0305- 04/30/90-01982

Document Control No. 4400-03-AADX

DRAFT WORK PLAN

VOLUME 1 - TECHNICAL APPROACH

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT THE
ABC ONE-HOUR CLEANERS SITE
JACKSONVILLE, NORTH CAROLINA

Work Assignment No. 03-4L9E

April 30, 1990

REGION

IV

Remedial Planning Activities at Selected Uncontrolled Hazardous Substance Disposal Sites

U.S. EPA Contract No. 68-W9-0057

Roy F. Weston, Inc.
6021 Live Oak Parkway
Norcross, GA 30093

WESTON
MANAGERS DESIGNERS/CONSULTANTS.
6021 LIVE OAK PARKWAY
NORCROSS, GA 30093
PHONE: (404) 448-0644

30 April 1990

Mr. John S. Nohrstedt
Remedial Project Manager
U.S. EPA Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

SUBJECT: ABC One Hour Cleaners Site,
Jacksonville, North Carolina
Work Assignment No. 03-4L-9E
Draft RI/FS Work Plan
DOCUMENT CONTROL NUMBER: 4400-03-AADX

Dear Mr. Nohrstedt:

Enclosed is WESTON's Draft RI/FS Work Plan for the subject project submitted in accordance with Task 3 of the project Statement of Work and the approved Work Plan Memorandum for the project. The Draft Work Plan consists of Volume 1, Technical Approach and Volume 2, Cost Proposal. Volume 1 presents our approach for conducting the following SOW tasks:

- Remedial Investigation:
  - Task 2, Community Relations: providing community relations support as needed.
  - Task 4, Site Investigation: implementation of the RI field work included in the Work Plan.
  - Task 5, Preliminary Remedial Technologies, and Task 6, Site Investigation Analysis, per the project SOW.
  - Task 7, Reporting Procedures (divided as we have discussed into Task 7A, RI Report, and Task 7B, Monthly Progress Reports and Project Management) per the project SOW.
- Feasibility Study:
  - Tasks 1 through 5 per the project SOW.

Work not addressed in the draft Work Plan includes the following:

- Remedial Investigation:
  - Task 0, Work Plan Memorandum: all work was previously completed.
  - Task 1, Review of Existing Data and Description of Current Activities: all work was completed concurrent with the preparation of the draft Work Plan as part of work previously authorized.
  - Task 2, Community Relations: the draft Community Relations Plan was prepared concurrent with this draft Work Plan. The Final Community Relations Plan will be prepared as part of work previously authorized.
  - Task 3, Work Plan Development: the draft Work Plan is being submitted herein. The final Work Plan will be prepared as part of work previously authorized.
  - Task 8, Post Screening Field Investigation: no treatability studies are proposed at this time and are not warranted based on existing information.
  - Task 9, Additional Requirements: EPA has not requested additional requirements under this project.
- Feasibility Study:
  - Task 6, Conceptual Design: the need for and nature of the conceptual design are highly uncertain at this time because of the limited data on the site.
  - Task 7, Final Report: the SOW calls for the final report to incorporate the conceptual design; the scope of the final report is therefore uncertain at this time.

We recommend that EPA defer inclusion of the conceptual design, and therefore, the final FS report. The need for and potential scale of remediation should become apparent during the site RI, at which time scoping of the conceptual design and final FS report efforts will be more meaningful.

As you are aware, the Work Plan has been prepared based upon a limited amount of data. Site-specific data has not been collected since 1985-86, and as a result of this, WESTON has proposed several initial field activities for on-site investigation. Additional field activities may be conducted during the RI depending on the findings of the initial field work.

We have included our assumptions inherent to estimating the costs for conducting the RI/FS. However, as the RI/FS process progresses, the cost estimates will be modified as more data become available. WESTON will keep you apprised of our findings and any anticipated changes in the project scope.

Our proposed site investigation plans include the use of an emerging technology, called "direct-push" technology (DPT), for collecting discrete groundwater samples without drilling or installing monitoring wells. Our objective in using DPT is to obtain areally and vertically extensive information on the distribution of contaminants in groundwater. This may be accomplished in a relatively short period of time at a cost substantially less than the cost of a comparable monitoring well program. The information obtained will be used to site monitoring wells for the level of quality control needed to support risk assessment and possible litigation or cost recovery actions. DPT is gaining wide acceptance within regulatory agencies, including EPA Region IV and the North Carolina Department of Environment, Health, and Natural Resources. We will be providing technical literature on DPT to you under separate cover.

Our schedule proposed for the RI/FS calls for conducting selected project activities concurrently to the extent feasible. WESTON is sensitive to EPA's desire to proceed as rapidly as possible with the process to obtain a record of decision for the site. Many of the field activities are scheduled to be conducted concurrently, and preparation of the RI report will begin while field activities are in progress and during the period of CLP sample analysis.

In addition, our schedule calls for the FS to begin during the site investigation analysis and risk assessment, at which time preliminary redefinition of the site and the site problems will have occurred. Because the SOW calls for no deliverables for Task 1 through 4 of the FS (also, WESTON has initiated none), we will be able to proceed directly from one FS task to the next with informal communication with EPA of our findings and interim decisions. We have, however, scheduled a two-week EPA review period between completion of the initial screening of alternatives (FS Task 4) and beginning evaluation of alternatives (FS Task 5) to ensure that EPA concurs with the alternatives that have been selected for detailed analysis.

We look forward to reviewing the draft Work Plan with you and to preparing the final version. Please call Kevin Boyer at 919/832-7043 or Michael Foulke at 404/448-0644 if you have any questions.

Sincerely,

ROY F. WESTON, INC.

Kevin R. Boyer, P.E.
Site Manager

Michael B. Foulke
Program Manager

KRB:MBF:bk

Enclosure

cc: Keith Mills, U.S. EPA
Charles Swan, U.S. EPA

DRAFT WORK PLAN

VOLUME 1 - TECHNICAL APPROACH

ABC ONE-HOUR CLEANERS SITE
JACKSONVILLE, NORTH CAROLINA

U.S. EPA Contract No. 68-W9-0057
Work Assignment No. 03-4L-9E

Document Control No. 4400-03-AADX

April 30, 1990

Prepared by: Kevin R. Boyer, P.E. Date: 4/30/90
Kevin R. Boyer, P.E.
WESTON Work Assignment Manager

Approved by: Michael B. Foulke Date: 4/30/90
Michael B. Foulke
WESTON Region IV Program Manager

Approved by: ____________________ Date: ________
John S. Nohrstedt
U.S. EPA Remedial Project Manager

Approved by: ____________________ Date: ________
Charles E. Swan
U.S. EPA Regional Project Officer

Prepared by:
Roy F. Weston, Inc.
6021 Live Oak Parkway
Norcross, Georgia 30093

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

LIST OF FIGURES

LIST OF TABLES

Section 1

1.0 INTRODUCTION

Roy F. Weston, Inc. (WESTON) is submitting this Work Plan to the U.S. Environmental Protection Agency (EPA), Region IV, for the ABC One-Hour Cleaners Site located in Jacksonville, North Carolina. The Work Plan was prepared under Work Assignment No. 03-4L-9E of Contract No. 68-W9-0057 between EPA and WESTON and in accordance with the Work Plan Memorandum for the site dated February 16, 1990. Upon approval of the Work Plan, WESTON is prepared to complete the described tasks.

This Work Plan presents the objectives, overall scope and strategy, estimated budget, and schedule for conducting field activities and engineering evaluations under a Remedial Investigation and Feasibility Study (RI/FS) for the site. The ultimate purpose of the RI/FS is to provide and evaluate information to support EPA's selection of a remedial action alternative that will eliminate or sufficiently reduce the risk posed by the site to public health and to the environment. Field information will be collected under the RI and evaluated under a risk assessment. Remedial action alternatives will be identified and evaluated under the FS.

The ABC One-Hour Cleaners Site RI/FS will be conducted in accordance with the requirements of the National Contingency Plan (NCP) as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA) and "EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final" (October 1988).

This Work Plan contains six major sections:

- Section 1.0, Introduction.
- Section 2.0, Site Background and Summary of Existing Data, summarizes the existing situation and presents WESTON's understanding of the site and the problems it poses.
- Section 3.0, Scoping of the Remedial Investigation/ Feasibility Study, presents a preliminary assessment of risks, identifies potential remedial action alternatives, and identifies preliminary applicable or relevant and appropriate requirements (ARARs).
- Sections 4.0 and 5.0 present task plans for the RI and FS, respectively.

- Section 6.0, Project Management, presents the anticipated project organization and project schedule.

The estimated budget for implementing the work described in the Work Plan is provided in a separate volume. The Community Relations Plan (CRP) also is provided as a separate volume.

The detailed approach to the field investigation will be presented separately in the Project Operations Plan (POP). The POP consists of a Field Sampling and Analysis Plan (FSAP), a Site Management Plan (SMP), and a Site Health and Safety Plan (HASP).

Section 2

2.0 SITE BACKGROUND AND SUMMARY OF EXISTING DATA

2.1 SITE LOCATION

ABC One-Hour Cleaners (ABC) is located at 2127 Lejeune Boulevard, Jacksonville, Onslow County, North Carolina (Figure 2-1). The dry cleaning facility site encompasses an area of approximately one acre. The active dry cleaning establishment, which consists of three buildings joined to form one complex, is located in the southern part of this property. The ABC facility is located across Lejeune Boulevard from the Camp Lejeune Marine Corps Base (Base) as shown in Figure 2-2.

2.2 SITE HISTORY AND STATUS

The ABC dry cleaning facility has been operating since 1954 (McMorris, 1987). Tetrachloroethylene (PCE) has been used at the facility to dry clean clothes since operation began. The solvent is presently stored in a 250-gallon above-ground storage tank in the rear building of the complex. Spent PCE is reclaimed through a filtration-distillation process in the building. Still bottoms generated from the recycling process are the only known hazardous wastes generated at the site. The dry still bottoms, which consisted of powder residues from ABC's filtering operations, were placed in the dirt drive west of the building complex, and disposed on-site by backfilling potholes in the parking lot. (Dunn, H. Glenn, January 18, 1989). Reportedly, all spent PCE is presently recycled on site. The still bottoms have been transported off-site for disposal since 1985 by Safety-Kleen, Inc., a hazardous waste disposal contractor (Dunn, H. Glenn, April 4, 1989).

A septic tank soil absorption system is located in the rear of the building complex. The septic system consists of an underground concrete tank with a concrete lid and a pipe of unknown length that discharges into the subsurface soil. The septic system is located within four feet (ft) of the PCE storage tank. The following information is quoted from correspondence from H. Glenn Dunn, Poyner & Spruill, dated April 4, 1989, to Ms. Joyce Catrett, EPA, Region IV:

- "The septic tank used by ABC was in the original building when it was constructed in the 1940's. ABC did not begin occupying the premises until 1954."

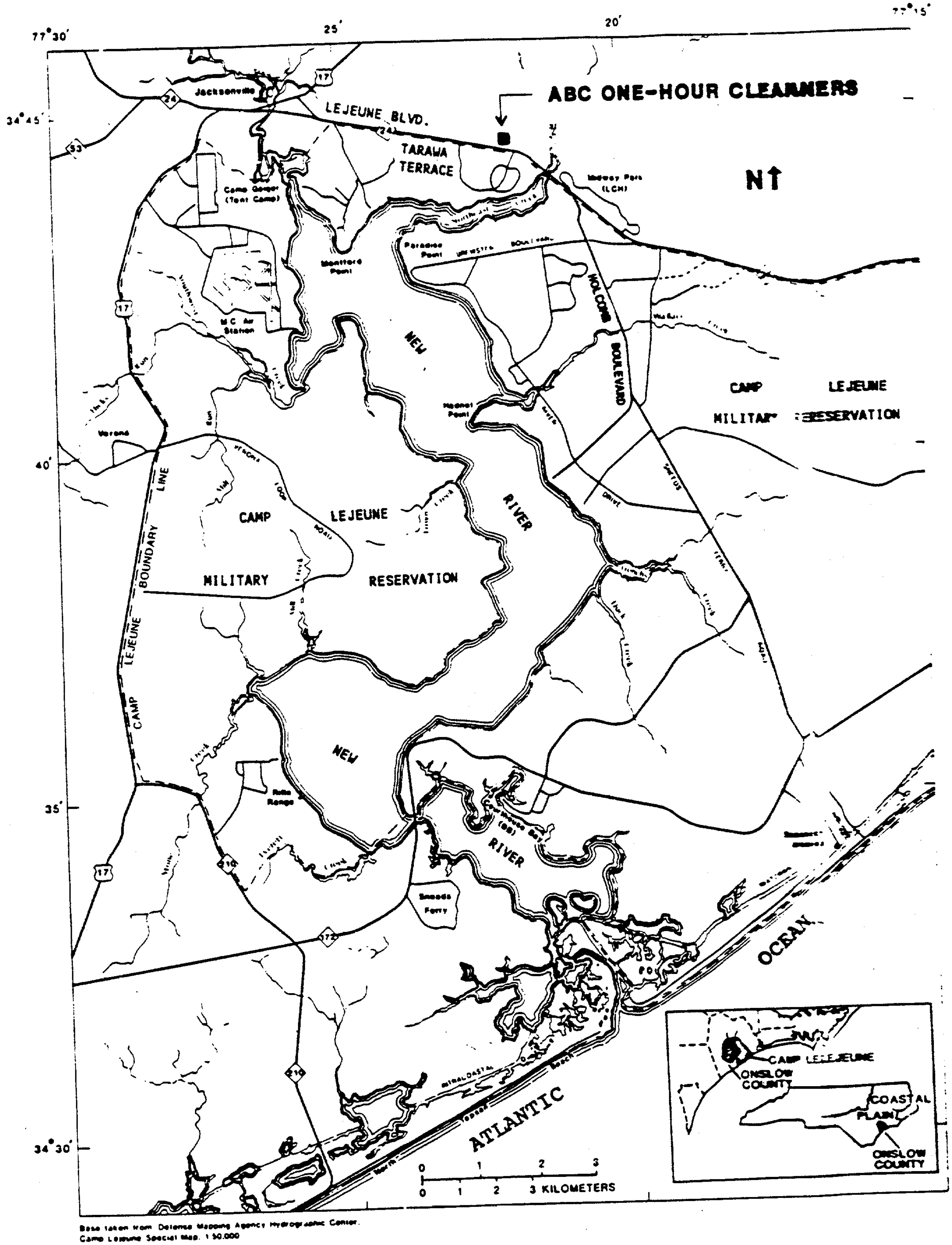

Figure 2-1

Site Location Map
(Modified from Harned et al., 1989)

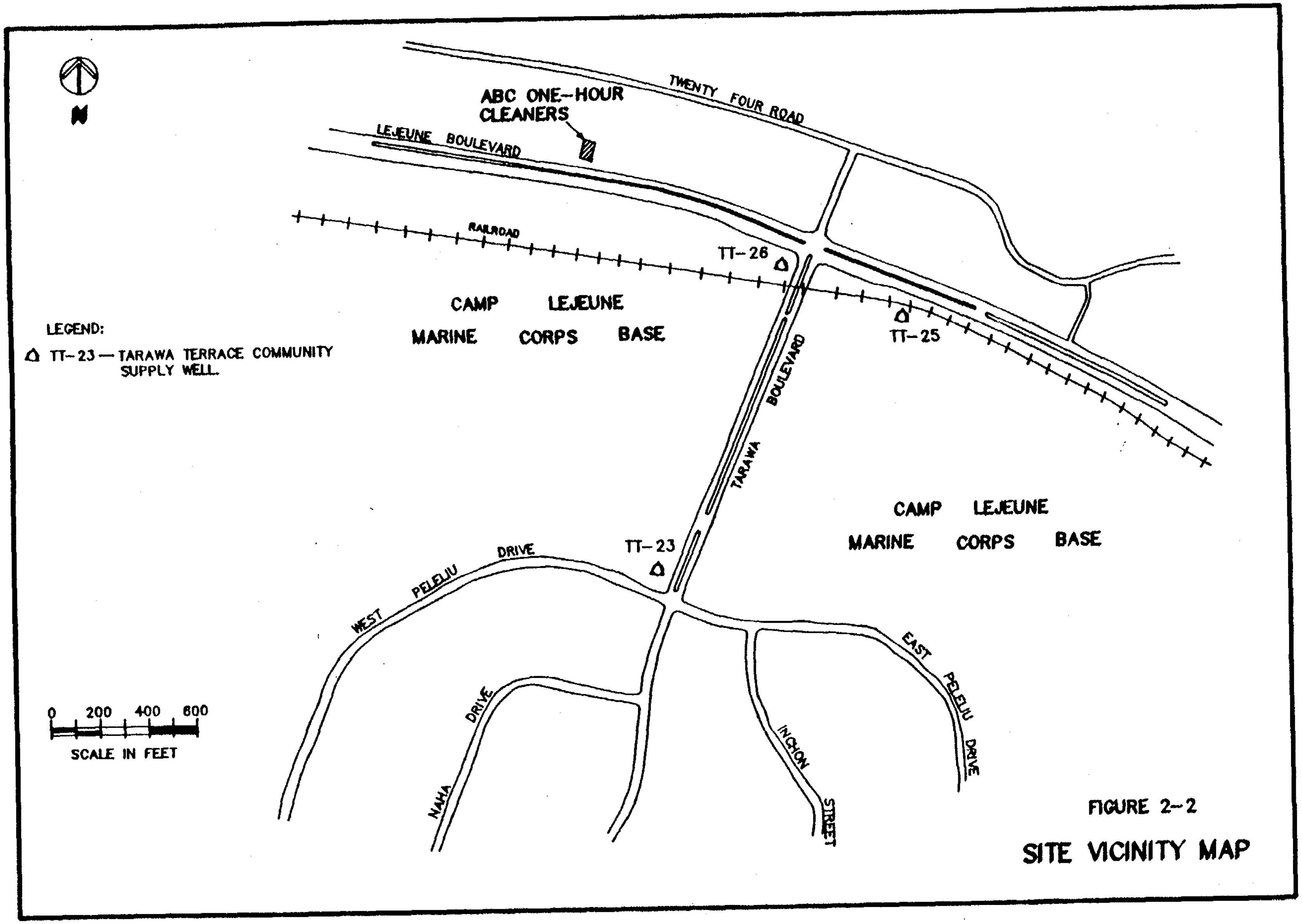

FIGURE 2-2

SITE VICINITY MAP

- "In the 1960's, ABC installed a floor drain and tied its wastewater discharge, except for its lavatories, into Weyerhauser Properties' water and sewer system."

- "ABC's lavatories remained tied into the septic tank until approximately 1985, at which time they were also tied into the Weyerhauser system."

- "ABC believes that state authorities were aware of the presence of the septic tank and ABC's tie in with the Weyerhauser system."

- "ABC has no further information on the location, installation, and connection of the septic tank or floor drain."

In July 1984, as part of a routine water quality evaluation, the Base collected groundwater samples from 40 of its community supply wells located on the Base. A North Carolina Department of Natural Resources and Community Development (NRCD) draft report (Shiver, 1985) stated that results from laboratory analyses of the samples indicated that volatile organic compounds (VOCs) were present in samples from two wells (TT-26, TT-23) at the Tarawa Terrace well field (Figure 2-2). The two wells are located approximately 900 ft (TT-26) and 1800 ft (TT-23) south-southeast of the ABC facility within the Tarawa Terrace Base housing complex. The two wells, along with an additional supply well (TT-25), removed from service in 1985, are believed to be located hydraulically downgradient of the ABC site.

In February 1985, the two affected Tarawa Terrace community supply wells were disconnected from the Base's drinking water system. A water line from the Base's Holcomb Boulevard system was connected to the Tarawa Terrace system to provide water supply. Both water supply systems are part of the Base-wide system and are not connected to the City of Jacksonville water supply system.

In April 1985, at the request of the Base, the NRCD installed three temporary monitoring wells (b-4, b-5, b-6) at the off-Base locations shown in Figure 2-3. In September 1985, groundwater samples were collected from the temporary monitoring wells and from the three out-of-service Base community supply wells (TT-23, TT-25, TT-26). Results from the laboratory analyses indicated that PCE was detected in all of the samples; several other VOCs were also detected. The highest PCE concentration (12,000 micrograms per

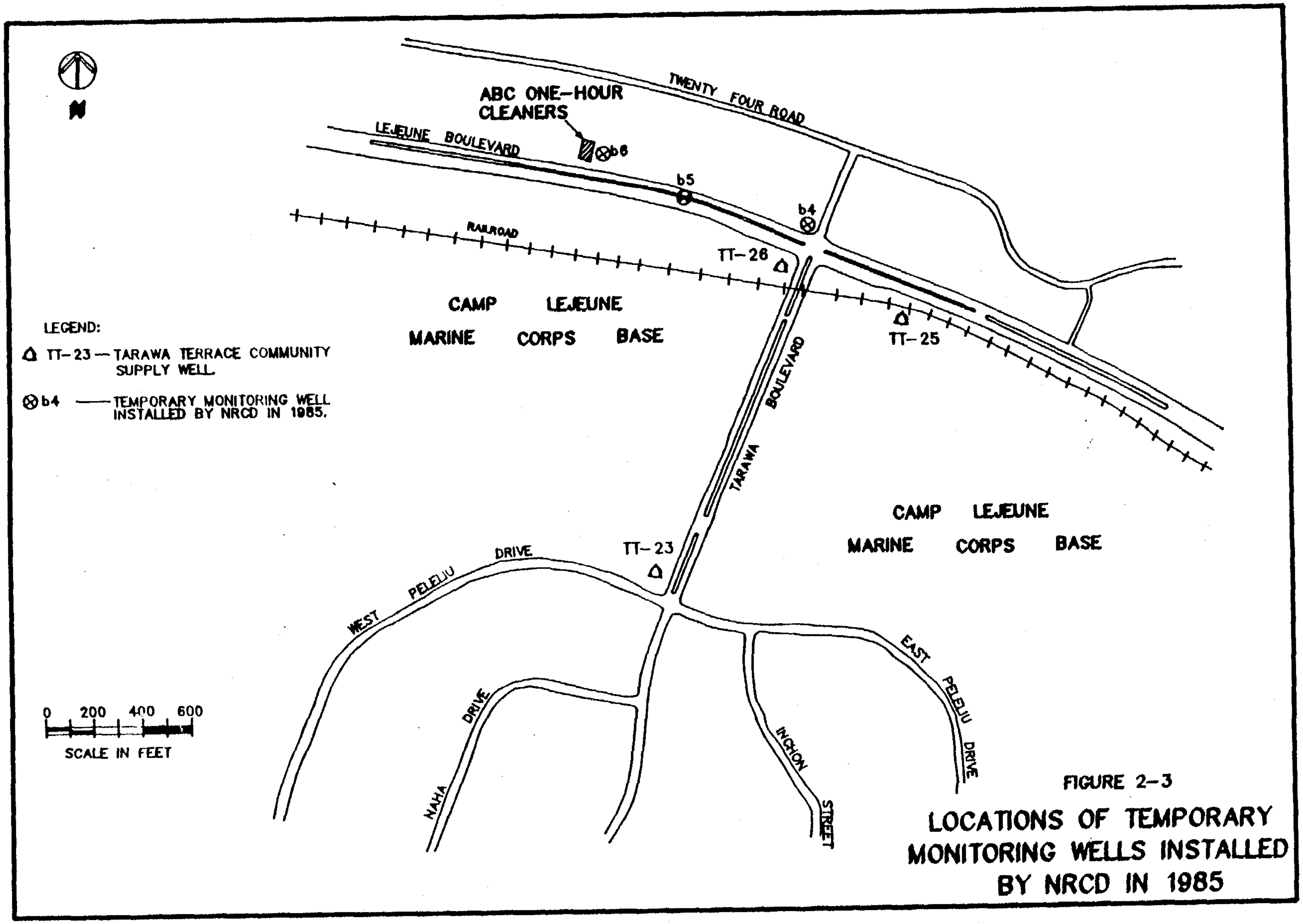

FIGURE 2-3

LOCATIONS OF TEMPORARY MONITORING WELLS INSTALLED BY NRCD IN 1985 liter [ug/L]), was detected in a groundwater sample from the temporary monitoring well located at the ABC site (b-6). Table 2-1 summarizes the results of these analyses.

Shiver (1985) reported that during a site inspection of the ABC facility, PCE was apparently entering the septic tank through spillage onto the floor that flowed into the floor drain and subsequently into the septic tank.

In April 1986, a consultant for ABC conducted an investigation of ABC's septic tank and the surrounding soils. Results of the investigation indicated that PCE was present in a septage sample collected from the septic tank at a concentration of 1,402 milligrams per liter (mg/L). Further, soil samples surrounding the septic tank and adjacent floor drain collected 4 ft below the floor surface indicated PCE concentrations as high as 404 milligrams per kilogram (Law Engineering Testing Company, 1986a). Sample locations are shown on Figure 2-4.

Results of the laboratory analyses from the April 1986 investigation conducted by Law Engineering Testing Company are presented in Table 2-2.

In September 1986, additional soil samples were collected from the ABC site and analyzed by ABC's consultant. Soil samples were collected at depths ranging from 4 to 12 ft below the floor surface. Figure 2-4 shows the locations of these samples. Results of laboratory analyses indicated that PCE and trichloroethylene (TCE) were detected in the soil samples (Law, Engineering Testing Company 1986b). Results of the laboratory analyses from the September 1986 investigation are provided in Table 2-3.

The ABC facility has been scored by EPA using the Hazard Ranking System. The site scored 29.11 and was subsequently placed on the CERCLA National Priorities List. The facility is classified as a small hazardous waste generator under RCRA and generates less than 1,000 kilograms per month of hazardous waste. The facility continues to be operated as a commercial dry cleaning establishment.

2.3 SITE CHARACTERISTICS

2.3.1 Physiography and Surface-Water Drainage

The Jacksonville area, including the ABC site, lies within the Coastal Plain physiographic province. The land surface within the Coastal Plain gently slopes eastward toward the Atlantic Ocean.

Table 2-1

Summary of Results of Analyses
of Groundwater Samples
Collected by North Carolina NRCD[1/]

Compound	b-4	b-5	b-6	TT-23	TT-25	TT-26
Tetrachloroethylene	2.2	4.9	12,000	132	0.43	1,580
Trichloroethylene	--	0.98	2.7	53	--	57
Vinyl chloride	--	--	--	--	--	27
Toluene	2.3	--	--	--	--	--
Trans-1,2-dichloroethylene	--	--	--	--	--	92
Benzene	--	2.3	--	--	--	--

Notes:

[1/]Concentrations are highest reported from multiple samplings and analyses in 1985.

-- = not detected or not reported. Laboratory detection limits were not reported.

Units are micrograms per liter (ug/L).

Source: Shiver, 1985.

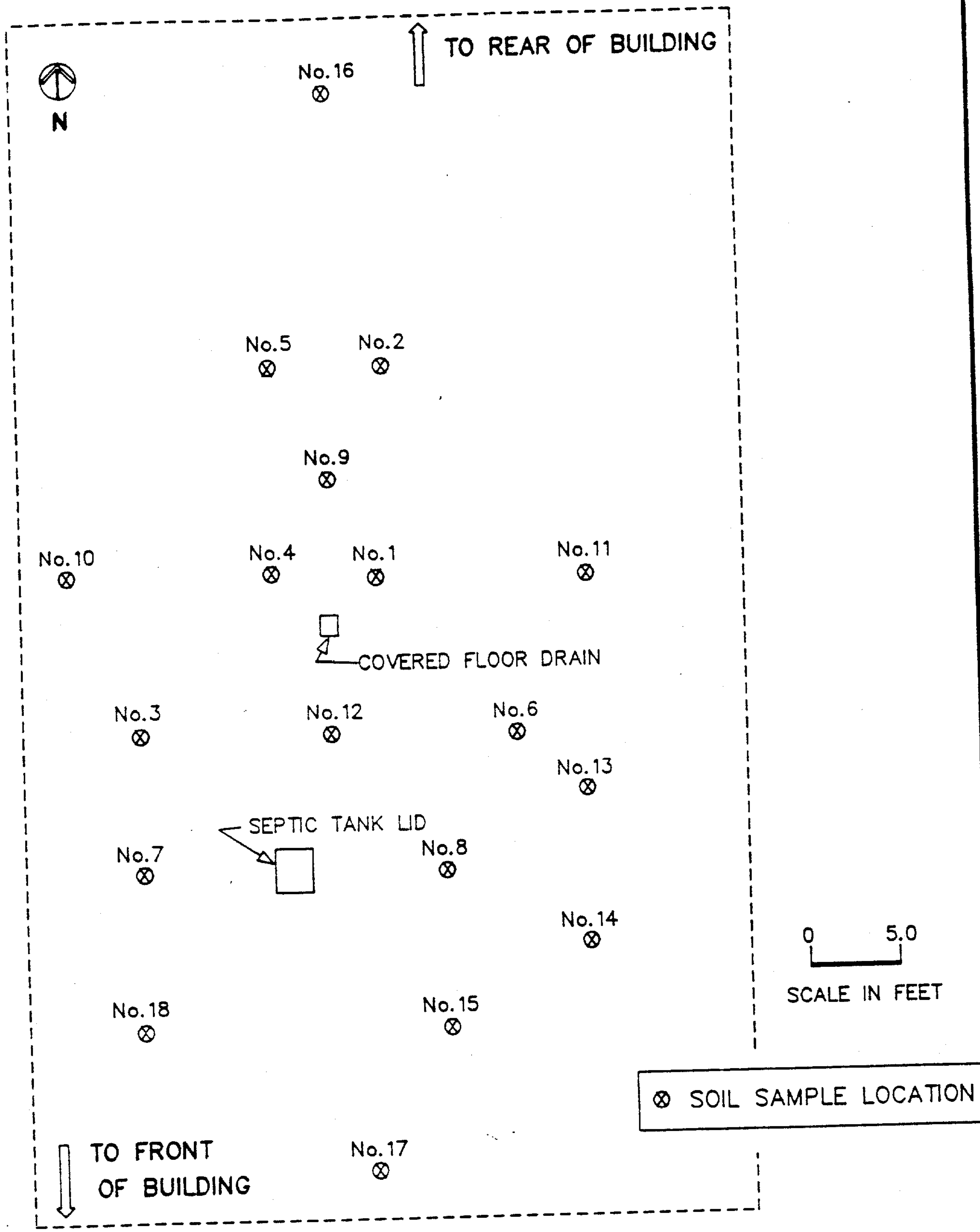

FIGURE 2-4

LOCATIONS OF SOIL SAMPLES COLLECTED AT THE ABC ONE-HOUR CLEANERS IN 1986

(Modified from Law Engineering Testing Company)

TABLE 2-2

RESULTS OF SEPTIC TANK AND SOIL SAMPLE ANALYSES[1/]

ABC One-Hour Cleaners
2127 Lejeune Boulevard
Jacksonville, North Carolina

Sample Identification[2/]	Units	Constituent			
		1,1 Dichloroethylene	1,2 Dichloroethylene	Trichloroethylene	Tetrachloroethylene
ABC Top (water)	mg/L[3/]	<.1	<.1	22	1.04
ABC Bottom (septage)	mg/L	24	15	9.5	1,402
ABC No. 1	mg/kg[4/]	<.1	11.3	4.0	85
ABC No. 2	mg/kg	<.1	0.4	0.1	1.4
ABC No. 3	mg/kg	<.1	0.9	0.5	2.3
ABC No. 4	mg/kg	<.1	7.3	2.3	18.4
ABC No. 5	mg/kg	<.1	2.3	0.4	2.0
ABC No. 6	mg/kg	<.1	0.5	0.5	1.4
ABC No. 7	mg/kg	<.1	0.9	1.2	
ABC No. 8	mg/kg	<.1	8.1	14	404
ABC No. 9	mg/kg	<.1	3.9	0.4	<.1

[1/] Samples were collected on April 8, 1986; samples were analyzed by Law Engineering and Testing Company.

[2/] ABC Top and Bottom samples were collected from the septic tank. ABC No. 1 through No. 9 were collected from four feet below land surface.

[3/] mg/L = milligrams per liter

[4/] mg/kg = milligrams per kilogram

Laboratory detection limits were not reported.

TABLE 2-3

RESULTS OF SOIL SAMPLE ANALYSES[1/]

ABC One-Hour Cleaners
2127 Lejeune Boulevard
Jacksonville, North Carolina

Boring No.	Depth (ft bls)[2/]	Constituent: 1,1 Dichloroethylene (mg/kg)[3/]	1,2 Dichloroethylene (mg/kg)	Trichloroethylene (mg/kg)	Tetrachloroethylene (mg/kg)
3	8	<.1	<.1	1.1	5.9
9	4	<.1	<.1	1.5	106
9	8	<.1	<.1	8.6	450
9	12	<.1	<.1	1.7	22
9	16	<.1	<.1	1.1	12
10	4	<.1	<.1	0.55	1.3
10	8	<.1	<.1	0.50	0.11
11	4	<.1	<.1	16	450
11	8	<.1	<.1	3.8	170
12	4	<.1	<.1	24	720
12	8	<.1	<.1	4.2	860
12	10	<.1	<.1	15	820
13	4	<.1	<.1	22	630
13	8	<.1	<.1	4.1	260
14	4	<.1	<.1	6.3	124
14	8	<.1	<.1	7.6	280
15	4	<.1	<.1	0.90	12
15	8	<.01	<.01	1.0	18
17	4	<.1	<.1	1.9	5.6
17	8	<.1	<.1	1.6	5.8
18	4	<.1	<.1	0.30	17
18	8	<.1	<.1	1.3	6.0

1/ Samples were collected on September 10-11, 1986; samples were analyzed by Law Engineering Testing Company.

2/ ft bls = feet below land surface

3/ mg/kg = milligrams per kilogram

Laboratory detection limits were not reported

The topography is typified by broad, relatively flat interstream areas, interrupted by low escarpments that are present adjacent to stream valleys.

Surface runoff from the site flows overland into ditches and culverts that are directed onto Base property and, along with runoff originating on the Base, into Northeast Creek (Figure 2-1). The site is located approximately 4400 feet northwest of Northeast Creek, and is situated at an elevation of about 30 feet above mean sea level (ft msl). The elevation of Northeast Creek is approximately 5 ft msl. Northeast Creek flows southwest to the New River, which drains into the Atlantic Ocean.

2.3.2 Groundwater Recharge and Discharge

The mean annual precipitation in Onslow County is 56 inches per year, and the mean evaporation rate is 42 inches per year (Clay et al., 1975). A portion of the excess rainfall that occurs in the area enters the ground in recharge areas and infiltrates downward to the water table. Groundwater flow is generally from the higher elevations to the lower elevations, where it is discharged to Northeast Creek, the New River, its tributaries, and the Atlantic Ocean. Due to the absence of streams or wetlands on the site, the immediate area probably represents a zone of recharge to the surficial aquifer.

2.3.3 Soils

The soils in the site area have been classified within the Onslow fine sandy soil association. Underlying the surface soils (approximately 5 to 7 inches thick) is a 6- to 8-inch thick hardpan layer (Jurney et al., 1923). This hardpan is composed of fine sand cemented with organic matter and iron, and may locally inhibit the downward movement of recharge.

2.3.4 Regional Geology and Hydrogeology

The sediments of the Coastal Plain physiographic province consist of interbedded sands, clays, calcareous clays, shell beds, sandstone, and limestone (Legrand, 1959). These sediments are layered in nearly horizontal interfingering beds and lenses that gently dip and thicken to the east. In the Base area the sediments were deposited in marine or near-marine environments, and are about 1,500 ft thick (Harned et al., 1989). Within this geologic column, a total of 10 potential water-bearing zones and 9 confining units have been described. In the site area, only the uppermost water-bearing zones are used for potable supplies, as salt water is found at increasingly higher concentrations from west to east in the aquifer system.

2.3.5 Local Geology

Soil data collected from boreholes b-4, b-5, and b-6 during drilling operations indicated that the surficial sediments beneath and within the immediate vicinity of the ABC site consist of "mud" and fine sand to a depth of approximately 60 ft below the land surface (ft bls) (NRCD unpublished lithologic logs, 1985).

2.3.6 Local Hydrogeology

Available local hydrogeologic information is limited to data presented in the NRCD investigation files and a study performed of the Base supply wells. A summary based on this data follows. Figure 2-5 shows a generalized geologic column and a "typical" water supply well at the Base. The surficial aquifer in the nearby Base area is reportedly composed of a silty sand and clay unit that occurs from land surface to about 75 ft bls. This unit is not used for water supply on the Base. Near the Base, the water table occurs from about 10 to 30 ft bls.

Underlying the surficial aquifer are beds of sand and limestone that comprise the Castle Hayne aquifer. The top of the aquifer occurs about 40 ft below msl. The upper half of the aquifer is reportedly composed of unconsolidated sand and the lower half is composed of consolidated to partly consolidated sand and limestone. Clay layers are present throughout the Castle Hayne aquifer, which has a thickness of about 300 ft in the vicinity of the ABC site. The clay layers are generally discontinuous and vary in thickness from about 5 to 20 ft (Harned et al., 1989).

Due to the lack of a continuous confining unit, there is probably considerable leakage of groundwater between the surficial aquifer and the Castle Hayne aquifer. Groundwater in the Castle Hayne aquifer reportedly occurs under both artesian and non-artesian conditions.

The Castle Hayne aquifer is the principal source of fresh water in Onslow County. A typical water supply well at the Base extends to a depth of approximately 150 ft bls, and yields 150 gallons per minute (gpm) (Harned et al., 1989). Transmissivities in the Castle Hayne aquifer, based on specific capacity tests, range from 4,200

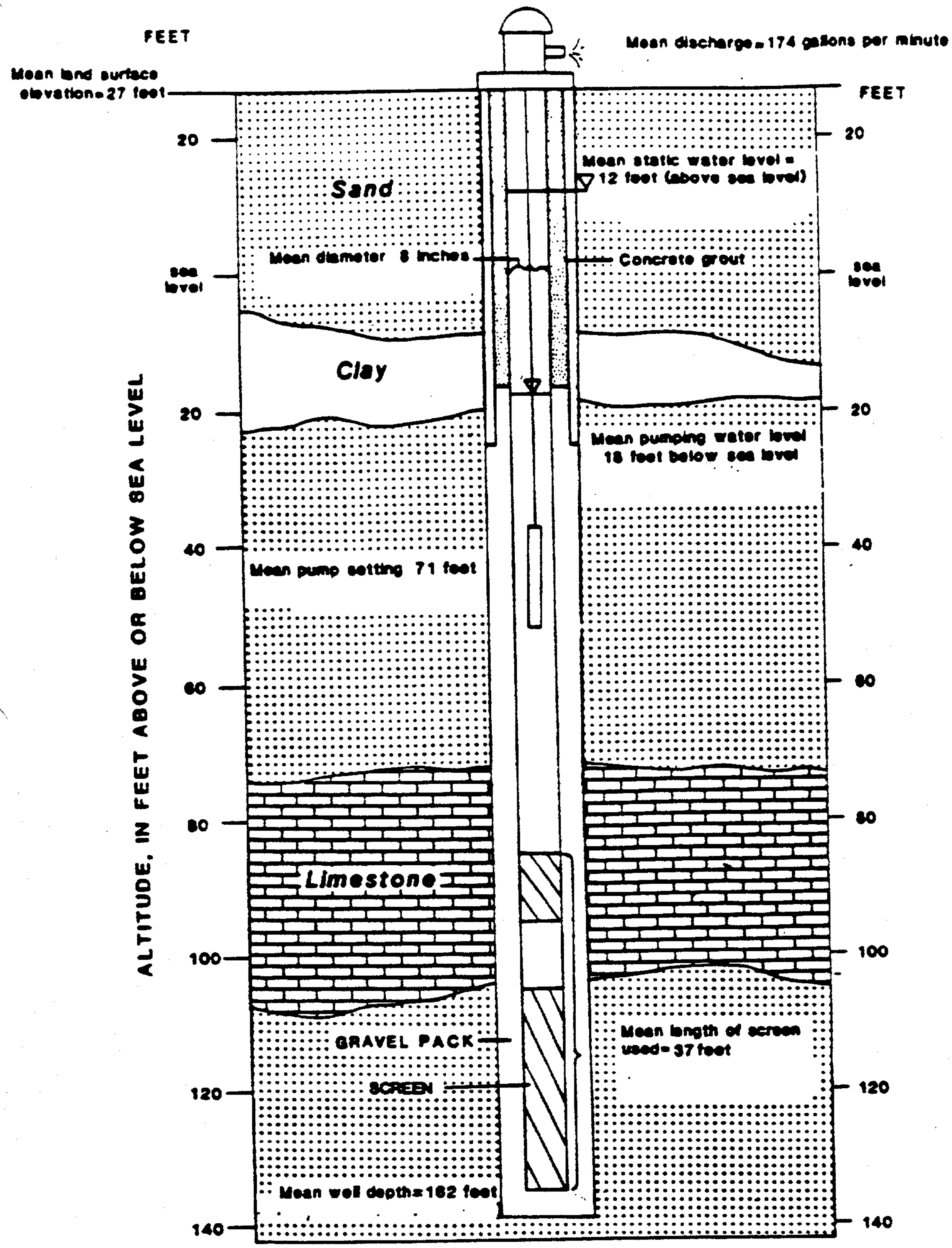

Figure 2-5

Generalized Geologic Section and Schematic Drawing of a Typical Water Supply Well at the Camp Lejeune Marine Corps Base

(Modified from Harned et al., 1989)

to 24,500 square feet per day (ft^2/d), and average about 10,200 ft^2/d. Table 2-4 presents well construction details for inactive community supply wells TT-23, TT-25, and TT-26.

The Beaufort and Peedee aquifers underlie the Castle Hayne aquifer, and are composed predominantly of sand with interbedded clay. In the vicinity of the Base, the aquifers contain salt water and are not used for potable water supply (Harned et al., 1989).

2.3.7 Distribution of Contaminants

A discussion of ABC's use of PCE is presented in Section 2.2. The quantity of PCE that was released into the septic tank is unknown. The quantity of still bottoms that was disposed on site is also unknown.

Investigations completed by others have revealed the presence of VOCs in the sludge and water within the on-site septic tank and in soils underlying the ABC building. VOCs have also been found in groundwater samples collected from three temporary monitoring wells located on and near the ABC site (b-4, b-5 and b-6) and three water supply wells located on the Base (TT-23, TT-25 and TT-26).

2.4 PRELIMINARY DEFINITION OF THE SITE

The site that is the subject of this RI/FS is preliminarily defined as the point of origin of the contaminants released to groundwater and the areal extent of migration of the contaminants. The site, so defined, consists of two "operable units":

- The source, preliminarily taken to consist of the septic tank at the ABC facility, the tank's contents, and surrounding and underlying unsaturated soils having VOC concentrations above a level of concern that has not yet been determined.

- The groundwater contaminant plume, consisting of the groundwater that has become contaminated by the released VOCs.

The area and depth of affected soil and groundwater and the distribution of subsurface VOCs have not yet been determined.

TABLE 2-4

WELL CONSTRUCTION DETAILS
TT-23, TT-25, TT-26

Well No.	Diameter (inches)	Screened Interval (ft bls)	Total Depth (ft bls)	Estimated Yield (gpm)
TT-23	--	--	263	--
TT-25	8	70-95 155-170	200	100-125
TT-26	8	--	100	150

-- = not available

gpm = gallons per minute

ft bls = feet below land surface

Source: (Harned et al., 1989)

2.5 SUMMARY STATEMENT OF THE PROBLEM

The problem to be addressed in this RI/FS is represented by the detection of VOCs in groundwater samples obtained from temporary monitoring wells and Base community water supply wells. The VOCs were detected in concentrations that exceeded: (1) EPA proposed and promulgated Maximum Contaminant Levels (MCLs) for drinking water, and (2) State of North Carolina groundwater quality standards. The MCL is the "maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system...." (40 CFR, Part 141.2).

The State of North Carolina regulations stipulate that the promulgated numerical standards are "... the maximum allowable concentrations resulting from any discharge of contaminants to the land or waters of the State, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage. Where groundwater quality standards have been exceeded due to man's activities, restoration efforts shall be designed to restore groundwater quality to the level of the standard or as closely thereto as is practicable...." (15 NCAC2L.0202).

Contaminated groundwater that has migrated toward or into on-Base or off-Base water supply wells could render the water supply unsuitable for drinking. In addition, contaminated groundwater introduced into the community water supply system could endanger the public health and welfare. Because VOCs were detected in groundwater samples from three Base community supply wells, the Base removed the wells from service. This situation caused the Base to: (1) fail to be able to realize the full benefit of its investment in the wells, and (2) expend additional funds to connect the community to an alternative water supply. Because the ABC site was believed to be the source for VOCs emanating into a groundwater system that provided drinking water to a large population, the site received a sufficiently high score to be placed on the National Priorities List.

Contaminated groundwater that discharges to Northeast Creek also could possibly come into contact with aquatic species. The potential for discharges to surface-water bodies will be determined during the RI.

To summarize the resulting adverse consequences may be:

(1) Groundwater in the nearby part of the Base's water supply system may be unsuitable for drinking and/or domestic uses;

(2) Groundwater contamination has or could migrate toward Northeast Creek, thus exposing aquatic species to VOCs;

(3) Groundwater contamination has or could affect other on-Base or off-Base water supply wells; and

(4) Other possible adverse impacts to human health or the environment.

Section 3

3.0 SCOPING OF THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY

3.1 OVERVIEW

The objectives of the remedial investigation (RI) for the ABC site are to identify the source and extent of contamination, the pathways of possible migration or releases to the environment, and the extent of potential human or other environmental exposure to contamination. The RI will present data on these matters in sufficient detail to determine the situation and the associated risks and to develop and evaluate remedial action alternatives.

Based on data developed during the RI, the feasibility study (FS) will be completed presenting a series of specific engineering alternatives for site remediation as appropriate. The purpose of the FS is to identify the most technically feasible, cost-effective remedial action that is protective of human health and the environment and is capable of accomplishing selected remedial response objectives.

The following sections present preliminary consideration of risks posed by the site, initial applicable or relevant and appropriate requirements (ARARs), scoping of remedial alternatives, RI/FS objectives, and initial data quality objectives.

3.2 PRELIMINARY RISK ASSESSMENT

The preliminary risk assessment provides an evaluation of potential threats posed by site contaminants to human health and the environment in the absence of any remedial action. In addition, the risk assessment provides the basis for determining whether remedial action is necessary and the justification for implementing remedial actions.

3.2.1 Preliminary Public Health and Ecological Risk Assessment

The preliminary public health and ecological risk assessment consists of four components:

(1) Identification of contaminants of concern,

(2) Identification of potential exposure pathways,

(3) Identification of potential receptors, and

(4) Risk characterization.

3.2.1.1 Preliminary Contaminants of Concern

Identification of contaminants of concern is generally made based on: (1) the quantity of the substances involved; (2) their relative toxicity or other adverse effects and concentrations of the substances; and (3) their fate and transport characteristics.

Table 3-1 presents the highest concentrations of various compounds so far observed in various environmental media at the ABC site.

Because relatively little site characterization work had been conducted in advance of the preparation of this Work Plan, and because chemical degradation and/or physical dilution and transport of the compounds could have occurred since the last sampling event in 1985, designation of final contaminants of concern would be premature. Until such time that additional site characterization is conducted and more comprehensive and current data are available, the eight compounds listed in Table 3-1 will be used as the preliminary list of the contaminants of concern.

These compounds have been observed in groundwater in concentrations that exceed both Federal promulgated and proposed primary drinking water Maximum Contaminant Levels (MCLs) and promulgated State of North Carolina groundwater quality standards (also see Section 2.5).

3.2.1.2 Exposure Pathways

Human receptors could be exposed to the contaminants of concern through one or more of the following reasonably probable pathways of exposure:

- Groundwater:
  - Ingestion of contaminated well water;
  - Showering/bathing with contaminated well water;
  - Inhalation of volatiles emitted from contaminated groundwater seeping into buildings or subsurface enclosures; and
  - Use of contaminated well water to irrigate gardens.

TABLE 3-1
MAXIMUM CONCENTRATIONS OF COMPOUNDS DETECTED AT THE ABC SITE IN VARIOUS MEDIA

Compound	Groundwater (ug/L)1/	Soil (ug/kg)2/	Septic (ug/L)2/	Septic Tank Sludge (ug/L)2/
Tetrachloroethylene	12,000	860,000	1,000	1,402,000
Trichloroethylene	53	24,000	22,000	9,500
Vinyl chloride	27	NA	NA	NA
Toluene	2.3	NA	NA	NA
Trans-1,2-dichloroethylene	92	NA	NA	NA
Benzene	2.3	NA	NA	NA
1,1-Dichloroethylene	NA	<100	<100	24,000
1,2-Dichloroethylene	NA	11,300	<100	15,000

1/ Concentrations are the highest levels detected in groundwater samples collected in 1985 (NRCD, 1985).

2/ Concentrations are the highest levels detected in samples collected in 1986 (Law Engineering Testing Company, 1986a and 1986b).

ug/L = micrograms per Liter
ug/kg = micrograms per kilogram
NA = not analyzed

- Surface Waters:
  - Direct contact from swimming in contaminated surface water;
  - Use of contaminated surface water to irrigate gardens; and
  - Ingestion of fish or shellfish taken from contaminated surface water.
- Soils:
  - Direct dermal contact with contaminated soils;
  - Direct ingestion of contaminated soils; and
  - Inhalation of volatiles emitted from contaminated soils into buildings or other enclosures.
- Air:
  - Inhalation of volatiles during intrusive on-site construction or investigation activities.
  - Showering/bathing with contaminated well water; and
  - Inhalation of volatiles emitted from contaminated groundwater seeping into buildings or subsurface enclosures.

In addition, aquatic receptors could be exposed to contamination if existing, in surface water. Terrestrial receptors at the ABC site, if any, could potentially be exposed to chemical compounds by direct contact or ingestion of soils or groundwater. Terrestrial receptors could also be exposed to chemicals by direct inhalation of volatile compounds.

Of the above, based on the limited available data and preliminary contaminants of concern, the following are considered to be realistic pathways of contaminant exposure from the site to human receptors:

- Ingestion of contaminated well water;

- Inhalation of volatiles during intrusive on-site construction or investigation activities;

- Inhalation of volatiles during bathing or showering with contaminated well water; and

- Inhalation of volatiles emitted into buildings or subsurface enclosures.

Pathways to non-human biological species, primarily aquatic species in surface water, could include groundwater discharge to Northeast Creek. It appears unlikely at this time that contaminated groundwater is discharging to Northeast Creek. If data generated by the RI indicate that this is not the case, the addition of one or more of the above surface water pathways may be warranted.

3.2.1.3 Potential Receptors

The ABC site is located in a primarily residential area; however, commercial development ie present along Lejeune Boulevard near the site. No human receptors in this area and in the Tarawa Terrace housing development of Camp Lejeune could be exposed to VOCs released from the site in a variety of ways, including the following (correlated to the pathways identified above):

- Groundwater:

  - Persons living or working at locations provided potable water by a system connected to an affected water supply well (ingestion, showering/bathing, inhalation of vapors in enclosures).

  - Persons eating foods grown in irrigated gardens at locations provided potable water by a system connected to an affected water supply well.

- Surface Water:

  - Persons swimming in contaminated surface water.

- Persons eating foods grown in gardens at locations where water taken from contaminated surface water is used for irrigation.

- Persons eating fish or shellfish taken from contaminated surface water.

- <u>Soils</u>:

  - Persons working or playing in or around contaminated surface soils or exposed subsurface soils (dermal contact, ingestion).

  - Persons working or living in buildings or other enclosures near contaminated soils (inhalation of vapors in enclosures).

- <u>Air</u>:

  - Persons working or playing in or around contaminated surface soils or exposed subsurface soils (inhalation of vapors from disturbed soils).

  - Persons living or working at locations provided potable water by a system connected to an affected water supply well (inhalation of vapors in basements/enclosures or while showering/bathing).

Aquatic and terrestrial habitats near the ABC site could be affected by chemical compounds emanating from the site. Characterization of the habitats to assess specific plant and animal receptors has not been conducted. The following possible aquatic habitats have been identified near the site:

- Northeast Creek,

- A marsh area southeast of the site bordering Northeast Creek, and

- New River into which Northeast Creek flows.

Potential receptors residing in these areas could include fish, reptiles, amphibians, invertebrates, and aquatic plants. Probable terrestrial habitats where amphibians, reptiles, birds, and mammals could reside include:

- Upland forested areas,
- Grassed areas, and
- Forested wetlands.

Of the above, the following are considered to be realistic potential receptors of the contaminants of concern through the identified pathways of exposure:

- Persons living or working at locations provided potable water by a system connected to an affected water supply well (ingestion, showering/bathing, inhalation of vapors in enclosures).
- Persons working or playing in or around contaminated surface soils or exposed subsurface soils (inhalation of vapors from disturbed soils).

Non-human biological species, primarily aquatic species in surface water, are not expected to be exposed to contaminants of concern at the site. If data generated by the RI indicate that this is not the case, the addition of one or more of the above surface water receptors may be warranted.

3.2.1.4 Preliminary Assessment of Risks

A preliminary assessment of risks posed by site contaminants found on site in groundwater and soil samples is addressed below.

Groundwater

Laboratory analysis of groundwater samples collected by NRCD in 1985 indicated that VOCs were detected in excess of Federal MCLs. Four of the preliminary contaminants of concern (PCE, TCE, vinyl chloride, and benzene) are known or suspected carcinogens. MCLs for these compounds have been established, in part, on the basis of concentrations corresponding to a 10^{-6} increased risk of cancer for persons consuming the water containing the compound at the MCL concentration over a lifetime. The VOC concentrations that were observed in water sampled from water supply wells TT-23 and TT-26 in 1985 exceeded the MCLs for PCE, TCE, and vinyl chloride. As a result, the wells were removed from service.

Because existing data do not provide information on contaminant distribution over a large area, it is uncertain whether the groundwater contaminant plume has or could migrate into the zones of influence of active water supply wells, thus increasing the risk to consumers of the well's water. Camp Lejeune reportedly has an ongoing program for monitoring for the possible presence of contaminants, including VOCs, in its water supply wells. Accordingly, it is not likely that VOCs in the Base's wells would be detected. However, it is possible that active off-Base water supply wells exist, in which case VOCs could be drawn into water supply without being detected. For this reason, the work proposed in the RI includes identification of such off-Base wells, sampling as appropriate, if existing, and evaluation of whether wells are likely to be affected in the future. On the basis of the limited existing information, there appears to be no increased risk to consumers of well water, given the inactive status of the affected supply wells. Further, no information has been found indicating that other, possibly affected wells exist.

The procedures established for the application of the Hazard Ranking System (HRS) require that sites be scored as if "unofficially" implemented mitigating measures (i.e., measures not having been selected and implemented in accordance with the National Contingency Plan) had not been implemented. In the case of the ABC site, the HRS score reflects the full population served by the Tarawa Terrace water supply system being exposed to the contaminants of concern, as if the affected supply wells remain active and the consumers were consuming contaminated water. As such, the removal of the affected wells from service would be considered to be an "interim" remedial response. Under this scenario, the highest contaminant concentrations observed in the supply wells correspond to the increased incidence of cancer shown in Table 3-2.

<u>Surface Water</u>

Based on the available information, surface water samples from water bodies near the site have not been collected for analysis of the compounds associated with the ABC site. The water body closest to the ABC site that is topographically downgradient and preliminarily thought to be hydrogeologically downgradient of the site is Northeast Creek, approximately 4,400 feet to the southeast. It is unlikely that surface soil contamination at the ABC facility would be carried by surface runoff in concentrations that could be detected in Northeast Creek. For this reason, the work proposed in the RI does not include sampling and analysis of surface water or associated aquatic biological species. If, however, the

TABLE 3-2

PRELIMINARY INCREASED RISK ASSOCIATED WITH OBSERVED HIGHEST CONTAMINANT CONCENTRATIONS IN GROUNDWATER OCCURRING IN DRINKING WATER

Compound	MCL (ug/L)	Potency Factor $(mg/kg/day^{-1})$	Approximately 10^{-6} Risk Conc. (ug/L)	Highest Groundwater Concentration (ug/L)	Increased Risk
Tetrachloroethylene	5	0.011	3.2	12,000	3.8×10^{-3}
Trichloroethylene	5	0.051	0.7	57	8.1×10^{-5}
Vinyl chloride	2	2.3	0.02	27	1.4×10^{-2}
Toluene	3,000	NA	NA	2.3	NA
Trans-1,2-dichloroethylene	100	NA	NA	92	NA
Benzene	5	0.029	1.2	2.3	1.9×10^{-6}
				Cumulative increased risk:	1.8×10^{-2}

Groundwater samples collected in 1985.

ug/L = micrograms per liter.

NA = Not applicable; compound not a carcinogen.

10^{-6} risk concentration is inversely proportional to the potency factor, which is a measure of relative carcinogenicity of the compound.

MCLs can be higher than 10^{-6} risk concentrations because of technical and economic considerations in achieving contaminant reduction in water treatment systems.

contamination is found to have migrated near the creek, or on-site surface soil contamination is higher than expected, the need to sample surface water and/or aquatic biological species may warrant reexamination.

Soil

Soil samples collected from beneath the floor and near the septic tank of the ABC facility revealed VOC concentrations as high as the following:

- Tetrachloroethylene: 860,000 ug/kg
- Trichloroethylene: 24,000 ug/kg
- 1,1-Dichloroethylene: <100 ug/kg
- 1,2-Dichloroethylene: 11,300 ug/kg

There is no information indicating that volatile vapors from the soils beneath the buildings are venting into the buildings and are being inhaled by workers or customers. It is reasonable to conclude that little, if any, such venting is occurring and that ongoing use of dry cleaning solvents in the buildings results in far higher airborne VOC concentrations.VOCs in the soil may be a source of contamination to the groundwater system. For this reason, the work proposed in the RI includes additional soil sampling around the buildings and analysis of the samples for VOCs.

3.3 INITIAL IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Superfund remedial actions under SARA must attain the applicable or relevant and appropriate requirements (ARARs) of federal, state, or local environmental statutes, whichever are most stringent. Federal standards could include RCRA, Clean Air Act, Safe Drinking Water Act, Clean Water Act, or the Toxic Substances Control Act. State of North Carolina standards could include any promulgated by the State Environment Management Commission. Screening of the remedial action alternatives will require an evaluation of each alternative with regard to its ability to comply with the ARARs. The ARARs are generally based on acceptable levels of contamination for the preservation of the environment and the public health and welfare. ARARs may also include consideration of technical and economic feasibility.

ARARs can be categorized as: (1) chemical-specific, (2) location-specific, or (3) action-specific requirements. Chemical-specific requirements are used to define acceptable exposure levels and are used to define remedial action objectives. Location-specific requirements set restrictions on activities within specific locations, such as floodplains or wetlands. Action-specific requirements set restrictions for particular treatment and disposal activities pertaining to hazardous wastes.

ARARs will be considered throughout the RI/FS process. As the RI/FS progresses, each ARAR will be defined based on the accumulated site data.

Preliminary ARARs have been identified for the ABC site based on the types of contamination detected, the chemical constituents, the potential fate and transport of the constituents, and the types of remedial alternatives. A preliminary list of chemical-specific ARARs for the preliminary contaminants of concern previously identified is presented in Table 3-3.

3.4 SCOPING OF REMEDIAL ALTERNATIVES

Soil and groundwater quality data collected at and near the ABC site allow identification of potentially applicable remedial action alternatives. These alternatives are based on the remedial response objectives described below.

3.4.1 Identification of Preliminary Remedial Response Objectives

Additional data for the ABC site is require to define: (1) the horizontal and vertical extent of soil and groundwater contamination, and (2) the potential impacts to human health and the environment. The following preliminary response objectives have been identified based on the limited existing site data:

- Prevent or control the ongoing release, if any, of VOCs from the source to groundwater.
- Ensure that VOCs do not enter drinking water supply systems in concentrations exceeding Federal MCLs.
- Reduce VOC concentrations in groundwater to levels corresponding to State of North Carolina groundwater quality standards.

TABLE 3-3

PRELIMINARY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Compound	Groundwater[2]	Drinking Water	Surface Water[5]: Fresh Chronic	Surface Water[5]: Marine Chronic	Surface Water[5]: Fish/Water Ingestion	Surface Water[5]: Fish Consumption	Soils
Tetrachloroethylene	0.7	5[3]	840	450	0.8	8.85	N/A
Trichchloroethylene	2.8	5[4]	21,900	N/A[6]	2.7	80.7	N/A
Vinyl chloride	0.015	2[4]	N/A	N/A	2	525	N/A
Toluene	1,000	3,000[3]	N/A	5,000	14,300	424,000	N/A
Trans-1,2-dichloroethylene	70	100[3]	N/A	N/A	0.033[7]	1.85[7]	N/A
Benzene	0.7	5[4]	N/A	700	0.66	40	N/A

[1] All units are micrograms per liter (ug/L).
[2] State of North Carolina Groundwater Quality Standard; 15NCAC2L.0202.
[3] Proposed National Primary Drinking Water Maximum Contaminant Level; FR Vol. 54, No. 97, 5/22/90.
[4] National Primary Drinking Water Maximum Contaminant Level; 40CFR141.61.
[5] Water Quality Criteria for Water, 1989, U.S. EPA Office of Water Regulations and Standards.
[6] N/A = no criteria or standard available.
[7] For total dichloroethylenes.

These objectives will need to be reevaluated as data from the RI become available. There is no indication or reason to suspect that surface water will be involved in the definition of the site, the site problem, or corresponding remedial action alternatives. As a result, no remedial response objectives pertaining to surface water are included at this point in the scoping of the project.

The objectives pertaining to source control and protection of drinking water supply systems are expected to be technically achievable with available technology. Accomplishing groundwater remediation to meet State of North Carolina groundwater quality standards, which are more stringent than Federal MCLs for drinking water for the preliminary compounds of concern, is not expected to be as readily achievable, and alternate allowable groundwater contaminant concentrations may need to be considered in developing final remedial response objectives and ARARs.

3.4.2 Identification of Preliminary Remedial Response Actions and Remedial Alternatives

The purpose of identifying potential remedial response actions early in the RI/FS is to identify alternate approaches for site remediation, to establish criteria for evaluating the alternate approaches under consideration, and to determine the type and extent of data needed to conceptualize, screen, and evaluate the alternatives. Based on the limited existing site data, the following remedial response actions and associated remedial alternatives could be applicable to remediation of the site:

- Source control (if a source is identified):
    - Excavation and removal or on-site treatment of affected unsaturated soils.
    - Removal of the septic tank and its contents.
    - Soil venting for removal of VOCs in unsaturated soils.
    - No action.
- Protection of drinking water supply systems:
    - Resumption of the use of the affected water supply wells with the provision of water treatment to achieve drinking water standards (air stripping and/or activated carbon).

- Resumption of the use of the affected water supply wells with no provision of water treatment. (Note: While this is clearly an unacceptable alternative, it could be considered to be the baseline situation and therefore the "no action" alternative. This is the situation taken to exist in the application of the Hazard Ranking System and presumably would have continued had well water samples not been analyzed and the alternate water supply provided).

- Permanent or long term deactivation of the affected water supply wells and provision of the water supply from an alternate source. (Note: This is the present status and also could be considered to be the "no action" alternative; i.e., the situation that would prevail in the absence of further remedial action).

- Interception of the groundwater contaminant plume with recovery wells to prevent additional, downgradient water supply wells from being affected, with the provision of water treatment (air stripping and/or activated carbon) to applicable standards and discharge of the treated water to surface water or to a sewerage system or return to the aquifer.

• Groundwater cleanup:

  - Pumping for removal of contaminated groundwater from all areas where State groundwater quality standards have been exceeded, treatment of the pumped water (air stripping and/or activated carbon) to applicable standards, and discharge of the treated water to surface water or to a sewerage system return to the aquifer.
  - No action.

These remedial response actions and associated remedial alternatives and technologies are either self-explanatory or are generally accepted and conventional for remediation of soils and groundwater contaminated with VOCs. The following are brief descriptions of the remedial technologies included above.

<u>Excavate and remove affected unsaturated soils</u>. Unsaturated soils containing VOCs above concentrations to be determined would be excavated and removed from the site. Various off-site treatment

and disposed options, such as thermal treatment and landfilling (within "land ban" restrictions), are possible. Removal of portions of the building floor and wall might be necessary. Clean soil would be used to backfill and the building would be repaired.

Remove the septic tank and it contents. The septic tank's contents would be pumped out and treated/disposed as liquid hazardous waste. The septic tank would be removed, steam-cleaned, and disposed as solid waste. The temporary removal of the floor and walls, backfilling, and repairs would be similar to the above.

Install and operate soil venting system. Unsaturated soils containing VOCs above concentrations to be determined would be treated in-place using soil venting technology, which draws air through the soil pores through vent wells, promoting volatilization of the VOCs. The resulting airstream could probably be discharged directly to the atmosphere, although treatment of the airstream with vapor-phase activated carbon or other techniques could be warranted. The system would operate in the range of a few months to a few years.

Provide an alternate water supply. Contaminated or threatened potable water supplies (contaminated groundwater within or near the zone of influence of active water supply wells) would be replaced with water obtained from another, noncontaminated source. Such sources could include the City of Jacksonville water distribution system or other supply wells. For example, the Holcomb Boulevard system was extended to serve Tarawa Terrace; this could be considered to be an interim remedial response under CERCLA/SARA.

Groundwater contaminant plume interception. The path of migration of contaminated groundwater would be intercepted by a line of groundwater extraction wells that would locally alter the hydraulic gradient. In altering the gradient, contaminated groundwater would be pumped to the ground surface where water treatment/disposal would be needed. The number, location, and depth of the wells, the screen intervals, and pumping rates would be based on findings of the RI. The duration of pumping of the wells could be several to ten or more years.

Groundwater contamination capture. Groundwater containing VOCs above concentrations to be determined would be captured by groundwater extraction wells strategically located to ultimately withdraw sufficient contaminant mass to reduce groundwater contamination to acceptable levels. Contaminated groundwater would be pumped to the ground surface where water treatment/disposal would be needed. The number, location, and depth of the wells, the screen intervals, and pumping rates would be based on findings of the RI. The duration of pumping of the wells could be several to ten or more years.

Resumption of use of affected water supply wells. The source of water supply for Tarawa Terrace would again be provided by the wells that have been taken out of service. Because of the presence of VOCs in the groundwater, water treatment would be needed to meet Federal drinking water standards before the water could be distributed.

Water treatment by air stripping. Water removed by extraction wells or supply wells would be treated by one of several air stripping methods, which promotes volatilization of VOCs by exposing the water to an air stream. The resulting air stream could be discharged directly to the atmosphere, although treatment of the air stream with vapor-phase activated carbon or other techniques could be warranted. Water treated for the purpose of providing potable water would be distributed to Tarawa Terrace. Water treated for contaminant plume interception or contaminant capture could be returned to the aquifer, discharged to surface water, or discharged to a sanitary sewer system. The air stripping system would operate as long as the extraction wells were operated.

Water treatment by carbon adsorption. Water removed by extraction wells would be treated by one of several possible methods of carbon adsorption. The most probable treatment method would be granular activated carbon which removes certain VOCs by physical/electrical attraction of the VOC molecules to the large available area of surface of granules of specially processed carbon. At or near the point of the carbon's saturation, it is reprocessed or disposed and replaced. Water treated for the purpose of providing potable water would be distributed to Tarawa Terrace. Water treated for contaminant plume interception or contaminant capture could be returned to the aquifer, discharged to surface water, or discharged to a sanitary sewer system. The carbon adsorption system would operate as long as the extraction wells were operated.

Discharge of extracted water to a sanitary sewer system. Water removed by extraction wells could be discharged to a sanitary sewer for treatment at a central plant, presumably the City of Jacksonville or the Camp Lejeune system. The discharge would occur as long as the extraction wells were to operate.

No action. In general, the "no action" alternative refers to the situation identified as the site problem being allowed to remain without remediation, although ongoing monitoring is often conducted and institutional constraints are sometimes placed on the use of the site (e.g., deed recordation, land-use restrictions). For the ABC site, no action could refer to one or combinations of the following:

- Allowing affected unsaturated soils and the septic tank to remain in place and/or untreated.
- Continuing provision of the water supply to the Tarawa Terrace housing development from the "alternate supply" (the Holcomb Boulevard system) and allowing the contaminants to remain in groundwater and to migrate along natural flow paths.
- Although clearly unacceptable, resume operation of the affected water supply wells and provide the contaminated water to Tarawa Terrace without treatment, as if the presence of the contaminants were not known and the alternate water supply had not been provided (i.e., no action of any kind taken at any time).

Before beginning work on the FS, the preliminary remedial response actions will be reevaluated and screened for reasonableness and probability of achieving the remedial response objectives. The FS process will best be served by developing the fewest number of alternatives that can reasonably be expected to be implemented (with the exception of "no action" alternatives as a basis of comparison). Care will be exercised to ensure that the selected technologies and alternatives are consistent and compatible with:

- The definition of the site.
- The definition of the site problem.
- Remedial response objectives.
- Selected ARARs.

3.5 RI/FS OBJECTIVES

The objectives of the ABC RI/FS are to identify the source and extent of contamination, the pathways of possible migration of releases to the environment, and the extent of potential human or other environmental exposure to contamination, such that sufficient site-specific data are collected to conduct an FS of remedial alternatives.

The objective of the FS is to develop and evaluate cost-effective, technically feasible remedial action alternatives that are protective of human health and the environment and that are capable of meeting selected ARARs.

3.6 INITIAL DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are based on the concept that different data uses may require different quality data. Data quality is the degree of certainty with respect to precision, accuracy, reproducibility, completeness, and comparability of a data base. DQOs are qualitative and quantitative statements specifying the quality of data required to support RI/FS activities (including field screening, characterization, and risk assessment) and to support remedial alternatives evaluation and selection decisions and enforcement. The four broad categories of data quality employed in the RI/FS process are described in the following paragraphs.

Level I - Field Screening. This level of data quality is the lowest, but provides the most rapid results. It is used to assist in the optimization of sampling locations and for health and safety support. Data generated provides presence/ absence of certain constituents and is generally qualitative rather than quantitative.

Level II - Field Analysis. This level of data quality is characterized by the use of analytical instruments that are carried in the field and the use of mobile laboratories. Depending on factors such as instrumentation and environmental matrix, data can be either qualitative or quantitative.

Level III - Laboratory Analysis. This level of quality represents data generated under laboratory conditions using EPA-approved procedures, but methods other than Contract Laboratory Program - Routine Analytical Services (CLP-RAS) protocols. This level of data is used for certain types of source, extent, or characterization, and to support evaluation of treatment technologies and treatability studies. These data are both qualitative and quantitative.

Level IV - CLP-RAS. This quality level represents confirmational data characterized by rigorous quality control and validation procedures. Level IV data is appropriate to support critical decisions, such as characterization to support risk assessment, enforcement, and cost recovery documentation. Level IV data are both qualitative and quantitative.

Specifics regarding QA/QC, costs, validation, and uses of each level of data are described in EPA Office of Emergency and Remedial Response and Office of Waste Programs Environmental Enforcement Guidance, Data Quality Objectives for Remedial Response Activities, March 1987 (EPA/540/G-87/003).

Data from the ABC site RI will be used for several purposes, as described in the following paragraphs. Table 3-4 summarizes the analytical parameters, data quality level, analytical resource, and data use for each medium to be sampled.

In the course of the RI/FS, the following general types of decisions will be made on the basis of data generated from various activities during the RI:

- Field sampling locations and depths.
- Personal health and safety.
- Risk assessment.
- Evaluation of remedial action alternatives.

Field sampling locations and depths will be selected on the basis of existing data and data that are progressively accumulated in the field. For example, field GC analyses (Level II data quality) of samples collected from existing wells will provide near-real-time data that could influence the placement of groundwater sampling points using direct-push technology (DPT). Similarly, groundwater samples collected by DPT will also be analyzed by the field GC, allowing successive points to be located for optional data acquisition. The collective body of field data will be used to locate permanent monitoring wells to be sampled for full-scale CLP laboratory analysis (Level IV data quality).

Decisions involving personal health and safety will be made on the basis of emissions of VOCs from the site into the atmosphere, possibly exposing site workers to inhalation of VOCs. Direct readings from PID and/or FID field instruments will be used to judge the degrees of exposure, the effectiveness of mitigating measures (such as fans or blowers), and the need for and type of personal protection equipment.

TABLE 3-4

INITIAL DATA QUALITY OBJECTIVES

SAMPLE MEDIUM/ANALYSES	ACTIVITY	TYPE DECISION/DATA USE	ANALYTICAL RESOURCE	DATA QUALITY LEVEL
GROUNDWATER				
Volatile organic compounds[1]	Analysis of samples collected using direct-push method	Gradient of contamination, locations of subsequent sampling points, future monitoring well locations	Field GC	II
Volatile organic compounds[1]	Analysis of samples from existing supply wells	Location of contamination, locations of future direct-push method groundwater sampling points, future monitoring well locations	Field GC	II
TCL volatile organic compounds[2]	Analysis of samples from existing supply wells and new monitoring wells	Exposure of consumers of water supplied by the supply wells, vertical and horizontal distribution of contaminants, locations of future monitoring wells, risk assessment, modeling, alternatives development and evaluation	CLP-RAS	IV

TABLE 3-4 (CONT'D)

INITIAL DATA QUALITY OBJECTIVES

SAMPLE MEDIUM/ANALYSES	ACTIVITY	TYPE DECISION/DATA USE	ANALYTICAL RESOURCE	DATA QUALITY LEVEL
SOILS				
Volatile organic compounds[3]	Headspace monitoring of soil samples	Screening/selecting soil samples for laboratory analysis, qualitative indication of contaminant distribution	PID/FID	I
TCL volatile organic compounds[2]	Analysis of split-soil samples	Vertical and horizontal distribution of contaminants, depths of well screens, locations of future monitoring wells, risk assessment, modeling, alternatives development and evaluation	CLP-RAS	IV
AIR				
Volatile organic compounds[3]	Monitoring of atmosphere during intrusive activities and well sampling	Personal protection mitigating measures and protective equipment	PID/FID	I

[1]Includes a list of volatile organic compounds to be included in the Project Operations Plan.
[2]Includes 34 volatile organic compounds.
[3]Direct reading of aggregate of volatile organic and hydrocarbon compounds.

Samples collected from study area monitoring wells and soils will provide the primary data for the risk assessment. These data will consist of results of analyses for the full TCL list of volatile organic compounds. These analyses will be performed using CLP-RAS Level IV protocols. This most stringent level of data quality is warranted because the data base will be used to support critical risk assessment decisions and possible cost-recovery actions.

Level III data usually suffice for most remedial alternative evaluations. However, since Level IV TCL data are being obtained to support the risk assessment, these data will also serve as the basis for the alternatives evaluation.

In conclusion, a variety of data levels is appropriate for the RI. The level of data is determined by the most critical use of the data. If data are needed for several types of decisions, the highest level of data needed to support those decisions will be collected.

Section 4

4.0 TASK PLAN FOR THE REMEDIAL INVESTIGATION

The following tasks are specified in the Scope of Work for the remedial investigation of the ABC site:

- Task 0: Work Plan Memorandum
- Task 1: Review of Existing Data and Description of Current Activity
- Task 2: Community Relations
- Task 3: Work Plan Development
- Task 4: Site Investigation
- Task 5: Preliminary Remedial Technologies
- Task 6: Site Investigation Analysis and Risk Assessment
- Task 7: Reporting Procedures
- Task 8: Laboratory Studies
- Task 9: Additional Requirements

The status and/or planned activities for these tasks are presented in the following sections.

4.1 TASK 0 - WORK PLAN MEMORANDUM

The Work Plan Memorandum for the project has been completed and approved by EPA. Work under this task has been completed.

4.2 TASK 1 - REVIEW OF EXISTING DATA AND DESCRIPTION OF CURRENT ACTIVITY

The review of existing data on the site was conducted concurrent with the preparation of this Work Plan. Background information is presented in Section 2.0 of this document.

4.3 TASK 2 - COMMUNITY RELATIONS

A Community Relations Plan for the project was prepared concurrent with the preparation of this Work Plan. Subsequent assistance to EPA in the form of coordinating public meetings and preparing fact sheets will be provided in accordance with the plan.

4.4 TASK 3 - WORK PLAN DEVELOPMENT

This document is the Work Plan for the activities to be conducted under the RI/FS project. The work to be conducted is described in Sections 4.5 through 4.10, Section 5.0, and the Community Relations Plan.

4.5 TASK 4 - SITE INVESTIGATION

The work to be conducted under this task includes the following:

- Preparation of a Project Operations Plan (POP), which includes:

  - A Field Sampling and Analysis Plan (FSAP)
  - A Site Management Plan (SMP)
  - A Health and Safety Plan (HASP).

- Implementation of the Work Plan and the POP.

The FSAP will include sampling and analytical objectives; the number, type and location of all samples to be collected during the field investigation; the site-specific quality assurance requirements; detailed procedures for field activities; and data management elements.

The SMP will include a brief description of the site, an operations plan outlining the site team organization and responsibilities, and the field operations schedule. This plan also addresses site security and control of access by unauthorized personnel.

The HASP will include site-specific health and safety and background information, a site-work hazard assessment, training requirements, monitoring procedures for site operations, safety and disposal procedures and other requirements in accordance with the HASP for the ARCS Program and WESTON's health and safety protocols.

Preparation of the POP is not part of the work proposed in this Work Plan; the POP will be prepared under previous and separate EPA authorization.

The work proposed to be implemented under this task is described in the following sections. The major objectives for the site investigation are:

- Define all contaminant sources;

- Define the horizontal and vertical extent of contamination;

- Characterize the regional and local hydrogeology;

- Provide a sufficient data base for the risk assessment; and
- Obtain data for remedial alternatives evaluation.

Table 4-1 presents a summary of activities that are planned for the RI, including the following:

- Conduct an inventory of existing water supply wells and collect samples from existing wells;
- Conduct a direct-push technology geologic and groundwater investigation to evaluate the horizontal and vertical extent of contamination;
- Install monitoring wells in the shallow and deep aquifers;
- Collect and analyze soil and groundwater samples; and
- Conduct aquifer testing.

Table 4-2 shows the type, method of analysis, and number of samples to be collected for each subtask.

Activities to be conducted during the site investigation task of the ABC RI/FS are described in the following sections.

4.5.1 Subtask 4.1 - Subcontractor Procurement

To meet the RI/FS requirements for the ABC site, several subcontractors will be used as appropriate to conduct various field services. These services include a direct-push technology (DPT) geologic and groundwater investigation, drilling and monitoring well installation, and surveying of the installed monitoring wells. The subcontractor services will include:

- Providing equipment and manpower for soil and groundwater sampling using DPT and on-site laboratory GC analyses.
- Providing equipment, manpower, and materials for drilling, soil sampling, monitoring well installation, and assistance with aquifer testing.

TABLE 4-1

SUMMARY OF PROPOSED SITE INVESTIGATION ACTIVITIES

Subtask No.	Description	Purpose	Use
4.3	Water Supply Well Inventory	Identify potential groundwater users	Identify potential wells for sampling and possible groundwater contamination receptors.
4.4	Collection and Analysis of Groundwater Samples from Existing Wells	Determine the present groundwater quality at and near ABC and the Base.	Provides data as to the horizontal extent of groundwater contamination and identifies high risk receptors.
4.5	Soil Boring Installation	Obtain site-specific geologic and hydrogeologic data.	Provides site specific delineation of aquifers and confining units, extent of VOCs in soil, data for source identification, and estimates of permeability to be used possibly in a model. Data can be used to design groundwater and soil remediation systems. Also provides data to determine sampling intervals for the Direct Push Technology investigation.

TABLE 4-1 (CONT'D)

SUMMARY OF PROPOSED SITE INVESTIGATION ACTIVITIES

Subtask No.	Description	Purpose	Use
4.6	Direct Push Technology Groundwater Sampling and On-site Analysis	Delineation of the VOC plume. Also obtain groundwater samples without installing monitoring wells. Advantages include no drill cuttings, and minimal exposure to subsurface contamination; also no disposal of hazardous waste.	Support decisions for locating permanent monitoring wells. May also provide estimates of hydraulic conductivity at the sampling interval.
4.7	Monitoring Well Installation - Surficial Aquifer Monitoring Wells and Castle Hayne Aquifer Monitoring Wells	Method for long-term monitoring of water quality in the surficial aquifer. Also provides a measuring point for water level data; provides data point for aquifer testing. Well clusters help define the vertical extent of contamination.	Provide groundwater sampling points. Provide water level data to determine hydraulic gradients and groundwater flow direction. From slug test data or a pumping test, hydraulic conductivity or transmissivity and storage values can be obtained for use in groundwater velocity calculations. Well clusters used to determine vertical hydraulic gradients. Head values give an indication as to the degree of confinement in the Castle Hayne aquifer. May be used in conjunction

TABLE 4-1 (CONT'D)

SUMMARY OF PROPOSED SITE INVESTIGATION ACTIVITIES

Subtask No.	Description	Purpose	Use
			with a leakance coefficient to determine leakage across a confining unit.
4.8	Monitoring Well Survey and Water-Level Measurements	Provide measuring points for water-level elevations.	Preparation of water table and potentiometric surface maps to determine groundwater flow directions, gradients, and recharge/ discharge areas.
4.9	Monitoring Well Sampling and Analysis	Determine water quality data and track plume migration.	Provide groundwater quality data to evaluate horizontal and vertical extent of contamination, to support risk assessments, and to support evaluation of remedial action alternatives.
4.10	Aquifer testing - Surficial and Castle Hayne aquifers	Determine hydraulic parameters of the aquifers	Used with surficial aquifer water-level data and effective porosity to calculate groundwater flow velocities. Data may be used as direct input to a model.

TABLE 4-2

SAMPLE COLLECTION SUMMARY

ABC One-Hour Cleaners
2127 Lejeune Boulevard
Jacksonville, North Carolina

Subtask No.	Description	No. of Samples	
		Field GC VOCs[1/]	TCL VOCs[2/]
4.4	Collection and Analysis of Groundwater Samples from Existing Wells		
	Groundwater Samples		10
	Duplicates		5
	Field Blanks		5
	Trip Blanks		2
	Rinsate Blanks		5
4.5	Soil Boring Installation		
	Soil Samples		20
	Duplicates		5
	Field Blanks		5
	Trip Blanks		2
4.6	DPT Groundwater Investigation and On-Site Analysis		
	Groundwater Samples	80	20
	Duplicates	15	5
	Field Blanks	15	5
	Trip Blanks		2
	Rinsate Blanks	15	5
4.9	Monitoring Well Sampling and Analysis		
	Surficial Aquifer Monitoring Wells		
	Groundwater Samples		10
	Duplicates		5
	Field Blanks		5
	Trip Blanks		2
	Rinsate Blanks		5

TABLE 4-2 (CONT'D)

SAMPLE COLLECTION SUMMARY

Subtask No.	Description	No. of Samples
	Castle Hayne Aquifer Monitoring Wells	
	Groundwater Samples	5
	Duplicates	2
	Field Blanks	2
	Trip Blanks	1
	Rinsate Blanks	2

1/ Samples will be analyzed in accordance with Level III data quality protocols.

2/ Samples will be analyzed in accordance with Level IV CLP data quality protocols.

- Land surveying for vertical and horizontal coordinates of monitoring wells and other physical features.

Request-for-quotation packages will be prepared and issued to at least three firms qualified to provide each required service. Copies of the packages will be provided to EPA. Quotations and qualifications of the firms will be reviewed, subcontractors will be selected, and subcontracts will be executed. Copies of the subcontracts will be provided to EPA.

4.5.2 Subtask 4.2 - Coordination and Mobilization

Coordination of activities will begin before the initiation of any subsurface field investigation or sampling programs.

Activities to be coordinated under this subtask include the following:

- Coordinating and scheduling field activities with the Base;
- Acquiring Department of Transportation right-of-way and drilling permits;
- Acquiring permission from property owners for site access and locating soil borings and/or monitoring wells;
- Siting above-ground and underground utilities, on and off-Base;
- Coordinating with City and County officials, if applicable;
- Coordinating with ABC;
- Locating soil borings and sampling locations, and
- Acquiring well construction permits and/or drilling/ excavation permits.

Mobilization, consisting of field personnel orientation and equipment mobilization, will be performed at the initiation of the subsurface field investigation and sampling programs. A field team orientation meeting will be held to familiarize personnel with site history, health and safety requirements, and field procedures.

Equipment mobilization will include the procurement of rentals (if appropriate) and set up of some or all of the following items:

- Field office (portable trailer)
- Portable lavatory
- Field GC
- Drilling and sampling equipment
- Subsurface investigation equipment
- Health and safety equipment
- Decontamination facilities and materials
- Utility hook-ups

4.5.3 Subtask 4.3 - Water Supply Well Inventory

A potable well inventory will be conducted to identify potential groundwater users. A door-to-door well inventory will be conducted to locate domestic potable water supply wells within a quarter-mile radius of the ABC site. Recently constructed residential developments and businesses known to be served by City of Jacksonville (City) water and having a very low probability of being served by well water (in consultation with City planning/public works/utilities personnel) will not be visited. Also, State and local agency files will be reviewed to locate potable water supply wells within a one-mile radius of the ABC site. To the extent possible, information on well construction (depth, screened interval) and usage will be collected.

Results of the water supply well inventory will be included in the RI report; if additional concerns arise from the inventory (for example, identification of potentially impacted wells), modifications to the investigation (e.g., additional sampling), will be proposed as appropriate.

4.5.4 Subtask 4.4 - Collection and Analysis of Groundwater Samples from Existing Wells

In consultation with EPA and, through EPA, State, City, and Base representatives, groundwater samples and water-level measurements will be collected from selected water supply wells, including

TT-23, TT-25, and TT-26. Permission to sample will be required from well owners before sampling. WESTON will make direct contact with the owners or assist EPA, the State, and/or the City in this regard.

The samples will be shipped to an analytical laboratory for CLP-RAS analyses for Target Compound List (TCL) VOCs. A sample turnaround time of 14 days will be specified so that areas with any contaminated community supply wells or privately owned wells can be quickly identified and included in the following field investigations. The water-quality data will be used to help delineate the horizontal extent of groundwater contamination and determine whether consumers of the well water are being exposed to contaminants. It is preliminarily assumed that groundwater samples from 10 wells will be collected and analyzed. Details on the sampling methodology, laboratory analytes, protocols, and quality assurance/quality control procedures and analyses will be contained in the Project Operations Plan (POP).

4.5.5 Subtask 4.5 - Soil Boring Installation

Approximately eight shallow soil borings will be installed to the water table on the ABC site immediately adjacent to the building complex (Figure 4-1). The purpose of the shallow soil borings is to delineate the extent of on-site soil contamination in the unsaturated zone. Split-spoon samples will be collected continuously to the total depth of each borehole. Select samples will be shipped to an analytical laboratory for chemical analyses for VOCs. Upon completion, the boreholes will be abandoned by filling the boreholes to land surface with a bentonite/grout mixture.

In addition to the shallow soil borings, two soil borings (preliminarily assumed to be ± 100 ft bls), will be installed in areas believed to be free of soil and groundwater contamination. These soil borings will be installed to collect unsaturated zone and saturated zone geologic and hydrogeologic data. One of these soil borings will be installed near the ABC facility; the other soil boring will be installed near community supply well TT-23. Split-spoon soil samples will be continuously collected to the total depth of each borehole. Shelby tube samples will be collected at selected intervals and shipped to a geotechnical laboratory for permeability testing. Upon completion, the boreholes will be abandoned as described above. If VOCs are detected during the installation of these two borings, as indicated by flame-ionization detector or photo-ionization detector split-

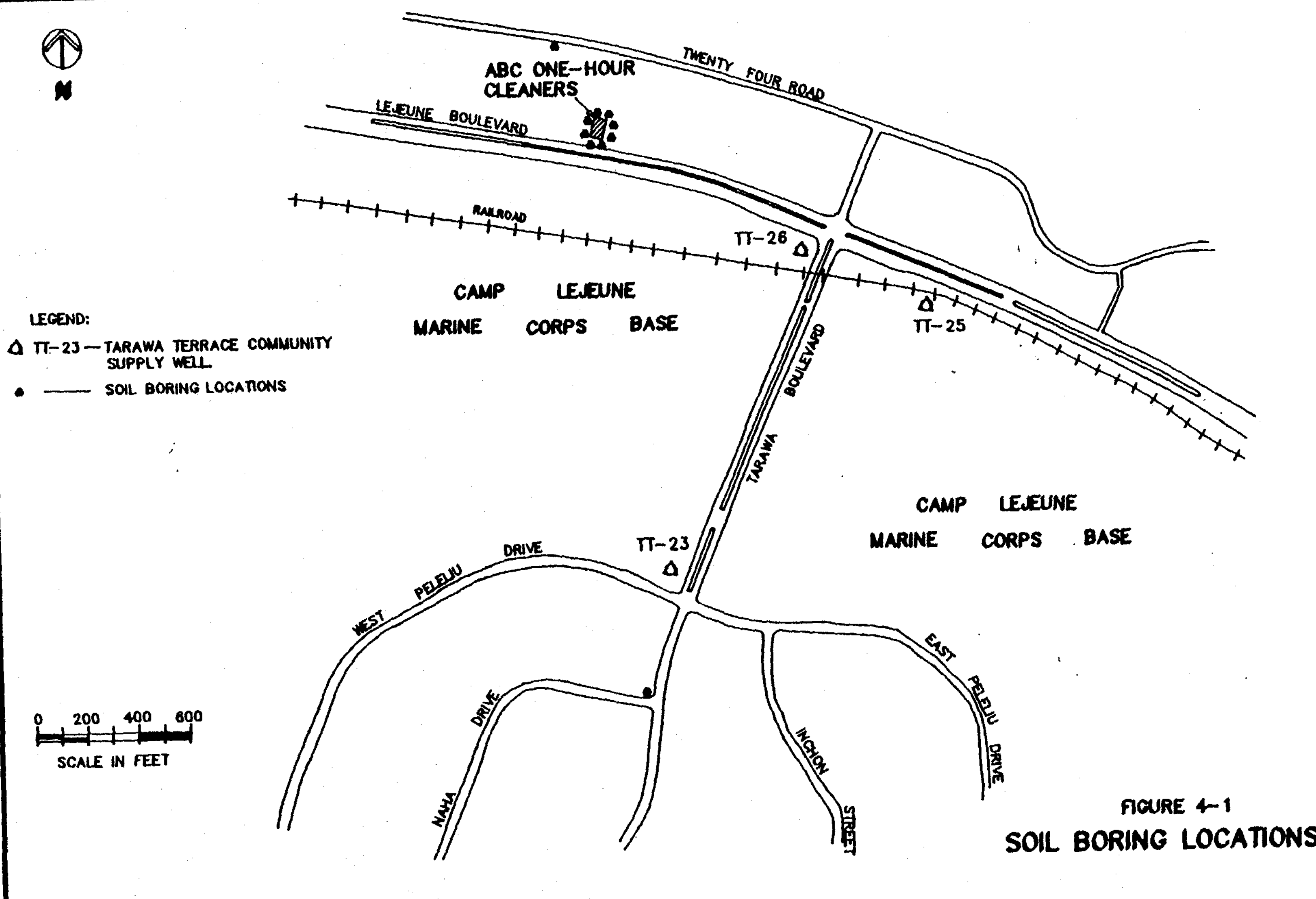

FIGURE 4-1
SOIL BORING LOCATIONS

spoon soil vapor readings, the boreholes will be abandoned at that depth by filling the boreholes to land surface with a bentonite/ grout mixture. Soils of relatively low permeability, that may comprise a semi-confining or confining unit will not be breached, thereby minimizing the possibility of introducing groundwater contamination to an underlying permeable zone.

4.5.6 Subtask 4.6 - Direct-Push Technology Groundwater Sampling and On-Site Analysis

Hydrogeologic data collected during the installation of the soil borings will be used to design a groundwater sampling program using direct push technology (DPT). DPT involves directly thrusting an instrument into the subsurface to obtain hydrogeologic measurements and to collect groundwater samples to initially evaluate the extent of shallow groundwater contamination. DPT eliminates the requirement of installing monitoring wells for collecting groundwater samples. In addition, as the sample instrument is pushed directly to the required sampling interval, no drill cuttings are generated, thereby reducing exposure to subsurface contamination and eliminating the handling and disposal of possibly contaminated soil cuttings and purge development water.

A trailer-mounted rig will be used to push a sample collection instrument to the desired sampling depth to be selected in the field. Under the control of the operator, the sample collection instrument's porous tip is exposed and sample collection begins. A transducer provides input to an on-site computer, and estimates of the formation's horizontal permeability may be determined based on the time rate of filling. Once the sample has been collected, the instrument is extracted and decontaminated. Each of the groundwater samples will be analyzed on site with a field GC for VOCs.

Approximately 20 percent of the groundwater samples will be split in the field and shipped to a CLP laboratory for analysis for the TCL VOCs to verify the results obtained with the field GC.

DPT groundwater samples are proposed for the ABC site and surrounding areas. Specifically, samples will be collected from the locations shown in Figure 4-2. The samples will be collected from depths to be determined at the completion of the soil boring installation. These samples will provide site-specific upgradient and downgradient shallow groundwater quality data; additional samples may be collected from the potential locations near the site (Figure 4-2) depending on conditions encountered in the field.

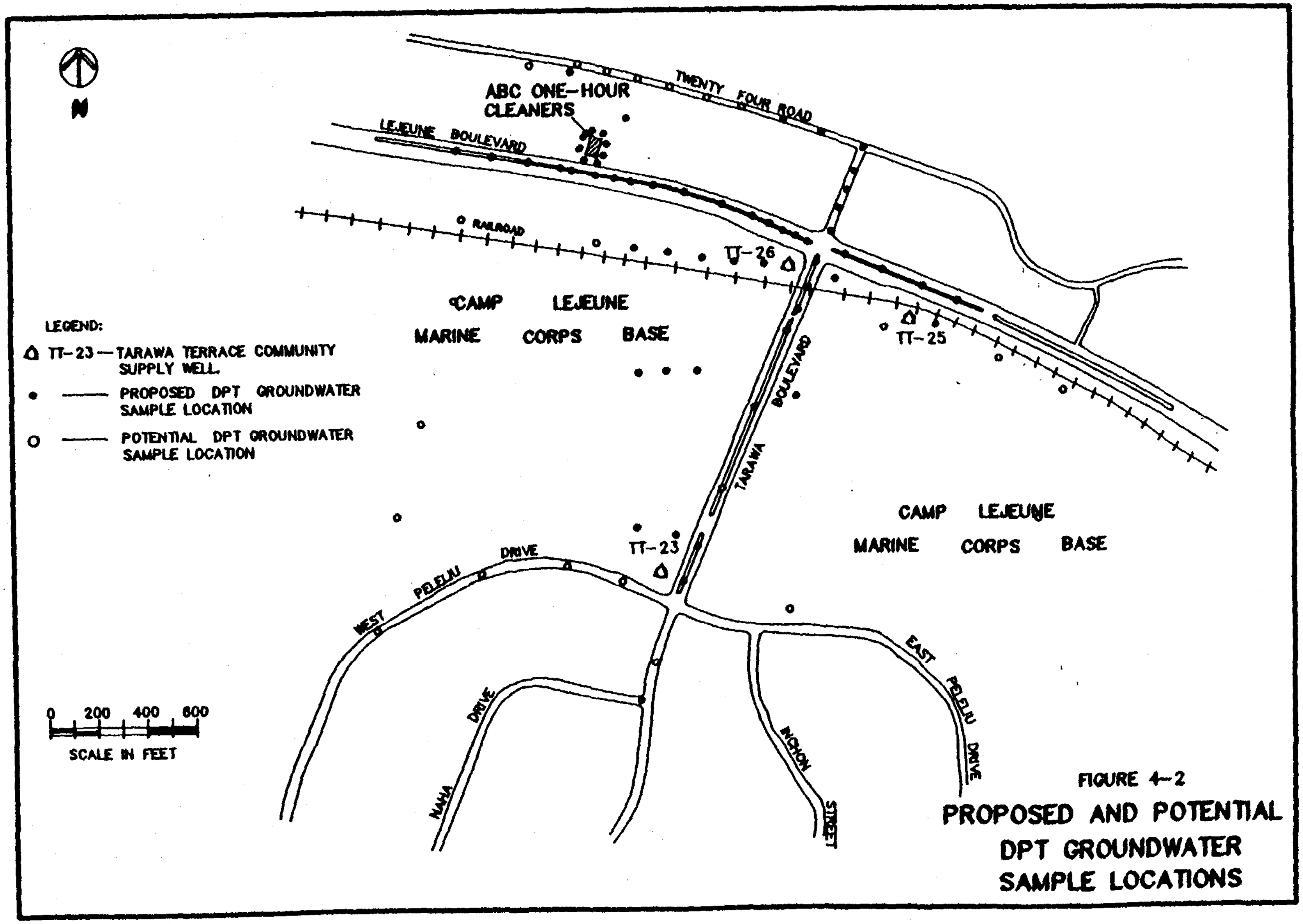

FIGURE 4-2
PROPOSED AND POTENTIAL DPT GROUNDWATER SAMPLE LOCATIONS

Samples may or may not be collected from the potential additional locations; these decisions will be made in the field based on the results of the field GC analyses from samples collected from the proposed DPT groundwater sample locations. It is preliminarily assumed that groundwater samples will be collected from a total of 80 proposed and potential locations. Details on the sampling methodology and analyses will be contained in the POP.

4.5.7 Subtask 4.7 - Monitoring Well Installation

Based on the results of analyses of groundwater samples using the DPT, monitoring wells will be installed: (1) to further define the horizontal and vertical extent of groundwater contamination; (2) to provide sampling locations for long-term monitoring for water quality data; (3) to provide water level elevation data for determining groundwater flow directions; and, (4) to provide possible data points for aquifer testing. Drilling and monitoring well installation details will be presented in the POP. Monitoring wells will be installed in both the surficial aquifer and the Castle Hayne aquifer. Monitoring well locations will be selected after review of results from the DPT activities.

4.5.7.1 Surficial Aquifer Monitoring Wells

Based on the results of the previous soil and groundwater sampling analyses, surficial aquifer monitoring wells will be installed to a depth of approximately 30 ft bls. These monitoring wells will be constructed using stainless steel casing and stainless steel screen to ensure the collection of representative groundwater quality samples. In addition, water level measurements will be collected from the wells to evaluate the direction of groundwater flow in the surficial aquifer. It is preliminarily assumed that 10 surficial aquifer monitoring wells will be installed.

4.5.7.2 Castle Hayne Aquifer Monitoring Wells

Based on the results of the previous field investigations, monitoring wells will be installed in the Castle Hayne aquifer. A number of these wells may be installed adjacent to the surficial aquifer monitoring wells, thereby forming monitoring well clusters. Arrangement of monitoring wells in a cluster allows for the measurement of water levels in distinct water-bearing units and for the determination of vertical hydraulic gradients. Water-level elevations determined from the well clusters will also provide information as to the degree of confinement of the Castle Hayne aquifer. When used in conjunction with vertical hydraulic conductivity data generated through geotechnical analysis of Shelby tube samples collected during the soil boring installations, the groundwater flux across the confining unit may be calculated.

The Castle Hayne aquifer monitoring wells will be constructed of stainless steel casing and stainless steel screen. In addition, the wells will be screened in a single water bearing zone so that groundwater samples and water level measurements collected during the field investigation are representative of the monitored zone. If a confining unit is present between the two aquifers, double casing technology will be installed to prevent the possible introduction of contamination to the Castle Hayne aquifer. Details will be provided in the POP. It is preliminarily assumed that five Castle Hayne aquifer monitoring wells will be installed to a depth of ± 100 ft bls.

4.5.8 Monitoring Well Survey and Water-Level Measurements

Upon completion of the surficial and Castle Hayne aquifer monitoring wells, the top-of-casing and ground surface elevations at the wells will be surveyed by a land surveyor certified in the State of North Carolina. The surveyed elevations will be referenced to a common datum (e.g., National Geodetic Vertical Datum). Reference elevations for nearby water supply wells may also be surveyed.

Water-level measurements will be collected from each monitoring well and referenced to the selected datum. Water-level measurements will be collected (1) before or during the monitoring well survey (2) before collecting groundwater samples, and (3) approximately one month after the wells are sampled.

The depth to water will be measured by a decontaminated water-level recording instrument (M-scope). For every water-level measurement event, at least three consecutive depth to water readings will be collected and recorded. Depth to water measurements will be collected until three readings are within a 0.01 foot range. Water-table elevation and potentiometric surface maps will be constructed so that groundwater flow directions and gradients in the surficial and Castle Hayne aquifers can be determined.

4.5.9 Monitoring Well Sampling and Analysis

Groundwater samples will be collected from each of the newly installed monitoring wells to further define the horizontal and vertical extent of contamination. The samples will be collected in accordance with procedures to be presented in the Field Sampling and Analysis Plan of the POP.

4.5.10 Aquifer Testing

Aquifer tests will be conducted as appropriate in the surficial and in the Castle Hayne aquifer monitoring wells. Data will be used to provide estimations of aquifer parameters for evaluation of potential groundwater remediation scenarios. Additional aquifer testing may be warranted at a later data depending upon the type of remedial action selected at the site.

4.5.10.1 Surficial Aquifer

Slug tests will be conducted in each of the surficial aquifer monitoring wells (10) to evaluate the hydraulic conductivity of the surficial aquifer. Hydraulic conductivity and/or lab permeability data will be used in conjunction with surficial aquifer water-level data to calculate groundwater flow velocities.

A surficial aquifer pumping test(s) may be conducted based upon (1) the permeability of the surficial sediments, and (2) the logistics of containing and disposing of the extracted groundwater. The POP will present a detailed discussion of the aquifer testing methodology.

4.5.10.2 Castle Hayne Aquifer

Based on the lithology encountered during the monitoring well installation, and upon other considerations, either slug tests or short-term specific capacity tests will be conducted in the Castle Hayne aquifer monitoring wells. An aquifer pumping test(s) may be conducted depending on the conditions encountered in the field. The POP will present a detailed discussion of the aquifer testing methodology. It is preliminarily assumed that a slug test will be conducted in each Castle Hayne aquifer monitoring well (5).

4.5.11 Groundwater Flow and Solute-Transport Modeling

Data collected during the site investigation may be incorporated into an analytical and/or numerical groundwater flow model(s). If conditions warrant such, an analytical and/or numerical solute-transport model(s) also may be developed. Although data collected may be used as direct input to an analytical equation or numerical code, additional field or laboratory data may be required to adequately characterize the groundwater system. Any plans for modeling at this time should be considered as preliminary because of insufficient characterization of the hydrogeology and extent of groundwater contaminants. Modeling will be applied only as warranted based upon the type of information needed to evaluate potential remedial options.

4.6 TASK 5 - PRELIMINARY REMEDIAL TECHNOLOGIES

On the basis of the findings of the RI, the following will be reevaluated and revised as warranted:

- Definition of the site.
- Definition of the site problem.
- Selection of remedial response objectives.
- Selection of preliminary remedial response technologies.
- Need for immediate or interim remedial measures.

The selected preliminary remedial response technologies will be presented in a matrix of technologies versus general evaluation factors such as: applicability to the problem, reliability, implementability, damage to the environment, initial cost, operating/maintenance costs, and others to be selected. Entries in the matrix will consist of comments and criteria that will influence the selection of technologies to be considered in the FS.

4.7 TASK 6 - SITE INVESTIGATION ANALYSIS AND RISK ASSESSMENT

4.7.1 Data Validation and Evaluation

Samples collected during the RI field activities will be analyzed in accordance with the DQOs. Field measurements of pH, temperature, and conductance will be performed as specified in EPA-Region IV Environmental Services Division Standard Operating Procedures and Quality Assurance Manual (ESD-SOP QAM).

Quality control during sample analysis is described by EPA's Contract Laboratory Program - Caucus Organic Protocol (CLP-COP). Quality control of this task will be in accordance with the EPA-Region IV ESD-SOP QAM.

Validation of measurements is a systematic process of reviewing data to ensure that the data are adequate for its intended use. The process includes the following activities:

- Auditing measurements system calibration and calibration verification;
- Auditing quality control activities;

- Reviewing data for technical credibility versus the sample site setting;

- Auditing field sample data records and chain-of-custody;

- Checking intermediate calculations; and

- Documenting the process.

The review and validation of CLP data will be performed according to the current Region IV Engineering Support Branch QA/QC guidelines.

Data reduction and evaluation is the process of organizing validated data into a working format and then reviewing and using the data to meet project objectives. Data obtained from the various field investigations will be condensed and organized to facilitate evaluation and presentation. Data reduction will result in the production of various tables, figures, and drawings describing and summarizing the pertinent site features. These might include:

- Figures displaying boring and monitoring well locations

- Hydrogeologic cross-sections

- Groundwater contour maps

- Contaminant contour maps

Data reduction will be facilitated by computerization. The computerized sampling and analytical data base will be amenable to manipulation and creation of different sorting profiles. Sorting profiles will assist in evaluating the occurrence and distribution of contaminants with the different media. Appropriate tables, maps, and figures will be produced to summarize the occurrence and distribution of contaminants on the site and adjacent areas.

Usable data, as determined by validation and evaluation, will be presented in data tables organized by sample media and location. Once data are reduced to this usable format, they will be reviewed and evaluated to determine if RI project objectives have been met. The data will then be used in the risk assessment to develop appropriate target levels for the FS.

4.7.2 - Baseline Public Health and Environmental Risk Assessment

The risk assessment that will be performed for the ABC site will be a baseline public health risk assessment. It is not expected that a baseline ecological risk assessment will be warranted. The assessment will be based on data obtained from the field investigation and will characterize the current and potential future public health and ecological risks that could occur if no remedial action were taken at the site. Evaluation of the no-action alternative is required under the NCP.

The baseline public health risk assessment will be conducted in accordance with procedures outlined in the EPA Superfund Public Health Evaluation Manual (SPHEM-EPA, 1986) and the EPA Superfund Environmental Evaluation Manual (EPA 1989).

There are two objectives to the baseline public health risk assessment: (1) the assessment provides information that can be used to evaluate the need for remediation, based on the potential health and ecological risks posed by the site; and (2) the baseline assessment provides a base for determining the reduction in risks resulting from the different remedial actions to be evaluated in the FS. Thus, the risk assessments will assist in selecting a remedial alternative for the site.

The major steps of the baseline risk assessment are as follows:

- Selection of contaminants of concern
- Identification of chemical-specific ARARs
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Identification of response objectives

Selection of Contaminants of Concern

The first step of the assessment process is the selection of contaminants of concern or indicator chemicals for which qualitative and quantitative analyses will be performed. If more than 10 or 15 contaminants are detected in each medium (groundwater, soils), indicator chemicals may be selected for the specific risk analyses. Indicator chemicals will be selected based on prevalence, concentrations, observed distributions among sampling locations, toxicity, carcinogenicity, environmental behavior, treatability, and availability of toxicity and health effects data.

Indicator chemicals will be selected only if a truly representative indicator list can be chosen without excluding any chemical which may cause significant human harm. The following information will be provided to support the selection of indicator chemicals:

- A complete list of all chemicals tested for and those contaminants which were detected;
- The indicator list; and
- The rationale for eliminating chemicals from the indicator list which were measured at the site.

<u>Identification of Chemical-Specific ARARs</u>

The Integrated Risk Information System (IRIS) of the EPA will be the primary source for ARARs for protection of human health. Additional ARARs will be included from State of North Carolina regulations. For contaminants of concern with no ARARs or health based numbers from IRIS, a literature search will be performed to develop health-based criteria.

<u>Public Health Exposure Assessment</u>

The purpose of the exposure assessment is to estimate the potential duration, frequency, and magnitude of exposure. This assessment includes locating populations at risk of exposure (identifying receptors), evaluating exposure routes, and estimating exposure conditions. A range of exposure conditions will be evaluated to represent the most probable and realistic maximum exposure conditions. Based on these exposure scenarios, body dose levels will be estimated for each contaminant of concern at each potential exposure point. Exposure assessments will be conducted following procedures outlined in the <u>Superfund Public Health Evaluation Manual</u> (EPA, 1986) and the <u>Superfund Exposure Assessment Manual</u> (EPA, 1988b).

The current or future pathways of exposure to contaminants are the use of contaminated groundwater from the shallow or deeper aquifers for drinking water, showers, or bathing; and inhalation of contaminants volatilized from soils.

The procedures for estimating concentrations of contaminants of concern at each exposure point and for estimating human exposure doses are discussed for each pathway in the following sections.

Shallow and Deep Aquifers as a Source of Domestic Water. Private and/or Base wells may be drawing water from the aquifers that were found to contain contaminants at levels above MCLs. The baseline risk assessment will characterize the potential risks associated with the use of both the shallow and deep aquifers.

The following routes of exposure will be assessed: ingestion, dermal contact, and inhalation. Standard assumptions regarding the ingestion of drinking water will be used for estimating the body dose levels of contaminants. Risks associated with inhalation of VOCs present as contaminants will be considered by estimating ambient air concentrations during showering.

Direct Contact with an Inadvertent Ingestion of Contaminated Soils. This scenario is not presently considered to realistically be of concern and will not be addressed in the risk assessment unless data obtained in the RI demonstrate otherwise.

Ingestion of Produce Grown on Contaminated Soils. This scenario is not presently considered to realistically be of concern and will not be addressed in the risk assessment unless data obtained in the RI demonstrate otherwise.

Inhalation of Contaminants Volatilized from Soils. It is conceivable that VOCs could be volatilizing into enclosed spaces, such as buildings and underground utilities, near the contaminant source and/or in areas of high VOC concentrations in groundwater. Persons living or working in such enclosed areas could be exposed to airborne VOCs. Also, persons working within or near open excavations in the same areas could be similarly exposed. While this scenario is considered to be of low probability and resulting exposure would probably be of brief duration, it will be considered in the risk assessment.

Direct Contact with the Incidental Ingestion of Surface Waters and Sediments. This scenario is not presently considered to realistically be of concern and will not be addressed in the risk assessment unless data obtained in the RI demonstrate otherwise.

Ingestion of Contaminated Fish from Northeast Creek. This scenario is not presently considered to realistically be of concern and will not be addressed in the risk assessment unless data obtained in the RI demonstrate otherwise.

Toxicity Assessment

The toxicity assessment will be performed to assess adverse effects on public health that may result from contaminant exposure. This will be accompanied by a narrative description of the toxicologic properties of contaminants of concern and an index of their toxicity (i.e., standards, guidelines, and/or criteria values).

Toxicity profiles will be developed for the contaminants of concern including a summary of both the carcinogenic and noncarcinogenic effects associated with acute, chronic, and lifetime exposure to these contaminants. A description of the potential environmental effects will also be included in these profiles.

A review of available dose-response information will also be provided. This review will focus on the quantitative toxicity standard and criteria values developed by various governmental agencies. The main source of such information will be the EPA IRIS. When available, cancer potency values and RfDs or other ADI values will be identified.

Risk Characterization

The risk characterization analysis will be based on information generated in the exposure assessment and toxicity assessment. Quantitative risk estimates will be developed if sufficient information exists to adequately characterize the exposure to and toxicity of contaminants. A qualitative risk assessment will be performed if this information is not available. The risk assessment will estimate the incident and/or severity of adverse human health effects by focusing on the carcinogenic and noncarcinogenic impacts of the contaminants of concern. Risks will be evaluated separately for potential exposures associated with each of the exposure scenarios previously described.

The incremental excess carcinogenic risks will be determined by multiplying the carcinogenic potency values derived by EPA's Carcinogen Assessment Group (CAG) by the site-specific exposure dose level. Cancer risks posed by exposure to multiple contaminants will be summed. The noncarcinogenic risks associated with exposure in the study area will be estimated by comparing the site-specific exposure dose levels to the relevant standard, criteria, and/or guideline values developed for the protection of public health (e.g., RfDs, MCLs, MDLGs, ADIs). The resulting ratio, referred to as the hazard index, provides a numerical ratio that can be used as a measure of risk. The sum of the hazard indices for multiple contaminants will be computed assuming additive risk from noncarcinogenic contaminants. The conclusion will include a summary of all carcinogenic and noncarcinogenic risks, identifying the significant contaminants and routes of exposure.

4.8 TASK 7 - REPORTING PROCEDURES

Under this task, all of the work completed during the RI will be compiled and presented in a formal report. Supporting materials, such as laboratory reports, logs, photographs, and calculations, will be included in appendices.

Project management and coordination and preparation of monthly progress reports will also be conducted under this task.

4.9 TASK 8 - POST SCREENING FIELD INVESTIGATION

At present, no field work beyond that described in Task 4 is anticipated. If, in the process of screening remedial action technologies in the feasibility study, it is determined that additional field or laboratory investigations are needed to properly evaluate remedial action alternatives, such investigations will be conducted under this task.

4.10 TASK 9 - ADDITIONAL REQUIREMENTS

Services outside of those included in Tasks 0 through 8 needed to support the RI will be provided as requested by EPA under this task.

Section 5

5.0 TASK PLAN FOR THE FEASIBILITY STUDY

In accordance with the project statement of work (SOW), the feasibility study (FS) will consist of the following tasks:

Task 1: Description of Proposed Responses

Task 2: Identification and Screening of Remedial Technologies

Task 3: Development of Alternatives

Task 4: Initial Screening of Alternatives

Task 5: Evaluation of the Alternatives

Task 6: Conceptual Design

Task 7: Final Report

The FS will be conducted according to the requirements of the tasks in the SOW and, to the extent that they are compatible and consistent with the SOW, the procedures recommended in "Guidance on Feasibility Studies under CERCLA" (EPA, 1986), "Guidance for Conducting RI/FS under CERCLA" (EPA, 1988), and ("Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites" (EPA, 1988).

5.1 TASK 1 - DESCRIPTION OF PROPOSED RESPONSES

To ensure that the FS begins on the basis of a common understanding of the need for and purpose of remedial action at the site, a summary of the situation will be prepared based on the findings of the RI. The summary will consist of:

- Brief description of the site background.
- Definition of the site problem(s).
- Statement of remedial response objectives.
- Stipulation of cleanup criteria.
- Selection of general response actions.

The summary will be provided to and discussed with all participants in the FS.

Significant site, environmental and health concerns, and ARARs will have been identified during the RI. These will include ARARs and remedial response objectives for addressing unacceptable risks to public health and the environment. Based on data collected in the RI, the preliminary remedial response objectives identified during the RI will be developed more fully and finalized. General response actions, or categories of remedial action alternatives, will be selected to address each site problem area response objective. These general response actions will form the basis for the technology screening.

To the extent applicable, the site problem(s), remedial response objectives, clean-up criteria, and general response actions will be described for individual operable units (e.g., contaminant source, groundwater contaminant plume, water supply system). Some preliminary general response actions and corresponding remedial action objectives, including identification of operable units, are shown in Table 5-1.

5.2 TASK 2 - IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

On the basis of technical guidance documents, general technical literature, and experience with site remediation, a list of potentially applicable remedial action technologies will be prepared for each general response action. This list will be prepared from guidance materials, technical literature, and experience with waste treatment, construction, and site remediation. The technologies on the list will be screened with regard to practical applicability under conditions of the site, remedial response objectives, and clean-up criteria. The result will be lists of specific technologies that have reasonable probability of contributing to the remediation of the site. Some preliminary remedial technologies and corresponding general response actions, remedial action objectives, and operable units for the ABC site are shown in Table 5-1.

5.3 TASK 3 - DEVELOPMENT OF ALTERNATIVES

The technologies resulting from the screening conducted during Task 2 will be used to develop remedial action alternatives, each of which will be developed to be capable of accomplishing the clean-up criteria for a designated site operable unit. Each alternative will consist of one or more technology. Technologies will be combined such that they are compatible and complete in that they appear reasonably capable of fulfilling the requirements of the corresponding general response action. Alternatives that reduce the toxicity, concentration, volume, or mobility of the contaminants will be developed as the situation allows.

TABLE 5-1

PRELIMINARY EXAMPLES OF OBJECTIVES, RESPONSE ACTIONS, AND TECHNOLOGIES THAT COULD BE CONSIDERED IN FS TASKS 1 AND 2

Preliminary Operable Unit	Preliminary Remedial Action Objectives	Preliminary General Response Actions	Preliminary Remedial Technologies
Contaminant source	Prevent/reduce future release of contaminants to groundwater	No action/institutional actions	Deed restrictions periodic groundwater analysis
		Removal actions	Excavation, treatment, replacement, disposal
		Collection/treatment actions	Soil venting, vapor treatment
Groundwater contaminant plume	Reduce groundwater contamination to acceptable levels	No action/institutional actions	Deed restrictions, well construction, use restrictions, periodic groundwater analysis
		Collection/treatment actions	Groundwater pumping, water treatment by air stripping and/or GAC, discharge treated water to aquifer, surface water, and/or sanitary sewer
	Prevent/control further migration	No action/institutional actions	Deed restrictions, well construction, use restrictions, periodic groundwater analysis
		Containment actions	Groundwater pumping, water treatment by air stripping and/or GAC, discharge treated water to aquifer, surface water, and/or sanitary sewer

TABLE 5-1 (CONT'D)

PRELIMINARY EXAMPLES OF OBJECTIVES, RESPONSE ACTIONS, AND TECHNOLOGIES THAT COULD BE CONSIDERED IN FS TASKS 1 AND 2

Preliminary Operable Unit	Preliminary Remedial Action Objectives	Preliminary General Response Actions	Preliminary Remedial Technologies
Water supply systems	Ensure continued water supply meeting applicable drinking water standards	No action/institutional actions	Alternate water supply from Holcomb Boulevard system (present situation)
		No action/institutional actions	None (1985 situation, before alternate water supply)
		Collection/treatment action	Resume use of wells, water treatment by air stripping and/or GAC, treated water to consumers

As required by SARA, alternatives will be developed in each of the following categories:

- An alternative for treatment that would eliminate, or minimize to the extent feasible, the need for long-term management (including monitoring) at the site;

- Alternatives that would use treatment as a primary component of an alternative to address the principal threats at the site;

- An alternative that relies on containment, with little or no treatment but is protective of human health and the environment by preventing potential exposure and/or by reducing mobility; and

- A "no action" alternative.

5.4 TASK 4 - INITIAL SCREENING OF ALTERNATIVES

The remedial alternatives resulting from Task 3 will be further screened to ensure that only alternatives having a reasonable probability of being found acceptable proceed to detailed evaluation. The following factors will be considered in the screening (excerpted in part from the project SOW):

- Environmental Protection: Only those alternatives that have a reasonable probability of satisfying the remedial response objectives and contribute substantially to the protection of public health, welfare, or the environment will be considered further. Source control alternatives will be capable of achieving adequate control of source materials. Off-site alternatives must be capable of minimizing or mitigating the threat to public health, welfare, or the environment.

- Environmental Effects: Alternatives that appear to pose significant adverse environmental effects will be excluded, unless mitigating measures can be incorporated into the alternative.

- Implementability and Reliability: Alternatives that appear to be extremely difficult to implement or do not appear to be capable of achieving the remedial objectives in a reasonable time period will be eliminated.

- Cost: Cost will be used to discriminate only among alternatives that provide similar results. Alternatives that appear to be capable of providing results similar to other alternatives, but appear likely to be substantially higher in cost, will be eliminated. Cost will be used to discriminate among treatment alternatives or nontreatment alternatives, but not between treatment and nontreatment alternatives. Initial (capital) and ongoing (operating and maintenance) costs will be considered based on cost data available in guidance and general literature.

- Permanence of Remedy: Permanent remedies will be preferred over landfilling or remedies that leave waste in-place, even if the cost exceeds those of other remedies. Non-permanent remedies that do not appear to offer significant advantages over permanent remedies will be eliminated.

- Innovative Technology Treatment and Resource Recovery: Alternatives incorporating innovative technologies will be preferred if there is reasonable belief that the innovative technology allows the alternative to offer potential for improved performance or implementability and poses fewer adverse impacts than other available alternatives. Alternatives incorporating innovative technologies will not be eliminated solely because of the inclusion of the technology.

5.5 TASK 5 - EVALUATION OF THE ALTERNATIVES

The remedial alternatives resulting from the screening during Task 4 will be further developed and undergo detailed evaluation for technical, environmental and cost considerations. A description of each alternative will be prepared, consisting at a minimum of the following (excerpted in part from the project SOW):

- Description of the alternative and the individual technologies.

- Special engineering considerations required to implement the alternatives (e.g., pilot treatment facility, additional studies needed to proceed with final remedial design);

- Environmental impacts of proposed methods and costs for mitigating any adverse effects;
- Operation, maintenance, and monitoring requirements of the remedy;
- Off-site disposal needs and transportation plans;
- Temporary storage requirements;
- Safety requirements for remedial action implementation (including on-site and off-site health and safety considerations);
- A description of how the alternative could be phased into individual operable units, if applicable. The description will include a discussion of how various operable units of the total remedy could be implemented individually or in groups, resulting in a significant improvement to the environment, savings in costs, or simplified logistics.
- A description of how each alternative could be segmented to allow staged implementation of segments over time, if applicable.
- A review of off-site waste treatment, storage, and disposal facilities that are part of the alternative to ensure that the facilities are in compliance with applicable RCRA requirements, both current and proposed.

Each alternative will undergo an environmental assessment. In accordance with the project SOW, the environmental assessment will include, at a minimum, an evaluation of each alternative's environmental effects, an analysis of measures to mitigate adverse effects, physical or legal constraints, and compliance with CERCLA or other regulatory requirements. Each alternative will be assessed in terms of the extent to which it mitigates damage to or protects public health, welfare, and the environment in comparison to the other alternatives. The specific considerations to be used in the assessment will be referenced to standards and criteria developed under Federal or State environmental and health statutes.

Each alternative will also undergo a detailed cost analysis. Estimates of initial costs and operating and maintenance costs over time will be prepared and the present-worth equivalent cost will be computed using a time-value-of-money rate (discount or interest rate) prevailing at the time or otherwise specified by EPA.

The detailed evaluation of the alternatives will conform to the requirements of the National Contingency Plan, in particular, Section 300.68 (h), Subpart F, and will consist of a technical, environmental, and cost evaluation. The detailed evaluation will follow the process as specified in the "Guidance on Feasibility Studies under CERCLA" (USEPA, 1985), as updated in J.W. Porter's December 1986 and July 1987 Memoranda on "Interim Guidance on Superfund Selection of Remedy", and "Guidance for Conducting RI/FS under CERCLA" (USEPA, 1988). In the latter guidance (USEPA, 1987; USEPA, 1988), a set of nine evaluation criteria are stipulated that are to be applied in the evaluation of each alternative.

Table 5-2 presents the nine evaluation criteria and the factors considered for each evaluation criterion. A brief description of each criterion follows. (Note that these criteria are similar, but not identical, to those listed in the project SOW. WESTON incorporated the criteria from guidance as appropriate for this FS).

Short-Term Effectiveness

This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative is evaluated with respect to its effects on the community and on-site workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

Long-Term Effectiveness

This criterion addresses the results of a remedial action in terms of the risk remaining at the site after the response objectives have been met. The primary focus on this evaluation is to determine the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the magnitude of remaining risk (measured by numerical standards, such as cancer risk levels), and the adequacy, suitability and long-term reliability of management controls for providing continued protection from residuals (i.e., assessment of potential failure

TABLE 5-2

DETAILED EVALUATION CRITERIA

- SHORT-TERM EFFECTIVENESS
  - Protection of community during remedial actions
  - Protection of workers during remedial actions
  - Time until remedial response objectives are achieved
  - Environmental impacts
- LONG-TERM EFFECTIVENESS
  - Magnitude of risk remaining at the site after the response objectives have been met
  - Adequacy controls
  - Reliability of controls
- REDUCTION OF TOXICITY, MOBILITY OR VOLUME
  - Treatment process and remedy
  - Amount of hazardous material destroyed or treated
  - Reduction in toxicity, mobility or volume of the contaminants
  - Irreversibility of the treatment
  - Type and quantity of treatment residuals
- IMPLEMENTABILITY
  - Ability to construct technology
  - Reliability of technology
  - Ease of undertaking additional remedial action, if necessary
  - Monitoring considerations
  - Coordination with other agencies
  - Availability of treatment, storage capacity, and disposal services
  - Availability of necessary equipment and specialists
  - Availability of prospective technologies

TABLE 5-2 (CONT'D)

DETAILED EVALUATION CRITERIA

- COST
  - Capital costs
  - Annual operating and maintenance costs
  - Present worth analysis
  - Sensitivity analysis

- COMPLIANCE WITH ARARs
  - Compliance with chemical-specific ARARs
  - Compliance with action-specific ARARs
  - Compliance with location-specific ARARs
  - Compliance with appropriate criteria, advisories and guidance

- OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

- STATE ACCEPTANCE

- COMMUNITY ACCEPTANCE

of the technical components). The long-term effectiveness factors cited in SARA, section 121 (b) (1) will be addressed.

Reduction of Toxicity, Mobility, and Volume

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility and volume, and the type and quantity of treatment residuals.

Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility considers construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility considers activities needed to coordinate with other agencies (e.g., state and local) in regards to obtaining permits or approvals for implementing remedial actions.

Cost

This criterion addresses the capital costs, annual operation and maintenance costs, and present-worth analysis.

Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of +50 percent to -30 percent.

A present-worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial action over its planned life. As suggested in the EPA's guidance (1988), a discount rate of five percent will be considered unless the market values indicate otherwise during the performance of the FS.

Compliance with ARARs

This criterion is used to determine how and to what extent each alternative complies with applicable or relevant and appropriate Federal and State requirements, as defined in CERCLA Section 121.

Overall Protection of Human Health and the Environment

This criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

State Acceptance

This criterion evaluates the technical and administrative issues and concerns the State may have regarding each of the alternatives. The factors to be evaluated include those features of alternatives that the State supports, reservations of the State, and opposition of the State.

Community Acceptance

This criterion incorporates public concerns into the evaluation of the remedial alternatives.

After each of the remedial alternatives has been assessed against the nine criteria, a comparative analysis will be performed. This analysis will compare all the remedial alternatives against each other for each of the nine evaluation criteria.

A draft report of the FS will be prepared, incorporating the results of Tasks 2 through 5. The process by which the final remedial action alternatives were selected will be included, and reasons for screening out alternatives will be provided. Detailed information on the alternatives, including cost estimates will be provided in appendices.

Information pertaining to the technical, environmental, and cost evaluating factors will be presented in matrix format. Entries in the matrix will be qualitative and will allow ready comparison of the alternatives with regard to each evaluation factor. One remedial alternative for each operable unit will be recommended for implementation and supporting reasons for the recommendation will be provided.

The FS report will be prepared and presented in the format specified in "Guidance for Conducting RI/FS Under CERCLA" (USEPA, 1988). Preliminarily, the FS report will be comprised of an executive summary and four sections. The executive summary will be a brief overview of the FS and the analysis underlying the remedial actions that were evaluated. The four report sections will be:

- Introduction and Site Background;
- Identification and Screening of Remedial Technologies;
- Development and Initial Screening of Remedial Alternatives; and
- Description and Detailed Analysis of Alternatives.

The introduction will provide background information regarding site location and facility history and operation. The nature of the problem, as identified through the various studies, will be presented. A summary of geohydrological conditions, remedial action objectives, nature and extent of contamination, and risk assessment addressed in the RI Report will also be provided.

The feasible technologies and process options for site remediation will be identified for each general response action, and the results of the remedial technologies screening will be described.

Remedial alternatives will be developed by combining the technologies identified in the previous screening process. The results of initial screening of remedial alternatives, with respect to effectiveness, implementability and cost, will be described.

A detailed description of the cost and non-cost features of each remedial action alternative passing the initial screening of the previous section will be presented. The detailed evaluation of each remedial alternative with respect to the nine evaluation criteria, will be presented. A comparison of these alternatives will also be presented.

5.6 TASK 6 - CONCEPTUAL DESIGN

Following EPA's selection of a remedial alternative for implementation, a conceptual design of that alternative will be prepared. As required by the project SOW, the conceptual design will include, but not be limited to, the engineering approach, including implementation schedule, special implementation requirements, institutional requirements, phasing and segmenting considerations, preliminary design criteria, preliminary site and facility layouts, budget cost estimate (including operation and maintenance costs), operating and maintenance requirements and duration, and an outline of the safety plan, including cost impact on implementation. Additional information required as the basis for the completion of the final remedial action design will also be included.

5.7 TASK 7 - FINAL REPORT

A final FS report will be prepared incorporating the results of Tasks 2 through 6 and EPA comments on the draft FS report. The report will include responses to comments by EPA peer reviewers and a Public Comment Responsiveness Survey.

Section 6

6.0 PROJECT MANAGEMENT

6.1 ORGANIZATION

The proposed project organization for the ABC One-Hour Cleaners Site is shown in Figure 6-1. WESTON's Regional Program Manager, Michael B. Foulke, is responsible for the quality of all of WESTON's ARCS Region IV work assignments. He monitors the progress of each work assignment to ensure that adequate resources are available and problems are avoided or identified and rectified early. Mr. Foulke implements the program standard of quality for work in the region and ensures that the Site Manager (SM) meets that standard. His review of deliverables emphasizes technical quality, schedule, and costs.

The SM, Kevin R. Boyer, has primary responsibility and authority for implementing and executing the RI/FS. He will report to the Regional Program Manager and will direct and/or delegate direction of the activities conducted on the project. The RI Leader, Randall McAlister, will guide and advise the Field Operations Leader during site investigations and provide direct and technical review in the RI report. The Field Operations Manager, Kevin Caravati, will organize, coordinate, and implement all site investigation activities with the assistance of technical staff. Mr. Boyer will also serve as the FS Manager and will direct the evaluation of alternatives and the conceptual design.

6.2 PROJECT SCHEDULE

The anticipated schedule for the project is shown on Figure 6-2. Work on subcontractor solicitation (RI Subtask 4.1) and the water supply well inventory (RI Subtask 4.3) will begin upon receipt of Work Plan approval. At that time, the schedule will be revised, if necessary, reflecting the actual start date. Various assumptions, which are identified in the Work Plan Cost Estimate provided as a separate volume and companion document, are reflected in the schedule.

6.3 DELIVERABLES

The anticipated deliverables for the project are listed in Table 6-1, along with the projected time of delivery relative to the time of Work Plan approval. Upon receipt of Work Plan approval, the delivery dates will be established, if necessary, reflecting the start date. The same assumptions referenced above apply to the timing of submiting deliverables.

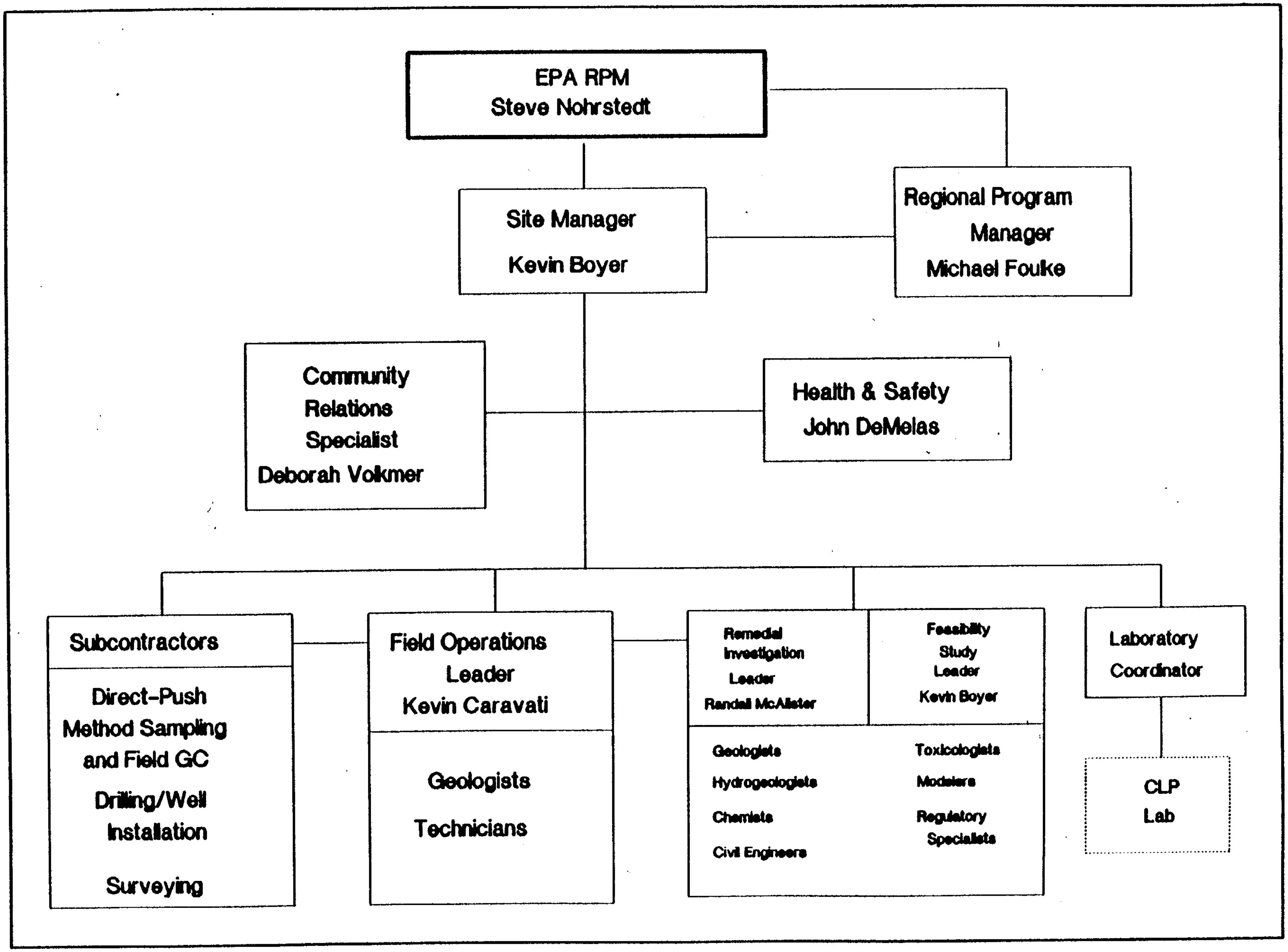

Figure 6-1. Proposed Project Organization

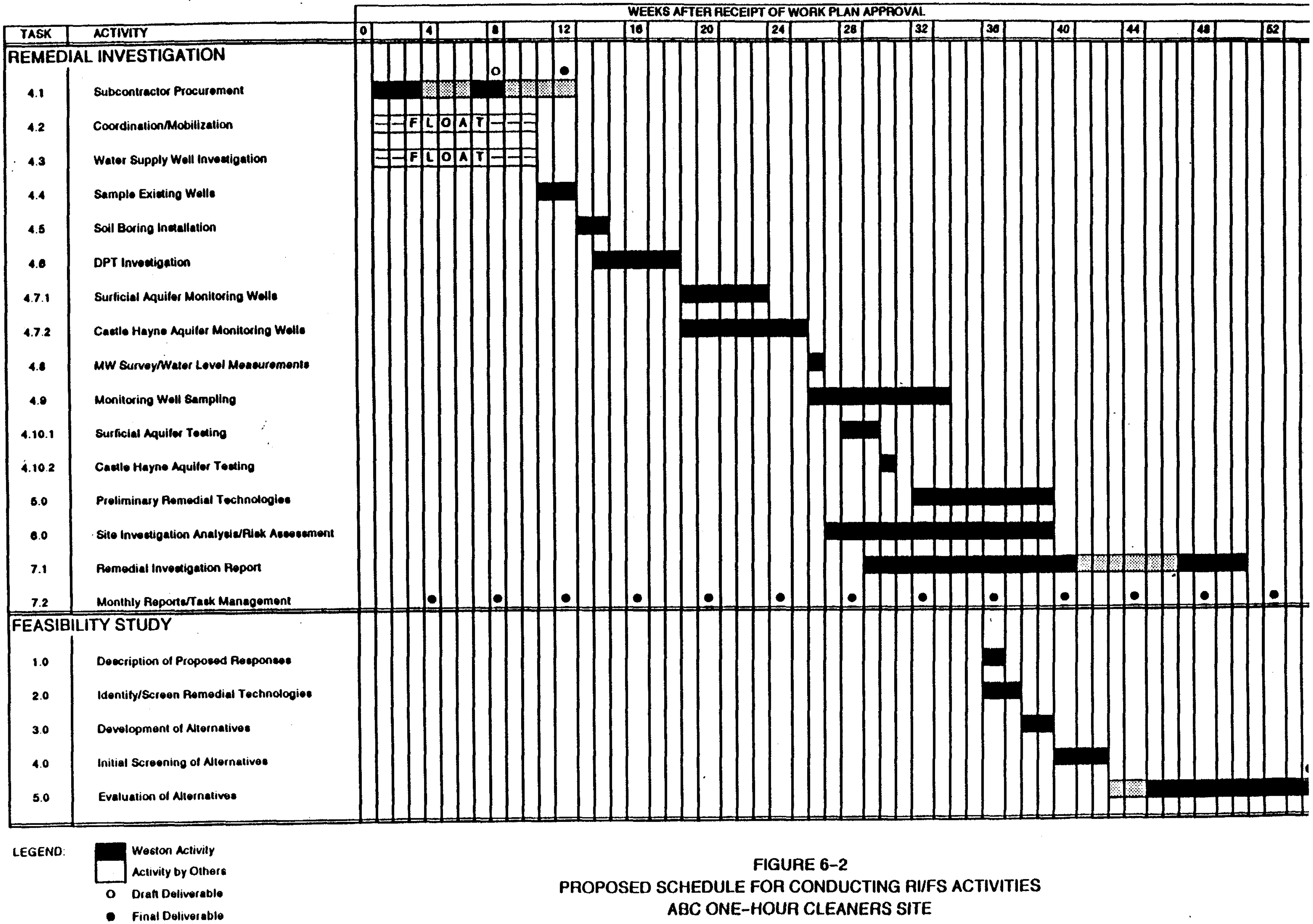

FIGURE 6–2
PROPOSED SCHEDULE FOR CONDUCTING RI/FS ACTIVITIES
ABC ONE-HOUR CLEANERS SITE

TABLE 6-1

ESTIMATED SCHEDULE FOR PROJECT PLANNING DELIVERABLES

ABC ONE-HOUR CLEANERS SITE

Deliverable	SOW Task/ Subtask	Weeks From WPA
Community relations materials (to be specified by EPA)	RI 2	TBD
Subcontractor service solicitation packages	RI 4.1	8
Subcontract documents	RI 4.1	12
Draft RI report	RI 7	40
Final RI report	RI 7	52
Draft FS report	FS 5	56
Monthly progress reports	RI 7	By 20th of following month

WPA - Work Plan Approval

TBD - To Be Determined

RI - Remedial Investigation Task

FS - Feasibility Study Task

6.4 PROJECT BUDGET

An estimate of the cost for implementing the Work Plan has been submitted in a separate volume. Various assumptions and bases for the cost estimate are included in the cost volume.

REFERENCES

Clay, J.W., 1975. North Carolina Atlas: University of North Carolina Press.

Dunn, H. Glenn, Pawner & Spruill. Correspondence to Joyce Catrett, EPA, January 18, 1989.

Dunn, H. Glenn, Pawner & Spruill. Correspondence to Joyce Catrett, EPA, April 4, 1989.

Harned, et al., 1989. Assessment of Hydrologic and Hydrogeologic Data at Camp Lejeune Marine corps Base, North Carolina: U.S. Geological Survey Water-Resources Investigation Report 89-4096, 64p.

Jurney, R.C., et al., 1923. Soil Survey of Onslow County, North Carolina: U.S. Department of Agriculture.

Legrand, H.E., 1960. Geology and Ground-Water Resources of the Wilmington - New Bern Area: North Carolina Department of Water Resources, Ground-Water Bulletin Number 1.

McMorris, Cheryl A., EPA Telephone. Conversation with Victor Melts, Manager, ABC One-Hour Cleaners, May 13, 1987.

Shiver, R., North Carolina Department of Natural Resources and Community Development, 1985. Draft Summary Report: Investigation to Define the Sources of Tetrachloroethylene that have contaminated three community water supply wells at Tarawa Terrace.

Document Control No. 4400-03-AADX

DRAFT WORK PLAN

VOLUME 2 - COST PROPOSAL

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT THE
ABC ONE-HOUR CLEANERS SITE
JACKSONVILLE, NORTH CAROLINA

Work Assignment No. 03-4L9E

April 30, 1990

REGION

IV

Remedial Planning Activities at Selected Uncontrolled Hazardous Substance Disposal Sites

U.S. EPA Contract No. 68-W9-0057

Roy F. Weston, Inc.
6021 Live Oak Parkway
Norcross, GA 30093

Section 1

1.0 INTRODUCTION

Volume 1 of the Work Plan for Remedial Investigation/Feasibility Study at the ABC One-Hour Cleaners Site describes the technical basis for performing tasks under this work assignment. The associated costs are presented in this volume and are tabulated in Section 2. Standard Form OF60 is also presented in Section 2.

1.1 ASSUMPTIONS

1.1.1 Cost Assumptions

Level of effort and costs for the Work Plan Phase are based upon the cost submittal included with the Work Plan Memorandum dated February 15, 1990.

Air fares for all travel are based upon lowest available coach fare with three-day prior ticket commitment.

1.2.1 Technical Assumptions

Assumptions inherent to the cost estimating process of specific subtasks are described below.

REMEDIAL INVESTIGATION

4.0 Site Investigation

Two (2) Weston staff members are included for activities at the site at any one time. Field costs are based upon a ten (10) hour workday, five (5) days per week. It is assumed that field personnel will return to their home base (Atlanta) at two-week intervals for two days. Per diem is included for all time away from the home base.

It is assumed that site activity will be performed in Level D safety protection. Costs for Level C safety equipment, such as respirators, are included in the event unexpected conditions are encountered.

Equipment rental is based upon standard catalog price listings of Weston's Central Equipment Stores. Government furnished equipment may be available for use at the site.

Costs have been included for four-month lease of two field vehicles.

4.1 Subcontractor Procurement

Subcontractor costs were solicited on the basis of the technical approach which has been identified in the work plan. A definitive scope of work and corresponding bid package will be issued during the initial tasks of the Remedial Investigation.

The schedule assumes a two-week response period from each bidder and a thirty-day review time by U.S. EPA of all subcontract procurements.

4.4 Sample Existing Wells

Ten (10) existing wells will be sampled for TCL VOC's only. The groundwater samples can be obtained from a tap or sampling port.

4.5 Soil Boring Installation

Eight (8) soil borings will be installed to the water table (± 20 ft bls). Two (2) soil borings will be installed to a depth below the water table. One (1) Shelby tube sample will be collected from each soil boring installed to the water table. Two (2) Shelby tube samples will be collected from each soil boring installed below the water table.

Assistance from Camp Lejeune will be sought in identifying and providing the use of an appropriate area for material and equipment staging, equipment cleaning, and material storage.

Soil cuttings will be placed in drums and stored at the staging area until appropriate disposition can be determined. Such disposition is not included in the cost proposal.

4.6 DPT Groundwater Investigation

One hundred (100) borings will be completed to a depth of 50 ft bls. Each groundwater sample will be analyzed for VOC's. Seven (7) borings/groundwater samples can be completed per day.

4.7 Surficial Aquifer and Castle Hayne Aquifer Monitoring Wells

Ten (10) stainless steel shallow monitoring wells will be installed to a depth of ± 30 ft bls. Five (5) stainless steel monitoring wells will be installed at the Castle Hayne Aquifer to ± 100 ft bls. Each of the monitoring wells will be continuously sampled with a split-spoon soil sampler or similar soil sampling instrument.

It has been assumed that all groundwater removed from monitoring wells for well development can be discharged to a City or Base sanitary sewer. Discussions regarding this issue have been held with the City of Jacksonville. The issue remains to be discussed with the Camp Lejeune.

4.8 Monitoring Well Survey and Water-Level Measurements

Three (3) rounds of water-level measurements will be collected from the monitoring wells.

4.9 Monitoring Well Sampling

All groundwater purged from the monitoring wells prior to sampling can be discharged to a sanitary sewer.

4.10 Aquifer Testing - Surficial and Castle Hayne Aquifers

A slug test will be prepared on each of the fifteen (15) monitoring wells. No additional aquifer testing will be required.

4.11 Groundwater Flow and Solute Transport Modeling

The technical approach contained herein assumes no groundwater flow or contaminant transport modeling will be required. If modeling is required, it will be addressed at a later time.

FEASIBILITY STUDY

6.0 and 7.0

The remedial action conceptual design and subsequent final report will be addressed at a later time.

1.3 WORK ASSIGNMENT SUMMARY OF COSTS

Table 2-1 presents a summary of all costs estimated for performing the RI/FS. Internal Weston expenses, such as equipment rental, expendable items procured from Central Stores, copying, and personal computer and CAD usage, are based upon standard catalog prices. General and administrative expense, as well as fees, are included in the catalog prices. For clarity of presentation, costs which are not subject to G&A expense, i.e., Weston internal other direct costs and special subcontractor pool costs, are identified in separate columns (4) and (6). G&A of 13.2% is calculated on the Subtotal Costs (Column 7) less Columns 4 and 6. Facilities Capital Cost of Money (FCCM) is not applied to costs which do not incur G&A expense.