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Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-89/048
June 1989

EPA

Superfund Record of Decision:

Cape Fear Wood Preserving, NC

50272-101

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16. Abstract (Limit: 200 words)

The 9-acre Cape Fear Wood Preserving site is in Cumberland County, North Carolina on a 41-acre tract of land. The predominantly flat site is comprised of the wood treatment facility, wetlands, and undisturbed forests. A variety of land uses exist in the area including industrial, agricultural and residential. The Cape Fear Wood Preserving facility operated from 1953 to 1983 first using a wood-treating process that included creosote and later switching to a technique known as the copper-chromium-arsenic (CCA) process. Liquid and sludge wastes generated by both of these processes were pumped into a drainage ditch and an unlined lagoon. In 1977, as a result of a State site investigation that revealed coal tar creosote contamination, the property owner was ordered to remove 900 yd^3 of creosote contaminated soil. In 1984 EPA conducted a site investigation which resulted in an emergency removal action. This action included excavating contaminated soil and sludge followed by offsite disposal and pumping lagoon water into onsite storage tanks. In 1986, 500 gallons of creosote spilled from a storage tank causing EPA to conduct a second emergency response. Emergency response activities included removal and solidification of 10 yd^3 of sludge and pumping of 15,000 gallons of CCA waste water into onsite storage tanks. The primary contaminants of concern affecting the soil, sediment, ground water, and surface water are VOCs including benzene, other organics including PAHs, and metals including arsenic and chromium.
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - Cape Fear Wood Preserving, NC
First Remedial Action - Final
Contaminated Media: soil, sediment, gw, sw
Key Contaminants: VOCs (benzene), organics (PAHs), metals (arsenic, chromium)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 123
	20. Security Class (This Page) None	22. Price

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16. Abstract (Continued)

The selected remedial action for this site includes offsite disposal of CCA salt crystals found in the drainage system and solidified creosote at a RCRA landfill and offsite disposal of asbestos-containing pipe insulation in the county solid waste facility; removal and decontamination of onsite pipes and tanks to be sold for scrap metal or disposed of in the county solid waste facility; excavation and onsite treatment of soil and sediment using soil flushing as the preferred alternative or a low thermal desorption process to remove organics followed by soil washing or fixation/stabilization/solidification to address inorganics (a soil washing treatability study will determine if the preferred alternative would be appropriate) followed by placement of treated soil and sediment in the excavated area and revegetation; pumping with onsite treatment of ground water and surface water with offsite discharge at a POTW or a surface stream; sale of 50,000 gallons of CCA solution to a buyer, if no buyer is found, CCA solution and CCA-contaminated wastewater will be treated using the ground water treatment system; and ground water monitoring. The estimated present worth cost for this remedial action ranges from $14,370,000 to $14,910,000 including present worth O&M costs which range from $1,020,000 to $1,310,000 for 30 years.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Cape Fear Wood Preserving
Fayetteville, Cumberland County, North Carolina

Statement of Purpose

This document represents the selected remedial action for this Site developed in accordance with CERCLA as amended by SARA, and to the extent practicable, the National Contingency Plan.

The State of North Carolina has concurred on the selected Remedy.

Statement of Basis

The decision is based upon the Administrative Record for the Cape Fear Wood Preserving Site. The attached index identifies the items which comprise the administrative record upon which the selection of a remedial action is based.

Description of Selected Remedy

Prior to initiating any remedial action on-site, a site survey will be conducted to determine the presence of any endangered plant species on-site. If endangered plant species are encountered, then the Department of the Interior/U.S. Fish and Wildlife Service needs to be consulted prior to initiating remedial action to decide how to proceed.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified creosote and asbestos-containing pipe insulation. The CCA crystals and solidified creosote will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.

The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous they will be transported to a RCRA permitted landfill for disposal.

The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,000 gallons of CCA contaminated wastewater will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater. All wastewater (i.e., cleaning equipment, etc.) generated by on-site activities will also be directed to the treatment system.

SOURCE CONTROL (Remediation of Contaminated Soils)

The preferred alternative for the remediation of contaminated soils/sediment is soil washing. The alternate source control alternative is a low thermal desorption process to remove the organics contaminants from the soil followed by either soil washing or a soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing treatability study to be conducted during the remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated

MIGRATION CONTROL (Remediation of Contaminated Groundwater)

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Groundwater removal will be conducted in 10,000 square foot subareas at a time, until the entire contaminated surficial aquifer is addressed. The well points will be moved from one area to another for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all applicable and relevant or appropriate requirements (ARARs).

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solution and alternative treatment technologies to the maximum extent practicable.

June 30, 1989
Date

Patrick M Tobin
Acting for Greer C. Tidwell
Regional Administrator

SUMMARY OF REMEDIAL SELECTION

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY
NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

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1.0 INTRODUCTION

The Cape Fear Wood Preserving (Cape Fear) Site was proposed for the National Priorities List (NPL) in June 1986 and was finalized in July 1987 as site number 572. The Cape Fear Site has been the subject of a Remedial Investigation (RI) and a Feasibility Study (FS), both of which were conducted under the REM II contract. The RI report, which examined air, groundwater, soil, and surface water and sediment contamination at the Site and the routes of exposure of these contaminants to the public and environment was completed in October 1988. The FS, which develops, examines and evaluates alternatives for remediation of the contamination found on site, was issued in final draft form to the public in February 1989.

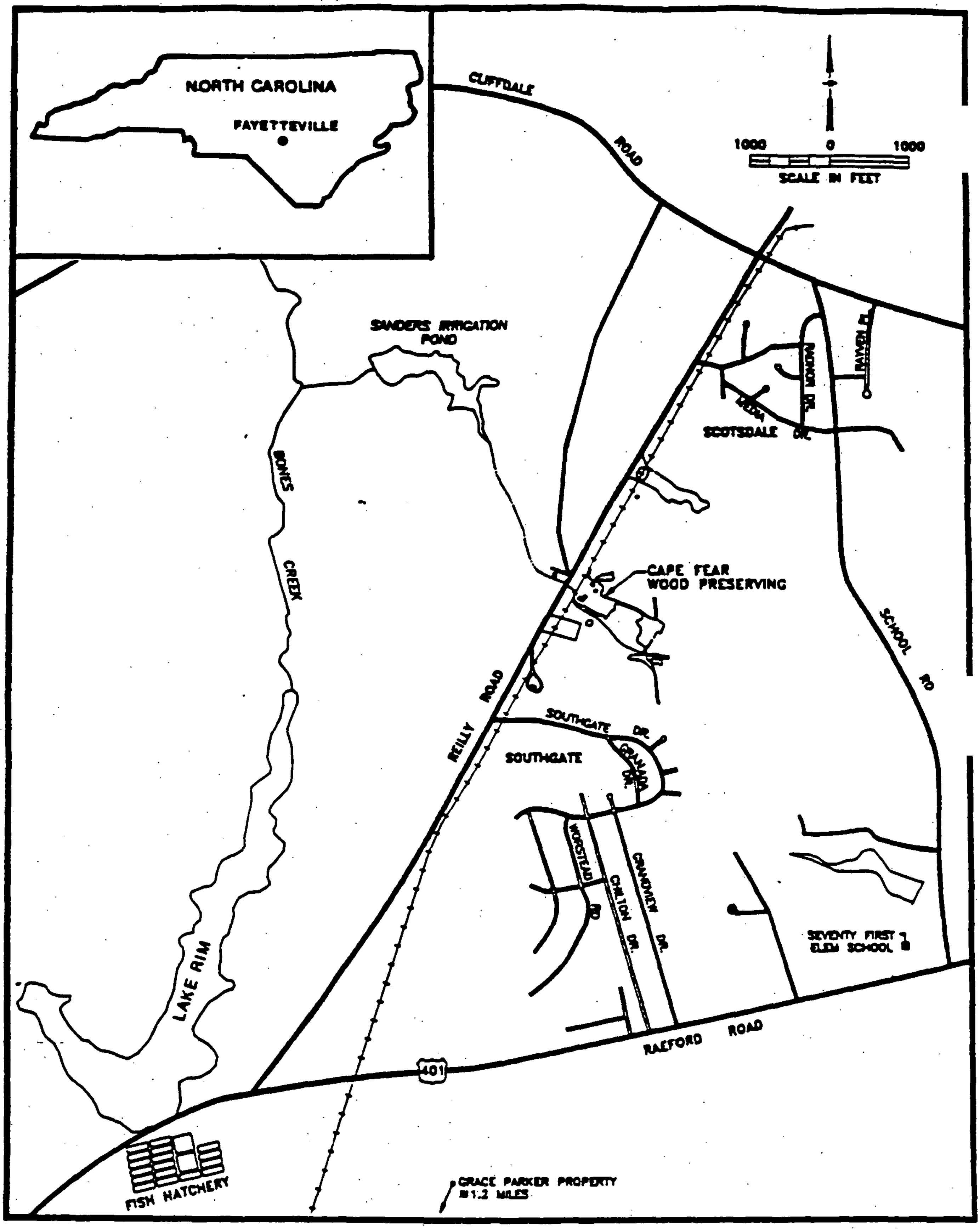
This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative.

1.1 SITE LOCATION AND DESCRIPTION

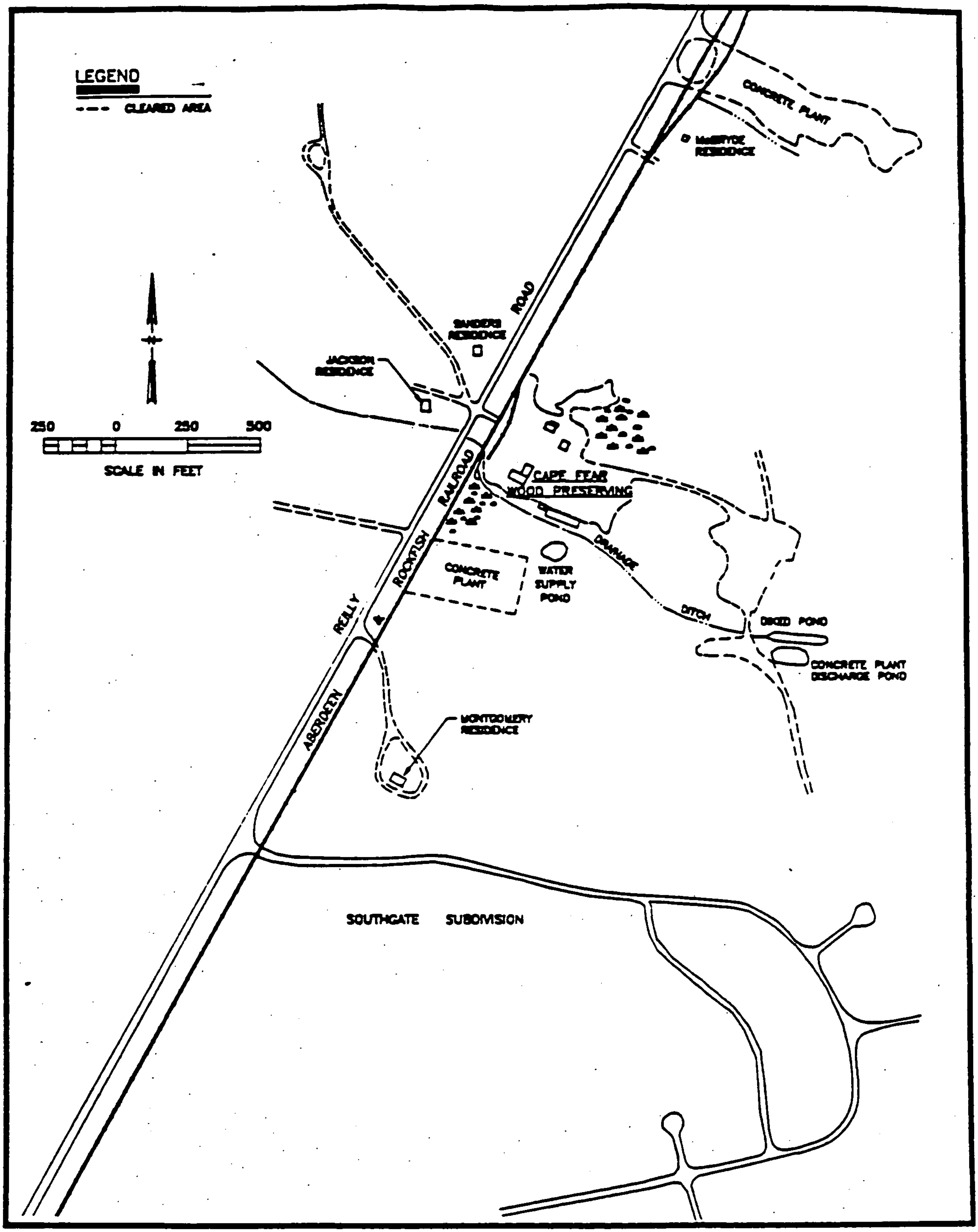
The Cape Fear Site is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401 (Figure 1). It includes about nine acres of a 41-acre tract of land near the intersection of latitude 35°02'57"N and longitude 79°01'17"W. The site is adjacent to other industrial/commercial establishments as well as private residences. Four homes are located near the site. In addition, a subdivision named "Southgate" is located approximately a quarter of a mile south of the site and houses approximately 1,000 people. Figures 2 and 3 show the area and major site features.

Of the approximately 41 acres comprising the site, less than 10 acres were developed by the facility. The remainder of the site is heavily wooded wit coniferous trees with a small swampy area northeast of the developed area. The site is highly disturbed in the vicinity of the plant facilities. The buildings are currently abandoned and in various states of disrepair. The swampy area consists of a seasonally flooded wetland dominated by rushes. The upland section of the site is sandy and well-drained. A site survey wi be required prior to initiating remedial action to determine if endangered plant species exist on-site.

The terrain of the Cape Fear Site is predominantly flat, with drainage provided by a swampy area on the northeast side of the site and a man-made ditch to the southeast that extends southeastwardly to a diked pond. A variety of land uses exist around the Cape Fear Site. The properties to t



LOCATION MAP	FIGURE 1
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	



AREA MAP

FIGURE NO. 2

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

north include an undisturbed pine forest, a concrete plant, and a few residential properties. To the east is a continuation of the undisturbed pine forest, and to the west is farmland used for growing crops and raising livestock. To the south is another concrete plant as well as the Southgate subdivision.

1.2 SITE HISTORY

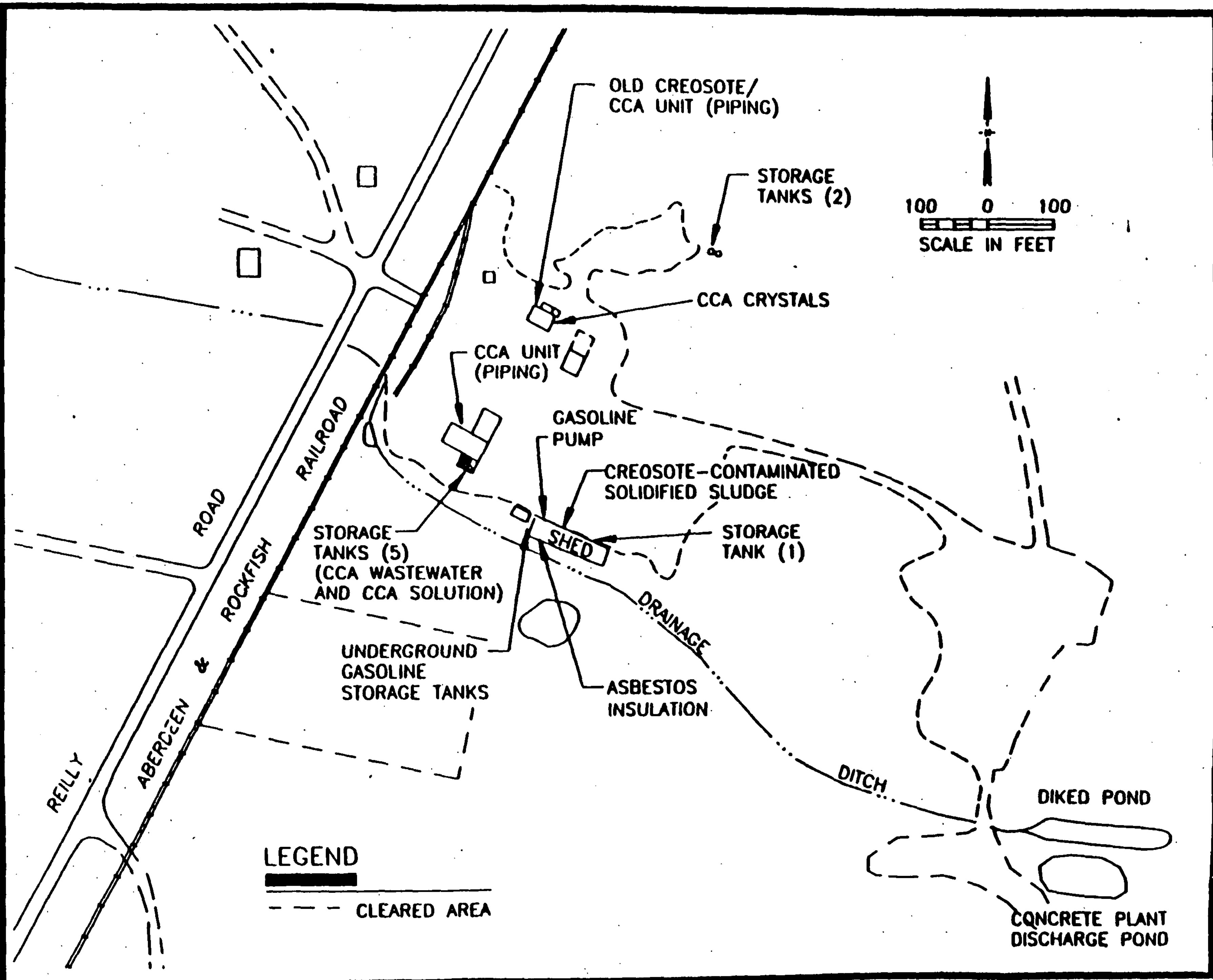
Operations at the Cape Fear Wood Preserving Site commenced in 1953 and continued until 1983. The Cape Fear Wood Preserving facility produced creosote-treated wood from 1953 until 1978 when demand for creosote-treated products declined. Wood was then treated by a wolmanizing process using salts containing sodium dichromate, copper sulfate, and arsenic pentoxide. This treatment process is known as the copper-chromium-arsenic (CCA) process. The date the CCA process was initiated is unknown. Nor is it known whether the creosote and CCA processes occurred simultaneously or in succession.

Both liquid and sludge wastes were generated by these two treatment processes. Waste from the creosote process was pumped into a concrete sump north of the treatment unit (Figure 3). As liquid separated from the sludge, it was pumped into a drainage ditch that lies southeasterly of the developed portion of the site and discharges into a diked pond. Stormwater runoff from the treatment yard also appears to drain into this ditch. Waste from the CCA treatment process was pumped into a unlined lagoon north of the dry kiln and allowed to percolate into the ground.

In the summer of 1977, the site was determined to be contaminated with constituents of coal tar and coal tar creosote. State authorities ordered the owner/operator to comply with North Carolina law. As a result, the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the site, and removed 900 cubic yards of creosote-contaminated soil from the treatment yard and the drainage ditch that parallels the railroad. The creosote-contaminated soil was transported for land-spreading to property leased from Grace Parker approximately 2.5 miles south of the site. The soil on this property was sampled as part of the RI. Low levels of polycyclic aromatic hydrocarbons (PAHs) were detected.

Sometime between 1979 and 1980, a new closed-circuit CCA plant was installed and the old creosote and CCA facilities were decommissioned. The new CCA plant was regulated under the Resource Conervation and Recovery Act (RCRA) a a small generator until 1983, when the company went out of business. The site was subsequently abandoned until the summer of 1988 at which time SECo, Investment, Inc. purchased the property.

The Environmental Protection Agency (EPA) conducted a site reconnaissance a site investigation in October 1984. Surface water, groundwater, soil and sediment samples were collected from the northeast swamp, diked pond, lagoo



SITE MAP

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

3

drainage ditch and a domestic well west of the site (S.T. Jackson). PAHs, which are creosote-related compounds, and the CCA metals were detected in all samples. Consequently, EPA conducted an emergency removal action at the site in January and February 1985. This actions included:

* Removal of creosote sludge from the creosote concrete sump;

* Removal of sludge from the lagoon to a depth of 7 feet, and solidification of the sludge with fly ash;

* Pumpage of lagoon water into storage tanks located south of the new CCA unit;

* Removal of contaminated soil from the drainage ditch that parallels the railroad tracks and at the culvert near Reilly Road;

* Removal of contaminated soils from a portion of the northeast swamp and stained areas in the treatment yard; and

* Back filling with clean sandy soil of areas where contaminated soil had been removed.

All contaminated soils and sludges removed were transported to the GSX hazardous waste landfill in Pinewood, South Carolina.

The NUS Corporation conducted an investigating of the site in May and October 1985. Soil, sediment, surface water and ground water samples were collected. Analytical results again showed that samples were contaminated with creosote-related compounds, arsenic, chromium and copper.

EPA conducted a second emergency response in September 1986 when site visits revealed that vandals had shot holes in a 3,000-gallon creosote storage tank spilling approximately 500 gallons of creosote on the ground. The cleanup operation consisted of:

* Removal, solidification, and transport of approximately 10 cubic yards of creosote-contaminated sludge to an on-site metal shed east of the new CCA unit;

* Removal and transport of the creosote storage tank to the on-site metal shed;

* Excavation and grading of the area where the creosote tank had leaked;

* Pumpage of approximately 15,000 gallons of CCA waste water from the CCA recovery sump into on-site storage tanks located south of the new CCA unit; and

* Containment of the CCA recovery sump within an earthen dike.

2.0 ENFORCEMENT ANALYSIS

eral Potentially Responsible Parties (PRPs) have been identified, including the Cape Fear Wood Preserving Company (no longer active), Johnson & Geddes Construction Company (no longer active), John R. Johnson, Doretta Ivey (wife of former president of the Cape Fear Wood Preserving Company -- deceased), and Dewey Ivey, Jr. (son of the former president -- deceased). Recently identified PRPs include SECO Investments, Inc. (SECO), Southeastern Concrete Products, Inc. (SE-Lum), Southeastern Concrete Products of Fayetteville, Inc. (SE-Fay), Mr. Steve Floyd, Mr. Louis Lindsey, and Mr. James Musselwhite.

In December 1984, EPA issued notice letters to the PRPs informing them of EPA's intention to conduct CERCLA remedial activities at the site unless the PRPs chose to conduct such actions themselves. The PRPs were sent notice letters rather than an administrative order because of their presumed inability to pay for remedial action. On June 5, 1989, these PRPs were sent RD/RA notice letters informing them that the Agency was considering spending Fund monies if they no not or incapable of conducting the project themselves.

3.0 CURRENT SITE STATUS

The site was abandoned from 1983 until the summer of 1988 when it was purchased by SECo, Investments, Inc. Presently, an area of approximately 10,000 square feet of the site near the railroad tracks has been enclosed by hained linked fence. Within the fence are some small earth-moving ipment and a concrete pad with a storage trailer on top. This area is nted to Southern Concrete Products, Inc.

In the fall of 1988 and at the direction of a Cumberland County building/construction inspector, the owner retrenched the majority of the drainage ditch, dug several new drainage trenches and breached the diked pond. Both the drainage ditch and the sediments within the drainage ditch and the diked pond and the sediments within the diked pond were areas targeted for remediation.

3.1 HYDROGEOLOGIC SETTING

The study area is underlain by two major stratigraphic formations: the Tuscaloosa and the Black Creek Formations. The Tuscaloosa Formation appears to rest directly on a basement rock complex and is mainly a massive clay unit containing interbedded layers of sand. The Black Creek Formation overlies the Tuscaloosa Formation and typically consists of thin layers of brownish to black clay alternating with thin layers of gray to white fine-grained quartz sand. The contact between the Black Creek beds and the Tuscaloosa clay is unconformable. In addition, the lithology of these formations is so similar, it is very difficult to differentiate between the formations based on visual inspection.

The Tuscaloosa and Black Creek Formations are overlain by undifferentiated surficial sediments. In the study area, the surficial sediments have a maximum thickness of 30 feet. These beds generally consist of unconsolidated, fine to medium-grained sand in a clay matrix.

Geologic logs recorded during monitor well and borehole installations indicate that the site is underlain by intermittent beds of sands, clays, and sands in clay matrices. One distinct clay to silty, sandy clay semi-confining unit, however, was identified. This unit divides the subsurface down to a depth of approximately 90 feet into two water producing zones.

The upper aquifer consists of unconsolidated sands and clays and is approximately 25 feet thick. The lower aquifer also consists of sands and clays and is approximately 50 feet thick. Separating the aquifers is a clay to silty, sandy clay semi-confining unit, approximately 15 feet thick, which acts as an aquitard. This unit is generally continuous across the site, but was reporting missing in one location along the access road. Underlying the lower aquifer is a stiff clay unit of unknown thickness, which is assumed to act as an aquiclude or aquitard based on physical descriptions of the material. This unit appears to be continuous across the entire site.

It has been determined that the groundwater flow in the lower aquifer is generally southwestward at the site (Figure 4) while groundwater flow in the upper aquifer is radial, moving in all directions from the site (Figure 5). This radial flow pattern in the upper aquifer is probably due to a combination of two geologic conditions:

Most of the steams in the study area have flood plains. Some have terraces that range in width from a few feet to several miles. Along each stream, the present flood plain width varies in response to geologic control, but the stream, flood plain, terraces, and valleys generally become wider downstream. The site does not lie within a floodplain.

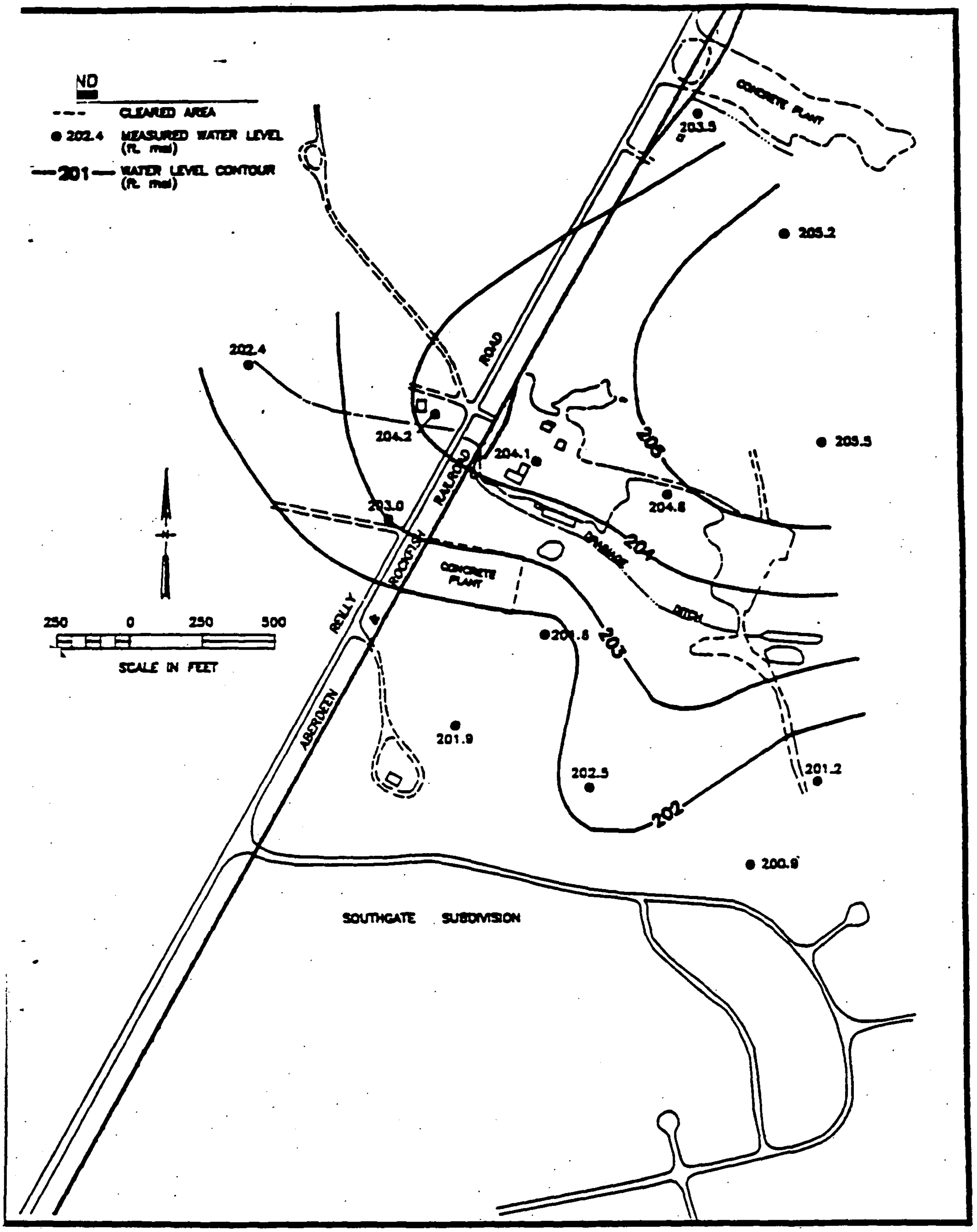
* The site is located at a topographic high point for the area and

* Sandy materials at the site facilitate higher rainfall recharge than in the surrounding areas.

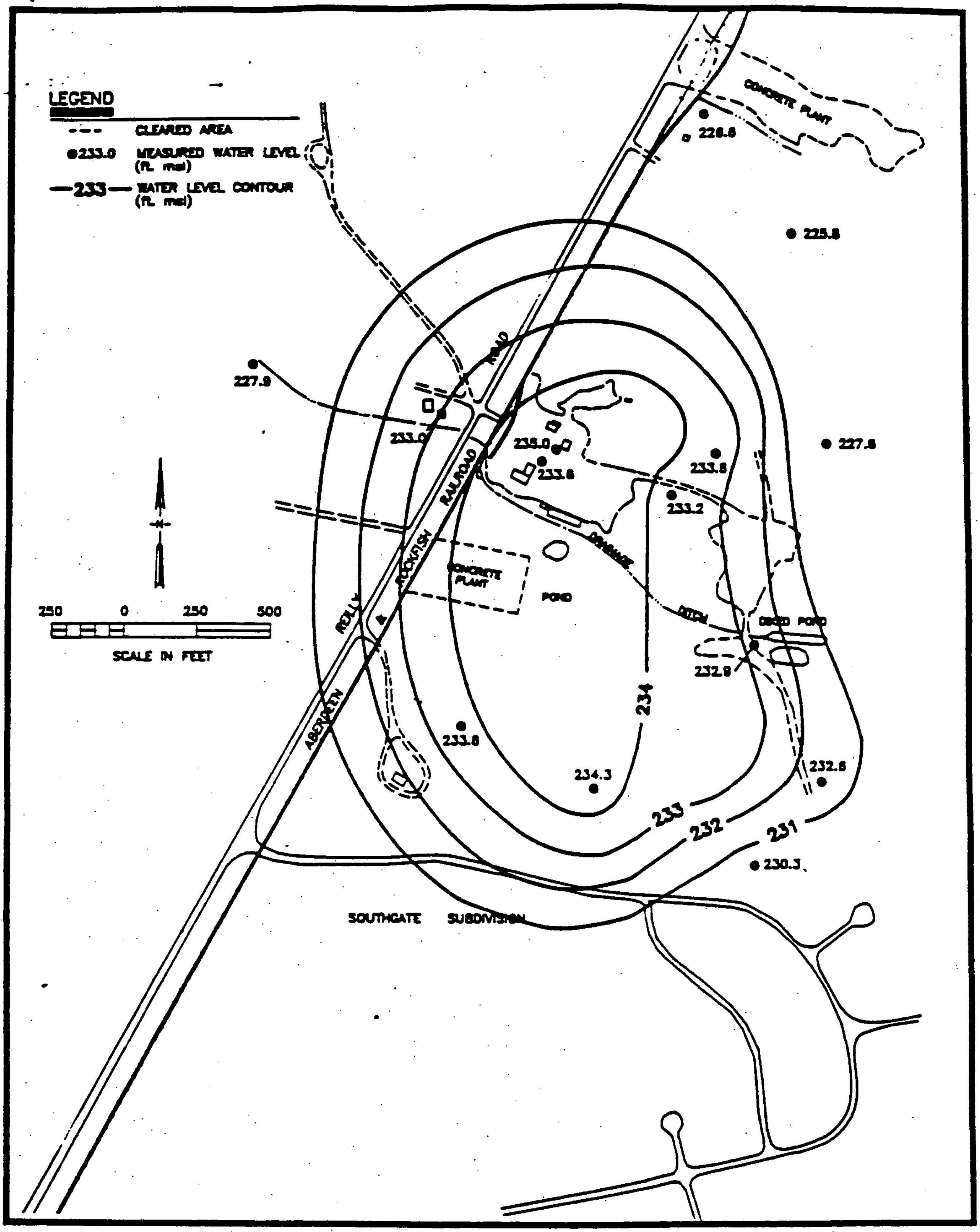
The southwestward flow pattern in the lower aquifer is probably in response to the regional flow pattern for this aquifer.

The average horizontal groundwater velocity (based on Darcey's Law for groundwater flow) in the upper aquifer is approximately 9 feet/year and for the lower aquifer, 16 feet/year. Therefore, in 35 years (the time since the beginning of plant operations), the maximum contaminant migration in the upper aquifer would be expected to be in the order of 300 to 400 feet from the source and 500 to 600 feet in the lower aquifer. The analytical data base supports this determination.

The average vertical groundwater velocity from the upper aquifer to the lower aquifer is estimated to be 3.0 feet/year.



LOWER AQUIFER WATER ELEVATIONS – 5/16/88	FIGURE NO.
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	4



UPPER AQUIFER WATER ELEVATIONS - 5/16/88

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

5

Both aquifers underlying the site have been classified as Class IIA using U.S. EPA Groundwater Classification Guidelines of December 1986.

3.2 SITE CONTAMINATION

Remedial Investigation field work centered on the developed area of the site, the swampy areas northeast and southwest of the developed area, the clearing east of the developed area, and the drainage ditch and diked pond. Soil, groundwater, surface water and sediment samples were collected in and around these areas. The soil samples analyzed in the on-site laboratory provided sufficient data to determine horizontal extent of contamination. The other environmental samples (water and sediment) and 25% of the soil samples, were sent to a laboratory in the Contract Laboratory Program (CLP) and analyzed for the compounds on the Target Compound List (TCL). Five groundwater samples analyzed for hexavalent chromium (Cr^{+6}) and four soil samples were analyzed for dioxins.

The major contaminants are the organic compounds (polycyclic aromatic hydrocarbons - PAHs) grouped under the general term of coal-tar based creosote and the the metals - copper, chromium and arsenic.

3.3 AIR CONTAMINATION

The most common sources of air contamination at hazardous waste sites are the volatilization of toxic organic chemicals and the spread of airborne contaminated dust particles. During the RI, site personnel used the HNu photoionization analyzer to monitor the air while performing the designated RI tasks. No airborne problems were encountered.

3.4 SOIL CONTAMINATION

The concentrations of contaminants detected in soil at the site are summarized in Table 1. This table provides the frequency of detection, the ranges of concentrations found in surficial soil at the site, and the background concentration ranges for those contaminants identified as chemicals of potential concern in Section 2.0 of the Risk Assessment (Appendix C of the FS). Dioxins were not detected in any of the four soil samples analyzed for this group of compounds.

Analyses of the soil samples indicate that in spite of previous removal actions, areas with high concentrations of inorganic chemicals and PAHs still remain. In general, the most contaminated areas are in the process area, the northeast seasonal swamp, along the access road to the back storage area, and along the drainage ditch southeast of the process site.

TABLE 1

SURFICIAL SOIL SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	Frequency of Detection (%)	Concentration Range	Background Concentration Range*
Inorganic Chemicals (mg/kg)			
Aluminum	99	ND-14000	1600-2900
Arsenic	68	ND-15000	ND
Barium	52	ND-110	ND-21
Chromium	68	ND-1300	2.6-5.2
Copper	69	ND-6100	ND-11
Iron	100	99-15000	1500-2400
Lead	39	ND-270	ND-70
Magnesium	62	ND-530	ND-210
Organic Chemicals (ug/kg)			
Benzene	6	ND-71	ND
Toluene	29	ND-1100	ND-390
PAHs (mg/kg)			
Acenaphthene	12	ND-1300	ND
Acenaphthylene	16	ND-244	ND
Anthracene	20	ND-24000	ND
Benzo(a)anthracene	12	ND-370	ND-0.072
Benzo(b and/or k)fluoranthene	26	ND-560	ND-0.20
Benzo(g,h,i)perylene	12	ND-13	ND-0.038
Benzo(a)pyrene	17	ND-180	ND-0.085
Chrysene	20	ND-630	ND-0.090
Dibenzo(a,h)anthracene	5	ND-7.8	ND
Fluoranthene	27	ND-2600	ND-0.16
Fluorene	18	ND-4100	ND
Indeno(1,2,3-cd)pyrene	12	ND-18	ND-0.047
Naphthalene	11	ND-390	ND
Phenanthrene	15	ND-8100	ND-0.039
Pyrene	29	ND-2200	ND-0.16
Total PAHs	53	ND-37000	ND-0.89

ND = Not detected
* = Based on the analytical results for the three background surficial soil samples (BCK-1, BCK-2, and BCK-3).

Figures 6 through 10 show the surficial soil analytical results for chromium, arsenic, total PAHs, benzene, and toluene, respectively. These chemicals were used extensively in past wood preserving operations at the site and therefore, are good indicators of the extent of site-related soil contamination. Figures 6 through 10 also show areas of high and moderate contamination compared to background levels.

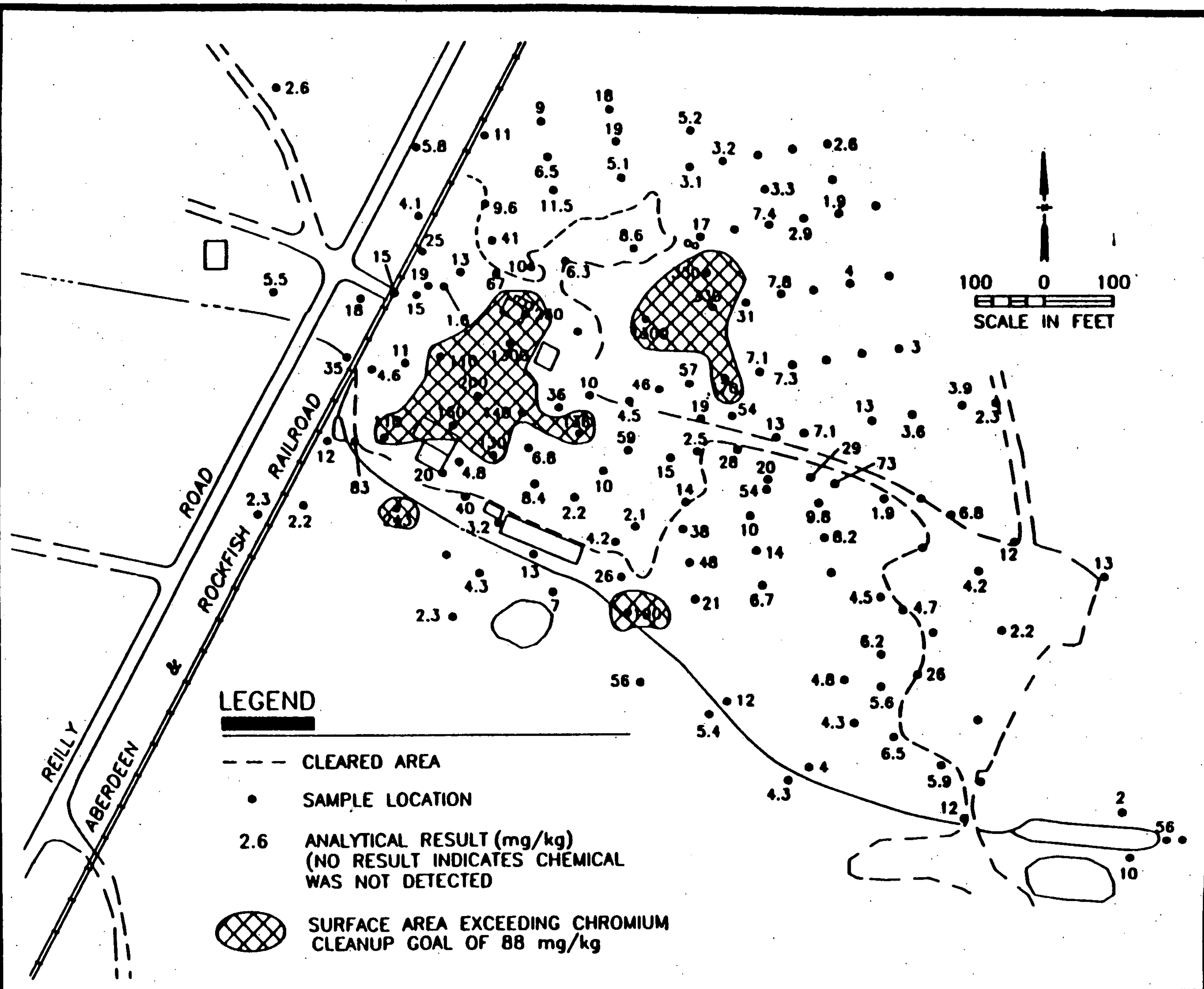
As shown in Figures 6 through 7, chromium and arsenic metal contamination is found mainly in the central process area and in the northeast seasonal swamp. Significantly elevated concentrations were also found along the access road and drainage ditch. The highest concentrations of chromium and arsenic (1300 and 15,000 mg/kg, respectively) were all found at grid point C-5 which is just south of the creosote unit.

PAHs are mainly concentrated in the western process area as shown in Figure 8. Isolated occurrences of high concentration were also found along the access road and the drainage ditch. The western process area was historically used to unload the creosote from the railroad cars which may explain the high concentrations of PAHs found in this area. The highest concentration of total PAHs (37,000 mg/kg) was found at SS-2 near the railroad. The second highest concentration of total PAHs (11,000 mg/kg) was found at grid point D-9 which is located in the bed of the drainage ditch. This sample is essentially a sediment sample, but was taken when the ditch was dry.

Results of the benzene and toluene analyses shown in Figures 9 and 10, respectively, indicate that volatile organics are not as widespread at the site as the inorganics and PAHs, but they are still prevalent. Of the two, toluene is by far the more prevalent. Toluene is concentrated mainly in the central process area and in the northeast seasonal swamp. The highest concentration of toluene (1100 mg/kg) was found at grid point C-5 which is just south of the creosote unit. Benzene is concentrated mainly in the southern process area with the highest concentration (71 mg/kg) found at grid point D-8 which is just east of the metal shed. It is believed that the source of the benzene contamination is the underground gasoline storage tank buried at the west end of the metal shed.

A comparison of the indicator chemical analytical results for soil samples collected at the surface and at depth (5 feet) is provided in Table 2. As shown, the majority of contamination is found at the surface, particularly around the perimeter of the contaminated area. Therefore, a sloping contaminated soil interface does not appear to be prevalent and the results of the surficial soil sampling program provide a valid determination of the horizontal extent of contamination.

A composite of these areal extents is provided in Figure 11, which shows surface soil locations exceeding the cleanup goals for all contaminants of concern. This area encompasses approximately 150,000 square feet (3.4 acres).



CHROMIUM CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

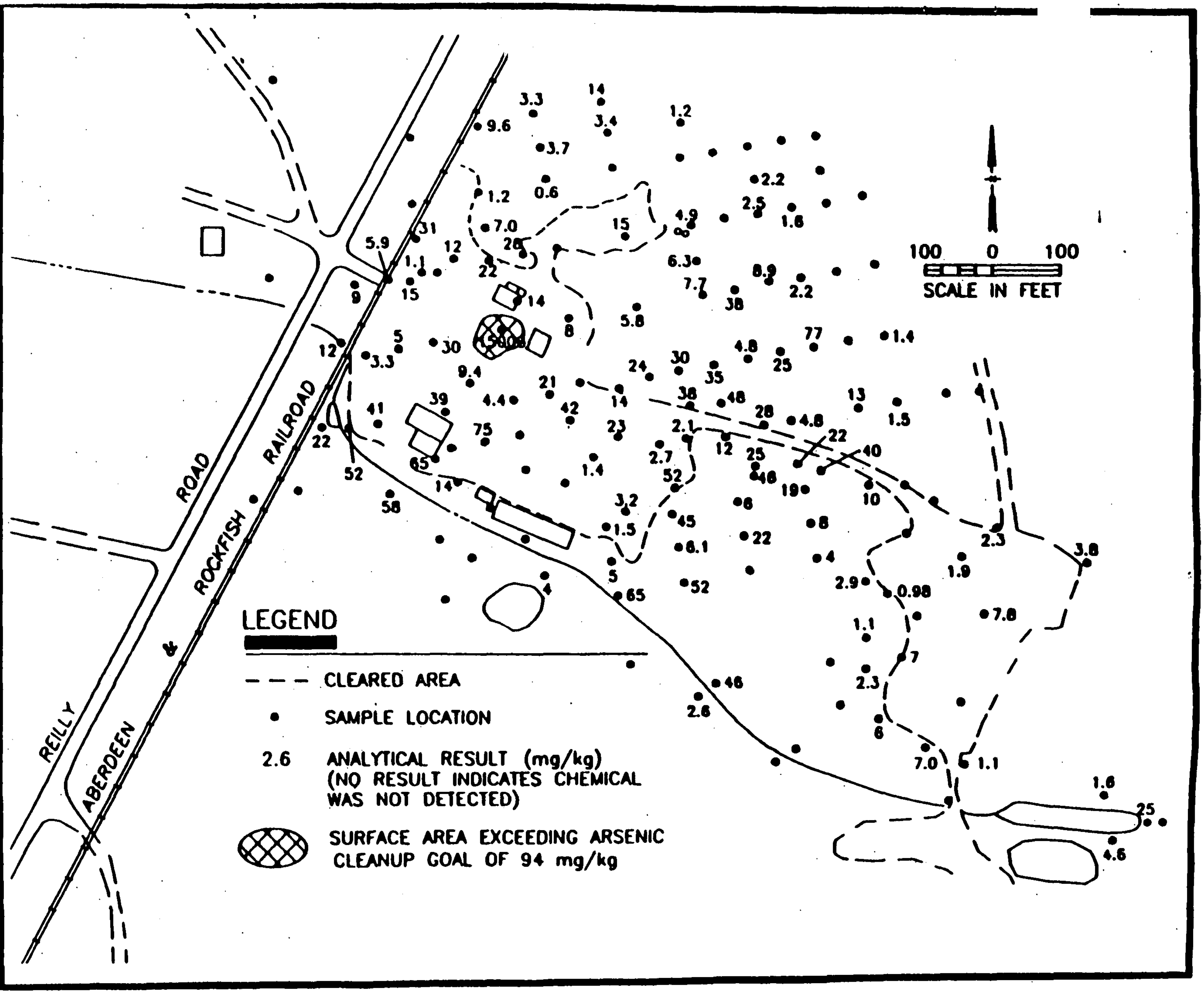
6

ARSENIC CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

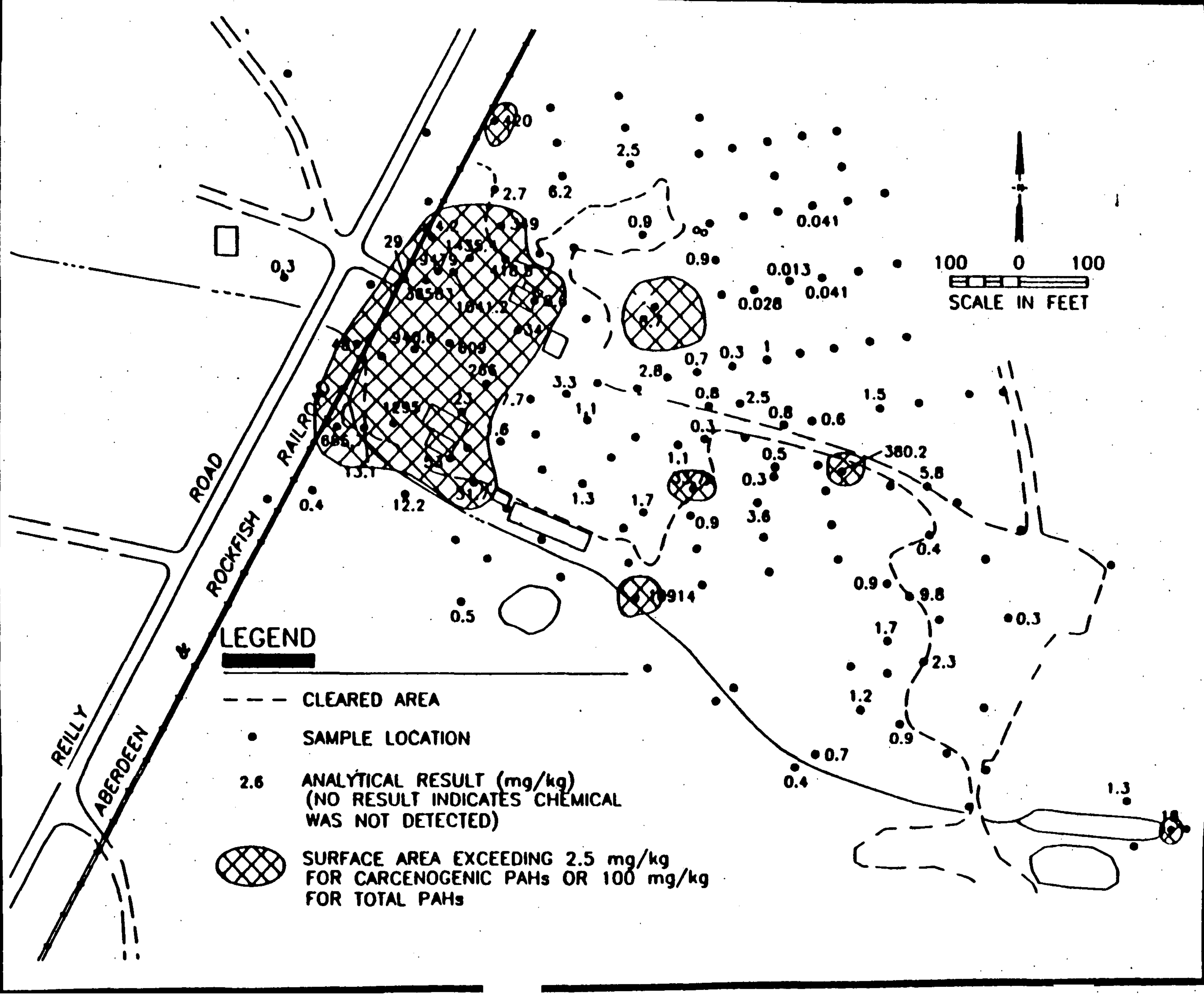
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 7



PAH CONCENTRATIONS EXCEEDING
CLEANUP GOALS IN SURFICIAL SOILS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.
8

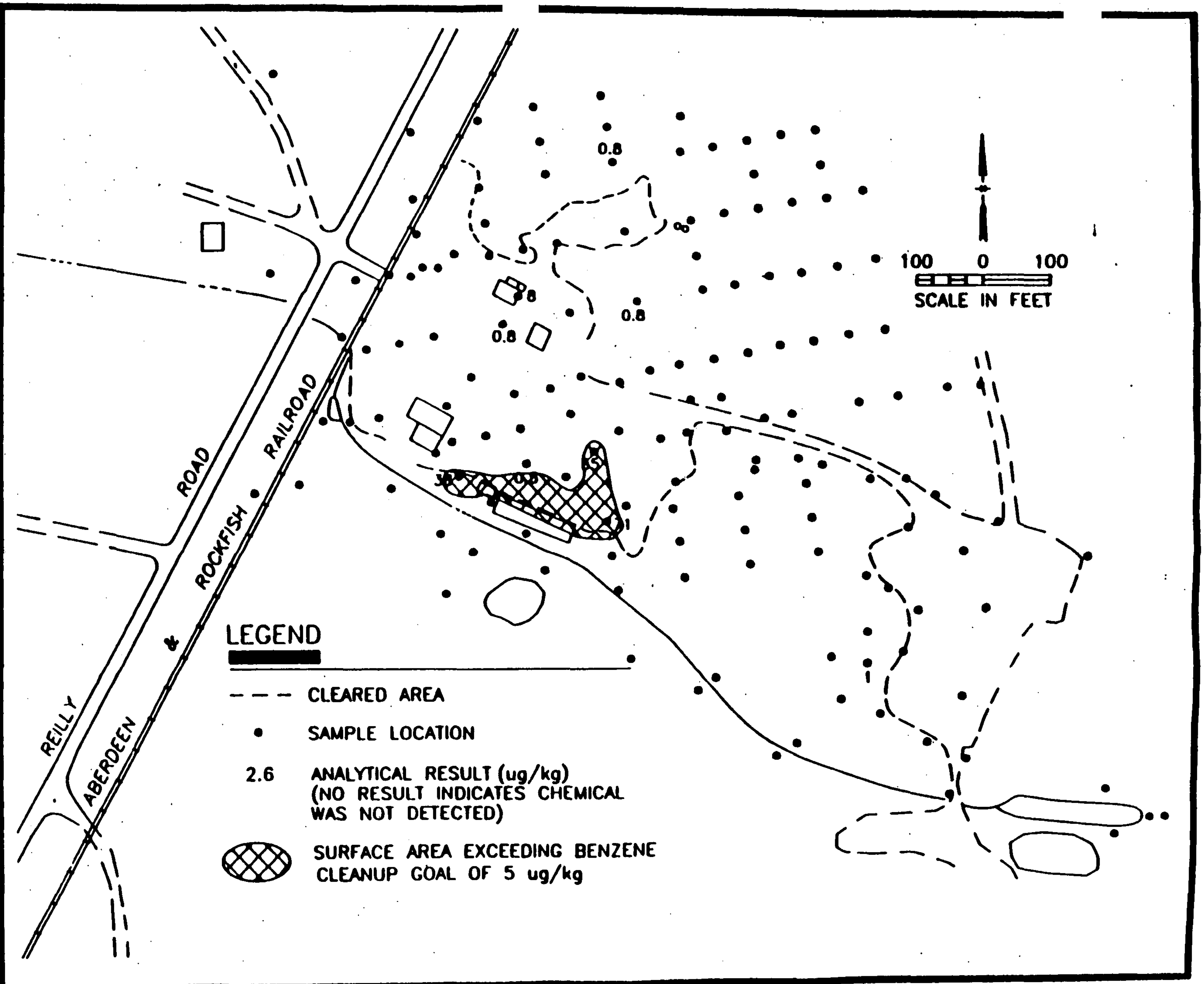


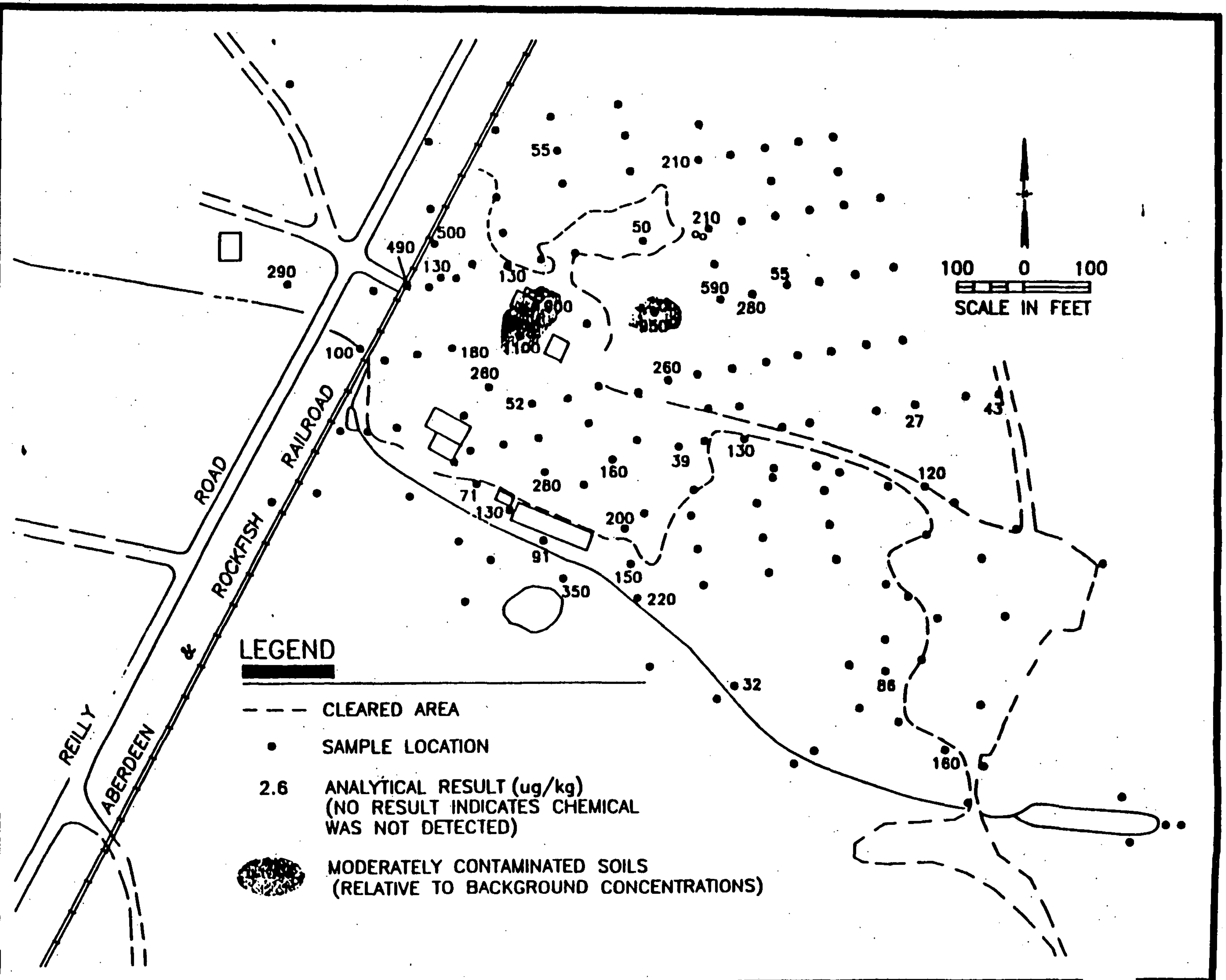
BENZENE CONCENTRATIONS EXCEEDING CLEANUP GOAL IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 9





TOLUENE CONCENTRATIONS IN SURFICIAL SOILS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE 10

HORIZONTAL EXTENT OF CONTAMINATION
EXCEEDING CLEANUP GOALS IN SURFICIAL SOILS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 11

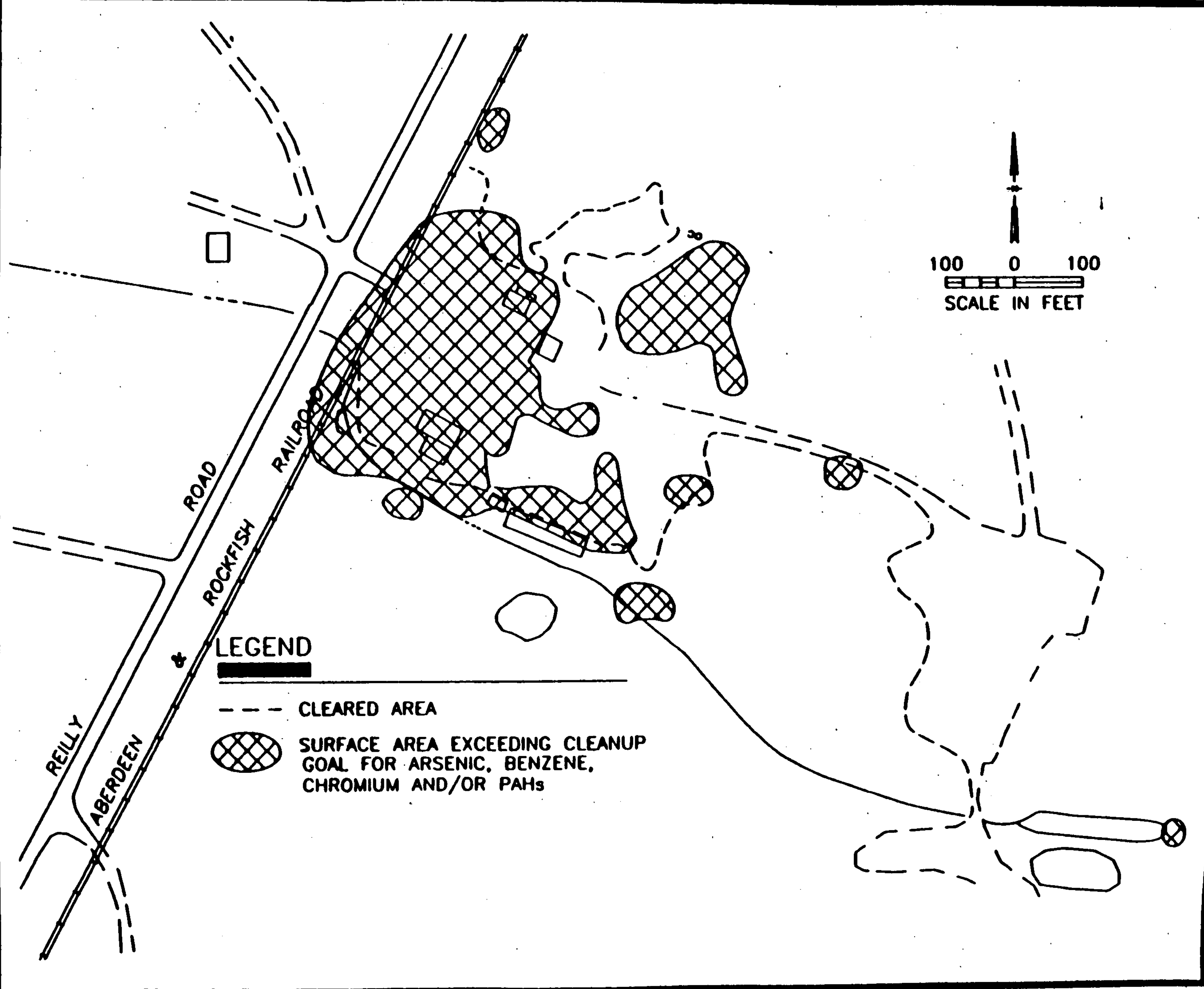


TABLE 2

COMPARISON OF 1-FOOT AND 5-FOOT SOIL SAMPLE RESULTS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
AA8-01	1	2.3	2.3	-	-	-	-
AA8-05	5	2.4	-	-	0.5	-	-
A4-01	1	18	4.8	9	-	-	-
A4-05	5	-	-	-	0.3	-	-
A6-01	1	110	27	41	1300	-	-
A6-05	5	8.6	-	-	1.6	-	-
A7-01	1	240	78	58	12	-	-
A7-05	5	120	32	54	0.52	-	-
B3-01	1	4.1	3.3	-	-	-	-
B3-05	5	7.1	-	-	2.0	-	-
B4-01	1	19	3.6	7.9	9500	130	-
B4-05	5	12	-	-	210	150	-
C2-01	1	11	4.8	9.6	420	-	-
C2-05	5	8.7	2.2	-	130	-	-
C4-01	1	67	13	22	420	130	-
C4-05	5	6.4	-	-	1000	-	-
C8-01	1	13	15	-	-	87	-
C8-05	5	-	-	-	-	-	-
D10-01	1	22	-	-	-	-	-
D10-05	5	-	-	-	-	-	-
E2-01	1	18	8	14	-	-	-
E2-05	5	7.1	2.4	-	-	-	-
G5-01	1	7.8	6.8	8.9	0.013	55	-
G5-05	5	4.5	-	-	-	-	-
SS3-01	1	230	20	130	8.6	900	8
SS3-05	5	240	6.5	180	2.3	-	-

TABLE 2
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
SS15-01	1	4.5	-	2.9	0.9	-	-
SS15-05	5	3.2	-	-	0.3	-	-
SS28-01	1	1.9	23	10	-	-	-
SS28-05	5	2.4	-	-	0.4	-	-
EXT21-01	1	5.2	-	1.2	-	-	-
EXT21-05	5	-	-	0.5	-	-	-
EXT22-01	1	3.2	-	-	-	-	-
EXT22-05	5	-	-	-	-	-	-
EXT27-01	1	9	8.8	77	-	4	-
EXT27-05	5	-	-	-	-	-	-
EXT29-01	1	3.6	6.4	1.5	-	27	-
EXT29-05	5	4.2	2.1	-	-	-	-
EXT31-01	1	8.2	7.7	8	-	-	-
EXT31-05	5	2.3	-	-	2.0	-	-
EXT34-01	1	26	7.7	5	-	150	-
EXT34-05	5	-	-	-	-	-	-
EXT41-01	1	-	-	-	-	-	-
EXT41-05	5	-	-	-	-	-	-
DD9-01	1	56	4.3	25	1.3	230	-
DD9-05	5	20	2.5	21	0.50	-	-

- = Not Detected

Results of the vertical extent of contamination analyses (borehole samples - Figure 12) indicate that although the surface is highly contaminated in several areas, the subsurface below two feet is generally uncontaminated. Indicator chemical analytical results for the borehole samples, including the background borehole, are provided in Table 3. The only significant contamination above background at depth is the PAH contamination found in BH-1 and BH-2. Moderate concentrations of PAHs were found down to a depth of approximately 23 feet in BH-1 and 46 feet in BH-2. BH-1 is located in the area of the creosote unloading zone, and BH-2 is located in the area of the creosote unit.

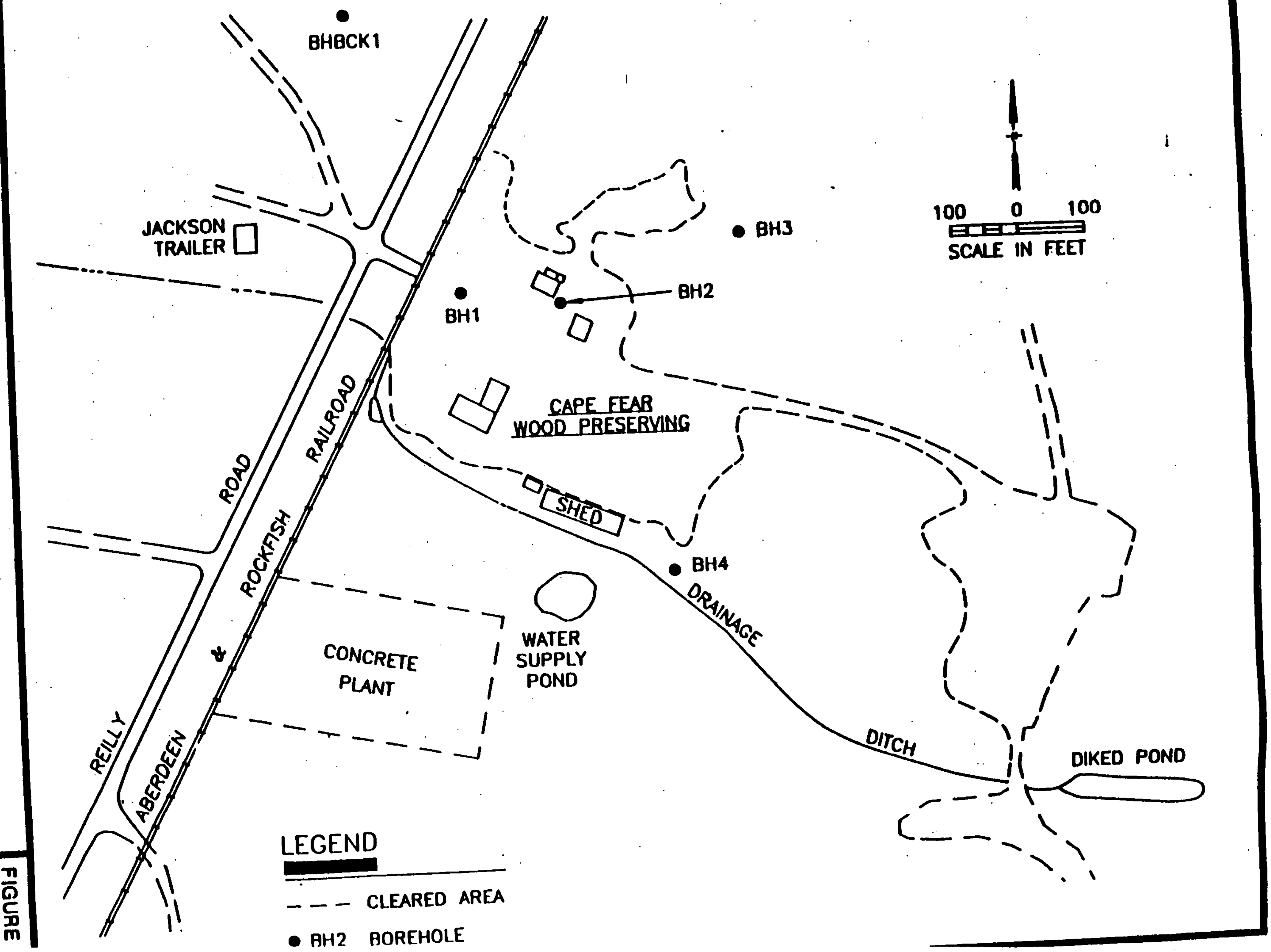
Since contaminated soils from the site were land farmed on property owned by Grace Parker, samples were collected here to insure that a health risk did not exist due these past disposal actions. The Grace Parker property analytical results for the chemicals of potential concern are shown in Table 4. As shown, the Grace Parker property has been contaminated with low levels of PAHs.

3.5 GROUNDWATER CONTAMINATION

Figure 13 locates the installed monitoring wells that provided the groundwater samples and Table 5 summarizes the concentrations of contaminants detected in groundwater that were identified as chemicals of potential concern in the Risk Assessment (Appendix C, Section 2.0 of the FS document). The complete analytical results can be seen in Appendix A of the RI Report.

In general, analyses of the groundwater samples indicate low-level contamination by a variety of inorganic and organic chemicals including several PAHs. The organic chemicals, however, are the only chemicals which indicate any kind of plume pattern or area of contamination which can be tied to the site. The inorganic chemicals do not show any kind of pattern and in most cases, higher concentrations are found off-site than on-site.

Figures 14 through 17 show the analytical results of total PAHs and total BTXs (benzene, toluene and xylene) in both the upper and lower aquifers. These contaminants are known to be site-related and for the most part are not naturally occurring and therefore, are good indicators of site induced contamination. In addition, because BTXs do not generally become tied up in the soil matrix, they are good indicators of the maximum extent of contamination. As can be seen in Figures 14 through 17, contaminant plumes have been identified in both aquifers based on the analytical results. The plume in the upper aquifer extends a few hundred feet in all directions around the wood preserving process area. The plume in the lower aquifer covers only a small protion of the process area and is located around well EW-01. The plume in this aquifer could be the result of contaminants migrating through the semi-confining unit, but is more likely due to poor construction of well EW-01 (an old industrial water supply well) providing the conduit for migration. Well EW-01 is screened in the lower part of the lower aquifer. If contaminants were migrating through the semi-confining unit to the depth of EW-01, a greater extent of contamination would be



BOREHOLE SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE 12

TABLE 3

BOREHOLE SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
BH1-S12	1	-	5	0.58	-	-	-
S13	3	12	-	-	0.6	-	-
S1	5	5.8	-	-	7.5	-	-
S2	7	5.4	-	-	0.3	-	-
S3	9	24	10	18	2.0	8	4
S4	11	12	-	-	280	-	-
S5	13	12	-	-	1.4	-	-
S6	15	10	-	-	0.3	-	-
S7	17	38	-	-	1.1	-	-
S8	19	8.5	-	-	0.7	-	-
S9	21	28	-	-	-	-	-
S10	23	14	-	-	8.2	-	-
S11	25	7.5	-	-	-	-	-
S14	31	27	-	-	-	-	-
S15	36	30	-	-	-	-	-
S16	41	10	-	-	-	-	-
S17	46	-	-	0.8	1.2	-	-
S18	51	10	2.6	0.6	-	-	-
S19	56	7.2	2.8	0.92	-	-	-
S20	61	-	2.4	-	-	-	-
S21	66	-	2.5	-	-	-	-
BH2-S1	1	214	32	16	0.3	-	-
S2	3	9.8	-	-	-	-	-
S3	5	8.2	2.3	-	-	-	-
S4	7	13	2.6	-	210	-	-
S5	9	11	2.8	-	670	-	-
S6	11	8.4	-	-	22	-	-
S7	13	4.2	7	2	4.0	-	-
S8	15	5.2	-	-	0.5	-	-
S9	17	9	-	-	6.9	300	17
S10	19	5.4	-	-	2.1	-	-
S11	26	25	-	-	20.1	-	-
S12	31	20	2.4	-	6.5	-	-
S13	36	8.5	2.6	-	0.7	-	-
S14	41	6.9	2.7	-	13.6	-	-
S15	46	9.6	8.2	4.7	8.2	70	-
S16	51	5.5	23	-	0.096	-	-

TABLE 3
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
S17	56	6.8	11	-	-	-	-
S18	61	-	2.6	-	-	-	-
S19	66	-	10	-	-	-	-
BH3-S1	1	-	-	1.1	-	-	-
S2	3	5.2	-	0.68	-	-	-
S3	5	-	-	0.62	0.6	-	-
S4	7	14	2.5	7.7	-	36	-
S5	9	16	2.9	0.55	-	-	-
S6	11	15	-	0.75	0.3	-	-
S7	13	13	-	-	-	-	-
S8	15	13	-	0.58	-	-	-
S9	17	12	-	-	0.3	-	-
S10	19	10	-	-	0.8	-	-
S11	24	-	-	-	-	-	-
S12	29	17	2.3	-	-	10	-
S13	31	32	-	-	-	-	-
S14	33	6.5	-	-	-	-	-
S15	35	-	-	-	-	-	-
S16	39	8.9	-	-	-	-	-
S17	44	4.6	2.9	-	-	-	-
S18	49	-	-	2.5	0.3	-	-
S19	54	4.8	2.6	-	0.3	-	-
S20	59	7.6	8.8	1.8	-	-	-
BH4-S2	3	-	-	1.4	-	-	-
S3	5	6	-	-	-	-	-
S4	7	6.8	2.8	-	-	-	-
S5	9	6.3	-	-	1.8	-	-
S6	11	-	-	-	-	-	-
S7	13	-	-	-	-	-	-
S8	15	-	-	-	-	-	-
S9	17	-	-	-	0.3	-	-
S10	19	-	-	-	-	-	-
S11	21	-	-	-	-	-	-
S12	23	-	-	-	-	-	-
S13	25	-	-	-	NA	-	-
S15	29	-	-	-	NA	-	-
S16	36	20	2.9	-	NA	-	-
S17	41	-	-	-	NA	-	-
S18	46	5.4	-	-	NA	-	-
S19	51	10	-	-	NA	-	-

TABLE 3
(Continued)

Sample	Approximate Depth (ft)	Chromium (mg/kg)	Copper (mg/kg)	Arsenic (mg/kg)	Total PAHs (mg/kg)	Toluene (ug/kg)	Benzene (ug/kg)
S20	56	15	3.1	4.2	-	25	-
S21	61	2.8	-	-	-	-	-
BHBCK1-S1	1	11	-	9.1	-	6	-
S3	5	-	-	-	-	-	-
S5	9	-	-	-	-	-	-
S8	15	4.9	-	-	-	110	-
S11	21	17	-	-	-	-	-
S13	25	5.5	-	-	-	38	-
S17	33	88	3	1.6	-	66	-
S20	39	-	-	-	-	-	-
S23	45	9.6	-	8.5	-	12	-
S24	47	-	-	0.7	-	-	-
S30	59	2.8	-	-	-	-	-

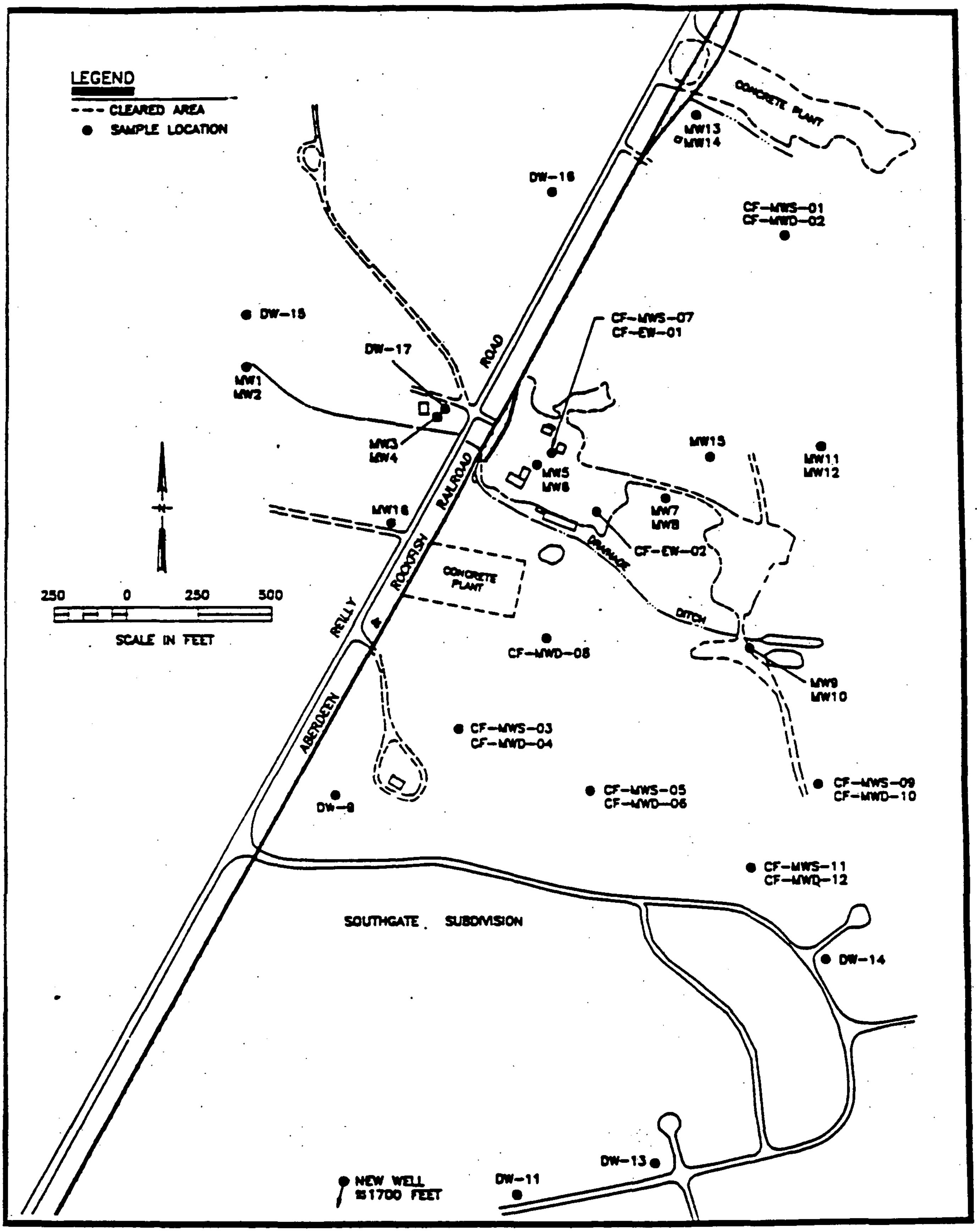
\- = Not detected
NA = Not analyzed

TABLE 4

GRACE PARKER PROPERTY SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	GP-1	GP-2	GP-3	GP-4
Inorganic Chemicals (mg/kg)				
Aluminum	2100	NA	NA	NA
Arsenic	-	-	-	-
Barium	8.5	NA	NA	NA
Chromium	4.1	-	2.2	2.1
Copper	2	6	4.4	6.3
Iron	1400	NA	NA	NA
Lead	-	NA	NA	NA
Magnesium	250	NA	NA	NA
Organic Chemicals (ug/kg)				
Benzene	-	-	53	-
Toluene	150	-	-	-
PAHs (mg/kg)				
Acenaphthene	-	-	-	-
Acenaphthylene	0.042	-	-	-
Anthracene	0.10	-	-	-
Benzo (a) anthracene	0.14	-	-	-
Benzo (b and/or k) fluoranthene	1.3	-	-	1.1
Benzo (g,h,i) perylene	0.19	-	-	-
Benzo (a) pyrene	0.44	-	-	0.3
Chrysene	0.20	-	-	-
Dibenzo (a,h) anthracene	0.068	-	-	-
Fluoranthene	0.12	-	-	0.3
Fluorene	-	-	-	0.8
Indeno (1,2,3-cd) pyrene	.35	-	-	-
Naphthalene	-	-	-	-
Phenanthrene	-	-	-	-
Pyrene	0.20	-	-	1.8
Total PAHs	3.2	-	-	4.3

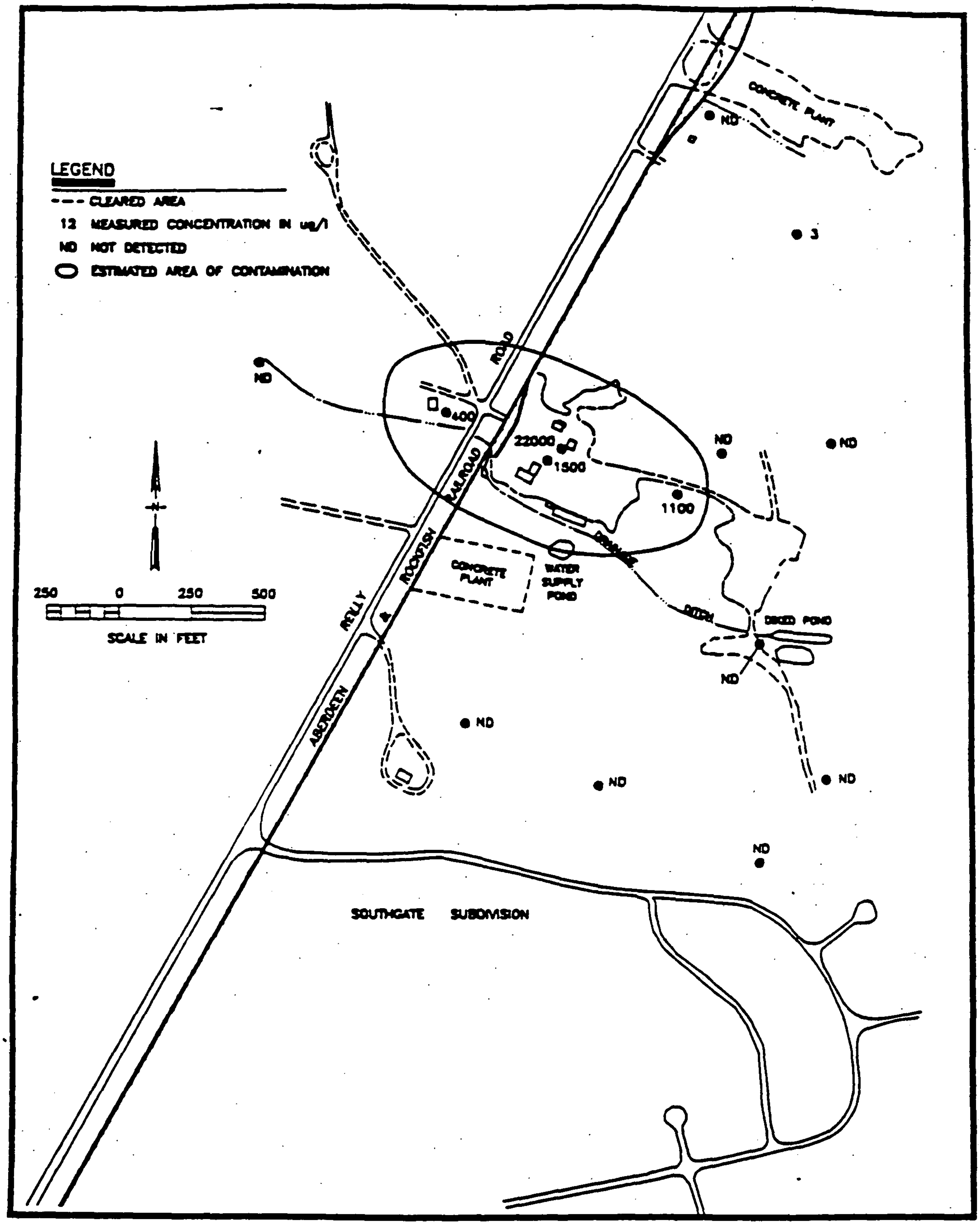
\- = Not detected
NA = Not analyzed



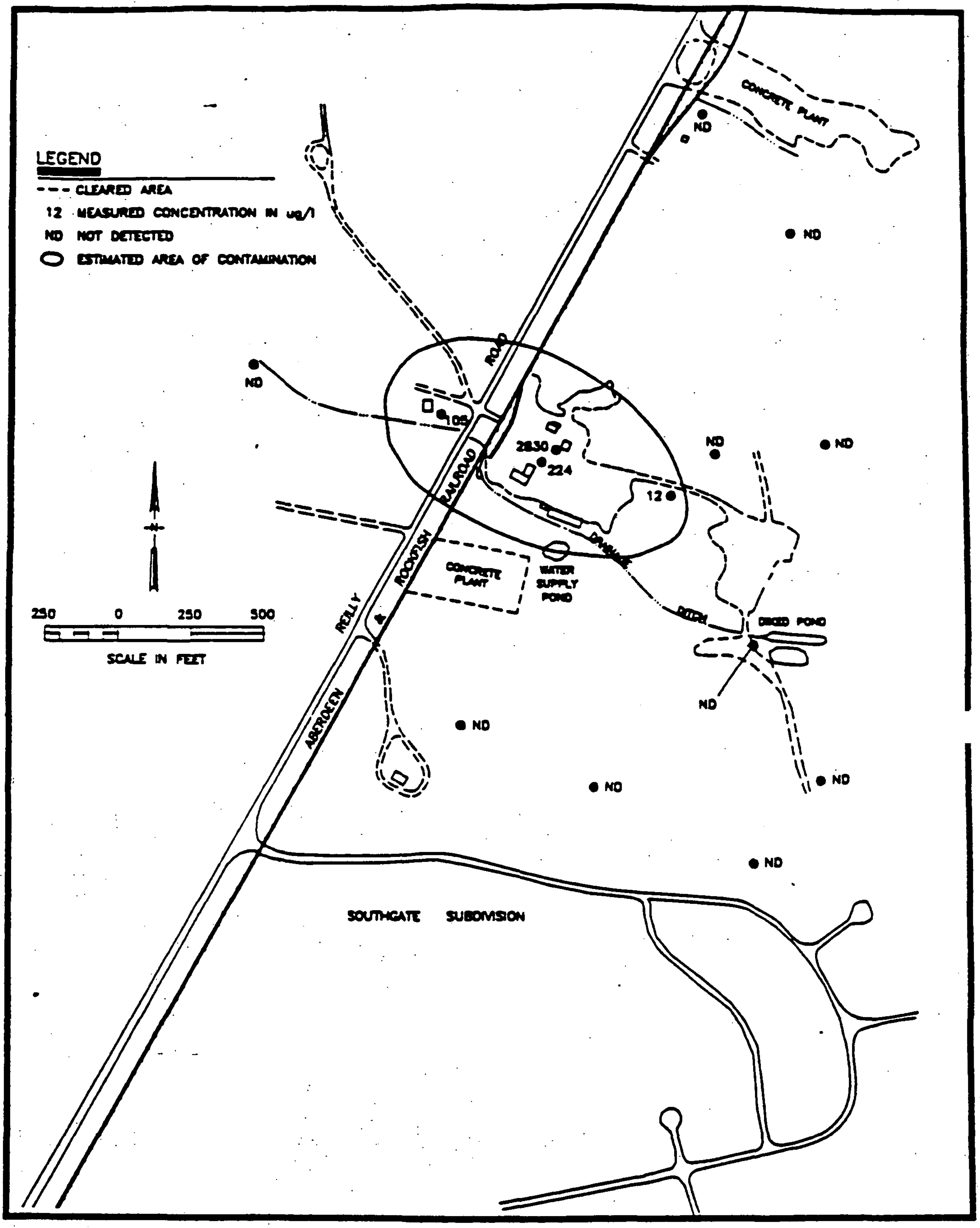
GROUND WATER SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

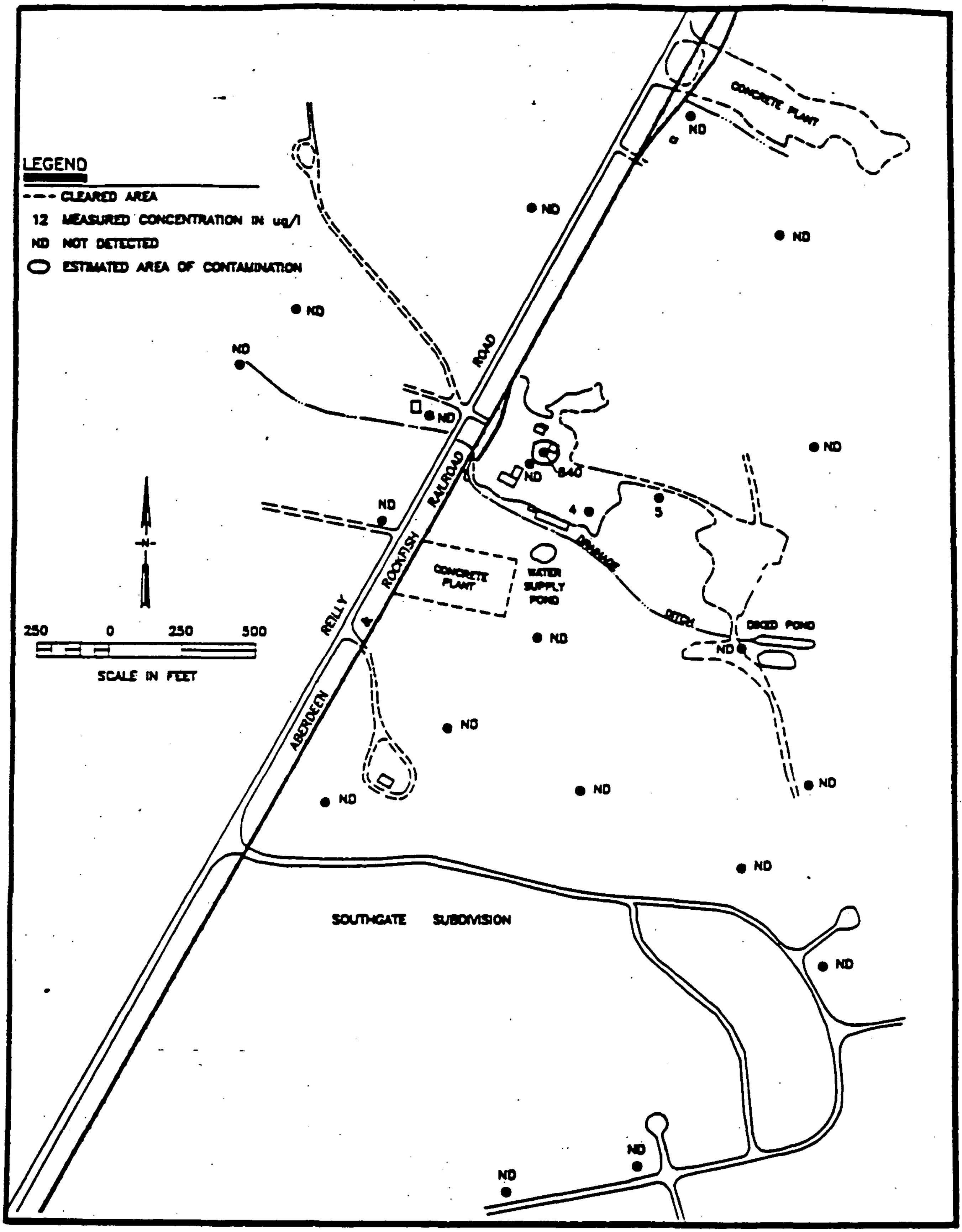
FIGURE NO. 13.



TOTAL PAH CONCENTRATIONS IN UPPER AQUIFER	FIGURE NO. 14
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	



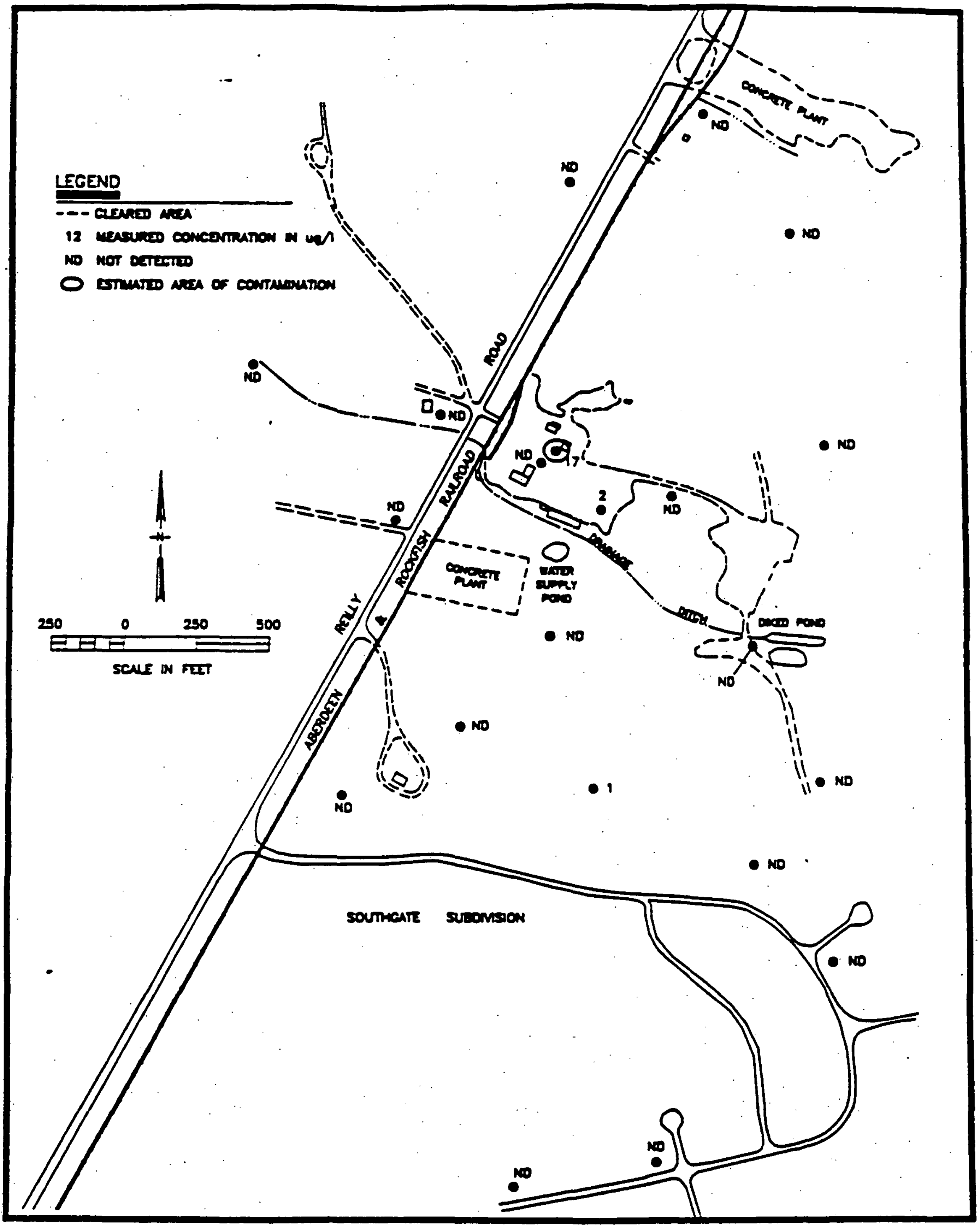
TOTAL BTX CONCENTRATIONS IN UPPER AQUIFER	FIGURE NO. 15
CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA	



TOTAL PAH CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 16



TOTAL BTX CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO. 17

expected in the groundwater, at least out to MW-6. Since MW-6 is located downgradient of EW-01 and in the middle of the processing area with the screen in the upper part of the lower aquifer, if contamination was migrating through the semi-confining layer, then it would be seen in MW-6.

The plume in the upper aquifer is consistent with the results of the hydrogeological analysis. The plume in the lower aquifer, however, is not consistent with the hydrogeologic analysis results. Contaminants do not appear to be migrating through the semi-confining unit into the lower aquifer indicating that contaminants are probably not moving vertically as groundwater moves. Retardation and/or decay processes in the upper aquifer and semi-confining unit have most likely kept the contaminants from entering the lower aquifer, to any significant degree.

Figures 18 through 21 show the analytical results for chromium and arsenic in both the upper and lower aquifers. These contaminants are also known to be site-related and therefore could be indicators of site induced contamination. As can be seen in Figures 18 through 21, however, the analytical results for these inorganic chemicals do not show any kind of plume pattern which can tie the inorganic contamination to the site.

The inorganic contamination found in the study area likely exists for one of two reasons:

* Naturally occurring conditions or

* Small, local sources of contamination.

All the inorganic chemicals listed in Table 5 are naturally occurring in the soils of the study area, and given the low pH of groundwater, most of the concentrations measured for these chemicals are probably within the natural variation of concentrations expected. This is especially true considering that the samples are not filtered before being analyzed. Three wells, however, appear to have an unusually high concentration of one particular element. These wells include MWS-1, MWS-9 and DW-14 which are far from the site. Both wells MWS-1 and MWS-9 have unusually high concentrations of chromium, while well DW-14 has an unusually high copper concentration. These wells have not exhibited any contamination in the past.

Of the five wells sampled and analyzed for hexavalent chromium (Cr^{+6}), only one showed evidence of Cr^{+6}. Well EW-02 had a concentration of 16 ug/l. The other four were below detection limits.

3.6 SURFACE WATER AND SEDIMENT

The concentrations of contaminants detected in surface water and sediment samples (sampling locations shown in Figure 22) are summarized in Tables 6 and 7, respectively. The tables present the analytical results for those chemicals identified as chemicals of potential concern in Section 2.0 of the Risk Assessment (Appendix C, Section 2.0 of the FS document). The complete analytical results can be seen in Appendix A of the RI Report).

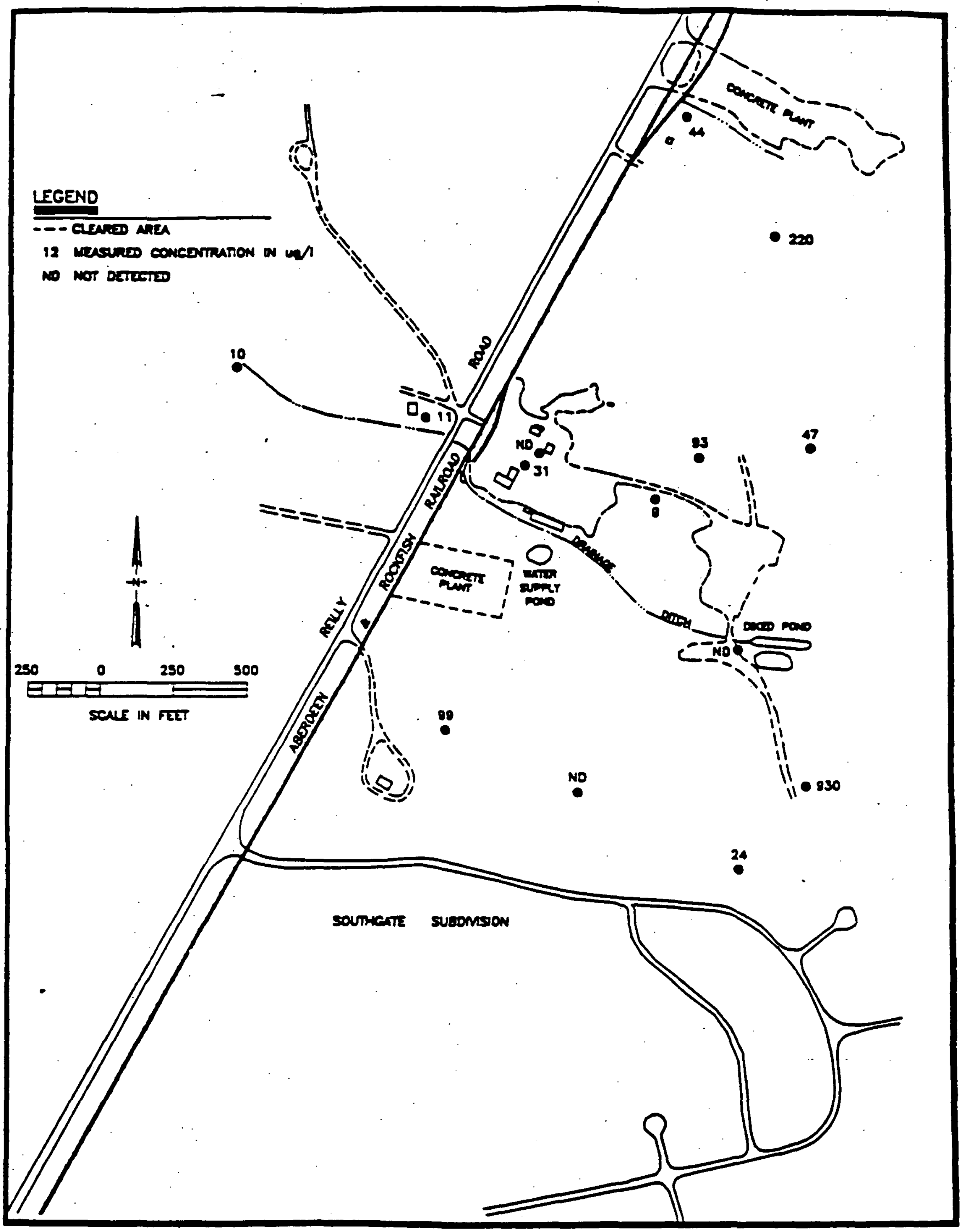
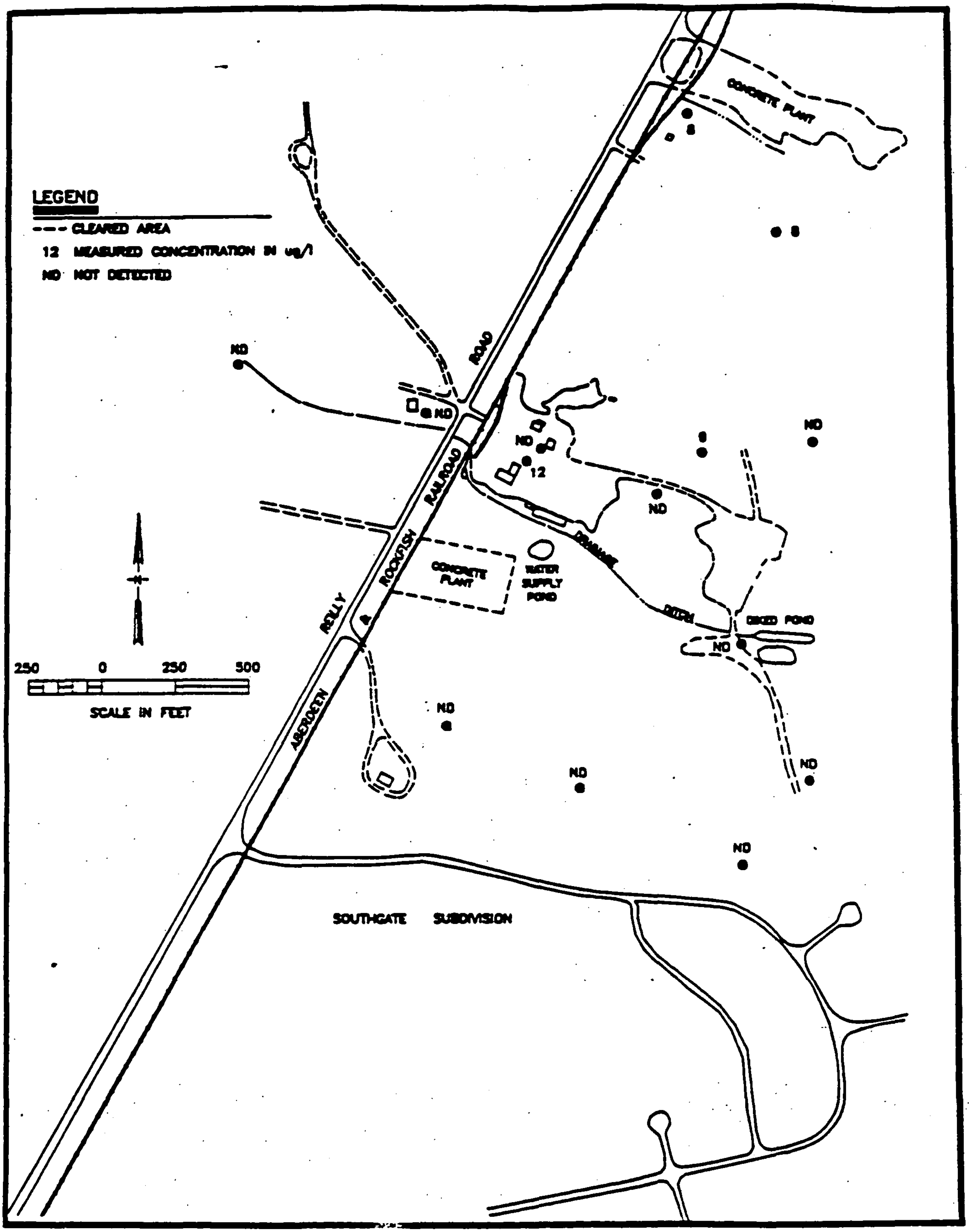


FIGURE NO. 18

CHROMIUM CONCENTRATIONS IN UPPER AQUIFER

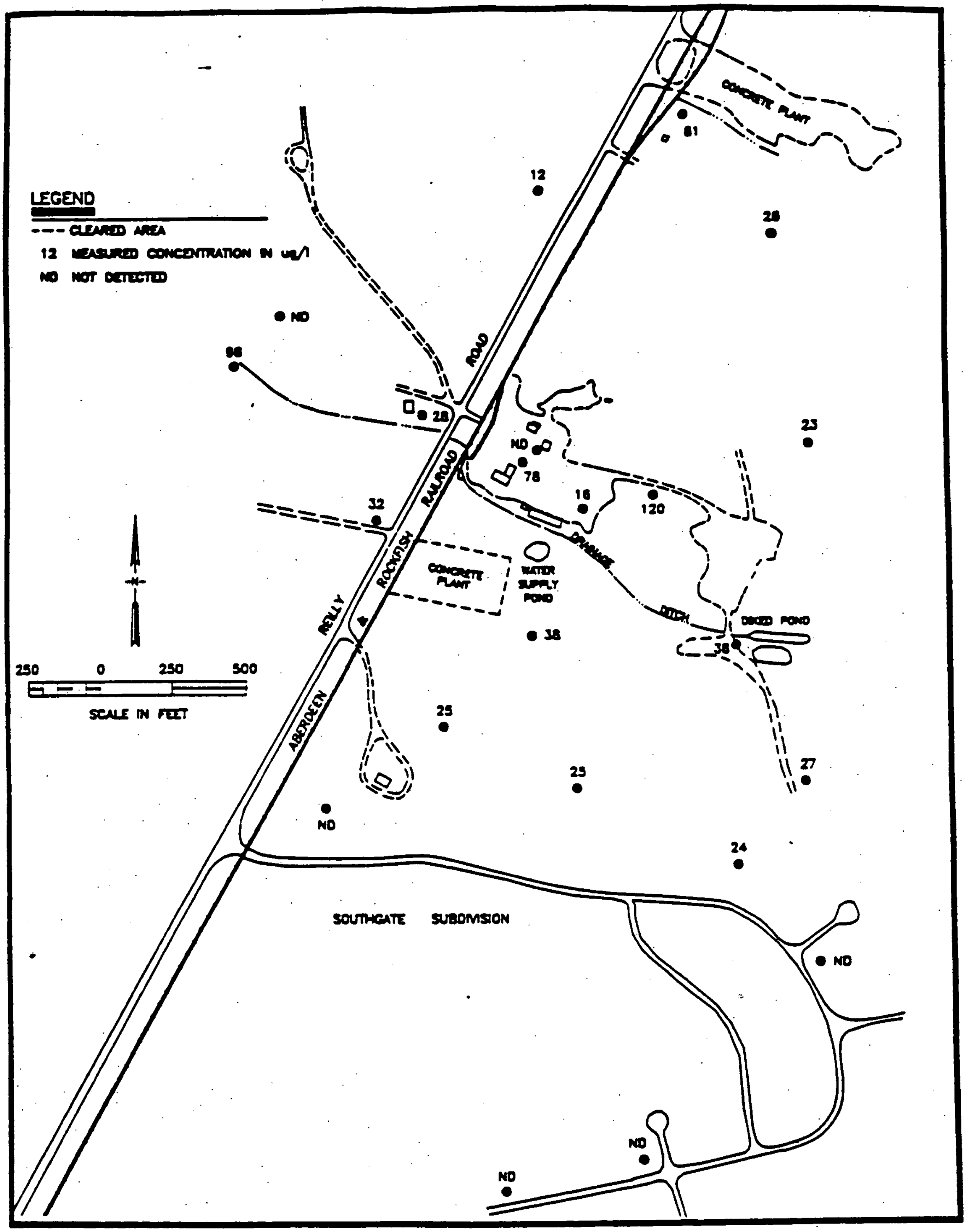
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA



ARSENIC CONCENTRATIONS IN UPPER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.
19



CHROMIUM CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

FIGURE NO
20

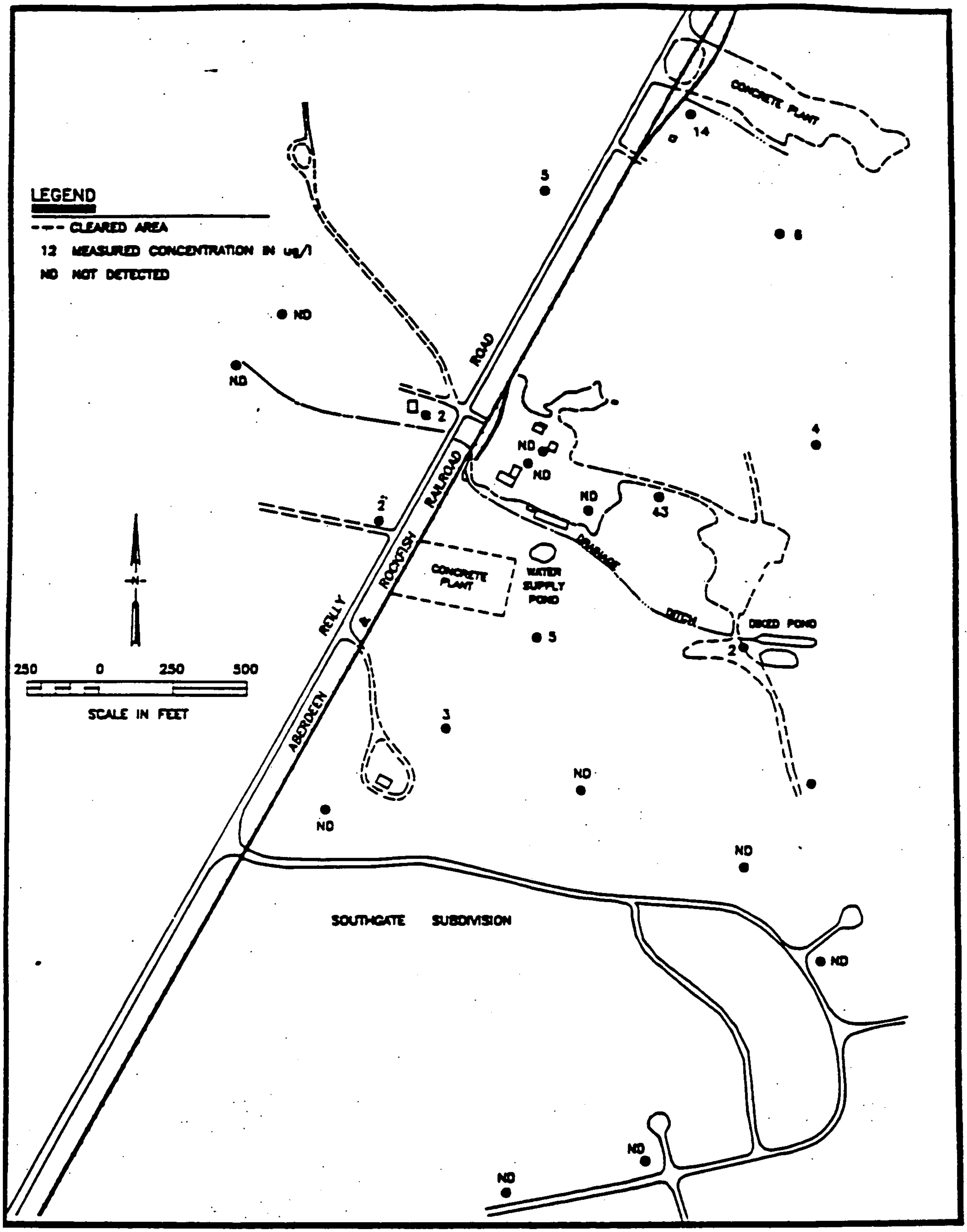


FIGURE NO. 21

ARSENIC CONCENTRATIONS IN LOWER AQUIFER

CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

TABLE 5

GROUND WATER SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	ARARs[1] MCL[2]	Other Guidance MCLG[3]	MW-1 2/10/88	MW-2 2/7/88	MW-3 2/10/88	MW-4 2/24/88	MW-5 2/10/88	MW-6 2/12/88	MW-7 2/10/88	MW-8 2/25/88	MW-9 2/10/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	NA	1800J	33000	1300J	3600J	3500J	1200J	1700J	31000J	2900J
Arsenic	50	50(P)	-	-	-	2	12JN	-	-	43	-
Barium	1000	1500(P)	-	220	-	56	-	-	-	210	-
Chromium	50	120(P)	10J	98	11J	28JN	31J	78J	9J	120JN	-
Copper	1000(S)	1300(P)	17J	26	19J	11	65J	170J	-	64	44J
Cyanide	NA	NA	-	-	-	-	40J	-	-	-	-
Iron	300(S)	NA	340J	24000	3100J	5400	2600J	5100J	12000J	63000J	980J
Lead	50	20(P)	-	22	-	-	-	-	-	42	-
Magnesium	NA	NA	640	4200	960	970	1100	800	520	2900	1100
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	35	-	24	-	-	-	-
2,4-Dimethylphenol	NA	NA	-	-	140	-	-	-	5J	-	-
Ethylbenzene	NA	680(P)	-	-	24	-	40	-	11	-	-
Styrene	NA	140(P)	-	-	2J	-	7	-	-	-	-
Toluene	NA	2000(P)	-	-	20	-	50	-	-	-	-
1,1,1-Trichloroethane	200	200	-	2J	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	50	-	150	-	12J	-	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	120	-	46	-	200	-	-
Acenaphthylene	NA	NA	-	-	7J	-	-	-	13	-	-
Anthracene	NA	NA	-	-	-	-	-	-	160	2J	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	5J	-	-
Chrysene	NA	NA	-	-	-	-	-	-	7J	-	-
Dibenzofuran	NA	NA	-	-	82	-	40	-	140	-	-
Fluoranthene	NA	NA	-	-	-	-	4J	-	50	-	-
Fluorene	NA	NA	-	-	35	-	9J	-	170	-	-
2-Methylnaphthalene	NA	NA	-	-	98	-	180	-	140	-	-
Naphthalene	NA	NA	-	-	38	-	1200	-	9J	-	-
Phenanthrene	NA	NA	-	-	24	-	24	-	160	3J	-
Pyrene	NA	NA	-	-	-	-	2J	-	41	-	-
Total PAHs	NA	NA	-	-	400	-	1500	-	1100	5	-

TABLE 5
(Continued)

	ARARs[1]	Other Guidance	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-15D*	MW-16	EW-01
	MCL[2]	MCLG[3]	2/23/88	2/12/88	2/24/88	2/10/88	2/25/88	2/10/88	2/10/88	2/24/88	2/10/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	NA	8400J	6000J	8000J	12000J	13000J	39000J	24000J	4000J	-
Arsenic	50	50(P)	2	-	4	8JN	14	-	9JN	2	-
Barium	1000	1500(P)	116	-	84	-	100	-	-	89	-
Chromium	50	120(P)	38JN	47J	23JN	44J	81JN	93J	59J	32JN	-
Copper	1000(S)	1300(P)	12	38J	14	33J	44	36J	32J	20	13J
Cyanide	NA	NA	-	-	-	-	-	30J	90J	-	-
Iron	300(S)	NA	11000J	9300J	21000J	16,000J	23000J	16000J	11000J	11000J	17000J
Lead	50	20(P)	-	-	-	-	40	-	-	-	-
Magnesium	NA	NA	1000	920	1600	1000	1500	1400	1100	690	510
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	-	-	-	-	-	-	2J
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	-	13
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	-	6
Styrene	NA	140(P)	-	-	-	-	-	-	-	-	-
Toluene	NA	2000(P)	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	200	200	-	-	-	-	11	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	-	15J
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	-	33
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	-	-
Anthracene	NA	NA	-	-	-	-	-	-	-	-	3J
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	2J
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	-	18
Fluoranthene	NA	NA	-	-	-	-	-	-	-	-	12
Fluorene	NA	NA	-	-	-	-	-	-	-	-	19
2-Methylnaphthalene	NA	NA	-	-	-	-	-	-	-	-	37
Naphthalene	NA	NA	-	-	-	-	-	-	-	-	680
Phenanthrene	NA	NA	-	-	-	-	-	-	-	-	23
Pyrene	NA	NA	-	-	-	-	-	-	-	-	11
Total PAHs	NA	NA	-	-	-	-	-	-	-	-	840

TABLE 5
(Continued)

	ARARs[1] MCL[2]	Other Guidance MCLG[3]	EW-02 2/12/88	MWS-1 2/8/88	MWD-2 2/8/88	MWS-3 2/9/88	MWD-4 2/24/88	MWS-5 2/9/88	MWD-6 2/8/88	MWS-7 2/9/88	MWD-8 2/23/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	NA	-	29000J	4200J	24000J	3000J	650J	4600J	1100J	1900J
Arsenic	50	50(P)	-	8JN	6JN	-	3	-	-	-	5
Barium	1000	1500(P)	-	-	-	-	51	-	-	-	62
Chromium	50	120(P)	16J	220J	26J	99J	25JN	-	25J	-	38JN
Copper	1000(S)	1300(P)	68J	50J	24J	38J	16	16J	28J	26J	20
Cyanide	NA	NA	-	120J	170J	120J	-	10J	30J	-	-
Iron	300(S)	NA	40000J	9000J	1400J	24000J	6200J	380J	10000J	6100J	18000J
Lead	50	20(P)	-	-	-	-	-	-	-	-	-
Magnesium	NA	NA	690	1900	1000	520	550	-	780	-	570
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	-	-	-	-	-	530J	-
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	120	-
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	760J	-
Styrene	NA	140(P)	-	-	-	-	-	-	-	550JN	-
Toluene	NA	2000(P)	2J	-	-	-	-	-	1J	-	-
1,1,1-Trichloroethane	200	200	-	-	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	2300J	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	350J	-
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	23	-
Anthracene	NA	NA	-	-	-	-	-	-	-	61	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	9J	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	-
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	200	-
Fluoranthene	NA	NA	-	-	-	-	-	-	-	70	-
Fluorene	NA	NA	-	-	-	-	-	-	-	200	-
2-Methylnaphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Naphthalene	NA	NA	4J	3J	-	-	-	-	-	21000	-
Phenanthrene	NA	NA	-	-	-	-	-	-	-	180	-
Pyrene	NA	NA	-	-	-	-	-	-	-	-	-
Total PAHs	NA	NA	4	3	-	-	-	-	-	22000	-

TABLE 5
(Continued)

	ARARs[1] MCL[2]	Other Guidance MCLG[3]	MWS-9 2/8/88	MWD-10 2/8/88	MWS-11 2/9/88	MWD-12 2/12/88	DW-9 2/9/88	DW-11 2/9/88	DW-13 2/9/88	DW-14 2/9/88	DW-15 2/9/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	NA	12000J	210J	5700J	1300J	-	-	130J	200J	-
Arsenic	50	50(P)	-	-	-	-	-	-	-	-	-
Barium	1000	1500(P)	-	-	-	-	-	-	-	-	-
Chromium	50	120(P)	930J	27J	24J	24J	-	-	-	-	-
Copper	1000(S)	1300(P)	67J	20J	46J	41J	16J	24J	31J	330J	24J
Cyanide	NA	NA	-	10J	-	-	-	-	-	10J	10J
Iron	300(S)	NA	190J	640J	1900J	1900J	-	-	-	300J	1200J
Lead	50	20(P)	-	-	-	-	-	-	-	-	-
Magnesium	NA	NA	520	390	500	440	-	930	750	620	490
Organic Chemicals (ug/l)											
Benzene	5	0	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	NA	NA	-	-	-	-	-	-	-	-	-
Ethylbenzene	NA	680(P)	-	-	-	-	-	-	-	-	-
Styrene	NA	140(P)	-	-	-	-	-	-	-	-	-
Toluene	NA	2000(P)	-	-	-	-	-	-	-	4J	-
1,1,1-Trichloroethane	200	200	-	-	-	-	-	-	-	-	-
Xylenes	NA	440(P)	-	-	-	-	-	-	-	-	-
PAHs (ug/l)											
Acenaphthene	NA	NA	-	-	-	-	-	-	-	-	-
Acenaphthylene	NA	NA	-	-	-	-	-	-	-	-	-
Anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	NA	NA	-	-	-	-	-	-	-	-	-
Chrysene	NA	NA	-	-	-	-	-	-	-	-	-
Dibenzofuran	NA	NA	-	-	-	-	-	-	-	-	-
Fluoranthene	NA	NA	-	-	-	-	-	-	-	-	-
Fluorene	NA	NA	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Naphthalene	NA	NA	-	-	-	-	-	-	-	-	-
Phenanthrene	NA	NA	-	-	-	-	-	-	-	-	-
Pyrene	NA	NA	-	-	-	-	-	-	-	-	-
Total PAHs	NA	NA	-	-	-	-	-	-	-	-	-

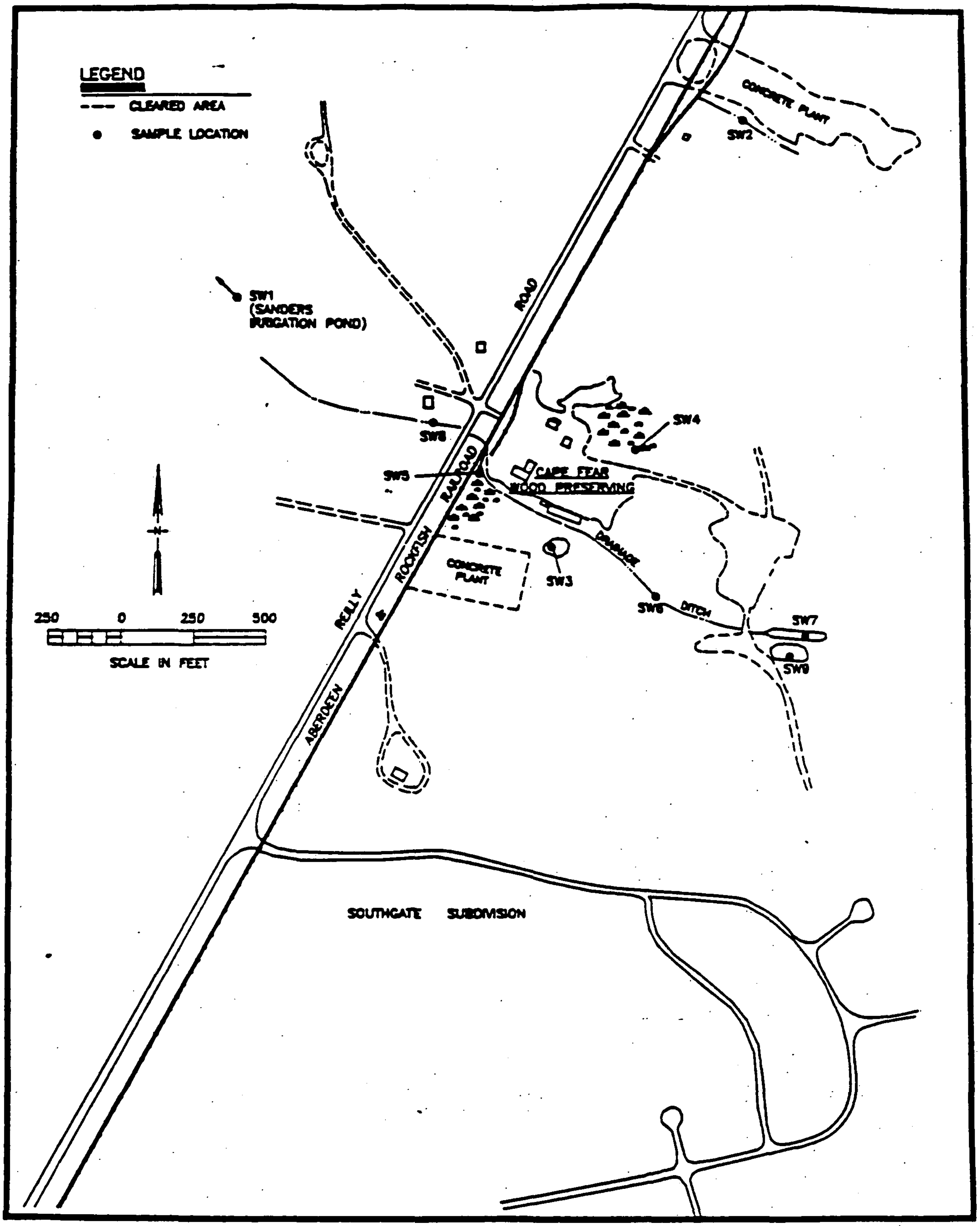
TABLE 5
(Continued)

	ARARs[1] MCL[2]	Other Guidance MCLG[3]	DW-16 2/25/88	DW-16D* 2/25/88	New Well 2/9/88
Inorganic Chemicals (ug/l)					
Aluminum	NA	NA	–	–	–
Arsenic	50	50(P)	–	5	–
Barium	1000	1500(P)	–	–	–
Chromium	50	120(P)	11J	12J	–
Copper	1000(S)	1300(P)	39J	37J	16J
Cyanide	NA	NA	–	–	–
Iron	300(S)	NA	15000J	22000J	–
Lead	50	20(P)	–	–	–
Magnesium	NA	NA	4600	4700	640
Organic Chemicals (ug/l)					
Benzene	5	0	–	–	–
2,4-Dimethylphenol	NA	NA	–	–	R
Ethylbenzene	NA	680(P)	–	–	R
Styrene	NA	140(P)	–	–	R
Toluene	NA	2000(P)	–	–	R
1,1,1-Trichloroethane	200	200	–	–	–
Xylenes	NA	440(P)	–	–	R
PAHs (ug/l)					
Acenaphthene	NA	NA	–	–	–
Acenaphthylene	NA	NA	–	–	–
Anthracene	NA	NA	–	–	–
Benzo (a) anthracene	NA	NA	–	–	–
Chrysene	NA	NA	–	–	–
Dibenzofuran	NA	NA	–	–	–
Fluoranthene	NA	NA	–	–	–
Fluorene	NA	NA	–	–	–
2-Methylnaphthalene	NA	NA	–	–	–
Naphthalene	NA	NA	–	–	–
Phenanthrene	NA	NA	–	–	–
Pyrene	NA	NA	–	–	–
Total PAHs	NA	NA	–	–	–

1 Applicable or Relevant and Appropriate Requirements (see Risk Assessment)
2 Federal Maximum Contaminant Level (see Risk Assessment)
3 Federal Maximum Contaminant Level Goal (see Risk Assessment)
NA = Not Available; criterion has not been developed for this chemical.
(P) = Proposed
(S) = Secondary MCL based on taste and odor

Concentration Footnotes

– = The compound was analyzed for but not detected.
J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not confirmed.
R = Data rejected and are totally unusable.
JN = The identification is tentative and the value is estimated.
* = Duplicate Sample.



SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

CAPE FEAR WOOD PRESERVING SITE

FAYETTEVILLE, NORTH CAROLINA

FIGURE NO.

22

TABLE 6

SURFACE WATER SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	ARARs[1]	SW-1 2/7/88	SW-2 2/7/88	SW-3 2/7/88	SW-4 2/7/88	SW-5 2/7/88	SW-5D* 2/7/88	SW-6 2/7/88	SW-7 2/7/88	SW-8 2/7/88	SW-9 2/7/88
Inorganic Chemicals (ug/l)											
Aluminum	NA	-	500J	410J	700J	4,200J	990J	1,000J	950J	930J	800J
Arsenic	50	-	-	-	390	170JN	170	310	210	-	-
Chromium	50	-	-	-	67J	94J	43J	55J	39J	-	59J
Copper	15	14J	21J	150J	160J	79J	57J	70J	42J	20J	22J
Iron	1,000	130J	2,400J	1,200J	340J	4,600J	1,200J	2,600J	2,100J	610J	180J
PAHs (ug/l)											
Anthracene	NA	-	-	-	-	28J	-	-	-	-	-
Benzo(a)anthracene	NA	-	-	-	-	1J	-	-	-	-	-
Chrysene	NA	-	-	-	-	3J	-	-	-	-	-
Fluoranthene	NA	-	-	-	-	1J	-	-	-	-	-
Pyrene	NA	-	-	-	-	3J	-	-	-	-	-
Total PAHs	NA	-	-	-	-	36	-	-	-	-	-

[1] - Applicable or Relevant and Appropriate Requirements (see Risk Assessment).

Footnotes

- \- = The compound was analyzed for but not detected.
- J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
- N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not been confirmed.
- R = Data are rejected and are totally unusable.
- JN = The identification is tentative and the value is estimated.
- * = Duplicate sample.
- NA = Not available; has not been developed for this chemical.

TABLE 7

SEDIMENT SAMPLING DATA SUMMARY
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

	SD-1 2/7/88	SD-2 2/7/88	SD-3 2/7/88	SD-4 2/7/88	SD-4D* 2/7/88	SD-5 2/7/88	SD-6 2/7/88	SD-7 2/7/88	SD-8 2/7/88	SD-9 2/7/88
<u>Inorganic Chemicals</u> (mg/kg)										
Aluminum	95	22,000	2,800	1,400	1,500	13,000	7,500	1,500	8,600	15,000
Arsenic	-	25JN	4.6JN	90JN	120JN	130JN	-	100JN	16JN	5.8JN
Chromium	-	660	9.4	220	330	160	12	110	28	17
Copper	28	830	9.6	83	110	30	7.3	12	15	1,000
Iron	160	16,000	1,700	810	910	4,000	9,800	750	9,800	12,000
Magnesium	-	4700	-	-	-	160	-	-	230	260
<u>PAHs</u> (ug/kg)										
Acenaphthene	-	-	-	13J	-	-	-	14,000	-	-
Acenapthylene	-	-	-	16J	-	-	-	-	-	-
Anthracene	-	-	-	60J	41J	720J	-	12,000	8J	-
Benzo(a)anthracene	-	-	-	-	170J	4,500J	-	6,200J	-	-
Benzo(b and/or k)fluoranthene	-	-	-	730J	320J	-	-	-	-	-
Benzo(a)pyrene	-	-	-	220J	130J	-	-	-	-	-
Chrysene	-	-	-	310J	330J	6,900J	-	8,000J	54J	-
Dibenzofuran	-	-	-	-	-	-	-	11,000	-	-
Fluoranthene	-	-	-	370J	380J	36,000	-	50,000	51J	40J
Fluorene	-	-	-	12J	-	-	-	25,000	-	-
2-Methylnaphthalene	R	25J	R	R	R	R	R	1,700J	R	R
Naphthalene	-	-	-	-	-	-	-	790J	-	-
Phenanthrene	-	-	-	-	-	-	-	62,000	-	-
Pyrene	-	25J	-	350J	410J	32,000	-	41,000	43J	17J
Total PAHs	-	50	-	2,100	1,800	80,000	-	230,000	160	57

<u>Footnotes</u>
- = The compound was analyzed for but not detected.
J = This number is estimated. The qualitative analysis is acceptable, but the value cannot be considered as accurate.
N = Presumptive evidence of presence of material. There is evidence that the material is present, but for some reason or combination of reasons, it has not been confirmed.
R = Data are rejected and are totally unusable.
JN = The identification is tentative and the value is estimated.
* = Duplicate Sample.

Although SW-2/SD-2 samples were intended to be background samples, the analytical results indicate otherwise. Highly elevated levels of some inorganic chemicals and the detection of PAHs, particularly in the sediment sample, indicate that this surface water has been influenced by some source of contamination. It is very unlikely the source of this contamination is site-related since the SW-2/SD-2 sampling point is approximately a quarter of a mile from the site. Because of the uncertainty associated with these samples, however, the analytical results were dropped from consideration as representing background concentrations.

In general, analyses of the surface water and sediment samples indicate contamination by PAHs and a few inorganic chemicals. The greatest concerns lie with the drainage ditch and diked pond to the south, and the seasonal swamp to the northeast where elevated levels of aluminum, arsenic, chromium, copper, iron and PAHs were found. Elevated levels of these contaminants were also found in the former water supply pond, the drainage ditch to the west and the concrete plant discharge pond to the southeast, but contamination in these surface water features is not as significant.

The elevated levels of arsenic, chromium, copper and PAHs found in the surface water and sediment samples taken near the site are most likely site-related since these chemicals were used extensively in past wood preserving operations at the site. Aluminum and iron contamination, however, is not expected to be site-related. The elevated concentrations of these chemicals are most likely due to natural conditions at the site. These chemicals are typical components of the soils in the study area and the low pH of surface water and groundwater in the area is probably causing them to leach from the soils into the water system where they can be easily transported. Field measurements of pH of natural waters at the site ranged from 3.7 to 7.9 and averaged 5.3.

3.7 RISK ASSESSMENT SUMMARY

The chemicals of potential concern identified for the site are inorganic compounds, polycyclic aromatic hydrocarbons (PAHs) and benzene. The inorganic compounds include chromium and arsenic.

Due to the uncertainty of land use in and around the site, several different land use scenarios were evaluated. The exposure pathways identified under current land use conditions (keep undeveloped with minimal industrialization) are the following:

* direct contact with contaminated surface soils by children trespassing on the site,

* inhalation of fugitive dust originating from contaminated soil areas by site trespassers and nearby residents, and

* contact with contaminated sediments by children wading on-site in the diked pond and drainage ditch.

Additional human exposure pathways are relevant if the future use of the site and surrounding area becomes either more industrial or residentially oriented. These additional exposure pathways are:

* direct contact with contaminated surface soils by future residents and workers,
* inhalation of fugitive dust originating from contaminated soil areas by future workers, and
* ingestion of groundwater from the upper and lower aquifers.

Because "applicable and relevant or appropriate requirements" (ARARs) are not available for all chemicals in all environmental media, risks were also quantitatively assessed for the identified exposure pathways. For lifetime exposures (70 years), risks were estimated assuming exposure concentrations remained constant over time.

Estimates of risks under current land use conditions are as follows. For direct contact with surface soils for children trespassing onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under the average case and 1 person out of 200,000 under the plausible maximum case. Risk under the plausible maximum case is due to carcinogenic PAHs. For inhalation of fugitive dust by onsite trespassers, individuals of the Jackson residence and residence in the Southgate subdivision, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average and plausible maximum cases. For children wading in onsite surface water and exposed to chemicals of potential concern in sediments, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average cases and 1 person out of 100,000 under a plausible maximum case. No carcinogenic chemicals of potential concern are detected in the residential wells, therefore ingestion of drinking water by current residents with residential wells, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000.

Estimates of risks under hypothetical future land use conditions are as follows. For potential exposure associated with direct contact with the soil at the site by future residents, the lifetime excess upper bound concern risk is 1 person out of 3,000,0000 under the average case and 1 person out of 1,000 under the plausible maximum case. Risks under both cases are due primarily to carcinogenic PAHs; under the plausible maximum case, the risk is due to arsenic is 1 person out of 200,000. For direct contact with soils by future workers onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under average case and 1 person out of 200,000 under the plausible maximum case. Risk under the plausible maximum case is due primarily to carcinogenic PAHs; the risk from arsenic under the plausible maximum case is 1 person out of 3,000,000. The risk associated with exposure to chemcials at the maximum detected sample concentrations would result in lifetime excess cancer risks of 1 person out of 8,000. For inhalation of fugitive dust by future workers onsite, the lifetime excess upper bound cancer risk is less than 1 person out of 1,000,000 under the average and plausible maximum cases. Ingestion of groundwater from the upper aquifer by future residents, the lifetime excess upper bound cancer risk is 1 person out of 4,000 under the average case and 1 person out of 6,000 under the plausible maximum case. And ingestion of groundwater from the lower aquifer by future residents, the lifetime excess upper bound cancer risk is less than 1 person out of 20,000 under the average case and 1 person out of 2,000 under the plausible maximum case.

Potential environmental impacts of the chemicals of potential concern at the site were also evaluated. Plant and animal species potentially exposed to the chemicals of concern at the site were identified based on a knowledge of the site and surrounding habitat. Risks were assessed by comparing the reported environmental concentration or the estimated dose with the selected toxicity value. Absolute conclusions regarding the potential environmental impacts at the Cape Fear Site cannot be made because there are many uncertainties surrounding the estimates of toxicity and exposure.

The maximum concentrations of arsenic, chromium, copper and lead found in the soils of the site exceed levels known to be phytotoxic in at least some species. The geometric mean concentrations of arsenic and chromium in the soils from the processing area are close to the levels toxic to some species and are possibly at concentrations that are toxic to species which occur in the area of the Cape Fear Site. Conclusions regarding adverse impacts to plants at the site are supported by the lack of vegetation across large areas of the site. Portions of the site that remain without vegetation offer little value as wildlife habitat and thus, the habitat value of the area is reduced.

Small mammals and deer that potentially use the surface water of the Cape Fear Site as a drinking water source do not appear to be at increased risk of adverse impacts, as the estimated intakes are well below those estimated to be associated with toxic effects. Birds ingesting water from the northeast swamp, ditch-diked pond area, and concrete plant discharge pond may be at increased risk of adverse impact from chromium as estimated intakes are approximately equal to the derived toxicity value. This may be of particular concern for red-cockaded woodpeckers, an endangered species potentially occurring in the area, a loss of even a single individual could adversely affect reproduction (and thus, the population) of this already stressed species. There are, however, many uncertainties surrounding the derivation of the toxicity values and the estimated intakes and therefore, absolute conclusions cannot be made.

Adverse impacts may also be occurring in the surface waters of the site. The concentrations of arsenic in the northeast swamp and the ditch-diked pond area exceed the acute and chronic Ambient Water Quality Criteria (AWQC) for this chemical. Chromium concentrations in the northeast swamp, the ditch-diked pond area and the concrete plant discharge pond exceed the acute and chronic AWQC. Copper concentrations exceed the acute and chronic criteria in the water supply pond, the northeast swamp, and the ditch-diked pond area. Aquatic species most likely impacted are insects, other invertebrates, and aquatic plants. It is difficult to determine the impact of these adverse effects on the aquatic populations of the area. However, the observed levels of contaminants in some of the surface waters at the site probably result in an exclusion of aquatic life in these waters, or a shift in community structure towards species more tolerant of high metal concentrations.

4.0 CLEANUP CRITERIA

The extent of contamination was defined in Section 3.0, Current Site Status. This section examines the ARARs associated with the contaminants found on site and the environmental medium contaminated. In the cases where no specific ARAR can be identified, a defendable remediation goal was generated. Table 8 provides a summary of the environmental mediums contaminated , the clean-up goals for the contaminants of concern in each medium, and a rationale for each specified clean-up goal.

4.1 GROUNDWATER REMEDIATION

In determining the degree of groundwater clean-up, Section 121(d) of the Superfund Amendment and Reauthorization Act of 1986 (SARA) requires that the selected remedial action establish a level or standard of control which complies with all ARARs, be cost-effective and achieve a clean-up level that is protective of human health and the environment. Finally, the remedy should utilize permanent treatment technologies to the maximum extent practicable.

For those contaminants found in the groundwater at the site, Table 8 presents the remediation levels the migration remedial alternative will achieve, at a minimum.

4.2 SOIL REMEDIATION

The Public Health and Environmental Assessment in the RI (Chapter 4), determined that risks to human as a result of exposure to on-site contaminants via inhalation, ingestion and dermal contact are very low under present Site conditions. For potential future use scenarios, the risk is slightly higher. Therefore, remediation and institutional controls will be necessary to assure that an increased risk to human health is not posed in the future.

Table 8 presents clean-up remediation levels that the source remediation alternative will achieve.

TABLE 8

SUMMARY OF CONTAMINATED MEDIA AND CLEANUP GOALS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Media	Site Related Contaminants Exceeding ARARs, Risk Assessment Values, or Environmental Criteria	Clean Up Goals	Rationale for Clean Up Goals
		ug/liter	
Ground Water	Benzene	5	a
	PAHs (carcinogenic)	10	b
	PAHs (noncarcinogenic)	14,350	c
		ug/liter	
Surface Water	Arsenic	12	d
	Chromium (total)	11	d
	Copper	14	e
		mg/kg	
Soil	Arsenic	94	c, f
	Benzene - Leachate Case	0.005	b
	Chromium (total) - Leachate Case	88	g
	PAHs (carcinogenic)	2.5	c, h
	PAHs (total)	100	i
		mg/kg	
Sediment	PAH (total)	3.0	j
	Arsenic	94	k
	Chromium (total) - Leachate Case	88	k

(a) ARAR = Maximum Contaminant Level (MCL).

(b) The Contract Laboratory Required Quantitation Limit (CLRQL) is proposed since the calculated risk assessment value is below analytical detection limits. Should the CLRQL reduce with time as analytical procedures improve, the new (lower) CLRQL would become the cleanup goal.

(c) Value derived using reverse risk assessment techniques.

TABLE 8
(continued)

(d) ARAR = Ambient Water Quality Criteria.

(e) The goal epresents background conditions since the Ambient Water Quality Criteria Concentration (6.5 ug/l) is below background.

(f) The future use worker scenario is used since this is the more likely future land use and arsenic is not posing a significant risk under current use conditions.

(g) The goal represents site background conditions (maximum of the range observed) since the calculated risk assessment value is below background levels.

(h) The value listed represents a current use scenario since this is more conservative than the levels derived for the future use worker scenario.

(i) Value is based on typical background concentrations (from the literature) since the calculated level necessary to prevent future leachate from exceeding a hazard index of 1 in ground water (60 mg/kg) is less than representative background conditions.

(j) Concentration researched by EPA to be protective of aquatic biota.

(k) The same value proposed for soils is applied due to a similar human exposure route, and low expected impact to surface water on a volumetric basis.

4.3 SURFACE WATER/SEDIMENT REMEDIATION

The following areas have been targeted for remediation: the water supply road, the northeast seasonal swamp, the drainage ditch south and west of the railroad tracks, the diked pond and the drainage ditch. The level of clean-up for the surface waters and sediment are also stated in Table 8.

5.0 ALTERNATIVES EVALUATED

The purpose of the remedial action at the Cape Fear Site is to minimize, if not mitigate contamination in the soils, groundwater, and surface waters and sediment and to reduce, if not eliminate, potential risks to human health and the environment. The following clean-up objectives were determined based on regulatory requirements and levels of contamination found at the Site:

* To protect the public health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, and erosion of soils into surface waters and wetlands;

* To prevent off-site movement of contaminated groundwater; and

* To restore contaminated groundwater to levels protective of human health and the environment.

Table 9 provides a list of possible remedial technologies applicable at the Cape Fear Site knowing the environmental media affected, the type of contaminants present and the concentration of each contaminant in each environmental medium. Table 10 lists those technologies retained after the initial screening. This initial screening evaluates the technologies on the following technical parameters:

* implementability,

* reliability and effectiveness, and

* previous experience.

These technologies address soils/sediments, surface water and groundwater and the hazardous material, tanks and piping and best meet the criteria of Section 300.65 of the national Contingency Plan (NCP).

Following the initial screening of the individual technologies, these technologies were combined to form a number of remedial action alternatives. These alternatives address the contaminated soils and sediments, surface water and groundwater, and hazardous materials, tanks and piping, and are listed in Tables 11 through 13, respectively. These remedial action alternatives are than screened and analyzed in relation to the nine point criteria.

TABLE 9

POSSIBLE REMEDIAL TECHNOLOGIES FOR SOIL AND SEDIMENTS AND GROUNDWATER AND SURFACE WATER

Response Action	Technology
SOIL AND SEDIMENTS	
Removal	Excavation Sediment Dredging and Dewatering
Treatment	Attenuation Washing Flushing Immobilization Biodegradation Thermal Processing Incineration
Containment/ Migration Control	Capping On-site Encapsulation/Landfill Solidification/Stabilization Vitrification Subsurface Barriers Off-site Landfill
GROUNDWATER AND SURFACE WATER	
Collection	Extraction Wells Subsurface Drains
Treatment	Air Stripping Steam Stripping Aeration Spray Irrigation Vacuum Extraction Flocculation, Sedimentation, Filtration Activated Carbon Adsorption Precipitation Ion Exchange Reverse Osmosis
Disposal	Discharge to Surface Water Publicly Owned Treatment Works Plant Aquifer Recharge

TABLE 10

RETAINED TECHNOLOGIES, APPLICABLE MEDIA, AND CONTAMINANTS
CONSIDERED FOR ALTERNATIVES DEVELOPMENT
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Media	Response Action	Remedial Technology	Applicable to
Soil/Sediment	Removal	Excavation	Soils > cleanup goals.
		Dredging	Sediments > cleanup goals.
	Containment	Capping	Soils and dewatered sediments, all contaminants of interest: As, benzene, Cr, PAHs.
	Treatment	Washing	Soils and sediments, all contaminants of interest: As, benzene, Cr, PAHs.
		Thermal Processing	Soils and sediments, organic contaminants: benzene and PAHs.
		Solidification/stabilization	Soils and sediments with As and Cr contamination.
Ground water/ surface water	Removal	Well Points	Upper aquifer, extraction of ground water > cleanup goals.
		Deep Well	Lower aquifer, extraction of ground water > cleanup goals.
		Pumping	Transfer of ground water and surface water > cleanup goals.
	Treatment	Flocculation, sedimentation, and filtration	Particulate removal in ground water and surface water in association with other treatment technologies (carbon adsorption, precipitation).
		Carbon Adsorption	Removal of organic and some inorganic constituents in ground water and surface water.
		Air Stripping	Removal of volatile organics (benzene) from ground water.
		Precipitation	Removal of metals (As, total Cr, Cu) from surface water and onsite wastewater.
	Discharge	To surface water	Treated effluent.
		To POTW	Pretreated effluent.

TABLE 10
(Continued)

Media	Response Action	Remedial Technology	Applicable to
Hazardous Materials, Tanks, and Piping	Removal	Excavation	Pipelines and the underground fuel tank.
		Containerization	Apparent CCA crystals, assumed asbestos insulation, creosote-contaminated solidified sludge, CCA solution.
		Offsite Transport	CCA solution.
	Containment	Solidification/stabilization	Creosote-contaminated solidified sludge.
	Treatment	Reduction	CCA solution and CCA wastewater, Cr^{+6} treatment if necessary. (Reduction of Cr^{+6} to Cr^{+3}.)
		Precipitation	CCA solution, CCA contaminated wastewater, and surface water treated onsite.
	Disposal	Offsite Landfill	Apparent CCA crystals, assumed asbestos insulation, creosote-contaminated solidified sludge, CCA solution, CCA contaminated wastewater, tanks and piping.
		Scrap Metal	Tanks and piping.

As = Arsenic
Cr = Chromium (total)
Cr^{+6} = Hexavalent chromium
Cu = Coppper
PAH = Polycyclic aromatic hydrocarbons

TABLE 11

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES FOR SOILS/SEDIMENTS CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA

Alternative	Technologies Employed
1S[*]	No action Natural flushing
2S	Excavate isolated areas of soil contamination Excavate/dredge sediments Dewater dredged sediments Cap soils and dewatered sediments
3S	Excavate/dredge soils and sediments Wash excavated materials onsite Water supply source: A. Purchase from Fayetteville Public Works Commission and truck to the site. B. Purchase from a private water company and pipe to the site. C. Install an onsite well outside the contaminant plume area. Redeposit washed soils/sediments in the excavated area
4S	Excavate/dredge soils/sediments Dewater dredged sediments Thermal process excavated materials Solidify/stabilize processed soils/sediments and redeposit in the excavated area.

[*] S denotes remedial alternative for soil/sediment.

TABLE 12

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES
FOR GROUND WATER AND SURFACE WATER
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Alternative	Technologies Employed
1W*	No action Long-term ground water monitoring
2W	Ground water extraction by well points and a deep well Flocculation, sedimentation, and filtration (surface and ground water) Activated Carbon Adsorption (surface and ground water) Discharge treated effluent to surface water (western ditch)
3W	Ground water extraction by well points and a deep well Flocculation, sedimentation, and filtration (ground water and surface water) Air stripping (ground water) Activated carbon adsorption (surface and ground water) Discharge treated effluent to surface water (western ditch)
4W	Ground water extraction by well points and a deep well Ground water treatment Filtration Air Stripping Activated carbon adsorption Surface water treatment Precipitation Flocculation, sedimentation, and filtration Discharge treated effluent to surface water (western ditch)
5W	Ground water extraction by well points and deep well(s) Pretreatment Precipitation (surface and ground water) Flocculation, sedimentation, and filtration (surface and ground water) Discharge to POTW

*W denotes remedial alternative for ground water or surface water.

TABLE 13

DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES FOR HAZARDOUS MATERIALS, TANKS, AND PIPING CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE, NORTH CAROLINA

Material	Alternative*	Technologies Employed
Apparent CCA Crystals**	1C	Offsite landfill (hazardous).
Asbestos Insulation** (Assumed)	1A	Offsite landfill (nonhazardous).
Solidified Sludge	1SS	Onsite disposal.
	2SS	Offsite landfill (hazardous).
CCA Wastewater and/or CCA 3% Solution	1L	Treat wastewater and solution onsite for Cr^{+6}. Treat wastewater and solution onsite with surface waters.
	2L	Treat wastewater and solution offsite.
	3L	Transport CCA solution offsite.
Tanks and Piping	1T/P + 2T/P	Locate (Piping) Empty (Tanks) Excavate (UST and Piping) Drain/Purge (Piping) Clean (Tanks and Piping) Cut (Tanks and Piping) Dispose of as:
	1T/P	Scrap metal
	2T/P	at an offsite landfill (nonhazardous)

*C denotes Crystals (apparent CCA)
A denotes Asbestos (assumed)
SS denotes Solidified Sludge
L denotes Liquid (CCA Wastewater and/or CCA 3% Solution)
T/P denotes Tanks/Piping

**Based on visual characterization. These materials were not sampled.

UST - Underground Storage Tank.

5.1 NINE POINT-EVALUATION CRITERIA FOR EVALUATING REMEDIAL ACTION ALTERNATIVES

Each alternative was evaluated using a number of evaluation factors. The regulatory basis for these factors comes from the National Contingency Plan (NCP) and Section 121 of SARA. Section 121(b)(1) states that, "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants and contaminants as a principal element, are to be preferred over remedial actions involving such treatment. The offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available."

Section 121 of SARA also requires that the selected remedy be protective of human health and the environment, cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Based on the statutory language and current U.S. EPA guidance, the nine criteria used to evaluate the remedial alternatives listed above were:

1. Overall Protection of Human Health and the Environment addresses whether or not the remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs addresses whether or not the remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statues and/or provide grounds for invoking a wavier.

3. Long-Term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of toxicity, mobility, or volume is the anticipated performance of the treatment technologies a remedy may employ.

5. Short-term effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation periods until cleanup goals are achieved.

6. Implementability is the technical and administrative feasibility of a remedy including the availability of goods and services needed to implement the chosen solution.

7. Cost includes capital and operation and maintenance costs.

8. Support Agency Acceptance indicates whether, based on its review of the RI/FS and Proposed Plan, the support agency (IDEM) concurs, opposes, or has no comment on the preferred alternative.

9. Community Acceptance indicates the public support of a given remedy. This criteria is discussed in the Responsiveness Summary.

5.1.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

All of the alternatives, with the exception of the no action alternative, would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk from the environment through treatment, engineering controls or institutional controls. As the no action alternative does not satisfy the remedial action goal to provide adequate protection of human health and the environment, it is not eligible for selection. The aspects considered in this evaluation are summarized in Table 14.

5.1.2 COMPLIANCE WITH ARARS

All of the alternatives, except for the no action alternative, would meet all applicable or relevant and appropriate requirements of Federal and State environmental laws. Section 6.6 (Table 21) lists the environmental regulations, policies and guidelines that are applicable to the Cape Fear site. Table 15 presents a summary of this evaluation.

Since all contamination on site is characterized as contaminted soil and debris and there is no RCRA characterized waste on-site, land ban requirements, as defined in 40 CFR 268, are not applicable at the Cape Fear site.

5.1.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

The aspects of this evaluation are summarized in Table 16 under the column entitled "Long Term Remediation Impact.

5.1.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The aspects of this evaluation are also summarized in Table 14 under the column entitled "Long Term Remediation Impact".

5.1.5 SHORT-TERM EFFECTIVENESS

The aspects of this evaluation are summarized in Table 16 under the column entitled "Short Term Remediation Impact".

TABLE 14

SUMMARY OF REMEDIAL ALTERNATIVES EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based on Sensitivity Analysis
1S: No action	Does not remove or contain contaminants.	Not applicable.	Not applicable.	Future land use and deed restrictions.	0	0	0
2S: Partial excavation/dredging of soils and sediments with surface capping	Contaminants are stored, not destroyed or removed. This is an effective process to prevent direct contact with contaminated materials and minimize vertical infiltration. Contaminated soils below the ground water table are not addressed.	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) could also be disturbed.	Decrease in contaminant mobility and reduction of direct contact risk.	Future land use and deed restrictions.	0.75	2.80	2.29-3.30
3S: Excavation/dredging with soil and sediment washing	Soil/sediment washing is considered to be an innovative technology for hazardous applications. The ability to meet cleanup goals for organic and inorganic contaminants must be demonstrated by treatability testing. Promising results have been obtained for PAHs. CCA will be more difficult to remove.	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) could also be disturbed.	Decreases in contaminant mobility and volume, reduced direct contact risk, and reduced leaching to ground water/surface water.	Future development allowed.	1.5	11.00	4.30-20.01

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based on Sensitivity Analysis
4S: Excavation/ dredging of soils/sediments with thermal processing and/or solidification	This combination of technologies is expected to exceed cleanup goals since separate treatment is provided for organic and inorganic contaminants. A laboratory "burn" would be required to establish operating parameters. Leachate testing would be required for solidified materials. Volume increase from solidification may be objectionable.	Potential air emissions during thermal processing could contain toxic gases (metal oxides). Displacement of aquatic biota and endangered plant species (if present) during excavation/ dredging.	Decreases contaminant M/T/V. Direct contact risk and contaminant leaching to surface and ground water should be greatly reduced.	Future development allowed.	1.5	14.03	5.67-26.14
GROUND WATER AND SURFACE WATER ALTERNATIVES							
1W: No action Long-Term Monitoring	Does not remove or contain contaminants. ARARs are exceeded. Monitors offsite contaminant migration.	Not applicable.	Not applicable.	Deed restriction for consumptive ground water use.	30 (monitoring)	0.59	N/A

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Mi: Total Present Worth	I o	d ity
2W: Flocculation, Sedimentation, Filtration Carbon Adsorption Discharge to Surface Water	It is expected that cleanup goals for PAHs will be met. Contaminant concentrations for benzene, copper, chromium and arsenic will be reduced but meeting ARARs is less certain. Testing would be required to assess the achievable contaminant reductions. Recovery of the full ground water plume will require offsite access/ easements.	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species.	NPDES permit for surface water discharge.	3.6	3.40	:	
3W: Flocculation, Sedimentation, Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	Cleanup goals for PAHs and benzene should be met. As with Alternative 2W, final CCA removal efficiencies must be demonstrated through testing. Recovery of the full ground water plume will require offsite access/ easements.	Sludge generation, elimination of existing aquatic biota (if present), and air emissions containing volatile organic contaminants.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species. Greater degree of risk reduction (than 2W) achieved by VOC treatment.	NPDES permit for surface water discharge.	3.6	3.42		

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost (Millions $): Total Present Worth	Cost (Millions $): Range Based on Sensitivity Analysis
4W: Surface Water Precipitation Flocculation, Sedimentation, Filtration; Ground Water Filtration, Air Stripping, Carbon Adsorption; Discharge to Surface Water	All cleanup goals and ARARs should be met. Recovery of the full ground water plume will require offsite access/easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation.	Greater degree of risk reduction than 2W or 3W because treatment distinguishes between different contaminants in groundwater and surface water respectively (organic vs. inorganic).	NPDES permit for surface water discharge.	3.8	3.65	3.57-4.14
5W: Flocculation, Sedimentation, Filtration; Discharge to POTW	All cleanup goals should be met. The most cost-effective pretreatment process should be determined by treatability testing. Recovery of the full ground water plume will require offsite access/easements. Piping to POTW will also require easements.	Sludge generation and elimination of existing aquatic biota (if present), during surface water remediation.	Greatest degree of risk reduction. Contaminated ground water and surface water are extracted. Effluent is direct to POTW rather than site surface water.	Local POTW must accept site wastewaters.	3.6	3.14	2.84-3.51

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost ($): Total Present Worth	Cost ($): Range Based on Sensitivity Analysis
1C: Offsite landfill (hazardous) of apparent CCA crystals	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduced ingestion/ direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.	Hazardous waste manifest and transport by a licensed hauler to permitted RCRA facility.	0.1	9,600	N/A
1A: Offsite landfill (nonhazardous) of assumed asbestos insulation	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduced ingestion/ direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.	Manifest and transport by licensed hauler to permitted RCRA facility.	0.1	13,500	N/A
1SS: Onsite disposal of solidified sludge	Direct contact risk reduced in association with a cap. Solidification should limit mobility but the matrix may loose integrity over time.	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure.	Future land use restrictions possible.	0.1	27,700	N/A
2SS: Offsite disposal of solidified sludge	Eliminates the risk of onsite exposure.	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure. Effective containment depends on integrity of the RCRA facility.	Hazardous waste manifest. Transport by licensed hauler to permitted RCRA facility.	0.1	28,900	N/A

TABLE 14
(Continued)

Remedial Alternative	Technical Considerations	Public Health and Environmental Considerations: Short Term Remediation Impact	Public Health and Environmental Considerations: Long Term Remediation Impact	Institutional Considerations	Estimated Time For Implementation (years)	Cost ($): Total Present Worth	Cost ($): Range Based on Sensitivity Analysis
1L: Onsite treatment of CCA solution and/or wastewater with discharge to surface water	Expected to meet ARARs. High contaminant concentrations will pose special considerations to meet NPDES or POTW requirements.	Sludge generation during treatment.	Reduced spill potential and contaminant migration.	NPDES permit or acceptance by POTW.	0.1	104,000	N/A
2L: Offsite transport and treatment of CCA solution and/or wastewater	Eliminates the risk of onsite exposure.	Accident risk due to offsite shipment (12 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration. Effective containment depends on integrity of the RCRA facility.	Hazardous waste manifest. Transport by licensed hauler to permitted RCRA facility.	0.1	126,100	N/A
3L: Offsite transport of CCA solution.	Recycles CCA solution. CCA contaminated wastewater would be treated on or offsite (Alternatives 1L or 2L).	Accident risk due to offsite shipment (10 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration onsite.	Liability waiver under CERCLA must be granted. Effective spill prevention, control, and countermeasures would be required at the relocation facility.	0.1	25,500	N/A
1T/P: Removal and cleaning of tanks and piping Recycle as scrap (sell)	Eliminates waste disposal concerns.	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.	EPA certification that tanks are nonhazardous.	0.1	(112,400)	N/A
2T/P: Removal and cleaning of tanks and piping Dispose of offsite in a nonhazardous landfill	Removes old tanks and piping from the site.	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.	Manifest and transport by a licensed hauler to permitted RCRA facility preferred.	0.1	87,900	N/A

TABLE 15

SUMMARY OF INSTITUTIONAL AND LAND USE RESTRICTIONS
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	ACTIVITIES: FENCING[1]	DEED RESTRICTIONS	LAND USE	LAND DEVELOPMENT	GROUND WATER USE
SOIL AND SEDIMENT ALTERNATIVES					
1S: No Action	Yes	Yes	Yes	Yes	N/A
2S: Surface Cap	Yes	Yes	Yes	No	N/A
3S: Washing	Yes	No	No	No	N/A
4S: Thermal Processing and/or Solidification	Yes	No	No	No	N/A
GROUND WATER AND SURFACE WATER ALTERNATIVES					
1W: No Action	Yes	Yes	N/A	N/A	Yes
2W: Pretreat and GAC	Yes	No	N/A	N/A	No
3W: 2W and Airstripping	Yes	No	N/A	N/A	No
4W: Segregated SW and GW Treatment	Yes	No	N/A	N/A	No
5W: Pretreatment and Discharge to POTW	Yes	No	N/A	N/A	No

(1) Fencing restrictions apply to the period of remediation only (except for no action).

Yes = Restrictions Apply
No = No restrictions after remediation assuming that ARARs or cleanup goals are met.
N/A = Not Applicable

TABLE 16

SUMMARY OF THE PUBLIC HEALTH AND ENVIRONMENTAL EFFECTS EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	SHORT-TERM REMEDIATION IMPACT	LONG-TERM RISK REDUCTION
SOIL AND SEDIMENT ALTERNATIVES		
1S: No Action	Not applicable	Not applicable
2S: Surface Cap	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) would be disturbed.	Decrease in contaminant mobility and reduction of direct contact risk.
3S: Washing	Dust releases during excavation and displacement of aquatic biota due to dredged sediments. Endangered plant species (if present) would be disturbed.	Decreases in contaminant mobility and volume, reduced direct contact risk, and reduced leaching to ground water/surface water.
4S: Thermal Processing and Solidification	Potential air emissions during thermal processing could contain toxic gases (metal oxides). Displacement of aquatic biota and endangered plant species (if present) during excavation/dredging.	Decreases contaminant M/T/V. Direct contact risk and contaminant leaching to surface and ground water should be greatly reduced.
GROUND WATER AND SURFACE WATER ALTERNATIVES		
1W: No Action	Not applicable	Not applicable
2W: Pretreat and GAC	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species.
3W: 2W and Airstripping	Sludge generation, elimination of existing aquatic biota (if present), and air emissions containing volatile organic contaminants.	Reduced public health risk associated with ingestion. Reduced toxicity to aquatic biota and the red-cockaded woodpecker, an endangered species. Greater degree of risk reduction (than 2W) achieved by VOC treatment.
4W: Segregated SW and GW treatment	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Greater degree of risk reduction than 2W or 3W because treatment distinguishes between different contaminants in groundwater and surface water respectively (organic vs. inorganic)

TABLE 16

(continued)

REMEDIAL ALTERNATIVE	SHORT-TERM REMEDIATION IMPACT	LONG-TERM RISK REDUCTION
5W: Pretreat and POTW	Sludge generation and elimination of existing aquatic biota (if present) during surface water remediation.	Greatest degree of risk reduction. Contaminated ground water and surface water are extracted. Effluent is direct to POTW rather than site surface water.
<u>HAZARDOUS MATERIALS, TANKS AND PIPING</u>		
1C and 1A: Offsite disposal of CCA Crystals and Asbestos Insulation	Worker exposure during removal.	Reduced ingestion/direct contact risk to wildlife and potential human exposure. Effective containment depends on integrity of the RCRA facility.
1SS: Onsite disposal of solidified sludge	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure.
2SS: Offsite disposal of solidified sludge	Worker exposure during removal.	Reduced direct contact risk to wildlife and human exposure. Effective containment depends on integrity of the RCRA facility.
1L: Onsite Treatment of CCA Solution and wastewater	Sludge generation during treatment.	Reduced spill potential and contaminant migration.
2L: Offsite Disposal of CCA Solution and wastewater	Accident risk due to offsite shipment (12 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration. Effective containment depends on integrity of the RCRA facility.
3L: Offsite Transport of CCA Solution	Accident risk due to offsite shipment (10 tanker trucks with hazardous liquids).	Reduced spill potential and contaminant migration onsite.
1T/P: Sell cleaned tanks/piping for scraps	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.
2T/P: Dispose of cleaned tanks and piping offsite	Contaminated water generated in wash process. Potential air release of volatile contaminants during excavation.	Reduced spill potential and contaminant migration.

TABLE 17

IMPLEMENTABILITY EVALUATION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	CONSTRAINTS TO IMPLEMENTATION	ESTIMATED TIME REQUIRED
SOIL AND SEDIMENT ALTERNATIVES		
1S: No Action	Not applicable	Not applicable
2S: Surface Cap	More extensive clearing and grubbing may be required outside the process area	9.3 months
3S: Washing	Implementation will depend on favorable results of treatability testing and use of non-toxic, non-hazardous surfactants.	1.5 years
4S: Thermal Processing and Solidification	Effectiveness must be demonstrated by treatability testing. The increased volume created by solidification may be objectionable.	1.5 years
GROUND WATER AND SURFACE WATER ALTERNATIVES		
1W: No Action	Not applicable	Not applicable
2W: Pretreat and GAC, 3W: 2W and Airstripping, and 4W: Segregated SW and GW	Recovery of the full extent of the estimated ground water plume will require offsite property easements/approval. Treatability testing would be required to demonstrate ultimate effectiveness.	3.6 - 3.8 years
5W: Pretreat and POTW	The recovery constraint for alternatives 2W-4W also applies. The POTW must accept the wastewater.	3.6 years
HAZARDOUS MATERIALS, TANKS AND PIPING		
1C and 1A: Offsite disposal of CCA Crystals and Asbestos Insulation	None	1 month
1SS: Onsite disposal of solidified sludge	Selection of Alternative 2S or 4S for soils and sediments.	1 month
2SS: Offsite disposal of solidified sludge	None	1 month
1L: Onsite Treatment of CCA Solution and/or wastewater	Selection of Alternative 4W or 5W for surface water treatment.	1 month
2L: Offsite Disposal of CCA Solution and/or wastewater	None	1 month
3L: Offsite transport of CCA Solution	A liability waiver under CERCLA is rquired.	1 month
1T/P: Sell cleaned tanks/piping for scrap	Tanks must be EPA certified as non-hazardous.	1 month
2T/P: Dispose of cleaned tanks and piping offsite	None	1 month

TABLE 18

SUMMARY OF PRESENT WORTH COSTS
FOR HAZARDOUS MATERIALS, TANKS AND PIPING
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

		TOTAL PRESENT WORTH COST[1] $
1C:	Offsite landfill (hazardous) of apparent CCA crystals	$ 9,600
1A:	Offsite landfill (non-hazardous) of assumed asbestos insulation	$ 13,500
1SS:	Onsite disposal of solidified sludge	$ 27,700
2SS:	Offsite disposal of solidified sludge	$ 28,900
1L:	Onsite treatment of CCA solution and/or wastewater discharge to surface water	$ 104,000
2L:	Offsite transport and treatment of of CCA solution and/or wastewater	$ 126,100
3L:	Offsite transport of CCA solution	$ 25,500
1T/P:	Removal and cleaning of tanks and piping Recycle as scrap (sell)	($ 112,400)
2T/P:	Removal and cleaning of tanks and piping Dispose of offsite in non-hazardous landfill	$ 87,900

(1) The total present worth is based on capital costs since remediation is one-time and does not involve O&M.

($) Indicates negative cost = cash flow payment.

TABLE 19

SUMMARY OF SENSITIVITY ANALYSIS FOR SOIL AND SEDIMENT ALTERNATIVES
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	Average Cost [1] ($1,000)	Minimum Cost ($1,000)	Maximum Cost ($1,000)
1S: No action	0	0	0
2S: Partial excavation/dredging of soils and sediments with surface capping	2,803	2,289	3,300
3S: Excavation/dredging with soil and sediment washing	10,995	4,300	20,009
4S: Excavation/dredging of soils/sediments with thermal processing and/or solidification	14,029	5,671	26,143

(1) The same as total present worth costs from Table 5-1.

TABLE 20

SUMMARY OF SENSITIVITY ANALYSIS FOR GROUND WATER AND SURFACE WATER ALTERNATIVES
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, NORTH CAROLINA

REMEDIAL ALTERNATIVE	Average Cost [1] ($1,000)	Minimum Cost ($1,000)	Maximum Cost ($1,000)
1W: No action Long-Term Monitoring	592	592	592
2W: Flocculation, Sedimentation, Filtration Carbon Adsorption Discharge to Surface Water	3,398	3,248	3,826
3W: Flocculation, Sedimentation, Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	3,426	3,225	3,861
4W: Surface Water Precipitation Flocculation, Sedimentation, Filtration Ground Water Filtration Air Stripping Carbon Adsorption Discharge to Surface Water	3,656	3,571	4,140
5W: Flocculation, Sedimentation, Filtration* Discharge to POTW	3,140	2,842	3,522

(1) The same as total present worth costs from Table 5-2.

* Minimum = filtration
Average = flocculation, sedimentation, filtration
Maximum = precipitation, flocculation, sedimentation, filtration

5.1.6 IMPLEMENTABILITY

Table 17 presents a summary of the evaluation performed on the constraints to implementation.

5.1.7 COST

Summaries of present worth costs including the minimum and maximum costs generated by a sensitivity analysis for these alternatives is given in Tables 18 through 20. The uncertainity considered in the sensitivity analysis was the volume. Volume for each contaminated environmental medium. No sensitivity analysis was conducted for the hazardous materials, tanks and piping alternatives.

5.1.8 STATE ACCEPTANCE

The State of North Carolina supports the alternative stated in the Declaration and Section 6.0. The State of Carolina recognizes the 10% cost share and operation and maintenance responsibilities associated with this alternative.

5.1.9 COMMUNITY ACCEPTANCE

The Agency conducted a Public Meeting on February 21, 1989 at the Seventy-First Senior High School Auditorium in Fayetteville, North Carolina. The Agency discussed the findings of the RI, reviewed the evaluation of remedial technologies and remedial action alternatives as presented in the Draft Final Feasibility Study dated December 16, 1988 and presented the Agency's preferred remedial action alternative. The meeting initiated a three week comment period. Besides the questions addressed at the public meeting, no additional comments/questions/concerns were received by the Agency.

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the RI, FS, Proposed Plan, and U.S. EPA's responses to the comments received.

6.0 RECOMMENDED ALTERNATIVE

6.1 DESCRIPTION OF RECOMMENDED REMEDY

Description of Selected Remedy

Prior to initiating any remedial action on-site, a site survey will be conducted to determine the presence of any endangered plant species exist on-site.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified creosote and asbestos-containing pipe insulation. The CCA crystals and solidified creosote will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.

The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous will be transported to a RCRA permitted landfill for disposal.

The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,000 gallons of CCA contaminated wastewater as well as wastewater generated on-site will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater.

SOURCE CONTROL (Remediation of Contaminated Soils)

The preferred alternative for the remediation of contaminated soils/sediment is a soil washing/flushing technique. The alternate source control alternative is a low temperature process to remove the organics contaminants followed by either a soil washing/flushing technique or soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing/flushing treatability study to be conducted during the remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated

MIGRATION CONTROL (Remediation of Contaminated Groundwater)

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Recovery will be conducted in 10,000 square foot subareas at a time, and the well points will be moved to adjacent areas for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all ARAR's.

This recommended alternatives meet the requirements of the NCP, 40 CFR Section 300.68(j) and SARA. This recommended remedy permanently and significantly reduces the volume of hazardous substances in the groundwater, reduces the toxicity and/or mobility of contaminants in the soils.

6.2 OPERATIONS AND MAINTENANCE

Long term operation and maintenance (O&M) will concentrate on the groundwater extraction, water treatment and groundwater monitoring systems.

6.3 COST OF RECOMMENDED ALTERNATIVE

The estimated present worth cost for containerizing and transporting the CCA crystals and solidified creosote to Pinewood, SC, is $42,400. The estimated cost for disposing of the asbestos-containing piping insulation at the local county landfill is $100. The present worth cost for cleaning and disposing of the tanks and piping is $87,900 if a metal dealer is found to purchase the scrap metal or $112,400 if the Agency needs to dispose of the scrap metal at Pinewood, SC. There are no O&M costs associated with the above activities.

The treatment of the liquids held in the tanks, 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater, has a present worth cost of approximately $104,000. The O&M costs have been factored into the O&M costs of operating and maintaining the water treatment system.

The estimated present worth cost for the soil washing/flushing alternative for contaminated soils and sediments is $11.00 million. This includes capital and O&M costs for the 1.5 year treatment period. The estimated present worth cost for the low temperature destruction process combined with either soil washing/flushing or a soil fixation/solidification/stabilization process for contaminated soils and sediments is $14.03 million. This includes capital and O&M costs for the treatment period.

The estimated present worth cost for pumping surface water and extracting groundwater and treating the commingled waters ranges from $3.4 to $3.65 million, depending on the extent of treatment and ultimate discharge point for the treated water. The capital costs and present worth O&M costs over 30 years range from $2.11 to $2.34 million and $1.02 to $1.31 million, respectively

The present worth cost of the preferred remedy, including all activities, ranges from $14.37 million to $14.91 million.

6.4 SCHEDULE

The planned schedule for remedial activities at the Cape Fear Site is as follows:

June 1989 --	Approve Record of Decision
July 1989 --	Initiate Remedial Design/Treatability Study
October 1989 --	Superfund/State Contract Signed
November 1989 --	Complete Treatability Studies
December 1989 --	Initiate Remedial Action for Addressing Contaminated Groundwater and Other Specific Cleanup Activities
April 1990 --	Complete Remedial Design for Source Control and Mobilize

6.5 FUTURE ACTIONS

The only anticipated future action expected to follow completion of the remedial action is periodic monitoring of groundwater to insure remediated levels obtained during the remediation is maintained.

6.6 CONSISTENT WITH OTHER ENVIRONMENTAL LAWS

A remedial action performed under CERCLA must comply with all applicable Federal, State and local regulations. All alternatives considered for the Cape Fear Site were evaluated on the basis of the degree to which they complied with these regulation. The recommended alternatives were found to meet or exceed all applicable environmental laws, as discussed below:

TABLE 21

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Resource Conservation and Recovery Act (RCRA)	
40 CFR 261: Definition and identification	Definition and identification of waste matrial as hazardous
40 CFR 262: Standards for generators of hazardous waste	Generator requirements include identification of waste generation activity, obtaining EPA ID number, record keeping, and use of uniform national manifest
40 CFR 263: Standards for treatment of hazardous waste	The transportation of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup
40 CFR 264: Standards for treatment of hazardous waste	Incineration requirements
40 CFR 264: Standards for Disposal of hazardous waste	Closure requirements Class C closure - landfill closure meeting minimum technology requirements for hazardous materials Class D closure - landfill closure meeting minimum technology requirements for non-hazardous materials
40 CFR 268: Land disposal restriction	Excavated waste disposed onsite may be subject to land disposal restriction if placement occurs
40 CFR 257: Standards for Disposal of hazardous waste	Closure requirements
40 CFR 264, Subpat I: Containers	Storage requirements for containers

TABLE 21
(continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Clean Water Act (CWA)	
40 CFR 122, 125: National Pollutant Discharge Elimination Systems (NPDES)	Discharges of extracted/treated groundwater will be subject to substantive requirements of the NPDES process if discharged to a local stream. NPDES is administrative by the state
40 CFR 403: Effluent Guidelines and Standards: Pretreatment Standards	Discharges of extracted/treated groundwater will be subject to pretreatment requirements if discharged tot he POTW
40 CFR 230: Dredge and Fill Requirements	Actions in a wetland or floodplain
Ambient Water Quality Criteria	AWQC may be used for discharge requirements where there are no state water quality standards
CAA Section 109 and 40 CFR 50: National Ambient Air Quality Standards	Preconstruction review of incineration NAAQS for PMIO applied to fugitive dust
Occupational Safety and Health Act	
29 CFR 1910: General standards for work protection	Worker safety for construction and operation of remedial action
29 CFR 1090: Regulations for workers involved in hazardous waste operations	Worker safety for construction and operation of remedial action
Hazardous Materials Transportation Act	
49 CFR 100 through 199: Transportation of hazardous material	The transport of hazardous waste is subject to DOT requirements

TABLE 21
(continued)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Law, Regulation, Policy and Standard	Application
Intergovernmental Review of Federal Programs	
Executive Order 12372	
40 CFR 29	State and local coordination and review of proposed EPA assisted projects
Fish and Wildlife Coordination Act	Protection of fish and wildlife when federal actions result in the control or modification of a natural stream or body of water
Endangered Species Act	
Section 7(c)	consultation with the fish and wildlife service if action may impact endangered species or critical habitat
Executive Orders for Flood Plains (EO 11988)	
40 CFR Part 6, Subpart A	Protection of flood plains affected by remedial action
Executive Orders for Wetlands (EO 11990)	Protection of wetlands affected by remedial action
Safe Drinking Water Act	Maximum Contaminant Levels (MCLs) established under the Sate Drinking Water Act were found to be relevant and appropriate to remedial action at the Cape Fear Site. The cleanup goals for groundwater were established in Section 4.
North Carolina Requirements	
State Drinking Water Standards	Maximum contaminant levels established by the State of North Carolina regulations; are adopted from those of the Federal Safe Drinking Water Act, and will be met.

7.0 COMMUNITY RELATIONS

Fact sheets were transmitted to interested parties, residents, media and local, state and federal officials during the RI/FS process. The Agency also conducted the FS public meeting.

The Information Repository/Administrative Record was established at Cumberland County Public Library & Information Center located at 300 Maiden Lane, Fayetteville, North Carolina 28301.

A public meeting was held on February 21, 1989, at the Seventy-First Senior High School in Fayetteville, North Carolina. At this meeting, the remedial alternatives developed in the FS were reviewed and discussed and EPA's preferred remedial alternative was disseminated. The groundwater migration alternative was presented as described in Section 6.1 Description of Recommended Alternative. Two source remediation alternatives were presented. EPA's preferred source remediation alternative for is a soil washing process. The Agency's back-up alternative in the event that a effective soil washing process cannot be devised is an on-site low temperature process to mitigate the organics followed by either soil washing or a soil fixation/solidification/stabilization process to address the metals. Both alternatives are permanent remediations but the soil washing alternative is estimated to be 3 million dollars less than the low temperature process.

The public comment period concluded on March 14, 1989. The only comments received during the public comment period were those aired and responded to at the public meeting. The Responsiveness Summary summarizes the comments stated in the public meeting.

8.0 STATE INVOLVEMENT

The State involvement has been maintained throughout the RI/FS process with reviewing pertinent documents such as the draft Remedial Investigation Report, the draft Feasibility Study, the draft Record of Decision and have been carbon copied all relevant correspondences.

The State of North Carolina supports the alternative stated in the Declaration and Section 6.0. The State of North Carolina recognizes the 10% cost share under CERCLA, Section 104(c) and operation and maintenance responsibilities associated with this alternative.

APPENCIES

APPENDIX A

RESPONSIVENESS SUMMARY

APPENDIX A

RESPONSIVENESS SUMMARY

This community responsiveness summary is divided into the following sections:

SECTION I. Overview. This section discusses EPA's preferred remedial action alternative and public reaction to this alternative.

SECTION II. Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during remedial planning activities at the Cape Fear Wood Preserving Site.

SECTION III. Summary of Major Comments Received During the Public Meeting and the Public Comment Period and EPA's Responses to These Comments. Both the comments and EPA's responses are provided.

SECTION IV. Remaining Concerns. This section describes the remaining community concerns that EPA should be aware of in conducting the remedial design and remedial action at the Cape Fear Wood Preserving Site.

SECTION V. Transcript of the Public Meeting. This section provides a transcript of the Feasibility Study Public Meeting held on February 21, 1989 at the Seventy-First Senior High School located near the site.

SECTION I. OVERVIEW

The public meeting at which EPA presented its preferred alternative to the public initiated the public comment period which ended on March 14, 1989. The alternative addresses both the soil and groundwater contamination problems at the Site. The preferred alternative specified in the Record of Decision (ROD) includes: permanent treatment of contaminated soil, groundwater, and surface water and sediment.

In the public meeting, held February 21, 1989, two remedial alternatives were proposed to the public for source control. Source control remedial actions addresses both contaminated soils and sediments in the drainage ditches and swamps. EPA's preferred alternative is soil washing which is expected to remove both the organic and inorganic contaminants. This is the preferred alternative because it eliminates, permanently, the source of contamination. In case that the treatability study indicates that soil washing will not achieve the cleanup goals stated in the Record of Decision (ROD), Table ___, the Agency proposed a low temperature desorption process to remove the organics and a soil fixation/stabilization/solidification process to address the inorganics. The soil washing treatability study is to be performed during the Remedial Design stage.

The community, in general, favors remedial action at the Site.

SECTION II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The Cape Fear Site is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401. It includes about nine acres of a 41-acre tract of land. The site is adjacent to other industrial/commercial establishments as well as private residences. Four homes are located near the site. In addition, a subdivision named "Southgate" is located approximately a quarter of a mile south of the site and houses approximately 1,000 people.

Interviews conducted in 1987 revealed that most residents on Reilly Road and on School Street have lived in the area for many years. Due to the transient nature of military life, the majority of Southgate residents are renters who are not in the area long enough to establish strong community ties.

Although there has been no organized community involvement with the Cape Fear site to date, community interest in, and concern with, contamination problems at the site have fluctuated in intensity since the discovery of contaminants in a residential well across from the site in 1977. Community concerns have rarely been expressed to government officials; rather, information has been shared and fears discussed primarily among area residents themselves.

Some specific fears expressed by local residents includes how they believe they have been and will be affected by the contamination problem. Other specific issues of concern mentioned by area residents and local officials are:

1. Extent and Nature of the Contamination

Area residents possess various amounts and types of information about the extent of contamination form the Cape Fear site, some of it stemming from misinformation and some from speculation. Residents do not have a thorough understanding of suspected contamination sources and whether or not the Agency is dealing with the full extent of the contamination problem.

2. Drinking Water Quality

Several residents expressed concern with the quality of their drinking water and the potential adverse health effects from its consumption.

3. Health and Safety

Several of the residents questioned the health and safety implications posed by the site's accessibility to children and young adults and suggested that the area be secured. The numerous acts of vandalism that have occurred at the site suggests that the area may be a gathering spot for youths carrying out activities that, at the time, go undetected.

4. Property Value and Quality of Life

Almost every resident interviewed mentioned reductions in their property value as an area of concern. Some local officials view the area surrounding the site as holding a good deal of potential for residential development. They are concerned that the property will not be restored to accommodate such growth.

5. Other Area-Wide Environmental Issues

According to local officials, an effort to site a hazardous waste incinerator in the area attracted 4,000 people to the public meeting of the proposed incinerator permit. Organized opposition to North Carolina's proposed membership in a low-level radioactive waste compact that would oblige the State to eventually host a disposal site.

III. SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE PUBLIC MEETING AND THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Comments raised during the Cape Fear Wood Preserving public meeting and public comment period are summarized briefly below. The comment period was open from February 21 to March 14, 1989 to receive comments from the public on the draft Feasibility Study and proposed remedial alternative.

There was a moderate response from the community in the public meeting but no comments were received during the pursueing three week public comment period. Summaries of the questions received during the public meeting are presented below.

Public Meeting

The public meeting was held on February 21, 1989 at the Seventy-First Senior High School auditorium. Questions and comments fell into five major categories including: concern about public health, thoroughness of research efforts to determine the extent and impact of contamination, time involved in cleaning up the Site and restoring the land, cost of the remedial action, and where the discharge of the treated/untreated water from the site will go.

The Agency's presentation and the questions and comments received from the public during the February 21, 1989 public meeting is provided in Section V.

Public Comment Period

No comments were received by the Agency during the three week comment period that ended on March 14, 1989.

IV. REMAINING PUBLIC CONCERNS

In addition to those concerns voiced at the public meeting, some additional public concerns are described below.

* Additional sampling/analysis of residential wells for volatile organics.

* Length of time prior to removing off-site monitor wells.

V. CAPE FEAR FEASIBILITY STUDY PUBLIC MEETING

CAPE FEAR PUBLIC MEETING
Fayetteville, North Carolina
21 February 1989
7:00 PM

JB: This is EPA's meeting on the Cape Fear Wood Preserving Site. As directed by the Superfund Law, the Agency is required to have at least one public meeting for a Superfund site at the conclusion or completion of the Feasibility Study for that site, and the Agency is now at that stage.

What I would like to do is briefly introduce those from the Agency who came up; and then, as briefly and quickly as possible, describe what we call the Remedial Investigation/Feasibility Study process, and then describe what we found on-site (the contamination), which is the RI findings; then briefly go through the evaluation process that we went through in the Feasibility Study to come up with the Remedy we selected or we're proposing to use to clean-up the site; then explain in better detail the remedy we're proposing; and then field any questions that you may have.

I'm Jon Bornholm; I've been with the Agency for almost five years. I'm in the Superfund Program on the Remedial side. This gentleman standing up is Michael Henderson with our Public Relations part, and Chris Kahle is also in the Superfund Program.

Out front, there are four packages of information: three fact sheets and one package of overheads I will go through tonight. The first package was sent out in November and basically tells or explains what the findings of the Remedial Investigation were. The second one, which was sent out in December, goes through the Feasibility Study. The last one is called the Proposed Plan, and it describes the alternatives evaluated to clean-up the site and then identifies the preferred remedial alternative.

This figure [ ] gives you an idea of where the site is. This [ ] is basically a more close-up picture; and this figure [ ] identifies more detail of the site itself.

The Remedial Investigation was conducted the summer of '87, and basically, the Remedial Investigation consisted of taking environmental samples, and analyzing those samples for contaminants we expected to see on-site as well as taking 10% of those samples and analyzing for a full range of possible contaminants. The environmental media sample included soils, subsurface soils, surface water and groundwater. The contaminants that were of concern were a result of the activities from the wood treating process, and basically that's creosote material, coal tar material and then metals coming from what's called a CCA process, a wolmanizing process. The letters stand for Copper, Chromium and Arsenic; those are the three metals we were looking at as well as the creosote.

The next couple of overheads I have show sampling areas and the range of concentrations we found on-site.

We used a grid system to take our surface soil samples, and this is for chromium. The colored-in areas are the areas that had levels higher than clean-up standards, so these would be the areas identified for remediation due to chromium contamination.

This overhead is for arsenic; again, we're talking about surface soils, and the hatched-in, x'ed-in area is the area that had arsenic levels above the clean-up standards, and this would be the area identified for remediation.

This overhead is for creosote. We use another term for it- PAHs (polycyclic aromatic hydrocarbons). Again, the area x'ed-in is the area identified for remediation due to contamination by creosote.

One of the compounds that we were not expecting to see on-site as a contaminant is benzene. This contaminant is basically due to the result of having a gasoline tank on-site, buried under the ground, that the operator used.

And we put all the areas together requiring remediation. This is basically what it looks like, and this is just for surface soils.

For surface water, we'll go back to this one map here, we're talking about from surface down to 3-5 feet in depth would be the depth that we. As far as surface water is concerned, we found that this drainage ditch here that leads back to this diked pond will also require remediation. That entails pumping out that water, treating the water, excavating the contaminated soils and treating those soils. So that will address surface water and sediments in this area. We did find some contamination in the swamp area back here which, again, we will address through excavation and treating that soil as well as surface water.

As far as groundwater contamination is concerned.... Although this identifies for creosote contamination in the upper aquifer, it's basically the same area for all the contaminants we look at.

We found that the upper aquifer at the site flows radially in all directions from the site. This is basically due to: 1) it being a high point in the area and 2) the high percentage of sand present at the site allows a high percolation rate in the ground.

And for the deeper aquifer, we only found a small area of contamination, which is right here [ ]. That's basically due to what we believe is an on-site production well used during the operation of the facility, contaminants leaking down the well-casing and getting into the deeper aquifer. That's why it's so localized.

One of the findings of one of the tasks of the Remedial Investigation is to quantify the amount of material (soils/groundwater) contaminated, and this table [ ] presents what we feel are the maximum and minimum amounts of contaminated material out there as well as an average.

That basically presents the findings of the Remedial Investigation. The Remedial Investigation had three basic questions we tried to answer: 1) What are the contaminants of concern at the site? 2) What concentration of the contaminants? 3) How far from the site has the contamination migrated? This information is fed into the Feasibility Study. The Feasibility Study evaluates, based on information from the Remedial Investigation, the types of clean-up alternatives that are feasible at the site.

Going from a list of approximately forty types of remediation, we narrowed it down to: four for addressing contaminated soils and sediments and five for addressing surface water and groundwater. One of the alternatives that we have to consider and carry all the way through the evaluation is what we call a No Action alternative. That's basically just to let the site sit there and monitor the contamination and the rate at which the contamination migrates. We use this as a base line measuring point to measure what good or benefit we get from our remedial alternatives.

For the contaminated soils these were the four alternatives that were evaluated in detail:

1S Again, No Action evaluation to present the base line measuring stick.

The other three are actual clean-up alternatives:

2S Is basically capping the contaminated area with a soil cap;

3S An excavation and soil-washing process

4S Again, we'd be digging up the contaminated soils and putting it through a low-temperature desorption/absorption process.

Where 1S and 2S are not permanent clean-ups. Obviously, under No Action, the contaminants would remain in place and, under 2S, the contaminants would remain in place although there would be a protective cap placed over them which would prevent rain basically from infiltrating the soils and helping spread contaminants into the groundwater.

3S and 4S are both permanent remedies; they will remediate the site and remove the contamination on a permanent basis.

Over here [ ] are the cost averages for each remediation; this is for soils and sediments. These numbers are based on that previous overhead [ ] that presented the max/min volume, so the cost is based on volumes of materials treated.

For groundwater and surface water [ ], again we looked at five alternatives in detail. The first one is No Action; that presents us with a base line to measure the other alternatives, the benefits to gain from the other alternatives.

2W through 5W are basically the same thing, the only difference is...; they are the same in the process that we are withdrawing or extracting water.

Q: I don't understand those figures.

A: The cost dollars? I'll get to those.

Q: I mean, $3395 for what?

A: OK, those are hundreds of thousands of dollars. So the first number would be $592,000. We're talking again in millions of dollars here, so we're talking about a range between: the high would be 2.8 million to, or the low 2.8 million to a high of 26 million.

2W through 5W, for withdrawing or excavating both surface water and groundwater, and the only differences between these alternatives is the degree we treat that water.

We really haven't, as far as selecting a specific treatment, we haven't done that, and we will do that after we talk with local sewer authorities and see if they will accept the water either with some type of treatment or with no treatment. We have not talked with the local sewer treatment plant. We don't know with regards to that.

There are some other odds and ends that need addressing on the site, and these are not in millions of dollars [ ]; these are the actual price tags, that we estimated, to deal with, to deal with the situation on-site. We found what we believe is asbestos-containing pipe insulation, what looked like CCA- Chromium, Copper Chromium Arsenic crystals, and what was left behind from on of our Emergency Responses, which is basically a pile of ten cubic yards of solidified creosote which remains on-site, and then the piping and tanks on-site as well.

Okay, this is basically what's presented in the Feasibility Study [ ]; this was done by the Agency's contractor. The last part, which is the actual selecting of the remedy which is left up to the Agency, and what the Agency has identified as a preferred alternative: I will start with what's up here. For the CCA crystals and creosote contaminated material; those two materials we are proposing to dispose off-site at a RCRA-approved hazardous landfill. There's two of them we're looking at: one is out over in Pinewood, South Carolina, GFX Hazardous Landfill, and the other one we looked at would be Emile, Alabama, which would be another hazardous waste landfill.

For the asbestos-containing piping insulation, we have been informed that Cumberland County Landfill can accept that, and therefore we are proposing to remove that and dispose of it at the local landfill.

And, for the liquids contained in the tanks, we would prefer to find a wood-treater who would be willing to accept that material, but in the likelihood that we would not find somebody, we would be proposing to treat that water on-site through the treatment system established for the groundwater and surface water, so that would be 1L.

Q: How can these price estimates be made without actual costs having been accrued and without knowing if the sewage treatment plant would accept the waste?

A: These prices are based on worst-case scenarios.

And then, once we empty the tanks, we clean them, try to render them non-hazardous and ideally we'd be able to sell them for scrap metal. And if we're able to do that, we'd make $112,000 (that's why the negative sign is up there); it wouldn't cost us anything to do that. The government would make money for once. If we can't render it non-hazardous or we can't find a scrap metal dealer to accept that metal after it's been cleaned, we could dispose of that at the county landfill, and the cost of that would be approximately $87,000.

For soils and sediments, the preferred or proposed clean-up method is 3S, so we're talking about, as a minimum cost, 4.3 million and, on the high end, 20.9 million to clean up the soil. There's one piece of information lacking that we're working with right now, or not working with unfortunately, and that is, we haven't performed a treatability study to make sure that the soil-washing process will work. So, as a fall-back position, we have identified 4S as a fall-back position in case we cannot find a soil-washing process that will work.

What the thermal process basically means is to process the soils and sediments through a low-temperature furnace at temperatures high enough to volatilize the creosote, to catch the exhaust gas coming off of that and then treating it with a scrubber and removing contaminants that way. Unfortunately, the thermal process itself does not address metals. Following that thermal process, we'd either use a filtration process where we'd be mixing with some type of concrete or similar material and making a concrete slab or monolith. Or use a soil-washing process to remove the soil. The price tag for that, for 4S, ranges from our estimates from 5.6 million to 26.1 million.

For the surface water and groundwater, again, right now we are proposing to pump the surface water as well as the contaminated groundwater. Our preferred discharge location or discharge point would be to the local sewer system. That would be the less costly, cheapest way to do it. Following negotiations with them, we'd have to negotiate haw much we could discharge to them and what levels of contaminants, if any, would remain in that water we discharge. They might require to clean it up to clean water specs. All that again is yet to be determined.

Q: Which number is that in the preferred alternatives?

A: It would be, it is the preferred alternative: To discharge to a POTW (publicly-owned treatment works).

If the sewer-system would not accept it, our other alternative, our other discharge alternative is to discharge it to a nearby surface stream, under what's called an NPDES permit (National Pollution Discharge and Elimination System). It has it's own criteria to protect surface water from contaminants, and we'd have to meet whatever level they set for that discharged water.

So, we're ranging from a minimum cost of approximately 2.8 million up to 3.5 million to treat surface water and groundwater, and these costs are based on the assumption that we will have to build some type of treatment plant on-site to treat this water.

Q: If you did air stripping, would you have to meet emission requirements?

A: We'd have to meet their specs. Superfund, although we have State and Federal permits, one thing Superfund doesn't actually have to do is get those permits; we have to meet the technical requirements of the permits. We would meet all requirements necessary.

This is just a quick overview of the soil-washing process [ ]. Basically it entails using a high pressure washing system to break up large aggregates of material, soil materials, and wash away the sludge, the contaminants, from the soil material. Clean soil, if it's heavy enough, would fall out due to gravity and be put back in place. The contaminants, creosote as well as metals, would come into solution or be removed as suspended solids in the waste water. That waste water would then be biologically treated to remove the creosote and we'd use some type of population/sedimentation/fixation process to remove the metals. Then that water can be recycled through the system.

Q: How is this process going to work at this large scale site?

A: It's being used as a pilot study right now at a Superfund site up in Minnesota. It's been shut down for the winter. The results seem positive. Again, we haven't done a treatability study and one of the main factors that would influence its acceptability here would be ???, basically the ratio between sand and clay that is in the ground. If we have a high clay content, then we'd have to use the other alternative, which was 4S which would be the thermal process which would be what we would be proposing.

Unfortunately, I did not itemize the total cost. For soils, we're using 10.9 million as the average cost; 3.4 million for addressing surface water and groundwater; if we can find a scrap metal dealer who will take the metal, these remedies here wouldn't cost anything, they'd kind of balance each other, but otherwise, we're talking about close to 200,000 for remediation of these items on this overhead [ ].

Are there any questions?

Q: When can we see some movement or activity out at the site?

A: Tonight starts, basically a, starts a three week comment period where the Agency encourages the public to express their feelings one way or the other about what we propose as a remedial alternative. Following the closure of that public comment period, we (the Agency) prepares a Responsiveness Summary where we respond to each comment we receive. That usually takes another two weeks. Then we prepare what's called a Record of Decision, we call is a ROD (another government acronym). The Record of Decision is a decision document; it's signed by the Regional Administrator, and it sets forth the actual clean-up that the Agency will implement at the site. And that could take up to a month. Since this is a Fund-lead site... In the Agency, we have two kinds of Superfund sites: one is Enforcement, where we have know PRPs, or potentially responsible parties- we have folks who created the contamination and they are paying for it; we have sites, such as Cape Fear Wood Preserving, which is called Fund-lead, and we haven't identified any responsible party for the contaminants on-site or the entity who created it is no longer around or doesn't have the money to pay for it, so Superfund fund pays for it. In sites like this, we need a matching 10% share from the State. We have to go through that negotiation with the State and that negotiation results in what's called a Superfund State Contract, and we're expecting to take two to three months to iron out the language.

Q: Following the Record of Decision?

A: Yes, a Record of Decision. We first have to get the State's concurrence on the remedy selected. If they do not concur, they do not match the funds and we don't clean up the site. Congress has mandated that we get the 10% matching funds before we do anything beyond this point.

Q: Does your report here take in consideration State officials saying that contaminant ... or solely on the knowledge...

A: We have all the documents that we generated to the State for review. They're using the same information we're using. These numbers are generated by our contractor who did the actual study. There's no reason why we would doubt this information. Where their actual decision role come in is what type of remedy they would like to see at the site. But they would be using the same information.

Q: Who is the contractor?

A: The contractor is Camp, Dresser & McKee. They're a national A & E (architecture and engineering) firm. We call them a REM II contractor. They've done work for the Agency east of the Mississippi. Their headquarters is outside Washington, but they have a local office in Atlanta, and that's the office we deal with.

Q: How reliable are the results that Camp, Dresser & McKee generated?

A: We have about three or four contractors we rely on to do this kind of work.

Q: If the degree of contaminants that you have shown here tonight, in your all background and experience, what is the possibility...is it at a level where the contaminants propose a health threat and what is the possibility of the no action alternative?

A: My feeling from what I've heard from the State is that they prefer some kind of permanent remedy at the site, not the No Action alternative. The No Action alternative, for at least surface soils, is not acceptable for health-based reasons.

Q: What about the water?

A: Again, the groundwater does exceed clean-up standards, and therefore we would encourage clean-up, not knowing what the future holds for that area. It could go one way or another. If it goes residential, we would have to clean it up; if it stays as it is, there's not much of a push to clean it up. It's not going to affect anyone.

Q: Is there any immediate danger within the area?

A: From groundwater? No, groundwater is very localized. The one well that was contaminated, I believe the owner/operator dug that person a new well.

Q: On that figure [2-6] does that big circle represent the upper water system or lower or both?

A: This big circle? It was the surficial, the upper aquifer.

Q: And what do you call upper as far as depth?

A: I think it goes down to between 30 and 50 feet and then we find a confining zone which separates the upper aquifer from the deeper aquifer.

Q:

A: Okay, this is the contaminants found in the upper aquifer.

Q: How far has the contamination gone?

A: This is the residence where we found contamination in the person's well. I would guess, looking at this scale, it's about 250 feet west.

Q: How far south has the contamination...

A: This should be the condition of the wells; they would show up clean.

Q:

A: I was under the assumption that we had a pair of wells there.

Q: Is that well a deep or shallow well?

A: I'm not sure if that's deep or shallow.

Q:

A: I don't have that information off hand, but hopefully I have it here.

Q:

A: I believe we found... Where that 400 is? There should be two here, and I... That 400 represents what we found in the shallow well. So, since we're talking about the upper aquifer, that's why there's no dot here; we only have a deep well there. So we found 400 ug/l of contaminants (PAHs). And this figure [ ] -- that oval is computer generated from groundwater modeling program.

Q: How long has it been since that well's been sampled?

A: I'd have to say August '87.

Q:

A: That might be date of the report. We performed the Remedial Investigation during the summer of '87. So it was sometime during that summer. Mr. Jackson's private well, which was a shallow, hand-dug well, which is near this point was found contaminated back in 1980 or 1979. And, in response, he was provided a new well.

Q: Let me ask you this: How far has the contamination moved since 1979?

A: This would be, this figure is based on data collected the summer of '87.

Q: Contamination was found in 1979/1980 across the road?

A: And we found contamination two summers ago and this 400 represents that contamination. And based on computer modeling, we have projected that the contaminants have migrated this far, as of the summer of '87. I think groundwater horizontal velocity is, I want to say, is 15 ft/yr -- the rate it's moving.

Q: 50 ft/yr?

A: 15 ft/yr is what we've calculated the water is moving. That's not to say the contamination is moving at that rate; it's just saying the water is moving at that rate. Contaminants don't move as quickly as the water does. So, if anything, it might be a tad larger than this area right now, but it wouldn't, cost-wise, it wouldn't effect the cost. Again, we're dealing with a maximum/minimum range, and I'm sure it will fall within that range of volume with the estimated cost it's based on.

Q: With contaminants on both side of the road and a ditch along side the road that crosses underneath the road.

A: That would be this right here [ ].

Q: That ditch I thought does on down to a lake, is there contamination from the site in the lake and ditch since the majority of flow appears to go in that direction.

A: We did not find, you know our Remedial Investigation, we did not find contaminants in this area, which was basically on the other side of Reilly Road. To answer the other question, we don't know.

I'm not saying no contamination has gone that far, but we don't have information to judge one way or the other. All we can do is work on the information we have, and, according to the samples collected during the Remedial Investigation, we did not find contamination in that ditch on the other side of the road.

Q: I think it was about 25 years ago, there was a pond and all the fish were killed in the pond by contamination.

JB: Back here somewhere?

Q: Did you find any contamination in that direction?

A: We did find contamination through this drainage ditch and in the diked pond that is an area targeted for remediation. We did not find surface water or sediment contamination in this ditch on this side, and therefore it was not identified as an area for remediation. As far as a pond in this area, we have no information to make one judgement or the other on that.

Any other questions?

Q: How about Southgate here?

A: All the supply wells in that area were tested, yes. And we found... The only thing we found in the wells were elevated levels of trihalomethanes (THMs).

Q: Did you find a source?

A: No, no, we weren't able to identify that to any source.

Q: It was one of the supply wells?

A: It was one of the supply wells in Southgate subdivision, and we found THM. THM is trihalomethane either chlorine or fluorine: trichloro- or trifluoromethane.

Q: That was in '87?

A: That was back in '87.

Q: And you tested for what?

A: We tested it looking for contaminants from this site. The levels were below drinking water standards. We did identify or notify the owner/operator of the well and the local government of our finding and as far as Superfund program goes, that's as far as we carry it. We identify the right folks hopefully and that's as far as we go with that.

Q:

A: No to this site, no.

Q: Do local officials know what has been found at the site?

A: As far as the local state offices, yes. The county offices...I have not been in direct contact with them. We have established an information repository/administrative record at the public library which contains all the documents including the information I reviewed tonight

JB: Any other questions. I thank you and appreciate you for coming. I hope cleanup gets going as quickly as possible.

END OF TAPE

APPENDIX B

PROPOSED PLAN/LEGAL NOTICE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

SUPERFUND PROGRAM PROPOSED REMEDIAL ACTION FACT SHEET

for

CAPE FEAR WOOD PRESERVING SITE FAYETTEVILLE CUMBERLAND COUNTY, NORTH CAROLINA

February 1989

For More Info Contact:
Jon Bornholm
Superfund Branch
(404)347-7791

CURRENT STATUS

This is the second Fact Sheet discussing the Feasibility Study (FS) for the Cape Fear Wood Preserving Superfund Site. The previous Fact Sheet highlighted and summarized the findings documented in the Draft Feasibility Study. This Fact Sheet proposes the Agency's preferred remedial alternative f the Cape Fear Site as well as inform the public of the upcoming public ..ing on the Feasibility Study. The main emphasis of the meeting will be c.. the Agency's proposed remedial action. The date of the meeting is February 21, 1989 at Seventy-First Senior High School Auditorium. The meeting is to begin at 7:00 pm. The Seventy-First Senior High School is located at on Raeford Road in Fayetteville, North Carolina.

SITE DESCRIPTION AND HISTORY

The history of the Site has been summarized in previous Fact Sheets and can be found in either the Remedial Investigation (RI) report or the Final Draft Feasibility Study document, copies of both are located in the Information Repository/Administrative Record (IR/AR). The IR/AR is located in the Cumberland County Public Library and Information Center.

Major site structures and features are shown in Figure 1. This figure will also allow the reader to locate areas on the Site that require remediation.

FEASIBILITY STUDY

Results of the RI show that the soils, sediments, surface water and groundwater contain contaminant concentrations above applicable relevant and appropriate requirements (ARARs) or target risk levels used in public health .luations (1 person out of 1,000,000 for carcinogenic compounds and a ..rd index of 1 for noncarcinogenic compounds). The contaminants targeted tor remediation are listed in Table 1 along with a specific cleanup goal for each contaminant in each environmental media (soil, surface water/sediment, each environmental media (soil, surface water/sediment, and groundwater) and the rationale for selecting the particular cleanup goal.

The cleanup goals were derived through reviewing existing ARARs, reverse risk assessment techniques (calculated values), background concentrations, environmental protectiveness, and analytical detection limits. Consideration was also given to direct contact exposure, leaching to groundwater and surface water as well as present and future residential versus industrial land use scenarios. All of the above information can be found in Appendix C - Risk Assessment of the Remedial Investigation Report dated October 6, 1988.

The FS stage of the Superfund process begins near the end of the RI. The primary objective of the FS is to document and support the selection of the most appropriate remedial clean-up response for a Superfund site. Briefly, the FS evaluates a list of remedial responses based on cost, engineering feasibility, environmental impact, and then recommends the most cost-effective solution for the contaminants found at a site that will adequately protect public health and the environment.

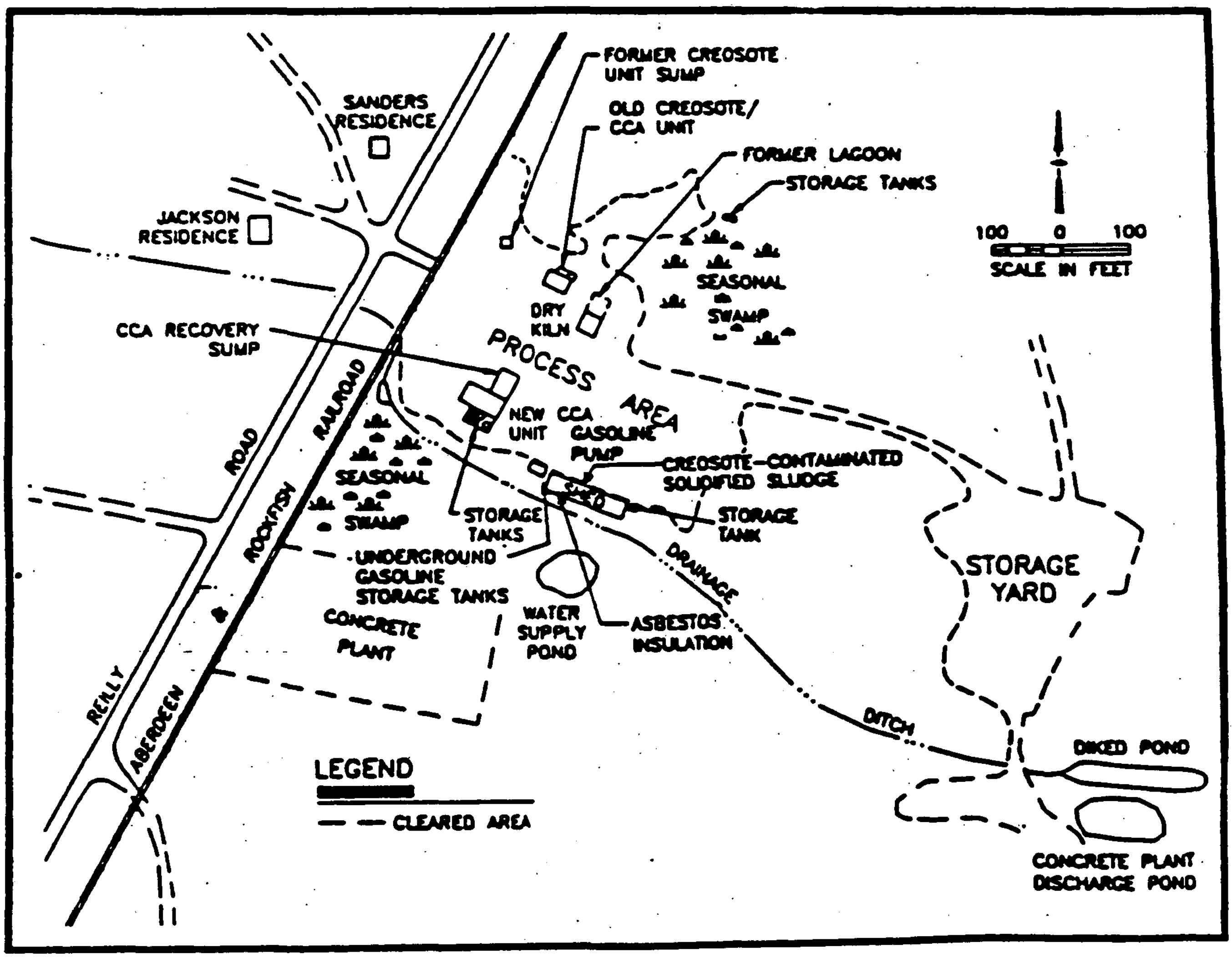


Figure 1. Site Map Identifying and Locating Site Features

TABLE 1. Summary Of Contaminated Media And Cleanup Goals

Media	Site Related Contaminants Exceeding ARARs, Risk Assessment Values, or Environmental Criteria	Clean Up Goals	Rationale for Cleanup Goals
		ug/liter	
Ground Water	Benzene	5	a
	PAHs (carcinogenic)	10	b
	PAHs (noncarcinogenic)	14,350	c
		ug/liter	
Surface Water	Arsenic	12	d
	Chromium (total)	11	d
	Copper	14	e
		mg/kg	
Soil	Arsenic	94	c, f
	Benzene	0.005	b
	Chromium (total)	88	g
	PAHs (carcinogenic)	2.5	c,h
	PAHs (total)	100	i
		mg/kg	
Sediment	PAH (total)	3.0	j
	Arsenic	94	k
	Chromium (total)	88	k

(a) ARAR - Maximum Contaminant Level (MCL).

(b) The Contract Laboratory Required Quantitation Limit is proposed since since the calculated risk assessment value is below analytical detection limits. Should this limit be reduce with time as analytical procedures improve, the new (lower) limit would become the cleanup goal.

(c) Value derived using reverse risk assessment techniques.

(d) ARAR - Ambient Water Quality Criteria.

(e) The goal presents background conditions since th Ambient Water Quality Criteria Concentration (6.5 ug/L) is below background.

(f) The future use worker scenario is used since this is the more likely future use and arsenic is not posing a significant risk under current use conditions.

(g) The goal represents site background conditions (maximum of the range observed) since the calculated risk assessment value is below background levels.

(h) The value listed represents a current use scenario sine this is more conservative than the levels derived for the future use worker scenario.

(i) Value is based on typical background concentrations (from the literature) since the calculated level necessary to prevent future leachate from exceeding a hazard index of 1 in groundwater (60mg/kg) is less than representative background conditions.

(j) Concentration researched by EPA to be protective of aquatic biota.

(k) The same value proposed for soils is applied due to a similar human exposure route, and low expected impact to surface water on a volumetric basis.

EXTENT OF CONTAMINATION

Based on clean-up goals, the extent of contamination was estimated for each environmental media. The following figures (Figures 2 through 4) define the areas of contamination requiring remediation for each contaminant or group of contaminants in each environmental media.

Soil

An evaluation of the soil sample results indicates that despite previous removal activities, areas with high inorganic (copper, chromium and arsenic) and polycyclic aromatic hydrocarbon (PAH) or creosote concentrations still remain. The areal extent of surface soil for all contaminants exceeding cleanup goals encompasses approximately 150,000 square feet (3.4 acres). In estimating the volume, a minimum 3 foot and maximum 10 foot contaminant depth are considered in the main process area and where subsurface contamination was identified. Outside the main process area, 1 foot and 3 foot minimum and maximum depths, respectively, are considered. Three feet is considered as a benchmark since this is the average depth to groundwater. Using minimum and maximum depths described, the total volume of soil for potential remediation ranges from 14,100 cubic yards to 46,800 cubic yards with an average of 30,500 cubic yards.

Figure 2 defines the area of the Site requiring surficial soil remediation. This area encompasses all areas found to be contaminated.

Surface Water and Sediment

Surface water locations exceeding cleanup goals for arsenic, chromium and copper include the water supply pond, the northeast seasonal swamp, the drainage ditch south and west of the railroad tracks, the diked pond, and concrete plant discharge pond. Depending on the season, an approximate minimum-maximum range of 0.8-1.2 million gallons (MG) is estimated, with an average of approximately 1.0 MG.

Sediments exceeding cleanup goals for total PAHs, arsenic and chromium line the northeast seasonal swamp, the drainage ditch south and west of the railroad tracks, and the diked pond (refer to Figure 1). Since the exact vertical profile of sediment contamination is not known, volumes were estimated for a minimum 1-foot depth, which represents a practical lower limit for removal, and a maximum 3-foot depth, the average depth to groundwater. The resulting minimum - maximum volume range for remediation is approximately 1,800-5,400 cubic yards with an average of 2,900 cubic yards.

Groundwater

Comparing results for polycyclic aromatic hydrocarbons and benzene, toluene and xylenes in both the upper and lower aquifers shows close correspondence in representing the horizontal extent of organic contamination. Using the organic areal extents, an upper aquifer thickness of 25 feet, lower aquifer depth of 50 feet, and an average effective soil porosity of 0.20, the volumes of contaminated groundwater in the upper and lower aquifers were estimated

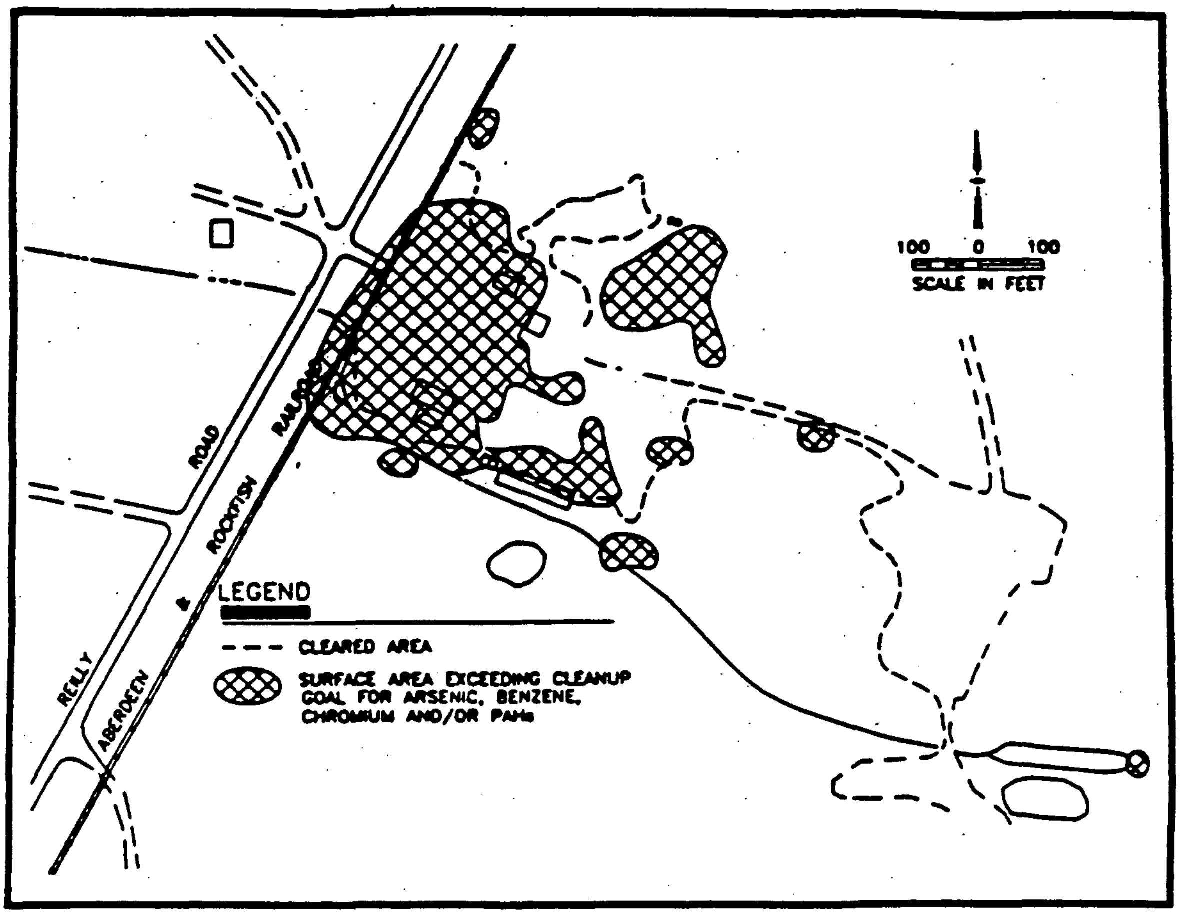


Figure 2. Horizontal Extent Of Contamination Exceeding Cleanup Goals In Surficial Soils

to be 23.48 and 0.6 million gallons, respectively. Experience at other contaminated sites shows that 4 times this contaminated volume may be required for withdrawal and treatment. Consequently, 93.9 and 2.4 million gallons have been used in the upper and lower aquifers, respectively, to estimate a maximum expected treatment duration.

Figure 3 provides the estimated boundary for the plume of contamination, including both PAHs and benzene, in the upper aquifer and Figure 4 provides the approximate plume boundary for both PAHs and benzene contamination in the lower aquifer.

PROPOSED CLEAN-UP GOALS

Are shown in Table 1.

REMEDIAL ACTION ALTERNATIVES EVALUATED

The entire list of remedial alternatives considered for the Cape Fear Site can be found in the previous Fact Sheet or in the Final Draft FS document (dated December 16, 1988) located in the IR/AR. These remedial action alternatives were formulated considering contaminant types, contaminant concentrations, and applicable technologies. The alternatives were then evaluated based on technical feasibility and implementability, long-term and short-term effectiveness and impacts, protectiveness of human health and the environment (i.e., level of risk reduction, compliance with ARARs or cleanup goals, and reductions in contaminant mobility/toxicity/volume), and cost. A summary of the remedial action alternatives evaluated for the contaminated soils and sediments is provided in Table 2. Similarily, Table 3 and Table 4 present the remedial action alternatives evaluated for groundwater/ surface water and the hazardous materials, tanks, and piping, respectively.

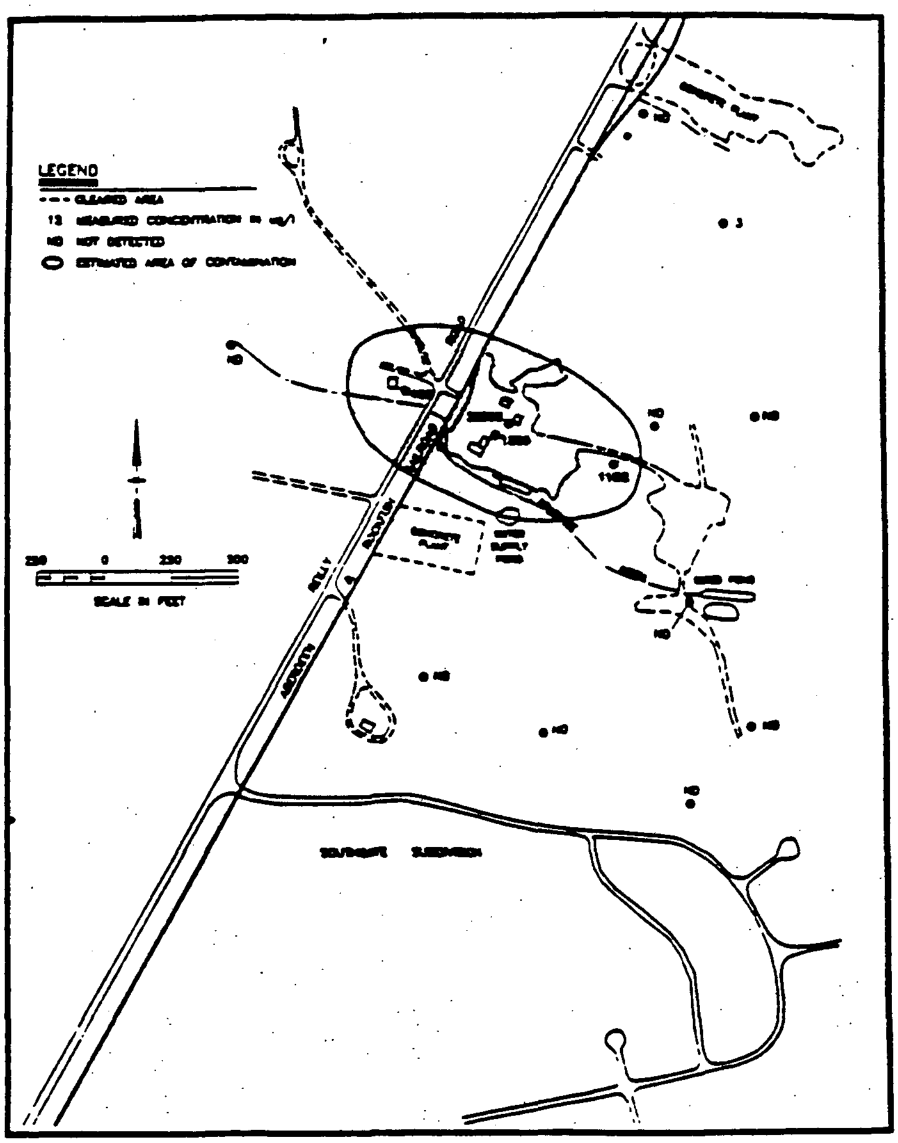


Figure 3. Approximate Upper Aquifer Plume Exceeding PAH and Benzene Cleanup Goals

SOILS/SEDIMENT ALTERNATIVES

ALTERNATIVE 1S: NO ACTION

This alternative provides the baseline case for comparing soil/sediment alternatives and the level of improvement achieved. No remedial action besides continued monitoring would be performed. Given the low solubility of PAHs, natural soil flushing is not expected to reduce soil contamination below cleanup goals within an acceptable time frame.

No reduction in the mobility/toxicity/volume (M/T/V) of the contaminants present are realized. Cleanup goals will be exceeded.

ALTERNATIVE 2S: PARTIAL EXCAVATION/DREDGING OF SOILS AND SEDIMENTS WITH SURFACE CAPPING

This alternative involves excavating contaminated soils outside the main process area and excavating/dredging contaminated sediments. Excavated/dredged materials would be transported to the central process area and capped along with the contaminated soils found in the process area.

This alternative would reduce the mobility of the contaminants but would not alter the toxicity or volume. This alternative could be implemented and completed in approximately 4 months.

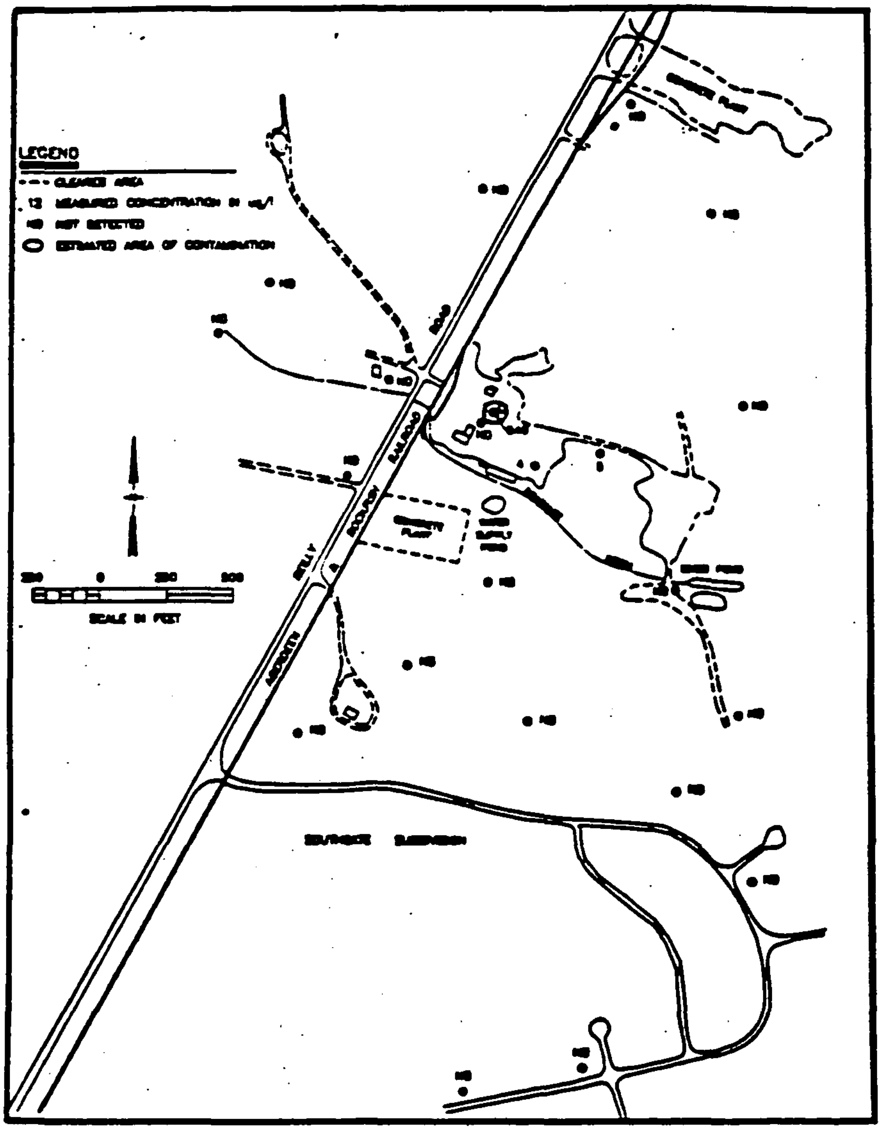


Figure 4. Approximate Lower Aquifer Plume Exceeding PAH and Benzene Cleanup Goals

ALTERNATIVE 3S: SOIL AND SEDIMENT WASHING

Soil/sediment washing involves on-site treatment of contaminated soils and sediments with water and detergents and/or surfactants, if necessary. Soils exceeding cleanup goals would be excavated and processed through a series of washing processes. The cleaned soils would be replaced in the excavation. The wastewater generated would be treated through the on-site water treatment system.

This alternative reduces the M/T/V of the contaminants by removing the contaminants from the soils/sediments. This alternative would take approximately 2 years to complete once implemented.

ALTERNATIVE 4S: THERMAL PROCESSING OF CONTAMINATED SOILS AND SEDIMENTS COMBINED WITH FIXATION/SOLIDIFICATION/STABILIZATION OR WASHING

This alternative involves the excavation of all contaminated soils and sediments exceeding cleanup goals. Materials containing organic

TABLE 2. Development Of Remedial Action Alternatives For Soils/Sediments

Alternative	Technologies Employed
1S*	No action Natural flushing
2S	Excavate isolated areas of soil contamination Excavate/dredge sediments Dewater dredged sediments Cap soils and dewatered sediments Revegetate
3S	Excavate/dredge soils and sediments Wash excavated materials onsite Water supply source: A. Purchase from Fayetteville Public Works Commission and truck to the site. B. Purchase from a private water company and pipe to the site. C. Install an onsite well outside the contaminant plume area. Redeposit washed soils/sediments in the excavated area Revegetate
4S	Excavate/dredge soils/sediments Dewater dredged sediments Thermal process excavated materials Solidify/stabilize processed soils/sediments and redeposit in the excavated area. Revegetate

*S denotes remedial alternative for soil/sediment.

TABLE 3. Development Of Remedial Action Alternatives For Groundwater And Surface Water

Alternative	Technologies Employed
1W*	No action Long-term groundwater monitoring
2W	Groundwater extraction by well points and a deep well Flocculation**, sedimentation, and filtration (surface and groundwater) Activated Carbon Adsorption (surface and groundwater) Discharge treated effluent to surface water (western ditch)
3W	Groundwater extraction by well points and a deep well Flocculation, sedimentation, and filtration (groundwater and surface water) Air stripping (groundwater) Activated carbon adsorption (surface and groundwater) Discharge treated effluent to surface water (western ditch)
4W	Groundwater extraction by well points and a deep well Groundwater treatment Filtration Air Stripping Activated carbon adsorption Surface water treatment Precipitation Flocculation, sedimentation, and filtration Discharge treated effluent to surface water (western ditch)
5W	Groundwater extraction by well points and deep well(s) Pretreatment Precipitation (surface and groundwater) Flocculation, sedimentation, and filtration (surface and groundwater) Discharge to POTW

* W denotes remedial alternative for groundwater or surface water.

** Flocculation - The removal of suspended material by adding chemicals resulting in the suspended materials forming heavier masses that will settle out.

concentrations greater than cleanup goals (PAHs and benzene) would undergo thermal desorption while soils with inorganic levels exceeding remediation objectives (arsenic and chromium) would be either fixated/solidified/stabilized or ran through a soil washing process.

This alternative reduces the M/T/V of the contaminants by removing the contaminants for the soils/sediments. This alternative would take approximately 2 years to complete once implemented.

GROUNDWATER ALTERNATIVES

ALTERNATIVE 1W: NO ACTION

The purpose of the no action alternative is to evaluate site impacts in the absence of remediation. As part of no action, groundwater monitoring would be conducted.

No exposure pathways are eliminated and reduction in the risk level are achieved. There is no reduction in the M/T/V of the contaminants. A 30-year time frame is used for comparative purposes.

ALTERNATIVE 2W: PUMP SURFACE WATER AND EXTRACT GROUNDWATER AND TREAT THROUGH FLOCCULATION, SEDIMENTATION, FILTRATION AND ACTIVATED CARBON ADSORPTION

Surface water and groundwater would be pumped to the treatment system on-site. Surface water would be removed from the northeast swamp, drainage ditch and diked pond before sediments remediation in these features. Groundwater extraction will be accomplished by well points in the upper aquifer. Recovery would be conducted at one approximate 10,000 square feet subarea at a time, and the well points would be moved to adjacent subareas for subsequent dewatering. The lower aquifer will be pumped following the completion of the remediation of the overlying upper aquifer to avoid potential drawdown of the contaminants.

Extraction and treatment of contaminated groundwater and surface water will reduce contaminant M/T/V. The overall project duration from design to closure is estimated to be about 3.6 years.

ALTERNATIVE 3W: PUMP SURFACE WATER AND EXTRACT GROUNDWATER AND TREAT THROUGH FLOCCULATION, SEDIMENTATION, FILTRATION, AIR STRIPPING AND ACTIVATED CARBON ADSORPTION

Surface water and groundwater would be pumped to the treatment system on-site. Surface water would be removed from the northeast swamp, drainage ditch and diked pond before sediments remediation in these features. Groundwater extraction will be accomplished by well points in the upper aquifer. Recovery would be conducted at one approximate 10,000 square feet subarea at a time, and the well points would be moved to adjacent subareas for subsequent dewatering. The lower aquifer will be pumped following the completion of the remediation of the overlying upper aquifer to avoid potential drawdown of the contaminants.

This scheme provides air stripping for groundwater and therefore achieves a higher level of treatment than provided in Alternative 2W. Extraction and treatment of contaminated groundwater and surface water will reduce contaminant M/T/V. The overall project duration from design to closure is estimated to be about 3.6 years.

ALTERNATIVE 4W: PRECIPITATION, FLOCCULATION, SEDIMENTATION AND FILTRATION OF SURFACE WATER. FILTRATION, SIR STRIPPING AND ACTIVATED CARBON ADSORPTION OF GROUNDWATER

This alternative provides separate treatment for surface water and groundwater based on the different contaminants found in these media.

Surface water will be pumped to a treatment system on-site. Surface water would be removed from the northeast swamp, drainage ditch and diked pond prior to sediment remediation in these targeted areas. Extracting groundwater will be accomplished by well points in the upper aquifer and pumped to a separate treatment system. Recovery would be conducted at one approximate 10,000 square feet subarea at a time, and the well points would be moved to adjacent subareas for subsequent dewatering. The lower aquifer will be pumped following the completion of the remediation of the overlying upper aquifer to avoid potential drawdown of the contaminants.

Extraction and treatment of contaminated groundwater and surface water will reduce contaminant M/T/V. The overall project duration from design to closure is estimated to be about 3.6 years.

ALTERNATIVE 5W: PRETREATMENT OF GROUNDWATER AND SURFACE WATER WITH DISCHARGE TO PUBLICLY OWNED TREATMENT WORK

As with other water alternatives, surface water will be pumped and groundwater extracted through well points. The water will be pretreated, as determined by the publicly owned treatment work (POTW), and the effluent will then be discharged to the POTW.

Extraction and treatment of contaminated groundwater and surface water will reduce contaminant M/T/V. The overall project duration from design to closure is estimated to be about 3.6 years.

ALTERNATIVES FOR HAZARDOUS MATERIALS, TANKS AND PIPING

ALTERNATIVE 1C AND 1A: OFFSITE LANDFILLING OF CCA CRYSTALS AND ASBESTOS-CONTAINING PIPE INSULATION

Small quantities of apparent CCA crystals, characterized as hazardous, will be transported to a RCRA permitted landfill. The asbestos-containing insulation, characterized as non-hazardous, will be disposed of at the Cumberland County Solid Waste Facility.

Contaminant mobility is reduced by removal. Since no treatment is evoked, toxicity and volume are unaffected. The above activities should be completed in a month.

ALTERNATIVE 1SS: ONSITE DISPOSAL OF SOLIDIFIED SLUDGE

On-site disposal of creosote contaminated sludge which was previously solidified will be capped along with other soils and sediments (Alternative 2S).

Disposing this solidified sludge on-site in association with a cap should reduce contaminant mobility but will have minimal affect on contaminant toxicity and volume.

ALTERNATIVE 2SS: OFFSITE DISPOSAL OF SOLIDIFIED SLUDGE

If either Alternative 2S or 4S is not selected, the creosote contaminated sludge will be transported to a RCRA permitted landfill for disposal.

Contaminant mobility is reduced by source removal, whereas toxicity and volume are unaffected.

ALTERNATIVE 1L: ONSITE TREATMENT OF CCA SOLUTION AND/OR WASTEWATER IN TANKS

The liquids would be fed at a low rate into the treatment system established for addressing the groundwater and surface water.

Contaminant mobility, toxicity and volume decrease with treatment.

ALTERNATIVE 2L: OFFSITE TREATMENT OF CCA SOLUTION AND/OR WASTEWATER IN TANKS

If Alternative 4W is not selected for surface water, other alternatives may not be adequate to treat high contaminant concentrations since they are not specifically targeted for metals removal. In this event, off-site treatment at a RCRA permitted facility is necessary.

A reduction in the contaminants toxicity (reduction of hexavalent chromium) and mobility would be reduced. Volume would remain unchanged.

ALTERNATIVE 3L: OFFSITE TRANSPORT OF CCA SOLUTION

As an alternative to headstrong the 3 percent CCA solution, this solution could be shipped to another wood preserver for use.

This alternative would achieve a reduction in the mobility and volume of the contaminant but since there was no treatment, toxicity remains the same.

ALTERNATIVE 1T/P AND 2T/P: REMEDIATION OF TANKS AND PIPING

Nine tanks, eight above ground and one below, remain on-site and are targeted for removal. In addition, piping associated with the tanks and piping tied into the wood treating process (both creosote and CCA) is scheduled for removal. Tanks and piping will be render non-hazardous through steam cleaning, flushing and rinsing (triple rinse). Alternative 1T/P provides an opportunity for a scrap metal dealer to purchase the metal and Alternative 2T/P allows for disposal of the cut up metal at the Cumberland County Solid Waste Facility.

TABLE 2. Development Of Remedial Action Alternatives For Hazardous Materials, Tanks, And Piping

Material	Alternative	Technologies Employed
Apparent CCA Crystals**	1C	Offsite landfill (hazardous).
Asbestos Insulation** (Assumed)	1A	Offsite landfill (nonhazardous).
Solidified Sludge	1SS	Onsite disposal.
	2SS	Offsite landfill (hazardous).
CCA Wastewater and/or CCA 3% Solution	1L	Treat wastewater and solution onsite for Cr^{+6} Treat wastewater and solution onsite with surface waters.
	2L	Treat wastewater and solution offsite.
	3L	Transport CCA solution offsite.
Tanks and Piping	1T/P + 2T/P	Locate (Piping) Empty (Tanks) Excavate (UST and Piping) Drain/Purge (Piping) Clean (Tanks and Piping) Cut (Tanks and Piping) Dispose of as:
	1T/P	Scrap metal
	2T/P	at an offsite landfill (nonhazardous)

* C denotes Crystals (apparent CCA)
A denotes Asbestos (assumed)
SS denotes Solidified Sludge
L denotes Liquid (CCA Wastewater and/or CCA 3% Solution)
T/P denotes Tanks/Piping

** Based on visual characterization. These materials were not sampled.

UST - Underground Storage Tank.

EPA'S PROPOSED REMEDIAL ALTERNATIVE

Prior to initiating any remedial action on-site, a site survey will be conducted to determine the presence of any endangered plant species exist on-site.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

Off-site disposal of sodium dicromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, solidified creosote and asbestos-containing pipe installation. Since CCA crystals and the solidified creosote are characterized as hazardous, they will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe installation is characterized non-hazardous and will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.

The tanks and associated piping, above and below ground, will be emptied, approximately 50,000 gallons of 3 percent CCA solution and 15,000 gallons of CCA contaminated wastewater, flushed and cleaned, including triple rinsing, to render them non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. Tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous will be transported to a RCRA permitted landfill for disposal.

A buyer for the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,000 gallons of the CCA contaminated wastewater as well as wastewater generated by on-site activities will be treated on-site through the water treatment system(s) set up for treating the pumped surface waters and extracted groundwater.

SOURCE CONTROL (Remediation of Contaminated Soils)

The preferred alternative for the remediation of contaminated soils/sediment is a soil washing technique. The alternate source control alternative is an on-site low temperature process to remove the organic contaminants followed by either a soil washing technique or soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative that will be implemented will be based on data generated by the soil washing treatability study to be conducted during remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site activities, those areas disturbed by remedial activities on-site will be revegetated.

MIGRATION CONTROL (Remediation of Contaminated Groundwater)

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Recovery will be conducted in

10,000 square foot subareas at a time, and the well points will be moved to adjacent areas for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. The range of treatment for the contaminated water includes air stripping, filtration through activated carbon filter, bioremediation, and metal removal through flocculation, sedimentation and precipitation. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a local surface stream. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluent will meet all ARAR's.

EXPRESS YOUR OPINION/PUBLIC COMMENT PERIOD

The Community's Role in the Superfund Process

EPA relies on the public to ensure that the cleanup method selected for each Superfund site meets the needs of the local community, in addition to being an effective solution to the problem. To this end, EPA has set a public comment period from February 21 through February 14, 1989 to encourage public participation in the selection process. In addition to the public comment period, the Agency held a public meeting at which the findings and conclusions of the FS will be presented to the public. Questions will be entertained at the meeting. The public meeting will be held on February 21, 1989 at 7:00 pm in the Seventy-First Senior High School Auditorium at Route 21, Box 479, Raeford Road, Fayetteville, North Carolina.

In addition, EPA has placed the RI/FS reports and this Proposed Plan in the public Information Repository. The Information Repository is located at the Cumberland County Public Library and Information Center. EPA encourages residents and other interested parties to make written and oral comments on the Proposed Plan and the FS document through February 14, 1989. Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision (ROD). The ROD is the document that states EPA's final alternative selection.

At this point, however, the proposed alternative is merely the preliminary choice for solving the contamination problems at the site. EPA will make the final selection only after consideration of all comments on any of the remedial alternatives addressed in this Proposed Plan and FS report.

EPA encourages the public to become involved in the selection process by attending the public meeting, becoming informed, and commenting on the alternative presented. The Agency will accept oral or written comments during the public comment period. Comments, or requests for further information, should be sent to:

Michael Henderson
Community Relations Coordinator
U.S. EPA, Region IV
345 Courtland Street, NE
Atlanta, GA 30365
(404)347-3004

The Agency encourages concerned citizens to become involved and have their names added to the Cape Fear Wood Preserving site mailing list. If you are interested, send your name and address to Jon Bornholm, EPA, 345 Courtland St., NE, Atlanta, GA 30365.

RECORD OF DECISION

The Record of Decision (ROD) is the decision document in which the Agency selects as well as supports the remedial alternative to be implemented at a Superfund site.

ADMINISTRATIVE RECORD/INFORMATION REPOSITORY

Section 113 (k) of the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund), as amended by the Superfund Amendments and Reauthorization Act (SARA), requires that the Agency establish an Administrative Record (AR) at or near the site at issue for public review. The AR is to contain all information used by the Agency to make its decision on the selection of a remedial response under the Superfund Law.

EPA has established an Information Repository/Administrative Record at the Cumberland County Public Library and Information Center. The Information Repository/Administrative Record must contain all the data/correspondences/documents/rationale used by the Agency in developing and choosing the remedial alternative selected to clean up the site.