Total Maximum Daily Load

Evaluation

for

Two Segments of Buffalo Creek
and
Tributary to Buffalo Creek
Near Carrolton, Georgia

in the

Tallapoosa River Basin

for

Copper

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 one of three categories with respect to designated uses: 1) supporting, 2) partially supporting, or 3) not supporting. 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 (GA EPD, 2000-2001).

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 three segments as not supporting their designated uses for the parameter copper (Cu) in the Tallapoosa River Basin (see Table 1). One of these segments is also listed for fecal coliform (FC). A separate TMDL is being proposed for fecal coliform.

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

Stream	Status	Water Use	Location	Criterion Violated	Miles
Buffalo Creek	Not Supporting	Fishing	Downstream Southwire Corp. (Carroll Co.)	Cu	3
Buffalo Creek	Not Supporting	Fishing	Upstream Little Tallapoosa River (Carroll Co.)	FC, Cu	6
Tributary to Buffalo Creek	Not Supporting	Fishing	Carrollton (Carroll County)	Cu	1

1.2 Watershed Description

The Buffalo Creek watershed is located in the Tallapoosa River Basin in Carroll County, Georgia, near the City of Carrolton. Carrolton is southwest of the metropolitan Atlanta area, on the western border of Georgia. Buffalo Creek is listed from downstream of Southwire Corporation to the confluence with the Little Tallapoosa River and is broken into two segments for listing purposes. The drainage area above the confluence of the Little Tallapoosa River is approximately 28 square miles. The area of the watershed for the segment downstream of Southwire Corporation is 11 square miles. The listed tributary to Buffalo Creek 's watershed area is estimated to be approximately 0.7square miles (see Figure 1).

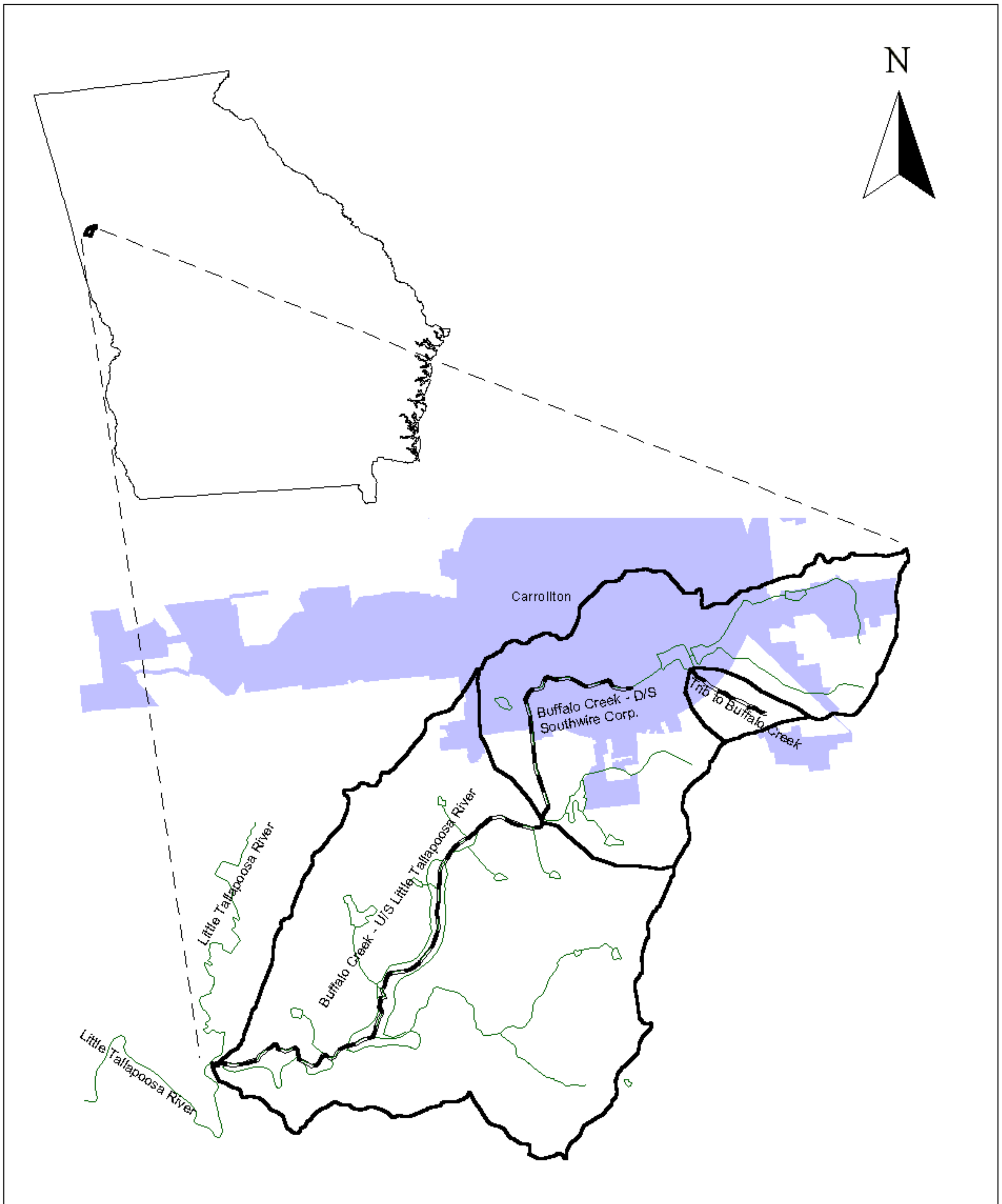

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Figure 1. Buffalo Creek Watersheds

The current landuse is predominately a mixture of pasture and forest. This area is developing and becoming more urban. Table 2 lists the land cover distribution and associated percent land cover for each watershed. All the watersheds are part of the Southern Upper Piedmont Ecoregion and are in the Southern Piedmont Soil Province.

Table 2. Land Cover Distribution

Watershed	Land Cover in Acres (Percentage)													
	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial/Industrial/ Transportation	Bare Rock/Sand/Clay	Quarries/Strip Mines/Gravel Pits	Transitional	Forest	Row Crops	Pasture/Hay	Other Grasses (Urban/Recreational ;e.g. parks/lawns)	Woody Wetlands	Emergent Herbaceous Wetlands	Total
Tributary to Buffalo Creek	8	0	16	45	0	0	0	373	28	23	7	4	0	504
	(1.6)	(0.0)	(3.2)	(8.9)	(0.0)	(0.0)	(0.0)	(74.0)	(5.6)	(4.6)	(1.4)	(0.8)	(0.0)	(100.0)
Buffalo Creek (upper)	147	0	725	694	0	0	39	3440	376	911	252	23	0	6608
	(2.2)	(0.0)	(11.0)	(10.5)	(0.0)	(0.0)	(0.6)	(52.1)	(5.7)	(13.8)	(3.8)	(0.3)	(0.0)	(100.0)
Buffalo Creek (lower)	144	0	125	86	0	0	0	5635	1014	3662	73	769	22	11532
	(1.2)	(0.0)	(1.1)	(0.7)	(0.0)	(0.0)	(0.0)	(48.9)	(8.8)	(31.8)	(0.6)	(6.7)	(0.2)	(100.0)

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- June 2002, establishes criteria for metals that apply to all waters of the State. This section provides the following definitions for acute and chronic criteria: "Acute criteria" corresponds to EPA's definition for Criteria Maximum Concentration (CMC), which is defined in 40CFR 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 Continuous Concentration (CCC), which is defined in 40CFR 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 criteria and chronic criteria 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 in 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 40CFR 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*" (USEPA, 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*. (USEPA, 1984)"

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 40CFR §122.45(c). Therefore, these TMDLs 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 Buffalo Creek segment downstream of Southwire and the unnamed tributary listings for copper resulted from EPD samples collected in the early 1990s. Recent data collected in 2001 confirmed these listings, as well as resulted in the listing of another segment of Buffalo Creek for copper, starting at the bottom of the originally listed segment and extending 6 miles to the confluence with the Little Tallapoosa River. The Little Tallapoosa meets its use criteria downstream of this confluence.

The recent water quality data for all the listed segments are provided in Table 3. Also provided are the acute and chronic criteria, the calculated translator, and the assumed dissolved copper concentration. The calculated translator is a function of the instream total suspended solids (TSS).

Table 3. Copper Data Collected from Tallapoosa River Basin

Location	Date	Measured Total Recoverable Copper (μg/L)	Calculated Translator (Total Recoverable to Dissolved)	Corresponding Dissolved Copper (μg/L)	Total Hardness (mg/L as $CaCO_3$)	Acute Criterion (μg/L)	Chronic Criterion (μg/L)
Buffalo Creek Downstream Southwire	5/8/01	10	2.0	4.9	25	3.6	2.7
	6/18/01	13	2.5	5.2	25	3.6	2.7
Buffalo Creek Upstream Little Tallapoosa R	5/8/01	13	2.9	4.5	30	4.3	3.2
	6/18/01	18	2.9	6.3	28	4.1	3.0
Tributary to Buffalo Creek upstream of Highway 166	3/28/01	90	3.0	30.3	464	62.8	37.1
	6/12/01	55	3.2	17.0	24	3.6	2.7
Tributary to Buffalo Creek downstream of Highway 166	3/28/01	95	3.0	32	326	41	25
	6/12/01	92	3.0	30.6	24	50	29

The Southwire Wire Plant typically discharges less than six times per year and only during severe rainfall events. During 2001, a drought year, the Wire Plant did not discharge at all. At the Southwire Copper Division, the wastewater treatment system collects and treats storm water from the manufacturing and material handling areas. The facility is a net consumer of water. As a result, total volumes discharged are slightly less than the total volume of storm water collected. The Copper Division discharges intermittently, depending upon the rainfall intensity and duration. Neither Southwire NPDES-permitted facility was discharging during, or several days prior to, the sampling events listed in Table 3 (Southwire, 2003).

3.0 SOURCE ASSESSMENT

A source assessment characterizes the known and suspected sources of copper in the watershed for 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 these TMDLs.

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" (40CFR 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 three industrial NPDES permitted discharges identified in this watershed. Table 4 provides a list of these facilities and their current copper limits.

The Southwire Wire Plant has a combined storm and process water sewer system initially installed in the 1950s to allow recycling of storm water from process building roofs (Southwire, 2003).

Table 4. NPDES Facilities in the Buffalo Creek Watershed

Facility Name	Permit No.	Receiving Water	NPDES Permit Limits			
			Flow[1] (MGD)	Daily Max Copper (lbs/day)	Total Heavy Metals[4] (µg/L)	PH
Southwire (Wire Plant)	GA0001139	Buffalo Creek	02a, 03a, 04a, 06a- Combine sewer overflows Low stream flow conditions			
			Monitor	0.329[3]	NA	>5.0 and <9.0
Southwire (Wire Plant)	GA0001139	Buffalo Creek	02b, 03b, 04b, 06b- Combine sewer overflows High stream flow conditions			
			Monitor	Monitor	NA	>5.0 and <9.0
Southwire (Copper Division) 001	GA0001571	Buffalo Creek	Monitor[2]	Monitor	1000	>6.0 and <9.0
Holox, Ltd.	GA0037494	Buffalo Creek	NA	NA	NA	NA

[1] Monitoring is required only when a discharge is occurring
[2] Wastewater treatment plant and commingled storm water
[3] Applies when actual discharge flow and receiving stream flow result in a daily average instream wastewater concentration (IWC) of 13.2% or greater.
[4] Total Heavy Metals is defined as the sum of cadmium, total chromium, copper, lead, nickel, silver, and zinc.

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 several industrial sites in these watersheds. Table 5 provides a list of those facilities that have submitted 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. It is unknown if there are any construction sites in this watershed.

Table 5. Facilities with a General Storm Water NPDES Permit

Facility Name	NOI No.	Receiving Watersheds and Streams
Cofer Technology Center	01346	Buffalo Creek
Holox, Inc.	02481	Buffalo Creek
Houghton International, Inc.	00322	Buffalo Creek
Southwire - Oak Mountain Academy	03012	Richards Lake
Southwire Company - Machinery Division	00350	Buffalo Creek
Southwire Company - Wire Mills	00351	Buffalo Creek
Southwire Cooper Division	00353	Buffalo Creek

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. 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, there are not any MS4s contributing copper to the watersheds.

The furnace operations at the Southwire Company copper smelter were sources of fugitive and stack air emissions, and thus sources of copper deposition to the land until the year 2000 (Southwire, 2003).

Southwire is involved with a Resource Conservation and Recovery Act (RCRA) site remediation. A total of eleven solid waste management units (SWMUs) and one hazardous waste management unit (HWMU) potentially impacted by metals have been identified at the Southwire Copper Division facility. A total of 6 SWMUs potentially impacted by metals have been identified at the Southwire Wire Mill facility. Each of these units will be evaluated to determine the extent of soil, surface water, and groundwater impact. GA EPD Hazardous Waste Management Branch is currently working with Southwire to define and schedule the RCRA activities (Southwire, 2001).

There are two inactive landfills in the Buffalo Creek Watershed. They are Southwire Company and McGukin-CedarHeights Road. It is unknown whether they are contributing copper to the watershed at this time.

It is unknown whether any nonpoint sources potentially cause or contribute to excursions of the water quality standard for copper. It is possible that sediment in the Creek contains copper, which could contribute to a background load.

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.

3.1 Remediation Activities

Southwire has completed several remediation efforts in the headwaters and streambed of a tributary to Buffalo Creek, which enters Richards Lake from the southeast. In 1995, and again in 1999, a section of the creek was cleaned by excavating impacted soils and sediments. In 1996, another section of the creek was similarly remediated. In 1999, a soil and streambed remediation project was completed to remove slag material from Southwire Copper Division smelting operations that had been used as structural fill material on Oak Mountain Academy property in the 1970s. Impacted areas were horizontally and vertically delineated and slag and contaminated soils and sediments were removed. The streambed from the Oak Mountain Academy property towards Richards Lake was also remediated (Southwire, 2003).

In the tributary to Buffalo Creek drainage area, several roads and materials handling areas around the Southwire Copper Division facility were remediated by removing impacted soils and backfilling with clean structural fill in 2000. The areas were then paved with concrete to further prevent storm water contact with underlying soils, to allow improved housekeeping, and to ease clean up of any future spills (Southwire, 2003).

A RCRA solid waste management unit, consisting of an intermittent stream bed and the adjacent drainage area northeast of the Southwire Copper Division facility, was remediated in 1999 as part of the 10,000,000-gallon pond project. Impacted soils and sediments were delineated and removed prior to excavation activities for the storm water pond (Southwire, 2003).

In June of 2000, smelting operations were permanently discontinued, thereby eliminating fugitive and stack air emissions. In addition, due to the shutdown of the smelter, secondary copper scrap and refinery intermediate materials that had been stored and handled during daily smelter operations have been completely removed from the site. Smelter and tank house equipment have been decontaminated, demolished and completely removed from the site. Southwire constructed a lined 10,000,000-gallon storm water retention pond to capture and allow extended settling of any solids washing from the site. Construction of the lined retention pond was completed in the latter part of 2000 (Southwire 2003).

In 2000 and 2001, Southwire completed an upgrade to the combined sewer handling and treatment system, including expanded interceptor sumps, pipe replacement, additional larger pump sets, a standby power supply system, and a 4,000,000-gallon water storage tank. The potential for mechanical and electrical failures to cause unpermitted discharges from the combined sewer system has been virtually eliminated. The frequency of permitted discharges of treated process water has been significantly reduced. The facility typically discharges less than six times per year and only during severe rainfall events (Southwire, 2003).

The numerous source identification and control projects, which have been completed by Southwire within the Buffalo Creek watershed upstream of the listed segments, have led to considerable improvements in surface water quality in the segment of Buffalo Creek downstream of Southwire and the tributary to Buffalo Creek. Since 1997, copper concentrations have decreased approximately 85 to 90% in Buffalo Creek downstream of Southwire and approximately 90% in the tributary to Buffalo Creek (Southwire, 2001).

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 these TMDLs 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 these TMDLs occur when the ratio of effluent or contaminated stormwater to stream flow is the greatest. The TMDLs are 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 Conditions Flows

Listed Stream	7Q10 (MGD/cfs)	1Q10 (MGD/cfs)
Buffalo Creek, Downstream Southwire	0.39/0.61	0.34/0.53
Buffalo Creek, Upstream Tallapoosa River	1.0/1.6	0.88/1.4
Tributary to Buffalo Creek	0.026/0.04	0.023/0.035

Second, the TMDLs are 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 acute and chronic water quality criteria for 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 hardnesses 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 concentration. 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 (USEPA, 1993). 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 (L/kg)
TSS = total suspended solids concentration (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 Condition Hardness and TSS

Listed Segment	Total Hardness (mg/L as $CaCO_3$)	TSS (mg/L)	Translator
Buffalo Creek, Downstream Southwire	25	3	2.4
Buffalo Creek, Upstream Tallapoosa River	28	10	2.9
Tributary to Buffalo Creek	25	14	3.0

5.0 ALLOCATIONS

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 whether adequate data exists 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 (USEPA TMDL Guidelines). A phased TMDL requires that 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 segments' 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
Buffalo Creek, Downstream Southwire	3.64	2.74	8.74	6.58
Buffalo Creek, Upstream Little Tallapoosa River	4.05	3.02	11.75	8.76
Tributary to Buffalo Creek	3.64	2.74	10.92	8.22

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. Table 5 lists seven facilities that are covered by the General Storm Water NPDES Permit for Industrial Activities.

There are three individual industrial NPDES permitted facilities in these watersheds. The Southwire Wire Plant currently has limitations for copper. These facilities are listed in Table 4 and the total WLA for all these facilities is given in Tables 9 through 11. If there are any other permitted sources of copper in the future, the WLA loads will be calculated using the effluent design flow. Since the industrial permits listed do not have a flow limitation, a TMDL in mass per day is not appropriate. It is more accurate and conservative to assign a wasteload allocation as a concentration. The mass limit for any value of flow (Q) will then be calculated by multiplying flow times concentration. The WLA requires that the effluent concentration from each point source not exceed the allowable instream copper concentration 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)

It is not known how much of the copper comes from nonpoint sources. The allowable instream copper concentration and wasteload allocation data is used to calculate the load allocations.

Based on information provided to EPD by Southwire, the Best Available Technology for the removal of copper is chemical precipitation. However, the concentration required by this TMDL may not be economically feasible. Therefore, Southwire may need to perform a use attainability study within three years, which would be reviewed for approval by both EPD and EPA.

5.3 Seasonal Variation

The low flow critical conditions incorporated in these TMDLs are assumed to represent the most critical design conditions and to provide year-round protection of water quality. These TMDLs are 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 TMDLs for the listed segments through the use of the 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 these TMDLs adequately accounts for the lack of knowledge concerning the relationship between effluent limitations and water quality.

5.5 Total Maximum Daily Load

These TMDLs are summarized in Tables 9 through 11.

Table 9. Copper TMDL Summary for Buffalo Creek, Downstream of Southwire

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	ΣQ_{WLA}X 2.74 µg/L for all conditions and flows	0.0041 kg/day for the 7Q10 ΣQ_{LA}X 2.74 µg /L for all conditions and flows	Implicit	0.0041 kg/day + WLA for the 7Q10 Q_{total} x 2.74 µg/L for all conditions and flows
Total Dissolved Copper	Acute	ΣQ_{WLA}X 3.64 µg/L for all conditions and flows	0.0047 kg/day for the 1Q10 ΣQ_{LA}X 3.64 µg/L for all conditions and flows	Implicit	0.0047 kg/day + WLA for the 1Q10 Q_{total} x 3.64 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	ΣQ_{WLA}X 6.58 µg/L for all conditions and flows	0.0097 kg/day for the 7Q10 ΣQ_{LA}X 6.58 µg/L for all conditions and flows	Implicit	0.0097 kg/day + WLA for the 7Q10 Q_{total} x 6.58 µg/L for all conditions and flows
Total Recoverable Copper	Acute	ΣQ_{WLA}X 8.74 µg/L for all conditions and flows	0.019 kg/day for the 1Q10 ΣQ_{LA}X 8.74 µg/L for all conditions and flows	Implicit	0.011 kg/day + WLA for the 1Q10 Q_{total} x 8.74 µg/L for all conditions and flows

* Based on the Draft EPA 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 source discharges to the watershed, including both continuous and storm water discharges.

Table 10. Copper TMDL Summary for Buffalo Creek, Upstream of the Little Tallapoosa River

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	ΣQ_{WLA}X 3.02 µg/L for all conditions and flows	0.011kg/day for the 7Q10 ΣQ_{LA}X 3.02 µg/L for all conditions and flows	Implicit	0.011 kg/day + WLA for the 7Q10 Q_{total} x 3.02 µg/L for all conditions and flows
Total Dissolved Copper	Acute	ΣQ_{WLA}X 4.05 µg/L for all conditions and flows	0.013 kg/day for the 1Q10 ΣQ_{LA}X 4.05 µg/L for all conditions and flows	Implicit	0.013 kg/day + WLA for the 7Q10 Q_{total} x 4.05 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	ΣQ_{WLA}X 8.76 µg/L for all conditions and flows	0.033kg/day for the 7Q10 ΣQ_{LA}X 8.76 µg/L for all conditions and flows	Implicit	0.033kg/day + WLA for the 7Q10 Q_{total} x 8.76 µg/L for all conditions and flows
Total Recoverable Copper	Acute	ΣQ_{WLA}X 11.8 µg/L for all conditions and flows	0.038 kg/day for the 1Q10 ΣQ_{LA}X 11.8 µg/L for all conditions and flows	Implicit	0.038 kg/day + WLA for the 7Q10 Q_{total} x 11.8 µg/L for all conditions and flows

* Based on the Draft EPA 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 source discharges to the watershed, including both continuous and storm water discharges.

Table 11. Copper TMDL Summary for Tributary to Buffalo Creek

Parameter	Criteria	WLA	LA	MOS	TMDL
Total Dissolved Copper	Chronic	ΣQ_{WLA}X 2.74 µg/L for all conditions and flows	0.00027 kg/day for the 7Q10 ΣQ_{LA}X 2.74 µg/L for all conditions and flows	Implicit	0.00027 kg/day + WLA for the 7Q10 Q_{total} x 2.74 µg/L for all conditions and flows
Total Dissolved Copper	Acute	ΣQ_{WLA}X 3.64 µg/L for all conditions and flows	0.00032 kg/day for the 1Q10 ΣQ_{LA}X 3.64 µg/L for all conditions and flows	Implicit	0.00032 kg/day + WLA for the 1Q10 Q_{total} x 3.64 µg/L for all conditions and flows
Total Recoverable Copper	Chronic	ΣQ_{WLA}X 8.22 µg/L for all conditions and flows	0.00081 kg/day for the 7Q10 ΣQ_{LA}X 8.22 µg/L for all conditions and flows	Implicit	0.00081 kg/day + WLA for the 7Q10 Q_{total} x 8.22 µg/L for all conditions and flows
Total Recoverable Copper	Acute	ΣQ_{WLA}X 10.9 µg/L for all conditions and flows	0.00095kg/day for the 1Q10 ΣQ_{LA}X 10.9 µg/L for all conditions and flows	Implicit	0.00095 kg/day + WLA for the 1Q10 Q_{total} x 10.9 µg/L for all conditions and flows

* Based on the Draft EPA 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 source 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. GA EPD 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 Tallapoosa River Basin along with the Coosa and Tennessee Basins were the basins of focused monitoring in 2001 and will again receive focused monitoring in 2006. Focused basin monitoring of these streams will be initiated, as appropriate, during the next monitoring cycle.

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, GA EPD 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 GA 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 will be provided for these TMDLs. During this time, the availability of these TMDLs will be public noticed, a copy of the TMDLs will be provided as requested, and the public will be invited to provide comments on the TMDLs.

7.0 INITIAL TMDL IMPLEMENTATION PLAN

GA EPD has coordinated with EPA to prepare this Initial TMDL Implementation Plan for this TMDL. GA EPD has also established a plan and schedule for development of a more comprehensive implementation plan after this TMDL is established. GA 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 GA EPD and/or Regional Development Centers (RDCs), or other GA EPD contractors (hereinafter, "GA EPD Contractors"), will develop expanded plans (hereinafter, "Revised TMDL Implementation Plans").

This Initial TMDL Implementation Plan, written by GA EPD and for which GA EPD and/or the GA 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. GA EPD and the GA 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. GA 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 GA EPD Contractor and approved by GA 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 GA EPD approves. If for any reason the GA EPD Contractor does not complete the BMP demonstration project, GA EPD will take responsibility for doing so.

3. As part of the Initial TMDL Implementation Plan the GA EPD brochure entitled "Watershed Wisdom -- Georgia's TMDL Program" will be distributed by GA EPD to the GA 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 GA EPD Contractor for its use in making presentations to appropriate stakeholders on TMDL Implementation Plan development.

4. If for any reason the GA EPD Contractor does not complete one or more elements of a Revised TMDL Implementation Plan, GA 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 December 2005.

6. The GA EPD Contractor helping to develop the Revised TMDL Implementation Plan, in coordination with GA 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 GA 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 GA EPD approves the Revised TMDL Implementation Plan.

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	–	–			–			–	

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