03.13-07/20/94-01507

FINAL

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION

OPERABLE UNIT NO. 10
SITE 35 - CAMP GEIGER AREA FUEL FARM

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0160

JULY 20, 1994

Prepared For:

DEPARTMENT OF THE NAVY
CHESAPEAKE DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Washington, D.C.

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

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LIST OF TABLES

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RESPONSE NO. 1 TO COMMENTS SUBMITTED BY
BULL MULLEN, LANTDIV
ON THE DRAFT INTERIM RI/FS
FAX DATED MAY 6, 1994

OU 10

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION

(Note: though not provided, comments have been numbered in order of occurrence)

1. Page ES-2, Paragraph 4, Sentence 2

Text has been modified as per comment.

2. Page ES-2, Paragraph 4, Last Sentence

Text has been modified as per comment.

3. Page 1-13

Baker will review the additional data obtained under the comprehensive RI/FS and incorporate appropriate and pertinent information into later revisions of this report.

4. Page 4-1

a. Analytical results in Table 4-1 are presented in the same units as reported by the laboratory. Modifying these results could potentially result in transcription errors. Results presented in Figure 4-1 were modified because only positive results are provided on the figure. Reporting positive results on Figure 4-1 with units of mg/Kg instead of µg/kg makes the figure more user friendly when evaluating the spatial nature of data. Baker requests that the presentation of analytical results on Table 4-1 and Figure 4-1 remain unchanged to prevent further errors in the reporting of analytical data.

b. Acetone is a possible laboratory contaminant but was not detected in corresponding blank samples. Data validation reports will be added as an Appendix F of the RI Report which discuss the acetone results.

5. Page 4-2

a. The laboratory needed to make dilutions to bring certain analytes within the working range of the instrument. This results in elevated detection limits for the non-detected chemicals.

b. Definitions for data qualifiers will be added to table.

6. Page 4-10

a. Definitions for data qualifiers will be added to table.

b. The validation report has been added as Appendix C to address any questions related to the validity of the data.

7. Page 4-12

Agreed.

8. Page 4-15

a. and b. Figure has been amended to correct these issues.

9. Page 4-19

Baker concurs with this comment. Figure 4-4, however, is primarily used to depict the hydrogeologic cross-section.

10. Page 5-2

These constituents were not eliminated from consideration in Section 5, however, the potential for these chemicals to occur as a result of laboratory or sampling activities is mentioned. These chemicals are later eliminated in the baseline risk assessment by a comparison with RBCs. Data validation reports have been provided in Appendix F and indicate that these chemicals were not detected in corresponding blank samples.

The natural occurrence of acetone is considered to be arguable by USEPA. Because no EPA reference could be located which supports the potential natural occurrence of acetone, Baker wishes to forgo a discussion on acetone at this time.

11. Page 5-10

Oil and grease has not typically been analyzed by Baker at other Camp Lejeune sites. Consequently, base-wide background oil and grease data are not available. However, background oil and grease data obtained from upstream sample locations indicate that concentrations of oil and grease encountered in site soils along Brinson Creek may not be site related. Eliminating oil and grease would be appropriate if an upstream source does exist. Oil and grease results obtained from potentially impacted site soils exhibit the presence of other fuel-related constituents including benzene, toluene, ethylbenzene, xylenes, and PAH. These were not detected in soil samples obtained along Brinson Creek. This, in addition to the background issue, is likely enough to support elimination of oil and grease.

12. Page 6-1

Not only are these compounds considered common laboratory contaminants, but they are not associated with site history, nor do their concentrations exceed the USEPA Region III RBC value. Therefore, they were not retained as a COPC.

INTERIM REMEDIAL ACTION FEASIBILITY STUDY

1. Page ES-3

Baker believes it is appropriate to exclude oil and grease from the remediation as per the discussion presented in the FS Report. Additional sediment and surface water data will be obtained under the comprehensive RI/FS which will further consider the remediation of Brinson Creek where elevated oil and grease levels are detected.

2. Page ES-7

Text modified as per comment.

3. Page 1-4

Analytical results in Table 4-1 are presented in the same units as reported by the laboratory. Modifying these results could potentially result in transcription errors. Results presented in Figure 4-1 were modified because only positive results are provided on the figure. Reporting positive results on Figure 4-1 with units of mg/Kg instead of µg/kg makes the figure more user friendly when evaluating the spatial nature of data. Baker requests that the presentation of analytical results on Table 4-1 and Figure 4-1 remain unchanged to prevent further errors in the reporting of analytical data.

4. Pages 1-6 and 2-7

Oil and grease has not typically been analyzed by Baker at other Camp Lejeune sites. Consequently, base-wide background oil and grease data are not available.

5. Page 5-24

Cost of potential liability cannot be quantified and typically is not computed to compare alternatives. Section 4.2 has been modified to include discussions of potential liability.

6. Appendix B

The actual method of treatment/disposal has been added to each contact form at a location where it will stand out.

RESPONSE NO. 2 TO COMMENTS SUBMITTED BY
ON THE DRAFT INTERIM RI/FS
KATE LANDMAN, LANTDIV per Bill Mullen email.
FAX DATED MAY 11, 1994

Because of the relatively high concentrations of toluene and xylenes in certain soil samples, dilution of the sample extract was necessary to quantify concentrations of these constituents. Dilution was necessary to get detector responses within the working calibration range established during standardization. Unfortunately, dilution serves to elevate reported detection limits for other analytes. Dilution cannot provide lower detection limits for those chemicals which are not detected.

Elevated detection limits do not affect the conclusions of the baseline risk assessment because: (1) the chemicals encountered in Site 35 soils were limited to fuel related constituents (i.e. toluene, xylenes, ethylbenzene, etc.) and (2) the COPC selection process limits the number of chemicals evaluated.

Comments to Draft Interim Remedial Action Remedial Investigation/Feasibility Study Operable Unit No. 10, (Site 35 - Camp Geiger Area Fuel Farm)

Provided by: William Mullen
Technical Remedial Manager,
LANTDIV, NAVFACENGCOM

Provided to: Ms. Katherine Landmen
Remedial Project Manager
LANTDIV, NAVFACENGCOM

Interim Remedial Action Remedial Investigation

ES-2	Sentence "Significant levels of fuel-related contaminants and TPH were not detected in these samples" should be reworded to "No significant levels of fuel-related contaminants and TPH were detected in surface soil or subsurface soil samples (if true) collected during the site investigation".
	Discussion of oil and grease sample results and possible natural sources of oil and grease should be enhanced so that both thoughts are connected and substantiated.
1-13	Additional hydrogeology information will be collected during the field work for OU-10 RI/FS. This information may provide definition of the confining unit and grain-size distribution of the sediments. The additional information should be included in later drafts of this report (if available).
4-1	Discussion in text and in Table 4-1 for compounds of concern analytical results is presented in µg/kg while results presented in Figure 4-1 is in mg/kg. Please be consistant with data presentation or clearly note reason for changing scale.
	What is source of the widespread distribution of Acetone in soil borings and surface soil samples? There is a later reference to possible lab or sampling contamination but this is not confirmed with results from lab blank. Please explain.
4-2	What is reason for very high minimum detection ranges for compounds of concern presented in Table 4-1?
	Provide definition of U, J, UJ in notes for table.
4-10	Provide definition of L, R, U, UL, J, K in notes for table.
	Discuss reasons for rejected and biased (low and high) sampling analysis results for Aluminium, Antimony, Beryllium, Chromium, Potassium, Selenium, Sodium, and Vanadium.
4-12	Discussion of naturally occuring compounds does not include any range of concentrations normally detected for naturally occuring compounds that are detected by the oil and grease analytical method.
4-15	Sampling results presented on Figure 4-2 for SB3005 indicate 3 duplicate samples for the 8-10' depth interval. TCL analytical results

	indicate that only 2 duplicate samples were collected at that depth and location. Please clarify. Also, link shown for one of those duplicates connects to results presented for BCSB03 (0-1'). Is this correct?
4-19	Depiction of well screen construction of MW-19 indicates that the water level has been above the screened interval for the two periods of measurement presented. Clearly this well would not be useful for analysis
5-2	I do not agree that compounds detected commonly in soils during this field event (acetone and bis(2-ethylhexyl)phthalate) should be disregarded as laboratory contamination, ***especially considering lab blanks do not show the presence of these compounds.*** Acetone is a naturally occuring compound and its dection, at low concentrations, may not necessarily represent a release. Please revise discussion accordingly.
5-10	Could those background samples be associated with some other site and therefore not representative of true background. If that is the case, eliminating oil and grease from the consideration as a compound of concern would not be appropriate
6-1	If acetone and phthalates were detected in samples and not in lab blank, how is it those compounds were not considered Compounds of Concern and evaluated for risk to human health and the environment?

Interim Remedial Action Feasibility Study

ES-3	Can oil and grease be excluded from remediation if it is detected in background samples? Isn't it still above acceptable state criteria?
ES-7	Statement that no action alternative will not provide a decrease in volume and toxicity over time does not correspond to natural biodegration and attenuation which has been shown to occur. Granted this gradual decrease in concentration/toxicity would be slower than other RAAs, it would still occur and should be noted.
1-4	See 2nd comment on page 4-1 of the RI.
1-6 and 2-7	See comment to page 5-10 of the RI.
5-24	Ranking of RAA's 2, 3, and 5 do not take into account potential future liability as a PRP for disposal of soil into a landfill. This could be a significant cost consideration and might need to be included (even if an actual cost can't be quantified for the liability). The liability for RAA 3 and 5 would be less if the final soil disposition is on Marine or Navy property.
Appendix B	Actual method of disposal and or treatment is not clear on the contact form is some cases.

Comments to: 8 November, 1993

Final Draft

Interim Remedial Action Remedial Investigation/Feasibility Study Project Plan

Operable Unit No. 10, (Site 35 - Camp Geiger Area Fuel Farm)

Provided by: William Mullen
Technical Remedial Manager,
LANTDIV, NAVFACENGCOM

Provided to: Ms. Katherine Landmen
Remedial Project Manager
LANTDIV, NAVFACENGCOM

Page 1-2, 1st and 2nd bullets, Petroleum products were exempted from Hazardous Waste by definition. Change word "hazardous" to "toxic" in both sentences.

Page 1-2, 2nd bullet, reference to near surface contamination should be better defined. Page 2-7 refers to the highest level contamination @ 8 feet bgs.

Page 1-2, 2nd bullet, sentence not clearly worded, do the soils migrate or do the contaminants?

Page 2-6, Figure 2-4. Delete "0" Contour line. There is no basis to the exact location for this line. The presence of a zero line is based on extremely sparse data points and is not defensible. For site work planning and clarity, replace the "0" with a "1" line. Also, due to the extreme differences in concentrations identified, perhaps log scale contour lines would be more effective in displaying the TPH concentrations within the soils.

Page 2-7, Last Paragraph. What analytical method to determine TPH concentrations will be used during this Interim Remedial Action Remedial Investigation/Feasibility Study Project? Method 418.2 is not a preferred method since it only provides total TPH, and a characterization of TPH components is not possible. EPA method 8015 or equivalent is preferred.

Page 3-3, first full sentence on page. If chlorinated solvents have been identified in ground water at site, and are potential soil contaminants at this site the reliance on visual classification of contamination as a screening tool is not acceptable. Soils heavily contaminated with petroleum products may mask the presence of chlorinated solvents, and certainly *may* have no relation to the presence of metals within the soils.

Since there is no information regarding the presence of chlorinate solvents or metals in the soil to date, use of visual contamination characteristics will not insure adequate analytical information is collected to provide an adequate remediation design. **Therefore, it is recommended that at several soil boring locations, all soil samples collected be analyzed to vertically characterize all contamination present. These**

locations should be, at a minimum, within the highest areas of previously identified contamination and at the furthest "up and down gradient" locations of sampling.

LIST OF FIGURES

APPENDICES

EXECUTIVE SUMMARY

Introduction

An Interim Remedial Action Remedial Investigation (RI) was conducted at Operable Unit 10, Site 35 - Camp Geiger Area Fuel Farm to provide additional data regarding petroleum hydrocarbon contaminated soil to support the selection of an interim remedial action. Previous investigations had determined the presence of fuel-related contamination in subsurface soils and shallow groundwater in the vicinity of the Fuel Farm. Based on previously obtained data and reports of fuel-like odors along Brinson Creek by Camp Lejeune, LANTDIV, and Baker personnel, an Interim Remedial Action RI and Feasibility Study (FS) was deemed necessary because it was determined qualitatively that:

- The existing site conditions potentially expose nearby human populations, animals, or food chains to toxic substances, pollutants, or contaminants; and

- High levels of toxic substances or pollutants in soils are largely at or near the surface that may migrate.

Site Location and Description

Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune, Onslow County. The main entrance to Camp Geiger is off U.S. Route 17, approximately 3.5 miles southeast of the City of Jacksonville, North Carolina. Site 35, the Camp Geiger Area Fuel Farm refers primarily to five, 15,000-gallon aboveground storage tanks (ASTs), a pump house, and a fuel unloading pad situated within Camp Geiger just north of the intersection of Fourth and "G" Streets.

Site History

Construction of Camp Geiger was completed in 1945, four years after construction of MCB, Camp Lejeune was initiated. Originally, the Fuel Farm ASTs were used for the storage of No. 6 fuel oil, but, were later converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. The date of their conversion is not known.

Routinely, the ASTs at Site 35 supply fuel to an adjacent dispensing pump. A leak in an underground line at the station was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period (Law, 1992). The leaking line was subsequently sealed and replaced.

The ASTs at Site 35 are currently used to dispense gasoline, diesel and kerosene to government vehicles and to supply USTs in use at Camp Geiger and the nearby New River Marine Corps Air Station. The ASTs are supplied by commercial carrier trucks which deliver product to fill ports located on the fuel unloading pad at the southern end of the facility. Six, short-run (120 feet maximum), underground fuel lines are currently utilized to distribute the product from the unloading pad to the ASTs. Product is dispensed from the ASTs via trucks and underground piping.

Reports of a release from an underground distribution line near one of the ASTs date back to 1957-58 (ESE, 1990). Apparently, the leak occurred as the result of damage to a dispensing pump. At that time the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released although records of the incident have since been destroyed. The fuel reportedly migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned.

Another abandoned underground distribution line extended from the ASTs to the former Mess Hall Heating Plant, located adjacent to "D" Street, between Third and Fourth Streets. The underground line dispensed No. 6 fuel oil to a UST which fueled the Mess Hall boiler. The Mess Hall, located across "D" Street to the west, is believed to have been demolished along with its Heating Plant in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp Geiger personnel along the unnamed drainage channels north of the Fuel Farm. Apparently, the source of the fuel, believed to diesel or jet fuel, was an unauthorized discharge from a tanker truck that was never identified. The Activity reportedly initiated an emergency clean-up which included the removal of approximately 20 cubic yards of soil.

The Fuel Farm is scheduled to be decommissioned in 1994. Plans are currently being prepared to empty, clean, dismantle, and remove the ASTs along with all concrete foundations, slabs on grade, berms and associated underground piping. The Fuel Farm is being removed to make way for a four lane divided highway proposed by the North Carolina Department of Transportation (NCDOT).

Previous Investigations and Findings

Previous investigations include an Initial Assessment Study (Water and Air Research [WAR], 1983), a Confirmation Study (Environmental Science and Engineering, Inc. [ESE], 1984 and 1987), a Focused Feasibility Study (NUS Corporation [NUS], 1990), and a Comprehensive Site Assessment (Law Engineering, Inc. [Law], 1991).

The Initial Assessment Study identified Site 35 as one of 23 sites warranting further investigation. Environmental media were not sampled as part of this study.

ESE performed the Confirmation Study at the Fuel Farm between 1984 and 1987. Soil, groundwater, surface water, and sediment samples were obtained and analyzed for lead and oil and grease. Groundwater was also analyzed for volatile organics. Oil and grease results indicated that soils northeast of the Fuel Farm were potentially impacted by site activities.

Additional wells were installed by NUS Corporation during the Focused Feasibility Study, which was conducted in 1990. Soil cuttings obtained from two of the four well boreholes contained hydrocarbon related contamination.

Law conducted the Comprehensive Site Assessment in 1991. A total of 18 soil borings were drilled, sampled and converted to nested wells that monitor the water table aquifer at two depths. An additional three soil borings were drilled to provide stratigraphic data. Five more soil borings were drilled to provide data regarding vadose zone contamination. Nine hand-auger samples were also obtained. A follow-up study was conducted subsequent to the Comprehensive Site Assessment. Three additional borings were drilled, sampled and converted to wells.

Law identified areas of impacted soil and groundwater directly beneath and apart from the Fuel Farm. The nature of the contamination included both chlorinated organic compounds (e.g., TCE, trans-1,2-DCE, and vinyl chloride) and petroleum hydrocarbons (e.g., TPH, MTBE, BTEX). The majority of the soil contamination encountered appeared to be associated with a fluctuating groundwater table. Two plumes of shallow groundwater contaminated with petroleum constituents and two plumes contaminated with chlorinated organics were identified. All four plumes were located north of Fourth Street and east of E Street except for a portion of a TCE plume extending southwest of Fourth Street.

The Interim Remedial Action RI conducted by Baker in 1993 and 1994 consisted of drilling seven additional soil borings including five in those areas where groundwater contamination plumes were suspected. A single soil sample was obtained from each of these soil borings and analyzed for TCL organics, TAL inorganics, TPH and oil and grease. Samples obtained from two boring locations (SB-30 and SB-34) displayed relatively high concentrations of benzene, toluene, ethylbenzene, xylenes, naphthalene and 2-methylnaphthalene; constituents commonly associated with fuels. These two locations also displayed the highest detected concentrations of TPH encountered during the Interim Remedial Action RI. Highest detected concentrations of these contaminants were in samples taken at or below the shallow water table.

The non-fuel related contaminant trichloroethene (TCE) was detected at concentrations below its corresponding contract required quantitation limit in two samples. One of these samples was obtained from background soil boring location SB-29.

In addition to soil boring samples a total of ten shallow soil samples were obtained in the vicinity of Brinson Creek and the unnamed drainage channels located to the north of the Fuel Farm. No significant levels of fuel-related contaminants and TPH were detected in these samples. Oil and grease was, however, detected in these shallow soil samples. Therefore, two additional samples were obtained approximately 1/2-mile upstream of the site along Brinson Creek to establish background levels of oil and grease. Background oil and grease results obtained upstream of Site 35 indicate that naturally-occurring organics in soils or an upgradient contamination source could be responsible for the positive oil and grease results obtained at the site. An additional sample was also obtained downstream of the site to identify the potential extent of contamination.

In general, the Interim Remedial Action RI data confirm the findings of the CSA (Law, 1992) that indicated contaminated soil conditions at Site 35 are primarily associated with a fluctuating shallow groundwater plume. Contamination encountered in the vicinity of monitoring wells MW-21 and MW-25 was detected at approximately two or more feet above the measured groundwater surface and may be indicative of contamination not associated with a fluctuating groundwater plume. To date, however, recorded groundwater levels provide insufficient data to afford an estimate of the range of groundwater elevation fluctuation at Site 35.

Nature and Extent of Contamination

Petroleum hydrocarbon contamination at Site 35 is primarily associated with shallow groundwater that is typically encountered across the site at six to eight feet below the ground surface (bgs). Law identified two distinct petroleum hydrocarbon shallow groundwater plumes including one directly beneath the Fuel Farm ASTs and another located immediately northwest of the Fuel Farm ASTs in the vicinity of the unnamed drainage channels that covey surface runoff to Brinson Creek.

In addition to contaminated groundwater samples, subsurface soil samples have been identified at the site as contaminated with petroleum hydrocarbons. The contaminated soil samples, for the most part, were obtained along a narrow zone that extends about one to two feet above the groundwater table (as measured on two separate occasions including once in August, 1991 by Law and again in March, 1994 by Baker). The soil contamination in this zone just above the top of shallow groundwater appears to have been transported there by a fluctuating groundwater table. In only three areas did the results of soil sampling indicate the presence of elevated petroleum hydrocarbon contamination at locations sufficiently above the top of groundwater such that the source of the contamination may not have been a fluctuating groundwater table. The three areas are located west and north of the Fuel Farm where past UST leakage and unauthorized discharges of fuel products were reported to have occurred and are centered around samples obtained from borings B-5 and B-6 and monitoring wells MW-25 and MW-21, respectively. Baker has estimated that approximately 3,800 cubic yards (5,000 tons) of contaminated soil is present in these areas.

Summary of Site Risks

As part of the Interim Remedial Action RI, a human health Risk Assessment was conducted to evaluate the current or future potential risks to human health resulting from the presence of petroleum hydrocarbon contaminants identified in soil located above the seasonal high water table at Operable Unit No. 10. An ecological risk assessment was not conducted as part of the Interim Remedial Action RI for two reasons. First, soil contamination is most prevalent at or near the groundwater surface, limiting the potential for direct exposure to ecological receptors. Second, an ecological risk assessment will be performed as part of the comprehensive Site 35 Remedial Investigation which is being conducted concurrently.

The construction worker was assumed to engage in excavation activities and could potentially contact contaminants in deep soil by dermal contact, through accidental ingestion and by inhaling contaminant-laden dust particles. A construction worker scenario is the most likely current potential human receptor as well as the most likely future receptor because of the new highway construction scheduled for Site 35. Benzene and arsenic were retained as chemicals of potential concern (COPCs) for quantitative evaluation in the preliminary baseline risk assessment. An incremental lifetime cancer risk (ICR) value of 3×10^{-6} was derived for the construction worker. This value falls within USEPA's target risk range of 10^{-6} to 10^{-4} which is generally considered to be acceptable by the Agency. Noncarcinogenic hazard index (HI) values fell below 1.0 suggesting that systemic adverse health effects would not occur subsequent to exposure.

An ecological risk assessment was not performed at this time because soil contaminants are encountered at depths 4 feet below the ground surface or more and occur primarily at or below the shallow water table. A comprehensive baseline ecological risk assessment, in addition to the baseline human health risk assessment, will, however, be conducted as part of the concurrent comprehensive Remedial Investigation at Site 35.

In addition to human health risks, North Carolina's Department of Environment, Health and Natural Resources Division of Environmental Management's Site Sensitivity Evaluation (SSE) was performed. SSE cleanup goals for gasoline, diesel and oil and grease were derived. Cleanup goals of 40 mg/kg, 160 mg/kg and 800 mg/kg, respectively, were calculated. The applicability of the SSE cleanup goals will be further addressed in the Interim Remedial Action Feasibility Study (FS).

1.0 INTRODUCTION

This Interim Remedial Action Remedial Investigation (RI) Report has been prepared by Baker Environmental, Inc. (Baker) for presentation to the Department of the Navy (DON), Naval Facilities Engineering Command, Atlantic Division (LANTDIV) under Navy CLEAN Contract Number N62470 to address petroleum hydrocarbon contaminated soil at Operable Unit (OU) No. 10, Site 35 - Camp Geiger Area Fuel Farm. The Interim Remedial Action RI has been conducted in accordance with guidelines and procedures presented in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300.430). The NCP was published under the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) commonly referred to Superfund and amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA 1988) was also used as guidance for preparing this document.

This report uses available information from previous investigations on surface and subsurface soils at Site 35 in conjunction with the soil data generated during the Interim Remedial Action RI conducted by Baker in December, 1993. Previous investigations were conducted by Water and Air Research, Inc., Environmental Science and Engineering, Inc. (ESE), NUS Corporation (NUS) and Law Engineering, Inc. (Law). The results of this Interim Remedial Action RI will serve as the basis for an evaluation of remedial action alternatives for mitigating potential risks to human health and the environment posed by the petroleum hydrocarbon contaminated soil at Site 35. Available results of previous investigations at two underground storage tank (UST) sites near the Fuel Farm have not been included in the overall evaluation of Site 35. The two tank sites include: (1) an abandoned No. 6 fuel oil UST adjacent to the Former Mess Hall Heating Plant; and (2) a former No. 2 fuel oil UST (removed) adjacent to Building G480 (Explosive Ordnance Disposal Armory, Office and Supply Building). Separate investigations at these UST sites are either ongoing or planned.

1.1 Purpose

The purpose of the Interim Remedial Action RI is to provide additional soil data for use in conjunction with existing data in an Interim Remedial Action Feasibility Study (FS) to support the selection of an Interim Remedial Action for petroleum hydrocarbon impacted soil at Site 35. Based on previously obtained data and reports of fuel-like odors along Brinson

Creek by Camp Lejeune, LANTDIV, and Baker personnel, an Interim Remedial Action RI and FS was deemed necessary because it was determined qualitatively that:

- The existing site conditions potentially expose nearby human populations, animals, or food chains to toxic substances, pollutants, or contaminants; and

- High levels of toxic substances or pollutants in soils are largely at or near the surface that may migrate.

Concurrent to the Interim Remedial Action RI/FS, a comprehensive site-wide RI/FS is being implemented as a separate study to evaluate other potentially impacted site media including groundwater, surface water, and sediment. Field activities for the comprehensive RI/FS were initiated in April 1994.

1.2 Site Background

This section presents an overview of site background information currently available at Site 35. Site background discussions are divided into location and setting, site history, and physical characteristics.

1.2.1 Location and Setting

MCB, Camp Lejeune (also referred to as the "Activity") is located in Onslow County, North Carolina. The facility covers approximately 236 square miles and is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean.

The eastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northwestern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina, borders MCB, Camp Lejeune to the north. MCB, Camp Lejeune is depicted in Figure 1-1.

Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune. The main entrance to Camp Geiger is off U.S. Route 17, approximately 3.5 miles southeast of the City of Jacksonville, North Carolina. Site 35, the Camp Geiger Area Fuel Farm refers primarily to five, 15,000-gallon aboveground storage tanks (ASTs), a pump house, and a fuel unloading pad

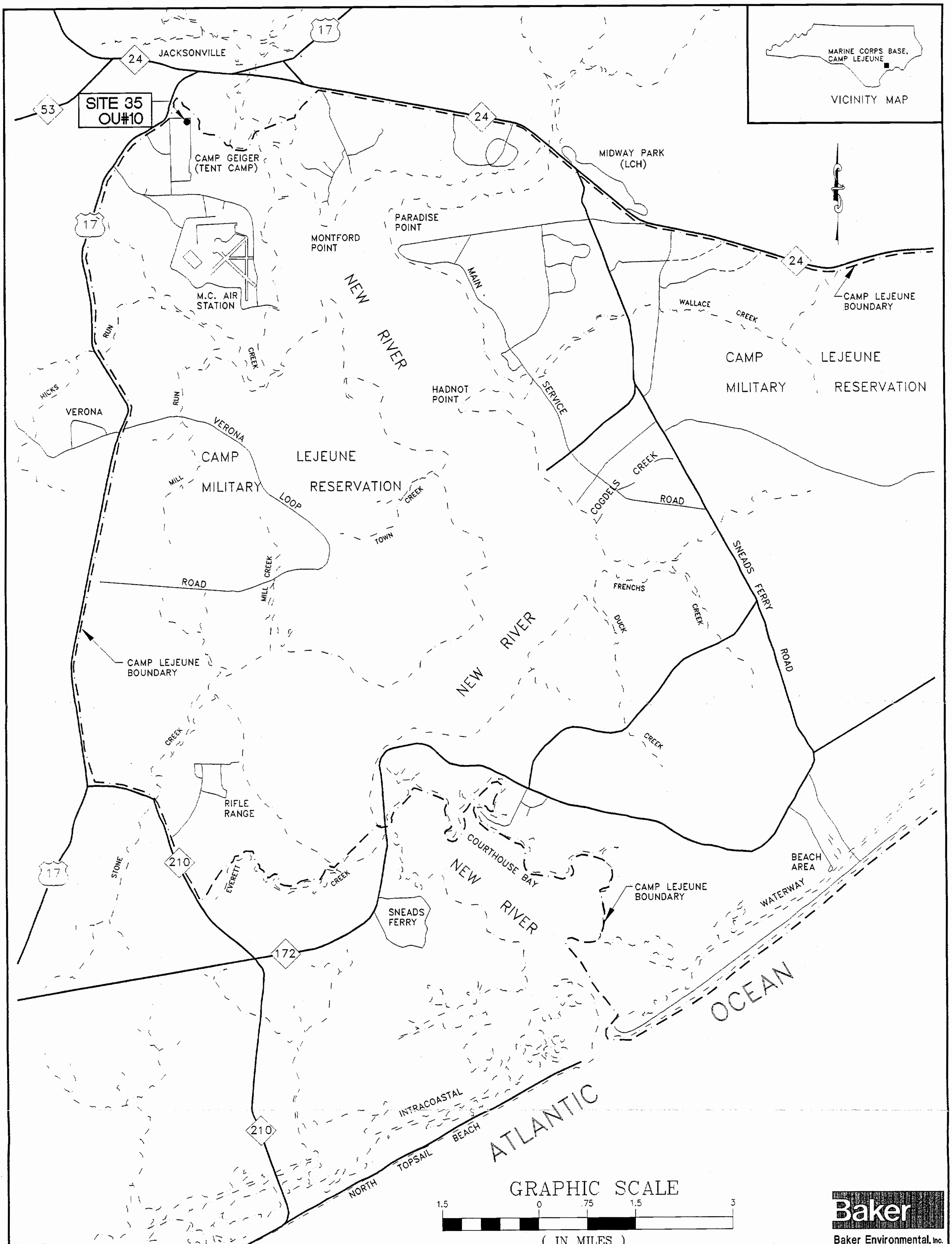


FIGURE 1-1
CAMP LEJEUNE AND SITE 35
LOCATION MAP

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01507 V01Z

situated within Camp Geiger just north of the intersection of Fourth and "G" Streets. Previous environmental investigations at the site identified underground fuel distribution piping that connect the ASTs to existing and former underground storage tanks (USTs) and expanded the Site 35 study area (see Figure 1-2). To date, the Site 35 study area has been roughly bounded on the west by D Street, on the north by Second Street, and on the east by Brinson Creek, and on the south by Fourth Street and Building No. TC-474.

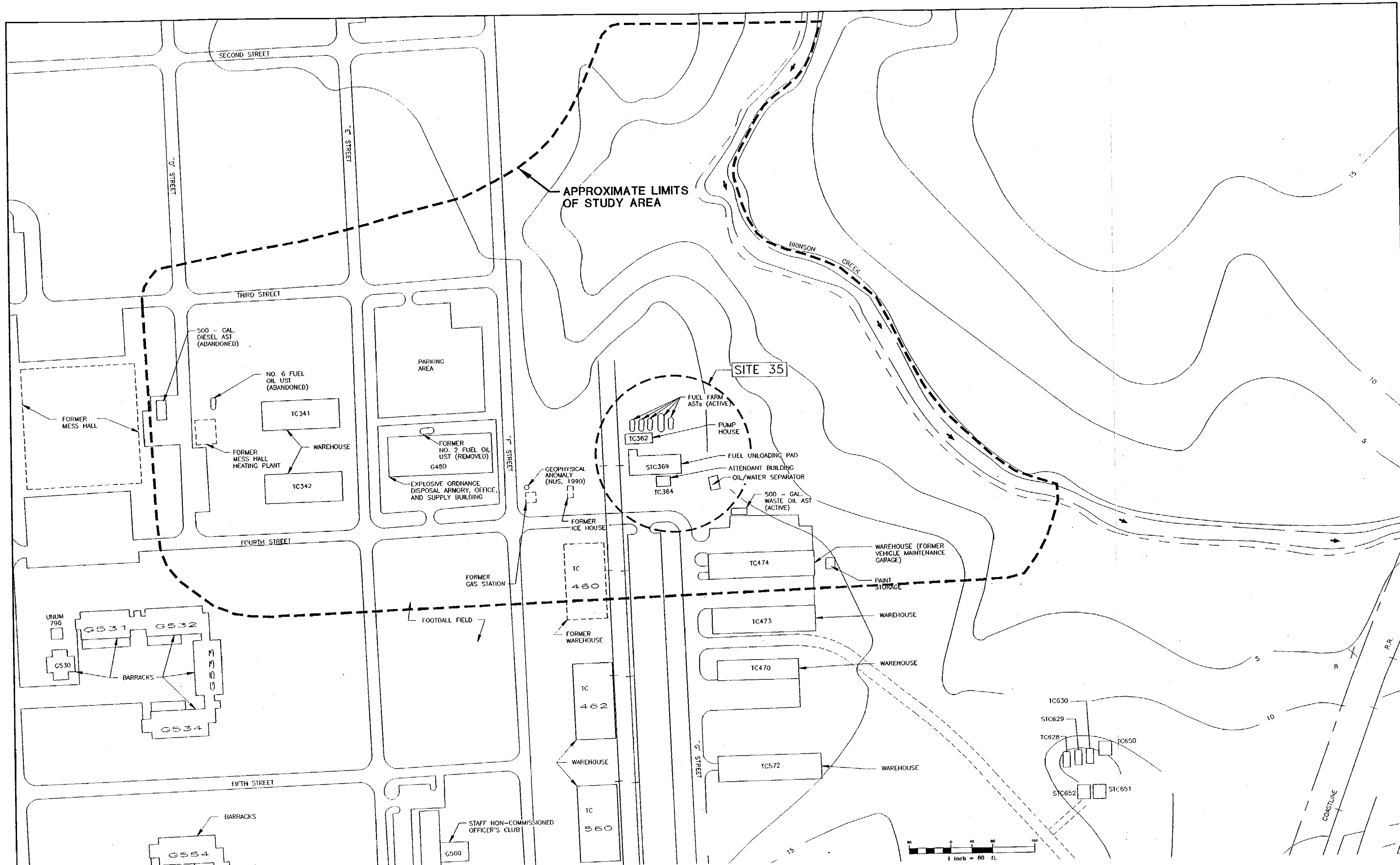
1.2.2 Site History

Construction of MCB, Camp Lejeune began in 1941 with the objective of developing the "Worlds Most Complete Amphibious Training Base." Construction started at Hadnot Point, where the major functions of the Activity are centered. Development at the Activity is primarily in five geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, and the Rifle Range Area.

Construction of Camp Geiger was completed in 1945, four years after construction of MCB, Camp Lejeune was initiated. Figure 1-2 presents a site map of the Camp Geiger Fuel Farm area. Originally, the Fuel Farm ASTs were used for the storage of No. 6 fuel oil, but, were later converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. The date of their conversion is not known.

Routinely, the ASTs at Site 35 supply fuel to an adjacent dispensing pump. A leak in an underground line at the station was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period (Law, 1992). The leaking line was subsequently sealed and replaced.

The ASTs at Site 35 are currently used to dispense gasoline, diesel and kerosene to government vehicles and to supply USTs in use at Camp Geiger and the nearby New River Marine Corps Air Station. The ASTs are supplied by commercial carrier trucks which deliver product to fill ports located on the fuel unloading pad at the southern end of the facility. Six, short-run (120 feet maximum), underground fuel lines are currently utilized to distribute the product from the unloading pad to the ASTs. Product is dispensed from the ASTs via trucks and underground piping.



LEGEND		
DATE	MARCH 1994	
SCALE	1" = 80'	
DRAWN	WJH	
REVIEWED	DLB	
S.O.#	62470-160-0000-07000	
CADD#	160502PP	

NORTH

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

SITE PLAN
SITE 35 – CAMP GEIGER AREA FUEL FARM

SCALE 1" = 80'
DATE MARCH 1994

FIGURE No.
1–2

01507V022

Reports of a release from an underground distribution line near one of the ASTs date back to 1957-58 (ESE, 1990). Apparently, the leak occurred as the result of damage to a dispensing pump. At that time the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released although records of the incident have since been destroyed. The fuel reportedly migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned.

Another abandoned underground distribution line extended from the ASTs to the former Mess Hall Heating Plant, located adjacent to "D" Street, between Third and Fourth Streets. The underground line dispensed No. 6 fuel oil to a UST which fueled the Mess Hall boiler. The Mess Hall, located across "D" Street to the west, is believed to have been demolished along with its Heating Plant in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp Geiger personnel along the unnamed drainage channels north of the Fuel Farm. Apparently, the source of the fuel, believed to diesel or jet fuel, was an unauthorized discharge from a tanker truck that was never identified. The Activity reportedly initiated an emergency clean-up which included the removal of approximately 20 cubic yards of soil.

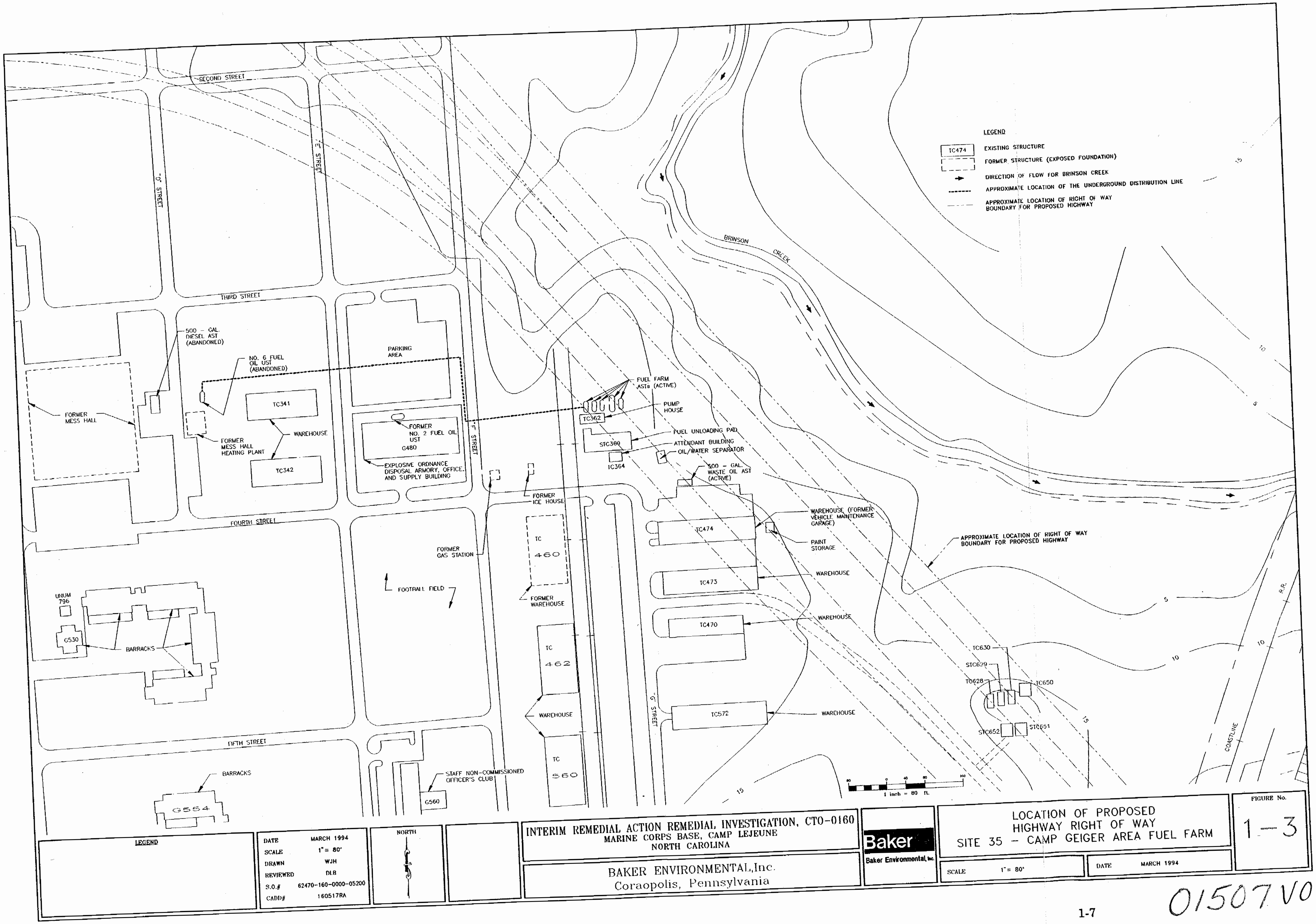
The Fuel Farm is scheduled to be decommissioned in 1994. Plans are currently being prepared to empty, clean, dismantle, and remove the ASTs along with all concrete foundations, slabs on grade, berms and associated underground piping. The Fuel Farm is being removed to make way for a four lane divided highway proposed by the North Carolina Department of Transportation (NCDOT) (see Figure 1-3).

1.2.3 Physical Characteristics

This section provides an overview of the physical features associated with MCB, Camp Lejeune.

1.2.3.1 Topography and Surface Drainage

The generally flat topography of MCB, Camp Lejeune is typical of the seaward portions of the North Carolina Coastal Plain. Elevations on the Base vary from sea level to 72 feet above mean sea level (msl); however, the elevation of most of Camp Lejeune is between 20 and 40 feet above msl.



LEGEND
TC474 EXISTING STRUCTURE
FORMER STRUCTURE (EXPOSED FOUNDATION)
DIRECTION OF FLOW FOR BRINSON CREEK
APPROXIMATE LOCATION OF THE UNDERGROUND DISTRIBUTION LINE
APPROXIMATE LOCATION OF RIGHT OF WAY BOUNDARY FOR PROPOSED HIGHWAY
SECOND STREET
THIRD STREET
FOURTH STREET
FIFTH STREET
"D" STREET
"E" STREET
"F" STREET
"G" STREET
BRINSON CREEK
500 - GAL. DIESEL AST (ABANDONED)
NO. 6 FUEL OIL UST (ABANDONED)
PARKING AREA
FORMER MESS HALL
FORMER MESS HALL HEATING PLANT
TC341
TC342
WAREHOUSE
FORMER NO. 2 FUEL OIL UST
G480
EXPLOSIVE ORDNANCE DISPOSAL ARMORY, OFFICE, AND SUPPLY BUILDING
FUEL FARM ASTs (ACTIVE)
PUMP HOUSE
TC362
FUEL UNLOADING PAD
ATTENDANT BUILDING
STC360
OIL/WATER SEPARATOR
TC364
500 - GAL. WASTE OIL AST (ACTIVE)
FORMER ICE HOUSE
WAREHOUSE (FORMER VEHICLE MAINTENANCE GARAGE)
TC474
PAINT STORAGE
TC473
WAREHOUSE
TC470
TC572
FORMER GAS STATION
FOOTBALL FIELD
TC 460
FORMER WAREHOUSE
TC 462
TC 560
UNUM 796
G530
BARRACKS
G554
G560
STAFF NON-COMMISSIONED OFFICER'S CLUB
APPROXIMATE LOCATION OF RIGHT OF WAY BOUNDARY FOR PROPOSED HIGHWAY
TC630
STC629
TC628
TC650
STC652
STC651
R.R.
COASTLINE
1 inch = 80 ft.
LEGEND
DATE MARCH 1994
SCALE 1" = 80'
DRAWN WJH
REVIEWED DLB
S.O.# 62470-160-0000-05200
CADD# 160517RA
NORTH
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION, CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA
BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania
Baker
Baker Environmental, Inc.
LOCATION OF PROPOSED HIGHWAY RIGHT OF WAY
SITE 35 - CAMP GEIGER AREA FUEL FARM
SCALE 1" = 80'
DATE MARCH 1994
FIGURE No.
1-3

01507V032

Surface drainage at Camp Lejeune is generally toward the New River, except in areas near the coast which drain toward the Intracoastal Waterway. In developed areas, natural drainage has been altered by asphalt cover, storm sewers, and drainage ditches. Approximately 70 percent of Camp Lejeune is in broad, flat interstream areas. Drainage is poor in these areas and the soils are often wet (Water and Air Research, 1983).

The U.S. Army Corps of Engineers has mapped the limits of the 100-year floodplain at Camp Lejeune at seven feet above msl in the upper reaches of the New River (Water and Air Research, 1983); this increases downstream to 11 feet above msl near the coastal area (Water and Air Research, 1983). Site 35 does not lie within the 100-year floodplain of the New River.

1.2.3.2 Regional Geology

MCB, Camp Lejeune is located in the Atlantic Coastal Plain physiographic province. The sediments of the Atlantic Coastal Plain consist of interbedded sands, clays, calcareous clays, shell beds, sandstone, and limestone. These sediments lay in interfingering beds and lenses that gently dip and thicken to the southeast (ESE, 1991). These sediments were deposited in marine or near-marine environments and range in age from early Cretaceous to Quaternary time and overlie igneous and metamorphic basement rocks of pre-Cretaceous age. Figure 1-4 presents the generalized geologic and hydrogeologic units for the coastal plain of North Carolina in which MCB Camp Lejeune is situated.

United States Geological Survey (USGS) studies at MCB, Camp Lejeune indicate that the Activity is underlain by seven sand and limestone aquifers separated by confining units of silt and clay. These include the water table (surficial water-bearing layer), Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. The combined thickness of these sediments is approximately 1,500 feet. Less permeable clay and silt beds function as confining units or semi-confining units which separate the aquifers and impede the flow of groundwater between aquifers. A generalized hydrogeologic cross-section (ESE, 1991) illustrates the relationship between the aquifers in this area (see Figure 1-5).

1.2.3.3 Regional Hydrogeology

The surficial water-bearing layer is a water table in a series of sediments, primarily sand and clay, which commonly extend to depths of 50 to 100 feet. This unit is not used for water supply on the Activity (Harned et al., 1989).

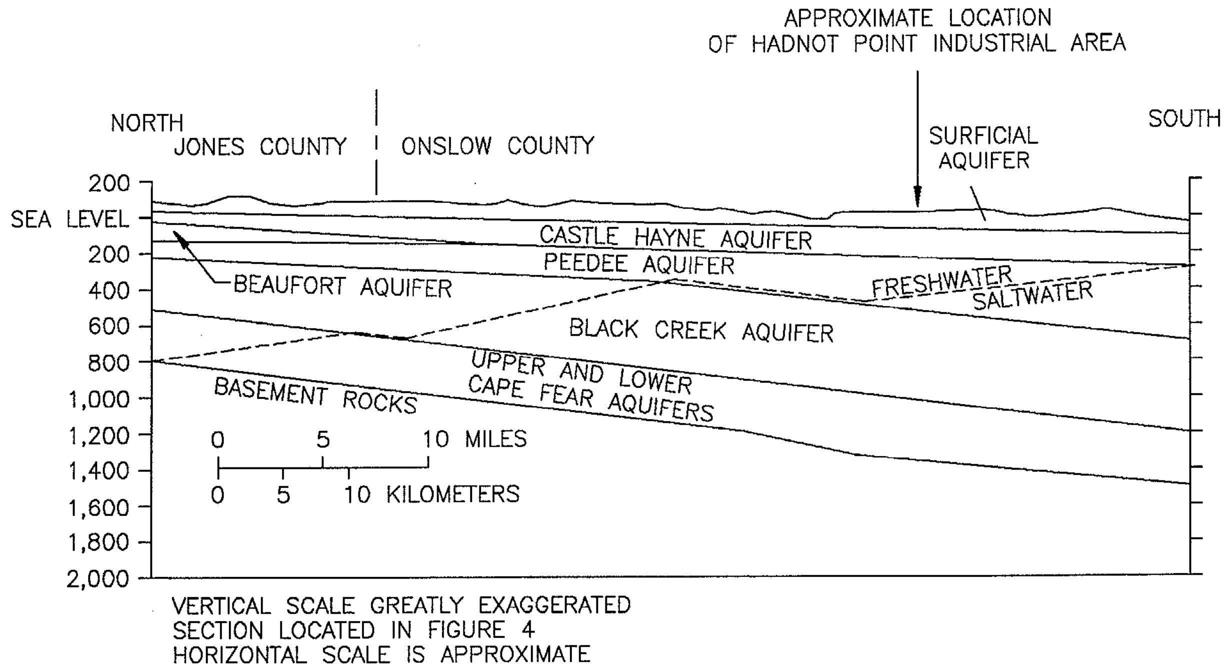
FIGURE 1-4

GEOLOGIC AND HYDROGEOLOGIC UNITS IN THE COASTAL PLAIN OF NORTH AMERICA

GEOLOGIC UNITS			HYDROGEOLOGIC UNITS
System	**Series**	**Formation**	**Aquifer and Confining Units**
Quaternary	Holocene/Pleistocene	Undifferentiated	Surficial aquifer
Tertiary	Pliocene	Yorktown Formation (1)	Yorktown confining unit
			Yorktown Aquifer
	Miocene	Eastover Formation (1)	
			Pungo River confining unit
		Pungo River Formation (1)	Pungo River Aquifer
		Belgrade Formation (2)	Castle Hayne confining unit
	Oligocene	River Bend Formation	Castle Hayne Aquifer
	Eocene	Castle Hayne Formation	Beaufort confining unit (3)
	Paleocene	Beaufort Formation	Beaufort Aquifer
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee confining unit
			Peedee Aquifer
		Black Creek and Middendorf Formations	Black Creek confining unit
			Black Creek Aquifer
		Cape Fear Formation	Upper Cape Fear confining unit
			Upper Cape Fear Aquifer
			Lower Cape Fear confining unit
			Lower Cape Fear Aquifer
	Lower Cretaceous (1)	Unnamed deposits (1)	Lower Cretaceous confining unit
			Lower Cretaceous Aquifer (1)
Pre-Cretaceous basement rocks		--	--

(1) Geologic and hydrologic units probably not present beneath MCB, Camp Lejeune.
(2) Constitutes part of the surficial aquifer and Castle Hayne confining unit in the study area.
(3) Estimated to be confined to deposits of Paleocene age in the study area.

Source: Harned et al., 1989.



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Baker
Baker Environmental, Inc.

FIGURE 1-5
GENERALIZED HYDROGEOLOGIC CROSS-SECTION
JONES AND ONSLOW COUNTIES, NORTH CAROLINA
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION, CTO-0160

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: HARNED, et. al., 1989

The principal water-supply aquifer for the Activity is found in the series of sand and limestone beds that occur between 50 and 300 feet below land surface. This series of sediments generally is known as the Castle Hayne Formation, associated with the Castle Hayne Aquifer. This aquifer is about 150 to 350 feet thick in the area and is the most productive aquifer in North Carolina.

Onslow County and Camp Lejeune lie in an area where the Castle Hayne Aquifer contains freshwater, although the proximity of saltwater in deeper layers just below the aquifer and in the New River estuary is of concern in managing water withdrawals. Overpumping of the deeper parts of the aquifer could cause encroachment of saltwater. The aquifer contains water having less than 250 mg/L (milligrams per liter) chloride throughout the area of the Activity.

The aquifers below the Castle Hayne lie in a thick sequence of sand and clay. Although some of these aquifers are used for water supply elsewhere in the Coastal Plain, they contain saltwater in the Camp Lejeune area and are not used.

Rainfall in the Camp Lejeune area enters the ground in recharge areas, infiltrates the soil, and moves downward until it reaches the water table, which is the top of the saturated zone. In the saturated zone, groundwater flows in the direction of lower hydraulic head, moving through the system to discharge areas like the New River and its tributaries, or the ocean.

The water table varies seasonally. The water table receives more recharge in the winter than in the summer when much of the water evaporates or is transpired by plants before it can reach the water table. Therefore, the water table generally is highest in the winter months and lowest in summer or early fall.

The hydraulic head in the semi-confined Castle Hayne aquifer, shows a different pattern of variation over time than that in the water table. Some seasonal variation also is common in the water levels of the Castle Hayne aquifer, but the changes tend to be slower and over a smaller range than for the water table.

1.2.3.4 Surface Water Hydrology

The dominant surface water feature at MCB, Camp Lejeune is the New River. It receives drainage from most of the Base. The New River is short, with a course of approximately

50 miles on the central Coastal Plain of North Carolina. Over most of its course, the New River is confined to a relatively narrow channel entrenched in Eocene and Oligocene limestones. South of Jacksonville, the river widens dramatically as it flows across less resistant sands, clays, and marls. At MCB, Camp Lejeune, the New River flows in a southerly direction into the Atlantic Ocean through the New River Inlet. Several small coastal creeks drain the area of MCB, Camp Lejeune not associated with the New River and its tributaries. These creeks flow into the Intracoastal Waterway, which is connected to the Atlantic Ocean by Bear Inlet, Brown's Inlet, and the New River Inlet (Water and Air Research, 1983). The New River, the Intracoastal Waterway, and the Atlantic Ocean meet at the New River Inlet.

1.2.3.5 Climatology

MCB, Camp Lejeune experiences mild winters and hot and humid summers. The average yearly rainfall is greater than 50 inches, and the potential evapotranspiration in the region varies from 34 to 36 inches of rainfall equivalent per year. The winter and summer seasons usually receive the most precipitation. Temperature ranges are reported to be 33 to 53°F in the winter (i.e., January) and 71°F to 88°F in the summer (i.e., July). Winds are generally south-southwesterly in the summer, and north-northwesterly in the winter (Water and Air Research, 1983).

1.2.3.6 Site Geology and Hydrogeology

The soil and stratigraphic borings drilled to date have encountered three distinctive units. The first unit is a fine- to medium-grained, unconsolidated sand. The thickness of this unit is from 15 to 30 feet. Law selected two samples of this unit to be analyzed for grain-size distribution, including samples from MW-23, collected from a depth of 8.5 to 10.5 feet, and from MW-24, collected from a depth of 13.5 to 15.5 feet. These analyses revealed that the samples generally contain 96 percent sand and 4 percent silt and clay.

The second unit is an colitic, fossiliferous limestone which ranges in thickness from 6.5 to 20 feet. The fossils consist of fragments of mollusks; the matrix consists of fine-grained sand, fine-grained phosphate grains and lime mud. Under the Folk classification (Blatt et al., 1972), this unit is a biosparite. Mr. Rick Shiver of the Wilmington Regional Office of the DEM stated that this unit is common in the Jacksonville area and is considered part of the unconfined, surficial aquifer. Law believes this unit is the River Bend Formation.

The third unit is an unconsolidated, dark gray to black silty, clayey sand. Because this unit may be a confining unit separating the surficial and Castle Hayne aquifers, Law did not attempt to completely penetrate this clayey sand, and therefore, the thickness is not known. This unit was sampled in SB-1, SB-2, SB-3 and MW-19. It was observed to be up to four feet thick in SB-2. Grain-size analysis of a sample from this unit revealed that the sample contained 79 percent fine sand, 9 percent silt and 12 percent clay.

This clayey sand is probably the same described by Harned, et al (1989) as one of the confining units occurring in the surficial aquifer and the Castle Hayne. Baker's experience at Camp Lejeune sites east of the New River is that the unit is not a confining unit in that area because it is thin and discontinuous. The Harned report noted, however, that the unit appears to be thicker and more continuous in the northwestern part of Camp Lejeune, where Site 35 is located. Law believes that this clayey sand acts as a confining unit in the study area due to its relatively high percentage of silt and clay. It is believed that this unit separates the surficial aquifer from the underlying Castle Hayne aquifer.

Groundwater in the surficial aquifer generally flows across the project site to the east, towards Brinson Creek. As indicated by comparing water level elevations recorded in 1991 between "shallow" and "deep" screened intervals, ground water in the surficial aquifer generally moves laterally across the project site with no significant vertical gradient.

The hydraulic conductivity of the unconsolidated sands within the surficial aquifer was calculated to be approximately 28 feet/day.

1.3 Report Organization

The Interim Remedial Action RI Report is comprised of seven sections. Section 1.0 - Introduction presents the purpose of the Interim Remedial Action RI and site background information. The results of previous investigations are summarized in Section 2.0 while Section 3.0 describes the field investigation activities conducted under the Interim Remedial Action RI. Laboratory analytical results are presented in Section 4.0. Section 5.0 provides a discussion of the nature and extent of petroleum hydrocarbon soil contamination based on the data obtained under the Interim Remedial Action RI and previous investigations. Section 6.0 - Risk Assessment evaluates the potential human health and environmental risks posed by the petroleum hydrocarbon constituents contained in the Site 35 soils. Finally, references are provided in Section 7.0.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS

The purpose of this section is to summarize and evaluate existing information pertaining to MCB, Camp Lejeune, and Site 35. Information presented herein can be found in the Initial Assessment Study of Marine Corps Base, Camp Lejeune, North Carolina (Water and Air Research, Inc., 1983), Final Site Summary Report, MCB Camp Lejeune (ESE, 1990) Draft Field Investigation/Focused Feasibility Study, Camp Geiger Fuel Spill Site (NUS, 1990), Underground Fuel Investigation and Comprehensive Site Assessment (Law, 1992) and the Addendum Report of Underground Fuel Investigation and Comprehensive Site Assessment (Law, 1993).

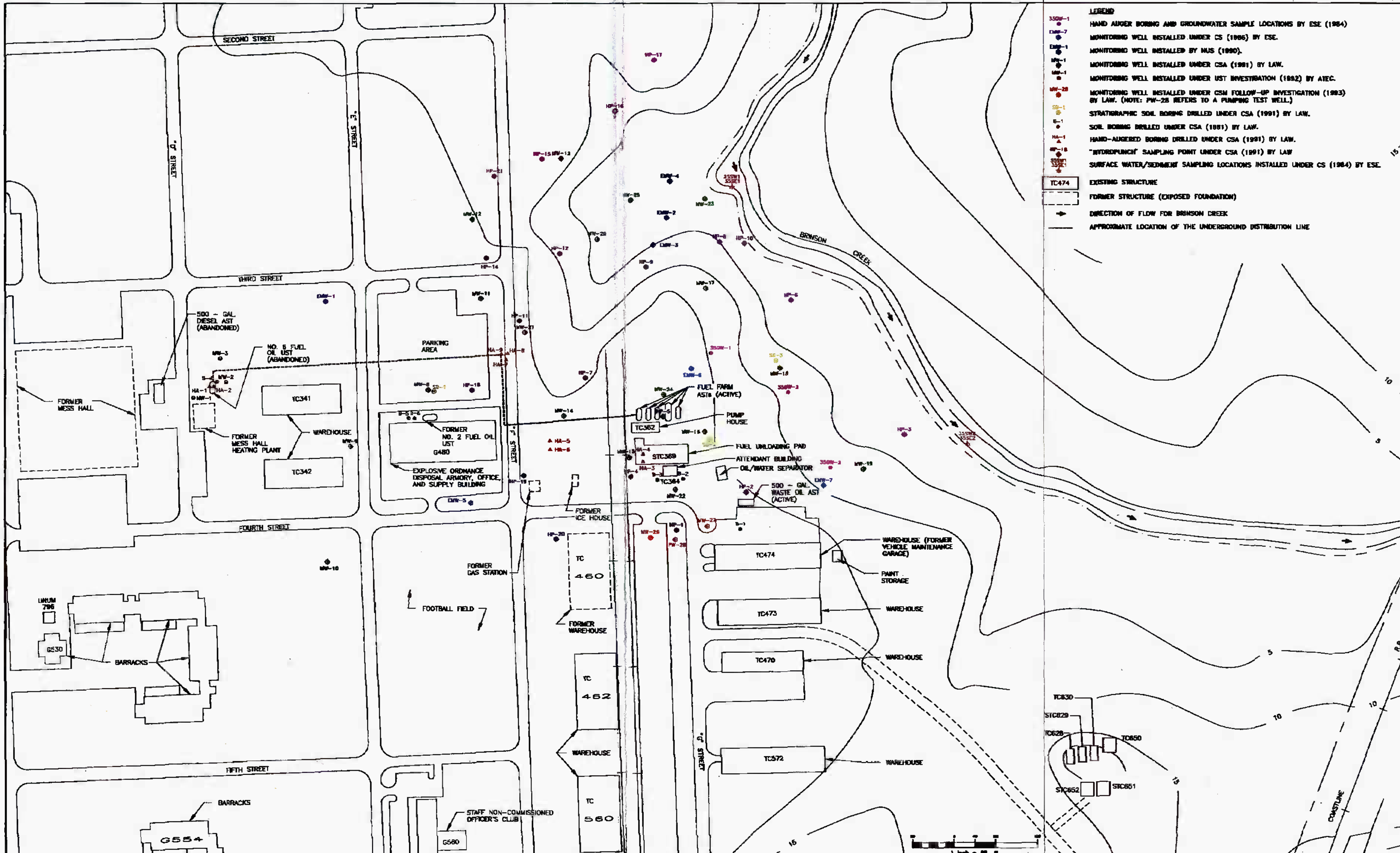
2.1 Initial Assessment Study

MCB, Camp Lejeune was placed on the National Priority List (NPL) in 1983 after the Initial Assessment Study (IAS) identified 76 potentially contaminated sites at the base (Water and Air Research, 1983). Site 35 was identified as one of 23 sites warranting further investigation. Sampling and analysis of environmental media was not conducted during the IAS.

2.2 Confirmation Study

ESE performed Confirmation Studies of the 22 sites requiring further investigation which included a study of the Fuel Farm between 1984 and 1987 (ESE, 1990). In 1984, ESE advanced three hand-auger borings (35GW-1, -2, and -3), and collected groundwater and soil samples from each location (see Figure 2-1). Soils were analyzed for lead and oil and grease. Lead was detected in soil samples obtained from hand auger borings at concentrations ranging from 6 to 8 mg/kg. Oil and grease was also detected at concentrations ranging from 40 to 2,200 mg/kg.

Shallow groundwater samples were obtained from the open boreholes and analyzed for lead, oil and grease, and volatile organic compounds (VOCs) including benzene, trans-1,2,-dichloroethene (trans-1,2,-DCE), trichloroethene (TCE), and methylene chloride. Lead was detected in each sample ranging from 3,659 µg/L (35GW-3) to 1,063 µg/L (35GW-1). Oil an grease was detected in only sample 35GW-2 at 46,000 µg/L. The only detected VOC was methylene chloride in sample 35GW-1 at 4 µg/L.



LEGEND	DATE MARCH 1994 SCALE 1" = 80' DRAWN W.M. REVIEWED D.B. S.O.# 62470-160-0000-05200 CADD# 160509RA	NORTH	INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION, CTO-0160 MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	EXISTING MONITORING WELLS AND SAMPLING LOCATIONS SITE 35 - CAMP GEIGER AREA FUEL FARM SCALE 1" = 80' DATE MARCH 1994	FIGURE No. 2-1

01507V04Y

In 1986, ESE collected two sediment (35SE1 and 35SE2) and two surface water (35SW1 and 35SW2) samples from Brinson Creek and installed three permanent monitoring wells (35GW-4, -5, and -6 which were later renamed EMW-5, -6, and -7), two east of and one west of the Fuel Farm. Surface water and sediment samples were analyzed for lead, oil and grease and ethylene dibromide. Groundwater samples were obtained in December 1986 and again in March 1987 and were analyzed for lead, oil and grease, and VOCs.

No target analytes were detected in either surface water sample. Both sediment samples were reported to contain lead and oil and grease although no data indicating actual levels of detection were provided in ESE's report. Levels were reported to be higher in the upstream sample, prompting ESE to suggest that the discharge of contaminated groundwater to the creek is occurring at the far northern section of the fuel farm ASTs or that the source of O&G and lead may be upstream.

Lead was detected in only one of six samples (33 µg/L: EMW-6) obtained from the three permanent monitoring wells. Oil and grease was detected in all six samples in a range from 200 µg/L (EMW-5: 12/86) to 12,000 µg/L (EMW-5: 3/87). Detected VOCs included benzene (range: 1.3 µg/L at EMW-7 to 30 µg/L at EMU-6), trans-1,2,-DCE (range: 3.2 µg/L at EMW-5 to 29 µg/L at EMW-7), and TCE (detected at 11 µg/L at EMW-7 on both sample dates).

2.3 Focused Feasibility Study

A Focused Feasibility Study (FFS) was conducted in 1990 in the area north of the Fuel Farm by NUS. Although the FFS was conducted, a Record of Decision was not signed as a result. The FFS included the installation of four groundwater monitoring wells numbered EMW-1, -2,-3, and -4 (see Figure 2-1). Baker was not able to obtain a copy of the NUS report. It was, however, discussed in the Comprehensive Site Assessment Report (Law, 1992). Law indicated that the results of laboratory analysis revealed that groundwater in one well and soil cuttings from two borings were contaminated with petroleum hydrocarbons although non-aqueous product was not observed. No quantifiable data was provided in the Law report.

A geophysical investigation was also conducted by NUS as part of the FFS in an attempt to identify USTs at the site of the former gas station. The results indicated the presence of a geophysical anomaly to the north of the former gas station.

2.4 Comprehensive Site Assessment

Law conducted a Comprehensive Site Assessment (CSA) during the fall of 1991 (Law, 1992). The CSA involved the drilling of 18 soil borings to depths ranging from 15 to 44.5 feet. These soil borings were ultimately converted to nested wells (MW-16 through 25) that monitor the water table aquifer along two zones (see Figure 2-1). The shallow or water table zone generally extends from 2.5 to 17.5 feet, below ground surface (bgs). The deeper zone monitored by the nested wells generally ranges from 17.5 to 35 feet bgs. Well MW-20 is the only single well installed by Law that is not a double nested well. It is screened from 3 to 12.5 feet bgs. Five additional soil borings were drilled and nine soil borings were hand-augered to provide data regarding vadose zone soil contamination. Three soil borings (SB-1, SB-2, SB-3) were drilled specifically to provide subsurface stratigraphic data. Additional groundwater data was provided via 21 drive-point groundwater or "Hydropunch" samples. A "Tracer" study was also performed to investigate the integrity of the ASTs and underground distribution piping.

Soil and groundwater samples obtained under the CSA were analyzed for both organic and inorganic compounds. Groundwater analyses included purgeable hydrocarbons (EPA 601), purgeable aromatics and methyl-tertiary butyl ether (MTBE) (EPA 602), polynuclear aromatic hydrocarbons (PAHs) (EPA 610), and unfiltered lead (EPA 239.2). Soil analyses were limited to total petroleum hydrocarbons (TPH) (SW846 3rd Edition, 5030/3550: gasoline/diesel fractions) and lead (SW846 3rd Edition, 6010). Ten soil samples were analyzed for ignitability by SW846 3rd Edition, 1010.

The results of the CSA identified areas of impacted soil and groundwater. The nature of the contamination included both halogenated (i.e., chlorinated) organic compounds (e.g., TCE, trans-1,2-DCE, and vinyl chloride) and nonhalogenated, petroleum-based constituents (e.g., TPH, MTBE, benzene, toluene, ethylbenzene, and xylene). The contamination encountered was typically identified in both shallow (2.5 to 17.5 feet bgs) and deep (17.5 to 35 feet bgs) wells.

Law also identified several plumes of shallow groundwater contamination including two plumes comprised primarily of petroleum-based constituents (e.g., BTEX) and two plumes comprised of halogenated organic compounds (e.g., TCE). The plumes are all located north of Fourth Street and east of E Street except for a portion of a TCE plume that extends southwest beyond the corner of Fourth and E Streets.

In general, contaminant concentrations in soil were greatest in those samples taken at or below the water table. Law concluded that soil contamination at Site 35 was likely due to the presence of a dissolved phase groundwater plume and seasonal fluctuations of the water table.

A follow-up to the CSA was conducted by Law in 1992. Reported as an Addendum to the CSA (Law, 1993), it was designed to provide further characterization of the southern extent of the previously identified petroleum contamination. Three monitoring wells were installed including MW-26, -27, and PW-28. Soil samples were obtained from each of these locations and analyzed for TPH (gasoline and diesel fractions). As part of the follow-up, a pump test was performed to estimate the hydraulic characteristics of the surficial aquifer. This test was designed to determine performance characteristics of the pumping well (PW-28) and to estimate hydraulic parameters of the aquifer. An approximate hydraulic conductivity of 100 feet/day was determined for the surficial aquifer.

A summary of the analytical results obtained under the CSA is provided in Appendix A.

2.5 Other Investigations

Two USTs located near the Fuel Farm have been the subject or previous investigations conducted under an Activity-wide UST program. The two USTs include a No. 6 fuel oil UST situated adjacent to the former Mess Hall Heating Plant and a No. 2 fuel oil UST situated adjacent to Building G480 (Explosive Ordnance and Disposal Armory, Office, and Supply Building). The former was abandoned in place years ago (date unknown) and has been the subject of previous environmental investigations performed by ATEC Associates, Inc. and Law. The latter was removed in January 1994 and is reported to be scheduled for an upcoming comprehensive environmental investigation.

3.0 INTERIM REMEDIAL ACTION FIELD INVESTIGATION

The Interim Remedial Action field investigation was initiated by Baker in December, 1993 to provide additional soil data to augment the existing Site 35 database, to determine the presence of non-fuel related chemical contaminants, to provide additional information regarding the extent of soil contamination, and to support an Interim Remedial Action FS. Soil boring samples and shallow soil samples were obtained at various locations across the site as presented on Figure 3-1. Specific RI field activities are discussed in the following sections.

3.1 Soil Borings

A total of seven soil borings (SB-29 through SB-35) were drilled during the Interim Remedial Action RI to provide chemical analytical data concerning the presence or absence of inorganics, petroleum hydrocarbons, and non-fuel related organics in the unsaturated zone soil. Soil boring logs are presented in Appendix B.

Soil boring SB-29 was drilled in an upgradient location near the corner of "D" Street and Third Street so as to provide background site data. Borings SB-30, SB-33, and SB-34 were located within the approximate limits of two combined benzene, toluene, ethylbenzene, and xylene (BTEX) contaminated shallow groundwater plumes previously identified by Law in the CSA (Law, 1992). Boring SB-30 was located near the center of the western-most plume which encompasses the former No. 2 fuel oil UST at Building G480, a section of the buried distribution pipeline that extends from the Fuel Farm to the abandoned No. 6 fuel oil UST at the former Mess Hall Heating Plant, and the unnamed drainage channels north of the Fuel Farm where past unauthorized discharges of fuel products reportedly occurred. SB-33 and SB-34 were drilled downgradient of the Fuel Farm, a suspected source of groundwater contamination. Borings SB-31 and SB-32 were located between the two BTEX plumes and within a plume of shallow groundwater that Law identified as being contaminated with chlorinated organic compounds. Finally SB-35 was located between Building TC474 (currently a warehouse and formerly a vehicle maintenance garage and suspected source of chlorinated groundwater contamination) and a plume of chlorinated shallow groundwater contamination identified by Law.

Soil borings were advanced through the unsaturated zone to depths of 6 to 12 feet using hollow stem augers. Soils were sampled continuously by split spoon over two-foot intervals. Each split-spoon sampler was screened using an HNu photoionization detector (PID) with an

LEGEND	DATE MARCH 1994 SCALE 1" = 80' DRAWN W.H. REVIEWED DLB W.O.# 62470-160-0000-07000 CAD# 19050484	NORTH		INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION CTO-0160 MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA BAKER ENVIRONMENTAL, Inc. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	INTERIM REMEDIAL ACTION RI SOIL BORING AND SAMPLE LOCATIONS SITE 35 – CAMP GEIGER AREA FUEL FARM SCALE 1" = 80' DATE MARCH 1994	FIGURE No. 3-1

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ionization potential of 11.7 eV. A discrete grab sample from each two-foot interval was containerized for headspace analysis. The remainder of the soil was containerized and marked for possible laboratory analysis. Results of head space analyses were then used to determine which soil sample would be submitted for laboratory analysis. Soil boring samples submitted to the laboratory were analyzed for USEPA Contract Laboratory Program (CLP) Target Compound List (TCL) volatiles and semivolatiles, Target Analyte List (TAL) inorganics, TPH by SW846 3rd. Edition, modified Method 8015 and oil and grease by SW846 3rd. Edition, Method 9071. Soil samples analyzed for TPH were extracted in accordance with SW846 3rd. Edition, Methods 5030 (gasoline range organics) and 3550 (diesel range organics).

In addition, a composite soil sample (SBC01) was obtained and analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) and RCRA hazardous waste characteristics (i.e. corrosivity, ignitability and reactivity). SBC01 was obtained by collecting soils from split spoon samples taken from boring locations SB-29, SB-30, SB-32, SB-33, SB-34, and SB-35. A sample was not obtained from location SB-31 because of limited sample volume.

3.2 Shallow Soil Samples

A total of 13 shallow surface soil samples (BCSB-01 through BCSB-13) were obtained from topographically low areas adjacent to Brinson Creek and the drainage channels located to the north of the Fuel Farm. Ten samples (BCSB-01 through BCSB-10) were obtained in December 1993. Three more samples (BCSB-11, -12, and -13) were obtained in March 1994 in order to provide additional data upstream and downstream of the site. Samples BCSB-11 and BCSB-12 were obtained from off-site locations north of Site 35, along the upstream reach of Brinson Creek and approximately 1,500 and 2,200 feet upstream of the unnamed drainage channel at BCSB-05 depicted on Figure 3-1. Sample BCSB-13 was obtained approximately 250 feet downstream of shallow soil sample location BCSB-10. In addition to shallow soil sampling, a shallow trench was excavated in the lower lying areas along Brinson Creek to provide for a visual examination of the shallow soils across an extended area. The shallow trench was excavated to depths ranging from one to three feet bgs using a gasoline-powered, walk-behind mechanical trencher.

One shallow soil sample was obtained from each sample location BCSB-01 through BCSB-13. Each sample was obtained from the 0 to 1-foot depth interval using hand trowels. These samples were containerized and submitted for laboratory analysis. Soil samples BCSB-01 through BCSB-10 were analyzed for CLP TCL volatiles and semivolatiles, TAL inorganics, TPH by SW846 3rd. Edition, modified Method 8015 and oil and grease by SW846 3rd. Edition, Method 9071. Soil samples BCSB-11, -12, and -13 were analyzed for TPH and oil and grease only. A composite sample (SBC02) was obtained from the ten shallow soil sampling locations and analyzed for full TCLP and RCRA characteristics.

3.3 Groundwater Level Measurements

In March 1994, Baker obtained water level measurements from selected well locations throughout Site 35 to provide additional seasonal groundwater level data and supplement water level measurements previously obtained by Law. The wells from which the measurements were obtained include MW-8, MW-9, MW-10, MW-11, MW-13, MW-15, MW-16, MW-17, MW-19, MW-20, MW-21, MW-22, MW-23, MW-24 and MW-27. The significance of additional water level measurements will be discussed in Section 4.0.

4.0 ANALYTICAL RESULTS

The following paragraphs present the analytical results for soil samples obtained under the Interim Remedial Action RI at Site 35.

4.1 TCL Organics

The results of soil analysis for TCL organics are presented in Table 4-1 and depicted on Figure 4-1. Analytical results in Table 4-1 are presented with appropriate data qualifiers. The data qualifier J means that analytical results are estimated. The data qualifier U means that the chemical was not detected above its corresponding limit of detection. Therefore, an analytical result of 33U J mg/kg means that the given chemical was not detected above the 33 mg/kg limit of detection and that the detection limit was an estimated value. An analytical result of 14 J mg/kg means that the chemical was positively detected at an estimated 14 mg/kg.

Volatile organic compounds (VOCs) including benzene, 2-hexanone, toluene, ethylbenzene and total xylenes were detected in two or more soil boring samples. Benzene was detected in two soil boring samples at concentrations of 410J µg/kg (SB3005) and 23,000 µg/kg (SB3405). Toluene was also detected in two soil boring samples at concentrations of 280J µg/kg (SB3005) and 190,000J µg/kg (SB3405). Ethylbenzene and total xylenes were detected in three soil boring samples at concentrations of 6,800 µg/kg and 13,000 µg/kg (SB3003), 14,000 µg/kg and 26,000 µg/kg (SB3005), 70,000 µg/kg and 320,000 µg/kg (SB3405), respectively. The contaminant 2-hexanaone was also detected in two soil boring samples (SB3005 and SB3405) at concentrations of 4,800 µg/kg and 12,000J µg/kg. Maximum contaminant concentrations were associated with soil boring samples obtained from the 8 to 10 feet depth interval bgs.

The VOC trichloroethene (TCE) was detected in background sample SB2903 (7 µg/kg) and site sample SB3102 (6 µg/kg). Acetone, a common laboratory contaminant, was also detected in background sample SB2903 (40 µg/kg) as well as eleven site samples. Concentrations of acetone in site samples ranged from 26J µg/kg (SB3502) to 1,300J µg/kg (BCSB06). The presence of acetone and TCE in the background soil boring indicates that their presence could be attributed to sources other than those at Site 35.

Semivolatile organic compounds (SVOCs) naphthalene, 2-methylnaphthylene, dibenzofuran, fluorene, phenanthrene, bis(2-ethylhexyl)phthalate and di-n-octylphthalate were detected in

TABLE 4-1
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	SB2903 4-6 ug/kg	SB3003 4-6 ug/kg	SB3005 8-10 ug/kg	SB3005D 8-10 ug/kg	SB3102 2-4 ug/kg	SB3203 4-6 ug/kg	SB3305 8-10 ug/kg	SB3405 8-9 ug/kg	SB3502 2-4 ug/kg	BCSB01 0-1 ug/kg	BCSB02 0-1 ug/kg
VOLATILES											
Chloromethane	11 UJ	1300 U	1400 U	1400 U	12 UJ	28 UJ	12 UJ	9100 U	12 UJ	36 UJ	18 UJ
Bromomethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
Vinyl Chloride	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Chloroethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
Methylene_Chloride	18 U	620 U	640 U	700 U	15 U	35 U	22 U	6000 U	13 U	38 UJ	23 UJ
Acetone	40 J	1300 UJ	1400 UJ	1400 UJ	27 J	150 J	51 J	9100 UJ	26 J	180 J	18 UJ
Carbon Disulfide	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
1,1-Dichloroethene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
1,1-Dichloroethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
1,2-Dichloroethene_(total)	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
Chloroform	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
1,2-Dichloroethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 U	9100 U	12 U	36 UJ	18 UJ
2-Butanone	11 UJ	1300 UJ	1400 UJ	1400 UJ	12 UJ	28 UJ	12 UJ	9100 UJ	12 UJ	36 UJ	18 UJ
1,1,1-Trichloroethane	11 U	1300 UJ	1400 UJ	1400 UJ	12 U	28 U	12 UJ	9100 UJ	12 U	36 UJ	18 UJ
Carbon Tetrachloride	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Bromodichloromethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
1,2-Dichloropropane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
cis-1,3-Dichloropropene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Trichloroethene	7 J	1300 U	1400 U	1400 U	6 J	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Dibromochloromethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
1,1,2-Trichloroethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Benzene	11 U	1300 U	410 J	1400 U	12 U	28 U	12 UJ	23000	12 U	36 UJ	18 UJ
trans-1,3-Dichloropropene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Bromoform	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
4-Methyl-2-pentanone	11 UJ	1300 UJ	1400 UJ	1400 UJ	12 UJ	28 UJ	12 UJ	9100 U	12 UJ	36 UJ	18 UJ
2-Hexanone	11 UJ	1300 UJ	4800 J	1800 J	12 UJ	28 UJ	12 UJ	12000 J	12 UJ	36 UJ	18 UJ
Tetrachloroethene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
1,1,2,2-Tetrachloroethane	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Toluene	11 U	1300 U	280 J	1400 U	12 U	28 U	12 UJ	190000 J	12 U	36 UJ	18 UJ
Chlorobenzene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Ethylbenzene	11 U	6800	14000	9600	12 U	28 U	12 UJ	70000	12 U	36 UJ	18 UJ
Styrene	11 U	1300 U	1400 U	1400 U	12 U	28 U	12 UJ	9100 U	12 U	36 UJ	18 UJ
Xylene (total)	11 U	13000	26000	17000	12 U	28 U	12 UJ	320000	12 U	36 UJ	18 UJ

TABLE 4-1 (continued)
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	SB2903 4-6 ug/kg	SB3003 4-6 ug/kg	SB3005 8-10 ug/kg	SB3005D 8-10 ug/kg	SB3102 2-4 ug/kg	SB3203 4-6 ug/kg	SB3305 8-10 ug/kg	SB3405 8-9 ug/kg	SB3502 2-4 ug/kg	BCSB01 0-1 ug/kg	BCSB02 0-1 ug/kg
SEMIVOLATILES											
Phenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
bis(2-Chloroethyl)ether	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2-Chlorophenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
1,3-Dichlorobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
1,4-Dichlorobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
1,2-Dichlorobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2-Methylphenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,2'-oxybis(1-Chloropropane)	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
4-Methylphenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
N-Nitroso-di-n-propylamine	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Hexachloroethane	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Nitrobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Isophorone	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2-Nitrophenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,4-Dimethylphenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
bis(2-Chloroethoxy)methane	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,4-Dichlorophenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
1,2,4-Trichlorobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Naphthalene	380 U	7100 J	34000	43000	370 U	370 U	380 U	31000	390 U	1200 U	610 U
4-Chloroaniline	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Hexachlorobutadiene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
4-Chloro-3-methylphenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2-Methylnaphthalene	380 U	34000	120000	130000	370 U	370 U	380 U	70000	390 U	1200 U	610 U
Hexachlorocyclopentadiene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 UJ	610 UJ
2,4,6-Trichlorophenol	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,4,5-Trichlorophenol	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
2-Chloronaphthalene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2-Nitroaniline	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
Dimethylphthalate	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Acenaphthylene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U

TABLE 4-1 (continued)
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No.	SB2903	SB3003	SB3005	SB3005D	SB3102	SB3203	SB3305	SB3405	SB3502	BCSB01	BCSB02
Depth (ft)	4-6	4-6	8-10	8-10	2-4	4-6	8-10	8-9	2-4	0-1	0-1
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
2,6-Dinitrotoluene	380 UJ	11000 UJ	23000 UJ	24000 UJ	370 UJ	370 UJ	380 UJ	22000 UJ	390 UJ	1200 UJ	610 UJ
3-Nitroaniline	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
Acenaphthene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,4-Dinitrophenol	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
4-Nitrophenol	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
Dibenzofuran	380 U	3100 J	8100 J	10000 J	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
2,4-Dinitrotoluene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Diethylphthalate	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
4-Chlorophenyl-phenylether	380 UJ	11000 UJ	23000 UJ	24000 UJ	370 UJ	370 UJ	380 UJ	22000 UJ	390 UJ	1200 UJ	610 UJ
Fluorene	380 UJ	5600 J	10000 J	13000 J	370 UJ	370 UJ	380 UJ	8200 J	390 UJ	1200 UJ	610 UJ
4-Nitroaniline	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
4,6-Dinitro-2-methylphenol	920 U	28000 UJ	58000 UJ	61000 UJ	900 U	890 U	920 U	54000 UJ	960 U	2800 UJ	1500 UJ
N-Nitrosodiphenylamine (1)	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
4-Bromophenyl-phenylether	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Hexachlorobenzene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Pentachlorophenol	920 U	28000 U	58000 U	61000 U	900 U	890 U	920 U	54000 U	960 U	2800 U	1500 U
Phenanthrene	380 U	6700 J	21000 J	27000	370 U	370 U	380 U	11000 J	390 U	1200 U	610 U
Anthracene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	280 J
Carbazole	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Di-n-butylphthalate	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 UJ	610 UJ
Fluoranthene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Pyrene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Butylbenzylphthalate	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
3,3'-Dichlorobenzidine	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Benzo(a)anthracene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Chrysene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
bis(2-Ethylhexyl)phthalate	130 J	11000 U	23000 U	24000 U	370 U	140 J	120 J	22000 U	160 J	1200 U	610 U
Di-n-octylphthalate	84 J	11000 U	23000 U	24000 U	370 U	93 J	100 J	22000 U	100 J	1200 U	610 U
Benzo(b)fluoranthene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Benzo(k)fluoranthene	380 UJ	11000 UJ	23000 UJ	24000 UJ	370 UJ	370 UJ	380 UJ	22000 UJ	390 UJ	1200 UJ	610 UJ
Benzo(a)pyrene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Indeno(1,2,3-cd)pyrene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Dibenz(a,h)anthracene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U
Benzo(g,h,i)perylene	380 U	11000 U	23000 U	24000 U	370 U	370 U	380 U	22000 U	390 U	1200 U	610 U

Note:
D - Duplicate Sample
J - Estimated
U - Not Detected

TABLE 4-1 (continued)
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	BCSB03 0-1 ug/kg	BCSB3D 0-1 ug/kg	BCSB04 0-1 ug/kg	BCSB05 0-1 ug/kg	BCSB06 0-1 ug/kg	BCSB07 0-1 ug/kg	BCSB08 0-1 ug/kg	BCSB09 0-1 ug/kg	BCSB10 0-1 ug/kg
VOLATILES									
Chloromethane	19 UJ	22 UJ	13 UJ	16 UJ	150 UJ	15 UJ	23 UJ	28 UJ	47 UJ
Bromomethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Vinyl Chloride	19 UJ	22 UJ	13 UJ	16 UJ	150 UJ	15 UJ	23 UJ	28 UJ	47 UJ
Chloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Methylene_Chloride	41 UJ	16 UJ	13 U	20 UJ	380 U	13 UJ	25 UJ	30 UJ	52 UJ
Acetone	350 J	22 UJ	13 U	16 UJ	1300 J	110 J	160 J	92 J	140 J
Carbon Disulfide	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,1-Dichloroethene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,1-Dichloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,2-Dichloroethene_(total)	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Chloroform	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,2-Dichloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
2-Butanone	19 UJ	22 UJ	13 U	16 UJ	150 UJ	15 UJ	23 UJ	28 UJ	47 UJ
1,1,1-Trichloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Carbon Tetrachloride	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Bromodichloromethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,2-Dichloropropane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
cis-1,3-Dichloropropene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Trichloroethene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Dibromochloromethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,1,2-Trichloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Benzene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
trans-1,3-Dichloropropene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Bromoform	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
4-Methyl-2-pentanone	19 UJ	22 UJ	13 U	16 UJ	150 UJ	15 UJ	23 UJ	28 UJ	47 UJ
2-Hexanone	19 UJ	22 UJ	13 U	16 UJ	150 UJ	15 UJ	23 UJ	28 UJ	47 UJ
Tetrachloroethene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
1,1,2,2-Tetrachloroethane	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Toluene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Chlorobenzene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Ethylbenzene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Styrene	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ
Xylene (total)	19 UJ	22 UJ	13 U	16 UJ	150 U	15 UJ	23 UJ	28 UJ	47 UJ

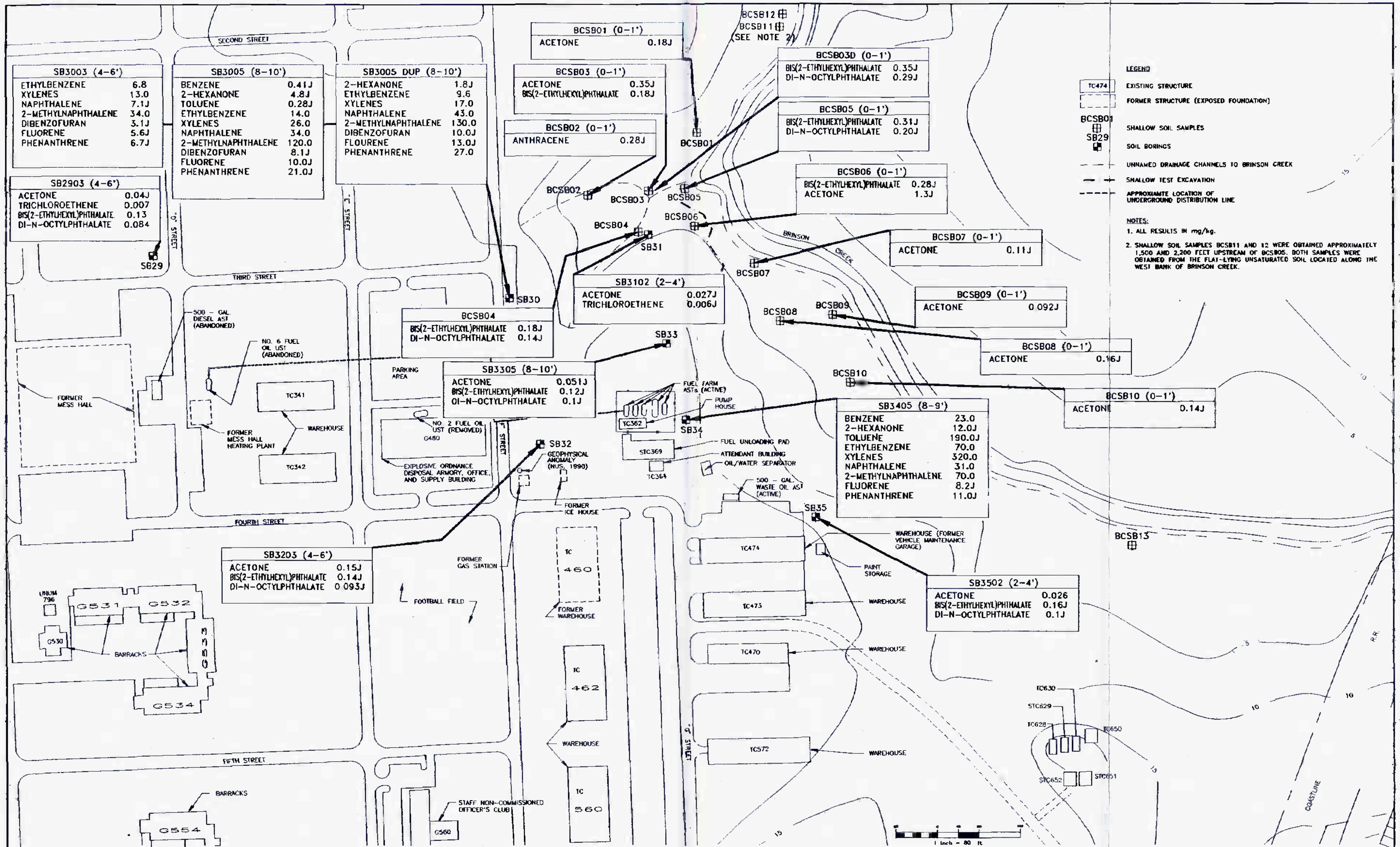
TABLE 4-1 (continued)
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	BCSB03 0-1 ug/kg	BCSB3D 0-1 ug/kg	BCSB04 0-1 ug/kg	BCSB05 0-1 ug/kg	BCSB06 0-1 ug/kg	BCSB07 0-1 ug/kg	BCSB08 0-1 ug/kg	BCSB09 0-1 ug/kg	BCSB10 0-1 ug/kg
SEMIVOLATILES									
Phenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
bis(2-Chloroethyl)ether	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2-Chlorophenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
1,3-Dichlorobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
1,4-Dichlorobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
1,2-Dichlorobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2-Methylphenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,2'-oxybis(1-Chloropropane)	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
4-Methylphenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
N-Nitroso-di-n-propylamine	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Hexachloroethane	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Nitrobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Isophorone	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2-Nitrophenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,4-Dimethylphenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
bis(2-Chloroethoxy)methane	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,4-Dichlorophenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
1,2,4-Trichlorobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Naphthalene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
4-Chloroaniline	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Hexachlorobutadiene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
4-Chloro-3-methylphenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2-Methylnaphthalene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Hexachlorocyclopentadiene	620 UJ	730 UJ	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
2,4,6-Trichlorophenol	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,4,5-Trichlorophenol	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
2-Chloronaphthalene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2-Nitroaniline	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
Dimethylphthalate	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Acenaphthylene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U

TABLE 4-1 (continued)
SOIL ORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No.	BCSB03	BCSB3D	BCSB04	BCSB05	BCSB06	BCSB07	BCSB08	BCSB09	BCSB10
Depth (ft)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
2,6-Dinitrotoluene	620 UJ	730 UJ	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
3-Nitroaniline	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
Acenaphthene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,4-Dinitrophenol	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
4-Nitrophenol	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
Dibenzofuran	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
2,4-Dinitrotoluene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Diethylphthalate	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
4-Chlorophenyl-phenylether	620 UJ	730 UJ	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
Fluorene	620 UJ	730 UJ	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
4-Nitroaniline	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
4,6-Dinitro-2-methylphenol	1500 UJ	1800 UJ	1000 UJ	1200 UJ	2400 UJ	1300 UJ	7400 UJ	2400 UJ	3800 UJ
N-Nitrosodiphenylamine (1)	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
4-Bromophenyl-phenylether	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Hexachlorobenzene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Pentachlorophenol	1500 U	1800 U	1000 U	1200 U	2400 U	1300 U	7400 U	2400 UJ	3800 U
Phenanthrene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Anthracene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Carbazole	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Di-n-butylphthalate	620 UJ	730 U	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
Fluoranthene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Pyrene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Butylbenzylphthalate	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
3,3'-Dichlorobenzidine	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Benzo(a)anthracene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Chrysene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
bis(2-Ethylhexyl)phthalate	180 J	350 J	180 J	310 J	280 J	530 U	3000 U	970 UJ	1600 U
Di-n-octylphthalate	620 U	290 J	140 J	200 J	990 U	530 U	3000 U	970 UJ	1600 U
Benzo(b)fluoranthene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Benzo(k)fluoranthene	620 UJ	730 UJ	420 UJ	500 UJ	990 UJ	530 UJ	3000 UJ	970 UJ	1600 UJ
Benzo(a)pyrene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Indeno(1,2,3-cd)pyrene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Dibenz(a,h)anthracene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U
Benzo(g,h,i)perylene	620 U	730 U	420 U	500 U	990 U	530 U	3000 U	970 UJ	1600 U

Note:
D - Duplicate Sample
J - Estimated
U - Not Detected



LEGEND	DATE	MARCH 1994	NORTH
	SCALE	1" = 80'	
	DRAWN	WJN	
	REVIEWED	DLB	
	S.O.#	62470-180-0000-05200	
	CADD#	160505RA	

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

INTERIM REMEDIAL ACTION RI
DETECTED TCL ORGANICS IN SOIL
SITE 35 – CAMP GEIGER AREA FUEL FARM

FIGURE No. 4-1

SCALE 1" = 80'
DATE MARCH 1994

01507V062

several soil boring samples. Phthalates were detected in background soil boring sample SB2903 and are known to be common laboratory contaminants. Their presence in shallow and subsurface soil samples is likely due to sources other than those at Site 35.

Naphthalene, 2-methylnaphthalene, fluorene, and phenanthrene are polynuclear aromatic hydrocarbons (PAHs). PAHs were detected in soil boring samples SB3003, SB3005 and SB3405. Naphthalene and 2-methylnaphthalene were detected at concentrations of 7,100J µg/kg and 34,000 µg/kg, 34,000 µg/kg and 120,000 µg/kg, 31,000 µg/kg and 70,000 µg/kg, respectively. Again, maximum detected SVOC concentrations were associated with soil boring samples taken from the 8 to 10 feet bgs interval, which is generally at, near, or below the water table.

4.2 TAL Inorganics

TAL inorganic analytical results obtained under the Interim Remedial Action RI are presented in Table 4-2. Data qualifiers presented in Table 4-2 include R (rejected), L (biased low) and K (biased high). The qualifier U indicates that the constituent was not detected above its limit of detection. The qualifier J means that the corresponding analytical result is estimated. Inorganic constituents including aluminum, arsenic, barium, beryllium, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium and zinc were detected in at least one soil sample.

Aluminum, calcium, iron, magnesium, manganese, sodium and potassium (in conjunction with carbon, oxygen and hydrogen) comprise over 99 percent of the elemental content of soils (Dragun, 1988). The occurrence of these chemicals in environmental media is expected, and their results fall within the ranges expected for soils of the eastern United States (Shacklette, et al., 1984). Therefore, the remainder of this section will focus on the occurrence of the trace elements, arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc.

Chromium was detected in every soil sample taken during the Interim Remedial Action RI. Chromium concentrations ranged from 1.7 L mg/kg (SB3102) to 20.5 L mg/kg (SB3005D). Mercury was detected with the second highest frequency, occurring at 12 of 17 soil sample locations. Mercury concentrations ranged from 0.02 K mg/kg (SB3203) to 0.27 K mg/kg (BCSB06). The inorganic zinc was detected at 11 of 17 soil sample locations at concentrations ranging from 10.4 mg/kg to 88.5 mg/kg. Vanadium was detected at 9 of 17 soil sample

TABLE 4-2
SOIL INORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	SB2903 4-6 mg/kg	SB3003 4-6 mg/kg	SB3005 8-10 mg/kg	SB3005D 8-10 mg/kg	SB3102 2-4 mg/kg	SB3203 4-6 mg/kg	SB3305 8-10 mg/kg	SB3405 8-9 mg/kg	SB3502 2-4 mg/kg	BCSB01 0-1 mg/kg
INORGANICS										
Aluminum	3330 L	959 L	1840 L	2400 L	2140 L	4300 L	3490 L	4480 L	1910 L	2960 L
Antimony	2.6 R	3 R	3.1 R	3.4 R	2.5 R	3.1 R	3 R	3 R	3.7 R	10.4 R
Arsenic	0.69 U	0.56 U	4 U	8	0.47 U	0.9 U	0.56 U	0.55 U	0.7 U	1.9 U
Barium	3.4 U	1.2 U	2.5 U	2.9 U	6.8 U	7.1 U	5 U	12.1 U	4.4 U	31.9 J
Beryllium	0.07 UL	0.08 UL	0.08 UL	0.09 UL	0.07 UL	0.08 UL	0.08 UL	0.08 UL	0.1 UL	0.27 UL
Cadmium	0.35 U	0.41 U	0.41 U	0.45 U	0.34 U	0.42 U	0.41 U	0.4 U	0.5 U	1.4 U
Calcium	133 U	264 J	51 U	38.5 U	234 J	268 J	113 U	116 U	416 J	12900
Chromium	4.8 L	4.3 L	12.3 L	20.5 L	1.7 L	6.2 L	7.2 L	6.9 L	2.6 L	6 L
Cobalt	0.53 U	0.62 U	0.63 U	0.69 U	0.52 U	0.64 U	0.62 U	0.61 U	0.77 U	2.1 U
Copper	0.92 U	1.3 U	2.3 U	3.7 U	0.42 U	0.52 U	0.87 U	0.5 U	0.62 U	8 J
Iron	1500 J	518 J	3560 J	6140 J	932 J	2500 J	1030 J	1440 J	823 J	5210 J
Lead	2.8 U	1.4 U	2 U	2.4 U	1.8 U	3.6 U	3.6 U	4.8 U	2.1 U	35 U
Magnesium	67 L	19.7 UL	78.1 L	96.8 L	55.5 L	133 L	125 L	186 L	29.4 UL	1480 L
Manganese	0.61 U	2.6 J	4.9	8.9	3.2	1.2 U	1.5 U	2.3 J	1.9 U	99.3
Mercury	0.08 K	0.02 U	0.02 U	0.02 U	0.02 U	0.02 K	0.02 U	0.02 U	0.03 U	0.14 K
Nickel	1.7 U	2 U	2 U	2.2 U	1.7 U	2.1 U	2 U	2 U	2.5 U	6.9 U
Postassium	138 UL	126 UL	128 UL	153 UL	106 UL	131 UL	126 UL	124 UL	156 UL	433 L
Selenium	0.28 UL	0.36 UL	0.64 UL	1.5 UL	0.28 UL	0.34 UL	0.64 UL	0.32 UL	0.41 UL	1.1 UL
Silver	0.59 U	0.7 U	0.71 U	0.78 U	0.59 U	0.72 U	0.7 U	0.69 U	0.86 U	2.4 U
Sodium	13.9 UL	15.3 UL	16.2 UL	24 UL	15.4 UL	29.3 UL	22.1 UL	20.9 UL	23.7 UL	1240 L
Thallium	0.46 U	0.54 U	0.55 U	0.6 U	0.46 U	0.56 U	0.54 U	0.53 U	0.67 U	1.9 U
Vanadium	4.1 UL	1.4 UL	13 L	22.9 L	1.9 UL	7.8 L	7.6 L	8.3 L	3.6 UL	10.5 L
Zinc	0.81 U	20.4	0.73 U	0.82 U	1.6 U	1.1 U	1.2 U	1.5 U	0.62 U	88.5

Notes:
D - Duplicate Sample   L - Biased Low
J - Estimated   U - Not Detected
K - Biased High

INORGANC.XLS

TABLE 4-2 (continued)
SOIL INORGANIC ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	BCSB02 0-1 mg/kg	BCSB03 0-1 mg/kg	BCSB3D 0-1 mg/kg	BCSB04 0-1 mg/kg	BCSB05 0-1 mg/kg	BCSB06 0-1 mg/kg	BCSB07 0-1 mg/kg	BCSB08 0-1 mg/kg	BCSB09 0-1 mg/kg	BCSB10 0-1 mg/kg
INORGANICS										
Aluminum	1390 L	3110 L	2810 L	1520 L	2500 L	4840 L	3190 L	3330 L	4660 L	3760 L
Antimony	4.3 R	4.5 R	5.8 R	2.3 R	3.2 R	7.6 R	4.7 R	5.4 R	7.2 R	12 R
Arsenic	1.2 U	0.83 U	1.1 U	0.43 U	0.99 U	1.4 U	1.6 U	1 U	1.3 U	2.2 U
Barium	13.5 U	21.7 U	22.1 U	7.8 U	10.9 U	25.9 J	23.6 U	18.3 U	22.2 U	28.2 J
Beryllium	0.11 UL	0.11 L	0.15 UL	0.06 UL	0.08 UL	0.19 UL	0.12 UL	0.2 UL	0.22 UL	0.31 UL
Cadmium	0.58 U	0.6 U	0.78 U	0.31 U	0.43 U	1 U	0.63 U	0.72 U	0.97 U	1.6 U
Calcium	3200	3180	3450	530 J	2580	8010	4450	1780	6280	23600
Chromium	4 L	6.6 L	6.2 L	3.5 L	5.2 L	8 L	5 L	5.4 L	8.2 L	7.6 L
Cobalt	0.88 U	0.92 U	1.2 U	0.47 U	0.66 U	3.1 U	1.4 U	1.1 U	1.6 U	2.5 U
Copper	6.3 U	4.7 U	5 U	0.92 U	6.8 U	7.1 U	3.6 U	3.7 U	6.9 U	7.6 U
Iron	2510 J	2340 J	2670 J	1070 J	3500 J	5170 J	3840 J	4390 J	6350 J	4560 J
Lead	46.1 U	45.3 U	49.1 U	14.5 U	42.3 U	61.1	21.6 U	41.6 U	61.3	69.2
Magnesium	149 L	163 L	150 L	42.5 L	411 L	1480 L	413 L	510 L	1290 L	1630 L
Manganese	59.2	7.3	9.5	4.2	18.7	97.1	38.9	8.7	63.3	105
Mercury	0.06 K	0.08 K	0.09 K	0.08 K	0.05 K	0.27 K	0.09 K	0.11 K	0.15 K	0.26 K
Nickel	2.9 U	3 U	3.9 U	1.5 U	2.1 U	5 U	3.4 K	3.6 U	6.1 J	8.3 J
Postassium	179 UL	186 UL	242 UL	105 UL	156 UL	315 UL	293 J	331 UL	471 UL	563 UL
Selenium	0.47 UL	0.49 UL	1 UL	0.25 L	0.52 UL	0.89 UL	0.53 UL	0.59 UL	1.8 UL	1.5 UL
Silver[1]	1 U	1 U	1.3 U	0.53 U	0.74 U	1.7 U	1.1 U	1.2 U	1.7 U	2.8 U
Sodium	83.2 UL	62.3 UL	70.9 UL	47.2 UL	1120 L	1510 L	67.6 UL	347 L	1390 UL	1730 L
Thallium	0.77 U	0.8 U	1 U	0.41 U	0.57 U	1.4 U	0.84 U	0.96 U	1.3 U	2.2 U
Vanadium	6.7 L	10.2 L	9.8 L	3.4 UL	5.6 UL	13.1 L	8.7 UL	12.4 L	15.3 L	18.1 L
Zinc	37.8	22.9	23.5	10.4	46.8	66	18.8	11.9	63.1	70.5

Notes:
D - Duplicate Sample
J - Estimated
K - Biased High
L - Biased Low
U - Not Detected

INORGANC.XLS

locations at concentrations ranging from 6.7 L mg/kg to 22.9 L mg/kg (SB3005D). The constituents barium and lead were detected at 3 of 17 soil sampling locations. The inorganic constituent most commonly associated with gasoline is lead. Lead was detected at shallow soil sample locations BCSB06, BCSB09 and BCSB10 at concentrations of 61.1, 61.3 and 69.2 mg/kg, respectively. Lead was not detected in any other shallow soil sample, nor was lead detected in any samples obtained from soil borings SB-29 through SB-35.

The inorganics arsenic, beryllium, copper and selenium were detected at 1 of 17 soil sample locations. Arsenic, beryllium, copper and selenium were detected at concentrations of 8 mg/kg (SB3005D), 0.11 L mg/kg (BCSB03), 8 J mg/kg (BCSB01) and 0.25 L mg/kg (BCSB04), respectively.

4.3 Total Petroleum Hydrocarbons and Oil and Grease

Total petroleum hydrocarbon (TPH) and oil and grease results, reported as gasoline and diesel, are presented in Table 4-3 and depicted in Figure 4-2. TPH was detected in soil boring samples SB3003, SB3005 and SB3405. Coincidentally, these samples also contained the highest detected concentrations of VOCs and SVOCs. Samples obtained from soil boring SB-30 (SB3003, SB3005) contained TPH as gasoline and diesel, with diesel being the more prolific hydrocarbon. The sample obtained from soil boring SB-34 (SB3405) also contained TPH as gasoline and diesel. However, gasoline was the most prolific hydrocarbon detected at this location. TPH was detected at a relatively low concentration (60 mg/kg) in one other sample, shallow soil sample BCSB01.

Positive analytical results for oil and grease were obtained from soil samples taken at all soil boring and shallow soil sampling locations. Oil and grease analysis provides a gross gravimetric indication of the presence of hydrocarbons in environmental samples. It is, therefore, not surprising that oil and grease was detected in every Site 35 soil sample obtained under the Interim Remedial Action RI. In general, the highest oil and grease results were observed in those samples containing the highest levels of VOCs, SVOCs and TPH. These samples are SB3003, SB3005 and SB3405. However, the fourth highest oil and grease result was obtained from shallow soil sample BCSB09 which did not display positive detections of TPH. Shallow soil samples obtained from the western bank of Brinson Creek contain positive results for oil and grease, despite the fact that VOCs, SVOCs and TPH (with the exception of BCSB01) were not detected. Oil and grease results for shallow soil samples ranged from 390 mg/kg (BCSB04) to 7,500 mg/kg (BCSB09). Because other fuel related contaminants are

TABLE 4-3
SOIL TOTAL PETROLEUM HYDROCARBON (TPH), OIL AND GREASE RESULTS
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	SB2903 4-6 mg/kg	SB3003 4-6 mg/kg	SB3005 8-10 mg/kg	SB305D 8-10 mg/kg	SB3102 2-4 mg/kg	SB3203 4-6 mg/kg	SB3305 8-10 mg/kg	SB3405 8-9 mg/kg	SB3502 2-4 mg/kg	BCSB01 0-1 mg/kg	BCSB02 0-1 mg/kg	BCSB03 0-1 mg/kg
TOTAL PETROLEUM HYDROCARBONS												
Gasoline	ND	650	1300	1400	ND	ND	ND	19000	ND	60	ND	ND
Diesel	ND	3500	6800	6800	ND	ND	ND	7100	ND	ND	ND	ND
OIL AND GREASE	290	7800	16000	16000	440	370	450	19000	370	3000	930	1300

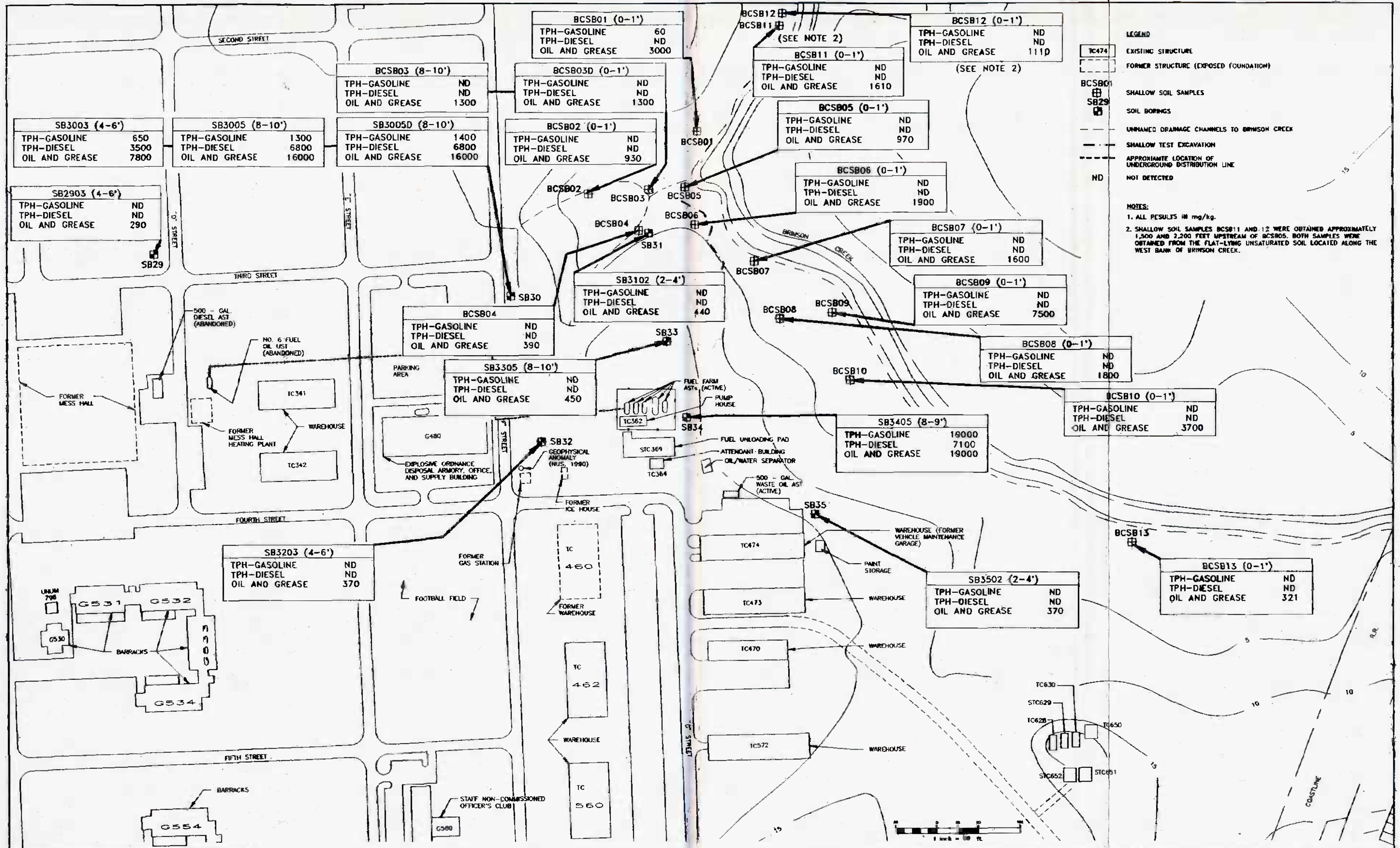
Notes:
ND - Not detected

OILGAS.XLS

TABLE 4-3 (continued)
SOIL TOTAL PETROLEUM HYDROCARBON (TPH), OIL AND GREASE RESULTS
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sample No. Depth (ft) Units	BCSB03D 0-1 mg/kg	BCSB04 0-1 mg/kg	BCSB05 0-1 mg/kg	BCSB06 0-1 mg/kg	BCSB07 0-1 mg/kg	BCSB08 0-1 mg/kg	BCSB09 0-1 mg/kg	BCSB10 0-1 mg/kg	BCSB11 0-1 mg/kg	BCSB12 0-1 mg/kg	BCSB13 0-1 mg/kg
TOTAL PETROLEUM HYDROCARBONS											
Gasoline	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diesel	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OIL AND GREASE	1300	390	970	1900	1600	1800	7500	3700	1610	1110	321

Notes:
ND - Not detected



LEGEND

DATE	MARCH 1994
SCALE	1" = 80'
DRAWN	WJH
REVIEWED	DLB
S.O.#	62470-180-0000-05200
CADD#	1605158A

NORTH

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

INTERIM REMEDIAL ACTION RI
SOIL TPH AND OIL AND GREASE RESULTS
SITE 35 - CAMP GEIGER AREA FUEL FARM

SCALE 1" = 80'
DATE MARCH 1994

FIGURE No.
4-2

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not detected in these samples, these results may be due to the presence of naturally occurring hydrocarbons. Table 4-4 presents a list of organic chemicals present in petroleum which can also occur naturally in soils. The potential for naturally occurring constituents influencing oil and grease results is supported by the oil and grease results obtained from shallow soil samples BCSB-11 (1610 mg/kg) and BCSB-12 (1110 mg/kg) located approximately 1/2-mile upstream of Site 35.

4.4 TCLP and RCRA Hazardous Characteristics

Composite soil samples SBC01 and SBC02 were analyzed for leachability via the Toxicity Characteristic Leaching Procedure (TCLP) and RCRA hazardous characteristics (corrosivity ignitability and reactivity) to determine if soils obtained from borings or shallow soils could be classified as hazardous according to RCRA criteria. TCLP results for volatiles, semivolatiles, pesticides and herbicides indicated no detections in either composite sample. Furthermore, corrosivity ignitability and reactivity results fell within acceptable limits. TCLP and RCRA hazardous characteristic results are presented in Appendix C.

4.5 Groundwater

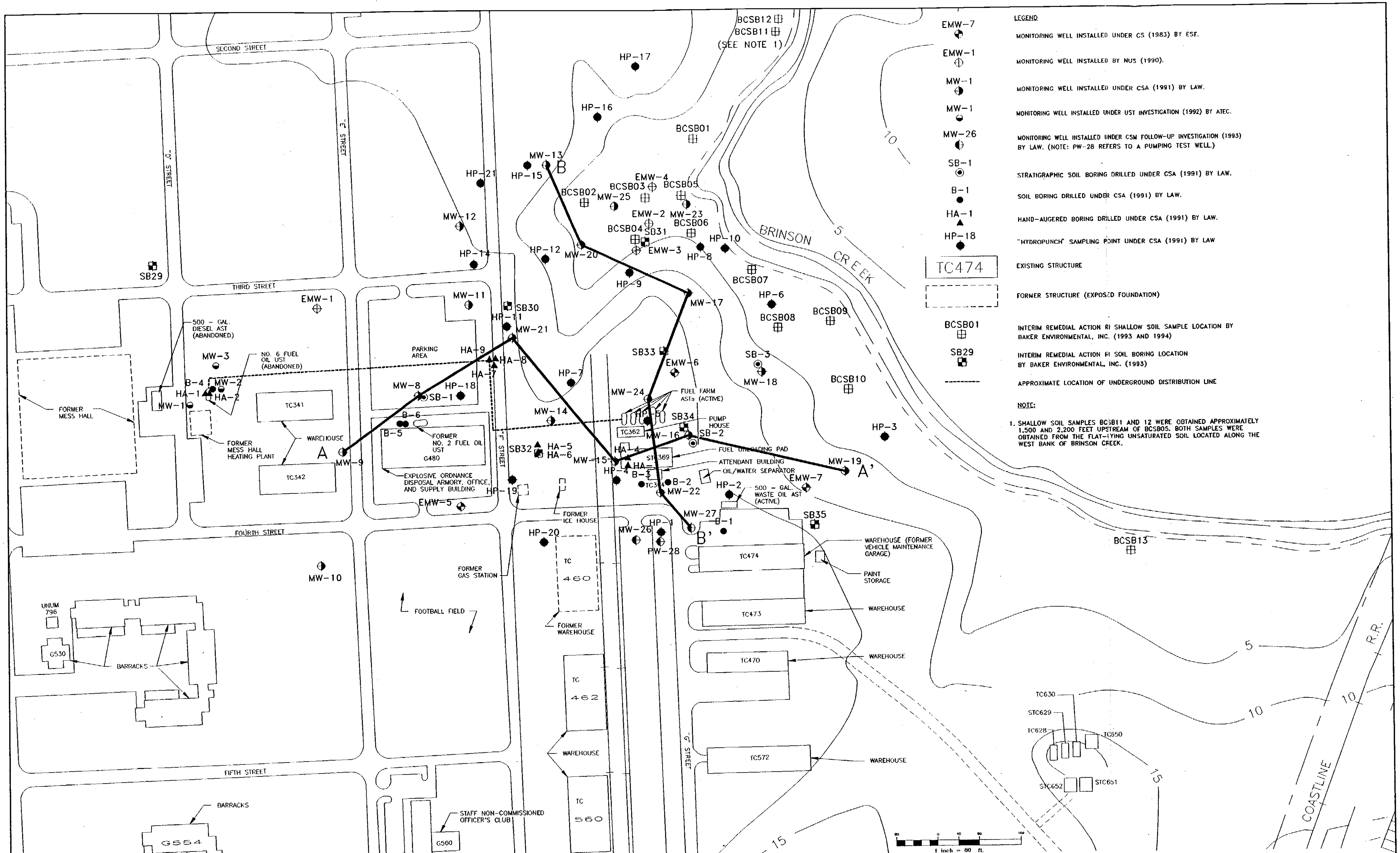
Appendix D presents Law's well construction logs and March, 1994 water level measurements obtained by Baker. Figures 4-3, 4-4, and 4-5 present geologic cross-sections for Site 35 developed using static water level measurements obtained by Law (August 1991) and Baker (March 1994). In general, depth to ground water is consistent with site topography and was encountered from approximately four to nine feet bgs throughout the site. Groundwater was encountered at depths of approximately one foot or less in the vicinity of Brinson Creek. Groundwater levels recorded to date do not provide sufficient data to allow for an estimate of the range of groundwater elevation fluctuation at Site 35.

Groundwater at Site 35 moves toward Brinson Creek and may recharge the creek during extremely wet or dry seasons. This potential interaction between groundwater fluctuation and surface waters may account for the inconsistently noticeable petroleum odor at Site 35.

TABLE 4-4
NATURALLY OCCURRING ORGANIC CHEMICALS IN SOILS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

acetic acid	alkanes
benzene	1,2-benzofluorene
benzoic acid	butanoic acid
carbazole	decanoic acid
2,6-dimethylundecane	n-docosane
n-dotriacontane	n-eicosane
eicosanoic acid	ethanol
ethylbenzene	formic acid
n-heneicosane	n-hentriacontane
heptacosane	n-heptadecane
n-hexadecane	hexadecanoic acid
methane	methanethiol
methanol	naphthalene
n-nonacosane	n-nondadecane
nonanoic acid	n-octacosane
pentacosane	n-pentadecane
pentanoic acid	perylene
phenanthrene	propanoic acid
n-tetracosane	n-tetradecane
tetradecanoic acid	toluene
n-triacontane	n-tricosane
m-xylene	o-xylene
p-xylene	

Reference: Dragun, 1988. The Soil Chemistry of Hazardous Materials.



DATE	MARCH 1994
SCALE	1" = 80'
DRAWN	WJH
REVIEWED	DLB
S.O.#	62470-160-0000-05200
CADD#	160507RA

NORTH

INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

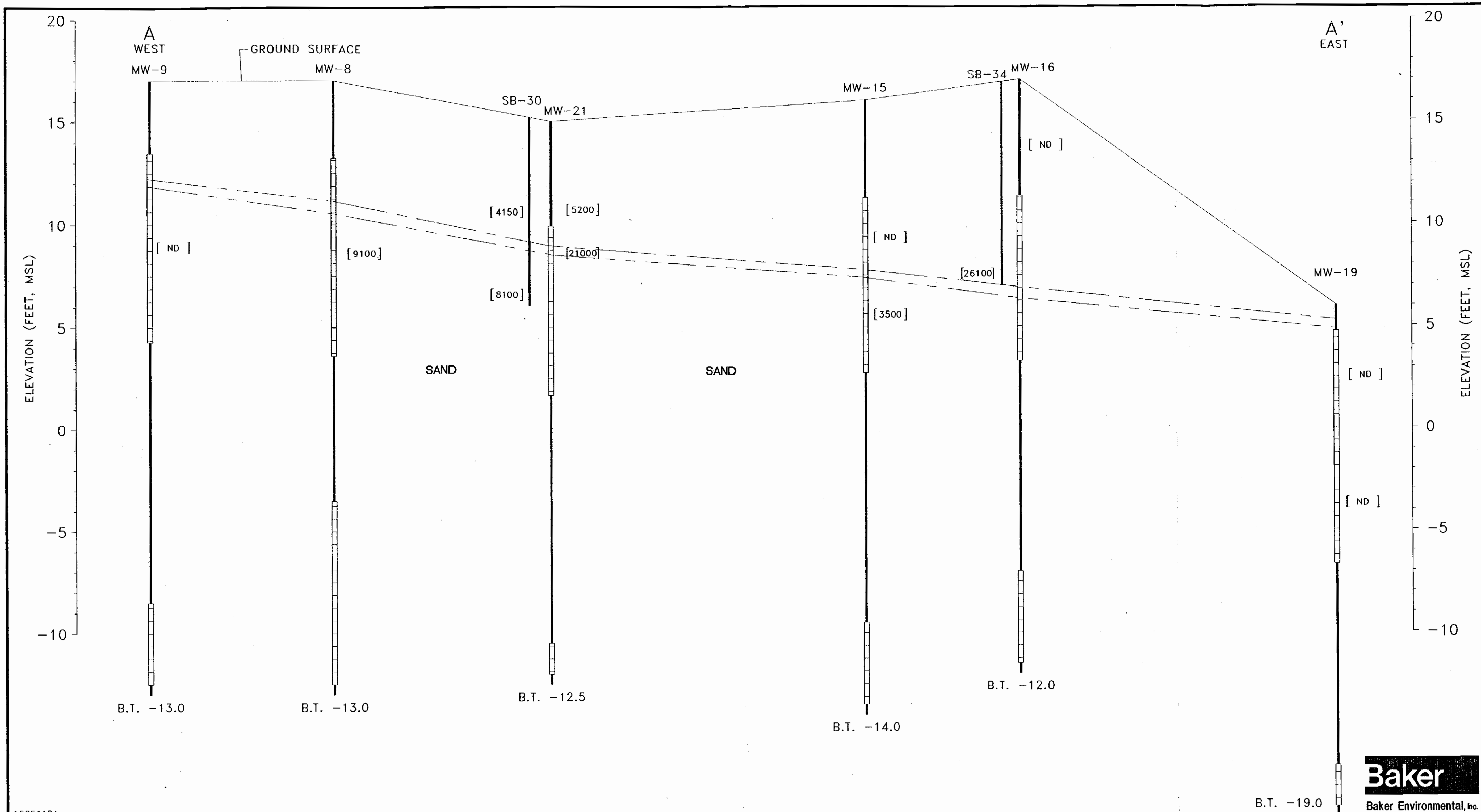
Baker
Baker Environmental, Inc.

INTERIM REMEDIAL ACTION RI
HYDROGEOLOGIC CROSS-SECTION LOCATIONS
SITE 35 – CAMP GEIGER AREA FUEL FARM

SCALE 1" = 80' DATE MARCH 1994

FIGURE No. 4-3

01507VB12



LEGEND

— — —	GROUNDWATER SURFACE (AUGUST 1991)
— – –	GROUNDWATER SURFACE (MARCH 1994)
B.T. X'	BORING TERMINATED, ELEVATION MSL
[ND]	TPH CONCENTRATIONS (mg/kg) IN SOILS
	WELL SCREEN INTERVAL
ND	NOT DETECTED AT METHOD DETECTION LIMITS

100 0 50 100 200

Horizontal Scale: 1 inch = 100 ft.

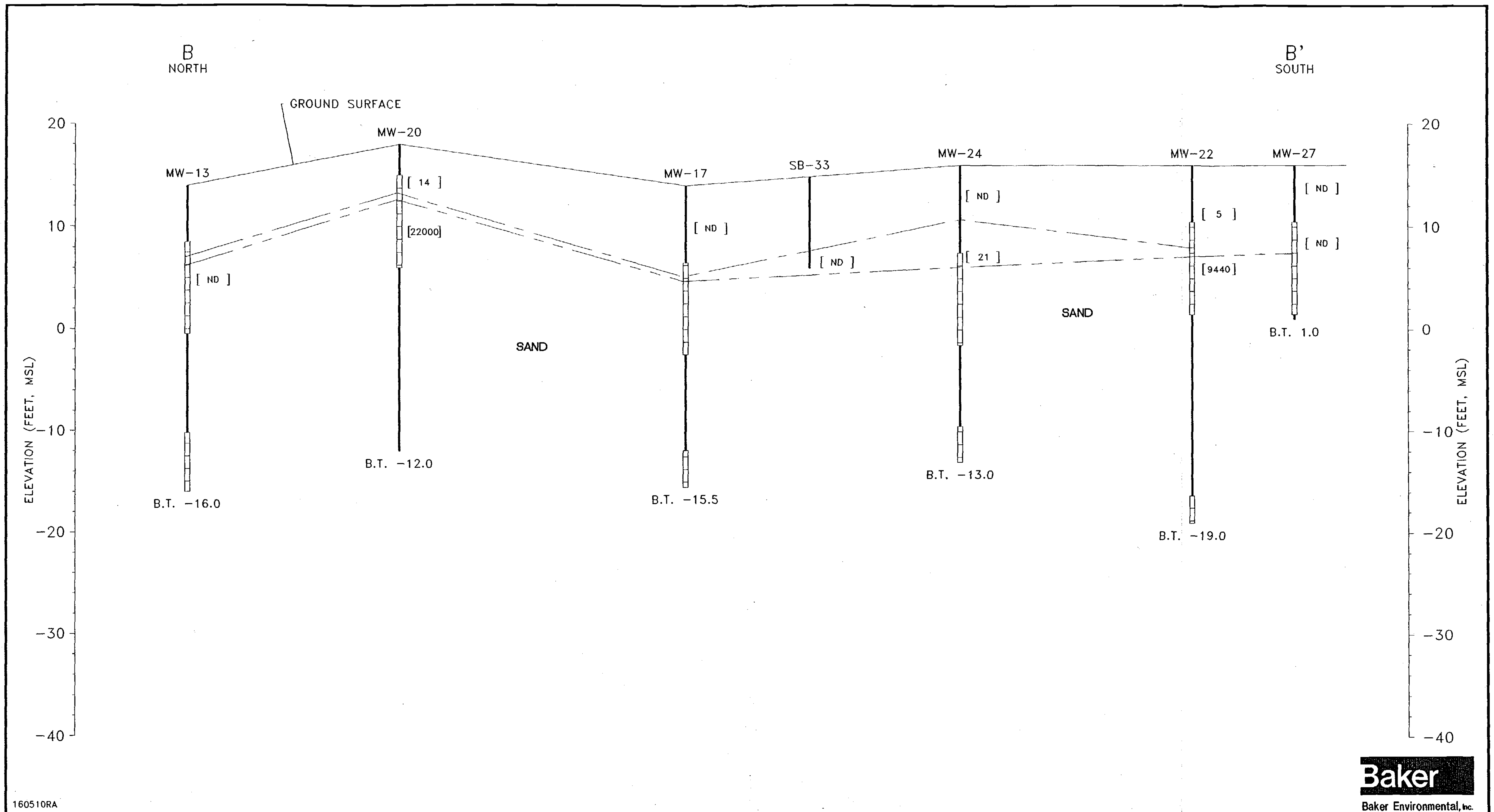
5 0 2.5 5 10

Vertical Scale: 1 inch = 5 ft.

THE SOIL BORING INFORMATION IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. SUBSURFACE CONDITIONS INTERPOLATED BETWEEN BORINGS ARE ESTIMATED BASED ON ACCEPTED SOIL ENGINEERING PRINCIPLES AND GEOLOGIC JUDGEMENT.

FIGURE 4-4
HYDROGEOLOGIC CROSS-SECTION A-A'
WITH SOIL TPH ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

— — —	GROUNDWATER SURFACE (AUGUST 1991)
— — —	GROUNDWATER SURFACE (MARCH 1994)
B.T. X'	BORING TERMINATED, ELEVATION MSL
[ND]	TPH CONCENTRATIONS (mg/kg) IN SOILS
	WELL SCREEN INTERVAL
ND	NOT DETECTED AT METHOD DETECTION LIMITS

80 0 40 80 160

Horizontal Scale: 1 inch = 80 ft.

10 0 5 10 20

Vertical Scale: 1 inch = 10 ft.

THE SOIL BORING INFORMATION IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. SUBSURFACE CONDITIONS INTERPOLATED BETWEEN BORINGS ARE ESTIMATED BASED ON ACCEPTED SOIL ENGINEERING PRINCIPLES AND GEOLOGIC JUDGEMENT.

FIGURE 4-5
HYDROGEOLOGIC CROSS-SECTION B-B'
WITH SOIL TPH ANALYTICAL RESULTS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

5.0 NATURE AND EXTENT OF CONTAMINATION

Analytical results from the Interim Remedial Action RI and previous investigations are combined in this section to identify soil areas of concern at Site 35 by a discussion of the nature and extent of soil contamination and, in particular, petroleum hydrocarbon contaminated soil.

In general, analytical data suggest that the petroleum hydrocarbon contamination at Site 35 is primarily located near the surface of shallow groundwater. Analytical results indicate that the highest TPH related contamination occurs at or below the water table and that groundwater fluctuations likely account for the subsurface soil contamination detected immediately above the top of groundwater. However, recorded groundwater elevation data contained to date is insufficient to afford an estimate of the range of groundwater elevation fluctuation at Site 35. Shallow zone groundwater at Site 35 trends toward Brinson Creek. It is conceivable that during the winter and summer months, when precipitation is highest, and following heavy rainfalls, shallow groundwater rises and discharges to Brinson Creek and the unnamed drainage channels located north of the Fuel Farm. This raising of the water table and subsequent interaction with surface waters of Brinson Creek or unnamed drainage channels may account for the inconsistently noticeable hydrocarbon odor at Site 35.

5.1 Source Characterization

Based on available historical records, the site layout, and the analytical data obtained to date, several possible sources of petroleum hydrocarbon soil contamination can be identified. No evidence of TPH-based surface soil contamination has been identified to date although contaminated plumes of shallow groundwater are evidenced by the data collected by Law under the CSA (Law, 1992). Consequently, it does not appear that past reported surface spills of fuel have substantially contributed to soil contamination at Site 35. One possible surface source of contamination is the Fuel Farm ASTs. However, the ASTs represent a surface obstruction and no soil samples have been obtained directly beneath them to date to verify the presence or absence of soil contamination at this location. Otherwise, the shallow groundwater has most likely been affected by subsurface sources such as leaking underground piping or USTs.

5.2 Non-Fuel Related Organics

Soil samples were analyzed for non-fuel related organic constituents under the Interim Remedial Action RI, but, not under any of the previous environmental investigations conducted at Site 35.

Non-fuel related organic constituents such as acetone, phthalates, and TCE were detected in subsurface soil samples obtained from soil borings drilled under Interim Remedial Action RI (see Figure 4-1). Acetone and phthalates were also detected in shallow surface soil samples. Acetone and phthalates, although not detected in corresponding blanks are probably laboratory or sampling induced contaminants.

TCE was detected at relatively low levels in two soil boring samples, including the background soil boring SB-29 and SB-31. The presence of TCE in Site 35 soils could be related to the practice of adding chlorinated solvents to No. 6 fuel oils to prevent separation and maintain viscosity during cooler weather or to the previously identified shallow groundwater plume contaminated with chlorinated organics (see Figure 3-1). The historical data and soil boring sample results do not indicate the source of TCE at Site 35. Determining the extent of TCE contamination in groundwater and the identification of the source of this contamination are two of the primary elements of the comprehensive RI/FS at Site 35 which was initiated in April 1994.

5.3 Inorganics

The extent of soil inorganics analyses at Site 35 performed to date includes data from the Confirmation Study by ESE, the Comprehensive Site Assessment by Law, and the Interim Remedial Action RI.

Lead was detected during the Confirmation Study at concentrations ranging from 6 mg/kg to 8 mg/kg in three hand-auger soil boring samples. These concentrations generally fall within the MCB Camp Lejeune base-specific background range for lead and within the lead range for soils and other surficial materials of the eastern United States (Shacklette and Boerngen, 1984). Soil lead was also analyzed during the CSA, but was detected at only one sample location, HA-4 (42 mg/kg).

The inorganic constituents, arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc were detected in one or more Interim Remedial Action RI samples throughout the Site 35 study area. The concentrations at which these analytes were detected fall within base-wide MCB Camp Lejeune background ranges and the range of element concentrations detected in eastern United States soils and surficial materials (Shacklette, et al., 1984) with the exception of arsenic. Inorganics were, however, detected at concentrations exceeding the results obtained from the Site 35 background sample (SB2903). Table 5-1 presents the maximum detected inorganic constituent concentrations and a comparison to Base-specific, site-specific, and literature background values. In general, there does not appear to be a significant source of inorganic contaminants in Site 35 soils.

5.4 TPH, Oil and Grease, and Other Fuel Related Organics

ESE undertook the Confirmation Study in 1984. During this study, three hand-auger soil boring samples were collected to the east of the Fuel Farm. The depths from which these soil samples were obtained were not provided, however, the samples were reported to have been analyzed for oil and grease. Oil and grease was detected at concentrations ranging from 40 mg/kg to 2,200 mg/kg.

Chemical analyses of soils performed during the CSA were limited to TPH and lead. Soil samples displaying the highest headspace PID readings were submitted to the laboratory for TPH (gasoline and diesel fractions) and lead analysis. TPH data from the CSA indicated the presence of fuel contamination west and northwest of the Fuel Farm (MW-8, MW-11, MW-20, MW-21, and MW-25) and in the immediate vicinity of the active ASTs (MW-15, MW-22, and B-2). The most highly impacted soil samples were those located at or below the water table (see Table 5-2).

The most prevalent chemicals detected in Site 35 soil boring samples collected during the Interim Remedial Action RI are those chemicals commonly associated with fuels including BTEX and PAHs. As in the case of the soil samples obtained under the CSA, organic contaminants detected generally appear to be associated with soil samples obtained from the interval located at or below the water table. Soil samples obtained from the unsaturated zone at Site 35 generally contained no detectable concentrations of BTEX, PAHs, or TPH. Two possible exceptions include subsurface soil samples obtained from wells MW-21 and MW-25 where elevated levels of TPH were detected in samples obtained approximately two or more feet above the measured groundwater surface (see Table 5-2). Oil and grease was, however,

TABLE 5-1

SITE BACKGROUND, EASTERN U.S. AND MAXIMUM DETECTED INORGANIC CONCENTRATIONS
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB, CAMP LEJEUNE, NORTH CAROLINA

Constituent	Maximum Detected Concen-trations (mg/kg)	Site Background (SB2903) (mg/kg)	Surface Soil Base-Specific Background (mg/kg)	Subsurface Soil Base-Specific Background (mg/kg)	Eastern U.S. Soils and Surface Materials(1) (mg/kg)
Arsenic	8.0	ND	<0.44 - 0.91	<0.47 - <0.65	<0.1 - >3
Barium	31.9 J	ND	3.5 - 16.5	<4.0 - 10.9	10 - 1500
Beryllium	0.11 L	ND	<0.06 - <0.22	<0.05 - <0.23	<1.0 - 7
Chromium	20.5 L	4.8 L	<0.06 - <3.2	<3.2 - 8.7	1 - 1000
Copper	8 J	ND	<1.1 - 3.1	<0.47 - 1.2	<1 - 700
Lead	69.2	ND	2.0 - 20.4	1.2 - 6.1	<10 - 300
Mercury	0.27 K	0.08 K	<0.02 - <0.12	<0.02 - <0.11	0.01 - 3.4
Nickel	8.3 J	ND	<1.5 - <4.4	<1.4 - <4.8	<5 - 700
Selenium	0.25 L	ND	<0.31 - <1	0.23 - <1	<0.1 - 3.9
Vanadium	22.9 L	ND	<2.1 - 5.3	<1.5 - 13.4	<7 - 300
Zinc	88.5	ND	<1.1 - 28.3	<0.19 - 11.6	<5 - 2900

Notes:

(1) Shacklette and Boerngen, 1984

ND = Not Detected
mg/kg = milligrams per kilogram
L = biased low
K = biased high
J = estimated
< = less than
> = greater than

TABLE 5-2
SOIL TPH AND LEAD RESULTS FROM THE CSA (LAW, 1992)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg)			DEPTH (bgs) TO WATER TABLE (8/91) (ft)	DEPTH (bgs) TO WATER TABLE (3/94) (ft) (1)
				TPH		LEAD		
				DIESEL	GASOLINE			
MW-8	1.5-2.0	8						
	3.5-4.0	3						
	5.5-6.0	55						
	7.5-8.0	85	*	9100	ND	ND	5.89	6.07
	9.5-10.0	42						
	11.5-12.0	4						
MW-9	1.5-2.0	ND						
	3.5-4.0	ND						
	5.5-6.0	ND					4.83	5.04
	7.5-8.0	ND	*	ND	ND	ND		
	9.6-10.0	ND						
MW-10	1.5-2.0	>2000	*	ND	ND	ND		
	3.5-4.0	220	*	ND	ND	ND	4.56	4.86
	5.5-6.0	105						
	10-10.5	40						
MW-11	1.5-2.0	ND						
	3.5-4.0	1.5					5.76	6.35
	5.5-6.0	30	*	2100	ND	ND		
	10-10.5	31	*	4	ND	ND		
MW-12	0-1.5	>2000	*	ND	ND	ND		
	1.5-3.0	75					6.86	NA
	3.0-4.5	200	*	ND	ND	ND		
	8.5-10	45						
MW-13	1.5-2.0	ND						
	3.5-4.0	ND					7.33	7.54
	5.5-6.0	ND						
	10.0-10.5	ND	*	ND	ND	ND		

Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

TABLE 5-2
SOIL TPH AND LEAD RESULTS FROM THE CSA (LAW, 1992)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg)			DEPTH (bgs) TO WATER TABLE (8/91) (ft)	DEPTH (bgs) TO WATER TABLE (3/94) (ft) (1)
				TPH		LEAD		
				DIESEL	GASOLINE			
MW-14	0-1.5	ND						
	1.5-3.0	3						
	3.0-4.5	60	*	0.3	ND	ND	7.07	NA
	8.5-10.0	16						
	13.5-15.0	3						
MW-15	1.5-2.0	ND						
	3.5-4.0	ND					8.05	8.16
	5.5-6.0	ND	*	ND	ND	ND		
	10.0-10.5	65	*	3500	ND	ND		
MW-16	0-1.5	30						
	1.5-3.0	110					10.25	10.37
	3.0-4.5	200	*	ND	ND	ND		
	8.5-10.0	155						
MW-17	1.5-2.0	ND						
	3.5-4.0	ND						
	5.5-6.0	ND	*	ND	ND	ND	8.51	8.63
	10.0-10.5	ND						
MW-19	1.5-2.0	ND						
	3.5-4.0	ND	*	ND	ND	ND	0.92	1.25
	5.5-6.0	ND						
	10.0-10.5	ND	*	ND	ND	ND		
MW-20	0-1.5	40						
	1.5-3.0	65					6.7	6.86
	3.0-4.5	300	*	14	ND	ND		
	8.5-10.0	220	*	22000	ND	ND		

Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

TABLE 5-2
SOIL TPH AND LEAD RESULTS FROM THE CSA (LAW, 1992)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg)			DEPTH (bgs) TO WATER TABLE (8/91) (ft)	DEPTH (bgs) TO WATER TABLE (3/94) (ft) (1)
				TPH		LEAD		
				DIESEL	GASOLINE			
MW-21	1.5-2.0	ND						
	3.5-4.0	60	*	5200	ND	ND	6.03	6.27
	5.5-6.0	75	*	21000	ND			
	10-10.5	35						
MW-22	0-1.5	10						
	1.5-3.0	2					8.76	9.0
	3.0-4.5	150	*	5	ND	ND		
	9.5-11.0	90	*	8900	540	ND		
MW-23	1.5-2.0	ND	*	ND	ND	ND		
	3.5-4.0	ND					3.15	1.93
	5.5-6.0	ND						
	10.0-10.5	ND						
MW-24	1.5-2.0	ND						
	3.5-4.0	ND	*	ND	ND	ND	5.76	9.92
	5.5-6.0	ND						
	10.0-10.5	3	*	21	ND	ND		
MW-25	1.5-2.0	22						
	3.5-4.0	45	*	8700	ND	ND	5.44	NA
	5.5-6.0	45	*	5700	ND	ND		
	10.0-10.5	2.5						
MW-26	0-1.5	ND						
	1.5-3.0	ND	*	ND	ND	NA	7.47	NA
	3.0-4.5	ND						
	6.0-7.5	ND	*	ND	ND	NA		
	9.5-11.0	ND						

Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

TABLE 5-2
SOIL TPH AND LEAD RESULTS FROM THE CSA (LAW, 1992)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg)			DEPTH (bgs) TO WATER TABLE (8/91) (ft)	DEPTH (bgs) TO WATER TABLE (3/94) (ft) (1)
				TPH		LEAD		
				DIESEL	GASOLINE			
MW-27	0-1.5	ND						
	1.5-3.0	ND	*	ND	ND	NA	8.22	8.39
	3.0-4.5	ND						
	6.0-7.5	ND	*	ND	ND	NA		
	9.5-11.0	ND						
PW-28	0-1.5	ND						
	1.5-3.0	ND						
	3.0-4.5	ND	*	ND	ND	NA	8.11	NA
	6.0-7.5	ND						
	9.5-11.0	ND	*	ND	ND	NA		
B-1	0-1.5	200						
	1.5-3.0	160	*	ND	ND	ND	NA	NA
	3-4.5	40						
	8.5-10.0	140	*	ND	ND	ND		
B-2	2.0-2.5	3						
	3.0-3.5	2					NA	NA
	4.0-4.5	8						
	5.0-5.5	7.5						
	5.5-6.0	12	*	ND	ND	ND		
	8.5-10	51	*	7600	630	ND		
B-4	0-1.5	0						
	1.5-3.0	11					NA	NA
	3.0-4.5	22	*	8400	ND	ND		
	8.5-10.0	50	*	5100	ND	ND		
B-5	0-1.5	ND						
	1.5-3.0	ND					NA	NA
	3.0-4.5	20	*	980	ND	ND		
	8.5-10.0	2	*	280	ND	ND		

Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

TABLE 5-2
SOIL TPH AND LEAD RESULTS FROM THE CSA (LAW, 1992)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg)			DEPTH (bgs) TO WATER TABLE (8/91) (ft)	DEPTH (bgs) TO WATER TABLE (3/94) (ft) (1)
				TPH		LEAD		
				DIESEL	GASOLINE			
B-6	0-1.5	2						
	1.5-3.0	ND						
	3.0-4.5	ND	*	7	ND	ND	NA	NA
	8.5-10	50	*	6200	ND	ND		
SB-3	0-1.5	ND						
	1.5-3.0	ND						
	3.0-4.5	9	*	ND	ND	ND	NA	NA
	8.5-10	10	*	ND	ND	ND		
HA-3	2	2	*	17	ND	ND	NA	NA
	4	5						
HA-4	2	4	*	ND	ND	42	NA	NA
	5	3						
HA-7	3	10						
	5	60	*	5700		ND	NA	NA
HA-8	5	8		NA	NA	NA	NA	NA
HA-9	3	ND		NA	NA	NA	NA	NA
	5	8		NA	NA	NA		

Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

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detected at every boring location and sampled depth interval. This is not unusual because oil and grease measurements are nonspecific, gravimetric analyses which can detect the presence of naturally occurring hydrocarbons. Oil and grease measurements were higher in samples which contained site-related contaminants (Table 5-3).

Oil and grease was also detected in shallow soil samples obtained along Brinson Creek and the unnamed drainage channels north of the active ASTs. However, other fuel-related contaminants and TPH were not detected in shallow soil samples, with the exception of BCSB-01, which contained 60 mg/kg TPH as gasoline. Surface soil samples BCSB-11 and BCSB-12 located approximately 1/4- to 1/2-mile upstream of the Fuel Farm exhibited oil and grease levels of 1610 mg/kg and 1110 mg/kg, respectively. Based on stream measurements obtained by Baker, these samples were obtained from locations beyond the reach of tidal influences and, consequently, indicate that high levels of naturally-occurring hydrocarbons are present in the soil adjacent to Brinson Creek.

TABLE 5-3
SOIL TPH AND LEAD RESULTS (BAKER, 1994)
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE LOCATION	SAMPLE DEPTH (ft)	PID READING (ppm)	SAMPLE ANALYZED	ANALYTICAL RESULTS (mg/kg) TPH		LEAD	OIL AND GREASE	DEPTH TO WATER TABLE (ft)
				DIESEL	GASOLINE			
SB29	0-2.0	6						
	2.0-4.0	7.5						
	4.0-6.0	8.5	*	ND	ND	ND	290	~7.0
SB30	0-2.0	12						
	2.0-4.0	65						
	4.0-6.0	187	*	3500	650	ND	7800	~6.0
	6.0-8.0	123						
	8.0-10.0	175	*	6800	1300	ND	16000	
SB31	0-2.0	NA						
	2.0-4.0	NA	*	ND	ND	ND	440	~4.0
	4.0-6.0	NA						
SB32	0-2.0	6.7						
	2.0-4.0	6.4						
	4.0-6.0	7	*	ND	ND	ND	370	
	6.0-8.0	6.2						~8.0
	8.0-10.0	NA						
SB33	0-2.0	6.5						
	2.0-4.0	6						
	4.0-6.0	5						~4.0
	6.0-8.0	5						
	8.0-10.0	8	*	ND	ND	ND	450	
SB34	0-2.0	5						
	2.0-4.0	17						
	4.0-6.0	21						
	6.0-8.0	NA						
	8.0-10.0	174	*	7100	19000	ND	19000	~10.0
SB35	0-2.0	NA						
	2.0-4.0	NA	*	ND	ND	ND	370	
	4.0-6.0	NA						~6.0

Notes:
ppm - parts per million
* - Indicates which sample interval was sent for laboratory analysis
ND - Not detected
NA - Not available
Water table depths are inferred using static water level measurements from nearby wells

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6.0 RISK ASSESSMENT

A preliminary risk assessment was performed as part of the Interim Remedial Action RI for Site 35, to evaluate the human health effects associated with potential exposure to contaminated environmental media. The preliminary risk assessment considers the most likely routes of potential human exposure under a no action scenario.

Ecological risks will not be evaluated in this section because soil contamination is primarily at or below the water table. An ecological risk assessment will be conducted in the comprehensive Site 35 RI which was initiated in April, 1994.

6.1 Introduction

The potential risks posed by exposure to soil contaminants at Site 35 were evaluated under a current no action scenario. This assumes that no remedial action would take place to remove or lessen site contamination, and that land usage would remain the same. The most likely scenario for exposure is considered to be to a construction worker performing excavation activities of either the surface or subsurface soils. The excavation activities could involve potential exposure to surface soils (defined as zero to one foot bgs), shallow unsaturated subsurface soils generally defined as (two to six feet bgs), or saturated subsurface soils generally defined as (six feet bgs or deeper). Excavation activities, like those involved in the construction of the proposed highway, would result in the potential dermal contact, accidental ingestion and inhalation of contaminants detected in surface and subsurface soils by construction workers. Potential exposure to shallow groundwater will not be addressed. It is not a current exposure pathway and Site 35 groundwater will be fully evaluated in the comprehensive RI/FS to begin in April 1994.

A physical description of Site 35 is presented in Section 1.2.1 of this report. Originally, the ASTs at Site 35 were used for the storage of No. 6 fuel oil. Later the ASTs were converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. There have been a number of leaks reported from both the ASTs and associated distribution lines which reportedly have migrated toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned. ASTs are currently used to disperse gasoline, diesel and kerosene for use at Camp Geiger and the nearby New River Marine Corps Air Station.

The preliminary risk assessment is comprised of nine sections, including the introduction. Section 6.2 presents the selective criteria and its application in identifying chemicals of potential concern. Section 6.3 identifies potential exposure under the no action scenario. Equations used to derive chronic daily intakes subsequent to exposure are also presented. The toxicity assessment is presented in Section 6.4 and risks are quantified in Section 6.5. Considerations other than human health risks for chemicals of potential concern are presented in Section 6.6. Uncertainties associated with quantified risks are presented in Section 6.7. Finally, results of the baseline risk assessment are presented in Section 6.8.

6.2 Chemicals of Potential Concern

Chemicals of Potential Concern (COPCs) are site-related contaminants used to quantitatively estimate potential human health risks. As stated in the previous section, surface soils and shallow and deep subsurface soils were evaluated during this study.

The selection of COPCs is probably the most complicated and subjective task in the risk assessment process. COPC selection was based on the information provided in USEPA's Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part A (USEPA, 1989b). Because RAGS provides a number of criteria by which chemical data can be evaluated, professional judgement becomes a factor as to how criteria are applied.

The criteria considered for use in selecting the COPCs from the constituents detected during the field sampling and analytical phase of the investigation are site history, prevalence (frequency), blank concentrations, and USEPA Region III's Risk Based Concentration (RBC) values (USEPA, 1994a). A brief description of these criteria is presented below. It is important to note that a contaminant does not need to fit into all of these categories in order to be retained as a COPC.

Site History

Review of historical information for a site is an important criterion for the selection of COPCs. A chemical present in environmental media which could reasonably be associated with past practices of processes at a site could be retained as a COPC. Chemicals not related to site activities may not be retained as COPCs for quantitative assessment if their presence cannot be associated with site history and pending further comparisons to other COPC selection criteria.

Site history is always considered in the development of site-specific work plans and the selection of analytical methodologies by which samples are analyzed. The history of Site 35 indicates the potential presence of fuel-related contaminants such as BTEX, PAHs, and lead. Certain fuel oil additives such as TCE and tetrachloroethene (solvents) may also be present in the Camp Geiger Fuel Farm site media. These chemicals were considered in the selection of analytical methodologies and will be given special attention in COPC selection.

Prevalence

The prevalence of a contaminant is also one of the most important criterion used to select COPCs. Prevalence considers the frequency of positive detections in environmental samples and the level at which the contaminant is detected. According to RAGS, a detection frequency of five percent (i.e., one in 20 samples) may be satisfactory for retaining a chemical as a COPC. Therefore, when appropriate, one positive detection in twenty or fewer environmental samples can be used in the selection of COPCs. For this risk assessment a sample size of less than 20 was realized for each media of concern. Therefore, this criteria could not be utilized. However, professional judgement was employed to allow for uncertainty with constituents detected only once in a sample set.

The concentration at which chemicals are detected in the soil is also an important consideration when evaluating prevalence. Chemicals detected with relatively low frequencies (i.e., less than five percent) cannot be eliminated as COPCs if detected at concentrations in excess of regulatory or site background concentrations.

Blank Concentrations

If a chemical is detected in blank samples, it will not be retained as a COPC in accordance with RAGS depending upon the concentrations of the chemical detected in environmental media. If blanks contain detectable results for common laboratory contaminants (i.e, acetone and methylene chloride), sample results will be considered as positive results only if they exceed 10 times the maximum amount detected in the associated blank. If the chemical detected in the blank is not a common laboratory contaminant, sample results will be considered as positive results only if they exceed five times the maximum amount detected in the associated blank.

Risk Based Concentration Values

If a chemical has not been retained or eliminated as a COPC at this point in the process, chemical concentrations will be compared to the Risk Concentration Values (RBC) values for commercial/industrial land use and/or residential land use. For the purposes of conservancy, the residential soil RBC values will be used for comparison in this preliminary risk assessment. RBCs were derived by USEPA Region III in January of 1993 to support the selection of COPCs and to eliminate two major limitations in the RAGS selection process. First, using RBCs prioritizes chemical toxicity and focuses the risk assessment on dominant COPCs and potential exposure routes. Second, using RBCs provides an absolute comparison of potential risks associated with the presence of a COPC in a given medium. RBC values are derived using conservative USEPA promulgated default values and all available toxicological information. Potential carcinogenic RBC values are protective individually (i.e., for each compound) of the 10^{-6} Incremental Cancer Risk (ICR) value, while noncarcinogenic RBC values are protective individually of a Hazard Index (HI) of 1.0. If the soil chemical concentration exceeds its respective RBC value, the chemical would be retained as a COPC. If the chemical concentration does not exceed the RBC, the chemical may be eliminated as a COPC. For evaluating multiple noncarcinogenic chemical exposures, the RBC values used in the selection of noncarcinogenic COPCs were obtained from the USEPA Region III RBC Table, First Quarter, 1993 (USEPA, 1993a) which are more conservative and are protective of an HI value of 0.1. For carcinogenic chemical exposures, the RBC values used in the selection of COPCs were obtained from the USEPA Region III RBC Table, First Quarter, 1994 (USEPA, 1994a) which are protective of an ICR of 1×10^{-6}.

The following paragraphs present the analytical data for soil samples obtained from Site 35, and applies the COPC selection criteria to develop lists of surface, shallow subsurface and deep subsurface soil COPCs.

6.2.1 Shallow Soil COPCs

One volatile organic compound (VOC), acetone, was detected seven out of 11 times at a maximum concentration of 1,300J µg/kg in the surface soil near Brinson Creek. However, acetone (a common laboratory contaminant) was well below the USEPA Region III residential soil RBC value and poses little risk to human health subsequent to exposure. Therefore, there were no shallow soil VOCs retained as COPCs for further quantitative evaluation at Site 35.

Semivolatile Organic Compounds (SVOCs), which include the noncarcinogenic polynuclear aromatic hydrocarbons (PAHs), were detected in the surface soils. One PAH, anthracene, was detected in the surface soil at 280J µg/kg. Two phthalates, bis(2-ethylhexyl)phthalate at 350J µg/kg and di-n-octyl phthalate at 290J µg/kg were also detected in surface soil samples. Phthalates (which are considered to be common laboratory contaminants) and anthracene were all detected at concentrations below their respective USEPA Region III residential soil RBC values. Carcinogenic PAHs (cPAHs) were not detected in the surface soil at Site 35. Consequently, PAHs were not retained as COPCs in the surface soil.

Several metals were detected in the surface soil including aluminum, barium, calcium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc. Each of these constituents, except for manganese, were well below their respective USEPA Region III RBC value for residential soil or were considered to be essential nutrients. Therefore, none of the metals were retained as COPCs.

Table 6-1 presents a summary of the frequency of detection and a comparison to USEPA Region III commercial/industrial and residential RBCs which were used to select COPCs at Site 35. Because no COPCs were retained for surface soils, potential human health risks will not be quantified for this soil interval at Site 35.

6.2.2 Subsurface Soil COPCs

Four VOCs, acetone, ethylbenzene, trichloroethene, and xylenes were detected in shallow unsaturated subsurface soil samples. Acetone was detected four times, at a maximum concentration of 150J µg/kg, ethylbenzene was detected once, at a maximum concentration of 6800 µg/kg, trichloroethene was detected twice at a maximum concentration of 7J µg/kg, and total xylenes were detected once, at a maximum concentration of 13,000 µg/kg. These concentrations were all well below the corresponding USEPA Region III residential soil RBC values and were therefore not retained as COPCs for the shallow subsurface soils.

In the saturated subsurface soils, six VOCs were detected including acetone (51J µg/kg), benzene (23,000 µg/kg), ethylbenzene (70,000 µg/kg), 2-hexanone (12,000 µg/kg), toluene (190,000J µg/kg), and total xylenes (320,000 µg/kg). One of these constituents, benzene, exceeded the residential soil RBC value of 22,000 µg/kg. Therefore, benzene was retained as a COPC for quantitative evaluation of saturated subsurface soils in the preliminary risk

TABLE 6-1

COMPARISON TO COPC CRITERIA
SURFACE SOIL
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Constituent	Frequency of Detection	Maximum Concentration (mg/kg)	Region III RBC Value Commercial/ Industrial Soil (mg/kg)	Region III RBC Value Residential Soil (mg/kg)	Retained/ Not Retained
Acetone	7/11	1.3J	10,000	780	Not Retained
Anthracene	1/11	0.28J	31,000	2300	Not Retained
bis(2-ethylhexyl) phthalate	5/11	0.35J	200	46	Not Retained
di-n-octyl phthalate	3/11	0.29J	2,000	160	Not Retained
Aluminum	11/11	4840L	100,000	23,000	Not Retained
Barium	3/11	31.9J	7,200	550	Not Retained
Calcium	11/11	23,600	--	--	Not Retained(1)
Chromium III	11/11	8.2L	100,000	7,800	Not Retained
Copper	1/11	8J	3,800	290	Not Retained(1)
Iron	11/11	6,350	--	--	Not Retained
Lead	3/11	69.2	*	*	--
Magnesium	11/11	1630L	--	--	Not Retained(1)
Manganese	11/11	105	510	39	Not Retained
Mercury	11/11	0.27K	31	2.3	Not Retained
Nickel	3/11	8.3J	2,000	160	Not Retained
Potassium	2/11	433L	--	--	Not Retained(1)
Selenium	1/11	0.25L	510	39	Not Retained
Sodium	5/11	1,730L	--	--	Not Retained(1)
Vanadium	8/11	18.1L	720	55	Not Retained
Zinc	11/11	88.5	31,000	2,300	Not Retained

Notes:

* RBCs for these constituents are not currently available.

(1) Not retained because of nutritional essentiality.

assessment. Identical SVOCs, which include the non-carcinogenic polynuclear aromatic hydrocarbons (nPAH), were detected in both shallow unsaturated subsurface and saturated subsurface soil samples taken throughout Site 35. The nPAHS detected in the subsurface soils included naphthalene, 2-methylnaphthalene, fluorene, and phenanthrene. Bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were also detected in subsurface soil samples. The phthalates and dibenzofuran were not retained as COPCs for Site 35 because they were detected at concentrations well below their corresponding USEPA Region III residential soil RBCs.

Several metals were detected in the shallow unsaturated subsurface soils, these included, aluminum, beryllium, calcium, chromium, iron, magnesium, manganese, mercury, vanadium, and zinc. Each of these constituents were well below their RBC values for residential soils. Therefore, none of the metals were retained as COPCs for the shallow subsurface soils.

Several metals were also detected in the saturated subsurface soils, these included, aluminum, arsenic, chromium, iron, magnesium, manganese, and vanadium. Of these constituents, only arsenic exceeded its RBC value for both commercial/industrial and residential soil and was retained as a COPC for Site 35.

Tables 6-2 and 6-3 present a summary of the analytical data for shallow and deep subsurface soils, respectively, including frequency of detection and a comparison to USEPA Region III industrial/commercial and residential soil RBCs.

6.3 Exposure Assessment

The exposure assessment identifies pathways and routes by which site-related constituents may reach potential receptors. This section further defines the potential source areas, migration pathways, exposure routes, and potential human receptors to COPCs in the subsurface soils at Site 35.

6.3.1 Exposure Pathways/Potential Receptors

An exposure pathway consists of a source or release from a source, a transport medium, an exposure point, and an exposure route. When all four of these components are present, the exposure pathway is considered complete. Complete exposure pathways, coupled with specific toxicological information, allow for the assessment of potential human health risk.

TABLE 6-2

COMPARISON TO COPC CRITERIA
SHALLOW UNSATURATED SUBSURFACE SOIL
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER FUEL FARM
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Constituent	Frequency of Detection	Maximum Concentration (mg/kg)	Region III RBC Value Commercial/ Industrial Soil (mg/kg)	Region III RBC Value Residential Soil (mg/kg)	Retained/ Not Retained
Acetone	4/5	0.15J	10,000	780	Not Retained
Ethylbenzene	1/5	6.8	10,000	780	Not Retained
Trichloroethene	2/5	0.007J	260	47	Not Retained
Xylenes	1/5	13	200,000	16,000	Not Retained
Dibenzofuran	1/5	3.1J	*	*	--
Fluorene	1/5	5.6J	4,100	310	Not Retained
Phenanthrene	1/5	6.7J	3,000	230	Not Retained
Bis (2-ethylhexyl) phthalate	3/5	0.16J	200	46	Not Retained
Di-n-octylphthalate	3/5	0.10J	2,000	160	Not Retained
Naphthalene	1/5	7.1J	4,100	310	Not Retained
2-methyl naphthalene	1/5	34	--	--	Not Retained
Aluminum	5/5	4300L	300,000	23,000	Not Retained
Beryllium	1/5	0.08L	0.67	0.15	Not Retained
Calcium	4/5	416J	--	--	Not Retained(1)
Chromium (III)	5/5	6.2L	100,000	7,800	Not Retained
Iron	5/5	2500J	--	--	Not Retained(1)
Magnesium	3/5	133L	--	--	Not Retained(1)
Manganese	2/5	3.2	510	39	Not Retained
Mercury	2/5	0.08K	31	2.3	Not Retained
Vanadium	1/5	7.8L	720	55	Not Retained
Zinc	1/5	20.4	31,000	2,300	Not Retained

Notes:

* RBCs for these constituents are not currently available.
(1) Not retained because of nutritional essentiality.

TABLE 6-3

COMPARISON TO COPC CRITERIA
SATURATED SUBSURFACE SOIL
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER FUEL FARM
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Constituent	Frequency of Detection	Maximum Concentration (mg/kg)	Region III RBC Value Commercial/ Industrial Soil (mg/kg)	Region III RBC Value Residential Soil (mg/kg)	Retained/ Not Retained
Acetone	1/4	0.051J	10,000	780	Not Retained
Benzene	2/4	23	99	22	Retained
2-Hexanone	3/4	12J	--	--	Not Retained
Toluene	2/4	190J	20,000	1,600	Not Retained
Ethylbenzene	3/4	70	10,000	780	Not Retained
Xylenes	3/4	320	200,000	16,000	Not Retained
Dibenzofuran	2/4	10J	*	*	--
Fluorene	3/4	13J	4,100	310	Not Retained
Phenanthrene	3/4	27	3,000	230	Not Retained
Bis (2-ethylhexyl) phthalate	1/4	0.12J	200	46	Not Retained
Di-n-octylphthalate	1/4	0.1J	2,000	160	Not Retained
Naphthalene	3/4	43	4,100	310	Not Retained
2-Methylnaphthalene	3/4	130	--	--	--
Aluminum	4/4	4,480L	300,000	23,000	Not Retained
Arsenic	1/4	8	1.6	0.97	Retained
Chromium (III)	4/4	20.5L	100,000	7,800	Not Retained
Iron	4/4	6,140J	--	--	Not Retained(1)
Magnesium	4/4	186	--	--	Not Retained(1)
Manganese	3/4	8.9	510	39	Not Retained
Vanadium	2/4	22.9L	720	55	Not Retained

Notes:

* RBCs for these constituents are not currently available.
(1) Not retained because of nutritional essentiality.

The exposure pathways of primary concern in this preliminary risk assessment are incidental soil ingestion, dermal contact, and inhalation of fugitive dust. The potential ingestion of soil may occur by incidental oral contact with hands, arms, or food items to which soil particles have adhered. The potential for absorption of COPCs via dermal contact or inhalation of COPCs adhering to dust particles released by wind erosion (fugitive dust) or as vapors is also considered high during excavations. For this reason, each of these pathways has been retained as a potential human health exposure pathway.

The inhalation of fugitive dust from affected soils was evaluated through the use of the Rapid Assessment Methodology For Estimating Potential Atmospheric Contamination (Cowherd et al., 1984) and the Near Field Box Model (Gradient Corp., 1988). Dust emission concentrations were estimated using upper 95th confidence limit of the arithmetic mean. The Rapid Assessment Model was used to generate an emission rate from affected soils and the Near Field Box Model was used to estimate an air concentration approximately 10 meters downwind of the potential soil source area.

The human receptor groups having the greatest potential for exposure is considered to be the construction workers. These human receptors were retained for quantitative evaluation in the risk characterization. Figure 6-1 presents the Model of Conceptual Exposure for the selection of exposure pathways and potential receptors.

6.3.2 Estimation of Chronic Daily Intakes

In order to quantify potential exposure, chronic daily intakes (CDIs) are calculated for each exposure pathway. The general equations and input parameters used in the calculation of chronic daily intakes (CDIs) are taken from USEPA's Standard Default Exposure Factors (USEPA, 1991) and Exposure Factors Handbook (USEPA, 1989), when available. All inputs not defined by USEPA are derived from the most recent USEPA publications concerning exposure or best professional judgement based on site-specific information. The equations for calculating the three exposure pathways of concern for the saturated subsurface soils at Site 35, are presented below. Input parameters used in the estimation of CDIs are presented in Table 6-4.

For the saturated subsurface soil exposure pathways, the default exposure frequency of 100 days/year (professional judgement/USEPA, 1991) for short-term seasonal activities was

FIGURE 6-1
MODEL OF CONCEPTUAL EXPOSURE
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB, CAMP LEJEUNE, NORTH CAROLINA

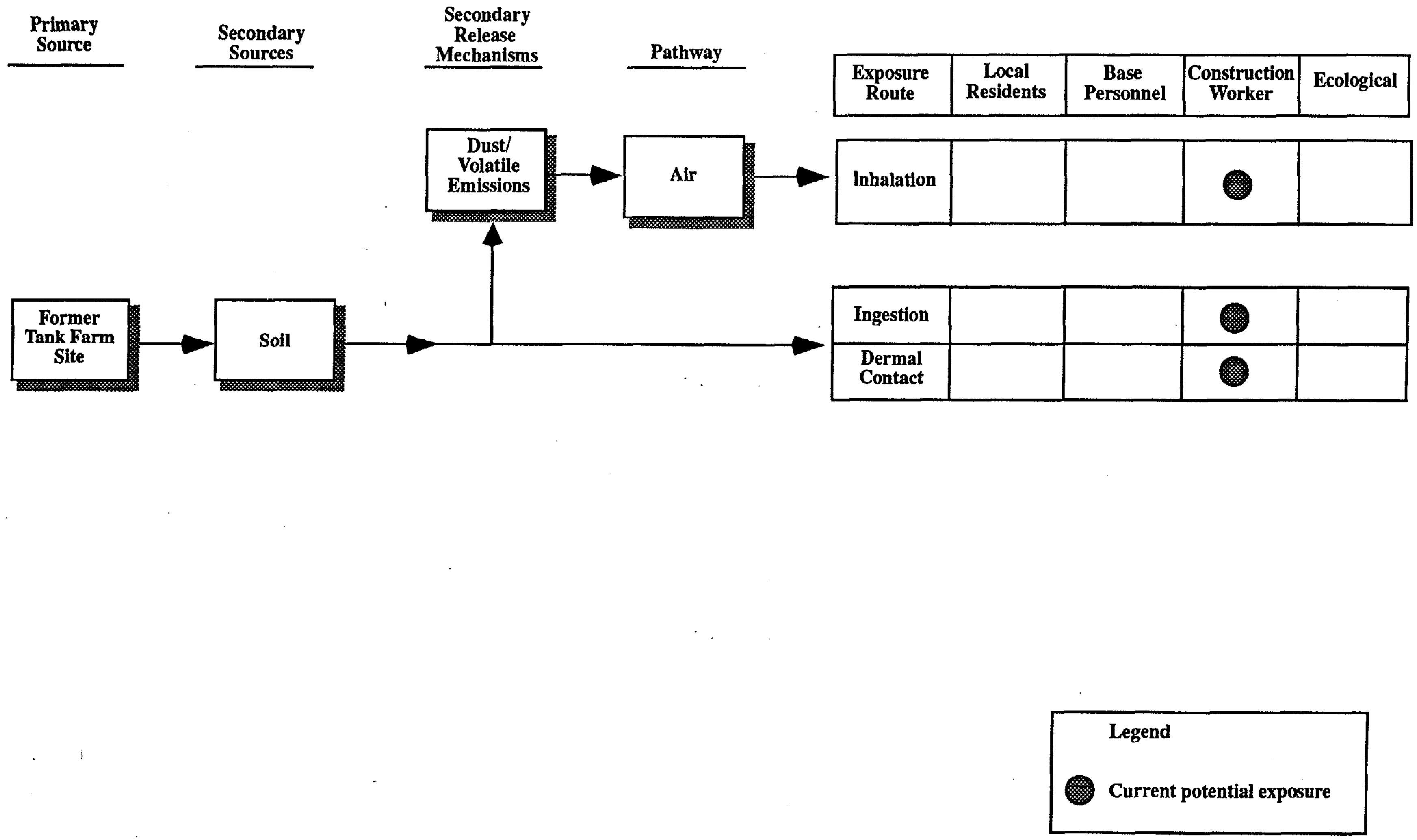

TABLE 6-4

EXPOSURE INPUT PARAMETERS FOR CALCULATING THE CHRONIC DAILY INTAKE FOR SOIL INGESTION, DERMAL CONTACT, AND INHALATION OF SATURATED SUBSURFACE SOIL
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER FUEL FARM AREA
MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

Input Parameter	Units	Adult Construction Worker Deep Subsurface Soil	Reference
Conversion Factor (CF)	kg/mg	1×10^{-6}	NA
Ingestion Rate (IR)	mg/day	480	USEPA, 1991
Exposure Frequency (EF)	days/year	100	Professional Judgement/ USEPA, 1991
Adherence Factor (AD or AF)	mg/cm^2	1.0	USEPA, 1992 USEPA, 1991
Dermal Absorption Factor (ABS)*	unitless	0.01/0.001	USEPA, 1992
Exposure Time (ET)	hours/day	8	Professional Judgement/ USEPA, 1991
Respiration Rate (RR)	m^3/hour	2.5	USEPA, 1991
Exposed Surface Area (SA)	cm^2/day	5300	USEPA, 1989
Exposure Duration (ED)	years	1	Professional Judgement/ USEPA, 1991
Body Weight (BW)	kg	70	USEPA, 1989b
Averaging Times (AT)**	days	25,550/365	USEPA, 1989b

NA = Not Applicable

Notes: * Organic Chemical/Inorganic Chemical Absorption rates of 1.0 percent and 0.1 percent, respectively.
** Carcinogenic and noncarcinogenic averaging times

References:
USEPA Standard Default Exposure Factors (USEPA, 1991)
USEPA Region IV (USEPA, 1992)
USEPA Exposure Factors Handbook (USEPA, 1989)
USEPA Risk Assessment Guidance for Superfund, Part A (USEPA, 1989b)

utilized. Potential carcinogenic health risks in a healthy adult were estimated using an exposure duration (professional judgement/USEPA 1991) of up to one year (an anticipated length of construction). Professional judgement was used in the determination of exposure time, which was assumed to be 8-hours per day. An 8-hour exposure corresponds to a 10-hour work day minus one hour for lunch and four 15-minute breaks.

The following sections present the general equations and input parameters used in the calculation of CDIs for each potential exposure pathway.

6.3.2.1 Commercial/Industrial Incidental Soil Ingestion

A saturated subsurface soil ingestion rate for a 70 kg adult worker was assumed to be 480 mg/day (USEPA, 1989b and USEPA, 1991). The exposure frequency for construction workers exposed to saturated subsurface soils was 100 days per year for one year (USEPA, 1991). The CDI for COPCs in soil can be calculated for all potential human receptors as follows:

$$\text{CDI (mg/kg-d)} = \frac{\text{CS x IR x CF x EF x ED}}{\text{BW x AT}_{c} \text{ or AT}_{nc}}$$

where:

CS	=	chemical concentration in soil (mg/kg)
IR	=	ingestion rate (mg/day)
CF	=	conversion factor (kg/mg)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yrs)
BW	=	adult body weight (kg)
ATc	=	averaging time, carcinogens (days)
ATnc	=	averaging time, noncarcinogens (days)

6.3.2.2 Commercial/Industrial Dermal Contact

The exposed skin surface area for a 70 kg adult male worker was assumed to be 5,300 cm^2/per day, which includes the head, forearms, hands, and lower legs (USEPA, 1989). Based on new information regarding soil to skin adherence constant (USEPA, 1992), a 1.0 mg/cm^2 adherence factor has been used. A skin absorption factor of one percent for organic compounds has been assumed (USEPA, 1992). The exposure frequency for potential exposure to deep subsurface soils was assumed to be 100 days per year for one year. The CDI associated with potential dermal contact of soils containing COPCs was expressed using the following equation:

$$\text{CDI (mg/kg-d)} = \frac{\text{CS x CF x SA x AF x ABS x EF x ED}}{\text{BW x AT}_c \text{ or AT}_{nc}}$$

where:

CS	=	chemical concentration in soil (mg/kg)
CF	=	conversion factor (kg/mg)
SA	=	skin surface area available for contact (cm^2/day)
AF	=	soil to skin adherence factor (mg/cm^2)
ABS	=	absorption factor (unitless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yrs)
BW	=	adult body weight (kg)
ATc	=	averaging time, carcinogens (days)
ATnc	=	averaging time, noncarcinogens (days)

6.3.2.3 Commercial/Industrial Inhalation of Fugitive Dust

For this exposure pathway, a respiration rate of 2.5 m^3/hour or 20 m^3/per 8-hour day for moderate activity was assumed (USEPA, 1991). The CDI for constituents in ambient air was expressed using the following equation:

$$\text{CDI (mg/kg-d)} = \frac{\text{CA x RR x ET x AB x EF x ED}}{\text{BW x AT}_c \text{ or AT}_{nc}}$$

where:

CA	=	chemical concentration in air (mg/m^3)
RR	=	respiration rate (m^3/hr)
ET	=	exposure time (hrs/day)
AB	=	absorbed fraction (unitless)
EF	=	exposure frequency (days/yr)
ED	=	exposure duration (yrs)
BW	=	adult body weight (kg)
ATc	=	averaging time, carcinogens (days)
ATnc	=	averaging time, noncarcinogens (days)

6.4 Toxicity Assessment

Section 6.2 identified the potential exposure pathways and potential human receptors for Site 35. This section will reviews the available toxicological information for each COPC.

6.4.1 Toxicological Evaluation

The toxicological evaluation characterizes the inherent toxicity of a compound and presents a review of available scientific data to determine the nature and extent of the potential human health and environmental effects associated with potential exposure to a chemical. The end product of these evaluations is a collection of toxicological profiles for the COPCs. These toxicological profiles provide the qualitative weight of evidence that demonstrate whether COPCs pose any actual or potential health and environmental effects. The toxicological profiles for the COPCs, benzene and arsenic, are presented in Appendix E.

6.4.2 Dose-Response Evaluation

An important component of a toxicological evaluation is the relationship between the dose of a compound and the potential for adverse effects resulting from that dose. Standard reference doses (RfDs), reference concentrations (RfCs), and carcinogenic slope factors (CSFs) have been developed for a variety of chemicals to assess this dose-response relationship. The RfDs/RfCs describe potential systemic or noncarcinogenic human health effects. CSFs are derived to represent the potential for carcinogenic effects in exposed individuals.

The USEPA has developed several sets of toxicity values to provide quantitative estimates of the potency of chemicals and their resultant toxic effects.

The hierarchy presented in RAGS for choosing these values is as follows:

- Integrated Risk Information System (IRIS) Database
- Health Effects Assessment Summary Table (HEAST)
- Other Sources

The IRIS data base (USEPA, 1994) is updated monthly and contains both verified RfDs and CSFs. HEAST (USEPA, 1993), on the other hand, provides both interim (unverified) and verified RfDs and CSFs and is published annually, incorporating any applicable changes to its database at that time. Other sources include the USEPA Region III Risk Based Concentration Tables (USEPA, 1994a) which contain USEPA Environmental Criteria and Assessment Office (ECAO) toxicity values as well as other USEPA toxicity values. These are used for some chemicals which are not currently provided in IRIS or HEAST.

Quantitative indices of toxicity and USEPA weight-of-evidence classifications for the COPCs are presented in Table 6-5. A definition for each of the weight-of-evidence categories is presented in Table 6-6.

6.4.2.1 Noncarcinogens

For noncarcinogenic effects, the USEPA assumes there is a threshold below which there will be no toxic effect (i.e., exposure to a defined level will not pose adverse effects). The EPA has formed a RfD Workgroup to review existing data used to derive RfDs. Once this task has been completed the verified RfDs and RfCs are available on the USEPA's IRIS computer database, which is updated on a monthly basis. Verified RfDs and RfCs are considered the most reliable basis for estimating noncarcinogenic risks due to chronic chemical exposures.

The RfD is developed for chronic and/or subchronic human exposure to chemicals and is based solely on the noncarcinogenic effects of chemical substances. It is defined as an estimate of daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime. The RfD is usually expressed as dose (mg) per unit body weight (kg) per unit time (day). An RfD is generally derived by dividing a no-observed-(adverse)-effect-level [NO(A)EL or NOEL] or a lowest-observed-adverse-effect-level (LOAEL) for the critical toxic effect by an appropriate "uncertainty factor (UF)." Effect levels are determined from laboratory or epidemiological studies. The uncertainty factor is based on the availability of toxicity data.

Uncertainty factors usually consist of multiples of 10, where each factor represents a specific area of uncertainty naturally present in the extrapolation process. These uncertainty factors are presented below and were extracted from the RAGS (USEPA, 1989b).

A UF of 10 is used:

- To account for variation in the general population and is intended to protect sensitive subpopulations (e.g., elderly, children).

- When extrapolating from animals to humans. This factor is intended to account for the interspecies variability between humans and other mammals.

TABLE 6-5

TOXICITY FACTORS FOR COPCs
SATURATED SUBSURFACE SOIL
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER FUEL FARM
MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

Compound	RfD(1) (Oral)	RfD(1) (Inhaled)	CSF(1) (Oral)	CSF(1) (Inhaled)	WOE(2)
Arsenic	3.00E04	NA	1.75	15.1	A
Benzene	NA	NA	2.90E-02	2.90E-02	A

Notes: CSF = Cancer Slope Factor (kg/day/mg)
RfD = Reference Dose (mg/kg/day)
WOE = Weight-of-Evidence
NA = Not Applicable

(1) Taken from USEPA IRIS Database (1994) or HEAST 1993
(2) See Table 6-6 for a definition of each classification

TABLE 6-6

USEPA WEIGHT-OF-EVIDENCE CATEGORIES FOR POTENTIAL CARCINOGENS INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION SITE 35 - CAMP GEIGER FUEL FARM MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

USEPA Category	Description of Group	Description of Evidence
Group A	Human carcinogen	Sufficient evidence of carcinogenicity in humans from epidemiological studies to support a causal association between exposure and carcinogenicity.
Group B1	Probable human carcinogen	Limited evidence of carcinogenicity in humans from epidemiologic studies.
Group B2	Probable human carcinogen	Sufficient evidence of carcinogenicity in animals, inadequate or lack of evidence of carcinogenicity in humans.
Group C	Possible human carcinogen	Limited evidence of carcinogenicity in animals, inadequate or lack of evidence of carcinogenicity in humans.
Group D	Not classified as to human carcinogenicity	Inadequate evidence of carcinogenicity in animals, inadequate or lack of evidence of carcinogenicity in humans.
Group E	No evidence of carcinogenicity in humans	No evidence for carcinogenicity in at least two adequate animal tests or in both epidemiologic and animal studies.

- When a NOAEL derived from a subchronic instead of chronic study is used as the basis for a chronic RfD.

- When a LOAEL is used instead of a NOAEL. This factor is intended to account for the uncertainty associated with extrapolating from LOAELs to NOAELs.

A Modifying Factor (MF) ranging from >0 to 10 is also applied to the RfD. This MF is included to reflect a qualitative professional assessment of additional uncertainties in the critical study and in the entire database, not specifically addressed by the preceding uncertainty factors. The default value for the MF is 1. Thus the RfD incorporates the certainty of the evidence for chronic, noncarcinogenic human health effects. Even if applicable human data exist, the RfD still maintains a margin of safety so that chronic human health effects are not underestimated.

6.4.2.2 Carcinogens

For carcinogenic effects, the USEPA assumes there is no threshold toxicity level; any level of exposure, no matter how small, poses some risk of developing cancer. USEPA has formed the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Workgroup to review and validate toxicity values used in developing CSFs. Once the slope factors have been verified via extensive peer review, they also appear in the IRIS data base.

The USEPA's Human Health Assessment Group (HHAG) reviews human, animal, and in vitro data on suspected chemical carcinogens and calculates CSFs for those determined to be carcinogenic. CSFs are used to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of potential carcinogen (USEPA, 1989). This factor is derived through an assumed low dosage, linear, multi-stage model and an extrapolation from high to low dose responses determined from animal studies (note that the model is more likely to overestimate than to underestimate the potential risk).

CSFs are generally reported in units of $(mg/kg\text{-}day)^{-1}$. The CSF represents the upper 95% confidence limit of the slope of the linear portion of the dose response curve. This means that there is reasonable confidence that the carcinogenic potency of a chemical will not be underestimated and is likely to be less than predicted.

6.5 Risk Characterization

The risk characterization combines the selected COPCs, the exposure assessment, and the toxicity assessment to produce a quantitative estimate of current potential human health risk associated with Site 35. Estimated lifetime incremental cancer risks (ICRs) and Hazard Indices (HIs) for the potential adult receptor group which could be exposed to COPCs via soil contact, ingestion and inhalation exposure pathways are discussed in this section. As a "worst case" scenario, the ICRs were calculated using the maximum detected concentration for each COPC.

Quantitative risk calculations for potentially carcinogenic compounds estimate inferentially (versus probabilistically) the potential ICR for an individual in a specified population. This unit of risk refers to a potential cancer risk that is above the background cancer risk in unexposed individuals. For example, an ICR of 1×10^{-6} indicates that an exposed individual has an increased probability of one in one million of developing cancer subsequent to exposure, over the course of their lifetime.

The potential lifetime ICR for an individual was estimated from the following relationship:

$$ICR = \sum_{i=1}^{n} CDI_i \times CSF_i$$

where the CSF_i is expressed as $(mg/kg/day)^{-1}$ for compound i, and CDI_i is expressed as mg/kg/day for compound i. Since the units of CSF are (mg chemical/kg body weight-day)$^{-1}$ and the units of CDI are [mg chemical/kg body weight-day], the ICR value is dimensionless. The above equation was derived assuming that cancer is a nonthreshold process and that the potential excess risk level is proportional to the cumulative intake over a lifetime.

For quantitative estimation of risk, it is assumed that cancer risks from multiple chemical exposures are additive. Since there are no mathematical models that adequately describe chemical antagonism or synergism (i.e., potential reversal or enhancement of effects, respectively), they will be discussed as part of the uncertainty analysis.

Noncarcinogenic compounds assume that a threshold toxicological effect exists. Therefore, the potential for noncarcinogenic effects are calculated by comparing CDI levels with threshold levels (RfDs) for each COPC.

Noncarcinogenic effects are estimated by calculating the Hazard Index (HI) which is derived as:

$$HI = \sum_{i=1}^{n} HQ_i$$

where: $HQ_i = CDI_i/RfD_i$

An HI is the ratio of the CDI to the reference dose (or reference concentration for inhalation exposure) that is considered to be below that level for which any adverse effects would be observed (these doses have been called "safe" or "acceptable"). HQ_i is the hazard quotient for contaminant i, CDI_i is the chronic daily intake (mg/kg/day) of contaminant i, and RfD_i is the reference dose (mg/kg/day) of the contaminant i over a prolonged period of exposure. RfC is the reference concentration used when determining exposure due to inhalation of particulates. Since the units of RfD are [mg/kg/day] and the units of CDI are [mg/kg/day], the hazard index is dimensionless.

To account for the additivity of noncarcinogenic risk following exposure to numerous chemicals, the HI, which is the sum of all the HQs, will be calculated. A ratio of 1.0 is used for examination of the HI. Ratios less than one indicate that adverse noncarcinogenic health effects are unlikely. Ratios greater than one indicate the potential for adverse noncarcinogenic health effects to occur at that exposure level and caution should be exercised. This does not mean, however, that adverse effects will definitely be observed since the RfD incorporates safety and modifying factors to ensure that it is well below that dose for which adverse effects have been observed. This procedure assumes that the risks from exposure to multiple chemicals are additive, an assumption that is probably valid for compounds that have the same target organ or cause the same toxic effect.

6.5.1 Potential Human Health Risks for the Construction Worker

Table 6-7 presents the ICR values derived for deep subsurface soil ingestion, dermal contact and inhalation, and the percent contribution of each COPC. Appendix F presents the calculations used to generate the risk values for each of these routes.

TABLE 6-7

INCREMENTAL LIFETIME CANCER RISKS FOR INGESTION, DERMAL CONTACT, AND INHALATION OF COPCs IN SATURATED SUBSURFACE SOIL BY ADULT CONSTRUCTION WORKERS SITE 35 - CAMP GEIGER FUEL FARM AREA MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

Constituent	Ingestion of Saturated Subsurface Soils		Dermal Contact with Saturated Subsurface Soils		Inhalation of Saturated Subsurface Soils	
	ICR	HI	ICR	HI	ICR	HI
Arsenic	3.8×10^{-7}	0.05	4.2×10^{-9}	0.0005	2.9×10^{-6}	--
Benzene	1.8×10^{-8}	--	2×10^{-9}	--	1.6×10^{-8}	--
Total	**3.9×10^{-7}**	**0.05**	**6×10^{-9}**	**0.0005**	**2.9×10^{-6}**	--

** = <1% of total risk

Calculated ICR values were compared to USEPA's target risk range of 1×10^{-6} to 1×10^{-4}. The target risk range represents those risk levels considered to be generally safe and protective of public health by the USEPA (USEPA, 1989a).

The ICR value derived for ingestion of saturated subsurface soil considered potential excavation activities and thus, a higher accidental soil ingestion rate (480 mg/day). The duration of this type of exposure is generally assumed to be one year or less with an exposure frequency of 100 days per year. Incorporating these inputs, the saturated subsurface ingestion ICR was approximately 4×10^{-7}, which falls below the target risk range that USEPA generally considers to be acceptable. The HI was 0.05, which is below 1.0, suggesting that adverse systemic health effects associated with potential accidental ingestion exposure will not occur.

The ICR value associated with the potential dermal contact of COPCs was approximately 6×10^{-9} falling below USEPA's generally acceptable target risk range. An HI of 0.0005 was below the 1.0, suggesting that adverse systemic health effects will not occur subsequent to dermal contact. The ICR value associated with the potential inhalation of modeled COPC concentrations in ambient air was approximately 2.9×10^{-6} which falls within USEPA's target risk range of 1×10^{-6} to 1×10^{-4}. HI values were not calculated because verified inhalation RfCs are not available for either benzene or arsenic.

6.6 Additional Considerations

There are currently no Federal guidelines or regulations pertaining to clean-up action levels for TPH or oil and grease. North Carolina's Department of Environment, Health and Natural Resources, Division of Environmental Management has developed a Site Sensitivity Evaluation (SSE)/Site Characteristics Evaluation for developing clean-up goals for TPH and oil and grease. The first step in the SSE process is categorizing the site. Site characteristics such as soil grain size, distance to the water table, and the presence of artificial conduits with the zone of contamination are considered in assigning the site one of five categories and calculating a total site characteristics score. The second step applies the characteristics score and site category to determine an initial cleanup level. An SSE was developed for Site 35 to determine low boiling TPH (i.e., gasolines), high boiling TPH (i.e., diesel) and oil and grease initial cleanup levels. The SSE is presented in Appendix G.

Based on the SSE, the following clean-up levels were derived:

- Gasoline 40 mg/kg
- Diesel 160 mg/kg

Because unacceptable human health risks subsequent to exposure were not derived for the site, these initial clean-up levels will be considered in the Feasibility Study and selection of remedies.

6.7 Uncertainty Analysis

Biological and environmental systems are not directly comparable to associated scientific disciplines such as chemistry and mathematics due to the natural variability of living systems. Risk assessment is based upon a mixture of sciences with varying levels of certainty, and the final estimation of the risk assessment is only as certain as the least certain component in the estimate. The results of the risk assessment are presented in terms of the potential for adverse effects based upon a number of very conservative assumptions. The tendency to be conservative is an effort to err on the side of the protection of health. The risks are indicators of possible risk, not a true measurement of actual risk. The human health risk evaluation is intended to contribute to the decision-making process and the management of MCB Camp Lejeune by interpreting the significance of the observed contamination.

Uncertainties are encountered throughout the process of performing a risk assessment. The exposure modeling can produce divergent results unless standardized assumptions are used and the possible variation in others are clearly understood. Similarly, toxicological assumptions, such as extrapolating from chronic animal studies to human populations, also introduce a great deal of uncertainty into the risk assessment. This section discusses sources of uncertainty inherent in the following elements of the preliminary human health risk assessment performed for Site 35:

- Use of analytical data (environmental chemistry sampling and analysis; misidentification or failure to be all-inclusive in chemical identification).

- Exposure assessment (choice of models and input parameters).

- Toxicity assessment (evaluation of toxicological data in dose response quantification).

- Risk characterization (assumptions concerning exposure scenarios and population quantification).

- Chemicals not quantitatively evaluated.

The variation of any factor used in the calculation of the exposure concentration will have an impact on the total carcinogenic risk. Uncertainties associated with this risk assessment are presented in Table 6-8 and discussed in the following paragraphs.

6.7.1 Analytical Data

The development of a risk assessment depends on the reliability of the analytical data available to the risk assessor. Analytical data are limited by the precision and accuracy of the methods of analysis. Analytical data are not absolute numbers and variability in sample results is inherent. The amount of variability in analytical results depends upon the sample media and the presence of interfering compounds. In addition, the number of sampling points can also directly affect the reliability of a risk evaluation. However, the potential effects on the overestimation or underestimation of risks is considered to be low.

Analytical results for Site 35 soil samples were subjected to an independent third party data validation. Volatile and semivolatile organic compound data and select inorganics were qualified "J" (estimated), K (biased) high or L (biased) low for quality control reasons or because concentrations were below Contract Required Quantification Limits (CRQLs). These qualifications will not affect the derived risk estimates because maximum detected COPC concentrations were used in the baseline risk assessment.

6.7.2 Exposure Assessment

In performing exposure assessments, uncertainties can arise in the estimation of chemical intakes resulting from contact by a receptor with a particular medium. The use of the 95th percent upper confidence limits of the arithmetic mean as the concentration term in estimating the CDI reduces the potential for underestimating exposure at Site 35. This means that, in general, there was an attempt to err on the side of health-protectiveness.

TABLE 6-8

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE PRELIMINARY HUMAN HEALTH RISK ASSESSMENT
INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION
SITE 35 - CAMP GEIGER FUEL FARM
MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

Uncertainty	Potential Magnitude for Over-Estimation of Risks	Potential Magnitude for Under-Estimation of Risks	Magnitude for Over or Under-Estimation of Risk
Analytical Data			
Sufficient samples may not have been taken to characterize the media being evaluated.			Low
Systematic or random errors in the chemical analysis may yield erroneous data.			Low
Exposure Assessment			
The use of the 95th percent upper confidence interval of the arithmetic mean data in the estimation of the ICR.	Moderate		
The standard assumptions regarding body weight, exposure period, life expectancy, population characteristics, and lifestyle may not be representative of the actual exposure situations.			Low
Toxicological Assessment			
Toxicological indices derived from high dose animal studies, extrapolated to low dose human exposure.	Moderate		
Use of unadjusted oral RfDs and CSFs to evaluate dermal risks.			Low
Risk Characterization			
Assumption of additivity in the quantitation of cancer risks without consideration of synergism, antagonism, promotion, and initiation.			Moderate
Additivity of risks by the individual exposure pathways of shallow subsurface and deep subsurface soil.			Low
Compounds not quantitatively evaluated.		Low	

Notes: Low - Assumptions categorized as "low" may effect risk estimates by less than one order of magnitude.

Moderate - Assumptions categorized as "moderate" may effect estimates of risk by between one and two orders of magnitude.

High - Assumptions categorized as "high" may effect estimates of risk by more than two orders of magnitude.

Source: Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). (USEPA, 1989b).

To estimate an intake, certain assumptions must be made about exposure events, exposure durations, and the corresponding assimilation of constituents by the receptor. Exposure factors have been generated by the scientific community and have undergone review by the USEPA. The USEPA has published an Exposure Factors Handbook which contains the best and most recent values. Regardless of the validity of these exposure factors, they have been derived from a range of values generated by studies of limited numbers on individuals. In all instances, values used in this risk assessment, scientific judgements, and conservative assumptions agree with those of the USEPA. Conservative assumptions, designed as not to underestimate daily intakes, were employed throughout this risk assessment and are adequately protective of human health.

6.7.3 Toxicity Assessment

In formulating quantitative estimates of the toxicity of varying dosage of a compound to human receptors, uncertainties arise from two sources. First, data on human exposure and the subsequent effects are usually insufficient, if they are available at all. Human exposure data usually lack adequate concentration estimations and suffer from inherent temporal variability. Therefore, animal studies are often used and new uncertainties arise from the process of extrapolating animal results to humans. Second, to obtain observable effects with a manageable number of experimental subjects, high doses of a compound are often used. In this situation, a high dose means that high exposures are used in the experiment with respect to most environmental exposures. Therefore, when applying the results of the animal experiment to the human condition, the effects at the high doses must be extrapolated to approximate effects at lower doses.

In extrapolating effects from high doses in animals to low doses in people, scientific judgment and conservative assumptions are employed. In selecting animal studies for use in dose-response calculations, the following factors are considered:

- Studies are preferred where the animal closely mimics human pharmacokinetics (how the body absorbs, distributes, metabolizes and excretes drugs).

- Studies are preferred where dose intake most closely mimics the intake route and duration for humans.

- Studies are preferred which demonstrate the most sensitive response to the compound in question.

Promulgated CSF values represent the 95th percent upper confidence limit value derived using the linear multistage statistical model so as to not underestimate carcinogenic potential.

The use of conservative assumptions in the statistics results in quantitative indices of toxicity that are not expected to underestimate potential toxic effects, but may overestimate these effects by an order of magnitude or more. This conservatism could be further compounded by the use of multiple data bases which contain toxicological indices no longer on line in IRIS. For example, the total site risk to commercial/industrial workers was primarily driven by the air exposure pathway. IRIS currently does not lists inhalation CSF values for PAHS because of the limited toxicological database via this pathway. USEPA Region III currently recommends the use of the off-line inhalation CSF values (i.e., HEAST or ECAO values) for the sake of conservatism. Total site risks may or may not be overestimated using this approach.

Oral toxicity values should be modified by an absorption factor to account for absorbed dermal dose. Absorption factors and toxicity value adjustment was not done as part of this baseline risk assessment. Modification of RfDs and CSFs by the default absorption factors for organics (0.01) and inorganics (0.001) does not affect the conclusions of the baseline risk assessment because calculated risk values fall below the target risk range and HIs are much lower than 1.0. For example, a dermal contact ICR value of 4.2×10^{-9} was derived for arsenic. Modification of the CSF to account for 0.1 percent absorption would result in an adjusted ICR value of 4.2×10^{-6}. Modification of the arsenic RfD by 0.1 percent absorption would result in an HI value of 0.5. The ICR value is still within the target risk range and the HI falls below 1.0 suggesting no systemic health effects subsequent to exposure.

6.7.4 Risk Characterization

The risk characterization bridges the gap between risk assessment and risk management, ultimately providing impetus for the remediation of the site.

Uncertainties associated with risk characterization include the assumption of chemical additivity (1 + 1 = 2) and the inability to predict synergistic (1 + 1 = 5), antagonistic

(3 + 2 = 1), promotive (promote an action to occur), or initiative (initiate an action to occur) interactions between COPCs. These uncertainties are inherent in any inferential risk assessment. USEPA promulgated inputs to the quantitative risk assessment and toxicological indices are calculated to be protective of the human receptor and to err conservatively, so as to not underestimate the potential human health risks.

6.7.5 Chemicals Not Quantitatively Evaluated

Dibenzofuran and 2-methylnaphthalene were not quantitatively evaluated in this preliminary risk assessment. The weight-of-evidence category for these chemicals are currently considered D, not classified as to human carcinogenicity. A provisional oral RfD of 0.004 mg/Kg/d is currently available from ECAO. Potential systemic effects to construction works exposed by dermal contact and accidental ingestion using the provisional RfD are minimal (HI = 0.002). Toxicological values were not available for lead, which is considered to be a B2 potential human carcinogen. For this preliminary risk assessment, the lack of available toxicological values for these constituents does not have a significant effect on the underestimation of risk, due to the conservation of the risk estimate and the relatively low environmental concentrations of these chemicals.

6.8 <u>Risk Assessment Summary</u>

The COPCs that were chosen to assess the potential human health risks posed by exposure to saturated subsurface soils at Site 35 were arsenic and benzene. The receptor of concern was determined to be a construction worker engaging in commercial/industrial activities who was assumed to potentially contact COPCs by three routes of exposure: incidental ingestion, dermal contact, and the inhalation of fugitive dusts. Potential exposure to saturated subsurface soils would occur in the event of excavation activities such as for new buildings, roads and utilities. Exposure frequency was assumed to be 100 days per year over a one-year period, for saturated subsurface soil.

Based upon these exposure assumptions, the total site ICR for potential exposure to the deep subsurface soil was 3 x 10^{-6}. The total site HI for potential exposure to noncarcinogenic constituents in the saturated subsurface soil was 0.05. The ICR value falls within USEPA's target risk range of 1 x 10^{-6} to 1 x 10^{-4}. The total HI value is less than 1.0 suggesting that adverse noncarcinogenic health effects are unlikely to occur. Table 6-9 provides a breakdown of the contribution to risk for each route of exposure.

TABLE 6-9

INCREMENTAL LIFETIME CANCER RISKS AND HAZARD INDICES FOR CONSTRUCTION WORKERS CONSIDERING INCIDENTAL INGESTION, DERMAL CONTACT, AND INHALATION OF FUGITIVE DUSTS SATURATED SUBSURFACE SOIL INTERIM REMEDIAL ACTION REMEDIAL INVESTIGATION SITE 35 - CAMP GEIGER FUEL FARM MCB CAMP LEJEUNE, JACKSONVILLE, NORTH CAROLINA

Exposure Route	Incremental Cancer Risk (ICR) for Saturated Subsurface Soil	Hazard Indices (HI) for Deep Subsurface Soil
Incidental Ingestion	3.9×10^{-7}	0.05
Dermal Contact	6×10^{-9}	0.0005
Inhalation of Fugitive Dusts	2.9×10^{-6}	NA
Total	$\mathbf{3.3 \times 10^{-6}}$	**0.05**

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APPENDIX A
SUMMARY OF ANALYTICAL RESULT OBTAINED UNDER CSA BY LAW

KEY TO SYMBOLS

SUMMARY OF LABORATORY ANALYSES

* Numerical standard has not been established; substances not allowed in detectable concentrations.
** Interim standard
N.D. = Not detected: see laboratory reports for applicable detection limits.
\- = Sample not analyzed for this parameter.

TABLE 4.2 (Page 1 of 3)
SUMMARY OF LABORATORY ANALYSES OF SOIL SAMPLES

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT
CAMP GEIGER AREA FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE LOCATION	SAMPLE DEPTH (ft)	TOTAL PETROLEUM HYDROCARBONS		IGNITABILITY (Degrees F)	LEAD (ug/L)
		VOLATILES (mg/kg)	SEMI-VOLATILES (mg/kg)		
HA-3	4	N.D.	17	--	N.D.
HA-4	2	N.D.	N.D.	--	42
HA-7	5	N.D.	5700	--	N.D.
B-1A	1.5 - 3.0	N.D.	N.D.	--	N.D.
B-1B	8.5 - 10.0	N.D.	N.D.	--	N.D.
B-2	5.5 - 6.0	N.D.	N.D.	--	N.D.
B-2	8.5 - 10.5	630	7600	--	N.D.
B-4A	3 - 4.5	N.D.	8400	--	N.D.
B-4B	8.5 - 10	N.D.	5100	--	N.D.
B-5A	3 - 4.5	N.D.	980	--	N.D.
B-5B	8.5 - 10	N.D.	280	--	N.D.
B-6A	3 - 4.5	N.D.	7	--	N.D.
B-6B	8.5 - 10	N.D.	6200	--	N.D.
MW-8	6.0 - 8.0	N.D.	9100	>200	N.D.
MW-8	14.0 - 16.0	N.D.	14,600	>200	N.D.
MW-9	6.0 - 8.0	N.D.	N.D.	>200	N.D.
MW-9	16.0 - 18.0	N.D.	N.D.	>200	N.D.
MW-10	0 - 1.5	N.D.	N.D.	--	N.D.

LAW ENGINEERING

TABLE 4.2 (Page 2 of 3)
SUMMARY OF LABORATORY ANALYSES OF SOIL SAMPLES

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT
CAMP GEIGER AREA FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE LOCATION	SAMPLE DEPTH (ft)	TOTAL PETROLEUM HYDROCARBONS		IGNITABILITY (Degrees F)	LEAD (ug/L)
		VOLATILES (mg/kg)	SEMI-VOLATILES (mg/kg)		
MW-10	1.5 - 3.0	N.D.	N.D.	--	N.D.
MW-11	4.0 - 6.0	N.D.	2100	>200	N.D.
MW-11	8.5 - 10.5	N.D.	4	>200	N.D.
MW-12	0 - 1.5	N.D.	N.D.	--	N.D.
MW-12	3.0 - 4.5	N.D.	N.D.	--	N.D.
MW-13	8.5 - 10.0	N.D.	N.D.	--	N.D.
MW-13	18.5 - 20.5	N.D.	N.D.	--	N.D.
MW-14	3.0 - 4.5	0.3	N.D.	--	N.D.
MW-14	18.5 - 20.0	N.D.	N.D.	--	N.D.
MW-15	4.0 - 6.0	N.D.	N.D.	--	N.D.
MW-15	8.5 - 10.5	N.D.	3500	--	N.D.
MW-16	3.0 - 4.5	N.D.	N.D.	--	N.D.
MW-16	18.5 - 20.0	1	8	--	N.D.
MW-17	4.0 - 6.0	N.D.	N.D.	--	N.D.
MW-17	18.5 - 20.5	N.D.	N.D.	--	N.D.
MW-18	3.0 - 4.5	N.D.	N.D.	--	N.D.
MW-18	8.5 - 10.0	N.D.	N.D.	--	N.D.
MW-19	2.0 - 4.0	N.D.	N.D.	--	N.D.

TABLE 4.2 (Page 3 of 3)
SUMMARY OF LABORATORY ANALYSES OF SOIL SAMPLES

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT
CAMP GEIGER AREA FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE LOCATION	SAMPLE DEPTH (ft)	TOTAL PETROLEUM HYDROCARBONS		IGNITABILITY (Degrees F)	LEAD (ug/L)
		VOLATILES (mg/kg)	SEMI-VOLATILES (mg/kg)		
MW-19	8.5 - 10.5	N.D.	N.D.	--	N.D.
MW-20	3.0 - 4.5	N.D.	14	--	N.D.
MW-20	8.5 - 10.0	N.D.	22,000	>200	N.D.
MW-21	2.0 - 4.0	N.D.	5,200	>200	N.D.
MW-21	4.0 - 6.0	N.D.	21,000	>200	N.D.
MW-22	3.0 - 4.5	N.D.	5	--	N.D.
MW-22	9.5 - 11.0	540	8900	>200	N.D.
MW-23	0 - 2.0	N.D.	N.D.	--	N.D.
MW-23	13.5 - 15.5	N.D.	N.D.	--	N.D.
MW-24	2.0 - 4.0	N.D.	N.D.	--	N.D.
MW-24	8.5 - 10.5	N.D.	21	--	N.D.
MW-25	2.0 - 4.0	N.D.	8700	--	N.D.
MW-25	4.0 - 6.0	N.D.	5700	--	N.D.

TABLE 4.3 (Page 1 of 2)
SUMMARY OF LABORATORY ANALYSES
HYDROPUNCH GROUND-WATER SAMPLES

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT
CAMP GEIGER FUEL FORM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE LOCATION	DATE SAMPLED	LABORATORY RESULTS (ug/l)				
		BENZENE	ETHYLBENZENE	TOLUENE	XYLENES (TOTAL)	METHYL TERT BUTYL ETHER
HP-1	8/5/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-2	8/7/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-3	8/7/91	0.7	N.D.	N.D.	N.D.	0.6
HP-4	8/6/91	0.2	1	N.D.	13	N.D.
HP-5	8/6/91	610	520	130	1900	N.D
HP-6	8/7/91	240	14	N.D.	N.D.	410
HP-7	8/6/91	8	1	N.D.	1	83
HP-8	8/7/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-9	8/7/91	N.D.	N.D.	N.D.	N.D.	3
HP-10	8/7/91	11	0.6	N.D.	2	N.D.
HP-11	8/6/91	350	350	N.D.	540	N.D.
HP-12	8/6/91	100	350	170	820	N.D.
HP-13	8/6/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-14	8/6/91	0.4	32	N.D.	24	N.D.
HP-15	8/6/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-16	8/6/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-17	8/6/91	N.D.	N.D.	2	N.D.	N.D.
HP-18	8/6/91	260	310	N.D.	740	N.D.

LAW ENGINEERING

TABLE 4.3 (Page 2 of 2)
SUMMARY OF LABORATORY ANALYSES
HYDROPUNCH GROUND-WATER SAMPLES

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT
CAMP GEIGER FUEL FORM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE LOCATION	DATE SAMPLED	LABORATORY RESULTS (ug/l)				
		BENZENE	ETHYLBENZENE	TOLUENE	XYLENES (TOTAL)	METHYL TERT BUTYL ETHER
HP-19	8/6/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-20	8/6/91	N.D.	N.D.	N.D.	N.D.	N.D.
HP-21	8/7/91	N.D.	N.D.	N.D.	N.D.	N.D.

TABLE 4.4 (Page 1 of 3)
SUMMARY OF LABORATORY ANALYSES
MONITORING WELL GROUND-WATER SAMPLES
SHALLOW SCREENED INTERVAL

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

		NC GROUND WATER STANDARD	EMW-1 (CGMW-1)	EMW-2 (CGMW-2)	EMW-3 (CGMW-3)	EMW-4 (CGMW-4)	EMW-5 (35GW-4)	EMW-6 (35GW-5)	EMW-7 (35GW-6)	MW-8S	MW-9S	MW-10S
	WELL NUMBER											
	DATE SAMPLED		9/3/91	9/5/91	9/5/91	9/5/91	9/4/91	9/5/91	9/5/91	9/4/91	9/3/91	9/3/91
PARAMETER (ug/l)	SCREENED INTERVAL (Feet)		8.5-17.5	1.87-10.87	3.06-12.06	2.61-11.61	10.5-24.5	10.5-24.5	10.5-24.5	4.5-13.5	3.5-12.5	4.5-13.5'
BENZENE		1	ND	40	ND	13	0.4	0.3	ND	52	45	3
TOLUENE		1000	ND	12	ND	ND	ND	ND	ND	ND	ND	5
ETHYLBENZENE		29	ND	41	ND	0.7	ND	ND	ND	73	ND	7
XYLENES TOTAL		400	ND	76	ND	2	ND	ND	ND	420	4	ND
METHYL TERTIARY BUTYL ETHER (MTBE)		50**	ND	ND	ND	ND	ND	3	ND	ND	46	ND
LEAD		50	14	ND	2	28	75	ND	12	5	ND	3
TRANS-1,2-DICHLOROETHENE		70	ND	ND	2	ND	0.7	ND	18	ND	ND	17
TRICHLOROETHENE		2.8	ND	ND	8	0.6	3	0.6	59	ND	ND	170
1-METHYLNAPTHALENE		*	-	-	-	-	-	-	-	450	-	-
2-METHYLNAPTHALENE		*	-	-	-	-	-	-	-	460	-	-

LAW ENGINEERING

TABLE 4.4 (Page 2 of 3)
SUMMARY OF LABORATORY ANALYSES
MONITORING WELL GROUND-WATER SAMPLES
SHALLOW SCREENED INTERVAL

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

	WELL NUMBER	NC GROUND WATER STANDARD	MW-11S	MW-12S	MW-13S	MW-14S	MW-15S	MW-16S	MW-17S	MW-18S	MW-19S	MW-20S
	DATE SAMPLED		9/4/91	9/4/91	9/4/91	9/4/91	9/4/91	9/5/91	9/5/91	9/5/91	9/4/91	9/4/91
PARAMETER (ug/l)	SCREENED INTERVAL (Feet)		4.5'-13.5'	5'-14'	5.5'-14.5'	3.5'-12.5'	4.5'-13.5'	5.0'-14.0'	7.5'-16.5'	3.0'12.0'	4.5'-13.5'	3.0'-12.0'
BENZENE		1	ND	ND	ND	0.6	4	40	0.5	52	ND	140
TOLUENE		1000	ND	ND	ND	ND	ND	230	ND	ND	ND	280
ETHYLBENZENE		29	80	ND	ND	ND	3	76	ND	ND	ND	320
XYLENES TOTAL		400	170	ND	ND	ND	29	800	ND	ND	ND	830
METHYL TERTIARY BUTYL ETHER (MTBE)		50**	ND	ND	ND	ND	ND	ND	1	32	ND	ND
LEAD		50	ND	16	7	2	5	6	6	9	36	ND
CHLOROFORM		0.19	ND	ND	ND	3	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHENE		70	ND	ND	ND	44	ND	ND	ND	ND	5	ND
TRICHLOROETHENE		2.8	ND	ND	ND	110	ND	ND	0.6	ND	31	ND
1,2-DICHLOROETHANE		*	ND	ND	ND	ND	ND	ND	1	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE		*	ND	ND	ND	ND	ND	ND	ND	ND	12	ND
TETRACHLOROETHENE		*	ND	ND	ND	ND	ND	ND	ND	ND	1	ND

LAW ENGINEERING

TABLE 4.4 (Page 3 of 3)
SUMMARY OF LABORATORY ANALYSES
MONITORING WELL GROUND-WATER SAMPLES
SHALLOW SCREENED INTERVAL

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

	WELL NUMBER	NC GROUND WATER STANDARD	MW-21S	MW-22S	MW-23S	MW-24S	MW-25S	MW-26S (MW-14S)	MW-27S (MW-24S)	POTABLE WATER
	DATE SAMPLED		9/4/91	9/4/91	9/5/91	9/5/91	9/4/91	9/4/91	9/5/91	5/29/91 8/5/91
PARAMETER (ug/l)	SCREENED INTERVAL (Feet)		4.5-13.5	5.5'-14.5'	2.5-9.5	8.5-17.5	4.5-13.5	3.5-12.5	8.5-17.5	-
BENZENE		1	220	2300	ND	11	26	0.6	12	ND
TOLUENE		1000	ND	ND	ND	ND	160	ND	ND	ND
ETHYLBENZENE		29	590	560	ND	10	190	ND	10	ND
XYLENES TOTAL		400	1100	740	ND	43	500	ND	43	ND
METHYL TERTIARY BUTYL ETHER (MTBE)		50**	ND	ND	ND	ND	ND	ND	ND	ND
LEAD		50	4	3	2	5	1	2	7	ND
CHLOROFORM		0.19	ND	ND	ND	ND	ND	3	ND	9
TRANS-1,2-DICHLOROETHENE		70	ND	ND	ND	ND	ND	51	ND	ND
TRICHLOROETHENE		2.8	ND	ND	0.6	ND	ND	120	ND	ND
TRICHLOROFLUOROMETHANE		*	ND	ND	0.9	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE		*	ND	ND	ND	ND	ND	ND	ND	14
BROMOFORM		0.19	ND	ND	ND	ND	ND	ND	ND	16
DIBROMOCHLOROMETHANE		*	ND	ND	ND	ND	ND	ND	ND	27
ACENAPTHENE		*	-	-	-	ND	ND	ND	0.7	-
FLUORENE		*	-	-	-	1	ND	ND	ND	-
1-METHYLNAPTHALENE		*	-	-	-	64	190	ND	42	-
2-METHYLNAPTHALENE		*	-	-	-	63	270	ND	42	-
NAPTHALENE		*	-	-	-	41	220	ND	31	-

LAW ENGINEERING

TABLE 4.5 (Page 1 of 2)

SUMMARY OF LABORATORY ANALYSES
MONITORING WELL GROUND-WATER SAMPLES
DEEP SCREENED INTERVAL

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

	WELL NUMBER	NC GROUND WATER STANDARD	MW-8D	MW-9D	MW-10D	MW-11D	MW-12D	MW-13D	MW-14D	MW-15D
	DATE SAMPLED		9/4/91	9/3/91	9/3/91	9/4/91	9/4/91	9/4/91	9/4/91	9/4/91
PARAMETER (ug/l)	SCREENED INTERVAL (Feet)		20.5-29.5	25.5-29.5	25.5-29.5	25.5-29.5	24-28	25.5-29.5	24.5-28.5	25.5-29.5
BENZENE		1	1	0.3	3	ND	ND	ND	0.8	ND
TOLUENE		1000	3	ND	2	ND	ND	ND	ND	ND
ETHYLBENZENE		29	26	ND	1	ND	ND	ND	ND	ND
XYLENES (TOTAL)		400	52	ND	ND	9	ND	ND	ND	ND
METHYL TERTIARY BUTYL ETHER (MTBE)		50**	ND	ND	ND	ND	ND	ND	ND	ND
LEAD		50	8	14	11	10	9	3	14	5
TRANS-1,2-DICHLOROETHENE		70	ND	0.9	110	ND	ND	ND	7	ND
TRICHLOROETHENE		2.8	0.7	14	810	ND	ND	ND	13	ND
VINYL CHLORIDE		*	ND	ND	6	ND	ND	ND	ND	ND

TABLE 4.5 (Page 2 of 2)

SUMMARY OF LABORATORY ANALYSES
MONITORING WELL GROUND-WATER SAMPLES
DEEP SCREENED INTERVAL

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

	WELL NUMBER	NC GROUND WATER STANDARD	MW-16D	MW-17D	MW-18D	MW-19D	MW-21D	MW-22D	MW-23D	MW-24D	MW-25D
	DATE SAMPLED		9/5/91	9/5/91	9/5/91	9/4/91	9/4/91	9/4/91	9/5/91	9/5/91	9/4/91
PARAMETER (ug/l)	SCREENED INTERVAL (Feet)		24.5'-28.5'	25-29	20.5-24.5	22.5-24.5	25.5-27	32'-35'	17.5-20	26.5-29	27.5-30
BENZENE		1	12	ND	ND	ND	0.4	50	ND	0.7	ND
TOLUENE		1000	23	ND	ND	ND	13	1	ND	ND	33
ETHYLBENZENE		29	21	ND	ND	ND	17	10	ND	1	110
XYLENES (TOTAL)		400	100	ND	ND	ND	93	8	ND	3	290
METHYL TERTIARY BUTYL ETHER (MTBE)		50**	ND	ND	1	ND	ND	ND	ND	ND	ND
LEAD		50	9	7	5	9	3	10	2	7	ND
TRANS-1,2-DICHLOROETHENE		70	ND	0.6	ND	92	2	ND	ND	ND	ND
TRICHLOROETHENE		2.8	ND	ND	0.9	630	6	ND	0.7	0.6	ND

LAW ENGINEERING

TABLE 5.1
SUMMARY OF LABORATORY ANALYSES
RINSE AND TRIP BLANKS

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

SAMPLE NUMBER	TYPE OF BLANK	DATE COLLECTED	DATE SUBMITTED	RESULTS (mg/l)
HYDROPUNCH SAMPLES				
AA11637	Trip		8/6	ND
AA11677	Trip		8/8	ND
AA11685	Rinse	8/6	8/8	ND
AA11686	Trip		8/8	ND
AA11740	Rinse	8/7	8/9	ND
AA11741	Trip		8/9	ND
MONITORING WELL SAMPLES				
AA12927	Trip		9/6	ND
AA12939	Rinse	9/4	9/6	Total Xylenes 2 MTBE 1
AA12940	Trip		9/6	Total Xylenes 2
AA12951	Rinse	9/4	9/6	Total Xylenes 2
AA12952	Trip		9/6	Total Xylenes 2
AA12985	Rinse	9/5	9/6	Total Xylenes 1
AA12986	Rinse	9/5	9/6	ND
AA12987	Trip		9/6	ND
AA12992	Rinse	9/5	9/6	Total Xylenes 1
AA12993	Trip		9/6	ND

LAW ENGINEERING

TABLE 6.1
SUMMARY OF EXPOSURE PATHWAYS

REPORT OF UNDERGROUND FUEL INVESTIGATION
COMPREHENSIVE SITE ASSESSMENT

CAMP GEIGER FUEL FARM
CAMP LEJEUNE, NORTH CAROLINA
LAW ENGINEERING JOB NO. J47590-6014

CONTAMINATED MEDIUM	INGESTION (EATING)	INGESTION (DRINKING)	INHALATION	ABSORPTION
Free Product	NA	No Exposure (1)	NA	No Exposure (1)
Soil	Contingent Exposure (2)	NA	NA	Contingent Exposure (2)
Ground Water	Exposure Unlikely (3)	Exposure Unlikely (3)	NA	Exposure Unlikely (3)
Surface Water	No Exposure (4)	No Exposure (4)	NA	No Exposure (4)
Vapor	NA	NA	Possible Exposure (5)	NA

Notes:

(1) No free product detected in surface waters; water supply wells draw from Castle Hayne aquifer.
(2) Potential for exposure only if subsurface below 8 feet BLS is disturbed.
(3) Through use of Camp Geiger water-supply wells for drinking, cooking, and bathing.
(4) Ground-water sampling results indicate that plume does not extend to surface waters.
(5) Potential for exposure during maintenance/repair work in subsurface utility confinements.

LAW ENGINEERING

APPENDIX B
INTERIM REMEDIAL ACTION RI
SOIL BORING LOGS

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN   BORING NO.: PSB-29
COORDINATES: EAST: ______   NORTH: ______
ELEVATION: SURFACE: ______   TOP OF STEEL CASING: ______

RIG: Mobile Drill B-61

	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	8	Sunny, 60°F	6	0932
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS: ______

DRILL RECORD							VISUAL DESCRIPTION					
DEPTH	SOIL / ROCK	Sample ID — Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0–2		S-1	1.8	4, 5, 6, 6			Topsoil: silty sand	Brown		Damp to moist 0.25'		
							SAND, very fine, trace Silt	Mixed brown & orange	Loose	Damp 2.0'		
2–4		S-2	1.9	8, 5, 6, 11			SAND, very fine, trace Silt, trace Clay, trace fine Gravel.	Mixed brown & orange	Loose	Moist; gravel consists of a few quartz chips in upper 0.3'. 4.0'		
4–6		S-3	2	7, 10, 11, 11			SAND, very fine, trace Silt, trace clay.	Mixed gray-brown & orange	Medium dense	Moist 5.2'		
							SAND, fine	Mixed white & orange		Damp 6.0'		
6–8		S-4	1.4	7, 5, 6, 6			SAND, very fine to fine	Orange; Gray-brown	Loose	Wet 8.0'		
8–10							Boring completed at 8.0'.					

DRILLING CO.: Environmental Monitoring & Testing Corp.   BAKER REP.: E. Brennan
DRILLER: Gene Barnes   BORING NO.: PSB-29   SHEET 1 OF 1

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN BORING NO.: PSB-30
COORDINATES: EAST: ______ NORTH: ______
ELEVATION: SURFACE: ______ TOP OF STEEL CASING: ______

RIG: Mobile Drill B-61	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	10	Sunny, 60°F	8	1107
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS: ______

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0–2		S-1	1.7	6, 6, 8, 11			Topsoil: silty sand	Brown		Moist 0.2'		
							SAND, very fine, trace silt, trace Gravel		Loose	Moist; slight petroleum odor. gravel consists of quartz chips. 2.0'		
2–4		S-2	1.7	9, 13, 8, 9			SAND, very fine	Mixed brown & orange	Loose	moist 3.0'		
							SAND, very fine to fine			Strong petroleum odor 4.0'		
4–6		S-3	1.45	8, 5, 6, 11			SAND, very fine to fine	Mixed medium & dark brown	Loose	Moist; slight petroleum odor 5.0'		
6–8		S-4	1.25	7, 7, 7, 5			SAND, very fine to fine	Light gray-brown	Loose	Moist; stronger petroleum odor		
8–10		S-5	1.8	6, 6, 4, 5						Wet 8.5'		
							SAND, very fine to fine, trace Silt	Mixed brown & orange		9.5'		
							SAND, very fine, little silt, trace Clay	orange-brown		strongest petroleum odor 10.0'		
							Boring completed at 10.0'					

DRILLING CO.: Environmental Monitoring & Testing Corp. BAKER REP.: E. Brennan
DRILLER: ______ BORING NO.: PSB-30 SHEET 1 OF 1

[illegible] Barnes

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN
BORING NO.: PSB-31
COORDINATES: EAST:
NORTH:
ELEVATION: SURFACE:
TOP OF STEEL CASING:

RIG: Mobile Drill B-61	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	6	Cloudy, rain, 40s	3.7	1658
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS:

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft & %)	Lab Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0–2		S-1	1.9	1, 1, 1, 1			SAND, and silt	Dark brown	Very soft	Damp; trace organic matter. 0.3'		
							SAND, very fine	Orange-brown	Very loose	Damp 2.0'		
2–4		S-2	1.5	1, 1, 2, 2			SAND, very fine, trace silt	Medium gray-brown	Very loose	Moist to wet (at 3.7') 4.0'		
4–6		S-3	1.1	3, 3, 3, 6			SAND, very fine to fine, little silt, trace clay	Light gray-brown	Soft	Wet 6.0'		
6							Boring completed at 6.0'.					

Depth scale: 1 2 3 4 5 6 7 8 9 10

DRILLING CO.: Environmental Monitoring & Testing Corp.
BAKER REP.: E. Brennan
DRILLER:
BORING NO.: PSB-31
SHEET 1 OF 1

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN BORING NO.: PSB-32
COORDINATES: EAST: ____ NORTH: ____
ELEVATION: SURFACE: ____ TOP OF STEEL CASING: ____

RIG: Mobile Drill B-61	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	10	P. Sunny, 50s	8.3	1217
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS: ____

DRILL RECORD

DEPTH	SOIL / ROCK	Sample ID — Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %
0–2		S-1	1.85	4, 5, 5, 8		
2–4		S-2	2	8, 6, 8, 8		
4–6		S-3	1.3	2, 4, 4, 5		
6–8		S-4	1.4	3, 2, 4, 6		
8–10		S-5	1.5	3, 3, 4, 5		

VISUAL DESCRIPTION

Classification (Grain Size, Principal Constituents, Etc.) / (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
Topsoil: silty sand	Dark brown		Damp		0.3'
SAND, very fine; trace silt	Gray-brown / orange-brown	Loose	Moist		2.0'
SAND, very fine, trace silt, trace organic matter	Medium gray-brown	Loose	Moist		2.9'
SAND, very fine	Mottled orange & brown	Loose	Moist; black specks (soft coal?) throughout		4'
CLAY, trace silt, trace very fine sand	Orange	Soft	Damp		5.4'
SAND, very fine, trace silt	orange	Loose	Damp to moist		6.0'
SAND, very fine	Orange	Very loose	moist		7.8'
SAND, very fine	Light gray orange-brown	Loose	Moist to wet		8.3'
SAND, very fine to fine	Light orange Light gray		Wet		10.0'
Boring completed	at	10.0'			

DRILLING CO.: Environmental Monitoring & Testing Corp. BAKER REP.: E. Brennan
DRILLER: Gene Barnes BORING NO.: PSB-32 SHEET 1 OF 1

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN BORING NO.: PSB-33
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF STEEL CASING:

RIG: Mobile Drill B-61	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	12	Cloudy, rain, 50s	9.8	1600
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS:

DRILL RECORD							VISUAL DESCRIPTION					
DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0-2		S-1	1.1	4, 4, 5, 5			Topsoil: silty sand	Dark brown		Damp	0.3'	
							SAND, very fine, trace silt	Orange-brown	Loose	Damp to moist		
2-4		S-2	2	4, 4, 9, 7				Dark gray-brown		Moist	2.9'	
								Dark brown				
4-6		S-3	2	5, 8, 9, 11			SAND, very fine, little clay, trace silt	Orange-brown	Medium stiff	Moist to wet	4.6'	
							CLAY, trace silt	Mottled gray & orange	- to stiff	Damp	6.2'	
6-8		S-4	1.4	5, 9, 11, 14			SAND, very fine	Mixed orange and light gray	Loose	Damp to moist	8.3'	
8-10		S-5	1.5	9, 15, 12, 10			SAND, very fine to fine	Loose to Medium dense		Moist; faint petroleum odor	9.8'	
10							CLAY, little silt, trace fine sand			Wet	10.0'	

DRILLING CO.: Environmental Monitoring & Testing Corp. BAKER REP.: E. Brennan
DRILLER: Gene Barnes BORING NO.: PSB-33 SHEET 1 OF 2

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation – Site 35
S.O. NO.: 19160-52-SRN
BORING NO.: PSB-33

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK
				3			SAND, very fine	Mottled orange + grey-brown	Very loose	Moist to wet	
11				4						strong petroleum odor 11.4'	
				3			CLAY, little Silt, trace v. f. Sand	" "	Soft	Moist to wet; 11.7'	
		S-6	1.4	4			SAND, very fine to fine	Mottled light gray + orange	Loose	Wet; faint petroleum odor 12.0'	
12							Boring completed at 12.0'				
13											
14											
15											
6											
7											
8											
9											
0											
1											
2											
3											
4											
5											
6											
7											
8											
9											
0											

DRILLING CO.: Env. Monitoring + Testing Corp.
BAKER REP.: E. Brennan
DRILLER: Gene Barnes
BORING NO.: PSB-33
SHEET 2 OF 2

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN BORING NO.: PSB-34
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF STEEL CASING:

RIG: Mobile Drill B-61

	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	10	Cloudy, light rain, 50s	9	1427
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS:

DEPTH	SOIL / ROCK	Sample ID — Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0–2		S-1	1.5	6, 6, 7, 4			Topsoil: silty sand (0.2')	Dark brown		Damp		
							SAND, very fine	Medium orange-brown	Loose	Moist		
2–4		S-2	1.8	3, 3, 4, 6			(2.7') SAND, very fine, trace silt	Orange-brown	Very loose to loose	Moist to wet		
4–6		S-3	1.8	4, 3, 5, 5				- and light gray	Loose	Moist		
6–8		S-4	1.5	4, 5, 5, 4								
8							(7.7') CLAY, little silt, trace very fine sand	Orange-brown		Moist to wet; slight petroleum odor		
8–9		S-5	1	3, 1			(8.0') SAND, very fine, little CLAY, trace silt	Medium gray	Very loose	Moist; strong petroleum odor. Wet at 9'		
9–10		S-6	0.7	3, 3			(10.0')					

DRILLING CO.: Environmental Monitoring & Testing Corp. BAKER REP.: E. Brennan
DRILLER: Gene Barnes BORING NO.: PSB-34 SHEET 1 OF 1

FIELD TEST BORING RECORD

Michael Baker, Jr., Inc.

PROJECT: Interim Remedial Investigation - Site 35
S.O. NO.: 19160-52-SRN   BORING NO.: PSB-35
COORDINATES: EAST: ______   NORTH: ______
ELEVATION: SURFACE: ______   TOP OF STEEL CASING: ______

RIG: Mobile Drill B-61	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2" OD		3¼" ID		12/10/93	6	Cloudy, 50s	5.4	1333
LENGTH	2'		5'						
TYPE	Std.		HS						
HAMMER WT.	140#								
FALL	30"								
STICK UP									

REMARKS: Domestic sewage odor noted at 5.4' is from sewer line break which occurred approximately 100' west of boring location on 12/8/93.

DRILL RECORD / VISUAL DESCRIPTION

DEPTH	SOIL / ROCK	Sample ID / Type - No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft & %)	Lab. Class / Pen. Rate	Lab. M.C. %	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
0–0.3				4			Topsoil: silty sand	Dark brown		Damp	0.3'	
1				7			SAND, very fine, trace organic matter,	Loose		Damp; organic matter from 0.3' to 0.8' (petrified bone?)		
2		S-1	1.8	6, 6			clayey lens at 1.6				2.0'	
3				3, 3			SAND, very fine, trace Silt, trace Clay.	Very loose		Moist	2.5'	
4		S-2	1.85	2, 4			SAND, very fine, trace Silt	Medium orange-brown		Moist	4.0'	
5				4, 5			SAND, very fine	Medium gray-orange-brown	Loose	Moist		
6		S-3	1.7	5, 4			SAND, very fine, trace silt	Medium gray-brown		Wet; domestic sewage odor	5.4'	
7							Boring completed	at	6.0'			
8												
9												
10												

DRILLING CO.: Environmental Monitoring & Testing Corp.   BAKER REP.: E. Brennan
DRILLER: Gene Barnes   BORING NO.: PSB-35   SHEET 1 OF 1

APPENDIX C
INTERIM REMEDIAL ACTION RI DATA VALIDATION REPORTS AND SUMMARIES

ORGANIC DATA

InterOffice Memorandum

Baker

To:	Dan Bonk	**Date:**	February 16, 1994
From:	Rich Hoff R.H.	**Subject:**	CTO 160, SDG# GEI01. Soil organic data validation.

This data validation report presents the validated data for twenty (20) soil samples and five (5) aqueous samples taken at Camp Geiger December 10 through December 13, 1993. These samples were analyzed for Target Compound List (TCL) volatiles and semivolatile organic analytes by the CLP Statement of Work (SOW). Soil samples were analyzed by Pace Laboratory (New England) The deliverable received was that of a NEESA level C format. Samples evaluated in this report are:

35ER01	BCSB09	SB3502
35ER02	BCSB10	35TB01
35FB01	BCSB3D	35TB02
BCSB01	SB2903	
BCSB02	SB3003	
BCSB03	SB3005	
BCSB04	SB3005D	
BCSB05	SB3102	
BCSB06	SB3203	
BCSB07	SB3305	
BCSB08	SB3405	

Data were reviewed using the most recent Laboratory Data Validation Functional Guidelines For Evaluating Organic Analysis and the 1993 Statement of Work for Organic Analysis.

Miscellaneous

Semivolatile surrogate recovery results for sample BCSB09 were all below minimum recovery criteria. The sample was reextracted and reanalyzed, therefore, no action concerning surrogate recoveries was taken.

Minor Issues

Minimum volatile internal standard performance criteria were exceeded for samples BCSB01, BCSB02, BCSB03, BCSB07, BCSB09, BCSB19 and BCSB3D. These samples, with the exception of BCSB03, were reanalyzed within holding times and again, internal standard performance failed to meet minimum criteria. As a result all volatile organic results for samples BCSB01, BCSB02, BCSB05, BCSB07, BCSB08, BCSB09, BCSB10 and BCSB3D were qualified as "J" estimated. All volatile organic results for sample BCSB03 were also qualified as "J" estimated because the sample should have been reanalyzed to determine matrix interference. Because multiple samples were reanalyzed and exhibited matrix effects, it was inferred that matrix effects occurred in sample BCSB03 as well. The results of the reanalyzed samples should be used instead of the original results because internal standards results were somewhat better during reanalysis.

Toluene was detected at a concentration of 190000 ug/Kg in sample SB3405, which exceeds linearity for the compound. The sample should have been reanalyzed at the appropriate dilution for more accurate quantification. Because the sample was not run at a more appropriate dilution, the toluene result was qualified as "J" estimated.

Methylene chloride was detected in laboratory blank VBLKDK at 10 ug/L. The chemical was also detected in other laboratory blank samples. Methylene chloride results (less than or equal to 10 times the maximum blank concentration) were qualified "U" not detected for both low level and medium level preps using the appropriate conversions.

Acetone (36.0%) exceeded initial calibration percent relative standard deviation (%RSD) criteria of 30 percent. All associated positive detections and non-detects were qualified as "J" or "UJ" estimated.

Chloromethane, vinyl chloride, acetone, 2-butanone, 1,1,1-trichloroethane, 4-methyl-2-pentanone and 2-hexanone exceeded continuing calibration criteria of 25% throughout this SDG. All associated positive and non-detect results were qualified either "J" or "UJ" estimated.

Semivolatile surrogates failed to achieve minimum recovery criteria in sample BCSB09. The sample was reextracted beyond the specified 7 day holding time. All surrogates passed recovery criteria upon reanalysis. All semivolatile compounds were qualified as "J" or "UJ" estimated because of the holding time exceedance. Results of the reextraction and reanalysis should be used despite this action.

Benzo(k)fluoranthene (36.0%) exceeded initial calibration %RSD criteria of 30%. All associated positive results and non-detects were qualified as "J" or "UJ", respectively.

The compounds 2,6-dinitrotoluene, 4-chlorophenyl-phenylether, fluorene, hexachlorocyclopentadiene, 4,6-dinitro-2-methylphenol, di-n-butylphthalate, bis(2-ethylhexyl)phthalate and di-n-octylphthalate exceeded continuing calibration %D criteria. All associated positive results and non-detects were qualified a "J" or "UJ", respectively.

Conclusions

All samples were successfully analyzed by the laboratory and data are useable for any intended purpose within the limits of validation qualification. Qualifiers used in this validation, qualified data and support documentation are presented in the following attachments.

RH/nd
Attachments

GLOSSARY OF DATA QUALIFIER CODES

CODES RELATED TO IDENTIFICATION

(confidence concerning presence or absence of compounds)

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

B = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

CODES RELATED TO QUANTITATION

(can be used for positive results and sample quantitation limits):

J = Analyte present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3003

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-2

ample wt/vol: 4.30 (g/mL) G   Lab File ID: E5544

evel: (low/med) MED   Date Received: 12/13/93

Moisture: not dec. 11   Date Analyzed: 12/17/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: 10000 (uL)   Soil Aliquot Volume: 100 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	1300	U
74-83-9	Bromomethane	1300	U
75-01-4	Vinyl Chloride	1300	U
75-00-3	Chloroethane	1300	U
75-09-2	Methylene Chloride	620	~~JB~~ u
67-64-1	Acetone	1300	UJ
75-15-0	Carbon Disulfide	1300	U
75-35-4	1,1-Dichloroethene	1300	U
75-34-3	1,1-Dichloroethane	1300	U
540-59-0	1,2-Dichloroethene (total)	1300	U
67-66-3	Chloroform	1300	U
107-06-2	1,2-Dichloroethane	1300	U
78-93-3	2-Butanone	1300	UJ
71-55-6	1,1,1-Trichloroethane	1300	UJ
56-23-5	Carbon Tetrachloride	1300	U
75-27-4	Bromodichloromethane	1300	U
78-87-5	1,2-Dichloropropane	1300	U
10061-01-5	cis-1,3-Dichloropropene	1300	U
79-01-6	Trichloroethene	1300	U
124-48-1	Dibromochloromethane	1300	U
79-00-5	1,1,2-Trichloroethane	1300	U
71-43-2	Benzene	1300	U
10061-02-6	trans-1,3-Dichloropropene	1300	U
75-25-2	Bromoform	1300	U
108-10-1	4-Methyl-2-Pentanone	1300	UJ
591-78-6	2-Hexanone	1300	UJ
127-18-4	Tetrachloroethene	1300	U
79-34-5	1,1,2,2-Tetrachloroethane	1300	U
108-88-3	Toluene	1300	U
108-90-7	Chlorobenzene	1300	U
100-41-4	Ethylbenzene	6800	
100-42-5	Styrene	1300	U
1330-20-7	Xylene (total)	13000	

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3003

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38736-2

Sample wt/vol: 4.30 (g/mL) G   Lab File ID: E5544

Level: (low/med) MED   Date Received: 12/13/93

% Moisture: not dec. 11   Date Analyzed: 12/17/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: 10000 (uL)   Soil Aliquot Volume: 100 (uL)

CONCENTRATION UNITS:
Number TICs found: 10   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	18.42	10000	J
2. 103651	BENZENE, PROPYL-	22.42	11000	JN
3. 98828	BENZENE, (1-METHYLETHYL)-	22.63	20000	JN
4. 620144	BENZENE, 1-ETHYL-3-METHYL-	23.55	21000	JN
5. 622968	BENZENE, 1-ETHYL-4-METHYL-	24.52	10000	JN
6. 1074175	BENZENE, 1-METHYL-2-PROPYL-	24.84	12000	JN
7. 535773	BENZENE, 1-METHYL-3-(1-METHY	25.00	17000	JN
8. 544763	HEXADECANE	27.14	12000	JN
9. 824226	1H-INDENE, 2,3-DIHYDRO-4-MET	28.41	14000	JN
10. 2471832	1H-INDENE, 1-ETHYLIDENE-	35.34	17000	JN

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3005

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEIO1

atrix: (soil/water) SOIL   Lab Sample ID: 38736-3

ample wt/vol: 4.10 (g/mL) G   Lab File ID: E5545

evel: (low/med) MED   Date Received: 12/13/93

Moisture: not dec. 14   Date Analyzed: 12/17/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: 10000 (uL)   Soil Aliquot Volume: 100 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	1400	U
74-83-9	Bromomethane	1400	U
75-01-4	Vinyl Chloride	1400	U
75-00-3	Chloroethane	1400	U
75-09-2	Methylene Chloride	640	~~J~~ BU
67-64-1	Acetone	1400	UJ
75-15-0	Carbon Disulfide	1400	U
75-35-4	1,1-Dichloroethene	1400	U
75-34-3	1,1-Dichloroethane	1400	U
540-59-0	1,2-Dichloroethene (total)	1400	U
67-66-3	Chloroform	1400	U
107-06-2	1,2-Dichloroethane	1400	U
78-93-3	2-Butanone	1400	UJ
71-55-6	1,1,1-Trichloroethane	1400	UJ
56-23-5	Carbon Tetrachloride	1400	U
75-27-4	Bromodichloromethane	1400	U
78-87-5	1,2-Dichloropropane	1400	U
10061-01-5	cis-1,3-Dichloropropene	1400	U
79-01-6	Trichloroethene	1400	U
124-48-1	Dibromochloromethane	1400	U
79-00-5	1,1,2-Trichloroethane	1400	U
71-43-2	Benzene	410	J
10061-02-6	trans-1,3-Dichloropropene	1400	U
75-25-2	Bromoform	1400	U
108-10-1	4-Methyl-2-Pentanone	1400	UJ
591-78-6	2-Hexanone	4800	J
127-18-4	Tetrachloroethene	1400	U
79-34-5	1,1,2,2-Tetrachloroethane	1400	U
108-88-3	Toluene	280	J
108-90-7	Chlorobenzene	1400	U
100-41-4	Ethylbenzene	14000	
100-42-5	Styrene	1400	U
1330-20-7	Xylene (total)	26000	

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3005

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-3

Sample wt/vol: 4.10 (g/mL) G Lab File ID: E5545

Level: (low/med) MED Date Received: 12/13/93

% Moisture: not dec. 14 Date Analyzed: 12/17/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: 10000 (uL) Soil Aliquot Volume: 100 (uL)

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 5814857	BENZENE, 1,1'-(1-METHYL-1,2-	22.61	43000	JN
2. 611143	BENZENE, 1-ETHYL-2-METHYL-	23.51	48000	JN
3. 622968	BENZENE, 1-ETHYL-4-METHYL-	24.50	24000	JN
4. 1074437	BENZENE, 1-METHYL-3-PROPYL-	24.82	26000	JN
5. 577162	ETHANONE, 1-(2-METHYLPHENYL)	24.98	33000	JN
6. 535773	BENZENE, 1-METHYL-3-(1-METHY	25.65	20000	JN
7. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	26.32	18000	JN
8. 112403	DODECANE	27.12	20000	JN
9. 874351	1H-INDENE, 2,3-DIHYDRO-5-MET	28.39	23000	JN
10. 2471832	1H-INDENE, 1-ETHYLIDENE-	35.28	34000	JN

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB305D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-4

ample wt/vol: 4.20 (g/mL) G Lab File ID: E5546

evel: (low/med) MED Date Received: 12/13/93

Moisture: not dec. 18 Date Analyzed: 12/17/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: 10000 (uL) Soil Aliquot Volume: 100 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	1400	U
74-83-9	Bromomethane	1400	U
75-01-4	Vinyl Chloride	1400	U
75-00-3	Chloroethane	1400	U
75-09-2	Methylene Chloride	700	~~JB~~ U
67-64-1	Acetone	1400	UJ
75-15-0	Carbon Disulfide	1400	U
75-35-4	1,1-Dichloroethene	1400	U
75-34-3	1,1-Dichloroethane	1400	U
540-59-0	1,2-Dichloroethene (total)	1400	U
67-66-3	Chloroform	1400	U
107-06-2	1,2-Dichloroethane	1400	U
78-93-3	2-Butanone	1400	UJ
71-55-6	1,1,1-Trichloroethane	1400	UJ
56-23-5	Carbon Tetrachloride	1400	U
75-27-4	Bromodichloromethane	1400	U
78-87-5	1,2-Dichloropropane	1400	U
10061-01-5	cis-1,3-Dichloropropene	1400	U
79-01-6	Trichloroethene	1400	U
124-48-1	Dibromochloromethane	1400	U
79-00-5	1,1,2-Trichloroethane	1400	U
71-43-2	Benzene	1400	U
10061-02-6	trans-1,3-Dichloropropene	1400	U
75-25-2	Bromoform	1400	U
108-10-1	4-Methyl-2-Pentanone	1400	UJ
591-78-6	2-Hexanone	1800	J
127-18-4	Tetrachloroethene	1400	U
79-34-5	1,1,2,2-Tetrachloroethane	1400	U
108-88-3	Toluene	1400	U
108-90-7	Chlorobenzene	1400	U
100-41-4	Ethylbenzene	9600	
100-42-5	Styrene	1400	U
1330-20-7	Xylene (total)	17000	

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB305D

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-4

Sample wt/vol: 4.20 (g/mL) G Lab File ID: E5546

Level: (low/med) MED Date Received: 12/13/93

% Moisture: not dec. 18 Date Analyzed: 12/17/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: 10000 (uL) Soil Aliquot Volume: 100 (uL)

CONCENTRATION UNITS:
Number TICs found: 10 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 611143	BENZENE, 1-ETHYL-2-METHYL-	22.59	38000	JN
2. 620144	BENZENE, 1-ETHYL-3-METHYL-	23.51	42000	JN
3. 1120214	UNDECANE	24.64	39000	JN
4. 1074437	BENZENE, 1-METHYL-3-PROPYL-	24.82	28000	JN
5. 577162	ETHANONE, 1-(2-METHYLPHENYL)	24.98	35000	JN
6. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	26.32	29000	JN
7. 17312537	DECANE, 3,6-DIMETHYL-	27.10	38000	JN
8.	UNKNOWN	27.38	25000	J
9. 874351	1H-INDENE, 2,3-DIHYDRO-5-MET	28.37	25000	JN
10. 91576	NAPHTHALENE, 2-METHYL-	35.24	29000	JN

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3405

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-7

ample wt/vol: 4.20 (g/mL) G Lab File ID: E5547

evel: (low/med) MED Date Received: 12/13/93

Moisture: not dec. 16 Date Analyzed: 12/17/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 6.7

oil Extract Volume: 10000 (uL) Soil Aliquot Volume: 100 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	9100	U
74-83-9	Bromomethane	9100	U
75-01-4	Vinyl Chloride	9100	U
75-00-3	Chloroethane	9100	U
75-09-2	Methylene Chloride	6000	~~J~~ BU
67-64-1	Acetone	9100	UJ
75-15-0	Carbon Disulfide	9100	U
75-35-4	1,1-Dichloroethene	9100	U
75-34-3	1,1-Dichloroethane	9100	U
540-59-0	1,2-Dichloroethene (total)	9100	U
67-66-3	Chloroform	9100	U
107-06-2	1,2-Dichloroethane	9100	U
78-93-3	2-Butanone	9100	UJ
71-55-6	1,1,1-Trichloroethane	9100	UJ
56-23-5	Carbon Tetrachloride	9100	U
75-27-4	Bromodichloromethane	9100	U
78-87-5	1,2-Dichloropropane	9100	U
10061-01-5	cis-1,3-Dichloropropene	9100	U
79-01-6	Trichloroethene	9100	U
124-48-1	Dibromochloromethane	9100	U
79-00-5	1,1,2-Trichloroethane	9100	U
71-43-2	Benzene	23000	
10061-02-6	trans-1,3-Dichloropropene	9100	U
75-25-2	Bromoform	9100	U
108-10-1	4-Methyl-2-Pentanone	9100	UJ
591-78-6	2-Hexanone	12000	J
127-18-4	Tetrachloroethene	9100	U
79-34-5	1,1,2,2-Tetrachloroethane	9100	U
108-88-3	Toluene	190000	~~E~~ J
108-90-7	Chlorobenzene	9100	U
100-41-4	Ethylbenzene	70000	
100-42-5	Styrene	9100	U
1330-20-7	Xylene (total)	320000	

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1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3405

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-7

Sample wt/vol: 4.20 (g/mL) G Lab File ID: E5547

Level: (low/med) MED Date Received: 12/13/93

% Moisture: not dec. 16 Date Analyzed: 12/17/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 6.7

Soil Extract Volume: 10000 (uL) Soil Aliquot Volume: 100 (uL)

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	15.46	69000	J
2. 98828	BENZENE, (1-METHYLETHYL)-	22.57	140000	JN
3.	UNKNOWN	22.68	60000	J
4. 622968	BENZENE, 1-ETHYL-4-METHYL-	23.49	190000	JN
5. 95636	BENZENE, 1,2,4-TRIMETHYL-	24.45	63000	JN
6. 1074175	BENZENE, 1-METHYL-2-PROPYL-	24.78	65000	JN
7. 2870044	BENZENE, 2-ETHYL-1,3-DIMETHY	24.94	70000	JN
8. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	26.27	72000	JN
9. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	28.35	82000	JN
10. 91576	NAPHTHALENE, 2-METHYL-	35.23	66000	JN

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB2903

ab ame: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-1

ample wt/vol: 5.20 (g/mL) G   Lab File ID: D8579

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: not dec. 14   Date Analyzed: 12/16/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	11	UJ
74-83-9	Bromomethane	11	U
75-01-4	Vinyl Chloride	11	U
75-00-3	Chloroethane	11	U
75-09-2	Methylene Chloride	18	~~B~~ BU
67-64-1	Acetone	40	J
75-15-0	Carbon Disulfide	11	U
75-35-4	1,1-Dichloroethene	11	U
75-34-3	1,1-Dichloroethane	11	U
540-59-0	1,2-Dichloroethene (total)	11	U
67-66-3	Chloroform	11	U
107-06-2	1,2-Dichloroethane	11	U
78-93-3	2-Butanone	11	UJ
71-55-6	1,1,1-Trichloroethane	11	U
56-23-5	Carbon Tetrachloride	11	U
75-27-4	Bromodichloromethane	11	U
78-87-5	1,2-Dichloropropane	11	U
10061-01-5	cis-1,3-Dichloropropene	11	U
79-01-6	Trichloroethene	7	J
124-48-1	Dibromochloromethane	11	U
79-00-5	1,1,2-Trichloroethane	11	U
71-43-2	Benzene	11	U
10061-02-6	trans-1,3-Dichloropropene	11	U
75-25-2	Bromoform	11	U
108-10-1	4-Methyl-2-Pentanone	11	UJ
591-78-6	2-Hexanone	11	UJ
127-18-4	Tetrachloroethene	11	U
79-34-5	1,1,2,2-Tetrachloroethane	11	U
108-88-3	Toluene	11	U
108-90-7	Chlorobenzene	11	U
100-41-4	Ethylbenzene	11	U
100-42-5	Styrene	11	U
1330-20-7	Xylene (total)	11	U

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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB2903

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-1

ample wt/vol: 5.20 (g/mL) G Lab File ID: D8579

evel: (low/med) LOW Date Received: 12/13/93

Moisture: not dec. 14 Date Analyzed: 12/16/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 67630	2-PROPANOL	6.55	7	JN

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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3203

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-5

ample wt/vol: 2.00 (g/mL) G Lab File ID: D8580

evel: (low/med) LOW Date Received: 12/13/93

Moisture: not dec. 12 Date Analyzed: 12/16/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	28	UJ
74-83-9	Bromomethane	28	U
75-01-4	Vinyl Chloride	28	U
75-00-3	Chloroethane	28	U
75-09-2	Methylene Chloride	35	~~B~~ U
67-64-1	Acetone	150	J
75-15-0	Carbon Disulfide	28	U
75-35-4	1,1-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
540-59-0	1,2-Dichloroethene (total)	28	U
67-66-3	Chloroform	28	U
107-06-2	1,2-Dichloroethane	28	U
78-93-3	2-Butanone	28	UJ
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
75-27-4	Bromodichloromethane	28	U
78-87-5	1,2-Dichloropropane	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-01-6	Trichloroethene	28	U
124-48-1	Dibromochloromethane	28	U
79-00-5	1,1,2-Trichloroethane	28	U
71-43-2	Benzene	28	U
10061-02-6	trans-1,3-Dichloropropene	28	U
75-25-2	Bromoform	28	U
108-10-1	4-Methyl-2-Pentanone	28	UJ
591-78-6	2-Hexanone	28	UJ
127-18-4	Tetrachloroethene	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U
108-88-3	Toluene	28	U
108-90-7	Chlorobenzene	28	U
100-41-4	Ethylbenzene	28	U
100-42-5	Styrene	28	U
1330-20-7	Xylene (total)	28	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3203

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-5

ample wt/vol: 2.00 (g/mL) G Lab File ID: D8580

evel: (low/med) LOW Date Received: 12/13/93

Moisture: not dec. 12 Date Analyzed: 12/16/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3502

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-6

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8581

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: not dec. 19   Date Analyzed: 12/16/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	UJ
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	13	~~B~~ BU
67-64-1	Acetone	26	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
540-59-0	1,2-Dichloroethene (total)	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	12	UJ
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	12	UJ
591-78-6	2-Hexanone	12	UJ
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
1330-20-7	Xylene (total)	12	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

| SB3502 |

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-6

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8581

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: not dec. 19   Date Analyzed: 12/16/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

Number TICs found: 0   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3102

ab me: PACE NEW ENGLA - Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-9

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8582

evel: (low/med) LOW Date Received: 12/13/93

Moisture: not dec. 13 Date Analyzed: 12/16/93

Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	UJ
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	15	~~B~~ BU
67-64-1	Acetone	27	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
540-59-0	1,2-Dichloroethene (total)	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	12	UJ
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	6	J
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	12	UJ
591-78-6	2-Hexanone	12	UJ
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
1330-20-7	Xylene (total)	12	U

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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3102

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-9

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8582

evel: (low/med) LOW Date Received: 12/13/93

Moisture: not dec. 13 Date Analyzed: 12/16/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB06

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-1

ample wt/vol: 1.00 (g/mL) G   Lab File ID: D8662

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 67   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	150	UJ
74-83-9	Bromomethane	150	U
75-01-4	Vinyl Chloride	150	UJ
75-00-3	Chloroethane	150	U
75-09-2	Methylene Chloride	380	~~B~~ BU
67-64-1	Acetone	1300	J
75-15-0	Carbon Disulfide	150	U
75-35-4	1,1-Dichloroethene	150	U
75-34-3	1,1-Dichloroethane	150	U
540-59-0	1,2-Dichloroethene (total)	150	U
67-66-3	Chloroform	150	U
107-06-2	1,2-Dichloroethane	150	U
78-93-3	2-Butanone	150	UJ
71-55-6	1,1,1-Trichloroethane	150	U
56-23-5	Carbon Tetrachloride	150	U
75-27-4	Bromodichloromethane	150	U
78-87-5	1,2-Dichloropropane	150	U
10061-01-5	cis-1,3-Dichloropropene	150	U
79-01-6	Trichloroethene	150	U
124-48-1	Dibromochloromethane	150	U
79-00-5	1,1,2-Trichloroethane	150	U
71-43-2	Benzene	150	U
10061-02-6	trans-1,3-Dichloropropene	150	U
75-25-2	Bromoform	150	U
108-10-1	4-Methyl-2-Pentanone	150	UJ
591-78-6	2-Hexanone	150	UJ
127-18-4	Tetrachloroethene	150	U
79-34-5	1,1,2,2-Tetrachloroethane	150	U
108-88-3	Toluene	150	U
108-90-7	Chlorobenzene	150	U
100-41-4	Ethylbenzene	150	U
100-42-5	Styrene	150	U
1330-20-7	Xylene (total)	150	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB06

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-1

ample wt/vol: 1.00 (g/mL) G Lab File ID: D8662

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 67 Date Analyzed: 12/21/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3305

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-8

ample wt/vol: 4.90 (g/mL) G   Lab File ID: D8651

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: not dec. 14   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	UJ
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	UJ
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	22	~~B~~u
67-64-1	Acetone	51	J
75-15-0	Carbon Disulfide	12	U
75-35-4	1,1-Dichloroethene	12	U
75-34-3	1,1-Dichloroethane	12	U
540-59-0	1,2-Dichloroethene (total)	12	U
67-66-3	Chloroform	12	U
107-06-2	1,2-Dichloroethane	12	U
78-93-3	2-Butanone	12	UJ
71-55-6	1,1,1-Trichloroethane	12	U
56-23-5	Carbon Tetrachloride	12	U
75-27-4	Bromodichloromethane	12	U
78-87-5	1,2-Dichloropropane	12	U
10061-01-5	cis-1,3-Dichloropropene	12	U
79-01-6	Trichloroethene	12	U
124-48-1	Dibromochloromethane	12	U
79-00-5	1,1,2-Trichloroethane	12	U
71-43-2	Benzene	12	U
10061-02-6	trans-1,3-Dichloropropene	12	U
75-25-2	Bromoform	12	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	12	U
79-34-5	1,1,2,2-Tetrachloroethane	12	U
108-88-3	Toluene	12	U
108-90-7	Chlorobenzene	12	U
100-41-4	Ethylbenzene	12	U
100-42-5	Styrene	12	U
1330-20-7	Xylene (total)	12	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3305

b Name: PACE NEW ENGLA   Contract: NEESAC

b Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

trix: (soil/water) SOIL   Lab Sample ID: 38736-8

mple wt/vol: 4.90 (g/mL) G   Lab File ID: D8651

vel: (low/med) LOW   Date Received: 12/13/93

Moisture: not dec. 14   Date Analyzed: 12/21/93

Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

il Extract Volume: (uL)   Soil Aliquot Volume: (uL)

umber TICs found: 1   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 67630	2-PROPANOL	6.59	8	JN

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07

b ne: PACE NEW ENGLA Contract: NEESAC

b Code: Case No.: BAKER SAS No.: SDG No.: GEI01

trix: (soil/water) SOIL Lab Sample ID: 38778-2

mple wt/vol: 5.10 (g/mL) G Lab File ID: D8661

vel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 38 Date Analyzed: 12/21/93

Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

il Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	16	UJ
74-83-9	Bromomethane	16	U
75-01-4	Vinyl Chloride	16	U
75-00-3	Chloroethane	16	U
75-09-2	Methylene Chloride	61	~~B~~UJ
67-64-1	Acetone	330	~~E~~J
75-15-0	Carbon Disulfide	16	UJ
75-35-4	1,1-Dichloroethene	16	U
75-34-3	1,1-Dichloroethane	16	U
540-59-0	1,2-Dichloroethene (total)	16	U
67-66-3	Chloroform	16	U
107-06-2	1,2-Dichloroethane	16	U
78-93-3	2-Butanone	16	U
71-55-6	1,1,1-Trichloroethane	16	U
56-23-5	Carbon Tetrachloride	16	U
75-27-4	Bromodichloromethane	16	U
78-87-5	1,2-Dichloropropane	16	U
10061-01-5	cis-1,3-Dichloropropene	16	U
79-01-6	Trichloroethene	16	U
124-48-1	Dibromochloromethane	16	U
79-00-5	1,1,2-Trichloroethane	16	U
71-43-2	Benzene	16	U
10061-02-6	trans-1,3-Dichloropropene	16	U
75-25-2	Bromoform	16	U
108-10-1	4-Methyl-2-Pentanone	16	U
591-78-6	2-Hexanone	16	U
127-18-4	Tetrachloroethene	16	U
79-34-5	1,1,2,2-Tetrachloroethane	16	U
108-88-3	Toluene	16	U
108-90-7	Chlorobenzene	16	U
100-41-4	Ethylbenzene	16	U
100-42-5	Styrene	16	U
1330-20-7	Xylene (total)	16	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB07

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: 38778-2

ample wt/vol: 5.10 (g/mL) G Lab File ID: D8661

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 38 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.07	9	J

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07RE

Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-2RE

Sample wt/vol: 5.30 (g/mL) G Lab File ID: D8682

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 38 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	15	UJ
74-83-9	Bromomethane	15	U
75-01-4	Vinyl Chloride	15	U
75-00-3	Chloroethane	15	U
75-09-2	Methylene Chloride	13	~~JB~~ ~~B~~ UJ
67-64-1	Acetone	110	J
75-15-0	Carbon Disulfide	15	UJ
75-35-4	1,1-Dichloroethene	15	U
75-34-3	1,1-Dichloroethane	15	U
540-59-0	1,2-Dichloroethene (total)	15	U
67-66-3	Chloroform	15	U
107-06-2	1,2-Dichloroethane	15	U
78-93-3	2-Butanone	15	U
71-55-6	1,1,1-Trichloroethane	15	U
56-23-5	Carbon Tetrachloride	15	U
75-27-4	Bromodichloromethane	15	U
78-87-5	1,2-Dichloropropane	15	U
10061-01-5	cis-1,3-Dichloropropene	15	U
79-01-6	Trichloroethene	15	U
124-48-1	Dibromochloromethane	15	U
79-00-5	1,1,2-Trichloroethane	15	U
71-43-2	Benzene	15	U
10061-02-6	trans-1,3-Dichloropropene	15	U
75-25-2	Bromoform	15	U
108-10-1	4-Methyl-2-Pentanone	15	U
591-78-6	2-Hexanone	15	U
127-18-4	Tetrachloroethene	15	U
79-34-5	1,1,2,2-Tetrachloroethane	15	U
108-88-3	Toluene	15	U
108-90-7	Chlorobenzene	15	U
100-41-4	Ethylbenzene	15	U
100-42-5	Styrene	15	U
1330-20-7	Xylene (total)	15	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB07RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-2RE

ample wt/vol: 5.30 (g/mL) G Lab File ID: D8682

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 38 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01

ab ame: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-3

ample wt/vol: 1.00 (g/mL) G   Lab File ID: D8663

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 72   Date Analyzed: 12/21/93

: Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	180	U J
74-83-9	Bromomethane	180	U
75-01-4	Vinyl Chloride	180	U
75-00-3	Chloroethane	180	U
75-09-2	Methylene Chloride	440	~~B~~ BUJ
67-64-1	Acetone	2600	J
75-15-0	Carbon Disulfide	180	U J
75-35-4	1,1-Dichloroethene	180	U
75-34-3	1,1-Dichloroethane	180	U
540-59-0	1,2-Dichloroethene (total)	180	U
67-66-3	Chloroform	180	U
107-06-2	1,2-Dichloroethane	180	U
78-93-3	2-Butanone	180	U
71-55-6	1,1,1-Trichloroethane	180	U
56-23-5	Carbon Tetrachloride	180	U
75-27-4	Bromodichloromethane	180	U
78-87-5	1,2-Dichloropropane	180	U
10061-01-5	cis-1,3-Dichloropropene	180	U
79-01-6	Trichloroethene	180	U
124-48-1	Dibromochloromethane	180	U
79-00-5	1,1,2-Trichloroethane	180	U
71-43-2	Benzene	180	U
10061-02-6	trans-1,3-Dichloropropene	180	U
75-25-2	Bromoform	180	U
108-10-1	4-Methyl-2-Pentanone	180	U
591-78-6	2-Hexanone	180	U
127-18-4	Tetrachloroethene	180	U
79-34-5	1,1,2,2-Tetrachloroethane	180	U
108-88-3	Toluene	180	U
108-90-7	Chlorobenzene	180	U
100-41-4	Ethylbenzene	180	U
100-42-5	Styrene	180	U
1330-20-7	Xylene (total)	180	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB01

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-3

ample wt/vol: 1.00 (g/mL) G Lab File ID: D8663

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 72 Date Analyzed: 12/21/93

Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-3RE

Sample wt/vol: 4.90 (g/mL) G   Lab File ID: D8676

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 72   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	36	UJ
74-83-9	Bromomethane	36	U
75-01-4	Vinyl Chloride	36	U
75-00-3	Chloroethane	36	U
75-09-2	Methylene Chloride	38	~~B~~BUJ
67-64-1	Acetone	180	J
75-15-0	Carbon Disulfide	36	UJ
75-35-4	1,1-Dichloroethene	36	U
75-34-3	1,1-Dichloroethane	36	U
540-59-0	1,2-Dichloroethene (total)	36	U
67-66-3	Chloroform	36	U
107-06-2	1,2-Dichloroethane	36	U
78-93-3	2-Butanone	36	U
71-55-6	1,1,1-Trichloroethane	36	U
56-23-5	Carbon Tetrachloride	36	U
75-27-4	Bromodichloromethane	36	U
78-87-5	1,2-Dichloropropane	36	U
10061-01-5	cis-1,3-Dichloropropene	36	U
79-01-6	Trichloroethene	36	U
124-48-1	Dibromochloromethane	36	U
79-00-5	1,1,2-Trichloroethane	36	U
71-43-2	Benzene	36	U
10061-02-6	trans-1,3-Dichloropropene	36	U
75-25-2	Bromoform	36	U
108-10-1	4-Methyl-2-Pentanone	36	U
591-78-6	2-Hexanone	36	U
127-18-4	Tetrachloroethene	36	U
79-34-5	1,1,2,2-Tetrachloroethane	36	U
108-88-3	Toluene	36	U
108-90-7	Chlorobenzene	36	U
100-41-4	Ethylbenzene	36	U
100-42-5	Styrene	36	U
1330-20-7	Xylene (total)	36	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB01RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-3RE

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8676

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 72 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	24.71	29	J

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08

ab me: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-4

ample wt/vol: 1.00 (g/mL) G   Lab File ID: D8664

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 57   Date Analyzed: 12/21/93

 Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	UG/KG	Q
74-87-3	Chloromethane	120	U J
74-83-9	Bromomethane	120	U
75-01-4	Vinyl Chloride	120	U
75-00-3	Chloroethane	120	U
75-09-2	Methylene Chloride	250	~~B~~ UJ
67-64-1	Acetone	1500	J
75-15-0	Carbon Disulfide	120	U J
75-35-4	1,1-Dichloroethene	120	U
75-34-3	1,1-Dichloroethane	120	U
540-59-0	1,2-Dichloroethene (total)	120	U
67-66-3	Chloroform	120	U
107-06-2	1,2-Dichloroethane	120	U
78-93-3	2-Butanone	120	U
71-55-6	1,1,1-Trichloroethane	120	U
56-23-5	Carbon Tetrachloride	120	U
75-27-4	Bromodichloromethane	120	U
78-87-5	1,2-Dichloropropane	120	U
10061-01-5	cis-1,3-Dichloropropene	120	U
79-01-6	Trichloroethene	120	U
124-48-1	Dibromochloromethane	120	U
79-00-5	1,1,2-Trichloroethane	120	U
71-43-2	Benzene	120	U
10061-02-6	trans-1,3-Dichloropropene	120	U
75-25-2	Bromoform	120	U
108-10-1	4-Methyl-2-Pentanone	120	U
591-78-6	2-Hexanone	120	U
127-18-4	Tetrachloroethene	120	U
79-34-5	1,1,2,2-Tetrachloroethane	120	U
108-88-3	Toluene	120	U
108-90-7	Chlorobenzene	120	U
100-41-4	Ethylbenzene	120	U
100-42-5	Styrene	120	U
1330-20-7	Xylene (total)	120	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB08

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-4

ample wt/vol: 1.00 (g/mL) G   Lab File ID: D8664

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 57   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08RE

Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-4RE

Sample wt/vol: 5.00 (g/mL) G   Lab File ID: D8677

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 57   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	23	U J
74-83-9	Bromomethane	23	U
75-01-4	Vinyl Chloride	23	U
75-00-3	Chloroethane	23	U
75-09-2	Methylene Chloride	25	~~B~~ UJ
67-64-1	Acetone	160	J
75-15-0	Carbon Disulfide	23	U J
75-35-4	1,1-Dichloroethene	23	U
75-34-3	1,1-Dichloroethane	23	U
540-59-0	1,2-Dichloroethene (total)	23	U
67-66-3	Chloroform	23	U
107-06-2	1,2-Dichloroethane	23	U
78-93-3	2-Butanone	23	U
71-55-6	1,1,1-Trichloroethane	23	U
56-23-5	Carbon Tetrachloride	23	U
75-27-4	Bromodichloromethane	23	U
78-87-5	1,2-Dichloropropane	23	U
10061-01-5	cis-1,3-Dichloropropene	23	U
79-01-6	Trichloroethene	23	U
124-48-1	Dibromochloromethane	23	U
79-00-5	1,1,2-Trichloroethane	23	U
71-43-2	Benzene	23	U
10061-02-6	trans-1,3-Dichloropropene	23	U
75-25-2	Bromoform	23	U
108-10-1	4-Methyl-2-Pentanone	23	U
591-78-6	2-Hexanone	23	U
127-18-4	Tetrachloroethene	23	U
79-34-5	1,1,2,2-Tetrachloroethane	23	U
108-88-3	Toluene	23	U
108-90-7	Chlorobenzene	23	U
100-41-4	Ethylbenzene	23	U
100-42-5	Styrene	23	U
1330-20-7	Xylene (total)	23	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB08RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-4RE

ample wt/vol: 5.00 (g/mL) G Lab File ID: D8677

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 57 Date Analyzed: 12/22/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 3 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 80568	.ALPHA.-PINENE (ACN)	24.71	740	JN
2.	UNKNOWN	26.61	21	J
3.	UNKNOWN	26.86	14	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09

:b me: PACE NEW ENGLA   Contract: NEESAC

:b Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

:trix: (soil/water) SOIL   Lab Sample ID: 38778-5

ample wt/vol: 4.90 (g/mL) G   Lab File ID: D8660

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 66   Date Analyzed: 12/21/93

Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

:il Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	30	UJ
74-83-9	Bromomethane	30	U
75-01-4	Vinyl Chloride	30	U
75-00-3	Chloroethane	30	U
75-09-2	Methylene Chloride	80	~~B~~ UJ
67-64-1	Acetone	750	EJ
75-15-0	Carbon Disulfide	30	UJ
75-35-4	1,1-Dichloroethene	30	U
75-34-3	1,1-Dichloroethane	30	U
540-59-0	1,2-Dichloroethene (total)	30	U
67-66-3	Chloroform	30	U
107-06-2	1,2-Dichloroethane	30	U
78-93-3	2-Butanone	30	U
71-55-6	1,1,1-Trichloroethane	30	U
56-23-5	Carbon Tetrachloride	30	U
75-27-4	Bromodichloromethane	30	U
78-87-5	1,2-Dichloropropane	30	U
10061-01-5	cis-1,3-Dichloropropene	30	U
79-01-6	Trichloroethene	30	U
124-48-1	Dibromochloromethane	30	U
79-00-5	1,1,2-Trichloroethane	30	U
71-43-2	Benzene	30	U
10061-02-6	trans-1,3-Dichloropropene	30	U
75-25-2	Bromoform	30	U
108-10-1	4-Methyl-2-Pentanone	30	U
591-78-6	2-Hexanone	30	U
127-18-4	Tetrachloroethene	30	U
79-34-5	1,1,2,2-Tetrachloroethane	30	U
108-88-3	Toluene	30	U
108-90-7	Chlorobenzene	30	U
100-41-4	Ethylbenzene	30	U
100-42-5	Styrene	30	U
1330-20-7	Xylene (total)	30	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB09

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-5

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8660

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 66 Date Analyzed: 12/21/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.05	18	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09RE

Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-5RE

Sample wt/vol: 5.30 (g/mL) G Lab File ID: D8683

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 66 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	28	UJ
74-83-9	Bromomethane	28	U
75-01-4	Vinyl Chloride	28	U
75-00-3	Chloroethane	28	U
75-09-2	Methylene Chloride	30	BUJ
67-64-1	Acetone	92	J
75-15-0	Carbon Disulfide	28	UJ
75-35-4	1,1-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
540-59-0	1,2-Dichloroethene (total)	28	U
67-66-3	Chloroform	28	U
107-06-2	1,2-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
75-27-4	Bromodichloromethane	28	U
78-87-5	1,2-Dichloropropane	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-01-6	Trichloroethene	28	U
124-48-1	Dibromochloromethane	28	U
79-00-5	1,1,2-Trichloroethane	28	U
71-43-2	Benzene	28	U
10061-02-6	trans-1,3-Dichloropropene	28	U
75-25-2	Bromoform	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
591-78-6	2-Hexanone	28	U
127-18-4	Tetrachloroethene	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U
108-88-3	Toluene	28	U
108-90-7	Chlorobenzene	28	U
100-41-4	Ethylbenzene	28	U
100-42-5	Styrene	28	U
1330-20-7	Xylene (total)	28	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB09RE

ıb Name: PACE NEW ENGLA Contract: NEESAC

ıb Code: Case No.: BAKER SAS No.: SDG No.: GEI01

ıtrix: (soil/water) SOIL Lab Sample ID: 38778-5RE

ımple wt/vol: 5.30 (g/mL) G Lab File ID: D8683

ıvel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 66 Date Analyzed: 12/22/93

Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

ıil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
lumber TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

100065

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6

ample wt/vol: 5.00 (g/mL) G   Lab File ID: D8652

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	48	UJ
74-83-9	Bromomethane	48	U
75-01-4	Vinyl Chloride	48	U
75-00-3	Chloroethane	48	U
75-09-2	Methylene Chloride	140	~~B~~ UJ
67-64-1	Acetone	1600	~~E~~ J
75-15-0	Carbon Disulfide	48	UJ
75-35-4	1,1-Dichloroethene	48	U
75-34-3	1,1-Dichloroethane	48	U
540-59-0	1,2-Dichloroethene (total)	48	U
67-66-3	Chloroform	48	U
107-06-2	1,2-Dichloroethane	48	U
78-93-3	2-Butanone	48	U
71-55-6	1,1,1-Trichloroethane	48	U
56-23-5	Carbon Tetrachloride	48	U
75-27-4	Bromodichloromethane	48	U
78-87-5	1,2-Dichloropropane	48	U
10061-01-5	cis-1,3-Dichloropropene	48	U
79-01-6	Trichloroethene	48	U
124-48-1	Dibromochloromethane	48	U
79-00-5	1,1,2-Trichloroethane	48	U
71-43-2	Benzene	48	U
10061-02-6	trans-1,3-Dichloropropene	48	U
75-25-2	Bromoform	48	U
108-10-1	4-Methyl-2-Pentanone	48	U
591-78-6	2-Hexanone	48	U
127-18-4	Tetrachloroethene	48	U
79-34-5	1,1,2,2-Tetrachloroethane	48	U
108-88-3	Toluene	48	U
108-90-7	Chlorobenzene	48	U
100-41-4	Ethylbenzene	48	U
100-42-5	Styrene	48	U
1330-20-7	Xylene (total)	48	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB10

Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6

ample wt/vol: 5.00 (g/mL) G   Lab File ID: D8652

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/21/93

Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
umber TICs found: 1   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.05	33	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10RE

Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-6RE

Sample wt/vol: 5.10 (g/mL) G   Lab File ID: D8684

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 79   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	47	UJ
74-83-9	Bromomethane	47	U
75-01-4	Vinyl Chloride	47	U
75-00-3	Chloroethane	47	U
75-09-2	Methylene Chloride	52	~~B~~UJ
67-64-1	Acetone	140	J
75-15-0	Carbon Disulfide	47	UJ
75-35-4	1,1-Dichloroethene	47	U
75-34-3	1,1-Dichloroethane	47	U
540-59-0	1,2-Dichloroethene (total)	47	U
67-66-3	Chloroform	47	U
107-06-2	1,2-Dichloroethane	47	U
78-93-3	2-Butanone	47	U
71-55-6	1,1,1-Trichloroethane	47	U
56-23-5	Carbon Tetrachloride	47	U
75-27-4	Bromodichloromethane	47	U
78-87-5	1,2-Dichloropropane	47	U
10061-01-5	cis-1,3-Dichloropropene	47	U
79-01-6	Trichloroethene	47	U
124-48-1	Dibromochloromethane	47	U
79-00-5	1,1,2-Trichloroethane	47	U
71-43-2	Benzene	47	U
10061-02-6	trans-1,3-Dichloropropene	47	U
75-25-2	Bromoform	47	U
108-10-1	4-Methyl-2-Pentanone	47	U
591-78-6	2-Hexanone	47	U
127-18-4	Tetrachloroethene	47	U
79-34-5	1,1,2,2-Tetrachloroethane	47	U
108-88-3	Toluene	47	U
108-90-7	Chlorobenzene	47	U
100-41-4	Ethylbenzene	47	U
100-42-5	Styrene	47	U
1330-20-7	Xylene (total)	47	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB10RE

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6RE

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8684

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/22/93

: Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB03

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-7

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8653

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 48   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	19	UJ
74-83-9	Bromomethane	19	U
75-01-4	Vinyl Chloride	19	U
75-00-3	Chloroethane	19	U
75-09-2	Methylene Chloride	41	~~B~~ UJ
67-64-1	Acetone	350	J
75-15-0	Carbon Disulfide	19	UJ
75-35-4	1,1-Dichloroethene	19	U
75-34-3	1,1-Dichloroethane	19	U
540-59-0	1,2-Dichloroethene (total)	19	U
67-66-3	Chloroform	19	U
107-06-2	1,2-Dichloroethane	19	U
78-93-3	2-Butanone	19	U
71-55-6	1,1,1-Trichloroethane	19	U
56-23-5	Carbon Tetrachloride	19	U
75-27-4	Bromodichloromethane	19	U
78-87-5	1,2-Dichloropropane	19	U
10061-01-5	cis-1,3-Dichloropropene	19	U
79-01-6	Trichloroethene	19	U
124-48-1	Dibromochloromethane	19	U
79-00-5	1,1,2-Trichloroethane	19	U
71-43-2	Benzene	19	U
10061-02-6	trans-1,3-Dichloropropene	19	U
75-25-2	Bromoform	19	U
108-10-1	4-Methyl-2-Pentanone	19	U
591-78-6	2-Hexanone	19	U
127-18-4	Tetrachloroethene	19	U
79-34-5	1,1,2,2-Tetrachloroethane	19	U
108-88-3	Toluene	19	U
108-90-7	Chlorobenzene	19	U
100-41-4	Ethylbenzene	19	U
100-42-5	Styrene	19	U
1330-20-7	Xylene (total)	19	U

FORM I VOA   3/90

100070

SHOULD HAVE BEEN RE-RUN

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB03

ıb Name: PACE NEW ENGLA   Contract: NEESAC

ıb Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

ıtrix: (soil/water) SOIL   Lab Sample ID: 38778-7

ımple wt/vol: 5.10 (g/mL) G   Lab File ID: D8653

ıvel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 48   Date Analyzed: 12/21/93

Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

ıil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
ıumber TICs found: 2   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 67630	2-PROPANOL	6.60	9	JN
2.	UNKNOWN	9.05	15	J

100071   FORM I VOA-TIC   3/90

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-8

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8656

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 56   Date Analyzed: 12/21/93

Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	22	U J
74-83-9	Bromomethane	22	U
75-01-4	Vinyl Chloride	22	U
75-00-3	Chloroethane	22	U
75-09-2	Methylene Chloride	61	~~B~~ UJ
67-64-1	Acetone	430	J
75-15-0	Carbon Disulfide	22	U J
75-35-4	1,1-Dichloroethene	22	U
75-34-3	1,1-Dichloroethane	22	U
540-59-0	1,2-Dichloroethene (total)	22	U
67-66-3	Chloroform	22	U
107-06-2	1,2-Dichloroethane	22	U
78-93-3	2-Butanone	22	U
71-55-6	1,1,1-Trichloroethane	22	U
56-23-5	Carbon Tetrachloride	22	U
75-27-4	Bromodichloromethane	22	U
78-87-5	1,2-Dichloropropane	22	U
10061-01-5	cis-1,3-Dichloropropene	22	U
79-01-6	Trichloroethene	22	U
124-48-1	Dibromochloromethane	22	U
79-00-5	1,1,2-Trichloroethane	22	U
71-43-2	Benzene	22	U
10061-02-6	trans-1,3-Dichloropropene	22	U
75-25-2	Bromoform	22	U
108-10-1	4-Methyl-2-Pentanone	22	U
591-78-6	2-Hexanone	22	U
127-18-4	Tetrachloroethene	22	U
79-34-5	1,1,2,2-Tetrachloroethane	22	U
108-88-3	Toluene	22	U
108-90-7	Chlorobenzene	22	U
100-41-4	Ethylbenzene	22	U
100-42-5	Styrene	22	U
1330-20-7	Xylene (total)	22	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-8

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8656

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 56   Date Analyzed: 12/21/93

: Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 1   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.04	16	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3DRE

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-8RE

Sample wt/vol: 5.20 (g/mL) G Lab File ID: D8678

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 56 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	22	UJ
74-83-9	Bromomethane	22	U
75-01-4	Vinyl Chloride	22	U
75-00-3	Chloroethane	22	U
75-09-2	Methylene Chloride	16	~~JB~~ UJ
67-64-1	Acetone	22	UJ
75-15-0	Carbon Disulfide	22	U
75-35-4	1,1-Dichloroethene	22	U
75-34-3	1,1-Dichloroethane	22	U
540-59-0	1,2-Dichloroethene (total)	22	U
67-66-3	Chloroform	22	U
107-06-2	1,2-Dichloroethane	22	U
78-93-3	2-Butanone	22	U
71-55-6	1,1,1-Trichloroethane	22	U
56-23-5	Carbon Tetrachloride	22	U
75-27-4	Bromodichloromethane	22	U
78-87-5	1,2-Dichloropropane	22	U
10061-01-5	cis-1,3-Dichloropropene	22	U
79-01-6	Trichloroethene	22	U
124-48-1	Dibromochloromethane	22	U
79-00-5	1,1,2-Trichloroethane	22	U
71-43-2	Benzene	22	U
10061-02-6	trans-1,3-Dichloropropene	22	U
75-25-2	Bromoform	22	U
108-10-1	4-Methyl-2-Pentanone	22	U
591-78-6	2-Hexanone	22	U
127-18-4	Tetrachloroethene	22	U
79-34-5	1,1,2,2-Tetrachloroethane	22	U
108-88-3	Toluene	22	U
108-90-7	Chlorobenzene	22	U
100-41-4	Ethylbenzene	22	U
100-42-5	Styrene	22	U
1330-20-7	Xylene (total)	22	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB3DRE

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-8RE

Sample wt/vol: 5.20 (g/mL) G Lab File ID: D8678

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 56 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02

ab me: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-9

ample wt/vol: 5.20 (g/mL) G   Lab File ID: D8657

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 46   Date Analyzed: 12/21/93

: Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	18	UJ
74-83-9	Bromomethane	18	U
75-01-4	Vinyl Chloride	18	U
75-00-3	Chloroethane	18	U
75-09-2	Methylene Chloride	54	~~B~~ UJ
67-64-1	Acetone	260	J
75-15-0	Carbon Disulfide	18	UJ
75-35-4	1,1-Dichloroethene	18	U
75-34-3	1,1-Dichloroethane	18	U
540-59-0	1,2-Dichloroethene (total)	18	U
67-66-3	Chloroform	18	U
107-06-2	1,2-Dichloroethane	18	U
78-93-3	2-Butanone	18	U
71-55-6	1,1,1-Trichloroethane	18	U
56-23-5	Carbon Tetrachloride	18	U
75-27-4	Bromodichloromethane	18	U
78-87-5	1,2-Dichloropropane	18	U
10061-01-5	cis-1,3-Dichloropropene	18	U
79-01-6	Trichloroethene	18	U
124-48-1	Dibromochloromethane	18	U
79-00-5	1,1,2-Trichloroethane	18	U
71-43-2	Benzene	18	U
10061-02-6	trans-1,3-Dichloropropene	18	U
75-25-2	Bromoform	18	U
108-10-1	4-Methyl-2-Pentanone	18	U
591-78-6	2-Hexanone	18	U
127-18-4	Tetrachloroethene	18	U
79-34-5	1,1,2,2-Tetrachloroethane	18	U
108-88-3	Toluene	18	U
108-90-7	Chlorobenzene	18	U
100-41-4	Ethylbenzene	18	U
100-42-5	Styrene	18	U
1330-20-7	Xylene (total)	18	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB02

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-9

ample wt/vol: 5.20 (g/mL) G Lab File ID: D8657

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 46 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 3779611	1,3,6-OCTATRIENE, 3,7-DIMETH	24.74	45	JN

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02RE

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-9RE

Sample wt/vol: 5.10 (g/mL) G Lab File ID: D8679

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 46 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	18	UJ
74-83-9	Bromomethane	18	U
75-01-4	Vinyl Chloride	18	U
75-00-3	Chloroethane	18	U
75-09-2	Methylene Chloride	23	~~B~~ UJ
67-64-1	Acetone	18	UJ
75-15-0	Carbon Disulfide	18	U
75-35-4	1,1-Dichloroethene	18	U
75-34-3	1,1-Dichloroethane	18	U
540-59-0	1,2-Dichloroethene (total)	18	U
67-66-3	Chloroform	18	U
107-06-2	1,2-Dichloroethane	18	U
78-93-3	2-Butanone	18	U
71-55-6	1,1,1-Trichloroethane	18	U
56-23-5	Carbon Tetrachloride	18	U
75-27-4	Bromodichloromethane	18	U
78-87-5	1,2-Dichloropropane	18	U
10061-01-5	cis-1,3-Dichloropropene	18	U
79-01-6	Trichloroethene	18	U
124-48-1	Dibromochloromethane	18	U
79-00-5	1,1,2-Trichloroethane	18	U
71-43-2	Benzene	18	U
10061-02-6	trans-1,3-Dichloropropene	18	U
75-25-2	Bromoform	18	U
108-10-1	4-Methyl-2-Pentanone	18	U
591-78-6	2-Hexanone	18	U
127-18-4	Tetrachloroethene	18	U
79-34-5	1,1,2,2-Tetrachloroethane	18	U
108-88-3	Toluene	18	U
108-90-7	Chlorobenzene	18	U
100-41-4	Ethylbenzene	18	U
100-42-5	Styrene	18	U
1330-20-7	Xylene (total)	18	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB02RE

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-9RE

Sample wt/vol: 5.10 (g/mL) G Lab File ID: D8679

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 46 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

FORM I VOA-TIC 3/90

100077

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB04

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-10

Sample wt/vol: 4.90 (g/mL) G   Lab File ID: D8680

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 22   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	13	UJ
74-83-9	Bromomethane	13	U
75-01-4	Vinyl Chloride	13	UJ
75-00-3	Chloroethane	13	U
75-09-2	Methylene Chloride	13	~~JB~~ U
67-64-1	Acetone	13	U
75-15-0	Carbon Disulfide	13	U
75-35-4	1,1-Dichloroethene	13	U
75-34-3	1,1-Dichloroethane	13	U
540-59-0	1,2-Dichloroethene (total)	13	U
67-66-3	Chloroform	13	U
107-06-2	1,2-Dichloroethane	13	U
78-93-3	2-Butanone	13	U
71-55-6	1,1,1-Trichloroethane	13	U
56-23-5	Carbon Tetrachloride	13	U
75-27-4	Bromodichloromethane	13	U
78-87-5	1,2-Dichloropropane	13	U
10061-01-5	cis-1,3-Dichloropropene	13	U
79-01-6	Trichloroethene	13	U
124-48-1	Dibromochloromethane	13	U
79-00-5	1,1,2-Trichloroethane	13	U
71-43-2	Benzene	13	U
10061-02-6	trans-1,3-Dichloropropene	13	U
75-25-2	Bromoform	13	U
108-10-1	4-Methyl-2-Pentanone	13	U
591-78-6	2-Hexanone	13	U
127-18-4	Tetrachloroethene	13	U
79-34-5	1,1,2,2-Tetrachloroethane	13	U
108-88-3	Toluene	13	U
108-90-7	Chlorobenzene	13	U
100-41-4	Ethylbenzene	13	U
100-42-5	Styrene	13	U
1330-20-7	Xylene (total)	13	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB04

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-10

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8680

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 22 Date Analyzed: 12/22/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 64175	ETHANOL (ACN)	5.61	33	JN

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05

ab~~ame: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-11

ample wt/vol: 5.00 (g/mL) G   Lab File ID: D8659

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 34   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	15	UJ
74-83-9	Bromomethane	15	U
75-01-4	Vinyl Chloride	15	U
75-00-3	Chloroethane	15	U
75-09-2	Methylene Chloride	40	~~B~~ UJ
67-64-1	Acetone	250	J
75-15-0	Carbon Disulfide	15	UJ
75-35-4	1,1-Dichloroethene	15	U
75-34-3	1,1-Dichloroethane	15	U
540-59-0	1,2-Dichloroethene (total)	15	U
67-66-3	Chloroform	15	U
107-06-2	1,2-Dichloroethane	15	U
78-93-3	2-Butanone	15	U
71-55-6	1,1,1-Trichloroethane	15	U
56-23-5	Carbon Tetrachloride	15	U
75-27-4	Bromodichloromethane	15	U
78-87-5	1,2-Dichloropropane	15	U
10061-01-5	cis-1,3-Dichloropropene	15	U
79-01-6	Trichloroethene	15	U
124-48-1	Dibromochloromethane	15	U
79-00-5	1,1,2-Trichloroethane	15	U
71-43-2	Benzene	15	U
10061-02-6	trans-1,3-Dichloropropene	15	U
75-25-2	Bromoform	15	U
108-10-1	4-Methyl-2-Pentanone	15	U
591-78-6	2-Hexanone	15	U
127-18-4	Tetrachloroethene	15	U
79-34-5	1,1,2,2-Tetrachloroethane	15	U
108-88-3	Toluene	15	U
108-90-7	Chlorobenzene	15	U
100-41-4	Ethylbenzene	15	U
100-42-5	Styrene	15	U
1330-20-7	Xylene (total)	15	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB05

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-11

ample wt/vol: 5.00 (g/mL) G Lab File ID: D8659

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 34 Date Analyzed: 12/21/93

: Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-11RE

Sample wt/vol: 4.80 (g/mL) G   Lab File ID: D8681

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 34   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	16	UJ
74-83-9	Bromomethane	16	U
75-01-4	Vinyl Chloride	16	U
75-00-3	Chloroethane	16	U
75-09-2	Methylene Chloride	20	BUJ
67-64-1	Acetone	16	UJ
75-15-0	Carbon Disulfide	16	U
75-35-4	1,1-Dichloroethene	16	U
75-34-3	1,1-Dichloroethane	16	U
540-59-0	1,2-Dichloroethene (total)	16	U
67-66-3	Chloroform	16	U
107-06-2	1,2-Dichloroethane	16	U
78-93-3	2-Butanone	16	U
71-55-6	1,1,1-Trichloroethane	16	U
56-23-5	Carbon Tetrachloride	16	U
75-27-4	Bromodichloromethane	16	U
78-87-5	1,2-Dichloropropane	16	U
10061-01-5	cis-1,3-Dichloropropene	16	U
79-01-6	Trichloroethene	16	U
124-48-1	Dibromochloromethane	16	U
79-00-5	1,1,2-Trichloroethane	16	U
71-43-2	Benzene	16	U
10061-02-6	trans-1,3-Dichloropropene	16	U
75-25-2	Bromoform	16	U
108-10-1	4-Methyl-2-Pentanone	16	U
591-78-6	2-Hexanone	16	U
127-18-4	Tetrachloroethene	16	U
79-34-5	1,1,2,2-Tetrachloroethane	16	U
108-88-3	Toluene	16	U
108-90-7	Chlorobenzene	16	U
100-41-4	Ethylbenzene	16	U
100-42-5	Styrene	16	U
1330-20-7	Xylene (total)	16	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB05RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

trix: (soil/water) SOIL Lab Sample ID: 38778-11RE

ample wt/vol: 4.80 (g/mL) G Lab File ID: D8681

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 34 Date Analyzed: 12/22/93

Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
umber TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

FORM I VOA-TIC 3/90

100083

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3003

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-11

ample wt/vol: 1.00 (g/mL) G Lab File ID: H3573

evel: (low/med) MED Date Received: 12/13/93

Moisture: 11 decanted: (Y/N) N Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	11000	U
111-44-4	bis(2-Chloroethyl)ether	11000	U
95-57-8	2-Chlorophenol	11000	U
541-73-1	1,3-Dichlorobenzene	11000	U
106-46-7	1,4-Dichlorobenzene	11000	U
95-50-1	1,2-Dichlorobenzene	11000	U
95-48-7	2-Methylphenol	11000	U
108-60-1	2,2'-oxybis(1-Chloropropane)	11000	U
106-44-5	4-Methylphenol	11000	U
621-64-7	N-Nitroso-di-n-propylamine	11000	U
67-72-1	Hexachloroethane	11000	U
98-95-3	Nitrobenzene	11000	U
78-59-1	Isophorone	11000	U
88-75-5	2-Nitrophenol	11000	U
105-67-9	2,4-Dimethylphenol	11000	U
111-91-1	bis(2-Chloroethoxy)methane	11000	U
120-83-2	2,4-Dichlorophenol	11000	U
120-82-1	1,2,4-Trichlorobenzene	11000	U
91-20-3	Naphthalene	7100	J
106-47-8	4-Chloroaniline	11000	U
87-68-3	Hexachlorobutadiene	11000	U
59-50-7	4-Chloro-3-methylphenol	11000	U
91-57-6	2-Methylnaphthalene	34000	
77-47-4	Hexachlorocyclopentadiene	11000	U
88-06-2	2,4,6-Trichlorophenol	11000	U
95-95-4	2,4,5-Trichlorophenol	28000	U
91-58-7	2-Chloronaphthalene	11000	U
88-74-4	2-Nitroaniline	28000	U
131-11-3	Dimethylphthalate	11000	U
208-96-8	Acenaphthylene	11000	U
606-20-2	2,6-Dinitrotoluene	11000	UJ
99-09-2	3-Nitroaniline	28000	U
83-32-9	Acenaphthene	11000	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3003

Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-11

ample wt/vol: 1.00 (g/mL) G Lab File ID: H3573

evel: (low/med) MED Date Received: 12/13/93

Moisture: 11 decanted: (Y/N) N Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	28000	U
100-02-7	4-Nitrophenol	28000	U
132-64-9	Dibenzofuran	3100	J
121-14-2	2,4-Dinitrotoluene	11000	U
84-66-2	Diethylphthalate	11000	U
7005-72-3	4-Chlorophenyl-phenylether	11000	UJ
86-73-7	Fluorene	5600	J
100-01-6	4-Nitroaniline	28000	U
534-52-1	4,6-Dinitro-2-methylphenol	28000	UJ
86-30-6	N-Nitrosodiphenylamine (1)	11000	U
101-55-3	4-Bromophenyl-phenylether	11000	U
118-74-1	Hexachlorobenzene	11000	U
87-86-5	Pentachlorophenol	28000	U
85-01-8	Phenanthrene	6700	J
120-12-7	Anthracene	11000	U
86-74-8	Carbazole	11000	U
84-74-2	Di-n-butylphthalate	11000	U
206-44-0	Fluoranthene	11000	U
129-00-0	Pyrene	11000	U
85-68-7	Butylbenzylphthalate	11000	U
91-94-1	3,3'-Dichlorobenzidine	11000	U
56-55-3	Benzo(a)anthracene	11000	U
218-01-9	Chrysene	11000	U
117-81-7	bis(2-Ethylhexyl)phthalate	11000	U
117-84-0	Di-n-octylphthalate	11000	U
205-99-2	Benzo(b)fluoranthene	11000	U
207-08-9	Benzo(k)fluoranthene	11000	UJ
50-32-8	Benzo(a)pyrene	11000	U
193-39-5	Indeno(1,2,3-cd)pyrene	11000	U
53-70-3	Dibenz(a,h)anthracene	11000	U
191-24-2	Benzo(g,h,i)perylene	11000	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3003

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-11

ample wt/vol: 1.00 (g/mL) G   Lab File ID: H3573

evel: (low/med) MED   Date Received: 12/13/93

Moisture: 11 decanted: (Y/N) N   Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/04/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.6

CONCENTRATION UNITS:

umber TICs found: 20   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 17312822	UNDECANE, 4,6-DIMETHYL-	7.08	60000	JN
2. 17301289	UNDECANE, 3,6-DIMETHYL-	8.26	36000	JN
62016346	OCTANE, 2,3,7-TRIMETHYL-	8.84	62000	JN
1120214	UNDECANE	9.11	100000	JN
5. 90120	NAPHTHALENE, 1-METHYL-	9.37	36000	JN
6. 54105667	CYCLOHEXANE, UNDECYL-	9.55	31000	JN
7. 25117311	TRIDECANE, 5-METHYL-	10.03	110000	JN
8. 1127760	NAPHTHALENE, 1-ETHYL-	10.10	22000	JN
9. 575439	NAPHTHALENE, 1,6-DIMETHYL-	10.22	37000	JN
10. 571584	NAPHTHALENE, 1,4-DIMETHYL-	10.35	43000	JN
11. 55045119	TRIDECANE, 5-PROPYL-	10.54	69000	JN
12. 2131422	NAPHTHALENE, 1,4,6-TRIMETHYL	11.30	16000	JN
13. 2131411	NAPHTHALENE, 1,4,5-TRIMETHYL	11.42	27000	JN
14. 62108229	DECANE, 2,5,9-TRIMETHYL-	12.04	40000	JN
15. 6418435	HEXADECANE, 3-METHYL-	12.44	62000	JN
16. 74645980	DODECANE, 2,7,10-TRIMETHYL-	12.49	38000	JN
17. 62108218	DECANE, 6-ETHYL-2-METHYL-	13.15	45000	JN
18. 2050773	DECANE, 1-IODO-	13.84	40000	JN
19. 1002433	UNDECANE, 3-METHYL-	14.48	30000	JN
20. 54833237	EICOSANE, 10-METHYL-	15.10	19000	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3005

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-12

Sample wt/vol: 1.00 (g/mL) G Lab File ID: H3576

Level: (low/med) MED Date Received: 12/13/93

% Moisture: 14 decanted: (Y/N) N Date Extracted: 12/21/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

Injection Volume: 2.0(uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) Y pH: 4.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	23000	U
111-44-4	bis(2-Chloroethyl)ether	23000	U
95-57-8	2-Chlorophenol	23000	U
541-73-1	1,3-Dichlorobenzene	23000	U
106-46-7	1,4-Dichlorobenzene	23000	U
95-50-1	1,2-Dichlorobenzene	23000	U
95-48-7	2-Methylphenol	23000	U
108-60-1	2,2'-oxybis(1-Chloropropane)	23000	U
106-44-5	4-Methylphenol	23000	U
621-64-7	N-Nitroso-di-n-propylamine	23000	U
67-72-1	Hexachloroethane	23000	U
98-95-3	Nitrobenzene	23000	U
78-59-1	Isophorone	23000	U
88-75-5	2-Nitrophenol	23000	U
105-67-9	2,4-Dimethylphenol	23000	U
111-91-1	bis(2-Chloroethoxy)methane	23000	U
120-83-2	2,4-Dichlorophenol	23000	U
120-82-1	1,2,4-Trichlorobenzene	23000	U
91-20-3	Naphthalene	34000	
106-47-8	4-Chloroaniline	23000	U
87-68-3	Hexachlorobutadiene	23000	U
59-50-7	4-Chloro-3-methylphenol	23000	U
91-57-6	2-Methylnaphthalene	120000	
77-47-4	Hexachlorocyclopentadiene	23000	U
88-06-2	2,4,6-Trichlorophenol	23000	U
95-95-4	2,4,5-Trichlorophenol	58000	U
91-58-7	2-Chloronaphthalene	23000	U
88-74-4	2-Nitroaniline	58000	U
131-11-3	Dimethylphthalate	23000	U
208-96-8	Acenaphthylene	23000	U
606-20-2	2,6-Dinitrotoluene	23000	UJ
99-09-2	3-Nitroaniline	58000	U
83-32-9	Acenaphthene	23000	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3005

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-12

Sample wt/vol: 1.00 (g/mL) G Lab File ID: H3576

Level: (low/med) MED Date Received: 12/13/93

% Moisture: 14 decanted: (Y/N) N Date Extracted: 12/21/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

Injection Volume: 2.0(uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) Y pH: 4.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	58000	U
100-02-7	4-Nitrophenol	58000	U
132-64-9	Dibenzofuran	8100	J
121-14-2	2,4-Dinitrotoluene	23000	U
84-66-2	Diethylphthalate	23000	U
7005-72-3	4-Chlorophenyl-phenylether	23000	UJ
86-73-7	Fluorene	10000	J
100-01-6	4-Nitroaniline	58000	U
534-52-1	4,6-Dinitro-2-methylphenol	58000	UJ
86-30-6	N-Nitrosodiphenylamine (1)	23000	U
101-55-3	4-Bromophenyl-phenylether	23000	U
118-74-1	Hexachlorobenzene	23000	U
87-86-5	Pentachlorophenol	58000	U
85-01-8	Phenanthrene	21000	J
120-12-7	Anthracene	23000	U
86-74-8	Carbazole	23000	U
84-74-2	Di-n-butylphthalate	23000	U
206-44-0	Fluoranthene	23000	U
129-00-0	Pyrene	23000	U
85-68-7	Butylbenzylphthalate	23000	U
91-94-1	3,3'-Dichlorobenzidine	23000	U
56-55-3	Benzo(a)anthracene	23000	U
218-01-9	Chrysene	23000	U
117-81-7	bis(2-Ethylhexyl)phthalate	23000	U
117-84-0	Di-n-octylphthalate	23000	U
205-99-2	Benzo(b)fluoranthene	23000	U
207-08-9	Benzo(k)fluoranthene	23000	UJ
50-32-8	Benzo(a)pyrene	23000	U
193-39-5	Indeno(1,2,3-cd)pyrene	23000	U
53-70-3	Dibenz(a,h)anthracene	23000	U
191-24-2	Benzo(g,h,i)perylene	23000	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3005

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

iatrix: (soil/water) SOIL   Lab Sample ID: 38736-12

iample wt/vol: 1.00 (g/mL) G   Lab File ID: H3576

.evel: (low/med) MED   Date Received: 12/13/93

; Moisture: 14   decanted: (Y/N) N   Date Extracted: 12/21/93

:oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/04/94

.njection Volume: 2.0(uL)   Dilution Factor: 2.0

:PC Cleanup: (Y/N) Y   pH: 4.4

iumber TICs found: 20   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 1074175	BENZENE, 1-METHYL-2-PROPYL-	6.57	51000	JN
2. 17312822	UNDECANE, 4,6-DIMETHYL-	7.08	110000	JN
3. 7045718	UNDECANE, 2-METHYL-	7.75	67000	JN
4. 17312822	UNDECANE, 4,6-DIMETHYL-	8.27	110000	JN
5. 62016346	OCTANE, 2,3,7-TRIMETHYL-	8.85	180000	JN
6. 1120214	UNDECANE	9.10	190000	JN
7. 90120	NAPHTHALENE, 1-METHYL-	9.38	110000	JN
8. 7045718	UNDECANE, 2-METHYL-	9.74	67000	JN
9. 25117311	TRIDECANE, 5-METHYL-	10.02	190000	JN
10. 1127760	NAPHTHALENE, 1-ETHYL-	10.10	93000	JN
11. 575371	NAPHTHALENE, 1,7-DIMETHYL-	10.22	120000	JN
12. 571584	NAPHTHALENE, 1,4-DIMETHYL-	10.36	150000	JN
13. 54105667	CYCLOHEXANE, UNDECYL-	10.47	70000	JN
14. 55045119	TRIDECANE, 5-PROPYL-	10.55	200000	JN
15.	UNKNOWN	11.54	33000	J
16. 19218941	TETRADECANE, 1-IODO-	11.66	51000	JN
17. 62108229	DECANE, 2,5,9-TRIMETHYL-	12.04	79000	JN
18. 19218941	TETRADECANE, 1-IODO-	12.43	58000	JN
19. 54105678	HEPTADECANE, 2,6-DIMETHYL-	12.48	93000	JN
20. 1002433	UNDECANE, 3-METHYL-	13.14	30000	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB305D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-13

ample wt/vol: 1.00 (g/mL) G Lab File ID: H3577

evel: (low/med) MED Date Received: 12/13/93

Moisture: 18 decanted: (Y/N) N Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

njection Volume: 2.0(uL) Dilution Factor: 2.0

PC Cleanup: (Y/N) Y pH: 4.2

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	24000	U
111-44-4	bis(2-Chloroethyl)ether	24000	U
95-57-8	2-Chlorophenol	24000	U
541-73-1	1,3-Dichlorobenzene	24000	U
106-46-7	1,4-Dichlorobenzene	24000	U
95-50-1	1,2-Dichlorobenzene	24000	U
95-48-7	2-Methylphenol	24000	U
108-60-1	2,2'-oxybis(1-Chloropropane)	24000	U
106-44-5	4-Methylphenol	24000	U
621-64-7	N-Nitroso-di-n-propylamine	24000	U
67-72-1	Hexachloroethane	24000	U
98-95-3	Nitrobenzene	24000	U
78-59-1	Isophorone	24000	U
88-75-5	2-Nitrophenol	24000	U
105-67-9	2,4-Dimethylphenol	24000	U
111-91-1	bis(2-Chloroethoxy)methane	24000	U
120-83-2	2,4-Dichlorophenol	24000	U
120-82-1	1,2,4-Trichlorobenzene	24000	U
91-20-3	Naphthalene	43000	
106-47-8	4-Chloroaniline	24000	U
87-68-3	Hexachlorobutadiene	24000	U
59-50-7	4-Chloro-3-methylphenol	24000	U
91-57-6	2-Methylnaphthalene	130000	
77-47-4	Hexachlorocyclopentadiene	24000	U
88-06-2	2,4,6-Trichlorophenol	24000	U
95-95-4	2,4,5-Trichlorophenol	61000	U
91-58-7	2-Chloronaphthalene	24000	U
88-74-4	2-Nitroaniline	61000	U
131-11-3	Dimethylphthalate	24000	U
208-96-8	Acenaphthylene	24000	U
606-20-2	2,6-Dinitrotoluene	24000	UJ
99-09-2	3-Nitroaniline	61000	U
83-32-9	Acenaphthene	24000	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB305D

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

:atrix: (soil/water) SOIL Lab Sample ID: 38736-13

;ample wt/vol: 1.00 (g/mL) G Lab File ID: H3577

.evel: (low/med) MED Date Received: 12/13/93

: Moisture: 18 decanted: (Y/N) N Date Extracted: 12/21/93

:oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

.njection Volume: 2.0(uL) Dilution Factor: 2.0

:PC Cleanup: (Y/N) Y pH: 4.2

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	61000	U
100-02-7	4-Nitrophenol	61000	U
132-64-9	Dibenzofuran	10000	J
121-14-2	2,4-Dinitrotoluene	24000	U
84-66-2	Diethylphthalate	24000	U
7005-72-3	4-Chlorophenyl-phenylether	24000	UJ
86-73-7	Fluorene	13000	J
100-01-6	4-Nitroaniline	61000	U
534-52-1	4,6-Dinitro-2-methylphenol	61000	UJ
86-30-6	N-Nitrosodiphenylamine (1)	24000	U
101-55-3	4-Bromophenyl-phenylether	24000	U
118-74-1	Hexachlorobenzene	24000	U
87-86-5	Pentachlorophenol	61000	U
85-01-8	Phenanthrene	27000	
120-12-7	Anthracene	24000	U
86-74-8	Carbazole	24000	U
84-74-2	Di-n-butylphthalate	24000	U
206-44-0	Fluoranthene	24000	U
129-00-0	Pyrene	24000	U
85-68-7	Butylbenzylphthalate	24000	U
91-94-1	3,3'-Dichlorobenzidine	24000	U
56-55-3	Benzo(a)anthracene	24000	U
218-01-9	Chrysene	24000	U
117-81-7	bis(2-Ethylhexyl)phthalate	24000	U
117-84-0	Di-n-octylphthalate	24000	U
205-99-2	Benzo(b)fluoranthene	24000	U
207-08-9	Benzo(k)fluoranthene	24000	UJ
50-32-8	Benzo(a)pyrene	24000	U
193-39-5	Indeno(1,2,3-cd)pyrene	24000	U
53-70-3	Dibenz(a,h)anthracene	24000	U
191-24-2	Benzo(g,h,i)perylene	24000	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB305D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-13

ample wt/vol: 1.00 (g/mL) G Lab File ID: H3577

evel: (low/med) MED Date Received: 12/13/93

Moisture: 18 decanted: (Y/N) N Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

njection Volume: 2.0(uL) Dilution Factor: 2.0

PC Cleanup: (Y/N) Y pH: 4.2

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 1074437	BENZENE, 1-METHYL-3-PROPYL-	6.58	68000	JN
2. 62016186	OCTANE, 5-ETHYL-2-METHYL-	7.09	140000	JN
1002171	DECANE, 2,9-DIMETHYL-	7.75	22000	JN
1002433	UNDECANE, 3-METHYL-	7.83	22000	JN
5. 17312822	UNDECANE, 4,6-DIMETHYL-	8.27	32000	JN
6. 1560970	DODECANE, 2-METHYL-	8.75	37000	JN
7. 62016346	OCTANE, 2,3,7-TRIMETHYL-	8.85	56000	JN
8. 1120214	UNDECANE	9.11	51000	JN
9. 90120	NAPHTHALENE, 1-METHYL-	9.38	37000	JN
10.	UNKNOWN	9.56	29000	J
11. 25117311	TRIDECANE, 5-METHYL-	10.02	61000	JN
12. 939275	NAPHTHALENE, 2-ETHYL-	10.12	24000	JN
13. 575439	NAPHTHALENE, 1,6-DIMETHYL-	10.23	34000	JN
14. 569415	NAPHTHALENE, 1,8-DIMETHYL-	10.37	41000	JN
15. 55045119	TRIDECANE, 5-PROPYL-	10.56	54000	JN
16. 29253369	NAPHTHALENE, (1-METHYLETHYL)	11.07	22000	JN
17. 55045142	TETRADECANE, 4-ETHYL-	11.67	32000	JN
18. 17301289	UNDECANE, 3,6-DIMETHYL-	12.04	59000	JN
19. 26730201	HEXADECANE, 7-METHYL-	12.43	54000	JN
20. 74645980	DODECANE, 2,7,10-TRIMETHYL-	12.49	95000	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3102

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-18

ample wt/vol: 30.50 (g/mL) G Lab File ID: H3531

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 13 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	370	U
111-44-4	bis(2-Chloroethyl)ether	370	U
95-57-8	2-Chlorophenol	370	U
541-73-1	1,3-Dichlorobenzene	370	U
106-46-7	1,4-Dichlorobenzene	370	U
95-50-1	1,2-Dichlorobenzene	370	U
95-48-7	2-Methylphenol	370	U
108-60-1	2,2'-oxybis(1-Chloropropane)	370	U
106-44-5	4-Methylphenol	370	U
621-64-7	N-Nitroso-di-n-propylamine	370	U
67-72-1	Hexachloroethane	370	U
98-95-3	Nitrobenzene	370	U
78-59-1	Isophorone	370	U
88-75-5	2-Nitrophenol	370	U
105-67-9	2,4-Dimethylphenol	370	U
111-91-1	bis(2-Chloroethoxy)methane	370	U
120-83-2	2,4-Dichlorophenol	370	U
120-82-1	1,2,4-Trichlorobenzene	370	U
91-20-3	Naphthalene	370	U
106-47-8	4-Chloroaniline	370	U
87-68-3	Hexachlorobutadiene	370	U
59-50-7	4-Chloro-3-methylphenol	370	U
91-57-6	2-Methylnaphthalene	370	U
77-47-4	Hexachlorocyclopentadiene	370	U
88-06-2	2,4,6-Trichlorophenol	370	U
95-95-4	2,4,5-Trichlorophenol	900	U
91-58-7	2-Chloronaphthalene	370	U
88-74-4	2-Nitroaniline	900	U
131-11-3	Dimethylphthalate	370	U
208-96-8	Acenaphthylene	370	U
606-20-2	2,6-Dinitrotoluene	370	UJ
99-09-2	3-Nitroaniline	900	U
83-32-9	Acenaphthene	370	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3102

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-18

ample wt/vol: 30.50 (g/mL) G   Lab File ID: H3531

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: 13   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 12/29/93

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	900	U
100-02-7	4-Nitrophenol	900	U
132-64-9	Dibenzofuran	370	U
121-14-2	2,4-Dinitrotoluene	370	U
84-66-2	Diethylphthalate	370	U
7005-72-3	4-Chlorophenyl-phenylether	370	UJ
86-73-7	Fluorene	370	UJ
100-01-6	4-Nitroaniline	900	U
534-52-1	4,6-Dinitro-2-methylphenol	900	U
86-30-6	N-Nitrosodiphenylamine (1)	370	U
101-55-3	4-Bromophenyl-phenylether	370	U
118-74-1	Hexachlorobenzene	370	U
87-86-5	Pentachlorophenol	900	U
85-01-8	Phenanthrene	370	U
120-12-7	Anthracene	370	U
86-74-8	Carbazole	370	U
84-74-2	Di-n-butylphthalate	370	U
206-44-0	Fluoranthene	370	U
129-00-0	Pyrene	370	U
85-68-7	Butylbenzylphthalate	370	U
91-94-1	3,3'-Dichlorobenzidine	370	U
56-55-3	Benzo(a)anthracene	370	U
218-01-9	Chrysene	370	U
117-81-7	bis(2-Ethylhexyl)phthalate	370	U
117-84-0	Di-n-octylphthalate	370	U
205-99-2	Benzo(b)fluoranthene	370	U
207-08-9	Benzo(k)fluoranthene	370	UJ
50-32-8	Benzo(a)pyrene	370	U
193-39-5	Indeno(1,2,3-cd)pyrene	370	U
53-70-3	Dibenz(a,h)anthracene	370	U
191-24-2	Benzo(g,h,i)perylene	370	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3102

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-18

ample wt/vol: 30.50 (g/mL) G Lab File ID: H3531

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 13 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.0

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 13475826	HEPTANE, 2,2,4,6,6-PENTAMETH	6.18	300	JN
2. 3522949	HEXANE, 2,2,5-TRIMETHYL-	6.56	640	JN
3. 3522949	HEXANE, 2,2,5-TRIMETHYL-	6.64	300	JN
4. 52896909	HEPTANE, 3-ETHYL-5-METHYL-	6.80	410	JN
5. 3522949	HEXANE, 2,2,5-TRIMETHYL-	7.30	490	JN
6. 15869940	OCTANE, 3,6-DIMETHYL-	7.75	490	JN
7.	UNKNOWN	9.11	260	J
8.	UNKNOWN	9.19	410	J
9.	UNKNOWN	9.27	300	J
10. 25013165	PHENOL, (1,1-DIMETHYLETHYL)-	10.62	600	JN
11.	UNKNOWN	10.73	340	J
12. 128370	PHENOL, 2,6-BIS(1,1-DIMETHYL	11.00	2600	JN
13. 57103	HEXADECANOIC ACID	14.26	600	JN
14. 1002842	PENTADECANOIC ACID	15.58	380	JN
15. 54833486	HEPTADECANE, 2,6,10,15-TETRA	16.95	110	JN
16. 7225641	HEPTADECANE, 9-OCTYL-	17.51	190	JN
17. 4292197	DODECANE, 1-IODO-	18.06	150	JN
18. 55045084	DODECANE, 2-METHYL-6-PROPYL-	18.57	190	JN
19.	UNKNOWN	18.80	1400	J
20.	UNKNOWN HYDROCARBON	19.10	750	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3203

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-14

ample wt/vol: 30.60 (g/mL) G   Lab File ID: H3528

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: 12   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 12/29/93

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 3.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	370	U
111-44-4	bis(2-Chloroethyl)ether	370	U
95-57-8	2-Chlorophenol	370	U
541-73-1	1,3-Dichlorobenzene	370	U
106-46-7	1,4-Dichlorobenzene	370	U
95-50-1	1,2-Dichlorobenzene	370	U
95-48-7	2-Methylphenol	370	U
108-60-1	2,2'-oxybis(1-Chloropropane)	370	U
106-44-5	4-Methylphenol	370	U
621-64-7	N-Nitroso-di-n-propylamine	370	U
67-72-1	Hexachloroethane	370	U
98-95-3	Nitrobenzene	370	U
78-59-1	Isophorone	370	U
88-75-5	2-Nitrophenol	370	U
105-67-9	2,4-Dimethylphenol	370	U
111-91-1	bis(2-Chloroethoxy)methane	370	U
120-83-2	2,4-Dichlorophenol	370	U
120-82-1	1,2,4-Trichlorobenzene	370	U
91-20-3	Naphthalene	370	U
106-47-8	4-Chloroaniline	370	U
87-68-3	Hexachlorobutadiene	370	U
59-50-7	4-Chloro-3-methylphenol	370	U
91-57-6	2-Methylnaphthalene	370	U
77-47-4	Hexachlorocyclopentadiene	370	U
88-06-2	2,4,6-Trichlorophenol	370	U
95-95-4	2,4,5-Trichlorophenol	890	U
91-58-7	2-Chloronaphthalene	370	U
88-74-4	2-Nitroaniline	890	U
131-11-3	Dimethylphthalate	370	U
208-96-8	Acenaphthylene	370	U
606-20-2	2,6-Dinitrotoluene	370	UJ
99-09-2	3-Nitroaniline	890	U
83-32-9	Acenaphthene	370	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3203

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-14

ample wt/vol: 30.60 (g/mL) G Lab File ID: H3528

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 12 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 3.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	890	U
100-02-7	4-Nitrophenol	890	U
132-64-9	Dibenzofuran	370	U
121-14-2	2,4-Dinitrotoluene	370	U
84-66-2	Diethylphthalate	370	U
7005-72-3	4-Chlorophenyl-phenylether	370	UJ
86-73-7	Fluorene	370	UJ
100-01-6	4-Nitroaniline	890	U
534-52-1	4,6-Dinitro-2-methylphenol	890	U
86-30-6	N-Nitrosodiphenylamine (1)	370	U
101-55-3	4-Bromophenyl-phenylether	370	U
118-74-1	Hexachlorobenzene	370	U
87-86-5	Pentachlorophenol	890	U
85-01-8	Phenanthrene	370	U
120-12-7	Anthracene	370	U
86-74-8	Carbazole	370	U
84-74-2	Di-n-butylphthalate	370	U
206-44-0	Fluoranthene	370	U
129-00-0	Pyrene	370	U
85-68-7	Butylbenzylphthalate	370	U
91-94-1	3,3'-Dichlorobenzidine	370	U
56-55-3	Benzo(a)anthracene	370	U
218-01-9	Chrysene	370	U
117-81-7	bis(2-Ethylhexyl)phthalate	140	J
117-84-0	Di-n-octylphthalate	93	J
205-99-2	Benzo(b)fluoranthene	370	U
207-08-9	Benzo(k)fluoranthene	370	UJ
50-32-8	Benzo(a)pyrene	370	U
193-39-5	Indeno(1,2,3-cd)pyrene	370	U
53-70-3	Dibenz(a,h)anthracene	370	U
191-24-2	Benzo(g,h,i)perylene	370	U

- 1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3203

Lab Name: PACE NEW ENGLA Contract: NEESAC

La. Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-14

Sample wt/vol: 30.60 (g/mL) G Lab File ID: H3528

Level: (low/med) LOW Date Received: 12/13/93

% Moisture: 12 decanted: (Y/N) N Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 3.9

Number TICs found: 8

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 7098217	TRITETRACONTANE	16.85	150	JN
2. 54833486	HEPTADECANE, 2,6,10,15-TETRA	17.40	220	JN
544763	HEXADECANE	17.94	260	JN
. 629992	PENTACOSANE	18.46	300	BJN
5.	UNKNOWN	18.96	630	J
6. 112958	EICOSANE	19.54	150	JN
7. 17851535	1,2-BENZENEDICARBOXYLIC ACID	19.84	150	JN
8. 85698	1,2-BENZENEDICARBOXYLIC ACID	21.35	110	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3305

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-17

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3530

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 14 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 3.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	380	U
111-44-4	bis(2-Chloroethyl)ether	380	U
95-57-8	2-Chlorophenol	380	U
541-73-1	1,3-Dichlorobenzene	380	U
106-46-7	1,4-Dichlorobenzene	380	U
95-50-1	1,2-Dichlorobenzene	380	U
95-48-7	2-Methylphenol	380	U
108-60-1	2,2'-oxybis(1-Chloropropane)	380	U
106-44-5	4-Methylphenol	380	U
621-64-7	N-Nitroso-di-n-propylamine	380	U
67-72-1	Hexachloroethane	380	U
98-95-3	Nitrobenzene	380	U
78-59-1	Isophorone	380	U
88-75-5	2-Nitrophenol	380	U
105-67-9	2,4-Dimethylphenol	380	U
111-91-1	bis(2-Chloroethoxy)methane	380	U
120-83-2	2,4-Dichlorophenol	380	U
120-82-1	1,2,4-Trichlorobenzene	380	U
91-20-3	Naphthalene	380	U
106-47-8	4-Chloroaniline	380	U
87-68-3	Hexachlorobutadiene	380	U
59-50-7	4-Chloro-3-methylphenol	380	U
91-57-6	2-Methylnaphthalene	380	U
77-47-4	Hexachlorocyclopentadiene	380	U
88-06-2	2,4,6-Trichlorophenol	380	U
95-95-4	2,4,5-Trichlorophenol	920	U
91-58-7	2-Chloronaphthalene	380	U
88-74-4	2-Nitroaniline	920	U
131-11-3	Dimethylphthalate	380	U
208-96-8	Acenaphthylene	380	U
606-20-2	2,6-Dinitrotoluene	380	UJ
99-09-2	3-Nitroaniline	920	U
83-32-9	Acenaphthene	380	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3305

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-17

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3530

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 14 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 3.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	920	U
100-02-7	4-Nitrophenol	920	U
132-64-9	Dibenzofuran	380	U
121-14-2	2,4-Dinitrotoluene	380	U
84-66-2	Diethylphthalate	380	U
7005-72-3	4-Chlorophenyl-phenylether	380	UJ
86-73-7	Fluorene	380	UJ
100-01-6	4-Nitroaniline	920	U
534-52-1	4,6-Dinitro-2-methylphenol	920	U
86-30-6	N-Nitrosodiphenylamine (1)	380	U
101-55-3	4-Bromophenyl-phenylether	380	U
118-74-1	Hexachlorobenzene	380	U
87-86-5	Pentachlorophenol	920	U
85-01-8	Phenanthrene	380	U
120-12-7	Anthracene	380	U
86-74-8	Carbazole	380	U
84-74-2	Di-n-butylphthalate	380	U
206-44-0	Fluoranthene	380	U
129-00-0	Pyrene	380	U
85-68-7	Butylbenzylphthalate	380	U
91-94-1	3,3'-Dichlorobenzidine	380	U
56-55-3	Benzo(a)anthracene	380	U
218-01-9	Chrysene	380	U
117-81-7	bis(2-Ethylhexyl)phthalate	120	J
117-84-0	Di-n-octylphthalate	100	J
205-99-2	Benzo(b)fluoranthene	380	U
207-08-9	Benzo(k)fluoranthene	380	UJ
50-32-8	Benzo(a)pyrene	380	U
193-39-5	Indeno(1,2,3-cd)pyrene	380	U
53-70-3	Dibenz(a,h)anthracene	380	U
191-24-2	Benzo(g,h,i)perylene	380	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3305

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-17

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3530

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 14 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 3.4

umber TICs found: 6

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 629629	PENTADECANE	17.47	120	JN
2. 54833486	HEPTADECANE, 2,6,10,15-TETRA	18.01	120	JN
3.	UNKNOWN HYDROCARBON	18.53	150	J
4. 85698	1,2-BENZENEDICARBOXYLIC ACID	18.79	120	JN
5.	UNKNOWN	19.03	350	J
6. 17851535	1,2-BENZENEDICARBOXYLIC ACID	21.50	120	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3405

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38736-16

Sample wt/vol: 1.10 (g/mL) G Lab File ID: H3578

Level: (low/med) MED Date Received: 12/13/93

% Moisture: 16 decanted: (Y/N) N Date Extracted: 12/21/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

Injection Volume: 2.0(uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) Y pH: 4.4

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	UG/KG	Q
108-95-2	Phenol	22000	U
111-44-4	bis(2-Chloroethyl)ether	22000	U
95-57-8	2-Chlorophenol	22000	U
541-73-1	1,3-Dichlorobenzene	22000	U
106-46-7	1,4-Dichlorobenzene	22000	U
95-50-1	1,2-Dichlorobenzene	22000	U
95-48-7	2-Methylphenol	22000	U
108-60-1	2,2'-oxybis(1-Chloropropane)	22000	U
106-44-5	4-Methylphenol	22000	U
621-64-7	N-Nitroso-di-n-propylamine	22000	U
67-72-1	Hexachloroethane	22000	U
98-95-3	Nitrobenzene	22000	U
78-59-1	Isophorone	22000	U
88-75-5	2-Nitrophenol	22000	U
105-67-9	2,4-Dimethylphenol	22000	U
111-91-1	bis(2-Chloroethoxy)methane	22000	U
120-83-2	2,4-Dichlorophenol	22000	U
120-82-1	1,2,4-Trichlorobenzene	22000	U
91-20-3	Naphthalene	31000	
106-47-8	4-Chloroaniline	22000	U
87-68-3	Hexachlorobutadiene	22000	U
59-50-7	4-Chloro-3-methylphenol	22000	U
91-57-6	2-Methylnaphthalene	70000	
77-47-4	Hexachlorocyclopentadiene	22000	U
88-06-2	2,4,6-Trichlorophenol	22000	U
95-95-4	2,4,5-Trichlorophenol	54000	U
91-58-7	2-Chloronaphthalene	22000	U
88-74-4	2-Nitroaniline	54000	U
131-11-3	Dimethylphthalate	22000	U
208-96-8	Acenaphthylene	22000	U
606-20-2	2,6-Dinitrotoluene	22000	UJ
99-09-2	3-Nitroaniline	54000	U
83-32-9	Acenaphthene	22000	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3405

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-16

ample wt/vol: 1.10 (g/mL) G   Lab File ID: H3578

evel: (low/med) MED   Date Received: 12/13/93

Moisture: 16   decanted: (Y/N) N   Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/04/94

njection Volume: 2.0(uL)   Dilution Factor: 2.0

PC Cleanup: (Y/N) Y   pH: 4.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	54000	U
100-02-7	4-Nitrophenol	54000	U
132-64-9	Dibenzofuran	22000	U
121-14-2	2,4-Dinitrotoluene	22000	U
84-66-2	Diethylphthalate	22000	U
7005-72-3	4-Chlorophenyl-phenylether	22000	UJ
86-73-7	Fluorene	8200	J
100-01-6	4-Nitroaniline	54000	U
534-52-1	4,6-Dinitro-2-methylphenol	54000	UJ
86-30-6	N-Nitrosodiphenylamine (1)	22000	U
101-55-3	4-Bromophenyl-phenylether	22000	U
118-74-1	Hexachlorobenzene	22000	U
87-86-5	Pentachlorophenol	54000	U
85-01-8	Phenanthrene	11000	J
120-12-7	Anthracene	22000	U
86-74-8	Carbazole	22000	U
84-74-2	Di-n-butylphthalate	22000	U
206-44-0	Fluoranthene	22000	U
129-00-0	Pyrene	22000	U
85-68-7	Butylbenzylphthalate	22000	U
91-94-1	3,3'-Dichlorobenzidine	22000	U
56-55-3	Benzo(a)anthracene	22000	U
218-01-9	Chrysene	22000	U
117-81-7	bis(2-Ethylhexyl)phthalate	22000	U
117-84-0	Di-n-octylphthalate	22000	U
205-99-2	Benzo(b)fluoranthene	22000	U
207-08-9	Benzo(k)fluoranthene	22000	UJ
50-32-8	Benzo(a)pyrene	22000	U
193-39-5	Indeno(1,2,3-cd)pyrene	22000	U
53-70-3	Dibenz(a,h)anthracene	22000	U
191-24-2	Benzo(g,h,i)perylene	22000	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3405

ab Name: PACE NEW ENGLA Contract: NEESAC

ab .ode: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-16

ample wt/vol: 1.10 (g/mL) G Lab File ID: H3578

evel: (low/med) MED Date Received: 12/13/93

Moisture: 16 decanted: (Y/N) N Date Extracted: 12/21/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/04/94

njection Volume: 2.0(uL) Dilution Factor: 2.0

PC Cleanup: (Y/N) Y pH: 4.4

CONCENTRATION UNITS:

umber TICs found: 20 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 611143	BENZENE, 1-ETHYL-2-METHYL-	5.51	78000	JN
2. 1074437	BENZENE, 1-METHYL-3-PROPYL-	6.57	74000	JN
2884062	NONANE, 2,3-DIMETHYL-	7.09	120000	JN
95932	BENZENE, 1,2,4,5-TETRAMETHYL	7.37	52000	JN
5. 7045718	UNDECANE, 2-METHYL-	7.76	52000	JN
6. 17312822	UNDECANE, 4,6-DIMETHYL-	8.28	95000	JN
7. 61141728	DODECANE, 4,6-DIMETHYL-	8.86	150000	JN
8. 17312822	UNDECANE, 4,6-DIMETHYL-	9.13	160000	JN
9. 54105667	CYCLOHEXANE, UNDECYL-	9.57	91000	JN
10. 1560970	DODECANE, 2-METHYL-	10.04	370000	JN
11. 569415	NAPHTHALENE, 1,8-DIMETHYL-	10.39	140000	JN
12. 55045119	TRIDECANE, 5-PROPYL-	10.56	190000	JN
13. 2131422	NAPHTHALENE, 1,4,6-TRIMETHYL	11.25	91000	JN
14. 55045119	TRIDECANE, 5-PROPYL-	11.67	210000	JN
15. 62108229	DECANE, 2,5,9-TRIMETHYL-	12.03	140000	JN
16. 6418435	HEXADECANE, 3-METHYL-	12.43	160000	JN
17. 74645980	DODECANE, 2,7,10-TRIMETHYL-	12.47	130000	JN
18. 1560970	DODECANE, 2-METHYL-	13.14	120000	JN
19. 54833486	HEPTADECANE, 2,6,10,15-TETRA	13.82	100000	JN
20. 54833486	HEPTADECANE, 2,6,10,15-TETRA	14.48	87000	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3502

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38736-15

ample wt/vol: 31.00 (g/mL) G   Lab File ID: H3529

evel: (low/med) LOW   Date Received: 12/13/93

Moisture: 19   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 12/29/93

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 6.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	390	U
111-44-4	bis(2-Chloroethyl)ether	390	U
95-57-8	2-Chlorophenol	390	U
541-73-1	1,3-Dichlorobenzene	390	U
106-46-7	1,4-Dichlorobenzene	390	U
95-50-1	1,2-Dichlorobenzene	390	U
95-48-7	2-Methylphenol	390	U
108-60-1	2,2'-oxybis(1-Chloropropane)	390	U
106-44-5	4-Methylphenol	390	U
621-64-7	N-Nitroso-di-n-propylamine	390	U
67-72-1	Hexachloroethane	390	U
98-95-3	Nitrobenzene	390	U
78-59-1	Isophorone	390	U
88-75-5	2-Nitrophenol	390	U
105-67-9	2,4-Dimethylphenol	390	U
111-91-1	bis(2-Chloroethoxy)methane	390	U
120-83-2	2,4-Dichlorophenol	390	U
120-82-1	1,2,4-Trichlorobenzene	390	U
91-20-3	Naphthalene	390	U
106-47-8	4-Chloroaniline	390	U
87-68-3	Hexachlorobutadiene	390	U
59-50-7	4-Chloro-3-methylphenol	390	U
91-57-6	2-Methylnaphthalene	390	U
77-47-4	Hexachlorocyclopentadiene	390	U
88-06-2	2,4,6-Trichlorophenol	390	U
95-95-4	2,4,5-Trichlorophenol	960	U
91-58-7	2-Chloronaphthalene	390	U
88-74-4	2-Nitroaniline	960	U
131-11-3	Dimethylphthalate	390	U
208-96-8	Acenaphthylene	390	U
606-20-2	2,6-Dinitrotoluene	390	UJ
99-09-2	3-Nitroaniline	960	U
83-32-9	Acenaphthene	390	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3502

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38736-15

Sample wt/vol: 31.00 (g/mL) G   Lab File ID: H3529

Level: (low/med) LOW   Date Received: 12/13/93

% Moisture: 19 decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 12/29/93

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 6.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	960	U
100-02-7	4-Nitrophenol	960	U
132-64-9	Dibenzofuran	390	U
121-14-2	2,4-Dinitrotoluene	390	U
84-66-2	Diethylphthalate	390	U
7005-72-3	4-Chlorophenyl-phenylether	390	UJ
86-73-7	Fluorene	390	UJ
100-01-6	4-Nitroaniline	960	U
534-52-1	4,6-Dinitro-2-methylphenol	960	U
86-30-6	N-Nitrosodiphenylamine (1)	390	U
101-55-3	4-Bromophenyl-phenylether	390	U
118-74-1	Hexachlorobenzene	390	U
87-86-5	Pentachlorophenol	960	U
85-01-8	Phenanthrene	390	U
120-12-7	Anthracene	390	U
86-74-8	Carbazole	390	U
84-74-2	Di-n-butylphthalate	390	U
206-44-0	Fluoranthene	390	U
129-00-0	Pyrene	390	U
85-68-7	Butylbenzylphthalate	390	U
91-94-1	3,3'-Dichlorobenzidine	390	U
56-55-3	Benzo(a)anthracene	390	U
218-01-9	Chrysene	390	U
117-81-7	bis(2-Ethylhexyl)phthalate	160	J
117-84-0	Di-n-octylphthalate	100	J
205-99-2	Benzo(b)fluoranthene	390	U
207-08-9	Benzo(k)fluoranthene	390	UJ
50-32-8	Benzo(a)pyrene	390	U
193-39-5	Indeno(1,2,3-cd)pyrene	390	U
53-70-3	Dibenz(a,h)anthracene	390	U
191-24-2	Benzo(g,h,i)perylene	390	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3502

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-15

ample wt/vol: 31.00 (g/mL) G Lab File ID: H3529

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 19 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 6.0

umber TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 54833486	HEPTADECANE, 2,6,10,15-TETRA	16.89	120	JN
2. 629992	PENTACOSANE	17.44	200	BJN
3. 30571712	DECANE, 3-BROMO-	17.98	240	JN
4. 544763	HEXADECANE	18.49	280	JN
5. 544763	HEXADECANE	19.01	320	JN
6.	UNKNOWN HYDROCARBON	19.58	200	J
7. 3648213	1,2-BENZENEDICARBOXYLIC ACID	19.89	160	JN
8. 630068	HEXATRIACONTANE	21.02	80	JN
9. 131157	1,2-BENZENEDICARBOXYLIC ACID	21.43	120	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-14

ample wt/vol: 30.60 (g/mL) G   Lab File ID: H3553

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 72   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 6.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	1200	U
111-44-4	bis(2-Chloroethyl)ether	1200	U
95-57-8	2-Chlorophenol	1200	U
541-73-1	1,3-Dichlorobenzene	1200	U
106-46-7	1,4-Dichlorobenzene	1200	U
95-50-1	1,2-Dichlorobenzene	1200	U
95-48-7	2-Methylphenol	1200	U
108-60-1	2,2'-oxybis(1-Chloropropane)	1200	U
106-44-5	4-Methylphenol	1200	U
621-64-7	N-Nitroso-di-n-propylamine	1200	U
67-72-1	Hexachloroethane	1200	U
98-95-3	Nitrobenzene	1200	U
78-59-1	Isophorone	1200	U
88-75-5	2-Nitrophenol	1200	U
105-67-9	2,4-Dimethylphenol	1200	U
111-91-1	bis(2-Chloroethoxy)methane	1200	U
120-83-2	2,4-Dichlorophenol	1200	U
120-82-1	1,2,4-Trichlorobenzene	1200	U
91-20-3	Naphthalene	1200	U
106-47-8	4-Chloroaniline	1200	U
87-68-3	Hexachlorobutadiene	1200	U
59-50-7	4-Chloro-3-methylphenol	1200	U
91-57-6	2-Methylnaphthalene	1200	U
77-47-4	Hexachlorocyclopentadiene	1200	UJ
88-06-2	2,4,6-Trichlorophenol	1200	U
95-95-4	2,4,5-Trichlorophenol	2800	U
91-58-7	2-Chloronaphthalene	1200	U
88-74-4	2-Nitroaniline	2800	U
131-11-3	Dimethylphthalate	1200	U
208-96-8	Acenaphthylene	1200	U
606-20-2	2,6-Dinitrotoluene	1200	UJ
99-09-2	3-Nitroaniline	2800	U
83-32-9	Acenaphthene	1200	U

1C -

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-14

Sample wt/vol: 30.60 (g/mL) G Lab File ID: H3553

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 72 decanted: (Y/N) N Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	2800	U
100-02-7	4-Nitrophenol	2800	U
132-64-9	Dibenzofuran	1200	U
121-14-2	2,4-Dinitrotoluene	1200	U
84-66-2	Diethylphthalate	1200	U
7005-72-3	4-Chlorophenyl-phenylether	1200	UJ
86-73-7	Fluorene	1200	UJ
100-01-6	4-Nitroaniline	2800	U
534-52-1	4,6-Dinitro-2-methylphenol	2800	UJ
86-30-6	N-Nitrosodiphenylamine (1)	1200	U
101-55-3	4-Bromophenyl-phenylether	1200	U
118-74-1	Hexachlorobenzene	1200	U
87-86-5	Pentachlorophenol	2800	U
85-01-8	Phenanthrene	1200	U
120-12-7	Anthracene	1200	U
86-74-8	Carbazole	1200	U
84-74-2	Di-n-butylphthalate	1200	UJ
206-44-0	Fluoranthene	1200	U
129-00-0	Pyrene	1200	U
85-68-7	Butylbenzylphthalate	1200	U
91-94-1	3,3'-Dichlorobenzidine	1200	U
56-55-3	Benzo(a)anthracene	1200	U
218-01-9	Chrysene	1200	U
117-81-7	bis(2-Ethylhexyl)phthalate	1200	U
117-84-0	Di-n-octylphthalate	1200	U
205-99-2	Benzo(b)fluoranthene	1200	U
207-08-9	Benzo(k)fluoranthene	1200	UJ
50-32-8	Benzo(a)pyrene	1200	U
193-39-5	Indeno(1,2,3-cd)pyrene	1200	U
53-70-3	Dibenz(a,h)anthracene	1200	U
191-24-2	Benzo(g,h,i)perylene	1200	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB01

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-14

ample wt/vol: 30.60 (g/mL) G Lab File ID: H3553

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 72 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 6.4

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	5.01	3900	J
2. 4889832	BICYCLO[3.1.1]HEPT-2-ENE, 3,	5.17	2500	JN
87445	CARYOPHYLLENE (VAN)	10.31	1200	JN
	UNKNOWN	10.38	1500	J
5. 1002842	PENTADECANOIC ACID	13.30	1600	JN
6. 2091294	9-HEXADECENOIC ACID	14.25	14000	JN
7. 57103	HEXADECANOIC ACID	14.31	7000	JN
8.	UNKNOWN	14.54	2200	J
9. 2091294	9-HEXADECENOIC ACID	15.40	8800	JN
10. 4292197	DODECANE, 1-IODO-	16.80	1500	JN
11.	UNKNOWN	17.09	12000	J
12. 630024	OCTACOSANE	17.33	2500	JN
13. 17301303	UNDECANE, 3,8-DIMETHYL-	17.84	1600	JN
14. 55045142	TETRADECANE, 4-ETHYL-	18.33	2700	JN
15. 17301303	UNDECANE, 3,8-DIMETHYL-	18.81	1300	JN
16. 54833486	HEPTADECANE, 2,6,10,15-TETRA	19.34	5100	JN
17. 54833486	HEPTADECANE, 2,6,10,15-TETRA	20.64	4900	JN
18.	UNKNOWN	22.40	1600	J
19.	UNKNOWN	23.43	4300	J
20.	UNKNOWN	23.62	1800	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-20

Sample wt/vol: 30.00 (g/mL) G Lab File ID: H3560

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 46 decanted: (Y/N) N Date Extracted: 12/22/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 5.5

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	610	U
111-44-4	bis(2-Chloroethyl)ether	610	U
95-57-8	2-Chlorophenol	610	U
541-73-1	1,3-Dichlorobenzene	610	U
106-46-7	1,4-Dichlorobenzene	610	U
95-50-1	1,2-Dichlorobenzene	610	U
95-48-7	2-Methylphenol	610	U
108-60-1	2,2'-oxybis(1-Chloropropane)	610	U
106-44-5	4-Methylphenol	610	U
621-64-7	N-Nitroso-di-n-propylamine	610	U
67-72-1	Hexachloroethane	610	U
98-95-3	Nitrobenzene	610	U
78-59-1	Isophorone	610	U
88-75-5	2-Nitrophenol	610	U
105-67-9	2,4-Dimethylphenol	610	U
111-91-1	bis(2-Chloroethoxy)methane	610	U
120-83-2	2,4-Dichlorophenol	610	U
120-82-1	1,2,4-Trichlorobenzene	610	U
91-20-3	Naphthalene	610	U
106-47-8	4-Chloroaniline	610	U
87-68-3	Hexachlorobutadiene	610	U
59-50-7	4-Chloro-3-methylphenol	610	U
91-57-6	2-Methylnaphthalene	610	U
77-47-4	Hexachlorocyclopentadiene	610	UJ
88-06-2	2,4,6-Trichlorophenol	610	U
95-95-4	2,4,5-Trichlorophenol	1500	U
91-58-7	2-Chloronaphthalene	610	U
88-74-4	2-Nitroaniline	1500	U
131-11-3	Dimethylphthalate	610	U
208-96-8	Acenaphthylene	610	U
606-20-2	2,6-Dinitrotoluene	610	UJ
99-09-2	3-Nitroaniline	1500	U
83-32-9	Acenaphthene	610	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-20

ample wt/vol: 30.00 (g/mL) G   Lab File ID: H3560

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 46   decanted: (Y/N) N   Date Extracted: 12/22/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.5

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1500	U
100-02-7	4-Nitrophenol	1500	U
132-64-9	Dibenzofuran	610	U
121-14-2	2,4-Dinitrotoluene	610	U
84-66-2	Diethylphthalate	610	U
7005-72-3	4-Chlorophenyl-phenylether	610	UJ
86-73-7	Fluorene	610	UJ
100-01-6	4-Nitroaniline	1500	U
534-52-1	4,6-Dinitro-2-methylphenol	1500	UJ
86-30-6	N-Nitrosodiphenylamine (1)	610	U
101-55-3	4-Bromophenyl-phenylether	610	U
118-74-1	Hexachlorobenzene	610	U
87-86-5	Pentachlorophenol	1500	U
85-01-8	Phenanthrene	610	U
120-12-7	Anthracene	280	J
86-74-8	Carbazole	610	U
84-74-2	Di-n-butylphthalate	610	UJ
206-44-0	Fluoranthene	610	U
129-00-0	Pyrene	610	U
85-68-7	Butylbenzylphthalate	610	U
91-94-1	3,3'-Dichlorobenzidine	610	U
56-55-3	Benzo(a)anthracene	610	U
218-01-9	Chrysene	610	U
117-81-7	bis(2-Ethylhexyl)phthalate	610	U
117-84-0	Di-n-octylphthalate	610	U
205-99-2	Benzo(b)fluoranthene	610	U
207-08-9	Benzo(k)fluoranthene	610	UJ
50-32-8	Benzo(a)pyrene	610	U
193-39-5	Indeno(1,2,3-cd)pyrene	610	U
53-70-3	Dibenz(a,h)anthracene	610	U
191-24-2	Benzo(g,h,i)perylene	610	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB02

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

iatrix: (soil/water) SOIL Lab Sample ID: 38778-20

iample wt/vol: 30.00 (g/mL) G Lab File ID: H3560

.evel: (low/med) LOW Date Received: 12/15/93

; Moisture: 46 decanted: (Y/N) N Date Extracted: 12/22/93

:oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

:njection Volume: 2.0(uL) Dilution Factor: 1.0

iPC Cleanup: (Y/N) Y pH: 5.5

iumber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	4.94	930	J
2.	UNKNOWN	5.16	490	J
3. 127913	.BETA.-PINENE	5.71	490	JN
4. 762629	1-PENTENE, 4,4-DIMETHYL-	6.28	2700	JN
5. 103093	ACETIC ACID, 2-ETHYLHEXYL ES	7.57	250	JN
6. 11029064	ELEMENE	10.01	370	JN
7. 5881174	OCTANE, 3-ETHYL-	10.29	930	JN
8.	UNKNOWN	14.26	860	J
9.	UNKNOWN	15.70	430	J
10.	UNKNOWN	17.07	2000	J
11.	UNKNOWN	18.20	4600	J
12.	UNKNOWN	18.35	680	J
13.	UNKNOWN	18.72	490	J
14.	UNKNOWN	19.03	1600	J
15.	UNKNOWN	19.15	2300	J
16. 17301303	UNDECANE, 3,8-DIMETHYL-	19.35	2700	JN
17. 17301303	UNDECANE, 3,8-DIMETHYL-	20.65	2200	JN
18.	UNKNOWN	22.40	1400	J
19.	UNKNOWN	22.48	620	J
20.	UNKNOWN	23.42	2200	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB03

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-18

Sample wt/vol: 30.50 (g/mL) G   Lab File ID: H3556

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: 48   decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 5.6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	620	U
111-44-4	bis(2-Chloroethyl)ether	620	U
95-57-8	2-Chlorophenol	620	U
541-73-1	1,3-Dichlorobenzene	620	U
106-46-7	1,4-Dichlorobenzene	620	U
95-50-1	1,2-Dichlorobenzene	620	U
95-48-7	2-Methylphenol	620	U
108-60-1	2,2'-oxybis(1-Chloropropane)	620	U
106-44-5	4-Methylphenol	620	U
621-64-7	N-Nitroso-di-n-propylamine	620	U
67-72-1	Hexachloroethane	620	U
98-95-3	Nitrobenzene	620	U
78-59-1	Isophorone	620	U
88-75-5	2-Nitrophenol	620	U
105-67-9	2,4-Dimethylphenol	620	U
111-91-1	bis(2-Chloroethoxy)methane	620	U
120-83-2	2,4-Dichlorophenol	620	U
120-82-1	1,2,4-Trichlorobenzene	620	U
91-20-3	Naphthalene	620	U
106-47-8	4-Chloroaniline	620	U
87-68-3	Hexachlorobutadiene	620	U
59-50-7	4-Chloro-3-methylphenol	620	U
91-57-6	2-Methylnaphthalene	620	U
77-47-4	Hexachlorocyclopentadiene	620	UJ
88-06-2	2,4,6-Trichlorophenol	620	U
95-95-4	2,4,5-Trichlorophenol	1500	U
91-58-7	2-Chloronaphthalene	620	U
88-74-4	2-Nitroaniline	1500	U
131-11-3	Dimethylphthalate	620	U
208-96-8	Acenaphthylene	620	U
606-20-2	2,6-Dinitrotoluene	620	UJ
99-09-2	3-Nitroaniline	1500	U
83-32-9	Acenaphthene	620	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB03

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-18

ample wt/vol: 30.50 (g/mL) G   Lab File ID: H3556

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 48   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1500	U
100-02-7	4-Nitrophenol	1500	U
132-64-9	Dibenzofuran	620	U
121-14-2	2,4-Dinitrotoluene	620	U
84-66-2	Diethylphthalate	620	U
7005-72-3	4-Chlorophenyl-phenylether	620	UJ
86-73-7	Fluorene	620	UJ
100-01-6	4-Nitroaniline	1500	U
534-52-1	4,6-Dinitro-2-methylphenol	1500	UJ
86-30-6	N-Nitrosodiphenylamine (1)	620	U
101-55-3	4-Bromophenyl-phenylether	620	U
118-74-1	Hexachlorobenzene	620	U
87-86-5	Pentachlorophenol	1500	U
85-01-8	Phenanthrene	620	U
120-12-7	Anthracene	620	U
86-74-8	Carbazole	620	U
84-74-2	Di-n-butylphthalate	620	UJ
206-44-0	Fluoranthene	620	U
129-00-0	Pyrene	620	U
85-68-7	Butylbenzylphthalate	620	U
91-94-1	3,3'-Dichlorobenzidine	620	U
56-55-3	Benzo(a)anthracene	620	U
218-01-9	Chrysene	620	U
117-81-7	bis(2-Ethylhexyl)phthalate	180	J
117-84-0	Di-n-octylphthalate	620	U
205-99-2	Benzo(b)fluoranthene	620	U
207-08-9	Benzo(k)fluoranthene	620	UJ
50-32-8	Benzo(a)pyrene	620	U
193-39-5	Indeno(1,2,3-cd)pyrene	620	U
53-70-3	Dibenz(a,h)anthracene	620	U
191-24-2	Benzo(g,h,i)perylene	620	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB03

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: 38778-18

;ample wt/vol: 30.50 (g/mL) G Lab File ID: H3556

.evel: (low/med) LOW Date Received: 12/15/93

; Moisture: 48 decanted: (Y/N) N Date Extracted: 12/17/93

:oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

.njection Volume: 2.0(uL) Dilution Factor: 1.0

;PC Cleanup: (Y/N) Y pH: 5.6

CONCENTRATION UNITS:

lumber TICs found: 20 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 1002842	PENTADECANOIC ACID	13.32	1200	JN
2.	UNKNOWN	13.39	820	J
	UNKNOWN	14.15	1800	J
	UNKNOWN	14.19	690	J
5.	UNKNOWN	14.28	2300	J
6.	UNKNOWN	14.54	1500	J
7.	UNKNOWN	15.40	1500	J
8. 17301303	UNDECANE, 3,8-DIMETHYL-	16.24	440	JN
9. 17301303	UNDECANE, 3,8-DIMETHYL-	16.80	690	JN
10. 335579	HEPTANE, HEXADECAFLUORO-	17.03	380	JN
11. 54833486	HEPTADECANE, 2,6,10,15-TETRA	17.34	1100	JN
12. 54833237	EICOSANE, 10-METHYL-	17.84	880	JN
13. 7098217	TRITETRACONTANE	18.34	1500	JN
14.	UNKNOWN	18.70	500	J
15. 544763	HEXADECANE	18.82	500	JN
16. 54833486	HEPTADECANE, 2,6,10,15-TETRA	19.36	2700	JN
17. 17301303	UNDECANE, 3,8-DIMETHYL-	20.65	1900	JN
18.	UNKNOWN	21.19	570	J
19.	UNKNOWN	22.47	630	J
20. 83476	.GAMMA.-SITOSTEROL	23.39	880	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB04

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-21

ample wt/vol: 30.10 (g/mL) G   Lab File ID: H3561

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 22   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 4.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	420	U
111-44-4	bis(2-Chloroethyl)ether	420	U
95-57-8	2-Chlorophenol	420	U
541-73-1	1,3-Dichlorobenzene	420	U
106-46-7	1,4-Dichlorobenzene	420	U
95-50-1	1,2-Dichlorobenzene	420	U
95-48-7	2-Methylphenol	420	U
108-60-1	2,2'-oxybis(1-Chloropropane)	420	U
106-44-5	4-Methylphenol	420	U
621-64-7	N-Nitroso-di-n-propylamine	420	U
67-72-1	Hexachloroethane	420	U
98-95-3	Nitrobenzene	420	U
78-59-1	Isophorone	420	U
88-75-5	2-Nitrophenol	420	U
105-67-9	2,4-Dimethylphenol	420	U
111-91-1	bis(2-Chloroethoxy)methane	420	U
120-83-2	2,4-Dichlorophenol	420	U
120-82-1	1,2,4-Trichlorobenzene	420	U
91-20-3	Naphthalene	420	U
106-47-8	4-Chloroaniline	420	U
87-68-3	Hexachlorobutadiene	420	U
59-50-7	4-Chloro-3-methylphenol	420	U
91-57-6	2-Methylnaphthalene	420	U
77-47-4	Hexachlorocyclopentadiene	420	UJ
88-06-2	2,4,6-Trichlorophenol	420	U
95-95-4	2,4,5-Trichlorophenol	1000	U
91-58-7	2-Chloronaphthalene	420	U
88-74-4	2-Nitroaniline	1000	U
131-11-3	Dimethylphthalate	420	U
208-96-8	Acenaphthylene	420	U
606-20-2	2,6-Dinitrotoluene	420	UJ
99-09-2	3-Nitroaniline	1000	U
83-32-9	Acenaphthene	420	U

FORM I SV-1   3/90

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB04

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-21

Sample wt/vol: 30.10 (g/mL) G Lab File ID: H3561

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 22 decanted: (Y/N) N Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 4.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1000	U
100-02-7	4-Nitrophenol	1000	U
132-64-9	Dibenzofuran	420	U
121-14-2	2,4-Dinitrotoluene	420	U
84-66-2	Diethylphthalate	420	U
7005-72-3	4-Chlorophenyl-phenylether	420	UJ
86-73-7	Fluorene	420	UJ
100-01-6	4-Nitroaniline	1000	U
534-52-1	4,6-Dinitro-2-methylphenol	1000	UJ
86-30-6	N-Nitrosodiphenylamine (1)	420	U
101-55-3	4-Bromophenyl-phenylether	420	U
118-74-1	Hexachlorobenzene	420	U
87-86-5	Pentachlorophenol	1000	U
85-01-8	Phenanthrene	420	U
120-12-7	Anthracene	420	U
86-74-8	Carbazole	420	U
84-74-2	Di-n-butylphthalate	420	UJ
206-44-0	Fluoranthene	420	U
129-00-0	Pyrene	420	U
85-68-7	Butylbenzylphthalate	420	U
91-94-1	3,3'-Dichlorobenzidine	420	U
56-55-3	Benzo(a)anthracene	420	U
218-01-9	Chrysene	420	U
117-81-7	bis(2-Ethylhexyl)phthalate	180	J
117-84-0	Di-n-octylphthalate	140	J
205-99-2	Benzo(b)fluoranthene	420	U
207-08-9	Benzo(K)fluoranthene	420	UJ
50-32-8	Benzo(a)pyrene	420	U
193-39-5	Indeno(1,2,3-cd)pyrene	420	U
53-70-3	Dibenz(a,h)anthracene	420	U
191-24-2	Benzo(g,h,i)perylene	420	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB04

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

:atrix: (soil/water) SOIL   Lab Sample ID: 38778-21

:ample wt/vol: 30.10 (g/mL) G   Lab File ID: H3561

.evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 22 decanted: (Y/N) N   Date Extracted: 12/17/93

.oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 4.9

CONCENTRATION UNITS:
.umber TICs found: 20   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 3779611	1,3,6-OCTATRIENE, 3,7-DIMETH	5.16	340	JN
2.	UNKNOWN	5.69	340	J
3. 515139	CYCLOHEXANE, 1-ETHENYL-1-MET	10.01	510	JN
4. 3853836	1H-BENZOCYCLOHEPTENE, 2,4A,5	10.96	470	JN
5. 483761	NAPHTHALENE, 1,2,3,5,6,8A-HE	11.14	470	JN
6. 6627889	PHENOL, 2,6-DIMETHOXY-4-(2-P	12.47	300	JN
7. 544638	TETRADECANOIC ACID	14.22	430	JN
8.	UNKNOWN	15.03	600	J
9.	UNKNOWN	15.41	5500	J
10.	UNKNOWN	15.99	600	J
11. 17312628	DECANE, 5-PROPYL-	16.80	430	JN
12.	UNKNOWN	17.04	1100	J
13. 54833237	EICOSANE, 10-METHYL-	17.34	640	JN
14. 17301303	UNDECANE, 3,8-DIMETHYL-	17.85	600	JN
15. 55045142	TETRADECANE, 4-ETHYL-	18.35	720	JN
16. 17301303	UNDECANE, 3,8-DIMETHYL-	18.83	640	JN
17.	UNKNOWN	18.93	510	J
18.	UNKNOWN	19.14	720	J
19. 17301303	UNDECANE, 3,8-DIMETHYL-	19.34	850	JN
20. 544763	HEXADECANE	20.64	680	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-22

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3562

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 34 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	500	U
111-44-4	bis(2-Chloroethyl)ether	500	U
95-57-8	2-Chlorophenol	500	U
541-73-1	1,3-Dichlorobenzene	500	U
106-46-7	1,4-Dichlorobenzene	500	U
95-50-1	1,2-Dichlorobenzene	500	U
95-48-7	2-Methylphenol	500	U
108-60-1	2,2'-oxybis(1-Chloropropane)	500	U
106-44-5	4-Methylphenol	500	U
621-64-7	N-Nitroso-di-n-propylamine	500	U
67-72-1	Hexachloroethane	500	U
98-95-3	Nitrobenzene	500	U
78-59-1	Isophorone	500	U
88-75-5	2-Nitrophenol	500	U
105-67-9	2,4-Dimethylphenol	500	U
111-91-1	bis(2-Chloroethoxy)methane	500	U
120-83-2	2,4-Dichlorophenol	500	U
120-82-1	1,2,4-Trichlorobenzene	500	U
91-20-3	Naphthalene	500	U
106-47-8	4-Chloroaniline	500	U
87-68-3	Hexachlorobutadiene	500	U
59-50-7	4-Chloro-3-methylphenol	500	U
91-57-6	2-Methylnaphthalene	500	U
77-47-4	Hexachlorocyclopentadiene	500	UJ
88-06-2	2,4,6-Trichlorophenol	500	U
95-95-4	2,4,5-Trichlorophenol	1200	U
91-58-7	2-Chloronaphthalene	500	U
88-74-4	2-Nitroaniline	1200	U
131-11-3	Dimethylphthalate	500	U
208-96-8	Acenaphthylene	500	U
606-20-2	2,6-Dinitrotoluene	500	UJ
99-09-2	3-Nitroaniline	1200	U
83-32-9	Acenaphthene	500	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-22

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3562

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 34 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1200	U
100-02-7	4-Nitrophenol	1200	U
132-64-9	Dibenzofuran	500	U
121-14-2	2,4-Dinitrotoluene	500	U
84-66-2	Diethylphthalate	500	U
7005-72-3	4-Chlorophenyl-phenylether	500	U J
86-73-7	Fluorene	500	U J
100-01-6	4-Nitroaniline	1200	U
534-52-1	4,6-Dinitro-2-methylphenol	1200	U J
86-30-6	N-Nitrosodiphenylamine (1)	500	U
101-55-3	4-Bromophenyl-phenylether	500	U
118-74-1	Hexachlorobenzene	500	U
87-86-5	Pentachlorophenol	1200	U
85-01-8	Phenanthrene	500	U
120-12-7	Anthracene	500	U
86-74-8	Carbazole	500	U
84-74-2	Di-n-butylphthalate	500	U J
206-44-0	Fluoranthene	500	U
129-00-0	Pyrene	500	U
85-68-7	Butylbenzylphthalate	500	U
91-94-1	3,3'-Dichlorobenzidine	500	U
56-55-3	Benzo(a)anthracene	500	U
218-01-9	Chrysene	500	U
117-81-7	bis(2-Ethylhexyl)phthalate	310	J
117-84-0	Di-n-octylphthalate	200	J
205-99-2	Benzo(b)fluoranthene	500	U
207-08-9	Benzo(k)fluoranthene	500	U J
50-32-8	Benzo(a)pyrene	500	U
193-39-5	Indeno(1,2,3-cd)pyrene	500	U
53-70-3	Dibenz(a,h)anthracene	500	U
191-24-2	Benzo(g,h,i)perylene	500	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB05

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-22

Sample wt/vol: 30.20 (g/mL) G Lab File ID: H3562

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 34 decanted: (Y/N) N Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 5.9

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 120401	DODECANAMIDE, N,N-BIS(2-HYDR	13.29	250	JN
2.	UNKNOWN	13.82	400	J
	UNKNOWN	14.14	600	J
	UNKNOWN	14.20	1100	J
5.	UNKNOWN	14.26	1200	J
6.	UNKNOWN	14.52	500	J
7.	UNKNOWN	15.40	1700	J
8.	UNKNOWN	16.26	250	J
9. 511159	2-PHENANTHRENOL, 4B,5,6,7,8,	16.40	450	JN
10. 511159	2-PHENANTHRENOL, 4B,5,6,7,8,	16.58	1300	JN
11. 1002433	UNDECANE, 3-METHYL-	16.82	500	JN
12.	UNKNOWN	17.06	2400	J
13. 630024	OCTACOSANE	17.35	750	JN
14. 544763	HEXADECANE	17.86	600	JN
15. 54833237	EICOSANE, 10-METHYL-	18.35	1000	JN
16.	UNKNOWN	18.84	750	J
17. 17301303	UNDECANE, 3,8-DIMETHYL-	19.37	2700	JN
18. 17301303	UNDECANE, 3,8-DIMETHYL-	20.69	3400	JN
19. 25117355	OCTADECANE, 5-METHYL-	22.51	1100	JN
20.	UNKNOWN	23.45	1400	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB06

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: 38778-12

sample wt/vol: 30.40 (g/mL) G Lab File ID: H3551

.evel: (low/med) LOW Date Received: 12/15/93

6 Moisture: 67 decanted: (Y/N) N Date Extracted: 12/17/93

concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	990	U
111-44-4	bis(2-Chloroethyl)ether	990	U
95-57-8	2-Chlorophenol	990	U
541-73-1	1,3-Dichlorobenzene	990	U
106-46-7	1,4-Dichlorobenzene	990	U
95-50-1	1,2-Dichlorobenzene	990	U
95-48-7	2-Methylphenol	990	U
108-60-1	2,2'-oxybis(1-Chloropropane)	990	U
106-44-5	4-Methylphenol	990	U
621-64-7	N-Nitroso-di-n-propylamine	990	U
67-72-1	Hexachloroethane	990	U
98-95-3	Nitrobenzene	990	U
78-59-1	Isophorone	990	U
88-75-5	2-Nitrophenol	990	U
105-67-9	2,4-Dimethylphenol	990	U
111-91-1	bis(2-Chloroethoxy)methane	990	U
120-83-2	2,4-Dichlorophenol	990	U
120-82-1	1,2,4-Trichlorobenzene	990	U
91-20-3	Naphthalene	990	U
106-47-8	4-Chloroaniline	990	U
87-68-3	Hexachlorobutadiene	990	U
59-50-7	4-Chloro-3-methylphenol	990	U
91-57-6	2-Methylnaphthalene	990	U
77-47-4	Hexachlorocyclopentadiene	990	UJ
88-06-2	2,4,6-Trichlorophenol	990	U
95-95-4	2,4,5-Trichlorophenol	2400	U
91-58-7	2-Chloronaphthalene	990	U
88-74-4	2-Nitroaniline	2400	U
131-11-3	Dimethylphthalate	990	U
208-96-8	Acenaphthylene	990	U
606-20-2	2,6-Dinitrotoluene	990	UJ
99-09-2	3-Nitroaniline	2400	U
83-32-9	Acenaphthene	990	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB06

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-12

ample wt/vol: 30.40 (g/mL) G Lab File ID: H3551

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 67 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 6.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	2400	U
100-02-7	4-Nitrophenol	2400	U
132-64-9	Dibenzofuran	990	U
121-14-2	2,4-Dinitrotoluene	990	U
84-66-2	Diethylphthalate	990	U
7005-72-3	4-Chlorophenyl-phenylether	990	UJ
86-73-7	Fluorene	990	UJ
100-01-6	4-Nitroaniline	2400	U
534-52-1	4,6-Dinitro-2-methylphenol	2400	UJ
86-30-6	N-Nitrosodiphenylamine (1)	990	U
101-55-3	4-Bromophenyl-phenylether	990	U
118-74-1	Hexachlorobenzene	990	U
87-86-5	Pentachlorophenol	2400	U
85-01-8	Phenanthrene	990	U
120-12-7	Anthracene	990	U
86-74-8	Carbazole	990	U
84-74-2	Di-n-butylphthalate	990	UJ
206-44-0	Fluoranthene	990	U
129-00-0	Pyrene	990	U
85-68-7	Butylbenzylphthalate	990	U
91-94-1	3,3'-Dichlorobenzidine	990	U
56-55-3	Benzo(a)anthracene	990	U
218-01-9	Chrysene	990	U
117-81-7	bis(2-Ethylhexyl)phthalate	280	J
117-84-0	Di-n-octylphthalate	990	U
205-99-2	Benzo(b)fluoranthene	990	U
207-08-9	Benzo(K)fluoranthene	990	UJ
50-32-8	Benzo(a)pyrene	990	U
193-39-5	Indeno(1,2,3-cd)pyrene	990	U
53-70-3	Dibenz(a,h)anthracene	990	U
191-24-2	Benzo(g,h,i)perylene	990	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB06

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-12

ample wt/vol: 30.40 (g/mL) G   Lab File ID: H3551

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 67   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 6.0

umber TICs found: 20   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	5.06	4400	J
2. 1002842	PENTADECANOIC ACID	13.31	1300	JN
3.	UNKNOWN	13.37	1000	J
4. 2091294	9-HEXADECENOIC ACID	14.22	6500	JN
5. 57103	HEXADECANOIC ACID	14.29	4800	JN
6.	UNKNOWN	14.54	2400	J
7. 74663857	CYCLOPROPANE, NONYL-	14.82	800	JN
8. 2091294	9-HEXADECENOIC ACID	15.39	6900	JN
9.	UNKNOWN	15.49	1100	J
10. 55045142	TETRADECANE, 4-ETHYL-	16.23	1700	JN
11. 17301303	UNDECANE, 3,8-DIMETHYL-	16.80	2900	JN
12.	UNKNOWN	17.03	2300	J
13. 22607165	1,5-HEPTADIENE-3,4-DIOL, 2,5	17.33	2500	JN
14. 55045142	TETRADECANE, 4-ETHYL-	17.84	3600	JN
15. 4292197	DODECANE, 1-IODO-	18.34	3700	JN
16. 54833486	HEPTADECANE, 2,6,10,15-TETRA	18.82	2500	JN
17. 54833486	HEPTADECANE, 2,6,10,15-TETRA	19.34	4800	JN
18. 54833486	HEPTADECANE, 2,6,10,15-TETRA	20.63	3500	JN
19. 7045718	UNDECANE, 2-METHYL-	22.45	1000	JN
20. 83476	.GAMMA.-SITOSTEROL	23.40	2200	JN

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-13

ample wt/vol: 30.10 (g/mL) G Lab File ID: H3552

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 38 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	530	U
111-44-4	bis(2-Chloroethyl)ether	530	U
95-57-8	2-Chlorophenol	530	U
541-73-1	1,3-Dichlorobenzene	530	U
106-46-7	1,4-Dichlorobenzene	530	U
95-50-1	1,2-Dichlorobenzene	530	U
95-48-7	2-Methylphenol	530	U
108-60-1	2,2'-oxybis(1-Chloropropane)	530	U
106-44-5	4-Methylphenol	530	U
621-64-7	N-Nitroso-di-n-propylamine	530	U
67-72-1	Hexachloroethane	530	U
98-95-3	Nitrobenzene	530	U
78-59-1	Isophorone	530	U
88-75-5	2-Nitrophenol	530	U
105-67-9	2,4-Dimethylphenol	530	U
111-91-1	bis(2-Chloroethoxy)methane	530	U
120-83-2	2,4-Dichlorophenol	530	U
120-82-1	1,2,4-Trichlorobenzene	530	U
91-20-3	Naphthalene	530	U
106-47-8	4-Chloroaniline	530	U
87-68-3	Hexachlorobutadiene	530	U
59-50-7	4-Chloro-3-methylphenol	530	U
91-57-6	2-Methylnaphthalene	530	U
77-47-4	Hexachlorocyclopentadiene	530	UJ
88-06-2	2,4,6-Trichlorophenol	530	U
95-95-4	2,4,5-Trichlorophenol	1300	U
91-58-7	2-Chloronaphthalene	530	U
88-74-4	2-Nitroaniline	1300	U
131-11-3	Dimethylphthalate	530	U
208-96-8	Acenaphthylene	530	U
606-20-2	2,6-Dinitrotoluene	530	UJ
99-09-2	3-Nitroaniline	1300	U
83-32-9	Acenaphthene	530	U

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200055

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-13

Sample wt/vol: 30.10 (g/mL) G   Lab File ID: H3552

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: 38 decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 5.7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1300	U
100-02-7	4-Nitrophenol	1300	U
132-64-9	Dibenzofuran	530	U
121-14-2	2,4-Dinitrotoluene	530	U
84-66-2	Diethylphthalate	530	U
7005-72-3	4-Chlorophenyl-phenylether	530	UJ
86-73-7	Fluorene	530	UJ
100-01-6	4-Nitroaniline	1300	U
534-52-1	4,6-Dinitro-2-methylphenol	1300	UJ
86-30-6	N-Nitrosodiphenylamine (1)	530	U
101-55-3	4-Bromophenyl-phenylether	530	U
118-74-1	Hexachlorobenzene	530	U
87-86-5	Pentachlorophenol	1300	U
85-01-8	Phenanthrene	530	U
120-12-7	Anthracene	530	U
86-74-8	Carbazole	530	U
84-74-2	Di-n-butylphthalate	530	UJ
206-44-0	Fluoranthene	530	U
129-00-0	Pyrene	530	U
85-68-7	Butylbenzylphthalate	530	U
91-94-1	3,3'-Dichlorobenzidine	530	U
56-55-3	Benzo(a)anthracene	530	U
218-01-9	Chrysene	530	U
117-81-7	bis(2-Ethylhexyl)phthalate	530	U
117-84-0	Di-n-octylphthalate	530	U
205-99-2	Benzo(b)fluoranthene	530	U
207-08-9	Benzo(k)fluoranthene	530	UJ
50-32-8	Benzo(a)pyrene	530	U
193-39-5	Indeno(1,2,3-cd)pyrene	530	U
53-70-3	Dibenz(a,h)anthracene	530	U
191-24-2	Benzo(g,h,i)perylene	530	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB07

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: 38778-13

ample wt/vol: 30.10 (g/mL) G Lab File ID: H3552

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 38 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.7

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	5.03	1900	J
2.	UNKNOWN	5.20	480	J
1002842	PENTADECANOIC ACID	13.28	480	JN
2091294	9-HEXADECENOIC ACID	14.21	3500	JN
5. 97789	GLYCINE, N-METHYL-N-(1-OXODO	14.28	2100	JN
6.	UNKNOWN	15.38	2100	J
7.	UNKNOWN	15.48	380	J
8. 17301303	UNDECANE, 3,8-DIMETHYL-	16.79	590	JN
9. 3160325	1-PENTEN-3-ONE, 4-METHYL-1-P	17.02	380	JN
10. 630068	HEXATRIACONTANE	17.33	910	JN
11. 7098217	TRITETRACONTANE	17.83	640	JN
12.	UNKNOWN	18.33	750	J
13. 27948125	CYCLOHEXANEACETIC ACID, BUTY	18.70	860	JN
14. 544763	HEXADECANE	18.81	540	JN
15.	UNKNOWN	19.15	1200	J
16. 54833486	HEPTADECANE, 2,6,10,15-TETRA	19.33	1900	JN
17. 54833486	HEPTADECANE, 2,6,10,15-TETRA	20.64	2500	JN
18.	UNKNOWN	22.43	3600	J
19. 630035	NONACOSANE	22.48	700	BJN
20. 83476	.GAMMA.-SITOSTEROL	23.42	1300	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-15

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3563

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 57 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 4.0

PC Cleanup: (Y/N) Y pH: 5.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	3000	U
111-44-4	bis(2-Chloroethyl)ether	3000	U
95-57-8	2-Chlorophenol	3000	U
541-73-1	1,3-Dichlorobenzene	3000	U
106-46-7	1,4-Dichlorobenzene	3000	U
95-50-1	1,2-Dichlorobenzene	3000	U
95-48-7	2-Methylphenol	3000	U
108-60-1	2,2'-oxybis(1-Chloropropane)	3000	U
106-44-5	4-Methylphenol	3000	U
621-64-7	N-Nitroso-di-n-propylamine	3000	U
67-72-1	Hexachloroethane	3000	U
98-95-3	Nitrobenzene	3000	U
78-59-1	Isophorone	3000	U
88-75-5	2-Nitrophenol	3000	U
105-67-9	2,4-Dimethylphenol	3000	U
111-91-1	bis(2-Chloroethoxy)methane	3000	U
120-83-2	2,4-Dichlorophenol	3000	U
120-82-1	1,2,4-Trichlorobenzene	3000	U
91-20-3	Naphthalene	3000	U
106-47-8	4-Chloroaniline	3000	U
87-68-3	Hexachlorobutadiene	3000	U
59-50-7	4-Chloro-3-methylphenol	3000	U
91-57-6	2-Methylnaphthalene	3000	U
77-47-4	Hexachlorocyclopentadiene	3000	UJ
88-06-2	2,4,6-Trichlorophenol	3000	U
95-95-4	2,4,5-Trichlorophenol	7400	U
91-58-7	2-Chloronaphthalene	3000	U
88-74-4	2-Nitroaniline	7400	U
131-11-3	Dimethylphthalate	3000	U
208-96-8	Acenaphthylene	3000	U
606-20-2	2,6-Dinitrotoluene	3000	UJ
99-09-2	3-Nitroaniline	7400	U
83-32-9	Acenaphthene	3000	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-15

ample wt/vol: 30.20 (g/mL) G Lab File ID: H3563

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 57 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 4.0

PC Cleanup: (Y/N) Y pH: 5.4

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	7400	U
100-02-7	4-Nitrophenol	7400	U
132-64-9	Dibenzofuran	3000	U
121-14-2	2,4-Dinitrotoluene	3000	U
84-66-2	Diethylphthalate	3000	U
7005-72-3	4-Chlorophenyl-phenylether	3000	UJ
86-73-7	Fluorene	3000	UJ
100-01-6	4-Nitroaniline	7400	U
534-52-1	4,6-Dinitro-2-methylphenol	7400	UJ
86-30-6	N-Nitrosodiphenylamine (1)	3000	U
101-55-3	4-Bromophenyl-phenylether	3000	U
118-74-1	Hexachlorobenzene	3000	U
87-86-5	Pentachlorophenol	7400	U
85-01-8	Phenanthrene	3000	U
120-12-7	Anthracene	3000	U
86-74-8	Carbazole	3000	U
84-74-2	Di-n-butylphthalate	3000	UJ
206-44-0	Fluoranthene	3000	U
129-00-0	Pyrene	3000	U
85-68-7	Butylbenzylphthalate	3000	U
91-94-1	3,3'-Dichlorobenzidine	3000	U
56-55-3	Benzo(a)anthracene	3000	U
218-01-9	Chrysene	3000	U
117-81-7	bis(2-Ethylhexyl)phthalate	3000	U
117-84-0	Di-n-octylphthalate	3000	U
205-99-2	Benzo(b)fluoranthene	3000	U
207-08-9	Benzo(k)fluoranthene	3000	UJ
50-32-8	Benzo(a)pyrene	3000	U
193-39-5	Indeno(1,2,3-cd)pyrene	3000	U
53-70-3	Dibenz(a,h)anthracene	3000	U
191-24-2	Benzo(g,h,i)perylene	3000	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB08

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-15

Sample wt/vol: 30.20 (g/mL) G   Lab File ID: H3563

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: 57   decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

Injection Volume: 2.0(uL)   Dilution Factor: 4.0

GPC Cleanup: (Y/N) Y   pH: 5.4

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 694871	BICYCLO[4.2.0]OCTA-1,3,5-TRI	4.58	3700	JN
2. 3779611	1,3,6-OCTATRIENE, 3,7-DIMETH	5.14	5200	JN
3. 98851	BENZENEMETHANOL, .ALPHA.-MET	7.80	1800	JN
4. 71127225	PYRIDO[1,2-A]AZEPINE-6,7,8,9	7.90	1800	JN
5. 104530	BENZENEPROPANAL	9.20	2200	JN
6. 87445	CARYOPHYLLENE (VAN)	10.33	5500	JN
7. 140103	2-PROPENOIC ACID, 3-PHENYL-,	10.42	6500	JN
8.	UNKNOWN	13.14	1500	J
9. 2091294	9-HEXADECENOIC ACID	14.16	2800	JN
10. 97789	GLYCINE, N-METHYL-N-(1-OXODO	14.22	3100	JN
11.	UNKNOWN	15.34	2500	J
12. 98839	BENZENE, (1-METHYLETHENYL)-	16.48	8000	JN
13.	UNKNOWN	17.12	59000	J
14. 55045084	DODECANE, 2-METHYL-6-PROPYL-	17.34	2500	JN
15.	UNKNOWN HYDROCARBON	18.34	2500	J
16.	UNKNOWN	19.03	13000	J
17. 55045119	TRIDECANE, 5-PROPYL-	19.37	31000	JN
18. 630024	OCTACOSANE	20.66	23000	JN
19. 544763	HEXADECANE	22.47	4000	JN
20. 514078	D-FRIEDOOLEAN-14-EN-3-ONE	23.40	10000	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-16

Sample wt/vol: 30.90 (g/mL) G   Lab File ID: H3554

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: 66 decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 5.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	940	U
111-44-4	bis(2-Chloroethyl)ether	940	U
95-57-8	2-Chlorophenol	940	U
541-73-1	1,3-Dichlorobenzene	940	U
106-46-7	1,4-Dichlorobenzene	940	U
95-50-1	1,2-Dichlorobenzene	940	U
95-48-7	2-Methylphenol	940	U
108-60-1	2,2'-oxybis(1-Chloropropane)	940	U
106-44-5	4-Methylphenol	940	U
621-64-7	N-Nitroso-di-n-propylamine	940	U
67-72-1	Hexachloroethane	940	U
98-95-3	Nitrobenzene	940	U
78-59-1	Isophorone	940	U
88-75-5	2-Nitrophenol	940	U
105-67-9	2,4-Dimethylphenol	940	U
111-91-1	bis(2-Chloroethoxy)methane	940	U
120-83-2	2,4-Dichlorophenol	940	U
120-82-1	1,2,4-Trichlorobenzene	940	U
91-20-3	Naphthalene	940	U
106-47-8	4-Chloroaniline	940	U
87-68-3	Hexachlorobutadiene	940	U
59-50-7	4-Chloro-3-methylphenol	940	U
91-57-6	2-Methylnaphthalene	940	U
77-47-4	Hexachlorocyclopentadiene	940	U
88-06-2	2,4,6-Trichlorophenol	940	U
95-95-4	2,4,5-Trichlorophenol	2300	U
91-58-7	2-Chloronaphthalene	940	U
88-74-4	2-Nitroaniline	2300	U
131-11-3	Dimethylphthalate	940	U
208-96-8	Acenaphthylene	940	U
606-20-2	2,6-Dinitrotoluene	940	U
99-09-2	3-Nitroaniline	2300	U
83-32-9	Acenaphthene	940	U

R

Use RE DATA

FORM I SV-1   3/90

200061

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-16

ample wt/vol: 30.90 (g/mL) G Lab File ID: H3554

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 66 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

iPC Cleanup: (Y/N) Y pH: 5.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	2300	U R
100-02-7	4-Nitrophenol	2300	U
132-64-9	Dibenzofuran	940	U
121-14-2	2,4-Dinitrotoluene	940	U
84-66-2	Diethylphthalate	940	U
7005-72-3	4-Chlorophenyl-phenylether	940	U
86-73-7	Fluorene	940	U
100-01-6	4-Nitroaniline	2300	U
534-52-1	4,6-Dinitro-2-methylphenol	2300	U
86-30-6	N-Nitrosodiphenylamine (1)	940	U
101-55-3	4-Bromophenyl-phenylether	940	U
118-74-1	Hexachlorobenzene	940	U
87-86-5	Pentachlorophenol	2300	U
85-01-8	Phenanthrene	940	U
120-12-7	Anthracene	940	U
86-74-8	Carbazole	940	U
84-74-2	Di-n-butylphthalate	940	U
206-44-0	Fluoranthene	940	U
129-00-0	Pyrene	940	U
85-68-7	Butylbenzylphthalate	940	U
91-94-1	3,3'-Dichlorobenzidine	940	U
56-55-3	Benzo(a)anthracene	940	U
218-01-9	Chrysene	940	U
117-81-7	bis(2-Ethylhexyl)phthalate	940	U
117-84-0	Di-n-octylphthalate	940	U
205-99-2	Benzo(b)fluoranthene	940	U
207-08-9	Benzo(k)fluoranthene	940	UJ
50-32-8	Benzo(a)pyrene	940	U
193-39-5	Indeno(1,2,3-cd)pyrene	940	U
53-70-3	Dibenz(a,h)anthracene	940	U
191-24-2	Benzo(g,h,i)perylene	940	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB09

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-16

ample wt/vol: 30.90 (g/mL) G   Lab File ID: H3554

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 66   decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.9

CONCENTRATION UNITS:

umber TICs found: 20   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 1002842	PENTADECANOIC ACID	13.28	480	JN
2. 2091294	9-HEXADECENOIC ACID	14.11	1100	JN
2091294	9-HEXADECENOIC ACID	14.16	1200	JN
	UNKNOWN	14.22	570	J
5.	UNKNOWN	14.50	860	J
6. 2091294	9-HEXADECENOIC ACID	15.37	2000	JN
7. 54833486	HEPTADECANE, 2,6,10,15-TETRA	16.23	480	JN
8. 54833486	HEPTADECANE, 2,6,10,15-TETRA	16.80	860	JN
9.	UNKNOWN	17.03	1400	J
10.	UNKNOWN	17.23	2000	J
11. 54833486	HEPTADECANE, 2,6,10,15-TETRA	17.33	1700	JN
12. 55045084	DODECANE, 2-METHYL-6-PROPYL-	17.84	1000	JN
13.	UNKNOWN	17.97	760	J
14. 17301303	UNDECANE, 3,8-DIMETHYL-	18.34	1400	JN
15. 55045108	TRIDECANE, 6-PROPYL-	18.80	670	JN
16. 55045142	TETRADECANE, 4-ETHYL-	19.35	4000	JN
17.	UNKNOWN	19.54	2100	J
18. 17301303	UNDECANE, 3,8-DIMETHYL-	20.64	4100	JN
19. 17312628	DECANE, 5-PROPYL-	22.46	1200	JN
20.	UNKNOWN	23.37	1500	J

R

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

| BCSB09RE |

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: 38778-16RE

Sample wt/vol: 30.00 (g/mL) G Lab File ID: H3638

.evel: (low/med) LOW Date Received: 12/15/93

 Moisture: 66 decanted: (Y/N) N Date Extracted: 01/06/94

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/11/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.9

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	970	UJ
111-44-4	bis(2-Chloroethyl)ether	970	U
95-57-8	2-Chlorophenol	970	U
541-73-1	1,3-Dichlorobenzene	970	U
106-46-7	1,4-Dichlorobenzene	970	U
95-50-1	1,2-Dichlorobenzene	970	U
95-48-7	2-Methylphenol	970	U
108-60-1	2,2'-oxybis(1-Chloropropane)	970	U
106-44-5	4-Methylphenol	970	U
621-64-7	N-Nitroso-di-n-propylamine	970	U
67-72-1	Hexachloroethane	970	U
98-95-3	Nitrobenzene	970	U
78-59-1	Isophorone	970	U
88-75-5	2-Nitrophenol	970	U
105-67-9	2,4-Dimethylphenol	970	U
111-91-1	bis(2-Chloroethoxy)methane	970	U
120-83-2	2,4-Dichlorophenol	970	U
120-82-1	1,2,4-Trichlorobenzene	970	U
91-20-3	Naphthalene	970	U
106-47-8	4-Chloroaniline	970	U
87-68-3	Hexachlorobutadiene	970	U
59-50-7	4-Chloro-3-methylphenol	970	U
91-57-6	2-Methylnaphthalene	970	U
77-47-4	Hexachlorocyclopentadiene	970	UJ
88-06-2	2,4,6-Trichlorophenol	970	U
95-95-4	2,4,5-Trichlorophenol	2400	U
91-58-7	2-Chloronaphthalene	970	U
88-74-4	2-Nitroaniline	2400	U
131-11-3	Dimethylphthalate	970	U
208-96-8	Acenaphthylene	970	U
606-20-2	2,6-Dinitrotoluene	970	UJ
99-09-2	3-Nitroaniline	2400	U
83-32-9	Acenaphthene	970	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

| BCSB09RE |

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-16RE

Sample wt/vol: 30.00 (g/mL) G Lab File ID: H3638

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 66 decanted: (Y/N) N Date Extracted: 01/06/94

OUT OF HOLDING TIME

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/11/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 5.9

All data "J"

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	2400	U J
100-02-7	4-Nitrophenol	2400	U
132-64-9	Dibenzofuran	970	U
121-14-2	2,4-Dinitrotoluene	970	U
84-66-2	Diethylphthalate	970	U
7005-72-3	4-Chlorophenyl-phenylether	970	U J
86-73-7	Fluorene	970	U J
100-01-6	4-Nitroaniline	2400	U J
534-52-1	4,6-Dinitro-2-methylphenol	2400	U J
86-30-6	N-Nitrosodiphenylamine (1)	970	U
101-55-3	4-Bromophenyl-phenylether	970	U
118-74-1	Hexachlorobenzene	970	U
87-86-5	Pentachlorophenol	2400	U
85-01-8	Phenanthrene	970	U
120-12-7	Anthracene	970	U
86-74-8	Carbazole	970	U
84-74-2	Di-n-butylphthalate	970	U J
206-44-0	Fluoranthene	970	U
129-00-0	Pyrene	970	U
85-68-7	Butylbenzylphthalate	970	U
91-94-1	3,3'-Dichlorobenzidine	970	U
56-55-3	Benzo(a)anthracene	970	U
218-01-9	Chrysene	970	U J
117-81-7	bis(2-Ethylhexyl)phthalate	970	U J
117-84-0	Di-n-octylphthalate	970	U
205-99-2	Benzo(b)fluoranthene	970	U
207-08-9	Benzo(k)fluoranthene	970	U J
50-32-8	Benzo(a)pyrene	970	U J
193-39-5	Indeno(1,2,3-cd)pyrene	970	U
53-70-3	Dibenz(a,h)anthracene	970	U
191-24-2	Benzo(g,h,i)perylene	970	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB09RE

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

iatrix: (soil/water) SOIL Lab Sample ID: 38778-16RE

iample wt/vol: 30.00 (g/mL) G Lab File ID: H3638

.evel: (low/med) LOW Date Received: 12/15/93

: Moisture: 66 decanted: (Y/N) N Date Extracted: 01/06/94

:oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/11/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

:PC Cleanup: (Y/N) Y pH: 5.9

:umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	13.24	490	J
2. 2091294	9-HEXADECENOIC ACID	14.07	1200	JN
3.	UNKNOWN	14.11	590	J
4. 1002842	PENTADECANOIC ACID	14.19	2600	JN
5.	UNKNOWN	14.46	1100	J
6.	UNKNOWN	15.33	1200	J
7.	UNKNOWN	16.58	490	J
8. 2050773	DECANE, 1-IODO-	16.74	490	JN
9.	UNKNOWN	16.98	2500	J
10. 62238113	DECANE, 2,3,5-TRIMETHYL-	17.28	980	JN
11. 544763	HEXADECANE	18.29	880	BJN
12. 630024	OCTACOSANE	19.29	5700	BJN
13.	UNKNOWN	19.99	690	J
14. 54833486	HEPTADECANE, 2,6,10,15-TETRA	20.58	6600	JN
15.	UNKNOWN	20.84	980	J
16.	UNKNOWN	21.01	780	J
17.	UNKNOWN	21.08	780	J
18. 55045108	TRIDECANE, 6-PROPYL-	22.36	2000	JN
19. 521039	STIGMAST-7-EN-3-OL, (3.BETA.	23.28	2600	JN
20.	UNKNOWN	23.65	590	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

latrix: (soil/water) SOIL   Lab Sample ID: 38778-17

Sample wt/vol: 30.40 (g/mL) G   Lab File ID: H3555

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: 79   decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 6.5

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	1600	U
111-44-4	bis(2-Chloroethyl)ether	1600	U
95-57-8	2-Chlorophenol	1600	U
541-73-1	1,3-Dichlorobenzene	1600	U
106-46-7	1,4-Dichlorobenzene	1600	U
95-50-1	1,2-Dichlorobenzene	1600	U
95-48-7	2-Methylphenol	1600	U
108-60-1	2,2'-oxybis(1-Chloropropane)	1600	U
106-44-5	4-Methylphenol	1600	U
621-64-7	N-Nitroso-di-n-propylamine	1600	U
67-72-1	Hexachloroethane	1600	U
98-95-3	Nitrobenzene	1600	U
78-59-1	Isophorone	1600	U
88-75-5	2-Nitrophenol	1600	U
105-67-9	2,4-Dimethylphenol	1600	U
111-91-1	bis(2-Chloroethoxy)methane	1600	U
120-83-2	2,4-Dichlorophenol	1600	U
120-82-1	1,2,4-Trichlorobenzene	1600	U
91-20-3	Naphthalene	1600	U
106-47-8	4-Chloroaniline	1600	U
87-68-3	Hexachlorobutadiene	1600	U
59-50-7	4-Chloro-3-methylphenol	1600	U
91-57-6	2-Methylnaphthalene	1600	U
77-47-4	Hexachlorocyclopentadiene	1600	UJ
88-06-2	2,4,6-Trichlorophenol	1600	U
95-95-4	2,4,5-Trichlorophenol	3800	U
91-58-7	2-Chloronaphthalene	1600	U
88-74-4	2-Nitroaniline	3800	U
131-11-3	Dimethylphthalate	1600	U
208-96-8	Acenaphthylene	1600	U
606-20-2	2,6-Dinitrotoluene	1600	UJ
99-09-2	3-Nitroaniline	3800	U
83-32-9	Acenaphthene	1600	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-17

Sample wt/vol: 30.40 (g/mL) G Lab File ID: H3555

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: 79 decanted: (Y/N) N Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 6.5

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	UG/KG	Q
51-28-5	2,4-Dinitrophenol	3800	U
100-02-7	4-Nitrophenol	3800	U
132-64-9	Dibenzofuran	1600	U
121-14-2	2,4-Dinitrotoluene	1600	U
84-66-2	Diethylphthalate	1600	U
7005-72-3	4-Chlorophenyl-phenylether	1600	UJ
86-73-7	Fluorene	1600	UJ
100-01-6	4-Nitroaniline	3800	U
534-52-1	4,6-Dinitro-2-methylphenol	3800	UJ
86-30-6	N-Nitrosodiphenylamine (1)	1600	U
101-55-3	4-Bromophenyl-phenylether	1600	U
118-74-1	Hexachlorobenzene	1600	U
87-86-5	Pentachlorophenol	3800	U
85-01-8	Phenanthrene	1600	U
120-12-7	Anthracene	1600	U
86-74-8	Carbazole	1600	U
84-74-2	Di-n-butylphthalate	1600	UJ
206-44-0	Fluoranthene	1600	U
129-00-0	Pyrene	1600	U
85-68-7	Butylbenzylphthalate	1600	U
91-94-1	3,3'-Dichlorobenzidine	1600	U
56-55-3	Benzo(a)anthracene	1600	U
218-01-9	Chrysene	1600	U
117-81-7	bis(2-Ethylhexyl)phthalate	1600	U
117-84-0	Di-n-octylphthalate	1600	U
205-99-2	Benzo(b)fluoranthene	1600	U
207-08-9	Benzo(k)fluoranthene	1600	UJ
50-32-8	Benzo(a)pyrene	1600	U
193-39-5	Indeno(1,2,3-cd)pyrene	1600	U
53-70-3	Dibenz(a,h)anthracene	1600	U
191-24-2	Benzo(g,h,i)perylene	1600	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB10

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-17

ample wt/vol: 30.40 (g/mL) G Lab File ID: H3555

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 79 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 6.5

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 1002842	PENTADECANOIC ACID	13.36	3300	JN
2.	UNKNOWN	13.42	2000	J
	UNKNOWN	14.22	6300	J
	UNKNOWN	14.28	2700	J
5. 57103	HEXADECANOIC ACID	14.34	7700	JN
6.	UNKNOWN	14.61	5000	J
7. 35507096	7-HEXADECENE, (Z)-	14.88	1900	JN
8.	UNKNOWN	15.44	6700	J
9.	UNKNOWN	16.65	2500	J
10.	UNKNOWN	17.08	2200	J
11. 61868039	HEPTADECANE, 2,3-DIMETHYL-	17.38	1600	JN
12. 17301303	UNDECANE, 3,8-DIMETHYL-	18.39	3000	JN
13. 54833237	EICOSANE, 10-METHYL-	18.87	1600	JN
14.	UNKNOWN	19.07	2200	J
15. 17301303	UNDECANE, 3,8-DIMETHYL-	19.40	9400	JN
16. 55045142	TETRADECANE, 4-ETHYL-	20.73	16000	JN
17.	UNKNOWN	21.23	1700	J
18. 17301303	UNDECANE, 3,8-DIMETHYL-	22.55	3900	JN
19. 83476	.GAMMA.-SITOSTEROL	23.48	4500	JN
20.	UNKNOWN	23.68	1400	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-19

ample wt/vol: 31.00 (g/mL) G Lab File ID: H3559

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 56 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.2

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	730	U
111-44-4	bis(2-Chloroethyl)ether	730	U
95-57-8	2-Chlorophenol	730	U
541-73-1	1,3-Dichlorobenzene	730	U
106-46-7	1,4-Dichlorobenzene	730	U
95-50-1	1,2-Dichlorobenzene	730	U
95-48-7	2-Methylphenol	730	U
108-60-1	2,2'-oxybis(1-Chloropropane)	730	U
106-44-5	4-Methylphenol	730	U
621-64-7	N-Nitroso-di-n-propylamine	730	U
67-72-1	Hexachloroethane	730	U
98-95-3	Nitrobenzene	730	U
78-59-1	Isophorone	730	U
88-75-5	2-Nitrophenol	730	U
105-67-9	2,4-Dimethylphenol	730	U
111-91-1	bis(2-Chloroethoxy)methane	730	U
120-83-2	2,4-Dichlorophenol	730	U
120-82-1	1,2,4-Trichlorobenzene	730	U
91-20-3	Naphthalene	730	U
106-47-8	4-Chloroaniline	730	U
87-68-3	Hexachlorobutadiene	730	U
59-50-7	4-Chloro-3-methylphenol	730	U
91-57-6	2-Methylnaphthalene	730	U
77-47-4	Hexachlorocyclopentadiene	730	UJ
88-06-2	2,4,6-Trichlorophenol	730	U
95-95-4	2,4,5-Trichlorophenol	1800	U
91-58-7	2-Chloronaphthalene	730	U
88-74-4	2-Nitroaniline	1800	U
131-11-3	Dimethylphthalate	730	U
208-96-8	Acenaphthylene	730	U
606-20-2	2,6-Dinitrotoluene	730	UJ
99-09-2	3-Nitroaniline	1800	U
83-32-9	Acenaphthene	730	U

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-19

ample wt/vol: 31.00 (g/mL) G Lab File ID: H3559

evel: (low/med) LOW Date Received: 12/15/93

Moisture: 56 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 01/03/94

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 5.2

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	1800	U
100-02-7	4-Nitrophenol	1800	U
132-64-9	Dibenzofuran	730	U
121-14-2	2,4-Dinitrotoluene	730	U
84-66-2	Diethylphthalate	730	U
7005-72-3	4-Chlorophenyl-phenylether	730	UJ
86-73-7	Fluorene	730	UJ
100-01-6	4-Nitroaniline	1800	U
534-52-1	4,6-Dinitro-2-methylphenol	1800	UJ
86-30-6	N-Nitrosodiphenylamine (1)	730	U
101-55-3	4-Bromophenyl-phenylether	730	U
118-74-1	Hexachlorobenzene	730	U
87-86-5	Pentachlorophenol	1800	U
85-01-8	Phenanthrene	730	U
120-12-7	Anthracene	730	U
86-74-8	Carbazole	730	U
84-74-2	Di-n-butylphthalate	730	U
206-44-0	Fluoranthene	730	U
129-00-0	Pyrene	730	U
85-68-7	Butylbenzylphthalate	730	U
91-94-1	3,3'-Dichlorobenzidine	730	U
56-55-3	Benzo(a)anthracene	730	U
218-01-9	Chrysene	730	U
117-81-7	bis(2-Ethylhexyl)phthalate	350	J
117-84-0	Di-n-octylphthalate	290	J
205-99-2	Benzo(b)fluoranthene	730	U
207-08-9	Benzo(k)fluoranthene	730	UJ
50-32-8	Benzo(a)pyrene	730	U
193-39-5	Indeno(1,2,3-cd)pyrene	730	U
53-70-3	Dibenz(a,h)anthracene	730	U
191-24-2	Benzo(g,h,i)perylene	730	U

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-19

ample wt/vol: 31.00 (g/mL) G   Lab File ID: H3559

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: 56 decanted: (Y/N) N   Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL)   Date Analyzed: 01/03/94

njection Volume: 2.0(uL)   Dilution Factor: 1.0

PC Cleanup: (Y/N) Y   pH: 5.2

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	13.30	880	J
2.	UNKNOWN	13.36	660	J
3.	UNKNOWN	14.12	1500	J
4.	UNKNOWN	14.18	590	J
5. 97789	GLYCINE, N-METHYL-N-(1-OXODO	14.25	2200	JN
6.	UNKNOWN	14.53	1400	J
7. 112801	9-OCTADECENOIC ACID (Z)-	15.38	1600	JN
8. 544763	HEXADECANE	16.80	510	JN
9. 630024	OCTACOSANE	17.33	1400	JN
10. 55333998	EICOSANE, 7-HEXYL-	17.84	660	JN
11. 629629	PENTADECANE	18.34	2000	JN
12. 55045084	DODECANE, 2-METHYL-6-PROPYL-	18.82	590	JN
13.	UNKNOWN	19.04	510	J
14.	UNKNOWN	19.17	1700	J
15. 54833486	HEPTADECANE, 2,6,10,15-TETRA	19.36	3100	JN
16. 85698	1,2-BENZENEDICARBOXYLIC ACID	19.61	370	JN
17. 55045142	TETRADECANE, 4-ETHYL-	20.64	2100	JN
18.	UNKNOWN	21.20	730	J
19.	UNKNOWN	22.47	730	J
20.	UNKNOWN	23.40	950	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB2903

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38736-10

Sample wt/vol: 30.40 (g/mL) G   Lab File ID: H3527

Level: (low/med) LOW   Date Received: 12/13/93

% Moisture: 14 decanted: (Y/N) N   Date Extracted: 12/17/93

Concentrated Extract Volume: 500.0 (uL)   Date Analyzed: 12/29/93

Injection Volume: 2.0(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y   pH: 4.8

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	380	U
111-44-4	bis(2-Chloroethyl)ether	380	U
95-57-8	2-Chlorophenol	380	U
541-73-1	1,3-Dichlorobenzene	380	U
106-46-7	1,4-Dichlorobenzene	380	U
95-50-1	1,2-Dichlorobenzene	380	U
95-48-7	2-Methylphenol	380	U
108-60-1	2,2'-oxybis(1-Chloropropane)	380	U
106-44-5	4-Methylphenol	380	U
621-64-7	N-Nitroso-di-n-propylamine	380	U
67-72-1	Hexachloroethane	380	U
98-95-3	Nitrobenzene	380	U
78-59-1	Isophorone	380	U
88-75-5	2-Nitrophenol	380	U
105-67-9	2,4-Dimethylphenol	380	U
111-91-1	bis(2-Chloroethoxy)methane	380	U
120-83-2	2,4-Dichlorophenol	380	U
120-82-1	1,2,4-Trichlorobenzene	380	U
91-20-3	Naphthalene	380	U
106-47-8	4-Chloroaniline	380	U
87-68-3	Hexachlorobutadiene	380	U
59-50-7	4-Chloro-3-methylphenol	380	U
91-57-6	2-Methylnaphthalene	380	U
77-47-4	Hexachlorocyclopentadiene	380	U
88-06-2	2,4,6-Trichlorophenol	380	U
95-95-4	2,4,5-Trichlorophenol	920	U
91-58-7	2-Chloronaphthalene	380	U
88-74-4	2-Nitroaniline	920	U
131-11-3	Dimethylphthalate	380	U
208-96-8	Acenaphthylene	380	U
606-20-2	2,6-Dinitrotoluene	380	UJ
99-09-2	3-Nitroaniline	920	U
83-32-9	Acenaphthene	380	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB2903

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-10

ample wt/vol: 30.40 (g/mL) G Lab File ID: H3527

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 14 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 4.8

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
51-28-5	2,4-Dinitrophenol	920	U
100-02-7	4-Nitrophenol	920	U
132-64-9	Dibenzofuran	380	U
121-14-2	2,4-Dinitrotoluene	380	U
84-66-2	Diethylphthalate	380	U
7005-72-3	4-Chlorophenyl-phenylether	380	UJ
86-73-7	Fluorene	380	UJ
100-01-6	4-Nitroaniline	920	U
534-52-1	4,6-Dinitro-2-methylphenol	920	U
86-30-6	N-Nitrosodiphenylamine (1)	380	U
101-55-3	4-Bromophenyl-phenylether	380	U
118-74-1	Hexachlorobenzene	380	U
87-86-5	Pentachlorophenol	920	U
85-01-8	Phenanthrene	380	U
120-12-7	Anthracene	380	U
86-74-8	Carbazole	380	U
84-74-2	Di-n-butylphthalate	380	U
206-44-0	Fluoranthene	380	U
129-00-0	Pyrene	380	U
85-68-7	Butylbenzylphthalate	380	U
91-94-1	3,3'-Dichlorobenzidine	380	U
56-55-3	Benzo(a)anthracene	380	U
218-01-9	Chrysene	380	U
117-81-7	bis(2-Ethylhexyl)phthalate	130	J
117-84-0	Di-n-octylphthalate	84	J
205-99-2	Benzo(b)fluoranthene	380	U
207-08-9	Benzo(k)fluoranthene	380	UJ
50-32-8	Benzo(a)pyrene	380	U
193-39-5	Indeno(1,2,3-cd)pyrene	380	U
53-70-3	Dibenz(a,h)anthracene	380	U
191-24-2	Benzo(g,h,i)perylene	380	U

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB2903

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38736-10

ample wt/vol: 30.40 (g/mL) G Lab File ID: H3527

evel: (low/med) LOW Date Received: 12/13/93

Moisture: 14 decanted: (Y/N) N Date Extracted: 12/17/93

oncentrated Extract Volume: 500.0 (uL) Date Analyzed: 12/29/93

njection Volume: 2.0(uL) Dilution Factor: 1.0

PC Cleanup: (Y/N) Y pH: 4.8

umber TICs found: 8

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 544763	HEXADECANE	16.82	110	JN
2. 630024	OCTACOSANE	17.37	190	JN
630035	NONACOSANE	17.91	270	BJN
630024	OCTACOSANE	18.42	230	JN
5.	UNKNOWN	18.91	690	J
6. 7225641	HEPTADECANE, 9-OCTYL-	19.48	150	JN
7.	UNKNOWN	19.79	150	J
8. 85698	1,2-BENZENEDICARBOXYLIC ACID	21.28	76	JN

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Lab File ID (Standard): D8649   Date Analyzed: 12/21/93

Instrument ID: DMS-HP   Time Analyzed: 1440

GC Column: 502.2   ID: 0.530(mm)   Heated Purge: (Y/N) Y

		IS1(BCM) AREA #	RT #	IS2(DFB) AREA #	RT #	IS3(CBZ) AREA #	RT #
	12 HOUR STD	49218	11.86	184592	14.15	151736	22.21
	UPPER LIMIT	98436	12.36	369184	14.65	303472	22.71
	LOWER LIMIT	24609	11.36	92296	13.65	75868	21.71
	EPA SAMPLE NO.						
01	BCSB01	24022 *	11.87	77677 *	14.17	55291 *	22.18
02	BCSB02	14851 *	11.83	48656 *	14.12	33564 *	22.17
03	BCSB03	16482 *	11.85	54010 *	14.15	36331 *	22.18
04	BCSB05	25307	11.84	87425 *	14.14	62309 *	22.16
05	BCSB06	33902	11.84	121399	14.13	90101	22.19
06	BCSB07	14056 *	11.87	44931 *	14.15	27576 *	22.18
07	BCSB08	31139	11.83	105070	14.15	65367 *	22.18
08	BCSB09	17104 *	11.83	57720 *	14.12	36703 *	22.15
09	BCSB10	18539 *	11.87	64555 *	14.15	44049 *	22.18
10	BCSB3D	18999 *	11.84	65004 *	14.14	40212 *	22.18
11	SB3305	38177	11.87	146975	14.14	116093	22.19
12	BCSB03MS	19188 *	11.83	66112 *	14.13	44263 *	22.16
13	BCSB03MSD	18489 *	11.86	71721 *	14.16	47399 *	22.19
14	VBLKDK	48354	11.87	185890	14.17	148148	22.22

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = + 100% of internal standard area.
AREA LOWER LIMIT = - 50% of internal standard area.
RT UPPER LIMIT = +0.50 minutes of internal standard RT.
RT LOWER LIMIT = -0.50 minutes of internal standard RT.

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

- 8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Lab File ID (Standard): D8670   Date Analyzed: 12/22/93

Instrument ID: DMS-HP   Time Analyzed: 1054

GC Column: 502.2   ID: 0.530(mm)   Heated Purge: (Y/N) Y

		IS1(BCM) AREA #	RT #	IS2(DFB) AREA #	RT #	IS3(CBZ) AREA #	RT #
	12 HOUR STD	50904	11.83	197163	14.11	163009	22.16
	UPPER LIMIT	101808	12.33	394326	14.61	326018	22.66
	LOWER LIMIT	25452	11.33	98582	13.61	81504	21.66
	EPA SAMPLE NO.						
01	BCSB01RE	18126 *	11.84	64165 *	14.11	41424 *	22.16
02	BCSB02RE	17605 *	11.85	61788 *	14.12	39463 *	22.17
03	BCSB04	30647	11.83	109878	14.10	84618	22.17
04	BCSB05RE	23061 *	11.85	84593 *	14.12	54912 *	22.16
05	BCSB07RE	17786 *	11.83	60560 *	14.10	42889 *	22.15
06	BCSB08RE	12772 *	11.83	46538 *	14.12	31184 *	22.14
[illegible]	BCSB09RE	13584 *	11.85	44212 *	14.12	31511 *	22.13
[illegible]	BCSB10RE	16631 *	11.83	63137 *	14.10	40457 *	22.13
09	BCSB3DRE	21582 *	11.84	73098 *	14.11	52929 *	22.14
10	VBLKDL	48928	11.85	178329	14.12	148264	22.15

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = + 100% of internal standard area.
AREA LOWER LIMIT = - 50% of internal standard area.
RT UPPER LIMIT = +0.50 minutes of internal standard RT.
RT LOWER LIMIT = -0.50 minutes of internal standard RT.

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3405

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38736-7

Sample wt/vol: 4.20 (g/mL) G   Lab File ID: E5547

Level: (low/med) MED   Date Received: 12/13/93

% Moisture: not dec. 16   Date Analyzed: 12/17/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 6.7

Soil Extract Volume: 10000 (uL)   Soil Aliquot Volume: 100 (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	9100	U
74-83-9	Bromomethane	9100	U
75-01-4	Vinyl Chloride	9100	U
75-00-3	Chloroethane	9100	U
75-09-2	Methylene Chloride	6000	J
67-64-1	Acetone	9100	U
75-15-0	Carbon Disulfide	9100	U
75-35-4	1,1-Dichloroethene	9100	U
75-34-3	1,1-Dichloroethane	9100	U
540-59-0	1,2-Dichloroethene (total)	9100	U
67-66-3	Chloroform	9100	U
107-06-2	1,2-Dichloroethane	9100	U
78-93-3	2-Butanone	9100	U
71-55-6	1,1,1-Trichloroethane	9100	U
56-23-5	Carbon Tetrachloride	9100	U
75-27-4	Bromodichloromethane	9100	U
78-87-5	1,2-Dichloropropane	9100	U
10061-01-5	cis-1,3-Dichloropropene	9100	U
79-01-6	Trichloroethene	9100	U
124-48-1	Dibromochloromethane	9100	U
79-00-5	1,1,2-Trichloroethane	9100	U
71-43-2	Benzene	23000	
10061-02-6	trans-1,3-Dichloropropene	9100	U
75-25-2	Bromoform	9100	U
108-10-1	4-Methyl-2-Pentanone	9100	U
591-78-6	2-Hexanone	12000	
127-18-4	Tetrachloroethene	9100	U
79-34-5	1,1,2,2-Tetrachloroethane	~~9100~~	~~U~~
108-88-3	Toluene	190000	E
108-90-7	Chlorobenzene	~~9100~~	~~U~~
100-41-4	Ethylbenzene	70000	
100-42-5	Styrene	9100	U
1330-20-7	Xylene (total)	320000	

OUT OF LINEAR RANGE

FORM I VOA   3/90

100036

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

SB3405

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38736-7

Sample wt/vol: 4.20 (g/mL) G   Lab File ID: E5547

Level: (low/med) MED   Date Received: 12/13/93

% Moisture: not dec. 16   Date Analyzed: 12/17/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 6.7

Soil Extract Volume: 10000 (uL)   Soil Aliquot Volume: 100 (uL)

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	15.46	69000	J
2. 98828	BENZENE, (1-METHYLETHYL)-	22.57	140000	JN
3.	UNKNOWN	22.68	60000	J
4. 622968	BENZENE, 1-ETHYL-4-METHYL-	23.49	190000	JN
5. 95636	BENZENE, 1,2,4-TRIMETHYL-	24.45	63000	JN
6. 1074175	BENZENE, 1-METHYL-2-PROPYL-	24.78	65000	JN
7. 2870044	BENZENE, 2-ETHYL-1,3-DIMETHY	24.94	70000	JN
8. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	26.27	72000	JN
9. 767588	1H-INDENE, 2,3-DIHYDRO-1-MET	28.35	82000	JN
10. 91576	NAPHTHALENE, 2-METHYL-	35.23	66000	JN

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKDG

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

latrix: (soil/water) SOIL Lab Sample ID: BD121693A

ample wt/vol: 5.00 (g/mL) G Lab File ID: D8575

.evel: (low/med) LOW Date Received:

6 Moisture: not dec. Date Analyzed: 12/16/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	3	J
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	10	U
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
540-59-0	1,2-Dichloroethene (total)	10	U
67-66-3	Chloroform	10	U
107-06-2	1,2-Dichloroethane	10	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	10	U
56-23-5	Carbon Tetrachloride	10	U
75-27-4	Bromodichloromethane	10	U
78-87-5	1,2-Dichloropropane	10	U
10061-01-5	cis-1,3-Dichloropropene	10	U
79-01-6	Trichloroethene	10	U
124-48-1	Dibromochloromethane	10	U
79-00-5	1,1,2-Trichloroethane	10	U
71-43-2	Benzene	10	U
10061-02-6	trans-1,3-Dichloropropene	10	U
75-25-2	Bromoform	10	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	10	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U
108-88-3	Toluene	10	U
108-90-7	Chlorobenzene	10	U
100-41-4	Ethylbenzene	10	U
100-42-5	Styrene	10	U
1330-20-7	Xylene (total)	10	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKDK

ab Name: PACE NEW ENGLA Contract: NEESAC

ab .ode: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: BD122193B

ample wt/vol: 5.00 (g/mL) G Lab File ID: D8650

evel: (low/med) LOW Date Received:

Moisture: not dec. Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	10	
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	10	U
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
540-59-0	1,2-Dichloroethene (total)	10	U
67-66-3	Chloroform	10	U
107-06-2	1,2-Dichloroethane	10	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	10	U
56-23-5	Carbon Tetrachloride	10	U
75-27-4	Bromodichloromethane	10	U
78-87-5	1,2-Dichloropropane	10	U
10061-01-5	cis-1,3-Dichloropropene	10	U
79-01-6	Trichloroethene	10	U
124-48-1	Dibromochloromethane	10	U
79-00-5	1,1,2-Trichloroethane	10	U
71-43-2	Benzene	10	U
10061-02-6	trans-1,3-Dichloropropene	10	U
75-25-2	Bromoform	10	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	10	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U
108-88-3	Toluene	10	U
108-90-7	Chlorobenzene	10	U
100-41-4	Ethylbenzene	10	U
100-42-5	Styrene	10	U
1330-20-7	Xylene (total)	10	U

QUALIFY
UT TO
1000 x DF

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKDL

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: BD122293A

Sample wt/vol: 5.00 (g/mL) G   Lab File ID: D8671

Level: (low/med) LOW   Date Received:

% Moisture: not dec.   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	2	J
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	10	U
75-35-4	1,1-Dichloroethene	10	U
75-34-3	1,1-Dichloroethane	10	U
540-59-0	1,2-Dichloroethene (total)	10	U
67-66-3	Chloroform	10	U
107-06-2	1,2-Dichloroethane	10	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	10	U
56-23-5	Carbon Tetrachloride	10	U
75-27-4	Bromodichloromethane	10	U
78-87-5	1,2-Dichloropropane	10	U
10061-01-5	cis-1,3-Dichloropropene	10	U
79-01-6	Trichloroethene	10	U
124-48-1	Dibromochloromethane	10	U
79-00-5	1,1,2-Trichloroethane	10	U
71-43-2	Benzene	10	U
10061-02-6	trans-1,3-Dichloropropene	10	U
75-25-2	Bromoform	10	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	10	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U
108-88-3	Toluene	10	U
108-90-7	Chlorobenzene	10	U
100-41-4	Ethylbenzene	10	U
100-42-5	Styrene	10	U
1330-20-7	Xylene (total)	10	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07

ab ame: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-2

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8661

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 38   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	16	U
74-83-9	Bromomethane	16	U
75-01-4	Vinyl Chloride	16	U
75-00-3	Chloroethane	16	U
75-09-2	Methylene Chloride	61	B
67-64-1	Acetone	330	E
75-15-0	Carbon Disulfide	16	U
75-35-4	1,1-Dichloroethene	16	U
75-34-3	1,1-Dichloroethane	16	U
540-59-0	1,2-Dichloroethene (total)	16	U
67-66-3	Chloroform	16	U
107-06-2	1,2-Dichloroethane	16	U
78-93-3	2-Butanone	16	U
71-55-6	1,1,1-Trichloroethane	16	U
56-23-5	Carbon Tetrachloride	16	U
75-27-4	Bromodichloromethane	16	U
78-87-5	1,2-Dichloropropane	16	U
10061-01-5	cis-1,3-Dichloropropene	16	U
79-01-6	Trichloroethene	16	U
124-48-1	Dibromochloromethane	16	U
79-00-5	1,1,2-Trichloroethane	16	U
71-43-2	Benzene	16	U
10061-02-6	trans-1,3-Dichloropropene	16	U
75-25-2	Bromoform	16	U
108-10-1	4-Methyl-2-Pentanone	16	U
591-78-6	2-Hexanone	16	U
127-18-4	Tetrachloroethene	16	U
79-34-5	1,1,2,2-Tetrachloroethane	16	U
108-88-3	Toluene	16	U
108-90-7	Chlorobenzene	16	U
100-41-4	Ethylbenzene	16	U
100-42-5	Styrene	16	U
1330-20-7	Xylene (total)	16	U

x 3 higher than RE

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB07

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-2

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8661

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 38   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

Number TICs found: 1   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.07	9	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-2RE

Sample wt/vol: 5.30 (g/mL) G   Lab File ID: D8682

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 38   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	15	U
74-83-9	Bromomethane	15	U
75-01-4	Vinyl Chloride	15	U
75-00-3	Chloroethane	15	U
75-09-2	Methylene Chloride	13	JB
67-64-1	Acetone	110	B
75-15-0	Carbon Disulfide	15	U
75-35-4	1,1-Dichloroethene	15	U
75-34-3	1,1-Dichloroethane	15	U
540-59-0	1,2-Dichloroethene (total)	15	U
67-66-3	Chloroform	15	U
107-06-2	1,2-Dichloroethane	15	U
78-93-3	2-Butanone	15	U
71-55-6	1,1,1-Trichloroethane	15	U
56-23-5	Carbon Tetrachloride	15	U
75-27-4	Bromodichloromethane	15	U
78-87-5	1,2-Dichloropropane	15	U
10061-01-5	cis-1,3-Dichloropropene	15	U
79-01-6	Trichloroethene	15	U
124-48-1	Dibromochloromethane	15	U
79-00-5	1,1,2-Trichloroethane	15	U
71-43-2	Benzene	15	U
10061-02-6	trans-1,3-Dichloropropene	15	U
75-25-2	Bromoform	15	U
108-10-1	4-Methyl-2-Pentanone	15	U
591-78-6	2-Hexanone	15	U
127-18-4	Tetrachloroethene	15	U
79-34-5	1,1,2,2-Tetrachloroethane	15	U
108-88-3	Toluene	15	U
108-90-7	Chlorobenzene	15	U
100-41-4	Ethylbenzene	15	U
100-42-5	Styrene	15	U
1330-20-7	Xylene (total)	15	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB07RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-2RE

ample wt/vol: 5.30 (g/mL) G Lab File ID: D8682

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 38 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-3

ample wt/vol: 1.00 (g/mL) G Lab File ID: D8663

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 72 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	180	U
74-83-9	Bromomethane	180	U
75-01-4	Vinyl Chloride	180	U
75-00-3	Chloroethane	180	U
75-09-2	Methylene Chloride	440	B
67-64-1	Acetone	2600	
75-15-0	Carbon Disulfide	180	U
75-35-4	1,1-Dichloroethene	180	U
75-34-3	1,1-Dichloroethane	180	U
540-59-0	1,2-Dichloroethene (total)	180	U
67-66-3	Chloroform	180	U
107-06-2	1,2-Dichloroethane	180	U
78-93-3	2-Butanone	180	U
71-55-6	1,1,1-Trichloroethane	180	U
56-23-5	Carbon Tetrachloride	180	U
75-27-4	Bromodichloromethane	180	U
78-87-5	1,2-Dichloropropane	180	U
10061-01-5	cis-1,3-Dichloropropene	180	U
79-01-6	Trichloroethene	180	U
124-48-1	Dibromochloromethane	180	U
79-00-5	1,1,2-Trichloroethane	180	U
71-43-2	Benzene	180	U
10061-02-6	trans-1,3-Dichloropropene	180	U
75-25-2	Bromoform	180	U
108-10-1	4-Methyl-2-Pentanone	180	U
591-78-6	2-Hexanone	180	U
127-18-4	Tetrachloroethene	180	U
79-34-5	1,1,2,2-Tetrachloroethane	180	U
108-88-3	Toluene	180	U
108-90-7	Chlorobenzene	180	U
100-41-4	Ethylbenzene	180	U
100-42-5	Styrene	180	U
1330-20-7	Xylene (total)	180	U

11.6 x higher

14 x higher than RE

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB01

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-3

ample wt/vol: 1.00 (g/mL) G   Lab File ID: D8663

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 72   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB01RE

Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-3RE

Sample wt/vol: 4.90 (g/mL) G Lab File ID: D8676

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 72 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	36	U
74-83-9	Bromomethane	36	U
75-01-4	Vinyl Chloride	36	U
75-00-3	Chloroethane	36	U
75-09-2	Methylene Chloride	38	B
67-64-1	Acetone	180	
75-15-0	Carbon Disulfide	36	U
75-35-4	1,1-Dichloroethene	36	U
75-34-3	1,1-Dichloroethane	36	U
540-59-0	1,2-Dichloroethene (total)	36	U
67-66-3	Chloroform	36	U
107-06-2	1,2-Dichloroethane	36	U
78-93-3	2-Butanone	36	U
71-55-6	1,1,1-Trichloroethane	36	U
56-23-5	Carbon Tetrachloride	36	U
75-27-4	Bromodichloromethane	36	U
78-87-5	1,2-Dichloropropane	36	U
10061-01-5	cis-1,3-Dichloropropene	36	U
79-01-6	Trichloroethene	36	U
124-48-1	Dibromochloromethane	36	U
79-00-5	1,1,2-Trichloroethane	36	U
71-43-2	Benzene	36	U
10061-02-6	trans-1,3-Dichloropropene	36	U
75-25-2	Bromoform	36	U
108-10-1	4-Methyl-2-Pentanone	36	U
591-78-6	2-Hexanone	36	U
127-18-4	Tetrachloroethene	36	U
79-34-5	1,1,2,2-Tetrachloroethane	36	U
108-88-3	Toluene	36	U
108-90-7	Chlorobenzene	36	U
100-41-4	Ethylbenzene	36	U
100-42-5	Styrene	36	U
1330-20-7	Xylene (total)	36	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

| BCSB01RE |

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-3RE

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8676

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 72 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	24.71	29	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-4

ample wt/vol: 1.00 (g/mL) G Lab File ID: D8664

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 57 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
74-87-3	Chloromethane	120	U	
74-83-9	Bromomethane	120	U	
75-01-4	Vinyl Chloride	120	U	
75-00-3	Chloroethane	120	U	
75-09-2	Methylene Chloride	250	B	10X
67-64-1	Acetone	1500		9X higher than RE
75-15-0	Carbon Disulfide	120	U	
75-35-4	1,1-Dichloroethene	120	U	
75-34-3	1,1-Dichloroethane	120	U	
540-59-0	1,2-Dichloroethene (total)	120	U	
67-66-3	Chloroform	120	U	
107-06-2	1,2-Dichloroethane	120	U	
78-93-3	2-Butanone	120	U	
71-55-6	1,1,1-Trichloroethane	120	U	
56-23-5	Carbon Tetrachloride	120	U	
75-27-4	Bromodichloromethane	120	U	
78-87-5	1,2-Dichloropropane	120	U	
10061-01-5	cis-1,3-Dichloropropene	120	U	
79-01-6	Trichloroethene	120	U	
124-48-1	Dibromochloromethane	120	U	
79-00-5	1,1,2-Trichloroethane	120	U	
71-43-2	Benzene	120	U	
10061-02-6	trans-1,3-Dichloropropene	120	U	
75-25-2	Bromoform	120	U	
108-10-1	4-Methyl-2-Pentanone	120	U	
591-78-6	2-Hexanone	120	U	
127-18-4	Tetrachloroethene	120	U	
79-34-5	1,1,2,2-Tetrachloroethane	120	U	
108-88-3	Toluene	120	U	
108-90-7	Chlorobenzene	120	U	
100-41-4	Ethylbenzene	120	U	
100-42-5	Styrene	120	U	
1330-20-7	Xylene (total)	120	U	

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB08

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

iatrix: (soil/water) SOIL   Lab Sample ID: 38778-4

iample wt/vol: 1.00 (g/mL) G   Lab File ID: D8664

.evel: (low/med) LOW   Date Received: 12/15/93

; Moisture: not dec. 57   Date Analyzed: 12/21/93

;C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

;oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08RE

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-4RE

Sample wt/vol: 5.00 (g/mL) G Lab File ID: D8677

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 57 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	23	U
74-83-9	Bromomethane	23	U
75-01-4	Vinyl Chloride	23	U
75-00-3	Chloroethane	23	U
75-09-2	Methylene Chloride	25	B
67-64-1	Acetone	160	
75-15-0	Carbon Disulfide	23	U
75-35-4	1,1-Dichloroethene	23	U
75-34-3	1,1-Dichloroethane	23	U
540-59-0	1,2-Dichloroethene (total)	23	U
67-66-3	Chloroform	23	U
107-06-2	1,2-Dichloroethane	23	U
78-93-3	2-Butanone	23	U
71-55-6	1,1,1-Trichloroethane	23	U
56-23-5	Carbon Tetrachloride	23	U
75-27-4	Bromodichloromethane	23	U
78-87-5	1,2-Dichloropropane	23	U
10061-01-5	cis-1,3-Dichloropropene	23	U
79-01-6	Trichloroethene	23	U
124-48-1	Dibromochloromethane	23	U
79-00-5	1,1,2-Trichloroethane	23	U
71-43-2	Benzene	23	U
10061-02-6	trans-1,3-Dichloropropene	23	U
75-25-2	Bromoform	23	U
108-10-1	4-Methyl-2-Pentanone	23	U
591-78-6	2-Hexanone	23	U
127-18-4	Tetrachloroethene	23	U
79-34-5	1,1,2,2-Tetrachloroethane	23	U
108-88-3	Toluene	23	U
108-90-7	Chlorobenzene	23	U
100-41-4	Ethylbenzene	23	U
100-42-5	Styrene	23	U
1330-20-7	Xylene (total)	23	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB08RE

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-4RE

Sample wt/vol: 5.00 (g/mL) G Lab File ID: D8677

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 57 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 80568	.ALPHA.-PINENE (ACN)	24.71	740	JN
2.	UNKNOWN	26.61	21	J
3.	UNKNOWN	26.86	14	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-5

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8660

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 66 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	30	U
74-83-9	Bromomethane	30	U
75-01-4	Vinyl Chloride	30	U
75-00-3	Chloroethane	30	U
75-09-2	Methylene Chloride	80	B
67-64-1	Acetone	750	E
75-15-0	Carbon Disulfide	30	U
75-35-4	1,1-Dichloroethene	30	U
75-34-3	1,1-Dichloroethane	30	U
540-59-0	1,2-Dichloroethene (total)	30	U
67-66-3	Chloroform	30	U
107-06-2	1,2-Dichloroethane	30	U
78-93-3	2-Butanone	30	U
71-55-6	1,1,1-Trichloroethane	30	U
56-23-5	Carbon Tetrachloride	30	U
75-27-4	Bromodichloromethane	30	U
78-87-5	1,2-Dichloropropane	30	U
10061-01-5	cis-1,3-Dichloropropene	30	U
79-01-6	Trichloroethene	30	U
124-48-1	Dibromochloromethane	30	U
79-00-5	1,1,2-Trichloroethane	30	U
71-43-2	Benzene	30	U
10061-02-6	trans-1,3-Dichloropropene	30	U
75-25-2	Bromoform	30	U
108-10-1	4-Methyl-2-Pentanone	30	U
591-78-6	2-Hexanone	30	U
127-18-4	Tetrachloroethene	30	U
79-34-5	1,1,2,2-Tetrachloroethane	30	U
108-88-3	Toluene	30	U
108-90-7	Chlorobenzene	30	U
100-41-4	Ethylbenzene	30	U
100-42-5	Styrene	30	U
1330-20-7	Xylene (total)	30	U

8x higher than the RE

FORM I VOA 3/90

100062

-1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

| BCSB09 |

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-5

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8660

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 66 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.05	18	J

FORM I VOA-TIC 3/90

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-5RE

Sample wt/vol: 5.30 (g/mL) G   Lab File ID: D8683

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 66   Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	28	U
74-83-9	Bromomethane	28	U
75-01-4	Vinyl Chloride	28	U
75-00-3	Chloroethane	28	U
75-09-2	Methylene Chloride	30	B
67-64-1	Acetone	92	
75-15-0	Carbon Disulfide	28	U
75-35-4	1,1-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
540-59-0	1,2-Dichloroethene (total)	28	U
67-66-3	Chloroform	28	U
107-06-2	1,2-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
75-27-4	Bromodichloromethane	28	U
78-87-5	1,2-Dichloropropane	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-01-6	Trichloroethene	28	U
124-48-1	Dibromochloromethane	28	U
79-00-5	1,1,2-Trichloroethane	28	U
71-43-2	Benzene	28	U
10061-02-6	trans-1,3-Dichloropropene	28	U
75-25-2	Bromoform	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
591-78-6	2-Hexanone	28	U
127-18-4	Tetrachloroethene	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U
108-88-3	Toluene	28	U
108-90-7	Chlorobenzene	28	U
100-41-4	Ethylbenzene	28	U
100-42-5	Styrene	28	U
1330-20-7	Xylene (total)	28	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB09RE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-5RE

ample wt/vol: 5.30 (g/mL) G Lab File ID: D8683

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 66 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

100065

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6

ample wt/vol: 5.00 (g/mL) G   Lab File ID: D8652

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	48	U
74-83-9	Bromomethane	48	U
75-01-4	Vinyl Chloride	48	U
75-00-3	Chloroethane	48	U
75-09-2	Methylene Chloride	140	B
67-64-1	Acetone	1600	E
75-15-0	Carbon Disulfide	48	U
75-35-4	1,1-Dichloroethene	48	U
75-34-3	1,1-Dichloroethane	48	U
540-59-0	1,2-Dichloroethene (total)	48	U
67-66-3	Chloroform	48	U
107-06-2	1,2-Dichloroethane	48	U
78-93-3	2-Butanone	48	U
71-55-6	1,1,1-Trichloroethane	48	U
56-23-5	Carbon Tetrachloride	48	U
75-27-4	Bromodichloromethane	48	U
78-87-5	1,2-Dichloropropane	48	U
10061-01-5	cis-1,3-Dichloropropene	48	U
79-01-6	Trichloroethene	48	U
124-48-1	Dibromochloromethane	48	U
79-00-5	1,1,2-Trichloroethane	48	U
71-43-2	Benzene	48	U
10061-02-6	trans-1,3-Dichloropropene	48	U
75-25-2	Bromoform	48	U
108-10-1	4-Methyl-2-Pentanone	48	U
591-78-6	2-Hexanone	48	U
127-18-4	Tetrachloroethene	48	U
79-34-5	1,1,2,2-Tetrachloroethane	48	U
108-88-3	Toluene	48	U
108-90-7	Chlorobenzene	48	U
100-41-4	Ethylbenzene	48	U
100-42-5	Styrene	48	U
1330-20-7	Xylene (total)	48	U

11.4 times higher than the RE

FORM I VOA   3/90

100066

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB10

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6

ample wt/vol: 5.00 (g/mL) G   Lab File ID: D8652

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

Number TICs found: 1   CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.05	33	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB10RE

Lab Name: PACE NEW ENGLA　　Contract: NEESAC

Lab Code:　　Case No.: BAKER　　SAS No.:　　SDG No.: GEI01

Matrix: (soil/water) SOIL　　Lab Sample ID: 38778-6RE

Sample wt/vol: 5.10 (g/mL) G　　Lab File ID: D8684

Level: (low/med) LOW　　Date Received: 12/15/93

% Moisture: not dec. 79　　Date Analyzed: 12/22/93

GC Column: 502.2　　ID: 0.530 (mm)　　Dilution Factor: 1.0

Soil Extract Volume: (uL)　　Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	47	U
74-83-9	Bromomethane	47	U
75-01-4	Vinyl Chloride	47	U
75-00-3	Chloroethane	47	U
75-09-2	Methylene Chloride	52	B
67-64-1	Acetone	140	
75-15-0	Carbon Disulfide	47	U
75-35-4	1,1-Dichloroethene	47	U
75-34-3	1,1-Dichloroethane	47	U
540-59-0	1,2-Dichloroethene (total)	47	U
67-66-3	Chloroform	47	U
107-06-2	1,2-Dichloroethane	47	U
78-93-3	2-Butanone	47	U
71-55-6	1,1,1-Trichloroethane	47	U
56-23-5	Carbon Tetrachloride	47	U
75-27-4	Bromodichloromethane	47	U
78-87-5	1,2-Dichloropropane	47	U
10061-01-5	cis-1,3-Dichloropropene	47	U
79-01-6	Trichloroethene	47	U
124-48-1	Dibromochloromethane	47	U
79-00-5	1,1,2-Trichloroethane	47	U
71-43-2	Benzene	47	U
10061-02-6	trans-1,3-Dichloropropene	47	U
75-25-2	Bromoform	47	U
108-10-1	4-Methyl-2-Pentanone	47	U
591-78-6	2-Hexanone	47	U
127-18-4	Tetrachloroethene	47	U
79-34-5	1,1,2,2-Tetrachloroethane	47	U
108-88-3	Toluene	47	U
108-90-7	Chlorobenzene	47	U
100-41-4	Ethylbenzene	47	U
100-42-5	Styrene	47	U
1330-20-7	Xylene (total)	47	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB10RE

Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-6RE

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8684

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 79   Date Analyzed: 12/22/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

100069   FORM I VOA-TIC   3/90

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB03

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-7

ample wt/vol: 5.10 (g/mL) G Lab File ID: D8653

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 48 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	19	U
74-83-9	Bromomethane	19	U
75-01-4	Vinyl Chloride	19	U
75-00-3	Chloroethane	19	U
75-09-2	Methylene Chloride	41	B
67-64-1	Acetone	350	
75-15-0	Carbon Disulfide	19	U
75-35-4	1,1-Dichloroethene	19	U
75-34-3	1,1-Dichloroethane	19	U
540-59-0	1,2-Dichloroethene (total)	19	U
67-66-3	Chloroform	19	U
107-06-2	1,2-Dichloroethane	19	U
78-93-3	2-Butanone	19	U
71-55-6	1,1,1-Trichloroethane	19	U
56-23-5	Carbon Tetrachloride	19	U
75-27-4	Bromodichloromethane	19	U
78-87-5	1,2-Dichloropropane	19	U
10061-01-5	cis-1,3-Dichloropropene	19	U
79-01-6	Trichloroethene	19	U
124-48-1	Dibromochloromethane	19	U
79-00-5	1,1,2-Trichloroethane	19	U
71-43-2	Benzene	19	U
10061-02-6	trans-1,3-Dichloropropene	19	U
75-25-2	Bromoform	19	U
108-10-1	4-Methyl-2-Pentanone	19	U
591-78-6	2-Hexanone	19	U
127-18-4	Tetrachloroethene	19	U
79-34-5	1,1,2,2-Tetrachloroethane	19	U
108-88-3	Toluene	19	U
108-90-7	Chlorobenzene	19	U
100-41-4	Ethylbenzene	19	U
100-42-5	Styrene	19	U
1330-20-7	Xylene (total)	19	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB03

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-7

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8653

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 48   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 2   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 67630	2-PROPANOL	6.60	9	JN
2.	UNKNOWN	9.05	15	J

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-8

ample wt/vol: 5.10 (g/mL) G   Lab File ID: D8656

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 56   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	22	U
74-83-9	Bromomethane	22	U
75-01-4	Vinyl Chloride	22	U
75-00-3	Chloroethane	22	U
75-09-2	Methylene Chloride	61	B
67-64-1	Acetone	430	
75-15-0	Carbon Disulfide	22	U
75-35-4	1,1-Dichloroethene	22	U
75-34-3	1,1-Dichloroethane	22	U
540-59-0	1,2-Dichloroethene (total)	22	U
67-66-3	Chloroform	22	U
107-06-2	1,2-Dichloroethane	22	U
78-93-3	2-Butanone	22	U
71-55-6	1,1,1-Trichloroethane	22	U
56-23-5	Carbon Tetrachloride	22	U
75-27-4	Bromodichloromethane	22	U
78-87-5	1,2-Dichloropropane	22	U
10061-01-5	cis-1,3-Dichloropropene	22	U
79-01-6	Trichloroethene	22	U
124-48-1	Dibromochloromethane	22	U
79-00-5	1,1,2-Trichloroethane	22	U
71-43-2	Benzene	22	U
10061-02-6	trans-1,3-Dichloropropene	22	U
75-25-2	Bromoform	22	U
108-10-1	4-Methyl-2-Pentanone	22	U
591-78-6	2-Hexanone	22	U
127-18-4	Tetrachloroethene	22	U
79-34-5	1,1,2,2-Tetrachloroethane	22	U
108-88-3	Toluene	22	U
108-90-7	Chlorobenzene	22	U
100-41-4	Ethylbenzene	22	U
100-42-5	Styrene	22	U
1330-20-7	Xylene (total)	22	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB3D

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-8

ample wt/vol: 5.10 (g/mL) G Lab File ID: D8656

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 56 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	UNKNOWN	9.04	16	J

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02

ab Name: PACE NEW ENGLA   Contract: NEESAC

ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

atrix: (soil/water) SOIL   Lab Sample ID: 38778-9

ample wt/vol: 5.20 (g/mL) G   Lab File ID: D8657

evel: (low/med) LOW   Date Received: 12/15/93

Moisture: not dec. 46   Date Analyzed: 12/21/93

C Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

oil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	18	U
74-83-9	Bromomethane	18	U
75-01-4	Vinyl Chloride	18	U
75-00-3	Chloroethane	18	U
75-09-2	Methylene Chloride	54	B
67-64-1	Acetone	260	
75-15-0	Carbon Disulfide	18	U
75-35-4	1,1-Dichloroethene	18	U
75-34-3	1,1-Dichloroethane	18	U
540-59-0	1,2-Dichloroethene (total)	18	U
67-66-3	Chloroform	18	U
107-06-2	1,2-Dichloroethane	18	U
78-93-3	2-Butanone	18	U
71-55-6	1,1,1-Trichloroethane	18	U
56-23-5	Carbon Tetrachloride	18	U
75-27-4	Bromodichloromethane	18	U
78-87-5	1,2-Dichloropropane	18	U
10061-01-5	cis-1,3-Dichloropropene	18	U
79-01-6	Trichloroethene	18	U
124-48-1	Dibromochloromethane	18	U
79-00-5	1,1,2-Trichloroethane	18	U
71-43-2	Benzene	18	U
10061-02-6	trans-1,3-Dichloropropene	18	U
75-25-2	Bromoform	18	U
108-10-1	4-Methyl-2-Pentanone	18	U
591-78-6	2-Hexanone	18	U
127-18-4	Tetrachloroethene	18	U
79-34-5	1,1,2,2-Tetrachloroethane	18	U
108-88-3	Toluene	18	U
108-90-7	Chlorobenzene	18	U
100-41-4	Ethylbenzene	18	U
100-42-5	Styrene	18	U
1330-20-7	Xylene (total)	18	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB02

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

iatrix: (soil/water) SOIL Lab Sample ID: 38778-9

ample wt/vol: 5.20 (g/mL) G Lab File ID: D8657

evel: (low/med) LOW Date Received: 12/15/93

; Moisture: not dec. 46 Date Analyzed: 12/21/93

iC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 3779611	1,3,6-OCTATRIENE, 3,7-DIMETH	24.74	45	JN

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-9RE

Sample wt/vol: 5.10 (g/mL) G   Lab File ID: D8679

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 46   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	18	U
74-83-9	Bromomethane	18	U
75-01-4	Vinyl Chloride	18	U
75-00-3	Chloroethane	18	U
75-09-2	Methylene Chloride	23	B
67-64-1	Acetone	18	U
75-15-0	Carbon Disulfide	18	U
75-35-4	1,1-Dichloroethene	18	U
75-34-3	1,1-Dichloroethane	18	U
540-59-0	1,2-Dichloroethene (total)	18	U
67-66-3	Chloroform	18	U
107-06-2	1,2-Dichloroethane	18	U
78-93-3	2-Butanone	18	U
71-55-6	1,1,1-Trichloroethane	18	U
56-23-5	Carbon Tetrachloride	18	U
75-27-4	Bromodichloromethane	18	U
78-87-5	1,2-Dichloropropane	18	U
10061-01-5	cis-1,3-Dichloropropene	18	U
79-01-6	Trichloroethene	18	U
124-48-1	Dibromochloromethane	18	U
79-00-5	1,1,2-Trichloroethane	18	U
71-43-2	Benzene	18	U
10061-02-6	trans-1,3-Dichloropropene	18	U
75-25-2	Bromoform	18	U
108-10-1	4-Methyl-2-Pentanone	18	U
591-78-6	2-Hexanone	18	U
127-18-4	Tetrachloroethene	18	U
79-34-5	1,1,2,2-Tetrachloroethane	18	U
108-88-3	Toluene	18	U
108-90-7	Chlorobenzene	18	U
100-41-4	Ethylbenzene	18	U
100-42-5	Styrene	18	U
1330-20-7	Xylene (total)	18	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

| BCSB02RE |

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

iatrix: (soil/water) SOIL Lab Sample ID: 38778-9RE

iample wt/vol: 5.10 (g/mL) G Lab File ID: D8679

.evel: (low/med) LOW Date Received: 12/15/93

: Moisture: not dec. 46 Date Analyzed: 12/22/93

:C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB04

Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-10

Sample wt/vol: 4.90 (g/mL) G Lab File ID: D8680

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 22 Date Analyzed: 12/22/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	13	U
74-83-9	Bromomethane	13	U
75-01-4	Vinyl Chloride	13	U
75-00-3	Chloroethane	13	U
75-09-2	Methylene Chloride	13	JB
67-64-1	Acetone	13	U
75-15-0	Carbon Disulfide	13	U
75-35-4	1,1-Dichloroethene	13	U
75-34-3	1,1-Dichloroethane	13	U
540-59-0	1,2-Dichloroethene (total)	13	U
67-66-3	Chloroform	13	U
107-06-2	1,2-Dichloroethane	13	U
78-93-3	2-Butanone	13	U
71-55-6	1,1,1-Trichloroethane	13	U
56-23-5	Carbon Tetrachloride	13	U
75-27-4	Bromodichloromethane	13	U
78-87-5	1,2-Dichloropropane	13	U
10061-01-5	cis-1,3-Dichloropropene	13	U
79-01-6	Trichloroethene	13	U
124-48-1	Dibromochloromethane	13	U
79-00-5	1,1,2-Trichloroethane	13	U
71-43-2	Benzene	13	U
10061-02-6	trans-1,3-Dichloropropene	13	U
75-25-2	Bromoform	13	U
108-10-1	4-Methyl-2-Pentanone	13	U
591-78-6	2-Hexanone	13	U
127-18-4	Tetrachloroethene	13	U
79-34-5	1,1,2,2-Tetrachloroethane	13	U
108-88-3	Toluene	13	U
108-90-7	Chlorobenzene	13	U
100-41-4	Ethylbenzene	13	U
100-42-5	Styrene	13	U
1330-20-7	Xylene (total)	13	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB04

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-10

ample wt/vol: 4.90 (g/mL) G Lab File ID: D8680

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 22 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 1 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1. 64175	ETHANOL (ACN)	5.61	33	JN

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Matrix: (soil/water) SOIL Lab Sample ID: 38778-11

Sample wt/vol: 5.00 (g/mL) G Lab File ID: D8659

Level: (low/med) LOW Date Received: 12/15/93

% Moisture: not dec. 34 Date Analyzed: 12/21/93

GC Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	15	U
74-83-9	Bromomethane	15	U
75-01-4	Vinyl Chloride	15	U
75-00-3	Chloroethane	15	U
75-09-2	Methylene Chloride	40	B
67-64-1	Acetone	250	
75-15-0	Carbon Disulfide	15	U
75-35-4	1,1-Dichloroethene	15	U
75-34-3	1,1-Dichloroethane	15	U
540-59-0	1,2-Dichloroethene (total)	15	U
67-66-3	Chloroform	15	U
107-06-2	1,2-Dichloroethane	15	U
78-93-3	2-Butanone	15	U
71-55-6	1,1,1-Trichloroethane	15	U
56-23-5	Carbon Tetrachloride	15	U
75-27-4	Bromodichloromethane	15	U
78-87-5	1,2-Dichloropropane	15	U
10061-01-5	cis-1,3-Dichloropropene	15	U
79-01-6	Trichloroethene	15	U
124-48-1	Dibromochloromethane	15	U
79-00-5	1,1,2-Trichloroethane	15	U
71-43-2	Benzene	15	U
10061-02-6	trans-1,3-Dichloropropene	15	U
75-25-2	Bromoform	15	U
108-10-1	4-Methyl-2-Pentanone	15	U
591-78-6	2-Hexanone	15	U
127-18-4	Tetrachloroethene	15	U
79-34-5	1,1,2,2-Tetrachloroethane	15	U
108-88-3	Toluene	15	U
108-90-7	Chlorobenzene	15	U
100-41-4	Ethylbenzene	15	U
100-42-5	Styrene	15	U
1330-20-7	Xylene (total)	15	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB05

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-11

ample wt/vol: 5.00 (g/mL) G Lab File ID: D8659

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 34 Date Analyzed: 12/21/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-11RE

Sample wt/vol: 4.80 (g/mL) G   Lab File ID: D8681

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 34   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	16	U
74-83-9	Bromomethane	16	U
75-01-4	Vinyl Chloride	16	U
75-00-3	Chloroethane	16	U
75-09-2	Methylene Chloride	20	B
67-64-1	Acetone	16	U
75-15-0	Carbon Disulfide	16	U
75-35-4	1,1-Dichloroethene	16	U
75-34-3	1,1-Dichloroethane	16	U
540-59-0	1,2-Dichloroethene (total)	16	U
67-66-3	Chloroform	16	U
107-06-2	1,2-Dichloroethane	16	U
78-93-3	2-Butanone	16	U
71-55-6	1,1,1-Trichloroethane	16	U
56-23-5	Carbon Tetrachloride	16	U
75-27-4	Bromodichloromethane	16	U
78-87-5	1,2-Dichloropropane	16	U
10061-01-5	cis-1,3-Dichloropropene	16	U
79-01-6	Trichloroethene	16	U
124-48-1	Dibromochloromethane	16	U
79-00-5	1,1,2-Trichloroethane	16	U
71-43-2	Benzene	16	U
10061-02-6	trans-1,3-Dichloropropene	16	U
75-25-2	Bromoform	16	U
108-10-1	4-Methyl-2-Pentanone	16	U
591-78-6	2-Hexanone	16	U
127-18-4	Tetrachloroethene	16	U
79-34-5	1,1,2,2-Tetrachloroethane	16	U
108-88-3	Toluene	16	U
108-90-7	Chlorobenzene	16	U
100-41-4	Ethylbenzene	16	U
100-42-5	Styrene	16	U
1330-20-7	Xylene (total)	16	U

FORM I VOA   3/90

100082

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSBO5RE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-11RE

Sample wt/vol: 4.80 (g/mL) G   Lab File ID: D8681

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 34   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
Number TICs found: 0   (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

FORM I VOA-TIC   3/90

100083

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3DRE

Lab Name: PACE NEW ENGLA   Contract: NEESAC

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

Matrix: (soil/water) SOIL   Lab Sample ID: 38778-8RE

Sample wt/vol: 5.20 (g/mL) G   Lab File ID: D8678

Level: (low/med) LOW   Date Received: 12/15/93

% Moisture: not dec. 56   Date Analyzed: 12/22/93

GC Column: 502.2   ID: 0.530 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	UG/KG	Q
74-87-3	Chloromethane	22	U
74-83-9	Bromomethane	22	U
75-01-4	Vinyl Chloride	22	U
75-00-3	Chloroethane	22	U
75-09-2	Methylene Chloride	16	JB
67-64-1	Acetone	22	U
75-15-0	Carbon Disulfide	22	U
75-35-4	1,1-Dichloroethene	22	U
75-34-3	1,1-Dichloroethane	22	U
540-59-0	1,2-Dichloroethene (total)	22	U
67-66-3	Chloroform	22	U
107-06-2	1,2-Dichloroethane	22	U
78-93-3	2-Butanone	22	U
71-55-6	1,1,1-Trichloroethane	22	U
56-23-5	Carbon Tetrachloride	22	U
75-27-4	Bromodichloromethane	22	U
78-87-5	1,2-Dichloropropane	22	U
10061-01-5	cis-1,3-Dichloropropene	22	U
79-01-6	Trichloroethene	22	U
124-48-1	Dibromochloromethane	22	U
79-00-5	1,1,2-Trichloroethane	22	U
71-43-2	Benzene	22	U
10061-02-6	trans-1,3-Dichloropropene	22	U
75-25-2	Bromoform	22	U
108-10-1	4-Methyl-2-Pentanone	22	U
591-78-6	2-Hexanone	22	U
127-18-4	Tetrachloroethene	22	U
79-34-5	1,1,2,2-Tetrachloroethane	22	U
108-88-3	Toluene	22	U
108-90-7	Chlorobenzene	22	U
100-41-4	Ethylbenzene	22	U
100-42-5	Styrene	22	U
1330-20-7	Xylene (total)	22	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BCSB3DRE

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

atrix: (soil/water) SOIL Lab Sample ID: 38778-8RE

ample wt/vol: 5.20 (g/mL) G Lab File ID: D8678

evel: (low/med) LOW Date Received: 12/15/93

Moisture: not dec. 56 Date Analyzed: 12/22/93

C Column: 502.2 ID: 0.530 (mm) Dilution Factor: 1.0

oil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

Number TICs found: 0 (ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

FORM I VOA-TIC 3/90

100085

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

ab Name: PACE NEW ENGLA Contract: NEESAC

a[illegible]ode: Case No.: BAKER SAS No.: SDG No.: GEI01

nstrument ID: EMS-HP Calibration Date(s): 11/22/93 11/22/93

eated Purge: (Y/N): N Calibration Times: 1130 1521

C Column: 502.2 ID: 0.530(mm)

LAB FILE ID: RRF10 = E5185 RRF20 = E5184
RRF50= E5187 RRF100= E5186 RRF200= E5180

COMPOUND		RRF10	RRF20	RRF50	RRF100	RRF200	RRF	% RSD	
Chloromethane		1.811	1.895	1.757	1.801	1.710	1.795	3.8	
Bromomethane	*	1.292	1.488	1.346	1.393	1.248	1.353	6.9	*
Vinyl Chloride	*	1.546	1.663	1.463	1.373	1.214	1.452	11.8	*
Chloroethane		0.799	0.974	0.895	0.953	0.890	0.902	7.6	
Methylene Chloride		1.784	1.674	1.493	1.384	1.516	1.570	10.1	
Acetone		0.719	0.322	0.418	0.333	0.572	0.473	36.0	
Carbon Disulfide		3.998	4.224	4.008	4.062	4.444	4.147	4.6	
1,1-Dichloroethene	*	1.441	1.335	1.303	1.234	1.353	1.333	5.7	*
1,1-Dichloroethane	*	2.938	3.054	2.893	2.757	3.050	2.938	4.2	*
1,2-Dichloroethene (total)		1.584	1.684	1.613	1.579	1.703	1.633	3.5	
Chloroform	*	2.648	2.614	2.703	2.552	2.763	2.656	3.1	*
1[illegible]Dichloroethane	*	1.741	1.788	1.734	1.631	1.642	1.707	4.0	*
2-[illegible]tanone		0.713	0.812	0.604	0.552	0.653	0.667	15.1	
1,1,1-Trichloroethane	*	0.420	0.407	0.407	0.373	0.404	0.402	4.3	*
Carbon Tetrachloride	*	0.343	0.350	0.368	0.322	0.348	0.346	4.8	*
Bromodichloromethane	*	0.489	0.539	0.488	0.454	0.507	0.495	6.3	*
1,2-Dichloropropane		0.362	0.357	0.328	0.315	0.350	0.342	5.9	
cis-1,3-Dichloropropene	*	0.338	0.357	0.355	0.341	0.359	0.350	2.8	*
Trichloroethene	*	0.347	0.348	0.356	0.314	0.358	0.345	5.2	*
Dibromochloromethane	*	0.360	0.410	0.372	0.364	0.364	0.374	5.5	*
1,1,2-Trichloroethane	*	0.230	0.259	0.230	0.208	0.222	0.230	8.1	*
Benzene	*	1.050	1.026	1.018	0.932	1.145	1.034	7.4	*
trans-1,3-Dichloropropene	*	0.480	0.473	0.475	0.428	0.481	0.467	4.8	*
Bromoform	*	0.303	0.306	0.305	0.304	0.314	0.306	1.4	*
4-Methyl-2-Pentanone		0.799	0.680	0.645	0.595	0.652	0.674	11.3	
2-Hexanone		0.385	0.288	0.257	0.225	0.246	0.280	22.4	
Tetrachloroethene	*	0.515	0.510	0.530	0.467	0.500	0.504	4.7	*
1,1,2,2-Tetrachloroethane	*	0.523	0.513	0.446	0.438	0.486	0.481	8.0	*
Toluene	*	1.613	1.556	1.510	1.398	1.624	1.540	6.0	*
Chlorobenzene	*	0.978	0.918	1.010	0.902	1.005	0.963	5.2	*
Ethylbenzene	*	0.477	0.459	0.456	0.417	0.435	0.449	5.2	*
Styrene	*	0.954	0.897	0.931	0.880	1.000	0.932	5.1	*
Xylene (total)	*	0.522	0.526	0.524	0.487	0.552	0.522	4.4	*
Toluene-d8		1.214	1.191	1.396	1.183	1.197	1.236	7.3	
Bromofluorobenzene	*	0.744	0.662	0.798	0.709	0.697	0.722	7.1	*
1,2-Dichloroethane-d4		1.295	1.273	1.443	1.320	1.260	1.318	5.6	

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Instrument ID: DMS-HP Calibration date: 12/16/93 Time: 1114

Lab File ID: D8574 Init. Calib. Date(s): 07/01/93 07/01/93

Heated Purge: (Y/N) Y Init. Calib. Times: 1042 1253

GC Column: 502.2 ID: 0.530(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane	0.711	0.902		-26.9	
Bromomethane	1.160	1.224	0.100	-5.5	25.0
Vinyl Chloride	0.804	0.999	0.100	-24.2	25.0
Chloroethane	0.557	0.621		-11.5	
Methylene Chloride	1.526	1.617		-6.0	
Acetone	0.372	0.466		-25.3	
Carbon Disulfide	4.021	4.253		-5.8	
1,1-Dichloroethene	0.931	0.965	0.100	-3.7	25.0
1,1-Dichloroethane	2.131	2.285	0.200	-7.2	25.0
1,2-Dichloroethene (total)	1.314	1.415		-7.7	
Chloroform	2.694	2.636	0.200	2.2	25.0
1,2-Dichloroethane	1.942	1.864	0.100	4.0	25.0
2-Butanone	0.583	0.739		-26.8	
1,1,1-Trichloroethane	0.566	0.526	0.100	7.1	25.0
Carbon Tetrachloride	0.528	0.468	0.100	11.4	25.0
Bromodichloromethane	0.665	0.678	0.200	-2.0	25.0
1,2-Dichloropropane	0.290	0.338		-16.6	
cis-1,3-Dichloropropene	0.504	0.595	0.200	-18.1	25.0
Trichloroethene	0.398	0.365	0.300	8.3	25.0
Dibromochloromethane	0.598	0.573	0.100	4.2	25.0
1,1,2-Trichloroethane	0.318	0.342	0.100	-7.5	25.0
Benzene	0.941	1.133	0.500	-20.4	25.0
trans-1,3-Dichloropropene	0.447	0.421	0.100	5.8	25.0
Bromoform	0.465	0.409	0.100	12.0	25.0
4-Methyl-2-Pentanone	0.493	0.657		-33.3	
2-Hexanone	0.261	0.334		-28.0	
Tetrachloroethene	0.366	0.336	0.200	8.2	25.0
1,1,2,2-Tetrachloroethane	0.648	0.732	0.500	-13.0	25.0
Toluene	1.281	1.440	0.400	-12.4	25.0
Chlorobenzene	0.957	0.971	0.500	-1.5	25.0
Ethylbenzene	0.449	0.478	0.100	-6.5	25.0
Styrene	0.994	1.028	0.300	-3.4	25.0
Xylene (total)	0.533	0.580	0.300	-8.8	25.0
Toluene-d8	1.152	1.227		-6.5	
Bromofluorobenzene	0.628	0.609	0.200	3.0	25.0
1,2-Dichloroethane-d4	1.617	1.520		6.0	

All other compounds must meet a minimum RRF of 0.010.

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: PACE NEW ENGLA Contract: NEESAC

Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Instrument ID: EMS-HP Calibration date: 12/17/93 Time: 1357

Lab File ID: E5535 Init. Calib. Date(s): 11/22/93 11/22/93

Heated Purge: (Y/N) N Init. Calib. Times: 1130 1521

GC Column: 502.2 ID: 0.530(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane	1.795	1.384		22.9	
Bromomethane	1.353	1.347	0.100	0.4	25.0
Vinyl Chloride	1.452	1.546	0.100	-6.5	25.0
Chloroethane	0.902	0.893		1.0	
Methylene Chloride	1.570	1.389		11.5	
Acetone	0.473	0.339		28.3	
Carbon Disulfide	4.147	3.326		19.8	
1,1-Dichloroethene	1.333	1.235	0.100	7.4	25.0
1,1-Dichloroethane	2.938	2.704	0.200	8.0	25.0
1,2-Dichloroethene (total)	1.633	1.440		11.8	
Chloroform	2.656	2.852	0.200	-7.4	25.0
1,2-Dichloroethane	1.707	1.992	0.100	-16.7	25.0
2-Butanone	0.667	0.423		36.6	
1,1,1-Trichloroethane	0.402	0.515	0.100	-28.1	25.0
Carbon Tetrachloride	0.346	0.421	0.100	-21.7	25.0
Bromodichloromethane	0.495	0.546	0.200	-10.3	25.0
1,2-Dichloropropane	0.342	0.306		10.5	
cis-1,3-Dichloropropene	0.350	0.368	0.200	-5.1	25.0
Trichloroethene	0.345	0.352	0.300	-2.0	25.0
Dibromochloromethane	0.374	0.381	0.100	-1.9	25.0
1,1,2-Trichloroethane	0.230	0.222	0.100	3.5	25.0
Benzene	1.034	0.942	0.500	8.9	25.0
trans-1,3-Dichloropropene	0.467	0.446	0.100	4.5	25.0
Bromoform	0.306	0.265	0.100	13.4	25.0
4-Methyl-2-Pentanone	0.674	0.426		36.8	
2-Hexanone	0.280	0.185		33.9	
Tetrachloroethene	0.504	0.432	0.200	14.3	25.0
1,1,2,2-Tetrachloroethane	0.481	0.403	0.500	16.2	25.0
Toluene	1.540	1.332	0.400	13.5	25.0
Chlorobenzene	0.963	0.919	0.500	4.6	25.0
Ethylbenzene	0.449	0.421	0.100	6.2	25.0
Styrene	0.932	0.928	0.300	0.4	25.0
Xylene (total)	0.522	0.510	0.300	2.3	25.0
Toluene-d8	1.236	1.314		-6.3	
Bromofluorobenzene	0.722	0.781	0.200	-8.2	25.0
1,2-Dichloroethane-d4	1.318	1.939		-47.1	

All other compounds must meet a minimum RRF of 0.010.

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Instrument ID: DMS-HP Calibration date: 12/21/93 Time: 1440

Lab File ID: D8649 Init. Calib. Date(s): 07/01/93 07/01/93

Heated Purge: (Y/N) Y Init. Calib. Times: 1042 1253

GC Column: 502.2 ID: 0.530(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane	0.711	0.958		-34.7	
Bromomethane	1.160	1.244	0.100	-7.2	25.0
Vinyl Chloride	0.804	1.033	0.100	-28.5	25.0
Chloroethane	0.557	0.640		-14.9	
Methylene Chloride	1.526	1.825		-19.6	
Acetone	0.372	0.387		-4.0	
Carbon Disulfide	4.021	4.802		-19.4	
1,1-Dichloroethene	0.931	0.975	0.100	-4.7	25.0
1,1-Dichloroethane	2.131	2.352	0.200	-10.4	25.0
1,2-Dichloroethene (total)	1.314	1.433		-9.1	
Chloroform	2.694	2.651	0.200	1.6	25.0
1,2-Dichloroethane	1.942	1.824	0.100	6.1	25.0
2-Butanone	0.583	0.757		-29.8	
1,1,1-Trichloroethane	0.566	0.519	0.100	8.3	25.0
Carbon Tetrachloride	0.528	0.478	0.100	9.5	25.0
Bromodichloromethane	0.665	0.654	0.200	1.7	25.0
1,2-Dichloropropane	0.290	0.347		-19.7	
cis-1,3-Dichloropropene	0.504	0.587	0.200	-16.5	25.0
Trichloroethene	0.398	0.374	0.300	6.0	25.0
Dibromochloromethane	0.598	0.572	0.100	4.3	25.0
1,1,2-Trichloroethane	0.318	0.352	0.100	-10.7	25.0
Benzene	0.941	1.125	0.500	-19.6	25.0
trans-1,3-Dichloropropene	0.447	0.418	0.100	6.5	25.0
Bromoform	0.465	0.412	0.100	11.4	25.0
4-Methyl-2-Pentanone	0.493	0.715		-45.0	
2-Hexanone	0.261	0.347		-33.0	
Tetrachloroethene	0.366	0.336	0.200	8.2	25.0
1,1,2,2-Tetrachloroethane	0.648	0.793	0.500	-22.4	25.0
Toluene	1.281	1.470	0.400	-14.8	25.0
Chlorobenzene	0.957	0.974	0.500	-1.8	25.0
Ethylbenzene	0.449	0.479	0.100	-6.7	25.0
Styrene	0.994	1.054	0.300	-6.0	25.0
Xylene (total)	0.533	0.585	0.300	-9.8	25.0
Toluene-d8	1.152	1.246		-8.2	
Bromofluorobenzene	0.628	0.615	0.200	2.1	25.0
1,2-Dichloroethane-d4	1.617	1.573		2.7	

All other compounds must meet a minimum RRF of 0.010.

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: PACE NEW ENGLA Contract: NEESAC

Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Instrument ID: DMS-HP Calibration date: 12/22/93 Time: 1054

Lab File ID: D8670 Init. Calib. Date(s): 07/01/93 07/01/93

Heated Purge: (Y/N) Y Init. Calib. Times: 1042 1253

GC Column: 502.2 ID: 0.530(mm)

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Chloromethane	0.711	0.940		-32.2	
Bromomethane	1.160	1.264	0.100	-9.0	25.0
Vinyl Chloride	0.804	1.040	0.100	-29.4	25.0
Chloroethane	0.557	0.657		-18.0	
Methylene Chloride	1.526	1.521		0.3	
Acetone	0.372	0.325		12.6	
Carbon Disulfide	4.021	4.624		-15.0	
1,1-Dichloroethene	0.931	0.959	0.100	-3.0	25.0
1,1-Dichloroethane	2.131	2.384	0.200	-11.9	25.0
1,2-Dichloroethene (total)	1.314	1.444		-9.9	
Chloroform	2.694	2.672	0.200	0.8	25.0
1,2-Dichloroethane	1.942	1.830	0.100	5.8	25.0
2-Butanone	0.583	0.622		-6.7	
1,1,1-Trichloroethane	0.566	0.512	0.100	9.5	25.0
Carbon Tetrachloride	0.528	0.462	0.100	12.5	25.0
Bromodichloromethane	0.665	0.635	0.200	4.5	25.0
1,2-Dichloropropane	0.290	0.340		-17.2	
cis-1,3-Dichloropropene	0.504	0.563	0.200	-11.7	25.0
Trichloroethene	0.398	0.357	0.300	10.3	25.0
Dibromochloromethane	0.598	0.549	0.100	8.2	25.0
1,1,2-Trichloroethane	0.318	0.330	0.100	-3.8	25.0
Benzene	0.941	1.099	0.500	-16.8	25.0
trans-1,3-Dichloropropene	0.447	0.403	0.100	9.8	25.0
Bromoform	0.465	0.386	0.100	17.0	25.0
4-Methyl-2-Pentanone	0.493	0.589		-19.5	
2-Hexanone	0.261	0.276		-5.7	
Tetrachloroethene	0.366	0.327	0.200	10.7	25.0
1,1,2,2-Tetrachloroethane	0.648	0.674	0.500	-4.0	25.0
Toluene	1.281	1.417	0.400	-10.6	25.0
Chlorobenzene	0.957	0.965	0.500	-0.8	25.0
Ethylbenzene	0.449	0.473	0.100	-5.3	25.0
Styrene	0.994	1.015	0.300	-2.1	25.0
Xylene (total)	0.533	0.566	0.300	-6.2	25.0
Toluene-d8	1.152	1.262		-9.5	
Bromofluorobenzene	0.628	0.626	0.200	0.3	25.0
1,2-Dichloroethane-d4	1.617	1.576		2.5	

All other compounds must meet a minimum RRF of 0.010.

2D

SOIL SEMIVOLATILE SURROGATE RECOVERY

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code:- Case No.: BAKER SAS No.: SDG No.: GEI01

.evel:(low/med) LOW

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	S7 (2CP)#	S8 (DCB)#	TOT OUT
01	BCSB01	40	40	43	28	27	34	31	36	0
02	BCSB02	42	45	50	34	29	41	34	35	0
03	BCSB03	49	51	58	40	35	47	40	45	0
04	BCSB04	56	57	63	45	40	40	45	53	0
05	BCSB05	51	54	67	41	36	50	40	43	0
06	BCSB06	50	50	52	37	29	43	36	43	0
07	BCSB07	44	44	47	32	28	40	34	40	0
08	BCSB08	45	54	63	39	35	46	41	42	0
09	BCSB09	15 *	17 *	21	13 *	12 *	16 *	13 *	14 *	7
10	BCSB09RE	46	53	59	43	34	46	40	37	0
11	BCSB10	53	55	62	42	36	51	42	45	0
12	BCSB3D	45	49	56	39	34	44	39	41	0
13	SB2903	54	57	57	43	36	43	42	53	0
14	SB3102	43	45	52	35	32	41	34	40	0
15	SB3203	52	53	55	41	37	45	40	50	0
16	SB3305	41	45	49	33	26	36	32	36	0
17	SB3502	53	55	55	41	34	42	40	50	0
18	BCSB03MS	44	46	50	36	33	40	35	40	0
19	BCSB03MSD	43	42	50	33	30	39	34	38	0
20	SBLKHN	52	53	57	39	34	46	39	49	0
21	SBLKHQ	61	60	68	45	39	56	45	56	0
22	SBLKHV	43	48	59	41	32	40	37	45	0

re-run
SB09
RE ⇔ OK

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(23-120)	
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)	
S3 (TPH)	= Terphenyl-d14	(18-137)	
S4 (PHL)	= Phenol-d5	(24-113)	
S5 (2FP)	= 2-Fluorophenol	(25-121)	
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)	
S7 (2CP)	= 2-Chlorophenol-d4	(20-130)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(20-130)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

6C

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

ab Name: PACE NEW ENGLA Contract: NEESAC

ab[illegible]de: Case No.: BAKER SAS No.: SDG No.: GEI01

nstrument ID: HMS-HP Calibration Date(s): 11/17/93 11/17/93

Calibration Times: 1549 1802

LAB FILE ID: RRF20 = H3133 RRF50 = H3132
RRF80 = H3131 RRF120= H3130 RRF160= H3129

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	RRF (mean)	% RSD
Diethylphthalate	1.863	1.714	1.570	1.508	1.402	1.611	11.2
4-Chlorophenyl-phenylether *	0.647	0.525	0.443	0.386	0.345	0.469	25.6*
Fluorene *	1.322	1.103	0.906	0.838	0.888	1.011	19.9*
4-Nitroaniline		0.458	0.462	0.470	0.512	0.476	5.2
4,6-Dinitro-2-methylphenol		0.146	0.149	0.141	0.134	0.142	4.6
N-Nitrosodiphenylamine (1)	0.625	0.564	0.528	0.468	0.386	0.514	17.8
4-Bromophenyl-phenylether *	0.269	0.249	0.236	0.215	0.205	0.235	11.0*
Hexachlorobenzene *	0.355	0.325	0.311	0.299	0.279	0.314	9.1*
Pentachlorophenol *		0.196	0.196	0.198	0.194	0.196	0.8*
Phenanthrene *	1.247	1.097	1.032	0.925	0.907	1.042	13.3*
Anthracene *	1.323	1.129	1.028	0.975	0.841	1.059	17.0*
Carbazole	1.274	1.171	1.091	1.040	0.946	1.104	11.3
Di[illegible]-butylphthalate	1.901	1.652	1.536	1.239	1.166	1.499	20.2
Fl[illegible]anthene *	1.390	1.214	1.153	1.063	0.980	1.160	13.5*
Pyrene *	1.392	1.308	1.182	1.114	1.121	1.223	10.0*
Butylbenzylphthalate	0.824	0.767	0.722	0.691	0.646	0.730	9.4
3,3'-Dichlorobenzidine	0.480	0.438	0.399	0.328	0.307	0.390	18.7
Benzo(a)anthracene *	1.263	1.117	0.991	0.899	0.878	1.030	15.6*
Chrysene *	1.239	1.063	1.053	0.956	0.946	1.051	11.2*
bis(2-Ethylhexyl)phthalate	1.208	1.079	1.008	0.890	0.808	0.999	15.7
Di-n-octylphthalate	1.797	1.657	1.509	1.366	1.229	1.512	14.9
Benzo(b)fluoranthene *	1.146	1.130	1.363	1.397	1.453	1.298	11.5*
Benzo(k)fluoranthene *	1.067	0.982	0.718	0.569	0.425	0.752	36.0*
Benzo(a)pyrene *	1.054	1.032	1.015	0.970	0.971	1.008	3.7*
Indeno(1,2,3-cd)pyrene *	1.193	1.209	1.191	1.171	1.178	1.188	1.2*
Dibenz(a,h)anthracene *	0.942	0.937	0.923	0.894	0.922	0.924	2.0*
Benzo(g,h,i)perylene *	1.022	1.032	1.019	1.010	1.036	1.024	1.0*
Nitrobenzene-d5 *	0.482	0.474	0.474	0.461	0.457	0.470	2.2*
2-Fluorobiphenyl *	1.599	1.408	1.278	1.200	1.237	1.344	12.1*
Terphenyl-d14 *	1.001	0.936	0.824	0.815	0.762	0.868	11.3*
Phenol-d5 *	2.515	2.403	2.327	2.163	2.081	2.298	7.7*
2-Fluorophenol *	1.800	1.776	1.738	1.668	1.574	1.711	5.3*
2,4,6-Tribromophenol	0.379	0.379	0.363	0.370	0.362	0.371	2.2
2-Chlorophenol-d4 *	1.891	1.774	1.710	1.560	1.460	1.679	10.2*
1,2-Dichlorobenzene-d4 *	1.039	0.955	0.910	0.814	0.737	0.891	13.3*

Compounds with required minimum RRF and maximum %RSD values.
[illegible] other compounds must meet a minimum RRF of 0.010.

FORM VI SV-2 3/90

200101

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

:nstrument ID: HMS-HP Calibration date: 12/29/93 Time: 0935

.ab File ID: H3525 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF (average)	RRF50	MIN RRF	%D	MAX %D
Phenol	1.842	2.039	0.800	-10.7	25.0
bis(2-Chloroethyl)ether	1.491	1.640	0.700	-10.0	25.0
2-Chlorophenol	1.331	1.439	0.800	-8.1	25.0
1,3-Dichlorobenzene	1.461	1.578	0.600	-8.0	25.0
1,4-Dichlorobenzene	1.398	1.582	0.500	-13.2	25.0
1,2-Dichlorobenzene	1.281	1.431	0.400	-11.7	25.0
2-Methylphenol	1.202	1.174	0.700	2.3	25.0
2,2'-oxybis(1-Chloropropane)	2.175	2.189		-0.6	
4-Methylphenol	1.277	1.254	0.600	1.8	25.0
N-Nitroso-di-n-propylamine	0.968	1.090	0.500	-12.6	25.0
Hexachloroethane	0.608	0.725	0.300	-19.2	25.0
Nitrobenzene	0.457	0.507	0.200	-10.9	25.0
Isophorone	0.911	0.999	0.400	-9.7	25.0
2-Nitrophenol	0.222	0.250	0.100	-12.6	25.0
2,4-Dimethylphenol	0.401	0.449	0.200	-12.0	25.0
bis(2-Chloroethoxy)methane	0.517	0.591	0.300	-14.3	25.0
2,4-Dichlorophenol	0.322	0.367	0.200	-14.0	25.0
1,2,4-Trichlorobenzene	0.345	0.404	0.200	-17.1	25.0
Naphthalene	0.954	1.132	0.700	-18.7	25.0
4-Chloroaniline	0.485	0.485		0.0	
Hexachlorobutadiene	0.193	0.233		-20.7	
4-Chloro-3-methylphenol	0.346	0.394	0.200	-13.9	25.0
2-Methylnaphthalene	0.611	0.695	0.400	-13.8	25.0
Hexachlorocyclopentadiene	0.321	0.348		-8.4	
2,4,6-Trichlorophenol	0.469	0.521	0.200	-11.1	25.0
2,4,5-Trichlorophenol	0.445	0.548	0.200	-23.2	25.0
2-Chloronaphthalene	1.229	1.433	0.800	-16.6	25.0
2-Nitroaniline	0.550	0.621		-12.9	
Dimethylphthalate	1.610	1.760		-9.3	
Acenaphthylene	1.757	2.120	1.300	-20.7	25.0
2,6-Dinitrotoluene	0.311	0.407	0.200	-30.9	25.0
3-Nitroaniline	0.462	0.480		-3.9	
Acenaphthene	1.155	1.319	0.800	-14.2	25.0
2,4-Dinitrophenol	0.206	0.198		3.9	
4-Nitrophenol	0.231	0.233		-0.9	
Dibenzofuran	1.660	1.897	0.800	-14.3	25.0
2,4-Dinitrotoluene	0.537	0.595	0.200	-10.8	25.0

All other compounds must meet a minimum RRF of 0.010.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

ab Name: PACE NEW ENGLA Contract: NEESAC

a de: Case No.: BAKER SAS No.: SDG No.: GEI01

nstrument ID: HMS-HP Calibration date: 12/29/93 Time: 0935

ab File ID: H3525 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate	1.611	1.828		-13.5	
4-Chlorophenyl-phenylether	0.469	0.646	0.400	-37.7	25.0
Fluorene	1.011	1.299	0.900	-28.5	25.0
4-Nitroaniline	0.476	0.519		-9.0	
4,6-Dinitro-2-methylphenol	0.142	0.162		-14.1	
N-Nitrosodiphenylamine (1)	0.514	0.585		-13.8	
4-Bromophenyl-phenylether	0.235	0.276	0.100	-17.4	25.0
Hexachlorobenzene	0.314	0.364	0.100	-15.9	25.0
Pentachlorophenol	0.196	0.197	0.050	-0.5	25.0
Phenanthrene	1.042	1.224	0.700	-17.5	25.0
Anthracene	1.059	1.221	0.700	-15.3	25.0
Carbazole	1.104	1.244		-12.7	
Di-n-butylphthalate	1.499	1.870		-24.8	
Fluoranthene	1.160	1.335	0.600	-15.1	25.0
Pyrene	1.223	1.383	0.600	-13.1	25.0
Butylbenzylphthalate	0.730	0.831		-13.8	
3,3'-Dichlorobenzidine	0.390	0.450		-15.4	
Benzo(a)anthracene	1.030	1.143	0.800	-11.0	25.0
Chrysene	1.051	1.148	0.700	-9.2	25.0
bis(2-Ethylhexyl)phthalate	0.999	1.172		-17.3	
Di-n-octylphthalate	1.512	1.769		-17.0	
Benzo(b)fluoranthene	1.298	1.194	0.700	8.0	25.0
Benzo(k)fluoranthene	0.752	1.003	0.700	-33.4	25.0
Benzo(a)pyrene	1.008	1.076	0.700	-6.7	25.0
Indeno(1,2,3-cd)pyrene	1.188	1.258	0.500	-5.9	25.0
Dibenz(a,h)anthracene	0.924	0.981	0.400	-6.2	25.0
Benzo(g,h,i)perylene	1.024	1.070	0.500	-4.5	25.0
Nitrobenzene-d5	0.470	0.535	0.200	-13.8	25.0
2-Fluorobiphenyl	1.344	1.505	0.700	-12.0	25.0
Terphenyl-d14	0.868	1.003	0.500	-15.6	25.0
Phenol-d5	2.298	2.387	0.800	-3.9	25.0
2-Fluorophenol	1.711	1.835	0.600	-7.2	25.0
2,4,6-Tribromophenol	0.371	0.420		-13.2	
2-Chlorophenol-d4	1.679	1.814	0.800	-8.0	25.0
1,2-Dichlorobenzene-d4	0.891	0.949	0.400	-6.5	25.0

All other compounds must meet a minimum RRF of 0.010.

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

:nstrument ID: HMS-HP   Calibration date: 01/03/94   Time: 0848

ab File ID: H3544   Init. Calib. Date(s): 11/17/93   11/17/93

Init. Calib. Times: 1549   1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Phenol	1.842	1.909	0.800	-3.6	25.0
bis(2-Chloroethyl)ether	1.491	1.686	0.700	-13.1	25.0
2-Chlorophenol	1.331	1.429	0.800	-7.4	25.0
1,3-Dichlorobenzene	1.461	1.562	0.600	-6.9	25.0
1,4-Dichlorobenzene	1.398	1.540	0.500	-10.2	25.0
1,2-Dichlorobenzene	1.281	1.419	0.400	-10.8	25.0
2-Methylphenol	1.202	1.195	0.700	0.6	25.0
2,2'-oxybis(1-Chloropropane)	2.175	2.233		-2.7	
4-Methylphenol	1.277	1.276	0.600	0.1	25.0
N-Nitroso-di-n-propylamine	0.968	0.989	0.500	-2.2	25.0
Hexachloroethane	0.608	0.704	0.300	-15.8	25.0
Nitrobenzene	0.457	0.507	0.200	-10.9	25.0
Isophorone	0.911	0.983	0.400	-7.9	25.0
2-Nitrophenol	0.222	0.253	0.100	-14.0	25.0
2,4-Dimethylphenol	0.401	0.424	0.200	-5.7	25.0
bis(2-Chloroethoxy)methane	0.517	0.588	0.300	-13.7	25.0
2,4-Dichlorophenol	0.322	0.362	0.200	-12.4	25.0
1,2,4-Trichlorobenzene	0.345	0.398	0.200	-15.4	25.0
Naphthalene	0.954	1.093	0.700	-14.6	25.0
4-Chloroaniline	0.485	0.493		-1.6	
Hexachlorobutadiene	0.193	0.228		-18.1	
4-Chloro-3-methylphenol	0.346	0.397	0.200	-14.7	25.0
2-Methylnaphthalene	0.611	0.690	0.400	-12.9	25.0
Hexachlorocyclopentadiene	0.321	0.406		-26.5	
2,4,6-Trichlorophenol	0.469	0.523	0.200	-11.5	25.0
2,4,5-Trichlorophenol	0.445	0.528	0.200	-18.6	25.0
2-Chloronaphthalene	1.229	1.388	0.800	-12.9	25.0
2-Nitroaniline	0.550	0.631		-14.7	
Dimethylphthalate	1.610	1.785		-10.9	
Acenaphthylene	1.757	2.107	1.300	-19.9	25.0
2,6-Dinitrotoluene	0.311	0.414	0.200	-33.1	25.0
3-Nitroaniline	0.462	0.453		1.9	
Acenaphthene	1.155	1.292	0.800	-11.9	25.0
2,4-Dinitrophenol	0.206	0.206		0.0	
4-Nitrophenol	0.231	0.235		-1.7	
Dibenzofuran	1.660	1.910	0.800	-15.1	25.0
2,4-Dinitrotoluene	0.537	0.590	0.200	-9.9	25.0

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA Contract: NEESAC

.a ode: Case No.: BAKER SAS No.: SDG No.: GEI01

.nstrument ID: HMS-HP Calibration date: 01/03/94 Time: 0848

.ab File ID: H3544 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate	1.611	1.857		-15.3	
4-Chlorophenyl-phenylether	0.469	0.647	0.400	-38.0	25.0
Fluorene	1.011	1.305	0.900	-29.1	25.0
4-Nitroaniline	0.476	0.488		-2.5	
4,6-Dinitro-2-methylphenol	0.142	0.193		-35.9	
N-Nitrosodiphenylamine (1)	0.514	0.595		-15.8	
4-Bromophenyl-phenylether	0.235	0.270	0.100	-14.9	25.0
Hexachlorobenzene	0.314	0.355	0.100	-13.1	25.0
Pentachlorophenol	0.196	0.199	0.050	-1.5	25.0
Phenanthrene	1.042	1.140	0.700	-9.4	25.0
Anthracene	1.059	1.171	0.700	-10.6	25.0
Carbazole	1.104	1.180		-6.9	
Di-n-butylphthalate	1.499	1.884		-25.7	
Fluoranthene	1.160	1.324	0.600	-14.1	25.0
Pyrene	1.223	1.336	0.600	-9.2	25.0
Butylbenzylphthalate	0.730	0.852		-16.7	
3,3'-Dichlorobenzidine	0.390	0.429		-10.0	
Benzo(a)anthracene	1.030	1.148	0.800	-11.5	25.0
Chrysene	1.051	1.177	0.700	-12.0	25.0
bis(2-Ethylhexyl)phthalate	0.999	1.175		-17.6	
Di-n-octylphthalate	1.512	1.823		-20.6	
Benzo(b)fluoranthene	1.298	1.315	0.700	-1.3	25.0
Benzo(k)fluoranthene	0.752	0.932	0.700	-23.9	25.0
Benzo(a)pyrene	1.008	1.102	0.700	-9.3	25.0
Indeno(1,2,3-cd)pyrene	1.188	1.312	0.500	-10.4	25.0
Dibenz(a,h)anthracene	0.924	1.030	0.400	-11.5	25.0
Benzo(g,h,i)perylene	1.024	1.139	0.500	-11.2	25.0
Nitrobenzene-d5	0.470	0.537	0.200	-14.3	25.0
2-Fluorobiphenyl	1.344	1.487	0.700	-10.6	25.0
Terphenyl-d14	0.868	0.954	0.500	-9.9	25.0
Phenol-d5	2.298	2.388	0.800	-3.9	25.0
2-Fluorophenol	1.711	1.879	0.600	-9.8	25.0
2,4,6-Tribromophenol	0.371	0.398		-7.3	
2-Chlorophenol-d4	1.679	1.779	0.800	-6.0	25.0
1,2-Dichlorobenzene-d4	0.891	0.948	0.400	-6.4	25.0

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA Contract: NEESAC

.ab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

:nstrument ID: HMS-HP Calibration date: 01/04/94 Time: 1333

.ab File ID: H3570 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Phenol	1.842	1.916	0.800	-4.0	25.0
bis(2-Chloroethyl)ether	1.491	1.650	0.700	-10.7	25.0
2-Chlorophenol	1.331	1.423	0.800	-6.9	25.0
1,3-Dichlorobenzene	1.461	1.554	0.600	-6.4	25.0
1,4-Dichlorobenzene	1.398	1.526	0.500	-9.2	25.0
1,2-Dichlorobenzene	1.281	1.402	0.400	-9.4	25.0
2-Methylphenol	1.202	1.188	0.700	1.2	25.0
2,2'-oxybis(1-Chloropropane)	2.175	2.243		-3.1	
4-Methylphenol	1.277	1.296	0.600	-1.5	25.0
N-Nitroso-di-n-propylamine	0.968	0.952	0.500	1.7	25.0
Hexachloroethane	0.608	0.686	0.300	-12.8	25.0
Nitrobenzene	0.457	0.481	0.200	-5.3	25.0
Isophorone	0.911	0.960	0.400	-5.4	25.0
2-Nitrophenol	0.222	0.270	0.100	-21.6	25.0
2,4-Dimethylphenol	0.401	0.410	0.200	-2.2	25.0
bis(2-Chloroethoxy)methane	0.517	0.577	0.300	-11.6	25.0
2,4-Dichlorophenol	0.322	0.367	0.200	-14.0	25.0
1,2,4-Trichlorobenzene	0.345	0.397	0.200	-15.1	25.0
Naphthalene	0.954	1.062	0.700	-11.3	25.0
4-Chloroaniline	0.485	0.469		3.3	
Hexachlorobutadiene	0.193	0.228		-18.1	
4-Chloro-3-methylphenol	0.346	0.399	0.200	-15.3	25.0
2-Methylnaphthalene	0.611	0.676	0.400	-10.6	25.0
Hexachlorocyclopentadiene	0.321	0.296		7.8	
2,4,6-Trichlorophenol	0.469	0.539	0.200	-14.9	25.0
2,4,5-Trichlorophenol	0.445	0.523	0.200	-17.5	25.0
2-Chloronaphthalene	1.229	1.366	0.800	-11.2	25.0
2-Nitroaniline	0.550	0.644		-17.1	
Dimethylphthalate	1.610	1.774		-10.2	
Acenaphthylene	1.757	2.022	1.300	-15.1	25.0
2,6-Dinitrotoluene	0.311	0.415	0.200	-33.4	25.0
3-Nitroaniline	0.462	0.453		1.9	
Acenaphthene	1.155	1.276	0.800	-10.5	25.0
2,4-Dinitrophenol	0.206	0.198		3.9	
4-Nitrophenol	0.231	0.238		-3.0	
Dibenzofuran	1.660	1.911	0.800	-15.1	25.0
2,4-Dinitrotoluene	0.537	0.615	0.200	-14.5	25.0

All other compounds must meet a minimum RRF of 0.010.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.a ode: Case No.: BAKER   SAS No.:   SDG No.: GEI01

:nstrument ID: HMS-HP   Calibration date: 01/04/94   Time: 1333

.ab File ID: H3570   Init. Calib. Date(s): 11/17/93   11/17/93

Init. Calib. Times: 1549   1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate	1.611	1.891		-17.4	
4-Chlorophenyl-phenylether	0.469	0.634	0.400	-35.2	25.0
Fluorene	1.011	1.261	0.900	-24.7	25.0
4-Nitroaniline	0.476	0.472		0.8	
4,6-Dinitro-2-methylphenol	0.142	0.189		-33.1	
N-Nitrosodiphenylamine (1)	0.514	0.556		-8.2	
4-Bromophenyl-phenylether	0.235	0.266	0.100	-13.2	25.0
Hexachlorobenzene	0.314	0.354	0.100	-12.7	25.0
Pentachlorophenol	0.196	0.202	0.050	-3.1	25.0
Phenanthrene	1.042	1.134	0.700	-8.8	25.0
Anthracene	1.059	1.184	0.700	-11.8	25.0
Carbazole	1.104	1.224		-10.9	
Di-n-butylphthalate	1.499	1.856		-23.8	
Fluoranthene	1.160	1.280	0.600	-10.3	25.0
Pyrene	1.223	1.356	0.600	-10.9	25.0
Butylbenzylphthalate	0.730	0.865		-18.5	
3,3'-Dichlorobenzidine	0.390	0.446		-14.4	
Benzo(a)anthracene	1.030	1.138	0.800	-10.5	25.0
Chrysene	1.051	1.190	0.700	-13.2	25.0
bis(2-Ethylhexyl)phthalate	0.999	1.200		-20.1	
Di-n-octylphthalate	1.512	1.853		-22.6	
Benzo(b)fluoranthene	1.298	1.235	0.700	4.9	25.0
Benzo(k)fluoranthene	0.752	0.993	0.700	-32.0	25.0
Benzo(a)pyrene	1.008	1.053	0.700	-4.5	25.0
Indeno(1,2,3-cd)pyrene	1.188	1.296	0.500	-9.1	25.0
Dibenz(a,h)anthracene	0.924	1.015	0.400	-9.8	25.0
Benzo(g,h,i)perylene	1.024	1.111	0.500	-8.5	25.0
Nitrobenzene-d5	0.470	0.531	0.200	-13.0	25.0
2-Fluorobiphenyl	1.344	1.423	0.700	-5.9	25.0
Terphenyl-d14	0.868	1.008	0.500	-16.1	25.0
Phenol-d5	2.298	2.365	0.800	-2.9	25.0
2-Fluorophenol	1.711	1.888	0.600	-10.3	25.0
2,4,6-Tribromophenol	0.371	0.424		-14.3	
2-Chlorophenol-d4	1.679	1.775	0.800	-5.7	25.0
1,2-Dichlorobenzene-d4	0.891	0.934	0.400	-4.8	25.0

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: PACE NEW ENGLA Contract: NEESAC

Lab Code: Case No.: BAKER SAS No.: SDG No.: GEI01

Instrument ID: HMS-HP Calibration date: 01/10/94 Time: 1217

Lab File ID: H3624 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Phenol	1.842	1.807	0.800	1.9	25.0
bis(2-Chloroethyl)ether	1.491	1.499	0.700	-0.5	25.0
2-Chlorophenol	1.331	1.423	0.800	-6.9	25.0
1,3-Dichlorobenzene	1.461	1.556	0.600	-6.5	25.0
1,4-Dichlorobenzene	1.398	1.514	0.500	-8.3	25.0
1,2-Dichlorobenzene	1.281	1.296	0.400	-1.2	25.0
2-Methylphenol	1.202	1.236	0.700	-2.8	25.0
2,2'-oxybis(1-Chloropropane)	2.175	2.140		1.6	
4-Methylphenol	1.277	1.226	0.600	4.0	25.0
N-Nitroso-di-n-propylamine	0.968	0.907	0.500	6.3	25.0
Hexachloroethane	0.608	0.658	0.300	-8.2	25.0
Nitrobenzene	0.457	0.500	0.200	-9.4	25.0
Isophorone	0.911	0.967	0.400	-6.1	25.0
2-Nitrophenol	0.222	0.263	0.100	-18.5	25.0
2,4-Dimethylphenol	0.401	0.437	0.200	-9.0	25.0
bis(2-Chloroethoxy)methane	0.517	0.591	0.300	-14.3	25.0
2,4-Dichlorophenol	0.322	0.354	0.200	-9.9	25.0
1,2,4-Trichlorobenzene	0.345	0.388	0.200	-12.5	25.0
Naphthalene	0.954	1.063	0.700	-11.4	25.0
4-Chloroaniline	0.485	0.432		10.9	
Hexachlorobutadiene	0.193	0.222		-15.0	
4-Chloro-3-methylphenol	0.346	0.376	0.200	-8.7	25.0
2-Methylnaphthalene	0.611	0.664	0.400	-8.7	25.0
Hexachlorocyclopentadiene	0.321	0.435		-35.5	
2,4,6-Trichlorophenol	0.469	0.518	0.200	-10.4	25.0
2,4,5-Trichlorophenol	0.445	0.477	0.200	-7.2	25.0
2-Chloronaphthalene	1.229	1.382	0.800	-12.4	25.0
2-Nitroaniline	0.550	0.632		-14.9	
Dimethylphthalate	1.610	1.770		-9.9	
Acenaphthylene	1.757	2.132	1.300	-21.3	25.0
2,6-Dinitrotoluene	0.311	0.433	0.200	-39.2	25.0
3-Nitroaniline	0.462	0.448		3.0	
Acenaphthene	1.155	1.270	0.800	-10.0	25.0
2,4-Dinitrophenol	0.206	0.205		0.5	
4-Nitrophenol	0.231	0.253		-9.5	
Dibenzofuran	1.660	1.871	0.800	-12.7	25.0
2,4-Dinitrotoluene	0.537	0.605	0.200	-12.7	25.0

All other compounds must meet a minimum RRF of 0.010.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

ab Name: PACE NEW ENGLA Contract: NEESAC

ab Code: - Case No.: BAKER SAS No.: SDG No.: GEI01

nstrument ID: HMS-HP Calibration date: 01/10/94 Time: 1217

ab File ID: H3624 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate	1.611	1.816		-12.7	
4-Chlorophenyl-phenylether	0.469	0.624	0.400	-33.0	25.0
Fluorene	1.011	1.267	0.900	-25.3	25.0
4-Nitroaniline	0.476	0.475		0.2	
4,6-Dinitro-2-methylphenol	0.142	0.194		-36.6	
N-Nitrosodiphenylamine (1)	0.514	0.555		-8.0	
4-Bromophenyl-phenylether	0.235	0.257	0.100	-9.4	25.0
Hexachlorobenzene	0.314	0.331	0.100	-5.4	25.0
Pentachlorophenol	0.196	0.160	0.050	18.4	25.0
Phenanthrene	1.042	1.148	0.700	-10.2	25.0
Anthracene	1.059	1.169	0.700	-10.4	25.0
Carbazole	1.104	1.072		2.9	
Di-n-butylphthalate	1.499	1.876		-25.2	
Fluoranthene	1.160	1.299	0.600	-12.0	25.0
Pyrene	1.223	1.361	0.600	-11.3	25.0
Butylbenzylphthalate	0.730	0.862		-18.1	
3,3'-Dichlorobenzidine	0.390	0.445		-14.1	
Benzo(a)anthracene	1.030	1.122	0.800	-8.9	25.0
Chrysene	1.051	1.169	0.700	-11.2	25.0
bis(2-Ethylhexyl)phthalate	0.999	1.203		-20.4	
Di-n-octylphthalate	1.512	1.792		-18.5	
Benzo(b)fluoranthene	1.298	1.353	0.700	-4.2	25.0
Benzo(k)fluoranthene	0.752	0.783	0.700	-4.1	25.0
Benzo(a)pyrene	1.008	1.052	0.700	-4.4	25.0
Indeno(1,2,3-cd)pyrene	1.188	1.248	0.500	-5.1	25.0
Dibenz(a,h)anthracene	0.924	0.966	0.400	-4.5	25.0
Benzo(g,h,i)perylene	1.024	1.066	0.500	-4.1	25.0
Nitrobenzene-d5	0.470	0.537	0.200	-14.3	25.0
2-Fluorobiphenyl	1.344	1.416	0.700	-5.4	25.0
Terphenyl-d14	0.868	0.940	0.500	-8.3	25.0
Phenol-d5	2.298	2.179	0.800	5.2	25.0
2-Fluorophenol	1.711	1.881	0.600	-9.9	25.0
2,4,6-Tribromophenol	0.371	0.380		-2.4	
2-Chlorophenol-d4	1.679	1.782	0.800	-6.1	25.0
1,2-Dichlorobenzene-d4	0.891	0.893	0.400	-0.2	25.0

All other compounds must meet a minimum RRF of 0.010.

SEMIVOLATILE CONTINUING CALIBRATION CHECK

.ab Name: PACE NEW ENGLA   Contract: NEESAC

.ab Code: Case No.: BAKER   SAS No.:   SDG No.: GEI01

:nstrument ID: HMS-HP   Calibration date: 01/11/94 Time: 0930

.ab File ID: H3637   Init. Calib. Date(s): 11/17/93   11/17/93

Init. Calib. Times: 1549   1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Phenol	1.842	1.810	0.800	1.7	25.0
bis(2-Chloroethyl)ether	1.491	1.504	0.700	-0.9	25.0
2-Chlorophenol	1.331	1.426	0.800	-7.1	25.0
1,3-Dichlorobenzene	1.461	1.541	0.600	-5.5	25.0
1,4-Dichlorobenzene	1.398	1.532	0.500	-9.6	25.0
1,2-Dichlorobenzene	1.281	1.346	0.400	-5.1	25.0
2-Methylphenol	1.202	1.243	0.700	-3.4	25.0
2,2'-oxybis(1-Chloropropane)	2.175	2.021		7.1	
4-Methylphenol	1.277	1.225	0.600	4.1	25.0
N-Nitroso-di-n-propylamine	0.968	0.999	0.500	-3.2	25.0
Hexachloroethane	0.608	0.670	0.300	-10.2	25.0
Nitrobenzene	0.457	0.492	0.200	-7.7	25.0
Isophorone	0.911	0.966	0.400	-6.0	25.0
2-Nitrophenol	0.222	0.265	0.100	-19.4	25.0
2,4-Dimethylphenol	0.401	0.434	0.200	-8.2	25.0
bis(2-Chloroethoxy)methane	0.517	0.585	0.300	-13.2	25.0
2,4-Dichlorophenol	0.322	0.352	0.200	-9.3	25.0
1,2,4-Trichlorobenzene	0.345	0.381	0.200	-10.4	25.0
Naphthalene	0.954	1.096	0.700	-14.9	25.0
4-Chloroaniline	0.485	0.434		10.5	
Hexachlorobutadiene	0.193	0.214		-10.9	
4-Chloro-3-methylphenol	0.346	0.383	0.200	-10.7	25.0
2-Methylnaphthalene	0.611	0.657	0.400	-7.5	25.0
Hexachlorocyclopentadiene	0.321	0.429		-33.6	
2,4,6-Trichlorophenol	0.469	0.496	0.200	-5.8	25.0
2,4,5-Trichlorophenol	0.445	0.482	0.200	-8.3	25.0
2-Chloronaphthalene	1.229	1.399	0.800	-13.8	25.0
2-Nitroaniline	0.550	0.609		-10.7	
Dimethylphthalate	1.610	1.712		-6.3	
Acenaphthylene	1.757	2.139	1.300	-21.7	25.0
2,6-Dinitrotoluene	0.311	0.418	0.200	-34.4	25.0
3-Nitroaniline	0.462	0.435		5.8	
Acenaphthene	1.155	1.305	0.800	-13.0	25.0
2,4-Dinitrophenol	0.206	0.221		-7.3	
4-Nitrophenol	0.231	0.248		-7.4	
Dibenzofuran	1.660	1.824	0.800	-9.9	25.0
2,4-Dinitrotoluene	0.537	0.608	0.200	-13.2	25.0

All other compounds must meet a minimum RRF of 0.010.

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

ab Name: PACE NEW ENGLA Contract: NEESAC

ab de: Case No.: BAKER SAS No.: SDG No.: GEI01

ıstrument ID: HMS-HP Calibration date: 01/11/94 Time: 0930

ab File ID: H3637 Init. Calib. Date(s): 11/17/93 11/17/93

Init. Calib. Times: 1549 1802

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate	1.611	1.807		-12.2	
4-Chlorophenyl-phenylether	0.469	0.613	0.400	-30.7	25.0
Fluorene	1.011	1.270	0.900	-25.6	25.0
4-Nitroaniline	0.476	0.454		4.6	
4,6-Dinitro-2-methylphenol	0.142	0.192		-35.2	
N-Nitrosodiphenylamine (1)	0.514	0.548		-6.6	
4-Bromophenyl-phenylether	0.235	0.256	0.100	-8.9	25.0
Hexachlorobenzene	0.314	0.330	0.100	-5.1	25.0
Pentachlorophenol	0.196	0.171	0.050	12.8	25.0
Phenanthrene	1.042	1.175	0.700	-12.8	25.0
Anthracene	1.059	1.167	0.700	-10.2	25.0
Carbazole	1.104	1.092		1.1	
Di-n-butylphthalate	1.499	1.914		-27.7	
Fluoranthene	1.160	1.252	0.600	-7.9	25.0
Pyrene	1.223	1.374	0.600	-12.4	25.0
Butylbenzylphthalate	0.730	0.871		-19.3	
3,3'-Dichlorobenzidine	0.390	0.387		0.8	
Benzo(a)anthracene	1.030	1.141	0.800	-10.8	25.0
Chrysene	1.051	1.152	0.700	-9.6	25.0
bis(2-Ethylhexyl)phthalate	0.999	1.251		-25.2	
Di-n-octylphthalate	1.512	1.957		-29.4	
Benzo(b)fluoranthene	1.298	1.321	0.700	-1.8	25.0
Benzo(k)fluoranthene	0.752	0.908	0.700	-20.7	25.0
Benzo(a)pyrene	1.008	1.056	0.700	-4.8	25.0
Indeno(1,2,3-cd)pyrene	1.188	1.191	0.500	-0.3	25.0
Dibenz(a,h)anthracene	0.924	0.928	0.400	-0.4	25.0
Benzo(g,h,i)perylene	1.024	1.008	0.500	1.6	25.0
Nitrobenzene-d5	0.470	0.534	0.200	-13.6	25.0
2-Fluorobiphenyl	1.344	1.391	0.700	-3.5	25.0
Terphenyl-d14	0.868	0.947	0.500	-9.1	25.0
Phenol-d5	2.298	2.235	0.800	2.7	25.0
2-Fluorophenol	1.711	1.891	0.600	-10.5	25.0
2,4,6-Tribromophenol	0.371	0.368		0.8	
2-Chlorophenol-d4	1.679	1.802	0.800	-7.3	25.0
1,2-Dichlorobenzene-d4	0.891	0.912	0.400	-2.4	25.0

All other compounds must meet a minimum RRF of 0.010.

INORGANIC DATA

InterOffice Memorandum

Baker

To:	Dan Bonk	**Date:**	February 16, 1994
From:	Rich Hoff R.H.	**Subject:**	CTO 160, SDG# GEI01. Soil inorganic data validation.

This data validation report presents the validated data for twenty (20) soil samples and three aqueous samples taken at Camp Geiger December 10 through December 13, 1993. These samples were analyzed for inorganic analytes by the CLP Statement of Work (SOW) ILM03.0. Soil samples were analyzed according to the latest inorganic CLP Statement of Work (SOW) by Pace Laboratory (New England) The deliverable received was that of a NEESA level C format. Samples evaluated in this report are:

35ER01	BCSB09	SB3502
35ER02	BCSB10	
35FB01	BCSB3D	
BCSB01	SB2903	
BCSB02	SB3003	
BCSB03	SB3005	
BCSB04	SB3005D	
BCSB05	SB3102	
BCSB06	SB3203	
BCSB07	SB3305	
BCSB08	SB3405	

Data were reviewed using the most recent Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analysis and the 1993 SOW for Inorganic Analysis.

Minor Issues

Initial calibration, continuing calibration, preparation blanks, equipment rinsate blanks and field blanks contained low levels of aluminum, arsenic, antimony, barium, copper, manganese, magnesium, calcium, cadmium, cobalt, iron, lead, potassium, sodium, selenium, vanadium and zinc. Because of the prevalence of these analytes in blanks run throughout the SDG, sample results were qualified as "U" not detected if they failed to exceed 5 times the maximum blank concentration adjusted to represent the soil matrix.

Lab blanks also displayed negative blank values for chromium throughout the SDG. Chromium levels less than or equal to 40 mg/Kg were qualified as "L" biased low.

The following concentrations represent 5 times the maximum detected blank concentration on a mass/mass basis:

aluminum	21.3 mg/Kg
barium	27.1 mg/Kg
antimony	16.1 mg/Kg

arsenic	5.8 mg/Kg
calcium	167 mg/Kg
copper	7.8 mg/Kg
cobalt	4.4 mg/Kg
lead	58.9 mg/Kg
magnesium	35 mg/Kg
manganese	1.9 mg/Kg
potassium	1106 mg/Kg
sodium	253 mg/Kg
iron	103.6 mg/Kg
selenium	3.3 mg/Kg
vanadium	5.6 mg/Kg.
zinc	9.3 mg/Kg

Spike sample results for antimony, beryllium and selenium fell outside of the specified 75% to 125% recovery range specified by the SOW. Positive and nondetect sample results associated with spike %R values greater than 30% but less than 75% were qualified either "L" or "UL" respectively. Sample results associated with %R values below
30% were qualified "L" and nondetect results were qualified "R" rejected.

The analytes aluminum, chromium, iron, magnesium, mercury, potassium, sodium and vanadium exceeded the 80 to 120 percent recovery criteria in a Laboratory Control Sample (LCS). Results less than the IDL will not be qualified for mercury because it's %R value exceeded the upper limit of 120. Positive mercury results will be qualified "K" as potentially biased high. Positive results and nondetect values for analytes with LCS recoveries between 50% and 79% were qualified as "L" and "UL", biased low, respectively.

Iron failed the laboratory duplicate criteria of plus or minus 35%. All corresponding iron results were qualified as "J" estimated.

Conclusions

All samples were successfully analyzed by the laboratory and data are useable for any intended purpose within the limits of validation qualification. Qualifiers used in this validation, qualified data and support documentation are presented in the following attachments.

RH/nd
Attachments

GLOSSARY OF DATA QUALIFIER CODES

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of compounds)

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

B = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

CODES RELATED TO QUANTITATION
(can be used for positive results and sample quantitation limits):

J = Analyte present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

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EPA SAMPLE NO.

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INORGANIC ANALYSIS DATA SHEET

BCSB01

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-025

Level (low/med): LOW Date Received: 12/15/93

% Solids: 28.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2960		L	P
7440-36-0	Antimony	10.4	~~U~~	~~N~~R	P
7440-38-2	Arsenic	1.9	U		P
7440-39-3	Barium	31.9	~~B~~	J	P
7440-41-7	Beryllium	0.27	U	L	P
7440-43-9	Cadmium	1.4	U		P
7440-70-2	Calcium	12900			P
7440-47-3	Chromium	6.0	~~B~~	L	P
7440-48-4	Cobalt	2.1	U		P
7440-50-8	Copper	8.0	~~B~~	J	P
7439-89-6	Iron	5210		~~*~~J	P
7439-92-1	Lead	35.0		u	P
7439-95-4	Magnesium	1480	~~B~~	L	P
7439-96-5	Manganese	99.3			P
7439-97-6	Mercury	0.14		K	CV
7440-02-0	Nickel	6.9	U		P
7440-09-7	Potassium	433	U	L	P
7782-49-2	Selenium	1.1	U	~~N~~L	P
7440-22-4	Silver	2.4	U		P
7440-23-5	Sodium	1240	~~B~~	L	P
7440-28-0	Thallium	1.9	U		P
7440-62-2	Vanadium	10.5	~~B~~	L	P
7440-66-6	Zinc	88.5			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB02

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-031

Level (low/med): LOW Date Received: 12/15/93

% Solids: 54.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1390		L	P
7440-36-0	Antimony	4.3	~~B~~	~~N~~ R	P
7440-38-2	Arsenic	1.2	~~B~~	u	P
7440-39-3	Barium	13.5	~~B~~	u	P
7440-41-7	Beryllium	0.11	U	L	P
7440-43-9	Cadmium	0.58	U		P
7440-70-2	Calcium	3200			P
7440-47-3	Chromium	4.0		L	P
7440-48-4	Cobalt	0.88	U		P
7440-50-8	Copper	6.3	~~B~~	u	P
7439-89-6	Iron	2510		~~E~~ J	P
7439-92-1	Lead	46.1		u	P
7439-95-4	Magnesium	149	~~B~~	L	P
7439-96-5	Manganese	59.2			P
7439-97-6	Mercury	0.06	~~B~~	K	CV
7440-02-0	Nickel	2.9	U		P
7440-09-7	Potassium	179	U	L	P
7782-49-2	Selenium	0.47	U	~~N~~ L	P
7440-22-4	Silver	1.00	U		P
7440-23-5	Sodium	83.2	~~B~~	uL	P
7440-28-0	Thallium	0.77	U		P
7440-62-2	Vanadium	6.7	~~B~~	L	P
7440-66-6	Zinc	37.8			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB03

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-029

Level (low/med): LOW Date Received: 12/15/93

% Solids: 52.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3110		L	P
7440-36-0	Antimony	4.5	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	0.83	U		P
7440-39-3	Barium	21.7	~~B~~	u	P
7440-41-7	Beryllium	0.11	U	L	P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	3180			P
7440-47-3	Chromium	6.6		L	P
7440-48-4	Cobalt	0.92	U		P
7440-50-8	Copper	4.7	~~B~~	u	P
7439-89-6	Iron	2340		~~*~~ J	P
7439-92-1	Lead	45.3		u	P
7439-95-4	Magnesium	163	~~B~~	L	P
7439-96-5	Manganese	7.3			P
7439-97-6	Mercury	0.08		K	CV
7440-02-0	Nickel	3.0	U		P
7440-09-7	Potassium	186	U	L	P
7782-49-2	Selenium	0.49	U	~~N~~ L	P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	62.3	~~B~~	UL	P
7440-28-0	Thallium	0.80	U		P
7440-62-2	Vanadium	10.2	~~B~~	L	P
7440-66-6	Zinc	22.9			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB3D

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-030

Level (low/med): LOW Date Received: 12/15/93

% Solids: 44.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2810		L	P
7440-36-0	Antimony	5.8	~~B~~	~~N~~ K	P
7440-38-2	Arsenic	1.1	~~B~~	U	P
7440-39-3	Barium	22.1	~~B~~	U	P
7440-41-7	Beryllium	0.15	U	L	P
7440-43-9	Cadmium	0.78	U		P
7440-70-2	Calcium	3450			P
7440-47-3	Chromium	6.2		L	P
7440-48-4	Cobalt	1.2	U		P
7440-50-8	Copper	5.0	~~B~~	U	P
7439-89-6	Iron	2670		*J	P
7439-92-1	Lead	49.1		U	P
7439-95-4	Magnesium	150	~~B~~	L	P
7439-96-5	Manganese	9.5			P
7439-97-6	Mercury	0.09		K	CV
7440-02-0	Nickel	3.9	U		P
7440-09-7	Potassium	242	U	L	P
7782-49-2	Selenium	1.0	~~B~~	~~N~~ UL	P
7440-22-4	Silver	1.3	U		P
7440-23-5	Sodium	70.9	~~B~~	UL	P
7440-28-0	Thallium	1.0	U		P
7440-62-2	Vanadium	9.8	~~B~~	L	P
7440-66-6	Zinc	23.5			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB04

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-032

Level (low/med): LOW Date Received: 12/15/93

% Solids: 78.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1520		L	P
7440-36-0	Antimony	2.3	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	0.43	U		P
7440-39-3	Barium	7.8	~~B~~	U	P
7440-41-7	Beryllium	0.06	U	L	P
7440-43-9	Cadmium	0.31	U		P
7440-70-2	Calcium	530	~~B~~	J	P
7440-47-3	Chromium	3.5		L	P
7440-48-4	Cobalt	0.47	U		P
7440-50-8	Copper	0.92	~~B~~	U	P
7439-89-6	Iron	1070		~~*~~ J	P
7439-92-1	Lead	14.5		U	P
7439-95-4	Magnesium	42.5	~~B~~	L	P
7439-96-5	Manganese	4.2			P
7439-97-6	Mercury	0.08		K	CV
7440-02-0	Nickel	1.5	U		P
7440-09-7	Potassium	105	~~B~~	UL	P
7782-49-2	Selenium	0.25	U	~~N~~ L	P
7440-22-4	Silver	0.53	U		P
7440-23-5	Sodium	47.2	~~B~~	UL	P
7440-28-0	Thallium	0.41	U		P
7440-62-2	Vanadium	3.4	~~B~~	UL	P
7440-66-6	Zinc	10.4			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB05

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-033

Level (low/med): LOW Date Received: 12/15/93

% Solids: 66.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2500		L	P
7440-36-0	Antimony	3.2	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	0.99	~~B~~	U	P
7440-39-3	Barium	10.9	~~B~~	U	P
7440-41-7	Beryllium	0.08	~~B~~	UL	P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	2580			P
7440-47-3	Chromium	5.2		L	P
7440-48-4	Cobalt	0.66	U		P
7440-50-8	Copper	6.8		U	P
7439-89-6	Iron	3500		~~*~~ J	P
7439-92-1	Lead	42.3		U	P
7439-95-4	Magnesium	411	~~B~~	L	P
7439-96-5	Manganese	18.7			P
7439-97-6	Mercury	0.05		K	CV
7440-02-0	Nickel	2.1	U		P
7440-09-7	Potassium	156	~~B~~	UL	P
7782-49-2	Selenium	0.52	~~B~~	~~N~~ UL	P
7440-22-4	Silver	0.74	U		P
7440-23-5	Sodium	1120		L	P
7440-28-0	Thallium	0.57	U		P
7440-62-2	Vanadium	5.6	~~B~~	UL	P
7440-66-6	Zinc	46.8			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB06

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-023

Level (low/med): LOW Date Received: 12/15/93

% Solids: 33.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4840		L	P
7440-36-0	Antimony	7.6	~~B~~	~~N~~ R	P
7440-38-2	Arsenic	1.4	U		P
7440-39-3	Barium	25.9	~~B~~	J	P
7440-41-7	Beryllium	0.19	U	L	P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	8010			P
7440-47-3	Chromium	8.0		L	P
7440-48-4	Cobalt	3.1	~~B~~	U	P
7440-50-8	Copper	7.1	~~B~~	U	P
7439-89-6	Iron	5170		~~*~~ J	P
7439-92-1	Lead	61.1			P
7439-95-4	Magnesium	1480	~~B~~	L	P
7439-96-5	Manganese	97.1			P
7439-97-6	Mercury	0.27		K	CV
7440-02-0	Nickel	5.0	U		P
7440-09-7	Potassium	315	U	L	P
7782-49-2	Selenium	0.89	~~B~~	~~N~~ UL	P
7440-22-4	Silver	1.7	U		P
7440-23-5	Sodium	1510	~~B~~	L	P
7440-28-0	Thallium	1.4	U		P
7440-62-2	Vanadium	13.1	~~B~~	L	P
7440-66-6	Zinc	66.0			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB07

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-024

Level (low/med): LOW Date Received: 12/15/93

% Solids: 62.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3190		L	P
7440-36-0	Antimony	4.7	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	1.6	~~B~~	U	P
7440-39-3	Barium	23.6	~~B~~	U	P
7440-41-7	Beryllium	0.12	U	L	P
7440-43-9	Cadmium	0.63	U		P
7440-70-2	Calcium	4450			P
7440-47-3	Chromium	5.0		L	P
7440-48-4	Cobalt	1.4	~~B~~	U	P
7440-50-8	Copper	3.6	~~B~~	U	P
7439-89-6	Iron	3840		~~*~~ J	P
7439-92-1	Lead	21.6		U	P
7439-95-4	Magnesium	413	B	L	P
7439-96-5	Manganese	38.9			P
7439-97-6	Mercury	0.09		K	CV
7440-02-0	Nickel	3.4	~~B~~	J	P
7440-09-7	Potassium	293	~~B~~	UL	P
7782-49-2	Selenium	0.53	~~B~~	~~N~~ UL	P
7440-22-4	Silver	1.1	U		P
7440-23-5	Sodium	67.6	~~B~~	UL	P
7440-28-0	Thallium	0.84	U		P
7440-62-2	Vanadium	8.7	~~B~~	UL	P
7440-66-6	Zinc	18.8			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB08

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-026

Level (low/med): LOW Date Received: 12/15/93

% Solids: 43.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3330		L	P
7440-36-0	Antimony	5.4	~~U~~	~~N~~ K	P
7440-38-2	Arsenic	1.00	U		P
7440-39-3	Barium	18.3	~~B~~	U	P
7440-41-7	Beryllium	0.20	~~B~~	UL	P
7440-43-9	Cadmium	0.72	U		P
7440-70-2	Calcium	1780			P
7440-47-3	Chromium	5.4		L	P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	3.7	~~B~~	U	P
7439-89-6	Iron	4390		~~*~~ J	P
7439-92-1	Lead	41.6		U	P
7439-95-4	Magnesium	510	~~B~~	L	P
7439-96-5	Manganese	8.7			P
7439-97-6	Mercury	0.11		K	CV
7440-02-0	Nickel	3.6	U		P
7440-09-7	Potassium	331	~~B~~	UL	P
7782-49-2	Selenium	0.59	U	~~N~~ L	P
7440-22-4	Silver	1.2	U		P
7440-23-5	Sodium	347	~~B~~	L	P
7440-28-0	Thallium	0.96	U		P
7440-62-2	Vanadium	12.4	~~B~~	L	P
7440-66-6	Zinc	11.9			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BCSB09

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-027

Level (low/med): LOW Date Received: 12/15/93

% Solids: 34.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4660		L	P
7440-36-0	Antimony	7.2	~~U~~	~~N~~R	P
7440-38-2	Arsenic	1.3	U		P
7440-39-3	Barium	22.2	~~B~~	U	P
7440-41-7	Beryllium	0.22	~~B~~	UL	P
7440-43-9	Cadmium	0.97	U		P
7440-70-2	Calcium	6280			P
7440-47-3	Chromium	8.2		L	P
7440-48-4	Cobalt	1.6	~~B~~	U	P
7440-50-8	Copper	6.9	~~B~~	U	P
7439-89-6	Iron	6350		~~*~~ J	P
7439-92-1	Lead	61.3			P
7439-95-4	Magnesium	1290	B	L	P
7439-96-5	Manganese	63.3			P
7439-97-6	Mercury	0.15		K	CV
7440-02-0	Nickel	6.1	~~B~~	J	P
7440-09-7	Potassium	471	~~B~~	UL	P
7782-49-2	Selenium	1.8	~~B~~	~~N~~ UL	P
7440-22-4	Silver	1.7	U		P
7440-23-5	Sodium	1390	~~B~~	UL	P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	15.3	~~B~~	L	P
7440-66-6	Zinc	63.1			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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EPA SAMPLE NO.

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INORGANIC ANALYSIS DATA SHEET

BCSB10

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38778-028

Level (low/med): LOW Date Received: 12/15/93

% Solids: 21.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3760		L	P
7440-36-0	Antimony	12.0	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	2.2	U		P
7440-39-3	Barium	28.2	~~B~~	J	P
7440-41-7	Beryllium	0.31	U	L	P
7440-43-9	Cadmium	1.6	U		P
7440-70-2	Calcium	23600			P
7440-47-3	Chromium	7.6	~~B~~	L	P
7440-48-4	Cobalt	2.5	U		P
7440-50-8	Copper	7.6	~~B~~	u	P
7439-89-6	Iron	4560		~~*~~ J	P
7439-92-1	Lead	69.2			P
7439-95-4	Magnesium	1630	~~B~~	L	P
7439-96-5	Manganese	105			P
7439-97-6	Mercury	0.26		K	CV
7440-02-0	Nickel	8.3	~~B~~	J	P
7440-09-7	Potassium	563	~~B~~	UL	P
7782-49-2	Selenium	1.5	~~B~~	~~N~~ UL	P
7440-22-4	Silver	2.8	U		P
7440-23-5	Sodium	1730	~~B~~	L	P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	18.1	~~B~~	L	P
7440-66-6	Zinc	70.5			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts: YES

Comments:
Artifacts: Roots

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1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB2903

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-019

Level (low/med): LOW Date Received: 12/13/93

% Solids: 86.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3330		L	P
7440-36-0	Antimony	2.6	~~U~~	NR	P
7440-38-2	Arsenic	0.69	~~B~~	U	P
7440-39-3	Barium	3.4	~~B~~	U	P
7440-41-7	Beryllium	0.07	U	L	P
7440-43-9	Cadmium	0.35	U		P
7440-70-2	Calcium	133	~~B~~	U	P
7440-47-3	Chromium	4.8		L	P
7440-48-4	Cobalt	0.53	U		P
7440-50-8	Copper	0.92	~~B~~	U	P
7439-89-6	Iron	1500		* J	P
7439-92-1	Lead	2.8		U	P
7439-95-4	Magnesium	67.0	~~B~~	L	P
7439-96-5	Manganese	0.61	~~B~~	U	P
7439-97-6	Mercury	0.08		K	CV
7440-02-0	Nickel	1.7	U		P
7440-09-7	Potassium	138	~~B~~	UL	P
7782-49-2	Selenium	0.28	U	~~N~~L	P
7440-22-4	Silver	0.59	U		P
7440-23-5	Sodium	13.9	~~B~~	UL	P
7440-28-0	Thallium	0.46	U		P
7440-62-2	Vanadium	4.1	~~B~~	UL	P
7440-66-6	Zinc	0.81	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3003

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-020

Level (low/med): LOW Date Received: 12/13/93

% Solids: 89.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	959		L	P
7440-36-0	Antimony	3.0	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	0.56	U		P
7440-39-3	Barium	1.2	~~B~~	U	P
7440-41-7	Beryllium	0.08	U	L	P
7440-43-9	Cadmium	0.41	U		P
7440-70-2	Calcium	264	~~B~~	J	P
7440-47-3	Chromium	4.3		L	P
7440-48-4	Cobalt	0.62	U		P
7440-50-8	Copper	1.3	~~B~~	U	P
7439-89-6	Iron	518		~~*~~ J	P
7439-92-1	Lead	1.4		U	P
7439-95-4	Magnesium	19.7	~~B~~	UL	P
7439-96-5	Manganese	2.6	~~B~~	J	P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	2.0	U		P
7440-09-7	Potassium	126	U	L	P
7782-49-2	Selenium	0.36	~~B~~	N UL	P
7440-22-4	Silver	0.70	U		P
7440-23-5	Sodium	15.3	~~B~~	UL	P
7440-28-0	Thallium	0.54	U		P
7440-62-2	Vanadium	1.4	~~B~~	UL	P
7440-66-6	Zinc	20.4			P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3005

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-021

Level (low/med): LOW Date Received: 12/13/93

% Solids: 86.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1840		L	P
7440-36-0	Antimony	3.1	~~U~~	~~N~~R	P
7440-38-2	Arsenic	4.0		U	P
7440-39-3	Barium	2.5	~~B~~	U	P
7440-41-7	Beryllium	0.08	U	L	P
7440-43-9	Cadmium	0.41	U		P
7440-70-2	Calcium	51.0	~~B~~	U	P
7440-47-3	Chromium	12.3		L	P
7440-48-4	Cobalt	0.63	U		P
7440-50-8	Copper	2.3	~~B~~	U	P
7439-89-6	Iron	3560		~~*~~ J	P
7439-92-1	Lead	2.0		U	P
7439-95-4	Magnesium	78.1	~~B~~	L	P
7439-96-5	Manganese	4.9			P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	2.0	U		P
7440-09-7	Potassium	128	U	L	P
7782-49-2	Selenium	0.64	~~B~~	~~N~~ UL	P
7440-22-4	Silver	0.71	U		P
7440-23-5	Sodium	16.2	~~B~~	UL	P
7440-28-0	Thallium	0.55	U		P
7440-62-2	Vanadium	13.0		L	P
7440-66-6	Zinc	0.73	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB305D

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-022

Level (low/med): LOW Date Received: 12/13/93

% Solids: 82.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2400		L	P
7440-36-0	Antimony	3.4	~~U~~	~~N~~R	P
7440-38-2	Arsenic	8.0			P
7440-39-3	Barium	2.9	~~B~~	U	P
7440-41-7	Beryllium	0.09	U	L	P
7440-43-9	Cadmium	0.45	U		P
7440-70-2	Calcium	38.5	~~B~~	U	P
7440-47-3	Chromium	20.5		L	P
7440-48-4	Cobalt	0.69	U		P
7440-50-8	Copper	3.7	~~B~~	U	P
7439-89-6	Iron	6140		~~*~~ J	P
7439-92-1	Lead	2.4		U	P
7439-95-4	Magnesium	96.8	~~B~~	L	P
7439-96-5	Manganese	8.9			P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	2.2	U		P
7440-09-7	Potassium	153	~~B~~	UL	P
7782-49-2	Selenium	1.5		~~N~~ UL	P
7440-22-4	Silver	0.78	U		P
7440-23-5	Sodium	24.0	~~B~~	UL	P
7440-28-0	Thallium	0.60	U		P
7440-62-2	Vanadium	22.9		L	P
7440-66-6	Zinc	0.82	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3102

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-027

Level (low/med): LOW Date Received: 12/13/93

% Solids: 87.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2140		L	P
7440-36-0	Antimony	2.5	~~U~~	~~N~~R	P
7440-38-2	Arsenic	0.47	U		P
7440-39-3	Barium	6.8	~~B~~	U	P
7440-41-7	Beryllium	0.07	~~B~~	UL	P
7440-43-9	Cadmium	0.34	U		P
7440-70-2	Calcium	234	~~B~~	J	P
7440-47-3	Chromium	1.7		L	P
7440-48-4	Cobalt	0.52	U		P
7440-50-8	Copper	0.42	U		P
7439-89-6	Iron	932		~~*~~ J	P
7439-92-1	Lead	1.8		U	P
7439-95-4	Magnesium	55.5	~~B~~	L	P
7439-96-5	Manganese	3.2			P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	1.7	U		P
7440-09-7	Potassium	106	U	L	P
7782-49-2	Selenium	0.28	U	~~N~~ L	P
7440-22-4	Silver	0.59	U		P
7440-23-5	Sodium	15.4	~~B~~	UL	P
7440-28-0	Thallium	0.46	U		P
7440-62-2	Vanadium	1.9	~~B~~	UL	P
7440-66-6	Zinc	1.6	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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EPA SAMPLE NO.

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INORGANIC ANALYSIS DATA SHEET

SB3203

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-023

Level (low/med): LOW Date Received: 12/13/93

% Solids: 88.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4300		L	P
7440-36-0	Antimony	3.1	~~U~~	~~N~~R	P
7440-38-2	Arsenic	0.90	~~B~~	U	P
7440-39-3	Barium	7.1	~~B~~	U	P
7440-41-7	Beryllium	0.08	U	L	P
7440-43-9	Cadmium	0.42	U		P
7440-70-2	Calcium	268	~~B~~	J	P
7440-47-3	Chromium	6.2		L	P
7440-48-4	Cobalt	0.64	U		P
7440-50-8	Copper	0.52	U		P
7439-89-6	Iron	2500		~~*~~ J	P
7439-92-1	Lead	3.6		U	P
7439-95-4	Magnesium	133	~~B~~	L	P
7439-96-5	Manganese	1.2	~~B~~	U	P
7439-97-6	Mercury	0.02	~~B~~	K	CV
7440-02-0	Nickel	2.1	U		P
7440-09-7	Potassium	131	U	L	P
7782-49-2	Selenium	0.34	U	~~N~~ L	P
7440-22-4	Silver	0.72	U		P
7440-23-5	Sodium	29.3	~~B~~	UL	P
7440-28-0	Thallium	0.56	U		P
7440-62-2	Vanadium	7.8	~~B~~	L	P
7440-66-6	Zinc	1.1	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3305

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-026

Level (low/med): LOW Date Received: 12/13/93

% Solids: 86.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3490		L	P
7440-36-0	Antimony	3.0	~~U~~	~~N~~R	P
7440-38-2	Arsenic	0.56	U		P
7440-39-3	Barium	5.0	~~B~~	U	P
7440-41-7	Beryllium	0.08	U	L	P
7440-43-9	Cadmium	0.41	U		P
7440-70-2	Calcium	113	~~B~~	U	P
7440-47-3	Chromium	7.2		L	P
7440-48-4	Cobalt	0.62	U		P
7440-50-8	Copper	0.87	~~B~~	U	P
7439-89-6	Iron	1030		~~*~~ J	P
7439-92-1	Lead	3.6		U	P
7439-95-4	Magnesium	125	~~B~~	L	P
7439-96-5	Manganese	1.5	~~B~~	U	P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	2.0	U		P
7440-09-7	Potassium	126	U	L	P
7782-49-2	Selenium	0.64	~~B~~	~~N~~ UL	P
7440-22-4	Silver	0.70	U		P
7440-23-5	Sodium	22.1	~~B~~	UL	P
7440-28-0	Thallium	0.54	U		P
7440-62-2	Vanadium	7.6	B	L	P
7440-66-6	Zinc	1.2	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

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INORGANIC ANALYSIS DATA SHEET

SB3405

Lab Name: PACE New England, Inc.   Contract:

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: MGEI01

Matrix (soil/water): SOIL   Lab Sample ID: 38736-025

Level (low/med): LOW   Date Received: 12/13/93

% Solids: 84.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4480		L	P
7440-36-0	Antimony	3.0	~~U~~	~~N~~ R	P
7440-38-2	Arsenic	0.55	U		P
7440-39-3	Barium	12.1	~~B~~	U	P
7440-41-7	Beryllium	0.08	U	L	P
7440-43-9	Cadmium	0.40	U		P
7440-70-2	Calcium	116	~~B~~	U	P
7440-47-3	Chromium	6.9		L	P
7440-48-4	Cobalt	0.61	U		P
7440-50-8	Copper	0.50	U		P
7439-89-6	Iron	1440		~~*~~ J	P
7439-92-1	Lead	4.8		U	P
7439-95-4	Magnesium	186	~~B~~	L	P
7439-96-5	Manganese	2.3	~~B~~	J	P
7439-97-6	Mercury	0.02	U		CV
7440-02-0	Nickel	2.0	U		P
7440-09-7	Potassium	124	U	L	P
7782-49-2	Selenium	0.32	U	~~N~~ L	P
7440-22-4	Silver	0.69	U		P
7440-23-5	Sodium	20.9	~~B~~	U L	P
7440-28-0	Thallium	0.53	U		P
7440-62-2	Vanadium	8.3	B	L	P
7440-66-6	Zinc	1.5	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN   Clarity Before: Texture: FINE

Color After: COLORLESS   Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SB3502

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Lab Sample ID: 38736-024

Level (low/med): LOW Date Received: 12/13/93

% Solids: 81.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1910		L	P
7440-36-0	Antimony	3.7	~~B~~	~~N~~R	P
7440-38-2	Arsenic	0.70	U		P
7440-39-3	Barium	4.4	~~B~~	U	P
7440-41-7	Beryllium	0.10	U	L	P
7440-43-9	Cadmium	0.50	U		P
7440-70-2	Calcium	416	~~B~~	J	P
7440-47-3	Chromium	2.6		L	P
7440-48-4	Cobalt	0.77	U		P
7440-50-8	Copper	0.62	U		P
7439-89-6	Iron	823		*J	P
7439-92-1	Lead	2.1		U	P
7439-95-4	Magnesium	29.4	~~B~~	UL	P
7439-96-5	Manganese	1.9	~~B~~	U	P
7439-97-6	Mercury	0.03	U		CV
7440-02-0	Nickel	2.5	U		P
7440-09-7	Potassium	156	U	L	P
7782-49-2	Selenium	0.41	U	~~N~~L	P
7440-22-4	Silver	0.86	U		P
7440-23-5	Sodium	23.7	~~B~~	UL	P
7440-28-0	Thallium	0.67	U		P
7440-62-2	Vanadium	3.6	~~B~~	UL	P
7440-66-6	Zinc	0.62	~~B~~	U	P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: FINE

Color After: COLORLESS Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

3
BLANKS (LAB

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum	17.9	U	17.9	U	21.3	B	18.4	B	17.900	U	P
Antimony	15.6	U	15.6	U	15.6	U	15.6	U	15.600	U	P
Arsenic	2.9	U	2.9	U	2.9	U	2.9	U	2.900	U	P
Barium	2.4	U	4.0	B	8.3	B	8.0	B	2.400	U	P
Beryllium	0.4	U	0.4	U	0.4	U	0.4	U	0.400	U	P
Cadmium	2.1	U	2.1	U	2.2	B	2.1	U	2.100	U	P
Calcium	19.0	U	19.0	U	19.0	U	20.3	B	135.010	B	P
Chromium	-9.0	B	-9.6	B	-8.1	B	-7.6	B	-8.590	B	P
Cobalt	3.2	U	3.2	U	4.4	B	3.2	B	3.200	U	P
Copper	2.6	U	2.6	U	3.8	B	4.3	B	2.700	B	P
Iron	-27.8	B	8.5	U	-17.8	B	8.5	U	103.600		P
Lead	0.7	U	0.7	U	0.7	U	0.7	U	1.110	B	P
Magnesium	22.0	U	22.0	U	29.7	B	22.0	U	26.690	B	P
Manganese	1.0	U	1.0	U	1.4	B	1.4	B	1.100	B	P
Mercury	0.1	U	0.1	U					0.100	U	CV
Nickel	10.4	U	10.4	U	10.4	U	10.4	U	10.400	U	P
Potassium	648.9	U	648.9	U	1105.7	B	766.4	B	648.900	U	P
Selenium	1.7	U	1.7	U	1.7	U	1.7	U	-2.150	B	P
Silver	3.6	U	3.6	U	3.6	U	3.6	U	3.600	U	P
Sodium	45.1	B	39.3	B	63.0	B	36.6	B	152.470	B	P
Thallium	2.8	U	2.8	U	2.8	U	2.8	U	2.800	U	P
Vanadium	3.3	U	3.3	U	5.6	B	5.0	B	3.300	U	P
Zinc	1.7	U	1.7	U	3.1	B	2.8	B	9.330	B	P
Cyanide											NR

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3
BLANKS

Lab Name: PACE New England, Inc.   Contract:

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: MGEI01

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum			17.9	U	17.9	U	17.9	U			P
Antimony			15.6	U	15.6	U	15.6	U			P
Arsenic			2.9	U	2.9	U	2.9	U			P
Barium			5.8	B	6.6	B	6.1	B			P
Beryllium			0.4	U	0.4	U	0.4	U			P
Cadmium			2.1	U	2.1	U	2.1	U			P
Calcium			19.0	U	19.0	U	19.0	U			P
Chromium			2.3	U	2.3	U	2.3	U			P
Cobalt			3.2	U	3.2	U	3.2	U			P
Copper			7.8	B	6.5	B	5.7	B			P
Iron			8.5	U	-9.2	B	-10.9	B			P
Lead			0.7	U	0.7	U	0.7	U			P
Magnesium			22.0	U	22.0	U	22.0	U			P
Manganese			1.6	B	1.9	B	1.5	B			P
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.100	U	CV
Nickel			10.4	U	10.4	U	10.4	U			P
Potassium			648.9	U	648.9	U	648.9	U			P
Selenium			1.7	U	1.7	U	1.7	U			P
Silver			3.6	U	3.6	U	-4.0	B			P
Sodium			34.2	B	48.2	B	66.5	B			P
Thallium			2.8	U	2.8	U	2.8	U			P
Vanadium			3.3	U	3.3	U	3.3	U			P
Zinc			2.6	B	3.1	B	2.4	B			P
Cyanide											NR

OVER →

U.S. EPA - CLP

3
BLANKS (LAB)

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum			17.9	U	17.9	U					P
Antimony			15.6	U	16.1	B					P
Arsenic			2.9	U					5.800	B	P
Barium			5.4	B	6.0	B			27.100	B	P
Beryllium			0.4	U	0.4	U					P
Cadmium			2.1	U	2.1	U			2.100	U	P
Calcium			19.0	U	23.1	B					P
Chromium			2.3	U	2.9	B			-8.000	B	P
Cobalt			3.2	U	3.2	B					P
Copper			4.1	B	5.1	B					P
Iron			-13.7	B	15.6	B					P
Lead			0.7	U					58.900		P
Magnesium			22.0	U	22.0	U					P
Manganese			1.6	B	1.9	B					P
Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.100	U	CV
Nickel			10.4	U	10.4	U					P
Potassium			689.9	B	648.9	U					P
Selenium			1.7	U					3.300	B	P
Silver			3.6	U	3.6	U			3.600	U	P
Sodium			88.4	B	138.9	B					P
Thallium			2.8	U							P
Vanadium			3.3	U	3.3	U					P
Zinc			2.0	B	3.5	B					P
Cyanide											NR

Chromium [illegible] again

* Qualify all chromium U values UL

All samples below 40 mg/kg L

400037

U.S. EPA - CLP

3
BLANKS (LAB)

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum									3.580	U	P
Antimony	15.6	U	15.6	U	15.6	U	15.6	U	3.120	U	P
Arsenic									0.580	U	P
Barium									0.480	U	P
Beryllium									0.080	U	P
Cadmium									0.420	U	P
Calcium									7.396	B	P
Chromium									0.460	U	P
Cobalt									0.640	U	P
Copper									0.646	B	P
Iron									1.700	U	P
Lead									0.520	B	P
Magnesium									4.400	U	P
Manganese									0.200	U	P
Mercury									0.015	U	CV
Nickel									2.080	U	P
Potassium									129.780	U	P
Selenium									0.340	U	P
Silver									0.720	U	P
Sodium									7.884	B	P
Thallium									0.560	U	P
Vanadium									0.660	U	P
Zinc									0.340	U	P
Cyanide											NR

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

35ER01

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): WATER Lab Sample ID: 38736-035

Level (low/med): LOW Date Received: 12/13/93

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	17.9	U		P
7440-36-0	Antimony	15.6	U		P
7440-38-2	Arsenic	2.9	U		P
7440-39-3	Barium	2.4	U		P
7440-41-7	Beryllium	0.40	U		P
7440-43-9	Cadmium	2.1	U		P
7440-70-2	Calcium	152	B		P
7440-47-3	Chromium	2.3	U		P
7440-48-4	Cobalt	3.2	U		P
7440-50-8	Copper	2.6	U		P
7439-89-6	Iron	17.2	B		P
7439-92-1	Lead	3.3			P
7439-95-4	Magnesium	29.5	B		P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	10.4	U		P
7440-09-7	Potassium	649	U		P
7782-49-2	Selenium	1.7	U		P
7440-22-4	Silver	3.6	U		P
7440-23-5	Sodium	253	B		P
7440-28-0	Thallium	2.8	U		P
7440-62-2	Vanadium	3.3	U		P
7440-66-6	Zinc	3.9	B		P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

35ER02

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): WATER Lab Sample ID: 38778-038

Level (low/med): LOW Date Received: 12/15/93

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	17.9	U		P	
7440-36-0	Antimony	15.6	U		P	
7440-38-2	Arsenic	2.9	U		P	
7440-39-3	Barium	2.4	U		P	
7440-41-7	Beryllium	0.40	U		P	
7440-43-9	Cadmium	2.1	U		P	
7440-70-2	Calcium	167	B		P	167 mg/kg
7440-47-3	Chromium	2.3	U		P	
7440-48-4	Cobalt	3.2	U		P	
7440-50-8	Copper	2.6	U		P	
7439-89-6	Iron	8.5	U		P	
7439-92-1	Lead	0.70	U		P	
7439-95-4	Magnesium	32.7	B		P	32.7 mg/kg
7439-96-5	Manganese	1.0	U		P	
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	10.4	U		P	
7440-09-7	Potassium	702	B		P	702 mg/kg
7782-49-2	Selenium	1.7	U		P	
7440-22-4	Silver	3.6	U		P	
7440-23-5	Sodium	242	B		P	242 mg/kg
7440-28-0	Thallium	2.8	U		P	
7440-62-2	Vanadium	3.3	U		P	
7440-66-6	Zinc	2.6	B		P	2.6 mg/kg
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

35FB01

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): WATER Lab Sample ID: 38736-036

Level (low/med): LOW Date Received: 12/13/93

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	19.2	B		P	19.2 mg/kg
7440-36-0	Antimony	15.6	U		P	
7440-38-2	Arsenic	2.9	U		P	
7440-39-3	Barium	2.4	U		P	
7440-41-7	Beryllium	0.40	U		P	
7440-43-9	Cadmium	2.1	U		P	
7440-70-2	Calcium	104	B		P	104 mg/kg
7440-47-3	Chromium	2.3	U		P	
7440-48-4	Cobalt	3.2	U		P	
7440-50-8	Copper	2.6	U		P	
7439-89-6	Iron	8.5	U		P	
7439-92-1	Lead	2.0	B		P	2.0 mg/kg
7439-95-4	Magnesium	35.3	B		P	35.3 mg/kg
7439-96-5	Manganese	1.0	U		P	
7439-97-6	Mercury	0.10	U		CV	
7440-02-0	Nickel	10.4	U		P	
7440-09-7	Potassium	731	B		P	731 mg/kg
7782-49-2	Selenium	1.7	U		P	
7440-22-4	Silver	3.6	U		P	
7440-23-5	Sodium	113	B		P	113 mg/kg
7440-28-0	Thallium	2.8	U		P	
7440-62-2	Vanadium	3.3	U		P	
7440-66-6	Zinc	5.5	B		P	5.5 mg/kg
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

BCSB03S

Lab Name: PACE New England, Inc. Contract:

Lab Code: Case No.: BAKER SAS No.: SDG No.: MGEI01

Matrix (soil/water): SOIL Level (low/med): LOW
% Solids for Sample: 52.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	29.1798		4.4776	U	127.36	22.9	N	P
Arsenic	75-125	390.6240		0.8324	U	509.42	76.7		P
Barium	75-125	421.4035		21.6504	B	509.42	78.5		P
Beryllium	75-125	9.5415		0.1148	U	12.74	74.9	N	P
Cadmium	75-125	12.3128		0.6028	U	12.74	96.6		P
Calcium									NR
Chromium	75-125	49.1747		6.5528		50.94	83.7		P
Cobalt	75-125	111.8237		0.9185	U	127.36	87.8		P
Copper	75-125	54.2792		4.7445	B	63.68	77.8		P
Iron									NR
Lead	75-125	144.1849		45.2698		127.36	77.7		P
Magnesium									NR
Manganese	75-125	111.7601		7.3192		127.36	82.0		P
Mercury	75-125	0.3901		0.0801	B	0.33	93.9		CV
Nickel	75-125	112.7178		2.9851	U	127.36	88.5		P
Potassium									NR
Selenium	75-125	362.0530		0.4879	U	509.42	71.1	N	P
Silver	75-125	10.7336		1.0333	U	12.74	84.3		P
Sodium									NR
Thallium	75-125	396.4595		0.8037	U	509.42	77.8		P
Vanadium	75-125	114.6918		10.2067	B	127.36	82.0		P
Zinc	75-125	125.2522		22.9047		127.36	80.4		P
Cyanide									NR

Comments:

U.S. EPA - CLP

7
LABORATORY CONTROL SAMPLE

Lab Name: PACE New England, Inc.   Contract:

Lab Code: Case No.: BAKER   SAS No.:   SDG No.: MGEI01

Solid LCS Source: ERA

Aqueous LCS Source: SOL+\SPX\VHG

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum	2000.0	2063.53	103.2	6000.0	3775.1		3600.0	8400.0	62.9
Antimony	500.0	577.16	115.4	27.8	21.0	B	14.0	117.0	75.5
Arsenic	2000.0	2033.11	101.7	67.7	70.7		41.0	105.0	104.4
Barium	2000.0	2002.11	100.1	187.0	153.8		131.0	243.0	82.2
Beryllium	50.0	48.57	97.1	57.5	47.4		35.0	81.0	82.4
Cadmium	50.0	60.01	120.0	110.0	100.1		55.0	166.0	91.0
Calcium	10000.0	10605.22	106.1	2040.0	1781.8	B	1220.0	2860.0	87.3
Chromium	200.0	201.40	100.7	189.0	137.8		95.0	265.0	72.9
Cobalt	500.0	530.31	106.1	87.0	80.1		43.0	130.0	92.1
Copper	250.0	254.81	101.9	141.0	116.9		84.0	200.0	82.9
Iron	1000.0	1058.75	105.9	10800.0	5568.6		7020.0	15100.0	51.6
Lead	500.0	485.82	97.2	100.0	85.1		55.0	140.0	85.1
Magnesium	10000.0	10293.73	102.9	2050.0	1372.8	B	1200.0	3080.0	67.0
Manganese	500.0	514.52	102.9	294.0	240.6		206.0	383.0	81.8
Mercury	8.0	7.75	96.9	2.4	2.9		1.3	3.8	120.8
Nickel	500.0	525.64	105.1	79.6	73.4		40.0	112.0	92.2
Potassium	10000.0	10548.17	105.5	2130.0	1488.4	B	1280.0	2770.0	69.9
Selenium	2000.0	1982.73	99.1	99.1	90.6		54.0	149.0	91.4
Silver	50.0	54.10	108.2	124.0	126.3		62.0	186.0	101.9
Sodium	10000.0	10442.44	104.4	527.0	419.2	B	316.0	738.0	79.5
Thallium	2000.0	1991.58	99.6	67.9	59.1		34.0	102.0	87.0
Vanadium	500.0	518.32	103.7	84.8	60.5		59.0	115.0	71.3
Zinc	500.0	514.09	102.8	197.0	165.0		98.0	280.0	83.8
Cyanide									

TCLP, RCRA, TPH AND OIL AND GREASE DATA

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR VOLATILE CONSTITUENTS

Laboratory Number	:	38736-028
Field Identification	:	SBC01
Extraction Date	:	12/16/93
TCLP Blank	:	90,002-329

Sample description : NON-HOMOGENEOUS BROWN SOIL

Extraction Fluid Selection (1,2):

Extraction Fluid #1 was used as specfied in the method.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 25 g of sample was added to the extractor with 500 mL of Extraction Fluid #1.

Extraction Time : 18.00 hrs

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid #1: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

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TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR VOLATILE CONSTITUENTS

Laboratory number: 38736 -028
Sample Designation:SBC01
Matrix: TCLP EXTRACT

Parameter	Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
VOLATILES	Date Analyzed: 12/23/93		
Vinyl chloride	BDL	0.2	.01
1,1-Dichloroethene	BDL	0.7	.005
1,2-Dichloroethane	BDL	0.5	.005
Chloroform	BDL	6.0	.005
Methyl ethyl ketone	BDL	200	.025
Carbon Tetrachloride	BDL	0.5	.005
Trichloroethene	BDL	0.5	.005
Benzene	BDL	0.5	.005
Tetrachloroethene	BDL	0.7	.005
Chlorobenzene	BDL	100	.005

Results uncorrected for matrix spike recovery.

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THE ASSURANCE OF QUALITY

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR VOLATILE CONSTITUENTS

Laboratory Number	:	38736-029
Field Identification	:	SBC01D
Extraction Date	:	12/16/93
TCLP Blank	:	90,002-329

Sample description : NON-HOMOGENEOUS MEDIUM BROWN SOIL

Extraction Fluid Selection (1,2):

Extraction Fluid #1 was used as specfied in the method.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 25 g of sample was added to the extractor with 2000 mL of Extraction Fluid #1.

Extraction Time : 18.00 hrs

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid #1: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

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TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR VOLATILE CONSTITUENTS

Laboratory number: 38736 -029
Sample Designation:SBC01D
Matrix: TCLP EXTRACT

Parameter	Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
VOLATILES	Date Analyzed: 12/23/93		
Vinyl chloride	BDL	0.2	.01
1,1-Dichloroethene	BDL	0.7	.005
1,2-Dichloroethane	BDL	0.5	.005
Chloroform	BDL	6.0	.005
Methyl ethyl ketone	BDL	200	.025
Carbon Tetrachloride	BDL	0.5	.005
Trichloroethene	BDL	0.5	.005
Benzene	BDL	0.5	.005
Tetrachloroethene	BDL	0.7	.005
Chlorobenzene	BDL	100	.005

Results uncorrected for matrix spike recovery.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR VOLATILE CONSTITUENTS

Laboratory Number : 38778-034
Field Identification : SBC02
Extraction Date : 12/16/93
TCLP Blank : 90,002-329

Sample description : NON-HOMOGENEOUS BROWN SOIL

Extraction Fluid Selection (1,2):

Extraction Fluid #1 was used as specfied in the method.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 25 g of sample was added to the extractor with 500 mL of Extraction Fluid #1.

Extraction Time : 18.00 hrs

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid #1: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR VOLATILE CONSTITUENTS

Laboratory number: 38778 -034
Sample Designation:SBC02
Matrix: TCLP EXTRACT

Parameter	Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
VOLATILES	Date Analyzed: 12/23/93		
Vinyl chloride	BDL	0.2	.01
1,1-Dichloroethene	BDL	0.7	.005
1,2-Dichloroethane	BDL	0.5	.005
Chloroform	BDL	6.0	.005
Methyl ethyl ketone	BDL	200	.025
Carbon Tetrachloride	BDL	0.5	.005
Trichloroethene	BDL	0.5	.005
Benzene	BDL	0.5	.005
Tetrachloroethene	BDL	0.7	.005
Chlorobenzene	BDL	100	.005

Results uncorrected for matrix spike recovery.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR NON-VOLATILE CONSTITUENTS

Laboratory Number	:	38736-028
Field Identification	:	SBC01
Extraction Date	:	12/17/93
TCLP Blank	:	90,001-219

Sample description : NON-HOMOGENEOUS MEDIUM BROWN SOIL

Extraction Fluid Selection (1,2):

A 5.0 gm portion of the sample was stirred with 96.5 mL deionized water. The pH at the end of 5 minutes was 6.40. 3.5 mL 1.0N HCl was added and the mixture was then heated to 50C for ten minutes. Upon cooling the pH was 1.62, therefore Extraction Fluid #1 was used.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 100 gm of sample was added to the extractor with 2000 mL Extraction Fluid #1.

Extraction Time : 18.00 hrs

Final pH : 5.08

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR NON-VOLATILE CONSTITUENTS

Laboratory number: 38736 -028
Sample Designation: SBC01
Matrix: TCLP EXTRACT

Parameter	Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
SEMIVOLATILES Date Extracted: 12/20/93	Date Analyzed: 01/06/94		
Pyridine	BDL	5.0	.056
1,4-Dichlorobenzene	BDL	7.5	.056
2,4-Dinitrotoluene	BDL	0.13	.056
2-Methylphenol	BDL	200	.056
3,4-Methylphenols	BDL	200	.056
Hexachloroethane	BDL	3.0	.056
Nitrobenzene	BDL	2.0	.056
Hexachlorobenzene	BDL	0.13	.056
Pentachlorophenol	BDL	100	.056
Hexachlorobutadiene	BDL	0.50	.056
2,4,6-Trichlorophenol	BDL	2.0	.056
2,4,5-Trichlorophenol	BDL	400	.056
PESTICIDES Date Extracted: 12/20/93	Date Analyzed: 12/21/93		
Gamma-BHC	BDL	0.4	.0003
Chlordane	BDL	0.03	.002
Endrin	BDL	0.02	.0003
Heptachlor	BDL	0.008	.0003
Heptachlor Epoxide	BDL	0.008	.0003
Toxaphene	BDL	0.5	.01
Methoxychlor	BDL	10	.002
HERBICIDES Date Extracted: 12/21/93	Date Analyzed: 12/23/93		
2,4-D	BDL	10	.005
Silvex	BDL	1	.005

Results uncorrected for matrix spike recovery.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR NON-VOLATILE CONSTITUENTS

Laboratory Number : 38736-029
Field Identification : SBC01D
Extraction Date : 12/17/93
TCLP Blank : 90,001-219

Sample description : NON-HOMOGENEOUS MEDIUM BROWN SOIL

Extraction Fluid Selection (1,2):

A 5.0 gm portion of the sample was stirred with 96.5 mL deionized water. The pH at the end of 5 minutes was 7.94. 3.5 mL 1.0N HCl was added and the mixture was then heated to 50C for ten minutes. Upon cooling the pH was 1.58, therefore Extraction Fluid #1 was used.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 100 gm of sample was added to the extractor with 2000 mL Extraction Fluid #1.

Extraction Time : 18.00 hrs

Final pH : 5.00

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

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TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR NON-VOLATILE CONSTITUENTS

Laboratory number: 38736 -029
Sample Designation: SBC01D
Matrix: TCLP EXTRACT

Parameter		Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
SEMIVOLATILES	Date Extracted: 12/20/93	Date Analyzed: 01/06/94		
Pyridine		BDL	5.0	.056
1,4-Dichlorobenzene		BDL	7.5	.056
2,4-Dinitrotoluene		BDL	0.13	.056
2-Methylphenol		BDL	200	.056
3,4-Methylphenols		BDL	200	.056
Hexachloroethane		BDL	3.0	.056
Nitrobenzene		BDL	2.0	.056
Hexachlorobenzene		BDL	0.13	.056
Pentachlorophenol		BDL	100	.056
Hexachlorobutadiene		BDL	0.50	.056
2,4,6-Trichlorophenol		BDL	2.0	.056
2,4,5-Trichlorophenol		BDL	400	.056
PESTICIDES	Date Extracted: 12/20/93	Date Analyzed: 12/21/93		
Gamma-BHC		BDL	0.4	.0003
Chlordane		BDL	0.03	.002
Endrin		BDL	0.02	.0003
Heptachlor		BDL	0.008	.0003
Heptachlor Epoxide		BDL	0.008	.0003
Toxaphene		BDL	0.5	.01
Methoxychlor		BDL	10	.002
HERBICIDES	Date Extracted: 12/21/93	Date Analyzed: 12/23/93		
2,4-D		BDL	10	.005
Silvex		BDL	1	.005

Results uncorrected for matrix spike recovery.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (1)
EXTRACTION FOR NON-VOLATILE CONSTITUENTS

Laboratory Number : 38778-034
Field Identification : SBC02
Extraction Date : 12/17/93
TCLP Blank : 90,001-219

Sample description : NON-HOMOGENEOUS MEDIUM BROWN SOIL & ROOTS

Extraction Fluid Selection (1,2):

A 5.0 gm portion of the sample was stirred with 96.5 mL deionized water. The pH at the end of 5 minutes was 7.50. 3.5 mL 1.0N HCl was added and the mixture was then heated to 50C for ten minutes. Upon cooling the pH was 1.59, therefore Extraction Fluid #1 was used.

Sample Preparation (1):

Since the sample contained no free liquid, it was not filtered before extraction. 100 gm of sample was added to the extractor with 2000 mL Extraction Fluid #1.

Extraction Time : 18.00 hrs

Final pH : 4.82

% Solids as defined in method : 100

References:

1. 40 CFR Part 261, Appendix II, Nov. 24, 1992

2. Extraction Fluid: 0.57% by volume glacial acetic acid to which 0.1N NaOH has been added to yield a pH of 4.93 +/- 0.05.

TOXICITY CHARACTERISTIC LEACHING PROCEDURE
ANALYSIS FOR NON-VOLATILE CONSTITUENTS

Laboratory number: 38778 -034
Sample Designation: SBC02
Matrix: TCLP EXTRACT

Parameter		Result (mg/L)	Regulatory Limit (mg/L)	Reporting Limit (mg/L)
SEMIVOLATILES	Date Extracted: 12/20/93	Date Analyzed: 01/06/94		
Pyridine		BDL	5.0	.056
1,4-Dichlorobenzene		BDL	7.5	.056
2,4-Dinitrotoluene		BDL	0.13	.056
2-Methylphenol		BDL	200	.056
3,4-Methylphenols		BDL	200	.056
Hexachloroethane		BDL	3.0	.056
Nitrobenzene		BDL	2.0	.056
Hexachlorobenzene		BDL	0.13	.056
Pentachlorophenol		BDL	100	.056
Hexachlorobutadiene		BDL	0.50	.056
2,4,6-Trichlorophenol		BDL	2.0	.056
2,4,5-Trichlorophenol		BDL	400	.056
PESTICIDES	Date Extracted: 12/20/93	Date Analyzed: 12/21/93		
Gamma-BHC		BDL	0.4	.0003
Chlordane		BDL	0.03	.002
Endrin		BDL	0.02	.0003
Heptachlor		BDL	0.008	.0003
Heptachlor Epoxide		BDL	0.008	.0003
Toxaphene		BDL	0.5	.01
Methoxychlor		BDL	10	.002
HERBICIDES	Date Extracted: 12/21/93	Date Analyzed: 12/23/93		
2,4-D		BDL	10	.005
Silvex		BDL	1	.005

Results uncorrected for matrix spike recovery.

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WASTE CHARACTERIZATION

Laboratory Number : 38736-28
Field Identification : SBC01

REACTIVITY

Analyst : WHL
Analysis Date : 12/17/93

Upon addition of 25 gms of the sample to 25 mL of water, the sample formed a partial suspension which eventually settled and evolved no gas. The temperature of the mixture changed from 20.5 degrees C to 20.0 degrees C during the 1 minute test period. No evidence of any reaction was observed.

Reference - Test Methods for Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.3.

IGNITABILITY

Analyst : WHL
Analysis Date : 12/17/93

A 5-10 gram portion of the sample was placed in a weighing dish and exposed to the flame from a propane torch. The sample could not be ignited within 30 seconds.

Reference - Test Methods for the Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.1.

WASTE CHARACTERIZATION

Laboratory Number : 38736-29
Field Identification : SBC01D

REACTIVITY

Analyst : WHL
Analysis Date : 12/17/93

Upon addition of 25 gms of the sample to 25 mL of water, the sample formed a partial suspension which eventually settled and evolved no gas. The temperature of the mixture changed from 20.5 degrees C to 20.0 degrees C during the 1 minute test period. No evidence of any reaction was observed.

Reference - Test Methods for Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.3.

IGNITABILITY

Analyst : WHL
Analysis Date : 12/17/93

A 5-10 gram portion of the sample was placed in a weighing dish and exposed to the flame from a propane torch. The sample could not be ignited within 30 seconds.

Reference - Test Methods for the Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.1.

WASTE CHARACTERIZATION

Laboratory Number : 38778-34
Field Identification : SBC02

REACTIVITY

Analyst : WHL
Analysis Date : 12/17/93

Upon addition of 25 gms of the sample to 25 mL of water, the sample formed a partial suspension which eventually settled and evolved no gas. The temperature of the mixture changed from 20.5 degrees C to 20.0 degrees C during the 1 minute test period. No evidence of any reaction was observed.

Reference - Test Methods for Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.3.

IGNITABILITY

Analyst : WHL
Analysis Date : 12/17/93

A 5-10 gram portion of the sample was placed in a weighing dish and exposed to the flame from a propane torch. The sample could not be ignited within 30 seconds.

Reference - Test Methods for the Evaluation of Solid Waste, EPA SW-846, 3rd Edition Volume One, Section C Chapter Seven, Section 7.1.

Field Identification: SBC01 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Corrosivity (pH, units)	8.0		38736-028	12/17/93	215	2.1.2/2
Releasable Sulfide (mg/Kg)	BDL	50	38736-028	12/15/93	187	7.3.4.2/2
Releasable Cyanide (mg/Kg)	BDL	1	38736-028	12/15/93	187	7.3.3.2/2

Field Identification: SBC01D Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Corrosivity (pH, units)	8.1		38736-029	12/17/93	215	2.1.2/2
Releasable Sulfide (mg/Kg)	BDL	50	38736-029	12/15/93	187	7.3.4.2/2
Releasable Cyanide (mg/Kg)	BDL	1	38736-029	12/15/93	187	7.3.3.2/2

Results expressed on a weight as received basis.

References: 2) EPA SW 846, 3rd Edition
3) Standard Methods, 16th Edition

Laboratory number: 38736 -010
Sample Designation: SB2903
Date Extracted: 12/17/93
Date Analyzed: 12/22/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 14 %, elevating the reporting limits by a factor of 1.15 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Indeterminate Lubricating Oil	TRACE	8

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

"TRACE" denotes probable presence below listed detection limit.

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Laboratory number: 38736 -011
Sample Designation: SB3003
Date Extracted: 12/17/93
Date Analyzed: 12/28/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 11 %, elevating the reporting limits by a factor of 1.11 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Probable Diesel Fuel	3500	200
Heavy Products	BDL	400

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

This sample required dilution to bring a high target analyte concentration into the calibration range.
Detection limits were elevated accordingly.

Laboratory number: 38736 -012
Sample Designation: SB3005
Date Extracted: 12/17/93
Date Analyzed: 12/28/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 14 %, elevating the reporting limits by a factor of 1.16 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Probable Diesel Fuel	6800	200
Heavy Products	BDL	400

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

This sample required dilution to bring a high target analyte concentration into the calibration range.
Detection limits were elevated accordingly.

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Laboratory number: 38736 -013
Sample Designation: SB305D
Date Extracted: 12/17/93
Date Analyzed: 12/28/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 18 %, elevating the reporting limits by a factor of 1.21 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Probable Diesel Fuel	6800	200
Heavy Products	BDL	400

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

This sample required dilution to bring a high target analyte concentration into the calibration range.
Detection limits were elevated accordingly.

Laboratory number: 38736 -014
Sample Designation: SB3203
Date Extracted: 12/17/93
Date Analyzed: 12/22/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 12 %, elevating the reporting limits by a factor of 1.14 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Heavy Products	BDL	7

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

Laboratory number: 38736 -015
Sample Designation: SB3502
Date Extracted: 12/17/93
Date Analyzed: 12/22/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 19 %, elevating the reporting limits by a factor of 1.23 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Heavy Products	BDL	8

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38736 -016
Sample Designation: SB3405
Date Extracted: 12/17/93
Date Analyzed: 12/28/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis.
Moisture content was 16 %, elevating the reporting limits by a factor of 1.18 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Probable Diesel Fuel	7100	200
Heavy Products	BDL	400

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

This sample required dilution to bring a high target analyte concentration into the calibration range.
Detection limits were elevated accordingly.

pace INCORPORATED THE ASSURANCE OF QUALITY

Laboratory number: 38736 -017
Sample Designation: SB3305
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 14 %, elevating the reporting limits by a factor of 1.16 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Heavy Products	BDL	8

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38736 -018
Sample Designation: SB3102
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 13 %, elevating the reporting limits by a factor of 1.14 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Indeterminate Lubricating Oil	TRACE	8

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

"TRACE" denotes probable presence below listed detection limit.

Laboratory number: 38778 -012
Sample Designation: BCSB06
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 67 %, elevating the reporting limits by a factor of 3.0 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	10
Indeterminate Lubricating Oil	230	20

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

Laboratory number: 38778 -013
Sample Designation: BCSB07
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 38 %, elevating the reporting limits by a factor of 1.62 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	5
Indeterminate Lubricating Oil	95	10

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

pace INCORPORATED THE ASSURANCE OF QUALITY

Laboratory number: 38778 -014
Sample Designation: BCSB01
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 72 %, elevating the reporting limits by a factor of 3.53 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	10
Indeterminate Lubricating Oil	360	20

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -015
Sample Designation: BCSB08
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 57 %, elevating the reporting limits by a factor of 2.3 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	8
Indeterminate Lubricating Oil	310	20

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -016
Sample Designation: BCSB09
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 66 %, elevating the reporting limits by a factor of 2.94 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	10
Indeterminate Lubricating Oil	110	20

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -017
Sample Designation: BCSB10
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 79 %, elevating the reporting limits by a factor of 4.71 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	20
Indeterminate Lubricating Oil	310	30

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

Laboratory number: 38778 -018
Sample Designation: BCSB03
Date Extracted: 12/23/93
Date Analyzed: 12/27/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 48 %, elevating the reporting limits by a factor of 1.92 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	6
Indeterminate Lubricating Oil	86	10

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -019
Sample Designation: BCSB3D
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 56 %, elevating the reporting limits by a factor of 2.25 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	7
Indeterminate Lubricating Oil	180	10

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -020
Sample Designation: BCSB02
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 46 %, elevating the reporting limits by a factor of 1.84 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	6
Indeterminate Lubricating Oil	310	10

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

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Laboratory number: 38778 -021
Sample Designation: BCSB04
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 22 %, elevating the reporting limits by a factor of 1.28 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	4
Indeterminate Lubricating Oil	67	9

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

Laboratory number: 38778 -022
Sample Designation: BCSB05
Date Extracted: 12/17/93
Date Analyzed: 12/23/93
Matrix: SOLID

Results are expressed on a dry (103 degrees C) basis. Moisture content was 34 %, elevating the reporting limits by a factor of 1.52 .

HYDROCARBON TYPE	CONCENTRATION (mg/kg)	REPORTING LIMIT (mg/kg)
Light Products	BDL	5
Indeterminate Lubricating Oil	120	10

METHOD REFERENCE: EPA SW 846, 3rd Edition. METHOD 8100(MODIFIED) and ASTM D 3328-78

BDL = Below reporting limit

Samples are compared to the following common commercial products in an effort to assess identity: gasoline, mineral spirits, kerosene, diesel/#2 fuel oil, #6 fuel oil, hydraulic oil, lubricating oil, mineral oil dielectric fluid (MODF).

Probable - Denotes similarity between chromatograms and one or more commercial materials.

Indeterminate - Indicates that significant difference exists between sample and commercial products.

pace INCORPORATED THE ASSURANCE OF QUALITY

Field Identification: SB2903

Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	16	38736-001	12/14/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	290	290	38736-010	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3003

Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	650	150	38736-002	12/15/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	7800	280	38736-011	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3005

Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	1300	170	38736-003	12/15/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	16000	280	38736-012	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB305D

Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	1400	180	38736-004	12/15/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	16000	300	38736-013	12/29/93	B-G1260	9071,503D/2,3

Results expressed on a dry weight basis.

Field Identification: SB3203 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	16	38736-005	12/14/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	370	280	38736-014	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3502 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	16	38736-006	12/14/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	370	300	38736-015	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3405 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	19000	1700	38736-007	12/20/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	19000	290	38736-016	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3305 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	17	38736-008	12/15/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	450	280	38736-017	12/29/93	B-G1260	9071,503D/2,3

Field Identification: SB3102 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	16	38736-009	12/15/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	440	280	38736-018	12/29/93	B-G1260	9071,503D/2,3

Results expressed on a dry weight basis.

Field Identification: BCSB06 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	40	38778-001	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1900	760	38778-012	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB07 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	24	38778-002	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1600	400	38778-013	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB01 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	60	54	38778-003	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	3000	930	38778-014	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB08 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	33	38778-004	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1800	560	38778-015	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB09 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	44	38778-005	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	7500	760	38778-016	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB10 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	70	38778-006	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	3700	1100	38778-017	12/30/93	B-G1262	9071,503D/2,3

Results expressed on a dry weight basis.

Field Identification: BCSB03 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	27	38778-007	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1300	480	38778-018	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB3D Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	32	38778-008	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1300	570	38778-019	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB02 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	26	38778-009	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	930	460	38778-020	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB04 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	19	38778-010	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	390	320	38778-021	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB05 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	23	38778-011	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	970	380	38778-022	12/30/93	B-G1262	9071,503D/2,3

Field Identification: SBC02 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Corrosivity (pH, units)	6.3		38778-034	12/17/93	215	2.1.2/2
Releasable Sulfide (mg/Kg)	BDL	50	38778-034	12/21/93	188	7.3.4.2/2
Releasable Cyanide (mg/Kg)	BDL	1	38778-034	12/20/93	188	7.3.3.2/2

Results expressed on a dry weight basis with the exception of releasables, which are expressed on a weight as received basis.

References: 2) EPA SW 846, 3rd Edition
3) Standard Methods, 16th Edition

Field Identification: BCSB03 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	27	38778-007	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1300	480	38778-018	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB3D Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	32	38778-008	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	1300	570	38778-019	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB02 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	26	38778-009	12/22/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	930	460	38778-020	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB04 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	19	38778-010	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	390	320	38778-021	12/30/93	B-G1262	9071,503D/2,3

Field Identification: BCSB05 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Total Gasoline (ug/g)	BDL	23	38778-011	12/23/93		8015(mod)/2
Oil and Grease by Gravimetry (ug/g)	970	380	38778-022	12/30/93	B-G1262	9071,503D/2,3

Field Identification: SBC02 Matrix: SOLID

Parameter	Result	Reporting Limit	Lab No.	Date Analyzed	QC Batch	Method/Ref.
Corrosivity (pH, units)	6.3		38778-034	12/17/93	215	2.1.2/2
Releasable Sulfide (mg/Kg)	BDL	50	38778-034	12/21/93	188	7.3.4.2/2
Releasable Cyanide (mg/Kg)	BDL	1	38778-034	12/20/93	188	7.3.3.2/2

Results expressed on a dry weight basis with the exception of releasables, which are expressed on a weight as received basis.

References: 2) EPA SW 846, 3rd Edition
3) Standard Methods, 16th Edition

APPENDIX D
WELL CONSTRUCTION LOGS
AND WATER LEVEL MEASUREMENTS

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-8
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See Address Below
   ADDRESS ______
   (Street or Route No.)
   City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/15/91 USE OF WELL Monitoring

** 4. TOTAL DEPTH S=14.0' D=30.0'

5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]

** 7. STATIC WATER LEVEL Below Top of Casing: S=8.24 FT. D=8.24'
(Use "+" if Above Top of Casing)

** 8. TOP OF CASING IS S=2.35 FT. Above Land Surface* D=2.50'
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm) N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	4.0 Ft.	2"	SCH 40	PVC
0	20.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.0	2.0 Ft.	Bentonite	Pour
15.0	18.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
4.5	13.5 Ft	2 in.	.010 in.	PVC
20.5	29.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	15.0 Ft.	Torpedo	Sand
18.0	30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH / DRILLING LOG

From	To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map.

**S = Shallow monitoring well
D = Deep monitoring well

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287
Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-9
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See Address Below
   ADDRESS ______
   (Street or Route No.)
   City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/16/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=13.0' D=30.0'
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
**7. STATIC WATER LEVEL Below Top of Casing: S=6.95 FT. D=6.99'
   (Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.12 FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	3.0 Ft.	2"	SCH 40	PVC
0	25.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.0	2.0 Ft.	Bentonite	Pour
13.0	16.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
3.5	12.5 Ft	2 in.	.010 in.	PVC
25.5	29.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	13.0 Ft.	Torpedo	Sand
16.0	30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287
Attn: Code 1821, Mr. Trueman Seamans

**S=Shallow monitoring well
D=Deep monitoring well

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kerr 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 5/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ____ SERIAL NO. ____
Lat. ____ Long. ____ Pc ____
Minor Basin ____
Basin Code ____
Header Ent. ____ GW-1 Ent. ____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-10
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS ____
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/19/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=14.0 D=30.0
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
**7. STATIC WATER LEVEL Below Top of Casing: S=7.05 FT. D=6.78'
   (Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.49 FT. Above Land Surface* D=2.51'
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ____
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ____
12. CASING:

Depth From	Depth To		Diameter	Wall Thickness or Weight/Ft.	Material
0	4.0	Ft.	2"	SCH 40	PVC
0	25.0	Ft.	2"	SCH 40	PVC
		Ft.			

13. GROUT:

Depth From	Depth To		Material	Method
1	2	Ft.	Bentonite	Pour
16	19	Ft.	Bentonite	Pour

14. SCREEN:

Depth From	Depth To		Diameter	Slot Size	Material
4.5	13.5	Ft.	2 in.	.010 in.	PVC
25.5	29.5	Ft.	2 in.	.010 in.	PVC
		Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	Depth To		Size	Material
2	14	Ft.	Torpedo	Sand
19	30	Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH / DRILLING LOG

Depth From	Depth To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

* Commander
Atlantic Division
Naval Facilities Engineering Comma[nd]
Norfolk, Virginia 23511-6287
Attn: Code 181, Mr. Trueman Seama[n]

**S=Shallow monitoring well
D=Deep monitoring well

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 5/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent. GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-11
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See Address Below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/19/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=14.0' D=30.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: S=8.27 FT. D=8.60
   (Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.51 FT. Above Land Surface* D=2.59
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0	4.0	Ft.	2"	SCH 40	PVC
0	25.0	Ft.	2"	SCH 40	PVC
		Ft.			

13. GROUT:

Depth From	To		Material	Method
1.0	2.0	Ft.	Bentonite	Pour
19.5	22.5	Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To		Diameter		Slot Size		Material
4.5	13.5	Ft.	2	in.	.010	in.	PVC
25.5	29.5	Ft.	2	in.	.010	in.	PVC
		Ft.		in.		in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
2.0	19.5	Ft.	Torpedo	Sand
22.5	30.0	Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DRILLING LOG

DEPTH From	To	Formation Description
		See Attached Test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Comm
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Sea

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY	
QUAD. NO.	SERIAL NO.
Lat.	Long. / Pc
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-12
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/19/91 USE OF WELL Monitoring
** 4. TOTAL DEPTH S=14.5' D=28.5'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
** 7. STATIC WATER LEVEL Below Top of Casing: S=9.58 FT. D=10.34'
   (Use "+" if Above Top of Casing)
** 8. TOP OF CASING IS S=2.72 FT. Above Land Surface* D=2.75
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0	4.5	Ft.	2"	SCH 40	PVC
0	23.5	Ft.	2"	SCH 40	PVC
		Ft.			

13. GROUT:

Depth From	To		Material	Method
2.0	3.0	Ft.	Bentonite	Pour
15.5	19.0	Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To		Diameter	Slot Size	Material
5.0	14.0	Ft	2 in.	.010 in.	PVC
24.0	28.0	Ft.	2 in.	.010 in.	PVC
		Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
3.0	14.5	Ft.	Torpedo	Sand
19.0	28.5	Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 5/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-13
Nearest Town: Jacksonville County: Onslow
Camp Geiger Fuel Farm
(Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
ADDRESS ______
(Street or Route No.)
City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/19/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=15.0' D=30.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: S=9.83 FT. D=9.96
(Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.50 FT. Above Land Surface* D=2.58'
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	5.0 Ft.	2"	SCH 40	PVC
0	25.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
2.0	3.0 Ft.	Bentonite	Pellets
18.5	22.5 Ft.	Bentonite	Pellets

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
5.5	14.5 Ft	2 in.	.010 in.	PVC
25.5	29.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
3.0	18.5 Ft.	Torpedo	Sand
22.5	30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH / DRILLING LOG

From	To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-14
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS ______
   (Street or Route No.)
   City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/20/91 USE OF WELL Monitoring
4. TOTAL DEPTH S=13.0 D=30.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: S=9.58 FT. D=9.51'
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS S=2.51 FT. Above Land Surface* D=2.47'
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	3.0 Ft.	2"	SCH 40	PVC
0	24.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.0	2.0 Ft.	Bentonite	Pour
18.0	21.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
3.5	12.5 Ft.	2 in.	.010 in.	PVC
24.5	28.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	13.0 Ft.	Torpedo	Sand
21.0	29.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DRILLING LOG

DEPTH From	To	Formation Description
		See Attached Test
		Boring Records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Comma
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well
Attn: Code 1821, Mr. Trueman Seaman

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb — 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT — DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent. GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-15
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/20/91 USE OF WELL Monitoring
*4. TOTAL DEPTH S=14.0 D=30.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
*7. STATIC WATER LEVEL Below Top of Casing: S=10.60 FT. D=10.70
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS S=2.55 FT. Above Land Surface D=2.52'
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0	To 4.0 Ft.	2"	SCH 40	PVC
From 0	To 25.0 Ft.	2"	SCH 40	PVC
From	To Ft.			

13. GROUT:

Depth		Material	Method
From 1.5	To 2.5 Ft.	Bentonite	Pour
From 17.5	To 23.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth		Diameter	Slot Size	Material
From 4.5	To 13.5 Ft	2 in.	.010 in.	PVC
From 25.5	To 29.5 Ft.	2 in.	.010 in.	PVC
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth		Size	Material
From 2.5	To 17.5 Ft.	Torpedo	Sand
From 25.0	To 30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH From	DEPTH To	DRILLING LOG Formation Description
		See attached test
		boring records

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kell 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-16
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS ______
   (Street or Route No.)
   City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/21/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=14.5' D=29.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: S=12.87 FT. D=12.92
   (Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.62 FT. Above Land Surface* D=2.58
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	4.5 Ft.	2"	SCH 40	PVC
0	24.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.0	2.0 Ft.	Bentonite	Pour
17.5	20.5 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
5.0	14.0 Ft.	2 in.	.010 in.	PVC
24.0	28.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	17.5 Ft.	Torpedo	Sand
20.0	24.5 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

See attached site location map

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent. GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-17
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/21/91 USE OF WELL Monitoring
** 4. TOTAL DEPTH S=17.0' D=29.5'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
** 7. STATIC WATER LEVEL Below Top of Casing: S=11.07 FT. D=10.92'
   (Use "+" if Above Top of Casing)
** 8. TOP OF CASING IS S=2.56 FT. Above Land Surface* D=2.50'
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0	To 7.0 Ft.	2"	SCH 40	PVC
From 0	To 24.5 Ft.	2"	SCH 40	PVC
From	To Ft.			

13. GROUT:

Depth		Material	Method
From 3.5	To 4.5 Ft.	Bentonite	Pour
From 19.5	To 22.5 Ft.	Bentonite	Pour

14. SCREEN:

Depth		Diameter	Slot Size	Material
From 7.5	To 16.5 Ft	2 in.	.010 in.	PVC
From 25.0	To 29.0 Ft.	2 in.	.010 in.	PVC
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth		Size	Material
From 4.5	To 19.5 Ft.	Torpedo	Sand
From 22.5	To 30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 3.5'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-18
Nearest Town: Jacksonville County: Onslow
Camp Geiger Fuel Farm
(Road, Community, or Subdivision and Lot No.)
2. OWNER *see address below
ADDRESS ______
(Street or Route No.)
City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/21/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=12.5' D=25.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: S=7.96 FT. D=7.96'
(Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.64 FT. Above Land Surface* D=2.62'
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	To	Ft. Diameter	Wall Thickness or Weight/Ft.	Material
0	2.5	2"	SCH 40	PVC
0	20.0	2"	SCH 40	PVC

13. GROUT:

Depth From	To	Material	Method
0.5	1.5 Ft.	Bentonite	Pour
14.0	17.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
3.0	12.0 Ft.	2 in.	.010 in.	PVC
20.5	24.5 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
1.5	14.0 Ft.	Torpedo	Sand
17.0	25.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 0.5'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Comma
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seama

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

ONLY
NO.
Minor Basin
Basin Code
Header Ent.
GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-19
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/22/91 USE OF WELL Monitoring
4. ** TOTAL DEPTH S=14.0' D=25.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. ** STATIC WATER LEVEL Below Top of Casing: S=3.54 FT. D=3.02
   (Use "+" if Above Top of Casing)
8. ** TOP OF CASING IS S=2.62 FT. Above Land Surface* D=2.58'
   *** Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0	To 4.0	Ft.	2"	SCH 40	PVC
From 0	To 22.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			

13. GROUT:

Depth		Material	Method
From 1.0	To 2.0 Ft.	Bentonite	Pour
From 17.0	To 20.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth		Diameter	Slot Size	Material
From 4.5	To 13.5 Ft.	2 in.	.010 in.	PVC
From 22.5	To 24.5 Ft.	2 in.	.010 in.	PVC
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth		Size	Material
From 2.0	To 15.0 Ft.	Torpedo	Sand
From 20.0	To 25.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 1.0'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ____ SERIAL NO. ____
Lat. ____ Long. ____ Pc ____
Minor Basin ____
Basin Code ____
Header Ent. ____ GW-1 Ent. ____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-20
Nearest Town: Jacksonville County: Onslow
Camp Geiger Fuel Farm
(Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
ADDRESS ____
(Street or Route No.)
City or Town ____ State ____ Zip Code ____
3. DATE DRILLED 8/23/91 USE OF WELL Monitoring
**4. TOTAL DEPTH 12.5'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: 9.08 FT.
(Use "+" if Above Top of Casing)
**8. TOP OF CASING IS 2.38 FT. Above Land Surface*
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ____
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ____
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	2.5 Ft.	2"	SCH 40	PVC
	Ft.			
	Ft.			

13. GROUT:

Depth From	To	Material	Method
.5	1.5 Ft.	Bentonite	Pour
	Ft.		

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
3.0	12.0 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
12.5	1.5 Ft.	Torpedo	Sand
	Ft.		

16. REMARKS: Concrete from 0 to 0.5'

DRILLING LOG

DEPTH From	To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent. GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-21
Nearest Town: Jacksonville County: Onslow
Camp Geiger Fuel Farm
(Road, Community, or Subdivision and Lot No.)
2. OWNER *see address below
ADDRESS
(Street or Route No.)
City or Town State Zip Code
3. DATE DRILLED 8/23/91 USE OF WELL Monitoring
** 4. TOTAL DEPTH S=14.0 D=27.5'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
** 7. STATIC WATER LEVEL Below Top of Casing: S=8.50 FT. D=8.62'
(Use "+" if Above Top of Casing)
** 8. TOP OF CASING IS S=2.47 FT. Above Land Surface*
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To	Ft.	Diameter	Wall Thickness or Weight/Ft.	Material
0	4.0	Ft.	2"	SCH 40	PVC
0	24.5	Ft.	2"	SCH 40	PVC
		Ft.			

13. GROUT:

Depth From	To	Ft.	Material	Method
1.0	2.0	Ft.	Bentonite	Pour
19.0	22.0	Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Ft.	Diameter	Slot Size	Material
4.5	13.5	Ft.	2 in.	.010 in.	PVC
25.5	27.0	Ft.	2 in.	.010 in.	PVC
		Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Ft.	Size	Material
2.0	14.0	Ft.	Torpedo	Sand
22.0	28.5	Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0' to 1.0'

DEPTH From	To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 5/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent. GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-22
Nearest Town: Jacksonville County: Onslow
Camp Geiger Fuel Form
(Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
ADDRESS
(Street or Route No.)
City or Town State Zip Code
3. DATE DRILLED 8/28/91 USE OF WELL Monitoring
4. TOTAL DEPTH S=15.0' D=35.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: S=11.67 FT. D=11.85'
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS S=2.91 FT. Above Land Surface* D=2.91'
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To		Diameter	Wall Thickness or Weight/Ft.	Material
0	5.0	Ft.	2"	SCH 40	PVC
0	32.0	Ft.	2"	SCH 40	PVC
		Ft.			

13. GROUT:

Depth From	To		Material	Method
2.0	3.0	Ft.	Bentonite	Pour
25.5	29.0	Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To		Diameter		Slot Size		Material
5.5	14.5	Ft.	2	in.	.010	in.	PVC
32.5	35.0	Ft.	2	in.	.010	in.	PVC
		Ft.		in.		in.	

15. SAND/GRAVEL PACK:

Depth From	To		Size	Material
3.0	25.5	Ft.	Torpedo	Sand
29.0	35.0	Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 2.0'

DEPTH / DRILLING LOG

DEPTH From	To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ____ SERIAL NO. ____
Lat. ____ Long. ____ Pc ____
Minor Basin ____
Basin Code ____
Header Ent. ____ GW-1 Ent. ____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-23
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS ____
   (Street or Route No.)
   City or Town ____ State ____ Zip Code ____
3. DATE DRILLED 8/27/91 USE OF WELL Monitoring
**4. TOTAL DEPTH S=9.5' D=20.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
**7. STATIC WATER LEVEL Below Top of Casing: S=5.50 FT. D=4.02
   (Use "+" if Above Top of Casing)
**8. TOP OF CASING IS S=2.35 FT. Above Land Surface* D=2.35

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST ____
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ____
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	2.0 Ft.	2"	SCH 40	PVC
0	17.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
0.5	1.0 Ft.	Bentonite	Pour
10.0	13.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
2.5	9.5 Ft.	2 in.	.010 in.	PVC
17.5	20.0 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
1.0	10.0 Ft.	Torpedo	Sand
13.0	21.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 0.5'

DEPTH / DRILLING LOG

From	To	Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Koll 10/14/91
SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 5/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ Pc ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-24
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *see address below
   ADDRESS ______
   (Street or Route No.)
   City or Town ______ State ______ Zip Code ______
3. DATE DRILLED 8/28/91 USE OF WELL Monitoring
4. TOTAL DEPTH S=18.0' D=29.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: S=7.96 FT. D=12.12'
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS S=2.20' FT. Above Land Surface* D=2.88'
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST ______
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

Depth From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
0	8.0 Ft.	2"	SCH 40	PVC
0	26.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	Depth To	Material	Method
0	3.0 Ft.	Bentonite	Pour
20.0	23.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	Depth To	Diameter	Slot Size	Material
8.5	17.5 Ft.	2 in.	.010 in.	PVC
26.5	29.0 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	Depth To	Size	Material
4.0	20.0 Ft.	Torpedo	Sand
23.0	29.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 3.0'

DEPTH From	DEPTH To	DRILLING LOG Formation Description
		See attached test boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb — 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT — DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. SERIAL NO.
Lat. Long. Pc
Minor Basin
Basin Code
Header Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0237-WM-0232

1. WELL LOCATION: (Show sketch of the location below) MW-25
   Nearest Town: Jacksonville County: Onslow
   Camp Geiger Fuel Farm
   (Road, Community, or Subdivision and Lot No.)
2. OWNER *See address below
   ADDRESS
   (Street or Route No.)
   City or Town State Zip Code
3. DATE DRILLED 8/29/91 USE OF WELL Monitoring
4. TOTAL DEPTH S=14.0 D=30.0'
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: S=7.65 FT. D=7.13
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS S=2.21 FT. Above Land Surface* D=2.19
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	4.0 Ft.	2"	SCH 40	PVC
0	27.0 Ft.	2"	SCH 40	PVC
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.0	2.0 Ft.	Bentonite	Pour
22.0	25.0 Ft.	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
4.5	13.5 Ft	2 in.	.010 in.	PVC
27.5	30.0 Ft.	2 in.	.010 in.	PVC
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	22.0 Ft.	Torpedo	Sand
25.0	30.0 Ft.	Torpedo	Sand

16. REMARKS: Concrete from 0 to 1.0'

DRILLING LOG

DEPTH From	To	Formation Description
		See attached test
		boring records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See attached site location map

*Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

**S=Shallow monitoring well
D=Deep monitoring well

Attn: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 10/14/91

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 5/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0277-WM-0297

1. WELL LOCATION: (Show sketch of the location below) MW-26
Nearest Town: Jacksonville County: Onslow
(Road, Community, or Subdivision and Lot No.)
2. OWNER * See Address Below
ADDRESS
(Street or Route No.)
City or Town State Zip Code
3. DATE DRILLED 10/29/92 USE OF WELL Monitoring
4. TOTAL DEPTH 14'
5. CUTTINGS COLLECTED YES [XX] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [XX]
7. STATIC WATER LEVEL Below Top of Casing: 7.47 FT.
(Use "+" if Above Top of Casing)
8. TOP OF CASING IS 0' FT. Above Land Surface*
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount
12. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
0	4.5 Ft.	2"	SCH 80	PVC
	Ft.			
	Ft.			

13. GROUT:

Depth From	To	Material	Method
1.5	3.0 Ft.	Bentonite	Pour
	Ft.		

14. SCREEN:

Depth From	To	Diameter	Slot Size	Material
4.5	13.5 Ft	2 in.	0.010 in.	PVC
	Ft.	in.	in.	
	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
3.0	14.0 Ft.	Torpedo	Sand
	Ft.		

16. REMARKS: Concrete from 0' - 1.5'

DEPTH From	To	DRILLING LOG Formation Description
		See Attached Test Boring Records

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Attached Site Location Map

* Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287
Attention: Code 1821, Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb — 12/14/92
SIGNATURE OF CONTRACTOR OR AGENT — DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 REV. 9/91

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY

QUAD. NO. ________ SERIAL NO. ________
Lat. ________ Long. ________ RO ________
Minor Basin ________
Basin Code ________
Header Ent. ________ GW-1 Ent. ________

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0277-WM-0297

1. WELL LOCATION: (Show sketch of the location below) MW-27
   Nearest Town: Jacksonville County: Onslow
   ____
   (Road, Community, or Subdivision and Lot No.)
2. OWNER * See Address Below
   ADDRESS ________
   (Street or Route No.)
   ____
   City or Town State Zip Code
3. DATE DRILLED 10/29/92 USE OF WELL Monitoring
4. TOTAL DEPTH 15'
5. CUTTINGS COLLECTED YES [XX] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [XX]
7. STATIC WATER LEVEL Below Top of Casing: 8.22 FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 0' FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ________
12. CASING:

Depth From	To	Ft. Diameter	Wall Thickness or Weight/Ft.	Material
0	5.5	2"	SCH 80	PVC

13. GROUT:

Depth From	To	Material	Method
1.5	3	Bentonite	Pour

14. SCREEN:

Depth From	To	Diameter (in.)	Slot Size (in.)	Material
5.5	14.5	2	0.010	PVC

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
3	15	Torpedo	Sand

16. REMARKS: Concrete from 0' - 1.5'

DEPTH From	To	DRILLING LOG Formation Description
		See Attached Test Boring Records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Attached Site Location Map

* Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287
Attention: Code 1821,
Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 12/14/92

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. ______ SERIAL NO. ______
Lat. ______ Long. ______ RO ______
Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent. ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0277-WM-0297

1. WELL LOCATION: (Show sketch of the location below) PW-28
   Nearest Town: Jacksonville County: Onslow
   ______ (Road, Community, or Subdivision and Lot No.)
2. OWNER * See Address Below
   ADDRESS ______ (Street or Route No.)
   ______ City or Town ______ State ______ Zip Code
3. DATE DRILLED 10/28/92 USE OF WELL Pump Test
4. TOTAL DEPTH 25'
5. CUTTINGS COLLECTED YES [XX] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [XX]
7. STATIC WATER LEVEL Below Top of Casing: 8.11 FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 0' FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount ______
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0	To 5.5	Ft.	4"	SCH 80	PVC
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 2	To 3	Ft.	Bentonite	Pour
From	To	Ft.		

14. SCREEN:

Depth		Diameter	Slot Size	Material
From 5.5	To 24.5 Ft.	4 in.	0.010 in.	PVC
From	To Ft.	in.	in.	
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

Depth		Size	Material
From 3	To 25 Ft.	Torpedo	Sand
From	To Ft.		

16. REMARKS: Concrete from 0' - 2'

DEPTH / DRILLING LOG

From	To	Formation Description
		See Attached Test Boring Records

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Attached Site Location Map

* Commander
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287
Attention: Code 1821,
Mr. Trueman Seamans

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Richard A. Kolb 12/14/92

SIGNATURE OF CONTRACTOR OR AGENT DATE

GW-1 REV. 9/91

Submit original to Division of Environmental Management and copy to well owner.

WATER LEVEL MEASUREMENTS
OBTAINED BY BAKER (4-18-94)

4-18-94 CTO - 0160 ~~0232~~ (11)

* - indicates that wells were not Marked S or D. Therefore we Diff. by orientation of TOC.

H2O Levels at Site 35

Well No. ~~MW-8~~ JSC ~~M~~ JSC	Time	Depth to H2O (TOC) (FT)
MW-8	1232	S - 8.42 D - 8.61
MW-9	1215	S - 7.16 D - 7.25
MW-10	1209	S - 7.35 D - 7.10
MW-11	1235	S - 8.86 D - 9.00
MW-13	1242	S - 10.04 D - 10.18
MW-15	1139	S - 10.71 D - 10.85
MW-16	1130	S - 12.99 D - 13.12
MW-17	1255	S - 11.19 D - 11.26
MW-19	1248	S - 3.87 D - 3.27
MW-20	1320	9.24
MW-22	1143	S - 11.91 D - 12.03
MW-23	1302	S - ~~4.28~~ 4.28 D - ~~5.73~~ 5.73
MW-24	1135	S - 12.12 D - 12.30
MW-26	1315	S - 7.90 D - ~~7.90~~ 7.27 *
MW-27	1201	6.80
MW-21	1238	S - 8.74 D - 8.87
EMW-1	1225	7.84
EMW-2	1309	2.09
EMW-4	Not Able to Open Cap	
EMW-6	1151	12.31
EMW-3	1259	7.17

JSC 4-19-94

APPENDIX E
TOXICOLOGICAL PROFILES

Date of Last Revision: 3/19/93
Revisor: Rich Hoff

ARSENIC

INTRODUCTION

Chemical Name: Arsenic
CAS Number: 7440-38-2
Molecular Formula: As
Molecular Weight: 74.92 g/mole
Chemical Structure: As

Arsenic (elemental) exists as a silvery to black, brittle, crystalline and amorphous metalloid. Arsenic is used in the production of glass, enamels, ceramics, oil, cloth, linoleum, electrical semiconductors, pigments, fireworks, pesticides, fungicides, veterinary pharmaceuticals and wood preservatives. Arsenic also has been shown to occur in municipal sewage (7).

FATE AND TRANSPORT

BCF (1): Accumulates to toxic levels in food chain organisms
Degradation Products: None
Solubility:
    In Water (5): Insoluble
    In Organics (6): Unknown (5); soluble in nitric acid
Vapor Pressure (6): 1 mm Hg @ 372° C (sublimes)
Specific Gravity (5): 5.727

Arsenic can occur in soil, water, or air. Since it is an element, it cannot be degraded by environmental processes. However, transformation from one arsenic compound to another is possible.

In the environment, arsenic can occur in four different oxidation states (-3, 0, +3, +5). The particular chemical speciation is important in determining mobility. Interconversions between the +3 and +5 states, as well as organic complexation, are most important (8).

In the soil, the concentration and chemical form in which arsenic occurs is affected by pH, soil type and iron and aluminum content of the soil. Lowered pH and reducing conditions tend to favor the development of arsine, a toxic gas comprised of arsenic and oxygen (7).

In the aquatic environment, volatilization is an important mechanism when biological activity or highly reducing conditions favor the production of arsine or methylarsenics. Sorption of arsenic onto sediments is also an important process in aquatic transport processes. While arsenic may cycle considerably in the environment given its mobility, the deep ocean probably serves as a sink for most inorganic arsenic (7).

PHARMACOKINETICS

Human and animal studies have shown that gastrointestinal absorption of arsenic is very high (>90 to 95 percent). Absorption of arsenic via the inhalation and dermal routes is limited in both animal and human studies. In terms of the developing fetus, inorganic arsenic has been shown to rapidly cross the transplacental barrier after oral administration to mice and rats (5).

Most animals and humans tend to clear arsenic rapidly from the blood and other tissues (including the liver, kidneys, and lungs). Arsenic has been shown to be retained in the brain of experimental animals (5). Arsenic has a tendency to accumulate in the skin and desquamous tissues, such as hair and nails of animals (2).

The main route of excretion for absorbed arsenic is via the urine. Studies demonstrate that only six to nine percent of ingested arsenic appears in the feces, indicating nearly complete gastrointestinal absorption of the metal. The biologiccal half-life is on the order of ten hours, with 50 to 80 percent excreted in about three days (2).

HUMAN HEALTH EFFECTS

Noncarcinogenic Effects

Trivalent compounds of arsenic are the principal toxic forms. Arsenic's principal mode of toxic action is at the cellular level, where it affects mitochondrial enzymes that are critical in tissue respiration (2).

Ingestion of large doses of arsenic can be acutely fatal. Symptoms include fever, anorexia, cardiac arrhythmia and eventual cardiovascular failure. Additionally, central nervous system (CNS) effects, including peripheral neuropathy and sensory loss, are usually noted (2).

Chronic long-term exposure is characterized by liver injury. This is usually reflected as jaundice, and may progress to cirrhosis. Also, peripheral vascular disease has been observed in persons chronically exposed to arsenic (2).

USEPA has established an oral RfD of 3×10^{-4} mg/kg/day for arsenic. This is based on keratosis and hyperpigmentation (1).

Carcinogenic Effects

Arsenic has been implicated as a carcinogen by the inhalation route in both animal and human studies.

Studies of populations living near arsenic-using pesticide manufacturing plants were shown to have an increased incidence of lung cancer. Also, case reports of arsenical pesticide applicators have demonstrated an association between arsenic exposure and lung cancer (1).

Evidence for the carcinogenicity of arsenic via oral exposure comes from an epidemiological study where an arsenic-contaminated water supply was associated with a significant increase in cancer of the bladder, lung, liver, kidney, skin and colon (1).

Because of arsenic's carcinogenic potential in humans, the EPA has classified it as a Group A carcinogen-human carcinogen. The carcinogenic slope factor for arsenic by inhalation exposure is 15.03 $(mg/kg/day)^{-1}$ derived from a unit risk of 0.0043 per $\mu g/m^3$. Also, a carcinogenic slope factor of 1.75 $(mg/kg/day)^{-1}$ has been derived for ingestion exposure to this element from a unit risk of 5×10^{-5} per µg/L (1,4).

ENVIRONMENTAL HEALTH EFFECTS

Aquatic

While various forms of inorganic arsenic seem to have roughly similar toxicities in aquatic organisms, they all seem to be much more toxic than the organic forms. Acute toxicity of adult freshwater animals has been shown to occur at arsenic trioxide levels as low as 812 µg/L and as as low as 40 µg/L in early life stage organisms (8).

Ambient Water Quality Criteria for the protection of aquatic organisms are as follows: (1)

Freshwater:

Acute Toxicity: 3.6×10^{2} µg/L (Arsenic III)
Chronic Toxicity: 1.9×10^{2} µg/L (Arsenic III)

Marine:

Acute Toxicity: 6.9×10^{1} µg/L (Arsenic III)
Chronic Toxicity: 3.6×10^{1} µg/L (Arsenic III)

Terrestrial and Avian

Information on arsenic toxicity among terrestrial wildlife is very limited. However, arsenic poisoning has been known to occur on rare occasions in domestic animals. Arsenic poisoning in domestic animals leads to hyperemia and edema of the gastrointestinal tract, hemorrhage of the cardiac serosal surfaces and peritoneum, and pulmonary congestion and edema (8).

REGULATORY LEVELS AND CRITERIA

The following regulatory levels and criteria have been established for arsenic:

OSHA TWA workplace exposure limit (5):	10 µg/m^3
NIOSH recommended exposure ceiling for occupational exposure (5):	2 µg/m^3
MCL(1):	0.05 mg/lL
ACGIH TLV-TWA (5):	0.2 mg/m^3
EPA Ambient Water Quality Criteria (5):	
Ingestion of Water and Aquatic Organisms:	2.2×10^{-6} mg/L
Ingestion of Organisms Only:	1.75×10^{-5} mg/L

SUMMARY OF TOXICOLOGICAL INDICES

EPA Carcinogenic Classification (1):	Group A-human carcinogen
Noncarcinogenic Effects	
Oral RfD (1):	3×10^{-4} mg/kg/day
Inhalation RfC (4):	Not Determined
Carcinogenic Effects:	
Inhalation CPF (1):	15.03 $(mg/kg/day)^{-1}$
Oral CPF (1):	1.75 $(mg/kg/day)^{-1}$

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7. Hazardous Waste Land Treatment. U.S. Environmental Protection Agency. April 1983.

8. <u>Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites</u>. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency. Washington, D.C. September 1985.

Date of Last Revision: 7/23/93

Revisor: Joy Marshall

BENZENE

INTRODUCTION

Chemical Name: Benzene

CAS Number: 71-43-2

Common Name: Annulene, Benzol, Coal naphtha

Molecular Formula: $C_6 H_6$

Molecular Weight: 78.12 g/mole

Chemical Structure:

Benzene appears colorless to light yellow. It is a mobile, nonpolar liquid with a high refractive nature. In the vapor state it burns with a smoky flame emitting an aromatic odor (2).

Benzene is used as a solvent and in the manufacturing of rubber, in oil refineries, chemical plants, retail stations, and shoe manufacturing (2).

FATE AND TRANSPORT

K_{oc} (2): 0.3-100

K_{ow} (4): 1.95 - 2.15

$t_{1/2}$ (6) : Expressed as degradation rate of 200-330 mg/L/day (estuarine)

Henry's Law Constant (7): 5.5×10^{-3} atm- m^3/mole

BCF: Not Available

Degradation Products (7): Benzene glycol, catechol

Solubility (7):

In Water: 1780 mg/L at 25°C

In Organics: Miscible

Vapor Pressure (1): 75 mm Hg at 20°C

Specific Gravity (1): 0.879 at 20°C

Benzene may appear in the ambient air, water, and soil. Although benzene is released into the environment by both natural and man-made sources, the contribution from the man-made source is most significant (4).

The combustion of gasoline is the most significant source of benzene release. Other minor sources are septic tank effluent, structural fires, and exhaled air of smokers (4).

Volatilization is the major transport process while atmospheric destruction of benzene is the most likely fate process (4).

In both soil and surface water, sorption is the primary removal method. Although bioaccumulation of benzene is low, the rate of biodegradation is enhanced by the presence of other hydrocarbons (4).

PHARMACOKINETICS

Benzene can be absorbed into the body by inhalation, ingestion, and dermal contact. Metabolic transformation must occur before benzene can exert its toxic effect. Benzene is distributed to the blood (approx. 30%) and to the bone marrow, adipose tissue, and liver (>50%) (4). Benzene exposure may lead to immunosuppression or sensitization, and cause neurotoxic effects (4).

Humans expire unmetabolized benzene in the breath and phenolic metabolites in the urine. The liver is the major site of benzene metabolism.

Humans eliminate unchanged benzene in exhaled air and as benzene metabolites in urine. Only a small amount of benzene is excreted in the feces (4).

HUMAN HEALTH EFFECTS

Noncarcinogenic Effects

Acute exposure to moderate concentrations of benzene may cause drowsiness, dizziness, headache, and nausea. If exposure continues, unconsciousness may occur (4). Long-term exposure to benzene may affect normal blood production resulting in severe anemia and internal bleeding (4). Prolonged or repeated dermal absorption of benzene may cause blistering, erythema, and dermatitis (4).

In humans, there is not sufficient evidence to link benzene to spontaneous abortions and miscarriages in pregnant women. Animal studies indicate adverse health effects on unborn test animals (4).

Benzene is genotoxic, causing structural chromosomal aberrations (4).

Carcinogenic Effects

The EPA has classified benzene as a Group A carcinogen - a human carcinogen. It has been determined that prolonged exposure to benzene vapors can result in the development of leukemia (4). The primary epidemiogical study supporting the carcinogenic effects from benzene inhalation indicates that the exposure duration ranged from less than five years to as many as 30 years. Based on this primary study, the EPA has derived a unit risk of 8.3×10^{-6} per $\mu g/m^3$ from which, an inhalation cancer slope factor of 2.9×10^{-2} $(mg/kg/day)^{-1}$ can be derived (3). Although benzene has been shown to be carcinogenic via the inhalation route, data relating the ingestion or dermal route of exposure to carcinogenic effects is insufficient (4). However, the EPA has derived an oral cancer slope factor of 2.9×10^{-2} $(mg/kg/day)^{-1}$ based on the risk posed from the inhalation route of exposure.

ENVIRONMENTAL HEALTH EFFECTS

Aquatic

The available data for benzene indicate that acute toxicity to freshwater life occurs at concentrations as low as 5,300 µg/L. For saltwater aquatic life, acute toxicity occurs at concentrations as low as 700 µg/L (5).

No data concerning chronic exposure to benzene in aquatic organisms is readily available (5).

Terrestrial and Avian

Information regarding the toxicity of benzene to terrestrial and avian wildlife and domestic animals was not found in the available literature.

SUMMARY OF REGULATORY LEVELS AND CRITERIA

EPA Carcinogenic Classification (3):	Class A - Human carcinogen
AWQC (3):	
Ingestion of Water and Organisms:	6.6×10^{-1} µg/L
Ingestion of Organisms Only:	$4.0 \times 10^{+1}$ µg/L
Reportable quantity(3):	10 lbs
ACGIH TLV(4):	32 mg/m^3
STEL(4):	75 mg/m^3
OSHA TWA(4):	30 mg/m^3
Ceiling level(4):	75 mg/m^3
Cancer Slope Factor (oral) (3):	2.9×10^{-2} $(mg/kg/day)^{-1}$
Cancer Slope Factor (inhalation) (3):	2.9×10^{-2} $(mg/kg/day)^{-1}$
MCL (drinking) (3):	0.005 mg/L
MCLG (3):	0 mg/L

SUMMARY OF TOXICOLOGICAL INDICES (3)

U.S. EPA Carcinogenicity Classification:	- B2 probable human carcinogen
Oral RfD:	Not Applicable
Inhalation RfC:	Not Applicable
Inhalation Cancer Unit Risk:	8.3 x 10-6 per µg/m^3
Oral CPF:	2.9×10^{-2} $(mg/kg/d)^{-1}$

REFERENCES

1. Chemical, Physical and Biological Properties of Compounds Present at Hazardous Waste Sites. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. September 1985.

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6. Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Company, Inc. New York, New York. 1983.

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APPENDIX F
RISK CALCULATIONS

SITE: Camp Geiger Area Fuel Farm
LOCATION: MCB - Camp Lejeune
JOB# 62470-160
DATE: April 4, 1994
DERMAL CONTACT AND INGESTION OF SITE SOILS BY CONSTRUCTION WORKERS.
LOCATION: MAXIMUM SUBSURFACE SOILS - soa160.wk1

PURPOSE: TO ESTIMATE THE ADVERSE HUMAN HEALTH RISKS ASSOCIATED WITH EXPOSURE TO AFFECTED SOILS.
LOGICAL, YET CONSERVATIVE ASSUMPTIONS ARE USED TO DETERMINE THE POTENTIAL RISKS ASSOCIATED WITH DERMAL CONTACT AND INGESTION.
INCREMENTAL CANCER RISKS (ICRs) AND HAZARD INDICES (HIs) ARE PRESENTED IN THE SPREADSHEET.

RELEVANT EQUATIONS:

1. CARCINOGENS

CDI derm = (CS)(SA)(AD)(ABS)(EF)(ED)(CF)/(BW)(AT)

WHERE: CS = THE CHEMICAL CONCENTRATION (mg/Kg)
SA = THE EXPOSED SURFACE AREA OF THE SKIN (cm^2)
AD = THE DERMAL ADHERENCE CONSTANT (mg/cm^2 d)
ABS = THE ABSORBED FRACTION (unitless)
EF = THE EXPOSURE FREQUENCY (d/yr)
ED = THE EXPOSURE DURATION (years)
CF = CONVERSION FACTOR (10^-6 Kg/mg)
BW = THE AVERAGE RECEPTOR BODY WEIGHT (Kg)
AT = THE AVERAGING TIME (70yrs x 365d/yr)

CDI ing = (CS)(IR)(CF)(EF)(ED)/(BW)(AT)

WHERE: CS = THE CONCENTRATION IN SOIL (mg/Kg)
CF = THE CONVERSION FACTOR (10^-6 Kg/mg)
IR = THE INGESTION RATE (mg/d)
EF = THE EXPOSURE FREQUENCY (d/yr)
ED = THE EXPOSURE DURATION (yr)
BW = BODY WEIGHT (Kg)
AT = THE AVERAGING TIME (70yrs x 365d/yr)

ICR = SUM(ICRi * CPFi) (linear)

TOTAL ICR = ICR derm + ICR ing

2. NONCARCINOGENS

CDI derm = (CS)(SA)(AD)(ABS)(EF)(ED)(CF)/(BW)(AT)

WHERE: CS = THE CHEMICAL CONCENTRATION (mg/Kg)
SA = THE EXPOSED SURFACE AREA OF THE SKIN (cm^2)
AD = THE DERMAL ADHERENCE CONSTANT (mg/cm^2 d)
ABS = THE ABSORBED FRACTION (unitless)
EF = THE EXPOSURE FREQUENCY (d/yr)
ED = THE EXPOSURE DURATION (years)
CF = CONVERSION FACTOR (10^-6 Kg/mg)
BW = THE AVERAGE RECEPTOR BODY WEIGHT (Kg)
AT = THE AVERAGING TIME (ED x 365d/yr)

CDI ing = (CS)(IR)(CF)(EF)(ED)/(BW)(AT)

WHERE: CS = THE CONCENTRATION IN SOIL (mg/Kg)
CF = THE CONVERSION FACTOR (10^-6 Kg/mg)
IR = THE INGESTION RATE (mg/d)
EF = THE EXPOSURE FREQUENCY (d/yr)
ED = THE EXPOSURE DURATION (yr)
BW = BODY WEIGHT (Kg)
AT = THE AVERAGING TIME (ED x 365d/yr)

HAZARD INDEX = SUM(DOSEi / RfDi)

TOTAL HI = HI derm + HI ing

SITE: CAMP GEIGER AREA FUEL FARM
LOCATION: MCB, CAMP LEJEUNE, NORTH CAROLINA; MAXIMUM SUBSURFACE SOILS
JOB # 62470-160
DATE: APRIL 4, 1994
DERMAL CONTACT AND INGESTION OF SITE SOILS BY CONSTRUCTION WORKERS

CONSTITUENTS	CS (mg/Kg)	AD (mg/cm^2 d)	CF (10^-6 Kg/mg)	SA (cm^2)	EF (d/yr)	ED (yrs)	ABS	BW (Kg)
Benzene	23	1	1.00E-06	5300	100	1	0.01	70
Arsenic	8	1	1.00E-06	5300	100	1	0.001	70
DERMAL CONTACT TOTAL								

CONSTITUENTS	CS (mg/Kg)	IR (mg/d)	EF (d/yr)	ED (yr)	BW (Kg)	AT Carc. (d)	AT Ncarc. (d)	INGESTION CARC. DOSE
Benzene	23	480	100	1	70	25550	365	6.17E-07
Arsenic	8	480	100	1	70	25550	365	2.15E-07
INGESTION TOTAL								
TOTAL								

SITE: CAMP GEIGER AREA FUEL FARM
LOCATION: MCB, CAMP LEJEUNE, NORTH CAROLINA; MAXIMUM SUBSURFACE SOILS
JOB # 62470-160
DATE: APRIL 4, 1994
DERMAL CONTACT AND INGESTION OF SITE SOILS BY CONSTRUCTION WORKERS

CONSTITUENTS	AT CARC. (d)	AT NCARC. (d)	DERMAL CARC. DOSE	DERMAL NONCARC. DOSE	CPF (Kg-d/mg)	RfD (mg/Kg-d)
Benzene	25550	365	6.82E-08	4.77E-06	0.029	NA
Arsenic	25550	365	2.37E-09	1.66E-07	1.75	0.0003
DERMAL CONTACT TOTAL						

CONSTITUENTS	INGESTION NONCARC. DOSE	CPF	RfD	INGESTION ICR	INGESTION HI	Percent Carc. Risk
Benzene	4.32E-05	0.029	NA	1.79E-08	0.00E+00	4.55
Arsenic	1.50E-05	1.75	0.0003	3.76E-07	5.01E-02	95.45
INGESTION TOTAL				3.94E-07	5.01E-02	100
TOTAL				4.00E-07	0.05	

SITE: CAMP GEIGER AREA FUEL FARM
LOCATION: MCB, CAMP LEJEUNE, NORTH CAROLINA; MAXIMUM SUBSURFACE SOILS
JOB # 62470-160
DATE: APRIL 4, 1994
DERMAL CONTACT AND INGESTION OF SITE SOILS BY CONSTRUCTION WORKERS

CONSTITUENTS	DERMAL ICR	DERMAL HI	PERCENT CARC. RISK	PERCENT HAZARD INDEX	EPA WEIGHT OF EVIDENCE
Benzene	1.98E-09	0.00E+00	32.27	0.00	A
Arsenic	4.15E-09	5.53E-04	67.73	100.00	A
DERMAL CONTACT TOTAL	6.13E-09	5.53E-04	100	100	

CONSTITUENTS	Percent Ncarc. Risk	COMMENTS
Benzene	0.00	
Arsenic	100.00	
INGESTION TOTAL	100	
TOTAL		

SITE: Camp Geiger Fuel Farm
LOCATION: MCB - Camp Lejeune
JOB# 62470-160
DATE: April 4, 1994
INHALATION OF FUGITIVE DUST EMISSIONS FROM SUBSURFACE SATURATED SOILS. dust160.wk1

PURPOSE: TO DETERMINE THE RISK POSED TO A CONSTRUCTION WORKER THROUGH THE INHALATION OF FUGITIVE DUST USING THE NEAR FIELD BOX MODEL. DISTANCE IS 10 m FROM POTENTIAL SOURCE AREA.

REFERENCES: COWHERD et al.,(1984)
PASQUILL, (1975)
HORST, (1979)

PERTINENT EQUATIONS:

Q = [a*E*A]*1E-6

where: Q = THE EMISSION RATE OF PARTICLES 10um AND SMALLER (mg/hr)
a = THE MASS FRACTION OF CONTAMINANTS IN THE PARTICLE EMISSIONS (ppm)
E = THE EMISSION FACTOR FOR PARTICLES 10um AND SMALLER (mg/m^2-hr)
A = THE CONTAMINATED AREA {ESTIMATED} (m^2)

E = 0.036(1-f)([u]/ut)^3(F(x))

where: f = THE FRACTION OF AREA COVERED BY VEGETATION
[u] = THE MEAN ANNUAL WIND SPEED (m/s)
ut = THE EROSION THRESHOLD SPEED SUCH THAT...
ut = u'*2.5*ln(700/zo)

u' = THE FRICTION VELOCITY(ESTIMATED OR MEASURED) AT THE SITE (m/s)
zo = THE ROUGHNESS HEIGHT (cm)
F(x) = THE THRESHOLD WIND SPEED:MEAN ANNUAL WIND SPEED FUNCTION [x=0.886(ut/[u])]

Ca = Q/H*W*U

where: Ca = CONCENTRATION OF CONTAMINANTS IN AMBIENT AIR (mg/m3)
H = DOWN WIND BOX HEIGHT (m) @ 10m
W = THE DOWN WIND WIDTH OF THE BOX (m)
U = THE AVERAGE WIND SPEED THROUGH THE BOX (m/s)

U = 0.22([u])*ln(2.5H)

CARCINOGENIC CONTAMINANTS

DOSE = Ca*RR*AB*D*ED*EV/BW*70*365

where:
RR = THE RESPIRATION RATE (m^3/hr)
AB = THE ABSORBED FRACTION
D = THE LENGTH OF A WORKDAY (hr/d)
ED = THE EXPOSURE DURATION (yrs)
EV = THE EVENTS PER YEAR (d/yr)
BW = THE RECEPTOR BODY WEIGHT (Kg)

NONCARCINOGENIC CONSTITUENTS

DOSE = Ca*RR*AB*D/BW

SITE: CAMP GEIGER FUEL FARM
LOCATION: MCB, CAMP LEJEUNE, NORTH CAROLINA
JOB# 62470-160
DATE: APRIL 4, 1994
INHALATION OF FUGATIVE DUST EMISSIONS FROM SUBSURFACE SATURATED SOILS

CONSTITUENT	a ppm	f	[u] m/s	u' m/s	Zo cm	F(x)	ut m/s	E mg/m^2-hr	A m^2
Benzene	23	0.05	3.06	0.25	100	1.92	1.22	1.05	3350
Arsenic	8	0.05	3.06	0.25	100	1.92	1.22	1.05	3350

CONSTITUENT	RR m^3/hr	AB	D hr/d	ED yrs	EV d/yrs	BW Kg	CARC. DOSE mg/Kg/d	NONCARC. DOSE mg/Kg/d	CPF Kg-d/mg
Benzene	0.83	1	8	1	100	70	5.55E-07	0.00E+00	0.029
Arsenic	0.83	1	8	1	100	70	1.93E-07	0.00E+00	15.1
TOTAL									

SITE: CAMP GEIGER FUEL FARM
LOCATION: MCB, CAMP LEJEUNE, NORTH CAROLINA
JOB# 62470-160
DATE: APRIL 4, 1994
INHALATION OF FUGATIVE DUST EMISSIONS FROM SUBSURFACE SATURATED SOILS

CONSTITUENT	Q mg/hr	H (x = 10) m	W m	U m/s	Ca mg/m^3
Benzene	2.26E-05	1.4	110	0.84	0.001495173
Arsenic	7.85E-06	1.4	110	0.84	0.00052006

CONSTITUENT	RfC mg/m^3	ICR	DOSE:RfD	COMMENTS
Benzene	NA	1.61E-08	0.00E+00	
Arsenic	NA	2.92E-06	0.00E+00	
TOTAL		2.93E-06	0.00E+00	

APPENDIX G
NCDEHNR SITE SENSITIVITY EVALUATION

Table 1

Site Sensitivity Evaluation (SSE)

Site Characteristics Evaluation (Step 1)

Characteristic	Condition	Rating	
Grain Size*	Gravel Sand Silt Clay	150 100 ✓ 50 0	100
Are relict structures, sedimentary structures, and/or textures present in the zone of contamination and underlying "soils"?	Present and intersecting the water table. Present but not intersecting the water table. None present.	10 5 0	10
Distance from location of deepest contaminated soil** to water table.	0 -5 feet (C, D & E sites only) 5 - 10 feet >10 - 40 feet > 40 feet	20 ✓ 20 10 0	20
Is the top of bedrock or transmissive indurated sediments located above the water table?	Yes No	20 0 ✓	0
Artificial conduits present within the zone of contamination.	Present and intersecting the water table. Present but not intersecting the water table. Not present.	10 5 ✓ 0	5

Total Site Characteristics Score: 135

* **Predominant** grain size based on Unified Soil Classification System or U.S. Dept. of Agriculture's Soil Classification Method.

** (>10 ppm TPFH by Method 5030; >40 ppm TPFH by Method 3550; >250 ppm O&G by Method 9071)

Table 2

Site Sensitivity Evaluation (SSE)

Initial Cleanup Level (Step 2) — Final Cleanup Level (Step 3)

EPA Method 5030 for Low Boiling Point Hydrocarbons such as Gasoline, Aviation Fuels, Gasohol

Total Site Characteristics Score	Initial Cleanup Level TPFH (ppm)
>150	≤10
121-150 ✓	20
91-120	40
61-90	60
31-60	80
0-30	100

Select Site Category* →

		Final Cleanup Level
Category A & B (Multiply initial cleanup level by 1)	1 x ____	= ______ ppm
Category C & D ✓ (Multiply initial cleanup level by 2)	2 x 20	= 40 ppm
Category E (Multiply initial cleanup level by 3)	3 x ____	= ______ ppm

EPA Method 3550 for High Boiling Point Hydrocarbons such as Kerosene, Diesel, Varsol, Mineral Spirits, Naphtha

Total Site Characteristics Score	Initial Cleanup Level TPFH (ppm)
>150	≤40
121-150 ✓	80
91-120	160
61-90	240
31-60	320
0-30	400

Select Site Category* →

		Final Cleanup Level
Category A & B (Multiply initial cleanup level by 1)	1 x ____	= ______ pp.
Category C & D (Multiply initial cleanup level by 2)	2 x 80	= 160 ppm
Category E (Multiply initial cleanup level by 3)	3 x ____	= ______ ppm

EPA Method 9071 for Heavy Fuels - Oil & Grease (O&G) such as Fuel Oil #4, #5, #6, Motor Oil, Hydraulic Fluid

Total Site Characteristics Score	Initial Cleanup Level O&G (ppm)
>150	≤250
121-150 ✓	400
91-120	550
61-90	700
31-60	850
0-30	1000

Select Site Category* →

		Final Cleanup Level
Category A & B (Multiply initial cleanup level by 1)	1 x ____	= ______ ppm
Category C & D (Multiply initial cleanup level by 2)	2 x 400	= 800 ppm
Category E (Multiply initial cleanup level by 3)	3 x ____	= ______ pp.

* See Site Category Descriptions, Table 3

TABLE 3

SSE SITE CATEGORY DESCRIPTIONS

<u>CATEGORY A</u> (*Site meets any <u>one</u> of the criteria*)

1. Water supply well(s) contaminated and <u>not served</u> by accessible public water supply.

2. Vapors present in confined areas at explosive or health concern levels.

3. Treated surface water supply in violation of the safe drinking water standards.

<u>CATEGORY B</u> (*Site meets any <u>one</u> of the criteria*)

1. Water supply well(s) contaminated, but served by accessible public water supply.

2. Water supply well(s) within 1500 feet of site, but not contaminated and not served by accessible public water supply.

3. Vapors present in confined areas but not at explosive or health concern levels.

<u>CATEGORY C</u> (*Site meets <u>both</u> of the criteria*)

1. No known water supply well(s) contaminated.

2. Water supply well(s) greater than 1500 feet from site but not served by accessible public water supply.

<u>CATEGORY D</u> (*Site meets <u>both</u> of the criteria*)

1. No known water supply well(s) contaminated.

2. Water supply well(s) within 1500 feet of site but served by accessible public water supply.

<u>CATEGORY E</u> (*Site meets <u>both</u> of the criteria*)

1. No known water supply well(s) contaminated or within 1500 feet of site.

2. Area served by accessible public water supply.

FINAL

INTERIM REMEDIAL ACTION FEASIBILITY STUDY

OPERABLE UNIT NO. 10
SITE 35 - CAMP GEIGER AREA FUEL FARM

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0160

JULY 20, 1994

Prepared For:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
AST	aboveground storage tank
Baker	Baker Environmental, Inc.
BCSB	Brinson Cfreek Soil Boring
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOD	Department of Defense
DON	Department of the Navy
EPA	United States Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FS	Feasibility Study
IAS	Initial Assessment Study
IR	Installation Restoration
LANTDIV	Naval Facilities Engineering Command, Atlantic Division
MCB	Marine Corps Base
mg/kg	Milligrams per kiligram
MW	monitoring well
NACIP	Navy Assessment and Control of Installation Pollutants
NCDEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCDOT	North Carolina Department of Transportation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NPL	National Priorities List
NPW	net present worth
O&M	operation and maintenance
OU	Operable Unit

PAH	polynuclear aromatic hydrocarbon
POTW	pubicly-owned treatment works
ppm	parts per million
PRAP	Proposed Remedial Action Plan
RA	risk assessment
RAA	remedial action alternative
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SB	soil boring
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TBC	(criteria) to be considered
TCE	trichloroethylene
TPH	total petroleum hydrocarbons
TRC	Technical Review Committee
USC	United States Code
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

EXECUTIVE SUMMARY

This report presents the Interim Remedial Action Feasibility Study (FS) for Operable Unit (OU) No. 10, Site 35 - Camp Geiger Area Fuel Farm, located at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The FS is based on data collected during the Interim Remedial Action Remedial Investigation (RI) conducted at Site 35 as well as data collected under previous investigations and is focused on petroleum hydrocarbon contaminated soil.

The Interim Remedial Action RI/FS was deemed necessary because:

- The existing site conditions potentially expose nearby human populations, animals, or food chains to toxic substances, pollutants, or contaminants.

- High levels of toxic substances or pollutants or contaminants in soils are largely at or near the surface that may migrate.

An Interim Remedial Action focused on petroleum hydrocarbon contaminated soil is intended to result in mitigation of the above factors. Elimination of the above factors may require a remedial action focused on groundwater contamination which will be considered under the comprehensive Site 35 RI/FS being performed concurrently.

Site Location and Description

Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune, Onslow County. The main entrance to Camp Geiger is off U.S. Route 17, approximately 3.5 miles southeast of the City of Jacksonville, North Carolina. Site 35, the Camp Geiger Area Fuel Farm refers primarily to five, 15,000-gallon aboveground storage tanks (ASTs), a pump house, and a fuel unloading pad situated within Camp Geiger just north of the intersection of Fourth and "G" Streets.

Site History

Construction of Camp Geiger was completed in 1945, four years after construction of MCB, Camp Lejeune was initiated. Originally, the Fuel Farm ASTs were used for the storage of No. 6 fuel oil, but, were later converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. The date of their conversion is not known.

Routinely, the ASTs at Site 35 supply fuel to an adjacent dispensing pump. A leak in an underground line at the station was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period (Law, 1992). The leaking line was subsequently sealed and replaced.

The ASTs at Site 35 are currently used to dispense gasoline, diesel and kerosene to government vehicles and to supply USTs in use at Camp Geiger and the nearby New River Marine Corps Air Station. The ASTs are supplied by commercial carrier trucks which deliver product to fill ports located on the fuel unloading pad at the southern end of the facility. Six, short-run (120 feet maximum), underground fuel lines are currently utilized to distribute the product from the unloading pad to the ASTs. Product is dispensed from the ASTs via trucks and underground piping.

Reports of a release from an underground distribution line near one of the ASTs date back to 1957-58 (ESE, 1990). Apparently, the leak occurred as the result of damage to a dispensing pump. At that time the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released although records of the incident have since been destroyed. The fuel reportedly migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned.

Another abandoned underground distribution line extended from the ASTs to the former Mess Hall Heating Plant, located adjacent to "D" Street, between Third and Fourth Streets. The underground line dispensed No. 6 fuel oil to a UST which fueled the Mess Hall boiler. The Mess Hall, located across "D" Street to the west, is believed to have been demolished along with its Heating Plant in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp Geiger personnel along the unnamed drainage channels north of the Fuel Farm. Apparently, the source of the fuel, believed to diesel or jet fuel, was an unauthorized discharge from a tanker truck that was never identified. The Activity reportedly initiated an emergency clean-up which included the removal of approximately 20 cubic yards of soil.

The Fuel Farm is scheduled to be decommissioned in 1994. Plans are currently being prepared to empty, clean, dismantle, and remove the ASTs along with all concrete foundations, slabs on grade, berms and associated underground piping. The Fuel Farm is being removed to make way for a four lane divided highway proposed by the North Carolina Department of Transportation (NCDOT).

Previous Investigations and Findings

Previous investigations include an Initial Assessment Study (Water and Air Research [WAR], 1983), a Confirmation Study (Environmental Science and Engineering, Inc. [ESE], 1984 and 1987), a Focused Feasibility Study (NUS Corporation [NUS], 1990), and a Comprehensive Site Assessment (Law Engineering, Inc. [Law], 1991).

The Initial Assessment Study identified Site 35 as one of 23 sites warranting further investigation. Environmental media were not sampled as part of this study.

ESE performed the Confirmation Study at the Fuel Farm between 1984 and 1987. Soil, groundwater, surface water, and sediment samples were obtained and analyzed for lead and oil and grease. Groundwater was also analyzed for volatile organics. Oil and grease results indicated that soils northeast of the Fuel Farm were potentially impacted by site activities.

Additional wells were installed by NUS Corporation during the Focused Feasibility Study, which was conducted in 1990. Soil cuttings obtained from two of the four well boreholes contained hydrocarbon related contamination.

Law conducted the Comprehensive Site Assessment in 1991. A total of 18 soil borings were drilled, sampled and converted to nested wells that monitor the water table aquifer at two depths. An additional three soil borings were drilled to provide stratigraphic data. Five more soil borings were drilled to provide data regarding vadose zone contamination. Nine hand-auger samples were also obtained. A follow-up study was conducted subsequent to the Comprehensive Site Assessment. Three additional borings were drilled, sampled and converted to wells.

Law identified areas of impacted soil and groundwater directly beneath and apart from the Fuel Farm. The nature of the contamination included both chlorinated organic compounds (e.g., TCE, trans-1,2-DCE, and vinyl chloride) and petroleum hydrocarbons (e.g., TPH, MTBE, BTEX). The majority of the soil contamination encountered appeared to be associated with a fluctuating groundwater table. Two plumes of shallow groundwater contaminated with petroleum constituents and two plumes contaminated with chlorinated organics were identified. All four plumes were located north of Fourth Street and east of E Street except for a portion of a TCE plume extending southwest of Fourth Street.

The Interim Remedial Action RI conducted by Baker in 1993 and 1994 consisted of drilling seven additional soil borings including five in those areas where groundwater contamination plumes were suspected. A single soil sample was obtained from each of these soil borings and analyzed for TCL organics, TAL inorganics, TPH and oil and grease. Samples obtained from two boring locations (SB-30 and SB-34) displayed relatively high concentrations of benzene, toluene, ethylbenzene, xylenes, naphthalene and 2-methylnaphthalene; constituents commonly associated with fuels. These two locations also displayed the highest detected concentrations of TPH encountered during the Interim Remedial Action RI. Highest detected concentrations of these contaminants were in samples taken at or below the shallow water table.

The non-fuel related contaminant trichloroethene (TCE) was detected at concentrations below its corresponding contract required quantitation limit in two samples. One of these samples was obtained from background soil boring location SB-29.

In addition to soil boring samples a total of ten shallow soil samples were obtained in the vicinity of Brinson Creek and the unnamed drainage channels located to the north of the Fuel Farm. No significant levels of fuel-related contaminants and TPH were detected in these samples. Oil and grease was, however, detected in these shallow soil samples. Therefore, two additional samples were obtained approximately 1/2-mile upstream of the site along Brinson Creek to establish background levels of oil and grease. Background oil and grease results obtained upstream of Site 35 indicate that naturally-occurring organics in soils or an upgradient contamination source could be responsible for the positive oil and grease results obtained at the site. An additional sample was also obtained downstream of the site to identify the potential extent of contamination.

In general, the Interim Remedial Action RI data confirm the findings of the CSA (Law, 1992) that indicated contaminated soil conditions at Site 35 are primarily associated with a fluctuating shallow groundwater plume. Contamination encountered in the vicinity of monitoring wells MW-21 and MW-25 was detected at approximately two or more feet above the measured groundwater surface and may be indicative of contamination not associated with a fluctuating groundwater plume. To date, however, recorded groundwater levels provide insufficient data to afford an estimate of the range of groundwater elevation fluctuation at Site 35.

Nature and Extent of Contamination

Petroleum hydrocarbon contamination at Site 35 is primarily associated with shallow groundwater that is typically encountered across the site at six to eight feet below the ground surface (bgs). Law identified two distinct petroleum hydrocarbon shallow groundwater plumes including one directly beneath the Fuel Farm ASTs and another located immediately northwest of the Fuel Farm ASTs in the vicinity of the unnamed drainage channels that covey surface runoff to Brinson Creek.

In addition to contaminated groundwater samples, subsurface soil samples have been identified at the site as contaminated with petroleum hydrocarbons. The contaminated soil samples, for the most part, were obtained along a narrow zone that extends about one to two feet above the groundwater table (as measured on two separate occasions including once in August, 1991 by Law and again in March, 1994 by Baker). The soil contamination in this zone just above the top of shallow groundwater appears to have been transported there by a fluctuating groundwater table. In only two areas did the results of soil sampling indicate the presence of elevated petroleum hydrocarbon contamination at locations sufficiently above the top of groundwater such that the source of the contamination may not have been a fluctuating groundwater table. The two areas are both located north of the Fuel Farm where past unauthorized discharges of fuel products were reported to have occurred and are centered around samples obtained from monitoring well MW-25 and monitoring well MW-21, respectively.

Summary of Site Risks

As part of the Interim Remedial Action RI, a human health Risk Assessment was conducted to evaluate the current or future potential risks to human health resulting from the presence of petroleum hydrocarbon contaminants identified in soil located above the seasonal high water table at Operable Unit No. 10. An ecological risk assessment was not conducted as part of the Interim Remedial Action RI for two reasons. First, soil contamination is most prevalent at or near the groundwater surface, limiting the potential for direct exposure to ecological receptors. Second, an ecological risk assessment will be performed as part of the comprehensive Site 35 Remedial Investigation which is being conducted concurrently.

A risk assessment was conducted for chemicals of potential concern (COPCs) detected in subsurface soil samples. COPCs are those chemicals detected with sufficient prevalence in an environmental medium retained for quantitative evaluation. COPCs at Site 35 include only benzene and arsenic.

Exposure to subsurface soils was evaluated considering on-site workers (commercial/ industrial) and potential dermal contact, particle inhalation and accidental ingestion scenarios. Future residential exposure pathways were not considered in the risk assessment because contamination was, in general, present at or below the water table. Furthermore, a more comprehensive Site 35 remedial investigation is ongoing.

Findings of the human health risk assessment conducted for Site 35 soils indicate that cancer risks occurring subsequent to worker-related exposure fall within the generally acceptable target risk range of 10^{-6} to 10^{-4}. Furthermore, noncarcinogenic adverse health effects will not occur subsequent to worker-related exposure.

Remediation Goals

Based on the results of the risk assessment, unacceptable human health risks are not expected at Site 35. Consequently, the scope and goals for the remediation of petroleum hydrocarbon contaminated soil were developed based on NC DEHNR guidelines for soil remediation. The NC DEHNR guidelines address the presence of low and high boiling point petroleum hydrocarbons and oil and grease. Remediation goals based on the NC DEHNR guidelines were developed by performing a Site Sensitivity Evaluation (SSE). Based on the SSE remediation goals were developed as follows:

- TPH (via EPA Method 5030/8015: low boiling point) = 40 mg/kg
- TPH (via EPA Method 3550/8015: high boiling point) = 160 mg/kg
- Oil and grease (via EPA Method 8071) = 800 mg/kg

Oil and grease was subsequently excluded from the remediation goals because it was detected in background surface soil samples (BCSB11 and BCSB1B) located approximately 1/4 to 1/2 mile upstream of the Fuel Farm at levels on the order of 1610 mg/kg and 1110 mg/kg, respectively, or more than twice the remediation goal based on the SSE. Stream level measurements indicate the locations of the upstream surface soil samples to be beyond the reach of tidal influences and, consequently, indicate that high levels of naturally-occurring hydrocarbons are present in the soil adjacent to Brinson Creek. Although other surface soil samples obtained under the Interim Remedial Action RI indicated the presence of oil and grease at levels as high as 7,500 mg/kg, only one of the surface soil samples (BSCB01) exhibited both detectable concentrations of TPH (60 mg/kg) and oil and grease (3,000 mg/kg). The discrepancy is likely due to the fact that oil and grease is a gravimetric analysis which is highly subject to interferences and influences such as those presented by many naturally-occurring organic chemicals that could be expected to be present in the frequently flooded soils adjacent to Brinson Creek.

Based on the remediation goals, soils exhibiting TPH levels in excess of 40 mg/kg as measured by EPA Method 5030/8015 and 160 mg/kg as measured by EPA Method 3550/8015 will be subject to remediation.

<u>Summary of Alternatives</u>

Various technologies and process options were screened and evaluated under the Interim Remedial Action FS. Ultimately, six Remedial Action Alternatives (RAAs) were developed and are listed as follows:

- RAA 1 - No Action
- RAA 2 - Source Removal and Off-Site Landfill Disposal
- RAA 3 - Source Removal and Off-Site Biotreatment
- RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration
- RAA 5 - Source Removal and Off-Site Soil Recycling
- RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption

A brief description of each alternative as well as the estimated cost and timeframe to implement the alternative are as follows:

- RAA 1 - No Action

  Capital Cost: $0
  Annual Operation and Maintenance (O&M) Cost: $0
  Months to Implement: 0

  The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no actions will be performed to reduce the toxicity, mobility, or volume of the contaminated soil at Site 35. This alternative assumes that passive remediation will occur via biodegradation and other natural attenuation processes and that contaminant levels will be reduced over an indefinite period of time.

- RAA 2 - Source Removal and Off-Site Landfill Disposal

  Capital Cost: $527,390
  Annual O&M Cost: $0
  Months to Implement: 2

  Under RAA 2, contaminated soil located above the seasonal high groundwater table will be excavated and transported off site to an appropriately permitted solid waste landfill.

- RAA 3 - Source Removal and Off-Site Biotreatment

  Capital Cost: $558,366
  Annual O&M Cost: $0
  Months to Implement: 2

  RAA 3 involves the excavation of contaminated soil above the seasonal high groundwater table and biological treatment at an off-site commercial composting landfarming facility. Biological treatment is a process whereby naturally occurring microorganisms are stimulated to consume petroleum hydrocarbons as food and fuel with the resulting byproducts being carbon dioxide and water.

- RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration

  Capital Cost: $455,304
  Annual O&M Cost: $0
  Months to Implement: 2

  RAA 4 involves the excavation of petroleum hydrocarbon contaminated soil above the seasonal high groundwater table for remediation via on-site, ex-situ soil aeration. In this process the excavated soil is vigorously agitated at a staging area in an effort to release volatile hydrocarbons from the soil to the atmosphere.

- RAA 5 - Source Removal and Off-Site Soil Recycling

  Capital Cost: $558,366
  Annual O&M Cost: $0
  Months to Implement: 2

  RAA 5 involves the excavation of contaminated soil located above the seasonal high groundwater table and transport to an off-site commercial soil recycling facility. Soil recycling processes utilize the soil for the production of basic materials such as brick and asphalt.

- RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption

  Capital Cost: $613,542
  Annual O&M Cost: $0
  Months to Implement: 2

  RAA 6 involves the excavation of contaminated soil located above the seasonal high groundwater table for remediation via on-site low temperature thermal desorption. This process is commercially available from contractors that utilize mobile units to heat wastes to between 200 and 600 degrees Fahrenheit. The heat volatizes organic contaminants which are then either collected in activated carbon, destroyed via catalytic oxidation, or released to the atmosphere.

Comparative Analysis of Alternatives

This FS has identified and evaluated a range of remedial action alternatives potentially applicable to the petroleum hydrocarbon contaminated soil at Site 35. Table 5-6 presents a summary of the detailed evaluation of these alternatives. A comparative analysis in which the alternatives are evaluated in relation to one another with respect to each of the nine evaluation criteria is presented below. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

Overall Protection of Human Health and the Environment

All of the RAAs except the No Action RAA will provide for an increase in the overall protection of human health and the environment. The greatest degree of protection base residents and staff will be provided by RAAs 2, 3, and 5 which involve source removal and disposal/treatment at an off-site facility. Under these alternatives, after the contaminated soil is excavated and removed from the site, clean borrow will be used as backfill. RAAs 4 and 6, on the other hand, will use the soil treated on site as backfill material. It is likely that some residual level of contaminants will remain in the post-treated soil although the levels, by design, will be below the remediation goals established in the FS. Consequently, the post-treated soil as backfill will not provide as great a degree of overall protection as the clean backfill to be used under RAAs 2, 3, and 5. However, the difference may largely be insignificant.

Compliance with ARARs

All of the RAAs except the No Action RAA will comply with all of the identified ARARs. The source removal actions must be executed to comply with NC DEHNR guidelines which were identified as chemical-specific criteria to be considered (TBC) and used as the basis of the remediation goals established under this FS. In addition, NC DEHNR guidelines for treating and disposing of contaminated soil are action-specific ARARs. It is assumed that commercial vendors contracted to treat the soil either on site or off site under RAAs 3, 5, and 6 will be pre-approved, appropriately permitted, or otherwise in compliance with all applicable NC DEHNR rules and guidelines. Under RAA 2, it is assumed that the proposed landfill will be permitted to accept non-hazardous, petroleum contaminated soil. The ex-situ soil aeration proposed under RAA 4 will likely be performed by the excavation contractor as this technology does not appear to be available locally as a specialized service. It is possible that soil aeration will not be completely effective and that some portion of the contaminated soil would need to be disposed/treated by an alternative means in order to comply with ARARs.

Long-Term Effectiveness and Permanence

All of the RAAs except the No Action RAA provide for an effective and permanent remediation which does not require any long-term soil monitoring.

Reduction of Toxicity, Mobility, or Volume of Contaminants

All of the RAAs provide for the reduction of toxicity, mobility, and volume of contaminants. The reduction to be expected from the No Action RAA will require substantially more time to achieve and is somewhat unpredictable. Under RAAs 2, 3, and 5, where the contaminated soil will be excavated and treated/disposed off site, the overall reduction is based strictly on the volume of contaminated soil removed. RAAs 4 and 6, however, involve the on-site treatment and reuse of the soil as backfill meaning that the total reduction is dependent both on the volume of soil removed and the total reduction of contaminant levels. The difference should not be significant since all of the remediation goals will be achieved by design.

Short-Term Effectiveness

The short-term effectiveness of the action oriented RAAs (2 through 6) are roughly equivalent. It is expected that each RAA will be fully implemented in about two months. VOC emissions will be expected during the excavation and staging activities of each RAA. A higher volume of VOC emissions can be expected under RAA 4 because the soil aeration process, by design, is intended to release the VOCs from the soil to the atmosphere.

Implementability

RAAs 2, 3, and 5 will be roughly equivalent to implement. Each of these RAAs will involve mobilization of construction equipment to the site for the performance of clearing, excavation, staging, and backfilling operations, and the off-site treatment/disposal of the contaminated soil. Since RAAs 3 and 5 involve off-site commercial biotreatment and soil recycling facilities, it can be reasoned that the RAA that offers more vendors would be more flexible and easier to implement. Baker identified more soil recycling facilities than biotreatment facilities that service the Camp Lejeune area. Consequently, RAA 5 (Source Removal and Off-Site Soil Recycling) was evaluated as easier to implement than RAA 3 (Source Removal and Off-Site Biotreatment).

RAAs 4 and 6 involve on-site treatment which will be more difficult to implement because more on-site activities will be involved. A staging area will need to be constructed for each RAA to provide a location where the excavated soil can be placed to be sampled and segregated as either clean or contaminated and await treatment/disposal. It is reasonable to assume that the staging area for the on-site RAAs 4 and 6 may need to be larger to afford space for on-site treatment activities.

RAAs 2 through 6 will require the construction of a decontamination area for equipment and personnel. All of the anticipated site activities involve standard construction techniques, equipment, and materials and should be relatively easy to implement.

Cost

The estimated costs of alternatives, excluding the No Action alternative, range from approximately $455,000 for RAA 4 (Source Removal and On-Site, Ex-Situ Soil Aeration) to approximately $613,542 for RAA 6 (Source Removal and On-Site Low Temperature Thermal Desorption). Although RAA 4 is estimated to be the lowest cost option it is the only alternative which involves technology that is not commercially supplied by specialty contractors. It is also the option believed to have the best chance of not performing as expected and, therefore, has the highest potential for increased costs. The contingency for RAA 4 at 25 percent is the highest of all of the RAAs which represents an attempt to recognize the uncertainties of this option. The ranking of the alternatives in terms of cost is as follows:

RAA 1:	No Action	$0
RAA 4:	Source Removal and On-Site, Ex-Situ Soil Aeration	$455,000
RAA 2:	Source Removal and Off-Site Landfill Disposal	$527,000
RAA 3:	Source Removal and Off-Site Biotreatment	$558,000
RAA 5:	Source Removal and Off-Site Soil Recycling	$558,000
RAA 6:	Source Removal and On-Site Low Temperature Thermal Desorption	$613,000

All of the costs shown are capital costs because none of the RAAs have any extended term operation and maintenance activities associated with them. In all cases, the cost of treatment/disposal was the most significant variable. The next most significant variable was the cost of off-site transportation of waste. The cost of transportation and treatment/disposal for all of the RAAs except RAA 4 are based on telephone quotations solicited by Baker from commercial vendors specifically for this project. The cost of on-site treatment under RAA 4 is based on Baker's estimate of the time and equipment required to execute this task rather than a quote from a commercial vendor because Baker did not identify a contractor that specializes in providing this technology. Telephone memos documenting the information provided by commercial vendors is presented in Appendix A.

In essence, the costs of RAAs 2, 3, 5, and 6 should be considered roughly equivalent because they are based on the casual quotations of commercial vendors. In an actual competitive bid situation the ranking of RAAs according to cost may be significantly different.

USEPA/State Acceptance

Neither the USEPA or NC DEHNR is likely to favor RAA 1 - No Action because it will not result in compliance with ARARs.

The USEPA is mandated to favor treatment over disposal alternatives and, therefore, RAA 2 - Source Removal and Off-Site Landfill Disposal will not likely be as acceptable as the other alternatives that feature treatment. The placement of non-hazardous, petroleum contaminated soil in an approved, permitted landfill is a common practice in North Carolina and will likely be acceptable to the NC DEHNR; however, the NC DEHNR, as a policy, prefers on-site as opposed to off-site remedial options.

Between the two on-site remedial options, RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration and RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption, RAA 4 will likely face objections from USEPA and NC DEHNR. The focus of these objections will be that this option is designed to release VOC contaminants from the soil to the atmosphere in an uncontrolled manner.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment.

1.0 INTRODUCTION

This report presents the Interim Remedial Action Feasibility Study (FS) for Operable Unit (OU) No. 10, Site 35 - Camp Geiger Area Fuel Farm, located at the Marine Corps Base (MCB), Camp Lejeune, North Carolina. This FS has been prepared by Baker Environmental, Inc. (Baker) under contract to the Naval Facilities Engineering Command, Atlantic Division (LANTDIV).

This Interim Remedial Action FS has been conducted in accordance with the guidelines and procedures delineated in the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) for remedial actions (40 CFR 300.430). These NCP regulations were promulgated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) commonly referred to as Superfund, and amended by the Superfund Amendments and Reauthorization Act (SARA) signed into law on October 17, 1986. The United States Environmental Protection Agency's (USEPA's) document Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988b) has been used as guidance for preparing this document.

This Interim Remedial Action FS is based on data collected during the Interim Remedial Action Remedial Investigation (RI) conducted at Site 35 as well as data collected under previous investigations and is focused only on the contaminated soil at the site. A comprehensive RI/FS at Site 35 is being executed as a separate study to evaluate conditions of other site media including groundwater, surface water, and sediment.

1.1 Purpose and Organization of the Report

1.1.1 Purpose of the FS

The FS process under CERCLA serves to ensure that appropriate remedial alternatives are developed and evaluated, such that relevant information concerning the remedial action options can be presented, and an appropriate remedy selected. The FS involves two major phases:

- Development and screening of remedial action alternatives, and
- Detailed analysis of remedial action alternatives.

The first phase includes the following major activities: (1) developing remedial action objectives, (2) developing general response actions, (3) identifying volumes or areas of affected media, (4) identifying and screening potential technologies and process options, (5) evaluating process options, (6) assembling alternatives, (7) defining alternatives, and (8) screening and evaluating alternatives. Section 121(b)(1) of CERCLA requires that an assessment of permanent solutions and alternative treatment technologies or resource recovery technologies that, in whole or in part, will result in a permanent and significant decrease in the toxicity, mobility, or volume of the hazardous substance, pollutant, or contaminant be conducted. In addition, according to CERCLA, treatment alternatives should be developed ranging from an alternative that, to the degree possible, would eliminate the need for long-term management to alternatives involving treatment that would reduce toxicity, mobility, or volume as their principal element. A containment option involving little or no treatment and a no action alternative should also be developed.

The second phase of the FS consists of: (1) evaluating the potential alternatives in detail with respect to nine evaluation criteria to address statutory requirements and preferences of CERCLA, and (2) performing a comparison analysis of the evaluated alternatives.

1.1.2 Report Organization

This FS Report is organized in five sections. The Introduction (Section 1.0) presents a brief discussion of the FS process, and site background information including a summary of the nature and extent of contamination at the site. Section 2.0 contains the remedial action objectives, requirements, and goals. Section 3.0 contains the identification and preliminary screening of the remedial action technologies. In addition, the general response actions are discussed. Section 4.0 contains the development and preliminary screening of remedial action alternatives. Section 5.0 presents the results of the detailed analysis of the remedial alternatives (both individual analysis and comparative analysis). The detailed analysis is based on a set of nine criteria including short- and long-term effectiveness, implementability, cost, state and local acceptance, compliance with applicable regulations, and overall protection of human health and the environment. The references are listed in Section 6.0.

1.2 Background Information

The purpose of this section is to summarize existing information pertaining to Site 35. Wherever possible, reference is made to the Interim Remedial Action RI Report (Baker, 1994) where this information has been previously written.

1.2.1 Description and Location

See Section 1.2.1 of the Interim Remedial Action RI Report.

1.2.2 History

See Section 1.2.2 of the Interim Remedial Action RI Report.

1.2.3 Previous Investigations and Findings

See Section 2.0 of the Interim Remedial Action RI Report.

1.2.4 Physical Characteristics of the Study Area

See Section 1.2.3 of the Interim Remedial Action RI Report.

1.2.5 Nature and Extent of Contamination

Analytical results from the Interim Remedial Action RI and previous investigations are combined in this section to identify soil areas of concern at Site 35 by a discussion of the nature and extent of soil contamination and, in particular, petroleum hydrocarbon contaminated soils.

In general, analytical data suggest that the petroleum hydrocarbon contamination at Site 35 is primarily located near the surface of shallow groundwater. Analytical results indicate that the highest TPH related contamination occurs at or below the water table and that groundwater fluctuations likely account for subsurface soil contamination detected immediately above the top of groundwater. However, recorded groundwater elevation data obtained to date is insufficient to afford an estimate of the range of groundwater elevation fluctuation at Site 35. Shallow zone groundwater at Site 35 trends toward Brinson Creek and the unnamed drainage channels located to the north of the active ASTs. Depths to groundwater generally decrease with proximity to these land features. It is conceivable that during the winter and summer months, when precipitation is highest, and following heavy rainfalls, shallow groundwater rises and discharges to Brinson Creek and the ditches north of the active ASTs. This raising of the water table and subsequent interaction with surface waters of Brinson Creek may account for the inconsistently hydrocarbon odor at Site 35.

1.2.5.1 Source Characterization

Based on available historical records, the site layout, and the analytical data obtained to date, several possible sources of petroleum hydrocarbon soil contamination can be identified. No evidence of TPH-based surface soil contamination has been identified to date although large contaminated plumes of shallow groundwater are evidenced by the data collected by Law under the CSA (Law, 1992). Consequently, it does not appear that past reported surface spills of fuel have substantially contributed to soil contamination at Site 35. One possible surface source of contamination is the Fuel Farm ASTs. However, the ASTs represent a surface obstruction and no soil samples have been obtained directly beneath them to date to verify the presence or absence of soil contamination at this location. Otherwise, the shallow groundwater has most likely been contaminated by subsurface sources such as leaking underground piping or USTs.

1.2.5.2 Non-Fuel Related Organics

Soil samples were analyzed for non-fuel related organic constituents under the Interim Remedial Action RI, but, not under any of the previous environmental investigations conducted at Site 35.

Non-fuel related organic constituents such as acetone, phthalates, and TCE were detected in subsurface soil samples obtained from soil borings drilled under Interim Remedial Action RI. Acetone and phthalates were also detected in shallow surface soil samples. Acetone and phthalates, although not detected in corresponding blanks are probably laboratory or sampling induced contaminants.

TCE was detected at relatively low levels in two soil boring samples. The presence of TCE in Site 35 soils could be related to the practice of adding chlorinated solvents to No. 6 fuel oils to prevent separation and maintain viscosity during cooler weather or to an, as yet unidentified source of TCE. The historical data and soil boring sample results do not indicate the source of TCE at Site 35. Determining the extent of TCE contamination in groundwater and the identification of the source of this contamination are two of the primary elements of the comprehensive RI/FS at Site 35 which was initiated in April 1994.

1.2.5.3 Inorganics

The extent of soil inorganics analyses at Site 35 performed to date includes data from the Confirmation Study by ESE, the Comprehensive Site Assessment by Law, and the Interim Remedial Action RI.

Lead was detected during the Confirmation Study at concentrations ranging from 6 mg/kg to 8 mg/kg in three hand-auger soil boring samples. Soil lead was also analyzed during the CSA, but was detected at only one sample location, HA-4 (42 mg/kg).

The inorganic constituents, arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc were detected in one or more samples throughout the Site 35 study area. The concentrations at which these analytes were detected fall within base-wide MCB Camp Lejeune background ranges and the range of element concentrations detected in eastern United States soils and surficial materials (Shacklette and Boerngen, 1984) with the exception of arsenic.. These chemicals were however detected at concentrations exceeding site background (SB2903) and bare specific background concentrations. In general, there does not appear to be a significant source of inorganic contaminants in Site 35 soils.

1.2.5.4 TPH, Oil and Grease, and Other Fuel Related Organics

ESE undertook the Confirmation Study in 1984. During this study, three hand-auger soil boring samples were collected to the east of the Fuel Farm ASTs. The depths from which these soil samples were obtained were not provided, however, the samples were reported to have been analyzed for oil and grease. Oil and grease was detected at concentrations ranging from 40 mg/kg to 2,200 mg/kg.

Chemical analyses of soils performed during the CSA were limited to TPH and lead. Soil samples displaying the highest headspace PID readings were submitted to the laboratory for TPH (as gasoline and diesel) and lead analysis. TPH data from the CSA indicated the presence of fuel contamination west and northwest of the Fuel Farm (MW-8, MW-11, MW-20, MW-21, and MW-25) and in the immediate vicinity of the active ASTs (MW-15, MW-22, and B-2). The most highly impacted soil samples were those located at or below the water table.

The most prevalent chemicals detected in Site 35 soil boring samples collected during the Interim Remedial Action RI are those chemicals commonly associated with fuels including BTEX and PAHs. As in the case of the soil samples obtained under the CSA, organic contaminants detected generally appear to be associated with soil samples obtained from the interval located at or below the water table. Soil samples obtained from the unsaturated zone at Site 35 generally contained no detectable concentrations of BTEX, PAHs, or TPH. Two possible exceptions include subsurface soil samples obtained from wells MW-21 and MW-25 where elevated levels of TPH were detected in samples obtained approximately two or more feet above the measured groundwater surface. Oil and grease was, however, detected at every boring location and sampled depth interval. This is not unusual because oil and grease measurements are nonspecific, gravimetric analyses which can detect the presence of naturally occurring hydrocarbons. Oil and grease measurements were higher in samples which contained site-related contaminants.

Oil and grease was also detected in shallow soil samples obtained along Brinson Creek and the unnamed drainage channels north of the active ASTs. However, other fuel-related contaminants and TPH were not detected in shallow soil samples, with the exception of BCSB-01, which contained 60 mg/kg TPH as gasoline. Surface soil samples BCSB-11 and BCSB-12 located approximately 1/4 to 1/2 mile upstream of the Fuel Farm exhibited oil and grease levels of 1610 mg/kg and 1110 mg/kg, respectively. Based on stream measurements obtained by Baker, these samples were obtained from locations beyond the reach of tidal influences and, consequently, indicate that high levels of naturally-occurring hydrocarbons are present in the soil adjacent to Brinson Creek.

1.2.6 Risk Assessment

Summary of Site Risks

As part of the Interim Remedial Action RI, a human health Risk Assessment was conducted to evaluate the current or future potential risks to human health resulting from the presence of petroleum hydrocarbon contaminants identified in soil located above the seasonal high water table at Operable Unit No. 10. An ecological risk assessment was not conducted as part of the Interim Remedial Action RI for two reasons. First, soil contamination is most prevalent at or below the water table, limiting the potential for direct exposure to ecological receptors. Second, an ecological risk assessment will be performed as part of the comprehensive Site 35 RI/FS which is being performed concurrently. A summary of the key findings from both of these studies is presented below.

A risk assessment was conducted for chemicals of potential concern (COPCs) detected in subsurface soil samples. COPCs are those chemicals detected with sufficient prevalence in an environmental medium retained for quantitative evaluation. COPCs at Site 35 include only benzene and arsenic.

Exposure to subsurface soils was evaluated considering on-site workers (commercial/industrial) and potential dermal contact, particle inhalation and accidental ingestion scenarios. Future residential exposure pathways were not considered in the risk assessment because contamination was, in general, present at or below the water table.

The incremental lifetime cancer risk (ICR) for on-site workers was estimated to be $3x10^{-6}$, which falls within USEPA's generally acceptable target risk range of $1x10^{-6}$ to $1x10^{-4}$. The target risk range means that one to one hundred additional cancer cases per million exposed individuals may be considered acceptable by USEPA depending on site specific factors. An ICR value of 3×10^{-6} means that three additional cancer cases per million exposed individuals may occur.

Noncarcinogenic or systemic health effects are evaluated using a hazard index (HI) value. An HI value equal to, or exceeding 1.0 indicates that the potential for noncarcinogenic health effects exists. HI values less than 1.0 indicate that noncarcinogenic health effects will not occur subsequent to exposure. An HI value of 0.05 was calculated for the on-site Site 35 worker and, therefore, noncarcinogenic health effects will not occur.

Findings of the human health risk assessment conducted for Site 35 soils indicate that cancer risks occurring subsequent to worker-related exposure fall within the generally acceptable target risk range of 10^{-6} to 10^{-4}. Furthermore, noncarcinogenic adverse health effects will not occur subsequent to worker-related exposure.

2.0 REMEDIAL ACTION OBJECTIVES, REQUIREMENTS AND GOALS

This section presents a discussion of the remedial action objectives for the petroleum hydrocarbon impacted soil at Site 35, the Camp Geiger Area Fuel Farm, the applicable or relevant and appropriate federal and state requirements, and the remediation goals that were developed for the site.

2.1 Remedial Action Objectives

Remedial action objectives are medium-specific or operable unit-specific goals established for protecting human health and the environment. At Site 35, the specific media on which the Remedial Action is focused is petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table. Soil above the seasonal high groundwater can be presumed to have been contaminated by a source other than the groundwater itself. If remediated and the source (i.e., underground piping, UST, or unauthorized surface discharge) addressed, the remedial action can be considered permanent. On the other hand, contaminated soil located above the groundwater table on any given day, but, below the seasonal high groundwater table cannot be permanently remediated without addressing the contaminated groundwater itself. All contaminated soil located below the seasonal high groundwater table will be addressed under the on-going full RI/FS at Site 35.

The remedial action objectives for the petroleum hydrocarbon contaminated soils located above the seasonal groundwater table at Site 35 include:

- Prevention of human and environmental exposure to the contaminated soils.
- Remediation to ARAR-based cleanup levels.

2.2 Applicable or Relevant and Appropriate Requirements

Under Section 121(d)(1) of CERCLA, remedial actions must attain a degree of cleanup which assures protection of human health and the environment. Additionally, CERCLA remedial actions that leave any hazardous substances, pollutants, or contaminants on site must meet, upon completion of the remedial action, a level or standard of control that at least attains standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate" under the circumstances of the release. These requirements are known as

"ARARs" (Applicable or Relevant and Appropriate Requirements). ARARs are derived from both federal and state laws. CERCLA's definition of "Applicable Requirements" is:

> . . . cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site.

CERCLA's definition of "Relevant and Appropriate Requirements" is:

> . . . cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

EPA has also indicated that "other" federal and state criteria, advisories, and guidelines may have To Be Considered (TBC) during the development of remedial alternatives. TBCs are not promulgated, not enforceable, and do not have the same status as ARARs. Yet, they may be useful in establishing a cleanup level or in designing the remedial action, especially when no specific ARARs exist or not sufficiently protective. Examples of such other criteria include EPA Drinking Water Health Advisories, Carcinogenic Potency Factors, and Reference Doses.

There are three types of ARARs/TBCs. The first type, chemical-specific ARARs/TBCs are requirements which set health or risk-based concentration limits or ranges for specific hazardous substances, pollutants, or contaminants. Maximum Contaminant Levels (MCLs) for groundwater and the National Air Quality Standards are examples of chemical-specific ARARs.

The second type of ARARs/TBCs, location-specific, set restrictions on activities based upon the characteristics of the site and/or surrounding area. Examples of this type of ARAR include federal and state siting laws for hazardous waste facilities and sites on the National Register of Historic Places.

The third classification of ARARs/TBCs, action-specific, refers to the requirements that set controls or restrictions on particular activities related to the management of hazardous substances, pollutants, or contaminants. RCRA regulations for closure of hazardous waste storage units, RCRA incineration standards, and pretreatment standards under the Clean

Water Act for discharges to publicly-owned treatment works (POTWs) are examples of action-specific ARARs.

ARARs/TBCs can be identified only on a site-specific basis. They depend on the detected chemicals at a site, specific site characteristics, and particular remedial actions proposed for the site.

A set of chemical-specific, location-specific, and action-specific ARARs/TBCs were identified and evaluated for Site 35. Table 2-1 presents a summary of the ARARs/TBCs that were determined to be applicable to the site.

A major consideration during ARARs/TBCs selection at Site 35 was the classification of petroleum-contaminated soil as a nonhazardous substance. Note, in accordance with CERCLA Title I, Section 101(14), the definition of a hazardous substance "... does not include petroleum, including crude oil or any fraction thereof which is not .... otherwise specifically listed or designated as a hazardous substance ...." Similarly, CERCLA Section 104(a)(2) excludes petroleum from the definition as a pollutant or contaminant. In addition, a July 31, 1987 memorandum from the USEPA General Counsel to the Assistant Administrator for Solid Waste and Emergency Response states that "... petroleum under CERCLA also includes hazardous substances which are normally mixed with or added to crude oil or crude fractions during the refining process." These substances would, therefore, include benzene, toluene, ethylbenzene, and xylene (BTEX) and TPH and would also be excluded from regulation under CERCLA. Results of Toxicity Characteristic Leaching Procedure (TCLP) and RCRA hazardous characteristics tests on composite surface and subsurface soil samples obtained from Site 35 under the Interim Remedial Action RI further indicate that the proper classification of the soil is as a nonhazardous substance.

2.3 Remediation Goals

The proposed remedial action at Site 35 is focused on petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table. Based on the data obtained to date, three areas of soil contamination requiring remediation have been identified which are depicted on Figure 2-1. The first area is located in the vicinity of the Fuel Farm ASTs. The other two areas are located north of the Fuel Farm. The larger of the other two areas is located along "F" Street and is based primarily on contaminated soil samples located above the seasonal high groundwater table obtained from hand auger boring HA-7, soil boring MW-21,

TABLE 2-1

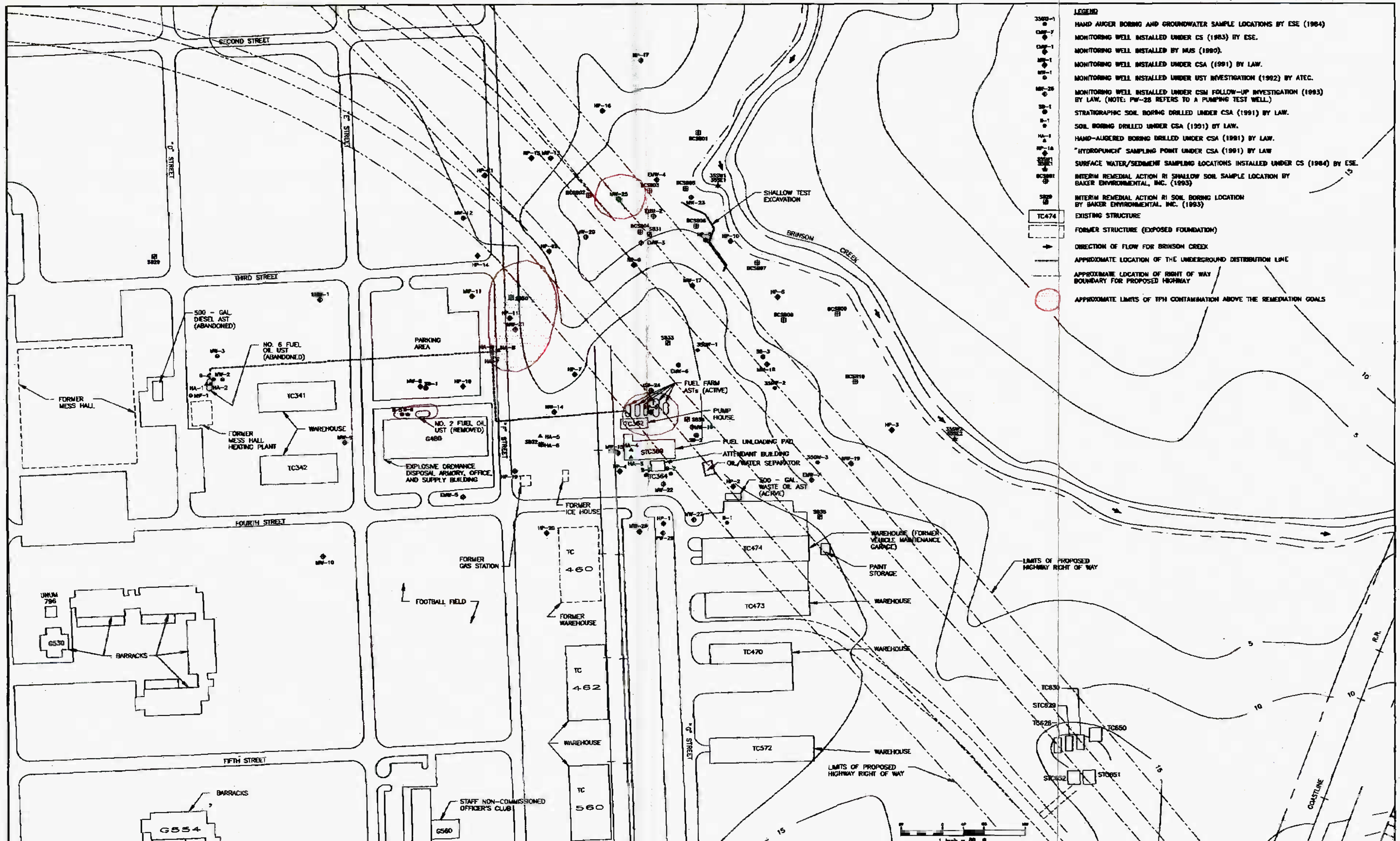
SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND CRITERIA TO BE CONSIDERED
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

ARAR/TBC Type	Standard, Requirement, Criteria, or Limitation	Description	Comments
Chemical-Specific	NCDEHNR guidelines for soil remediation (NCDEHNR, Division of Environmental Management, Groundwater Section, March 1993)	Provides a means for establishing TPH soil cleanup levels using a site characterization and rating system.	All individual chemical compounds are covered by the TPH cleanup levels unless non-petroleum hydrocarbons are present which is not the case at Site 35.
Location-Specific	Endangered Species Act (50 CFR Part 200 and Part 402)	Requires action to conserve endangered species within critical habitats upon which endangered species depend, involves consultation with the Department of Interior.	Endangered species have been identified near the site. This Act will be applicable if these endangered species are found at the site.
Location-Specific	Fish and Wildlife Coordination Act (16 USC 661-666)	Requires action to protect fish and wildlife from actions modifying streams or areas affecting streams.	Brinson Creek is located adjacent to OU No. 10. If remedial actions are implemented that modify or impact this stream, then this will be an ARAR.
Location-Specific	Executive Order 11990 on Protection of Wetlands (40 CFR 6)	Establishes special requirements for federal agencies to avoid the adverse impacts associated with the destruction of loss of wetlands.	Based on a review of Wetland Inventory Maps, low-lying areas contiguous to Brinson Creek are wetlands. If remedial actions are implemented that modify or impact these wetlands, this will be an ARAR.
Location-Specific	Executive Order 11988 on Floodplain Management	Establishes special requirements for federal agencies to evaluate the adverse impacts associated with direct and indirect floodplain development.	The 100-year floodplain of Brinson Creek adjoins Site 35. If remedial actions are implemented that modify or impact the 100-year floodplain, then this will be an ARAR.

TABLE 2-1 (Continued)

SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND CRITERIA TO BE CONSIDERED
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

ARAR/TBC Type	Standard, Requirement, Criteria, or Limitation	Description	Comments
Action-Specific	Clean Air Act - National Ambient Air Quality Standards (40 CFR 50)	Federal air standards established for six criteria pollutants.	These standards may be applicable for any alternative that generate air pollutants.
Action-Specific	Clean Water Act (33 USC 404)	Prohibits discharge of dredged or fill material into a wetland without a permit.	This will be an ARAR due to the proximity of wetlands associated with Brinson Creek.
Action-Specific	NCDEHNR guidelines for soil remediation (NCDEHNR Division of Environmental Management, Groundwater Section, March 1993)	Provides guidelines for the application of various remediation methods to petroleum hydrocarbon impacted soil.	Covers on-site and off-site treatment and off-site disposal and is an ARAR pertaining to remedial actions undertaken at this site.



LEGEND	DATE JULY 1994 SCALE 1" = 80' DRAWN WJH REVIEWED DLB S.O.# 62470-232-0000-07000 CADD# 2325029	NORTH

INTERIM PROPOSED REMEDIAL ACTION PLAN CTO-0160
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

LIMITS OF TOTAL PETROLEUM HYDROCARBON SOIL CONTAMINATION
SITE 35 - CAMP GEIGER AREA FUEL FARM

SCALE 1" = 80'   DATE JULY 1994

FIGURE No. 2-1

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and possibly soil boring SB30. The small area is based on contaminated soil samples obtained from soil boring MW-25. It is estimated that approximately 3,700 cubic yards (4,900 tons) of contaminated soil is present in these areas (see Appendix A).

The analytical data generated as part of the Interim Remedial Action RI and data generated during previous investigations conducted at Site 35 identified the presence of TPH contaminated soil in the vicinity of the Fuel Farm ASTs and to the north and northwest of the Fuel Farm in a broad area extending from the former UST adjacent to the Explosive Ordnance Disposal Building to vicinity of monitoring well MW-25. In general, the analytical data suggests that the majority of the petroleum hydrocarbon contaminated soil is present along a narrow zone that begins just above the top of the shallow groundwater table. In essence, this contaminated soil is an extension of groundwater contamination which has been identified under the previous investigations and, particularly under the CSA conducted by Law. It can be assumed that seasonal fluctuations in the contaminated groundwater table has resulted in the contamination of soil just above the groundwater table. This is supported by data which shows very little contamination is present in soil located more than a foot or two above the shallow groundwater table as measured on two separate dates by Law and Baker. Two apparent exceptions include subsurface soil samples obtained from well borings MW-21 and MW-25 where elevated levels of TPH were detected in samples obtained approximately two or more feet above the measured groundwater surface.

The baseline risk assessment conducted at Site 35 examined the potential for adverse human health effects to occur subsequent to subsurface soil exposure. Results of the baseline risk assessment indicate that the unacceptable cancer risks and adverse noncarcinogenic health effects associated with potential on-site worker exposure will not occur. On-site workers were considered the only potential human receptors because of the proximity of soil contamination to the water table and proposed plans to construct a highway through the site. Results of the baseline risk assessment indicate that a no action remedy would be adequately protective of human health. No ecological risk assessment was conducted as part of the Interim Remedial Action RI because of the depths of the soil contamination limits possible ecological exposure to contaminated soil. An ecological risk assessment will conducted as part of the comprehensive RI/FS that is being performed concurrently at Site 35.

Because unacceptable human health risks are not expected at Site 35, the scope and goals for the remediation of petroleum hydrocarbon contaminated soil were developed based on NC DEHNR guidelines for soil remediation (NC DEHNR, 1993) which falls under the category of

TBC versus ARAR because these guidelines are not promulgated or enforceable. The NC DEHNR guidelines address the presence of low and high boiling point petroleum hydrocarbons and oil and grease. Remediation goals based on the NC DEHNR guidelines were developed by performing a Site Sensitivity Evaluation (SSE). Based on the SSE, remediation goals were developed as follows:

- TPH (via EPA Method 5030/8015: low boiling point) = 40 mg/kg
- TPH (via EPA Method 3550/8015: high boiling point) = 160 mg/kg
- Oil and Grease (via EPA Method 8071) = 800 mg/kg

Oil and grease was subsequently excluded from the remediation goals because it was detected in background surface soil samples (BCSB11 and BCSB13) samples located approximately 1/4 to 1/2 mile upstream of the Fuel Farm at levels on the order of 1610 mg/kg and 1110 mg/kg, respectively, or more than twice the remediation goal based on the SSE. Stream level measurements indicate the locations of the upstream surface soil samples to be beyond the reach of tidal influences and, consequently, indicate that high levels of naturally occurring hydrocarbons are present in the soil adjacent to Brinson Creek. Although other surface soil samples obtained under the Interim Remedial Action RI indicted the presence of oil and grease at levels as high as 7,500 mg/kg, only one of the surface soil samples (BCSB01) exhibited both detectable concentrations of TPH (60 mg/kg) and oil and grease (3,000 mg/kg). The discrepancy is likely due to the fact that oil and grease is a gravimetric analysis which is highly subject to interferences and influences such as those presented by many naturally occurring organic chemicals that could be expected to be present in the frequently flooded soils adjacent to Brinson Creek.

Based on the remediation goals, soils exhibiting TPH levels in excess of 40 mg/kg as measured by EPA Method 5030/8015 and 160 mg/kg as measured by EPA Method 3550/8015 will be subject to remediation.

3.0 IDENTIFICATION AND PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES

The purpose of this section is to identify general response actions and to conduct a preliminary screening of remedial action technologies that may be applicable for the petroleum hydrocarbon contaminated soil at Site 35. Section 3.1 identifies a set of general response actions that may be applicable to the site. Section 3.2 includes the identification of remedial technologies applicable to soil remediation. Section 3.3 presents the preliminary screening of the set of identified remedial technologies. Section 3.4 presents a summary of the preliminary screening, and Section 3.5 presents the process option evaluation.

3.1 General Response Actions

General response actions are broad-based, medium-specific categories of actions that can be identified to satisfy the remedial action objectives of an FS. For this Interim Remedial Action FS, petroleum hydrocarbon contaminated soil at Site 35, located above the seasonal high groundwater table, is the media of concern. Based on the results of previous investigations, four areas of petroleum hydrocarbon contaminated soil (based on actual or suspected TPH concentrations) are depicted on Figure 2-1. The total estimated volume of contaminated soil is approximately 3,800 cubic yards (see Appendix A). The contamination has been identified as being located from roughly three to six feet bgs in the area surrounding monitoring well MW-21, from the interval three to four feet bgs in the area surrounding monitoring well MW-25, and from the interval three to four feet in the vicinity of the UST formerly located on the north side of Building G480. No data is available directly beneath the Fuel Farm, but it has been assumed that some soil contamination exists in this area since the Fuel Farm is the likely source of the shallow contaminated groundwater plume located in this area (Law, 1992). The Fuel Farm is scheduled to be dismantled in November 1994.

Five general response actions have been identified for the petroleum hydrocarbon contaminated soils at Site 35: (1) No Action, (2) Institutional Controls, (3) Containment Actions, (4) Source Removal, and (5) Treatment and Disposal Actions. A brief description of each of these response actions follows.

3.1.1 No Action

A no action response provides the baseline assessment for the comparison with other remedial alternatives that have a greater level of response. A no action response may be considered appropriate when an alternative response action may cause a greater environmental or health danger than the no action alternative itself. The NCP requires the evaluation of the no action response as part of the FS process.

3.1.2 Institutional Controls

Institutional controls are various "institutional" actions that can be implemented at a site as part of a complete remedial alternative to minimize exposure to potential hazards at the site. Institutional controls may include monitoring (i.e., soil and groundwater) programs, access restrictions (i.e., fencing), and land-use limitations (i.e., deed restrictions). The application of institutional controls is a means of allowing contaminated media to remain in place under controlled conditions.

3.1.3 Source Control and Containment

Source control and containment measures include various technologies which contain and/or isolate the constituents of concern on a site. The measures provide isolation and prevent direct exposure with or migration of the contaminated media without disturbing or removing the waste from the site. Containment technologies generally include surface controls (e.g., grading, revegetation), capping, or vertical barriers.

3.1.4 Source Removal

Excavation of contaminated soil is typically performed to make the soil available for treatment or disposal in an on-site or off-site landfill. Excavation is generally accomplished with conventional heavy construction equipment including backhoes, cranes, bulldozers, loaders, scrapers, and haulers. Excavation is applicable to almost all sites containing contaminated soil. The cost of excavation depends on factors such as the vertical and horizontal extent of contamination, and the presence of surface structures that would impede direct excavation.

3.1.5 Treatment and Disposal

Treatment options for petroleum hydrocarbon contaminated soil can be broadly categorized as biological, physical/chemical, and thermal. Each treatment category can be subdivided into in-situ and ex-situ applications. All in-situ applications are by definition, on-site options, whereas, ex-situ applications may be either on site or off site. The petroleum hydrocarbon contaminated soil at Site 35 is classified as nonhazardous waste suitable for disposal in an appropriately permitted solid waste landfill. The purpose of any treatment, therefore, would be to upgrade the environmental characteristics of the contaminated soil so that this material will be suitable for reuse (e.g., backfill or compost) so as to avoid landfill disposal.

3.2 Identification of Remedial Action Technologies

Potentially applicable technology types and process options were identified for Site 35 for each corresponding general response action. The term 'technology type' refers to general categories of technologies such as physical/chemical treatment, thermal treatment, and biological treatment. The term 'process option' refers to specific processes within each technology type. For example, bioventing is an in-situ biological treatment process option and soil washing is an ex-situ physical/chemical process option. Several technology types may be identified for each general response action, and multiple process options may exist within each technology type.

Remedial action technologies potentially applicable to the petroleum hydrocarbon impacted soils at Site 35 are listed on Table 3-1 with respect to their corresponding general response action. Also identified on the table are applicable process options associated with each of the listed technologies. The technologies/ process options will be screened in the next section.

3.3 Preliminary Screening of Remedial Action Technologies

In this step, the set of technology types and process options identified in the previous section were reduced (or screened) by evaluating the technologies/process options with respect to technical implementability and site-specific factors. This screening step is site-specific and was accomplished by using readily available information from the Interim Remedial Action RI on contaminant types and concentrations and on-site characteristics to screen out technologies and process options that could not be effectively implemented at the site (USEPA, 1988a). One unique factor considered during the preliminary screening process at Site 35 is that the site is currently being considered by the North Carolina Department of Transportation (NCDOT) for the construction of a four lane, divided highway. The proposed right-of-way, according to the most current information available at the time this report was prepared, is aligned roughly parallel to Brinson Creek. The centerline of the right-of-way is located between the Fuel Farm

TABLE 3-1

POTENTIAL REMEDIAL ACTION TECHNOLOGIES AND PROCESS OPTIONS
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Technology Type	Process Option	Disposal Option
No Action	Passive Remediation	--	Soil remains in place.
Institutional Controls	Monitoring	Groundwater Monitoring	Soil remains in place.
		Soil Monitoring	Soil remains in place.
	Land-Use Limitations	Deed Restrictions	Soil remains in place.
	Access Restrictions	Fencing	Soil remains in place.
Source Control and Containment	Capping	Clay/Soil Cap	Soil remains in place.
		Asphalt/Concrete Cap	Soil remains in place.
		Soil Cover	Soil remains in place.
		Multilayered Cap	Soil remains in place.
	Isolation Barriers	Slurry Wall	Soil remains in place.
		Sheet Pile Wall	Soil remains in place.
	Grading	Grading	Soil remains in place.
	Revegetation	Revegetation	Soil remains in place.
Source Removal	Excavation	Excavation	Treatment for reuse or placement in an off-site landfill.
Treatment and Disposal	Biological Treatment	In-Situ ● Biodegradation ● Bioventing	Soil remains in place.

TABLE 3-1 (Continued)

POTENTIAL REMEDIAL ACTION TECHNOLOGIES AND PROCESS OPTIONS
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Technology Type	Process Option	Disposal Option
Treatment and Disposal (continued)	Biological Treatment (continued)	Ex-Situ ● Composting ● Landfarming ● Slurry Reactors	Soil treated for reuse as fill.
	Physical/Chemical Treatment	In-Situ ● Soil Vapor Extraction ● Soil Flushing ● Solidification/Stabilization ● Pneumatic Fracturing	Soil remains in place.
		Ex-Situ ● Soil Vapor Extraction ● Soil Washing ● Solidification/Stabilization ● Soil Aeration ● Dehalogenation ● Solvent Extraction ● Chemical Reduction/Oxidation ● Soil Recycling	Soil treated for reuse as fill. Soil used for the production of bricks or asphalt.
	Thermal Treatment	In-Situ ● Vitrification ● Heat Enhanced Vapor Extraction	Soil remains in place.
		Ex-Situ ● Vitrification ● Incineration ● Low-Temperature Thermal Desorption ● High-Temperature Thermal Desorption ● Pyrolysis	Soil treated for reuse as fill.
	Disposal	Solid Waste Landfill	Landfill

and Brinson Creek (see Figure 2-1). NCDOT has indicated its desire to initiate construction of this highway in the summer of 1995.

Baker, to date, has not participated with NCDOT in detailed discussions concerning the proposed highway. Nevertheless, based upon a review of the available boring logs and Baker's extensive experience with highway and geotechnical design, it was assumed that as much as five feet (plus or minus a foot or two) of soil located above the seasonal high groundwater table would be removed along the right-of-way and replaced with compacted fill to provide an adequate foundation for the highway. The assumed need for soil excavation is physical rather than environmental in that available boring logs indicate that potentially five feet of geotechnically unsuitable, soft soil is present across much of the site at the ground surface.

A brief description of each technology/process option and the preliminary screening is presented below.

3.3.1 No Action

The no action response provides a baseline for comparison with other soil response actions. Under the no action response for Site 35, the petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table will be left in place. Presumably, some attenuation of contaminant levels will occur over time, however, this form of remediation is strictly passive.

The effectiveness of the passive remediation process relies upon several natural processes such as biodegradation, volatilization, photolysis, leaching, and adsorption to mitigate contaminants of concern. Factors that influence the natural processes for passive remediation include: water content in soil, soil porosity/permeability, clay content, adsorption site density, pH, oxidation/reduction potential, temperature, wind, evaporation, precipitation, indigenous microbial community, chemical composition and concentration, depth of incorporation, irrigation management, soil management, and availability of nutrients. These factors will not affect all natural processes in the same manner. For example, extremely high temperatures will enhance subsurface volatilization but also inhibit biodegradation. The effectiveness of passive remediation depends on complex relationships among all of the natural processes and is a function of the above-mentioned factors (Weston, 1991).

As required by the NCP, the no action response will be retained for further evaluation.

3.3.2 Institutional Controls

This section discusses and evaluates the three institutional controls identified for Site 35 which include monitoring, land-use limitations, and access restrictions.

3.3.2.1 Monitoring

Monitoring refers normally to groundwater and soil monitoring at sites where contaminated soil is of concern. Groundwater monitoring is useful if it can be used to determine the degree that groundwater has been impacted over time by contaminated soil. At Site 35, data obtained to date indicates that the shallow groundwater is already sufficiently impacted such that it is unlikely a significant increase in contamination will result from the leaching of additional contaminants from the soil. Groundwater monitoring may be an appropriate institutional control relative to the groundwater contamination problem itself. However, it does not appear to be an effective institutional control for soil contamination and will not be retained for further evaluation.

A soil monitoring program at Site 35 is not applicable, because under the proposed highway construction scenario, the impacted soil will either be removed or will be inaccessible because the highway will be, in effect, a soil cap. Therefore, soil monitoring will not be implementable and has not been retained for further evaluation.

3.3.2.2 Land-Use Limitations

Deed restrictions are a form of land-use limitation that may be used as an institutional control measure. Selected areas within a site may be subject to a deed restriction thereby limiting the future use of that land. A typical example is a RCRA landfill. After a landfill has been closed, that area of land becomes subject to a deed restriction providing that no future disturbance (development, excavation, etc.) is permitted.

The construction of a highway over the property would, in essence, serve as a deed restriction for the indefinite life of the highway. As indicated on Figure 2-1, a portion of the identified zone of soil contamination extends outside of the limits of the proposed highway right-of-way. It has been assumed that the edge of the proposed highway could be extended to include this area and, for that matter, the precise limits of the highway right-of-way will not be finalized until the completion of the final highway design. Therefore, land-use limitations will be retained for further evaluation.

3.3.2.3 Access Restrictions

Limiting access to a site via fencing can be considered an institutional control. If the highway is constructed, fencing is impractical because a highway cannot be enclosed by a fence on four sides. Because this institutional control would be ineffective, it has not been retained for further evaluation.

3.3.3 Source Control and Containment

This section presents source control and containment options including capping, isolation barriers, grading, and revegetation.

3.3.3.1 Capping

Capping techniques are employed whenever contaminated materials are to be buried or left in place at a site. Capping prevents contact with contaminated soil. Capping is a reliable technology for sealing off contamination from the aboveground environment, for minimizing underground migration of wastes, and for use as a physical contact barrier. There are many variations in cap designs and materials that are available. Potential capping materials include: bentonite clay, synthetic membranes, natural soils, admixed soils, portland cement, and bitumen (emulsified asphalt). Most caps consist of multiple layers of material. Single layer designs are typically used for special purposes such as a physical contact barrier (Wagner, 1986).

At this site, the proposed highway will be, in essence, a cap although the design and construction of the highway will likely entail the removal of contaminated soil that such a cap is intended to cover. Nevertheless, the highway is a form of multi-layered soil cap and has been retained for further evaluation.

3.3.3.2 Isolation Barriers

Isolation barriers typically refer to a form of vertical construction that is placed completely around a zone of contamination to isolate the zone. Isolation barriers are often constructed with a horizontal cap at the ground surface to restrict vertical infiltration of water through the zone of contamination. The two most common types of vertical barriers include slurry walls and sheet pile walls.

Slurry walls refer to a two to three-foot wide wall of soil bentonite that is installed as a slurry. Typically, the slurry is either poured into a mechanically excavated trench or mixed under pressure directly into the subsurface soil with large augers. Sheet pile walls refer to interlocking steel sheets that are driven directly into the ground.

Although isolation barriers would be effective, it may be difficult to integrate this option into the overall highway design without delaying the proposed highway construction. Therefore, isolation barriers have not been retained for further evaluation.

3.3.3.3 Grading

Grading is the general term applied to methods used to reshape the land surface to manage surface water infiltration and runoff and to control erosion (USEPA, 1987a). Site grading will be performed as part of the proposed highway construction and, therefore, has not been retained for further evaluation as an independent source control and containment action.

3.3.3.4 Revegetation

The establishment of a vegetative cover is a cost-effective method to stabilize the surface of a newly graded and/or capped site (USEPA, 1987a). Revegetation is an integral part of highway embankment construction and, therefore, has not been retained for further evaluation as an independent source control and containment action.

3.3.4 Source Removal

Source removal at Site 35 refers to the excavation of contaminated soil located above the seasonal high groundwater table. Contaminated soil located below the level of the seasonal high groundwater table will be addressed under the comprehensive FS that will consider remedial alternatives for contaminated groundwater. Excavation of contaminated soil followed by land disposal or treatment are performed extensively in waste site remediation. In this case, appropriate land disposal is at an off-site solid waste facility permitted to accept nonhazardous, petroleum hydrocarbon contaminated soil and treatment may include one or more available on-site or off-site technologies.

Excavation activities involve the physical removal of contaminated soil by using conventional heavy construction equipment such as backhoes, cranes, bulldozers, and loaders. This is a common and well-established technique used at many waste sites. A typical practice is to excavate and remove contaminated 'hot spots' and to employ other remedial technologies for less contaminated soils.

Excavation is appropriate for the petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table at Site 35 and will be retained for further evaluation.

3.3.5 Treatment and Disposal

This section discusses the treatment and disposal actions identified for Site 35 which include biological treatment, physical/chemical treatment, thermal treatment, in-situ treatment, and off-site landfill/disposal.

3.3.5.1 Biological Treatment

Biological treatment refers to a natural process where microorganisms metabolize contaminants for food and fuel. In general, this technology is used for the mitigation of organic contaminants versus inorganic contaminants. At the current state of commercial development, it is most effective on light and medium molecular weight hydrocarbons, nonchlorinated or monochlorinated organic compounds and one, two, and three-ring aromatic compounds. Depending on the method of application, and numerous other variables, the required treatment period can vary from days to years. However, most biotreatment projects are designed to complete a treatment cycle in three to six months (Swett, 1992).

The technology has both in-situ and ex-situ applications and can be both aerobic and anaerobic. Aerobic applications are the most common because oxygen-induced biodegradation is generally more efficient than anaerobic biodegradation. However, anaerobic systems have been demonstrated on a laboratory or pilot-scale to be an efficient means of biologically degrading certain multi-chlorinated organic compounds such as TCE. The most common biological treatment technologies are briefly described in the following sections.

3.3.5.1.1 *In-situ*

In-situ biological treatment involves the use of existing and/or newly introduced biomass to degrade the contaminants of concern in the contaminated soil. The biomass may need to be initially acclimated and biological activity enhanced via the addition of nutrients, oxygen, and water. Other physical parameters, such as temperature, permeability and nutrient and oxygen migration, must also be evaluated.

The two most common forms of in-situ biological treatment are referred to as biodegradation and bioventing. In biodegradation, the activity is stimulated by circulating a water-based mix of microbes, nutrients, and oxygen through the contaminated soil. In bioventing, oxygen is delivered to the contaminated soil by forced air to increase oxygen concentrations and stimulate bioactivity. The forced air injection phase of bioventing results in some volatilization if VOCs are present. Often a bioventing system includes air extraction wells to control the collection of VOCs which otherwise would seep through the ground surface and be released to the atmosphere. The bioventing process differs from conventional vapor extraction in that soil moisture and nutrient levels are monitored and maintained through the occasional application of water-based solutions.

In-situ biological treatment is commercially available for most petroleum hydrocarbon contaminated soils and would be implementable at Site 35. Its primary disadvantage is that it is a slow process where predicting the required treatment period is difficult. The proposed highway construction start date for summer 1995 may not provide sufficient time to ensure the effectiveness of this process. Therefore, it has not been retained for further evaluation.

3.3.5.1.2 *Ex-situ*

Ex-situ biotreatment differs from in-situ biotreatment in that the former is applied aboveground in a special cell or vessel. The three most common forms of ex-situ biotreatment are composting, landfarming, and slurry reactors.

Composting

Composting refers to a method that can be applied both on site and off site, however, at least one permitted off-site commercial composting facility is available which services the MCB Camp Lejeune area.

The presence of an operating off-site commercial facility makes the consideration of on-site composting impractical because of the capital costs associated with the design and construction of an on-site facility.

Composting is a proven technology for achieving accelerated biodegradation of select industrial and municipal wastes under controlled conditions. In composting, the material to be composted may be mixed with a bulking agent such as wood chips, straw, horse manure, sawdust, leaves, or paper. The bulking agent can serve as a source of carbon, nutrients, or microbes, in addition to increasing porosity and aeration. Once the mixture is in place, it undergoes a self-heating process caused by microbial activity. After composting, the material is usually cured for approximately 30 days. During this period, additional decomposition as well as stabilization, pathogen destruction, and degassing take place. The decomposted waste is reduced in weight and volume, and the process produces a stabilized material which can be used as backfill (USEPA and USAF, 1993).

Composting is a potentially effective technology for the remediation of petroleum hydrocarbon contaminated soil at Site 35 and will be retained for further evaluation.

Landfarming

In landfarming, contaminated soil is spread over the ground surface or across a treatment cell constructed with an impermeable liner and periodically turned over or tilled to maximize oxygen transfer and stimulate bioactivity. It has documented success as a technology effective for the treatment of petroleum hydrocarbon contaminated soil. The process differs from conventional soil aeration in that moisture and nutrient levels are monitored and maintained to maximize bioactivity, (Freeman, 1989). Landfarming can be performed on site or off site. However, as with composting, a permitted, operating off-site commercial landfarming is available that services the MCB Camp Lejeune area which makes the design and construction of an on-site facility impractical. Since this is a potentially effective technology for petroleum hydrocarbon contaminated soil, off-site landfarming has been retained for further evaluation.

Slurry Reactors

Slurry reactors refer to biological treatment technology whereby fiberglass or steel tanks are used to contain and treat contaminants in an aqueous slurry. The slurry is created by combining soil or sludge with water and other additives. The slurry is mixed to keep solids suspended and microorganisms in contact with the soil contaminants. Nutrients, oxygen, and pH in the bioreactor are controlled to optimize biodegradation. Upon completion of the process, the slurry is dewatered and the treated soil is disposed (Ross, 1990).

Slurry reactors represent perhaps the most efficient means of biotreatment because all of the variables (i.e., temperature, oxygen levels, nutrients, etc.) can be readily controlled and optimized. The capital, operation and maintenance costs associated with this technology have limited its application to sites where the impacted soil matrix includes a substantial amount of clay which limits oxygen transfer by more conventional techniques. Since the media concern at Site 35 is primarily petroleum hydrocarbon contaminated sand and silt, slurry reactors would likely not be cost effective with other technologies and has not been retained for further evaluation.

3.3.5.2 Physical/Chemical Treatment

Physical/chemical treatment refers to a broad spectrum of technologies. Physical treatment involves a physical process that does not include a chemical, biological, or temperature induced reaction. Chemical treatment processes are those where the primary catalyst is a chemical reaction.

3.3.5.2.1 In-Situ

In-situ physical/chemical treatment includes processes such as vapor extraction, soil flushing, solidification/stabilization, and pneumatic fracturing.

Soil Vapor Extraction

Soil vapor extraction (SVE) is an in-situ technology for extracting and removing VOCs from the vadose or unsaturated zone in subsurface soils. It is most effective in granular, highly permeable soil. Well points are used to induce a vacuum that allows for the extraction of VOCs in gaseous form. Sometimes vacuum well points are combined with air injection well points to maximize air transfer through the contaminated zone. The extracted contaminated gas first passes through a vapor-liquid separator. The resulting off-gas will normally undergo activated carbon treatment before being released into the atmosphere. Subsurface vacuum and soil vapor concentrations are monitored using vadose zone monitoring wells (Hutzler, 1990).

SVE technology is commercially proven and would be implementable and likely effective at Site 35. However, it is difficult to predict the required period of treatment for this technology and remediation may not be complete in time for the start of highway construction currently proposed for summer 1995. Therefore, it has not been retained for further evaluation.

Soil Flushing

Soil flushing is an in-situ technology for extracting organic and inorganic compounds from soil media using extraction fluids and an injection/recirculation network. Extraction fluids include water, water surfactant mixtures, acids or bases (for inorganic) compounds, chelating agents, oxidizing agents, or reducing agents. The extraction fluids are injected into the area of contamination, and the contaminated eluate is pumped to the surface for on- or off-site treatment, disposal, recirculation, or reinjection. Soil characteristics such as type, conductivity, containment, and uniformity must be considered prior to application of this technology. In addition, soil flushing solutions must have good extraction capability, low volatility, minimal toxicity, and be amenable to recovery or recycling (USEPA and USAF, 1993).

Unlike SVE technology, soil flushing does not have an extensive successful commercial track record. If it were applied at Site 35, it would be difficult to accurately predict its required period of operation, meaning that remediation may not be complete in time for the start of highway construction. Therefore, it has not been retained for further evaluation.

Solidification/Stabilization

In-situ solidification/stabilization refers to a variety of processes where contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization) (USEPA and USAF, 1993).

Solidification/stabilization has documented success in reducing the leachability of metals in soil, but, its effectiveness with organic chemicals, such as those at Site 35, has been inconsistent. Therefore, it has not been retained for further evaluation.

Pneumatic Fracturing

Pneumatic fracturing is an in-situ technology where pressurized air is injected beneath the surface to develop cracks in low permeability and over-consolidated sediments, opening new passageways that increase the effectiveness of many in-situ processes and enhance extraction efficiencies (USEPA and USAF, 1993).

The shallow soils at Site 35 are comprised primarily of permeable sands which are not representative of the conditions for which pneumatic fracturing was designed. Therefore, it has not been retained for further evaluation.

3.3.5.2.1 Ex-Situ

Ex-situ physical/chemical treatment includes soil vapor extraction, soil washing, solidification/ stabilization, soil aeration, dehalogenation, solvent extraction, chemical reduction/oxidation, and soil recycling.

Vapor Extraction

Soil vapor extraction (SVE) as an ex-situ technology is identical to its in-situ counterpart except that the soil is placed in a pile atop the ground surface and rigged for the application of a vacuum. The technology can be expected to be nearly 100 percent effective on the volatile portion of the petroleum hydrocarbons present in the soil, less effective on semivolatiles, and ineffective on non-volatile hydrocarbons. Based on data obtained to date, the nature of the contamination in the soil at Site 35 appears to be comprised primarily of volatile and semivolatile hydrocarbons which this technology is designed to remediate. Therefore, it has been retained for further evaluation.

Soil Washing

Soil washing is the technical ex-situ equivalent to soil flushing described previously. Contaminated soil is washed with a water/surfactant solution on a preconstructed pad or within a specially designed unit. Discharge fluids are collected and treated. This technology is potentially effective for petroleum hydrocarbon contaminated soil. Therefore, it has been retained for further evaluation.

Solidification/Stabilization

Solidification/stabilization as an ex-situ process is technically similar to its in-situ counterpart. It has not been retained for further evaluation because it is a technology applicable primarily to metals contaminated soil and has an inconsistent track record with organic contaminated soil.

Soil Aeration

Soil aeration is an ex-situ process whereby the soil is vigorously agitated by various mechanical means in an effort to release VOCs to the atmosphere. Soil aeration can be implemented via mechanical tilling and mixing or merely using a backhoe bucket to pick the soil up and move it around on a low permeability pad. Like soil vapor extraction it may be effective for remediating the petroleum hydrocarbon contamination at Site 35. Therefore, it has been retained for further evaluation.

Dehalogenation

Dehalogenation is an ex-situ process designed to remove chlorinated organic compounds in a slurry batch reactor. Since chlorinated compounds are not a component of the contaminated soil at Site 35, this technology has not been retained for further evaluation.

Solvent Extraction

Solvent extraction is an ex-situ process whereby waste and solvent are mixed in an extractor, dissolving the organic contaminant into the solvent. The extracted organics and solvent are then placed in a separator, where the contaminants and solvent are separated for treatment and further use.

The principal waste treatment application of solvent extraction is the removal of phenols which are not present at Site 35 (Freeman, 1989). Therefore, it has not been retained for further evaluation.

Chemical Reduction/Oxidation

Chemical reduction/oxidation is an ex-situ process that converts hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, and/or inert. The reducing/oxidizing agents most commonly used are ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide (Freeman, 1989).

This process is most commonly used for the treatment of metals contamination which is not a concern at Site 35. Therefore, it has not been retained for further evaluation.

Soil Recycling

Soil recycling refers to several ex-situ processes that utilize petroleum-hydrocarbon contaminated soils in the production of end products such as asphalt and brick. It is a commercially proven technology and several permitted facilities service the MCB Camp Lejeune area. It has been retained for further evaluation.

3.3.5.3 Thermal Treatment

Thermal treatment refers to processes that expose contaminated media to elevated temperatures. The processes are used to remediate soils that are contaminated with various organic chemicals, but is ineffective for metals. Broadly defined, thermal treatment can be categorized as an organic chemical destruction process (e.g., incineration and pyrolysis), an organic chemical separation process (e.g., low temperature and high temperature thermal desorption), or a organic and inorganic chemical conversion process (e.g., vitrification). The technology has in-situ and ex-situ applications which are discussed in the following sections.

3.3.5.3.1 In-Situ

In-situ thermal treatment includes vitrification and heat enhanced vapor extraction.

Vitrification

Vitrification can be applied as an in-situ process. Contaminated soils and sludges are melted at high temperature to form a glass and crystalline structure with very low leaching characteristics (USEPA and USAF, 1993). Vitrification is not a commercially established technology and would be difficult to implement in the time available prior to the construction of the proposed highway. Therefore, it has not been retained for further evaluation.

Heat Enhanced Vapor Extraction

Heat enhanced vapor extraction is an in-situ thermal process where steam/hot air injection or electric/radio frequency heating is used to increase the mobility of volatiles and facilitate extraction (USEPA and USAF, 1993). As in the case of non-heat enhanced vapor extraction, the effectiveness of this technology prior to the construction of the highway is an uncertainty. Therefore, it has not been retained for further evaluation.

3.3.5.3.2 Ex-Situ

Ex-situ thermal treatment includes vitrification, incineration, low temperature thermal desorption, and high temperature thermal desorption.

Vitrification

Vitrification as an ex-situ process is similar to its in-situ counterpart except it is applied to contaminated soil that has been excavated and placed atop the ground surface. Vitrification is not a commercially established technology and would be difficult to implement since very few firms are experienced in its application. Therefore, it has not been retained for further evaluation.

Incineration

Incineration is a commercially available ex-situ thermal treatment process where high temperatures, 1,600° - 2,200°F (871° - 1,204°C), are used to volatilize and combust (in the presence of oxygen) organic constituents in hazardous wastes (Freeman, 1989). It is a proven remedial technology for petroleum hydrocarbon soil. Therefore, it has been retained for further evaluation.

Low Temperature Thermal Desorption

Low temperature thermal desorption is a commercially available ex-situ process where wastes are heated to 200° - 600°F (93° - 315°C) to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to the gas treatment system (USEPA and USAF, 1993). Several vendors of this technology service the MCB Camp Lejeune area which use mobile units to implement this technology on site. This technology may be applied on site or off site depending on the cost of mobilization/demobilization versus hauling the contaminated soil to an off-site facility. Therefore, it has been retained for further evaluation.

High Temperature Thermal Desorption

High temperature thermal desorption is a commercially available ex-situ process where wastes are heated to 600° - 1,000°F (315°-538°C) to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to the gas treatment system (USEPA and USAF, 1993). This process is more costly than low temperature thermal desorption because of the high energy requirements needed to produce higher temperature. Since low temperature thermal desorption is routinely used to remediate petroleum contaminated soils, this higher temperature, more costly alternative is unnecessary. Therefore, it has not been retained for further evaluation.

Pyrolysis

Pyrolysis is an ex-situ process where chemical decomposition is induced in organic materials by heat in the absence of oxygen. Organic materials are transformed into gaseous components and a solid residue (coke) containing fixed carbon and ash. This process is not presently commercially available (USEPA and USAF, 1993). Therefore, it has not been retained for further evaluation.

3.4 Summary of Preliminary Remedial Action Technology Screening

The results of the preliminary technology screening are summarized on Table 3-2. The screening eliminated several remedial action technologies because they were determined to be ineffective, not implementable, or not cost effective for the site-specific conditions at Site 35. The technologies that were eliminated include:

- Groundwater and soil monitoring
- Access restrictions (fencing)
- Isolation barriers (slurry walls and sheet piling)

TABLE 3-2

SUMMARY OF SCREENING OF REMEDIAL ACTION TECHNOLOGIES FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Description	Screening Comments
No Action	Passive Remediation	Not Applicable	No Action	Required for consideration by NCP.
Institutional Controls	Monitoring	Groundwater Monitoring	Ongoing monitoring of existing monitoring wells.	Results would not be representative of the impacts from the contaminated soils at the site. Not retained.
		Soil Monitoring	Ongoing monitoring of soils via soil borings.	Not applicable due to proposed highway construction scenario. Not retained.
	Land-Use Limitations	Deed Restrictions	Serves to limit the future use of that land.	The proposed highway would, in effect, serve as a deed restriction for the life of the highway. Retained.
	Access Restrictions	Fencing	Install fencing around affected area to limit access.	Not applicable because a highway cannot be enclosed by a fence. Not retained.
Source Control and Containment	Capping	Clay/Soil Cap	Compacted clay covered with soil, over areas of contamination.	In general, CAP options are not applicable in lieu of the proposed highway construction. However, the highway itself in essence serves as a soil cap. Retained.
		Asphalt Cap	Spray application of a layer of asphalt over areas of contamination.	
		Soil Cover	Soil layer used to seal off contamination from the aboveground environment.	
		Multilayered Cap	Clay and synthetic membrane covered by soil over areas of contamination.	
	Isolation Barriers	Slurry Wall	2 to 3-foot thick soil bentonite wall encircling the impacted soil.	Difficult to integrate with highway design and construction. Not retained.
		Sheet Pile Wall	Interlocking steel sheet pile wall encircling the impacted soil.	
	Grading	Grading	Modifying the natural topography and run-off characteristics at a site to control infiltration and erosion.	Will be performed as part of proposed highway construction. Not retained as an independent remedial action.
	Revegetation	Revegetation	A vegetative cover used to stabilize the surface of a waste site.	Will be performed as part of proposed highway construction. Not retained as an independent remedial action.
Source Removal	Excavation	Excavation	Excavation and removal of contaminated soils via general construction equipment for treatment or direct disposal.	Potentially applicable. Retained.

TABLE 3-2 (Continued)

SUMMARY OF SCREENING OF REMEDIAL ACTION TECHNOLOGIES FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Description	Screening Comments
Treatment and Disposal	Biological Treatment	In-Situ Biodegradation	Stimulates microbial activity by circulating water-based solutions through impacted soil.	Not applicable because of uncertainties regarding required treatment period. Not retained.
		In-Situ Bioventing	Stimulates microbial activity be delivering oxygen via forced air while maintaining moisture and nutrient levels.	Not applicable because of uncertainties regarding required treatment period. Not retained.
		Ex-Situ Composting	Excavated soils are placed in piles where bulking agents, nutrients, and microbes are added and heat is generated to promote microbial activity.	Commercially available off site. Retained.
		Ex-Situ Landfarming	Excavated soils are spread over ground surface and tilled/mixed to maximize oxygen transfer.	Commercially available off site. Retained.
		Ex-Situ Slurry Reactors	Water is added to impacted soil and treated biologically in a fiberglass or steel tank.	Associated costs limit its use to impacted soils with substantial clay contents. Not retained.
	Physical/Chemical Treatment	In-Situ Soil Vapor Extraction	An induced vacuum is used to remove volatiles from the soil matrix.	Not applicable due to uncertain period of treatment. Not retained.
		In-Situ Soil Soil Flushing	Contaminants are flushed from impacted and collected via groundwater extraction.	Lack of extensive track record results in uncertainties regarding effectiveness and period of treatment. Not retained.
		In-Situ Solidification/ Stabilization	Contaminants are bound in a solidified mass or chemically stabilized to reduce mobility.	Primarily used for metals contaminated soils. Not retained.
		In-Situ Pneumatic Fracturing	Pressurized air used to increase permeability and remove volatile compounds.	Not applicable. Process is geared toward sites with low permeability soils. Not retained.
		Ex-Situ Soil Vapor Extraction	Same as in-situ except application is aboveground.	Potentially effective. Unlike in-situ, time is not as critical of a factor. Retained.
		Ex-Situ Soil Washing	Same as in-situ soil flushing except application is aboveground.	Potentially effective. Unlike in-situ soil flushing, time is not as critical of a factor. Retained.
		Ex-Situ Solidification/ Stabilization	Same as in-situ except application is aboveground.	Primarily used for metals contaminated soils. Not retained.

TABLE 3-2 (Continued)

SUMMARY OF SCREENING OF REMEDIAL ACTION TECHNOLOGIES FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Description	Screening Comments
Treatment and Disposal (Continued)	Physical/Chemical Treatment (Continued)	Ex-Situ Soil Aeration	Impacted soil is aggressively agitated to release volatiles to the atmosphere.	Similar to vapor extraction except capital costs are expected to be lower and treatment period is not a factor because application is ex-situ. Retained.
		Ex-Situ Dehalogenation	Slurry batch reactor chlorine removal system.	Not applicable. Contaminants of concern do not include chlorinated compounds. Not retained.
		Ex-Situ Solvent Extraction	Waste and solvent are mixed and separated to remove dissolved organics from waste.	Track record of process is based primarily on phenol removal which is not a contaminant of concern at Site 35. Not retained.
		Ex-Situ Chemical/Reduction Oxidation	Process adds chemicals to convert hazardous compounds to nonhazardous or less toxic compounds.	Process not generally used for petroleum hydrocarbons. Not retained.
		Ex-Situ Soil Recycling	Petroleum hydrocarbon impacted soil used to produce brick and asphalt.	Commercially available. Retained.
	Thermal Treatment	In-Situ Vitrification	Contaminated soils are melted at high temperatures to form a glass and crystalline structure with low leaching characteristics.	Not commercially established. May be difficult to implement in available timeframe. Not retained.
		In-Situ Heat Enhanced Vapor Extraction	Steam or hot air injection used to supplement normal vapor extraction process.	Effectiveness within available timeframe is questionable. Not retained.
		Ex-Situ Vitrification	Same as in-situ except application is aboveground.	Not commercially established. Not retained.
		Ex-Situ Incineration	Destruction of organic contaminants at high temperatures.	Proven effective. Retained.
		Ex-Situ Low Temperature Thermal Desorption	Wastes are heated to 200°-600°F to volatilize water and organic constituents.	Commercially available. Retained.
		Ex-Situ High Temperature Thermal Desorption	Wastes are heated at 600°-1,000°F to volatilize water and organic contaminants.	More costly than low temperature desorption without additional benefits in this case. Not retained.
	Disposal	Pyrolysis	Chemical decomposition is induced by heat in the absence of oxygen.	Not commercially available. High costs expected. Not retained.
		Landfill	Excavated soil transported off site to an appropriately permitted solid waste landfill.	Commonly used in North Carolina for petroleum/hydrocarbon contaminated soil. Retained.

- Grading
- Revegetation
- In-situ biodegradation
- In-situ bioventing
- Ex-situ bioslurry reactors
- In-situ soil vapor extraction
- In-situ soil flushing
- In-situ solidification/stabilization
- In-situ pneumatic fracturing
- Ex-situ solidification/stabilization
- Ex-situ dehalogenation
- Ex-situ solvent extraction
- Ex-situ chemical reduction/oxidation
- In-situ vitrification
- In-situ heat enhanced vapor extraction
- Ex-situ vitrification
- High temperature thermal desorption
- Pyrolysis

The remaining technologies passed the preliminary screening and will be considered further.

3.5 Process Option Evaluation

The objective of the process option evaluation is to select only one process option for each applicable remedial technology type to simplify the subsequent development and evaluation of alternatives without limiting flexibility during remedial design. More than one process option may be selected for a technology type if the processes are sufficiently different in their performance that one would not adequately represent the other. The representative process provides a basis for developing performance specifications during preliminary design; however, the specific process option used to implement the remedial action may not be selected until the remedial design phase. The criteria used for this evaluation was effectiveness, implementability, and relative cost.

The results of this evaluation are presented on Table 3-3. The rationale for eliminating certain technology/process options include:

TABLE 3-3

SUMMARY OF PROCESS OPTION EVALUATION FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Evaluation			Evaluation Results
			Effectiveness	Implementability	Cost	
No Action	Passive Remediation	Not Applicable	• Does not meet remediation goals • No exposures during construction; unknown impact during implementation • Not a proven or reliable technology	• Easily implemented • No equipment or workers required	None	Retained (required by NCP)
Institutional Controls	Land Use Limitations	Deed Restrictions (for proposed highway)	• Remediation goals met if contaminated soil is removed prior to or as part of highway construction • Low exposures during soil excavation	• Easily implemented • Restricts future land use for any remaining contaminated soil that may not have been identified and excavated	Low capital No maintenance (except that provided by NCDOT)	Not retained
Source Control and Containment	Capping	Proposed Highway as Soil Cover	• Remediation goals met if contaminated soil is removed prior to or as part of highway construction • Low exposures during soil excavation	• Easily implemented because highway construction to be performed by NCDOT contractor	Low capital costs vary with selected treatment/disposal option No maintenance (except that provided by NCDOT)	Not retained

TABLE 3-3 (Continued)

SUMMARY OF PROCESS OPTION EVALUATION FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Evaluation: Effectiveness	Evaluation: Implementability	Evaluation: Cost	Evaluation Results
Source Removal	Excavation	Excavation	• Can remove soils with contamination above the remedial goals • Low exposures during soil excavation • Follow-up treatment/disposal required	• Easily implemented • Equipment and workers easily obtainable • Excavated soils will need to be replaced if treated/disposed off site	Low capital; no maintenance	Retain
Treatment and Disposal	Biological Treatment	Ex-Situ Composting	• Meets remediation goals when off site facility accepts soil • Established track record for successful treatment of petroleum hydrocarbon contaminated soils	• Commercially available off site	Low capital; no maintenance	Retained (combined with ex-situ landfarming)
		Ex-Situ Landfarming	• Meets remediation goals when off site facility accepts soil • Established track record for successful treatment of petroleum hydrocarbon contaminated soils	• Commercially available off site	Low capital; no maintenance	Retained (combined with ex-situ composting)
	Physical/Technical Treatment	Ex-Situ Vapor Extraction	• Can potentially meet remediation goals • Success dependent on overall volatility of the contaminants remaining in the excavated soil	• Implementable on site, not commercially available off site • Requires off-the-shelf equipment • Treated soil could be reused as backfill	Moderate capital, moderate O&M	Not Retained
		Ex-Situ Soil Washing	• Can potentially meet remediation goals • Requires collection, treatment, and discharge of wash water	• Implementable on site via commercial vendor • Treated soil could be reused as backfill	Moderate capital, high O&M	Not Retained

TABLE 3-3 (Continued)

SUMMARY OF PROCESS OPTION EVALUATION FOR PETROLEUM HYDROCARBON CONTAMINATED SOIL
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

General Response Action	Remedial Technology	Process Option	Evaluation: Effectiveness	Evaluation: Implementability	Evaluation: Cost	Evaluation Results
Treatment and Disposal (Cont.)	Physical/Technical Treatment (Cont.)	Ex-Situ Soil Aeration	• Can potentially meet remediation goals • Success dependent on overall volatility of the contaminants remaining in the excavated soil	• Easily implemented on site • Requires only a PVC underliner and standard construction equipment • Treated soil could be reused as backfill	Low capital; no maintenance	Retained
		Ex-Situ Recycling	• Meets remediation goals when off site facility accepts soil • Accepted method for reusing petroleum hydrocarbon contaminated soil	• Commercially available off site	Low capital; no maintenance	Retained
	Thermal Treatment	Ex-Situ Low Temperature Desorption	• Meets remediation goals when off site facility accepts soil • Established track record for successful treatment of petroleum contaminated soil	• Commercially available as an on site technology	Low capital; no maintenance	Retained
		Incineration	• Meets remediation goals when off site facility accepts soil • Established track record for successful treatment of petroleum contaminated soil	• Commercially available off site	High capital; no maintenance	Not retained
	Disposal	Solid Waste Landfill	• Meets remediation goals if facility is appropriately permitted to accepted petroleum hydrocarbon contaminated soil	• Commercially available off site	Low capital, no maintenance	Retained

- Land-use limitations was eliminated because the proposed highway is in the planning and pre-design stage and is not considered to be optional. All of the other technology options were considered under the assumption that the highway will be constructed.

- Capping in the form of the proposed highway was eliminated because it is a baseline condition rather than a technology option. All other technology options were considered under the assumption that the highway will be constructed.

- Ex-situ composting was combined with ex-situ landfarming and retained for further evaluation as ex-situ biotreatment. Both options involve biological treatment and are available commercially from off-site vendors.

- Ex-situ soil vapor extraction was eliminated because the anticipated mobilization/demobilization and operating costs are expected to make this technology uncompetitive with other available options. Furthermore, it is similar to ex-situ soil aeration which was retained.

- Ex-situ soil washing was eliminated because the anticipated mobilization/demobilization and operating costs are expected to make this technology uncompetitive with other available options.

- Incineration was not retained because it was not expected to be cost competitive with other available thermal treatment options.

It is important to note that the elimination of a process option does not mean that the process option/technology can never be reconsidered for the site. As stated above, the purpose of this part of the FS process is to simplify the development and evaluation of potential alternatives.

4.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

In this section, general response actions and the process options chosen to represent the various technology types applicable for the petroleum hydrocarbon contaminated soil at Site 35 will be combined to form remedial action alternatives. Following development, each alternative will be evaluated against the short-term and long-term aspects of three criteria (effectiveness, implementability, and cost). The alternatives with the most favorable composite evaluation of all criteria will be retained for further consideration during the detailed evaluation (Section 5.0).

4.1 Development of Alternatives

The general response actions and process options chosen to represent the various applicable technologies identified on Table 3-3 have been combined into six remedial action alternatives (RAAs) potentially applicable for the petroleum hydrocarbon contaminated soils at Site 35. A distinction has been between on-site and off-site applications of technology process options. This is based on recent Baker telephone conversations with various local vendors who indicated whether or not a particular process option was available on-site or off-site (See Appendix B).

These RAAs combine one or more of the previously screened process options as follows:

- RAA 1: No Action
- RAA 2: Source Removal and Off-Site Landfill Disposal
- RAA 3: Source Removal and Off-Site Biotreatment
- RAA 4: Source Removal and On-Site, Ex-Situ Soil Aeration
- RAA 5: Source Removal and Off-Site Soil Recycling
- RAA 6: Source Removal and On-Site Low Temperature Thermal Desorption

The approximate areas to be remediated under RAAs 2 through 6 are depicted in Figure 2-1.

4.1.1 Alternative 1: No Action

Under the No Action RAA, no remedial actions will be performed to reduce the toxicity, mobility, or volume of the petroleum hydrocarbon contaminated soil at Site 35. This method assumes that passive remediation will occur via biodegradation and other natural attenuation processes and that the contaminant levels will be reduced over an indefinite period of time. However, the achievable reductions versus time is difficult if not impossible to predict.

At Site 35, the implementation of the No Action RAA will not result in a definable adverse risk to human health or the environment. According to the Interim Remedial Action RI Report, the petroleum hydrocarbon contaminated soil present at Site 35 are classified as non-hazardous waste and the risks associated with the contaminant levels present are within the acceptable range.

The No Action RAA is required by the NCP to provide a baseline for comparison with other soil alternatives. Since contaminants will remain at the site under this alternative, USEPA is required by the NCP [40 CFR 300.515(e)(ii)] to review the effects of this alternative no less often than every five years.

4.1.2 Alternative 2: Source Removal and Off-Site Landfill Disposal

Under Alternative 2, petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table will be excavated and transported off site to a solid waste landfill permitted to accept non-hazardous, petroleum hydrocarbon contaminated soil. The areas to be remediated are depicted in Figure 2-1.

4.1.2.1 Site Preparation Activities

Site preparation activities for this RAA will include obtaining site access, equipment mobilization/demobilization, and constructing decontamination and staging areas. It is anticipated that the Fuel Farm will have been dismantled and removed from Site 35 prior to the initiation of soil remediation activities and that some clearing of trees will be required.

4.1.2.2 Excavation, Staging, and Backfill Activities

Excavation activities will take place at the areas shown in Figure 2-1. The areal extent of the excavation will likely vary from that depicted on Figure 2-1 as this drawing is an approximation based on limited data. Nevertheless, based on the limits depicted in Figure 2-1, it is estimated that the total volume of soil to be excavated will be 7,800 cubic yards of which 3,800 cubic yards (5,100 tons) will be soil contaminated with petroleum hydrocarbons and 4,200 cubic yards will be clean (See Appendix A). Excavation will be limited to soils in the unsaturated soil zone located above the seasonally high shallow ground water table. Based on this criteria, excavation will be limited to approximately the top six feet of soil (lesser amounts in low-lying areas). All impacted soil located at or below the seasonal high groundwater table will be addressed as part of an overall groundwater remediation program at Site 35.

It is anticipated that excavation will be completed with conventional construction equipment (i.e., backhoes and front-end loaders). Soil samples will be obtained from the excavation to confirm that remediation goals have been achieved. Excavated soil will be segregated as clean or contaminated and placed on plastic sheets in staging areas near the excavation. Both clean and contaminated soils will be sampled and analyzed in the staging area to verify that only clean soil will be returned to the excavation as backfill. Additional clean borrow soil will be imported to the site for use as backfill replacing the contaminated soil hauled off site.

4.1.2.3 Off-Site Hauling and Disposal Activities

Contaminated soil will be loaded onto dump trucks at the on-site staging area for hauling to an appropriate off-site disposal facility.

4.1.2.4 Residual Waste Management Activities

Residual wastes associated with this RAA are expected to be minimal. The contaminated soil when excavated and placed in the staging area, is expected to emit volatile organic compounds to the atmosphere. These emissions will need to be monitored as part of the contractor's health and safety program. Decontamination fluids will be generated that will require sampling and disposal. Contaminated personal protective clothing, sheeting used in the staging area, and miscellaneous garbage will also be generated and require proper disposal.

4.1.3 Alternative 3: Source Removal and Off-Site Biotreatment

Alternative 3 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and biological treatment at an off-site commercial composting or landfarming facility. The areas to be remediated are depicted on Figure 2-1.

4.1.3.1 Site Preparation Activities

Site preparation activities for this RAA will include obtaining site access, equipment mobilization/demobilization, and constructing decontamination and staging areas. It is anticipated that the Fuel Farm will have been dismantled and removed from Site 35 prior to the initiation of soil remediation activities and that some clearing of trees will be required.

4.1.3.2 Excavation, Staging, and Backfill Activities

Excavation activities will take place at the areas shown in Figure 2-1. The areal extent of the excavation will likely vary from that depicted on Figure 2-1 as this drawing is an approximation based on limited data. Nevertheless, based on the limits depicted in Figure 2-1, it is estimated that the total volume of soil to be excavated will be 7,800 cubic yards, of which 3,800 cubic yards (5,100 tons) will be soil contaminated with petroleum hydrocarbons and 4,200 cubic yards will be clean (See Appendix A). Excavation will be limited to soils in the unsaturated soil zone located above the seasonally high shallow ground water table. Based on this criteria, excavation will be limited to approximately the top six feet of soil (lessor amounts in low-lying areas). All impacted soil located at or below the seasonal-high groundwater table will be addressed as part of an overall groundwater remediation program at Site 35.

It is anticipated that excavation will be completed with standard construction equipment (i.e., backhoes and front-end loaders). Soil samples will be obtained from the excavation to confirm that remediation goals have been achieved. Excavated soil will be segregated as clean or contaminated and placed on plastic sheets in staging areas near the excavation. Both clean and contaminated soils will be sampled and analyzed in the staging area to verify that only clean soil will be returned to the excavation as backfill. Additional clean borrow soil will be imported to the site for use as backfill replacing the contaminated soil hauled off site.

4.1.3.3 Off-Site Hauling and Treatment Activities

Contaminated soil will be loaded onto dump trucks at the on-site staging area for hauling to the off-site composting or landfarming facility.

4.1.3.4 Residual Waste Management Activities

Residual wastes associated with this RAA are expected to be minimal. The contaminated soil when excavated and placed in the staging area, is expected to emit volatile organic compounds to the atmosphere. These emissions will need to be monitored as part of the contractor's health and safety program. Decontamination fluids will be generated that will require sampling and disposal. Contaminated personal protective clothing, sheeting used in the staging area, and miscellaneous garbage will also be generated and require proper disposal.

4.1.4 Alternative 4: Source Removal and On-Site, Ex-Situ Soil Aeration

Alternative 4 involves the excavation of petroleum hydrocarbon contaminated soil above the seasonal high groundwater table for remediation via on-site, ex situ soil aeration. The areas to be remediated are depicted on Figure 2-1.

4.1.4.1 Site Preparation Activities

Site preparation activities for this RAA will include obtaining site access, equipment mobilization/demobilization, and constructing decontamination and staging areas. It is anticipated that the Fuel Farm will have been dismantled and removed from Site 35 prior to the initiation of soil remediation and that some clearing of trees will be required.

4.1.4.2 Excavation and Staging Activities

Excavation activities will take place at the areas shown in Figure 2-1. The areal extent of the excavation will likely vary from that depicted on Figure 2-1 as this drawing is an approximation based on limited data. Nevertheless, based on the limits depicted in Figure 2-1, it is estimated that the total volume of soil to be excavated will be 7,800 cubic yards, of which 3,800 cubic yards (5,100 tons) will be soil contaminated with petroleum hydrocarbons and 4,200 cubic yards will be clean (See Appendix A). Excavation will be limited to soils in the unsaturated soil zone located above the seasonally high shallow groundwater table. Based on this criteria, excavation will be limited to approximately the top six feet of soil. All impacted soil located at or below the seasonal-high groundwater table will be addressed as part of an overall groundwater remediation program at Site 35.

It is anticipated that excavation will be completed with standard construction equipment (i.e., backhoes and front-end loaders). Soil samples will be obtained from the excavation to confirm that remediation goals have been achieved. Excavated soil will be segregated as clean or contaminated and placed on plastic sheets in the staging area near the excavation to await treatment on-site.

4.1.4.3 On-Site Treatment and Backfill Activities

All on-site treatment will occur within the staging area. The contractor will submit a treatment plan detailing treatment and monitoring activities. The post-treated soil will be sampled and analyzed to ensure compliance with the remediation goals. Post-treated soil that achieves the remediation goals will be reused for backfill. Soil which does not achieve the remediation goals will be disposed in an off-site landfill permitted to accept petroleum contaminated soil or treated via an alternative approved technology. Additional clean borrow soil may be required for use as backfill to replace the contaminated soil hauled off site.

4.1.4.4 Residual Waste Management Activities

Residual wastes associated with this RAA are expected to be minimal. The contaminated soil when excavated and agitated/aerated in the staging area, is expected to emit volatile organic compounds to the atmosphere. These emissions will need to be monitored as part of the contractor's health and safety program. Decontamination fluids will be generated that will require sampling and disposal. Contaminated personal protective clothing, sheeting used in the staging area, and miscellaneous garbage will also be generated and require proper disposal.

4.1.5 Alternative 5: Source Removal and Off-Site Soil Recycling

Alternative 5 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and shipment to off-site commercial soil recycling facility for use in the production of bricks or asphalt. The areas to be remediated are depicted in Figure 2-1.

4.1.5.1 Site Preparation Activities

Site preparation activities for this RAA will include obtaining site access, equipment mobilization/demobilization, and constructing decontamination and staging areas. It is anticipated that the Fuel Farm will have been dismantled and removed from Site 35 prior to the initiation of soil remediation and that some clearing of trees will be required.

4.1.5.2 Excavation, Staging, and Backfill Activities

Excavation activities will take place at the areas shown in Figure 2-1. The areal extent of the excavation will likely vary from that depicted on Figure 2-1 as this drawing is an approximation based on limited data. Nevertheless, based on the limits depicted in Figure 2-1, it is estimated that the total volume of soil to be excavated will be 7,800 cubic yards, of which 3,800 cubic yards (5,100 tons) will be soil contaminated with petroleum hydrocarbons and 4,200 cubic yards will be clean (See Appendix A). Excavation will be limited to soils in the unsaturated soil zone located above the seasonally high shallow groundwater table. Based on this criteria, excavation will be limited to approximately the top six feet of soil (lesser amounts in low-lying areas). All impacted soil located at or below the seasonal high groundwater table will be addressed as part of an overall groundwater remediation program at Site 35.

It is anticipated that excavation will be completed with standard construction equipment (i.e., backhoes and front-end loaders). Soil samples will be obtained from the excavation to confirm that remediation goals have been achieved. Excavated soil will be segregated as clean or contaminated and placed on plastic sheets in the staging area near the excavation. Both clean and contaminated soils will be sampled and analyzed in the staging area to verify that only clean soil will be returned to the excavation as backfill. Additional clean borrow soil will be imported to the site for use as backfill replacing the contaminated soil hauled off site.

4.1.5.3 Off-Site Hauling and Treatment Activities

Contaminated soil will be loaded onto dump trucks at the on-site staging area for hauling to the off-site soil recycling facility.

4.1.5.4 Residual Waste Management Activities

Residual wastes associated with this RAA are expected to be minimal. The contaminated soil when excavated and placed in the staging area, is expected to emit volatile organic compounds to the atmosphere. These emissions will need to be monitored as part of the contractor's health and safety program. Decontamination fluids will be generated that will require sampling and disposal. Contaminated personal protective clothing, sheeting used in the staging area, and miscellaneous garbage will also be generated and require proper disposal.

4.1.6 Alternative 6: Source Removal and On-Site Low Temperature Thermal Desorption

Alternative 6 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table for remediation via on-site, ex-situ low temperature thermal desorption. This process involves heating the contaminated soil in a mobile unit to temperatures of 200 to 600 degrees Fahrenheit. Volatile organic compounds are separated from the soil matrix and either captured in activated carbon, released to the atmosphere, or treated via catalytic oxidation.

4.1.6.1 Site Preparation Activities

Site preparation activities for this RAA will include obtaining site access, equipment mobilization/demobilization, and constructing decontamination and staging areas. It is anticipated that the Fuel Farm will have been dismantled and removed from Site 35 prior to the initiation of soil remediation and that some clearing of trees will be required.

4.1.6.2 Excavation and Staging Activities

Excavation activities will take place at the areas shown in Figure 2-1. The areal extent of the excavation will likely vary from that depicted on Figure 2-1 as this drawing is an approximation based on limited data. Nevertheless, based on the limits depicted in Figure 2-1, it is estimated that the total volume of soil to be excavated will be 7,800 cubic yards, of which 3,800 cubic yards (5,100 tons) will be soil contaminated with petroleum hydrocarbons and 4,200 cubic yards will be clean (See Appendix A). Excavation will be limited to soils in the unsaturated soil zone defined as that zone of soil located above the seasonally high shallow groundwater table. Based on this criteria, excavation will be limited to approximately the top six feet of soil (lesser amounts in low-lying areas). All impacted soil located at or below the seasonal-high groundwater table will be addressed as part of an overall groundwater remediation program at Site 35.

It is anticipated that excavation will be completed with standard construction equipment (i.e., backhoes and front-end loaders). Soil samples will be obtained from the excavation to confirm that remediation goals have been achieved. Excavated soil will be segregated as clean or contaminated and placed on plastic sheets in the staging area near the excavation to await treatment on site.

4.1.6.3 On-Site Treatment and Backfill Activities

All on-site treatment will occur within the staging area. The contractor will submit a treatment plan detailing treatment and monitoring activities. The post-treated soil will be sampled and analyzed to ensure compliance with the remediation goals. Post-treated soil that achieves the remediation will be reused for backfill. Soil which does not achieve the remediation goals will be disposed in an off-site landfill permitted to accept petroleum contaminated soil. Additional clean borrow soil may be required for use as backfill to replace the contaminated soil hauled off site.

4.1.6.4 Residual Waste Management Activities

Residual wastes associated with this RAA are expected to be minimal. The contaminated soil, when excavated and placed in the staging area, is expected to emit volatile organic compounds to the atmosphere. These emissions will need to be monitored as part of the contractor's health and safety program. Decontamination fluids will be generated that will require sampling and disposal. Contaminated personal protective clothing, sheeting used in the staging area, and miscellaneous garbage will also be generated and require proper disposal.

4.2 Screening of Alternatives

This section presents the initial screening that was conducted on the potential RAAs developed for the contaminated soils at Site 35. The objective of this screening is to make comparisons between similar alternatives, so that only the most promising ones are carried forward for further evaluation. Thus, the alternatives will be evaluated more generally in this phase than during the detailed analysis (USEPA, 1988b).

As per USEPA guidance, the alternatives were evaluated against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost (USEPA, 1988b). The effectiveness criteria is measured in terms of protecting human health and the environment. Each alternative will be evaluated as to its effectiveness in providing protection and reduction in toxicity, mobility, or volume. Short-term effectiveness will be evaluated based on the construction and implementation period, while long-term effectiveness will be based on the period after the remedial action is complete (USEPA, 1988b).

The implementability criteria includes both the technical and administrative feasibility of constructing, operating, and maintaining an RAA with respect to site-specific conditions. Technical feasibility refers to the ability to construct, operate, and meet technology-specific regulations for process options until a remedial action is complete. Administrative feasibility refers to the ability to obtain approvals for treatment, storage, and disposal services, and the requirements for, and availability of, specific equipment and technical specialists (USEPA, 1988b).

The focus of the cost evaluation is to make comparative estimates for alternatives with relative accuracy. The cost estimates will be based on cost curves, generic unit costs, vendor information, conventional cost-estimating guides, and/or prior similar estimates. Both capital and operation and maintenance (O&M) cost will be considered during this screening. A present worth analysis will also be conducted to evaluate expenditures (operation and maintenance costs) that occur over different time periods (USEPA, 1988b).

4.2.1 Alternative 1: No Action

Under the No Action RAA, the petroleum hydrocarbon contaminated soil at Site 35 will remain in place in their present condition. No remedial actions will be implemented. The no action alternative is required by the NCP to provide a baseline for comparison with other alternatives.

4.2.1.1 Effectiveness

The No Action RAA would not provide any short-term or long-term protection to human health or the environment with respect to exposure to petroleum hydrocarbons soil located above the seasonal high groundwater table. In addition, the alternative would not provide for any short-term reduction in toxicity, mobility, or volume of contaminants in the soils. However, as indicated by the risk assessment performed under the Interim Remedial Action RI, the current risk to human health and the environment presented by the existing petroleum hydrocarbon soil contamination is within the acceptable range. Some reduction in the toxicity, mobility, or volume of contaminants may occur through natural attenuation processes over the long-term.

4.2.1.2 Implementability

The No Action RAA would be both technically and administratively easy to implement since there are no activities associated with the alternative.

4.2.1.3 Cost

No capital or O&M costs are associated with the No Action RAA.

4.2.2 Alternative 2: Source Removal and Off-Site Landfill Disposal

Alternative 2 involves the excavation of impacted soil located above the seasonal high groundwater level and disposal at an off-site solid waste landfill permitted to accept non-hazardous, petroleum contaminated soil.

4.2.2.1 Effectiveness

This alternative provides both short-term and long-term protection to human health and the environment because the contaminated soil will be removed from the site. In addition, the alternative will provide short-term and long-term reduction of toxicity, mobility, and volume of contaminants at the site.

4.2.2.2 Implementability

Technically, this alternative is conventional and should be easy to implement. All of the petroleum hydrocarbon contaminated soil is located in areas that are directly accessible to excavation equipment although some vegetation clearing will be required. The only existing surface structures are the above ground storage tanks associated with the tank farm and these are currently scheduled to be dismantled and removed from the site in 1994 well before the implementation of Interim Remedial Actions. Some clean soil excavation will be required to access the contaminated soil. The remediation contractor will construct a staging area on site where the clean and contaminated soil can be segregated. This staging area will likely consist of plastic sheeting laid directly atop a flat surface with haybales placed around the perimeter to reduce the potential for off-site runoff of contaminants. For costing purposes it was assumed that the concrete slab-on-grade located at the site of the Former Mess Hall would be suitable.

It is assumed that the remediation contractor selected to execute this RAA will obtain the necessary permits and approvals to transport and dispose of petroleum hydrocarbon contaminated soil off site. Additional proof will be required from the disposal facility to document that it is permitted to accept this soil. Some additional testing prior to off-site shipping may be needed to meet permit requirements.

Contaminated soil transported to an off-site disposal/treatment facility, in theory, becomes the property and liability of that facility. Nevertheless, some generators of contaminated materials are hesitant of transporting their waste to an off-site facility based on concerns of assuming future liabilities associated with the off-site facility. Treatment options presumably carry less risk because the contaminated soil is treated as opposed to directly disposed.

Clean backfill will be needed to fill in the excavations.

4.2.2.3 Cost

Low capital costs and no O&M costs are anticipated for this RAA. The capital costs cover soil excavation (including mobilization/demobilization, decontamination, contaminated decontamination fluids and refuse disposal, and site restoration); confirmation sampling and analysis activities; off-site transportation; tipping/disposal fees at the off-site landfill; and backfill.

A preliminary estimate of the capital costs for this RAA is approximately $300,000. Since there are no estimated O&M costs, the net present worth equates to the total capital cost.

4.2.3 Alternative 3: Source Removal and Off-Site Biotreatment

Alternative 3 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and biological treatment at an off-site commercial composting or landfarming facility.

4.2.3.1 Effectiveness

This alternative provides both short-term and long-term protection to human health and the environment because the contaminated soil will be removed from the site. In addition, the alternative will provide short-term and long-term reduction of toxicity, mobility, and volume of contaminants at the site.

4.2.3.2 Implementability

Technically, this alternative is conventional and should be easy to implement. All of the petroleum hydrocarbon contaminated soil is located in areas that are directly accessible to excavation equipment although some vegetation clearing will be required. The only existing surface structures are the above ground storage tanks associated with the tank farm and these are currently scheduled to be dismantled and removed from the site in 1994 well before the implementation of Interim Remedial Actions. Some clean soil excavation will be required to access the contaminated soil. The remediation contractor will construct a staging area on site where the clean and contaminated soil can be segregated. This staging area will likely consist of plastic sheeting laid directly atop a flat surface with haybales placed around the perimeter to reduce the potential for off-site runoff of contaminants. For costing purposes it was assumed that the concrete slab-on-grade located at the site of the Former Mess Hal would be suitable.

The remediation contractor selected to execute this RAA will obtain the necessary permits and approvals to transport and dispose of petroleum hydrocarbon contaminated soil off site. Additional proof will be required from the treatment facility to document that it is permitted to accept this soil. Some additional testing prior to off-site shipping may be needed to meet permit requirements.

Contaminated soil transported to an off-site disposal/treatment facility, in theory, becomes the property and liability of that facility. Nevertheless, some generators of contaminated materials are hesitant of transporting their waste to an off-site facility based on concerns of assuming future liabilities associated with the off-site facility. Treatment options presumably carry less risk because the contaminated soil is treated as opposed to directly disposed.

It has been assumed that the contaminated soil from Site 35 will not be returned to Site 35 after treatment and that clean backfill will be needed to fill in the excavations.

4.2.3.3 Cost

Low capital costs and no O&M costs are anticipated for this RAA. The capital costs cover soil excavation (including mobilization/demobilization, decontamination, contaminated decontamination fluids and refuse disposal, and site restoration); confirmation sampling and analysis activities; off-site transportation; tipping/disposal fees at the off-site treatment facility; and backfill.

A preliminary estimate of the capital costs for this RAA is approximately $350,000. Since there are no estimated O&M costs, the net present worth equates to the total capital cost.

4.2.4 Alternative 4: Source Removal and On-Site, Ex-Situ Soil Aeration

Alternative 4 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and physical treatment via on-site, ex-situ soil aeration. The soil aeration process involves the vigorous physical agitation of the contaminated soil in an effort to promote volatilization and the release of contaminants to the atmosphere.

4.2.4.1 Effectiveness

This alternative provides both short-term and long-term protection to human health and the environment, but, potentially not to the degree of other RAAs where the contaminated soil is disposed/treated off site. The treatment phase of this RAA will be designed to remediate the petroleum hydrocarbon contaminated soil to below the remediation goals. After treatment the soil will be returned to the excavation as backfill. Since the treatment process is designed only to reduce contaminant levels to below the remediation goals and not to non-detect levels, it can be assumed that some level of petroleum hydrocarbons will remain in the treated soil, which will then be used as backfill. Nevertheless, this alternative can be expected to provide short-term and long-term reduction of toxicity, mobility, and volume of contaminants at the site.

It is possible that this method may not be completely effective. As a volatilization process it will not be as effective reducing the levels of semivolatile petroleum hydrocarbons and will be ineffective reducing the levels of non-volatile petroleum hydrocarbons. The data obtained under previous investigations indicate that the majority of the petroleum hydrocarbon contaminated soil identified to date is comprised of lighter fraction petroleum hydrocarbons which are volatile in nature. However, the history of the site does not preclude the possibility of encountering heavier and less volatile or non-volatile petroleum hydrocarbons. Consequently, a contingency needs to built into this RAA to account for the possibility that a portion of the excavated contaminated soil may not be able to be remediated via this technique and that additional treatment/disposal may be required.

4.2.4.2 Implementability

Technically, this alternative is conventional and should be easy to implement. All of the petroleum hydrocarbon contaminated soil is located in areas that are directly accessible to excavation equipment although some vegetation clearing will be required. The only existing surface structures are the above ground storage tanks associated with the tank farm and these are currently scheduled to be dismantled and removed from the site in 1994 well before the implementation of Interim Remedial Actions. Some clean soil excavation will be required to access the contaminated soil. The remediation contractor will construct a staging area on site where the clean and contaminated soil can be segregated. This staging area will likely consist of plastic sheeting laid directly atop a flat surface with haybales placed around the perimeter to reduce the potential for off-site runoff of contaminants. For costing purposes it was assumed that the concrete slab-on-grade located at the site of the Former Mess Hall would be suitable.

The staging area for this RAA will likely need to be larger than the staging areas required for the other RAAs because additional space will be needed to perform the soil aeration. The remediation contractor will provide a mechanical means of agitating the soil to release the volatile organics to the atmosphere. This might involve a mechanical mixer or perhaps only a backhoe bucket depending on the levels of contamination encountered.

It is assumed that the ex-situ, soil aeration process will be applied for a two-month period. The possibility exists that soil aeration may not be completely effective for some portion of the contaminated soil and that an alternative treatment/disposal option may become necessary.

If a portion of the contaminated soil is transported to the off-site treatment/disposal facility, it in theory, becomes the property and liability of that facility. Nevertheless, some generators of contaminated materials are hesitant of transporting their waste to an off-site facility based on concerns of assuming future liabilities associated with the off-site facility. Presumably, the risk would be less at an off-site treatment facility than at an off-site disposal facility because the contaminated soil is treated as opposed to being directly disposed.

It has been assumed that the contaminated soil successfully treated via ex-situ soil aeration will be used as backfill.

4.2.4.3 Cost

Low capital costs and no O&M costs are anticipated for this RAA. The capital costs cover soil excavation (including mobilization/demobilization, decontamination, contaminated decontamination fluids and refuse disposal, and site restoration); confirmation sampling and analysis activities; construction of a staging area and on-site treatment area; and backfill. Some additional off-site transportation, off-site treatment treatment/disposal, and backfill costs may be incurred if the soil aeration process is not completely effective.

Preliminary costing of this alternative has estimated the capital cost to be approximately $200,000. Since there are no estimated O & M costs, the net process worth equates to the total capital cost.

4.2.5 Alternative 5: Source Removal and Off-Site Soil Recycling

Alternative 5 involves the excavation of petroleum contaminated soil located above the seasonal high groundwater table and transport to an off-site recycling facility for reuse in the production of bricks or asphalt.

4.2.5.1 Effectiveness

This alternative provides both short-term and long-term protection to human health and the environment because the contaminated soil will be removed from the site. In addition, the alternative will provide short-term and long-term reduction of toxicity, mobility, and volume of contaminants at the site.

4.2.5.2 Implementability

Technically, this alternative is conventional and should be easy to implement. All of the petroleum hydrocarbon contaminated soil is located in areas that are directly accessible to excavation equipment although some vegetation clearing will be required. The only existing surface structures are the above ground storage tanks associated with the tank farm and these are currently scheduled to be dismantled and removed from the site in 1994 well before the implementation of Interim Remedial Actions. Some clean soil excavation will be required to access the contaminated soil. The remediation contractor will construct a staging area on site where the clean and contaminated soil can be segregated. This staging area will likely consist of plastic sheeting laid directly atop a flat surface with haybales placed around the perimeter to reduce the potential for off-site runoff of contaminants. For costing purposes it was assumed that the concrete slab-on-grade located at the site of the Former Mess Hall would be suitable.

The remediation contractor selected to execute this RAA will obtain the necessary permits and approvals to transport and dispose of petroleum hydrocarbon contaminated soil off site. Additional proof will be required from the recycling facility to document that it is permitted to accept this soil. Some additional testing prior to off-site shipping may be needed to meet permit requirements.

Contaminated soil transported to an off-site disposal/treatment facility, in theory, becomes the property and liability of that facility. Nevertheless, some generators of contaminated materials are hesitant of transporting their waste to an off-site facility based on concerns of assuming future liabilities associated with the off-site facility. Treatment options presumably carry less risk because the contaminated soil is treated as opposed to directly disposed.

It has been assumed that the contaminated soil from Site 35 will not be returned to Site 35 after treatment and that clean backfill will be needed to fill in the excavations.

4.2.5.3 Cost

Low capital costs and no O&M costs are anticipated for this RAA. The capital costs cover soil excavation (including mobilization/demobilization, decontamination, contaminated decontamination fluids and refuse disposal, and site restoration); confirmation sampling and analysis activities; off-site transportation; tipping/disposal fees at the off-site soil recycling facility; and backfill.
A preliminary estimate of the capital costs for this RAA is approximately $350,000. Since there are no estimated O&M costs, the net present worth equates to the total capital cost.

4.2.6 Alternative 6: Source Removal and On-Site Low Temperature Thermal Desorption

Alternative 6 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and treatment via on-site low temperature thermal desorption.

4.2.6.1 Effectiveness

This alternative provides both short-term and long-term protection to human health and the environment, but, potentially not to the degree of other RAAs where the contaminated soil is disposed/treated off site. The treatment phase of this RAA will be designed to remediate the petroleum hydrocarbon contaminated soil to below the remediation goals. After treatment the soil will be returned to the excavation as backfill. Since the treatment process is designed only to reduce contaminant levels to below the remediation goals and not to non-detect levels, it can be assumed that some level of petroleum hydrocarbons will remain in the treated soil, which will then be used as backfill. Nevertheless, this alternative can be expected to provide short-term and long-term reduction of toxicity, mobility, and volume of contaminants at the site.

4.2.6.2 Implementability

Technically, this alternative is conventional and should be easy to implement. All of the petroleum hydrocarbon contaminated soil is located in areas that are directly accessible to excavation equipment, although some vegetation clearing will be required. The only existing surface structures are the above ground storage tanks associated with the tank farm and these are currently scheduled to be dismantled and removed from the site in 1994 well before the implementation of Interim Remedial Actions. Clean soil excavation will be required to access the contaminated soil. The remediation contractor will construct a staging area on site where the clean and contaminated soil can be segregated. This staging area will likely consist of plastic sheeting laid directly atop a flat surface with haybales placed around the perimeter to reduce the potential for off-site runoff of contaminants. For costing purposes it was assumed that the concrete slab-on-grade located at the site of the Former Mess Hall would be suitable.

In addition to the staging area for this RAA, the remediation contractor will establish a treatment area where he will locate the low temperature thermal desorption unit. This area will likely be situated directly adjacent to the staging area so as to minimize the need to transport contaminated soil over clean portions of the site.

It has been assumed that the contaminated soil successfully treated via low temperature thermal desorption will be used as backfill.

4.2.6.3 Cost

Low capital costs and no O&M costs are anticipated for this RAA. The capital costs cover soil excavation (including mobilization/demobilization, decontamination, contaminated decontamination fluids and refuse disposal, and site restoration); confirmation sampling and analysis activities; construction of a staging area and on-site treatment area; treatment; and backfill.

A preliminary estimate of the capital costs for this RAA is approximately $370,000. Since there no estimated O&M costs, the net present worth equates to the total capital cost.

4.3 Summary of Screening Alternatives

Based on the results of the preliminary screening of alternatives, all of the RAAs are potentially effective, implementable, and reasonably cost comparable. The variation in costs is not sufficient to eliminate further consideration of any of the alternatives at this stage. In addition, to the No Action alternative RAA 1, there are two on-site alternatives (RAAs 4 and 6) and three off-site alternatives (RAAs 2, 3, and 5). The on-site alternatives provide for the reuse of the treated soil as backfill. In addition, the on-site alternatives reduce the potential future liability of MCB Camp Lejeune by virtue of not transporting contaminated soil to an off-site facility. Off-site alternatives offer the advantage of having the contaminated soil completely removed from the site and replaced with clean backfill.

5.0 DETAILED ANALYSIS OF ALTERNATIVES

This section of the FS contains the detailed analysis of the set of six RAAs remaining after the initial screening process presented in Section 4.0. This analysis has been conducted to provide sufficient information to adequately compare the alternatives, select an appropriate remedy for the site (i.e, the soils), and demonstrate satisfaction of the CERCLA remedy selection requirements in the Record of Decision (ROD) (USEPA, 1988b).

The extent to which alternatives are assessed during this detailed analysis is influenced by the available data, the number and types of alternatives being analyzed, and the degree to which alternatives were previously analyzed during their development and screening (USEPA, 1988b).

The following nine evaluation criteria serve as the basis for conducting the detailed analysis:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short-term effectiveness
6. Implementability
7. Cost
8. USEPA/State acceptance
9. Community acceptance

The first two criteria (Threshold Criteria) relate directly to statutory findings; the next five criteria (Primary Balancing Criteria) are the primary criteria upon which the analysis is based; and the final two criteria (Modifying Criteria) are typically evaluated following comment on the RI/FS report and the proposed plan.

The individual analysis of the seven alternatives is presented in the following subsections.

5.1 Individual Analysis of Alternatives

This analysis includes an assessment and a summary profile of each of the RAAs against the evaluation criteria, and a comparative analysis among the RAAs to assess the relative performance of each with respect to each of the evaluation criterion.

The cost estimates that have been developed for each of the RAAs include only capital expenditures as none of the RAAs have O&M costs associated with their implementation. The accuracy of each cost estimate depends upon the assumptions made and the availability of costing information.

5.1.1 Alternative 1: No Action

5.1.1.1 Description

Under the No Action RAA, the contaminated soils at the site will remain as they are. No remedial actions will be implemented. The no action alternative is required by the NCP to provide a baseline for comparison with other soil alternatives. Passive remediation may occur via natural attenuation processes and may result in some measurable reduction in contaminant levels over a long period of time.

5.1.1.2 Assessment

Overall Protection of Human Health and the Environment

The No Action RAA does not provide any protection to human health or to the environment with respect to exposure to petroleum hydrocarbon contaminated soil at Site 35. However, the results of the risk assessment performed for the Interim Remedial Action indicates the risks associated with the petroleum hydrocarbon contaminated soil at Site 35 are within the acceptable range.

Compliance With ARARs

Under the No Action RAA, the levels of total petroleum hydrocarbons (TPH) in the contaminated soil exceed the remediation goals. Therefore, this alternative will not meet this chemical-specific ARAR identified in Section 2.3.

Long-Term Effectiveness and Permanence

The risk assessment performed under the Interim Remedial Action RI indicates that the risks associated with the petroleum contaminated soil at Site 35 are within the acceptable range. Natural attenuation processes may reduce the levels of contaminants if no actions are implemented; however, the extent of the attenuation and time required to achieve it is impossible to predict.

Since the contaminants will remain at the site, the USEPA/state will be required to conduct a review of the site every five years.

In summary, the No Action Alternative can not be considered as a permanent alternative.

Reduction of Toxicity, Mobility, or Volume

Alternative 1 does not include any form of treatment with the exception of natural biodegradation and attenuation. These processes may reduce the toxicity, mobility, or volume of toxic contaminants at Site 35; however, the extent of the attenuation and time required to achieve this reduction is impossible to predict.

Short-Term Effectiveness

Since there are no remedial action activities associated with the No Action RAA, there will be minimal, if any, risks to the community, base personnel, or civilian base operations staff by implementing this alternative. In addition, there are no environmental impacts expected with respect to implementation. The time to achieve the remedial response objectives can not be estimated.

The implementation of the no-action alternative will increase the potential for exposure for workers involved in any future highway construction that involves soil excavation. The potential exposure will be limited to the inhalation of VOC emissions and direct contact with contaminated soils.

Implementability

With respect to technical feasibility, the No Action RAA is easily implemented since no activities are conducted, and therefore, no process facilities need to be constructed and/or operated. This alternative does not include any type of monitoring activities.

In terms of administrative feasibility, this alternative should not require coordination with other agencies. The availability of services and materials is not applicable to this alternative.

Cost

There are no capital costs or O&M costs associated with the No Action RAA.

USEPA/State Acceptance

It is anticipated that the USEPA and the NC DEHNR would not prefer the No Action alternative since it may not be protective to human health and the environment.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment on the RI/FS reports and the Proposed Remedial Action Plan (PRAP).

5.1.2 Alternative 2: Source Removal and Off-site Landfill Disposal

5.1.2.1 Description

Alternative 2 involves the excavation of impacted soil located above the seasonal high groundwater table and disposal at an off-site solid waste landfill permitted to accept non-hazardous, petroleum contaminated soil.

5.1.2.2 Assessment

Overall Protection of Human Health and the Environment

This alternative does provide for overall protection of human health and the environment at Site 35 because the soil contaminated at levels above the remediation goals will be excavated and disposed off site. Clean soil will be used as backfill.

Compliance With ARARs

This alternative will meet the ARARs identified for the site.

Long-Term Effectiveness and Permanence

This is a long-term effective and permanent remedial action that involves the complete removal and off-site disposal of contaminated soil located above the seasonal high groundwater table. The remediation of contaminated soil located below the seasonal high groundwater table will be addressed under future groundwater remedial actions.

Reduction of Toxicity, Mobility, or Volume

Since contaminated soils located above the seasonal high groundwater table will be completely removed to the levels prescribed by the remediation goals, a reduction of toxicity, mobility and volume of contaminants will be achieved.

Short-Term Effectiveness

The implementation of this alternative will pose little, if any, risk to the military or civilian population of Camp Geiger. The potential exposure will be limited to volatile organic compound (VOC) emissions during excavation and loading for off-site transport activities. In addition to VOC emissions, risks to workers charged with implementing the remedial action will include direct contact with contaminated soils. The implementation of this alternative will include provisions for monitoring VOC emissions to ensure that potential environmental impacts are managed within limits acceptable to USEPA and NC DEHNR.

Implementability

This alternative will be readily implemented using standard equipment and technology. The estimated time required to remove the contaminated soil from the site is about two months. In terms of administrative feasibility, this alternative will require coordination with agencies such as the NCDOT for the off-site transport of contaminated soil. USEPA and NC DEHNR approval of the off-site disposal facility would also be required.

Cost

The estimated capital cost of this alternative is $527,390 (See Table 5-1). The major cost variables included the cost of off-site transportation of waste and the disposal fee cost. Both of these variables were estimated based on telephone conversations with two commercial vendors (See Appendix B). There are no O&M costs associated with this alternative.

USEPA/State Acceptance

In general, it is the policy of the USEPA to favor alternatives other than off-site landfill disposal. However, landfill disposal of non-hazardous, petroleum hydrocarbon contaminated soil is relatively commonplace in North Carolina and it is anticipated that the NC DEHNR will have no major objections to this alternative.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment on the RI/FS reports.

5.1.3 Alternative 3: Source Removal and Off-Site Biotreatment

5.1.3.1 Description

Alternative 3 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and treatment at an off-site commercial composting or landfarming facility.

TABLE 5-1
DETAIL COSTING EVALUATION

ALTERNATE 2: SOURCE REMOVAL AND OFF-SITE LANDFILL DISPOSAL
CAPITAL COST ESTIMATE

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost		
SITE PREPARATION							
Equipment Mobilization	Lump Sum	1	1,000	1,000		1 dozer, 1 loader, 1 backhoe	MEANS, 1994: 022-274-0100
Personnel Mobilization	Lump Sum	1	5,000	5,000			
Pre-Construction Submittals	Lump Sum	1	9,000	9,000			
Site Clearing	Acre	2	5,000	10,000		Clear and Grub Brush, Trees to 12" dia.,	MEANS, 1994: 021-104-0200,
				0		Remove Stumps	021-104-0250
Temporary Office Trailer Rent	Month	2	150	300			MEANS, 1994: 015-904-0250
Trailer Mob and Setup	Lump Sum	1	1,000	1,000			Engineering Estimate
Decontamination Area	Lump Sum	1	5,000	5,000		Equipment and Personnel Decon Area	Engineering Estimate
Staging Area	Lump Sum	1	27,800	27,800		Liner with soil cover on existing concrete slab.	Engineering Estimate
Laydown Area	Lump Sum	1	6,000	6,000			Engineering Estimate
Miscellaneous	Lump Sum	1	3,500	3,500		Utilities Hookup, Erosion Control, Safety Fencing	Engineering Estimate
				0			
SOIL EXCAVATION/STAGING				0			
Excavation/Staging	CY	8,000	10	80,000		Loader or Backhoe	MEANS, 1994: 022-254-0500, 022-266-0400
Confirmation/Characterization	Samples	80	250	20,000		Includes Labor and Analysis (TPH)	See Note 1
Testing				0			
				0			
OFF-SITE HAULING/DISPOSAL				0			
Transportation	Ton	5,100	10	51,000		Assumes 100 mile limit	See Note 2
Disposal Fee	Ton	5,100	20	102,000			See Note 2
				0			
SITE RESTORATION				0			
Backfill	CY	3,800	7.70	29,260		Material and Hauling	MEANS, 1994: 022-238-0200,
				0			022-266-1110
Placement and Compaction	CY	3,800	1.50	5,700		Riding Vibrating Roller, 12" Lifts	MEANS, 1994: 022-226-5060,
				0			022-262-0010
Pavement Replacement	SY	450	13	6,000			Engineering Estimate
General Site Cleanup	Lump Sum	1	1,300	1,300		0.30 Percent of Total Capital Cost	MEANS, 1994: 017-004-0010
Equipment Demobilization	Lump Sum	1	1,000	1,000			Engineering Estimate
				0			
DEMOBILIZATION							
Equipment & Trailer Demob	Lump Sum	1	1,500	1,500			Engineering Estimate
Personnel Demob	Lump Sum	1	2,000	2,000			Engineering Estimate
Post-Construction Submittals	Lump Sum	1	2,500	2,500			Engineering Estimate
Miscellaneous	Lump Sum	1	1,800	1,800		Remove Utilities, Erosion Control,Safety Fencing	Engineering Estimate
DISTRIBUTIVE COSTS							
Supervision	Lump Sum	1	39,000	39,000			Engineering Estimate
Per Diem	Lump Sum	1	16,000	16,000		@ $66/day	Engineering Estimate
Home Office/Eng'r/H & S/ QA/QC	Lump Sum	1	6,000	6,000		15 % of Supervision	Engineering Estimate
Vehicles	Lump Sum	1	2,200	2,200		Pickup Trucks (2)	MEANS, 1994: 016-420-7200
SUBTOTAL CAPITAL COST					$435,860		
Engineering @ 6 %		0.06		26,152			
Contingencies @ 15 %		0.15		65,379			
TOTAL CAPITAL COST					$527,390		

NOTES: (1) Based on one sample per 100 CY of excavated soil. Each sample to be analyzed for TPH (Methods 3550/5030).
(2) Based on telephone quotes (See Appendix B).

5.1.3.2 Assessment

Overall Protection of Human Health and the Environment

This alternative does provide for overall protection of human health and the environment at Site 35 because the soil contaminated at levels above the remediation goals will be excavated and treated off site. Clean soil borrow will be used as backfill.

Compliance With ARARs

This alternative uses proven technology that will meet the ARARs identified for the site.

Long-Term Effectiveness and Permanence

This is a long-term effective and permanent remedial action that involves the complete removal and off-site treatment of contaminated soil located above the seasonal high groundwater table. The remediation of contaminated soil located below the seasonal high groundwater table will be addressed under future groundwater remedial actions.

Reduction of Toxicity, Mobility, or Volume

Since contaminated soils located above the seasonal high groundwater table will be completely removed to the levels prescribed by the remediation goals, a reduction of toxicity, mobility and volume of contaminants will be achieved.

Short-Term Effectiveness

The implementation of the excavation portion of this alternative will pose little, if any, risk to the military or civilian population of Camp Geiger. The potential exposure will be limited to volatile organic compound (VOC) emissions during excavation and loading for off-site transport activities. In addition to VOC emissions, risks to workers charged with implementing the remedial action will include direct contact with contaminated soils. The implementation of this alternative will include provisions for monitoring VOC emissions to ensure that potential environmental impacts are managed within limits acceptable to USEPA and NC DEHNR.

Implementability

This alternative will be readily implemented using standard equipment and technology. The estimated time required to remove the contaminated soil from the site is about two months.

In terms of administrative feasibility, this alternative will require coordination with agencies such as the NCDOT for the off-site transport of contaminated soil. USEPA and NC DEHNR approval of the off-site treatment facility would also be required.

Cost

The estimated capital costs of this alternative is $558,336 (See Table 5-2). The largest variables included waste transportation and treatment costs. Baker's estimate is based on a telephone quotation obtained from a commercial vendor of composting and landfarming technologies (See Appendix B).

USEPA/State Acceptance

It is anticipated the the USEPA and NC DEHNR would have no major objectives to this alternative.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment on the RI/FS reports.

5.1.4 Alternative 4: Source Removal and On-Site, Ex-Situ Soil Aeration

5.1.4.1 Description

Alternative 4 involves the excavation of petroleum contaminated soil located above the seasonal high groundwater table for remediation via on-site, ex-situ soil aeration.

TABLE 5-2
DETAIL COSTING EVALUATION

ALTERNATE 3: SOURCE REMOVAL AND OFF-SITE BIOTREATMENT
CAPITAL COST ESTIMATE

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost		
SITE PREPARATION							
Equipment Mobilization	Lump Sum	1	1,000	1,000		1 dozer, 1 loader, 1 backhoe	MEANS, 1994: 022-274-0100
Personnel Mobilization	Lump Sum	1	5,000	5,000			
Pre-Construction Submittals	Lump Sum	1	9,000	9,000			
Site Clearing	Acre	2	5,000	10,000		Clear and Grub Brush, Trees to 12" dia.,	MEANS, 1994: 021-104-0200,
				0		Remove Stumps	021-104-0250
Temporary Office Trailer Rent	Month	2	150	300			MEANS, 1994: 015-904-0250
Trailer Mob and Setup	Lump Sum	1	1,000	1,000			Engineering Estimate
Decontamination Area	Lump Sum	1	5,000	5,000		Equipment and Personnel Decon Area	Engineering Estimate
Staging Area	Lump Sum	1	27,800	27,800		Liner with soil cover on existing concrete slab.	Engineering Estimate
Laydown Area	Lump Sum	1	6,000	6,000			Engineering Estimate
Miscellaneous	Lump Sum	1	3,500	3,500		Utilities Hookup, Erosion Control, Safety Fencing	Engineering Estimate
				0			
SOIL EXCAVATION/STAGING				0			
Excavation/Staging	CY	8,000	10	80,000		Loader or Backhoe	MEANS, 1994: 022-254-0500,
							022-266-0400
Confirmation/Characterization	Samples	80	250	20,000		Includes Labor and Analysis (TPH)	See Note 1
Testing				0			
				0			
OFF-SITE HAULING/DISPOSAL				0			
Transportation	Ton	5,100	10	51,000		Assumes 100 mile limit	See Note 2
Disposal Fee	Ton	5,100	25	127,500			See Note 2
				0			
SITE RESTORATION				0			
Backfill	CY	3,800	7.70	29,260		Material and Hauling	MEANS, 1994: 022-238-0200,
				0			022-266-1110
Placement and Compaction	CY	3,800	1.50	5,700		Riding Vibrating Roller, 12" Lifts	MEANS, 1994: 022-226-5060,
				0			022-262-0010
Pavement Replacement	SY	450	13	6,000			Engineering Estimate
General Site Cleanup	Lump Sum	1	1,400	1,400		0.30 Percent of Total Capital Cost	MEANS, 1994: 017-004-0010
Equipment Demobilization	Lump Sum	1	1,000	1,000			Engineering Estimate
				0			
DEMOBILIZATION							
Equipment & Trailer Demob	Lump Sum	1	1,500	1,500			Engineering Estimate
Personnel Demob	Lump Sum	1	2,000	2,000			Engineering Estimate
Post-Construction Submittals	Lump Sum	1	2,500	2,500			Engineering Estimate
Miscellaneous	Lump Sum	1	1,800	1,800		Remove Utilities, Erosion Control,Safety Fencing	Engineering Estimate
DISTRIBUTIVE COSTS							
Supervision	Lump Sum	1	39,000	39,000			Engineering Estimate
Per Diem	Lump Sum	1	16,000	16,000		@ $66/day	Engineering Estimate
Home Office/Eng'r/H & S/ QA/QC	Lump Sum	1	6,000	6,000		15 % of Supervision	Engineering Estimate
Vehicles	Lump Sum	1	2,200	2,200		Pickup Trucks (2)	MEANS, 1994: 016-420-7200
SUBTOTAL CAPITAL COST					$461,460		
Engineering @ 6 %		0.06		27,688			
Contingencies @ 15 %		0.15		69,219			
TOTAL CAPITAL COST					$558,366		

NOTES: (1) Based on one sample per 100 CY of excavated soil. Each sample to be analyzed for TPH (Methods 3550/5030).
(2) Based on telephone quotes (See Appendix B).

5.1.4.2 Assessment

Overall Protection of Human Health and the Environment

This alternative does provide for overall protection of human health and the environment at Site 35 because the soil contaminated at levels above the remediation goals will be excavated and treated on site. The treated soil will be used as backfill. Since the object of the treatment process is to reduce the levels of contaminants to below the remediation goals, but not necessarily to non-detect levels, it can be assumed that some residual levels of contaminants will remain in the treated soil. Therefore, this alternative may not be as protective of human health as other alternatives whereby the contaminated soil is removed from the site and replaced with clean backfill.

Compliance With ARARs

This alternative is designed to meet the ARARs identified for the site.

If the implementation of this process is not completely effective (i.e., if contaminant levels remain above the remediation goals after treatment in all or a portion of the impacted soil), then the remaining contaminated soil will need to be treated/disposed off site.

Long-Term Effectiveness and Permanence

This is a long-term effective and permanent remedial action that involves the complete removal and on-site treatment of contaminated soil located above the seasonal high groundwater table. The remediation of contaminated soil located below the seasonal high groundwater table will be addressed under future groundwater remedial actions.

Reduction of Toxicity, Mobility, or Volume

Since contaminated soils located above the seasonal high groundwater table will be removed and treated to the levels prescribed by the remediation goals, a reduction of toxicity, mobility and volume of contaminants will be achieved.

Short-Term Effectiveness

The implementation of the excavation portion of this alternative will pose little, if any, risk to the military or civilian population of Camp Geiger. The potential exposure will be limited to volatile organic compound (VOC) emissions during excavation and on-site treatment activities. In addition to VOC emissions, risks to workers charged with implementing the remedial action will include direct contact with contaminated soils. The implementation of RAA 4 will include provisions for monitoring VOC emissions to ensure that potential environmental impacts are managed within limits acceptable to USEPA and NC DEHNR.

Implementability

This alternative will be readily implemented using standard equipment and technology. The estimated time required to excavate and treat the contaminated soil and backfill the excavation is about two months. This includes one month of mobilization/demobilization, site preparation, and excavation and one month of treatment.

In terms of administrative feasibility, this alternative will require coordination with agencies such as USEPA and NC DEHNR whose approval of the project Work Plan will be required.

Cost

The estimated capital cost of this alternative is $455,304 (See Table 5-3). Baker could not identify a commercial vendor of this technology. Consequently, the cost to implement on-site treatment is based on Baker's estimate of the time and equipment required to complete the task. There are no O&M costs associated with this alternative.

USEPA/State Acceptance

It is anticipated the the USEPA and NC DEHNR may object to this alternative because by design it will release volatile contaminants to the atmosphere in an uncontrolled manner.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment on the RI/FS reports.

TABLE 5-3
DETAIL COSTING EVALUATION

ALTERNATE 4: SOURCE REMOVAL AND ON-SITE, EX SITU SOIL AERATION
CAPITAL COST ESTIMATE

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost		
SITE PREPARATION							
Equipment Mobilization	Lump Sum	1	1,000	1,000		1 dozer, 1 loader, 1 backhoe	MEANS, 1994: 022-274-0100
Personnel Mobilization	Lump Sum	1	5,000	5,000			
Pre-Construction Submittals	Lump Sum	1	9,000	9,000			
Site Clearing	Acre	2	5,000	10,000		Clear and Grub Brush, Trees to 12" dia., Remove Stumps	MEANS, 1994: 021-104-0200, 021-104-0250
Temporary Office Trailer Rent	Month	2	150	300			MEANS, 1994: 015-904-0250
Trailer Mob and Setup	Lump Sum	1	1,000	1,000			Engineering Estimate
Decontamination Area	Lump Sum	1	5,000	5,000		Equipment and Personnel Decon Area	Engineering Estimate
Staging Area	Lump Sum	1	27,800	27,800		Liner with soil cover on existing concrete slab.	Engineering Estimate
Laydown Area	Lump Sum	1	6,000	6,000			Engineering Estimate
Miscellaneous	Lump Sum	1	3,500	3,500		Utilities Hookup, Erosion Control, Safety Fencing	Engineering Estimate
SOIL EXCAVATION/STAGING							
Excavation/Staging	CY	8,000	10	80,000		Loader or Backhoe	MEANS, 1994: 022-254-0500, 022-266-0400
Confirmation Testing	Samples	80	250	20,000		Includes Labor and Analysis (TPH)	See Note 1
ON-SITE TREATMENT							
Equipment Mobilization	Lump Sum	1	5,000	5,000		Assumes 100 mile limit	See Note 2
Equipment Rental	Months	2	25,000	50,000			See Note 2
Post-Treatment Testing	Samples	40	250	10,000			Engineering Estimate
SITE RESTORATION							
Backfill	CY	3,800	7.70	29,260		Material and Hauling	MEANS, 1994: 022-238-0200, 022-266-1110
Placement and Compaction	CY	3,800	1.50	5,700		Riding Vibrating Roller, 12" Lifts	MEANS, 1994: 022-226-5060, 022-262-0010
Pavement Replacement	SY	450	13	6,000			Engineering Estimate
General Site Cleanup	Lump Sum	1	1,000	1,000		0.30 Percent of Total Capital Cost	MEANS, 1994: 017-004-0010
Equipment Demobilization	Lump Sum	1	1,000	1,000			Engineering Estimate
DEMOBILIZATION							
Equipment & Trailer Demob	Lump Sum	1	1,500	1,500			Engineering Estimate
Personnel Demob	Lump Sum	1	2,000	2,000			Engineering Estimate
Post-Construction Submittals	Lump Sum	1	2,500	2,500			Engineering Estimate
Miscellaneous	Lump Sum	1	1,800	1,800		Remove Utilities, Erosion Control,Safety Fencing	Engineering Estimate
DISTRIBUTIVE COSTS							
Supervision	Lump Sum	1	39,000	39,000			Engineering Estimate
Per Diem	Lump Sum	1	16,000	16,000		@ $66/day	Engineering Estimate
Home Office/Eng'r/H & S/ QA/QC	Lump Sum	1	6,000	6,000		15 % of Supervision	Engineering Estimate
Vehicles	Lump Sum	1	2,200	2,200		Pickup Trucks (2)	MEANS, 1994: 016-420-7200
SUBTOTAL CAPITAL COST					$347,560		
Engineering @ 6 %		0.06		20,854			
Contingencies @ 25 %		0.25		86,890			
TOTAL CAPITAL COST					$455,304		

NOTES: (1) Based on one sample per 100 CY of excavated soil. Each sample to be analyzed for TPH (Methods 3550/5030).
(2) Based on telephone quotes (See Appendix B).

5.1.5 Alternative 5: Source Removal and Off-Site Soil Recycling

5.1.5.1 <u>Description</u>

Alternative 5 involves the excavation of petroleum contaminated soil located above the seasonal high groundwater table and transport to an off-site soil recycling facility for reuse in the production of bricks or asphalt.

5.1.5.2 <u>Assessment</u>

Overall Protection of Human Health and the Environment

This alternative does provide for overall protection of human health and the environment at Site 35 because the soil contaminated at levels above the remediation goals will be excavated and transported off site to an approved recycling facility. Clean soil borrow will be used as backfill.

Compliance With ARARs

This alternative will meet the ARARs identified for the site.

Long-Term Effectiveness and Permanence

This is a long-term effective and permanent remedial action that involves the complete removal and off-site treatment of contaminated soil located above the seasonal high groundwater table. The remediation of contaminated soil located below the seasonal high groundwater table will be addressed under future groundwater remedial actions.

Reduction of Toxicity, Mobility, or Volume

Since contaminated soils located above the seasonal high groundwater table will be completely removed to the levels prescribed by the remediation goals, a reduction of toxicity, mobility and volume of contaminants will be achieved.

Short-Term Effectiveness

The implementation of the excavation portion of this alternative will pose little, if any, risk to the military or civilian population of Camp Geiger. The potential exposure will be limited to volatile organic compound (VOC) emissions during excavation and loading for off-site transport activities. In addition to VOC emissions, risks to workers charged with implementing the remedial action will include direct contact with contaminated soils. The implementation of this alternative will include provisions for monitoring VOC emissions to ensure that potential environmental impacts are managed within limits acceptable to USEPA and NC DEHNR.

Implementability

This alternative will be readily implemented using standard equipment and technology. The estimated time required to remove the contaminated soil from the site is about two months.

In terms of administrative feasibility, this alternative will require coordination with agencies such as the NCDOT for the off-site transport of contaminated soil. USEPA and NC DEHNR approval of the off-site treatment facility would also be required.

Cost

The estimated capital cost of this alternative is $558,366 (See Table 5-4). The largest variables include cost of waste transportation and off-site recycling. Baker's estimate is based on telephone quotes from multiple commercial vendors of this technology (See Appendix B). There are no O&M costs associated with this alternative.

USEPA/State Acceptance

It is anticipated the the USEPA and NC DEHNR would have no major objectives to this alternative.

Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment on the RI/FS reports.

TABLE 5-4
DETAIL COSTING EVALUATION

ALTERNATE 5: SOURCE REMOVAL AND OFF-SITE SOIL RECYCLING
CAPITAL COST ESTIMATE

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost		
SITE PREPARATION							
Equipment Mobilization	Lump Sum	1	1,000	1,000		1 dozer, 1 loader, 1 backhoe	MEANS, 1994: 022-274-0100
Personnel Mobilization	Lump Sum	1	5,000	5,000			
Pre-Construction Submittals	Lump Sum	1	9,000	9,000			
Site Clearing	Acre	2	5,000	10,000		Clear and Grub Brush, Trees to 12" dia.,	MEANS, 1994: 021-104-0200,
				0		Remove Stumps	021-104-0250
Temporary Office Trailer Rent	Month	2	150	300			MEANS, 1994: 015-904-0250
Trailer Mob and Setup	Lump Sum	1	1,000	1,000			Engineering Estimate
Decontamination Area	Lump Sum	1	5,000	5,000		Equipment and Personnel Decon Area	Engineering Estimate
Staging Area	Lump Sum	1	27,800	27,800		Liner with soil cover on existing concrete slab.	Engineering Estimate
Laydown Area	Lump Sum	1	6,000	6,000			Engineering Estimate
Miscellaneous	Lump Sum	1	3,500	3,500		Utilities Hookup, Erosion Control, Safety Fencing	Engineering Estimate
				0			
SOIL EXCAVATION/STAGING				0			
Excavation/Staging	CY	8,000	10	80,000		Loader or Backhoe	MEANS, 1994: 022-254-0500,
							022-266-0400
Confirmation/Characterization	Samples	80	250	20,000		Includes Labor and Analysis (TPH)	See Note 1
Testing				0			
				0			
OFF-SITE HAULING/DISPOSAL				0			
Transportation	Ton	5,100	10	51,000		Assumes 100 mile limit	See Note 2
Disposal Fee	Ton	5,100	25	127,500			See Note 2
				0			
SITE RESTORATION				0			
Backfill	CY	3,800	7.70	29,260		Material and Hauling	MEANS, 1994: 022-238-0200,
				0			022-266-1110
Placement and Compaction	CY	3,800	1.50	5,700		Riding Vibrating Roller, 12" Lifts	MEANS, 1994: 022-226-5060,
				0			022-262-0010
Pavement Replacement	SY	450	13	6,000			Engineering Estimate
General Site Cleanup	Lump Sum	1	1,400	1,400		0.30 Percent of Total Capital Cost	MEANS, 1994: 017-004-0010
Equipment Demobilization	Lump Sum	1	1,000	1,000			Engineering Estimate
				0			
DEMOBILIZATION							
Equipment & Trailer Demob	Lump Sum	1	1,500	1,500			Engineering Estimate
Personnel Demob	Lump Sum	1	2,000	2,000			Engineering Estimate
Post-Construction Submittals	Lump Sum	1	2,500	2,500			Engineering Estimate
Miscellaneous	Lump Sum	1	1,800	1,800		Remove Utilities, Erosion Control,Safety Fencing	Engineering Estimate
DISTRIBUTIVE COSTS							
Supervision	Lump Sum	1	39,000	39,000			Engineering Estimate
Per Diem	Lump Sum	1	16,000	16,000		@ $66/day	Engineering Estimate
Home Office/Eng'r/H & S/ QA/QC	Lump Sum	1	6,000	6,000		15 % of Supervision	Engineering Estimate
Vehicles	Lump Sum	1	2,200	2,200		Pickup Trucks (2)	MEANS, 1994: 016-420-7200
SUBTOTAL CAPITAL COST					$461,460		
Engineering @ 6 %		0.06		27,688			
Contingencies @ 15 %		0.15		69,219			
TOTAL CAPITAL COST					$558,366		

NOTES: (1) Based on one sample per 100 CY of excavated soil. Each sample to be analyzed for TPH (Methods 3550/5030).
(2) Based on telephone quotes (See Appendix B).

5.1.6 Alternative 6: Source Removal and On-Site Low Temperature Thermal Desorption

5.1.6.1 <u>Description</u>

Alternative 6 involves the excavation of petroleum hydrocarbon contaminated soil located above the seasonal high groundwater table and treatment via on-site low temperature thermal desorption.

5.1.6.2 <u>Assessment</u>

Overall Protection of Human Health and the Environment

This alternative does provide for overall protection of human health and the environment at Site 35 because the soil contaminated at levels above the remediation goals will be excavated and treated on site. The treated soil will be used as backfill. Since the object of the treatment process is to reduce the levels of contaminants to below the remediation goals, but, not necessarily to non-detect levels, it can be assumed that some residual levels of contaminants will remain in the treated soil. Therefore, this alternative may not be protective of human health as other alternatives whereby the contaminated soil is removed from the site and replaced with clean backfill.

Compliance With ARARs

This alternative uses proven technology that will meet the ARARs identified for the site.

Long-Term Effectiveness and Permanence

This is a long-term effective and permanent remedial action that involves the complete removal and on-site treatment of contaminated soil located above the seasonal high groundwater table. The remediation of contaminated soil located below the seasonal high groundwater table will be addressed under future groundwater remedial actions.

Reduction of Toxicity, Mobility, or Volume

Since contaminated soils located above the seasonal high groundwater table will be completely removed and treated to the levels prescribed by the remediation goals, a reduction of toxicity, mobility and volume of contaminants will be achieved.

Short-Term Effectiveness

The implementation of the excavation portion of this alternative will pose little, if any, risk to the military or civilian population of Camp Geiger. The potential exposure will be limited to volatile organic compound (VOC) emissions during excavation and on-site treatment activities. In addition to VOC emissions, risks to workers charged with implementing the remedial action will include direct contact with contaminated soils. The implementation of this alternative will include provisions for monitoring VOC emissions to ensure that potential environmental impacts are managed within limits acceptable to USEPA and NC DEHNR.

Implementability

This alternative will be readily implemented using standard equipment and technology. The estimated time required to excavate and treat the contaminated soil and backfill the excavation is about two months.

In terms of administrative feasibility, this alternative will require coordination with agencies such as the USEPA and NC DEHNR whose approval of the project work plan will be required.

Cost

The estimated capital cost of this alternative is $613,542 (See Table 5-5). The largest variable in this estimate is the cost of treatment which is based on a telephone quote from a single North Carolina-based vendor (See Appendix B). The quoted cost of treatment is similar to others obtained by Baker staff for the application of this technology in other parts of the U.S. There are no O&M costs associated with this alternative.

TABLE 5-5
DETAIL COSTING EVALUATION

ALTERNATE 6: SOURCE REMOVAL AND ON-SITE, LOW TEMOERATURE THERMAL DESORPTION
CAPITAL COST ESTIMATE

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost		
SITE PREPARATION							
Equipment Mobilization	Lump Sum	1	1,000	1,000		1 dozer, 1 loader, 1 backhoe	MEANS, 1994: 022-274-0100
Personnel Mobilization	Lump Sum	1	5,000	5,000			
Pre-Construction Submittals	Lump Sum	1	9,000	9,000			
Site Clearing	Acre	2	5,000	10,000		Clear and Grub Brush, Trees to 12" dia.,	MEANS, 1994: 021-104-0200,
				0		Remove Stumps	021-104-0250
Temporary Office Trailer Rent	Month	2	150	300			MEANS, 1994: 015-904-0250
Trailer Mob and Setup	Lump Sum	1	1,000	1,000			Engineering Estimate
Decontamination Area	Lump Sum	1	5,000	5,000		Equipment and Personnel Decon Area	Engineering Estimate
Staging Area	Lump Sum	1	27,800	27,800		Liner with soil cover on existing concrete slab.	Engineering Estimate
Laydown Area	Lump Sum	1	6,000	6,000			Engineering Estimate
Miscellaneous	Lump Sum	1	3,500	3,500		Utilities Hookup, Erosion Control, Safety Fencing	Engineering Estimate
				0			
SOIL EXCAVATION/STAGING				0			
Excavation/Staging	CY	8,000	10	80,000		Loader or Backhoe	MEANS, 1994: 022-254-0500,
							022-266-0400
Confirmation Testing	Samples	80	250	20,000		Includes Labor and Analysis (TPH)	See Note 1
				0			
ON-SITE TREATMENT				0			
Equipment Mobilization	Lump Sum	1	10,000	10,000		Assumes 100 mile limit	See Note 2
Treatment Fee	Tons	5,100	40	204,000			See Note 2
Post-Treatment Testing	Samples	40	250	10,000			Engineering Estimate
				0			
SITE RESTORATION				0			
Backfill	CY	3,800	7.70	29,260		Material and Hauling	MEANS, 1994: 022-238-0200,
				0			022-266-1110
Placement and Compaction	CY	3,800	1.50	5,700		Riding Vibrating Roller, 12" Lifts	MEANS, 1994: 022-226-5060,
				0			022-262-0010
Pavement Replacement	SY	450	13	6,000			Engineering Estimate
General Site Cleanup	Lump Sum	1	1,500	1,500		0.30 Percent of Total Capital Cost	MEANS, 1994: 017-004-0010
Equipment Demobilization	Lump Sum	1	1,000	1,000			Engineering Estimate
				0			
DEMOBILIZATION							
Equipment & Trailer Demob	Lump Sum	1	1,500	1,500			Engineering Estimate
Personnel Demob	Lump Sum	1	2,000	2,000			Engineering Estimate
Post-Construction Submittals	Lump Sum	1	2,500	2,500			Engineering Estimate
Miscellaneous	Lump Sum	1	1,800	1,800		Remove Utilities, Erosion Control,Safety Fencing	Engineering Estimate
DISTRIBUTIVE COSTS							
Supervision	Lump Sum	1	39,000	39,000			Engineering Estimate
Per Diem	Lump Sum	1	16,000	16,000		@ $66/day	Engineering Estimate
Home Office/Eng'r/H & S/ QA/QC	Lump Sum	1	6,000	6,000		15 % of Supervision	Engineering Estimate
Vehicles	Lump Sum	1	2,200	2,200		Pickup Trucks (2)	MEANS, 1994: 016-420-7200
SUBTOTAL CAPITAL COST					$507,060		
Engineering @ 6 %		0.06		30,424			
Contingencies @ 15 %		0.15		76,059			
TOTAL CAPITAL COST					$613,542		

NOTES: (1) Based on one sample per 100 CY of excavated soil. Each sample to be analyzed for TPH (Methods 3550/5030).
(2) Based on telephone quotes (See Appendix B).

TABLE 5-6

SUMMARY OF ALTERNATIVES EVALUATION
INTERIM REMEDIAL ACTION FEASIBILITY STUDY, CTO-0160
SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

	Alternative 1: No Action	Alternative 2: Source Removal and Off-Site Landfill	Alternative 3: Source Removal and Off-Site Biotreatment
Overall Protection of Human Health and Environment	No reduction in potential risks.	Removes contaminated soil from site, thereby eliminating potential exposure to and migration of contaminants.	Removes contaminated soil from site thereby eliminating potential exposure to and migration of contaminants.
Compliance with ARARs			
• Chemical-Specific ARARs	Does not meet NC DEHNR guidelines for TPH soil remediation.	Will comply with NC DEHNR guidelines for TPH soil remediation.	Will comply with NC DEHNR guidelines for TPH soil remediation.
• Location-Specific ARARs	Contaminated soils left in place under no action could impact wetlands and, in turn, fish and wildlife.	Source removal will reduce risks to wetlands, the floodplain, and endangered species in the Camp Lejeune area.	Source removal will reduce risks to wetlands, the floodplain, and endangered species in the Camp Lejeune area.
• Action-Specific ARARs	Not relevant. There are no actions.	Will comply with NC DEHNR guidelines for disposal/treatment.	Will comply with NC DEHNR guidelines for disposal/treatment.
Long-Term Effectiveness and Permanence	Source remains in place. Natural attenuation may reduce contaminant levels, but is unpredictable.	Contaminated soil as a source is permanently removed from site.	Contaminated soil as a source is permanently removed from site.
Reduction of Toxicity, Mobility, or Volume	Natural attenuation may reduce contaminant levels, but is unpredictable.	Total reduction equal to volume of soil removed.	Total reduction equal to volume of soil removed.
Short-Term Effectiveness	No increased risk to community and no risk to workers because no remedial action is implemented.	Excavation and handling would release VOCs to atmosphere. Work to be completed in 1 to 2 months.	Excavation and handling would release VOCs to atmosphere. Work to be completed in 1 to 2 months.
Implementability	Nothing to implement.	Standard construction operation. Easy to implement. NC DEHNR approved landfills available.	Standard construction operation. Easy to implement. Commercial vendors available.
Costs			
Capital	$0	$527,390	$558,366
O&M	$0	$0	$0
USEPA/State Acceptance	USEPA and state will likely not prefer this alternative.	USEPA has a Federal mandate to favor treatment over disposal options. State has preference for on-site versus off-site treatment.	USEPA has a Federal mandate to favor treatment over disposal options. State has preference for on-site versus off-site treatment.

TABLE 5-6 (Continued)

SUMMARY OF ALTERNATIVES EVALUATION
INTERIM REMEDIAL ACTION RECORD OF DECISION, CTO-0160
SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

	Alternative 4: Source Removal and On-Site Ex-Situ Soil Aeration	Alternative 5: Source Removal and Off-Site Soil Recycling	Alternative 6: Source Removal and On-Site Low Temperature Thermal Desorption
Overall Protection of Human Health and Environment	Risks reduced, but perhaps not to the degree of other alternatives because treated soil is used as backfill.	Removes contaminated soil from site, thereby eliminating potential exposure to and migration of contaminants.	Risks reduced, but not perhaps not to the degree of other alternatives because treated soil is used as backfill.
Compliance with ARARs			
• Chemical-Specific ARARs	Will comply with NC DEHNR guidelines for TPH soil remediation.	Will comply with NC DEHNR guidelines for TPH soil remediation.	Will comply with NC DEHNR guidelines for TPH soil remediation.
• Location-Specific ARARs	Will reduce risks to wetlands, the floodplain, and endangered species in the Camp Lejeune area, but not perhaps to degree of other alternatives because treated soil is used as backfill.	Source removal will reduce risks to wetlands, the floodplain, and endangered species in the Camp Lejeune area.	Will reduce risks to wetlands, the floodplain, and endangered species in the Camp Lejeune area, but not perhaps to degree of other alternatives because treated soil is used as backfill.
• Action-Specific ARARs	Will comply with NC DEHNR guidelines for disposal/treatment.	Will comply with NC DEHNR guidelines for disposal/treatment.	Will comply with NC DEHNR guidelines for disposal/treatment.
Long-Term Effectiveness and Permanence	Reductions in contaminant achieved via on-site treatment will be permanent. No long-term monitoring required.	Contaminated soil as a source is permanently removed from site.	Reductions in contaminant achieved via on-site treatment will be permanent. No long-term monitoring required.
Reduction of Toxicity, Mobility, or Volume	Total reduction is equal to volume of soil treated and total reduction of contaminant levels.	Total reduction equal to volume of soil removed.	Total reduction is equal to volume of soil treated and total reduction of contaminant levels.
Short-Term Effectiveness	Excavation, handling, and treatment would release VOCs to atmosphere during construction.	Excavation and handling would release VOCs to atmosphere. Work to be completed in 1 to 2 months.	Excavation and handling would release VOCs to atmosphere. Work to be completed in 1 to 2 months.
Implementability	Standard construction operation for excavation and treatment. No special equipment required.	Standard construction operation. Easy to implement. Commercial vendors available.	Standard construction operation. Easy to implement. Commercial vendors available.
Costs Capital O&M	 $455,304 $0	 $558,366 $0	 $613,542 $0
USEPA/State Acceptance	Potential objections regarding unrestricted VOC emissions during treatment. Engineering controls may be required.	USEPA has a Federal mandate to favor treatment over disposal options. State has preference for on-site versus off-site treatment.	USEPA has a Federal mandate to favor treatment over disposal options. State has preference for on-site versus off-site treatment.

5.2.2 Compliance with ARARs

All of the RAAs except the No Action RAA will comply with all of the identified ARARs/TBCs. The source removal actions must be executed to comply with NC DEHNR guidelines which were identified as chemical-specific ARARs/TBCs and used as the basis of the remediation goals established under this FS. In addition, NC DEHNR guidelines for treating and disposing of contaminated soil are action-specific ARARs/TBCs. It is assumed that commercial vendors contracted to treat the soil either on site or off site under RAAs 3, 5, and 6 will be pre-approved, appropriately permitted, or otherwise in compliance with all applicable NC DEHNR rules and guidelines. Under RAA 2, it is assumed that the proposed landfill will be permitted to accept non-hazardous, petroleum contaminated soil. The ex-situ soil aeration proposed under RAA 4 will likely be performed by the excavation contractor as this technology does not appear to be available locally as a specialized service. It is possible that soil aeration will not be completely effective and that some portion of the contaminated soil would need to be disposed/treated by an alternative means in order to comply with ARARs.

5.2.3 Long-Term Effectiveness and Permanence

All of the RAAs except the No Action RAA provide for an effective and permanent remediation which does not require any long-term soil monitoring.

5.2.4 Reduction of Toxicity, Mobility, or Volume of Contaminants

All of the RAAs except the No Action RAA provide for the reduction of toxicity, mobility, and volume of contaminants. Under RAAs 2, 3, and 5, where the contaminated soil will be excavated and treated/disposed off site, the overall reduction is based strictly on the volume of contaminated soil removed. RAAs 4 and 6, however, involve the on-site treatment and reuse of the soil as backfill meaning that the total reduction is dependent both on the volume of soil removed and the total reduction of contaminant levels. The difference should not be significant since all of the remediation goals will be achieved by design.

5.2.5 Short-Term Effectiveness

The short-term effectiveness of the action oriented RAAs (2 through 6) are roughly equivalent. It is expected that each RAA will be fully implemented in about two months. VOC emissions will be expected during the excavation and staging activities of each RAA. A higher volume of

VOC emissions can be expected under RAA 4 because the soil aeration process, by design, is intended to release the VOCs from the soil to the atmosphere.

5.2.6 Implementability

RAAs 2, 3, and 5 will be roughly equivalent to implement. Each of these RAAs will involve mobilization of construction equipment to the site for the performance of clearing, excavation, staging, and backfilling operations, and the off-site treatment/disposal of the contaminated soil. Since RAAs 3 and 5 involve off-site commercial biotreatment and soil recycling facilities, it can be reasoned that the RAA that offers more vendors would be more flexible and easier to implement. Baker identified more soil recycling facilities than biotreatment facilities that service the Camp Lejeune area. Consequently, RAA 5 (Source Removal and Off-Site Soil Recycling) was evaluated as easier to implement than RAA 3 (Source Removal and Off-Site Biotreatment).

RAAs 4 and 6 involve on-site treatment which will be more difficult to implement because more on-site activities will be involved. A staging area will need to be constructed for each RAA to provide a location where the excavated soil can be placed to be sampled and segregated as either clean or contaminated and await treatment/disposal. It is reasonable to assume that the staging area for the on-site RAAs 4 and 6 may need to be larger to afford space for on-site treatment activities.

RAAs 2 through 6 will require the construction of a decontamination area for equipment and personnel. All of the anticipated site activities involve standard construction techniques, equipment, and materials and should be relatively easy to implement.

5.2.7 Cost

The estimated costs of alternatives, excluding the No Action alternative, range from approximately $455,000 for RAA 4 (Source Removal and On-Site, Ex-Situ Soil Aeration) to approximately $613,000 for RAA 6 (Source Removal and On-Site Low Temperature Thermal Desorption). Although RAA 4 is estimated to be the lowest cost option it is the only alternative which involves technology that is not commercially supplied by specialty contractors. It is the option believed to have the best chance of not performing as expected and, therefore, has the highest potential for increased costs. The contingency for RAA 4 at 25 percent is the highest of all of the RAAs which represents an attempt to recognize the uncertainties of this option. The ranking of the alternatives in terms of cost is as follows:

RAA 1:	No Action	$0
RAA 4:	Source Removal and On-Site, Ex-Situ Soil Aeration	$455,304
RAA 2:	Source Removal and Off-Site Landfill Disposal	$527,390
RAA 3:	Source Removal and Off-Site Biotreatment	$558,366
RAA 5:	Source Removal and Off-Site Soil Recycling	$558,366
RAA 6:	Source Removal and On-Site Low Temperature Thermal Desorption	$613,542

All of the costs shown are capital costs because none of the RAAs have any extended term operation and maintenance activities associated with them. In all cases, the cost of treatment/disposal was the most significant variable. The next most significant variable was the cost of off-site transportation of waste. The cost of transportation and treatment/disposal for all of the RAAs except RAA 4 are based on telephone quotations solicited by Baker from commercial vendors specifically for this project. The cost of on-site treatment under RAA 4 is based on Baker's estimate of the time and equipment required to execute this task rather than a quote from a commercial vendor because Baker did not identify a contractor that specializes in providing this technology. Telephone memos documenting the information provided by commercial vendors is presented in Appendix B.

5.2.8 USEPA/State Acceptance

Neither the USEPA or NC DEHNR is likely to favor RAA 1 - No Action because it will not result in compliance with ARARs.

The USEPA is mandated to favor treatment over disposal alternatives and, therefore, RAA 2 - Source Removal and Off-Site Landfill Disposal will not likely be as acceptable as the other alternatives that feature treatment. The placement of non-hazardous, petroleum contaminated soil in an approved, permitted landfill is a common practice in North Carolina and will likely be acceptable to the NC DEHNR; however, the NC DEHNR, as a policy, prefers on-site as opposed to off-site remedial options. The other off-site remedial alternatives, RAA 3 - Source Removal and Off-Site Biotreatment and RAA 5 - Source Removal and Off-Site Soil Recycling, similarly, will not likely be favored by NC DEHNR.

Between the two on-site remedial options, RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration and RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption, RAA 4 will likely face objections from USEPA and NC DEHNR. The focus of these objections will be that this option is designed to releases VOC contaminants from the soil to the atmosphere in an uncontrolled manner.

5.2.9 Community Acceptance

To be addressed in the Record of Decision (ROD) following public comment.

6.0 REFERENCES

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APPENDIX A
CALCULATIONS

S.O. No. CTO 160

Subject: Interim RA Feasibility Study

Site 35- Camp Geiger Area Fuel Farm — Sheet No. 1 of 6

MCB Camp Lejeune, North Carolina — Drawing No.

Computed by DLB — Checked By — Date 3-15-94

Baker

Excavation Volume Calculations

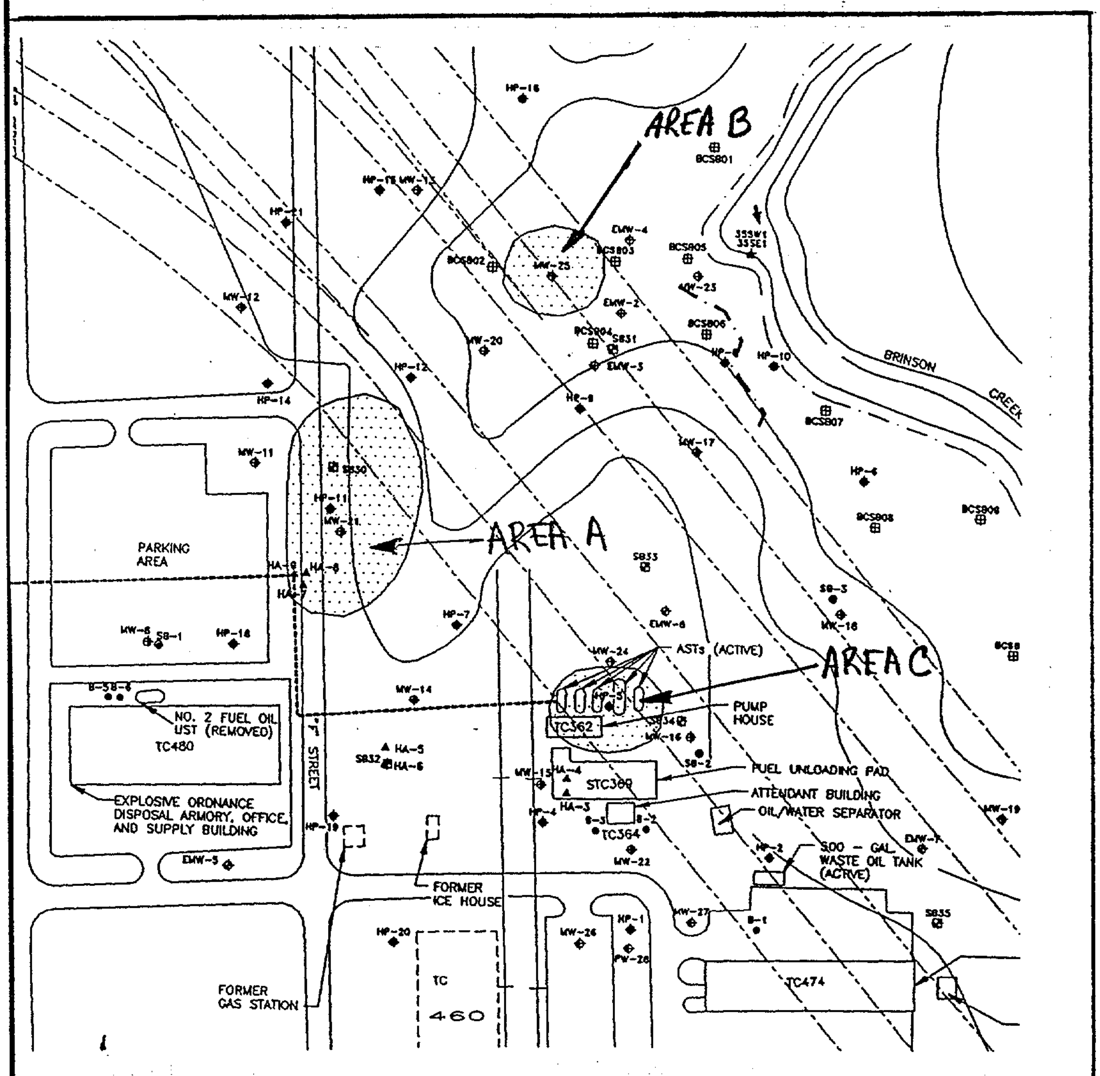
The areas to be excavated are depicted on the figure below

The measured areas are:

Area A = 23,085 SF

Area B = 6,674 SF

Area C = 7,354 SF



At areas A and B results of laboratory analysis have identified TPH contamination, the zones of this contamination are as follows:

Area A = (3'-6) ft BGS

Area B = (3-4) ft BGS

No TPH contamination has been identified within Area C or around its perimeter, however, no soil borings were drilled inside this area, presumably because it was an active AST area with numerous underground lines and a concrete foundation. Nevertheless, it is reasonable to assumed that the fuel farm is a source of TPH contamination, particularly because a TPH plume in shallow groundwater has identified directly below the fuel farm. At Area C, assume that excavation will occur to 6 feet BGS and that 50% of the excavated will be contaminated.

S.O. No. CTO 160

Subject: INTERIM RA FEASIBILITY STUDY

SITE 35 - CAMP GEIGER AREA FUEL FARM Sheet No. 2 of 6

MCB CAMP LEJEUNE, NORTH CAROLINA Drawing No. ______

Computed by ______ Checked By ______ Date ______

Baker

THE TOTAL VOLUME OF SOIL TO BE EXCAVATED IS GREATER THAN THE TOTAL VOLUME OF CONTAMINATED SOIL BECAUSE, BASED ON AVAILABLE DATA, CLEAN SOIL LIKELY OVERLIES THE CONTAMINATED SOIL AND WILL NEED TO BE SEGREGATED AT A STAGING AREA.

ESTIMATED VOLUME OF SOIL TO BE EXCAVATED

AREA A = 23,085 SF (6FT) = 138,510 CF/27CF/CY = 5,130 CY

↑ TOTAL DEPTH OF EXCAVATION (SEE pg 1)

AREA B = 6,674 SF (4FT) = 26,696 CF/27CF/CY = 989 CY

AREA C = 7,354 SF (6FT) = 44,124 CF/27CF/CY = 1,634 CY

TOTAL = 7,753 CY

ESTIMATED VOLUME OF CONTAMINATED SOIL

AREA A = 23,085 SF (3FT) = 69,255 CF/27CF/CY = 2,565 CY

↑ TOTAL THICKNESS OF CONTAMINATED ZONE (SEE pg 1)

AREA B = 6,674 SF (1FT) = 6,674 CF/27CF/CY = 247 CY

AREA C = 7,354 SF (3FT) = 22,062 CF/27CF/CY = 817 CY

↑ 50% OF TOTAL VOLUME EXCAVATED (SEE pg 1)

TOTAL = 3,629 CY

ESTIMATED VOLUME OF CLEAN SOIL

7,753 CY - 3,629 CY = 4,124 CY

CONVERSION TO TONS

$$1\,CY \left(\frac{27\,CF}{CY}\right)\left(\frac{100\,Lbs}{CF}\right)\left(\frac{1\,TON}{2000\,Lb}\right) = 1.35\,\frac{TONS}{CY}$$

WEIGHT OF CONTAMINATED SOIL = 3,629 CY (1.35 TONS/CY) = 4,899 TONS

S.O. No. CTO 160

Subject: INTERIM RA FEASIBILITY STUDY

SITE 35 - CAMP GEIGER AREA FUEL FARM — Sheet No. 3 of 6

MCB CAMP LEJEUNE, NORTH CAROLINA — Drawing No.

Computed by DLB — Checked By — Date 3-15-94

Baker

OTHER MISCELLANEOUS CALCULATIONS

TOTAL CLEARING REQUIRED (IN ACRES)

AREAS A & B ONLY BECAUSE AREA C INCLUDES THE FUEL FARM WHICH IS SCHEDULE FOR DISMANTLING AND REMOVAL PRIOR TO THE IMPLEMENTATION OF ANY SOIL REMEDIAL ACTIONS

AREA A + AREA B = (23,085 + 6,674) SF / (43,560 SF/ACRE) = 0.7 ACRES

USE 2 ACRES TO ACCOUNT FOR OVERCLEARING REQUIRED.

CONFIRMATION SAMPLING

ASSUME TWO SAMPLES PER 200 CY OF EXCAVATED SOIL WILL BE REQUIRED. ONE SAMPLE WILL BE OBTAINED INSIDE THE EXCAVATION TO CONFIRM THAT LIMITS OF CONTAMINATION HAVE BEEN REACHED. THE OTHER SAMPLE WILL BE OBTAINED IN THE STAGING AREA TO ALLOW FOR THE SEGREGATION OF CONTAMINATED AND CLEAN SOIL.

ASSUME EACH SAMPLE WILL BE ANALYZED FOR TPH VIA METHODS 3550 AND 5030 AND OIL AND GREASE VIA METHOD 9071

COST PER METHOD

TPH 5030 = $ [illegible]

TPH 3550 = $ [illegible]0

$180

S.O. No. CTO 160

Subject: INTERIM RA FEASIBILITY STUDY
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

Sheet No. 4 of 6

Drawing No.

Computed by DJS Checked By

Date 3/31/94

Baker

Staging Area

Assume 250' x 250' Area (Former mess hall concrete pad)

Assume Geomembrane Liner 250' x 250'

250' x 250' = 62,500 SF = 6944 SY

Say 6950 SY

Assume \$4/SY material & installation costs

4/SY x 6950 SY = \$27,800

Assume excavated soil placed over liner to protect liner, site set up to minimize equipment movement on liner.

Total Costs (Staging) = \$27,800

S.O. No. CTO 160

Subject: INTERIM RA FEASIBILITY STUDY

SITE 35 - CAMP GEIGER AREA FUEL FARM — Sheet No. 5 of 6

MCB CAMP LEJEUNE, NORTH CAROLINA — Drawing No.

Computed by DJS — Checked By — Date 3/31/94

Baker

Backfill

Assume 3700 CY required

Assume on-base borrow source with 5 mile R.T. haul.

Assume placement in 12" lifts, 2 passes for compaction

Excavation -

Means 022-238-0200
(1 CY hyd. backhoe)

$1.91/CY x 3700 CY = $7,070

Hauling -

Means 022-266-1110
(16½ CY dump trailer)

$5.80/CY x 3700 CY = 21,460

Total (Excavation & Haul) = 28,530

Spread dumped backfill by dozer

Means 022-262-0010

$1.33/CY x 3700 CY = 4,920

Compaction -

Means 022-226-5060

$0.15/CY x 3700 CY = 560

Total (Placement & Compaction) = 5,480

S.O. No. CTO 160

Subject: Interim RA Feasibility Study

Site 35 - Camp Geiger Area Fuel Farm

MCB Camp Lejeune, North Carolina

Sheet No. 6 of 6

Drawing No.

Computed by DJS Checked By

Date 3/31/94

Baker

Use Treated Soil as Back fill

Loading Treated Soil

Means 022-238-1601
(3 CY Wheel Loader)
\#0.87/CY x 3700 CY = 3,220

Hauling Soil to restore excavated area with off-road trucks

Means 022-266-2020
\$1.67/CY x 3700 CY = 6,180

Total = 9,400

APPENDIX B
TECHNOLOGY VENDOR INFORMATION

Baker

Attachments: _____ Yes _____ No

Navy CLEAN Contact Form

Contact made by: Dave Schneider

Date: 10/19/93

Time: ________

CTO Na Phase III Real Estate Acquisition Survey, Greater Sandy Run Area Onslow County, North Carolina

CTO Number: 205

Provide all appropriate information in this section.

Anette Tyson / Noel Lions	McGill Environmental (COMPOSTING)
Person Contacted	Company Name
	919-532-2539
Title	Phone Number
Street Address (including P.O.B.)	
City	State / Zip Code

Status (check appropriate box)

Government Contact
- ____ Contract Specialist
- ____ Engineer-In-Charge
- ____ Activity Contact
- ____ Other ____________

Subcontractor
- ____ Roy F. Weston
- ____ Foster Wheeler
- ____ Drilling Firm
- ____ Laboratory
- ____ Surveyor
- X Other Disposal (Composting)

MEANS OF COMMUNICATION:

- X Initiated
- X Phone Call
- ____ Other, Explain
- ____ Received
- ____ Letter
- ____ In Person Visit

Initial contact was with Ms. Tyson; Mr. Lions later supplied information due to Ms. Tyson being out of office.

SUMMARY:

Mr. Lions provided the following information for disposal of petroleum-contaminated sandy soil based on 1,000 - 5,000 CY (1,300 - 7,000 T), site Camp Lejeune, loading from stockpile or "easy excavation":

- Disposal/tipping cost (conceptual budget) \$17-\$18/ton (sandy soil), \$24/ton with waste oil
- Load and haul \$8-\$9/ton
- Disposal - soils treated through composting inside buildings using forced aeration
- Limits/restrictions - no TPH or BTEX restrictions
  below TCLP metals
  PCB levels < 50 ppm
- Also, process can be done on-site; no air control required

Action needed? ____ Yes ____ No If yes, by whom?
What action is needed?

DISTRIBUTE COPIES TO:

CTO # 205
Subfile:

Baker

Attachments: ______ Yes ______ No

Navy CLEAN Contact Form

Contact made by: Dave Schneider

Date: 10/19/93

Time: ____________

CTO Na Phase III Real Estate Acquisition Survey, Greater Sandy Run Area
Onslow County, North Carolina

CTO Number: 205

Provide all appropriate information in this section.

Mr. Jim Fox
Person Contacted

American Soils Corp. (Soil Recycling: Asphalt)
Company Name

Title

919-977-7332 (Off-Site Biotreatment)
Phone Number

Street Address (including P.O.B.)

City

State

Zip Code

Status (check appropriate box)

Government Contact
______ Contract Specialist
______ Engineer-In-Charge
______ Activity Contact
______ Other ____________

Subcontractor
______ Roy F. Weston
______ Foster Wheeler
______ Drilling Firm
______ Laboratory
______ Surveyor
X Other Disposal (Asphalt)

MEANS OF COMMUNICATION:
X Initiated
X Phone Call
______ Other, Explain
______ Received
______ Letter
______ In Person Visit

SUMMARY:

Mr. Fox provided the following information for disposal of petroleum-contaminated sandy soil based on 1,000 - 5,000 CY (1,300 - 7,000 T), site Camp Lejeune, loading from stockpile or "easy excavation":

- Disposal/tipping cost (conceptual budget): $25.50/ton
- Load and haul: $6/ton
- Disposal/end product/plant location: Asphalt - New Bern, NC
- Limits/restrictions: TPH concentration must average <2400 ppm
  No TCE-contaminated soils
- Bio facility Elizabeth City, NC - same price
- On-site bio will be available in near future

Action needed? ____ Yes ____ No If yes, by whom?
What action is needed?

DISTRIBUTE COPIES TO:

CTO # 205
Subfile:

Attachments: _____ Yes _____ No

Baker

Navy CLEAN Contact Form

Contact made by: Dave Schneider

Date: 10/20/93

Time: ____________

CTO No. Phase III Real Estate Acquisition Survey, Greater Sandy Run Area
Onslow County, North Carolina

CTO Number: 205

Provide all appropriate information in this section.

Mr. Blaine Miller
Person Contacted

Cherokee Resources (Soil Recycling : Bricks)
Company Name

Title

919-774-5312 (Off Site Biotreatment)
Phone Number

Street Address (including P.O.B.)

City

State

Zip Code

Status (check appropriate box)

Government Contact
_____ Contract Specialist
_____ Engineer-In-Charge
_____ Activity Contact
_____ Other ____________

Subcontractor
_____ Roy F. Weston
_____ Foster Wheeler
_____ Drilling Firm
_____ Laboratory
_____ Surveyor
__X__ Other - Disposal (Bricks)

MEANS OF COMMUNICATION:
__X__ Initiated
__X__ Phone Call
_____ Other, Explain
_____ Received
_____ Letter
_____ In Person Visit

SUMMARY:

Mr. Miller provided the following information for disposal of petroleum-contaminated sandy soil based on 1,000 - 5,000 CY (1,300 - 7,000 T), site Camp Lejeune, loading from stockpile or "easy excavation":

- Disposal/tipping cost (conceptual budget): $23-29/ton $25/ton for sandy soil
- Load and haul: $20/ton
- Disposal/end product/plant location: Bricks
- Limits/restrictions: BTEX for stack emissions
- Blend to provide good mix
- Also Bioremediate at Fayetteville, NC facility, same disposal cost, Load and Trucking approx. $15/ton.

Action needed? _____ Yes _____ No If yes, by whom?
What action is needed?

DISTRIBUTE COPIES TO:

CTO # 205
Subfile:

Attachments: ____ Yes ____ No

Baker

Navy CLEAN Contact Form

Contact made by: Dave Schneider

Date: 10/19/93

Time: ______

CTO Na Phase III Real Estate Acquisition Survey, Greater Sandy Run Area Onslow County, North Carolina

CTO Number: 205

Provide all appropriate information in this section.

Mr. David Arrowood	Cunningham Brick Co. (SOIL RECYCLING : BRICKS)
Person Contacted	Company Name
	919-472-6181
Title	Phone Number
Route 2	
Street Address (including P.O.B.)	

Thomasville	NC	27360
City	State	Zip Code

Status (check appropriate box)

Government Contact
- ____ Contract Specialist
- ____ Engineer-In-Charge
- ____ Activity Contact
- ____ Other ______

Subcontractor
- ____ Roy F. Weston
- ____ Foster Wheeler
- ____ Drilling Firm
- ____ Laboratory
- ____ Surveyor
- X Other Disposal (Bricks)

MEANS OF COMMUNICATION:
- X Initiated
- X Phone Call
- ____ Other, Explain
- ____ Received
- ____ Letter
- ____ In Person Visit

SUMMARY:

Mr. Arrowood provided the following information for disposal of petroleum-contaminated sandy soil based on 1,000 - 5,000 CY (1,300 - 7,000 T), site Camp Lejeune, loading from stockpile or "easy excavation":

- Disposal/tipping cost (conceptual budget): $20-$30/ton
- Load and haul: $15-$17/ton Would be lower during winter
- Disposal/end product/plant location: Bricks
- Limits/restrictions: no TPH maximum
- Permitted for petroleum-contaminated soils only
  - TPH 3550, 5030, O & G 9071
  - TCLP metals/waste oil 8240 regular method (toxicity test)
  - 8270 regular method (toxicity test)
  - 8080 PCBs

Action needed? ____ Yes ____ No If yes, by whom?
What action is needed?

DISTRIBUTE COPIES TO:

CTO # 205
Subfile:

(LOW TEMP THERMAL DESORPTION)

MICHAEL BAKER, JR., INC.

PHONE CALL REPORT

PROJECT/LOCATION: INTERIM RA FS
CAMP GEIGER AREA FUEL FARM - SITE 35
CAMP LEJEUNE, NORTH CAROLINA

S.O. No.:

DATE: 3-18-94

CONTRACT NO.:

To: JIM NOLES / MIKE McCLUNG — From: DAN BONK

Repres.: FOUR SEASONS IND SERVICES, INC. GREENSBORO, NC — Repres.: BAKER

Phone No.: 910-273-~~[illegible]~~ 2718 — Phone No.:

Subject: FOUR SEASONS PROVIDES A VARIETY OF HAZARDOUS WASTE SERVICES INCLUDING GENERAL HAULING AND DISPOSAL TO VARIOUS LANDFILLS. THEY ALSO PROVIDE LOW TEMPERATURE THERMAL DESORPTION TECHNOLOGY VIA ONE OF TWO MOBILE UNITS

COST FOR DISPOSAL OF NON-HAZARDOUS PETROLEUM CONTAMINATED SOIL — ASSUME \$20 TO \$25 / TON

LOADING AND HAULING VARIES WITH FACILITY, BUT \$10 / TON IS REASONABLE MID RANGE NUMBER. COULD GO HIGHER OR LOWER DEPENDING ON WHICH LANDFILL PROVIDES BEST PRICE. KEY TO LOWEST COST IS TO GET BEST COMBINATION OF LOW DISPOSAL FEES AND LOADING/HAULING COSTS

TWO LOW TEMPERATURE THERMAL UNITS (MOBILE)

SMALL UNIT CAN HANDLE UP TO \$2,000 TONS @ 15 TO 20 TONS/HR
MOB/DEMOB \$2,000, TREATMENT \$40-45/TON

LARGE UNIT CAN HANDLE UP TO 10,000 TONS @ 60 TONS/HR MAX
MOB/DEMOB \$10,000, TREATMENT \$40-45/TON

PREPARED BY D. BONK TITLE ______ PAGE 1 OF 1

OP-3
9/80

(LANDFILL DISPOSAL)

MICHAEL BAKER, JR., INC.

PHONE CALL REPORT

PROJECT/LOCATION: INTERIM RA FS
CAMP GEIGER FUEL FARM, ~~E~~ SITE 35
CAMP LEJEUNE, NC

S.O. No.: CTO 160
DATE: 3-23-94
CONTRACT NO.:

To: JIM SWET (JS) From: DAN BONK
Repres.: AMERICAN WASTE SERVICES EXPORT, PA Repres.: BAKER
Phone No.: 412-733-3000 Phone No.:

Subject: AWS OPERATES LANDFILLS IN SEVERAL STATES FOR HAZARDOUS AND NON-HAZARDOUS WASTE. THEY WILL BID FOR HAULING AND DISPOSAL WORK ANYWHERE ALONG THE EAST COAST AND FEEL THEY COULD BE COMPETITIVE IN CAMP LEJEUNE, NORTH CAROLINA AREA.

DISPOSAL/TIPPING FEES

NON-HAZARDOUS, PETROLEUM CONTAMINATED SOIL $22-25/TON

CHARACTERISTIC HAZARDOUS WASTE ~$200/TON

U-LISTED ~~[illegible]~~ WASTE >$400/TON

COULDN'T QUOTE HAULING FEES AT THIS TIME.

PREPARED BY D. BONK TITLE PAGE 1 OF 1

OP-3
9/80

Bricks

MICHAEL BAKER JR., INC.

PHONE CALL REPORT

PROJECT/LOCATION: Cherry Point
Generic CAP

S.O. No.: 19186

DATE: 5/6/93

CONTRACT NO.: CLEAN

To: Bill Wornom

Repres.: Soil Reclaiming, Inc

Phone No.: (919) 774-3077

From: Gordon Ruggaber

Repres.: BET

Phone No.: (412) 269-2068

Subject: Mr. Wornom provided the following info. on disposal of petroleum-contaminated soil:

All soil goes into bricks.

Facility name is Lee Brick & Tile

$400 minimum

Not economic for < 500 tons

Disposal for 500 tons $18/ton disposal

Hauling $22-23/ton

loading $2/ton

TPH should average less than 1,200 ppm

cc: Dave Mamrose

PREPARED BY ______ TITLE ______ PAGE 1 OF 1

OP-3C
10/92