

## **TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT**

For Toxicity in Eastanollee Creek  
Stephens County, Georgia  
Savannah River Basin  
(HUC 03060102)

March 2005



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 a Total Maximum Daily Load (TMDL) for toxicity for Eastanollee Creek in the Savannah River Basin. Subsequent actions must be consistent with this TMDL.

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Date

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## Table of Contents

Table of Contents.....	ii
Introduction.....	1
Background.....	1
Source Assessment.....	2
Target Identification.....	3
TMDL Target.....	3
Critical Condition Determination.....	4
Total Maximum Daily Load (TMDL) Calculation.....	4
Wasteload Allocation.....	4
Load Allocation.....	5
Margin of Safety.....	5
Seasonal Variation.....	5
TMDL Results.....	7
Allocation of Responsibility.....	7
References.....	8

## Introduction

The U.S. Environmental Protection Agency (EPA) Region 4 is establishing this Total Maximum Daily Load (TMDL) for toxicity for Eastanollee Creek in Stephens County. The listed segments are as follows:

- Eastanollee Creek (Toccoa to Lake Hartwell)

These segments are listed on the State of Georgia's 2004 Section 303(d) list of impaired waters because mercury in certain species of fish tissue exceeds the Georgia Department of Natural Resources (GDNR) Fish Consumption Guidelines State's guidelines.

TMDLs are required for waters on a state's Section 303(d) list by Section 303(d) of the Clean Water Act (CWA) and the associated regulations at 40 CFR Part 130. A TMDL proposes the maximum amount of a pollutant a waterbody can assimilate without exceeding the applicable water quality standard. The TMDL allocates the total allowable pollutant load to individual sources or categories of pollution sources through wasteload allocations (WLAs) for point sources regulated by the National Pollutant Discharge Elimination System (NPDES) program and through load allocations (LAs) for all other sources. The WLAs and LAs in the TMDL provide a basis for states to reduce pollution from both point and nonpoint sources that will lead to restoration of the quality of the impaired waterbody. The purpose of this TMDL is to identify the allowable load of toxicity that will result in attainment of the applicable water quality standard.

This TMDL satisfies a consent decree obligation established in *Sierra Club, et. al. v. EPA*, Civil Action: 94-CV-2501-MHS. The Consent Decree requires TMDLs to be developed for all waters on Georgia's current Section 303 (d) list consistent with the schedule established by Georgia for its rotating basin management approach. The State of Georgia requested EPA to develop this TMDL, and as such, EPA is establishing this TMDL for Georgia for the listed segments in the Ogeechee watershed.

## Background

Eastanollee Creek originates in the City of Toccoa, Georgia. From Toccoa, Eastanollee Creek flows east south east for approximately 11 miles through Stephens County before draining to Lake Hartwell. Georgia's 2002 Section 303(d) list identified Eastanollee Creek, from Toccoa to Lake Hartwell, as not supporting its designated use for fishing, propagation of fish, shellfish, game, and other aquatic life. Coat America (NPDES Permit #GA0002038) and the City of Toccoa-Eastanollee (NPDES Permit #GA0021814) and are the only two point sources that discharge directly to Eastanollee Creek.

## Eastanollee Creek Watershed

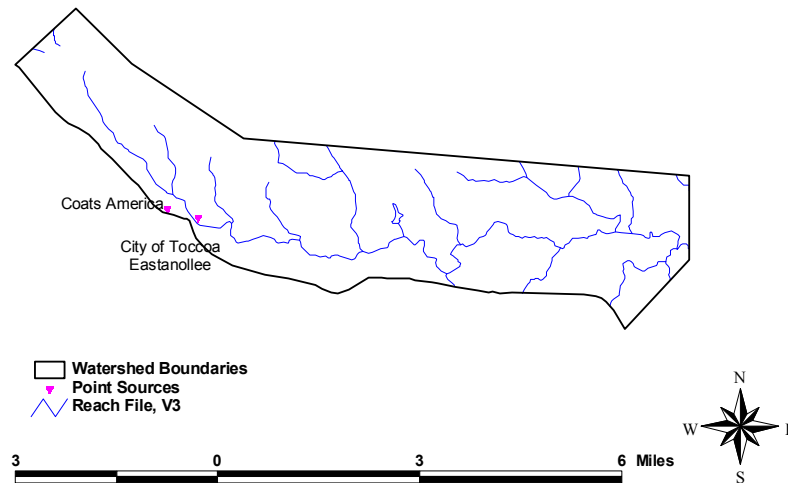


Figure 1. Eastanollee Creek Watershed

### Source Assessment

Known sources of toxicity to Eastanollee Creek include Coats America and the City of Toccoa. Coats America discharge is located approximately 0.5 miles downstream of the City of Toccoa-Eastanollee discharge. Coats America is required to monitor and report toxicity quarterly. It is estimated that Coats America discharge comprises approximately 70% of the total flow in Eastanollee Creek. Toxicity was discovered as an issue in Coats America discharge in 1989. Since discovering that toxicity exists within Coats America discharge, a toxicity reduction evaluation (TRE) was to be completed. Between 1992 and 1996 Coats America undertook two major modifications of its wastewater treatment process to reduce the concentration of copper and zinc. In 1996, Coats installed equipment to add polymer to reduce the concentration of both metals and color. Coats also installed a clarifier to collect the coagulated materials. After construction of the clarifiers, Coats had problems passing the chronic whole effluent toxicity (WET) using *ceriodaphnia dubia*. In response to this problem, Coats also installed constructed wetlands to provide additional treatment of its wastewater. Since 1998, Coats America was required to conduct quarterly whole effluent toxicity (WET) to ensure an instream waste concentration (the percent concentration of effluent in the receiving stream, after mixing) of 56% at 7Q10 flow whereby to demonstrate that their effluent was not acutely toxic.

The City of Toccoa-Eastanollee discharge is located approximately 7.7 miles upstream from of Lake Hartwell. The City of Toccoa is also required to monitor and report toxicity annually. In the year

2000, EPA developed TMDLs for copper and zinc for Eastanollee Creek. The TMDL identified Coats America and the City of Toccoa as the source of copper and zinc. These TMDLs were established on July 2, 2001. Since the approval of the TMDL, the City of Toccoa National Primary Discharge Elimination System (NPDES) permit has been modified to include effluent limits for copper and zinc. Because the City of Toccoa effluent also indicated toxicity, their revised NPDES permit included an end-of-pipe WET limit. There are no known nonpoint sources of toxicity in the Eastanollee Creek watershed.

## Target Identification

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.

The Environmental Protection Division of the Georgia Department of Natural Resources (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.”

For an effluent dominated stream such as Eastanollee Creek, it is expected that protection against chronic toxicity will inherently provide protection against acute toxicity. An explanation of this is provided in the TMDL Results section of this report. 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 Eastanollee Creek does not exceed 1.0  $TU_c$  under critical conditions.

## TMDL Target

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 No Observed Effect Concentration (NOEC). For example, an effluent discharge with a NOEC of 50% reflects a  $TU_c$  of 2.0. In addition, 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 simple mass-balance equation reflecting critical flow conditions can be used for the TMDL development. The target is  $TU_c = 1$

## Critical Condition Determination

As documented in Georgia's 2002 §303(d) list, GAEPD indicated that the only potential cause of toxicity impairment to Eastanollee Creek was the effluent from Coats America. Since there is no known potential nonpoint source contributions to toxicity in Eastanollee Creek, the critical flow conditions for this TMDL are represented by a scenario where the ratio of effluent to stream flow is the greatest. For protection against chronic toxicity, the critical flow condition occurs when both Coats America and the City of Toccoa are discharging at their design capacity (i.e., 3.95 million gallons per day), and the stream is flowing at 7Q10 conditions (i.e., 1.47 cubic feet per second or 1.47 cfs).

Facility	Design Flow
City of Toccoa WPCP (1.008 TU <sub>c</sub> )	1.45 MGD
Coats America (1.008 TU <sub>c</sub> )	2.5 MGD

## 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:

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

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while attaining 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 Eastanollee Creek, the Total Maximum Daily Load is expressed in terms of chronic toxicity units (TU<sub>c</sub>s).

## Wasteload Allocation

Under critical low flow conditions, the toxicity wasteload allocation (WLA) for Eastanollee Creek is expressed as follows:

$$\text{Toxicity from point sources} = 100 / \text{NOEC} = 100 / \text{IWC} = 100 / 99.2 = 1.008 \text{ TU}_c$$

The instream waste concentration (IWC), which is expressed as a percent, represents the portion of the receiving stream volume comprised of effluent (discharged wastewater from the pipe) during "7Q10 conditions". IWC is calculated using the following formula:

$$\text{IWC} = \frac{\text{A.D.D}}{(7\text{Q}10)(0.646)+(\text{A.D.D})} \times 100$$

where ADD equals the average daily discharge of wastewater measured in million gallons daily (mgd)., and 7Q10 is defined as the minimum average flow for a period of seven consecutive days that has an average recurrence of once in ten years. For this case, the average daily discharge is 0.70 cfs.

Both of these facilities currently have toxicity limits/monitoring in their permits which requires them to eliminate toxicity from their discharge. The current permitted requirements do comply with the wasteload allocation shown below.

## Load Allocation

As GAEPD documented in its 2002 §303(d) list, the only potential cause of toxicity impairment to Eastanollee Creek was the effluent from the City of Toccoa WPCP and Coats America. Therefore, the existing toxicity contribution to Eastanollee Creek from nonpoint sources is assumed to be 0.0 TU<sub>c</sub>. Since the wasteload allocation uses all of the assimilative capacity of Eastanollee Creek during critical conditions, the allocation to the nonpoint sources (i.e., the load allocation) is set to equal the existing toxicity contribution of 0.0 TU<sub>c</sub>.

## 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 effluent limitations and water quality. There are two basic methods for incorporating the MOS:

1. Implicitly incorporating the MOS using conservative assumptions to develop allocations; or
2. Explicitly specifying a portion of the total TMDL as the MOS; using the remainder for allocations.

The MOS is incorporated implicitly into the TMDL process by the use of critical low flow conditions.

## Seasonal Variation



The low flow critical conditions incorporated in this TMDL represent the most critical design condition and will provide 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<sub>c</sub> for Eastanollee Creek as follows:

$$\begin{aligned}
 \text{instream toxicity} &= \frac{\text{upstream toxicity} \times \text{upstream flow} + \text{effluent toxicity} \times \text{effluent flow}}{\text{upstream flow} + \text{effluent flow}} \\
 &= \frac{0.0 \text{ TU}_c \times 0.685 \text{ MGD} + 1.008 \text{ TU}_c \times 3.95 \text{ MGD}}{0.685 \text{ MGD} + 3.95 \text{ MGD}} \\
 &= 1.0 \text{ TU}_c
 \end{aligned}$$

**Table 2 - TMDL SUMMARY**

Parameter	WLA	LA	MOS	TMDL
Chronic toxicity	City of Toccoa WPCP (1.008 TU <sub>c</sub> )	0.0 TU <sub>c</sub>	Implicit	1.008 TU <sub>c</sub>
Chronic toxicity	Coats America (1.008 TU <sub>c</sub> )	0.0 TU <sub>c</sub>	Implicit	1.008 TU <sub>c</sub>

It is expected that maintaining protection against chronic toxicity in Eastanollee Creek, by using chronic toxicity units for the TMDL, will inherently maintain protection against acute toxicity. To understand this, one must recognize that achieving the TMDL of 1.008 TU<sub>c</sub> means that there will be no toxic effects of any kind to organisms in Eastanollee Creek when the stream is composed of 99.2% wastewater. If there are no toxic effects of any kind to organisms when the stream is composed of 99.2% wastewater, then it is expected that there will be no acute toxic effects (i.e., lethality) to organisms when the stream is composed of 100% wastewater.

## Allocation of Responsibility

This TMDL has been established to protect Eastanollee Creek against chronic toxicity. Through its National Pollutant Discharge Elimination System (NPDES) permitting process, GAEPD has determined that Coats America and the City of Toccoa has reasonable potential of discharging chronically toxic effluent. Based on this, both Coats America and the City of Toccoa-Eastanollee have limits in their current NPDES permit that requires both monitoring and reporting of toxicity.

## References

1. Environmental Protection Division of the Georgia Department of Natural Resources. NPDES Reasonable Potential Procedures. Atlanta, GA. January 1995.
2. Environmental Protection Division of the Georgia Department of Natural Resources. *Final version of the Georgia 1998 303(d) list*. Atlanta, GA. December 22, 1998.
3. Environmental Protection Division of the Georgia Department of Natural Resources. Rules and Regulations for Water Quality Control, Chapter 391-3-6. Atlanta, GA. April 2000.
4. United States District Court, Northern District of Georgia, Atlanta Division. ORDER re: Civil Action 1:94-CV-2501-MHS, March 23, 2001.
5. 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.
6. USEPA. Total Maximum Daily Load (TMDL) Development for Copper in Rocky Creek. U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. January 5, 2000.
7. USEPA. Total Maximum Daily Load (TMDL) Development for Toxicity in Rocky Creek. U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. January 5, 2000.
8. USEPA. Letter from James G. Giattina to Alan W. Hallum of the GAEPD regarding the “Final 2002 § 303(d) List”. U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. April 29, 2003.