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**WATER QUALITY
MANAGEMENT PROGRAM**

TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

For Cyanide and Zinc

In the

BUCK CREEK

In the Savannah River Basin

(HUC 3060109)

Screven County, Georgia

Introduction

Section 303(d) of the Clean Water Act (CWA) as Amended by the Water Quality Act of 1987, Public Law 100-4, and the United States Environmental Protection Agency's (USEPA/EPA) Water Quality Planning and Management Regulations [Title 40 of the Code of Federal Regulation (40 CFR), Part 130] require each State to identify those waters within its boundaries not meeting water quality standards applicable to the waters' designated uses. The identified waters are prioritized based on the severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants violating or causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. 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 nonpoint sources and restore and maintain the quality of their water resources (USEPA, 1991).

Problem Definition

Georgia's final 1998 Section 303(d) list identified Buck Creek, a tributary to the Savannah River as not supporting its designated use with the pollutants of concern being cyanide and zinc. The only pollutant source is the Sylvania Water Pollution Control Plant (WPCP). There are no other known sources of cyanide and zinc within the watershed. This TMDL will be used to set the Total Maximum Daily Load for cyanide and zinc.

The TMDL is being proposed pursuant to EPA commitments in the October 1997 Consent Decree in the Georgia TMDL lawsuit. These conditions include a requirement that TMDLs be proposed by August 30, 1999, for each water on the 1998 303(d) list that is impacted by a National Pollutant Discharge Elimination System (NPDES) permitted point source or point sources, and is located in

the Savannah/Ogeechee Basins. The TMDL will be calculated under low flow summer time conditions, which represents lowest level of available dilution, and critical conditions.

Target Identification

The target level for the development of this cyanide TMDL is the numeric criterion established in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised November 23, 1998. Georgia Regulation 391-3-6-.03(5)(e)(iii)(2)(a) establishes the freshwater criterion for cyanide expressed in terms of total in the water column. Criteria were promulgated such that instream concentrations should not exceed the acute criterion indicated under 1-day, 10-year minimum flow (1Q10) or higher stream flow conditions and should not exceed the chronic criterion under 7-day, 10-year minimum flow (7Q10) conditions. The numeric criterion for cyanide in freshwater is 5.2 ug/l.

The target level for the development of this zinc TMDL is the numeric criterion established in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6, Revised November 23, 1998. Georgia Regulation 391-3-6-.03(5)(e)(ii)(5)(a) establishes the freshwater criterion for zinc expressed in terms of the dissolved fraction in the water column. Criteria were promulgated such that instream concentrations should not exceed the acute criterion indicated under 1-day, 10-year minimum flow (1Q10) or higher stream flow conditions and should not exceed the chronic criterion under 7-day, 10-year minimum flow (7Q10) conditions. The numeric criterion for zinc in freshwater, assuming a hardness of than 100 mg/l, is 103 ug/l.

Background

The segment that is impaired is located directly downstream of the Sylvania WPCP. Buck Creek is an effluent dominated stream; the 7Q10 flow for Buck Creek is 0.0 cms. Recent data collected by the Georgia EPD indicate that the Sylvania WPCP is meeting its effluent limits and that zinc and cyanide are no longer a problem. The TMDL will address and support the current effluent limitations of the Sylvania Plant WPCP.

Numeric Targets and Sources - Model Development

The steady-state model provides predictions for only a single set of environmental conditions. For permitting purposes, steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For discharges to riverine systems, critical environmental conditions correspond to drought upstream flows. The assumption behind steady-state modeling is that permit limits that protect water quality during critical conditions will be protective for the large majority of environmental conditions that occur.

Critical Condition Determination

The most critical condition for this segment of the Buck Creek will be used to determine the TMDL. Cyanide and zinc will be considered a conservative substance in the TMDL calculation. Because the 7Q10 flow for Buck Creek is 0.0 cms, the effluent concentration of zinc and cyanide must meet the State of Georgia's water quality standards. For the Buck Creek segment, the critical flow will be considered 0.065 cms, the design flow for the Sylvania WPCP.

Total Maximum Daily Load (TMDL)

The TMDL is the total amount of pollutant that can be assimilated by the receiving water body while achieving water quality standards. Since the Sylvania WPCP is the only known permitted point source of cyanide or zinc, and the cause of the cyanide and zinc impairment has been identified to be this facility, a TMDL will be developed to set effluent limits that meet water quality standards.

Margin of Safety

The margin of safety (MOS) is part of the TMDL development process. There are two basic methods for incorporating the MOS (USEPA, 1991a):

- Implicitly incorporating the MOS using conservative model assumptions to develop allocations, or
- Explicitly specifying a portion of the total TMDL as the MOS; using the remainder for

allocations.

The MOS is incorporated implicitly into this modeling process by selecting the critical low flow.

TMDL Calculation

The TMDL calculation will utilize the conservation of mass principle, where the load can be calculated by using the following relationship:

$$\text{Concentration} = \text{Load} / \text{Flow (Buck Creek + WWTP)}$$

Rearranging this equation the maximum load can be calculated as follows:

$$\text{Load} = \text{Concentration (Water Quality Standard)} * \text{Flow (Buck Creek + WWTP)}$$

The Total Maximum Daily Load to Buck Creek for zinc and cyanide is given in Table 1.

Since a TMDL is the sum of waste load allocations (WLA) plus load allocation (LA) and a margin of safety (MOS), the TMDL can be represented as:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

Table 1 TMDL Calculation and Waste Load Allocation

Pollutant	TMDL (kg/day)	WLA (kg/day)	LA (kg/day)	MOS
Cyanide	0.029	0.029	0.0	Implicit
Zinc	0.58	0.58	0.0	Implicit

Seasonal Variation

The low flow condition represents the most critical design condition and will provide year round protection.

Allocation of Responsibility and Recommendations

The allocation of cyanide and zinc load to Buck Creek is given Table 1. The NPDES permit for Sylvania WPCP supports these TMDL calculations. The Sylvania Plant in the past has been out of compliance with the effluent limitation prescribed by the State of Georgia. Continuing monitoring

should occur to insure compliance with this TMDL and NPDES effluent limitations.

References:

Better Assessment Science Integrating Point and Nonpoint Sources, BASINS, Version 2, User's Manual. EPA-823-B-98-006

Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03, Water Use Classifications and Water Quality Standards

Sierra Club v. EPA & Hankinson USDC-ND-GA Atlanta Div. #1: 94-CV-2501-MHS

USEPA. Guidance for Water Quality-based Decisions: The TMDL Process. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA/440/4-91-001, April 1991.
