Total Maximum Daily Load

Evaluation

for Copper

in the Flint River Basin

The Flint River Upstream of Hartsfield Airport
Mud Creek
Sullivan Creek

Submitted to:

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

Submitted by:
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Atlanta, Georgia

January 2003

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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.

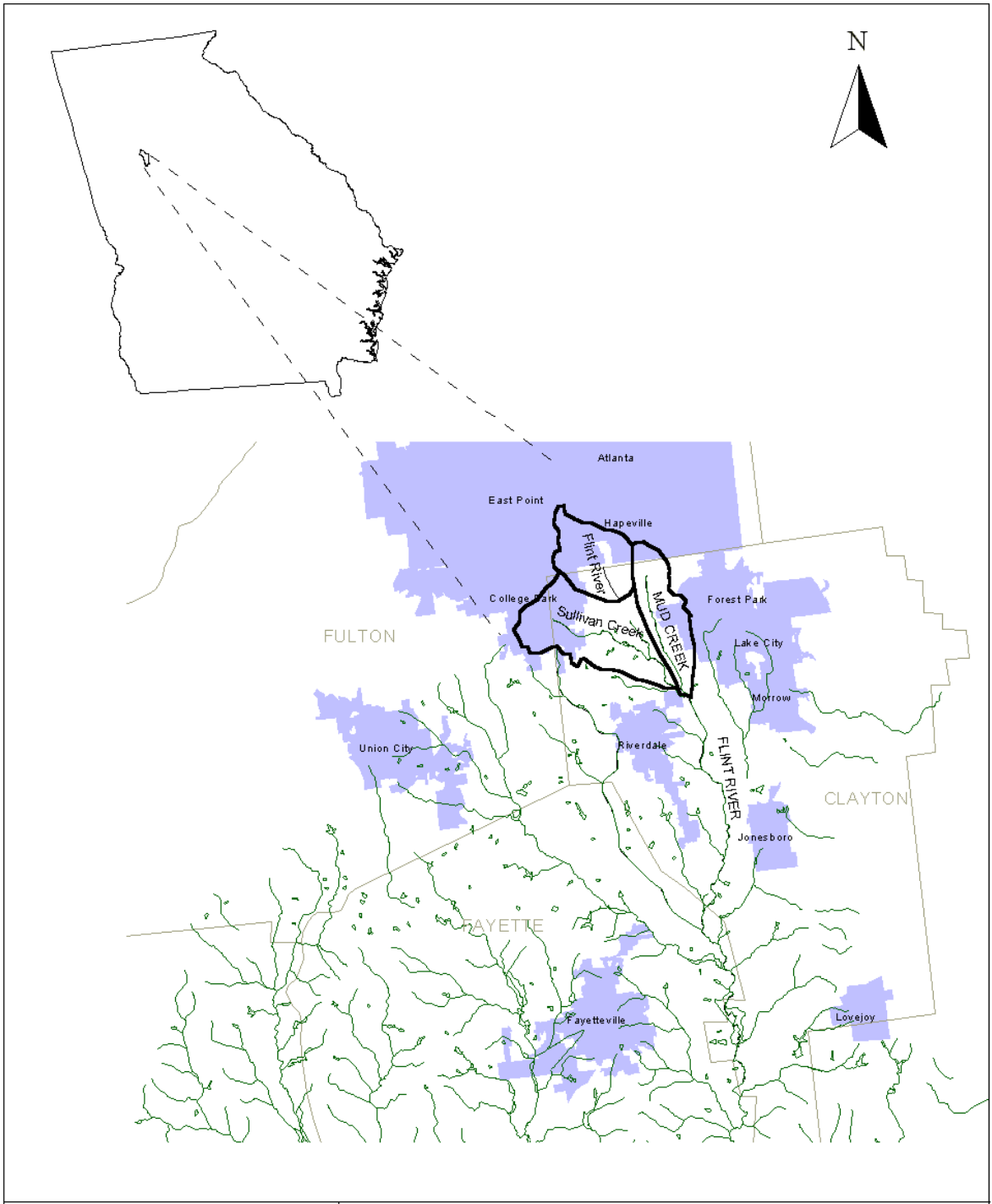
The State of Georgia has identified one segment that is partially supporting its designated use and two segments that are not supporting their designated uses for the parameter copper in the Flint River Basin (see Table 1). All of these segments are also listed for fecal coliform and two segments (Flint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

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

STREAM	STATUS	Water Use	LOCATION	Criterion Violated	MILES
Flint River	Not Supporting	Fishing	Upstream Hartsfield Airport (Clayton Co)	Fecal coliform, Cu, Zn	1
Mud Creek	Not Supporting	Fishing	Downstream Hapeville (Fulton/Clayton Co)	Fecal coliform, Cu, Zn	5
Sullivan Creek	Partially Supporting	Fishing	Clayton Co	Fecal coliform, Cu	5

1.2 Watershed Description

The Flint River, Mud Creek and Sullivan Creek watersheds are located in the Flint River basin in Metropolitan Atlanta, Clayton County (see Figure 1). The watersheds are part of the Southern Lower Piedmont Ecoregion and are in the Southern Piedmont Soil Province. The drainage areas for the Flint River, Mud Creek, and Sullivan Creek are approximately 4.9 square miles, 4.8 square miles, and 5.2 square miles, respectively. The landuse is predominantly urban and all the watersheds are highly developed.



TMDL Evaluation - Copper Flint River Basin	Figure 1. Flint River (Upstream of Hartsfield Airport), Mud Creek, and Sullivan Creek Watersheds

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 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 Flint River's use support determination was made for copper based on a 1992 Intensive Survey by EPD. It remains on the list based on total dissolved copper data collected in 1999 and 2000 by Clayton County. EPD also sampled for total recoverable copper, hardness, and Total Suspended Solids (TSS) in 2000. This information is provided in Table 2.

Mud Creek's use support determination was made for copper based on a 1993 Intensive Survey by EPD. It remains on the list based on total dissolved copper data collected in 1999 and 2000 by Clayton County. EPD also sampled for total recoverable copper, hardness, and TSS in 2000. This information is provided in Table 2.

Sullivan Creek's use support determination was made for copper based on water quality samples taken by Clayton County in 1999 and 2000. Total dissolved copper was measured by Clayton County. This information is provided in Table 2.

Table 2. Copper Data Collected From Flint River Basin

Location	Date	Measured Total Recoverable Copper Concentration (μg/L)	Calculated Translator (Total Recoverable to Dissolved)	Calculated or *Measured Dissolved Copper Concentration (μg/L)	Measured Total Hardness (mg/L as $CaCO_3$)	Acute Criterion (μg/L)	Chronic Criterion (μg/L)
Flint River	12/1/99	Not Measured	3.8	*15.5	Not Measured	7.78	5.46
Flint River	12/8/99	Not Measured	3.8	*6.47	Not Measured	7.78	5.46
Flint River	1/17/00	Not Measured	3.8	*16.3	Not Measured	7.78	5.46
Flint River	2/10/00	Not Measured	3.8	*0.9	Not Measured	7.78	5.46
Flint River	2/17/00	Below Detection Limit	3.8	Not Detected	60	7.78	5.46
Flint River	10/19/00	Below Detection Limit	3.8	Not Detected	56	7.78	5.46
Mud Creek	12/1/99	Not Measured	5.0	*4.92	Not Measured	4.86	3.56
Mud Creek	12/8/99	Not Measured	5.0	*6.30	Not Measured	4.86	3.56
Mud Creek	1/17/00	Not Measured	5.0	*7.43	Not Measured	4.86	3.56
Mud Creek	2/10/00	Not Measured	5.0	*1.21	Not Measured	4.86	3.56
Mud Creek	2/17/00	Below Detection Limit	5.0	Not Detected	44	4.86	3.56
Mud Creek	10/19/00	Below Detection Limit	5.0	Not Detected	34	4.86	3.56
Sullivan Creek	12/1/99	Not Measured	3.8	*5.47	Not Measured	4.86	3.56
Sullivan Creek	12/8/99	Not Measured	3.8	*1.57	Not Measured	4.86	3.56
Sullivan Creek	1/17/00	Not Measured	3.8	*6.30	Not Measured	4.86	3.56
Sullivan Creek	2/10/00	Not Measured	3.8	*1.60	Not Measured	4.86	3.56

3.0 SOURCE ASSESSMENT

A source assessment characterizes the known and suspected sources of copper in the watersheds for use in a water quality model and the development of the TMDL. The potential sources of copper in these watersheds 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 no industrial or municipal NPDES permitted discharges identified in the listed watersheds. However, Ford Motor Assembly Co. had a NPDES permit (GA0001716) to discharge into Mud Creek that was revoked in June 2000. Storm water discharges from this facility are currently covered under the General Storm Water NPDES Permit Associated with Industrial Activities.

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 3 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 Clayton County (see Table 3). MS4 permits require the prohibition of non-storm water discharges (i.e., illicit discharges) into the storm sewer systems, and controls to reduce the 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 is one permitted sanitary waste landfill in the Sullivan Creek watershed: WMI – Rolling Hill, 031-017D(SL). It is unknown whether this landfill is contributing copper to the listed segment at this time.

Table 3. Facilities with a General Storm Water NPDES Permit

Facility Name	Permit No. NOI No.	Receiving Watersheds and Streams
Atlanta	GAS000100	Flint & Chattahoochee Watersheds
Clayton County	GAS000107	Flint & Ocmulgee Watersheds
College Park	GAS000109	Flint & Chattahoochee Watersheds
East Point	GAS000114	Flint, Chattahoochee & Ocmulgee Watersheds
Forest Park	GAS000116	Flint, Chattahoochee & Ocmulgee Watersheds
Fulton County	GAS000117	Flint, Chattahoochee, Ocmulgee & Coosa Watersheds
Hapeville	GAS000119	Flint & Ocmulgee Watersheds
Airborne Express	02948	Flint River
Airport Group International	03839	Flint River
Airtran Airlines	02972	Flint River
American Airlines, Inc.	03118	Flint River
Apac Georgia, Inc.	03345	Flint River
Atlantic Southeast Airlines	03262	Flint River
British Airways	03013	Flint River
Emery Worldwide - Atl.	00167	Flint River
Federal Express Atlr	02969	Flint River
Hartsfield Atlanta International Airport	03343	Flint River
Hartsfield Atlanta International Airport	00206	Flint River
Japan Airlines	03400	Flint River
Kiwi International Holdings, Inc.	03197	Flint River
Lockheed Air Terminal, Inc.	02174	Flint River
Marta - South Yard Rail Maintenance	01261	Flint River
Mercury Air Center	03260	Flint River
Northwest Airlines, Inc.	01340	Flint River
TWA Airlines LLC Atl Station	03814	Flint River
United Airlines	03009	Flint River
Atlanta Worldport Delta Air Lines, Inc.	00593	Mud Creek
Bagcraft Corporation Of America	02324	Mud Creek
C. W. Matthews - Plant #11	01131	Mud Creek
Ford Motor Atlanta Assembly Plant	02880	Mud Creek
Forest Park Asphalt Plant #78431	03757	Mud Creek/ Flint River
H. B. Fuller Company	01140	Mud Creek
International Paper Company	03101	Mud Creek
Newell Recycling Of Atlanta, Inc.	02198	Mud Creek
Rexam Beverage Can Company	00255	Mud Creek
Safety Carrier, Inc.	01610	Mud Creek
Sses-Ford/Hapeville Transfer Station	02781	Mud Creek
The Clorox Company	00405	Mud Creek
United Parcel Service, Inc.	00754	Mud Creek
United Parcel Service, Inc. - Airport Hub	00762	Mud Creek
Usco Distribution Services, Inc.	02328	Mud Creek
Blount Construction Asphalt Plant	02157	Sullivan Creek
Blue Circle Aggregates - Clayton County	02488	Sullivan Creek
C.W. Mathews Asphalt Plant #20	03871	Sullivan Creek
Coca-Cola Enterprises	02243	Sullivan Creek
Scholle Corporation	00515	Sullivan Creek

The Valvoline Company	00046	Sullivan 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 source 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 4 provides the critical flow data for the listed segments.

Table 4. Critical Flow Conditions

Listed Stream	7Q10 (MGD/cfs)	1Q10 (MGD/cfs)
Flint River	0.29/0.44	0.26/0.40
Mud Creek	0.28/0.43	0.26/0.39
Sullivan Creek	0.30/0.47	0.27/0.42

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 5.

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 two of the listed segments. There was no data for Sullivan Creek, so the lesser value from the other two nearby segments was used. Table 5 also shows the average TSS and the corresponding translator for the listed segments.

Table 5. Critical Hardness and TSS

Listed Segment	Total Hardness (mg/L as $CaCO_3$)	TSS (mg/L)	Translator
Flint River	56	75	4.1
Mud Creek	34	50	3.8
Sullivan Creek	34	50	3.8

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 6 shows the dissolved copper chronic and acute criteria and the allowable instream total recoverable copper concentrations to protect against chronic and acute effects.

Table 6. Allowable Instream Copper Concentrations

Listed Stream	Copper (µg/L)			
	Dissolved Acute Criterion	Dissolved Chronic Criterion	Allowable Total Recoverable Acute Concentration	Allowable Total Recoverable Chronic Concentration
Flint River	7.78	5.46	31.9	22.4
Mud Creek	4.86	3.56	18.5	13.5
Sullivan Creek	4.86	3.56	18.5	13.5

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 no NPDES permitted facilities with copper permit limits in these watersheds. If there are any permitted sources of copper in the future, the WLA loads will be calculated using the effluent design flow and the critical low 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 silvicultural
- 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 7 through 9.

Table 7. Copper TMDL Summary for Flint River

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 5.46 µg/L for all conditions and flows	0.0058kg/day for the 7Q10 ΣQ_{LA}X 5.46 µg/L for all conditions and flows	Implicit	0.0058 kg/day for the 7Q10 Q_{total} x 5.46 µg/L for all conditions and flows
Total Dissolved Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 7.78 µg/L for all conditions and flows	0.0074 kg/day for the 1Q10 ΣQ_{LA}X 7.78 µg/L for all conditions and flows	Implicit	0.0074 kg/day for the 1Q10 Q_{total} x 7.78 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 22.4 µg/L for all conditions and flows	0.0236 kg/day for the 7Q10 ΣQ_{LA}X 22.4 µg/L for all conditions and flows	Implicit	0.0236 kg/day for the 7Q10 Q_{total} x 22.4 µg/L for all conditions and flows
Total Recoverable Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 31.9 µg/L for all conditions and flows	0.0301 kg/day for the 1Q10 ΣQ_{LA}X 31.9 µg/L for all conditions and flows	Implicit	0.0301 kg/day for the 1Q10 Q_{total} x 31.9 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 8. Copper TMDL Summary for Mud Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 3.56 µg/L for all conditions and flows	0.0036kg/day for the 7Q10 ΣQ_{LA}X 3.56 µg/L for all conditions and flows	Implicit	0.0036kg/day for the 7Q10 Q_{total} x 3.56 µg/L for all conditions and flows
Total Dissolved Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 4.86 µg/L for all conditions and flows	0.0046 kg/day for the 1Q10 ΣQ_{LA}X 4.86 µg/L for all conditions and flows	Implicit	0.0046 kg/day for the 1Q10 Q_{total} x 4.86 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 13.5 µg/L for all conditions and flows	0.0137 kg/day for the 7Q10 ΣQ_{LA}X 13.5 µg/L for all conditions and flows	Implicit	0.0137 kg/day for the 7Q10 Q_{total} x 13.5 µg/L for all conditions and flows
Total Recoverable Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 18.5 µg/L for all conditions and flows	0.0175 kg/day for the 1Q10 ΣQ_{LA}X 18.5 µg/L for all conditions and flows	Implicit	0.0175 kg/day for the 1Q10 Q_{total} x 18.5 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 9. Copper TMDL Summary for Sullivan Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 3.56 µg/L for all conditions and flows	0.0039 kg/day for the 7Q10 ΣQ_{LA}X 3.56 µg/L for all conditions and flows	Implicit	0.0039 kg/day for the 7Q10 Q_{total} x 3.56 µg/L for all conditions and flows
Total Dissolved Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 4.86 µg/L for all conditions and flows	0.0048 kg/day for the 1Q10 ΣQ_{LA}X 4.86 µg/L for all conditions and flows	Implicit	0.0048 kg/day for the 1Q10 Q_{total} x 4.86 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	*Not Applicable for the 7Q10 ΣQ_{WLA}X 13.5 µg/L for all conditions and flows	0.015 kg/day for the 7Q10 ΣQ_{LA}X 13.5 µg/L for all conditions and flows	Implicit	0.015 kg/day for the 7Q10 Q_{total} x 13.5 µg/L for all conditions and flows
Total Recoverable Copper	Acute	*Not Applicable for the 1Q10 ΣQ_{WLA}X 18.5 µg/L for all conditions and flows	0.018 kg/day for the 1Q10 ΣQ_{LA}X 18.5 µg/L for all conditions and flows	Implicit	0.018 kg/day for the 1Q10 Q_{total} x 18.5 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 Flint River Basin along with the Chattahoochee 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

There currently are no NPDES permitted discharges to the listed segments. If a permit were to be issued in the future, an allocation to an individual 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 segment 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 future 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 future 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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