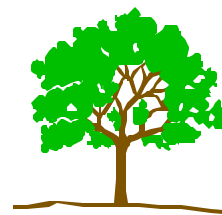


US EPA ARCHIVE DOCUMENT

**RCRA Showcase Pilot
Region III
Plume Delineation through Tree Cores
Former Lucent Technologies Richmond Works Facility**



Introduction

The former Lucent Technologies Richmond Works facility, is approximately 120 acres in size and located about five miles east of Richmond, Virginia. The Richmond facility was constructed in 1977 and has been in continuous operation since that time. Storage and use of chlorinated solvents at the Richmond Works facility until 1989 contributed to the on-site groundwater contamination at the site. Lucent sold the facility in 1996, however, Lucent retains responsibility for remediation of the impacted groundwater.

In accordance with an Administrative Order, the former Lucent Technologies Richmond Works facility has operated a groundwater recovery system since 1995. Lucent designed the system to provide source removal and hydraulic containment of groundwater contaminated with volatile organic constituents. Unfortunately, performance monitoring indicated that the system was not operating as expected and the plume was not being controlled by the recovery system. In response to this observation, Lucent implemented a series of modifications to enhance performance during the spring of 2000. These enhancements included:

- installation of additional perimeter recovery wells along a preferential pathway;
- installation of a new recovery well in the source area;
- modification of source area groundwater recovery wells to vacuum enhanced recovery wells;
- rehabilitation of perimeter extraction wells; and,
- improvements to the operation and maintenance of the system to reduce downtime.

Although these modifications increased the rate of contaminant removal, it may take several years until contaminant concentrations stabilize at the perimeter of the groundwater monitoring network. Stabilized or decreasing contaminant concentrations in the perimeter monitoring well network will support EPA's Environmental Indicator (EI) goal "Migration of Contaminated Groundwater Under Control."

Given the period of time since the contaminants were originally released to groundwater, the plume is likely at equilibrium conditions downgradient of the current perimeter monitoring wells. Rather than requiring the facility to install additional downgradient wells, EPA, with the support of the United States Geological Survey (USGS) and in conjunction with the facility, is proposing to use tree cores to define the groundwater plume for the purpose of meeting the Groundwater EI.

Background

Don Vroblesky of the USGS has initiated work demonstrating that tree core analyses can be used to delineate contamination of shallow groundwater by volatile organic constituents. Work at several sites has shown that headspace gas chromatography analysis of tree cores, from trees overlying groundwater contaminated with volatile organic constituents, contains the same volatile organic constituents. The constituents in various species of trees appear to reflect the configuration of the groundwater contaminant plume.

At the former Lucent Technologies facility groundwater occurs 5 to 15 feet below the ground surface. Groundwater contamination is limited to the shallow water table aquifer. This shallow aquifer is composed of a fifteen foot thick silty clay layer overlying a twenty foot sand layer. The silty clay layer thins downgradient causing groundwater to ultimately discharge into a wetland. Beneath this shallow aquifer is a clay layer at least fifty feet thick overlying a second water bearing aquifer. The deep aquifer is not contaminated.

At the former Lucent Technologies facility, a variety of trees overlie the groundwater plume prior to its discharge into the wetlands. The unique combination of type of contaminants, shallow groundwater, and limited depth of contamination offers favorable conditions to map a plume using tree cores.

Proposal

This pilot proposes to collect tree cores from a variety of species proximate to groundwater monitoring wells. The team will use this data to determine the following:

- Are the trees able to provide an indication of groundwater contamination;
- Is there a correlation between the concentrations found in the head space from a tree core and the concentration of contaminants in a nearby well;
- Of the three constituents of interest, 1,1,1-TCA, 1,1-DCE and 1,1-DCA, which constituent provides the best correlation; and
- Of the variety of trees sampled, which species provides the best correlation to groundwater concentrations.

If a reasonable correlation exists, then the team can select appropriate trees downgradient to determine the extent of groundwater contamination. After evaluating the results of the tree cores collected to delineate the plume, EPA will select locations for confirmatory groundwater sampling.

Plume delineation through tree core analysis is a potentially cost effective and simple approach to meet the Groundwater EI at this site and offers EPA an opportunity to test a new tool for site characterization.

Schedule

Initial Sampling Event	September, 2001
Analysis of Results	December, 2001
Interim Report	March, 2002
Plume Delineation Sampling	March, 2002
Analysis of Results	May, 2002
Confirmatory Groundwater Sampling	June, 2002
Summary Report	September, 2002

Region III Contacts

Name: Robert Greaves, Chief, RCRA General Operations Branch
Phone: (215) 814-3423
Email: greaves.bob@epa.gov

Name: Russell Fish, Project Manager
Phone: (215) 814-3226
Email: fish.russell@epa.gov

Name: Deborah Goldblum, Geologist
Phone: (215) 814-3432
Email: goldblum.deborah@epa.gov