Total Maximum Daily Load

Evaluation

for

Copper

in the

Chattahoochee River Basin

Big Creek
Orr Creek
Park Branch
Utoy Creek

Submitted to:

The U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

Submitted by:
The Georgia Department of Natural Resources
Environmental Protection Division
Atlanta, Georgia

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1.0 INTRODUCTION

1.1 Background

The State of Georgia 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; supporting, partially supporting, or not supporting their designated uses depending on water quality assessment results. These water bodies are found on Georgia's 305(b) list 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 305(b) partially and not supporting water bodies are also assigned to Georgia's 303(d) list, also named after that section of the CWA. Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the water quality constituent(s) in violation of the water quality standard. 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 reduce pollution and to restore and maintain water quality.

The State of Georgia has identified one segment that is partially supporting its designated use for the parameter copper and three segments that are not supporting their designated uses in the Chattahoochee River Basin (see Table 1). All of these segments are also listed for fecal coliform and one segment (Utoy Creek) is also listed for zinc. Separate TMDLs are being proposed for these parameters.

Table 1. 303(d) Listed Stream Segments Located in the Chattahoochee River Basin

STREAM	STATUS	Water Use	LOCATION	Criterion Violated	MILES
Orr Creek	Not Supporting	Fishing	U/S Castleberry Rd (Tyson Foods) to Big Creek (Forsyth Co)	Fecal coliform, Cu	3
Big Creek	Partially Supporting	Fishing	Headwaters to Cheatham Creek (Forsyth Co)	Fecal coliform, Cu	2
Park Branch	Not Supporting	Fishing	LaGrange (Troup Co)	Fecal coliform, Cu	2
Utoy Creek	Not Supporting	Fishing	Atlanta (Fulton Co)	Fecal coliform, Cu, Zn	5

1.2 Watershed Description

The Orr Creek watershed is located in the Chattahoochee River Basin in Forsyth County, Georgia, near the City of Cumming. This area is in the northern part of Metropolitan Atlanta. The Orr Creek watershed is approximately 2.1 square miles in area. Orr Creek is a tributary to Big Creek (see Figure 1). The area is developing and is predominantly urban.

The Big Creek watershed is listed from the headwaters to Cheatham Creek. The drainage area above the confluence is approximately 13.9 square miles. This watershed is located in the Chattahoochee River Basin in Forsyth County, Georgia, near the City of Cumming. This area is considered to be in the northern part of Metropolitan Atlanta. The area is developing and is predominantly urban (see Figure 1).

The Utoy Creek watershed is located in the Chattahoochee River basin in Metropolitan Atlanta, Fulton County (see Figure 2). The watershed is approximately 34.2 square miles in area. North Utoy Creek and South Utoy Creek combine to form Utoy Creek approximately five miles above the mouth at the Chattahoochee River. Both branches flow under Interstate 285 prior to the confluence. The landuse for the Utoy Creek drainage basin is predominantly urban and is highly developed.

The Park Branch watershed is in Troup County, Georgia, near the City of LaGrange. The Park Branch watershed is approximately 2.1 square miles in area. The landuse for this watershed is urban (see Figure 3). All the watersheds are part of the Southern Lower Piedmont Ecoregion and are in the Southern Piedmont Soil Province.

1.3 Water Quality Standard

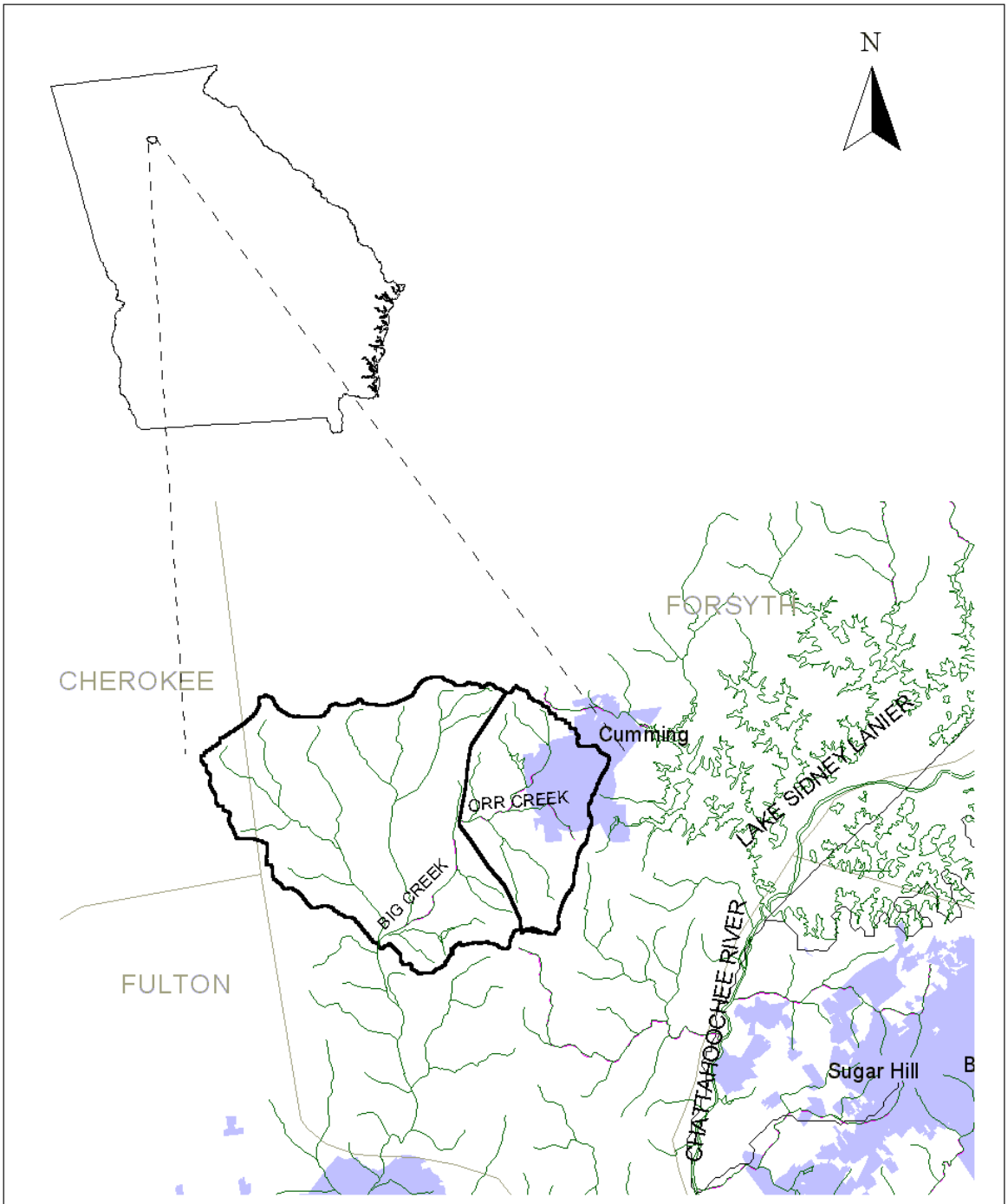
The water use classification for all of these segments is Fishing. The fishing classification, as stated in Georgia's Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03(6)(c), is established to protect the "propagation of fish, shellfish, game and other aquatic life; secondary contact recreation in and on the water; or for any other use requiring water of a lower quality."

Chapter 391-3-6-.03 of Georgia's Rules and Regulations, Revised-October 2001, establishes criteria for metals that apply to all waters in the State. This section provides the following definitions for acute and chronic criteria: "Acute criteria" corresponds to EPA's definition for Criteria Maximum Concentration, which is defined in 40 CFR 131.36 as the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (1-hour average) without deleterious effects. "Chronic criteria" corresponds to EPA's definition for Criteria Maximum Concentration, which is defined in 40 CFR 131.36 as the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. The established acute criterion and chronic criterion for dissolved copper are as follows:

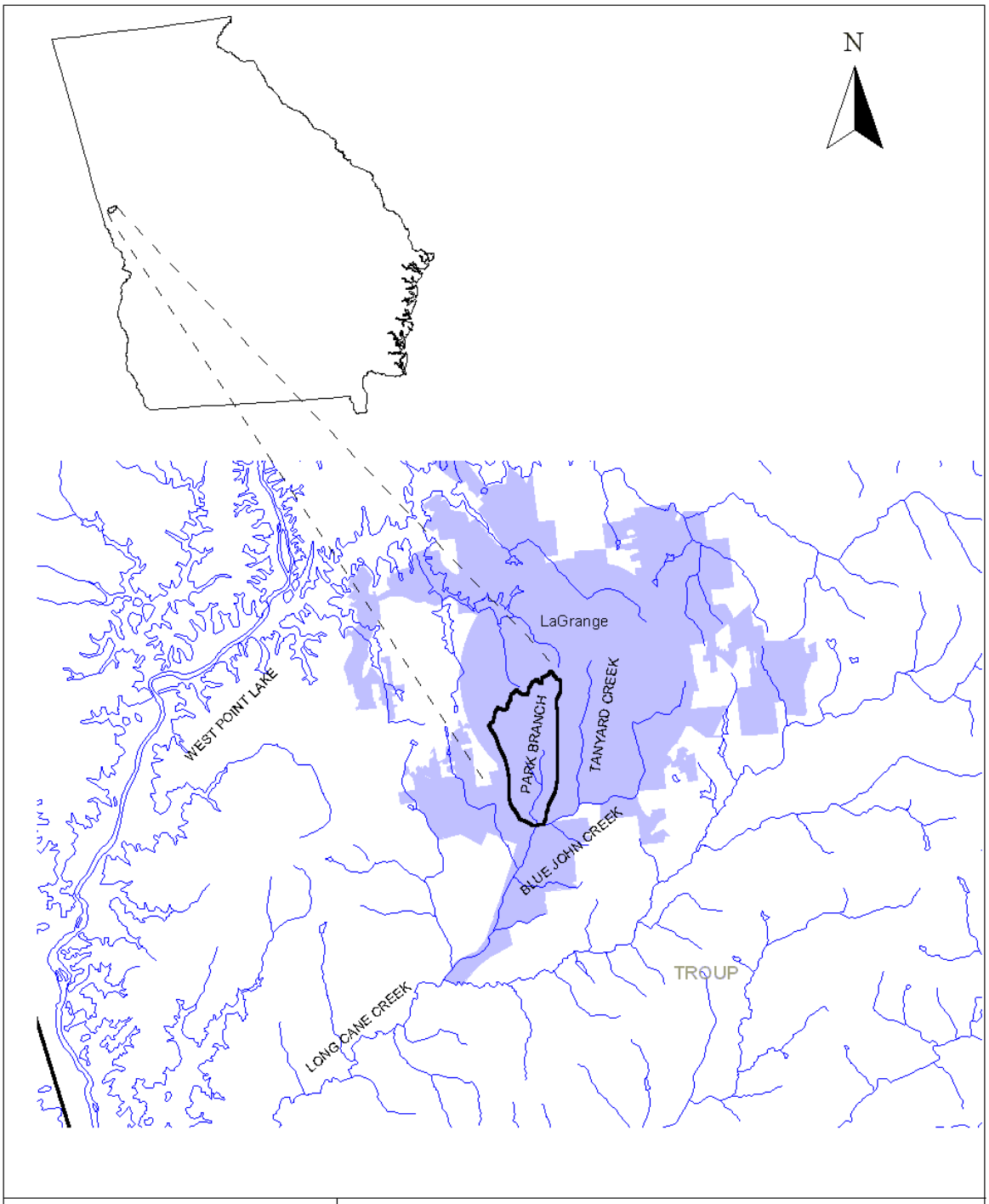
$$\text{acute criteria for dissolved copper} = (e^{(0.9422[\ln(\text{hardness})] - 1.700)})(0.96)\ \mu g/L$$
$$\text{chronic criteria for dissolved copper} = (e^{(0.8545[\ln(\text{hardness})] - 1.702)})(0.96)\ \mu g/L$$

The hardness used in the above equations is expressed as mg/L as $CaCO_3$. The minimum hardness allowed for use in these equations shall not be less than 25 mg/L as $CaCO_3$, and the maximum shall not be greater than 400 mg/L as $CaCO_3$.

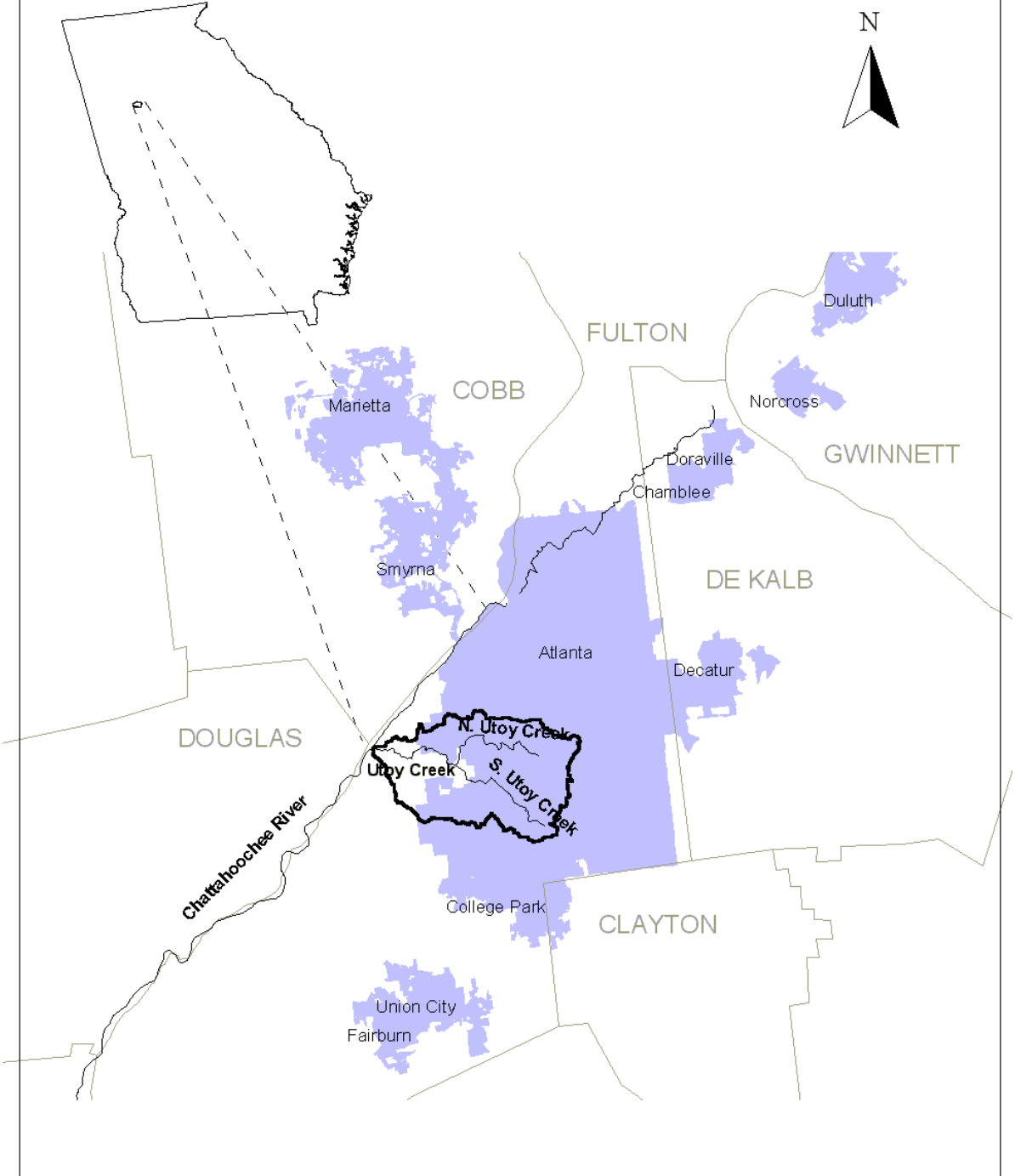
This regulation requires that instream concentrations of dissolved copper shall not exceed the acute criteria at 1Q10 or higher stream flow conditions, and shall not exceed the chronic criteria at 7Q10 or higher stream flow conditions. This is consistent with 40 CFR 131.36 regarding applicability. For protection of aquatic life, States are required to use a flow value not less than the 1Q10 for the acute criteria and not less than the 7Q10 for the chronic criteria. The 1Q10 is the lowest one-day flow with a recurrence of once in 10 years determined



TMDL Evaluation - Copper Chattahoochee River Basin	Figure 1. Big Creek and Orr Creek Watersheds



TMDL Evaluation - Copper Chattahoochee River Basin	Figure 2. Park Branch Watershed



TMDL Evaluation - Copper Chattahoochee River Basin	Figure 3. Utoy Creek Watershed

hydrologically. The 7Q10 is the minimum average flow for seven consecutive days with a 10- year recurrence interval determined hydrologically.

In accordance with 391-3-6-.03(5)(e)(ii), EPA's "Guidance Document of Dynamic Modeling and Translators" (August 1993) may be used to determine the relationship between the total recoverable metal concentration and the dissolved form. The metals translator is determined using the default linear partition coefficient values found in an EPA document entitled, "Technical Guidance Manual for Performing Waste Load Allocations – Book II: Streams and Rivers."

In addition, 391-3-6-.06(4)(d)5.(ii)(b)(2) allows methods from this EPA guidance document to be used to translate dissolved criteria concentrations into total recoverable permit limits. Metals effluent permit limitations are required to be expressed as total recoverable metal per 40 CFR §122.45(c). Therefore, the TMDL will be expressed as both the total maximum daily load of total recoverable copper that will be protective of the dissolved copper chronic criterion and the total maximum daily load of total recoverable copper that will be protective of the dissolved copper acute criterion.

2.0 WATER QUALITY ASSESSMENT

The Orr Creek and Big Creek listings for copper resulted from data collected during a special investigation in the vicinity of the Tyson Foods discharge in Forsyth County. The investigation was conducted from July through December 2000. The Park Branch listing was also the result of samples collected by EPD in 2000. One sample was collected and it resulted in the listing of this segment for copper. The Utoy Creek listing for copper resulted from the water quality assessment of data collected at Great Southwest Parkway near Atlanta, Georgia. Two water quality samples were collected in 2001.

The water quality data for all the listed segments are provided in Table 2. Also provided are the acute and chronic criteria, the calculated translator, and assumed dissolved copper concentration. The calculated translator is a function of the instream TSS. This table shows that all samples had copper concentrations above the criteria.

Table 2. Copper Data Collected From Chattahoochee River Basin

Location	Date	Measured Total Recoverable Copper Concentration (μg/L)	Calculated Translator (Total Recoverable to Dissolved)	Assumed Dissolved Copper Concentration (μg/L)	Measured Total Hardness (mg/L as $CaCO_3$)	Acute criterion (μg/L)	Chronic Criterion (μg/L)
Big Creek d/s of Kelly Mill	7/18/00	13	2.8	4.6	34	3.64	2.74
Big Creek d/s of Kelly Mill	11/28/00	9.2	2.8	3.3	24	3.64	2.74
Big Creek at Bethelview	7/18/00	18	2.8	6.4	32	3.64	2.74
Big Creek at Bethelview	11/28/00	7	2.8	2.5	24	3.64	2.74
Orr Creek at Tolbert Street	11/28/00	23	2.2	10.4	28	4.05	3.02
Orr Creek at Jason Drive	7/18/00	21	2.2	9.5	44	4.05	3.02
Orr Creek at Jason Drive	11/28/00	20	2.2	9.1	32	4.05	3.02
Park Branch	3/27/00	45	4.4	10.2	20	3.64	2.74
Utoy Creek	3/1/01	310	3.2	96.9	40	5.67	4.09
Utoy Creek	8/9/01	140	3.2	43.8	40	5.67	4.09

3.0 SOURCE ASSESSMENT

A source assessment characterizes the known and suspected sources of copper in the watershed for use in a water quality model and the development of the TMDL. The potential sources of copper in this watershed are from both point sources and nonpoint sources. Both will be addressed in this TMDL.

Title IV of the Clean Water Act establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES permit program requires permits for the discharge of "pollutants" from any "point source" into "waters of the United States" (40 CFR 122.1). Basically, there are two categories of NPDES permits: 1) municipal and industrial wastewater treatment facilities and 2) regulated storm water discharges.

In general, industrial and municipal wastewater treatment facilities have NPDES permits with effluent limits. These permit limits are either based on federal and state effluent guidelines (technology-based limits) or on water quality standards (water quality-based limits). Municipal and industrial wastewater treatment facilities' discharges may contribute copper to receiving waters. There are four NPDES permitted discharges identified in this watershed. Table 3 provides a list of these facilities.

Table 3. NPDES Permits

Facility Name	Permit No.	Average or Permitted Flow	Listed Watershed
City of Cumming WPCP	GA 0046019	8 MGD	Big Creek
Tyson Foods	GA 0001074	1.4 MGD	Orr Creek
East Point Water Treatment Plant	GAG640000	Backwash	Utoy Creek
Metalplate Galvanizing	GA0037907	0.0001 MGD	Utoy Creek

Some storm water runoff is covered under the NPDES Permit Program. It is considered a diffuse source of pollution. Unlike other NPDES permits that establish end-of-pipe limits, storm water NPDES permits establish controls. Currently, regulated storm water discharges include those associated with industrial activities, including construction sites five acres or greater, and large and medium municipal separate storm sewer systems (MS4s).

Storm water discharges associated with industrial activities are currently covered under a General Storm Water NPDES Permit. This permit requires visual monitoring of storm water discharges, site inspections, implementation of Best Management Practices (BMPs), and record keeping. There are numerous industrial and construction sites in these watersheds. Table 4 provides a list of those facilities that have submittal a Notice of Intent to be covered under Georgia's General Storm Water NPDES Permit Associated with Industrial Activities. It is unknown at this time whether these facilities are contributing copper to the watershed.

Storm water discharges from MS4s are very diverse in pollutant loadings and frequency of discharge. At present, all cities and counties within Georgia that had a population of greater than 100,000 at the time of the 1990 Census are permitted for storm water discharge. This includes 60 permittees, 45 of which are located in the greater Atlanta metro area, including Fulton County (see Table 4). MS4 permits require the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems, and controls to reduce the

Table 4. Facilities with a General Storm Water NPDES Permit

Facility Name	Permit No. NOI No.	Receiving Watersheds and Streams
Atlanta	GAS000100	Chattahoochee & Flint Watersheds
Forsyth County	GAS000300	Chattahoochee & Coosa Watersheds
Fulton County	GAS000117	Chattahoochee, Flint, Ocmulgee & Coosa Watersheds
Abrams Fixture Corporation	01011	Utoy Creek
All American Gourmet Company	00076	Utoy Creek
Barton Brands Of Georgia	00064	North Utoy Creek
Cascade Road Landfill	02959	Utoy Creek
Central Metals Company	01052	Utoy Creek
Central Of Georgia Railroad Company	00800	Utoy Creek
City Of Atlanta - Utoy Creek WRC	02833	Utoy Creek
Coca-Cola USA - Beverage Base Plant	01237	Utoy Creek
Continental Plastic Containers #430	03899	Utoy Creek
Crown Cork & Seal Company, Inc.	00606	Utoy Creek
Dispersions, Inc.	00524	Utoy Creek
Federal Express QFEA	02925	Utoy Creek
Foamex, LP	02934	Utoy Creek
Fort McPherson	00766	South Utoy Creek
Kor-Chem Incorporated	03817	Utoy Creek
Lester Laboratories, Inc.	00162	Utoy Creek
Metalplate Galvanizing, L.P.	01259	Utoy Creek
Metro Alloys, Inc.	03048	Utoy Creek
Metro Alloys, Inc.	03855	South Utoy River
Norfolk Southern - East Point Yard	00793	Utoy Creek
Selig Chemical Industries	00575	Utoy Creek
Southern Wood Piedmont Company	00269	Utoy Creek
Stanley Bostitch	00158	Utoy Creek
Sun Chemical Corporation	02678	Utoy Creek
Tecpro Corporation	00409	Utoy Creek
Tenneco Packaging – Hexacomb	02691	Utoy Creek
U.S.P.S. Vehicle Maintenance Facility	02409	North Utoy Creek
Utoy Creek Water Reclamation Center	03828	Utoy Creek
Vinings Industries	01911	Utoy Creek
Wilbert Burial Vault Company	00115	Utoy Creek
William C. Meredith Company, Inc.	00872	South Utoy Creek

discharge of pollutants to the maximum extent practicable, including the use of management practices, control techniques and systems, and design and engineering methods (Federal Register, 1990). A site-specific management plan outlining appropriate controls is referenced in the permit, but it is a separate document. At this time, it is unknown whether MS4s are contributing copper to the watersheds.

There are four permitted landfills in the watersheds of the listed segments. It is unknown whether these are contributing copper to the watershed at this time. Table 5 lists the landfills located in the watershed.

Table 5. Landfill Sites

Facility Name	Permit No.	Type of Landfill	Listed Watershed
East Point Landfill	060-017D(L)	Dry trash	Utoy Creek
MacDougald Construction Co.	060-039D(L)	Dry Trash	Utoy Creek
United Waste Westview PH2	060-062D(SL)	Sanitary Landfill	Utoy Creek
Atlanta - Cascade Road SL	060-046D(SL)	Sanitary Landfill	Utoy Creek

It is unknown whether any nonpoint sources potentially cause or contribute to excursions of the water quality standard for copper. There is no data available that indicate any specific nonpoint sources of copper. Properties such as malleability, ductility, conductivity, corrosion resistance, alloying qualities and pleasing appearance make copper's use universal in the electrical, construction and automotive industries (Moore and Ramamoorthy, 1981). However, the relationship of these potential sources and water quality is not well understood or documented at this time.

4.0 TMDL DEVELOPMENT APPROACH

An important component of TMDL development is to establish the relationships between loadings and instream water quality. In this section, the numerical modeling techniques used to develop the TMDL are discussed.

4.1 Steady-State Mass Balance Approach

Steady-state models are applied for "critical" environmental conditions that represent extremely low assimilative capacity. For effluent-dominated riverine systems, critical environmental conditions correspond to low 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. A mass balance equation is used to calculate allowable copper allocations under critical conditions in order to protect the listed streams.

4.2 Critical Conditions

The critical flow conditions for this TMDL occur when the ratio of effluent or contaminated stormwater to stream flow is the greatest. The TMDL is presented two ways. First, a total daily mass load for the low flow conditions of 7Q10 and 1Q10 is given. It is assumed that these are the critical conditions for aquatic life. The 7Q10 and chronic criteria provide protection of the chronic standard and the 1Q10 and the acute criteria provide protection of the acute standard. Table 6 provides the critical flow data for the listed segments.

Table 6. Critical Flow Conditions

Listed Stream	7Q10 (MGD/cfs)	1Q10 (MGD/cfs)
Big Creek	0.52/0.82	0.48/0.75
Orr Creek	0.084/0.13	0.078/0.12
Park Branch	0.12/0.19	0.11/0.17
Utoy Creek	2.2/3.4	2.0/3.1

Second, the TMDL is also expressed as an equation that shows the load as a function of the total flow at any given time. Since instantaneous samples are used to evaluate compliance with the standards, as well as the need for a TMDL, this flow dependent load, or concentration approach, is more meaningful. This approach takes into account seasonable variability and makes it easier to evaluate compliance with the TMDL.

The receiving water's hardness is a critical condition in calculating the dissolved fraction of copper in the creek. A lower hardness results in a higher proportion of metal in the dissolved form, resulting in a more conservative criterion. Based on the available data, the hardness used for critical conditions in the listed segments are shown in Table 7.

In order to convert measured total recoverable copper concentrations to estimated dissolved copper concentrations, a translator is calculated. This translator is dependent on the instream TSS. As the TSS concentration increases, a smaller percent of the metal is in the dissolved form. The equations used to calculate the translator are taken from EPA guidance. The ratio of

the total measured metal concentration (C_t) to the calculated dissolved concentration (C_d) is the translator. The equations are provided below for reference.

$$C_t/C_d = 1 + K_d \times TSS \times (10^{-6}\ kg/mg)$$

Where: K_d = partition coefficient for copper in L/kg
TSS = total suspended solids concentration in mg/L

The partition coefficient for copper:

$$K_d = K_{po} \times TSS^a$$

Where: K_{po} * = 1.04×10^6
a * = -0.7436

* Note: It is important to note that the authors of EPA's "Technical Guidance Manual" derived the above values for the 'K_{po}' coefficient and the 'a' exponent based on the statistical analysis of 2,253 data records collected from rivers and streams distributed throughout the United States.

Instream TSS data are also available for the listed segments. Table 7 shows the average TSS and the corresponding translator for the listed segments.

Table 7. Critical Hardness and TSS

Listed Segment	Total Hardness (mg/L as $CaCO_3$)	TSS (mg/L)	Translator
Big Creek	25	8	2.8
Orr Creek	28	2	2.2
Park Branch	25	98	4.4
Utoy Creek	40	17.4	3.2

5.0 ALLOCATION

A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be assimilated by the receiving waterbody without exceeding the applicable water quality standard. A TMDL is the sum of the individual waste load allocations (WLAs) and load allocations (LAs) for nonpoint sources and natural background (40 CFR 130.2) for a given waterbody. The TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving water body. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures. For copper, the TMDLs are expressed as mass per day and as a concentration.

A TMDL is expressed as follows:

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

The TMDL calculates the WLAs and LAs with margins of safety to meet the stream's water quality standards. The allocations are based on estimates that use the best available data and provide the basis to establish or modify existing controls so that water quality standards can be achieved. In developing a TMDL, it is important to consider if adequate data are available to identify the sources, fate, and transport of the pollutant to be controlled.

TMDLs may be developed using a phased approach. Under a phased approach, the TMDL includes: 1) WLAs that confirm existing limits and controls or lead to new limits, and 2) LAs that confirm existing controls or include implementing new controls (EPA TMDL Guidelines). A phased TMDL requires additional data be collected to determine if load reductions required by the TMDL lead to the attainment of water quality standards.

The TMDL Implementation Plan will establish a schedule or timetable for the installation and evaluation of point and nonpoint source control measures, data collection, assessment of water quality standard attainment, and if needed, additional modeling. Future monitoring of the listed segment water quality will then be used to evaluate this phase of the TMDL, and if necessary, to reallocate the loads.

Based on critical conditions established in Section 4.2, Table 8 shows the dissolved copper chronic and acute criteria and the allowable instream total recoverable copper concentrations to protect against chronic and acute effects.

Table 8. Allowable Instream Copper Concentrations

Listed Stream	Copper (µg/L)			
	Dissolved Acute Criterion	Dissolved Chronic Criterion	Allowable Total Acute Concentration	Allowable Total Chronic Concentration
Big Creek	3.64	2.74	10.2	7.67
Orr Creek	4.05	3.02	8.91	6.64
Park Branch	3.64	2.74	16.0	12.1
Utoy Creek	5.67	4.09	18.1	13.1

The following sections describe the various copper TMDL components.

5.1 Waste Load Allocations

The waste load allocation (WLA) is the portion of the receiving water's loading capacity that is allocated to existing or future point sources. Waste load allocations are provided to the point sources from municipal and industrial wastewater treatment systems that have NPDES effluent limits.

State and Federal Rules define storm water discharges covered by NPDES permits as point sources. However, storm water discharges are from diffuse sources and there are multiple storm water outfalls. Storm water sources (point and nonpoint) are different than traditional NPDES permitted sources in four respects: (1) they do not produce a continuous (pollutant loading) discharge; (2) their pollutant loading depends on the intensity, duration, and frequency of rainfall events, over which the permittee has no control; (3) the activities contributing to the pollutant loading may include various allowable activities of others, and control of these activities is not solely within the discretion of the permittee; and (4) they do not have wastewater treatment plants that control specific pollutants to meet numerical limits.

The intent of storm water NPDES permits is not to treat the water after collection, but to reduce the exposure of storm water to pollutants by implementing various controls. It would be infeasible and prohibitively expensive to try to control pollutant discharges from each storm water outfall. Therefore, storm water NPDES permits require the establishment of controls or BMPs to reduce pollutants from entering the environment.

There are four NPDES permitted facilities in these watersheds, but none have permit limits for copper. These facilities are listed in Table 3 and the total WLA for all these facilities is given in the TMDL tables below. If there are any other permitted sources of copper in the future, the WLA loads will be calculated using the effluent design flow. The WLA requires the effluent concentrations from each point source not exceed the allowable instream total dissolved and total recoverable copper chronic and acute concentrations at the end of pipe without any dilution.

5.2 Load Allocations

The load allocation (LA) is the portion of the receiving water's loading capacity that is attributed to existing or future nonpoint sources or to natural background sources. Nonpoint sources are identified in 40 CFR 130.6 as follows:

- Residual waste
- Land disposal
- Agricultural and silivicultural
- Mines
- Construction
- Saltwater intrusion
- Urban storm water (non-permitted)

There are currently no known copper contributions from nonpoint sources. The allowable instream copper concentration and wasteload allocation data is used to calculate the load allocations.

5.3 Seasonal Variation

The low flow critical conditions incorporated in this TMDL are assumed to represent the most critical design conditions and to provide year-round protection of water quality. This TMDL is expressed as a total load during the critical low flow period as well as a concentration. This takes into account the seasonal variability in flows and potential pollutant loads.

5.4 Margin of Safety

The MOS is a required component of TMDL development. As specified by section 303(d) of the CWA, the margin of safety must 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 incorporate the MOS using conservative model assumptions to develop allocations, or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations.

The MOS was implicitly incorporated into the TMDL for the listed segments through the use of critical conditions established in Section 4.2 of this report. Through the use of low flow conditions, the lowest of available hardness values, and the methods used to develop the translators, the margin of safety for this TMDL adequately accounts for the lack of knowledge concerning the relationship between effluent limitations and water quality.

5.5 Total Maximum Daily Load

This TMDL can be summarized in Tables 9 through 12.

Table 9. Copper TMDL Summary for Big Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*0.083 kg/day ΣQ_{WLA}X 2.74 μg/L for all conditions and flows	0.0054 kg/day for the 7Q10 ΣQ_{LA}X 2.74 μg /L for all conditions and flows	Implicit	0.088 kg/day for the 7Q10 and current WLA Q_{total} x 2.74 μg/L for all conditions and flows
Total Dissolved Copper	Acute	*0.11 kg/day ΣQ_{WLA}X 3.64 μg/L for all conditions and flows	0.0066 kg/day for the 1Q10 ΣQ_{LA}X 3.64 μg/L for all conditions and flows	Implicit	0.117 kg/day for the 1Q10 and current WLA Q_{total} x 3.64 μg/L for all conditions and flows
Total Recoverable Copper	Chronic	*0.23 kg/day ΣQ_{WLA}X 7.67 μg/L for all conditions and flows	0.015 kg/day for the 7Q10 ΣQ_{LA}X 7.67 μg/L for all conditions and flows	Implicit	0.245 kg/day for the 7Q10 and current WLA Q_{total} x 7.67 μg/L for all conditions and flows
Total Recoverable Copper	Acute	*0.309 kg/day ΣQ_{WLA}X 10.2 μg/L for all conditions and flows	0.019 kg/day for the 1Q10 ΣQ_{LA}X 10.2 μg/L for all conditions and flows	Implicit	0.328 kg/day for the 1Q10 and current WLA Q_{total} x 10.2 μg/L for all conditions and flows

* Based on the Draft Interoffice Memorandum on “Estimating Water Quality Loadings from MS4 Areas” dated 12/19/02, “If the critical period is a low flow event, the load from the MS4 does not have to be quantified and a WLA for the storm water sources is not necessary…”

ΣQ_{WLA} is the sum of all current, potential and future NPDES regulated point sources discharges to the watershed, including both continuous and storm water discharges.

Table 10. Copper TMDL Summary for Orr Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*0.0160kg/day ΣQ_{WLA}X 3.02 μg/L for all conditions and flows	0.00096kg/day for the 7Q10 ΣQ_{LA}X 3.02 μg/L for all conditions and flows	Implicit	0.0170 kg/day for the 7Q10 and current WLA Q_{total} x 3.02 μg/L for all conditions and flows
Total Dissolved Copper	Acute	*0.0214kg/day ΣQ_{WLA}X 4.59 μg/L for all conditions and flows	0.00195 kg/day for the 1Q10 ΣQ_{LA}X 4.59 μg/L for all conditions and flows	Implicit	0.0234 kg/day for the 1Q10 and current WLA Q_{total} x 4.59 μg/L for all conditions and flows
Total Recoverable Copper	Chronic	*0.035kg/day ΣQ_{WLA}X 6.64 μg/L for all conditions and flows	0.00211kg/day for the 7Q10 ΣQ_{LA}X 6.64 μg/L for all conditions and flows	Implicit	0.0373kg/day for the 7Q10 and current WLA Q_{total} x 6.64 μg/L for all conditions and flows
Total Recoverable Copper	Acute	*0.0472kg/day ΣQ_{WLA}X 8.91 μg/L for all conditions and flows	0.00263 kg/day for the 1Q10 ΣQ_{LA}X 8.91 μg/L for all conditions and flows	Implicit	0.0498 kg/day for the 1Q10 and current WLA Q_{total} x 8.91 μg/L for all conditions and flows

* Based on the Draft Interoffice Memorandum on “Estimating Water Quality Loadings from MS4 Areas” dated 12/19/02, “If the critical period is a low flow event, the load from the MS4 does not have to be quantified and a WLA for the storm water sources is not necessary…”

ΣQ_{WLA} is the sum of all current, potential and future NPDES regulated point sources discharges to the watershed, including both continuous and storm water discharges.

Table 11. Copper TMDL Summary for Park Branch

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 2.74 μg/L for all conditions and flows	0.00124 kg/day for the 7Q10 ΣQ_{LA}X 2.74 μg/L for all conditions and flows	Implicit	0.00124 kg/day for the 7Q10 Q_{total} x 2.74 μg/L for all conditions and flows
Total Dissolved Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 3.64 μg/L for all conditions and flows	0.00151 kg/day for the 1Q10 ΣQ_{LA}X 3.64 μg/L for all conditions and flows	Implicit	0.00151 kg/day for the 1Q10 Q_{total} x 3.64 μg/L for all conditions and flows
Total Recoverable Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 12.1 μg/L for all conditions and flows	0.00549 kg/day for the 7Q10 ΣQ_{LA}X 12.1 μg/L for all conditions and flows	Implicit	0.00549 kg/day for the 7Q10 Q_{total} x 12.1 μg/L for all conditions and flows
Total Recoverable Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 16.0 μg/L for all conditions and flows	0.00666kg/day for the 1Q10 ΣQ_{LA}X 16.0 μg/L for all conditions and flows	Implicit	0.00666 kg/day for the 1Q10 Q_{total} x 16.0 μg/L for all conditions and flows

* Based on the Draft Interoffice Memorandum on “Estimating Water Quality Loadings from MS4 Areas” dated 12/19/02, “If the critical period is a low flow event, the load from the MS4 does not have to be quantified and a WLA for the storm water sources is not necessary…”

ΣQ_{WLA} is the sum of all current, potential and future NPDES regulated point sources discharges to the watershed, including both continuous and storm water discharges.

Table 12. Copper TMDL Summary for Utoy Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 4.09 μg/L for all conditions and flows	0.034 kg/day for the 7Q10 ΣQ_{LA}X 4.09 μg/L for all conditions and flows	Implicit	0.034 kg/day for the 7Q10 Q_{total} x 4.09 μg/L for all conditions and flows
Total Dissolved Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 5.67 μg/L for all conditions and flows	0.0429 kg/day for the 1Q10 ΣQ_{LA}X 5.67 μg/L for all conditions and flows	Implicit	0.0429 kg/day for the 1Q10 Q_{total} x 5.67 μg/L for all conditions and flows
Total Recoverable Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 13.1 μg/L for all conditions and flows	0.109 kg/day for the 7Q10 ΣQ_{LA}X 13.1 μg/L for all conditions and flows	Implicit	0.109 kg/day for the 7Q10 Q_{total} x 13.1 μg/L for all conditions and flows
Total Recoverable Copper	Acute	*Not Applicable for the 7Q10 ΣQ_{WLA}X 18.1 μg/L for all conditions and flows	0.137 kg/day for the 1Q10 ΣQ_{LA}X 18.1 μg/L for all conditions and flows	Implicit	0.137 kg/day for the 1Q10 Q_{total} x 18.1 μg/L for all conditions and flows

* Based on the Draft Interoffice Memorandum on “Estimating Water Quality Loadings from MS4 Areas” dated 12/19/02, “If the critical period is a low flow event, the load from the MS4 does not have to be quantified and a WLA for the storm water sources is not necessary…”

ΣQ_{WLA} is the sum of all current, potential and future NPDES regulated point sources discharges to the watershed, including both continuous and storm water discharges.

6.0 RECOMMENDATIONS

6.1 Monitoring

Water quality monitoring is conducted at a number of locations across the State each year. GAEPD has adopted a basin approach to water quality management; an approach that divides Georgia's major river basins into five groups. This approach provides for additional monitoring to be focused on one of the five basin groups each year. The Chattahoochee River Basin along with the Flint River Basin were the basins of focused monitoring in 2000 and will again receive focused monitoring in 2005. Focused basin monitoring of these streams will be initiated, as appropriate, during the next monitoring cycle to determine if this stream is meeting copper water quality criteria.

6.2 Reasonable Assurance

An allocation to a point source discharger does not automatically result in a permit limit or a monitoring requirement. Through its NPDES permitting process, Georgia will determine whether the permitted dischargers to the listed watersheds have a reasonable potential of discharging copper levels equal to or greater than the allocated load. The results of this reasonable potential analysis will determine the specific type of requirements in an individual facility's NPDES permit. As part of its analysis, the EPD will use its EPA-approved 2001 NPDES Reasonable Potential Procedures to determine whether monitoring requirements or effluent limitations are necessary.

If effluent limitations are determined to be necessary for any or all of these facilities, they should be established in accordance with Georgia Rules and Regulations for Water Quality Control, Section 391-3-6-.06(4)(d)5.(ii)(b)(2). This regulation establishes that to protect against chronic effects, an effluent limitation should be imposed as a monthly average limit. To protect against acute effects, an effluent limitation should be imposed as a daily maximum limit. Additionally, if effluent limitations or monitoring requirements are determined through a reasonable potential analysis to be necessary for any or all of these facilities, it is recommended that concentration limits or concentration monitoring requirements should be imposed in addition to any loading limits or monitoring requirements.

6.3 Public Participation

A thirty-day public notice was provided for this TMDL. During that time the availability of the TMDL was public noticed, a copy of the TMDL was provided as requested, and the public was invited to provide comments on the TMDL.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. EPD and EPA have executed a Memorandum of Understanding that documents the schedule for developing the more comprehensive plans. This Initial TMDL Implementation Plan includes a list of BMPs and provides for an initial implementation demonstration project to address one of the major sources of pollutants identified in this TMDL, while State and/or local agencies work with local stakeholders to develop a revised TMDL implementation plan. It also includes a process whereby EPD and/or Regional Development Centers (RDCs), or other EPD contractors (hereinafter, "EPD Contractors"), will develop expanded plans (hereinafter, "Revised TMDL Implementation Plans").

This Initial TMDL Implementation Plan, written by EPD and for which EPD and/or the EPD Contractor are responsible, contains the following elements.

1. EPA has identified a number of management strategies for the control of nonpoint sources of pollutants, representing some best management practices. The "Management Measure Selector Table" shown below identifies these management strategies by source category and pollutant. Nonpoint sources are the primary cause of excessive pollutant loading in most cases. Any wasteload allocations in this TMDL will be implemented in the form of water-quality based effluent limitations in NPDES permits issued under CWA Section 402. [See 40 C.F.R. § 122.44(d)(1)(vii)(B)]. NPDES permit discharges are a secondary source of excessive pollutant loading, where they are a factor, in most cases.

2. EPD and the EPD Contractor will select and implement one or more BMP demonstration projects for each River Basin. The purpose of the demonstration projects will be to evaluate by River Basin and pollutant parameter the site-specific effectiveness of one or more of the BMPs chosen. EPD intends that the BMP demonstration project be completed before the Revised TMDL Implementation Plan is issued. The BMP demonstration project will address the major pollutant categories of concern for the respective River Basin as identified in the TMDLs. The demonstration project need not be of a large scale, and may consist of one or more measures from the Table or equivalent BMP measures proposed by the EPD Contractor and approved by EPD. Other such measures may include those found in EPA's "Best Management Practices Handbook," the "NRCS National Handbook of Conservation Practices," or any similar reference, or measures that the volunteers, etc., devise that EPD approves. If for any reason the EPD Contractor does not complete the BMP demonstration project, EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan the EPD brochure entitled "Watershed Wisdom -- Georgia's TMDL Program" will be distributed by EPD to the EPD Contractor for use with appropriate stakeholders for this TMDL. Also, a copy of the video of that same title will be provided to the EPD Contractor for its use in making presentations to appropriate stakeholders on TMDL Implementation Plan development.

4. If for any reason the EPD Contractor does not complete one or more elements

of a Revised TMDL Implementation Plan, EPD will be responsible for getting that (those) element(s) completed, either directly or through another contractor.

5. The deadline for development of a Revised TMDL Implementation Plan is the end of August 2004.

6. The EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with EPD, will work on the following tasks involved in converting the Initial TMDL Implementation Plan to a Revised TMDL Implementation Plan:

   A. Generally characterize the watershed;
   B. Identify stakeholders;
   C. Verify the present problem to the extent feasible and appropriate, (e.g., local monitoring);
   D. Identify probable sources of pollutant(s);
   E. For the purpose of assisting in the implementation of the load allocations of this TMDL, identify potential regulatory or voluntary actions to control pollutant(s) from the relevant nonpoint sources;
   F. Determine measurable milestones of progress;
   G. Develop monitoring plan, taking into account available resources, to measure effectiveness; and
   H. Complete and submit to EPD the Revised TMDL Implementation Plan.

7. The public will be provided an opportunity to participate in the development of the Revised TMDL Implementation Plan and to comment on it before it is finalized.

8. The Revised TMDL Implementation Plan will supersede this Initial TMDL Implementation Plan when the Revised TMDL Implementation Plan is approved by EPD.

Management Measure Selector Table

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	*Metals (copper, lead, zinc, cadmium)*	PCBs, toxaphene
Agriculture	1. Sediment & Erosion Control	_	_		_	_				
	2. Confined Animal Facilities	_	_							
	3. Nutrient Management	_	_							
	4. Pesticide Management		_							
	5. Livestock Grazing	_	_		_	_				
	6. Irrigation		_		_	_				
Forestry	1. Preharvest Planning				_	_				
	2. Streamside Management Areas	_	_		_	_				
	3. Road Construction &Reconstruction		_		_	_				
	4. Road Management		_		_	_				
	5. Timber Harvesting		_		_	_				
	6. Site Preparation & Forest Regeneration		_		_	_				
	7. Fire Management	_	_	_	_	_				
	8. Revegetation of Disturbed Areas	_	_	_	_	_				
	9. Forest Chemical Management		_			_				

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	*Metals (copper, lead, zinc, cadmium)*	PCBs, toxaphene
	10. Wetlands Forest Management	_	_	_		_		_		
Urban	1. New Development	_	_		_	_			_	
	2. Watershed Protection & Site Development	_	_		_	_		_	_	
	3. Construction Site Erosion and Sediment Control		_		_	_				
	4. Construction Site Chemical Control		_							
	5. Existing Developments	_	_		_	_			_	
	6. Residential and Commercial Pollution Prevention	_	_							
Onsite Wastewater	1. New Onsite Wastewater Disposal Systems	_	_							
	2. Operating Existing Onsite Wastewater Disposal Systems	_	_							
Roads, Highways and Bridges	1. Siting New Roads, Highways & Bridges	_	_		_	_			_	
	2. Construction Projects for Roads, Highways and Bridges		_		_	_				
	3. Construction Site Chemical Control for Roads, Highways and Bridges		_							

Land Use	Management Measures	Fecal Coliform	Dissolved Oxygen	pH	Sediment	Temperature	*Toxicity*	*Mercury*	*Metals (copper, lead, zinc, cadmium)*	PCBs, toxaphene
	4. Operation and Maintenance-Roads, Highways and Bridges	–	–			–			–	

REFERENCES

GAEPD, Rules *and Regulations For Water Quality Control, Chapter 391-3-6, Revised October 2001*, Georgia Department of Natural Resources, Environmental Protection Division.

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