TOTAL MAXIMUM DAILY LOAD (TMDL)

for

Priority Organics (Polychlorinated Biphenyls [PCBs])

in

Weiss Lake

Coosa River Basin (HUC 03150105)

Cherokee County, Alabama

From Georgia-Alabama State Line to Weiss Dam in Alabama

EPA United States Environmental Protection Agency

Region 4 serving the southeast

In compliance with the provisions of the Federal Clean Water Act, 33 U.S.C §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 400-4, the U.S Environmental Protection Agency is hereby establishing the Total Maximum Daily Load (TMDL) for Priority Organics (Polychlorinated Biphenyls [PCBs]) in Weiss Lake, Coosa River Basin. Subsequent actions must be consistent with this TMDL.

/s/ 11/1/04

James D. Giattina, Director Date

Water Management Division

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1.0 Introduction

1.1 Background

Water bodies on the 303(d) list are required to have a Total Maximum Daily Load (TMDL) evaluation for the pollutant(s) that do not meet water quality criteria. 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 in order to reduce pollution, and to restore and maintain water quality.

The State of Alabama assesses its water bodies for compliance with water quality 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. Water bodies classified as "partially supporting" or "not supporting" their designated uses are included on the 303(d) list of impaired waters. The Alabama Department of Environmental Management (ADEM) criteria for listing water bodies on the 303(d) for USEPA priority organics (e.g., PCBs, chlordane) is based on the Alabama Department of Public Health (ADPH) fish consumption advisory guidelines. A water body is

- **Fully Supporting** - ADPH has not issued a consumption advisory or has lifted a previous consumption advisory,
- **Partially Supporting** when ADPH has issued a "Limited Consumption" advisory affecting only a subgroup of the population or restricting the quantity of fish that should be eaten, and
- **Not Supporting** when ADPH has issued a "No Consumption" advisory.

It is important to note that these advisories are based on Food and Drug Administration (FDA) action levels. The FDA action level for a "no consumption" designation is 2 ppm in fish tissues for total PCBs. A concentration of 1 to 1.99 ppm triggers a "limited consumption" advisory.

Weiss Lake water use classification, as defined in the ADEM *Water Use Classifications for Interstate and Intrastate Waters Administrative Code*, Chapter 335-6-11, is swimming and fish & wildlife (ADEM, 2002). This reservoir appeared on the Alabama 1996, 1998, and 2002 303(d) lists

of impaired waters because it was "partially supporting" these uses following "limited consumption" ADPH advisory issuances. These advisories were issued based on ADEM results from 1992-1994 sample analyses for PCBs in channel catfish tissues. This TMDL addresses PCBs in fish tissues and applies to Weiss Lake from the dam to the Alabama-Georgia state line. The Lake was also listed for nutrients and pH. The TMDLs for these pollutants are not addressed in this document.

1.2 Nature, Health Effects, and Occurrence of PCBs in the Environment

PCBs are a group of synthetic organic chemicals that have been used commercially in the United States since 1929. They consist of 209 possible individual chlorinated biphenyl compounds or "congeners" that differ according to the percentage of chlorine in the mixture (EPA, 1999). These congeners vary in their physical and chemical properties and toxicity depending on the number of chlorine molecules in the compound.

The manufacture of PCBs was banned in the United States in 1979. At that time, most of the commercial PCBs were manufactured by Monsanto Chemical Company and sold under the trade name Aroclor. Their use widely varied including plasticizers, heat-transfer fluids, adhesives, solvent extenders, hydraulic fluids, organic diluents, and dielectric fluids (Cairns et al., 1986). The USEPA (1993) has estimated that approximately 1.3 billion pounds of PCBs were already sold in the United States at the time they were banned from production. Of that amount, roughly 60 percent are still in use in PCB transformers and mineral oil transformers, 35 percent were disposed in landfills, while the remaining 5 percent were incinerated or degraded in the environment.

PCBs were primarily introduced in the environment through losses during the production phase. Losses continued by ways of leaks at poorly maintained storage and disposal sites, and releases from faulty equipments containing PCBs. While PCBs remain mostly on the land environment, small amounts are released in the air as a result of incomplete combustion during incineration of PCB-containing products (USDHHS, 1995). The amount released to the atmosphere returns to earth as wet or dry deposition. Ultimately, PCBs end up in soils and aquatic systems. In these environments, they are stable, relatively insoluble, and bound to organic matter and sediments.

Humans may be exposed to PCBs by ingestion of contaminated food, dermal contact with contaminated materials, or by inhalation. Contamination by ingestion is primarily due to consumption of contaminated fish (USDHHS, 1995). PCBs have been found to bioaccumulate in fish at amounts unsafe for human consumption because of their high ability to deposit in fatty tissues (USEPA, 1980). Although not experimented on humans, animals exposed to PCBs have shown several health effects including toxicity to the liver, gastrointestinal system, blood, skin, endocrine system, immune system, and nervous system. PCBs are also classified as probable human carcinogens (Group B2) (USEPA, 1999).

1.3 Watershed Description

Weiss Lake and its tributaries are part of the Coosa River system. The Coosa River originates in Tennessee as the Conasauga River and in the north Georgia mountains as the Etowah, Coosawattee and Chattooga Rivers. Lake Weiss was formed when Alabama Power impounded the Coosa River in 1961 for the purpose of hydroelectric power generation. Lake Weiss drains approximately 13,657 square kilometers, most of which is located in northwest Georgia. The dam is a gravity concrete and earth-fill type with a maximum height of 26 meters. The reservoir is located in Cherokee County in northeastern Alabama near the Alabama-Georgia state line (See Figure 1). The headwaters of the reservoir extend into Floyd County, Georgia. The Alabama towns of Centre, Leesburg, and Cedar Bluff are located in the immediate proximity of Lake Weiss, and the City of Rome, Georgia is located approximately 27 river miles upstream from the reservoir's headwaters. The reservoir lies in the Coosa Basin in the valley and ridge physiographic province of Northern Alabama. The reservoir at full pool encompasses over 12,000 hectares of surface area and a volume of almost 38,000 hectare-meters.

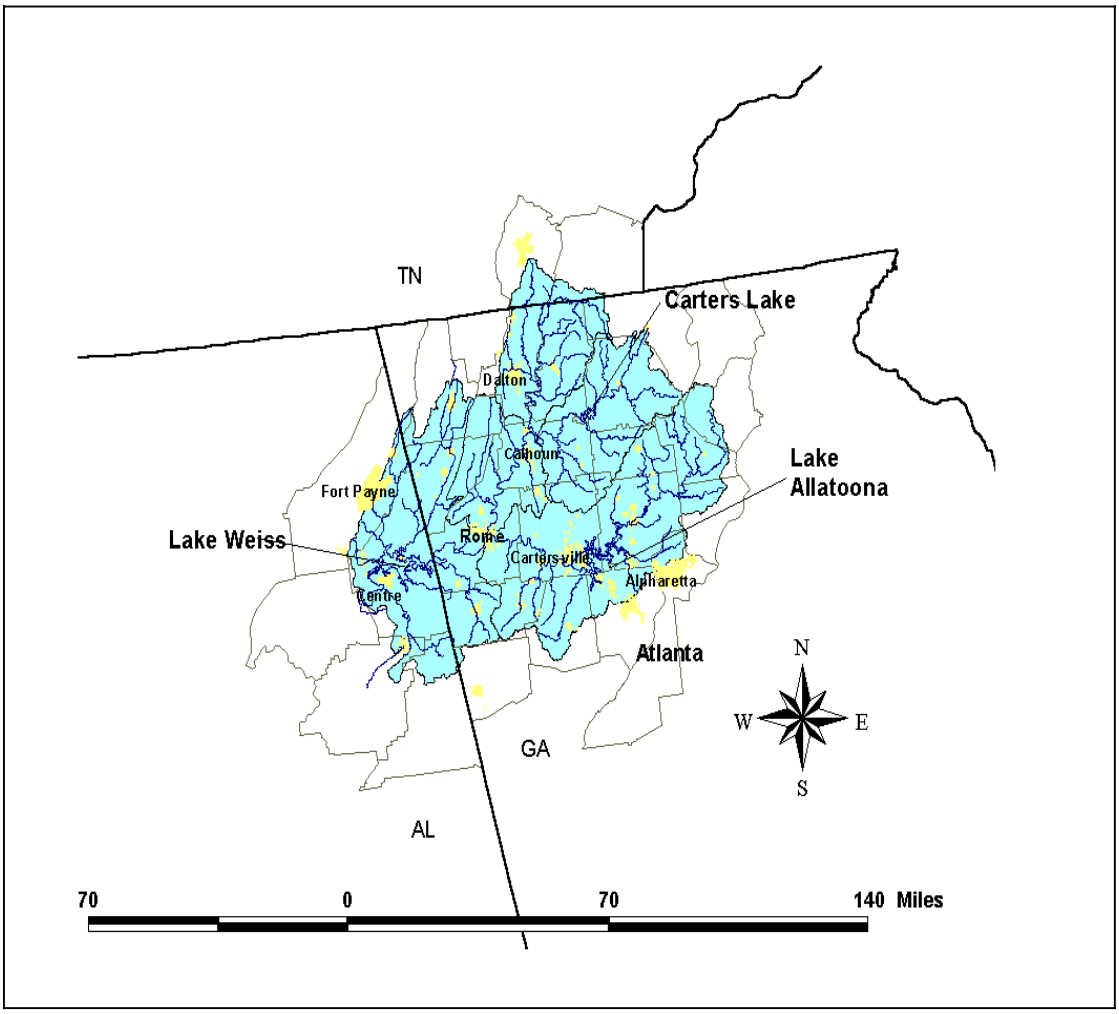

Figure 1. Location of Weiss Lake, Coosa River Basin.

1.4 Applicable Water Quality Standard

TMDLs are established at levels necessary to attain and maintain the applicable numerical water quality standards (see 40 CFR Section 130.7(c)(1)). The Alabama's freshwater chronic aquatic life criteria for PCBs, as stated in the Alabama's Department of Environmental Management *Water*

Quality Criteria Administrative Code, Chapter 335-6-10 Section (07), is 0.014 ug/l. The code also specifies that for pollutants USEPA classified as carcinogens and for which water use classification is public water supply and fish consumption, the human health criteria (under annual average or higher stream flow conditions) should be computed as:

$$\text{Concentration (mg/l)} = (\text{HBW} \times \text{RL})/(\text{CPF} \times [(\text{FCR} \times \text{BCF}) + \text{WCR}])$$

in which,

HBW = human body weight, set at 70 kg

RL = risk level, set at $1x\ 10^{-5}$

CPF = cancer potency factor, which is 7.7 kg-day/day for PCBs

FCR = fish consumption rate, set at 0.030 kg/day

BCF = bioconcentration factor, which is 31,200 kg/l for PCBs

WCR = water use consumption rate, set at 2 l/day

PCB concentration = $(70\ \text{kg} \times 10^{-5})/(7.\ 7\ \text{kg-day/day} \times [(0.030\ \text{kg/day} \times 31{,}200\ \text{l/kg}) + 2\ \text{l/day}]) =$

97×10^{-9} mg/l or 0.000097 ug/l

The Alabama human health criteria for PCBs is therefore 0.000097 ug/l.

2.0 Source Assessment

A source assessment characterizes the known and suspected sources of PCBs in the watershed for use in the development of the TMDL. As indicated earlier, an analysis of fish samples collected by ADEM from 1992 to 1994 in Weiss Lake showed the presence of PCBs in channel catfish tissues. The 1998 and 2002 303 (d) lists attributed the origin of PCBs to out-of-state sources, presumably the state of Georgia. The Georgia Environmental Protection Division (GAEPD) has found PCBs in fish tissues and sediment samples in upstream waters of the Coosa River since the 1970's (GADNR, 1998). The 1998 Coosa River Basin Management Plan reports on the source of PCBs in the Coosa River and subsequently in Weiss Lake as follows:

> "The contamination of fish in the Coosa River was attributed to the General Electric Company's plant in Rome, which began operations in 1954. Efforts were made in the late 1970's and 1980's by Georgia Environmental Protection Division (EPD) and USEPA to ensure that releases of PCBs from the facility to the environment were minimized. The facility was closed in June 1998. Currently, the facility has a NPDES permit, which requires monitoring and control of storm water discharges of PCBs, and several areas on the facility's property are regulated under the Resource Conservation and Recovery Act. Both of these regulatory activities are under the purview of EPD.

In summary, PCBs in channel catfish tissues from Weiss Lake originated from dissolved PCBs and contaminated sediments in upstream waters of the Coosa River. That is, contaminated surface runoff, interflow and possibly groundwater, and eroded sediments from upland sites entered the River.

Atmospheric deposition has been found to be an important source of PCBs. The major source of PCB in the atmosphere is volatilization from contaminated sites dues to leak or losses at storage and disposal facilities or from incineration of products containing PCBs. Considering that PCBs are no longer produced and that losses at the GE plant in Rome, GA have been contained through the NPDES permit, the direct contribution of atmospheric wet and dry depositions of PCBs from the Rome site to Weiss Lake can be considered insignificant compared to upstream waters in the Coosa River.

3.0. TMDL Development Approach

An important component of TMDL development is to establish relationships between source loadings and instream water quality. This section describes the numerical approach used to develop the TMDL. The Alabama human health water quality standard for PCBs under average stream flow conditions was computed earlier and is equal to 0.000097 ug/l. This standard, if met, should protect against contaminated fish tissues in Weiss Lake and tributaries. It is also protective of the FDA action level of 2 ppm for fish consumption and the ADPH fish consumption guidance levels. As indicated earlier, ADPH fish consumption advisory issuances are based on FDA action levels.

In order for Weiss Lake to meet the water quality standard for PCBs, the concentration of total PCBs in water column should be below 0.000097 ug/l. Therefore, the TMDL expressed as an annual average load is computed as the product of the annual average flow and the water quality standard. The 10-year average flow, obtained using 1991-2000 daily flow measured on the Coosa River at the Alabama-Georgia state line, is 232 m^3/sec. Therefore,

TMDL = 232 m^3/sec x 0.000097 ug/l x1000 l/m^3 x 86400 sec/day x 365 days/year x 10^{-9} kg/ug
= 0.71 kg/year.

The total PCB loading into Weiss Lake must be limited to 0.71 kg/year. In other words, the State of Georgia TMDL for PCBs should allow an average of 0.71 kg/year or less to enter Weiss Lake at the Alabama-Georgia state line for the Lake to achieve and maintain its designated uses in Alabama. Since the sources are "out-of-state" in Georgia, this TMDL allocates an aggregate allowable PCB load of 0.71 kg/year, which includes both point and nonpoint source contributions from Georgia.

4.0. Allocations

A TMDL is the amount of a pollutant that can be assimilated by the receiving waterbody without exceeding the applicable water quality standard. It is expressed as the sum of waste load allocation (WLA) and load allocation (LA). The TMDL must also include a margin of safety (MOS). The MOS is either implicit or explicit and accounts for the uncertainty in the relationship between pollutant loads and the water quality response of the receiving waters.

4.1. Waste Load and Load Allocations

The WLAs 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. 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. Since the source of

impairment of Weiss Lake is "out of state" and total PCBs are delivered in water at the Alabama-Georgia state line, this TMDL does not discriminate between WLAs and LA upstream of the state line. There are no known sources, either point or nonpoint, located on the Alabama side of Weiss Lake.

4.2 Margin of Safety

The MOS is a required component of TMDL. It may be implicitly incorporated in the TMDL using conservative model assumptions to develop load allocations or explicitly specified as a portion of the TMDL while using the remainder for allocations. For this TMDL, the MOS was implicitly incorporated in the use of the following conservative assumptions:

- All PCBs are biological available and it is assumed that there is no decay of PCBs between the State line and Weiss Dam.
- All point and nonpoint sources are given an allocation equivalent to the water quality standard at the end of pipe. This is necessary because it is not known if the background PCB concentration is below the standard.
- The TMDL is expressed as an average PCB loading based on annual average flow. There is no particular year(s) that would show discernable critical conditions necessary to affect bioaccumulation of PCBs in fish tissues. This is because PCBs bioaccumulate very slowly through the years.

4.3 Seasonal Variations

PCB loadings in Weiss Lake at the Alabama-Georgia State line are expected to fluctuate based on the amount of stream flow and subsequently rainfall. Therefore, one would expect greater PCB loadings in the spring and summer months when rainfall is higher than in other seasons. The biocumulation of PCBs in fish tissues is a slow process. In addition, the Alabama water quality criteria to protect human health is based on chronic effects over a long-term period of time. This TMDL provides for year-round protection of water quality standards and therefore adequately accounts for seasonal variability.

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