FINAL

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • TAMPA BAY BASIN

TMDL Report

Nutrient TMDL for Lower Sweetwater Creek (WBID 1570A)

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and
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Acknowledgments

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TMDL Program

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

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STORET Program

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

2002 305(b) Report

http://www.dep.state.fl.us/water/docs/2002_305b.pdf

Criteria for Surface Water Quality Classifications

http://www.dep.state.fl.us/legal/rules/shared/62-302t.pdf

Basin Status Report for the Tampa Bay Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Water Quality Assessment Report for the Tampa Bay Tributaries Basin

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Allocation Technical Advisory Committee (ATAC) Report

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U.S. Environmental Protection Agency

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 total nitrogen (TN) in the tidal segment of Lower Sweetwater Creek (LSC) in the Tampa Bay Basin. Using the methodology described in Chapter 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR) (Florida Department of Environmental Protection, 2001) to identify and verify water quality impairments, the tidal reach was verified as impaired for dissolved oxygen (DO) and nutrients, and was included on the Verified List of impaired waters for the Tampa Bay Basin that was adopted by Secretarial Order on August 28, 2002. The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards, based on the relationship between pollution sources and instream water quality conditions. This TMDL establishes the allowable loadings of nitrogen to the creek that would restore the waterbody so that it meets its applicable water quality criteria for nutrients.

1.2 Identification of Waterbody

The LSC watershed is located in northwestern Hillsborough County, just west of the city of Tampa **(Figure 1.1).** The watershed is approximately 9.5 square miles in size (6,055 acres). The headwaters are located at Egypt Lake, and the main channel flows southwest for approximately 6.5 miles before discharging into Old Tampa Bay. The watershed is generally bordered on the east by Armenia Avenue, on the west by Webb Road, on the north by Sligh Avenue, and on the south by Tampa Bay Boulevard, Memorial Highway, and Old Tampa Bay.

The watershed receives runoff from portions of the Town 'n Country area of Hillsborough County, portions of Tampa International Airport (TIA), the Town 'n Country Hospital, and portions of Al Lopez Park and the Drew Park area of the city of Tampa. Hillsborough Avenue divides the watershed in an east-west direction roughly into two halves. Veteran's Expressway, Dale Mabry Highway, Anderson Road, and Eisenhower Boulevard are other major roads that pass through the watershed (Hillsborough County Public Works Department, 2002).

The climate in Hillsborough County is subtropical. The average annual rainfall is approximately 50 inches. The wet season is approximately 4 months long during the summer, usually beginning in June and ending in September. The summer is generally hot and humid, with daily high temperatures in the 90s. Afternoon thunderstorms of high intensity and short duration are common during the wet season.

The topography of the LSC watershed is relatively flat with gentle slopes. Areas adjacent to Old Tampa Bay and the Town 'n Country area are relatively flat, while some of the interior regions near Egypt Lake have somewhat more relief. In the Town 'n Country area, ground elevations are on the order of 6 to 13 feet (NGVD), while north of Egypt Lake the elevations are as high as 40 feet above sea level (Hillsborough County Public Works Department, 2002).

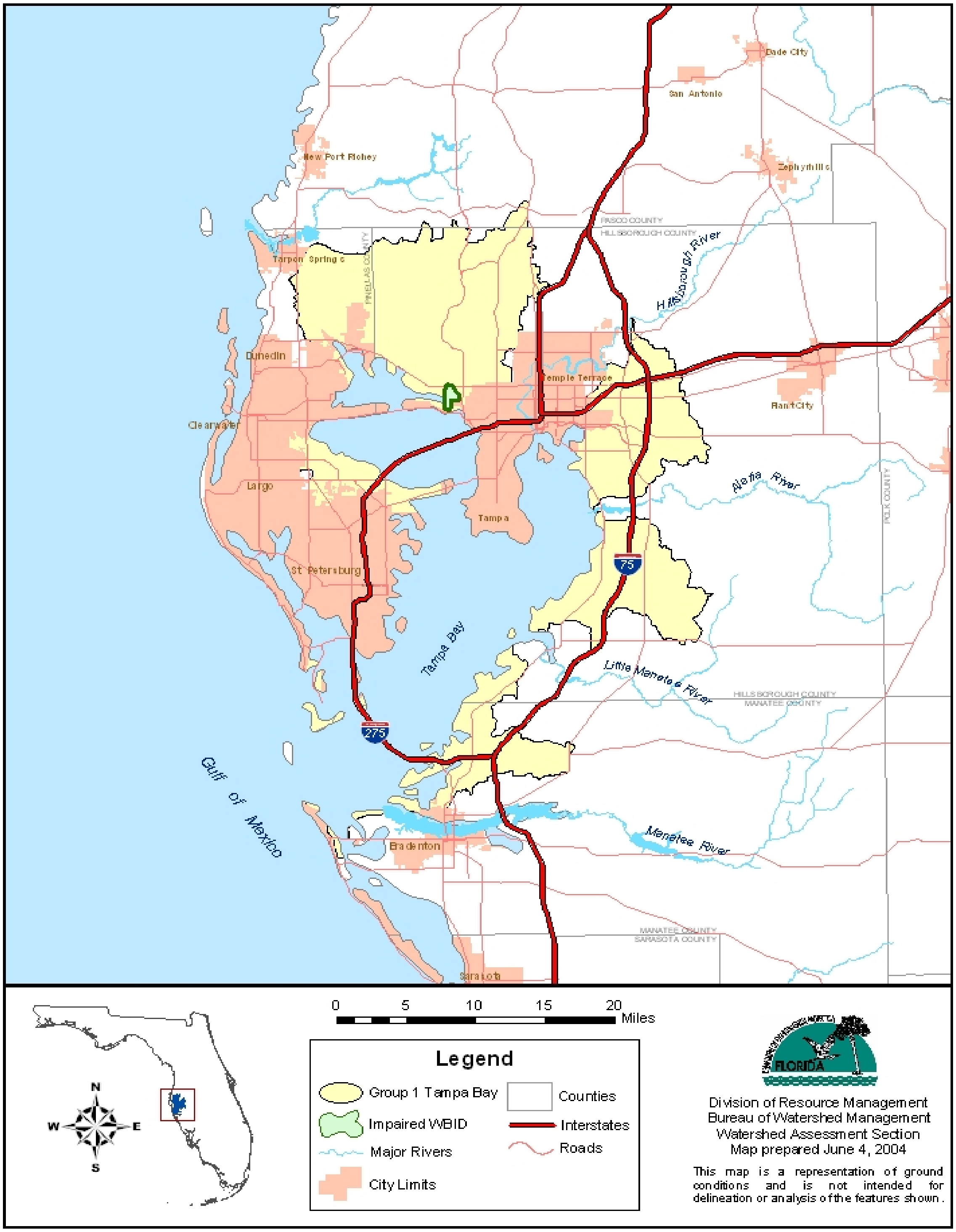

Figure 1.1. Location of the LSC Watershed and Major Geopolitical Features in the Coastal Old Tampa Bay Planning Unit

Most of the soils in the LSC watershed are not well drained. However, due primarily to the effects of development, many of these soils are in a "drained" condition. For instance, in the Town 'n Country area and in the residential areas farther south toward Old Tampa Bay, the natural soils have been "drained" through the lowering of surficial ground water levels. The lower water table levels in these areas have resulted from the construction of storm sewer systems and drainage ditches associated with site development. The soils along and around the Henry Street Canal (HSC) are in a similar condition. The soils farther to the east, around Egypt Lake, range from well drained to poorly drained, as are the soils in the southeastern portion of the watershed (Hillsborough County Public Works Department, 2002).

The LSC watershed is one of the most heavily urbanized in Hillsborough County. Approximately 67 percent **(**Florida Department of Environmental Protection, June 2004) of the land use is urban and built-up, which includes high-density residential, commercial, industrial, and institutional development. Approximately 14.7 percent of the land use is transportation and utilities related. These two activities account for 81.7 percent of the land use in the watershed.

Significant residential areas are located in the southwestern, western, and eastern portions of the watershed. These tend to be older neighborhoods, mostly comprising lots less than a quarter acre in size. There watershed contains no traditional agricultural areas. The largest concentration of commercial/industrial land use is located at the TIA and in the areas immediately adjacent to the airport property. The Drew Park area, located east of the airport in the jurisdictional boundaries of the city of Tampa, has the largest extent of commercial land cover. The areas adjacent to Hillsborough Avenue, Dale Mabry Highway, Anderson Road, Benjamin Road, and Memorial Highway also contain intensive commercial development (Hillsborough County Public Works Department, 2002).

Land use in the areas around Egypt Lake includes more single-family residences. However, there are a few rather large apartment complexes adjacent to the lake. The area contains very little open space. Horizon Park and the Rocky Point Golf Course, in addition to county-owned property at Westgate Park and land adjacent to Occident Street, are among the largest land cover features containing open space. Tidal marshes are located in the south and southeastern portions of the watershed, along Old Tampa Bay, but this area also contains a dense residential neighborhood (Hillsborough County Public Works Department, 2002).

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Coastal Old Tampa Bay Planning Unit into water assessment polygons with a unique **w**ater**b**ody **id**entification (WBID) number for each water segment or stream reach. The LSC watershed comprises of four WBIDs: WBID 1570, Sweetwater Creek; WBID 1570A, Lower Sweetwater Creek-Tidal; WBID 1570Y, Egypt Lake; and WBID 1570Z, Egypt Lake Drainage Area **(Figure 1.2).** This TMDL specifically addresses the nutrient impairment identified in the tidal segment of the Lower Sweetwater Creek watershed (WBID 1570A).

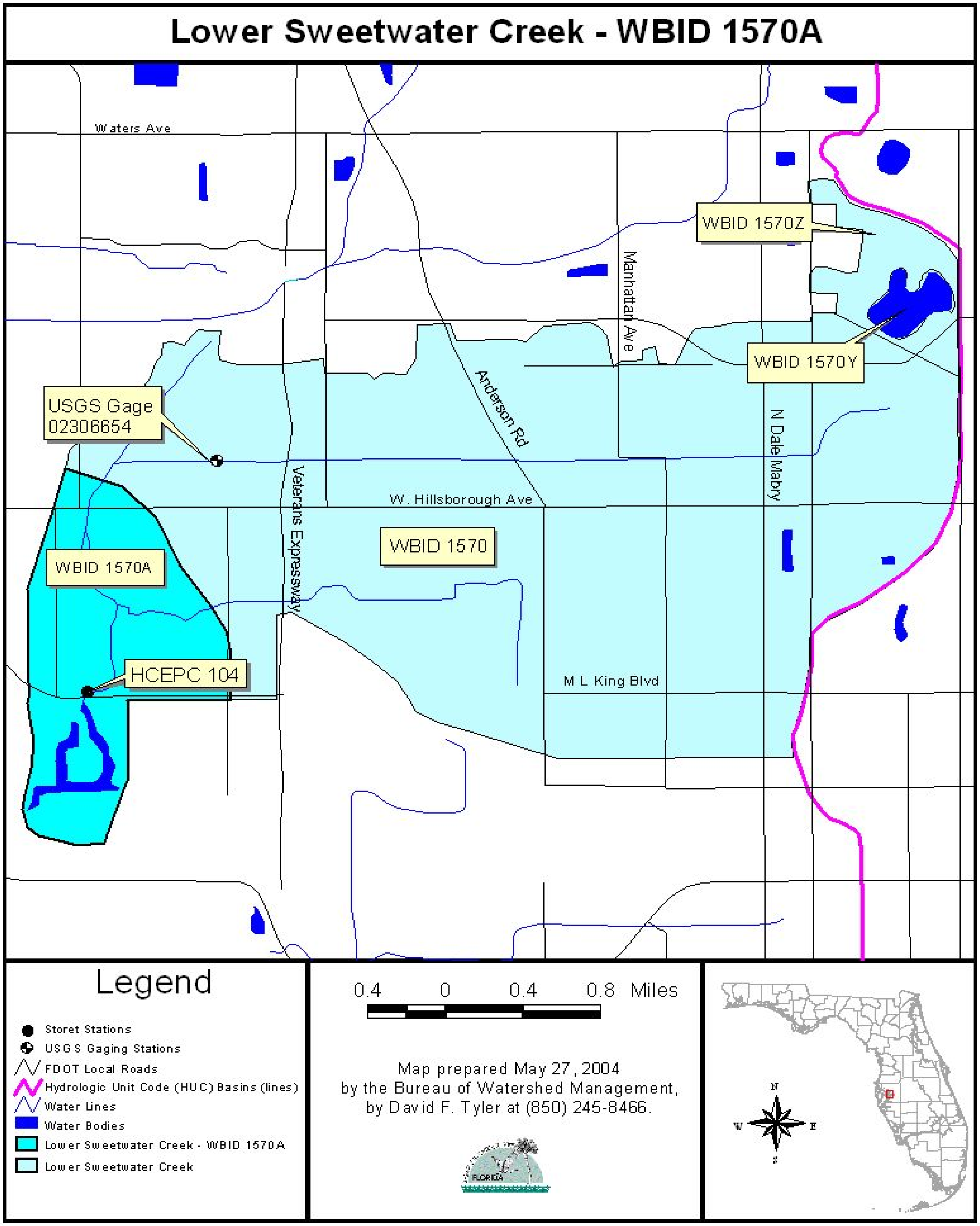

Figure 1.2. Lower Sweetwater Creek Watershed and Monitoring Locations

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 5-year cycle, provides a framework for implementing the TMDL Program–related requirements of the 1972 Federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA, Chapter 99-223, Laws of Florida).

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

This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of TN needed to address the nutrient impairment in the LSC watershed. The action plan's activities will depend heavily on the active participation of Hillsborough County, the Southwest Florida Water Management District (SWFWMD), businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the 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 identified impairment of the listed waters on a schedule. The Department has developed these lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin is also required by the FWRA (Subsection 403.067[4)], Florida Statutes [F.S.]), and the Department is developing basin-specific lists as part of the watershed management cycle.

Florida's 1998 303(d) list did not include the LSC watershed. The Direct Runoff to Bay segment (WBID 1601) was incorrectly included on the 1998 303(d) list based on the data collected in LSC. Subsequently, WBID 1601 was removed from the 303(d) list because no data were collected in this segment and LSC (WBID 1570A) was properly included on the list in this segment's place.

The 1998 303(d) list included 47 waterbodies (WBIDs) in the Tampa Bay Basin (Florida Department of Environmental Protection, 1998). However, the 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), (Florida Department of Environmental Protection, 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 impairments in the LSC watershed and verified impairments for DO and nutrients **(Table 2.1).** The main source of data for the IWR assessment was a long-term monitoring station (HCEPC 104) sampled by the Hillsborough County Environmental Protection Commission (HCEPC) **(Figure 1.2).** The IWR methodology uses chlorophyll *a* measurements (a measure of algal biomass) to interpret Florida's narrative nutrient criterion, and the number of DO criterion exceedances is evaluated to assess for DO impairment.

The DO results for 1995 to 2003 (the verified period used for the IWR assessment) are shown in **Figure 2.1. Figure 2.2** displays the annual average chlorophyll *a* levels for the verified period. The tidal segment is listed for DO because, from 1995 to 2002, more than 10 percent of the DO results did not meet the marine DO criterion of 4 milligrams per liter (mg/L). The tidal segment is listed for nutrients because, with the exception of the annual average for 2003, all of the annual average chlorophyll *a* values were greater than the listing threshold for estuaries of 11 micrograms per liter (μg/L). The segment is also listed for nutrients because annual average chlorophyll *a* values were more than 50 percent greater than the historical chlorophyll *a* value of 10.4 μg/L for at least 2 consecutive years during the verified period. The historical value is based on the lowest 5-year average for the period of record, which for LSC is 1982 to 1986. **Table 2.2** provides summary statistics for DO and chlorophyll *a* during the verified period, and the individual water quality measurements used in the assessment are provided in **Appendix B.** The highest chlorophyll *a* value measured, 138 μg/L, suggests that an algal bloom was occurring at the time of sampling.

Table 2.1. Verified Impaired Listings in the LSC Watershed, WBID 1570A

Parameters of Concern	Priority for TMDL Development	Projected Year for TMDL Development*
Nutrients (Historical Chlorophyll and Chlorophyll *a*)	High	2003
Dissolved Oxygen	High	2003

*These TMDLs were scheduled to be completed by December 31, 2003, based on a Consent Decree between the EPA and EarthJustice, but the Consent Decree allows a 9-month extension for completing the TMDLs.

Table 2.2. Summary Statistics for DO and Chlorophyll *a* for the IWR Verified Period (1995 – 2002), LSC Watershed, WBID 1570A

Parameter	Station ID	Number of Samples	Minimum	Mean	Median	Maximum
Dissolved Oxygen (mg/L)	HCEPC 104	96	0.12	3.01	2.60	7.00
Chlorophyll *a* (μg/L)	HCEPC 104	96	0.70	19.26	14.92	138.49

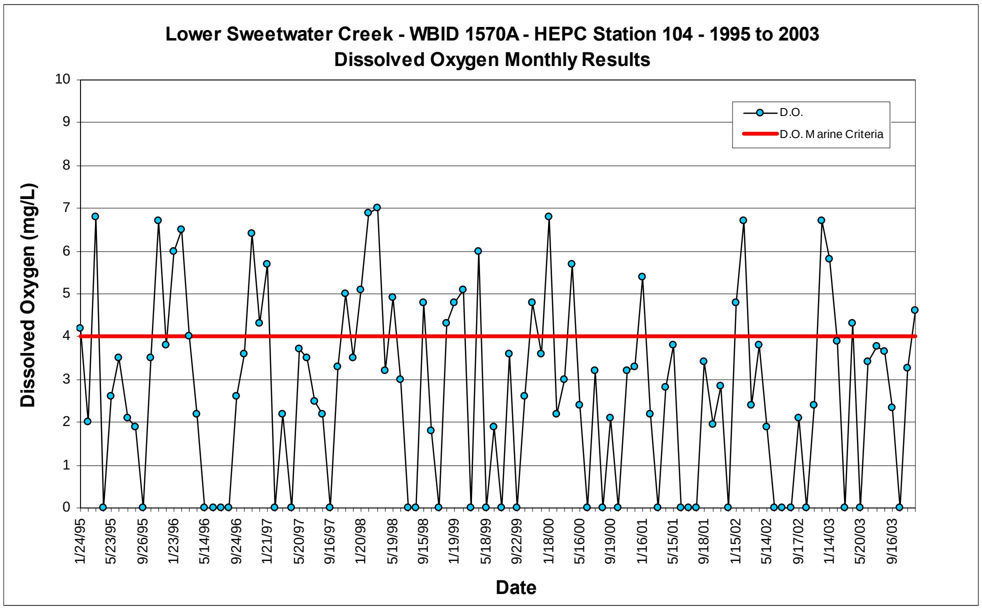

Figure 2.1. DO Results Based on the IWR Assessment for LSC, WBID 1570A

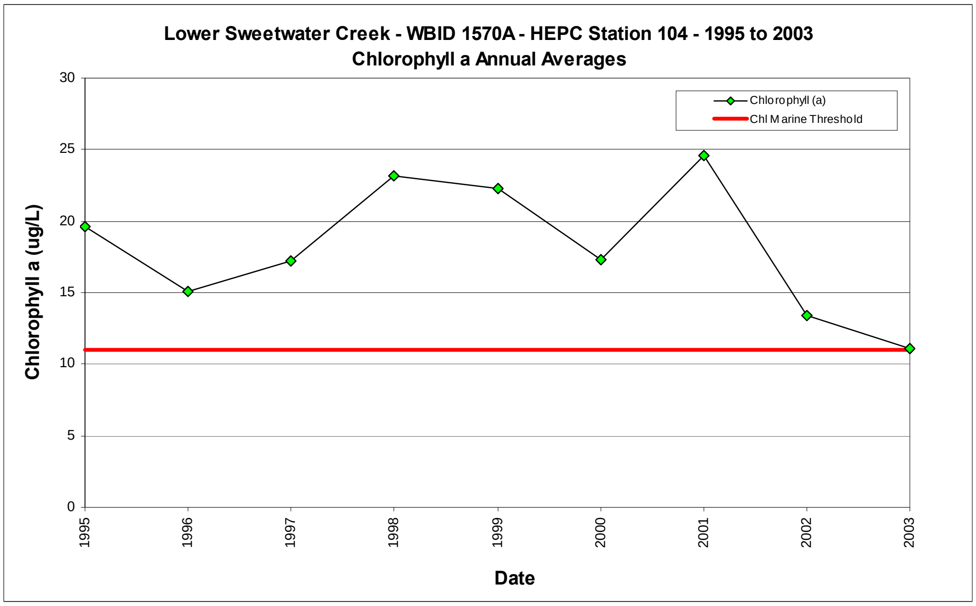

Figure 2.2. Chlorophyll *a* Results Based on the IWR Assessment for LSC, WBID 1570A

As part of the listing process, the Department attempts to identify the limiting nutrient or nutrients for the impaired segment. The limiting nutrient, generally nitrogen or phosphorus, is defined as the nutrient that limits plant growth when it is not available in sufficient quantities. A limiting nutrient is a chemical necessary for plant growth, but available in quantities smaller than those needed for algae, represented by chlorophyll *a*, and macrophytes to grow. Once the limiting nutrient in a waterbody is exhausted, algae stop growing. If more of the limiting nutrient is added, larger algal populations will result, until their growth is again limited by nutrients or other environmental factors.

In Florida waterbodies, nitrogen and phosphorus are most often the limiting nutrients, and nitrogen is typically the limiting nutrient in most Florida estuaries. There is a general understanding in the marine scientific community that nitrogen is the principal cause of nutrient overenrichment in coastal systems (National Research Council, 1993) and an analysis of the data from LSC supports this conclusion.

Determining the limiting nutrient in a waterbody can be accomplished by comparing the ratio of nitrogen to phosphorus in the waterbody, with water column ratios of TN to total phosphorus (TP) of less than 10 indicating nitrogen limitation. For the LSC watershed, the median TN to TP ratio at HCEPC Station 104 from 1995 to 2002 was 6.9, indicating that nitrogen is the limiting nutrient. While nitrogen is the limiting nutrient, it is also elevated in the watershed compared with other Florida estuaries. The TN median value of 1.15 mg/L for the same period exceeded the nutrient screening level value of 1.0 mg/L for marine waters. In contrast, the phosphorus median value of 0.17 mg/L is just below the screening level of 0.19 mg/L for marine waters. These screening level values represent the 70^{th} percentile for state estuaries, based on STORET data from 1970 to 1987 (Friedemann and Hand, 1989.)

Since nitrogen is the limiting nutrient, reductions in TN loadings would be expected to result in decreases in chlorophyll *a.* Reductions in TN loading are also expected to result in additional benefits for other parameters contributing to the impairment including DO and biochemical oxygen demand (BOD). Reductions in nitrogen will result in lower algal biomass levels in the water column, and lower algal biomass levels will result in smaller diurnal fluctuations in DO and less algal-based total suspended solids and reduced BOD**.**

The expectation that reductions in nitrogen loading will provide improvements in other parameters is supported by a statistical evaluation of data from HCEPC Station 104. A simple linear regression of chlorophyll *a* versus BOD showed a positive correlation with an r^2 value of 0.49 **(Figure 2.3).** Chlorophyll *a* was also found to be slightly correlated with organic nitrogen, with an r^2 value of 0.3 **(Figure 2.4).**

Processes that consume oxygen from the water column, such as the microbial breakdown of organic material and sediment oxygen demand (SOD), are fairly constant over the short term. Algal populations, however, can increase rapidly, and the production of oxygen as a result of photosynthesis during daylight hours and the respiration or consumption of oxygen from the water column at night can result in large diurnal fluctuations of DO in the water column. A fraction of increased algal biomass will also become part of the organic material that is broken down by microbes or settles to the bottom.

The proposed nitrogen reduction is expected to decrease algal biomass to the point that the estuarine threshold of 11 µg/l will not be exceeded. The reduction in nitrogen loads is also expected to improve DO by reducing the diurnal fluctuations in DO and improving DO levels. A recent stormwater treatment project implemented in the Lake Egypt drainage basin decrease pollutant loads entering the lake, benefiting surface water quality downstream of the lake. In the last two years, annual average chlorophyll *a* values have declined, reaching a low of 11 µg/L in 2003 **(Figure 2.2).**

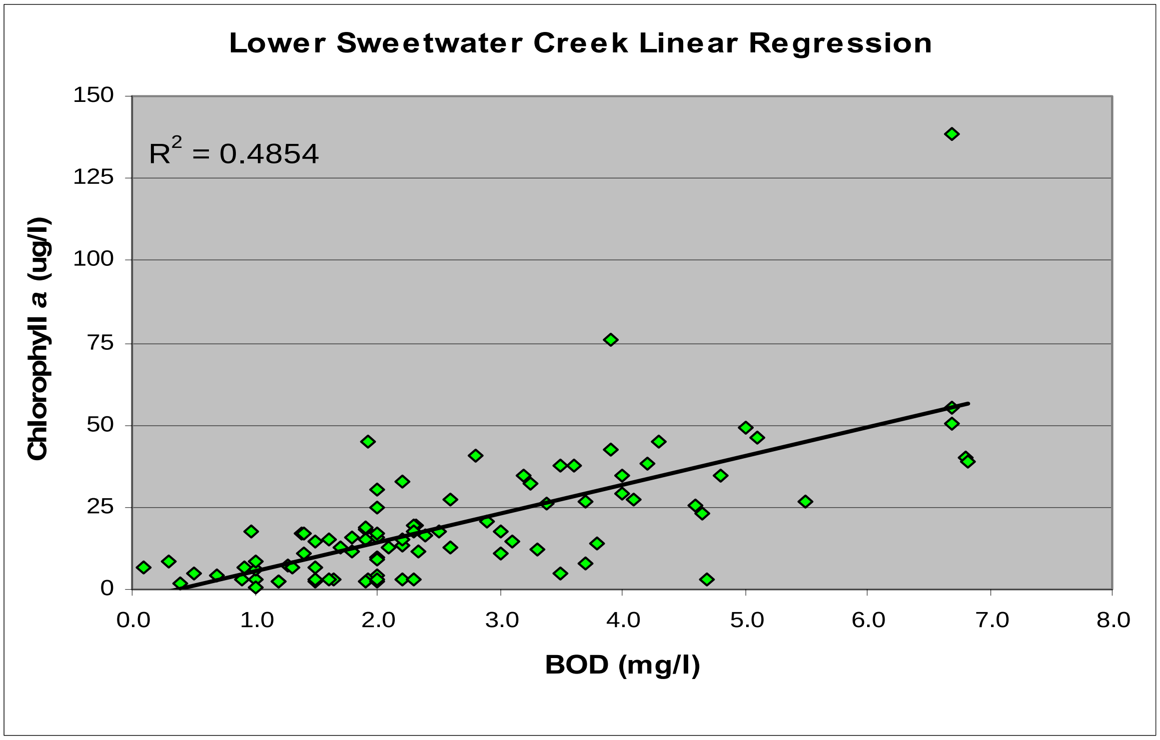

Figure 2.3. Chlorophyll *a* vs. BOD for LSC, WBID 1570A

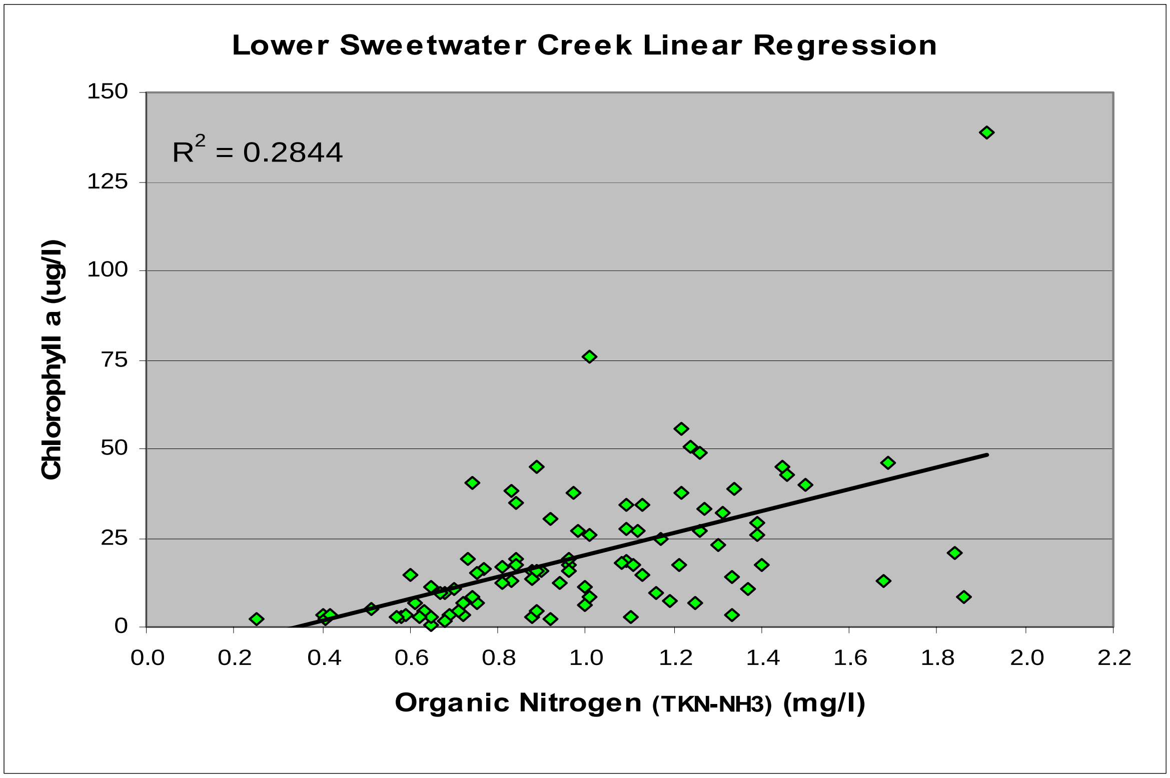

Figure 2.4. Chlorophyll *a* vs. Organic Nitrogen for LSC, WBID 1570A

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)**

The tidal segment of LSC, WBID 1570A, is a Class III marine waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Class III water quality criteria applicable to the observed impairment are the DO and narrative nutrient criteria.

3.2 Applicable Water Quality Standards and Numeric Water Quality Targets

3.2.1 DO Criterion

The Class III marine criterion for DO, established by Subsection 62-302.530(31), F.A.C., states that DO shall not average less than 5.0 mg/L in a 24-hour period, and shall not be less than 4 mg/L, and that normal daily and seasonal fluctuations above these levels shall be maintained.

3.2.2 Interpretation of Narrative Nutrient 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. While the IWR provides a threshold for nutrient impairment for streams and estuaries based on annual average chlorophyll *a* levels, these thresholds are not standards and need not be used as the nutrient-related water quality target for TMDLs. In fact, in recognition that the IWR thresholds were developed using statewide average conditions, the IWR (Section 62-303.450, F.A.C.) specifically allows the use of alternative, site-specific thresholds that more accurately reflect conditions beyond which an imbalance in flora or fauna occurs in the waterbody.

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 estuaries, the Department applied a chlorophyll *a* target for this TMDL that should result in an annual average chlorophyll below the IWR impairment threshold for estuaries (11 ug/L).

This approach minimizes the potential for listing the water as impaired in the future. However, since the target is not based 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 or pollutants causing impairment in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either "point sources" or "nonpoint sources." Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term "nonpoint sources" was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA's National Pollutant Discharge Elimination System (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 A** 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. 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 Point Sources

4.2.1 NPDES Permitted Wastewater Facilities

There are no permitted wastewater treatment facilities or industrial facilities that discharge either directly or indirectly into the Lower Sweetwater Creek watershed.

4.2.2 Municipal Separate Storm Sewer System Permittees

Municipal separate storm sewer systems (MS4s) may discharge nutrients to waterbodies in response to storm events. To address stormwater discharges, the EPA developed the NPDES stormwater permitting program in two phases. Phase I, promulgated in 1990, addresses large and medium MS4s located in incorporated places and counties with populations of 100,000 or more. Phase II permitting began in 2003. Regulated Phase II MS4s, which are defined in Section 62-624.800, F.A.C., typically cover urbanized areas serving jurisdictions with a population of at least 10,000 or discharge into Class I or Class II waters, or Outstanding Florida Waters.

The stormwater collection systems in the Lower Sweetwater Creek watershed, which are owned and operated by Hillsborough County in conjunction with the Florida Department of Transportation, are covered by a Phase I MS4 permit. The LSC basin is also included in the Phase II NPDES stormwater permitting program. Currently, there are five on-going stormwater Capital Improvement Projects (CIPs) in the watershed (WBIDs 1570A and 1570). One stormwater improvement project, Lake View Park Sub Drive Phase II Outfall (CIP # 41054), was completed in November, 2003. On-going stormwater CIPs include the Lower Sweetwater Master Implementation Plan (CIP # 40038), Town 'n' Country Drive Cross Drains (CIP # 41078), Town 'n' Country Drive FDOT Pump Station (CIP # 41099), Tanglewood Phase II Culverts (CIP # 41124), and Sligh Avenue Phase III Stormwater Management System Upgrade downstream of Egypt Lake (CIP # 47344) (Hillsborough County and University of South Florida, 2003). In addition, Hillsborough County has installed a Vortechnix unit on the northeast side of Lake Egypt to treat stormwater at an inflow area to the lake (see Chapter 5, Section 5.4).

4.3 Land Uses and Nonpoint Sources

Nutrient loading from urban areas is most often attributable to multiple sources, including stormwater runoff, leaks and overflows from sanitary sewer systems, illicit discharges of sanitary waste, runoff from improper disposal of waste materials, leaking septic systems, and domestic animals. Because the LSC watershed is primarily urban, wildlife and agricultural animals or livestock sources are not expected to contribute significantly to the TN load.

The total nonpoint source loads for each pollutant were quantified based on land use areas in the watershed. The loadings include runoff from urban areas and transportation and utility areas. Part of the surface runoff loads come from atmospheric deposition that falls directly onto the land surface. Although not specifically quantified, the runoff from residential areas includes leachate from septic systems.

4.3.1 Land Uses

The spatial distribution and acreage of different land use categories were identified using 1999 land use coverage data (scale 1:40,000) contained in the Department's geographic information system (GIS) library (Florida Department of Environmental Protection, June 2004) **(Figure 4.1)**. **Table 4.1** tabulates the Level 3 land use attributes in the entire watershed (WBIDs 1570, 1570A, 1570Y, and 1570Z). The predominant land uses are urban and transportation land uses, which comprise approximately 81.7 percent of the watershed's total area. **Table 4.3** provides the different land use attributes below USGS gage 2306654 used in the WMM analysis. Similar to the entire LSC watershed, urban and transportation land uses dominate the ungaged area comprising of approximately 84.7 percent of the watershed's total area.

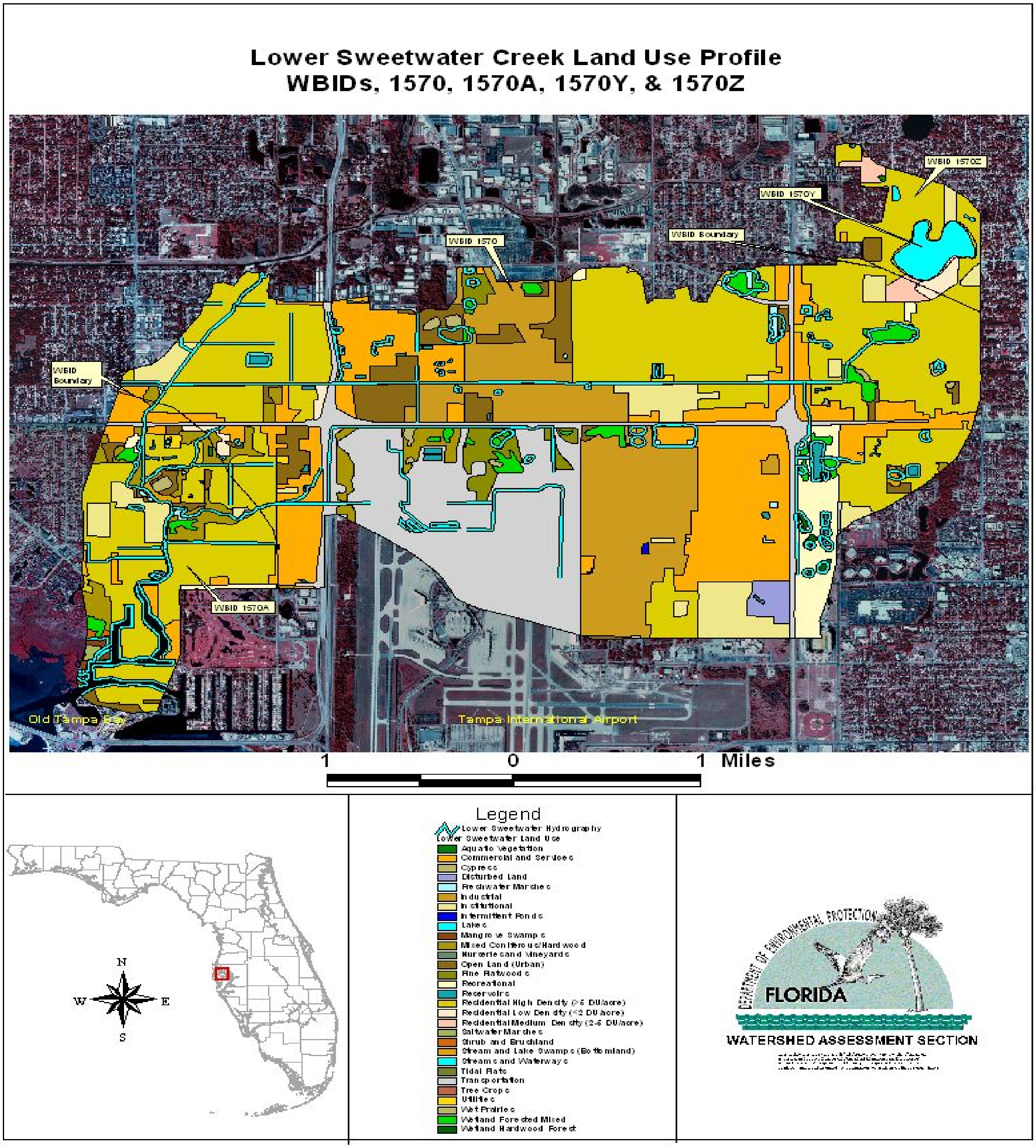

Figure 4.1 Lower Sweetwater Creek Land Use Profile for WBIDs 1570, 1570A, 1570Y, and 1570Z (1999)

Table 4.1. Classification of Land Use Categories in the LSC Watershed, WBIDs 1570, 1570A, 1570Y, and 1570Z, above and below USGS Gage 02306654 (1999)

Level 1	Level 2	Level 3	Land Use Attribute	Acres	Sq. Miles	Percent
1000	1300	1300	Residential High Density	2095.7	3.274	34.607%
1000	1400	1400	Commercial and Services	961.5	1.502	15.878%
8000	8100	8100	Transportation	880.0	1.375	14.531%
1000	1500	1500	Industrial	740.2	1.156	12.222%
1000	1700	1700	Institutional	268.2	0.419	4.428%
1000	1900	1900	Open Land	260.1	0.406	4.296%
1000	1800	1800	Recreational	187.8	0.293	3.102%
4000	4300	4340	Hardwood Conifer Mixed	134.9	0.211	2.228%
6000	6300	6300	Wetland Forested Mixed	103.1	0.161	1.703%
4000	4100	4110	Pine Flatwoods	74.1	0.116	1.223%
5000	5200	5200	Lakes	67.6	0.106	1.116%
5000	5300	5300	Reservoirs	51.1	0.080	0.844%
5000	5400	5400	Bays And Estuaries	49.5	0.077	0.817%
1000	1200	1200	Residential Medium Density	43.2	0.068	0.714%
6000	6400	6430	Wet Prairies	23.5	0.037	0.389%
6000	6400	6410	Freshwater Marshes	22.8	0.036	0.376%
1000	1100	1100	Residential Low Density	17.8	0.028	0.294%
6000	6100	6150	Stream And Lake Swamps	14.9	0.023	0.246%
5000	5100	5100	Streams And Waterways	13.9	0.022	0.229%
8000	8300	8300	Utilities	10.6	0.017	0.174%
6000	6100	6120	Mangrove Swamps	10.1	0.016	0.166%
6000	6100	6100	Wetland Hardwood Forests	7.6	0.012	0.125%
6000	6400	6420	Saltwater Marshes	4.4	0.007	0.072%
3000	3200	3200	Shrub And Brushland	2.9	0.005	0.048%
6000	6500	6530	Intermittent Ponds	2.5	0.004	0.041%
6000	6500	6510	Tidal Flats	2.3	0.004	0.037%
6000	6400	6440	Emergent Aquatic Vegetation	1.9	0.003	0.032%
6000	6200	6210	Cypress	1.8	0.003	0.030%
6000	6400	6440	Aquatic Vegetation	0.7	0.001	0.012%
2000	2200	2200	Tree Crops	0.6	0.001	0.009%
2000	2400	2400	Nurseries and Vineyards	0.5	0.001	0.008%
Land Use Summation				6,055.8	9.46	100%

Hillsborough County Septic Tanks

Onsite sewage treatment and disposal systems (OSTDSs), including septic tanks, are commonly used where providing central sewer is not cost-effective or practical. When properly sited, designed, constructed, maintained, and operated, OSTDSs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTDS is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, however, OSTDSs can be a source of nutrients (nitrogen and phosphorus), pathogens, and other pollutants to both ground water and surface water. As of 2001, Hillsborough County had roughly 100,483 septic systems (Florida Department of Health, 2004). Data for septic tanks are based on 1970 – 2001 census results, with year-by-year additions based on new septic tank construction. The data do not reflect septic tanks that have been removed going back to 1970. From fiscal years 1993–2002, 9,140 permits for repairs were issued (Florida Department of Health, 2004). Based on the number of permitted septic tanks and housing units located in the county, approximately 76 percent of the housing units are connected to a wastewater treatment facility, with the remaining 24 percent utilizing septic tank systems.

Hillsborough County Population

According to the U.S Census Bureau, the population density in and around WBIDs 1570, 1570A, 1570Y and 1570Z in the year 2000 was at or less than 950 people per square mile of land area. The Bureau reports that the total population for Hillsborough County for 2000 was 998,948 with 425,962 housing units. For all of Hillsborough County, the Bureau reported a housing density of 405 houses per square mile. This places Hillsborough County as having one of the highest housing densities in the state in 2000; a ranking of 6th out of 67 counties in the state of Florida (U.S. Census Bureau, 2004). This is also supported by the land use coverage information, which shows that 36 percent of the land use is dedicated to residences.

Nonpoint sources addressed in this report primarily include loadings from surface runoff. TN and TP loadings from surface runoff were estimated using the loadings calculated at the U.S. Geological Survey (USGS) gage, shown in **Figure 1.2,** and the Watershed Management Model (WMM), which is based on the imperviousness and event mean concentrations (EMCs) from different land use types in the watershed.

4.3.2 Estimating Nonpoint Loadings

The total loadings of nitrogen and phosphorus generated in the LSC watershed were estimated using two methods. First, the loadings at the USGS gage (02306654) located on the Henry Street Canal at Golden Drive were calculated, based on measured flow data and an estimate of water quality in the freshwater reach. Second, the loadings from the ungaged portion of the watershed were estimated using the WMM. The sum of the loads from these two methods was the estimate of the total loads generated in the watershed. The loads were calculated for the 1995 to 2003 period. The 2003 loads are considered the best estimate of existing conditions, because the 2003 rainfall best represents the long-term average rainfall in the watershed compared with the previous 6 years **(Figure 4.2).** The long-term average annual total rainfall is 47 inches, and the rainfall total was 52 inches in 2003 (National Weather Service, 2004).

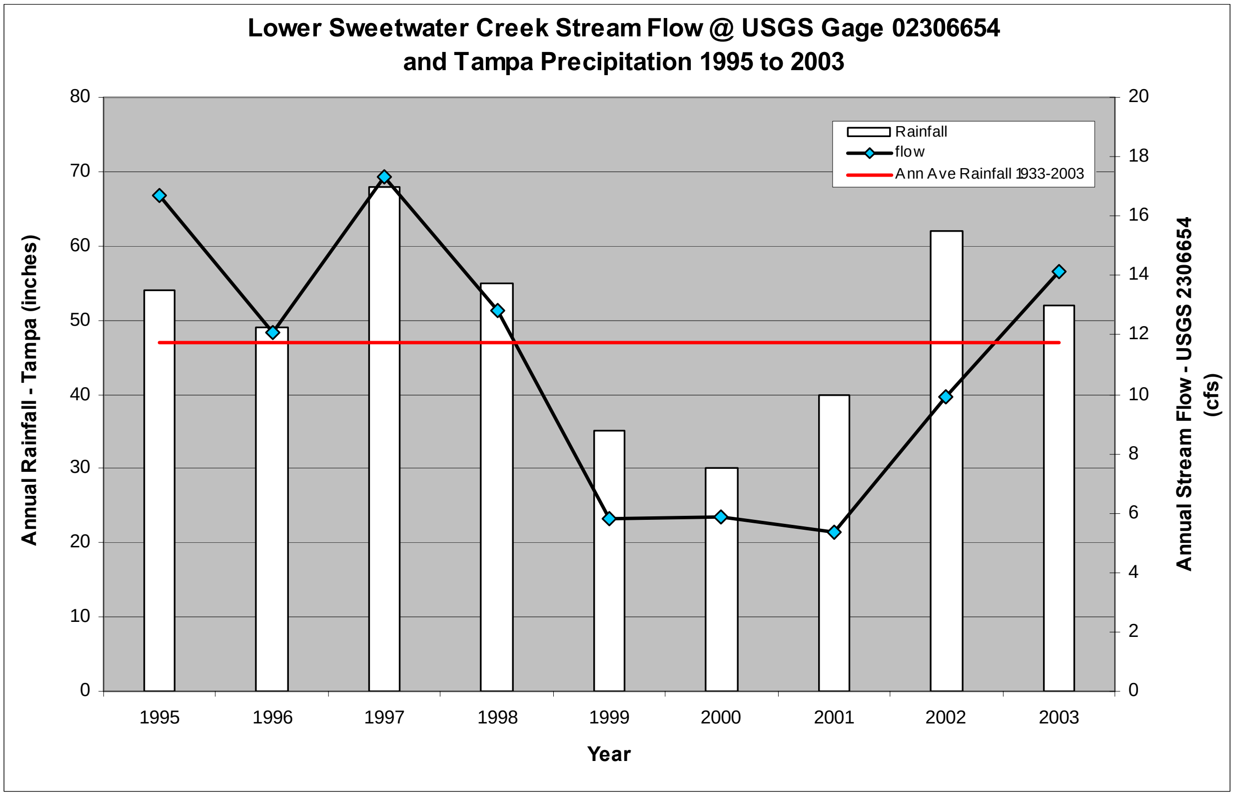

Figure 4.2. Annual Total Precipitation and Annual Average Flow in LSC, WBID 1570A

Estimating TN and TP loadings at the USGS Gage

The nutrient loadings at the USGS gage were calculated using the gaged flow and the nutrient concentrations measured at HCEPC Station 104. Since this station is tidally influenced, only measured data collected under low-salinity conditions (less than or equal to 2.7 parts per thousand [ppt]) were used in the calculation. The low-salinity nutrient results are considered representative of nutrient levels in the freshwater section of the watershed. Monthly loads were calculated using the monthly average streamflow and the median value of the low-salinity TN and TP results (N = 10) collected between 1995 and 2003. The monthly loads were summed to obtain the annual loading from the gaged portion of the watershed. The gaged watershed TN and TP loadings for 2003 were 26,143 pounds and 3,615 pounds, respectively. **Table 4.2** shows the annual loadings for the 1995 to 2003 period.

Table 4.2. TN and TP Loading Estimates for the LSC Watershed, WBID 1570A

Year	TN Load below USGS Gage (lbs)	TN Load at USGS Gage (lbs)	Watershed TN Load (lbs)	TP Load below USGS Gage (lbs)	TP Load at USGS Gage (lbs)	Watershed TP Load (lbs)
1995	32,716	30,920	63,637	5,278	4,276	9,554
1996	29,863	22,294	52,157	4,818	3,083	7,901
1997	40,924	31,993	72,917	6,602	4,425	11,027
1998	33,453	23,541	56,994	5,397	3,256	8,653
1999	21,057	10,720	31,777	3,397	1,482	4,880
2000	18,041	10,842	28,884	2,911	1,499	4,410
2001	24,025	9,888	33,913	3,876	1,367	5,243
2002	37,515	18,309	55,824	6,052	2,532	8,584
2003	31,423	26,143	57,565	5,069	3,615	8,685

Estimating TN and TP Loadings Using the Watershed Management Model

The WMM was used to estimate nonpoint source loading below USGS Gage 02306654. The WMM is designed to estimate annual or seasonal pollutant loadings from a given watershed and evaluate the effect of watershed management strategies on water quality (Camp, Dresser, and McKee, 1998). The Department originally funded the WMM development under contract to Camp, Dresser, and McKee (CDM), and CDM has subsequently refined the model. While the strength of the model is its capability of characterizing pollutant loadings from nonpoint sources (such as those from stormwater runoff, stream baseflow, and leakage of septic tanks), the model also handles point sources such as discharges from wastewater treatment facilities. The estimation of pollution load reduction from partial or full-scale implementation of on-site or regional best management practices (BMPs) is also part of the model; however, the BMP load reduction component was not utilized in the LSC load estimation.

The fundamental assumption of the model is that the amount of stormwater runoff from any given land use is in direct proportion to annual rainfall. The quantity of runoff is controlled by that fraction of the land use category that is characterized as impervious and the runoff coefficients of both pervious and impervious area. The governing equation is as follows:

$$\textbf{(1)}\ R_L = [C_p + (C_I - C_p)\ IMP_L] * I$$

Where:

R_L = total average annual surface runoff from land use L (inches/year),
IMP_L = fractional imperviousness of land use L,
I = long-term average annual precipitation (inches/year),
C_P = pervious area runoff coefficient, and

C_I = impervious area runoff coefficient.

The model estimates pollutant loadings based on nonpoint pollution loading factors (expressed as pounds/acre/year) that vary by land use and the percent imperviousness associated with each land use. The pollution loading factor, M_L, is computed for each land use L by the following equation:

(2) $\mathbf{M_L = EMC_L * R_L * K}$

Where:

M_L = loading factor for land use L (pounds/acre/year),
EMC_L = event mean concentration of runoff from land use L (mg/L); EMC varies by land use and pollutant,
R_L = total average annual surface runoff from land use L computed from Equation (1) (inches/year), and
K = 0.2266, a unit conversion constant.

The data required for applying the WMM include the following:

- Area of all the land use categories and the area served by septic tanks,
- Percent impervious area of each land use category,
- EMC for each pollutant type and land use category,
- Percent EMC of each pollutant type that is in suspended form,
- Annual precipitation,
- Annual baseflow and baseflow concentrations of pollutants, and
- Point source flows and pollutant concentrations.

Data Required for Estimating TN and TP Loadings. To estimate the TN and TP loadings from the LSC watershed using the WMM, the following data were obtained:

A. Rain precipitation data were obtained from the weather station located at Tampa International Airport (National Weather Service Station 88788). These data were retrieved from the Climate Interactive Rapid Retrieval User System (CIRRUS) hosted by the Southeast Regional Climate Center. **Figure 4.2** depicts the annual average precipitation and annual average flow at USGS Gage 02306654 from 1995 to 2003.

B. Areas of different land use categories in the LSC watershed below the USGS gage were obtained by aggregating Level 1 land use coverages and by separating the low-, medium-, and high-density residential land uses from the urban land use category. **Table 4.3** shows the 10 land use categories applied in the WMM. These categories were used because the land use runoff concentrations for southwest Florida are available for these 10 land uses **(Table 4.4).** The dominant land use category in the LSC watershed below the gage is high-density residential, which accounts for about 33 percent of the watershed's total area. Transportation and commercial areas account for 37.5 percent of the ungaged watershed area. The areas occupied by nonanthropogenic land uses account for only 15 percent of the area.

Table 4.3. Percent of Directly Connected Impervious Area for Different Land Use Categories in the LSC Watershed, WBID 1570A, below USGS Gage 02306654

Land Use Category	Area (acres)	Percent Impervious*	Impervious Runoff Coefficient	Pervious Runoff Coefficient	Annual Precipitation (inches)	Runoff (acre-feet)
Forest/rural open	182.80	0.5%	0.95	0.159	51.99	129.1
Urban open	659.26	0.5%	0.95	0.041	51.99	131.4
Agricultural	0.00	0.5%	0.95	0.317	51.99	0.0
Low-density residential	4.76	14.7%	0.95	0.150	51.99	5.5
Medium-density residential	0.00	28.1%	0.95	0.088	51.99	0.0
High-density residential	852.85	67.0%	0.95	0.120	51.99	2,498.2
Communication/highways	733.23	36.2%	0.95	0.542	51.99	2,190.8
Water	70.75	52.6%	0.95	0.000	51.99	153.2
Rangeland	2.95	0.0%	0.95	0.163	51.99	2.1
Wetlands	76.74	0.0%	0.95	0.230	51.99	76.5
TOTAL	**2,583.3**					**5,186.71**

*Percent impervious is the percent of area directly connected to the impervious area (i.e., directly connected impervious area [DCIA]).

Table 4.4. Land Use Runoff Concentrations (Event Mean Concentrations) in Southwest Florida

FLUCCS ID	Land Use	BOD (mg/L)	TN (mg/L)	TP (mg/L)
4000	Forest/rural open	1.23	1.09	0.046
1000-(1100+1200+1300)	Urban open	7.4	1.12	0.18
2000	Agriculture	3.8	2.32	0.344
1100	Low-density residential	4.3	1.64	0.191
1200	Medium-density residential	7.4	2.18	0.335
1300	High-density residential	11.0	2.42	0.49
8000	Communication and transportation	6.7	2.23	0.27
3000+7000	Rangeland	3.8	2.32	0.344
5000	Water	1.6	1.60	0.067
6000	Wetlands	2.63	1.01	0.09

C. Percent impervious area of each land use category is a very important parameter in estimating surface runoff using the WMM. Nonpoint pollution monitoring studies throughout the United States over the past 15 years have shown that annual per-acre discharges of urban stormwater pollution are positively related to the amount of imperviousness in land use (Camp, Dresser, and McKee, 1998). Ideally, the impervious area is the area that does not retain water; therefore, 100 percent of the precipitation falling on the impervious area should become surface runoff. In practice, however, the runoff coefficient for the impervious area typically ranges between 95 and 100 percent. Impervious runoff coefficients lower than this range were observed in the literature, but usually the number should not be lower than 80 percent. For the pervious area, the runoff coefficient usually ranges from 10 to 20 percent. However, values lower than this range were also observed (Camp, Dresser, and McKee, 1998).

It should be noted that the impervious area percentages do not necessarily represent the directly connected impervious area (DCIA). Using a single-family residence as an example, rain falls on rooftops, sidewalks, and driveways. The sum of these areas may represent 30 percent of the total lot. However, much of the rain that falls on the roof drains to the grass and infiltrates to the ground or runs off the property, and thus does not run directly to the street. For the purposes of the WMM modeling, whenever the watershed area contributing to the surface runoff was considered, DCIA was used in place of impervious area. **Table 4.3** lists the percent of DCIA for different land use categories in the watershed and the quantity of surface runoff for TN and TP.

D. Local event mean concentrations (EMCs) of TN and TP for different land use categories for southwest Florida were obtained from Harper and Baker (2003) and are presented in **Table 4.4. Table 4.5** provides the LSC contribution of nitrogen and phosphorus loads from the different EMCs and land use categories below USGS gage 0236654 in 2003.

E. The sediment delivery ratio determines how much TN and TP attaching to suspended particles will be delivered to the destination waterbody. In this study, the sediment delivery ratio was estimated using the correlation between delivery ratio and watershed area developed by Roehl (1962), which in this TMDL is 1.0.

F. **Atmospheric Loading of TN and TP** falling directly into the stream through precipitation is one source of loading to the LSC watershed that was not considered by the WMM. The surface water area in the watershed is relatively small with the atmospheric load falling directly on the water expected to be minimal.

4.3.3 Estimated Loads

The estimated TN and TP loads in the ungaged portion of the watershed for 2003 are 31,423 pounds and 5,069 pounds, respectively **(Table 4.2)**. **Figures 4.3** and **4.4** display the relative percent contributions of TN and TP loads, respectively, from each land use category. The figures show that high-density residential and highway/transportation land uses contribute the largest quantities of TN and TP to the LSC watershed below the USGS gage. For TN, high-density residential land use contributes 52 percent of the load, with highway/transportation contributing 42 percent of the load. For TP, 66 percent of the load is derived from high-density residential areas, with 32 percent derived from highway/transportation land use.

Between 1995 and 2003, the annual TN loadings generated in the LSC watershed varied from a low of 28,884 pounds in 2000 to a high of 72,917 pounds in 1997 **(Table 4.2).** The annual TP loadings ranged from a low of 4,410 pounds in 2000 to a high of 11,027 pounds in 1997. Over the 9-year period, the lowest annual rainfall occurred in 2000 and the highest annual rainfall occurred in 1997 **(Figure 4.2).** The annual TN and TP loads in 2003 were 57,565 pounds and 8,685 pounds, respectively, when the total annual rainfall amount was 52 inches.

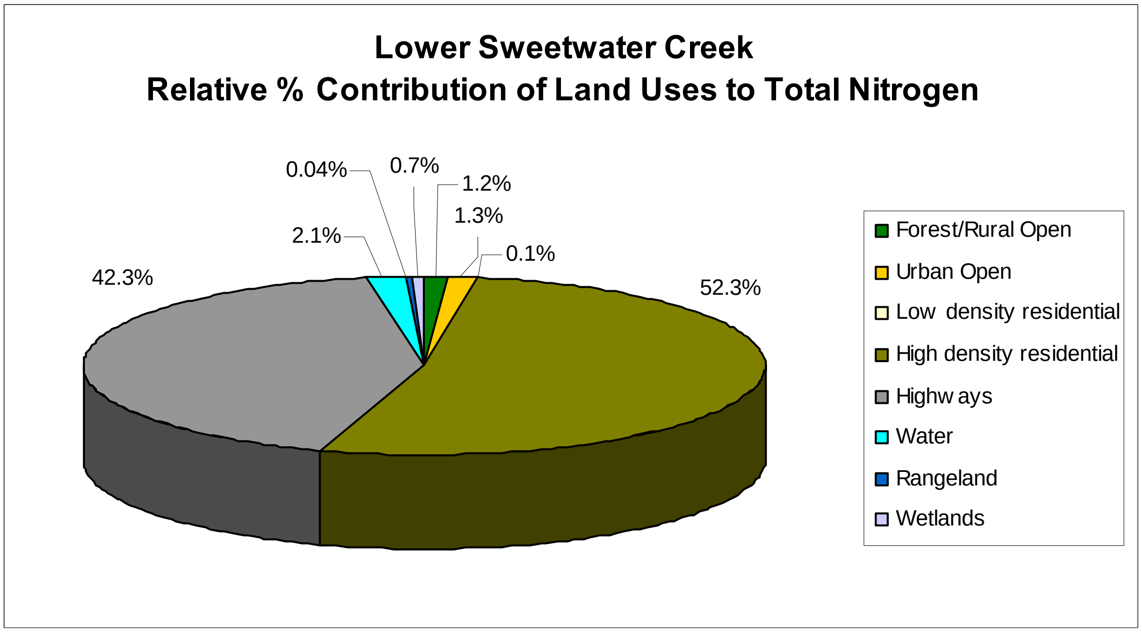

Figure 4.3. Percent Contribution of Nitrogen Loads from Different Land Use Categories in LSC (WBID 1570A) in 2003

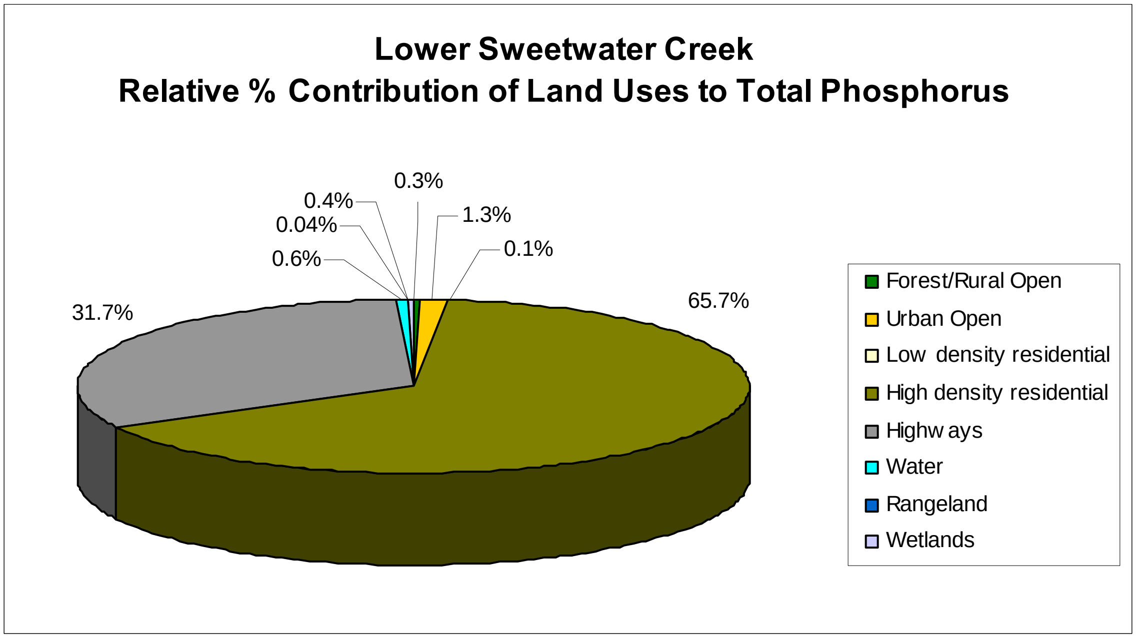

Figure 4.4. Percent Contribution of Phosphorus Loads from Different Land Use Categories in LSC (WBID 1570A) in 2003

Table 4.5. LSC Contribution of Nitrogen and Phosphorus Loads from Different Land Use Categories below USGS Gage 02306654

Land Use Category	TN EMC (mg/L)	TP EMC (mg/L)	D-TN (mg/L)	D-TP (mg/L)	Delivery Ratio	TN Load (lbs)	TP Load (lbs)	Percent of total TN	Percent of total TP
Forest/ rural open	1.09	0.046	1.09	0.05	1	382.5	16.1	1.22	0.32
Urban open	1.12	0.18	1.12	0.18	1	400.2	64.3	1.27	1.27
Agricultural	2.32	0.344	2.32	0.34	1	0.0	0.0	0.00	0.00
Low-density residential	1.64	0.191	1.64	0.19	1	24.6	2.9	0.08	0.06
Medium-density residential	2.18	0.335	2.18	0.34	1	0.0	0.0	0.00	0.00
High-density residential	2.42	0.49	2.42	0.49	1	16,440.1	3,328.2	52.32	65.67
Highways	2.23	0.27	2.23	0.27	1	13,285.6	1,608.6	42.28	31.73
Water	1.6	0.067	1.60	0.07	1	666.4	27.9	2.12	0.55
Rangeland	2.32	0.344	2.32	0.34	1	13.1	1.9	0.04	0.04
Wetlands	1.01	0.09	1.01	0.09	1	210.0	18.7	0.67	0.37
Total						**31,422.7**	**5,069.3**		

D-TN is the calculated EMC for dissolved TN. Concentration of particulate form is considered to be zero; Percent of suspended TN is considered to be zero.
D-TP is the calculated EMC for dissolved TP. Concentration of particulate form is considered to be zero; Percent of suspended TP is considered to be zero.
Delivery Ratio is the fraction of the suspended TN and TP loadings that eventually reaches the stream.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

The goal of this TMDL development is to identify the maximum allowable TN loading to the watershed, so that the tidal segment of LSC will meet the nutrient water quality criterion and maintain its function and designated use as a Class III water. The Department initially attempted to determine LSC's assimilative capacity through the statistical evaluation of available nutrient loading and chlorophyll *a* data, but these efforts were not successful (see the next section). Because a statistically significant relationship between loading and chlorophyll *a* was not found, the Department estimated the assimilative capacity for TN based on the observation that the annual average chlorophyll *a* value in 2003 did not exceed the IWR estuary threshold of 11 μg/L, while the previous 8 years exceeded the threshold **(Figure 2.2).** In the last 2 years, annual average chlorophyll *a* values have declined considerably, which may be attributed to management activities in and around Lake Egypt (described in **Section 5.4**). Maintaining the TN loading at the 2003 levels and applying a margin of safety (MOS) should prevent increases in chlorophyll *a* values. Therefore, the pollutant loading target (TMDL) for the LSC watershed is an annual TN loading of 57,565 pounds or less, which is the load estimated for 2003.

It should be noted that the TN loading estimates for 1999 through 2002 were actually lower than those estimated for 2003 **(Table 4.2),** and that the creek had higher annual average chlorophyll *a* values for these years. The lower TN loading in 1999, 2000, and 2001, however, was largely due to lower-than-average rainfall in these years. Because the nutrient impairment is expected to be due primarily to stormwater loading, the Department concluded that the assimilative capacity should be based on the estimated load for a year approximating average rainfall conditions. The Department acknowledges that rainfall and estimated loading for 1998 were fairly similar to those for 2003, but that chlorophyll *a* levels were significantly higher in 1998. However, the loading estimates (both from the WMM and gage information) do not take into account any reductions in nutrient loading from stormwater management activities that have been implemented over the last few years in the watershed.

For these reasons, the Department concluded that the loading for 2003 is a reasonable estimate of the assimilative capacity for the creek. However, since the annual average chlorophyll *a* level for 2003 was exactly at the IWR threshold of 11 μg/L, a MOS is needed to account for the uncertainty in the relationship between the pollutant loading and receiving water quality. An explicit MOS of 20 percent was incorporated in the TMDL to ensure that the IWR estuarine threshold of 11 μg/L will not be exceeded in the future. The watershed load allocation is 46,052 pounds per year, derived by subtracting 20 percent from the TMDL.

5.2 Attempts To Develop Empirical Relationships

Attempts were made to identify relationships between the watershed TN loading and the chlorophyll *a* values measured at HCEPC Station 104. No strong correlation between loadings and receiving water quality was found. This lack of a relationship is at least partially due to the limited information used to derive the loading estimates. For example, there was no freshwater monitoring site available for calculating the gaged load to the creek, and only a small number of samples (N = 10) collected at the long-term tidal station are considered representative of water quality in the gaged portion of the watershed. Because of the paucity of freshwater data, the median value of these 10 samples was used to calculate the loads between 1995 and 2003. Interbasin water transfers that may be occurring would also need to be factored into the loading calculation.

Additional monitoring and evaluation must be continued and will be addressed in the development of the implementation plan for the LSC watershed TMDL.

5.3 Relationships Between Nutrients and DO

Reductions in TN loading are also expected to result in additional benefits for other water quality variables potentially causing impairment, including DO and BOD. The analysis of the LSC data, described in Chapter 2, suggests that reductions in nitrogen will result in lower algal biomass levels in the water column and less algal-based total suspended solids and BOD. The lower algal biomass levels are expected to result in smaller diurnal fluctuations in DO.

Although the chlorophyll *a* threshold was met in 2003, DO levels did not appear to increase compared with previous years, when the annual average chlorophyll *a* concentration was above the threshold. Additional information is needed to determine the assimilative loading capacity to meet the DO criterion.

5.4 Current Restoration and Management Projects

Several management activities implemented in and around Lake Egypt in recent years may be contributing to the lower chlorophyll *a* concentrations observed in the tidal segment. Hillsborough County has installed a Vortechnix unit on the northeast side of Lake Egypt to treat stormwater at an inflow to the lake. Also, in past years, the lake was treated with herbicides and stocked with fish, which destroyed the lake macrophyte community and resulted in periodic phytoplankton blooms (Jack Merriam, personal communication, 2004). These practices have ceased, and in recent years the macrophytes have started to recover and phytoplankton blooms have not been observed. The changes in lake management activities should decrease the nutrient load flowing from Lake Egypt, providing benefits to surface water quality downstream of the lake.

5.5 Critical Conditions

The estimated assimilative capacity was based on long-term average conditions (i.e., values from all four seasons in calendar year 2003) rather than critical/seasonal conditions because (a) the methodology used to determine the assimilative capacity does not lend itself very well to short-term assessments, (b) the Department is generally more concerned with the net change in overall primary productivity in the segment, which is better addressed on an annual basis, and (c) the methodology used to determine impairment is based on an annual average and requires data from all four quarters of a calendar year.

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. The goal of the TMDL development for LSC is to identify the maximum allowable TN loading to the watershed so that the tidal segment will meet applicable water quality standards and maintain its function and designated use as a Class III water.

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) that takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

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

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

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

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

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

This approach is consistent with federal regulation 40 CFR § 130.2[I] (U.S. Environmental Protection Agency, 2003), which states that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measure. The TMDL for LSC is expressed in terms of pounds per year and represents the maximum annual load the tidal segment can assimilate and maintain the narrative nutrient criterion **(Table 6.1).**

Table 6.1. TMDL Components and Current Loadings for the LSC Watershed

Parameter	WLA		LA (lbs/year)	MOS[1] (lbs/year)	TMDL (lbs/year)	Percent Reduction
	Wastewater (lbs/year)	NPDES Stormwater (Percent Reduction)				
Total Nitrogen	NA	20	46,052	11,513	57,565	20

[1] The MOS is 20 percent of the TMDL for TN.
NA – Not Applicable.

6.2 Load Allocation (LA)

As described in Chapter 4, the nonpoint source loadings for the LSC TMDL are based on loadings calculated at the USGS gage and loadings estimated using the WMM for the watershed downstream of the gage, minus a MOS. The LA to nonpoint sources in this TMDL is 46,052 pounds per year of TN **(Table 6.1).** It should be noted that the LA includes loading from stormwater discharges regulated by the Department and the water management districts that are not part of the NPDES stormwater program (see **Appendix A**).

6.3 Wasteload Allocation (WLA)

6.3.1 NPDES Wastewater Discharges

There are no permitted NPDES wastewater discharges to LSC. As such, the WLA for wastewater discharges is not applicable.

6.3.2 NPDES Stormwater Discharges

The WLA for stormwater discharges with an MS4 permit is a 20 percent reduction in TN loading, which is the same percent reduction in load that is required for nonpoint sources to meet the allowable loading of 46,052 pounds per year of TN **(Table 6.1).** The 20 percent reduction is the MOS for the TMDL. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

TMDLs must address uncertainty issues by incorporating a MOS into the analysis. The MOS is a required component of a TMDL and accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving waterbody (Clean Water Act, Section 303[d][1][c]). Considerable uncertainty is usually inherent in estimating nutrient loading from nonpoint sources, as well as predicting water quality response. The effectiveness of management activities (e.g., stormwater management plans) in reducing loading is also subject to uncertainty.

The MOS can either be implicitly accounted for by choosing conservative assumptions about loading or water quality response, or explicitly accounted for during the allocation of loadings. While the Department usually uses an implicit MOS based on the conservative assumptions in the models used to determine the assimilative capacity, an explicit MOS was used because this TMDL was not based on modeling. For the LSC watershed, an explicit MOS of 20 percent was applied to the TN loading for 2003 **(Table 6.1).** An explicit MOS was warranted because the annual average chlorophyll *a* value for 2003 was exactly at the IWR estuarine threshold.

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 LSC watershed. 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.

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Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

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

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a 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 1 of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 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 similar to other point sources of pollution, such as domestic and industrial wastewater discharges. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

Appendix B: Water Quality Monitoring Results for the Verified Period (1995 – 2002), LSC, WBID 1570A

HEPC Station	Date	TN (mg/L)	Organic Nitrogen (mg/L)	BOD 5-day	DO (mg/L)	Chlorophyll *a* (μg/L)
104	1/24/1995	1.78	1.10	2.20	4.2	2.9
104	2/21/1995	1.26	0.88	2.30	2	2.8
104	3/21/1995	1.4	1.39	4.60	6.8	25.6
104	4/25/1995	1.33	1.09	1.90	1.2	18.4
104	5/23/1995	1.28	1.26	5.00	2.6	49.0
104	6/27/1995	0.96	0.58	1.20	3.5	2.5
104	7/25/1995	1.46	0.89	0.50	2.1	4.7
104	8/22/1995	1.39	0.92	1.50	1.9	2.4
104	9/26/1995	1.8	1.45	4.30	1.28	44.9
104	10/24/1995	1.74	1.27	2.20	3.5	32.9
104	11/28/1995	1.31	1.30	4.65	6.7	23.2
104	12/12/1995	1.3	1.01	3.39	3.8	25.9
104	1/23/1996	1.13	0.96	0.98	6	17.7
104	2/20/1996	1.1	0.75	0.10	6.5	6.9
104	3/19/1996	1.66	1.46	3.90	4	42.8
104	4/16/1996	1.57	1.19	1.28	2.2	7.1
104	5/14/1996	1.37	1.33	4.70	0.7	3.2
104	6/18/1996	1.09	0.72	1.92	0.84	3.2
104	7/16/1996	0.77	0.40	1.64	0.7	3.2
104	8/20/1996	1.05	0.81	1.39	0.5	16.9
104	9/24/1996	1.15	0.89	1.93	2.6	45.0
104	10/15/1996	1.11	1.00	2.34	3.6	11.3
104	11/19/1996	0.87	0.84	2.32	6.4	19.2
104	12/10/1996	1.01	0.63	2.00	4.3	4.3
104	1/21/1997	0.8	0.73	2.30	5.7	19.3
104	2/18/1997	0.89	0.59	1.50	0.82	3.3
104	3/18/1997	1.21	1.13	4.80	2.2	34.4
104	4/15/1997	0.92	0.70	1.40	1.36	10.9
104	5/20/1997	1.18	1.12	2.60	3.7	27.2
104	6/17/1997	1	0.98	5.50	3.5	26.7
104	7/22/1997	1.39	1.22	3.50	2.5	37.8
104	8/19/1997	1.24	0.90	1.60	2.2	15.5
104	9/16/1997	1.06	0.84	2.30	1.44	17.5
104	10/14/1997	1.36	0.83	2.10	3.3	13.0
104	11/18/1997	1.27	0.69	1.00	5	3.3
104	12/9/1997	1.46	0.88	2.00	3.5	15.7
104	1/20/1998	1.21	0.71	0.70	5.1	4.3
104	2/17/1998	0.72	0.51	3.50	6.9	5.0
104	3/17/1998	1	0.81	2.60	7	12.5
104	4/21/1998	2	1.91	6.70	3.2	138.5
104	5/19/1998	0.9	0.88	2.20	4.9	13.5
104	6/16/1998	0.83	0.77	2.40	3	16.5

HEPC Station	Date	TN (mg/L)	Organic Nitrogen (mg/L)	BOD 5-day	DO (mg/L)	Chlorophyll *a* (μg/L)
104	7/21/1998	0.75	0.41	1.90	1.36	2.3
104	8/25/1998	1.19	0.96	1.90	1.6	18.9
104	9/15/1998	1.23	0.97	3.60	4.8	37.6
104	10/20/1998	1.33	0.96	2.20	1.8	15.5
104	11/17/1998	1.15	0.68	0.40	1.6	1.9
104	12/8/1998	0.81	0.65	1.80	4.3	11.4
104	1/19/1999	0.77	0.65	1.00	4.8	0.7
104	2/16/1999	0.65	0.57	1.60	5.1	3.1
104	3/16/199	1.02	0.65	0.90	1.04	2.8
104	4/20/1999	1.12	1.09	4.10	6	27.4
104	5/18/1999	1.17	1.09	4.00	1.36	34.4
104	6/15/1999	0.93	0.83	4.20	1.9	38.2
104	7/20/1999	1.25	1.22	6.70	1.6	55.5
104	8/17/1999	0.77	0.74	2.80	3.6	40.6
104	9/22/1999	1.06	0.74	0.30	0.14	8.7
104	10/12/1999	0.93	0.84	3.20	2.6	34.7
104	11/16/1999	0.76	0.60	1.50	4.8	14.8
104	12/14/1999	0.77	0.61	1.50	3.6	6.9
104	1/18/2000	0.98	0.89	1.80	6.8	15.9
104	2/15/2000	0.93	0.62	1.20	2.2	2.6
104	3/14/2000	1.34	1.26	3.70	3	27.0
104	4/18/2000	1.09	1.08	3.00	5.7	17.7
104	5/16/2000	1.38	1.21	2.50	2.4	17.7
104	6/20/2000	1.72	1.69	5.10	1.32	46.2
104	7/18/2000	1.8	1.40	1.40	3.2	17.2
104	8/15/2000	1.69	1.25	1.30	0.47	6.8
104	9/19/2000	1.91	1.68	1.70	2.1	13.0
104	10/10/2000	1.97	1.86	3.70	1.12	8.2
104	11/14/2000	1.91	1.84	2.90	3.2	20.7
104	12/12/2000	1.38	1.13	3.10	3.3	14.4
104	1/16/2001	1.02	0.94	3.30	5.4	12.4
104	2/20/2001	1.51	1.50	6.80	2.2	39.9
104	3/20/2001	1.36	1.01	3.90	0.84	75.7
104	4/17/2001	1.33	1.24	6.70	2.8	50.6
104	5/15/2001	1.36	1.33	3.80	3.8	13.9
104	6/19/2001	1.38	1.34	6.83	0.26	38.9
104	7/24/2001	0.94	0.75	1.91	0.12	15.1
104	8/21/2001	1.38	1.31	3.26	0.74	32.0
104	9/18/2001	1.35	0.72	0.91	3.4	
104	10/16/2001	0.92	0.64	1.4	1.95	3.04
104	11/13/2001	0.9	0.65	1.1	2.85	1.71
104	12/11/2001	1.07	0.74	1.2	0.93	4.62
104	1/15/2002	0.577	0.25	2.0	4.8	2.2
104	2/19/2002	0.771	0.68	2.0	6.7	9.6
104	3/19/2002	1.141	1.11	2.0	2.4	17.2

HEPC Station	Date	TN (mg/L)	Organic Nitrogen (mg/L)	BOD 5-day	DO (mg/L)	Chlorophyll *a* (μg/L)
104	4/16/2002	1.210	1.16	2.0	3.8	9.7
104	5/14/2002	1.523	1.37	3.0	1.9	10.8
104	6/18/2002	1.475	1.39	4.0	0.36	29.2
104	7/23/2002	1.419	1.17	2.0	0.4	24.9
104	8/20/2002	1.343	1.00	1.0	1.02	6.2
104	9/17/2002	1.191	1.01	1.0	2.1	8.5
104	10/15/2002	1.155	0.92	2.0	1.3	30.3
104	11/19/2002	0.959	0.67	2.0	2.4	9.3
104	12/10/2002	0.868	0.42	2.0	6.7	3.1

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