TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For Toxicity in Marburg Creek

Barrow County, Georgia

Oconee River Basin
(HUC 03070101)

January 25, 2002

Executive Summary

The State of Georgia's 2000 Section 303(d) list identified Marburg Creek, from Masseys Lake to the Creek's confluence with the Apalachee River, as not supporting its designated use for the parameter toxicity. The listing of Marburg Creek for toxicity was based on whole effluent toxicity tests conducted on effluent from the Winder Marburg Creek Water Pollution Control Plant (WPCP). The Total Maximum Daily Load (TMDL) established for this water requires that effluent from the point source as well as waters originating from nonpoint sources shall not exhibit any toxicity. The TMDL is expressed in terms of chronic toxicity units and can be summarized as follows:

TMDL SUMMARY

Parameter	Wasteload Allocation	Load Allocation	Margin of Safety	TMDL
Chronic toxicity	Winder Marburg Creek WPCP (1.0 TU_c)	0.0 TU_c	Implicit	1.0 TU_c

Under the authority of Section 303(d) of the Clean Water Act, 33 U.S.C. 1251 et seq., as amended by the Water Quality Act of 1987, P.L. 100-4, the U.S. Environmental Protection Agency is hereby establishing a TMDL for toxicity for the protection of aquatic life in the Marburg Creek watershed.

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Date

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Introduction

The Environmental Protection Division of the Georgia Department of Natural Resources (GAEPD) assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories; fully supporting, partially supporting, or not supporting their designated uses depending on water quality assessment results. These water bodies are found in GAEPD's 305(b) report as required by that section of the CWA that defines the assessment process, and are published in *Water Quality in Georgia* every two years.

Some of the waters in GAEPD's 305(b) report that have been identified as partially supporting or not supporting their designated uses are assigned to GAEPD's §303(d) list. These water bodies are considered to be water quality limited and cannot meet their designated use standards. Water bodies on the §303(d) list are required to have a Total Maximum Daily Load (TMDL) established for each water quality parameter where designated uses are not being fully attained. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and instream water quality conditions. This allows water quality based controls to be developed to ensure water quality standards are attained.

On its 2000 §303(d) list GAEPD has identified 7 miles of Marburg Creek, from Masseys Lake to the Creek's confluence with the Apalachee River, as not supporting its designated uses for the parameter toxicity. GAEPD originally listed this water for toxicity in 1992. In addition to toxicity, Marburg Creek is also included on GAEPD's 2000 §303(d) list for the parameter fecal coliform. EPA proposed a TMDL to address the fecal coliform impairment in Marburg Creek on August 30, 2001.

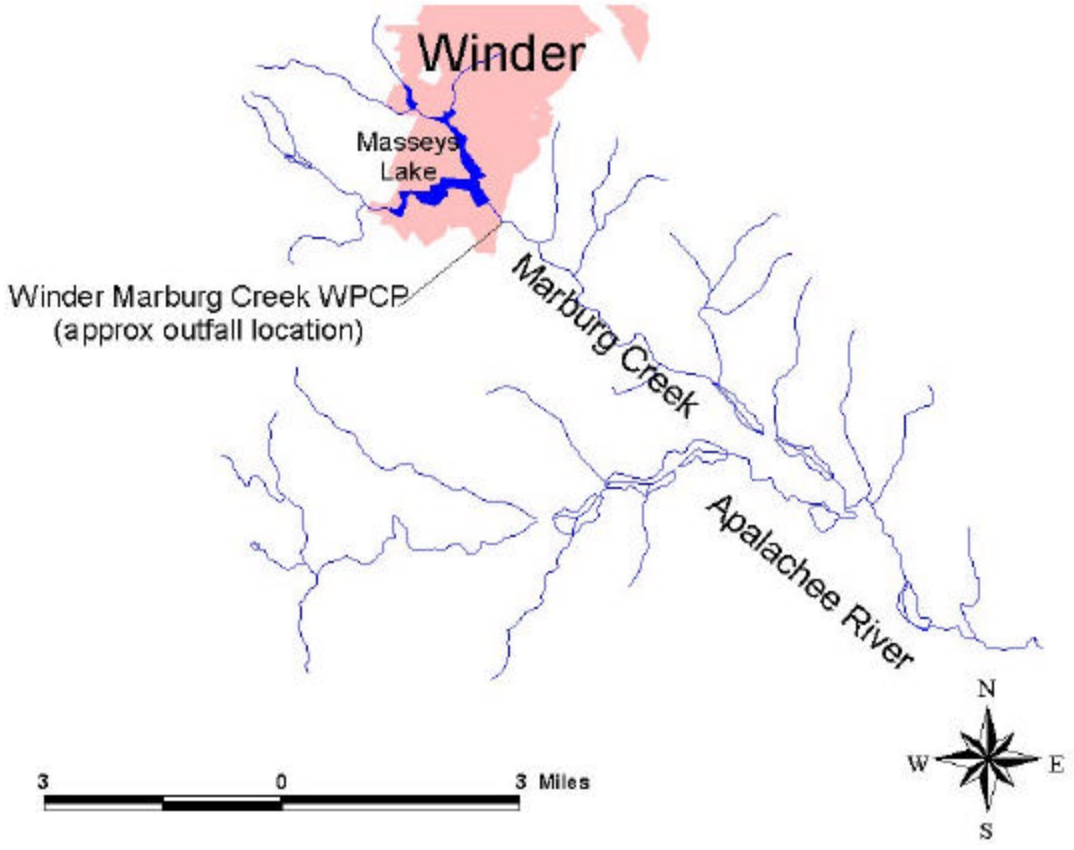
The potential causes of Marburg Creek's impairment from fecal coliform and toxicity are described on GAEPD's 2000 list as urban runoff and the municipal discharge from the City of Winder. However, Georgia listed Marburg Creek as being impaired from toxicity solely on the basis of the results of whole effluent toxicity (WET) tests conducted on effluent from the Winder Marburg Creek Water Pollution Control Plant (WPCP) in 1990. During discussions EPA had with GAEPD following the August 30, 2001 proposal of this toxicity TMDL, GAEPD clarified that nonpoint sources in the Marburg Creek watershed are believed to only impact the fecal

coliform impairment. There is no evidence that nonpoint sources cause or contribute to toxicity impairment.

Watershed Description

Marburg Creek is located in the Oconee River basin in northeast Georgia in Barrow County. The watershed is part of the Southern Outer Piedmont ecoregion of the Southeastern Temperate Forested Plains and Hills. Marburg Creek originates west of the City of Winder and and flows through agricultural, forested, and urban areas for approximately 10 miles before its confluence with the Apalachee River. Masseys Lake, the upstream boundary of Marburg Creek's impairment, is located approximately 7 miles upstream of the mouth of Marburg Creek (see Figure 1).

Figure 1. Marburg Creek Watershed



The Winder Marburg Creek WPCP is operating under a National Pollutant Discharge

Elimination System (NPDES) permit issued by GAEPD and is permitted to discharge 0.6 million gallons per day (MGD) of wastewater. During an acute toxicity study conducted by GAEPD in February 1990, toxicity test results indicated acute toxicity in the effluent. Based on a review of the available information and data associated with the WPCP, no additional toxicity tests have been conducted.

The 7-day, 10-year minimum (7Q10) statistical flow value associated with Marburg Creek is not meaningful because of the dam located on Masseys Lake. The minimum discharge of water released from the dam is 1.2 cubic feet per second (cfs). Considering that the toxicity in Marburg Creek is considered to be exclusively caused by the point source, the 7Q10 flow could potentially be used in a dilution calculation to determine the allowable level of toxicity from the Winder Marburg Creek WPCP. However, as part of the margin of safety for this TMDL, dilution from the minimum release from the dam is not included in the TMDL calculation.

Target Identification

The water use classification for Marburg Creek is fishing. The fishing classification, as stated in Georgia's Rules and Regulations for Water Quality Control chapter 391-3-6-.03(6)(c), is established to protect the "[p]ropagation of Fish, Shellfish, Game and Other Aquatic Life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality."

Protection against toxic releases is called for under the CWA Section 101(a)(3), which states that "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." In addition, CWA Section 303(c) requires States to develop water quality standards to protect the public health or welfare, enhance the quality of water, and serve the purposes of the CWA. In turn, water quality standards are composed of the designated use of the receiving water, water quality criteria (numeric or narrative) to protect the designated use, and an antidegradation statement.

GAEPD has established narrative criteria for toxicity that applies to all waters of the State. Georgia Regulation 391-3-6-.03(5)(e) of Georgia's Rules and Regulations for Water Quality Control states that "[a]ll waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or

aquatic life."

This TMDL for Marburg Creek is being developed to provide protection against chronic toxicity. As it is explained in more detail in the TMDL Results section of this report, protection against chronic toxicity will inherently provide protection against acute toxicity. In accordance with EPA's Technical Support Document For Water Quality-based Toxics Control, an instream chronic toxicity not exceeding 1.0 chronic toxic units (TU_c) is representative of no chronic toxic effects. Therefore, this TMDL is being developed such that the chronic toxicity of Marburg Creek does not exceed 1.0 TU_c.

Linkage Between Numeric Targets and Sources

The basis for GAEPD's inclusion of Marburg Creek on its §303(d) list for toxicity is the results of toxicity tests conducted on the treated effluent from the Winder Marburg Creek WPCP. Allocations for this TMDL are being established to ensure that the point source does not discharge any level of toxicity and that waters originating from nonpoint sources continue not to exhibit any level of toxicity.

The No Observed Effect Concentration (NOEC) represents the highest tested concentration of an effluent at which no adverse effects are observed on the aquatic test organisms during a WET test. EPA's Technical Support Document For Water Quality-based Toxics Control (TSD) defines the TU_c associated with an effluent discharge as being equal to 100 divided by the NOEC. For example, an effluent discharge with a NOEC of 50% reflects a TU_c of 2.0. In addition, it is important to note that EPA's TSD suggests that the TU_c associated with a stream that exhibits no toxicity before it receives any wastewater is equal to zero (i.e., $TU_c=0$).

Total Maximum Daily Load (TMDL) Calculation

A TMDL is comprised of the sum of individual wasteload allocations (WLAs) for point sources, and load allocations (LAs) for both nonpoint sources and natural background levels for a given watershed. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relation between pollutant loads and the quality of the receiving water body. Conceptually, this definition is denoted by the equation:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). In accordance with 40 CFR Part 130.2(i), "TMDLs can be expressed in terms of ... mass per time, toxicity, or other appropriate measure(s)." In addition, NPDES permitting regulations in 40 CFR 122.45(f) state that "All pollutants limited in permits shall have limitations...expressed in terms of mass except...pollutants which cannot appropriately be expressed by mass." For the toxicity TMDL for Marburg Creek, the Total Maximum Daily Load is expressed in terms of chronic toxicity units.

Wasteload Allocation

As part of the margin of safety for this TMDL, dilution of receiving waters is not considered in the allowable NOEC for the point source. As a result, the NOEC for the effluent from this facility must be 100%. Therefore, the wasteload allocation for the Winder Marburg Creek WPCP can be expressed as follows:

$$WLA = 100 / NOEC = 100 / 100 = 1.0\ TU_c$$

Load Allocation

EPA's TSD suggests that the TU_c associated with a stream that exhibits no toxicity before it receives any wastewater is equal to zero (i.e., $TU_c = 0$). Therefore, a gross load allocation to the nonpoint sources is established as 0.0 TU_c. Considering that there is no evidence that any nonpoint sources in the watershed cause or contribute to the toxicity in Marburg Creek, it is assumed that this load allocation is currently being maintained.

Margin of Safety

In accordance with section 303(d)(1)(c) of the CWA, the margin of safety (MOS) shall account for any lack of knowledge concerning the relationship between the allocated pollutant loads and water quality. There are two basic methods for incorporating the MOS:

1. Implicitly incorporating the MOS using conservative assumptions and methods to develop allocations; or

2. Explicitly specifying a portion of the total TMDL as the MOS; using the remainder for allocations.

The MOS for this TMDL is implicit because of the conservative assumptions and methods used to develop the wasteload allocation and the load allocation. As a result of not using the dilution of the 7Q10 flow in the wasteload allocation calculation, the TMDL provides the maximum amount of protection against toxicity to Marburg Creek. That is, the most stringent allocations possible are given to both the point source and any potential nonpoint sources, therefore ensuring the elimination of any uncertainty about the relationship between the allocated toxic loads and water quality.

Seasonal Variation

The wastleload allocation and the load allocation apply regardless of the specific time of year or the particular environmental conditions in the watershed. Therefore, the TMDL provides for year-round protection of water quality.

TMDL Results

This TMDL can be shown to be protective of an instream chronic toxicity of 1.0 TU_c for Marburg Creek as follows:

$$\text{instream toxicity} = \frac{\text{upstream toxicity } \mathbf{x} \text{ upstream flow } \mathbf{+} \text{ effluent toxicity } \mathbf{x} \text{ effluent flow}}{\text{upstream flow } \mathbf{+} \text{ effluent flow}}$$

$$= \frac{0.0\ TU_c \text{ x upstream flow } + 1.0\ TU_c \text{ x } 1.75 \text{ MGD}}{\text{upstream flow } + 1.75 \text{ MGD}}$$

$$= \frac{1.0\ TU_c \text{ x } 1.75 \text{ MGD}}{\text{upstream flow } + 1.75 \text{ MGD}}$$

The above quantity can never exceed 1.0 TU_c regardless of the magnitude of the upstream flow.

Table 1 - TMDL SUMMARY

Parameter	Wasteload Allocation	Load Allocation	Margin of Safety	TMDL
Chronic toxicity	Winder Marburg Creek WPCP (1.0 TU_c)	0.0 TU_c	Implicit	1.0 TU_c

Maintaining protection against chronic toxicity in Marburg Creek will inherently maintain protection against acute toxicity. To understand this, one must recognize that the above allocations require that there shall be no observable toxic effects from the point source and no observable toxic effects from any nonpoint sources. If there are no observable toxic effects, it is inherent that there will be no acute or lethal effects. The above TMDL protects against both chronic and acute toxicity.

Implementation

EPA has always recognized that implementation of TMDLs is important, since a TMDL improves water quality when the pollutant allocations are implemented, not when a TMDL is established. EPA believes, however, that TMDL implementation – and implementation planning – is the responsibility of the State of Georgia, through its administration of the National Pollutant Discharge Elimination System (NPDES) point source permit program and through its administration of any regulatory or non-regulatory nonpoint source control programs. Neither the Clean Water Act nor EPA's current regulations require a TMDL to include an implementation plan.

A consent decree in the case of Sierra Club v. EPA, 1:94-cv-2501-MHS (N.D. Ga.) requires the State or EPA to develop TMDLs for all waterbodies on the State of Georgia's current 303(d) list according to a schedule contained in the decree. On July 24, 2001, the district court entered an order finding that the decree also requires EPA to develop TMDL implementation plans. EPA disagrees with the court's conclusion that implementation plans are required by the decree and has appealed the July 24, 2001, order. The Agency is moving forward, however, to comply with the implementation obligations contained in this order.

Implementation of the wasteload allocation for this TMDL will be conducted by GAEPD through its NPDES permitting process. The issuance of the NPDES permit for the facility impacted by the wasteload allocation of this TMDL should be done in accordance with the State's July 2,

2001 "Basin Permitting Strategy." In accordance with this Strategy, the NPDES permits for the facility impacted by this TMDL shall be issued within 18 months of the date the TMDL is established. Therefore, it is anticipated that the NPDES permit for the facility impacted by this TMDL will be issued by July 25, 2003.

Concerning the establishment of appropriate NPDES permitting requirements for the facility included in the wasteload allocation, it is important to note that the allocation does not automatically result in permit limits or monitoring requirements. GAEPD will determine through its NPDES permitting process whether the Winder Marburg Creek WPCP has a reasonable potential of discharging chronically toxic effluent. The results of this reasonable potential analysis will determine the specific type of requirement(s) for this facility's NPDES permit. As part of its analysis, the State's NPDES permitting group will use its most current EPA-approved NPDES Reasonable Potential Procedures and Whole Effluent Toxicity Strategy to determine whether chronic WET monitoring requirements or limitations are necessary.

In accordance with EPA guidance, a Toxicity Identification Evaluation/Toxicity Reduction Evaluation (TIE/TRE) process may be used to identify and reduce contaminants in municipal and industrial wastewater that cause toxicity. Detailed information concerning this process is described in the following EPA documents:

- Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
- Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations (EPA/600/2-88-070)
- Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants (EPA 833-B-99-002)
- Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures, Second Edition (EPA/600/6-91/003)
- Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity (EPA/600/R-92/080)
- Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity (EPA/600/R-92/081)
- Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I (EPA/600/6-91/005F)

The TIE/TRE process may be used by the Winder Marburg Creek WPCP if there is a need to identify and reduce contaminants in its effluent that cause or contribute to toxicity.

As stated in the Introduction section of this report, there is no evidence that there are any nonpoint sources that cause or contribute to toxicity in Marburg Creek. Therefore, it is assumed that the load allocation established by this TMDL is currently being attained and there is no need for further implementation of the load allocation.

References

1. Environmental Protection Division of the Georgia Department of Natural Resources. *Memorandum from David L. Bullard to Alan W. Hallum regarding the "Basin Permitting Strategy."* Atlanta, GA. July 2, 2001.

2. Environmental Protection Division of the Georgia Department of Natural Resources. *Letter with attachments regarding the final update of the Georgia 2000 303(d) list.* Atlanta, GA. June 8, 2001.

3. Environmental Protection Division of the Georgia Department of Natural Resources. Letter and attachments regarding "Reasonable Potential procedures and Whole Effluent Toxicity Strategy." May 30, 2001.

4. Environmental Protection Division of the Georgia Department of Natural Resources. Rules and Regulations for Water Quality Control, Chapter 391-3-6. Atlanta, GA. July 2000.

5. USEPA. Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA 833-B-99-002. August 1999.

6. USEPA. Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/600/R-92/080. September 1993.

7. USEPA. Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/600/R-92/081. September 1993.

8. USEPA. Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/600/6-91/005F. May 1992

9. USEPA. Technical Support Document for Water Quality-based Toxics Control. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/505/2-90-001. March 1991.

10. USEPA. Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures, Second Edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/600/6-91/003. February 1991.

11. USEPA. Generalized Methodology for Conducting Industrial Toxicity Reduction Evaluations. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/600/2-88-070. April 1989.