

TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For Toxicity in Rocky Creek
Wilkes County, Georgia
Savannah River Basin
(HUC 03060102)

June 21, 2001



Total Maximum Daily Load (TMDL) Summary

The U.S. Environmental Protection Agency is hereby establishing a TMDL for toxicity for the protection of aquatic life in the Rocky Creek watershed. The State of Georgia's 1998 Section 303(d) list identified Rocky Creek, downstream of the Washington Water Pollution Control Plant (WPCP), in the Savannah River basin as not supporting its designated use for the parameters toxicity and copper. The State of Georgia indicated in its 2000 Section 303(d) list that Rocky Creek was no longer impaired from toxicity and copper, and EPA approved that determination. The United States District Court for the Northern District Court of Georgia, Atlanta Division on March 23, 2001 ordered the United States Environmental Protection Agency (EPA) to establish TMDLs for toxicity and copper for Rocky Creek by June 21, 2001.

EPA proposed toxicity and copper TMDLs for Rocky Creek on April 19, 2001 for public review and comment. Based on comments that were received, minor changes to the TMDL report were made including the addition of a map of Rocky Creek and a correction concerning a reference to the U.S. District Court for the Northern District of Georgia, Atlanta Division. The toxicity TMDL for Rocky Creek can be summarized as follows:

ROCKY CREEK TOXICITY TMDL SUMMARY

Parameter	WLA	LA	MOS	TMDL
Chronic Toxicity	Washington WPCP (1.008 TU _c)	0.0 TU _c	Implicit	1.008 TU _c

Original signed by _____
 Beverly H. Banister, Director
 Water Management Division

June 21, 2001 _____
 Date

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Introduction

A toxicity Total Maximum Daily Load (TMDL) and a copper TMDL for Rocky Creek were proposed by the United States Environmental Protection Agency (EPA) for public review and comment on January 5, 2000. The EPA held a public meeting in Washington, Georgia on February 15, 2000 to present information and hear comments on the proposed Rocky Creek TMDLs. Based on information that became available during the months that followed the public notice of the Rocky Creek TMDLs, the Environmental Protection Division of the Georgia Department of Natural Resources (GAEPD), with EPA's support, determined that Rocky Creek was no longer impaired from toxicity and copper and thus removed these parameters from its §303(d) list (i.e., impaired waters list). At that time, GAEPD also determined that Rocky Creek was biologically impaired and listed Rocky Creek Creek for "Biota". On May 5, 2000, EPA informed all Rocky Creek TMDL commenters and public hearing attendees that EPA's approval of GAEPD's §303(d) list would result in the withdrawal of the Rocky Creek TMDLs. EPA approved GAEPD's §303(d) list on August 28, 2000.

On March 23, 2001, based on the plaintiff's motion for action under the October 1997 Consent Decree between the Sierra Club, et al., and the EPA, the United States District Court for the Northern District Court of Georgia, Atlanta Division ordered the EPA to establish TMDLs for copper and toxicity for Rocky Creek by June 21, 2001. EPA determined that the TMDLs should be re-proposed for public review and comment before they are finalized. This determination was made considering that significant changes to the copper TMDL were necessary based on a change in the appropriate copper water quality target for Rocky Creek. In order to provide the public an opportunity to review and comment on the copper TMDL and toxicity TMDL concurrently, both TMDLs were re-proposed on April 19, 2001. Based on comments that were received from the public, minor changes to the TMDL report were made including the addition of a map of Rocky Creek and a correction concerning a reference to the U.S. District Court for the Northern District of Georgia, Atlanta Division.

The 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 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.

EPA is establishing this TMDL under CWA section 303(d)(2) pursuant to an order issued in the case *Sierra Club v. EPA*, 1:94-CV-2501-MHS (N.D. Ga.). In the absence of that court order, EPA would not issue this TMDL. The Rocky Creek is not on the current CWA section 303(d) list for toxicity, nor is it impaired by toxicity. As described in the Problem Definition section of this report, EPA and GAEPD determined that Rocky Creek is currently fully supporting its designated uses for toxicity based on an assessment of the most recent whole effluent toxicity test results. Georgia submitted its 2000 list to EPA for approval on April 28, 2000, and EPA approved it on August 28, 2000. Georgia has no current obligation under the Clean Water Act to submit to EPA TMDLs for that water/pollutant combination, and EPA has neither the obligation nor the authority to establish such TMDLs in Georgia's place under CWA section 303(d)(2) in the absence of the current court order. In addition, EPA does not believe that Congress intended either the States or EPA to establish TMDLs pursuant to 303(d)(2) for pollutants that are not impairing a waterbody. TMDLs for waters that are meeting water quality standards, are to be developed pursuant to section 303(d)(3). However, Congress conferred authority to estimate such informational TMDLs exclusively upon the States and did not contemplate any role for EPA. States are not required to submit (d)(3) TMDLs to EPA for review and EPA neither approves nor disapproves (d)(3) TMDLs. EPA has filed an appeal of the March 23, 2001, order in *Sierra Club v. EPA*, which directed EPA to establish this TMDL. If the March 23 order is vacated, EPA would withdraw the TMDL on the ground that EPA is not authorized to establish such TMDL under the authorities of section 303(d).

Problem Definition

Georgia's 1998 Section 303(d) list identified Rocky Creek, downstream of the Washington Water Pollution Control Plant (WPCP), as not supporting its designated use for fishing, propagation of fish, shellfish, game, and other aquatic life. Concentrations of copper in excess of the water quality standard and toxicity were identified as the criteria violated while the potential cause of impairment was identified as the municipal facility. The City's WPCP is the only point source discharging to Rocky Creek. GAEPD used the results of chronic Whole Effluent Toxicity (WET) tests conducted on effluent from the WPCP between 1990 and 1996 as its sole basis for determining that Rocky Creek was impaired for the parameter toxicity. Each of these test results indicated that the City's wastewater was chronically toxic.

Five additional chronic WET tests were conducted on the City of Washington's wastewater between January and March 2000. The results of each of these tests, performed on undiluted wastewater, indicated that the Washington WPCP's effluent was not toxic. Since these recent data show the City's effluent is not toxic and, therefore, will not likely cause toxicity in Rocky Creek under critical low flow conditions, EPA recommended in a April 4, 2000 letter to GAEPD that toxicity should be removed as a problem parameter from Rocky Creek on the State's Section 303(d) list. GAEPD concurred with EPA's assessment and did not include toxicity as a problem parameter for Rocky Creek on its 2000 Section 303(d) list. Although Rocky Creek is currently fully supporting its designated uses for the parameter toxicity, this TMDL will establish allowable loads to Rocky Creek in terms of chronic toxicity units, at a level which will maintain water quality standards in the Creek.

Target Identification

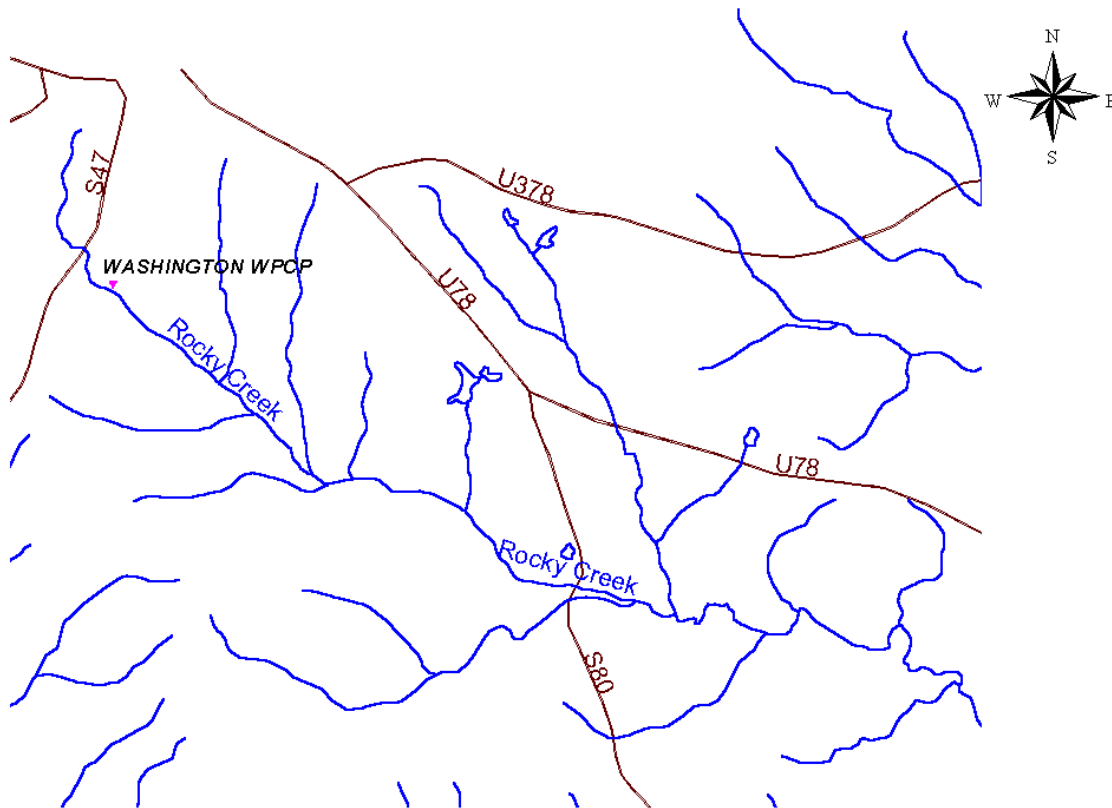
Protection against toxic releases is called for under the CWA Section 101(a)(3), which states that "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." In addition, CWA Section 303(c) requires States to develop water quality standards to protect the public 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 which 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 Rocky 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 Rocky Creek does not exceed 1.0 TU_c under critical conditions.

Background

Rocky Creek originates less than one mile from the center of Washington, Georgia. The creek originates in an urban setting but much of its watershed lies in rural areas amidst pasture lands and forested areas. Rocky Creek flows for approximately twelve miles through southern Wilkes County before it empties into Little River just upstream of Clarks Hill Reservoir and the City's main water intake. Rocky Creek is in the Little River Watershed which lies in the middle of the Savannah River basin in eastern Georgia.

Figure 1. Rocky Creek Watershed

The Washington WPCP is the only point source discharger of wastewater in the Rocky Creek watershed. It treats both municipal and industrial wastewater using an activated sludge system with a design capacity of 4.0 million gallons per day (MGD) discharge of treated wastewater. Between 1992 and 1994 the WPCP underwent modifications to reduce the environmental impact of its effluent to Rocky Creek, including the reduction of salts and surfactants in the effluent and dechlorination. In September 1995, a major source of chlorides, dyes, surfactants, and other chemicals was eliminated when Concord Fabrics, a large textile industry, was closed. The WPCP, however, continues to treat a significant amount of industrial flow from six local industries. The most significant of these contributors is the Standard Coosa Thatcher Corporation, a yarn dyeing facility, accounting for approximately 50-60 percent of the plant's flow. The five additional industries are Paper Pak, an adult diaper manufacturer; Clarke Schwebel, which produces computer boards and fiberglass; Edison Plastic, a manufacturer of backing for diapers; International Paper; and Anthony Forest Products.

Rocky Creek is an effluent dominated stream with the point source contributing to an instream waste concentration (IWC) of 99.2 percent at critical 7Q10 low flow conditions. The IWC represents the percent concentration of effluent in the receiving stream, after mixing. The Washington WPCP is the only point source discharger of wastewater in the Rocky Creek River Watershed. There are no known non-point source contributors of toxicity to Rocky Creek.

The historical record indicates that toxicity associated with the Washington WPCP had been a problem as long ago as at least eleven years. The last documented evidence of WET toxicity was recorded in March 1996. As seen below in Table 1, the five most recent WET tests indicated no toxicity in 100% effluent. For each of the tests, *Ceriodaphnia dubia* was used as the test organism.

Table 1 – Chronic WET Test Results

Test Date	No Observed Effect Concentration (NOEC)	PASSED / FAILED test at low flow critical conditions
3/90	17.5%	FAILED
3/93	50 %	FAILED
4/94	50 %	FAILED
2/95	75 %	FAILED
8/95	60 %	FAILED
3/96	60 %	FAILED
1/00	100 %	PASSED
2/00	100 %	PASSED
2/00	100 %	PASSED
2/00	100 %	PASSED
3/00	100 %	PASSED

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. The NOEC percentages of each test between 1990 and 1996 fell below the IWC under 7Q10 flow conditions, each test was positive for chronic toxicity. Although Concord Fabrics discontinued contributing to the City of Washington WPCP's wastewater after September 1995, one WET test conducted after this date (i.e., in March 1996) still indicated chronic toxicity. However, there is no evidence of toxicity associated with the City of Washington's effluent since that time.

Linkage Between Numeric Targets and Sources

For TMDL purposes, steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For effluent-dominated riverine systems where there are no known sources of nonpoint source pollution, critical environmental conditions correspond to drought upstream flows. The assumption behind steady-state modeling is that effluent concentrations that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur.

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, 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.

Critical Condition Determination

As documented in Georgia's 1998 §303(d) list, GAEPD indicated that the only potential cause of toxicity impairment to Rocky Creek was the effluent from the City of Washington WPCP. Since there is no known potential nonpoint source contribution to toxicity in Rocky 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 the Washington WPCP is discharging at its design capacity (i.e., 4.0 million gallons per day) and the stream is flowing at 7Q10 conditions (i.e., 0.05 cubic feet per second or 0.05 cfs).

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 Rocky Creek, the Total Maximum Daily Load is expressed in terms of chronic toxicity units (TU_c s).

Wasteload Allocation

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

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

Load Allocation

As GAEPD documented in its 1998 §303(d) list, the only potential cause of toxicity impairment to Rocky Creek was the effluent from the City of Washington WPCP. Therefore, the existing toxicity contribution to Rocky Creek from nonpoint sources is assumed to be 0.0 TU_c . Since the wasteload allocation uses all of the assimilative capacity of Rocky 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_c.

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_c for Rocky Creek as follows:

$$\begin{aligned}
 \text{instream toxicity} &= \frac{\text{upstream toxicity} \times \text{upstream flow} + \text{effluent toxicity} \times \text{effluent flow}}{\text{upstream flow} + \text{effluent flow}} \\
 &= \frac{0.0 \text{ TU}_c \times 0.05 \text{ cfs} + 1.008 \text{ TU}_c \times 4.0 \text{ MGD (1.547 cfs / MGD)}}{0.05 \text{ cfs} + 4.0 \text{ MGD (1.547 cfs / MGD)}} \\
 &= 1.0 \text{ TU}_c
 \end{aligned}$$

Table 2 - TMDL SUMMARY

Parameter	WLA	LA	MOS	TMDL
Chronic toxicity	Washington WPCP (1.008 TU _c)	0.0 TU _c	Implicit	1.008 TU _c

It is expected that maintaining protection against chronic toxicity in Rocky 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_c means that there will be no toxic effects of any kind to organisms in Rocky 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 Rocky Creek against chronic toxicity. Through its National Pollutant Discharge Elimination System (NPDES) permitting process, GAEPD will determine whether the City of Washington has a reasonable potential of discharging chronically toxic effluent. A wasteload allocation to an individual point source discharger does not automatically result in a permit limit or a monitoring requirement. Concerning the City of Washington WPCP, the State's NPDES permitting group will evaluate the available chronic WET test data in light of Georgia's most current EPA-approved NPDES Reasonable Potential Procedures to determine whether chronic WET monitoring requirements or limitations are necessary.

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 Robert F. McGhee to Alan W. Hallum of the Environmental Protection Division. U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. April 28, 2000.
9. USEPA. Memorandum from Robert F. McGhee to Rocky Creek TMDL Public Hearing Attendees and Commenters regarding "Notice of 303(d) List Change which may affect proposed TMDLs for waters and pollutants of concern in the State of Georgia." U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. May 5, 2000.

10. USEPA. Letter from Beverly H. Banister to Alan W. Hallum of the GAEPD regarding the "Final 2000 § 303(d) List". U.S. Environmental Protection Agency, Region 4, Water Management Division. Atlanta, GA. August 28, 2000.