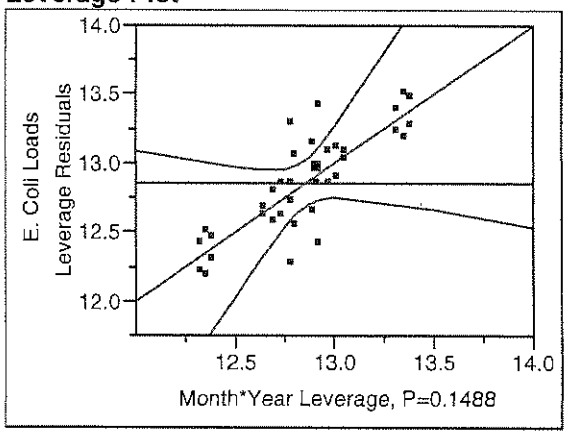
Stream
Leverage Plot



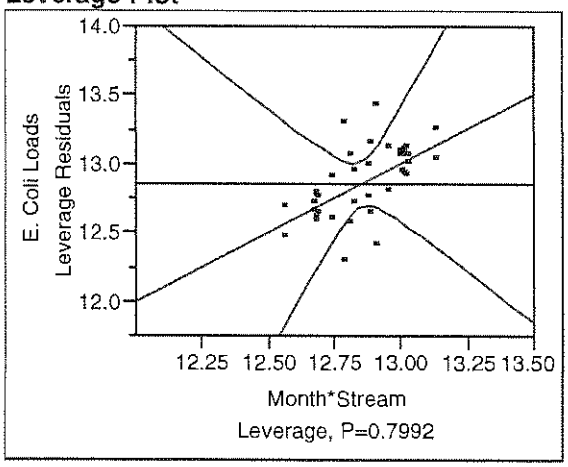
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	12.913026	0.10381515	12.9130
Downstream	12.784533	0.10381515	12.7845

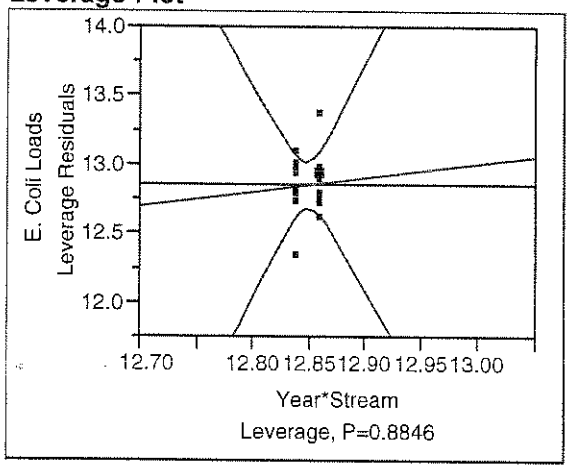
Month*Year
Leverage Plot



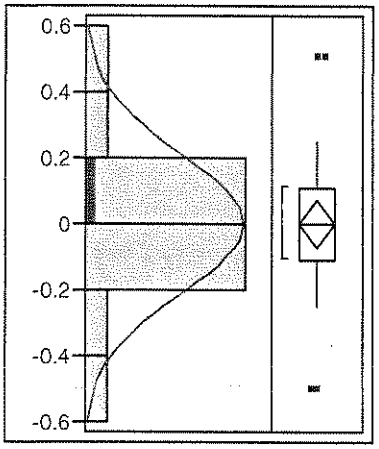
Month*Stream
Leverage Plot



Year*Stream
Leverage Plot



Residual E. Coli Loads



Normal(-2e-15,0.21058)

Quantiles

100.0%	maximum	0.5046
99.5%		0.5046
97.5%		0.5046
90.0%		0.2487
75.0%	quartile	0.1092
50.0%	median	-2e-15
25.0%	quartile	-0.1092
10.0%		-0.2487
2.5%		-0.5046
0.5%		-0.5046
0.0%	minimum	-0.5046

Moments

Mean	-2.37e-15
Std Dev	0.2105755
Std Err Mean	0.0350959
upper 95% Mean	0.0712485
lower 95% Mean	-0.071249
N	36

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	-2.37e-15	-0.071249	0.0712485
Dispersion	σ	0.2105755	0.1707939	0.2746828

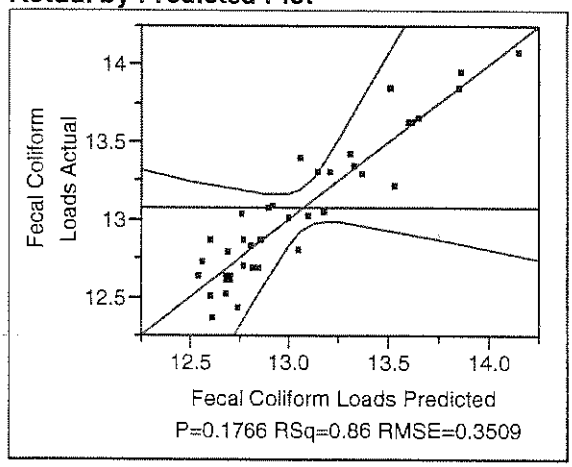
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.940902	0.0542

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Response Fecal Coliform Loads
Whole Model
Actual by Predicted Plot



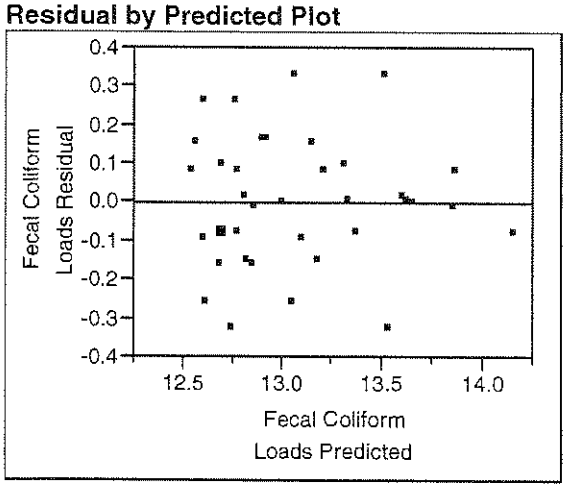
Summary of Fit

RSquare	0.864258
RSquare Adj	0.40613
Root Mean Square Error	0.350903
Mean of Response	13.07544
Observations (or Sum Wgts)	36

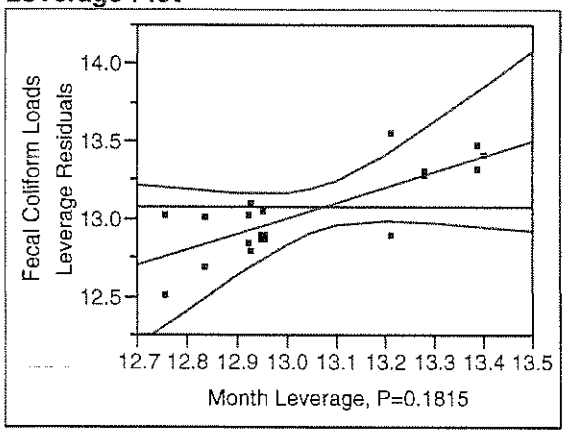
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	27	6.2718347	0.232290	1.8865
Error	8	0.9850635	0.123133	Prob > F
C. Total	35	7.2568981		0.1766

Residual by Predicted Plot



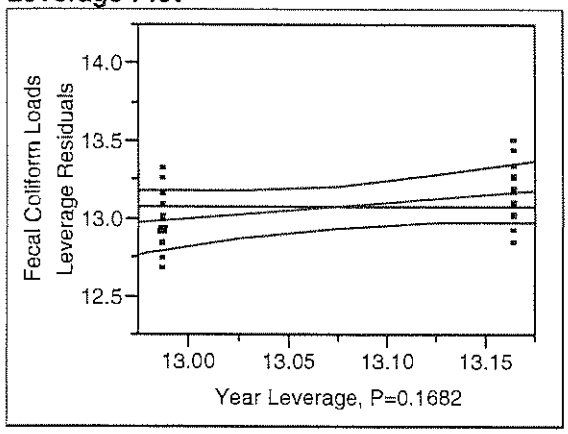
Month
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
April	12.929877	0.17545151	12.9299
August	12.952974	0.17545151	12.9530
July	12.923428	0.17545151	12.9234
June	13.211586	0.17545151	13.2116
March	13.388387	0.17545151	13.3884
May	13.280884	0.17545151	13.2809
November	12.835233	0.17545151	12.8352
October	13.398777	0.17545151	13.3988
September	12.757848	0.17545151	12.7578

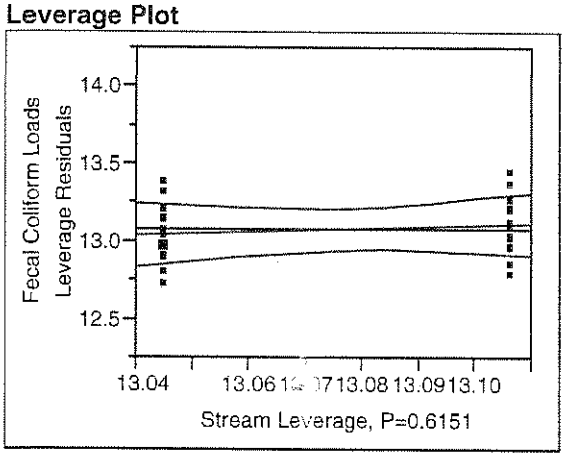
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.986839	0.08270864	12.9868
2006	13.164049	0.08270864	13.1640

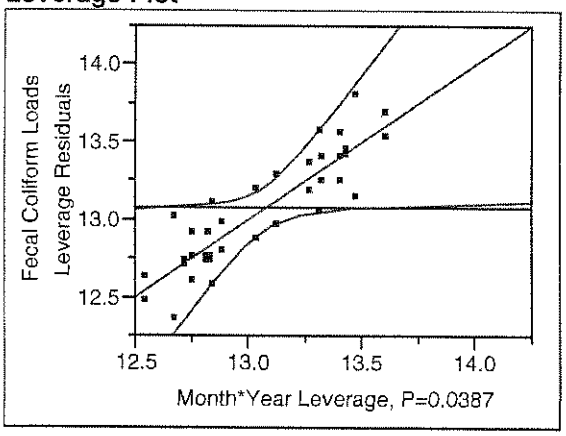
Stream
Leverage Plot



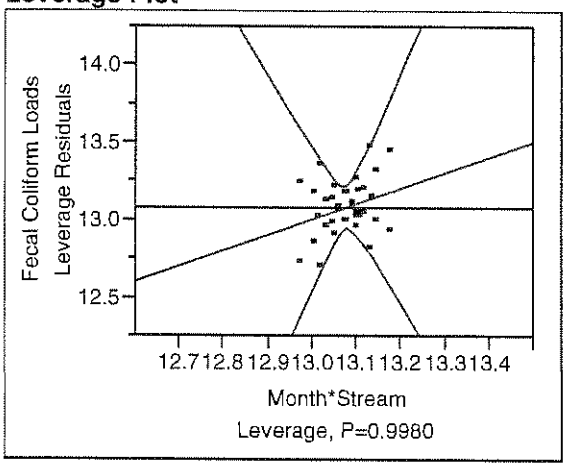
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	13.106034	0.08270864	13.1060
Downstream	13.044854	0.08270864	13.0449

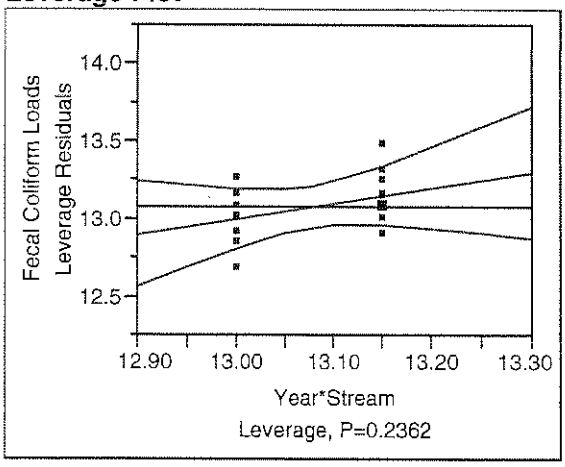
Month*Year
Leverage Plot



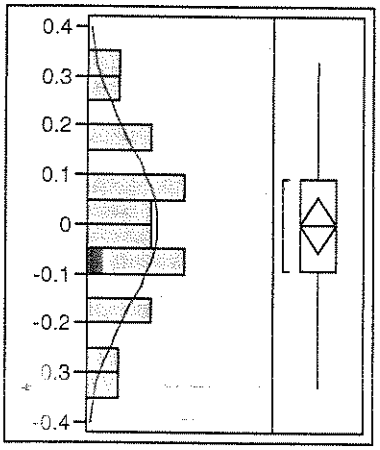
Month*Stream
Leverage Plot



Year*Stream
Leverage Plot



Residual Fecal Coliform Loads



Normal(3e-15,0.16776)

Quantiles

100.0%	maximum	0.3275
99.5%		0.3275
97.5%		0.3275
90.0%		0.2593
75.0%	quartile	0.0942
50.0%	median	4.4e-15
25.0%	quartile	-0.0942
10.0%		-0.2593
2.5%		-0.3275
0.5%		-0.3275
0.0%	minimum	-0.3275

Moments

Mean	2.961e-15
Std Dev	0.1677637
Std Err Mean	0.0279606
upper 95% Mean	0.0567631
lower 95% Mean	-0.056763
N	36

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2.961e-15	-0.056763	0.0567631
Dispersion	σ	0.1677637	0.1360701	0.2188374

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.976080	0.6125

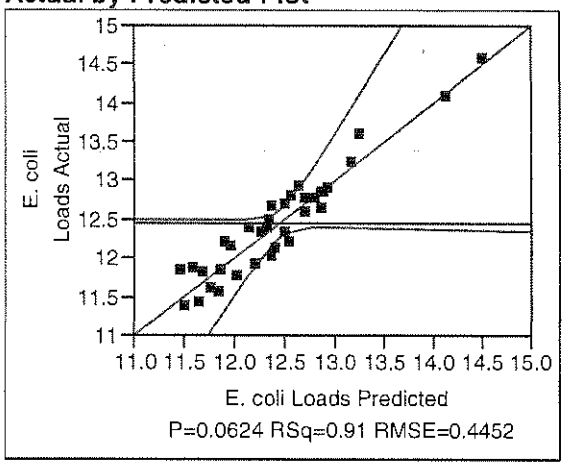
Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Appendix A-4

Full Factorial Analysis Results
Surface Loads of *E. coli* and Fecal Coliform
on the Rock River

Appendix A.4
Full Factorial Analysis Results
Surface Loads of E. coli and Fecal Coliform on the Rock River

Least Squares Fit
Response E. coli Loads
Whole Model
Actual by Predicted Plot



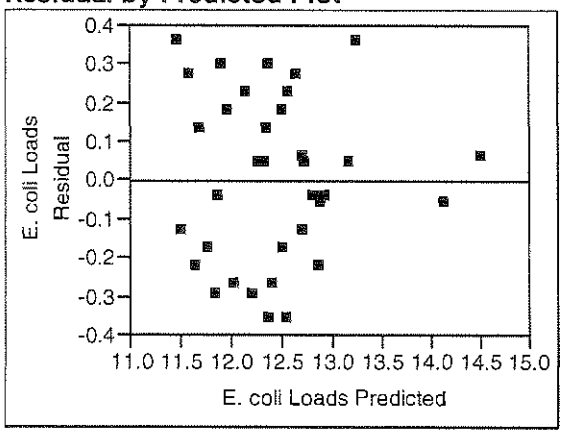
Summary of Fit

RSquare	0.906076
RSquare Adj	0.589081
Root Mean Square Error	0.445213
Mean of Response	12.43991
Observations (or Sum Wgts)	36

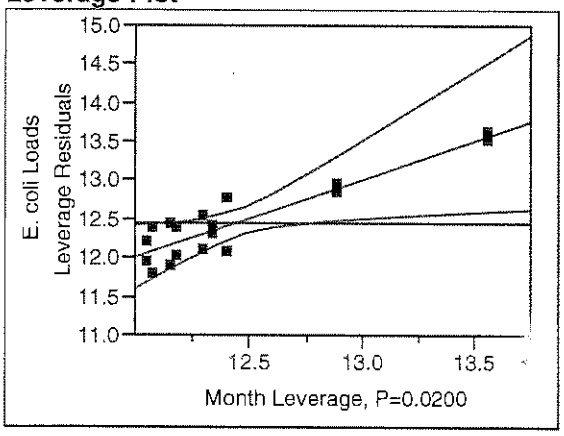
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	27	15.297182	0.566562	2.8583
Error	8	1.585714	0.198214	Prob > F
C. Total	35	16.882896		0.0624

Residual by Predicted Plot



Month
Leverage Plot



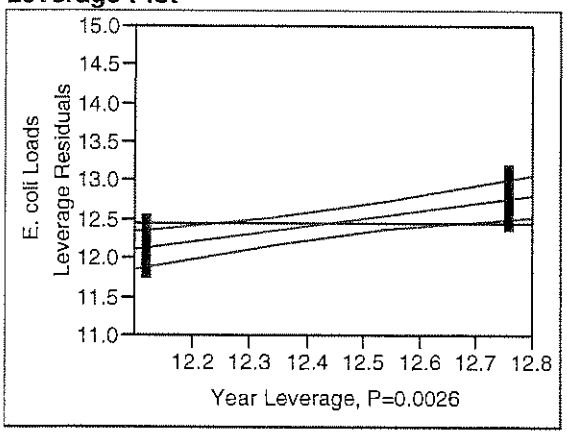
LSMeans Differences Tukey HSD

α=0.050 Q=4.07747

Level			Least Sq Mean
March	A		13.554513
April	A	B	12.886709
August	A	B	12.401932
May	A	B	12.343620
October	A	B	12.299962
June		B	12.184784
November		B	12.157210
July		B	12.075411
September		B	12.055084

Levels not connected by same letter are significantly different.

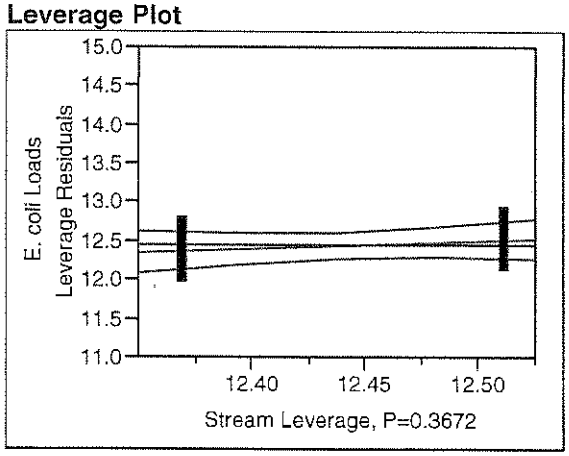
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.120521	0.10493760	12.1205
2006	12.759306	0.10493760	12.7593

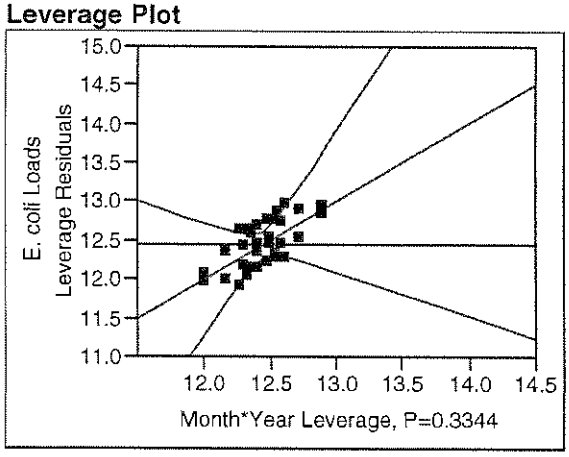
Stream
Leverage Plot



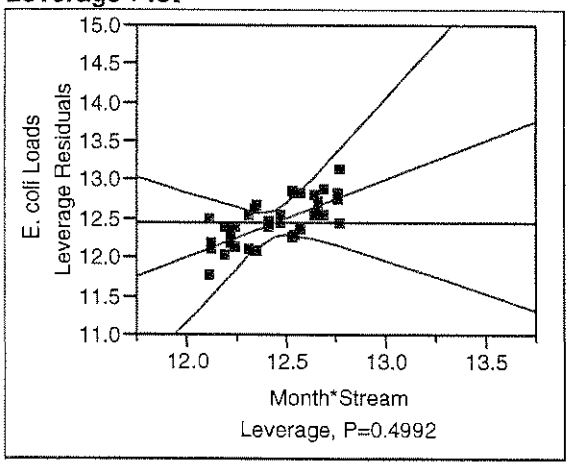
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	12.368995	0.10493760	12.3690
Downstream	12.510832	0.10493760	12.5108

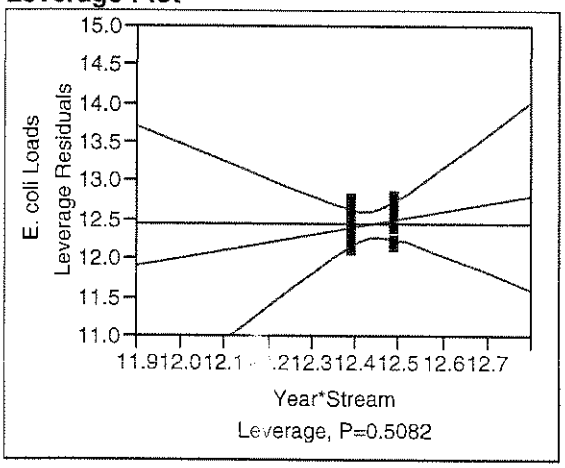
Month*Year
Leverage Plot



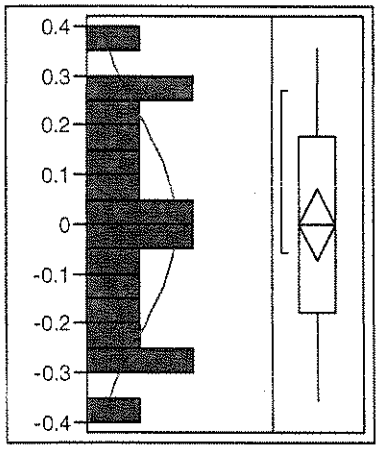
Month*Stream
Leverage Plot



Year*Stream
Leverage Plot



Residual E. coli Loads



Normal(-8e-16,0.21285)

Quantiles

100.0%	maximum	0.3565
99.5%		0.3565
97.5%		0.3565
90.0%		0.2984
75.0%	quartile	0.1778
50.0%	median	-9e-16
25.0%	quartile	-0.1778
10.0%		-0.2984
2.5%		-0.3565
0.5%		-0.3565
0.0%	minimum	-0.3565

Moments

Mean	-8.39e-16
Std Dev	0.2128523
Std Err Mean	0.0354754
upper 95% Mean	0.0720189
lower 95% Mean	-0.072019
N	36

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	-8.39e-16	-0.072019	0.0720189
Dispersion	σ	0.2128523	0.1726406	0.2776526

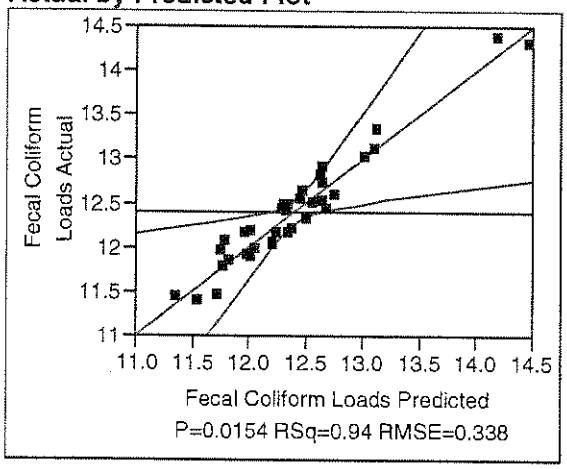
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.956388	0.1660

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Response Fecal Coliform Loads
Whole Model
Actual by Predicted Plot



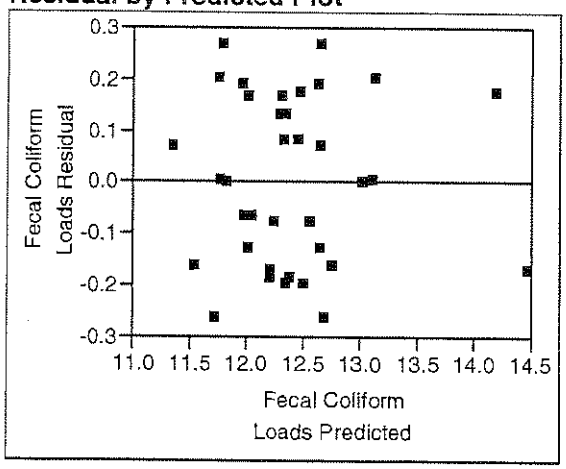
Summary of Fit

RSquare	0.939214
RSquare Adj	0.734061
Root Mean Square Error	0.337981
Mean of Response	12.39677
Observations (or Sum Wgts)	36

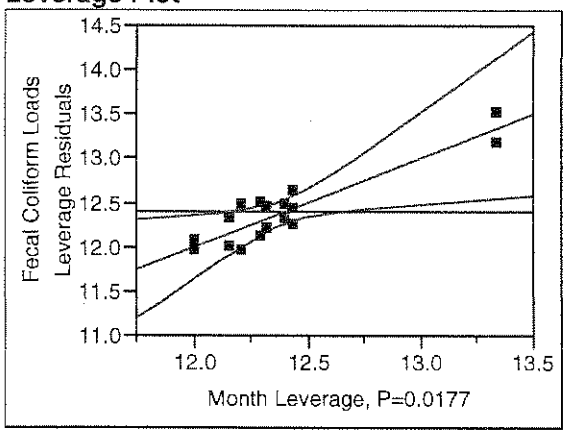
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	27	14.119998	0.522963	4.5781
Error	8	0.913848	0.114231	Prob > F
C. Total	35	15.033847		0.0154

Residual by Predicted Plot



Month
Leverage Plot



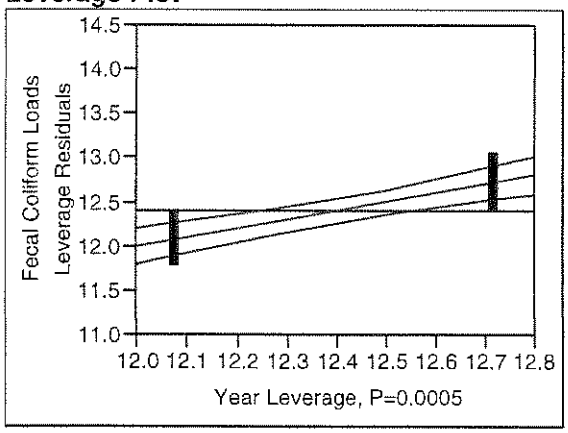
LSMeans Differences Tukey HSD

α=0.050 Q=4.07747

Level			Least Sq Mean
March	A		13.331285
August	A	B	12.431483
May	A	B	12.428187
April	A	B	12.396948
October		B	12.323098
June		B	12.293462
November		B	12.208724
September		B	12.152014
July		B	12.005708

Levels not connected by same letter are significantly different.

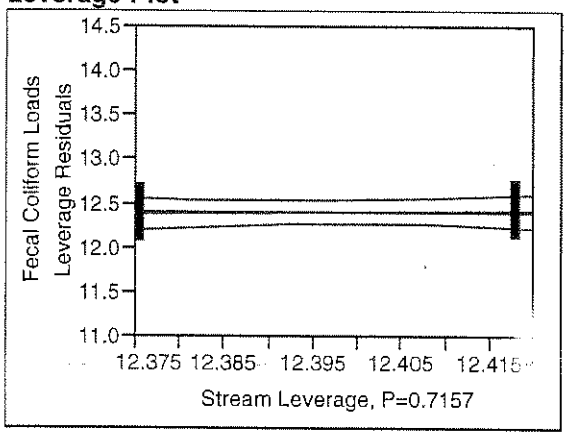
Year
Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2005	12.075751	0.07966285	12.0758
2006	12.717784	0.07966285	12.7178

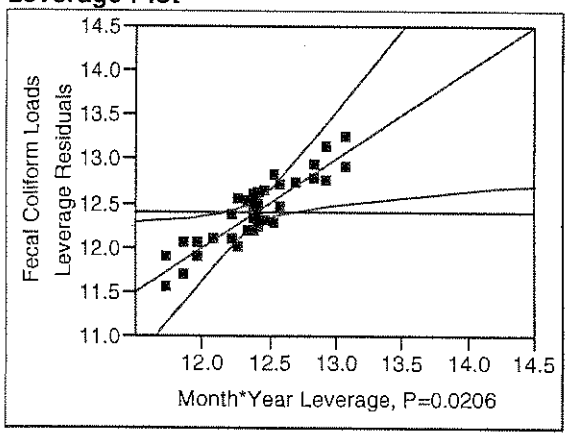
Stream
Leverage Plot



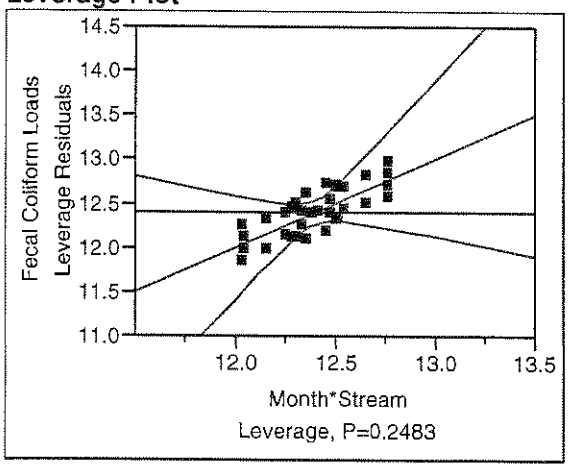
Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Upstream	12.375509	0.07966285	12.3755
Downstream	12.418027	0.07966285	12.4180

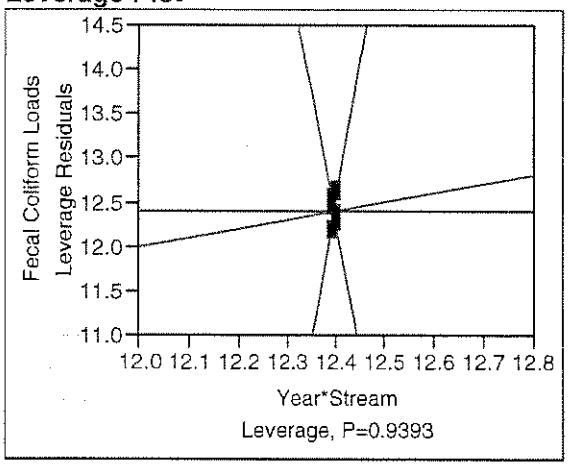
Month*Year
Leverage Plot



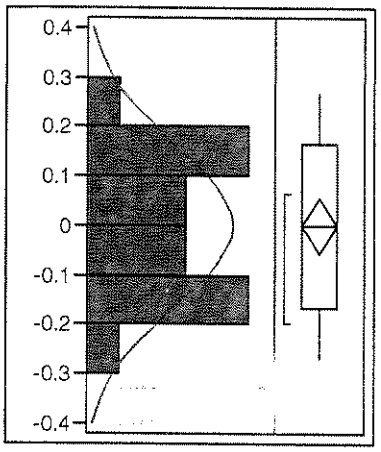
Month*Stream
Leverage Plot



Year*Stream
Leverage Plot



Residual Fecal Coliform Loads



Normal(9.4e-16,0.16159)

Quantiles

100.0%	maximum	0.2653
99.5%		0.2653
97.5%		0.2653
90.0%		0.1992
75.0%	quartile	0.1652
50.0%	median	3.6e-15
25.0%	quartile	-0.1652
10.0%		-0.1992
2.5%		-0.2653
0.5%		-0.2653
0.0%	minimum	-0.2653

Moments

Mean	9.375e-16
Std Dev	0.1615858
Std Err Mean	0.026931
upper 95% Mean	0.0546728
lower 95% Mean	-0.054673
N	36

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	9.375e-16	-0.054673	0.0546728
Dispersion	σ	0.1615858	0.1310592	0.2107786

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.932772	0.0304

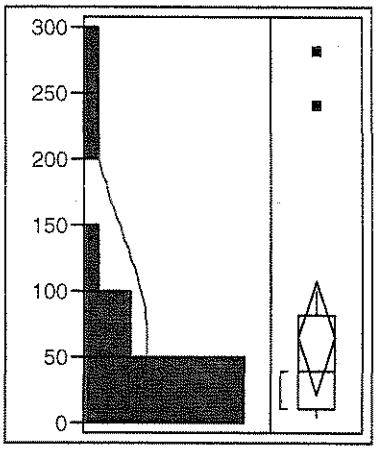
Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Appendix A-5

QA/QC Calculations for Field Duplicates and Corresponding Samples Sample Location M-1

Appendix A.5
QA/QC Calculations for Field Duplicates and Corresponding Samples
Sample Location M-1

Distributions Sample Type=FD
E. coli



Normal(64.6875,81.5571)

Quantiles

100.0%	maximum	280.00
99.5%		280.00
97.5%		280.00
90.0%		252.00
75.0%	quartile	82.50
50.0%	median	40.00
25.0%	quartile	10.00
10.0%		8.50
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	64.6875
Std Dev	81.557112
Std Err Mean	20.389278
upper 95% Mean	108.14622
lower 95% Mean	21.228783
N	16

Fitted Normal
Parameter Estimates

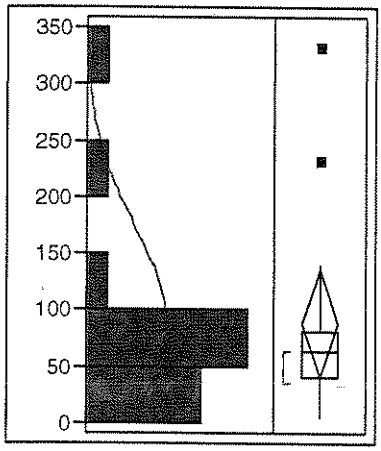
Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	64.6875	21.228783	108.14622
Dispersion	σ	81.557112	60.246635	126.22523

Goodness-of-Fit Test
Shapiro-Wilk W Test

W	Prob<W
0.697524	0.0002

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Fecal Coliform



Normal(88.1333,85.607)

Quantiles

100.0%	maximum	330.00
99.5%		330.00
97.5%		330.00
90.0%		270.00
75.0%	quartile	82.00
50.0%	median	64.00
25.0%	quartile	40.00
10.0%		18.20
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	88.133333
Std Dev	85.606965
Std Err Mean	22.103623
upper 95% Mean	135.54089
lower 95% Mean	40.725777
N	15

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	88.133333	40.725777	135.54089
Dispersion	σ	85.606965	62.675135	135.01066

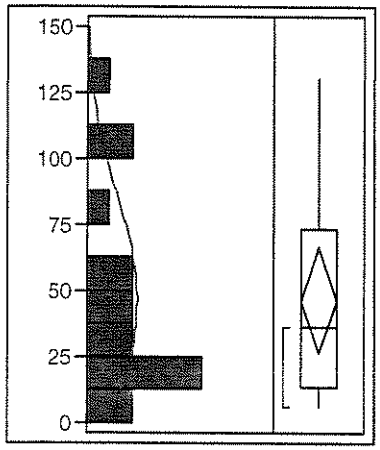
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.731918	0.0006

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chlor A



Normal(46.5882,38.759)

Quantiles

100.0%	maximum	130.00
99.5%		130.00
97.5%		130.00
90.0%		114.00
75.0%	quartile	73.50
50.0%	median	36.00
25.0%	quartile	13.50
10.0%		10.80
2.5%		6.00
0.5%		6.00
0.0%	minimum	6.00

Moments

Mean	46.588235
Std Dev	38.758965
Std Err Mean	9.4004298
upper 95% Mean	66.516256
lower 95% Mean	26.660214
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	46.588235	26.660214	66.516256
Dispersion	σ	38.758965	28.866508	58.988391

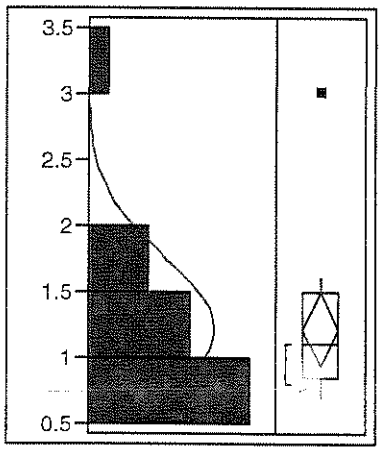
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.868946	0.0211

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TNK



Normal(1.21706,0.54938)

Quantiles

100.0%	maximum	3.0000
99.5%		3.0000
97.5%		3.0000
90.0%		1.8800
75.0%	quartile	1.5000
50.0%	median	1.1000
25.0%	quartile	0.8500
10.0%		0.7800
2.5%		0.7000
0.5%		0.7000
0.0%	minimum	0.7000

Moments

Mean	1.2170588
Std Dev	0.5493833
Std Err Mean	0.133245
upper 95% Mean	1.4995257
lower 95% Mean	0.934592
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.2170588	0.934592	1.4995257
Dispersion	σ	0.5493833	0.4091641	0.8361224

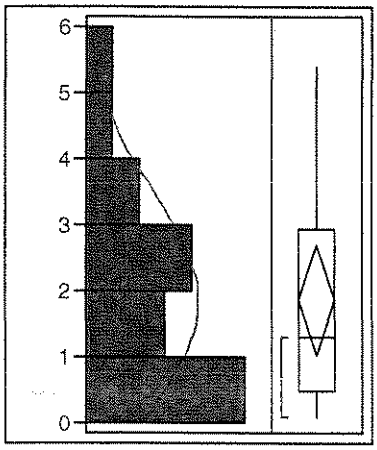
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.757654	0.0006

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrate



Normal(1.86412,1.61538)

Quantiles

100.0%	maximum	5.4000
99.5%		5.4000
97.5%		5.4000
90.0%		4.8400
75.0%	quartile	2.9500
50.0%	median	1.3000
25.0%	quartile	0.4850
10.0%		0.1000
2.5%		0.1000
0.5%		0.1000
0.0%	minimum	0.1000

Moments

Mean	1.8641176
Std Dev	1.6153756
Std Err Mean	0.3917861
upper 95% Mean	2.6946671
lower 95% Mean	1.0335682
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.8641176	1.0335682	2.6946671
Dispersion	σ	1.6153756	1.203083	2.4584868

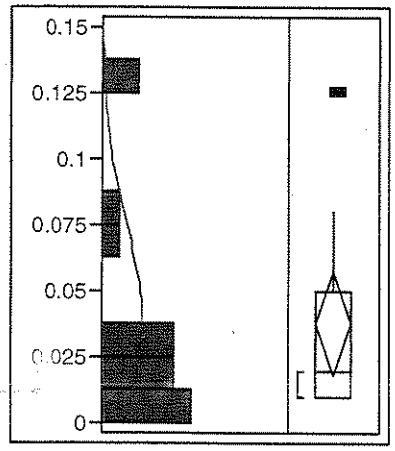
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.908924	0.0959

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrite



Normal(0.03794,0.03833)

Quantiles

100.0%	maximum	0.12500
99.5%		0.12500
97.5%		0.12500
90.0%		0.12500
75.0%	quartile	0.05000
50.0%	median	0.02000
25.0%	quartile	0.01000
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0379412
Std Dev	0.0383267
Std Err Mean	0.0092956
upper 95% Mean	0.0576469
lower 95% Mean	0.0182354
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0379412	0.0182354	0.0576469
Dispersion	σ	0.0383267	0.0285445	0.0583305

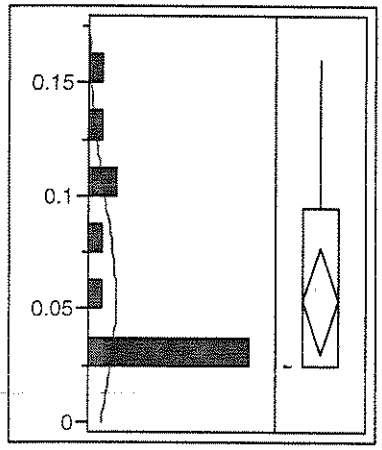
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.713946	0.0002

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Ammonia



Normal(0.05382,0.04557)

Quantiles

100.0%	maximum	0.16000
99.5%		0.16000
97.5%		0.16000
90.0%		0.13600
75.0%	quartile	0.09500
50.0%	median	0.02500
25.0%	quartile	0.02500
10.0%		0.02500
2.5%		0.02500
0.5%		0.02500
0.0%	minimum	0.02500

Moments

Mean	0.0538235
Std Dev	0.0455703
Std Err Mean	0.0110524
upper 95% Mean	0.0772536
lower 95% Mean	0.0303934
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0538235	0.0303934	0.0772536
Dispersion	σ	0.0455703	0.0339394	0.0693548

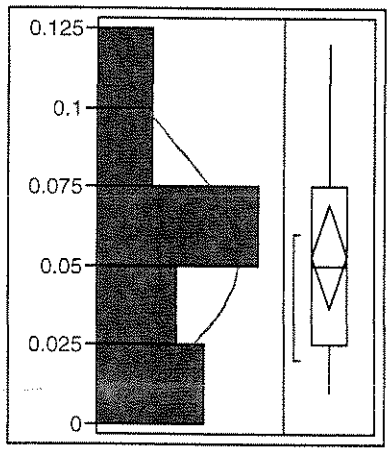
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.686761	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

ORP



Normal(0.05294,0.03236)

Quantiles

100.0%	maximum	0.12000
99.5%		0.12000
97.5%		0.12000
90.0%		0.10400
75.0%	quartile	0.07500
50.0%	median	0.05000
25.0%	quartile	0.02500
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0529412
Std Dev	0.0323583
Std Err Mean	0.007848
upper 95% Mean	0.0695783
lower 95% Mean	0.0363041
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0529412	0.0363041	0.0695783
Dispersion	σ	0.0323583	0.0240995	0.049247

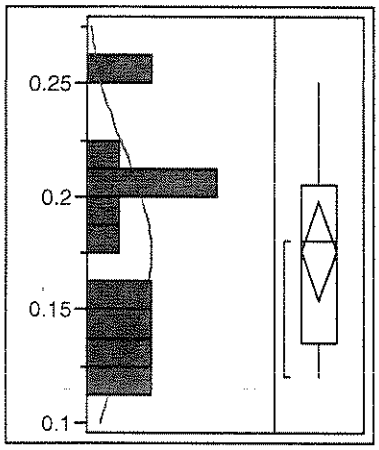
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.954578	0.5328

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TP



Normal(0.17588,0.04331)

Quantiles

100.0%	maximum	0.25000
99.5%		0.25000
97.5%		0.25000
90.0%		0.25000
75.0%	quartile	0.20500
50.0%	median	0.18000
25.0%	quartile	0.13500
10.0%		0.12000
2.5%		0.12000
0.5%		0.12000
0.0%	minimum	0.12000

Moments

Mean	0.1758824
Std Dev	0.0433098
Std Err Mean	0.0105042
upper 95% Mean	0.1981502
lower 95% Mean	0.1536145
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.1758824	0.1536145	0.1981502
Dispersion	σ	0.0433098	0.0322558	0.0659144

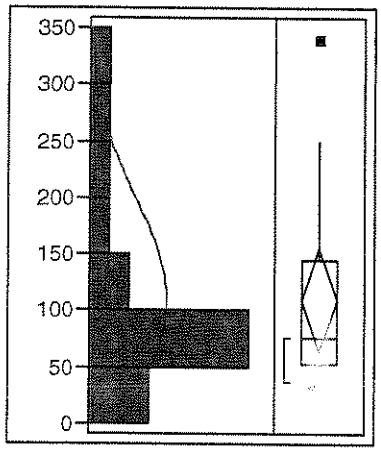
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.922668	0.1638

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TSS



Normal(109.029,88.7846)

Quantiles

100.0%	maximum	337.00
99.5%		337.00
97.5%		337.00
90.0%		267.40
75.0%	quartile	145.00
50.0%	median	76.00
25.0%	quartile	52.25
10.0%		34.40
2.5%		24.00
0.5%		24.00
0.0%	minimum	24.00

Moments

Mean	109.02941
Std Dev	88.784583
Std Err Mean	21.533424
upper 95% Mean	154.67823
lower 95% Mean	63.380591
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	109.02941	63.380591	154.67823
Dispersion	σ	88.784583	66.12408	135.12383

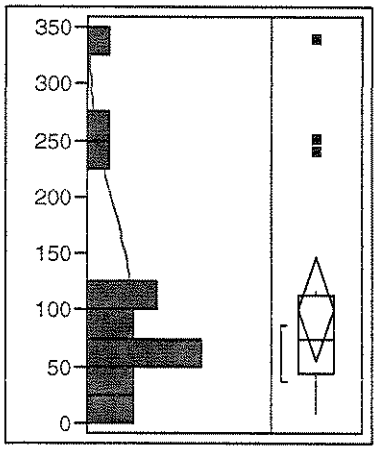
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.796308	0.0018

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

VSS



Normal(101.188,89.9666)

Quantiles

100.0%	maximum	337.00
99.5%		337.00
97.5%		337.00
90.0%		267.40
75.0%	quartile	113.50
50.0%	median	73.70
25.0%	quartile	45.00
10.0%		20.80
2.5%		8.00
0.5%		8.00
0.0%	minimum	8.00

Moments

Mean	101.18824
Std Dev	89.966639
Std Err Mean	21.820115
upper 95% Mean	147.44481
lower 95% Mean	54.931658
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	101.18824	54.931658	147.44481
Dispersion	σ	89.966639	67.004439	136.92283

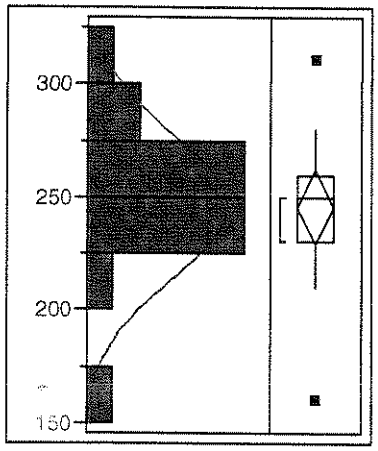
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.795827	0.0018

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TDS



Normal(245.882,32.2217)

Quantiles

100.0%	maximum	310.00
99.5%		310.00
97.5%		310.00
90.0%		286.00
75.0%	quartile	260.00
50.0%	median	250.00
25.0%	quartile	230.00
10.0%		200.00
2.5%		160.00
0.5%		160.00
0.0%	minimum	160.00

Moments

Mean	245.88235
Std Dev	32.221659
Std Err Mean	7.8149002
upper 95% Mean	262.4492
lower 95% Mean	229.3155
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	245.88235	229.3155	262.4492
Dispersion	σ	32.221659	23.99772	49.039075

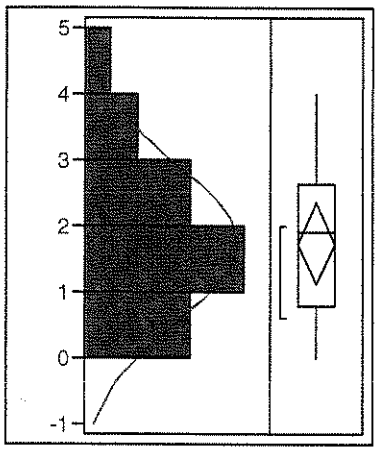
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.925109	0.1801

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

CBOD



Normal(1.74118,1.18747)

Quantiles

100.0%	maximum	4.0000
99.5%		4.0000
97.5%		4.0000
90.0%		3.6800
75.0%	quartile	2.6500
50.0%	median	1.9000
25.0%	quartile	0.8000
10.0%		0.0000
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	0.0000

Moments

Mean	1.7411765
Std Dev	1.1874652
Std Err Mean	0.2880026
upper 95% Mean	2.3517147
lower 95% Mean	1.1306382
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.7411765	1.1306382	2.3517147
Dispersion	σ	1.1874652	0.8843882	1.8072376

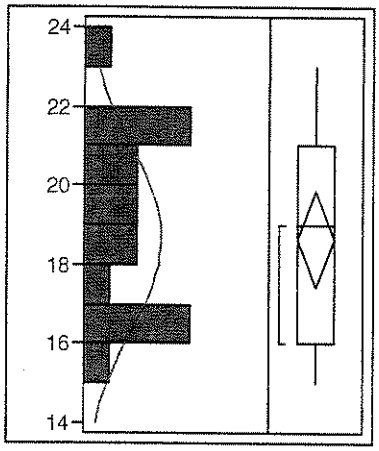
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.965598	0.7377

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chloride



Normal(18.6471,2.37016)

Quantiles

100.0%	maximum	23.000
99.5%		23.000
97.5%		23.000
90.0%		21.400
75.0%	quartile	21.000
50.0%	median	19.000
25.0%	quartile	16.000
10.0%		15.800
2.5%		15.000
0.5%		15.000
0.0%	minimum	15.000

Moments

Mean	18.647059
Std Dev	2.3701576
Std Err Mean	0.5748477
upper 95% Mean	19.865681
lower 95% Mean	17.428436
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	18.647059	17.428436	19.865681
Dispersion	σ	2.3701576	1.7652219	3.6072115

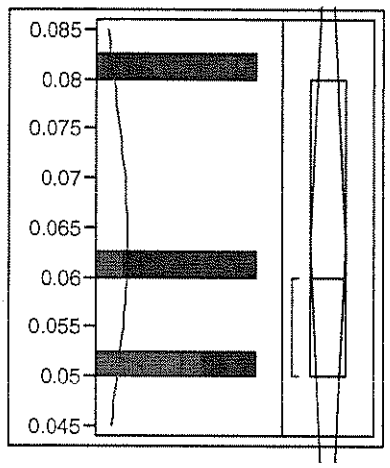
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.931431	0.2300

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Total Ba



Normal(0.06333,0.01528)

Quantiles

100.0%	maximum	0.08000
99.5%		0.08000
97.5%		0.08000
90.0%		0.08000
75.0%	quartile	0.08000
50.0%	median	0.06000
25.0%	quartile	0.05000
10.0%		0.05000
2.5%		0.05000
0.5%		0.05000
0.0%	minimum	0.05000

Moments

Mean	0.0633333
Std Dev	0.0152753
Std Err Mean	0.0088192
upper 95% Mean	0.1012792
lower 95% Mean	0.0253875
N	3

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0633333	0.0253875	0.1012792
Dispersion	σ	0.0152753	0.0079532	0.0960009

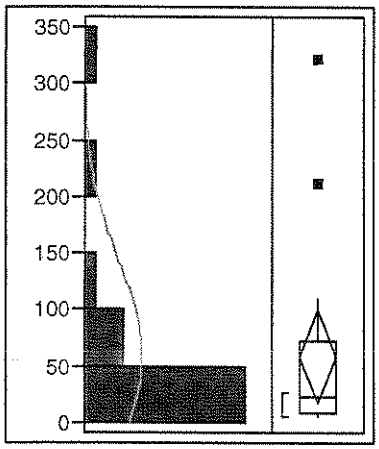
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.964286	0.6369

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Sample Type=Sample
E. coli



Normal(58.7222,83.1284)

Quantiles

100.0%	maximum	320.00
99.5%		320.00
97.5%		320.00
90.0%		221.00
75.0%	quartile	72.50
50.0%	median	23.50
25.0%	quartile	8.75
10.0%		5.00
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	58.722222
Std Dev	83.128395
Std Err Mean	19.593551
upper 95% Mean	100.061
lower 95% Mean	17.383444
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	58.722222	17.383444	100.061
Dispersion	σ	83.128395	62.378516	124.62143

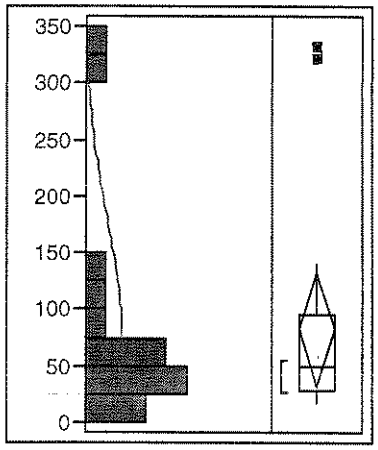
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.675691	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Fecal Coliform



Normal(82.5294,97.0935)

Quantiles

100.0%	maximum	330.00
99.5%		330.00
97.5%		330.00
90.0%		322.00
75.0%	quartile	96.00
50.0%	median	50.00
25.0%	quartile	28.50
10.0%		19.60
2.5%		18.00
0.5%		18.00
0.0%	minimum	18.00

Moments

Mean	82.529412
Std Dev	97.093459
Std Err Mean	23.548623
upper 95% Mean	132.45026
lower 95% Mean	32.608562
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	82.529412	32.608562	132.45026
Dispersion	σ	97.093459	72.312279	147.76935

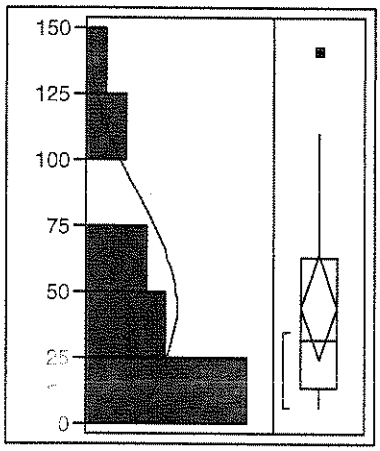
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.650466	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chlor A



Normal(44.1667,40.109)

Quantiles

100.0%	maximum	140.00
99.5%		140.00
97.5%		140.00
90.0%		113.00
75.0%	quartile	62.75
50.0%	median	32.00
25.0%	quartile	13.75
10.0%		8.70
2.5%		6.00
0.5%		6.00
0.0%	minimum	6.00

Moments

Mean	44.166667
Std Dev	40.109043
Std Err Mean	9.453792
upper 95% Mean	64.112424
lower 95% Mean	24.220909
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	44.166667	24.220909	64.112424
Dispersion	σ	40.109043	30.097328	60.12923

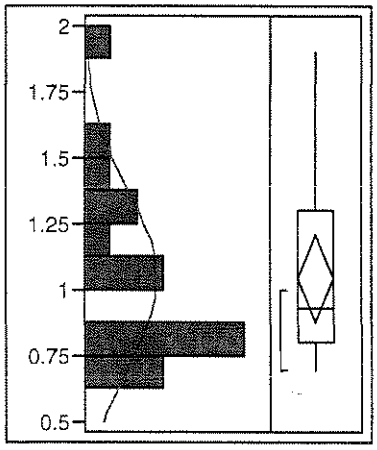
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.832968	0.0046

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TNK



Normal(1.045,0.33326)

Quantiles

100.0%	maximum	1.9000
99.5%		1.9000
97.5%		1.9000
90.0%		1.5400
75.0%	quartile	1.3000
50.0%	median	0.9350
25.0%	quartile	0.8000
10.0%		0.7000
2.5%		0.7000
0.5%		0.7000
0.0%	minimum	0.7000

Moments

Mean	1.045
Std Dev	0.3332593
Std Err Mean	0.07855
upper 95% Mean	1.210726
lower 95% Mean	0.879274
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.045	0.879274	1.210726
Dispersion	σ	0.3332593	0.2500736	0.4996037

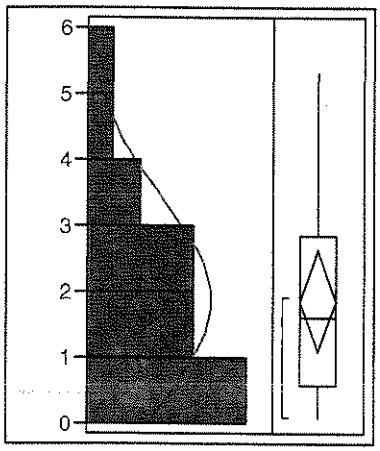
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.875545	0.0220

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrate



Normal(1.855,1.55405)

Quantiles

100.0%	maximum	5.3000
99.5%		5.3000
97.5%		5.3000
90.0%		4.7600
75.0%	quartile	2.8500
50.0%	median	1.6000
25.0%	quartile	0.5825
10.0%		0.1000
2.5%		0.1000
0.5%		0.1000
0.0%	minimum	0.1000

Moments

Mean	1.855
Std Dev	1.5540545
Std Err Mean	0.3662942
upper 95% Mean	2.6278131
lower 95% Mean	1.0821869
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.855	1.0821869	2.6278131
Dispersion	σ	1.5540545	1.1661432	2.3297514

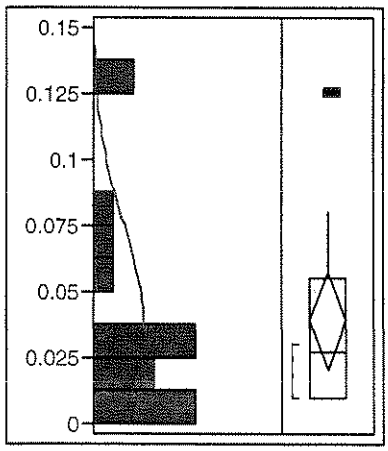
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.915251	0.1065

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrite



Normal(0.03917,0.03707)

Quantiles

100.0%	maximum	0.12500
99.5%		0.12500
97.5%		0.12500
90.0%		0.12500
75.0%	quartile	0.05500
50.0%	median	0.02750
25.0%	quartile	0.01000
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0391667
Std Dev	0.0370711
Std Err Mean	0.0087377
upper 95% Mean	0.0576017
lower 95% Mean	0.0207317
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0391667	0.0207317	0.0576017
Dispersion	σ	0.0370711	0.0278177	0.0555749

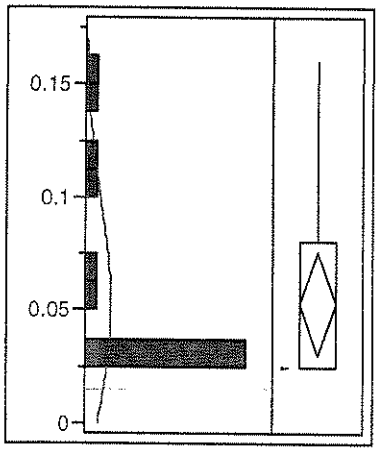
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.752504	0.0003

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Ammonia



Normal(0.05278,0.04631)

Quantiles

100.0%	maximum	0.16000
99.5%		0.16000
97.5%		0.16000
90.0%		0.14200
75.0%	quartile	0.08000
50.0%	median	0.02500
25.0%	quartile	0.02500
10.0%		0.02500
2.5%		0.02500
0.5%		0.02500
0.0%	minimum	0.02500

Moments

Mean	0.0527778
Std Dev	0.0463117
Std Err Mean	0.0109158
upper 95% Mean	0.075808
lower 95% Mean	0.0297475
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0527778	0.0297475	0.075808
Dispersion	σ	0.0463117	0.0347517	0.0694279

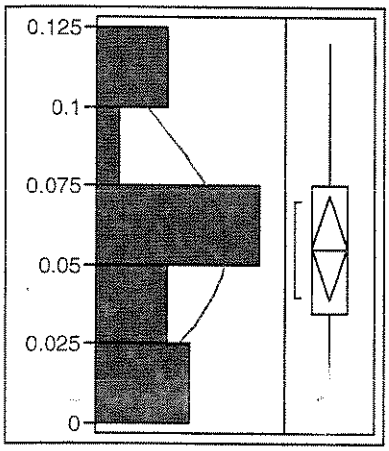
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.658603	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

ORP



Normal(0.05556,0.03258)

Quantiles

100.0%	maximum	0.12000
99.5%		0.12000
97.5%		0.12000
90.0%		0.10200
75.0%	quartile	0.07500
50.0%	median	0.05500
25.0%	quartile	0.03500
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0555556
Std Dev	0.0325797
Std Err Mean	0.0076791
upper 95% Mean	0.0717571
lower 95% Mean	0.039354
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0555556	0.039354	0.0717571
Dispersion	σ	0.0325797	0.0244474	0.0488417

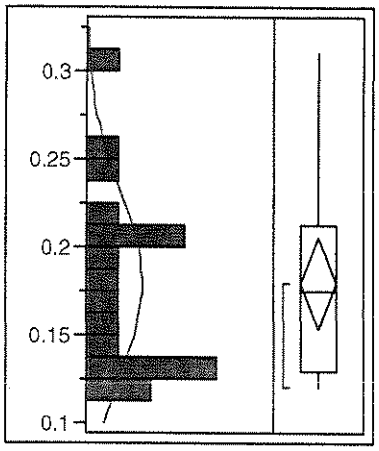
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.948821	0.4068

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TP



Normal(0.17944,0.05319)

Quantiles

100.0%	maximum	0.31000
99.5%		0.31000
97.5%		0.31000
90.0%		0.25600
75.0%	quartile	0.21250
50.0%	median	0.17500
25.0%	quartile	0.13000
10.0%		0.12000
2.5%		0.12000
0.5%		0.12000
0.0%	minimum	0.12000

Moments

Mean	0.1794444
Std Dev	0.0531891
Std Err Mean	0.0125368
upper 95% Mean	0.2058948
lower 95% Mean	0.1529941
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.1794444	0.1529941	0.2058948
Dispersion	σ	0.0531891	0.0399125	0.0797382

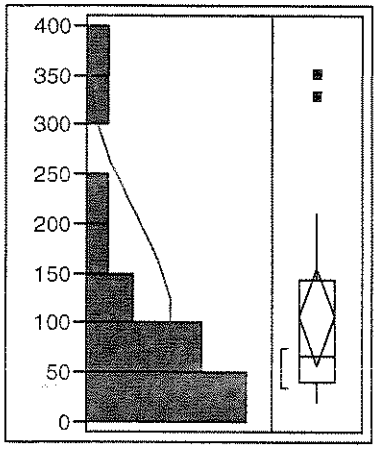
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.909879	0.0856

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TSS



Normal(106.306,99.1136)

Quantiles

100.0%	maximum	350.00
99.5%		350.00
97.5%		350.00
90.0%		329.30
75.0%	quartile	143.00
50.0%	median	67.50
25.0%	quartile	41.00
10.0%		29.05
2.5%		20.50
0.5%		20.50
0.0%	minimum	20.50

Moments

Mean	106.30556
Std Dev	99.113592
Std Err Mean	23.361298
upper 95% Mean	155.59359
lower 95% Mean	57.017526
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	106.30556	57.017526	155.59359
Dispersion	σ	99.113592	74.37361	148.58555

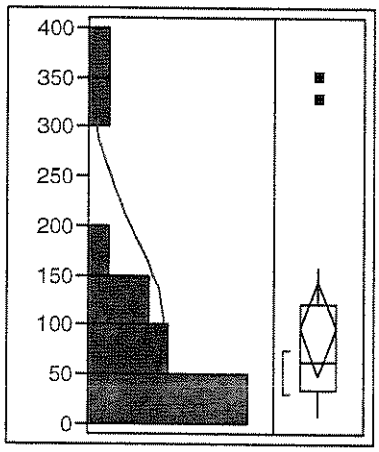
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.764689	0.0005

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

VSS



Normal(96.1889,96.9537)

Quantiles

100.0%	maximum	350.00
99.5%		350.00
97.5%		350.00
90.0%		329.30
75.0%	quartile	121.25
50.0%	median	62.00
25.0%	quartile	35.00
10.0%		19.30
2.5%		8.50
0.5%		8.50
0.0%	minimum	8.50

Moments

Mean	96.188889
Std Dev	96.953724
Std Err Mean	22.852212
upper 95% Mean	144.40284
lower 95% Mean	47.974936
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	96.188889	47.974936	144.40284
Dispersion	σ	96.953724	72.752872	145.34759

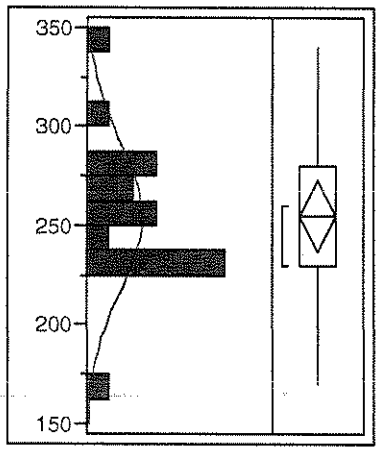
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.739179	0.0002

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TDS



Normal(255,37.4559)

Quantiles

100.0%	maximum	340.00
99.5%		340.00
97.5%		340.00
90.0%		313.00
75.0%	quartile	280.00
50.0%	median	255.00
25.0%	quartile	230.00
10.0%		224.00
2.5%		170.00
0.5%		170.00
0.0%	minimum	170.00

Moments

Mean	255
Std Dev	37.455856
Std Err Mean	8.82843
upper 95% Mean	273.62636
lower 95% Mean	236.37364
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	255	236.37364	273.62636
Dispersion	σ	37.455856	28.10641	56.151722

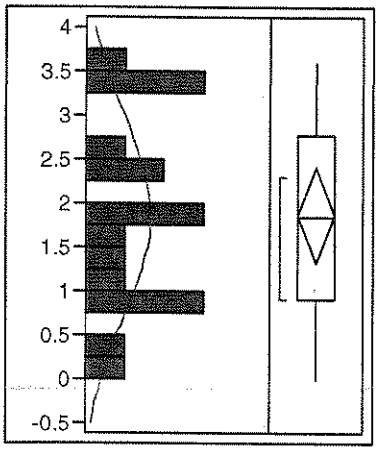
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.933601	0.2246

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

CBOD



Normal(1.86389,1.10131)

Quantiles

100.0%	maximum	3.6000
99.5%		3.6000
97.5%		3.6000
90.0%		3.4200
75.0%	quartile	2.7750
50.0%	median	1.8500
25.0%	quartile	0.9000
10.0%		0.2250
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	0.0000

Moments

Mean	1.8638889
Std Dev	1.1013101
Std Err Mean	0.2595813
upper 95% Mean	2.4115575
lower 95% Mean	1.3162202
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.8638889	1.3162202	2.4115575
Dispersion	σ	1.1013101	0.8264095	1.6510225

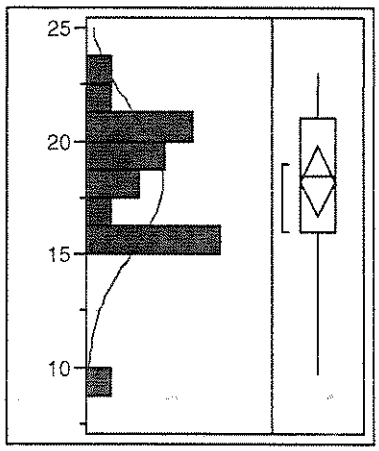
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.951938	0.4562

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chloride



Normal(18.2056,3.1072)

Quantiles

100.0%	maximum	23.000
99.5%		23.000
97.5%		23.000
90.0%		22.100
75.0%	quartile	21.000
50.0%	median	18.500
25.0%	quartile	16.000
10.0%		15.370
2.5%		9.700
0.5%		9.700
0.0%	minimum	9.700

Moments

Mean	18.205556
Std Dev	3.107197
Std Err Mean	0.7323734
upper 95% Mean	19.750728
lower 95% Mean	16.660383
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	18.205556	16.660383	19.750728
Dispersion	σ	3.107197	2.3316021	4.6581357

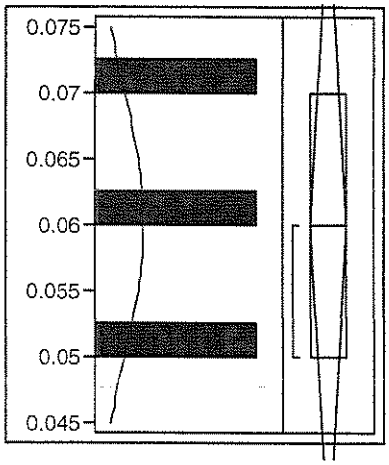
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.913593	0.0996

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Total Ba



Normal(0.06,0.01)

Quantiles

100.0%	maximum	0.07000
99.5%		0.07000
97.5%		0.07000
90.0%		0.07000
75.0%	quartile	0.07000
50.0%	median	0.06000
25.0%	quartile	0.05000
10.0%		0.05000
2.5%		0.05000
0.5%		0.05000
0.0%	minimum	0.05000

Moments

Mean	0.06
Std Dev	0.01
Std Err Mean	0.0057735
upper 95% Mean	0.0848414
lower 95% Mean	0.0351586
N	3

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.06	0.0351586	0.0848414
Dispersion	σ	0.01	0.0052066	0.0628473

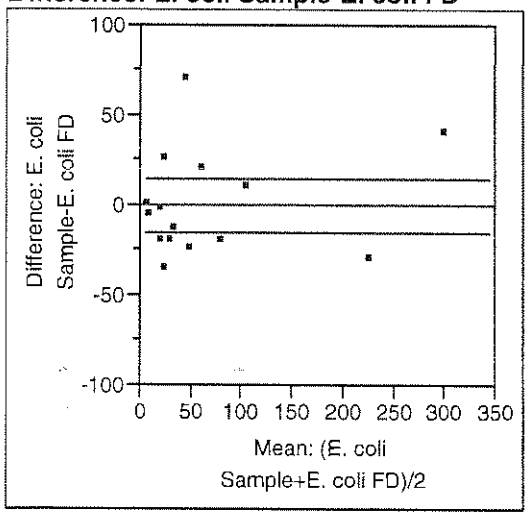
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
1.000000	1.0000

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Matched Pairs
Difference: E. coli Sample-E. coli FD

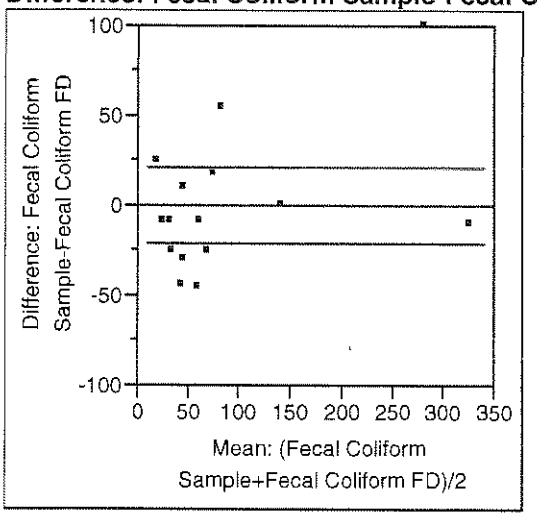


E. coli Sample	64.1875	t-Ratio	-0.07132
E. coli FD	64.6875	DF	15
Mean Difference	-0.5	Prob > |t|	0.9441
Std Error	7.01071	Prob > t	0.5280
Upper95%	14.443	Prob < t	0.4720
Lower95%	-15.443		
N	16		
Correlation	0.94646		

Wilcoxon Sign-Rank

	E. coli Sample-E. coli FD
Test Statistic	-8.500
Prob > |z|	0.648
Prob > z	0.676
Prob < z	0.324

Matched Pairs
Difference: Fecal Coliform Sample-Fecal Coliform FD

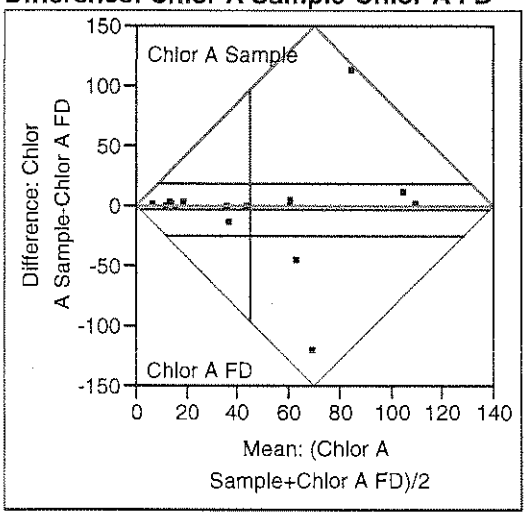


Fecal Coliform Sample	88.2	t-Ratio	0.006728
Fecal Coliform FD	88.1333	DF	14
Mean Difference	0.06667	Prob > |t|	0.9947
Std Error	9.90885	Prob > t	0.4974
Upper95%	21.319	Prob < t	0.5026
Lower95%	-21.186		
N	15		
Correlation	0.93184		

Wilcoxon Sign-Rank

	Fecal Coliform Sample-Fecal Coliform FD
Test Statistic	-7.000
Prob > |z|	0.683
Prob > z	0.659
Prob < z	0.341

Matched Pairs
Difference: Chlor A Sample-Chlor A FD

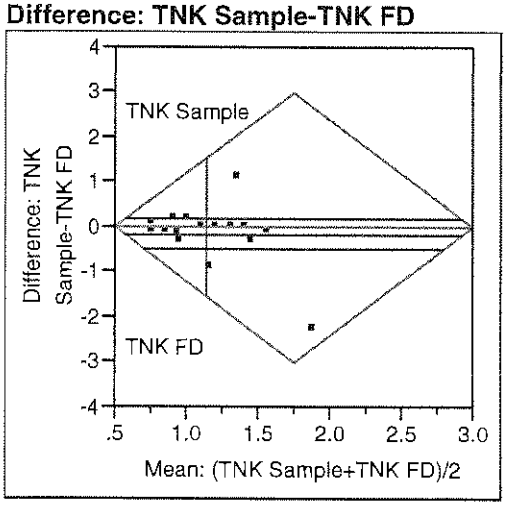


Chlor A Sample	42.9412	t-Ratio	-0.352
Chlor A FD	46.5882	DF	16
Mean Difference	-3.6471	Prob > |t|	0.7294
Std Error	10.3611	Prob > t	0.6353
Upper95%	18.3175	Prob < t	0.3647
Lower95%	-25.612		
N	17		
Correlation	0.42728		

Wilcoxon Sign-Rank

	Chlor A Sample-Chlor A FD
Test Statistic	-7.500
Prob > |z|	0.578
Prob > z	0.711
Prob < z	0.289

Matched Pairs
Difference: TNK Sample-TNK FD



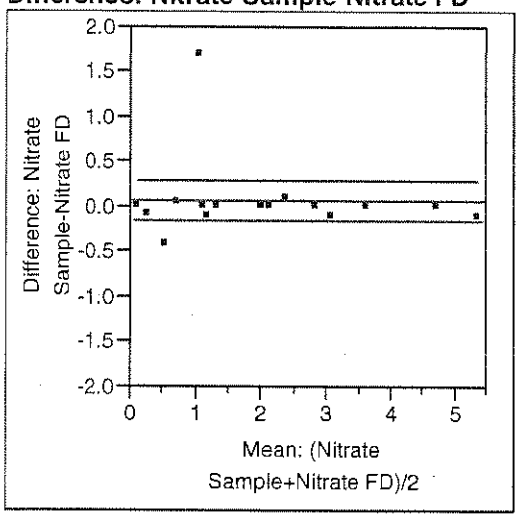
TNK Sample	1.05941	t-Ratio	-0.98064
TNK FD	1.21706	DF	16
Mean Difference	-0.1576	Prob > |t|	0.3414
Std Error	0.16076	Prob > t	0.8293
Upper95%	0.18315	Prob < t	0.1707
Lower95%	-0.4984		
N	17		
Correlation	-0.0633		

Wilcoxon Sign-Rank

	TNK Sample-TNK FD
Test Statistic	-15.500
Prob > |z|	0.292
Prob > z	0.854
Prob < z	0.146

Matched Pairs

Difference: Nitrate Sample-Nitrate FD

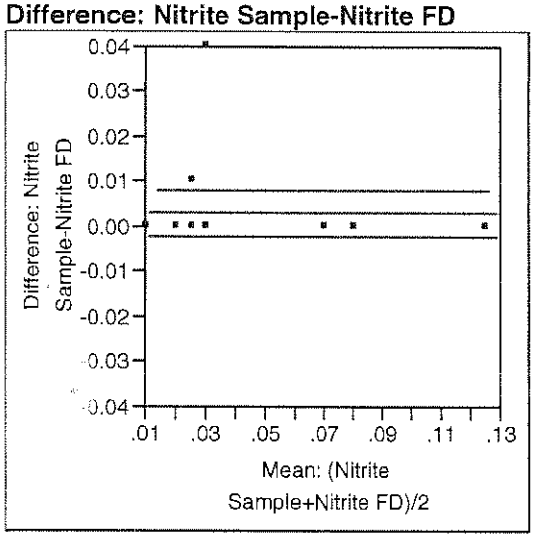


Nitrate Sample	1.92412	t-Ratio	0.565371
Nitrate FD	1.86412	DF	16
Mean Difference	0.06	Prob > |t|	0.5797
Std Error	0.10612	Prob > t	0.2898
Upper95%	0.28497	Prob < t	0.7102
Lower95%	-0.165		
N	17		
Correlation	0.96268		

Wilcoxon Sign-Rank

	Nitrate Sample-Nitrate FD
Test Statistic	-4.500
Prob > |z|	0.594
Prob > z	0.703
Prob < z	0.297

Matched Pairs
Difference: Nitrite Sample-Nitrite FD

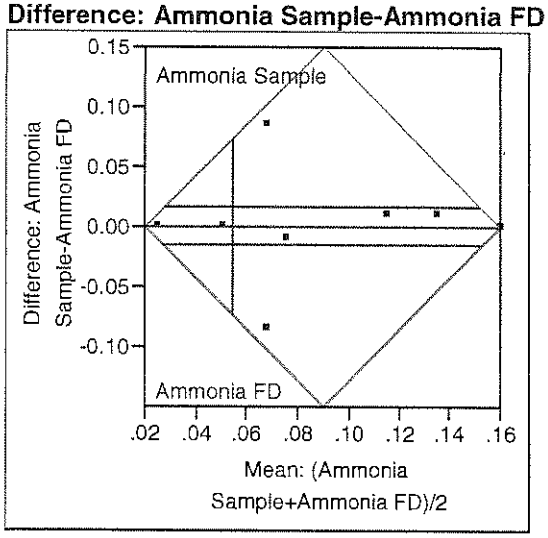


Nitrite Sample	0.04088	t-Ratio	1.230915
Nitrite FD	0.03794	DF	16
Mean Difference	0.00294	Prob > |t|	0.2361
Std Error	0.00239	Prob > t	0.1181
Upper95%	0.00801	Prob < t	0.8819
Lower95%	-0.0021		
N	17		
Correlation	0.96646		

Wilcoxon Sign-Rank

	Nitrite Sample-Nitrite FD
Test Statistic	1.500
Prob > |z|	0.500
Prob > z	0.250
Prob < z	0.750

Matched Pairs
Difference: Ammonia Sample-Ammonia FD

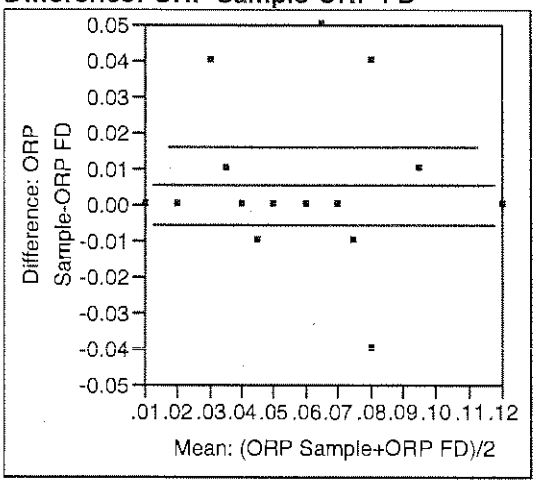


Ammonia Sample	0.05441	t-Ratio	0.079896
Ammonia FD	0.05382	DF	16
Mean Difference	0.00059	Prob > |t|	0.9373
Std Error	0.00736	Prob > t	0.4687
Upper95%	0.0162	Prob < t	0.5313
Lower95%	-0.015		
N	17		
Correlation	0.7864		

Wilcoxon Sign-Rank

	Ammonia Sample-Ammonia FD
Test Statistic	1.000
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Matched Pairs
Difference: ORP Sample-ORP FD

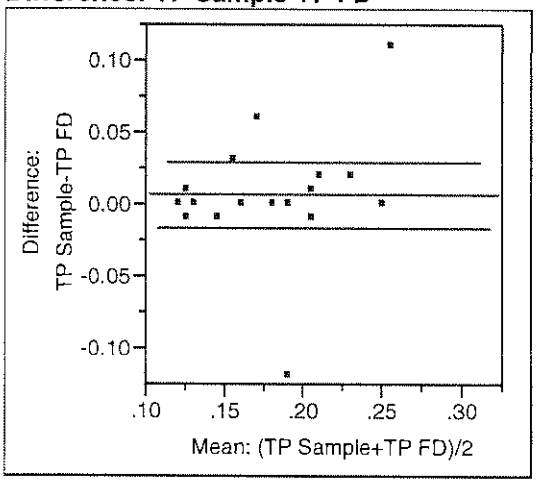


ORP Sample	0.05824	t-Ratio	1.027314
ORP FD	0.05294	DF	16
Mean Difference	0.00529	Prob > |t|	0.3196
Std Error	0.00515	Prob > t	0.1598
Upper95%	0.01622	Prob < t	0.8402
Lower95%	-0.0056		
N	17		
Correlation	0.77872		

Wilcoxon Sign-Rank

	ORP Sample-ORP FD
Test Statistic	7.000
Prob > |z|	0.422
Prob > z	0.211
Prob < z	0.789

Matched Pairs
Difference: TP Sample-TP FD

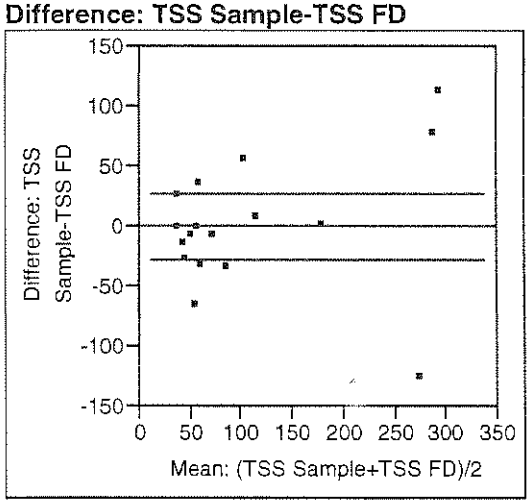


TP Sample	0.18235	t-Ratio	0.600434
TP FD	0.17588	DF	16
Mean Difference	0.00647	Prob > |t|	0.5566
Std Error	0.01078	Prob > t	0.2783
Upper95%	0.02932	Prob < t	0.7217
Lower95%	-0.0164		
N	17		
Correlation	0.59435		

Wilcoxon Sign-Rank

	TP Sample-TP FD
Test Statistic	13.000
Prob > |z|	0.261
Prob > z	0.130
Prob < z	0.870

Matched Pairs
Difference: TSS Sample-TSS FD

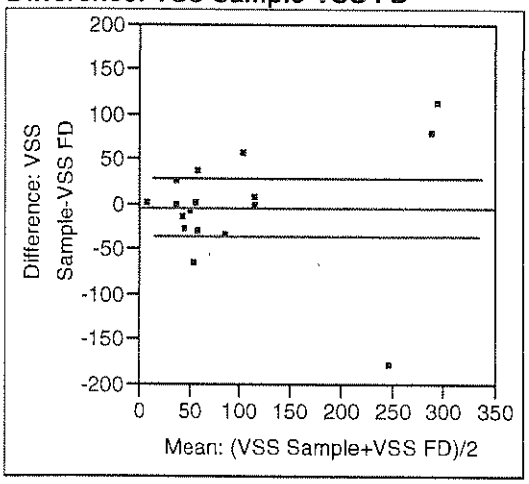


TSS Sample	108.265	t-Ratio	-0.05807
TSS FD	109.029	DF	16
Mean Difference	-0.7647	Prob > |t|	0.9544
Std Error	13.1684	Prob > t	0.5228
Upper95%	27.151	Prob < t	0.4772
Lower95%	-28.68		
N	17		
Correlation	0.8463		

Wilcoxon Sign-Rank

	TSS Sample-TSS FD
Test Statistic	-6.500
Prob > |z|	0.754
Prob > z	0.623
Prob < z	0.377

Matched Pairs
Difference: VSS Sample-VSS FD

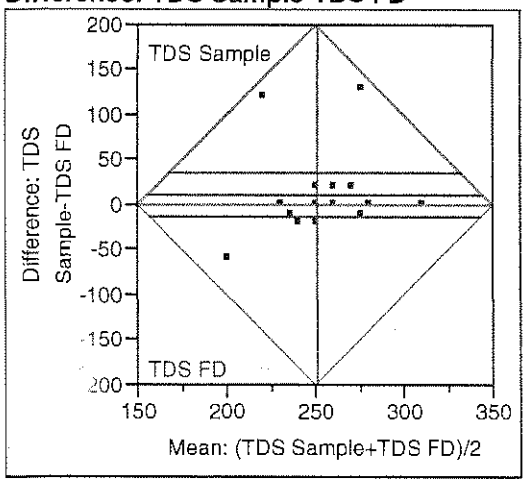


VSS Sample	97.7647	t-Ratio	-0.22445
VSS FD	101.188	DF	16
Mean Difference	-3.4235	Prob > |t|	0.8253
Std Error	15.2531	Prob > t	0.5874
Upper95%	28.9117	Prob < t	0.4126
Lower95%	-35.759		
N	17		
Correlation	0.7848		

Wilcoxon Sign-Rank

	VSS Sample-VSS FD
Test Statistic	-7.000
Prob > |z|	0.756
Prob > z	0.622
Prob < z	0.378

Matched Pairs
Difference: TDS Sample-TDS FD

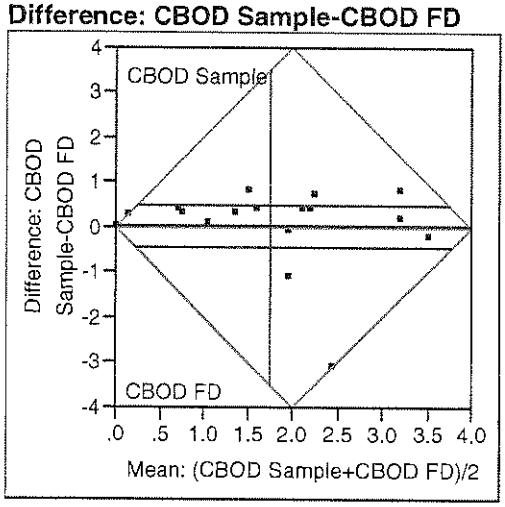


TDS Sample	256.471	t-Ratio	0.929516
TDS FD	245.882	DF	16
Mean Difference	10.5882	Prob > |t|	0.3664
Std Error	11.3911	Prob > t	0.1832
Upper95%	34.7363	Prob < t	0.8168
Lower95%	-13.56		
N	17		
Correlation	0.11479		

Wilcoxon Sign-Rank

	TDS Sample-TDS FD
Test Statistic	6.000
Prob > |z|	0.641
Prob > z	0.320
Prob < z	0.680

Matched Pairs
Difference: CBOD Sample-CBOD FD

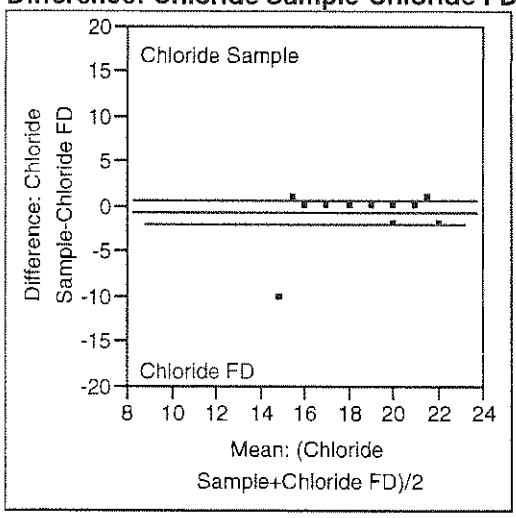


CBOD Sample	1.77353	t-Ratio	0.144928
CBOD FD	1.74118	DF	16
Mean Difference	0.03235	Prob > |t|	0.8866
Std Error	0.22323	Prob > t	0.4433
Upper95%	0.50559	Prob < t	0.5567
Lower95%	-0.4409		
N	17		
Correlation	0.67082		

Wilcoxon Sign-Rank

	CBOD Sample-CBOD FD
Test Statistic	32.000
Prob > |z|	0.102
Prob > z	0.051
Prob < z	0.949

Matched Pairs
Difference: Chloride Sample-Chloride FD

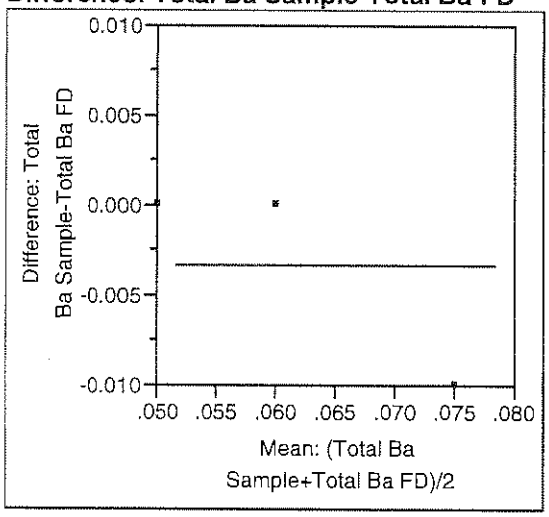


Chloride Sample	17.9235	t-Ratio	-1.15256
Chloride FD	18.6471	DF	16
Mean Difference	-0.7235	Prob > |t|	0.2660
Std Error	0.62776	Prob > t	0.8670
Upper95%	0.60726	Prob < t	0.1330
Lower95%	-2.0543		
N	17		
Correlation	0.54635		

Wilcoxon Sign-Rank

	Chloride Sample-Chloride FD
Test Statistic	-4.500
Prob > |z|	0.250
Prob > z	0.875
Prob < z	0.125

Matched Pairs
Difference: Total Ba Sample-Total Ba FD



Total Ba Sample	0.06	t-Ratio	-1
Total Ba FD	0.06333	DF	2
Mean Difference	-0.0033	Prob > |t|	0.4226
Std Error	0.00333	Prob > t	0.7887
Upper95%	0.01101	Prob < t	0.2113
Lower95%	-0.0177		
N	3		
Correlation	0.98198		

Wilcoxon Sign-Rank

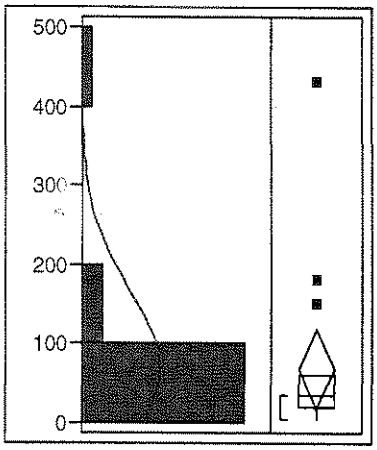
	Total Ba Sample-Total Ba FD
Test Statistic	-0.500
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Appendix A-6

QA/QC Calculations for Field Duplicates and Corresponding Samples Sample Location M-10

Appendix A.6
QA/QC Calculations for Field Duplicates and Corresponding Samples
Sample Location M-10

Distributions Sample Type=FD
E. coli



Normal(69.2222,101.26)

Quantiles

100.0%	maximum	430.00
99.5%		430.00
97.5%		430.00
90.0%		205.00
75.0%	quartile	60.00
50.0%	median	36.00
25.0%	quartile	19.50
10.0%		5.00
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	69.222222
Std Dev	101.26004
Std Err Mean	23.867219
upper 95% Mean	119.57765
lower 95% Mean	18.866791
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	69.222222	18.866791	119.57765
Dispersion	σ	101.26004	75.984274	151.80337

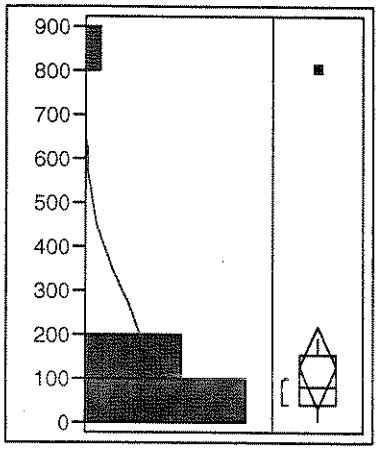
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.591508	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Fecal Coliform



Normal(125.588,182.49)

Quantiles

100.0%	maximum	800.00
99.5%		800.00
97.5%		800.00
90.0%		312.00
75.0%	quartile	155.00
50.0%	median	80.00
25.0%	quartile	42.50
10.0%		9.00
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	125.58824
Std Dev	182.49043
Std Err Mean	44.260431
upper 95% Mean	219.41616
lower 95% Mean	31.760314
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	125.58824	31.760314	219.41616
Dispersion	σ	182.49043	135.91337	277.73747

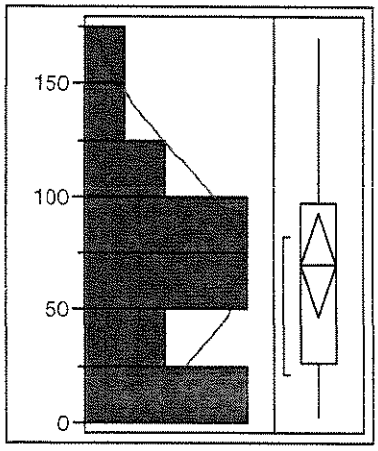
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.541520	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chlor A



Normal(69.8333,45.9197)

Quantiles

100.0%	maximum	170.00
99.5%		170.00
97.5%		170.00
90.0%		143.00
75.0%	quartile	97.25
50.0%	median	69.50
25.0%	quartile	26.25
10.0%		6.60
2.5%		3.00
0.5%		3.00
0.0%	minimum	3.00

Moments

Mean	69.833333
Std Dev	45.919687
Std Err Mean	10.823374
upper 95% Mean	92.668656
lower 95% Mean	46.99801
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	69.833333	46.99801	92.668656
Dispersion	σ	45.919687	34.457563	68.840223

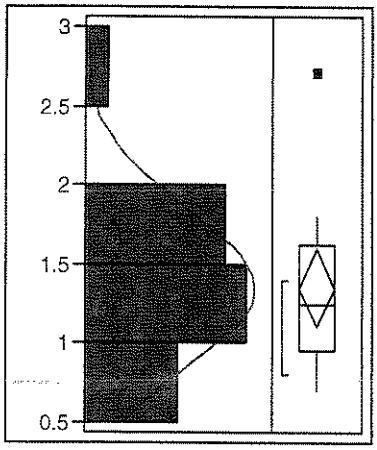
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.967195	0.7436

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TKN



Normal(1.35056,0.49194)

Quantiles

100.0%	maximum	2.7000
99.5%		2.7000
97.5%		2.7000
90.0%		1.8900
75.0%	quartile	1.6250
50.0%	median	1.2500
25.0%	quartile	0.9525
10.0%		0.7900
2.5%		0.7000
0.5%		0.7000
0.0%	minimum	0.7000

Moments

Mean	1.3505556
Std Dev	0.4919406
Std Err Mean	0.1159515
upper 95% Mean	1.5951919
lower 95% Mean	1.1059192
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.3505556	1.1059192	1.5951919
Dispersion	σ	0.4919406	0.3691461	0.7374898

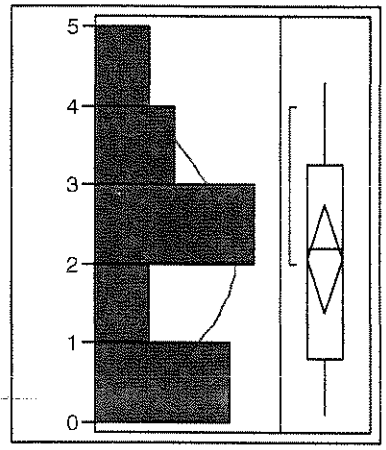
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.912952	0.0970

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrate



Normal(2.07778,1.3718)

Quantiles

100.0%	maximum	4.3000
99.5%		4.3000
97.5%		4.3000
90.0%		4.0300
75.0%	quartile	3.2500
50.0%	median	2.2000
25.0%	quartile	0.8000
10.0%		0.1000
2.5%		0.1000
0.5%		0.1000
0.0%	minimum	0.1000

Moments

Mean	2.0777778
Std Dev	1.3717981
Std Err Mean	0.3233359
upper 95% Mean	2.7599569
lower 95% Mean	1.3955986
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2.0777778	1.3955986	2.7599569
Dispersion	σ	1.3717981	1.0293803	2.0565229

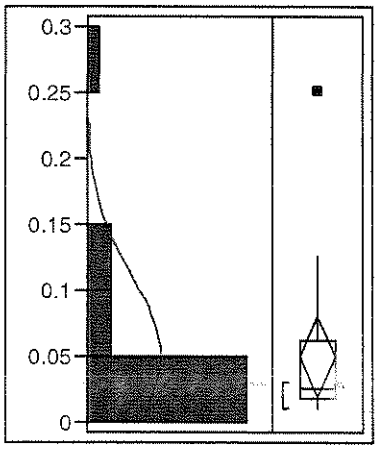
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.944958	0.3515

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrite



Normal(0.05,0.06133)

Quantiles

100.0%	maximum	0.25000
99.5%		0.25000
97.5%		0.25000
90.0%		0.13750
75.0%	quartile	0.06250
50.0%	median	0.02500
25.0%	quartile	0.01750
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.05
Std Dev	0.0613332
Std Err Mean	0.0144564
upper 95% Mean	0.0805003
lower 95% Mean	0.0194997
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.05	0.0194997	0.0805003
Dispersion	σ	0.0613332	0.0460237	0.0919473

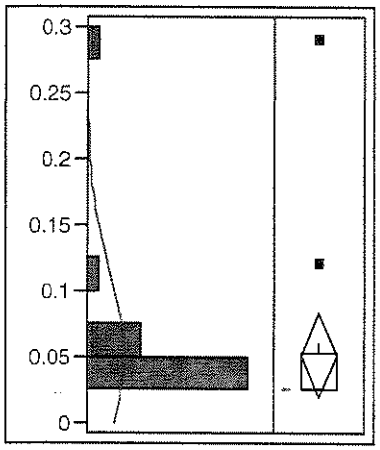
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.666082	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Ammonia



Normal(0.05167,0.06424)

Quantiles

100.0%	maximum	0.29000
99.5%		0.29000
97.5%		0.29000
90.0%		0.13700
75.0%	quartile	0.05250
50.0%	median	0.02500
25.0%	quartile	0.02500
10.0%		0.02500
2.5%		0.02500
0.5%		0.02500
0.0%	minimum	0.02500

Moments

Mean	0.0516667
Std Dev	0.0642376
Std Err Mean	0.0151409
upper 95% Mean	0.0836113
lower 95% Mean	0.0197221
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0516667	0.0197221	0.0836113
Dispersion	σ	0.0642376	0.0482031	0.0963014

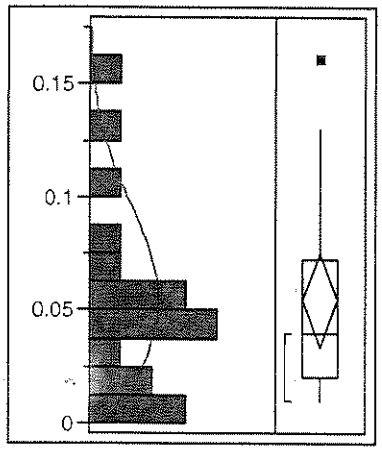
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.479372	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

ORP



Normal(0.05444,0.04176)

Quantiles

100.0%	maximum	0.16000
99.5%		0.16000
97.5%		0.16000
90.0%		0.13300
75.0%	quartile	0.07250
50.0%	median	0.04000
25.0%	quartile	0.02000
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0544444
Std Dev	0.0417587
Std Err Mean	0.0098426
upper 95% Mean	0.0752106
lower 95% Mean	0.0336783
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0544444	0.0336783	0.0752106
Dispersion	σ	0.0417587	0.0313352	0.0626023

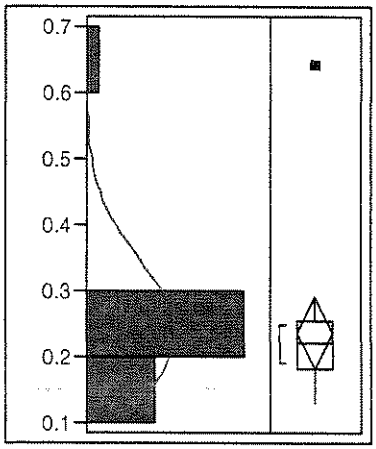
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.881435	0.0276

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TP



Normal(0.23667,0.11029)

Quantiles

100.0%	maximum	0.64000
99.5%		0.64000
97.5%		0.64000
90.0%		0.32500
75.0%	quartile	0.25500
50.0%	median	0.22000
25.0%	quartile	0.18250
10.0%		0.13900
2.5%		0.13000
0.5%		0.13000
0.0%	minimum	0.13000

Moments

Mean	0.2366667
Std Dev	0.1102937
Std Err Mean	0.0259965
upper 95% Mean	0.2915144
lower 95% Mean	0.1818189
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.2366667	0.1818189	0.2915144
Dispersion	σ	0.1102937	0.082763	0.1653462

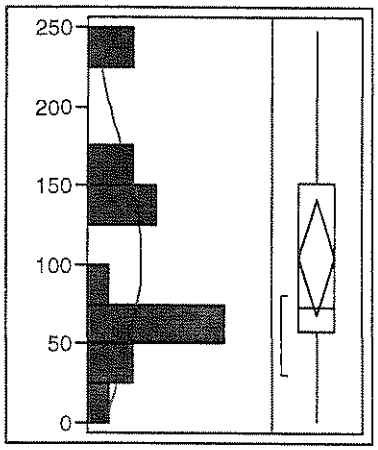
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.646514	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TSS



Normal(104.765,72.2887)

Quantiles

100.0%	maximum	247.00
99.5%		247.00
97.5%		247.00
90.0%		247.00
75.0%	quartile	151.00
50.0%	median	73.00
25.0%	quartile	58.00
10.0%		24.30
2.5%		1.50
0.5%		1.50
0.0%	minimum	1.50

Moments

Mean	104.76471
Std Dev	72.288726
Std Err Mean	17.532591
upper 95% Mean	141.93214
lower 95% Mean	67.597273
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	104.76471	67.597273	141.93214
Dispersion	σ	72.288726	53.838463	110.0183

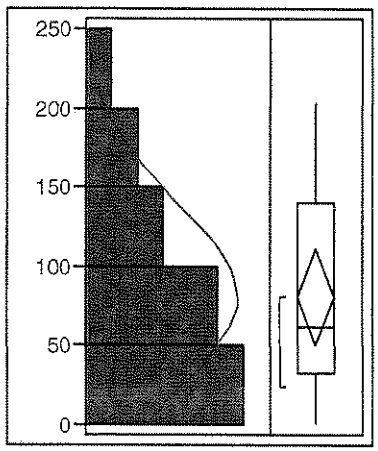
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.907341	0.0902

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

VSS



Normal(80.8653,59.3445)

Quantiles

100.0%	maximum	203.00
99.5%		203.00
97.5%		203.00
90.0%		166.20
75.0%	quartile	140.25
50.0%	median	62.00
25.0%	quartile	32.50
10.0%		6.70
2.5%		1.50
0.5%		1.50
0.0%	minimum	1.50

Moments

Mean	80.865294
Std Dev	59.344511
Std Err Mean	14.393158
upper 95% Mean	111.37743
lower 95% Mean	50.353162
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	80.865294	50.353162	111.37743
Dispersion	σ	59.344511	44.198002	90.318129

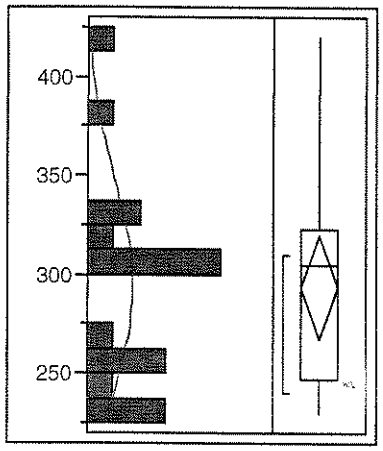
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.934305	0.2567

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TDS



Normal(293.889,52.9305)

Quantiles

100.0%	maximum	420.00
99.5%		420.00
97.5%		420.00
90.0%		384.00
75.0%	quartile	322.50
50.0%	median	305.00
25.0%	quartile	247.50
10.0%		230.00
2.5%		230.00
0.5%		230.00
0.0%	minimum	230.00

Moments

Mean	293.88889
Std Dev	52.930464
Std Err Mean	12.47583
upper 95% Mean	320.21059
lower 95% Mean	267.56719
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	293.88889	267.56719	320.21059
Dispersion	σ	52.930464	39.718363	79.350387

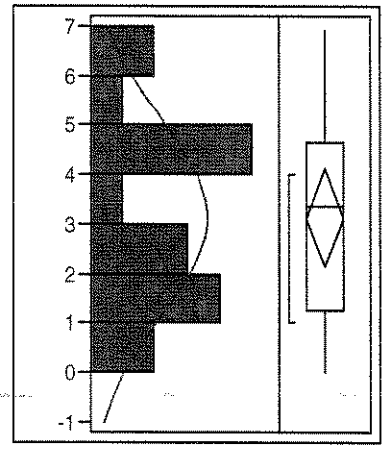
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.915673	0.1084

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

CBOD



Normal(3.13889,1.99356)

Quantiles

100.0%	maximum	6.9000
99.5%		6.9000
97.5%		6.9000
90.0%		6.1800
75.0%	quartile	4.6750
50.0%	median	3.3500
25.0%	quartile	1.2500
10.0%		0.8100
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	0.0000

Moments

Mean	3.1388889
Std Dev	1.9935599
Std Err Mean	0.4698866
upper 95% Mean	4.1302629
lower 95% Mean	2.1475149
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3.1388889	2.1475149	4.1302629
Dispersion	σ	1.9935599	1.4959426	2.9886333

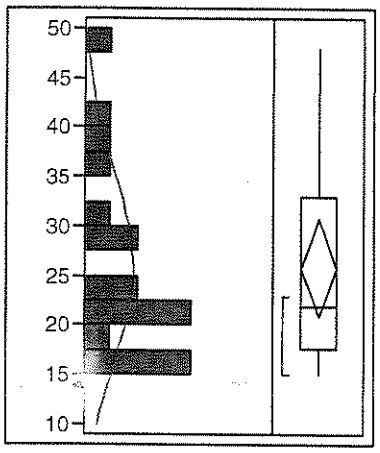
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.951630	0.4512

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chloride



Normal(25.8333,9.90692)

Quantiles

100.0%	maximum	48.000
99.5%		48.000
97.5%		48.000
90.0%		42.600
75.0%	quartile	33.000
50.0%	median	22.000
25.0%	quartile	17.750
10.0%		15.000
2.5%		15.000
0.5%		15.000
0.0%	minimum	15.000

Moments

Mean	25.833333
Std Dev	9.9069197
Std Err Mean	2.3350834
upper 95% Mean	30.759929
lower 95% Mean	20.906738
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	25.833333	20.906738	30.759929
Dispersion	σ	9.9069197	7.4340297	14.851899

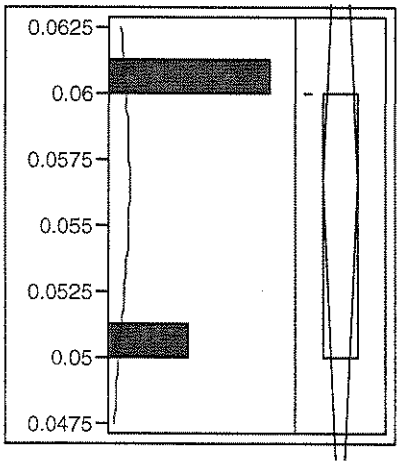
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.897291	0.0516

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Total Ba



Normal(0.05667,0.00577)

Quantiles

100.0%	maximum	0.06000
99.5%		0.06000
97.5%		0.06000
90.0%		0.06000
75.0%	quartile	0.06000
50.0%	median	0.06000
25.0%	quartile	0.05000
10.0%		0.05000
2.5%		0.05000
0.5%		0.05000
0.0%	minimum	0.05000

Moments

Mean	0.0566667
Std Dev	0.0057735
Std Err Mean	0.0033333
upper 95% Mean	0.0710088
lower 95% Mean	0.0423245
N	3

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0566667	0.0423245	0.0710088
Dispersion	σ	0.0057735	0.003006	0.0362849

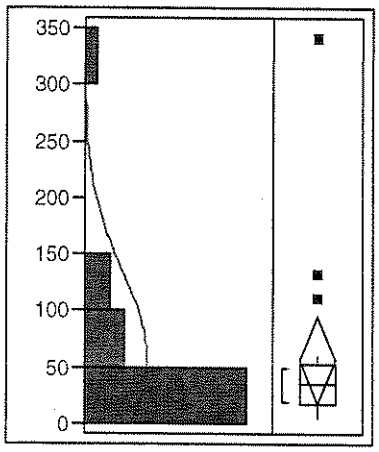
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.750000	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Sample Type=Sample
E. coli



Normal(56.7778,78.2068)

Quantiles

100.0%	maximum	340.00
99.5%		340.00
97.5%		340.00
90.0%		151.00
75.0%	quartile	52.50
50.0%	median	35.00
25.0%	quartile	17.50
10.0%		5.00
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	56.777778
Std Dev	78.206781
Std Err Mean	18.433515
upper 95% Mean	95.669095
lower 95% Mean	17.88646
N	18

Fitted Normal
Parameter Estimates

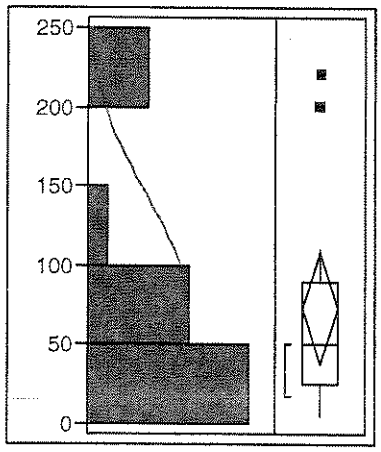
Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	56.777778	17.88646	95.669095
Dispersion	σ	78.206781	58.685399	117.24323

Goodness-of-Fit Test
Shapiro-Wilk W Test

W	Prob<W
0.603473	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Fecal Coliform



Normal(72.8824,68.4625)

Quantiles

100.0%	maximum	220.00
99.5%		220.00
97.5%		220.00
90.0%		204.00
75.0%	quartile	90.00
50.0%	median	50.00
25.0%	quartile	25.00
10.0%		15.40
2.5%		5.00
0.5%		5.00
0.0%	minimum	5.00

Moments

Mean	72.882353
Std Dev	68.462474
Std Err Mean	16.604589
upper 95% Mean	108.08251
lower 95% Mean	37.682197
N	17

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	72.882353	37.682197	108.08251
Dispersion	σ	68.462474	50.988785	104.19502

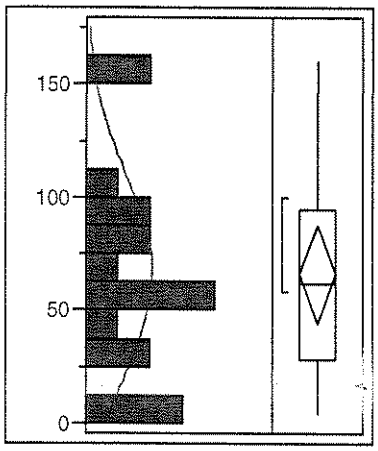
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.774937	0.0009

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chlor A



Normal(65.8889,44.2226)

Quantiles

100.0%	maximum	160.00
99.5%		160.00
97.5%		160.00
90.0%		151.00
75.0%	quartile	94.25
50.0%	median	61.50
25.0%	quartile	28.25
10.0%		7.60
2.5%		4.00
0.5%		4.00
0.0%	minimum	4.00

Moments

Mean	65.888889
Std Dev	44.222551
Std Err Mean	10.423355
upper 95% Mean	87.880246
lower 95% Mean	43.897532
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	65.888889	43.897532	87.880246
Dispersion	σ	44.222551	33.184053	66.295971

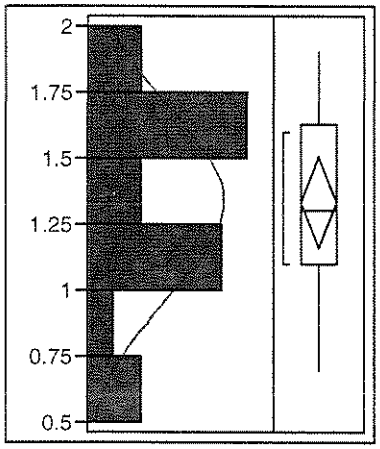
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.940838	0.2995

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TKN



Normal(1.335,0.35437)

Quantiles

100.0%	maximum	1.9000
99.5%		1.9000
97.5%		1.9000
90.0%		1.8100
75.0%	quartile	1.6250
50.0%	median	1.3000
25.0%	quartile	1.1000
10.0%		0.7000
2.5%		0.7000
0.5%		0.7000
0.0%	minimum	0.7000

Moments

Mean	1.335
Std Dev	0.3543719
Std Err Mean	0.0835262
upper 95% Mean	1.511225
lower 95% Mean	1.158775
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1.335	1.158775	1.511225
Dispersion	σ	0.3543719	0.2659162	0.5312544

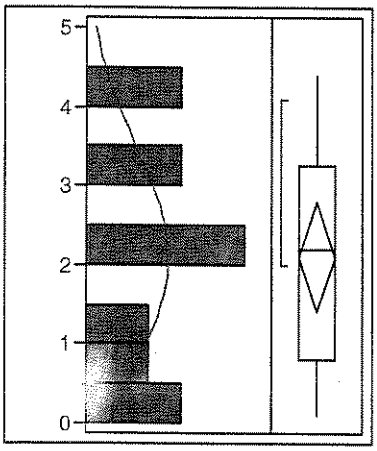
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.957311	0.5507

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrate



Normal(2.10111,1.39048)

Quantiles

100.0%	maximum	4.4000
99.5%		4.4000
97.5%		4.4000
90.0%		4.1300
75.0%	quartile	3.2500
50.0%	median	2.2000
25.0%	quartile	0.8150
10.0%		0.1900
2.5%		0.1000
0.5%		0.1000
0.0%	minimum	0.1000

Moments

Mean	2.1011111
Std Dev	1.3904798
Std Err Mean	0.3277392
upper 95% Mean	2.7925804
lower 95% Mean	1.4096418
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2.1011111	1.4096418	2.7925804
Dispersion	σ	1.3904798	1.0433988	2.0845294

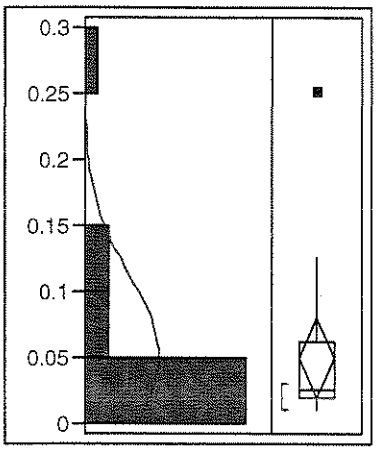
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.944906	0.3508

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Nitrite



Normal(0.05056,0.06099)

Quantiles

100.0%	maximum	0.25000
99.5%		0.25000
97.5%		0.25000
90.0%		0.13750
75.0%	quartile	0.06250
50.0%	median	0.02500
25.0%	quartile	0.02000
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0505556
Std Dev	0.0609939
Std Err Mean	0.0143764
upper 95% Mean	0.0808871
lower 95% Mean	0.020224
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0505556	0.020224	0.0808871
Dispersion	σ	0.0609939	0.0457691	0.0914387

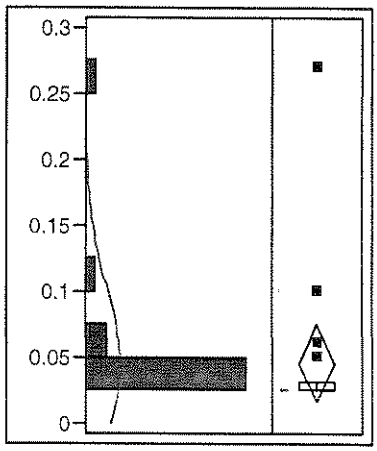
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.660355	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Ammonia



Normal(0.04611,0.05915)

Quantiles

100.0%	maximum	0.27000
99.5%		0.27000
97.5%		0.27000
90.0%		0.11700
75.0%	quartile	0.03125
50.0%	median	0.02500
25.0%	quartile	0.02500
10.0%		0.02500
2.5%		0.02500
0.5%		0.02500
0.0%	minimum	0.02500

Moments

Mean	0.0461111
Std Dev	0.0591497
Std Err Mean	0.0139417
upper 95% Mean	0.0755256
lower 95% Mean	0.0166966
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0461111	0.0166966	0.0755256
Dispersion	σ	0.0591497	0.0443852	0.088674

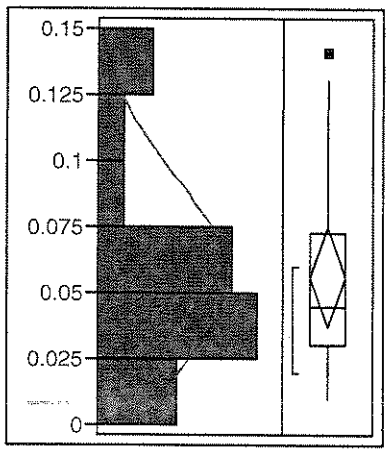
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.420239	<.0001

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

ORP



Normal(0.05611,0.03744)

Quantiles

100.0%	maximum	0.14000
99.5%		0.14000
97.5%		0.14000
90.0%		0.13100
75.0%	quartile	0.07250
50.0%	median	0.04500
25.0%	quartile	0.03000
10.0%		0.01000
2.5%		0.01000
0.5%		0.01000
0.0%	minimum	0.01000

Moments

Mean	0.0561111
Std Dev	0.0374384
Std Err Mean	0.0088243
upper 95% Mean	0.0747288
lower 95% Mean	0.0374934
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0561111	0.0374934	0.0747288
Dispersion	σ	0.0374384	0.0280933	0.0561256

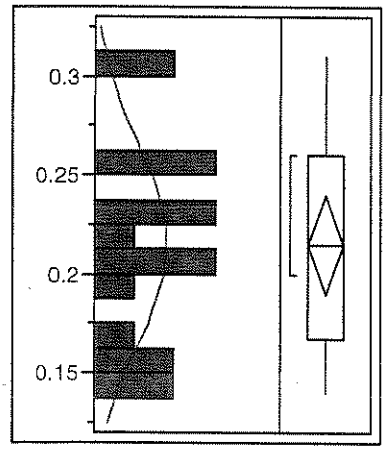
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.907876	0.0789

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TP



Normal(0.215,0.05056)

Quantiles

100.0%	maximum	0.31000
99.5%		0.31000
97.5%		0.31000
90.0%		0.30100
75.0%	quartile	0.26000
50.0%	median	0.21500
25.0%	quartile	0.16750
10.0%		0.14000
2.5%		0.14000
0.5%		0.14000
0.0%	minimum	0.14000

Moments

Mean	0.215
Std Dev	0.0505557
Std Err Mean	0.0119161
upper 95% Mean	0.2401408
lower 95% Mean	0.1898592
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.215	0.1898592	0.2401408
Dispersion	σ	0.0505557	0.0379364	0.0757903

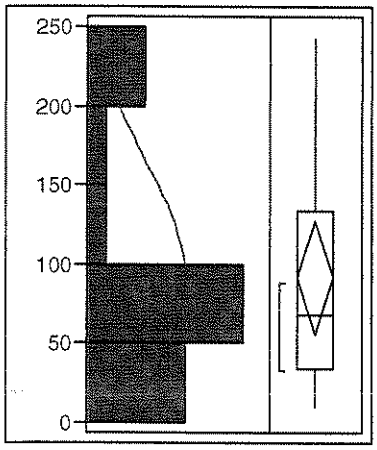
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.959219	0.5866

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TSS



Normal(91.7222,72.1604)

Quantiles

100.0%	maximum	242.00
99.5%		242.00
97.5%		242.00
90.0%		215.90
75.0%	quartile	134.38
50.0%	median	68.00
25.0%	quartile	33.75
10.0%		13.55
2.5%		9.50
0.5%		9.50
0.0%	minimum	9.50

Moments

Mean	91.722222
Std Dev	72.160406
Std Err Mean	17.008371
upper 95% Mean	127.60675
lower 95% Mean	55.837697
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	91.722222	55.837697	127.60675
Dispersion	σ	72.160406	54.148273	108.17884

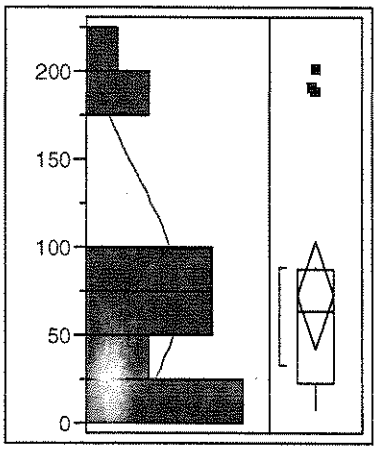
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.864765	0.0146

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

VSS



Normal(73.1167,61.3755)

Quantiles

100.0%	maximum	200.00
99.5%		200.00
97.5%		200.00
90.0%		190.55
75.0%	quartile	87.50
50.0%	median	64.00
25.0%	quartile	23.00
10.0%		9.36
2.5%		8.10
0.5%		8.10
0.0%	minimum	8.10

Moments

Mean	73.116667
Std Dev	61.375539
Std Err Mean	14.466353
upper 95% Mean	103.638
lower 95% Mean	42.595329
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	73.116667	42.595329	103.638
Dispersion	σ	61.375539	46.055443	92.01077

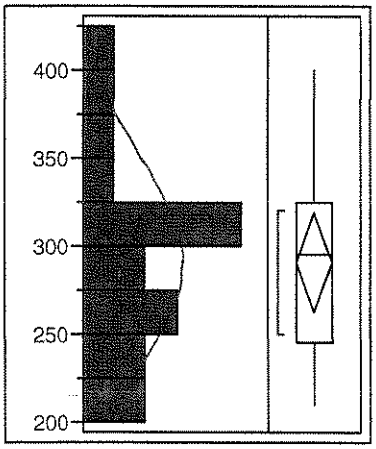
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.836146	0.0052

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

TDS



Normal(291.111,56.9715)

Quantiles

100.0%	maximum	400.00
99.5%		400.00
97.5%		400.00
90.0%		382.00
75.0%	quartile	325.00
50.0%	median	295.00
25.0%	quartile	245.00
10.0%		210.00
2.5%		210.00
0.5%		210.00
0.0%	minimum	210.00

Moments

Mean	291.11111
Std Dev	56.971498
Std Err Mean	13.428311
upper 95% Mean	319.44237
lower 95% Mean	262.77985
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	291.11111	262.77985	319.44237
Dispersion	σ	56.971498	42.750706	85.408479

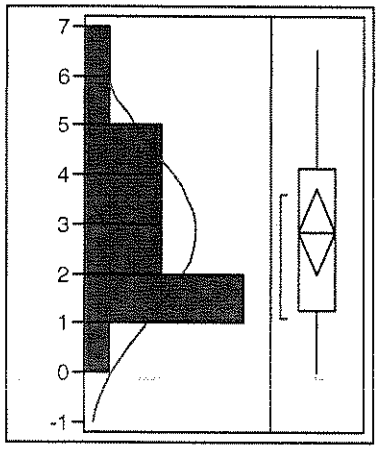
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.956940	0.5438

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

CBOD



Normal(2.85556,1.71849)

Quantiles

100.0%	maximum	6.5000
99.5%		6.5000
97.5%		6.5000
90.0%		5.1500
75.0%	quartile	4.1500
50.0%	median	2.8500
25.0%	quartile	1.2500
10.0%		0.9900
2.5%		0.0000
0.5%		0.0000
0.0%	minimum	0.0000

Moments

Mean	2.8555556
Std Dev	1.7184885
Std Err Mean	0.4050516
upper 95% Mean	3.7101398
lower 95% Mean	2.0009713
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2.8555556	2.0009713	3.7101398
Dispersion	σ	1.7184885	1.2895324	2.5762617

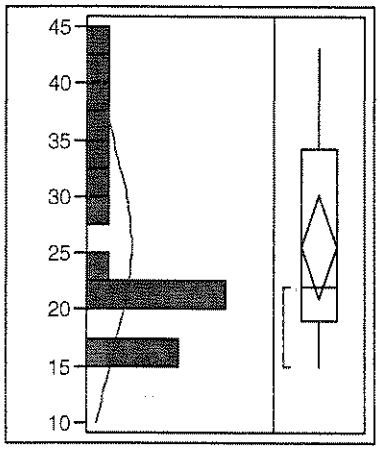
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.961025	0.6215

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Chloride



Normal(25.6111,9.25545)

Quantiles

100.0%	maximum	43.000
99.5%		43.000
97.5%		43.000
90.0%		41.200
75.0%	quartile	34.250
50.0%	median	22.000
25.0%	quartile	19.000
10.0%		15.000
2.5%		15.000
0.5%		15.000
0.0%	minimum	15.000

Moments

Mean	25.611111
Std Dev	9.2554524
Std Err Mean	2.181531
upper 95% Mean	30.213739
lower 95% Mean	21.008483
N	18

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	25.611111	21.008483	30.213739
Dispersion	σ	9.2554524	6.9451767	13.875256

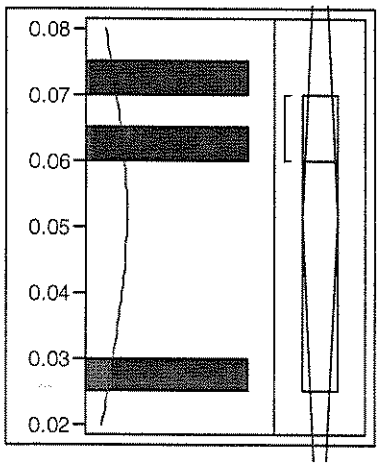
Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.894650	0.0464

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Total Ba



Normal(0.05167,0.02363)

Quantiles

100.0%	maximum	0.07000
99.5%		0.07000
97.5%		0.07000
90.0%		0.07000
75.0%	quartile	0.07000
50.0%	median	0.06000
25.0%	quartile	0.02500
10.0%		0.02500
2.5%		0.02500
0.5%		0.02500
0.0%	minimum	0.02500

Moments

Mean	0.0516667
Std Dev	0.0236291
Std Err Mean	0.0136423
upper 95% Mean	0.1103646
lower 95% Mean	-0.007031
N	3

Fitted Normal
Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	0.0516667	-0.007031	0.1103646
Dispersion	σ	0.0236291	0.0123027	0.1485025

Goodness-of-Fit Test

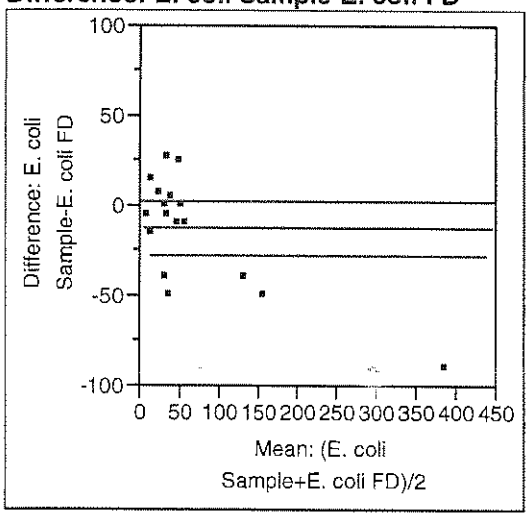
Shapiro-Wilk W Test

W	Prob<W
0.906716	0.4072

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Matched Pairs

Difference: E. coli Sample-E. coli FD

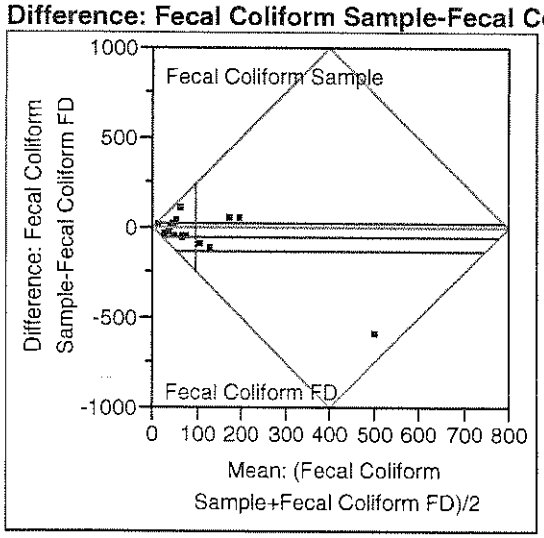


E. coli Sample	56.7778	t-Ratio	-1.73083
E. coli FD	69.2222	DF	17
Mean Difference	-12.444	Prob > |t|	0.1016
Std Error	7.18987	Prob > t	0.9492
Upper95%	2.72486	Prob < t	0.0508
Lower95%	-27.614		
N	18		
Correlation	0.97481		

Wilcoxon Sign-Rank

	E. coli Sample-E. coli FD
Test Statistic	-26.000
Prob > |z|	0.188
Prob > z	0.906
Prob < z	0.094

Matched Pairs
Difference: Fecal Coliform Sample-Fecal Coliform FD



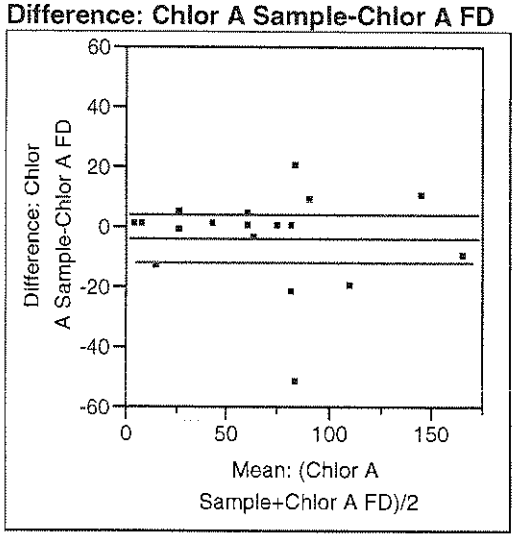
Fecal Coliform Sample	72.8824	t-Ratio	-1.42629
Fecal Coliform FD	125.588	DF	16
Mean Difference	-52.706	Prob > |t|	0.1730
Std Error	36.9531	Prob > t	0.9135
Upper95%	25.6313	Prob < t	0.0865
Lower95%	-131.04		
N	17		
Correlation	0.59133		

Wilcoxon Sign-Rank

	Fecal Coliform Sample-Fecal Coliform FD
Test Statistic	-31.500
Prob > |z|	0.141
Prob > z	0.929
Prob < z	0.071

Matched Pairs

Difference: Chlor A Sample-Chlor A FD

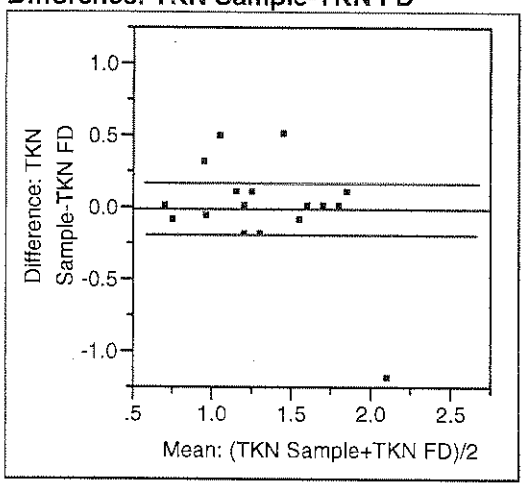


Chlor A Sample	65.8889	t-Ratio	-1.06229
Chlor A FD	69.8333	DF	17
Mean Difference	-3.9444	Prob > |t|	0.3030
Std Error	3.71314	Prob > t	0.8485
Upper95%	3.88959	Prob < t	0.1515
Lower95%	-11.778		
N	18		
Correlation	0.9396		

Wilcoxon Sign-Rank

	Chlor A Sample-Chlor A FD
Test Statistic	-10.000
Prob > |z|	0.587
Prob > z	0.707
Prob < z	0.293

Matched Pairs
Difference: TKN Sample-TKN FD

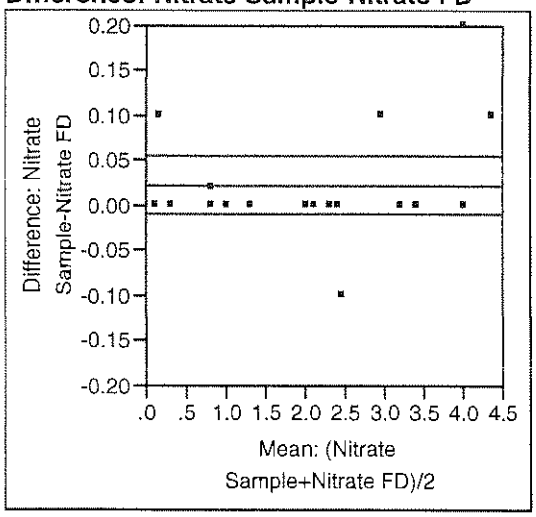


TKN Sample	1.335	t-Ratio	-0.18555
TKN FD	1.35056	DF	17
Mean Difference	-0.0156	Prob > |t|	0.8550
Std Error	0.08383	Prob > t	0.5725
Upper95%	0.16132	Prob < t	0.4275
Lower95%	-0.1924		
N	18		
Correlation	0.69144		

Wilcoxon Sign-Rank

	TKN Sample-TKN FD
Test Statistic	3.000
Prob > |z|	0.833
Prob > z	0.417
Prob < z	0.583

Matched Pairs
Difference: Nitrate Sample-Nitrate FD

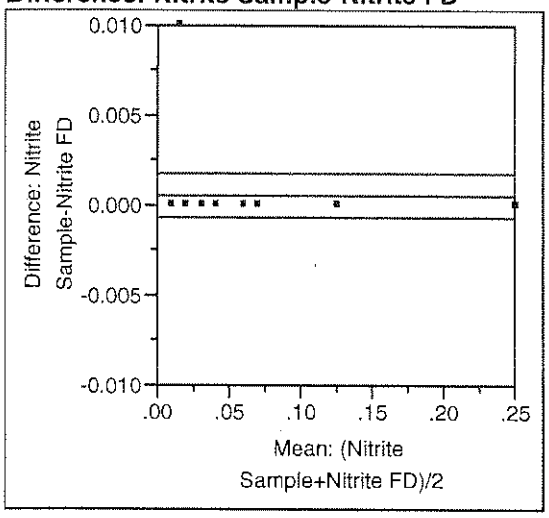


Nitrate Sample	2.10111	t-Ratio	1.536155
Nitrate FD	2.07778	DF	17
Mean Difference	0.02333	Prob > |t|	0.1429
Std Error	0.01519	Prob > t	0.0715
Upper95%	0.05538	Prob < t	0.9285
Lower95%	-0.0087		
N	18		
Correlation	0.999		

Wilcoxon Sign-Rank

	Nitrate Sample-Nitrate FD
Test Statistic	7.000
Prob > |z|	0.188
Prob > z	0.094
Prob < z	0.906

Matched Pairs
Difference: Nitrite Sample-Nitrite FD

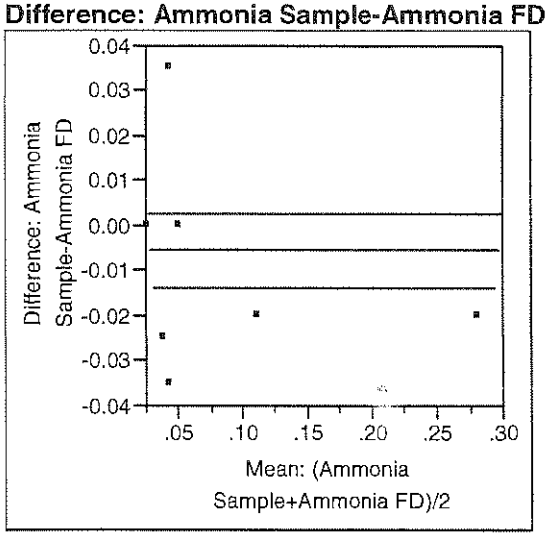


Nitrite Sample	0.05056	t-Ratio	1
Nitrite FD	0.05	DF	17
Mean Difference	0.00056	Prob > |t|	0.3313
Std Error	0.00056	Prob > t	0.1657
Upper95%	0.00173	Prob < t	0.8343
Lower95%	-0.0006		
N	18		
Correlation	0.99927		

Wilcoxon Sign-Rank

	Nitrite Sample-Nitrite FD
Test Statistic	0.500
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Matched Pairs
Difference: Ammonia Sample-Ammonia FD

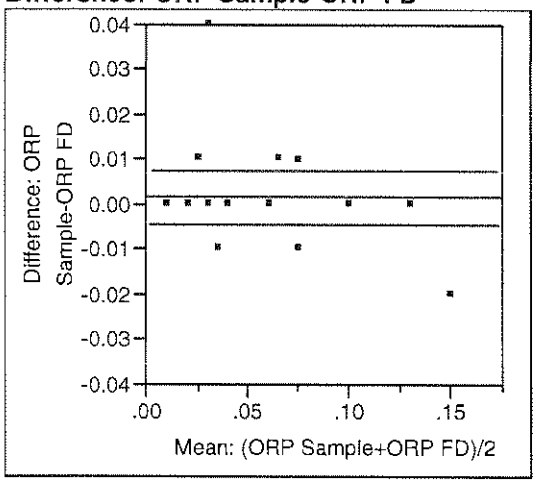


Ammonia Sample	0.04611	t-Ratio	-1.44161
Ammonia FD	0.05167	DF	17
Mean Difference	-0.0056	Prob > |t|	0.1676
Std Error	0.00385	Prob > t	0.9162
Upper95%	0.00258	Prob < t	0.0838
Lower95%	-0.0137		
N	18		
Correlation	0.96823		

Wilcoxon Sign-Rank

	Ammonia Sample-Ammonia FD
Test Statistic	-5.500
Prob > |z|	0.313
Prob > z	0.844
Prob < z	0.156

Matched Pairs
Difference: ORP Sample-ORP FD

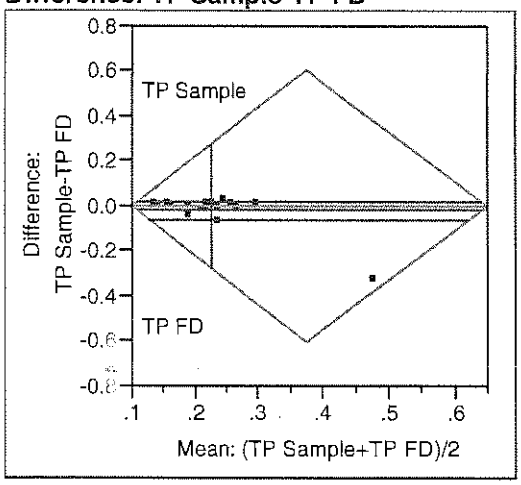


ORP Sample	0.05611	t-Ratio	0.589015
ORP FD	0.05444	DF	17
Mean Difference	0.00167	Prob > |t|	0.5636
Std Error	0.00283	Prob > t	0.2818
Upper95%	0.00764	Prob < t	0.7182
Lower95%	-0.0043		
N	18		
Correlation	0.95988		

Wilcoxon Sign-Rank

	ORP Sample-ORP FD
Test Statistic	2.000
Prob > |z|	0.828
Prob > z	0.414
Prob < z	0.586

Matched Pairs
Difference: TP Sample-TP FD

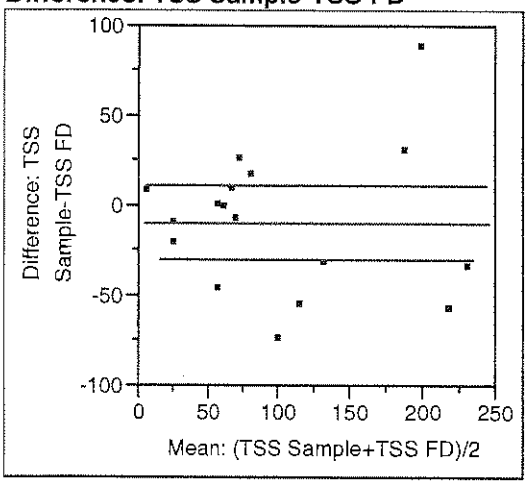


TP Sample	0.215	t-Ratio	-1.14668
TP FD	0.23667	DF	17
Mean Difference	-0.0217	Prob > |t|	0.2674
Std Error	0.0189	Prob > t	0.8663
Upper95%	0.0182	Prob < t	0.1337
Lower95%	-0.0615		
N	18		
Correlation	0.74374		

Wilcoxon Sign-Rank

	TP Sample-TP FD
Test Statistic	-9.500
Prob > |z|	0.597
Prob > z	0.701
Prob < z	0.299

Matched Pairs
Difference: TSS Sample-TSS FD

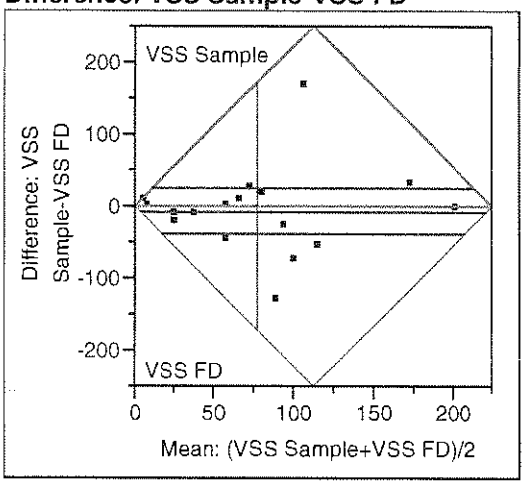


TSS Sample	95.1765	t-Ratio	-0.99657
TSS FD	104.765	DF	16
Mean Difference	-9.5882	Prob > |t|	0.3338
Std Error	9.62125	Prob > t	0.8331
Upper95%	10.8079	Prob < t	0.1669
Lower95%	-29.984		
N	17		
Correlation	0.85058		

Wilcoxon Sign-Rank

	TSS Sample-TSS FD
Test Statistic	-22.500
Prob > |z|	0.258
Prob > z	0.871
Prob < z	0.129

Matched Pairs
Difference: VSS Sample-VSS FD

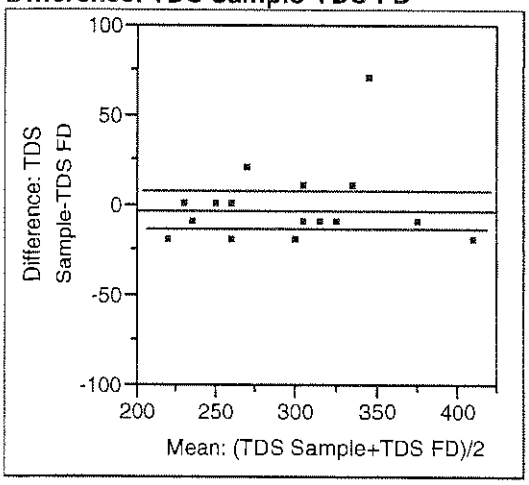


VSS Sample	73.5941	t-Ratio	-0.49817
VSS FD	80.8653	DF	16
Mean Difference	-7.2712	Prob > |t|	0.6251
Std Error	14.5956	Prob > t	0.6874
Upper95%	23.6702	Prob < t	0.3126
Lower95%	-38.213		
N	17		
Correlation	0.51944		

Wilcoxon Sign-Rank

	VSS Sample-VSS FD
Test Statistic	-17.000
Prob > |z|	0.397
Prob > z	0.802
Prob < z	0.198

Matched Pairs
Difference: TDS Sample-TDS FD

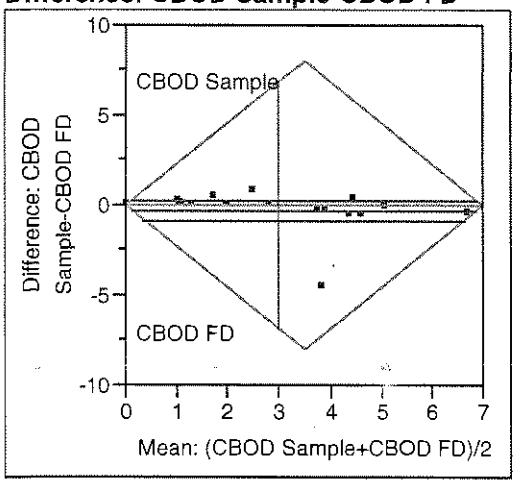


TDS Sample	291.111	t-Ratio	-0.54459
TDS FD	293.889	DF	17
Mean Difference	-2.7778	Prob > |t|	0.5931
Std Error	5.10066	Prob > t	0.7034
Upper95%	7.98367	Prob < t	0.2966
Lower95%	-13.539		
N	18		
Correlation	0.92506		

Wilcoxon Sign-Rank

	TDS Sample-TDS FD
Test Statistic	-24.500
Prob > |z|	0.154
Prob > z	0.923
Prob < z	0.077

Matched Pairs
Difference: CBOD Sample-CBOD FD

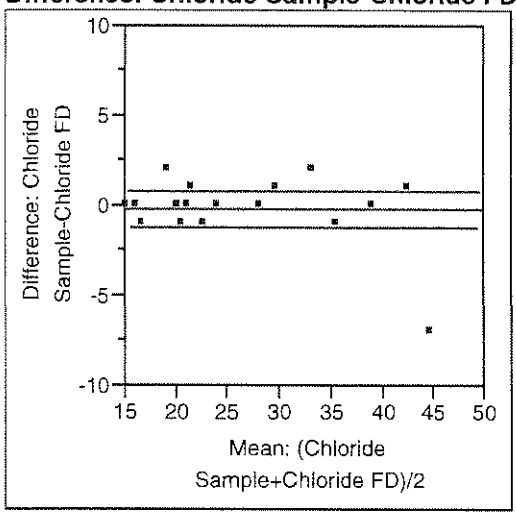


CBOD Sample	2.85556	t-Ratio	-1.0663
CBOD FD	3.13889	DF	17
Mean Difference	-0.2833	Prob > |t|	0.3012
Std Error	0.26572	Prob > t	0.8494
Upper95%	0.27728	Prob < t	0.1506
Lower95%	-0.8439		
N	18		
Correlation	0.82556		

Wilcoxon Sign-Rank

	CBOD Sample-CBOD FD
Test Statistic	-13.000
Prob > |z|	0.383
Prob > z	0.808
Prob < z	0.192

Matched Pairs
Difference: Chloride Sample-Chloride FD

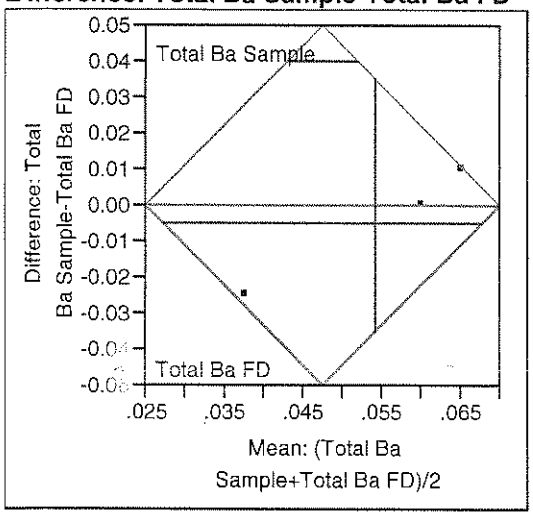


Chloride Sample	25.6111	t-Ratio	-0.48932
Chloride FD	25.8333	DF	17
Mean Difference	-0.2222	Prob > |t|	0.6309
Std Error	0.45414	Prob > t	0.6846
Upper95%	0.73593	Prob < t	0.3154
Lower95%	-1.1804		
N	18		
Correlation	0.98207		

Wilcoxon Sign-Rank

	Chloride Sample-Chloride FD
Test Statistic	1.500
Prob > |z|	0.916
Prob > z	0.458
Prob < z	0.542

Matched Pairs
Difference: Total Ba Sample-Total Ba FD



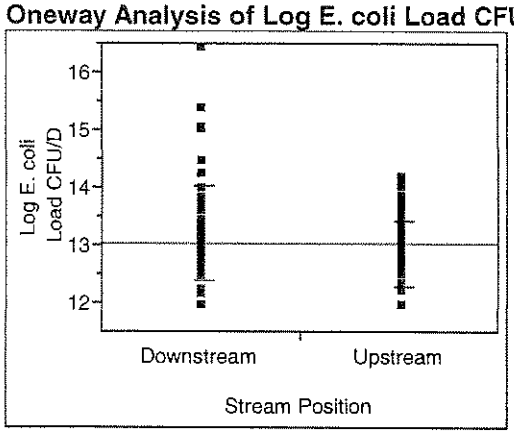
Total Ba Sample	0.05167	t-Ratio	-0.48038
Total Ba FD	0.05667	DF	2
Mean Difference	-0.005	Prob > |t|	0.6784
Std Error	0.01041	Prob > t	0.6608
Upper95%	0.03978	Prob < t	0.3392
Lower95%	-0.0498		
N	3		
Correlation	0.97736		

Wilcoxon Sign-Rank

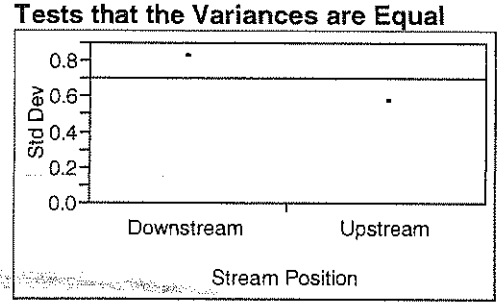
	Total Ba Sample-Total Ba FD
Test Statistic	-0.500
Prob > |z|	1.000
Prob > z	0.500
Prob < z	0.500

Appendix A.7
Comparison of Load Variability in Surface Water of the Mississippi River Upstream and Downstream of the Cities

Oneway Analysis of Log E. coli Load CFU/D By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	0.8171941	0.5682515	0.5388011
Upstream	54	0.5632768	0.4661878	0.4576010

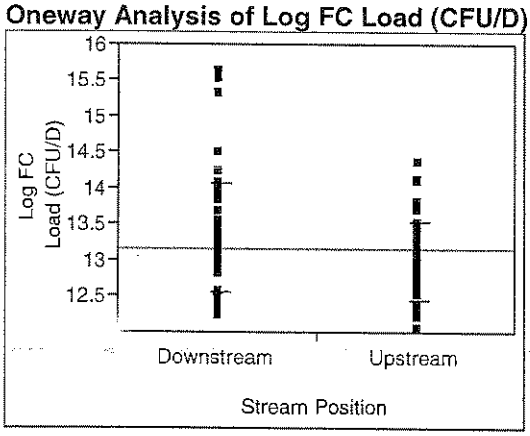
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.3467	1	106	0.1285
Brown-Forsythe	0.6372	1	106	0.4265
Levene	1.2942	1	106	0.2578
Bartlett	7.1081	1	.	0.0077
F Test 2-sided	2.1048	53	53	0.0077

Welch Anova testing Means Equal, allowing Std Devs Not Equal

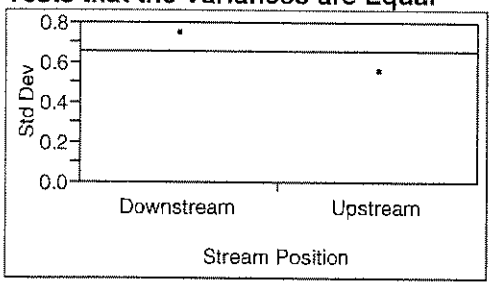
F Ratio	DFNum	DFDen	Prob > F
7.7382	1	94.087	0.0065

t Test
2.7818

Oneway Analysis of Log FC Load (CFU/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	0.7469166	0.5243261	0.5243261
Upstream	54	0.5506235	0.4431060	0.4430066

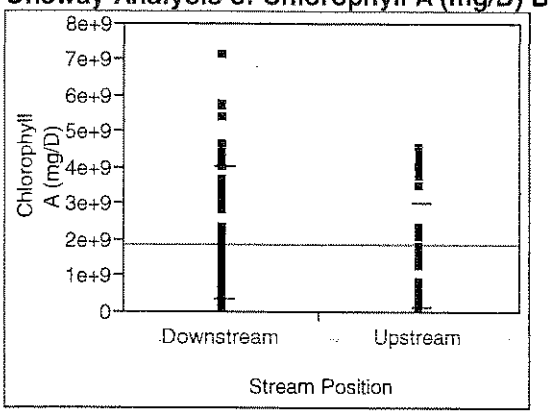
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.4258	1	106	0.1223
Brown-Forsythe	0.9370	1	106	0.3353
Levene	0.9352	1	106	0.3357
Bartlett	4.8073	1	.	0.0283
F Test 2-sided	1.8401	53	53	0.0283

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
6.7097	1	97.472	0.0111

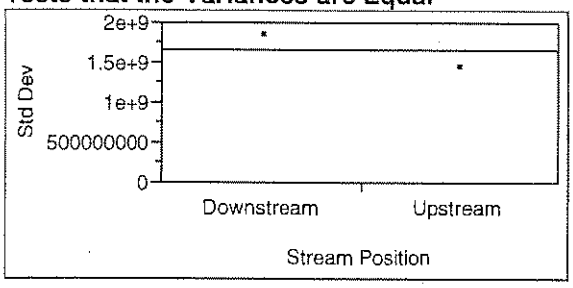
t Test
2.5903

Oneway Analysis of Chlorophyll A (mg/D) By Stream Position



Missing Rows
2

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	52	1.8445e+9	1.5383e+9	1.4695e+9
Upstream	54	1.4442e+9	1.1774e+9	1.1221e+9

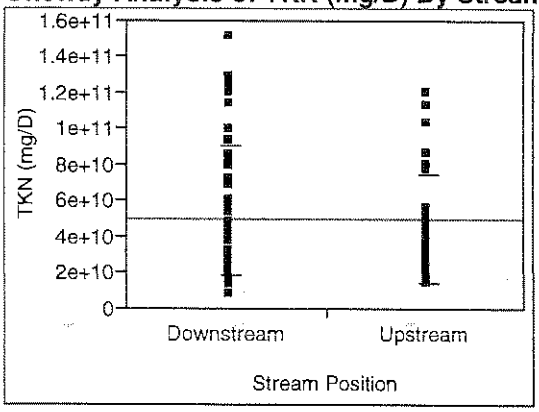
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	3.6181	1	104	0.0599
Brown-Forsythe	2.4183	1	104	0.1230
Levene	4.1647	1	104	0.0438
Bartlett	3.0606	1	.	0.0802
F Test 2-sided	1.6311	51	53	0.0799

Welch Anova testing Means Equal, allowing Std Devs Not Equal

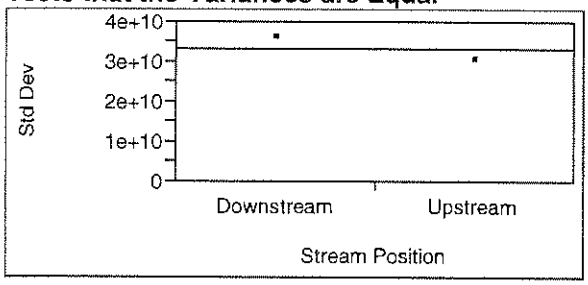
F Ratio	DFNum	DFDen	Prob > F
3.5578	1	96.596	0.0623

t Test
1.8862

Oneway Analysis of TKN (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	3.612e+10	2.866e+10	2.733e+10
Upstream	54	3.022e+10	2.292e+10	2.186e+10

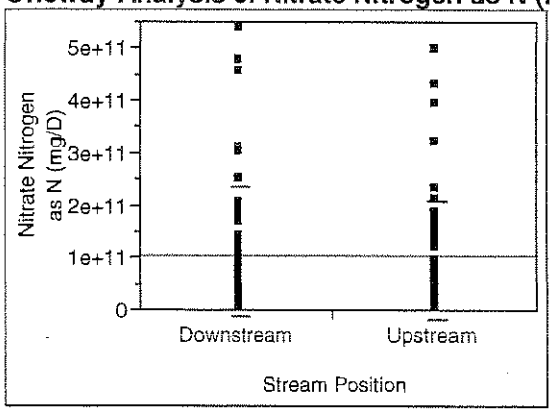
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.4444	1	106	0.2321
Brown-Forsythe	1.3480	1	106	0.2482
Levene	2.1048	1	106	0.1498
Bartlett	1.6618	1	.	0.1974
F Test 2-sided	1.4287	53	53	0.1974

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
2.6678	1	102.8	0.1055

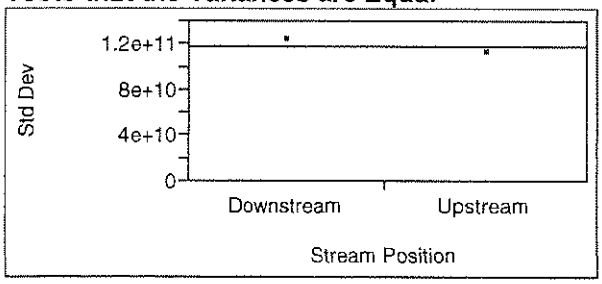
t Test
1.6333

Oneway Analysis of Nitrate Nitrogen as N (mg/D) By Stream Position



Missing Rows
1

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	53	1.235e+11	9.06e+10	8.495e+10
Upstream	54	1.12e+11	8.236e+10	7.613e+10

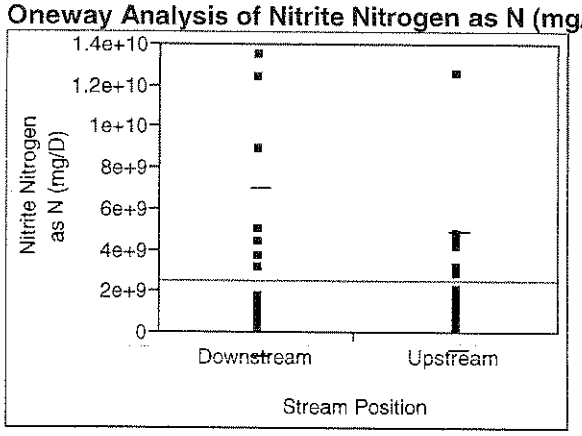
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.1871	1	105	0.6662
Brown-Forsythe	0.2405	1	105	0.6249
Levene	0.2904	1	105	0.5911
Bartlett	0.4889	1	.	0.4844
F Test 2-sided	1.2141	52	53	0.4839

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.5155	1	103.62	0.4744

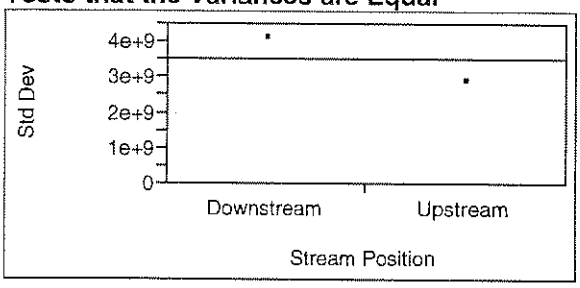
t Test
0.7180

Oneway Analysis of Nitrite Nitrogen as N (mg/D) By Stream Position



Missing Rows
1

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	53	4.0778e+9	2.9763e+9	2.4216e+9
Upstream	54	2.8994e+9	1.8981e+9	1.6069e+9

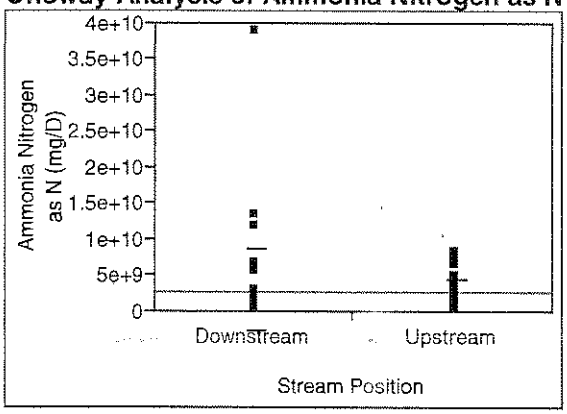
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.1421	1	105	0.1463
Brown-Forsythe	1.6473	1	105	0.2022
Levene	5.0518	1	105	0.0267
Bartlett	5.9465	1	.	0.0147
F Test 2-sided	1.9779	52	53	0.0147

Welch Anova testing Means Equal, allowing Std Devs Not Equal

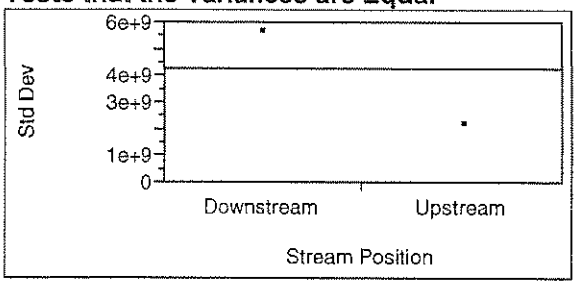
F Ratio	DFNum	DFDen	Prob > F
1.5776	1	93.759	0.2122

t Test
1.2560

Oneway Analysis of Ammonia Nitrogen as N (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	5.6537e+9	2.8323e+9	2.2058e+9
Upstream	54	2.1871e+9	1.6438e+9	1.4921e+9

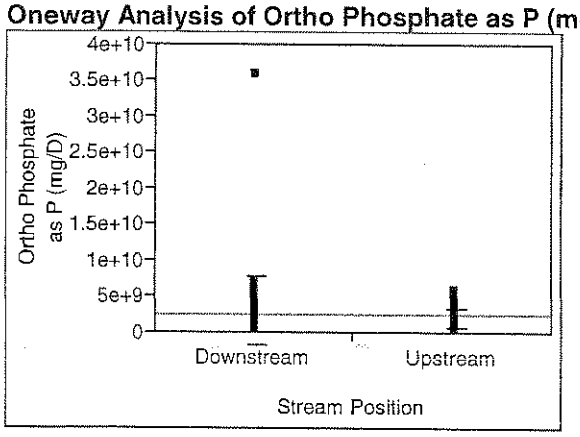
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.2240	1	106	0.2711
Brown-Forsythe	0.8161	1	106	0.3684
Levene	2.9541	1	106	0.0886
Bartlett	41.5894	1	.	<.0001
F Test 2-sided	6.6825	53	53	<.0001

Welch Anova testing Means Equal, allowing Std Devs Not Equal

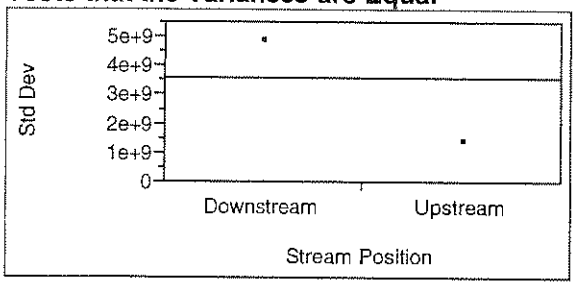
F Ratio	DFNum	DFDen	Prob > F
0.9946	1	68.515	0.3221

t Test
0.9973

Oneway Analysis of Ortho Phosphate as P (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	4.8362e+9	2.1059e+9	1.8299e+9
Upstream	54	1.3564e+9	977962735	968941930

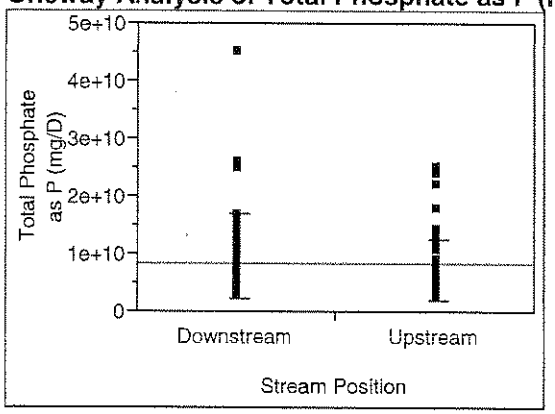
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.1079	1	106	0.2949
Brown-Forsythe	1.8267	1	106	0.1794
Levene	3.4814	1	106	0.0648
Bartlett	68.6613	1	.	<.0001
F Test 2-sided	12.7122	53	53	<.0001

Welch Anova testing Means Equal, allowing Std Devs Not Equal

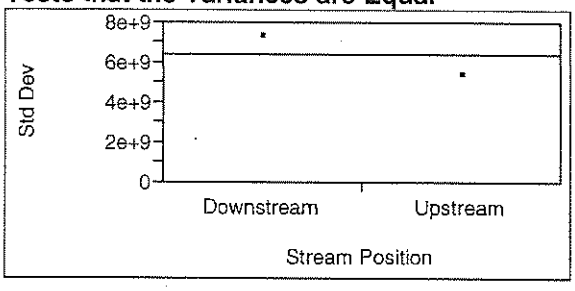
F Ratio	DFNum	DFDen	Prob > F
1.7582	1	61.287	0.1898

t Test
1.3260

Oneway Analysis of Total Phosphate as P (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	7.2769e+9	4.7722e+9	4.4003e+9
Upstream	54	5.3422e+9	3.8865e+9	3.5329e+9

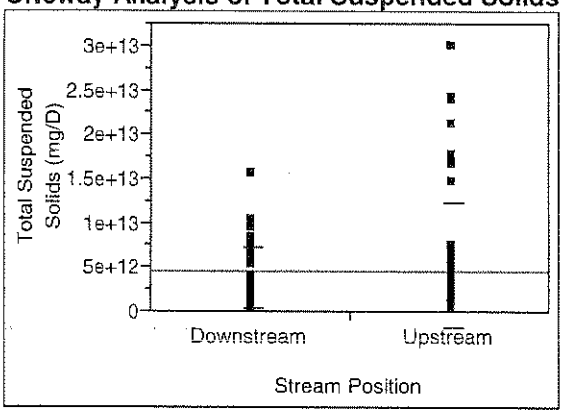
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.8697	1	106	0.3532
Brown-Forsythe	0.6859	1	106	0.4094
Levene	0.9875	1	106	0.3226
Bartlett	4.9377	1	.	0.0263
F Test 2-sided	1.8555	53	53	0.0263

Welch Anova testing Means Equal, allowing Std Devs Not Equal

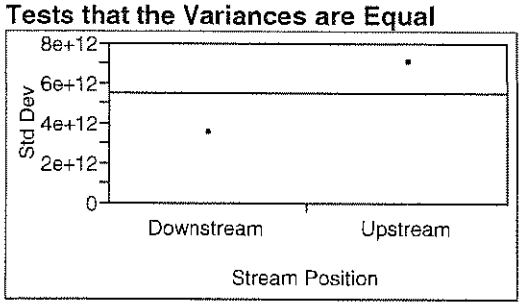
F Ratio	DFNum	DFDen	Prob > F
3.5679	1	97.269	0.0619

t Test
1.8889

Oneway Analysis of Total Suspended Solids (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	3.48e+12	2.945e+12	2.655e+12
Upstream	54	7.004e+12	4.852e+12	4.077e+12

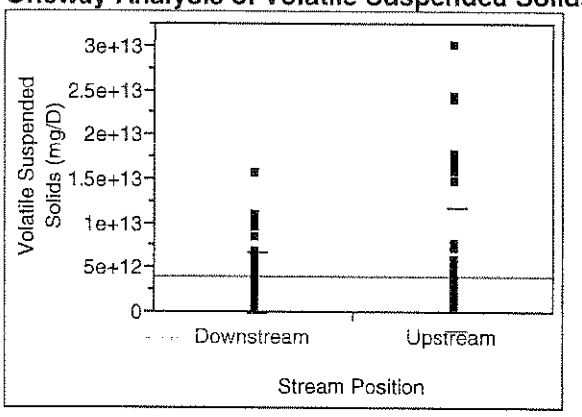
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	5.5859	1	106	0.0199
Brown-Forsythe	2.2367	1	106	0.1377
Levene	6.9332	1	106	0.0097
Bartlett	23.8227	1	.	<.0001
F Test 2-sided	4.0497	53	53	<.0001

Welch Anova testing Means Equal, allowing Std Devs Not Equal

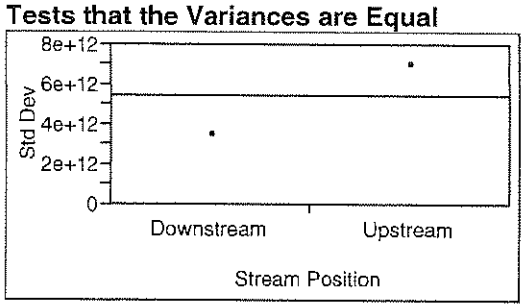
F Ratio	DFNum	DFDen	Prob > F
1.8196	1	77.67	0.1813

t Test
1.3489

Oneway Analysis of Volatile Suspended Solids (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	3.401e+12	2.694e+12	2.3e+12
Upstream	54	6.926e+12	4.846e+12	3.922e+12

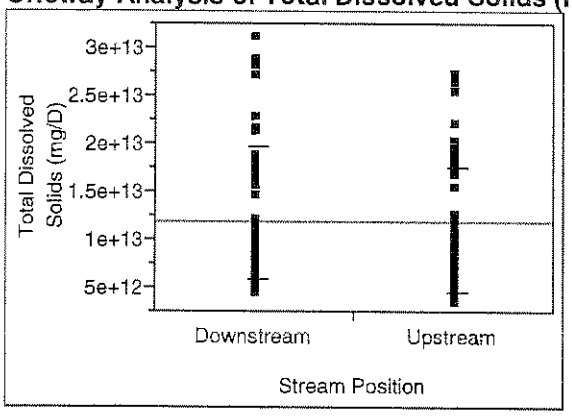
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	5.2636	1	106	0.0237
Brown-Forsythe	2.8211	1	106	0.0960
Levene	8.8621	1	106	0.0036
Bartlett	24.5767	1	.	<.0001
F Test 2-sided	4.1466	53	53	<.0001

Welch Anova testing Means Equal, allowing Std Devs Not Equal

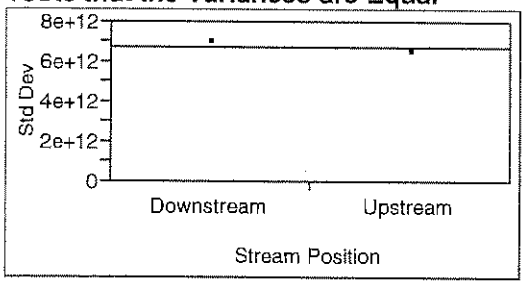
F Ratio	DFNum	DFDen	Prob > F
2.1254	1	77.158	0.1489

t Test
1.4579

Oneway Analysis of Total Dissolved Solids (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	6.934e+12	5.708e+12	5.479e+12
Upstream	54	6.493e+12	5.34e+12	4.996e+12

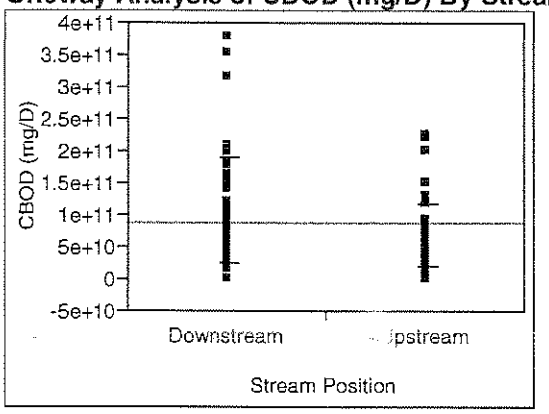
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.2379	1	106	0.6267
Brown-Forsythe	0.2934	1	106	0.5892
Levene	0.2613	1	106	0.6103
Bartlett	0.2259	1	.	0.6346
F Test 2-sided	1.1402	53	53	0.6346

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1.6626	1	105.55	0.2001

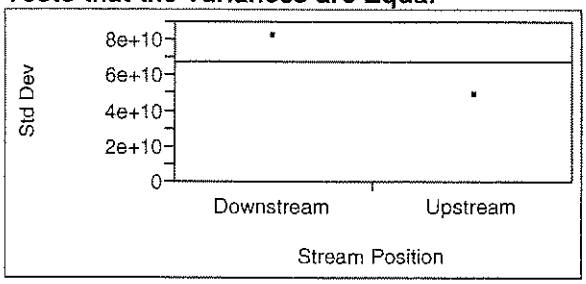
t Test
1.2894

Oneway Analysis of CBOD (mg/D) By Stream Position



Missing Rows
1

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	8.228e+10	6.286e+10	6.12e+10
Upstream	53	4.875e+10	3.349e+10	3.321e+10

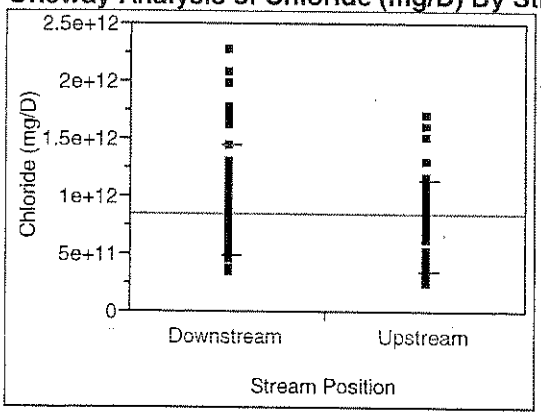
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	4.6555	1	105	0.0332
Brown-Forsythe	8.9461	1	105	0.0035
Levene	11.5642	1	105	0.0010
Bartlett	13.5925	1	.	0.0002
F Test 2-sided	2.8481	53	52	0.0002

Welch Anova testing Means Equal, allowing Std Devs Not Equal

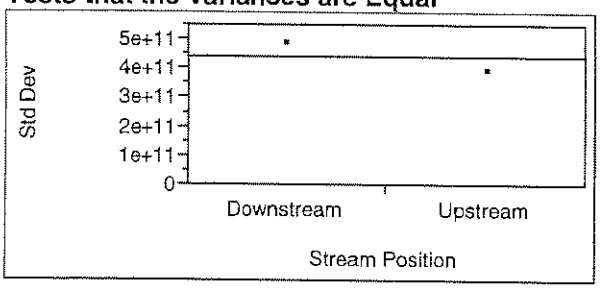
F Ratio	DFNum	DFDen	Prob > F
8.6894	1	86.429	0.0041

t Test
2.9478

Oneway Analysis of Chloride (mg/D) By Stream Position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	54	4.82e+11	3.791e+11	3.765e+11
Upstream	54	3.923e+11	3.219e+11	3.149e+11

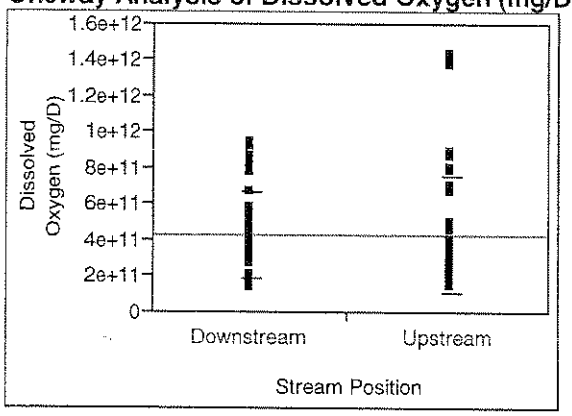
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.1601	1	106	0.1446
Brown-Forsythe	1.3310	1	106	0.2512
Levene	1.3153	1	106	0.2540
Bartlett	2.2108	1	.	0.1370
F Test 2-sided	1.5096	53	53	0.1371

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
7.2088	1	101.8	0.0085

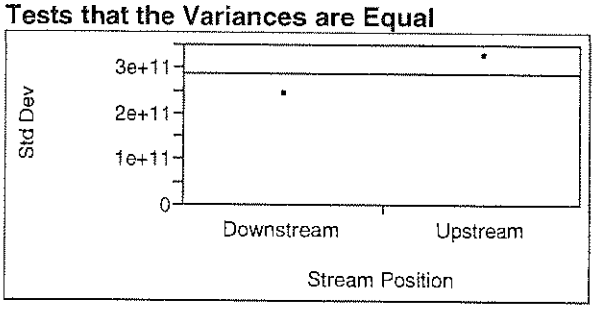
t Test
2.6849

Oneway Analysis of Dissolved Oxygen (mg/D) By Stream Position



Missing Rows
6

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	50	2.401e+11	1.92e+11	1.863e+11
Upstream	52	3.248e+11	2.416e+11	2.14e+11

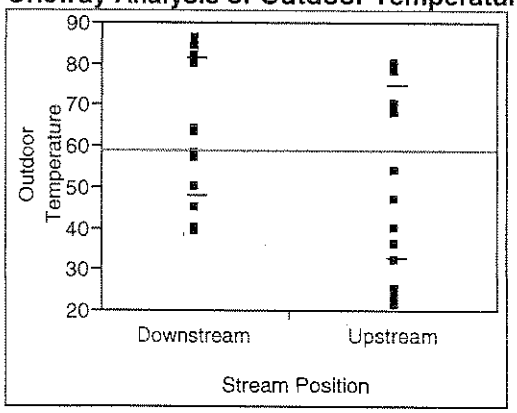
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.0858	1	100	0.1518
Brown-Forsythe	0.3979	1	100	0.5296
Levene	1.8808	1	100	0.1733
Bartlett	4.4290	1	.	0.0353
F Test 2-sided	1.8294	51	49	0.0355

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.0000	1	93.887	0.9954

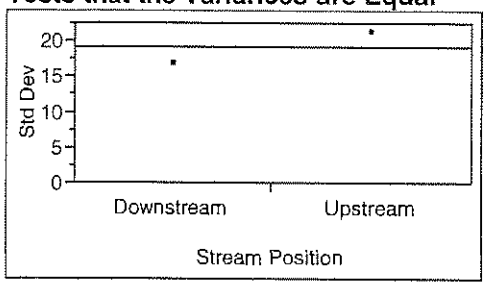
t Test
0.0058

Oneway Analysis of Outdoor Temperature By Stream Position



Missing Rows
15

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	45	16.66733	14.56000	14.33333
Upstream	48	21.04621	18.97656	18.93750

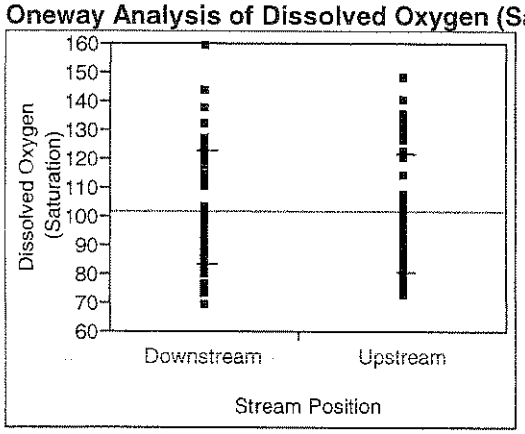
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	7.9300	1	91	0.0060
Brown-Forsythe	4.8203	1	91	0.0307
Levene	6.6318	1	91	0.0116
Bartlett	2.4122	1	.	0.1204
F Test 2-sided	1.5945	47	44	0.1212

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
8.0180	1	88.575	0.0057

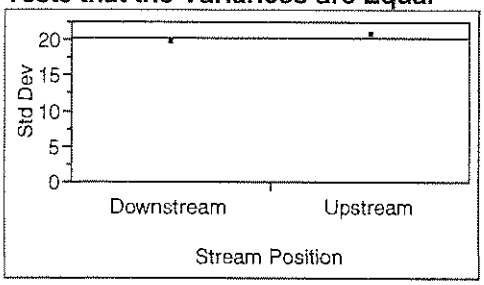
t Test
2.8316

Oneway Analysis of Dissolved Oxygen (Saturation) By Stream Position



Missing Rows
9

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	47	19.63529	15.90213	15.46170
Upstream	52	20.66862	17.02041	16.70769

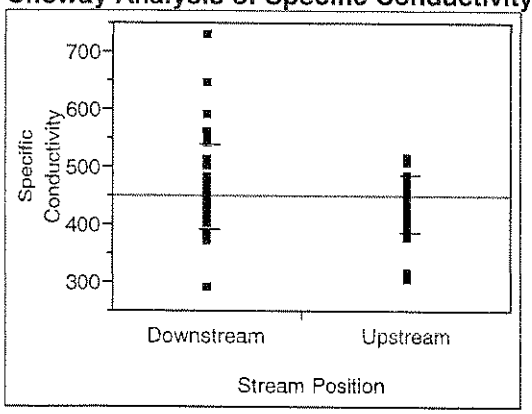
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.1593	1	97	0.6907
Brown-Forsythe	0.2428	1	97	0.6233
Levene	0.2382	1	97	0.6266
Bartlett	0.1257	1	.	0.7230
F Test 2-sided	1.1080	51	46	0.7267

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.2493	1	96.75	0.6187

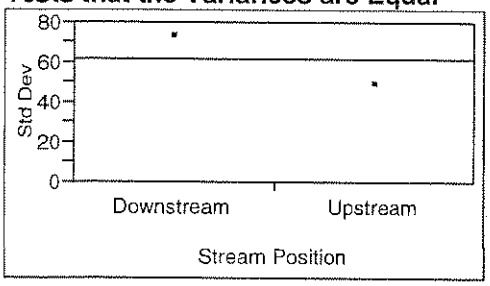
t Test
0.4993

Oneway Analysis of Specific Conductivity By Stream Position



Missing Rows
9

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	47	72.76660	51.93391	51.23404
Upstream	52	49.05797	38.19231	38.19231

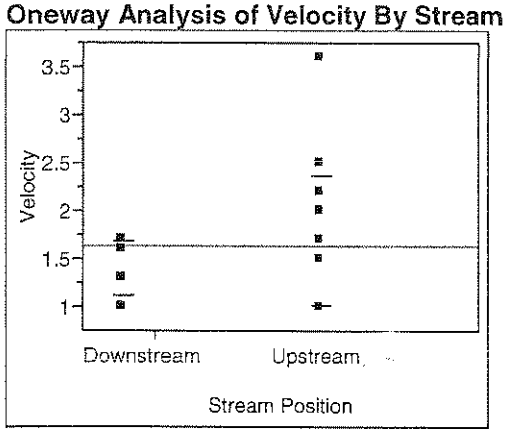
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.6923	1	97	0.1041
Brown-Forsythe	2.3271	1	97	0.1304
Levene	2.7623	1	97	0.0997
Bartlett	7.3528	1	.	0.0067
F Test 2-sided	2.2001	46	51	0.0066

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
5.1165	1	79.463	0.0264

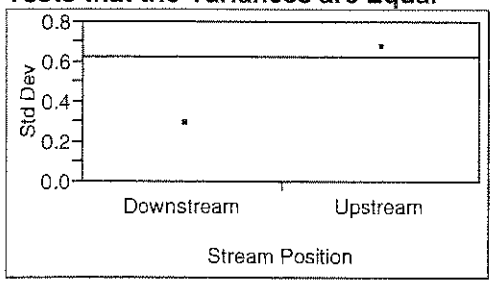
t Test
2.2620

Oneway Analysis of Velocity By Stream Position



Missing Rows
42

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	12	0.2860388	0.2500000	0.2500000
Upstream	54	0.6733237	0.5277778	0.5277778

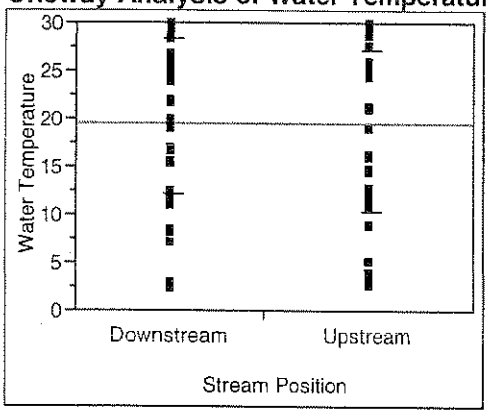
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.3624	1	64	0.1292
Brown-Forsythe	5.0252	1	64	0.0285
Levene	5.3066	1	64	0.0245
Bartlett	8.8403	1	.	0.0029
F Test 2-sided	5.5411	53	11	0.0039

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
5.6986	1	41.659	0.0216

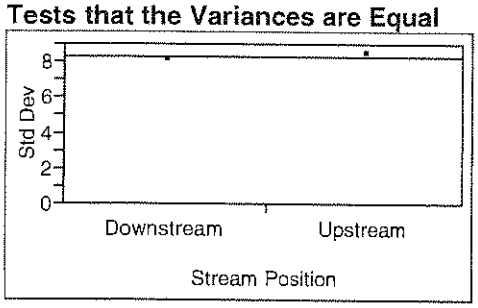
t Test
2.3872

Oneway Analysis of Water Temperature By Stream Position



Missing Rows
7

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	47	8.096941	6.847904	6.614468
Upstream	54	8.460385	7.441276	7.433889

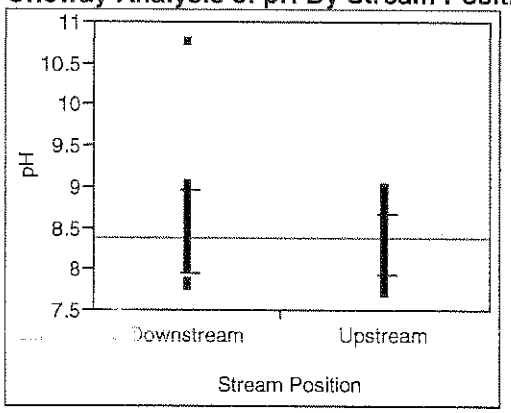
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.1708	1	99	0.6803
Brown-Forsythe	0.7058	1	99	0.4029
Levene	0.5423	1	99	0.4632
Bartlett	0.0938	1	.	0.7594
F Test 2-sided	1.0918	53	46	0.7646

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.7867	1	98.087	0.3773

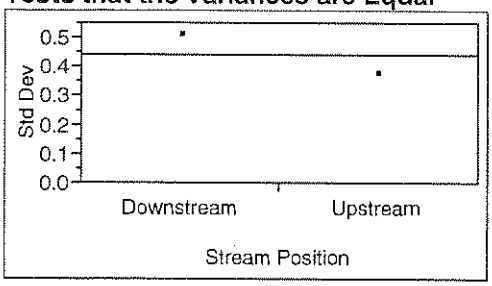
t Test
0.8870

Oneway Analysis of pH By Stream Position



Missing Rows
9

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	47	0.5032603	0.3760616	0.3742553
Upstream	52	0.3751458	0.3285059	0.3136538

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.0728	1	97	0.3029
Brown-Forsythe	1.1090	1	97	0.2949
Levene	0.8244	1	97	0.3662
Bartlett	4.1150	1	.	0.0425
F Test 2-sided	1.7996	46	51	0.0420

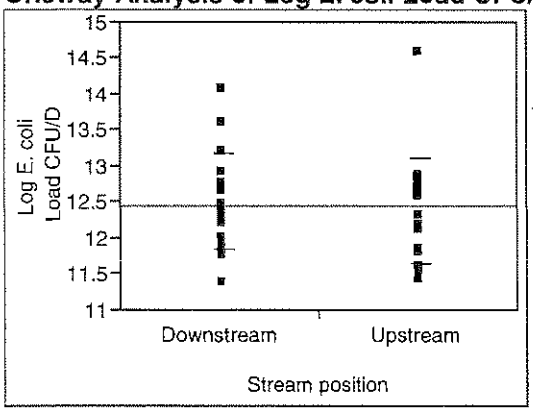
Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
3.1332	1	84.569	0.0803

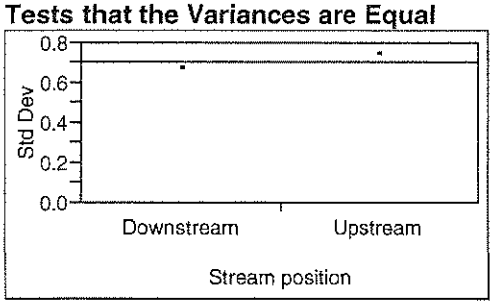
t Test
1.7701

Appendix A.8
Comparison of Load Variability in Surface Water of the Rock River Upstream and Downstream of the Cities

Oneway Analysis of Log E. coli Load CFU/D By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	0.6644439	0.5020289	0.4974955
Upstream	18	0.7355102	0.5452741	0.5391272

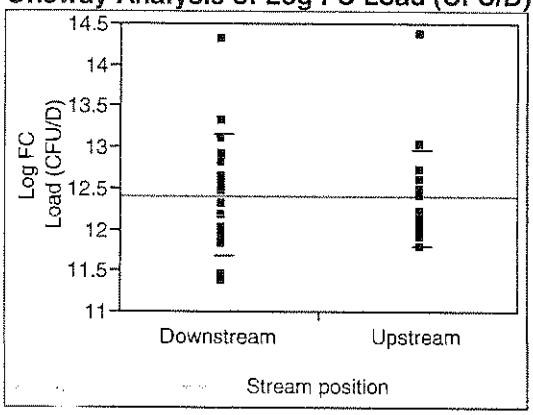
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.0924	1	34	0.7630
Brown-Forsythe	0.0715	1	34	0.7907
Levene	0.0840	1	34	0.7737
Bartlett	0.1702	1	.	0.6799
F Test 2-sided	1.2254	17	17	0.6800

Welch Anova testing Means Equal, allowing Std Devs Not Equal

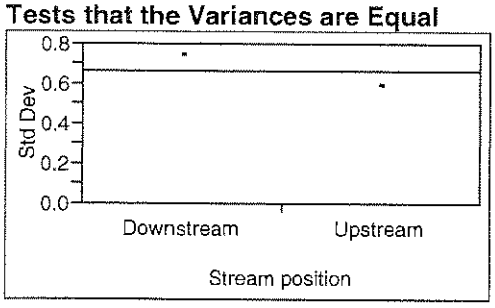
F Ratio	DFNum	DFDen	Prob > F
0.3686	1	33.655	0.5479

t Test
0.6071

Oneway Analysis of Log FC Load (CFU/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	0.7332809	0.5416464	0.5361102
Upstream	18	0.5879507	0.3799579	0.3607512

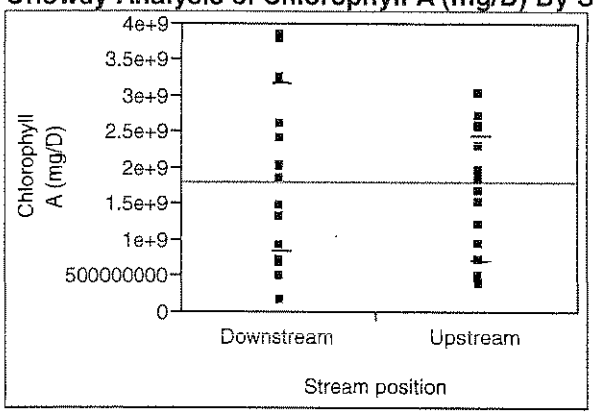
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.3621	1	34	0.5513
Brown-Forsythe	1.1502	1	34	0.2911
Levene	1.1207	1	34	0.2972
Bartlett	0.7993	1	.	0.3713
F Test 2-sided	1.5555	17	17	0.3714

Welch Anova testing Means Equal, allowing Std Devs Not Equal

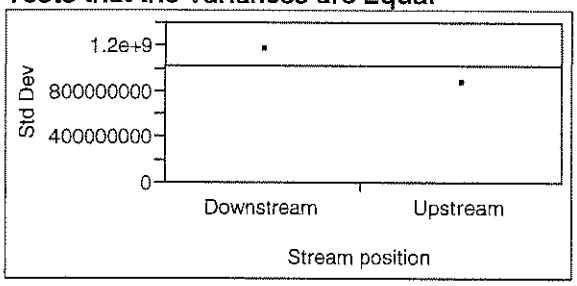
F Ratio	DFNum	DFDen	Prob > F
0.0368	1	32.466	0.8490

t Test
0.1919

Oneway Analysis of Chlorophyll A (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	1.1601e+9	954333333	954333333
Upstream	18	863296047	725308642	715444444

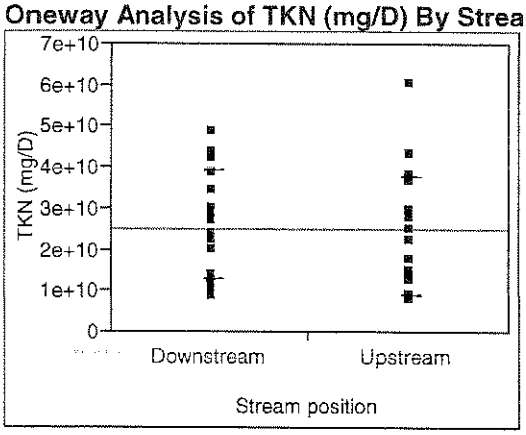
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	3.0229	1	34	0.0911
Brown-Forsythe	1.6702	1	34	0.2049
Levene	1.6569	1	34	0.2067
Bartlett	1.4218	1	.	0.2331
F Test 2-sided	1.8059	17	17	0.2332

Welch Anova testing Means Equal, allowing Std Devs Not Equal

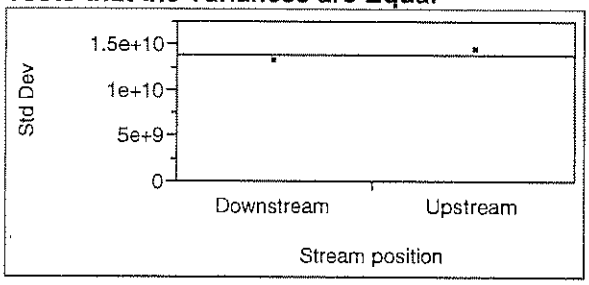
F Ratio	DFNum	DFDen	Prob > F
1.6246	1	31.409	0.2118

t Test
1.2746

Oneway Analysis of TKN (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	1.318e+10	1.11e+10	1.11e+10
Upstream	18	1.433e+10	1.132e+10	1.118e+10

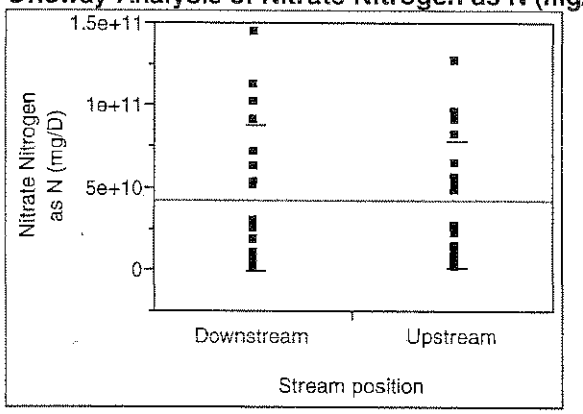
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.1299	1	34	0.7208
Brown-Forsythe	0.0008	1	34	0.9780
Levene	0.0073	1	34	0.9323
Bartlett	0.1159	1	.	0.7335
F Test 2-sided	1.1825	17	17	0.7336

Welch Anova testing Means Equal, allowing Std Devs Not Equal

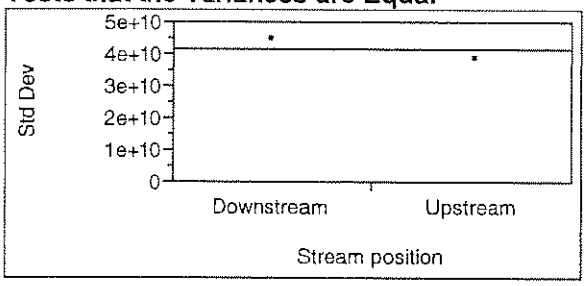
F Ratio	DFNum	DFDen	Prob > F
0.3426	1	33.764	0.5622

t Test
0.5853

Oneway Analysis of Nitrate Nitrogen as N (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	4.439e+10	3.715e+10	3.553e+10
Upstream	18	3.865e+10	3.277e+10	3.13e+10

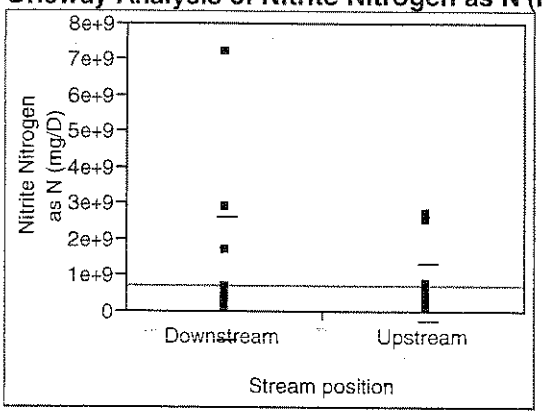
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.3968	1	34	0.5330
Brown-Forsythe	0.1933	1	34	0.6629
Levene	0.4002	1	34	0.5312
Bartlett	0.3150	1	.	0.5746
F Test 2-sided	1.3187	17	17	0.5747

Welch Anova testing Means Equal, allowing Std Devs Not Equal

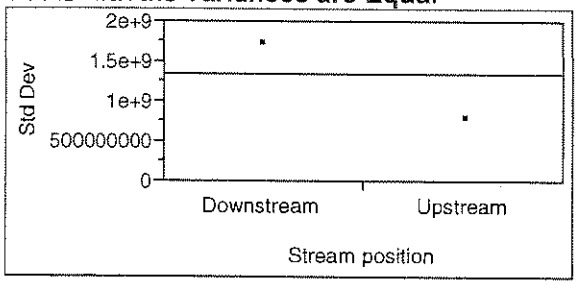
F Ratio	DFNum	DFDen	Prob > F
0.0785	1	33.37	0.7810

t Test
0.2803

Oneway Analysis of Nitrite Nitrogen as N (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	1.7144e+9	1.0012e+9	754055556
Upstream	18	786820792	493913580	414111111

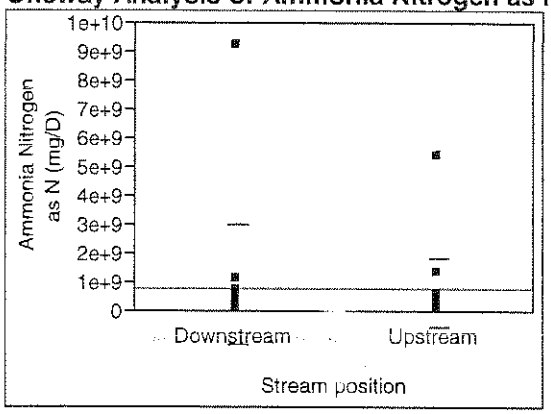
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.9430	1	34	0.3384
Brown-Forsythe	0.6645	1	34	0.4206
Levene	2.0689	1	34	0.1595
Bartlett	9.1427	1	.	0.0025
F Test 2-sided	4.7475	17	17	0.0025

Welch Anova testing Means Equal, allowing Std Devs Not Equal

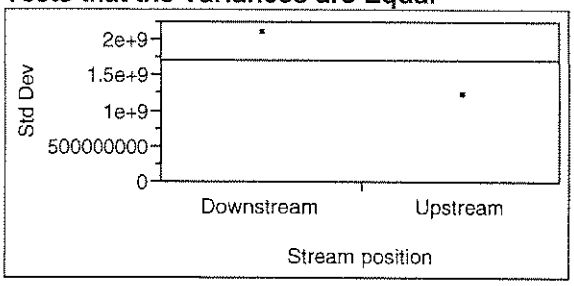
F Ratio	DFNum	DFDen	Prob > F
0.7371	1	23.857	0.3991

t Test
0.8586

Oneway Analysis of Ammonia Nitrogen as N (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	2.0885e+9	945950617	666222222
Upstream	18	1.2187e+9	606382716	466611111

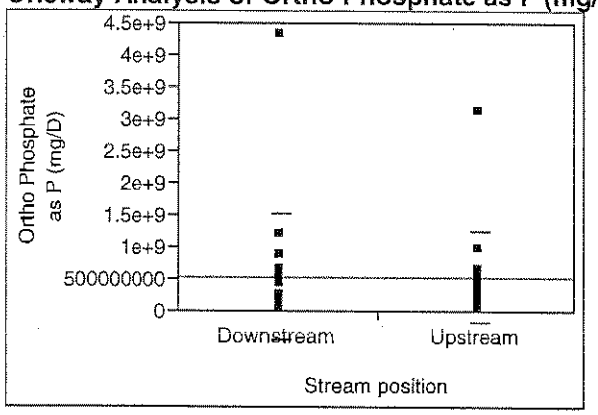
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.4299	1	34	0.5164
Brown-Forsythe	0.1288	1	34	0.7219
Levene	0.4602	1	34	0.5021
Bartlett	4.5761	1	.	0.0324
F Test 2-sided	2.9367	17	17	0.0324

Welch Anova testing Means Equal, allowing Std Devs Not Equal

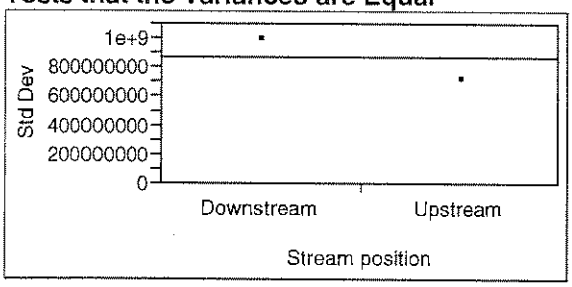
F Ratio	DFNum	DFDen	Prob > F
0.2032	1	27.375	0.6557

t Test
0.4508

Oneway Analysis of Ortho Phosphate as P (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	994967567	543222222	430138889
Upstream	18	711788409	421277778	394250000

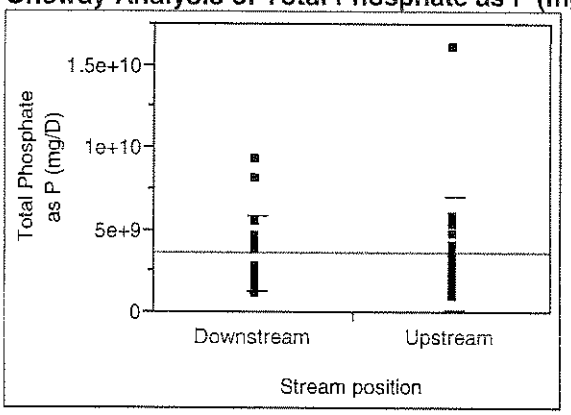
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.2601	1	34	0.6134
Brown-Forsythe	0.0179	1	34	0.8942
Levene	0.2687	1	34	0.6076
Bartlett	1.8189	1	.	0.1774
F Test 2-sided	1.9540	17	17	0.1775

Welch Anova testing Means Equal, allowing Std Devs Not Equal

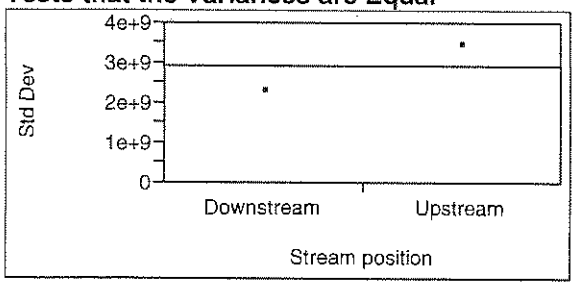
F Ratio	DFNum	DFDen	Prob > F
0.0010	1	30.789	0.9744

t Test
0.0324

Oneway Analysis of Total Phosphate as P (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	2.2736e+9	1.725e+9	1.725e+9
Upstream	18	3.4315e+9	2.017e+9	1.8722e+9

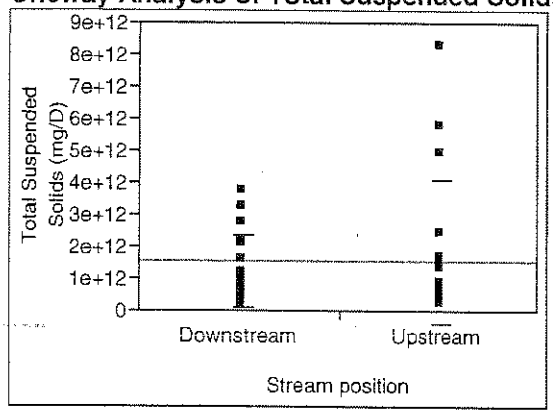
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.4808	1	34	0.4928
Brown-Forsythe	0.0355	1	34	0.8517
Levene	0.1618	1	34	0.6900
Bartlett	2.7229	1	.	0.0989
F Test 2-sided	2.2780	17	17	0.0989

Welch Anova testing Means Equal, allowing Std Devs Not Equal

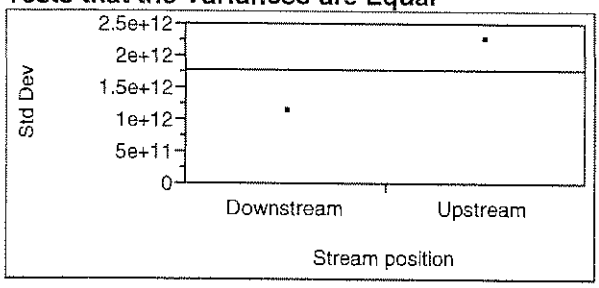
F Ratio	DFNum	DFDen	Prob > F
0.0011	1	29.514	0.9742

t Test
0.0326

Oneway Analysis of Total Suspended Solids (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	1.118e+12	9.11e+11	8.499e+11
Upstream	18	2.24e+12	1.571e+12	1.342e+12

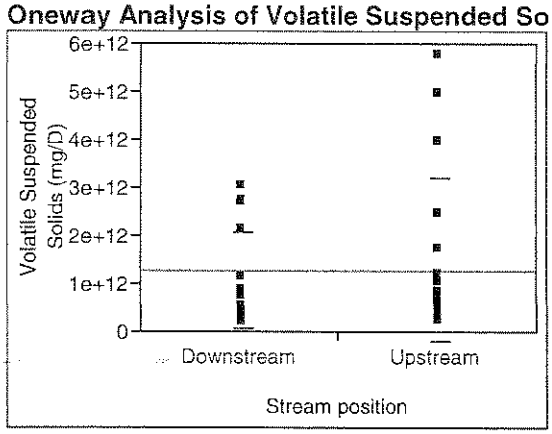
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.0720	1	34	0.1592
Brown-Forsythe	0.9059	1	34	0.3479
Levene	2.8287	1	34	0.1018
Bartlett	7.4034	1	.	0.0065
F Test 2-sided	4.0134	17	17	0.0065

Welch Anova testing Means Equal, allowing Std Devs Not Equal

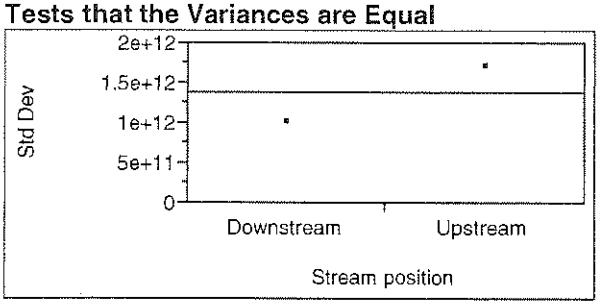
F Ratio	DFNum	DFDen	Prob > F
1.0692	1	24.976	0.3110

t Test
1.0340

Oneway Analysis of Volatile Suspended Solids (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	9.994e+11	8.359e+11	7.215e+11
Upstream	18	1.691e+12	1.265e+12	1.058e+12

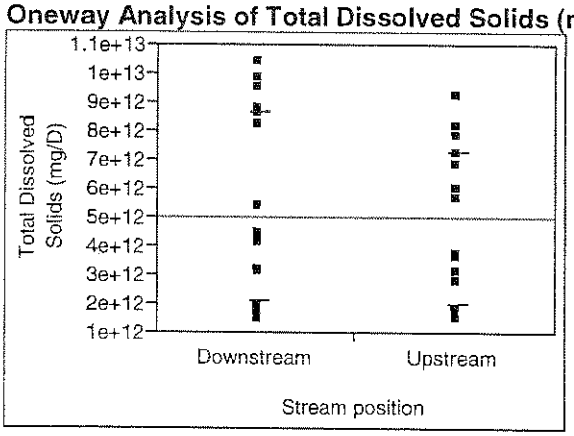
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.1187	1	34	0.1547
Brown-Forsythe	0.6876	1	34	0.4127
Levene	2.3250	1	34	0.1366
Bartlett	4.3685	1	.	0.0366
F Test 2-sided	2.8619	17	17	0.0366

Welch Anova testing Means Equal, allowing Std Devs Not Equal

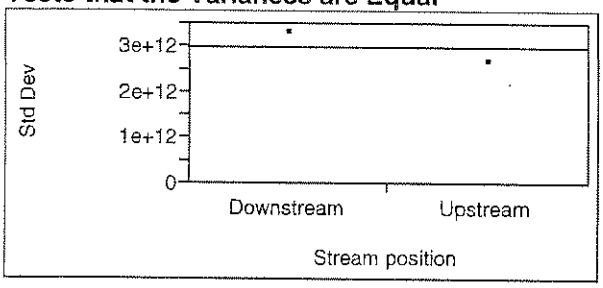
F Ratio	DFNum	DFDen	Prob > F
0.9238	1	27.588	0.3448

t Test
0.9612

Oneway Analysis of Total Dissolved Solids (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	3.283e+12	2.916e+12	2.81e+12
Upstream	18	2.646e+12	2.357e+12	2.254e+12

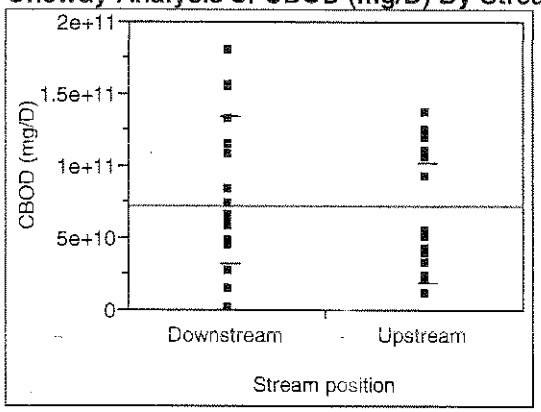
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	2.8274	1	34	0.1018
Brown-Forsythe	0.8919	1	34	0.3516
Levene	1.9423	1	34	0.1725
Bartlett	0.7613	1	.	0.3829
F Test 2-sided	1.5389	17	17	0.3830

Welch Anova testing Means Equal, allowing Std Devs Not Equal

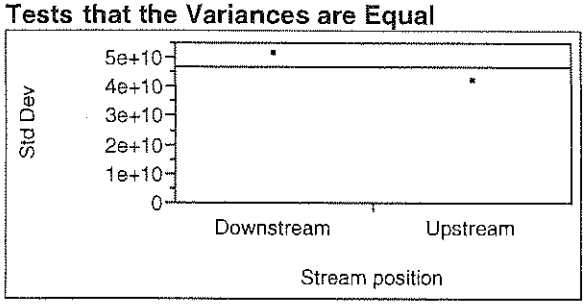
F Ratio	DFNum	DFDen	Prob > F
0.5678	1	32.534	0.4565

t Test
0.7535

Oneway Analysis of CBOD (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	5.098e+10	4.195e+10	4.079e+10
Upstream	18	4.175e+10	3.62e+10	3.239e+10

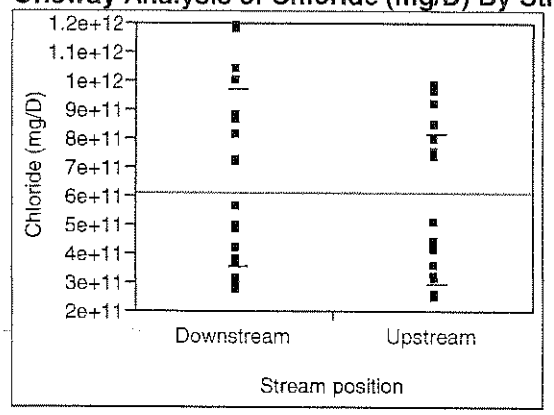
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.1413	1	34	0.2929
Brown-Forsythe	0.6287	1	34	0.4333
Levene	0.5449	1	34	0.4655
Bartlett	0.6538	1	.	0.4187
F Test 2-sided	1.4907	17	17	0.4188

Welch Anova testing Means Equal, allowing Std Devs Not Equal

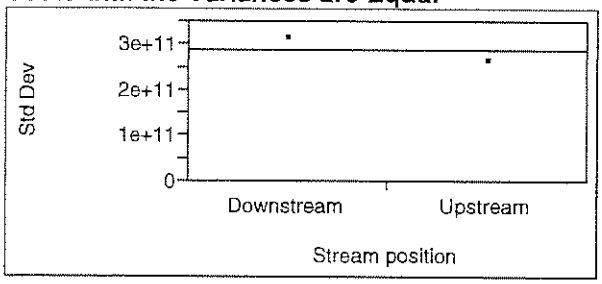
F Ratio	DFNum	DFDen	Prob > F
2.1735	1	32.73	0.1500

t Test
1.4743

Oneway Analysis of Chloride (mg/D) By Stream position



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	18	3.101e+11	2.686e+11	2.686e+11
Upstream	18	2.633e+11	2.326e+11	2.212e+11

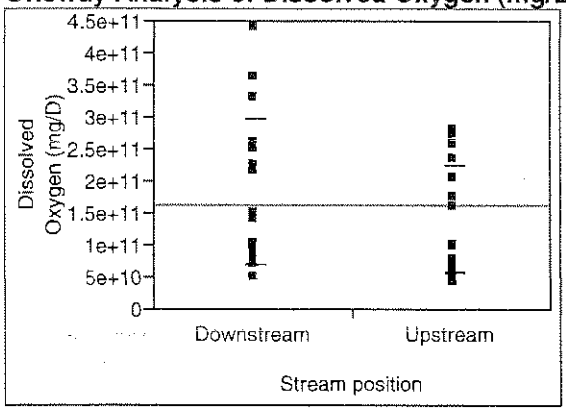
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.1412	1	34	0.2929
Brown-Forsythe	0.8885	1	34	0.3525
Levene	0.7323	1	34	0.3981
Bartlett	0.4406	1	.	0.5068
F Test 2-sided	1.3874	17	17	0.5069

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1.3004	1	33.128	0.2623

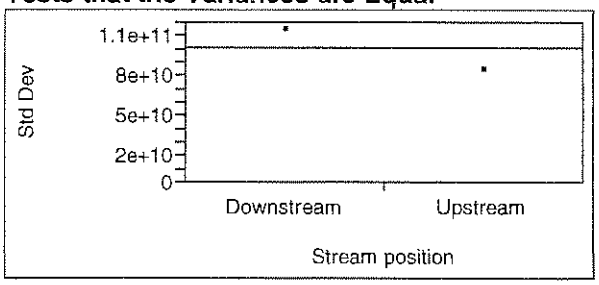
t Test
1.1403

Oneway Analysis of Dissolved Oxygen (mg/D) By Stream position



Missing Rows
2

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	17	1.142e+11	9.468e+10	8.885e+10
Upstream	17	8.427e+10	7.441e+10	7.221e+10

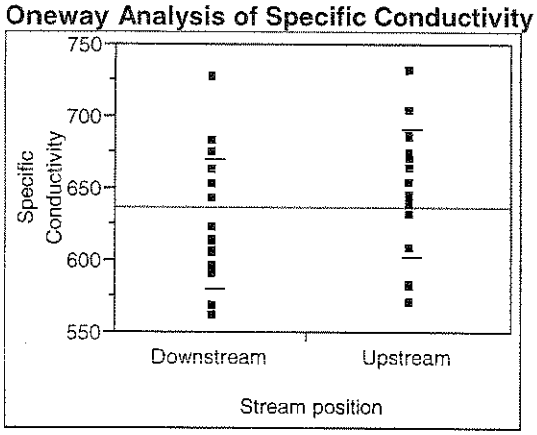
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	1.6925	1	32	0.2026
Brown-Forsythe	0.5063	1	32	0.4819
Levene	1.4739	1	32	0.2336
Bartlett	1.4138	1	.	0.2344
F Test 2-sided	1.8374	16	16	0.2345

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1.4859	1	29.436	0.2325

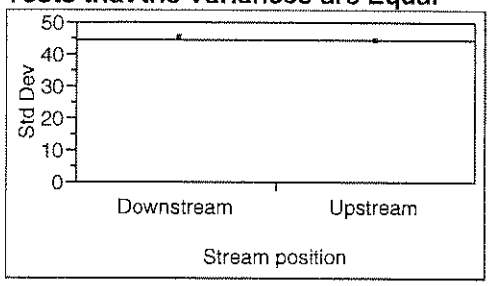
t Test
1.2190

Oneway Analysis of Specific Conductivity By Stream position



Missing Rows
3

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	16	44.86201	36.06250	34.12500
Upstream	17	44.22960	34.26990	34.17647

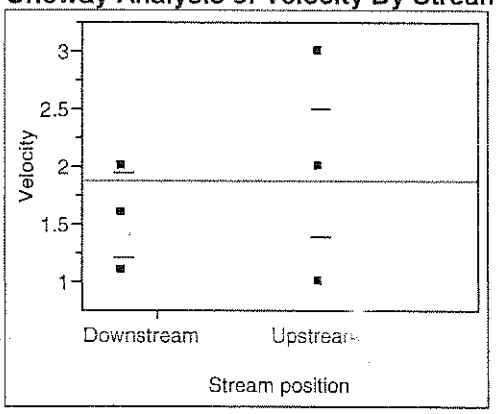
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.0037	1	31	0.9521
Brown-Forsythe	0.0000	1	31	0.9959
Levene	0.0396	1	31	0.8435
Bartlett	0.0030	1	.	0.9561
F Test 2-sided	1.0288	15	16	0.9518

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
1.8904	1	30.818	0.1791

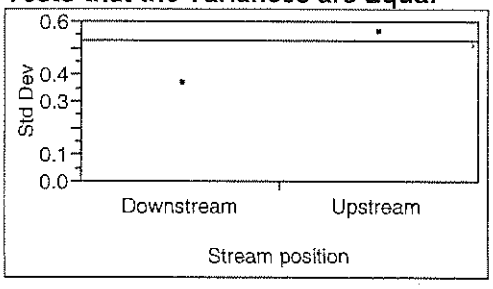
t Test
1.3749

Oneway Analysis of Velocity By Stream position



Missing Rows
15

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	4	0.3685557	0.2375000	0.2250000
Upstream	17	0.5557189	0.3321799	0.2941176

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.4329	1	19	0.5185
Brown-Forsythe	0.0787	1	19	0.7822
Levene	0.1698	1	19	0.6849
Bartlett	0.6322	1	.	0.4265
F Test 2-sided	2.2735	16	3	0.5447

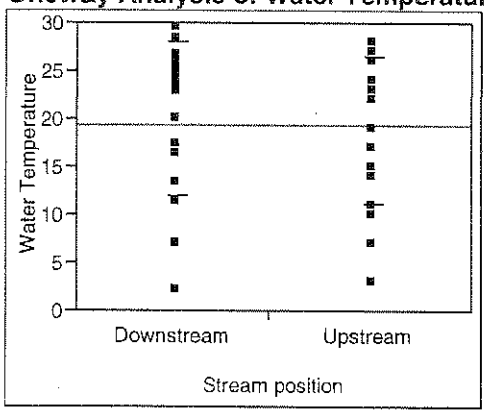
Warning: Small sample sizes. Use Caution.

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
2.5724	1	6.7083	0.1546

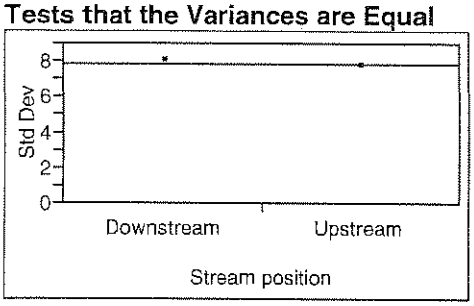
t Test
1.6039

Oneway Analysis of Water Temperature By Stream position



Missing Rows
3

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	16	8.005304	6.529531	6.153125
Upstream	17	7.699312	6.442907	6.235294

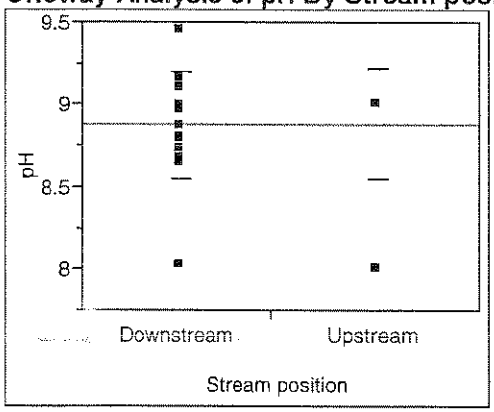
Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.0306	1	31	0.8623
Brown-Forsythe	0.0017	1	31	0.9670
Levene	0.0037	1	31	0.9521
Bartlett	0.0228	1	.	0.8800
F Test 2-sided	1.0811	15	16	0.8757

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.1677	1	30.684	0.6850

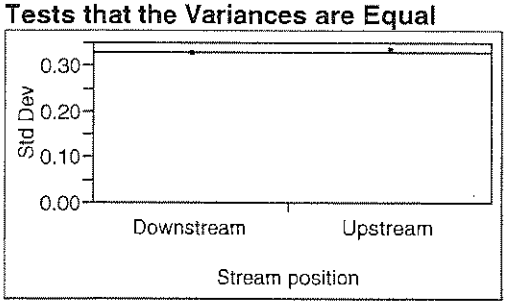
t Test
0.4095

Oneway Analysis of pH By Stream position



Missing Rows
3

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Downstream	16	0.3242883	0.2371094	0.2368750
Upstream	17	0.3321056	0.2076125	0.1176471

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	0.0036	1	31	0.9526
Brown-Forsythe	1.4728	1	31	0.2341
Levene	0.1300	1	31	0.7209
Bartlett	0.0085	1	.	0.9265
F Test 2-sided	1.0488	16	15	0.9309

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
0.0084	1	30.953	0.9275

t Test
0.0917

APPENDIX B

ANALYTICAL DATA