

DRAFT

**FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Division of Water Resource Management, Bureau of Watershed Management

NORTHEAST DISTRICT • LOWER ST. JOHNS BASIN

**TMDL Report**

**Fecal Coliform and Total Coliform  
TMDL for Moncrief Creek  
(WBID 2228)**

**David Wainwright**



**July 2005**

DRAFT

## Acknowledgments

---

Editorial assistance provided by: Wayne Magley, Ph.D., Jan Mandrup-Poulsen, Daryll Joyner, and Linda Lord.

For additional information on the watershed management approach and impaired waters in the Northeast Basin, contact:

Jennifer Gihring  
Florida Department of Environmental Protection  
Bureau of Watershed Management  
Watershed Planning and Coordination Section  
2600 Blair Stone Road, Mail Station 3565  
Tallahassee, FL 32399-2400  
jennifer.gihring@dep.state.fl.us  
Phone: (850) 245-8418; Suncom: 205-8418  
Fax: (850) 245-8434

Access to all data used in the development of this report can be obtained by contacting:

David Wainwright  
Florida Department of Environmental Protection  
Bureau of Watershed Management  
Watershed Assessment Section  
2600 Blair Stone Road, Mail Station 3555  
Tallahassee, FL 32399-2400  
david.wainwright@dep.state.fl.us  
Phone: (850) 245-8469; Suncom: 205-8469  
Fax: (850) 245-8536

# Contents

---

|                                                                                 |           |
|---------------------------------------------------------------------------------|-----------|
| <b>Chapter 1: INTRODUCTION</b>                                                  | <b>1</b>  |
| 1.1 Purpose of Report                                                           | 1         |
| 1.2 Identification of Waterbody                                                 | 1         |
| 1.3 Background                                                                  | 5         |
| <b>Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM</b>                          | <b>6</b>  |
| 2.1 Statutory Requirements and Rulemaking History                               | 6         |
| 2.2 Information on Verified Impairment                                          | 6         |
| <b>Chapter 3: DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS</b> | <b>9</b>  |
| 3.1 Classification of the Waterbody and Criteria Applicable to the TMDL         | 9         |
| 3.2 Applicable Water Quality Standards and Numeric Water Quality Target         | 9         |
| <b>Chapter 4: ASSESSMENT OF SOURCES</b>                                         | <b>10</b> |
| 4.1 Types of Sources                                                            | 10        |
| 4.2 Potential Sources of Coliforms in Moncrief Creek Watershed                  | 10        |
| 4.2.1 Point Sources                                                             | 10        |
| 4.2.2 Land Uses and Nonpoint Sources                                            | 12        |
| <b>Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY</b>                        | <b>20</b> |
| 5.1 Determination of Loading Capacity                                           | 20        |
| 5.1.1 Data Used in the Determination of the TMDL                                | 20        |
| 5.1.2 TMDL Development Process                                                  | 23        |
| 5.1.3 Critical Conditions/Seasonality                                           | 25        |
| <b>Chapter 6: DETERMINATION OF THE TMDL</b>                                     | <b>30</b> |
| 6.1 Expression and Allocation of the TMDL                                       | 30        |
| 6.2 Load Allocation (LA)                                                        | 31        |
| 6.3 Wasteload Allocation (WLA)                                                  | 31        |
| 6.3.1 NPDES Wastewater Discharges                                               | 31        |
| 6.3.2 NPDES Stormwater Discharges                                               | 31        |
| 6.4 Margin of Safety (MOS)                                                      | 31        |
| <b>Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND</b>        | <b>33</b> |
| 7.1 Basin Management Action Plan                                                | 33        |

|                                                                                                                                |           |
|--------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>References.</b>                                                                                                             | <b>36</b> |
| <b>Appendices</b>                                                                                                              | <b>37</b> |
| Appendix A: Background Information on Federal and State Stormwater Programs                                                    | 37        |
| Appendix B: Historical Discharge Data (August 1998 – December 2004) for Millennium Specialty Chemicals                         | 38        |
| Appendix C: Estimates of Coliform Loadings to Moncrief Creek from Millennium Specialty Chemicals (August 1998 – December 2004) | 40        |
| Appendix D: Historical Fecal Coliform Observations in Moncrief Creek                                                           | 42        |
| Appendix E: Historical Total Coliform Observations in Moncrief Creek                                                           | 45        |
| Appendix F: Kruskal – Wallis Analysis of Fecal Coliform Observations versus Month in Moncrief Creek                            | 48        |
| Appendix G: Kruskal – Wallis Analysis of Fecal Coliform Observations versus Season in Moncrief Creek                           | 49        |
| Appendix H: Kruskal – Wallis Analysis of Total Coliform Observations versus Month in Moncrief Creek                            | 50        |
| Appendix I: Kruskal – Wallis Analysis of Total Coliform Observations versus Season in Moncrief Creek                           | 51        |
| Appendix J: Fecal Coliform Observations by Station and Season in Moncrief Creek                                                | 52        |
| Appendix K: Total Coliform Observations by Station and Season in Moncrief Creek                                                | 53        |
| Appendix L: Chart of Rainfall for Jacksonville International Airport (JIA) from 1990 – 2004                                    | 54        |
| Appendix M: Spearman Correlation Matrix Analysis for Precipitation and Fecal Coliforms in Moncrief Creek                       | 55        |
| Appendix N: Spearman Correlation Matrix Analysis for Precipitation and Fecal Coliforms in Moncrief Creek                       | 56        |
| Appendix O: Analysis of Fecal Coliform Observations versus Precipitation in Moncrief Creek                                     | 57        |
| Appendix P: Analysis of Total Coliform Observations versus Precipitation in Moncrief Creek                                     | 60        |
| Appendix Q: Monthly and Annual Precipitation 1955 – 2004 from JIA                                                              | 63        |
| Appendix R: Annual and Monthly Average Precipitation at JIA                                                                    | 64        |
| Appendix S: Executive Summary of Tributary Pollution Assessment Project (TPAP)                                                 | 65        |

## List of Tables

|                                                                                                                    |    |
|--------------------------------------------------------------------------------------------------------------------|----|
| Table 2.1. Summary of Fecal and Total Coliform Data by Month for Verified Period (January 1, 1996 – June 30, 2003) | 7  |
| Table 2.2. Summary of Fecal Coliform Data by Season for Verified Period (January 1, 1996 – June 30, 2003)          | 7  |
| Table 2.3. Annual Summaries of Fecal and Total Coliform Data for Verified Period (January 1, 1996 – June 30, 2003) | 8  |
| Table 4.1. Annual Summary of Millennium Specialty Chemicals Discharge Monitoring Data                              | 11 |
| Table 4.2. Classification of Land Use Categories in the Moncrief Creek Watershed                                   | 13 |
| Table 4.3. Estimation of Average Household Size in the Moncrief Creek Watershed                                    | 16 |
| Table 4.4. Estimation of Annual Fecal Coliform Loading from Failed Septic Tanks in the Moncrief Creek Watershed    | 17 |
| Table 4.6. Estimated Loading from Dogs in the Moncrief Creek Watershed                                             | 18 |
| Table 4.7. Estimated Loading from the Wastewater Collection Systems                                                | 18 |
| Table 4.8. Summary of Estimated Potential Coliform Loading From Various Sources the Cedar River Watershed          | 19 |
| Table 5.1. Sampling Station Summary for the Moncrief Creek Watershed                                               | 20 |
| Table 5.2. Statistical Table of Observed Historical Coliform Data for Moncrief Creek                               | 22 |
| Table 5.3. Calculation of Reductions for the Fecal Coliform TMDL for Moncrief Creek                                | 24 |
| Table 5.4. Calculation of Reductions for the Total Coliform TMDL for Moncrief Creek                                | 25 |
| Table 5.5. Summary of Fecal Coliform Data by Hydrological Condition                                                | 27 |
| Table 5.6. Summary of Total Coliform Data by Hydrological Condition                                                | 28 |
| Table 6.1. TMDL Components for Moncrief Creek                                                                      | 31 |

## List of Figures

|                                                                                                     |    |
|-----------------------------------------------------------------------------------------------------|----|
| Figure 1.1. Location of Moncrief Creek and Major Geopolitical Features in the St. Johns River Basin | 2  |
| Figure 1.2. Moncrief Creek Watershed                                                                | 3  |
| Figure 1.3. WBIDs in the Trout River Planning Unit                                                  | 4  |
| Figure 4.1. Principal Land Uses in the Moncrief Creek Watershed                                     | 14 |
| Figure 4.2. Population Density in the Moncrief Creek Watershed                                      | 15 |
| Figure 4.3. Septic Tank Repair Permits Issued March 1990 – April 2004 for Moncrief Creek Area       | 17 |
| Figure 5.1. Sampling Sites with Historical Data in Moncrief Creek Watershed                         | 21 |
| Figure 5.2. Historical Fecal Coliform Observations for Moncrief Creek                               | 22 |
| Figure 5.3. Historical Observations Total Coliforms for Moncrief Creek                              | 23 |
| Figure 5.4. Fecal Coliform Data by Hydrological Condition Based on Rainfall                         | 28 |
| Figure 5.5. Total Coliform Data by Hydrological Condition Based on Rainfall                         | 29 |
| Figure 7.1. Map of WBIDs included in the TPAP study                                                 | 34 |

## **Web sites**

### ***Florida Department of Environmental Protection, Bureau of Watershed Management***

#### **TMDL Program**

<http://www.dep.state.fl.us/water/tmdl/index.htm>

#### **Identification of Impaired Surface Waters Rule**

<http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf>

#### **STORET Program**

<http://www.dep.state.fl.us/water/storet/index.htm>

#### **2000 305(b) Report**

<http://www.dep.state.fl.us/water/305b/index.htm>

#### **Criteria for Surface Water Quality Classifications**

[http://www/dep.state.fl.us/legal/legaldocuments/rules/ruleslistnum.htm](http://www.dep.state.fl.us/legal/legaldocuments/rules/ruleslistnum.htm)

#### **Basin Status Report for the Lower St. Johns River Basin**

[http://www.dep.state.fl.us/water/tmdl/stat\\_rep.htm](http://www.dep.state.fl.us/water/tmdl/stat_rep.htm)

#### **Water Quality Assessment Report for the Lower St. Johns River Basin**

<http://www.dep.state.fl.us/water/tmdl/docs/Allocation.pdf>

### ***U.S. Environmental Protection Agency, National STORET Program***

<http://www.epa.gov/storet/>



# Chapter 1: INTRODUCTION

---

## 1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for fecal and total coliforms for the Moncrief Creek watershed in the Trout River Planning Unit. The creek was verified impaired for fecal and total coliforms, and was included on the Verified List of impaired waters for the Lower St. Johns River Basin that was adopted by Secretarial Order in May 2004. The TMDL establishes the allowable loadings to Moncrief Creek that would restore the waterbody so that it meets its applicable water quality criteria for coliforms.

## 1.2 Identification of Waterbody

Moncrief Creek is located in the City of Jacksonville, Duval County, in northeast Florida (Figure 1.1). The creek, which is a second order stream with marine characteristics, is approximately 1.8 miles long with an approximate 5.92 square-mile (mi<sup>2</sup>) drainage area that flows into the Trout River, which flows into the St. Johns River (**Figures 1.1 and 1.2**). The Moncrief Creek watershed is located on the western edge of the City of Jacksonville and, as a result, is highly urban. Additional information about the stream's hydrology and geology are available in the Basin Status Report for the Lower St. Johns River Basin (Florida Department of Environmental Protection [FDEP], 2004).

For assessment purposes, the Department has divided the St. Johns River Basin into water assessment polygons with a unique **waterbody identification** (WBID) number for each watershed or stream reach. Moncrief Creek lies within one WBID, 2228, as shown in **Figure 1.2**, which this TMDL addresses.

Moncrief Creek is part of the Trout River Planning Unit (PU). Planning units are groups of WBIDs, which in turn are part of a larger basin, in this case the Lower St. Johns River Basin. The Trout River planning unit consists of 18 WBIDs. **Figure 1.3** shows the location of these WBIDs, Moncrief Creek's location in the planning unit, and a list of other WBIDs in the PU.

Figure 1.1. Location of Moncrief Creek and Major Geopolitical Features in the St. Johns River Basin

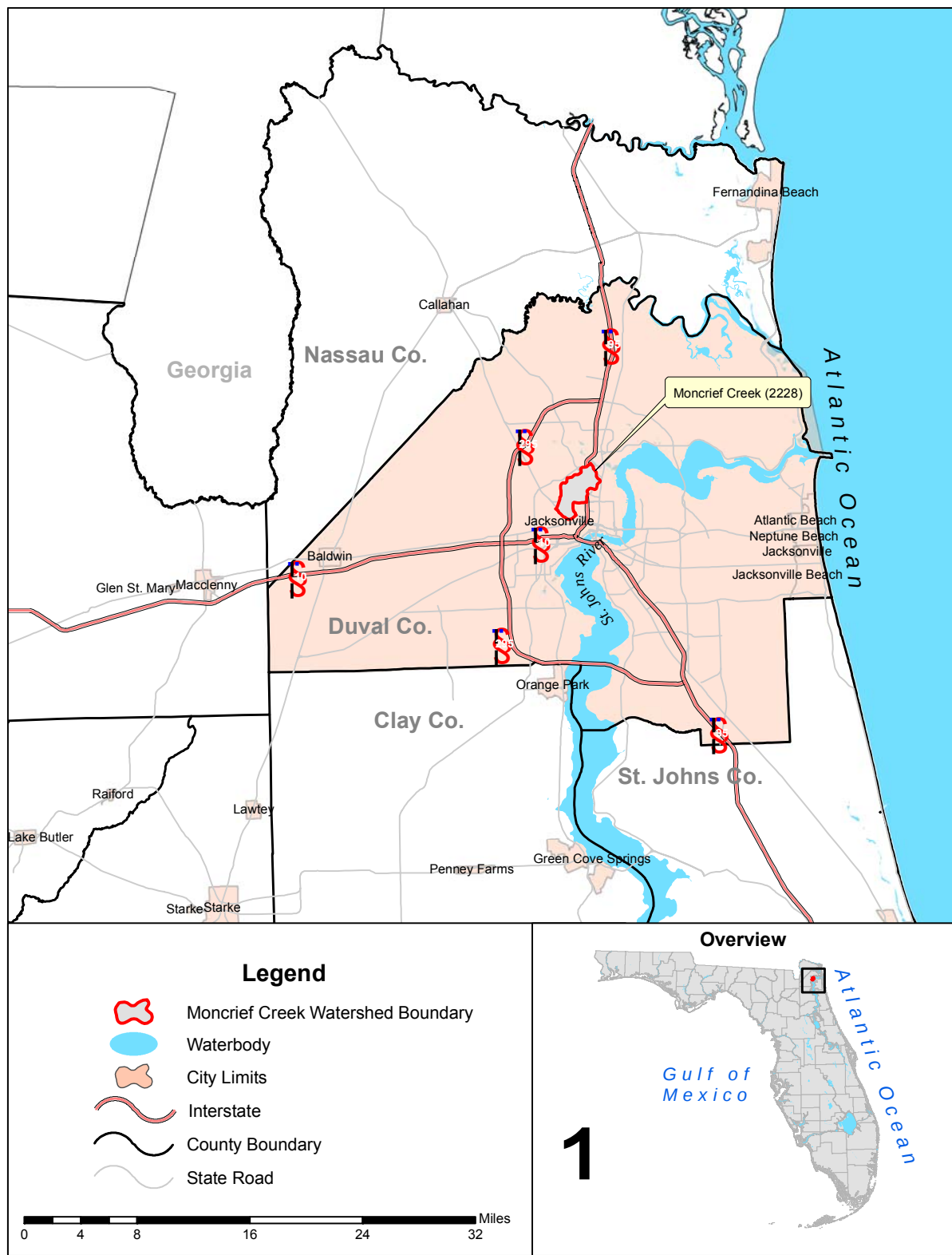


Figure 1.2. Moncrief Creek Watershed

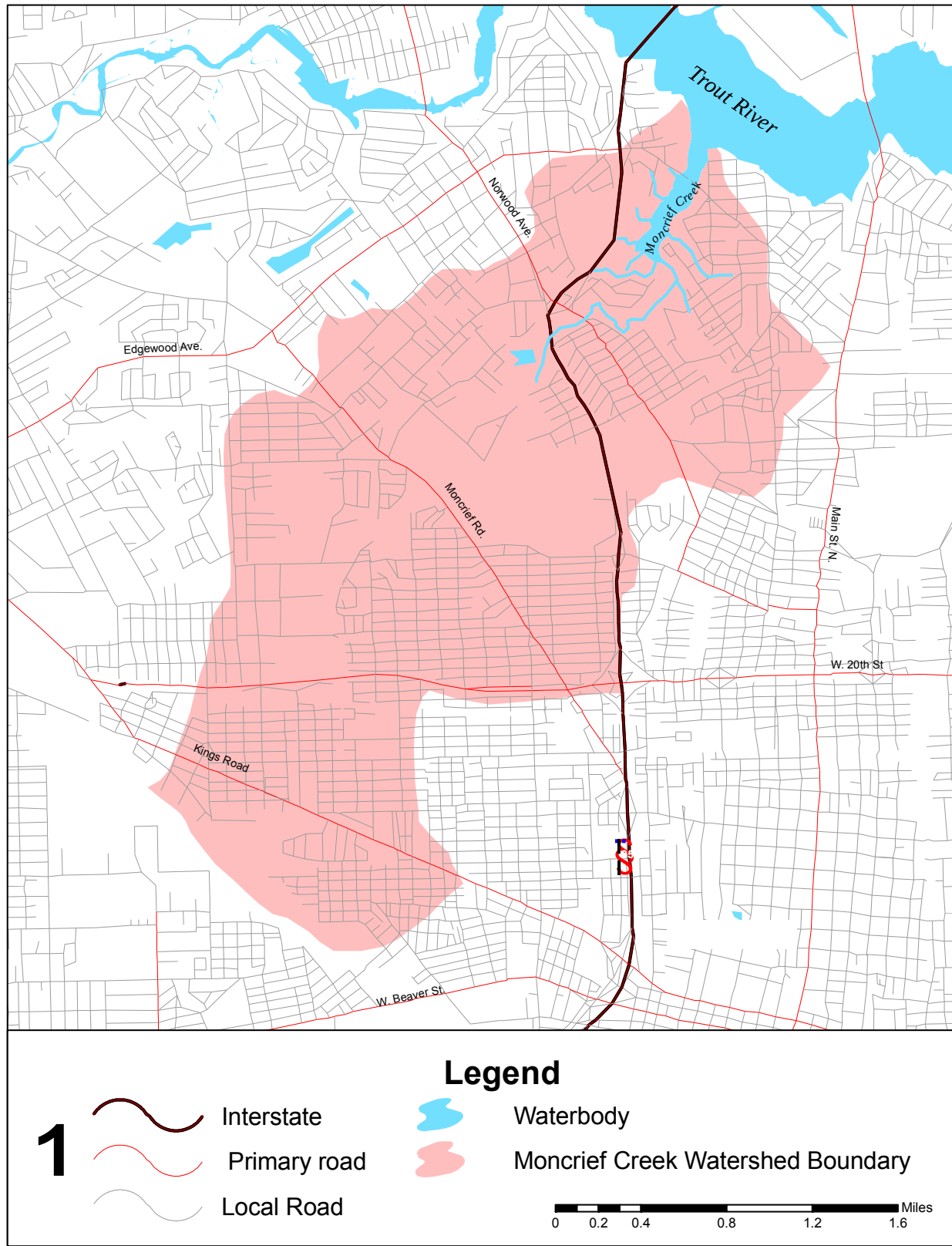
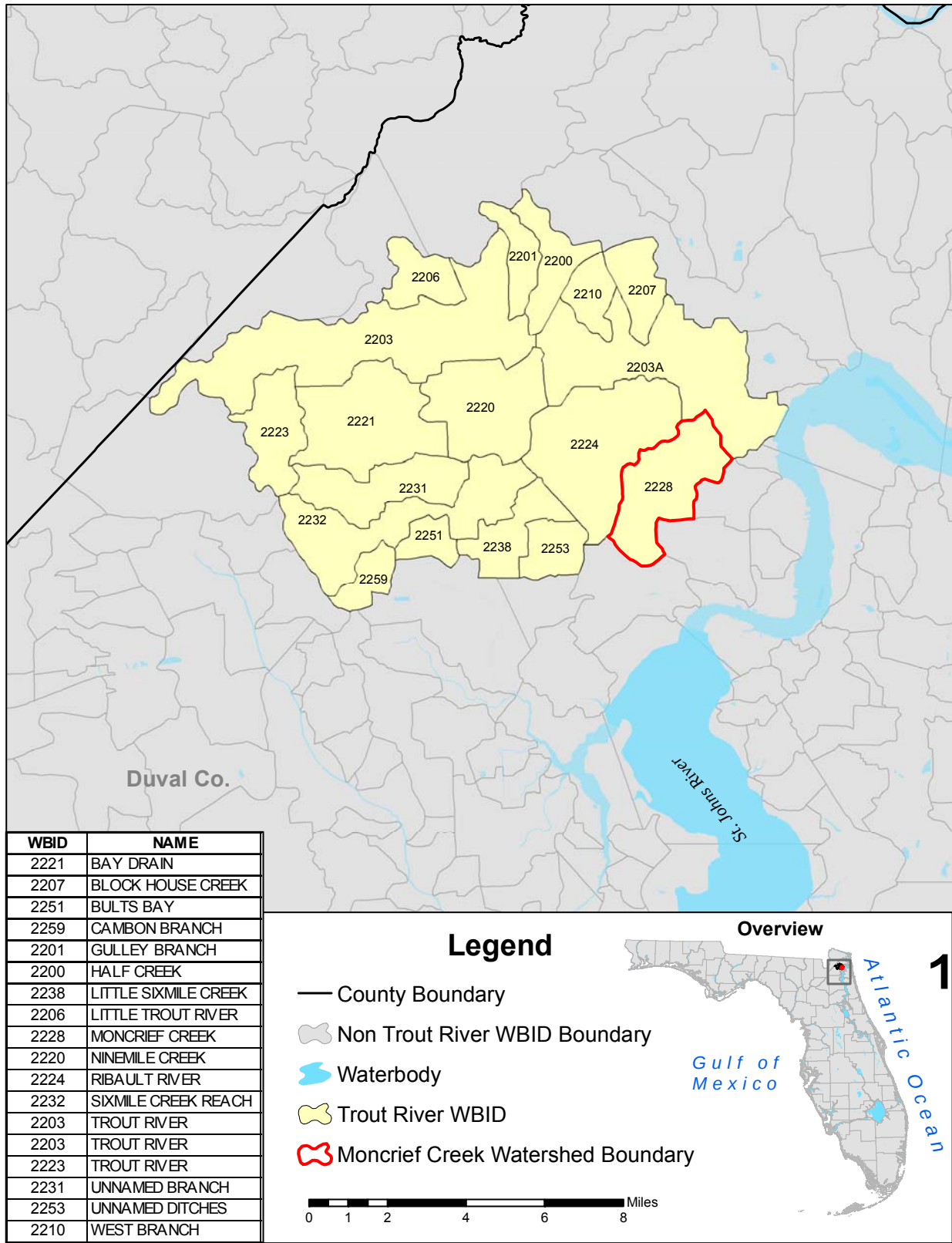


Figure 1.3. WBIDs in the Trout River Planning Unit



### 1.3 Background

This report was developed as part of the Florida Department of Environmental Protection's (Department) watershed management approach for restoring and protecting state waters and addressing TMDL Program requirements. The watershed approach, which is implemented using a cyclical management process that rotates through the state's fifty-two river basins over a five-year cycle, provides a framework for implementing the TMDL Program—related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA, Chapter 99-223, Laws of Florida).

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. TMDLs provide important water quality restoration goals that will guide restoration activities.

This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of fecal and total coliforms that caused the verified impairment of Moncrief Creek. These activities will depend heavily on the active participation of the St. Johns River Water Management District, the City of Jacksonville, Jacksonville Electric Authority (JEA), local businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

# Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

---

## 2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the EPA a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant source in each of these impaired waters on a schedule. The Department has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4]) Florida Statutes [F.S.], and the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list included 55 waterbodies and 277 parameters in the Lower St. Johns River Basin. However, the Florida Watershed Restoration Act (FWRA - Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rulemaking process, the Environmental Regulation Commission adopted the new methodology as Chapter 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001.

## 2.2 Information on Verified Impairment

The Department used the IWR to assess water quality impairments in Moncrief Creek and has verified the creek is impaired for both fecal and total coliforms based on data in the Department's IWR database. **Tables 2.1** through **2.3** provide summary results for fecal and total coliform for the verification period, which for Group 2 waters is January 1, 1996 – June 30, 2003, by month, season, and year, respectively.

There is a 74.1 percent overall exceedance rate for fecal coliforms and a 65.0 percent overall exceedance rate for total coliforms. Fecal coliform exceedances occur in all seasons, however as shown in **Table 2.2**, a greater number occur in the summer months (July – September), and the least amount occur in the winter (January - March). Additionally, the greatest percent of exceedances occurred during the month of August; the least in February (**Table 2.1**). The highest counts occurred during September (25,875 counts/100 mL). February was the only month for which data exist and no exceedances occurred.

Total coliform exceedances occurred in the spring (April – June), summer (July – September), and fall (October – December). The highest number of exceedances occurred in the spring season. No exceedances occurred during the winter season. There were 100% exceedances for the months of May, September, and December.

With respect to sampling stations, many stations do not have but a few samples, which make it difficult to do too much analysis. For fecal coliforms, there are three stations which have more than five samples. When considering fecal coliforms, even using all the data, coliform values seem to decrease going downstream. The trend also appears to exist with the total coliform data, but again,

many of the station have limited data, and overall there is less data than for fecal coliform. Sampling stations are discussed further in **Section 5.1**.

**Table 2.1. Summary of Fecal and Total Coliform Data by Month for Verified Period (January 1, 1996 – June 30, 2003)**

| <b>FECAL COLIFORMS<sup>1</sup></b> |    |         |         |        |        |                    |              |                    |
|------------------------------------|----|---------|---------|--------|--------|--------------------|--------------|--------------------|
| Month                              | N  | Minimum | Maximum | Median | Mean   | No. of Exceedances | % Exceedance | Mean Precipitation |
| January                            | 6  | 120     | 13,000  | 1,960  | 4,702  | 4                  | 66.67%       | 2.39               |
| February                           | 2  | 80      | 130     | 105    | 105    | 0                  | 0.00%        | 3.14               |
| March                              | 4  | 120     | 500     | 436    | 373    | 2                  | 50.00%       | 3.95               |
| April                              | 7  | 70      | 50,000  | 500    | 7,617  | 4                  | 57.14%       | 2.8                |
| May                                | 6  | 180     | 32,000  | 500    | 5,767  | 4                  | 66.67%       | 1.61               |
| June                               | 4  | 36      | 5,000   | 1,900  | 2,209  | 3                  | 75.00%       | 7.40               |
| July                               | 5  | 36      | 24,000  | 7,000  | 7,767  | 4                  | 80.00%       | 6.72               |
| August                             | 10 | 90      | 5,000   | 700    | 1,303  | 7                  | 70.00%       | 6.72               |
| September                          | 4  | 500     | 89,600  | 6,700  | 25,875 | 4                  | 100.00%      | 9.94               |
| October                            | 6  | 40      | 1,300   | 400    | 525    | 3                  | 50.00%       | 3.39               |
| November                           | 1  | 1,300   | 1,300   | 1,300  | 1,300  | 1                  | 100.00%      | 1.81               |
| December                           | 8  | 40      | 12,000  | 1,249  | 4,493  | 4                  | 50.00%       | 3.12               |
| <b>TOTAL COLIFORMS<sup>2</sup></b> |    |         |         |        |        |                    |              |                    |
| Month                              | N  | Minimum | Maximum | Median | Mean   | No. of Exceedances | % Exceedance | Mean Precipitation |
| January                            | 2  | 300     | 667     | 484    | 484    | 0                  | 0.00%        | 2.39               |
| February                           | 2  | 80      | 300     | 190    | 190    | 0                  | 0.00%        | 3.14               |
| March                              | 1  | 900     | 900     | 900    | 900    | 0                  | 0.00%        | 3.95               |
| April                              | 2  | 170     | 800     | 485    | 485    | 0                  | 0.00%        | 2.8                |
| May                                | 2  | 2,833   | 157,000 | 79,917 | 79,917 | 2                  | 100.00%      | 1.61               |
| June                               | 2  | 1,000   | 2,400   | 1,700  | 1,700  | 0                  | 0.00%        | 7.40               |
| July                               | 1  | 240     | 240     | 240    | 240    | 0                  | 0.00%        | 6.72               |
| August                             | 4  | 1,167   | 21,800  | 3,150  | 7,317  | 2                  | 50.00%       | 6.72               |
| September                          | 1  | 7,500   | 7,500   | 7,500  | 7,500  | 1                  | 100.00%      | 9.94               |
| October                            | 2  | 40      | 800     | 420    | 420    | 0                  | 0.00%        | 3.39               |
| November                           | 0  | ---     | ---     | ---    | ---    | ---                | ---          | 1.81               |
| December                           | 2  | 2,500   | 74,800  | 38,650 | 38,650 | 2                  | 100.00%      | 3.12               |

Coliform counts are #/100 mL

<sup>1</sup>Exceedances represent values above 400 counts/100 mL

<sup>2</sup>Exceedances represent values above 2,400 counts/100 mL

Mean precipitation is for Jacksonville International Airport (JIA) in inches

**Table 2.2. Summary of Fecal Coliform Data by Season for Verified Period (January 1, 1996 – June 30, 2003)**

| <b>FECAL COLIFORMS<sup>1</sup></b> |    |         |         |        |        |                    |              |                    |
|------------------------------------|----|---------|---------|--------|--------|--------------------|--------------|--------------------|
| Season                             | N  | Minimum | Maximum | Median | Mean   | No. of Exceedances | % Exceedance | Mean Precipitation |
| Winter                             | 12 | 80      | 13,000  | 500    | 2,493  | 6                  | 50.00%       | 3.16               |
| Spring                             | 17 | 36      | 50,000  | 500    | 5,692  | 11                 | 64.71%       | 3.82               |
| Summer                             | 19 | 36      | 89,600  | 800    | 8,177  | 15                 | 78.95%       | 7.79               |
| Fall                               | 15 | 40      | 12,000  | 500    | 2,693  | 8                  | 53.33%       | 2.77               |
| <b>TOTAL COLIFORMS<sup>2</sup></b> |    |         |         |        |        |                    |              |                    |
| Season                             | N  | Minimum | Maximum | Median | Mean   | No. of Exceedances | % Exceedance | Mean Precipitation |
| Winter                             | 5  | 80      | 900     | 300    | 449    | 0                  | 0.00%        | 3.16               |
| Spring                             | 6  | 170     | 157,000 | 1,700  | 27,367 | 2                  | 33.33%       | 3.82               |
| Summer                             | 5  | 240     | 21,800  | 1,300  | 5,901  | 2                  | 40.00%       | 7.79               |
| Fall                               | 5  | 40      | 74,800  | 2,500  | 17,128 | 3                  | 60.00%       | 2.77               |

Coliform counts are #/100 mL

<sup>1</sup>Exceedances represent values above 400 counts/100 mL

<sup>2</sup>Exceedances represent values above 2,400 counts/100 mL

Mean precipitation is for Jacksonville International Airport (JIA) in inches

Table 2.3. Annual Summaries of Fecal and Total Coliform Data  
for Verified Period (January 1, 1996 – June 30, 2003)

| <b>FECAL COLIFORMS<sup>1</sup></b> |          |                |                |               |             |                           |                     |                            |
|------------------------------------|----------|----------------|----------------|---------------|-------------|---------------------------|---------------------|----------------------------|
| <b>Year</b>                        | <b>N</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Median</b> | <b>Mean</b> | <b>No. of Exceedances</b> | <b>% Exceedance</b> | <b>Total Precipitation</b> |
| 1996                               | 6        | 40             | 2,400          | 400           | 778         | 3                         | 50.00%              | 60.63                      |
| 1997                               | 5        | 70             | 2,100          | 210           | 548         | 1                         | 20.00%              | 57.27                      |
| 1998                               | 12       | 36             | 24,000         | 500           | 3,543       | 7                         | 58.33%              | 56.72                      |
| 1999                               | 8        | 170            | 50,000         | 1,050         | 8,696       | 7                         | 87.50%              | 42.44                      |
| 2000                               | 10       | 40             | 32,000         | 2,350         | 7,314       | 9                         | 90.00%              | 39.77                      |
| 2001                               | 9        | 180            | 5,000          | 700           | 1,381       | 7                         | 77.78%              | 49.14                      |
| 2002                               | 13       | 90             | 89,600         | 398           | 9,029       | 6                         | 46.15%              | 54.72                      |
| <b>TOTAL COLIFORMS<sup>2</sup></b> |          |                |                |               |             |                           |                     |                            |
| <b>Year</b>                        | <b>N</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Median</b> | <b>Mean</b> | <b>No. of Exceedances</b> | <b>% Exceedance</b> | <b>Total Precipitation</b> |
| 1996                               | 5        | 300            | 2,400          | 800           | 1,120       | 0                         | 0.00%               | 60.63                      |
| 1997                               | 4        | 40             | 2,500          | 125           | 698         | 1                         | 25.00%              | 57.27                      |
| 1998                               | 5        | 240            | 5,000          | 900           | 1,488       | 1                         | 20.00%              | 56.72                      |
| 2000                               | 2        | 7,500          | 157,000        | 82,250        | 82,250      | 2                         | 100.00%             | 39.77                      |
| 2001                               | 1        | 667            | 667            | 667           | 667         | 0                         | 0.00%               | 49.14                      |
| 2002                               | 4        | 1,167          | 74,800         | 12,317        | 25,150      | 3                         | 75.00%              | 54.72                      |

Coliform counts are #/100 mL

<sup>1</sup>Exceedances represent values above 400 counts/100 mL

<sup>2</sup>Exceedances represent values above 2,400 counts/100 mL

Mean precipitation is for Jacksonville International Airport (JIA) in inches

## Chapter 3. DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

---

### 3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

Florida's surface waters are protected for five designated use classifications, as follows:

|                  |                                                                                                             |
|------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Class I</b>   | <b>Potable water supplies</b>                                                                               |
| <b>Class II</b>  | <b>Shellfish propagation or harvesting</b>                                                                  |
| <b>Class III</b> | <b>Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife</b> |
| <b>Class IV</b>  | <b>Agricultural water supplies</b>                                                                          |
| <b>Class V</b>   | <b>Navigation, utility, and industrial use (there are no state waters currently in this class)</b>          |

Moncrief Creek is a Class III marine waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criteria applicable to the impairment addressed by this TMDL are fecal and total coliforms.

### 3.2 Applicable Water Quality Standards and Numeric Water Quality Target

#### 3.2.1 Fecal Coliform Criterion

Numeric criteria for bacterial quality are expressed in terms of coliform bacteria concentrations. The water quality criteria for protection of Class III waters, as established by Chapter 62-302, F.A.C., states the following:

***Fecal Coliform Bacteria:***

*The most probable number (MPN) or membrane filter (MF) counts per 100 ml of fecal coliform bacteria shall not exceed a monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day.*

***Total Coliform Bacteria:***

*The MPN per 100 ml shall be less than or equal to 1,000 as a monthly average nor exceed 1,000 in more than 20 percent of the samples examined during any month; and less than or equal to 2,400 at any time.*

The criteria state that monthly averages shall be expressed as geometric means based on a minimum of ten samples taken over a thirty-day period. However, there were insufficient data (less than 10 samples in a given month) available to evaluate the geometric mean criterion for fecal coliform bacteria. Therefore, the criterion selected for the TMDLs was not to exceed 400 for fecal coliforms, nor exceed 2,400 for total coliforms.

## Chapter 4: ASSESSMENT OF SOURCES

---

### 4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of nutrients in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either “point sources” or “nonpoint sources.” Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term “nonpoint sources” was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA’s National Pollutant Discharge Elimination Program (NPDES). These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over five acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term “point source” will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) **AND** stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see Section 6.1). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

### 4.2 Potential Sources of Coliforms in Moncrief Creek Watershed

#### 4.2.1 Point Sources

There are four permitted industrial wastewater facilities in the Moncrief Creek watershed. However, only one of the facilities (Millennium Specialty Chemicals, discussed in the next several paragraphs) discharges into Moncrief Creek. Two of the other three facilities are car wash businesses (Speed Wash, permit #FLA011464, and Jax Car Wash, permit #FLA011552), that recycle their wash water and are not permitted to discharge into surface waters. A third facility, First Student, Incorporated (permit #FLR05F474), is located within the watershed, but the outfall for this facility is located in McCoy Creek, an adjoining watershed.

Millennium Specialty Chemicals (permit #FL0000884) is an organic chemicals manufacturing facility. The facility is permitted to discharge 0.600 MGD boiler and cooling tower (non-contact) blowdown,

steam condensate wastewater, and stormwater (treated separately from other waste) into Moncrief Creek. In addition to the surface water discharge, a permit issued Millennium Specialty Chemicals in 2003 allows the First-Tee Golf Course to use 1.3 MGD of the facility's stormwater for course irrigation water, but does not appear to have a discharge permit. Beginning in 1998, the Millennium permit required monitoring for both total and fecal coliforms, and the Department has fecal and total coliform monitoring data beginning in August 1998.

Due to facility construction, an exemption from the fecal coliform state criterion of 800 counts/100 mL daily maximum was granted in 1998, and ended April 2001. The exemption allowed for a daily limit of 4,500 counts/100 mL. During this time, the 4,500 counts/100 mL was exceeded twice (in August and September 1999, daily maximum counts were 6,500 and 7,000 counts/100 mL, respectively). These are the only two reported exceedances of the permitted effluent limits.

An exemption from the state criterion was also granted for total coliforms until April 2001, which allowed a daily maximum of 5,000 counts/100 mL. During this time, the permit limit was exceeded eight times, with the highest discharge concentration of 67,000 counts/100 mL recorded in April 1999. In April 2001, permit limits reverted back to the state criterion of 2,400 counts/100 mL as a daily maximum. From April 2001 through December 2004, that criterion was exceeded seven times, with a maximum discharge concentration of 22,000 counts/100 mL in March 2004. As a result of the earlier exceedances, a warning letter was issued in April 1999, and a Consent Order (#97-1188) and an Administrative Order (#041-NE) were subsequently issued for copper, iron, fecal coliforms, and total coliforms.

Discharge flow from the facility averaged 0.392 MGD from August 1998 – December 2004. Annual summaries of fecal coliform, total coliform, and flow monitoring results from August 1998 – December 2004 for the Millennium facility are presented in **Table 4.1**. Data for these parameters from this time for the facility are presented in **Appendix B**. Using the data from August 1998 – December 2004 (as presented in **Appendix B**), the average fecal coliform loading from the facility is  $1.21 \times 10^{11}$  organisms per day and the average total coliform loading is  $7.49 \times 10^{11}$  organisms per day. Loading estimates based on this data are included in **Appendix C**. From April 2001 – December 2004, which is after the plant upgrades, the average fecal coliform loading was  $1.72 \times 10^9$  organisms per day and  $9.88 \times 10^{10}$  organisms per day for total coliform. There isn't enough sample data to correlate with facility discharge data to determine a potential link between discharge and exceedances. For fecal coliform, there are only seven months in which both facility discharge data and sample data exist. Of those seven months, the highest monthly average discharge for fecal coliform was 50 counts/100 mL. Total coliforms only had two months in which data overlap, making it all the more difficult to make a correlation.

**Table 4.1. Annual Summary of Millennium Specialty Chemicals Discharge Monitoring Data**

| Year  | Fecal Coliform (#/100 mL) |         |         | Total Coliform (#/100 mL) |         |         | Flow (MGD) |         |         |
|-------|---------------------------|---------|---------|---------------------------|---------|---------|------------|---------|---------|
|       | Minimum                   | Maximum | Average | Minimum                   | Maximum | Average | Minimum    | Maximum | Average |
| 1998* | 8                         | 58      | 30      | 56                        | 500     | 270     | 0.574      | 0.761   | 0.689   |
| 1999  | 3                         | 7,000   | 1,750   | 100                       | 67,000  | 12,633  | 0.451      | 0.864   | 0.612   |
| 2000  | 27                        | 3,000   | 673     | 300                       | 30,000  | 6,383   | 0.163      | 0.890   | 0.568   |
| 2001  | 2                         | 240     | 38      | 50                        | 30,000  | 4,286   | 0.102      | 0.365   | 0.259   |
| 2002  | 2                         | 17      | 7       | 17                        | 900     | 471     | 0.105      | 0.400   | 0.298   |
| 2003  | 7                         | 79      | 33      | 27                        | 6,300   | 626     | 0.145      | 0.394   | 0.247   |
| 2004  | 2                         | 70      | 28      | 8                         | 22,000  | 2,221   | 0.123      | 0.920   | 0.258   |

\* Data from 1998 only represents August through December

### Municipal Separate Storm Sewer System Permittees

The City of Jacksonville and the Florida Department of Transportation (FDOT) District 2 are co-permittees for a Phase I NPDES municipal separate storm sewer system (MS4) permit (permit FLS000012) that covers the Moncrief Creek watershed. Responsibility for the permit is shared among FDOT, and the Cities of Jacksonville, Neptune Beach, and Atlantic Beach.

#### 4.2.2 Land Uses and Nonpoint Sources

Additional coliform loadings to Moncrief Creek are generated from nonpoint sources in the basin. Potential nonpoint sources of coliforms include loadings from surface runoff, wildlife, pets, leaking or overflowing sewage lines, and leaking septic tanks.

#### Land Uses

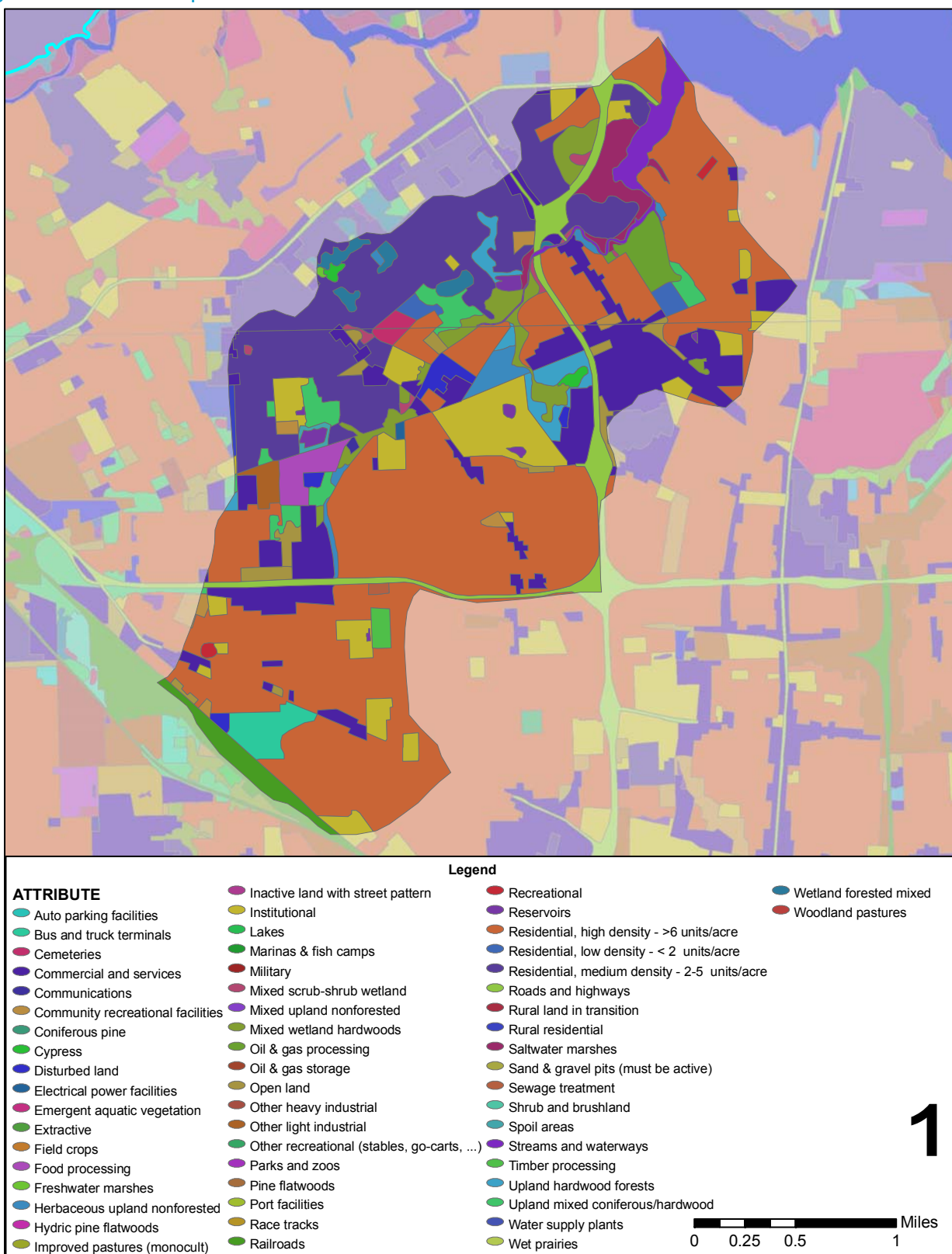
The spatial distribution and acreage of different land use categories were identified using the 2000 land use coverage contained in the Department's Geographic Information System (GIS) library, initially provided by the SJRWMD. Land use categories and acreages in the watershed were aggregated using the Level 3 codes tabulated in **Table 4.2**. **Figure 4.1** shows the principal land uses in the watershed.

The Moncrief Creek watershed is a highly urban area, occupying approximately 5.92 mi<sup>2</sup>. As shown in **Table 4.2**, the majority of the land is high density residential (42.23 percent), followed by medium density residential (15.44 percent). Non-natural land uses, including residential areas (high, medium, and low), institutional uses, commercial services, golf courses, etc., comprise 86.5 percent of the watershed area or 3,281 acres. Natural land use types, such as mixed wetland hardwoods, upland mixed coniferous/hardwoods, streams, mixed scrub-shrub wetlands, etc., comprise 13.5 percent, or 510 acres. According to the land use, there are no livestock agriculture land use types.

**Table 4.2. Classification of Land Use Categories in the Moncrief Creek Watershed**

| Level 3 Land Use Code | Attribute                                                  | Acres           | Percent of Total Area |
|-----------------------|------------------------------------------------------------|-----------------|-----------------------|
| 1300                  | Residential, high density - 6 or more dwelling units/acre  | 1,600.57        | 42.23%                |
| 1200                  | Residential, medium density - 2-5 dwelling units/acre      | 585.15          | 15.44%                |
| 1400                  | Commercial and services                                    | 412.92          | 10.90%                |
| 1700                  | Institutional                                              | 256.50          | 6.77%                 |
| 8140                  | Roads and highways (divided 4-lanes with medians)          | 118.08          | 3.12%                 |
| 6170                  | Mixed wetland hardwoods                                    | 101.42          | 2.68%                 |
| 4340                  | Upland mixed coniferous/hardwood                           | 73.31           | 1.93%                 |
| 5100                  | Streams and waterways                                      | 61.74           | 1.63%                 |
| 6420                  | Saltwater marshes                                          | 57.10           | 1.51%                 |
| 4200                  | Upland hardwood forests                                    | 55.11           | 1.45%                 |
| 1900                  | Open land                                                  | 53.99           | 1.42%                 |
| 8120                  | Railroads                                                  | 47.32           | 1.25%                 |
| 8130                  | Bus and truck terminals                                    | 44.67           | 1.18%                 |
| 1540                  | Oil & gas processing                                       | 40.82           | 1.08%                 |
| 3100                  | Herbaceous upland nonforested                              | 37.98           | 1.00%                 |
| 1510                  | Food processing                                            | 35.88           | 0.95%                 |
| 6300                  | Wetland forested mixed                                     | 29.72           | 0.78%                 |
| 7400                  | Disturbed land                                             | 28.17           | 0.74%                 |
| 1860                  | Community recreational facilities                          | 23.49           | 0.62%                 |
| 1100                  | Residential, low density - less than 2 dwelling units/acre | 20.16           | 0.53%                 |
| 5300                  | Reservoirs - pits, retention ponds, dams                   | 17.74           | 0.47%                 |
| 1550                  | Other light industrial                                     | 16.80           | 0.44%                 |
| 1480                  | Cemeteries                                                 | 13.46           | 0.36%                 |
| 6460                  | Mixed scrub-shrub wetland                                  | 12.27           | 0.32%                 |
| 1520                  | Timber processing                                          | 11.73           | 0.31%                 |
| 6210                  | Cypress                                                    | 8.46            | 0.22%                 |
| 1800                  | Recreational                                               | 6.16            | 0.16%                 |
| 7430                  | Spoil areas                                                | 5.52            | 0.15%                 |
| 1180                  | Rural residential                                          | 4.98            | 0.13%                 |
| 8340                  | Sewage treatment                                           | 3.38            | 0.09%                 |
| 8310                  | Electrical power facilities                                | 2.38            | 0.06%                 |
| 8200                  | Communications                                             | 1.95            | 0.05%                 |
| 6410                  | Freshwater marshes                                         | 1.01            | 0.03%                 |
| <b>Total:</b>         |                                                            | <b>3,789.94</b> | <b>100.00%</b>        |

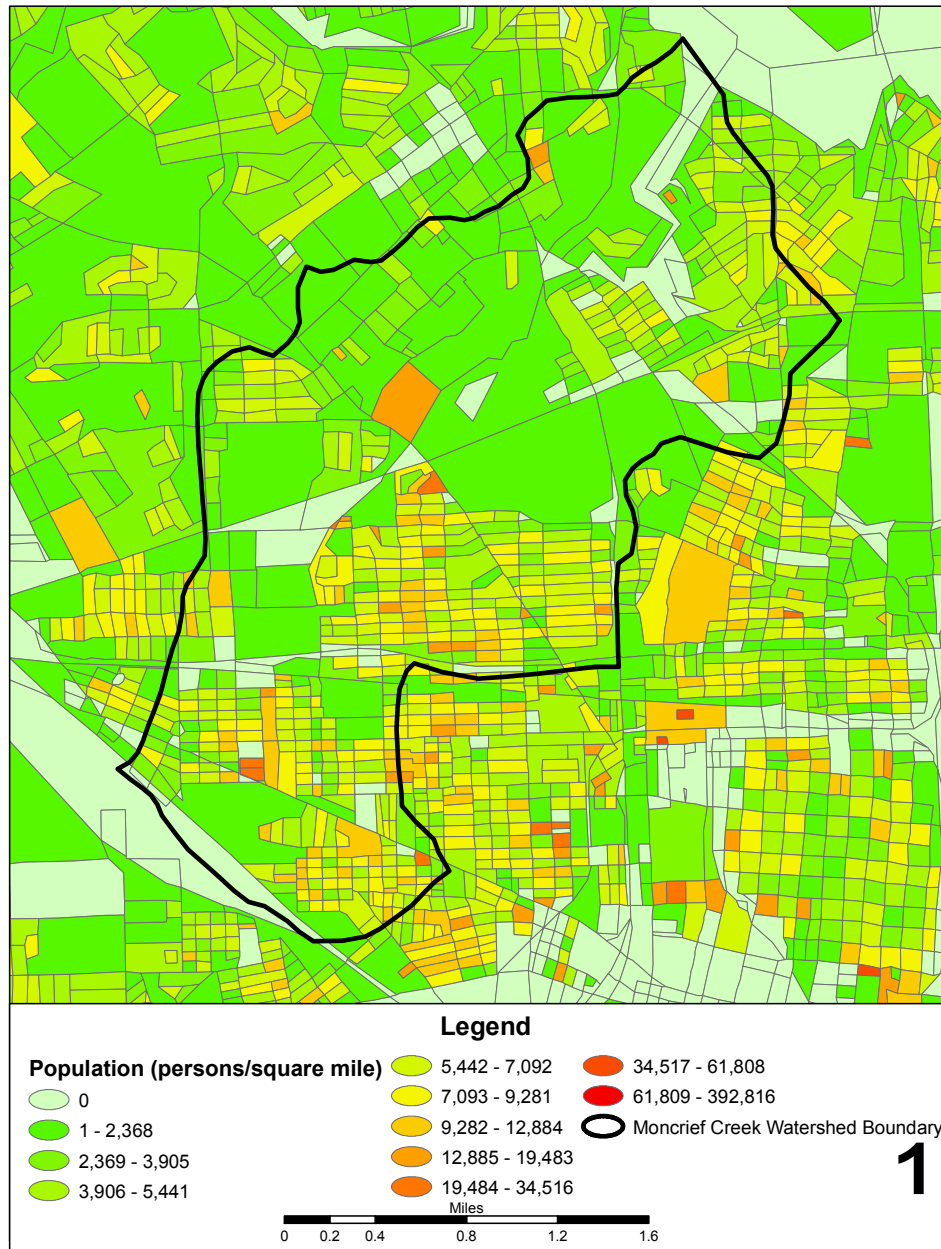
Figure 4.1. Principal Land Uses in the Moncrief Creek Watershed



## Population

According to the U.S Census Bureau, census block population densities in the Moncrief watershed in the year 2000 ranged from 0 – 61,808 persons per square mile, with an average of 3,360 persons per square mile in the watershed (**Figure 4.2**). The Census Bureau reports that for all of Duval County, the total population for 2000 was approximately 780,000, with 329,778 housing units and an average occupancy rate of 92.1 percent (303,747 units). For all of Duval County, the Bureau reported a housing density of 426 houses per square mile. This places Duval County seventh in housing densities and population in Florida (U.S. Census Bureau Web site, 2005).

Figure 4.2. Population Density in the Moncrief Creek Watershed



## Septic Tanks

Using data supplied by the Department of Revenue and Department of Health (DoH), it is estimated that approximately 57 percent of residences within Duval County are connected to a wastewater treatment plant, with the rest utilizing septic tanks (Department of Revenue cadastral data, 2003, and DoH Website). The DoH reports that as of fiscal year 2003-2004, there were 88,834 permitted septic tanks in Duval County (DoH Website). From fiscal years 1994–2004, 4,954 permits for repairs were issued, or an average of approximately 450 repairs annually (DoH Website) countywide.

As noted previously, there are an estimated 3,360 persons/mi<sup>2</sup> in the WBID, or 19,891 persons in the watershed area. The average household in the Moncrief Creek watershed has 2.59 persons (see **Table 4.3**). According to the DoH, there is an annual average of 450 repairs (fiscal years 1994 – 2004) in Duval County. Based on this, there is an average of approximately 4 failures in the Moncrief Creek watershed.

To focus on the Moncrief Creek watershed, the Department obtained septic tank repair permit data from JEA for their service area, which includes the Moncrief Creek watershed. The data include septic tank repair permit records issued from March 1990 – April 2004, areas serviced by a wastewater treatment facility (WWTF), and areas where high numbers of failing septic tanks are present. This information is presented in **Figure 4.3** in map form. The data show there were 114 permits for repairs issued during this time in the watershed, or an average of 8.1 repairs per year. This estimate is twice than estimates based on DoH countywide data.

Some areas of the watershed, mostly in the northern portion, are in septic tank phase out areas, or areas that have the highest priority to be sewerred to eliminate septic tanks due to high failure rates. Approximately 8.78 percent of the watershed is included in one of these areas. Of the 114 repair permits issued, 37 (32.46 percent) are within a septic tank phase out area. This is shown in **Figure 4.3**.

Based on this data provided by JEA, which is more watershed specific than that of the countywide DoH data, there was an average of 8.1 permits issued in the watershed for septic tank repairs. If this estimate is rounded up to 10 (to allow for those septic tanks where failures may not be known or have not been repaired), and using 70 gallons/day/person (U.S. Environmental Protection Agency [USEPA], 2001), a loading of  $6.98 \times 10^{11}$  colonies/day is derived. This estimation is shown in **Table 4.4**.

**Table 4.3. Estimation of Average Household Size in the Moncrief Creek Watershed**

| Household Size                 | No. of Households | Percentage of Total | Number of People |
|--------------------------------|-------------------|---------------------|------------------|
| 1-person household             | 2,275             | 29.61%              | 2,275            |
| 2-person household             | 2,079             | 27.05%              | 4,158            |
| 3-person household             | 1,394             | 18.14%              | 4,182            |
| 4-person household             | 979               | 12.74%              | 3,917            |
| 5-person household             | 548               | 7.13%               | 2,740            |
| 6-person household             | 247               | 3.22%               | 1,483            |
| 7-or-more-person household     | 162               | 2.11%               | 1,136            |
| <b>TOTAL:</b>                  | <b>7,685</b>      | <b>100.00%</b>      | <b>19,891</b>    |
| <b>AVERAGE HOUSEHOLD SIZE:</b> |                   |                     | <b>2.59</b>      |

Data from U.S. Census Bureau web site, 2005, based on Duval County tracts which are present in the Moncrief Creek watershed

**Table 4.4. Estimation of Annual Fecal Coliform Loading from Failed Septic Tanks in the Moncrief Creek Watershed**

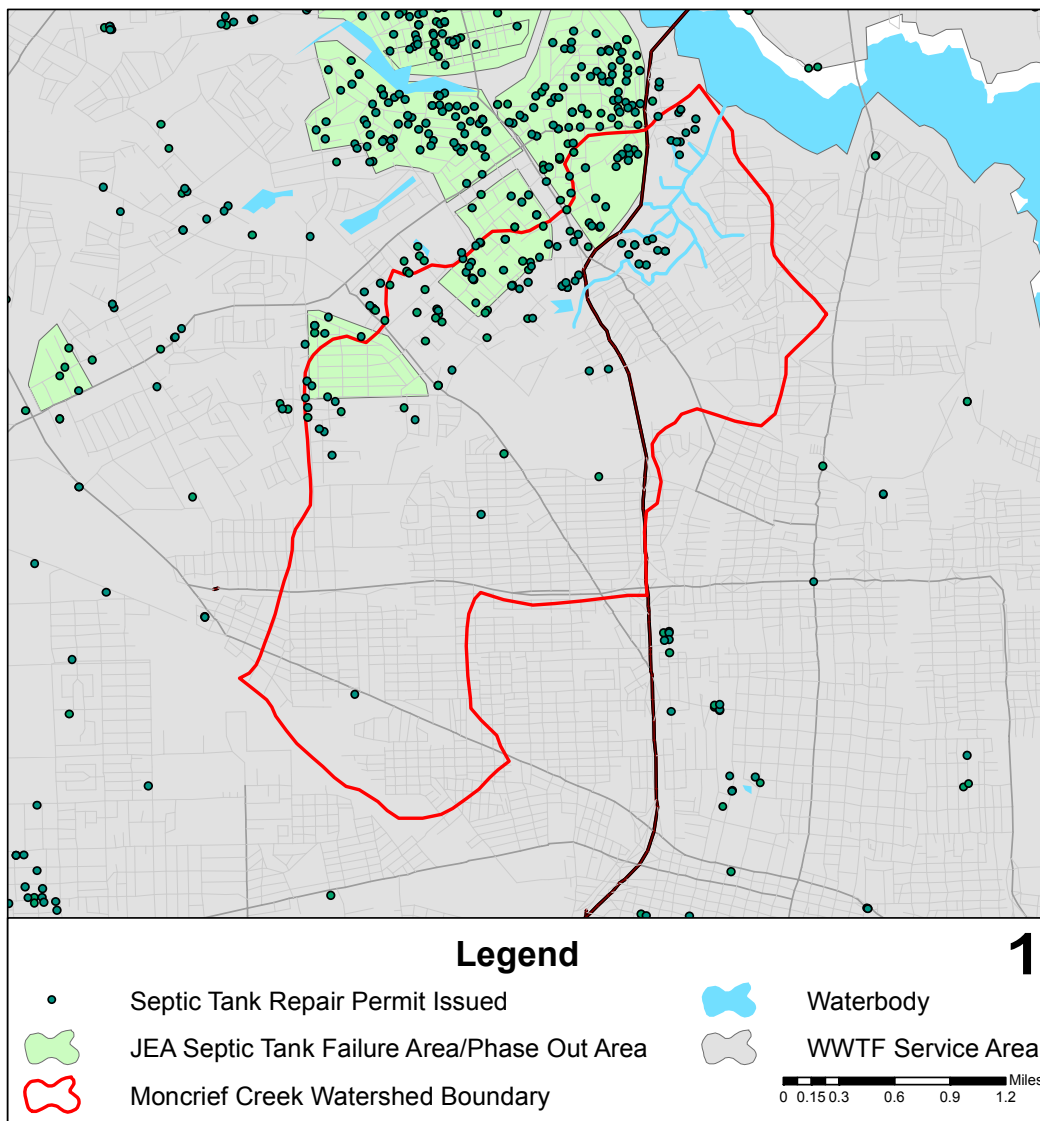
| Estimated Population Density and Area      | WBID Area (mi <sup>2</sup> ) | Estimated Population in Watershed | Estimated Number of Tank Failures <sup>1</sup> | Estimated Load From Failed Tank <sup>2</sup> | Gallons/Person/Day <sup>2</sup> | Estimated Number Persons Per Household <sup>3</sup> | Estimated Load From Failing Tanks |
|--------------------------------------------|------------------------------|-----------------------------------|------------------------------------------------|----------------------------------------------|---------------------------------|-----------------------------------------------------|-----------------------------------|
| 3,360 persons/mi <sup>2</sup> in WBID 2228 | 5.92                         | 19,891                            | 10                                             | 1.00 x 10 <sup>4</sup> /mL                   | 70                              | 2.59                                                | 6.86 x 10 <sup>11</sup>           |

<sup>1</sup> Based on septic tank repair permits issued in the watershed from March 1990 – April 2004 (Fl. DoH and JEA information) – see text

<sup>2</sup> From EPA document "Protocol for Developing Pathogen TMDLs."

<sup>3</sup> From U.S Census Bureau, see Table 4.3 for more information on this estimate.

**Figure 4.3. Septic Tank Repair Permits Issued March 1990 – April 2004 for Moncrief Creek Area**



## Agricultural Sources

According to level 3 land use, there are no agricultural type land uses in the Moncrief Creek watershed. As noted in **Section 4.2.2**, the majority of the land use (86.5 percent) consists of residential and commercial and services, and other non-natural categories.

## Pets

While it is doubtful that agriculture has very little, if any, influence on the basin, it is very possible that pets, especially dogs, are having an impact on the waterbody. The Department has been unable to obtain numbers of dogs in the area; however, estimates can be made using literature based values of dog ownership rates (**Table 4.4**). For example, using household-to-dog ratio estimates from the American Veterinary Medical Association (AVMA), and assuming that coliforms from 10 percent of dogs reach the waterbody and are viable upon reaching it, the approximate loading would be  $1.39 \times 10^{12}$  organisms/day. This is an estimate, as the actual loading from dogs is not known.

**Table 4.6. Estimated Loading from Dogs in the Moncrief Creek Watershed**

| Pet  | Estimated No. of Households in 2322 | Estimated Household:Pet Ratio <sup>1</sup> | Estimated Total Dog Population in Watershed | Estimated Loading of Total | Estimated No. of Pets with Impact to Creek | Estimated Counts/Pet/Day <sup>2</sup> | Estimated Counts/Day  |
|------|-------------------------------------|--------------------------------------------|---------------------------------------------|----------------------------|--------------------------------------------|---------------------------------------|-----------------------|
| Dogs | 7,685                               | 0.361                                      | 2,774                                       | 10%                        | 277                                        | $5 \times 10^9$                       | $1.39 \times 10^{12}$ |

<sup>1</sup>From the American Veterinary Medical Association website, which states the original source to be the "U.S Pet Ownership and Demographics Sourcebook," 2002.

<sup>2</sup>From EPA document, "Protocol for Developing Pathogen TMDLs," 2001.

## Leaking or Overflowing Wastewater Collection Systems

As noted previously, it has been estimated that 57 percent of households in Duval County are connected to wastewater facilities. Assuming 7,685 homes in the watershed, with 2.59 people per home, and a 70 gallon per person per day discharge, and also assuming that the countywide average of 57 percent are connected to a WWTF applies in Moncrief Creek, a daily flow of approximately  $3.00 \times 10^6$  L (0.793 MGD) is transported through the collection system. The EPA Protocol for Developing Pathogen TMDLs (EPA, 2001) suggests that a 5% leakage rate from collection systems is realistic. Based on this and EPA values for fecal and total coliforms in raw sewage, the potential loadings of fecal and total coliforms from leaking sewer lines are  $7.50 \times 10^{13}$  and  $1.50 \times 10^{16}$  organisms/day, respectively (**Table 4.7**).

**Table 4.7. Estimated Loading from the Wastewater Collection Systems**

| Coliforms | Estimated Homes on Central Sewer | Estimated Daily Flow (L) | Daily Leakage (L)  | Raw Sewage Counts/100ml | Estimated Counts/Day  |
|-----------|----------------------------------|--------------------------|--------------------|-------------------------|-----------------------|
| Fecals    | 4,380                            | $3.00 \times 10^6$       | $1.50 \times 10^4$ | $5 \times 10^6$         | $7.50 \times 10^{12}$ |
| Totals    | 4,380                            | $3.00 \times 10^6$       | $1.50 \times 10^4$ | $1 \times 10^9$         | $1.50 \times 10^{15}$ |

**Table 4.8** summarizes the various estimates from various sources. It is important to note that this is not a complete list (wildlife, for example, is missing) and represents estimates of potential loadings. Proximity to the waterbody, rainfall frequency and magnitude, and temperature are just a few of the factors that could influence and determine the actual loadings from these sources that reach the Cedar River.

Table 4.8. Summary of Estimated Potential Coliform Loading From Various Sources  
the Cedar River Watershed

| Source             | Fecal Coliforms       | Total Coliforms        |
|--------------------|-----------------------|------------------------|
| Septic Tanks       | $6.86 \times 10^{11}$ | $>6.86 \times 10^{11}$ |
| Pets               | $1.39 \times 10^{12}$ | $>1.39 \times 10^{12}$ |
| Collection Systems | $7.50 \times 10^{13}$ | $1.50 \times 10^{15}$  |

# Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

## 5.1 Determination of Loading Capacity

The methodology used for this TMDL was the “percent reduction” methodology. The Department generally prefers to use the load duration curve or “Kansas” method for coliform TMDLs, but this method could not be used because there are no stream gauging stations on Moncrief Creek. To determine the TMDL, the percent reduction that would be required for each of the exceedances to meet applicable criteria was determined, and the median value of all of these reductions for both fecal and total coliforms determined the overall required reduction, and therefore the TMDL.

### 5.1.1 Data Used in the Determination of the TMDL

There are seven sampling stations in Moncrief Creek that have historical coliform observations. The primary data collector of historical data is the City of Jacksonville, with some data being collected by the Department and the SJRWMD. **Table 5.1** shows summaries, by station, of the Department's data inventory for Moncrief Creek. **Figure 5.1** shows the location of the sample sites, and **Table 5.2** provides a brief overview data from each site. **Figures 5.2** and **5.3** are charts showing the observed historical data over time, and **Appendices D** and **E** contain all historical observations for fecal and total coliforms from all sites. **Table 4.5** shows average coliform counts by year.

**Table 5.1. Sampling Station Summary for the Moncrief Creek Watershed**

| FECAL COLIFORMS                   |                  |                                   |                      |    |
|-----------------------------------|------------------|-----------------------------------|----------------------|----|
| Station                           | STORET ID        | Station Owner                     | Year(s) with Data    | N  |
| MONCRIEF CR @ 26TH ST.            | 21FLA 20030576   | FL. DEPT. OF ENV. PROT.           | 1998                 | 1  |
| MONCRIEF CR AT MONCRIEF ROAD      | 21FLA 20030726   | FL. DEPT. OF ENV. PROT.           | 2000-2001            | 3  |
| MONCRIEF CR N OF 33RD ST BRID     | 21FLA 20030316   | FL. DEPT. OF ENV. PROT.           | 2002                 | 2  |
| MONCRIEF CREEK AT 33RD. STREET    | 21FLJXWQTR316    | CITY OF JACKSONVILLE              | 1991-1995; 1998-2002 | 41 |
| MONCRIEF CREEK AT HWY 111         | 21FLSJWMLSJ907   | ST. JOHNS RIVER WATER MAN. DISTR. | 1992-1993            | 4  |
| MONCRIEF CREEK AT LEM TURNER ROAD | 21FLJXWQTR114    | CITY OF JACKSONVILLE              | 1991-1996; 1998-2002 | 4  |
| MONCRIEF CREEK NEAR MOUTH         | 21FLSJWM20030115 | ST. JOHNS RIVER WATER MAN. DISTR. | 1995-1998            | 17 |
| TOTAL COLIFORMS                   |                  |                                   |                      |    |
| Station                           | STORET ID        | Station Owner                     | Year(s) with Data    | N  |
| MONCRIEF CR @ 26TH ST.            | 21FLA 20030576   | FL. DEPT. OF ENV. PROT.           | 1998                 | 1  |
| MONCRIEF CR AT MONCRIEF ROAD      | 21FLA 20030726   | FL. DEPT. OF ENV. PROT.           | 2000-2001            | 3  |
| MONCRIEF CR N OF 33RD ST BRID     | 21FLA 20030316   | FL. DEPT. OF ENV. PROT.           | 2002                 | 3  |
| MONCRIEF CREEK AT 33RD. STREET    | 21FLJXWQTR316    | CITY OF JACKSONVILLE              | 1991-1995            | 18 |
| MONCRIEF CREEK NEAR MOUTH         | 21FLSJWM20030115 | ST. JOHNS RIVER WATER MAN. DISTR. | 1995-1998            | 16 |

Figure 5.1. Sampling Sites with Historical Data in Moncrief Creek Watershed



Table 5.2. Statistical Table of Observed Historical Coliform Data for Moncrief Creek

| FECAL COLIFORMS                   |    |         |         |        |        |             |               |
|-----------------------------------|----|---------|---------|--------|--------|-------------|---------------|
| Station                           | N  | Minimum | Maximum | Median | Mean   | Exceedances | % Exceedances |
| MONCRIEF CR @ 26TH ST.            | 1  | 1,800   | 1,800   | 1,800  | 1,800  | 1           | 100.00%       |
| MONCRIEF CR AT MONCRIEF ROAD      | 3  | 920     | 32,000  | 11,440 | 1,400  | 3           | 100.00%       |
| MONCRIEF CR N OF 33RD ST BRIDGE   | 2  | 12,000  | 89,600  | 50,800 | 50,800 | 2           | 100.00%       |
| MONCRIEF CREEK AT 33RD. STREET    | 42 | 40      | 28,000  | 4,714  | 2,350  | 36          | 85.71%        |
| MONCRIEF CREEK AT HWY 111         | 4  | 20      | 835     | 505    | 582    | 3           | 75.00%        |
| MONCRIEF CREEK AT LEM TURNER ROAD | 39 | 90      | 160,000 | 9,442  | 1,300  | 30          | 76.92%        |
| MONCRIEF CREEK NEAR MOUTH         | 17 | 36      | 2,400   | 562    | 130    | 5           | 29.41%        |
| TOTAL COLIFORMS                   |    |         |         |        |        |             |               |
| Station                           | N  | Minimum | Maximum | Median | Mean   | Exceedances | % Exceedances |
| MONCRIEF CR @ 26TH ST.            | 1  | 5,000   | 5,000   | 5,000  | 5,000  | 1           | 100.00%       |
| MONCRIEF CR AT MONCRIEF ROAD      | 3  | 667     | 157,000 | 55,056 | 7,500  | 2           | 66.67%        |
| MONCRIEF CR N OF 33RD ST BRID     | 3  | 2,833   | 74,800  | 33,144 | 21,800 | 3           | 100.00%       |
| MONCRIEF CREEK AT 33RD. STREET    | 18 | 2,300   | 160,000 | 57,794 | 26,000 | 17          | 94.44%        |
| MONCRIEF CREEK AT LEM TURNER ROAD | 18 | 800     | 160,000 | 33,661 | 9,000  | 13          | 72.22%        |
| MONCRIEF CREEK NEAR MOUTH         | 16 | 40      | 5,000   | 1,221  | 850    | 2           | 12.50%        |

Coliform concentrations are #/100 mL

Figure 5.2. Historical Fecal Coliform Observations for Moncrief Creek

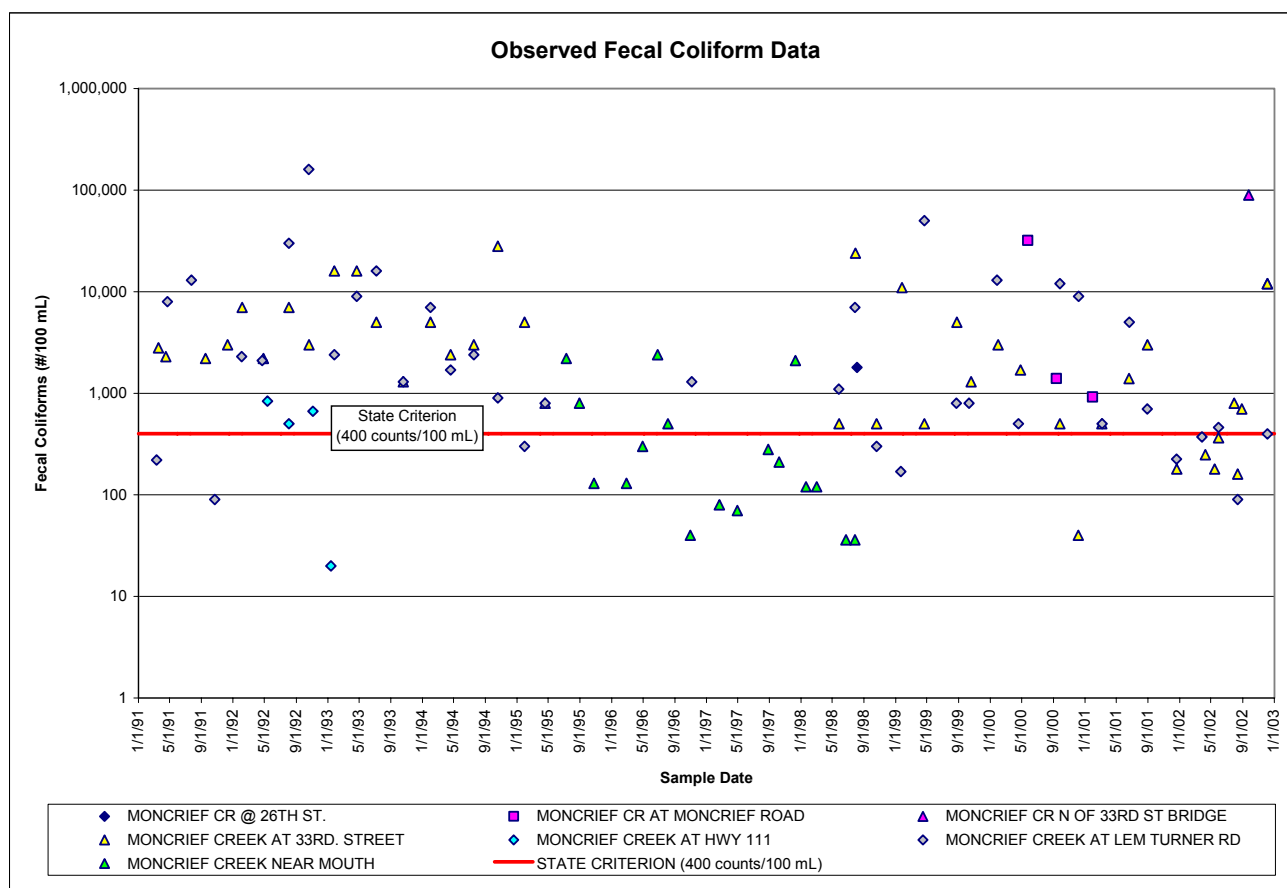
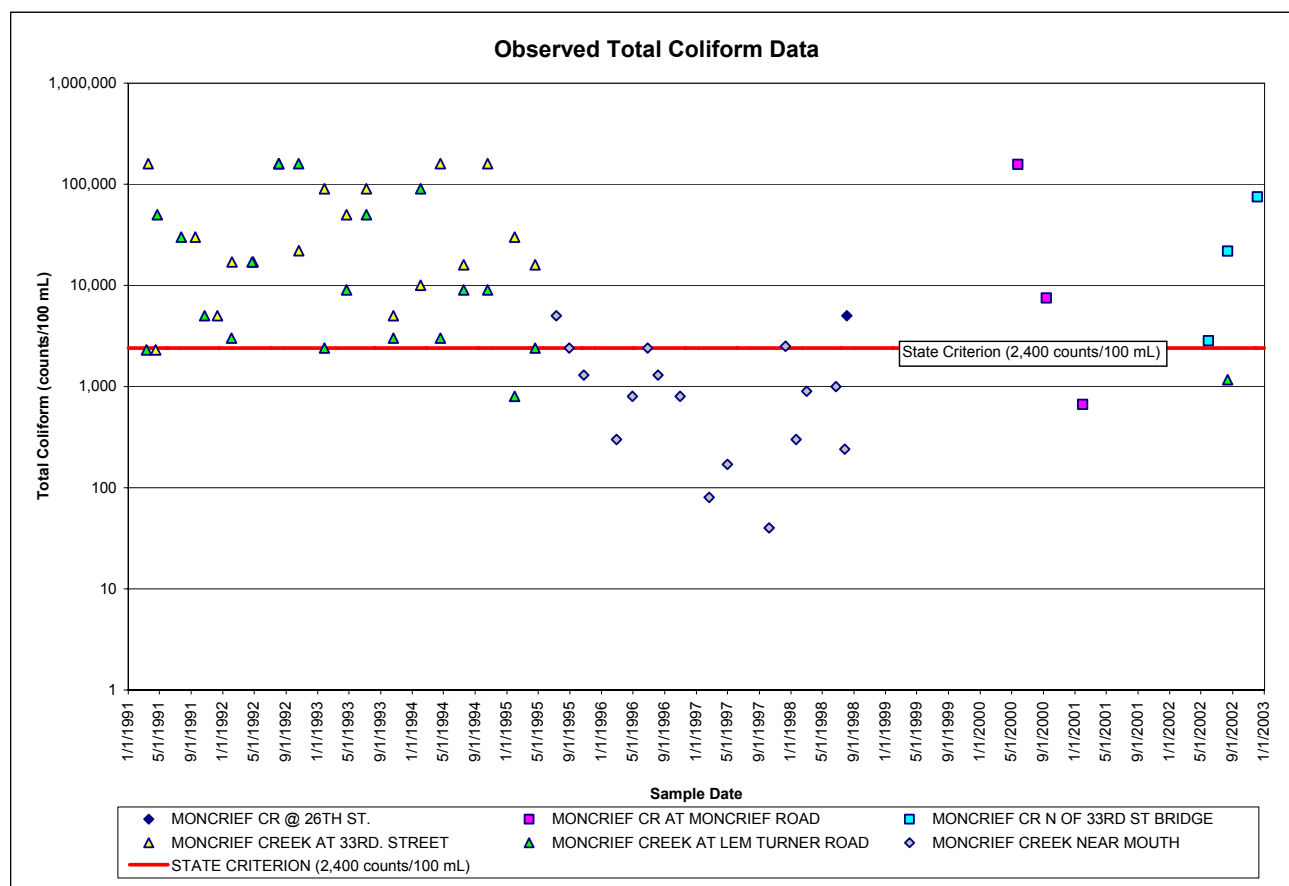


Figure 5.3. Historical Observations Total Coliforms for Moncrief Creek



### 5.1.2 TMDL Development Process

Due to the lack of flow data, a simple calculation was performed to determine the needed reduction. Exceedances of the state criterion for fecal coliforms were compared to the criterion of 400 counts/100mL and exceedances of the total coliforms criterion were compared to 2,400 counts/100 mL. For each individual exceedance, the individual required reduction was calculated using the following:

$$\frac{[(\text{observed value}) - (\text{state criterion})] \times 100}{(\text{observed value})}$$

After the individual results were calculated, the median of the individual values was calculated, which is 83 percent for fecal coliforms and 97 percent for total coliforms. This means that in order to meet the applicable state criteria, an 83 percent reduction in current loading for fecal coliforms and a 98 percent reduction in current loading for total coliforms are necessary, and are therefore the TMDLs for Moncrief Creek. **Table 5.3** shows the individual reduction calculations for fecal coliforms, and **Table 5.4** shows them for total coliforms.

**Table 5.3. Calculation of Reductions for the Fecal Coliform TMDL for Moncrief Creek**

| DATE     | LOCATION                       | VALUE   | REQUIRED REDUCTION |
|----------|--------------------------------|---------|--------------------|
| 3/19/91  | MONCRIEF CREEK AT 33RD. STREET | 2,800   | 85.71%             |
| 4/16/91  | MONCRIEF CREEK AT 33RD. STREET | 2,300   | 82.61%             |
| 4/23/91  | MONCRIEF CR. AT LEM TURNER RD  | 8,000   | 95.00%             |
| 7/24/91  | MONCRIEF CR. AT LEM TURNER RD  | 13,000  | 96.92%             |
| 9/16/91  | MONCRIEF CREEK AT 33RD. STREET | 2,200   | 81.82%             |
| 12/11/91 | MONCRIEF CREEK AT 33RD. STREET | 3,000   | 86.67%             |
| 2/3/92   | MONCRIEF CR. AT LEM TURNER RD  | 2,300   | 82.61%             |
| 2/5/92   | MONCRIEF CREEK AT 33RD. STREET | 7,000   | 94.29%             |
| 4/22/92  | MONCRIEF CR. AT LEM TURNER RD  | 2,100   | 80.95%             |
| 4/27/92  | MONCRIEF CREEK AT 33RD. STREET | 2,200   | 81.82%             |
| 5/13/92  | MONCRIEF CREEK AT HWY 111      | 835     | 52.10%             |
| 8/3/92   | MONCRIEF CREEK AT HWY 111      | 500     | 20.00%             |
| 8/3/92   | MONCRIEF CR. AT LEM TURNER RD  | 30,000  | 98.67%             |
| 8/3/92   | MONCRIEF CREEK AT 33RD. STREET | 7,000   | 94.29%             |
| 10/19/92 | MONCRIEF CR. AT LEM TURNER RD  | 160,000 | 99.75%             |
| 10/20/92 | MONCRIEF CREEK AT 33RD. STREET | 3,000   | 86.67%             |
| 11/4/92  | MONCRIEF CREEK AT HWY 111      | 664     | 39.76%             |
| 1/26/93  | MONCRIEF CREEK AT 33RD. STREET | 16,000  | 97.50%             |
| 1/26/93  | MONCRIEF CR. AT LEM TURNER RD  | 2,400   | 83.33%             |
| 1/26/93  | MONCRIEF CREEK AT 33RD. STREET | 16,000  | 97.50%             |
| 4/22/93  | MONCRIEF CR. AT LEM TURNER RD  | 9,000   | 95.56%             |
| 4/22/93  | MONCRIEF CREEK AT 33RD. STREET | 16,000  | 97.50%             |
| 7/7/93   | MONCRIEF CREEK AT 33RD. STREET | 5,000   | 92.00%             |
| 7/7/93   | MONCRIEF CR. AT LEM TURNER RD  | 16,000  | 97.50%             |
| 10/19/93 | MONCRIEF CR. AT LEM TURNER RD  | 1,300   | 69.23%             |
| 10/19/93 | MONCRIEF CREEK AT 33RD. STREET | 1,300   | 69.23%             |
| 2/1/94   | MONCRIEF CREEK AT 33RD. STREET | 5,000   | 92.00%             |
| 2/1/94   | MONCRIEF CR. AT LEM TURNER RD  | 7,000   | 94.29%             |
| 4/19/94  | MONCRIEF CREEK AT 33RD. STREET | 2,400   | 83.33%             |
| 4/19/94  | MONCRIEF CR. AT LEM TURNER RD  | 1,700   | 76.47%             |
| 4/19/94  | MONCRIEF CREEK AT 33RD. STREET | 2,400   | 83.33%             |
| 7/18/94  | MONCRIEF CR. AT LEM TURNER RD  | 2,400   | 83.33%             |
| 7/18/94  | MONCRIEF CREEK AT 33RD. STREET | 3,000   | 86.67%             |
| 10/18/94 | MONCRIEF CR. AT LEM TURNER RD  | 900     | 55.56%             |
| 10/18/94 | MONCRIEF CREEK AT 33RD. STREET | 28,000  | 98.57%             |
| 1/30/95  | MONCRIEF CREEK AT 33RD. STREET | 5,000   | 92.00%             |
| 4/19/95  | MONCRIEF CR. AT LEM TURNER RD  | 800     | 50.00%             |
| 4/19/95  | MONCRIEF CREEK AT 33RD. STREET | 800     | 50.00%             |
| 7/10/95  | MONCRIEF CREEK NEAR MOUTH      | 2,200   | 81.82%             |
| 8/29/95  | MONCRIEF CREEK NEAR MOUTH      | 800     | 50.00%             |

| DATE           | LOCATION                       | VALUE        | REQUIRED REDUCTION |
|----------------|--------------------------------|--------------|--------------------|
| 6/26/96        | MONCRIEF CREEK NEAR MOUTH      | 2,400        | 83.33%             |
| 8/5/96         | MONCRIEF CREEK NEAR MOUTH      | 500          | 20.00%             |
| 11/5/96        | MONCRIEF CR. AT LEM TURNER RD  | 1,300        | 69.23%             |
| 12/10/97       | MONCRIEF CREEK NEAR MOUTH      | 2,100        | 80.95%             |
| 5/26/98        | MONCRIEF CR. AT LEM TURNER RD  | 1,100        | 63.64%             |
| 5/27/98        | MONCRIEF CREEK AT 33RD. STREET | 500          | 20.00%             |
| 7/27/98        | MONCRIEF CR. AT LEM TURNER RD  | 7,000        | 94.29%             |
| 7/27/98        | MONCRIEF CR. AT LEM TURNER RD  | 7,000        | 94.29%             |
| 7/29/98        | MONCRIEF CREEK AT 33RD. STREET | 24,000       | 98.33%             |
| 8/4/98         | MONCRIEF CR @ 26TH ST.         | 1,800        | 77.78%             |
| 10/19/98       | MONCRIEF CREEK AT 33RD. STREET | 500          | 20.00%             |
| 1/25/99        | MONCRIEF CREEK AT 33RD. STREET | 11,000       | 96.36%             |
| 4/21/99        | MONCRIEF CREEK AT 33RD. STREET | 500          | 20.00%             |
| 4/21/99        | MONCRIEF CR. AT LEM TURNER RD  | 50,000       | 99.20%             |
| 8/23/99        | MONCRIEF CR. AT LEM TURNER RD  | 800          | 50.00%             |
| 8/25/99        | MONCRIEF CREEK AT 33RD. STREET | 5,000        | 92.00%             |
| 10/11/99       | MONCRIEF CR. AT LEM TURNER RD  | 800          | 50.00%             |
| 10/19/99       | MONCRIEF CREEK AT 33RD. STREET | 1,300        | 69.23%             |
| 1/26/00        | MONCRIEF CR. AT LEM TURNER RD  | 13,000       | 96.92%             |
| 1/31/00        | MONCRIEF CREEK AT 33RD. STREET | 3,000        | 86.67%             |
| 4/18/00        | MONCRIEF CR. AT LEM TURNER RD  | 500          | 20.00%             |
| 4/26/00        | MONCRIEF CREEK AT 33RD. STREET | 1,700        | 76.47%             |
| 5/25/00        | MONCRIEF CR AT MONCRIEF ROAD   | 32,000       | 98.75%             |
| 9/12/00        | MONCRIEF CR AT MONCRIEF ROAD   | 1,400        | 71.43%             |
| 9/25/00        | MONCRIEF CR. AT LEM TURNER RD  | 12,000       | 96.67%             |
| 9/25/00        | MONCRIEF CREEK AT 33RD. STREET | 500          | 20.00%             |
| 12/6/00        | MONCRIEF CR. AT LEM TURNER RD  | 9,000        | 95.56%             |
| 1/30/01        | MONCRIEF CR AT MONCRIEF ROAD   | 920          | 56.52%             |
| 3/6/01         | MONCRIEF CREEK AT 33RD. STREET | 500          | 20.00%             |
| 3/7/01         | MONCRIEF CR. AT LEM TURNER RD  | 500          | 20.00%             |
| 6/19/01        | MONCRIEF CREEK AT 33RD. STREET | 1,400        | 71.43%             |
| 6/20/01        | MONCRIEF CR. AT LEM TURNER RD  | 5,000        | 92.00%             |
| 8/28/01        | MONCRIEF CR. AT LEM TURNER RD  | 700          | 42.86%             |
| 8/29/01        | MONCRIEF CREEK AT 33RD. STREET | 3,000        | 86.67%             |
| 5/30/02        | MONCRIEF CR. AT LEM TURNER RD  | 460          | 13.04%             |
| 7/30/02        | MONCRIEF CREEK AT 33RD. STREET | 800          | 50.00%             |
| 8/28/02        | MONCRIEF CREEK AT 33RD. STREET | 700          | 42.86%             |
| 9/24/02        | MONCRIEF CR N OF 33RD ST BRID  | 89,600       | 99.55%             |
| 12/5/02        | MONCRIEF CR N OF 33RD ST BRID  | 12,000       | 96.67%             |
| 12/5/02        | MONCRIEF CREEK AT 33RD. STREET | 12,000       | 96.67%             |
| <b>MEDIAN:</b> |                                | <b>2,600</b> | <b>84.52%</b>      |

Table 5.4. Calculation of Reductions for the Total Coliform TMDL for Moncrief Creek

| DATE           | LOCATION                          | VALUE         | REQUIRED REDUCTION |
|----------------|-----------------------------------|---------------|--------------------|
| 3/19/1991      | MONCRIEF CREEK AT 33RD. STREET    | 160,000       | 99.75%             |
| 4/23/1991      | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000        | 99.20%             |
| 7/24/1991      | MONCRIEF CREEK AT LEM TURNER ROAD | 30,000        | 98.67%             |
| 9/16/1991      | MONCRIEF CREEK AT 33RD. STREET    | 30,000        | 98.67%             |
| 10/22/1991     | MONCRIEF CREEK AT LEM TURNER ROAD | 5,000         | 92.00%             |
| 12/11/1991     | MONCRIEF CREEK AT 33RD. STREET    | 5,000         | 92.00%             |
| 2/3/1992       | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000         | 86.67%             |
| 2/5/1992       | MONCRIEF CREEK AT 33RD. STREET    | 17,000        | 97.65%             |
| 4/22/1992      | MONCRIEF CREEK AT LEM TURNER ROAD | 17,000        | 97.65%             |
| 4/27/1992      | MONCRIEF CREEK AT 33RD. STREET    | 17,000        | 97.65%             |
| 8/3/1992       | MONCRIEF CREEK AT 33RD. STREET    | 160,000       | 99.75%             |
| 8/3/1992       | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000       | 99.75%             |
| 10/19/1992     | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000       | 99.75%             |
| 10/20/1992     | MONCRIEF CREEK AT 33RD. STREET    | 22,000        | 98.18%             |
| 1/26/1993      | MONCRIEF CREEK AT 33RD. STREET    | 90,000        | 99.56%             |
| 4/22/1993      | MONCRIEF CREEK AT 33RD. STREET    | 50,000        | 99.20%             |
| 4/22/1993      | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000         | 95.56%             |
| 7/7/1993       | MONCRIEF CREEK AT 33RD. STREET    | 90,000        | 99.56%             |
| 7/7/1993       | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000        | 99.20%             |
| 10/19/1993     | MONCRIEF CREEK AT 33RD. STREET    | 5,000         | 92.00%             |
| 10/19/1993     | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000         | 86.67%             |
| 2/1/1994       | MONCRIEF CREEK AT 33RD. STREET    | 10,000        | 96.00%             |
| 2/1/1994       | MONCRIEF CREEK AT LEM TURNER ROAD | 90,000        | 99.56%             |
| 4/19/1994      | MONCRIEF CREEK AT 33RD. STREET    | 160,000       | 99.75%             |
| 4/19/1994      | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000         | 86.67%             |
| 7/18/1994      | MONCRIEF CREEK AT 33RD. STREET    | 16,000        | 97.50%             |
| 7/18/1994      | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000         | 95.56%             |
| 10/18/1994     | MONCRIEF CREEK AT 33RD. STREET    | 160,000       | 99.75%             |
| 10/18/1994     | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000         | 95.56%             |
| 1/30/1995      | MONCRIEF CREEK AT 33RD. STREET    | 30,000        | 98.67%             |
| 4/19/1995      | MONCRIEF CREEK AT 33RD. STREET    | 16,000        | 97.50%             |
| 7/10/1995      | MONCRIEF CREEK NEAR MOUTH         | 5,000         | 92.00%             |
| 12/10/1997     | MONCRIEF CREEK NEAR MOUTH         | 2,500         | 84.00%             |
| 8/4/1998       | MONCRIEF CR @ 26TH ST.            | 5,000         | 92.00%             |
| 5/25/2000      | MONCRIEF CR AT MONCRIEF ROAD      | 157,000       | 99.75%             |
| 9/12/2000      | MONCRIEF CR AT MONCRIEF ROAD      | 7,500         | 94.67%             |
| 5/30/2002      | MONCRIEF CR N OF 33RD ST BRID     | 2,833         | 85.88%             |
| 8/12/2002      | MONCRIEF CR N OF 33RD ST BRID     | 21,800        | 98.17%             |
| 12/5/2002      | MONCRIEF CR N OF 33RD ST BRID     | 74,800        | 99.47%             |
| <b>MEDIAN:</b> |                                   | <b>17,000</b> | <b>97.65%</b>      |

### 5.1.3 Critical Conditions/Seasonality

Exceedances in Moncrief Creek cannot be associated with flows, as no flow data within the basin have been reported. Therefore, the effects of flow under various conditions cannot be determined or be considered as a critical condition.

Historical fecal and total coliform observations in Moncrief Creek are provided in **Appendices D and E**. Coliform data have been presented by month, season, and year to determine whether certain patterns are evident in the data set.

A non-parametric test (Kruskal-Wallis) was applied to both the fecal and total coliform datasets to determine whether there were significant differences among months or seasons. At an alpha ( $\alpha$ ) level of 0.05, neither fecal nor total coliforms had significant differences among months or seasons (**Appendices F, G, H, and I**). It is very difficult to evaluate possible patterns among months due to the small sample sizes. For example, the range in monthly observations for fecal coliforms varies from 2 to 17 in a given month, with seven months having less than 10 observations. The sample sizes for total coliforms were even smaller, with only two months having more than seven samples. Grouping observations by season increased sample sizes for statistical comparison and, as seen in **Table 2.3**, for fecal coliforms the summer (July – September) season had the highest exceedance rate (79 percent). For total coliforms, the highest exceedance rate occurred in fall (October – December), with a 60 percent exceedance rates. A likely factor that could contribute to these monthly or seasonal differences would be the pattern of rainfall. Comparisons of station and seasons are presented in **Appendices J and K**.

Rainfall records for the Jacksonville International Airport (**Appendix L** illustrates rainfall from 1990 – 2004) were used to determine rainfall amounts associated with individual sampling dates. Rainfall recorded on the day of sampling (1D), the cumulative total for the day of and the previous two days (3D), the cumulative total for the day of and the previous six days (7D) were all paired with the respective coliform observation. A spearman correlation matrix was generated that summarized the simple correlation coefficients between the various rainfall and coliform measures (**Appendices M and N**). The simple correlations ( $r$  values in the Spearman Correlation table) between both fecal and total coliforms and the various rainfall totals were positive, suggesting that as rainfall (and possible runoff) increased, so did the number of coliforms.

Simple linear regressions were performed between the coliform observation and rainfall total to determine whether any of the relationships were significant at an  $\alpha$  level of 0.05. Although the  $r^2$  values were low, the correlations between fecal coliforms and the 3D and 7D precipitation were not significant, but when compared to the 1D rainfall totals, there is some significance (**Appendix O**). In the case of total coliforms, the 3D rainfall totals were significant, where as the 1D and 7D totals were not significant at  $\alpha=0.05$  (**Appendices P**). As noted in the previously, the highest percentage of exceedances of fecal coliforms occurred in September and November. For total coliforms, the greatest percentage of exceedances occurred in May, September, and December. The historical plot of monthly average rainfall (**Appendix Q**) indicates that monthly rainfall totals increase in June and peak in September and by October return to levels observed in February and March. **Appendix R** includes a graph of annual rainfall over the 1955 – 2004 period versus the long-term average (52.27 inches) over this period. The years of 1996 – 1998 represented above average rainfall years while the years 1999 – 2001 were below average and 2002 was again above average. Higher percentages of fecal coliform exceedances occurred between 1999 – 2001 than did 1996 - 1998. This seems to indicate an overall inverse relationship to precipitation with fecal coliforms, which may indicate point sources may be contributing to exceedances more than nonpoint sources; but exceedances are most likely due to a combination of factors from both types of sources. There are fewer total coliform samples, and no year has over five samples; therefore it is more difficult to determine a trend with precipitation, and does not appear to be an obvious trend.

Hydrologic conditions were analyzed using rainfall, since no flow data was available. A loading curve type chart, that would normally be applied to flow events, was created using precipitation data from JIA from 1990 – 2004 instead. The chart was divided in the same manner as if flow was being analyzed, where extreme precipitation events represent the upper percentiles (0-5<sup>th</sup> percentile), followed by large precipitation events (5<sup>th</sup> – 15<sup>th</sup> percentile), medium precipitation events (15<sup>th</sup> – 40<sup>th</sup> percentile), small precipitation events (40<sup>th</sup> – 60<sup>th</sup> percentile), and no recordable precipitation events (60<sup>th</sup> – 100<sup>th</sup> percentile). Three day (day of and two days prior) precipitation accumulations were used in the analysis.

Data show that fecal coliform exceedances occurred over all hydrologic conditions; however, the least percentage of exceedances (63.64 percent) occurred under what would be considered small precipitation events. The greatest percentage of exceedances (100 percent) occurred within extreme precipitation events. If a large percentage of exceedances occur during no measurable precipitation days, it is suspected that point sources are contributing. Likewise, if a large percentage of exceedances are found to be occurring after large and extreme precipitation events, this may indicate that exceedances are more nonpoint source driven; perhaps from stormwater conveyance systems or various land uses. With respect to fecal coliforms in Moncrief Creek, there is a downward trend in exceedances with decreasing precipitation, with exception of the no measurable precipitation range. This most likely indicates that exceedances are being influenced by nonpoint sources.

Total coliforms have a high number of exceedances in the extreme and large event ranges, which decreases in the medium event range and increases again in the small and no measurable precipitation event ranges. Such a pattern may indicate that there is a combination of point and nonpoint sources affecting exceedances. **Table 5.4** is a summary of data and hydrologic conditions. **Figure 5.3** shows the same data visually.

**Table 5.5. Summary of Fecal Coliform Data by Hydrological Condition**

| Precipitation Event | Event Range   | Total Values | Number of Exceedances | Percent Exceedance | Number of Non-Exceedances | Percent Non-Exceedance |
|---------------------|---------------|--------------|-----------------------|--------------------|---------------------------|------------------------|
| Extreme             | >2.1"         | 10           | 10                    | 100.00%            | 0                         | 0.00%                  |
| Large               | 1.33" - 2.1"  | 7            | 6                     | 85.71%             | 1                         | 14.29%                 |
| Medium              | 0.18" - 1.33" | 24           | 17                    | 70.83%             | 7                         | 29.17%                 |
| Small               | 0.01" - 0.18" | 22           | 14                    | 63.64%             | 8                         | 36.36%                 |
| None/Not Measurable | <0.01"        | 43           | 30                    | 69.77%             | 13                        | 30.23%                 |

Figure 5.4. Fecal Coliform Data by Hydrological Condition Based on Rainfall

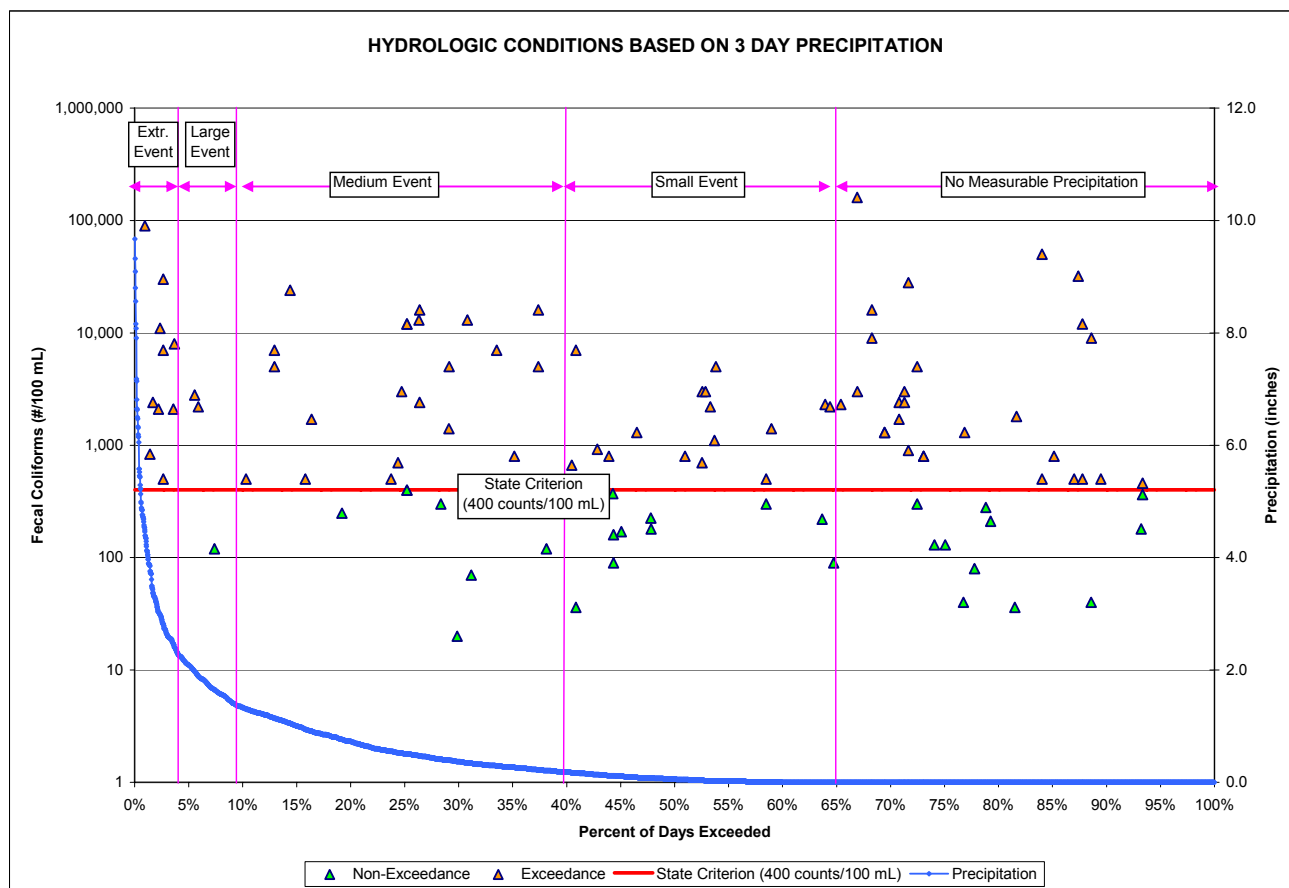
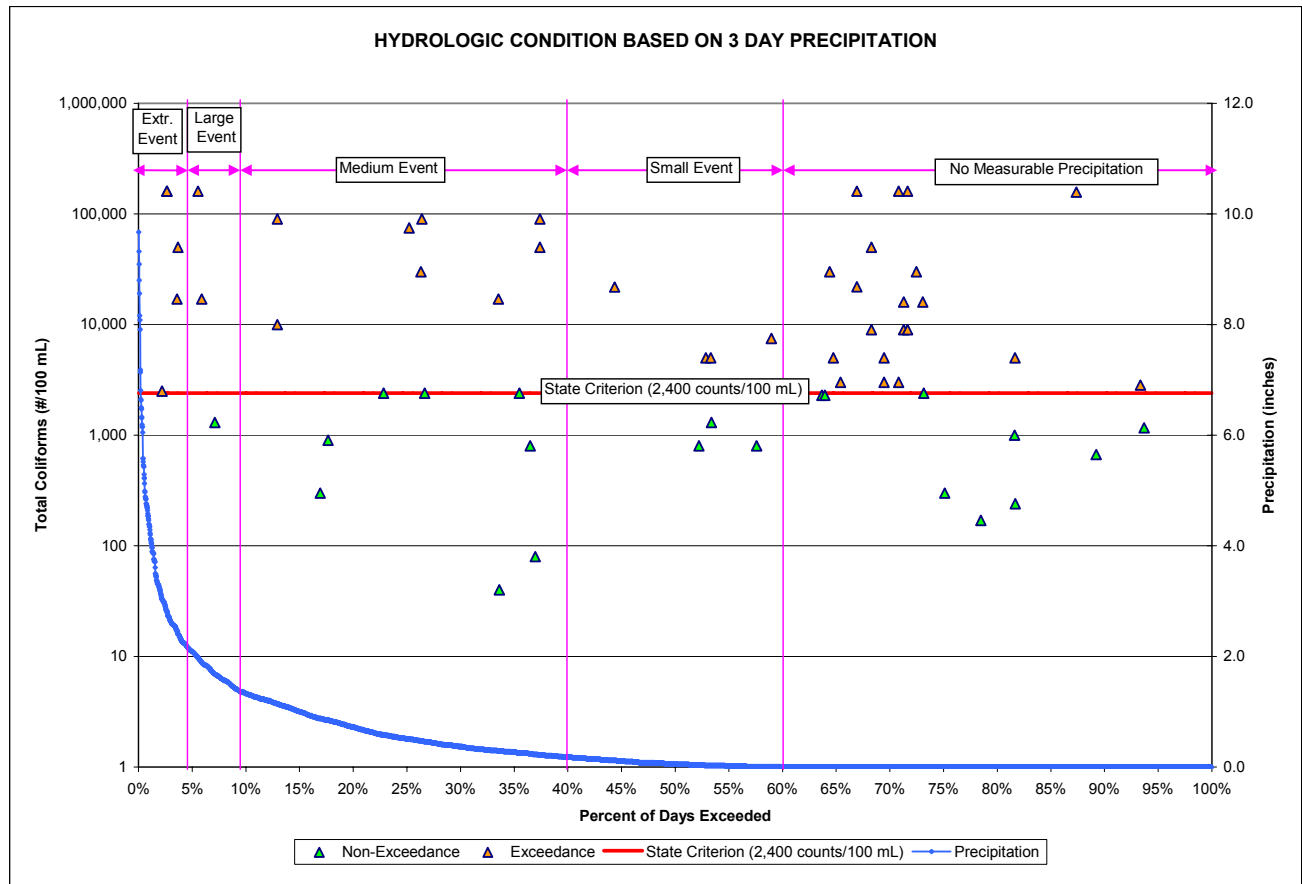


Table 5.6. Summary of Total Coliform Data by Hydrological Condition

| Precipitation Event | Event Range   | Total Values | Number of Exceedances | Percent Exceedance | Number of Non-Exceedances | Percent Non-Exceedance |
|---------------------|---------------|--------------|-----------------------|--------------------|---------------------------|------------------------|
| Extreme             | >2.1"         | 5            | 5                     | 100.00%            | 0                         | 0.00%                  |
| Large               | 1.33" - 2.1"  | 5            | 4                     | 80.00%             | 1                         | 20.00%                 |
| Medium              | 0.18" - 1.33" | 14           | 6                     | 42.86%             | 8                         | 57.14%                 |
| Small               | 0.01" - 0.18" | 7            | 4                     | 57.14%             | 3                         | 42.86%                 |
| None/Not Measurable | <0.01"        | 29           | 20                    | 68.97%             | 9                         | 31.03%                 |

Figure 5.5. Total Coliform Data by Hydrological Condition Based on Rainfall



## Chapter 6: DETERMINATION OF THE TMDL

---

### 6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (Waste Load Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\text{TMDL} \cong \sum \text{WLAs}_{\text{wastewater}} + \sum \text{WLAs}_{\text{NPDES Stormwater}} + \sum \text{LAs} + \text{MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as “percent reduction” because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of BMPs.

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or **other appropriate measure**. TMDLs for Moncrief Creek are expressed in terms of counts per 100 mL and percent reduction, and represent the maximum fecal and total coliform load the creek can assimilate and maintain the applicable coliform criteria (**Table 6.1**).

Table 6.1. TMDL Components for Moncrief Creek

| WBID | Parameter      | TMDL<br>(colonies/100 mL) | WLA        |                     | LA<br>(Percent<br>Reduction) | MOS      |
|------|----------------|---------------------------|------------|---------------------|------------------------------|----------|
|      |                |                           | Wastewater | NPDES<br>Stormwater |                              |          |
| 2228 | Fecal Coliform | 400                       | 83%        | 83%                 | 83%                          | Implicit |
| 2228 | Total Coliform | 2,400                     | 98%        | 98%                 | 98%                          | Implicit |

## 6.2 Load Allocation (LA)

A fecal coliform reduction of 83 percent and a total coliform reduction of 98 percent are required from nonpoint sources. It should be noted that the load allocation includes loading from stormwater discharges that are not part of the NPDES Stormwater Program.

## 6.3 Wasteload Allocation (WLA)

### 6.3.1 NPDES Wastewater Discharges

The WLA for fecal coliforms for the Millennium Specialty Chemicals (permit #FL0000884) is to meet the applicable fecal coliform criterion. This facility, as well as any future facilities permitted to discharge wastewater to the Moncrief Creek watershed, will be required to meet state Class III criteria for fecal coliforms and therefore will not be allowed to exceed 200 counts/100 mL as a monthly average or 400 counts/100 mL at any given time for fecal coliforms.

Similarly, the WLA for total coliforms for Millennium Specialty Chemicals is to meet the applicable total coliform criterion. Total coliform values shall not exceed 1,000 counts/100mL as a monthly average, exceed 1,000 counts/100 mL in 20 percent of the samples examined during any month, or exceed 2,400 counts/100 mL at any time.

### 6.3.2 NPDES Stormwater Discharges

The WLA for the City of Jacksonville and FDOT's MS4 permit (permit FL000012) is an 83 percent reduction in current anthropogenic fecal coliform loading and a 98 percent reduction in current anthropogenic total coliform loading from the MS4. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls for which it owns or otherwise has responsible control, and is not responsible for reducing other nonpoint source loads within its jurisdiction.

## 6.4 Margin of Safety (MOS)

Consistent with the recommendations of the Allocation Technical Advisory Committee (FDEP, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. A MOS was included in the TMDL by not allowing any exceedances of the state criterion, even though intermittent natural exceedances of the criterion would be expected and would be taken into account when determining impairment. Additionally, the TMDL calculated for fecal coliforms was based on

meeting the water quality criterion of 400 counts/100 mL without any exceedances, while the actual criterion allows for 10 percent exceedances over the criterion.

# Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN

## DEVELOPMENT AND BEYOND

---

### 7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for Moncrief Creek. This document will be developed over the next year in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

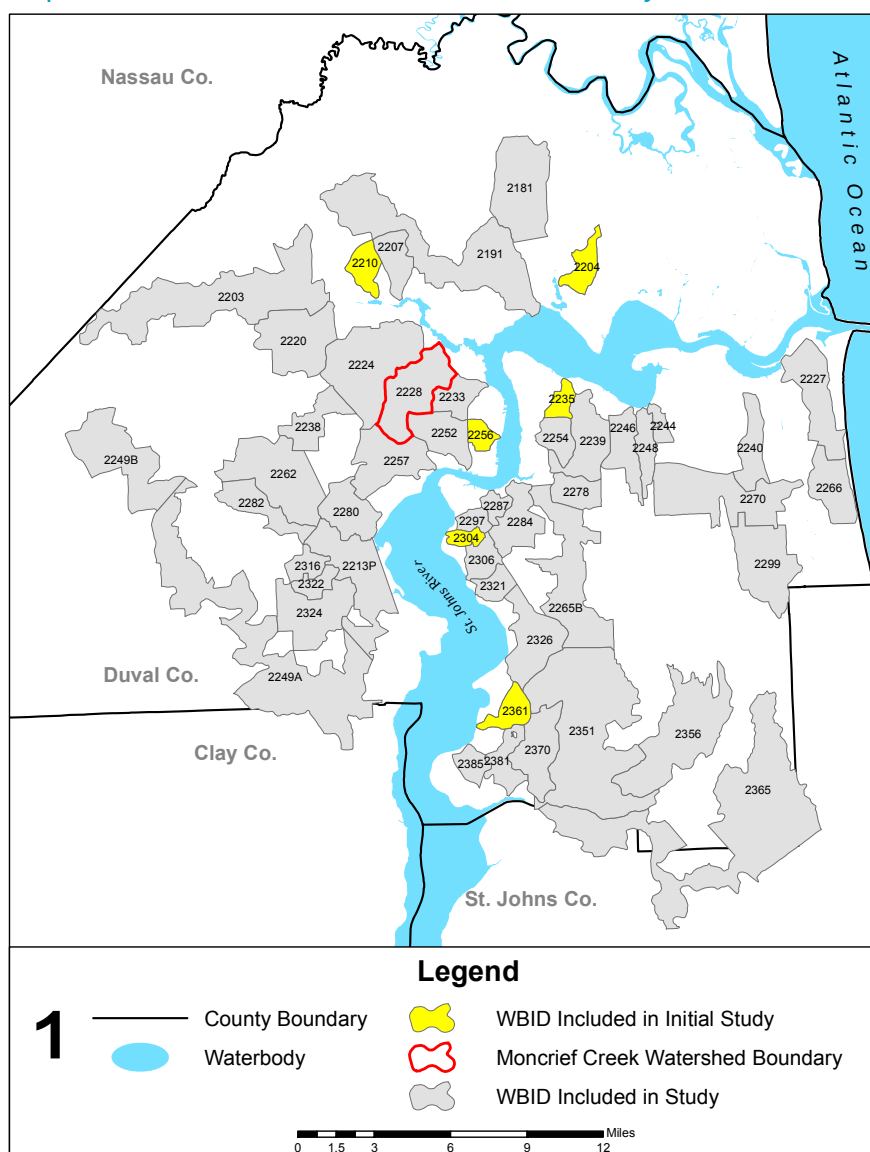
- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken or prohibited,
- Local water quality standards, permits, or load limitation agreements, and
- Monitoring and follow-up measures.

The BMAP for Moncrief Creek will include the results of a project funded by JEA that will consider 51 drainage basins in the general area of the City of Jacksonville, which includes Moncrief Creek. The project, known as the Tributary Pollution Assessment Project (TPAP), is directed by a Tributary Assessment Team (TAT) consisting of representatives from JEA, the Department, City of Jacksonville, Duval County Health Department, Water and Sewer Expansion Authority, U.S. Army Corps of Engineers, St. Johns River Keepers, and PBS & J, who is the primary contractor for the project.

The goal of the TPAP is to devise a standard manual that can be used for tributary sanitary surveys in the Duval County area. The manual will be developed by studying 6 of the 51 watersheds deemed to be of the highest priority by JEA and the contractors, along with a control watershed. After the manual has been developed, it will be applied to the remaining 45 watersheds, and may then be expanded to other watersheds in the Duval County area. The manual will be used to help better determine the health of these watersheds and to determine potential sources of contamination, especially with respect to fecal coliforms. This will help JEA, who is the sewer utility provider in the area, concentrate repair efforts and to identify those areas where failing septic tanks may be playing a role in contamination. The drainage basins included in this initial study are shown in **Figure 7.1**, and include:

- Big Davis Creek (2356)
- Big Fishwier Creek (2280)
- Blockhouse Creek (2207)
- Broward River (2191)
- Butcher Pen Creek (2322)
- Cedar River (2262)
- Christopher Branch (2321)
- Cormorant Branch (2381)
- Cow Head Creek (2244)
- Craig Creek (2297)
- Deep Bottom Creek (2361)
- Deer Creek (2256)
- Dunn Creek (2181)
- Durbin Creek (2365)
- Fishing Creek (2324)
- Gin House Creek (2248)
- Goodbys (2326)
- Greenfield Creek (2240)
- Hogan Creek (2252)
- Hogpen Creek (2270)
- Hopkins Creek (2266)
- Jones Creek (2246)
- Julington Creek (2351)
- Little Potsburg Creek (2284)
- Little Sixmile Creek (2238)
- Long Branch (2233)
- Mandarin Drain (2385)
- McCoy Creek (2257)
- McGirts Creek (2249B)
- Miller Creek (2287)
- Miramar Creek (2304)
- **Moncrief Creek (2228)**
- New Castle Creek (2235)
- New Rose Creek (2306)
- Nine Mile Creek (2220)
- Oldfield Creek (2370)
- Open Creek (2299)
- Ortega River (2213P)
- Ortega River (2249A)
- Potsburg Creek (2265B)
- Red Bay Branch (2254)
- Ribault River (2224)
- Sherman Creek (2227)
- Silversmith Creek (2278)
- Sixmile Reach (2232)
- Strawberry Creek (2239)
- Terrapin Creek (2204)
- Trout River (2203)
- West Branch (2210)
- Williamson Creek (2316)
- Wills Branch (2282)

Figure 7.1. Map of WBIDs included in the TPAP study



The WBIDs included in this study have been categorized based on the primary land use (SJRWMD 2000 data) in the WBID – urban, suburban, or rural. Further efforts were made to identify potential sources of fecal coliform contamination based on land uses, JEA information, and survey data. The WBIDs were then prioritized based on this, as well as existing data. Six WBIDs of highest concern were selected for the initial study (3 urban, 2 suburban, and 1 rural). At the time this document was compiled, a control waterbody had yet to be selected.

Initial sampling for the study is set to begin on the six initial WBIDs on July 26, 2005 and end on February 1, 2006. The final deliverable (manual) will be submitted to JEA on June 1, 2006, and will be available for public review and comment on June 16, 2006. Four types of fecal indicators (fecal coliforms, *E. coli*, *Enterococci*, and coliphages) will be studied. *Enterococcus faecalis* will be studied in an attempt to further identify potential sources of sewage, and samples will be checked for human/ruminant primers. In addition, optical brighteners (using fluorometric techniques) will be included to bolster potential sewage sources input identification.

The executive summary submitted to the Department by JEA and PBS & J is attached as **Appendix S**. It is expected that the results of this study will be used to help guide identification of restoration projects during BMAP development. In addition to addressing failing septic tanks, BMAP plans may include some sort of public education in picking up after dogs. As **Table 4.6** shows, potential impacts from dogs could be significant. If pet owners are educated on the potential impacts their pets are having on Moncrief Creek, and they are inclined to take action, this could potentially decrease a source load.

## References

---

American Veterinary Medical Association Website, 2005. Available at <http://www.avma.org/membshp/marketstats/formulas.asp>

Florida Administrative Code. Chapter 62-302, Surface Water Quality Standards.

Florida Administrative Code. Chapter 62-303, Identification of Impaired Surface Waters.

Florida Department of Environmental Protection. February 2001. *A Report to the Governor and the Legislature on the Allocation of Total Maximum Daily Loads in Florida*. Tallahassee, Florida: Bureau of Watershed Management.

Florida Department of Environmental Protection. March 2003. Lower St. Johns Basin Status Report. Tallahassee, Florida. Available at [http://www.dep.state.fl.us/water/tmdl/stat\\_rep.htm](http://www.dep.state.fl.us/water/tmdl/stat_rep.htm)

Florida Department of Environmental Protection. 2001. Ocklawaha Basin Status Report. Tallahassee, Florida. Available at [http://www.dep.state.fl.us/water/tmdl/stat\\_rep.htm](http://www.dep.state.fl.us/water/tmdl/stat_rep.htm).

Florida Department of Health Web site. 2005. Available at <http://www.doh.state.fl.us/>.

Florida Department of Health Web site. 2005. Available at <http://www.doh.state.fl.us/environment/OSTDS/statistics/NewInstallations.htm>

Florida Department of Health Web site. 2005. Available at <http://doh.state.fl.us/environment/ostds/statistics/repairs.htm>

Florida Watershed Restoration Act. Chapter 99-223, Laws of Florida.

U. S. Census Bureau. 2005. Available at <http://www.census.gov/>.

# Appendices

---

## Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, F.A.C.

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a SWIM plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. No PLRG has been developed for Newnans Lake at the time this study was conducted.

In 1987, the U.S. Congress established Section 402(p) as part of the federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES stormwater permitting program to designate certain stormwater discharges as "point sources" of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific Standard Industrial Classification (SIC) codes, construction sites disturbing five or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as municipal separate storm sewer systems (MS4s). However, because the master drainage systems of most local governments in Florida are interconnected, the EPA has implemented Phase 1 of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the fifteen counties meeting the population criteria.

An important difference between the federal and state stormwater permitting programs is that the federal program covers both new and existing discharges, while the state program focuses on new discharges. Additionally, Phase 2 of the NPDES Program will expand the need for these permits to construction sites between one and five acres, and to local governments with as few as 10,000 people. These revised rules require that these additional activities obtain permits by 2003. While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility similar to other point sources of pollution, such as domestic and industrial wastewater discharges. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a re-opener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

## Appendix B: Historical Discharge Data (August 1998 – December 2004) for Millennium Specialty Chemicals

| Facility ID | Facility Name          | Report Date | Fecal Coliform      |                     |            | Total Coliform      |                     |            | Flow          |            |
|-------------|------------------------|-------------|---------------------|---------------------|------------|---------------------|---------------------|------------|---------------|------------|
|             |                        |             | Value<br>(#/100 mL) | Limit<br>(#/100 mL) | Limit Type | Value<br>(#/100 mL) | Limit<br>(#/100 mL) | Limit Type | Flow<br>(MGD) | Limit Type |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/98     | 30                  | 4500                | DAILY MX   | 60                  | 5000                | DAILY MX   | 0.740         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/98     | 8                   | 4500                | DAILY MX   | 56                  | 5000                | DAILY MX   | 0.682         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/98    | 22                  | 4500                | DAILY MX   | 464                 | 5000                | DAILY MX   | 0.761         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/98    | 58                  | 4500                | DAILY MX   | 500                 | 5000                | DAILY MX   | 0.574         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/99     | 3200                | 4500                | DAILY MX   |                     | 5000                | DAILY MX   | 0.486         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/28/99     | 3                   | 4500                | DAILY MX   |                     | 5000                | DAILY MX   | 0.520         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/99     | 45                  | 4500                | DAILY MX   | >6000               | 5000                | DAILY MX   | 0.451         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/99     | 18                  | 4500                | DAILY MX   | 67000               | 5000                | DAILY MX   | 0.460         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/99     | 18                  | 4500                | DAILY MX   | 100                 | 5000                | DAILY MX   | 0.570         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/99     | 90                  | 4500                | DAILY MX   | 480                 | 5000                | DAILY MX   | 0.533         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/99     | 400                 | 4500                | DAILY MX   | 1000                | 5000                | DAILY MX   | 0.864         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/99     | 6500                | 4500                | DAILY MX   | 5250                | 5000                | DAILY MX   | 0.780         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/99     | 7000                | 4500                | DAILY MX   | 38000               | 5000                | DAILY MX   | 0.697         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/99    | 1900                | 4500                | DAILY MX   | 3000                | 5000                | DAILY MX   | 0.673         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/99    | 130                 | 4500                | DAILY MX   | 500                 | 5000                | DAILY MX   | 0.650         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/99    | 1700                | 4500                | DAILY MX   | 5000                | 5000                | DAILY MX   | 0.657         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/00     | 27                  | 4500                | DAILY MX   | 1600                | 5000                | DAILY MX   | 0.562         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/29/00     | 3000                | 4500                | DAILY MX   | 24000               | 5000                | DAILY MX   | 0.517         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/00     | 170                 | 4500                | DAILY MX   | 9000                | 5000                | DAILY MX   | 0.495         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/00     | 130                 | 4500                | DAILY MX   | 3000                | 5000                | DAILY MX   | 0.543         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/00     | 900                 | 4500                | DAILY MX   | 1600                | 5000                | DAILY MX   | 0.540         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/00     | 170                 | 4500                | DAILY MX   | 500                 | 5000                | DAILY MX   | 0.618         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/00     | 80                  | 4500                | DAILY MX   | 300                 | 5000                | DAILY MX   | 0.163         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/00     | 220                 | 4500                | DAILY MX   | 1400                | 5000                | DAILY MX   | 0.694         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/00     | 2800                | 4500                | DAILY MX   | 2800                | 5000                | DAILY MX   | 0.690         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/00    | 300                 | 4500                | DAILY MX   | 800                 | 5000                | DAILY MX   | 0.638         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/00    | 110                 | 4500                | DAILY MX   | 30000               | 5000                | DAILY MX   | 0.890         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/00    | 170                 | 4500                | DAILY MX   | 1600                | 5000                | DAILY MX   | 0.465         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/01     | 240                 | 4500                | DAILY MX   | 30000               | 5000                | DAILY MX   | 0.331         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/28/01     | 30                  | 4500                | DAILY MX   | 2200                | 5000                | DAILY MX   | 0.297         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/01     | 4                   | 4500                | DAILY MX   | 50                  | 5000                | DAILY MX   | 0.102         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/01     | 21                  | 800                 | DAILY MX   | 14000               | 2400                | DAILY MX   | 0.132         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/01     | 2                   | 800                 | DAILY MX   | 170                 | 2400                | DAILY MX   | 0.142         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/01     | 4                   | 800                 | DAILY MX   | 320                 | 2400                | DAILY MX   | 0.361         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/01     |                     | 800                 | DAILY MX   | 2,400               | 2400                | DAILY MX   | 0.365         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/01     | 50                  | 800                 | DAILY MX   | 170                 | 2400                | DAILY MX   | 0.255         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/01     | 4                   | 800                 | DAILY MX   | 350                 | 2400                | DAILY MX   | 0.354         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/01     | 4                   | 800                 | DAILY MX   | 350                 | 2400                | DAILY MX   | 0.354         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/01    | 50                  | 800                 | DAILY MX   | 170                 | 2400                | DAILY MX   | 0.250         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/01    |                     | 800                 | DAILY MX   | 4900                | 2400                | DAILY MX   | 0.246         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/01    | 4                   | 800                 | DAILY MX   | 2800                | 2400                | DAILY MX   | 0.283         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/02     | 2                   | 800                 | DAILY MX   | 840                 | 2400                | DAILY MX   | 0.330         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/28/02     | 2                   | 800                 | DAILY MX   | 95                  | 2400                | DAILY MX   | 0.299         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/02     | 2                   | 800                 | DAILY MX   | 80                  | 2400                | DAILY MX   | 0.338         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/02     |                     | 800                 | DAILY MX   | 210                 | 2400                | DAILY MX   | 0.337         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/02     | 8                   | 800                 | DAILY MX   |                     | 2400                | DAILY MX   | 0.365         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/02     | 7.8                 | 800                 | DAILY MX   | 900                 | 2400                | DAILY MX   | 0.215         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/02     |                     | 800                 | DAILY MX   | 900                 | 2400                | DAILY MX   | 0.207         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/02     | 13                  | 800                 | DAILY MX   | 430                 | 2400                | DAILY MX   | 0.385         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/02     | 4                   | 800                 | DAILY MX   | 700                 | 2400                | DAILY MX   | 0.400         | MO AVG     |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/02    | 17                  | 800                 | DAILY MX   | 110                 | 2400                | DAILY MX   | 0.306         | MO AVG     |

## Appendix B: Historical Discharge Data (August 1998 – December 2004) for Millennium Specialty Chemicals (continued)

| Facility ID | Facility Name          | Report Date | Fecal Coliform   |                  |                         | Total Coliform   |                  |            | Flow       |                         |
|-------------|------------------------|-------------|------------------|------------------|-------------------------|------------------|------------------|------------|------------|-------------------------|
|             |                        |             | Value (#/100 mL) | Limit (#/100 mL) | Limit Type <sup>1</sup> | Value (#/100 mL) | Limit (#/100 mL) | Limit Type | Flow (MGD) | Limit Type <sup>2</sup> |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/02    | 7                | 800              | DAILY MX                | 900              | 2400             | DAILY MX   | 0.105      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/02    |                  | 800              | DAILY MX                | 17               | 2400             | DAILY MX   | 0.285      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/03     |                  | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.330      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/28/03     |                  | 800              | DAILY MX                | 45               | 2400             | DAILY MX   | 0.394      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/03     |                  | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.355      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/03     | 33               | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.379      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/03     | 13               | 800              | DAILY MX                | 140              | 2400             | DAILY MX   | 0.270      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/03     |                  | 800              | DAILY MX                | 180              | 2400             | DAILY MX   | 0.190      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/03     | 79               | 800              | DAILY MX                | 6300             | 2400             | DAILY MX   | 0.199      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/03     | 33               | 800              | DAILY MX                | 350              | 2400             | DAILY MX   | 0.237      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/03     | 7                | 800              | DAILY MX                | 27               | 2400             | DAILY MX   | 0.154      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/03    |                  | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.158      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/03    |                  | 800              | DAILY MX                | 220              | 2400             | DAILY MX   | 0.155      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/03    |                  | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.145      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 1/31/04     | 9                | 800              | DAILY MX                | 11               | 2400             | DAILY MX   | 0.122      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 2/29/04     |                  | 800              | DAILY MX                | 8                | 2400             | DAILY MX   | 0.166      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 3/31/04     |                  | 800              | DAILY MX                | 22000            | 2400             | DAILY MX   | 0.128      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 4/30/04     | 17               | 800              | DAILY MX                | 920              | 2400             | DAILY MX   | 0.155      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 5/31/04     |                  | 800              | DAILY MX                |                  | 2400             | DAILY MX   | 0.190      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 6/30/04     |                  | 800              | DAILY MX                | 140              | 2400             | DAILY MX   | 0.920      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 7/31/04     | 2                | 800              | DAILY MX                | 110              | 2400             | DAILY MX   | 0.466      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 8/31/04     | 17               | 800              | DAILY MX                | 49               | 2400             | DAILY MX   | 0.204      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 9/30/04     | 70               | 800              | DAILY MX                | 170              | 2400             | DAILY MX   | 0.199      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 10/31/04    | 33               | 800              | DAILY MX                | 70               | 2400             | DAILY MX   | 0.180      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 11/30/04    | 8                | 800              | DAILY MX                | 33               | 2400             | DAILY MX   | 0.175      | MO AVG                  |
| FL0000884   | MILLENNIUM SPEC. CHEM. | 12/31/04    | 70               | 800              | DAILY MX                | 920              | 2400             | DAILY MX   | 0.185      | MO AVG                  |

 Values shaded in yellow exceed permitted limits for parameter

This table represents data available in the Departments Permit Compliance System (PCS) database. Some values are blank, as they may not have been reported to the Department

<sup>1</sup> DAILY MX = Daily Maximum

<sup>2</sup> MO AVG = Monthly Average

**NOTE:** As discussed in the text, the facility was granted an exemption for fecal and total coliforms from August 1998 – March 2001 due to plant upgrades.

## Appendix C: Estimates of Coliform Loadings to Moncrief Creek from Millennium Specialty Chemicals (August 1998 – December 2004)

| Report Date | Flow (MGD) | Fecal Coliform   |                                   | Total Coliform   |                                   |
|-------------|------------|------------------|-----------------------------------|------------------|-----------------------------------|
|             |            | Value (#/100 mL) | Estimated Loading (organisms/day) | Value (#/100 mL) | Estimated Loading (organisms/day) |
| 8/31/98     | 0.740      | 30               | 8.40E+10                          | 60               | 1.68E+11                          |
| 9/30/98     | 0.682      | 8                | 2.07E+10                          | 56               | 1.45E+11                          |
| 10/31/98    | 0.761      | 22               | 6.34E+10                          | 464              | 1.34E+12                          |
| 11/30/98    | 0.574      | 58               | 1.26E+11                          | 500              | 1.09E+12                          |
| 1/31/99     | 0.487      | 3,200            | 5.90E+12                          | ---              | ---                               |
| 2/28/99     | 0.520      | 3                | 5.90E+09                          | ---              | ---                               |
| 3/31/99     | 0.451      | 45               | 7.68E+10                          | 6,000            | 1.02E+13                          |
| 4/30/99     | 0.460      | 18               | 3.13E+10                          | 67,000           | 1.17E+14                          |
| 5/31/99     | 0.570      | 18               | 3.88E+10                          | 100              | 2.16E+11                          |
| 6/30/99     | 0.533      | 90               | 1.82E+11                          | 480              | 9.68E+11                          |
| 7/31/99     | 0.864      | 400              | 1.31E+12                          | 1,000            | 3.27E+12                          |
| 8/31/99     | 0.780      | 6,500            | 1.92E+13                          | 5,250            | 1.55E+13                          |
| 9/30/99     | 0.697      | 7,000            | 1.85E+13                          | 38,000           | 1.00E+14                          |
| 10/31/99    | 0.673      | 1,900            | 4.84E+12                          | 3,000            | 7.64E+12                          |
| 11/30/99    | 0.650      | 130              | 3.20E+11                          | 500              | 1.23E+12                          |
| 12/31/99    | 0.657      | 1,700            | 4.23E+12                          | 5,000            | 1.24E+13                          |
| 1/31/00     | 0.562      | 27               | 5.74E+10                          | 1,600            | 3.40E+12                          |
| 2/29/00     | 0.517      | 3,000            | 5.87E+12                          | 24,000           | 4.70E+13                          |
| 3/31/00     | 0.495      | 170              | 3.19E+11                          | 9,000            | 1.69E+13                          |
| 4/30/00     | 0.543      | 130              | 2.67E+11                          | 3,000            | 6.17E+12                          |
| 5/31/00     | 0.540      | 900              | 1.84E+12                          | 1,600            | 3.27E+12                          |
| 6/30/00     | 0.618      | 170              | 3.98E+11                          | 500              | 1.17E+12                          |
| 7/31/00     | 0.163      | 80               | 4.94E+10                          | 300              | 1.85E+11                          |
| 8/31/00     | 0.694      | 220              | 5.78E+11                          | 1,400            | 3.68E+12                          |
| 9/30/00     | 0.690      | 2,800            | 7.31E+12                          | 2,800            | 7.31E+12                          |
| 10/31/00    | 0.638      | 300              | 7.24E+11                          | 800              | 1.93E+12                          |
| 11/30/00    | 0.890      | 110              | 3.71E+11                          | 30,000           | 1.01E+14                          |
| 12/31/00    | 0.465      | 170              | 2.99E+11                          | 1,600            | 2.82E+12                          |
| 1/31/01     | 0.331      | 240              | 3.01E+11                          | 30,000           | 3.76E+13                          |
| 2/28/01     | 0.297      | 30               | 3.37E+10                          | 2,200            | 2.47E+12                          |
| 3/31/01     | 0.102      | 4                | 1.54E+09                          | 50               | 1.93E+10                          |
| 4/30/01     | 0.132      | 21               | 1.05E+10                          | 14,000           | 7.00E+12                          |
| 5/31/01     | 0.142      | 2                | 1.08E+09                          | 170              | 9.16E+10                          |
| 6/30/01     | 0.361      | 4                | 5.47E+09                          | 320              | 4.37E+11                          |
| 7/31/01     | 0.365      | ---              | ---                               | 240              | 3.32E+11                          |
| 8/31/01     | 0.255      | 50               | 4.83E+10                          | 170              | 1.64E+11                          |
| 9/30/01     | 0.354      | 4                | 5.36E+09                          | 350              | 4.69E+11                          |
| 9/30/01     | 0.254      | 4                | 3.85E+09                          | 350              | 3.37E+11                          |
| 10/31/01    | 0.250      | 50               | 4.73E+10                          | 170              | 1.61E+11                          |
| 11/30/01    | 0.246      | ---              | ---                               | 4,900            | 4.56E+12                          |
| 12/31/01    | 0.283      | 4                | 4.28E+09                          | 2,800            | 3.00E+12                          |
| 1/31/02     | 0.330      | 2                | 2.50E+09                          | 840              | 1.05E+12                          |
| 2/28/02     | 0.300      | 2                | 2.27E+09                          | 95               | 1.08E+11                          |
| 3/31/02     | 0.338      | 2                | 2.56E+09                          | 80               | 1.02E+11                          |
| 4/30/02     | 0.337      | ---              | ---                               | 210              | 2.68E+11                          |
| 5/31/02     | 0.365      | 8                | 1.11E+10                          | ---              | ---                               |
| 6/30/02     | 0.216      | 8                | 6.37E+09                          | 900              | 7.34E+11                          |

**Appendix C: Estimates of Coliform Loadings to Moncrief Creek from  
Millennium Specialty Chemicals (August 1998 – December 2004) (continued)**

| Report Date     | Flow<br>(MGD) | Fecal Coliform   |                                         | Total Coliform |                                         |
|-----------------|---------------|------------------|-----------------------------------------|----------------|-----------------------------------------|
|                 |               | Value (#/100 mL) | Estimated<br>Loading<br>(organisms/day) | Report Date    | Estimated<br>Loading<br>(organisms/day) |
| 7/31/02         | 0.207         | ---              | ---                                     | 900            | 7.05E+11                                |
| 8/31/02         | 0.385         | 13               | 1.89E+10                                | 430            | 6.27E+11                                |
| 9/30/02         | 0.400         | 4                | 6.06E+09                                | 700            | 1.06E+12                                |
| 10/31/02        | 0.306         | 17               | 1.97E+10                                | 110            | 1.27E+11                                |
| 11/30/02        | 0.105         | 7                | 2.78E+09                                | 900            | 3.58E+11                                |
| 12/31/02        | 0.285         | ---              | ---                                     | 17             | 1.83E+10                                |
| 1/31/03         | 0.330         | ---              | ---                                     | 49             | 6.12E+10                                |
| 2/28/03         | 0.394         | ---              | ---                                     | 45             | 6.71E+10                                |
| 3/31/03         | 0.355         | ---              | ---                                     | 49             | 6.58E+10                                |
| 4/30/03         | 0.379         | 33               | 4.73E+10                                | 49             | 7.03E+10                                |
| 5/31/03         | 0.270         | 13               | 1.33E+10                                | 140            | 1.43E+11                                |
| 6/30/03         | 0.190         |                  |                                         | 180            | 1.29E+11                                |
| 7/31/03         | 0.200         | 79               | 5.98E+10                                | 6,300          | 4.77E+12                                |
| 8/31/03         | 0.237         | 33               | 2.96E+10                                | 350            | 3.14E+11                                |
| 9/30/03         | 0.154         | 7                | 4.08E+09                                | 27             | 1.57E+10                                |
| 10/31/03        | 0.159         | ---              | ---                                     | 49             | 2.94E+10                                |
| 11/30/03        | 0.155         | ---              | ---                                     | 220            | 1.29E+11                                |
| 12/31/03        | 0.145         | ---              | ---                                     | 49             | 2.69E+10                                |
| 1/31/04         | 0.123         | 9                | 4.18E+09                                | 11             | 5.10E+09                                |
| 2/29/04         | 0.167         | ---              | ---                                     | 8              | 5.05E+09                                |
| 3/31/04         | 0.129         | ---              | ---                                     | 22,000         | 1.07E+13                                |
| 4/30/04         | 0.156         | 17               | 1.00E+10                                | 920            | 5.43E+11                                |
| 5/31/04         | 0.190         | ---              | ---                                     | ---            | ---                                     |
| 6/30/04         | 0.920         | ---              | ---                                     | 140            | 4.88E+11                                |
| 7/31/04         | 0.466         | 2                | 3.53E+09                                | 110            | 1.94E+11                                |
| 8/31/04         | 0.205         | 17               | 1.32E+10                                | 49             | 3.80E+10                                |
| 9/30/04         | 0.200         | 70               | 5.29E+10                                | 170            | 1.28E+11                                |
| 10/31/04        | 0.180         | 33               | 2.25E+10                                | 70             | 4.78E+10                                |
| 11/30/04        | 0.176         | 8                | 5.32E+09                                | 33             | 2.20E+10                                |
| 12/31/04        | 0.186         | 70               | 4.92E+10                                | 920            | 6.47E+11                                |
| <b>AVERAGE:</b> | <b>0.389</b>  | <b>493</b>       | <b>1.21E+12</b>                         | <b>4,066</b>   | <b>7.49E+12</b>                         |
| <b>MEDIAN:</b>  | <b>0.338</b>  | <b>30</b>        | <b>4.73E+10</b>                         | <b>430</b>     | <b>4.88E+11</b>                         |

**NOTE:** This table represents data available in the Departments Permit Compliance System (PCS) database. Some values are blank, as they may not have been reported to the Department, and is based on the data in Appendix B.

## Appendix D: Historical Fecal Coliform Observations in Moncrief Creek

| WATERBODY      | WBID | SAMPLE DATE | STATION       | LOCATION                          | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|---------------|-----------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 3/12/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,300           |             |
| MONCRIEF CREEK | 2228 | 3/12/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,300           |             |
| MONCRIEF CREEK | 2228 | 3/19/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 3/19/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 4/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 2,300           |             |
| MONCRIEF CREEK | 2228 | 4/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 2,300           |             |
| MONCRIEF CREEK | 2228 | 4/23/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/23/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/24/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 30,000          |             |
| MONCRIEF CREEK | 2228 | 7/24/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 30,000          |             |
| MONCRIEF CREEK | 2228 | 9/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 9/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 10/22/1991  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/22/1991  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 5,000           |             |
| MONCRIEF CREEK | 2228 | 12/11/1991  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 12/11/1991  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 2/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/5/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 2/5/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1992   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1992   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/27/1992   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/27/1992   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         |             |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         |             |
| MONCRIEF CREEK | 2228 | 10/19/1992  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 10/19/1992  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 10/20/1992  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 22,000          |             |
| MONCRIEF CREEK | 2228 | 10/20/1992  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 22,000          |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 10,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 90,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 90,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 10,000          |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |

### Appendix D: Historical Fecal Coliform Observations in Moncrief Creek (continued)

| WATERBODY      | WBID | SAMPLE DATE | STATION          | LOCATION                          | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|------------------|-----------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 800             |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 800             |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/10/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 5,000           | Q           |
| MONCRIEF CREEK | 2228 | 7/10/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 5,000           |             |
| MONCRIEF CREEK | 2228 | 8/29/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 8/29/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           |             |
| MONCRIEF CREEK | 2228 | 10/24/1995  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 10/24/1995  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           |             |
| MONCRIEF CREEK | 2228 | 2/27/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 2/27/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 4/29/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 4/29/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 6/26/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 6/26/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 8/5/1996    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 8/5/1996    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 10/30/1996  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 10/30/1996  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 2/19/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 80              | Q           |
| MONCRIEF CREEK | 2228 | 2/19/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 80              | Q           |
| MONCRIEF CREEK | 2228 | 4/30/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 170             | Q           |
| MONCRIEF CREEK | 2228 | 4/30/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 170             | Q           |
| MONCRIEF CREEK | 2228 | 10/8/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 40              |             |
| MONCRIEF CREEK | 2228 | 10/8/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 40              |             |
| MONCRIEF CREEK | 2228 | 12/10/1997  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,500           |             |
| MONCRIEF CREEK | 2228 | 12/10/1997  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,500           |             |
| MONCRIEF CREEK | 2228 | 1/20/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             |             |
| MONCRIEF CREEK | 2228 | 1/20/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 3/2/1998    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 900             |             |
| MONCRIEF CREEK | 2228 | 3/2/1998    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 900             | Q           |
| MONCRIEF CREEK | 2228 | 6/23/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,000           |             |
| MONCRIEF CREEK | 2228 | 6/23/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,000           | Q           |
| MONCRIEF CREEK | 2228 | 7/27/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 240             |             |
| MONCRIEF CREEK | 2228 | 7/27/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 240             |             |
| MONCRIEF CREEK | 2228 | 8/4/1998    | 21FLA 20030576   | MONCRIEF CR @ 26TH ST.            | 5,000           |             |

## Appendix D: Historical Fecal Coliform Observations in Moncrief Creek (continued)

| WATERBODY      | WBID | SAMPLE DATE | STATION        | LOCATION                      | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|----------------|-------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 5/25/2000   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 157,000         |             |
| MONCRIEF CREEK | 2228 | 9/12/2000   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 7,500           |             |
| MONCRIEF CREEK | 2228 | 1/30/2001   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 667             |             |
| MONCRIEF CREEK | 2228 | 5/30/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 2,833           |             |
| MONCRIEF CREEK | 2228 | 8/12/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 21,800          |             |
| MONCRIEF CREEK | 2228 | 8/12/2002   | 21FLA 20030114 | MONCRIEF CR LEM TURNER RD BR  | 1,167           |             |
| MONCRIEF CREEK | 2228 | 12/5/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 74,800          |             |

 Shaded cells are values which exceed the state criterion of 400 counts/100 mL

Remark Codes:

Q – Sample held beyond normal holding time

L – Off scale high. Actual value not known, but known to be greater than the value shown

**NOTE:** Some samples were seen as duplicates (i.e. same date and location) and were averaged, per the IWR, for TMDL determination. Appendix B includes all data contained in the IWR database. For this reason, some discrepancies may exist between Appendix B and tables contained in the text.

## Appendix E: Historical Total Coliform Observations in Moncrief Creek

| WATERBODY      | WBID | SAMPLE DATE | STATION       | LOCATION                          | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|---------------|-----------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 3/12/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,300           |             |
| MONCRIEF CREEK | 2228 | 3/12/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,300           |             |
| MONCRIEF CREEK | 2228 | 3/19/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 3/19/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 4/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 2,300           |             |
| MONCRIEF CREEK | 2228 | 4/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 2,300           |             |
| MONCRIEF CREEK | 2228 | 4/23/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/23/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/24/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 30,000          |             |
| MONCRIEF CREEK | 2228 | 7/24/1991   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 30,000          |             |
| MONCRIEF CREEK | 2228 | 9/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 9/16/1991   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 10/22/1991  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/22/1991  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 5,000           |             |
| MONCRIEF CREEK | 2228 | 12/11/1991  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 12/11/1991  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 2/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/5/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 2/5/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1992   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1992   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/27/1992   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 4/27/1992   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 17,000          |             |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         |             |
| MONCRIEF CREEK | 2228 | 8/3/1992    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         |             |
| MONCRIEF CREEK | 2228 | 10/19/1992  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 10/19/1992  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 160,000         | L           |
| MONCRIEF CREEK | 2228 | 10/20/1992  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 22,000          |             |
| MONCRIEF CREEK | 2228 | 10/20/1992  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 22,000          |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 1/26/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 50,000          |             |
| MONCRIEF CREEK | 2228 | 4/22/1993   | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 50,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 7/7/1993    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 90,000          |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 5,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 10/19/1993  | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 10,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 90,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR114 | MONCRIEF CREEK AT LEM TURNER ROAD | 90,000          |             |
| MONCRIEF CREEK | 2228 | 2/1/1994    | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 10,000          |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR316 | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |

### Appendix E: Historical Total Coliform Observations in Moncrief Creek (continued)

| WATERBODY      | WBID | SAMPLE DATE | STATION          | LOCATION                          | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|------------------|-----------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 4/19/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 3,000           |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/18/1994   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 9,000           |             |
| MONCRIEF CREEK | 2228 | 10/18/1994  | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 160,000         |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 30,000          |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 800             |             |
| MONCRIEF CREEK | 2228 | 1/30/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 800             |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR114    | MONCRIEF CREEK AT LEM TURNER ROAD | 2,400           |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 4/19/1995   | 21FLJXWQTR316    | MONCRIEF CREEK AT 33RD. STREET    | 16,000          |             |
| MONCRIEF CREEK | 2228 | 7/10/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 5,000           | Q           |
| MONCRIEF CREEK | 2228 | 7/10/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 5,000           |             |
| MONCRIEF CREEK | 2228 | 8/29/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 8/29/1995   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           |             |
| MONCRIEF CREEK | 2228 | 10/24/1995  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 10/24/1995  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           |             |
| MONCRIEF CREEK | 2228 | 2/27/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 2/27/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 4/29/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 4/29/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 6/26/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 6/26/1996   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,400           | Q           |
| MONCRIEF CREEK | 2228 | 8/5/1996    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 8/5/1996    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,300           | Q           |
| MONCRIEF CREEK | 2228 | 10/30/1996  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 10/30/1996  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 800             | Q           |
| MONCRIEF CREEK | 2228 | 2/19/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 80              | Q           |
| MONCRIEF CREEK | 2228 | 2/19/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 80              | Q           |
| MONCRIEF CREEK | 2228 | 4/30/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 170             | Q           |
| MONCRIEF CREEK | 2228 | 4/30/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 170             | Q           |
| MONCRIEF CREEK | 2228 | 10/8/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 40              |             |
| MONCRIEF CREEK | 2228 | 10/8/1997   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 40              |             |
| MONCRIEF CREEK | 2228 | 12/10/1997  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,500           |             |
| MONCRIEF CREEK | 2228 | 12/10/1997  | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 2,500           |             |
| MONCRIEF CREEK | 2228 | 1/20/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             |             |
| MONCRIEF CREEK | 2228 | 1/20/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 300             | Q           |
| MONCRIEF CREEK | 2228 | 3/2/1998    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 900             |             |
| MONCRIEF CREEK | 2228 | 3/2/1998    | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 900             | Q           |
| MONCRIEF CREEK | 2228 | 6/23/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,000           |             |
| MONCRIEF CREEK | 2228 | 6/23/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 1,000           | Q           |
| MONCRIEF CREEK | 2228 | 7/27/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 240             |             |
| MONCRIEF CREEK | 2228 | 7/27/1998   | 21FLSJWM20030115 | MONCRIEF CREEK NEAR MOUTH         | 240             |             |
| MONCRIEF CREEK | 2228 | 8/4/1998    | 21FLA 20030576   | MONCRIEF CR @ 26TH ST.            | 5,000           |             |

## Appendix E: Historical Total Coliform Observations in Moncrief Creek (continued)

| WATERBODY      | WBID | SAMPLE DATE | STATION        | LOCATION                      | VALUE (#/100mL) | REMARK CODE |
|----------------|------|-------------|----------------|-------------------------------|-----------------|-------------|
| MONCRIEF CREEK | 2228 | 5/25/2000   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 157,000         |             |
| MONCRIEF CREEK | 2228 | 9/12/2000   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 7,500           |             |
| MONCRIEF CREEK | 2228 | 1/30/2001   | 21FLA 20030726 | MONCRIEF CR AT MONCRIEF ROAD  | 667             |             |
| MONCRIEF CREEK | 2228 | 5/30/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 2,833           |             |
| MONCRIEF CREEK | 2228 | 8/12/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 21,800          |             |
| MONCRIEF CREEK | 2228 | 8/12/2002   | 21FLA 20030114 | MONCRIEF CR LEM TURNER RD BR  | 1,167           |             |
| MONCRIEF CREEK | 2228 | 12/5/2002   | 21FLA 20030316 | MONCRIEF CR N OF 33RD ST BRID | 74,800          |             |

 Shaded cells are values which exceed the state criterion of 2,400 counts/100 mL

Remark Codes:

Q – Sample held beyond normal holding time

L – Off scale high. Actual value not known, but known to be greater than the value shown

**NOTE:** Some samples were seen as duplicates (i.e. same date and location) and were averaged, per the IWR, for TMDL determination. Appendix B includes all data contained in the IWR database. For this reason, some discrepancies may exist between Appendix B and tables contained in the text.

## Appendix F: Kruskal – Wallis Analysis of Fecal Coliform Observations versus Month in Moncrief Creek

Categorical values encountered during processing are:

MONTH (12 levels)

1, 2, 3, 4, 5, 6, 7,  
8, 9, 10, 11, 12

Kruskal-Wallis One-Way Analysis of Variance for 106 cases

Dependent variable is VALUE

Grouping variable is MONTH

| Group | Count | Rank Sum |
|-------|-------|----------|
| 1     | 12    | 702.500  |
| 2     | 6     | 335.000  |
| 3     | 6     | 197.500  |
| 4     | 17    | 965.500  |
| 5     | 7     | 310.000  |
| 6     | 4     | 208.500  |
| 7     | 10    | 710.000  |
| 8     | 14    | 689.000  |
| 9     | 5     | 351.500  |
| 10    | 15    | 722.000  |
| 11    | 2     | 94.000   |
| 12    | 8     | 385.500  |

Kruskal-Wallis Test Statistic = 9.684

Probability is 0.559 assuming Chi-square distribution with 11 df

## Appendix G: Kruskal – Wallis Analysis of Fecal Coliform Observations versus Season in Moncrief Creek

Categorical values encountered during processing are:

SEASON2 (4 levels)

1, 2, 3, 4

Kruskal-Wallis One-Way Analysis of Variance for 106 cases

Dependent variable is VALUE

Grouping variable is SEASON2

| Group | Count | Rank Sum |
|-------|-------|----------|
| 1     | 24    | 1235.000 |
| 2     | 28    | 1484.000 |
| 3     | 29    | 1750.500 |
| 4     | 25    | 1201.500 |

Kruskal-Wallis Test Statistic = 2.344

Probability is 0.504 assuming Chi-square distribution with 3 df

## Appendix H: Kruskal – Wallis Analysis of Total Coliform Observations versus Month in Moncrief Creek

Categorical values encountered during processing are:

MONTH (11 levels)

1, 2, 3, 4, 5, 6, 7,  
8, 9, 10, 12

Kruskal-Wallis One-Way Analysis of Variance for 60 cases

Dependent variable is VALUE

Grouping variable is MONTH

| Group | Count | Rank Sum |
|-------|-------|----------|
| 1     | 6     | 138.000  |
| 2     | 6     | 160.500  |
| 3     | 3     | 85.000   |
| 4     | 12    | 378.000  |
| 5     | 2     | 77.000   |
| 6     | 2     | 31.500   |
| 7     | 7     | 249.500  |
| 8     | 7     | 233.000  |
| 9     | 2     | 77.000   |
| 10    | 10    | 299.500  |
| 12    | 3     | 101.000  |

Kruskal-Wallis Test Statistic = 4.641

Probability is 0.914 assuming Chi-square distribution with 10 df

## Appendix I: Kruskal – Wallis Analysis of Total Coliform Observations versus Season in Moncrief Creek

Categorical values encountered during processing are:

SEASON (4 levels)

1, 2, 3, 4

Kruskal-Wallis One-Way Analysis of Variance for 60 cases

Dependent variable is VALUE

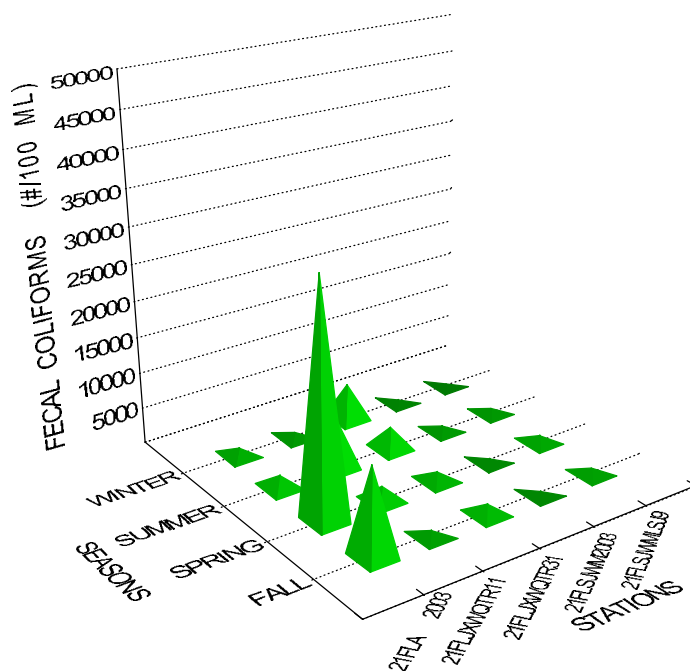
Grouping variable is SEASON

| Group | Count | Rank Sum |
|-------|-------|----------|
| 1     | 15    | 383.500  |
| 2     | 16    | 486.500  |
| 3     | 16    | 559.500  |
| 4     | 13    | 400.500  |

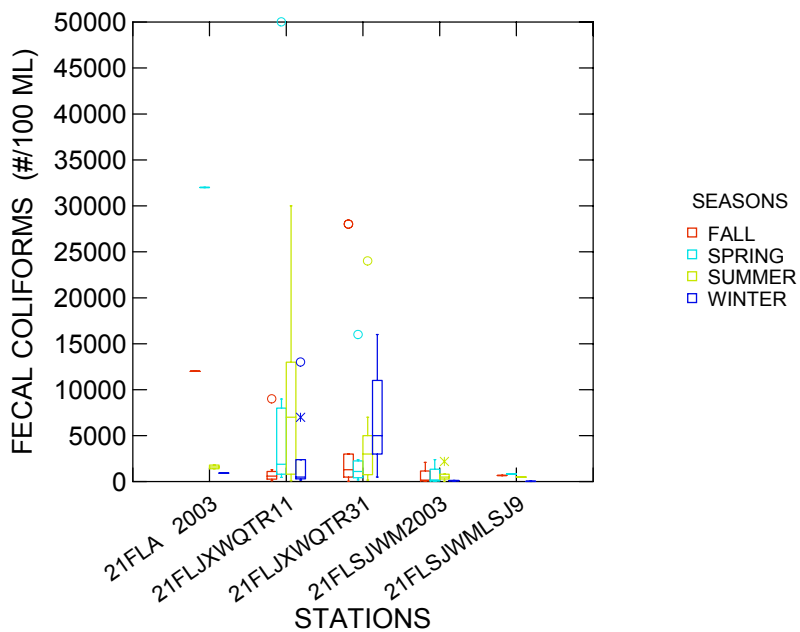
Kruskal-Wallis Test Statistic = 2.255

Probability is 0.521 assuming Chi-square distribution with 3 df

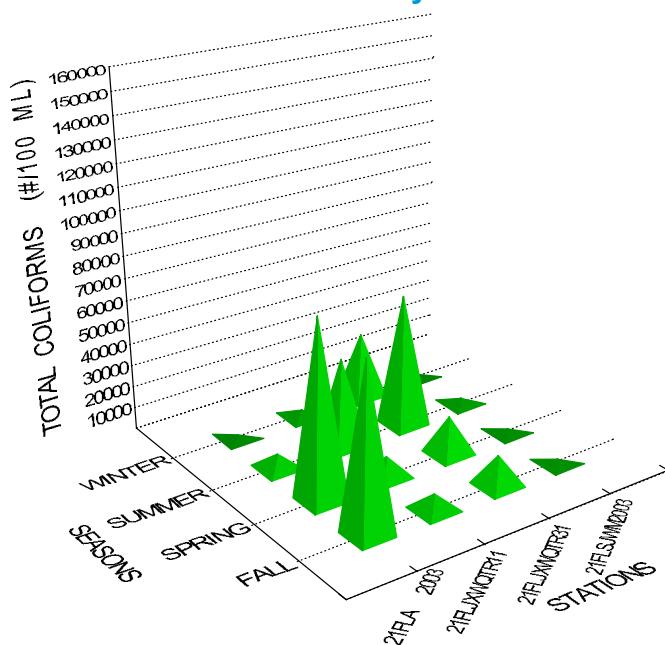
## Appendix J: Fecal Coliform Observations by Station and Season in Moncrief Creek



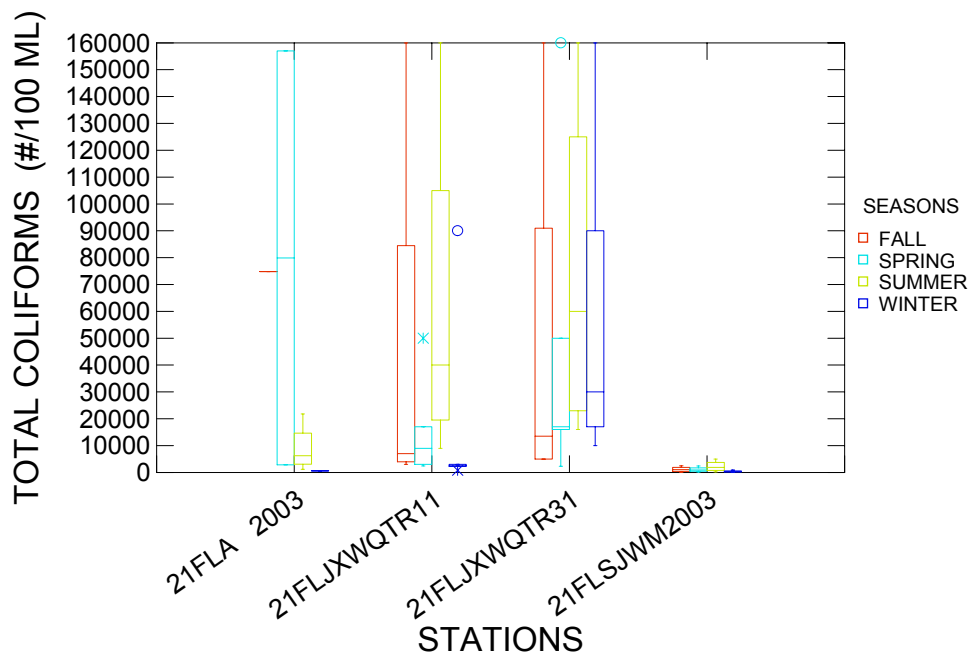
| Station                           | STORET ID        |
|-----------------------------------|------------------|
| MONCRIEF CR @ 26TH ST.            | 21FLA 20030576   |
| MONCRIEF CR AT MONCRIEF ROAD      | 21FLA 20030726   |
| MONCRIEF CR N OF 33RD ST BRID     | 21FLA 20030316   |
| MONCRIEF CREEK AT 33RD. STREET    | 21FLJXWQTR316    |
| MONCRIEF CREEK AT LEM TURNER ROAD | 21FLJXWQTR114    |
| MONCRIEF CREEK NEAR MOUTH         | 21FLSJWM20030115 |



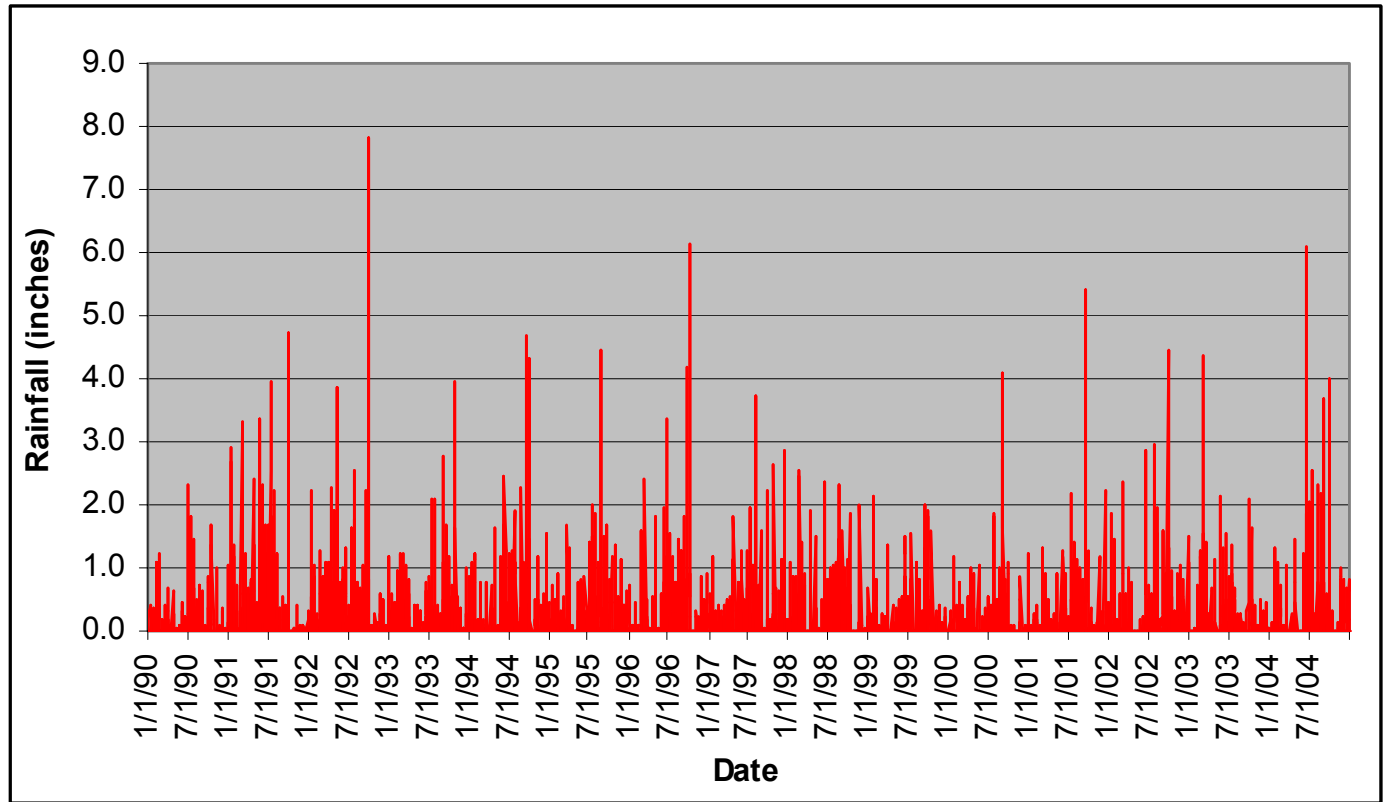
## Appendix K: Total Coliform Observations by Station and Season in Moncrief Creek



| Station                           | STORET ID        |
|-----------------------------------|------------------|
| MONCRIEF CR @ 26TH ST.            | 21FLA 20030576   |
| MONCRIEF CR AT MONCRIEF ROAD      | 21FLA 20030726   |
| MONCRIEF CR N OF 33RD ST BRID     | 21FLA 20030316   |
| MONCRIEF CREEK AT 33RD. STREET    | 21FLJXWQTR316    |
| MONCRIEF CREEK AT HWY 111         | 21FLSJWMLSJ907   |
| MONCRIEF CREEK AT LEM TURNER ROAD | 21FLJXWQTR114    |
| MONCRIEF CREEK NEAR MOUTH         | 21FLSJWM20030115 |



**Appendix L: Chart of Rainfall for Jacksonville International Airport (JIA) from 1990 – 2004**



## Appendix M: Spearman Correlation Matrix Analysis for Precipitation and Fecal Coliforms in Moncrief Creek

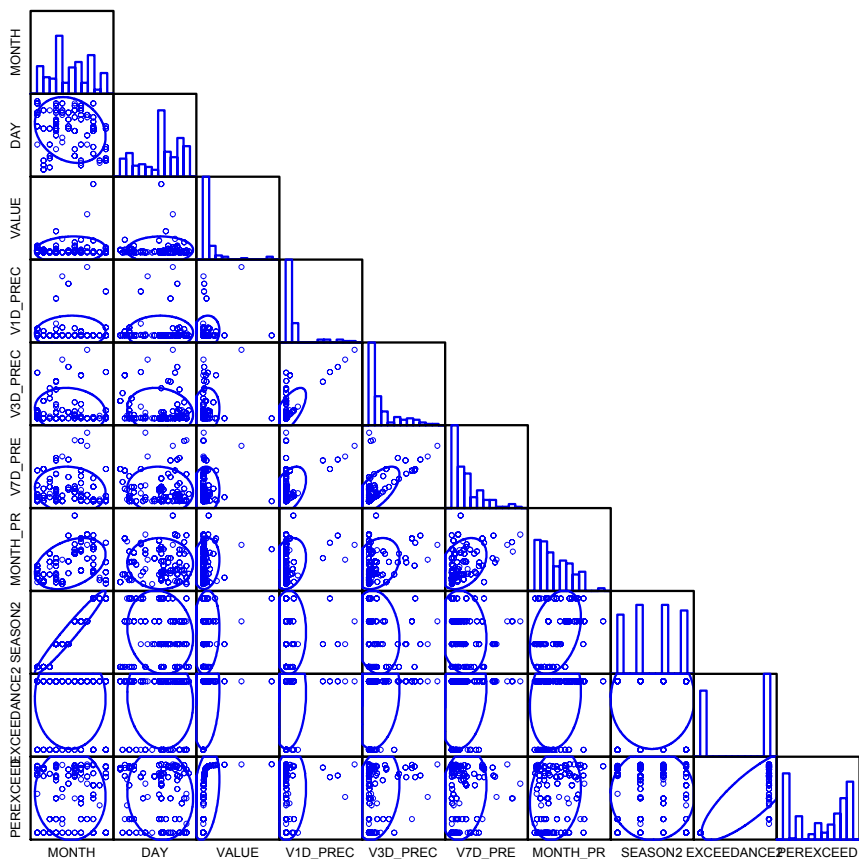
The following results are for:

WBID\$ = 2228

Spearman correlation matrix

|             | MONTH  | DAY    | VALUE  | V1D_PREC | V3D_PREC |
|-------------|--------|--------|--------|----------|----------|
| MONTH       | 1.000  |        |        |          |          |
| DAY         | -0.226 | 1.000  |        |          |          |
| VALUE       | -0.047 | -0.072 | 1.000  |          |          |
| V1D_PREC    | -0.020 | 0.005  | 0.167  | 1.000    |          |
| V3D_PREC    | -0.204 | -0.007 | 0.205  | 0.543    | 1.000    |
| V7D_PRE     | -0.236 | -0.116 | 0.208  | 0.253    | 0.619    |
| MONTH_PR    | 0.359  | -0.045 | 0.135  | 0.181    | 0.183    |
| SEASON2     | 0.975  | -0.178 | -0.017 | -0.045   | -0.233   |
| EXCEEDANCE2 | -0.000 | -0.113 | 0.755  | 0.127    | 0.156    |
| PEREXCEED   | -0.048 | -0.075 | 0.992  | 0.157    | 0.203    |

|             | V7D_PRE | MONTH_PR | SEASON2 | EXCEEDANCE2 | PEREXCEED |
|-------------|---------|----------|---------|-------------|-----------|
| V7D_PRE     | 1.000   |          |         |             |           |
| MONTH_PR    | 0.367   | 1.000    |         |             |           |
| SEASON2     | -0.263  | 0.374    | 1.000   |             |           |
| EXCEEDANCE2 | 0.282   | 0.124    | 0.012   | 1.000       |           |
| PEREXCEED   | 0.220   | 0.144    | -0.017  | 0.761       | 1.000     |



## Appendix N: Spearman Correlation Matrix Analysis for Precipitation and Fecal Coliforms in Moncrief Creek

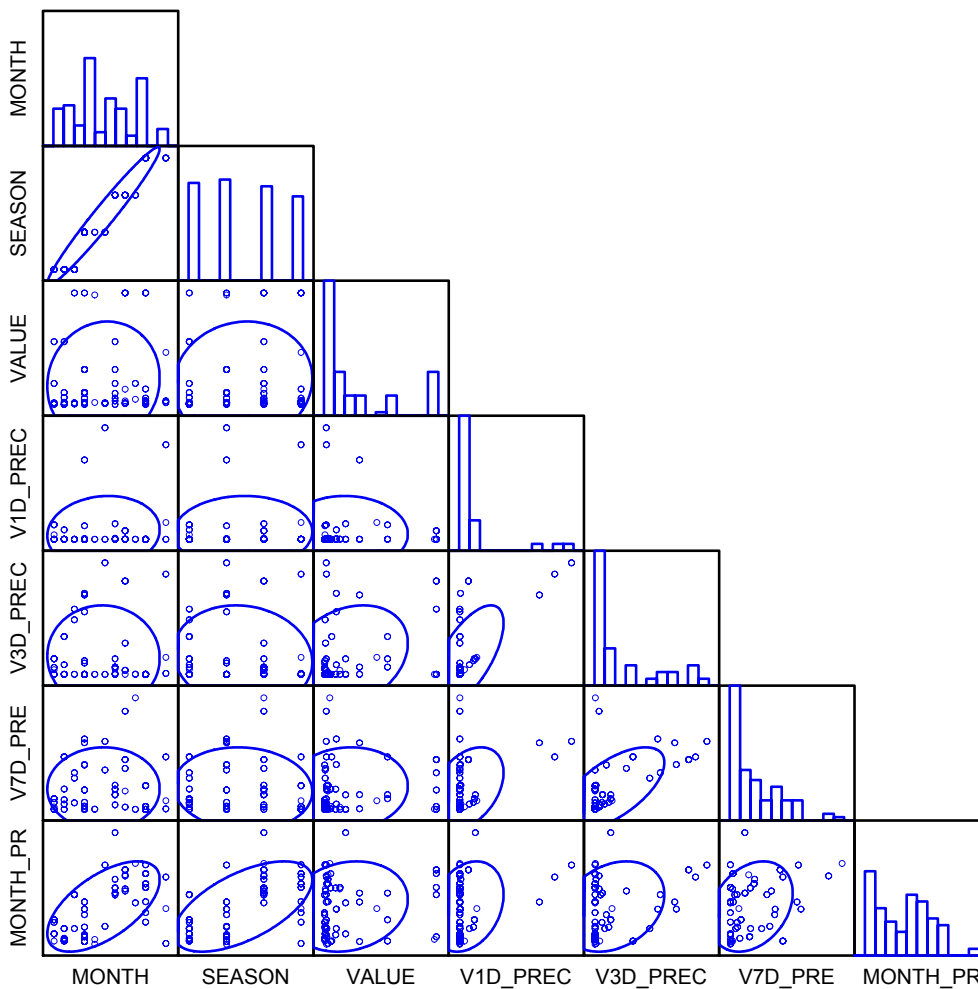
The following results are for:

WBID\$ = 2228

Spearman correlation matrix

|          | MONTH  | SEASON | VALUE | V1D_PREC | V3D_PREC |
|----------|--------|--------|-------|----------|----------|
| MONTH    | 1.000  |        |       |          |          |
| SEASON   | 0.978  | 1.000  |       |          |          |
| VALUE    | 0.115  | 0.121  | 1.000 |          |          |
| V1D_PREC | -0.047 | -0.055 | 0.158 | 1.000    |          |
| V3D_PREC | -0.142 | -0.188 | 0.181 | 0.645    | 1.000    |
| V7D_PRE  | -0.081 | -0.138 | 0.141 | 0.312    | 0.673    |
| MONTH_PR | 0.604  | 0.607  | 0.168 | 0.268    | 0.194    |

|          | V7D_PRE | MONTH_PR |
|----------|---------|----------|
| V7D_PRE  | 1.000   |          |
| MONTH_PR | 0.290   | 1.000    |



## Appendix O: Analysis of Fecal Coliform Observations versus Precipitation in Moncrief Creek

### Analysis of sample day precipitation (1 day)

Dep Var: VALUE N: 106 Multiple R: 0.216 Squared multiple R: 0.047

Adjusted squared multiple R: 0.038 Standard error of estimate: 18599.759

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t     | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|-------|-----------|
| CONSTANT | 5597.196    | 1883.877  | 0.000    | .         | 2.971 | 0.004     |
| V1D_PREC | 5535.692    | 2448.910  | 0.216    | 1.000     | 2.260 | 0.026     |

### Analysis of Variance

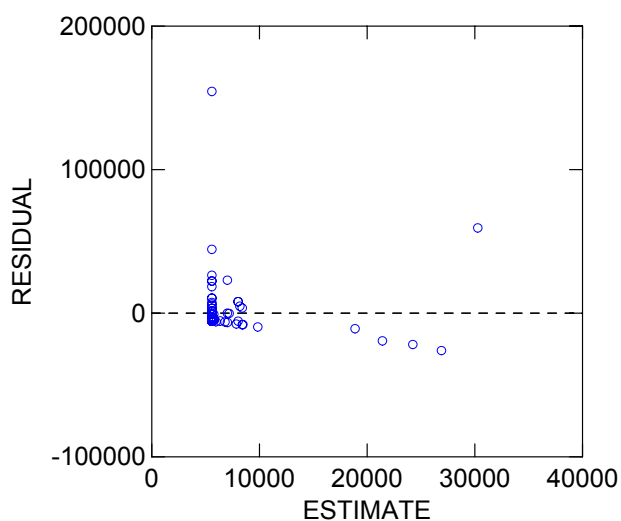
| Source     | Sum-of-Squares | df  | Mean-Square | F-ratio | P     |
|------------|----------------|-----|-------------|---------|-------|
| Regression | 1.76772E+09    | 1   | 1.76772E+09 | 5.110   | 0.026 |
| Residual   | 3.59789E+10    | 104 | 3.45951E+08 |         |       |

\*\*\* WARNING \*\*\*

Case 3 is an outlier (Studentized Residual = 14.444)  
Case 14 has large leverage (Leverage = 0.130)  
Case 30 has large leverage (Leverage = 0.238)  
Case 38 has large leverage (Leverage = 0.182)  
Case 82 has large leverage (Leverage = 0.321)  
Case 82 is an outlier (Studentized Residual = 4.164)

Durbin-Watson D Statistic 2.084  
First Order Autocorrelation -0.043

Plot of residuals against predicted values



## Analysis of sample day and two days prior precipitation (3 day)

Dep Var: VALUE N: 106 Multiple R: 0.168 Squared multiple R: 0.028

Adjusted squared multiple R: 0.019 Standard error of estimate: 18780.439

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t     | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|-------|-----------|
| CONSTANT | 5108.041    | 2068.903  | 0.000    | .         | 2.469 | 0.015     |
| V3D_PREC | 3357.021    | 1931.614  | 0.168    | 1.000     | 1.738 | 0.085     |

### Analysis of Variance

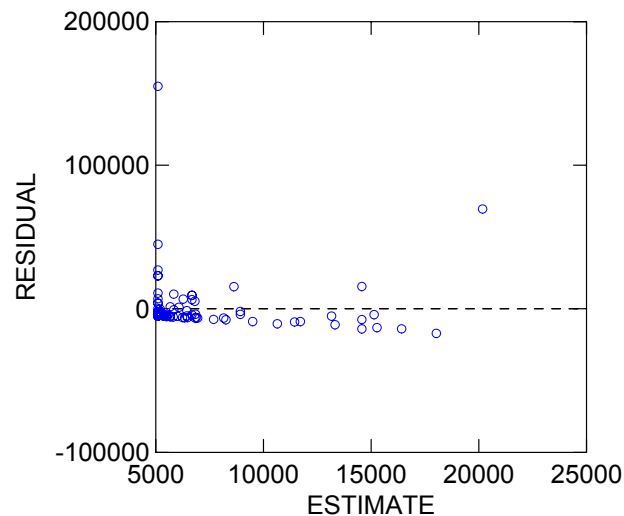
| Source     | Sum-of-Squares | df  | Mean-Square | F-ratio | P     |
|------------|----------------|-----|-------------|---------|-------|
| Regression | 1.06532E+09    | 1   | 1.06532E+09 | 3.020   | 0.085 |
| Residual   | 3.66813E+10    | 104 | 3.52705E+08 |         |       |

\*\*\* WARNING \*\*\*

Case 3 is an outlier (Studentized Residual = 14.206)  
Case 30 has large leverage (Leverage = 0.128)  
Case 82 has large leverage (Leverage = 0.177)  
Case 82 is an outlier (Studentized Residual = 4.424)

Durbin-Watson D Statistic 2.090  
First Order Autocorrelation -0.046

Plot of residuals against predicted values



**Analysis of sample day and six days prior precipitation (7 day)**

Dep Var: VALUE N: 106 Multiple R: 0.052 Squared multiple R: 0.003

Adjusted squared multiple R: 0.000 Standard error of estimate: 19025.731

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t     | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|-------|-----------|
| CONSTANT | 6061.651    | 2322.870  | 0.000    | .         | 2.610 | 0.010     |
| V7D_PRE  | 670.238     | 1269.673  | 0.052    | 1.000     | 0.528 | 0.599     |

**Analysis of Variance**

| Source     | Sum-of-Squares | df  | Mean-Square | F-ratio | P     |
|------------|----------------|-----|-------------|---------|-------|
| Regression | 1.00869E+08    | 1   | 1.00869E+08 | 0.279   | 0.599 |
| Residual   | 3.76458E+10    | 104 | 3.61978E+08 |         |       |

\*\*\* WARNING \*\*\*

Case 3 is an outlier (Studentized Residual = 13.503)

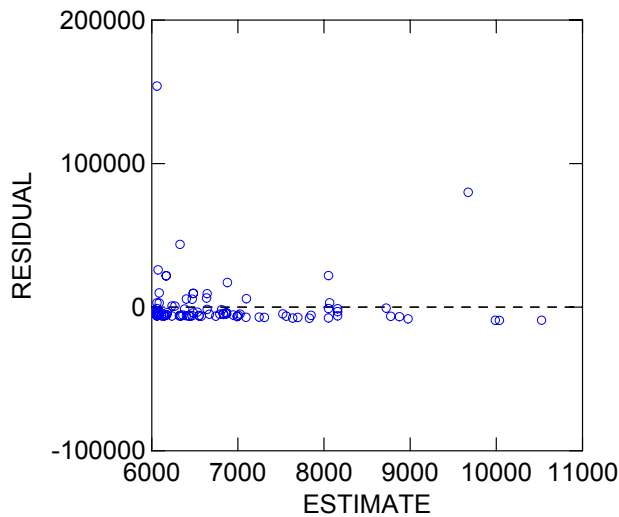
Case 73 has large leverage (Leverage = 0.147)

Case 82 is an outlier (Studentized Residual = 4.862)

Durbin-Watson D Statistic 2.115

First Order Autocorrelation -0.059

Plot of residuals against predicted values



## Appendix P: Analysis of Total Coliform Observations versus Precipitation in Moncrief Creek

### Analysis of sample day precipitation (1 day)

Dep Var: VALUE N: 60 Multiple R: 0.034 Squared multiple R: 0.001

Adjusted squared multiple R: 0.000 Standard error of estimate: 52292.798

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t      | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|--------|-----------|
| CONSTANT | 32827.360   | 7073.507  | 0.000    | .         | 4.641  | 0.000     |
| V1D_PREC | -2780.586   | 10628.904 | -0.034   | 1.000     | -0.262 | 0.795     |

### Analysis of Variance

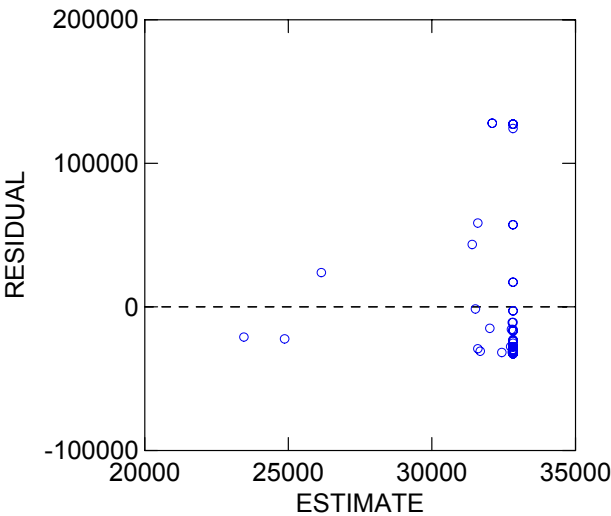
| Source     | Sum-of-Squares | df | Mean-Square | F-ratio | P     |
|------------|----------------|----|-------------|---------|-------|
| Regression | 1.87146E+08    | 1  | 1.87146E+08 | 0.068   | 0.795 |
| Residual   | 1.58603E+11    | 58 | 2.73454E+09 |         |       |

\*\*\* WARNING \*\*\*

Case 17 has large leverage (Leverage = 0.217)  
Case 27 has large leverage (Leverage = 0.432)  
Case 59 has large leverage (Leverage = 0.309)

Durbin-Watson D Statistic 1.966  
First Order Autocorrelation 0.008

Plot of residuals against predicted values



**Analysis of sample day and two days prior precipitation**

Dep Var: VALUE N: 60 Multiple R: 0.257 Squared multiple R: 0.066  
 Adjusted squared multiple R: 0.050 Standard error of estimate: 50569.825

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t     | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|-------|-----------|
| CONSTANT | 24931.000   | 7469.912  | 0.000    | .         | 3.338 | 0.001     |
| V3D_PREC | 14702.603   | 7267.514  | 0.257    | 1.000     | 2.023 | 0.048     |

**Analysis of Variance**

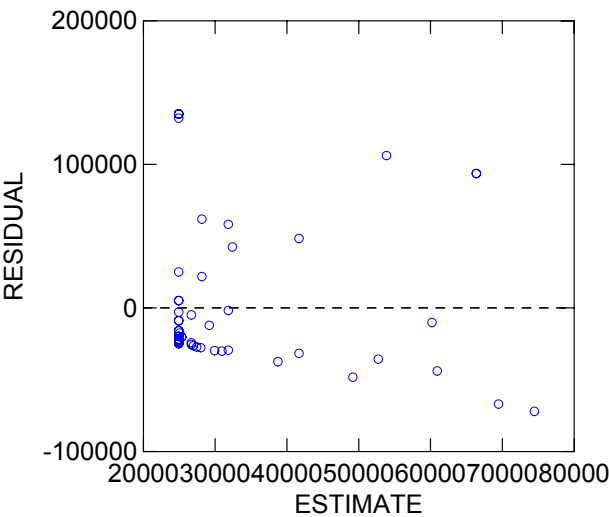
| Source     | Sum-of-Squares | df | Mean-Square | F-ratio | P     |
|------------|----------------|----|-------------|---------|-------|
| Regression | 1.04665E+10    | 1  | 1.04665E+10 | 4.093   | 0.048 |
| Residual   | 1.48324E+11    | 58 | 2.55731E+09 |         |       |

\*\*\* WARNING \*\*\*

Case 27 has large leverage (Leverage = 0.187)

Durbin-Watson D Statistic 1.965  
 First Order Autocorrelation 0.010

Plot of residuals against predicted values



## Analysis of sample day and six days prior precipitation (7 day)

Dep Var: VALUE N: 60 Multiple R: 0.039 Squared multiple R: 0.002

Adjusted squared multiple R: 0.000 Standard error of estimate: 52282.903

| Effect   | Coefficient | Std Error | Std Coef | Tolerance | t     | P(2 Tail) |
|----------|-------------|-----------|----------|-----------|-------|-----------|
| CONSTANT | 30645.113   | 8656.598  | 0.000    | .         | 3.540 | 0.001     |
| V7D_PRE  | 1335.385    | 4440.949  | 0.039    | 1.000     | 0.301 | 0.765     |

## Analysis of Variance

| Source     | Sum-of-Squares | df | Mean-Square | F-ratio | P     |
|------------|----------------|----|-------------|---------|-------|
| Regression | 2.47161E+08    | 1  | 2.47161E+08 | 0.090   | 0.765 |
| Residual   | 1.58543E+11    | 58 | 2.73350E+09 |         |       |

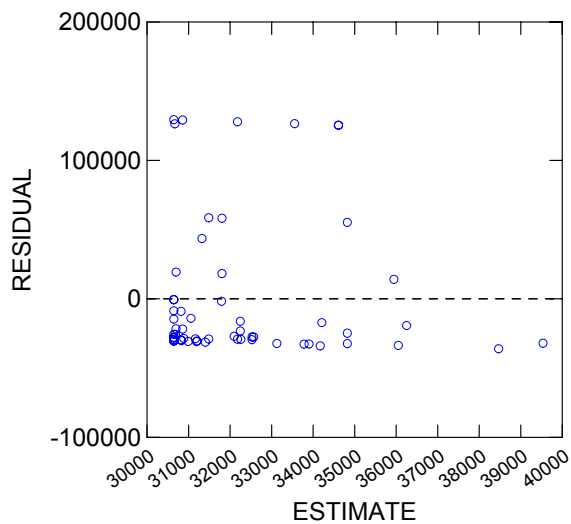
\*\*\* WARNING \*\*\*

Case 45 has large leverage (Leverage = 0.230)

Durbin-Watson D Statistic 1.955

First Order Autocorrelation 0.014

Plot of residuals against predicted values

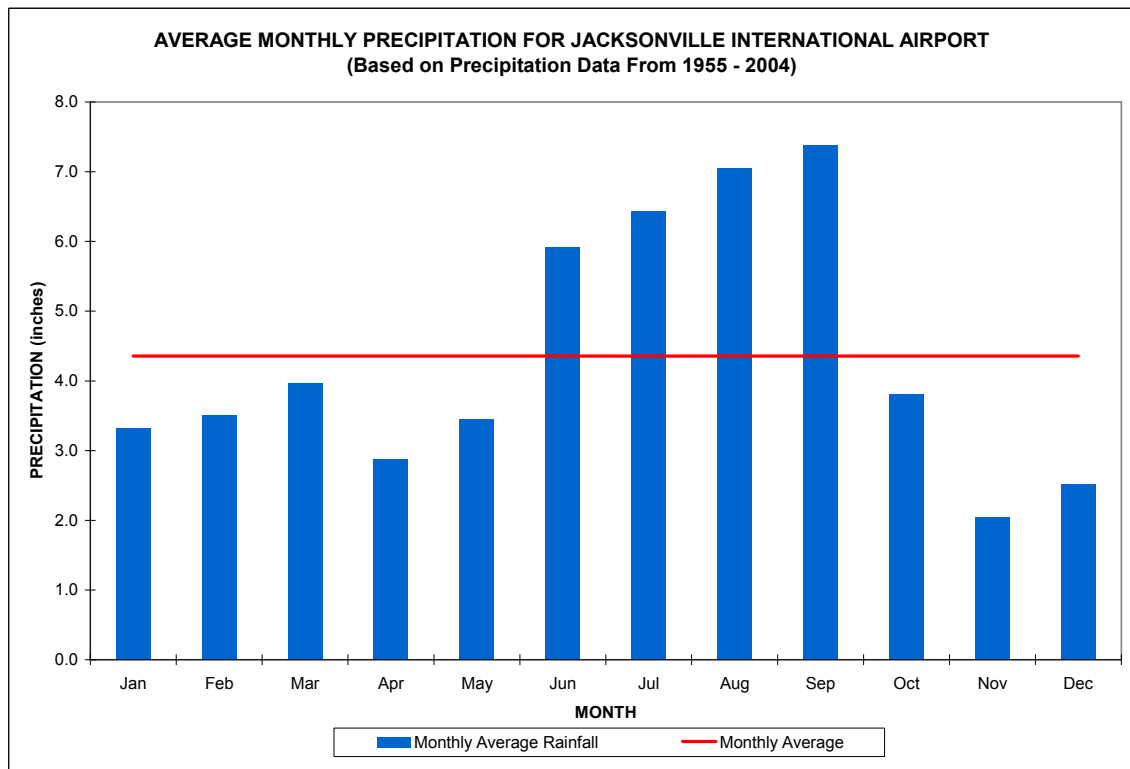
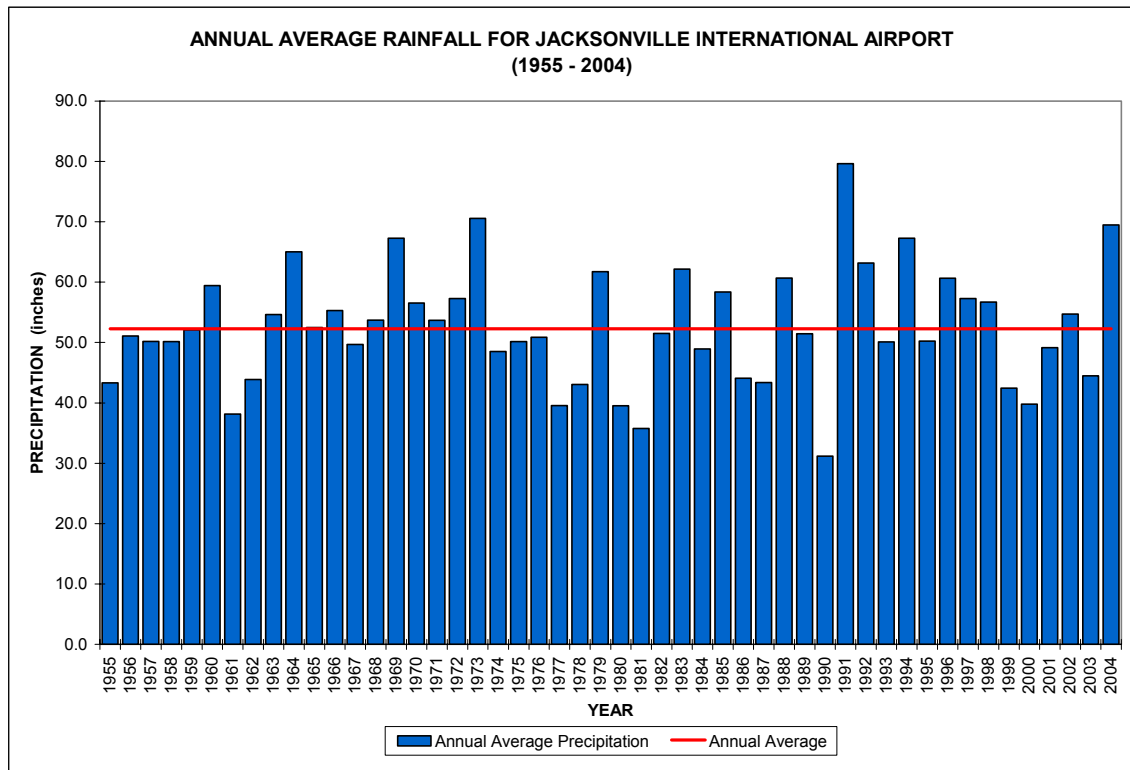


## Appendix Q: Monthly and Annual Precipitation 1955 – 2004 from JIA

| Year       | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Annual Total |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| 1955       | 3.09        | 2.46        | 1.66        | 1.5         | 4.51        | 2.7         | 5.53        | 3.85        | 10.56       | 5.36        | 1.9         | 0.21        | 43.33        |
| 1956       | 2.91        | 2.94        | 0.81        | 2.33        | 3.98        | 7.87        | 8.25        | 5.24        | 2.89        | 13.44       | 0.38        | 0.04        | 51.08        |
| 1957       | 0.33        | 1.69        | 3.87        | 1.61        | 5.25        | 7.1         | 12.34       | 3.3         | 8.33        | 3.5         | 1.55        | 1.31        | 50.18        |
| 1958       | 3.39        | 3.74        | 3.38        | 8.24        | 3.79        | 3.96        | 4.37        | 4.67        | 4.75        | 5.07        | 2.02        | 2.76        | 50.14        |
| 1959       | 2.97        | 5.22        | 9.75        | 2.65        | 9.2         | 2.94        | 4.51        | 2.86        | 5.67        | 3.12        | 2.24        | 0.95        | 52.08        |
| 1960       | 2.07        | 5.17        | 6.94        | 3.54        | 1.18        | 4.7         | 16.21       | 6.5         | 8.57        | 2.95        | 0.11        | 1.51        | 59.45        |
| 1961       | 2.87        | 4.85        | 1.17        | 4.16        | 3.06        | 5.27        | 3.48        | 10.64       | 1.02        | 0.27        | 0.89        | 0.47        | 38.15        |
| 1962       | 2.16        | 0.52        | 3.1         | 2.36        | 1.12        | 8.22        | 6.31        | 10.07       | 4.37        | 1.13        | 2.08        | 2.46        | 43.90        |
| 1963       | 5.39        | 6.93        | 2.23        | 1.75        | 1.74        | 12.49       | 6.47        | 4.95        | 4.88        | 1.53        | 2.7         | 3.6         | 54.66        |
| 1964       | 7.29        | 6.55        | 1.76        | 4.65        | 4.8         | 4.67        | 6.12        | 5.63        | 10.31       | 5.09        | 3.33        | 4.83        | 65.03        |
| 1965       | 0.65        | 5.5         | 3.91        | 0.95        | 0.94        | 9.79        | 2.71        | 9.58        | 11.02       | 1.75        | 1.92        | 3.75        | 52.47        |
| 1966       | 4.56        | 5.97        | 0.71        | 2.25        | 10.43       | 7.74        | 11.09       | 3.88        | 5.94        | 1.38        | 0.21        | 1.14        | 55.30        |
| 1967       | 3.05        | 4.35        | 0.81        | 2           | 1.18        | 12.9        | 5.22        | 12.31       | 1.8         | 1.13        | 0.24        | 4.69        | 49.68        |
| 1968       | 0.82        | 3.05        | 1.2         | 0.99        | 2.17        | 12.25       | 6.84        | 16.24       | 2.68        | 5.09        | 1.3         | 1.09        | 53.72        |
| 1969       | 0.84        | 3.39        | 4.23        | 0.34        | 3.78        | 5.12        | 5.89        | 15.1        | 10.33       | 9.81        | 4.56        | 3.87        | 67.26        |
| 1970       | 4.18        | 8.85        | 9.98        | 1.77        | 1.84        | 2.65        | 7.6         | 10.96       | 3.2         | 3.95        | 0           | 1.57        | 56.55        |
| 1971       | 2.01        | 2.55        | 2.41        | 4.07        | 1.9         | 5.52        | 5.07        | 12.83       | 4.17        | 6.46        | 0.83        | 5.87        | 53.69        |
| 1972       | 5.77        | 3.48        | 4.43        | 2.98        | 8.26        | 6.75        | 3.15        | 9.76        | 2.6         | 4.46        | 4.22        | 1.43        | 57.29        |
| 1973       | 4.64        | 5.07        | 10.18       | 11.61       | 5.33        | 4.1         | 5.45        | 7.49        | 7.86        | 4.08        | 0.44        | 4.32        | 70.57        |
| 1974       | 0.28        | 1.28        | 3.47        | 1.53        | 4.14        | 5.53        | 9.83        | 11.23       | 8.13        | 0.34        | 1.03        | 1.73        | 48.52        |
| 1975       | 3.48        | 2.58        | 2.46        | 5.78        | 7           | 5.21        | 6.36        | 6.23        | 5.24        | 3.63        | 0.39        | 1.79        | 50.15        |
| 1976       | 2.29        | 1.05        | 3.41        | 0.63        | 10.02       | 4.26        | 5.41        | 6.37        | 8.56        | 1.63        | 2.43        | 4.81        | 50.87        |
| 1977       | 2.96        | 3.24        | 1.03        | 1.76        | 3.07        | 2.65        | 1.97        | 7.26        | 7.45        | 1.68        | 3.11        | 3.38        | 39.56        |
| 1978       | 4.64        | 4.17        | 2.83        | 2.24        | 9.18        | 2.62        | 6.67        | 2.39        | 4.4         | 1.26        | 0.8         | 1.84        | 43.04        |
| 1979       | 6.28        | 3.75        | 1           | 4.18        | 7.54        | 5.91        | 4.67        | 4.78        | 17.75       | 0.25        | 3.64        | 2.01        | 61.76        |
| 1980       | 2.61        | 1.06        | 6.83        | 3.91        | 3.02        | 4.59        | 5.29        | 3.97        | 3.03        | 2.69        | 2.32        | 0.21        | 39.53        |
| 1981       | 0.92        | 4.53        | 5.41        | 0.32        | 1.48        | 3.31        | 2.46        | 6.47        | 1.22        | 1.35        | 4.92        | 3.38        | 35.77        |
| 1982       | 3           | 1.67        | 4.26        | 3.6         | 3.55        | 8.06        | 3.81        | 6.93        | 9.32        | 3.37        | 1.93        | 2.02        | 51.52        |
| 1983       | 7.19        | 4.27        | 8.46        | 4.65        | 1.38        | 6.86        | 6.11        | 4.63        | 4.61        | 4.29        | 3.32        | 6.42        | 62.19        |
| 1984       | 2.13        | 4.67        | 5.77        | 3.14        | 1.46        | 4.76        | 6.01        | 3.78        | 12.28       | 1.53        | 3.3         | 0.13        | 48.96        |
| 1985       | 1.05        | 1.45        | 1.26        | 2.76        | 2.08        | 3.71        | 6.33        | 8.93        | 16.82       | 8.34        | 2.07        | 3.59        | 58.39        |
| 1986       | 4.19        | 4.72        | 5.44        | 0.93        | 2.13        | 2.53        | 3.27        | 9.6         | 1.99        | 1.8         | 2.85        | 4.65        | 44.10        |
| 1987       | 4.09        | 6.47        | 6.27        | 0.14        | 0.75        | 4.18        | 4.4         | 4.48        | 7.13        | 0.3         | 5.02        | 0.16        | 43.39        |
| 1988       | 6.36        | 6.08        | 2.65        | 3.44        | 1.35        | 3.71        | 4.5         | 8.48        | 16.36       | 2.35        | 4.27        | 1.13        | 60.68        |
| 1989       | 1.73        | 1.77        | 2.14        | 2.79        | 1.55        | 3.66        | 8.98        | 9.16        | 14.37       | 1.39        | 0.51        | 3.4         | 51.45        |
| 1990       | 1.84        | 4.07        | 1.59        | 1.34        | 0.18        | 1.59        | 6.53        | 3.81        | 2.6         | 4.54        | 1.17        | 1.94        | 31.20        |
| 1991       | 10.2        | 1.52        | 7.33        | 6.31        | 9.35        | 11.7        | 15.9        | 3.48        | 6.2         | 6.36        | 0.71        | 0.57        | 79.63        |
| 1992       | 5.79        | 2.64        | 4.09        | 5.33        | 5.97        | 7.04        | 3.32        | 10.76       | 7.33        | 8.34        | 1.92        | 0.65        | 63.18        |
| 1993       | 3.86        | 2.89        | 5.98        | 0.85        | 1.6         | 2.52        | 7.54        | 2.96        | 7.6         | 8.84        | 3.58        | 1.9         | 50.12        |
| 1994       | 6.58        | 0.92        | 2.14        | 1.51        | 3.15        | 13.96       | 8.26        | 3.29        | 9.79        | 10.23       | 3.49        | 3.94        | 67.26        |
| 1995       | 1.91        | 2.07        | 3.67        | 1.77        | 1.77        | 5.35        | 9.45        | 9.93        | 5.41        | 3.53        | 3.2         | 2.19        | 50.25        |
| 1996       | 1.11        | 1.11        | 6.83        | 2.85        | 0.72        | 11.41       | 4.2         | 7.83        | 8.49        | 11.46       | 1.39        | 3.23        | 60.63        |
| 1997       | 2.91        | 1.28        | 1.84        | 4.56        | 3.43        | 6.33        | 7.69        | 8.24        | 3.97        | 4.84        | 2.41        | 9.77        | 57.27        |
| 1998       | 3.49        | 11.12       | 2.64        | 4.71        | 0.96        | 2.95        | 7.29        | 10.09       | 7.65        | 3.01        | 2.39        | 0.42        | 56.72        |
| 1999       | 4.63        | 1.7         | 0.4         | 1.92        | 1.02        | 7.75        | 3.56        | 3.51        | 13          | 3.24        | 0.83        | 0.88        | 42.44        |
| 2000       | 2.77        | 1.17        | 1.79        | 2.6         | 1.15        | 2.43        | 5.69        | 7.38        | 11.64       | 0.23        | 1.55        | 1.37        | 39.77        |
| 2001       | 0.91        | 0.68        | 5.48        | 0.62        | 2.56        | 5.59        | 8.31        | 3.58        | 16.03       | 0.81        | 1.44        | 3.13        | 49.14        |
| 2002       | 4.48        | 0.82        | 4.38        | 2.41        | 0.47        | 6.24        | 7.8         | 8.14        | 9.31        | 2.58        | 2.68        | 5.41        | 54.72        |
| 2003       | 0.07        | 4.66        | 10.71       | 2.63        | 2.54        | 6.75        | 7.33        | 1.83        | 3.04        | 2.98        | 0.74        | 1.19        | 44.47        |
| 2004       | 1.64        | 4.47        | 1.36        | 2.02        | 1.24        | 17.15       | 8.6         | 9.85        | 16.31       | 1.32        | 2.85        | 2.66        | 69.47        |
| <b>AVG</b> | <b>3.32</b> | <b>3.50</b> | <b>3.96</b> | <b>2.88</b> | <b>3.45</b> | <b>5.92</b> | <b>6.44</b> | <b>7.05</b> | <b>7.38</b> | <b>3.81</b> | <b>2.05</b> | <b>2.51</b> | <b>52.27</b> |

Rainfall is in inches, and represents data from Jacksonville International Airport (JIA)

## Appendix R: Annual and Monthly Average Precipitation at JIA



## Appendix S: Executive Summary of Tributary Pollution Assessment Project (TPAP)

### Tributary Pollution Assessment Executive Summary

The Tributary Pollution Assessment Project involves developing and evaluating a methodology for conducting tributary pollution assessments for listed water bodies in the Duval County area, as referenced in the Reasonable Assurance (RA) Plan. Duval County has approximately 100 tributary Water Body IDs (WBIDs), i.e. small to large tributaries of the St. Johns River, identified by the State. The RA Plan provides reasonable assurance that the fecal coliform levels of the 51 top-ranked WBIDs will be reduced sufficiently to restore them to their designated use for recreation. The 51 WBIDs are grouped into four priority groups in the RA Plan.

PBS&J was contracted by JEA to develop a methodology for conducting tributary pollution assessments for sources of fecal coliform contamination in the listed tributaries. This methodology will be field-verified by conducting sanitary surveys of selected tributary water body segments, and revised based on lessons learned from this process. The final product of this endeavor will be a *Tributary Pollution Assessment Manual* that can be used as a blueprint for conducting sanitary surveys.

The Tributary Pollution Assessment Project is a continuation of the effort started under the RA Plan. The RA Plan participants have been brought together to form the Tributary Assessment Team (TAT). The TAT will serve as an advisory committee to the PBS&J Project Team throughout the development of the *Tributary Pollution Assessment Manual*. The TAT is composed of representatives from:

- JEA
- City of Jacksonville Environmental Quality Division
- City of Jacksonville Public Works Department
- Duval County Health Department
- Florida Department of Environmental Protection
- St. Johns Riverkeeper
- Water and Sewer Expansion Authority
- US Army Corps of Engineers

Other representatives (from these and additional entities) may be included in the TAT activities in varying roles, as relevant.

Our approach for developing and evaluating a methodology for conducting tributary pollution assessments is divided into six major phases including:

- 1) Pre-planning;
- 2) Planning;
- 3) Development of *Tributary Pollution Assessment Manual*;
- 4) Evaluation of Methodology/Manual by Conducting Sanitary Surveys;
- 5) Summary Report; and
- 6) Public Workshop.

The Pre-Planning phase (Phase I) entailed four main goals:

- 1) to obtain and review all documents included in the RA Plan;
- 2) to develop categories for tributary classification and categorize the 51 priority WBIDs;
- 3) to overlay each WBID onto land use, infrastructure, and historical sampling maps to begin assessing probable sources and migration pathways; and

4) to develop the *Draft Work Plan*.

The Planning phase (Phase II) begins with the organization and initial meeting of the Tributary Assessment Team (TAT) with the ultimate goal of finalizing the *Work Plan*.

The Development of the *Tributary Pollution Assessment Manual* phase (Phase III) primarily involves the formulation of the assessment methodology for each tributary category described in the Pre-Planning phase, the use of a decision tree to determine which assessment methodology corresponds to each of the highest-ranked WBIDs, and the establishment of a model monitoring plan for each tributary category. This phase will be completed upon submitting the *Manual* to the TAT for review.

The next phase, Evaluation of Methodology/Manual by Conducting Sanitary Surveys (Phase IV), entails field-verification of the methodology described in the *Draft Tributary Pollution Assessment Manual* for the highest ranked water bodies for each category (or as determined to ensure adequate geographical representation of the study area) and applying the results to recommend generic corrective actions and revise the methodology, if necessary. The outcome of this phase would be the *Tributary Pollution Assessment Manual*.

The final two phases, Summary Report (Phase V) and Public Workshop (Phase VI), would entail providing a summary of the results of the tributary pollution assessments, including a discussion of lessons learned and site-specific corrective actions, to JEA and presenting the results from the *Tributary Pollution Assessment Manual* to the public. The final phase would also include a written summary of public input received at the workshop.

For additional information, please contact: Don Deis, PBS&J Project Manager, at (904) 363-8442 or [drdeis@pbsj.com](mailto:drdeis@pbsj.com).



Florida Department of Environmental  
Protection  
Division of Water Resource Management  
Bureau of Watershed Management  
2600 Blair Stone Road, Mail Station 3565  
Tallahassee, Florida 32399-2400  
(850) 245-8561  
[www.dep.state.fl.us/water/](http://www.dep.state.fl.us/water/)