FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • TAMPA BAY TRIBUTARIES BASIN

TMDL Report

Nutrient and Dissolved Oxygen TMDL for Thirty Mile Creek

Polk County, Florida
WBID 1639

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September 17, 2004

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

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2002 305(b) Report

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Basin Status Report for the Tampa Bay Tributaries Basin

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Region 4: Total Maximum Daily Loads in Florida

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Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for nutrients and dissolved oxygen (DO) for Thirty Mile Creek, which is part of the larger Alafia River Planning Unit and the Tampa Bay Tributaries Basin. The stream was verified impaired for nutrients and DO, and was included on the Verified List of impaired waters for the Tampa Bay Tributaries Basin that was adopted by Secretarial Order in May 2004. This TMDL establishes the allowable loadings to Thirty Mile Creek that would restore the waterbody such that it meets its applicable water quality criteria for DO and nutrients.

1.2 Identification and Description of Thirty Mile Creek

Thirty Mile Creek is located in west-central Polk County and a small part of Hillsborough County, east of Tampa, near the Town of Mulberry, in west central Florida **(Figure 1.1).** The headwaters of the creek are at the confluence of Guy Branch, George Allen Creek, and an unnamed tributary. Other tributaries that flow into Thirty Mile Creek include Beulah Branch and three unnamed tributaries **(Figure 1.2).** Thirty Mile Creek is approximately 2.7 miles long, occupying an approximate 6.5 square-mile drainage area, with the North Prong of the Alafia River as the receiving water.

Phosphate mining and associated activities dominate the eastern and southern portions of the watershed. The western portion primarily contains crop and pasturelands, hardwood conifer stands, tree crops, and other more natural land use types (see **Section 4.2.2** for an in-depth discussion of land uses in the watershed). Due to the regulations surrounding mining activities, there is a riparian zone along most of the creek. As a result, it is heavily shaded for the majority of its length. The creek widens out and flow slows where it passes under the bridge at Nichols Road. Also, due to the bridge, this portion of the creek is not quite as shaded. Approximately 0.5 miles upstream of Nichols Road, the creek crosses under CSX railroad tracks, passing through a seven-foot concrete culvert.

There are no major population centers in the watershed, but the Town of Mulberry, the City of Lakeland, and Plant City are in the general vicinity. Thirty Mile Creek is a second-order stream. Additional information about the creek's hydrology and geology are available in the Basin Status Report for the Tampa Bay Tributaries Basin (Florida Department of Environmental Protection, June 2002; available at the Web site listed on page vi).

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Alafia River Basin into water assessment areas with a unique **w**ater**b**ody **id**entification (WBID) number for each watershed or stream reach. Thirty Mile Creek consists of one segment, referred to as WBID 1639 **(Figure 1.3)**.

Figure 1.1. Location of Thirty Mile Creek and Major Geopolitical Features in the Alafia River Basin

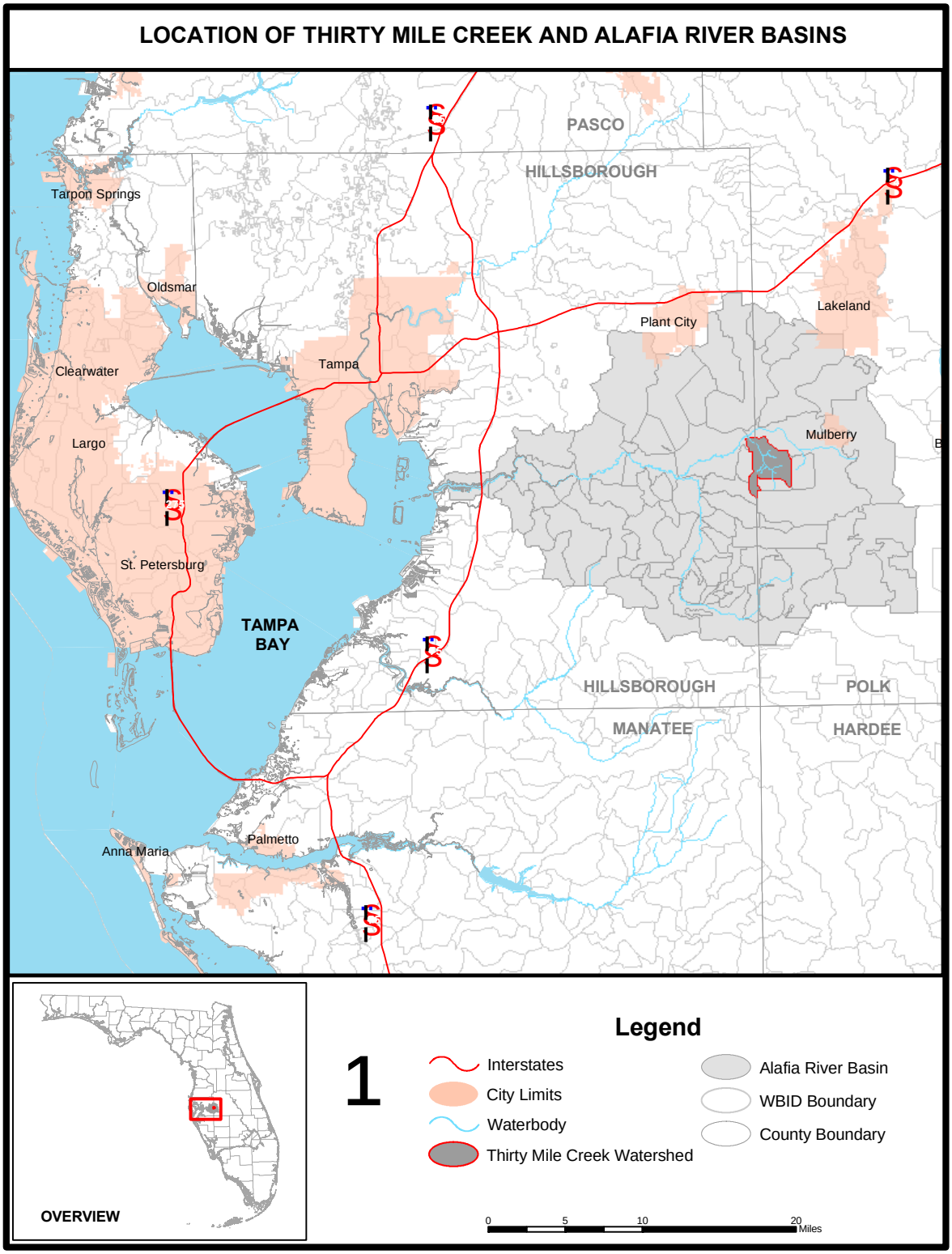


Figure 1.2. Thirty Mile Creek Tributaries

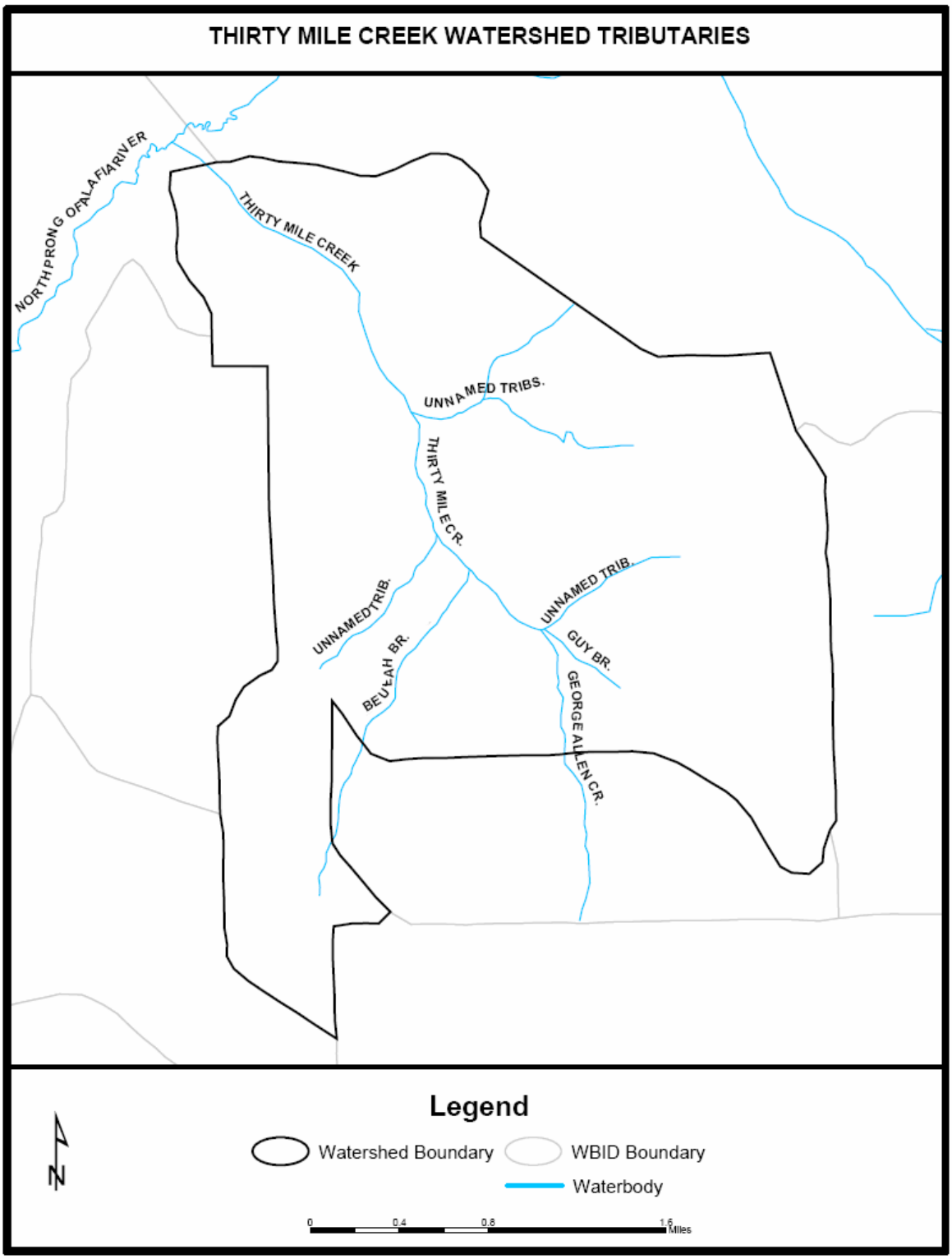
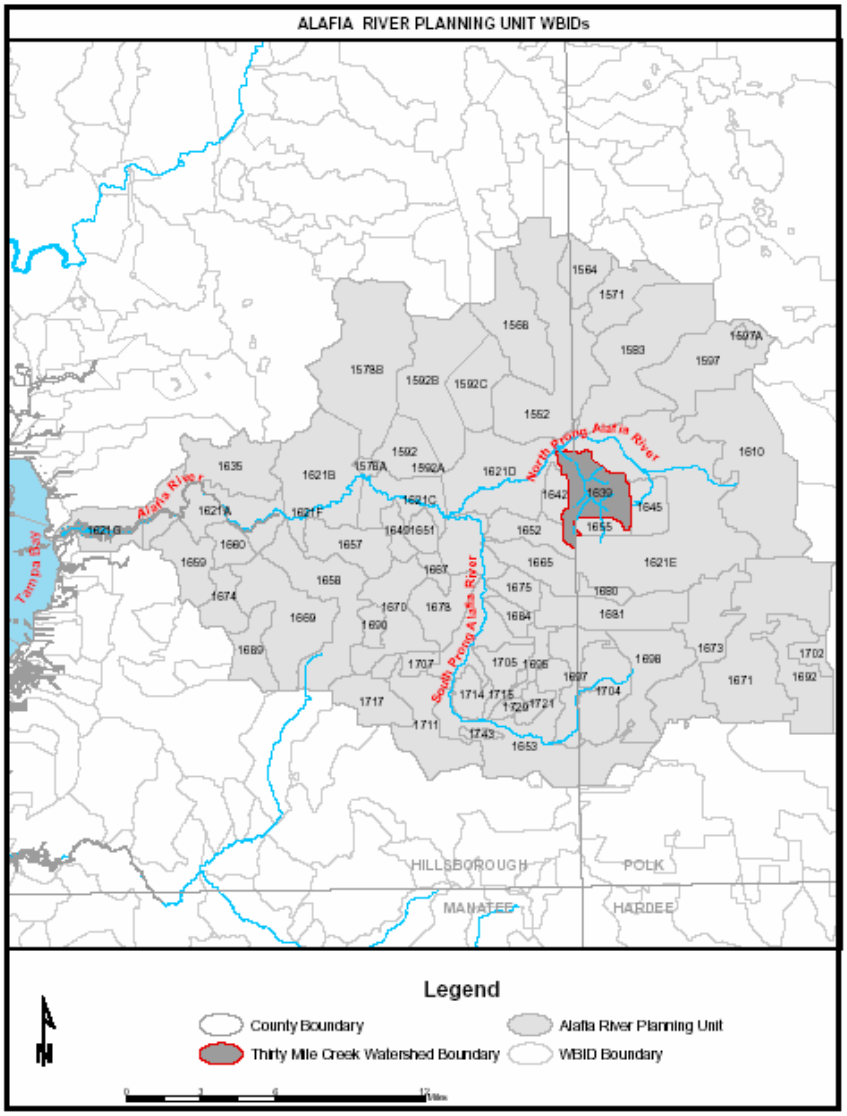


Figure 1.3. WBIDs in the Alafia River Basin, Including Thirty Mile Creek



WBID	WATERSHED NAME	WBID	WATERSHED NAME	WBID	WATERSHED NAME	WBID	WATERSHED NAME
1552	ENGLISH CREEK	**1639**	**THIRTYMILE CREEK**	1659	RICE CREEK	1692	HOOKERS PRAIRIE
1564	HAMILTON BRANCH	1578A	TURKEY CK AB ALAFIA R	1660	BELL CREEK	1695	BOGGY BRANCH
1568	HOWELL BRANCH	1642	SLOMAN BRANCH	1665	MIZELLE CREEK	1697	LAKE BRANCH
1571	AIRPORT BRANCH	1621A	ALAFIA R AB HILLS. BAY	1667	UNNAMED STREAM	1698	MINED AREA
1578B	TURKEY CK AB LTL ALAFIA	1592A	MEDARD RESERVOIR	1669	BELL CREEK RESERVOIR	1702	MINED AREA
1583	POLEY CREEK	1621C	ALAFIA R AB TURKEY CK	1670	DOE BRANCH	1704	MINED AREA
1592B	LTL ALAFIA AB MEDARD	1645	BIRD BRANCH	1671	MINED AREA	1705	MCMULLEN BRANCH
1597	LAKE DRAIN	1649	MCCULLOUGH BRANCH	1673	HOOKERS PRAIRIE	1707	MINED AREA
1597A	SCOTT LAKE - OPEN WATER	1651	MC DONALD BRANCH	1674	PELLEHAM BRANCH	1711	HURRAH CREEK
1592C	ENGLISH CREEK	1621G	ALAFIA R AB HILLS.BAY	1675	OWENS BRANCH	1714	MINED AREA
1610	MINED AREA	1652	WEST BRANCH	1678	CHITC BRANCH	1715	MINED AREA
1621B	ALAFIA R AB FLINT HAWK	1621F	LITHIA SPRINGS	1680	MINED AREA	1717	LEWIS BRANCH
1621E	NORTH PRONG ALAFIA R.	1653	SOUTH PRONG ALAFIA R	1681	MINED AREA	1721	MINED AREA
1592	LTL ALAFIA BL MEDARD	1655	MINED AREA	1684	HALLS BRANCH	1729	GULLY BRANCH
1621D	NORTH PRONG ALAFIA R.	1657	LITTLE FISHHAWK CREEK	1689	BOGGY CREEK	1743	MINED AREA
1635	BUCKHORN SPRING	1658	FISHHAWK CREEK	1690	FLAT CREEK		

1.3 Background

This report was developed as part of the Department's 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 52 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).

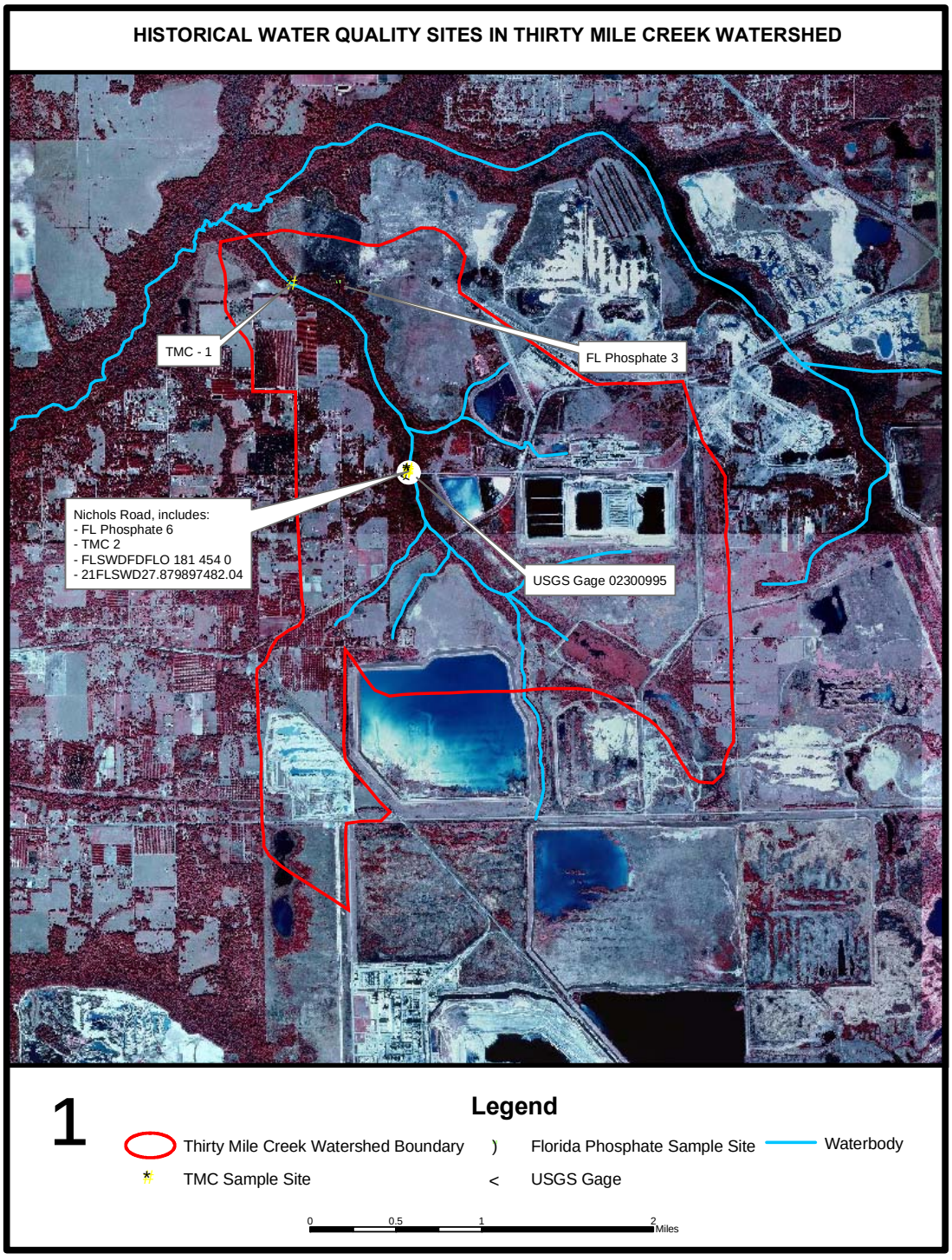
A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting water quality standards. TMDLs 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 chlorophyll (by reducing the amount of available nutrients) and increase DO concentrations that caused the verified impairment of Thirty Mile Creek. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFWMD), local governments, 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.

1.4 Existing Data

Three locations on Thirty Mile Creek have historical data in the Department's Impaired Waters Rule (IWR) database, which contains data from three organizations. The SWFWMD, the Department's Southwest District (the District), and the Florida Phosphate Council (FPC) have all collected data on Thirty Mile Creek at Nichols Road (C.R. 676). Two other stations have been established that do not appear at road crossings. One is, located at 27° 53' 45.5" 82° 03' 04.4", and has been sampled by the District. This station is approximately 1.4 miles downstream of the Nichols Road site. A nearby station, known as Phosphate 3, has been established by the FPC, is located approximately 1.18 miles downstream of Nichols Road at 27° 53' 44.9" 082° 30' 18.00". **Figure 1.4** shows the locations of the sites where reported data have been collected.

Figure 1.4. Locations of Historical Water Quality Stations within the Thirty Mile Creek Watershed



The SWFWMD collected data at the Nichols Road site from December 1992 through April 1994, and from January 2000 through December 2003. The FPC data were collected as part of a monitoring program established under a Memorandum of Agreement (MOA) with the Department that required the North Prong of the Alafia River and its tributaries (including two sites in Thirty Mile Creek) to be sampled bimonthly for five years. While the FPC still sponsors sampling on Thirty Mile Creek, data considered in this assessment were collected at Phosphate 6 (Nichols Road) and Phosphate 3 (downstream of Nichols Road) from May 1998 through November 2003 **(Figure 1.4).**

The District also collected data at Nichols Road from March 2002 through June 2003, and collected data from April 2002 through January 2003 at a downstream site, TMC–01 **(Figure 1.4),** which is approximately 1.4 miles downstream of Nichols Road. **Table 1.1** contains a partial list of parameters collected at the three sites as well as data reported to the Department by National Point Source Discharge Elimination System (NPDES) permitted facilities through monthly Discharge Monitoring Reports (DMRs).

Table 1.1. Parameters Collected at Sites on Thirty Mile Creek

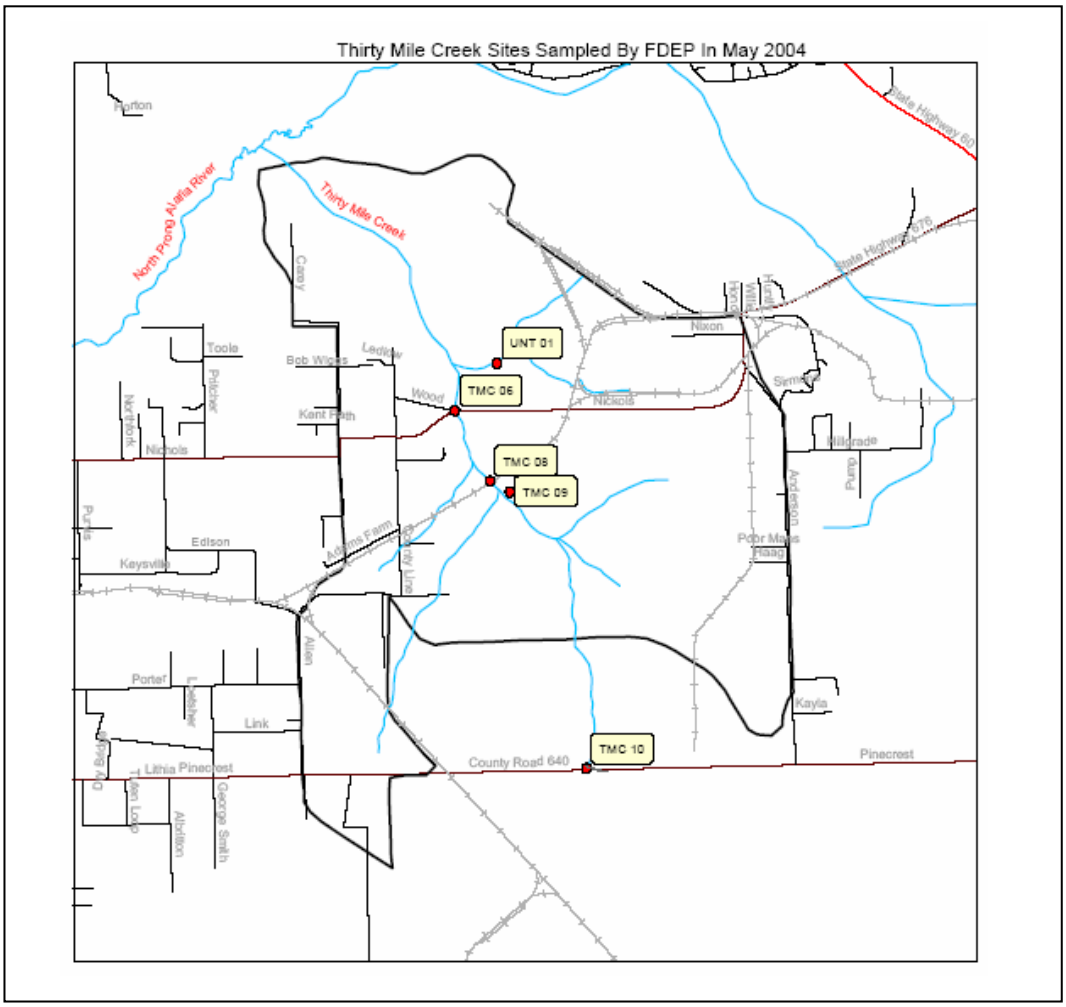
Sampled Parameter	Phosphate 3 Site*	TMC–1 Site*	Nichols Road Site*	Discharge Monitoring Reports (DMR)
Ammonia				X
Corrected Chlorophyll		X	X	
Chlorophyll *b*			X	
Chlorophyll *c*			X	
Color		X	X	
Dissolved Oxygen	X	X	X	X
Dissolved Solids			X	
Flow	X			
Nitrate Nitrite	X	X	X	
Nitrogen Ammonia	X	X	X	
Ortho-phosphate		X	X	X
pH	X	X	X	X
Phaeophytin *a*			X	
Secchi Depth		X	X	
Temperature	X	X	X	X
TKN		X		
Total nitrogen			X	X
Total phosphorous	X	X	X	
Turbidity		X	X	X
Unionized Ammonia				X

* See **Figure 1.4** for locations of sample sites.

The mining facilities in the watershed have changed ownership several times in the past few decades, and the Department has issued several permits to these various owners and facilities over the years. As required by the discharge permits, the facility owners have collected both effluent and ambient data. Most of the outfalls discharge indirectly into Thirty Mile Creek. The facilities report data to the Department on a monthly basis as part of a Discharge Monitoring Report (DMR). As of February 2004, the database contains monthly summary data records for these facilities and the various permits from January 31, 1989, through October 31, 2003. **Section 4.2** describes the facilities and their activities.

The Department's Watershed Assessment Section conducted a survey on Thirty Mile Creek in May 2004. Of the seven sampling sites included in the survey, five were in the Thirty Mile Creek watershed. Three were on Thirty Mile Creek, one was on George Allen Creek, one was on an unnamed tributary to Thirty Mile Creek, and two were on the North Prong of the Alafia River. **Figure 1.5** shows the sites sampled in the survey.

Figure 1.5. Sites Sampled by the Department during May 2004 Survey



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 U.S. Environmental Protection Agency (EPA) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing the impairment of the listed waters on a schedule. The Department has developed these biannual lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin is also required by the Florida Watershed Restoration Act (FWRA [Subsection 403.067(4)], Florida Statutes [F.S.]); the list is amended annually to include updates for each basin statewide.

Of the 62 waterbodies in the Alafia River Basin, 10 were on the 1998 303(d) list for one or more parameters. Thirty Mile Creek was listed for nutrients, coliforms, and DO, and the North Prong of the Alafia River (WBIDs 1621D and 1621E) was listed for nutrients, coliforms, and DO. The creek is a Group 1/Group 2 water with high priority for TMDL development, and, according to the Consent Decree between EPA and Earth Justice (Florida Wildlife Federation vs. Carol M. Browner [EPA], June 1999), TMDLs for the creek for nutrients, coliforms, and DO were due in 2003, while Alafia River TMDLs were listed as “low priority” and are due in 2008. 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. The list of waters for which impairments have been verified using the methodology in the IWR is referred to as the Verified List.

2.2 Information on Verified Impairment

The Department used the IWR to assess water quality in Thirty Mile Creek, and verified the stream was impaired for nutrients and DO **(Table 2.1)**. **Table 2.2** provides annual mean chlorophyll *a* values for those years where enough data were available to calculate an annual average per the IWR. The annual average chlorophyll *a* concentration in 2002 exceeded the IWR threshold of 20 micrograms per liter (µg/L) for streams and led to the verification of the creek as nutrient impaired. Based upon nitrogen-to-phosphorus ratios **(Appendices A** and **B),** nitrogen was determined to be the limiting nutrient in Thirty Mile Creek. **Table 2.3** shows statistics for DO, including the number of exceedances and samples collected in Thirty Mile Creek. As shown in the table, instream DO values are frequently below the DO criterion of 5.0 mg/L (Chapter 62-302, Florida Administrative Code [F.A.C]). Of the 157 DO samples, 74 values were below the DO criterion (or 47.1 percent), and the IWR listing threshold for impairment for this sample size is only 22 exceedances.

Table 2.1. Verified Impaired Segments in Thirty Mile Creek, WBID 1639

Parameters of Concern	Priority for TMDL Development	Projected Year for TMDL Development
Dissolved Oxygen	High	2003
Nutrients (based on chlorophyll),	High	2003

Table 2.2. Annual Average Chlorophyll Data for Thirty Mile Creek, WBID 1639

Year	Annual Average Chlorophyll Value
2000	1.99 µg/L
2001	2.44 µg/L
2002	28.27 µg/L
2003	9.33 µg/L

Table 2.3. Statistical Summary of DO Data for Thirty Mile Creek, WBID 1639

Nichols Road Site							
	Average	**Median**	**Minimum**	**Maximum**	**N**	**Exceedances of 5.0mg/L Criterion**	**Percent Exceedance of 5.0 mg/L Criterion**
Winter	6.83	7.30	3.05	8.62	11	2	18.18%
Spring	6.08	6.30	4.09	8.06	10	2	20.00%
Summer	5.03	4.90	3.37	6.58	15	8	53.33%
Fall	6.25	6.89	4.06	8.23	9	2	22.22%
Downstream Sites							
	Average	**Median**	**Minimum**	**Maximum**	**N**	**Exceedances of 5.0mg/L Criterion**	**Percent Exceedance of 5.0 mg/L Criterion**
Winter	6.30	6.15	3.20	8.65	25	6	24.00%
Spring	4.13	3.73	0.34	11.12	23	17	73.91%
Summer	4.17	3.93	2.60	6.90	32	24	75.00%
Fall	5.40	5.10	2.64	7.83	25	12	48.00%
Summary of All DO Data for Thirty Mile Creek*							
	Average	**Median**	**Minimum**	**Maximum**	**N**	**Exceedances of 5.0 mg/L Criterion**	**Percent Exceedance of 5.0 mg/L Criterion**
All Data	5.30	5.16	0.34	11.12	157	74	47.13%

* Includes data collected during the Department's May 2004 survey, which were collected at sites other than Nichols Road.

Additional analysis identified nutrients as a causative pollutant of the DO impairment, based on elevated concentrations of nutrients relative to other streams in the state. The nutrient impacts to DO are typically associated with increased plant growth (both rooted and floating). Photosynthesis by plants during the day increases DO levels in the water column, while plant respiratory requirements during the night can result in decreased DO levels. This can account for large DO swings within the water column over a 24-hour period. Floating vegetation also reduces the surface area available for atmospheric reaeration on the surface of the water. Finally, plant material that settles to the bottom is remineralized by bacteria, which increases the sediment oxygen demand (SOD). Photographs of Thirty Mile Creek at Nichols Road in **Figure 2.1** and the corresponding DO time series illustrate the combined influence of these factors on DO.

2.3 Other Indications of Nutrient Impairment

Although excessive algal mats have not been reported in the creek, the chlorophyll data indicate that some rather significant chlorophyll swings have occurred. SWFWMD staff (Personal communication, May 17, 2004) indicate that the water at Nichols Road has turned green (from algae and chlorophyll) on several occasions. A Department survey of Thirty Mile Creek in May 2004 revealed an abundance of floating and emergent plants at Nichols Road **(Figure 2.1),** while upstream, near sites TMC–08 and TMC–09, emergent plants are nearly nonexistent. Along this portion of the stream, the water is more shaded and tends to have a higher velocity.

Figure 2.1. Images of Thirty Mile Creek, May 4, 2004

Thirty Mile Creek at Nichols Road, looking downstream (May 4, 2004)

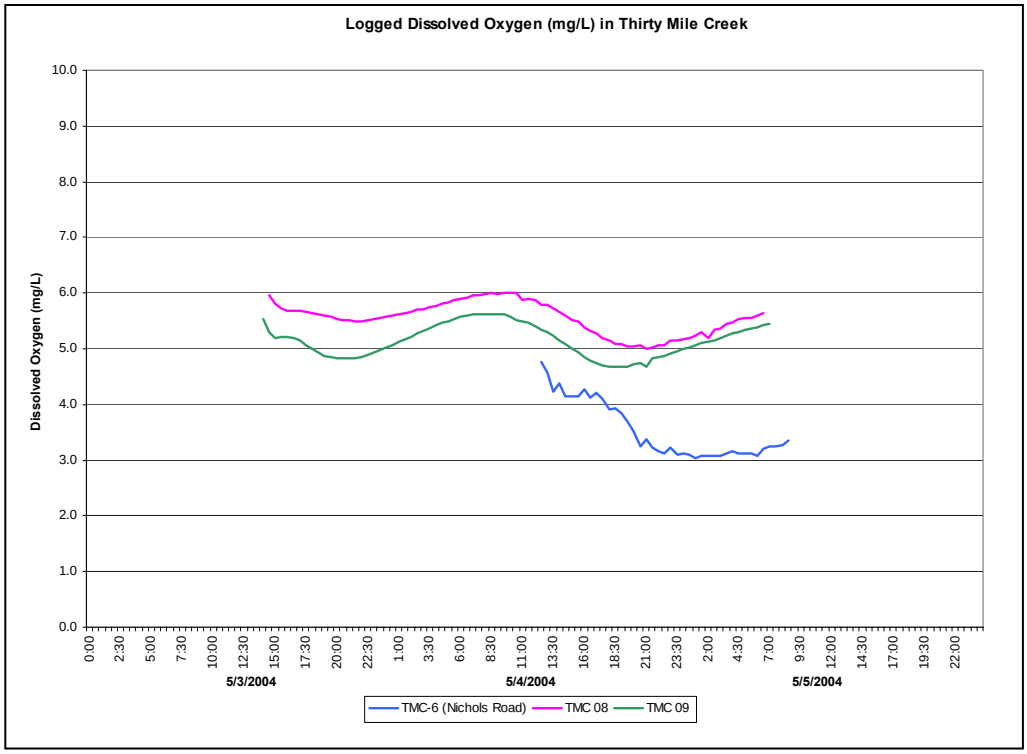
Thirty Mile Creek at Nichols Road, looking upstream (May 4, 2004)

Thirty Mile Creek at TMC-09 site, looking downstream (May 4, 2004)

Thirty Mile Creek at TMC-08 site, looking downstream near the railroad crossing. (May 4, 2004)

During the May 2004 survey conducted by the Department, three data loggers were deployed in Thirty Mile Creek — one each at TMC–09, TMC–08, and TMC–06. Logged parameters include DO, pH, temperature, and specific conductance. The loggers collected data every half-hour for approximately 30 hours at TMC-08 and TMC-09. Data were logged every half-hour at TMC–06 (Nichols Road) for approximately 22 hours. While the DO exhibited the typical daily fluctuations (**Figure 2.2**), it was also quite a bit lower at Nichols Road compared with the other sites, with all measurements being below 5.0 mg/L. This is believed to be due, at least in part, to the conditions discussed above, such as floating vegetation, shading, and lower velocities (due to stream morphology).

Figure 2.2. Logged DO Data from May 2004 Survey



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)**

Thirty Mile Creek is a Class III 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 DO and nutrients.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

The Class III freshwater DO criterion states that DO shall not be less than 5.0 mg/L (Chapter 62-3.2, F.A.C., Surface Water Quality Standards). In contrast to this straightforward numeric DO criterion, Florida's nutrient criterion is narrative only — nutrient concentrations of a body of water shall not be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. Accordingly, a nutrient-related target was needed to represent levels at which an imbalance in flora or fauna is expected to occur.

In translating the narrative nutrient criterion for this TMDL, the Department wanted to ensure that the creek would not be identified as impaired by nutrients in the future according to the assessment methodology in the IWR. Given the uncertainty of nutrient reactions within streams, the Department has applied a chlorophyll a target for this TMDL that should result in an annual average chlorophyll below the IWR impairment threshold for streams. Specifically, the Department calculated an allocation for Total Nitrogen that would ensure that the waterbody does not exceed 20 ug/L in any given month. Not only will this approach minimize the potential for listing the water as impaired in the future, it also provides an additional margin of safety that the narrative nutrient criterion will be met. However, since the target is not based specifically on a site-specific evaluation of when imbalance of flora or fauna occurs, the TMDL will be revisited in the future to determine if a more site-specific target can be used.

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 the pollutant of concern 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" has been used to describe intermittent, often 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 NPDES Program. 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 C** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term "point source" is 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 6.2**). 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 Nutrients in the Thirty Mile Creek Watershed

4.2.1 Point Sources

The majority of land in the watershed is presently owned and managed by a single phosphate mining company, International Mineral and Chemical (IMC). Currently, there are three permitted outfalls that discharge (directly or indirectly) into Thirty Mile Creek (**Table 4.1** and **Figure 4.1**). Over the past several decades, property within the watershed has been owned and/or managed by numerous companies that have utilized the land for the mining of phosphate and manufacture of associated products. As recently as 2002, 5,975 acres in the general area of Thirty Mile Creek changed ownership. This change affected two outfalls, which are now operated and maintained by IMC. Currently, IMC holds all discharge permits in the watershed. Outfalls 008 and 009 under NPDES Permit #FL0000256 were acquired by IMC in January 2003. In February 2004, the Department received a request to transfer Outfall 001-1 under NPDES Permit #FL0030139 to a private individual who now owns the property on which the discharge is located. The request is currently under review by the Department.

Table 4.1. Summary of Permitted Point Sources Summary in the Thirty Mile Creek Watershed

Permitted Company	NPDES Permit Number	Latest Permit Issued	Outfall Number	Daily Maximum TN Concen-tration	Monthly Average TN Maximum	Daily Maximum TP Concen-tration	Monthly Average TP Maximum	Minimum DO Concen-tration.	Receiving Water	Estimated Average Monthly Discharge for 2003 (MGD)
IMC Phosphates Company	FL0030139	3/2002	001-1	3.0 mg/L*	N/A	N/A	N/A	5.0 mg/L	Unnamed tributary to Thirty Mile Creek	3.82
IMC/Kingsford Mine Complex	FL0000256	12/2003	009-1†	3.0 mg/L	N/A	5.0 mg/L*	3.0 mg/L	5.0 mg/L	Guy Branch	10.00
IMC/Kingsford Mine Complex	FL0000256	12/2003	008-1‡	3.0 mg/L	N/A	5.0 mg/L*	3.0 mg/L	5.0 mg/L	George Allen Creek	No reported discharge since December 2002

† Until December 2003, this was Outfall 001-1 under NPDES #FL0000311.
‡ Until December 2003, this was Outfall 003-1 under NPDES #FL0000311.
* These concentrations are "target" levels, and as such, an exceedance does not necessarily require enforcement action.
N/A – Does not apply to this permit

According to information in the Department's Industrial Wastewater Section files, the IMC facility suspended production of product in October 1998 and permanently ceased operations in December 1998 in the watershed. Prior to October 1998, the facility manufactured sulfuric acid, phosphoric acid, and mono- and diammonium phosphate. Other onsite activities included shipping, processing material, electric cogeneration, phosphogypsum storage, raw materials storage, and wastewater storage. The facility manufactured approximately 1.5 million tons of phosphogypsum and 300,000 tons of phosphoric acid annually. The site also includes a 50-acre lined process-water cooling pond and associated water pumps, and a 180-acre unlined phosphogypsum stack. The phosphogypsum stack is equipped with a two-stage liming/acidulation treatment system used to treat process pond water prior to being discharged through Outfall 001.

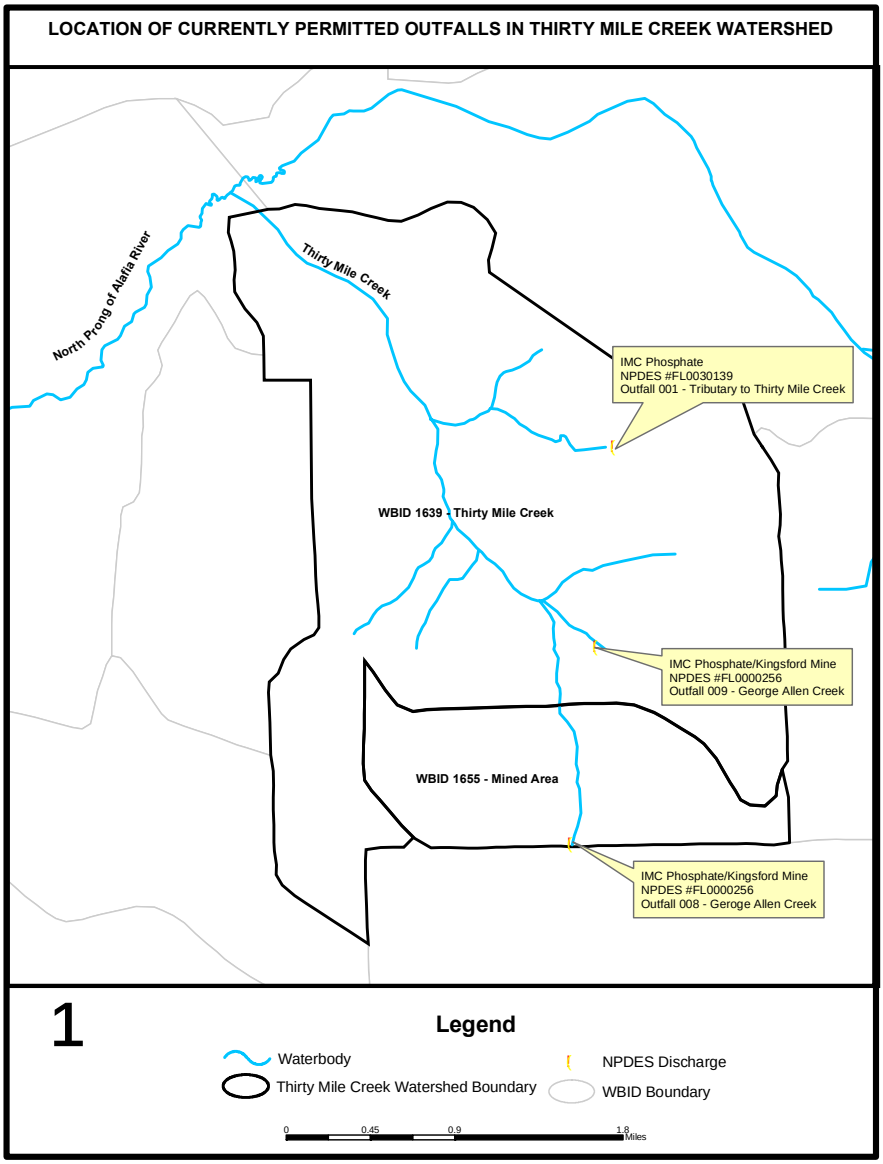
The Department issued IMC a temporary deactivation permit (# 99-001) on November 11, 1999. Prior to that time, the facility held a permit allowing the discharge of once-through, non-contact cooling water, boiler blowdown, stormwater, and contaminated non-process wastewater into an unnamed creek. The creek flows into Thirty Mile Creek before reaching the North Prong of the Alafia River. Discharge was via Outfall 001, under NPDES Permit # FL0030139 **(Figure 4.1).** Currently, all discharge permits are for stormwater holding ponds, allowing discharge of excess stormwater through the outfall. The permits do not specify a maximum flow; rather, they are based on the surge capacity of each holding pond. The discharge from Outfall 001 appears to be mechanically aerated prior to reaching Thirty Mile Creek. In addition to having a surface water discharge permit, the facility also has a ground water discharge permit (as this is a surface water TMDL, the ground water permit will not be discussed).

While operations at the facility have been permanently suspended and the associated gypsum stack is currently in the process of being closed, IMC is planning to mine an approximately 40-acre tract of land. This tract is south of Nichols Road and the settling pond, along Thirty Mile Creek. It is estimated that the operation will take three months. Mining was originally set to begin in fall 2004, however recent communication with IMC officials indicate mining may begin

sooner (Personal communication May 14, 2004). As required, the area will be reclaimed after being mined.

Under the discharge permit, the facility is required to implement certain Best Management Practices (BMPs). The permit specifies that these will include plans which prevent, or minimize the potential for, the release of pollutants from ancillary activities, including material storage areas, plant site runoff; in-plant transfer; process and material handling areas; loading and unloading operations; and sludge and waste disposal areas to waters of the state through plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In addition, the facility is required to amend the BMP plan whenever there is a change in the facility or change in the operation of the facility that materially increases the potential for the ancillary activities to result in a discharge of significant amounts of pollutants.

Figure 4.1. Currently Permitted Point Sources in the Thirty Mile Creek Watershed, WBID 1639



Until recently, Agrifos, L.L.C. was another NPDES permit holder in the watershed. However, the company ceased all operations in 2000 and went out of business. Some of the property formerly owned by Agrifos was sold to IMC. An individual purchased another portion of the land.

According to the Department's Industrial Wastewater Section's files, the Agrifos facility consisted of phosphate mining and beneficiation, phosphatic clay settling areas, sand tailings disposal areas, and a mine water recirculation system. Operations entailed slurrying mined ore into a pit and pumping it to the beneficiation plant where fine clays and sand were separated from the phosphate rock. The resulting product was then shipped to another facility for drying and shipping.

Agrifos held a NPDES permit (# FL0000311-003) to discharge stormwater into waters that reach Thirty Mile Creek. Due primarily to the transfer of approximately 5,975 acres of previously mined land from Agrifos to IMC's Kingsford Mine Complex, a revised permit was issued to IMC in December 2002. Under the revised permit, Agrifos Outfalls 001 and 003 under NPDES Permit # FL0000311 were reassigned to IMC's NPDES Permit # FL0000256 as Outfalls 009 and 008, respectively. Outfall D-008 discharges wastewater consisting of excess mine recirculation water and stormwater into George Allen Creek, a tributary to Thirty Mile Creek. IMC has not discharged from Outfall D-008 since December 2002 (this was confirmed through personal communication with IMC personnel). The average discharge from Outfall 009 was approximately 10 mgd in 2003. Discharge from both outfalls reach Thirty Mile Creek.

Estimating Point Source Loads

Point source effluent loads were calculated using DMRs from the permitted facilities. These reports include flow and other chemical sampling data as required in the permit. The data are generally required to be submitted as either a daily or monthly average or daily maximum (depending on parameter and facility type) concentration.

All current permits issued within the Thirty Mile Creek watershed are required to report flow (MGD), TN (mg/L), and TP (mg/L), among other parameters. As previously mentioned, data are reported to the Department on a monthly basis, and are reported as daily or monthly averages or maximums as stated in the permit. TN and TP loadings from 1998 to 2003 were estimated based on these data.

NPDES Permit # FL0000256, issued in December 2003, set the daily maximum TN concentration at 3.0 mg/L, and stated "Total nitrogen shall be for monitoring and reporting only, except: if monitoring shows total nitrogen levels exceed 3.0 mg/L maximum for more than one 30-day period per calendar year..." If this condition is not met, the permit requires IMC to initiate a study and begin actions to alleviate the excess TN concentration.

Some permits issued in the watershed in the past set have set 3.0 mg/L as a maximum concentration while others used 3.0 mg/L as a "goal" or "target." **Table 4.2** shows TN and TP concentrations from 1998 to 2003. This table clearly shows that this level of 3.0 mg/L has been exceeded on several occasions in the past. It should be noted that IMC obtained ownership of the outfalls in January 2003. Since this time, effluent TN concentrations have not exceeded 3.0 mg/L.

Table 4.2. Monthly and Flow Weighted TN and TP DMR Concentrations

NPDES Permit #:	FL0000311/(Under FL0000256 12/2002)			FL0000311/(Under FL0000256 12/2002)			Flow	Flow
Outfall ID:	001 (Known as 009 as of 12/2002)			003 (Known as 008 as of 12/2002)			Weighted	Weighted
Discharges To:	Guy Branch			George Allen Creek			TN	TP
Monitoring Date	Daily Maximum TN Concentration (mg/L)	Daily Maximum TP Concentration (mg/L)	Monthly Average Flow (MGD)	Daily Maximum TN Concentration (mg/L)	Daily Maximum TP Concentration (mg/L)	Monthly Average Flow (MGD)	(mg/L)	(mg/L)
3/31/1998	0.34	1.57	39.120	0.36	0.28	0.0002	0.34	1.57
4/30/1998	0.36	2.75	12.580	0.53	0.35	0.0160	0.36	2.75
5/31/1998	0.41	2.84	2.820	0.74	2	0.0010	0.41	2.84
6/30/1998	0.29	2.75	1.945	0.53	0.28	0.0010	0.29	2.75
7/31/1998	1.7	1.73	9.031	0.46	1.74	0.0010	1.70	1.73
8/31/1998	0.52	1.27	9.966	0.92	1.76	0.0010	0.52	1.27
9/30/1998	0.35	1.3	20.623	0.51	0.71	0.0010	0.35	1.30
10/31/1998	0.4	1.82	8.802	0.51	1.21	0.0010	0.40	1.82
11/30/1998	0.41	2.32	1.768	0.31	1.67	0.0010	0.41	2.32
12/31/1998	0.57	2.76	2.530	0.6	0.3	0.0010	0.57	2.76
1/31/1999	0.34	4.07	3.495	0.6	0.29	0.0010	0.34	4.07
2/28/1999	0.31	3.9	0.770	0.44	0.3	0.0010	0.31	3.90
3/31/1999				0.26	0.25	0.0040	0.26	1.52
4/30/1999	0.27	1.27	0.928	0.43	0.28	0.0037	0.27	1.27
5/31/1999	0.27	1.26	1.432	0.43	0.51	0.0040	0.27	1.26
6/30/1999	0.35	0.62	1.323	0.43	0.54	0.0042	0.35	0.62
7/31/1999	0.84	1.65	8.938	0.83	0.21	0.0043	0.84	1.65
8/31/1999	0.58	1.42	13.450				0.58	1.42
9/30/1999	0.82	1.57	11.234	0.42	0.22	0.0047	0.82	1.57
10/31/1999	0.61	1.3	15.209	0.75	0.31	0.0044	0.61	1.30
11/30/1999	0.7	1.06	4.971	0.94	0.27	0.0030	0.70	1.06
12/31/1999	0.77	1.63	6.230	0.64	1.48	0.0027	0.77	1.63
1/31/2000	2.66	1.68	8.391	1.69	1.09	0.0025	2.66	1.68
2/29/2000	3.66	4.1	7.155	1.11	0.6	0.0024	3.66	4.10
3/31/2000	3.8	1.7	2.333	3.4	0.44	0.0027	3.80	1.70
4/30/2000	1.8	1.8	3.877	2.29	0.9	0.0022	1.80	1.80
5/31/2000	0.85	2.64	1.339	1.14	0.28	0.0024	0.85	2.64
6/30/2000	1.57	2.37	1.037	2.03	0.39	0.0029	1.57	2.36
7/31/2000	1.12	1.6	9.833	0.78	0.26	0.0037	1.12	1.60
8/31/2000	1.6	1.87	8.500	1.44	0.36	0.0027	1.60	1.87
9/30/2000	2.67	2.3	5.833	3.1	0.57	0.0019	2.67	2.30
10/31/2000		2.75	0.729	2.04	0.48	0.0018	2.04	2.74
11/30/2000	2.53	2.75	0.203	2.15	0.44	0.0008	2.53	2.74
12/31/2000	1.64	2.37	0.226	1.2	0.27	0.0007	1.64	2.36
1/31/2001	2.63	2.2	0.367	1.82	0.17	0.0006	2.63	2.20
2/28/2001	1.4	2.18	0.504	1.38	0.37	0.0004	1.40	2.18
3/31/2001	0.06	2.06	1.956	0.28	0.28	0.0005	0.06	2.06
4/30/2001	2.29	1.93	1.233	1.45	0.35	0.0015	2.29	1.93
5/31/2001	2.33	5.37	0.014	1.2	0.58	0.0007	2.28	5.14
6/30/2001	10.2	2.35	1.708	14.2	3.7	0.0006	10.20	2.35
7/31/2001	2.62	2	12.061	1.55	0.22	0.0034	2.62	2.00
8/31/2001	1.23	1.55	8.011	1.39	1.57	0.0037	1.23	1.55
9/30/2001	1.71	2.72	4.911	3.43	1.21	0.0040	1.71	2.72
10/31/2001	4.09	1.28	1.993	2.7	1.56	0.0034	4.09	1.28
11/30/2001	2.97	1.39	0.526	1.78	0.37	0.0029	2.96	1.38
12/31/2001	2.55	1.34	0.707	3	0.34	0.0027	2.55	1.34
1/31/2002	3.5	0.84	0.922	1.5		0.0024	3.49	0.84
2/28/2002	3.02	1.16	2.498	4.02	0.18	0.0027	3.02	1.16
3/31/2002	2.66	1.12	0.712	2.85	0.82	0.0031	2.66	1.12
4/30/2002	1.31	1.18	1.359	1.3	1.02	0.0031	1.31	1.18
5/31/2002	3.61	4.56	0.160	4.24	3.48	0.0020	3.62	4.55
6/30/2002	2.08	1.61	3.952		0.56		2.08	1.61
7/31/2002	6.44	1.59	6.212	4.58	0.11	0.0035	6.44	1.59
8/31/2002	7.03	1.5	2.951	2.37	3.4	0.0036	7.02	1.50
9/30/2002	4.73	1.94	1.551	4.55			4.73	1.94
10/31/2002	8.48	2.06	2.405	12.5	1.07	0.0033	8.49	2.06

Table 4.2 (continued). Monthly and Flow Weighted TN and TP DMR Concentrations

NPDES Permit #:	FL0000311/(Under FL0000256 12/2002)			FL0000311/(Under FL0000256 12/2002)			Flow	Flow
Outfall ID:	001 (Known as 009 as of 12/2002)			003 (Known as 008 as of 12/2002)			Weighted	Weighted
Discharges To:	Guy Branch			George Allen Creek			TN	TP
Monitoring Date	TN Concentration (mg/L)	TP Concentration (mg/L)	Flow (MGD)	TN Concentration (mg/L)	TP Concentration (mg/L)	Flow (MGD)	(mg/L)	(mg/L)
11/30/2002	8.06	0.93	3.199	7.41	2.1	0.0040	8.06	0.93
12/31/2002	1.7	0.9	15.690	1.68	0.2	0.0035	1.70	0.90
1/31/2003	2.17	1.17	31.166	----	----	----	2.17	1.17
2/28/2003	2.6	1.3	18.162	----	----	----	2.60	1.30
3/31/2003	2.59	1.44	6.269	----	----	----	2.59	1.44
4/30/2003	1.14	0.67	0.414	----	----	----	1.14	0.67
5/31/2003	1.68	0.93	10.57	----	----	----	1.68	0.93
6/30/2003	1.47	1.65	11.72	----	----	----	1.47	1.65
7/31/2003	1.35	0.78	24.13	----	----	----	1.35	0.78
8/31/2003	1.02	0.68	59.95	----	----	----	1.02	0.68
9/30/2003	1.11	0.61	84.711	----	----	----	1.11	0.61
10/31/2003	1.02	0.54	48.85	----	----	----	1.02	0.54
11/30/2003	1.14	0.35	5.44	----	----	----	1.14	0.35
12/31/2003	0.85	0.33	1.060	----	----	----	0.85	0.33
1/31/2004	0.88	0.28	0.67	----	----	----	0.88	0.28
2/29/2004	0.82	0.46	1.07	----	----	----	0.82	0.46
3/31/2004	0.77	0.61	1.35	----	----	----	0.77	0.61
4/30/2004	1.46	0.61	1.37	----	----	----	1.46	0.61
5/31/2004	1.05	0.46	1.56	----	----	----	1.05	0.46
6/30/2004	1.64	0.69	1.32	----	----	----	1.64	0.69

Note: Some values were missing from the record, which resulted in blank cells.
TN values shaded in gray exceeded the 3.0 mg/L "target concentration."
TP values shaded in gray exceeded the 5.0 mg/L "target concentration."
Outfall 008 has not discharged since January 2003, as indicated by "---"

The current permit states that TP concentrations shall not exceed a daily maximum of 5.0 mg/L or a monthly average of 3.0 mg/L. **Table 4.2** presents TP data from 1998 to 2003. It appears that daily maximum TP concentrations have not exceeded 5.0 mg/L in the past.

NPDES permits state that DO levels must be above a minimum of 5.0 mg/L, permits issued in the Thirty Mile Creek watershed are no exception. Since 1998, meeting this concentration does not appear to have been a problem, as annual averages for this time have been at least 5.0 mg/L. Annual average and monthly effluent DO concentration box plots are presented in **Appendix D.1** and **D.2**.

Municipal Separate Storm Sewer System Permits (MS4)

Polk County has a countywide Phase I Municipal Separate Storm Sewer System (MS4) permit (# FLS000015). While this permit includes most of the drainage area of Thirty Mile Creek (a small portion of the area is in Hillsborough County), the area in and around Thirty Mile Creek is mostly rural and phosphate mining property. The area is county maintained and stormwater systems are not evident. For this reason, MS4 loadings and allocations were not considered in the development this TMDL.

4.2.2 Land Uses

The Thirty Mile Creek watershed drains approximately 4,240 acres (approximately 6.5 square miles) into the North Prong of the Alafia River. Land use categories in the watershed were aggregated using the Florida Land Use Classification Code System (FLUCCS) Level 3 codes **(Table 4.3). Figure 4.2** shows the acreage of the principal land uses in the watershed.

The Thirty Mile Creek watershed is part of the Alafia River Planning Unit, which has an area of approximately 270,134 acres (approximately 422 square miles). According to the SWFWMD's 1999 Geographic Information System (GIS) land use coverage, the dominant land use by far in the Thirty Mile Creek watershed and the Alafia River Planning Unit is "extractive," at nearly 61 percent (2,565 acres) in the watershed and almost 36 percent in the Planning Unit. The extent of the extractive category can be observed in **Figure 4.2**. This is due to the phosphate mining and manufacturing facility located in the basin. **Table 4.3** compares the land uses from Thirty Mile Creek and the Alafia River Planning Unit, and **Figure 4.2** shows the land uses in Thirty Mile Creek and the planning unit.

Figure 4.2. Principal Land Uses in the Thirty Mile Creek Watershed (Based on SWFWMD 1999 Land Use)

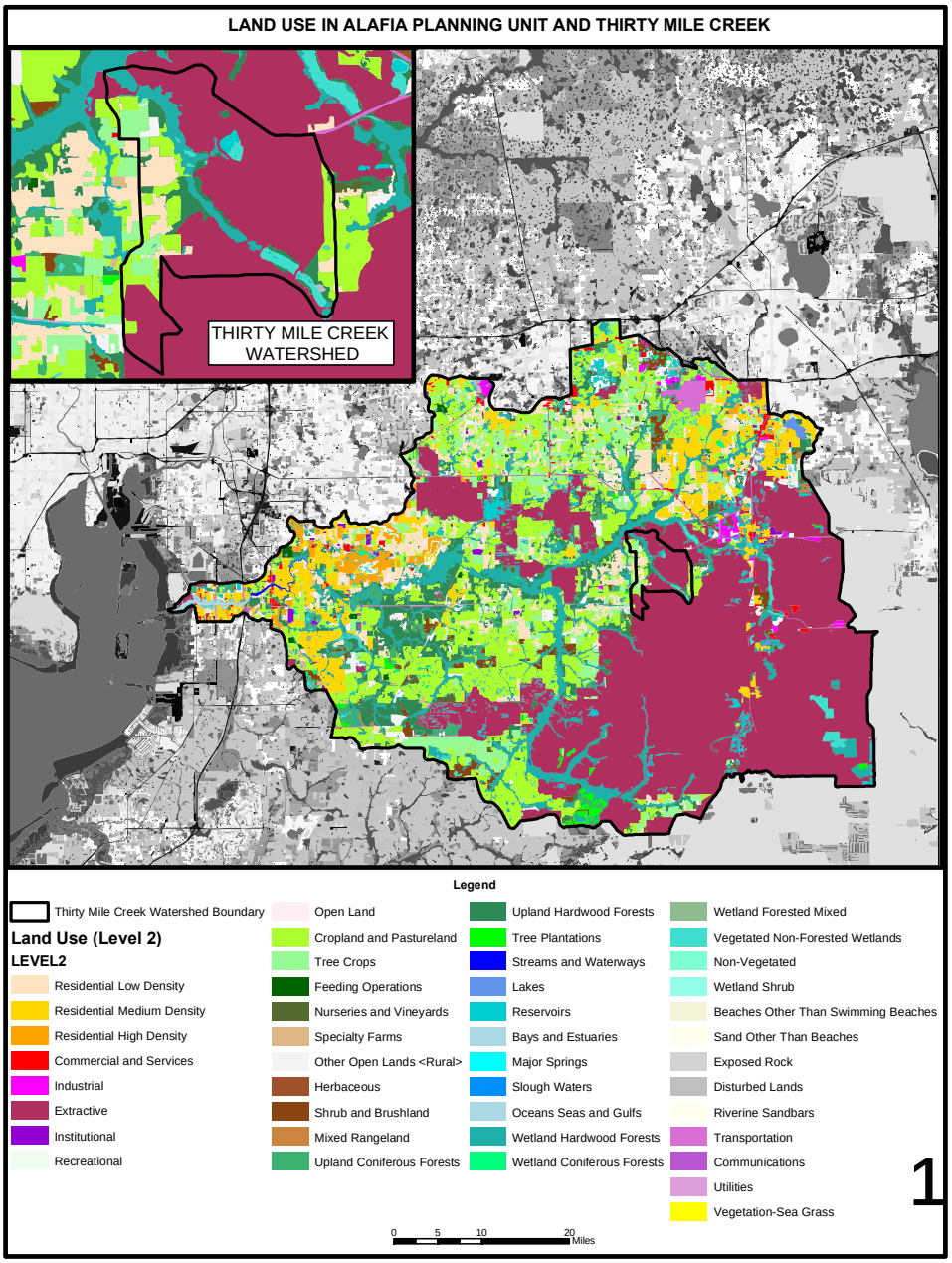


Table 4.3. Land Use Categories in the Thirty Mile Creek Watershed (Based on SWFWMD 1999 Land Use)

LAND USE			CATEGORY	ALAFIA RIVER PLANNING UNIT		THIRTY MILE CREEK WATERSHED	
Level 1	Level 2	Level 3		Acres	Percent	Acres	Percent
1000	1100	1100	Residential Low Density < 2 Dwelling Units	14,741.09	5.46%	257.83	6.08%
1000	1200	1200	Residential Med. Density 2->5 Dwelling Unit	16,706.22	6.18%	---	---
1000	1300	1300	Residential High Density	3,968.83	1.47%	---	---
1000	1400	1400	Commercial and Services	2,260.98	0.84%	0.51	0.01%
1000	1500	1500	Industrial	1,283.52	0.48%	---	---
1000	1600	1600	Extractive	96,926.12	35.88%	2,564.59	60.53%
1000	1700	1700	Institutional	791.17	0.29%	---	---
1000	1800	1800	Recreational	1,480.90	0.55%	---	---
1000	1900	1900	Open Land	2,489.41	0.92%	---	---
2000	2100	2100	Cropland and Pastureland	40,019.31	14.81%	479.46	11.32%
2000	2100	2140	Row Crops	5,144.64	1.90%	10.66	0.25%
2000	2200	2200	Tree Crops	12,840.80	4.75%	182.26	4.30%
2000	2300	2300	Feeding Operations	530.32	0.20%	---	---
2000	2400	2400	Nurseries and Vineyards	568.06	0.21%	---	---
2000	2500	2500	Specialty Farms	48.67	0.02%	---	---
2000	2500	2550	Tropical Fish Farms	396.25	0.15%	---	---
2000	2600	2600	Other Open Lands	3,198.14	1.18%	28.06	0.66%
3000	3100	3100	Herbaceous	185.30	0.07%	---	---
3000	3200	3200	Shrub and Brushland	3,880.49	1.44%	---	---
3000	3300	3300	Mixed Rangeland	192.33	0.07%	---	---
4000	4100	4100	Upland Coniferous Forest	564.99	0.21%	6.12	0.14%
4000	4100	4110	Pine Flatwoods	3,638.94	1.35%	---	---
4000	4100	4120	Longleaf Pine – Xeric Oak	11.94	0.00%	---	---
4000	4200	4200	Upland Hardwood Forests	1,309.55	0.48%	---	---
4000	4300	4340	Hardwood Conifer Mixed	16,287.95	6.03%	255.83	6.04%
4000	4400	4400	Tree Plantations	1,268.78	0.47%	0.35	0.01%
5000	5100	5100	Streams and Waterways	177.89	0.07%	---	---
5000	5200	5200	Lakes	562.57	0.21%	---	---
5000	5300	5300	Reservoirs	5,452.26	2.02%	36.80	0.87%
5000	5400	5400	Bays and Estuaries	513.77	0.19%	---	---
6000	6100	6100	Wetland Hardwood Forests	1.26	0.00%	---	---
6000	6100	6110	Bay Swamps	3.84	0.00%	---	---
6000	6100	6120	Mangrove Swamps	25.23	0.01%	---	---
6000	6100	6150	Stream and Lake Swamps (bottomland)	22,411.19	8.30%	304.00	7.17%
6000	6200	6200	Wetland Coniferous Forests	14.69	0.01%	---	---
6000	6200	6210	Cypress	677.75	0.25%	---	---
6000	6300	6300	Wetland Forested Mixed	461.03	0.17%	---	---
6000	6400	6410	Freshwater Marshes	4,026.22	1.49%	50.40	1.19%
6000	6400	6420	Saltwater Marshes	65.78	0.02%	---	---
6000	6400	6430	Wet Prairies	852.10	0.32%	---	---
6000	6400	6440	Emergent Aquatic Vegetation	461.21	0.17%	54.85	1.29%
6000	6500	6510	Tidal Flats/submerged Shallow Platform	4.62	0.00%	---	---
6000	6500	6530	Intermittent Ponds	36.71	0.01%	---	---
7000	7400	7400	Disturbed Land	651.01	0.24%	5.45	0.13%
8000	8100	8100	Transportation	2,404.47	0.89%	---	---
8000	8200	8200	Communications	59.19	0.02%	---	---
8000	8300	8300	Utilities	536.86	0.20%	---	---
			TOTAL:	**270,134.38**	**100.00%**	**4,237.16**	**100.00%**

"Crop and pastureland" is the second largest land use in both watersheds (11.3 percent in Thirty Mile Creek watershed and 14.8 percent in the Planning Unit). There is little developed land in the Thirty Mile Creek watershed and relatively little in the Alafia River Planning Unit. Within the Thirty Mile Creek watershed, low-density residences (less than two dwelling units per acre) occupy approximately 6 percent of the land. There are no medium or high-density residential areas in the watershed. The commercial and services category occupies approximately 0.01 percent of the land area. Most of the rest of the watershed consists of a natural type land cover, such as water, marshes and other wetlands, open land, and various types of forested areas.

4.2.3 Other Data Collected for TMDL Determination

TN and TP Loadings from Leakage of Septic Tanks

Loadings from septic tanks were not considered in this TMDL. Although residences in the Thirty Mile Creek watershed probably use septic tanks, the residential density based on land use (discussed in **Section 4.2.2**) is very low, and therefore any contribution from faulty septic tanks was deemed minimal.

Flow Determination

Routine monitoring data collected by the SWFWMD and the FPC were used in conjunction with stream gaging data supplied by the United States Geological Survey (USGS) to estimate loadings at Nichols Road. The USGS maintains a water level recording gage (#02300995) at Nichols Road **(Figure 1.4).** While USGS obtains water level data at this site, they do not calculate flows from these data **(Appendix E).** The FPC, as part of its routine monitoring, has reported some flow data **(Table 5.6)** at a site downstream of Nichols Road (Phosphate 3 **[Figure 1.4]).**

Because stage data exist at Nichols Road, but there is no corresponding flow data at this site, flows had to be estimated at Nichols Road. Flow was estimated by subtracting the estimated flow coming in from the Unnamed Tributary (using DMR data) between Nichols Road and the Phosphate 3 site. This tributary is the only known discharge to the creek between these two sites. This estimated flow was matched with a gage height from the USGS gage. The values were plotted and a line of best fit (power curve method) was used to estimate flow for the rest of the stream gage values at Nichols Road **(Appendix F).** Estimated flow data were used in conjunction with FPC and SWFWMD routine monitoring data to estimate TN and TP loading at Nichols Road.

Precipitation Data

Because there are no known weather stations in the immediate area of the watershed, precipitation data from five stations in areas surrounding the watershed were averaged and used for this analysis. Data from weather stations in Plant City, Lakeland, Bartow, Winter Haven, and Mountain Lake were used **(Figure 4.3).** Precipitation between the stations often varied significantly. These data were retrieved from the Climate Interactive Rapid Retrieval User System (CIRRUS), managed by the Southeast Regional Climate Center. Although precipitation data were not used for the final determination of the TMDL, the data were acquired in an attempt to determine if precipitation is a critical condition. **Tables 4.4** and **4.5** present annual average precipitation and seasonal variation for each weather station.

Figure 4.3. Location of Weather Stations in the Vicinity of Thirty Mile Creek Used to Calculate Precipitation

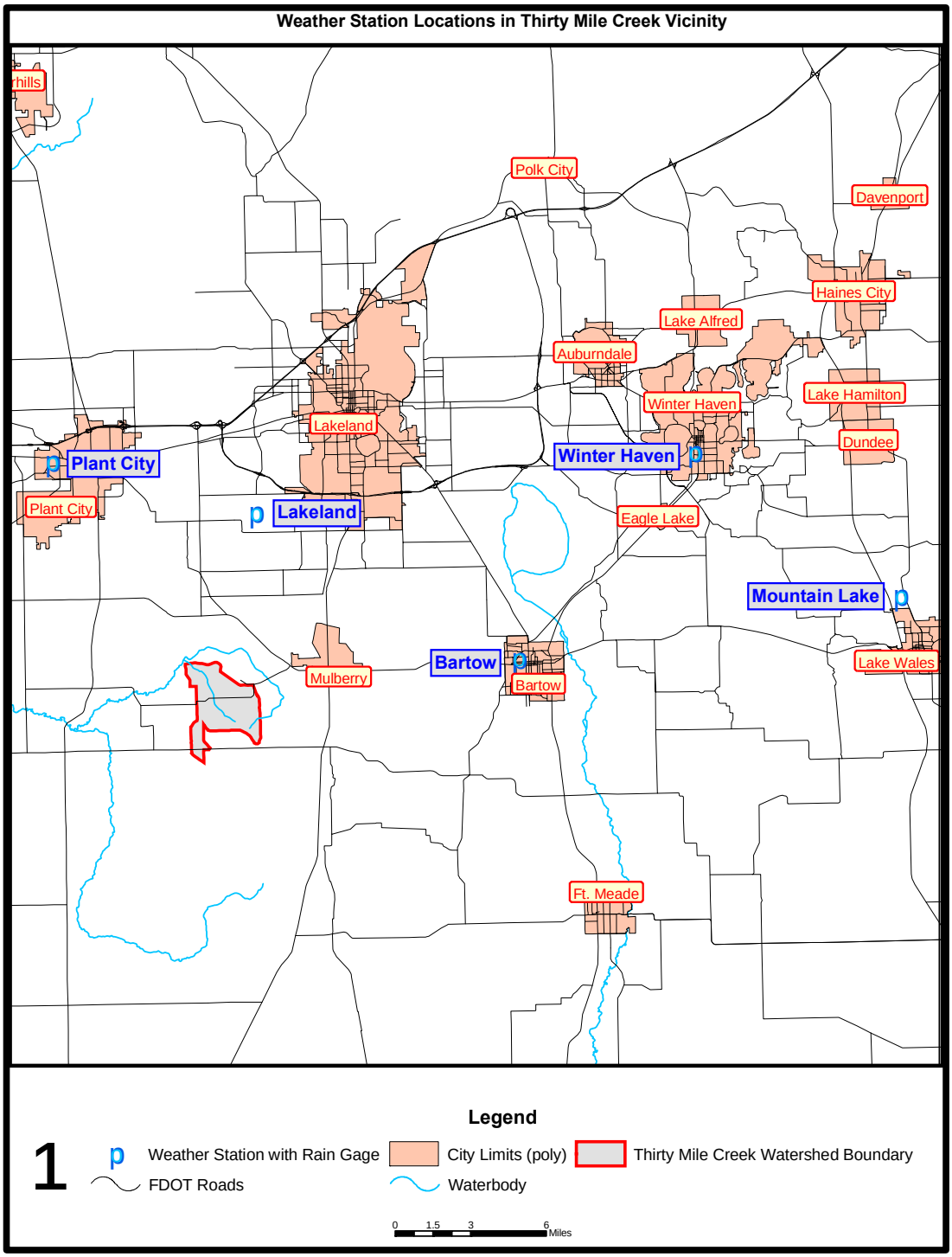


Table 4.4. Long-Term Average Quarterly and Average Annual Precipitation (in Inches) in Vicinity Thirty Mile Creek Vicinity, 1996 – 2003

Year/Season	Weather Station Location					Season Average	Average Annual Total
	Bartow	Winter Haven	Lakeland	Mountain Lake	Plant City		
1996							
Winter	12.1	15.09	13.72	11.78	14.01	13.34	
Spring	12.11	11.59	15.69	16.51	16.68	14.52	
Summer	16.38	16.23	16.47	17.71	11.14	15.59	
Fall	5.51	7.33	6.97	7.13	8.36	7.06	50.50
1997							
Winter	5.24	4.43	3.48	5.08	2.55	4.16	
Spring	12.33	11.6	12.73	13.55	12.49	12.54	
Summer	22.49	15.6	21.17	19.29	20.17	19.74	
Fall	20.14	11.84	20.76	12.92	22.85	17.70	54.14
1998							
Winter	20.36	17.8	18.64	14.31	19.44	18.11	
Spring	3.08	2.9	4.19	3.42	3.85	3.49	
Summer	34.41	36.41	27.49	18.88	34.8	30.40	
Fall	4.48	5.06	4.09	3.42	4.31	4.27	56.27
1999							
Winter	2.75	3.98	4.72	4.46	4.42	4.07	
Spring	17.52	17.87	19.24	15.48	14.25	16.87	
Summer	12.84	14.02	19.6	10.82	21.11	15.68	
Fall	9.18	8.76	5.1	8.32	6.91	7.65	44.27
2000							
Winter	2.32	1.98	3.02	2.22	3.96	2.70	
Spring	8.64	12.50	9.22	7.13	17.29	10.96	
Summer	23.35	28.06	23.73	18.47	19.12	22.55	
Fall	1.56	4.73	2.29	1.71	2.01	2.46	38.66
2001							
Winter	9.50	6.63	9.15	5.46	9.94	8.14	
Spring	8.53	11.17	9.14	9.69	9.02	9.51	
Summer	28.48	36.62	36.88	37.04	34.23	34.65	
Fall	3.05	4.48	2.50	4.52	4.36	3.78	56.08
2002							
Winter	5.22	7.70	7.13	5.22	5.50	6.15	
Spring	15.90	22.81	18.29	15.23	18.76	18.20	
Summer	25.48	26.53	23.00	16.83	20.26	22.42	
Fall	24.84	24.56	18.16	21.80	17.71	21.41	68.19
2003							
Winter	11.25	13.05	13.92	11.80	12.95	12.59	
Spring	23.31	16.96	21.35	17.20	22.28	20.22	
Summer	23.65	17.14	21.55	20.51	23.73	21.32	Insufficient Data
						Average Rainfall 1996 – 2002:	**52.60**

Table 4.5. Annual Precipitation (in Inches) in Thirty Mile Creek Vicinity, 1996 – 2002

Year	Weather Station Location				
	Bartow	Winter Haven	Lakeland	Mountain Lake	Plant City
1996	46.1	50.24	52.85	53.13	50.19
1997	60.2	43.47	58.14	50.84	58.06
1998	62.33	62.17	54.41	40.03	62.4
1999	42.29	44.63	48.66	39.08	46.69
2000	35.87	47.27	38.26	29.53	42.38
2001	49.56	58.90	57.67	56.71	57.55
2002	71.44	81.60	66.58	59.08	62.23
				Average Rainfall 1996 – 2002:	**52.60**

TN and TP Loadings for the Thirty Mile Creek Watershed

Table 4.6 shows the estimated annual TN and TP loadings for the Thirty Mile Creek watershed. The information in the table is based on FPC data collected at the Phosphate 3 sampling site **(Figure 1.5). Appendices G** through **I** present historical TN, TP, and chlorophyll data collected on Thirty Mile Creek. **Table 4.7** shows the estimated TN and TP loadings from permitted NPDES discharges within the Thirty Mile Creek watershed. The estimates are based on DMR data reported to the Department by IMC. IMC is not required to report average TN concentrations and only reports the maximum concentration. Total phosphate values are required to be reported as both monthly average and monthly maximum. For consistency, the table shows loading calculations using the average monthly flow and monthly maximum reported TN and TP values. Since nearly all chlorophyll data were collected at Nichols Road, and Outfall 001 for NPDES Permit # FL0030139 is downstream of Nichols Road, the estimated loading for this discharge is shown in a separate column in the table.

Table 4.6. Estimated Annual TN and TP Loadings for the Thirty Mile Creek Watershed, Based on Historical Data, 1998 – 2002

Year	Date	Flow (cfs)	TN (mg/L)	TN (kilograms per year)	TP (mg/L)	TP (kilograms per year)
1998	5/14	2.83	1.7	4,296.70	2.1	5,307.69
	7/9	18.37	5.0	82,031.19	3.2	52,499.96
	9/10	11.09	5.3	52,493.71	12	118,853.68
	11/12	13.44	3.9	46,812.70	3.4	40,811.08
Average		**11.43**	**3.98**	**46,408.58**	**5.18**	**54,368.10**
1999	1/12	9.82	2.7	23,679.64	4	35,080.95
	3/17	7.5	3.0	20,094.74	1.5	10,047.37
	5/13	25.21	2.7	60,790.61	3	67,545.12
	7/15	15.33	3.7	50,657.50	3.1	42,442.77
	9/14	19.23	1.8	30,913.75	2.1	36,066.04
	11/17	6.2	3.7	20,487.70	2.2	12,181.88
Average		**13.88**	**2.93**	**34,437.32**	**2.65**	**33,894.02**
2000	1/18	14.99	2.2	29,452.64	4.6	61,582.78
	3/15	12.67	2.5	28,288.93	2.2	24,894.26
	5/10	24.61	7.3	160,448.01	6	131,875.08
	7/6	7.77	6.8	47,187.81	2.4	16,654.52
	9/13	9.17	3.4	27,845.06	2.2	18,017.39
	11/21	5.37	3.1	14,867.43	2	9,591.89
Average		**12.43**	**4.22**	**51,348.31**	**3.23**	**43,769.32**
2001	1/16	5.74	2.5	12,815.98	2.2	11,278.06
	3/14	3.99	3.3	11,759.44	2.2	7,839.63
	5/9	3.47	2.2	6,817.92	1.7	5,268.39
	7/17	44.91	1.8	72,196.38	2.54	101,877.11
	9/18	51.59	2.0	92,150.01	1.8	82,935.01
	11/15	6.19	4.1	22,665.97	1.9	10,503.74
Average		**19.32**	**2.65**	**36,400.95**	**2.06**	**36,616.99**
2002	1/15	9.31	3.6	29,933.12	1.5	12,472.13
	3/12	7.58	2.7	18,278.17	1.8	12,185.45
	5/22	3.69	2.8	9,227.50	1.5	4,943.31
	7/12	5.65	2.0	10,092.02	2.1	10,596.63
	9/18	5.00	2.6	11,610.29	1.8	8,037.90
	11/15	9.38	3.4	28,482.73	1.9	15,916.82
Average		**6.77**	**2.85**	**17,937.31**	**1.77**	**10,692.04**

Table 4.7. Estimated NPDES Discharge of Monthly TN and TP Loadings for the Thirty Mile Creek Watershed, October 1999 – December 2002

Month/Year	Estimated Monthly TN Loading (kg/month)	Estimated Monthly TP Loading (kg/month)
10/31/1999	1,531.44	2,588.35
11/30/1999	800.16	807.96
12/31/1999	750.61	600.02
1/31/2000	2,724.47	1,230.06
2/29/2000	3,197.80	1,747.20
3/31/2000	1,179.66	489.40
4/30/2000	964.20	626.19
5/31/2000	282.64	460.06
6/30/2000	531.79	614.32
7/31/2000	1,456.51	1,882.47
8/31/2000	1,861.15	1,942.36
9/30/2000	2,011.79	1,566.42
10/31/2000	144.10	309.77
11/30/2000	207.63	147.49
12/31/2000	249.27	209.44
1/31/2001	292.62	197.47
2/28/2001	221.44	185.18
3/31/2001	158.17	454.24
4/30/2001	3,409.56	470.57
5/31/2001	98.68	62.21
6/30/2001	2,201.94	450.86
7/31/2001	3,932.98	2,312.10
8/31/2001	1,317.03	1,743.21
9/30/2001	1,162.07	1,198.14
10/31/2001	1,097.08	376.93
11/30/2001	337.92	287.22
12/31/2001	351.72	171.68
1/31/2002	532.80	168.71
2/28/2002	1,024.35	398.21
3/31/2002	391.85	129.89
4/30/2002	369.15	212.09
5/31/2002	228.75	133.81
6/30/2002	1,175.42	669.24
7/31/2002	4,775.10	799.08
8/31/2002	2,549.74	376.81
9/30/2002	979.77	261.00
10/31/2002	2,509.34	461.06
11/30/2002	3,139.02	190.64
12/31/2002	3,302.09	1,744.94

4.2.4 Estimation of Nonpoint Source TN Concentration

Atmospheric deposition of TN and loading of TN from the various land uses within the basin were considered. To estimate the atmospheric deposition, the surface area of Thirty Mile Creek and associated tributaries was estimated. Atmospheric nitrogen loading rates were obtained from the National Atmospheric Deposition Program's (NAPD) National Trends Network. Deposition rates used were based on NADP site FL41, located near Sarasota, FL. (NADP Website, 2004). This site was closest to the Thirty Mile Creek watershed. It was estimated that the surface area of Thirty Mile Creek and associated tributaries occupy approximately 3.6 hectares (8.90 acres). The estimated loadings from atmospheric deposition for years 1998 – 2003 were used to calculate the atmospheric depositional loading for each year, and the results from each year were averaged. The depositional loadings provided by NADP only include wet weather conditions; therefore the estimated loading was doubled to account for dry weather deposition. Using this methodology, atmospheric loading to surface waters was calculated to be 184.6 pounds/year. Data used in this determination are presented in **Appendix J**.

In addition, land use loadings for TN and TP were estimated using the Watershed Management Model (WMM) spreadsheet. The model uses land uses, event mean concentrations (EMC), pervious and impervious runoff coefficients, and annual precipitation to estimate loadings from various land uses.

The first step in estimating land use loadings is to determine the annual stormwater runoff. This was done by determining the acreage attributed to each of the land use categories found within the watershed. Pervious and non-pervious percentages and runoff coefficients for each land use were collected. The average annual precipitation from 1996 – 2002 (52.60 inches) for five nearby weather stations (see **Figure 4.3**) was used for precipitation in the determination. Using this information, WMM calculates the annual stormwater runoff, which was estimated to be 6,442.42 acre-feet.

After determining stormwater runoff, WMM was used to calculate annual TN and TP loadings using EMCs. WMM estimated the annual TN loading to be 27,158.8 pounds. To estimate the nonpoint source TN concentration, the atmospheric deposition (184.6 pounds/year) was added to the estimated land use loading. A concentration of 1.6 mg/L was calculated from the annual loading. Data and calculations used to determine the loading are presented in **Appendix K**.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Overall Approach

The goal of the TMDL development for Thirty Mile Creek is to identify the maximum allowable TP and TN loadings to the creek, so that the stream will meet and maintain its function and designated use as a Class III water. The following three steps were taken to achieve this goal: 1) available information on the watershed was compiled and evaluated, 2) the Department attempted to model the creek using SIMRIV and conducted intensive surveys to collect synoptic data set for model application and 3) finally, a detailed data analysis was carried out to determine significant relationships between specific variables and instream chlorophyll concentrations.

5.2 Attempts to Model Thirty Mile Creek

The first step in developing the TMDL for Thirty Mile Creek was to compile and evaluate all known available data and information for the watershed. This included land use information, precipitation, point source information (including the location of outfalls, parameter concentrations, flows, etc.), and historical stream data. Historical water quality data were primarily limited to the lower portion of the creek (Nichols Road and sites downstream). It became evident that some parameters, mainly flow and chlorophyll, had not been collected at all stations **(Table 1.1),** or there were very few observations for a parameter at a station. For example, most of the chlorophyll data were collected at Nichols Road, while chlorophyll was collected at TMC–01 only once. Data upstream of Nichols Road were virtually nonexistent.

In an attempt to collect data upstream of Nichols Road, and to obtain data to calibrate the SIMRIV model, the Department conducted a survey on Thirty Mile Creek in May 2004. The survey included seven sampling sites within the watershed. Three were on Thirty Mile Creek; one was on George Allen Creek; another on an unnamed tributary to Thirty Mile Creek, and two sites were on the North Prong of the Alafia River. **Figure 1.5** shows the sites sampled during the survey, and **Appendix L** presents the sample results. While the chlorophyll data results indicated generally good water quality, the data were not useful for model calibration because all of the chlorophyll *a* results for all seven sampled sites were at or near the laboratory minimum detection limit of 0.85 µg/L. In addition, IMC staff recently sampled Thirty Mile Creek within the company's property boundary (the TMC–09 site **[Figure 1.4]),** and the chlorophyll values were below detection as well **(Appendix M)**.

In addition to the low chlorophyll values, other issues hampered the Department's attempt to model the system. The SIMRIV model is a simple, one-dimensional, steady-state model that simulates algal growth, along with the uptake and assimilation of several nitrogen and phosphorus species. As shown in **Figure 2.1**, the rooted and floating macrophyte biomass was significant in the vicinity of Nichols Road. Most water quality models, including SIMRIV, do not simulate rooted and floating macrophytes and their impact on processes such as nutrient uptake and DO exchange or reaeration.

Another complicating factor in attempting to model the system was a recently discovered discharge to the creek. In May 2004, Department staff were contacted by an IMC representative and informed of a non-permitted discharge that was reaching Thirty Mile Creek. Groundwater seepage was collecting in a ditch, running parallel to the CSX railroad tracks before reaching Thirty Mile Creek between the TMC–09 and TMC–08 sites. The seepage consisted of a groundwater plume from an adjacent area, which was released from a former chemical processing facility. Under a Consent Order issued by the Department to the previous property owner, the area will be remediated by through mining (Personal communication, August 16, 2004).

Subsequent to the development of this TMDL (and modeling attempt), IMC submitted data they had recently collected on this discharge. The data represented in **Appendix N**. The data clearly show that while flow was relatively little (0.0432 MGD), the discharge was high in TN (about 200mg/L), leading to an estimated annual TN loading of 26,298 pounds. Again, this data was not supplied to the Department prior to the modeling attempt, and therefore could not be accounted for in the model.

Based on these factors (the lack of data above Nichols Road, the lack of calibration data, the need to estimate flows, and the non-permitted discharge) the Department decided not to pursue this modeling effort but decided instead to focus on the historical, survey, and DMR data to determine the assimilative capacity of the creek for nutrients.

5.3. Data Analysis

TN, TP, and chlorophyll *a* concentrations for Thirty Mile Creek from 1998 through 2003 were obtained from the IWR database and by contacting SWFWMD staff. **Figure 1.4** shows the locations of the individual stations from which water quality data were collected. Annual averages for TN and TP, along with quarterly mean values for chlorophyll *a* concentrations were calculated based on observed data. Quarterly TN, TP, and chlorophyll *a* values were then used to calculate annual mean values. The long-term annual average values of these data were calculated based on annual mean values of each year from 2000 through 2003. The long-term annual average values for the entire verified period were calculated based on the individual mean values of each year from January 1, 1996, through June 30, 2003 (for which enough data exist). The seasonal trends of TN, TP and chlorophyll *a* were examined by calculating the long-term quarterly mean values based on the quarterly mean values of each year. **Table 5.1** lists the individual annual mean for TN, TP, and chlorophyll *a,* and **Table 5.2** lists the long-term quarterly TN, TP, and chlorophyll *a* results. **Table 5.3** lists the corrected chlorophyll data that resulted in the verified impairment of Thirty Mile Creek.

While there were enough data to calculate averages for TN and TP, there were insufficient data to calculate annual average chlorophyll *a* values for 1998 and 1999. **Table 5.1** shows that the annual average chlorophyll *a* values at Nichols Road increased slightly from 2000 to 2001, and then increased significantly in 2002. The table also shows that the annual average TP concentrations have declined every year from 1998 through 2003. TN concentrations decreased from 1998 through 2001, then increased in 2002 and 2003.

Table 5.2 shows that the highest concentrations of TP and chlorophyll *a* occur during the summer months (July – September), while the highest concentrations of TN occur during the spring months (April – June). TP concentrations remain basically the same during the winter (January – March) and spring months (April – June). Chlorophyll *a* concentrations are lowest during the spring months.

Primary production in Thirty Mile Creek is limited by nitrogen. This is supported by the TN/TP ratios of both the historical data for the creek and the DMR data. If the TN/TP ratio is less than 10, then the system tends to be nitrogen limited. In contrast, if the ratio is greater than 30, the system is phosphorus limited. If the ratio is between 10 and 30, then some co-limitation is occurring. As shown in **Appendices A** and **B**, with exception of one high TN/TP ratio on the DMR plot, the ratios are clearly less than 10.

Table 5.1. Annual Averages of TN, TP, and Chlorophyll *a* Values in Thirty Mile Creek at Nichols Road, 1998 – 2003

Year	Annual Mean TP Concentration (mg/L)	Annual Mean TN Concentration (mg/L)	Annual Mean Chlorophyll *a* Concentration (µg/L)
1998	3.84	6.37	*
1999	2.40	4.27	*
2000	2.26	3.48	2.91
2001	1.81	2.27	4.31
2002	1.66	3.02	28.27
2003	1.12	4.93	9.33

* Not enough data were available to determine an annual average based on the IWR for this year.

Table 5.2. Seasonal Variation of TN, TP, and Chlorophyll *a* in Thirty Mile Creek at Nichols Road

Season	Average TP Concentration (mg/L)	Average TN Concentration (mg/L)	Average Chlorophyll *a* Concentration (µg/L)
Winter	1.87	3.39	7.34
Spring	1.87	4.70	6.13
Summer	2.08	3.07	16.17
Fall	1.65	3.97	12.04

Table 5.3. Corrected Chlorophyll Values for 2002

Sample Date	Sample Location	Corrected Chlorophyll Value (µg/L)
01/08/02	Thirty Mile Creek at Nichols Road	3.05
02/05/02	Thirty Mile Creek at Nichols Road	1
03/04/02	Thirty Mile Creek at Nichols Road	10.455
3/27/2002	TMC–1 Thirty Mile Creek	0.85
4/2/2002	Thirty Mile Creek at Nichols Road	1.75
5/6/2002	Thirty Mile Creek at Nichols Road	4.38
6/3/2002	Thirty Mile Creek at Nichols Road	68.1
7/4/2002	Thirty Mile Creek at Nichols Road	37.4
8/7/2002	Thirty Mile Creek at Nichols Road	65
9/5/2002	Thirty Mile Creek at Nichols Road	26.6
10/1/2002	Thirty Mile Creek at Nichols Road	85.4
11/4/2002	Thirty Mile Creek at Nichols Road	20.7
12/3/2002	Thirty Mile Creek at Nichols Road	18.4

Upon further analysis of the TN concentrations from the outfalls above Nichols Road, a strong correlation was found between these TN concentrations and chlorophyll values at Nichols Road. In this analysis, the TN concentrations from both outfalls above Nichols Road (NPDES Permit # FL0000256, along with Outfalls 008 and 009) were flow weighted using the monthly average flow, based on DMR flow data, to get a monthly average TN discharge concentration. This weighted monthly TN concentration was then compared to the measured chlorophyll value from Nichols Road **(Table 5.4)** for the same month. A Pearson Correlation Matrix was performed using the DMR TN concentrations and measured chlorophyll *a* values **(Table 5.5). Equation 1** shows the correlation between chlorophyll at Nichols Road and the flow weighted monthly average effluent TN concentration, and has an r value of 0.580. This correlation is significant at an alpha level of 0.05. Based on a linear regression, the monthly average TN concentration explained nearly 33 percent of the variance in chlorophyll concentrations at Nichols Road. **Appendix O.1** and **O.2** contains cumulative frequency profiles of various key parameter analyses, and **Appendix P** contains the linear regression.

Equation 1: Correlation between Chlorophyll *a* at Nichols Road and Flow Weighted Monthly Average TN Concentrations

Chlorophyll (Nichols Road) = -5.056 + 6.611 x monthly average effluent TN concentration

Negative correlations were found between DO at Nichols Road and monthly discharge TN maximum concentrations, monthly discharge TP maximum concentrations, and monthly discharge TP average concentrations. The correlation between DO and monthly discharge TP maximum concentration was significant at an alpha level of 0.11 and was performed on the same data.

Table 5.4 contains a column with the flow weighted TN concentration. Those months with values exceeding 3.0 mg/L are shaded in gray. The table contains another column with the measured chlorophyll values from Nichols Road, with values exceeding 20 µg/L shaded in yellow. Of the 12 TN values exceeding 3.0 mg/L, eight (or 66 percent) occurred in 2002. This corresponds to when the highest concentrations of chlorophyll were measured, which led to the verified impairment for nutrients.

Table 5.4. Monthly Comparison of Flow, TN Concentrations, and Chlorophyll *a* at Nichols Road, February 2000 – December 2003

DMR Reporting Date	DMR Monthly Average Discharge (mgd)	Flow Weighted DMR Maximum TN Concentration (mg/L)	Chlorophyll *a* Concentration* (µg/L)	Chlorophyll Sample Date
2/29/2000	7.2	3.66	0.763	2/9/2000
3/31/2000	2.3	3.80	4.27	3/15/2000
4/30/2000	3.9	1.80	8.54	4/4/2000
5/31/2000	1.3	0.85	1	5/11/2000
6/30/2000	1.0	1.57	7.63	6/8/2000
7/31/2000	9.8	1.12	0.801	7/10/2000
8/31/2000	8.5	1.60	1	8/8/2000
9/30/2000	5.8	2.67	1	9/12/2000
10/31/2000	0.0	2.04	1	10/3/2000
11/30/2000	0.2	2.53	5.34	11/6/2000
12/31/2000	0.2	1.64	1	12/6/2000
1/31/2001	0.4	2.63	1	1/10/2001
2/28/2001	0.5	1.40	3.2	2/7/2001
3/31/2001	2.0	0.06	1	3/7/2001
4/30/2001	1.2	2.29	0	4/3/2001
5/31/2001	0.0	2.28	1	5/9/2001
6/30/2001	1.7	10.20	No Data	No Data
7/31/2001	12.1	2.62	32.6	7/16/2001
8/31/2001	8.0	1.23	1	8/9/2001
9/30/2001	4.9	1.71	1	9/4/2001
10/31/2001	2.0	4.09	1.6	10/2/2001
11/30/2001	0.5	2.96	4.61	11/6/2001
12/31/2001	0.7	2.55	2.65	12/3/2001
1/31/2002	0.9	3.49	3.05	01/08/02
2/28/2002	2.5	3.02	1	02/05/02
3/31/2002	0.7	2.66	10.455	03/04/02
4/30/2002	1.4	1.31	1.75	4/2/2002
5/31/2002	0.2	3.62	4.38	5/6/2002
6/30/2002	4.0	2.08	68.1	6/3/2002
7/31/2002	6.2	6.44	37.4	7/4/2002
8/31/2002	3.0	7.02	65	8/7/2002
9/30/2002	1.6	4.73	26.6	9/5/2002
10/31/2002	2.4	8.49	85.4	10/1/2002
11/30/2002	3.2	8.06	20.7	11/4/2002
12/31/2002	15.7	1.70	18.4	12/3/2002
1/31/2003	31.2	2.17	18.2	1/7/2003
2/28/2003	18.2	2.60	56	2/5/2003
3/31/2003	6.3	2.59	1	3/5/2003
4/30/2003	0.4	1.14	1.28	4/8/2003
5/31/2003	0.0	No Data	2.05	5/6/2003
6/30/2003	0.0	No Data	2.04	6/2/2003
7/31/2003	0.0	No Data	15.8	7/7/2003
8/31/2003	0.0	No Data	9.61	8/5/2003
9/30/2003	84.7	1.11	2.22	9/2/2003
10/31/2003	0.0	No Data	1.8	10/8/2003
11/30/2003	0.0	No Data	1	11/6/2003
12/31/2003	1.1	0.85	1	12/2/2003

Note: Months with values exceeding TN concentrations of 3.0 mg/L are shaded in gray. Months with chlorophyll values exceeding 20 µg/L are shaded in yellow.
*All chlorophyll data are from Nichols Road.

Table 5.5. Pearson Correlation Matrix

	Month	Year	Estimated Flow (cfs)	Chlorophyll *a* (µg/L)	DO (mg/l)
Month	1				
Year	-0.034	1			
Estimated Flow (cfs)	0.037	0.211	1		
Chlorophyll *a* (µg/L)	0.104	0.235	0.069	1	
DO (mg/l)	-0.218	0	-0.03	0.012	1
Average TP Load (mg/L)	-0.149	0.065	0.658	0.123	0.067
Maximum TN Concentration (mg/L)	0.174	0.132	-0.123	0.58	-0.049
Maximum TP Load (mg/L)	-0.173	-0.019	0.637	0.18	0.125
Average TP Concentration (mg/L)	-0.179	-0.76	-0.163	-0.239	-0.118
Maximum TP Concentration (mg/L)	-0.164	-0.595	-0.24	-0.042	-0.253
Maximum TN Load (mg/L)	-0.025	0.238	0.644	0.277	0.111
Flow from DMR Data (mgd)	-0.052	0.313	0.678	0.18	0.147
Previous-Day Precipitation (inches)	0.159	-0.009	0.189	0.256	-0.212
Three-Day Prior Precipitation (inches)	0.086	-0.118	0.076	-0.112	-0.295
Seven-Day Prior Precipitation (inches)	0.041	-0.143	0.413	0.031	-0.179
Seven-Day Prior Precipitation (inches)	-0.025	0.082	0.54	0.219	-0.032
	Average TP Load (mg/L)	**Maximum TN Concentration (mg/L)**	**Maximum TP Load (mg/L)**	**Average TP Concentration (mg/L)**	**Maximum TP Concentration (mg/L)**
Average TP Load (mg/L)	1				
Maximum TN Concentration (mg/L)	-0.185	1			
Maximum TP Load (mg/L)	0.963	-0.096	1		
Average TP Concentration (mg/L)	0.025	-0.237	0.064	1	
Maximum TP Concentration (mg/L)	-0.018	0.066	0.129	0.772	1
Maximum TN Load (mg/L)	0.677	0.038	0.665	-0.198	-0.143
Flow from DMR Data (mgd)	0.92	-0.167	0.835	-0.229	-0.258
Previous-Day Precipitation (inches)	-0.053	0.219	0.002	-0.11	0.074
Three-Day Prior Precipitation (inches)	0.097	-0.133	0.143	0.194	0.208
Seven-Day Prior Precipitation (inches)	0.231	-0.22	0.244	0.195	0.089
Seven-Day Prior Precipitation (inches)	0.438	0.066	0.413	0.077	-0.021
	Maximum TN Load (mg/L)	**Flow from DMR Data (mgd)**	**Same-Day Precipitation (inches)**	**Previous-Day Precipitation (inches)**	**Three-Day Prior Precipitation (inches)**
Maximum TN Load (mg/L)	1				
Flow from DMR Data (mgd)	0.788	1			
Same-Day Precipitation (inches)	-0.016	-0.063	1		
Previous-Day Precipitation (inches)	-0.04	0.036	0.239	1	
Three-Day Prior Precipitation (inches)	0.004	0.144	0.223	0.513	1
Seven-Day Prior Precipitation (inches)	0.312	0.413	0.428	0.193	0.573
	Seven-Day Prior Precipitation (inches)				
Seven-Day Prior Precipitation (inches)	1				

As mentioned previously, the FPC was required, as part of the Memorandum of Agreement, to collect flow at the Phosphate 3 site in Thirty Mile Creek. Flow data were collected every other month, starting in May 1998 and ending in November 2003 under the MOA, but the FPC continues to sponsor sampling at these sites. **Table 5.6** presents the FPC flow data.

Table 5.6. Bimonthly Flows (in cfs) Reported by the FPC, 1998 – 2003

YEAR											
1998		1999		2000		2001		2002		2003	
Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
		1/12	9.82	1/18	14.99	1/16	5.74	1/15	9.31	1/15	20.5
		3/17	7.5	3/15	12.67	3/14	3.99	3/12	7.58	3/13	6.3
5/14	2.83	5/13	25.21	5/10	24.61	5/9	3.47	5/22	3.69	5/14	6.3
7/9	18.37	7/15	15.33	7/6	7.77	7/17	44.91	7/12	5.65	7/18	46.7
9/10	11.09	9/14	19.23	9/13	9.17	9/18	51.59	9/18	5.00	9/16	44.9
11/12	13.44	11/17	6.2	11/21	5.37	11/15	6.19	11/15	9.38	11/13	20.4

5.4 Estimation of Assimilative Capacity

As noted in Chapter 3, the water quality target is to maintain annual average chlorophyll *a* levels below 20 µg/L. Based on the data analysis, there is a significant correlation between instream chlorophyll *a* concentrations and the monthly average TN concentration being discharged upstream of Nichols Road. Using **Equation 1**, a monthly average effluent TN concentration of 3.79 mg/L would yield a chlorophyll concentration of 20 µg/L. Available creek and effluent data also show that chlorophyll *a* values are generally less than 20 µg/L when creek TN concentrations are less than 3 mg/L.

Table 5.7 shows the estimated annual TN loadings for NDPES discharges reaching Thirty Mile Creek. The estimates were calculated using the monthly average TN concentrations, based on DMR data reported to the Department. Flows used to calculate the loadings are based on monthly average flow, as reported by the facility. Loadings are grouped by those discharges that reach Thirty Mile Creek above Nichols Road, and those that reach Thirty Mile Creek below Nichols Road. This was done because the vast majority of chlorophyll *a* data, and nearly all of the data used to determine the TMDL, were collected at Nichols Road. Loadings downstream of Nichols Road did not contribute to excessive chlorophyll concentrations at Nichols Road (the only value *not* from Nichols Road included in the assessment was a non-detect value from TMC–1).

While the period of record for the DMR data for most of these discharges is from 1989 through 2003, the Department felt that more recent data better represent current conditions in Thirty Mile Creek. There were no TN data reported to the Department for the outfall downstream of Nichols Road prior to October 1999. Note that each annual load estimate is based on the product of a monthly average discharge and a monthly TN average concentration. Without additional monthly TN measurements, the variability in TN discharged each month is unknown, and the actual TN load is almost certainly lower than estimated. The combined TN loading in the right-hand column of **Table 5.7** represents the annual NPDES estimated TN load leaving the Thirty Mile Creek watershed and entering the North Prong of the Alafia River.

As previously noted, there were negative correlations between DO at Nichols Road and the discharge monthly average TN concentration, discharge monthly average TP concentration, and discharge monthly maximum TP concentration. The negative correlation suggests an inverse relationship; as discharge nutrient concentrations increase, there is a corresponding decrease in DO at Nichols Road. Addressing the nutrient impairment by reducing the TN concentrations in the NPDES discharges will also address the low DO in Thirty Mile Creek. Similarly, the new permit condition that limits both monthly mean and maximum TP concentrations in the discharge will also have a positive influence on instream DO levels (the correlation between monthly TP maximum concentration and DO was significant at an alpha level of 0.11). Reducing the amount of available nitrogen in the water will reduce algal and emergent aquatic vegetation biomass. This will in turn reduce the amount of dead and decaying plant matter in the water column and sediment that consumes oxygen from the water column. Also, by decreasing the biomass of emergent and floating vegetation, the surface area for reaeration increases, potentially increasing DO in the water column.

Table 5.7. Estimated Maximum Annual TN Loads from NPDES Discharges, 1998 – 2003

Year	Estimated NDPES Annual Loading above Nichols Road† (lbs.)	Estimated NDPES Annual Loading below Nichols Road† (lbs.)	Estimated NDPES Total Annual Loading† (lbs.)
1998	13,604		13,604
1999	11,426		11,426
2000	27,358	5,182	32,540
2001	21,330	11,069	32,399
2002	41,961	4,490	46,451
2003	56,624	15,129	71,752
Average	**28,717**	**8,967**	**45,786**

† Estimates are based on the monthly average TN concentrations. See text for more details.

5.5 Critical Conditions

Summer is the critical condition for Thirty Mile Creek as the combination of increased rainfall, optimal water temperature, increased light, and sufficient residence time enhance plant growth during this time. Of the 12 samples collected during the summer season, four (33.3 percent) exceeded 20 µg/L. In 2002, all three samples collected during the summer months exceeded 20 µg/L **(Table 5.3).**

Summer is also the critical condition for the creek because the discharges to the creek from point sources are significantly higher during the summer season (July – September). There is a significant correlation (at an alpha level of 0.05) between NPDES discharges and prior seven-day accumulated precipitation and seasons **(Appendix Q).** The highest discharges occur during the summer season, corresponding to generally higher chlorophyll *a* values **(Table 5.2)**.

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).

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 Thirty Mile Creek are expressed in terms of TN concentration and represent the monthly (for the WLA) and annual (for the LA) average TN concentration the stream can assimilate and meet the narrative nutrient criterion and the freshwater DO criterion **(Table 6.1).**

Table 6.1. TMDL Components for Thirty Mile Creek, WBID 1639

Parameter	TMDL TN Concentration	WLA TN Concentration	LA TN Concentration	MOS
Total Nitrogen	3.0 mg/L	3.0 mg/L (monthly average)	1.6 mg/L (annual average)	Implicit

Note: As described in **Section 6.2,** this WLA includes a percent reduction in current loading from sources covered by the NPDES Stormwater Program.

6.2 Load Allocation

The LA is an annual average TN concentration of 1.6 mg/L. This corresponds to the estimate of the current concentration of nonpoint source loading in the basin (see Chapter 4). Reductions in nonpoint source loadings were not warranted because the Thirty Mile Creek watershed is rather small (approximately 6.5 square miles) and most of the watershed is extractive (approximately 60 percent, according to the SRWMD 1995 land use information), containing settling ponds, gypsum stacks, and mined areas (although most have been reclaimed, as required). Stormwater from these areas is collected, processed, and then discharged. This treated stormwater was considered in the NPDES discharge portion of the TMDL. Cropland and pastureland was the next highest percent acreage (11.3 percent). Upland forest, mixed hardwood conifer, marshes, streams, lakes and swamps combined occupy 14.5 percent of the acreage in the watershed. Only approximately 6 percent of the watershed acreage is classified as low-density residential.

6.3 Wasteload Allocation (WLA)

The TMDL requires that TN concentrations discharged from Outfalls 008 and 009 associated with IMC's NPDES permit # FL0000256 not exceed 3.0 mg/L as a monthly average. These outfalls are upstream of Nichols Road, where the majority of the historical chlorophyll data have been collected, and therefore represents the portion of the creek where the annual average chlorophyll exceeded the 20 µg/L threshold. Although outfall 001 in NPDES Permit # FL0030139 was not included in this TMDL allocation because it is downstream of Nichols Road, the Department recommends that the permit include a monthly average TN limit of 3 mg/L for Outfall 001. This would help ensure that the chlorophyll concentrations near the mouth of Thirty Mile Creek would be maintained below an annual average of 20 µg/L.

As mentioned previously, although this area is covered under Polk County's MS4 permit, the area is rural, with only about 6 percent of the acreage classified as low-density residential, no medium- or high-density residential, and 0.01 percent in commercial activities. Because there was no evidence of any type of MS4 stormwater system contributing to Thirty Mile Creek, MS4s were not considered in this TMDL.

6.4 Margin of Safety (MOS)

Consistent with the recommendations of the Allocation Technical Advisory Committee (Florida Department of Environmental Protection, February 2001), an implicit margin of safety (MOS) was used in the development of this TMDL. A MOS was included in the TMDL by establishing the discharge TN limit of 3.0 mg/L as a monthly average rather than a monthly limit of 3.79 mg/L, as determined from **Equation 1,** and by setting the water quality target based on monthly average chlorophyll a values, rather than an annual average.

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 the Tampa Bay Tributaries Basin. 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 Thirty Mile Creek will include requirements for IMC to meet the 3.0 mg/L monthly maximum concentration and to address the non-permitted discharge on IMC property that is reaching Thirty Mile Creek.

While it is unclear how long this non-permitted discharge has been occurring, IMC has anecdotal information suggesting the discharge was present as early back as early as 1999 (Personal communication, August 16, 2004). IMC has already begun addressing this discharge and is planning action to eliminate it. In August 2004, IMC officials contacted the Department one again regarding the discharge. It was made known that, in an attempt to collect and prevent the discharge from reaching the creek, a sump had been dug and the water was being kept from reaching the creek. As a long-term solution, IMC plans to mine the area between the settling pond and Thirty Mile Creek, essentially eliminating or stopping the source of the water. Mining was initially set to begin in October 2004, however since this seepage has been identified, and due to the impacts it is believed to have on instream nutrient concentrations, mining may begin earlier in 2004. Now that this discharge is reaching Thirty Mile Creek, and the nitrogen being discharged through the outfalls does not exceed 3.0 mg/L, the amount of available nitrogen to photosynthetic organisms and nuisance aquatic species of plants will be significantly reduced. This will reduce chlorophyll production, thus achieving annual average chlorophyll concentrations of less than 20 µg/L and maintain DO levels above 5.0 mg/L.

References

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Personal communication. May 17, 2004. Electronic correspondence between SWFWMD and Department personnel.

Personal communication. May 21, 2004. Electronic correspondence between IMC staff and Department personnel.

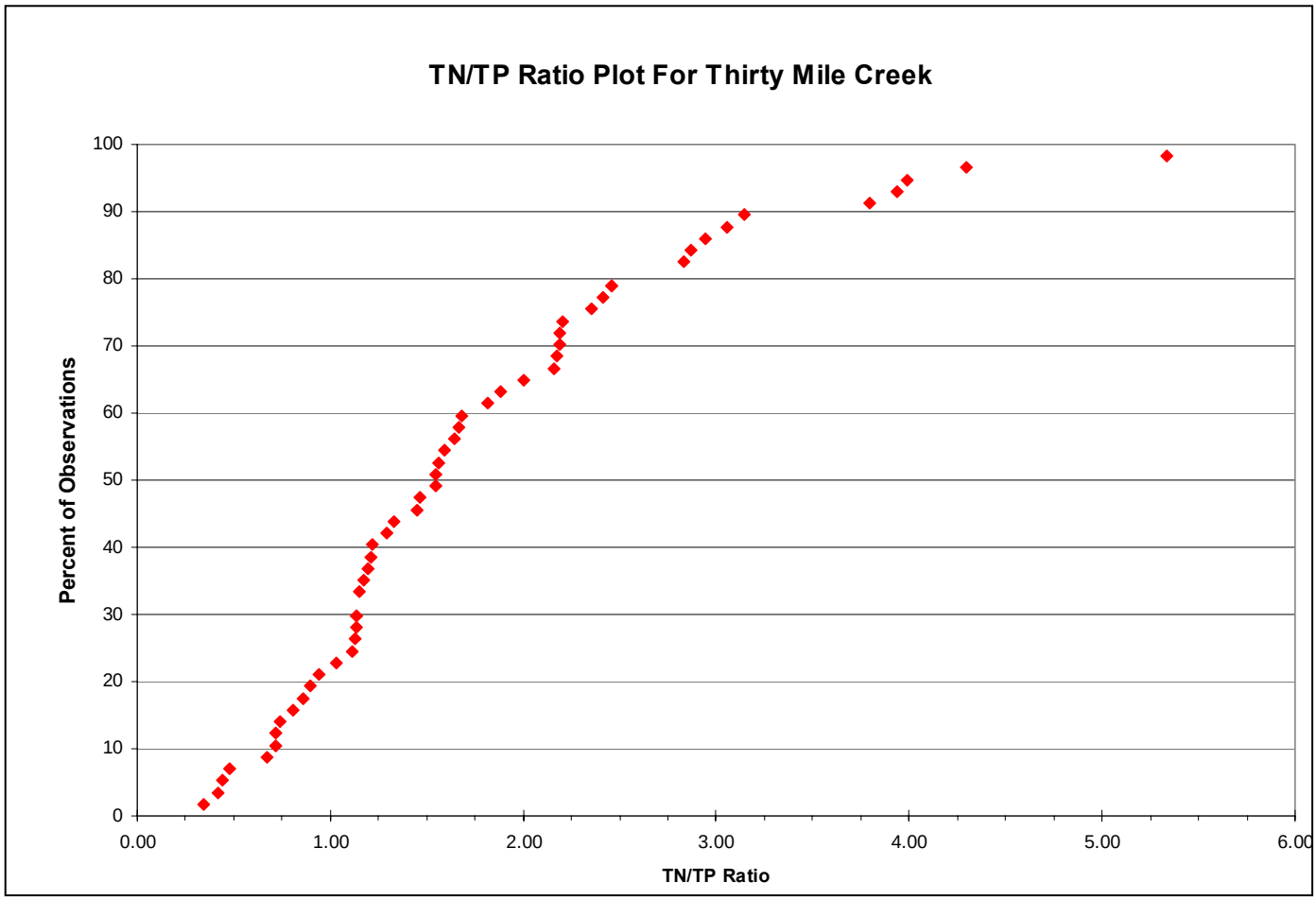
Personal communication. May 21, 2004. Electronic correspondence between SWFWMD and Department personnel.

Personal communication. June 14, 2004. Electronic correspondence between IMC staff and Department personnel.

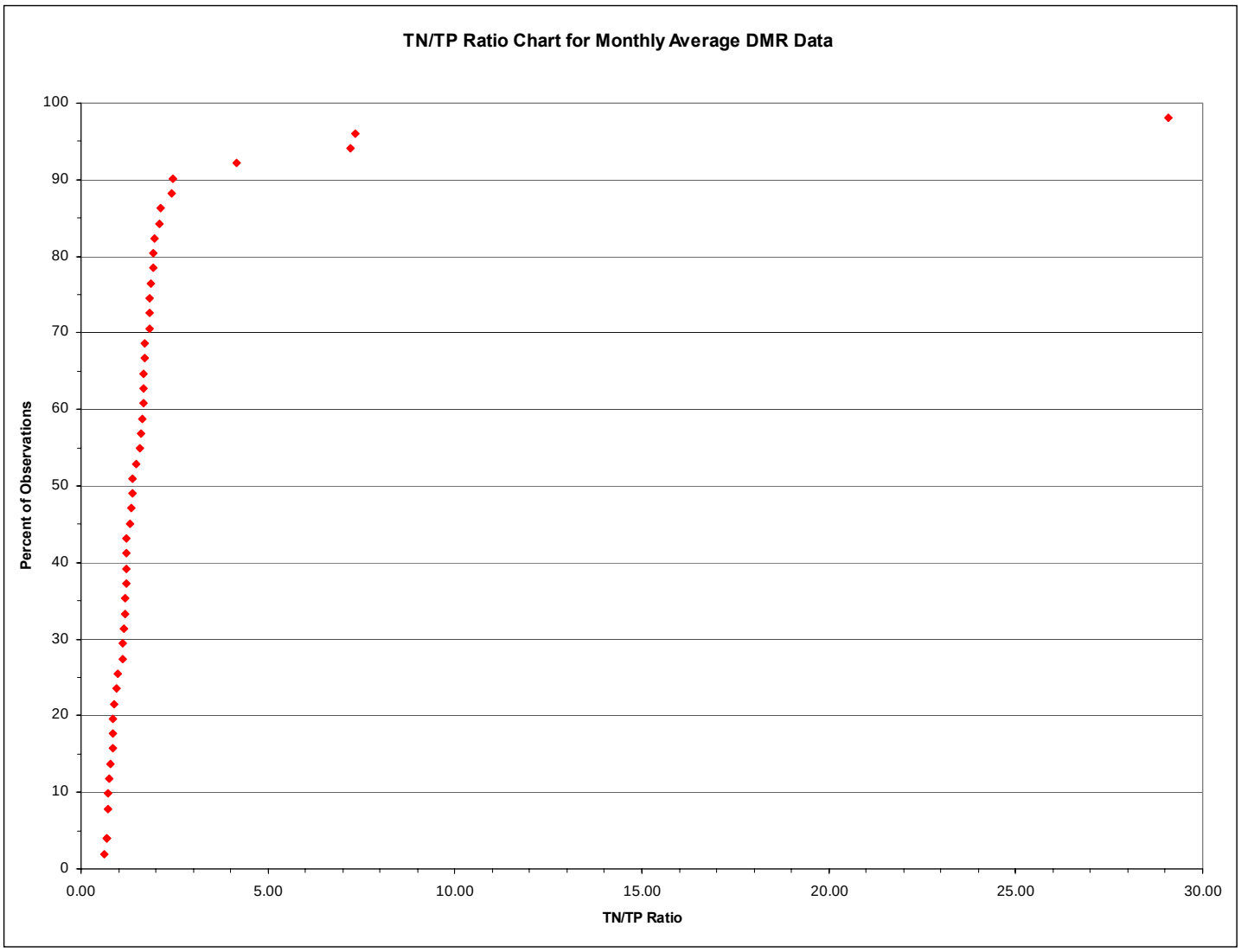
Personal communication. August 16, 2004. Comments submitted by IMC in writing on draft *Nutrient and Dissolved Oxygen TMDL for Thirty Mile Creek*.

Appendices

Appendix A: Cumulative Frequency TN/TP Plot for Thirty Mile Creek Historical Data



Appendix B: Cumulative Frequency TN/TP Plot for Thirty Mile Creek DMR Data



Appendix C: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state 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.

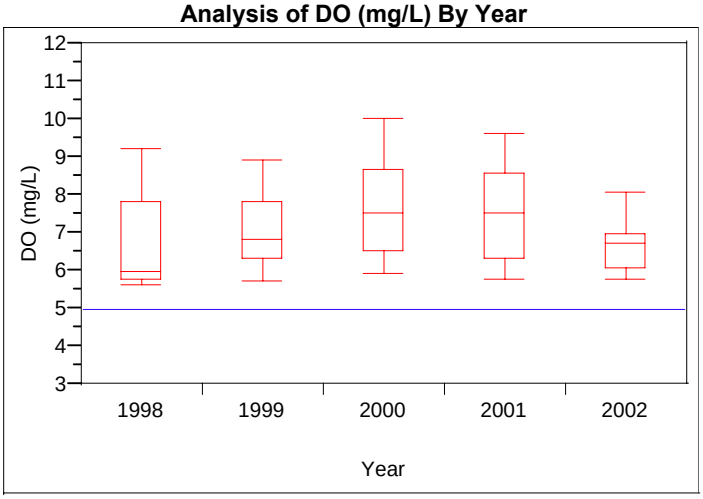
The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a Surface Water Improvement and Management (SWIM) plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation 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 report was developed.

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 5 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 I 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 15 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 II of the NPDES Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. The 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, as are 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 D.1: Box Plots of Annual Average Effluent DO Concentrations

NPDES PERMIT #FL0000256 – OUTFALL 008
Analysis of DO (mg/L) By Year

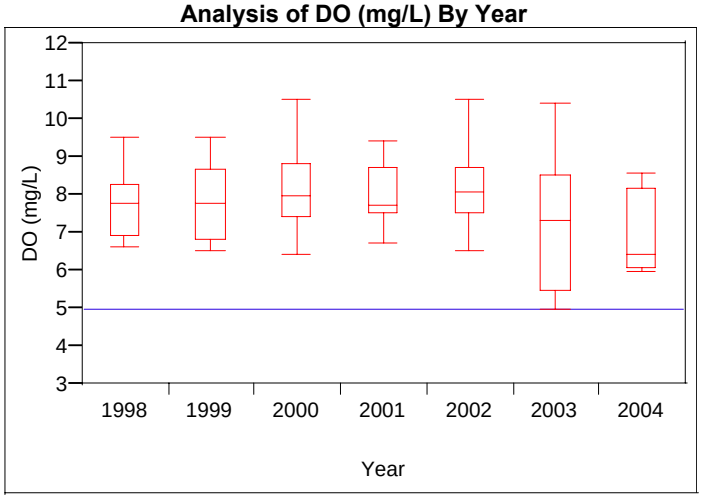


Quantiles

Year*	Minimum	10%	25%	Median	75%	90%	Maximum
1998	5.6	5.62	5.8	6	7.8	9.02	9.2
1999	5.7	5.7	6.3	6.8	7.8	8.82	8.9
2000	5.9	6.05	6.525	7.5	8.675	9.7	10
2001	5.8	5.96	6.3	7.5	8.6	9.2	9.6
2002	5.8	5.8	6.05	6.7	6.95	9.43	10

* Outfall 008 has not discharges since December 2002

NPDES PERMIT #FL0000256 – OUTFALL 009
Analysis of DO (mg/L) By Year

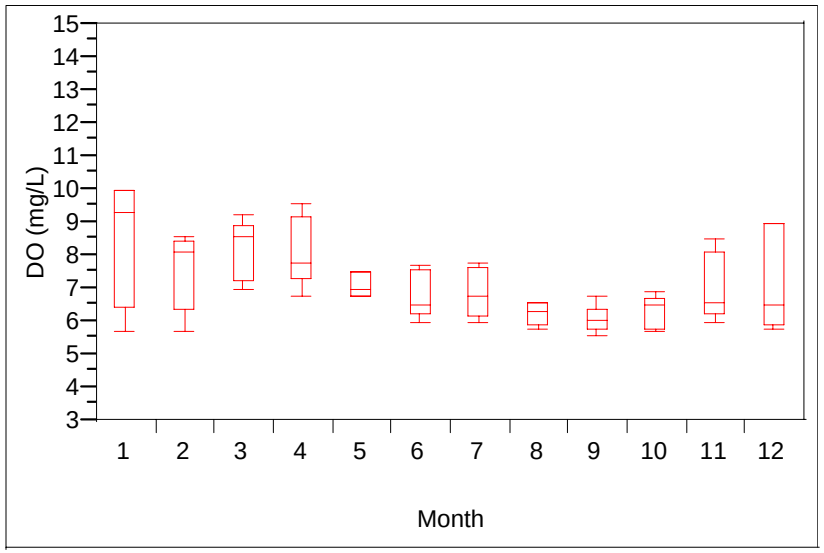


Quantiles

Year	Minimum	10%	25%	Median	75%	90%	Maximum
1998	6.6	6.61	6.925	7.75	8.275	9.4	9.5
1999	6.5	6.5	6.8	7.75	8.65	9.29	9.5
2000	6.4	6.61	7.4	7.95	8.825	10.2	10.5
2001	6.7	6.82	7.5	7.7	8.7	15.16	19
2002	6.5	6.68	7.5	8.05	8.725	10.29	10.5
2003	5	5.08	5.5	7.3	8.5	10.36	10.4
2004	6	6	6.1	6.4	8.2	8.6	8.6

Appendix D.2: Box Plots of Annual Effluent DO Concentrations by Month

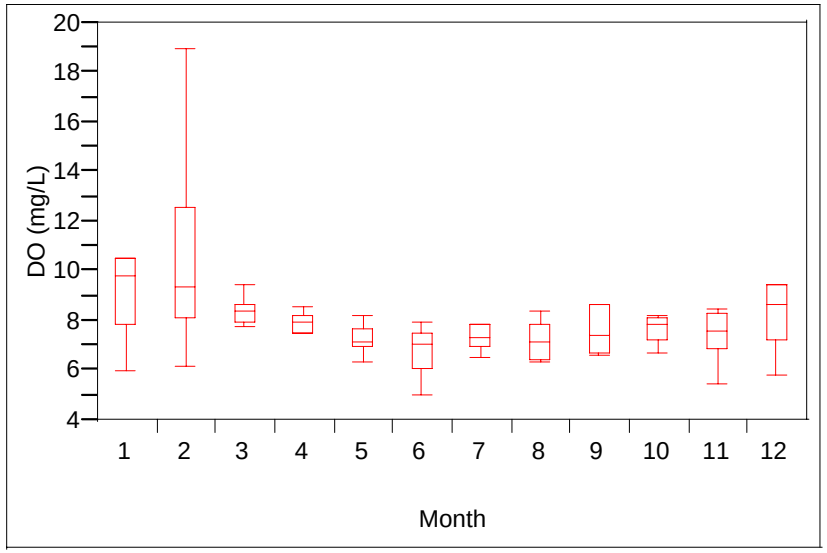
NPDES PERMIT #FL0000256 – OUTFALL 008
Analysis of DO (mg/L) By Month



Quantiles

Month	Minimum	10%	25%	Median	75%	90%	Maximum
1	5.7	5.7	6.425	9.3	10	10	10
2	5.7	5.7	6.35	8.1	8.45	8.6	8.6
3	7	7	7.2	8.6	8.9	9.2	9.2
4	6.8	6.8	7.3	7.8	9.15	9.6	9.6
5	6.8	6.8	6.8	7	7.5	7.5	7.5
6	6	6	6.2	6.5	7.55	7.7	7.7
7	6	6	6.15	6.8	7.65	7.8	7.8
8	5.8	5.8	5.9	6.3	6.55	6.6	6.6
9	5.6	5.6	5.75	6.05	6.35	6.8	6.8
10	5.7	5.7	5.75	6.5	6.7	6.9	6.9
11	6	6	6.25	6.6	8.1	8.5	8.5
12	5.8	5.8	5.9	6.5	8.95	9	9

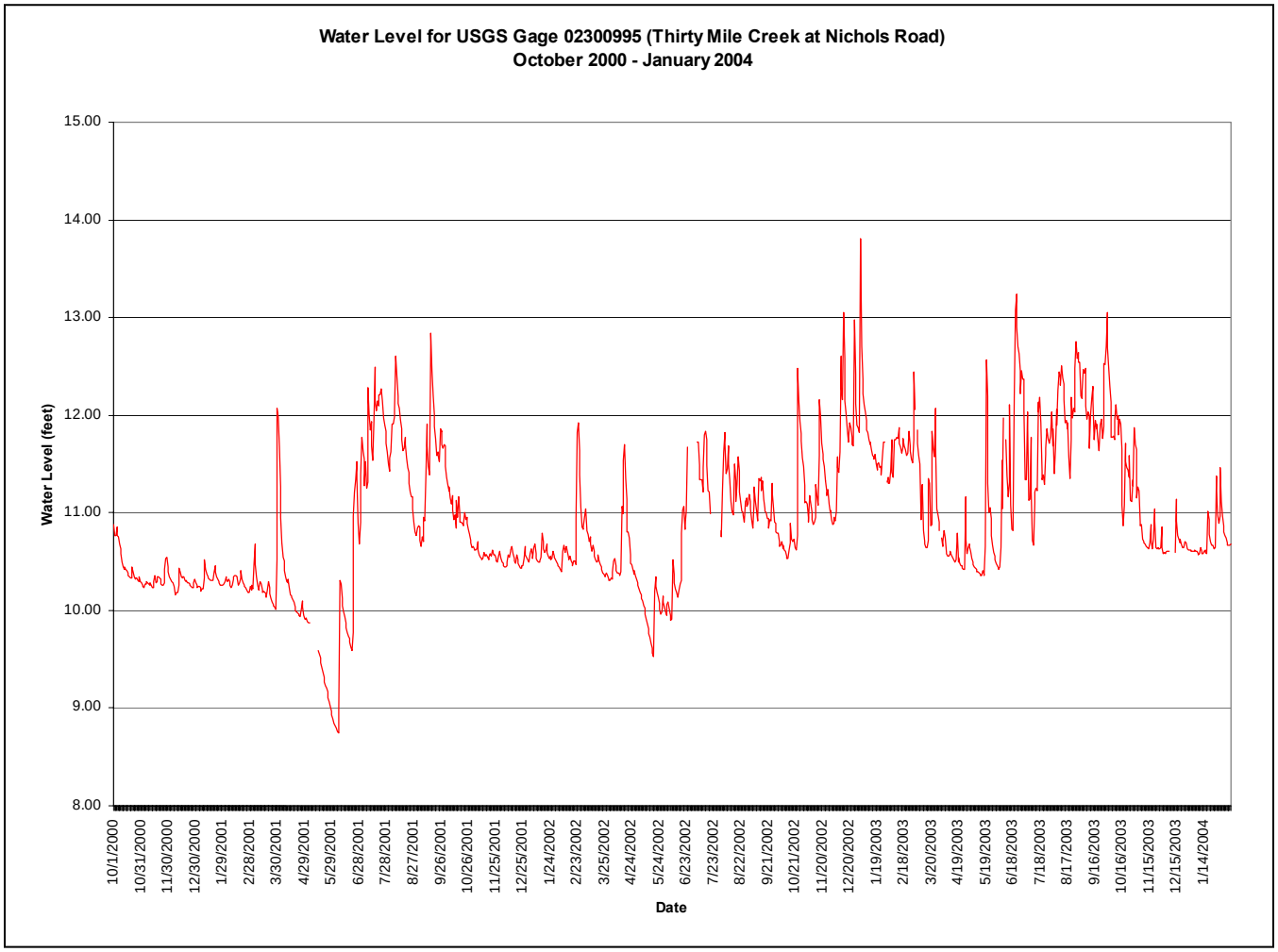
NPDES PERMIT #FL0000256 – OUTFALL 009
Analysis of DO (mg/L) By Month



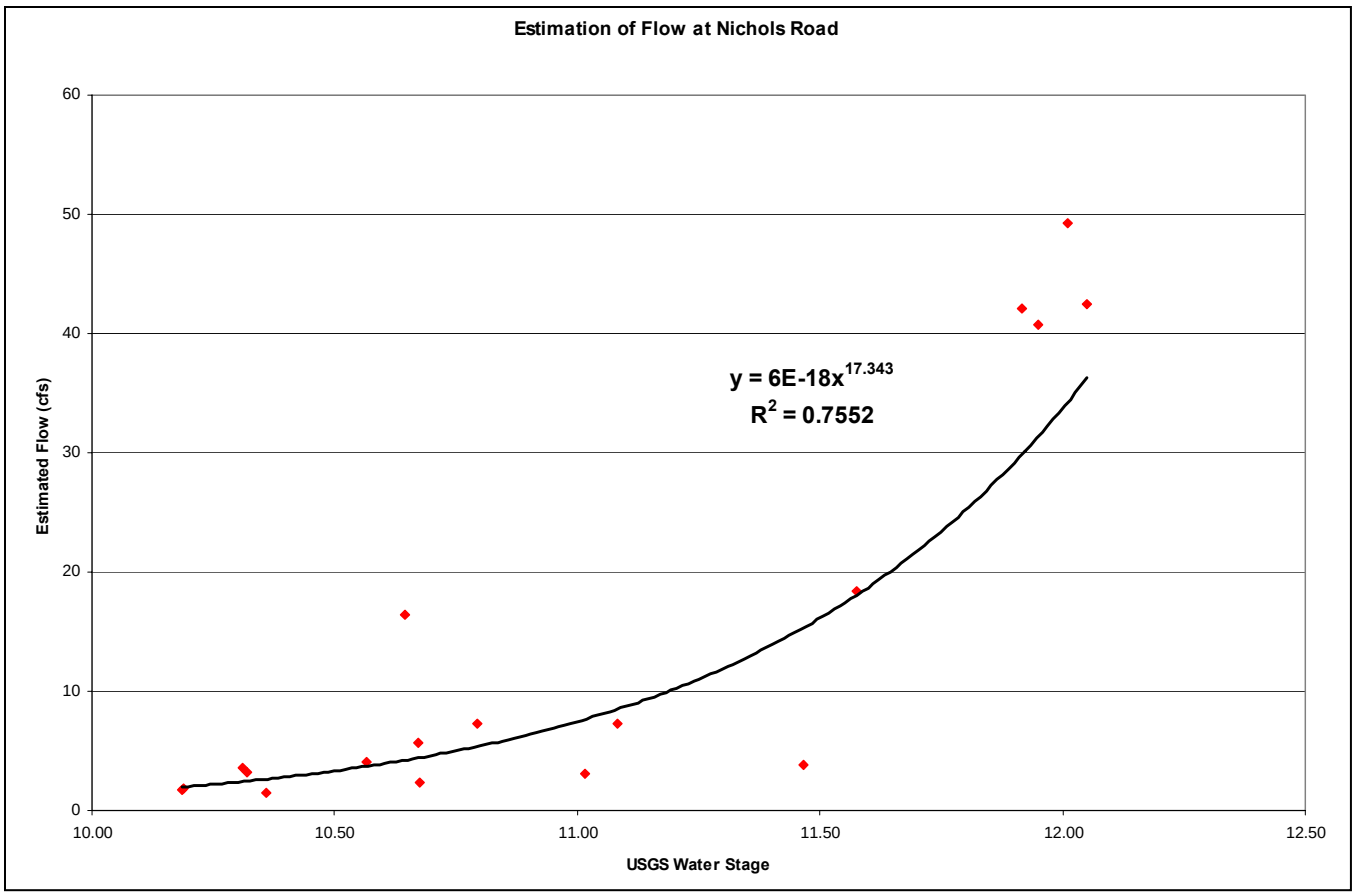
Quantiles

Month	Minimum	10%	25%	Median	75%	90%	Maximum
1	6	6	7.875	9.8	10.5	10.5	10.5
2	6.2	6.2	8.15	9.4	12.55	19	19
3	7.8	7.8	8	8.4	8.7	9.5	9.5
4	5.4	5.4	7.5	8	8.2	8.6	8.6
5	6.4	6.4	7	7.2	7.7	8.2	8.2
6	5	5	6.125	7.05	7.55	8	8
7	6.5	6.5	6.95	7.35	7.9	7.9	7.9
8	6.4	6.4	6.475	7.15	7.875	8.4	8.4
9	6.6	6.6	6.7	7.4	8.7	8.7	8.7
10	6.7	6.7	7.25	7.9	8.1	8.2	8.2
11	5.5	5.5	6.925	7.6	8.275	8.5	8.5
12	5.8	5.8	7.225	8.65	9.5	9.5	9.5

Appendix E: Water Level Data from USGS Gage 02300995 (Thirty Mile Creek at Nichols Road), October 2000 – January 2004



Appendix F: Calculation of Estimated Flows at Nichols Road



Appendix G: Measured Chlorophyll *a* Concentrations in Thirty Mile Creek, 2000 – 2004

Data Collector*	Site Description	Date	Value (µg/L)	Remark Code
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/9/2000	0.763	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/15/2000	4.27	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/4/2000	8.54	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/11/2000	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/8/2000	7.63	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/10/2000	0.801	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/8/2000	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/12/2000	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/3/2000	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2000	5.34	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/6/2000	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/10/2001	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/7/2001	3.2	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/7/2001	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/3/2001	0	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/9/2001	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/16/2001	32.6	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/9/2001	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/4/2001	1	U
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/2/2001	1.6	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2001	4.61	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2001	2.65	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	01/08/02	3.05	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	02/05/02	1	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	03/04/02	10.455	
FDEP TAMPA	TMC–1 Thirty Mile Creek	3/27/2002	0.85	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/2/2002	1.75	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2002	4.38	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/3/2002	68.1	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/4/2002	37.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/7/2002	65	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/5/2002	26.6	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/1/2002	85.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/4/2002	20.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2002	18.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/7/2003	18.2	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/5/2003	56	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/5/2003	1	<
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/8/2003	1.28	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2003	2.05	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/2/2003	2.04	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/7/2003	15.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/5/2003	9.61	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/2/2003	2.22	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/8/2003	1.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2003	1	<
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/2/2003	1	<
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	2/24/2004	1	U
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	3/3/2004	1	U
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	4/5/2004	1	U
FDEP - WAS	Thirty Mile Creek @ Nichols Road	5/4/2004	0.85	U
FDEP - WAS	Thirty Mile Creek @ RR Bridge	5/4/2004	0.96	U
FDEP - WAS	Thirty Mile Creek @ IMC Property	5/4/2004	0.85	U
FDEP - WAS	Thirty Mile Creek @ CR 640	5/4/2004	0.85	U
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	5/11/2004	1	U

* Data Collector:
SWFWMD – Southwest Florida Water Management District
FDEP WAS – Florida Department of Environmental Protection, Watershed Assessment Section
IMC Global – International Mineral and Chemical, Global
FDEP Tampa – Florida Department of Environmental Protection, Tampa District

Remark Codes:
U – Material was analyzed for, but was not detected
> - Concentration is below detection limit

Appendix H: Measured TP Concentrations in Thirty Mile Creek, 1992 – 2004

Data Collector*	Site Description	Date	Value (mg/L)	Code
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/1/1992	1.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/16/1993	1.1	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/9/1993	0.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/23/1993	0.54	A
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/28/1994	1.938	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/18/1994	0.859	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/21/1994	1.501	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/17/1994	1.626	Q
FPC	21FLA FLPhosphate03	5/14/1998	2.1	
FPC	21FLA FLPhosphate06	5/14/1998	1.6	
FPC	21FLA FLPhosphate03	7/9/1998	3.2	
FPC	21FLA FLPhosphate06	7/9/1998	1.9	
FPC	21FLA FLPhosphate03	9/10/1998	12	
FPC	21FLA FLPhosphate06	9/10/1998	3	
FPC	21FLA FLPhosphate03	11/12/1998	3.4	
FPC	21FLA FLPhosphate06	11/12/1998	3.5	
FPC	21FLA FLPhosphate03	1/12/1999	4	
FPC	21FLA FLPhosphate06	1/12/1999	3.4	
FPC	21FLA FLPhosphate03	3/17/1999	1.5	
FPC	21FLA FLPhosphate06	3/17/1999	2.9	
FPC	21FLA FLPhosphate03	5/13/1999	3	
FPC	21FLA FLPhosphate06	5/13/1999	1.5	
FPC	21FLA FLPhosphate03	7/15/1999	3.1	
FPC	21FLA FLPhosphate06	7/15/1999	2	
FPC	21FLA FLPhosphate03	9/14/1999	2.1	
FPC	21FLA FLPhosphate06	9/14/1999	1.4	
FPC	21FLA FLPhosphate03	11/17/1999	2.2	
FPC	21FLA FLPhosphate06	11/17/1999	1.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/5/2000	1.38	
FPC	21FLA FLPhosphate03	1/18/2000	4.6	
FPC	21FLA FLPhosphate06	1/18/2000	1.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/9/2000	1.51	
FPC	21FLA FLPhosphate03	3/15/2000	2.2	
FPC	21FLA FLPhosphate06	3/15/2000	1.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/15/2000	1.31	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/4/2000	1.92	
FPC	21FLA FLPhosphate03	5/10/2000	6	
FPC	21FLA FLPhosphate06	5/10/2000	3.1	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/11/2000	3.46	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/8/2000	1.51	
FPC	21FLA FLPhosphate03	7/6/2000	2.4	
FPC	21FLA FLPhosphate06	7/6/2000	1.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/10/2000	2.3	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/8/2000	2.31	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/12/2000	1.95	
FPC	21FLA FLPhosphate03	9/13/2000	2.2	
FPC	21FLA FLPhosphate06	9/13/2000	1.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/3/2000	2.11	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2000	1.8	
FPC	21FLA FLPhosphate03	11/21/2000	2	
FPC	21FLA FLPhosphate06	11/21/2000	1.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/6/2000	1.77	

Appendix H (continued): Measured TP Concentrations in Thirty Mile Creek, 1992 – 2004

Data Collector*	Site Description	Date	Value (mg/L)	Code
FPC	21FLA FLPhosphate03	1/6/2001	2.2	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/10/2001	1.65	
FPC	21FLA FLPhosphate06	1/16/2001	2.3	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/7/2001	2.26	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/7/2001	2.04	
FPC	21FLA FLPhosphate03	3/14/2001	1.7	
FPC	21FLA FLPhosphate06	3/14/2001	1.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/3/2001	1.74	
FPC	21FLA FLPhosphate03	5/9/2001	1.7	
FPC	21FLA FLPhosphate06	5/9/2001	2.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/9/2001	2.26	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/16/2001	1.82	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/16/2001	1.82	
FPC	21FLA FLPhosphate03	7/17/2001	2.5	
FPC	21FLA FLPhosphate06	7/17/2001	1.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/9/2001	1.76	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/9/2001	1.76	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/4/2001	1.62	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/4/2001	1.62	
FPC	21FLA FLPhosphate03	9/18/2001	1.8	
FPC	21FLA FLPhosphate06	9/18/2001	2.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/2/2001	1.25	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/2/2001	1.25	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2001	1.44	Q
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2001	1.44	
FPC	21FLA FLPhosphate03	11/15/2001	1.9	
FPC	21FLA FLPhosphate06	11/15/2001	1.5	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2001	1.39	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2001	1.39	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/8/2002	1.25	
FPC	21FLA FLPhosphate03	1/15/2002	1.5	
FPC	21FLA FLPhosphate06	1/15/2002	3.2	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/5/2002	1.27	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/4/2002	1.11	
FPC	21FLA FLPhosphate03	3/12/2002	1.8	
FPC	21FLA FLPhosphate06	3/12/2002	1.3	
FDEP -	TMC-1 Thirty Mile Creek	3/27/2002	1.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/2/2002	1.3	
FDEP -	TMC-1 Thirty Mile Creek	4/10/2002	3.1	
FDEP -	TMC-2 Thirty Mile Creek	4/10/2002	1.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2002	2.1	
FPC	21FLA FLPhosphate03	5/22/2002	1.5	
FPC	21FLA FLPhosphate06	5/22/2002	0.9	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/3/2002	0.798	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/4/2002	1.33	
FPC	21FLA FLPhosphate03	7/12/2002	2.1	
FPC	21FLA FLPhosphate06	7/12/2002	1.6	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/7/2002	2	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/5/2002	2.11	
FPC	21FLA FLPhosphate03	9/18/2002	1.8	
FPC	21FLA FLPhosphate06	9/18/2002	1.5	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/1/2002	1.78	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/4/2002	1.65	
FPC	21FLA FLPhosphate03	11/15/2002	1.9	

Appendix H (continued): Measured TP Concentrations in Thirty Mile Creek, 1992 – 2004

Data Collector*	Site Description	Date	Value (mg/L)	Code
FPC	21FLA FLPhosphate06	11/15/2002	1.5	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2002	1.12	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/7/2003	1.17	
FDEP - TAMPA	TMC-2 Thirty Mile Creek	1/13/2003	1.6	
FPC	21FLA FLPhosphate03	1/15/2003	1.7	
FPC	21FLA FLPhosphate06	1/15/2003	0.9	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/5/2003	0.921	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/5/2003	1.77	
FPC	21FLA FLPhosphate03	3/13/2003	1.8	
FPC	21FLA FLPhosphate06	3/13/2003	1.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/8/2003	1.13	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2003	0.98	
FPC	21FLA FLPhosphate03	5/14/2003	1.2	
FPC	21FLA FLPhosphate06	5/14/2003	1	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/2/2003	0.97	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/7/2003	0.787	
FPC	21FLA FLPhosphate03	7/18/2003	1.3	
FPC	21FLA FLPhosphate06	7/18/2003	0.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/5/2003	0.687	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/2/2003	0.919	
FPC	21FLA FLPhosphate03	9/16/2003	1.3	
FPC	21FLA FLPhosphate06	9/16/2003	0.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/8/2003	0.814	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2003	0.91	
FPC	21FLA FLPhosphate03	11/13/2003	1.5	
FPC	21FLA FLPhosphate06	11/13/2003	0.9	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/2/2003	0.758	
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	2/24/2004	1.3	
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	3/3/2004	2.15	
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	4/5/2004	0.58	
FDEP - WAS	Thirty Mile Creek @ Nichols Road	5/4/2004	1.9	
FDEP - WAS	Thirty Mile Creek @ RR Bridge	5/4/2004	2.2	
FDEP - WAS	Thirty Mile Creek @ IMC Property	5/4/2004	1.7	
FDEP - WAS	Thirty Mile Creek @ CR 640	5/4/2004	1.9	
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	5/11/2004	0.74	

* Data Collector:
SWFWMD – Southwest Florida Water Management District
FPC – Florida Phosphate Council
FDEP WAS – Florida Department of Environmental Protection, Watershed Assessment Section
FDEP Tampa – Florida Department of Environmental Protection, Tampa District
IMC Global – International Mineral and Chemical, Global

Remark Codes:
A – Value reported is the mean of two or more determinations
Q – Sample held beyond normal holding time

Appendix I: Measured TN Concentrations in Thirty Mile Creek, 1992 – 2004

Data Owner*	Site Description	Date	Value (mg/L)	Result Code
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/1/1992	1.24	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/16/1993	1.83	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/9/1993	1.50	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/23/1993	1.15	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/28/1994	4.55	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/18/1994	0.82	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/21/1994	2.40	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/17/1994	3.06	C
FPC	21FLA FLPhosphate03	5/14/1998	1.65	C
FPC	21FLA FLPhosphate06	5/14/1998	6.30	C
FPC	21FLA FLPhosphate03	7/9/1998	5.00	C
FPC	21FLA FLPhosphate06	7/9/1998	2.31	C
FPC	21FLA FLPhosphate03	9/10/1998	5.30	C
FPC	21FLA FLPhosphate06	9/10/1998	15.60	C
FPC	21FLA FLPhosphate03	11/12/1998	3.88	C
FPC	21FLA FLPhosphate06	11/12/1998	10.90	C
FPC	21FLA FLPhosphate03	1/12/1999	2.66	C
FPC	21FLA FLPhosphate06	1/12/1999	7.50	C
FPC	21FLA FLPhosphate03	3/17/1999	3.02	C
FPC	21FLA FLPhosphate06	3/17/1999	10.80	C
FPC	21FLA FLPhosphate03	5/13/1999	2.68	C
FPC	21FLA FLPhosphate06	5/13/1999	1.73	C
FPC	21FLA FLPhosphate03	7/15/1999	3.68	C
FPC	21FLA FLPhosphate06	7/15/1999	8.60	C
FPC	21FLA FLPhosphate03	9/14/1999	1.83	C
FPC	21FLA FLPhosphate06	9/14/1999	1.01	C
FPC	21FLA FLPhosphate03	11/17/1999	3.70	C
FPC	21FLA FLPhosphate06	11/17/1999	4.00	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/5/2000	1.76	C
FPC	21FLA FLPhosphate03	1/18/2000	2.16	C
FPC	21FLA FLPhosphate06	1/18/2000	1.98	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/9/2000	4.54	C
FPC	21FLA FLPhosphate03	3/15/2000	2.50	C
FPC	21FLA FLPhosphate06	3/15/2000	1.93	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/15/2000	1.40	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/4/2000	1.33	C
FPC	21FLA FLPhosphate03	5/10/2000	7.30	C
FPC	21FLA FLPhosphate06	5/10/2000	3.24	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/11/2000	4.76	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/8/2000	8.80	C
FPC	21FLA FLPhosphate03	7/6/2000	6.80	C
FPC	21FLA FLPhosphate06	7/6/2000	5.00	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/10/2000	3.48	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/8/2000	2.97	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/12/2000	2.50	C
FPC	21FLA FLPhosphate03	9/13/2000	3.37	C
FPC	21FLA FLPhosphate06	9/13/2000	3.00	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/3/2000	4.62	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2000	2.14	C
FPC	21FLA FLPhosphate03	11/21/2000	3.10	C
FPC	21FLA FLPhosphate06	11/21/2000	2.40	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/6/2000	2.42	C
FPC	21FLA FLPhosphate03	1/6/2001	2.45	C

Appendix I (continued): Measured TN Concentrations in Thirty Mile Creek, 1992 – 2004

Data Owner*	Site Description	Date	Value (mg/L)	Result Code
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/10/2001	3.15	C
FPC	21FLA FLPhosphate06	1/16/2001	2.60	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/7/2001	2.95	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/7/2001	3.37	C
FPC	21FLA FLPhosphate03	3/14/2001	3.31	C
FPC	21FLA FLPhosphate06	3/14/2001	2.80	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/3/2001	1.91	C
FPC	21FLA FLPhosphate03	5/9/2001	2.16	C
FPC	21FLA FLPhosphate06	5/9/2001	0.83	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/9/2001	0.87	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/16/2001	2.31	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/16/2001	2.31	C
FPC	21FLA FLPhosphate03	7/17/2001	1.82	C
FPC	21FLA FLPhosphate06	7/17/2001	1.69	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/9/2001	1.42	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/9/2001	1.42	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/4/2001	2.40	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/4/2001	2.40	C
FPC	21FLA FLPhosphate03	9/18/2001	2.00	C
FPC	21FLA FLPhosphate06	9/18/2001	1.03	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/2/2001	2.32	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/2/2001	2.32	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2001	0.01	C
FPC	21FLA FLPhosphate03	11/15/2001	4.05	C
FPC	21FLA FLPhosphate06	11/15/2001	4.7	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2001	1.62	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2001	3.42	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/8/2002	3.59	
FPC	21FLA FLPhosphate03	1/15/2002	3.6	
FPC	21FLA FLPhosphate06	1/15/2002	4.16	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/5/2002	2.76	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/4/2002	2.09	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/4/2002	2.09	
FPC	21FLA FLPhosphate03	3/12/2002	2.66	
FPC	21FLA FLPhosphate06	3/12/2002	2.03	
FDEP - TAMPA	TMC-1 Thirty Mile Creek	3/27/2002	2.70	C
FDEP - TAMPA	TMC-1 Thirty Mile Creek	4/10/2002	2.63	C
FDEP - TAMPA	TMC-2 Thirty Mile Creek	4/10/2002	2.65	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2002	1.56	
FPC	21FLA FLPhosphate03	5/22/2002	2.81	
FPC	21FLA FLPhosphate06	5/22/2002	5.5	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/3/2002	2.44	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/4/2002	2.12	
FPC	21FLA FLPhosphate03	7/12/2002	2	
FPC	21FLA FLPhosphate06	7/12/2002	1.95	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/7/2002	4.38	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/5/2002	3.83	
FPC	21FLA FLPhosphate03	9/18/2002	2.57	
FPC	21FLA FLPhosphate06	9/18/2002	2.22	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/1/2002	3.90	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/4/2002	3.98	
FPC	21FLA FLPhosphate03	11/15/2002	3.4	

Appendix I (continued): Measured TN Concentrations in Thirty Mile Creek, 1992 – 2004

Data Owner*	Site Description	Date	Value (mg/L)	Result Code
FPC	21FLA FLPhosphate06	11/15/2002	3.5	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/3/2002	4.47	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	1/7/2003	1.73	C
FDEP - TAMPA	TMC-2 Thirty Mile Creek	1/13/2003	3.30	C
FPC	21FLA FLPhosphate03	1/15/2003	2.36	
FPC	21FLA FLPhosphate06	1/15/2003	1.94	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	2/5/2003	2.68	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	3/5/2003	2.82	C
FPC	21FLA FLPhosphate03	3/13/2003	3.77	
FPC	21FLA FLPhosphate06	3/13/2003	1.56	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	4/8/2003	10.60	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	5/6/2003	18.50	C
FPC	21FLA FLPhosphate03	5/14/2003	2.7	
FPC	21FLA FLPhosphate06	5/14/2003	15.4	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	6/2/2003	16.30	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	7/7/2003	1.52	C
FPC	21FLA FLPhosphate03	7/18/2003	1.65	
FPC	21FLA FLPhosphate06	7/18/2003	2.02	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	8/5/2003	1.10	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	9/2/2003	1.19	C
FPC	21FLA FLPhosphate03	9/16/2003	2.3	
FPC	21FLA FLPhosphate06	9/16/2003	1.59	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	10/8/2003	1.49	C
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	11/6/2003	4.54	C
FPC	21FLA FLPhosphate03	11/13/2003	2.9	
FPC	21FLA FLPhosphate06	11/13/2003	8.8	
SWFWMD	Thirty Mile Creek above Alafia River N Prong (Nichols Road)	12/2/2003	10.60	C
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	2/24/2004	8.70	C
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	3/3/2004	10.02	C
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	4/5/2004	4.79	C
FDEP	Thirty Mile Creek @ Nichols Road	5/4/2004	2.40	C
FDEP	Thirty Mile Creek @ RR Bridge	5/4/2004	3.29	C
FDEP	Thirty Mile Creek @ IMC Property	5/4/2004	3.12	C
FDEP	Thirty Mile Creek @ CR 640	5/4/2004	1.11	C
IMC GLOBAL	Thirty Mile Creek (Downstream of FL0000256-009 discharge)	5/11/2004	1.78	C

* Data Collector:
SWFWMD – Southwest Florida Water Management District
FPC – Florida Phosphate Council
FDEP WAS – Florida Department of Environmental Protection, Watershed Assessment Section
FDEP Tampa – Florida Department of Environmental Protection, Tampa District
IMC Global – International Mineral and Chemical, Global
Remark Code:
C – Calculated value

Appendix J: Data Used to Determine Atmospheric Loading to Thirty Mile Creek and Tributaries

ESTIMATED WATERBODY SURFACE AREA

WATERBODY	ESTIMATED AREA (acres)	ESTIMATED AREA (HECTARES)
THIRTY MILE CREEK	4.28	1.73
GEORGE ALLEN CREEK	1.01	0.41
BEULAH BRANCH	1.01	0.41
GUY BRANCH	0.26	0.11
UNNAMED TRIB 1	0.43	0.18
UNNAMED TRIB 2	0.49	0.20
UNNAMED TRIB 3	1.30	0.53
TOTAL:	**8.79**	**3.56**

ESTIMATED NADP TN ATMOSPHERIC LOADING

YEAR	DEPOSITION NH4 (kg/ha)	DEPOSITION NO3 (kg/ha)	DEPOSITION NH4+NO3 (kg/ha)
1998	1.76	11.47	13.23
1999	1.1	9.41	10.51
2000	1.21	9.11	10.32
2001	1.61	10.37	11.98
2002	1.66	10.25	11.91
2003	2.15	9.69	11.84
AVERAGE:	1.58	10.05	**11.63**

ESTIMATED LOADING BASED ON ABOVE INFORMATION:

(11.63 kg/ha) x (3.56 ha) = 41.40 kg/year TN wet-weather loading

(41.40 kg/year) x (2 [accounts for dry weather deposition]) = **82.81 kg/year** TN atmospheric loading

82.81 kg/year = **182.56 lbs/year** TN atmospheric loading

Appendix K: Land Use Loading Estimates

STORMWATER RUNOFF CALCULATION

Land Use Category	Area[1] (acre)	Percent Impervious	Impervious Runoff Coefficient	Pervious Runoff Coefficient[2]	Precipitation (in/year)[3]	Runoff (acre-feet)
Forest/Rural Open	844.3	0.5%	0.95	0.159	52.60	603.1
Open Water/Lake	332.1	100.0%	0.95	0.000‡	52.60	1,382.9
General Agriculture	182.2	0.0%	0.95	0.317‡	52.60	253.2
Low density residential	257.8	14.7%	0.95	0.150	52.60	302.8
Mining	1,070.6	23.0%	0.95	0.361‡	52.60	2,329.8
Low - Intensity Commercial	5.9	91.0%	0.95	0.729‡	52.60	24.1
Pasture	779.4	0.0%	0.95	0.355‡	52.60	1,212.8
Row Crops	10.7	0.0%	0.95	0.204‡	52.60	9.5
Wetlands	105.3	0.0%	0.95	0.230	52.60	106.2
Total	**3,588.29**					**6,224.42**

[1] The estimated area of Thirty Mile Creek (8.79 acres, see **Appendix O**) and those areas where stormwater is believed to be collected and discharged via an outfall (approximately 640 acres) were subtracted from the acreage used.

[2] All pervious runoff coefficients are from "Watershed Management User's Model Manual" (CDM, 1998), except for "Open Water/Lake," "General Agriculture," "Mining," "Pasture," and "Row Crops," which are from "Evaluation of Alternative Stormwater Regulations for Southwest Florida Final Report" (Environmental Research and Design, 2003).

[3] Rainfall used are the average of five nearby weather stations for years 1996 – 2002. See **Figure 4.3** and **Table 4.5**.

ESTIMATED BOD, TN, AND TP LOADING FROM LAND USE IN THIRTY MILE CREEK WATERSHED

Land Use Type	Event Mean Concentration[1] CTN (mg/L)	CTP (mg/L)	Concentrations of Dissolved Form (calculated) CDTN (mg/L)	CDTP (mg/L)	Delivery Ratio	Estimated Annual Loadings TN load (lbs)	TP load (lbs)
Forest/Rural Open	1.09	0.046	1.1	0.0	1	1,787.6	75.4
Open Water/Lake	1.6	0.067	1.6	0.1	1	6,017.1	252.0
General Agriculture	2.32	0.344	2.3	0.3	1	1,597.2	236.8
Low density residential	1.64	0.191	1.6	0.2	1	1,350.6	157.3
Mining	1.18	0.15	1.2	0.2	1	7,476.1	950.3
Low - Intensity Commercial	1.12	0.18	1.1	0.2	1	73.3	11.8
Pasture	2.48	0.476	2.5	0.5	1	8,179.2	1,569.9
Row Crops	2.88	0.638	2.9	0.6	1	74.7	16.5
Wetlands	1.01	0.09	1.0	0.1	1	291.6	26.0
Total						**26,847.3**	**3,296.1**

[1] All event mean concentrations (EMC) are from "Watershed Management User's Model Manual" (CDM, 1998), except for "Open Water/Lake," "General Agriculture," "Mining," "Pasture," and "Row Crops," which are from "Evaluation of Alternative Stormwater Regulations for Southwest Florida Final Report" (Environmental Research and Design, 2003).

ESTIMATE OF TN CONCENTRATION FROM LAND USE AND ATMOSPHERIC DEPOSITION:

$$\frac{(27{,}033 \text{ lbs/yr TN*}) \times (4.5359 \times 10^5 \text{ mg/lbs})}{(6{,}224.42 \text{ ac/ft/yr}) \times (3.259 \times 10^5 \text{ gal/ac ft}) \times (3.785 \text{ L/gal})} = \mathbf{1.59 \text{ mg/L}}$$

* TN loading includes land use loading and atmospheric deposition estimates

Appendix L: Data Collected during the Department's Thirty Mile Creek Survey, May 2004

Site	Location	Date	Time	Total Depth (FT)	Temp. (°C)	Spec. Cond. (µmhos)	pH (su)	DO (mg/L)	DO (%)	Flow (cfs)	BOD 5 (mg/L)	Chl. *a* (µg/L)	Phaeo-phytin (µg/L)	Chloride (mg/L)	Sulfate (mg/L)	NH3N (mg/L)	NO2NO3 (mg/L)	TKN (mg/L)	TP (mg/L)	Ortho-Phos. (mg/L)	TN (calc. - mg/L)
TMC 06	Thirty Mile Creek at Nichols Rd.	5/4/04	1103	4.0	20.16	613	6.81				0.49	0.85	0.85	14	170	5.9	1.1	7.7	1.9	1.5	8.8
TMC 06	Thirty Mile Creek at Nichols Rd.	5/5/04	832	4.0	19.16	638	7.05	4.14	45.8												
TMC 08	Thirty Mile Creek at Nichols Rd.	5/3/04	1455	1.5	22.28	493	6.66	5.94	69.0												
TMC 08	Thirty Mile Creek at Nichols Rd.	5/4/04	1015	1.5	19.89	617	6.90	8.54	94.0	3.63	0.81	0.96	0.96	12	170	8.3	0.49	9.3	2.2	1.9	9.79
TMC 08	Thirty Mile Creek at Nichols Rd.	5/5/04	754		18.89	665	7.04	6.28	67.0												
TMC 09	Thirty Mile Creek on IMC Property	5/3/04	1529	1.5	22.08	580	6.59	6.32	71.7												
TMC 09	Thirty Mile Creek on IMC Property	5/4/04	930	1.5	20.10	497	7.01	6.56	77.2	3.32	0.42	0.85	0.85	11	100	3.1	0.52	4.2	1.7	1.5	4.72
TMC 09	Thirty Mile Creek on IMC Property	5/5/04	810		18.98	466	7.22	5.90	63.6												
TMC 10	Thirty mile Creek at S.R. 640	5/4/04	815	1.5	20.25	410	6.76	3.38	35.9	1.43	0.82	0.85	0.85	12	80	0.022	0.007	0.87	1.9	1.4	0.877
UT01	Unnamed Tributary to Thirty Mile Creek	5/4/04	1240	1.0	24.56	408	6.78			3.98	0.38	0.85	0.85	9.1	98	0.96	2.3	1.3	3.8	2.7	3.6
NPA01	N. Prong Alafia @ Keysville Rd.	5/4/04	1345		22.20	547	6.68	7.37	84.5		0.31	0.85	0.85	30	150	0.26	0.86	0.9	2.7	2	1.76
NPA02	N. Prong Alafia @ C.R. 37	5/4/04	1621	2.0	24.72	958	6.55	5.07	61.4		0.77	0.85	0.85	35	340	0.049	0.13	0.73	3.8	3.4	0.86
BLANK	Blank	5/4/04									0.2	0.85	0.85	0.2	0.2	0.01	0.004	0.06	0.02		0.064

Appendix M: Thirty Mile Creek Data Collected by IMC, 2004

Date	Time	Sample Qualities	pH (std units)	Specific Conductance (umhos/cm)	Total Kjeldahl Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chlorophyll *a* (mg/m^3)	Nitrate-Nitrite (mg/L)	TN (mg/L)
2/24/04	13:25	Clear/Light Tan, No Odor, No Sediment	7.17	518	2.8	1.3	1	1	3.8
3/3/04	12:20	Clear/Tannic, No Odor, No Sediment	7.11	467	2.6	2.15	1	0.72	3.32
4/5/04	11:20	Clear, No Odor, No Sediment	7.5	459	1.1	0.58	1	0.59	1.69
5/11/04	11:00	Clear/Light Tan, No Odor, No Sediment	7.13	457	1.2	0.74	1	0.91	2.11

Data was collected by IMC personnel near the TMC – 09 (see **Figure 1.6** for location).

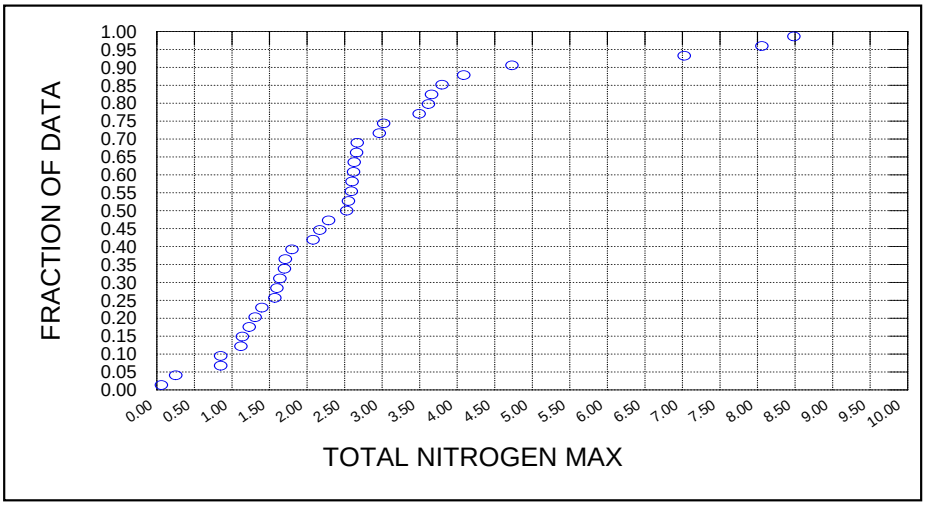
Appendix N: Preliminary 2004 Data Provided to the Department by IMC for Non-permitted Seepage Discharge

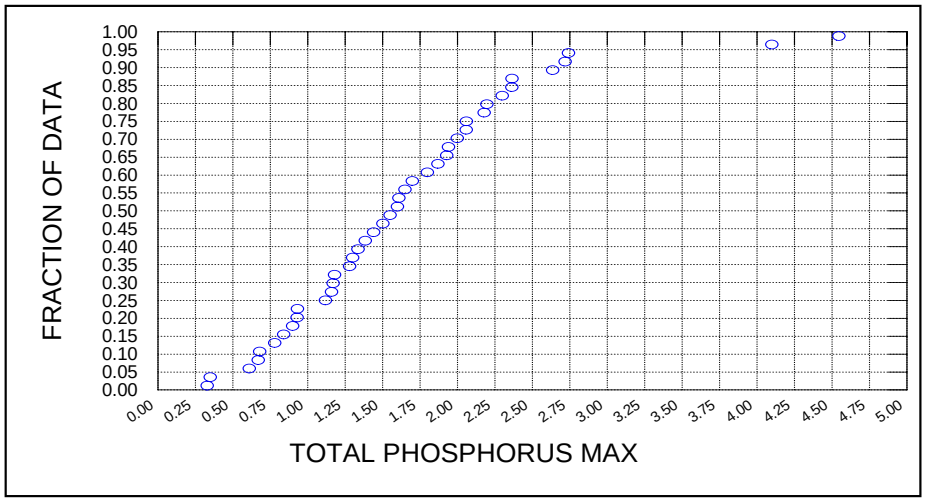
Date	Flow (gallons/minute)	Conductance (umhos/cm)	Nitrate-Nitrate (mg/L)	Ammonia Nitrogen (mg/L)	TKN (mg/L)	pH (std units)	Fluoride (mg/L)	Total P (mg/L)	Sulfate (mg/L)
5/5/04	Visible Flow	18,840	0.06	213.7	205.8	3.65	2.1	60.3	
5/6/04	Visible Flow	5,774	0.05	218	209	3.49	4	61.8	2,968
5/14/04				130.7					
5/20/04	11.4								
5/24/04	7.9								
5/28/04				221.4					
6/4/04	12.7			219.8					
6/9/04	20.0			238.2					
6/15/04	75.6			171.8					
6/21/04	46.6			204.3					
6/24/04	35.1								
6/29/04	31.7			212.2					
7/8/04				228.9					

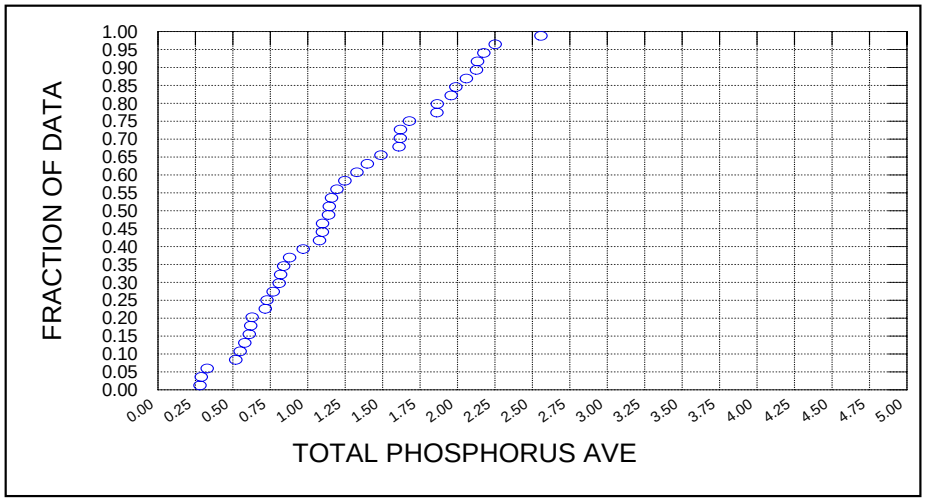
* Data provided by IMC 8/16/04; if no data was provided then the cell was left blank

Loading Estimate: 26, 298 lbs/year (72 lbs/day), based on following assumptions: Total Nitrogen – 200 mg/L
Average Flow – 0.0432 MGD (30 gallons/minute)

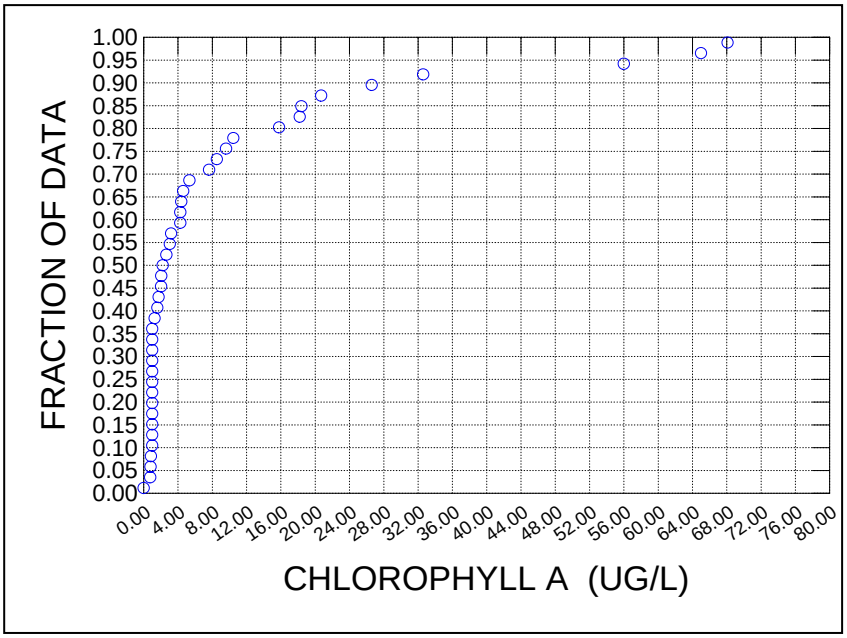
Appendix O.1: Cumulative Frequency Plots of Monthly Flow Weighted Discharge TN and TP Concentrations at Nichols Road

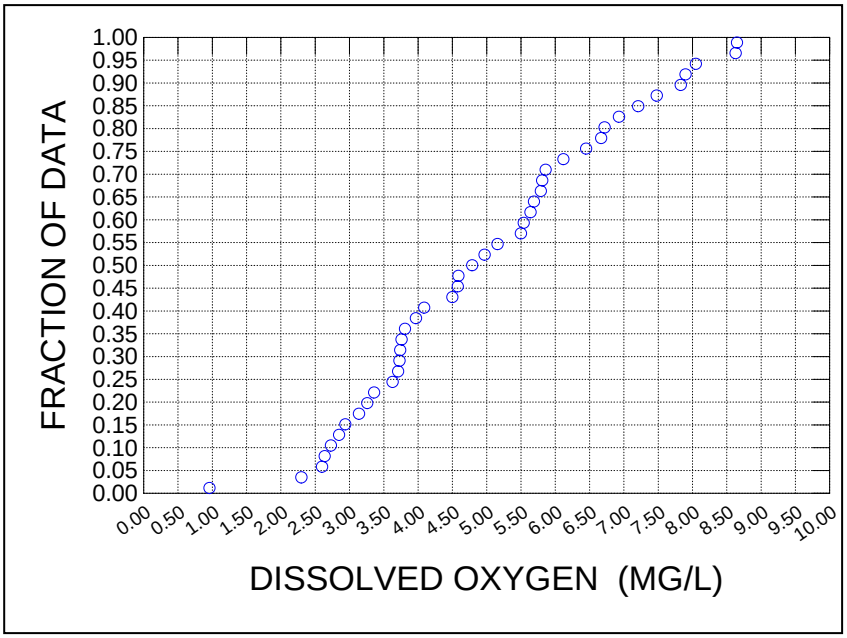






Appendix O.2: Cumulative Frequency Plots of Chlorophyll *a* and DO Measurements at Nichols Road





Appendix P: Linear Regressions of TN and TP Concentrations and Chlorophyll *a* at Nichols Road

Linear Regression of Flow Weighted Monthly TN Maximum Discharge Concentration Versus Chlorophyll *a* at Nichols Road

Dep Var: CHLOROA N: 37 Multiple R: 0.580 Squared multiple R: 0.336

Adjusted squared multiple R: 0.317 Standard error of estimate: 17.801

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	-5.056	5.105	0	.	-0.99	0.329
MAX TN CONCEN.	6.611	1.57	0.58	1	4.21	0

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	5616.085	1	5616.085	17.723	0
Residual	11090.576	35	316.874		

Linear Regression of Flow Weighted Monthly TP Average Discharge Concentration Versus DO at Nichols Road

Dep Var: DOMGL N: 42 Multiple R: 0.253 Squared multiple R: 0.064

Adjusted squared multiple R: 0.041 Standard error of estimate: 1.859

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	5.861	0.622	0	.	9.419	0
MAX. TP CONCEN.	-0.549	0.332	-0.253	1	-1.653	0.106

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	9.441	1	9.441	2.731	0.106
Residual	138.262	40	3.457		

Appendix Q: Analysis of NPDES Discharge, Prior Seven-Day Accumulated Precipitation, and Season

Kruskal-Wallis One-Way Analysis of Variance

Dependent variable is DMR Discharge Data (mgd)
Grouping variable is SEASON

Group	Count	Rank Sum
Winter	12	249
Spring	10	162
Summer	11	360
Fall	10	175

Kruskal-Wallis Test Statistic = 11.566
Probability is 0.009 assuming Chi-square distribution with 3 df

Dep Var: DMR Discharge Data N: 43 Multiple R: 0.413 Squared multiple R: 0.171

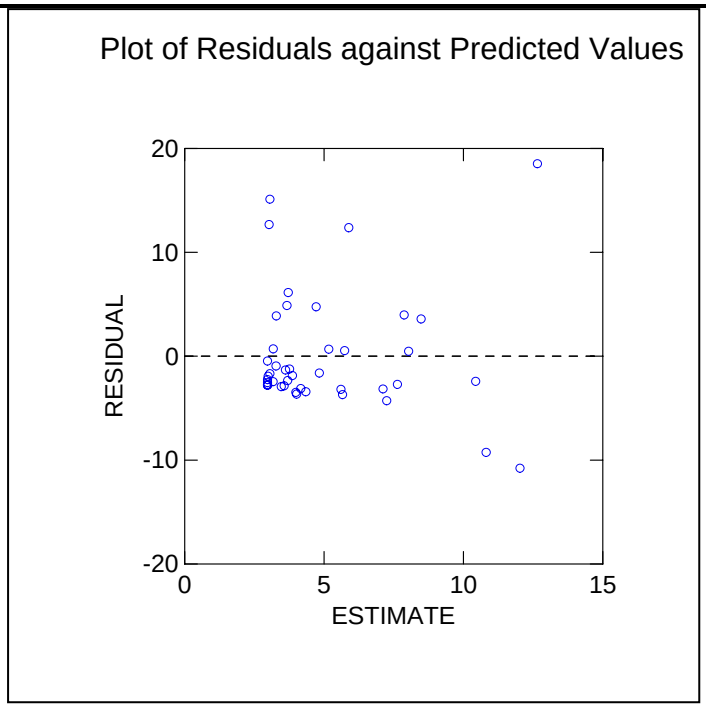
Adjusted squared multiple R: 0.150 Standard error of estimate: 5.860

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
Constant	2.972	1.153	0	.	2.578	0.014
Seven-Day Prior Precipitation	14.962	5.153	0.413	1	2.904	0.006

Analysis of Variance

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Regression	289.522	1	289.522	8.431	0.006
Residual	1408.018	41	34.342		

Durbin-Watson D Statistic 0.872
First Order Autocorrelation 0.557



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