United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-88/037
June 1988

EPA

Superfund Record of Decision:

Wamchem, SC

50272-101

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SUPERFUND RECORD OF DECISION
Wamchem, SC
First Remedial Action - Final

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14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 21-acre Wamchem site is located in Burton, Beaufort County, South Carolina on a small island in the midst of a salt marsh near McCalleys Creek, a tidal stream. The creek is considered to be a habitat for the loggerhead turtle, a federally listed threatened species, and a probable habitat for the short-nosed sturgeon, also a federally listed endangered species. The water table aquifer at the site discharges into the creek, and has no distinct confining unit separating it from the underlying Floridan aquifer, the principal aquifer in the region. Between 1959 and 1972, the Beaufort Chemical and Research Company owned and operated the site, producing dyes for the textile industry. In 1972, M. Lowenstein Company purchased the facility and continued operations until 1981. When solvent recovery and recycling operations were discontinued at the site, M. Lowenstein Company closed the plant in 1982. Liquid wastes generated at the site were discharged to a drainage ditch leading to two unlined ponds. A ditch was later extended from one of the ponds, discharging wastes directly into McCalleys Creek. Waste treatment methods changed, and the ponds and ditches were replaced by an unlined holding pond and a waste lagoon in 1972; however, these were soon replaced by two spray fields and a concrete-lined holding pond in 1975. In 1977, the South Carolina Department of Health and Environmental Control (SCDHEC) required the
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Wamchem, SC
First Remedial Action - Final
Contaminated Media: gw, soil
Key Contaminants: organics, VOCs (benzene, toluene, xylenes)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 53
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

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* hem, SC
F st Remedial Action - Final

16. ABSTRACT (continued)

company to use a spray-irrigation technique to improve its wastewater process. The wastes discharged onto the spray fields consisted of neutralized sulfuric acid and process water. Although the system was found to be in compliance with SCDHEC standards, ground water contamination was documented at the site in 1982. Current soil and ground water contaminants include: VOCs, benzene, toluene, xylenes, semi-volatiles, and organics.

The selected remedial action for this site includes: ground water pump and treatment using carbon adsorption with offsite discharge to a stream; excavation and low temperature thermal aeration of 2,000 yd^3 of contaminated soil followed by onsite disposal; and ground water monitoring. The estimated capital cost for this remedial action is $1,310,000, with annual O&M of $155,100.

ENFORCEMENT
RECORD OF DECISION
REMEDIAL ALTERNATIVE SECTION

WAMCHEM SITE
BURTON, BEAUFORT COUNTY
SOUTH CAROLINA

PREPARED BY:

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

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Wamchem
Burton, Beaufort County, South Carolina

Statement of Purpose

This decision 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.

Description of the Selected Remedy

GROUNDWATER

- Extraction of contaminated groundwater
- On-site treatment of extracted groundwater
- Discharge of treated groundwater to off-site stream
- Groundwater remediation will be performed until all contaminated water meets the cleanup goals specified in the attached summary of Alternative Selection.

SOIL

- On-site treatment of contaminated soil (approximately 2,000 cubic yards) to remove organic contaminants.

Declaration

The State of South Carolina has concurred on the selected remedy.

This remedy is supported by the Administrative Record.

"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 principle element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable."

Greer C. Tidwell
Regional Administrator

JUN 30 1988
Date

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

WAMCHEM SITE
BURTON, BEAUFORT COUNTY, SOUTH CAROLINA

PREPARED BY:

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

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WAMCHEM SITE
BURTON, BEAUFORT, COUNTY SOUTH CAROLINA

1.0 INTRODUCTION

The Wamchem Site was proposed for inclusion on the National Priorities List (NPL) in September 1983 and ranks 211 out of 802 NPL Sites. The Wamchem Site has been the subject of a Remedial Investigation (RI) and Feasibility Study (FS) performed by the responsible party, Springs Industries, under an Administrative Order by Consent dated April 16, 1986. The RI report, which examines air, sediment, soil, surface water and groundwater contamination at the site was completed on April 21, 1987. The FS, which develops and examines alternatives for remediation of the site, was issued in draft form to the public on May 16, 1988.

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 Wamchem Site is located in Beaufort County, South Carolina, approximately 7 miles northwest of the town of Beaufort (Figure 1). The site consists of approximately 21 acres and is located on a small island in the midst of a salt marsh near the upper reach of McCalleys Creek, a tidal stream.

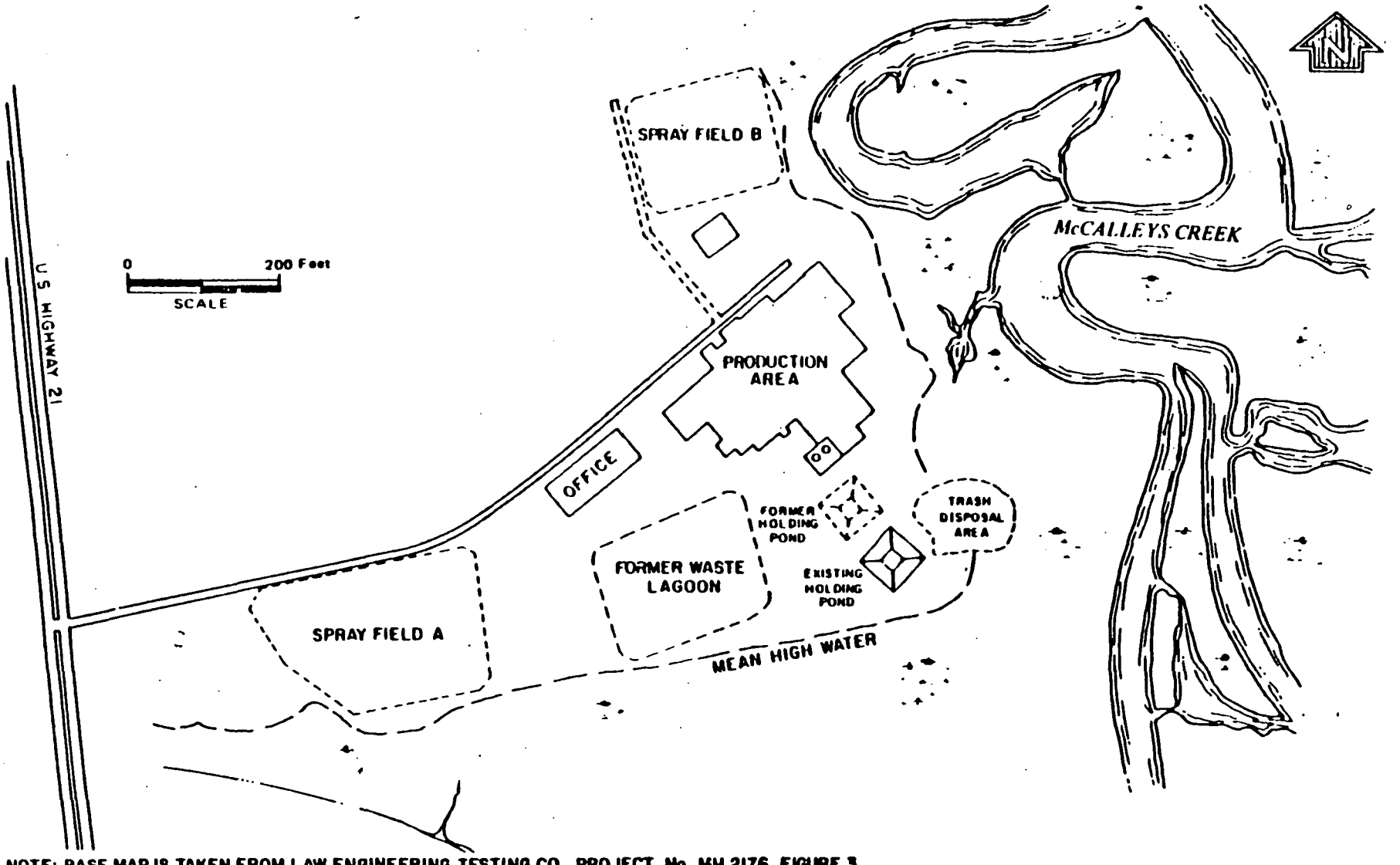
The Wamchem Site contains two spray fields, a production area, an office, a waste lagoon, a trash disposal area and two holding ponds, none of which are currently in use (Figure 2).

The land near the Wamchem Site has been developed without zoning and is a combination of residential, commercial, industrial, and military development (Figure 3). The Wamchem site is surrounded by a salt marsh bordering McCalleys on the north, east, and south sides. U.S. Highway 21 borders on the west side of the site. A motel, located across U.S. Highway 21 on the west side of the highway has less than 10 units, and is currently operated as a campground. Five mobile homes are located to the north of the motel. Approximately 10 residents are located along a road cut through on the eastern side of U.S. highway 21. The area where these residences are located is less than a mile north of the site. One family lives adjacent to the northern boundary of the site.

A large 1,000-unit housing development is located at Laurel Bay 3 miles to the southwest. Two small chemical companies are located within a mile of the Wamchem Site, and the 5,300-acre federally owned U.S. Marine Corps Air Station is located one mile south of the plant off U.S. Highway 21.

Beaufort County is approximately 69 miles from Charleston, South Carolina and approximately 50 miles from Savannah, Georgia. The population of the county is

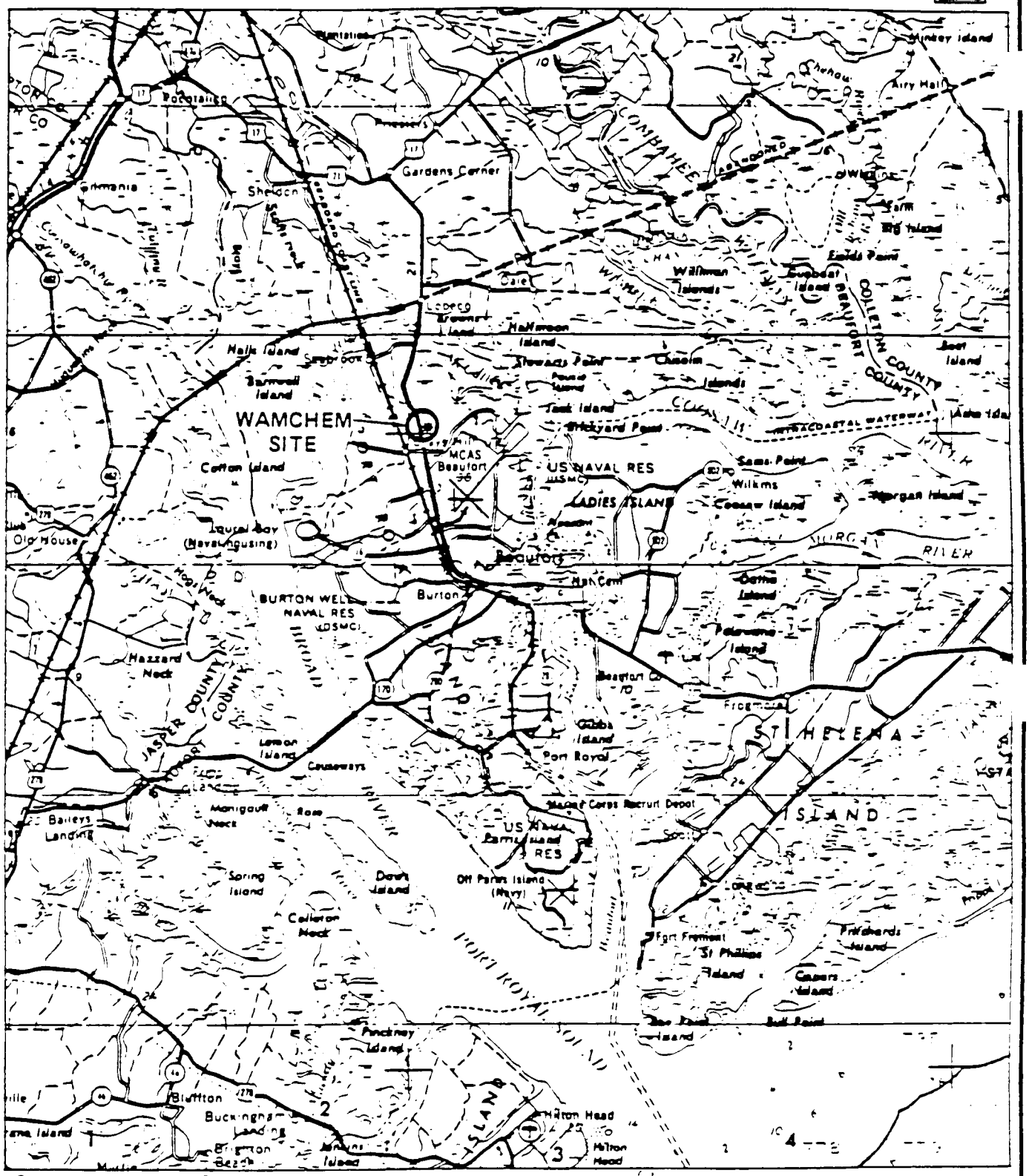
FIGURE 1
REGIONAL LOCATION MAP



NOTE: BASE MAP IS TAKEN FROM LAW ENGINEERING TESTING CO., PROJECT No. MH 2176, FIGURE 3.

FIGURE 2
WAMCHEM SITE FACILITIES MAP

Dames & Moore



● Approximate site location

FIGURE 3
WAMCHEM SITE AND VICINITY

Dames & Moore

65,364 according to the 1980 census.

1.2 Site History

The Wamchem site was originally owned and operated by the Beaufort Chemical and Research Company which produced intermediate dyes for the textile industry between 1959 and 1972. In 1972, M. Lowenstein Company purchased the facility and continued operation of the plant until 1981. In 1981, solvent recovery and recycling operations at the site were discontinued and in 1982, the M. Lowenstein Company closed the plant. Springs Industries, Inc. acquired the M. Lowenstein Company as a subsidiary in 1985.

Waste handling at the site evolved from an initial procedure of discharging liquid wastes to a drainage ditch leading to two small, unlined holding ponds; a ditch later was extended from one of the ponds, discharging wastes directly into McCalleys Creek. As waste treatment methods changed, the ditch and small ponds were replaced. An unlined holding pond and waste lagoon were constructed in 1972; however, these were soon replaced with two spray fields and a concrete - lined holding pond in 1975. In 1977, the South Carolina Department of Health and Environmental Control (SCDHEC) required the company to use a spray-irrigation technique to improve its wastewater treatment process. According to SCDHEC, the wastes discharged onto the spray fields consisted of neutralized sulfuric acid and process water. Although the wastewater system was found to be in compliance with SCDHEC's standards, groundwater contamination was documented at the site in 1982.

The principal types of synthesis conducted at the Wamchem Site were nitrations, catalytic hydrogenations, oxidations, animations, amidations, esterifications, condensations, low pressure reactions, and sulfonations- almost always involving an aromatic substrate molecule. A 1978 initial TOSCA inventory list cited the following as being the major products used/manufactured at Wamchem: 3-nitro, 4-methylbenzamide; 4-aminobenzamide; 4-nitrobenzamide; 3-nitro,4-methylbenzoic acid; 3-nitro, 4-methylbenzamide; secondary-butyl, nitrobenzene, and 4-nitrobenzoic acid.

The Wamchem Site was placed on the National Priorities List in September 1983 due to the presence of potable water wells within a three mile radius of the site. EPA and M. Lowenstein Company signed a RI/FS Consent Agreement on April 16, 1986. The final RI was issued April 21, 1987 and the draft FS was released to the public May 16, 1988.

The objectives of the site investigation were to:

* Characterize and quantify contamination attributable to the Wamchem Site in groundwater, soils, surface water, bottom sediments in McCalleys Creek and surfaces of onsite buildings.

* Better define the geology and hydrology in the vicinity of the site, especially with respect to the interrelationships among McCalleys Creek, the water table aquifer, and the Floridan Aquifer with an emphasis on the problem of defining contaminant transport.

* Assess the risks that contaminants attributable to the site pose to human health and the environment.

The purpose of the feasibility study was to develop and examine remedial alternatives for the site, and to screen these alternatives on the basis of protection of human health and the environment, cost-effectiveness and technical implementability. In accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), alternatives in which treatment would permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances at the site were preferred over those alternatives not involving such treatment.

2.0 ENFORCEMENT ANALYSIS

The Wamchem Site was added to the NPL in September 1983 and EPA assumed lead responsibility for the site at that time. The current owner, Springs Industries, acquired the site in 1985 and agreed to perform the RI/FS. A notice letter was sent to Springs Industries on January 15, 1986. Negotiations for the RI/FS Consent Agreement were concluded with the signing of the document by both EPA and M. Lowenstein Company on April 16, 1986.

3.0 CURRENT SITE STATUS

3.1 Hydrogeologic Setting

The Wamchem Site is generally located downgradient of a basin ridge coincident with the north-south trend of U.S. Highway 21; therefore all surface drainage from the site is within the confines of the McCalleys Creek basin. Discharge from McCalleys Creek may take several routes due to the connectivity of the channel reaches. Therefore the Coosaw River, Beaufort River, Whale Branch, and Broad River may be recipients of discharge from McCalleys Creek. Ultimately, these rivers are connected to Port Royal Sound to the south and St. Helena Sound to the east.

The water table aquifer at the Wamchem Site is composed predominantly of Sands and there is no distinct confining unit separating the water table aquifer from the underlying Floridan Aquifer. However, the difference in hydraulic conductivity between the water table aquifer and the Floridan Aquifer results in partial confinement of the Floridan Aquifer by the water table aquifer. The vertical hydraulic gradient between the two aquifers was positive (upward) during the RI field work. This indicates that the Wamchem Site is in a zone of discharge for the Floridan Aquifer.

In the Beaufort County region, the Floridan Aquifer is mainly composed of the Santee and Ocala Limestones. The Ocala Limestone in the Beaufort County region is made up of a lower and an upper unit. This upper unit is the principal aquifer in the region and was estimated to supply over 99 percent of the groundwater and more than 75 percent of all water used in Beaufort County in 1976.

Water tables tend to be very shallow in the swampy, to topographically lower

elevations and range from surface grade to approximately three feet deep..

3.2 Site Contamination

The Wamchem Site contains six main areas designated as Spray Field A, Spray Field B, Former Waste Lagoon, Former Holding Pond, Existing Holding Pond, and Trash Disposal Area. Soil, groundwater, surface water and sediment samples have been collected in and around each area and analyzed. All samples have been analyzed for Hazardous Substances List (HSL) volatiles, semivolatiles and metals.

Soils

An onsite mobile laboratory was used to screen soil samples taken from 43 locations on the Wamchem Site. The screening program analyzed 98 soil samples for three volatile organic compounds (benzene, toluene, and 1,1,2-trichloroethane) and two semivolatile compounds (aniline and nitrobenzene). The purpose of the soil screening program was to rapidly assess the spatial distribution and concentrations of the compounds outlined above.

Based upon the results of the field screening program, five soil samples were sent to a CLP laboratory to be analyzed for HSL volatiles semivolatiles and metals. These were SO-20 and SO-21 (former holding pond), SO-18 (Former waste lagoon), SO-30 (production area) and SO-45 (background) (Figure 4). Results of these analyses are presented in Table 1 and summarized in Figure 5.

The results of these analyses indicated that the main area of soil contamination was in the vicinity of the former holding pond. Additional soil borings were conducted in this area to fully delineate the amount of soil contamination. Figure 6 shows the locations of these soil samples and Table 2 summarizes the analyses results.

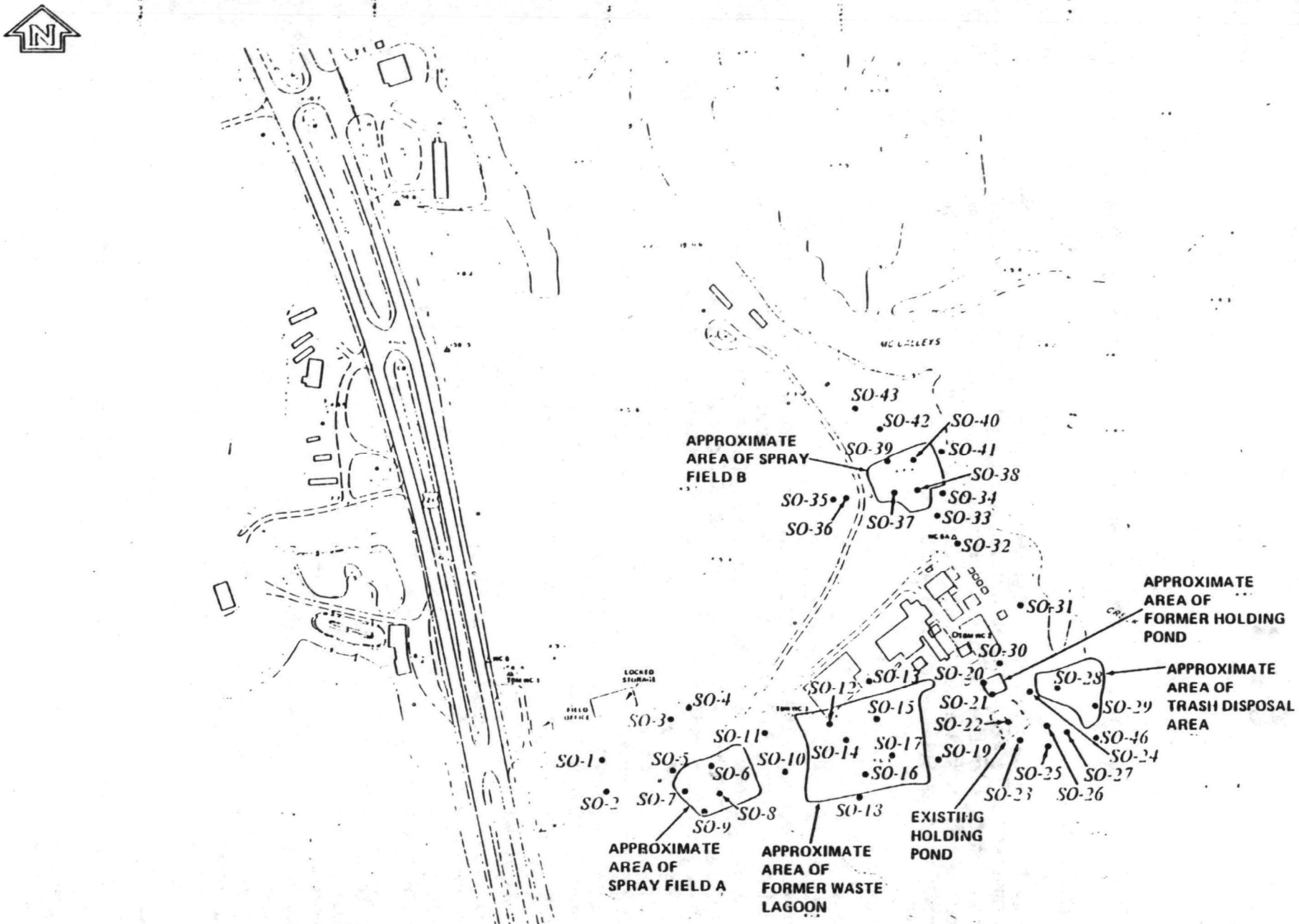
In addition to the HSL volatiles and semivolatiles, various organic compounds not belonging to the HSL were detected. Twenty tentatively identified compounds were detected in SO-20B, ranging in concentrations from a minimum of 49,000 ug/kg for 1-ethyl-3-methylbenzene to a maximum of 2,900,000 ug/kg for 7-chlorothiazolo (5,4-D) pyrimidine. Soil sample SO-21B contained 15 tentatively identified compounds, with a minimum concentration of 15 ug/kg for trichlorofluoromethane to a maximum concentration of 380,000 ug/kg for a benzoic acid isomer.

Surface Water

The surface water sampling locations are shown on Figure 7. The results of the analyses did not reveal any HSL organic compounds, however ten tentatively identified compounds were detected. All were hydrocarbons and ranged in concentration from 8 ug/l to 38 ug/l in sample SW-4.

Sediment

The sediment sampling locations are shown on Figure 7 and results are given in



Base Map Prepared by
Continental Aerial Surveys, Inc., 1986

FIGURE 4

**SOIL SAMPLING LOCATIONS DUR
THE WAMCHEM SITE REMEDI
INVESTIGATION, AUGUST 198**

TABLE 1

RESULTS OF ANALYSIS OF

SOILS COLLECTED AUGUST 1986 (ug/kg)

Compound	S0-18	S0-20	S0-21	S0-30	S0-45
Methylene chloride	20B	1300JB	11B	49B	76B
Acetone	33B		100	36B	81B
2-Butanone			53		
Benzene			1.4J		1.7JB
Toluene		12000J	20		
Total Xylene		720,000	290	48	
Phenol	68J				
1,2 Dichloro benzene		11,000J		1300J	
Benzoic Acid	170J				
1,2,4 Trichloro benzene		18000J		29000	
Napthalene		4000J			
2,4-Dinitro toluene	100J	480000	53000		
Di-n-butyl phthalate					81JB
Bis(2-ethyl-hexyl)phthalate	68J				340JB
1,4 Dichloro benzene		35,000			

J- Indicates an estimated value.
B- Analyte was found in the blank as well as the sample.

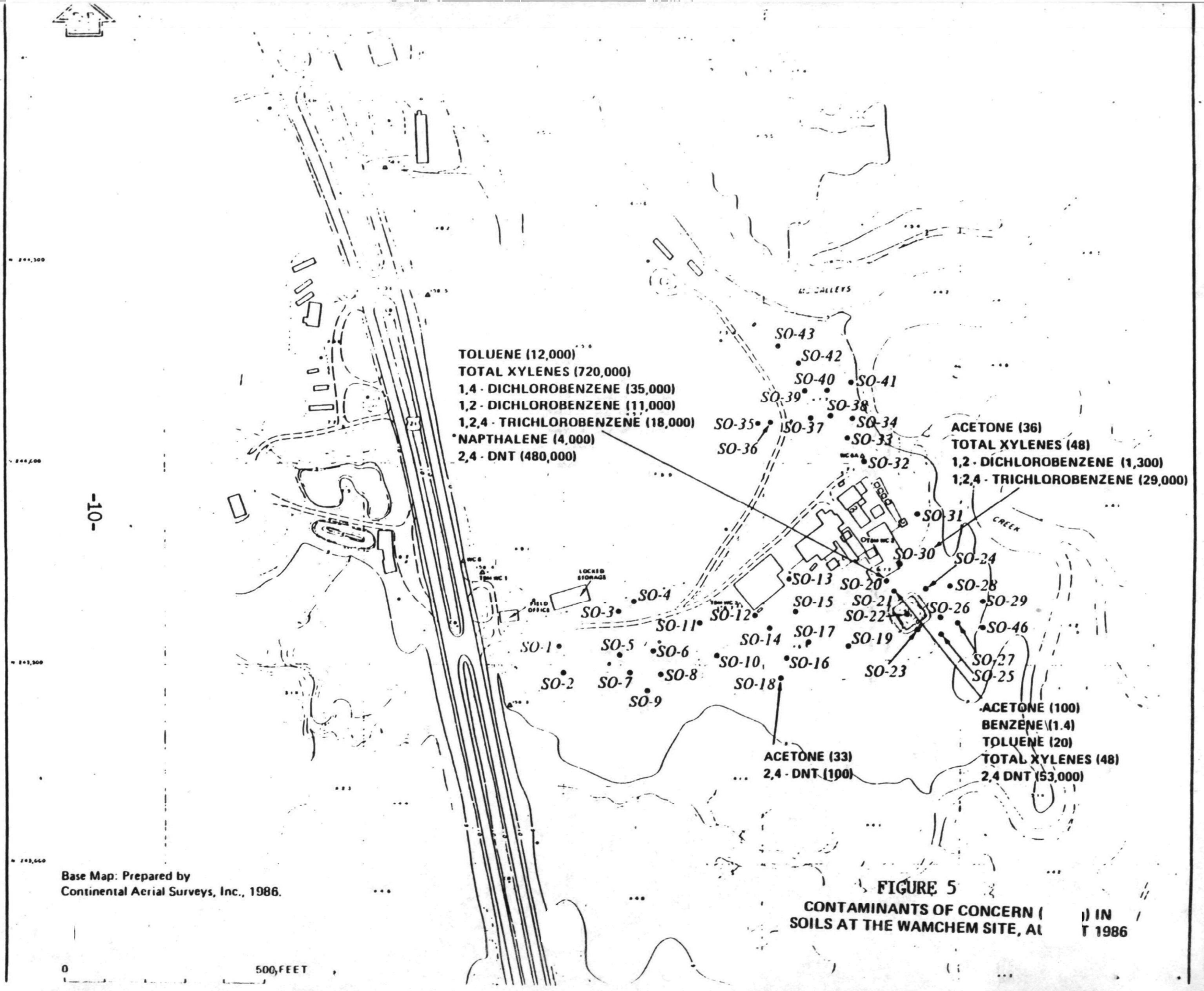


FIGURE 5

CONTAMINANTS OF CONCERN ( ) IN
SOILS AT THE WAMCHEM SITE, AL T 1986

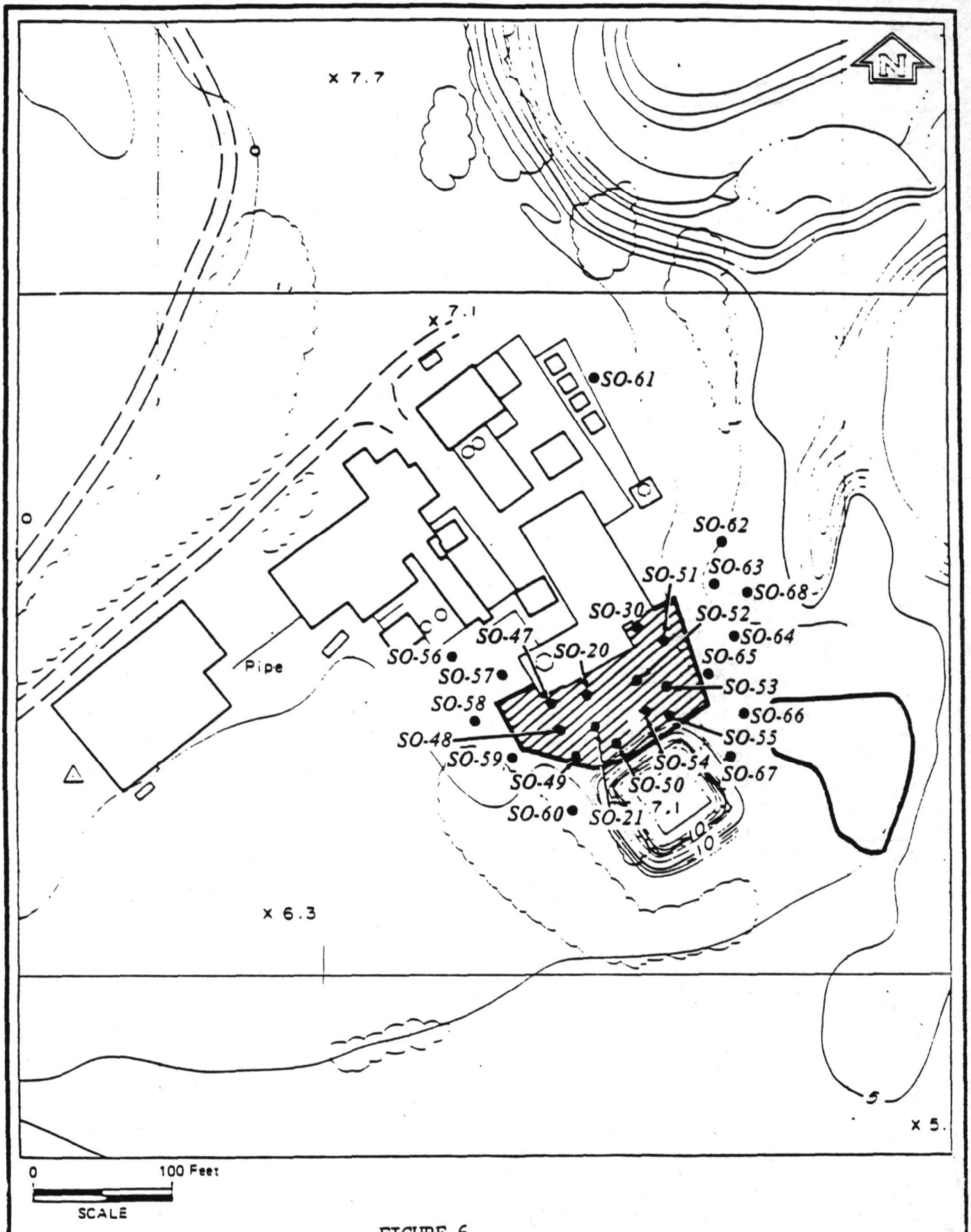


FIGURE 6

ADDITIONAL SOIL SAMPLING LOCATIONS

TABLE 2
SOIL SAMPLE ANALYSIS RESULTS (ug/kg)

	S020A	S020B	S020C	S021A	S021B	S021C	S030A	S030B	S047A	S047B	S047C
Methylene Chloride	25B	1300JB	5200B	10B	11B	48B	---	28B	16B	12B	22B
Acetone	---	---	11000B	11B	100	260B	36B	70B	20B	17B	92B
1,2 Dichloroethane	---	---	---	---	---	11	---	---	---	---	---
2-Butanone	---	---	---	---	53	220	---	6.2J	---	---	---
Benzene	---	---	---	---	1.4J	2.0J	---	---	---	---	1.3JB
Tetrachloroethene	---	---	2500J	---	---	6.7U	---	---	---	---	---
Toluene	---	12000J	21000	---	20	72	---	2.1J	9.7	---	---
Chlorobenzene	---	---	---	---	---	13	---	---	---	---	---
Ethyl Benzene	---	---	1100J	---	---	9.1	---	---	---	---	---
Total Xylene	---	720000	140000	---	290	370	---	48	250	2.9J	---
Phenol	---	---	---	---	---	830	---	280J	91J	---	---
1,4-Dichlorobenzene	---	3500	720000	---	---	2400	---	84J	1100	---	---
1,2-Dichlorobenzene	---	11000J	110000	---	---	3400	1300J	290J	---	---	---
Nitrobenzene	---	---	---	---	---	600	---	---	---	---	---
2-Nitrophenol	---	---	---	---	---	7100	---	---	---	---	---
2,4-Dimethyl phenol	---	---	---	---	---	---	---	---	95J	---	---
Benzoic Acid	50J	---	---	---	---	1400J	---	---	470J	---	---
2,4-Dichlorophenol	---	---	4400J	---	---	100J	---	59J	660	160J	420J
1,2,4-Trichlorobenzene	---	18000J	460000	---	---	660	29000	4200	5200	---	---
Naphthalene	---	4000J	---	---	---	---	---	46J	---	---	---
4-Chloro 3-ethyl phenol	---	---	---	---	---	---	---	93J	---	---	---
2,4-Dinitrophenol	---	---	---	---	---	4400	---	---	---	---	---
2,4 Dinitrotoluene	---	480000	100000	---	53000	6600	---	---	---	3300	240J
4-Nitrophenol	---	---	---	---	---	1400JD	---	---	---	---	---
bis(2-ethylhexyl)phthalate	54J	---	3600J	---	---	---	---	---	---	---	---

TABLE 2 (continued)
SOIL SAMPLE ANALYSIS RESULTS (ug/kg)

	S048A	S048B	S048C	S049A	S049B	S049C	S050A	S050B	S050C	S051A	S051B	S051C
Methylene Chloride	18B	14B	29B	18B	17B	20B	320B	24B	16B	14B	19B	550JB
Acetone	6.9JB	60B	44B	37B	22B	37B	13B	130B	71B	50B	75B	140B
Chloroform	---	---	1.7J	---	---	11	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---	---	---	---	---	45
Toluene	---	9.6	5.5J	---	---	32	2.7J	9.7	1.7J	5.8	---	---
1,1,2,2-Tetrachloroethane	---	---	15	---	---	14	---	---	---	---	---	---
Chlorobenzene	---	---	---	---	---	3.6J	---	2.4J	---	---	---	---
Total Xylene	6.5	---	25	---	9.4	150	---	80	25	81	28	3.4J
Ethyl Benzene	---	---	---	---	---	---	---	1.9J	---	---	---	---
Phenol	---	79J	48J	100J	---	110J	---	360J	---	---	180J	130J
1,4-Dichlorobenzene	1800	2500	220J	---	---	74J	180J	310J	250J	160J	160J	---
1,2-Dichlorobenzene	---	100J	96J	---	---	---	70J	150J	140J	410	440J	---
4-Methylphenol	---	---	---	---	59J	---	---	---	---	---	---	---
2,4-Dichlorophenol	610	7400D	130J	---	---	---	---	76J	---	54J	93J	---
1,2,4-Trichlorobenzene	12000D	11000D	270J	670	110J	190J	1200	410J	630	8900D	1900	---
2-Nitrophenol	---	---	---	---	---	---	---	290J	---	---	---	---
Benzoic Acid	---	---	---	---	150J	---	---	770J	---	230J	---	3000
4-Nitrophenol	---	---	---	---	---	---	---	---	---	54J	---	---
2,4 Dinitrotoluene	1600	1400	3300	150J	120J	3200	170J	6300	75J	330J	---	---
4-Nitroaniline	---	---	---	---	---	---	---	---	---	320J	520J	1200J
Pentachlorophenol	---	---	---	---	---	---	---	55J	---	---	---	---
Di-ni-butyl phthalate	100J	79J	---	---	---	---	44J	---	---	---	---	---
Pyrene	---	---	---	---	---	---	40J	---	---	---	---	---
bis(2-ethylhexyl)phthalate	---	---	---	63J	---	---	---	59J	41J	---	---	---
4-Chloroaniline	78J	---	---	---	---	---	---	---	---	---	---	---
2,4,5-Trichlorophenol	---	390J	---	---	---	---	---	---	---	---	---	---
2,4 Dinitrophenol	---	---	160J	---	---	---	---	---	---	---	---	---

TABLE 2 (continued)
SOIL SAMPLING ANALYSIS RESULTS (ug/kg)

	S052A	S052B	S052C	S053A	S053B	S053C	S054A	S054B	S054C	S055A	S055B	S055C	S056A
Methylene Chloride	550JB	13B	15B	12B	22B	49B	42B	36B	65B	26B	22B	7.6B	14B
Acetone	1600	270B	82B	42B	100B	130B	7.3JB	67B	220B	170B	54B	180B	7JB
Trans-1,2 Dichloroethene	---	7.2	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	5.8J	2.6J	29D	---	---	---	---	2J
2-Butanone	---	---	83	---	11J	22	---	---	35	---	---	---	---
Trichloroethene	---	4.2J	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	66	30	9.0	2.1J	1.5J	---	36	1.9J	---	---	---	1J
Chlorobenzene	---	2.3J	3.2J	1.7J	---	---	---	3.2J	---	---	---	---	---
Ethyl Benzene	---	2.6J	2.9J	3.3J	---	---	---	---	---	---	---	---	---
Total Xylene	---	690	200	200	48	---	---	1800D	---	9.9	---	---	---
Phenol	---	1500	260J	---	---	460	---	2300	250J	120J	83J	76J	---
1,4-Dichlorobenzene	---	190J	650	820	150J	140J	---	660J	120J	410J	120J	50J	---
1,2-Dichlorobenzene	---	420J	2400	600	140J	91J	---	560J	81J	440J	140J	55J	---
4-Methylphenol	---	---	---	---	---	---	---	---	68J	---	---	---	---
Nitrobenzene	---	---	260J	2400	---	---	---	---	---	---	90J	---	---
2-Nitrophenol	---	120J	150J	---	---	---	---	---	---	---	---	---	---
2,4-Dimethylphenol	---	3300	57J	82J	---	---	---	1400	51J	---	---	---	---
Benzoic Acid	---	---	1100J	450J	---	63J	---	---	310J	460J	---	---	---
2,4 Dichlorophenol	---	---	61J	540	---	---	---	---	51J	240J	---	---	---
1,2,4-Trichlorobenzene	---	1000	2500	440000D	7400	17000D	130J	1800	64J	86000D	16000D	1000	---
Naphthalene	---	200J	---	---	---	---	---	1800	---	---	---	---	---
2-Methylnaphthalene	---	---	---	---	---	---	---	740J	---	---	---	---	---
2,4,6-Trichlorophenol	---	---	---	800	---	---	---	---	---	---	---	---	---
2,4,5-Trichlorophenol	---	---	41J	800J	---	---	---	---	---	---	---	---	---
2,4 Dinitrotoluene	---	160000D	9800D	1700	3400	890	---	300000D	1700	750	320J	980	---
4-Nitroaniline	---	---	5000	---	---	---	---	---	---	---	---	---	---
Hexachlorobenzene	---	370J	---	---	---	---	---	---	---	---	---	---	---
Pentachlorophenol	---	510J	---	---	---	---	---	---	---	---	---	---	---
Phenanthrene	---	850	---	---	---	---	---	---	---	---	---	---	---
Di-n-butyl phthalate	---	370J	---	---	---	---	---	---	---	---	---	---	---
Fluoranthene	---	1100	---	---	---	---	---	1000J	---	---	---	---	---
Pyrene	---	250J	---	---	---	---	---	1500	---	---	---	---	---
3,3-Dichloro benzidine	---	---	69J	---	---	---	---	---	---	---	---	---	---
bis(2-ethylhoxyl)phthalate	---	2700	69J	71J	61J	---	---	12000	98J	68J	41J	71J	98J
Chrysene	---	---	---	---	---	---	---	1400	---	---		---	---
trachloroethene	---	430	540D		---	---	---	2.2J	---	---		---	---

TABLE 2 (continued)
SOIL SAMPLING ANALYSIS RESULTS (ug/kg)

	S058A	S061A	S061B	S061C	S062A	S062B	S062C	S063A	S064A	S064B	S064C	S065A	S066A	S066B	S066C	S068A
Methylene Chloride	20B	27B	20B	15B	17B	44B	31B	22B	27B	53B	33B	13B	38B	22B	28D	17B
Acetone	---	11BJ	49	43	24B	47B	100	32B	40B	60B	270E	32B	27B	48B	150B	13JB
Chloroform	---	---	---	4J	1J	---	3J	---	---	7JB	---	---	---	---	---	---
2-Butanone	---	---	---	---	---	---	---	---	---	---	91	---	---	---	---	---
Toluene	---	---	---	---	---	---	4J	33	110	3J	10	3J	---	---	---	---
Chlorobenzene	---	---	---	---	---	---	3J	2J	---	---	---	1J	---	---	---	---
Total Xylene	---	---	---	---	---	7	9	630E	240	49	35	33	---	---	---	---
Phenol	---	---	---	---	---	---	---	---	---	---	110J	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	270J	89J	400	290J	270J	71J	---	---	---	---	---
1,2-Dichlorobenzene	---	---	---	---	120J	6300	1500	440	---	710	170J	---	---	---	---	---
2,4-Dichlorobenzene	830	---	---	---	---	---	---	160J	160J	160J	53J	---	---	110J	---	---
1,2,4-Trichlorobenzene	2800	---	---	---	---	1300	72J	---	82J	---	---	4200	470	380J	---	---
4-Nitrophenol	---	---	---	---	---	---	---	---	490J	---	100J	---	---	---	---	---
2,4-Dinitrotoluene	610	---	---	---	---	---	---	---	---	200J	97J	---	---	---	---	---
Di-ni-butylphthalate	---	---	---	65J	---	---	---	---	---	---	---	---	---	---	---	---
Fluoranthene	40J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pyrene	49J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
bis(2-ethylheryl)phthalate	---	---	---	---	---	---	---	---	---	---	---	83J	42J	---	---	---
Di-n-octyl Phtalate		---	---	---	---	---	---	---	---	---	---	---	---	---	110J	---

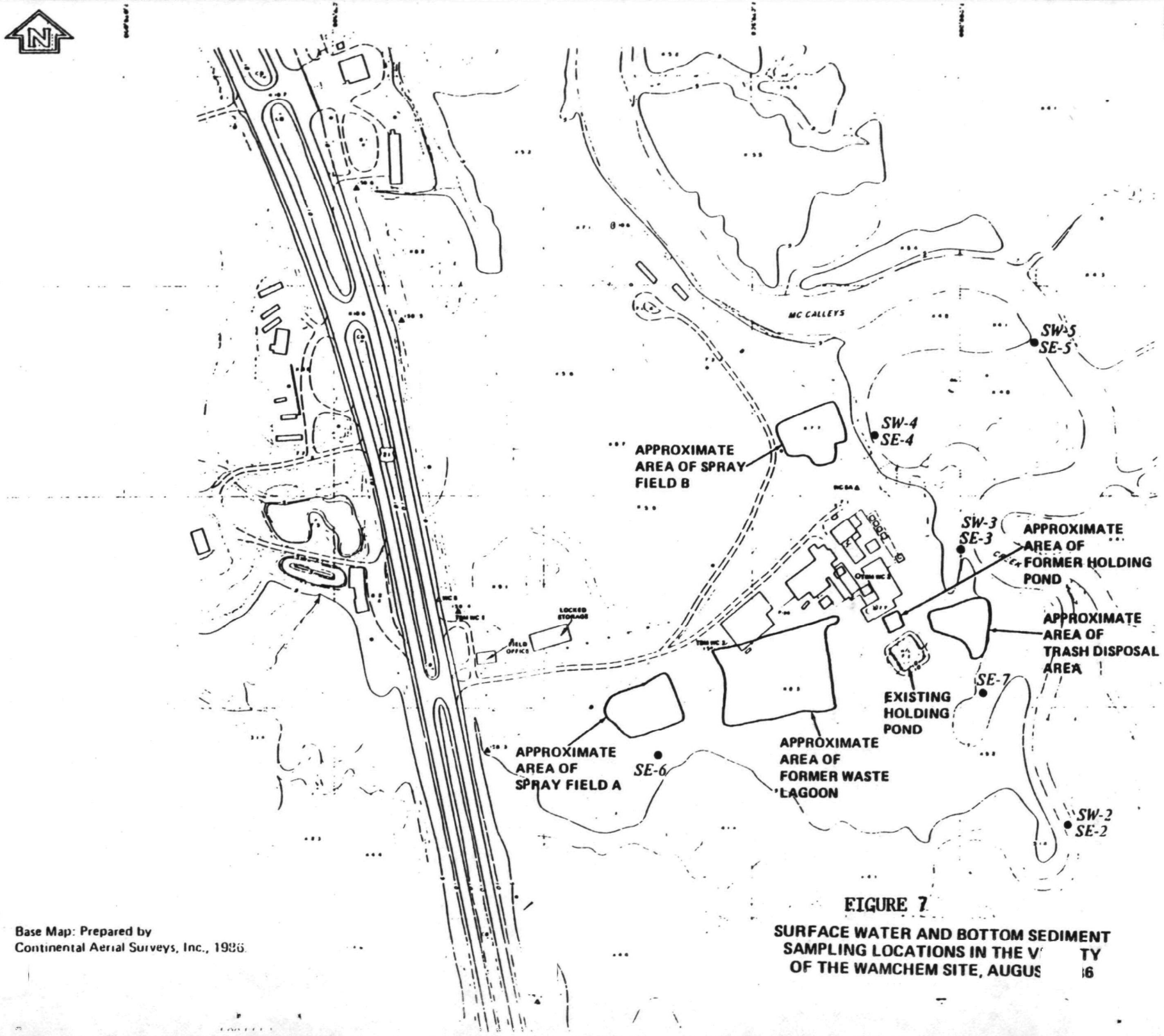


FIGURE 7

SURFACE WATER AND BOTTOM SEDIMENT
SAMPLING LOCATIONS IN THE V TY
OF THE WAMCHEM SITE, AUGUS 6

Base Map: Prepared by
Continental Aerial Surveys, Inc., 1986

Table 3. The highest level of contamination was found in sample SE-3. This sample is downgradient of the former holding pond and contained methylene chloride (59 ug/kg), acetone (26 ug/kg), benzene (1.9 ug/kg), Chlorobenzene (180 ug/kg), 1,4-Dichlorobenze (190 ug/kg), 1,2-dichlorobenzene (240 ug/kg), and pyrene (220 ug/kg). The sample also contained fourteen tentatively identified hydrocarbons ranging from 71 ug/kg to 920 ug/kg. SE-1 is a background sample.

Onsite Structures

Nine building wipe samples were taken from onsite structures and analyzed for HSL semivolatiles and metals. Table 4 summarizes the results, and the locations are shown on Figure 8.

A total of four HSL semivolatile compounds were detected, all of which were phthalate esters.

Wastes

During the RI investigation, two waste samples were encountered. One (SO-46) was a mixture of soil and red and yellow material obtained in the vicinity of the trash disposal area. The other sample (DM-1) was in a drum located in one of the onsite buildings. The RCRA characterization analyses for these samples (Flash Point, Reactivity, Corrosivity, and Metals) found that they do not exhibit the characteristics of a hazardous waste.

Groundwater

The results of the HSL volatile and semivolatile analyses for ten on-site monitoring wells (RI-1A through RI-7B) and ten off-site residential supply wells (RI-9 through RI-23) can be found in Tables 5 and 6, respectively. The locations of the onsite wells are shown in Figure 9, and the domestic well locations are shown in Figure 10.

The deep aquifer, the Floridan, did not contain any volatile or semivolatile compounds. The shallow monitoring wells near the perimeter of the production area and the former holding pond showed the greatest amount of contamination.

The analyses for the residential and commercial offsite wells detected only trace amounts of organics in three of the ten wells.

Oysters

Oyster samples were collected from two locations in McCalleys Creek (one adjacent to the site) and two background stations (Figure 11) and were analyzed for acetone, benzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dinitrotoluene, naphthalene, toluene, 1,2,4-trichlorobenzene and xylene. These analyses were conducted to determine whether site related contaminants were bioaccumulating in the aquatic life. None of the contaminants were detected in any of the tissue samples. Split samples taken by the U.S. Fish and Wildlife confirmed these results, and in addition, found that metals were not a concern.

TABLE 3

SEDIMENT ANALYSIS RESULTS
AUGUST 1986 (ug/kg)

Compound	SE-1	SE-2	SE-3	SE-4	SE-5	SE-6	SE-7
Methylene Chloride	29 B	20 B	59	71	42	92	20 B
Acetone	20 B	22 B	26	51	10J	60	18 B
Carbon Disulfide				2.4J			
Chloroform		9.8					
Benzene			1.9J				
Toluene					1.9J		
Chlorobenzene			180				
1,4 Dichloro-benzene			190J				
1,2 Dichloro-benzene			240J				
Pyrene			220J				

TABLE 4

RESULTS OF BUILDING WIPE SAMPLES
AUGUST, 1986 ng/sample

Compound	BUILDING 1	2	3	4	5	6	7	8	9
Diethyl-phthalate			2J	2.2J	2.8J				3.6J
Di-n-butyl-phthalate	4.3JB		12JB	16JB	12JB	13JB	9.1JB	19JB	17JB
Butyl beryl-phthalate	7.7J	5300	4.7J						
Bis(2-ethylhexyl) Phthalate	4.9JB		7.3JB	3.2JB	6.7JB	2.6JB			

B - Analyte was found in the blank as well as the sample. It indicates possible or probable blank contamination.

J - Indicates an estimated value.

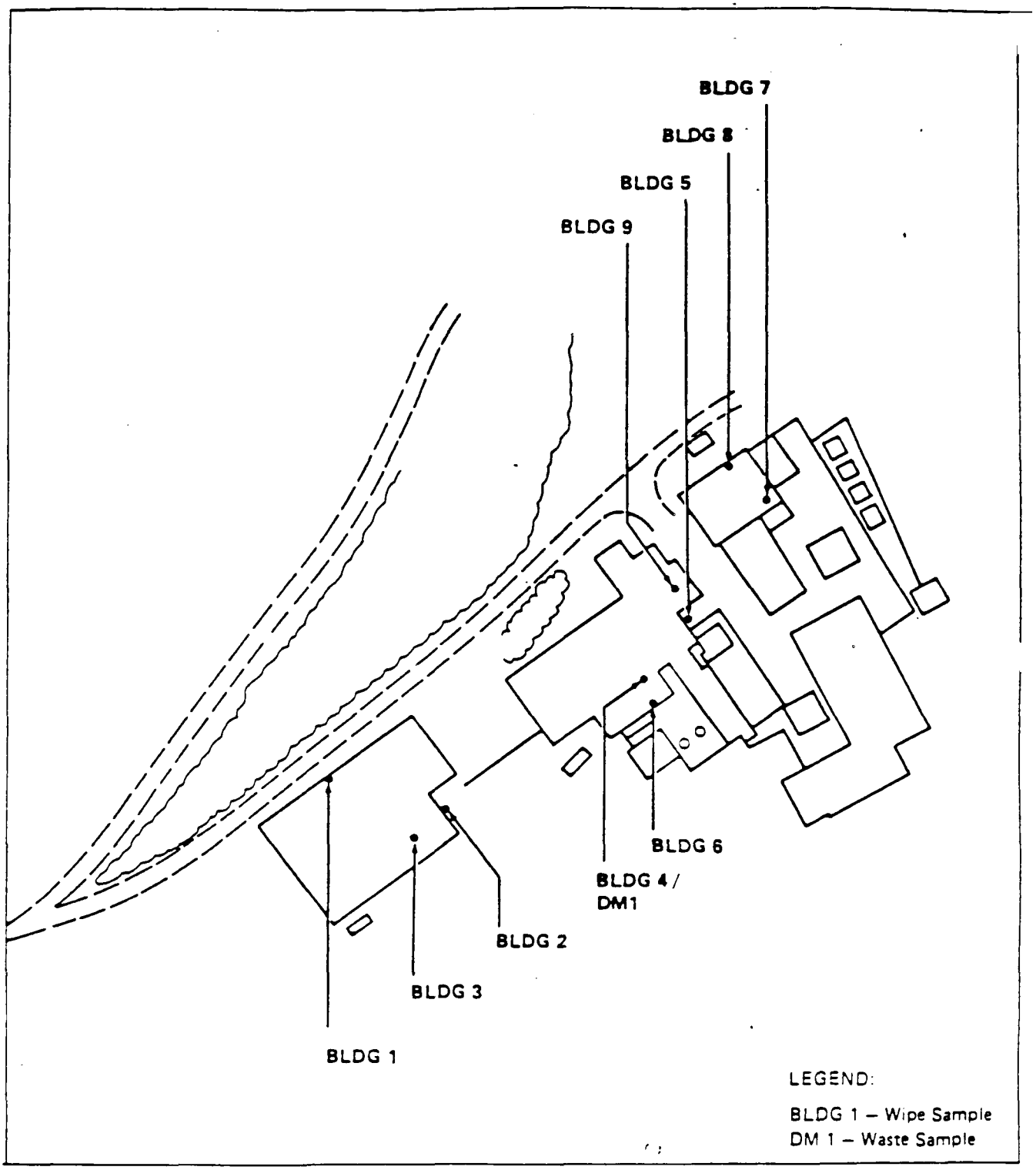


FIGURE 8

APPROXIMATE LOCATIONS OF BUILDING WIPE AND WASTE SAMPLES COLLECTED ON THE WAMCHEM SITE, AUGUST 1986

TABLE 5
GROUNDWATER ANALYSIS OF ONSITE WELLS (ug/l)
AUGUST 1986

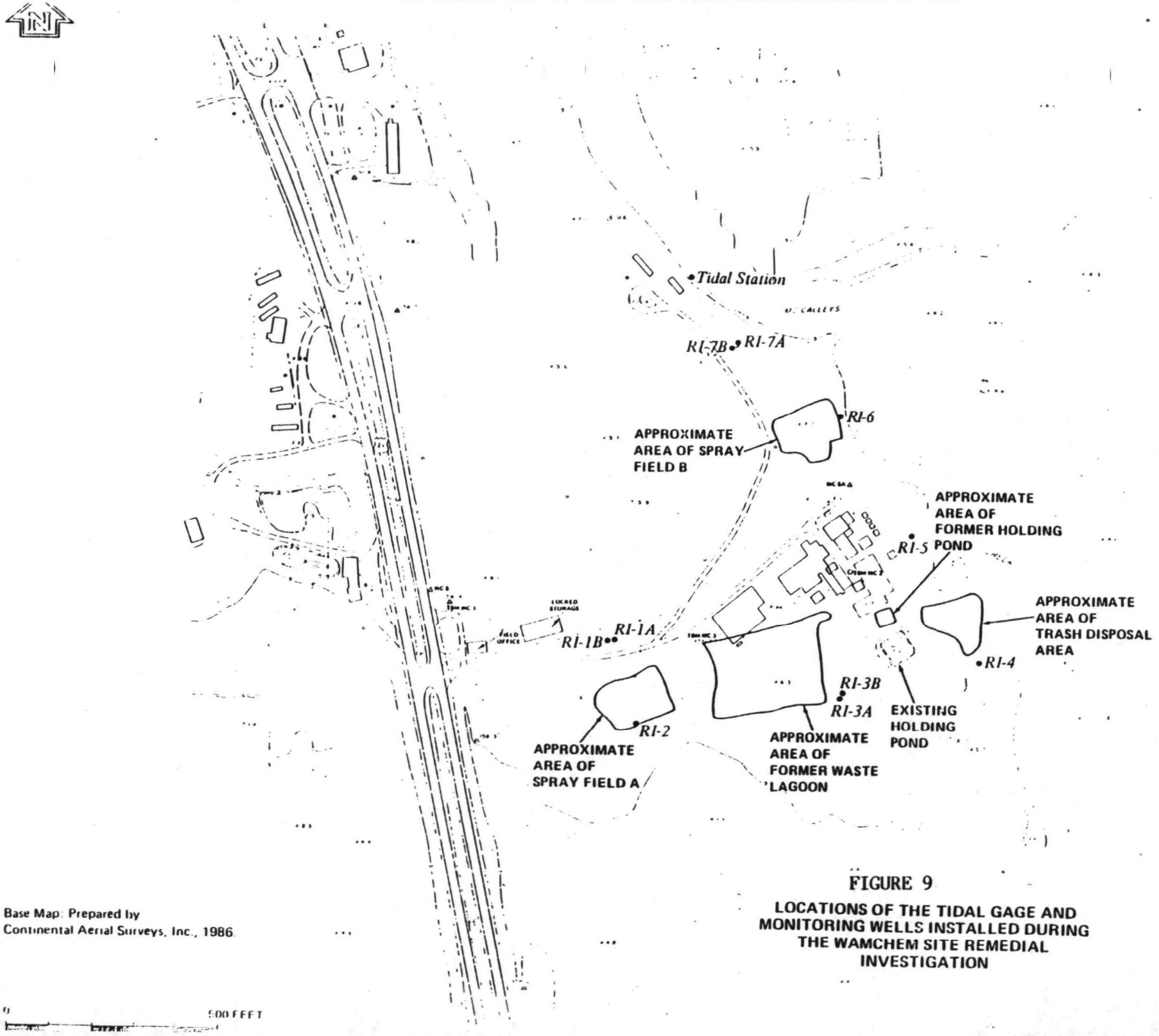
Compound	RI-1A	RI-3A	RI-7A	RI-1B	RI-2	RI-3B	RI-4	RI-5	RI-6	RI-7B
Methylene-Chloride	-	-	-	-	-	-	1.5J	830JB	1.1J	3.9J
Acetone	-	-	-	-	-	-	6.6B	68000B	-	-
Benzene	-	-	-	-	-	12	-	2100	55	-
Toluene	-	-	-	-	-	-	-	3900	1.5J	-
Chloro-benzene	-	-	-	-	-	-	-	-	15	-
Ethyl Ben-zene	-	-	-	-	-	-	-	-	2.1J	-
Total Xylene	-	-	-	-	-	40	2.3J	4500	4.2J	-
bis(2-Chloro ethyl)ether	-	-	-	-	-	-	-	23	-	-
1,3 Dichloro-benzene	-	-	-	-	-	-	-	-	2J	-
1,4-Dichloro-benzene	-	-	-	-	-	-	-	-	19J	-
1,2-Dichloro-benzene	-	-	-	-	-	-	-	-	19J	-
4-Methylphenol	-	-	-	-	-	-	-	-	4.4J	-
Isophorone	-	-	-	-	-	-	-	300	-	-
4-Chloroaniline	-	-	-	-	-	-	-	-	4.4J	-
Di-n-buthyl phthalate	-	-	-	-	-	5.4J	-	-	-	-
bis(2ethylhexyl) phthalate	-	-	-	-	-	3.2J	-	-	-	-

" - " - undetected

TABLE 6

Groundwater Analysis of
Offsite Wells (ug/l)
August 1986

Compound	RI-9	RI-11	RI-12	RI-13	RI-14	RI-19	RI-20	RI-21	RI-22	RI-23
Methlene Chloride	-	-	-	-	1.3J	-	1.2J	-	-	-
Di-n-octyl phthalate	-	-	-	-	-	-	-	-	-	3.2J



Base Map: Prepared by
Continental Aerial Surveys, Inc., 1986.

FIGURE 9

LOCATIONS OF THE TIDAL GAGE AND MONITORING WELLS INSTALLED DURING THE WAMCHEM SITE REMEDIAL INVESTIGATION

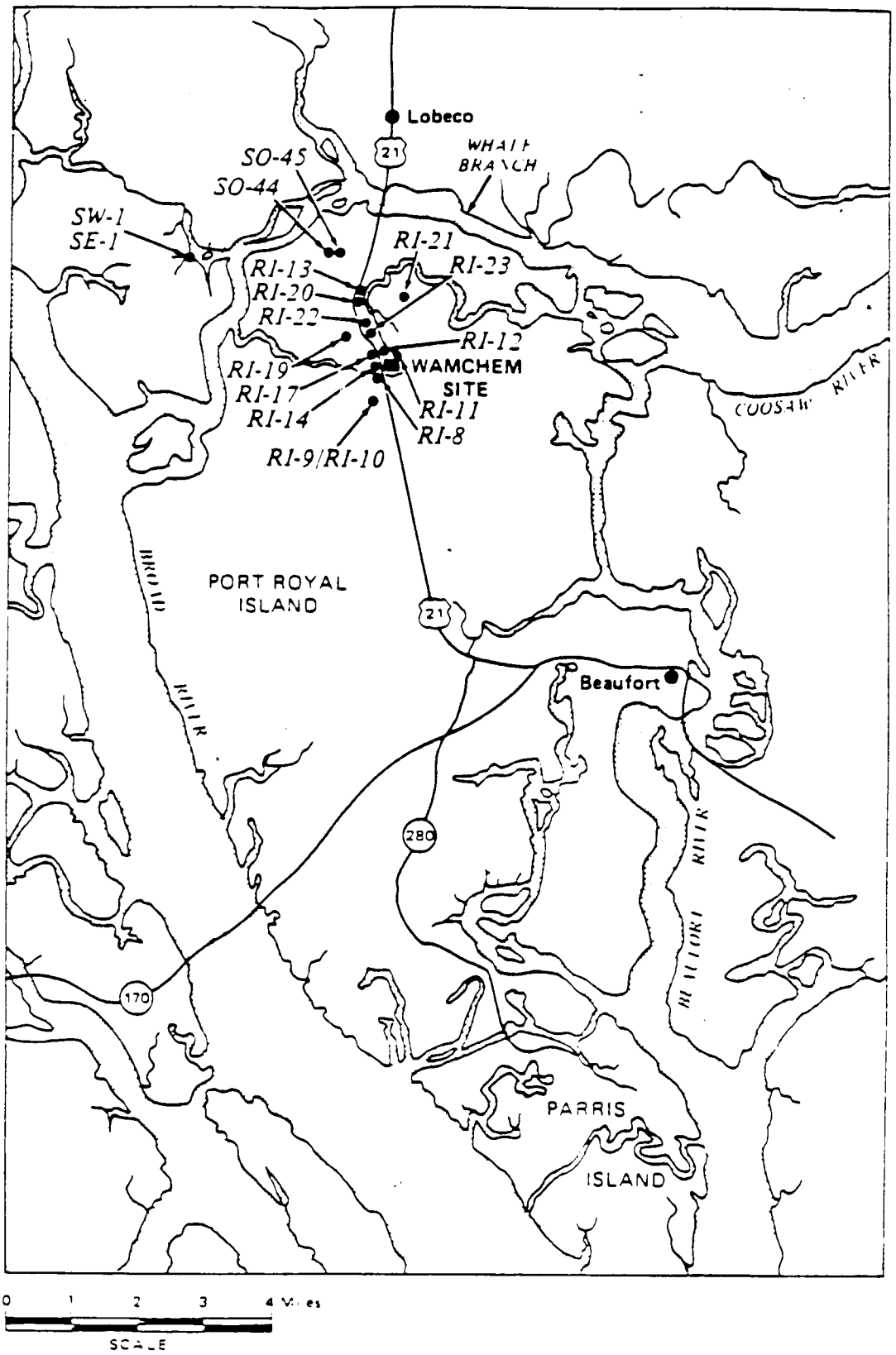


FIGURE 10

LOCATIONS OF DOMESTIC AND COMMERCIAL WELLS, AND BACKGROUND SOIL, SURFACE WATER AND SEDIMENT SAMPLES DURING THE WAMCHEM SITE REMEDIAL INVESTIGATION, AUGUST 1986

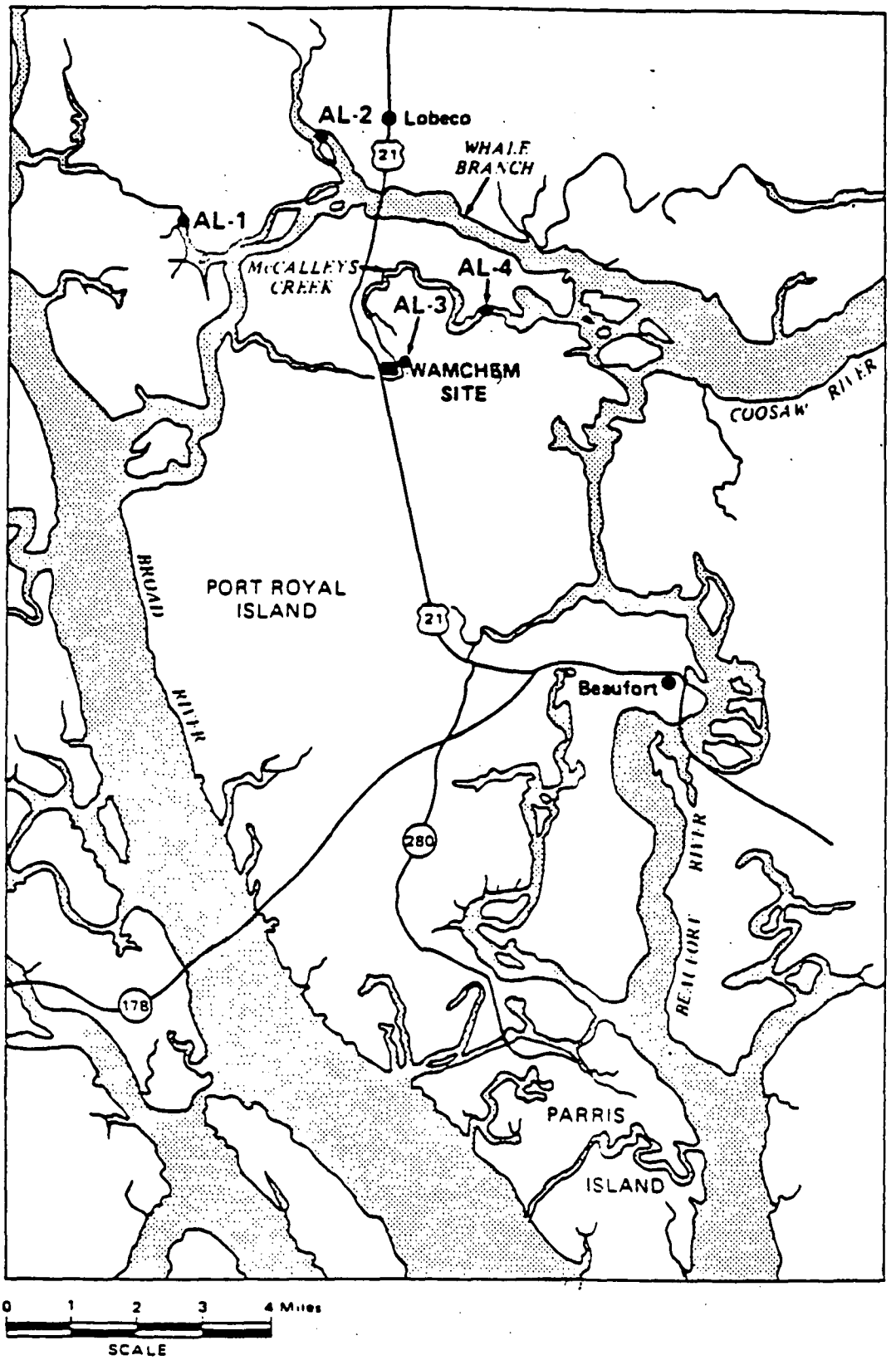


FIGURE 11
LOCATIONS OF AQUATIC LIFE SAMPLE STATIONS
WAMCHEM SITE

3.3 Receptors

Based upon the data gathered during the RI and biological resources identified on and in the vicinity of the site, the potential human and environmental receptors include the following:

* Nearby rural population that uses groundwater for drinking purposes. These residents rely on groundwater wells for their water supply.

* Nearby rural population that uses groundwater for domestic purposes other than drinking, such as showering, bathing, food preparation, clothes washings, lawn or garden watering, etc.

* Recreational users of surface waters from McCalleys Creek.

* Humans consuming game animals (fish, small animals) that can be contaminated by infestion of bioaccumulative contaminants.

* Bottom feeders of contaminated sediment in McCalleys Creek and their potential influence on the food chain.

* Threatened or endangered species present in the vicinity of McCalleys Creek.

* Aquatic biota, fauna, and flora in and around the site that may be stressed.

* Persons that come into direct dermal contact with contaminants present at the site.

* Onsite remediation workers that inhale elevated concentrations of volatiles during soil disturbance or that have direct dermal contact with contaminated soil.

4.0 CLEANUP CRITERIA

The extent of contamination was defined in Section 3.0, Current Site Status. This section examines the relevance and appropriateness of water quality criteria under the circumstances of release of contaminants at this Site. Based upon criteria found to be relevant and appropriate, the minimum goals of remedial action at this site have been developed.

4.1 Groundwater Remediation

In determining the degree of groundwater cleanup, Section 121(d) of the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires that the selected remedial actions establish a level or standard of control which complies with all "applicable or relevant and appropriate requirements (ARARs)".

Groundwater in the surficial aquifer at the Wamchem Site is classified as Class I, following methodology in the Final Draft of the U.S. EPA Groundwater

Classification Guidelines of December 1986. Class I groundwaters are afforded extraordinary protection due to the risk of further endangerment to species dependent upon unique habitats.

Groundwater in the deeper aquifer, the Floridan, is classified as Class II A using the above cited guidelines. Class II A groundwaters are a current source of drinking water. However the deep aquifer was found not to be contaminated.

The surficial aquifer at the site discharges into McCalleys Creek. Based on reported sightings, the scientific literature and substantiating documentation from the U.S. National Marine Fisheries Service, McCalleys Creek is considered to be habitat for the loggerhead turtle (Caretta caretta), a federally listed threatened species. A turtle sighting in McCalleys Creek was reported to EPA in 1988 by the Wamchem site caretaker, who has lived adjacent to the creek for numerous years. Other species of sea turtles, all of which are either threatened or endangered, may also be present in the area. An official sighting of a Kemp's Ridley turtle in the vicinity of McCalleys Creek was recorded by the US Fish and Wildlife Service in 1987. In addition to supporting sea turtles, McCalleys Creek is probable habitat for the short-nosed sturgeon, a federally listed endangered species of fish. Equal protection is afforded to both threatened and endangered species under the Endangered Species Act.

The value to the environment of Class I groundwater resources supports restoration of this contaminated groundwater to levels protective of the environment. The groundwater is highly vulnerable to contamination and supplies a sensitive ecological system supporting a unique habitat. Based upon groundwater classification, remediation of the groundwater to reduce contaminants to levels protective of the environment would be necessary. Groundwater cleanup goals given in Table 7 meet these requirements.

The conclusion of the above discussion is that a no-action alternative for groundwater would be out of compliance with Section 121 of SARA which requires cleanup of contaminated groundwater to levels which are protective of human health and the environment.

Indicator chemicals were used to establish cleanup goals for groundwater. All indicator chemicals analyzed for in the RI were utilized in the Public Health Evaluation. Levels presented as groundwater cleanup goals are based on the Federal Ambient Water Quality Criteria (AWQC).

4.2 Soil Remediation

The Public Health Assessment in the RI report determined that risks to human health as a result of exposure to on-site contaminants via inhalation, ingestion, and dermal contact are low under present use conditions at the Site. Contaminants remaining in the soil will, however, continue to leach into the groundwater. Therefore the cleanup goals presented in Table 8 are estimates of contaminant concentrations in soil at the Wamchem Site that would not result in future exceedances of AWQC in groundwater at the source area due to leaching of soil contaminants.

The model used was by Summers (1980) and assumes that a certain percentage of the rainfall at the site will infiltrate the site and desorb contaminants from

TABLE 7

GROUNDWATER CLEANUP GOALS

COMPOUND	CLEANUP GOAL mg/l
Acetone	1000a
Benzene	0.70
1, 2 - Dichlorobenzene	1.97
1, 4 - Dichlorobenzene	1.97
2, 4 - Dinitrotoluene	0.37
Napthalene	2.35
Toluene	5.00
1, 2, 4 - Trichlorobenzene	0.129a
Total Xylene	2.0

Goals based upon USEPA Ambient Water Quality Criteria for Aquatic Organisms.

a- No AWQC available. Goal based upon a general aquatic rating assigned by the Registry of Toxic Effects of Chemical Substances, 1982.

TABLE 7

GROUNDWATER CLEANUP GOALS

COMPOUND	CLEANUP GOAL mg/l
Acetone	1000a
Benzene	0.70
1, 2 - Dichlorobenzene	1.97
1, 4 - Dichlorobenzene	1.97
2, 4 - Dinitrotoluene	0.37
Napthalene	2.35
Toluene	5.00
1, 2, 4 - Trichlorobenzene	0.129a
Total Xylene	2.0

Goals based upon USEPA Ambient Water Quality Criteria for Aquatic Organisms.

a- No AWQC available. Goal based upon a general aquatic rating assigned by the Registry of Toxic Effects of Chemical Substances, 1982.

TABLE 8

SOIL CLEANUP GOALS

COMPOUND	CLEANUP GOAL (mg/kg)
Acetone	97.81
Benzene	2.43
1,2 - Dichlorobenzene	33.43
1,4 - Dichlorobenzene	38.06
2,4 - Dinitrotoluene	3.62
Naphthalene	74.57
Toluene	34.47
1,2,4 - Trichlorobenzene	4.23
Total Xylene	67.58

the soil based on an equilibrium soil-water partitioning. It is further assumed that this contaminated infiltrate will mix completely with a portion of the groundwater below the site, resulting in an equilibrium groundwater concentration.

According to this model, the mixing of groundwater and infiltration and the resultant contaminant concentrations in groundwater are related as follows:

$$Cgw = \frac{Qp\ Cp}{Qp + Qgw}$$

Where:

Cgw - Contaminant concentration in the groundwater (ug/l)
Qp - Volumetric flow rate of infiltration (soil pore water) into the groundwater ($ft^{3/day}$)
Qgw - Volumetric flow rate of groundwater ($ft^{3/day}$)
Cp - Contaminant concentrations in the infiltrate (ug/l).

4.3 Surface Water/ Sediment Remediation

No surface water contamination (HSL volatiles, semivolatiles) was detected in McCalleys Creek. While the contaminant levels in the sediment (see Table 3) are very low and not a cause for concern, it is anticipated that remediation of the contaminant source will result in the decrease of sediment contamination to acceptable levels. Thus, it was concluded that direct remediation of the surface water and sediment is not necessary.

5.0 ALTERNATIVES EVALUATION

The purpose of remedial action at the Wamchem Site is to mitigate and minimize contamination in the soils and groundwater, and to reduce potential risks to human health and the environment. The following cleanup objectives were determined based on regulatory requirements and level of contamination found at the site:

* To protect the human health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, or the leaching of contaminants into groundwater.

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

An initial screening of possible technologies was performed to identify those which best meet the criteria of Section 300.68 of the National Contingency Plan (NCP) (Table 9).

Following the initial screening of technologies, potential remedial action alternatives were identified and analyzed (Table 10). These alternatives were further screened and those which best satisfied the cleanup objectives, while also being cost effective and technically feasible were developed further (Table 11).

TABLE 9

Remedial Alternatives for Groundwater and Soil

Groundwater--General Response Actions

I. No Action
II. Containment
    A. Capping
    B. Subsurface barriers
    C. Access limitations
III. Collection/Control
    A. Pumping
    B. Subsurface drains
IV. Treatment
    A. Biological treatment
    B. Chemical treatment
    C. Physical treatment

Soils--General Response Actions

I. No Action
II. Containment
    A. Capping
    B. Grading
    C. Revegetation
III. Disposal
    A. Excavation and removal
    B. Offsite disposal
    C. Onsite land disposal
IV. In-Situ Treatment
    A. Bioreclamation
    B. Chemical treatment
V. Direct Treatment
    A. Biological treatment
    B. Chemical treatment
    C. Physical treatment

TABLE 10

Preliminary Screening of Remedial Action Technologies--
Applicable Technologies for Groundwater and Soil Treatment

General Response Action	Technology/Technology Option	Comments
Collection/control	Pumping	Well- oint system best suited to hydrology of site.
Treatment	Chemical treatment Neutralization Hydrolysis Oxidation Ultraviolet ozonation	Auxiliary processes for pretreatment or posttreatment and/or polishing; will be added into final design where applicable.
	Physical treatment Flocculation and sedimentation Activated carbon Air stripping	
Disposal	Excavation and removal	
	Offsite disposal Landfilling	
In-situ treatment	Detoxification Hydrolysis Oxidation Neutralization	
Direct treatment	Physical treatment LTTA Thermal destruction (incineration)	Will require trial burn and possible delisting of ash.

TABLE 10 (cont'd)

Preliminary Screening of Remedial Action Technologies--
Inapplicable Technologies for Groundwater and Soil Treatment

General Response Action	Technology/Technology Option	Comments
Containment	Caps	Of limited durability, subject to settlement and shrinkage; short-term use only.
	Vertical subsurface barriers (any material)	Groundwater hydrology and high water table preclude use; unproven technology, expensive, possible waste incompatibility, difficult to form complete seal.
	Horizontal subsurface barriers (grout curtains)	
	Access limitations	
Collection/control	Subsurface drains	Topology precludes gravity flow; high water table, artesian conditions, and high soil hydraulic conductivity will likely lead to leachate bridging or underflow of drain.
Treatment	Biological	
	Fixed film processes	Used for colloidal and suspended organic matter, which is not found in Wamchem groundwater in sufficient quantities.
	Activated sludge	Not suited to contaminants of concern; insufficient BOD.
	Chemical	
	Precipitation	Not suited for use with soluble organics; currently has no practical applications involving reduction of organics.
	Reduction	
	Physical	
	Distillation, flashing, rectification	Insufficient concentrations of organics. Not cost effective.
	Reverse osmosis	
	Evaporation	Not possible due to presence of volatile organics.
	Thermal destruction	Insufficient heating value.

TABLE 10 (cont'd)

General Response Action	Technology/Technology Option	Comments
	Discharge to POTW	Prohibitively expensive; distance is too far for piping.
Containment	Capping, grading, revegetation	Primarily for erosion control; not necessary at Wamchem Site.
	Onsite land disposal	Not permitted under RCRA regulations.
In-Situ Treatment	Bioreclamation	Unproven, high risk.
	Chemical Immobilization	Not suitable for the soluble organics found at Wamchem Site; unproven, possible further water table contamination.
	Mobilization	
	Solidification/stabilization	Not applicable to other than near-surface soil contamination due to mixing requirements.
Direct treatment	Biological treatment Composting	Insufficient substrate for continuing biodegradation.

TABLE 11

Summary of Remediation Alternatives

Alternative	Cost ($1,000) Capital	Cost ($1,000) Annual O&M	Net Present Value (10%)	Public Health Concerns	Environmental Concerns	Primary System Operation Life (yrs)[a]	Technical Concerns	Comments
1. No action	0	0	0	Does not meet remedial objectives for soils.	No immediate threat.	NA	None.	Meets ARAR's at point of discharge.
2. Soil excavation and disposal, provisory groundwater treatment, and monitoring[a]	610.9	107.3	1,101.6	Onsite dermal and inhalation exposure possible during period of remediation only.	Minimal. Temporarily increased noise and dust levels.	1	None.	Removes contamination source. Meets ARAR's at point of discharge. Protective of environment--no threat to wetlands.
3. LTTA of soil, provisory groundwater treatment, and monitoring	911.8	107.3	1,400.3	Onsite dermal and inhalation exposure possible during period of remediation only.	Minimal. Temporarily increased noise and dust levels.	1	None.	Destroys contamination source. Meets ARAR's at point of discharge. Protective of environment--no threat to wetlands.
4. Incineration of soil, provisory groundwater treatment, and monitoring	2,438.8	107.3	2,927.3	Onsite dermal and inhalation risk during remediation. Possible air releases.	Increased noise and dust. Backfilled ash has no nutrient value, will require revegetation.	1	Mobile units are large and require significant heavy equipment during mob/demobilization. Auxiliary fuel will be required.	Same as above. Also ash may require delisting before requirement onsite.
5. Soil excavation and disposal, groundwater treatment and monitoring	1,009.7	156.1	1,798.0	Onsite dermal and inhalation exposure possible during excavation.	Temporarily increased noise and dust levels.	10	Requires NPDES permit. Long treatment time for remediation.	Meets ARAR's at source. May pose threat to wetland due to groundwater extraction and discharge.
6. LTTA of soil, groundwater treatment and monitoring	1,310.6	156.1	2,098.9	Minimal. Onsite dermal and inhalation exposure possible during construction.	Temporarily increased noise and dust levels.	10	Requires NPDES permit. Long treatment time for remediation.	Destroys contamination source. Meets ARAR's at source. May pose threat to wetlands due to groundwate extraction and discharge.
7. Incineration of soil, groundwater treatment and monitoring	2,837.6	156.1	3,625.9	Onsite dermal and inhalation risk during remediation. Possible air releases.	Increased noise and dust. Backfilled ash has no nutrient value, will require revegetation.	10	Mobile units require significant heavy equipment during mob/demobilization. Auxiliary fuel will be required. Requires NPDES permit. Long treatment time for remediation.	See above. Also, ash may require delisting before replacement on site.

[a] All monitoring costs for 30 years.

5.1 Alternatives

Alternatives 1: No Action

This alternative will eventually reduce the volume of soil contamination through natural flushing. Contaminant mobility and toxicity are not reduced in the absence of treatment. Given the contaminant concentrations at the Site, the time required to significantly reduce contaminant levels is unrealistic. No action does not provide permanent source control.

Alternative 2: Excavation, Removal, and Transport of Soil, Groundwater Monitoring, Provisory Groundwater Treatment

This alternative would involve the excavation and removal of contaminated soil and the transport of this soil to an approved treatment, storage and disposal (TSD) facility. The technologies would include excavation; dewatering of excavated soils; removal of soils and transportation to a TSD facility; backfilling with clean soil, and revegetation.

This alternative would meet soil remedial action objectives and remove the source of contamination onsite but would not destroy it. Thus, it is not considered a permanent remedy.

Quarterly monitoring of groundwater at the 10 existing wells, and three additional wells and surface water is recommended for a period of five years. After this, annual sampling should be sufficient. Included in this alternative is a provision that groundwater treatment would be initiated upon detection of any site related contaminants in the surface water.

The ARARs for groundwater at this site are the ambient water quality criteria. Groundwater monitoring will not reduce the level of contamination in the groundwater and therefore, would not meet the groundwater ARAR.

Alternative 3: Low Temperature Thermal Aeration of Soil, Groundwater Monitoring, Provisory Groundwater Treatment

This alternative would involve the excavation, treatment and backfilling of contaminated soils. The technologies would include excavation; LTTA of soils, backfilling of treated soils; and revegetation.

The system has proved highly reliable in pilot tests and is available as a complete system, maintained and operated by the patent owner. Periodic sampling during excavation is required to determine whether remedial action objectives are being met, as well as whether optimum system operating parameters are being maintained. The LTTA process for soils does not meet the definition of an incinerator under RCRA and therefore is not subject to incineration performance standards. Following the LTTA process, soils will be redeposited onsite. Treatment time is estimated to take one year.

Alternative 4: Incineration of Soil, Groundwater Monitoring, Provisory Groundwater Treatment

This alternative would involve the onsite incineration of excavated

contaminated soil utilizing a mobile incineration unit, the subsequent backfilling of clean ash in the excavated area, and revegetation of the disturbed area.

The system requires trained operators during treatment, and on-site ash testing will be required to ensure that contaminant destruction is complete. Mobilization and demobilization of the mobile incineration units is a major portion of the time and expense. Many systems require cranes, riggers, pad construction, and trained personnel for assembly.

Treatment times would range from 1-2 months, not counting mobilization/demobilization time.

Alternative 5: Excavation, Removal, and Transport of Soil, Air Stripping and Carbon Adsorption of Groundwater.

This option would involve the air stripping of extracted groundwater followed by carbon adsorption. For the contaminants found in the groundwater at the Wamchem Site, neither activated carbon adsorption not air stripping could be used singly as a complete treatment. The two processes are frequently combined, usually resulting in a more economical and feasible system than either one alone.

The useful life of the combined system, assuming proper operation and maintenance, should be approximately 20 years, but the treatment system is only predicted to be in use for 10 years.

Treated groundwater would be discharged in McCalleys Creek pursuant to state water pollution control requirements.

Alternative 6: Low Temperature Thermal Aeration of Soil Air Stripping and Carbon Adsorption of Groundwater.

This alternative would provide a permanent remedy for both soil and groundwater. Both treatments have been described earlier.

Alternative 7: Incineration of Soil, Air Stripping and Carbon Adsorption of Groundwater.

This alternative would provide a permanent remedy for both soil and groundwater. Both treatments have been described earlier.

6.0 RECOMMENDED ALTERNATIVES

6.1 Description of Recommended Remedy

The recommended alternatives for remediation of groundwater and soil contamination at the Wamchem Site include extraction, treatment and discharge of groundwater; and on-site treatment of contaminated soil (Alternative 6).

These recommended alternatives meet the requirements of the National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR 300.68 (j), and the

Superfund Amendments and Reauthorization Act of 1986 (SARA). This recommended remedy permanently and significantly reduces the volume of hazardous substances in the groundwater, and reduces the volume of contaminants in the soil.

6.2 Operation and Maintenance

When the remedy is completed no long-term operation and maintenance (O&M) will be required.

6.3 Cost of Recommended Alternatives

Capital costs for groundwater remediation is $414,900 with system operating and maintenance cost at $155,100 per year, which includes sampling and analysis. The total present worth of the groundwater remediation is $1,203,200. The LTTA process is based on the excavation and treatment of 2000 cubic yards of soil. The use of a mobile unit has the advantage of no capital investments, and since complete destruction of the waste is achieved, no operation and maintenance costs are incurred beyond the first year. Overall cost for soil excavation, treatment backfilling and periodic sampling is estimated at $ 895,700.

The Total present worth cost of this remedy, including both soil and groundwater remediation, is $2,098,900.

6.4 Schedule

The planned schedule for remedial activities at the Wamchem Site will be governed by the signing of the Consent Decree, but tentatively is as follows:

June 1988 - Approve Record of Decision
September 1988 - Sign Consent Decree
October 1988 - Begin Remedial Design
March 1989 - Complete Remedial Design
May 1989 - Begin Mobilization

6.5 Future Actions

Groundwater monitoring will be required throughout the remedial activities to assure the effectiveness of the groundwater cleanup.

6.6 Consistency with Other Environmental Laws

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

* Resource Conservation and Recovery Act

  The LTTA process for soils does not meet the definition of an incinerator under RCRA and therefore is not subject to incinerator performance

standards.

* Clean Water Act

Trace amounts of contamination were detected in sediments in McCalleys Creek. The soil and groundwater remediation will delete the source of any future contamination. AWQC for the protection of saltwater aquatic life have been used in the development of remedial action.

* Floodplain Management Executive Order 11988

The site is located within the 100-year floodplain and subject to the requirements of E.O. 11988. Any hazardous waste storage or treatment facilities must be protected from the 100-year flood.

* Department of Transportation

Transportation of hazardous substances is regulated by the Department of Transportation. The alternative chosen does not involve transportation of hazardous waste.

* Occupational Safety and Health Administration

A health and safety plan will be developed during remedial design and will be followed during the field activities to assure that regulations of the Occupational Safety and Health Administration (OSHA) are followed.

* Safe Drinking Water Act

Drinking water standards (MCL'S, MCLG's) are not applicable.

* National Pollutant Discharge Elimination System

Discharge of treated groundwater is part of the recommended alternative. This discharge will meet effluent limit requirements of the National Pollutant Discharge Elimination System (NPDES). Aquatic Life chronic toxicity values, which are used in the NPDES permitting system, were used in determining the groundwater cleanup goals in Section 4.

* Endangered Species Act

The recommended remedial alternative is protective of species listed as endangered or threatened under the Endangered Species Act. Requirements of the Interagency Section 7 consultation Process, 50 CFR, Part 402, will be met. The Department of the Interior, Fish and Wildlife Service and National Oceanic and Atmospheric Administration (NOAA), will be consulted during remedial design to assure that any endangered or threatened species are not adversely impacted by implementation of this remedy.

* Ambient Air Quality Standards

The soil and groundwater treatment systems will be designed and monitored

to assure that air emissions meet all state and Federal Standards.

* State Drinking Water Standards

  Maximum contaminant levels established by the State of South Carolina are not applicable to the site.

7.0 COMMUNITY RELATIONS

Fact sheets were transmitted to interested parties, residents near the Site, media and state, local and federal officials before the RI work began at the Site in July 1986.

An information repository was established at the Beaufort County Library in Beaufort, South Carolina.

A fact sheet describing the results of the RI was transmitted to interested parties in August 1987.

A public notice was published in the Beaufort Gazette on May 6, 1988. This notice announced the beginning of the Public comment period and requested any persons desiring a public meeting to contact the EPA Project Manager.

No comments were received during the three-week public comment period which ended June 6, 1988.

1. LOB—New York 8, Kansas City 6. 2B—RHenderson, Mattingly. HR—BJackson (5). SB—Wilson (6), Brett (2), RHenderson (25). S—Randolph. SF—Pagliarulo 2.

	IP	H	R	ER	BB	SO
New York						
Dotson W,4-0	6 2-3	6	3	2	3	3
Guante S,3	2 1-3	1	0	0	0	3
Kansas City						
Gubicza L,3-3	6 2-3	8	5	5	3	3
Farr	1 1-3	1	0	0	1	0
Quisnbry	1	1	0	0	0	0

WP—Gubicza.

Umpires—Home, Brinkman; First, Welke; Second, Cooney; Third, Merrill.

T—2:58. A—38,255.

□ □ □ □

DETROIT	ab	r	h	bi	CALIFORNIA	ab	r	h	bi
Pettis cf	5	1	2	0	McLmr 2b	5	1	0	0
Whitakr 2b	4	1	1	1	Bucknr dh	3	0	1	0
Salazar lf	2	0	0	0	Armas dh	2	0	0	0
Sheridan lf	0	0	0	1	Joyner 1b	4	2	2	1
Tramml ss	5	1	3	2	CDavis rf	4	1	1	1
Herndn dh	2	1	1	0	Ray lf	4	0	1	1
DEvns dh	3	0	1	1	Howell 3b	3	0	1	1
Lemon rf	4	1	2	1	Polidor 3b	0	0	0	0
Knight 1b	3	1	1	1	DWhite cf	3	0	1	0
Bergmn 1b	0	0	0	0	Wynegar c	3	1	1	0
Brokns 3b	2	1	0	0	Hndrck ph	1	0	0	0
Heath c	3	1	1	1	Boone c	0	0	0	0
					Schofild ss	4	0	3	0
Totals	33	8	12	8	Totals	36	5	11	4

Detroit	040	201	001—8
California	001	130	000—5

Game Winning RBI — Lemon (3).

DP—Detroit 2, California 2. LOB—Detroit 6, California 6. 2B—Joyner, DWhite. 3B—Joyner, CDavis. SB—McLemore (6), Pettis (15). S—Sheridan. SF—Sheridan.

	IP	H	R	ER	BB	SO
Detroit						
Terrell	4 2-3	9	5	5	1	2
Hernandz W,2-1	3	1	0	0	1	3
Henneman S,9	1 1-3	1	0	0	0	1
California						
Finley L,2-4	1 1-3	6	4	4	1	1
Cliburn	2 1-3	2	2	2	2	1
Krawczyk	1 1-3	1	0	0	2	0
Harvey	3	1	1	1	0	3
Buice	1	2	1	1	0	0

HBP—Salazar by Cliburn. WP—Terrell. BK—Finley 2.

Umpires—Home, Coble; First, McClelland; Second, Denkinger; Third, McCoy.

T—3:24. A—23,821.

□ □ □ □

CLEVELAND	ab	r	h	bi	SEATTLE	ab	r	h	bi
RWsgtn 3b	4	0	1	0	Kingery rf	5	1	1	1
Upshaw 1b	4	0	0	0	Bradley c	4	2	1	1
Franco 2b	5	0	0	0	Cotto cf	4	1	2	0
Carter cf	3	2	3	0	ADavis 1b	4	1	2	5
Hall lf	4	0	1	0	Phelps dh	4	0	2	0
Kittle dh	4	0	2	2	Brantley lf	4	0	2	0
DClark rf	3	0	2	0	Presley 3b	3	0	0	0
Allanson c	4	0	0	0	Renteri 2b	3	0	0	0
JBell ss	3	0	1	0	MDiaz ss	0	0	0	0
					Reynlds 2b	4	2	2	0
Totals	34	2	10	2	Totals	35	7	12	7

Cleveland	000	100	010—2
Seattle	002	005	00x—7

Game Winning RBI — Bradley (1).

E—Brantley. DP—Cleveland 1, Seattle 2. LOB—Cleveland 10, Seattle 7. 2B—RWashington, Reynolds, Bradley, Brantley, Kingery, Carter. 3B—Reynolds. HR—ADavis (3). SB—Carter (8).

	IP	H	R	ER	BB	SO
Cleveland						
Yett L,2-2	5 2-3	10	5	5	3	1
Dedmon	0	1	1	1	0	0
Schatzedr	1 1-3	1	1	1	0	2
DJones	1	0	0	0	0	0
Seattle						
Swift W,2-0	8	9	2	2	5	3
MJackson	1	1	0	0	0	0

Dedmon pitched to 1 batter in the 6th.

PB—Bradley.

Umpires—Home, Barnett; First, Cousins; Second, Roe; Third, Kosc.

T—2:38. A—6,590.

□ □ □ □

PHILA	ab	r	h	bi	CINCINNATI	ab	r	h	bi
Samuel 2b	5	0	1	0	Larkin ss	5	3	2	1
Dernier cf	2	0	0	0	Sabo 3b	5	1	1	0
MThmp cf	2	1	1	0	Daniels lf	3	2	1	0
Bradley lf	5	1	2	1	EDavis cf	5	4	3	3
Schmdt 3b	3	0	0	0	Esasky 1b	5	0	1	1
Parrish c	3	1	1	1	Cncpcn 2b	4	0	2	1
Hayes 1b	3	1	1	2	RRonck rf	5	0	2	3
MYoung rf	4	0	1	0	McGriff c	3	0	1	0
Jeltz ss	3	0	0	0	Brownng p	2	0	0	0
GGross ph	1	0	0	0	ONeill ph	1	0	0	0
Ritchie p	0	0	0	0	Rijo p	1	0	0	0
Carman p	2	0	0	0					
Aguayo ph	1	0	0	0					
Dawley p	0	0	0	0					
Harris p	0	0	0	0					
Clay p	0	0	0	0					
Daulton ph	1	0	0	0					
Almon ss	0	0	0	0					
Totals	35	4	6	4	Totals	39			

Philadelphia	001	002	1(4
Cincinnati	001	120	42x—10

Game Winning RBI — EDavis (4).

E—Sabo, Almon, Samuel. DP—Cincinnati 1. LOB—Philadelphia 8, Cincinnati 9. 2B—Parrish, EDavis, MYoung. 3B—Bradley. HR—Larkin (5), EDavis (4), Hayes (1). SB—EDavis (12), Samuel (7).

U.S. ENVIRONMENTAL PROTECTION AGENCY SEEKS COMMENTS ON WAMCHEM SUPERFUND SITE CLEANUP

The U.S. Environmental Protection Agency (EPA) is seeking comments on a report that outlines clean-up alternatives for the Wamchem Superfund site, Beaufort, South Carolina.

Comments can be written or given by telephone. Also, EPA will hold a public meeting to explain the proposed cleanup, if requested. If a public meeting is desired, please call (404) 347-7791 or write:

Giezelle S. Bennett
U.S. Environmental Protection Agency
Superfund Branch
345 Courtland Street, NE
Atlanta, GA 30365

no later than May 23, 1988.

The Wamchem site is located near U.S. Highway 21 in Beaufort County, South Carolina, seven miles northwest of the Town of Beaufort. It is located on a small island in the middle of a salt marsh, near the upper reach of McCalleys Creek. The adjacent area is primarily rural, with some residential and commercial areas along U.S. High 21 to the north and south. A U.S. Marine Corps Air Station is located one mile so the site.

The site was originally owned and operated by the Beaufort Chemical and Research Company, which produced intermediate dyes for the textile industry between 1959 and 1972. M. Lowenstein Company purchased the facility in 1972 and continued operations until 1981. Springs Industries, Inc., acquired the M. Lowenstein Company as a subsidiary in 1985. Waste handling at the site utilized two spray fields, two holdong ponds, a waste lagoon, and a trash disposal area.

A remedial investigation and feasibility study was initiated at the Wamchem site in April 1986. The purpose of the remedial investigation was to determine the nature and extent of the contamination at the site. The results of the remedial investigation indicated significant soil and shallow ground-water contamination in the vicinity of a former holding pond, and small amounts of contamination in the sediments of McCalleys Creek, adjacent to the site.

The purpose of the feasibility study is to screen, evaluate, and determine an alternative to reduce the toxicity, mobility, and volume of the contamination at the site in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.

The alternative preferred by EPA consists of treatment of the contaminated soils by a low-temperature thermal aeration process and treatment of the contaminated groundwater by activated carbon adsorption and air stripping. These measures are described in detail in the feasibility study report.

A final decision on the alternative most protective of human health and the environment and economically feasible will be made after all comments from the public have been received and evaluated.

The feasibility study report will be made available for public review on or about May 16, 1988, in the Beaufort County Library, 710 Craven Street, Beaufort, South Carolina.

Those wishing to comment on the study should do so by June 6, 1988, by cont

Giezelle S. Bennett
U.S. Environmental Protection Agency
Superfund Branch
345 Courtland Street, NE
Atlanta, GA 30365

U.S. EPA offers cleanup plan for county hazardous waste site

By MARY JO MILLER
Special to The Packet

BEAUFORT — The U.S. Environmental Protection Agency has released its plans for cleaning up another of Beaufort County's three hazardous waste sites.

The agency, in a report on file at the Beaufort County Library, outlines several processes that would use oxygen, carbon and heat to clean contaminated soil and groundwater at the Wamchem Inc. site near the marsh on the west bank of McCalley's Creek off U.S. 21.

The EPA will accept both oral and written comments on its study until June 6. After the comments have been evaluated, the agency plans to make a final decision on its method of cleanup.

"We should begin actually cleaning up the site in May 1989," said Giezelle Bennett, EPA project manager.

The cost of the cleanup is estimated at approximately $1.3 million, according to the report.

The Wamchem site, originally owned by Beaufort Chemical and Research Co., was listed among the country's 100 most hazardous sites in 1984, making it eligible for cleanup under the EPA's "Superfund" program along with two other Beaufort County sites.

The other sites are the Independent Nail Co., which is currently being cleaned up, and the Kalama Speciality Chemicals Inc., both off U.S. 21 north of Beaufort.

EPA sampling at the Wamchem site, which was closed in 1982, detected several toxic chemicals, including acetone, benzene, toluene and xylenes in soil and shallow groundwater and in the sediment of McCalley Creek, where shellfishing has been prohibited.

Health officials consider all three sites potentially hazardous because they are above the Floridan aquifer, the primary drinking water source for well users in Beaufort, Colleton, Jasper and Hampton counties.

A 1986 study showed the Wamchem site contains soil and shallow groundwater contamination in an on site wastewater pond and small amounts of contamination in the sediment of McCalley Creek, where shellfishing has been prohibited.

Although sampling revealed small amounts of contaminants in a restricted portion of the shallow, water table aquifer beneath the Wamchem site, the agency said it had detected no site-related contamination in the Floridan aquifer.

To comment on the cleanup, contact Bennett at the U.S. EPA, 345 Courtland Street N.E., Atlanta 30365, or call (404) 347-7791.

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

July 8, 1988

Mr. Greer C. Tidwell
Regional Administrator
US EPA, Region IV
345 Courtland Street
Atlanta, Georgia 30365

RE: Final Draft Record of Decision (ROD)
Wamchem Site - Beaufort, South Carolina

Dear Mr. Tidwell:

The Department has reviewed the Record of Decision (ROD) for the Wamchem site received on June 6, 1988. The ROD is only for the EPA selected remedial action for this site developed in accordance with CERCLA, as amended by SARA and to the extent practicable, the National Contingency Plan.

Since the current owner, Springs Industries, is negotiating an agreement with EPA to perform the Remedial Action (RA); the State is not required to match fund for the costs associated with this ROD. Therefore, the State of South Carolina concurs with EPA's selected remedy which addresses groundwater and soil as follows:

Groundwater

1. Extraction of contaminated groundwater.
2. On-site treatment of extracted groundwater.
3. Discharge of treated groundwater to off-site stream.
4. Groundwater remediation will be performed until all contaminated water meets the cleanup goals specified in the summary of Alternate Selection.

Soil

On-site treatment of contaminated soil (approximately 2,000 cu. yds.) to remove organic contaminants. The technologies will include excavation; low temperature thermal aeration of soils, backfilling of treated soils; and re/vegetation.

The State has confidence in EPA's administration and enforcement of the ROD's objectives and purpose and also that Springs Industries Inc. will remediate the Wamchem Site as directed.

Sincerely,

R. Lewis Shaw

R. Lewis Shaw
Deputy Commissioner
Environmental Quality Control

RLS:alf

cc: Gil Trentanove
Hartsill Truesdale
George Nelson
Ken Taylor
Lynn Martin
Keith Lindler