

# TOTAL MAXIMUM DAILY LOAD (TMDL) FOR DISSOLVED OXYGEN (DO) IN BROOKER CREEK (WIBID #1474)

Hillsborough, Pinelass, and Pasco Counties, Florida

Prepared by:  
US Environmental Protection Agency  
Region 4  
Atlanta, GA

September 30, 2004



## Table of Contents

PREAMBLE .....	1
INTRODUCTION .....	1
PROBLEM DEFINITION AND WATERSHED DESCRIPTION .....	2
WATER QUALITY STANDARD AND TARGET IDENTIFICATION ...	2
WATER QUALITY AND ENVIRONMENTAL DATA .....	2
SOURCE ASSESSMENT .....	3
TMDL DEVELOPMENT .....	4
Expression and Allocation of the TMDL .....	4
TMDL Computations .....	4
CRITICAL CONDITIONS .....	5
RECOMMENDATIONS .....	5

## List of Tables

Table 1. Water quality monitoring stations in WBID 1474 .....	2
Table 2. Summary of data for Brooker Creek WBID 1474 .....	3
Table 3. TMDLs for Brooker Creek (WBID #1474) .....	4

## List of Figures

Figure 1 Location of Brooker Creek in Florida (WIBD #1474) .....	6
Figure 2. Dissolved oxygen concentrations measured in Brooker Creek ...	7
Figure 3. Flow measurements for Brooker Creek (WBID #1474) .....	7
Figure 4. Nitrate/nitrite concentrations measured in Brooker Creek .....	8
Figure 5. Ammonia concentrations measured in Brooker Creek .....	8
Figure 6. Nitrogen Kjeldahl concentrations measured in Brooker Creek .....	9
Figure 7. Total phosphorus concentrations measured in Brooker Creek .....	9

## **PREAMBLE**

This Total Maximum Daily Load (TMDL) for Brooker Creek (WBID 1474) is being established as required by the Consent Decree Florida Wildlife Federation, et al. v. Carol Browner, et al. The U.S. Environmental Protection Agency (EPA) has analyzed the available data and information for this waterbody, and has determined that this waterbody is *likely* not meeting the State of Florida's applicable water quality standard for dissolved oxygen (DO) due to naturally-occurring conditions. If the waterbody is not meeting its applicable water quality standards due to natural conditions (i.e., a pollutant is not causing the impairment), a TMDL would not be necessary nor would it be required by the consent decree. However, the existing data and information does not provide certainty that a pollutant is *not* causing the violation of the DO water quality standard; therefore, as a legal precaution, EPA is fulfilling its court-ordered commitment by proposing a TMDL for this waterbody. The TMDL, as proposed, indicates that the existing water quality standard for DO is not attainable in this waterbody, and therefore, recommends that the State of Florida establish a site-specific criterion for DO for this waterbody.

In this proposed TMDL, EPA is seeking comments on the technical analysis presented in the TMDL. EPA is also requesting stakeholders to submit any additional data and information related to the causes of non-attainment of the DO water quality standard in this waterbody. If EPA is able to establish that the low DO conditions of the waterbody are due to natural conditions, the TMDL will not be finalized. If, on the other hand, EPA obtains data and information indicating a pollutant to be the cause, EPA will revise the TMDL to reflect this finding.

## **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 water body 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 non-point 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 this approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. This approach is also the framework FDEP uses for implementing TMDLs. The state's 52 basins are divided in 5 groups. Water quality is assessed in each group on a rotating five-year cycle. For assessment purposes, FDEP has divided the basins into water assessment polygons with a unique **waterbody identification** (WBID) for each watershed or stream reach.

**PROBLEM DEFINITION AND WATERSHED DESCRIPTION**

Brooker Creek (WBID #1474) is located in the Coastal Old Tampa Bay Tributaries Planning Unit. It drains land areas in three counties, primarily Hillsborough and Pinelass. Less than 10% of the WIBID is in Pasco County. The major land/cover use is wetlands (31%) followed by development (29%), forest (16%), agriculture (14%), rangeland (5%), and water (5%). Brooker Creek is covered by 4 MS4 areas including East Lake, Oldsmar, Keystone and Odessa. There are no NPDES facilities with permit limits for DO that are discharging directly into Brooker Creek. The creek was listed on the 303(d) for low DO. Therefore, EPA is responsible for developing the TMDL. Figure 1 Shows the location of Brooker Creek.

**WATER QUALITY STANDARD AND TARGET IDENTIFICATION**

Dissolved Oxygen (DO) shall not be less than 5.0 milligrams/L in a 24-hour period and shall never be less than 4.0 milligrams/L. Normal daily and seasonal fluctuations above these levels shall be maintained (FAC 62-3-2.530 (12)).

**WATER QUALITY AND ENVIRONMENTAL DATA**

Table 1 provides a list of water quality monitoring stations within the listed segment. Each station is identified and the time period of record is given for the individual stations. A summary analysis of DO data is presented in Table 2. The distribution of DO AND LOW measurements ARE presented in Figure 2 and 3, respectively. Over the evaluation period, there were 558 violations of the DO criteria out of 660 measurements, or 89 percent. Nutrient data is presented in Figures 4 to 7.

**Table 1. Water quality monitoring stations in WBID 1474**

Station number	Station Name	First Date	Last Date
21FLPDEMAMB 04-3	brooker creek	1/27/1999	12/3/2002
21FLPDEMAMB 04-2	brooker creek	9/1/1999	12/11/2002
21FLPDEM04-03	brooker cr n of tarpon woods blvd bridge	1/25/1995	10/15/2003
21FLPDEM04-02	brooker cr hillsborough co n keystone rd brdg	5/22/1991	10/15/2003
21FLPDEM04-01	brooker ck w side of elk rd brdg	1/17/1991	12/21/1994
112WRD 280753082411102	eldridge wilde swi-2s nr tarpon springs fl	11/11/1999	11/11/1999
112WRD 280753082411101	eldridge wilde swi-2d nr tarpon springs fl	11/11/1999	11/11/1999
112WRD 02307359	brooker creek nr tarpon springs, fla.	2/5/1991	9/10/2001
112WRD 02307323	brooker creek nr lake fern, fla.	5/2/1991	4/8/1993

**Table 2. Summary of data for Brooker Creek WBID 1474**

<b>Parameter</b>	<b>Obs</b>	<b>Max</b>	<b>Min</b>	<b>Mean</b>	<b>StDev</b>	<b>Violations</b>	<b>Florida Criteria</b>
Dissolved Oxygen (mg/l)	660	10.25	0.04	2.62	1.75	588	5

### **SOURCE ASSESSMENT**

Low DO in water bodies may be associated with high BOD loads and excessive nutrient enrichment from urban areas. Excessive nutrient enrichment contributes to DO depletion via algae, and plant growth and decay. However, there are no point sources of nutrients or BOD in the Booker Creek contributing areas.

Another potential source of nutrients in Brooker Creek is groundwater and overland flow from development and agriculture (non point sources). However, the Creek was delisted for nutrients and therefore is not impaired by these constituents. Brooker Creek was not listed for BOD impairment. Also, an assessment of BOD values collected from 1992 to 1999 have a media value of 1.1 mg/l. The stream water quality criteria the sate uses for determining whether or not a waterbody is impaired is 1.50 mg/L.

Another potential source of nutrients in Brooker Creek is groundwater and overland flow from development and agriculture (non point sources). Despite a high percentage of these land uses in its watershed, nutrient values observed in the creek are not elevated and therefore not likely responsible for low DO in the Creek. For example, average values were 0.04 mg/l for nitrate/nitrite, 0.09 mg/l for ammonia, and 0.11 mg/l for total phosphorus. In comparison, statewide averages for nitrate/nitrite, ammonia, and total phosphorus are 0.100 mg/l, 0.04 mg/l and 0.09 mg/l, respectively (Ocklawaha Basin Status Report, DEP, Nov. 2001). Nutrient data at these levels are evidence that non point sources of nutrient and are not likely responsible for low DO in Brooker Creek waters.

Low DO levels observed in Brooker Creek are most likely due to high content of naturally-occurring organic matter in the associated riparian wetlands. Pools of low DO waters in these wetlands exist as a result of warm temperatures that promote algae and plant growth, and subsequent decay. Periods of low dissolved oxygen occur in the stream as it drains these wetland areas. Little reaeration and water stagnation due to low stream gradients and respiration from algae and other plants contribute also to DO depletion.

### **TMDL DEVELOPMENT**

#### **Expression and Allocation of the TMDL**

The objective of a TMDL is to provide a basis for allocating loads among all of the known pollutant sources. A TMDL is expressed as the sum of all point source loads

(Waste Load Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality. The equation is:

$$\text{TMDL} = \sum \text{WLA} + \sum \text{LAS} + \text{MOS}$$

**TMDL Computations**

Dissolved oxygen TMDL for Brooker Creek is computed as the amount of DO needed to bring the current DO levels to the standard of 5 mg/L. The average DO value for Brooker Creek is 2.62 mg/L. Its average flow obtained from data measured during the 1994-1999 period (See Figure 2) is: 12.66 cubic feet per second (cfs). TMDL computations are as follows:

Average DO concentration needed to bring the system to 5 mg/L=

$$5 \text{ mg/L} - 2.62 \text{ mg/l} = 2.38 \text{ mg/L}$$

Average amount of DO needed to bring Brooker Creek up to 5 mg/L=

DO concentration x Flow

$$2.38 \text{ mg/L} \times 12.66 \text{ ft}^3/\text{second} \times 28.32 = 853.20 \text{ mg/s}$$

28.32 is the conversion factor from ft<sup>3</sup> to liters.

Since 1 mg/s is equal to 0.19 lbs/day,

DO needed to bring the system to the standard is therefore:

$$853.20 \times 0.19 = 162.52 \text{ lbs/day}$$

The TMDL components are presented in Table 3.

**Table 3. TMDLs for Brooker Creek (WBID #1474)**

WBID	Parameter	TMDL (lb/day)	LA (lb/day)	WLA <sup>1</sup>		MOS <sup>2</sup> (lb/day)
				Continuous (lb/day)	MS4	
1474	Dissolved Oxygen	178.77	162.52	0	0	16.3

Where,

<sup>1</sup>WLAs is broken out into two separate categories for wastewater discharges and stormwater discharges regulated under the NPDES program. There were no point sources

discharging in Brooker Creek. Waste load allocation from stormwater discharges. As discussed above, BOD and nutrients appear not to be sources of DO impairment in Brooker Creek.

<sup>2</sup>Margin of safety (MOS). MOS is explicitly assigned 10% reduction in DO loading numerical target.

### **CRITICAL CONDITIONS**

Brooker Creek TMDL for DO is based on averages rather than variations over a given time period. This is because the approaches used to compute TMDL were based on long-term rather than short-term assessments, and that the methodology to determine the impairment in the Creek was based on annual basis and therefore required data collected over a long time period.

### **RECOMMENDATIONS**

It is recommended not to allow any point sources of BOD and nutrients discharge to the creek. The state should consider developing site-specific dissolved oxygen criteria.

# Brooker Creek (WBID 1474)

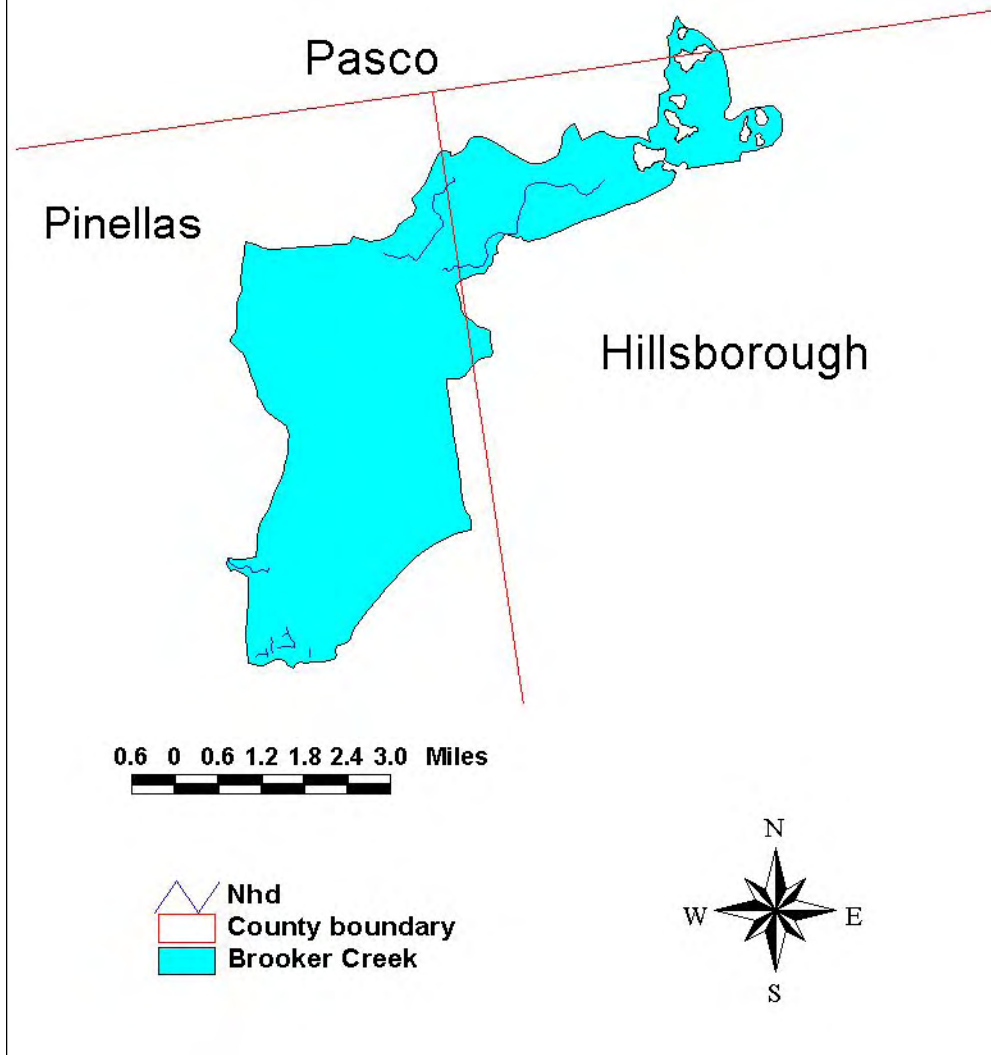


Figure 1. Location of Brooker Creek (WBID #1474)





