United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R04-92/105
August 1992

EPA

Superfund Record of Decision:

Potter's Septic Tank Service Pits, NC

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R04-92/105	2.	3. Recipient's Accession No.

4. Title and Subtitle SUPERFUND RECORD OF DECISION Potter's Septic Tank Service Pits, NC First Remedial Action - Final	5. Report Date 08/05/92 6.
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

PB93-964007

16. Abstract (Limit: 200 words)

The 5-acre Potter's Septic Tank Service Pits (Potters's Pits) is located in a rural section of Brunswick County, North Carolina. The surrounding land use is semi-rural residential. The site is situated within a residential community known as the Town of Sandy Creek. The Chinnis Branch waterbody traverses the site, flowing from southwest to northeast. A forest/wetland region covers approximately half of the site. There are no public water supplies within approximately 10 miles of Sandy Creek because the current residences use private domestic water wells and onsite septic systems. The EPA Domestic Water Survey for the subdivision indicates that there are 60 wells in the area. Between 1969 and 1976, before the land was developed for residential use, a family business operated sludge hauling and oil spill clean-up companies as well as waste disposal pits on the site. Disposal practices consisted of placing petroleum waste products and septic tank sludges either in shallow unlined pits or directly on the land surface. In 1976, an unlined pit failed, allowing approximately 20,000 gallons of oil to flow into Chinnis Branch. The U.S. Coast Guard responded to the spill pursuant to CWA. Additionally, the site owners pumped the remaining oil from the breached pit and three other onsite pits for offsite disposal. Approximately 150

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Potter's Septic Tank Service Pits, NC
First Remedial Action - Final
Contaminated Media: gw, sw
Key Contaminants: VOCs (benzene, toluene, xylenes), other organics (naphthalene), metals (chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 130
	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

Abstract (Continued)

truck loads of oil sludges and stained soil were removed. Thick oil sludge that could not be pumped was mixed with sand and buried onsite. In 1982, Dixie and Earl Gurkin purchased the site and discovered buried wastes, which resulted in an EPA investigation that revealed soil and ground water contamination. In 1984, EPA conducted an emergency removal, excavating an estimated 1,770 tons of oil, sludge, and contaminated soil for offsite disposal. This ROD addresses the ground water treatment and contaminated soils at the site. Primary contaminants of concern affecting surface and subsurface soil are VOCs and semi-VOCs, including napthalene, metals, and pesticides. Ground water is contaminated with VOCs, including benzene, ethyl benzene, toluene; other organics including naphthalene, and xylenes; and metals, including chromium and lead.

The selected remedial action for this site includes excavating all soils that exceed the soil clean-up standards; treating contaminated soils by using an onsite ex-situ thermal desorption process; performing secondary treatment of the concentrated organic contaminants, a by-product of thermal desorption which will depend upon the vendor; sampling and analyzing the treatment residue; disposing onsite the nonhazardous treated soil to grade and revegatate with native grasses; or onsite solidifying of soils containing levels of chromium, lead, and zinc above clean-up standards for offsite disposal. The ground water remedy includes extracting ground water across the site in the surficial aquifer; treating the extracted ground water onsite by chemical treatment; air stripping to remove contaminants; surface discharge of the treated ground water to Chinnis Branch; and continued analytical monitoring for contaminants in ground water. The current residents who live onsite will be moved before remedial activities begin. The total estimated present worth for the cleanup is $11,800,000, of which $7,100,000 is for ground water extraction treatment and $4,700,000 is for soil remediation. Associated O&M costs were not provided for this remedy.

<u>PERFORMANCE STANDARDS OR GOALS</u>: Chemical-specific goals for cleanup are based on the more stringent state or federal standards for ground water and soil cleanup for metals, including chromium and lead; other organics, including naphthalene; and metals, including benzene, toluene, and xylenes; and federal land disposal restrictions pertaining to storage and transportation of hazardous waste.

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

POTTER'S SEPTIC TANK SERVICE PITS SITE
SANDY CREEK, BRUNSWICK COUNTY
NORTH CAROLINA

AUGUST 5, 1992

PREPARED BY:

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

POTTER'S SEPTIC TANK SERVICE PITS SITE

RECORD OF DECISION

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RECORD OF DECISION

Remedial Alternative Selection

Site Name and Location

Potter's Septic Tank Service Pits Site
Sandy Creek, Brunswick County, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Potter's Septic Tank Service Pits Site in Sandy Creek, North Carolina. The remedy was chosen 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), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for the site.

Assessment of the Site

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, and/or the environment.

Description of the Selected Remedy

This remedy addresses both soil and groundwater contamination at the site. The major components of the selected remedy include:

GROUNDWATER

Extraction of groundwater across the site in the surficial aquifer that is contaminated above Maximum Contaminant Levels and/or the North Carolina Groundwater Standards;

On-site treatment of extracted groundwater by chemical treatment and air stripping to remove contaminants;

Surface water discharge of the treated groundwater to Chinnis Branch; and

Continued analytical monitoring for contaminants in groundwater.

SOIL

The current residents (Gurkins) who presently live on the site will be moved before remedial activities begin;

Excavation of all soils exceeding the soil clean-up standards established in this ROD;

Treatment of contaminated soil using on-site ex-situ thermal desorption process;

Secondary treatment of the concentrated organic contaminants, a by-product of thermal desorption which will depend upon the vendor;

Sampling and analysis of the treatment residue;

Proper transportation and storage of RCRA hazardous wastes;

On-site disposal of the non-hazardous treated soil into the original excavated areas, backfilling with soil to grade and revegatation with native grasses;

On-site solidification of soils containing levels of chromium, lead, and zinc above clean-up standards for off-site disposal;

Additional Sampling and Monitoring

Additional sampling and analyses of the deeper aquifer to determine the extent (if any) of contamination in this aquifer of site contaminants. During the RI Addendum, one sample from a deep well showed benzene in excess of MCLs.

Additional sampling and analyses will be done in Area 3 to better characterize the soils.

Description of the Contingency Remedy For Soils

The current residents (Gurkins) who live on the site will be moved before remedial activities begin;

Excavation of all soils exceeding the soil clean-up standards established in this ROD;

Use of the Toxicity Characteristic Leaching Procedure (TCLP) tests on the soil to identify whether the soil is a characteristic hazardous waste;

If soil is not a charateristic hazardous waste (passes TCLP), then the soil will be transported directly to a landfill for disposal;

If the soil is a characteristic hazardous waste (fails TCLP), then the soil will have to be treated before disposal at a RCRA permittted landfill;

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (or "a waiver can be justified for whatever Federal and State applicable or relevant and appropriate requirement that will not be met"), and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, and/or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above groundwater standards, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. A 5-year review (or performance evaluation) will be prepared at least once every five years until groundwater contaminant concentrations no longer exceed groundwater standards.

Patrick M Tobin
for Greer C. Tidwell
Regional Administrator

AUG 0 5 1992
Date

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
POTTER'S SEPTIC TANK SERVICE PITS SITE
SANDY CREEK, NORTH CAROLINA

1.0 INTRODUCTION

The Potter's Septic Tank Service Pits site was proposed for inclusion on the National Priorities List (NPL) in June 1988 and was finalized on the NPL in March 1989. The Potter's Pits site is a 5-acre area where waste disposal pits were operated. Disposal practices consisted of placing waste petroleum products and septic tank sludges in shallow unlined pits or directly on the land surface. The Remedial Investigation (RI) Report which was completed in December of 1991, consisted of a two-phase investigation that fully characterized the presence and extent of contamination on and off site by evaluating the sediments, surface water, groundwater, surface soils, and subsurface soils. The Feasibility Study (FS) which develops and analyzes potential alternatives for remediation at the site was issued to the public in April of 1992.

This Record of Decision (ROD) has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative, in accordance with Section 113(k)(2)(B)(v) and Section 117 (b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act ((SARA) P.L. 99-499). The Administrative Record for the Potter's Pits site forms the basis for the Record of Decision contained herein.

2.0 SITE NAME, LOCATION, AND DESCRIPTION

The Potter's Septic Tank Service Pits (Potter's Pits) site is located in a rural section of Brunswick County, North Carolina approximately 17 miles west of Wilmington off of highway 74/76 in a residential community known as the Town of Sandy Creek (Figure 1). Sandy Creek is subdivided into one to two acre lots, each with a private domestic water well. There are approximately 150 residential lots of which 70 are currently occupied.

The Potter's Pits site was divided into three study areas; Area 1 and 3 are located in residential lots within Sandy Creek, and Area 2 was located approximately 1.5 miles north across U.S. Highway 74/76 (Figure 1 and 2). Area 1 comprises the actual Potter's Pits site. Area 3 was included in the investigation because historical aerial photographs suggested that this area might have been used as a disposal site. During the Remedial Investigation (RI) phase, area 3 was determined not to be a problem. Additionally area 2 was thought to be located approximately 0.4 miles from area 1 somewhere off of highway 74/76, but was removed from further investigation

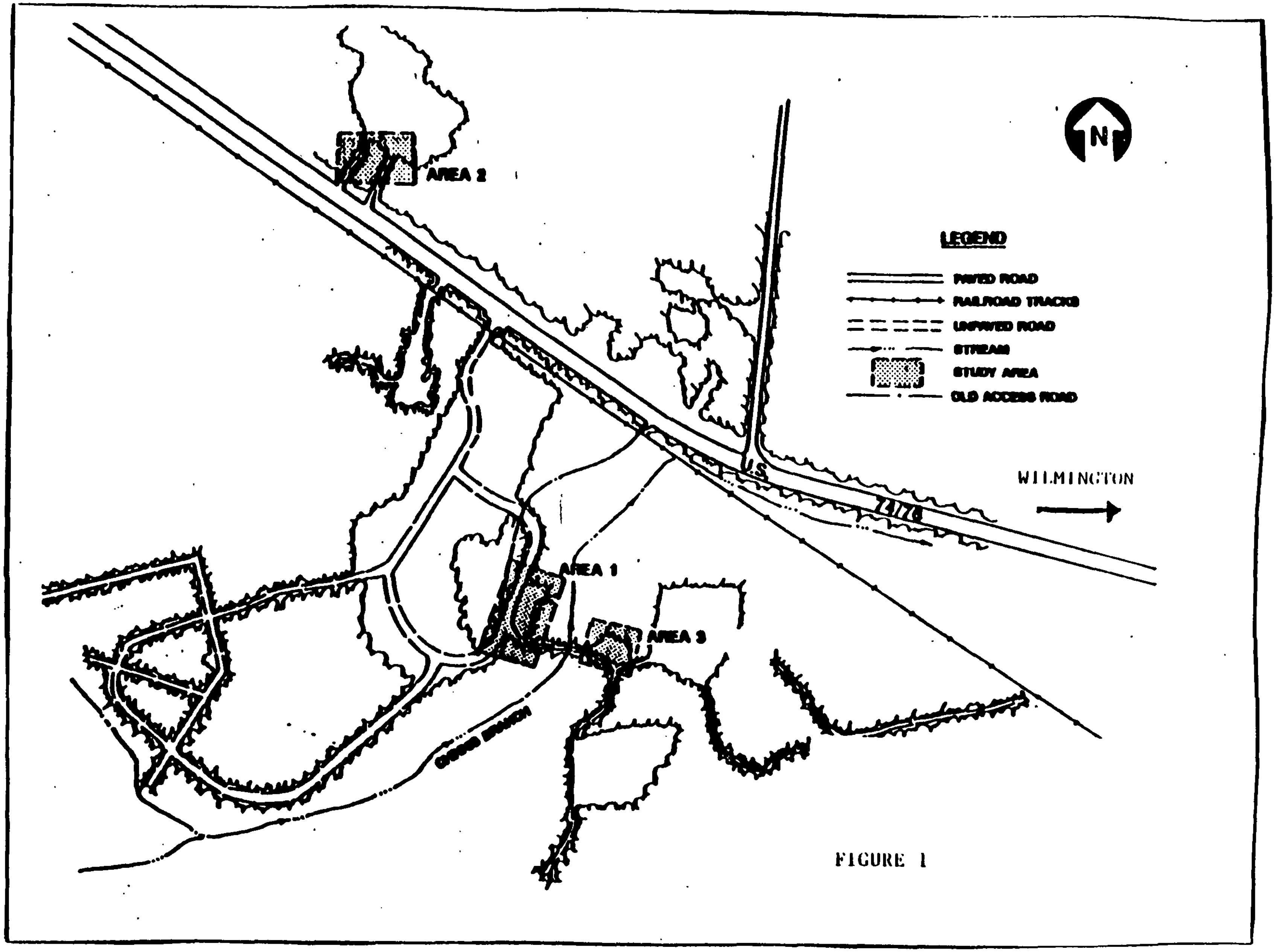
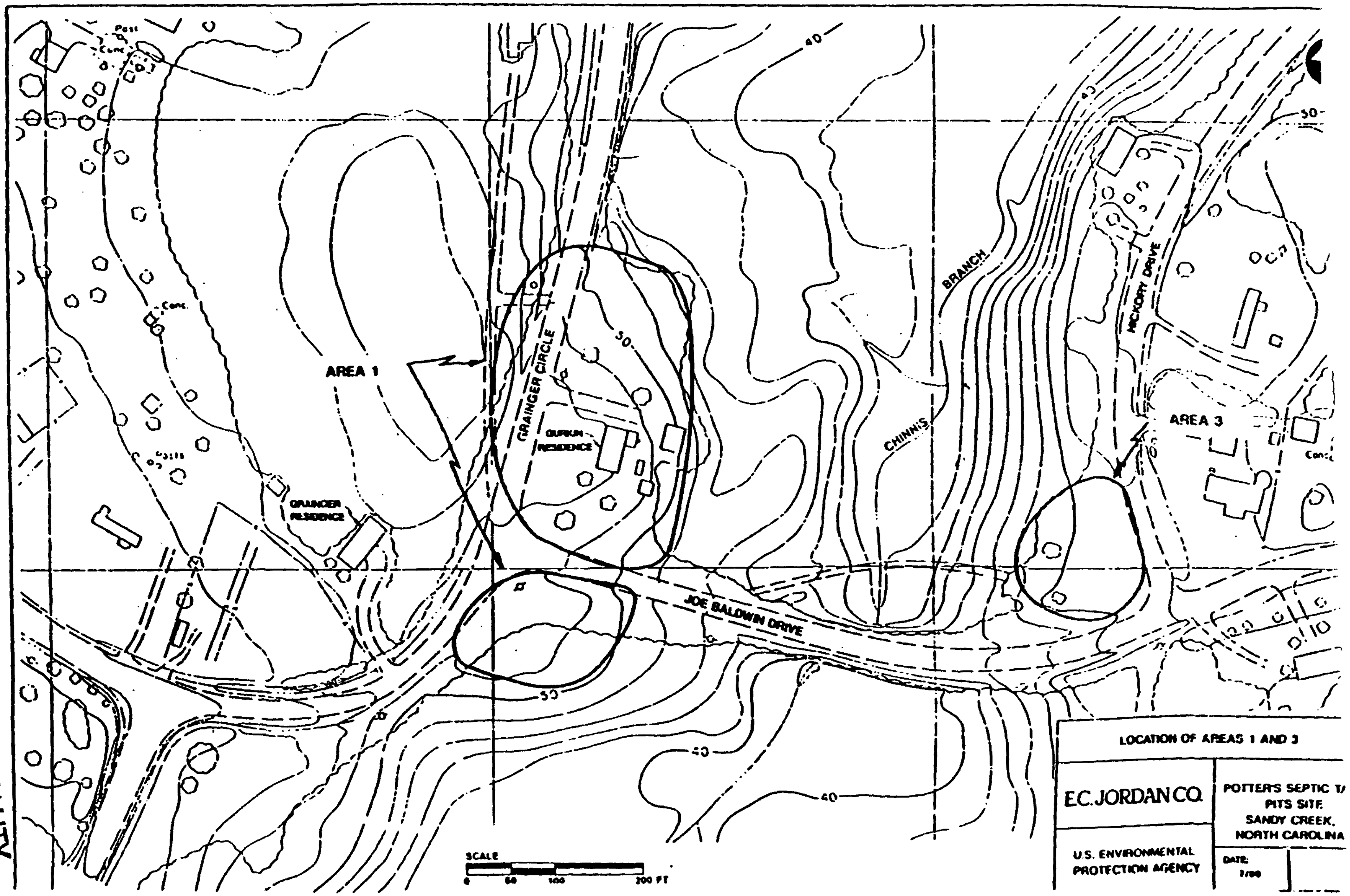

AREA 2
AREA 1
AREA 3
N
LEGEND
PAVED ROAD
RAILROAD TRACKS
UNPAVED ROAD
STREAM
STUDY AREA
OLD ACCESS ROAD
U.S.
74/76
WILMINGTON

FIGURE 1

Figure 2



AREA 1
AREA 3
GRAINGER CIRCLE
GRAINGER RESIDENCE
DURKIN RESIDENCE
JOE BALDWIN DRIVE
HICKORY DRIVE
CHINNIS
BRANCH
40
50
SCALE
0
50
100
200 FT
LOCATION OF AREAS 1 AND 3
E.C. JORDAN CO.
POTTER'S SEPTIC TA
PITS SITE
SANDY CREEK,
NORTH CAROLINA
U.S. ENVIRONMENTAL
PROTECTION AGENCY
DATE
7/90

after an extensive search indicated that no additional information regarding its location or existence could be found.

2.1 Surface Features

The topography, type of soils in the area, and other relevant surface features of the site are illustrated on Figure 3. The site is located in Brunswick County which lies entirely within the Coastal Plain. The site itself lies at approximately 60 feet above mean sea level (msl) and is adjacent to Little Green Swamp, which forms the headwaters of Chinnis Branch. Chinnis Branch traverses the site, flowing from the southwest to the northeast direction.

Surface drainage from the site is toward Chinnis Branch which lies at 36 to 38 feet msl in the site area. Chinnis Branch flows into Rattlesnake Branch which then converges with Hood Creek, just south of Mount Misery Road. Hood Creek drops steeply as it flows into the Cape Fear River, which empties into the Atlantic Ocean.

The immediate area surrounding Chinnis Branch is a forest/wetland region. This forest/wetland region covers approximately half of the site.

The other prominent feature at the site is the residential house located approximately in the location of the former disposal pit in Area 1 as can be seen on the site map (Figure 2). The land surrounding the site is a residential community and has other residential homes bordering the property.

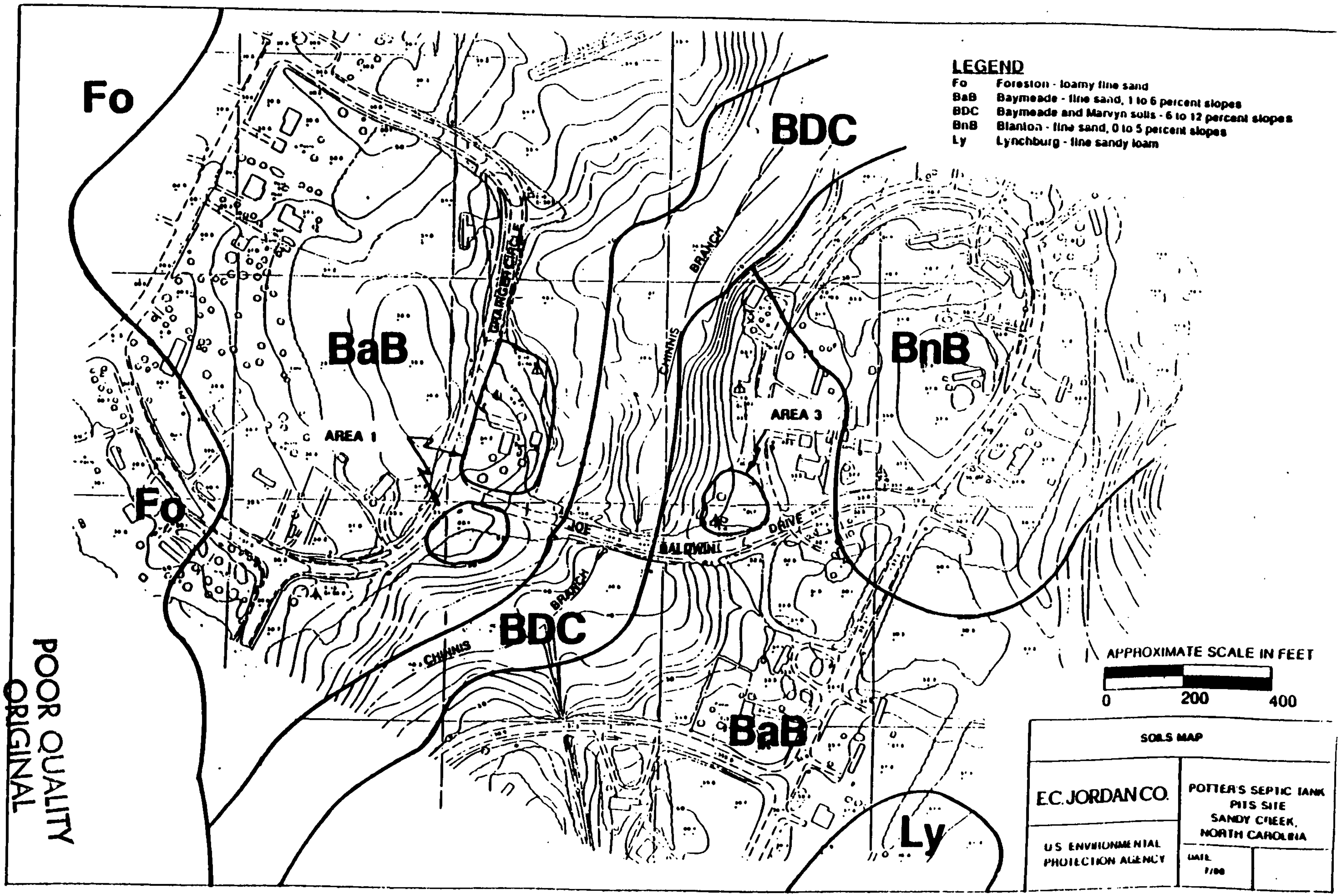
2.2 Subsurface Features

The oldest sedimentary formation in Brunswick County is the Tuscaloosa Formation of Late Cretaceous age. The Tuscaloosa is typified by sands and clays of alluvial origin. Specific geologic conditions at the site were determined by visual examination of soil samples and rock cuttings observed during groundwater monitoring well drilling.

Surface material at the site is composed of Miocene or younger sediments typically 5 to 20 feet in thickness. These sediments are primarily composed of silty fine sands, clayey sands, and poorly graded sands. Underlying the surficial sediments is a poorly defined, discontinuous, high plasticity, gray to dark gray, clay layer that ranges from 5 to 20 feet below land surface (bls) and is 0.5 to 5 feet thick. This layer is believed to be a semi-confining unit throughout the site area. Below the clay layer is a dark grey marl approximately 3 feet thick. Underlying the marl is the bedrock, composed of either calcareous sandstone or an impure limestone. Depth to bedrock ranges from 24 to 42 feet bls.

Lithologic data collected in the RI suggest that two aquifers are being monitored at the site. The aquifers are separated by the clay layer, observed at approximately 5 to 20 feet bls. The depth

Figure 3



POOR QUALITY ORIGINAL

of the clay layer is reduced in the vicinity of Chinnis Branch. From the data collected during the RI, it has been determined that the second aquifer is semi-confined, as the clay unit does not appear to be present at all locations.

Groundwater measurements collected during the RI support a two-aquifer scenario. While water level data collected from many of the wells can be interpreted to support either a one or a two aquifer hypothesis, head differentials observed in the cluster comprised of shallow wells EPA-07 and MW-201 and deep well EPA-08 strongly suggest two separate aquifers are being monitored (Figure 4).

The horizontal gradient and direction of groundwater flow is to the east-southeast toward Chinnis Branch and the adjacent wetland areas (Figure 4). Based on information collected in the phase I RI and verified in the phase II RI Addendum, the calculated values of groundwater velocity for the site range from 5.2 to 10.4 feet per day. These estimated velocities appear relatively high, given the comparatively limited distribution of contamination observed at the site. Although flow velocities are an important component, contaminant transport will also be controlled by numerous other chemical specific and environmental interactions and variables. Since the contaminants have not migrated very far, these other factors are assumed to be affecting the contaminant transport.

2.3 Current Land Use

The Potter's Pits site is located in the Town of Sandy Creek in the Northwest Township of Brunswick County. The current and projected land use of this area is semi-rural residential. A map of the town is provided on Figure 5. The typical homes are manufactured houses (mobile or modular) on one- to two-acre lots. There are no public water supplies within approximately 10 miles of Sandy Creek, and the current residences use private domestic water wells and on-site septic systems. The EPA Domestic Water Survey for the subdivision indicates that there are 60 wells and that most are 25 to 40 feet deep, with two wells over 100 feet.

To date there are no schools, hospitals, or public parks within this district. Recreational activities include wading in Chinnis Branch.

A current estimate of the population size in the area surrounding the site was derived from a survey completed on March 8, 1990 by the Town Clerk of Sandy Creek. A summary of the survey results is as follows:

* 148 residential lots,
* 70 occupied dwellings, and
* 185 estimated residents, of which approximately 60 are children

Figure 4

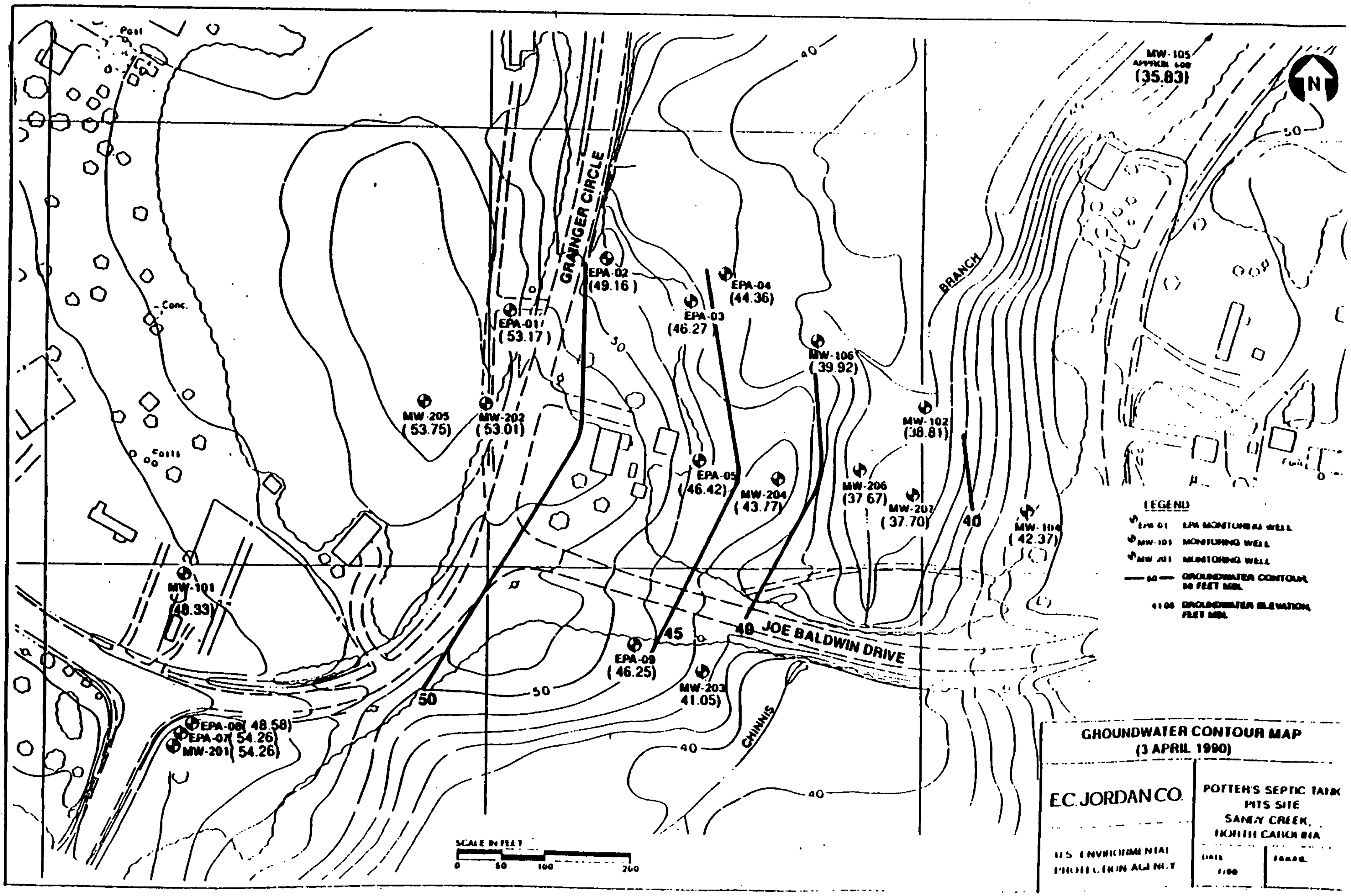
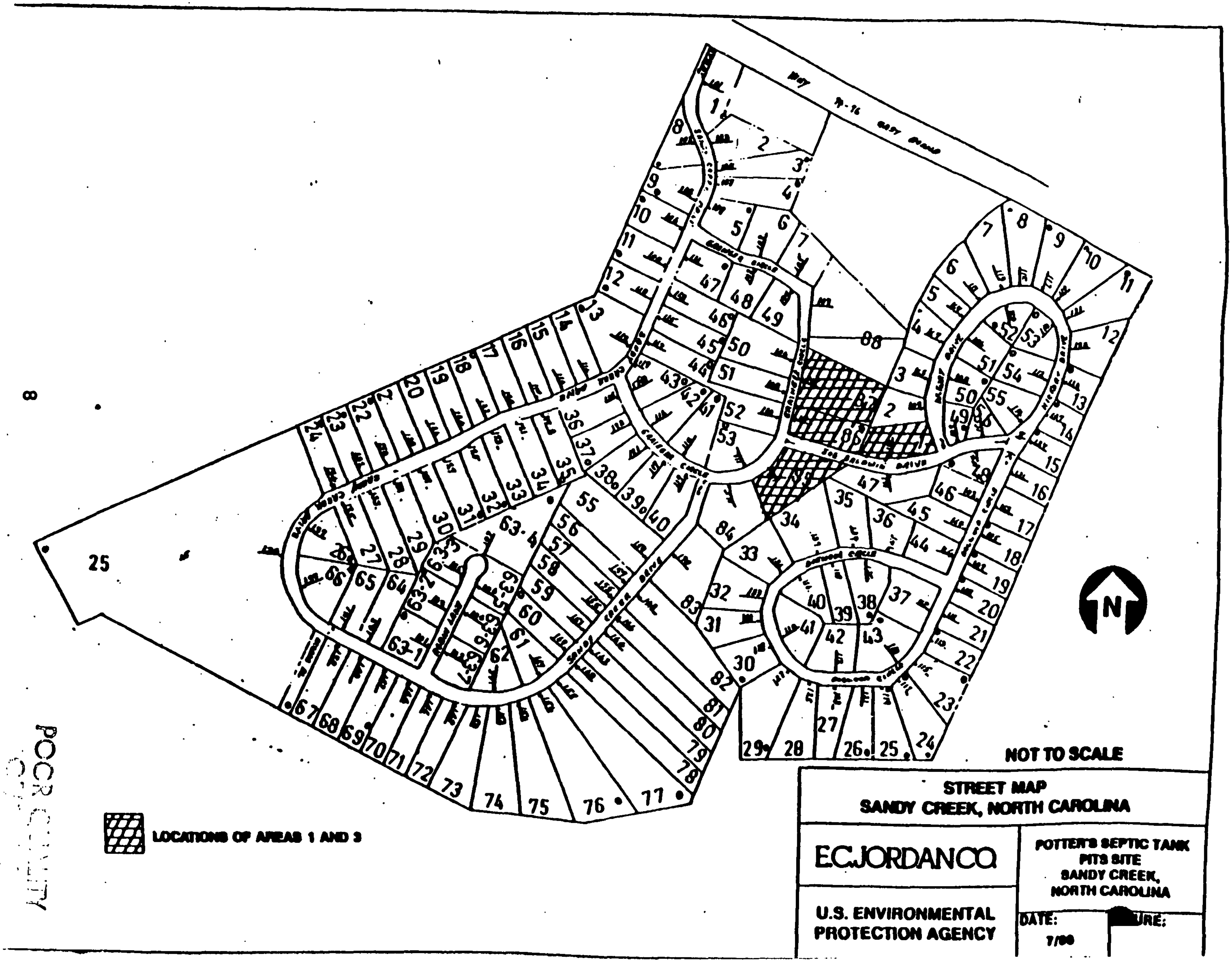

GROUNDWATER CONTOUR MAP
(3 APRIL 1990)
E.C. JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
LEGEND
GRAINGER CIRCLE
JOE BALDWIN DRIVE
BRANCH
CHINNIS
MW-105
(35.83)
EPA-02
(49.16)
EPA-04
(44.36)
EPA-03
(46.27)
EPA-01
(53.17)
MW-106
(39.92)
MW-205
(53.75)
MW-202
(53.01)
MW-102
(38.81)
EPA-05
(46.42)
MW-204
(43.77)
MW-206
(37.67)
MW-207
(37.70)
MW-104
(42.37)
MW-101
(48.33)
EPA-09
(46.25)
MW-203
41.05)
EPA-08 (48.58)
EPA-07 (54.26)
MW-201 (54.26)
50
45
40
SCALE IN FEET
0
50
100
200

Figure 5


N
NOT TO SCALE
LOCATIONS OF AREAS 1 AND 3
STREET MAP
SANDY CREEK, NORTH CAROLINA
E.C.JORDAN CO.
POTTER'S SEPTIC TANK
PITS SITE
SANDY CREEK,
NORTH CAROLINA
U.S. ENVIRONMENTAL
PROTECTION AGENCY
DATE:

Increased population density is anticipated. During the years 1980 through 1988, housing units and the population of the district increased by approximately 32 percent annually.

3.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Between 1969 and 1976, before the land was developed for residential use, the Skipper family operated sludge hauling and oil spill cleanup companies in this area. Specifically they operated waste disposal pits. Disposal practices consisted of placing waste petroleum products and septic tank sludges in shallow unlined pits or directly on the land surface.

In May 1976, the North Carolina Department of Natural and Economic Resources (NCDNER) informed Mr. Ward Skipper that an oil disposal pit (Area 2) located near Maco violated North Carolina statutes and must be cleaned up immediately. At that time, approximately 2,000-3,000 gallons of black oil was pumped from the pit and the pit area was covered with soil. Documentation pertaining to the chemical composition of materials disposed in the pit, the fate of the liquid removed from the pit, and the quantities and characteristics of the material buried on site have not been found.

In August 1976, an unlined pit in Area 1 (Figure 2) failed and allowed approximately 20,000 gallons of oil to escape. The oil flowed into Chinnis Brach and then into Rattlesnake Branch. The U.S. Coast Guard responded pursuant to Section 311 of the Clean Water Act to conduct the cleanup.

Also, in August of 1976, Mr. Otto Skipper (brother of Ward Skipper) began pumping out the oil remaining in the breached disposal pit (Area 1). Approximately 20,000 gallons of oil were removed from this pit and transported to Fort Bragg Military Reservation in Fayetteville, North Carolina. Three other pits containing oil, as well as the oil recovered from the receiving stream, was also taken to Fort Bragg. In addition, approximately 150 dump truck loads of oil sludge and oil stained dirt were excavated and hauled to Brunswick County landfill in Leland, North Carolina for final disposal. The thick oil sludge that could not be pumped was mixed with sand and buried on site.

The Skipper Estate changed ownership in 1980. Wachovia State Bank, through foreclosure, took possession of the property in January 1980. Investment Management Corporation later purchased the property and subdivided it for residential development. This development became known as Sandy Creek Acres and later as the Town of Sandy Creek. Earl and Dixie Gurkin purchased the site lots in 1982. They found waste materials buried in their yard (Area 1) in July of 1983. The State of North Carolina sampled the soil and groundwater. Analysis of these samples confirmed the presence of contamination. The site owner's water well was condemned, and they were connected to a neighbor's well (Grainger's well, Figure 2).

3.1 Initial Investigations

In September 1983, EPA and the Region IV Field Investigation Team (FIT) performed an electromagnetic survey of the site, monitored the air under the present owner's home, and collected soil, surface water, and groundwater samples for laboratory analysis. In February 1984, EPA-Region IV used ground penetrating radar (GPR) to further define the site boundaries.

In March 1984, an immediate Removal Action at the Potter's Pits site (Area 1) was requested by the EPA Office of Emergency and Remedial Response. On March 21, 1984, a Superfund removal was begun centering around Area 1. A total of 1,770 tons of oily sludge and contaminated soils were excavated and transported to a hazardous waste landfill in Pinewood, South Carolina. Soil removal activities were completed on April 2, 1984 (Figure 6). An emergency removal is conducted anytime at a site when there is an imminent threat to human health or the environment from a contaminant.

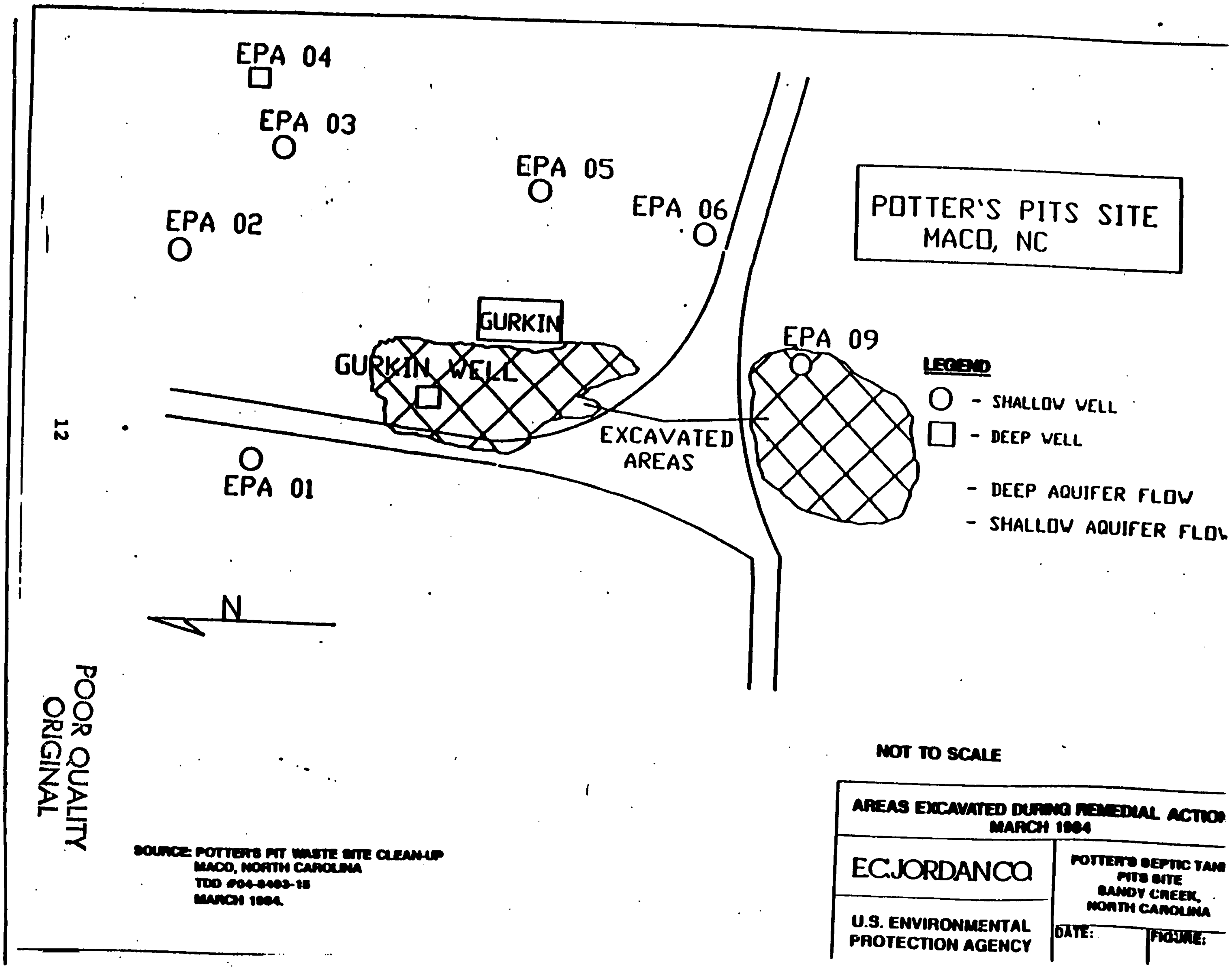
In May 1984, EPA-Region IV proposed a groundwater monitoring plan to determine if the Potter's Pits site (Area 1) presented a threat to surrounding groundwater sources. Contamination of the shallow aquifer had been documented at the site during the September 1983 FIT investigation in groundwater samples taken from both a residential and a monitoring well on site. However, in order to characterize the nature and extent of the groundwater contamination in this area, additional wells were proposed. Nine monitoring wells were subsequently installed and sampled by EPA (Figure 6). The locations of these wells were based on the assumption that the groundwater flow was in a northeasterly direction. The samples were analyzed for volatile organic compounds. Relatively high concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX) were detected in some of the groundwater samples.

The wells were resampled in 1988 by the State of North Carolina. These samples were analyzed for volatile organics, phenols, priority pollutant metals, and several nutrients. BETX and phenols were the predominant contaminants detected. In addition, the 1988 data indicated the possibility of low level benzene, ethylbenzene, and xylenes in a "deep" well which would indicate that the "deep" aquifer had now been affected.

3.2 Remedial Investigation

Based on the site investigation, the site was placed on the National Priorities List (NPL); therefore a Remedial Investigation and Feasibility Study (RI/FS) was warranted. The primary objectives of a RI/FS are to assess the nature and distribution of contaminants at the site and to characterize the site hydrology and geology. The types of analyses included in the RI were selected to characterize these factors to the extent required to evaluate potential risks, if any, to human health and the environment, and to evaluate alternatives for site remediation. Toward this end, the RI analyzed for potential sources of contamination in the following media:

Figure 6


EPA 04
EPA 03
EPA 05
EPA 06
EPA 02
POTTER'S PITS SITE
MACO, NC
GURKIN
GURKIN WELL
EPA 09
LEGEND
- SHALLOW WELL
- DEEP WELL
- DEEP AQUIFER FLOW
- SHALLOW AQUIFER FLOW
EXCAVATED AREAS
EPA 01
N
NOT TO SCALE
SOURCE: POTTER'S PIT WASTE SITE CLEAN-UP
MACO, NORTH CAROLINA
TDD #04-8403-15
MARCH 1984.
AREAS EXCAVATED DURING REMEDIAL ACTIO
MARCH 1984
E.C.JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
POTTER'S SEPTIC TAN
PITS SITE
SANDY CREEK,
NORTH CAROLINA
DATE:
FIGURE:

* Soils
* Air
* Groundwater
* Surface water/stream sediment

Since the site was placed on the NPL, the site was eligible to be cleaned up under Superfund. There were no willing Potential Responsible Parties (PRP) involved at this time; therefore, the site became a fund-lead project which means the EPA hired contractors to perform the RI/FS. Ebasco Services began the initial phase of the Remedial investigation which occurred from January 1990 through April 1990 with a final report on September 1990. The principal results and findings of the Remedial Investigation are discussed in further detail in Section 6.0 - Summary of Site Characteristics, of this document.

3.3 Remedial Investigation Addendum Report

After the initial remedial investigation was completed, it was determined that a phase II or Remedial Investigation Addendum was necessary due to lack of complete information. Therefore, in April of 1991, EPA conducted the supplemental field investigation to address the data gaps and irregularities identified in the initial RI. The media sampled during this phase included additional shallow and deep groundwater samples, a few surface and subsurface soil samples, and two surface water and sediment samples. A report was generated in July of 1991 which described the field effort. The Remedial Investigation Addendum Report was compiled using the field data collected by EPA by ROY F. WESTON. WESTON was retained by EPA to do the Remedial Investigation Addendum Report and the Feasibility Study Report for this Site. The principal results and findings of the RI Addendum Report are discussed in detail in Section 6.0 - Summary of Site Characteristics, of this document.

4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with public participation requirements of CERCLA Sections 113 (k)(2)(B)(i-v) and 117, a comprehensive community relations program was developed and implemented throughout the remedial process at the Potter's Pits site.

In March of 1984, before the beginning of the immediate removal action done by EPA, EPA and North Carolina State officials held an availability session to answer any questions the public may have toward the impending removal. This availability session was announced in the Wilmington Star News.

Community interviews were conducted in January of 1990 to find out what the concerns of the community were and to explain the Remedial Investigation process to the citizens.

In January of 1990, a Remedial Investigation/Feasibility Study (RI/FS) Kick-Off Fact Sheet was prepared and delivered to interested citizens and local officials included on the site's mailing list. This fact sheet explained the overall process of Superfund, the upcoming RI/FS at the Potter's Pits site, and opportunities for community involvement. A RI/FS Kick-Off meeting was held on February 28, 1990 with the community at Sandy Creek to present the objectives of the investigation, describe the activities that were to take place as part of the investigation, and to answer any questions the public had regarding the upcoming investigation.

Following the completion of the RI in March of 1991, a RI/FS Findings Fact Sheet was prepared and released to the public in March of 1991. A public meeting was held to formally present the findings of the RI on March 28, 1991. Findings of the Baseline Risk Assessment were discussed as well as the future direction of the site.

The finalized RI/FS Reports and Proposed Plan for the Potter's Pits site were released to the public in April of 1992. These documents were made available for public review at the EPA Region IV Records Center, and the Columbus County Library (East Branch). The notice of the availability of these documents and notification of the Proposed Plan Public Meeting was announced in the Wilmington Star News on April 30, 1992. The Proposed Plan Public Meeting was held on May 12, 1992 at the Hood Creek Community Center. At this meeting, representatives from EPA and NCDEHNR presented EPA's preferred alternative for cleanup of the site and answered any questions the public had regarding the preferred alternative, other alternatives considered in the FS, or any other concerns the public had related to the cleanup of this site.

Various press releases were issued throughout the different stages of this project. These press releases announced meetings and announced the preferred alternative for cleanup at the site.

The mandatory 30-day public comment period was held from April 30 -

May 30, 1992. A response to the comments received during this comment period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the selected remedial action for the Potter's Pits site in Sandy Creek, North Carolina, chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the Administrative Record for this site.

5.0 SUMMARY OF SITE CHARACTERISTICS

This Section of the Record of Decision summarizes the results of the site field investigations which were conducted as part of the Remedial Investigation and the Remedial Investigation Addendum Report. The sampling plan for the Potter's Pits site was based on initial investigations conducted by North Carolina State, the soil gas survey performed by EPA, topographic drainage characteristics, and results of previous regulatory site investigations. The types of samples collected were surface and subsurface soils, groundwater, stream sediment, air, surface water from Chinnis Branch, and private residential well samples around the site. Areas identified as potential constituent sources include Areas 1, 2, and 3 as identified on Figure 1.

5.1 Study Area 2

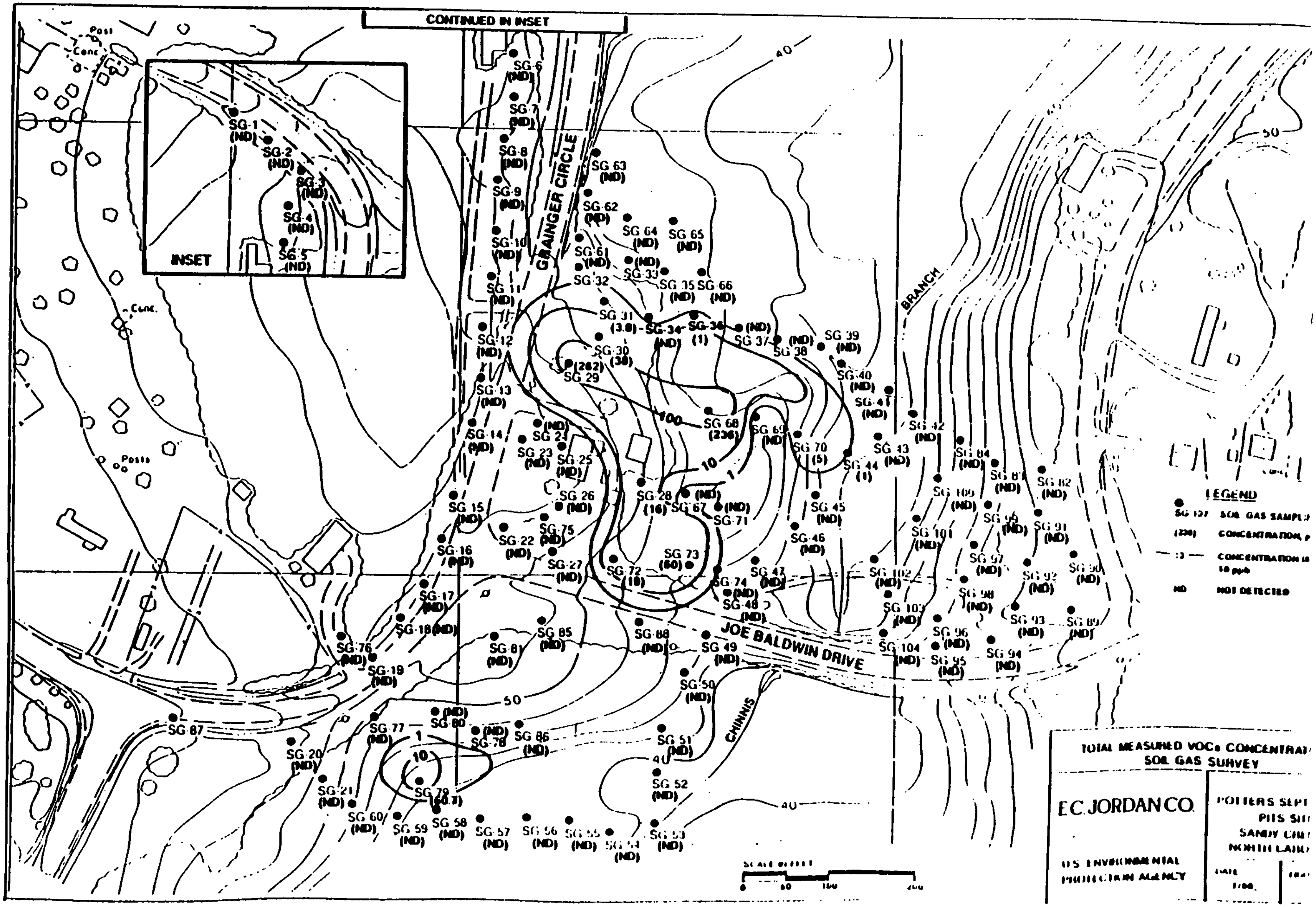
Study area 2 was identified as a potential area of concern during the development of the Potter's Pits Work Plan based on the available historical records. A letter from the North Carolina Department of Natural and Economic Resources (NCDNER) (May 19, 1976) to Mr. Ward Skipper documented that the waste oil disposal pit located on his property north of U.S. Highway 74/76 was in violation of North Carolina General Statute 143-215.83. Mr. Lawrence McCandless (USCG) and Mr. Rick Schiver (regional hydrologist for the NCDNER) had inspected the disposal pit and described it as being approximately 60 feet long and 20 feet wide. It was estimated that the pit contained in excess of 2,000 to 3,000 gallons of black oil. Mr. Skipper conducted the cleanup after receiving the May 19,1976 letter in which he was advised that clean-up actions should be immediately initiated. The only reference to the pit location in the historical records was that it was approximately 0.4 miles from the pit which caused the spill on August 5, 1976 (Area 1).

Due to the uncertainty of the exact location of this disposal pit, investigative activities conducted during the RI were structured as follows: additional record searches, further analysis of historical aerial photographs, interviews with local, state, and federal officials who observed the disposal pits during the May 1976 Area 2 cleanup, and a site reconnaissance of the general area north of U.S. Highway 74/76 by RI field team members. After all of this investigative work was done, Area 2 was still not located. It was determined at that time that no further investigative activities would be done regarding Area 2.

5.2 Soil Gas Survey

A soil gas survey was conducted at the site from January 15 to 19, 1990. A total of 104 soil gas samples were collected and analyzed from Area 1 (85 samples) and Area 3 (19 samples). Soil gas sampling locations and general overall results are presented in Figure 7. The highest concentration of volatile organic compounds (VOCs) were detected just north of the Gurkin residence in Area 1

Figure 7


CONTINUED IN INSET
INSET
GRAINGER CIRCLE
JOE BALDWIN DRIVE
BRANCH
CHINNIS
LEGEND
NOT DETECTED
TOTAL MEASURED VOCs CONCENTRA
SOIL GAS SURVEY
E.C. JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY

and a small area south of Joe Baldwin Drive in the empty field. No occurrences of detectable levels of VOCs were measured in soil gas samples collected from Area 3 east of Chinnis Branch.

The soil gas survey was used to detect VOCs in soils and groundwater and to reduce the number of soil borings and monitoring wells needed to characterize the extent of volatile contamination. Soil gas samples were collected around the perimeter of Area 1 to verify the actual study area boundaries.

5.3 Subsurface Soils

5.3.1 Remedial Investigation

The subsurface soil samples were taken between January 30 and February 20, 1990. A total of 80 soil borings were completed in Area 1 (78 borings) and Area 3 (2 borings). Boring locations are shown on Figure 8. A total of 254 soil samples were collected from the 80 borings at 5-foot intervals. Results of the GC analysis are presented in the RI. The location and general overall results of the CLP soil data is presented in Figures 9 - 14.

The results of the CLP data revealed two extensive areas of contamination. Both areas are within the general vicinity of the former waste oil pits. Elevated levels of VOCs (primarily BTEX), SVOCs (primarily naphthalene), and metals were detected in both areas. Pesticides were detected in four soil samples (SS-10, SS-28, and SS-69). No PCBs were detected in any of the subsurface soil samples.

5.3.2 Remedial Investigation Addendum

During the Phase II investigation, six samples were taken during the installation of additional monitoring wells; the other three were taken from soil borings (Figure 15). The contaminants that were detected were the same as was detected in the initial RI. Summary data of the soil samples are presented in the RI Addendum.

5.4 Surface Soils

5.4.1 Remedial Investigation

Twenty-three surface soil samples (0 to 6 inches) were collected from within study areas 1 and 3, between March 14 - 16, 1990 (Figure 16). The results of this analysis indicated very low levels of 1,1,1-trichloroethane, toluene, carbon disulfide, and styrene. Elevated levels of HCB, anthracene, and 4-chloro-3-methylphenol were detected in a limited number of samples. Four pesticides were detected in three surface soil samples.

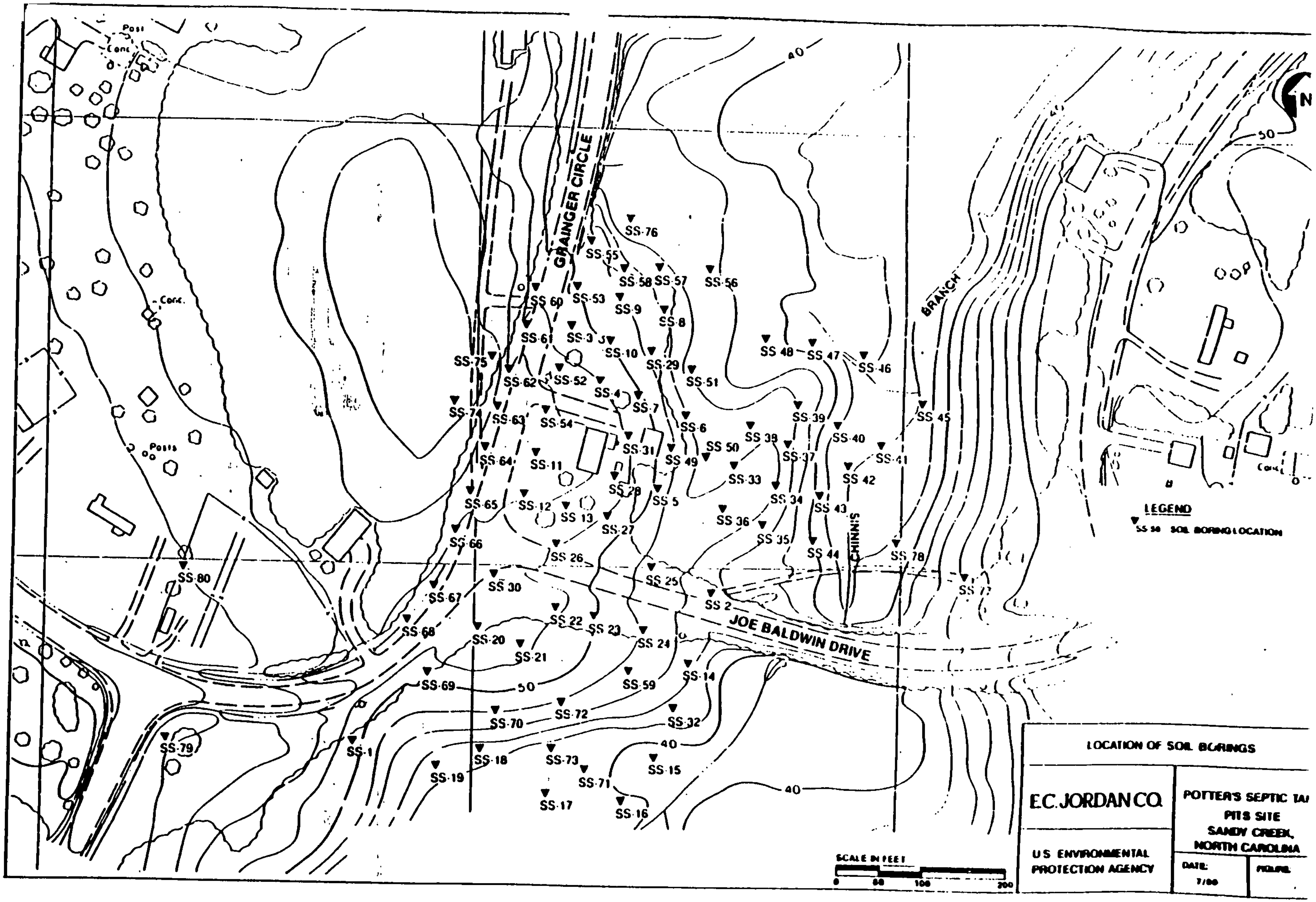
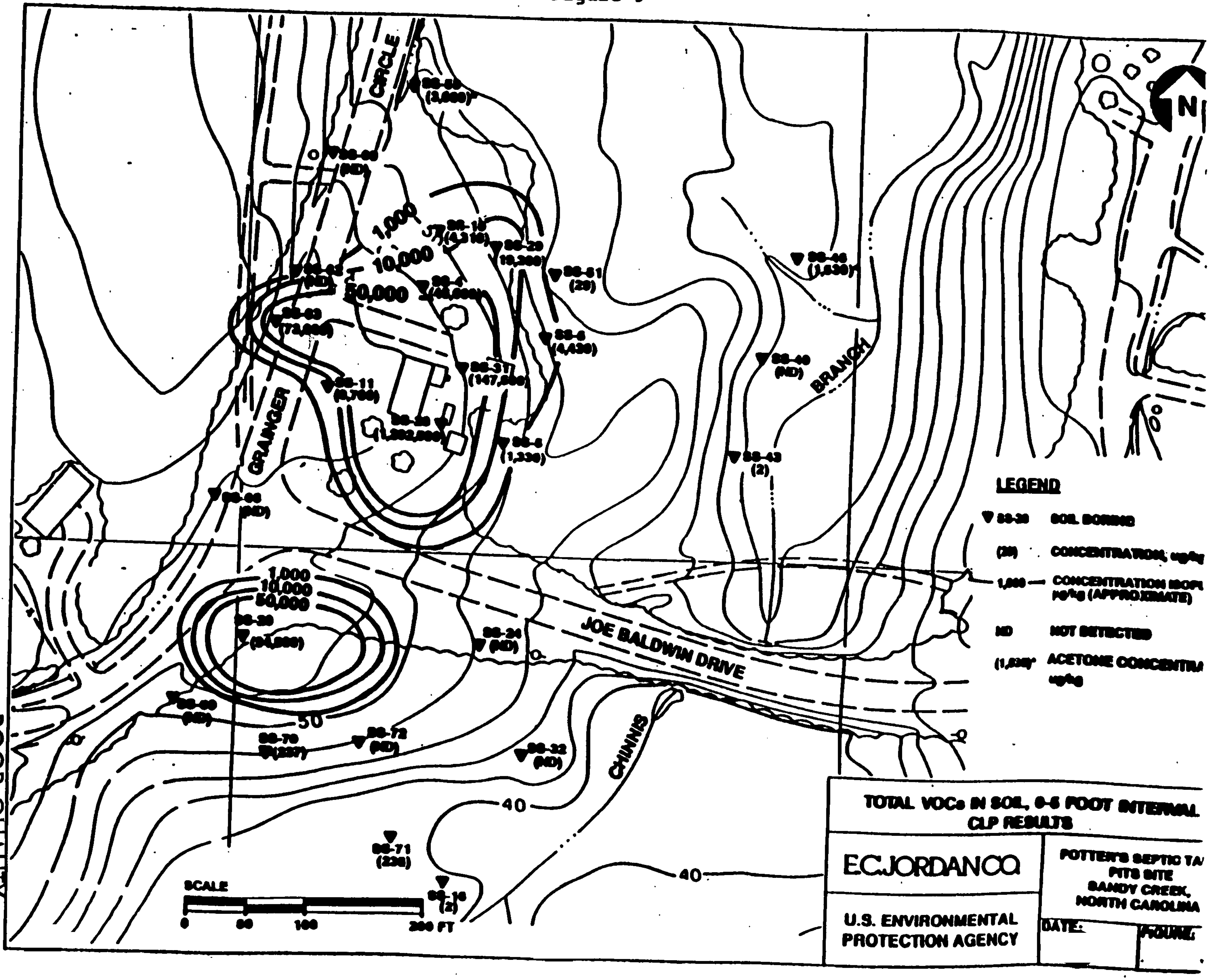

GRAINGER CIRCLE
JOE BALDWIN DRIVE
BRANCH
CHINNIS
LEGEND
SS 56 SOIL BORING LOCATION
LOCATION OF SOIL BORINGS
E.C. JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
POTTER'S SEPTIC TA
PITS SITE
SANDY CREEK,
NORTH CAROLINA
DATE:
7/86
FIGURE:
SCALE IN FEET
0
50
100
200
N
40
50
Post
Conc.
Posts

Figure 8

Figure 9



CIRCLE
GRANGER
JOE BALDWIN DRIVE
BRANCH
CHINNIS
1,000
10,000
50,000
50
40
40
N
SCALE
0
50
100
200 FT
LEGEND
SOIL BORING
CONCENTRATION
NOT DETECTED
ACETONE CONCENTRA
TOTAL VOCs IN SOIL, 0-5 FOOT INTERVAL
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL
PROTECTION AGENCY
POTTER'S SEPTIC TA
PITS SITE
SANDY CREEK,
NORTH CAROLINA
DATE:
FIGURE:

Figure 10

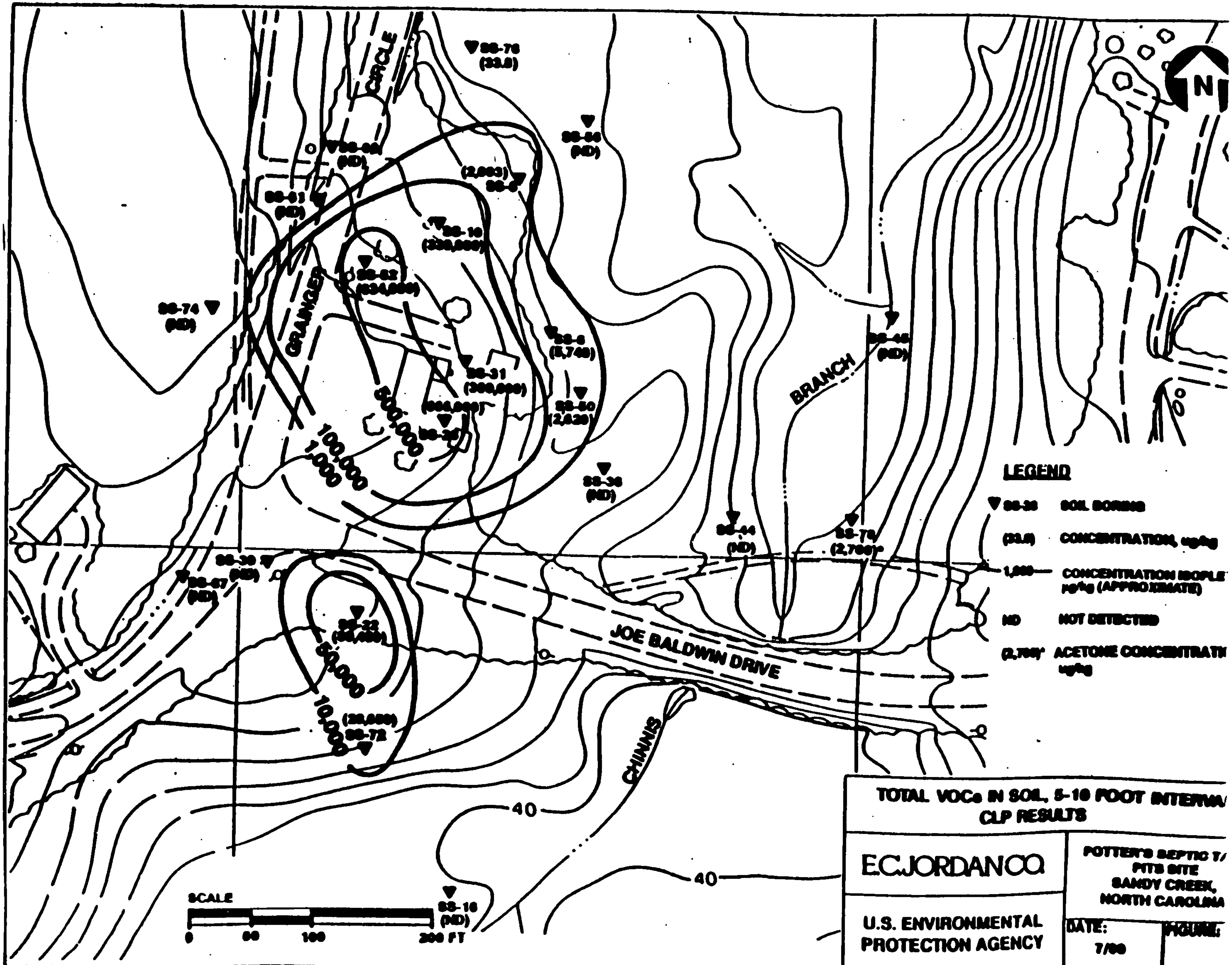

CIRCLE
GRANGER
BRANCH
JOE BALDWIN DRIVE
CHINNIS
500,000
100,000
1,000
50,000
10,000
40
40
LEGEND
SOIL BORING
CONCENTRATION, ug/kg
NOT DETECTED
SCALE
0
50
100
200 FT
TOTAL VOCs IN SOIL, 5-10 FOOT INTERVA
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
SANDY CREEK,
NORTH CAROLINA
DATE:

Figure 11

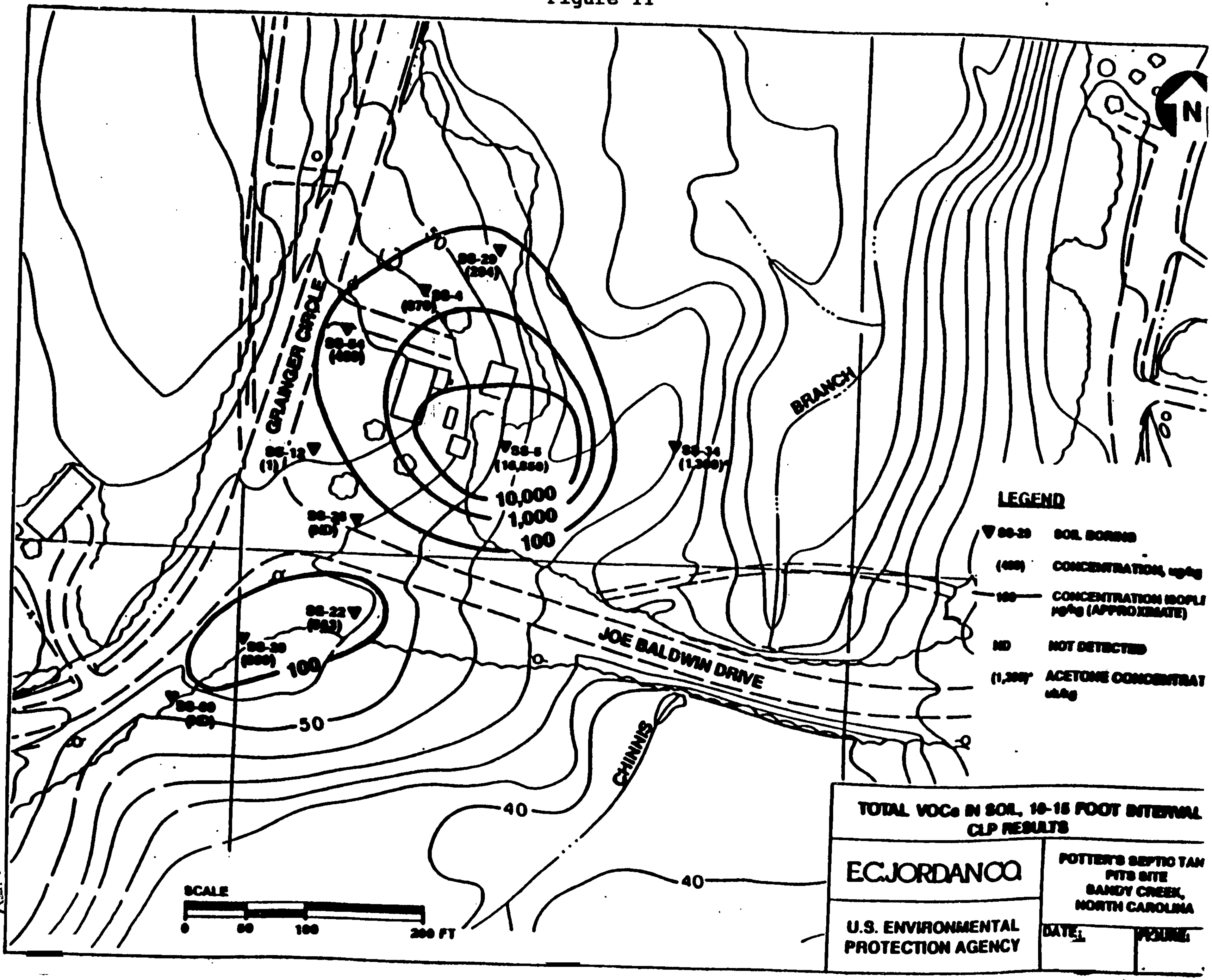
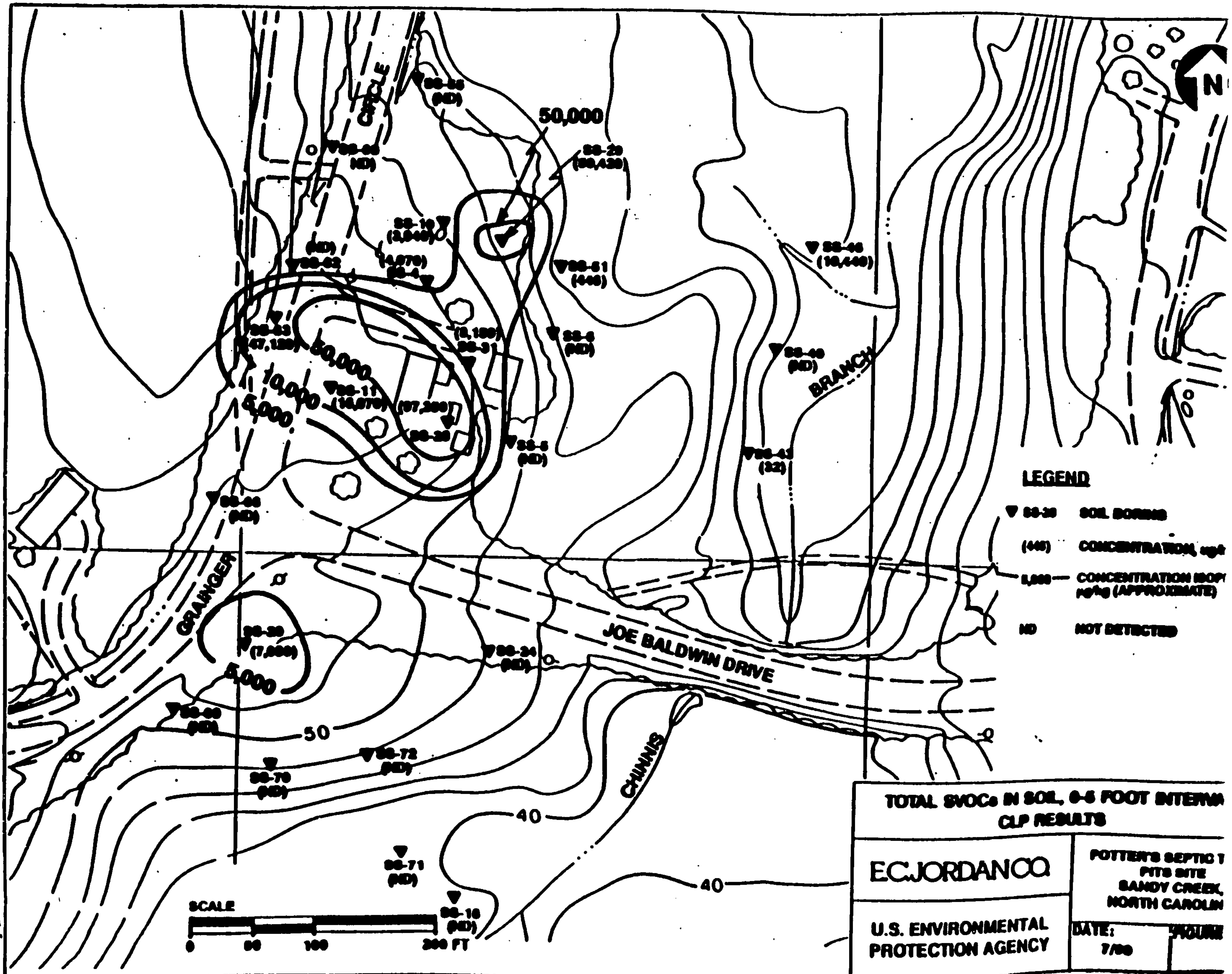

GRANGER CIRCLE
BRANCH
JOE BALDWIN DRIVE
CHINNIS
10,000
1,000
100
100
50
40
40
LEGEND
NOT DETECTED
TOTAL VOCs IN SOIL, 10-15 FOOT INTERVAL
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL
PROTECTION AGENCY
SCALE
0
50
100
200 FT
N

Figure 12



50,000
CIRCLE
10,000
5,000
GRAINGER
JOE BALDWIN DRIVE
BRANCH
CHINNIS
50
40
40
LEGEND
SOIL BORING
NOT DETECTED
SCALE
0
200 FT
TOTAL SVOCs IN SOIL, 0-5 FOOT INTERVA
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
POTTER'S SEPTIC T
PITS SITE
SANDY CREEK,
NORTH CAROLIN
DATE:

Figure 13

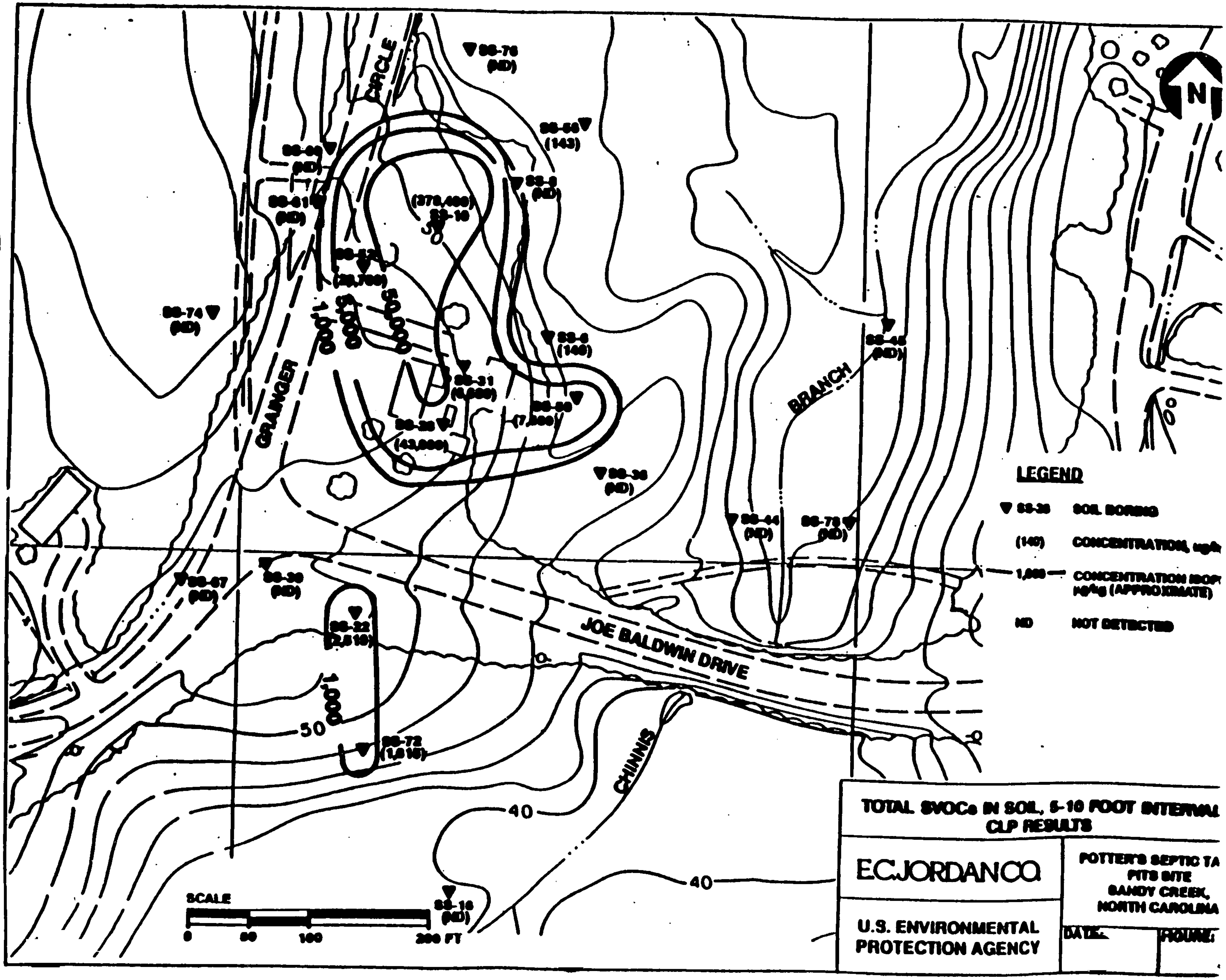

CIRCLE
GRAINGER
BRANCH
JOE BALDWIN DRIVE
CHINNIS
SS-74
(ND)
SS-76
(ND)
SS-66
(143)
(378,400)
SS-10
SS-36
(ND)
SS-44
(ND)
SS-45
(ND)
SS-30
(ND)
SS-67
(ND)
SS-22
SS-72
SS-16
(ND)
1,000
50,000
50
40
LEGEND
SOIL BORING
CONCENTRATION
NOT DETECTED
SCALE
0
50
100
200 FT
TOTAL SVOCs IN SOIL, 5-10 FOOT INTERVAL
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL PROTECTION AGENCY
POTTER'S SEPTIC TA
PITS SITE
SANDY CREEK,
NORTH CAROLINA
DATE:
FIGURE:

Figure 14

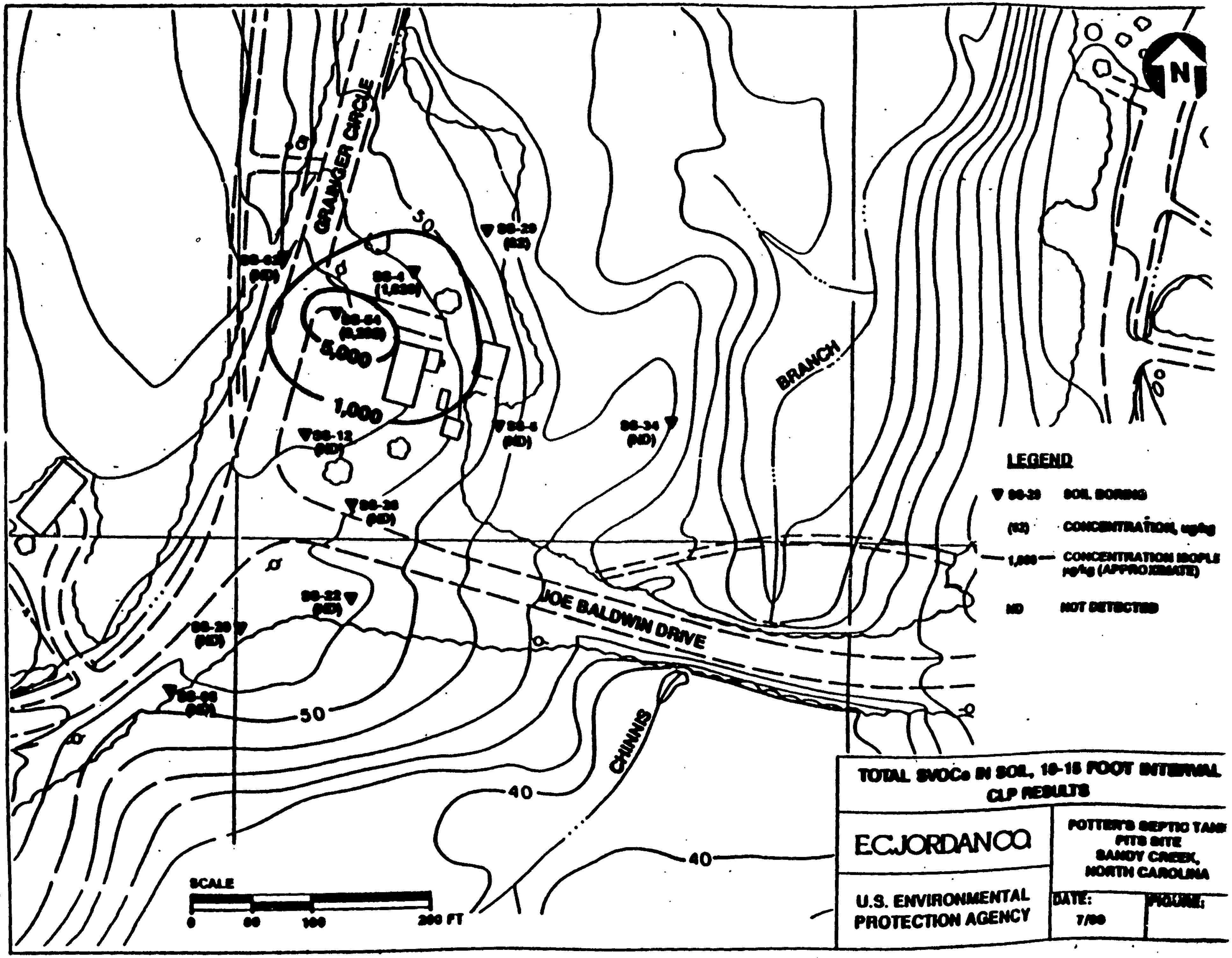

GRANGER CIRCLE
JOE BALDWIN DRIVE
BRANCH
CHINNIS
50
5,000
1,000
40
N
LEGEND
SOIL BORING
NOT DETECTED
SCALE
0
100
200 FT
TOTAL SVOCs IN SOIL, 10-15 FOOT INTERVAL
CLP RESULTS
E.C.JORDAN CO.
U.S. ENVIRONMENTAL
PROTECTION AGENCY
POTTER'S SEPTIC TANK
PITS SITE
SANDY CREEK,
NORTH CAROLINA
DATE:
FIGURE:

Figure 15

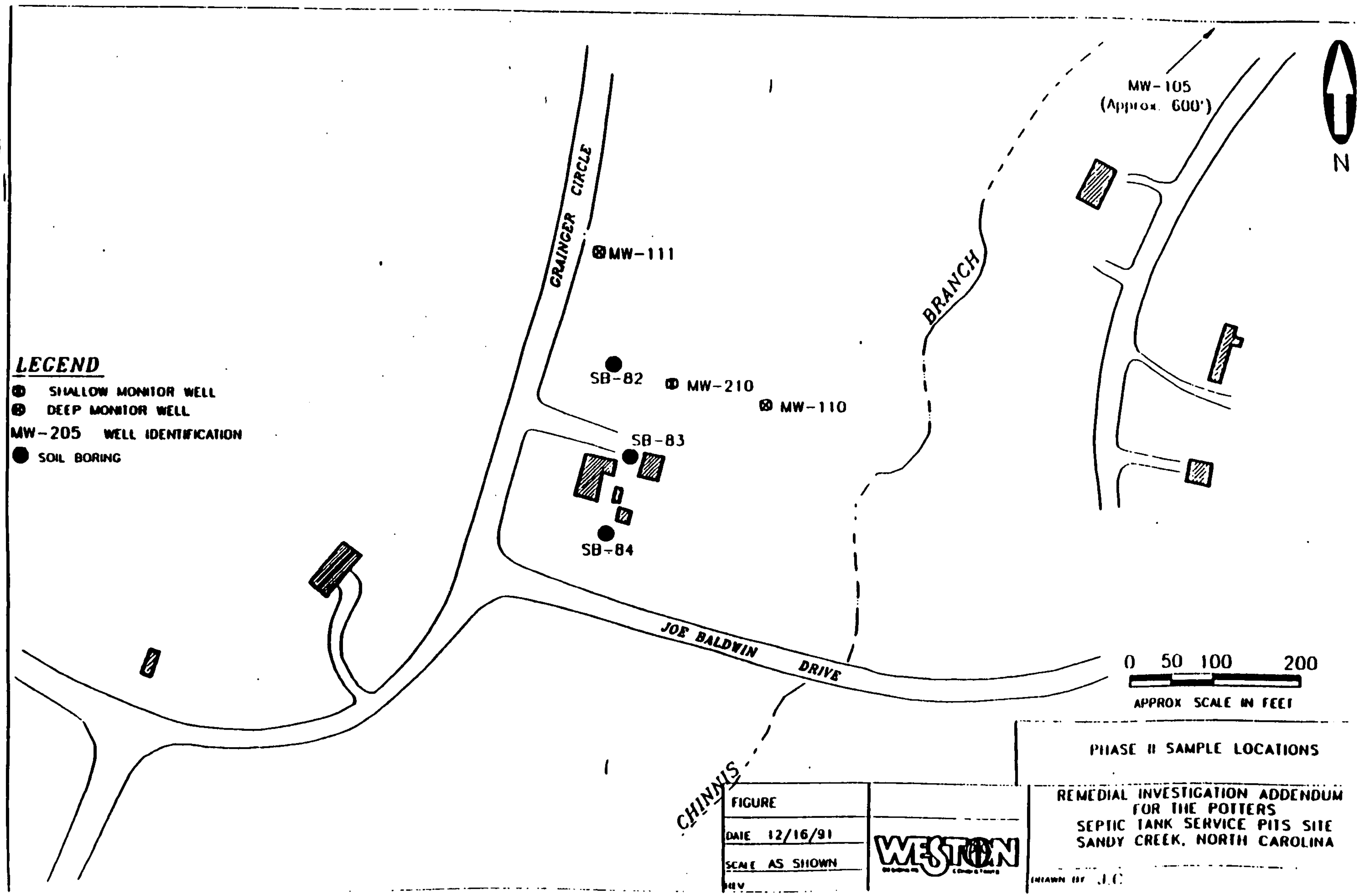
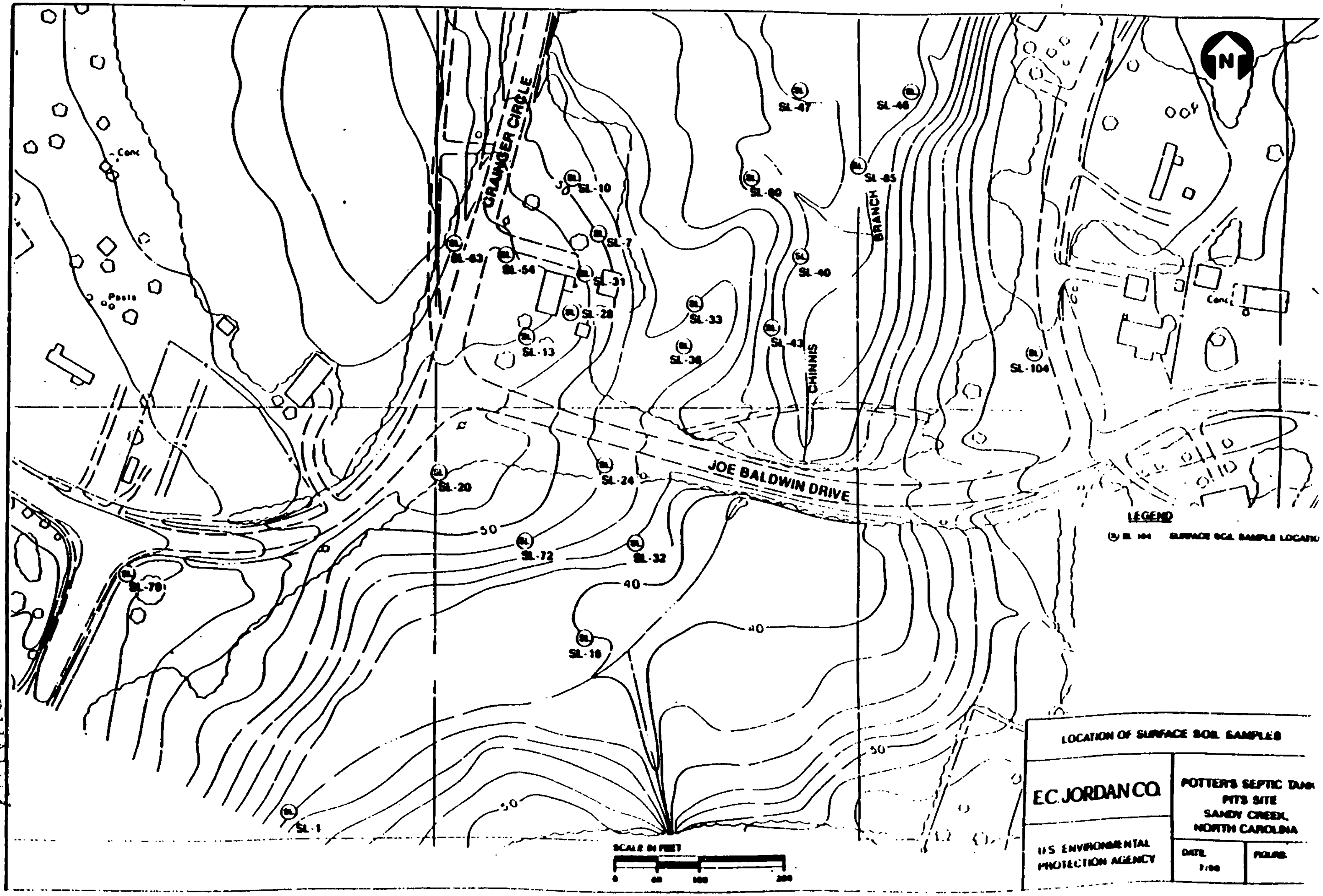

LEGEND
SHALLOW MONITOR WELL
DEEP MONITOR WELL
MW-205 WELL IDENTIFICATION
SOIL BORING
GRAINGER CIRCLE
MW-111
SB-82
MW-210
MW-110
SB-83
SB-84
BRANCH
MW-105
(Approx. 600')
N
JOE BALDWIN DRIVE
CHINNIS
0 50 100 200
APPROX SCALE IN FEET
PHASE II SAMPLE LOCATIONS
FIGURE
DATE 12/16/91
SCALE AS SHOWN
REV
WESTON
REMEDIAL INVESTIGATION ADDENDUM
FOR THE POTTERS
SEPTIC TANK SERVICE PITS SITE
SANDY CREEK, NORTH CAROLINA
DRAWN BY J.C

Figure 16



N
GRAINGER CIRCLE
JOE BALDWIN DRIVE
BRANCH
CHINNIS
SL-47
SL-46
SL-10
SL-60
SL-65
SL-7
SL-63
SL-54
SL-31
SL-40
SL-33
SL-28
SL-43
SL-13
SL-36
SL-104
SL-20
SL-24
SL-72
SL-32
SL-70
SL-16
SL-1
50
40
Conc
Posts
LEGEND
LOCATION OF SURFACE SOIL SAMPLES
E.C. JORDAN CO.
POTTER'S SEPTIC TANK
PITS SITE
SANDY CREEK,
NORTH CAROLINA
U.S. ENVIRONMENTAL
PROTECTION AGENCY
DATE
FIGURE
SCALE IN FEET

Barium, chromium, lead, and vanadium were detected in almost all surface soil samples. Elevated levels of select heavy metals and micronutrient metals were detected in surface soil samples SL-16 and SL-72. These samples also contained elevated levels of the detected pesticides.

5.4.2 Remedial Investigation Addendum

No surface soil samples were taken during the RI Addendum.

5.5 Surface Water and Stream Sediments

5.5.1 Remedial Investigation

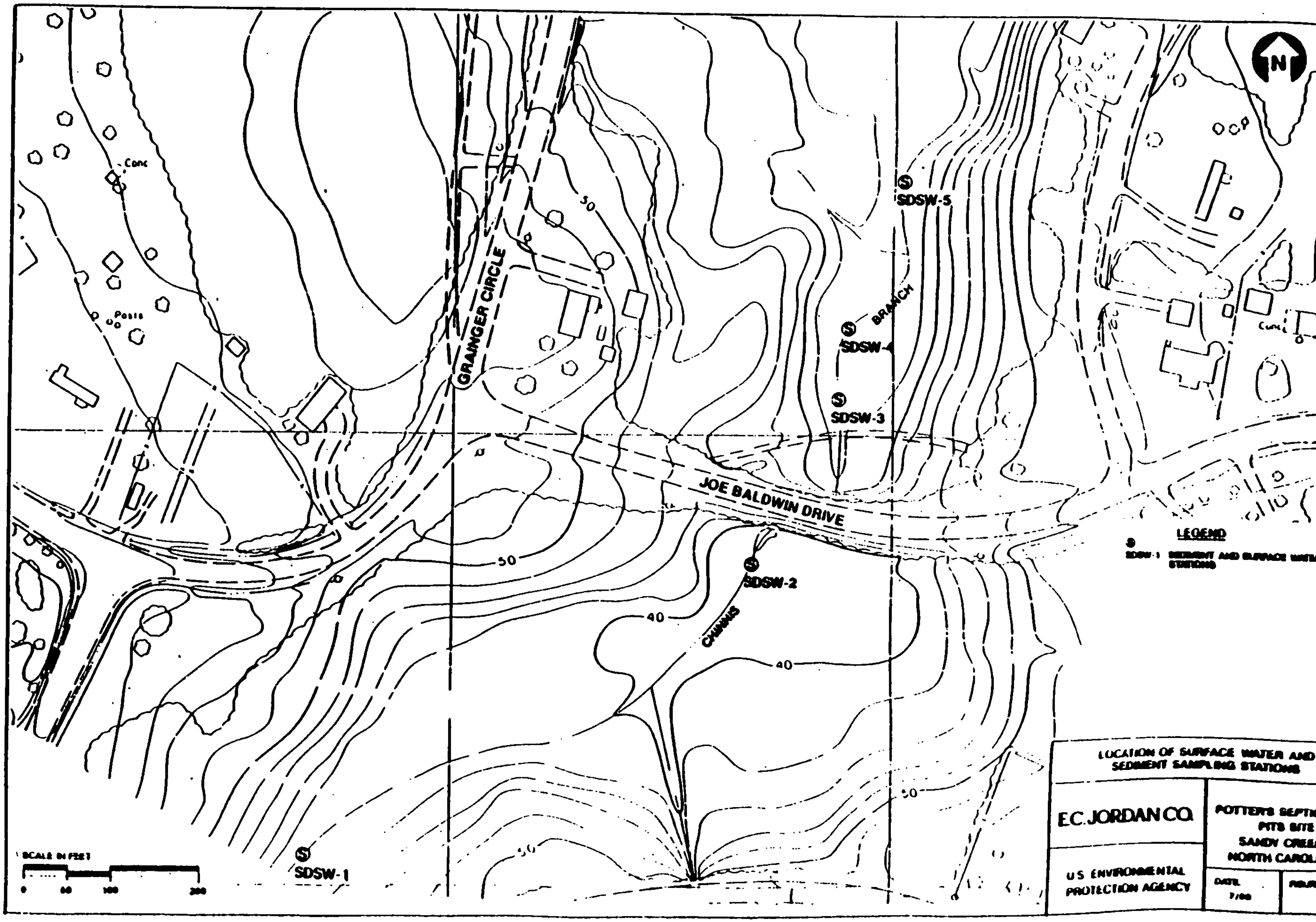
Five surface water and sediment sampling stations were established on Chinnis Branch at the locations depicted in Figure 17. Surface water samples were collected at each of the five stations on March 13, 1990, while sediment samples were collected on March 19, 1990. Both sets of samples were sent to the CLP laboratory for analysis of TCL parameters.

No VOCs, pesticides, or PCBs were detected in any of the surface water samples. Besides the major cations, no metals were detected except for the sample collected at station SDSW-1, the anticipated background station. This sample had significant levels of silver (5,000 ug/l), cadmium (7,900 ug/l), copper (850 ug/l), and lead (700 ug/l), yet very low concentrations of the base metals. This appears to be a reversal of metal dominance when compared to samples obtained from the other four stations.

No detectable levels of VOCs, SVOCs, pesticides, or PCBs were observed in any of the five sediment samples. Eight of the 23 TCL metals were detected in at least one sediment sample. The common constituents of the alumino-silicate minerals were present in all five samples. Zinc was present in all samples except for the sediment sample collected at Station SDSW-1. In addition to the aforementioned metals, chromium was detected in sample SD3 (2.6 mg/kg), lead was detected in samples SD2 (1.2 mg/kg), and SD4 (1.1J mg/kg), and vanadium was detected in sample SD4 (2 mg/kg).

In comparing metals data for sediment versus surface water samples at station SDSW-1, there appears to be little correlation between the elevated levels of heavy metals in surface water and the levels in the sediment. Sediment data at station SDSW-1 are more comparable to data obtained from the other four sampling stations. As such, the surface water metals data from SW-1 is suspect and was not used in any component of the risk analysis.

Figure 17



29

POOR QUALITY ORIGINAL

5.5.2 Remedial Investigation Addendum

To confirm the background concentrations of metals and other constituents, a surface water sample (SW-1) and sediment sample (SD-1) were collected from Chinnis Branch (Figure 18). These samples were analyzed for volatile and extractable organic compounds, pesticides, PCBs, unfiltered metals, and cyanide. This location was resampled because of the unusual detection of metals in the original RI.

VOCs, SVOCs, pesticides, PCBs, and cyanide were not detected. Copper was the only metal found above the State Freshwater Standards. This is an upstream sample and is not considered to be site related.

5.6 Groundwater

5.6.1 Residential Wells

A total of 59 residential wells were sampled and analyzed for TCL parameters (VOCs, SVOCs, pesticides/PCBs, and metals). No SVOCs, pesticides, or PCBs were found above detection levels in any of the residential wells. VOCs were detected in only one well (RW-4) located at the entrance of the Town of Sandy Creek and upgradient of the site. The RW-4 VOC result appears to be anomalous as there were no VOCs detected and quantified, but presumptive evidence of low concentrations of almost all VOCs was reported. RW-4 was subsequently resampled and found to have no VOCs detected.

Low concentrations of selected metals were detected in all residential wells. Summary statistics for metals in drinking water wells are presented in the RI Report. The absence of the other contaminant classes (e.g., VOCs, SVOCs, and pesticides/PCBs), and the widespread distribution of many of these metals, indicate that the metal concentrations detected represent background concentrations for the local drinking water aquifer system.

5.6.2 Groundwater Flow

Three local aquifer systems have been identified in the site vicinity: the surficial aquifer, the Tertiary limestone aquifer, and the Cretaceous aquifer. The limestone aquifer is locally semi-confined but may be in hydraulic connection with the surficial aquifer. The deeper regional aquifer is the Cretaceous aquifer. This aquifer appears to be confined in its extent and hydraulically separate from both the surficial and the limestone aquifer systems. In the site vicinity, the Cretaceous aquifer is brackish and unusable as a source of drinking water.

Water level measurements were taken from the monitoring wells during the course of the field work at the site. This water level data was used to determine the water table configuration at the site. Groundwater is approximately 10 feet below the land surface at the western edge of the site and reaches the surface at the wetlands along the eastern edge of the site. The wetland area and the creek are the discharge area for the shallow aquifer.

Groundwater flow within the surficial aquifer is toward the east-southeast to Chinnis Branch and the adjacent wetland area in the vicinity of the site. As indicated by the equipotential lines on Figure 18, the hydaulic gradient steepens near Chinnis Branch in response to topographical features. Figure 19 shows groundwater elevations for the deeper aquifer.

Hydraulic conductivity tests were performed on the monitoring wells and used to estimate groundwater velocity at the site. Hydraulic conductivity values ranged from 8.62E-05 to 1.51E-03 feet/sec across the site. The values for wells screened within the deep zone range from 6.61E-04 to 1.34E-03.

The horizontal gradient across the site to Chinnis Branch is approximately 0.03 feet per second. The horizontal hydraulic gradient from a presumed eastern edge of the source area (EPA-05) to Chinnis Branch (MW-206) is approximately 0.06 feet per second.

Groundwater velocities were calculated using the following equation:

$$Vs = Ki/n$$

Vs = Groundwater Velocity
K = Hydraulic Conductivity
i = Hydraulic Gradient
n = Effective Porosity

The mean hydraulic conductivity for all wells was used in this calculation. The effective porosity is estimated to range from 0.18 for silty sands to 0.27 for well sorted coarse grained sands. An average value of .23 was selected for the calculations. The calculated values of groundwater velocity for the site range from 5.2 to 10.4 feet/day.

These estimated velocities appear relatively high, given the comparatively limited distribution of contamination observed at the site. Although flow velocities are an important component, contaminant transport will also be controlled by numerous other chemical specific and environmental interactions and variables.

5.6.3 Groundwater Quality

Twenty one monitoring wells have been installed at the site

Figure 18

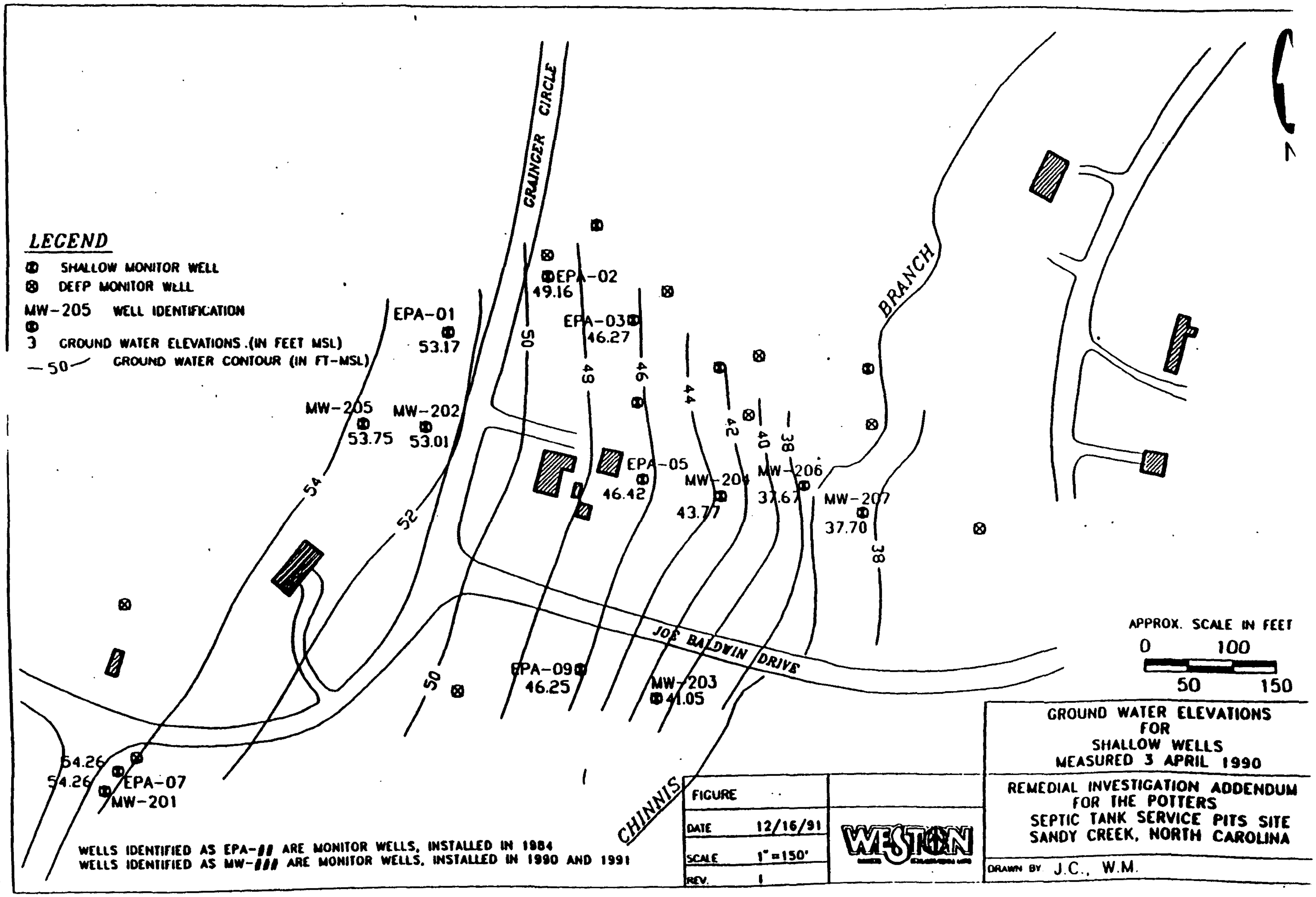
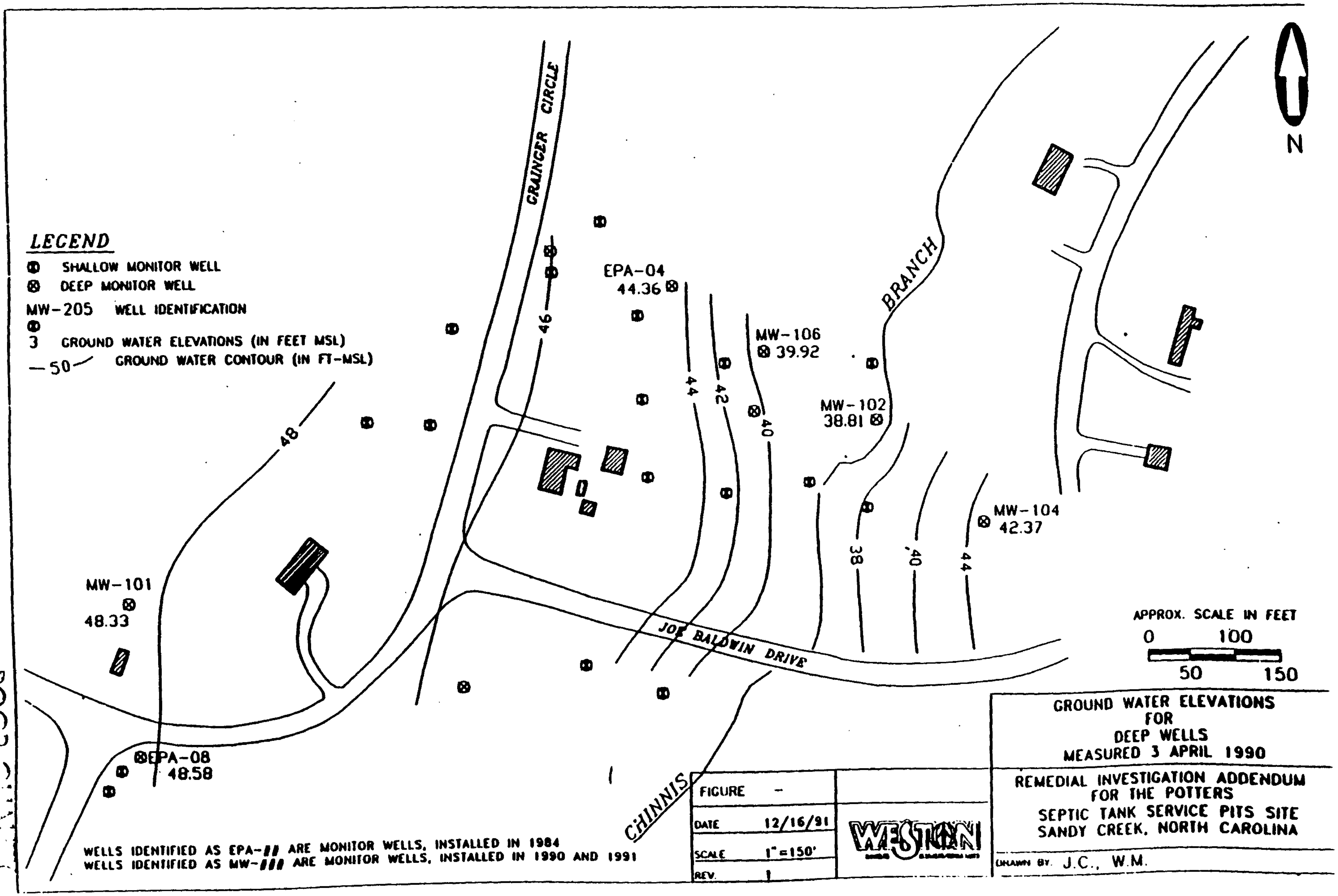

GRAINGER CIRCLE
BRANCH
JOE BALDWIN DRIVE
CHINNIS
LEGEND
SHALLOW MONITOR WELL
DEEP MONITOR WELL
MW-205 WELL IDENTIFICATION
3 GROUND WATER ELEVATIONS (IN FEET MSL)
—50— GROUND WATER CONTOUR (IN FT-MSL)
EPA-01
53.17
EPA-02
49.16
EPA-03
46.27
MW-205
53.75
MW-202
53.01
EPA-05
46.42
MW-204
43.77
MW-206
37.67
MW-207
37.70
EPA-09
46.25
MW-203
41.05
54.26
54.26
EPA-07
MW-201
54
52
50
48
46
44
42
40
38
APPROX. SCALE IN FEET
0 50 100 150
WELLS IDENTIFIED AS EPA-## ARE MONITOR WELLS, INSTALLED IN 1984
WELLS IDENTIFIED AS MW-### ARE MONITOR WELLS, INSTALLED IN 1990 AND 1991
FIGURE
DATE 12/16/91
SCALE 1" = 150'
REV. 1
WESTON
GROUND WATER ELEVATIONS FOR SHALLOW WELLS MEASURED 3 APRIL 1990
REMEDIAL INVESTIGATION ADDENDUM FOR THE POTTERS SEPTIC TANK SERVICE PITS SITE SANDY CREEK, NORTH CAROLINA
DRAWN BY J.C., W.M.

Figure 19


LEGEND
SHALLOW MONITOR WELL
DEEP MONITOR WELL
MW-205 WELL IDENTIFICATION
3 GROUND WATER ELEVATIONS (IN FEET MSL)
—50— GROUND WATER CONTOUR (IN FT-MSL)
GRAINGER CIRCLE
BRANCH
JOE BALDWIN DRIVE
CHINNIS
EPA-04
44.36
MW-106
39.92
MW-102
38.81
MW-104
42.37
MW-101
48.33
EPA-08
48.58
48
46
44
42
40
38
N
APPROX. SCALE IN FEET
0 100
50 150
WELLS IDENTIFIED AS EPA-## ARE MONITOR WELLS, INSTALLED IN 1984
WELLS IDENTIFIED AS MW-### ARE MONITOR WELLS, INSTALLED IN 1990 AND 1991
GROUND WATER ELEVATIONS FOR DEEP WELLS MEASURED 3 APRIL 1990
REMEDIAL INVESTIGATION ADDENDUM FOR THE POTTERS SEPTIC TANK SERVICE PITS SITE SANDY CREEK, NORTH CAROLINA
FIGURE -
DATE 12/16/91
SCALE 1" = 150'
REV. 1
WESTON
DRAWN BY. J.C., W.M.

(Figure 20). Six of the 21 wells were installed at upgradient or background locations: MW-101, MW-105, MW-201, MW-205, EPA-07, and EPA-08. The analytical results fom these wells and from the residential wells, will be used as a reference for comparison to downgradient results.

Nine wells (EPA-01 through EPA-09) were installed and sampled by EPA Region IV in 1984 (Figure 6). The groundwater samples were analyzed for VOCs. Eight of the nine wells were sampled again in 1988 as part of a periodic monitoring program performed by the State of North Carolina. These samples were analyzed for VOCs, selected metals, phenol, and selected nutrients. Monitoring well EPA-06 was damaged after the 1984 sampling event and can no longer be sampled.

In February and March 1990, 12 additional wells of varying depths were installed as part of the initial RI. These wells included seven shallow wells, whose depths were less than 20 feet (MW-201 through MW-207) and five deep wells, whose depths ranged from 20 to 42 feet (MW-101 through MW-106, excluding MW-103).

In April of 1991, additional wells were installed as part of the Remedial Investigation Addendum. The following is a list of those wells: one shallow temporary well (TW-01), two shallow permanent wells (MW-110 and MW-111), one temporary deep well (TW-02), and two permanent deep wells (MW-210 and MW-211).

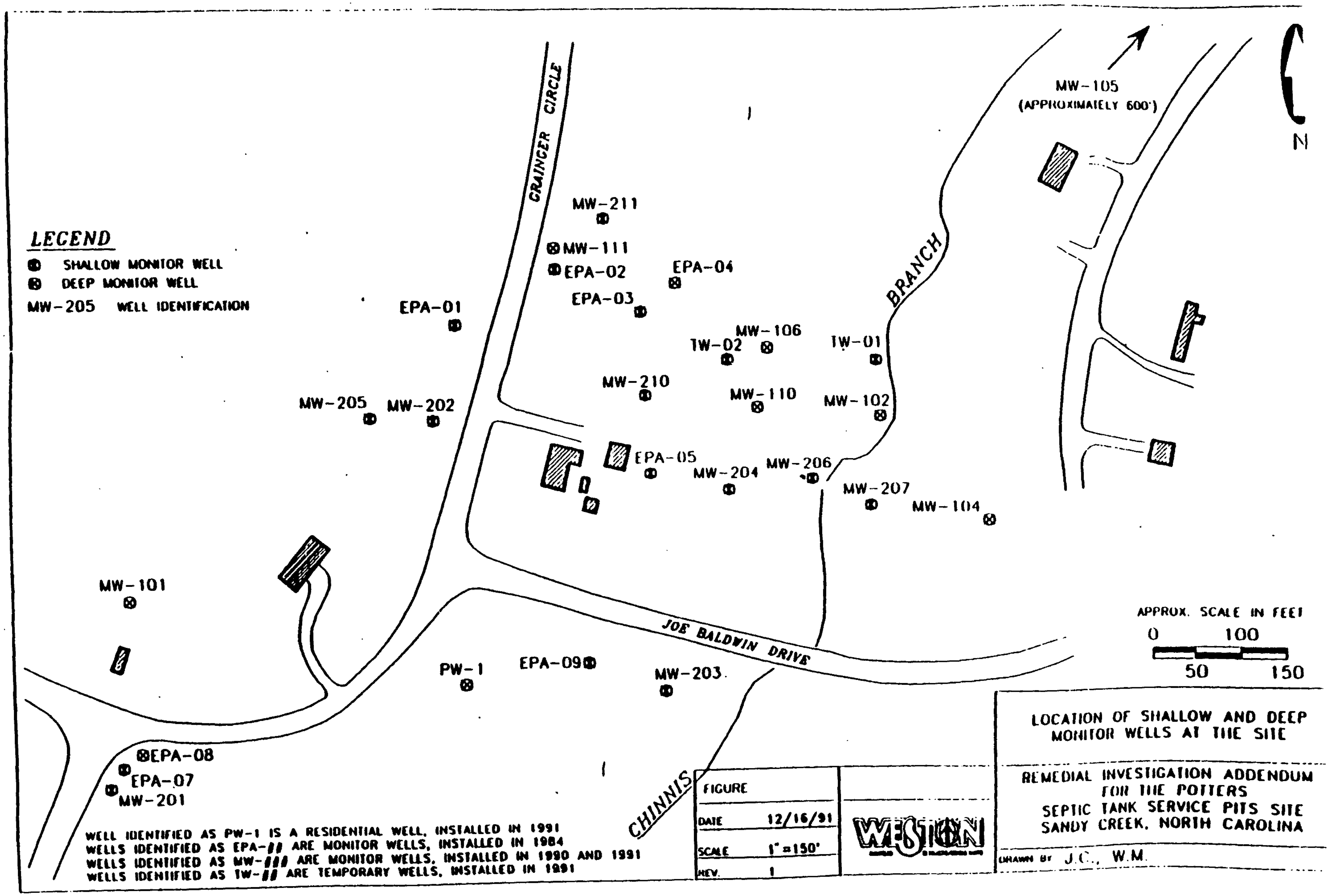
Monitoring wells were sampled in 1984, 1988, 1990 as part of the RI, and in 1991 as part of the RI Addendum. Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene, Chromium, and lead were detected above MCLs or health-based clean-up standards. The contaminants with their respective concentration ranges that were detected at the site are listed in Table 1. Figure 21 shows the approximate location of the ethylbenzene plume in the shallow aquifer. The other contaminants are similar in location to the ethylbenzene plume (See RI Addendum).

Groundwater samples from all wells on site were also analyzed for total suspended solids, total ammonia, nitrite, and nitrate. All groundwater samples were well below the drinking water standard of 10 mg/l nitrate.

5.8 Air Monitoring

A total of five residential air samples were collected from within the crawl spaces and interiors of the Gurkin and Grainger homes on February 28, 1990. Sampling was conducted at these two residences since they are situated on or near the former waste disposal pits and the human exposure to VOCs is a potential risk. Methylene chloride was detected inside the Grainger residence at a concentration of 11 ppbv. Low levels of chloromethane (16 ppbv)

Figure 20

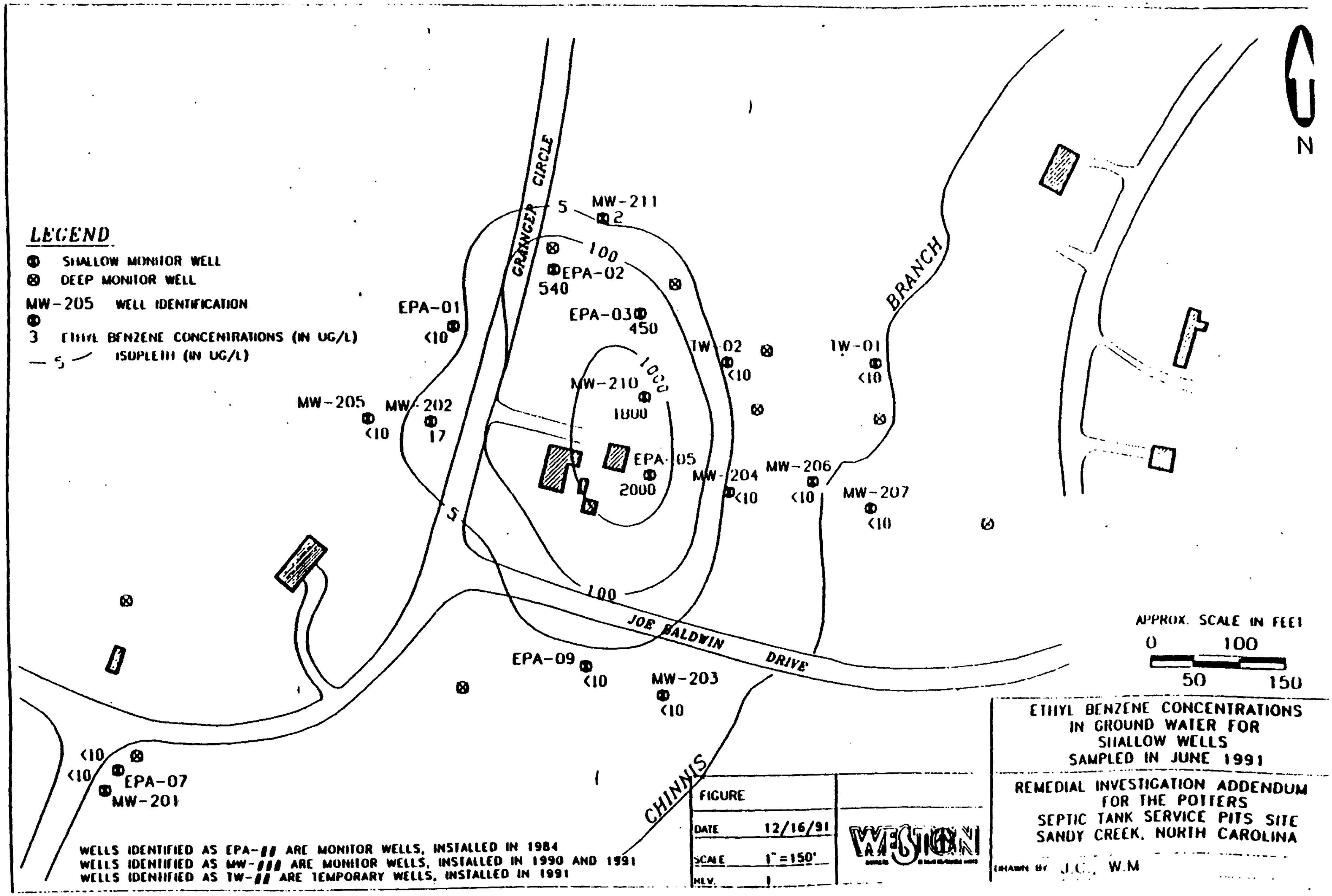


LEGEND
SHALLOW MONITOR WELL
DEEP MONITOR WELL
MW-205 WELL IDENTIFICATION
GRAINGER CIRCLE
BRANCH
JOE BALDWIN DRIVE
CHINNIS
MW-105 (APPROXIMATELY 600')
N
MW-211
MW-111
EPA-02
EPA-04
EPA-03
EPA-01
MW-106
TW-02
TW-01
MW-210
MW-110
MW-102
MW-205
MW-202
EPA-05
MW-204
MW-206
MW-207
MW-104
MW-101
PW-1
EPA-09
MW-203
EPA-08
EPA-07
MW-201
APPROX. SCALE IN FEET
0 100
50 150
WELL IDENTIFIED AS PW-1 IS A RESIDENTIAL WELL, INSTALLED IN 1991
WELLS IDENTIFIED AS EPA-## ARE MONITOR WELLS, INSTALLED IN 1984
WELLS IDENTIFIED AS MW-### ARE MONITOR WELLS, INSTALLED IN 1990 AND 1991
WELLS IDENTIFIED AS TW-## ARE TEMPORARY WELLS, INSTALLED IN 1991
FIGURE
DATE 12/16/91
SCALE 1" = 150'
REV. 1
WESTON
LOCATION OF SHALLOW AND DEEP MONITOR WELLS AT THE SITE
REMEDIAL INVESTIGATION ADDENDUM FOR THE POTTERS SEPTIC TANK SERVICE PITS SITE SANDY CREEK, NORTH CAROLINA
DRAWN BY J.C., W.M.

TABLE 1

GROUNDWATER CONTAMINANT CONCENTRATION RANGES	
CONTAMINANT	CONCENTRATION RANGE
1. Benzene	90 - 3150 ppb
2. Toluene	29000 ppb
3. Ethylbenzene	22 - 2400 ppb
4. Xylenes	98 - 26000 ppb
5. Naphthalene	42 - 125 ppb
6. Chromium	19 - 2500 ppb
7. Lead	6 - 25 ppb

Figure 21



LEGEND
SHALLOW MONITOR WELL
DEEP MONITOR WELL
MW-205 WELL IDENTIFICATION
3 ETHYL BENZENE CONCENTRATIONS (IN UG/L)
5 ISOPLETH (IN UG/L)
GRAINGER CIRCLE
BRANCH
JOE BALDWIN DRIVE
CHINNIS
MW-211
2
EPA-02
540
EPA-01
<10
EPA-03
450
TW-02
<10
TW-01
<10
MW-210
1800
MW-205
<10
MW-202
17
EPA-05
2000
MW-204
<10
MW-206
<10
MW-207
<10
EPA-09
<10
MW-203
<10
EPA-07
MW-201
5
100
1000
N
APPROX. SCALE IN FEET
0 50 100 150
WELLS IDENTIFIED AS EPA-## ARE MONITOR WELLS, INSTALLED IN 1984
WELLS IDENTIFIED AS MW-### ARE MONITOR WELLS, INSTALLED IN 1990 AND 1991
WELLS IDENTIFIED AS TW-## ARE TEMPORARY WELLS, INSTALLED IN 1991
FIGURE
DATE 12/16/91
SCALE 1"=150'
REV. 1
ETHYL BENZENE CONCENTRATIONS IN GROUND WATER FOR SHALLOW WELLS SAMPLED IN JUNE 1991
REMEDIAL INVESTIGATION ADDENDUM FOR THE POTTERS SEPTIC TANK SERVICE PITS SITE SANDY CREEK, NORTH CAROLINA
DRAWN BY J.C., W.M

and 1,1,1-trichloroethane (1.5 ppbv) were detected in the crawl space beneath the Grainger residence. No VOCs were detected within or beneath the Gurkin residence.

5.9 Nature and Extent of Contamination

The following discussion is a summary of the nature and extent of contamination and affected media at the Potter's Pits site.

- The Constituents of Concern (COC) list (44 organics and metals) for the site was developed for purposes of the Baseline Risk Assessment discussed in Section 6.0 - Summary of Site Risks - and are to be addressed through the selected remedy in this ROD. This list includes those constituents that are related to the past waste disposal activities, as indicated by the composition of the waste (petroleum products), or have been detected repeatedly throughout the site. The COC is listed in Table 2.

- The extent of contamination at the Potter's Pits site is limited to the immediate vicinity of the two former waste disposal areas (i.e., Area 1: north and south of Joe Baldwin Drive) and the areas immediately downgradient of each and toward Chinnis Branch. Laboratory data indicate that the former waste disposal areas have impacted groundwater and soils. Petroleum constituents and selected heavy metals were prevalent throughout both areas.

- Area 3 is not an area of concern

- No residential well is being impacted by contamination from the Potter's Pits site except the Gurkin's well which is on the site in the former disposal area. They have been taken off this well and connected to the Grainger's well across the street and upgradient from the site.

- The extent of groundwater contamination has primarily been confined to the shallow aquifer and is restricted to the area encompassing the former disposal pits. Groundwater data indicates that the levels of contaminants, principally organics, currently exceed the established Maximum Contaminant Levels (MCL).

- During the Remedial Investigation Addendum it was determined that the deep aquifer may also be impacted. Further testing will be done to identify whether the contamination, if any, has migrated to the deeper aquifer.

- The RI Addendum data confirms the original RI data to the extent that pesticides, PCB's, and cyanides do not appear to be contaminants of concern at the site.

- Variability in metals concentrations in both the shallow and deep aquifer background wells prohibits the development of a confident estimate of background levels of metals in these aquifers; therefore, additional groundwater sampling of these wells will be performed during the Remedial Design.

- Both surface water and sediment in Chinnis Branch exhibit concentrations of naturally occurring metals which cannot be attributed directly to site source contamination. The upstream surface water sample represented a highly unusual water quality which was resampled during the RI Addendum phase.

- Based upon the lack of pump test information, additional tests to further define the aquifer characteristics will be considered as part of the Remedial Design.

6.0 SUMMARY OF SITE RISKS

A Baseline Risk Assessment was conducted as part of the Remedial Investigation to assess the potential effect on public health and welfare from the Potter's Pits waste constituents of concern that were identified during the RI. The Baseline Risk Assessment can be found in its entirety in Section 7.0 of the Final Remedial Investigation Report. This section of the Record of Decision presents a summary of site risks and consists of the following sections: contaminant identification, exposure assessment, toxicity assessment, risk characterization, and environmental (ecological) assessment.

6.1 Contaminant Identification

Data collected during the RI were reviewed and evaluated to determine the contaminants in each media (groundwater, surface and subsurface soil, and surface water and sediment in Chinnis Branch) at the site which are most likely to pose risks to public health. In the Baseline Risk Assessment, the site was divided into three areas (Figure 22): Area 1A, Area 1B, and Forest/Wetland.

Once these contaminants of concern were identified (Table 2), exposure concentrations in each media were estimated by calculating the 95% upper confidence level (UCL) of the arithmetic average of all samples. If this 95% UCL was greater than the maximum detected concentration, then the maximum detected concentration was used for the exposure concentration. Appendix I contains tables (1-11) which identify the contaminants of concern, arithmetic mean, standard deviation, 95% UCL, minimum and maximum detected, and frequency of detection for all media sampled and analyzed in the Risk Assessment.

6.2 Exposure Assessment

The exposure assessment identified potential pathways and routes for contaminants of concern. Two overall exposure conditions were evaluated. The first was the current land use condition, which considers the site as it currently exists. The second was the future land use condition, which evaluates potential risks that may be associated with any probable change in site use assuming no remedial action occurs.

Presently, none of the contaminated groundwater is being used, but EPA and the State of North Carolina have classified this aquifer as a Class II B aquifer. A resource which should be maintained at drinking water quality.

The exposure pathways that were evaluated under current land use conditions were:

* Ingestion and dermal contact of chemicals in on-site and off-site surface water and sediment in Chinnis Branch by a

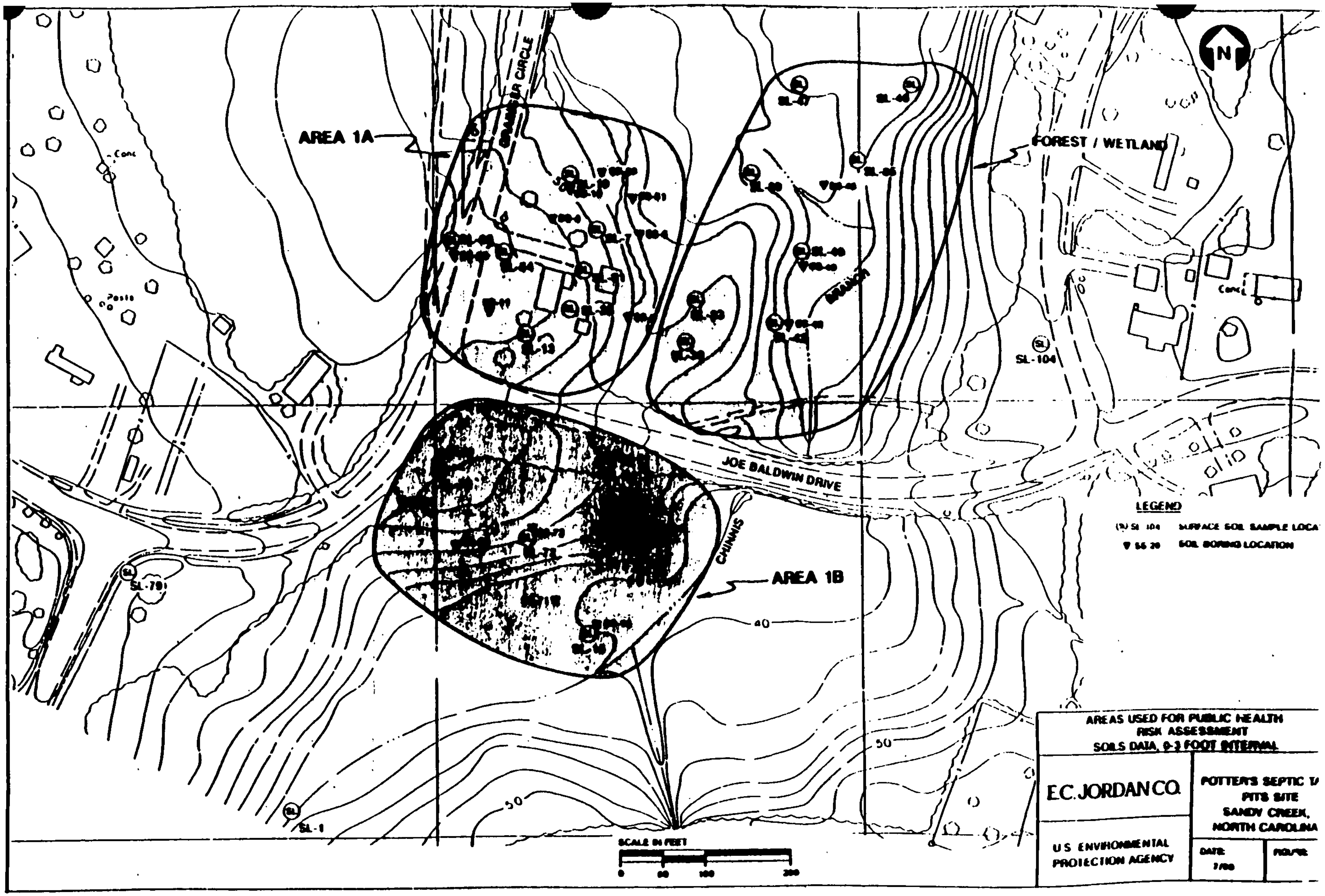

AREA 1A
FOREST / WETLAND
JOE BALDWIN DRIVE
CHINNIS
AREA 1B
SL-104
SL-79
SL-1
40
50
LEGEND
SOIL BORING LOCATION
AREAS USED FOR PUBLIC HEALTH
RISK ASSESSMENT
SOILS DATA, 0-3 FOOT INTERVAL
E.C. JORDAN CO.
PITS SITE
SANDY CREEK,
NORTH CAROLINA
U.S. ENVIRONMENTAL
PROTECTION AGENCY
SCALE IN FEET

Figure 22

Contaminants of Concern, All Media

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Ground-water	Surface Soil	Subsurface Soil	Indoor Air	Surface Water[1]	Sediment
Volatile organics						
Benzene [2]	X	X	X		X	
Chlorobenzene	X					
Chloromethane [2]	X					
Ethyl benzene	X	X	X			
Methylene chloride [2]				X		
Toluene	X	X	X			
Total xylenes	X	X	X			
1,1,1-Trichloroethane				X		
Pesticides						
alpha-Chlordane [2]		X				
4,4'-DDD [2]		X				
4,4'-DDT [2]		X				
Delta BHC [2]		X				
Dieldrin [2]		X	X			
Endrin ketone			X			
Methoxychlor			X			
Semi-volatiles						
Acenaphthene	X	X	X			
Anthracene		X	X			
Benzo(a)anthracene [2]		X	X			
Benzo(b and/or k)fluoranthene [2]		X	X			
Benzo(ghi)perylene		X				
Benzo(a)pyrene [2]		X	X			
Bis(2-ethylhexyl)phthalate [2]		X	X			
Chrysene [2]		X	X			
Dibenzofuran	X	X	X			
2,4-Dimethylphenol	X					
Fluoranthene	X	X	X			
Fluorene	X	X	X			
Hexachlorobenzene [2]		X				
Indeno(1,2,3-cd)pyrene [2]	X					
2-Methylnaphthalene	X	X	X			
Naphthalene	X	X	X			
Phenanthrene	X	X	X			
Phenol		X				
Pyrene	X	X	X			

NOTES:

1 Based on groundwater discharge to Chinnis Branch
2 Carcinogen

Table 2 (cont.)

Contaminants of Concern, All Media

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Ground-water	Surface Soil	Subsurface Soil	Indoor Air	Surface Water[1]	Sediment
Metals						
Barium	X	X	X		X	
Beryllium		X	X			
Chromium	X	X	X		X	X
Copper		X	X			
Lead	X	X	X		X	X
Manganese	X	X			X	X
Mercury		X				
Nickel	X	X	X		X	
Vanadium	X	X	X			X
Zinc	X	X	X		X	X

NOTES:

1 Based on groundwater discharge to Chinnis Branch.

young adolescent (ages 6 - 15),

* Ingestion of fish from Chinnis Branch,

* Ingestion and dermal contact of chemicals in surface and subsurface soils (two scenarios were addressed: adult and worker),

* Ingestion of produce grown on-site,

* Inhalation of chemicals in and beneath existing residences (Gurkins and Graingers).

The exposure pathways that were evaluated under future land use conditions were:

* Ingestion and dermal contact with contaminated groundwater,

* Inhalation of VOCs during showering (adult),

* Ingestion of produce irrigated with contaminated groundwater,

* Ingestion of chemicals in on-site and off-site surface water and sediment in Chinnis Branch by a young adolescent (ages 6 - 15),

* Ingestion of fish from Chinnis Branch,

* Ingestion and dermal contact with chemicals in surface and subsurface soils (two scenarios: adult and worker),

* Ingestion of produce grown on-site.

Appendix II contains tables (1-6) which indicate what exposure and intake assumptions were used in the Risk Assessment in all of these scenarios. Groundwater and subsurface soils were not evaluated in the forest/wetland area because this area, due to its proximity to the Chinnis Branch floodplain, showed little potential for development as a residential area. Exposure to contaminants in this area would only occur if wells were drilled or if excavation into subsurface soils was required.

6.3 Toxicity Assessment

Under current EPA guidelines, the likelihood of adverse effects to occur in humans from carcinogens and noncarcinogens are considered separately. These are discussed below.

6.3.1 Carcinogens

EPA uses a weight-of-evidence system to classify a chemical's potential to cause cancer in humans. All evaluated chemicals fall into one of the following categories: Class A- Known

Human Carcinogen; Class B- Probable Human Carcinogen- B1 means there is limited human epidemiological evidence, and B2 means there is sufficient evidence in animals and inadequate or no evidence in humans; Class C- Possible Human Carcinogen; Class D- Not classifiable as the Human Carcinogenicity; and Class E- Evidence of noncarcinogenicity for Humans.

Cancer Slope Factors (CSFs), indicative of carcinogenic potency, are developed by EPA's Carcinogenic Assessment Group to estimate excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. CSFs, which are expressed in units of (mg/kg-day)-1, are multiplied by the estimated intake of a potential carcinogen to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" refers to the conservative estimate of the risks calculated from the CSF. This approach makes underestimation of the actual cancer risk highly unlikely.

6.3.2 Noncarcinogens

Reference Doses (RFDs) have been developed by EPA for indicating the potential for adverse health effects other than cancer (systemic). RFDs, which are expressed in units of mg/kg-day, are estimates of chronic daily exposure for humans, including sensitive individuals, that are thought to be free of any adverse effects. RFDs are derived from human epidemiological data or extrapolated from animal studies to which uncertainty factors have been applied. These uncertainty factors help ensure that the RFDs will not underestimate the potential for adverse noncarcinogenic effects to occur. Estimated intake of chemicals from environmental media (i.e., the amount of chemicals ingested from contaminated drinking water) can be compared to the RFD for each of the contaminants.

Table 3 lists chemicals contributing most significantly to carcinogenic and noncarcinogenic risk at the Potter's Pits site. Appendix H of the RI lists all the Reference Doses and the Cancer Slope Factors for the contaminants of concern. Table 4 and 5 lists the exposure media, route of exposure, and the associated risk for the carcinogenic and noncarcinogenic contaminants.

6.4 Risk Characterization Summary

To quantitatively assess the risks from the Potter's Pits site, the chronic daily intakes (CDI) were combined with the health effects criteria.

Table 3

CHEMICALS CONTRIBUTING MOST SIGNIFICANTLY TO NON CARCINOGENIC RISK

Exposure Media	Area 1A	Area 1B	Forest/Wetland
Groundwater	Benzene	Lead, Benzene	--
Surface Water	--	--	--
Sediment	--	--	--
Surface Soil	Lead	Lead, Zinc	cPAHs
Subsurface Soil	--	--	--
Air	--	--	--

CHEMICALS CONTRIBUTING MOST SIGNIFICANTLY TO CARCINOGENIC RISK

Exposure Media	Area 1A	Area 1B	Forest/Wetland
Groundwater	Benzene	Benzene	--
Surface Water	--	--	Benzene
Sediment	--	--	--
Surface Soil	Benzene, cPAHs	Benzene, Chlordane[1], Dieldrin[1]	cPAHs
Subsurface Soil	cPAHs	Benzene[2]	--
Air	Methylene chloride, chloromethane	--	--

Note: cPAHS indicates carcinogenic PAHs.
1: Not part of cleanup scenario.
2: Risk below 1.0E-06.

Table 4

CARCINOGENIC RISK BY LOCATION AND EXPOSURE ROUTE

Exposure Media	Route of Exposure	Area 1A Residential	Area 1B Potential Residential	Forest/ Wetland
Groundwater	Ingestion	1.1×10^{-3}	1.8×10^{-6}	--
	Inhalation during showering	7.3×10^{-4}	2.1×10^{-6}	--
	Dermal contact during showering	1.5×10^{-5}	4.3×10^{-8}	--
	Dermal contact while washing	1.9×10^{-5}	5.5×10^{-8}	--
	Ingestion of produce irrigated with groundwater	4.6×10^{-4}	1.32×10^{-6}	--
	Total	2.32×10^{-3}	5.3×10^{-6}	
Surface Water	Ingestion	--	--	2.8×10^{-11}
	Dermal contact	--	--	2.9×10^{-9}
	Fish ingestion	--	--	3.0×10^{-9}
	Total			5.9×10^{-9}
Sediment	Ingestion	--	--	NA
	Dermal contact	--	--	NA
Surface Soil	Ingestion	1.2×10^{-5}	4.0×10^{-7}	7.8×10^{-7}
	Dermal contact	1.1×10^{-4}	1.8×10^{-6}	3.5×10^{-6}
	Ingestion of produce	3.9×10^{-4}	4.7×10^{-5}	--
	Total	5.12×10^{-4}	4.92×10^{-5}	4.3×10^{-6}
Subsurface Soil	Ingestion	6.7×10^{-7}	1.8×10^{-10}	--
	Dermal contact	1.4×10^{-6}	8.6×10^{-14}	--
	Total	2.07×10^{-6}	1.8×10^{-10}	
Air	Inhalation	2.6×10^{-5}	--	--

NA indicates not applicable.

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Table 5

NON-CARCINOGENIC RISK BY LOCATION AND EXPOSURE ROUTE

Exposure Media	Route of Exposure	Area 1A	Area 1B	Forest/Wetland
Groundwater	Ingestion	920	5.4	
	Inhalation during showering	460	1.3	--
	Dermal contact during showering	9.5	0.032	--
	Dermal contact while washing	12	0.04	--
	Ingestion of produce irrigated with groundwater	290	1.9	--
	Total	1,691.5	8.67	
Surface Water	Ingestion	--	--	0.000095
	Dermal contact	--	--	0.0066
	Fish ingestion	--	--	0.0084
	Total			0.0150
Sediment	Ingestion	--	--	0.0000052
	Dermal contact	--	--	0.00000073
Surface Soil	Ingestion	5.3	1.8	0.21
	Dermal contact	0.33	0.13	0.027
	Ingestion of produce	77	36.3	--
	Total	82.63	38.23	0.157
Subsurface Soil	Ingestion	0.013	0.0023	--
	Dermal contact	0.0059	0.00024	--
	Total	0.0189	0.00254	
Air	Inhalation	0.0033	--	--

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For potential carcinogens, excess lifetime upperbound cancer risks were obtained by multiplying the estimated CDI for each chemical by its cancer slope factor. The total upperbound excess lifetime cancer risk for each pathway was obtained by summing the chemical-specific risk estimates. A cancer risk level of 1E-6 represents an upper bound probability of one in one million that an individual could develop cancer due to exposure to the potential carcinogen under the specified exposure conditions.

Potential risks for noncarcinogens are presented as the ratio of the CDI to the reference dose (hazard quotient) for each chemical. The sum of the hazard quotients of all chemicals under consideration is called the hazard index. The hazard index is useful as a reference point for gauging the potential effects of environmental exposures to complex mixtures. In general, a hazard index value greater than 1.0 indicates that the potential exists for adverse health effects to occur from the assumed exposure pathways and durations, and that remedial action may be warranted for the site.

As presented before Tables 4 and 5 summarize the quantitative estimates of risk under the current and future land use scenario for each target population respectively.

EPA's targeted risk range for cleanup of Superfund Sites is E-04 to E-06. Risks less than E-04 are deemed acceptable and those greater than E-06 are unacceptable to EPA. Risks that fall between E-04 to E-06 may or may not warrant action, depending on site-specific factors considered by the risk manager. Noncarcinogenic HI values greater than 1.0 indicate that remedial action should be taken.

At Potter's Pits site, benzene and carcinogenic PAHs' pose the carcinogenic risk and lead and zinc pose the noncarcinogenic risk.

Table 6 represents the contaminants of concern with their associated human health risk level and clean-up standard.

The human health risk posed by the ingestion of groundwater was determined by comparing detected levels of the contaminants with drinking water standards for these substances. The following chemicals were detected in samples taken from site groundwater wells in concentrations that exceed their respective MCLs or health based clean-up standards: benzene, toluene, ethylbenzene, xylenes, naphthalene, lead, and chromium. Any exceedance of the MCL values by water samples taken within the contamination plume at or downgradient to the area of attainment represents a cause for concern.

The local aquifer system consists of a surficial aquifer, a semi-confined limestone (tertiary) aquifer, and the confined Cretaceous aquifer. The surficial and the limestone aquifer are the primary sources of drinking water. Locally the water quality in the Cretaceous aquifer is brackish and is not useable as a drinking

Table 6

Potential Cleanup Levels For Soils

Chemical	Mean Conc. mg/kg	Carcinogenic Risk	Non-Carcinogenic Risk Hazard Index (HI)[1]	Potential Cleanup Levels (mg/kg)			
				E-06	E-05	E-04	HI=1
Surface Soil (Area 1A)							
Benzene	0.73	1.96×10^{-5}		0.037	0.37	3.7	
Carcinogenic PAH[2]	5.13	4.65×10^{-4}		0.011	0.11	1.1	
Lead	722.51		64.5				11.2
Surface Soil (Area 1B)							
Benzene	0.096	2.61×10^{-6}		0.037	0.37	3.7	
Lead	250		22.38				11.2
Zinc	2269.19		18.61				122
Surface Soil (Wetlands)							
Carcinogenic PAH	0.44	3.18×10^{-6}		0.138	1.38	13.8	
Subsurface[3] Soil (Area 1A)							
Carcinogenic PAH	14.71	2.07×10^{-6}		7.106	71.06	710.6	

1: Non-carcinogenic metal cleanup level based on attainment of a Hazard Index of 1.
2: Carcinogenic Polynuclear Aromatic Hydrocarbons.
3: Depths below 3 feet have been considered subsurface as in the Risk Assessment.

water source. The surficial aquifer has been contaminated and is the aquifer of concern in this ROD. Of all residential wells in the area, only the residential well (Gurkin's well) on site was affected by the contaminants. The current residents were taken off that well and placed on another well across the street (Grainger's well). The deeper aquifer is potentially contaminated and will be monitored and investigated during Remedial Design.

EPA also calculated soil clean-up standards for protection of groundwater. The method used to calculated these numbers is outlined in Appendix A of the FS.

6.5 Risk Uncertainty

There is a generally recognized uncertainty in human risk values developed from experimental data. This is primarily due to the uncertainty of data extrapolation in the areas of (1) high to low dose exposure and (2) animal data to human experience. The site-specific uncertainty is mainly in the degree of accuracy of the exposure assumptions. Most of the assumptions used in this and any risk assessment have not been verified. For example, the degree of chemical absorption from the gut or through the skin or the amount of soil contact is not known with certainty.

In the presence of such uncertainty, the Agency and the risk assessor has the obligation to make conservative assumptions such that the chance is very small, approaching zero, for the actual health risk to be greater than that determined through the risk process. On the other hand, the process is not to yield absurdly conservative risks values that have no basis in reality. The balance was kept in mind in the development of exposure assumptions and pathways and in the interpretation of data and guidance for this baseline risk assessment.

6.6 Environmental (ecological) Risks

EPA also decided not to use the risk numbers generated in the Ecological Risk Section. The reasons for this decision are outlined below:

- Clean-up standards based on human health concerns would probably address ecological concerns with respect to contaminants such as zinc and PAHs, which have lower clean-up standards for human health concerns than those calculated for ecological concerns.

- Some of the soil contaminants of concern can be deleted with respect to ecological concerns, based upon their infrequent detection and/or low concentrations (e.g., beryllium, mercury, selenium, DDT, and DDD). For example, selenium was detected in only 2 of 11 soil samples in the forest/wetland north area and was not detected in the other two receptors areas. Although selenium can have toxicological effects on biota, selenium levels in on-site soils were within background soil concentrations (i.e., near detection limits). Vanadium is widespread in surface soils at the site. However, the concentrations indicated on the FS figures are actually within or slightly above background levels, except for two samples in the forest/wetland south area and one in the forest/wetland north area. Copper was at or above the clean-up standard at one location in each of the three receptor areas, and chromium was above the clean-up standard at only two locations, both in the forest/wetland south area.

- Some of the locations at which contaminants were found above the calculated clean-up standard for ecological concerns are already targeted for clean-up of other contaminants based upon human health concerns (e.g. chromium and copper at SS-72, which contains dieldrin and zinc above the human health-based clean-up standards). It is probable that remediation of these locations for human health concerns (e.g., through excavation and removal of soils) will also benefit the biota.

- The potential benefits of remediation of contaminated soils based on ecological concerns, particularly in the wetland areas, must be weighed against the potential damage to the wetlands that might occur during remediation. The two forest/wetland areas combined cover 5.28 acres. These areas constitute a portion of a larger forest/wetland area extending along Chinnis Branch. Many animal species expected to be found in the two forest/wetland areas of the site have home ranges greater than 5 acres. As indicated in the RI, their exposure to site soil contaminants would likely be less than that of species with smaller home ranges. In the absence of remediation of some contaminants to clean-up standards for ecological concerns, possible adverse effects to populations of animal species with smaller home ranges, resulting from more frequent exposure to site contaminants, might be offset by recruitment of individuals from the adjoining forest/wetland areas.

- The uncertainties associated with extrapolation of toxicological data from one contaminant to another, and from one species to another, is significant. Some aspects of the exposure assumptions used are questionable in the ecological assessment, and it may be that the portions of the site where significant contamination has been identified are no longer suitable habitat for the species used in the ecological risk assessment. In addition, the approach used in the ecological assessment represents a new departure in the evaluation of potential environmental/ecological effects. The approach emphasized protection of individuals, as opposed to local populations, ofindigenous species. In the past, EPA has focused efforts towards the protection of local populations of indigenous species, except where there is evidence that a threatened or endangered species is present.

6.7 Risk Assessment Summary

Based on all of the above information, clean-up standards were established for contaminated soils and groundwater. Described below is how each clean-up standard was established.

It should be noted that as discussed in the RI, the low concentrations and spotty distribution of the pesticides on-site made it doubtful whether these chemicals are associated with dumping at the site, as opposed to spraying for purposes of pest control; therefore, pesticide contamination has been determined not to be a concern at this site.

Table 7 lists the soil clean-up standards that will be used at the Potter's Pits site. All of the clean-up standards are based on the protection of groundwater except for zinc and carcinogenic PAHs. These standards for protection of groundwater were more stringent than the standards developed in the Risk Assessment to protect human health. In the case of zinc and carcinogenic PAHs, their clean-up standard is based on dermal contact with the surface soil. Lead's clean-up standard as stated above is based on the protection of groundwater. Although the calculated risk based clean-up standard for lead is lower, EPA guidance (OSWER Directive #9355.4-02, Sept. 7, 1989) has recommended the use of 500 ppm to 1000 ppm in residential soils; therefore, it is EPA's belief that the clean-up standard of 25 ppm for the protection of groundwater will also be protective of human health.

Table 8 lists the groundwater clean-up standards that will be used at the Potter's Pits site. All of the clean-up standards are either MCLs, North Carolina Groundwater Standards, or health-based levels.

Benzene: For benzene the 5 ppb Federal MCL will be used instead of the 1 ppb which is the North Carolina Groundwater Standard. The State water quality standard for benzene adopted pursuant to G.S. 143-214.1 and 143B-282(2) can be deviated from "where the maximum allowable concentration of a substance is less than the limit of detectability" (15 A NCAC 2L.0202(b) (1)). Presently, 5 ppb is the lowest concentration current analytical technology can consistently detect with accuracy. Consequently, EPA and NCDEHNR concur that 5 ppb should be the groundwater ARAR for benzene at the site.

Toluene: The North Carolina Groundwater Standard of 1,000 ppb will be used for the clean-up standard which is the most stringent standard.

Ethylbenzene: The North Carolina Groundwater Standard of 29 ppb will be used for the clean-up standard which is the most stringent standard.

Xylenes: The North Carolina Standard of 400 ppb will be used for the clean-up standard which is the most stringent.

TABLE 7

FINAL SOIL CLEAN-UP STANDARDS				
MEDIUM	CONTAMINANT	CLEAN-UP STANDARD	POINT OF COMPLIANCE	BASIS OF STANDARD
SOIL	Benzene	.010 ppm	All site grounds	Protection of groundwater
	Toluene	3.4 ppm	All site grounds	Protection of groundwater
	Ethyl-benzene	.235 ppm	All site grounds	Protection of groundwater
	Xylenes	3.5 ppm	All site grounds	Protection of groundwater
	Napthalene	1.8 ppm	All site grounds	Protection of groundwater
	*Carcinogenic PAHs	.011 ppm	Top foot of soil on site	Risk
	Lead	25 ppm	All site grounds	Protection of groundwater
	Chromium	97.2 ppm	All site grounds	Protection of groundwater
	*Zinc	122 ppm	Top foot of soil on site	Risk

* These two clean-up standards will be applied to the top foot of soil.

TABLE 8

FINAL GROUNDWATER CLEAN-UP STANDARDS				
MEDIUM	CONTAMINANT	CLEAN-UP STANDARD	POINT OF COMPLIANCE	BASIS OF STANDARD
WATER	Benzene	5 ppb	Plume Periphery	Federal MCL
	Toluene	1,000 ppb	Plume Periphery	N.C. Ground-water Standard
	Ethyl-benzene	29 ppb	Plume Periphery	N.C. Ground-water Standard
	Xylenes	400 ppb	Plume Periphery	N.C. Ground-water Standard
	Naphthalene	30 ppb	Plume Periphery	Health-Based Level
	Chromium	50 ppb	Plume Periphery	N.C. Ground-water Standard
	Lead	15 ppb	Plume Periphery	Federal Action Level

Napthalene: There are no MCLs or North Carolina Groundwater Standards for Napthalene. Therefore, the health-based standard of 30 ppb will be used for the clean-up standard.

Chromium: The North Carolina Groundwater Standard of 50 ppb will be used for the clean-up standard since it is the most stringent.

Lead: The Federal action level of 15 ppb will be used for the clean-up standard since it is the most stringent.

7.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

A Feasibility Study (FS) was conducted to develop and evaluate remedial alternatives to address the contamination at the Potter's Pits site. The primary objective of the FS was to determine and evaluate alternatives for the appropriate remedial action to prevent or mitigate the migration or the release or threatened release of hazardous substances from the site. The following section of this ROD provides a summary of the alternatives considered for the remediation of the contaminated soils and the contaminated groundwater, as well as the process and criteria EPA used to narrow the list of potential remedial alternatives.

The FS was conducted in basically three phases that are all contained in one report (FS). The first phase consisted of identifying possible cleanup standards for each of the affected media. Remedial action standards were specified for the site constituents using criteria that are protective of human health and the environment. To achieve these standards, general response actions were identified for each medium, including soil and groundwater.

Clean-up standards for affected surface and subsurface soils and groundwater were established through the Baseline Risk Assessment discussed in Section 6.0 of this document.

Presently all estimates described in the groundwater alternatives are based on the remediation of the shallow aquifer only. It has not been determined if the deeper aquifer needs to be remediated. The possible extent of this contamination shall be further defined during the Remedial Design/Remedial Action (RD/RA) phase of this project. This will have a significant impact on the cost and time of remediation of the groundwater.

The list of technologies that was identified through a screening process was used to assemble different technologies for the remediation of both groundwater and soils and represents a range of no action, containment, and treatment technologies.

In phase II, specific components of each remedial alternative were described in greater detail to evaluate the remedial alternatives according to effectiveness, implementability, and cost. Following this screening process, three groundwater technologies and seven soil remediation technologies were retained for further consideration in phase III of the FS.

Phase III consisted of a detailed evaluation and comparative analysis of the remedial alternatives based on nine criteria. These nine criteria are listed and defined in Section 8.0 of this ROD. Also included in Section 8.0 is a comparative analysis of the remedial alternatives described in this Section.

The following sub-sections further define the alternatives developed and evaluated in the FS and the ARARs associated with these alternatives.

7.1 Applicable and Relevant and Appropriate Requirements (ARARs)

This Section examines and specifies the clean-up goals for each environmental medium adversely impacted by the contaminants found in association with the Potter's Pits site.

7.1.1 Action-Specific ARARs

Action-specific requirements are technology-based and establish performance, design, or other similar action-specific controls or regulations on activities related to the management of hazardous substances or pollutants. Listed below are all potential action-specific ARARS for contaminated soil and groundwater. For a more complete description of each ARAR, please refer to the Feasibility Study.

FEDERAL ARARs:

* Resource Conservation Recovery Act (42 U.S.C. 6901-6987)
  - Hazardous Waste Management Systems (40 CFR Part 260)
  - Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)
  - Standards Applicable to Transporters of Hazardous Waste (40 CFR Part 263)
  - Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities (40 CFR Part 264)
  - General Facility Standards (Subpart B)
  - Preparedness and Prevention (Subpart C)
  - Contingency Plan and Emergency Procedures (Subpart D)
  - Manifest System, Recordkeeping, Reporting (Subpart E)
  - Release from Solid Waste Management Units (SWMUs) (Subpart F)
  - Closure and Post-Closure (Subpart G)
  - Use and Management of Containers (Subpart I)
  - Tanks (Subpart J)
  - Waste Piles (Subpart L)
  - Land Treatment (Subpart M)
  - Landfills (Subpart N)

- Incinerators (Subpart O)

- Process Vents (Subpart AA)

- Equipment Leaks (Subpart BB)

- Interim Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (40 CFR Part 265.400 Subpart Q)

- Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Mangement Facilities (40 CFR Part 266)

- Land Disposal Restrictions (40 CFR Part 268)

* Clean Water Act (33 U.S.C. 1251-1376)

  - National Pollutant Discharge Elimination System (NPDES) (40 CFR Part 125)

  - Effluent Guidelines and Standards for the Point Source Category (40 CFR Part 401)

  - National Pretreatment Standard (40 CFR 403)

* Safe Drinking Water Act (40 U.S.C. 300)

  - Underground Injection Control Regulations (40 CFR Parts 144-147)

* Clean Air Act (42 U.S.C. 7401)

  - New Source Performance Standards (40 CFR Part 60)

  - Occupational Safety and Health Act (29 U.S.C. 651-678 29 CFR 1910)

  - Hazardous Materials Transportation Act (49 U.S.C. 1801-1813)

  - Hazardous Materials Transportation Regulations (40 CFR Parts 107, 171-177)

STATE ARARS:

* NC Solid and Hazardous Waste Management Act (General Statutes, Chapter 130A, Article 9)

  - Solid Waste Management Rules (15A NCAC 13A)

  - Hazardous Waste Management (15A NCAC 13A)

* Water Pollution Control Regulations (NCAC Title 15 Chapter 2, Subchapter 2H)

  - Wastewater Treatment Requirements (NCAC Title 15, Chapter 2, Subchapter 2H.01)

  - Erosion Control (15 NCAC Chapter 4 Subchapter 4B)

* NC Water and Air Resources Act (General Statutes Chapter 143, Article 21)

  - Standards for Contaminants (NCAC Title 15A, Chapter 2, Subchapter 2D)

  - Standards for Sources of VOCs (NCAC Title 15A, Chapter 2, Subchapter 2D)

* NC Groundwater Quality Standards (NCAC Title 15A, Chapter 2, Subchapters 2L.0100, 2L.0200, 2L.0300)

* NC Well Construction Act (General Statutes Chapter 87)

7.1.2 Chemical-Specific ARARs

Chemical-specific ARARs are concentration limits established by government agencies for a number of contaminants in the environment. Chemical-specific ARARs can also be derived in the Risk Assessment. Listed below is all of the potential chemical-specific ARARs for contaminated soil and groundwater at the Potter's Pits site. A more detailed discussion of these ARARs is provided in the Feasibility Study.

FEDERAL ARARS:

* Resource Conservation and Recovery Act (42 U.S.C. 6901-6987)

  - Identification and Listing of Hazardous Waste (40 CFR Part 261)

  - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F)

* Clean Water Act (33 U.S.C. 1251-1376)

  - Water Quality Criteria (40 CFR Part 131)

* Safe Drinking Water Act (40 U.S.C. 300)

  - National Primary Drinking Water Standards (40 CFR Part 141)

  - National Secondary Drinking Water Standards (40 CFR Part 143)

- Maximum Contaminant Level Goals (40 CFR Part 141)

STATE ARARS:

* NC Hazardous Waste Management Rules and Solid Waste Management Law (15A NCAC 13A)

  - Identification and Listing of Hazardous Waste (15A NCAC 13A.0006)
* Water Quality Standards Applicable to the Surface Waters of NC (15 A NCAC 2B.0100

* NC Drinking Water Act (General Statutes Chapter 130A, Article 10)

* NC Groundwater Quality Standards (NCAC Title 15A, Chapter 2, Subchapters 2L.0100, 2L.0200, 2L.0300

7.1.3 Location-Specific ARARs

Location-specific ARARs are design requirements or activity restrictions based on the geographical and/or physical positions of the site and its surrounding area. There requirements and/or restrictions can be stipulated by Federal, State or local governments. Listed below is all the potential location-specific ARARs for the Potter's Pits site. A more detailed description of these ARARs are outlined in the Feasibility Study.

FEDERAL ARARS:

* Resource Conservation and Recovery Act (42 U.S.C. 6901-6987)

  - Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264.18)

* Executive Order on Protection of Wetlands (Executive Order No. 11,990 40 CFR 6.302(a) and Appendix A)

STATE ARARs:

* NC Solid and Hazardous Waste Management Act (General Statutes, Chapter 130A, Article 9)

  - Siting Criteria for Hazardous Waste Treatment and Disposal Facilities (15 A NCAC 13A.0009)

7.1.4 "To Be Considered" (TBCs) ARARs

* Primary Drinking Water Standard Proposed Maximum Contaminant Levels (Proposed MCLs) found in the May 22, 1989 Federal Register.

* Reference Dose (RFD), is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Interim Final Risk Assessment Guidance for Superfund (Human Health Evaluation Manual Part A.

* EPA Health Advisories guidelines developed by the EPA Office of Drinking Water for chemicals that may be intermittently encountered in public water supply systems.

* EPA Ambient Water Quality Criteria (AWQC) are guidelines that were developed for pollutants in surface waters pursuant to Section 304 (a)(1) of the Clean Water Act.

* Carcinogenic Potency Factors (CPFs) are used for estimating the lifetime probability (assumed 70-year lifespan) of human receptors contracting cancer as a result of exposure to known or suspected carcinogens. Interim Final Risk Assessment Guidance for Superfund Human Health Evaluation Manual Part A.

* EPA's Groundwater Protection Strategy (EPA 1984) policy is to restore groundwater to its beneficial uses within a time frame that is reasonable. The aquifer of concern at the Potter's Pits site is used as a source of drinking water.

7.2 Groundwater Control Alternatives

Three sets of alternatives were developed to address groundwater contamination at the site. The groundwater control (GWC) alternatives are listed and described below.

7.2.1 GWC-1: No Action

In accordance with the NCP, EPA has evaluated a "No Action" alternative as part of the FS. The No Action alternative serves as a basis against which other alternatives can be compared. Under the No Action Alternative, no remedial response would be performed on any of the groundwater at the site.

The only active component of this alternative is long-term groundwater monitoring. This program would be implemented to assess the effect of waste constituents on the site over a 30-year design life. Groundwater quality at the site would be monitored semiannually for volatile organic compounds, semi-volatile organics, and inorganics.

Since this remedy results in hazardous waste remaining on-site which will not allow unlimited use and unrestricted exposure, CERCLA requires that the site be reviewed every five years. During this review, the monitoring program would be re-evaluated to assess the appropriateness of the sampling program.

This alternative does not reduce the risk calculated by the Baseline Risk Assessment for either soils or groundwater.

The estimated present-worth, including 30-year O&M costs, of GWC-1 is $ 140,000.

7.2.2 GWC-2: Institutional Controls

The Institutional Controls Alternative includes the following:

- The current residents and dwelling (a mobile home) will be transported and re-established on another lot. This will require a new foundation, well and septic systems, electrical and plumbing hook-ups in addition to the relocation of the dwelling.

- Applicable legal controls would be implemented including deed restrictions for land use of the site and adjacent property, and water well construction permit restrictions for areas within the zone of influence (ZOI) of the contaminant plume. Legal controls can be filed through the local government offices.

- Implementation of a monitoring program would consist of groundwater sampling on a semi-annual basis. Groundwater samples would be collected from both upgradient and downgradient wells, in both the shallow and deep aquifers, and analyzed for organic and selected metals (lead and chromium).

Review of the site would be conducted every five years since hazardous substances are remaining on site and will not allow for unlimited use and unrestricted exposure.

This alternative reduces the incremental risk for current site conditions by restricting access to the groundwater and by preventing future groundwater use that would allow repeated, frequent contact with it.

Environmental monitoring similar to that discussed under GWC-1 would also be conducted as part of this alternative. The total present-worth cost for implementation of Institutional Controls is $1,400,000.

7.2.3 GWC-3: Groundwater Recovery and Treatment

This alternative involves the recovery of all site groundwater currently exceeding cleanup standards through a system of numerous extraction wells. The treatment system for the extracted groundwater would involve installing piping from each extraction well to a common treatment area, a specific treatment system, and discharging the treated groundwater into Chinnis Branch. This treated groundwater would meet the subtantive requirements of a National Pollutant Discharge Elimination System (NPDES) permit and any other ARARs. Because of the nature of contaminants, it is necessary to use a "treatment train" system where several different technologies are used to treat the different contaminants. For groundwater, air stripping would be used to remove the VOCs and chemical treatment (precipitation /flocculation/ filtration) would be used to remove the heavy metals from the groundwater. These technologies are described below:

AIR STRIPPING

In the air stripping system, the groundwater is pumped from the well and sent to the top of an air stripping tower. While the water cascades down through a large tube, a high-powered fan literally blows the contaminants from the water. The fan then sends the contaminated air out of the top of the air stripping tower. The volatilized contaminants are treated by an off-gas system. The air stripping system is most effective in removing VOCs; It is not effective with other contaminants, such as heavy metals.

CHEMICAL TREATMENT

The chemical treatment process used in this alternative involves precipitation/flocculation/filtration for the removal of the heavy metals of concern (lead, zinc, and chromium). Precipitation involves addition of chemicals to the groundwater to transform dissolved contaminants into insoluble precipitates. Flocculation then promotes the precipitates to agglomerate or clump together which facilitates their subsequent removal by filtration.

During this chemical process, the filtered material or sludge will be collected and stored in a dumpster and will have to be hauled off-site for treatment (if required) and disposal in accordance with applicable regulations.

To assess the effectiveness of the treatment system, the influent and effluent will be monitored weekly. Remedial pumping on-site will continue until the contaminant concentrations in groundwater consistently meet remedial objectives. Once the system is turned off monitoring would continue for at least an additional 5 years to ensure that all contaminant concentrations remain below these objectives at the points of compliance.

The present worth estimate would be $ 7,100,000. This estimate is based on the source removed. (An estimated 50 years will be needed to treat the aquifer).

7.3 Remedial Alternatives for Source Control

Seven different alternatives are presented to address source control at the Potter's Pits site. The Source Control alternatives (SC) are listed and described below:

7.3.1 SC-1: No Action

In the No Action alternative, no further remedial actions would occur. Some remediation may occur through natural processes. Site soil contamination would slowly decrease over time, and would continue to contribute chemicals to the groundwater.

Review of the site would be conducted every five years since hazardous substances would remain on site and would not allow for unlimited use and unrestricted exposure.

This alternative does not reduce the risk for being exposed to the contaminated soil.

The present worth cost is $ 140,000.

7.3.2 SC-2: Institutional Controls

The Institutional Controls Alternative includes the following:

- The current residents and dwelling (a mobile home) will be transported and re-established on another lot. This will require a new foundation, well and septic systems, electrical and plumbing hook-ups in addition to the relocation of the dwelling.

- Site access restrictions will involve erection of physical barriers to minimize the potential for contact with contaminated soils, and implementation of deed restrictions to regulate land usage by legal means.

- The physical barrier selected to prevent access to the site is a six-foot high cyclone fence. Fencing would be installed around all areas containing soils presenting a concern for human health. The fence will be placarded at twenty-five-foot intervals along its perimeter with a warning about site conditions.

- Implementation of a monitoring program would consist of soil sampling on a biannual basis. Soil samples would be collected downgradient from the site, upgradient from the site, and on the site. Samples collected would be analyzed for the presence of volatile organic contaminants and selected metals.

Review of the site would be conducted every five years since hazardous substances are remaining on site and would not allow for unlimited use and unrestricted exposure.

The estimated present-worth, including 30-year O&M costs, of SC-1 is $ 1,400,000.

7.3.3 SC-3: Soil Removal and Off-Site Disposal

The current residents (Gurkins) on-site would be moved to another location. This alternative consists of the excavation of soils (surface and subsurface) that exceed soil cleanup standards. If the contaminated soil passes toxicity characteristic leaching procedure (TCLP), soils removed would be transported to an off-site permitted landfill for disposal. If the contaminated soils do not pass TCLP, the soil would have to be treated at a facility such as an incinerator and then disposed of at a hazardous waste landfill. The excavation area would be filled with clean soil, compacted, and graded to original contour.

For purposes of the cost estimate, it is assumed that the contaminated soil is not classified as a hazardous waste. This can be confirmed by performing TCLP tests as specified in 40 CFR 261. Therefore, it is assumed that the contaminated soil at the site would meet the RCRA Land Disposal Restrictions and could be directly landfilled at a RCRA-approved landfill facility without pretreatment.

Transportation of the material off-site would be performed with bulk dump trucks. RCRA regulations require the generator and transporter to comply with the manifest system for each shipment of hazardous material transported off-site.

During the implementation, dust control measures would be implemented to protect the community from the dust generated through the excavation, soil erosion, and truck traffic. On-site, the dust can be controlled with water sprays while an air monitoring program is implemented to detect any tract levels of contaminants in the air.

There is a RCRA-approved hazardous waste landfill located in Pinewood, South Carolina, which is approximately 170 miles from the site. The landfill is operated by Laidlaw Environmental Services, Inc. and may be available to accept the type of contaminated soil at the site.

The estimated costs for this alternative is estimated at $6,280,000.

7.3.4 SC-4: Soil Stabilization/Solidification

The current residents (Gurkins) would be moved from the site to another location. This alternative is a treatment technology that mixes the contaminated soil with another substance such as cement, kiln dust, lime, fly ash, silicates, and clay. This admix converts the contaminants into their least soluble, mobile, or toxic form, thus minimizing their potential for migration. This mixture of material is then placed back where it was excavated. A low permeability clay cover would be placed over the stabilized/solidified, contaminated soils to minimize the potential for leaching.

Treatability studies would be required to determine the best admix to use and whether to treat the soils in-situ or ex-situ.

To ensure adequacy and reliability of controls, a monitoring program would remain in effect, allowing for repair of the cap if damage due to erosion or vegetation is noted.

It is assumed that the contaminated soil is not classified as a hazardous waste. Regardless of the RCRA hazardous waste classification, the RCRA Land Disposal Restrictions would not apply to soils that are stabilized/solidified in situ, since these restrictions only apply when exhumation and replacement occur. If an ex situ stabilization/solidification process is used, the Land Disposal Restrictions and other RCRA requirements may apply (again, assuming the soils are classified as a hazardous waste.)

The estimated cost is $5,500,000.

7.3.5 SC-5: On-Site Incineration

The current residents (Gurkins) would be moved from the site. This alternative consists of the excavation of the contaminated soils, on-site incineration of the soils, and disposal of the ash. A transportable incinerator would be mobilized to the site to perform the incineration.

Rotary Kiln incineration is a process in which solid and liquid wastes are fed into a rotating chamber where they are exposed to temperatures ranging from 1500 to 3000 degrees Fahrenheit. The heat reduces organic (carbon-containing) compounds into their basic atomic elements, for example, hydrogen, nitrogen, and carbon. In combination with oxygen, these form stable compounds such as water, carbon dioxide, and nitrogen oxides.

Although residual concentrations of the contaminants of concern cannot be determined until a treatability study is performed, it is anticipated that the treated soils would not be a listed hazardous waste and would therefore be used to backfill the excavations. The treated soils may require a stabilization/solidification step to immobilize the inorganic compounds that are not affected by the thermal treatment. At a minimum, it is expected that the treated soils would meet the applicable requirements necessary for land disposal in a permitted off-site RCRA landfill. For costing purposes, this alternative is based on the assumption that the treated soils would be delisted (if required) and used to backfill the excavations. In addition, for costing purposes, it is assumed that approximately 10 percent of the residual ash (i.e. ash with elevated metals concentrations) would require stabilization/ solidification prior to delisting.

An additional 20% (by volume) of off-site backfill would be required to account for the volume reduction caused by incineration.

Destruction removal efficiencies (DREs) for incinerated RCRA hazardous waste must be greater than 99.99%. It is assumed that the on-site incinerator would be able to achieve these standards. Laboratory-scale testing may be used to provide a better estimate of the destruction efficiencies that would be expected at the site.

The estimated cost is $12,400,000.

7.3.6 SC-6: Soil Washing

The current residents would be moved to another location. This alternative is a batch process in which contaminated soils are thoroughly mixed with successive rinse solutions formulated to remove waste constituents from the soils. Acid rinses are frequently used to solubilize metals, transferring the metals from a solid or sorbed state to an aqueous phase. The aqueous phase is then separated from the solid matrix by decanting. The rinsate from this step is then treated using conventional wastewater technology for metals removal, such as pH adjustment, flocculation, clarification, and dewatering. Process waters would be temporarily stored in on-site tanks until recycled. Wastewater sludges would be dewatered and stockpiled. Dewatered sludges would be transported to a RCRA-approved facility for treatment (if required) and landfilled.

The soil washing system should be able to achieve removal efficiencies in excess of 90% for VOCs, PAHs, and metals, according to most literature regarding this treatment technology. Removal efficiencies as high as 99.9% have been observed for VOCs in sandy soils (EPA, 1991). Reported removal rates for SVOCs and metals are somewhat lower and are generally in the 90% to 95% range.

It should be noted that, as evidenced in the published literature, the final concentrations of SVOCs and metals in the washed soils are generally higher than the action levels being applied to the site. The high removal efficiencies achieved are the result of high initial concentrations. Attainment of the action levels for SVOCs and metals may not be possible using standard water and surfactant or water and chelant washing. Processes using stronger and more specialized solvents may be necessary to achieve acceptable results. The site-specific effectiveness would be determined through laboratory and field scale treatability studies.

Depending on the soil washing process utilized, some stabilization/solidification technique may be necessary. It is possible that the treated soil would either meet the requirements of the RCRA Land Disposal Restrictions and could be directly landfilled at a RCRA approved landfill facility or if the soil is clean, the soil could be placed back into the excavated areas.

The estimated cost is $12,300,000.

7.3.7 SC-7: Low Temperature Thermal Desorption and Stabilization

The current residents (Gurkins) would be moved to another location. This alternative consists of excavating contaminated soil and treating the soils by thermal desorption. Treatment would consist of volatilizing the organic contaminants at temperatures usually between 300 - 800 degrees F. with the off-gases being treated to prevent the release of contaminants. The waste stream would be treated by stabilization if needed.

Off-gas treatment varies depending on the vendor, but usually consists of either: 1) thermal oxidation in a thermal oxidation chamber similar to incinerators; 2) condensing and concentrating the organics into a significantly smaller mass for further treatment; or 3) passing the off-gases through activated carbon to adsorb the contaminants and then regenrating the carbon. This Record of Decision will not select the off-gas treatment so as not to limit vendor competition. However, EPA will review and approve the secondary treatment prior to implementation. Standards for the operation of hazardous waste incinerators are relevant and appropriate requirements for thermal desorption unit.

After the soils are treated, they will be analyzed to insure the soils meet the soil clean-up standards established in Section 9.4 of this ROD. If the soils are clean, they will be used as backfill. If the soils are still contaminated with metals, then that particular stockpile will be stabilized and taken off-site for disposal.

This alternative will comply with Land Disposal Restrictions through a Treatability Variance for the contaminated soils.

The estimated cost is $ 4,700,000.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

During the phase III of the FS, the alternatives retained for further consideration and described in Section 7.0 were analyzed in detail using the nine evaluation criteria. A comparative analysis was conducted to determine which alternative provides the best balance of tradeoffs with respect to the following nine criteria:

Threshold Criteria -

1) Overall Protection of Human Health and the Environment;

2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs);

Primary Balancing Criteria -

3) Long-Term Effectiveness and Permanence;

4) Reduction of Toxicity, Mobility, and Volume;

5) Short-Term Effectiveness;

6) Implementability;

7) Cost;

Modifying Criteria -

8) State/Support Agency Acceptance, and;

9) Community Acceptance.

Discussion of the relative performance of the alternatives for both soil and groundwater with respect to the nine criteria is included below. First, the groundwater alternatives will be compared and then the source control (soil) alternatives will be compared using these criteria.

8.1 Groundwater

8.1.1 Overall Protection of Human Health and the Environment

This criteria addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. EPA has established a limit of E-04 to E-06 as acceptable limits for excess lifetime carcinogenic risks. EPA has also established that a hazard index rating exceeding 1.0 for non-carcinogenic constituents suggests potential concern for toxic effects in sensitive portions of the exposed population.

Under potential future conditions the No Action (GW-1) alternative would not address contaminant levels in groundwater, and it would allow for possible ingestion of groundwater from wells drilled in the contaminated area. Since the No Action alternative does not meet this criteria for overall protection of human health and the environment, it will be dropped from the rest of the evaluation. There is uncertainty about the long term effectiveness of the Institutional Alternative (GW-2). Alternative GW-3 would prevent migration of contaminated groundwater and recover groundwater to meet cleanup standards.

8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion assesses the alternatives to determine wether they attain ARARs under federal and state environmental laws, or provide justification for waiving an ARAR. Section 7.1 defines the three types of ARARs: action-specific, chemical-specific, and location-specific. Site-specific ARARs are identified below.

There are no federal or state chemical-specific ARARs for the contaminants detected in the soils as there are no action-specific ARARs for Aternative SC-1. RCRA requirements for Alternative SC-4 (Stabilization) may be relative and appropriate. All alternatives will have to meet location-specific ARARs. Alternatives SC-2 through SC-7 will comply with all applicable ARARs, including Land Disposal Requirements (LDRs) by complying with and meeting Treatability Variance standards/levels. Because the LDR treatment (clean-up levels) are based on treating less complex matrices of industrial process wastes then what is present at the Potter's site, the selected remedy will comply with the LDRs through a Treatability Variance for the contaminated soil. The Treatability Variance does not remove the requirement to treat restricted soil wastes: it allows the establishment of LDR standards on actual data collected from the site. LDR treatment levels will be met for the soil and for any sludge or used activated carbon generated by the treatment process. Table provides the alternate treatment variance levels under LDR.

MCLs and North Carolina Groundwater Standards are ARARs for site groundwater. The Institutional Controls alternative would not comply with ARARs. Alternative GW-3 would reduce the levels of contaminants in the groundwater and comply with ARARs. The treated water would be discharged into Chinnis Branch and would meet the subtantive requirements of a National Pollution Discharge Elimination System (NPDES) permitting limits. If, at completion of the action, ARARs cannot be met, a waiver for technical impracticability would be obtained and groundwater use restrictions would continue.

8.1.3 Long-Term Effectiveness and Permanence

This evaluation criterion refers to expected residual risk and the ability of the alternative to maintain reliable protection of human health and the environment over time, once clean-up standards have been met.

Under the Institutional Controls (GW-2) alternative, contaminated groundwater could migrate off-site; therefore, it is not considered to be a permanent or effective remedial solution. Contaminant concentrations would be permanently reduced through groundwater recovery for Alternative GW-3. Air Stripping and Chemical Treatment is considered the best available treatment for heavy metals and volatile organic compounds in groundwater.

8.1.4 Reduction of Toxicity, Mobility, or Volume

This criterion takes into account the anticipated performance of the treatment technology a remedial alternative may employ.

The GW-2 alternative would not significantly reduce the toxicity, mobility, or volume of contaminants in groundwater. Alternative GW-3 would reduce the volume of contaminants in the aquifer through recovery and treatment.

8.1.5 Short-Term Effectiveness

This refers to the likelihood of adverse impacts on human health and the environment that may be posed during the construction and implementation of an alternative until the clean-up standards are achieved.

All of the alternatives can be implemented without significant risk to the community or on-site workers and without adverse environmental impacts.

8.1.6 Implementability

This criterion refers to the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement a particular option.

None of the alternatives would pose significant concerns regarding implementation. Construction of the treatment systems would not be conducted until discharge requirements for the treated water were defined.

8.1.7 Cost

This criterion estimates the total cost required to implement an alternative and includes the estimated capitol, Operation and Maintenance (O&M) costs, and present-worth costs. Table 9 provides a comparison of costs for all alternatives discussed in this section.

TABLE 9

COSTS FOR GROUNDWATER ALTERNATIVES	
GROUNDWATER ALTERNATIVES	PRESENT WORTH COSTS
GWC - 1	$ 140,000
GWC - 2	$ 1,400,000
GWC - 3	$ 7,100,000 (50 YEARS)

8.2 Source Remediation

8.2.1 Overall Protection of Human Health and the Environment

Potential risks due to site soils under current and potential future conditions are not within the acceptable risk range as specified in the National Contingency Plan (NCP). Alternatives SC-1 and SC-2 would not decrease the risks associated with the soils. Alternatives SC-3 through SC-7 would all decrease the risk and mitigate any further contamination to groundwater.

8.2.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternatives SC-3 through SC-7 would meet RCRA closure requirements for waste in place if applicable. Also any of these alternatives would have to comply with Land Disposal Restrictions (LDRs) through a Treatability Variance.

8.2.3 Long-Term Effectiveness and Permanence

Alternatives SC-1 and SC-2 would not be effective in reducing the contaminants. There is a question concerning the effectiveness of SC-2 in preventing human contact with the soils, especially over a long period of time. Alternatives SC-3 through SC-7 would result in a permanent reduction in site risks.

8.2.4 Reduction of Toxicity, Mobility, or Volume

Contaminant levels would remain unchanged for alternatives SC-1 and SC-2. There is a question concerning how effective stabilization/ solidification (SC-4) for preventing the organic contaminants from leaching on a long term basis. The rest of the alternatives would be effective in reducing the toxicity, mobility, and volume of contaminants.

8.2.5 Short-Term Effectiveness

Alternative SC-1 and SC-2, No Action and Institutional Controls, presents no immediate threat to human health and the environment to implement in the short-term.

Contaminated soils containing COCs at concentrations exceeding soil clean-up standards will be excavated and treated under alternatives SC-3 through SC-7. Site disturbances due to excavation and material handling are extensive, but manageable. Dust emissions during excavation and treatment can be effectively controlled with standard engineering controls such as increasing the moisture content of the materials. The volume of truck traffic required in all of these alternatives significantly reduces the short-term effectiveness.

Site disturbances for alternative SC-3, off-site disposal, are extensive due to the volume of truck traffic. SC-3 requires approximately 500 -700 truckloads of waste at 20 tons per truckload. For alternative SC-4, stabilization/solidification, extensive truck usage would also be required due to the volume of clay required to construct the protective clay cap after the stabilization has taken place.

In alternatives SC-5 and SC-7, the thermal desorption unit and the incinerator would produce a considerable amount of noise during operation.

8.2.6 Implementability

No implementation is needed for the no action alternative. Off-site disposal to a RCRA-approved landfill and incinerator have been conducted successfully at other Superfund Sites. Implementation of alternatives SC-5 and SC-7 may depend on the availability of a mobile thermal desorption equipment and mobile incineration equipment, respectively.

There may be insufficient space at the site to fit the desorption or incineration unit and auxilary equipment.

8.2.7 Cost

Alternatives SC-1 and SC-2 are low-cost remedies that offer no treatment of the source material. The treatment technologies (SC-3, 4, and 7) provide remedies with a high degree of permanence at costs that are mid-range for the alternatives evaluated in Phase III of the FS. The incineration and soil washing alternative would achieve a high amount of permanence, but the costs are high related to burning and disposal. The source removal alternative (SC-3) would also achieve substantial risk reduction in terms of future exposure to waste constituents, but the short-term risks are greater than for the other alternatives, and the costs are higher.

Table 10 shows costs for each alternative.

8.3 State/Support Agency Acceptance

The North Carolina Department of Environment, Health, and Natural Resources (NCDEHNR) has been actively involved in the RI/FS and the remedy selection process at the Potter's Pits site. NCDEHNR has reviewed this Record of Decision and concurs with all aspects of EPA's selected remedy. NCDEHNR's conditional concurrence letter on the selected remedy for the Potter's Pits site is included in an Appendix to this Record of Decision.

TABLE 10

COSTS FOR SOURCE REMEDIATION ALTERNATIVES	
SOURCE REMEDIATION ALTERNATIVES	ESTIMATED COSTS
SC - 1	$ 140,000
SC - 2	$ 1,400,000
SC - 3	$ 6,280,000
SC - 4	$ 5,500,000
SC - 5	$ 12,400,000
SC - 6	$ 12,300,000
SC - 7	$ 4,700,000

8.4 Community Acceptance

EPA solicited input from the community on the Proposed Plan for cleanup of the Potter's Pits site. Although public comments indicated no specific opposition to the preferred alternative, some local residents did express concern over the noise associated with the thermal desorption unit, and the actual time of implementation of the entire Remedial Action. These issues are addressed individually in the attached Responsiveness Summary.

9.0 THE SELECTED REMEDY

EPA has selected Alternative GW-3, Groundwater Recovery and Treatment, as the remedy to address contaminated groundwater, and SC-7, Low Temperature Thermal Desorption and Stabilization as the remedy to address the contaminated soils at the Potter's Pits site. The remedy for the cleanup of the Potter's Pits site consists of the following components:

9.1 GW-3: Groundwater Recovery and Treatment System

Extraction wells and pumping systems will be installed to restore the contaminated aquifer (plume: Figure 22) to within acceptable drinking water standards by removing groundwater from the area of peak contamination concentration. In addition, as areas are cleaned, pumping locations and rates may need to be adjusted. Locations of the wells will be determined during the remedial design after the aquifer characteristics are defined. Varying pumping rates are also beneficial in flushing the groundwater flow divide between adjacent pumping wells. The relationships between individual pumping wells and the cumulative effects of drawdown from several pumping wells will be evaluated. Accordingly, it is probable that the scenario initially chosen will need to be modified following startup. Pumping rates may be varied and recovery wells may be added to or removed from the system.

The elevated metals at the site (chromium and lead) will be treated by precipitation, flocculation, and filtration process. This treatment system will remove the metals from groundwater and form a sludge. This remedy is described in Section 7.1.3 of the ROD. The sludge cake is stored in a dumpster and hauled off-site for treatment (if required) and disposal following applicable regulations.

It should be noted that the chromium species present in the groundwater is currently unknown, as is its distribution between liquid and solid phases. Since performance is species specific, both speciation (i.e. hexavalent and trivalent chromium analysis) and treatability testing will be needed before design. Depending on the results, modifications to the treatment scheme may be necessary (e.g. reduction of hexavalent to trivalent chromium, addition of iron for improved coprecipitation and/or ion exchange). Alternatively, if chromium and iron levels in the dissolved phase (as determined during pump test sampling) are below effluent criteria, certain treatment steps may be deleted (i.e. aeration, clarification, filter press, ect...)

After the treatment process for metals is finished, the groundwater flows to a holding tank from where it is pumped to the top of an air stripping unit. The present state guidelines allow discharge of up to 40 lbs/day without treatment. Accordingly, no emission control is required as per the state guidelines (15A NCAC 2D.0518). In the event the air exhaust will not meet the state guideline of 40 lbs/day, then the air will be treated through a carbon adsorption system before it is released into the atmosphere.

If the carbon adsorption is needed, then once these units have reached their capacity for adsorbing organic impurities, the carbon granules can be regenerated.

The treated water from the stripper flows by gravity to a holding tank and will then be pumped to a discharge location. Discharge will be directly into Chinnis Branch on-site after meeting the substantive requirements of an NPDES permit.

In Section 9.2, there is a description of how the source will be removed and treated at the site. Based on this fact, the duration of the groundwater recovery and treatment system will be approximatly 50 years. In other words, it will take a minimum of 50 years to clean-up the shallow aquifer to the groundwater clean-up standards that are established in Section 9.6 of this ROD.

Signs and institutional controls will be established to identify the presence and nature of wastes in the groundwater and limit use until remediation is complete.

The present worth cost of this portion of the selected remedy for groundwater is $ 7,100,000. Table 11 shows a break-down of the costs associated with this aspect of the selected remedy.

9.2 Additional Data Requirements and Monitoring of the Groundwater

9.2.1 Monitoring Program

The monitoring program that will be developed before and during this remedial action will include periodic water-level measurements in all wells and groundwater sampling and analysis from selected wells on a scheduled basis. A post startup evaluation will be made to determine if additional monitoring wells are necessary. Monitoring frequency will be greater during the initial phase of operation, and based on results, could be decreased as the system begins to equilibriate. The monitoring frequency will be temporarily increased following any program changes in the recovery system.

The monitoring program will include assessment of the following:

* Variations in pumping well water quality and constituent loading to treatment systems.
* Hydraulic effects on off-site residential water supplies.
* Decommissioning of wells no longer needed in the recovery system as clean-up progresses.

9.2.2 Additional Data Requirements for the Deep Aquifer

As discussed earlier, lithologic and hydrologic data collected

TABLE 11

COST FOR THE GROUNDWATER RECOVERY AND TREATMENT SYSTEM			
CAPITOL COSTS	UNITS	COST PER UNIT	COSTS ($)
Recovery Well Installation			
Labor	300	60	18,000
Expenses	45	150	6,750
Equipment	1	2,000	2,000
Driller	180	75	13,500 (6-30ft.wells)
Treatment Plant Installation			
Complete (See Table 38 for breakdown)	1	562,000	562,000
Pumps and Piping			
Labor	1,200	10	12,000
Electrical	7	100	700
Piping	1,200	10	12,000
Pumps	6	500	3,000
O&M Costs			
Maintenance			
Treatment Plant (3%)	3	16,860	16,860
Recovery Wells (20%)	20	8,050	8,050
Pumps Piping (20%)	20	5,540	5,540
Fence (5%)	5	1,200	1,200
Operations			
Labor	3	40,000	120,000
Expenses	1	10,000	10,000
Chemicals	1	11,500	11,500

TABLE 11 (Cont...)			
Electrical	1	9,000	9,000
Sludge Transp and Disposal	60	457	27,390
Monitoring (Influent and Effluent)	104	350	36,400
Capitol Subtotal (Not Treatment Percent)			67,950
Engineering (25 %)			16,988
Contingency (25 %)			21,234
Total Capitol			106,172
Subtotal O&M Annual			245,940
Engineering (25 %)			61,485
Contingency (25 %)			76,856
Total O&M Annual			384,281
TOTAL PRESENT WORTH COST OF TREATMENT FOR 50 YEARS			7,121,000

in the RI suggest that two aquifers are present at the site. Benzene was not detected in the deep wells during the initial RI but was detected during the Phase II RI sampling in one deep well (MW-110) at 58 ug/l. To evaluate the extent of benzene contamination in the deep aquifer, additional sampling will be performed during subsequent phases of this project (Remedial Design). In order to fully assess the extent of deep aquifer contamination, additional wells may be necessary. Since benzene was detected only once and its extent is not clearly defined, calculation of clean-up times and cost estimates do not reflect the clean-up of the deeper aquifer.

9.3 Low Temperature Thermal Desorption and Stabilization

The selected remedy for soil contamination, alternative SC-7, involves the use of the innovative technology, Low Temperature Thermal Desorption (LTTD). EPA has selected this remedy based upon consideration of the requirements of CERCLA and the detailed analysis of the alternatives. This remedy is described in Section 7.2.7 of the ROD.

The current residence (Gurkins) and their home will be moved off-site to another location before Remedial Action begins.

The next step in implementing this remedy is soils excavation. All soil which exceed the soil clean-up standards outlined in Section 9.6 of this ROD will be excavated and treated. A sampling program shall be developed and conducted prior to excavation to determine the actual volume of soils requiring remedial action. Confirmation sampling shall also be conducted following excavation and prior to backfilling treated soils to ensure the underlying soils and the treated soils meet the appropriate clean-up standards.

Placement of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDRs) is not applicable to this CERCLA response action. The area of contamination (AOC) at the site shall be delineated by the aerial extent, or boundary, of contiguous contamination. The AOC shall consists of approximately 5-acres that includes the Gurkin's property, the empty field across from the Gurkin's property which is separated by Joe Baldwin Drive, and also the lot next to the Grainger's house across Grainger's Circle from the Gurkin's property. According to RCRA, placement does not occur when wastes are moved within a single AOC. As part of the selected remedy, all excavated wastes shall be consolidated, pre-processed, and treated within the established AOC.

Additional waste characterization shall be done as part of the RD/RA process. The Toxicity Characteristic Leaching Procedure (TCLP) test shall be done on the affected soils to identify if these soils exhibit hazardous waste characteristics for any of the waste constituents. If the soils show the presence of a characteristic RCRA waste at the site, Land Disposal Restrictions (LDRs) would then be applicable to this response action through a

Treatability Variance. The treatment level range established through a Treatability Variance that Low Temperature Thermal Desorption (LTTD) will attain for each constituent as determined by the indicated analysis are listed in Table 12. Treatment of waste material at the site shall meet these promulgated Federal standards.

After the contaminated soil is treated, the soil will be analyzed to insure the soil clean-up standards have been met. If the levels of inorganics are higher than the clean-up standards established for soil, then the soils will be stabilized/solidified and either transported off-site for disposal at a RCRA permitted hazardous waste landfill or buried on-site following all applicable Land Disposal Restrictions and Minimum Technology Requirements. soil stabilization/Solidification is described in Section 7.2.4 of the ROD.

From the soil data collected in the RI, it is not anticipated that all of the soils will be contaminated with the inorganics; therefore composite samples will be collected from stockpiles and analyzed for inorganics of concern (lead and zinc). If the stockpile results are above the soil clean-up standards, then that batch of soil will be stabilized on-site or transported to an off-site RCRA landfill for disposal.

The soil which has been successfully treated and has passed any necessary TCLP tests will be backfilled, graded, and planted with suitable vegetation. The Potter's Pits site shall have a fence and proper warning signs posted in visible locations in order to provide site control during remedial action.

Implementation of this portion of the Remedial Action will take approximately 4 months (if the LTTD is operating 24 hours a day at a process rate of 5 tons per hour) once the system has started treatment.

The estimated costs of this estimate is approximately $ 4,700,000. This implementation and cost estimate assume 10,100 cubic yards of soil will be excavated and treated. As stated previously, the exact location and volume of soil which will be excavated and treated will be determined during the Remedial Design. This will have an impact on the cost and implementation time of the remedy. Table 13 shows a break-down of the costs associated with this aspect fo the selected remedy.

9.4 Additional Data Requirements for Area 3 Soils

Since limited sampling was conducted in Area 3 during the remedial Investigation, a soil boring will be installed near MW-104 and samples collected by compositing 2.5 foot intervals continuously to 12.5 feet below ground surface (5 samples). These samples will have a complete TCL/TAL analyses performed.

TABLE 12

TOXICITY CHARACTERISTIC LEACHING PROCEDURE Regulatory Limits Treated/Solidified Waste	
CONSTITUENT	TCLP REGULATORY LEVEL (mg/l)
Benzene	0.5
Toluene	1.12
Ethylbenzene	0.05
Xylene	0.05
Lead	5.0
Chromium	5.0

TABLE 13

COST FOR LOW TEMPERATURE THERMAL DESORPTION AND STABILIZATION			
CAPITAL COSTS	UNITS	COST PER UNIT	COSTS ($)
Project Plans	1	40,000	40,000
Erosion Control	300	10	3,000
Mobilization	1	10,000	10,000
Fence	1,600	15	24,000
Residence Relocation	1	10,000	10,000
Excavation	10,100 Cu.Yd.	10	101,000
Treatability Study	1	150,000	150,000
Thermal Desorption	13,635 Tons	170	2,317,950
Stabilization (20 %)	2020 Cu. Yd.	100	202,000
Off-Site Disposal	2 Trucks	3600	72,000
Verification	60	350	21,000
Backfill	10,100 Cu.Yd.	10	101,000
Regrade Reseed	4	1500	6,000
Capitol Subtotal			2,993,150
Engineering (25 %)			748,288
Contingency (25%)			935,360
Total Capitol			4,676,798

9.5 Total Cost of the Selected Remedy

Therefore, EPA's selected remedy for 50 years of pump and treat of the contaminated groundwater and thermal treatment of the contaminated soils will have a total present worth cost of $ 11,800,000. Tables 11 and 13 show the break-down of cost associated with this selected remedy.

9.6 Performance Standards To Be Attained

Performance standards are defined as any applicable or relevant and appropriate standards/requirements, clean-up goals and/or levels, or remediation goals and/or levels to be achieved by the remedial action. The performance standards to be met/attained by the Potter's Pits remedial action are specified below.

9.6.1 Soil Clean-up Standards

If the soils are not a characteristic hazardous waste, the clean-up standards for soils are based on two criteria: (1) to reduce dermal contact risks to E-04 to E-06; and (2) to protect groundwater from contaminants migrating from the soil.

Soil clean-up standards were derived from risk calculations based on dermal exposure to the contaminants of concern found in site soils. A more thorough description of the derivation of the soil clean-up standards is presented in Section 6.0 of the RI Report. A leachate model as described in the FS report (Appendix A) was used to estimate the subsurface soil clean-up standards necessary to protect the groundwater from contaminated leachate containing the groundwater contaminants of concern. The more conservative of the two clean-up standards for each contaminant was selected as the remedial standard.

The remediation standards for soil contaminants of concern are listed in Table 14. This Table summarizes the soil clean-up standards selected for the Site on the basis of both direct risk exposure (for zinc and carcinogenic PAHs' only) and groundwater protection.

9.6.2 Groundwater Clean-up standards

The goal of this part of the remedial action is to restore the groundwater to its beneficial use, which is, at this site, Class IIB, a source of drinking water. Based on information obtained during the RI, and the analysis of all remedial alternatives, EPA believes that the selected remedy will achieve this goal. Groundwater remediation standards and the range of concentrations detected for each contaminant are listed in Table 15. These standards are either MCLs, health-based standards (napthalene), or North Carolina Groundwater Standards. The approximate location of the contaminant plume is shown on Figure 21.

TABLE 14

SOIL CLEAN-UP STANDARDS	
CONTAMINANTS	CLEAN-UP STANDARDS
Benzene	.010 ppm
Toluene	3.4 ppm
Ethylbenzene	.235 ppm
Xylenes	3.5 ppm
Napthalene	1.8 ppm
*Carcinogenic PAHs	.011 ppm
Lead	25 ppm
Chromium	97.2 ppm
*Zinc	122 ppm

*Note: These two clean-up standards (zinc and carcinogenic PAHs) will be applied to the top foot of soil only.

TABLE 15

GROUNDWATER CLEAN-UP STANDARDS	
CONTAMINANT	CLEAN-UP STANDARD
Benzene	5 ppb
Toluene	1,000 ppb
Ethylbenzene	29 ppb
Xylenes	400 ppb
Napthalene	30 ppb
Chromium	50 ppb
Lead	15 ppb

9.7 Contingency Measures for Groundwater Remedial Action

Groundwater contamination may be especially persistent in the immediate vicinity of the contaminants' source, where concentrations are relatively high. The ability to achieve clean-up standards at all points throughout the area of attainment, or plume, cannot be determined until the extraction system has been implemented, modified as necessary, and plume response monitored over time. If the selected remedy cannot meet remediation standards, which are a combination of MCLs, proposed MCLs, health-based standards, and North Carolina Groundwater Standards at any or all of the monitoring points during implementation, the contingency measures and levels, described in this section, may replace the selected remedy and levels. Such contingency measures will, at a minimum, prevent further migration of the plume and include a combination of containment technologies (groundwater extraction and treatment) and institutional controls. These measures are considered to be protective of human health and the environment, and are technically practicable under the corresponding circumstances.

The selected remedy will include groundwater extraction for an estimated period of 50 years, during which time the system's performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. Modifications may include any or all of the following:

a) at individual wells where clean-up standards have been attained, pumping may be discontinued;

b) alternating pumping at wells to eliminate stagnation points;

c) pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into groundwater; and

d) installation of additional extraction wells to facilitate or accelerate clean-up of the contaminant plume.

To ensure that clean-up standards continue to be maintained, the aquifer will be monitored at those wells where pumping has ceased on an occurrence of at least every 5 years following discontinuation of groundwater extraction.

If it is determined, on the basis of the preceeding criteria and the system performance data, that certain portions of the aquifer cannot be restored to their beneficial use, any or all of the following measures involving long-term management may be implemented for an indefinite period of time, as a modification of the existing system:

a) low level pumping would be implemented as a long-term gradient control, or containment measure;

b) chemical-specific ARARs would be waived for the clean-up of those portions of the aquifer based on the technical impracticability of achieving further contaminant reduction;

c) institutional controls would be provided/maintained to restrict access to those portions of the aquifer which remain above health-based standards;

d) continued monitoring of specified wells; and

e) periodic reevaluation of remedial technologies for groundwater restoration.

The decision to invoke any or all of these measures may be made during a periodic performance evaluation (5 year review) of the remedial action which will occur at least once every five years or at the conclusion of remedial action under this ROD. Should EPA decide that an ARAR waiver is appropriate, due to non-compliance with an ARAR or ARARs as the result of technical impracticability from an engineering perspective, it will notify and seek concurrence from the State prior to granting such a waiver pursuant to CERCLA Sections 121(d)(4) and (f)(2). Also, an Explanation of Significant Differences would be issued to inform the public of the details of these actions, should they occur.

9.8 Contingency Measures for Soils Remedial Action

A contingency ROD is appropriate when the performance of an innovative treatment technology appears to be the most promising option, but additional testing will be needed during remedial design to verify the technology's performance capabilities; in this case, a more "proven approach" is identified as a contingency remedy.

Should implementation of the thermal desorption method prove ineffective for remediation of soils, SC-3, off-site disposal, will be implemented as the Agency's contingency alternative.

The criteria that EPA will use to decide to implement the contingency alternative instead of the selected remedy are:

* Failure to meet remediation standards;

* Failure to meet TCLP requirements;

* Inadequate space for the LTTD unit and to safely treat the excavated soils;

* Significant cost increase for thermal desorption which would exceed the cost of off-site disposal.

This alternative would involve the excavation and off-site disposal of soils exceeding the remediation standards. Soils failing toxicity characteristic leaching procedure (TCLP) test would be considered hazardous by characteristic and have to be treated at an off-site facility before disposed at a RCRA-permitted landfill. Soils passing the TCLP would be sent directly to a RCRA-permitted landfill. Composite samples would be collected from stockpiles and analyzed by the TCLP. The entire stockpile would then be disposed according to its composite TCLP analysis.

Confirmation sampling would be conducted to ensure that remediation standards are attained. Excavated areas would then be covered with clean fill and vegetated with a perennial grass.

The estimated cost for this estimate is $ 6,280,000. Table 16 shows a break-down of the costs associated with the contingency plan for the contaminated soils.

TABLE 16

COST FOR SOIL REMOVAL AND OFF-SITE DISPOSAL			
CAPITOL COSTS	UNITS	COST PER UNIT	COSTS ($)
Project Plans	1	40,000	40,000
Erosion Control	300	10	3,000
Mobilization	1	10,000	10,000
Residence Relocation	1	10,000	10,000
Excavation and Disposal			
Excavation	10,100	10	101,000
Transportation	13,130	30	393,900
Disposal	13,130	250	3,282,500
Verification	100	350	35,000
Backfill	13,130	10	131,130
Regrade/Reseed	4	1,500	6000
O&M COSTS			
Labor	16	40	640
Equipment	1	500	500
Analytics	30	350	10,500
Expenses	2	150	300
SUBTOTAL			4,024,470
Engineering (25 %)			1,006,117
Contingency (25 %)			1,257,647
TOTAL			6,288,234

10.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The selected Remedy will address contaminated media at the site by eliminating, to the extent practicable, the volume and migration of contaminants present. This action will remediate all areas of contamination at the site. EPA has identified the following remedial action objectives for the cleanup of the Potter's Pits site:

10.1 Contaminated Soil

Soils which pose a potential threat to groundwater will be excavated and thermally treated. Surface soils which contain zinc, lead and carcinogenic PAHs above the clean-up standards established to protect human health via direct contact will also be excavated and thermally treated.

10.2 Groundwater

The groundwater remediation is proposed to protect public health and the environment by controlling exposure to the contaminated groundwater and controlling migration of the contamination through groundwater pump and treat. Contaminated groundwater in the surficial aquifer will be extracted for treatment until groundwater is restored to drinking water quality. The groundwater usage will be restricted in these areas until groundwater clean-up standards have been achieved.

At this time it is assumed that the surficial aquifer is the only aquifer that is contaminated. During the Remedial Design, some or all of the monitoring wells (shallow and deep) will be resampled to determine if the contamination extends into the deeper aquifer. Additional wells may be needed to better define the vertical extent of contamination. At that time the decision will be made whether groundwater in the deep aquifer has also been contaminated in which case it may also need to be treated. The treatment of this deeper aquifer would be the same as outlined in this ROD; only the system itself may have to be modified. Additional extraction wells would have to be placed in the deeper aquifer.

11.0 STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedy for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy for the Potter's Pits site meets these statutory determinations.

11.1 Protection of Human Health and the Environment

The selected remedy will permanently treat the groundwater and soil and remove or minimize the potential risk associated with the wastes. Dermal, ingestion, and inhalation contact with site contaminants would be eliminated.

Potential short-term risks posed by the selected remedy or the contingency remedy would increase potential for erosion of affected materials by wind and rain during excavation and staging, would be controlled by standard enginnering practices, such as dust control and air monitoring. No unacceptable short-term risks or cross-media impacts will be caused by implementation of the selected remedy or the contingency remedy.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will be in full compliance with all applicable or relevant and appropriate chemical-, action-, and location-specific requiremnts (ARARs). A complete discussion of these ARARs which are to be attained is included in Section 7.1 of the ROD. This Section also describes the "To Be Considered" ARARs.

11.3 Cost-Effectiveness

Both the selected Remedy, GW-3 and SC-7, and the contingency remedy for soil, SC-3, were chosen because they provided the best balance among the criteria used to evaluate the alternatives considered in the detailed analysis. These alternatives were found to achieve both adequate protection of human health and the environment and are cost-effective when compared to other acceptable alternatives.

11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable (MEP)

The selected remedy represents the maximum extent to which permanent solutions and treatment can be practicably utilized for this action. Of the alternatives that are protective of human health and the environment and comply with ARARs, EPA and the State have determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness, implementability, and cost; State and community acceptance, and the statutory preference for treatment as a principal element.

11.5 Preference for Treatment as a Principal Element

The preference for treatment is satisfied by the use of thermal desorption to remove contamination from the soil at the site and the use of chemical and physical treatment of the contaminated groundwater at the site. The principal threats at the site will be mitigated by use of these treatment technologies.

12.0 EXPLANATION OF SIGNIFICANT DIFFERENCES

CERCLA Section 117(b) requires an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan. Below are the specific changes made in the ROD as well as the supporting rationale for making those changes. The Proposed Plan was disseminated to the public on April 30, 1992. Table 1 of the Proposed Plan, lists the maximum concentration detected and the clean-up standard associated with each soil contaminant of concern. Since issuance of the Proposed Plan, carcinogenic PAHs was added to the list of soil contaminants that will be cleaned up in the soil at the Potter's Pits site. Also the contingency alternative for soil remediation was changed from incineration to off-site disposal.

Carcinogenic PAHs was found in the risk assessment to have a risk of 4.64E-04 which is within in EPA's acceptable risk range of E-04 to E-06. Since Potter's Pits is in a residential community where people could potentially be on-site on a regular basis, it has been decided to add this contaminant as a chemical of concern. Therefore, this contaminant's clean-up standard will be applied to surface soils as it is a risk generated clean-up standard based on dermal contact.

The contingency alternative was changed from incineration as described in the Proposed Plan to off-site disposal. Since both alternatives achieved the same level of protection of human health and the environment, then a cost comparison of these two alternatives was done. The cost of incineration was estimated to be $ 12,400,000 versus the cost of off-site disposal at $ 6,280,000; therefore, off-site disposal is more economical. Secondly, if the installation of the Low Temperature Thermal Desorption Unit is not feasible due to limited space, then an incineration unit would also have the same problem.

APPENDIX I

Table 1

Summary Statistics for Groundwater
Area 1A

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/ℓ)						
Benzene	702	1,373	4,512	90	3,150	3 /5
Ethyl benzene	560	1,034	3,431	22	2,400	4 /5
Toluene	5,805	12,967	41,800	29,000	29,000	1 /5
Total xylenes	5,442	11,495	37,352	98	26,000	4/5
Semi-Volatiles (µg/ℓ)						
Acenaphthalene	7.9	4.8	21.1	3	13	3 /5
Dibenzofuran	6.2	1.3	9.7	7	8	2 /5
2,4-Dimethylphenol	28.1	51.4	170.7	120	120	1 /5
Fluoranthene	4.6	1.2	7.9	6	2.5	1 /5
Fluorene	6.6	2.1	12.3	7	10	2 /5
2-Methylnaphthalene	7.8	3.9	18.6	3	13	4 /5
Naphthalene	57.3	43.6	178.4	42	125	4 /5
Phenanthrene	8.5	4.7	21.4	11	16	2 /5
Pyrene	4.6	0.8	6.9	3.5	3.5	1 /5
Metals (µg/ℓ)						
Aluminum	13,820	17,440.7	62,235.4	5,250	45,000	5 /5
Barium	62	57.2	220.3	60	155	3 /5
Chromium (total)[1]	537	1,097.8	3,585	19	2,500	5 /5
Iron	25,200	15,340	67,785	14,500	51,000	5 /5
Lead	13	8	34	6	25	5 /5
Magnesium	3,390	3,990.7	14,468.1	1,200	10,500	5 /5
Manganese	78	91.2	331.6	22	240	5 /5
Nickel	38	30.2	121.4	21.3	78	3 /5
Potassium	2,150	1,975.2	7,633	1,400	5,350	3 /5
Sodium	64,860	125,887	41,6313	5,000	290,000	5 /5
Vanadium	25	26.7	99.3	12	71	4 /5
Zinc	25	8.2	47.8	16	37	5 /5

NOTE:

1 Measured total chromium is assumed to be 10% chromium VI and 90% chromium III.

POOR QUALITY
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Table 2

Summary Statistics for Groundwater
Area 1B

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/ℓ)						
Benzene	7.5	2.1	34.5	6	9	2 /2
Chlorobenzene	3.3	1.1	16.7	4	4	1 /2
Ethyl benzene	4	3.5	48.4	1	1	1 /2
Metals (µg/ℓ)						
Aluminum	7,200	8,202.4	111,420	1,400	13,000	2 /2
Barium	78	45.3	653	46	110	2 /2
Chromium[1]	165	205.1	2,770.5	20	310	2 /2
Iron	37,500	9,192.4	154,299	31,000	44,000	2 /2
Magnesium	2,900	141.4	4,696.9	2,800	3,000	2 /2
Manganese	35	0.7	43.5	34	35	2 /2
Potassium	1,725	1,520.3	21,041.7	2,800	2,800	1 /2
Sodium	37,500	12,020.8	190,237	29,000	46,000	2 /2
Vanadium	18	18.4	251.6	31	31	1 /2
Zinc	24	5	86.4	20	27	2 /2

NOTE:

1 Measured total chromium is assumed to be 10% chromium VI and 90% chromium III.

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Table 3

Summary statistics for Estimated Surface Water Concentrations

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation [1]	95% UCL [1]	Minimum Detected [1]	Maximum Detected [1]	Frequency of Detection [1]
Volatile Organics (µg/ℓ)						
Benzene	3.4	1.8	9.1	2	6	3 /4
Metals (µg/ℓ)						
Aluminum	2,865	2,790.1	11,743.2	700	6,600	4 /4
Barium	35	11.7	71.8	32	45	3 /4
Chromium [2]	14.1	7.5	38	15	21	3 /4
Lead	2.3	1.9	8.1	5	5	1 /4
Manganese	85	64.2	289.1	39	180	4 /4
Nickel	50.8	50.3	210.9	56	120	2 /4
Zinc	8.6	5.7	26.6	13	14	2 /4

Concentrations Assuming 75 Percent Dilution

	Mean	95% UCL	Maximum	Actual Surface Water Data Mean [3]
Volatile Organics (µg/ℓ)				
Benzene	0.84	2.27	1.5	<5
Metals (µg/ℓ)				
Aluminum	716.3	2935.8	1,650	283.8
Barium	8.6	18	11.3	<30
Chromium [2]	3.5	9.5	5.3	<7
Lead	0.6	2	1.3	<0.5
Manganese	21.3	72.3	45	15.8
Nickel	12.7	52.7	30	<27
Zinc	2.2	6.7	4	<20.

NOTES:

1 Based on analytical results for MW-102, MW-106, MW-206, and MW-207
2 Total chromium is assumed to be 10% chromium VI and 90% chromium III.
3 Appendix E

POOR QUALITY ORIGINAL

Table 4

Summary Statistics for Sediment[1]

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Metals (mg/kg)						
Aluminum	1,350	310.9	2,339.3	1,000	1,700	4 /4
Chromium	1.78	0.6	3.5	2.6	2.6	1 /4
Iron	1,682.5	860.9	4,422	880	2,800	4 /4
Lead	1.09	0.6	3	1.1	1.9	3 /4
Magnesium	32.6	6.9	54.7	25	39	4 /4
Manganese	4.1	1.9	10	3	7	4 /4
Vanadium	1.5	0.6	3.3	1	2	1 /4
Zinc	4.35	1.5	9	2.9	5.9	4 /4

NOTE:

1 Results from SD-1 were not included in summary statistics as this was the upgradient sample.

Table 5

Summary Statistics for Surface Soils
(0 to 3-foot depth)
Area 1A

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/kg)						
Benzene	3,461	13,032	31,089	730	730	1 /17
Bromomethane	1,435	3,736	9,356	3	3	1 /17
Ethyl benzene	5,884	18,945	46,068	240	78,500	7 /17
Toluene	3,559	13,017	31,154	3	54,000	8 /17
Total xylene	79,532	257,784	626,034	0.26	1,070,000	10 /17
Pesticides (µg/kg)						
Delta BHC	11	20	53	87.5	87.5	1 /17
Dieldrin	19	25	72	21	21	1 /17
Semivolatiles (µg/kg)						
2-Methylnaphthalene	3,061	9,057	22,261	66	38,000	8 /17
Acenaphthene	2,049	5,990	14,749	69	4,200	6 /17
Anthracene	4,602	10,096	26,004	290	36,000	7 /17
Benzo(a)anthracene	1,855	5,970	14,512	180	1,400	3 /17
Benzo(a)pyrene	1,816	5,975	14,483	210	600	2 /17
Benzo(b and/or k)fluoranthene	1,867	5,967	14,517	280	1,400	2 /17
Benzo(g,h,i)perylene	1,802	5,979	14,476	190	190	1 /17
Chrysene	1,863	5,970	14,518	100	1,500	4 /17
Dibenzofuran	2,102	5,967	14,752	58	3,700	5 /17
Fluoranthene	2,377	6,201	15,523	230	9,100	5 /17
Fluorene	1,625	3,292	8,605	43	13,350	7 /17
Indeno(1,2,3-cd)pyrene	1,804	5,978	14,477	230	230	1 /17
Naphthalene	4,433	13,879	33,857	114	58,000	9 /17
Phenanthrene	3,404	6,948	18,135	210	16,000	6 /17
Phenol	1,802	5,978	14,476	395	395	1 /17
Pyrene	2,087	5,985	14,775	49	4,300	6 /17
Metals (mg/kg)						
Aluminum	4,630.88	3,694.73	12,463.72	1,800	13,000	17 /17
Arsenic	0.69	0.77	2.32	3.4	3.4	1 /17
Barium	13.69	22.2	60.76	3.5	90.5	7 /17
Beryllium	0.82	2.05	5.17	0.11	8.2	3 /17
Cadmium	0.53	0.59	1.78	0.382	0.382	1 /17
Calcium	2,966.54	8,337.8	20,642.68	25	35,000	15 /17
Chromium[1]	6.45	4.1	15.13	1.6	14	17 /17
Cobalt	1.21	0.38	2.02	0.7	1.4	1 /17
Copper	8.71	12.69	35.62	0.75	43	4 /17
Iron	55	13,610.47	34,381.85	410	58,000	17 /17
Lead	88.71	300.38	722.51	2.7	1,250	17 /17
Magnesium	237.68	441.47	1,173.59	56	1,900	13 /17
Manganese	10.67	10.72	33.39	2	48	17 /17
Nickel	2.87	1.19	5.39	3	5.55	4 /17
Potassium	157.5	93.86	356.48	120	440	3 /17
Sodium	72.57	79.38	240.87	110	250	2 /17
Thallium	0.22	0.12	0.48	0.51	0.51	1 /17
Vanadium	9.	7.28	26.42	3	29	16 /17
Zinc	32.28	66.	172.2	5.4	265	8 /17

NOTE:

1 Total chromium is assumed to be 10% chromium VI and 90% chromium III.

Table 6

Summary Statistics for Surface Soils
(0 to 3-foot depth)
Area 18

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/kg)						
Benzene	113	328	828	74	96	2 /13
Carbon Disulfide	186	336	918	1	1	1 /13
Ethylbenzene	665	2,354	5,795	24	8,500	3 /13
m- and/or p-Xylene				75	110	2 /6
o-Xylene				64	64	1 /6
Toluene	550	1,938	4,773	2	2	1 /13
Total xylenes	6,644	23,843	58,599	139	86,000	3 /13
Pesticides (µg/kg)						
4,4'-DDD	27	20	71	42	42	2 /13
4,4'-DDT	43	53	158	110	190	2 /13
Alpha chlordane	62	97	272	370	370	1 /9
Dieldrin	24	16	60	35	35	1 /13
Semivolatiles (µg/kg)						
Acenaphthene	575	318	1,268	180	180	1 /13
Anthracene	580	311	1,259	250	250	1 /13
Fluorene	576	315	1,263	220	220	1 /13
Naphthalene	869	1,303	3,708	230	5,100	2 /13
Phenanthrene	659	464	1,670	1,900	1,900	1 /13
Phenol	581	310	1,258	260	260	1 /13
Metals (mg/kg)						
Aluminum	5,913.85	5,710.38	18,356.77	0	23,000	13/13
Barium	32.54	51.42	144.58	1.9	150	10/13
Beryllium	0.35	0.33	1.06	0.25	0.6	2 /13
Cadmium	0.74	0.92	2.74	3.6	3.6	1 /13
Calcium	5,196.15	12,786	33,056.85	60	47,000	9 /13
Chromium[1]	27.9	56.79	151.64	2.3	170	12/13
Cobalt	5.69	11.98	31.79	23	40	2 /13
Copper	22.	45.85	121.91	2.2	160	3 /13
Iron	1,695.15	1,656.11	5,303.82	27	5,800	13/13
Lead	58.96	101.53	280.17	2.6	250	10/13
Magnesium	108.77	136.84	406.94	50	530	8 /13
Manganese	57.84	143.91	371.42	1.9	520	13/13
Mercury	0.19	0.38	1	0.34	1.4	2 /13
Nickel	3.49	3.1	10.25	2	2	1 /13
Silver	1.94	5.13	13.13	19	19	1 /13
Strontium	3.83	4.32	13.25	1	11	4 /4
Titanium	65.5	23.29	116.25	38	100	4 /4
Vanadium	13.15	15.49	46.80	2.4	54	11/13
Yytrium	1.9	2.12	6.53	1.2	5.4	2 /4
Zinc	287.03	909.67	2,269.19	1.2	3,300	6 /13

NOTE:

[1] Total chromium is assumed to be 10% chromium VI and 90% chromium III.

Table 7

Summary Statistics for Surface Soils
Forest/Wetland Area

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/kg)						
Acetone	164.86	415.07	1,089.65	1,400	1,400	1 /11
Styrene	4.23	1.81	8.26	7	7	1 /11
Total xylenes	15.59	37.98	100.20	3.5	130	2 /11
Semivolatiles (µg/kg)						
Benzo(a)pyrene	457.05	177.25	851.95	138	440	2 /11
Bis(2-ethylhexyl)phthalate	1,332.73	2,879.34	7,767.89	1,000	10,000	1 /11
Hexachlorobenzene	.520.45	224.08	1,019.71	980	980	1 /11
Metals (mg/kg)						
Aluminum	7,481.82	5,351.37	19,404.67	950	18,000	11/11
Arsenic	0.93	0.96	3.07	3.6	3.6	1 /11
Barium	32.38	33.61	107.27	11	98	7 /11
Calcium	1,961.14	3,749.54	10,315.10	230	13,000	9 /11
Chromium[1]	8.82	8.05	26.76	3.1	31	11/11
Cobalt	2.52	1.71	6.32	7	7	1 /11
Copper	4.76	8.47	23.63	3.2	29	2 /11
Cyanide	0.9	142	1.85	1.9	1.9	1 /11
Iron	9,781.82	11,462.71	35,320.73	400	36,000	11/11
Lead	20.65	24.57	75.39	4	86	11/11
Magnesium	178.82	134.60	478.71	50	480	11/11
Manganese	18.63	20.99	65.39	3.8	65	11/11
Mercury	0.80	2.36	6.05	7.9	7.9	1 /11
Selenium	0.99	0.91	3.01	2.7	2.8	2 /11
Vanadium	13.93	9.78	35.72	5.8	37	10/11
Zinc	15.02	22.99	66.25	53	68	2 /11

NOTE:

1 Total chromium is assumed to be 10% chromium VI and 90% chromium III.

Table 8

Summary Statistics for Subsurface Soils
Area 1A

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/kg)						
Acetone	4,209.58	5,746.6	16,857.86	2,000	2,500	2 /12
Benzene	2,973.96	4,143.56	12,093.94	37	7,000	4 /12
Ethyl benzene	14,809.21	27,218.79	74,717.76	1	84,000	8 /12
Toluene	14,540.46	2,575.43	71,492.27	120	81,000	5 /12
Total xylenes	136,432.3	222,334	625,789.3	1	580,000	12/12
Pesticides (µg/kg)						
Dieldrin	14.17	5.5	26.26	12	12	1 /12
Semi-volatiles (µg/kg)						
Acenaphthene	4,464.58	10,650.15	27,905.57	110	370,000	3 /12
Anthracene	2,082.50	3,800.29	10,446.94	330	9,900	3 /12
Benzo(a)anthracene	1,910.83	3,281.36	9,133.1	170	6,700	2 /12
Benzo(a)pyrene	2,343.50	4,215.09	11,620.91	62	62	1 /12
Benzo(b and/or k)fluoranthene	2,350.83	4,210.83	11,618.88	150	150	1 /12
Bis(2-ethylhexyl)phthalate	2,947.50	4,417.3	12,669.98	7,600	7,600	1 /12
Chrysene	2,004.17	3,437.93	9,571.04	190	7,800	2 /12
Dibenzofuran	3,953.75	9,000.09	23,762.95	170	31,000	3 /12
Fluoranthene	5,567.75	14,290.37	37,020.85	98	50,000	3 /12
Fluorene	3,446.42	7,670.25	20,328.63	62	26,000	5 /12
2-Methylnaphthalene	4,994.58	8,941.97	2,467.85	150	28,000	6 /12
Naphthalene	8,233.75	15,396.94	42,122.41	410	50,000	6 /12
Phenanthrene	10,676.58	31,413.2	79,820.03	180	110,000	4 /12
Pyrene	3,137.50	6,603.14	17,671.01	690	22,000	3 /12
Metals (mg/kg)						
Aluminum	5,625	5,789	18,367	330	19,000	12/12
Arsenic	1.12	1.9	5.31	7.1	7.1	1 /12
Barium	11.13	15.75	45.79	1.9	48	5 /12
Beryllium	3.4	10.28	26.03	0.12	36	2 /12
Calcium	2,036.17	4,795.46	12,588.97	260	17,000	6 /12
Chromium[1]	9.63	8.41	28.13	1.8	23	10/12
Cobalt	1.63	1.5	4.93	3.2	5.5	2 /12

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Table 9

Summary Statistics for Subsurface Soils
Area 1A

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Copper	8.77	8.64	27.79	4.7	20	5 /12
Iron	2,989.17	3,060.39	9,725.09	140	10,000	12/12
Lead	23.45	31.73	93.28	1.1	76	12/12
Magnesium	310.75	345.90	1,072.09	14	1,000	9 /12
Manganese	21.52	26.16	79.08	2.8	83	11/12
Nickel	4.21	2.68	10.11	2.1	8	6 /12
Potassium	312.08	338.41	1,056.92	560	1,100	3 /12
Vanadium	15.02	13.8	45.6	4.6	39	10/12
Zinc	15.26	15.83	50.09	2.5	52	9 /12

NOTE:

1 Total chromium is assumed to be 10% chromium VI and 90% chromium III.

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Table 10

Summary Statistics for Subsurface Soils
Area 1B

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (µg/kg)						
Benzene	674.89	1,773.19	4,763.87	12	37	2 /9
Ethyl benzene	1,103.11	2,155	6,072.55	33	5,700	4 /9
Methyl isobutyl ketone	6,317.72	17,810.60	47,388.98	2,800	2,800	1 /9
Toluene	1,670.44	3,360.03	9,418.68	3	9,300	4 /9
m- and/or p-Xylene	2,224.94	6,665.65	17,595.94	20,000	20,000	1 /2
o-Xylene	441.61	1,315.67	3,475.55	3,950	3,950	1 /2
Total xylenes	14,423.33	28,814.66	80,869.93	5	75,000	6 /9
Pesticides (µg/kg)						
Endrin ketone	27	33.96	105.3	100	100	1 /9
Methoxychlor	81.28	73.08	249.8	270	270	1 /9
Semi-volatiles (µg/kg)						
2-Methylnaphthalene	371.67	235.66	915.11	515	750	2 /9
Naphthalene	586.67	602.31	1,975.59	1,500	1,700	2 /9
Phenanthrene	327.67	259.36	925.82	69	69	1 /9
Metals (mg/kg)						
Aluminum	3,329.44	3,167.53	10,633.78	620	8,600	9 /9
Barium	7.14	11	32.51	1	36	7 /9
Calcium	421.67	835.97	2,349.41	240	2,600	3 /9
Chromium[1]	5.18	4.27	15.06	1.2	13	8 /9
Iron	2,545	2,615.04	8,575.26	380	6,900	9 /9
Lead	3.99	4.26	13.82	2.9	15	6 /9
Magnesium	124.22	199.16	583.43	24	640	8 /9
Manganese	6.33	12.28	34.65	1.8	36	8 /9
Nickel	2.69	2.09	7.52	8	8	1 /9
Strontium	0.88	0.53	7.61			1 /2
Titanium	25.75	18.03	254.85			2 /2
Vanadium	7.17	6.69	29.52	1.3	32	8 /8
Zinc	3.73	3.48	11.76	9.55	9.55	1 /9

NOTE:

1 Total chromium is assumed to be 10% chromium VI and 90% chromium III.

Table 11

Summary Statistics for Indoor Air

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Compound	Arithmetic Mean	Standard Deviation	95% UCL	Minimum Detected	Maximum Detected	Frequency of Detection
Volatile Organics (ppb/v)						
Chloromethane	3.87	7	21.88	16	16	1 /4
Methylene chloride	2.92	4.67	14.93	11	11	1 /4
1,1,1-Trichloroethane	0.97	0.33	1.81	1.5	1.5	1 /4

NOTE:

PPAR-03 not included in statistical summary as this sample represents background.

APPENDIX II

Table 1

Dermal, Ingestion, and Inhalation Exposure to Groundwater Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Age	Adult	
Average Body Weight	70	kg
Average Surface Area Exposed (washing)	2,300	cm^2 (1)
Average Surface Area Exposed (showering)	18,200	cm^2 (2)
Incidental Ingestion from Washing	0	ℓ
Ingestion as Drinking Water	2	ℓ/day
Inhalation Rate	1.3	m^3/hr
Frequency of Event	365	events/year
Duration of Event (washing)	2	hours
Duration of Event (showering)	0.2	hours
Duration of Exposure	30	years (3)

NOTES:

EPA (1989b)
1. Hands and Forearms, Adult
2. Total body surface
3. EPA, (1989a)

Table 2

Ingestion of Produce Exposure
Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Age	Adult	
Average Body Weight	70	kg
Ingestion Rate, Root & Leafy Crops	11.9	g, dry wt/day [1]
Other Crops	198.1	g, dry wt/day [1]
Fraction Homegrown, Root & Leafy Crops	40.5	percent [1]
Other Crops	32.9	percent [1]
Exposure Frequency	365	days/year
Exposure Duration	30	years [2]
Body Weight	70	kg
Life Expectancy	75	years

NOTES:

1. EPA, 1990.
2. EPA, 1989a.

Table 3

Ingestion and Dermal Exposure to Surface Water and Sediment Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Age	6-15	years
Average Body Weight	37	kg
Average Surface Area Exposed	6,500	cm^2 (1)
Soil Contacted	1.5	mg/cm^2
Incidental Ingestion of Sediment	100	mg/event
Incidental Ingestion of Water	1.0	mℓ/event
Frequency of Events	72	events/year [(2)]
Duration of Event	2	hours
Total Exposure Duration	9	years

NOTES:

Reference: EPA, 1989 a.b.

1. Arithmetic mean of arms, hands, legs and feet of child resident.
2. Assumes two visits per week to Chinnis Branch for the nine months of mild weather.

Table 4

Ingestion of Fish
Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Age	Adult	
Average Body Weight	70	kg
Consumption Rate	6.5	g/day
Percent Contribution from Site	10	percent
Frequency of Exposure	365	days/year
Exposure Duration	30	years

NOTE:

Reference: U.S. EPA, 1989a.

Table 5

Ingestion and Dermal Exposure to Soils
Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

	Resident		Septic System Installer	
Age	1-75	years	Adult	
Average Body Weight	70	kg	70	kg
Average Surface Area[1]	3,000	cm^2	4,000	cm^2
Soil Contacted	1.5	mg/cm^2	1.5	mg/cm^2
Incidental Ingestion	100	mg/event	100	mg/event
Frequency of Exposure[2]				
Surface soils				
Current Residence	260	events/yr	-	
Future Residence	260	events/yr	-	
Forest	50	events/yr	-	
Soils < 3′ deep	5	events/yr	-	
Soils > 3′ deep	5	events/yr	-	
Total Exposure Duration[3]	30	yrs	5	yrs

NOTES:

References: USEPA 1989 b. Exposure Factors Handbook.
1. Arithmetic mean used for: Resident men's and women's arms and legs. Septic System Installer men's forearms, hands and lower legs.
2. Nine months per year of mild weather in eastern North Carolina is assumed. The arithmetic mean of outdoor cleaning time is assumed to involve soil work at less than 3-foot depth.
3. Length of residence is an upper bound estimate. Septic System Installer exposure assumes that the same worker annually installs a system in Area 1A and Area 1B.

POOR QUALITY ORIGINAL

Table 6

Inhalation of Indoor Air
Exposure Parameters

Potter's Septic Tank Pits Site
Sandy Creek, North Carolina

Age	Adult
Average Body Weight	70 kg
Inhalation Rate	1.1 m^3/hour
Exposure Time	16 hr/day
Frequency of Exposure	365 days/year
Exposure Duration	30 years

NOTE

References: U.S. EPA, 1989a,b.

APPENDIX III

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

July 29, 1992

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

Subject: Conditional Concurrence with the Record of Decision
Potters Septic Tank Service Pits
Maco, Brunswick County, NC

Dear Mr. Tidwell:

The State of North Carolina has completed review of the attached Record of Decision and concurs with the selected remedy subject to the following conditions.

1. All surface and subsurface soils must achieve cleanup levels based on not exceeding a collective excess carcinogenic risk of 1×10^{-6} or a Hazard Index of 1. If, after remediation is complete, the total residual risk level exceeds 1×10^{-6}, the site will require deed recordation/restriction to document the presence of residual contamination and possibly limit the future use of the property as specified in NCGS 130A-310.8.

2. State concurrence on this Record of Decision and the selected remedy for the site is based solely on the information contained in the Record of Decision. Should the State receive new or additional information which significantly affects the conclusions or remedy selection contained in the Record of Decision, it may modify or withdraw this concurrence with written notice to EPA Region IV.

3. State concurrence on this Record of Decision in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the clean up of the site. The State reserves the right to review, comment, and make independent assessment of all future work relating to this site.

4. A proposal of cleanup levels from groundwater should not exceed the North Carolina NCAC Title 15A Subchapter 2L groundwater standards unless a variance is obtained from the Division of Environmental Management. You may direct your requests for a variance to Mr. Preston Howard, Director, Division of Environmental Management, PO Box 27687, Raleigh, NC 27611. I have spoken with Bill Jeter with the Division of Environmental Management regarding using the MCL instead of the 2L groundwater standard for ethylbenzene. Mr. Jeter felt that there would not likely be a problem in receiving a variance from the ethylbenzene standard because the standard is based on taste.

The State of North Carolina appreciates the opportunity to comment on the Revised Draft Record of Decision for the subject site, and we look forward to working with EPA on the final remedy.

Sincerely,

Charlotte Jesneck

Charlotte Jesneck, Head
Inactive Hazardous Sites Branch
NC Superfund Section

cc: Michael Kelly
Curt Fehn
Darcy Duin

Attachment

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET. N.E.
ATLANTA. GEORGIA 30365

4WD-NSRB

July 30, 1992

Charlotte Jesneck
North Carolina Department of Environment,
Health, and Natural Resources
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

RE: Response to Conditions Included in North Carolina's Conditional Concurrence for the Potter's Septic Tank Pits Superfund Site Record of Decision

Dear Ms. Jesneck:

EPA-Region IV appreciates the State's conditional concurrence on the Record of Decision (ROD) for the Potter's Septic Tank Service Pits Superfund site located in Sandy Creek, North Carolina. For the record, EPA would like to respond to the conditions formulated by North Carolina Department of Environment, Health and Natural Resources (NCDEHNR) - Superfund Section and specified in your July 29, 1992 correspondence to Mr. Greer Tidwell. Your July 29, 1992 letter, along with this response, will be included in Appendix I of the ROD. These letters should stand as official documentation that EPA-Region IV and NCDEHNR-Superfund Section have agreed on the preferred alternatives at this point in time.

Of the four conditions expressed, only the first condition requires a response from the Agency. In response to NCDEHNR-Superfund Section first condition, the State may in the future put in place, pursuant to State law (G.S. 130A-310.8), a deed recordation / restriction to document the presence of residual contamination which may limit the future use of the property. As stated, this would be done after the completion of the site's remediation.

Please contact me at (404) 347-7791 if you have any questions or comments regarding this matter.

Sincerely,

Darcy Duin
Remedial Project Manager

cc: Curt Fehn, EPA