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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

NORTHEAST DISTRICT • LOWER ST. JOHNS BASIN

TMDL Report

Fecal Coliform TMDL for Butcher Pen Creek (WBID 2322)

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Florida Department of Environmental Protection

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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

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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

Basin Status Report for the Lower St. Johns River Basin

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/stat_rep.htm

Allocation Technical Advisory Committee (ATAC) Report

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 coliforms for Butcher Pen Creek in the Ortega River Planning Unit of the Lower St. Johns River basin. The creek was verified as impaired for fecal 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 Butcher Pen Creek that would restore the waterbody so that it meets its applicable water quality criteria for fecal coliforms.

1.2 Identification of Waterbody

Butcher Pen Creek is located in Duval County, in northeast Florida, with an approximate 1.31 square-mile (mi^2) drainage area that flows directly into the Cedar River and then the Ortega River before reaching the St. Johns River (**Figures 1.1** and **1.2**). The creek is approximately 1.6 miles long and is a second order stream. The Butcher Pen Creek watershed is located on the southwestern edge of the City of Jacksonville, in an area known as Cedar Hills and, as a result, is highly urbanized. Additional information about the creek'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 **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. Butcher Pen Creek consists of one segment, which lies in WBID 2322, as shown in **Figure 1.2**, which this TMDL addresses.

Butcher Pen Creek is part of the Ortega River Planning Unit (PU). Planning units are groups of smaller watersheds (WBIDs) that are part of a larger basin unit, in this case the Lower St. Johns Basin. The Ortega River Planning Unit consists of 30 WBIDs. **Figure 1.3** shows the location of these WBIDs, Butcher Pen Creek's location in the planning unit, and a list of the other WBIDs in the planning unit.

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

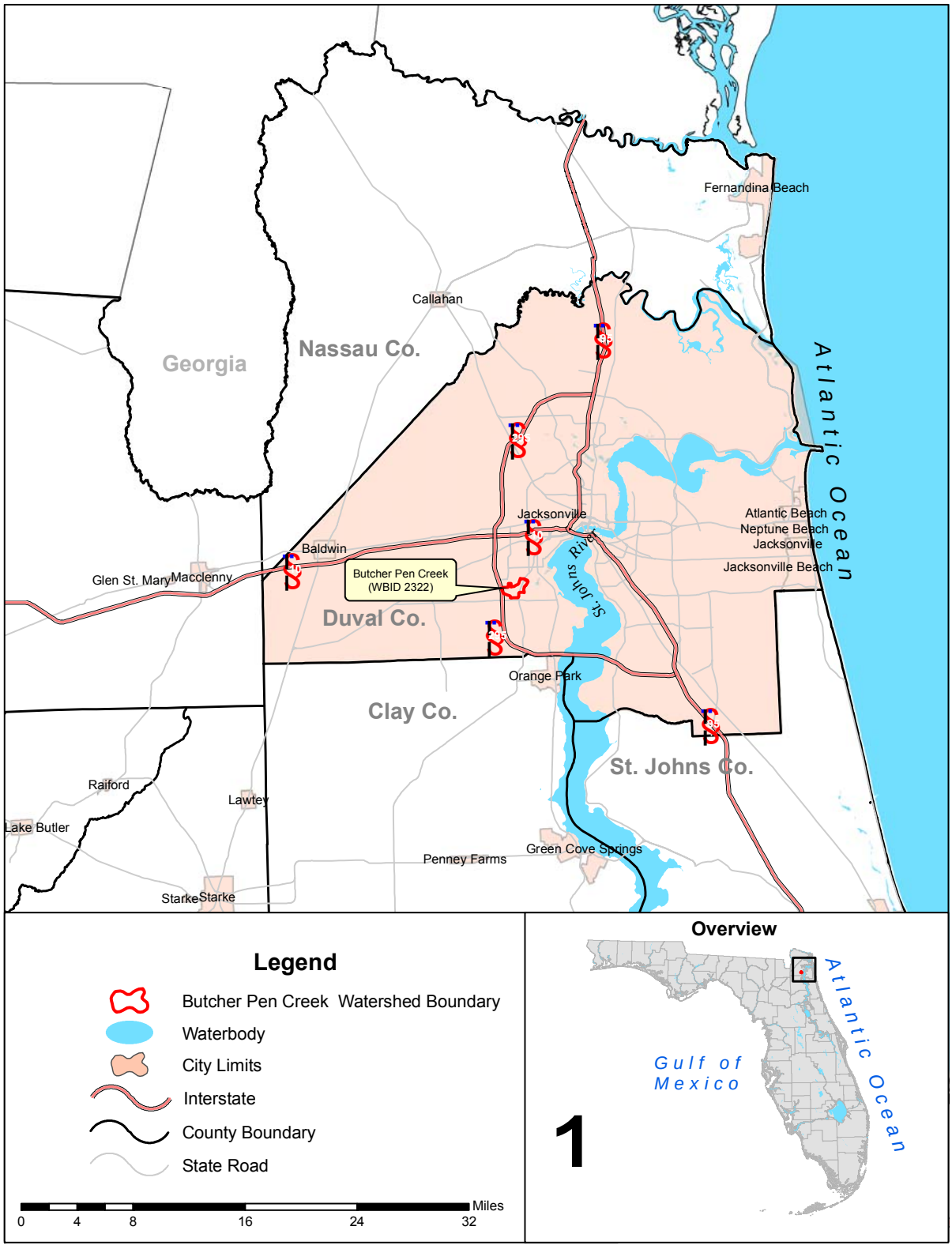


Figure 1.2. Butcher Pen Creek WBID

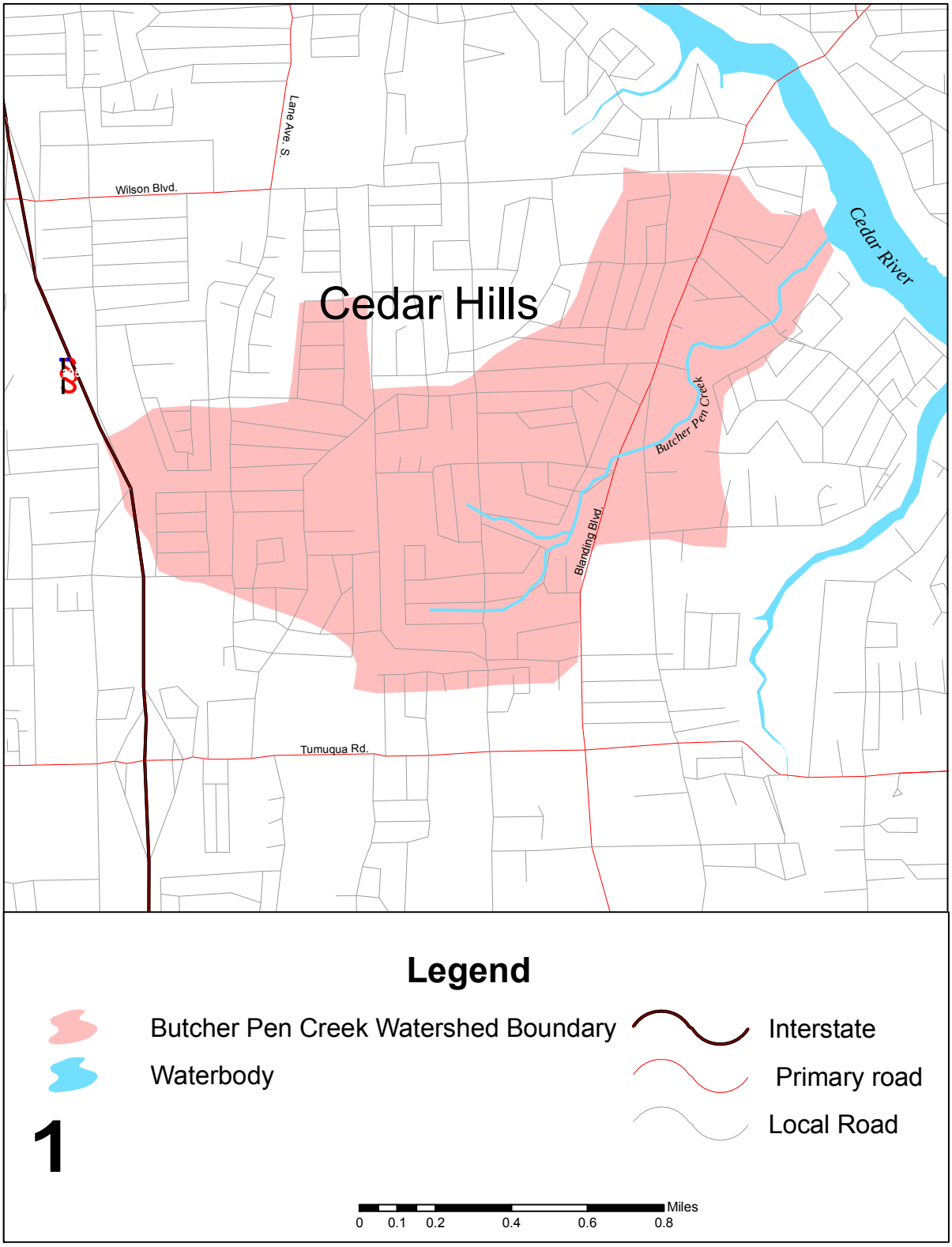
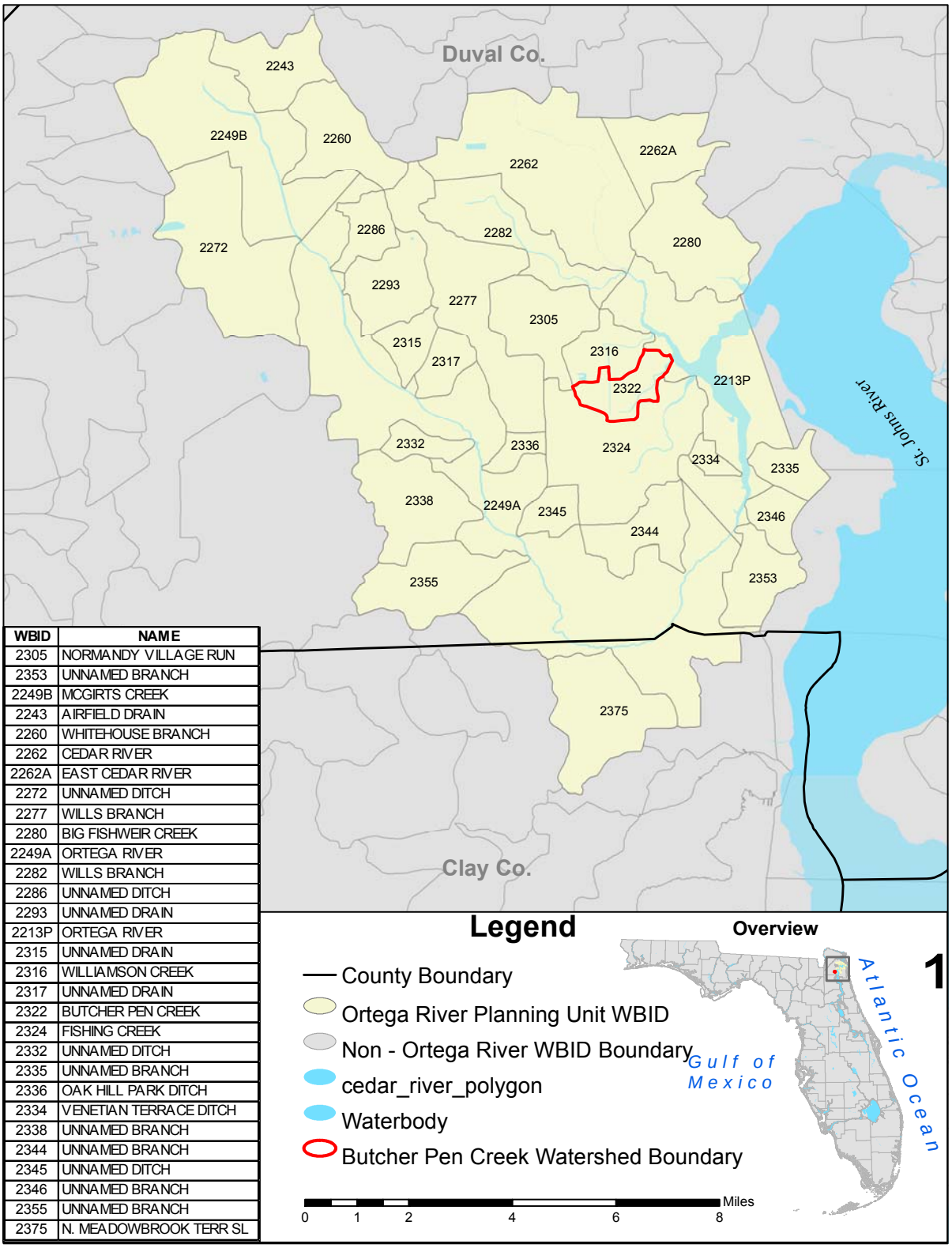


Figure 1.3. WBIDs in the Ortega River Planning Unit



WBID	NAME
2305	NORMANDY VILLAGE RUN
2353	UNNAMED BRANCH
2249B	MCGIRTS CREEK
2243	AIRFIELD DRAIN
2260	WHITEHOUSE BRANCH
2262	CEDAR RIVER
2262A	EAST CEDAR RIVER
2272	UNNAMED DITCH
2277	WILLS BRANCH
2280	BIG FISHWEIR CREEK
2249A	ORTEGA RIVER
2282	WILLS BRANCH
2286	UNNAMED DITCH
2293	UNNAMED DRAIN
2213P	ORTEGA RIVER
2315	UNNAMED DRAIN
2316	WILLIAMSON CREEK
2317	UNNAMED DRAIN
2322	BUTCHER PEN CREEK
2324	FISHING CREEK
2332	UNNAMED DITCH
2335	UNNAMED BRANCH
2336	OAK HILL PARK DITCH
2334	VENETIAN TERRACE DITCH
2338	UNNAMED BRANCH
2344	UNNAMED BRANCH
2345	UNNAMED DITCH
2346	UNNAMED BRANCH
2355	UNNAMED BRANCH
2375	N. MEADOWBROOK TERR SL

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 coliforms that caused the verified impairment of Butcher Pen 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 causing impairment of these 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 rule-making 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 Butcher Pen Creek and has verified the creek is impaired for fecal coliforms based on data in the Department's IWR database. **Tables 2.1** through **2.3** provide summary results for fecal coliform data 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 95 percent overall exceedance rate for fecal coliforms in Butcher Pen Creek. Exceedances occur in all seasons and all months (Tables 2.1 and 2.2). In fact, there is a 100 percent exceedance rate for all months except April, which has a 66.67 percent exceedance rate (**Table 2.1**).

Two of the three stations have less than five samples, which make it difficult to analyze spatial trends. Sampling stations are discussed further in **Section 5.1**.

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

Month	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
January	2	1,300	2,300	1,800	1,800	2	100.00%	2.39
February	1	6,000	6,000	6,000	6,000	1	100.00%	3.14
March	1	492	492	492	492	1	100.00%	3.95
April	3	270	1,700	1,100	1,023	2	66.67%	2.80
May	2	460	500	480	480	2	100.00%	1.61
June	0	---	---	---	---	---	---	7.40
July	1	90,000	90,000	90,000	90,000	1	100.00%	6.72
August	1	2,400	2,400	2,400	2,400	1	100.00%	6.72
September	4	500	2,400	1,801	1,626	4	100.00%	9.94
October	2	3,000	9,000	6,000	6,000	2	100.00%	3.39
November	1	800	800	800	800	1	100.00%	1.81
December	3	1,425	5,200	4,800	3,808	3	100.00%	3.12

Coliform counts are #/100 mL
Exceedances represent values above 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)

Season	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
Winter	4	492	6,000	1,800	2,523	4	100.00%	3.16
Spring	5	270	1,700	500	806	4	80.00%	3.82
Summer	6	500	90,000	2,134	16,484	6	100.00%	7.79
Fall	6	800	9,000	3,900	4,038	6	100.00%	2.77

Coliform counts are #/100 mL
Exceedances represent values above 400 counts/100 mL
Mean precipitation is for Jacksonville International Airport (JIA) in inches

Table 2.3. Summary of Fecal Coliform Data by Year for Verified Period (January 1, 1996 – June 30, 2003)

Year	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
1996	1	800	800	800	800	1	100.00%	5.05
1998	4	500	90,000	5,368	25,309	4	100.00%	4.73
1999	4	270	3,000	2,350	1,993	3	75.00%	3.54
2000	4	1,300	4,800	2,050	2,550	4	100.00%	3.31
2001	4	500	6,000	1,263	2,256	4	100.00%	4.10
2002	4	460	5,200	1,180	2,005	4	100.00%	4.56

Table represents years for which data exist
Coliform counts are #/100 mL
Exceedances represent values above 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:

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

Butcher Pen Creek is a Class III fresh 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 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 fecal 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.*

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 were not to exceed 400.

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.

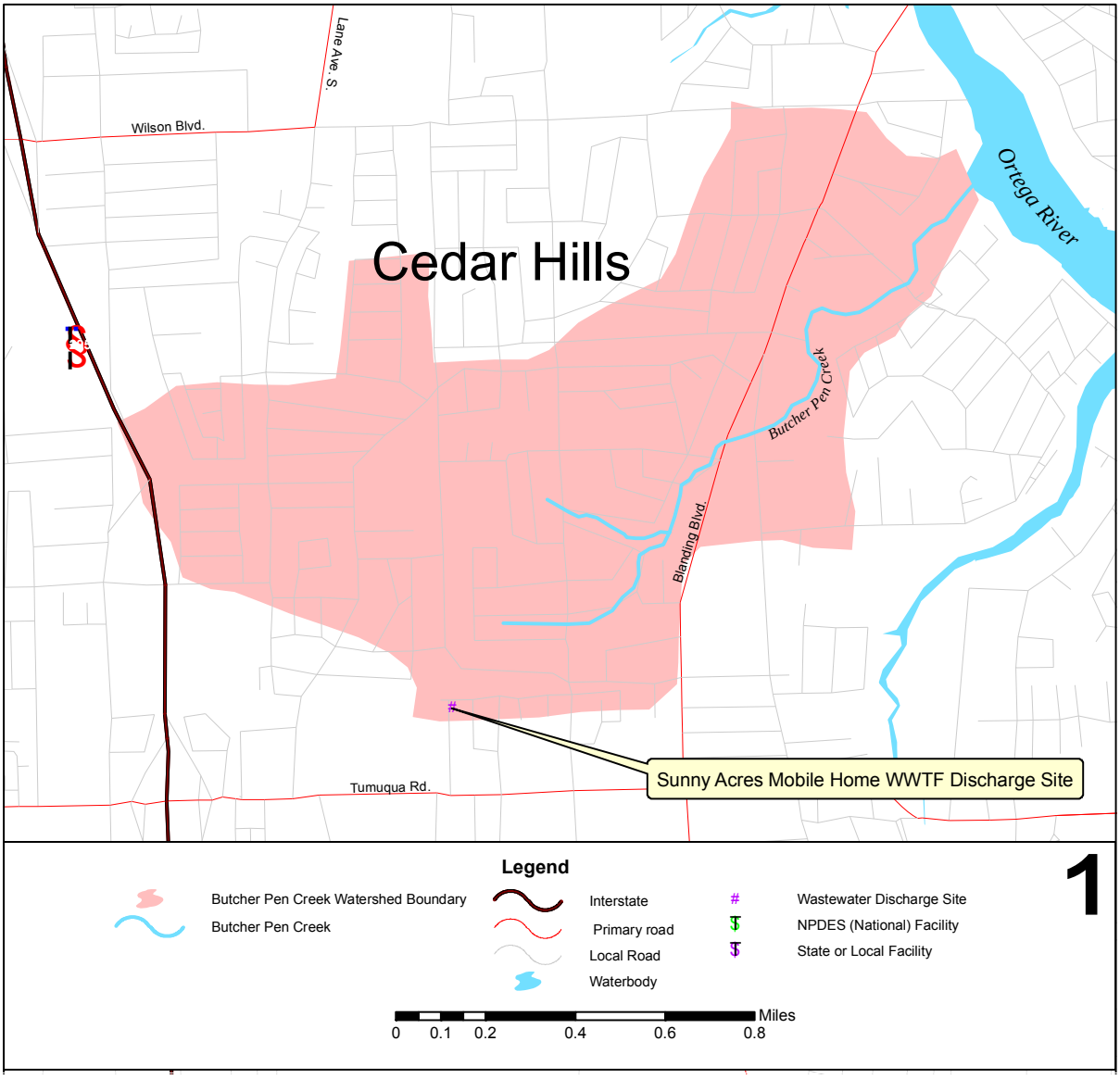
4.2 Potential Sources of Coliforms in Butcher Pen Creek Watershed

4.2.1 Point Sources

There is one domestic wastewater facility, Sunny Acres Mobile Park WWTF (AKA Buffcar, Inc. WWTF – permit #FLA0043915), that is authorized to discharge into Butcher Pen Creek (Figure 4.1). The facility, which discharges to the creek via a ditch, is located in the southwestern corner of the basin (**Figure 4.1).** It has a design capacity and annual average discharge limit of 0.015 million gallons per day (MGD), and according to the Department's monitoring records, the average monthly flow for 2004 was 0.0065 MGD. A summary of effluent coliform values from 1996 – 2004 is included as **Appendix B**. The average concentration during this time was 43 counts/100 mL, and the median was 2 counts/100 mL. Reported data show one violation of the state or permitted criterion for fecal coliforms during the verified period (January 1, 1996 – June

2003). This occurred in July 1996, when the average monthly count was 1,600/100 mL. **Appendix C** provides flow data from the facility from Department records. Based on data supplied to the Department, the average fecal concentration discharged from the Sunny Acres Mobile Home WWTF between January 1996 and December 2004 is 1.55 x 10^8 colonies/day.

Figure 4.1. Location of Sunny Acres Mobile Home Park WWTF (Buffcar, Inc)



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 Butcher Pen Creek watershed. Responsibility for the permit is

shared among FDOT, and the Cities of Jacksonville, Neptune Beach, and Atlantic Beach. However, the City of Jacksonville is the only one with interest in the watershed.

4.2.2 Land Uses and Nonpoint Sources

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

Land Uses

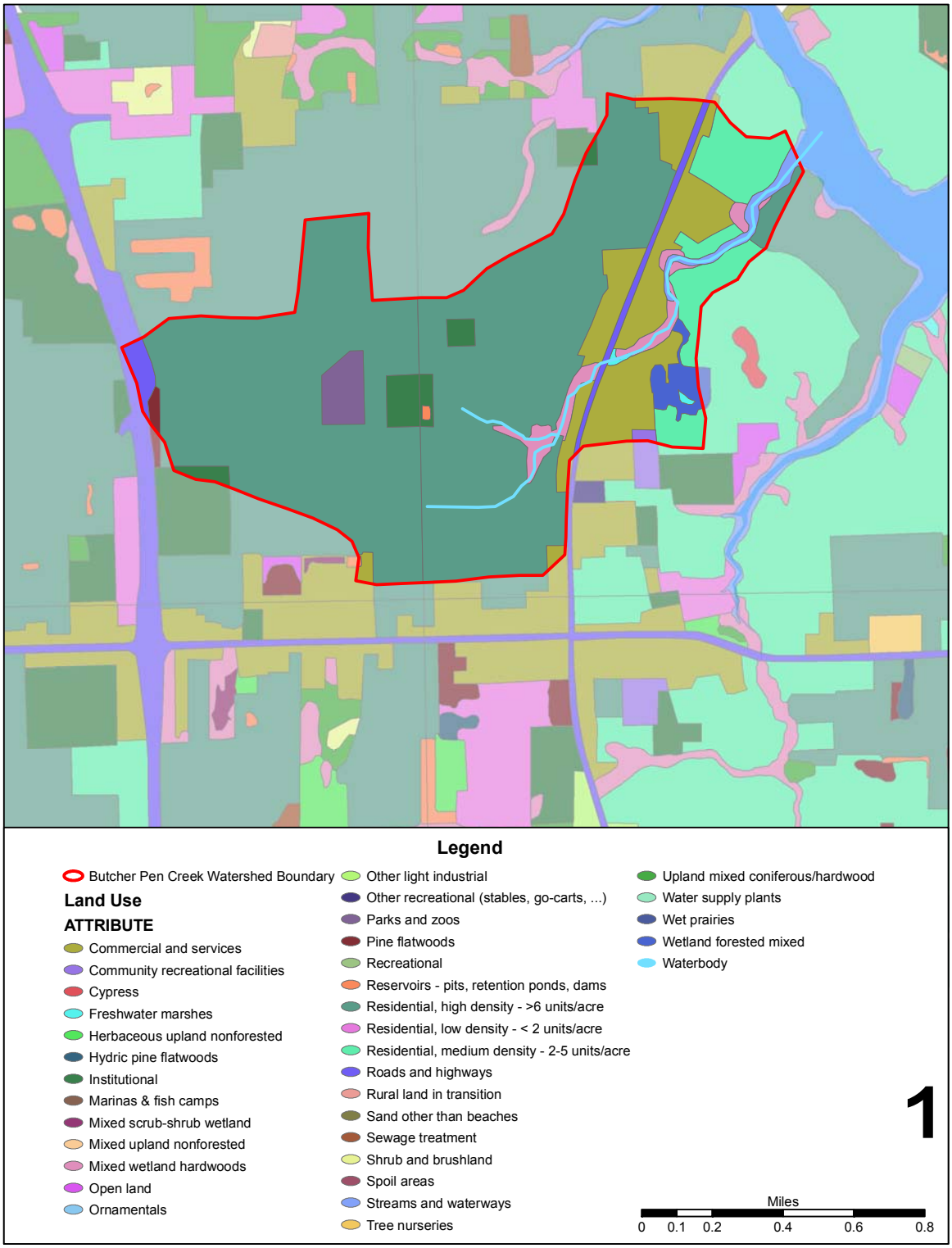
The spatial distribution and acreage of different land use categories were identified using the 2000 land use coverage contained in the Department's Geographic Information System (GIS) library, initially provided by the SJRWMD. Land use categories and acreages in the watershed were aggregated using the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

The Butcher Pen Creek watershed is a small, but highly urbanized area. As **Table 4.1** shows, the majority of the land is high density residential (68.7 percent), followed by commercial and services (12.2 percent) and medium density residential (7.2 percent). Natural land use types (pine flatwoods, streams, marshes, mixed wetland hardwoods, and wetland forested mixed) comprise 46.7 acres – a mere 5.6 percent of the land use in the watershed. According to the land use coverage, there are no livestock land use categories in the watershed.

Table 4.1. Classification of Land Use Categories in the Butcher Pen Creek Watershed

Level 3 Land Use Code	Attribute	Acres	Percent of Total
1300	Residential, high density - 6 or more dwelling units/acre	576.44	68.67%
1400	Commercial and services	102.44	12.20%
1200	Residential, medium density - 2-5 dwelling units/acre	60.70	7.23%
6170	Mixed wetland hardwoods	20.73	2.47%
1700	Institutional	20.67	2.46%
8140	Roads and highways (divided 4-lanes with medians)	17.15	2.04%
1850	Parks and zoos	14.00	1.67%
6300	Wetland forested mixed	11.45	1.36%
5100	Streams and waterways	10.19	1.21%
4110	Pine flatwoods	2.20	0.26%
1860	Community recreational facilities	1.42	0.17%
6410	Freshwater marshes	1.36	0.16%
5300	Reservoirs - pits, retention ponds, dams	0.73	0.09%
	TOTAL:	**839.48**	**100.00%**

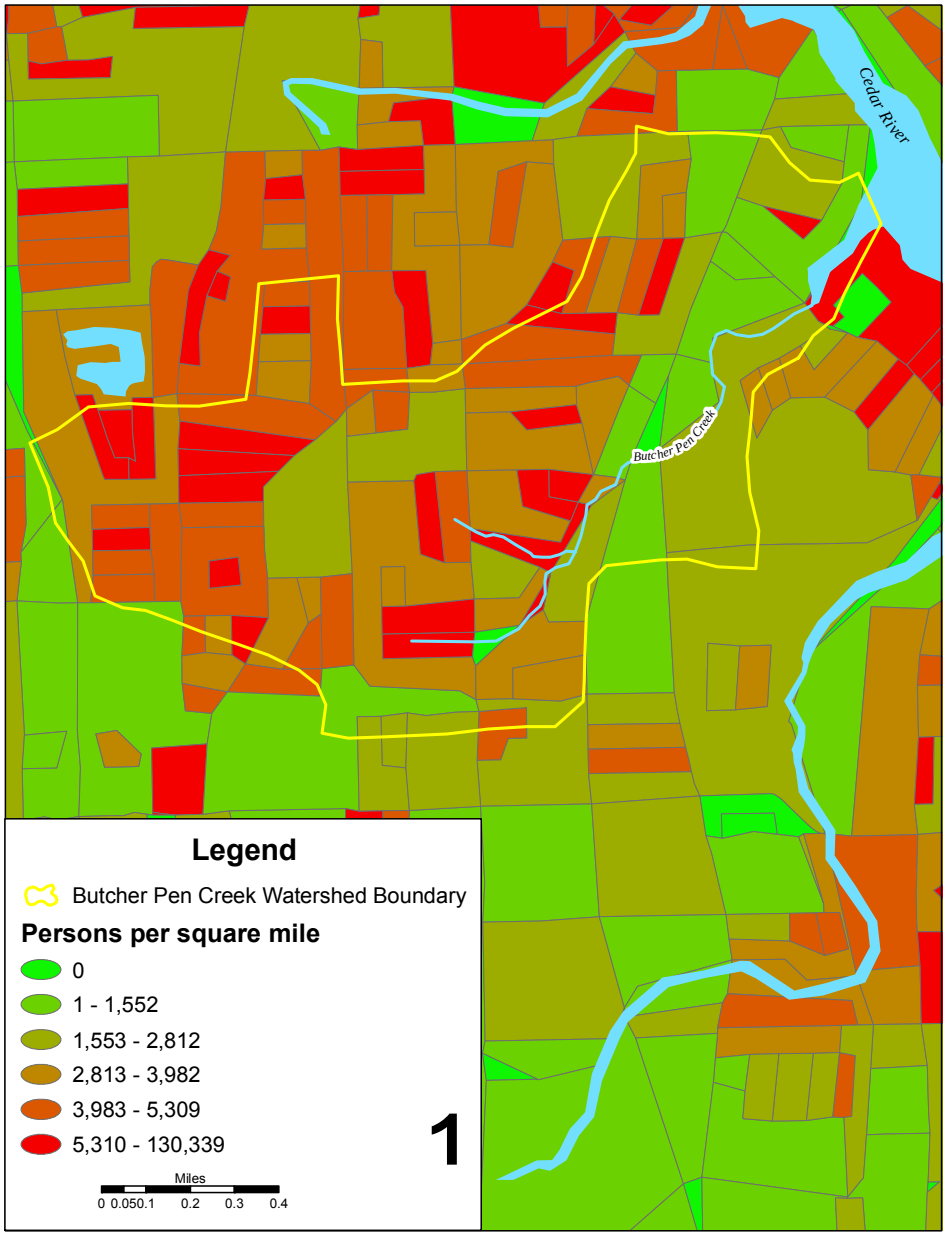
Figure 4.2. Principal Land Uses in the Butcher Pen Creek Watershed



Population

According to the U.S Census Bureau, census block population densities in the Butcher Pen Creek watershed in the year 2000 ranged from 0 – 9,971 persons per square mile, with an average 3,180 persons per square mile in the watershed **(Figure 4.3)**. Based on this average, the estimated population in the Butcher Pen Creek watershed would be 4,167. 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 4.3. Population Density in the Butcher Pen 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 3,180 persons/mi^2 in the WBID, or 4,167 persons in the watershed area. The average household in the Butcher Pen Creek watershed has 2.62 persons (see **Table 4.2**). 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 annual average of less than one failure in the Butcher Pen Creek watershed.

To focus on the Butcher Pen Creek watershed, the Department obtained septic tank repair permit data from JEA for their service area, which includes the Butcher Pen 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 4.4** in map form. The data show there were 15 permits for repairs issued during this time in the watershed, or an average of one repair per year. This estimate equals that based on the DoH countywide data.

There are no areas in the Butcher Pen watershed in septic tank phase out areas, or areas that have the highest priority to be sewered to eliminate septic tanks due to high failure rates.

Based on this data provided by JEA, which is more watershed specific than that of the countywide DoH data, there was an average of one permit issued annually in the watershed for septic tank repairs. If this estimate is rounded up to two (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 1.39 x 10^{10} colonies/day is derived. This estimation is shown in **Table 4.3.**

Table 4.2. Estimation of Average Household Size in the Butcher Pen Creek Watershed Area

Household Size	No. of Households	Percentage of Total	Number of People
1-person household	357	23%	357
2-person household	553	35%	1,106
3-person household	270	17%	810
4-person household	224	14%	895
5-person household	119	8%	597
6-person household	46	3%	273
7-or-more-person household	18	1%	128
TOTAL:	**1,587**	**100%**	**4,167**
		AVERAGE HOUSEHOLD SIZE:	**2.62**

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

Table 4.3. Estimation of Annual Fecal Coliform Loading from Failed Septic Tanks in the Butcher Pen Creek Watershed

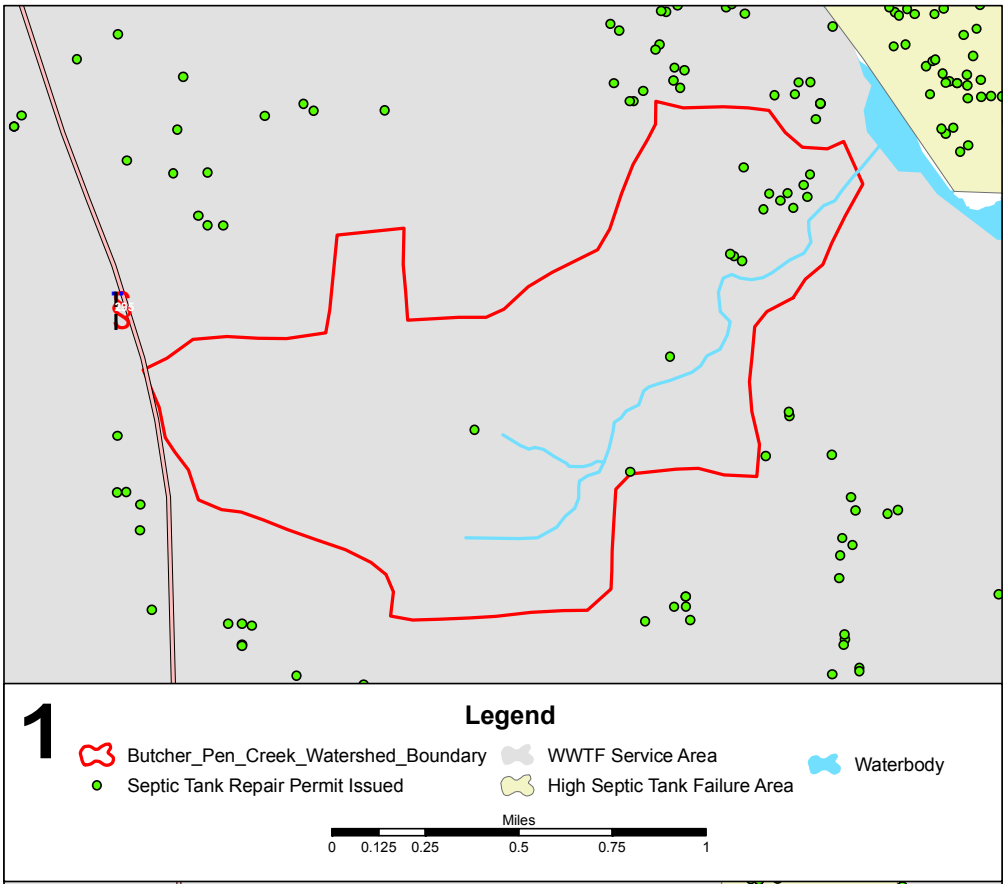
Estimated Population Density and Area	WBID Area (mi^2)	Estimated Population in Watershed	Estimated Number of Tank Failures[1]	Estimated Load From Failed Tank[2]	Gallons/ Person/ Day[2]	Estimated Number Persons Per Household[3]	Estimated Load From Failing Tanks
3,180 persons/mi^2 in WBID 2322	1.31	4,167	2	1.00 x 10^4/mL	70	2.62	1.39 x 10^{10}

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

[2] From EPA document "Protocol for Developing Pathogen TMDLs."

[3] From U.S Census Bureau, see Table 4.3 for more information on this estimate.

Figure 4.4. Septic Tank Repair Permits Issued March 1990 – April 2004 for Butcher Pen Creek Area



4.3 Source Summary

4.3.1 Summary of Fecal Coliform Loadings to Butcher Pen Creek from Various Sources

According to level 3 land use there, are no agricultural areas in the Butcher Pen Creek watershed. As noted in **Section 4.2.2** the majority of the land use (88.1 percent) consists of residential and commercial and services. While it is doubtful that agriculture has any influence on the basin, because the area is highly urbanized with a large number of people per square mile, it is very possible that pets, especially dogs, have an impact on the waterbody. The Department has been unable to obtain data on the number 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 from10 percent of dogs reach the waterbody and are viable upon reaching it, the approximate loading would be 2.85 x 10^{11} organisms/day. This is an estimate, as the actual loading from dogs is not known.

Table 4.4. Estimated Loading from Dogs in the Butcher Pen Creek Watershed

Pet	Estimated No. of Households in 2322	Estimated Household:Pet Ratio[1]	Estimated Total Dog Population in Watershed	Estimated Loading of Total	Estimated No. of Pets with Impact to Creek	Estimated Counts/Pet/Day[2]	Estimated Counts/Day
Dogs	1,587	0.361	573	10%	57	5 x 10^{9}	2.85 X 10^{11}

[1]From the American Veterinary Medical Association website, which states the original source to be the "U.S Pet Ownership and Demographics Sourcebook," 2002.
[2] 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 1,587 homes in the watershed, with 2.62 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 Butcher Pen Creek, a daily flow of approximately 6.27 x 10^{5} L (0.166 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 rate and EPA values for fecal coliforms in raw sewage, the potential loadings of fecal coliforms from leaking sewer lines is 7.50 x 10^{13} (**Table 4.5**).

Table 4.5. 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	905	6.27 x 10^{5}	3.14 x 10^{4}	5 x 10^{6}	1.57 X 10^{12}

Table 4.6 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 Butcher Pen Creek.

Table 4.6. Summary of Estimated Potential Coliform Loading From Various Sources in the Butcher Pen Creek Watershed

Source	Fecal Coliforms
Point Sources	1.55×10^{8}
Septic Tanks	1.39×10^{10}
Pets	2.89×10^{11}
Collection Systems	1.57×10^{12}

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 Butcher Pen 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 three sampling stations on Butcher Pen Creek that have historical coliform observations **(Figure 5.1).** The primary collector of historical data is the City of Jacksonville, which maintained a routine (quarterly) sampling site at Wesconnet Boulevard (STORET ID: CR2). Some data were also collected by the SJRWMD in 1992 and 1993 and the Department in 1998. **Table 5.1** shows data collection information for each of the stations, and **Figure 5.1** shows the location of the sample sites. **Figure 5.2** shows the observed historical data analysis, and **Appendix D** contains the historical fecal coliform observations from the sites for the planning and verified periods for the Lower St. Johns River basin.

Table 5.1. Sampling Station Summary for the Butcher Pen Creek Watershed

Station	STORET ID	Station Owner[1]	Years With Data	N
BUTCHER PEN CR AT BLANDING BLVD	21FLA 20030580	FDEP	1998	1
BUTCHER PEN CREEK AT WESTCONNET BLVD.	21FLJXWQCR2	COJ	1991 - 1996, 1998 - 2002	39
BUTCHER PEN CREEK NEAR MOUTH	21FLSJWMLSJ910	SJRWMD	1992 - 1993	4

[1]FDEP = Fl. Dept. of Env. Prot.; COJ = City of Jacksonville; SJRWMD = St. Johns River Water Management District

Table 5.2. Statistical Summary of Historical Data for Butcher Pen Creek

Station	N	Minimum	Maximum	Median	Mean	Exceedances	% Exceedances
BUTCHER PEN CR AT BLANDING BLVD	1	1,735	1,735	1,735	1,735	1	100%
BUTCHER PEN CREEK AT WESTCONNET BLVD.	39	270	160,000	3,000	13,434	37	95%
BUTCHER PEN CREEK NEAR MOUTH	4	550	2,100	900	1,113	4	100%
AVERAGE:	14.7	852	54,612	1,878	5,427	14	98%

Coliform concentrations are counts/100 mL

Figure 5.1. Historical Sample Sites in Butcher Pen Creek Watershed

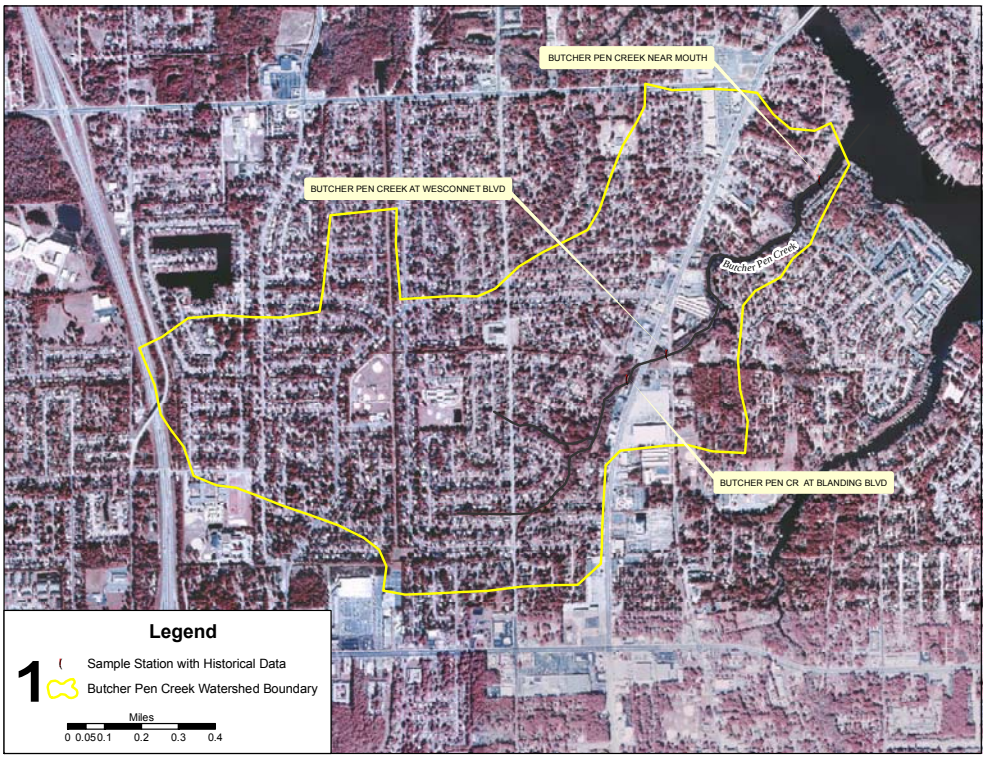
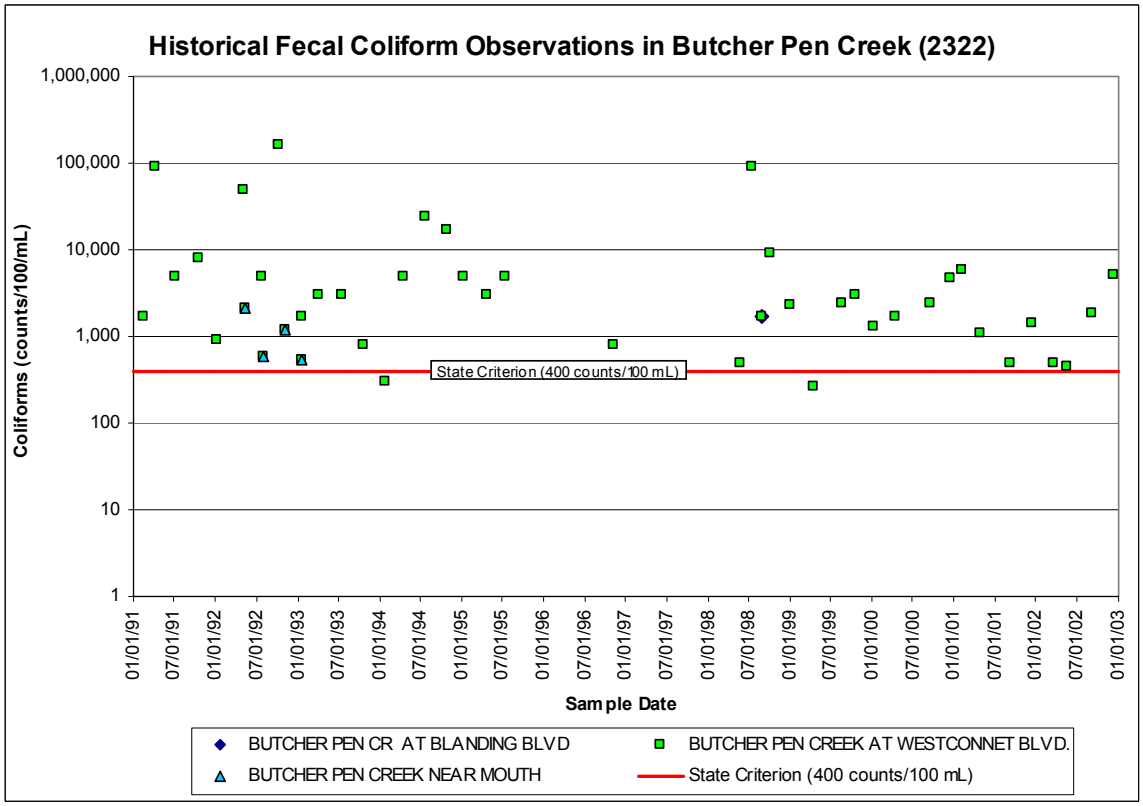


Figure 5.2. Historical Fecal Coliform Observations for Butcher Pen Creek



5.1.2 TMDL Development Process

Due to the lack of supporting flow information, a simple calculation was performed to determine the needed reduction. Exceedances of the state criterion were compared to the criterion of 400 counts/100mL. For each individual exceedance, an 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. This means that in order to meet the state criterion of 400 counts/100mL, an 83 percent reduction in current loading are necessary, and is therefore the TMDL for Butcher Pen Creek. **Table 5.3** shows annual summaries of data used in the calculation of the TMDL, and **Table 5.4** shows the individual calculations for Butcher Pen Creek, which includes all exceedances.

Table 5.3. Annual Summary of Historical Observed Fecal Coliform Data in Butcher Pen Creek

Year	N	Minimum	Maximum	Median	Mean	No. of Exceedances	% Exceedance	Mean Precipitation
1991	4	1,700	90,000	6,500	26,175	4	100.00%	6.64
1992	7	600	160,000	2,100	31,400	7	100.00%	5.27
1993	5	550	3,000	1,700	1,810	5	100.00%	4.18
1994	4	300	24,000	11,000	11,575	3	75.00%	5.61
1995	3	3,000	5,000	5,000	4,333	3	100.00%	4.19
1996	1	800	800	800	800	1	100.00%	5.05
1998	4	500	90,000	5,368	25,309	4	100.00%	4.73
1999	4	270	3,000	2,350	1,993	3	75.00%	3.54
2000	4	1,300	4,800	2,050	2,550	4	100.00%	3.31
2001	4	500	6,000	1,263	2,256	4	100.00%	4.10
2002	4	460	5,200	1,180	2,005	4	100.00%	4.56
AVERAGE:	**4.0**	**907**	**35,618**	**3,574**	**10,019**	**3.82**	**0.95**	**4.21**

Coliform counts are #/100 mL and represent years for which data exists

Table 5.4. Calculation of Reductions for the Fecal Coliform TMDL for Butcher Pen Creek

Sample Date	Location	Observed Value (Exceedance)	Required Reduction
2/12/1991	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	76.47%
4/10/1991	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	99.56%
7/2/1991	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	92.00%
10/14/1991	BUTCHER PEN CREEK AT WESTCONNET BLVD.	8,000	95.00%
1/7/1992	BUTCHER PEN CREEK AT WESTCONNET BLVD.	900	55.56%
5/4/1992	BUTCHER PEN CREEK AT WESTCONNET BLVD.	50,000	99.20%
5/11/1992	BUTCHER PEN CREEK NEAR MOUTH	2,100	80.95%
7/22/1992	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	92.00%
8/4/1992	BUTCHER PEN CREEK NEAR MOUTH	600	33.33%
10/7/1992	BUTCHER PEN CREEK AT WESTCONNET BLVD.	160,000	99.75%
11/4/1992	BUTCHER PEN CREEK NEAR MOUTH	1,200	66.67%
1/19/1993	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	76.47%
1/20/1993	BUTCHER PEN CREEK NEAR MOUTH	550	27.27%
4/5/1993	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	86.67%
7/14/1993	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	86.67%
10/18/1993	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	50.00%
4/18/1994	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	92.00%
7/20/1994	BUTCHER PEN CREEK AT WESTCONNET BLVD.	24,000	98.33%
10/24/1994	BUTCHER PEN CREEK AT WESTCONNET BLVD.	17,000	97.65%
1/11/1995	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	92.00%
4/25/1995	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	86.67%
7/11/1995	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	92.00%
11/6/1996	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	50.00%
5/26/1998	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	20.00%
7/13/1998	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	99.56%
9/1/1998	BUTCHER PEN CR AT BLANDING BLVD	1,735	76.95%
10/7/1998	BUTCHER PEN CREEK AT WESTCONNET BLVD.	9,000	95.56%
1/5/1999	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,300	82.61%
8/18/1999	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	83.33%
10/20/1999	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	86.67%
1/10/2000	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,300	69.23%
4/17/2000	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	76.47%
9/19/2000	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	83.33%
12/18/2000	BUTCHER PEN CREEK AT WESTCONNET BLVD.	4,800	91.67%
2/8/2001	BUTCHER PEN CREEK AT WESTCONNET BLVD.	6,000	93.33%
4/26/2001	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,100	63.64%
9/5/2001	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	20.00%
12/11/2001	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,425	71.93%
3/20/2002	BUTCHER PEN CREEK AT WESTCONNET BLVD.	492	18.70%
5/16/2002	BUTCHER PEN CREEK AT WESTCONNET BLVD.	460	13.04%
9/9/2002	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,867	78.58%
12/10/2002	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,200	92.31%
	MEDIAN:	**2,400**	**83.33%**

5.2.3 Critical Conditions/Seasonality

Exceedances in Butcher Pen 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 coliform observations in Butcher Pen Creek are provided in **Appendices D**. 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 the fecal coliform dataset to determine whether there were significant differences among months or seasons. At an alpha (α) level of 0.05, there are significant differences among months and seasons (**Appendices E,** and **F**). 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 1 to 14 in a given month, with seven months having less than seven observations. Grouping observations by season increased sample sizes for statistical comparison and, as seen in **Table 2.2**, winter (January – March), summer (July – September), and fall (October – December) all have a 100 percent exceedances rate. 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 **Appendix G**.

Rainfall records for the Jacksonville International Airport (**Appendix H** 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 values (**Appendix I**). The simple correlations (r values in the Spearman Correlation table) between both fecal 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 coliform observations and rainfall totals to determine whether any of the relationships were significant at an α level of 0.05. Although the r^2 values were low, the correlations between fecal coliforms and the 1D and 3D precipitation were not significant, but when compared to the 7D rainfall totals, there is some significance (**Appendix J**). A table of historical monthly average rainfall (**Appendix K**) indicates that monthly rainfall totals increase in June and peak in September and by October return to levels observed in February and March. **Appendix L** 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. For years where data exist (1996 and 1998 – 2002), all but 1999 have a 100 percent exceedances rate. In 1999 there was a 75 percent exceedances rate. Exceedances are most likely due to a combination of factors from both point and nonpoint sources

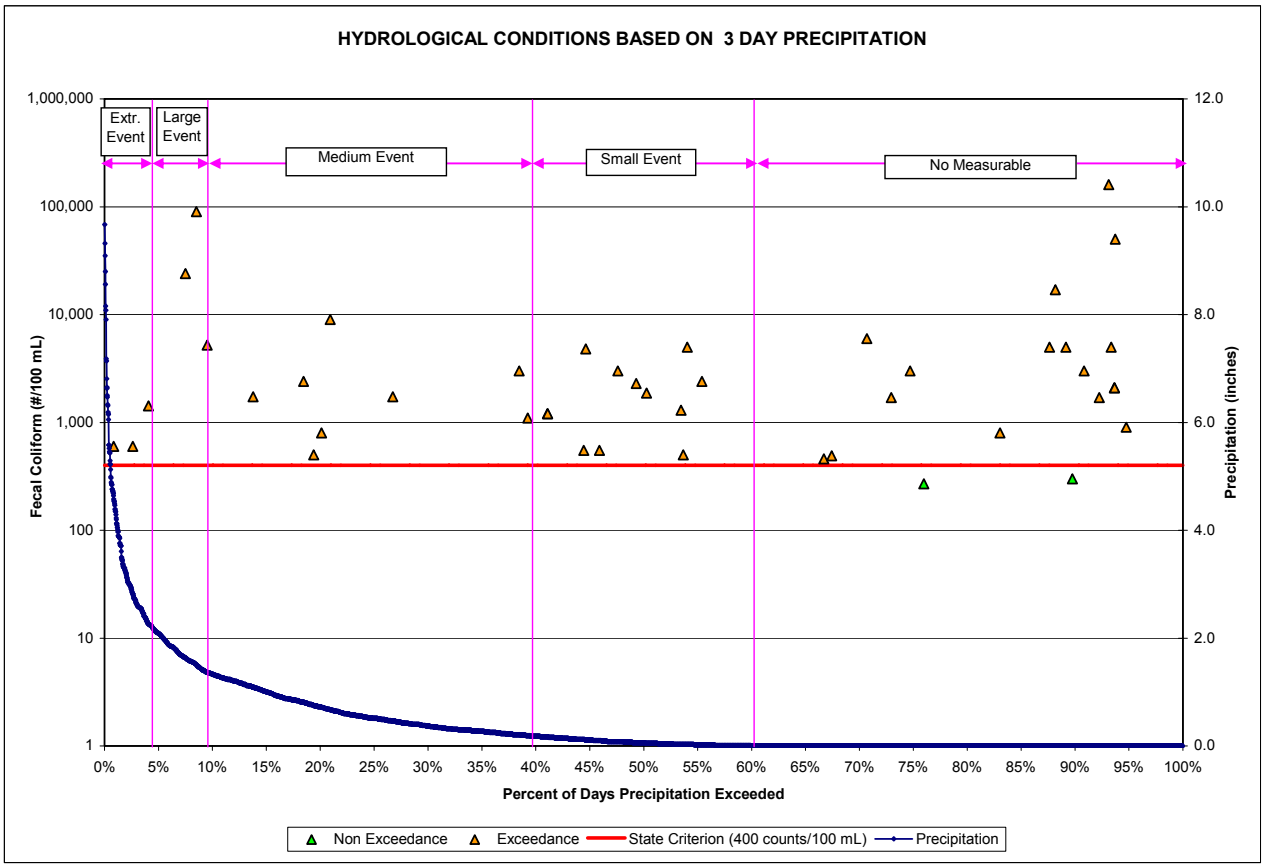
Since no flow data was available, hydrologic conditions were analyzed using rainfall. A loading curve type chart, that would normally be applied to flow events, was created using precipitation data from JIA from 1990 – 2004 instead. The chart was divided in the same manner as if flow was being analyzed, where extreme precipitation events represent the upper percentiles (0-5th percentile), followed by large precipitation events (5th – 15th percentile), medium precipitation events (15th – 40th percentile), small precipitation events (40th – 60th percentile), and no recordable precipitation events (60th – 100th 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 (89.47 percent) occurred when no measurable rainfall was reported. The greatest percentage of exceedances (100 percent) occurred within all other 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 such a high exceedance rate, it is most likely that exceedances are from a variety of sources, both point and nonpoint. **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-Excedances	Percent Non-Exceedance
Extreme	>2.1"	3	3	100.00%	0	0.00%
Large	1.33" - 2.1"	4	4	100.00%	0	0.00%
Medium	0.18" - 1.33"	7	7	100.00%	0	0.00%
Small	0.01" - 0.18"	12	12	100.00%	0	0.00%
None/Not Measurable	<0.01"	19	17	89.47%	2	10.53%

Figure 5.3. Fecal 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:

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

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

$$\mathbf{TMDL \cong \sum WLAs_{wastewater} + \sum WLAs_{NPDES\ Stormwater} + \sum LAs + MOS}$$

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 Butcher Pen Creek are expressed in terms of both counts per 100 mL and percent reduction, and represent the maximum daily fecal coliform load the creek can assimilate and maintain the fecal coliform criterion **(Table 6.1).**

Table 6.1. TMDL Components for Butcher Pen Creek

WBID	Parameter	TMDL (colonies/100 mL)	WLA		LA (Percent Reduction)	MOS
			Wastewater (colonies/day)	NPDES Stormwater		
2322	Fecal Coliform	400	Point Sources Must Meet Permit Limits	83%	83%	Implicit

6.2 Load Allocation (LA)

A fecal coliform reduction of 83 percent is 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 the Sunny Acres Mobile Park WWTF is to meet the applicable water quality criteria for fecal coliforms, which is the current effluent limit for the facility. Any future discharge permits issued within the Butcher Pen Creek basin will also be required to meet state Class III criteria for fecal coliforms as well as the TMDL value, and therefore will not be allowed to exceed 200 counts/100 mL as a monthly average, 400 counts/100 mL in more than 10 percent of the samples, or 800 counts/100 mL at any given time.

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6.3.2 NPDES Stormwater Discharges

The WLA for the City of Jacksonville and FDOT's MS4 permit is an 83 percent reduction in current anthropogenic fecal coliform loading. 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 fecal coliform 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 Butcher Pen 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:

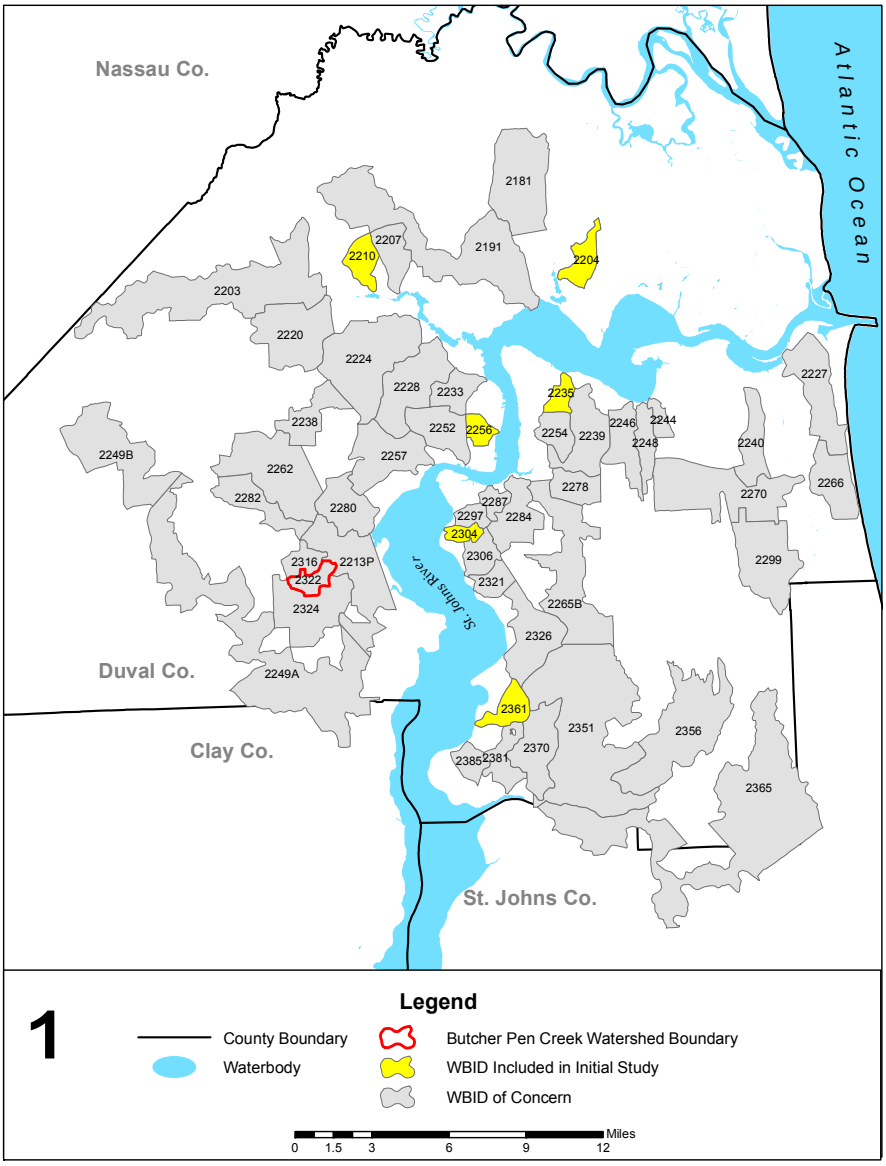
- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken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

The BMAP for Butcher Pen 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 Butcher Pen 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:

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

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 M**. 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 4.4** shows, potential impacts from dogs and cats could be significant. If pet owners are educated on the potential impacts their pets are having on Butcher Pen Creek, and they are inclined to take action, this could potentially decrease a source load. When considering the significance of the seven day rainfall, this could be a potentially significant load to the stream.

Again, considering the significance of the rainfall to exceedances, a closer look at current stormwater management practices may be warranted. This is further supported when considering the highest concentrations of coliforms are, by far, found in the summer months when precipitation can occur nearly every day, with occasional significant amounts of rainfall. The BMAP for Butcher Pen Creek may include improved stormwater management.

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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: Table of Fecal Concentrations from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 - 2004

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (#/100 mL)	Limit (#/100 mL)	Concen. Base	No Discharge
FL0043915	BUFFCAR INC WWTF	1/31/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	2/29/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	3/31/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	4/30/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	5/31/96	COLIFORM, FECAL	7	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	6/30/96	COLIFORM, FECAL	220	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	7/31/96	COLIFORM, FECAL	1600	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	8/31/96	COLIFORM, FECAL	130	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	9/30/96	COLIFORM, FECAL	240	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	10/31/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	11/30/96	COLIFORM, FECAL	13	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	12/31/96	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	1/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	2/28/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	3/31/97	COLIFORM, FECAL	80	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	4/30/97	COLIFORM, FECAL	130	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	5/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	6/30/97	COLIFORM, FECAL	4	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	7/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	8/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	9/30/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	10/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	11/30/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	12/31/97	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	1/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	2/28/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	3/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	4/30/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	5/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	6/30/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	7/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	8/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	9/30/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	10/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	11/30/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	12/31/98	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	1/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	2/28/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	3/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	4/30/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	5/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	6/30/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	7/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	8/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	9/30/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	10/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	11/30/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	12/31/99	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	1/31/2000	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	2/29/2000	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	3/31/2000	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	4/30/2000	COLIFORM, FECAL	2	800	DAILY MX	
FL0043915	BUFFCAR INC WWTF	5/31/2000	COLIFORM, FECAL		800	MAXIMUM	B

Appendix B: Table of Fecal Concentrations from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 – 2004 (Continued)

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (#/100 mL)	Limit (#/100 mL)	Concen. Base	No Discharge
FL0043915	BUFFCAR INC WWTF	6/30/2000	COLIFORM, FECAL	86	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	7/31/2000	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	8/31/2000	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	9/30/2000	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	10/31/2000	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	11/30/2000	COLIFORM, FECAL	10	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	12/31/2000	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	1/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	2/28/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	3/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	4/30/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	5/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	6/30/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	7/31/2001	COLIFORM, FECAL		800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	8/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	9/30/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	9/30/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	10/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	11/30/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	12/31/2001	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	1/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	2/28/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	3/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	4/30/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	5/31/2002	COLIFORM, FECAL	2	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	6/30/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	7/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	8/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	9/30/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	10/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	11/30/2002	COLIFORM, FECAL	2	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	12/31/2002	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	1/31/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	2/28/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	3/31/2003	COLIFORM, FECAL	38	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	4/30/2003	COLIFORM, FECAL	39	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	5/31/2003	COLIFORM, FECAL	112	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	6/30/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	7/31/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	8/31/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	9/30/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	10/31/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	11/30/2003	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	12/31/2003	COLIFORM, FECAL		800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	1/31/2004	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	2/29/2004	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	3/31/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	4/30/2004	COLIFORM, FECAL	4	800	MAXIMUM	

Appendix B: Table of Fecal Concentrations from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 – 2004 (Continued)

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (#/100 mL)	Limit (#/100 mL)	Concen. Base	No Discharge[1]
FL0043915	BUFFCAR INC WWTF	5/31/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	6/30/2004	COLIFORM, FECAL		800	MAXIMUM	B
FL0043915	BUFFCAR INC WWTF	7/31/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	8/31/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	9/30/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	10/31/2004	COLIFORM, FECAL	4	800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	11/30/2004	COLIFORM, FECAL		800	MAXIMUM	
FL0043915	BUFFCAR INC WWTF	12/31/2004	COLIFORM, FECAL		800	MAXIMUM	

[1]A “B” code means no flow was detected
Shaded cells exceeded permit limits for the month

Appendix C: Table of Flow from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 - 2004

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (MGD)	Design Capacity	Concen. Base
FL0043915	BUFFCAR INC WWTF	1/31/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/29/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/96	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/96	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/96	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/96	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/96	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/96	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/96	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/97	FLOW	2	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/97	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/97	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/97	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/97	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/97	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/97	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/98	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/98	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/98	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/98	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/98	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/98	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/98	FLOW	0.011	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/99	FLOW	0.011	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/99	FLOW	0.011	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/99	FLOW	0.011	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/99	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/2000	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/29/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/2000	FLOW	0.010	0.015	MO AVG

Appendix C: Table of Flow from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 – 2004 (Continued)

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (MGD)	Design Capacity	Concen. Base
FL0043915	BUFFCAR INC WWTF	6/30/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/2000	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2000	FLOW	0.10	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/2000	FLOW	0.010	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/2001	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/2001	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/2001	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/2002	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/2002	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/2002	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/2002	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/2002	FLOW	0.005	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/2002	FLOW	0.005	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/2002	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/2002	FLOW	0.008	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2002	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/2002	FLOW	0.07	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/2002	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/2002	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/28/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/2003	FLOW	0.009	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/2003	FLOW	0.005	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	5/31/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2003	FLOW	0.005	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/2003	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/2003	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/2003	FLOW	0.05	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	1/31/2004	FLOW	0.005	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	2/29/2004	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	3/31/2004	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	4/30/2004	FLOW	0.006	0.015	MO AVG

Appendix C: Table of Flow from Sunny Acres Mobile Park, WWTF (Buffcar, Inc. WWTF) from 1996 – 2004 (Continued)

Facility ID	Facility Name	Monitoring Date	Parameter Description	Value (MGD)	Design Capacity	Concen. Base
FL0043915	BUFFCAR INC WWTF	5/31/2004	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	6/30/2004	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	7/31/2004	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	8/31/2004	FLOW	0.006	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	9/30/2004	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	10/31/2004	FLOW	0.007	0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	11/30/2004	FLOW		0.015	MO AVG
FL0043915	BUFFCAR INC WWTF	12/31/2004	FLOW	0.008	0.015	MO AVG

Shaded cells represent values exceeding 0.015 MGD, which is the annual average limit and the design capacity of the facility.

Appendix D: Historical Fecal Coliform Observations in Butcher Pen Creek

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
BUTCHER PEN CR.	2322	2/12/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	2/12/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	4/10/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	
BUTCHER PEN CR.	2322	4/10/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	
BUTCHER PEN CR.	2322	7/2/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	7/2/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	10/14/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	8,000	
BUTCHER PEN CR.	2322	10/14/1991	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	8,000	
BUTCHER PEN CR.	2322	1/7/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	900	
BUTCHER PEN CR.	2322	1/7/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	900	
BUTCHER PEN CR.	2322	5/4/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	50,000	
BUTCHER PEN CR.	2322	5/4/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	50,000	
BUTCHER PEN CR.	2322	5/11/1992	21FLSJWMLSJ910	BUTCHER PEN CREEK NEAR MOUTH	2,100	
BUTCHER PEN CR.	2322	7/22/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	7/22/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	8/4/1992	21FLSJWMLSJ910	BUTCHER PEN CREEK NEAR MOUTH	600	P
BUTCHER PEN CR.	2322	10/7/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	160,000	L
BUTCHER PEN CR.	2322	10/7/1992	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	160,000	L
BUTCHER PEN CR.	2322	11/4/1992	21FLSJWMLSJ910	BUTCHER PEN CREEK NEAR MOUTH	1,200	B
BUTCHER PEN CR.	2322	1/19/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	1/19/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	1/20/1993	21FLSJWMLSJ910	BUTCHER PEN CREEK NEAR MOUTH	550	
BUTCHER PEN CR.	2322	4/5/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	4/5/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	7/14/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	7/14/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	10/18/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	
BUTCHER PEN CR.	2322	10/18/1993	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	
BUTCHER PEN CR.	2322	1/25/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	300	
BUTCHER PEN CR.	2322	1/25/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	300	
BUTCHER PEN CR.	2322	4/18/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	4/18/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	7/20/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	24,000	
BUTCHER PEN CR.	2322	7/20/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	24,000	
BUTCHER PEN CR.	2322	10/24/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	17,000	
BUTCHER PEN CR.	2322	10/24/1994	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	17,000	
BUTCHER PEN CR.	2322	1/11/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	1/11/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	4/25/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	4/25/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	7/11/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	7/11/1995	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,000	
BUTCHER PEN CR.	2322	11/6/1996	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	
BUTCHER PEN CR.	2322	11/6/1996	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	800	
BUTCHER PEN CR.	2322	5/26/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	
BUTCHER PEN CR.	2322	5/26/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	
BUTCHER PEN CR.	2322	7/13/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	
BUTCHER PEN CR.	2322	7/13/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	90,000	
BUTCHER PEN CR.	2322	9/1/1998	21FLA 20030580	BUTCHER PEN CR AT BLANDING BLVD	1,735	Q
BUTCHER PEN CR.	2322	10/7/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	9,000	
BUTCHER PEN CR.	2322	10/7/1998	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	9,000	
BUTCHER PEN CR.	2322	1/5/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,300	

Appendix D: Historical Fecal Coliform Observations in Butcher Pen Creek (Continued)

WATERBODY	WBID	SAMPLE DATE	STATION	LOCATION	VALUE (#/100mL)	REMARK CODE
BUTCHER PEN CR.	2322	1/5/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,300	
BUTCHER PEN CR.	2322	4/14/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	270	
BUTCHER PEN CR.	2322	4/14/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	270	
BUTCHER PEN CR.	2322	8/18/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	
BUTCHER PEN CR.	2322	8/18/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	
BUTCHER PEN CR.	2322	10/20/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	10/20/1999	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	3,000	
BUTCHER PEN CR.	2322	1/10/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,300	
BUTCHER PEN CR.	2322	1/10/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,300	
BUTCHER PEN CR.	2322	4/17/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	4/17/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,700	
BUTCHER PEN CR.	2322	9/19/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	
BUTCHER PEN CR.	2322	9/19/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	2,400	
BUTCHER PEN CR.	2322	12/18/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	4,800	
BUTCHER PEN CR.	2322	12/18/2000	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	4,800	
BUTCHER PEN CR.	2322	2/8/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	6,000	
BUTCHER PEN CR.	2322	2/8/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	6,000	
BUTCHER PEN CR.	2322	4/26/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,100	
BUTCHER PEN CR.	2322	4/26/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,100	
BUTCHER PEN CR.	2322	9/5/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	
BUTCHER PEN CR.	2322	9/5/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	500	
BUTCHER PEN CR.	2322	12/11/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,340	
BUTCHER PEN CR.	2322	12/11/2001	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,510	
BUTCHER PEN CR.	2322	3/20/2002	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	492	
BUTCHER PEN CR.	2322	5/16/2002	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	460	
BUTCHER PEN CR.	2322	9/9/2002	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	1,867	
BUTCHER PEN CR.	2322	12/10/2002	21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.	5,200	
BUTCHER PEN CR.	2322	12/10/2002	21FLA 20030760	BUTCHER PEN CR AT WESCONNETT	5,200	

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

Remark Codes: L – Off-scale high. Actual value not known, but known to be greater then value shown

Q – Sample held beyond normal holding time

P – Too numerous to count

B – Results based on colony counts outside the acceptable range

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: Kruskall – Wallis Analysis of Fecal Coliform Observations versus Season in Butcher Pen Creek

The following results are for:
WBID$ = 2322

Categorical values encountered during processing are:
SEASON2 (4 levels)
1, 2, 3, 4

Kruskal-Wallis One-Way Analysis of Variance for 80 cases
Dependent variable is VALUE
Grouping variable is SEASON2

Group	Count	Rank Sum
1	18	527.000
2	20	744.000
3	21	966.000
4	21	1003.000

Kruskal-Wallis Test Statistic = 7.860
Probability is 0.049 assuming Chi-square distribution with 3 df

Appendix F: Kruskall – Wallis Analysis of Fecal Coliform Observations versus Month in Butcher Pen Creek

The following results are for:
WBID$ = 2322

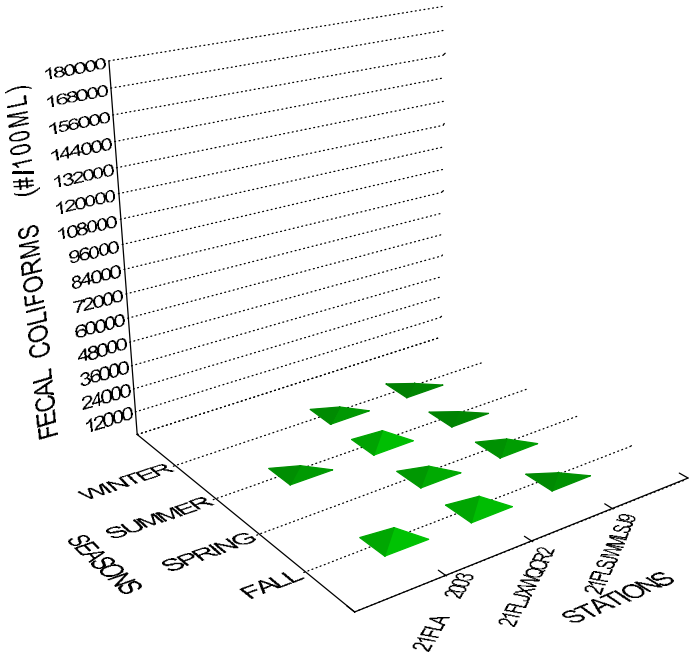
Categorical values encountered during processing are:
MONTH (11 levels)
1, 2, 3, 4, 5, 7, 8,
9, 10, 11, 12

Kruskal-Wallis One-Way Analysis of Variance for 80 cases
Dependent variable is VALUE
Grouping variable is MONTH

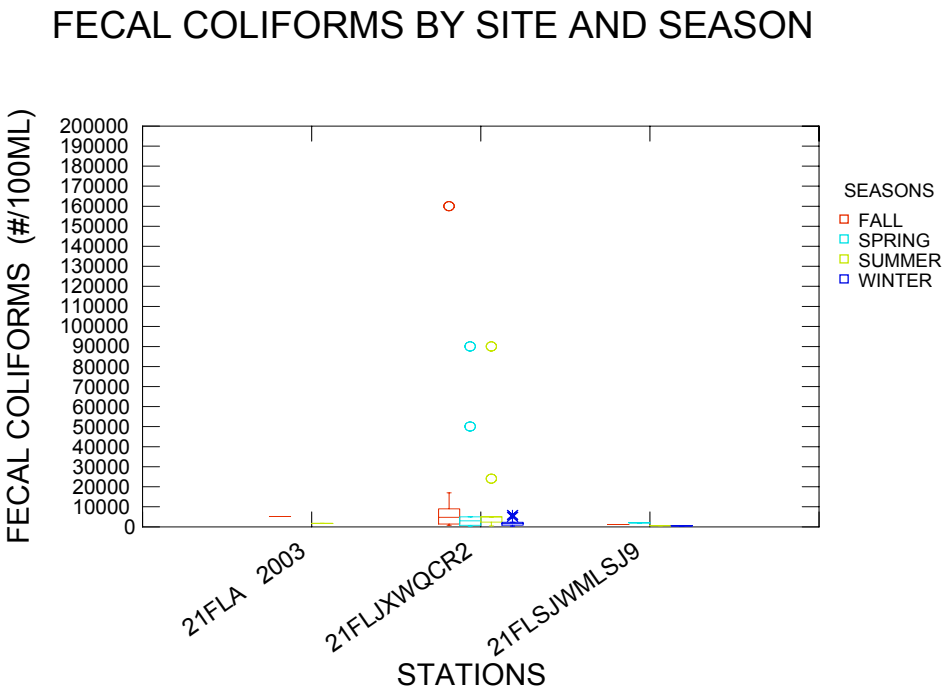
Group	Count	Rank Sum
1	13	337.000
2	4	184.000
3	1	6.000
4	14	541.000
5	6	203.000
7	12	718.000
8	3	89.000
9	6	159.000
10	12	682.000
11	3	50.000
12	6	271.000

Kruskal-Wallis Test Statistic = 28.703
Probability is 0.001 assuming Chi-square distribution with 10 df

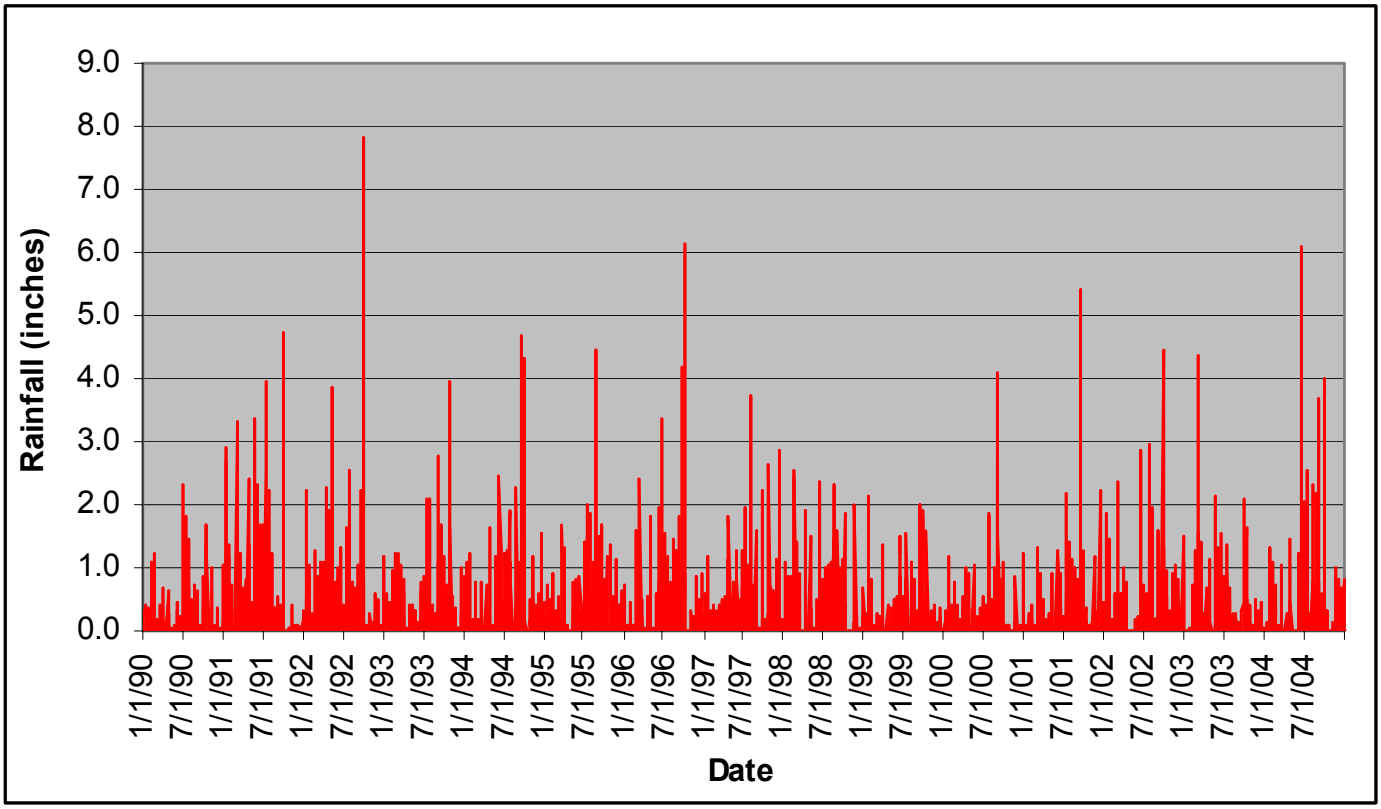
Appendix G: Chart of Fecal Coliform Observations and Stations in Butcher Pen Creek



STORET ID	Location
21FLA 20030580	BUTCHER PEN CR AT BLANDING BLVD
21FLJXWQCR2	BUTCHER PEN CREEK AT WESTCONNET BLVD.
21FLSJWMLSJ910	BUTCHER PEN CREEK NEAR MOUTH



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

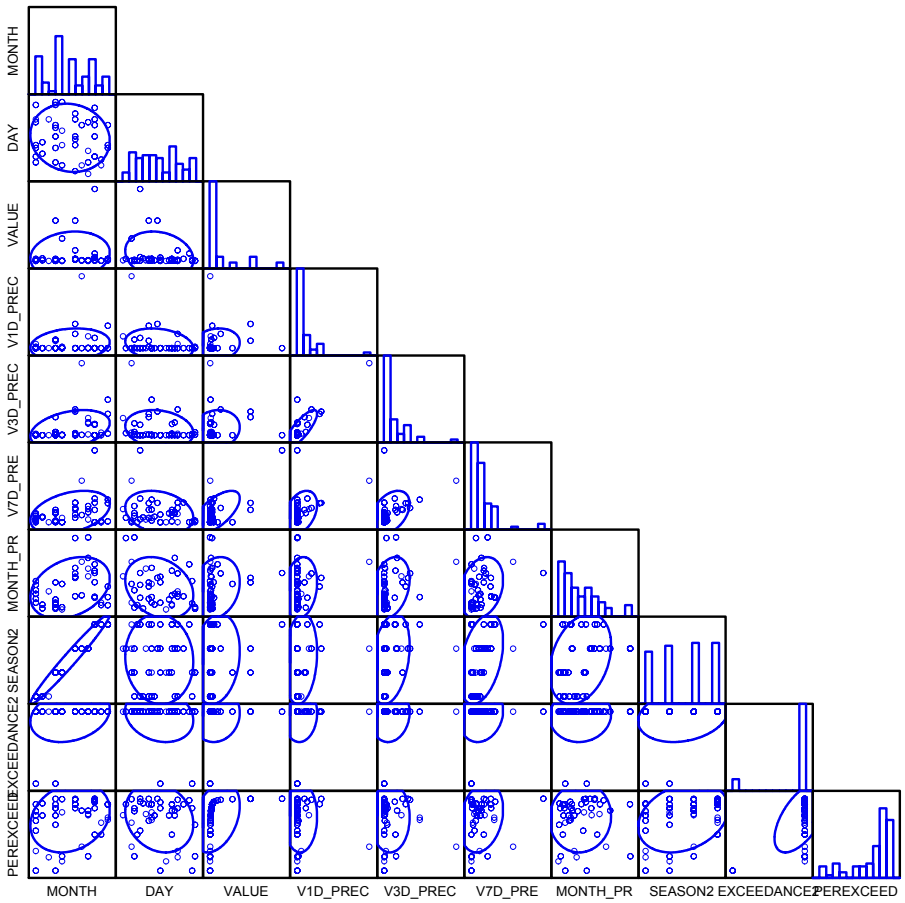


Appendix I: Spearman Correlation Matrix Analysis for Precipitation and Fecal Coliforms in Butcher Pen Creek

The following results are for:
WBID$ = 2322
Spearman correlation matrix

	MONTH	DAY	VALUE	V1D_PREC	V3D_PREC
MONTH	1.000				
DAY	-0.092	1.000			
VALUE	0.237	-0.153	1.000		
V1D_PREC	0.073	-0.208	0.161	1.000	
V3D_PREC	0.338	-0.164	0.074	0.649	1.000
V7D_PRE	0.303	-0.171	0.315	0.425	0.480
MONTH_PR	0.275	-0.170	0.216	0.106	0.247
SEASON2	0.977	-0.055	0.304	0.070	0.313
EXCEEDANCE2	0.243	-0.189	0.378	0.135	0.225
PEREXCEED	0.238	-0.154	1.000	0.161	0.074

	V7D_PRE	MONTH_PR	SEASON2	EXCEEDANCE2	PEREXCEED
V7D_PRE	1.000				
MONTH_PR	0.298	1.000			
SEASON2	0.343	0.314	1.000		
EXCEEDANCE2	0.329	0.007	0.221	1.000	
PEREXCEED	0.315	0.214	0.305	0.378	1.000



Appendix J: Analysis of Fecal Coliform Observations and Precipitation in Butcher Pen Creek

FECAL COLIFORM DATA VERSUS DAY OF SAMPLING PRECIPITATION

The following results are for:
WBID$ = 2322

Dep Var: VALUE N: 80 Multiple R: 0.140 Squared multiple R: 0.020

Adjusted squared multiple R: 0.007 Standard error of estimate: 31186.285

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	11632.498	3689.376	0.000	.	3.153	0.002
V1D_PREC	18411.316	14728.516	0.140	1.000	1.250	0.215

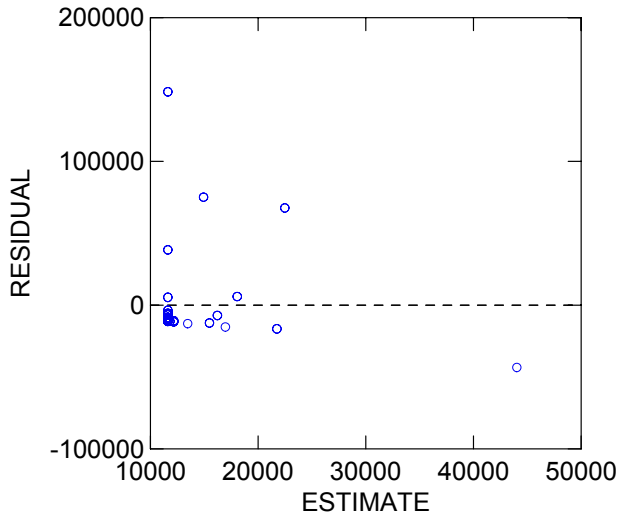
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	1.51977E+09	1	1.51977E+09	1.563	0.215
Residual	7.58616E+10	78	9.72584E+08		

*** WARNING ***
Case 432 has large leverage (Leverage = 0.641)
Case 433 is an outlier (Studentized Residual = 5.667)
Case 434 is an outlier (Studentized Residual = 5.667)

Durbin-Watson D Statistic 1.261
First Order Autocorrelation 0.367

Plot of residuals against predicted values



FECAL COLIFORM DATA VERSUS DAY OF SAMPLING AND TWO DAYS PRIOR PRECIPITATION

The following results are for:
WBID$ = 2322

Dep Var: VALUE N: 80 Multiple R: 0.121 Squared multiple R: 0.015

Adjusted squared multiple R: 0.002 Standard error of estimate: 31264.564

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	11227.215	3919.123	0.000	.	2.865	0.005
V3D_PREC	5178.233	4798.155	0.121	1.000	1.079	0.284

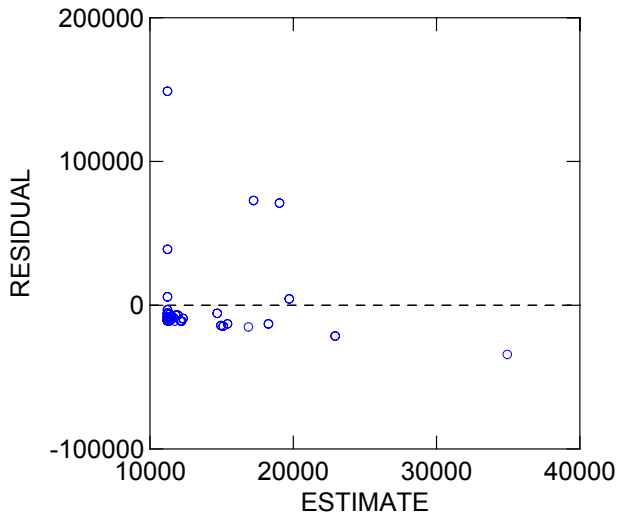
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	1.13846E+09	1	1.13846E+09	1.165	0.284
Residual	7.62429E+10	78	9.77473E+08		

*** WARNING ***
Case 432 has large leverage (Leverage = 0.430)
Case 433 is an outlier (Studentized Residual = 5.675)
Case 434 is an outlier (Studentized Residual = 5.675)

Durbin-Watson D Statistic 1.214
First Order Autocorrelation 0.391

Plot of residuals against predicted values



FECAL COLIFORM DATA VERSUS DAY OF SAMPLING AND SIX DAYS PRIOR PRECIPITATION

The following results are for:
WBID$ = 2322

Dep Var: VALUE N: 80 Multiple R: 0.656 Squared multiple R: 0.430

Adjusted squared multiple R: 0.423 Standard error of estimate: 23783.384

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	-2752.624	3371.352	0.000	.	-0.816	0.417
V7D_PRE	14103.205	1839.186	0.656	1.000	7.668	0.000

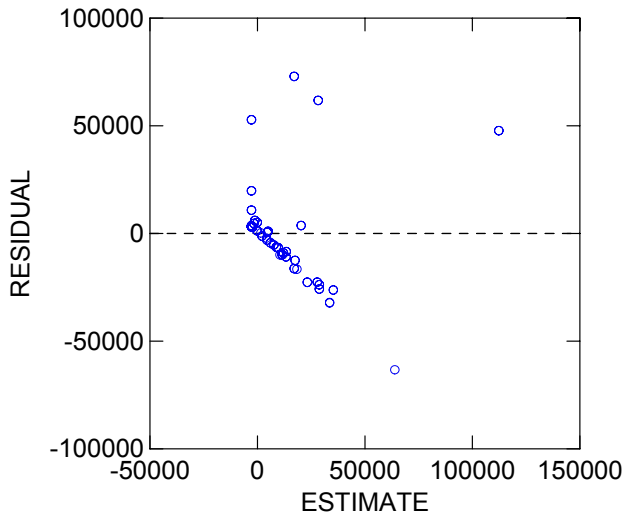
Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	3.32607E+10	1	3.32607E+10	58.801	0.000
Residual	4.41207E+10	78	5.65649E+08		

*** WARNING ***
Case 433 has large leverage (Leverage = 0.308)
Case 434 has large leverage (Leverage = 0.308)

Durbin-Watson D Statistic 1.129
First Order Autocorrelation 0.429

Plot of residuals against predicted values

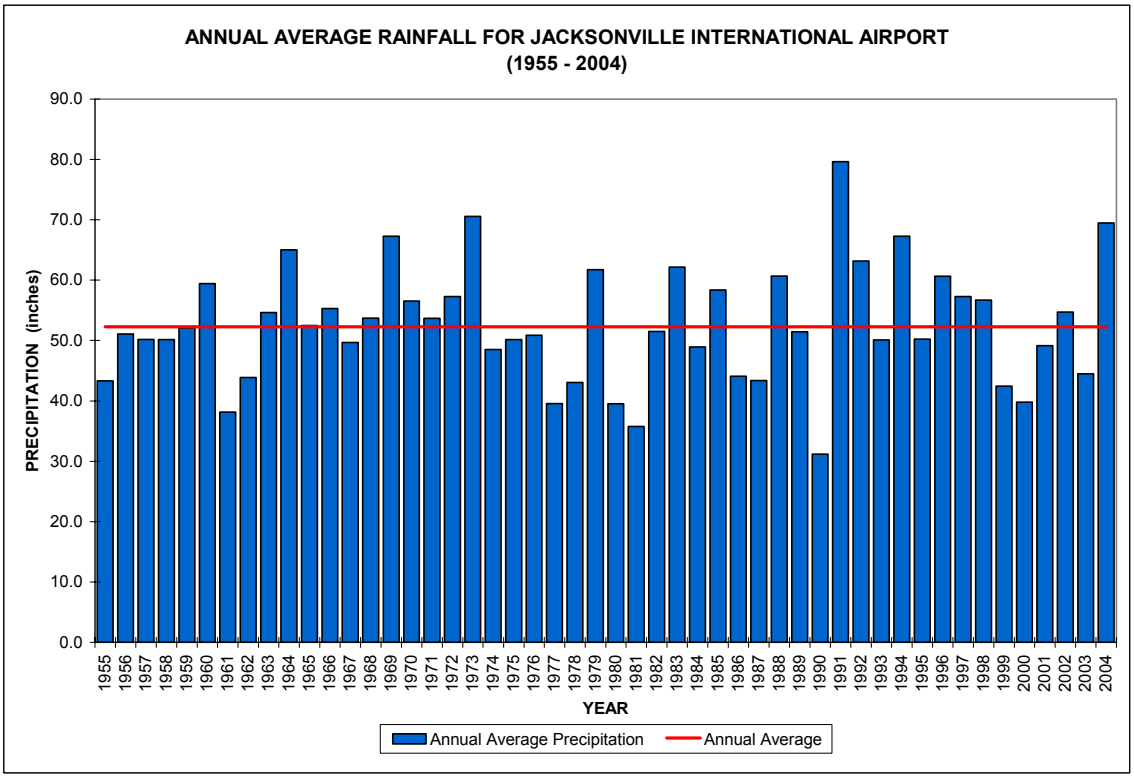


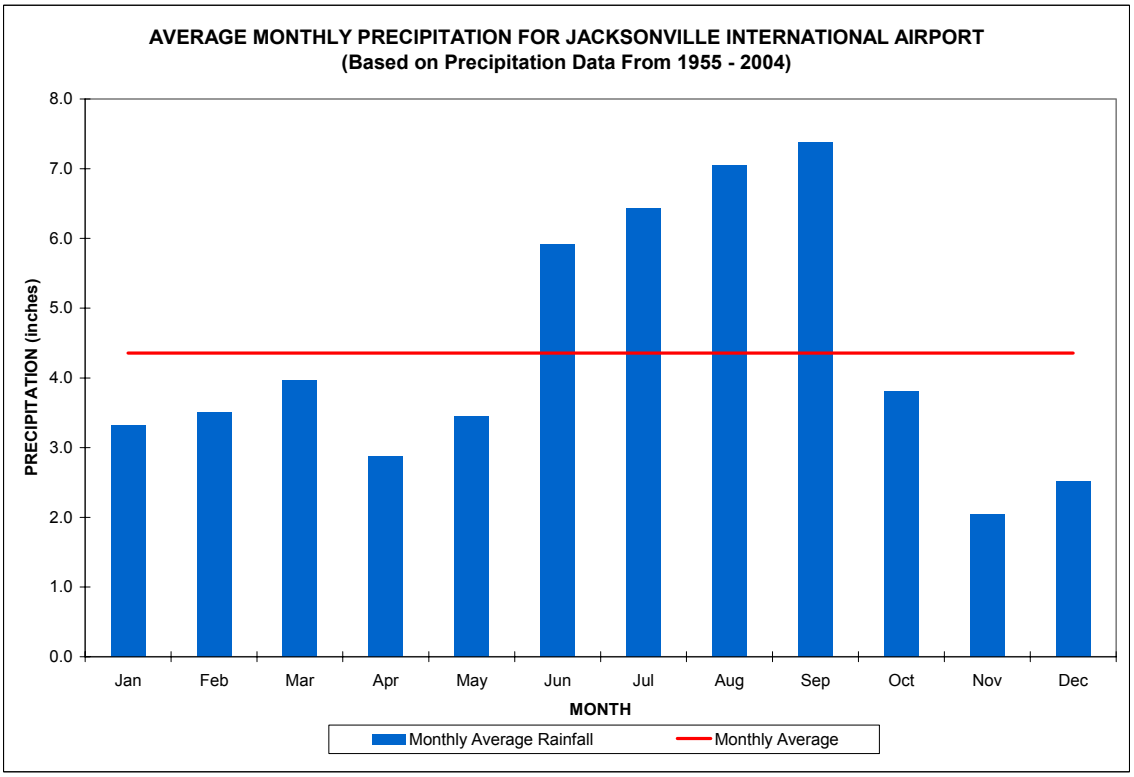
Appendix K: Monthly and Annual Precipitation 1955 – 2004 from JIA

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**
AVG	**3.32**	**3.50**	**3.96**	**2.88**	**3.45**	**5.92**	**6.44**	**7.05**	**7.38**	**3.81**	**2.05**	**2.51**	**52.27**

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

Appendix L: Annual and Monthly Average Precipitation at JIA





Appendix M: 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.

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