Total Maximum Daily Load

for

Fecal Coliforms

in

Phillippi Creek (WBID 1937)

August 2010

Region4 serving the southeast

In compliance with the provisions of the Federal Clean Water Act, 33 U.S.C §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 400-4, the U.S. Environmental Protection Agency is hereby establishing this Total Maximum Daily Load (TMDL) for fecal coliforms in Phillippi Creek (WBID 1937). Subsequent actions must be consistent with this TMDL.

/s/ 8/23/2010

James D. Giattina, Director
Water Protection Division

Date

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LIST OF ABBREVIATIONS

BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CO_2	Carbon Dioxide
DO	Dissolved Oxygen
DYNHYD	Dynamic Estuary Model Hydrodynamic Program
EMC	Event Mean Concentration
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FLUCCS	Florida Land Use Cover Classification System
FS	Florida Statutes
GIS	Geographic Information System
HUC	Hydrologic Unit Code
IWR	Impaired Waters Rule
KM^2	Square Kilometers
L	Liters
L/FT^3	Liters per Cubic Foot
LA	Load Allocation
LB/YR	Pounds per year
MF	Membrane Filter
MGD	Million Gallons per Day
MG/L	Milligram per liter
ML	Milliliters
MOS	Margin of Safety
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer Systems
NASS	National Agriculture Statistics Service
NH_4	Ammonia Nitrogen
NHD	National Hydrography Data
NO_2	Nitrite
NO_3	Nitrate
NPDES	National Pollutant Discharge Elimination System

OBS	Observations
PLRG	Pollutant Load Reduction Goal
SEC/DAY	Seconds per Day
SIMPLE	Spatially Integrated Model for Pollutant Loading Estimates
SWFWMD	Southwest Florida Water Management District
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorus
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WBID	Water Body Identification
WLA	Waste Load Allocation
WQS	Water Quality Standards
WMD	Water Management District
WTF	Water Treatment Facility
WWTP	Waste Water Treatment Plant
YR	Year

SUMMARY SHEET

Total Maximum Daily Load (TMDL)

1. **303(d) Listed Waterbody Information**
   State: Florida
   Major River Basins: Sarasota Bay (HUC 03100201).

1998 303(d) Listed Waterbodies for TMDLs addressed in this report:

WBID	Segment Name	County	Class and Waterbody Type	Constituent(s)
1937	Phillippi Creek	Sarasota	Class III Freshwater Stream	Fecal Coliform Bacteria

2. **TMDL Endpoints (i.e., Targets)**

Class III Waters (Fresh):

Fecal Coliforms:

The State of Florida's water quality criteria state that fecal coliform concentrations are not to exceed 400 MPN/100mL in more than 10 percent of the samples and not to exceed 800 MPN/100mL in any one sample. Insufficient data were collected to evaluate the chronic fecal coliform criterion (i.e., 200 MPN/100mL expressed as geometric mean of 10 or more samples collected in a 30-day period). The percent reduction required for the fecal coliform TMDL was calculated to meet the instantaneous criterion of 800 MPN/100ml, since that resulted in a more stringent reduction.

3. **TMDL Approach**

The fecal coliform TMDL allocation is expressed as the percent reduction that would meet all components of the bacterial water quality standard for Class III waters. Load duration curves were developed in order to better understand the hydrologic conditions under which the water quality typically exceed the fecal coliform criteria.

4. **TMDL Allocations**

Parameter	TMDL (%)	WLA[1]		LA (%)
		Facility (MPN/100ml)	MS4 (%)[2]	
Fecal Coliforms	98	NA	98	98

Notes for TMDL Allocations table:

1. The WLA is separated into an allocation for continuous NPDES facilities and an allocation for the MS4. WBID 1937 is within the collection area for Phase I MS4 permit # FLS000004, which is held by the City of Sarasota, Sarasota County, and other co-permittees. Due to the infeasibility of separating the contributions from diffuse MS4 and non-MS4 sources, MS4s are allocated the same percent reductions as the Load Allocation. The NPDES facilities that currently operate within the Phillippi Creek

watershed discharge to land or storage ponds and are not expected to cause or contribute to impairments, therefore WLAs for these individual facilities are not provided.

2. Percent reduction in total pollutant loading from current conditions to achieve the applicable standard. The percent reductions are applied to nonpoint sources (LA) and MS4s.

5. Endangered Species (yes or blank):

6. USEPA Lead on TMDL (USEPA or blank): USEPA

7. TMDL Considers Point Source, Nonpoint Source, or both: Both

8. Major NPDES Discharges to surface waters addressed in TMDL:

NPDES Permit	Facility Name	Discharge Type
FLS000004	Sarasota County, City of Sarasota	MS4

NOTE: There are also three active NPDES facilities in the Phillippi Creek Watershed. However, since none of the facilities were believed to cause or contribute significantly to the impairments, none of the facilities were assigned WLAs.

1. Introduction

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting water quality standards. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Florida Department of Environmental Protection (FDEP) developed a statewide, watershed-based approach to water resource management. Under the watershed management approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework FDEP uses for developing and implementing TMDLs. The state's 52 basins are divided into 5 groups, and water quality is assessed in each group on a rotating 5-year cycle. FDEP also established five water management districts (WMD) responsible for managing ground and surface water supplies in the counties encompassing the districts. Phillippi Creek is a Group 3 waterbody managed by the Southwest Florida Water Management District (SWFWMD).

For the purpose of planning and management, the WMDs divided the district into planning units defined as either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. These planning units contain smaller, hydrological based units called drainage basins, which are further divided by FDEP into "water segments". A water segment usually contains only one unique waterbody type (stream, lake, canal, etc.) and is about 5 square miles. Unique numbers or waterbody identification (WBIDs) numbers are assigned to each water segment. This TMDL report addresses WBID 1937 of Phillippi Creek. The geographic location of this WBID is shown in Figure 1.

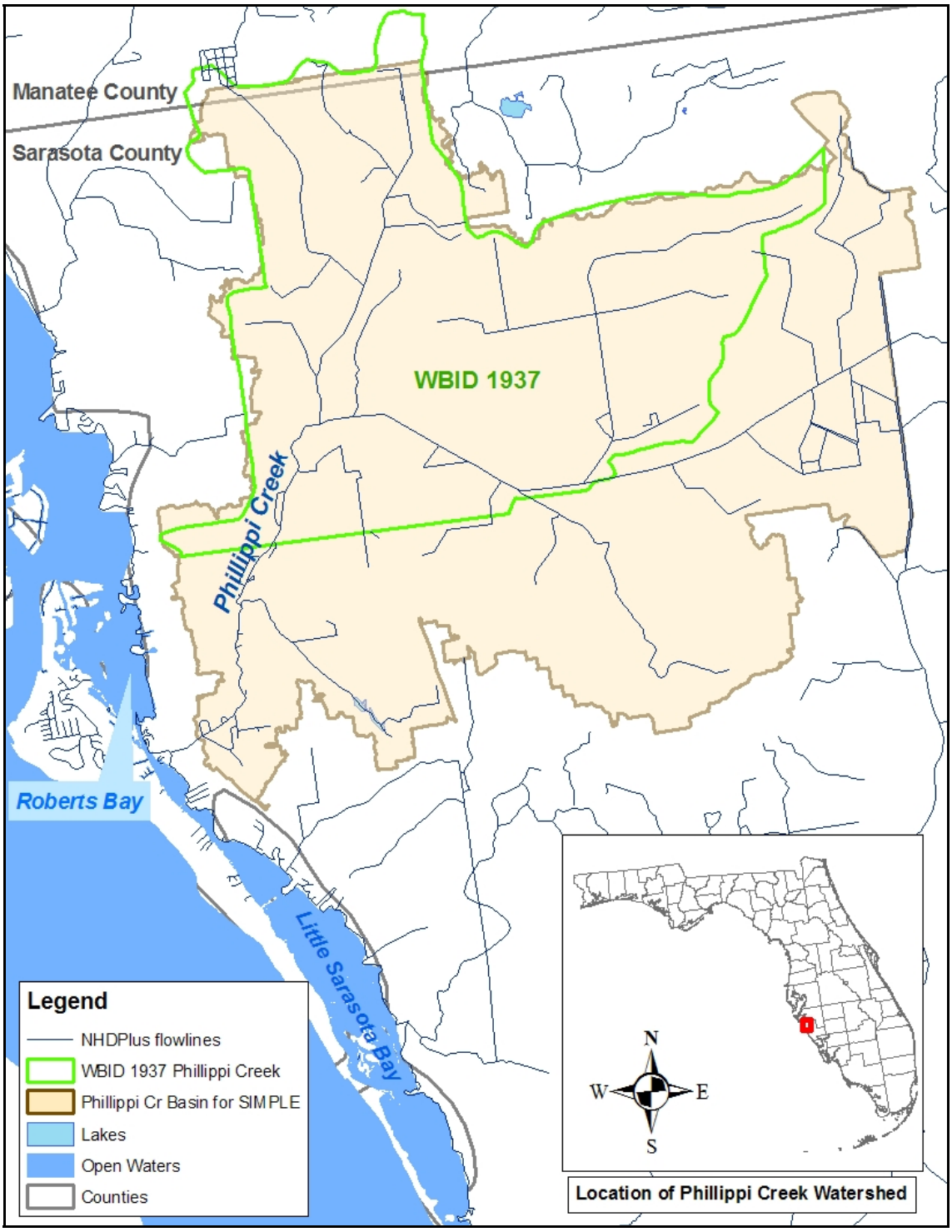

Figure 1. Location of WBID 1937 (Phillippi Creek).

2. Problem Definition

To determine the status of surface water quality in the state, three categories of data – chemistry data, biological data, and fish consumption advisories – were evaluated to determine potential impairments. The level of impairment is defined in the Identification of Impaired Surface Waters Rule (IWR), Section 62-303 of the Florida Administrative Code (FAC). Potential impairments are determined by assessing whether a waterbody meets the criteria for inclusion on the planning list. Once a waterbody is on the planning list, additional data and information will be collected and examined to determine if the water should be included on the verified list. The IWR defines the thresholds for determining if waters should be placed on the state's planning and verified lists.

Florida's final 1998 Section 303(d) list identified Water Body Identifications (WBIDs) in the Sarasota Bay Basin that are not supporting water quality standards (WQS). The TMDLs addressed in this document are being established pursuant to USEPA commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). After assessing all readily available water quality data, USEPA is responsible for determining whether a TMDL should be developed for fecal coliform bacteria in WBID 1937 of Phillippi Creek.

The format of the remainder of this report is as follows: Chapter 3 is a general description of the impaired watershed; Chapter 4 describes the water quality standards and target criteria; and Chapter 5 describes the data assessments; Chapter 6 describes the sources contributing to the impairments; Chapter 7 describes the approach used to develop the TMDL; and Chapter 8 explains the TMDL allocations.

3. Watershed Description

Phillippi Creek drains approximately 56 square miles of northern Sarasota County, including part of the city of Sarasota. The watershed consists of a network of natural streams and man-made channels that carry water away from relatively flat, low-lying, and poorly drained soils. Phillippi Creek flows southwesterly toward its mouth, emptying into a southern segment of Sarasota Bay called Roberts Bay. The sub-basin, which is the third largest in Sarasota County, is the largest contributor of freshwater, nutrients, and metals to Roberts Bay (FDEP, 2003).

As can be seen in Figure 2, landuse in the Phillippi Creek watershed is largely developed. Over 70 percent of the watershed area consists of urban, residential, commercial, or industrial developments (Table 1). In fact, private residences and their back yards and docks directly abut many segments of Phillippi Creek. Sarasota County holds a Phase I Municipal Separate Storm Sewer System (MS4) permit #FLS000004, which covers the city of Sarasota, as well as other co-permittees. Approximately seven percent of the watershed is used for agricultural purposes such as cropland and pastureland, mostly in the eastern portion. Forest, water, wetlands, and transportation and utilities each take up about five percent of the overall landuse. There are two Water Treatment Facilities (WTFs), as well as a minor Waste Water

Treatment Plant (WWTP), located in the Phillippi Creek watershed. All of these facilities discharge to percolation ponds, which may overflow to Phillippi Creek during rain events. The South Gate WWTP (FL0032808) is a major domestic facility that had discharged directly to Phillippi Creek until June 2008, when the effluent started being sent to the Bee Ridge Water Reclamation Facility (David Pouso, personal communication). Additional information about these National Pollutant Discharge Elimination System (NPDES) facilities may be found in Section 6.1.

Table 1. Land Cover Distribution for Phillippi Creek Watershed.[1]

Impaired Waterbody	WBID(s)	Unit[2]	Urban Residential & Built-Up	Agriculture	Upland Nonforested	Forest	Water	Wetlands	Transportation & Utilities	Disturbed Land	Total
Phillippi Creek	1937, 1941, 1947, 1966, 1971, 1971A	Km^2	103.4	9.8	0.6	7.4	7.6	6.7	7.7	0.09	143.3
		percent	72%	7%	0.4%	5%	5%	5%	5%	0.1%	100%

Notes:

1. Land use data are based on 2006 SWFWMD land cover features categorized according to the Florida Land Use and Cover Classification System (FLUCCS). The features were photointerpreted from 2006 one-foot color infrared digital aerial photographs at the 1:12,000 scale. Areas in the table represent the watershed, not just the area draining to the impaired segment (WBID 1937).
2. Km^2= square kilometers.
3. The urban/residential and built-up category includes commercial, industrial and extractive uses.
4. The upland nonforested category includes shrub and brushland.

Many of the residential developments in the Phillippi Creek watershed were designed to have their sewage treated by onsite septic tanks and small, private package plants. The elevated bacteria levels that lead to Phillippi Creek being 303(d)-listed for fecal coliforms has been attributed to failures of these septic systems. To mitigate this problem, Sarasota County established the Phillippi Creek Septic System Replacement Program in 2000. The main program goal is to remove approximately 14,000 septic systems, replacing them with connections to a central sewer line (Sarasota County Government, 2009). This multi-year program has already completed septic system replacement in some service areas of the watershed. Work will continue in other areas, with priority being placed on those areas deemed to have a higher likelihood of septic system failure.

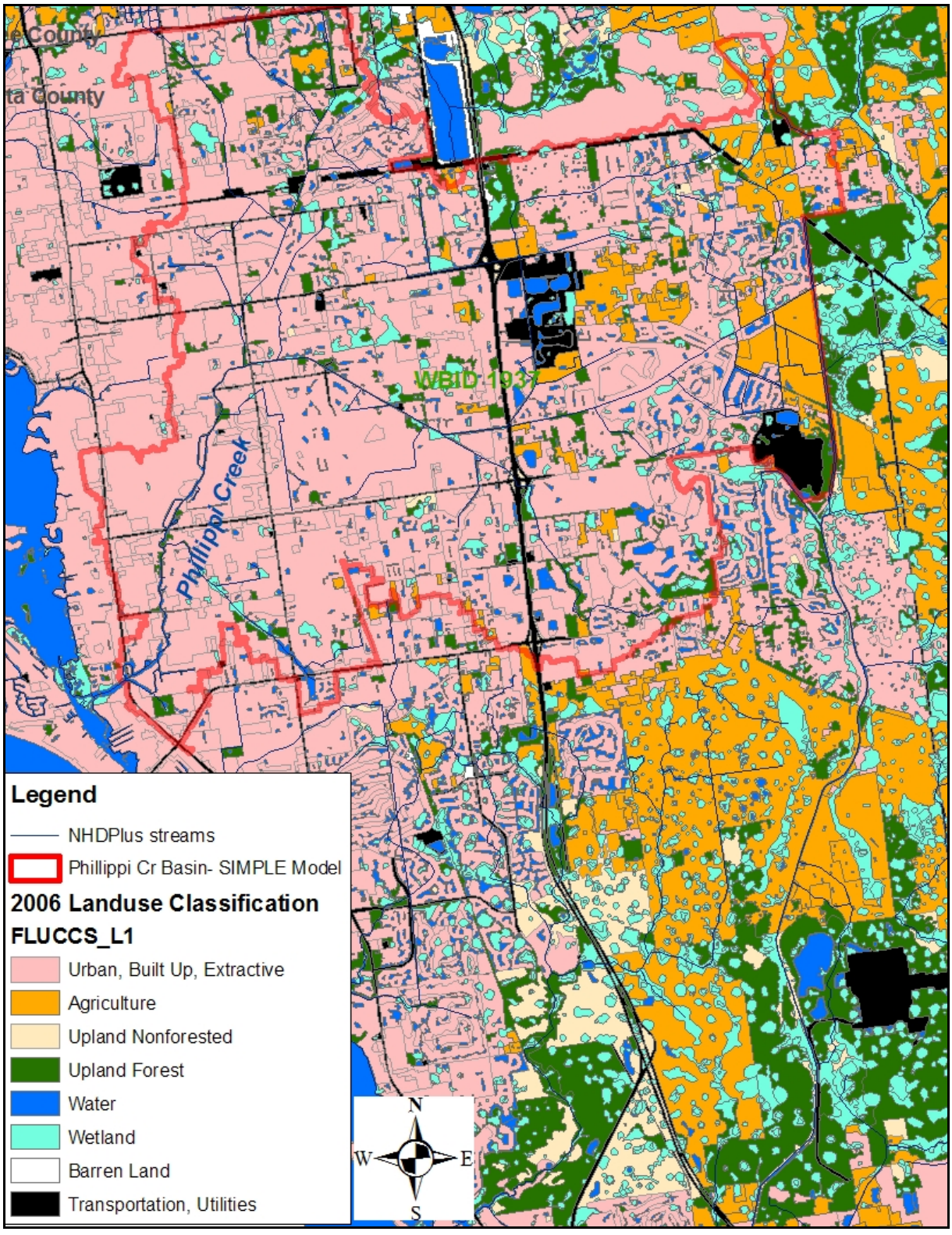

Figure 2. Landuse in the Phillippi Creek Watershed.

4. Water Quality Standards

WBID 1937, the segment of Phillippi Creek addressed in this TMDL report, is a predominantly freshwater Class III stream. Downstream of this is WBID 1947, a Class III marine estuary. The designated uses of Class III waters include recreation, and propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The water quality criteria for protection of Class III waters are established by the State of Florida in the Florida Administrative Code (FAC), Section 62-302.530. The individual criteria should be considered in conjunction with other provisions in water quality standards that apply to all waters, including Section 62-302.500 FAC [Surface Waters: Minimum Criteria, General Criteria], unless alternative or more stringent criteria are specified in FAC Section 62-302.530. In addition, unless otherwise stated, all criteria express the maximum not to be exceeded at any time. The specific criteria addressed in this TMDL document are provided below.

4.1. Fecal Coliform Bacteria (Class III Fresh and Marine):

> The most probable number (MPN) or membrane filter (MF) counts per 100 ml of fecal coliform bacteria shall not exceed a monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period. [FAC 62-302.530 (6)]

The geometric mean criteria reflect chronic or long-term water quality conditions, whereas the 400 and 800 values reflect acute or short-term conditions. To determine the impairment status of the streams, available data were assessed against both components of the acute criteria. It was not possible to assess against the geometric mean criteria due to insufficient data. The 800 MPN/100 ml criterion was selected as the endpoint for the fecal coliform TMDL, since this resulted in more stringent reductions.

5. Water Quality Assessment

A water quality assessment was conducted to review fecal coliform data for WBID 1937 of Phillippi Creek. Water quality data from Version 35 of FDEP's IWR database were assessed, along with information provided by Sarasota County. The IWR database contains data from various sources within the state of Florida, including the Water Management Districts and counties.

Table 2 identifies monitoring stations located within WBID 1937 of Phillippi Creek and lists their time period of record. The locations of these sampling stations are displayed in Figure 3, and summary statistics for water quality data collected in the WBID between December 1997 and March 2008 is provided in Table 3. The original data are included in the Administrative Record for this report, and are also available upon request. Explanations of data remark codes are provided in Appendix A.

Table 2. Water Quality Monitoring Stations in WBID 1937.

Station	Station Name	First Date	Last Date	Obs.[1]
21FLBRA 1937-A	1937 - Phillippi Creek - bridge on Fruitville Rd	06/20/2007	01/17/2008	141
21FLGW 3502	Phillippe Creek near Bee Ridge Road.	10/12/1998	03/03/2008	3411
21FLGW FLO0100	Phillippe Creek near Bee Ridge Road	12/03/1997	09/23/1998	181
21FLGW FLO0102	Phillippe Creek	12/03/1997	09/23/1998	184
21FLTPA 27183038230361	TP183-Phillippe Creek	02/22/2003	01/15/2004	158
21FLTPA 27192228228518	TP184-Phillippe Creek	02/22/2003	01/12/2004	153

NOTES:
1. Obs= number of observations for all water quality parameters.

Table 3. Summary Statistics of Water Quality Data for WBID 1937.

Parameter	Obs.	Mean	Min.	Max.	First Date	Last Date
Fecal Coliform (MPN/100ml)	134	1235.8	18	32000	12/03/1997 11:15	03/03/2008 10:00

NOTES:

1. Obs= number of observations; Max= maximum value; Min= minimum value; Mean= average value.
2. Some values contributing to these statistics are below the practical quantification or reporting limit; in those instances the value was left as the reported limit. Please see original data for associated remark codes.

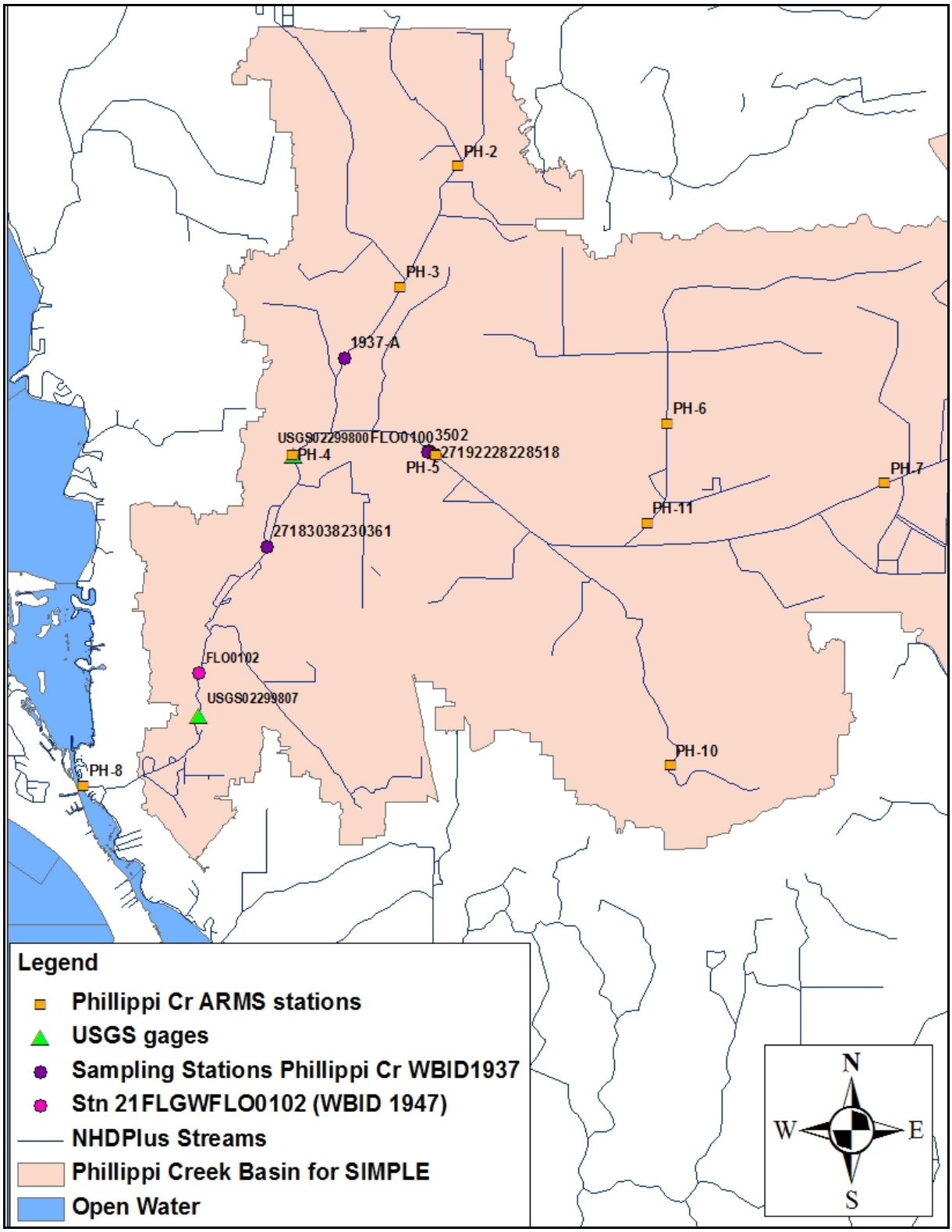

Figure 3. Locations of sampling stations in the Phillippi Creek Watershed.

5.1. Water Quality Data:

5.1.1. Stream Flow

Stream flow is an important factor affecting water quality, especially insofar as it determines the available loading capacity for pollutants such as bacteria. Flow conditions also influence DO concentrations more directly. Measurements taken at the United States Geological Survey (USGS) Gage #02299780, near Bee Ridge Florida, show that the streamflow of Phillippi Creek is highly variable, but usually below 60 cubic feet per second (cfs; Figure 4). The flow at that gage is below two cfs less than one percent of the time.

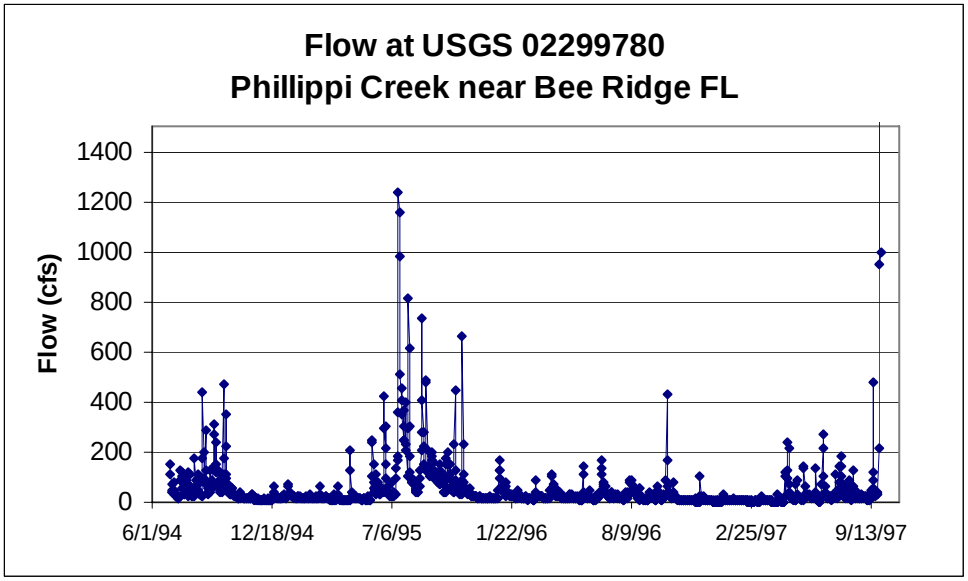

Figure 4. Flow in WBID 1937 of Phillippi Creek at USGS Gage 02299780.

5.1.2. Fecal Coliform Bacteria

In WBID 1937 of Phillippi Creek, 75 of 134 fecal coliform samples (56 percent) are above the 400 MPN/100 ml criterion that should not be exceeded in more than 10 percent of measurements (Table 4). About one-quarter (25 percent) of the samples also exceed the 800 MPN/100 ml instantaneous criterion. Excursions above the criteria occur during different seasons and flow conditions. Several days of extremely elevated bacteria concentrations are also apparent from the data record (Figure 5). In order to display the majority of data, the scale of this chart does not show several of the highest concentrations. The relationship between stream flow and excursions of the fecal coliform concentrations will be discussed further in the TMDL Approach section.

Table 4. Water Quality Statistics for Fecal Coliforms in Phillippi Creek WBID 1937.

WBID	Number of Samples	Minimum Concentration (MPN/100ml)	Maximum Concentration (MPN/100ml)	Mean Concentration (MPN/100ml)	# Samples >400 (MPN/100ml)	# Samples >800 (MPN/100ml)
1937	134	18	32,000	1,236	75	33

Notes:
Geometric means were not evaluated, since fewer than 10 samples were collected in any 30-day period.

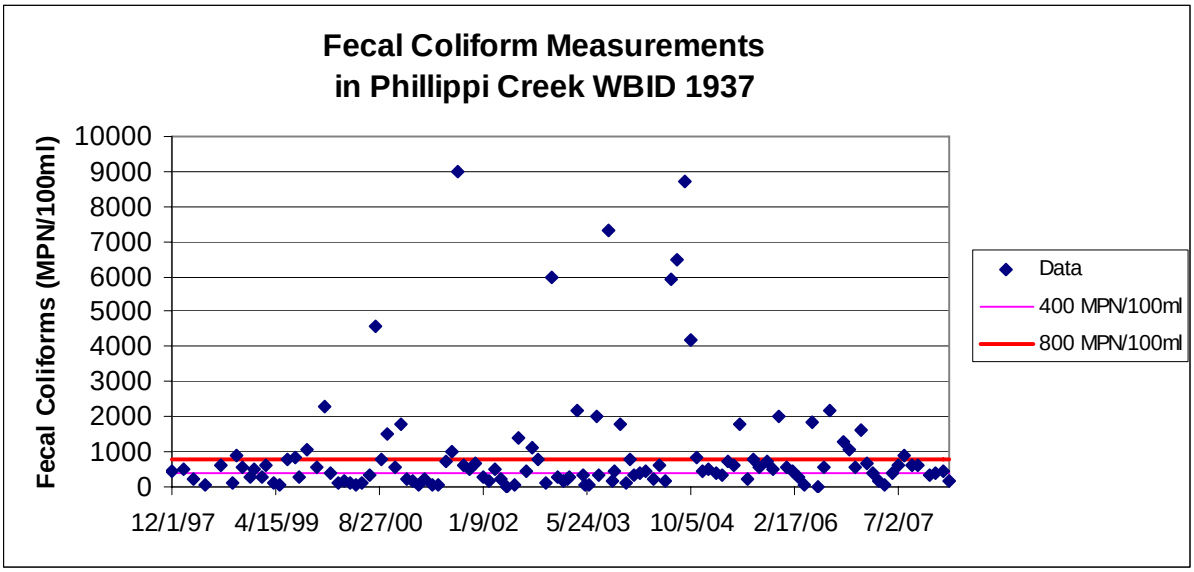

Figure 5. Fecal Coliform Measurements in Phillippi Creek WBID 1937.

5.2. Summary of Data Assessments:

Fecal coliform data show excursions above the criteria during different seasons and flow conditions. Based on this information, and the presence of potential point and nonpoint sources, EPA determined that it is necessary to establish a TMDL for fecal coliform bacteria in WBID 1937.

6. Source and Load Assessment

An important part of the TMDL analysis is the identification of source categories, source subcategories, or individual sources of pollutants in the watershed and the amount of loading contributed by each. Sources are broadly classified as either point or nonpoint sources depending on how diffuse they are and whether or not they are permitted under the National Pollutant Discharge Elimination System (NPDES) program. Pollutants, including nutrients and fecal coliform bacteria, may enter surface waters from both point and nonpoint sources.

A point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source discharges of industrial wastewater and treated sanitary wastewater must be authorized by NPDES permits. NPDES permitted entities, including certain urban stormwater discharges such as Municipal Separate Storm Sewer Systems (MS4 areas), certain industrial facilities, and construction sites over one acre, are stormwater driven sources considered "point sources" in this report. Typically, excursions of fecal coliform bacteria that occur during periods of reduced rainfall result from a lack of dilution for point source discharges or other sources located close to the waterbody.

Nonpoint sources of pollution are diffuse sources that cannot be identified as entering a waterbody through a discrete conveyance at a single location. Nonpoint sources generally, but not always, involve accumulation of pollutants on land surfaces and wash-off as a result of storm events. For bacteria, typical nonpoint sources include wildlife, agricultural animals, onsite sewer treatment and disposal systems (such as septic tanks), and residential developments outside of Phase I or II MS4 permitted areas.

6.1. Point Sources:

6.1.1. Permitted Point Sources

A TMDL wasteload allocation (WLA) is given to NPDES permitted facilities discharging to surface waters within an impaired watershed. Facilities that dispose of wastewater by means other than a surface water discharge, such as spray irrigation or underground injection wells, typically treat wastewater to less stringent secondary standards. Any pollutant loads emanating from these facilities would be accounted for in the TMDL's load allocation (LA) for nonpoint sources. There are four NPDES-permitted facilities that discharge within the Phillippi Creek watershed, including two water treatment facilities, and two wastewater treatment plants (Figure 6).

The South Gate WWTP (FL0032808) is a major domestic wastewater treatment plant that discharged its effluent directly to Phillippi Creek until June 2008. The permit for this facility includes limits for fecal coliform bacteria, nutrients, BOD, DO, and total suspended solids (TSS), as well as a few other parameters (FDEP, 2004a). The construction of a master lift station at the site allowed the effluent to be sent to the Bee Ridge Water Reclamation Facility. This facility sends reclaimed water to Sarasota County's North Master Reuse System (permit #FLA177008; David Pouso, personal communication). Pollutant loads from this facility are included in the TMDL analysis.

The Dolomite Utilities Fruitville WWTP (FL0134589) is permitted to discharge up to 2.4 million gallons per day (MGD) 3-Month Average Daily Flow (FDEP, 2004b). The effluent eventually flows from contact basins, over weirs, to a common wet well, from which water is pumped into different reclaimed water storage ponds. Some fraction of the reclaimed water is discharged into a storm water storage lake system at the Tatum Ridge Golf Course, which can intermittently overflow to the Sarasota County Celery Fields storm water facility and then into Phillippi Creek, when the water level rises above the daily storage capacity of the lakes. The

Tatum Ridge Ponds can hold up to 8.1 million gallons of water, representing approximately 3.4 days of storage if the facility were to discharge its full design capacity only to these ponds. Other available storage ponds do not flow to Phillippi Creek. Discharges from this WWTP were accounted for in the modeling analysis of pollutant loads being delivered to Phillippi Creek. The facility was not assigned a TMDL WLA, because it is not expected to significantly cause or contribute to impairment. The permit requires the facility to measure and report the number and duration of any discharges from the reuse system, but it does not include water quality limits for reclaimed water. For the 22 month period between August 2007 and June 2009, the facility did not report any discharges from any of the ponds, including those located on the Tatum Ridge Golf Course which may overflow to Phillippi Creek (Michelle Duggan, FDEP Southwest District, personal communication 08/11/09). Surface water discharges from the storage ponds are very infrequent, and occur only during high rainfall events.

Camelot Lakes (FL0188999) is a water treatment facility which utilizes reverse osmosis to provide potable water to the residents of Camelot Communities (FDEP, 2006a). The facility has a design flow of 0.041 MGD (0.063 cfs). The filtered concentrate is not treated prior to being discharged to an on-site stormwater pond for dilution and storage. During periods of high rainfall, water may overflow from this pond into an unnamed ditch which carries it to Phillippi Creek. Because the discharge is rainfall dependent, it is highly variable. Algal growth potential tests of the stormwater pond, which may receive runoff from other sources in addition to the WTF, indicated that the effluent is nutrient enriched. Although the effluent samples from the pond were not acutely toxic, and did not violate any permit conditions during the bioassay sampling, there have been past excursions below the DO permit limits of 5.0 mg/L (FDEP, 2006a). Discharges from this facility are included in the TMDL analysis of estimated pollutant loads being delivered to Phillippi Creek. Although the facility has a potential for indirect surface water discharge to the stream during periods of high rainfall, it is not assigned a TMDL WLA because it is not expected to significantly cause or contribute to impairment. The effluent will be diluted in the storage pond, and only overflow to Phillippi Creek during stormwater-driven events. Even assuming that the entire design flow of the facility were to be discharged directly to the stream, 99 percent of the time, the discharge would constitute less than 4 percent of the overall stream flow as measured at USGS 0229780/PH-5. The fraction of flow contributed from the plant would likely be much less than four percent during the rainfall events when overflow of the storage pond would occur.

The Lake Tippecanoe Owners Association (FL0188981) is a water treatment plant which provides drinking water to residents of Lake Tippecanoe Condominiums (FDEP, 2006b). The water plant uses reverse osmosis to remove minerals from water, before discharging them to on-site stormwater pond. The only treatment for the mineral concentrate is the dilution provided by any stormwater in the pond, so the actual degree of dilution will vary depending on the antecedent rainfall conditions. The maximum daily flow to the pond is 0.014 MGD (0.022 cfs). Any overflow from the pond is discharged through a concrete pipe to a ditch along Bliss Road, where it may drain to Phillippi Creek. As such, this facility is only expected to result in a discharge to Phillippi Creek during periods of high rainfall. Discharges from this water treatment plant were also accounted for in the estimated pollutant

loads being delivered to Phillippi Creek. Similar to Camelot Communities, this facility has a potential for indirect surface water discharge to the stream during periods of high rainfall. However, since the facility is not expected to cause or contribute to impairment in Phillippi Creek, it is not assigned a TMDL WLA. Effluent from the facility is diluted in the on-site stormwater pond, overflowing to Phillippi Creek only during stormwater-driven events. Even assuming that the entire design flow of the facility were to be discharged directly to the stream, without any dilution, the discharge would only contribute slightly more than 1 percent of the overall stream flow as measured at USGS 0229780/PH-5 even at the lowest flows. The fraction of flow contributed from the plant would likely be much less than four percent during the rainfall events when overflow of the storage pond would occur.

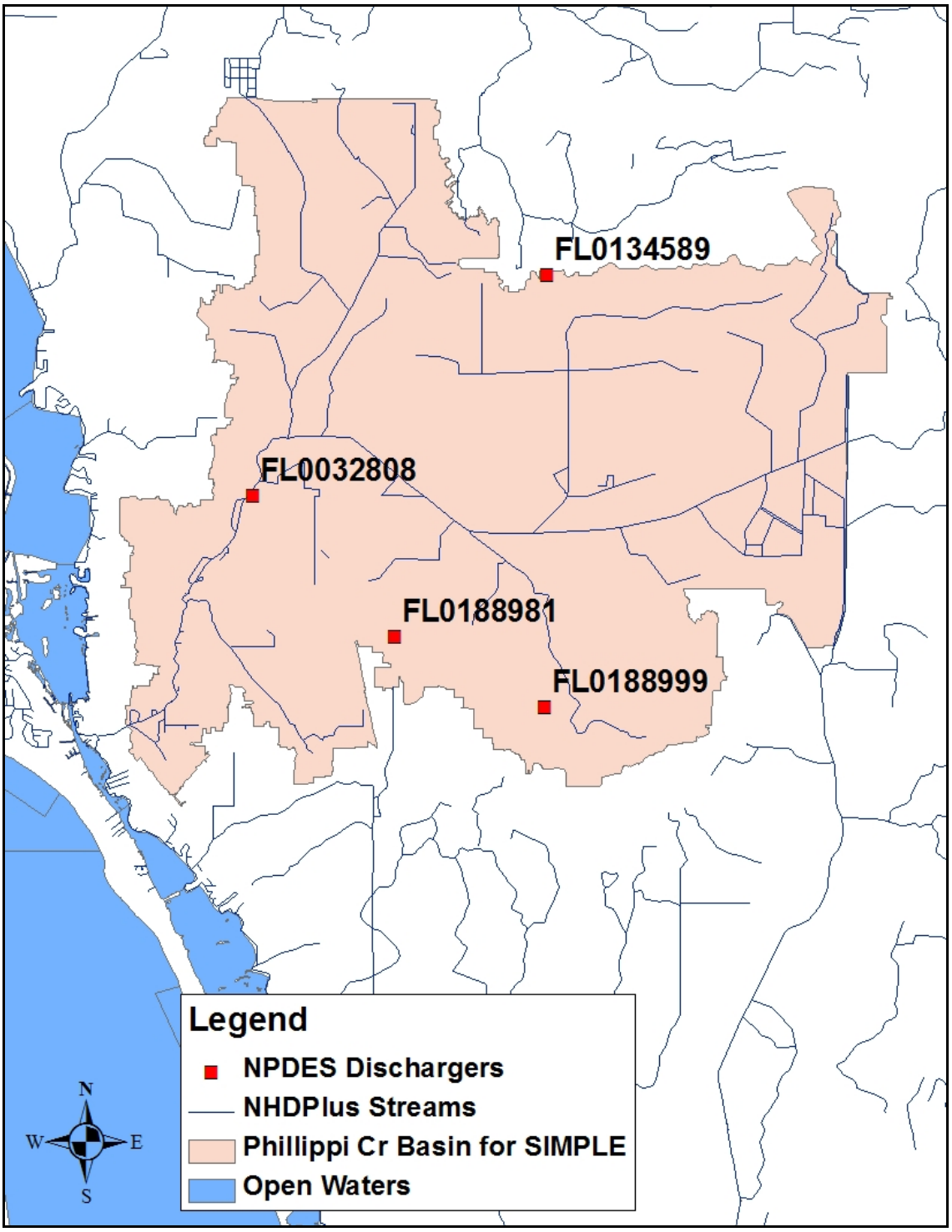

Figure 6. Location of NPDES facilities in the Phillippi Creek Watershed.

6.1.2. Municipal Separate Storm Sewer System Permits

The 1987 amendments to the Clean Water Act designated certain stormwater discharges as point sources requiring NPDES stormwater permits. The regulated activities involve Municipal Separate Storm Sewer Systems (MS4s), construction sites over one acre, and specific industrial operations. Although these types of stormwater discharges are now considered point sources with respect to permitting and TMDLs, they behave similarly to nonpoint sources in that they are driven by rainfall-runoff processes leading to the intermittent discharge of pollutants from land use activities in response to storms.

According to 40 CFR 122.26(b)(8), an MS4 is defined as "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.

(ii) Designed or used for collecting or conveying storm water;

(iii) Which is not a combined sewer; and

(iv) Which is not part of a Publicly Owned Treatment Works."

In 1990, EPA developed rules establishing Phase I of the NPDES stormwater program, designed to prevent harmful pollutants washed into MS4s by stormwater runoff, or dumped directly into them, from being delivered to local waterbodies. Phase I of the program required operators of "medium" and "large" MS4s (generally serving populations of 100,000 or more) to implement a stormwater management program as a means of controlling polluted discharges. Approved stormwater management programs for medium and large MS4s are required to address a variety of water quality related issues including roadway runoff management, municipal owned operations, and hazardous waste treatment, etc. Because the master drainage systems of most local governments in Florida are interconnected, EPA implemented Phase 1 of the MS4 permitting program on a countywide basis, which brings in all cities, Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 15 counties meeting the population criteria.

Phase II of the NPDES stormwater rule extended coverage to certain "small" MS4s and to construction sites between one and five acres. Small MS4s are defined as any municipal stormwater collection system that does not meet the criteria of a medium or large MS4 covered by Phase I. Only a select subset of small MS4s requires an NPDES stormwater permit. These "regulated small MS4s" include those located in "urbanized areas" as defined by the Bureau of Census, and other small MS4s designated by NPDES permitting authorities.

In October 2000, US EPA authorized FDEP to implement the NPDES stormwater program in all areas of Florida except Indian tribal lands. FDEP's authority to administer the NPDES program is set forth in Section 403.0885, FS. The three major components of NPDES stormwater regulations are:

- MS4 permits that are issued to entities that own and operate master stormwater systems, primarily local governments. Permittees are required to implement comprehensive stormwater management programs designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable.

- Stormwater associated with industrial activities, which is regulated primarily by a multisector general permit that covers various types of industrial facilities. Regulated industrial facilities must obtain NPDES stormwater permit coverage and implement appropriate pollution prevention techniques to reduce contamination of stormwater.

- Construction activity general permits for projects that ultimately disturb one or more acres of land and which require the implementation of stormwater pollution prevention plans to provide for erosion and sediment control during construction.

WBID 1937 of Phillippi Creek is affected by Phase I MS4 permit FLS000004, which covers Sarasota County and the city of Sarasota, as well as other co-permittees. Stormwater discharges conveyed through the storm sewer system covered by the permit are subject to the WLA of the TMDL. Any newly designated MS4s will also be required to achieve the percent reduction allocation presented in this TMDL.

6.2. Nonpoint Sources:

Nonpoint source pollution generally involves a buildup of pollutants on the land surface that wash off during rain events and as such, represent contributions from diffuse sources, rather than from a defined outlet. Potential nonpoint sources are commonly identified, and their

loads estimated, based on land cover data. Most methods calculate nonpoint source loadings as the product of the water quality concentration and runoff water volume associated with certain land use practices. The mean concentration of pollutants in the runoff from a storm event is known as the Event Mean Concentration, or EMC.

The land use distribution of the Phillippi Creek watershed provides insight into potential nonpoint sources of nutrients and fecal coliform bacteria. As can be seen in Figure 2, much of the watershed consists of urban, residential, and commercial areas associated with the city of Sarasota. Agriculture is also an important source in the eastern half of the basin. Landcover acreages and percentages for the Phillippi Creek watershed were provided in Table 1.

6.2.1. Urban, Residential, and Commercial Development

The urban land use category accounts for residential, industrial, commercial and recreational uses, including golf courses. Pollutant loads of fecal coliform and nutrients originating from urban areas (whether within an MS4 jurisdiction or not) is attributable to multiple sources including storm water 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.

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 outlined in Chapter 403 of the Florida Statutes (FS), was established as a technology-based program that relies upon the implementation of Best Management Practices (BMPs) that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, FAC.

Florida's stormwater program is unique in having a performance standard for older stormwater systems that were built before the implementation of the Stormwater Rule in 1982. This rule states: "the pollutant loading from older stormwater management systems shall be reduced as needed to restore or maintain the beneficial uses of water" (Section 62-40-.432 (5) (c), FAC).

In 1994, state legislation created the Environmental Resource Permitting program to consolidate stormwater quantity, stormwater quality, and wetlands protection into a single permit. Presently, the majority of environmental resource permits are issued by the state's water management districts, although DEP continues to issue permits for specific projects.

Nonstructural and structural BMPs are an integral part of Florida's stormwater programs. Nonstructural BMPs, often referred to as "source controls", are those that can be used to prevent the generation of NPS pollutants or to limit their transport off-site. Typical nonstructural BMPs include public education, land use management, preservation of wetlands and floodplains, and minimizing impervious surfaces. Technology-based structural BMPs are used to mitigate the increased stormwater peak discharge rate, volume, and pollutant loadings that accompany urbanization.

Urban, residential, and commercial developments are likely the most important nonpoint sources in the Phillippi Creek watershed. Landuses in this category comprise over 70 percent of the watershed area.

6.2.2. Agriculture

Agricultural lands include improved and unimproved pasture, row and field crops, tree crops, nurseries, and specialty farms. Agricultural activities, including runoff of fertilizers or animal wastes from pasture and cropland and direct animal access to streams, can generate fecal coliform and nutrient loading to streams. While agriculture represents only about seven percent of the overall area in the Phillippi Creek watershed, it is more common in the eastern, less urbanized areas of the basin. Almost 70 percent of the existing agricultural use is classified as cropland and pastureland, with 14 percent (i.e. less than 1 percent of the overall watershed area) comprised of open, rural lands, and 10 percent used for tree crops.

The USDA National Agricultural Statistics Service (NASS) compiles Census of Agriculture data by county for virtually every facet of U.S. agriculture (USDA NASS, 2007). The "Census of Agriculture Act of 1997" (Title 7, United States Code, Section 2204g) directs the Secretary of Agriculture to conduct an agricultural census on a 5-year cycle, collecting data for the years ending in 2 and 7. According to 2007 Census of Agriculture data, there were 100 farms which fertilized approximately 7,975 acres with commercial fertilizer, lime and soil conditioners in Sarasota County, Florida. The census also shows that approximately 554 acres of 29 farms were fertilized with manure. Livestock counts of cattle and pigs in Sarasota County are provided in Table 5. Because agricultural census data are collected at the county level, the extent to which these values pertain to agricultural fields within the impaired watershed is not specified. Land use data and aerial coverage of the watershed show that Phillippi Creek and its tributaries are bordered by some agricultural uses in the upper watershed (Figure 2). As such, agricultural uses could be a relevant source of pathogen loading to some sections of Phillippi Creek.

Table 5. 2007 Agricultural Census Data for Livestock in Sarasota County, Florida.

County	Livestock	Number of Farms	Number of Animals
Sarasota	Cattle and Calves	149	16,845
	Hogs and Pigs	19	44

Note: 1. A farm is defined as any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year.

6.2.3. Wildlife

Wildlife deposit their feces onto land surfaces where it can be transported to nearby streams during storm events. Generally, the nutrient and fecal coliform bacteria load from wildlife is assumed to represent background concentrations, as the contribution from this source is small relative to the load from urban and agricultural areas in most impaired watersheds. This appears to be the case for Phillippi Creek, where undeveloped forest and wetland areas are minimal. Any strategy employed to control this source would probably have a negligible impact on obtaining water quality standards.

6.2.4. Onsite Sewage Treatment and Disposal Systems (Septic Tanks)

Onsite sewage treatment and disposal systems (OSTDs), including septic tanks, are commonly used where providing access to sewer systems is not cost effective or practical. Most septic tanks are used for individual households or small commercial establishments that are in rural or remote areas, or in urban areas not served by a domestic wastewater facility. Water from septic tanks is typically released to the ground through on-site, subsurface drain fields or boreholes that allow the water from the tank to percolate (usually into the surficial aquifers) and either transpire to the atmosphere through surface vegetation or add to the flow of shallow ground water.

When properly sited, designed, constructed, maintained, and operated, OSTDs are a safe means of disposing of domestic waste. The effluent from a well-functioning OSTD receives natural biological treatment in the soil and is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, OSTDs can be a source of nutrients, pathogens, and other pollutants to both ground water and surface water. Failure of septic systems is probably a very important source of coliform bacteria and nutrient loading in the Phillippi Creek watershed.

The State of Florida Department of Health publishes data on new septic tank installations and the number of septic tank repair permits issued for each county in Florida. Table 6 summarizes the cumulative number of septic systems installed in Sarasota County since the 1970 census and the total number of repair permits issued for the ten years between 1998-99 and 2007-08 (FDOH, 2009). The data do not reflect septic tanks removed from service. The number of septic tanks in the Phillippi Creek watershed has been estimated at 32,000 (Peeler et al, 2006). Section 3 provides some information about the Phillippi Creek Septic System Replacement Program, an effort initiated by Sarasota County to identify and replace failing septic systems in the watershed.

Table 6. County Estimates of Septic Tanks and Repair Permits.

County	Number Septic Tanks (1970- 2008)	Number of Repair Permits Issued (1998 – 2008)
Sarasota	80,014	4158

Note: Source: http://www.doh.state.fl.us/environment/ostds/statistics/ostdsstatistics.htm

7. Analytical Approach

7.1. FECAL COLIFORM TMDL:

The analytical approach for developing coliform TMDLs depends on the number of water quality samples and the availability of flow data. When long-term records of water quality and flow data are not available, the TMDL is frequently expressed as a percent reduction. The reduction is based on instream samples violating the water quality criteria and the target concentration. Load duration curves may be developed when sufficient data are available to develop a relationship between flow and concentration. Since some flow data were measured for Phillippi Creek, load duration curves were developed in order to better understand the hydrologic conditions under which the water quality typically exceed the fecal coliform criteria. The load duration curves essentially define the maximum loads (i.e. TMDLs) allowable under various flows. Since the allowable load for a given day will vary depending on the flow, the TMDL is represented in the TMDL table as the percent reduction that would meet all components of the criteria. In the case of Phillippi Creek, the percent reduction is calculated for the maximum concentration to meet the instantaneous criterion of 800 MPN/100ml.

7.1.1. Flow Duration Curve

The first step in developing load duration curves is to create the corresponding flow duration curves. A flow duration curve displays the cumulative frequency distribution of daily flow data over the period of record. The curve relates flows measured or estimated for a particular location on the stream to a duration interval representing the percent of time those flows are equaled or exceeded. Values toward the right side of the plot indicate low-flow conditions that are surpassed with greater frequency. Values on the left side of the plot represent high flows that occur less frequently. For example, the stream's discharge is expected to be equal to or greater than the flow corresponding to a duration interval of 30 approximately 30 percent of the time, and less than that value approximately 70 percent of the time. Flow duration curves are limited to the period of record available at a flow gage.

Flow data from USGS gage 02299780, located on Phillippi Creek near Bee Ridge, FL and flow data collected by Sarasota County at station PH-5, located on Phillippi Creek near the USGS gage, were used to generate the flow duration curve. The flow record at the USGS gage, which drains approximately 32 square miles, extends from July 1994 to September 1997. The flow data from Sarasota County were collected between June 2003 and September 2008 at a station estimated to drain approximately 31 square miles. As can be seen in the flow duration curve, flow in Phillippi Creek near Bee Ridge Florida is below 60 cfs about 80 percent of the time (Figure 7).

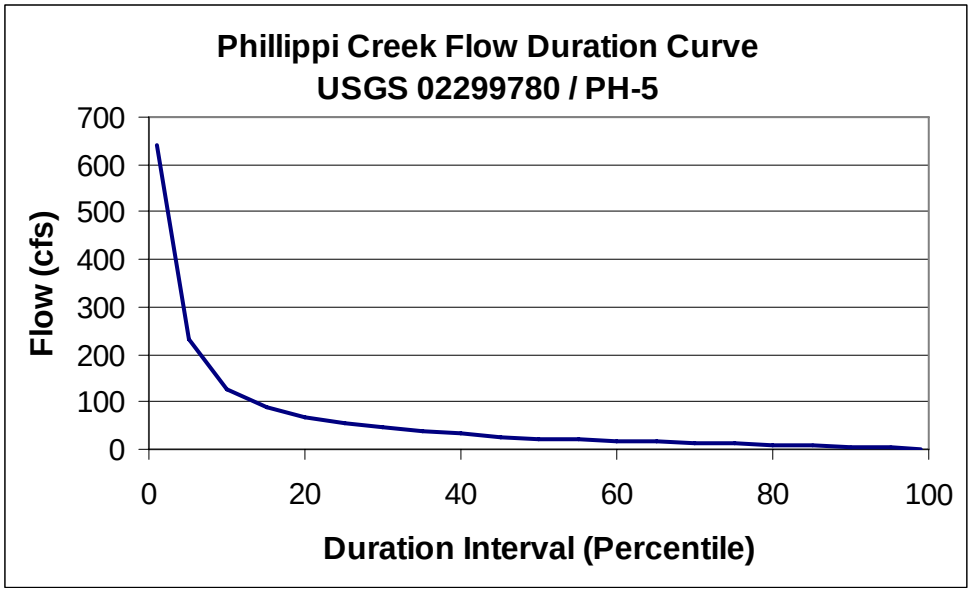

Figure 7. Flow Duration Curve for Phillippi Creek.

7.1.2. Load Duration Curve

A load duration curve was developed for Phillippi Creek in order to identify the environmental conditions under which the bacteria data were collected. Load duration curves display the relationship between stream flow and water quality, allowing the frequency and magnitude of water quality standard exceedances to be better understood. Load duration curves may also provide information about likely pollutant sources, since different types of sources tend to dominate under different flow conditions.

The load duration curve is a visual display of the existing and allowable loads at each interval on the flow duration curve. Loads are calculated by multiplying the flow at each interval by a fecal coliform concentration and appropriate unit conversion factors.

$$Load = Concentration \times Flow \times ConversionFactor$$

Where:

Load = bacterial load in units of MPN/day
Flow = stream flow in units of cubic feet per second (cfs)
Concentration = existing or allowable concentration in units of MPN/100mL
Conversion Factor = (28.247 L/ft^3 * 86400 sec/day * 1000mL/L)/100mL

Existing loads are based on the instream coliform concentrations measured during ambient monitoring. Allowable loads are based on the applicable water quality criterion- either the daily "not to exceed" criterion of 800 MPN/100ml, or 400 MPN/100ml, which may be exceeded in up to 10 percent of the samples.

Load duration curves for both components of the acute water quality criteria were constructed for Phillippi Creek. Fecal coliform concentrations measured at station PH-5 were then plotted on the curve using the duration interval of the stream flow on the date of sampling. For most dates, stream flow was measured at that location. For bacteria data collected between January 1998 and May 2003, when flow data were not available from PH-5, the flow was estimated using the drainage-area ratio method. The drainage-area ratio method estimates the stream flow for a location of interest by multiplying the measured stream flow from a nearby gaging station by the ratio of the drainage areas for the ungaged and gaged sites:

$$Flow_{ungaged} = \left(\frac{Area_{ungaged}}{Area_{gaged}} \right) \times Flow_{gaged}$$

The flow record at USGS gage 02300032, located on the Braden River near Lorraine, Florida was considered to be suitable for the drainage-area ratio analysis due to its proximity to Phillippi Creek and the similarity in watershed area draining to the gage.

On the load duration curve, values that plot above the allowable line represent excursions of the criterion while values that plot below the line represent compliance with the criterion. The location of monitoring data on the load duration curve may suggest potential sources and delivery mechanisms of the pollutant. In general, violations appearing on the right side of the curve occurred during low flow events and are indicative of continuous pollutant sources, such as NPDES permitted discharges, leaking collection lines, or leaking septic systems. Livestock having access to streams could also be a source during low flows (livestock are not expected to be in the stream during high flows). Violations that appear on the left side of the curve occurred during high flow events, indicating rainfall-drive sources.

Duration curve intervals can be grouped into broad categories, or zones, in order to provide insight about the conditions and patterns associated with the impairment (Cleland, 2003). Load duration curves are frequently divided into five flow zones: one zone representing high flows, another for moist conditions, one covering median or mid-range flows, another for dry conditions, and a zone representing low flows.

The fecal coliform data for WBID 1937 of Phillippi Creek were collected under the entire range of flow conditions. As can be seen in Figure 8, bacterial loads in Phillippi Creek exceed the target loads for both components of the acute criteria (i.e. 400MPN/100 ml and 800 MPN/100 ml) under high, mid-range, and low flow conditions. For convenience, Figure 9 shows the load duration curve on a smaller scale, and Table 7 provides the allowable loads for both components of the water quality standard under various flows and percent flow durations. The fact that the data record shows excursions occurring under various flow conditions suggests that fecal coliform bacteria may be introduced to Phillippi Creek from both continuous and wet-weather sources.

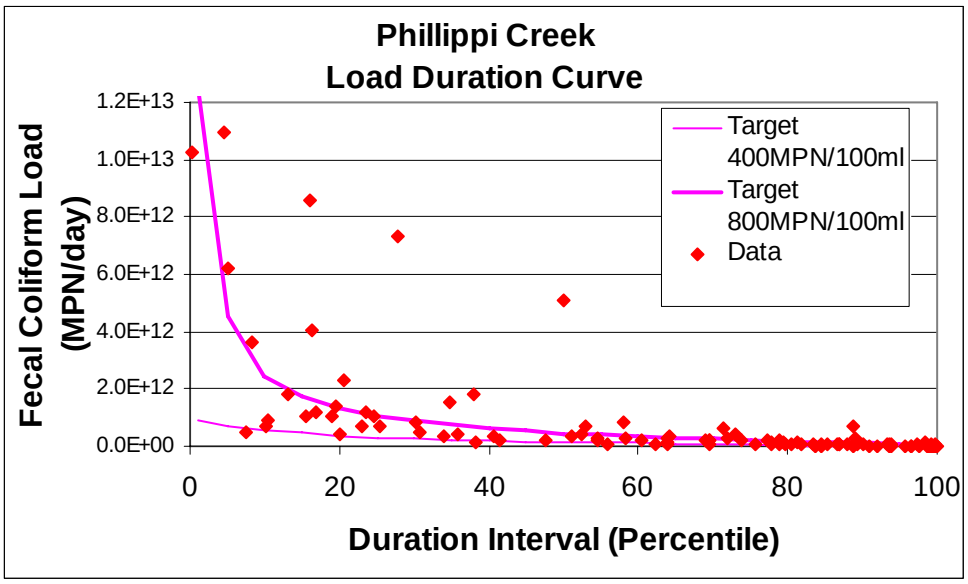

Figure 8. Load duration curve for Phillippi Creek (WBID 1937).

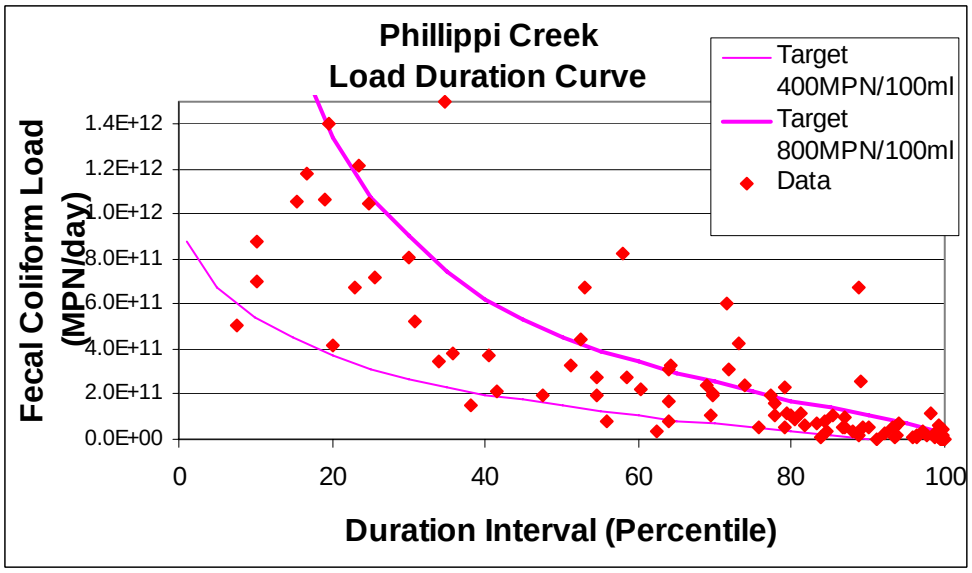

Figure 9. Load duration curve for Phillippi Creek (WBID 1937).

Table 7. Target Bacteria Loads for Flow Ranges Measured in Phillippi Creek.

Flow Rank (Duration) (%)	Flow (cfs) near USGS 02299780 and PH-5	Target Load to Meet 400 MPN/100ml	Target Load to Meet 800 MPN/100ml
1	639.18	6.25525E+12	1.25105E+13
5	232	2.27043E+12	4.54087E+12
10	125.45	1.2277E+12	2.4554E+12
15	89.67	8.77542E+11	1.75508E+12
20	68.58	6.71163E+11	1.34233E+12
25	55.09	5.3913E+11	1.07826E+12
30	46.39	4.53989E+11	9.07978E+11
35	38.18	3.73643E+11	7.47286E+11
40	31.83	3.115E+11	6.22999E+11
45	27	2.64232E+11	5.28463E+11
50	23.13	2.26358E+11	4.52717E+11
55	20	1.95727E+11	3.91454E+11
60	17.72	1.73414E+11	3.46828E+11
65	15	1.46795E+11	2.93591E+11
70	13	1.27223E+11	2.54445E+11
75	11	1.0765E+11	2.153E+11
80	8.6	84162654720	1.68325E+11
85	7.4	72419028480	1.44838E+11
90	5.4	52846318080	1.05693E+11
95	3.5	34252243200	68504486400
99	1.62	15853895424	31707790848
100	0.2	1957271040	3914542080

7.1.3. Percent Reduction

The percent reduction required to meet the TMDL endpoint is based on the following equation:

$$\%\text{Reduction} = \left(\frac{[existing] - [criterion]}{[existing]} \right) \times 100$$

Where:
% Reduction = percent reduction
[*existing*] = existing concentration
[*criterion*] = criterion concentration (i.e. target)

Since the water quality standard for fecal coliform bacteria states that up to 10 percent of samples are allowed to exceed a concentration of 400 MPN/100ml, the existing condition of the waterbody should be represented using a percentile slightly higher than the 90th, in order to ensure that less than 10 percent of the values exceed the criterion. A 90th percentile concentration implies that 90 percent of the measured values are lower than this concentration, and 10 percent are higher. For the TMDL, the 95th percentile of fecal coliform measurements for each waterbody was calculated and compared against a target of 400 MPN/100 ml. This would meet the water quality standard and provide a margin of safety by ensuring that only 5 percent of the data exceed a concentration of 400 MPN/100ml. The percent reduction was also calculated using the maximum concentration measured to represent the existing condition and the 800 MPN/100 ml criterion as the target. The larger of the two percent reduction values was selected as the TMDL. In this TMDL, existing conditions are represented by the maximum concentration measured, and the percent reduction is calculated to meet the 800 MPN/100 ml acute criterion, since that resulted in a higher reduction. In summary, this TMDL target is "not to exceed 800 MPN/100 ml".

8. TMDLs

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 in-stream water quality conditions. A TMDL for a given pollutant and waterbody can be expressed as the sum of all point source loads (Waste Load Allocations or WLA), non-point source loads (Load Allocations or LA), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality. Conceptually, this definition is represented by the equation:

$$TMDL = \Sigma WLAs + \Sigma LAs + MOS$$

The objective of a TMDL is to allocate loads among the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time (e.g. pounds per day), toxicity, or other appropriate measure.

By showing the allowable bacteria loads corresponding to given flows in Phillippi Creek, the load duration curves displayed in Figure 8 and Table 7 essentially represent the TMDLs to achieve the longer-term, chronic (400 MPN/100ml) and acute (800 MPN/100ml) components of the fecal coliform criteria. Since the allowable load for a given day will vary depending on the stream flow in Phillippi Creek on that day, the fecal coliform TMDL is represented in the table as the maximum percent reduction that meets all components of the criteria. In the case of Phillippi Creek, the percent reduction is calculated for the maximum concentration to meet the instantaneous criterion of 800 MPN/100ml, since that was the most stringent reduction required (Table 8).

Table 8. TMDL Allocations for Phillippi Creek WBID 1937.

Parameter	TMDL (%)	WLA[1]		LA (%)
		Facility (MPN/100ml)	MS4 (%)[2]	
Fecal Coliforms	98	NA	98	98

Notes:

1. The WLA is separated into an allocation for continuous NPDES facilities and an allocation for the MS4. WBID 1937 is within the collection area for Phase I MS4 permit # FLS000004, which is held by the City of Sarasota, Sarasota County, and other co-permittees. Due to the infeasibility of separating the contributions from diffuse MS4 and non-MS4 sources, MS4s are allocated the same percent reductions as the Load Allocation. Because none of the NPDES facilities that currently operate within the Phillippi Creek watershed are expected to cause or contribute to impairments, WLAs for these individual facilities are not provided and no reductions are necessary.
2. Percent reduction in total pollutant loading from current conditions to achieve the applicable standard. The percent reductions are applied to nonpoint sources (LA) and MS4s.

8.1. Existing Conditions

Existing conditions represent the current water quality conditions of a waterbody. For the fecal coliform TMDL, existing conditions are being conservatively represented using the maximum of measured concentrations. The maximum and 95th percentile concentrations, as well as the percent reduction required for the 95th percentile to meet the chronic criterion, and for the maximum to meet the instantaneous criterion, are shown in Table 9.

Table 9. Percent Reductions for Fecal coliforms in Phillippi Creek (WBID 1937).

95th Percentile Fecal Coliform Concentration in WBID 1937	6175 MPN/100ml
Percent Reduction to meet 400 MPN/100ml	94 percent
Maximum Fecal Coliform Concentration in WBID 1937	32,000 MPN/100ml
Percent Reduction to meet 800 MPN/100ml (TMDL Target)	98 percent

NOTES: Data with Remark Code Q, meaning the sample was held beyond normal holding time, were included in the TMDL analysis. Holding samples on ice slows the metabolism of the organisms, resulting in no appreciable growth. The actual concentration is expected to be at least as high as reported.

8.2. Critical Conditions and Seasonal Variation

USEPA regulations at 40 CFR 130.7(c)(1) require TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. The critical condition is the combination of environmental factors creating the "worst case" scenario of water quality conditions in the waterbody. By achieving the water quality standards at critical conditions, it is expected that water quality standards should be achieved during all other times. Seasonal variation must also be considered to ensure that water quality standards will be met during all seasons of the year, and that the TMDLs account for any seasonal change in flow or pollutant discharges, and any applicable water quality criteria or designated uses (such as swimming) that are expressed on a seasonal basis.

The critical condition for nonpoint source loadings is typically an extended dry period followed by a rainfall runoff event. During the dry weather period, pollutants build up on the land surface, and are washed off by rainfall. The critical condition for continuous point source loading typically occurs during periods of low stream flow when dilution is minimized. The fecal coliform load duration curve for Phillippi Creek suggests that excursions may occur during a range of flow conditions. Critical conditions and seasonal variation are accounted for in the fecal coliform TMDL by using all available data in the TMDL analysis. These data were collected during various seasons and flow conditions. The TMDL percent reduction is based on the largest percent reduction that would be required from the range of available data. By achieving this reduction, water quality standards should be achieved during all other time periods. In addition, the fecal coliform load duration curve portrays allowable loads under various hydrologic conditions.

8.3. Margin of Safety

The Margin of Safety accounts for uncertainty in the relationship between a pollutant load and the resultant condition of the waterbody. There are two methods for incorporating a Margin of Safety in the analysis: a) implicitly incorporate the MOS using conservative assumptions to develop TMDL allocations; or b) explicitly reserve a portion of the TMDL as the MOS and use the remainder for point and nonpoint source allocations. In the TMDL approach for fecal coliforms, an implicit MOS was incorporated by representing existing conditions using the highest measured fecal coliform concentration, and basing the required reductions on it, to meet the 800 MPN/100ml criterion.

8.4. Waste Load Allocations

Since there are no facilities discharging directly into surface waters there are no wasteload allocations for facilities. Only MS4s are assigned a WLA for this TMDL. The MS4s are assigned the same percent reduction as the non-point sources under the load allocation.

8.4.1. NPDES Dischargers

WBID 1937 of Phillippi Creek has three NPDES facilities that maintain NPDES permits to discharge within the watershed: FL0134589 Dolomite Utilities Fruitville; FL0188999 Camelot Lakes; and FL0188981 Lake Tippecanoe Owners Association. However, none of the facilities are assigned WLAs since they do discharge directly to Phillippi Creek and are not expected to cause or contribute to impairment of Phillippi Creek. All three NPDES permittees normally discharge to groundwater or surface application. The discharge only reaches surface waters in the Phillippi Creek watershed during very infrequent, high rainfall events, and on those rare occasions, the discharge should represent insignificant fractions of the stream flow. Loads from the South Gate WWTP (FL0032808) are not assigned a WLA because the facility does not currently have a surface water discharge.

8.4.2. Municipal Separate Storm Sewer System Permits

Phillippi Creek is also affected by Phase I MS4 permit # FLS000004, which is held by the City of Sarasota, Sarasota County, and other co-permittees. At this time is not possible to isolate the loading discharging exclusively from the MS4 area. The WLA assigned to the MS4 area is expressed in terms of the percent reduction required to attain the applicable TMDL target. Each permittee covered in the permit is ultimately responsible for the anthropogenic loads associated with stormwater outfalls they own or over which they otherwise have responsible control.

The WLA for MS4s are expressed in terms of percent reductions equivalent to the reductions required for nonpoint sources. Given the available data, it is not possible to estimate loadings coming exclusively from the MS4 areas. Although the aggregate WLAs for stormwater discharges are expressed in numeric form, i.e., percent reduction, based on the information available today, it is infeasible to calculate numeric WLAs for individual stormwater outfalls because discharges from these sources can be highly intermittent, are usually characterized by very high flows occurring over relatively short time intervals, and carry a variety of pollutants whose nature and extent varies according to geography and local land use. For example, municipal sources such as those covered by these TMDLs often include numerous individual outfalls spread over large areas. Water quality impacts, in turn, also depend on a wide range of factors, including the magnitude and duration of rainfall events, the time period between events, soil conditions, fraction of land that is impervious to rainfall, other land use activities, and the ratio of stormwater discharge to receiving water flow.

These TMDLs assume for the reasons stated above that it is infeasible to calculate numeric water quality-based effluent limitations for stormwater discharges. Therefore, in the absence of information presented to the permitting authority showing otherwise, these TMDLs assume that water quality-based effluent limitations for stormwater sources of nutrients derived from this TMDL can be expressed in narrative form (e.g., as best management practices), provided that: (1) the permitting authority explains in the permit fact sheet the reasons it expects the chosen BMPs to achieve the aggregate wasteload allocation for these stormwater discharges; and (2) the state will perform ambient water quality monitoring for bacteria for the purpose of determining whether the BMPs in fact are achieving the aggregate wasteload allocation.

The percent reduction calculated for nonpoint sources is assigned to the MS4 as loads from both sources typically occur in response to storm events. Permitted MS4s will be responsible for reducing only the loads associated with stormwater outfalls which it owns, manages, or otherwise has responsible control. MS4s are not responsible for reducing other nonpoint source loads within its jurisdiction. Best management practices for the MS4 service should be developed to meet the percent reduction targets in Table 8. All Phase I MS4 permits issued in Florida include a re-opener clause allowing permit revisions for implementing TMDLs once they are formally adopted by rule. Florida may designate an area as a regulated Phase II MS4 in accordance with Rule 62-620.800, FAC. Florida's Phase II MS4 Generic Permit has a "self-implementing" provision that requires MS4 permittees to update their stormwater management program as needed to meet their TMDL allocations once those TMDLs are adopted. Any future MS4s permitted in the area are automatically assigned a WLA equivalent to the prescribed percent reduction.

8.5. Load Allocations

The primary mode for transport of fecal coliforms to streams is during a storm event. Urban development modifies the land surface from a pervious land cover to an impervious surface and this results in higher peak flow rates that wash pollutant-enriched water into the stream. The load allocation calls for reductions in fecal coliform bacteria from nonpoint sources throughout the watershed equal to the loads provided in Table 8. These reductions are expected to result in attainment of the bacteria standards.

8.6. Recommendations

The initial step in implementing a pathogen TMDL is to more specifically locate source(s) of bacteria in the watershed. FDEP employs the Basin Management Action Plan (B-MAP) as the mechanism for developing strategies to accomplish the specified load reductions. Components of a B-MAP are:

- Allocations among stakeholders
- Listing of specific activities to achieve reductions
- Project initiation and completion timeliness
- Identification of funding opportunities
- Agreements
- Local ordinances
- Local water quality standards and permits
- Follow-up monitoring

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9. Appendix A- Water Quality Remark Codes.

Table A- 1. Guide to Water Quality Remark Codes (Rcode column in data tables)

Remark Code	Definition
A	Value reported is mean of two or more samples
B	Result based on colony counts outside the acceptable range
E	Extra sample taken in compositing process
I	The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.
K	Off-scale low. Actual value not known, but known to be less than value shown
L	Off-scale high. Actual value not known, but known to be greater than value shown
Q	Sample held beyond normal holding time
T	Value reported is less than the criteria of detection
U	Material was analyzed for but not detected. Value stored is the limit of detection.
<	NAWQA – actual value is known to be less than the value shown

10. Appendix B- Background Information on State and Federal 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. In 1994, the Department's stormwater treatment requirements were integrated with the stormwater flood control requirements of the state's water management districts, along with wetland protection requirements, into the Environmental Resource Permit regulations.

Chapter 62-40, F.A.C., also requires the WMDs to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a SWIM plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL.

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 permitting program to designate certain stormwater discharges as "point sources" of pollution. The EPA promulgated regulations and began implementing the Phase I NPDES stormwater program in 1990. 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, EPA implemented Phase I of the MS4 permitting program on a countywide basis, which brought 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. EPA authorized the Department to implement the NPDES stormwater program (with the exception of Indian lands) in October 2000.

An important difference between the federal NPDES and Florida's stormwater/environmental resource permitting programs is that the NPDES Program covers both new and existing discharges, while the state program focuses on new discharges only. Additionally, Phase II of the NPDES Program, implemented in 2003, expands the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. These revised rules require that these additional activities obtain permits by 2003.

While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility, as are other point sources of pollution such as domestic and industrial wastewater discharges. It should be noted that all MS4 permits issued in Florida include a reopener clause that allows permit revisions to implement TMDLs when the implementation plan is formally adopted.