

Expanded Site Inspection Update  
Cone Mills (Old Union Bleachery) Site  
Greenville County  
EPA ID. SCD 003 358 744

Prepared By: Christopher Bartley 

Reviewed By: Jonathan McInnis 

Site Assessment Section

Bureau of Land & Waste Management

South Carolina Department of Health & Environmental Control

2600 Bull Street

Columbia, SC 29201

November 15, 2006

I. SCOPE OF WORK.....	1
II. INTRODUCTION.....	1
III. SITE BACKGROUND AND HISTORY .....	3
IV. SOURCE CHARACTERIZATION.....	5
V. GROUNDWATER PATHWAY .....	8
VI. SURFACE WATER PATHWAY .....	8
VII. SOIL EXPOSURE PATHWAY .....	15
VIII. CONCLUSIONS AND RECOMMENDATIONS .....	16
IX. REFERENCES .....	17
FIGURES.....	19

## **I. SCOPE OF WORK**

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Site Assessment Section of the South Carolina Department of Health and Environmental Control (SCDHEC, or The Department) conducted an Expanded Site Inspection (ESI) Update of the Cone Mills (Old Union Bleachery) site in Greenville County, South Carolina. The scope of the investigation included a review of available file information, site reconnaissance, a sampling trip, and a target survey. As part of this investigation, a number of samples were collected from surface water and surface water sediments. The primary objectives of this investigation were to identify and to characterize any impact(s) to nearby surface water and wetlands.

## **II. INTRODUCTION**

The Cone Mills (Old Union Bleachery) textile plant, known currently as U.S. Finishing, was one of the oldest operating textile facilities in the United States until it was partially destroyed by fire and operations were ceased in November 2003. The plant is located approximately three miles north of downtown Greenville (Greenville County), South Carolina, along the banks of Langston Creek near the Reedy River. The plant opened around 1902 and was owned by the Arrington Family. In 1947, the Aspinook Corporation bought the facility briefly before selling it to the Cone Mills Corporation in 1952. Cone Mills operated the facility until it was sold to American Fast Print in 1984. The facility operated under the name U.S. Finishing until it closed.

During its century of operations, the textile plant has prepared gray goods and/or dyed corduroy, denims, and cotton-synthetics. In addition to various dyes and caustics used over the years, sodium dichromate was used as a mordant until the mid-1970's. Multiple historical releases of substances to the environment have been documented throughout the site's operations. Today, however, much of the facility's hazardous materials have been removed from the site.

A large plume of chromium-contaminated groundwater underlies much of the eastern portion of the site, including Langston Creek. A system of recovery wells and a water treatment system were in place to prevent this contaminated groundwater plume from entering Langston Creek and, subsequently, the Reedy River. While the system was functioning, contaminated groundwater migration to surface water was generally prevented. However, due to the system owner/operator's (Cone Mills) impending bankruptcy, the system was taken offline on June 18, 2004 after approximately 20 years of operation. According the last remedial report issued on the system before it was shut down, chromium levels detected in the groundwater underneath the Langston Creek floodplain were as high as 81 ppm.

SCDHEC conducted site reconnaissance activities at the facility and surrounding areas in June and July 2004. Several areas of potential environmental concern were identified and targeted for sampling.

ESI Sampling activities were conducted at the site during the week of August 16, 2004. As part of this investigation, environmental samples were collected from on and off-site surface water, surface water sediments, soils, groundwater, and from potential sources. Elevated levels of metals and PCB's were found in soils and sediments. Elevated levels of metals were also found in groundwater. This investigation also identified a source area (the Northern Reservoir) that discharges overland to Langston Creek *upstream* of the site, as well as upstream of the background & control samples collected during the investigation.

In February 2005, the SCDHEC State Remediation Section retained MACTEC Engineering and Consulting, Inc., of Greenville, SC, to conduct further sampling at the site. Surface water samples were collected from Langston Creek, and surface water, sediment, and fish tissue samples were collected from the Northern Reservoir. Groundwater samples were also collected from several monitoring wells. The results of this investigation again demonstrated elevated levels of metals in the Northern Reservoir sediments and in onsite groundwater. PCB's were detected in fish tissue samples, and subsequently, a fish consumption advisory was issued by SCDHEC for the Northern Reservoir.

During the week of June 20, 2005, SCDHEC conducted an ESI Update sampling event at this site in order to evaluate background levels in Langston Creek *above* all identified site influences and to investigate potential site impacts to wetlands. Surface water and sediment samples were also collected from another large reservoir nearby that was historically used in a manner similar to the Northern Reservoir. The sampling results of this ESI Update identified elevated levels of metals in surface water and sediments. Based on the findings of this sampling investigation, this site would normally be considered a priority for further action under Superfund and would be evaluated using the Hazard Ranking System (HRS) for possible inclusion on the National Priorities List (NPL). However, SCDHEC recently obtained a Consent Decree with the site's Potentially Responsible Parties (PRP's) to address the environmental concerns at this site. Therefore, provided that these actions are conducted to the satisfaction of the Department, this site is not recommended for further federal Superfund action at this time.

### III. SITE BACKGROUND AND HISTORY

#### A. Ownership History

Present Owner: American Fast Print (U.S. Finishing)<sup>†</sup> (1984 – Present)

Contact: Pete Bednar  
c/o U.S. Finishing  
PO Box 5765  
Spartanburg, SC 29304

Phone (mobile): 865-216-5290

Previous Owners: Cone Mills Corporation (1952 – 1984)  
Aspinook Corporation (1947 – 1952)  
The Arrington Family (1902 – 1947)

<sup>†</sup>Cone Mills Corporation operated the onsite groundwater recovery system (±0.4 acres) under a consent order with SCDHEC until Cone's bankruptcy in June 2004.

#### B. Description and Setting

The Cone Mills/Union Bleachery site is located along the Reedy River approximately 3 miles north of downtown Greenville in Greenville County, South Carolina (34° 53' 2.91" North Latitude, 82° 25' 31.31" West Longitude) (Ref. 4, 22). The old textile facility is bordered to the east by Langston Creek and Hwy 253, and to the south by the Reedy River. Old Buncombe Road forms the northern boundary of the facility, and a residential neighborhood is located immediately to the west. The entire facility is fenced and a guard is stationed at the gate. However, the fence is not maintained in several areas and evidence of unrestricted access was observed (Ref. 7). The general topography of the site is a northwest to east/southeast slope toward Langston Creek and the Reedy River. Groundwater flow in the area follows the same trend (Ref. 21). Several ponds are located in the area. One small pond (<0.25 ac.), an impoundment of Langston Creek, is immediately east of the facility. Two other large ponds (both >1 ac.) are north and northwest of the facility. These two ponds historically received water pumped from the Langston Creek impoundment. Access is not adequately restricted to either impoundment, and fishing occurs in both (Ref. 7). Langston Creek and the Reedy River are also fisheries (Ref. 7, 13). In addition, a school is located north of the site directly across Old Buncombe Road from the large easternmost reservoir. A large aeration lagoon (>3 ac.) occupies a portion of the southern extent of the site as well. Other notable site features include: a former sludge burial area west of the aeration lagoon; Cone Mills' groundwater remediation system (chemical precipitation of chromium), housed in a fenced area on the eastern side of the site; and the Reedy River floodplain dump area, south of the aeration lagoon. A general site map showing areas of concern is included in Figure 2.

### **C. Process and Waste Disposal History**

There are many different types of textile dyeing and finishing processes. The specifics of operations at this facility over its long history are unknown. However, the American textile industry in general employed a wide variety of dye classes and associated chemicals over the years. In brief, fabrics were commonly immersed in dye and a chemical fixative, called a mordant, which binds the dye pigment to the fiber. Mordants were often metal salts containing iron, copper, or chromium. In the U.S., chromium as sodium dichromate or as a complex chromium chromate was one of the most prevalent. Other metals salts such as those of copper, nickel, antimony, zinc, and barium, as well as stannates and arsenates were used to decrease mordant solubility and thereby help fix the mordant. Direct dyeings and many sulfur dyeings also used chromium and/or copper salts as an aftertreatment to improve fastness (Ref. 19).

As noted earlier, this particular textile plant has prepared gray goods, dyed corduroy, denims, and cotton-synthetics during its long history of operations. Sodium dichromate was used at this facility until approximately 1974. However, the fabric took up only a fraction of the chromium solution (Ref. 21). The remaining process waste was piped to the aeration lagoon (constructed in the mid-1960's) and then to the sanitary sewer system. Prior to the aeration lagoon's construction, accounts indicate the facility was discharging waste directly to Langston Creek and/or the Reedy River (Ref. 7, 8, 9). This discharge point was located in the Langston Creek impoundment (Ref. 7). Some reports also indicate that waste from the dye ranges may have at times been discharged directly to the basement of the facility (Ref. 21).

Multiple releases to the environment have been documented throughout this facility's operations. For example, chromium contamination of soils and groundwater has been attributed largely to leaking underground pipes that brought the chromium solution from a storage tank to the dye ranges. Much of the chromium-contaminated soil in the area of this line was removed in the mid-1990's (Ref. 15). A large plume of chromium-contaminated groundwater underlies the Langston Creek floodplain east of the facility. Groundwater migration to surface water seems to have been assuaged when the site's pump and treat system was operational. However, since the pump and treat was taken offline in 2004, Cr-contaminated groundwater outcropping in Langston Creek seems to be occurring to a small degree once more.

After the use of chromium was discontinued at this facility in 1974, chromium containing sludge was removed from the aeration lagoon and buried onsite (Ref. 13, 17, 21). Two years later, a major leak was discovered in the lagoon when effluent escaped through a rupture in the bottom of the lagoon. This waste traveled through old, abandoned piping to the former pump-house on the Reedy, filled the building, and then flowed into the river. The leak was discovered when personnel from SCDHEC noted color in the Reedy (Ref. 2).

Historical aerial photographs indicate that the Reedy River floodplain was used as a disposal area (Ref. 5). Coal wastes and other miscellaneous material were noted in the area (Ref. 7).

An onsite water treatment plant was used for preparation of process water for use by the mill. The water used in this plant was taken from the Northern and Northwestern Reservoirs. The water stored in these reservoirs was pulled from intakes on the Reedy River, and later from the Langston Creek impoundment, downstream of the former plant outfall. Filter waste from the water treatment plant was given to mill village residents for use in their gardens (Ref. 2, 7, 8, 9).

During the fire in 2003, millions of gallons of fire suppression water containing unknown constituents from the facility were released to Langston Creek and the Reedy River (Ref. 1).

#### **IV. SOURCE CHARACTERIZATION**

##### **Groundwater**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area. Additionally, this source was further characterized as part of an investigation conducted by the SCDHEC State Remediation Section. This groundwater sampling event yielded similar results. These results will not be discussed individually here, but are attached in the Appendix 4: Site Assessment Report; Cone Mills Site.

##### **Northern Reservoir**

Located on a local topographic high, this reservoir is bordered to the northwest and southeast by residential property, to the northeast by woodlands, and to the immediate west by Old Buncombe Road. Lakeview Middle School is directly across Old Buncombe Road. No perennial streams feed into the reservoir. The reservoir is partially fenced, but it is regularly accessed for fishing and recreational use. Empty bait containers, discarded fishing equipment, refuse, and swimming children were noted and photographed during reconnaissance and sampling activities conducted by SCDHEC personnel (Ref. 22). This surface impoundment is considered a source and a target.

During the ESI sampling event, a sediment sample collected from the Northern Reservoir showed elevated levels of metals, semi-volatiles, pesticides, and PCB's. For a discussion of analytical results and sample locations from this investigation, please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site.

During the State Remediation sampling event, multiple sediment samples were collected from the Northern Reservoir. These data will not be discussed individually, but can be seen in Appendix 4: Site Assessment Report; Cone Mills Site. The sediment analytical results mirror the

results of the ESI sampling. In addition, as part of this investigation, fish tissue samples were collected from the reservoir. Elevated levels of PCB's were identified in largemouth bass. Based on these findings, SCDHEC issued a consumption advisory for this species in this water body, and the site owner posted warning signage around the perimeter.

During the ESI Update sampling event, one (1) sediment sample, *USF-022-SE*, was collected from directly downstream of the spillway pipe where effluent from the reservoir flows overland to Langston Creek. This sample shows that the same metals that are elevated in the reservoir sediments are elevated in the spillway sediments. These analytical results indicate that a release of contaminants from the reservoir has occurred. Selected data for the spillway are shown in Table 1. A sample map is included in Figure 4. A complete set of the analytical data is included in Appendix 2: ESI Update Cone Mills (Old Union Bleachery Site).

**Table 1:** Cone Mills Site Northern Reservoir Spillway and Northwestern Reservoir Sediments Selected analytical data

Analyte	USF-001-SE (background)	USF-022-SE	USF-023-SE
Aluminum	10000 J	<b>47000 J</b>	<b>62000 J</b>
Arsenic	0.60 UJ	<b>9.1 J</b>	2.3 J
Barium	110	<b>370</b>	<b>500</b>
Chromium	16	<b>130</b>	47
Copper	5.7 J	<b>5000 J</b>	<b>56 J</b>
Iron	13000 J	<b>39000 J</b>	<b>59000 J</b>
Lead	7.7	<b>230 J</b>	<b>150 J</b>
Magnesium	2500	2400	<b>14000</b>
Manganese	160	<b>640</b>	400
Total Hg	0.13 U	<b>0.66</b>	0.19 U
Vanadium	25	<b>82</b>	<b>160</b>
Zinc	30 J	<b>190 J</b>	<b>110 J</b>

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

This large reservoir was constructed in the 1950's for process water storage (Ref. 8, 9). Intakes on the Reedy River and in the Langston Creek impoundment were used to move water up to this more than 16-acre reservoir. Though the intakes on the Reedy River were no longer operable, U.S. Finishing used the intakes on Langston Creek to keep the reservoir filled (Ref. 7). Water stored in this reservoir (and another reservoir to the northwest of the site) was pumped to the onsite water

treatment facility and prepared as process water for the facility. However, during mid-2005, the intakes in the Langston Creek impoundment became unusable when the impoundment's dam was damaged. As a result, the water level in the reservoir is slowly declining.

In an attempt to remove the human health exposure risk posed by the fish in the Northern Reservoir, American Fast Print has retained an environmental consulting firm to drain the Northern Reservoir. They plan to drain the water from the reservoir overland to (ultimately) Langston Creek without disturbing the contaminated sediment in the reservoir. The fish are to be disposed. These actions raise several concerns that may need to be evaluated. For instance, the 2004 ESI and subsequent investigations have demonstrated elevated levels of copper and chromium in both the sediments and the spillway of the Northern Reservoir. The horizontal extent of contamination in the overland runoff pathway to (ultimately) Langston Creek has not been assessed. Discharges from the reservoir could result in scour and transport of contaminants. Secondly, once the contaminated sediment is exposed and begins to dry, there is potential for transport of contaminant-laden fine-grained particles to neighboring properties, most notably Lakeview school directly across Old Buncombe Road from the reservoir. Lastly, access must continue to be controlled to this area once contaminated sediments become available for direct contact until proper remedial measures address this source area.

#### **Aeration Lagoon**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

#### **Old Brine Pit**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

#### **GW-WWTP Basin**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

#### **Stained Soil Areas**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

### **Exposed Soil Area**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

### **Reedy River Floodplain Soils**

No significant changes in the status of this source area have occurred since the ESI sampling event. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this source area.

## **V. GROUNDWATER PATHWAY**

### **A. Regional Characteristics**

The site is located in the Piedmont province of the Saluda River Sub-Basin. Major rocks are highly folded mica schist, granitoid and biotite gneiss, amphibolite and some igneous rocks. Wells in the Greenville County area are typically screened at depths ranging from 150 to 300 feet with yields of 15 to 20 gpm (Ref. 18). Locally, the site is underlain by saprolite and bedrock at depths of 35-40 feet. The upland soils on this site are very deep, well drained, and moderately permeable; floodplain soils are very deep, poorly drained, and moderately permeable (Ref. 4, 20).

### **B. Groundwater Targets**

No further target considerations have been identified in the groundwater pathway for this site since the 2004 ESI. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this pathway's targets.

## **VI. SURFACE WATER PATHWAY**

### **A. Regional Characteristics**

Greenville County is located in the piedmont of South Carolina. The average annual temperature maximum is 63.3° F, and the average annual temperature minimum is 47.7° F (Ref. 10). The county average annual rainfall is 75.13 inches, and the 2-year, 24-hour rainfall amount is 4.6 inches (Ref. 10). The area annual average pan evaporation is 50 inches (Ref. 16). The site is located within the Saluda River watershed. Locally, the site drains generally to the southeast into Langston Creek and/or the Reedy River. The Reedy River near the city of Greenville drains 48.6 mi<sup>2</sup> and has a mean annual flow of 83 cfs (Ref. 18). The target distance limit is 15 in-water miles, encompassing

Langston Creek from Brooks Avenue (furthest downstream PPE) to the Reedy River downstream of Lake Conestee.

The surface water characteristics of this site are complex. Langston Creek flows along the eastern boundary of the site from north to south and joins the Reedy River on the southeastern corner of the site near the Reedy River Floodplain source area. Four tributaries join Langston Creek as it flows past the site. The floodplains of both Langston Creek and the Reedy River include wetlands. In addition, Langston Creek has been impounded onsite, although today the dam of this impoundment is damaged and not currently in service. The original, now unused, outfall from the mill is located in this impoundment (Ref. 7). There is a water intake in this impoundment that was used to pull water up to a large reservoir (<16 acres) to the north of the site for process water storage. This reservoir, when filled to capacity, discharged overland to wetlands and subsequently Langston Creek - upstream of the site. A general diagram of surface water features is included in Figure 3. In addition, a second reservoir is located to the northwest of the site. Cone Mills formerly used this reservoir for process water storage as well. Prior to the construction of the aeration lagoon, intakes on the Reedy River brought water to these reservoirs. Neither reservoir receives water from a perennial or an intermittent stream.

### **C. Surface Water Targets and Impacts**

Langston Creek, the Reedy River, the Northern Reservoir, and the Northwestern Reservoir are target fisheries (Ref. 7, 13). No analyte was reported above three times background in the sediments or surface water at the time of the original ESI sampling of Langston Creek or the Reedy River. However, the samples were taken immediately following a period of heavy rainfall (Ref. 7). Water levels in both the creek and river were elevated above base flow conditions. Any infiltration into the stream from the underlying contaminated groundwater plume may have been veiled by storm water run-off. Therefore, it is believed that these samples may not adequately represent the surface water conditions of these streams.

The Northern Reservoir is a source area that has been identified as a fishery. As stated earlier, the reservoir is partially fenced, but it was regularly accessed for fishing and recreational use. Empty bait containers, discarded fishing equipment, refuse, and swimming children were noted and photographed during reconnaissance and sampling activities conducted by SCDHEC personnel (Ref. 7). One sediment sample (*CM-006-SE*) and one surface water sample (*CM-006-SW*) were collected from the reservoir near the influent pipe of this source. No analyte was reported in the surface water of the reservoir above detection limits. However, the sediments contain elevated levels of copper at 6800 ppm, chromium at 250 ppm, and aluminum at 51000 ppm. Other metals, semi-volatiles, pesticides, and PCB's were also elevated in this sample. Please refer to the 2004 ESI included in Appendix 1 for a discussion of data collected during that investigation.

Sampling conducted by MACTEC (for SCDHEC) in February 2005 produced similar sediment analytical results (Appendix 4). This sampling event also identified elevated PCB levels in

largemouth bass. As discussed earlier, after the impoundment on Langston Creek was damaged and rendered inoperable, American Fast Print has decided to drain the Northern Reservoir overland and then collect and dispose all the fish.

At the time of the initial sampling, the exact history of the Northwestern Reservoir was unknown. As a result, no samples were collected from this surface water feature as part of that investigation. However, sediment sampling during the ESI Update revealed elevated metals in *USF-023-SE*. Selected analytical results for sediments collected from the Northwestern Reservoir are shown in Table 1. A sample map is included in Figure 4. A complete list of analytical results is attached in Appendix 2.

Additional sampling of the Langston Creek surface water pathway was also conducted as part of the ESI Update during June 2005. The primary purpose of this sampling was to re-evaluate the surface water conditions at the site with background values collected from upstream of all known site influences. Fifteen (15) surface water and fifteen (15) sediment samples were collected from Langston Creek and its tributaries as part of the ESI Update investigation. These samples show elevated metals in both surface water and sediment as the creek flows past the site. Most notably, chromium levels in surface water were as high as 140 ppb in surface water (*USF-013-SW*). The highest chromium level identified in sediments was 11,000 ppm (*USF-005-SE*). Selected analytical results are shown for the surface water and sediments collected from Langston Creek in Tables 2 and Table 3 respectively. A sample map is included in Figure 4. A complete list of analytical results is attached in Appendix 2.

**Table 2: Cone Mills Site Surface Water Selected Analytical Results**

Analyte	USF-001-SW (background)	USF-002-SW	USF-003-SW	USF-004-SW	USF-005-SW
Aluminum	1900 J	<b>8600</b>	460 J	880 J	180 J
Arsenic	10 U	10 U	10 U	10 U	10 U
Barium	36 J	82 J	68 J	70 J	87 J
Chromium	1.5 J	<b>8.2 J</b>	10 U	1.2 J	<b>23</b>
Copper	1.6 R	4.2 J	25 U	25 U	25 U
Iron	2000	<b>8000</b>	4300	2600	<b>16000</b>
Lead	4.6 R	5.1 R	10 U	10 U	10 U
Magnesium	1100 J	1700 J	1900 J	2200 J	2100 J
Manganese	52	<b>200</b>	<b>340</b>	130	<b>740</b>
Total Hg	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vanadium	3.5 J	<b>17 J</b>	1.6 R	1.7 J	50 U
Zinc	5.3 J	<b>17 J</b>	15 J	11 J	2.9 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 2: Continued**

Analyte	USF-001-SW (background)	USF-006-SW	USF-007-SW	USF-008-SW	USF-009-SW
Aluminum	1900 J	11000 J	1400 J	1500 J	1600 J
Arsenic	10 U	10 U	10 U	10 U	10 U
Barium	36 J	<b>160 J</b>	34 J	34 J	34 J
Chromium	1.5 J	10	1.3 J	1.5 J	1.4 J
Copper	1.6 R	5.6 J	1.9 J	25 U	1.4 R
Iron	2000	<b>17000</b>	1700	1800	1800
Lead	4.6 R	12	10 U	10 U	10 U
Magnesium	1100 J	2500 J	1100 J	1100 J	1100 J
Manganese	52	<b>610</b>	51	49	49
Total Hg	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Vanadium	3.5 J	<b>23 J</b>	2.7 J	2.8 J	3.0 J
Zinc	5.3 J	<b>69</b>	4.8 J	4.7 J	6.9 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 2: Continued**

Analyte	USF-001-SW (background)	USF-010-SW	USF-011-SW	USF-012-SW	USF-013-SW
Aluminum	1900 J	3600 J	1600 J	1000 J	<b>110000 J</b>
Arsenic	10 U	10 U	10 U	10 U	10 U
Barium	36 J	86 J	36 J	79 J	<b>1100</b>
Chromium	1.5 J	<b>6.6 J</b>	1.8 J	<b>23</b>	<b>140</b>
Copper	1.6 R	2.2 J	25 U	25 U	<b>77</b>
Iron	2000	<b>7400</b>	2100	3300	<b>110000</b>
Lead	4.6 R	5.4 R	10 U	6.7 J	<b>180</b>
Magnesium	1100 J	2000 J	1200 J	2400 J	<b>14000</b>
Manganese	52	<b>360</b>	64	<b>160</b>	<b>1400</b>
Total Hg	0.20 U	0.20 U	0.20 U	0.20 U	0.15 UJ
Vanadium	3.5 J	8.4 J	3.2 J	3.6 J	<b>260</b>
Zinc	5.3 J	13 J	5.0 J	13	<b>350</b>

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 2:** Continued

Analyte	USF-001-SW (background)	USF-014-SW	USF-015-SW
Aluminum	1900 J	3400 J	1900 J
Arsenic	10 U	10 U	5.0 UJ
Barium	36 J	<b>130 J</b>	41 J
Chromium	1.5 J	<b>12</b>	2.8 J
Copper	1.6 R	25 U	25 U
Iron	2000	<b>9900</b>	2900
Lead	4.6 R	5.6 R	10 U
Magnesium	1100 J	2600 J	1300 J
Manganese	52	<b>490</b>	72
Total Hg	0.20 U	0.20 U	0.20 U
Vanadium	3.5 J	7.6 J	4.8 J
Zinc	5.3 J	<b>23 J</b>	7.5 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 3:** Cone Mills Site Sediments Selected Analytical Results

Analyte	USF-001-SE (background)	USF-002-SE	USF-003-SE	USF-004-SE	USF-005-SE
Aluminum	10000 J	18000 J	26000 J	8000 J	<b>50000 J</b>
Arsenic	0.60 UJ	1.6 U	2.2 U	1.0 UJ	1.8 UJ
Barium	110	140	240	71	<b>410</b>
Chromium	16	21	28	30	<b>11000</b>
Copper	5.7 J	7.8 J	17 J	5.7 J	<b>30 J</b>
Iron	13000 J	12000 J	24000 J	11000 J	<b>110000 J</b>
Lead	7.7	12	<b>130</b>	<b>37</b>	<b>200</b>
Magnesium	2500	2500	3800	630	3700
Manganese	160	95	180	62	<b>740</b>
Total Hg	0.13 U	0.16 U	0.12 UJ	0.04 UJ	0.18 UJ
Vanadium	25	32	64	29	<b>120</b>
Zinc	30 J	35 J	<b>100 J</b>	27 J	<b>200 J</b>

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 3: Continued**

Analyte	USF-001-SE (background)	USF-006-SE	USF-007-SE	USF-008-SE	USF-009-SE
Aluminum	10000 J	<b>39000 J</b>	<b>30000 J</b>	<b>36000 J</b>	26000 J
Arsenic	0.60 UJ	1.1 UJ	0.88 UJ	1.3 UJ	1.8 J
Barium	110	200	240	270	200
Chromium	16	<b>68</b>	37	40	33
Copper	5.7 J	13 J	9.3 J	8.0 J	10 J
Iron	13000 J	37000 J	15000 J	16000 J	22000 J
Lead	7.7	<b>45</b>	19	22	23
Magnesium	2500	2700	4200	3400	3300
Manganese	160	150	110	130	190
Total Hg	0.13 U	0.07 UJ	0.07 UJ	0.05 UJ	0.05 UJ
Vanadium	25	<b>100</b>	57	60	53
Zinc	30 J	71 J	48 J	47 J	46 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 3: Continued**

Analyte	USF-001-SE (background)	USF-010-SE	USF-011-SE	USF-012-SE	USF-013-SE
Aluminum	10000 J	28000 J	25000 J	18000 J	26000 J
Arsenic	0.60 UJ	2.0 J	1.3 UJ	1.7 U	0.98 UJ
Barium	110	190	200	170	210
Chromium	16	<b>200</b>	<b>220</b>	<b>180</b>	<b>51</b>
Copper	5.7 J	14 J	13 J	12 J	12 J
Iron	13000 J	22000 J	19000 J	14000 J	21000 J
Lead	7.7	<b>42</b>	<b>28</b>	<b>50</b>	<b>26 J</b>
Magnesium	2500	2500	3400	2200	3800
Manganese	160	160	210	100	170
Total Hg	0.13 U	0.07 UJ	0.05 UJ	0.06 UJ	0.17 U
Vanadium	25	57	53	52	50
Zinc	30 J	63 J	51 J	69 J	62 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

**Table 3: Continued**

Analyte	USF-001-SE (background)	USF-014-SE	USF-015-SE
Aluminum	10000 J	<b>45000 J</b>	<b>53000 J</b>
Arsenic	0.60 UJ	1.5 U	1.9 J
Barium	110	260	<b>370</b>
Chromium	16	<b>55</b>	<b>41</b>
Copper	5.7 J	13 J	12 J
Iron	13000 J	<b>39000 J</b>	19000 J
Lead	7.7	<b>49 J</b>	29 J
Magnesium	2500	4500	4000
Manganese	160	190	130
Total Hg	0.13 U	0.15 U	0.16 U
Vanadium	25	<b>120</b>	<b>89</b>
Zinc	30 J	80 J	55 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

Lastly, sediment samples were collected from wetlands areas associated at this site. An upgradient wetland was used as background, and one (1) upgradient sample was collected from this area. This wetland is not characterized on US Fish and Wildlife Service (USFWS) National Wetlands Inventories. Downstream wetlands have also been identified in close proximity to the site. These wetlands lie along Langston Creek downstream of Brooks Avenue and upstream of the Langston Creek/Reedy River confluence. These wetlands do appear on USFWS inventories (Ref. 4). The wetland is located along Langston Creek east of the aeration lagoon source area and west of Highway 253. It is classified as palustrine, scrub-shrub, broad-leaved deciduous/needle-leaved evergreen, and temporarily flooded. Two (2) release samples were collected from this wetland. These two release samples demonstrate elevated metals in sediments, namely chromium at 550 ppm and arsenic at 370 ppm. Selected analytical results are shown for wetland sediments in Table 4 respectively. A sample map is included in Figure 4. A complete list of analytical results is attached in Appendix 2.

**Table 4: Cone Mills Site Wetlands Sediments Selected Analytical Results**

Analyte	USF-016-SE (background)	USF-017-SE	USF-018-SE
Aluminum	65000 J	50000 J	14000 J
Arsenic	6.3 J	6.5 J	<b>370 J</b>
Chromium	54	<b>550</b>	42
Copper	21 J	40 J	<b>100</b>
Iron	41000 J	42000 J	58000 J
Lead	67 J	77 J	130 J
Magnesium	3600	1400	4400
Manganese	260	540	570
Total Hg	0.12 UJ	0.19	0.06 UJ
Vanadium	110	160	45
Zinc	83 J	230 J	190 J

values shown in bold indicate > 3 times background; "J" indicates identification of analyte is acceptable, reported value is an estimate; "U" indicates analyte not detected at or above reporting limit; "UJ" indicates analyte not detected at or above reporting limit, reporting limit is an estimate.

According to the USFWS, “The Service’s objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis” (Ref. 4). Since a release has been identified in this wetland, onsite delineation of the wetland was necessary. The boundaries of the wetland were identified and delineated with GPS (see Figure 5) (Ref. 4, 7).

## VII. SOIL EXPOSURE PATHWAY

The upland soils on this site are classified as Cecil series sandy loam. Alluvial soils are classified as Chewacla series loam. The upland soils are characteristically very deep, well drained, and moderately permeable; floodplain soils are very deep, poorly drained, and moderately permeable (Ref. 4, 20).

No further target considerations have been identified in the soil exposure pathway for this site since the 2004 ESI. Please refer to Appendix 1: Expanded Site Inspection Cone Mills (Old Union Bleachery) Site for a description of this pathway’s targets.

## **VIII. CONCLUSIONS AND RECOMMENDATIONS**

Based on the current findings of this sampling investigation, this site would normally be a priority for further action under Superfund and would be evaluated using the Hazard Ranking System (HRS) for possible inclusion on the National Priorities List (NPL). However, SCDHEC has reached a settlement with the site's PRP's (see Appendix 3: SCDHEC vs. American Fast Print Consent Decree). Provided that the terms of this agreement are being met by the defendants to the Department's satisfaction, no further federal action is recommended at this time.

## IX. REFERENCES

- (1) Alongi, Paul. "Runoff from mill fire discolors Reedy." The Greenville News (Online). Posted 11/10/03.
- (2) Alsplough, T.A. of Cone Mills. Letter to Henry Gibson, SCDHEC, regarding dye lagoon leak. 5/28/76.
- (3) Annual Evaluation Report for the Groundwater Remediation System: Former Union Bleachery Site. February 2004. by RMT, Inc. Selected sections included. *The entire report is available in SCDHEC Site Assessment Section.*
- (4) ArcGIS. selected layers, SCDHEC database. *Available in SCDHEC Site Assessment Section.*
- (5) Aerial Photographs, Greenville County. 1951, 1965, 1970, 1978 Flights. *Available at University of South Carolina Cooper Library.*
- (6) EPA: Surf Your Watershed  
<http://www.epa.gov/surf/>
- (7) Field Logbooks for Cone Mills (Old Union Bleachery). *Available in SCDHEC Site Assessment Section.*
- (8) Haynesworth, J.J. Letter to W.T. Linton of Water Pollution Control Authority. 1/27/56.
- (9) Perkins, R.T. "Union Bleachery Leads Way In Cleaning Up Reedy". The Greenville News. 12/18/55.
- (10) SC DNR State Climatology Office  
Index:  
<http://www.dnr.state.sc.us/water/climate/sco/index.html>  
Maximum Rainfall Intensities by County:  
[http://water.dnr.state.sc.us/climate/sco/pcp\\_ints.html#chart](http://water.dnr.state.sc.us/climate/sco/pcp_ints.html#chart)
- (11) SC State Budget & Control Board Office of Research & Statistics: SC Population Reports  
[http://www.ors2.state.sc.us/population/census00/town\\_pop.asp#towng](http://www.ors2.state.sc.us/population/census00/town_pop.asp#towng)
- (12) SCDHEC Consent Order with Cone Mills Corporation- Union Bleachery. 5/21/84
- (13) Site Inspection Report: Cone Mills (Union Bleachery Site). Prepared by Susan Snook,

SCDHEC. 6/29/93.

- (14) Smith, Johnnie W., Water Pollution Control. Letter to W.T. Linton, Executive Director, Water Pollution Control. Report of Reedy River Conditions. 9/14/64.
- (15) Soil Removal Report: Former Union Bleachery. May 1995. by RMT, Inc. Selected sections included. *The entire report is available in SCDHEC Site Assessment Section.*
- (16) South Carolina Average Annual Pan Evaporation  
[http://water.dnr.state.sc.us/climate/sco/products/sc\\_evap.gif](http://water.dnr.state.sc.us/climate/sco/products/sc_evap.gif)
- (17) South Carolina Pollution Control Authority. Application to Construct Waste Treatment System. Attached proposal for sludge drying lagoon. 12/5/74.
- (18) South Carolina Water Resources Commission. South Carolina State Water Assessment. SCWRC Report No. 140, September 1983. *Available in SCDHEC Site Assessment Section*
- (19) Standen, A. ed. (1965) Kirk-Othmer Encyclopedia of Chemical Technology 2nd ed. Vol. 7. John Wiley and Sons, New York.
- (20) USDA-NRCS Soil Survey Division: Official Soils Description Query  
<http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi>
- (21) Union Bleachery Site RI/FS. July 1991. by Geotrans, Inc. & Rogers & Callcott Engineers, Inc.
- (22) United States Geological Survey, Topographical Maps:  
Paris Mountain & Greenville Quadrangles, SC. 7.5 Minutes. Revised 1980
- (23) Webb, Kathy of The Fletcher Group. Letter to Chris Bartley, SCDHEC. Soil & Sediment Removal Activity. 10/20/04.

Figure 1: Site Topographic Map with 1999 Aerial Photo Overlay.

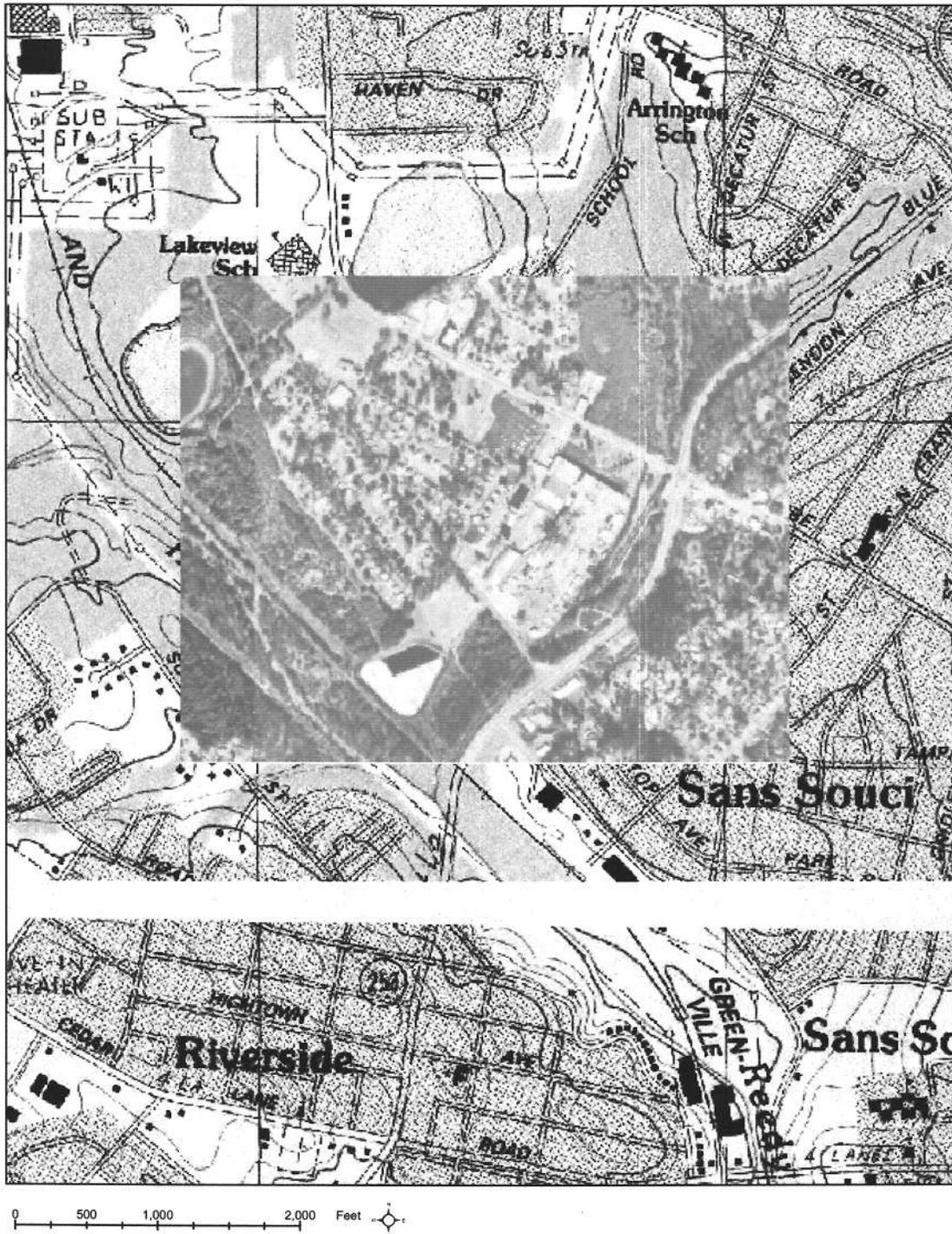


Figure 2: General Site Map. 1999 Aerial Photo.



Figure 3: General Site Surface Water Attributes Map. The dotted red line indicates the cycle of water between Langston Creek, the plant process water piping system, and the Northern Reservoir. All known current and former intakes/outfalls are shown as large red markers. The exact location of the former intake/outfall in the Northwestern Reservoir (yellow marker) is unknown. Blue arrows indicate flow direction. The large blue marker depicts the location of the process water treatment facility. Note: piping from the Langston Impoundment and the Northern Reservoir intersects at the aeration lagoon; however, water from the lagoon is not exchanged at this intersection.

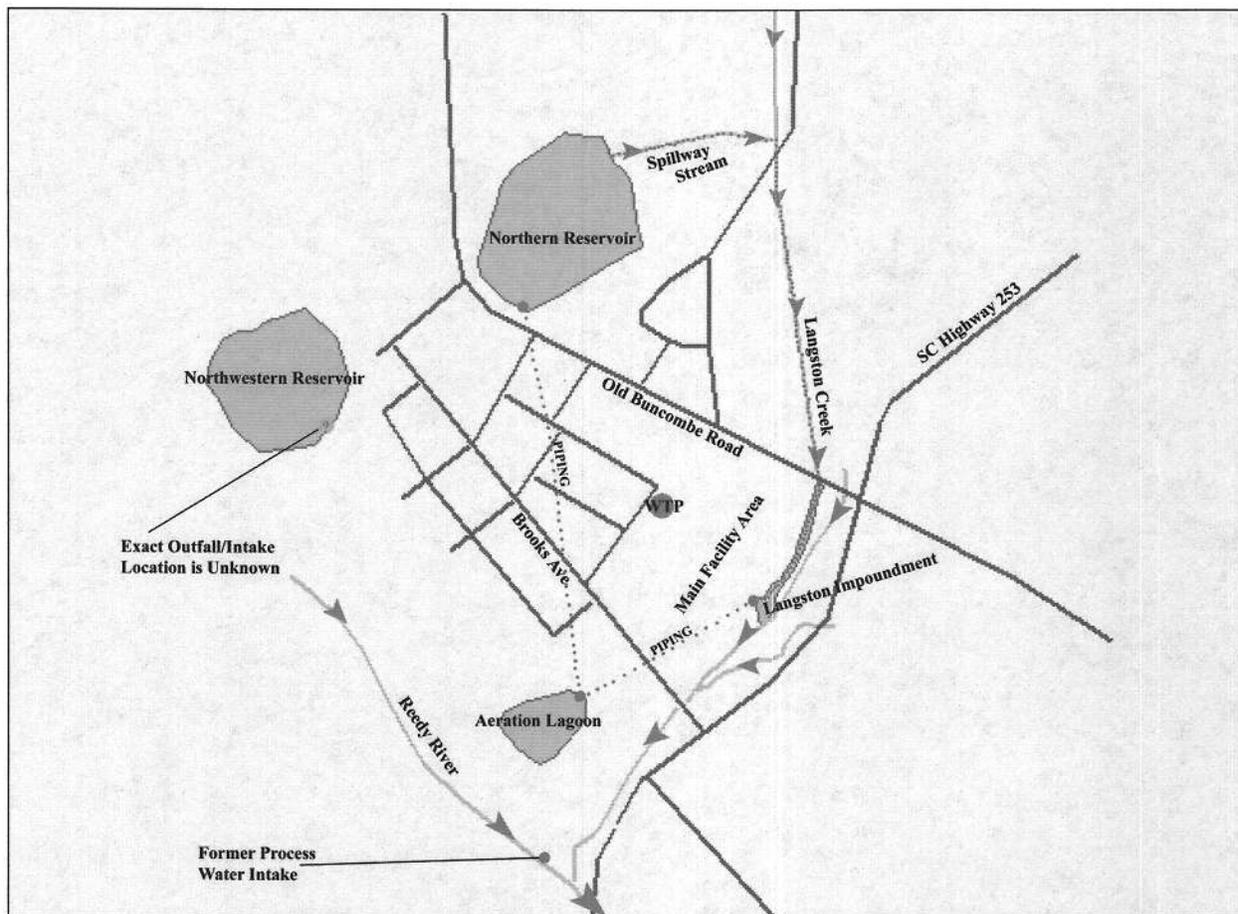


Figure 4: ESI Update Cone Mills (Old Union Bleachery) Site Surface Water and Sediment Sample Location Map, 1999 Aerial Photo.

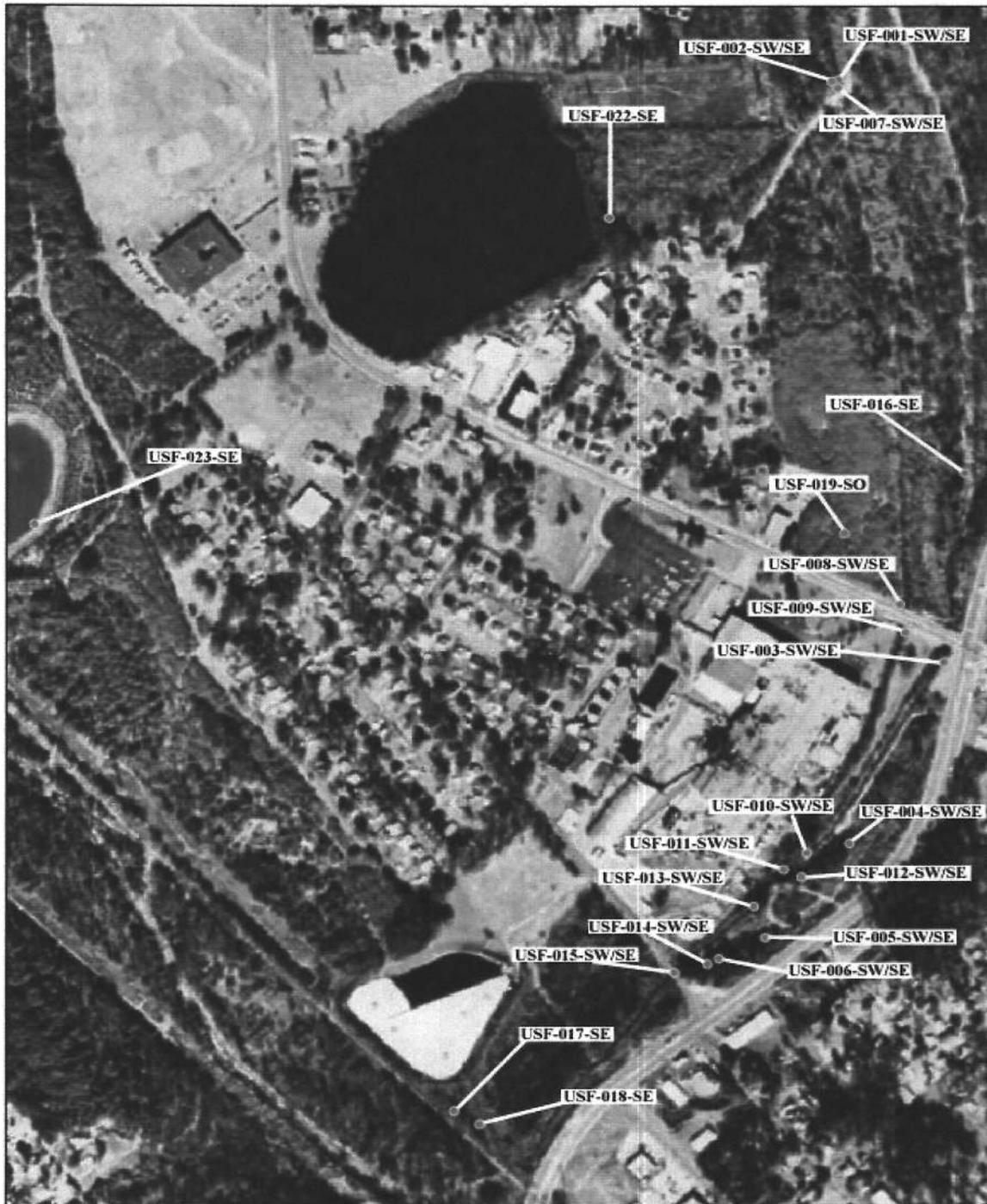
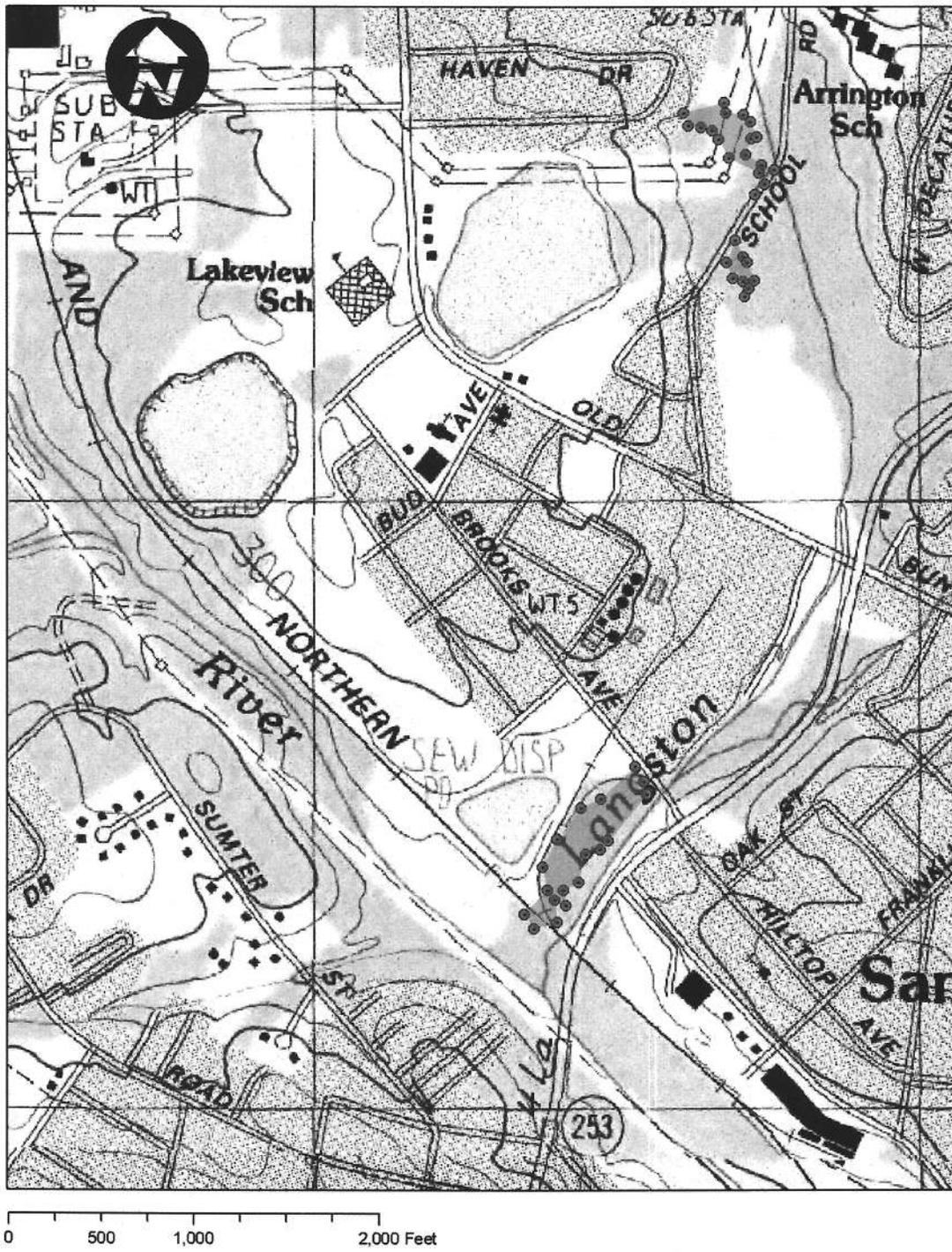


Figure 5: ESI Update Cone Mills (Old Union Bleachery) Site Wetlands Delineation. USGS 1980 Topo. Wetlands Areas are highlighted in red.



## **References**

**Expanded Site Inspection Update  
Cone Mills (Old Union Bleachery) Site  
Greenville County  
EPA ID. SCD 003 358 744**

Prepared By: Christopher Bartley  
Site Assessment Section  
Bureau of Land & Waste Management  
South Carolina Department of Health & Environmental Control  
2600 Bull Street  
Columbia, SC 29201

November 15, 2006

## IX. REFERENCES

- (1) Alongi, Paul. "Runoff from mill fire discolors Reedy." The Greenville News (Online). Posted 11/10/03.
- (2) Alsplough, T.A. of Cone Mills. Letter to Henry Gibson, SCDHEC, regarding dye lagoon leak. 5/28/76.
- (3) Annual Evaluation Report for the Groundwater Remediation System: Former Union Bleachery Site. February 2004. by RMT, Inc. Selected sections included. *The entire report is available in SCDHEC Site Assessment Section.*
- (4) ArcGIS. selected layers, SCDHEC database. *Available in SCDHEC Site Assessment Section.*
- (5) Aerial Photographs, Greenville County. 1951, 1965, 1970, 1978 Flights. *Available at University of South Carolina Cooper Library.*
- (6) EPA: Surf Your Watershed  
<http://www.epa.gov/surf/>
- (7) Field Logbooks for Cone Mills (Old Union Bleachery). *Available in SCDHEC Site Assessment Section.*
- (8) Haynesworth, J.J. Letter to W.T. Linton of Water Pollution Control Authority. 1/27/56.
- (9) Perkins, R.T. "Union Bleachery Leads Way In Cleaning Up Reedy". The Greenville News. 12/18/55.
- (10) SC DNR State Climatology Office  
Index:  
<http://www.dnr.state.sc.us/water/climate/sco/index.html>  
Maximum Rainfall Intensities by County:  
[http://water.dnr.state.sc.us/climate/sco/pcp\\_ints.html#chart](http://water.dnr.state.sc.us/climate/sco/pcp_ints.html#chart)
- (11) SC State Budget & Control Board Office of Research & Statistics: SC Population Reports  
[http://www.ors2.state.sc.us/population/census00/town\\_pop.asp#towng](http://www.ors2.state.sc.us/population/census00/town_pop.asp#towng)
- (12) SCDHEC Consent Order with Cone Mills Corporation- Union Bleachery. 5/21/84
- (13) Site Inspection Report: Cone Mills (Union Bleachery Site). Prepared by Susan Snook,

SCDHEC. 6/29/93.

- (14) Smith, Johnnie W., Water Pollution Control. Letter to W.T. Linton, Executive Director, Water Pollution Control. Report of Reedy River Conditions. 9/14/64.
- (15) Soil Removal Report: Former Union Bleachery. May 1995. by RMT, Inc. Selected sections included. *The entire report is available in SCDHEC Site Assessment Section.*
- (16) South Carolina Average Annual Pan Evaporation  
[http://water.dnr.state.sc.us/climate/sco/products/sc\\_evap.gif](http://water.dnr.state.sc.us/climate/sco/products/sc_evap.gif)
- (17) South Carolina Pollution Control Authority. Application to Construct Waste Treatment System. Attached proposal for sludge drying lagoon. 12/5/74.
- (18) South Carolina Water Resources Commission. South Carolina State Water Assessment. SCWRC Report No. 140, September 1983. *Available in SCDHEC Site Assessment Section*
- (19) Standen, A. ed. (1965) Kirk-Othmer Encyclopedia of Chemical Technology 2nd ed. Vol. 7. John Wiley and Sons, New York.
- (20) USDA-NRCS Soil Survey Division: Official Soils Description Query  
<http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi>
- (21) Union Bleachery Site RI/FS. July 1991. by Geotrans, Inc. & Rogers & Callcott Engineers, Inc.
- (22) United States Geological Survey, Topographical Maps:  
Paris Mountain & Greenville Quadrangles, SC. 7.5 Minutes. Revised 1980
- (23) Webb, Kathy of The Fletcher Group. Letter to Chris Bartley, SCDHEC. Soil & Sediment Removal Activity. 10/20/04.