

ORNL/ER-206/V2

Energy Systems Environmental Restoration Program  
Clinch River Environmental Restoration Program

# **Final Project Report on Arsenic Biogeochemistry in the Clinch River and Watts Bar Reservoir**

## **Volume 2: Quality Assurance/Quality Control Summary Report for Arsenic Biogeochemistry in the Clinch River and Watts Bar Reservoir**

*K. A. Newman, C. J. Ford, J. T. Byrd*

Date Issued--April 1995

Prepared by Environmental Sciences Division, Oak Ridge National Laboratory, ESD Publication 4185

Prepared for U.S. Department of Energy Office of Environmental Management under budget and reporting code EW  
20

Environmental Restoration and Waste Management Programs, Oak Ridge National Laboratory, Oak Ridge,  
Tennessee 37831-6285, managed by MARTIN MARIETTA ENERGY SYSTEMS, INC. for the U.S. DEPARTMENT  
OF ENERGY under contract DE-AC05-84OR21400

---

### **Author Affiliations**

C. J. Ford is a member of the Environmental Sciences Division of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. J. T. Byrd is employed by the Department of Chemistry and Physics at Armstrong State College, Savannah Georgia. K. A. Newman is employed by Scientific Applications International Corporation, Oak Ridge, Tennessee.

---

### **Executive Summary**

Arsenic contamination was studied in the Clinch River/Watts Bar Reservoir (CR/WBR) system downstream from the U. S. Department of Energy's Oak Ridge Reservation (ORR). Arsenic is of particular interest and concern because (1) it occurs commonly in coal-bearing rock and waste products

such as fly ash associated with the burning of coal, (2) it is classified as a Class A carcinogen by the U. S. Environmental Protection Agency, and (3) disposal of fly ash, both on and off the ORR, may have contaminated surface water and sediments in the Clinch River and Watts Bar Reservoir. The present study differs from previous reports on arsenic concentrations in the CR/WBR system in the use of much more sensitive and precise processing and analytical techniques to measure arsenic species (arsenate, arsenite, and organic arsenic) at levels well below the ecological and human health risk screening criteria. The absolute detection limits using these techniques are approximately 20 to 40 pmol/L, or 0.0015 to 0.003 µg/L.

Four main sites were sampled quarterly over a 3-year period (1990 through 1992). Sites investigated included Lower Watts Bar Reservoir near the Watts Bar Dam (Tennessee River kilometer 849.6), the Kingston area (Clinch River kilometer 1.6), Poplar Creek (Poplar Creek kilometer 1.6), and the McCoy Branch Embayment (McCoy Branch kilometer 0.3). Additional sites were investigated in the vicinity of these main stations to determine the distribution of contamination and to identify possible alternative or additional sources of arsenic.

Detection limits that were a factor of 20 below the minimum risk screening criteria were achieved for 100% of arsenic speciation data. However, 118 samples for inductively coupled plasma metals analysis were not preserved to analytical specifications, and the analytical holding times for 180 ion chromatography samples were not met. More rigorous preservative testing protocols and more tightly defined analytical statements of work will prevent these problems in the future.

Introduction, background, materials and methods, results, discussion, and conclusions are presented in Volume 1. The Quality Assurance/Quality Control Summary Report; the listing of water quality and surface water arsenic speciation data by source and site; and the listing of pore water arsenic speciation and particle-to-water distribution coefficients for As, Fe, and Mn by source, site, and season are presented in Volume 2.

The Clinch River Environmental Restoration Program is currently completing the second phase of the Clinch River Remedial Investigation, with the intent of performing a baseline risk assessment on collected data. The data collected for this report will contribute to the baseline risk assessment for the Clinch River. Many of the goals of the Clinch River Remedial Investigation were refined using the results of this study.