Second Five-Year Review Report
for
Tennessee Products Superfund Site

EPA ID # TND071516959

Chattanooga
Hamilton County, Tennessee

September 2016

Prepared By:
TDEC-DoR.
1301 Riverfront Parkway, Suite 206
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For:
United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

Franklin E. Hill
Director, Superfund Division

Date: 9/26/16

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List of Acronyms

4C	Chattanooga Creek Cleanup Committee, LLC
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and xylenes
BWSC	Barge, Waggoner, Sumner and Cannon, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLP	Contract Laboratory Program
cm	centimeter
COCs	Chemicals of Concern
DDT	Dichlorodiphenyltrichloroethane
DNAPL	Dense Non-Aqueous Phase Liquid
DoR	Division of Remediation
EC's	Engineering Controls
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
ICs	Institutional Controls
LIF	Laser Induced Fluorescence
MCL	Maximum Contaminant Levels
mg/kg	milligrams per kilogram
NAPL	Non-Aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ORD	Office of Research and Development
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated biphenyls
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SESD	Science and Ecosystems Support Division SESD
SI	Site Inspection

SPME	Solid Phase Micro Extraction
SWP	Southern Wood Piedmont
TAL	Target Analyte List
TBCs	To-Be-Considered Criteria
TEF	Toxicity Equivalence Factor
TEQ	Toxic Equivalency
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCL	Target Compound List
TDEC	Tennessee Department of Environment and Conservation
TDWQC	Tennessee Division of Water Quality Control
TPS	Tennessee Products Superfund Site
TVA	Tennessee Valley Authority

Executive Summary

Introduction

This is the second Five-Year Review (FYR) for the Tennessee Products Superfund Site (TPS). The triggering action for this statutory review is the completion date of the first FYR, which was September 27, 2011. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that then existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.
In order to minimize risks posed by the contaminants to human health and the environment, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal, emphasis was placed on waste-to-fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling. In situations where excavation was not practicable, the sediments were covered in place and physically stabilized.

Remedial Action Objectives

The Remedial Actions Objectives (RAO's), as specified in the Record of Decision (ROD) are:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).
- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.
- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.
- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.
- Minimize potential for leaching of COCs to groundwater from areas of high concentration.

On November 23, 2010, EPA submitted official comments to TDEC on the planned modification of SWP's Post-Closure permit. The substance of those comments was that the modified permit should require SWP to take some regular action toward ensuring that the barrier in the creek remains effective. On June 13, 2011, and again on September 12, 2011, personnel from the EPA Region 4 Superfund Division met with representatives from Southern Wood Piedmont (SWP) and the Tennessee Department of Environment and Conservation (TDEC) Resource Conservation and Recovery Act (RCRA) Program to discuss the requirements of the TDEC RCRA Post Closure Permit for the SWP facility. EPA proposed to SWP and TDEC that future inspection and monitoring of the AquaBlok® cap performance should be included in the Final RCRA Post Closure Permit issued by TDEC. The Final permit for the SWP facility was issued November 17, 2011, and stipulated quarterly visual inspections of the AquaBlok® cap and annual Laser Induced Fluorescence (LIF) sampling of the cap.

Technical Assessment

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

Conclusion

Two years of SPME monitoring and four years of LIF monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Therefore, the remedy implemented at the Tennessee Products Site remains protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Tennessee Products		
EPA ID: TND071516959		
Region: 4	**State:** TN	**City/County:** Chattanooga/Hamilton County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Troy Keith (reviewed by EPA)
Author affiliation: TDEC Division of Remediation
Review period: 2/3/2016 – 9/27/2016
Date of site inspection: 6/23/2016
Type of review: Statutory
Review number: 2
Triggering action date: 09/27/2011
Due date *(five years after triggering action date)*: 09/27/2016

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
NA

Issues and Recommendations Identified in the Five-Year Review:
NA

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-Term Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended. Therefore, the remedy at the Tennessee Products Site remains protective of human health and the environment, both in the short term and long term.	

Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control.

Are Necessary Institutional Controls in Place?
☐ All ☐ Some ☒ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☒ Yes ☐ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

Second Five-Year Review Report
Tennessee Products Superfund Site

1.0 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency prepares FYRs pursuant to Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."

The Tennessee Department of Environment and Conservation (TDEC), Division of Remediation (DoR), conducted the FYR and prepared this report regarding the remedy implemented at the Tennessee Products Site (TPS) in Chattanooga, Hamilton County, Tennessee. This FYR was conducted from February 2016 to September 2016. EPA Region 4 is the lead agency for developing and implementing the remedy for the Potentially Responsible Party (PRP)-financed cleanup at the Site.

This is the second FYR for the Tennessee Products Site (Site). The triggering action for this statutory review is the completion date of the first FYR, which was September 27, 2011. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one Operable Unit, which was addressed in two remedial action phases of work, all of which are addressed in this FYR. Phase I was a non-time critical removal that took place in 1997 and 1998, prior to the ROD. The Phase II remedial action took place from 2005 through 2007, after the ROD was issued.

2.0 Site Chronology

The following table lists the dates of important events for the Tennessee Products Superfund Site.

Table 1: Chronology of Site Events

CHRONOLOGY OF EVENTS	
DATE	**DESCRIPTION OF EVENT**
June 1, 1981	Discovery
January 1, 1983	Preliminary Assessment
June 1, 1984	Site Inspection
November 2, 1990	Site Inspection
September 8 – October 10, 1993	Removal Action
January 18, 1994	Proposal to the National Priorities List (NPL)
September 29, 1995	Finalized on the NPL
June 24, 1997 – December 4, 1998	Removal Action
April 12, 2002	EPA and 4C enter into an Administrative Order on Consent for the Remedial Design/Remedial Action (RD/RA)
September 30, 2002	Remedial Investigation/Feasibility Study (RI/FS) completed Record of Decision (ROD) Signed
August 3, 2004	Explanation of Significant Difference (ESD)
May 4, 2005	RD/RA Consent Decree Filed
May 10, 2005	Barge, Waggoner, Sumner, and Cannon, Inc. (BWSC) Health and Safety Plan, Preconstruction Survey Work Plan, and Remedial Design Work Plan Submitted
May 27, 2005	Preliminary Design Drawings and Document Submitted
June 15, 2005	Envirocon Health and Safety Plan Submitted
June 22, 2005	Stakeholders Meeting Held
July 14, 2005	State of Tennessee Special Waste Application Submitted
July 26, 2005	Remedial Action Work Plan Submitted
August 2005	Access Agreements Reached with all Landowners
August 2, 2005	Storm Water Pollution Prevention Plan Submitted
September 6, 2005	Project Orientation and Mobilization to Site
September 20, 2005	Pre-Construction Meeting and Public Meeting Held
September 23, 2005	Project Quality Management Plan Submitted
October 3, 2005	Background Air Monitoring at Perimeter Completed
October 7, 2005	Final Design Drawings and Document Submitted
October 11, 2005	Background Air Samples Collected
October 11 – 20, 2005	Comparison Water Samples from Upstream of Project Limits Collected
October 12, 2005	Authorization to Proceed with Full Scale Remediation Received from EPA
October 26, 2005	Representative Samples from Northeast Tributary Area Prior to Excavation Collected

November 1, 2005	Project Status Presentation to Chattanooga City Council
November 2, 2005	Media Day Held
November 10, 2005	Verification of Performance Standard Obtainment for Station 12+75 to Station 22+50 (Stream Reach 1) Completed
December 1, 2005	Confirmation Samples from Northeast Tributary Area Collected
December 14, 2005	Verification of Performance Standard Obtainment for Station 60+00 to Station 61+00 (Bypass) Completed
December 27, 2005	Removal at Northeast Tributary Confirmed Complete
January 6, 2006	EPA and TDEC Performed Inspection of Changed Conditions (mobile Non-Aqueous Phase Liquid (NAPL)
January 31, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)
March 6 – 20, 2006	EPA Performs Site Investigation Related to NAPL
March 8, 2006	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 24, 2006	Verification of Performance Standard Obtainment for Station 22+50 to Station 29+50 (Stream Reach 2) Completed
June 13, 2006	Verification of Performance Standard Obtainment for Station 29+50 to Station 40+00 (Stream Reach 2) Completed
June 20, 2006	Statement of Work Modified by EPA
June 22, 2006	Request to Modify Project Quality Management Plan Tab B-Performance Standards Verification Plan Submitted
July 8, 2006	Special Waste Recertification Submitted
July 28, 2006	Verification of Performance Standard Obtainment for Station 40+00 to Station 57+50 (Stream Reaches 3 & 4) Completed
August 29, 2006	EPA Approves the Use of AquaBlok® as an Isolation Barrier
September 1, 2006	Verification of Performance Standard Obtainment for Station 57+50 to Station 77+00 (Stream Reach 4) Completed
September 12, 2006	Verification of Performance Standard Obtainment for Station 77+00 to Station 80+00 (Stream Reach 4) Completed
September 15, 2006	Remedial Action Plan – Supplement for Modified Statement of Work and Project Quality Management Plan – Supplement for Modified Statement of Work Submitted and Notification by EPA for Suspension of Excavation Work in Reach 5 until 2007
November 28, 2006	Isolation Barrier Verification of Performance Standard Obtainment for Station for 45+00 to Station 80+00 Completed
December 15, 2006	Envirocon Demobilization for Winter Shutdown Complete (Security and Inspections Continue)
April 16, 2007	Envirocon Remobilization to Site; Winter Shutdown Concluded
May 21, 2007	Verification of Performance Standard Obtainment for Station 80+00 to Station 83+25 (Stream Reach 4) Completed
May 31, 2007	Verification of Performance Standard Obtainment for Station 83+25 to Station 85+25 (Stream Reach 4) Completed
June 8, 2007	Special Waste Recertification Submitted
June 14, 2007	Verification of Performance Standard Obtainment for Station 85+25 to Station 88+00 (Stream Reaches 4 & 5) Completed and

	Isolation Barrier Verification of Performance Standard Obtainment for Station for 80+00 to Station 83+25 Completed
June 21, 2007	Verification of Performance Standard Obtainment for Station 88+00 to Station 90+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 83+25 to Station 85+25 Completed
June 28, 2007	Verification of Performance Standard Obtainment for Station 90+00 to Station 93+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 85+25 to Station 88+00 Completed
July 11, 2007	Verification of Performance Standard Obtainment for Station 93+00 to Station 95+00 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 88+00 to Station 93+00 Completed
August 7, 2007	Verification of Performance Standard Obtainment for Station 95+00 to Station 100+00 (Stream Reach 5) Completed
August 14, 2007	Verification of Performance Standard Obtainment for Station 100+00 to Station 102+50 (Stream Reach 5) Completed and Isolation Barrier Verification of Performance Standard Obtainment for Station for 93+00 to Station 95+00 Completed
August 23, 2007	Isolation Barrier Verification of Performance Standard Obtainment for Station for 95+00 to Station 102+50 Completed and Pre-Final Construction Inspection Completed
September 6, 2007	Pre-Final Construction Report Submitted
September 13, 2007	Final Inspection Completed
September 14, 2007	Envirocon demobilizes from the Site
October 25, 2007	Public Meeting Held
September 26, 2008	Close Out Report
October 27,2009 through November 10, 2009	Samples Collected from Isolation Barrier
November 1, 2010 through November 17, 2010	Samples Collected from Isolation Barrier
September 27, 2011	First Five Year Review
May 2012	Samples Collected from Isolation Barrier
May 2013	Samples Collected from Isolation Barrier
May 2014	Samples Collected from Isolation Barrier
May 2015	Samples Collected from Isolation Barrier
February 3, 2016	Scoping Meeting
June 23, 2016	Site Inspection
July 13, 2016	Public Notice

3.0 Background

3.1 Physical Characteristics

Chattanooga Creek originates from the slopes of Lookout Mountain in Georgia, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River upstream of Nickajack Reservoir. The creek is a gaining stream throughout its course. The majority of tributaries enter the creek in Georgia with the exception of Dobbs Branch, which enters Chattanooga Creek three miles upstream of the mouth of the creek. Figure 1 depicts the location of the Tennessee Products Superfund (TPS) Site in relation to regional and local surroundings. Figure 2 depicts the TPS site, via aerial photo coverage, in relation to its immediate surroundings.

The TPS Site includes approximately a 2.5-mile section of Chattanooga Creek that contained sediments contaminated primarily with polycyclic aromatic hydrocarbons (PAHs). During the last several decades, a coke plant complex and adjacent industrial facilities in an urban industrial and residential area of south Chattanooga were owned and operated by various entities. The nature of operations and waste disposal practices led to the contamination of Chattanooga Creek sediments. Numerous discharges of contaminated water to Chattanooga Creek via tributaries were documented. Results of previous investigations and subsequent evaluations indicated that existing conditions posed an unacceptable risk to human health, if exposure to the contaminated sediments were to occur.

The TPS Site is surrounded by mixed use areas, consisting of commercial, residential and industrial. Although most of the Site is fairly isolated and inaccessible to residents due to being surrounded by wooded floodplain, portions of the Site may be accessed by road crossings at two locations.
The only environmentally sensitive areas associated with the site are the wetlands that occupy topographically low areas of the adjacent floodplain. Chattanooga Creek is an impaired stream (303D) as a result of upstream agricultural runoff and other anthropological inputs, such as junk yards and sewer overflows.

Figure 1: Location Map for the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."

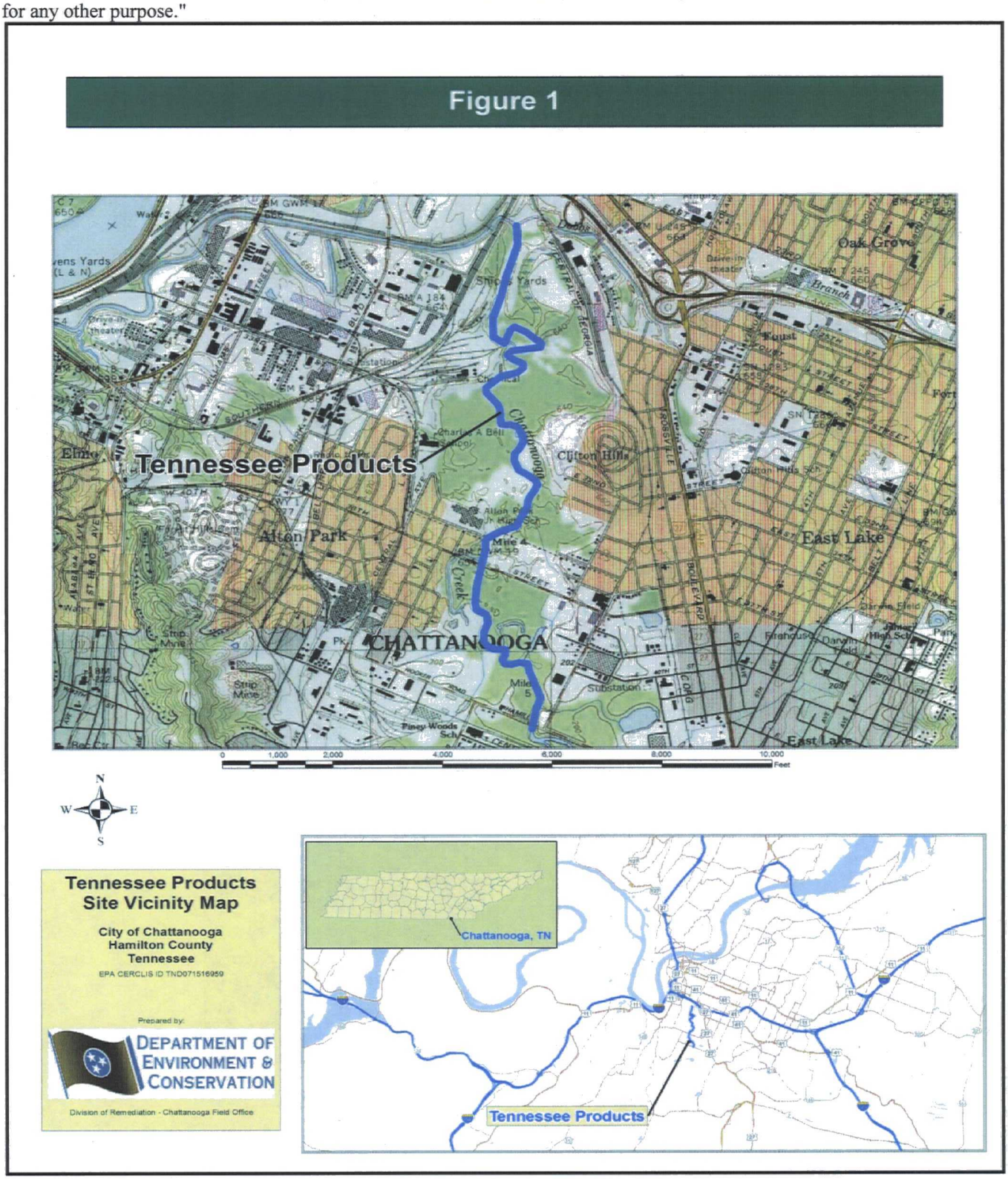
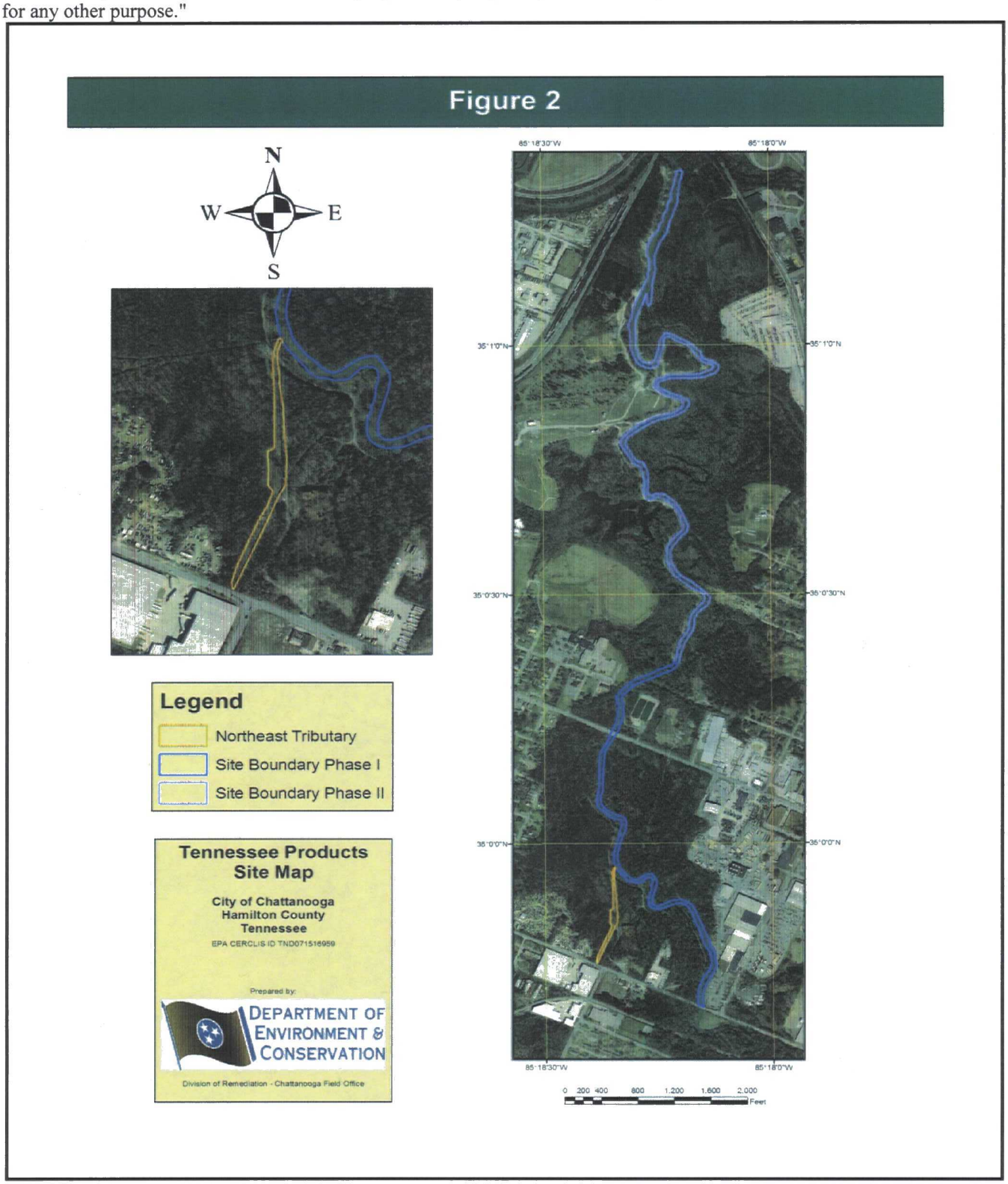


Figure 2: Detailed Map of the Tennessee Products Superfund Site

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."



3.2 Land and Resource Use

Land Use

The Tennessee Products Superfund site is located in a populated area immediately west of downtown Chattanooga, Tennessee. An assessment of current land usage adjacent to the Site was conducted during the Remedial Investigation. The TPS Site is located in the South Side Area Planning District as designated by the Chattanooga-Hamilton County Regional Planning Agency. The boundaries of the South Side Planning District are defined to the north by I-24, to the south by the State line, to the east by Chattanooga Creek, and to the west by Lookout Mountain.

Prior Land Use

According to 1994 data compiled by the Planning Agency, the land use for this area was: (1) 20% residential; (2) 10% industrial; (3) 27% vacant (i.e., either on steep slopes or in the floodplain); (4) 6% commercial; (5) 5% institutional; (6) 9% recreation; and (7) 23% other (i.e., including streets, water, utilities). Interspersed within the industrial facilities are several housing projects and many individual residences.

Current Land Use

Land uses essentially are the same as they were at the time of the Record of Decision (ROD).

Projected Land Use

Projected land use for this area is: (1) 25% residential; (2) 16% industrial; (3) 4% commercial; (4) 2% institutional; (5) 32.5% recreation; and (6) 20% other (i.e., including streets, water, utilities). The Chattanooga-Hamilton County Regional Planning Agency did not project the "Vacant" category percentage, as it is assumed that it will be incorporated into the future Residential, Commercial and Recreational uses.

Ground and Surface Water Uses

Prior Resource Use

At the time of the ROD, private drinking water wells were not known to exist within a 4-mile radius of the Site. Drinking water for the area was supplied by the Tennessee-American Water Company whose intake is on the Tennessee River approximately four (4) miles upstream of the confluence of Chattanooga Creek and the Tennessee River. Groundwater was not generally used for irrigation or livestock watering. The closest active industrial wells (1999) to the Site were Southern Cellulose Products' two wells (both 150 feet deep) on 38th Street, and the Chattanooga Glass Company well (325 feet deep) on West 45th Street. There were no known nearby surface water withdrawals (for drinking water) located downstream of the Site in Chattanooga Creek or the Tennessee River. The closest downstream public water withdrawal intake was located at South Pittsburg, Tennessee, on the Tennessee River, approximately 30 river-miles downstream from the confluence of Chattanooga Creek and the Tennessee River. Chattanooga Creek was used for swimming, playing, and fishing by both children and adults, although warning signs have been posted. Consumption of fish caught from the Creek has been reported, also despite warning signs. In addition, homeless people are reported to sometimes bathe in the Creek and drink Creek water.

Current Resource Use

With exception of the Chattanooga Glass Company well (325 feet deep) on West 45th Street, resource uses are essentially the same as they were at the time of the ROD. The Chattanooga Glass Company is no longer in operation, so it is presumed that the well is no longer in use.

Projected Resource Use
Resource use is not expected to change in the foreseeable future.

Hydrogeology and Hydrology
Groundwater in the region occurs within both the unconsolidated and consolidated materials. The unconsolidated materials include the alluvial deposits and residuum described above. These materials generally have low water yield and are thus not considered an important groundwater source.
The consolidated materials consist of shale, sandstone, limestone, and dolomite that form the bedrock. Water in limestone typically occurs in secondary features such as fractures and bedding planes, particularly those that have been enlarged by solution of calcareous material. These features occur erratically and cause hydraulic conductivities to be extremely variable throughout the region. This property explains why one well may be dry and another nearby well at the same depth into the bedrock produces water. Typically, most of the water encountered in limestone is near the top of the rock where weathering has increased the number of secondary features.

Shales generally have low yields. Sandstones, particularly those on Lookout Mountain, may yield large quantities of water. Limestones and dolomites produce variable amounts of water depending on the number and size of fractures and solution cavities encountered. In general, the most productive aquifers in the region are the formations of the Knox Group.

Groundwater is recharged primarily by the percolation of rainwater through the soils. Generally, groundwater discharges locally to ponds, streams (such as Chattanooga Creek), springs, and by general seepage.

Chattanooga Creek is in the Tennessee River basin, which is regulated by a series of dams along the River and large tributary dams in the headwaters. Chattanooga Creek originates from the slopes of Georgia's Lookout Mountain, flows approximately 26 miles northward into Tennessee and eventually into the Tennessee River just downstream of downtown Chattanooga, and above Nickajack Reservoir. Nickajack Lake is the result of the Tennessee Valley Authority (TVA) constructing a hydroelectric dam at River Mile 425. The Creek is a gaining stream throughout its course and in its Georgia headwaters is fed by several springs. Some of the more notable springs feeding it are Powder Mill, Tannery, Crutchfield, and Blowing. The majority of contributing tributaries also enter the Creek's base flow in Georgia, except for Dobbs Branch, which is three miles upstream from the mouth of the Creek. In its entirety, the Chattanooga Creek has a watershed of nearly 75 square miles, of which approximately twenty per cent is in Tennessee. It occupies the northern portion of the Chattanooga Valley between Lookout Mountain and Missionary Ridge.

Average annual streamflow in Chattanooga Creek in Tennessee is on the order of 100 cubic feet per second (cfs). The Creek falls about 1.5 feet per mile and is relatively shallow, usually not over 4 feet deep and in many places much less, on the order of 3 to 4 inches, depending on the time of year. The average depth appears to be 2 to 4 feet, except where artificially deepened. In the extremely shallow areas, a brisk current is evident, but along most of the length of Creek in Tennessee, the current is scarcely discernable. The stream banks appear to average approximately 2 to 4 feet, except where

artificially heightened. Occasional flooding occurs, as evidenced by trash entangled in trees and bushes 3 to 4 feet above the normal stream level.

The topography of the surrounding area of Chattanooga Creek is rough and mountainous, promoting a special susceptibility of the stream to overflow due too heavy, short duration, spring and summer storms. Floodplain development is considered to be heavy in the Chattanooga Creek basin. Backwater from severe Tennessee River floods could extend up the entire length of Chattanooga Creek. Headwater flooding prevails along Chattanooga Creek, but has not been a major problem. In the past, as recently as March 2003, Tennessee River backwater has caused heavy flood damage to the highly developed floodplain.

3.3 History of Contamination

3.3.1 Historical Origin of Contamination

3.3.1.1 Coke Plant

The coke production processes at the former Tennessee Products Coke Plant (Coke Plant) over its 82-year history (1913-1995) have led to the environmental problems in nearby areas, including Chattanooga Creek. Briefly, coal carbonization removes gases from coal by heating. This process changes coal to coke, which is used for industrial purposes. The off-gases were used for residential heating and lighting. A typical coke oven produced 80% coke, 12% coke-oven gases, 3% coal tar (containing primarily phenols, naphthalene, and other various PAHs), and 1 % light oils (such as benzene, toluene, and xylene). The only known regulated hazardous waste generated by the coke production process is a decanter tank car sludge (i.e., waste K087) which contains primarily phenol and naphthalene. The waste handling procedures used by the Coke Plant over its 82-year history are uncertain. However, uncontrolled dumping of coal tar wastes off-site was apparently a procedure used at one time as is indicated by the discovery of the Chattanooga Creek Tar Deposit and the Hamill Road Dumps. In December 1993, EPA conducted a search for other coal tar waste deposits along the floodplain of Chattanooga Creek between 38th Street and Hooker Road Bridge, on the west side of the Creek, but no additional sites were found.

Although not a direct waste disposal method, numerous discharges of contaminated surface water to the northeast and northwest tributaries have been documented from 1977 until 1990. These tributaries flow from the Coke Plant and discharge to the Creek 1,800 feet downstream of the Creek's intersection with Hamill Road Bridge. The contaminated surface water contained significant levels of PAHs, phenols, oil, and grease, ammonia, and metals. In addition, the Coke Plant reportedly maintained a private sewer line that discharged wastewaters directly to Chattanooga Creek 1 and 1/8 miles from the plant. This sewer line existed in 1944 and appears on a 1967 diagram of the Plant. The sewer line was constructed and used by both the Chattanooga Coke and Gas Company and the Tennessee Products Corporation, which dates its operation and use to as early as 1926. There is evidence that the sewer line was also used by the Reilly Tar and Chemical Company. Reportedly, the sewer line terminated at the Creek just upstream of the Hamill Road Bridge. Based on the results of geophysical surveying conducted during the Remedial Investigation, the sewer line still exists beneath both the Coke Plant and the Velsicol facility. However, instead of discharging directly into Chattanooga Creek, the sewer line appears to have been rerouted such that it now terminates at the Northeast Tributary, just south of the railroad tracks traversing through the middle of the Landes Company site.

The EPA conducted two aerial photographic studies of an area surrounding the Tennessee Products Site. One analysis was to identify potential locations of coal tar deposits in the vicinity of Chattanooga Creek. The purpose of the other analysis was to document past waste disposal activities and other environmentally significant events on and near the Coke Plant.

Up to 23 aerial photographs spanning a period from 1935 through 1994 were analyzed. The analysis identified suspected disposal areas, impoundments, staining, tanks, debris, coal storage areas, open storage areas, containers and drums, mounded material which may represent waste piles, probable vegetation damage due to surface run-off from the Site areas, and discharges to surface drainage pathways.

In general, the aerial photographs showed the nature of the activities on-site. On the Tennessee Products Site, the old Coke Plant area, the photographs clearly showed coal storage, processing, and loading areas, as well as dark staining on the ground throughout the Coke Plant area.
In addition, several of the aerial photos showed mounded dark materials on both sides of the railroad tracks at the eastern corner of the Coke Plant. Open storage and debris piles were also evident in this general area on several aerial photos. In the 1958 aerial photo, an area to the south and across the railroad tracks from the mounded material is an area which appears as stressed vegetation. The distressed vegetation area is larger in the 1964 aerial photo. An oil/water separator was visible on the 1973 aerial photo and was located on the Coke Plant side of the railroad tracks in the aforementioned area. The installation of the oil/water separator indicated a wastewater discharge. The overflow from this oil/water separator would flow northward in a ditch that follows the railroad track. This ditch leads to the Northeast Tributary via a culvert under the railroad tracks.

The coke production process and the migration off-plant of production products and residues are responsible for a wide variety of contaminants at other Site areas, including the Creek. These contaminants include, but are not limited to, a wide variety of PAHs, including lighter chemicals such as benzene, toluene, ethyl benzene, and xylene (BTEX), and metals.

3.3.1.2 Reilly Tar Facility

The Reilly Tar property had been used to produce coal tar products (i.e., road tar and ruffing pitch and other coal tar pitches) from 1921 to 1976. The tar products were made from the by-products of the adjacent coke production plant. In 1976 Velsicol purchased a parcel of land from Reilly Tar and Chemical.

3.3.1.3 Velsicol Chemical Facility

The original facility at the Velsicol main plant site was constructed in 1948 by the Tennessee Products Corporation to expand toluene chlorination operations from the adjacent coke plant.
Velsicol purchased the facility from the TPC in 1963. At the time of the purchase, the following chemicals were being produced at the plant: benzoyl chloride, benzoic acid, benzyl chloride, benzyl alcohol, benzotrichloride, benzoate esters, benzoguanamine, benzonitrile, benzaldehyde, and sodium benzoate.

3.3.1.4 Southern Wood Piedmont

The Southern Wood Piedmont wood treatment facility operated from 1925 until 1988. It is located adjacent to the Middle Reach of the Chattanooga Creek below the 38th Street Bridge. Up until 1940 wastewater from the facility was discharged directly in the Creek. Later this wastewater was channeled into a wetland adjacent to the Creek and finally into a City sewer line.

3.3.2 Investigations

3.3.2.1 State and Federal Investigations and Enforcement

In 1973 and 1977, EPA conducted a number of studies in the Chattanooga area, including two which focused on Chattanooga Creek. The early studies centered on water quality, and did not address the Creek sediments. The major sources of contamination were identified, and the wastewater discharges, as well as Chattanooga Creek surface water, were characterized. These early studies included analyses of water for organic compounds.

In 1980, the Tennessee Valley Authority (TVA) conducted a special survey for toxic priority pollutants which included sediment samples. The findings indicated that much of the Creek sediment was contaminated. During this period an agreement was reached between EPA and Velsicol Chemical Company to prevent the migration of contaminants from the area known as "Residue Hill." Residue Hill (Hill) is a capped landfill located south of the Site, which contains chemical residues and that were leaking leachate. The Hill was capped and a leachate collection system installed in an attempt to stabilize the Hill.

The discovery of toxic materials in the Creek during the TVA study and the completion of the Velsicol project highlighted the need for further data to adequately characterize the Creek's water quality, contaminant concentrations in the sediment and aquatic biota. In order to address these data gaps, an aquatic life study was conducted by the Tennessee Division of Water Quality Control (TDWQC) during June 1981; EPA, TVA, and TDWQC performed a sediment study of the Creek during 1981 and a water quality study was done by TDWQC in July 1982. Results of these studies showed that the worst contamination in the Creek occurred between Creek mile (cm) 5.06 and cm 2.10. This stretch of the Creek included the Hamill Road Dump # 1 (i.e., HRD1) site which contained a wide variety of organic compounds. Within this reach of the Creek also lies the sewer outfall and tributaries (Northeast and Northwest Tributaries) that for many years served as conduits for Velsicol Chemical, Reilly Tar (Reilly Industries, Inc.), and Coke Plant wastewater discharges into the Creek. A large deposit of PAH-contaminated soil/sediment was detected near Creek mile 4.47 at the confluence of the Creek and the Northeast Tributary. The sewer outfall was just upstream of the Hamill Street Bridge; reportedly, the sewer was in working order from 1944 onward and was abandoned at some unknown time decades later.

The Site was the subject of a June 1981 Discovery under the Superfund pre-remedial program. A Preliminary Assessment (PA) was completed by the TDEC, in January 1983 under the USEPA CERCLA PA/SI Cooperative Agreement with EPA Region 4. This assessment indicated that the Site had significant contamination, further studies were warranted, and the Site was a good candidate for the National Priorities List (NPL). As a result, a high priority Site Inspection was conducted. A Site visit was made on May 8, 1986, and an inspection was performed on May 12, 1986 by the TDEC.

During 1990, a water quality and sediment study was completed by Dynamac Corporation for the EPA on the Creek. Additionally, Resource Conservation and Recovery Act (RCRA) 3007 information request letters were sent to all facilities located along the Creek. Responses to these letters provided some information regarding potential sources of contamination from these industries. Results of the sediment study indicated that the areas previously identified during the 1980s were still contaminated to the same relative degree. The sediment study also concluded that the PAHs were the most abundant compounds detected, and that general water quality above Dobbs Branch (i.e., Upper and Middle Reaches) had slightly improved. The improvement can probably be attributed to elimination of wastewater discharges to the Creek, remediation of Hamill Road Dump # 1 and Hamill Road Dump # 3, partial remediation of the Southern Wood Piedmont site and the installation of an infiltration collection system at the 38th Street Dump. Comparisons of the 1980 and 1990 studies show that contaminant concentrations and stream conditions below Dobbs Branch (i.e., the Lower Reach) had not changed.

In mid-1992, the Science and Ecosystems Support Division (SESD) of the EPA, EPA contractors and TDEC collected sediment samples from the Georgia/Tennessee state line to the Creek's mouth at the Tennessee River. Following data collection, the EPA prepared the *Chattanooga Creek Sediment Profile Study Report*. The field effort was divided into two phases. Phase I consisted of collecting sixty sediment/soil samples, 13 water samples and one waste sample. This initial phase of the study indicated that the lower reaches of the Creek bed, from the Hamill Road Bridge downstream, are naturally underlain with a heavy clay deposit. The sampling also indicated that Creek sediments along the entire length of the Site are contaminated with coal tar derivatives. Less ubiquitous, and often associated with the mound deposits near the Hamill Road Bridge, are other VOCs indicative of chemical manufacturing/ processing. Other contaminants of concern sporadically found on-site are: BTEX compounds (i.e., benzene, toluene, ethylbenzene, and xylenes); pesticides; PCBs (polychlorinated biphenyls); and metals (i.e., chromium, mercury, lead, and barium). Water samples infrequently exhibited contamination and were shown to be nearly as clean as the control sample upstream of the heavily industrialized section of the Creek (i.e., upstream of the Upper Reach).

Phase II of the survey delineated and quantified the Creek sediments contaminated with coal tar derivatives from Hamill Road Bridge to Dobbs Branch. During this field effort, cross-sections were set up at intervals along this reach and core samples were taken down to natural alluvial materials. This enabled the EPA to get a profile of the Creek bed and extrapolate volumes of material which needed to be removed. The estimate derived from these studies predicted that 14,500 cubic yards of material would need to be removed from the streambed.

In 1993, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard." Because of the unrestricted access to a portion of the Creek, people could be exposed to Site-related contaminants through ingestion and dermal contact. The coal tar deposits are also physical hazards to adults and children that wander into these areas. ATSDR's recommendations were: (1) dissociate nearby residents from the coal tar deposits; (2) continue characterization studies of the Site; (3) consider the Site for inclusion on the NPL; (4) use appropriate EPA statutory or regulatory authority to take necessary actions; and, (5) consider other coal tar contaminated sites along the Creek for inclusion on the NPL. Based on this Health Advisory, EPA initiated a non-time-critical removal of the most accessible coal tar deposits along the Upper Reach of the Creek and at the former Southern Coke and Chemical plant site (i.e., the Coke Plant area). In 1996, EPA issued an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action, which was consistent with a planned long-term remedial action strategy. On September 26, 1996, EPA

issued an Action Memorandum approving the proposed non-time-critical removal action as described in the EE/CA. After commencing the removal action, the EPA recognized that volume of sediment contaminated with coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and August 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of Creek sediments contaminated with coal tar derivatives.

In June/July of 1997, the U.S. Army Corps of Engineers, working under a cooperative agreement with the EPA, had its primary contractor for the project, IT Corporation, perform a delineation of coal tar deposits in the Creek. The purpose of the delineation was to determine the distribution and quantities of coal tar in the Creek for the upcoming removal action. The delineation occurred along a 5,800 foot section of the Creek, starting at Hamill Road Bridge and ending 1,300 feet downstream of the East 38th Street Bridge, in the vicinity of Alton Park Junior High School.

Earlier, in March/April of 1997, IT Corporation had performed a delineation of coal tar deposits in the Creek starting approximately 1,350 feet downstream of the East 38th Street Bridge to the property line of Southern Wood Piedmont Company. This comprised an approximately 2,600 feet reach of the Creek. On May 18, 1998, IT Corporation completed a delineation of coal tar deposits in the Creek sediments upstream of Hamill Road Bridge. The reach delineated extended from 100 feet upstream of the Hamill Road Bridge to the Hamill Road Bridge itself.

3.3.2.2 PRP Investigations

In December 1995, Mead Corporation, a potentially responsible party, completed a '*Post-Removal Baseline Assessment*' of the Coke Plant area in which both soil and groundwater sampling was conducted. A total of 83 soil (i.e., 40 surface and 43 subsurface), 17 groundwater, and 1 DNAPL (i.e., dense non-aqueous phase liquids) samples were collected and analyzed for Target Compound List (TCL) volatile organic chemicals, and Target Analyte List (TAL) inorganic chemicals (i.e., metals) using EPA Contract Laboratory Program (CLP) protocols. Unfortunately, the results of this investigation were not made available to EPA until the field investigation for the EPA Fund-lead RI was already more than 50 % complete. Thus, there was much duplication of effort between Mead Corporation's field investigation and the EPA RI. However, because the data collected by Mead Corporation appeared to be valid and appropriate for a remedial investigation, this data was incorporated and was discussed in the subsequent sections of the RI along with the data collected by the EPA contractor as part of the planned Fund-lead remedial investigation.

3.4 Initial Response

On September 26, 1996, the EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1998.

Over the course of the eighteen months of the Phase I removal action, a total of 4,235 linear feet of Chattanooga Creek was excavated, along with three isolated tar pits located in the flood plain and

adjacent to the former coke plant. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek.

3.5 Basis for Taking Action

As stated in Section 3.3.2, in 1993, the ATSDR issued a Public Health Advisory for Chattanooga Creek. The Health Advisory concluded that the "the presence of the coal tar in and around the creek poses a health and safety hazard." Characterization of soils and sediments in Chattanooga Creek revealed the presence of numerous contaminants. Risk evaluation of the contaminants estimated the total current excess carcinogenic risk from direct exposure to Site soils to be as high as 2E-04. Sediment was also found to present elevated risk. The Contaminants of Concern (COCs) contributing most to this risk level were benzo(a)pyrene and other PAHs in sediment. This risk level indicates that if no clean-up action was taken, an individual visiting the site could have an increased probability of 2 in 10,000 of developing a detectable cancer within a lifetime as a result of site-related exposure to COCs based upon reasonable maximum exposures (RMEs). It should be noted that risk associated with exposure to non-carcinogenic contaminants was deemed acceptable. Table 2 presents the estimated carcinogenic risk posed by the principal Site COCs through several possible exposure scenarios.

Table 2: Risk Characterization Summary

Table 2
Risk Characterization Summary - Carcinogens (Reasonable Maximum Exposure (RME) Scenario)

Scenario Timeframe: Current
Receptor Population: On-Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Excess Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Route Total
Soil	Soil (and Soil Dust)	Northeast Tributary Area - On-Site Worker Scenario	Alpha-BHC	3E-06	8E-10	2E-06	5E-06
			Arsenic	7E-06	2E-08	1E-06	8E-06
			Benzo(a)anthracene	1E-04	3E-08	8E-05	2E-04
			Benzo(b &/or k) fluoranthene	2E-04	6E-08	2E-04	4E-04
			Benzo(a)pyrene	1E-06	3E-07	1E-03	1E-03
			Carbazole	3E-07	---	3E-07	6E-07
			Chromium	---	1E-07	---	1E-07
			Chrysene	1E-06	3E-10	8E-07	2E-06
			4,4-DDE	8E-07	---	6E-07	1E-06
			Dibenzo(a,h)anthracene	1E-04	3E-08	1E-04	2E-04
			Dieldrin	2E-07	6E-11	1E-07	3E-07
			Indeno(1,2,3-cd)pyrene	6E-05	2E-08	5E-05	1E-04
			Column Total	2E-03	6E-07	1E-03	2E-03
On-Site Worker Current Excess Carcinogenic Risk Subtotal =							2E-03
On-Site Worker Current Excess Carcinogenic Risk Total =							2E-03

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current

Receptor Population : Site Visitor **Receptor Age :** Adult							
				Excess Carcinogenic Risk			
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Route Total**
Soil	Soil	Northeast Tributary Area - Site Visitor Scenario	Alpha-BHC	2E-07	3E-11	3E-07	5E-07
			Arsenic	3E-07	7E-10	2E-07	5E-07
			Benzo(a)anthracene	6E-06	4E-09	1E-05	2E-05
			Benzo(b &/or k) fluoranthene	1E-05	2E-09	2E-05	3E-05
			Benzo(a)pyrene	2E-05	1E-08	1E-04	1E-04
			Carbazole	2E-08	---	3E-08	3E-08
			Chrysene	6E-08	8E-10	1E-07	2E-07
			4,4-DDE	5E-08	---	8E-08	1E-07
			Dibenzo(a,h)anthracene	7E-06	9E-10	1E-05	2E-05
			Dieldrin	1E-08	2E-12	2E-06	2E-06
			Indeno(1,2,3-cd)pyrene	4E-06	5E-10	6E-06	1E-05
			Column Totals	1E-04	2E-08	2E-04	2E-04
Site Visitor Current Excess Carcinogenic Risk Subtotal =							2E-04
Site Visitor Current Excess Carcinogenic Risk Total =							2E-04

Table 2
Risk Characterization Summary - Carcinogens (RME Scenario)

Scenario Timeframe : Current **Receptor Population :** Resident **Receptor Age :** Adult							
				Excess Carcinogenic Risk			
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Ingestion**	**Inhalation**	**Dermal**	**Exposure Route Total**
Sediment	Sediment	Chattanooga Creek - Middle Reach - Resident Scenario (Adult)	Alpha-BHC	5E-06	---	9E-06	1E-05
			Arsenic	2E-07	---	1E-07	3E-07
			Benzene	3E-10	---	3E-10	6E-10
			Benzo(a)anthracene	2E-05	NA	4E-05	6E-05
			Benzo(b &/or k) fluoranthene	3E-05	NA	5E-05	8E-05
			Benzo(a)pyrene	2E-04	NA	3E-04	5E-04
			Beryllium	7E-08	---	3E-08	1E-07
			Carbazole	3E-07	---	5E-07	8E-07
			Carbon Tetrachloride	2E-09	---	2E-09	4E-09
			Chrysene	2E-07	NA	3E-07	5E-07
			4,4-DDT(p,p-DDT)	2E-08	---	3E-08	5E-08
			Dibenzo(a,h)anthracene	1E-05	NA	2E-05	3E-05
			Dieldrin	2E-06	---	3E-06	5E-06
			Gamma-Chlordane	4E-08	---	8E-08	1E-07
Sediment (cont'd)	Sediment (cont'd)	Chattanooga Creek - Middle Reach Resident Scenario (Adult) (cont'd)	Hexachlorobenzene	2E-07	---	4E-07	6E-07
			Indeno(1,2,3-cd)pyrene	1E-05	NA	2E-05	3E-05
			PCB-1248	1E-06	---	2E-06	3E-06
			PCB-1260	4E-07	---	7E-07	1E-06
			2,3,7,8-TCDD TEQ	3E-07	---	6E-07	9E-07
			Column Totals	3E-04	---	5E-04	7E-04
Resident Current Excess Carcinogenic Risk Subtotal =							7E-04
Resident Current Excess Carcinogenic Risk Total =							7E-04

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The Site, as defined in the September 30, 2002 ROD, is the bed and banks of Chattanooga Creek, and comprises only one OU. Although there are areas of the Chattanooga Creek flood plain that were also addressed under the TPS remedial action, these areas were not broken out into separate OU's, but instead were addressed as part of the same OU and remedy selected for the TPS Site.
The RAO's, as specified in the ROD were:

- Minimize direct contact by the public and workers with soil and sediments containing excessive levels of Chemicals of Concern (COCs).
- Minimize direct contact by the public and workers with surface water containing excessive levels of COCs.
- Minimize direct contact by the public and workers with groundwater containing excessive levels of COCs.
- Minimize transport of contaminated soil and sediment by erosion to water courses, including the Tennessee River.
- Minimize potential for leaching of COCs to groundwater from areas of high concentration.

In order to accomplish the RAO's specified above, a remedy was chosen that consisted of a combination of the following: excavation, stabilization, treatment, recycling, offsite disposal and stream restoration. During the first phase of removal (1997-1998), emphasis was placed on waste to fuel recycling of the excavated and stabilized sediments. Due to changing economic conditions and associated cost constraints, the second phase of remedial work (2005-2007) opted for chemical stabilization and offsite disposal of the excavated sediments in lieu of recycling, as specified in the August 3, 2004 (ESD. In

situations where excavation was not practicable, the sediments were covered in place and physically stabilized. There were no Institutional Controls (IC's) specified in the remedy, and there are none in place. The focus of the remedy consisted of removal of contaminants, as presented in the following excerpt from the ROD:

> *A general description of the Selected Remedy is presented in this section. The details of the design for the Selected Remedy will be set forth in the EPA-approved Remedial Design during the Remedial Design and Remedial Action (RD/RA) phases of the Site response. The Selected Remedy focuses on the Middle Reach of Chattanooga Creek and an area of the bank of the Northeast Tributary where old contaminated dredging spoils are mounded.*
>
> - *Chattanooga Creek Sediments -*
>   - *The Middle Reach of the Creek has numerous areas of coal tar-contaminated sediments (i.e., sediment bars) which will be re-identified, excavated, and processed to consolidate coal tar residues which will then be transported to an EPA-approved off-site facility for waste-to-fuel recycling. The remediation of the Middle Reach of the Creek and the bank of the Northeast Tributary (an area of mounded dredging spoils about 10 feet by 100 feet in area) will be conducted in a manner similar to the approach used to conduct the 1997-98 non-time-critical removal of the sediments in the Upper Reach of the Creek in 1997-98. Unlike many contaminants, coal tar derivatives are remarkably visible in sediments. Hence, in the 1997-98 non-time-critical removal, visual determination of the extent of PAH contamination was used. The same technique for identification will be used for the Middle Reach cleanup. However, if certain excavated sediments appear to be uncontaminated, then those sediments shall be subjected to sampling and analyses for the PAHs on the Target Compound List (TCL). The action levels for sediment removal will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.).*
>
> - *Northeast Tributary Area (mounded dredging spoils) –*
>   - *The previously identified area of mounded dredging spoils (an estimated 444 cubic yards), along the bank of the Northeast Tributary, will be excavated, removed, and consolidated with excavated Creek sediments for off-site waste-to-fuel recycling. The dredging spoils will be excavated using visual identification of the grossly contaminated sediments and soils. Once the spoils piles are removed, confirmatory sampling and analyses of soils for the PAHs on the Target Compound List (TCL) will be undertaken to determine whether additional excavation and removal of soils will occur. The action levels for soil removal upon confirmatory sampling and analysis will reflect EPA's excess lifetime carcinogenic risk range of 1×10^{-6} to 1×10^{-4} (See Table G - 9.). Once all affected soils are removed, the excavated area will be filled with clean fill and seeded to promote the growth of local natural foliage.*

Although not specified directly in the ROD, in situations during the Phase I remedial action where it was not practicable to remove all contaminants (i.e. old meanders and certain portions of creek banks), preventing exposure to any residual contaminants was conducted via Engineering Controls (EC's), which consisted of geotextile fabric, soil and rip rap covers. It should also be noted that the above

excerpt does not reflect the modification to disposal specified in the ESD. The ESD allowed disposal of stabilized sediments at a local municipal landfill rather than at a waste-to-fuel facility.

4.2 Remedy Implementation

On September 26, 1996, EPA issued an Action Memorandum approving the proposed non-time-critical removal action (Phase I removal action) as described in the 1996 EE/CA. After commencing the removal action in June, 1997, EPA recognized that the volume of sediments contaminated by coal tar derivatives, as estimated in the EE/CA, was too low. Consequently, on September 24, 1997, and December 5, 1998, EPA issued two additional Action Memoranda authorizing the expenditure of additional amounts to address the actual volume of contaminated sediments in the Creek. The removal Action was completed in December, 1988.

Over the course of the 18months of the Phase I removal action, EPA's contractor, IT Corporation, excavated a total of 4,235 linear feet of Chattanooga Creek, along with three isolated tar pits located in the flood plain and adjacent to the former coke plant. The Phase I remedial action began at the Hamill Road Bridge and ended approximately 1,350 feet downstream of the East 38th Street Bridge. The total material excavated was 25,350 cubic yards, of which 22,934 cubic yards came from the excavation of Chattanooga Creek. Figure 2 depicts the location of the Phase I removal action for Chattanooga Creek. In 2003, negotiations began between EPA and PRPs for reimbursement of costs associated with previous removals and for implementation of additional remedial actions. On May 4, 2005, a RD/RA Consent Decree was filed, which included the following PRPs: the United States General Services Administration, MW Custom Papers, LLC (MeadWestvaco Corporation); Reilly Industries, Inc. (now known as Vertellus); and Southern Wood Piedmont Company. The private PRPs formed the Chattanooga Creek Cleanup Committee, LLC (4C) to implement the remedial action selected in the 2002 ROD, as amended by the August 3, 2004 ESD. Other PRPs, including the United States General Services Administration, Velsicol, and NWI, contributed financially, but were not actively involved with the remedial action at the Site.

4C's contractor, Envirocon, mobilized to the site in early September 2005 to begin the Phase II remedial action. Phase II began at1,354 feet north of the 38th Street Bridge, where it was determined Phase I ended, and extended approximately 10,250 feet to the confluence of Chattanooga Creek and Dobbs Branch, an approximate 1.9 mile reach. Remediation of a dredged spoil pile located along the Northeast Tributary was also included in the ROD and incorporated into the Phase II remedial action.
Site preparation activities were completed during September and October 2005. Excavation and stabilization of contaminated sediments began in mid-October, 2005, and was performed until work could no longer continue efficiently due to weather conditions in January 2006. Necessary equipment and personnel were remobilized in mid-April 2006 to continue sediment excavation and stabilization activities and begin restoration activities. Construction activities were performed until December 2006 when the second and final winter shutdown began. This final winter shutdown ended in April 2007. Again, necessary equipment and personnel returned to the Site to complete sediment excavation and stabilization and site restoration activities. During winter shutdowns, heavy equipment was decontaminated and removed from the Site and the drying bed was covered. A limited number of personnel remained on-site to maintain erosion controls, monitor water management systems, provide site security, and perform other required inspection and monitoring activities. Work was completed in September 2007, and all equipment, temporary structures, and temporary utilities were removed.

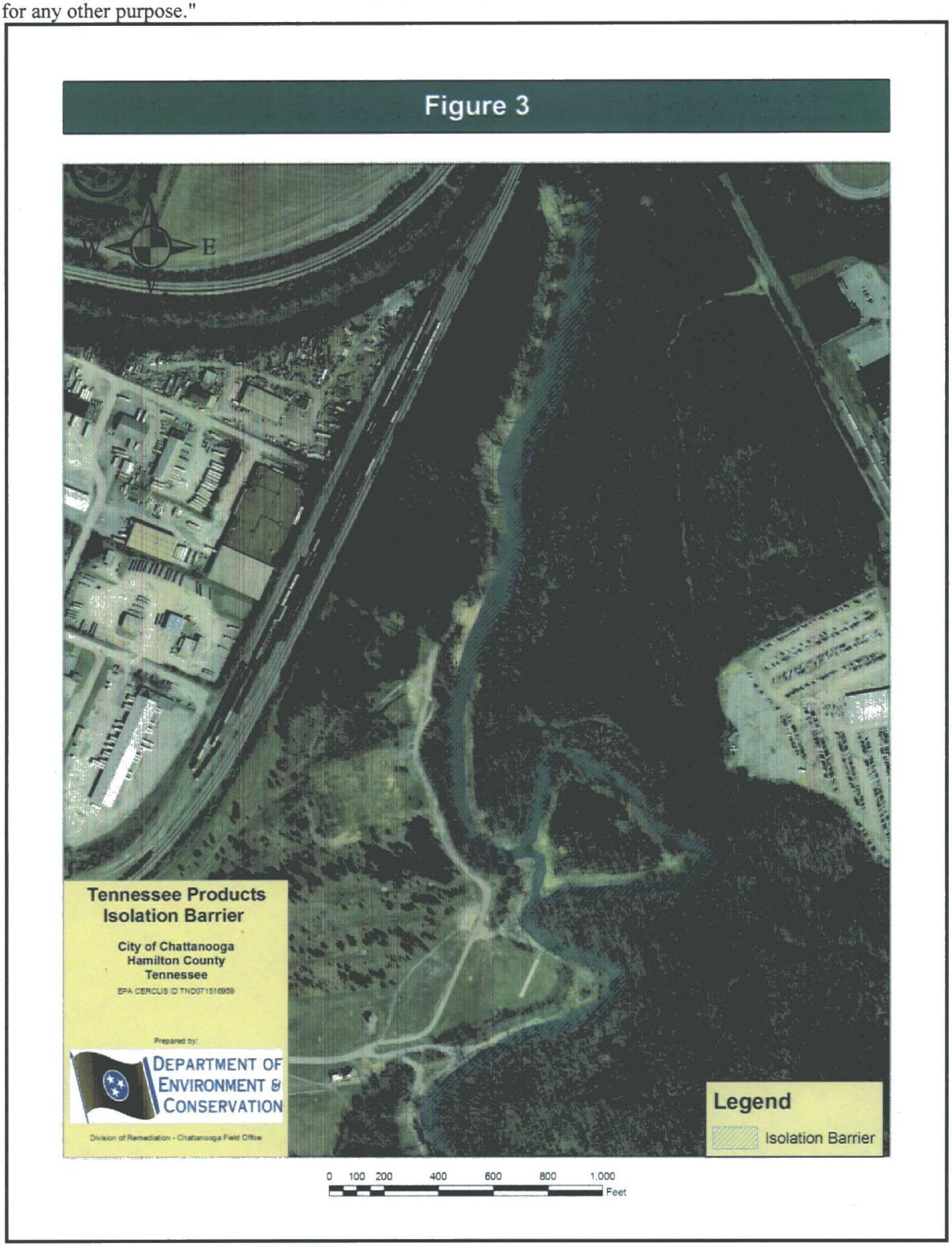
Chattanooga Creek makes an oxbow as it flows onto the property owned by Southern Wood Piedmont Company. During excavation of a portion of the oxbow in January 2006, a black liquid was observed infiltrating the bottom of the excavation. Notifications to the EPA and TDEC were made of this condition. Envirocon placed 12-inches of clay in the first 250-foot section of the oxbow in an attempt to seal off the liquid. The seal did not work. Discussions and investigations by EPA SESD took place during the winter shutdown to determine an appropriate response to address the black liquid, now known to be non-aqueous phase liquid (NAPL). Based upon the EPA SESD NAPL Assessment Report released in June 2006, the EPA modified the scope of work to include installation of a protective isolation barrier to mitigate recontamination concerns.

The design for the isolation barrier included the use of AquaBlok®, which is a patented solid aggregate that is coated with a clay polymer that expands when hydrated. As the AquaBlok® materials hydrate and coalesce, the mass transforms into a cohesive, low permeability barrier. For the isolation barrier, a minimum 12-inch prepared subgrade soil layer was placed over the creek bed and banks to a level that was a minimum of three feet above the highest point of observed NAPL intrusion. The creek banks were graded or maintained at a maximum 2:1 slope. In addition, holes created by previous excavations were filled to create a generally smooth surface, thus creating a longitudinal cross section of the creek that is gently undulating without any abrupt changes in grade.

Ultimately, 5,750 linear feet of isolation barrier was placed in the creek channel, beginning approximately 4,500 feet downstream of the 38th Street Bridge, where the NAPL first became evident along property owned by Southern Wood Piedmont. Placement of the isolation barrier continued uninterrupted, due to the presence of NAPL, until the termination of the Phase II remedial action at the confluence of Dobbs Branch, approximately 10,250 feet downstream of the 38th Street Bridge. Figure 3 depicts the approximate extent of the AquaBlok® isolation barrier.

Figure 3: AquaBlok® Isolation Barrier Location Map

Disclaimer: "This map and any boundary lines within the map are approximate and subject to change. The map does not purport to be a survey. The map is for informational purposes only regarding the EPA's response actions at the site, and is not intended for any other purpose."



4.3 Operation and Maintenance (O&M)

The ROD does not include allowances for O&M, as the assumption at the time the ROD was prepared was that all contamination would be removed. Therefore, there are no O&M requirements or costs under CERCLA associated with the TPS Site at the time of this FYR. However, O&M has been incorporated under RCRA and is further discussed below.

As stated in the above section, the unanticipated occurrence of NAPL along the Southern Wood Piedmont property necessitated the placement of the isolation barrier. As long as NAPL remains present beneath the isolation barrier, periodic inspection of the isolation barrier is warranted to verify its effectiveness in preventing NAPL breakthrough to Chattanooga Creek.

EPA's Office of Research and Development (ORD) laboratory in Cincinnati, OH is involved in contaminated sediments research and was interested in the performance of the AquaBlok® isolation barrier at this site. EPA ORD issued a task order to Tetra Tech in October 2009 that employed solid phase microextraction (SPME) probes to measure pore water trends in the cap layer over time. This task order provided funding and resources to monitor cap performance for three years (2009, 2010 and 2011). The majority of field work and data analysis was subcontracted to Dr. Danny Reible with the Environmental and Water Resources Engineering College at the University of Texas at Austin. Monitoring data generated by this effort indicated the cap was effective in isolating the residual contamination from release to surface water or sediment.

The revised permit for the SWP facility was issued November 17, 2011. The revised permit stipulated quarterly visual inspections of the AquaBlok® cap and annual Laser Induced Fluorescence (LIF) sampling. Arcadis U.S., Inc. conducted visual inspections beginning in March 2012 and LIF sampling began in May 2012. LIF sampling takes place at five locations, beginning immediately upstream of the AquaBlok® cap, and continuing to the downstream extent of the cap (Figure 4). The most recent inspection report available was completed by Arcadis in October 2015. The next annual inspection report is due October 2016. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended.

Long term O&M is necessary due to the presence of DNAPL. Continuation of the RCRA SWP post closure permit monitoring and sampling obligation is necessary to verify the AquaBlok® cap functions as designed.

Figure 4: Sample Location Map*

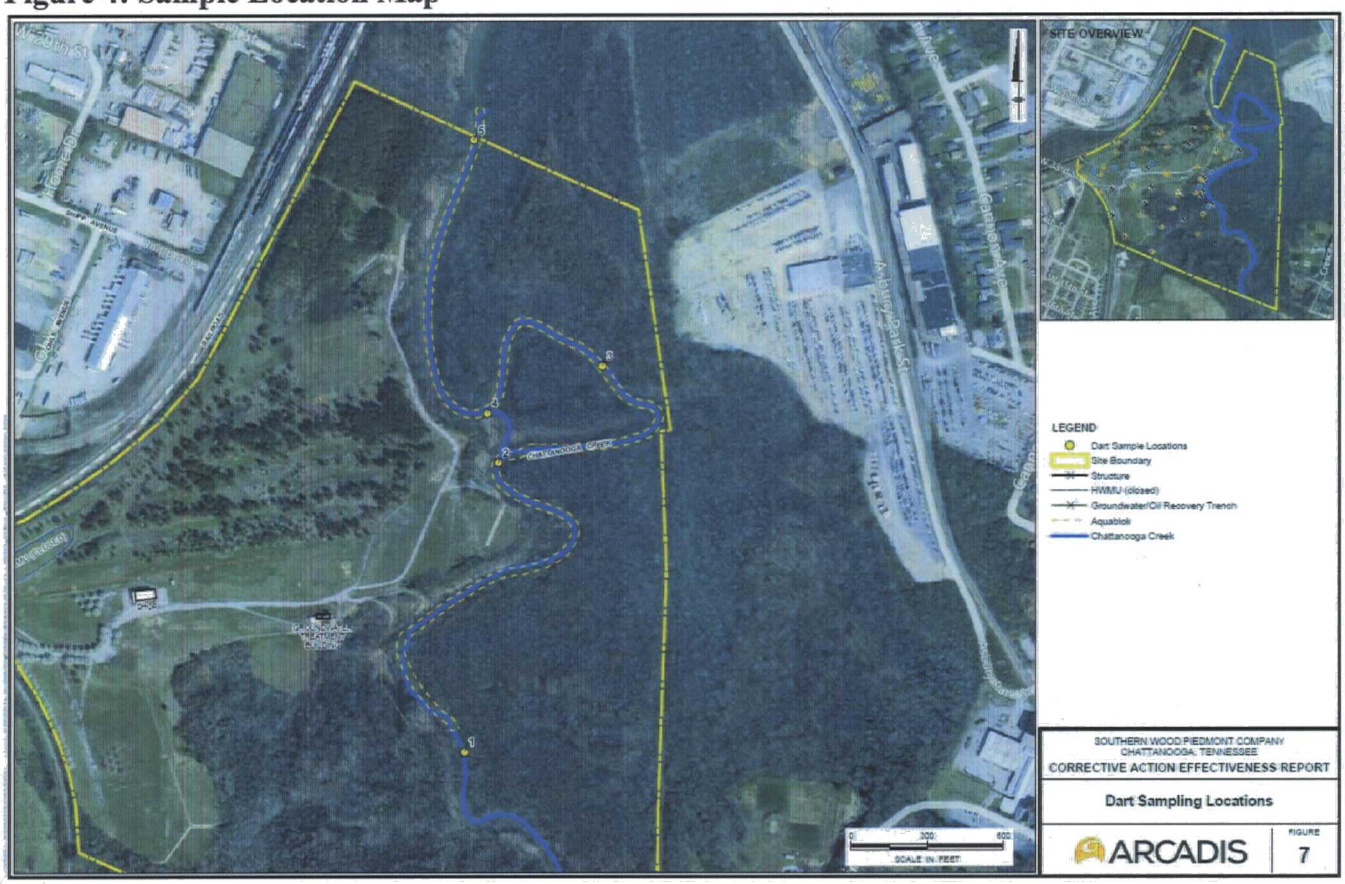


*Figure taken from the Southern Wood Piedmont Arcadis Corrective Action Effectiveness Report No. 15, dated October 2015.

5.0 Progress Since the Last Five-Year Review

Since the first FYR for the TPS Site, the permit for the SWP was revised to include quarterly visual inspections of the AquaBlok® cap and annual LIF sampling. Beginning in March 2012, four years of these monitoring and inspection events have taken place, with the fifth year underway. The inspections indicate the AquaBlok® cap is functioning as intended.

The protectiveness statement from the first FYR is:

The remedy implemented at the Tennessee Products Site currently protects human health and the environment. Two years of SPME monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface. Porewater concentrations in the upper layers of the cap are very low (e.g. in the parts per trillion range) and do not exceed chronic surface water quality criteria. It is important to note that comparisons of porewater concentrations to surface water quality criteria is very conservative in that substantial dilution would be expected between porewater and surface water. Moreover, there is little change between the 2009 and 2010 PAH concentrations in the cap material suggesting that no significant migration of contaminants is occurring up through the AquaBlok® barrier. However, in order for the remedy to be protective in the long term, there needs to be a mechanism in place to ensure regular inspection and monitoring of the barrier's effectiveness. To that end, EPA has requested that TDEC include the necessary inspection and monitoring requirements to the TDEC RCRA Post-Closure Permit for the SWP facility.

The 2011 FYR included one issue and one recommendation. This report summarizes each recommendation and its current status below.

Issue:
There should be some mechanism in place for continued monitoring and regular inspections to ensure future protectiveness of this remedy.

Recommendation:
Follow up with SWP and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.

Table 3: Progress on Recommendations from the 2011 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Follow up with SWP and TDEC RCRA Program from 06/14/11 and 09/12/11 meetings to verify that inspection and monitoring of the AquaBlok® cap was incorporated into Final RCRA Post Closure Permit for the SWP Facility.	SWP	09/12/2011	The RCRA SWP Post Closure Permit was modified to include quarterly visual inspections of the AquaBlok® cap and annual LIF sampling.	11/17/2011

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated this FYR in February 2016, and scheduled its completion for September 2016. The EPA TPS Site review team was led by Craig Zeller of EPA, Remedial Project Manager (RPM) for the TPS Site, and also included the EPA site attorney. On February 3, 2016 EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;
- Interviews; and
- Five-Year Review Report development and review.

6.2 Community Notification

On July 13, 2016 a public notice was published in the *Chattanooga Times-Free Press* announcing the commencement of the Five-Year Review process for the TPS Site, providing Mr. Craig Zeller's contact information, and inviting community participation. The press notice is available in Appendix B.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository: Tennessee Department of Environmental and Conservation, Chattanooga Field Office, 1301 Riverfront Parkway, Chattanooga, TN. Upon completion of the FYR, a public notice will be placed in the *Chattanooga Times-Free Press* to announce the availability of the final FYR report in the Site document repository.

On September 19, 2016 the DoR attended a community meeting to discuss the TPS Site. The community was aware of the site, but many individuals were unaware of the completed remedial action. DoR summarized the remedial actions and emphasized analytical data and monitoring indicate the TPS Site is not impacted by Site related contamination. The community requested copies of the FYR be provided for two local repositories. Additional concerns were expressed by some community members for portions of Chattanooga Creek located downstream of the TPS Site based on the historical presence of former industrial sites located along the creek that were not addressed by the TPS Site removals.

6.3 Document Review

This FYR included a review of relevant, site-related documents comprised of the four Arcadis LIF reports. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund RAs must meet any federal standards, requirements, criteria, or limitations that are determined to be legally ARARs. Applicable or Relevant and Appropriate Requirements are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding, but should be considered in

determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARs, EPA's approach to determining if a RA is protective of human health and the environment involves consideration of TBCs along with ARARs. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the Maximum Contaminant Levels (MCLs) specified under the Safe Drinking Water Act (SDWA) as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any Site, various numerical quantity requirements can be ARARs.

There were no numeric cleanup goals specified for the sediments in Chattanooga Creek. The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. Standard construction methods and best professional judgment were used to remove visually contaminated sediments from the creek bed. Where visible contamination extended into the creek bank, a maximum of three feet was to be removed horizontally from the original bank and then sealed off. Field representatives from the PRPs contractor, BWSC, inspected completed stream reaches before notifying EPA that a reach was ready for inspection by EPA to verify achievement of the performance standard.

The final remedy selected for this Site in the ROD was designed to decrease the total excess lifetime carcinogenic risks, based on removal of Reasonable Maximum Exposure (RME) levels of PAHs in soil and sediments, at least two (2) orders of magnitude below the 1 X 10^{-6} risk level (i.e., down to 1 x 10^{-8}), which would meet or exceed all chemical-specific ARARs, as well as meet location- and action-specific ARARs. However, as mentioned above, confirmation sampling within the limits of the creek channel excavation was not required. Therefore, there are no chemical-specific ARARs identified in the selected remedy for sediments, surface water or groundwater within the ROD and subsequent ESD. The ROD did stipulate confirmatory sampling for soils associated with the Northeast Tributary. Risk-based chemical-specific ARARs for the Northeast Tributary are listed in Table 3.

Table 4: Remedial Goal Options for Northeast Tributary Dredging Spoils

	Carcinogenic Risk Level (Exposure Frequency = 104 days/year)		
Chemical (TEF)	**For 1E-06** (mg/kg)	**For 1E-05** (mg/kg)	**For 1E-04** (mg/kg)
Benzo[a]pyrene (1.0)	0.6	6	60
Benzo[a]anthracene (0.1)	6	60	600
Benzo[b/k]fluoranthene (0.1)	6	60	600
Chrysene (0.001)	600	6,000	60,000
Dibenz[ah]anthracene (1.0)	0.6	6	60
Indeno[123-cd]pyrene (0.1)	6	60	600

Note: All soil Remedial Goal Options values shown are mg/kg.
TEF - Toxicity Equivalence Factor- relates carcinogenic potency of other PAHs to that of Benzo[a]pyrene.

6.4 Data Review

Soil

The ROD required that confirmation sampling be conducted for the remedial action conducted at the Northeast Tributary. Two composite surface soil samples were collected and analyzed for PAHs to verify that remaining PAH concentrations were below the action level specified in the ROD. The results of the two confirmation samples demonstrated compliance with the action levels specified in the ROD. The ROD required that sampling be performed for excavated overburden within the creek working limits that appeared to be uncontaminated and was to be placed back in the creek. The visibly clean overburden was to be segregated and tested for the PAHs on the Target Compound List (TCL). The action level for sediment removal reflects EPA's excess lifetime carcinogenic risk of 1×10^{-6} to 1×10^{-4}. These carcinogenic risk levels equate to 0.6 mg/kg to 60 mg/kg benzo(a)pyrene, respectively. Uncontaminated sediment (overburden) was segregated and placed back in the creek at only one location during the remedial effort. Clay overburden was removed within the short-circuit portion (bypass) of the oxbow for use in construction of a dam in the oxbow area and for modified restoration within the reach. Prior to use, a representative sample of the clay was collected and analyzed for PAHs on the TCL. The results indicated that concentrations of PAHs in the clay were below the remedial goal and the material was appropriate for use at the project site.

Groundwater

Groundwater sampling was not required by the ROD. Groundwater samples were not collected during the remedial action.

Surface Water

The ROD did not specify performance requirements for water quality during implementation of the remedial action at the TPS Site. However, all reasonable efforts were taken to minimize impacts to the creek. The remedial goal was to not degrade water quality as compared to water quality upstream of the project. Treatment units were operated and water quality monitoring was conducted throughout implementation of the remedial action. As a precautionary measure, oil containment booms were in place downstream of temporary coffer dams and booms were in place throughout the construction phase at the most downstream portion of the site. Daily inspections were conducted of the booms to look for evidence of sheens or other signs that may indicate treatment was not successful. During the initial shutdown in early 2006, daily inspections were also made at the oxbow to look for the presence of a visible sheen from the NAPL encountered prior to shut down.

While a NPDES permit was not required for the discharge from the AquaShield™ treatment units to Chattanooga Creek, discussions were held with the TDEC Division of Water Pollution Control to determine appropriate effluent limits as guidance for discharges from the two treatment units. It was agreed by the project team that analytical results of effluent samples collected from the two units would be compared to typical NPDES effluent limits of 10 milligram per Liter (mg/L) for oil and grease, 200 mg/L for total suspended solids (TSS), and a range of 6.0 to 9.0 standard units (s.u.) for pH. These parameters would be used to evaluate the effectiveness of treatment and minimize the impacts to Chattanooga Creek. It was also agreed to collect three background samples from Chattanooga Creek upstream of the project limits for comparison to treatment unit effluent samples to ensure water quality was not degraded.

A total of 44 effluent samples, not including QC samples, were collected from the treatment unit at the creek. Analytical results for the effluent samples at the creek treatment unit were typically below the NPDES effluent limits. One sample in November 2005 and two samples collected in June 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison. One sample collected in July 2006 had an oil and grease concentration of 11 mg/L, just slightly over the 10 mg/L limit used for comparison.

A total of 29 effluent samples, not including QC samples, were collected from the treatment unit at the drying bed. Analytical results for the effluent samples at the drying bed treatment unit were typically below the NPDES effluent limits. Four samples (collected November 22, 2005, January 20, 2006, January 25, 2006, and February 23, 2006) had a pH of over 9 s.u. The elevated pH in November 2005 is believed to be a result of the limestone fines used during the drying bed construction entering the collection piping. Two samples collected in December 2005 and January 2006 had TSS concentrations greater than the 200 mg/L limit used for comparison.

Sediment/Porewater
The ROD required that visual determination of the extent of PAH contamination be utilized to determine the limits of excavation at the creek. Confirmation sampling within the limits of the creek channel excavation was not required. However, ORD provided funding to collect samples as part of a Sediment Sorption research project, which is a large EPA ORD effort to better understand reactive caps. ORD's goal was to assess the effectiveness of the AquaBlok® (isolation barrier) in minimizing vertical and advective transport, as well as obtain a visual understanding of its resistance to erosion. EPA ORD provided funding and resources for 3 years of S SPME monitoring for AquaBlok® cap effectiveness. Sediment grab samples were also collected. This sampling indicated the cap functioned as intended. The permit for the SWP facility, revised November 17, 2011, stipulated quarterly visual inspections of the AquaBlok® cap and annual LIF sampling. The visual inspections began in March 2012 and LIF sampling began in May 2012. Four LIF sampling events between May 2012 and May 2015 indicate contamination is not migrating through the cap.

6.5 Site Inspection

The TPS Site was inspected by Craig Zeller of EPA and Troy Keith of TDEC on June 23, 2016. The inspection area was comprised of the portion of creek where AquaBlok® layer began (approximately 45+00) and downstream to the oxbow. The remaining portions of the creek were inaccessible due overgrown conditions on land and deadfall blocking the creek.

The primary purpose of the inspections was to attempt visual verification of the integrity of the isolation barrier and stream bank stability. There are currently no IC's emplaced as part of the TPS remedial action, nor were any required by the ROD.

During the inspections, personnel saw no indication of stream bank or isolation barrier instability, which would be manifested in the form of erosion and partial or complete slumps of the creek bank. Fallen trees were observed in a few locations along the bank. Observations were limited to areas above the water surface and the depth that water clarity limited observations, which was approximately one foot below the water surface. The site is well vegetated. There is not a site inspection checklist as there is no infrastructure associated with this remedy to inspect or document. The inspection photo log is attached in Appendix C of this FYR.

6.6 Interviews

Interviews with the EPA RPM, and personnel who routinely inspect the site are presented in Appendix D. Also see Section 6.2.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The past four years of LIF monitoring of the AquaBlok® cap indicate the barrier is effectively isolating any residual NAPL source material remaining in the subsurface.

7.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes. All the exposure assumptions, toxicity data, cleanup levels, and RAOs utilized when the ROD and ESD were issued are still valid.

7.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

Yes. Site inspections conducted in 2009, 2010 and 2016 indicate a potentially significant issue with regard to deadfall (e.g. trees falling into restored creek channel). While extremely difficult to prevent, these dead trees could potentially puncture or breach the AquaBlok® protective isolation barrier. Annual inspections should continue to visually inspect the restored stream channel for any signs of sheens or NAPL migration through the cap.

7.4 Technical Assessment Summary

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. Therefore, the implemented remedy at the TPS remains protective of both human health and the environment.

8.0 Issues, Recommendations and Follow-up Actions

Table 5: Issues and Recommendations Identified in the Five-Year Review

There are no issues or recommendations.

9.0 Protectiveness Statements

Conclusions from sediment monitoring indicate the AquaBlok® cap is effectively maintaining surface water concentrations below relevant surface water criteria. All inspections and sampling events conducted as of the time of this FYR indicate the AquaBlok® cap is functioning as intended. Therefore, the remedy at the Tennessee Products Site remains protective of human health and the environment, both in the short term and long term.

10.0 Next Review

The next FYR for the Tennessee Products Site will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

Date	Document
5/1999	Final Report, Removal Action for the Tennessee Products Superfund Site
9/30/2002	Tennessee Products Superfund Site Record of Decision
11/2007	Final remedial Action Report, Tennessee Products Superfund Site
9/2008	Superfund Final Close Out Report, Tennessee Products NPL Site
9/2012	Arcadis Corrective Action Effectiveness Report No. 12, Southern Wood Piedmont
9/2013	Arcadis Corrective Action Effectiveness Report No. 13, Southern Wood Piedmont
9/2014	Arcadis Corrective Action Effectiveness Report No. 14, Southern Wood Piedmont
9/2015	Arcadis Corrective Action Effectiveness Report No. 15, Southern Wood Piedmont

Appendix B: Press Notices

2895134
US EPA
A AJANAKU

STATE OF TENNESSEE
HAMILTON COUNTY

Before me personally appeared Jim Stevens who being duly sworn, that he is the Legal Sales Representative of the CHATTANOOGA TIMES FREE PRESS and that the Legal Ad of which the attached is a true copy, has been published in the above Newspaper and on the website on the following dates, to-wit:

July 13 2016

And that there is due or has been paid the CHATTANOOGA TIMES FREE PRESS for publication the sum of $253.37 Dollars. (Includes $10.00 Affidavit Charge).

Jim Stevens

Sworn to and subscribed before me, this 13th day of July 2016.

Amanda Crawford

My Commission Expires 10/17/2018

Chattanooga Times Free Press

LEGAL NOTICE

U. S. Environmental Protection Agency, Region 4 Announces the Second Five Year Review For the Tennessee Products Superfund Site, Chattanooga, Hamilton County, Tennessee

The U.S. Environmental Protection Agency (EPA) is conducting the Second Five Year Review of the remedy for the removal of contaminated sediments in Chattanooga Creek from the Workman Road Bridge (formerly Hamill Road) to Dobbs Branch, a tributary near I-24 in south Chattanooga. This Five-Year Review is associated with the Tennessee Products Superfund Site (the Site) located near the Alton Park/Piney Woods neighborhood in south Chattanooga, Hamilton County, Tennessee.

Sediments in Chattanooga Creek became contaminated with coal tar constituents and was caused, in part, by a former coke plant, a tar and chemical company, and a wood treater located near the area. Cleanup work in Chattanooga Creek was conducted in two phases. Phase 1 addressed contaminated sediments from Workman Road Bridge to the 38th Street Bridge, and Phase 2 addressed contaminated sediments from the 38th Street Bridge to Dobbs Branch. In general, both phases of cleanup work involved sediment excavation, off-site disposal, and creek channel restoration. In May 2005, EPA finalized a legal settlement (Consent Decree) with parties potentially responsible for the coal tar and creosote contamination. These parties were collectively known as the Chattanooga Creek Cleanup Committee (4C). Phase 2 cleanup work was completed in September 2007 under the terms of the Consent Decree.

EPA invites community participation in the Five-Year Review process.

The EPA is beginning the Second Five-Year Review to ensure that the remedy at the Site remains protective of human health and the environment. As part of the Five-Year Review process, EPA will be available to answer any questions about the Site. Community members who have questions about the Site, the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Mr. Craig Zeller
Remedial Project Manager
U.S. EPA, Region 4
61 Forsyth St. (11th Floor)
Atlanta, GA 30303
Phone: 404-562-8827
Zeller.Craig@epa.gov

The EPA plans to complete the Second Five-Year Review report by September 2016. A copy of the final report, and other Site related documents can be reviewed at the Tennessee Department of Environment and Conservation (TDEC) Chattanooga Field Office at 1301 Riverfront Parkway. Please contact Mr. Troy Keith at 423-634-5755 or via email at Troy.Keith@tn.gov for arrangements.

Appendix C
Five-Year Review Site Inspection Checklist

Five-Year Review Site Inspection Checklist

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should to be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

I. Site Information
II. Interviews
III. On-site Documents & Records Verified
IV. O&M Costs
V. Access and Institutional Controls
VI. General Site Conditions
VII. Landfill Covers
VIII. Vertical Barrier Walls
IX. Groundwater/Surface Water Remedies
X. Other Remedies
XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as "not applicable," but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Tennessee Products	**Date of inspection: 06/23/2016**
Location and Region: Chattanooga, TN, Region 4	**EPA ID: TND071516959**
Agency, office, or company leading the five-year review: TDEC-DoR	**Weather/temperature: Clear/ 90's**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other Sub-aqueous cap. This inspection form is not generally compatible with the remedy. Additional information is attached.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Andrew Davis (Name) Project Manager (Title) 09/6/2016 (Date)
   Interviewed ☐ at site ☐ at office ☒ by email Phone no. _____
   Problems, suggestions; ☒ Report attached See Appendix D for interview form.

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☒ Report attached.

EPA RPM, Craig Zeller.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits _____ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☒ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost
From _____ To _____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

_____

_____

_____

_____

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks _____

_____

_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident

Remarks _____

_____

2. **Land use changes on site** ☐ N/A

Remarks _____

_____

3. **Land use changes off site** ☐ N/A

Remarks _____

_____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks _____

_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____
   _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

The remedy is a sub-aqueous cap

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition☐ All required wells properly operating ☐ Needs Maintenance ☒ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☒ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☒ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☒ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs Maintenance ☒ N/A

Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is functioning as designed. The sub-aqueous cap appears to be in good condition and monitoring data indicate contamination is effectively contained.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Site Visit Trip Report

On 6/23/2016 T. Keith (DoR), C. Zeller (EPA) and R. Sewell (MEI) conducted a site visit to observe conditions related to the condition of the sub-aqueous cap in Chattanooga Creek adjacent to the Southern Wood Piedmont site. The inspection was limited to portions of the creek that were accessible and visible by foot. This area consisted of the portion of channel where the cap began (Station 45+00) to the oxbow (Station 60+00). No slumps were observed. In areas where the water depth and clarity allowed for observation of the channel bed, the cap appeared to be in good condition. Numerous trees are down in, and across, the creek channel.

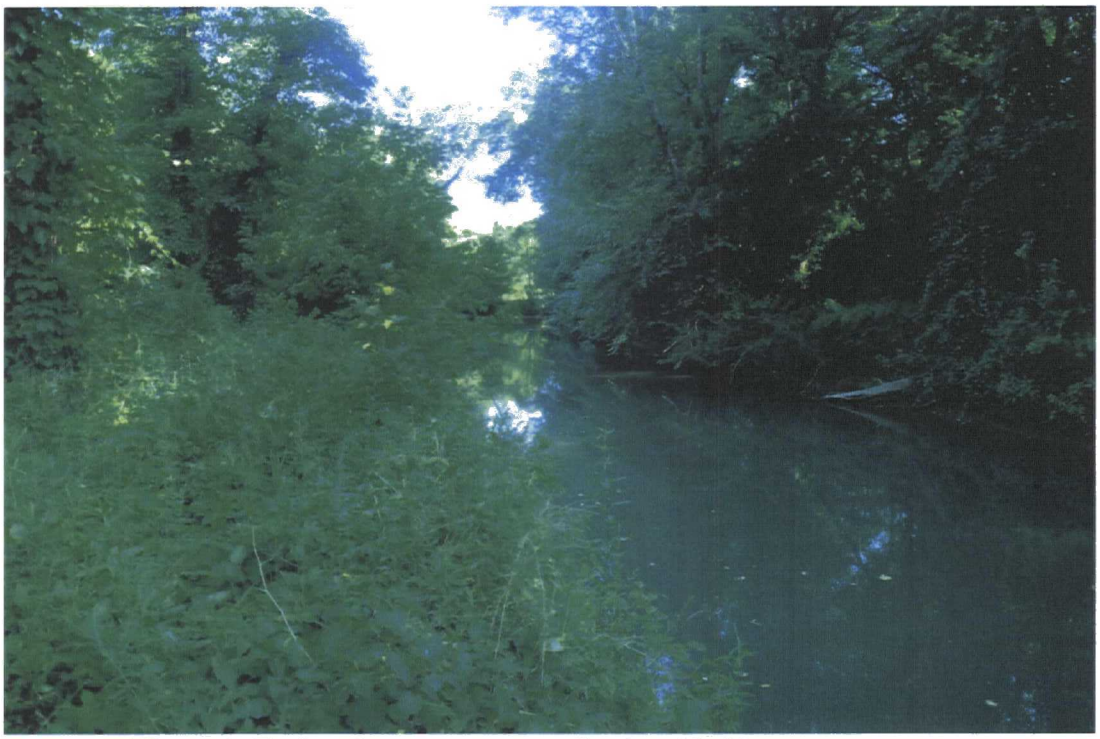


Photo 1: Facing downstream near Station 45+00.

Photo 2: Facing downstream near Station 50+00.

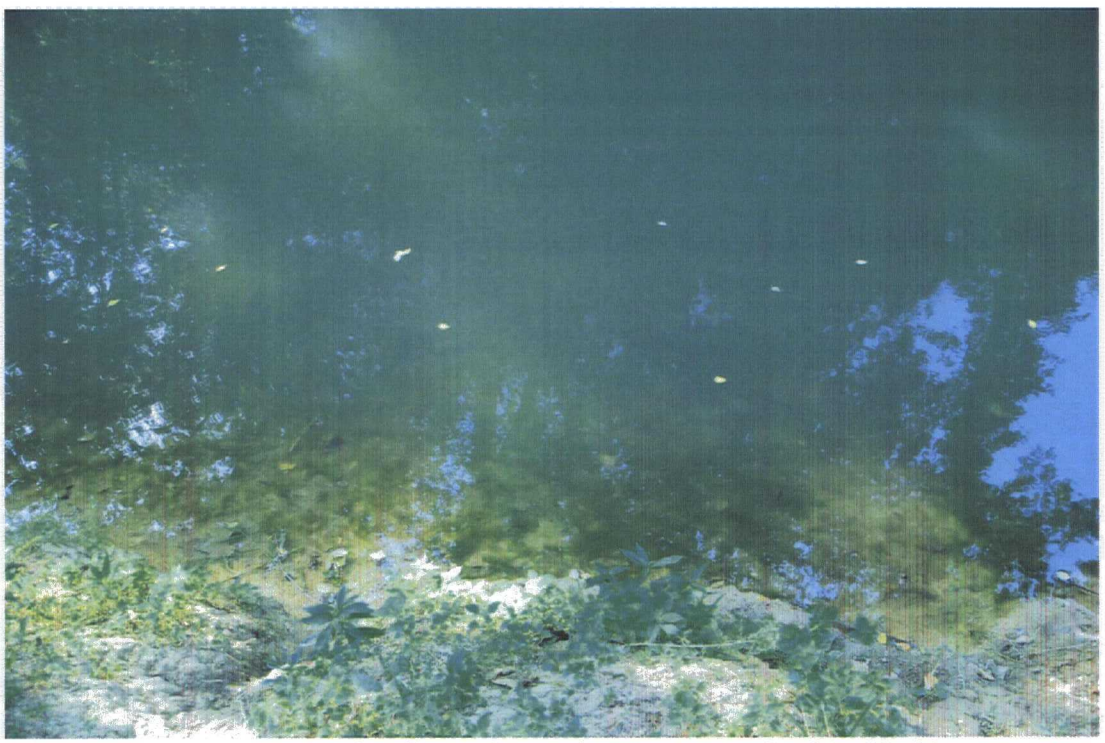


Photo 3: View of sediment layer above cap near Station 50+00.

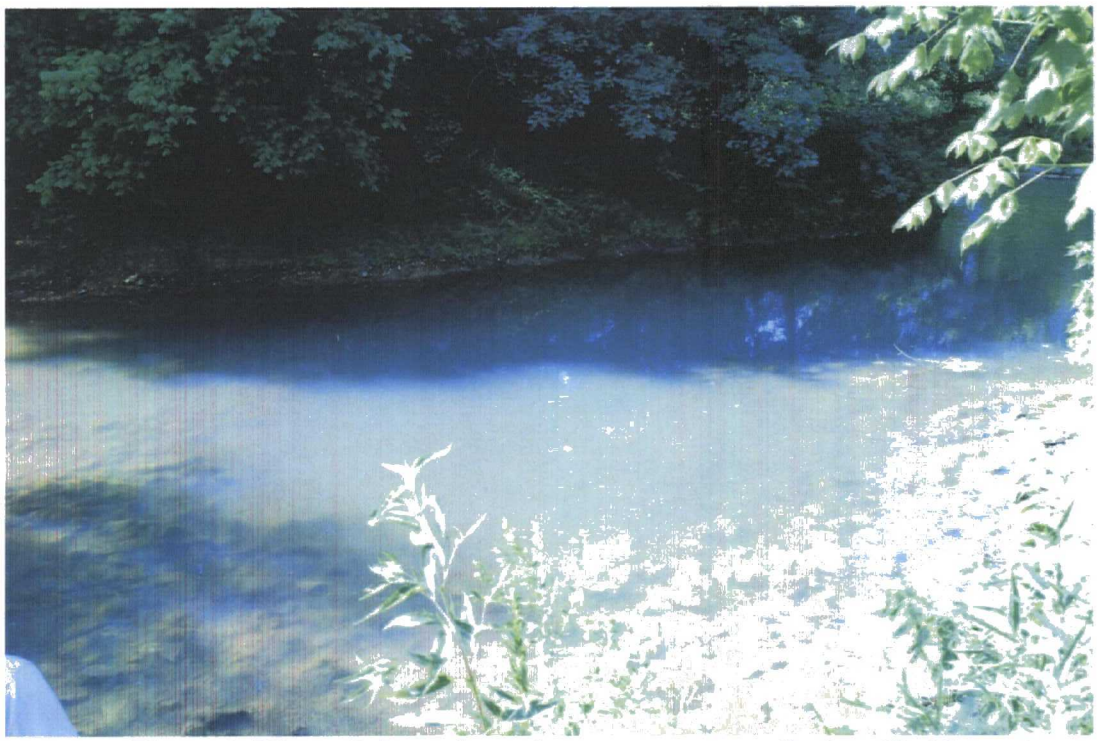


Photo 4: View of channel at oxbow entrance near Station 60+00.

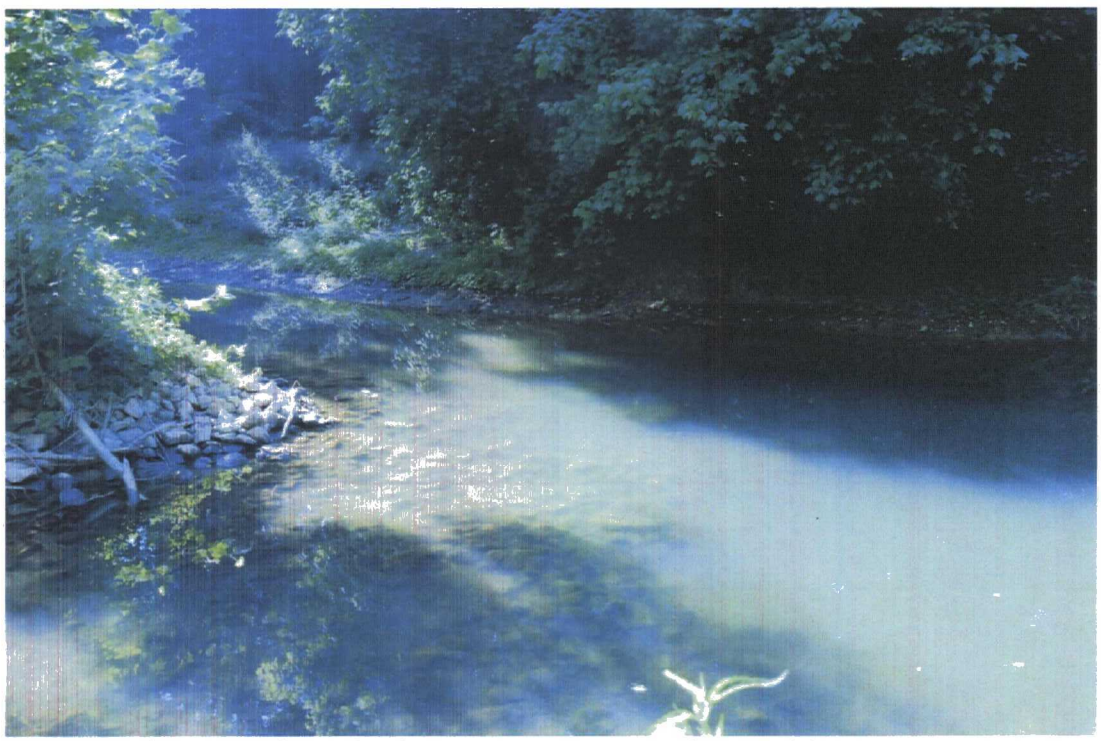


Photo 5: View of oxbow entrance near Station 60+00.

Photo 6: View of oxbow short-circuit, facing downstream, near Station 60+00.

Appendix D: Interviews

Interview Form for Five-Year Review

Site Name: TN Products
Interviewer's Name: Troy Keith **Affiliation:** TDEC
Interviewee's Name: Craig Zeller, Project Manager **Affiliation:** EPA Region 4 (Superfund)
Contact Information: U.S. EPA Region 4
61 Forsyth Street
Atlanta, GA 30303
Zeller.craig@Epa.gov
404-562-8827

Type of Interview: Email
Date: September 6, 2016

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

I remain very satisfied with the success of the cleanup of Chattanooga Creek. Annual monitoring conducted Arcadis, on behalf Southern Wood Piedmont, under the TDEC RCRA program is sufficient to monitor long-term integrity of AquaBlok cap. Re-use activity is hard to gauge considering the site is a creek.

2. What is your assessment of the current performance of the remedy in place at the Site?

Monitoring of the AquaBlok protective cover conducted by Arcadis indicates it remains protective and continues to protect against potential re-contamination.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No, I am not.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

Nothing substantive at this time.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

No, I am not.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

IC's are not a component of the remedy at this site.

7. Are you aware of any changes in projected land use(s) at the Site?

None.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

None. I would not hesitate to employ AquaBlok at other projects should the situation warrant.

Site Name: TN Products
Interviewer's Name: Troy Keith **Affiliation:** TDEC
Interviewee's Name: Andrew Davis, Project Manager **Affiliation:** Arcadis
Contact Information: Arcadis
30 Patewood Drive, Suite 155
Greenville, SC 29615
864.987.3917

Type of Interview: Email
Date: September 6, 2016

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

Overall, the remedy implemented remains protective of both human health and the environment. The ongoing monitoring program provides adequate data to gauge the continued effectiveness of the remedy.

2. What is your assessment of the current performance of the remedy in place at the Site?

The remedy in place continues to remain protective, as originally intended. The ongoing monitoring program, via both visual inspections and laboratory testing, verifies the performance of the remedy.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No complaints have been received by Arcadis.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

In 2011, Institutional Controls formerly associated with the Chattanooga Creek were added into the SWP Chattanooga Facility HSWA Permit as part of a Permit Modification. Since the addition, monitoring of the aquablok has been periodically performed. Currently, the Creek is inspected on a quarterly basis with an annual collection of DART samples which are submitted for LIF analysis.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

Yes, institutional controls are performing as intended

7. Are you aware of any changes in projected land use(s) at the Site?

Currently, there are no future projected land uses changes associated with the site. Any potential alternatives would be evaluated prior to implementation.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

None at this time.