Indiana Department of Environmental Management

White River TMDL Study

September 2003

This study was prepared for the City of Indianapolis for IDEM pursuant to a contract with the State of Indiana.

Final Report

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List of Acronyms

AAC – Acute Aquatic Criterion
AWT- Advanced Wastewater Treatment
CAC – Chronic Aquatic Criterion
CWA – Clean Water Act
CSO – Combined Sewer Overflow
IDEM – Indiana Department of Environmental Management
IMAGIS – Indianapolis Mapping and Geographic Infrastructure System
LTCP – Long Term Control Plan
MCHD – Marion County Health Department
MOS – Margin of Safety
NPDES- National Pollutant Discharge Elimination System
OES – Office of Environmental Services
TMDL- Total Maximum Daily Load
TSS- Total Suspended Solids

Executive Summary

The City of Indianapolis has collected water quality data from the West Fork White River in Marion County and south to Waverly since 1991. In 1998, the Indiana Department of Environmental Management (IDEM) determined that segments of the river in this area do not consistently comply with the state's water quality standards for the following parameters:

- Ammonia
- Cyanide
- Dissolved Oxygen
- *E. coli* Bacteria

As a result, portions of the White River were put on the 1998 303(d) list and required to have a Total Maximum Daily Load (TMDL) evaluation for these constituents. This study was prepared for the City of Indianapolis for IDEM pursuant to a contract with the State of Indiana. Development of a TMDL was investigated for the four parameters listed above. Results of the investigations are summarized for each parameter as follows:

Ammonia: During data analysis for this TMDL, it was determined that the data did not support a need for a TMDL on the White River for ammonia. A request by the City of Indianapolis to remove the West Fork of the White River for ammonia from the 303(d) list was reviewed and approved by IDEM. In IDEM's Summary Response to Comments, IDEM states, "IDEM re-evaluated these listings in light of the data submitted by the City of Indianapolis, Department of Public Works. IDEM will recommend that the West Fork of the White River from the confluence of Fall Creek to the confluence of Pleasant Run be delisted for ammonia." A check against the draft 2002 303(d) list verifies that the White River is not listed as impaired for ammonia.

Cyanide: Analysis (provided in Section 3) indicates that the Belmont and Southport Advanced Wastewater Treatment (AWT) Plants are the primary sources of cyanide. Hence, control of cyanide is addressed through the National Pollutant Discharge Elimination System (NPDES) permits for those AWT Plants. Under IDEM 303(d) listing methodologies, the White River segments should be listed as Category 4b, not as Category 5 for cyanide. Category 4b is for "Waterbodies Where Other Pollution Control Measures Could Result in Attainment of Water Quality Standards" and a TMDL need not be completed. As a result, a TMDL evaluation was not required or performed for this pollutant. As explained more fully in Section 3, although cyanide exceedances in the White River downstream of the AWT Plants are observed, it should be noted that both AWT Plants currently are in compliance with NDPES permit requirements.

Dissolved Oxygen: Low dissolved oxygen, which violates the state's instream water quality standard, was determined to be caused by combined sewer overflow (CSO) discharges. The city's CSO Long Term Control Plan (LTCP) is being developed and will address this parameter. Under IDEM's 303(d) listing methodologies, the White River segments should be listed in Category 4b, not in Category 5 for dissolved oxygen. Category 4b is for "Waterbodies Where Other Pollution Control Measures could Result in Attainment of the Water Quality Standards" and a TMDL need not be completed. As a result, a TMDL evaluation was not required or performed for this parameter.

***E. coli* bacteria**: *E. coli* bacteria standards of 125 colony forming units (cfu)/100 ml (geometric mean of five samples collected over 30 days) and 235 cfu/100 ml (maximum day value) are often exceeded on the river. An *E. coli* bacteria model of the White River was developed and calibrated to the existing instream data. A ten-year period of time was simulated to predict resultant instream *E. coli* bacteria counts for each day of the simulation period. Data collected by several agencies was obtained for the model development.

The White River was divided into three segments for analysis purposes:

- White River North Segment-- Upstream Marion County line to Lake Indy
- White River CSO Segment -- Lake Indy to Tibbs/Banta Landfill
- White River South Segment -- Tibbs/Banta Landfill to Waverly

Sources of *E. coli* bacteria in the watershed include CSOs, urban stormwater, failing septic systems, illicit storm drain connections, AWT plants and pollutants from wildlife and domestic animals. Point sources and nonpoint sources were characterized and represented in the model for evaluation of loadings to determine the required action necessary to attain water quality standards.

The existing daily *E. coli* bacteria loads are presented in **Table E.1** for point and non-point sources. As can be seen from the table, CSO discharges and stormwater runoff contribute the largest *E. coli* bacteria loads into the White River system.

Based on the modeled *E. coli* bacteria concentrations and stream flow, the allowable *E. coli* TMDLs for White River were determined. The TMDL is calculated as 125 cfu *E. coli* bacteria/100 ml multiplied by the average daily flow for the stream segment during the recreational season (April to October). The TMDLs are based on meeting water quality standards. The allowable *E. coli* bacteria TMDLs and required reductions are as follows:

White River North:

Existing Waste Load	= 4.85 x 10^{11} cfu
Existing Load	= 5.15 x 10^{12} cfu
Existing Out of County Load	= 1.01 x 10^{12} cfu
Existing Total Load	= 6.64 x 10^{12} cfu
TMDL	= 3.40 x 10^{12} cfu
Required Reduction	= 49%

White River CSO Area:

Existing Waste Load	= 5.80 x 10^{14} cfu
Existing Load	= 2.26 x 10^{12} cfu
Existing Out of County Load	= 1.01 x 10^{12} cfu
Existing Total Load	= 5.84 x 10^{14} cfu
TMDL	= 4.09 x 10^{12} cfu
Required Reduction	= 99%

White River South:

Existing Waste Load	= 5.65 x 10^{14} cfu
Existing Load	= 2.84x 10^{12} cfu
Existing Out of County Load	= 1.01 x 10^{12} cfu
Existing Total Load	= 5.69 x 10^{14} cfu
TMDL	= 4.87 x 10^{12} cfu
Required Reduction	= 99%

Table E.1 presents the loads from the individual *E. coli* bacteria sources.

TABLE E.1: SUMMARY OF EXISTING *E. COLI* BACTERIA LOAD FOR THE APRIL TO OCTOBER RECREATIONAL SEASON
WHITE RIVER

Scenario	Point Source -- AWT Discharges (cfu)*	Point Source -- CSO Discharges (cfu)*	Point Source -- Permitted Stormwater Discharges (cfu)*	Point Source -- Illicit Sanitary Connections (cfu)*	**Total Point Source Load (cfu)**	Nonpoint Source -- Unpermitted Stormwater Discharges (cfu)*	Nonpoint Source -- Wildlife (cfu)*	Nonpoint Source -- Failing Septic Systems (cfu)*	**Total Nonpoint Source Load (cfu)**	Upstream out-of-county sources (cfu)*	**Total Load (cfu)**	TMDL (cfu)	**Required Load Reduction to meet TMDL (%)**
White River-North Existing	0	2.01E+10	4.65E+11	1.21E+08	**4.85E+11**	4.97E+12	8.60E+10	9.72E+10	**5.15E+12**	1.01E+12	**6.64E+12**	3.40E+12	**49%**
White River-CSO Existing	1.07E+11	5.72E+14	8.11E+12	2.84E+08	**5.80E+14**	2.01E+12	1.15E+11	1.34E+11	**2.26E+12**	1.01E+12	**5.84E+14**	4.09E+12	**99%**
White River-South Existing	2.64E+11	5.56E+14	9.40E+12	2.99E+08	**5.65E+14**	1.90E+12	7.56E+11	1.81E+11	**2.84E+12**	1.01E+12	**5.69E+14**	4.87E+12	**99%**

*Note: All loads presented in are the average daily loads for the recreational season. These loads may be different from the loads presented in Section 5, which are for the entire year.

Section 1
Introduction

The State of Indiana assesses its water bodies for compliance with water quality standards established for their designated uses as required by the federal Clean Water Act (CWA). Assessed water bodies are placed into five categories depending on water quality assessment results: supporting, partially supporting, water bodies with insufficient or no data, impaired but not requiring TMDLs, and finally, water bodies not supporting their designated uses and requiring TMDLs. These water bodies are found on Indiana's 303(d) list, which is published every two years, as required by section 303(d) of the CWA.

Some of the 305(b) partially and not supporting water bodies are also assigned to Indiana's 303(d) list, also named after a section of the CWA. Water bodies on the 303(d) list are required to have a TMDL evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and instream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality. TMDLs must meet the requirements set forth in federal regulation at 40 CFR 130.2 and 130.7

In 1998, water quality data collected by the Indiana Department of Environmental Management (IDEM) indicate that segments of the West Fork of the White River do not comply with the following water quality standards:

- Ammonia
- Cyanide
- Dissolved Oxygen
- *E. coli* Bacteria

As a result, segments of the White River from upstream Marion County boundary to Waverly were added to the State's 1998 303(d) list and scheduled for a TMDL evaluation.

Water quality data obtained from different sources was used to develop a TMDL. Available data has been gathered from the City of Indianapolis Office of Environmental Services (OES), the Marion County Health Department (MCHD), and IDEM pertaining to the White River for use in performing a TMDL. The following sections describe the White River study segment, the parameter of concern, and the applicable water quality standards. A summary of the available data for each parameter from each source and weather condition, TMDL load analysis, public participation process, monitoring plan, and implementation activities and schedule is also given. For purposes of this report, references to the White River are intended to mean specifically the West Fork of the White River.

Section 2
Background Information

The study segments relevant for this TMDL report consist of the White River from the Marion County border upstream to Waverly at State Route 144 downstream.

2.1 Parameters of Concern

The State of Indiana's 1998 Section 303(d) list shows four parameters of concern for the White River within the study segment described above:

- Ammonia
- Cyanide
- Dissolved Oxygen, and
- *E. coli* Bacteria.

Section 303(d) of the Clean Water Act requires states to list waters for which technology-based limits alone do not ensure attainment of water quality standards. States are to list and set priority rankings for their listed impaired waters. To address water body segments on the 303(d) list, states are required to develop TMDLs that allow these segments to attain water quality standards. This report presents instream data as well as the load allocations to achieve water quality standards for *E. coli*.

2.2 Water Quality Standards

IDEM has promulgated water quality standards to protect designated uses of waterways. Each of the listed parameters (ammonia, cyanide, dissolved oxygen, and *E. coli* bacteria) has listed numeric values or a formula to calculate numeric values for the standards, which can be used as target values for the TMDL.

2.2.1 Ammonia

The State water quality standards have numeric limits on maximum ammonia concentrations and 24-hr average ammonia concentrations. The ammonia water quality standards are variable based on the stream temperature and pH.

2.2.2 Cyanide

The State's water quality standard has a total cyanide standard of 5.2 ug/L for Chronic Aquatic Criterion (CAC) and 22 ug/L for Acute Aquatic Criterion (AAC). The CAC is a 4-day average, whereas the AAC is a maximum.

2.2.3 Dissolved Oxygen

The applicable dissolved oxygen standard is as follows:

> *Concentrations of dissolved oxygen shall average at least five (5.0) milligrams per liter per calendar day and shall not be less than four (4.0) milligrams per liter at any time.*

2.2.4 Bacteria

The applicable bacteria standard is for *E. coli* and is as follows:

> *… for full body contact recreational uses E. coli bacteria, using membrane filter (MF) count, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period.*

E. coli bacteria is used as the water quality indicator and the target values are:

- Monthly geometric mean not to exceed 125 cfu/100 ml
- Monthly maximum count sampled not to exceed 235 cfu/100 ml.

Section 3
Data Sources and Initial Assessment

The Indiana water quality standards for dissolved oxygen, *E. coli* bacteria, and cyanide are being exceeded in the White River. At the beginning of this TMDL project, ammonia was listed on the 303(d) list. However, a review of the ammonia data indicates that this parameter no longer exceeds the state standard. Ammonia levels were part of the data set collected for this project and are included in this section.

Instream water quality data was obtained for the White River from the upstream boundary of Marion County downstream to Waverly for use in performing a TMDL analysis. This section describes the sources of the data collected for review and gives an assessment of compliance for each parameter.

3.1 Data Sources

Instream water quality data characterizing ammonia, cyanide, dissolved oxygen, and *E. coli* bacteria was obtained from the following sources:

- City of Indianapolis Department of Public Works Office of Environmental Services (OES),
- Marion County Health Department (MCHD), and
- Indiana Department of Environmental Management (IDEM).

3.2 Sampling Locations

Data for each parameter were collected at various intervals and locations by the three agencies. The sampling locations for each agency are shown on **Figure 3.1**.

OES has collected samples and performed analyses for all four parameters being reviewed at six locations on the White River. These sampling locations are:

- 82^{nd} Street – This site is the same location as the IDEM 86^{th} Street station
- Morris Street
- Harding Street
- Tibbs/Banta Landfill
- Southwestway Park
- Waverly and State Road 144

OES also installed continuous monitoring instrumentation in the White River and collected dissolved oxygen data in 15-minute intervals at three locations on the White River from June 2001 to December 2001. These sites are:

- 16^{th} Street: 1998-present, except 2002, May/June – December
- Indianapolis Power and Light Dam: 1998-present, May/June - December

- Waverly and State Road 144: 1998-present, May/June - December

MCHD collected samples and performed analysis for *E. coli* bacteria at eight locations and dissolved oxygen at nine locations on the White River. All locations were sampled from April to October each year. All sites were sampled monthly, with the exception of the New York Street location, which was sampled five times per month. The locations along with their beginning and ending sampling dates are as follows:

- 96th Street – April 2000 to October 2001
- Marina Drive – April 1998 to October 2001
- Ruth Drive – April 1998 to October 2001
- Howland at Crittenden – April 1998 to October 2001 (dissolved oxygen only)
- Broad Ripple Park ramp – April 1998 to October 2001
- 6800 Cornell Avenue – April 1998 to October 2001
- Lake Indy - June 1996 to October 2001
- New York Street – May 2001 to present
- Raymond Street – June 1996 to October 2001

IDEM collected dissolved oxygen data at thirteen sites on the White River. The site locations and frequency of sampling are as follows for two sites located inside and one site located outside of Marion County:

- 86th Street in Nora – Monthly from March 1991 to present and Weekly from March 2001 to July 2001. This site is the same as the OES 82nd Street station.
- Raymond Street - Weekly from March 2001 to July 2001
- Waverly and State Road 144 – Monthly from April 1991 to present

The other ten sites of the thirteen locations that were used by IDEM were located within Marion County. These sites had limited sampling. The location and frequency of sampling for these sites are:

- 37 feet from right bank and on left bank in line with yellow and brown building next to water tower, downstream of confluence with Big Eagle Creek, upstream of confluence with Lick Creek – Sampled July 22, 2000
- Approximately 100 feet downstream of Stout Dam on east bank – Sampled July 25, 2000
- Under power lines above Harding Street – Sampled July 27, 2000
- Under power lines, across from and opposite bank of Belmont AWT Plant effluent outfall – Sampled July 27, 2000 and August 8, 2000
- Belmont AWT Plant Effluent Outfall – Sampled July 27, 2000 and August 8, 2000

- Adjacent to Water Tower, 75 feet from right bank, downstream of confluence with Big Eagle Creek, upstream of confluence with Lick Creek – Sampled July 27, 2000
- Over old sheet piling, 162 feet from USGS Gauge station, 38 feet from bank – Sampled July 27, 2000
- 160 feet from right bank, 1000 feet from conveyor building, 500 feet downstream from gage, downstream of confluence with Big Eagle Creek, upstream of confluence with Lick Creek – Sampled July 27, 2000
- Near west bank, adjacent to Indianapolis Power & Light water tower – Sampled July 27, 2000
- 210 feet from south corner of intake control building, 200 feet from north corner of building, downstream of confluence with Big Eagle Creek, upstream of confluence with Lick Creek – Sampled July 27, 2000

3.3 Data Review and Initial Findings

CDM has reviewed the available data for use in performing a TMDL for *E. coli*. All data collected by OES, MCHD, and IDEM are considered to have received quality assurance checks by the respective collecting entity (OES, MCHD, or IDEM). In addition, IDEM has approved the use of OES and MCHD data for this analysis. Additional data checking was not performed as part of this project. Data flagged by the collecting entity as questionable are presented in the attached graphs and noted as being questionable, but they have not been used for determination of compliance.

All accepted data are considered comparable. OES and TMDL sampling (April 2002-October 2002) used the same method for comparison purposes. That is, where data is collected by more than one entity at a particular monitoring location, the data sets are combined for the assessment of compliance with the applicable standard.

The data obtained from the various sources and locations was evaluated for compliance with the Indiana surface water quality standards as set in the Indiana Administrative Code (327 IAC 2-1-6) for each parameter. The following subsections summarize the findings for each parameter reviewed.

3.3.1 Ammonia

Ammonia data for January 2000 to December 2001 available from the OES was reviewed. Currently, the State of Indiana uses water quality standards developed for ammonia by EPA in 1999. The data obtained for this parameter are provided in the Appendices in table format. The plots are in order from upstream to downstream locations. Review of this data indicates that for the past two years (2000 and 2001), the stream consistently met the Indiana standard (1999 EPA Standard) for ammonia, as summarized in **Figures 3.2 through 3.5**. IDEM has delisted ammonia on the 2002 proposed 303(d) listings for the White River in Indianapolis.

3.3.2 Cyanide

Quarterly cyanide data obtained from the City of Indianapolis OES for the period of March 2000 to November 2001 and IDEM data was reviewed. **Figures 3.6 through 3.9** present the information graphically. The current Indiana surface water quality standard for total cyanide for the chronic aquatic criterion (CAC) is 5.2 ug/L (327 IAC 2-1-6 Table 1). The data obtained for this parameter are provided in the Appendices in table format. The plots are in order from upstream to downstream locations. As shown in these figures, cyanide exceedances in the White River appear to stem from discharges from the Belmont and Southport AWT plants. This assessment is supported by the data for the Tibbs/Banta Landfill, Southwestway Park, and Waverly (SR 144) sampling stations. The data at these stations show a number of exceedances while data upstream of these stations and both AWT plants shows only one cyanide exceedance (at the 86th Street site), as shown in **Figure 3.6**.

Although cyanide exceedances in the White River downstream of the AWT Plants are observed, it should be noted that both AWT Plants currently are in compliance with NDPES permit requirements. The current NPDES permits contain new effluent limits for cyanide based upon total cyanide, compared with the effluent limits in the previous permits, which were based upon amenable, or free, cyanide. Because of the new effluent limits, the permits provide three-year compliance schedules, during which the previous effluent limits remain in effect. The AWT Plants continue to meet those limits.

3.3.3 Dissolved Oxygen

Dissolved oxygen (DO) data has been collected at 15 locations on the White River at varying intervals ranging from monthly to weekly from January 2000 to December 2001. The data for 14 stations out of 15 showed one hundred percent compliance with the Indiana DO standard of 4 mg/L minimum and 5 mg/L average per day. The one exception was at the New York Street station, where there was one occurrence of being below th~~e sta~~ndard of 4 mg/L. **Figures 3.10 though 3.17** and **Figure 3.23** present this information.

In addition to the grab samples, OES also deployed continuous dissolved oxygen and temperature probes at three locations on the White River: 16th Street, Indianapolis Power and Light (IPL), and Waverly (SR 144) for June to December, from 1998 to present, except for the year 2000 on 16th Street. Compliance with the minimum value of 4 mg/L for DO was 100% at the 16th Street and IPL monitoring stations, where it was only 96% of the time for the Waverly (SR 144) station. Compliance with the daily average of 5 mg/L was 100% at 16th Street, 99.3% at IPL, and 98.7% at Waverly (SR 144). **Figures 3.18** and **3.19** present this information. Daily averages for the sample data are presented in **Figures 3.20 through 3.22.**

3.3.4 *E. coli* Bacteria

MCHD uses the Quanitray 2000 tray-counting method. Samples are prepared with the Colilert reagent and incubated for 24 to 48 hours prior to application on the trays.

The City's OES has used **Standard Methods for the Examination of Water and Wastewater** (prepared and published by the American Public Health Association/American Water Works Association/Water Environment Federation-latest edition) as a reference to determine the method(s) used to enumerate fecal Coliform and *E. coli* bacteria concentrations in surface water samples.

In order to produce as accurate of a value as possible, OES has been using Membrane Filtration (MF) as opposed to Most Probable Number (MPN) methods. The specific method for determining fecal Coliform concentrations is referenced as 9222 D, using mFC broth with Rosolic acid, incubating the samples at 44.5 Deg C (+/- 0.2 Deg C), for a 24 hour period, +/- 2 hours.

OES has been using a slightly modified Membrane Filter method 9222 G as an extension of 9222 D to obtain an *E. coli* bacteria value. This method uses the same filter pad from the fecal Coliform method and reincubates the filter pad on a nutrient agar plate containing the organic salt 4-methyl-umbelliferyl-Beta-D glucuronide (MUG). Reincubation is conducted for 4 hours at 35.0 degrees Celsius (+/- 0.5 deg C). When added to the agar plate, MUG causes *E. coli* bacteria colonies to fluoresce under an ultraviolet light source (366 nm). Extensive comparison testing was performed using the mTEC *E. coli* bacteria method to analyze WWTP and surface water samples. In addition, freeze dried *E. coli* bacteria cultures were obtained and rehydrated to evaluate both methods. The comparison evaluation resulted in a good correlation between the two test methods, and the "pure" *E. coli* bacteria culture sample was determined to be accurately reported. The rehydrated cultures did not have a reference concentration.

E. coli bacteria sampling data for January 2000 to December 2002 was analyzed from OES, MCHD, and IDEM. The percent compliance of *E. coli* bacteria generally decreases when moving from the upstream boundary at 96th Street (64%) to the downstream boundary at Waverly (21%) for the maximum monthly sampled value of 235 cfu/100 ml standard. Only the New York Street sampling location has sufficient sampling frequency (5 samples in 30 days) for a geometric mean comparison. That station never achieved compliance with the geometric mean monthly standard of 125 cfu/100 ml during 2001. **Figures 3.24 through 3.32** present this information.

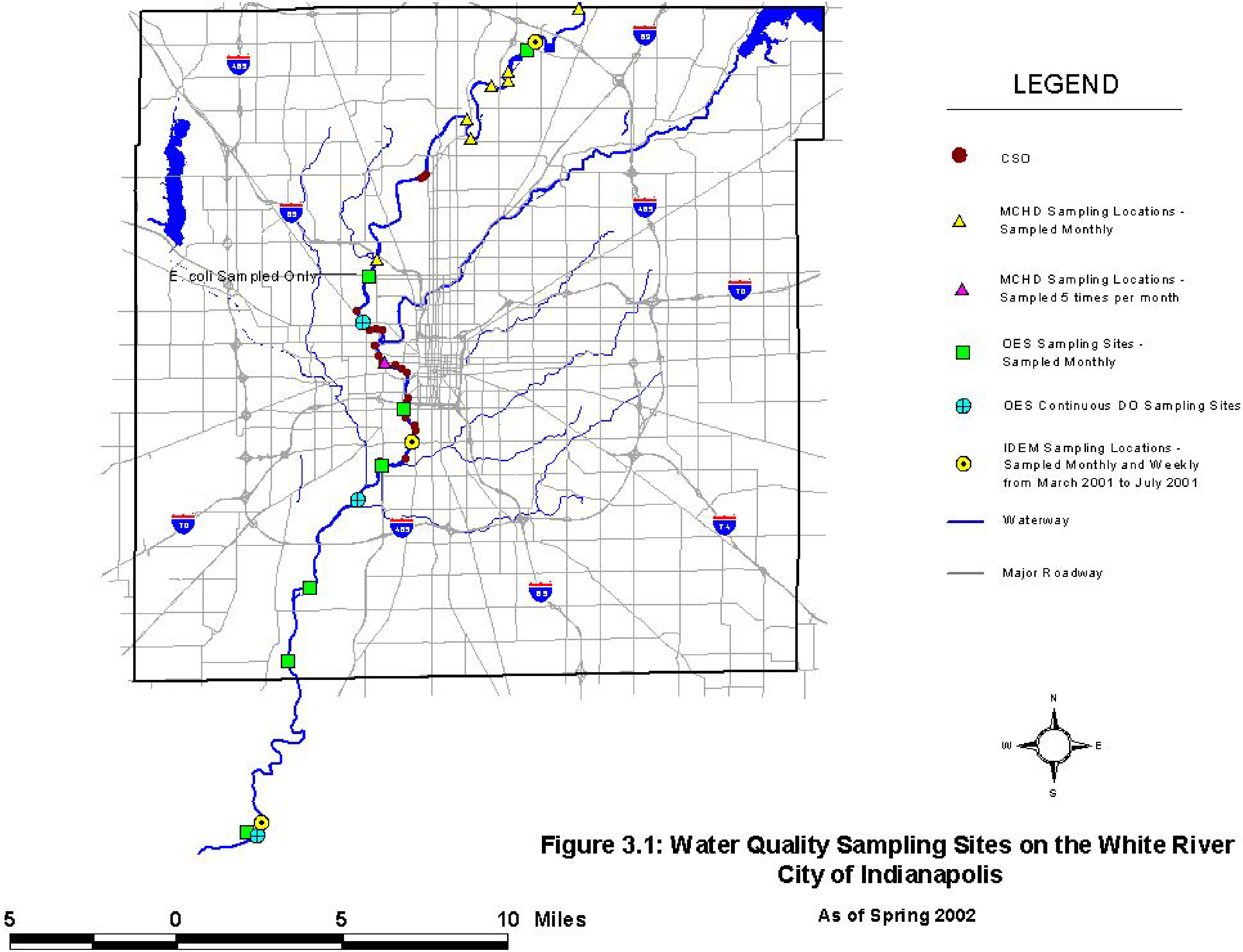
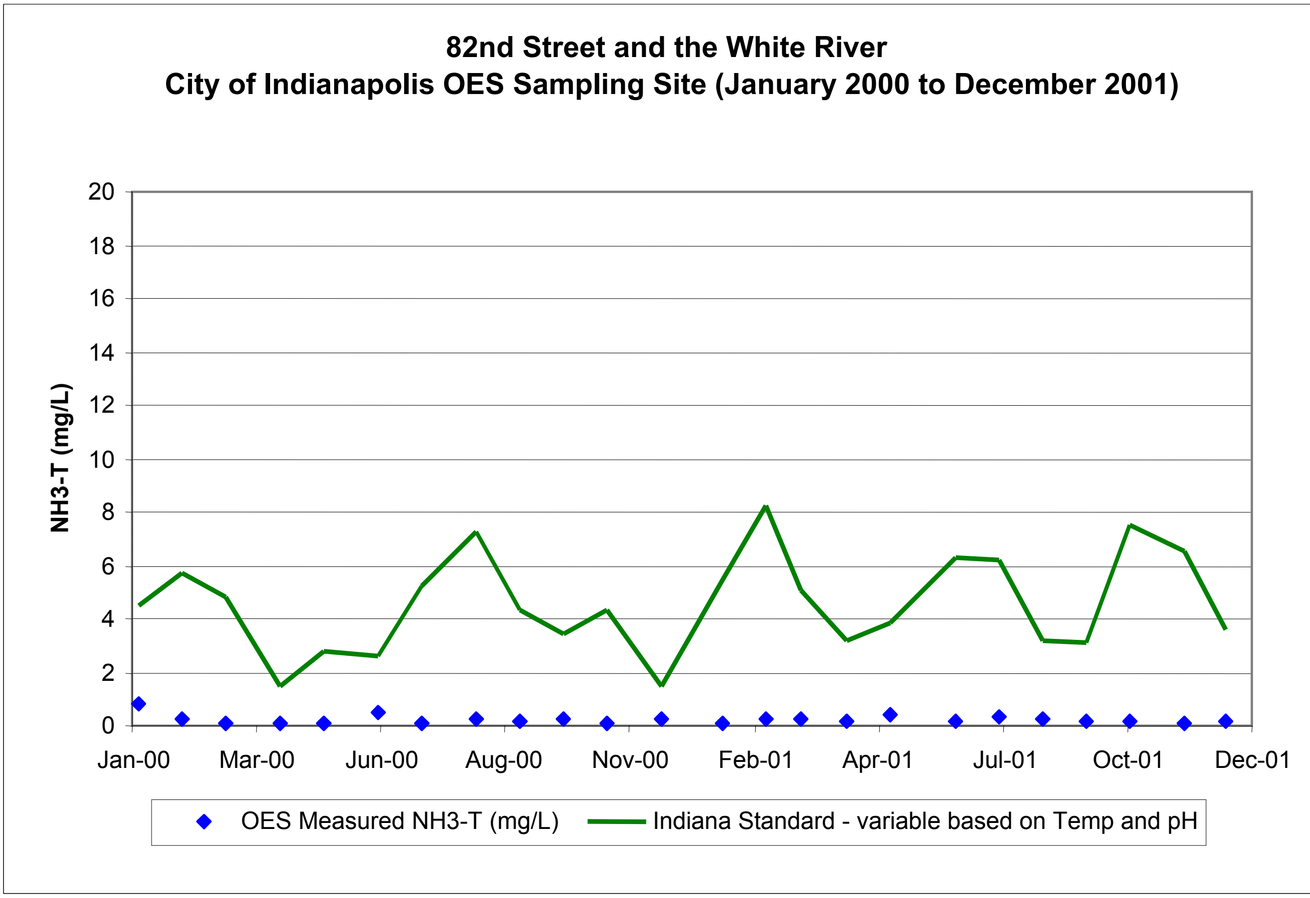


Figure 3.1: Water Quality Sampling Sites on the White River
City of Indianapolis

As of Spring 2002

Figure 3.2: White River Ammonia Data



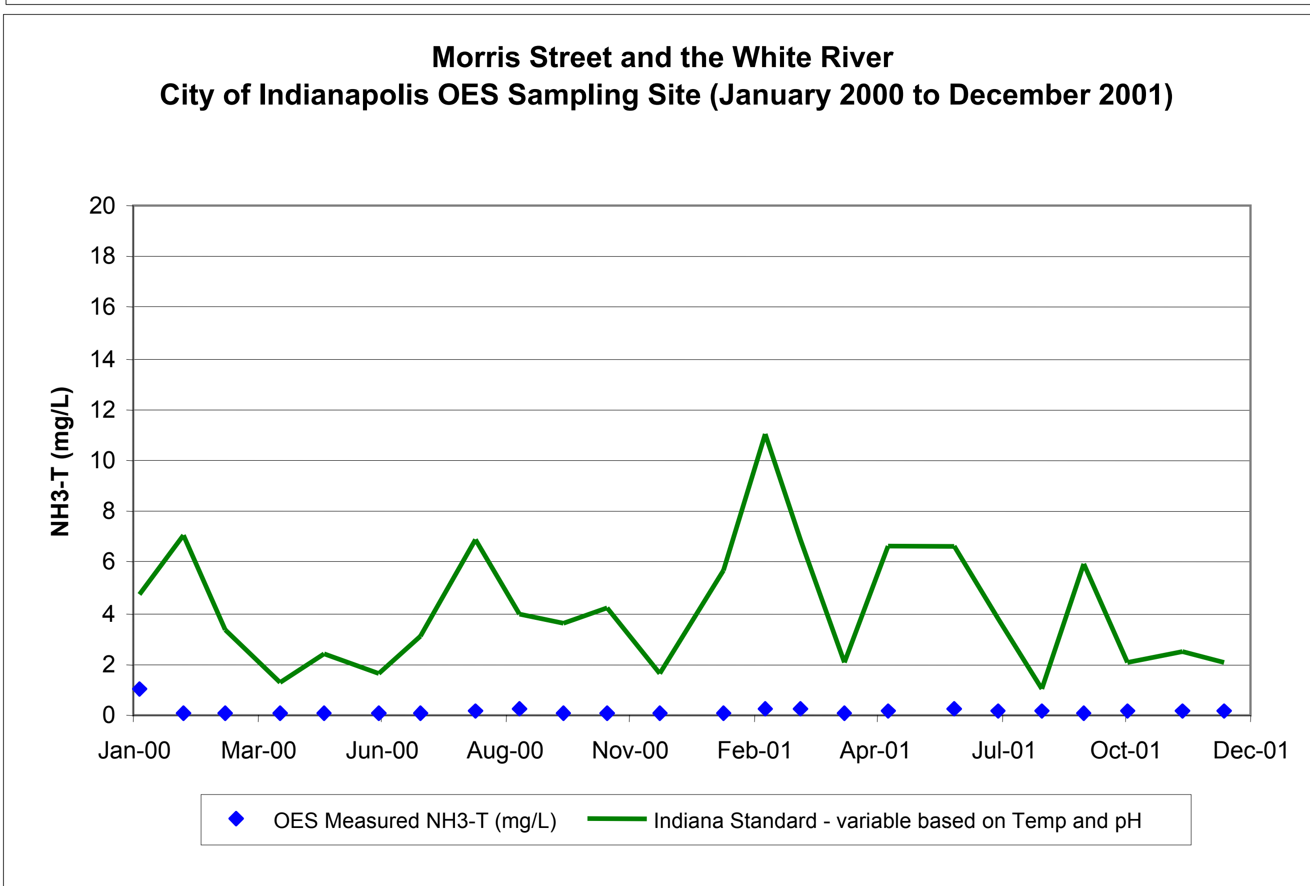
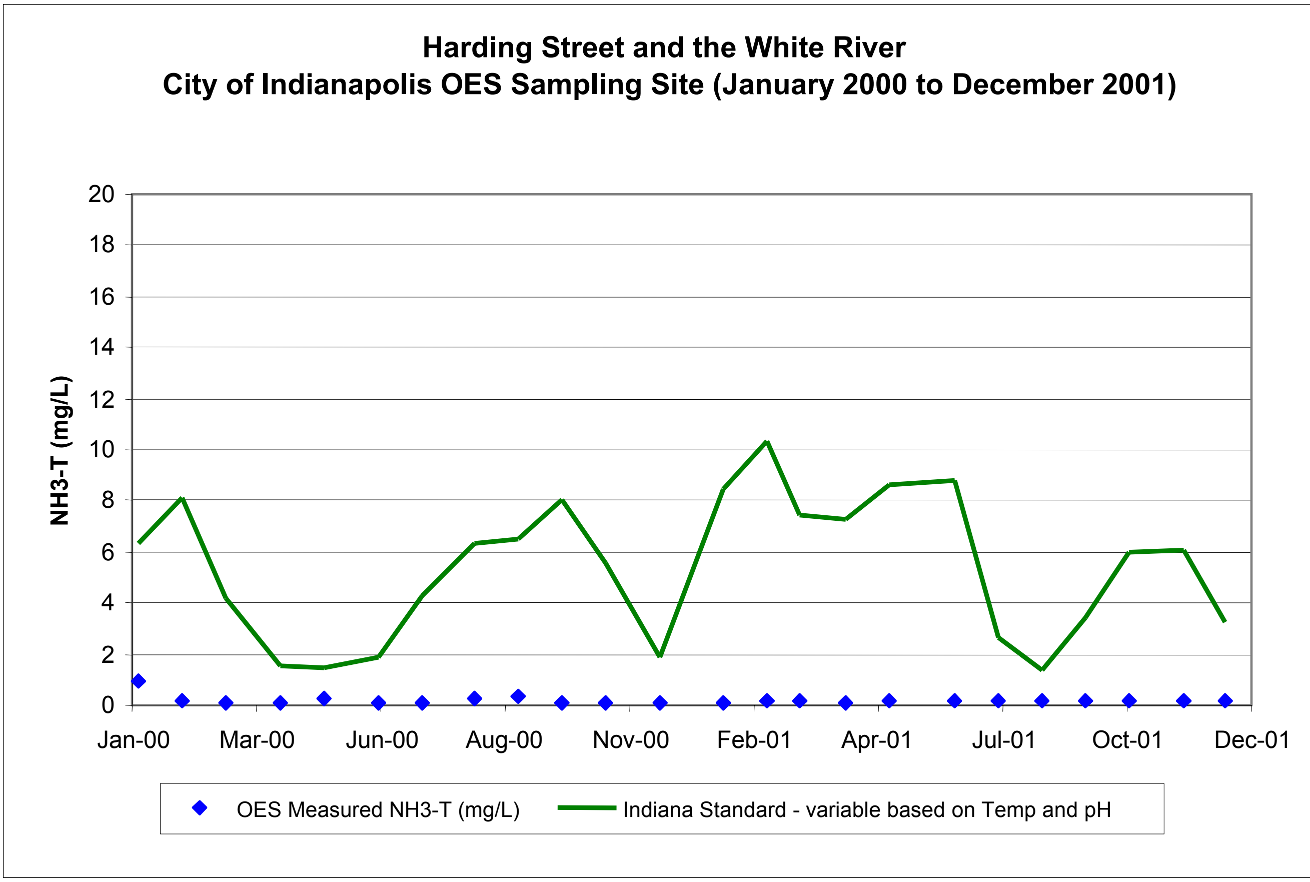
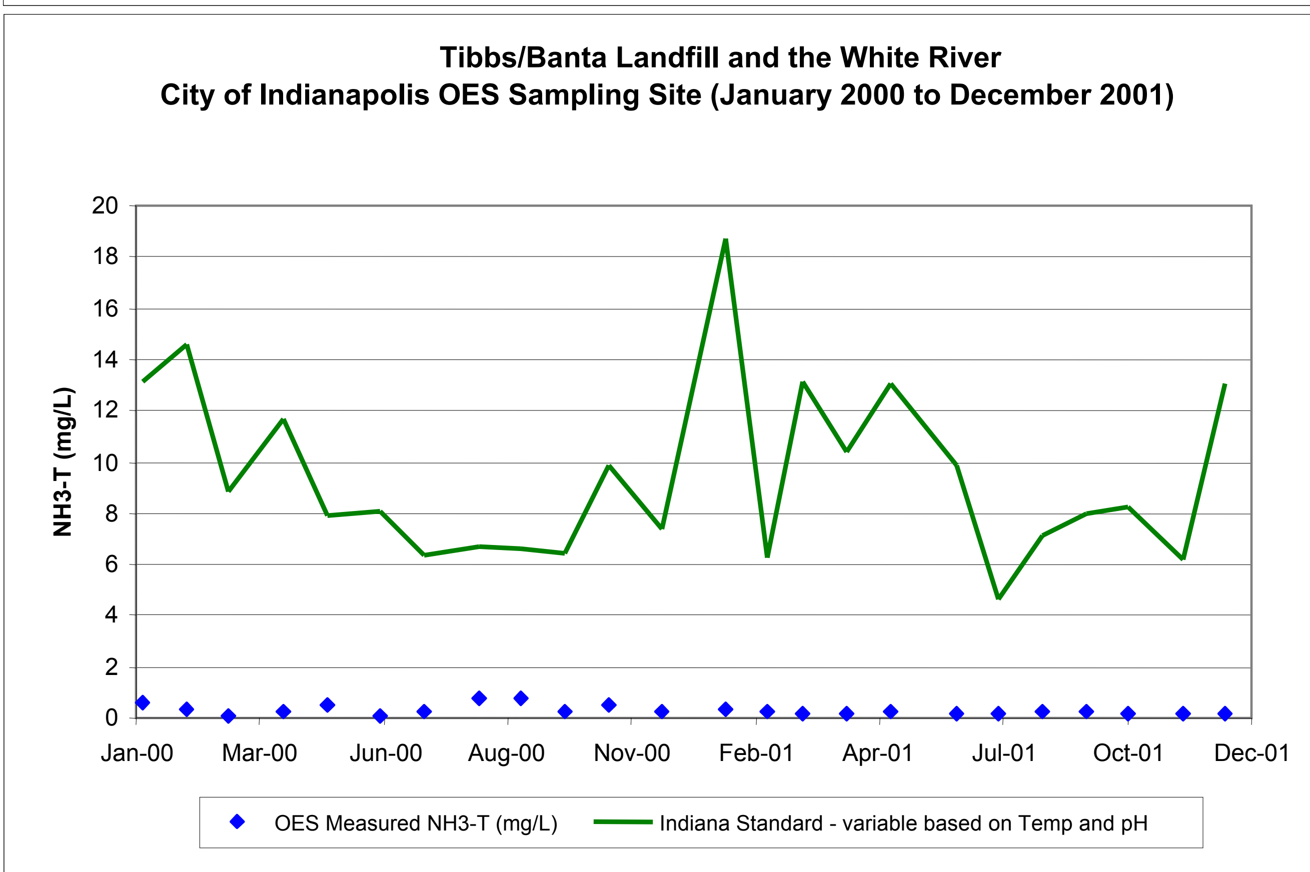


Figure 3.3: White River Ammonia Data





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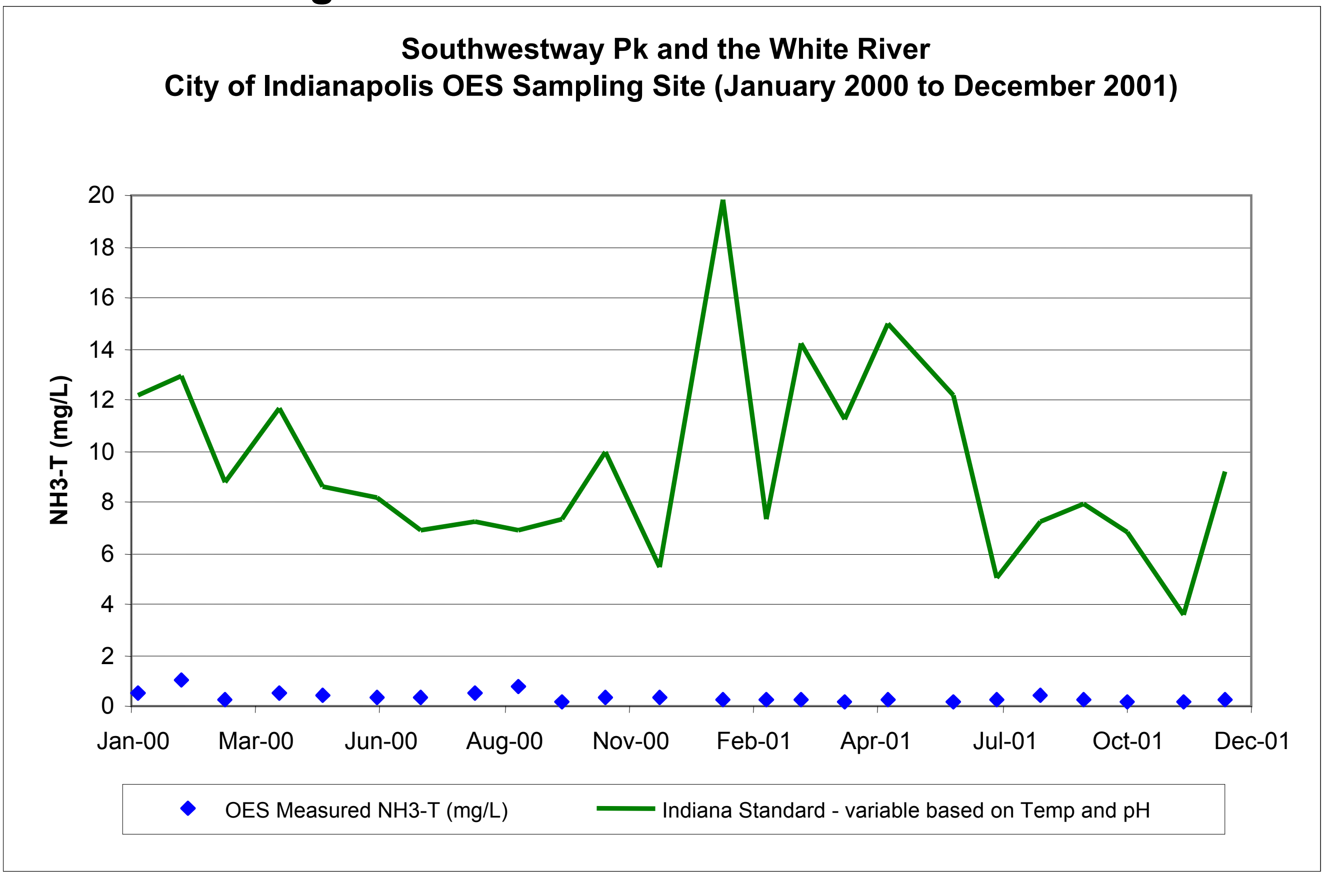


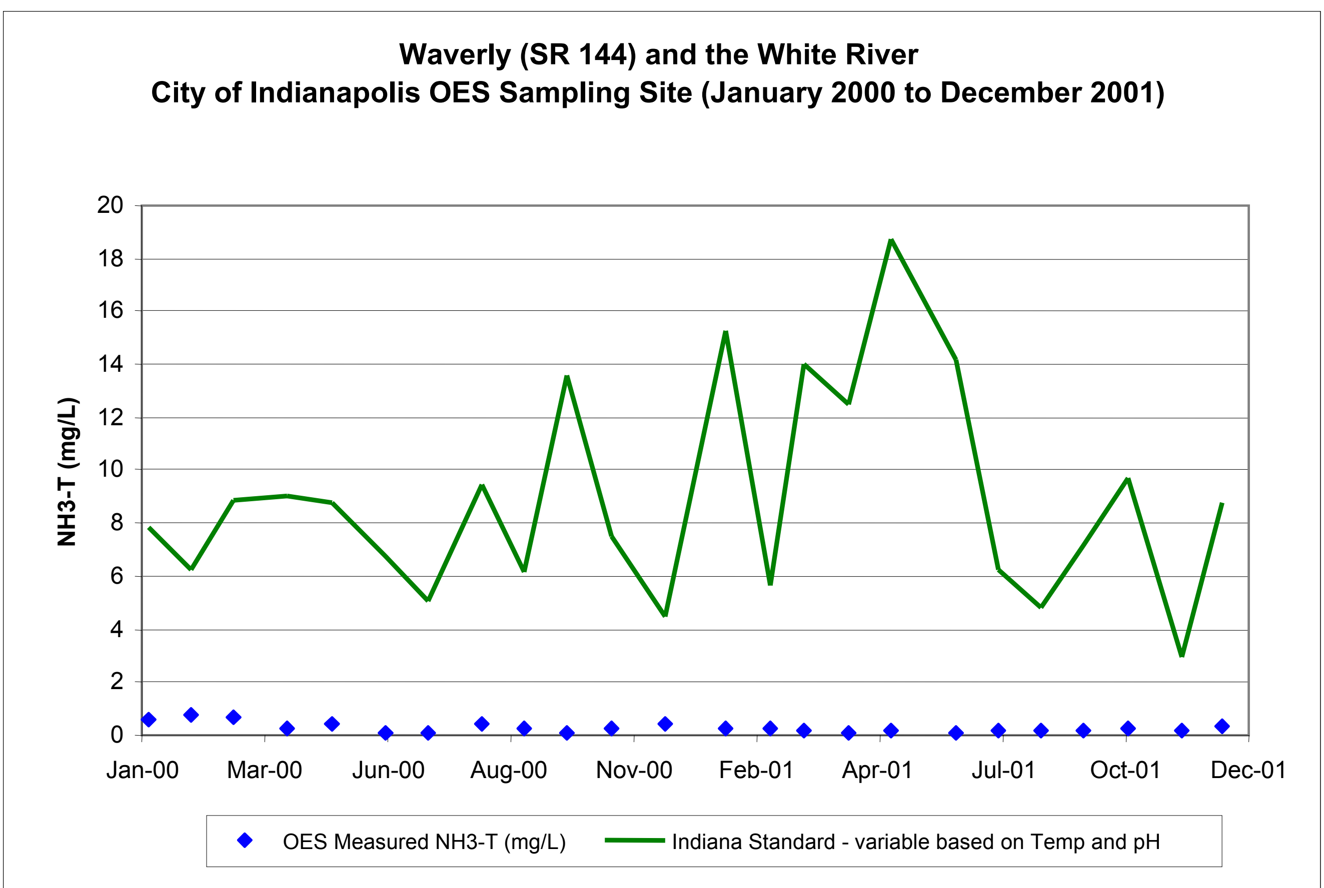


Figure 3.5: White River Ammonia Data

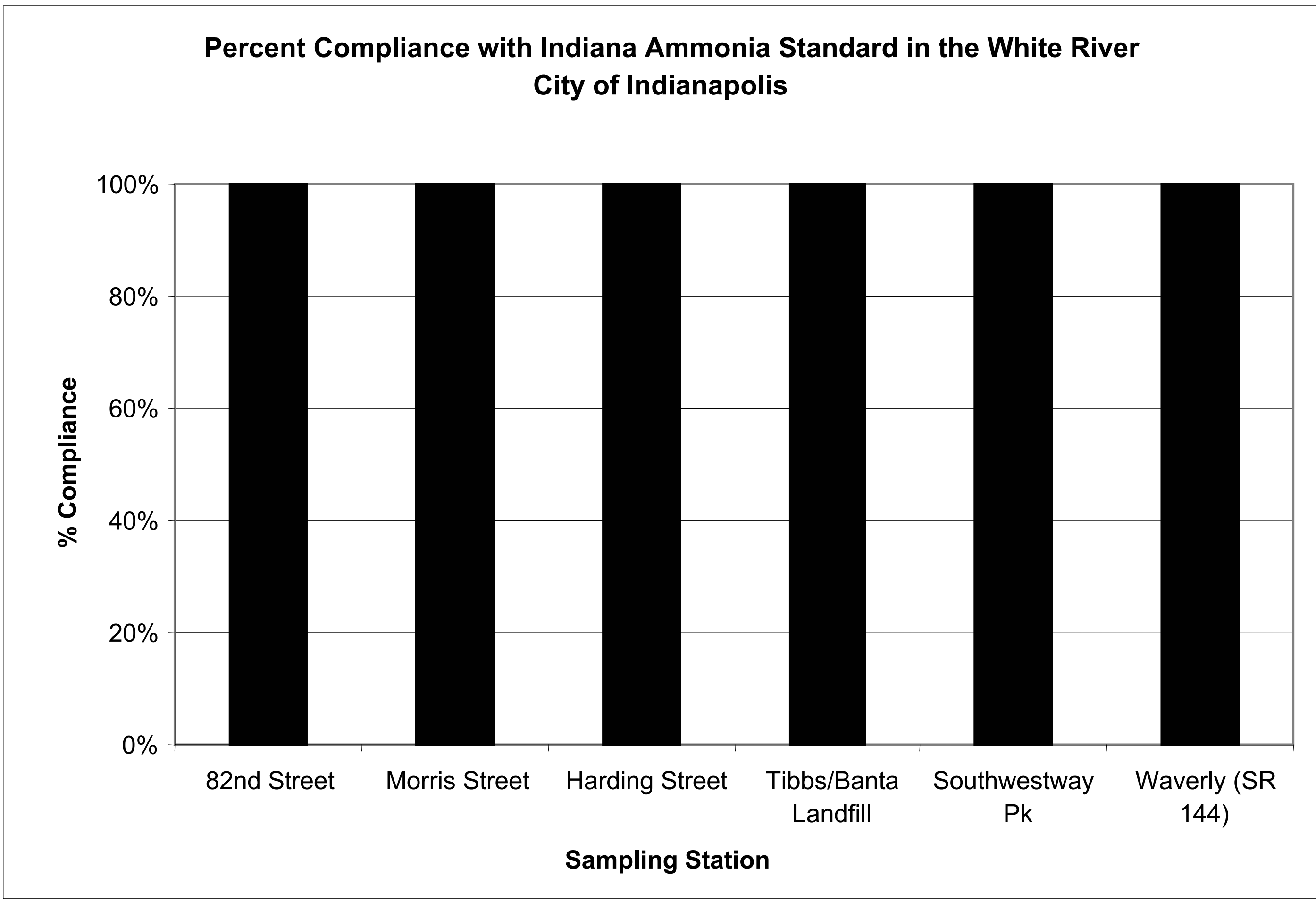
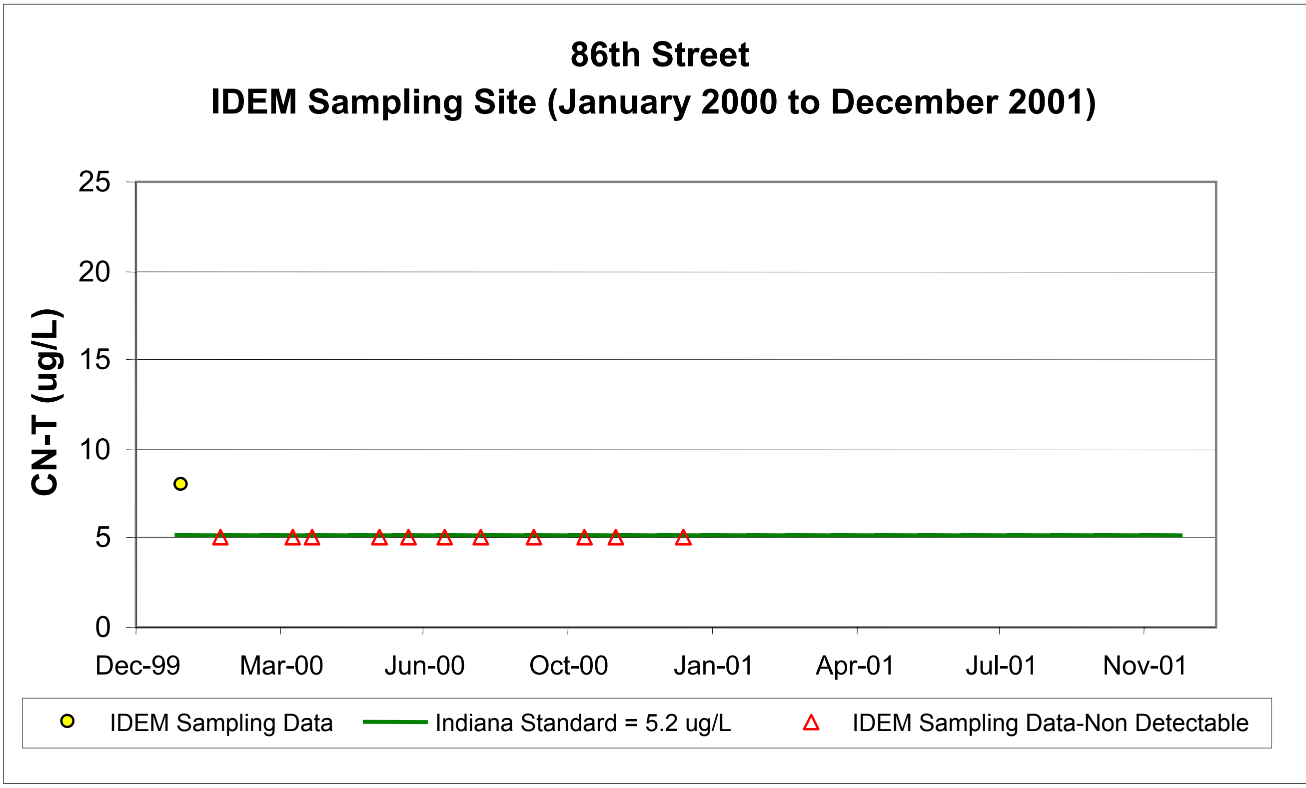


Figure 3.6: White River Cyanide Data



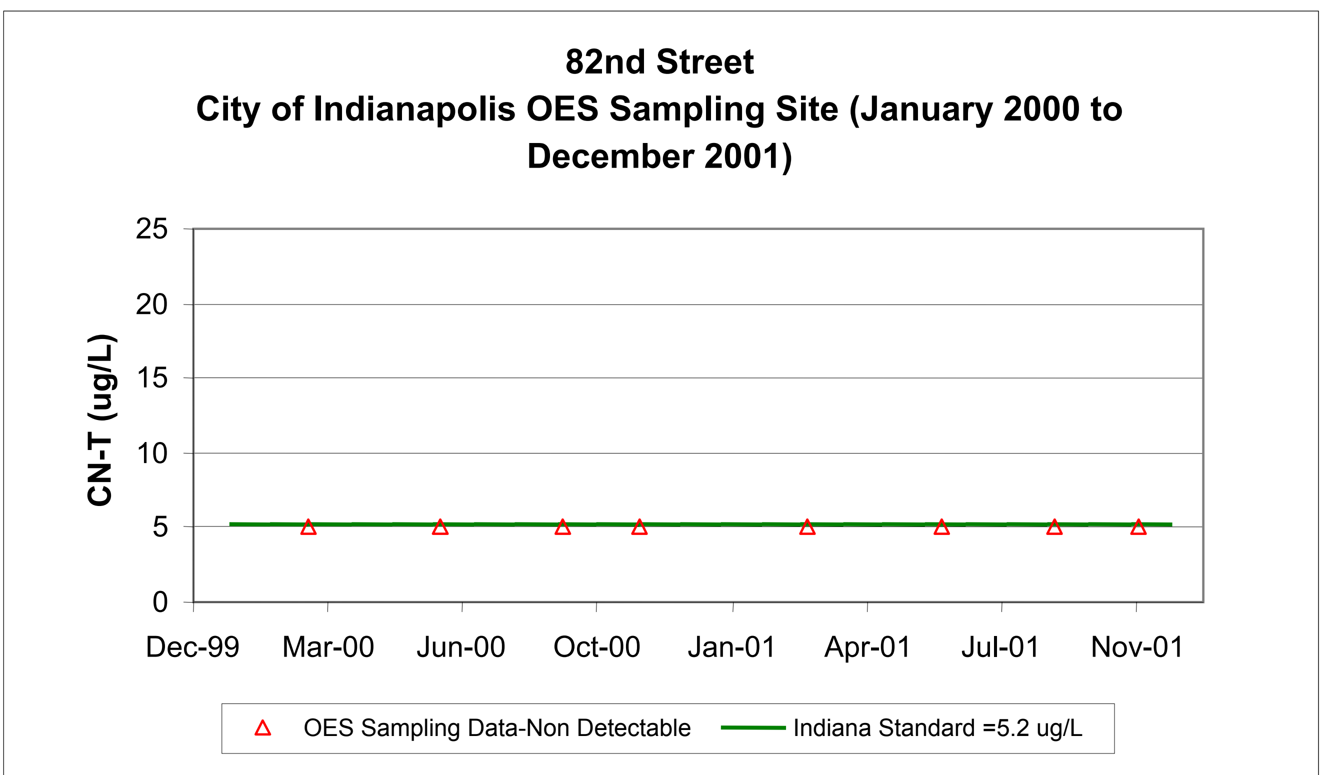
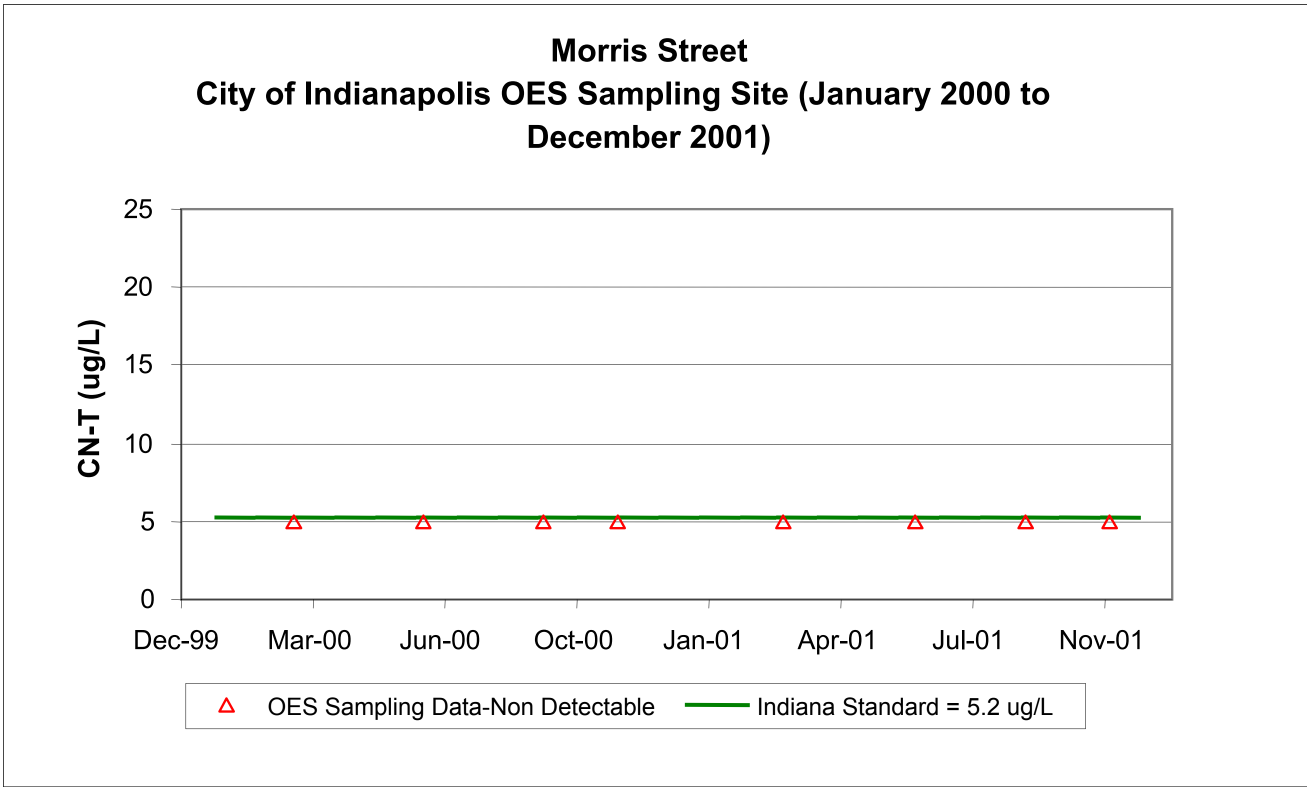


Figure 3.7: White River Cyanide Data



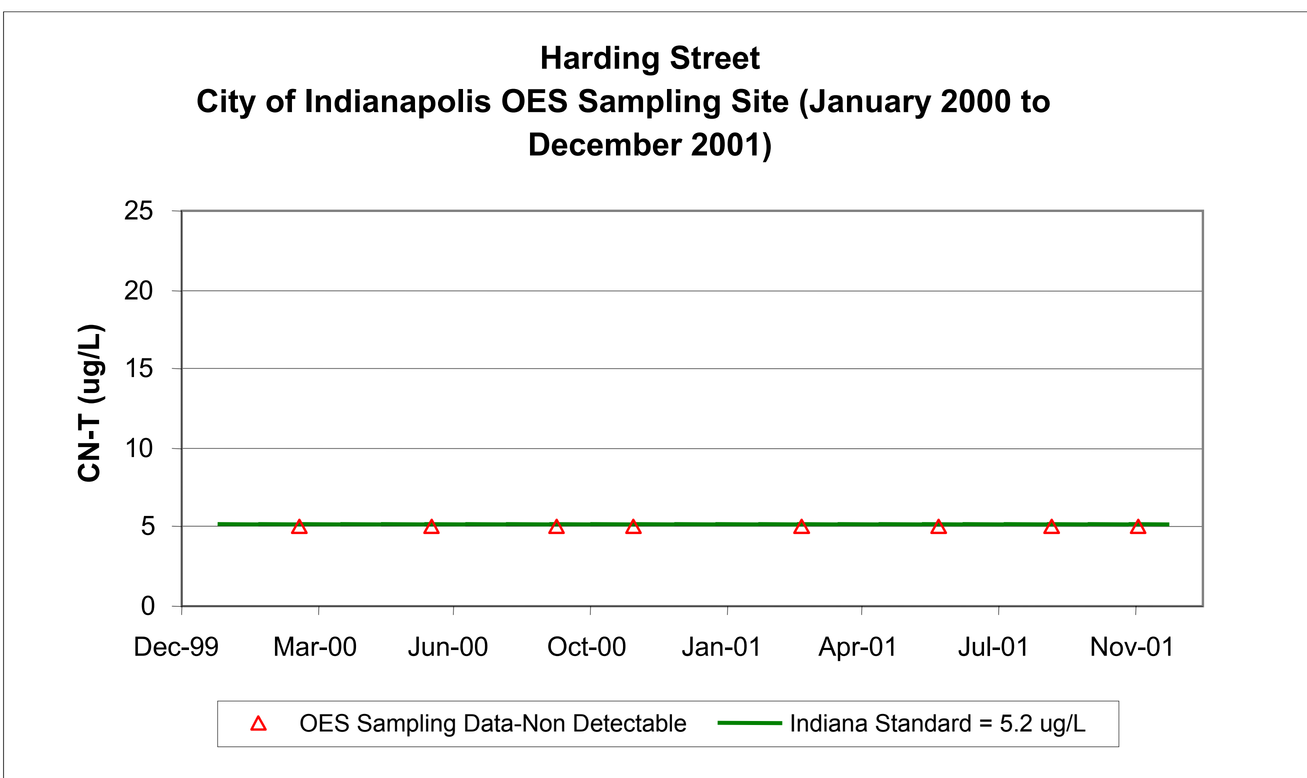
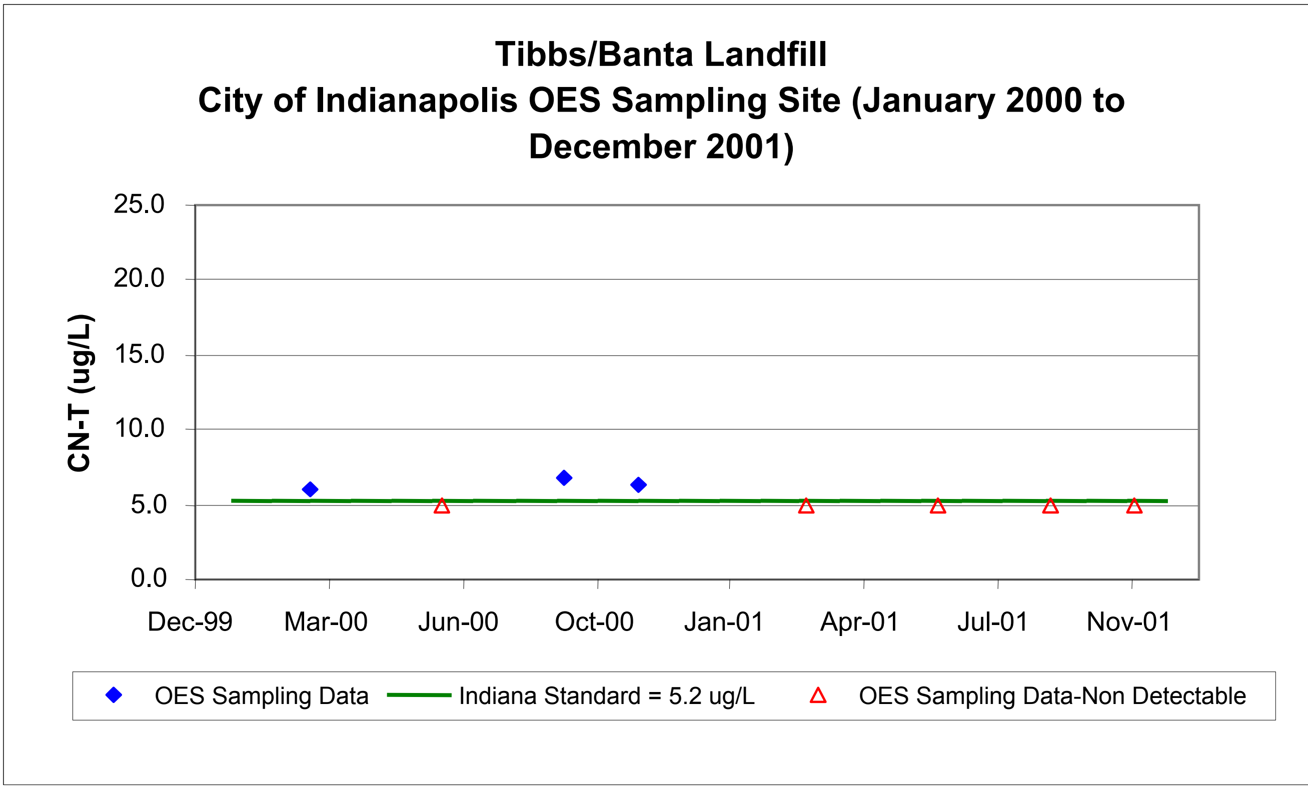


Figure 3.8: White River Cyanide Data



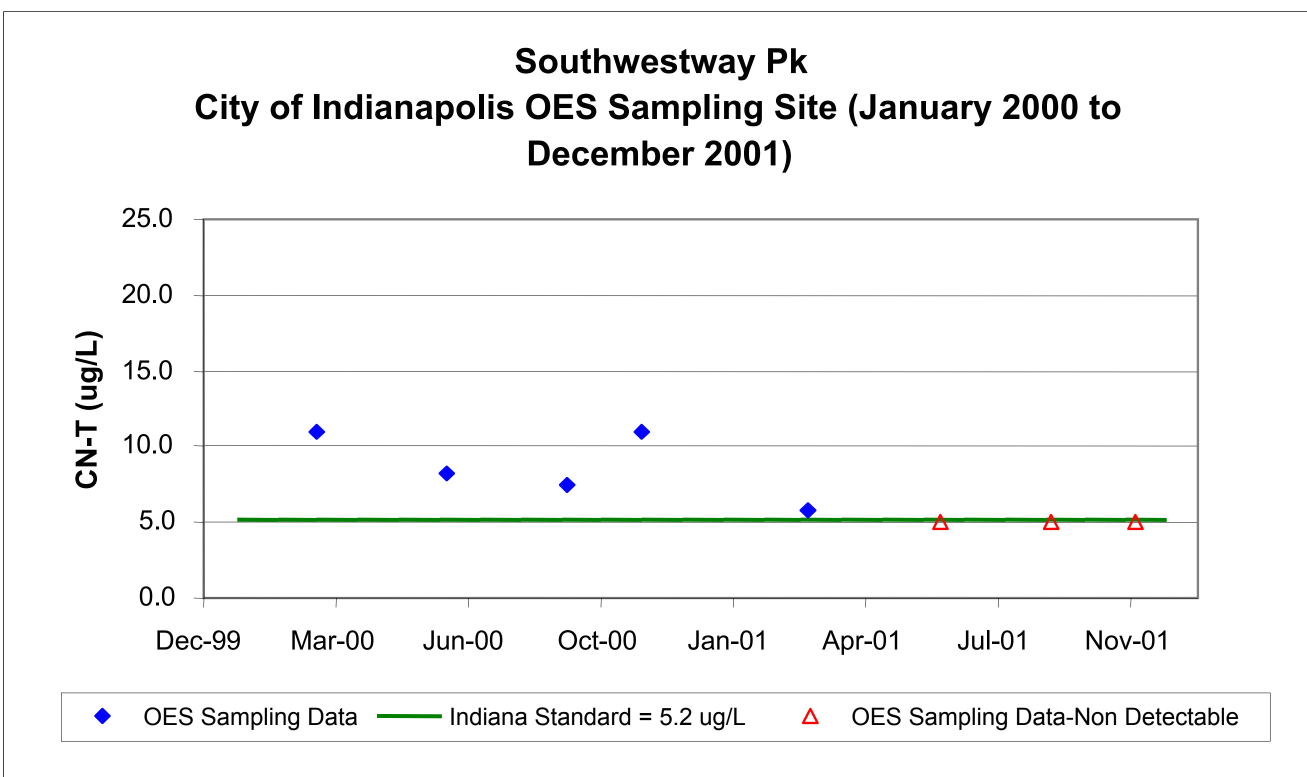
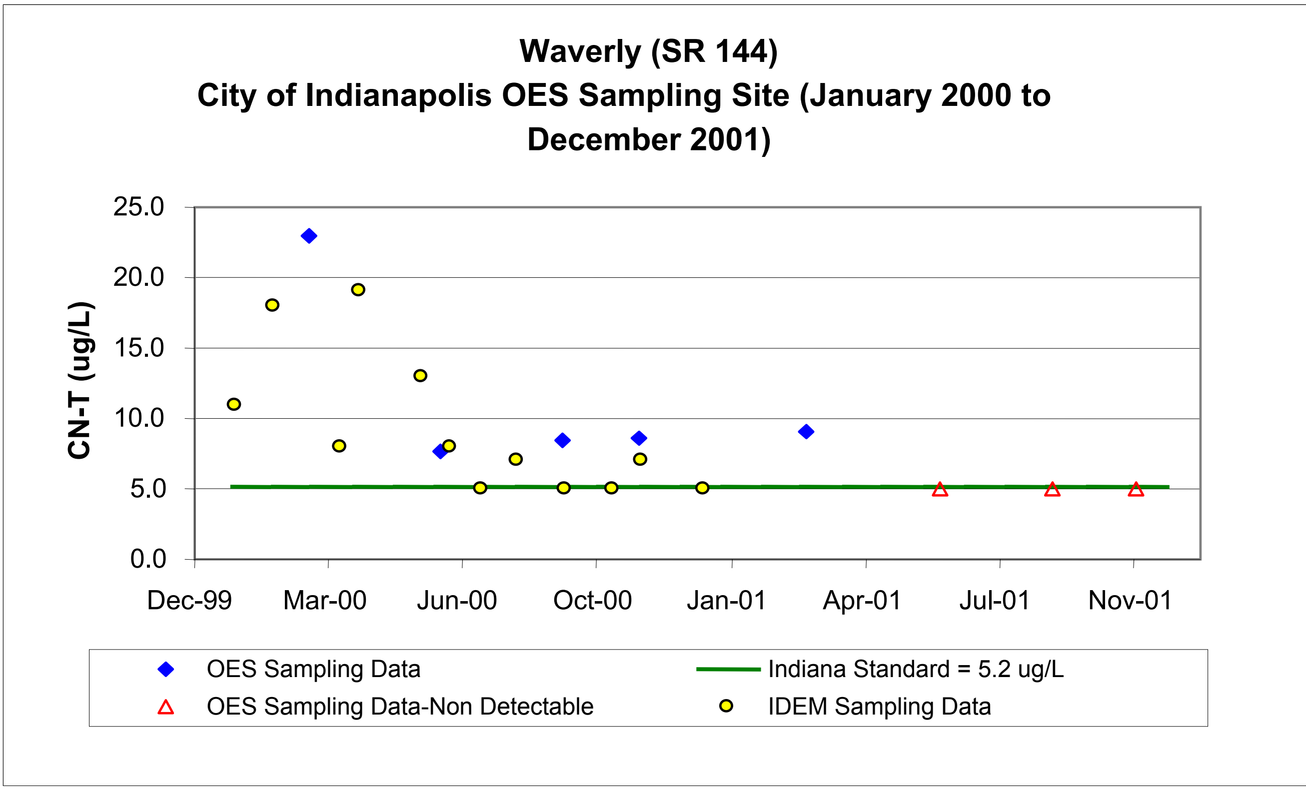


Figure 3.9: White River Cyanide Data



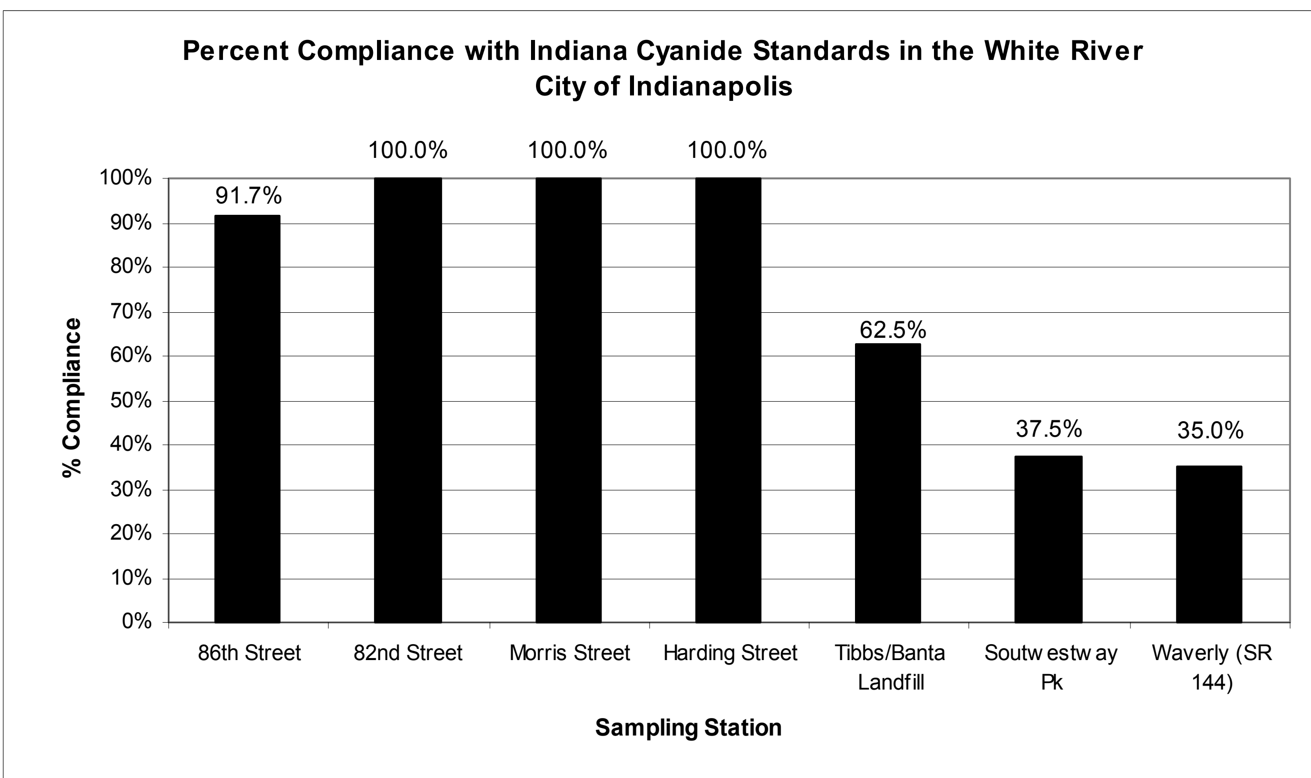


Figure 3.10: White River Dissolved Oxygen Data

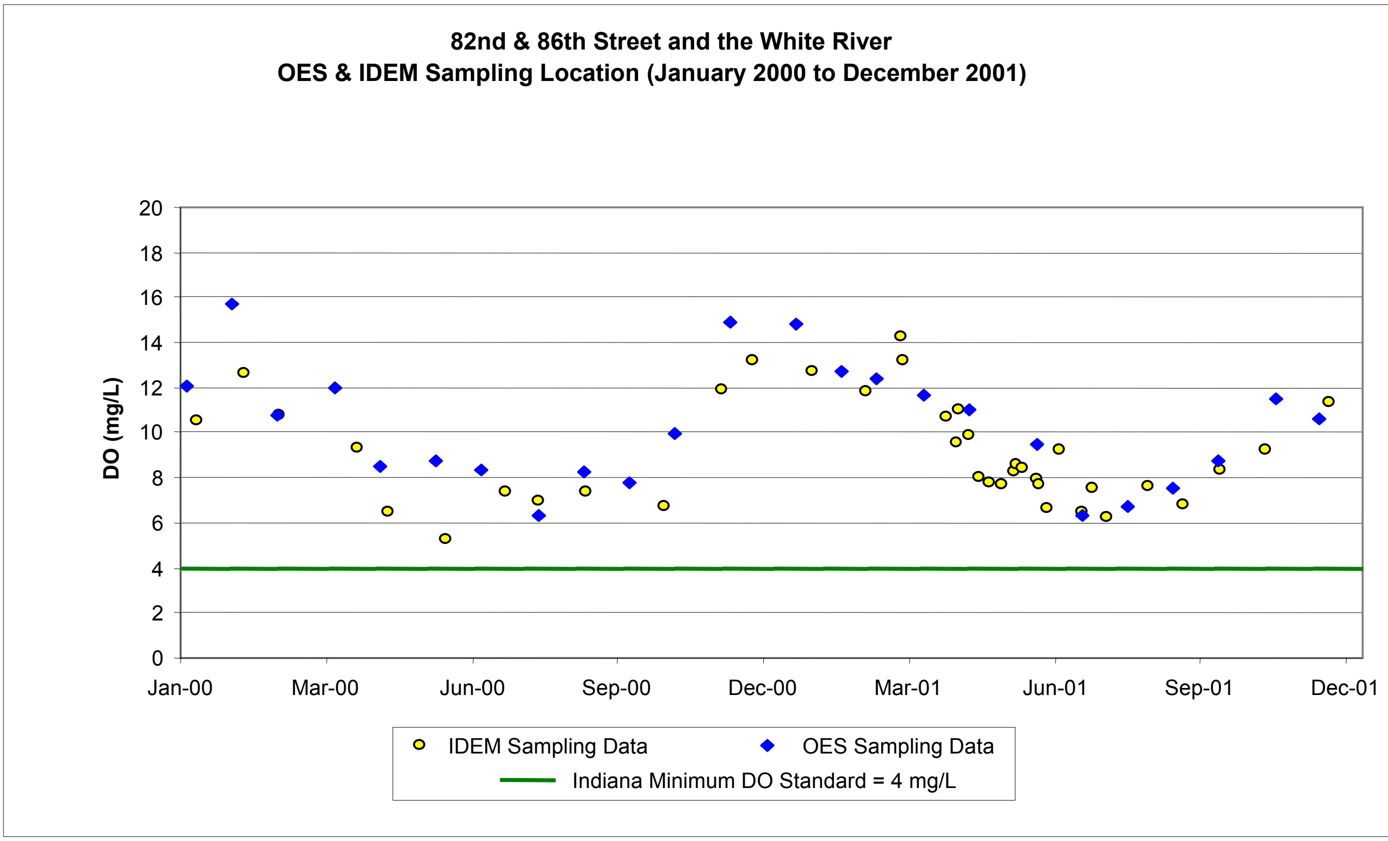
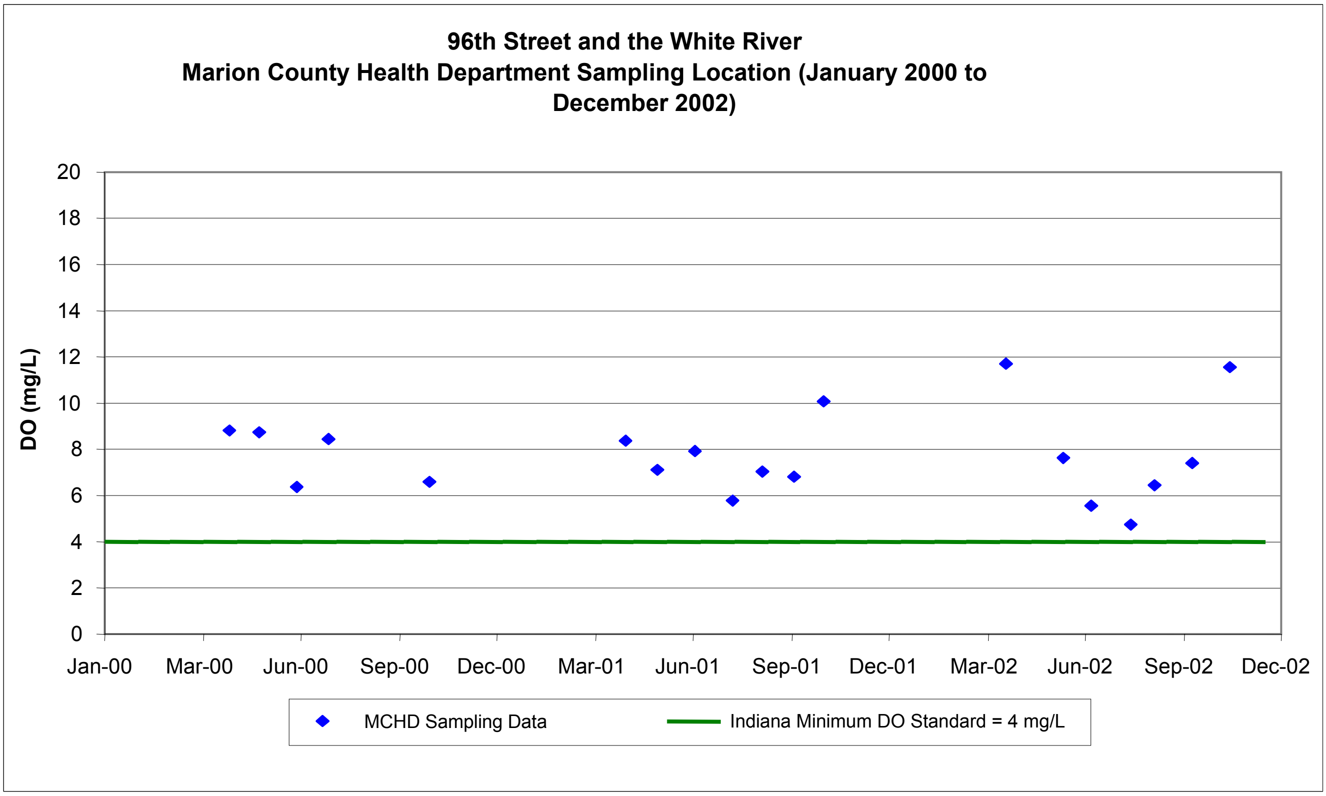


Figure 3.11: White River Dissolved Oxygen Data



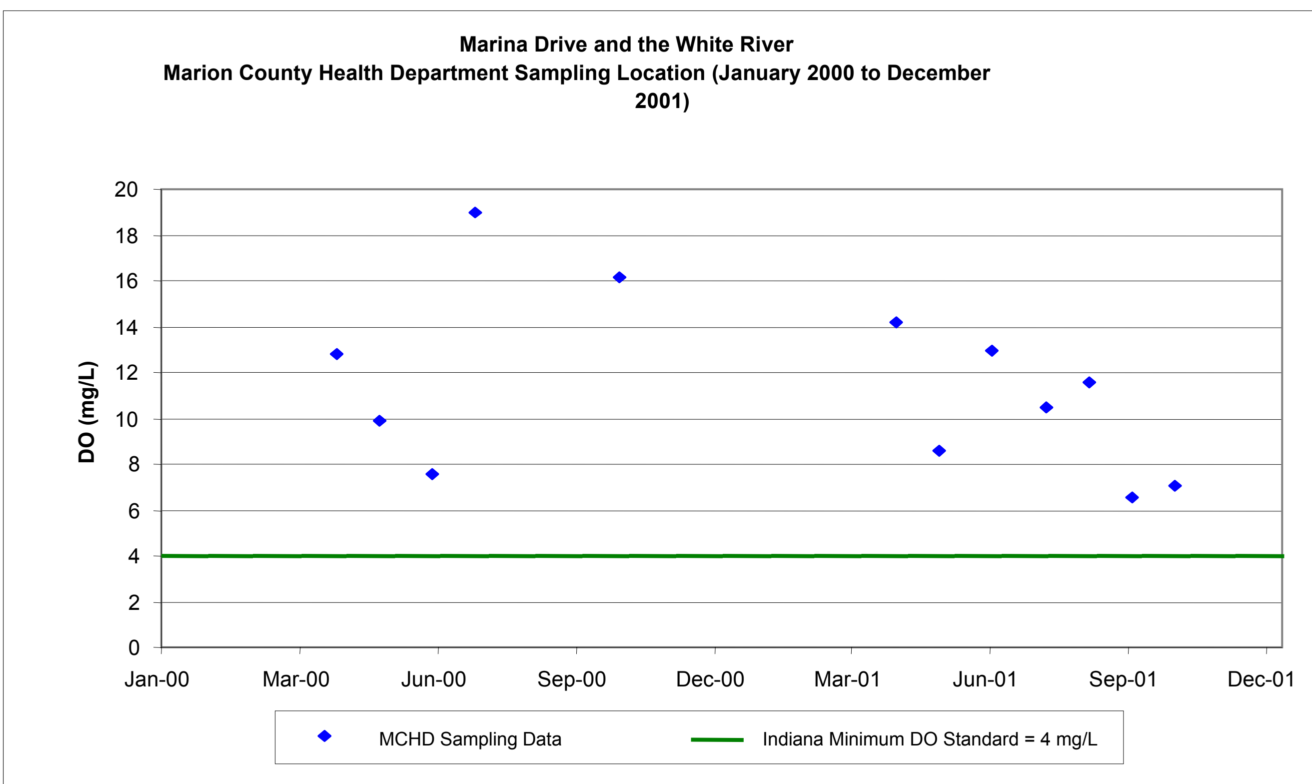
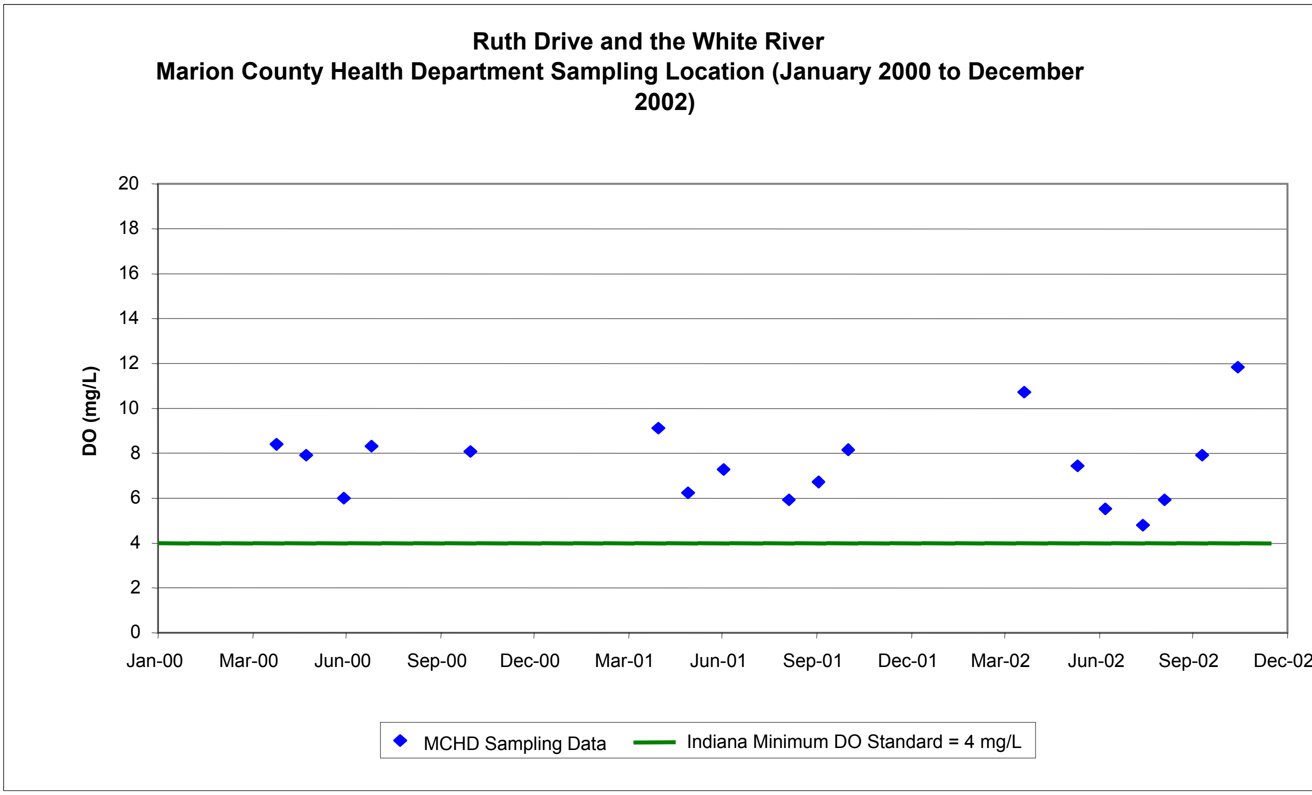


Figure 3.12: White River Dissolved Oxygen Data



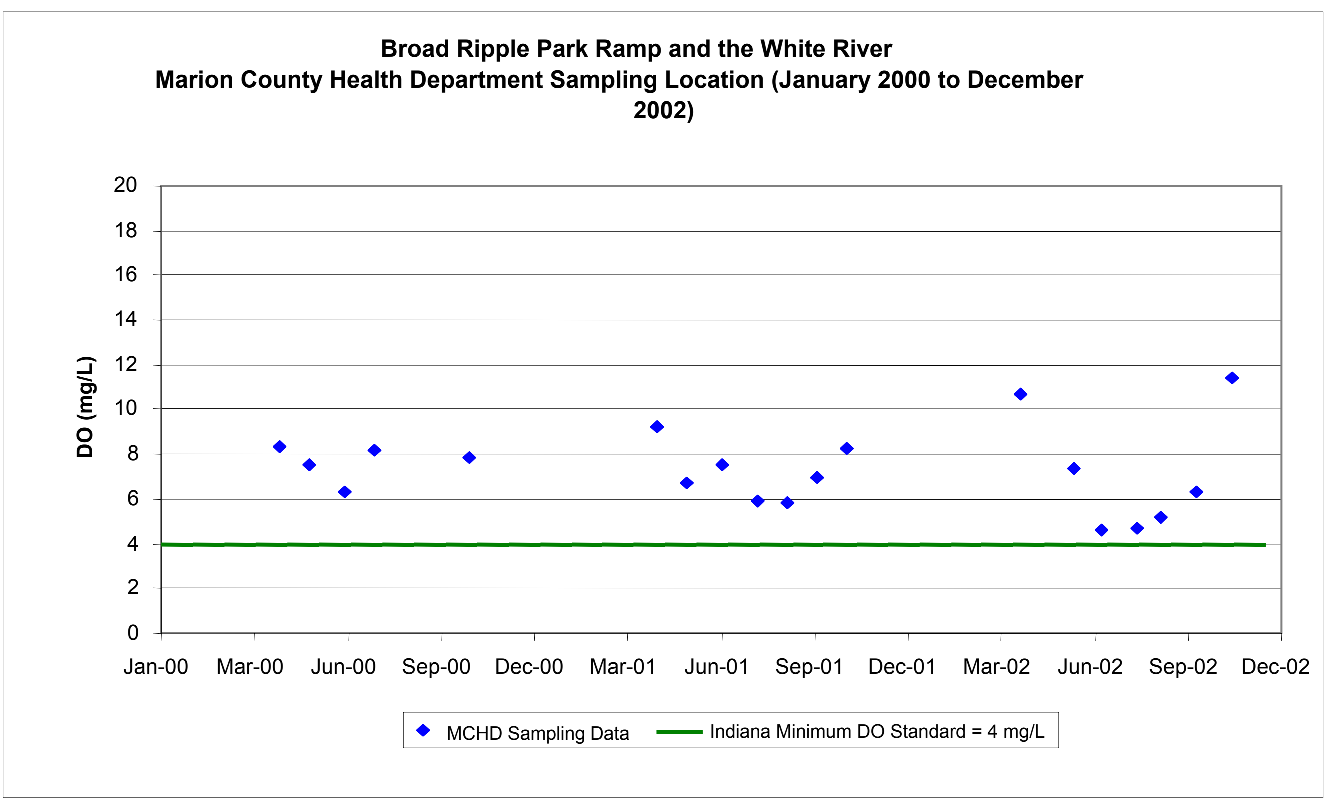
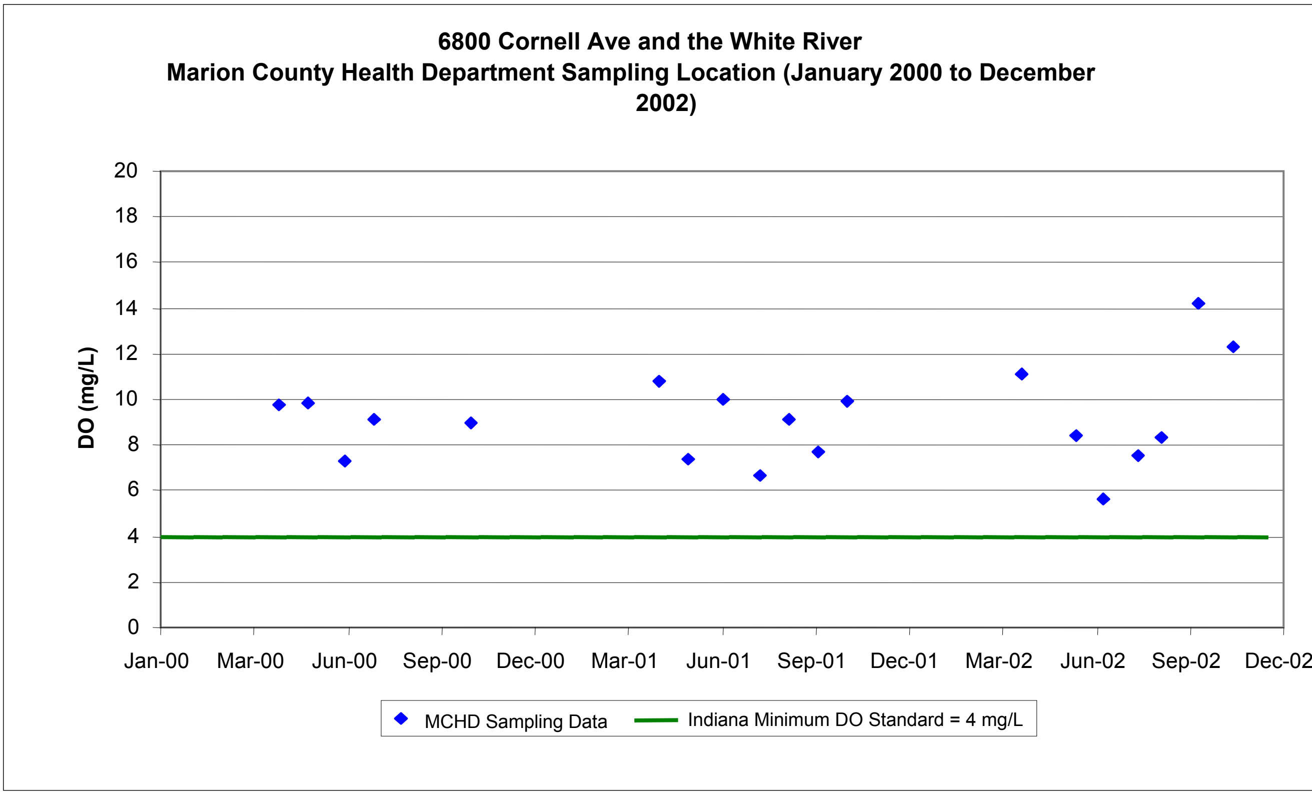


Figure 3.13: White River Dissolved Oxygen Data



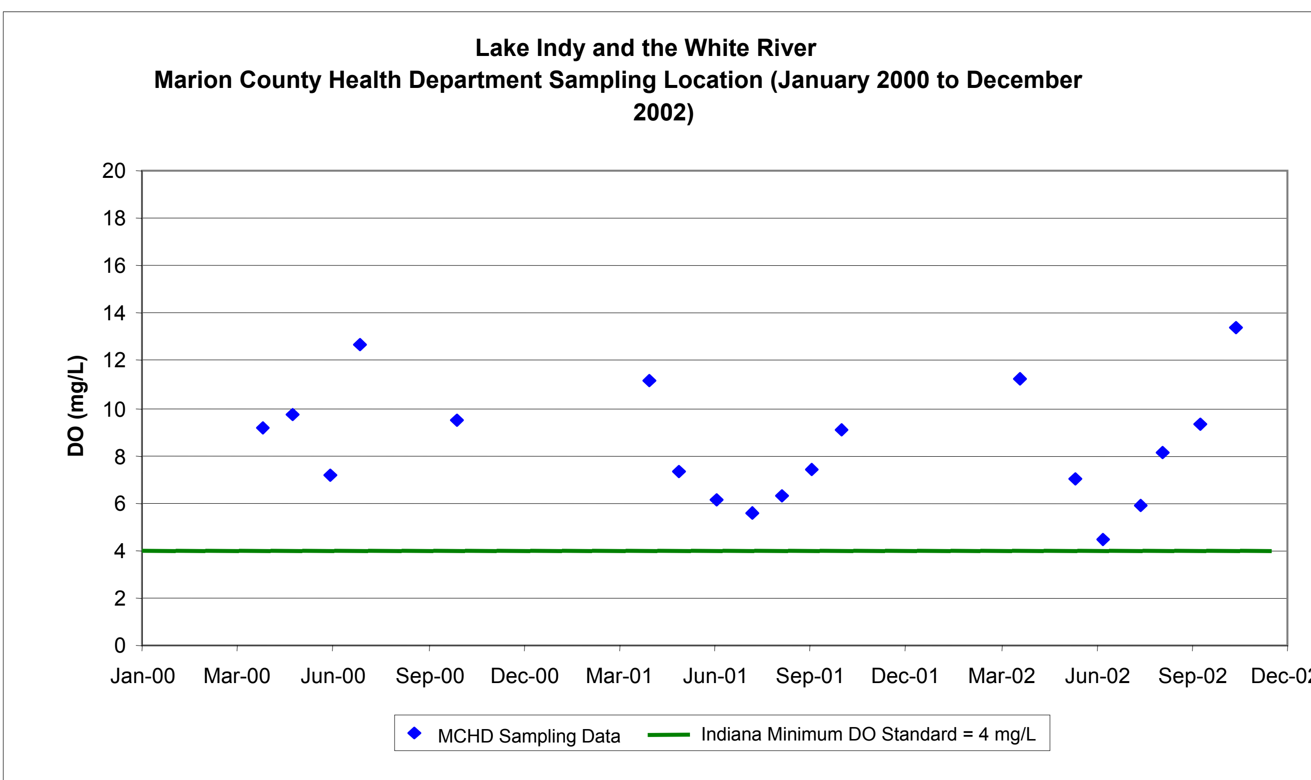
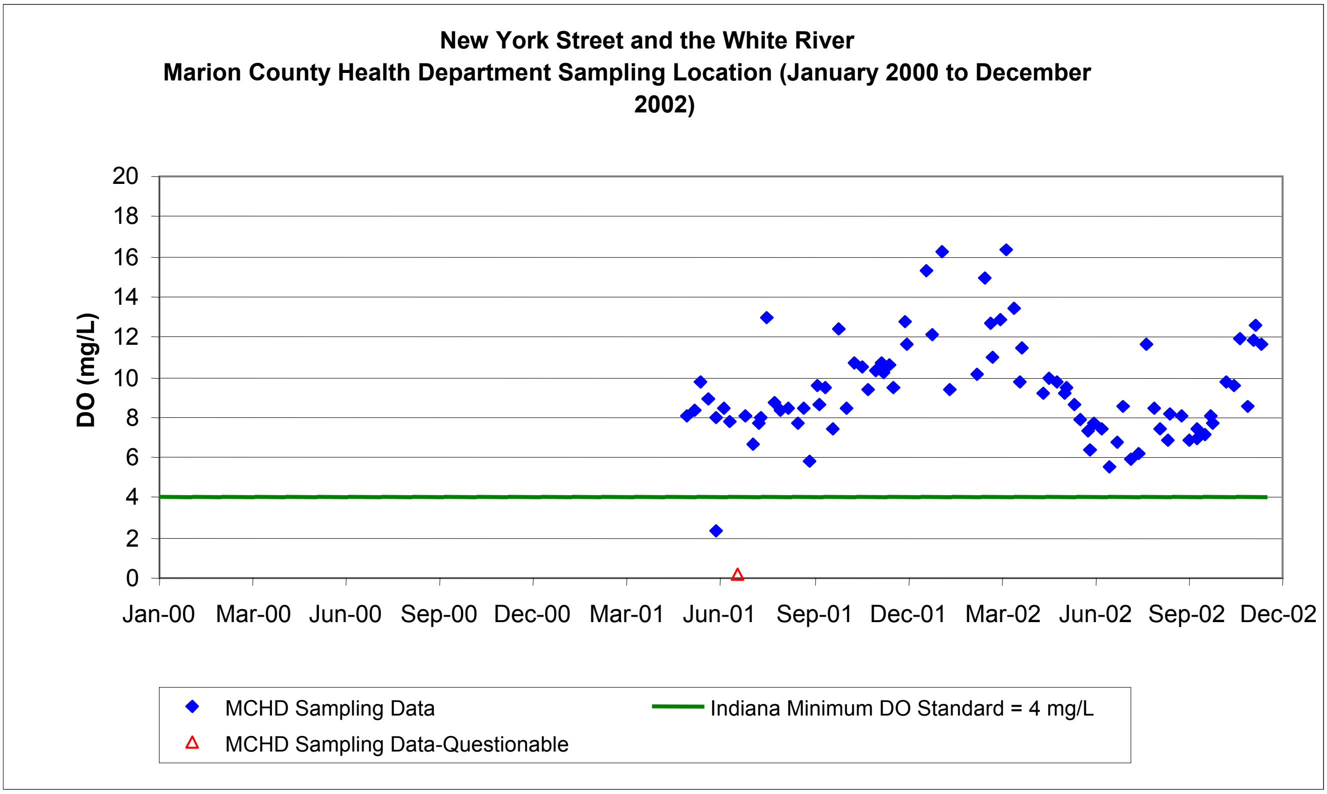


Figure 3.14: White River Dissolved Oxygen Data



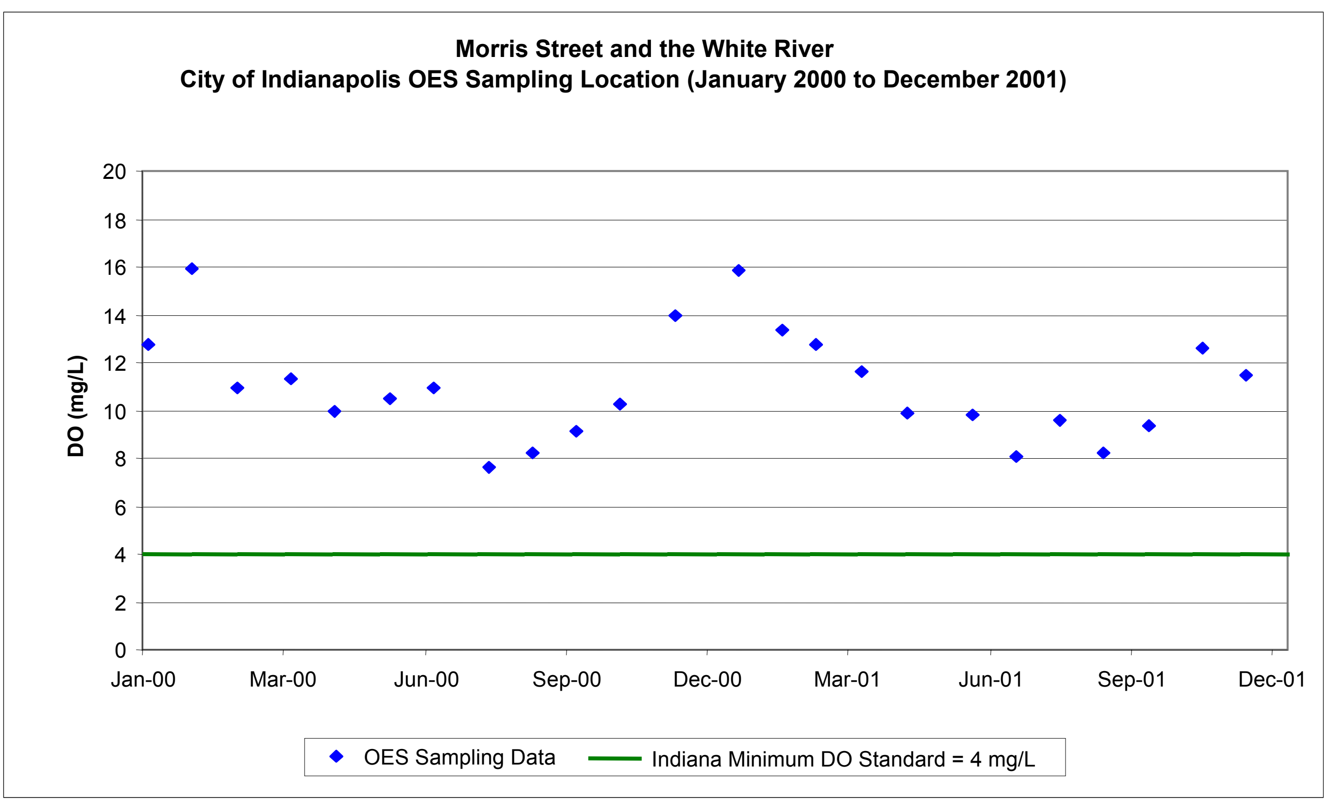
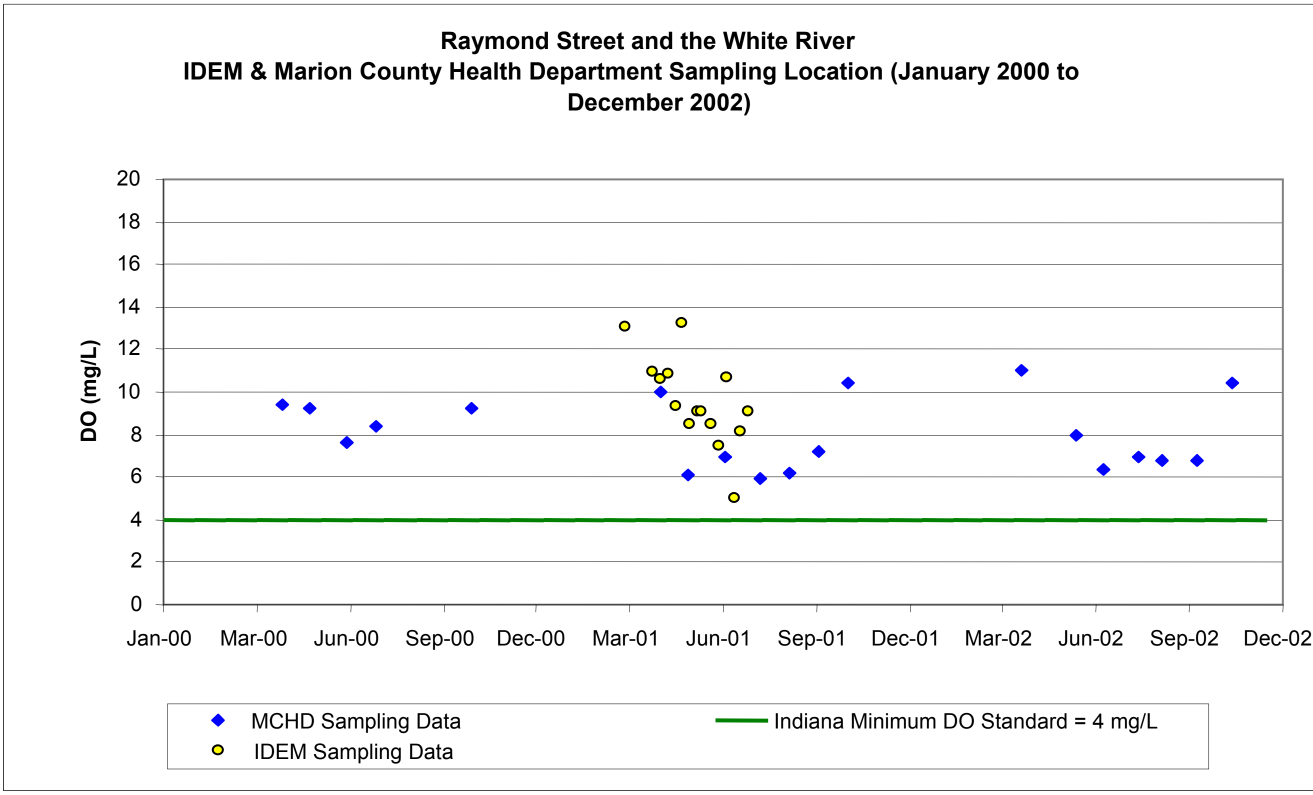


Figure 3.15: White River Dissolved Oxygen Data



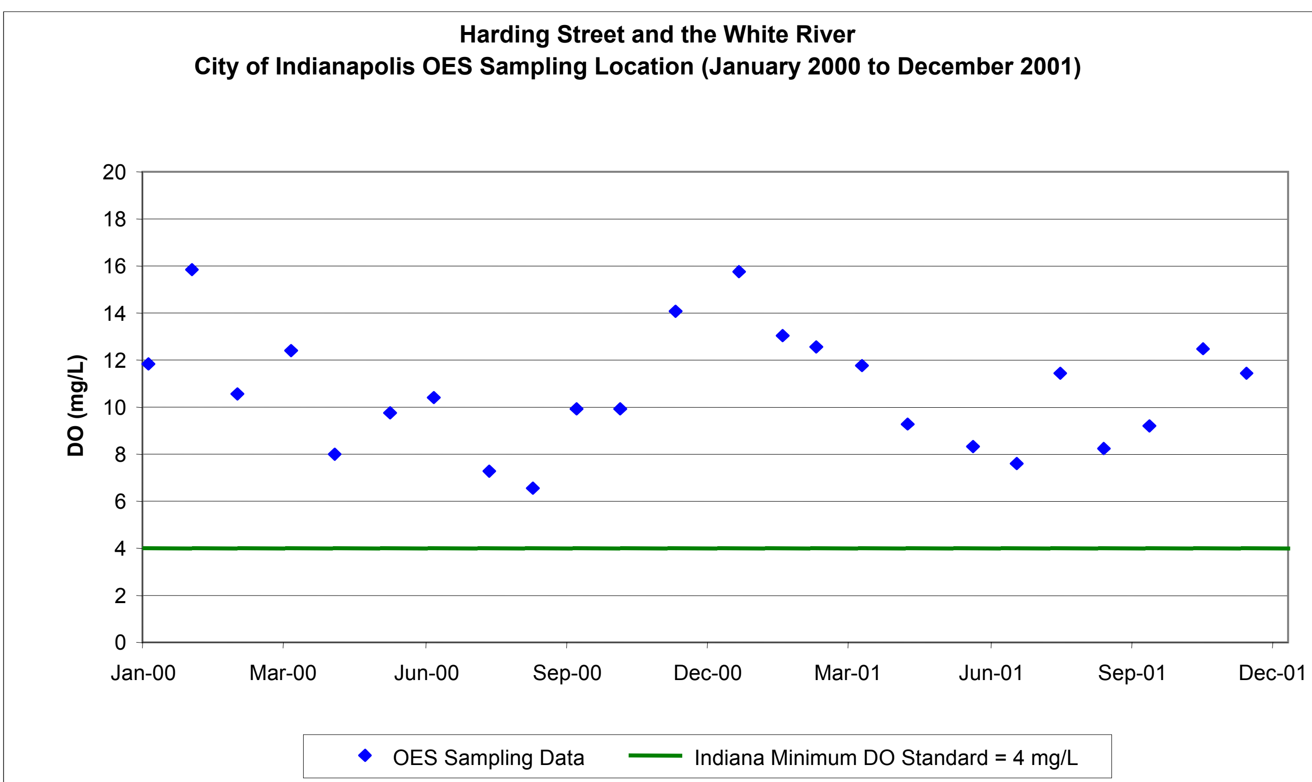
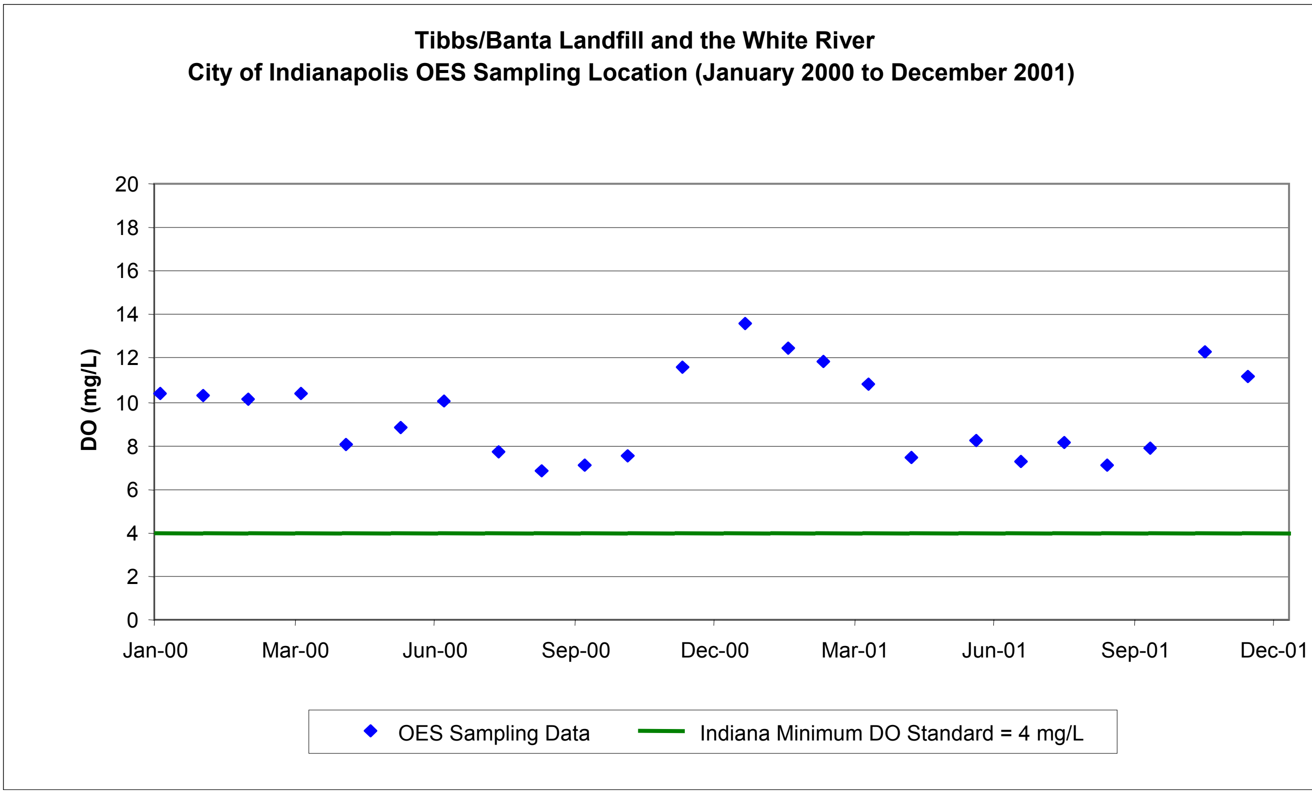


Figure 3.16: White River Dissolved Oxygen Data



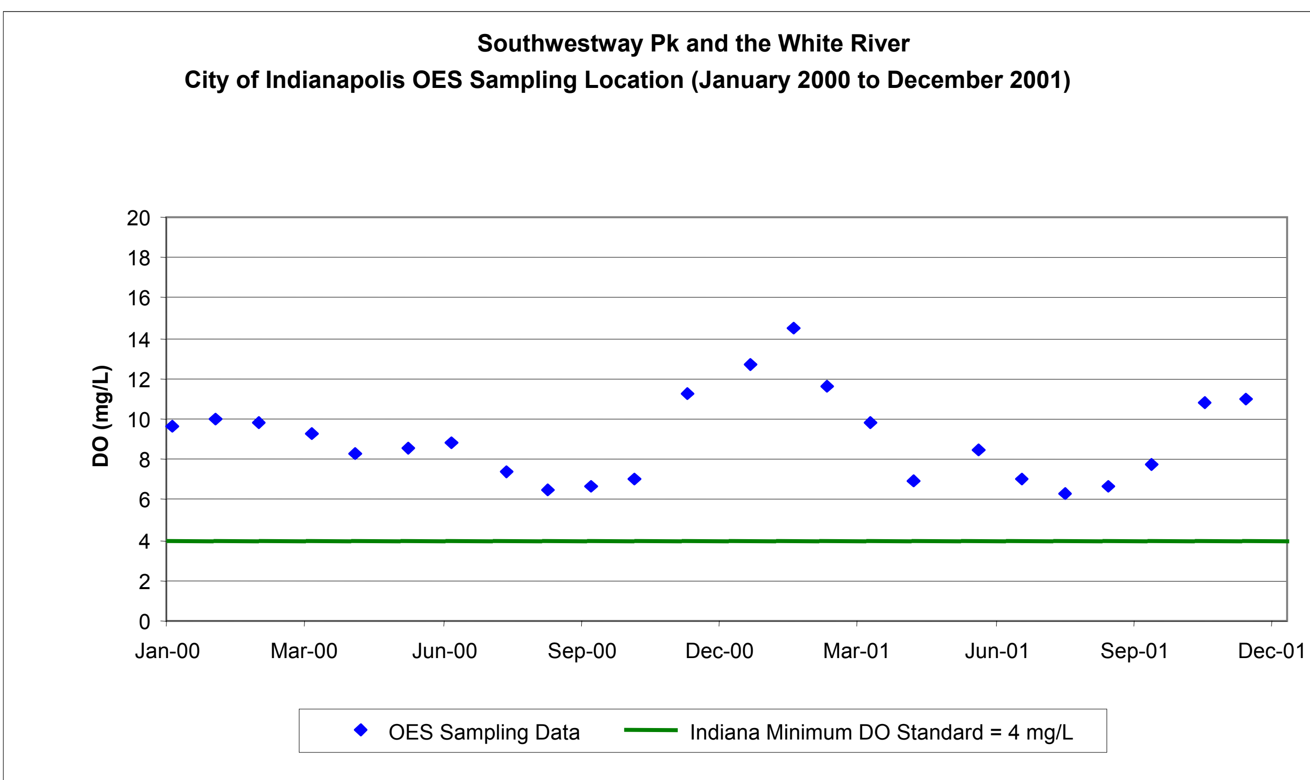


Figure 3.17: White River Dissolved Oxygen Data

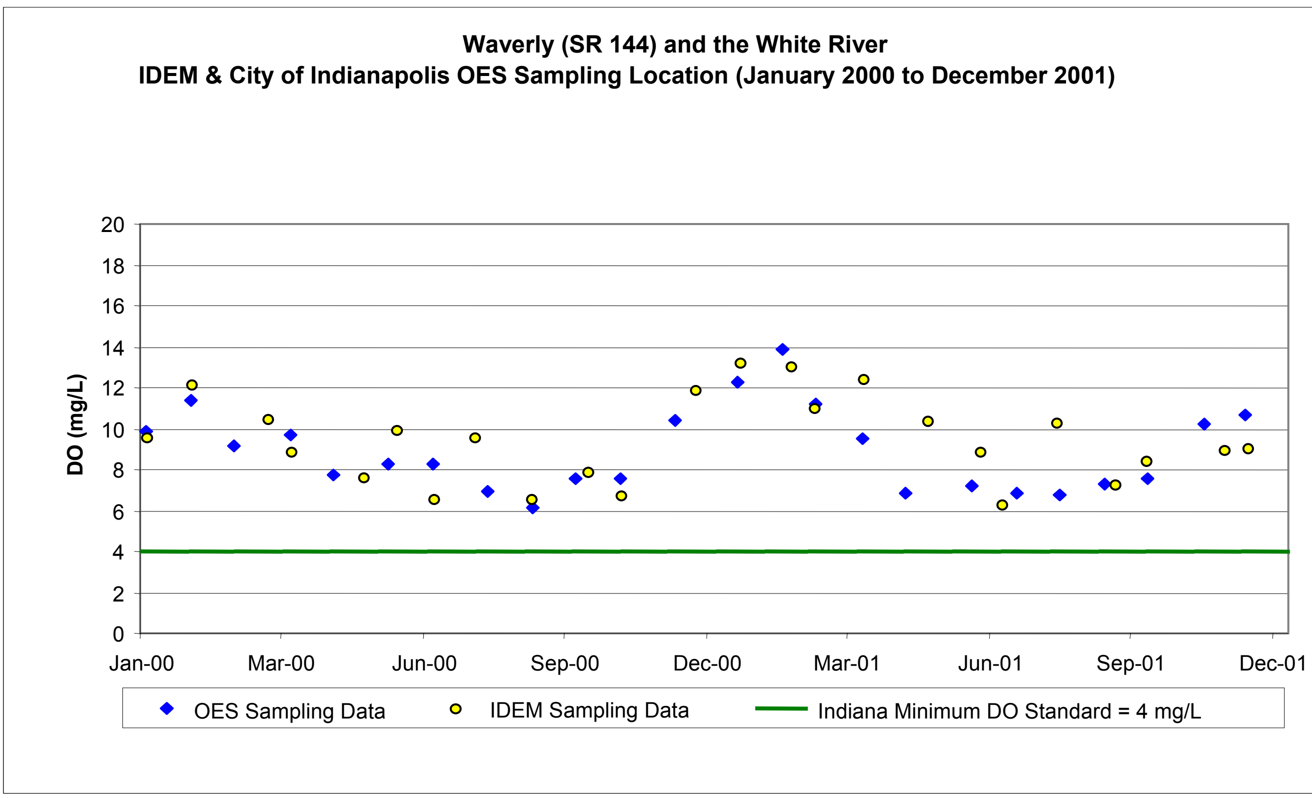
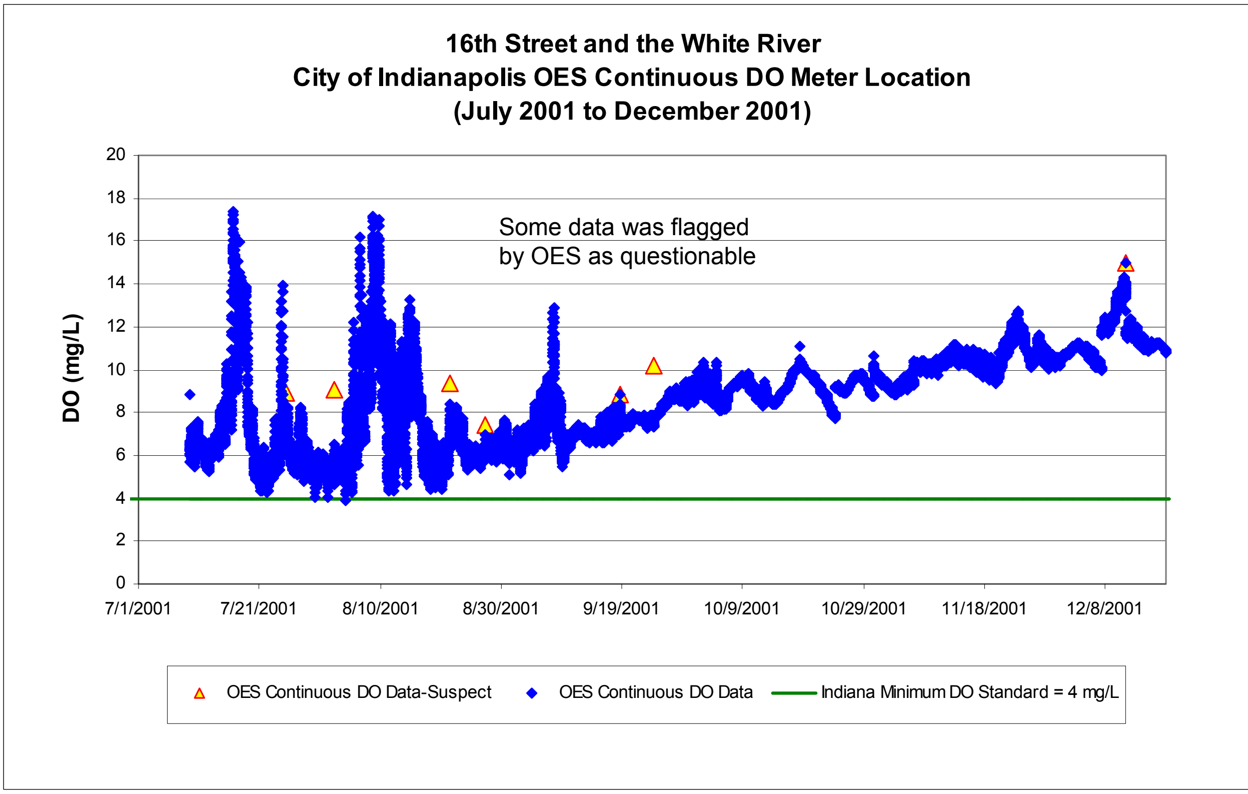


Figure 3.18: White River Continuous Dissolved Oxygen Data



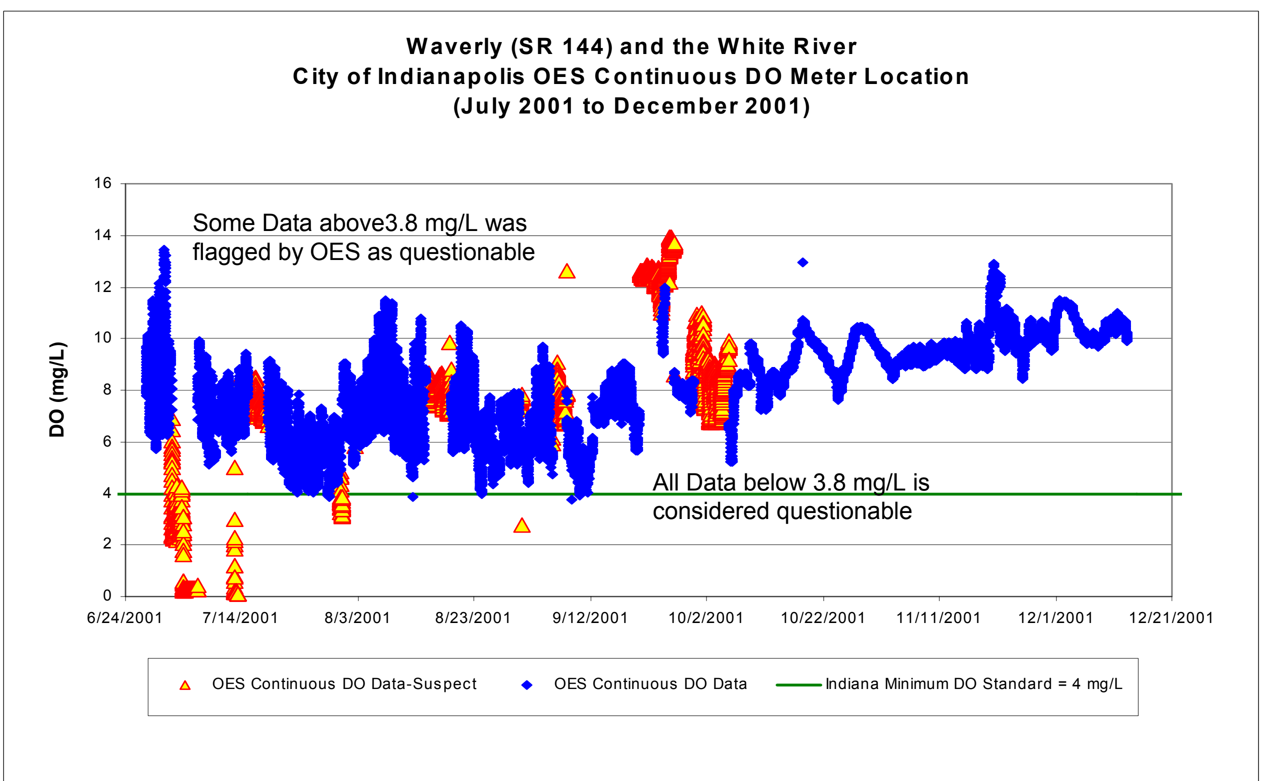


Figure 3.19: White River Continuous Dissolved Oxygen Data

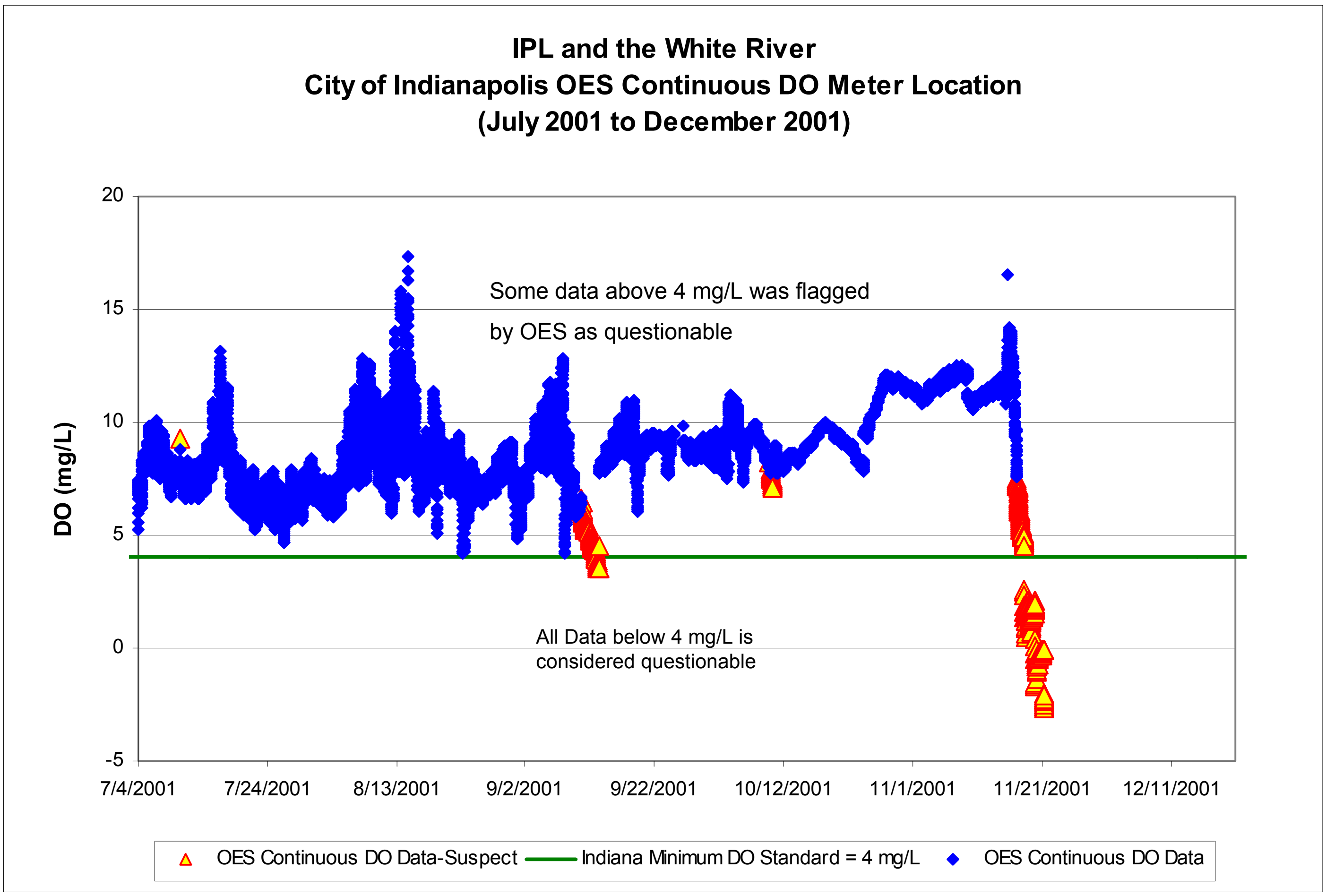


Figure 3.20: White River Average Daily Dissolved Oxygen Data

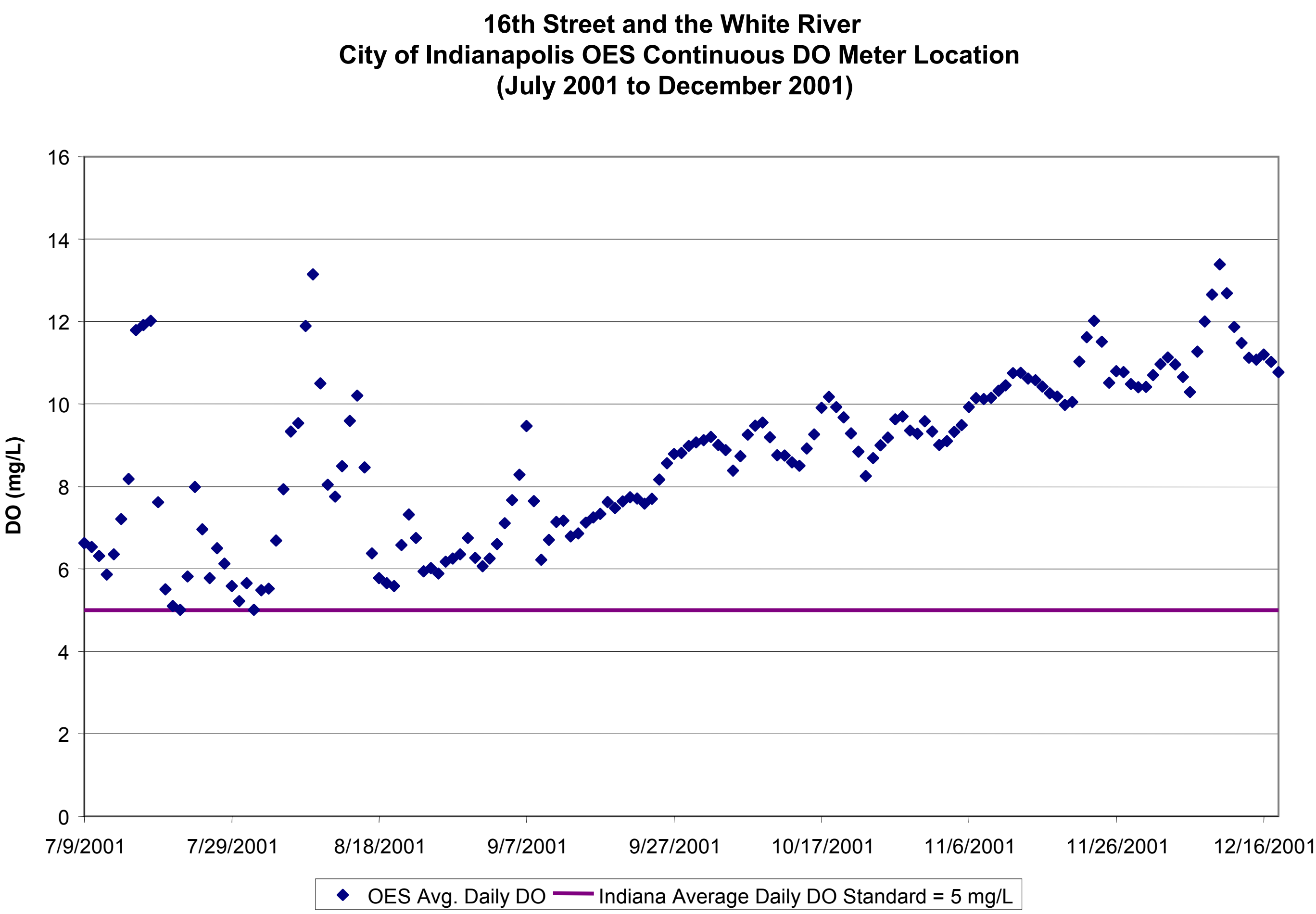


Figure 3.21: White River Average Daily Dissolved Oxygen Data

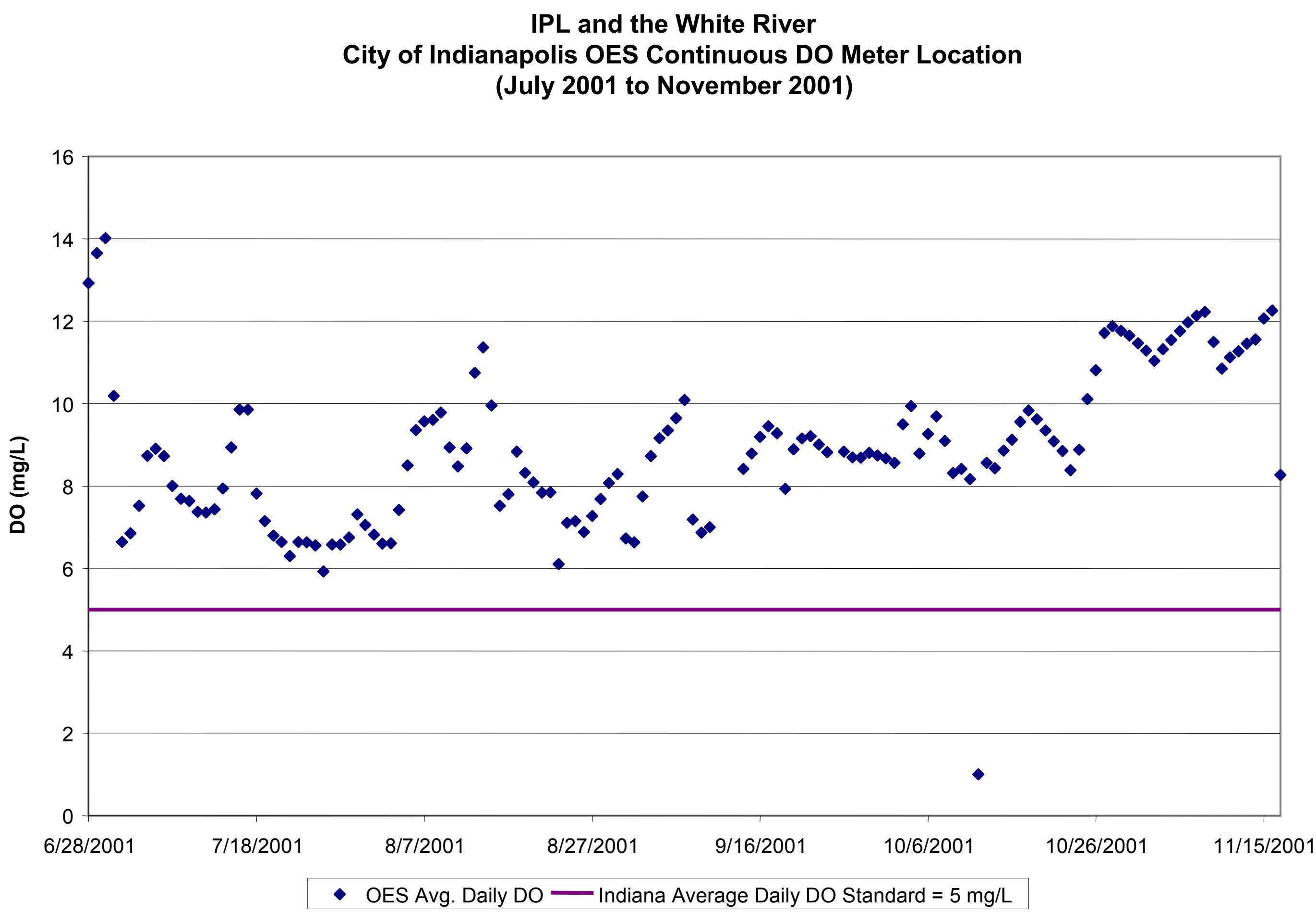


Figure 3.22: White River Average Daily Dissolved Oxygen Data

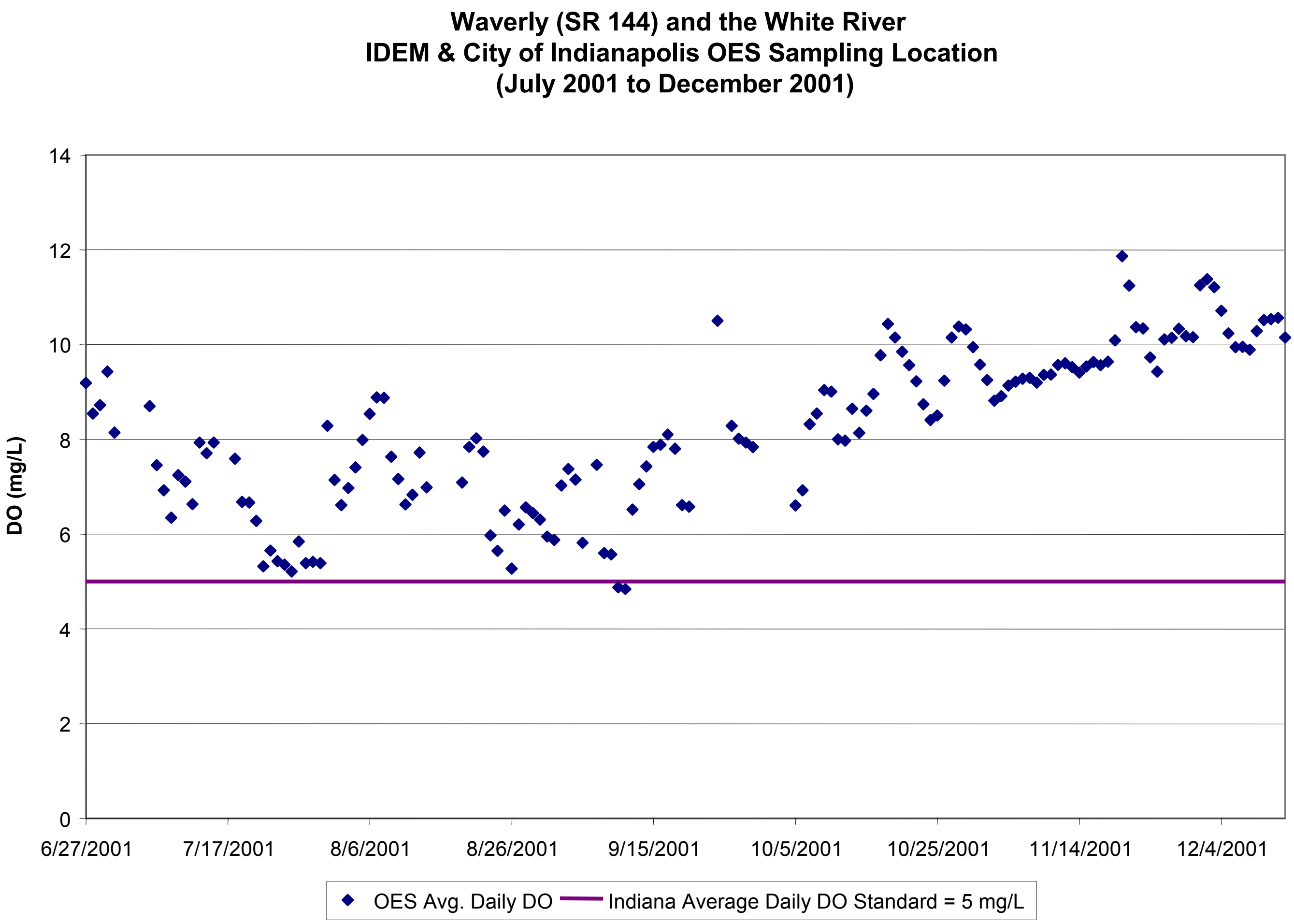
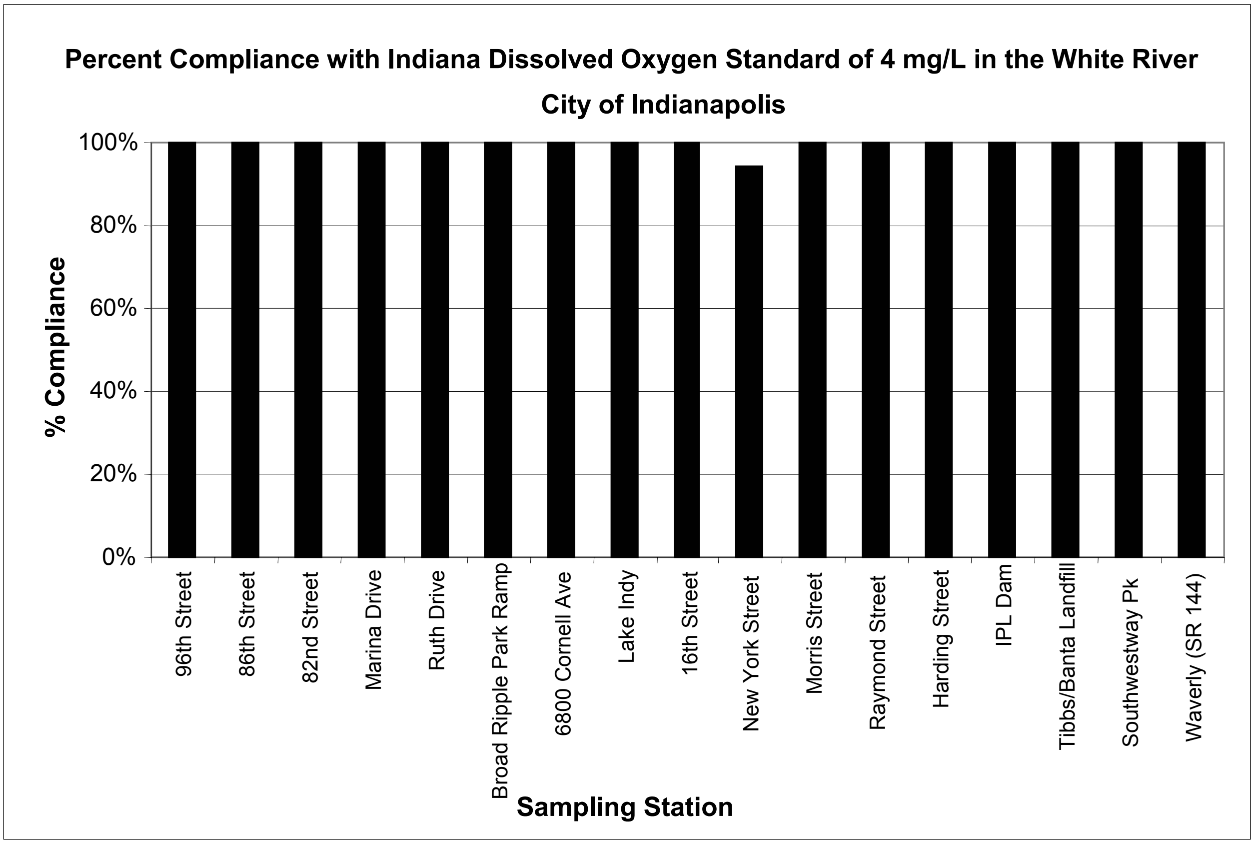


Figure 3.23: White River Dissolved Oxygen Data



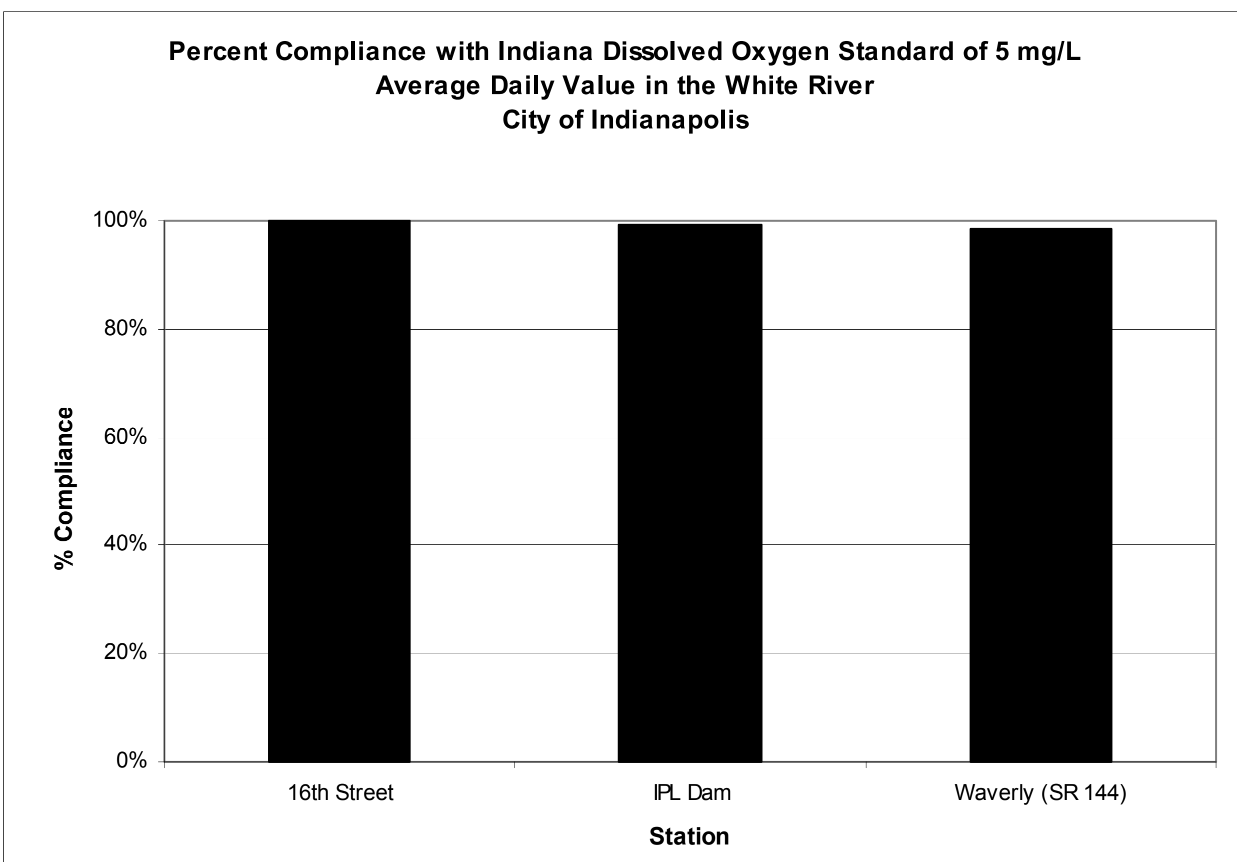
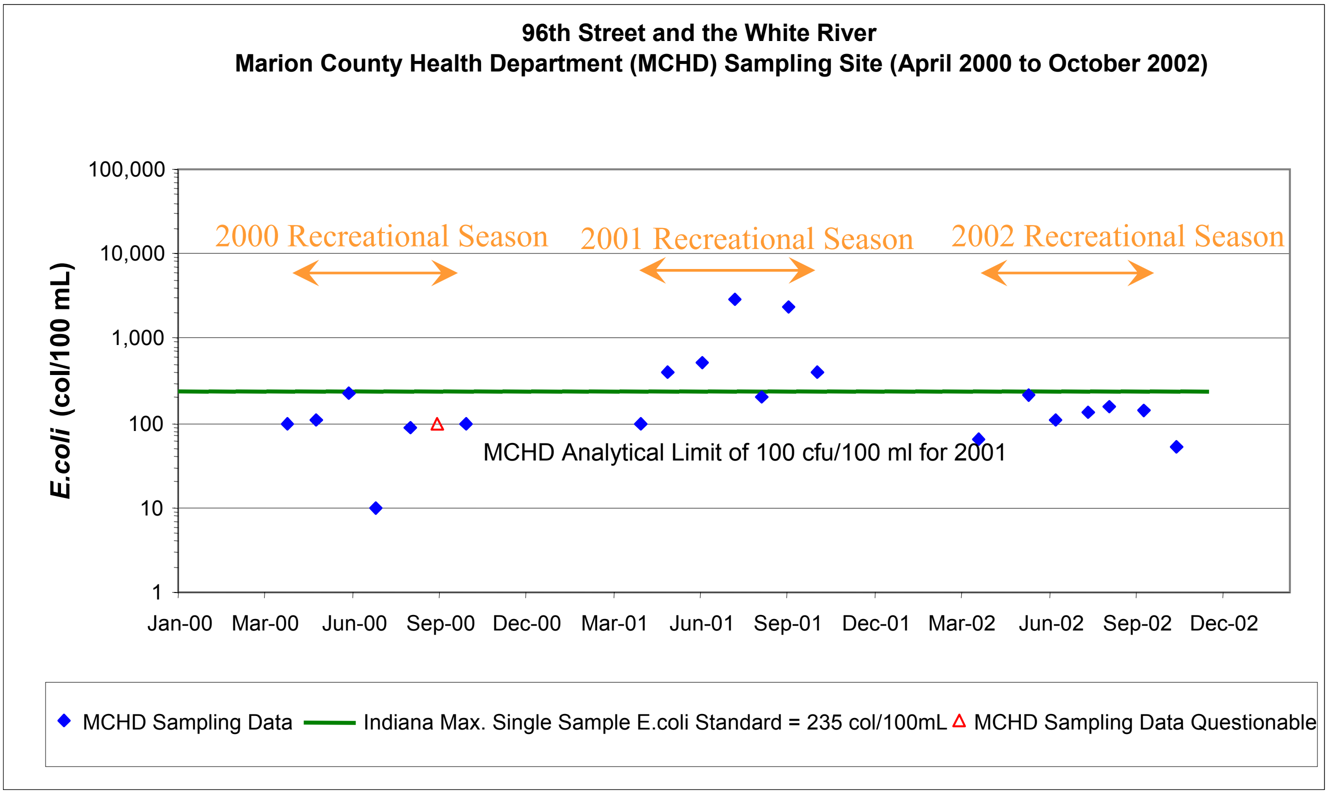


Figure 3.24: White River *E. coli* Data



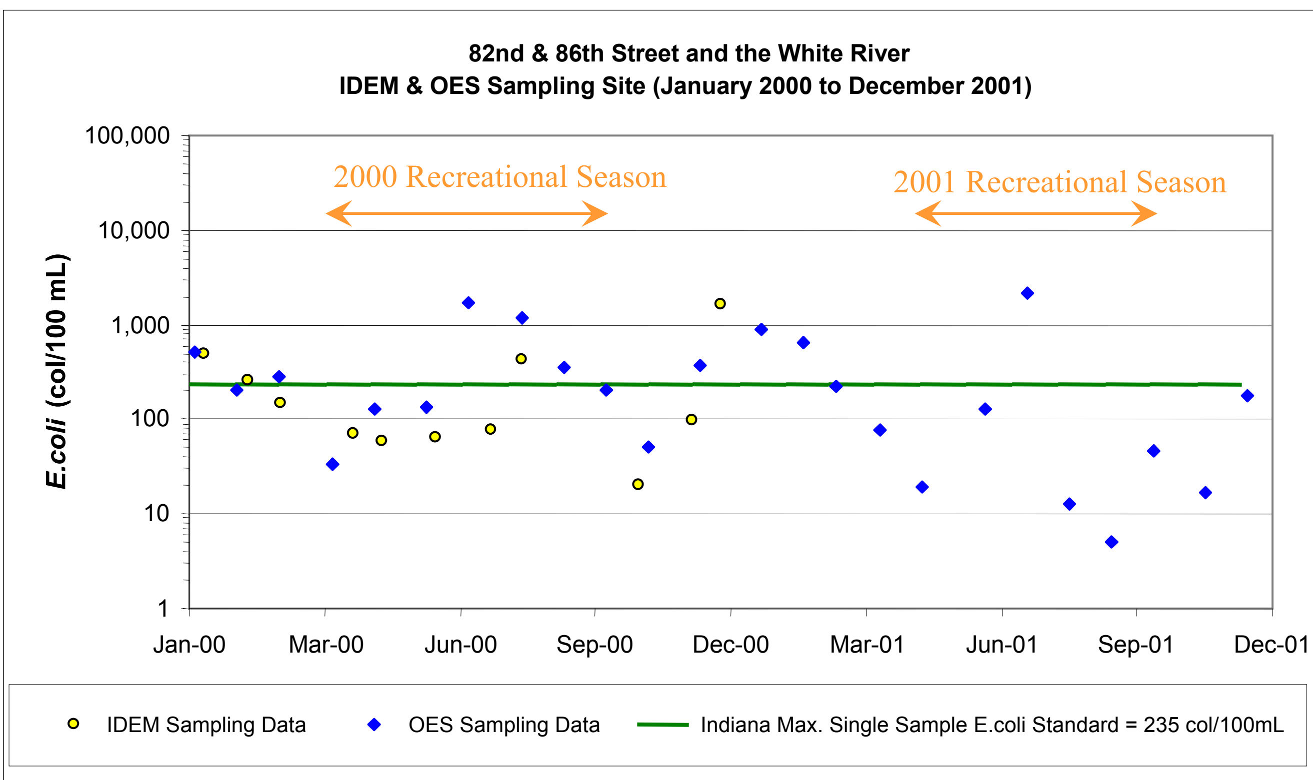


Figure 3.25: White River *E. coli* Data

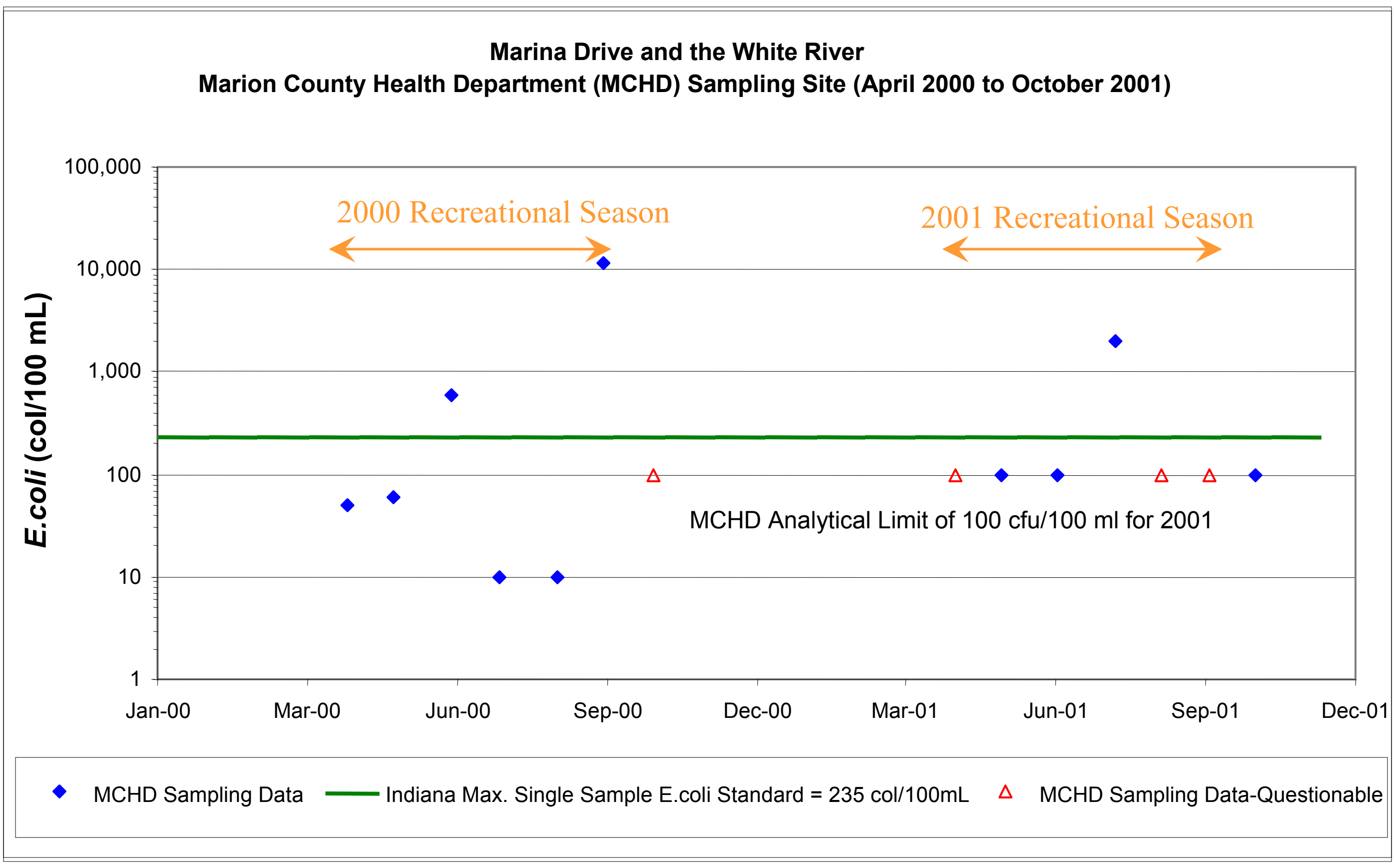
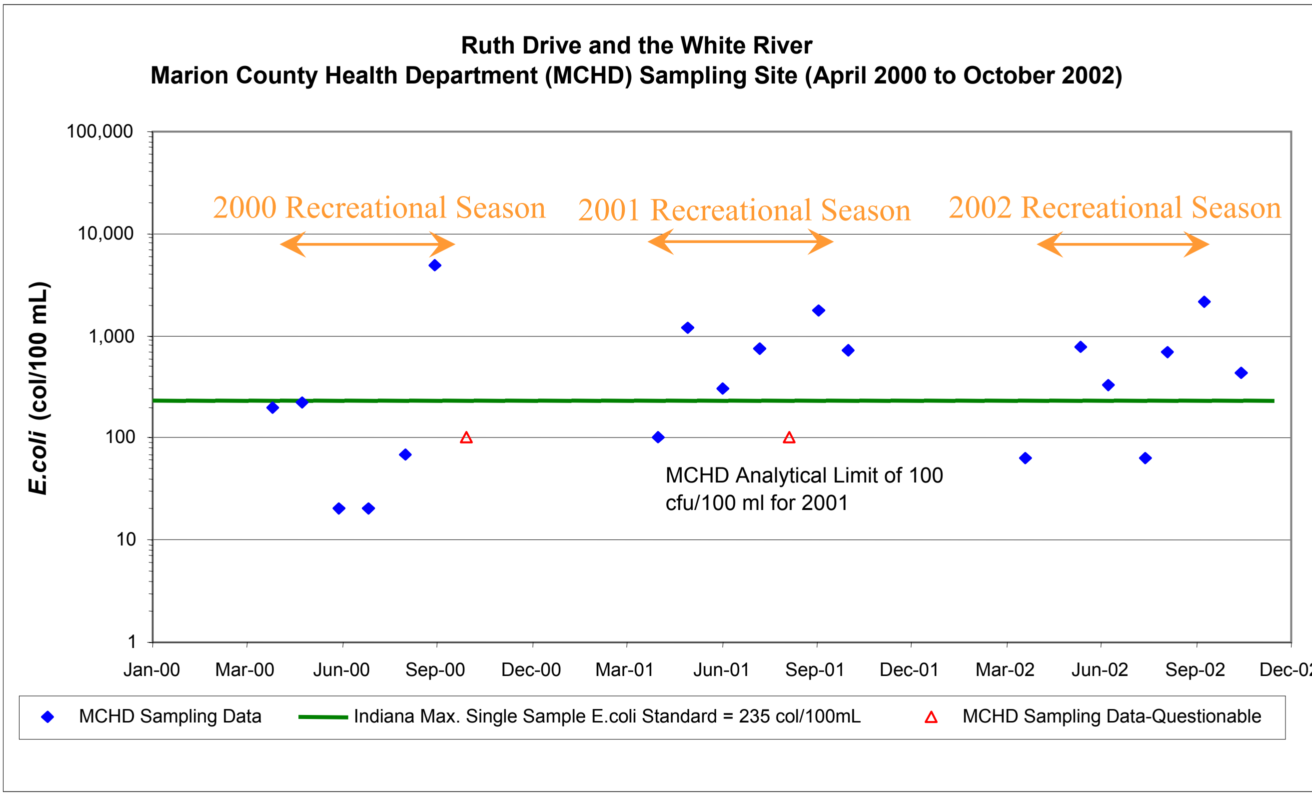


Figure 3.26: White River *E. coli* Data



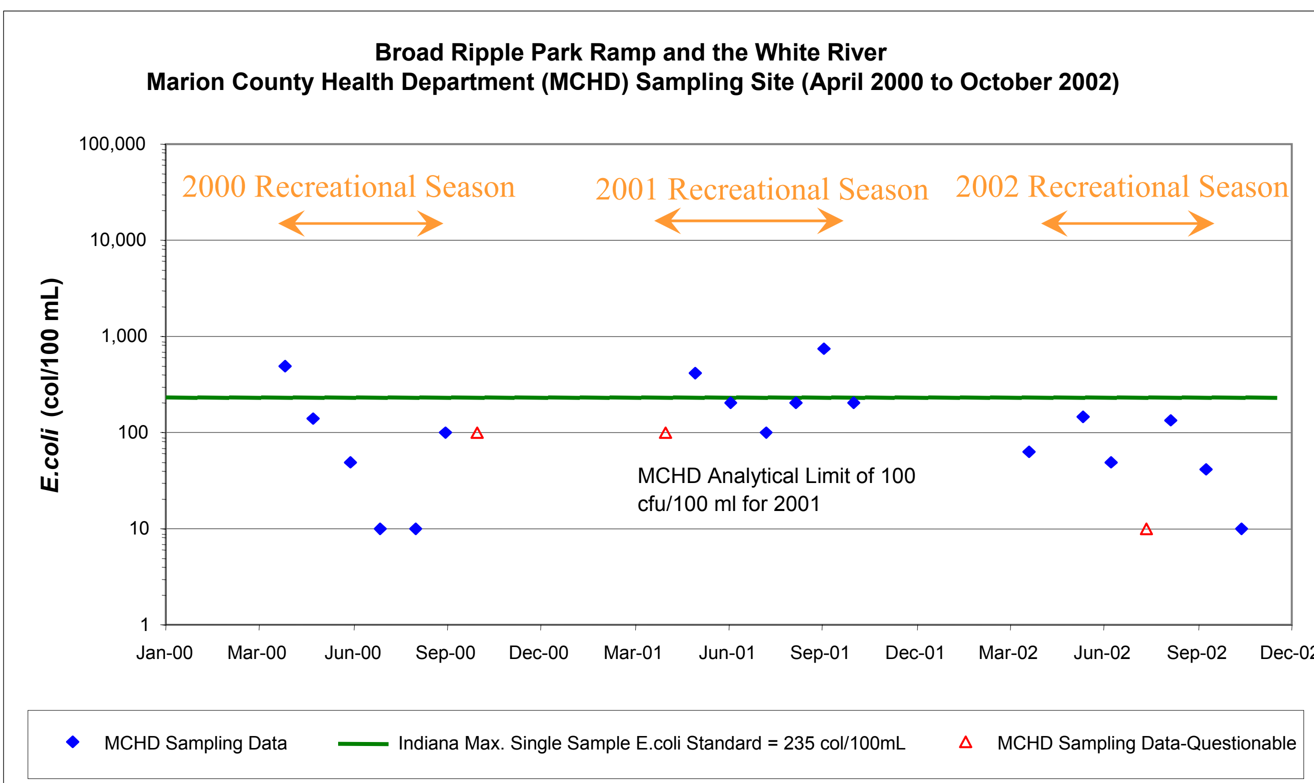
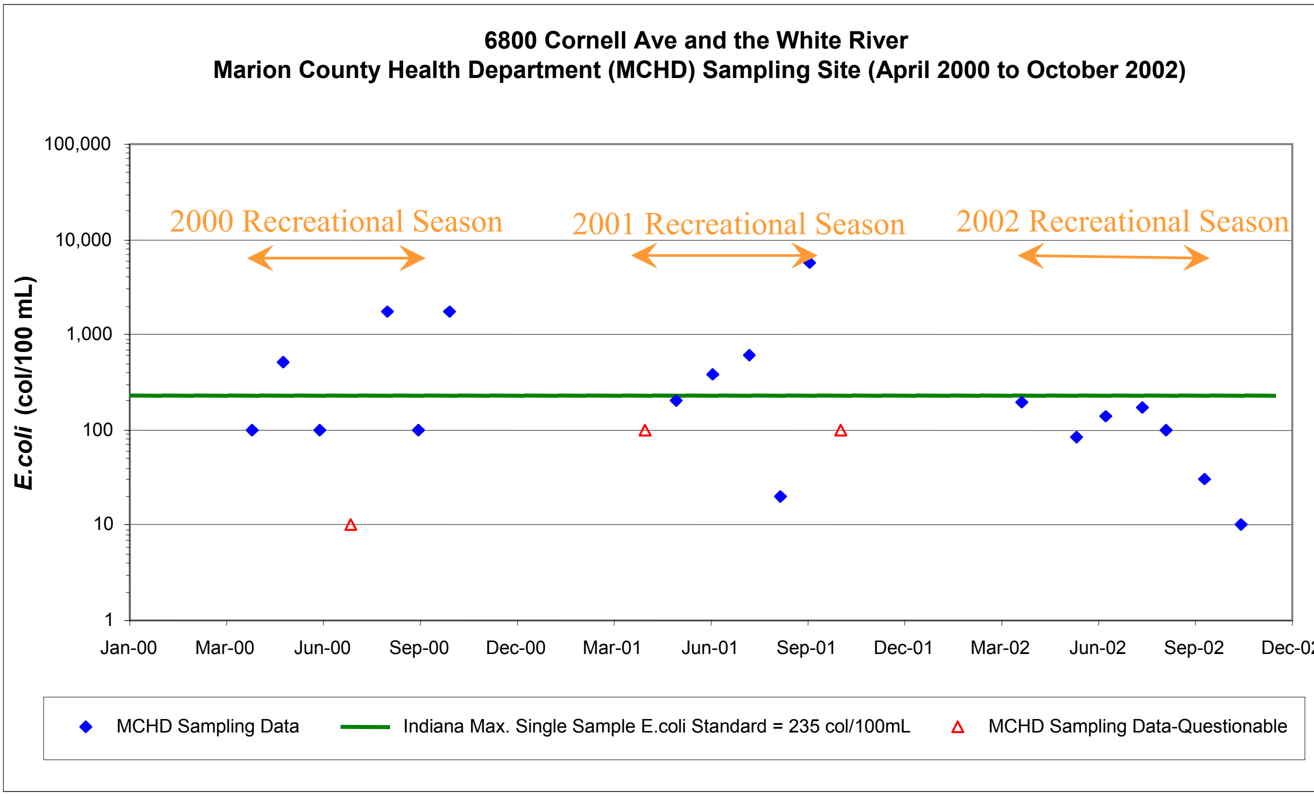


Figure 3.27: White River *E. coli* Data



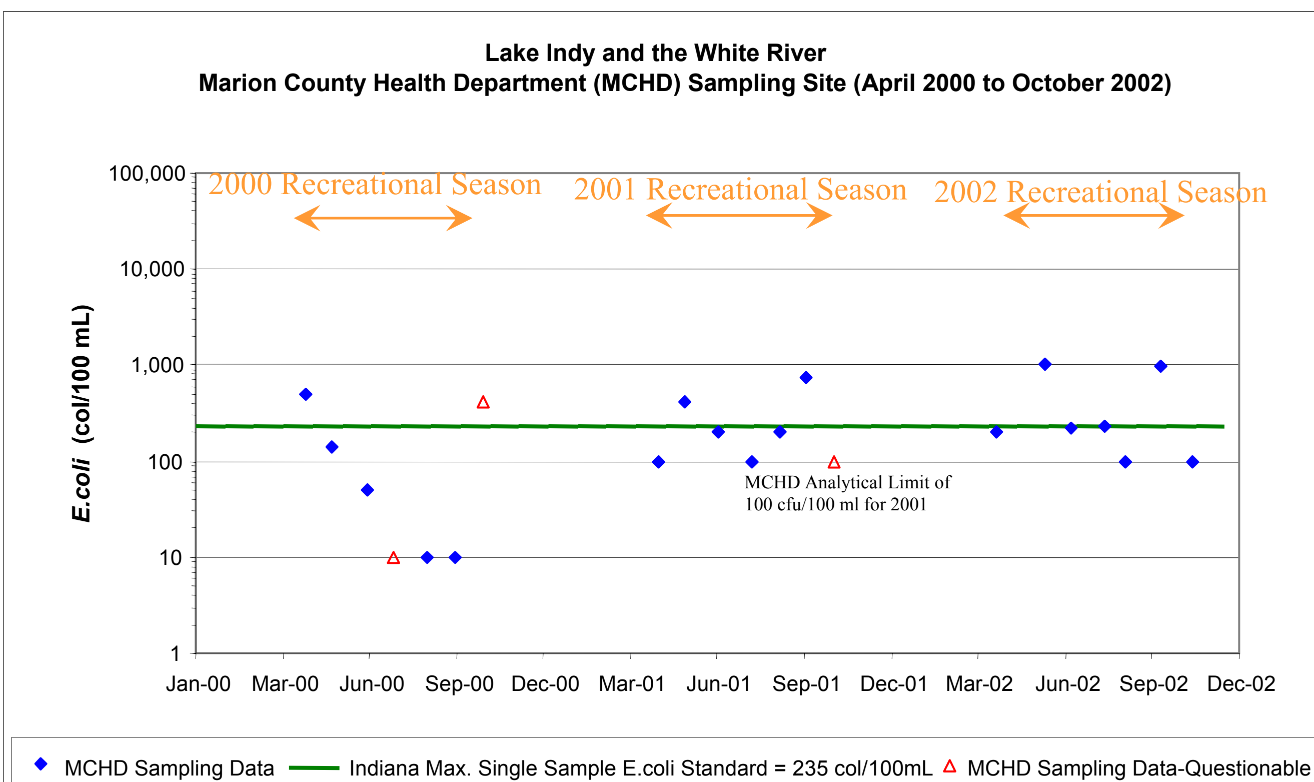
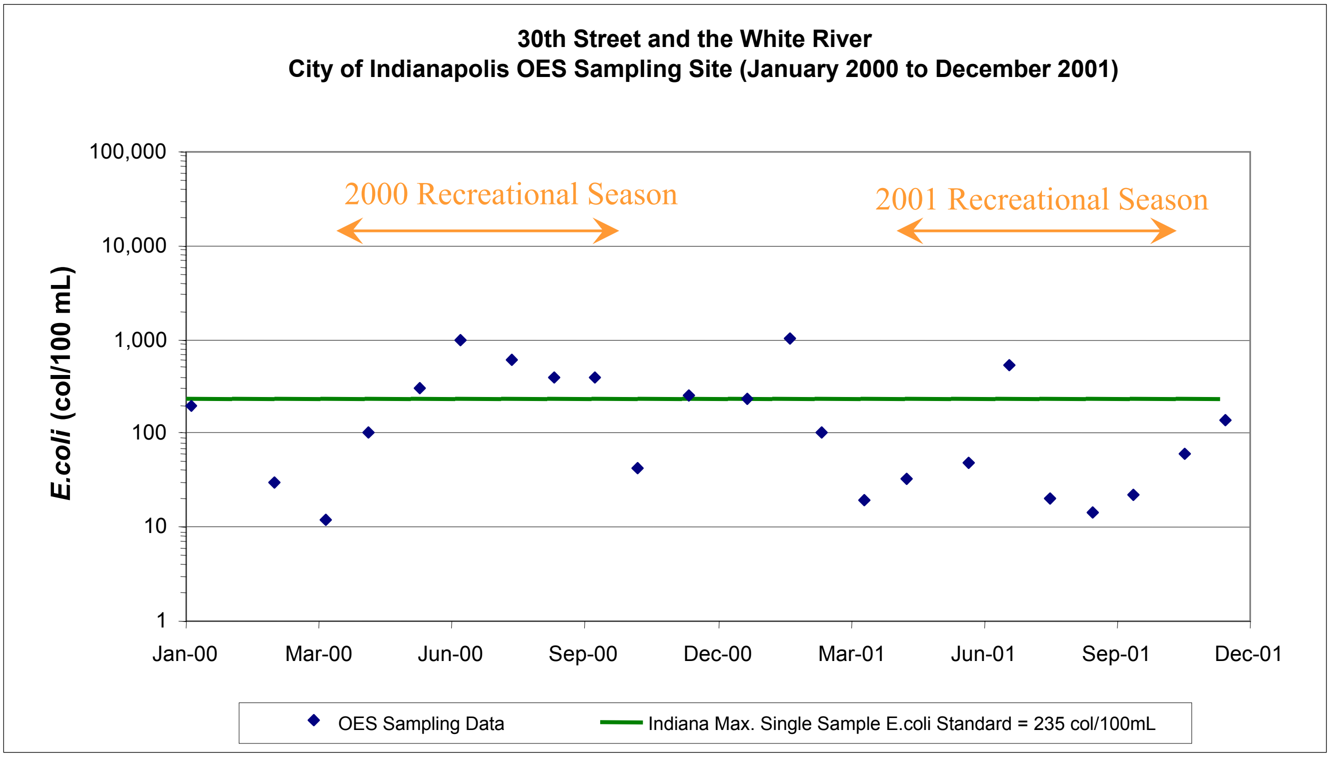


Figure 3.28: White River *E. coli* Data



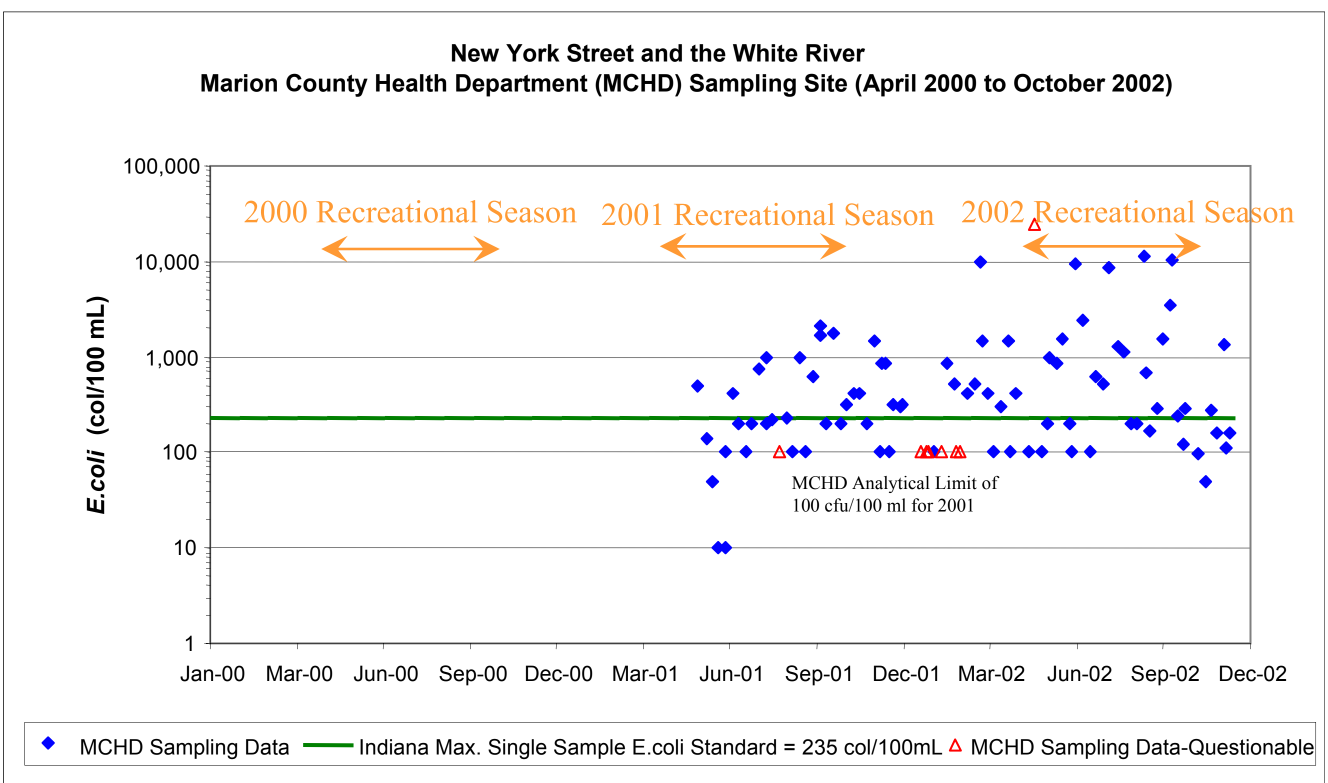
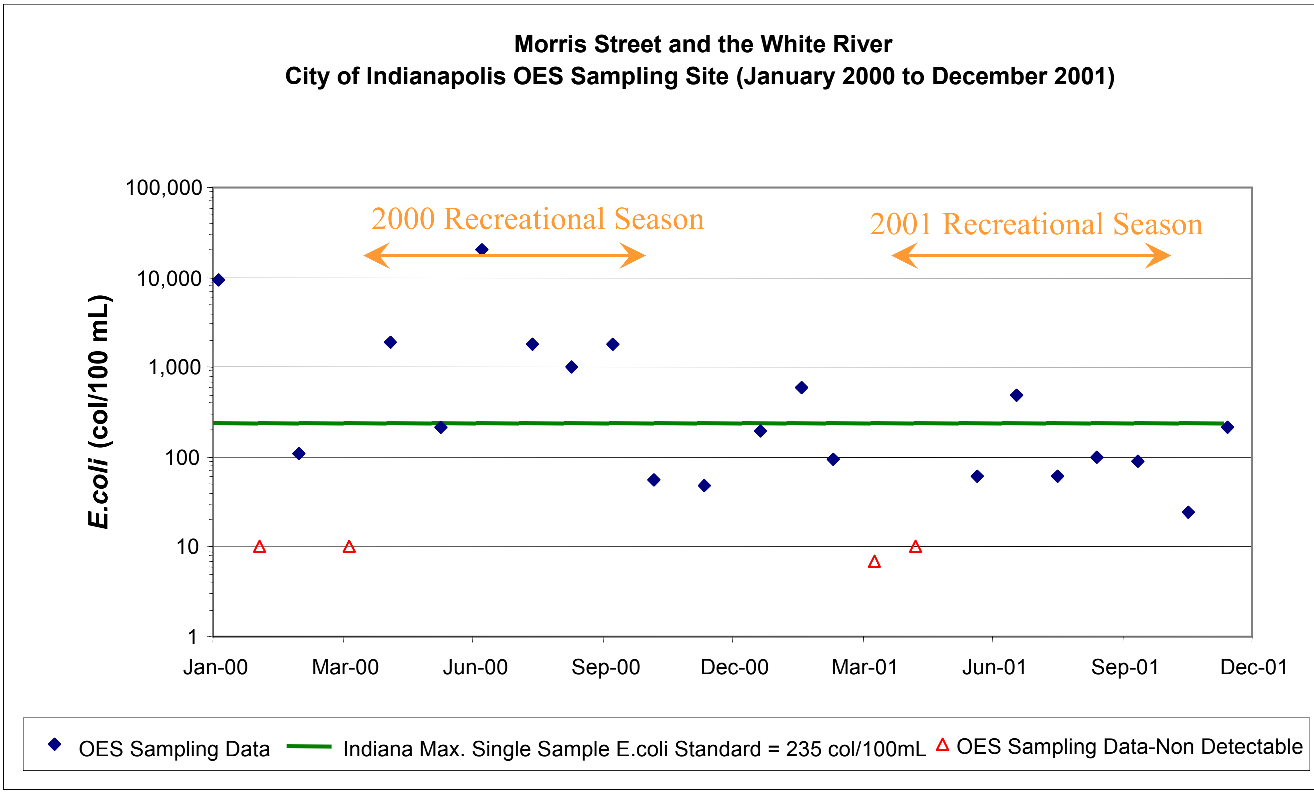


Figure 3.29: White River *E. coli* Data



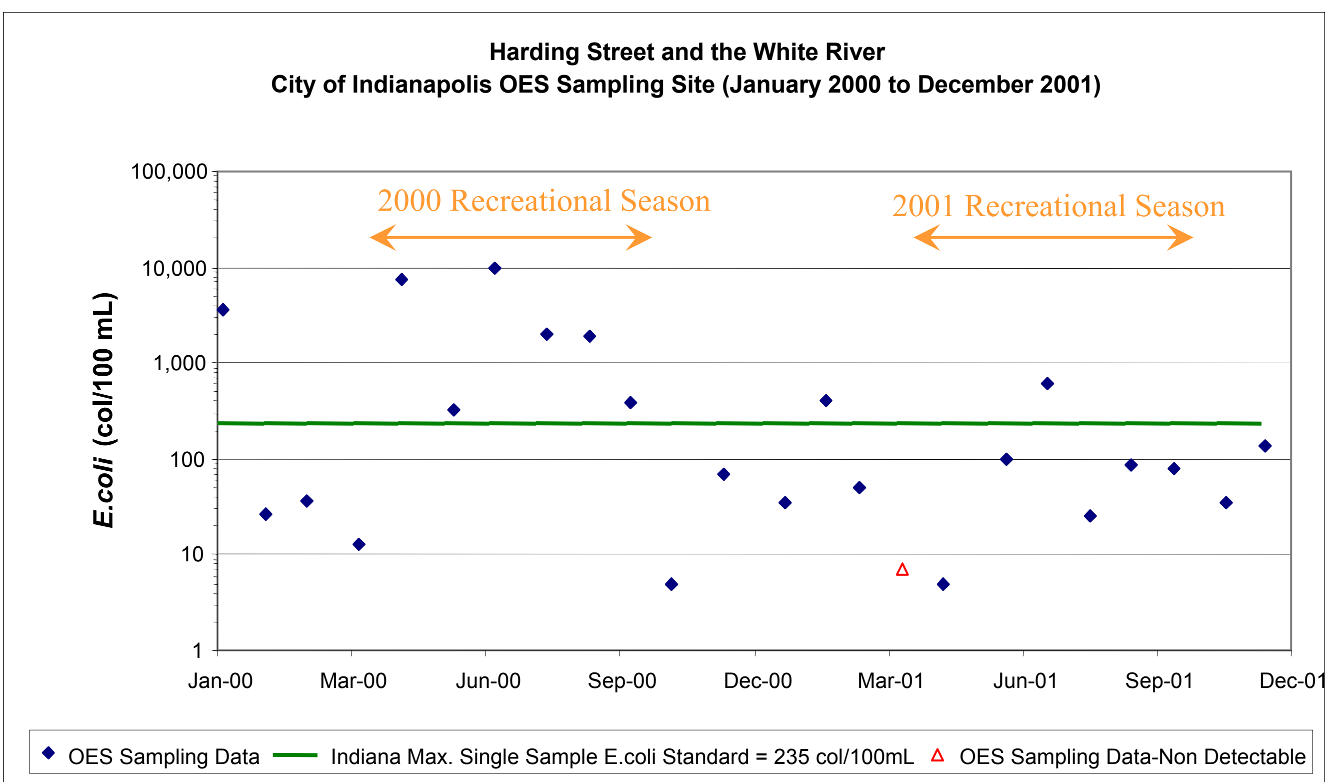
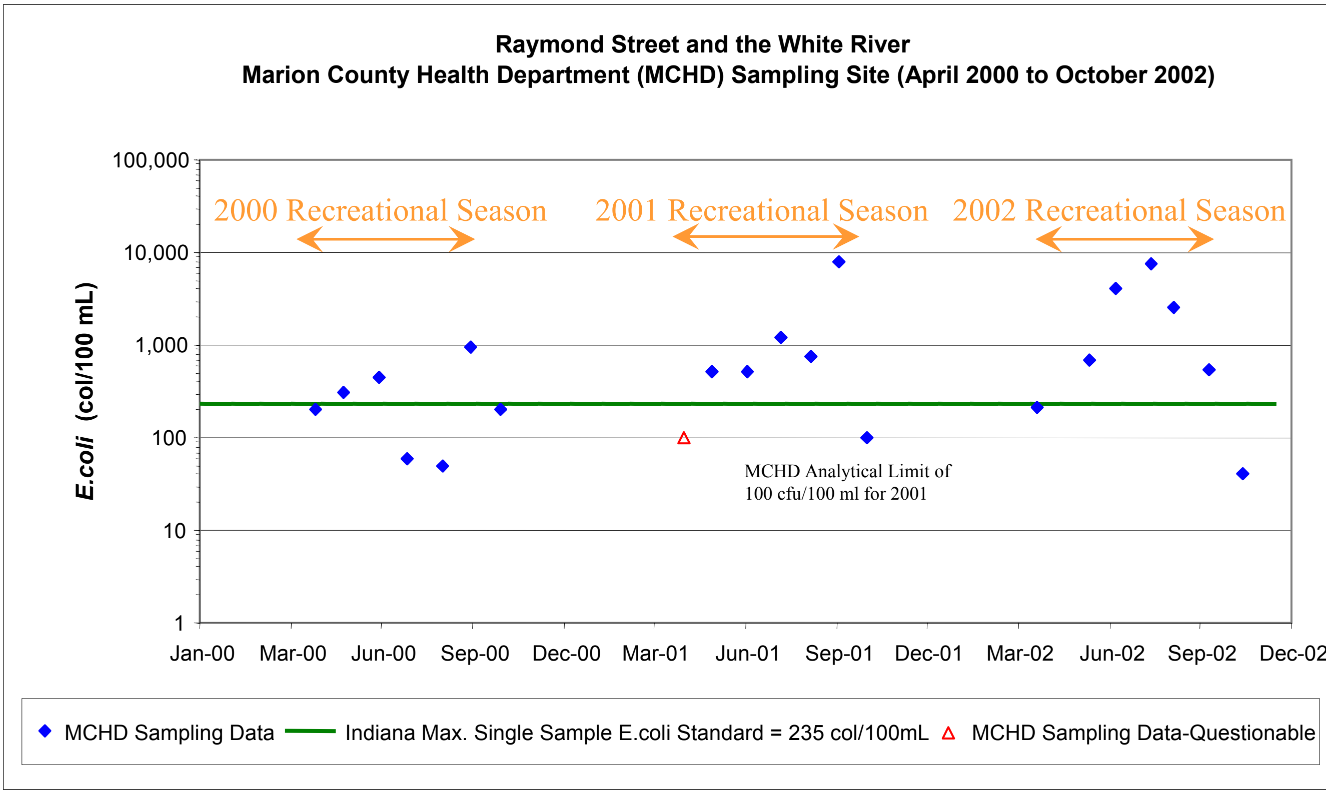


Figure 3.30: White River *E. coli* Data



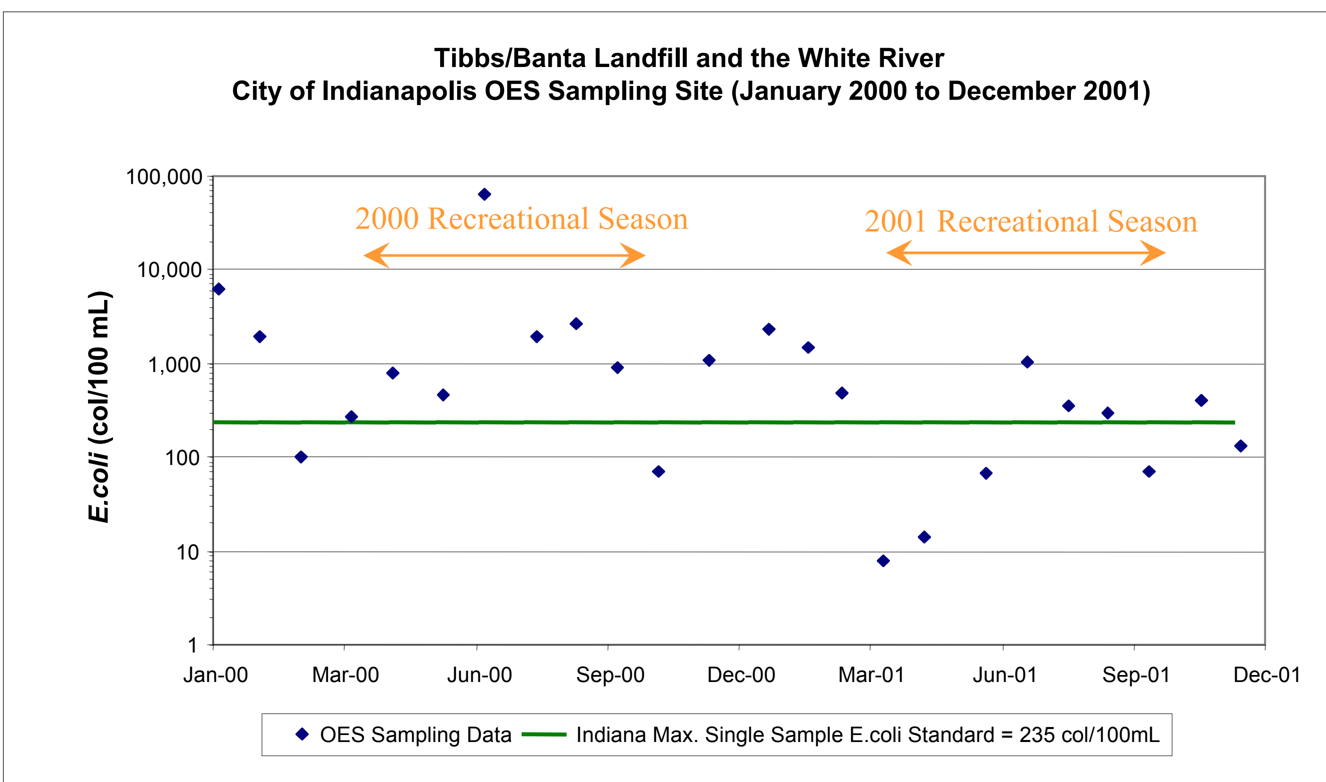
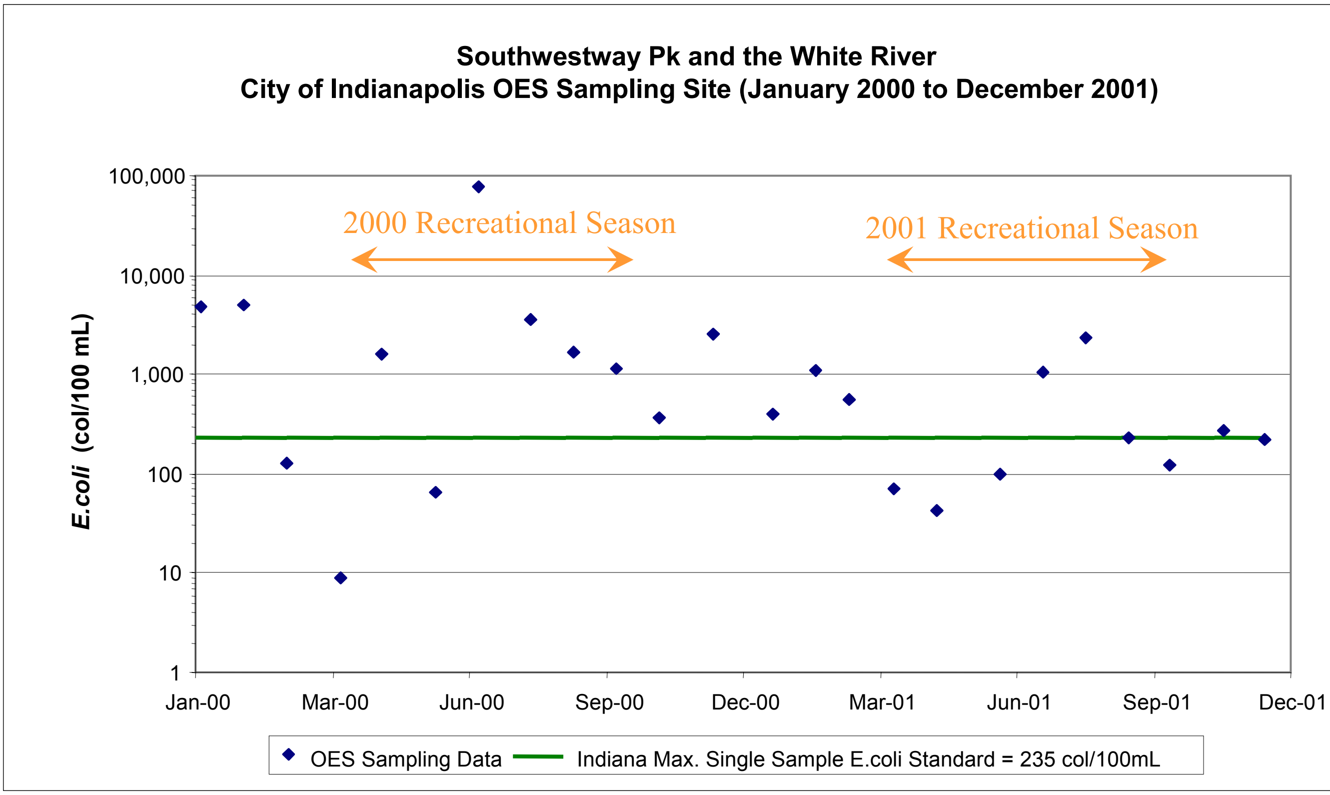


Figure 3.31: White River *E. coli* Data



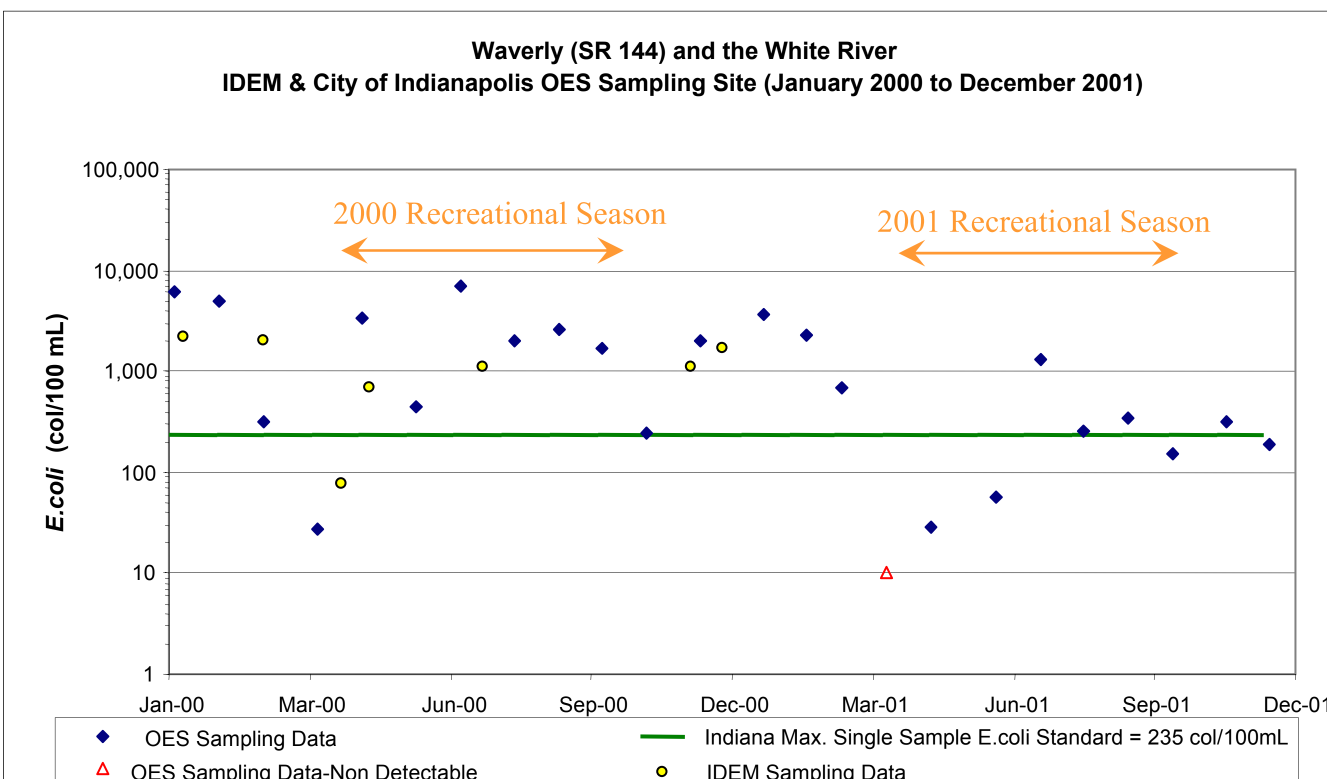
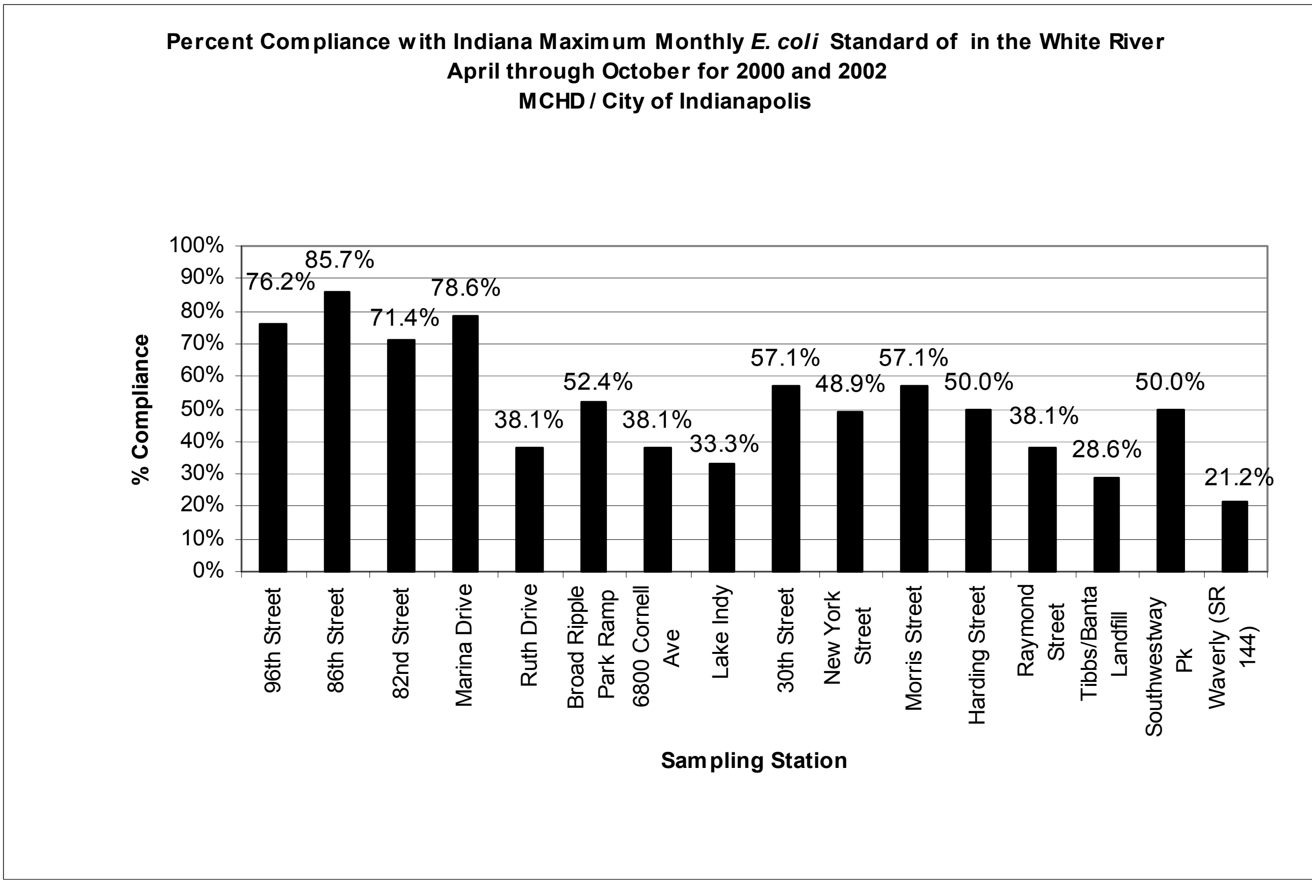
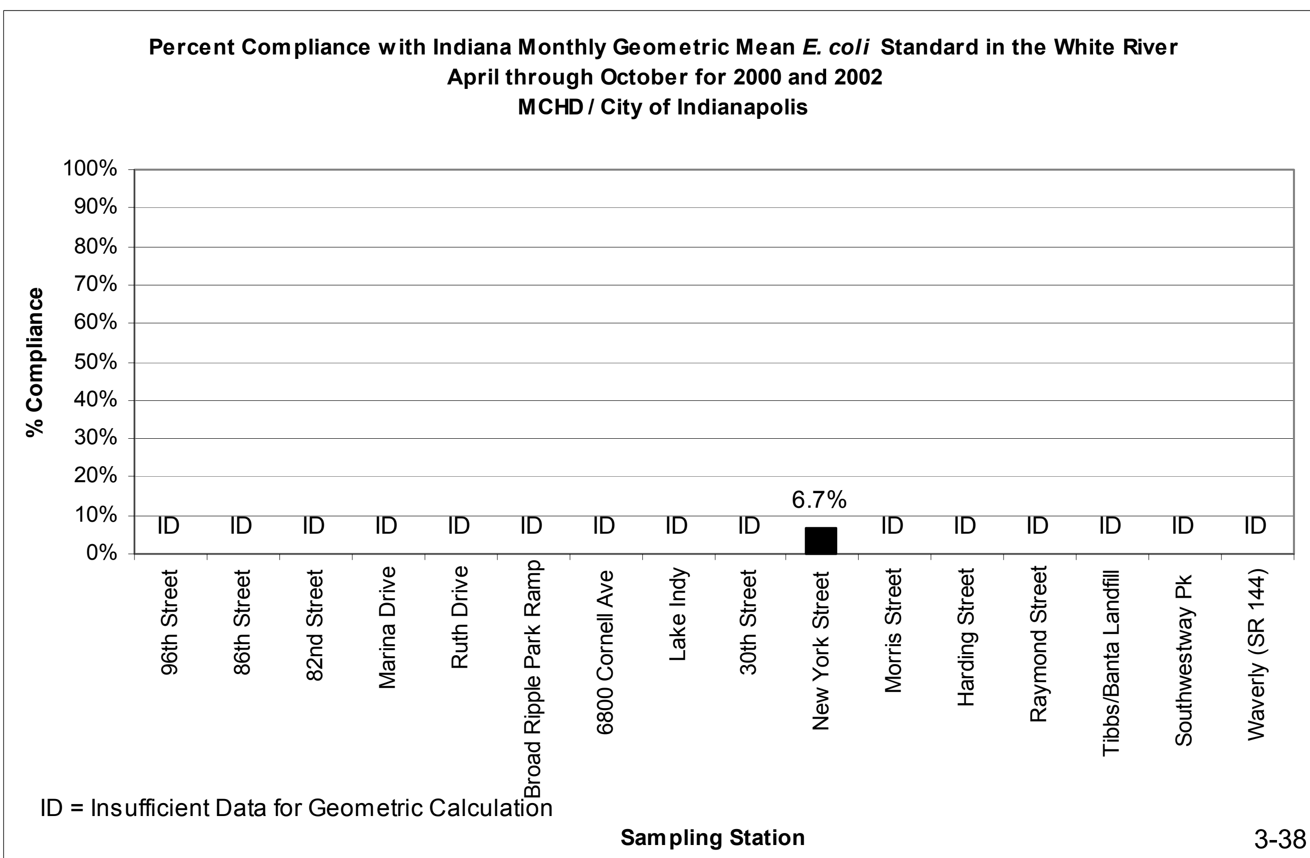


Figure 3.32: White River *E. coli* Data





Section 4
Water Quality Characterization

The previous section documents the existing water quality for White River. The findings indicate that the *E. coli* bacteria standard of 125 cfu/100 ml (geometric mean of five samples collected over 30 days) and 235 cfu/100 ml, (maximum day value) are often exceeded on the river.

4.1 Compliance Evaluation

Ammonia: During data analysis for this TMDL, it was determined that the data did not support a need for a TMDL on the White River for ammonia. A request by the City of Indianapolis to remove the West Fork of the White River for ammonia from the 303(d) list was reviewed and approved by IDEM. In IDEM's Summary Response to Comments, IDEM states, "IDEM re-evaluated these listings in light of the data submitted by the City of Indianapolis, Department of Public Works. IDEM will recommend that the West Fork of the White River from the confluence of Fall Creek to the confluence of Pleasant Run be delisted for ammonia." A check against the draft 2002 303(d) list verifies that the White River is not listed as impaired for ammonia.

Cyanide: The earlier analysis indicated that the primary source of cyanide is the city's AWTs at Belmont and Southport. The instream water quality monitoring data supports this finding. Hence, control of cyanide will be addressed through the NPDES permit associated with the AWTs. The AWTs meet the effluent limit for cyanide. Section 3.3.2 discusses the city's application for a variance on the standard.

Dissolved Oxygen: Low dissolved oxygen which can exceed the instream water quality standard is caused by CSO discharges for this river segment. The city's CSO Long Term Control Plan (LTCP) is being developed and will address this parameter.

E. coli bacteria: Based on the above, the remainder of this report will focus on the source assessment and load characterization of *E. coli* bacteria. *E. coli* bacteria data for 2000, 2001, and 2002 were analyzed for compliance with three reference criteria as follows:

- IDEM's geometric mean water quality standard for *E. coli* bacteria which is 125 cfu/100 ml or less,
- IDEM's 303(d) Listing Methodology (2002) guidance of no more than 10 percent of samples be above 235 cfu/100 ml, and
- IDEM's 303(d) Listing Methodology (2002) guidance of no sample having an *E. coli* bacteria count greater than 10,000 cfu/100 ml.

In order to better determine bacteria sampling, data was separated into two categories, wet weather and dry weather. Wet weather is defined as precipitation (greater than trace amounts or greater than 0.1 inch) and the three days following that precipitation. The three day period was determined by an analysis of *E. coli* bacteria in stormwater and CSOs as part of the April 2001 LTCP (CDM, 2003.) Dry weather is any time other than wet weather.

In addition, the White River was divided into three segments for analysis purposes.

- White River North Segment -- Upstream Marion County line to Lake Indy (upstream of CSO area),
- White River CSO Area Segment -- Lake Indy to Tibbs/Banta Landfill, and
- White River South Segment -- Tibbs/Banta Landfill to Waverly (downstream of CSO area).

Table 4.1 and **Figure 4.1** show the extent of each river segment. The segment between the upstream Marion County Line to Lake Indy is considered upstream of the CSO area since the three CSOs that discharge within that area are only active an average of one time per year.

The findings of the compliance analysis are presented in **Table 4.2** for the three segments on the White River for dry weather, wet weather and all weather. This information is presented in **Figures 4.2 through 4.4**.

4.1.1 All Weather Analysis

All three river segments are not in compliance with the *E. coli* bacteria geometric mean standard of 125 cfu/100 ml, and the reference criteria of less than 10% of samples greater than 235 cfu/100 ml and no samples in excess of 10,000 cfu/100 ml. The analysis suggests that all segments of the White River are not able to accept the *E. coli* bacteria load from wildlife, failed septic systems, stormwater, and CSO sources. However, the White River upstream of Lake Indy is close to meeting the Indiana geometric mean standard of 125 cfu/100 ml.

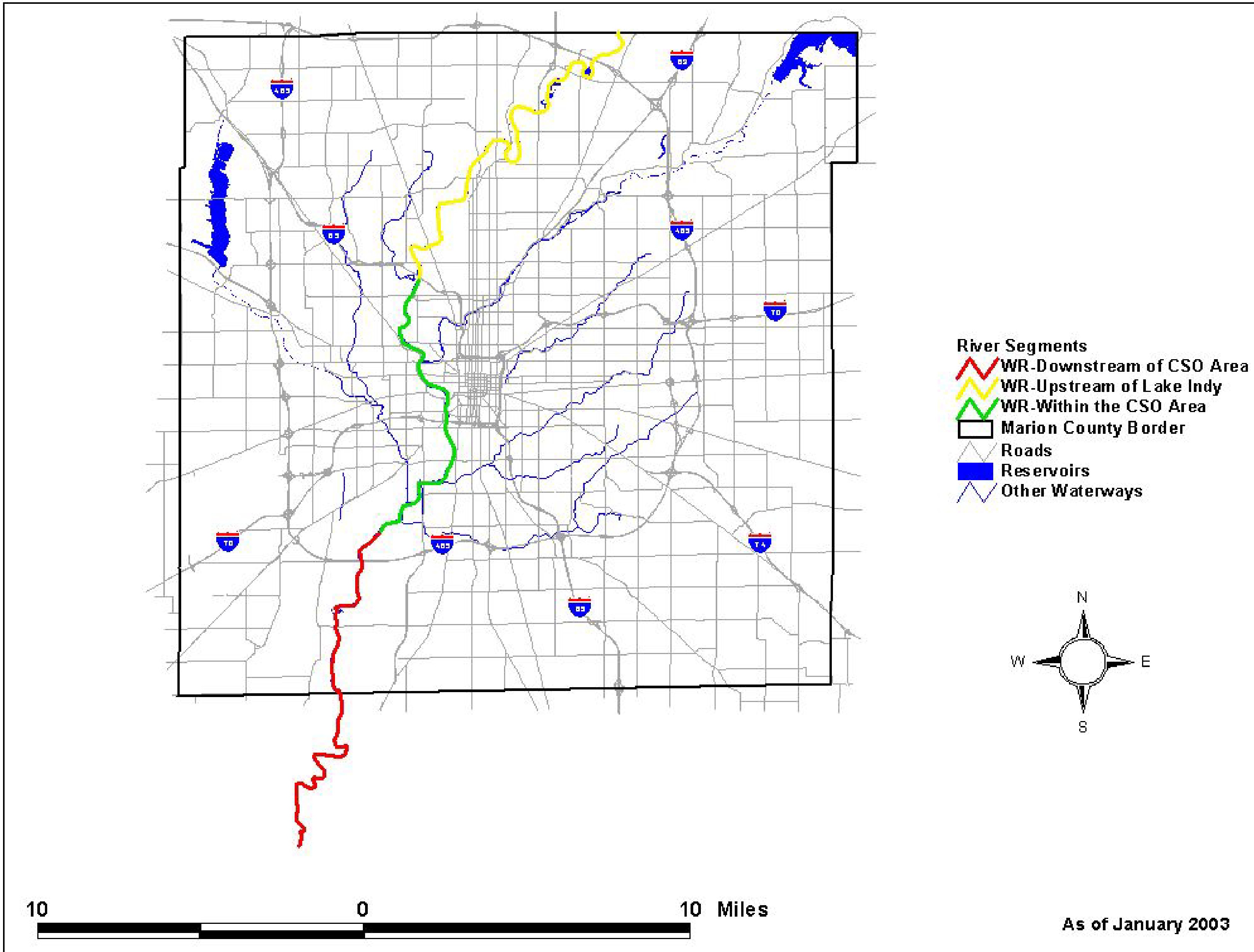
4.1.2 Dry Weather

Two of the river segments, the White River upstream of Lake Indy and the CSO area, have *E. coli* bacteria geometric mean values lower than the Indiana geometric mean standard of 125 cfu/100 ml. However, neither river segment is in compliance with the reference criteria of less than 10% of samples greater than 235 cfu/100 ml during dry weather. The analysis suggests that the White River through the CSO area has sufficient baseflow to absorb the *E. coli* bacteria load during a "typical" dry weather day; however, frequent low flow conditions or fluctuations in the septic or wildlife loads occur more than 10% of the time during dry weather. The White River segment downstream of the CSO area is in excess of the Indiana geometric mean standard of 125 cfu/100 ml and the reference criteria of less than 10% of samples greater than 235 cfu/100 ml during dry weather. The analysis suggests that the stream receives excessive *E. coli* bacteria loadings from failed septics and wildlife sources.

4.1.3 Wet Weather

All of the river segments are in excess of all criteria during wet weather. The analysis suggests that all segments of the White River receive excessive *E. coli* bacteria loadings from stormwater and CSO sources. However, the number of samples in excess of 10,000 cfu/100 ml for the White River CSO area is less than that for the Fall Creek and Pleasant Run CSO areas during wet weather. This suggests that the White River possesses more baseflow to absorb the wet weather load. However, the % of samples in excess of 235 cfu/100 ml for the White River CSO area is comparable to the Fall Creek and Pleasant Run CSO areas.

Figure 4.1: White River - River Segments



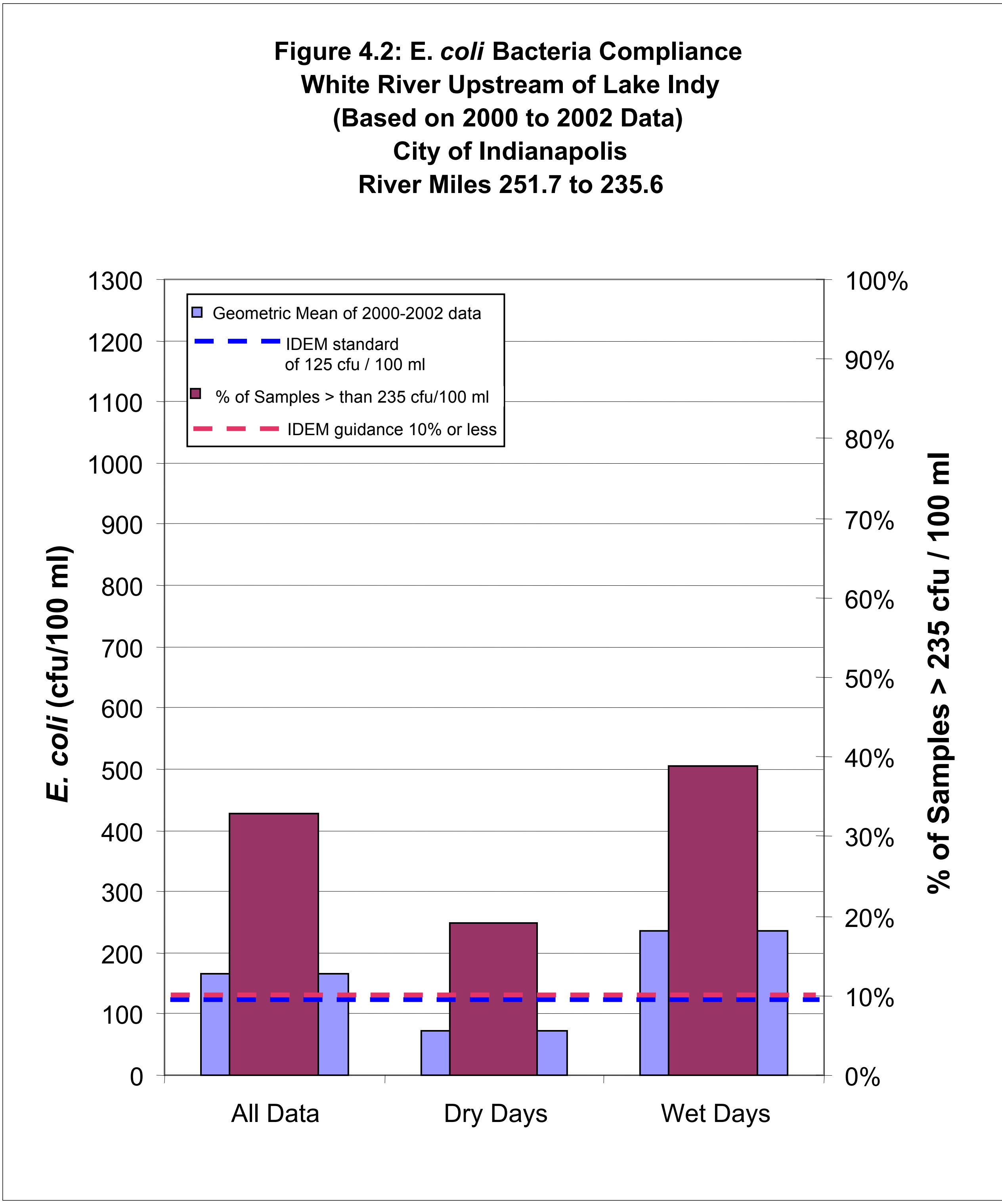


Figure 4.2: E. *coli* Bacteria Compliance
White River Upstream of Lake Indy
(Based on 2000 to 2002 Data)
City of Indianapolis
River Miles 251.7 to 235.6
Geometric Mean of 2000-2002 data
IDEM standard of 125 cfu / 100 ml
% of Samples > than 235 cfu/100 ml
IDEM guidance 10% or less
E. coli (cfu/100 ml)
% of Samples > 235 cfu / 100 ml
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
All Data
Dry Days
Wet Days

Figure 4.3: E. *coli* Bacteria Compliance
White River Within CSO Area
(Based on 2000 to 2002 Data)
City of Indianapolis
River Miles 235.6 to 225.1

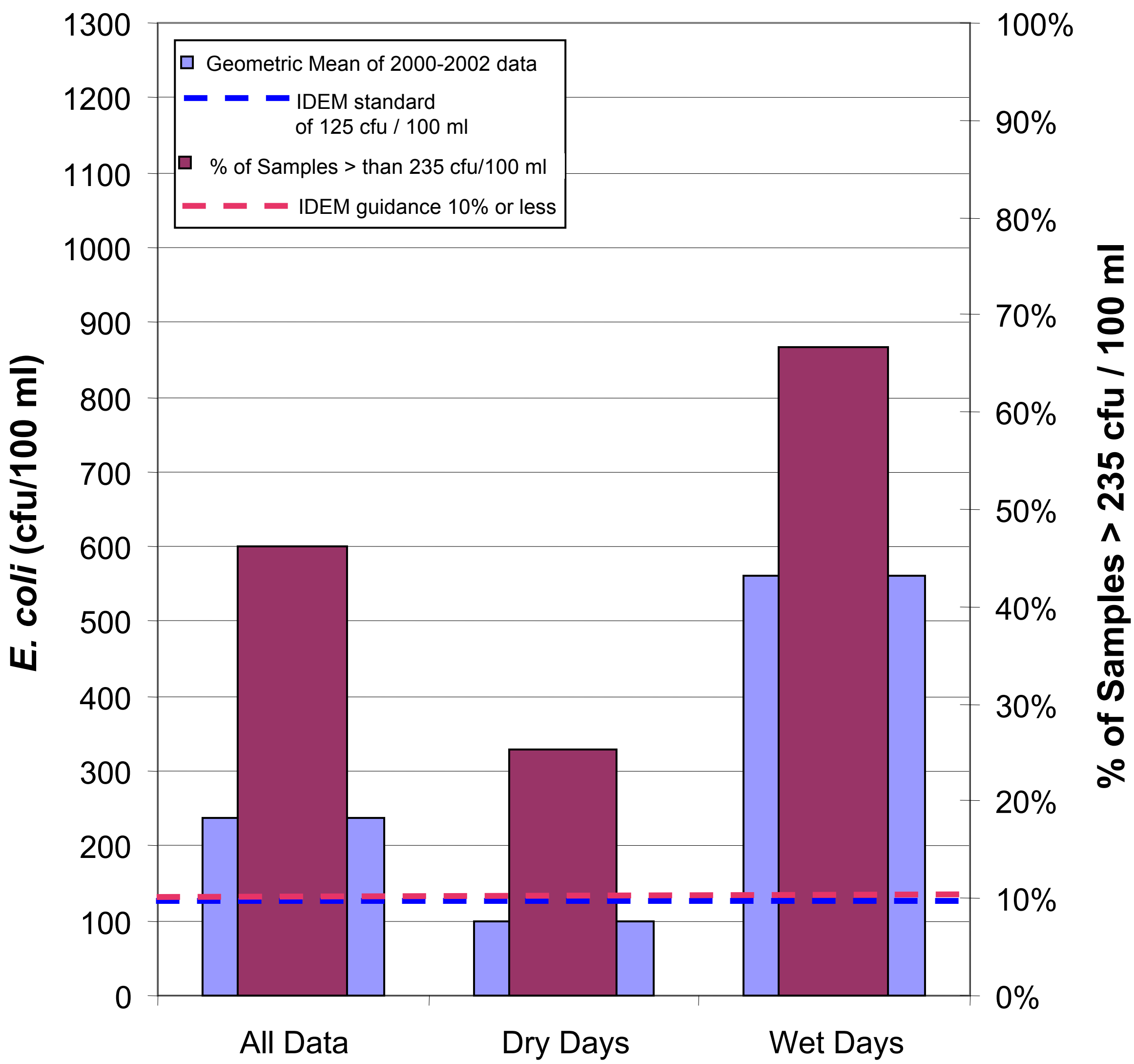


Figure 4.4: E. *coli* Bacteria Compliance
White River Downstream of CSO Area
(Based on 2000 to 2002 Data)
City of Indianapolis
River Miles 225.1 to 212

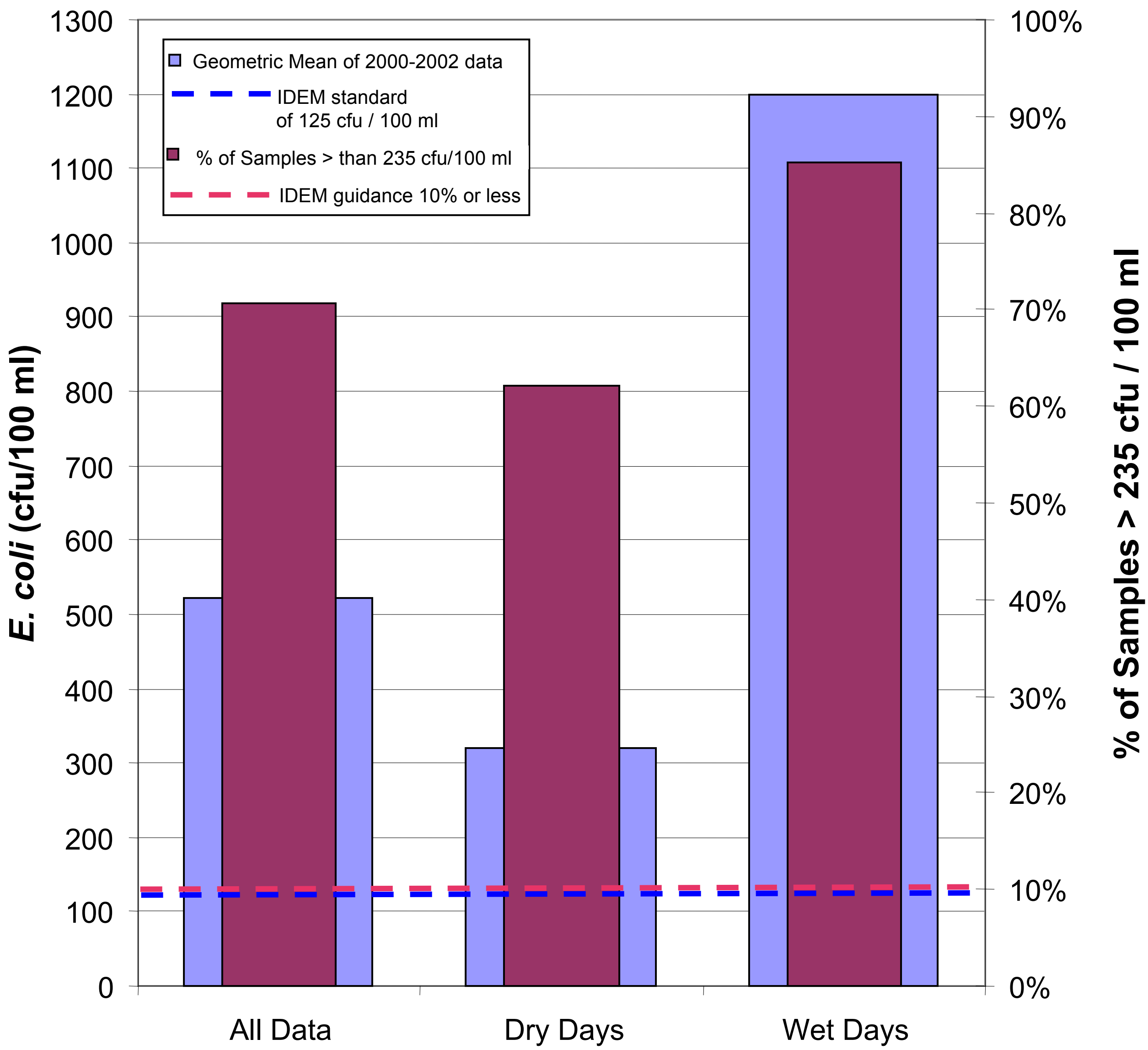


Table 4.1: Segment River Mile

River Segment	River Mile Start	River Mile End
White River - Upstream of Lake Indy	251.7	235.6
White River - Within CSO Area	235.6	225.1
White River - Downstream of CSO Area	225.1	212

Table 4.2: *E. coli* Bacteria Compliance

All Data				
River Segment	**Geometric Mean of 2000-2002 data**	**% of Samples > 235 cfu/100 ml**	**Total Number of Samples > 10,000 cfu/100 ml**	**Total Number of Samples**
White River - Upstream of Lake Indy	166	32.9%	1	155
White River - Within CSO Area	238	46.2%	4	184
White River - Downstream of CSO Area	410	63.8%	2	47
Dry Weather				
River Segment	**Geometric Mean of 2000-2002 data**	**% of Samples > 235 cfu/100 ml**	**Total Number of Samples > 10,000 cfu/100 ml**	**Total Number of Samples**
White River - Upstream of Lake Indy	74	19.1%	0	47
White River - Within CSO Area	99	25.3%	0	91
White River - Downstream of CSO Area	165	44.0%	0	25
Wet Weather				
River Segment	**Geometric Mean of 2000-2002 data**	**% of Samples > 235 cfu/100 ml**	**Total Number of Samples > 10,000 cfu/100 ml**	**Total Number of Samples**
White River - Upstream of Lake Indy	236	38.9%	1	108
White River - Within CSO Area	561	66.7%	4	93
White River - Downstream of CSO Area	1159	86.4%	2	22
State Guidance[(1)]	**(IDEM standard of 125 cfu/100 ml)**	**(IDEM Guidance 10% or less)**	**(IDEM Guidance None > 10,000 cfu/100 ml)**	

[(1)] **Indiana's 303(d) Listing Methodology for Impaired Waterbodies and Total Maximum Daily Load - September 2002**

Section 5
Source Characterization

A model was developed to simulate the impact of both dry and wet weather sources to the White River. The model simulates wet weather *E. coli* bacteria sources including CSOs and urban/residential nonpoint sources. Additionally, work was performed to define the sources of dry weather *E. coli* bacteria and the components of urban/residential nonpoint source wet weather contaminants.

A source assessment is used to characterize the known and suspected sources of *E. coli* bacteria in the watershed for development of the TMDL. The *E. coli* bacteria for this TMDL was characterized for the following sources:

- Septic systems
- Illicit connections to storm drains
- Advanced Wastewater Treatment plants
- Wildlife/Natural
- Stormwater runoff
- Combined sewer overflows
- Upstream sources

The source assessment evaluated the type, magnitude, timing, and location of pollutant loading to the impaired water bodies for *E. coli* bacteria. The relative rankings of the pollutant contribution for each parameter were established based on the available source data.

5.1 Septic Systems

Failing septic systems have been linked to increased *E. coli* bacteria levels in streams throughout the world. In accordance with the City of Indianapolis' Septic Tank Elimination Program, a list of neighborhoods with failing septic systems is kept and updated based on new information. Scheduling of sewer projects in each neighborhood is partially based on the degree of system failure that is observed. Priority levels 1 through 3 are assigned with Priority 1 typically corresponding to neighborhoods with the highest degree of failure. The failure information was obtained for the period of 2000 through 2002 and was compared to sampling data for that same period.

As of early 2000, there was one Priority 1 septic neighborhood within the watershed boundary that directly drains into the White River within Marion County, as well as 15 Priority 2 and 20 Priority 3 septic neighborhoods. For areas draining into one of the tributary streams, there are approximately 30 Priority 1 septic neighborhoods, 22 Priority 2 septic neighborhoods, and 26 Priority 3 septic neighborhoods. The number of septic systems in each watershed was estimated based on the city's GIS data for septic neighborhoods, buildings, and watersheds. *E. coli* bacteria loads were estimated based on an estimated failure rate, flow rate, and *E. coli* bacteria counts for the septic neighborhoods. For purposes of the TMDL analysis, the failure rate for septic systems was related to the priority level of the neighborhood as follows:

- Priority 1: 25% failure rate
- Priority 2: 15% failure rate
- Priority 3: 10% failure rate
- All others: 5% failure rate

The city's reported failure rate is often much higher than the values used in this TMDL, as septic system "failure" may not result in *E. coli* bacteria reaching the stream. Septic system failure rates were validated using the instream *E. coli* bacteria data during the development of the model. A flow of 100 gallons/person-day and a concentration of 10,000 cfu/100 ml (Horsley and Whitten, 1996) for each failing septic system were assigned. Leaking septic systems are characterized as a point source having constant flow and concentration. The loading rate attributed to leaking septic systems is estimated to be 1.67 x 10^{11} cfu per day. **Table 5.1** summarizes the estimated failed septic system *E. coli* bacteria loadings into the White River. The average daily load is calculated as the average daily septic flow multiplied by the average daily septic *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days.

5.2 Illicit Connections

Stormwater outfalls often carry *E. coli* bacteria during dry weather because of loadings from illicit sanitary connections to the stormwater collection system. The City of Indianapolis Fifth Annual Report (2002) for the NPDES stormwater permit (AMEC, 2003) reported that approximately 7.7% of the stormwater outfalls sampled contained dry weather flows. This flow is assumed to contain *E. coli* bacteria. For each illicit discharge, a flow of 20 gpd with 10,000 cfu/100 ml for *E. coli* bacteria was assigned. This flow rate and concentration were validated using the instream *E. coli* bacteria data during the development of the model. **Table 5.2** summarizes the estimated illicit storm drain *E. coli* bacteria loadings into the White River. The average daily load is calculated as the average daily illicit connection flow multiplied by the average daily illicit connection *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days.

5.3 Wildlife and Natural Background

Not all *E. coli* bacteria in waterways is the result of man-made sources. Wildlife, both instream and on-bank, can be a source of *E. coli* bacteria to the streams. To estimate the potential load from wildlife, the instream monitoring station at 71st Street on Fall Creek was utilized. The land use above 71st Street on Fall Creek indicates natural conditions with the least anthropogenic sources in the study area. Please consult the

Fall Creek TMDL Report (CDM, 2003) for more information. The *E. coli* bacteria monitoring data from this station was used to represent the wildlife or natural *E. coli* bacteria load into the streams. **Table 5.3** summarizes the estimated *E. coli* bacteria concentrations and loadings into the White River that are a result of natural biota in the watersheds. All *E. coli* bacteria concentrations shown in the table received adjustment during model calibration (Section 6.2). This load represents wildlife or natural *E. coli* bacteria during dry weather conditions only. *E. coli* bacteria from wildlife or natural sources that is conveyed to the river by surface runoff is discussed in Section 5.4. The average daily load is calculated as the average daily natural background flow multiplied by the average daily natural background *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days.

5.4 Stormwater Runoff

Stormwater often carries *E. coli* bacteria because of loadings from domestic animals, wildlife, and agricultural land. Information from the City of Indianapolis' stormwater program and GIS coverages provided insight into the contribution of stormwater to the *E. coli* bacteria exceedance. Due to variations in solid deposits and *E. coli* bacteria loadings in residential, commercial, and other property types, a range of *E. coli* bacteria concentrations was assumed for each land use. Average stormwater *E. coli* bacteria counts were estimated from literature values and based on Indianapolis Mapping and Geographic Infrastructure System (IMAGIS) land use and watershed coverages. These bacteria counts were applied to daily surface runoff flows from October 1991 to October 2001 as predicted using the city's watershed model. **Table 5.4** contains a summary of the average daily surface runoff flows and *E. coli* bacteria loadings into White River based on land use. This load contains all sources of *E. coli* bacteria carried in from stormwater runoff, including wildlife. The average daily load is calculated as the average daily stormwater runoff flow multiplied by the average daily stormwater runoff *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days. **Table 5.5** shows the percentages of stormwater loads into the White River that come from permitted (storm drain outfall), non-permitted (surface runoff), and out-of-county sources. This information is pertinent to the TMDL analysis as the city's stormwater programs only address the control of stormwater *E. coli* bacteria from sources within the county.

5.5 Advanced Wastewater Treatment Plants

As a requirement of the City of Indianapolis AWT plants' NPDES permits, the treatment plant influent and effluent is monitored for *E. coli* bacteria. **Table 5.6** summarizes the estimated *E. coli* bacteria loadings into the White River from the Belmont and Southport AWT plants. The average daily load is calculated as the average daily effluent flow multiplied by the average daily effluent *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days.

5.6 Combined Sewer Overflows

Combined sewer overflows (CSOs) can be a large source of *E. coli* bacteria in urban streams. The CSO flows and *E. coli* bacteria loadings were determined using a methodology similar to that being used for the CSO Control Technologies Evaluation (CDM, 2003) in the CSO LTCP. CSO discharges were predicted by the city's collection system model for a ten-year period of time (October 1991 to October 2001). *E. coli* bacteria sampling of CSO discharges were performed by the city in 2001 to characterize CSO discharges. Concentrations ranged from 500,000 cfu/100 ml up to 900,000 cfu/100 ml. The CSO flows and *E. coli* bacteria loads were predicted using the city's models and sampling data. **Table 5.7** contains a summary of the estimated *E. coli* bacteria loadings from CSOs on the White River and to the tributaries of the White River. The average annual CSO loads and the average CSO *E. coli* bacteria concentrations were determined from hydraulic model simulations. The average daily load is the annual load divided by 365. The average monthly load is the daily load multiplied by 30 days.

5.7 Upstream *E. coli* Bacteria Contributions

In addition to the in-county sources discussed above, the White River receives *E. coli* bacteria from various sources in Hamilton County and the watershed north. For the purposes of this analysis, the upstream loadings were assumed constant for dry weather and wet weather flow conditions, and are summarized in **Table 5.8**. The average daily load is calculated as the average daily upstream flow multiplied by the average daily upstream *E. coli* bacteria concentration. The average monthly load is the daily load multiplied by 30 days.

TABLE 5.1: FAILING SEPTIC SYSTEMS
WHITE RIVER

Watershed	Approximate Count of Septic Systems				Total Septics	Estimated Failing Septic Systems	Approximate Population	Estimated Failing Septic Flow (MGD)	Estimated Failing Septic Daily Load (cfu)	Estimated Failing Septic Monthly Load (cfu)
	Barrett Law Priority 1	Barrett Law Priority 2	Barrett Law Priority 3	Non-Barrett Law						
Howland & Johnson Ditch	0	130	1044	0	1174	124	434	0.04	1.64E+10	4.92E+11
Crooked & Williams Creek	908	8	840	44	1800	314	1100	0.11	4.17E+10	1.25E+12
White River North	0	867	1614	78	2559	295	1034	0.10	3.91E+10	1.17E+12
Eagle & Guion Creek***	158	433	563	78	1232	165	576	0.06	2.18E+09	1.64E+11
White River CSO	0	667	430	215	1312	154	538	0.05	2.04E+10	6.11E+11
State Ditch, Buck & Lick Creek****	1188	1416	838	1162	4604	651	2280	0.23	2.16E+10	6.47E+11
White River South	108	620	612	253	1593	194	678	0.07	2.57E+10	7.70E+11
Assumed Failure Rate	**25%**	**15%**	**10%**	**5%**						
Totals	**2362**	**4141**	**5941**	**1830**	**14274**	**1897**	**6640**	**0.66**	**1.67E+11**	**5.11E+12**

*Assumptions include 3.5 persons per septic system, 100 gpcd septic flow, and 10,000 cfu/100 ml E. coli in the septic flow
**Persons per system and per capita flows taken from May 1989 DPW Design Standards
***Considered a secondary input with reduced loading into the White River CSO Reach(1,000 cfu/100 ml E. coli in septic flow)
****Considered a secondary input with reduced loading into the White River South Reach(2,500 cfu/100 ml E. coli in septic flow)

TABLE 5.2: ILLICIT CONNECTIONS TO STORM DRAINS
WHITE RIVER

Watershed	# of Storm Outfalls	Miles of Storm Sewer and Drains	Approximate number of Illicit Connections	Illicit Flow (MGD)	Estimated Illicit Connection Daily Load (cfu)	Estimated Illicit Connection Monthly Load (cfu)
White River North	29	131	2	4.00E-05	1.51E+07	4.54E+08
White River CSO	150	119	12	2.40E-04	9.08E+07	2.73E+09
White River South	20	152	2	4.00E-05	1.51E+07	4.54E+08
Howland Ditch	Included in White River North Summary					0.00E+00
Crooked Creek & Johnson Ditch	123	196	9	1.80E-04	6.81E+07	2.04E+09
Williams Creek	59	72	5	1.00E-04	3.79E+07	1.14E+09

*Illicit Connections for each stream segment assumed at 7.7% of outfalls (based on 2002 NPDES Stormwater report sampling data)
20 gpd sanitary flow, and 10,000 cfu/100 ml E. coli in the illicit flow

TABLE 5.3: INSTREAM WILDLIFE WHITE RIVER				
Watershed	Average Dry-Weather *E. coli* (cfu/100 ml)	Average Dry-Weather stream flow (cfs)	Approximate Instream Wildlife Daily Load (cfu)	Estimated Instream Wildlife Monthly Load (cfu)
Crooked Creek*	25	19.4	1.19E+10	3.56E+11
White River North*	33	91	7.31E+10	2.19E+12
White River CSO*	5	78	9.49E+09	2.85E+11
White River South*	48	546	6.41E+11	1.92E+13

*The 71st Street Sampling Station along Fall Creek is not in close proximity to any septic systems. Its dry-weather observed *E. coli* bacteria concentrations are assumed to be the result of wildlife. This concentration is applied to all other streams

*These concentrations received adjustment during model calibration. Calibrated concentrations are shown.

TABLE 5.4: STORMWATER RUNOFF FROM SEPARATE SEWER AREAS WHITE RIVER											
	Approximate Percentage of Specified Land use								Approximate Average E. Coli Concentration (cfu/100 ml)	Daily Average Stormwater Flow (cfs)	Daily Average Stormwater Load (cfu)
Land use Type	Commercial	Residential	Historic & Hospital	Industrial	Parks	Highway ROW	Spec. Uses	University			
Zoning Class	All C's	All D's	All H's	All I's	All PK's	ROW, RC	All SU's	All U's			
Assumed E. coli concentration	2000	2250	2500	2000	2500	3000	2500	2000			
White River Upstream	12%	68%	3%	4%	2%	2%	9%	0%	2300	81	4.54E+12
White River CSO	8%	48%	1%	22%	7%	3%	8%	4%	2200	35	1.90E+12
White River South	5%	67%	0%	12%	2%	1%	13%	0%	2300	22	1.24E+12

TABLE 5.5: UNPERMITTED AND PERMITTED STORMWATER RUNOFF SOURCES WHITE RIVER							
Watershed	**Permitted Storm Sewer Area (Acres)**	**Area without Storm Sewers (Acres)**	**Area outside County (Acres)**	**Total Area (Acres)**	**% Permitted**	**% Unpermitted**	**% Out of County**
White River North*	24,000	-	254,000	278,000	9%	0%	91%
White River CSO**	12,000	3,000	-	15,000	80%	20%	0%
White River South***	43,000	9,000	-	52,000	83%	17%	0%

*Includes Howland & Johnson Ditch, Crooked Creek & Williams Creek
**Includes Eagle & Guion Creek
***Includes State Ditch, Lick Creek, and Buck Creek

TABLE 5.6: AWT TREATED EFFLUENT WHITE RIVER					
Watershed	AWT Discharge	Average Discharge Flow (MGD)	Average E. coli Concentration (cfu/100 ml)	Average Daily AWT Load (cfu)	Average Monthly AWT Load (cfu)
White River CSO	Belmont	96	30	1.26E+11	3.77E+12
White River South	Southport	79	52	1.60E+11	4.79E+12

*E. Coli discharges not monitored from Jaunary to March
*AWT data recorded from April through October 2002 MOR's

TABLE 5.7: COMBINED SEWER OVERFLOWS WHITE RIVER							
Watershed	# Of CSO Regulators	# of CSO Outfalls	Annual Average CSO Volume (MG)	Average CSO E. Coli Concentration (cfu/100 ml)	Annual Average CSO E. Coli Load (cfu)	Daily Average CSO E. Coli Load (cfu)	Monthly Average CSO E. Coli Load (cfu)
Fall Creek CSO	35	26	1713	9.33E+05	4.02E+16	1.10E+14	3.30E+15
Pleasant Run CSO	51	51	334	1.21E+06	1.51E+16	4.13E+13	1.24E+15
White River CSO	35	26	1110	1.01E+06	5.23E+16	1.43E+14	4.30E+15
Pogues Run CSO	24	23	1046	1.28E+06	4.67E+16	1.28E+14	3.84E+15
Eagle Creek CSO	N/A	N/A	66	7.19E+05	2.05E+15	5.62E+12	1.69E+14

*Flows and bacteria loadings are from the 50-year rainfall record Flows and loads presented are model results.

**White River regulator and outfall counts include Eagle Creek

TABLE 5.8: HAMILTON COUNTY FLOW WHITE RIVER				
Watershed	Average E. coli (cfu/100 ml)	Average stream flow (cfs)	Approximate Hamilton Co. Daily Load (cfu)	Estimated Hamilton County Monthly Load (cfu)
Hamilton County -- Dry*	60	229	3.36E+11	1.01E+13
Hamilton County -- Wet**	186	229	1.04E+12	3.13E+13

*The dry-weather geometric mean of the 96th street sampling station was assumed to be the Hamilton Co. dry-weather concentration

*This concentration was later adjusted to match observed daily data

**The wet-weather gemetric mean of the 96th street sampling station was assumed to be the Hamilton Co. wet-weather concentration

Section 6
Total Maximum Daily Load Analysis

A TMDL is a tool for meeting water quality standards. It is based on the relationship between sources of pollutants and instream water quality conditions. The TMDL establishes the allowable loadings for point and nonpoint sources of specific pollutants that a waterbody can receive without exceeding water quality standards, thereby providing the basis for establishing water quality based pollutant controls.

6.1 Goals

Using the U.S. EPA *Protocol for Developing Pathogen TMDLs* (January 2001), the following steps were followed and utilized to develop a TMDL:

- **Problem identification**: Identify key factors and background information for water body that describe the nature of the impairment.
- **Water quality indicators and targets**: Identify numeric indicators and target values that can be used to evaluate attainment of water quality standards.
- **Source assessment**: Identify and characterize sources of pollutant to water body.
- **Linkage between water quality targets and sources**: Linkage establishes the cause and effect relationship between the pollutant sources and the instream water quality response. The linkage is further used to estimate the load assimilation capacity of the water body, which is the maximum amount of pollutant loading a water body, can assimilate and still attain water quality standards.
- **Load allocation**: Based on the established target/sources linkage, pollutant loadings that will not exceed the load assimilation capacity and will lead to attainment of the water quality standard can be determined.
- **Assembling the TMDL**: The elements of a TMDL submittal are compiled to facilitate TMDL review.
- **Follow-up monitoring and evaluation**: After implementation of the TMDL, follow-up monitoring is used to assess if the TMDL results in attaining water quality standards for the water body.

6.2 Methods

An *E. coli* bacteria model of the White River from Marion County downstream to Waverly was developed and calibrated to the existing instream *E. coli* bacteria data. The model simulated the daily instream bacteria counts for each stream segment based on loads from the sources described in Section 5. For the dry weather sources, a constant load was applied. The dry weather sources are failing septics, wildlife and natural background, illicit storm drain connections, and upstream out-of-county sources. For stormwater runoff and CSO discharges, the *E. coli* bacteria load was based on the city's separate sewer area water quality model for stormwater and the collection system interceptor model for CSO discharges during wet weather. A ten-year period of time (October 1991 through September 2001) was simulated. Data on stream flow was used to predict the resultant instream *E. coli* bacteria counts for each day for the ten-year period.

Daily flow data for the White River – Indianapolis and Stout stations was obtained from the USGS for the period of October 1, 1991 through September 30, 2001. This flow data was used for the daily *E. coli* bacteria model.

Table 6.1 presents a sample page from the daily *E. coli* bacteria model for the White River CSO area. **Figure 6.1** presents the predicted instream bacteria counts for April 1, 1997 to October 31, 1997 for the White River CSO Area segment. **Figure 6.2** presents the predicted instream bacteria counts for April 1, 1997 to October 31, 1997 for the White River South segment.

Model calibration consisted of comparisons of the geometric mean, percent of samples greater than 235 cfu/100 ml, and the number of samples over 10,000 cfu/100 ml per year of sampling. These comparisons were performed for both dry weather and wet weather data. The calibration of the model for *E. coli* bacteria included quality checks of the USGS daily flow data, adjustment for *E. coli* bacteria contributions from wildlife for all reaches, adjustment for the Pleasant Run failed septic flow *E. coli* bacteria contributions, and for *E. coli* bacteria contributions from stormwater. **Table 6.2** contains a summary of the observed and modeled *E. coli* bacteria loading parameters for the three watersheds modeled from October 1991 through September 2001. The percentage of observed and predicted days in excess of 235 cfu/100 ml for dry, wet, and all weather conditions is reported in the table. **Table 6.3** summarizes the daily failed septic, illicit storm drain connections, wildlife, stormwater, and CSO *E. coli* bacteria loadings into the White River.

6.3 Seasonality

The TMDL for all segments of the White River has been calculated for the recreational season, which is April through October. Calculating a TMDL for this period will be more conservative than a calculation over an entire year.

6.4 Critical Condition

The TMDL for all segments of the White River has been calculated for the recreational season, which is April through October. The recreational season is considered to be the critical condition evaluated for the White River.

6.5 Margin of Safety (MOS)

The Margin of Safety (MOS) is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) Implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) Explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this

TMDL the MOS was implicitly incorporated into the modeling process by using conservative assumptions.

The assumptions used to represent the various loads from CSOs, stormwater, failed septic systems and other sources are generally conservative. Greater reductions in *E. coli* bacteria will likely occur than those predicted based on the model and analysis.

Additional conservative assumptions in the modeling process include:

- The model has the die-off rate of *E. coli* bacteria set to 0.0 for each model stream segment. In general, the stream segments have short travel times, typically a day or less.
- Inclusion of natural/background contributions in the analysis, which recognizes the presence of *E. coli* bacteria that can not be removed from the stream.
- The model simulation is over a 10-year time period to represent the stream flow variations that occur.
- TMDLs are set on the April through October recreational period, which is the lowest flow period of the year.

6.6 Existing and Allowable *E. coli* Bacteria Load

The existing *E. coli* bacteria loads, both point and nonpoint sources, for the White River are presented in **Table 6.4** . The components of the point source loads include AWT discharges, CSOs, permitted stormwater discharges, and illicit storm drain connections. The components of the nonpoint source loads are unpermited stormwater discharges, wildlife and natural background, and failing septic systems. All *E. coli* bacteria loads presented are calculated for the recreational season.

Based on the modeled *E. coli* bacteria concentrations and stream flow, the allowable *E. coli* TMDLs for the White River were determined. The TMDL is calculated as 125 cfu *E. coli* bacteria/100 ml multiplied by the average daily flow for the stream segment during the recreational season. TMDLs are based on meeting water quality standards. The allowable *E. coli* bacteria TMDLs and required reductions for the White River are as follows.

White River North:

Existing Waste Load	= 4.85×10^{11} cfu
Existing Load	= 5.15×10^{12} cfu
Existing Out of County Load	= 1.01×10^{12} cfu
Existing Total Load	= 6.64×10^{12} cfu
TMDL	= 3.40×10^{12} cfu
Required Reduction	= 49%

White River CSO Area:

Existing Waste Load	= 5.80 x 10^{14} cfu
Existing Load	= 2.26 x 10^{12} cfu
Existing Out of County Load	= 1.01 x 10^{12} cfu
Existing Total Load	= 5.84 x 10^{14} cfu
TMDL	= 4.09 x 10^{12} cfu
Required Reduction	= 99%

White River South:

Existing Waste Load	= 5.65 x 10^{14} cfu
Existing Load	= 2.84x 10^{12} cfu
Existing Out of County Load	= 1.01 x 10^{12} cfu
Existing Total Load	= 5.69 x 10^{14} cfu
TMDL	= 4.87 x 10^{12} cfu
Required Reduction	= 99%

Figure 6.1: Predicted White River CSO Area Daily *E. coli* Bacteria Counts
April 1, 1997 through October 31, 1997

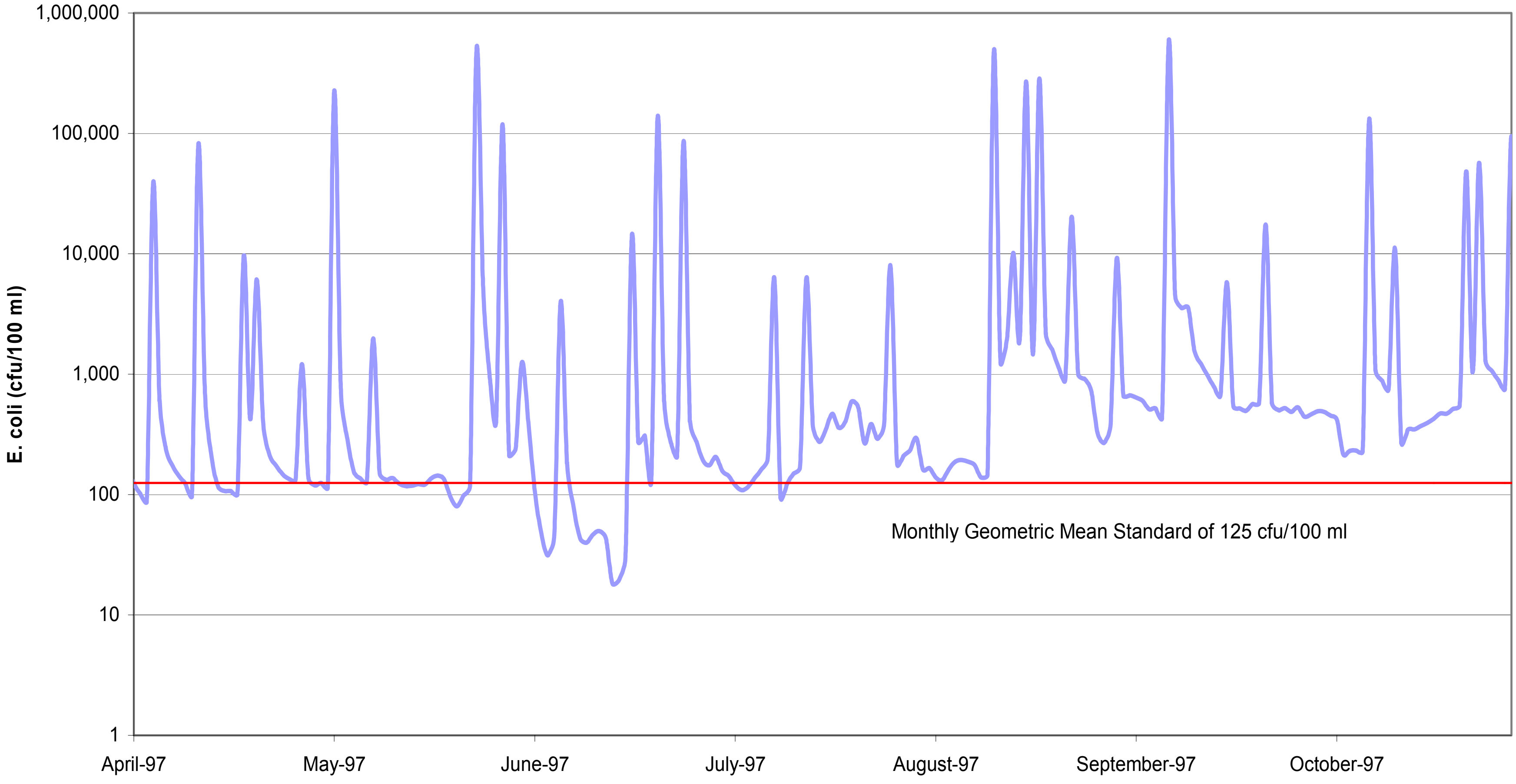


Figure 6.2: Predicted White River South Daily *E. coli* Bacteria Counts

April 1, 1997 through October 31, 1997

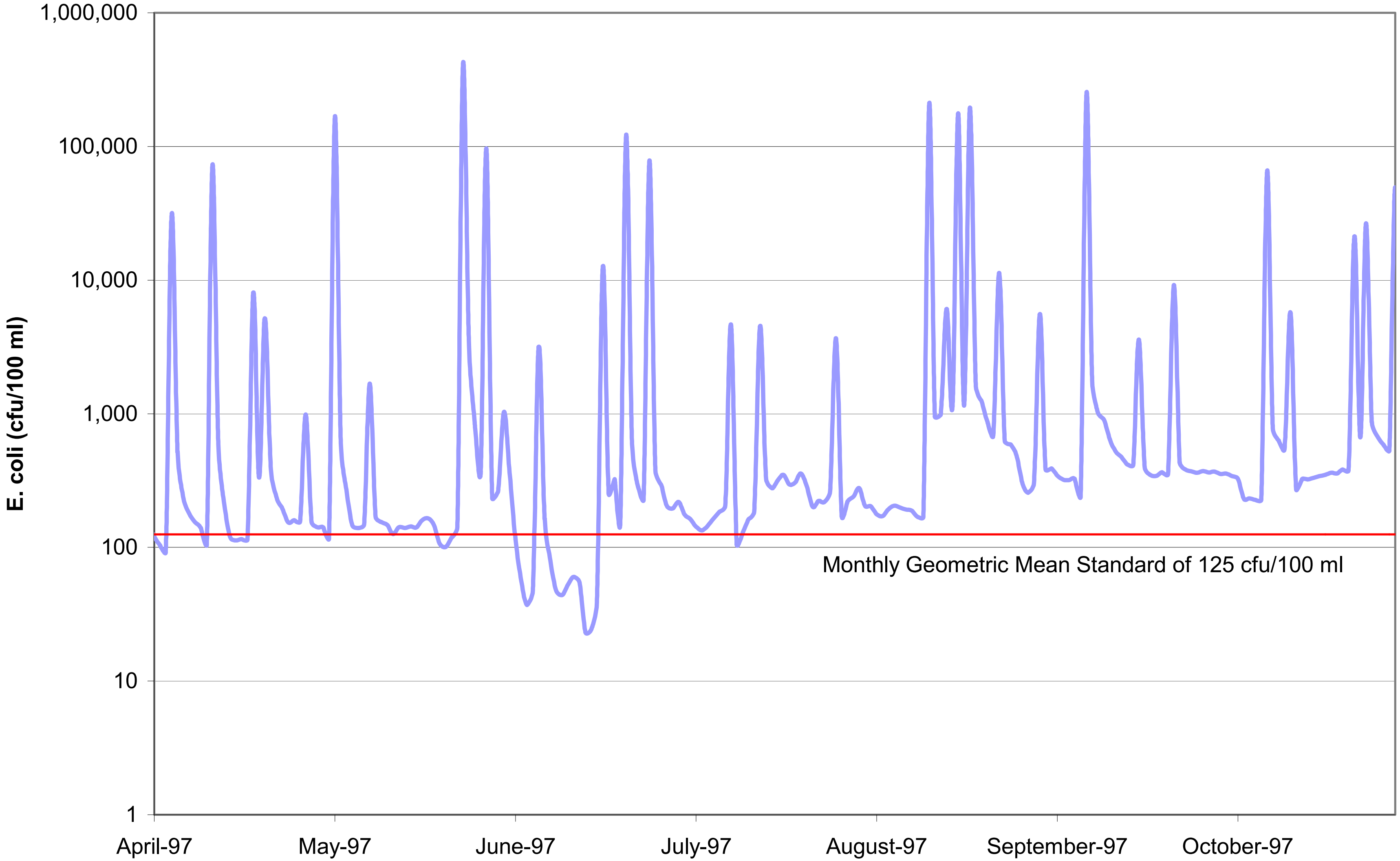


TABLE 6.1: SAMPLE OF WHITE RIVER CSO AREA DAILY *E. coli* COUNTS												
Date	Average Daily Flow (cfs)	CSO Flow (cfs)	Total Flow (cfs)	Hamilton Co. Load (cfu/day)	Septic Load (cfu/day)	Illicit Load (cfu/day)	AWT Load (cfu/day)	Wildlife Load (cfu/day)	Stormwater Runoff Load (cfu/day)	CSO Load (cfu/day)	Total Load (cfu/day)	Resulting Concentration (cfu/100 ml)
10/1/1991	83	0	83	3.36E+11	1.34E+11	2.84E+08	1.26E+11	1.15E+11	0.00E+00	0.00E+00	7.11E+11	350
10/2/1991	67	0	67	3.36E+11	1.34E+11	2.84E+08	1.26E+11	1.15E+11	0.00E+00	0.00E+00	7.11E+11	434
10/3/1991	143	8	151	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	5.07E+12	1.98E+14	2.04E+14	55,505
10/4/1991	116	0	116	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.25E+12	0.00E+00	2.66E+12	939
10/5/1991	319	101	420	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.71E+13	2.59E+15	2.62E+15	254,814
10/6/1991	221	0	221	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	8.41E+12	0.00E+00	9.83E+12	1,818
10/7/1991	178	0	178	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.94E+12	0.00E+00	6.36E+12	1,460
10/8/1991	150	0	150	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.18E+12	0.00E+00	4.59E+12	1,251
10/9/1991	129	0	129	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.14E+12	0.00E+00	3.55E+12	1,126
10/10/1991	173	3	176	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.34E+12	6.59E+13	7.17E+13	16,689
10/11/1991	156	0	156	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.08E+12	0.00E+00	3.50E+12	918
10/12/1991	117	0	117	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.38E+12	0.00E+00	2.80E+12	979
10/13/1991	106	0	106	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	9.72E+11	0.00E+00	2.39E+12	921
10/14/1991	120	1	121	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.11E+12	3.62E+13	3.97E+13	13,367
10/15/1991	125	0	125	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.21E+12	0.00E+00	2.63E+12	859
10/16/1991	110	0	110	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	7.67E+11	0.00E+00	2.18E+12	812
10/17/1991	110	0	110	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	5.33E+11	0.00E+00	1.95E+12	725
10/18/1991	116	0	116	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.82E+11	0.00E+00	1.80E+12	634
10/19/1991	113	0	113	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	6.68E+11	0.00E+00	2.08E+12	754
10/20/1991	117	0	117	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.33E+11	0.00E+00	1.75E+12	611
10/21/1991	127	0	127	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.20E+11	0.00E+00	1.64E+12	527
10/22/1991	128	0	128	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.52E+11	0.00E+00	1.57E+12	501
10/23/1991	127	0	127	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.08E+11	0.00E+00	1.52E+12	491
10/24/1991	136	1035	1171	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.16E+11	2.67E+16	2.67E+16	930,498
10/25/1991	265	0	265	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.79E+13	0.00E+00	3.94E+13	6,071
10/26/1991	2540	0	2540	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.04E+14	0.00E+00	2.06E+14	3,308
10/27/1991	1710	0	1710	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	9.62E+13	0.00E+00	9.76E+13	2,334
10/28/1991	994	0	994	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.22E+13	0.00E+00	3.36E+13	1,383
10/29/1991	654	0	654	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.50E+13	0.00E+00	1.64E+13	1,027
10/30/1991	393	7	400	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	8.17E+12	1.82E+14	1.92E+14	19,614
10/31/1991	294	0	294	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.91E+12	0.00E+00	6.33E+12	880
11/1/1991	332	0	332	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	6.58E+12	0.00E+00	8.00E+12	985
11/2/1991	306	0	306	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.13E+12	0.00E+00	5.54E+12	740
11/3/1991	251	0	251	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.57E+12	0.00E+00	3.99E+12	649
11/4/1991	228	0	228	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.86E+12	0.00E+00	3.28E+12	588
11/5/1991	223	0	223	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.29E+12	0.00E+00	2.71E+12	496
11/6/1991	211	0	211	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	9.17E+11	0.00E+00	2.33E+12	452
11/7/1991	197	0	197	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	1.13E+12	7.77E+12	1.03E+13	2,138
11/8/1991	208	0	208	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	6.99E+11	0.00E+00	2.12E+12	416
11/9/1991	204	0	204	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.86E+11	0.00E+00	1.90E+12	381
11/10/1991	199	0	199	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	3.53E+11	0.00E+00	1.77E+12	364
11/11/1991	197	0	197	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.61E+11	0.00E+00	1.68E+12	348
11/12/1991	203	1	204	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	9.62E+11	2.22E+13	2.46E+13	4,933
11/13/1991	196	0	196	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	4.72E+11	0.00E+00	1.89E+12	394
11/14/1991	190	1	191	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	2.78E+11	1.39E+13	1.56E+13	3,345
11/15/1991	200	0	200	1.04E+12	1.34E+11	2.84E+08	1.26E+11	1.15E+11	5.70E+11	0.00E+00	1.99E+12	406

TABLE 6.2: COMPARISON OF OBSERVED AND MODELED E. COLI COUNTS WHITE RIVER

	Geometric Mean of *E. coli* bacteria			% of Days *E. coli* bacteria > 235 cfu/100 ml			# of Days per year *E. coli* bacteria > 10,000 cfu/100 ml		
Stream Reach	All	Dry**	Wet***	All	Dry**	Wet***	All	Dry**	Wet***
White River-North Measured*	166	74	236	33%	19%	39%	1	0	1
White River-North Modeled	181	73	210	40%	0%	43%	0	0	0
White River-CSO Measured*	238	99	561	46%	25%	67%	3	0	3
White River-CSO Modeled	459	113	551	54%	19%	56%	37	0	37
White River-South Measured*	410	165	1159	64%	44%	86%	1	0	1
White River-South Modeled	455	166	539	56%	33%	58%	35	0	35

*Measured *E. Coli* Counts are reported in Table 4.2

**The Dry weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for dry weather days only

***The Wet weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for wet weather days only

TABLE 6.3: TOTAL AVERAGE E. COLI DAILY LOAD WHITE RIVER

Watershed	Average Daily Septic Load (cfu)	Average Daily Illicit Connection Load (cfu)	Average Daily Wildlife Load (cfu)	Average Daily AWT Load (cfu)	Average Daily Stormwater Load (cfu)	Average Daily CSO Load (cfu)	Total Average Daily Load (cfu)	Total Cumulative Daily Load (cfu)
Inflow from Hamilton County			3.36E+11		7.06E+11		1.04E+12	
Howland & Johnson Ditch	1.64E+10	0.00E+00	9.79E+08				1.74E+10	
Crooked & Williams Creek	4.17E+10	1.06E+08	1.19E+10				5.36E+10	
White River North	3.91E+10	1.51E+07	7.31E+10		4.54E+12		4.65E+12	**5.76E+12**
Fall Creek -- Reduced 75% for Dry Weather	1.16E+10	4.35E+07	1.92E+10		1.76E+12	1.10E+14	1.12E+14	
Pleasant Run -- Reduced 75% for Dry Weather	2.39E+09	2.84E+07	4.89E+08		2.99E+11	4.13E+13	4.16E+13	
Pogues Run CSO						1.28E+14	1.28E+14	
Eagle Creek CSO						5.62E+12	5.62E+12	
White River CSO	2.26E+10	9.08E+07	9.49E+09	1.26E+11	1.90E+12	1.43E+14	1.45E+14	**4.38E+14**
White River South	4.73E+10	1.51E+07	6.41E+11	1.60E+11	1.24E+12		2.08E+12	**4.40E+14**

*Note: Flows for Howland Ditch, and Johnson Ditch are not currently known. The bacteria loading was assumed to be the same as Pleasant Run

**Note: Stormwater loads for Howland Ditch, Crooked Creek, Johnson Ditch, and Williams Creek are lumped into the White River loads

***Note: Septic Loads from Eagle and Guion Creeks are lumped into the White River CSO Loads

****Note: Septic Loads from State Ditch, Lick Creek, and Buck Creek are lumped into the White River South Loads

TABLE 6.4: SUMMARY OF EXISTING *E. COLI* BACTERIA LOAD FOR THE APRIL TO OCTOBER RECREATIONAL SEASON
WHITE RIVER

Scenario	Point Source -- AWT Discharges (cfu)*	Point Source -- CSO Discharges (cfu)*	Point Source -- Permitted Stormwater Discharges (cfu)*	Point Source -- Illicit Sanitary Connections (cfu)*	**Total Point Source Load (cfu)**	Nonpoint Source -- Unpermitted Stormwater Discharges (cfu)*	Nonpoint Source -- Wildlife (cfu)*	Nonpoint Source -- Failing Septic Systems (cfu)*	**Total Nonpoint Source Load (cfu)**	Upstream out-of-county sources (cfu)*	**Total Load (cfu)**	TMDL (cfu)	**Required Load Reduction to meet TMDL (%)**
White River-North Existing	0	2.01E+10	4.65E+11	1.21E+08	**4.85E+11**	4.97E+12	8.60E+10	9.72E+10	**5.15E+12**	1.01E+12	**6.64E+12**	3.40E+12	**49%**
White River-CSO Existing	1.07E+11	5.72E+14	8.11E+12	2.84E+08	**5.80E+14**	2.01E+12	1.15E+11	1.34E+11	**2.26E+12**	1.01E+12	**5.84E+14**	4.09E+12	**99%**
White River-South Existing	2.64E+11	5.56E+14	9.40E+12	2.99E+08	**5.65E+14**	1.90E+12	7.56E+11	1.81E+11	**2.84E+12**	1.01E+12	**5.69E+14**	4.87E+12	**99%**

*Note: All loads presented in are the average daily loads for the recreational season. These loads may be different from the loads presented in Section 5, which are for the entire year.

Section 7
Public Participation

7.1 Public Meetings

To date, the IDEM has held three public stakeholder meetings to present the progress of the TMDL program for the White River. Information such as a summary of findings, characterization of the river, weather conditions and how results are affected, model introduction, and an overview of the TMDL process were presented. The public participation meetings were held on September 17, 2002; December 16, 2002; and March 31, 2003. The draft findings of this report were presented to community stakeholders on July 7, 2003.

IDEM invited all registered neighborhood organizations in Indianapolis, as well as many major environmental groups. Groups in attendance at the public stakeholder meetings include the Wet Weather Technical Advisory Committee and the Friends of the White River.

In addition to the TMDL process, water quality-related public outreach is a key component of the city's CSO LTCP and stormwater programs.

Section 8
Implementation Activities and Schedule

The ultimate goal of the TMDL program is to improve water quality in our streams by determining the allowable pollutant load and reducing loads accordingly. While there are no specific activities planned as a result of this TMDL study, results of this TMDL study have been incorporated into the existing programs for control of stormwater, failed septic systems, and CSOs for the City of Indianapolis. Each of these programs is briefly described below.

8.1 Stormwater Program

The city utilizes new construction or redevelopment permitting as an opportunity to control stormwater flows that discharge into receiving streams or the CSO system through the recently revised Chapter 700 to Section 581 of the City of Indianapolis Code (Stormwater Management and Sediment Control). Chapter 700 requires best management practices (BMPs) to improve the quality of the stormwater runoff whenever new construction or redevelopment that disturbs more than 1/2 - acre is proposed anywhere in Marion County. The city is implementing this proactive approach in the CSO area to improve water quality even though it is not required by the NPDES stormwater permit. The city requires that prior to new construction, reconstruction, or remodeling, contractors and developers must submit a stormwater control plan and obtain drainage permits to address stormwater runoff originating from the sites. In the CSO area, controlling stormwater runoff has the added benefit of potentially reducing CSO discharges to the receiving streams. In addition, at locations where the stormwater runoff is controlled and then treated by BMPs before being discharged directly to the receiving streams, the city stormwater programs require developers to improve the urban stormwater quality.

Control of stormwater runoff quality is based on the management of total suspended solids (TSS). The target TSS removal rate is 80%. The requirements apply to all areas of the county except the city limits of Beech Grove, Lawrence, Southport and Speedway. Control of sediment is required for construction site runoff citywide.

Based on the target TSS removal rate and application of the target rate, the city's current stormwater NPDES Permit program is assumed to reduce the stormwater *E. coli* bacteria load by 10 percent. This reduction is considered to be an estimate of the program's effectiveness, not an objective.

8.2 Septic Tank Elimination Program

Of the 320,000 homes in Marion County, approximately 18,000 are served by septic systems that were targeted for replacement in the Septic Tank Elimination Program. This program prioritized 161 unsewered areas for conversion to sewers. The master plan ranks each area based on the following criteria: septic failure rate, stream bacteriological impairment, wellfield protection, presence of residential wells, proximity to greenways, petitions from residents or Marion County Health &

Hospital Corp., number of residents in favor of the project, cost, and downstream capacity. These areas are then placed into one of four categories: Priority 1, Priority 2, Priority 3, and all others.

8.3 CSO Long Term Control Plan

In 2001, the City of Indianapolis submitted a CSO Long Term Control Plan (LTCP) for review to IDEM and the U.S. EPA. This plan proposed an 85% level of capture to achieve water quality standards within the streams of Indianapolis given financial constraints. The plan consisted of AWT enhancements, various system control alternatives, streambank restoration and sediment removal, and accelerated septic system removal.

Negotiations with IDEM and Region V EPA are ongoing and may affect the final level of capture and pollutant removal rates achieved through the LTCP. A final CSO LTCP is expected in spring 2004.

Section 9
Monitoring Plan

An integral part of managing the progress of a TMDL program is monitoring. The current monitoring programs performed by the City of Indianapolis Office of Environmental Services and the Marion County Health Department will continue throughout the implementation of load allocations. These monitoring programs consist of sampling at the locations and intervals described in Section 3 of this report.

As the city's watershed improvement programs are implemented, this continued monitoring will allow the city and IDEM the opportunity to review progress towards meeting water quality standards. As this monitoring indicates and in accordance with EPA's guidance, IDEM and the City of Indianapolis reserve the right to adapt these projected programs if necessary.

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WHITE RIVER TMDL REPORT

APPENDICES

Date	Sampling Location							
	82nd Street							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	0.81	3.51	8.15	0.0692	4.50	1.0131	1	1
2/2/2000	0.23	1.03	8.06	0.0583	5.69	1.1630	1	1
3/1/2000	0.10	10.04	8.09	0.1075	4.78	1.1115	1	1
4/5/2000	0.10	10.71	8.62	0.1134	1.49	0.4642	1	1
5/3/2000	0.10	18.16	8.33	0.1907	2.76	0.7569	1	1
6/7/2000	0.52	18.89	8.35	0.1998	2.64	0.7321	1	1
7/5/2000	0.10	25.52	7.81	0.1923	5.24	1.6407	1	1
8/9/2000	0.22	23.79	7.67	0.1737	7.29	1.9303	1	1
9/6/2000	0.20	21.06	8.08	0.2137	4.36	1.1285	1	1
10/4/2000	0.22	20.44	8.21	0.2137	3.43	0.9211	1	1
11/1/2000	0.10	14.12	8.13	0.1435	4.30	1.0453	1	1
12/6/2000	0.21	0.51	8.67	0.0560	1.44	0.4270	1	1
1/15/2001	0.10	2.71	8.07	0.0657	5.46	1.1457	1	1
2/12/2001	0.27	2.55	7.86	0.0607	8.25	1.5397	1	1
3/6/2001	0.22	4.51	8.09	0.0736	5.06	1.1115	1	1
4/4/2001	0.18	10.45	8.27	0.1111	3.20	0.8357	1	1
5/2/2001	0.42	20.62	8.15	0.2137	3.85	1.0131	1	1
6/13/2001	0.19	25.18	7.71	0.1793	6.25	1.8471	1	1
7/11/2001	0.29	24.9	7.73	0.1819	6.18	1.8056	1	1
8/8/2001	0.24	28.57	7.99	0.2125	3.19	1.2887	1	1
9/5/2001	0.17	23.32	8.17	0.2137	3.07	0.9818	1	1
10/3/2001	0.14	17.44	7.88	0.1823	7.49	1.4998	1	1
11/7/2001	0.11	9.61	7.94	0.1015	6.55	1.3828	1	1
12/4/2001	0.16	9.29	8.22	0.1027	3.61	0.9064	1	1

Date	Sampling Location							
	Morris Street							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	1.06	3.57	8.13	0.0695	4.70	1.0453	1	0
2/2/2000	0.10	1.26	7.95	0.0577	7.11	1.3638	1	1
3/1/2000	0.10	10.61	8.25	0.1125	3.35	0.8635	1	1
4/5/2000	0.10	11.09	8.68	0.1167	1.32	0.4199	1	1
5/3/2000	0.10	18.11	8.40	0.1937	2.43	0.6733	1	1
6/7/2000	0.10	20.60	8.55	0.2137	1.66	0.5224	1	1
7/5/2000	0.10	26.13	8.08	0.2137	3.10	1.1285	1	1
8/9/2000	0.21	25.02	7.65	0.1709	6.88	1.9719	1	1
9/6/2000	0.27	22.21	8.09	0.2137	3.94	1.1115	1	1
10/4/2000	0.10	19.94	8.20	0.2130	3.61	0.9360	1	1
11/1/2000	0.10	14.76	8.13	0.1492	4.26	1.0453	1	1
12/6/2000	0.10	1.31	8.60	0.0595	1.68	0.4801	1	1
1/15/2001	0.10	0.94	8.06	0.0578	5.69	1.1630	1	1
2/12/2001	0.22	3.01	7.67	0.0544	11.01	1.9303	1	1
3/6/2001	0.30	4.26	7.94	0.0703	6.93	1.3828	1	1
4/4/2001	0.10	11.50	8.47	0.1204	2.07	0.5982	1	1
5/2/2001	0.18	20.49	7.88	0.2006	6.62	1.4998	1	1
6/13/2001	0.22	24.85	7.68	0.1752	6.67	1.9095	1	1
7/11/2001	0.20	25.80	8.00	0.2135	3.76	1.2703	1	1
8/8/2001	0.16	30.00	8.53	0.2137	1.00	0.5404	1	1
9/5/2001	0.10	24.51	7.77	0.1872	5.97	1.7228	1	1
10/3/2001	0.15	17.78	8.47	0.1860	2.05	0.5982	1	1
11/7/2001	0.20	10.65	8.38	0.1128	2.51	0.6963	1	1
12/4/2001	0.16	9.25	8.47	0.1024	2.08	0.5982	1	1

Date	Sampling Location							
	Harding Street							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	0.96	4.11	7.99	0.0715	6.36	1.2887	1	1
2/2/2000	0.19	1.49	7.87	0.0563	8.16	1.5197	1	1
3/1/2000	0.10	10.72	8.15	0.1135	4.19	1.0131	1	1
4/5/2000	0.10	11.42	8.62	0.1197	1.50	0.4642	1	1
5/3/2000	0.29	18.24	8.63	0.1917	1.48	0.4565	1	1
6/7/2000	0.10	20.16	8.50	0.2137	1.90	0.5686	1	1
7/5/2000	0.10	25.87	7.92	0.2051	4.28	1.4214	1	1
8/9/2000	0.24	25.04	7.71	0.1793	6.31	1.8471	1	1
9/6/2000	0.35	22.22	7.82	0.1935	6.47	1.6204	1	1
10/4/2000	0.10	19.97	7.78	0.1881	8.07	1.7022	1	1
11/1/2000	0.10	15.35	8.01	0.1556	5.56	1.2521	1	1
12/6/2000	0.10	1.39	8.55	0.0598	1.88	0.5224	1	1
1/15/2001	0.10	1.61	7.85	0.0561	8.43	1.5597	1	1
2/12/2001	0.21	3.12	7.71	0.0566	10.35	1.8471	1	1
3/6/2001	0.21	4.27	7.90	0.0689	7.43	1.4604	1	1
4/4/2001	0.10	10.83	7.88	0.1074	7.23	1.4998	1	1
5/2/2001	0.18	20.53	7.71	0.1793	8.65	1.8471	1	1
6/13/2001	0.18	24.39	7.50	0.1489	8.79	2.2780	1	1
7/11/2001	0.18	26.18	8.15	0.2137	2.66	1.0131	1	1
8/8/2001	0.21	29.41	8.38	0.2137	1.37	0.6963	1	1
9/5/2001	0.19	24.52	8.08	0.2137	3.44	1.1285	1	1
10/3/2001	0.15	18.12	7.97	0.1873	5.99	1.3260	1	1
11/7/2001	0.13	10.55	7.98	0.1108	6.07	1.3073	1	1
12/4/2001	0.15	8.27	8.27	0.0963	3.28	0.8357	1	1

Date	Sampling Location							
	Tibbs/Banta							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	0.60	9.11	7.49	0.0700	13.11	2.2978	1	1
2/2/2000	0.38	10.96	7.39	0.0714	14.55	2.4897	1	1
3/1/2000	0.10	12.58	7.75	0.1122	8.87	1.7641	1	1
4/5/2000	0.22	15.69	7.54	0.1159	11.70	2.1979	1	1
5/3/2000	0.49	20.08	7.79	0.1898	7.89	1.6817	1	1
6/7/2000	0.10	20.57	7.75	0.1846	8.11	1.7641	1	1
7/5/2000	0.24	24.85	7.71	0.1793	6.39	1.8471	1	1
8/9/2000	0.80	24.98	7.67	0.1737	6.71	1.9303	1	1
9/6/2000	0.77	22.21	7.85	0.2105	6.59	1.5597	1	1
10/4/2000	0.22	24.25	7.73	0.1819	6.46	1.8056	1	1
11/1/2000	0.54	20.89	7.60	0.1638	9.87	2.0754	1	1
12/6/2000	0.29	7.60	7.89	0.0869	7.35	1.4801	1	1
1/15/2001	0.32	5.75	7.19	0.0384	18.71	2.8286	1	1
2/12/2001	0.23	3.32	7.98	0.0642	6.23	1.3073	1	1
3/6/2001	0.18	6.83	7.51	0.0614	13.15	2.2581	1	1
4/4/2001	0.13	13.72	7.64	0.1110	10.35	1.9927	1	1
5/2/2001	0.27	22.50	7.26	0.1123	13.08	2.7177	1	1
6/13/2001	0.21	24.37	7.40	0.1336	9.91	2.4711	1	1
7/11/2001	0.17	26.09	7.86	0.1982	4.65	1.5397	1	1
8/8/2001	0.30	28.33	7.45	0.1413	7.12	2.3760	1	1
9/5/2001	0.23	24.69	7.56	0.1578	7.97	2.1573	1	1
10/3/2001	0.18	20.78	7.73	0.1819	8.24	1.8056	1	1
11/7/2001	0.21	12.39	7.97	0.1262	6.15	1.3260	1	1
12/4/2001	0.20	10.15	7.48	0.0740	13.07	2.3176	1	1

Date	Sampling Location							
	Southwestway Pk							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	0.53	9.79	7.54	0.0766	12.14	2.1979	1	1
2/2/2000	0.99	10.27	7.49	0.0755	12.91	2.2978	1	1
3/1/2000	0.27	12.48	7.76	0.1122	8.74	1.7434	1	1
4/5/2000	0.47	15.66	7.54	0.1156	11.70	2.1979	1	1
5/3/2000	0.46	19.77	7.74	0.1808	8.60	1.7848	1	1
6/7/2000	0.30	19.96	7.77	0.1867	8.19	1.7228	1	1
7/5/2000	0.35	24.88	7.66	0.1723	6.85	1.9511	1	1
8/9/2000	0.47	24.85	7.62	0.1666	7.27	2.0341	1	1
9/6/2000	0.76	22.15	7.78	0.1885	6.93	1.7022	1	1
10/4/2000	0.19	24.16	7.65	0.1709	7.31	1.9719	1	1
11/1/2000	0.31	20.52	7.61	0.1652	9.99	2.0547	1	1
12/6/2000	0.35	8.56	8.01	0.0918	5.49	1.2521	1	1
1/15/2001	0.29	6.87	7.11	0.0371	19.84	2.9446	1	1
2/12/2001	0.25	3.45	7.92	0.0662	7.29	1.4214	1	1
3/6/2001	0.22	6.85	7.45	0.0577	14.17	2.3760	1	1
4/4/2001	0.15	14.07	7.58	0.1077	11.21	2.1164	1	1
5/2/2001	0.25	22.46	7.10	0.0892	15.01	2.9583	1	1
6/13/2001	0.18	24.28	7.20	0.1034	12.17	2.8133	1	1
7/11/2001	0.26	25.91	7.82	0.1935	5.02	1.6204	1	1
8/8/2001	0.42	27.53	7.48	0.1458	7.25	2.3176	1	1
9/5/2001	0.26	24.46	7.58	0.1608	7.88	2.1164	1	1
10/3/2001	0.20	20.90	7.88	0.2114	6.78	1.4998	1	1
11/7/2001	0.15	12.32	8.22	0.1276	3.57	0.9064	1	1
12/4/2001	0.28	10.83	7.73	0.0974	9.22	1.8056	1	1

Date	Sampling Location							
	Waverly (SR 144)							
	NH3-T (mg/L)	Temp (C)	pH (units)	1992 Standard (mg/L)		1999 Standard Total Ammonia	% Compliance with Indiana Standard	% Compliance 1999 Standard
				Standard - Unionized Ammonia	Standard - Total Ammonia			
1/5/2000	0.55	8.17	7.85	0.0882	7.81	1.5597	1	1
2/2/2000	0.79	8.58	7.98	0.0972	6.20	1.3073	1	1
3/1/2000	0.71	12.87	7.75	0.1144	8.85	1.7641	1	1
4/5/2000	0.28	14.17	7.73	0.1225	9.00	1.8056	1	1
5/3/2000	0.38	19.61	7.73	0.1778	8.75	1.8056	1	1
6/7/2000	0.10	19.88	7.89	0.2004	6.76	1.4801	1	1
7/5/2000	0.10	25.86	7.82	0.1935	5.04	1.6204	1	1
8/9/2000	0.43	24.84	7.41	0.1351	9.48	2.4523	1	1
9/6/2000	0.28	21.84	7.87	0.1994	6.12	1.5197	1	1
10/4/2000	0.10	23.04	6.99	0.0654	13.58	3.0965	1	1
11/1/2000	0.26	18.83	7.83	0.1813	7.54	1.6001	1	1
12/6/2000	0.43	6.98	8.14	0.0882	4.44	1.0291	1	1
1/15/2001	0.27	6.35	7.39	0.0521	15.26	2.4897	1	1
2/12/2001	0.26	3.79	8.05	0.0705	5.61	1.1805	1	1
3/6/2001	0.18	6.80	7.46	0.0582	14.01	2.3567	1	1
4/4/2001	0.10	13.60	7.50	0.0968	12.53	2.2780	1	1
5/2/2001	0.21	21.87	6.80	0.0536	18.72	3.2859	1	1
6/13/2001	0.11	23.61	7.07	0.0853	14.16	2.9982	1	1
7/11/2001	0.20	25.54	7.69	0.1766	6.28	1.8887	1	1
8/8/2001	0.21	27.41	7.78	0.1885	4.83	1.7022	1	1
9/5/2001	0.13	24.19	7.66	0.1723	7.19	1.9511	1	1
10/3/2001	0.23	20.55	7.63	0.1681	9.70	2.0134	1	1
11/7/2001	0.15	12.76	8.30	0.1291	2.93	0.7955	1	1
12/4/2001	0.32	10.31	7.76	0.0955	8.79	1.7434	1	1

White River Cyanide Sampling Data

Date	OES Sampling Sites					
	82nd Street		Morris Street		Harding Street	
	CN_T (ug/L)	% Compliance	CN_T (ug/L)	% Compliance	CN_T (ug/L)	% Compliance
3/1/2000	5.0	1	5.0	1	5.0	1
6/7/2000	5.0	1	5.0	1	5.0	1
9/6/2000	5.0	1	5.0	1	5.0	1
11/1/2000	5.0	1	5.0	1	5.0	1
3/6/2001	5	1	5	1	5	1
6/13/2001	5.0	1	5.0	1	5.0	1
9/5/2001	5.0	1	5.0	1	5.0	1
11/7/2001	5.0	1	5.0	1	5.0	1

White River Cyanide Sampling Data

Date	OES Sampling Sites					
	Tibbs/Banta		Southwestway Pk		Waverly (SR 144)	
	CN_T (ug/L)	% Compliance	CN_T (ug/L)	% Compliance	CN_T (ug/L)	% Compliance
3/1/2000	6.0	0	11.0	0	23.0	0
6/7/2000	5.0	1	8.2	0	7.6	0
9/6/2000	6.8	0	7.5	0	8.4	0
11/1/2000	6.4	0	11.0	0	8.6	0
3/6/2001	5	1	5.8	0	9	0
6/13/2001	5.0	1	5.0	1	5.0	1
9/5/2001	5.0	1	5.0	1	5.0	1
11/7/2001	5.0	1	5.0	1	5.0	1

Date	OES Sampling Locations					
	82nd Street DO (mg/L)	% Compliance	Morris Street DO (mg/L)	% Compliance	Harding Street DO (mg/L)	% Compliance
1/5/2000	12.10	1	12.73	1	11.83	1
2/2/2000	15.72	1	15.92	1	15.82	1
3/1/2000	10.8	1	10.98	1	10.55	1
4/5/2000	11.96	1	11.3	1	12.42	1
5/3/2000	8.53	1	9.98	1	8.00	1
6/7/2000	8.76	1	10.49	1	9.78	1
7/5/2000	8.34	1	10.93	1	10.41	1
8/9/2000	6.34	1	7.66	1	7.32	1
9/6/2000	8.25	1	8.19	1	6.59	1
10/4/2000	7.81	1	9.14	1	9.88	1
11/1/2000	10	1	10.24	1	9.89	1
12/6/2000	14.89	1	13.97	1	14.10	1
1/15/2001	14.79	1	15.84	1	15.80	1
2/12/2001	12.73	1	13.35	1	13.05	1
3/6/2001	12.35	1	12.76	1	12.59	1
4/4/2001	11.7	1	11.65	1	11.78	1
5/2/2001	11.01	1	9.88	1	9.25	1
6/13/2001	9.49	1	9.84	1	8.32	1
7/11/2001	6.34	1	8.08	1	7.58	1
8/8/2001	6.69	1	9.62	1	11.48	1
9/5/2001	7.56	1	8.25	1	8.25	1
10/3/2001	8.76	1	9.35	1	9.19	1
11/7/2001	11.48	1	12.58	1	12.46	1
12/4/2001	10.64	1	11.5	1	11.45	1

Date	OES Sampling Locations					
	Tibbs/Banta DO (mg/L)	% Compliance	Southwestway Pk DO (mg/L)	% Compliance	Waverly (SR 144) DO (mg/L)	% Compliance
1/5/2000	10.41	1	9.63	1	9.88	1
2/2/2000	10.31	1	10	1	11.38	1
3/1/2000	10.12	1	9.79	1	9.14	1
4/5/2000	10.39	1	9.24	1	9.66	1
5/3/2000	8.09	1	8.28	1	7.72	1
6/7/2000	8.85	1	8.57	1	8.26	1
7/5/2000	10.03	1	8.81	1	8.31	1
8/9/2000	7.71	1	7.41	1	6.90	1
9/6/2000	6.85	1	6.46	1	6.10	1
10/4/2000	7.07	1	6.65	1	7.59	1
11/1/2000	7.5	1	7.02	1	7.6	1
12/6/2000	11.57	1	11.25	1	10.39	1
1/15/2001	13.60	1	12.74	1	12.26	1
2/12/2001	12.47	1	14.52	1	13.84	1
3/6/2001	11.83	1	11.59	1	11.19	1
4/4/2001	10.78	1	9.85	1	9.52	1
5/2/2001	7.42	1	6.95	1	6.88	1
6/13/2001	8.24	1	8.49	1	7.19	1
7/11/2001	7.30	1	7.07	1	6.85	1
8/8/2001	8.16	1	6.35	1	6.73	1
9/5/2001	7.07	1	6.64	1	7.26	1
10/3/2001	7.89	1	7.72	1	7.56	1
11/7/2001	12.3	1	10.78	1	10.23	1
12/4/2001	11.18	1	10.98	1	10.71	1

Date	MCHD Sampling Locations					
	Raymond Street DO mg/L	% Compliance	96th Street DO mg/L	% Compliance	Marina Drive DO mg/L	% Compliance
4/24/2000	9.39	1	8.79	1	12.81	1
5/22/2000	9.25	1	8.73	1	9.88	1
6/26/2000	7.64	1	6.36	1	7.53	1
7/24/2000	8.39	1	8.41	1	18.99	1
8/28/2000						
9/25/2000						
10/25/2000	9.26	1	6.56	1	16.18	1
4/24/2001	10.02	1	8.4	1	14.2	1
5/22/2001	6.13	1	7.12	1	8.59	1
6/25/2001	6.95	1	7.94	1	12.96	1
7/30/2001	5.89	1	5.81	1	10.47	1
8/27/2001	6.19	1	7.01	1	11.6	1
9/24/2001	7.19	1	6.82	1	6.55	1
10/22/2001	10.42	1	10.06	1	7.05	1
4/8/2002	11.05	1	11.74	1		
5/30/2002	7.93	1	7.62	1		
6/25/2002	6.37	1	5.52	1		
7/30/2002	6.97	1	4.77	1		
8/21/2002	6.82	1	6.46	1		
9/25/2002	6.82	1	7.44	1		
10/29/2002	10.46	1	11.58	1		

Date	MCHD Sampling Locations					
	Ruth Drive	%	Howland at Crittenden	%	Broad Ripple Park Ramp	%
	DO mg/L	Compliance	DO mg/L	Compliance	DO mg/L	Compliance
4/24/2000	8.43	1	9.45	1	8.34	1
5/22/2000	7.9	1	5.58	1	7.57	1
6/26/2000	6	1	7.17	1	6.31	1
7/24/2000	8.32	1	4.77	1	8.15	1
8/28/2000						
9/25/2000						
10/25/2000	8.05	1	8.1	1	7.85	1
4/24/2001	9.13	1	7.07	1	9.2	1
5/22/2001	6.24	1	5.81	1	6.71	1
6/25/2001	7.27	1	8.25	1	7.5	1
7/30/2001			3.94	0	5.94	1
8/27/2001	5.9	1	5.18	1	5.81	1
9/24/2001	6.74	1	4.95	1	6.95	1
10/22/2001	8.15	1	9.77	1	8.29	1
4/8/2002	10.69	1			10.65	1
5/30/2002	7.47	1			7.38	1
6/25/2002	5.49	1			4.65	1
7/30/2002	4.77	1			4.73	1
8/21/2002	5.96	1			5.18	1
9/25/2002	7.91	1			6.3	1
10/29/2002	11.88	1			11.39	1

Date	MCHD Sampling Locations			
	6800 Cornell Ave	%	Lake Indy	%
	DO mg/L	Compliance	DO mg/L	Compliance
4/24/2000	9.78	1	9.16	1
5/22/2000	9.88	1	9.71	1
6/26/2000	7.3	1	7.19	1
7/24/2000	9.14	1	12.63	1
8/28/2000				
9/25/2000				
10/25/2000	8.93	1	9.46	1
4/24/2001	10.82	1	11.14	1
5/22/2001	7.39	1	7.35	1
6/25/2001	10.01	1	6.17	1
7/30/2001	6.68	1	5.56	1
8/27/2001	9.16	1	6.31	1
9/24/2001	7.68	1	7.39	1
10/22/2001	9.96	1	9.05	1
4/8/2002	11.1	1	11.24	1
5/30/2002	8.42	1	7.02	1
6/25/2002	5.61	1	4.49	1
7/30/2002	7.52	1	5.86	1
8/21/2002	8.35	1	8.14	1
9/25/2002	14.17	1	9.31	1
10/29/2002	12.29	1	13.4	1

MCHD Sampling Locations		
Date	New York Street	%
	DO mg/L	Compliance
05/22/01	8.11	1
05/30/01	8.32	1
06/05/01	9.78	1
06/12/01	8.95	1
06/19/01	8	1
06/20/01	2.32	0
06/26/01	8.42	1
07/03/01	7.79	1
07/10/01	0.16	0
07/17/01	8.11	1
07/24/01	6.69	1
07/31/01	7.73	1
08/01/01	7.97	1
08/07/01	12.92	1
08/14/01	8.75	1
08/21/01	8.31	1
08/28/01	8.47	1
09/05/01	7.73	1
09/11/01	8.46	1
09/18/01	5.8	1
09/25/01	9.58	1
09/26/01	8.65	1
10/02/01	9.49	1
10/09/01	7.39	1
10/16/01	12.4	1
10/23/01	8.48	1
10/30/01	10.74	1
11/06/01	10.54	1
11/13/01	9.39	1
11/20/01	10.33	1
11/26/01	10.69	1
11/28/01	10.19	1
12/03/01	10.61	1
12/06/01	9.46	1
12/11/01		
12/17/01	12.79	1
12/19/01	11.62	1
01/08/02	15.29	1
01/14/02	12.11	1
01/16/02		
01/22/02	16.2	1
01/29/02	9.38	1
02/05/02		
02/11/02		
02/13/02		
02/18/02		
02/26/02	10.16	1
03/05/02	14.95	1

MCHD Sampling Locations		
Date	New York Street DO mg/L	% Compliance
03/11/02	12.71	1
03/13/02	11.03	1
03/19/02	12.91	1
03/25/02	16.3	1
04/02/02	13.41	1
04/08/02	9.76	1
04/10/02	11.48	1
04/16/02		
04/30/02	9.17	1
05/06/02	10	1
05/13/02	9.78	1
05/20/02	9.24	1
05/22/02	9.49	1
05/29/02	8.65	1
06/04/02	7.91	1
06/11/02	7.3	1
06/13/02	6.35	1
06/18/02	7.67	1
06/25/02	7.46	1
07/03/02	5.51	1
07/09/02	6.8	1
07/16/02	8.56	1
07/23/02	5.95	1
07/31/02	6.2	1
08/07/02	11.67	1
08/15/02	8.45	1
08/20/02	7.45	1
08/27/02	6.81	1
08/29/02	8.2	1
09/03/02		
09/10/02	8.09	1
09/17/02	6.89	1
09/24/02	7.4	1
09/25/02	6.98	1
10/02/02	7.11	1
10/08/02	8.09	1
10/10/02	7.72	1
10/23/02	9.79	1
10/30/02	9.57	1
11/05/02	11.92	1
11/12/02	8.58	1
11/18/02	11.83	1
11/20/02	12.58	1
11/25/02	11.61	1

IDEM Sampling Locations											
Date	Daily Rainfall (in)	Raymond Street DO (mg/L)	% Compliance	Date	Waverly (SR 144) DO (mg/L)	% Compliance	Date	Daily Rainfall (in)	86th Street DO (mg/L)	% Compliance
3/21/2001	0	13.08	1	1/6/2000	9.5	1	1/11/2000	0	10.5	1
4/18/2001	0	10.96	1	2/3/2000	12.1	1	2/10/2000	0.04	12.6	1
4/25/2001	0	10.56	1	3/23/2000	10.4	1	3/2/2000	0	10.8	1
5/2/2001	0	10.82	1	4/7/2000	8.8	1	4/20/2000	0.04	9.3	1
5/9/2001	0	9.35	1	5/23/2000	7.6	1	5/8/2000	0	6.5	1
5/15/2001	0	13.23	1	6/13/2000	9.86	1	6/13/2000	0	5.29	1
5/23/2001	0.07	8.49	1	7/7/2000	6.5	1	7/20/2000	0	7.4	1
5/30/2001	0	9.04	1	8/2/2000	9.5	1	8/9/2000	0.17	7	1
6/4/2001	0.48	9.04	1	9/7/2000	6.5	1	9/7/2000	0	7.4	1
6/13/2001	0	8.48	1	10/12/2000	7.8	1	10/26/2000	0	6.7	1
6/20/2001	0.24	7.43	1	11/3/2000	6.7	1	11/30/2000	0	11.9	1
6/27/2001	0	10.66	1	12/20/2000	11.8	1	12/20/2000	0	13.2	1
7/5/2001	0.87	5.04	1	1/18/2001	13.2	1	1/25/2001	0	12.7	1
7/11/2001	0	8.17	1	2/19/2001	13	1	2/28/2001	0	11.8	1
7/18/2001	0	9.07	1	3/6/2001	10.9	1	3/21/2001	0	14.24	1
				4/5/2001	12.4	1	3/22/2001	0	13.2	1
				5/16/2001	10.3	1	4/18/2001	0	10.7	1
				6/19/2001	8.8	1	4/25/2001	0	9.55	1
				7/3/2001	6.2	1	4/26/2001	0	11	1
				8/7/2001	10.2	1	5/2/2001	0	9.88	1
				9/13/2001	7.2	1	5/9/2001	0	7.98	1
				10/3/2001	8.4	1	5/15/2001	0	7.76	1
				11/21/2001	8.9	1	5/23/2001	0.07	7.68	1
				12/6/2001	9	1	5/30/2001	0	8.22	1
							5/31/2001	0.09	8.6	1
							6/4/2001	0.48	8.46	1
							6/13/2001	0	7.95	1
							6/14/2001	0	7.67	1
							6/20/2001	0.24	6.68	1
							6/27/2001	0	9.2	1
							7/5/2001	0.87	794	1
							7/11/2001	0	6.5	1
							7/18/2001	0	7.5	1
							7/26/2001	0.06	6.2	1
							8/21/2001	0	7.6	1
							9/11/2001	0	6.8	1
							10/4/2001	0	8.3	1
							11/1/2001	0	9.2	1
							12/11/2001	0	11.3	1

Daily Summaries of OES Continuous DO Monitoring								
16th Street			IPL Dam			Waverly (SR144)		
Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)
7/9/2001	6.62	1	6/28/2001	12.92	1	6/27/2001	9.19	1
7/10/2001	6.54	1	6/29/2001	13.65	1	6/28/2001	8.54	1
7/11/2001	6.32	1	6/30/2001	14.01	1	6/29/2001	8.72	1
7/12/2001	5.87	1	7/1/2001	10.19	1	6/30/2001	9.43	1
7/13/2001	6.35	1	7/2/2001	6.64	1	7/1/2001	8.14	1
7/14/2001	7.21	1	7/3/2001	6.85	1	7/2/2001	NA	NA
7/15/2001	8.18	1	7/4/2001	7.52	1	7/3/2001	NA	NA
7/16/2001	11.79	1	7/5/2001	8.74	1	7/4/2001	NA	NA
7/17/2001	11.91	1	7/6/2001	8.90	1	7/5/2001	NA	NA
7/18/2001	12.01	1	7/7/2001	8.72	1	7/6/2001	8.70	1
7/19/2001	7.62	1	7/8/2001	8.01	1	7/7/2001	7.45	1
7/20/2001	5.51	1	7/9/2001	7.69	1	7/8/2001	6.93	1
7/21/2001	5.10	1	7/10/2001	7.64	1	7/9/2001	6.35	1
7/22/2001	5.01	1	7/11/2001	7.38	1	7/10/2001	7.25	1
7/23/2001	5.82	1	7/12/2001	7.36	1	7/11/2001	7.11	1
7/24/2001	7.98	1	7/13/2001	7.44	1	7/12/2001	6.63	1
7/25/2001	6.96	1	7/14/2001	7.95	1	7/13/2001	7.93	1
7/26/2001	5.77	1	7/15/2001	8.94	1	7/14/2001	7.71	1
7/27/2001	6.50	1	7/16/2001	9.85	1	7/15/2001	7.93	1
7/28/2001	6.13	1	7/17/2001	9.86	1	7/16/2001	NA	NA
7/29/2001	5.58	1	7/18/2001	7.81	1	7/17/2001	NA	NA
7/30/2001	5.22	1	7/19/2001	7.14	1	7/18/2001	7.59	1
7/31/2001	5.66	1	7/20/2001	6.80	1	7/19/2001	6.68	1
8/1/2001	5.00	1	7/21/2001	6.64	1	7/20/2001	6.66	1
8/2/2001	5.48	1	7/22/2001	6.30	1	7/21/2001	6.28	1
8/3/2001	5.52	1	7/23/2001	6.64	1	7/22/2001	5.32	1
8/4/2001	6.69	1	7/24/2001	6.64	1	7/23/2001	5.65	1
8/5/2001	7.93	1	7/25/2001	6.56	1	7/24/2001	5.42	1
8/6/2001	9.33	1	7/26/2001	5.92	1	7/25/2001	5.35	1
8/7/2001	9.54	1	7/27/2001	6.58	1	7/26/2001	5.21	1
8/8/2001	11.89	1	7/28/2001	6.58	1	7/27/2001	5.84	1
8/9/2001	13.14	1	7/29/2001	6.76	1	7/28/2001	5.39	1
8/10/2001	10.50	1	7/30/2001	7.31	1	7/29/2001	5.41	1
8/11/2001	8.05	1	7/31/2001	7.06	1	7/30/2001	5.39	1
8/12/2001	7.75	1	8/1/2001	6.83	1	7/31/2001	8.28	1
8/13/2001	8.49	1	8/2/2001	6.61	1	8/1/2001	7.15	1
8/14/2001	9.59	1	8/3/2001	6.61	1	8/2/2001	6.61	1
8/15/2001	10.21	1	8/4/2001	7.42	1	8/3/2001	6.97	1
8/16/2001	8.46	1	8/5/2001	8.50	1	8/4/2001	7.41	1
8/17/2001	6.38	1	8/6/2001	9.36	1	8/5/2001	7.99	1
8/18/2001	5.78	1	8/7/2001	9.56	1	8/6/2001	8.54	1
8/19/2001	5.65	1	8/8/2001	9.61	1	8/7/2001	8.89	1
8/20/2001	5.59	1	8/9/2001	9.79	1	8/8/2001	8.87	1
8/21/2001	6.58	1	8/10/2001	8.93	1	8/9/2001	7.63	1
8/22/2001	7.32	1	8/11/2001	8.48	1	8/10/2001	7.16	1
8/23/2001	6.75	1	8/12/2001	8.91	1	8/11/2001	6.62	1
8/24/2001	5.94	1	8/13/2001	10.74	1	8/12/2001	6.83	1
8/25/2001	6.02	1	8/14/2001	11.36	1	8/13/2001	7.72	1
8/26/2001	5.89	1	8/15/2001	9.96	1	8/14/2001	6.98	1
8/27/2001	6.18	1	8/16/2001	7.52	1	8/15/2001	NA	NA
8/28/2001	6.25	1	8/17/2001	7.80	1	8/16/2001	NA	NA
8/29/2001	6.35	1	8/18/2001	8.83	1	8/17/2001	NA	NA
8/30/2001	6.75	1	8/19/2001	8.32	1	8/18/2001	NA	NA
8/31/2001	6.26	1	8/20/2001	8.09	1	8/19/2001	7.09	1
9/1/2001	6.07	1	8/21/2001	7.84	1	8/20/2001	7.84	1
9/2/2001	6.25	1	8/22/2001	7.85	1	8/21/2001	8.02	1
9/3/2001	6.61	1	8/23/2001	6.11	1	8/22/2001	7.74	1
9/4/2001	7.11	1	8/24/2001	7.11	1	8/23/2001	5.97	1
9/5/2001	7.67	1	8/25/2001	7.15	1	8/24/2001	5.65	1

Daily Summaries of OES Continuous DO Monitoring								
16th Street			IPL Dam			Waverly (SR144)		
Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)
9/6/2001	8.28	1	8/26/2001	6.89	1	8/25/2001	6.50	1
9/7/2001	9.47	1	8/27/2001	7.27	1	8/26/2001	5.28	1
9/8/2001	7.65	1	8/28/2001	7.68	1	8/27/2001	6.20	1
9/9/2001	6.22	1	8/29/2001	8.07	1	8/28/2001	6.57	1
9/10/2001	6.71	1	8/30/2001	8.29	1	8/29/2001	6.44	1
9/11/2001	7.14	1	8/31/2001	6.73	1	8/30/2001	6.31	1
9/12/2001	7.17	1	9/1/2001	6.63	1	8/31/2001	5.95	1
9/13/2001	6.79	1	9/2/2001	7.75	1	9/1/2001	5.87	1
9/14/2001	6.86	1	9/3/2001	8.73	1	9/2/2001	7.02	1
9/15/2001	7.12	1	9/4/2001	9.16	1	9/3/2001	7.37	1
9/16/2001	7.24	1	9/5/2001	9.35	1	9/4/2001	7.15	1
9/17/2001	7.34	1	9/6/2001	9.64	1	9/5/2001	5.82	1
9/18/2001	7.62	1	9/7/2001	10.09	1	9/6/2001	NA	NA
9/19/2001	7.48	1	9/8/2001	7.19	1	9/7/2001	7.46	1
9/20/2001	7.64	1	9/9/2001	6.87	1	9/8/2001	5.59	1
9/21/2001	7.74	1	9/10/2001	7.00	1	9/9/2001	5.57	1
9/22/2001	7.71	1	9/11/2001	NA	NA	9/10/2001	4.88	0
9/23/2001	7.58	1	9/12/2001	NA	NA	9/11/2001	4.84	0
9/24/2001	7.70	1	9/13/2001	NA	NA	9/12/2001	6.52	1
9/25/2001	8.17	1	9/14/2001	8.42	1	9/13/2001	7.05	1
9/26/2001	8.56	1	9/15/2001	8.79	1	9/14/2001	7.42	1
9/27/2001	8.79	1	9/16/2001	9.20	1	9/15/2001	7.84	1
9/28/2001	8.81	1	9/17/2001	9.45	1	9/16/2001	7.89	1
9/29/2001	8.99	1	9/18/2001	9.28	1	9/17/2001	8.10	1
9/30/2001	9.07	1	9/19/2001	7.93	1	9/18/2001	7.80	1
10/1/2001	9.12	1	9/20/2001	8.89	1	9/19/2001	6.61	1
10/2/2001	9.20	1	9/21/2001	9.15	1	9/20/2001	6.57	1
10/3/2001	9.01	1	9/22/2001	9.21	1	9/21/2001	NA	NA
10/4/2001	8.88	1	9/23/2001	9.01	1	9/22/2001	NA	NA
10/5/2001	8.38	1	9/24/2001	8.82	1	9/23/2001	NA	NA
10/6/2001	8.74	1	9/25/2001	NA	NA	9/24/2001	10.50	1
10/7/2001	9.26	1	9/26/2001	8.84	1	9/25/2001	NA	NA
10/8/2001	9.47	1	9/27/2001	8.70	1	9/26/2001	8.28	1
10/9/2001	9.55	1	9/28/2001	8.69	1	9/27/2001	8.01	1
10/10/2001	9.19	1	9/29/2001	8.80	1	9/28/2001	7.93	1
10/11/2001	8.76	1	9/30/2001	8.74	1	9/29/2001	7.83	1
10/12/2001	8.75	1	10/1/2001	8.67	1	9/30/2001	NA	NA
10/13/2001	8.59	1	10/2/2001	8.56	1	10/1/2001	NA	NA
10/14/2001	8.50	1	10/3/2001	9.50	1	10/2/2001	NA	NA
10/15/2001	8.92	1	10/4/2001	9.94	1	10/3/2001	NA	NA
10/16/2001	9.27	1	10/5/2001	8.79	1	10/4/2001	NA	NA
10/17/2001	9.91	1	10/6/2001	9.26	1	10/5/2001	6.61	1
10/18/2001	10.17	1	10/7/2001	9.69	1	10/6/2001	6.93	1
10/19/2001	9.92	1	10/8/2001	9.09	1	10/7/2001	8.32	1
10/20/2001	9.67	1	10/9/2001	8.32	1	10/8/2001	8.54	1
10/21/2001	9.29	1	10/10/2001	8.42	1	10/9/2001	9.04	1
10/22/2001	8.84	1	10/11/2001	8.17	1	10/10/2001	9.00	1
10/23/2001	8.25	1	10/12/2001	1.00	0	10/11/2001	8.00	1
10/24/2001	8.68	1	10/13/2001	8.56	1	10/12/2001	7.97	1
10/25/2001	9.00	1	10/14/2001	8.43	1	10/13/2001	8.64	1
10/26/2001	9.19	1	10/15/2001	8.85	1	10/14/2001	8.13	1
10/27/2001	9.63	1	10/16/2001	9.12	1	10/15/2001	8.61	1
10/28/2001	9.70	1	10/17/2001	9.56	1	10/16/2001	8.96	1
10/29/2001	9.36	1	10/18/2001	9.84	1	10/17/2001	9.78	1
10/30/2001	9.27	1	10/19/2001	9.62	1	10/18/2001	10.44	1
10/31/2001	9.58	1	10/20/2001	9.35	1	10/19/2001	10.15	1
11/1/2001	9.33	1	10/21/2001	9.08	1	10/20/2001	9.85	1
11/2/2001	9.01	1	10/22/2001	8.85	1	10/21/2001	9.57	1
11/3/2001	9.10	1	10/23/2001	8.38	1	10/22/2001	9.22	1
11/4/2001	9.33	1	10/24/2001	8.88	1	10/23/2001	8.74	1

Daily Summaries of OES Continuous DO Monitoring								
16th Street			IPL Dam			Waverly (SR144)		
Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)	Date	Average Daily DO	% Compliance (5 mg/L)
11/5/2001	9.49	1	10/25/2001	10.11	1	10/24/2001	8.41	1
11/6/2001	9.92	1	10/26/2001	10.81	1	10/25/2001	8.50	1
11/7/2001	10.14	1	10/27/2001	11.71	1	10/26/2001	9.24	1
11/8/2001	10.12	1	10/28/2001	11.88	1	10/27/2001	10.15	1
11/9/2001	10.15	1	10/29/2001	11.77	1	10/28/2001	10.38	1
11/10/2001	10.32	1	10/30/2001	11.65	1	10/29/2001	10.32	1
11/11/2001	10.45	1	10/31/2001	11.46	1	10/30/2001	9.94	1
11/12/2001	10.74	1	11/1/2001	11.29	1	10/31/2001	9.57	1
11/13/2001	10.76	1	11/2/2001	11.04	1	11/1/2001	9.25	1
11/14/2001	10.62	1	11/3/2001	11.32	1	11/2/2001	8.82	1
11/15/2001	10.58	1	11/4/2001	11.54	1	11/3/2001	8.91	1
11/16/2001	10.42	1	11/5/2001	11.76	1	11/4/2001	9.13	1
11/17/2001	10.26	1	11/6/2001	11.97	1	11/5/2001	9.22	1
11/18/2001	10.18	1	11/7/2001	12.13	1	11/6/2001	9.28	1
11/19/2001	9.98	1	11/8/2001	12.23	1	11/7/2001	9.29	1
11/20/2001	10.05	1	11/9/2001	11.50	1	11/8/2001	9.19	1
11/21/2001	11.03	1	11/10/2001	10.86	1	11/9/2001	9.36	1
11/22/2001	11.62	1	11/11/2001	11.12	1	11/10/2001	9.37	1
11/23/2001	12.01	1	11/12/2001	11.27	1	11/11/2001	9.57	1
11/24/2001	11.51	1	11/13/2001	11.46	1	11/12/2001	9.61	1
11/25/2001	10.52	1	11/14/2001	11.56	1	11/13/2001	9.52	1
11/26/2001	10.80	1	11/15/2001	12.06	1	11/14/2001	9.41	1
11/27/2001	10.77	1	11/16/2001	12.25	1	11/15/2001	9.54	1
11/28/2001	10.48	1	11/17/2001	8.27	1	11/16/2001	9.63	1
11/29/2001	10.41	1				11/17/2001	9.56	1
11/30/2001	10.42	1				11/18/2001	9.64	1
12/1/2001	10.70	1				11/19/2001	10.09	1
12/2/2001	10.96	1				11/20/2001	11.86	1
12/3/2001	11.13	1				11/21/2001	11.24	1
12/4/2001	10.96	1				11/22/2001	10.37	1
12/5/2001	10.66	1				11/23/2001	10.34	1
12/6/2001	10.29	1				11/24/2001	9.73	1
12/7/2001	11.27	1				11/25/2001	9.43	1
12/8/2001	12.00	1				11/26/2001	10.11	1
12/9/2001	12.65	1				11/27/2001	10.14	1
12/10/2001	13.38	1				11/28/2001	10.33	1
12/11/2001	12.69	1				11/29/2001	10.17	1
12/12/2001	11.87	1				11/30/2001	10.16	1
12/13/2001	11.48	1				12/1/2001	11.25	1
12/14/2001	11.12	1				12/2/2001	11.38	1
12/15/2001	11.08	1				12/3/2001	11.21	1
12/16/2001	11.20	1				12/4/2001	10.72	1
12/17/2001	11.02	1				12/5/2001	10.24	1
12/18/2001	10.77	1				12/6/2001	9.95	1
						12/7/2001	9.96	1
						12/8/2001	9.89	1
						12/9/2001	10.28	1
						12/10/2001	10.51	1
						12/11/2001	10.54	1
						12/12/2001	10.56	1
						12/13/2001	10.15	1

Date	Wet or Dry Data?	OES Sampling Locations			
		82nd Street		Morris Street	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
1/5/2000	Wet	522	0	9454	0
2/2/2000	Dry	200	1	10	1
3/1/2000	Wet	280	0	108	1
4/5/2000	Wet	34	1	10	1
5/3/2000	Wet	131	1	1900	0
6/7/2000	Dry	133	1	220	1
7/5/2000	Wet	1700	0	20000	0
8/9/2000	Wet	1200	0	1800	0
9/6/2000	Dry	360	0	1000	0
10/4/2000	Wet	200	1	1803	0
11/1/2000	Dry	51	1	56	1
12/6/2000	Dry	371	0	48	1
1/15/2001	Wet	900	0	193	1
2/12/2001	Dry	640	0	600	0
3/6/2001	Dry	220	1	95	1
4/4/2001	Dry	76	1	7	1
5/2/2001	Dry	19	1	10	1
6/13/2001	Dry	127	1	62	1
7/11/2001	Wet	2200	0	480	0
8/8/2001	Dry	13	1	62	1
9/5/2001	Dry	5	1	100	1
10/3/2001	Dry	46	1	92	1
11/7/2001	Dry	17	1	24	1
12/4/2001	Dry	176	1	210	1

Date	Wet or Dry Data?	OES Sampling Locations			
		Harding Street		Tibbs/Banta	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
1/5/2000	Wet	3636	0	6091	0
2/2/2000	Dry	27	1	1900	0
3/1/2000	Wet	36	1	100	1
4/5/2000	Wet	13	1	273	0
5/3/2000	Wet	7500	0	800	0
6/7/2000	Dry	328	0	454	0
7/5/2000	Wet	9909	0	65000	0
8/9/2000	Wet	2000	0	1967	0
9/6/2000	Dry	1909	0	2600	0
10/4/2000	Wet	380	0	900	0
11/1/2000	Dry	5	1	72	1
12/6/2000	Dry	68	1	1070	0
1/15/2001	Wet	35	1	2350	0
2/12/2001	Dry	400	0	1500	0
3/6/2001	Dry	50	1	488	0
4/4/2001	Dry	7	1	8	1
5/2/2001	Dry	5	1	14	1
6/13/2001	Dry	100	1	67	1
7/11/2001	Wet	620	0	1050	0
8/8/2001	Dry	25	1	360	0
9/5/2001	Dry	86	1	290	0
10/3/2001	Dry	80	1	72	1
11/7/2001	Dry	35	1	400	0
12/4/2001	Dry	135	1	133	1

Date	Wet or Dry Data?	OES Sampling Locations			
		Southwestway Pk		Waverly (SR 144)	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
1/5/2000	Wet	4800	0	6000	0
2/2/2000	Dry	5000	0	5000	0
3/1/2000	Wet	130	1	315	0
4/5/2000	Wet	9	1	27	1
5/3/2000	Wet	1600	0	3300	0
6/7/2000	Dry	66	1	443	0
7/5/2000	Wet	77000	0	7000	0
8/9/2000	Wet	3600	0	2000	0
9/6/2000	Dry	1639	0	2545	0
10/4/2000	Wet	1167	0	1700	0
11/1/2000	Dry	360	0	240	0
12/6/2000	Dry	2560	0	2020	0
1/15/2001	Wet	400	0	3650	0
2/12/2001	Dry	1100	0	2250	0
3/6/2001	Dry	560	0	688	0
4/4/2001	Dry	72	1	10	1
5/2/2001	Dry	43	1	29	1
6/13/2001	Dry	100	1	57	1
7/11/2001	Wet	1067	0	1300	0
8/8/2001	Dry	2350	0	260	0
9/5/2001	Dry	230	1	350	0
10/3/2001	Dry	120	1	152	1
11/7/2001	Dry	270	0	320	0
12/4/2001	Dry	220	1	187	1

Date	Wet or Dry Data?	OES Sampling Locations	
		30th Street	
		E. Coli (col/100 mL)	% Compliance
1/5/2000	Wet	200	1
2/2/2000	Dry		
3/1/2000	Wet	30	1
4/5/2000	Wet	12	1
5/3/2000	Wet	100	1
6/7/2000	Dry	300	0
7/5/2000	Wet	980	0
8/9/2000	Wet	600	0
9/6/2000	Dry	400	0
10/4/2000	Wet	400	0
11/1/2000	Dry	42	1
12/6/2000	Dry	255	0
1/15/2001	Wet	233	1
2/12/2001	Dry	1033	0
3/6/2001	Dry	104	1
4/4/2001	Dry	19	1
5/2/2001	Dry	33	1
6/13/2001	Dry	48	1
7/11/2001	Wet	540	0
8/8/2001	Dry	20	1
9/5/2001	Dry	14	1
10/3/2001	Dry	22	1
11/7/2001	Dry	60	1
12/4/2001	Dry	140	1

Date	Wet or Dry Data?	MCHD Sampling Locations							
		Raymond Street		96th Street		Marina Drive		Ruth Drive	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
4/24/2000	Wet	200	1	100	1	50	1	200	1
5/22/2000	Wet	310	0	110	1	60	1	220	1
6/26/2000	Wet	440	0	220	1	590	0	20	1
7/24/2000	Dry	60	1	10	1	10	1	20	1
8/28/2000	Dry	50	1	90	1	10	1	70	1
9/25/2000	Wet	970	0	100	1	11300	0	4960	0
10/25/2000	Wet	200	1	100	1	100	1	100	1
4/24/2001	Wet	100	1	100	1	100	1	100	1
5/22/2001	Wet	520	0	410	0	100	1	1200	0
6/25/2001	Dry	520	0	520	0	100	1	310	0
7/30/2001	Wet	1200	0	2850	0	2030	0	740	0
8/27/2001	Wet	740	0	200	1	100	1	100	1
9/24/2001	Wet	7980	0	2330	0	100	1	1750	0
10/22/2001	Dry	100	1	410	0	100	1	730	0
4/8/2002	Wet	209	1	63	1			63	
5/30/2002	Wet	683	0	213	1			780	
6/25/2002	Wet	4106	0	108	1			335	
7/30/2002	Wet	7701	0	131	1			63	
8/21/2002	Wet	2613	0	158	1			689	
9/25/2002	Dry	545	0	143	1			2187	
10/29/2002	Wet	41	1	52	1			432	

Date	Wet or Dry Data?	MCHD Sampling Locations					
		Broad Ripple Park Ramp		6800 Cornell Ave		Lake Indy	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
4/24/2000	Wet	500	0	200	1	1000	0
5/22/2000	Wet	140	1	390	0	220	1
6/26/2000	Wet	50	1	620	0	230	1
7/24/2000	Dry	10	1	10	1	10	1
8/28/2000	Dry	10	1	20	1	100	1
9/25/2000	Wet	100	1	5650	0	970	0
10/25/2000	Wet	100	1	100	1	410	0
4/24/2001	Wet	100	1	100	1	100	1
5/22/2001	Wet	410	0	520	0	630	0
6/25/2001	Dry	200	1	100	1	1690	0
7/30/2001	Wet	100	1	1750	0	2110	0
8/27/2001	Wet	200	1	100	1	200	1
9/24/2001	Wet	740	0	1710	0	1750	0
10/22/2001	Dry	200	1	100	1	100	1
4/8/2002	Wet	62		197		187	
5/30/2002	Wet	148		85		546	
6/25/2002	Wet	50		141		2987	
7/30/2002	Wet	10		175		146	
8/21/2002	Wet	132		98		218	
9/25/2002	Dry	41		31		86	
10/29/2002	Wet	10		10		345	

MCHD Sampling Locations			
Date	Wet or Dry Data?	New York Street	
		E. Coli (col/100 mL)	% Compliance
05/22/01	Wet	200	1
05/30/01	Wet	310	0
06/05/01	Wet	410	0
06/12/01	Dry	410	0
06/19/01	Dry	200	1
06/20/01	Wet	1480	0
06/26/01	Dry	100	1
07/03/01	Wet	860	0
07/10/01	Wet	850	0
07/17/01	Dry	100	1
07/24/01	Wet	310	0
07/31/01	Dry	300	0
08/01/01	Dry	310	0
08/07/01	Dry	100	1
08/14/01	Dry	100	1
08/21/01	Wet	860	0
08/28/01	Dry	510	0
09/05/01	Dry	410	0
09/11/01	Wet	520	0
09/18/01	Wet	9880	0
09/25/01	Wet	1460	0
09/26/01	Dry	410	0
10/02/01	Dry	100	1
10/09/01	Dry	300	0
10/16/01	Wet	1460	0
10/23/01	Dry	100	1
10/30/01	Dry	410	0
11/06/01	Dry	100	1
11/13/01	Dry	100	1
11/20/01	Wet	200	1
11/26/01	Wet	970	0
11/28/01	Wet	840	0
12/03/01	Dry	1530	0
12/06/01	Wet	200	1
12/11/01	Dry	100	1
12/17/01	Wet	9580	0
12/19/01	Wet	2400	0
01/08/02	Dry	100	1
01/14/02	Dry	100	1
01/16/02	Dry	100	1
01/22/02	Dry	100	1
01/29/02	Dry	100	1
02/05/02	Dry	630	0
02/11/02	Wet	520	0
02/13/02	Wet	100	1
02/18/02	Dry	100	1

MCHD Sampling Locations			
Date	Wet or Dry Data?	New York Street	
		E. Coli (col/100 mL)	% Compliance
02/26/02	Wet	8500	0
03/05/02	Wet	1280	0
03/11/02	Wet	1100	0
03/13/02	Wet	200	1
03/19/02	Wet	200	1
03/25/02	Wet	11530	0
04/02/02	Dry	683	0
04/08/02	Wet	169	1
04/10/02	Wet	295	0
04/16/02	Wet	1565	0
04/30/02	Wet	3448	0
05/06/02	Wet	24195	0
05/13/02	Wet	10462.4	0
05/20/02	Wet	240	0
05/22/02	Wet	121	1
05/29/02	Wet	295	0
06/04/02	Dry	96	1
06/11/02	Dry	50	1
06/13/02	Wet	272	0
06/18/02	Wet	160	1
06/25/02	Wet	1334	0
07/03/02	Dry	109	1
07/09/02	Wet	158	1
07/16/02	Dry	41	1
07/23/02	Wet	131	1
07/31/02	Wet	259	0
08/07/02	Dry	41	1
08/15/02	Wet	63	1
08/20/02	Wet	4106	0
08/27/02	Dry	148	1
08/29/02	Dry	52	1
09/03/02	Dry	98	1
09/10/02	Dry	20	1
09/17/02	Wet	318	0
09/24/02	Wet	413	0
09/25/02	Dry	187	1
10/02/02	Dry	97	1
10/08/02	Dry	301	0
10/10/02	Dry	145	1
10/23/02	Dry	86	1
10/30/02	Wet	2755	0
11/05/02	Wet	109	1
11/12/02	Wet	1565	0
11/18/02	Wet	98	1
11/20/02	Wet	20	1
11/25/02	Dry	31	1

IDEM Sampling Sites					
Date	Wet or Dry Data?	86th Street		Waverly (SR 144)	
		E. Coli (col/100 mL)	% Compliance	E. Coli (col/100 mL)	% Compliance
1/11/2000	Wet	490	0	2200	0
2/10/2000	Wet	260	0		
3/2/2000	Wet	150	1	2000	0
4/20/2000	Wet	70	1	78	1
5/8/2000	Wet	58	1	690	0
6/13/2000	Wet	65	1		
7/20/2000	Wet	77	1	1100	0
8/9/2000	Wet	430	0	1200 (QJ)	0
9/7/2000	Dry	25 (QJ)	1	690 (QJ)	0
10/26/2000	Dry	20	1		
11/30/2000	Dry	98	1	1100	0
12/20/2000	Wet	1600	0	1700	0