

**SITE STATUS SUMMARY**  
**SANGAMO-WESTON SUPERFUND SITE (PICKENS, SC)**

**Site Description**

The affected areas are a seven-mile stretch of Twelvemile Creek and 56,000-acre Hartwell Lake. Hartwell Lake is a man-made reservoir created by the construction of Hartwell Dam across the Savannah River by the USACE between 1955 and 1963. Twelvemile Creek is the primary tributary into the headwaters of the lake and contains three masonry impoundments (private hydroelectric dams) along its length. Sediment in both Twelvemile Creek and Hartwell Lake is contaminated with PCBs that originated from a Sangamo Weston capacitor plant that discharged PCB-containing wastewater into Town Creek, a tributary to Twelvemile Creek. Sediment PCB concentrations in the lower seven-mile stretch of Twelvemile Creek, interchangeably known as the Twelvemile Creek Arm and Seneca Creek Arm, and a depositional area, were originally measured in the 1 to 3 ppm range at the surface and slightly higher in deeper sediments. Portions of the Twelvemile Creek Arm were found to contain up to 61 ppm PCBs. In 1991/92, maximum PCB concentrations measured in sediment core samples from the upper section of Hartwell Lake (where Twelvemile Creek enters) exhibited concentrations of 5 to 11 ppm; PCB concentrations in sediment in the lower part of the lake were typically below 1 ppm.

As a result of the PCB concentrations found in sediment, in 1990 the site was placed on the NPL and is fund-lead.

**Selected Remedial Action**

In June 1994, a ROD was issued for the site that specified as the only selected remedy monitored natural recovery supplemented by institutional controls. The selected target cleanup standard for sediment was 1 ppm PCBs based upon technical feasibility; the affected area covers approximately 730 acres with a total estimated volume of 4.7 million cy of PCB-contaminated sediment. For fish, the FDA action level of 2 ppm PCBs was selected, also based upon technical feasibility. A carcinogenic risk-based approach was evaluated by determining the concentration levels in largemouth bass that would result in acceptable risk to anglers through ingestion of fish. Utilizing EPA risk assessment methods, a fish tissue concentration of 0.036 ppm was associated with a  $10^{-4}$  risk. The risk-based fish cleanup goal of 0.036 ppm was determined to be technically impracticable. Natural recovery of largemouth bass within Hartwell Lake to below the FDA action level of 2 ppm PCBs was predicted by modeling to occur within 12 years (by 2004).

Both EPA and the public rejected as too costly (\$500 million minimum) remedies associated with removal, treatment, and disposal of the estimated 4.7 million cy of PCB-contaminated sediment. EPA also rejected alternatives that involved aggressive engineering controls to contain or remove and dispose of PCB-contaminated sediment as being too costly (\$30-50 million) and not providing a significant reduction in overall risk.

The June 1994 ROD required the annual monitoring of surface sediment at 20 locations in Twelvemile Creek and Lake Hartwell and of aquatic biota (primarily a comprehensive fish tissue study for largemouth bass, catfish, and hybrid bass) at six stations for 15 years minimum. The

resulting PCB data trends are to be used to support decisions to modify the fish advisory. In addition to fish and surface sediment sampling, an exposure assessment is performed annually using Asian clams (*Corbicula*).

Additionally, fish consumption advisories have been in place for Lake Hartwell since 1976, and were last modified in 1998 when steps were taken to issue a joint advisory between Georgia and South Carolina. The current advisory adopts a risk-based approach that issues meal frequency advice to Lake Hartwell anglers based on species harvested and PCB concentration trends in fish tissue. A Public Education Program was initiated in July 1998 by preparing a color brochure for fish advisories that was widely distributed in retail outlets, visitor centers and campgrounds around the lake.

### **Annual Monitoring Results**

The annual biota and sediment monitoring has been implemented in the Spring of each year since 1994. This effort currently includes: 1) surface sediment sampling at 21 locations in Twelvemile Creek and Lake Hartwell; 2) fish tissue analyses at six stations in Lake Hartwell for largemouth bass, catfish, and hybrid bass; 3) fish tissue analyses on forage fish species at three locations in Lake Hartwell; and 4) 28-day caged corbicula analyses at seven stations in Twelvemile Creek. Reportedly, sediment data indicate that surficial sediment PCB concentrations in Twelvemile Creek have decreased steadily since 1990 due to ongoing physical processes such as burial, mixing/dispersion, and PCB dechlorination. Reportedly, sediment age dating indicates that a majority of surficial sediments in Twelvemile Creek will reach the 1 ppm cleanup goal between 2007 and 2011. However, the most recent EPA five-year review of the site performed in 2004 concluded that although sediment concentrations continue to measurably decrease, PCB concentrations in largemouth bass, channel catfish, and hybrid bass have not responded as measurably to the decreased surface sediment trends. The attached Table 1 presents a summary of fish and sediment data that have been collected as part of the ROD requirements.

### **Scheduled Site Activities**

Annual sampling has been historically conducted during the late spring (April and May) followed by analysis and report generation in August or September. The next EPA five-year review of the site is scheduled for 2009.

Additionally, a 2006 technical agreement between the Natural Resource Trustees and the PRP, Schlumberger Technology Corporation, requires the PRP to pay \$11.8 million in NRD claims and to spend an additional \$8 to \$10 million to purchase and remove two of three hydroelectric dams (Woodside 1 and 2) on the Twelvemile Creek Arm of Lake Hartwell. EPA supports the settlement as they believe represents the most permanent solution for enhancing the ongoing natural transport of clean sediment downstream to speed burial of the contaminated sediment. Dam removal is to begin following finalizing an agreement between the PRP and a local water utility company on a disposal location for the approximately 400,000 cy of mostly clean sand trapped behind the dams. Reportedly, the sand will be used to fill in two areas owned by the utility company, near the dam that will remain in place on Twelvemile Creek, for the purpose of creating water retention capacity for future use by the utility company. Once an agreement is in

place on sand disposal, anticipated by the end of September 2007, it is anticipated that it will take between 12 and 18 months to remove the sand prior to starting the demolition of the dams.

## **References**

*Five-Year Review Report for the Sangamo-Weston/Twelvemile Creek/Lake Hartwell PCB Contamination Superfund Site*, EPA, Atlanta, GA, September 2004, <http://www.epa.gov/Region4/waste/npl/nplsc/sangamsc.htm>.

*Lake Hartwell 2004 Fish and Sediment Study, Operable Unit 2 ROD Monitoring Program*, URS, Franklin, TN, September 2004, <http://www.epa.gov/Region4/waste/npl/nplsc/sangamsc.htm>.

*Lake Hartwell 2005 Fish and Sediment Study, Operable Unit 2 ROD Monitoring Program*, URS, Franklin, TN, August 2005, <http://www.epa.gov/Region4/waste/npl/nplsc/sangamsc.htm>.

*Lake Hartwell 2006 Fish and Sediment Study, Operable Unit 2 ROD Monitoring Program*, URS, Franklin, TN, August 2006, <http://www.epa.gov/Region4/waste/npl/nplsc/sangamsc.htm>.

*Long-term Recovery of PCB-Contaminated Surface Sediments at the Sangamo-Weston/Twelvemile Creek/Lake Hartwell Superfund Site*, R. Brenner, V. Magar, J. Ickes, e. Foote, J. Abbott, L. Bingler, E. Crecelius, *Environmental Science & Technology*/Volume 38, No. 8, 2004.

*Natural Resource Damage Assessment and Restoration Program - Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell PCB Contamination Superfund Site, South Carolina*, U.S. Fish and Wildlife Service, Charleston, SC, circa 2006.

Personal communications w/ C. Zeller, Remedial Project Manager, EPA.

**Table 1: Sangamo Weston Annual Fish and Sediment Monitoring Results**

**[Data provided for 2003 and before are from the MCSS Database; the documents from which the 2004 to 2006 data were summarize are listed in the reference section]**

Fish sample results through 2006 show a general reduction in PCB concentrations when compared to 1990 and 1991 data. The PCB concentration range found in fish collected from the six sample locations from 1990 through 2006 are summarized below.

<u>Largemouth bass</u>	<u>Hybrid bass</u>	<u>Channel catfish</u>
1990: 6 to >14 ppm	1990: ~2.30 ppm	1990: 3.0 to 3.90 ppm
1991: >0.5 to 2 ppm	1991: 1.3 to 5.20 ppm	1991: 0.30 to 0.70 ppm
1998: 0.13 to 8.69 ppm	1998: 2.04 to 3.58 ppm	1998: 0.06 to 2.53 ppm
1999: 0.27 to 11.96 ppm	1999: 0.99 to 4.36 ppm	1999: 0.08 to 2.27 ppm
2000: 0.11 to 11.00 ppm	2000: 2.84 to 3.68 ppm	2000: 0.18 to 1.31 ppm
2001: 0.14 to 6.93 ppm	2001: 2.46 to 6.29 ppm	2001: 0.19 to 0.97 ppm
2002: 0.12 to 4.51 ppm	2002: 1.71 to 2.58 ppm	2002: 0.06 to 0.78 ppm
2003: 0.11 to 4.54 ppm	2003: 2.21 to 7.90 ppm	2003: 0.05 to 1.55 ppm
2004: 0.09 to 3.38 ppm	2004: 1.50 to 4.57 ppm	2004: 0.05 to 1.76 ppm
2005: 0.10 to 5.79 ppm	2005: 1.06 to 3.05 ppm	2005: 0.08 to 4.51 ppm
2006: 0.16 to 6.32 ppm	2006: 1.26 to 3.33 ppm	2006: 0.11 to 3.60 ppm

In 1995, the sampling of three species of forage fish was added to the fish sampling program and samples of these fish species are being collected at three of the six sampling locations. Maximum PCB concentrations for each fish from each year beginning in 1999 are:

<u>Bluegill</u>	<u>Threadfin shad</u>	<u>Gizzard shad</u>
1999: 2.19 ppm	1999: 5.01 ppm	1999: 4.49 ppm
2000: 3.70 ppm	2000: 3.48 ppm	2000: 4.74 ppm
2001: 3.37 ppm	2001: 2.99 ppm	2001: 6.16 ppm
2002: 1.01 ppm	2002: 4.8 ppm	2002: 3.65 ppm
2003: 1.29 ppm	2003: 1.63 ppm	2003: 3.97 ppm
2004: 2.94 ppm	2004: 0.62 ppm	2004: 4.68 ppm
2005: 2.58 ppm	2005: 6.5 ppm	2005: 9.6 ppm
2006: 3.0 ppm	2006: 5.2 ppm	2006: 32 ppm

Surface sediment samples (top 6 inches) have been collected at 21 sampling locations annually beginning in 1995. The following is a summary of PCB concentrations in sediment samples collected from 2000 through 2006:

Upper Twelvemile Creek (four sediment samples collected each year)

2000: <0.06 to 2.71 ppm  
2001: 0.22 to 2.5 ppm  
2002: <0.063 to 4.26 ppm  
2003: <0.063 to 3.25 ppm  
2004: <0.063 to 4.07 ppm  
2005: 0.22 to 2.3 ppm  
2006: 1.10 ppm to 3.5 ppm

Middle Twelvemile Creek (two sediment samples collected each year)

2000: 2.08 and 12.5 ppm  
2001: 2.3 and 2.6 ppm  
2002: 3.3 and 5.55 ppm  
2003: 0.331 and 2.27 ppm  
2004: 0.513 and 2.13 ppm  
2005: 0.082 and 1.8 ppm  
2006: 1.9 and 2.1 ppm

Lower Twelvemile Creek (two sediment samples collected each year)

2000: 1.33 and 1.97 ppm  
2001: 3.98 and 5.73 ppm  
2002: 1.92 and 9.68 ppm  
2003: 1.77 and 5.51 ppm  
2004: 1.72 and 2.48 ppm  
2005: 0.74 and 5.81 ppm  
2006: 2.1 and 2.4 ppm

Seneca River Arm (aka, Twelvemile Creek Arm)/Upper Hartwell Lake (two sediment samples collected each year)

2000: 1.18 and 0.52 ppm  
2001: 0.445 and 0.814 ppm  
2002: 0.539 and 0.896 ppm  
2003: 0.642 and 1.61 ppm  
2004: 0.507 and 0.693 ppm  
2005: 0.43 and 0.92 ppm  
2006: 0.71 and 0.80 ppm

Lower Hartwell Lake (one sediment sample collected each year)

2000: 2.36 ppm  
2001: 0.487 ppm  
2002: 2.93 ppm  
2003: 1.25 ppm  
2004: 1.41 ppm  
2005: 1.90 ppm  
2006: 2.9 ppm